

Wayne County Illicit Discharge Elimination Training Program

DEVELOPED AND PRESENTED BY:


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Water Quality Management Division
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Program Outline


- Introduction
- Basic Investigations
- Advanced Investigations
- Prevention Considerations
- Case Studies
- Tabletop Exercise

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- # Program Outline
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WHAT IS AN ILLICIT DISCHARGE?

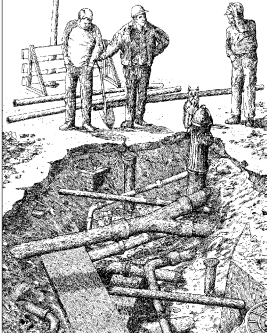
- Failing septic field
 - When sanitary sewage escapes an on-site sewage disposal system and migrates to a water course
- Spilling or dumping
 - Mishandling materials in a manner which allows those materials to migrate to a water course
- Illicit Connection
 - Creates an illicit discharge

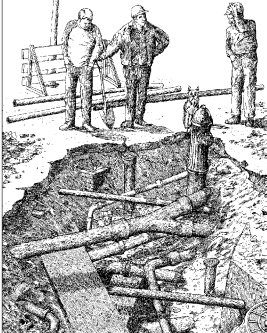
A photograph of an industrial facility, possibly a wastewater treatment plant. It shows large metal structures, pipes, and a concrete floor. There are yellow bollards in the foreground. The image is somewhat blurry and has a yellowish tint.

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WHAT IS AN ILLICIT CONNECTION?

- When a pipe intended for a sanitary sewer ends up in a storm drain



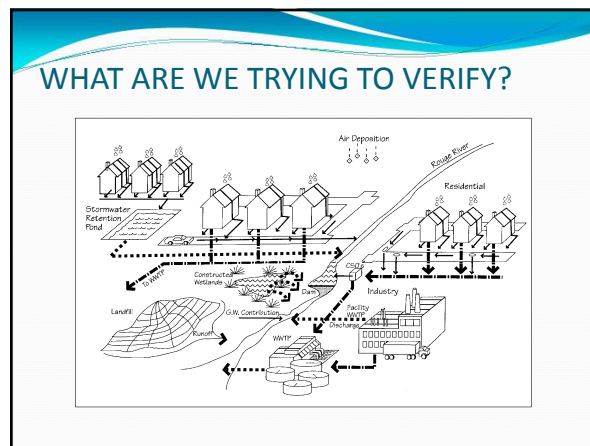
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WHAT ARE WE TRYING TO VERIFY?

The diagram illustrates the complex pathways of contaminants from various sources into a river system. Key components include:

- Stormwater Retention Pond:** Collects runoff from a residential area (labeled with Pb, Cd, Cu, Zn, Cr, Mn, Ni, Fe, Hg, As, Se, V, Mo, Co, Sb, Sn, Bi, W, Br, I, Ba, Sr, La, Ce, Pr, Nd, P, S, Cl, K, Ca, Mg, Na, Li, Rb, Cs, Fr, Be, B, Al, Ga, In, Tl, Pb, Bi, Po, At, Rn, Ac, Th, Pa, U, Np, Pu, Am, Cm, Bk, Cf, Es, Fm, Md, No, Lr) and discharges into the river.
- Landfill:** A source of leachate (labeled with Pb, Cd, Cu, Zn, Cr, Mn, Ni, Fe, Hg, As, Se, V, Mo, Co, Sb, Sn, Bi, W, Br, I, Ba, Sr, La, Ce, Pr, Nd, P, S, Cl, K, Ca, Mg, Na, Li, Rb, Cs, Fr, Be, B, Al, Ga, In, Tl, Pb, Bi, Po, At, Rn, Ac, Th, Pa, U, Np, Pu, Am, Cm, Bk, Cf, Es, Fm, Md, No, Lr) that infiltrates the ground and enters the river.
- Construction site:** A source of sediment and contaminants (labeled with Pb, Cd, Cu, Zn, Cr, Mn, Ni, Fe, Hg, As, Se, V, Mo, Co, Sb, Sn, Bi, W, Br, I, Ba, Sr, La, Ce, Pr, Nd, P, S, Cl, K, Ca, Mg, Na, Li, Rb, Cs, Fr, Be, B, Al, Ga, In, Tl, Pb, Bi, Po, At, Rn, Ac, Th, Pa, U, Np, Pu, Am, Cm, Bk, Cf, Es, Fm, Md, No, Lr) that enters the river.
- Air Deposition:** Contaminants (labeled with Pb, Cd, Cu, Zn, Cr, Mn, Ni, Fe, Hg, As, Se, V, Mo, Co, Sb, Sn, Bi, W, Br, I, Ba, Sr, La, Ce, Pr, Nd, P, S, Cl, K, Ca, Mg, Na, Li, Rb, Cs, Fr, Be, B, Al, Ga, In, Tl, Pb, Bi, Po, At, Rn, Ac, Th, Pa, U, Np, Pu, Am, Cm, Bk, Cf, Es, Fm, Md, No, Lr) falling from the atmosphere into the river.
- Residential:** A source of contaminants (labeled with Pb, Cd, Cu, Zn, Cr, Mn, Ni, Fe, Hg, As, Se, V, Mo, Co, Sb, Sn, Bi, W, Br, I, Ba, Sr, La, Ce, Pr, Nd, P, S, Cl, K, Ca, Mg, Na, Li, Rb, Cs, Fr, Be, B, Al, Ga, In, Tl, Pb, Bi, Po, At, Rn, Ac, Th, Pa, U, Np, Pu, Am, Cm, Bk, Cf, Es, Fm, Md, No, Lr) that enters the river.
- Industry:** A source of contaminants (labeled with Pb, Cd, Cu, Zn, Cr, Mn, Ni, Fe, Hg, As, Se, V, Mo, Co, Sb, Sn, Bi, W, Br, I, Ba, Sr, La, Ce, Pr, Nd, P, S, Cl, K, Ca, Mg, Na, Li, Rb, Cs, Fr, Be, B, Al, Ga, In, Tl, Pb, Bi, Po, At, Rn, Ac, Th, Pa, U, Np, Pu, Am, Cm, Bk, Cf, Es, Fm, Md, No, Lr) that enters the river.

The diagram shows the flow of water and contaminants from these sources into the River, highlighting the complexity of the system and the need for verification.



WHAT CAN THE FIELD STAFF DO TO CLEAN UP OUR ENVIRONMENT?

- Be an alert observer
- Report suspicious discharges

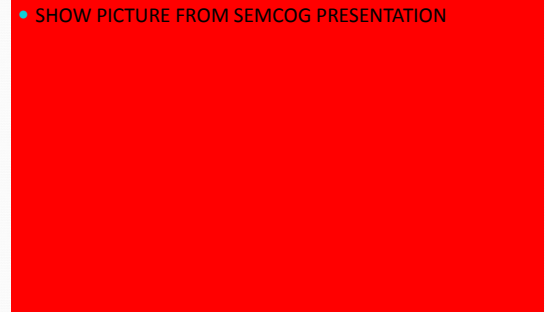
Remember - even small discharges are large pollutant sources if they pollute day after day after day...



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APPLICABLE TO DPW YARDS

- SHOW PICTURE FROM SEMCOG PRESENTATION



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Tabletop Exercise

WHAT IS THE PURPOSE OF AN OUTFALL SURVEY?

- Locate outfalls
- Identify areas with potential illicit connections/discharges
- Determine conditions of outfall structures
- Locate potential sample collection points
- Identify failing septic systems along streambanks
- Locate abandoned dumps along streambanks



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FIELD PLANNING & PREPARATIONS

- Pre-survey planning
 - Identify area
 - Prepare data collection method
 - Develop sampling method, if necessary
- Community notification
- Examine sewer maps
- Identify outfall ownership
- Assemble equipment
- Survey form



FIELD PLANNING & PREPARATIONS

- Personnel safety
 - Property rights
 - Traffic control
 - Confined space entry
 - Opening of manhole covers
 - Exposed barrels
 - Crew size
- Communication & security
 - Personal safety equipment
 - Insects & animals
 - First aid
 - Terrain
 - Plants



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OUTFALL SURVEY

- Field procedure
 - Photographs
 - Measurements
 - Location/GPS
 - Type of outfalls



- Record physical condition of outfall/headwall
- Record stream conditions
- Other observations
- Ownership verification

TYPES OF OUTFALLS



OUTFALL SURVEY: SUSPICIOUS DISCHARGES

- Recognizing the signs
- Potential pollution sources
- Describe on outfall survey form
- Sampling



OUTFALL SURVEY: SUSPICIOUS DISCHARGES

- Stream bank observations
 - Exposed fill
 - Erosion
 - Discharging septic systems
 - Former landfills
 - Dump sites



OUTFALL SURVEY: DISTINGUISHING VISUAL OBSERVATIONS

- Sewage discharge
- Non-sewage discharge
- Natural phenomena



SEWAGE DISCHARGE

- Gray/Black water/staining



SEWAGE DISCHARGE

- Sewage Fungus



SEWAGE DISCHARGE

- Oil and paper



SEWAGE DISCHARGE

- Failing drain field



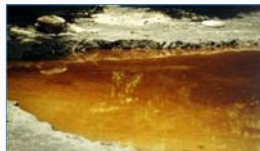
SEWAGE DISCHARGE

- Septic system discharge



NON-SEWAGE DISCHARGE

- Oily discharge



NATURAL PHENOMENA

- False Oil sheen



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NATURAL PHENOMENA

- Foaming and Tannin



NATURAL PHENOMENA

- Iron bacteria



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OUTFALL SURVEY: PHYSICAL PARAMETERS

- Odor
 - Industrial sources: can include spoiled organic (rotten egg smell) products, oil, gasoline, specific chemicals, solvents
 - Sewage sources: foul odor
- Color/Turbidity
 - Groundwater is usually clear and colorless
 - Inappropriate discharges are often turbid or discolored water

FALSE NEGATIVES CAN OCCUR

The absence of these parameters does not mean that an illicit discharge is not occurring

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OUTFALL SURVEY: PHYSICAL PARAMETERS

- Floatable Matter
 - Industrial sources: animal fats, food products, oils, solvents, sawdust, foams, packing materials, fuels
 - Sanitary sources: fecal matter, other sanitary wastes
- Deposits and Stains
 - Coatings that remain on the streambank or on the outfall structure after a non-stormwater discharge has ceased.
 - Industrial sources: often dark staining
 - Sanitary sources: black and gray

FALSE NEGATIVES CAN OCCUR

The absence of these parameters does not mean that an illicit discharge is not occurring

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OUTFALL SURVEY: PHYSICAL PARAMETERS



OUTFALL SURVEY: PHYSICAL PARAMETERS

- Vegetation
 - Inhibited or excessive growth at the outlet based on surrounding conditions
 - Consider weather conditions and time of year
 - Vegetation conditions can show effects after the flow ceases

FALSE NEGATIVES CAN OCCUR

The absence of these parameters does not mean that an illicit discharge is not occurring

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OUTFALL SURVEY: PHYSICAL PARAMETERS

- Structural Damage
 - Industrial discharges with abnormal pH can cause pitting or spalling of the outfall structure
 - Don't confuse with the results of structure age, hydraulic scour or poor construction

FALSE NEGATIVES CAN OCCUR

The absence of these parameters does not mean that an illicit discharge is not occurring

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OUTFALL SURVEY: CHEMICAL PARAMETERS

- Ammonia (NH₃)
 - Produced by decay of organic nitrogen compounds
 - Low background levels exist from decay of plant and animal matter
 - Use to identify sanitary wastewater & septic tank effluent. Can also indicate ammonia based cleaners & fertilizer runoff
 - Visual method, numeric result



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OUTFALL SURVEY: CHEMICAL PARAMETERS

- Detergents (Anionic Surfactants)
 - Found in household detergents
 - Use to identify sanitary wastewater, but not septic tank effluent
 - Visual method, numeric result
 - Low background levels exist – why?

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OUTFALL SURVEY: CHEMICAL PARAMETERS

- Conductivity
 - Use as an indicator of dissolved solids
 - Use to identify sanitary wastewater, septic effluent, industrial water and irrigation water
 - Instrumental method, numeric result
 - Tap water very low (225 μ S/cm)

OUTFALL SURVEY: CHEMICAL PARAMETERS

- Temperature
 - Use to identify sanitary wastewater, septic effluent and industrial water
 - Useful during cold months
 - Instrumental method, numeric result

SOUTHEAST MICHIGAN EXPERIENCE: FIELD PARAMETERS

- Add parameter summary from the idep work group

POST SURVEY TASKS

- Summarize field information
- Prioritize your sites based on field screening
- Address “hot spots” and complaints first
- Determine system ownership
- Determine approach for investigation

Program Outline

Introduction

Basic Investigations

Advanced Investigations

Prevention Considerations

Case Studies

Tabletop Exercise

ELEMENTS OF ADVANCED INVESTIGATION

- Planning the investigation
- Narrowing down the problem area
- Isolating the source



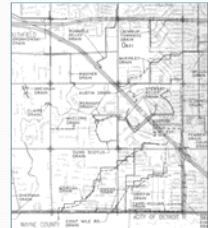
PLANNING THE INVESTIGATION

- What area does the outfall/storm sewer system drain?
- What is the land use in area?
 - Residential/business/commercial
 - Know the “lay of the land”



NOTE:

- Is it a CSO area?
- Sewer separation projects
- Hybrid systems
- Other exceptions



PLANNING THE INVESTIGATION

- Reviewing drain plans
- Select inspection points
 - Field verify
- Notify affected parties of investigation efforts/problem
- Utilize mailings to gain public buy-in



PLANNING THE INVESTIGATION

- Discuss investigation details (safety, procedures and equipment)
- Notify local agencies



TYPICAL EQUIPMENT

- Survey forms
- USGS maps
- Compass
- Backpack/equipment bag
- Sledgehammer
- Manhole hook
- Measuring tape
- Flashlight
- Rope
- Mirrors
- Hard hats
- Safety vests
- Latex gloves
- Waders
- Field radios
- Camera
- GPS
- Test kits/meters



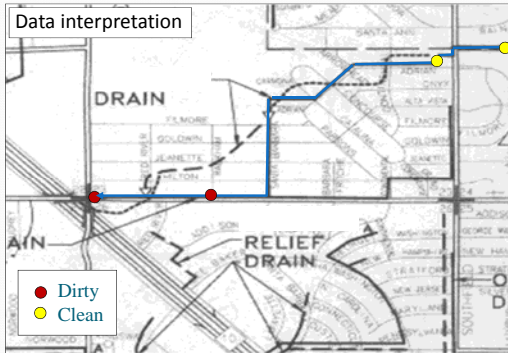
NARROWING DOWN THE PROBLEM AREA

- Inspect planned locations
- Survey the investigation area
 - Adjacent land use
 - Commercial/industrial housekeeping practices
 - Signs of dumping
 - Other irregularities



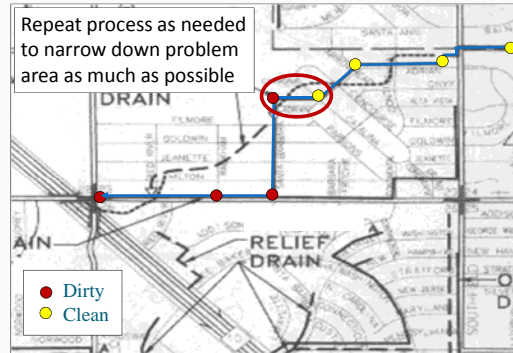
NARROWING DOWN THE PROBLEM AREA

Data interpretation



NARROWING DOWN THE PROBLEM AREA

Repeat process as needed to narrow down problem area as much as possible



ISOLATING THE SOURCE

- Techniques
 - Televising the sewer
 - Dye testing
 - Intensive sampling
 - Other



TELEVISING TECHNIQUE

- Televising (T.V.) the sewer
 - To see illicit taps
 - To see condition of the sewer line
 - To create permanent record

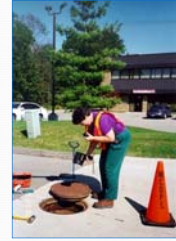


PROS/CONS OF TELEVISIONING

- Pros
 - May have equipment in-house
 - Easy to see active taps
 - Record of observations
 - Only way to observe pipe between manholes
 - Less intrusive
- Cons
 - Expensive to hire out work
 - Difficult to characterize inactive taps
 - Interpreting the results is time consuming
 - Won't work on obstructed sewers (root overgrown, etc.)
 - May require confined space entry
 - May be pipe-size limited, depending on type of equipment
 - Won't work in water-filled pipes

DYE TESTING TECHNIQUE

- Storm sewer
 - May show inter-connections between sewer systems
 - Leaks from a sanitary sewer to storm sewer (e.g., sanitary sewer goes through a county drain)
 - MDEQ notification required
- Facility
 - To determine if illicit connections exist



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DYE TESTING FACILITIES

- Equipment
 - Million candle power light
 - Dye
 - Radios
 - Other, as required
- Other issues
 - Confined space
 - Manhole access



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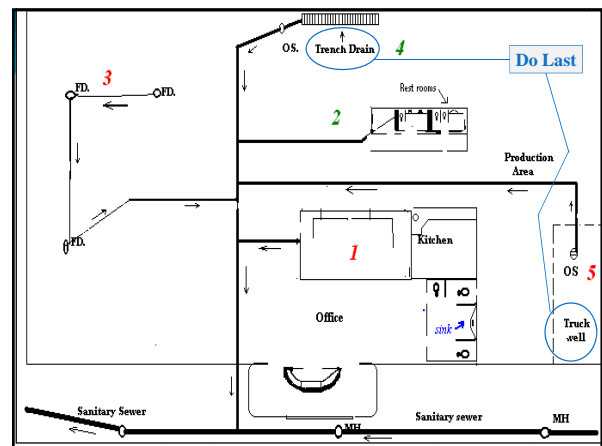
DYE TESTING FACILITIES

- Site visit
 - Program introduction
 - Visit purpose
 - Small facility
 - Large facility
- Site evaluation
 - Small facility
 - Site visit
 - Housekeeping practices
 - Large facility
 - Site drawings
 - Site visit
 - Housekeeping practices
 - Formulate testing plan



DYE TESTING FACILITIES

- Must obtain Michigan Rule 97 approval
- Dropping the dye
 - Liquid/strips (state-approved)
 - Alternate colors
 - Account for all dye



DYE TESTING FACILITIES

- Field records
 - Site utility plan
 - Mark plan
 - Field sketch
 - Field data
 - Fixtures tested, date, time and dye color
 - Photos



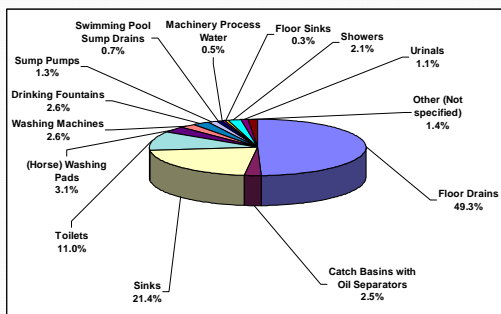
DYE TESTING FACILITIES

- Exit interview
 - Results of dye test
 - Other potential issues
 - Storm water in sanitary sewer
 - Improper housekeeping practices (change SOPs)



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Wayne County Illicit Connections October 1987 through December 2005



PROS/CONS OF DYE TESTING

- Pros
 - Easy to do
 - Materials are inexpensive
 - Results will show specific source
- Cons
 - Time consuming in low flow
 - Difficult to see dye
 - Need homeowners/business owners cooperation
 - Public reaction to dye in stream



INTENSIVE SAMPLING TECHNIQUE

- To find off-hours or intermittent flows or peak activity
 - Automatic samplers
 - Flow meters
 - Multiple sampling at specific sites



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PROS/CONS OF INTENSIVE SAMPLING

- Pros
 - Good for intermittent flows
 - Fills data gaps
 - Good for off-hour sampling
 - Auto samplers can be left unstaffed
 - Useful in residential areas
 - Effective method to isolate source areas
- Cons
 - Does not point to specific source
 - May create inconclusive data
 - Limited holding times
 - Expensive lab analysis
 - May require confined space entry

OTHER TECHNIQUES

- Smoke testing
- Drain walk
- Use your imagination



ELIMINATING THE DISCHARGE

- Contact the responsible party by informal and formal means
- State and federal regulations
 - Clean Water Act
 - Michigan Act 451, Part 31, Section 324.3109 of 1994
- Local codes and ordinances
 - Failing septic systems (Health Code)
 - Illicit connections (Michigan/International Plumbing Code)
 - Discharges to County Drains (Michigan Drain Code)
 - Dumping (litter ordinances)

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ELIMINATING THE DISCHARGE

- Give responsible party time to address problem
- Follow-up investigation (to see if problem is fixed)
- If problem is fixed, investigation is closed
 - Site visit to confirm corrections
 - Send confirmation letter

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PREVENTION CONSIDERATIONS

- Designers and plan reviewers are a key to "prevention"
 - Plans and specs
 - First line of IDEP defense
- Site related design issues
 - Know public sewer infrastructure
 - Foundation sump pumps
 - Mobile floor washing machines
- Building related issues: original design, modifications and additions
 - Truck wells, floor drains



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Introduction

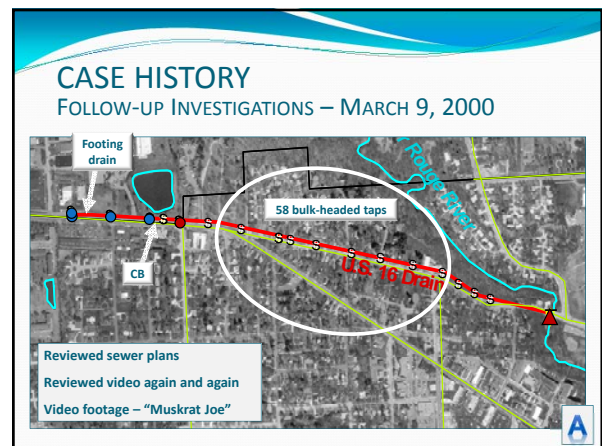
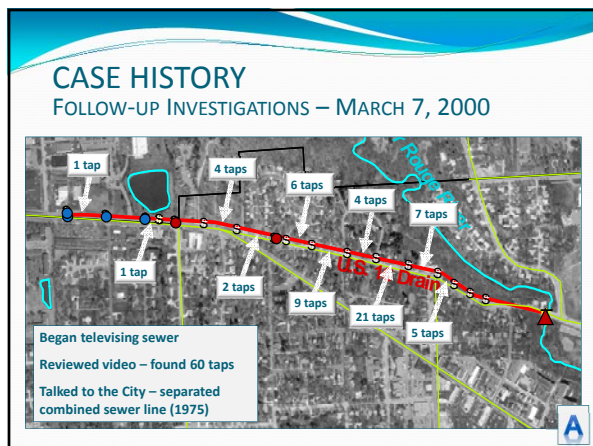
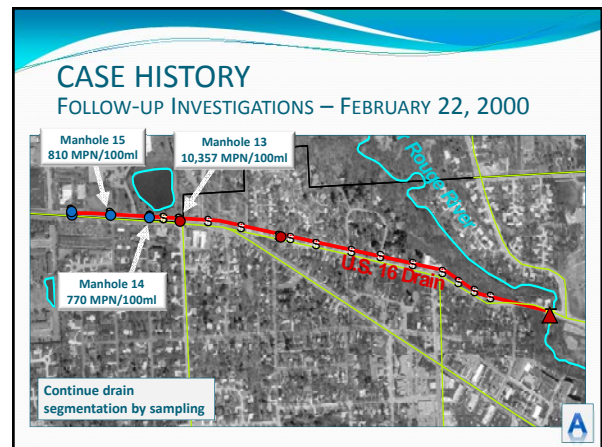
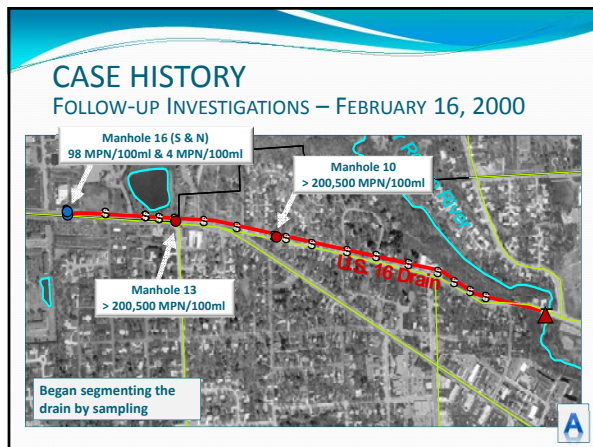
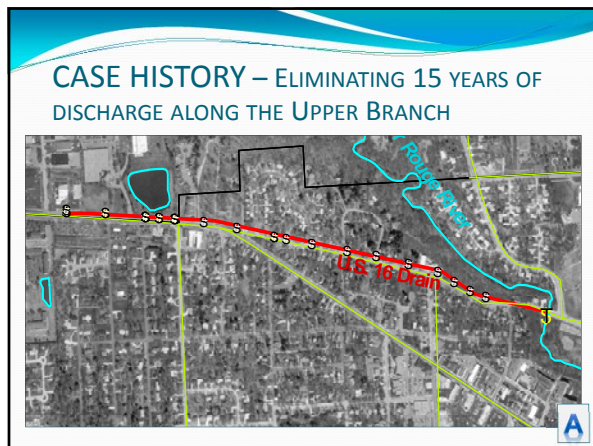
Basic Investigations

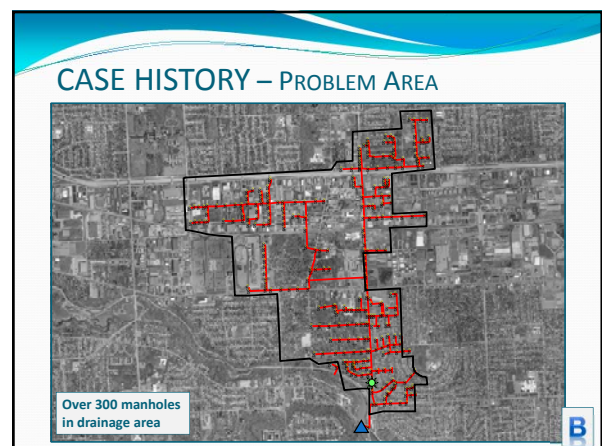
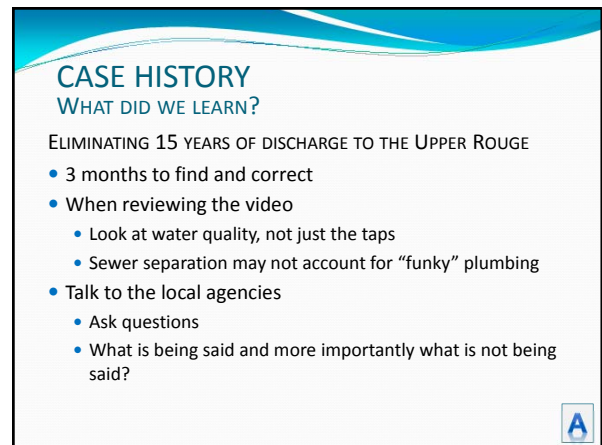
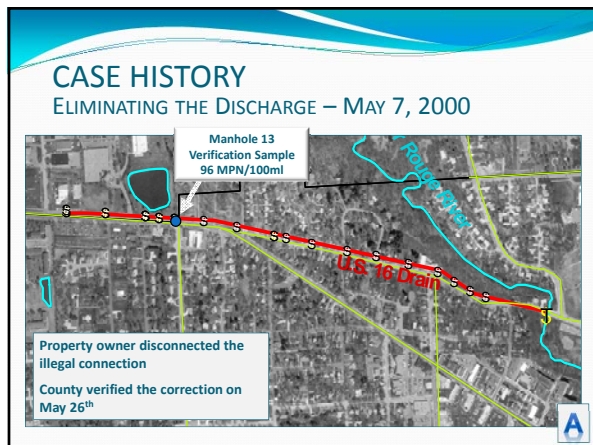
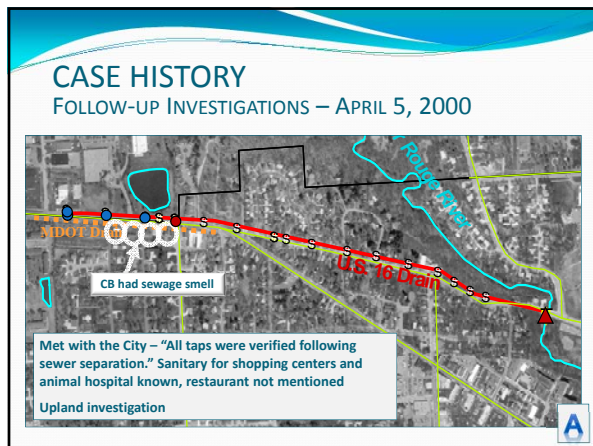
Advanced Investigations

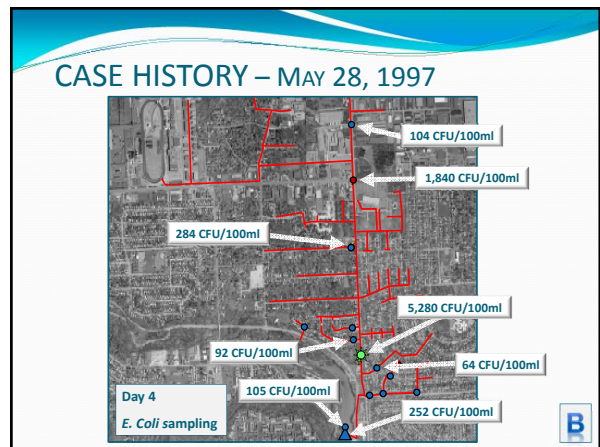
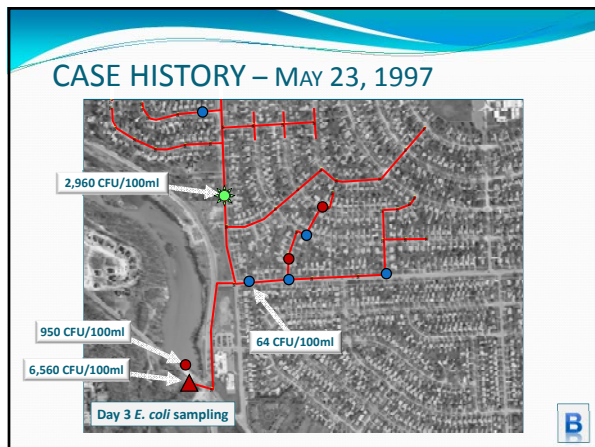
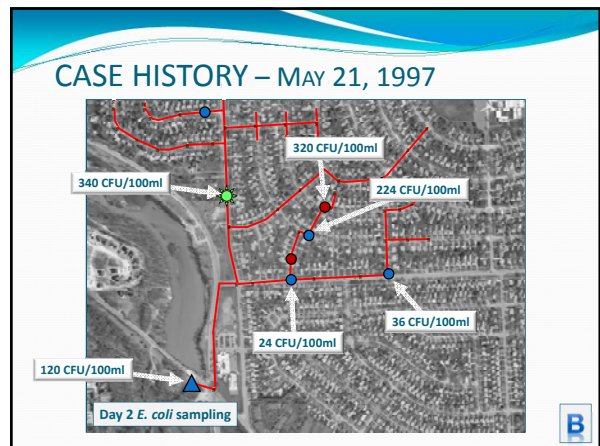
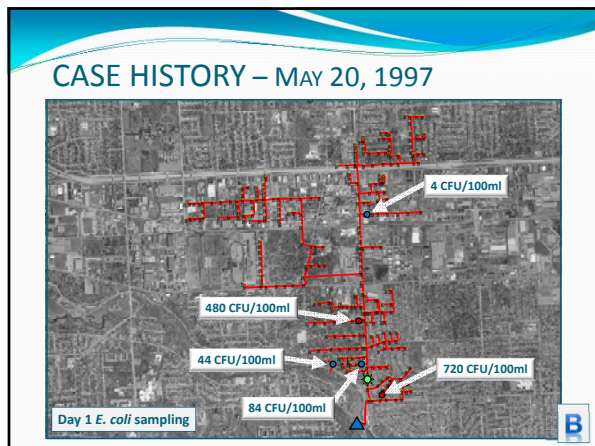
Prevention Considerations

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CASE HISTORY

INITIAL INVESTIGATIONS

- 1997 city planning
 - TV'ed sewer – no taps (completed)
 - Sent letters to residents (not completed)
 - Dye tested homes (not completed)
- 1997 County actions
 - Intermittent monitoring
 - Does problem still exist?
 - Evidence of problem disappeared
 - Continued monitoring



CASE HISTORY

ELIMINATING THE DISCHARGE

- Memorial Day 1998 – problem back!
 - Sent letters out
 - Dye testing
 - Educational material sent to homeowners
- Late 1998 – evidence problem disappeared
- 1999 - Clean
- 2000 - Clean



CASE HISTORY

WHERE DID IT COME FROM?

- Probable cause
 - Recreational vehicle/boat dumping sanitary waste
 - Pet waste



CASE HISTORY

WHAT DID WE LEARN?

RESTORING RECREATIONAL USE ALONG THE MIDDLE BRANCH

- Persistence pays
- Observable presence in the area had an affect
- Public education worked



CASE HISTORY – FOLLOW YOUR NOSE

- Foul odor in wood lot near residential property
- Sewage like odor coming from manhole in the street



CASE HISTORY – JULY 1997



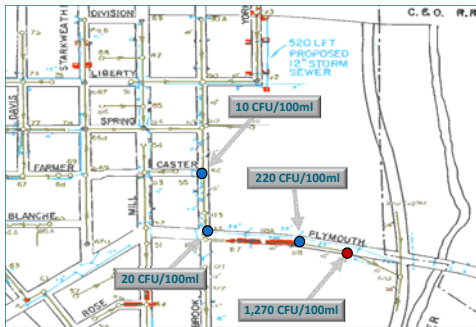
CASE HISTORY – NOVEMBER 1997



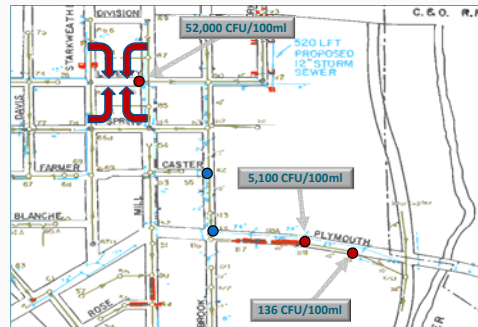
CASE HISTORY – MAY 15, 1998



CASE HISTORY – MAY 27, 1998



CASE HISTORY – SEPTEMBER 27, 1998



CASE HISTORY

WHAT DID WE LEARN?

FOLLOW YOUR NOSE

- There is usually a basis for a persistent complaint
- Timing is everything
- Sometimes you just get lucky

CASE HISTORY

JUST WHEN YOU THOUGHT IT WAS SAFE



CASE HISTORY – JUNE 2, 2005

- Strong sewage odor reported from the same manhole in the street
- Investigation leads to the same outfall
 - A plugged sanitary sewer line upstream is found
 - Line unplugged, jetted and the sewage flow stops in the storm sewer
 - How did it get into the storm sewer???



CASE HISTORY

ISOLATING THE SOURCE

- A cracked sanitary sewer crossing through the storm sewer is the culprit...
- The sanitary sewer line blockage caused sewage to back up and overflow into the storm sewer



CASE HISTORY

ELIMINATING THE DISCHARGE

- Now is it really safe?!?!?



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GROUP PROBLEM SOLVING SESSION

- Divide the class into groups
- Each group must select a leader
- Leaders will present problem methodology and solution to the class
- Rules
 - Each group will have limited resources
 - Each group will have 1 hour to solve the problem
 - Facilitators will be available to answer questions

GROUP PROBLEM SOLVING SESSION

PROBLEM

- Milky white discharge
- Happens frequently; not every day
- Sewage-like odor
- Black grease and oil observed
- Suds noticed on riffles 3 feet downstream of outfall
- No suds present upstream of outfall
- On way to site, drove through commercial strips and medium/light industrial area
- Investigation begins in late summer

OBJECTIVE

- Find the source(s) of the illicit discharges



