Water Environment Association

and a

Preserving & Enhancing Ohio's Water Environment



Odor Control in Large Diameter Sewers City of Columbus, Ohio Downtown Area Odor Control



City of Columbus, Ohio Downtown Area Odor Control

- Project Overview
- Field Investigations
- Detailed Design



Project Overview

ØDLZ

- Olentangy Scioto Intercepting Sewer (OSIS)
 - 123-inch (10'-3") circular sewer with 0.06 % slope
 - 140-inch (11'-9") circular sewer with 0.05% slope
 - 123-inch X 144-inch (10'-3" x 12'-0") rectangular sewer with 0.05% slope
 - 48 mgd dry weather flow
- Franklin Main Sanitary Sewer
 - 54-60-inch circular sewer
 - 3 mgd average dry weather flow



Project Overview





First Night Columbus



Columbus Jazz and Ribfest



Project Overview Odor Hot Spots





- H₂S Monitoring
- Pressure Monitoring
- Fan Testing









- Fan testing and monitoring July 28 through August 16, 2004
- Air flow rate 13,000 (north site) 17,000 cfm (south site)

- Manhole Near Federal Courthouse
 - Positive pressure 96% (max 0.18 inches wc)
 - Negative pressure 2% (max -0.07 inches wc)
 - Neutral pressure 2%
 - During fan test pressure dropped to -0.11 inches wc

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Field Investigations FRANKLIN MAIN MANHOLE NEAR FEDERAL COURTHOUSE

- Manhole in Bicentennial Park
 - Positive pressure 44% (max 0.42 inches wc)
 - Negative pressure 10% (max 0.04 inches wc)
 - Neutral pressure 55%
 - H₂S averaged ~1 ppm with a max of 12 ppm
 - During fan test pressure dropped to -0.064 inches wc and H₂S dropped to 0 ppm

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Field Investigations

Field Investigations OSIS - CHESTNUT STREET REGULATOR

- Positive pressure 87% (max ~0.696 inches wc)
- Negative pressure 10% (min -2.302 inches wc)
- Neutral pressure 3%
- H₂S averaged 7 ppm with a max of 36 ppm
- During fan test H₂S dropped to an average of 0.3 ppm with a max of 12 ppm

Field Investigations OSIS - CHESTNUT STREET REGULATOR

Field Investigations osis - Spring Street Regulator

- Positive pressure 18% (max ~0.432 inches wc)
- Negative pressure 56% (min -0.207 inches wc)
- Neutral pressure 26%
- H2S significantly reduced during fan testing

Field Investigations OSIS - SPRING STREET REGULATOR

Field Investigations osis – Rich STREET REGULATOR

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- H₂S reduced from 8.7 ppm (average) to 0.9 ppm (average)
- Neutral or negative pressure increased from 21% to 48% of time

SUMMARY

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- 90% to 95% reduction in OSIS H₂S gas concentrations
- OSIS depressurization is very small compared to the reduction in H₂S gas
- There could be a constriction in the OSIS between Long Street and Broad Street. Performing a CCTV and Sonar inspection would provide insight into the condition of the sewer as well as the cause (if any) of the pressure fluctuations.
- Catch Basin at Broad Street requires p-trap
- Catch basin near the Rich Street regulator requires p-trap
- Connecting sewers are a minor odor contribution

RECOMMENDATIONS

MDLZ

- 45,000 CFM Biofilter at former Fleet Management site
- 22,500 CFM Biofilter just north of downtown
- Install an air trap/P-trap on the catch basins at the Broad and Rich Street regulators
- Install a solid manhole cover on the FM manhole near Long Street and in Bicentennial Park
- Evaluate the level of debris in the OSIS and review the potential methods to "clean" the sewer and remove contributing agents

Detailed Design BIOFILTER COMPONENTS

- Foul air duct from sewer
- Blower to draw foul air
- Air distribution system
- Filter
- Irrigation System
- Leachate Drainage System

Detailed Design BIOFILTER COMPONENTS

Detailed Design Design PARAMETERS

Biofilter No. 1 – At former

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- Fleet Management Site
 - Airflow: 45,000 cfm
 - Four cells @ 50 feet wide and 45 feet long
 - Nominal Media Depth: 78 inches
 - Lava rock: 48-inches
 - Large Bark Nuggets: 30inches
 - Inlet air constituents
 - Hydrogen sulfide; 20 ppmv maximum, 5 ppmv average

Detailed Design Design PARAMETERS

- Biofilter No. 2 Near Vine St. and Neil Avenue
 - Airflow: 22,500 cfm
 - Two cells @ 50 feet wide and 45 feet long
 - Nominal Media Depth: 78-inches
 - Lava rock: 48-inches
 - Large Bark Nuggets: 30-inches
 - Inlet air constituents
 - Hydrogen sulfide; 20 ppmv maximum, 5 ppmv average

Detailed Design

DLZ

FOUL AIR DUCT AND DISTRIBUTION PIPING CONSIDERATIONS

- Corrosion Resistance
 - PVC (small diameters)
 - Fiberglass Reinforced Polymer Pipe (large diameters)
 - Dampers

Detailed Design BLOWER CONSIDERTIONS

- Corrosion resistant
- Variable speed
- Vibration
- Noise

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Foul air duct connection

Detailed Design PLENUM CONSIDERATIONS

Perforated Pipe and Stone

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Detailed Design PLENUM CONSIDERATIONS

Pre-manufactured Plastic Floor

- Hallsten
- BACTee

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Detailed Design FILTER CONSIDERATIONS

- Dual Media Filters
 - Organic and Inorganic Media
 - Proven to produce effluent with < 0.005 ppm H2S

Detailed Design FILTER CONSIDERATIONS

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Pilot tested inorganic media

Crushed Granite (limestone degrades)

Lava Rock

Tire Chips

Detailed Design

- Lava Rock Advantages
 - H2S Removal
 - Airflow Characteristics
 - Moisture Retension
 - Light Weight (compared to granite)

Detailed Design IRRIGATION SYSTEM CONSIDERATIONS

- Sprinklers (with automatic controls system)
- Drip tubes

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- Must be replaced with media
- Humidification chambers

Detailed Design UNDERDRAIN SYSTEM

- Leachate may be acidic
- Corrosion protection of underdrain trench and piping
- Corrosion protection for manhole at sewer discharge point

QUESTIONS?