

SULFUR and COLLECTION SYSTEMS: A COMMON BUT OVERLOOKED CHALLENGE

Wisconsin Wastewater Operators Association
2015 Annual Conference

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OVERVIEW

- BACKGROUND
- CHALLENGES
- STRATEGIC SOLUTIONS

OVERVIEW

- **BACKGROUND**
 - SULFUR
 - CASE STUDY EXAMPLES
- **CHALLENGES**
 - SOURCES
 - FACTORS and RELATIONSHIPS
 - BIO / CHEMISTRY
 - EFFECTS
- **STRATEGIC SOLUTIONS**
 - SOURCE PREVENTION
 - PRETREATMENT
 - MITIGATION
 - REHABILITATION and REPAIR

BACKGROUND

- **SULFUR**

- REQUIRED for WASTEWATER PROTEIN SYNTHESIS

- **CASE STUDY EXAMPLES**

- ADELL
- CASCADE
- HEART of the VALLEY METROPOLITAN SEWERAGE DISTRICT

CHALLENGES

- SOURCES
- FACTORS and RELATIONSHIPS
- BIO / CHEMISTRY
- EFFECTS / CONCERNS

CHALLENGES

- **SOURCES**

- GROUNDWATER
- INDUSTRIAL SULFUR BASED ACIDS
- SO_4^{2-} SULFATE ION

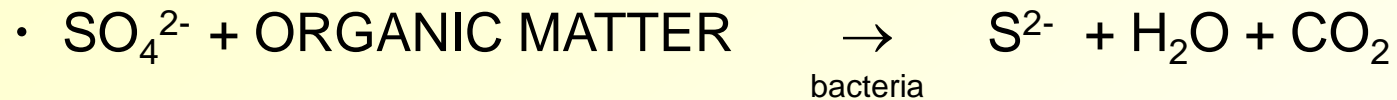
- **FACTORS and RELATIONSHIPS**

- CONCENTRATION
- DIURNAL FLOWS
- TURBULENCE $\rightarrow ++\text{O}_2 \rightarrow \text{H}_2\text{S} \uparrow$
- pH \downarrow for BACTERIA

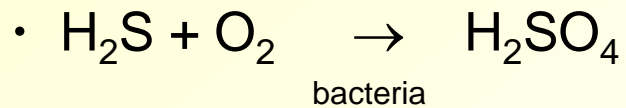
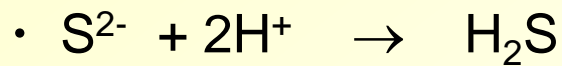


CHALLENGES

- **Bio / CHEMISTRY**

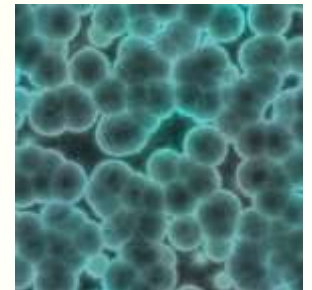


ANAEROBIC BIOLOGIC REDUCTION



AEROBIC BIOLOGIC OXIDATION

Thiobacillus thiooxidans (concretivorous) - Latin for “concrete-eating”
common sulfur-oxidizing bacteria

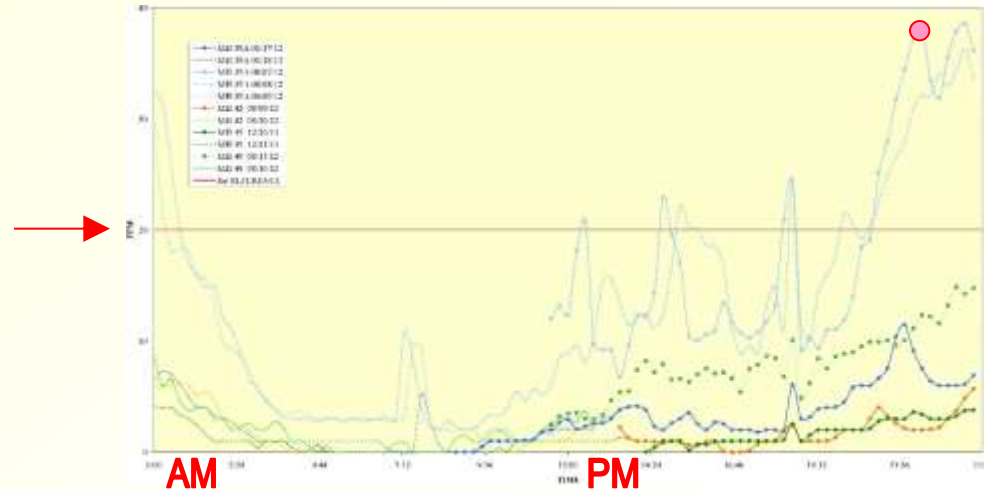


CHALLENGES

- **EFFECTS / CONCERNS**

- **H₂S**

- HAZMAT / SAFETY
- ODOR fⁿ (H₂S + IRON)
- GAS is CORROSIVE
- BURNED GAS CAN DAMAGE EQUIPMENT
- HEAVIER than AIR GAS
- RELATIONSHIP to DIURNAL FLOW CYCLE



- **S²⁻ SULFIDES**

- > 200 ppm CAN AFFECT DIGESTOR BIOLOGY

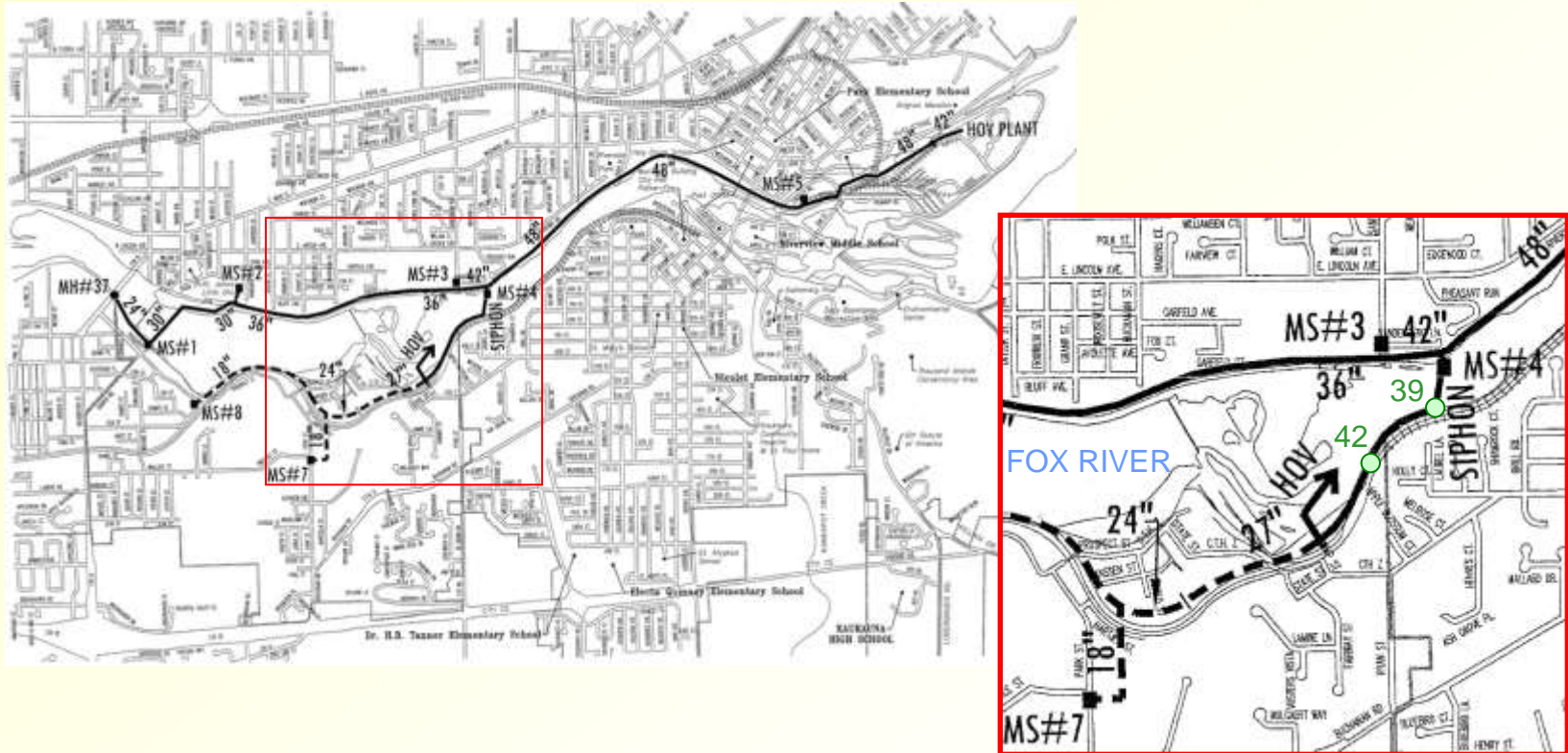
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CHALLENGES

- **EFFECTS / CONCERNS**

- H_2SO_4 fⁿ (MICROBIAALLY INDUCED CORROSION - MIC)
- LOW but PERSISTENT CONCENTRATIONS
- CORRODES METALS, MASONRY, CONCRETE

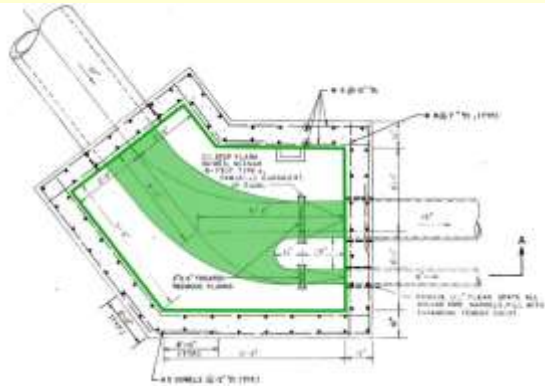


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CHALLENGES

- **EFFECTS / CONCERNS**
 - H_2SO_4 and MIC



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CHALLENGES

- **EFFECTS / CONCERNS**
 - H_2SO_4 and MIC



STRATEGIC SOLUTIONS

- SOURCE PREVENTION
- PRETREATMENT
- MITIGATION
- REHABILITATION and REPAIR

STRATEGIC SOLUTIONS

- **SOURCE PREVENTION**
 - MONITOR and INVENTORY SOURCES
 - INDUSTRIAL USE of SULFUR ACIDS
- **PRETREATMENT**
 - SOURCE REDUCTION
 - POTABLE WATER SYSTEMS

STRATEGIC SOLUTIONS

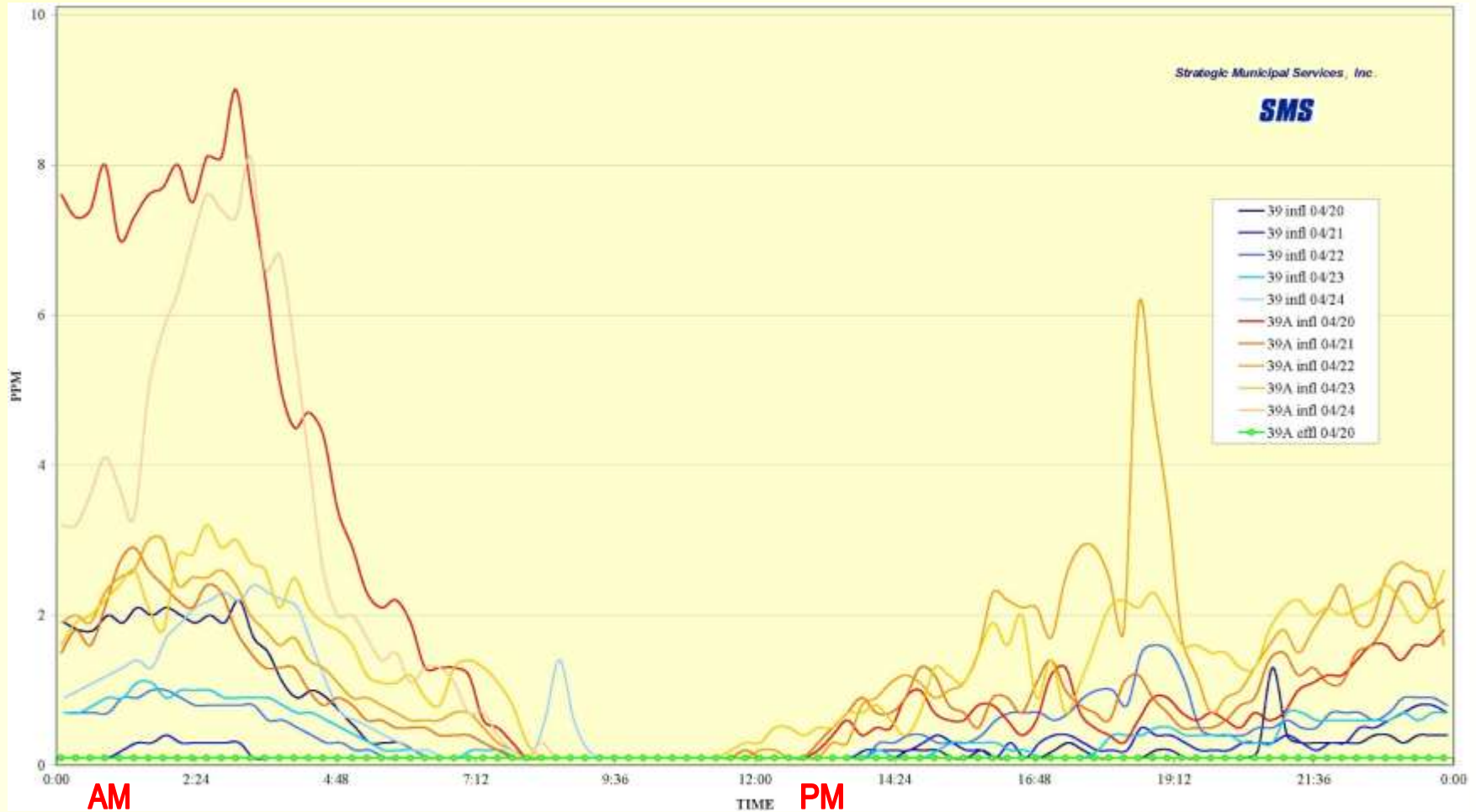
- **MITIGATION**
 - **VENTING** (REMOVE “FOOD” SOURCE)
 - **ODOR / REMOVAL**
 - PRIMARILY H₂S, REDUCED SULFUR and NITROGEN BASED



- TYPICALLY NOT CONVENTIONAL CARBON BASED FILTERS

STRATEGIC SOLUTIONS

- **MITIGATION**
 - **VENTING and ODOR CONTROL**



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STRATEGIC SOLUTIONS

- **MITIGATION**
 - **NEW CONSTRUCTION**
 - CRYSTALLINE TECHNOLOGIES
 - e.g. CONSHIELD, XYPEX
 - COATING SYSTEMS
 - EPOXIES
 - CALCIUM ALUMINATE CEMENTS
 - e.g. APS PERMAFORM, RAVEN
 - AVOID TURBULENT FLOW / DROPS / TRANSITIONS



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STRATEGIC SOLUTIONS

- **REHABILITATION, REPAIR and REPLACEMENT**
 - LINERS - PIPE and STRUCTURES
 - CRYSTALLINE TECHNOLOGIES
 - eg. CONSHIELD, XYPEX
 - COATING SYSTEMS



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STRATEGIC SOLUTIONS

- **REHABILITATION, REPAIR and REPLACEMENT**
 - QUALITY CONTROL – STANDARD TESTS
 - CORROSION RESISTANCE
 - ADHESION
 - UNIFORM and COMPLETE COATING



- “TIPS”
 - NOT POLY-UREA / MOISTURE SENSITIVE SYSTEMS

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