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**Project name:**
MSD Odor Control Master Plan

**Project ref:**
60644274

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# Final Memo

**Subject:** Technical Memorandum #6 - Collection System and Pumping Stations Sampling Results Evaluation

**Encl:** Attachment 1- Collection System Sampling Locations
Attachment 2- Collection System Sampling Results
Attachment 3- Pump Station Sampling Results

## 1. Introduction

MSD contracted a consulting engineering firm in Autumn 2021 to perform liquid and vapor sampling and laboratory analysis at selected locations within the Morris Forman Collection System and pumping facilities. Sampling locations in the Collection System were selected based on customer odor complaints which showed relatively high odor impacts within the Chickasaw, Shawnee, California, and Park DuValle neighborhoods. Specific treatment facility/ pump station structures were also identified as high-priority potential odor sources during development of **TM#5** (Odor Impact Evaluation) and therefore were included in the priority initial sampling efforts. The purpose of this document is to review, evaluate the analytical sampling results from the 2021 sampling events and provide conclusions for the Odor Control Master Plan.

### 1.1 Collection System Sampling Program Description

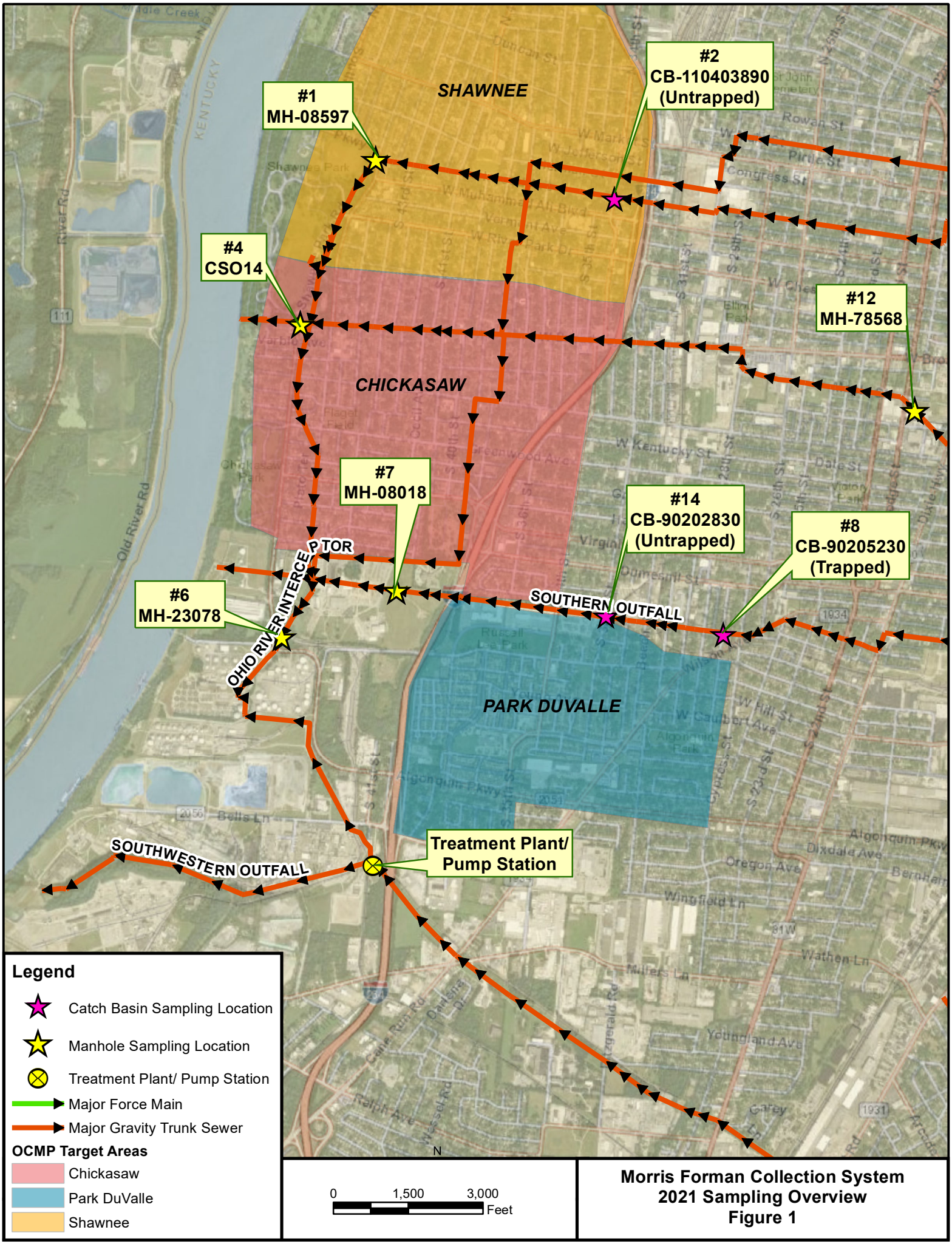
The eight (8) sampling locations listed in **Table 1** were selected for field sampling to further evaluate the existing odor conditions in target areas of the collection system. Collection system sampling was performed during warm and dry weather periods in mid-

October 2021 and samples were sent to multiple laboratories for various analytical results.

**Figure 1** shows an overview map of the collection system sampling locations included in the Autumn 2021 sampling efforts. Refer to **Attachment 1** for zoomed-in maps of each individual sampling site.

**Table 1: Collection System Sampling Overview**

| Sample ID | MSD Unit ID | Adjacent Neighborhood(s) | Sampling Type | Date(s) of Sampling |
|---|---|---|---|---|
| 1 | MH-8597 | Shawnee | Vapor & Liquid | 10/12/21- 10/14/2021 |
| 2 | CB-110403890 (Untrapped) | Shawnee | Vapor | 10/12/21- 10/14/2021 |
| 4 | CSO14 | Chickasaw | Vapor & Liquid | 10/12/21- 10/14/2021 |
| 6 | MH-23078 | Chickasaw | Vapor | 10/12/21- 10/14/2021 |
| 7 | MH-08018 | Park Duvalle/Chickasaw | Vapor & Liquid | 10/12/21- 10/14/2021 |
| 8 | CB-90205230 (Trapped) | Park Duvalle/Chickasaw | Vapor | 10/12/21- 10/14/2021 |
| 12 | MH-78568 | California | Vapor & Liquid | 10/12/21- 10/14/2021 |
| 14 | CB-090202830 (Untrapped) | Park Duvalle | Vapor | 10/12/21- 10/14/2021 |


#1
MH-08597
#2
CB-110403890
(Untrapped)
#4
CSO14
#12
MH-78568
#7
MH-08018
#14
CB-90202830
(Untrapped)
#8
CB-90205230
(Trapped)
#6
MH-23078
SHAWNEE
CHICKASAW
PARK DUVALLE
OHIO RIVER INTERCEPTOR
SOUTHERN OUTFALL
SOUTHWESTERN OUTFALL
Treatment Plant/
Pump Station
Legend
Catch Basin Sampling Location
Manhole Sampling Location
Treatment Plant/ Pump Station
Major Force Main
Major Gravity Trunk Sewer
OCMP Target Areas
Chickasaw
Park DuValle
Shawnee
N
0
1,500
3,000
Feet
Morris Forman Collection System
2021 Sampling Overview
Figure 1

## 1.2 Treatment Plant/ Pump Station Sampling

Sampling and laboratory analyses were also performed at the treatment plant/ pump station structures outlined in **Table 3**. 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.

**Table 2: Treatment Plant/ Pump Station Sampling Overview**

| Sample ID | Description | Date(s) of Sampling |
|---|---|---|
| B1 | Splitter Structure #2 | 9/22/2021 |
| B2 | HRTB Influent | 9/22/2021 |
| B3 | Grit Dumpster | 9/22/2021 |
| B4 | Grit Tank Influent | 9/22/2021 |
| S1 | Dumpster Room | 9/13/2021 |
| S2 | Splitter Structure #1 | 9/13/2021 |
| S3 | Influent Junction Structure | 9/13/2021 |

# 2. Sampling Results Analysis

**Table 3** and **Table 4** were developed to summarize the analyzed sampling results from the Autumn 2021 sampling events at the select treatment facilities/pump stations and collection system locations in comparison to target limits for each sampling parameter. Average values are presented for analytes which consisted of multiple samples. 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 maximum reporting limit. Red text indicates instances where sampling results exceeded target limits.

Target thresholds were assigned to each analyte based on various regulatory standards and guidelines. For analytes without required exposure limits, available guidelines and mean air odor detection thresholds were utilized to assign a target limit and are noted for each analyte.

## Table 3: Collection System Sampling Results Evaluation

| | Sampling Parameter | Target Limit | | | Sampling Unit | Sampling Location | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Value | Unit | Reference* | | 1 MH-8597 | 2 CB-110403890 (Untrapped) | 4 CSO14 | 6 MH-23078 | 7 MH-08018 | 8 CB-90205230 (Trapped) | 12 MH-78568 | 14 CB-090202830 (Untrapped) |
| Liquid Sampling | **pH** | N/A | - | - | - | 4.6 | - | 6.8 | 6.3 | 7.1 | - | NL | - |
| | **Dissolved Sulfide** | N/A | - | - | ppm | ND | - | 4.8 | ND | ND | - | NL | - |
| | **Acetone** | 1000 | ppm | OSHA Permissible Exposure Limits [3] | ppm | ND | - | ND | 0.11 | ND | - | NL | - |
| | **Toluene** | 20 ppm as 8-hour time weighted average; 500 ppm for 10-min | | OSHA Permissible Exposure Limits [3] | ppm | ND | - | 0.048 | ND | ND | - | NL | - |
| | **BOD** | 250 | mg/L | MSD Wastewater/ Stormwater Discharge Regulations [4] | mg/L | **263** | - | **338** | **496** | 236 | - | NL | - |
| | **Dissolved Oxygen** | N/A | - | - | mg/L | 1.68 | - | 4.7 | ND | ND | - | NL | - |
| | **Sulfate** | N/A | - | - | mg/L | 47.6 | - | 14 | 57.5 | 138 | - | NL | - |
| | **TSS** | 270 | mg/L | MSD Wastewater/ Stormwater Discharge Regulations [4] | mg/L | 169 | - | **310** | 246 | 121 | - | NL | - |
| | **Ammonia** | 50 | mg/L | OSHA Permissible Exposure Limits [3] | mg/L | 38.6 | - | **55** | 13.1 | 19.8 | - | NL | - |
| Vapor Sampling | **Odor (Average)** | ** | - | - | D/T | 1,105 | 690 | 27,000 | 12,500 | 305 | 93 | 3,300 | 235 |
| | **$H_2S$** | 10.0 ppb (Maximum 1-Hour average) | | APCD Ambient Air Quality Standards [1] | ppb | 7.5 | ND | SL | **3,500** | **78** | 5.9 | **250** | SL |
| Reduced Sulfur Compounds | **Carbonyl Sulfide** | 5 ppm as 8-hour time weighted average | | ACGIH Threshold Limit Value [5] | ppm | ND | ND | SL | ND | 0.0062 | ND | 0.012 | SL |
| | **Methyl Mercaptan** | 10 ppm as ceiling limit; 0.5 ppm as 8-hour time weighted average | | OSHA Permissible Exposure Limits [3] / ACGIH Threshold Limit Value [5] | ppm | ND | ND | SL | 0.100 | 0.011 | ND | 0.110 | SL |
| | **Dimethyl Sulfide** | 10 ppm as 8-hour time weighted average | | ACGIH Threshold Limit Value [5] | ppm | ND | ND | SL | 0.024 | 0.0052 | ND | 0.056 | SL |
| Aldehydes | **Formaldehyde** | 0.75 | ppm | OSHA Permissible Exposure Limits [3] | ppm | 0.0021 | 0.0024 | 0.011 | 0.0033 | 0.0027 | 0.0022 | 0.0028 | ND |
| | **Valeraldehyde** | 0.0278 | ppm | Approaches to Total VOC Guidelines [6] | ppm | ND | 0.00088 | 0.0013 | 0.0012 | 0.0033 | ND | 0.0012 | ND |
| | **Hexanal** | N/A | - | - | ppm | 0.00071 | 0.0011 | 0.0015 | 0.00088 | 0.0023 | 0.00072 | 0.0019 | ND |
| | **Butyraldehyde** | 0.0047 | ppm | Approaches to Total VOC Guidelines [6] | ppm | ND | ND | 0.0017 | 0.0014 | ND | ND | ND | ND |
| | **Acetaldehyde** | 200 | ppm | OSHA Permissible Exposure Limits [3] | ppm | ND | ND | 0.0056 | ND | ND | ND | 0.022 | ND |
| | **Acetone** | 62 | ppm | AIHA Mean Air Odor Threshold [2] | ppm | ND | ND | 0.0026 | ND | ND | ND | ND | ND |

***Red text** **indicates sampling location exceeded analyte target limit.**

****Target odor threshold is 20 D/T at critical odor receptors and will be determined via air dispersion modelling**

**Notes:**

$H_2S$= Hydrogen Sulfide
BOD= Biological Oxygen Demand
TSS= Total Suspended Solids
MCL= Maximum Contaminant Level
ppm= parts per million
ppb= marts per billion; ppbV= parts per billion by volume
ND= Non-Detect – Compound was analyzed for, but not detected above the method detection limit
SL= Sample Loss – Air sample was damaged during shipment to laboratory
NL=No Liquid – no liquid was present at sample location.

***Target Limit References:**

1. APCD Ambient Air Quality Standards, Regulation 3.01 Section 7
2. American Industrial Hygiene Association, 1989
3. OSHA Permissible Exposure Limits, Annotated Table Z-1, 8-hour Time Weighted Average
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)

## Table 4: Treatment Plant/ Pump Station Sampling Results Evaluation

| | | Sampling Parameter | Target Limit | | | Sampling Unit | Sampling Location | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Value | Unit | Reference* | | B1: Splitter Structure #2 | B2: HRTB Influent | B3: Grit Dumpster | B4: Grit Tank Influent | S1: Dumpster Room | S2: Splitter Structure #1 | S3: Influent Junction Structure |
| Liquid Sampling | | **Acetone** | 1000 | ppm | OSHA Permissible Exposure Limits [3] | ppm | - | - | - | ND | - | - | 0.11 |
| | | **Naphthalene** | 10 | ppm | OSHA Permissible Exposure Limits [3] | ppm | - | - | - | ND | - | - | 0.058 |
| | | **BOD** | 250 | mg/L | MSD Wastewater/ Stormwater Discharge Regulations [4] | mg/L | - | - | - | 96 | - | - | 2 |
| | | **Dissolved Oxygen** | N/A | - | - | mg/L | - | - | - | 6 | - | - | 166 |
| | | **Sulfate** | N/A | - | - | mg/L | - | - | - | 20 | - | - | 1.2 |
| | | **TSS** | 270 | mg/L | MSD Wastewater/ Stormwater Discharge Regulations [4] | mg/L | - | - | - | 102 | - | - | 68.53 |
| | | **Ammonia** | 50 | mg/L | OSHA Permissible Exposure Limits [3] | mg/L | - | - | - | 1 | - | - | **124** |
| Vapor Sampling | | **Odor (Average)** | ** | - | - | D/T | 4,667 | 92 | 70 | - | 6,600 | 106,000 | - |
| | Reduced Sulfur Compounds | **$H_2S$ (Average)** | 10.0 ppb (Maximum 1-Hour average) | | APCD Ambient Air Quality Standards [1] | ppb | **31.7** | 5.2 | 5.5 | - | **177** | **166,667** | - |
| | | **Carbonyl Sulfide** | 5 ppm as 8-hour time weighted average | | ACGIH Threshold Limit Value [5] | ppm | **0.0054** | ND | ND | - | 0.031 | 0.160 | - |
| | | **Methyl Mercaptan** | 10 ppm as ceiling limit; 0.5 ppm as 8-hour time weighted average | | OSHA Permissible Exposure Limits [3] / ACGIH Threshold Limit Value [5] | ppm | ND | ND | ND | - | **0.703** | **1.433** | - |
| | | **Dimethyl Sulfide** | 10 ppm as 8-hour time weighted average | | ACGIH Threshold Limit Value [5] | ppm | 0.0136 | ND | ND | - | 0.327 | 0.071 | - |
| | | **Carbon Disulfide** | 20 ppm as 8-hour time weighted average; 100 ppm for 30-min | | OSHA Permissible Exposure Limits [3] | ppm | ND | ND | ND | - | 0.022 | ND | - |
| | | **Dimethyl Disulfide** | 0.5 ppm as 8-hour time weighted average | | ACGIH Threshold Limit Value [5] | ppm | ND | ND | ND | - | 0.143 | ND | - |
| | Aldehydes | **Formaldehyde** | 0.75 | ppm | OSHA Permissible Exposure Limits [3] | ppm | 0.005 | 0.003 | 0.006 | - | 0.0023 | 0.0027 | - |
| | | **Valeraldehyde** | 0.0278 | ppm | Approaches to Total VOC Guidelines [6] | ppm | ND | ND | ND | - | 0.001 | 0.0022 | - |
| | | **Hexanal** | N/A | - | - | ppm | ND | ND | ND | - | 0.001 | 0.00085 | - |
| | | **Butyraldehyde** | 0.0047 | ppm | Approaches to Total VOC Guidelines [6] | ppm | **0.018** | 0.007 | **0.021** | - | 0.0017 | 0.0022 | - |
| | | **Acetaldehyde** | 200 | ppm | OSHA Permissible Exposure Limits [3] | ppm | ND | ND | ND | - | ND | 0.0023 | - |
| | | **Acetone** | 62 | ppm | AIHA Mean Air Odor Threshold [2] | ppm | 0.042 | 0.031 | 0.058 | - | 0.0023 | 0.0081 | - |
| | | **Benzaldehyde** | 46.1 | ppm | Approaches to Total VOC Guidelines [6] | ppm | 0.002 | 0.001 | 0.003 | - | ND | ND | - |
| | | **m,p-Tolualdehyde** | N/A | - | N/A | ppm | 0.001 | 0.001 | 0.002 | - | ND | ND | - |

***Red text** **indicates sampling location exceeded analyte target limit**

****Target odor threshold is 20 D/T at critical odor receptors and will be determined via air dispersion modelling**

**Notes:**

$H_2S$= Hydrogen Sulfide
BOD= Biological Oxygen Demand
TSS= Total Suspended Solids
ppm= parts per million
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ND= Non-Detect – Compound was analyzed for, but not detected above the method detection limit
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***Target Limit References:**

1. APCD Ambient Air Quality Standards, Regulation 3.01 Section 7
2. American Industrial Hygiene Association, 1989
3. 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)

# 3. Conclusions

The initial collection system sampling results indicated the exceedance of analyte target limits at several locations. **Table 5** summarizes the sampling results evaluation for each of the sampling locations and was developed to aid the odor control master plan in the selection of odor control improvements and mitigation of current odor impacts within the collection system and select pumping and 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.

**Table 5: Collection System and Treatment Plant Sampling Results Summary**

| Sampling Location | Location Description | Potential Odor Receptors | Target Limit Exceedance(s) | Odor Control Priority |
|---|---|---|---|---|
| **Collection System** | | | | |
| **6: MH-23078** | Ohio River Interceptor | Chickasaw residents, Adjacent properties near Plant | BOD, $H_2S$ | High |
| **4: CSO14** | Western Outfall | Chickasaw residents | BOD, TSS, Ammonia | High |
| **12: MH-78568** | Western Outfall | Chickasaw residents | $H_2S$ | Moderate |
| **7: MH-08018** | Southern Outfall | Park DuValle residents | $H_2S$ | Moderate |
| **1: MH-8597** | Northwestern Interceptor | Shawnee residents | BOD | Low |
| **8: CB-90205230** | Southern Outfall | Park DuValle residents | - | N/A |
| **14: CB-090202830** | Southern Outfall | Park DuValle residents | - | N/A |
| **2: CB-110403890** | Northwestern Interceptor | Shawnee residents | - | N/A |
| **Treatment Plant** | | | | |
| **S2: Splitter Structure #1** | | Park DuValle residents; Adjacent properties | $H_2S$, Methyl Mercaptan | High |
| **S1: Dumpster Room** | | | $H_2S$, Methyl Mercaptan | High |
| **B1: Splitter Structure #2** | | | $H_2S$, Butyraldehyde | High |
| **B3: Grit Dumpster** | | | Butyraldehyde | Low |
| **S3: Influent Junction Structure** | | | Ammonia | Low |
| **B2: HRTB Influent** | | | - | N/A |
| **B3: Grit Tank Influent** | | | - | N/A |

The findings from the Autumn 2021 collection system and pump station sampling events indicated that odor control improvements would be most beneficial along the Western Outfall and Ohio River Interceptor, Treatment Plant Splitter Structure #1 and Dumpster Room, as well as Splitter Structure #2. The odor detection values obtained from the sampling efforts will also

be incorporated into the air dispersion model to assess community odor impacts at critical receptors.

It should be noted that this preliminary report is based on data available at the time of development and will be updated following the completion of future sampling efforts.