PLEASE TAKE NOTICE THAT THE FOLLOWING MEETING WILL HELD IN-PERSON WITH A VIRTUAL ATTENDANCE OPTION

The Owosso Mid-Shiawassee County Wastewater Treatment Plant Review Board will conduct an in-person meeting with a virtual attendance option on May 23, 2023.

OWOSSO MID-COUNTY WWTP REVIEW BOARD
Tuesday, May 23, 2023
at 4:30 p.m.
1410 Chippewa Trail
Owosso, MI 48867

The public may attend in-person or virtually but cannot participate in public comment virtually. Virtual attendees may submit questions or comments via email to the Plant Superintendent at timothy.guysky@ci.owosso.mi.us a minimum of 24 hours prior to the meeting.

VIRTUAL OPTION DETAILS:

- **Join Zoom Meeting:**
  https://us02web.zoom.us/j/84980256881?pwd=NktlekhMMk5TaFlvN3doV2xqRzd1dz09

- **Meeting ID:** 849 8025 6881
- **Password:** 366921

- **One tap mobile**
  +13052241968,,84980256881#,,,,*366921# US
  +13092053325,,84980256881#,,,,*366921# US

- **Dial by your location**
  +1 305 224 1968 US
  +1 309 205 3325 US

- **For video instructions visit:**
  - Signing up and Downloading Zoom https://youtu.be/qsy2Ph6kSf8
  - Joining a Zoom Meeting https://youtu.be/hIkCmbvAHQQ
  - Joining and Configuring Audio and Video https://youtu.be/-s76QHshQnY

- **Helpful notes for participants:** Helpful Hints

Any person who wishes to contact members of the WWTP Review Board to provide input or ask questions on any business coming before the Board on May 23, 2023 may do so by calling or e-mailing the WWTP Superintendent prior to the meeting at (989)725-0562 or timothy.guysky@ci.owosso.mi.us.

The City of Owosso will provide necessary reasonable auxiliary aids and services, such as signers for the hearing impaired and audio recordings of printed materials being considered at the meeting, to individuals with disabilities at the meeting/hearing upon seventy-two (72) hours notice to the City of Owosso. Individuals with disabilities requiring auxiliary aids or services should contact the City of Owosso by writing, calling, or emailing the following: Owosso WWTP Superintendent, 301 West Main Street, Owosso, MI 48867; Phone: (989) 725-0562; Email: timothy.guysky@ci.owosso.mi.us. The City of Owosso Website address is www.ci.owosso.mi.us.

WARNING: According to the State Attorney General, interrupting a public meeting in Michigan with hate speech or profanity could result in criminal charges under several State statutes relating to Fraudulent Access to a Computer or Network (MCL 752.797) and/or Malicious Use of Electronics Communication (MCL 750.540). Per the US Attorney for Eastern Michigan, Federal charges may include disrupting a public meeting, computer intrusion, using a computer to commit a crime, hate crimes, fraud, or transmitting threatening communications.

City of Owosso related meetings are being monitored and violations of statutes will be prosecuted.

OWOSSO MID-SHIAWASSEE COUNTY WWTP
REVIEW BOARD

MEETING NOTICE

DATE: **May 23, 2023 (Tuesday)**

TIME: **4:30 P.M.**

PLACE: **1410 Chippewa Trail, Owosso, MI 48867 with virtual option for non-board members (details attached)**

AGENDA:

1. Roll

2. Previous Meeting Minutes
   a) April 25, 2023*

3. Secretary's Report
   a) Plant Performance Summary (April 2023) *
   b) Plant Operations and staffing
   c) WWTP project updates: Solids Handling Project; Secondary/Tertiary Process Rehab

4. Old Business
   a) Hydrogen Sulfide Study*

5. New Business
   a) FY 2023-24 Service Unit Charges*

6. Citizens'/Members' comments

7. Adjourn

Tim Guysky, Secretary

***** **Written information previously transmitted or enclosed.**

The city of Owosso will provide necessary reasonable auxiliary aids and services, such as signers for the hearing impaired and audiotapes of printed materials being considered at the meeting, to individuals with disabilities at the meeting/hearing upon seventy-two hours' notice to the city of Owosso. Individuals with disabilities requiring auxiliary aids or services should contact the city of Owosso by writing or calling the following: Tim Guysky, 301 West Main Street, Owosso, MI 48867 (989)-725-0562.

OWOSSO MID-SHIAWASSEE COUNTY WWTP REVIEW BOARD
MEETING MINUTES - DRAFT

April 25, 2023 4:30 P.M. W.W.T.P.

1. Roll (4:30 P.M.)

Members Present:	R. Holzheuer, R. Suchanek, J. Archer, J. Sawyer
Alternates Present:	T. Crawford
Others Present:	T. Guysky, WWTP Superintendent/Board Secretary
	J. Bloomfield, Owosso Twp/Caledonia Twp Utility Authority

2. Minutes of the March 28, 2023 meeting: Motion by Suchanek to approve the March 28, 2023 meeting minutes. Support by Holzheuer. Discussion centered around Sawyer's objection to the phrase "removal of all text in item 4a) Hydrogen Sulfide Mitigation referring to the hydrogen sulfide study and the resulting directives for mitigation." Additional general discussion concerned Sawyer's opinion that certain sections of the minutes lack context, as well as discussion related to the City of Owosso's Sanitary Sewer Overflow (SSO) mitigation efforts and the City of Owosso's ability to impose deadlines on the service units for H2S mitigation measures. Sawyer noted Corunna's current and historical usage of their retention basin to divert flow from the collection system. He also noted a work session to review the 1977 Wastewater Plant Agreement may be a good idea. Motion by Sawyer to approve the minutes of the March 28, 2023 meeting amended as follows: strike the phrase "removal of all text in item 4a) Hydrogen Sulfide Mitigation referring to the hydrogen sulfide study and the resulting directives for mitigation." and replace with "removal of all text in 4a) Hydrogen Sulfide Mitigation following the first two sentences". Motion fails for lack of support. Sawyer noted he believed minutes approved otherwise would be incorrect. Vote on Suchanek's original motion to approve carries 3-1 (Suchanek – yes, Archer – yes, Holzheuer – yes, Sawyer – no).

3. Secretary's Report:
   a) Plant Performance Summary (March 2023): Guysky noted full permit compliance for March 2023.

   b) Plant Operations and Staffing: Guysky noted higher flows in April due to seasonal wet weather events which resulted in expected increase in chemical and energy usage. With regard to staffing, there are three positions currently open: Operator/Mechanic, Plant Shift Attendant, and Part-Time Lab Technician. A seasonal part time position has been filled, with plans to utilize that person in the laboratory.

   c) WWTP Project Updates: Guysky notified the Board construction on the Solids Handling project is progressing with major equipment closer to delivery and install. Lead times on other equipment will extend project completion into early 2024. The Secondary/Tertiary rehab project (a.k.a. Phase I) design is complete, with bidding scheduled for May 4, with construction possibly starting by October. There was general discussion regarding the plant capacity following all future planned projects, with Guysky noting the plant capacity will remain at 18 MGD, but with full treatment at that flow and a 5 million gallon retention basin.

4. Old Business:

   a) Hydrogen Sulfide Mitigation: Bloomfield noted the Owosso Township/Caledonia Township Utility Authority had just received their consulting engineer (Prein and Newhof) review of the Review Board-commissioned H2S study. He also noted the Utility Authority Board would need time to review and decide on course of action before anything could be presented to the Review Board. He felt by the May Review Board meeting there would be something to present. Suchanek noted this would be acceptable from the City of Owosso's perspective, though the requirement to have some sort of H2S treatment in place by August 1, 2023 would stand. He also offered that Prein and Newhof would be welcomed at any Review Board meeting if it aided discussion and resolution efforts. There was general discussion on potential mitigation measures such as chemical treatment, vortex manholes and aeration.

5. New Business:

   NONE

6. Citizens'/Members' Comments:

   Suchanek noted his appreciation for Bloomfield's attendance and his update on the Utility Authority's efforts.

   There was further board discussion on H2S mitigation measures in general, Fishbeck study clarifications, and the August 1, 2023 deadlines for at least temporary mitigation measures. Also discussed were wastewater plant capacity and future project plans.

7. Adjourn: Motion to adjourn by Archer. Support by Suchanek. No discussion. Motion carries 4-0. Meeting adjourned at 6:09 p.m.

Respectfully submitted, Timothy J. Guysky, Secretary
Approval by Review Board pending

PLANT PERFORMANCE SUMMARY

		PERMIT LIMIT	CURRENT YEAR APRIL 2023		PREVIOUS YEAR APRIL 2022	
PLANT FLOW						
	AVERAGE	No Limit	6.40	MGD	5.68	MGD
	MAXIMUM	No Limit	14.12	MGD	7.80	MGD
PRECIPITATION			3.80	Inches	3.33	Inches
CARBONACEOUS BIOCHEMICAL OXYGEN DEMAND (CBOD-5)						
	"30 Day" Average	25 mg/L	4.5	mg/L	4.4	mg/L
	Maximum Day	40 mg/L	7.1	mg/L	7.3	mg/L
	Maximum 7 Day Average	NO LIMIT	6.6	mg/L	5.2	mg/L
	"30 Day" Average	1300 lbs/day	273	lbs/day	215	lbs/day
	Maximum 7 Day Average	2000 lbs/day	615	lbs/day	300	lbs/day
	Percent Removal	85%	88	%	90	%
TOTAL SUSPENDED SOLIDS (T.S.S.)						
	"30 Day" Average	30 mg/L	12	mg/L	6	mg/L
	Maximum 7 Day Average	45 mg/L	20	mg/L	7	mg/L
	"30 Day" Average	1500 lbs/day	790	lbs/day	286	lbs/day
	Maximum 7 Day Average	2300 lbs/day	2015	lbs/day	420	lbs/day
	Percent Removal	85%	89	%	93	%
AMMONIA NITROGEN (NH3-N)						
	"30 Day" Average	11 mg/L	0.14	mg/L	0.22	mg/L
	Maximum Day	15 mg/L	0.45	mg/L	0.90	mg/L
	"30 Day" Average	530 lbs/day	11.7	lbs/day	12.8	lbs/day
	Maximum 7 Day Average	750 lbs/day	35.6	lbs/day	37.4	lbs/day
TOTAL PHOSPHORUS						
	"30 Day" Average	1.0 mg/l	0.58	mg/L	0.43	mg/L
	"30 Day" Average	50 lbs/day	32	lbs/day	21	lbs/day
DISSOLVED OXYGEN						
	Minimum	G.T. 3.0 mg/L	10.0	mg/L	10.9	mg/L
pH						
	Maximum	L.T. 9.0	8.59		8.52	
	Minimum	G.T. 6.5	7.71		8.18	
TOTAL RESIDUAL CHLORINE (TRC)						
	Maximum	38 ug/L	< 10	ug/L	< 10	ug/L
FECAL COLIFORM						
	"30 Day" Mean	200 Col./100 mls	58	Col./100mls	23	Col./100mls
	Maximum 7 Day Average	400 Col./100mls	241	Col./100mls	55	Col./100mls
COMPLIANCE			Complied with all permit limits		Complied with all permit limits	

CODE: L.T. = LESS THAN
G.T. = GREATER THAN
NR = ANALYSIS NOT REQUIRED

NOTE: ALL PERMIT LIMITS ARE MAXIMUMS UNLESS OTHERWISE INDICATED

MEMORANDUM

TO: MID-COUNTY WWTP REVIEW BOARD

FROM: TIM GUYSKY, WWTP Superintendent, Board Secretary

DATE: May 16, 2023

RE: FY 2023-24 SERVICE UNIT O & M CHARGE, REPLACEMENT CHARGE AND DEBT SERVICE CHARGE

For Fiscal Year 2023-24, the City of Owosso requests Review Board approval for the Operation and Maintenance (O & M) Charge of $1,850,637 to be billed to the Service Units monthly at $154,220 proportioned by metered flow. Amounts as follows, but please note the flow % is a projection based on FY 2021-22 flows. Amounts will be billed based on the actual flows for each specific month.

Service Unit	Flow %	Amount
City of Owosso	68.93	$1,275,695
Owosso Township	11.30	$209,120
Caledonia Township	6.81	$126,058
City of Corunna	12.96	$239,764

The City of Owosso also requests Review Board approval for a Replacement Charge of $296,918 proportioned by metered flow and $125,605 by contract percentage, for a total of $422,523 to be billed to the Service Units monthly at $35,210. Amounts as follows, but please note the flow % is a projection based on FY 2021-22 flows. Amounts will be billed based on the actual flows for each specific month.

Service Unit	Flow %	Amount
City of Owosso	68.93	$204,674
Owosso Township	11.30	$33,552
Caledonia Township	6.81	$20,225
City of Corunna	12.96	$38,468

Service Unit	Contract %	Amount
City of Owosso	53.0	$66,571
Owosso Township	21.5	$27,005
Caledonia Township	16.3	$20,474
City of Corunna	9.2	$11,556

(continued next page)

Debt Service Charges for Fiscal Year 2023-24 will be $348,753 to be billed monthly at $29,063 by contract percentage. Amounts as follows:

Service Unit	Contract %	Amount
City of Owosso	53.0	$184,839
Owosso Township	21.5	$74,982
Caledonia Township	16.3	$56,847
City of Corunna	9.2	$32,085

TJG

Prein&Newhof
Engineers ▪ Surveyors ▪ Environmental ▪ Laboratory

April 20, 2023
2230361

Mr. Brody Langtry
Owosso/Caledonia Townships Utility Authority
135 North State Road
Owosso, MI 48867

RE: City of Owosso - Hydrogen Sulfide Study Review

Dear Mr. Langtry:

Following the Authority's request, we have completed a review of the City of Owosso's Draft Hydrogen Sulfide Study dated February 28, 2023. Along with the report we have reviewed the raw Odalogger data referenced in the Study.

We do not see any issues with the report methodology; however, we do not agree with the assessment of the data or the recommendations. The primary concern outlined in the report is the wastewater leaving Pump Station (PS) 7, PS 8 and the Ferry PS. Our review of the data indicates the H_2S concentrations diminished as the flow approached the WWTP. Furthermore, the levels seen at the WWTP Screening Room do not appear out of range for typical installations and we believe can be controlled with proper ventilation.

The report routinely states peak H_2S concentrations at various locations, however, no review is provided of these peak results indicating duration and number of occurrences. These peaks tend to be short term and do not appear to have much of an effect on the concentrations seen at the WWTP Screening Room. The average concentrations are more telling as to what is going on. We have enclosed graphs of five of these peaks for reference.

Figure 1 shows one of the higher levels measured at the WWTP Screening Room (SR) with a measured peak of 28 PPM. There are relatively mild peaks at MH 3 upstream of the plant. Note little impact on the WWTP SR with a spike in MH 3 at approximately 6:30 PM and then a spike on the WWTP SR following a mild increase in MH 3 at 11:50 AM. The elevated level at the WWTP SR lasts for two hours after MH 3 has declined.

The highest peak in MH 3 occurred on August 3, shown in Figure 2 and does correlate with an elevated H_2S period from MH 4. These peaks however do not appear consistent with how the concentrations at the various manholes typically react to each other as seen in the other graphs. Considering this event's the inconsistency and that no increase at the Screening Room is visible, the data does not support this event causing a spike at the plant

Figure 3 shows a spike from 7:30 PM on August 25 to 3:00 AM on August 26 showing a modest increase of H2S at the plant with a peak reading at the beginning of the event of 14 with the levels trending down as the peak in MH 3 increases. Also note August 24 of the same figure the levels are H2S in the WWTP SR are actually higher than the levels seen in MH 3, this occurs in

other events as well (see Figure 1 and Figure 4) which could indicate another source of the H_2S such as from the plant or turbulence between MH 3 and the SR.

Figure 5 shows the response the SR from elevated levels in MH 3 with a maximum reading at the SR of 13 on September 7.

Figure 6 shows the response at the WWTP SR at the highest recorded peak in MH 4. The highest reading in the SR is only 4 ppm. Monitoring results in MH 3 were not available. The high levels appear to have minimal effect on the WWTP SR.

Monitoring in the WWTP SR indicated a single peak measurement of 68 ppm H_2S on September 16. When reviewing the data this occurred 34 seconds after a reading of 3 ppm and 26 seconds before a reading of 3 ppm. The average during the 15 minutes and 6 hours before and after the high reading without the high reading included was 4 ppm. The highest reading during that time period was 17 ppm 5 hours after the peak reading. The 68 ppm of H_2S appears to be erroneous data. No manhole data was available for this date. The next highest reading was 35 ppm which occurred on September 11, no data from the manholes was available.

The report lists several recommendations in four categories, for reducing the H_2S concentrations within the waste stream: Operation and Maintenance, Dissolved Oxygen and Mixing, Ventilation, and Chemical Treatment.

The Operation and Maintenance recommendations are good recommendations in general but will have little effect on the H_2S concentrations at the headworks. The pump set points and pump speeds were initially designed to meet the flushing requirements and minimize detention times, but these can be reviewed again and modified if necessary. Working Air Releases are critical to maximizing efficiency and reducing internal pipe corrosion but do not affect H_2S concentrations in a meaningful way.

Dissolved Oxygen and Mixing could provide some reduction. Aerating the wetwells may provide some improvement, however, the impact will likely be limited and not fully solve the issue due to force main retention times and will require odor control and ventilation improvements at the lift stations. Vortex manholes as suggested will not work for the Pump Station 8 discharge due to lack of the required elevation drop. Vortex manholes at the PS 7/Ferry discharge may be possible with modifications to the force mains. Currently the necessary drop is not available. Shallowing of the force main to provide additional drop may be possible, however, only about four feet would be gained. Wetwell mixing systems as suggested, will not, in our opinion have any measurable effect on the H_2S levels.

Ventilation improvements to the wet wells will only reduce H_2S effects at the pump station location and will have little effect on the downstream H_2S concentrations. The report does not mention ventilation of the collection system, however, our opinion is it may be the most effective solution available. A location would need to be identified where a blower system could be installed. The intent is to pull air from the pipe which draws the H_2S gases out of the pipe and then send the odor laden air through a filter. This could be placed on the gravity sewer on Hintz or Middleton Roads where odor complaints have been received. This option will require ongoing maintenance and can be costly to construct. Further review to identify a site, sizing and develop cost estimates will be required to further assess this option.

The final recommendation was chemical treatment. Chemical treatment was reviewed in 2013 for the Ferry Street PS. Based on the assessment completed in 2013, chemical treatment could be effective, however, will require a substantial amount of chemical. The previous study estimated

$40,000 of chemical a year in 2013 dollars for the Ferry Street Station alone. PS 8 will require more chemical due to its higher flows. If chemical treatment were to be pursued, we would recommend a single dose location near the end of the force main on Hintz Road, not at PS 8. This location would provide the greatest impact to the H_2S levels downstream.

In summary, based on the data provided we do not believe the levels seen at the WWTP are outside normal H_2S levels in similar installations and should be able to be controlled by proper ventilation systems. The levels of H_2S in the Authority's sanitary sewers appear to be diminishing as it progresses downstream, and the large spikes have minor impacts to the levels seen at the plant. However, due to the ongoing complaints of odor along Hintz Road, ventilation may be recommended with further review.

Thank you for the opportunity to review this study. Please let us know if you have any additional questions or need clarifications.

Sincerely,

Prein&Newhof

Matthew R. Hulst, P.E.

Enclosures: Figures 1 – 6

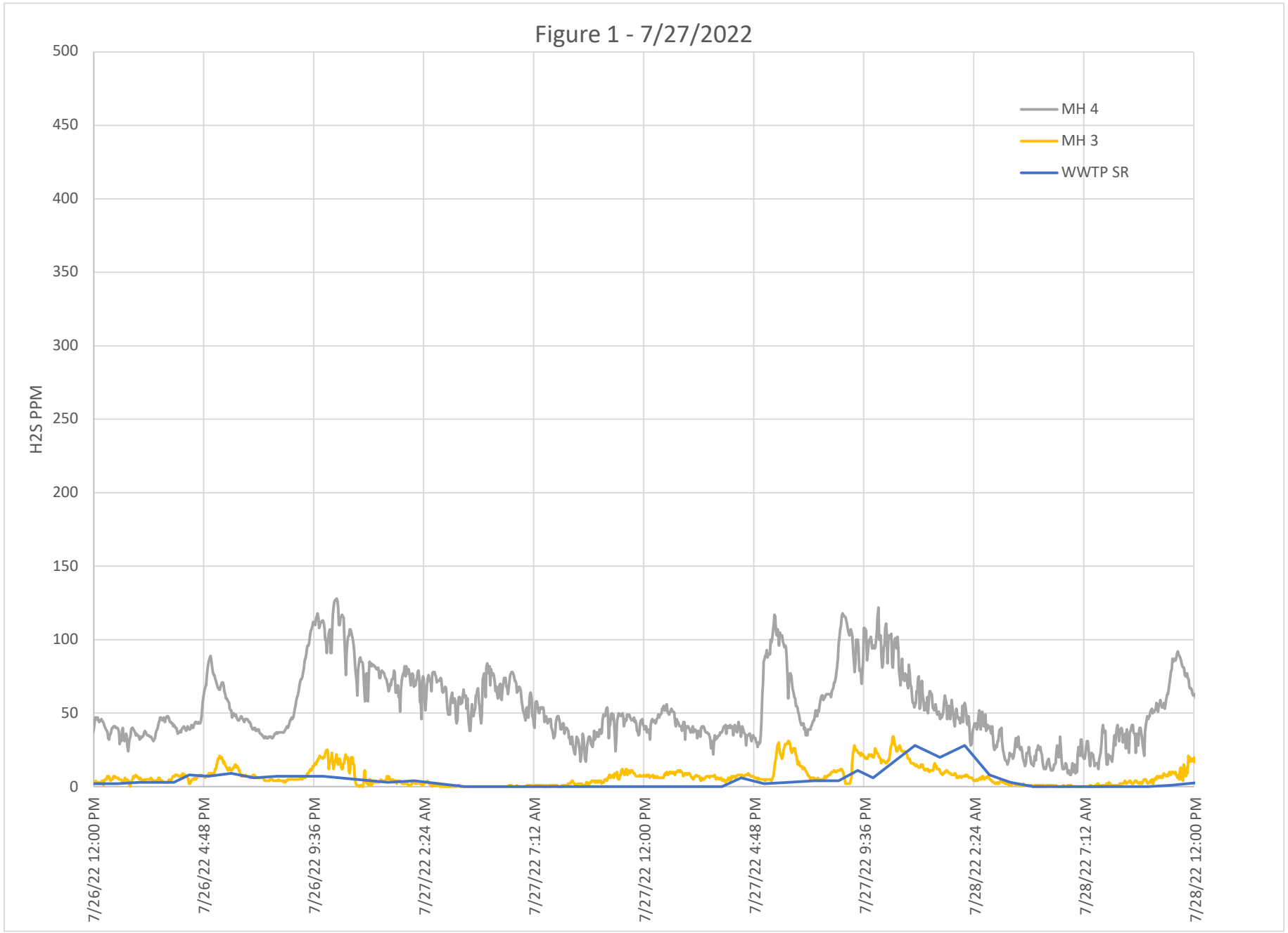
Figure 1 - 7/27/2022
H2S PPM
500
450
400
350
300
250
200
150
100
50
0
MH 4
MH 3
WWTP SR
7/26/22 12:00 PM
7/26/22 4:48 PM
7/26/22 9:36 PM
7/27/22 2:24 AM
7/27/22 7:12 AM
7/27/22 12:00 PM
7/27/22 4:48 PM
7/27/22 9:36 PM
7/28/22 2:24 AM
7/28/22 7:12 AM
7/28/22 12:00 PM

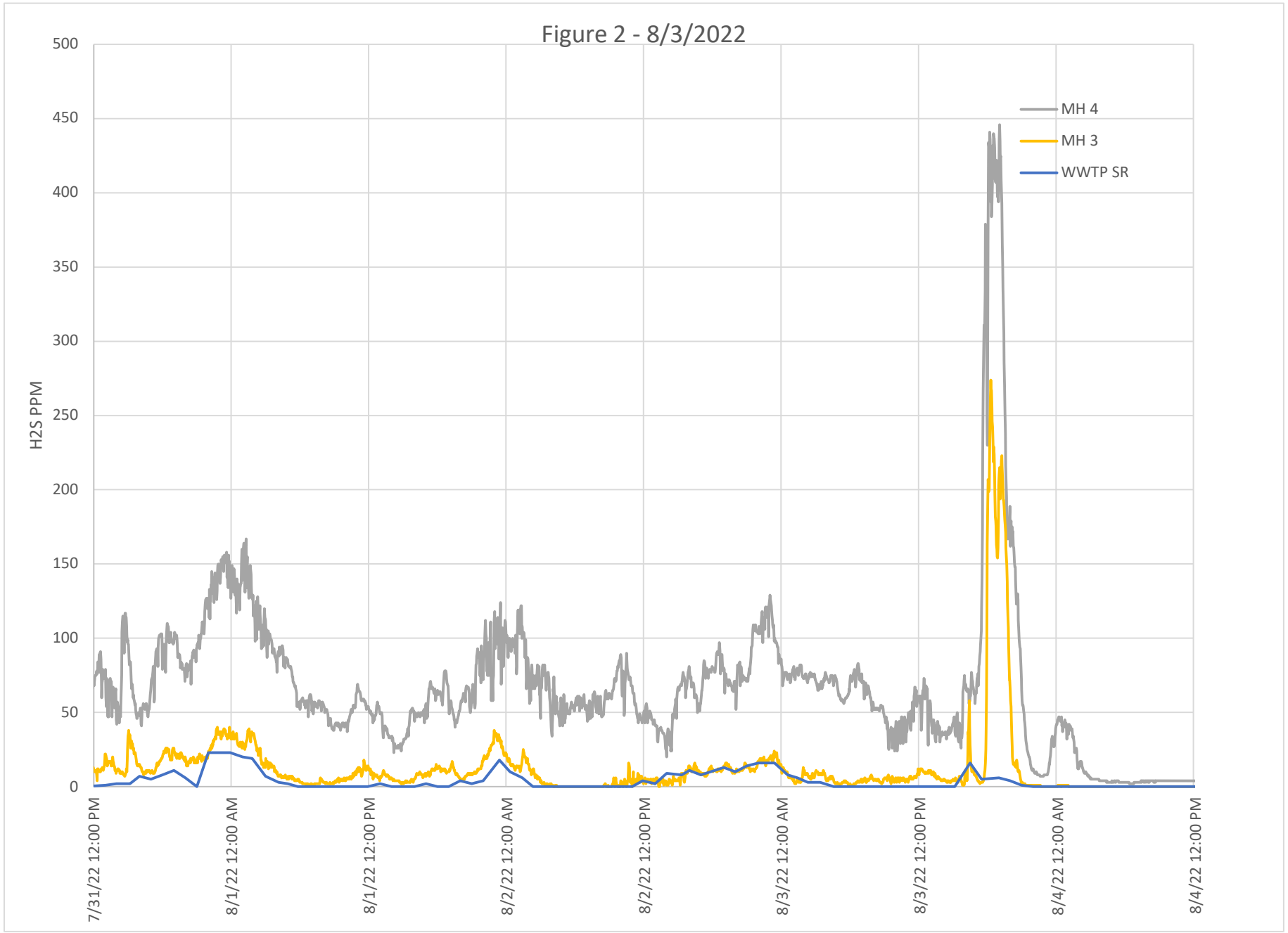
Figure 2 - 8/3/2022
H2S PPM
500
450
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250
200
150
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MH 4
MH 3
WWTP SR
7/31/22 12:00 PM
8/1/22 12:00 AM
8/1/22 12:00 PM
8/2/22 12:00 AM
8/2/22 12:00 PM
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8/4/22 12:00 AM
8/4/22 12:00 PM

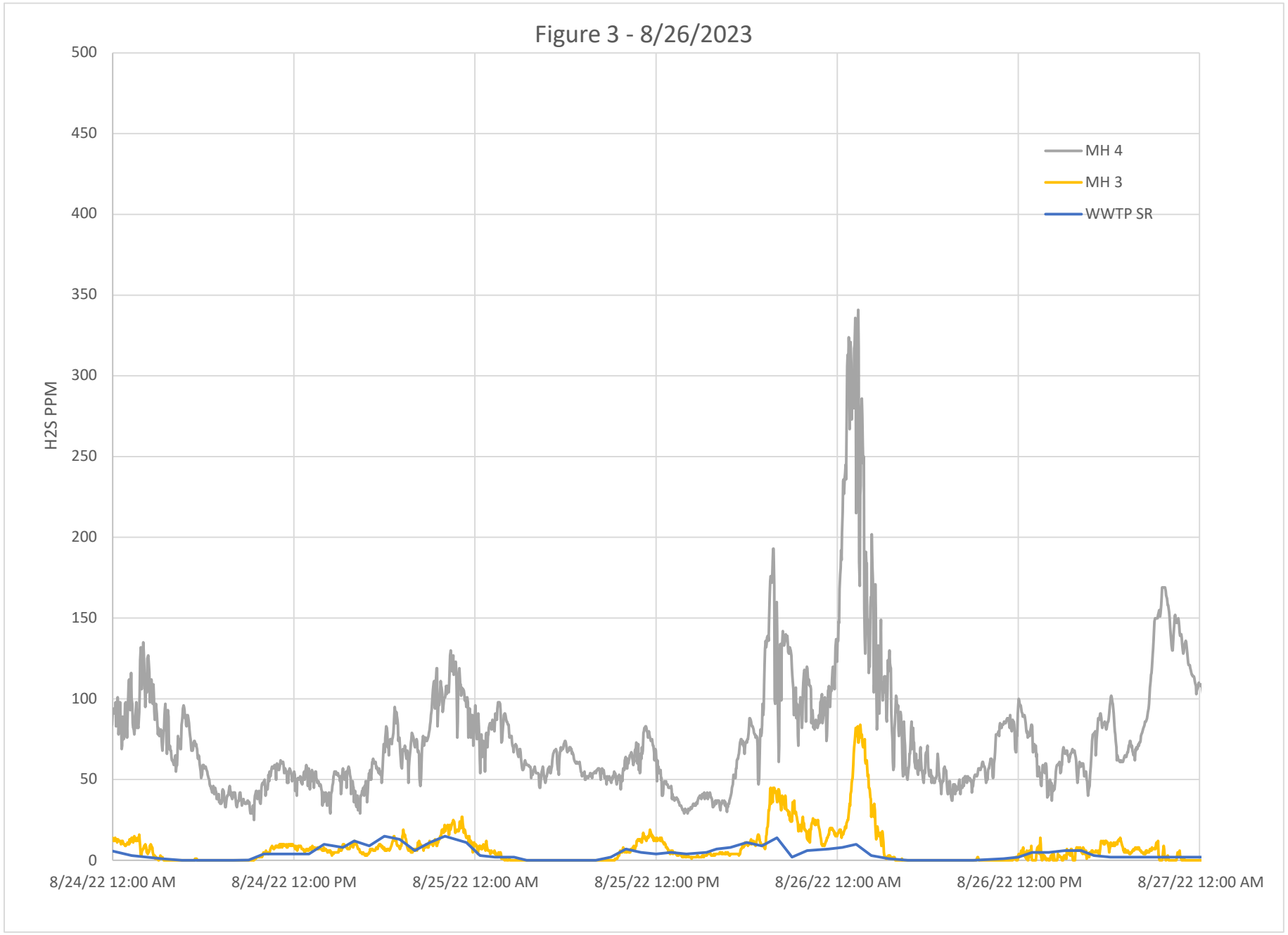
Figure 3 - 8/26/2023
H2S PPM
500
450
400
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250
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8/24/22 12:00 AM
8/24/22 12:00 PM
8/25/22 12:00 AM
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8/27/22 12:00 AM
MH 4
MH 3
WWTP SR

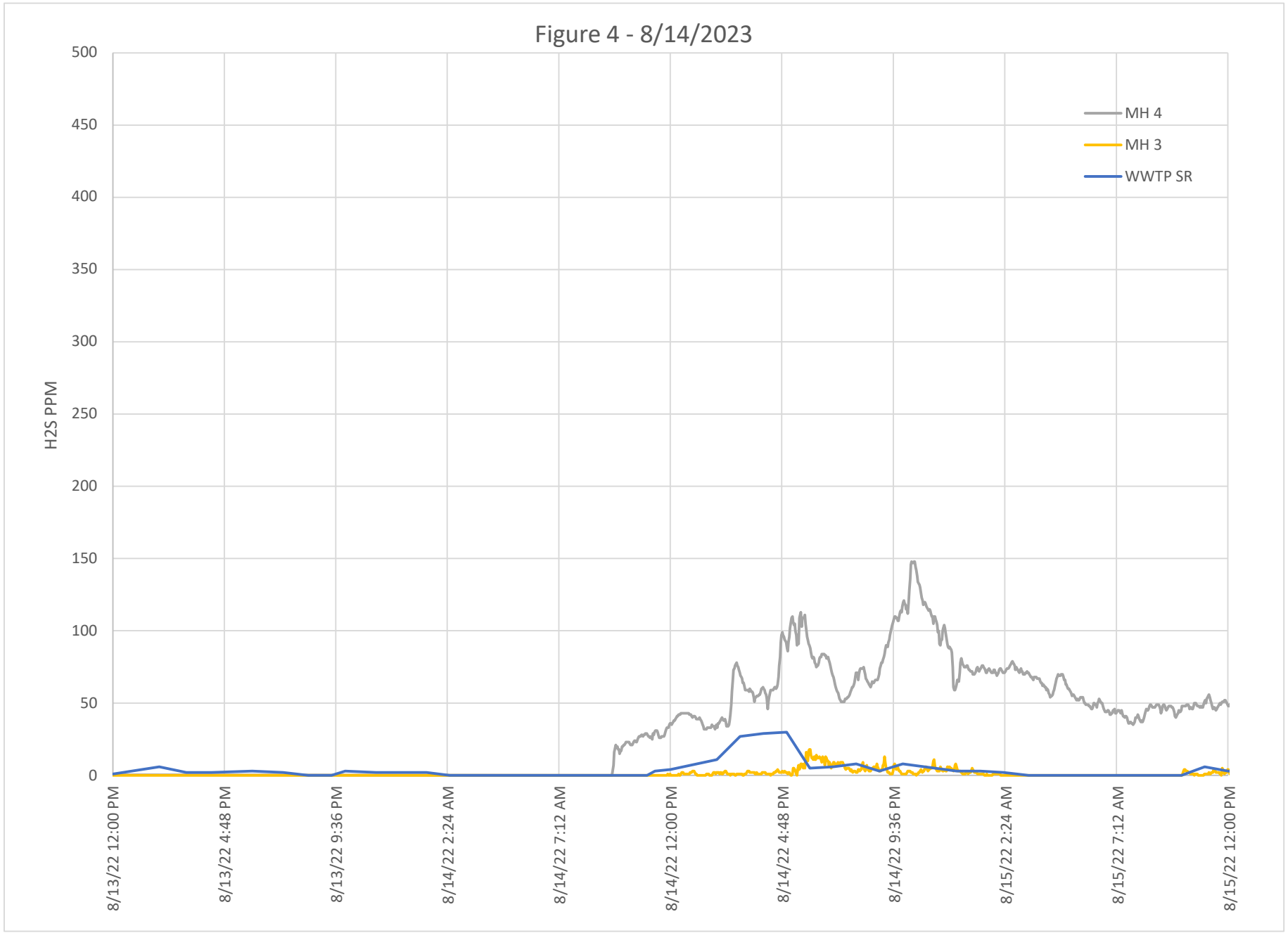
Figure 4 - 8/14/2023
H2S PPM
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450
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MH 4
MH 3
WWTP SR
8/13/22 12:00 PM
8/13/22 4:48 PM
8/13/22 9:36 PM
8/14/22 2:24 AM
8/14/22 7:12 AM
8/14/22 12:00 PM
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8/15/22 7:12 AM
8/15/22 12:00 PM

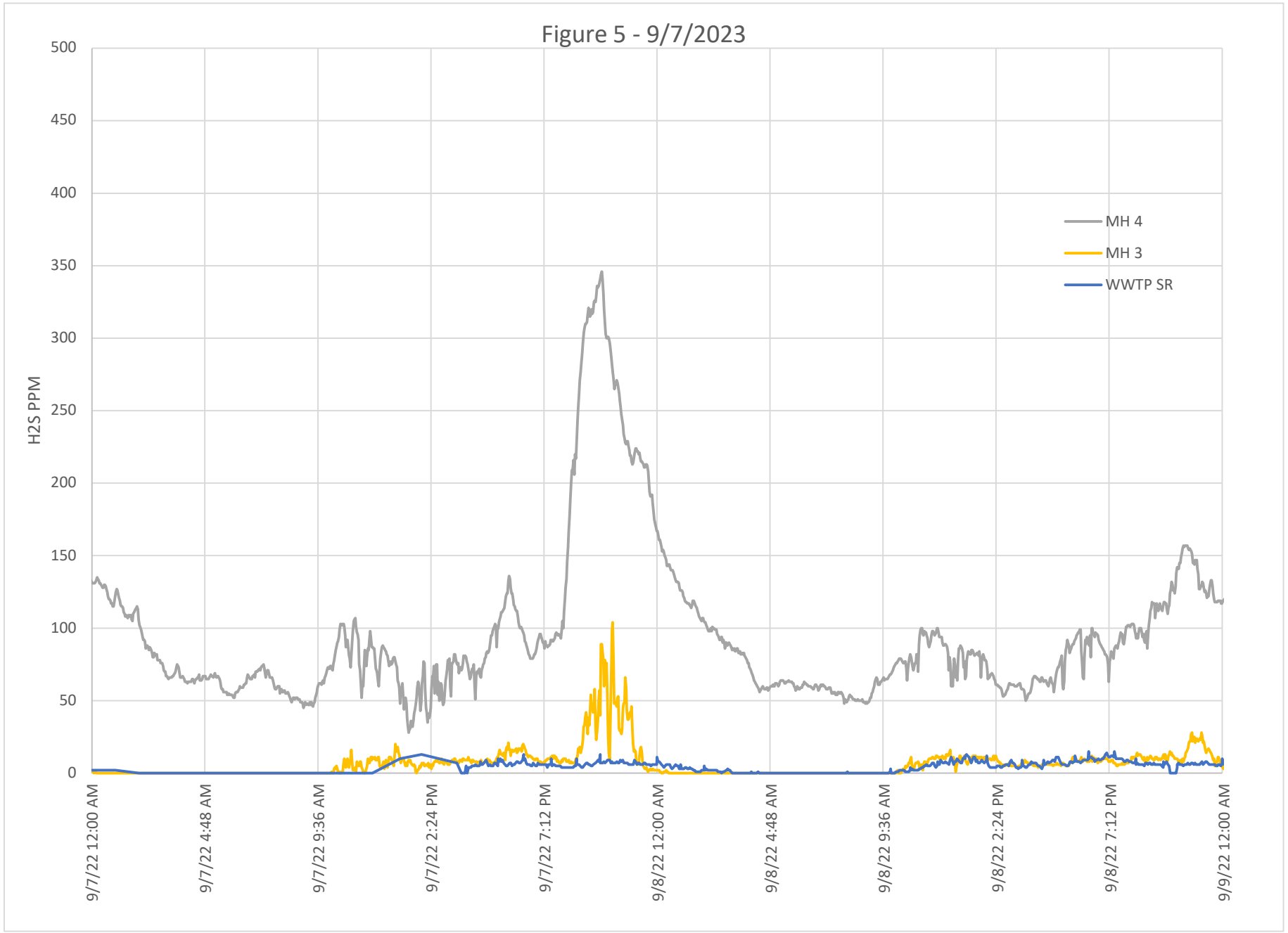
Figure 5 - 9/7/2023
H2S PPM
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MH 4
MH 3
WWTP SR
9/7/22 12:00 AM
9/7/22 4:48 AM
9/7/22 9:36 AM
9/7/22 2:24 PM
9/7/22 7:12 PM
9/8/22 12:00 AM
9/8/22 4:48 AM
9/8/22 9:36 AM
9/8/22 2:24 PM
9/8/22 7:12 PM
9/9/22 12:00 AM

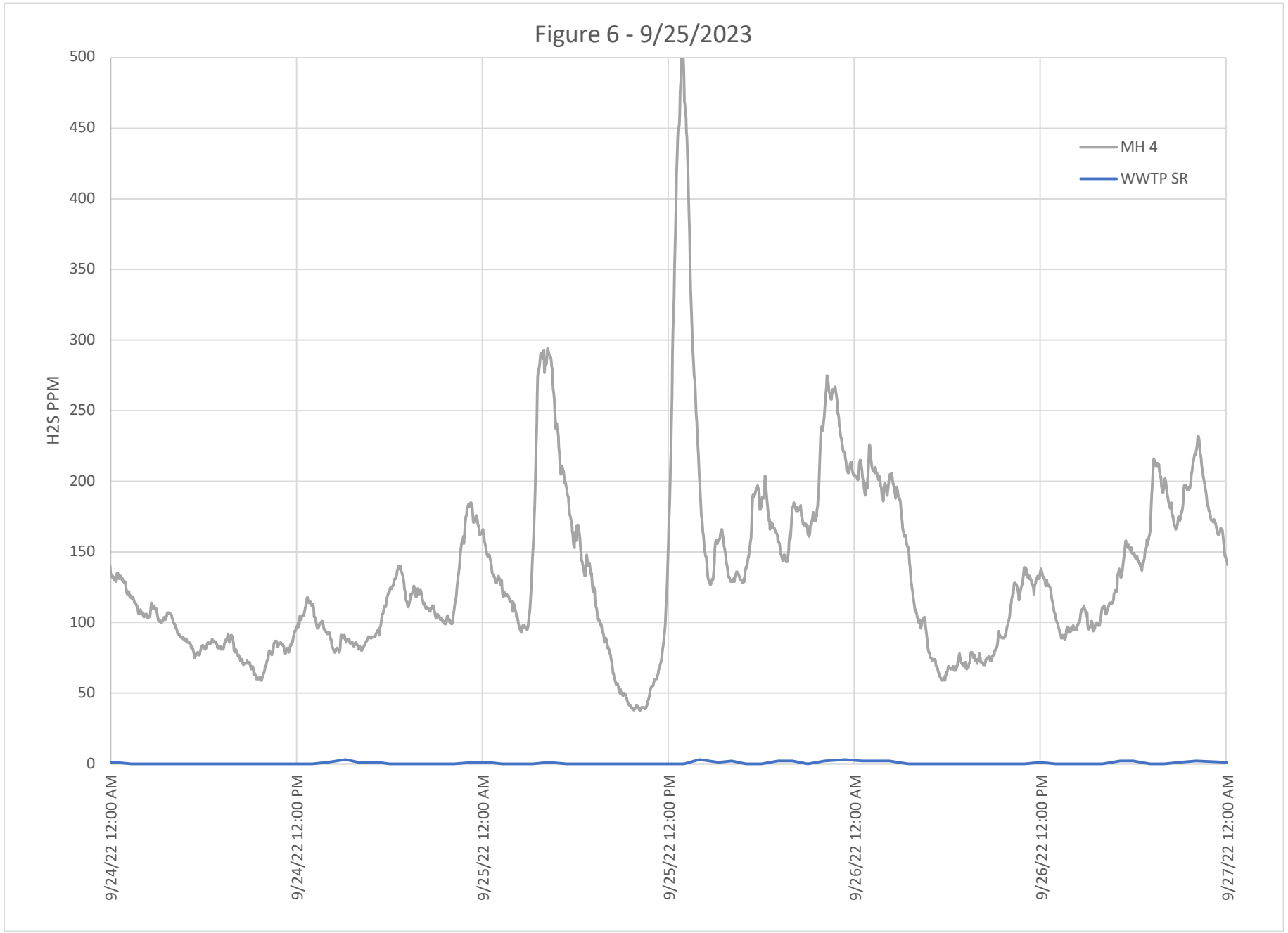
Figure 6 - 9/25/2023
H2S PPM
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MH 4
WWTP SR
9/24/22 12:00 AM
9/24/22 12:00 PM
9/25/22 12:00 AM
9/25/22 12:00 PM
9/26/22 12:00 AM
9/26/22 12:00 PM
9/27/22 12:00 AM

106 W. Allegan St. Suite 500
Lansing, MI 48933
O: 517.371.1200
www.c2ae.com

May 23, 2023

Mr. Joe Sawyer
City Manager
City of Corunna
402 N. Shiawassee St
Corunna, MI 48817

Re: Hydrogen Sulfide Analysis and Treatment Options

Dear Joe,

As requested by the City of Corunna, we have reviewed the H2S report dated April 4, 2023 prepared by Fishbeck for the City of Owosso and detailed sampling data. We offer the following summary and recommendations:

In 2019 the City of Owosso reconfigured the headworks at the wastewater treatment facility (WWTF) which changed the grit removal system, reconfigured the incoming flow channels and relocated the fine screens to an enclosed area. Subsequent to that project, the WWTF staff began noticing a significant increase in the rate of corrosion in that enclosed space. Facility staff suspected increased levels of hydrogen sulfide (H2S) gas and conducted a study of the levels of H2S gas at the WWTF headworks as well as in various locations within the collection system. In the case of Corunna's system, testing was conducted at the Ferry Street Pump Station (FSPS) wetwell and at one manhole downstream of where that station discharges its flows north of the city on M-21. In addition to the air samples, waste stream samples were taken at the FSPS wetwell and discharge manhole at M-21 and tested for sulfide content.

H2S gas can be extremely hazardous, with the ability to cause pulmonary issues at levels approaching 100 ppm, sudden unconsciousness at levels above 500 parts per million (ppm) and even death if the levels exceed 1,000 ppm. As part of the Owosso study, monitoring was done with equipment that automatically takes readings on a set schedule based on the programming set up at the time of placement. Units were left in place at each location between one to three months.

The H2S monitoring at the WWTF headworks screening room, with over 8,000 observations, resulted in Minimum levels of zero ppm, Maximum 68 ppm and Average 3.6 ppm. The testing done at the FSPS wetwell, with over 24,000 observations resulted in Minimum levels of zero, Maximum 20 ppm and Average 3.2 ppm. The testing done at one manhole downstream from the FSPS forcemain discharge manhole on M-21, with over 36,000 observations, resulted in Minimum levels of zero, Maximum 302 ppm and Average 43 ppm. It should be noted that the H2S testing manhole on M-21 contains both City of Corunna's and Caledonia Township's flows.

The study also conducted monitoring at other locations between the City of Corunna and the WWTF. These tests, all with over 20,000 observations, had test results that varied with Minimum 8 to 100 ppm, Maximum 274 to 508 ppm and Averages 6 to 100 ppm. A map of these locations is attached to this report. The map includes Average, Median and Maximum H2S test results, as well as data for the common month of September 2022 when all locations were sampled except MH #4A. The table below summarizes the sample data:

c2ae architecture • engineering

Hydrogen Sulfide (H2S) Testing Summary Table

Sample Location	Maximum H2S Reading ppm (Date)	# of Tests over 10 ppm (# of different days)	# of Test over 20 ppm (# of different days)	# of Test over 60 ppm (# of different days)	# of Test over 100 ppm (# of different days)	# of Test over 200 ppm (# of different days)
Screen Rm	68 (9/16/22)	868 (48 days)	73 (14 days)	0	0	0
MH #R	48 (10/27/22)	603 (8 days)	287 (3 days)	0	0	0
MH #1	29 (9/15/22)	413 (20 days)	17 (3 days)	0	0	0
MH #2	143 (10/9/22)	5,785	2,266	244 (10 days)	64 (3 days)	0
MH #2A	414 (9/28/22)	8,507	7,675	5,305	3,228	409 (10 days)
MH #2B	2 (9/22/22)	0	0	0	0	0
MH #3	274 (8/3/22)	9,217	2,444	101 (3 days)	58 (1 day)	28 (1 day)
MH #4 *	508 (9/25/22)	53,683	52,958	33,766	12,764	901 (16 days)
MH #4A	27 (7/22/22)	5 (1 day)	1 (1 day)	0	0	0
MH #6	302 (8/25/22)	20,009	18,457	15,151	10,245	674 (9 days)
MH #7	298 (10/6/22)	27,512	23,367	10,994	2,629	22 (6 days)
MH #7A PS #7	134 (8/25/22)	495 (15 days)	278 (6 days)	70 (2 days)	35 (1 day)	0
MH #8 FSPS	20 (10/3/22)	62 (7 days)	0	0	0	0

* MH #4 also had 163 H2S Tests over 300 ppm that occurred on 6 different days.

Based on the testing performed it is evident that there are H2S gas levels higher than desirable in the wastewater system for the limited number of days shown. In addition, the high levels at the headworks are the apparent cause of increased corrosion at the WWTF. The H2S report dated April 4, 2023 prepared by Fishbeck provides recommendations for potential solutions including removal of excess solids, dissolved oxygen and mixing, ventilation at pumping stations and chemical treatments.

There are two issues associated with high H2S gas levels. One, as mentioned in the existing report, is to reduce the levels such that the corrosion issue at the WWTF is resolved. This is important for the safety of plant personnel but also because it is not financially acceptable to be replacing key/expensive equipment which is not able to reach its typical service life due to H2S gas levels. The second issue is H2S gas in the collection system to the WWTF. High H2S gas levels also cause corrosion of the system components along the way. Plastic pipe is not impacted by the presence of this gas, however any sections of concrete pipe and all the manholes along the way will experience corrosive conditions.

In order to address the high levels of H2S at the WWTF, it would be most beneficial to apply a remedy close to the plant such that the gas levels are low at the plant. Solutions to benefit the collection system would likely require applying remedies at multiple locations along the route to the WWTF. This treatment methodology would protect both the collection system and the WWTF equipment. The decision regarding application and location of treatment will require discussion between the City of Owosso, the Owosso Township/Caledonia Township Utility Authority, and other municipalities discharging into the system.

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While operational changes at the FSPS may improve the H2S levels at the wetwell and discharge point, it will not resolve the issue further downstream. Conversion of the FSPS discharge manhole to a vortex manhole, which basically injects air into the flow at discharge location, is a passive system with no moving parts. It's a potential solution if the manhole is deep enough to allow that application but the amount of air capable of being injected is limited and is only atmospheric air. Chemical treatment is also a possible solution but that option ties the City of Corunna to perpetual chemical purchases. Chemical treatment at FSPS was previously evaluated and found to be costly with limited downstream success at reducing H2S levels.

Another H2S treatment option is installing a system to inject air into the waste stream using pressure to increase the oxygen level to prevent the flow from becoming septic and resulting in H2S gas development. Unfortunately, injecting atmospheric air, which is almost 80% nitrogen, is not very efficient. Therefore, there are systems available which processes atmospheric air to develop a gas that is 90-95% pure oxygen. This type of system is more efficient and does not require the perpetual purchase of chemicals, however there is a large initial capital investment between $150,000 to $250,000 depending on the size of the unit required. The decision which needs to be made is whether to treat for both the collection system AND the WWTF or concentrate on the WWTF.

There are other H2S control systems as well. C2AE has performed preliminary investigation into oxygen injection systems and identified a system that would be appropriate for this application. The system is manufactured by Anue Water Technologies and we have met with a representative to evaluate how suitable this technology would be for this application. Based on our discussions it would appear that this type of system should be evaluated further including field testing of their pilot unit. Their stated pilot testing cost was less than $10,000, which would be per location if it was decided to evaluate this system to protect both the collection system and the WWTF. If the focus is the WWTF it may be possible to conduct a pilot test at one location.

The option exists for the City of Corunna to provide operational changes and treatment to address their components (e.g. Ferry Street Pump Station) such that their discharge into the manhole on M-21 is at acceptable H2S levels. Unfortunately, there is still a long flow path to the WWTF such that any operational changes or treatment will not last all the way to the plant. The level of H2S will likely increase along the way as the treatment application is used up. In addition, Corunna's sanitary flow become combined with other flows downstream and if the other municipal governments are not taking any action, the effect of any City of Corunna action becomes negligible.

There is still more evaluation work to be done to arrive at a suitable solution. As an example, routine cleaning of the shared gravity collection system must be completed on an annual or bi-annual basis and tributary pump station wetwells must be cleaned more frequently to properly remove excess solids in the system that are contributing to the H2S issue. We do not believe this routine cleaning has been performed on a regular basis and therefore recommend that the system be cleaned before additional testing is taken.

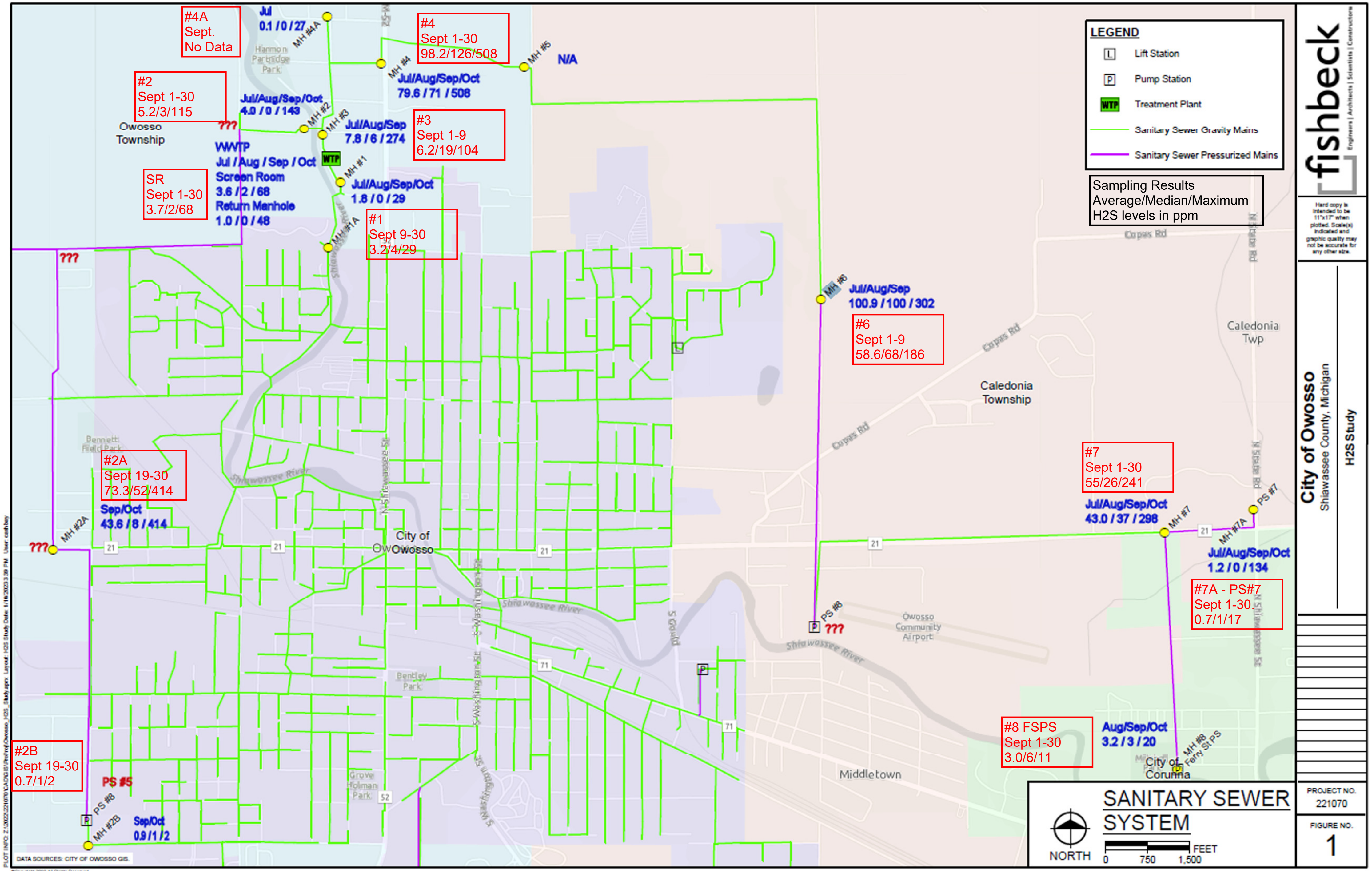
In addition, the City of Owosso report has identified ventilation improvements at the plant. This should be further pursued for the best impact at the plant. For any applications in the collection system between Corunna and the WWTF, coordination will be needed among the multiple municipalities and the Authority to establish priorities and options. Regardless of what action is decided upon, any mechanical/chemical solutions should be pilot tested to confirm its ability to improve the situation.

Sincerely,
C2AE

James J. Minster, PE
Civil Engineer

William J. Kimble, PE
Government Market Leader

Enclosure: Figure No. 1 – Sanitary Sewer System Map with H2S Test Results from H2S Study prepared by Fishbeck on April 4, 2023


LEGEND
Lift Station
Pump Station
Treatment Plant
Sanitary Sewer Gravity Mains
Sanitary Sewer Pressurized Mains
Sampling Results Average/Median/Maximum H2S levels in ppm
#4A Sept. No Data
Jul 0.1 / 0 / 27
MH #4A
#4 Sept 1-30 98.2/126/508
MH #5
N/A
MH #4
Jul/Aug/Sep/Oct 79.6 / 71 / 508
#2 Sept 1-30 5.2/3/115
Jul/Aug/Sep/Oct 4.0 / 0 / 143
MH #2
MH #3
Jul/Aug/Sep 7.8 / 6 / 274
#3 Sept 1-9 6.2/19/104
Owosso Township
???
WWTP Jul / Aug / Sep / Oct Screen Room 3.6 / 2 / 68 Return Manhole 1.0 / 0 / 48
WTP
MH #1
Jul/Aug/Sep/Oct 1.8 / 0 / 29
SR Sept 1-30 3.7/2/68
#1 Sept 9-30 3.2/4/29
MH #1A
MH #6
Jul/Aug/Sep 100.9 / 100 / 302
#6 Sept 1-9 58.6/68/186
Caledonia Twp
Caledonia Township
#2A Sept 19-30 73.3/52/414
Sep/Oct 43.6 / 8 / 414
MH #2A
City of Owosso
#7 Sept 1-30 55/26/241
Jul/Aug/Sep/Oct 43.0 / 37 / 298
MH #7
MH #7A
PS #7
Jul/Aug/Sep/Oct 1.2 / 0 / 134
#7A - PS#7 Sept 1-30 0.7/1/17
PS #8
Owosso Community Airport
Shiawassee River
Bentley Park
#2B Sept 19-30 0.7/1/2
PS #5
PS #8
MH #2B
Sep/Oct 0.9 / 1 / 2
#8 FSPS Sept 1-30 3.0/6/11
Aug/Sep/Oct 3.2 / 3 / 20
MH #8 Ferry St PS
City of Corunna
Middletown
SANITARY SEWER SYSTEM
NORTH
FEET 0 750 1,500
DATA SOURCES: CITY OF OWOSSO GIS.
fishbeck
Engineers | Architects | Scientists | Constructors
City of Owosso
Shiawassee County, Michigan
H2S Study
PROJECT NO. 221070
FIGURE NO. 1