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MSD Odor Control Master Plan

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Memo

Subject: Technical Memorandum #6A – Morris Forman Water Quality Treatment Center Air and Liquid Sampling Results Analysis

1. Introduction

1.1 Odor Control Master Plan Background

In response to receiving a Notice of Violation (NOV) in November 2019 for failure to control odors from the Morris Forman Water Quality Treatment Center (WQTC, Plant) and its collection system, MSD entered into an agreed order with the Louisville Metro Air Pollution Control District (APCD) to develop and implement a phased District-wide Odor Control Master Plan. MSD has contracted AECOM to provide MSD with professional engineering services for the development of Phase I of the Odor Control Master Plan (Odor Control Master Plan), which is focused on the Morris Forman Service Area. MSD also contracted with a public relations firm to increase public engagement and communications during development and implementation of the phased Odor Control Master Plan.

The Morris Forman WQTC, constructed and commissioned in 1958, is currently the largest wastewater treatment plant in the state of Kentucky. Located in the western region of Louisville along the Ohio River, the plant is responsible for treating 120 MGD of dry weather flow and a peak capacity of 350 MGD during wet weather flow conditions.

Despite recent efforts by MSD to reduce odor emissions generated from the Morris Forman WQTC through development and phased implementation of the 2001 Morris Forman Odor Control Master Plan and 2009 follow-up report, the neighboring community has experienced odors leading to a significant amount of complaints, specifically during the summer of 2019. Primary affected residents were in the Chickasaw, California, and Park DuValle neighborhoods.

1.2 Purpose

This Report is intended to document Sampling Program efforts to date for the Morris Forman WQTC and a separate Wet Weather Treatment Facility (WWTF). The main objectives of this Report are to:

- Summarize and analyze the liquid and vapor sampling in critical areas of the treatment facilities
- Incorporate findings from this TM#6A into TM#7 (Current Odor Control Technologies Performance Evaluation), TM#8 (New Odor Control Technologies Performance Evaluation), and TM#9 (Odor Control Conceptual Design)

1.3 Previous Documentation and Implementation Schedule

In accordance with the agreed order, MSD has submitted several documents to APCD to demonstrate ongoing odor control efforts. Table 1 shows MSD's completed and ongoing efforts towards the APCD agreed order.

Table 1 – Phase I Master Plan Implementation Schedule

Title	Due Date	Status
TM#1 Morris Forman WQTC Background Document Review	Q1 2021	Completed
TM#2 Collection System Background Document Review	Q2 2021	Completed
TM#3 Pump Stations Background Document Review	Q2 2021	Completed
TM#4 WQTC, Pump Stations and Combined Sewer System Planned Process Modifications	Q1 2021	Completed
TM#5 Current WQTC, Pumping Stations, and Combined Sewer System Odor Impact Evaluation	Q2 2021	Completed
TM#6A, TM#6B, TM #6C Morris Forman WQTC (TM#6A), Collection System (TM #6B), and Pump Stations (TM #6C) Sampling Phase Results Analysis	Q4 2022	Completed
TM#7A Morris Forman WQTC Current Odor Technologies Performance Evaluation	Q4 2022	Completed
TM#7B Collection System Current Odor Technologies Performance Evaluation		
TM#7C Pump Stations Current Odor Technologies Performance Evaluation		
TM#8 New Odor Control Technologies Recommendation	Q4 2022	Ongoing
TM#9 Odor Control Conceptual Design	Q4 2022	Ongoing
Odor Control Master Plan Phase I Final Report	Q4 2022	Ongoing

2. Morris Forman WQTC Sampling

2.1 Sampling Locations

Sampling was performed at four (4) structures located at the WWTF and twenty-five (25) structures located at MFWQTC in Summer 2020, Summer 2021, Spring 2022, and Summer 2022 which are summarized in Table 2. These structures were selected for liquid and vapor sampling based on recommendations and discussions with MSD staff and high-priority odor impact ratings determined during previous TMs (refer to TM#5).

Liquid sampling was performed by MSD staff, and vapor sampling was contracted to a third-party contractor. Liquid and vapor samples were quantified by third-party laboratories.

Table 2 – Morris Forman WQTC Sampling Overview

Sample ID	Location	Description	Date(s) of Sampling
B1	WWTF	Splitter Structure #2	9/22/2021
B2	WWTF	HRTB Influent	9/22/2021
B3	WWTF	Grit Dumpster	9/22/2021
B4	WWTF	Grit Tank Influent	9/22/2021
1	MFWQTC	DAFT Outlet	3/7/2022
2A	MFWQTC	East Headworks 1st Floor	6/14/2021
2B	MFWQTC	East Headworks 2nd Floor	6/14/2021
3	MFWQTC	West Headworks	6/14/2021
4A	MFWQTC	East Headworks Grit Channel	6/14/2021
4B	MFWQTC	West Headworks Grit Channel	6/14/2021
5	MFWQTC	Dumpster Room	6/14/2021
6	MFWQTC	SHOC Bioscrubber Inlet	-
7A	MFWQTC	SHOC Bioscrubber #1 Outlet	-
7B	MFWQTC	SHOC Bioscrubber #2 Outlet	-
8	MFWQTC	Thickened Solids Holding Tank	-
9	MFWQTC	Digester	6/14/2021
10	MFWQTC	Dewatering Building Exhaust	8/18/2022
11	MFWQTC	Silo Dust Wet Scrubber Inlet	-
12	MFWQTC	Silo Dust Wet Scrubber Outlet	5/18/2022
13A	MFWQTC	RTO #1 Inlet	5/17/2022
13B	MFWQTC	RTO #2 Inlet	7/27/2022
14A	MFWQTC	RTO #1 Outlet	5/17/2022
14B	MFWQTC	RTO #2 Outlet	7/27/2022
15	MFWQTC	Fugitive Dust Wet Scrubber #1 Inlet (From Recycle Bin)	-
16	MFWQTC	Fugitive Dust Wet Scrubber #2 Inlet (From Shaker, Crusher, and Pellet Coolers)	-
17A	MFWQTC	Fugitive Dust Wet Scrubber #1 Outlet	5/18/2022

17B	MFWQTC	Fugitive Dust Wet Scrubber #2 Outlet	7/27/2022
18	MFWQTC	MEB Exhaust	8/18/2022
U1	MFWQTC	Sed. Basin Aerated Influent Channel	9/30/2020
U2	MFWQTC	Sed. Basin #1 Inlet	9/30/2020
U3	MFWQTC	Sed. Basin #1 Outlet	9/30/2020
U4	MFWQTC	Sed. Basin #1 Weir	9/30/2020
U5	MFWQTC	Sed. Basin #4 Inlet	9/30/2020
U6	MFWQTC	Sed. Basin #4 Outlet	9/30/2020
U7	MFWQTC	Sed. Basin #4 Weir	9/30/2020
U8	MFWQTC	Sed. Basin Eff. Channel	9/30/2020
U9	MFWQTC	BOC Inlet	-
U10	MFWQTC	BOC Outlet	-

-Sampling has not been performed at these locations or has not been analyzed by the appropriate laboratory

2.2 Sampling Program

Major odor-emitting processes at the Morris Forman WQTC were targeted for a vapor and liquid sampling program to determine the existing odor conditions at process areas. Sampling procedures were developed and implemented to evaluate the concentration of relevant contaminants from existing infrastructure, recently implemented infrastructure which has not been evaluated in detail, and infrastructure that is currently under development or considered for future development.

Table 3, Table 4, and Table 5 summarize the vapor sampling parameters, description, and corresponding standard or guideline used during the Sampling Program. Samples were obtained when odor control systems and related equipment were fully operational. A vacuum chamber, pump, and Tygon tubing were used at point sources to prevent contamination of air samples.

Table 6 summarizes the liquid sampling parameters, descriptions, and corresponding standard or guideline used during the Sampling Program.

Table 3 – Sampling Program Parameters – Vapor (Locations 1-10 and 18)

Sampling Parameter	Description	Standard/ Guideline
1 Odor	10-liter Tedlar bags were used to collect grab samples which were shipped to a sensory consultant to measure odor detectability as Detection-to-Threshold (D/T)	ASTM E679-91/ E544-99
2 Reduced Sulfur Compounds (RSC)	3-liter Tedlar bags were used to collect grab samples which were shipped to a laboratory for analysis	ASTM 5504-12
3 Volatile Organic Compounds (VOCs)	3-liter Tedlar bags were used to collect grab samples which were shipped to a laboratory for analysis	EPA TO-15
4 Ammonia	Air samples were pulled from the odor and RSC grab sample bags and tested on-site using GASTEC detector tubes and pump model GV-100S	EPA CTM 027 (Vapor); APHA 4500-NH3 (Liquid)
5 Amines	Sorbent tubes were used to collect air samples which were shipped to a laboratory for analysis	OSHA Method 40

6	Aldehydes	Sorbent tubes were used to collect air samples which were shipped to a laboratory for analysis	EPA TO-11A
7	Instantaneous Hydrogen Sulfide (H ₂ S)	Instantaneous H ₂ S concentrations were measured with an Arizona Instruments Jerome 631X analyzer	-

Table 4 – Sampling Program Parameters – Vapor (Locations 12-17)

Sampling Parameter	Description	Standard/ Guideline	
1	Odor	10-liter Tedlar bags were used to collect grab samples which were shipped to a sensory consultant to measure odor detectability as Detection-to-Threshold (D/T)	ASTM E679-91/ E544-99
2	Reduced Sulfur Compounds (RSC)	6-liter canisters were used to collect air samples which were shipped to a laboratory for analysis	ASTM 5504-12/ EPA 16C
3	Ammonia	6-liter canisters were used to collect air samples which were shipped to a laboratory for analysis	EPA 320
4	Amines	Sorbent tubes were used to collect air samples which were shipped to a laboratory for analysis	OSHA Method 40
5	Particulate Matter: Size < 10 µm (PM ₁₀) Size < 2.5 µm (PM _{2.5}) Total (TPM)	CPE particulate filters derived from an M-5 sampling train were used to collect samples which were shipped to laboratory for analysis	EPA 201A/202/50/5
6	Fuel Analysis	6-liter canisters were used to collect air samples which were shipped to a laboratory for analysis	EPA 19/ASTM D1946/ D3588/ D6228/3176- 74/3176-89
7	Instantaneous Nitrogen Oxides (NO _x)	Thermo Scientific (Thermo) Model 42H, 42C-HL, or 42i-HL chemiluminescent NO _x analyzer was used to measure instantaneous NO _x concentration	EPA 7E
8	Instantaneous Hydrogen Sulfide (H ₂ S)	Commercial analyzer with a dry sorbent sulfur dioxide scrubber that complies with EPA 16C was used to measure instantaneous H ₂ S concentration	EPA 16C
9	Instantaneous Volatile Organic Compounds (VOCs)	Thermo Model 55C or 55i flame ionization analyzer equipped with a built-in gas chromatographic separatory column was used to measure instantaneous VOC concentration	EPA TO-15/ EPA 25A/ EPA 25C
10	Instantaneous Sulfur Dioxide (SO ₂)	Thermo Model 43, 43C, or 43i pulsed fluorescence instrument or equivalent was used to measure instantaneous SO ₂ concentration	EPA 6C
11	Instantaneous Carbon Monoxide (CO)	Thermo Model 48, 48C, or 48i non-dispersive infrared (NDIR) instrument with gas filter correlation was used to measure instantaneous CO concentration	EPA 10

12	Instantaneous Oxygen (O ₂)	Servomex Series 1440 paramagnetic dry O ₂ analyzer and a CAI Model 602, or equivalent, Galvanic Fuel Cell wet O ₂ analyzer was used to measure instantaneous O ₂ concentration	EPA 3A
13	Instantaneous Carbon Dioxide (CO ₂)	Servomex Series 1440 NDIR dry CO ₂ analyzer was used to measure instantaneous CO ₂ concentration	EPA 3A

Table 5 – Sampling Program Parameters – Vapor (Locations U1-U8)

Sampling Parameter	Description	Standard/ Guideline	
1	Odor	10-liter Tedlar bags were used to collect grab samples which were shipped to a sensory consultant to measure odor detectability as Detection-to-Threshold (D/T)	ASTM E679
2	Reduced Sulfur Compounds (RSC)	1-liter Tedlar bags were used to collect grab samples which were shipped to a laboratory for analysis	ASTM 5504
3	Volatile Organic Compounds (VOCs)	1-liter Tedlar bags were used to collect grab samples which were shipped to a laboratory for analysis	EPA TO-15
4	Instantaneous Hydrogen Sulfide (H ₂ S)	Instantaneous H ₂ S concentrations were measured with a commercial analyzer	-

Table 6 – Sampling Program Parameters – Liquid

Sampling Parameter	Description	Standard/ Guideline	
1	pH	pH meters used to measure pH within (2) hours of sampling	APHA 4500-H
2	Dissolved Oxygen (DO)	Azide modification to the Winkler Titration Method was used to measure DO	APHA 4500-O
3	Dissolved Sulfides	Samples were collected directly from a catch basin and were shipped to laboratory for analytical analysis	APHA 4500-S2
4	Sulfates	Samples were collected directly from a catch basin and were shipped to laboratory for analytical analysis	APHA 4110B
5	Ammonia	Ammonia-selective electrode method was used to analyze liquid samples within 24 hours	APHA 4500-NH3
6	5-day Biological Oxygen Demand (BOD5)	The difference in DO before and after incubation of liquid samples for five days was measured	APHA 5210B
7	Volatile Organic Compounds (VOCs)	GC/MS instrumentation used to analyze VOCs in liquid samples	EPA 624/625
8	Total Suspended Solids (TSS)	Samples were filtered, dried, and weighed	APHA 2540-D

Table 7, Table 8, Table 9, and Table 10 were developed to summarize the sampling results from the Summer 2020, Summer 2021, Spring 2022, and Summer 2022 sampling events at the WWTF and MFWQTC locations in comparison to target limits for each sampling parameter. Results are reported as low or high. In the event that the sampling location showed both non-detect (ND) and detectable values, the values were averaged by replacing the ND value with the minimum reporting limit. Red text indicates instances where sampling results exceeded target limits at the odor sources.

Table 7 – WWTF Sampling Results Evaluation

Sampling Parameter		Sampling ID and Location				
		B1 Splitter Structure #2	B2 HRTB Influent	B3 Grit Dumpster	B4 Grit Tank Influent	
Liquid Sampling	Acetone	-	-	-	ND	
	Naphthalene	-	-	-	ND	
	BOD	-	-	-	Low	
	Dissolved Oxygen	-	-	-	Low	
	Sulfate	-	-	-	Low	
	TSS	-	-	-	Low	
	Ammonia	-	-	-	Low	
Vapor Sampling	Odor	High	High	High	-	
	Reduced Sulfur Compounds	H ₂ S	Low	Low	Low	-
		Carbonyl Sulfide	Low	ND	ND	-
		Methyl Mercaptan	ND	ND	ND	-
		Dimethyl Sulfide	Low	ND	ND	-
		Carbon Disulfide	ND	ND	ND	-
		Dimethyl Disulfide	ND	ND	ND	-
		Aldehydes	Formaldehyde	Low	Low	Low
	Valeraldehyde		ND	ND	ND	-
	Hexanal		ND	ND	ND	-
	Butyraldehyde		High	Low	High	-
	Acetaldehyde		ND	ND	ND	-
	Acetone		Low	Low	Low	-
	Benzaldehyde		Low	Low	Low	-
m,p-Tolualdehyde	Low	Low	Low	-		

*Red text indicates sampling location exceeded analyte target limit at the odor source.

***Target Limit Resources:**

1. Air Pollution Control District (APCD) Ambient Air Quality Standards, Regulation 3.01 Section 7
2. American Industrial Hygiene Association (AIHA), 1989
3. Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits, Annotated Table Z-1
4. Louisville MSD Wastewater/ Stormwater Discharge Regulations
5. American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value
6. Approaches to Total VOC Guidelines, Alberta Environment-Based on Effects Screening Level (ESL)
7. National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit
8. United States Department of Energy (DOE) Protective Action Criteria for Chemicals (PACs) PAC-1

Notes:

H₂S= Hydrogen Sulfide

BOD= Biological Oxygen Demand

TSS= Total Suspended Solids

ND= Non-Detect – Compound was analyzed for, but not detected above the method detection limit

- = Substance was not sampled for or has not been analyzed by the appropriate laboratory

Table 8 – Morris Forman WQTC Sampling Results Evaluation (Sampling Locations 1-10)

Sampling Parameter		1 DAFT Outlet	2A East Headworks 1 st Floor	2B East Headworks 2 nd Floor	3 West Headworks	4A East Headworks Grit Channel	4B West Headworks Grit Channel	5 Dumpster Room	9 Digester	10 Dewatering Building Exhaust
Vapor Sampling	Odor	High	High	High	High	High	High	High	High	High
	Ammonia	-	-	-	-	-	-	-	-	Low
	H ₂ S	ND	Low	Low	Low	Low	Low	Low	Low	Low
	Carbonyl Sulfide	ND	ND	ND	ND	ND	Low	Low	ND	Low
	Methyl Mercaptan	ND	Low	ND	Low	Low	Low	Low	Low	Low
	Dimethyl Sulfide	ND	ND	ND	ND	ND	Low	Low	ND	Low
	Carbon Disulfide	ND	Low	Low	ND	Low	Low	Low	Low	Low
	Diethyl Sulfide	ND	ND	ND	ND	ND	Low	ND	ND	ND
	Dimethyl Disulfide	Low	ND	ND	ND	Low	ND	Low	ND	Low

***Red text indicates sampling location exceeded analyte target limit at the odor source.**

***Target Limit Resources:**

1. Air Pollution Control District (APCD) Ambient Air Quality Standards, Regulation 3.01 Section 7
2. American Industrial Hygiene Association (AIHA), 1989
3. Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits, Annotated Table Z-1
4. Louisville MSD Wastewater/ Stormwater Discharge Regulations
5. American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value
6. Approaches to Total VOC Guidelines, Alberta Environment-Based on Effects Screening Level (ESL)
7. National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit
8. United States Department of Energy (DOE) Protective Action Criteria for Chemicals (PACs) PAC-1

Notes:

H₂S= Hydrogen Sulfide

ND= Non-Detect – Compound was analyzed for but not detected above the method detection limit

- = Substance was not sampled for or has not been analyzed by the appropriate laboratory

Liquid sampling was not performed for the WQTC locations.

The following compounds were tested for but not detected in the vapor at any location in the treatment plant:

cis-1,2-Dichloroethene, n-Propylbenzene, Diethylamine, Dimethylamine, Ethylamine, Methylamine, Trichloroethene, 1,4-Dioxane, Methyl Methacrylate, cis-1,3-Dichloropropene, 4-Methyl-2-pentanone, trans-1,3-Dichloropropene, 1,1,2-Trichloroethane, 2-Hexanone, Dibromochloromethane, 1,2-Dibromoethane, Chlorobenzene, Bromoform, 1,1,2,2-Tetrachloroethane, Benzyl Chloride, 1,3-Dichlorobenzene, 1,2-Dichlorobenzene, 1,2-Dibromo-3-chloropropane, 1,2,4-Trichlorobenzene, Naphthalene, Hexachlorobutadiene, formaldehyde

An extensive list of VOC compounds were tested for as part of the sampling program, but the results were well below the target limits; therefore, the results were excluded from this table for clarity.

Table 9: Morris Forman WQTC Main Equipment Building Sampling Results Evaluation (Sampling Locations 12-18)

Sampling Parameter		12 Silo Dust Scrubber Outlet	13A RTO # 1 Inlet	13B RTO # 2 Inlet	14A RTO # 1 Outlet	14B RTO # 2 Outlet	17A Fugitive Dust Scrubber # 1 Outlet	17B Fugitive Dust Scrubber # 2 Outlet	18 MEB Exhaust
Vapor Sampling	Odor	High	High	High	High	High	High	High	High
	Ammonia	Low	Low	Low	High	Low	High	Low	ND
	H ₂ S	Low	Low	Low	Low	Low	Low	Low	Low
	Reduced Sulfur Compounds	Low	Low	Low	Low	Low	Low	Low	Low
	Methyl Mercaptan	High	High	High	High	High	High	High	Low
	Dimethyl Sulfide	Low	Low	Low	Low	Low	Low	Low	ND
	Carbon Disulfide	Low	Low	Low	Low	Low	Low	Low	Low
	Dimethyl Disulfide	Low	Low	High	High	High	High	High	Low

***Red text indicates sampling location exceeded analyte target limit at the odor source.**

***Target Limit Resources:**

1. Air Pollution Control District (APCD) Ambient Air Quality Standards, Regulation 3.01 Section 7
2. American Industrial Hygiene Association (AIHA), 1989
3. Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits, Annotated Table Z-1
4. Louisville MSD Wastewater/ Stormwater Discharge Regulations
5. American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value
6. Approaches to Total VOC Guidelines, Alberta Environment-Based on Effects Screening Level (ESL)
7. National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit
8. United States Department of Energy (DOE) Protective Action Criteria for Chemicals (PACs) PAC-1

Notes:

H₂S= Hydrogen Sulfide

ND= Non-Detect – Compound was analyzed for but not detected above the method detection limit

Liquid sampling was not performed for the WQTC locations.

The following compounds were tested for but were well below the target limits; therefore, the results were excluded from this table for clarity.

Dimethylamine, Monomethylamine, Trimethylamine, Methane, Ethane, and Propane

Table 10: Morris Forman WQTC Clarifier Sampling Results Evaluation (Sampling Locations U1-U8)

Sampling Parameter		U1 Aerated Influent Channel	U2 Sed. Basin #1 Inlet	U3 Sed. Basin #1 Outlet	U4 Sed. Basin #1 Weir	U5 Sed. Basin #4 Inlet	U6 Sed. Basin #4 Outlet	U7 Sed. Basin #4 Weir	U8 Sed. Basin Eff. Channel
Vapor Sampling	Odor	High	High	High	High	High	High	High	High
	H ₂ S	High	Low	Low	Low	Low	Low	Low	Low
	Carbonyl Sulfide	Low	ND	ND	ND	ND	Low	ND	ND
	Methyl Mercaptan	Low	Low	Low	Low	Low	Low	Low	Low
	Dimethyl Sulfide	Low	Low	Low	Low	Low	Low	Low	Low
	Carbon Disulfide	Low	ND	ND	ND	ND	Low	ND	Low
	Dimethyl Disulfide	Low	High	ND	ND	Low	ND	ND	ND

*Red text indicates sampling location exceeded analyte target limit at the odor source.

***Target Limit Resources:**

1. Air Pollution Control District (APCD) Ambient Air Quality Standards, Regulation 3.01 Section 7
2. American Industrial Hygiene Association (AIHA), 1989
3. Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits, Annotated Table Z-1
4. Louisville MSD Wastewater/ Stormwater Discharge Regulations
5. American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value
6. Approaches to Total VOC Guidelines, Alberta Environment-Based on Effects Screening Level (ESL)
7. National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit
8. United States Department of Energy (DOE) Protective Action Criteria for Chemicals (PACs) PAC-1

Notes:

H₂S= Hydrogen Sulfide

ND= Non-Detect – Compound was analyzed for but not detected above the method detection limit

Liquid sampling was not performed for the WQTC locations.

The following compounds were tested for but were well below the target limits; therefore, the results were excluded from this table for clarity.

Acetone, Trichlorofluoromethane (CFC 11), 2-Propanol (Isopropyl Alcohol), Acrylonitrile, 1,1-Dichloroethene, Methylene Chloride, 3-Chloro-1-propene (Allyl Chloride), Trichlorotrifluoroethane (CFC 113), Carbon Disulfide, trans-1,2-Dichloroethene, 1,1-Dichloroethane, Methyl tert-Butyl Ether, Vinyl Acetate, 2-Butanone (MEK), cis-1,2-Dichloroethene, Ethyl Acetate, n-Hexane, Chloroform, Tetrahydrofuran (THF), 1,2-Dichloroethane, 1,1,1-Trichloroethane, Benzene, Carbon Tetrachloride, Cyclohexane, 1,2-Dichloropropane, Bromodichloromethane, Trichloroethene, 1,4-Dioxane, Methyl Methacrylate, n-Heptane, cis-1,3-Dichloropropene, 4-Methyl-2-pentanone, trans-1,3-Dichloropropene, 1,1,2-Trichloroethane, Toluene, 2-Hexanone, Dibromochloromethane, 1,2-Dibromoethane, n-Butyl Acetate, n-Octane, Tetrachloroethene, Chlorobenzene, Ethylbenzene, m,p-Xylenes, Bromoform, Styrene, o-Xylene, n-Nonane, 1,1,2,2-Tetrachloroethane, Cumene, alpha-Pinene, n-Propylbenzene, 4-Ethyltoluene, 1,3,5-Trimethylbenzene, 1,2,4-Trimethylbenzene, Benzyl Chloride, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 1,2-Dichlorobenzene, d-Limonene, 1,2-Dibromo-3-chloropropane, 1,2,4-Trichlorobenzene, Naphthalene, and Hexachlorobutadiene.

3. Conclusions

3.1 Liquid Sampling Results

The liquid sampling was performed at the WWTF Grit Tank Influent only, and the results indicate no exceedances of analyte target limits.

3.2 Vapor Sampling Results

The vapor sampling results indicate exceedances of analyte target limits at several locations. Table 11 summarizes the sampling results for each of the sampling locations and was developed to aid the odor control master plan in the selection of odor control improvements within the treatment facilities.

The sampling locations are presented in order of highest to lowest estimated odor impacts. The odor detection values obtained from the sampling efforts will be incorporated into the air dispersion model to assess community odor impacts at critical receptors. Potential odor receptors for the Morris Forman WQTC and WWTF are Park DuValle residents and properties adjacent to the treatment facilities.

Table 11 – Morris Forman WQTC and Bells Lane WWTF Sampling Results Summary

Sampling Location	Target Limit Exceedance(s)	Odor Control Priority
U7: Sed. Basin #4 Weir	Odor	High
U1: Aerated Influent Channel	Odor, H ₂ S	High
U2: Sed. Basin #1 Inlet	Odor, Dimethyl Disulfide	High
U8: Sed. Basin Eff. Channel	Odor	High
U3: Sed. Basin #1 Outlet	Odor	High
U5: Sed. Basin #4 Inlet	Odor	High
U4: Sed. Basin #1 Weir	Odor	High
17B: Fugitive Dust Scrubber # 2 Outlet	Odor, Methyl Mercaptan, Dimethyl Sulfide	High
U6: Sed. Basin #4 Outlet	Odor	High
17A: Fugitive Dust Scrubber # 1 Outlet	Odor, Ammonia, Methyl Mercaptan, Dimethyl Sulfide	High
4B: West Headworks Grit Channel	Odor	High
B1: WWTF Splitter Structure #2	Odor, Butyraldehyde	High
1: DAFT Exhaust	Odor	High
4A: East Headworks Grit Channel	Odor	High
14A: RTO # 1 Outlet	Odor, Ammonia, Methyl Mercaptan, Dimethyl Sulfide	High
14B: RTO # 2 Outlet	Odor, Methyl Mercaptan, Dimethyl Sulfide	High-Low

Sampling Location	Target Limit Exceedance(s)	Odor Control Priority
10: Dewatering Building Exhaust	Odor	High-Low
3: West Headworks	Odor	High-Low
9: Digester	Odor	High-Low
12: Silo Dust Scrubber Outlet	Odor, Methyl Mercaptan	High-Low
2A: East Headworks 1st Floor	Odor	Low
5: Dumpster Room	Odor	Low
2B: East Headworks 2nd Floor	Odor	Low
18: MEB Exhaust	Odor	Low
WWTF Grit Dumpster	Odor, Butyraldehyde	Low
WWTF HRTB Influent	Odor	Low
13A: RTO #1 Inlet	Odor, Methyl Mercaptan	N/A*
13B: RTO #2 Inlet	Odor, Methyl Mercaptan, Dimethyl Sulfide	N/A*
B4: WWTF Grit Tank Influent	-	N/A*

* The inlet odor parameters are less important than the odor outlet parameters.

In summary, the findings from the 2020, 2021, and 2022 sampling events at the Morris Forman treatment facilities indicate that odor control improvements will be further assessed at the locations shown below. The list of locations where odor control will be recommended is being further evaluated as part of the master plan development and may be updated based on air dispersion modeling results in TM #8A and the Odor Control Master Plan.

- Sedimentation Basins
- Headworks
- WWTF Splitter Structure #2
- DAFT Exhaust
- Dewatering Building Exhaust
- Digester
- Silo Dust Wet Scrubber
- RTO
- Fugitive Dust Wet Scrubber

4. Recommendation

The air dispersion modeling task and Odor Control Master Plan will assess the odor impacts at the critical receptors and determine which of the locations identified on Table 11 should have odor control systems installed.