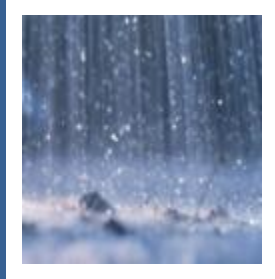


# Lower Mill Creek Partial Remedy

Hamilton County  
Board of County  
Commissioners  
Public Hearing

*October 8, 2012*



# Today's Agenda

- MSD's Recommended Alternative
- MSD's Strategic Separation Approach
- Model & Local Data
- Confidence in Results
- Regulator Feedback

# Recommended Alternative

Sub-Basin	MG CSO Reduction	Capital Cost (2006\$)	Cost/Gallon	No. of CSOs	CSOs
Lick Run	726	\$200,492,000	\$0.28	1	5
Wooden Shoe	156	\$ 27,534,000	\$0.17	2	217, 483
West Fork	299	\$73,971,000	\$0.25	12	117,123,125,126,127, 128,130,203,527,528, 529,530
Bloody Run	93	\$10,651,000	\$0.04	1	181
CSO 488 Storage	47	\$3,421,000	\$0.23	1	488
4 RTCs	737	--	--	2	5,125,482,485
<b>Total</b>	<b>2,058</b>	<b>\$316,069,000</b>		<b>19</b>	

# Sustainable Alternative

From April 2, 2012 LMCPR Preliminary Findings Report

Real Time Control Facilities (CSOs)	5,125, 181, 482, 485/487
West Fork Channel Grate Modifications	YES
New Storm Sewers (ft)	104,400
Relocated Combined Sewers (ft)	21,500
Naturalized Channels (ft)	5,500
Valley Conveyance System (ft)	8,100
Natural Conveyance/Stream Separation (ft)	20,000
Non-Tunnel Storage Capacity (mg)	5
Additional EHRT Capacity (mgd)	20
Stormwater Detention Basins (acre - ft)	80

## Phase 1 Highlights

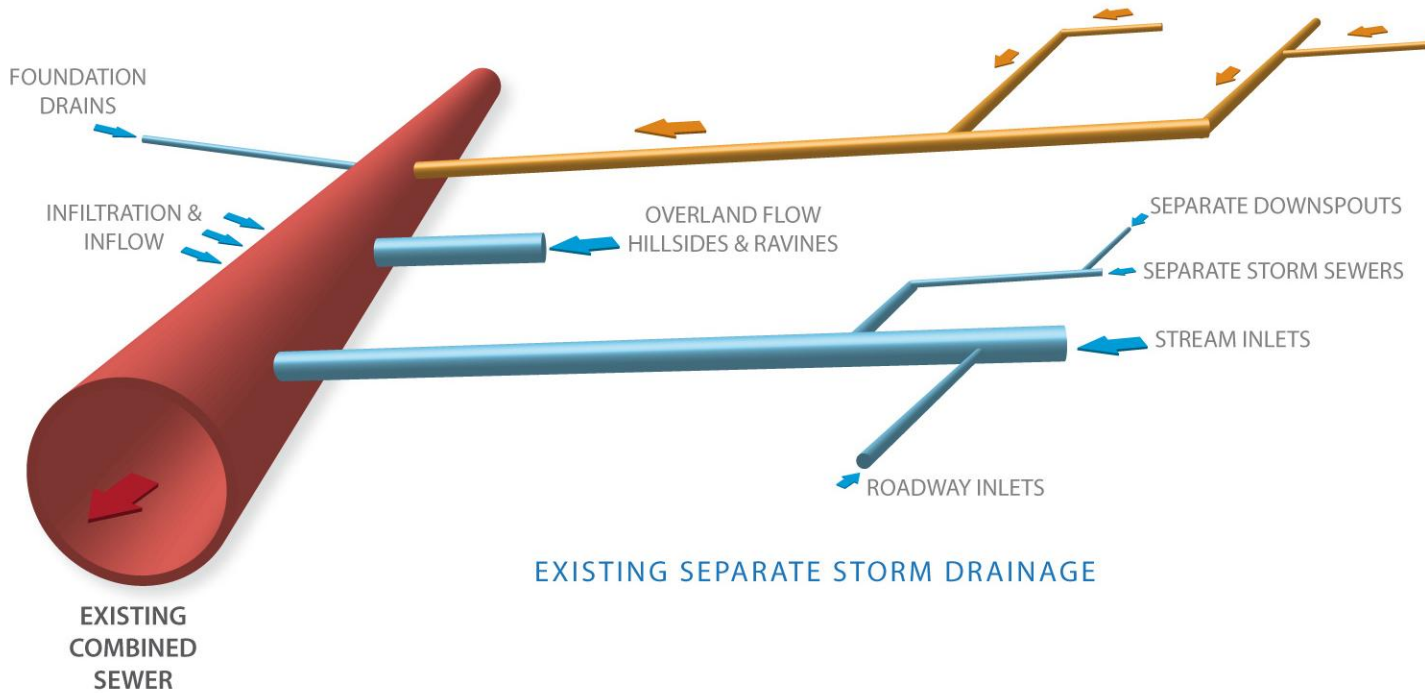
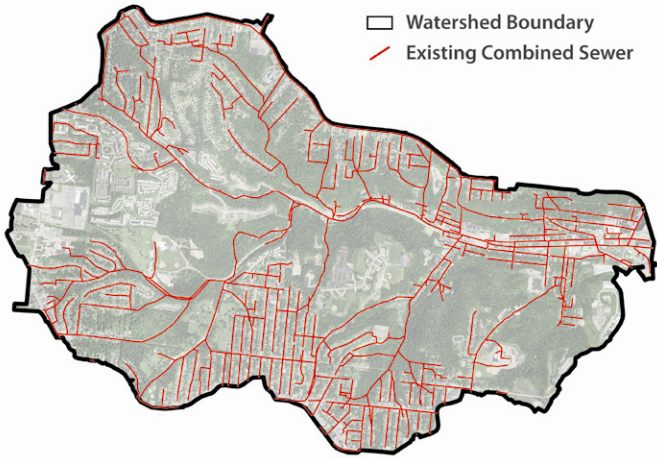
- Kings Run Source Control & Storage
- Bloody Run, Mitchell, Ross Run RTC
- Storage at CSO 488
- West Fork Source Control, Storage & RTC
- Lick Run Source Control & RTC





# Existing CSS Infrastructure

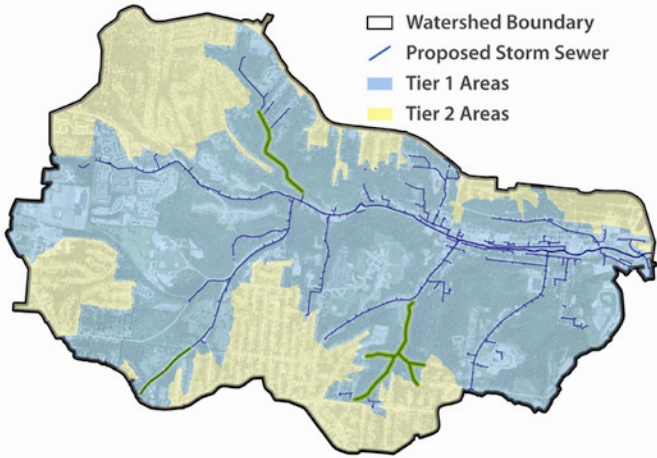
- Watershed Boundary
- Existing Combined Sewer



EXISTING SEPARATE STORM DRAINAGE

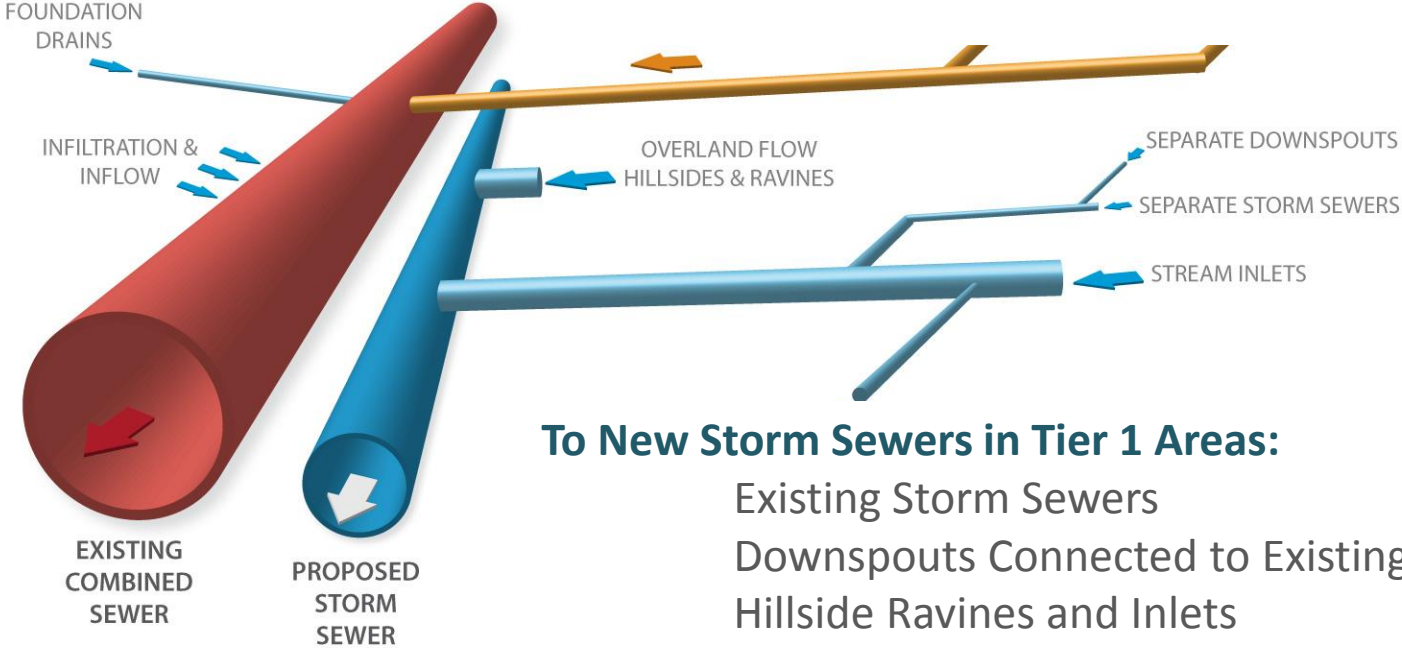
- LEGEND
- EXISTING SEPARATE STORM DRAINAGE
  - EXISTING COMBINED SEWER
  - EXISTING SEPARATE SANITARY

# Strategic Separation Approach



## To Existing Combined Sewers:

- Foundation Drains
- Downspouts Connected to Existing CSS
- Inflow and Infiltration
- Stream Inlets In Tier 2 Areas
- Roadway Inlets in Tier 2 Areas



## To New Storm Sewers in Tier 1 Areas:

- Existing Storm Sewers
- Downspouts Connected to Existing Storm
- Hillside Ravines and Inlets
- Stream Inlets
- Roadway Inlets
- Overland Flow (Tier 2 also)

# Model & Local Data

The Consent Decree requires a wet weather solution that is based on USEPA's hydraulic and hydrologic modeling software.



## Local Data Used for Inputs

Pipe Sizes & Shapes  
Invert Elevations  
Hydraulic Interconnections  
Sediment Depth  
Underflow Pipe Diameters  
Regulator Function  
Topography & Land Use

## Local Data to Refine Model's Assumptions

Pan Evaporation Data  
300 Soil Borings – soil & groundwater  
Ops Interviews – surcharges, pumps  
Weir & Orifice Settings  
Runoff Catchment Parameters

## Local Data to Confirm Model's Results

Sanitary Flow Monitoring  
Storm Flow Monitoring  
Telog Overflow Data  
USGS Mill Creek Level Gauges  
RTC & Interceptor Level Monitors



CONFIGURATION OF THE COLLECTIONS SYSTEM  
**EXISTING CONDITIONS**  
IMAGE NOT TO SCALE HUMAN NATURE, INC.

- LEGEND
- EXISTING SEPARATE STORM DRAINAGE
  - EXISTING COMBINED SEWER
  - EXISTING SEPARATE SANITARY

## Local Data Used for Inputs

- Pipe Sizes & Shapes
- Invert Elevations
- Hydraulic Interconnections
- Sediment Depth
- Underflow Pipe Diameters
- Regulator Function
- Topography & Land Use

Local Data to

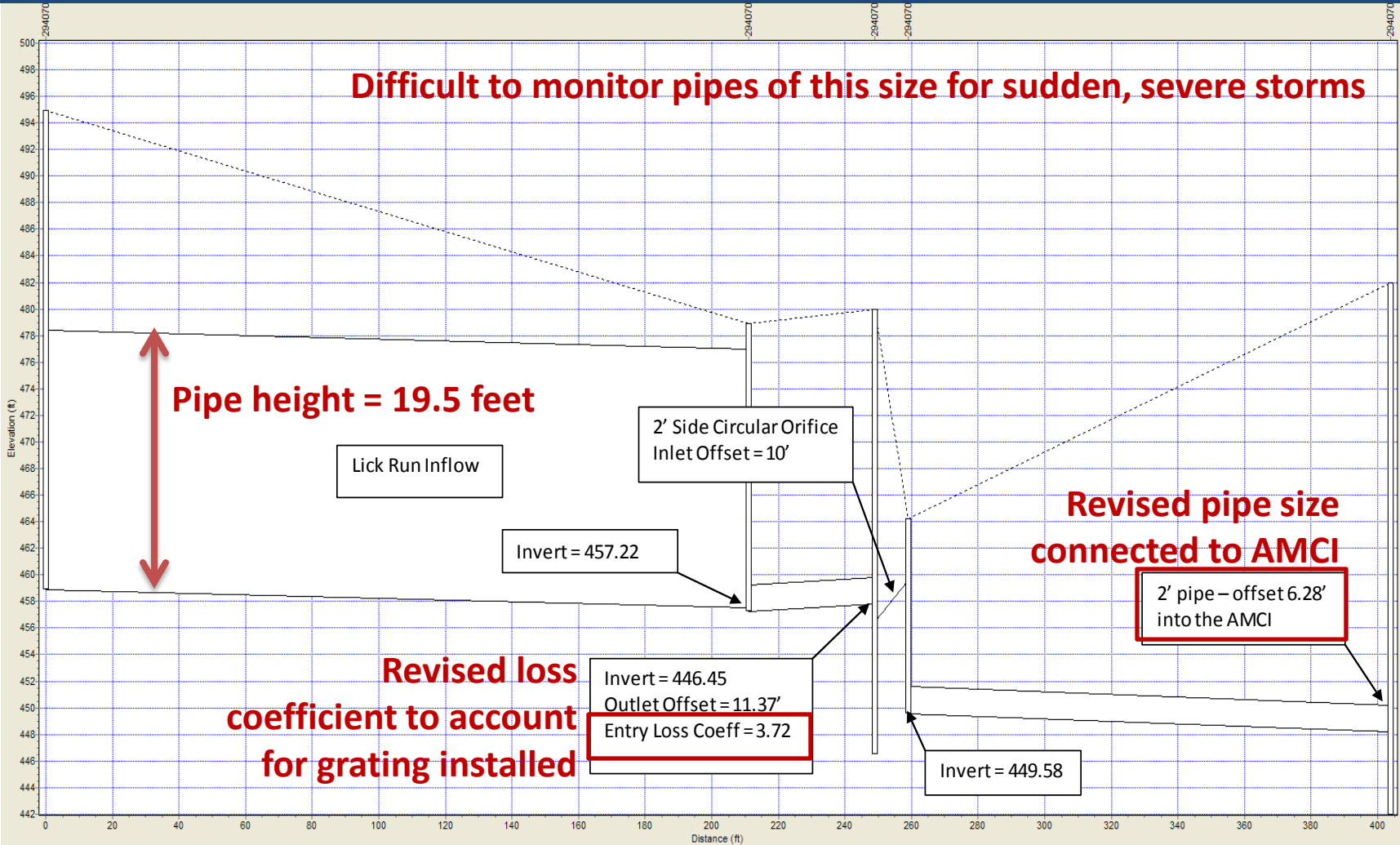
# INPUT INTO MODEL



# Local Data – Model Inputs

## Updated Underflow Structure

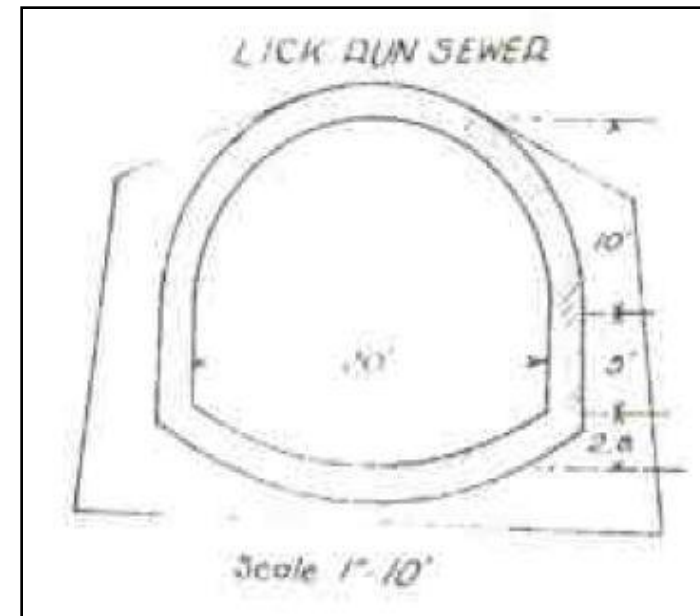
**Difficult to monitor pipes of this size for sudden, severe storms**



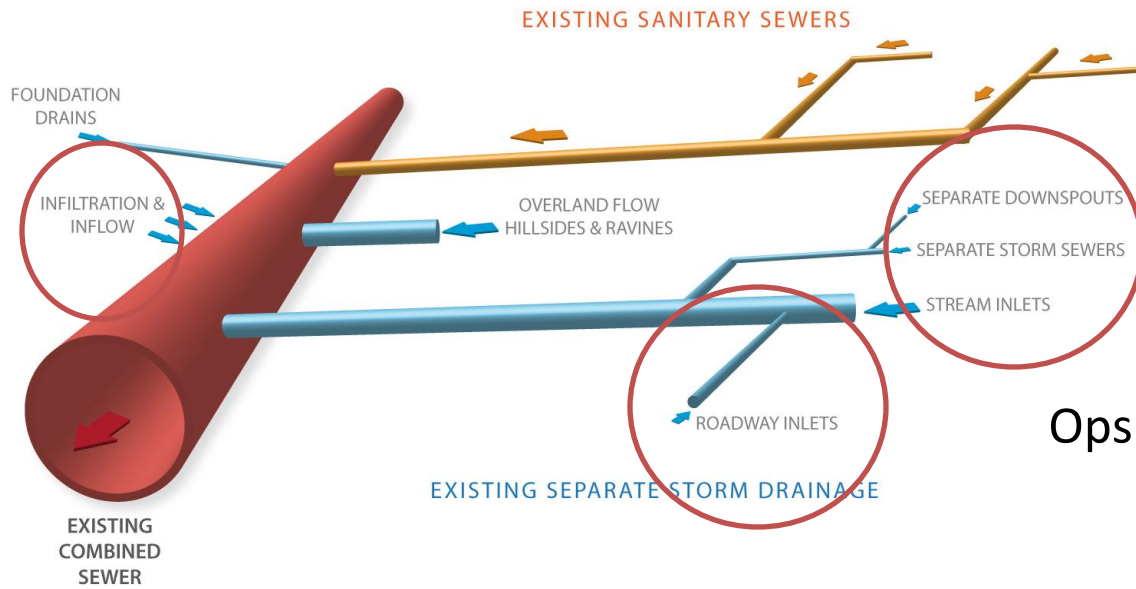
# Model Updates

- ✓ Added 10,000 sf of area for each node
- ✓ 9 sealed manholes adjusted to prevent surcharge
- ✓ Created custom shapes for conduits

- Ponding turned on
- Blind MHs
- Shape/Size Updates



Conduit	Original Shape	Original Size	New shape	New size
28605024-28605025	HORIZ_ELLIPSE	17.83' x 20'	CUSTOM	17.8' x 20'
28605025-28605026	HORIZ_ELLIPSE	17.83' x 20'	CUSTOM	17.8' x 20'
28605026-28605029B	RECT_CLOSED	17.83' x 20.5'	CUSTOM	17.8' x 20'
28605029B-29408023	RECT_CLOSED	17.75' x 20.5'	CUSTOM	17.8' x 20.5'
29408023-29408050	CIRCULAR	14.5'	CUSTOM	17.8' x 20.5'
29408050-29408049	CIRCULAR	14.5'	CIRCULAR	19.5'



## Local Data to Refine Model's Assumptions

Pan Evaporation Data

300 Soil Borings

Ops Interviews – surcharges, pumps

Weir & Orifice Settings

Runoff Catchment Parameters

CONFIGURATION OF THE COLLECTIONS SYSTEM  
**EXISTING CONDITIONS**  
IMAGE NOT TO SCALE

HUMAN NATURE, INC.

### LEGEND

- EXISTING SEPARATE STORM DRAINAGE
- EXISTING COMBINED SEWER
- EXISTING SEPARATE SANITARY

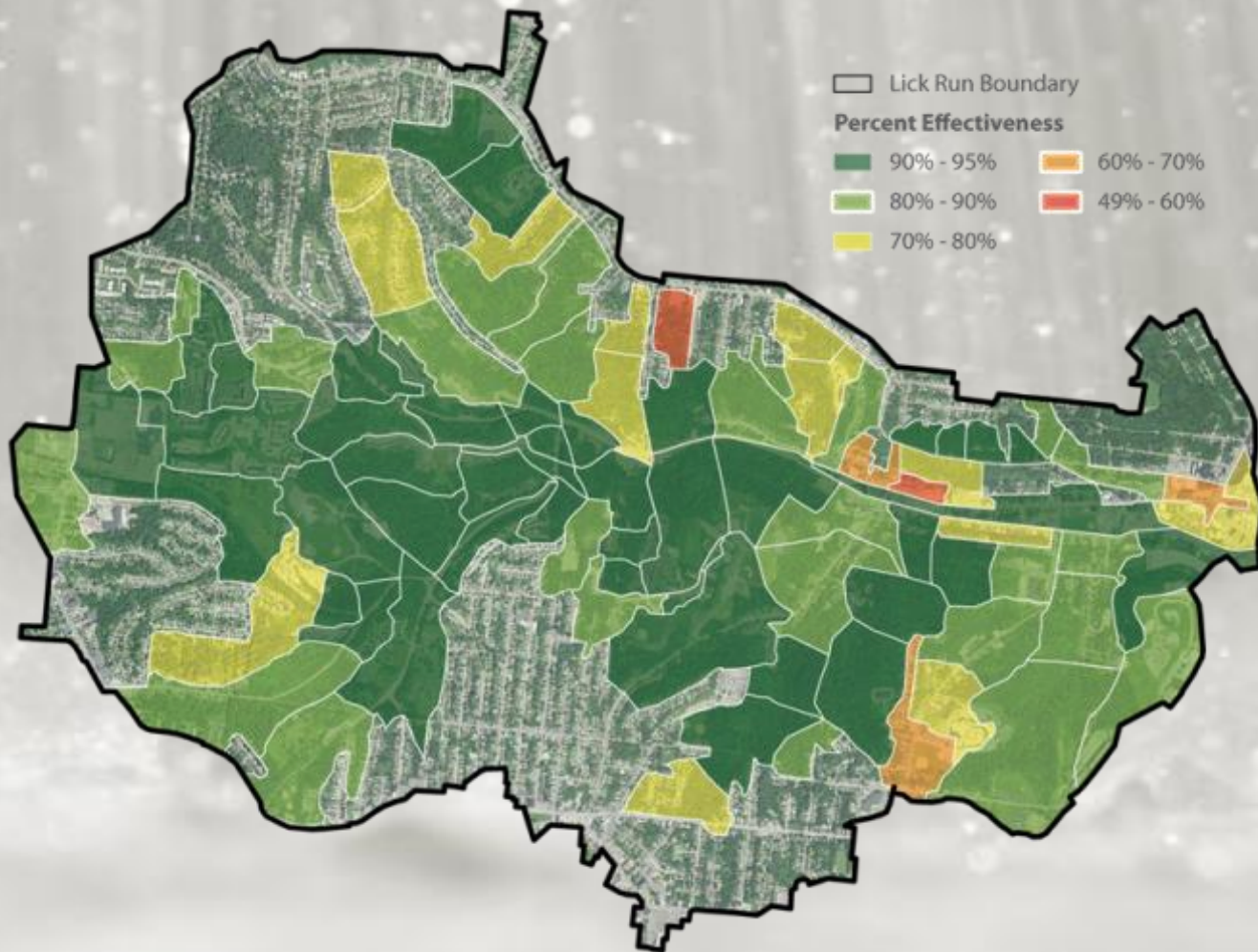
Local Data to

# REFINE MODEL ASSUMPTIONS

# Lick Run Separation Assumptions Summary

- Pan elevation data based upon local NOAA information added into the model to account for local climatic conditions in lieu of using regional information
- 300 soil borings were advanced to confirm soil conditions and the ground water elevation for the Lick Run area in lieu of using regional information
- Operational staff interviews conducted to gain an accurate understanding of locations of surcharges in the existing system and control settings
- Weir and orifice control setting and operational logic were adjusted to match actual conditions in lieu of using typical values
- Runoff catchment parameters were field verified to account for local data unique to each sub-catchment areas in lieu of using regional published information

# Lick Run Percent Stormwater Capture Results





# Local Data – Refine Assumptions



## FA-2

Part of Queen City and Cora Avenues R/W  
Sewer Separation

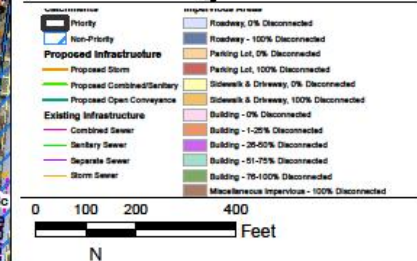
**Lick Run Conceptual Plan:**  
Estimated Percent Effectiveness - 90%

**Detailed Impervious Evaluation:**  
Estimated Percent Effectiveness - 82%

Catchment Area: 27.18 Acres  
Roadway: 0.15 Acres  
Building: 1.72 Acres  
Parking: 0.30 Acres  
Driveways and Sidewalks: 1.08 Acres  
Miscellaneous Impervious: 0.01 Acres  
Total Pervious Area: 23.93 Acres

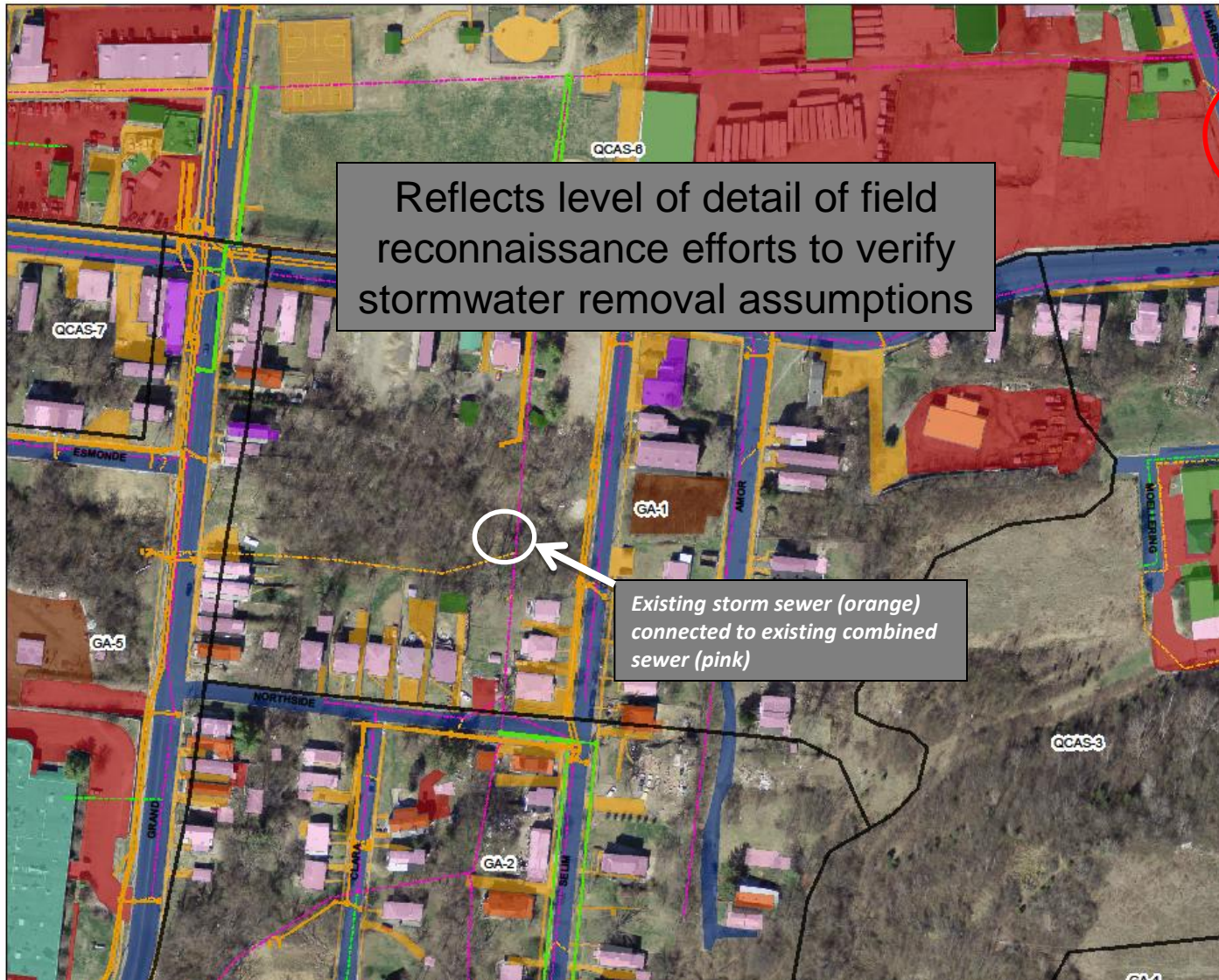
Percent Impervious: 12%

Area Removed:  
Impervious: 1.60 Acres  
Pervious: 23.93 Acres  
Total Area: 25.53 Acres  
Percent of Catchment Area: 94%





# Local Data – Refine Assumptions



Reflects level of detail of field reconnaissance efforts to verify stormwater removal assumptions

Existing storm sewer (orange) connected to existing combined sewer (pink)

## GA-1

Part of Grand and Selim Avenues Sewer Separation

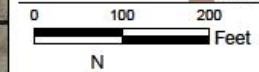
**Lick Run Conceptual Plan:**  
Estimated Percent Effectiveness - 75%

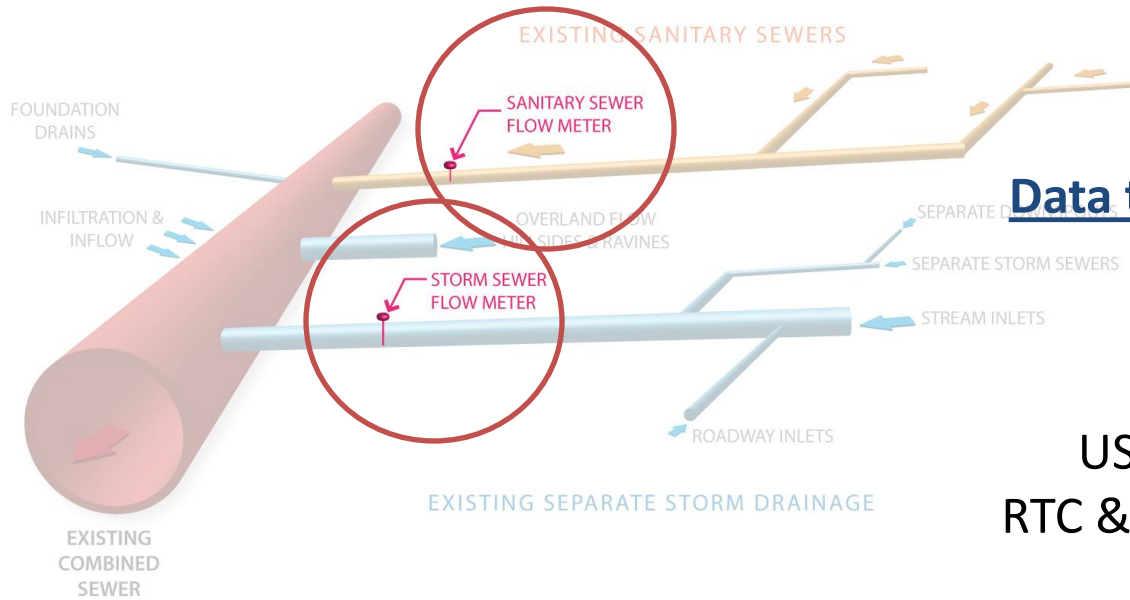
**Detailed Impervious Evaluation:**  
Estimated Percent Effectiveness - 83%

Catchment Area: 13.28 Acres  
 Roadway: 1.61 Acres  
 Building: 1.34 Acres  
 Parking: 0.51 Acres  
 Driveways and Sidewalks: 1.04 Acres  
 Miscellaneous Impervious: 0.20 Acres  
 Total Pervious Area: 8.57 Acres

Percent Impervious: 35%

Area Removed:  
 Impervious: 3.53 Acres  
 Pervious: 8.57 Acres  
 Total Area: 12.11 Acres  
 Percent of Catchment Area: 91%





## Data to Confirm Model's Results

- Sanitary Flow Monitoring
- Storm Flow Monitoring
- Tellog Overflow Data
- USGS Mill Creek Level Gauges
- RTC & Interceptor Level Monitors

CONFIGURATION OF THE COLLECTIONS SYSTEM  
**EXISTING CONDITIONS**  
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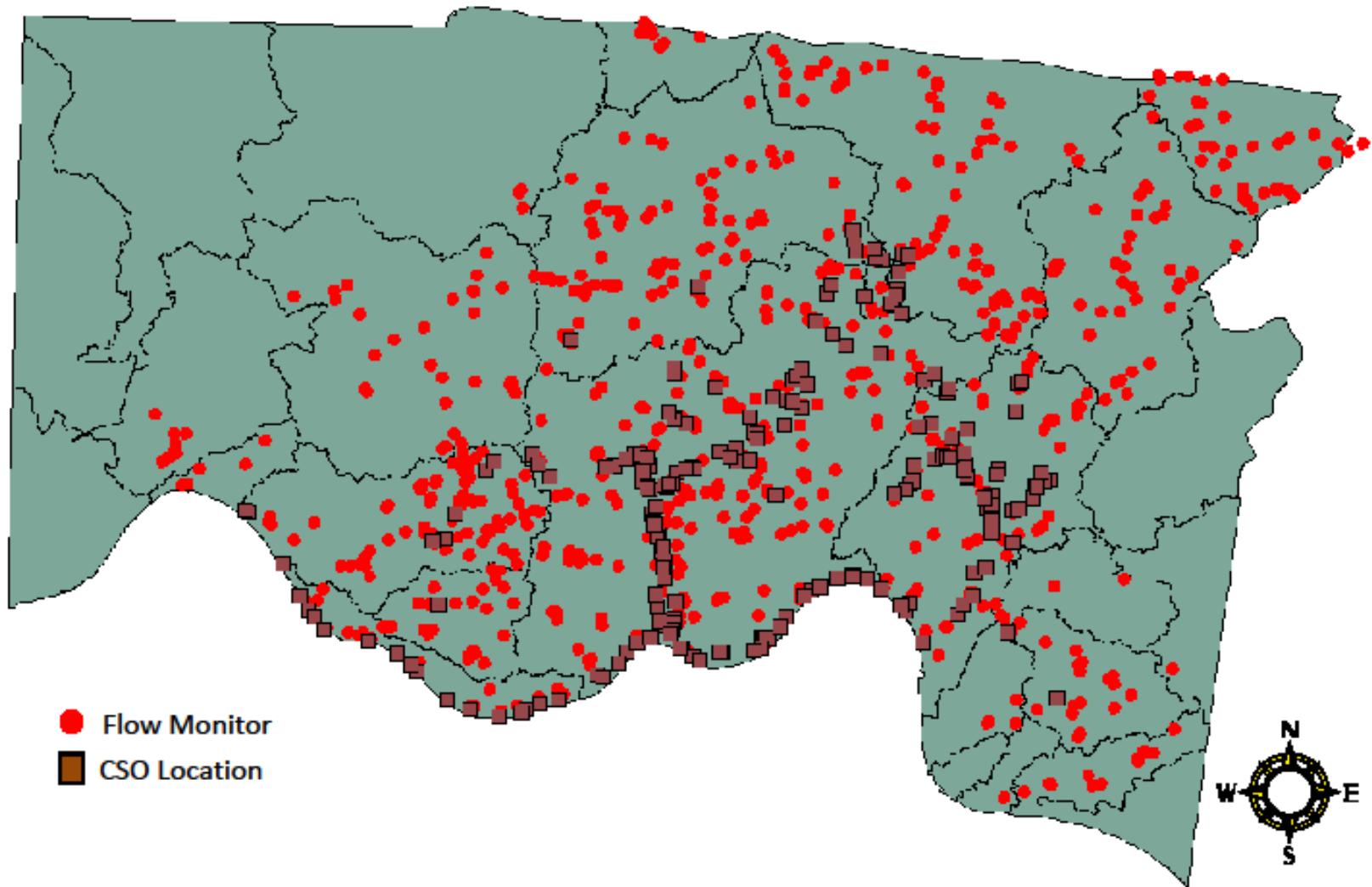
- LEGEND
- EXISTING SEPARATE STORM DRAINAGE
  - EXISTING COMBINED SEWER
  - EXISTING SEPARATE SANITARY

Local Data to

# CONFIRM MODEL RESULTS

# Local Data – Flow Monitoring Sites

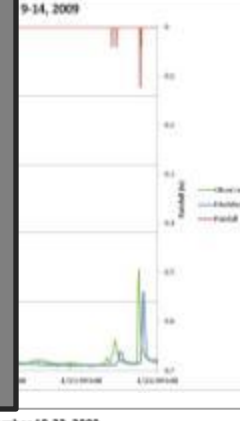
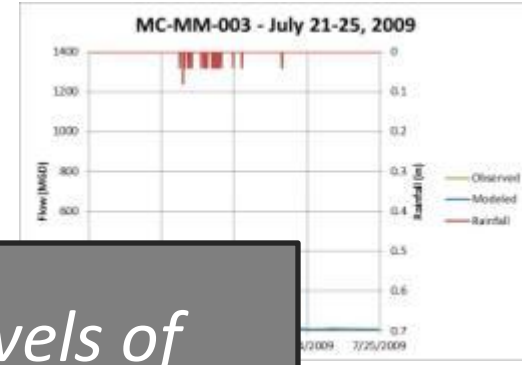
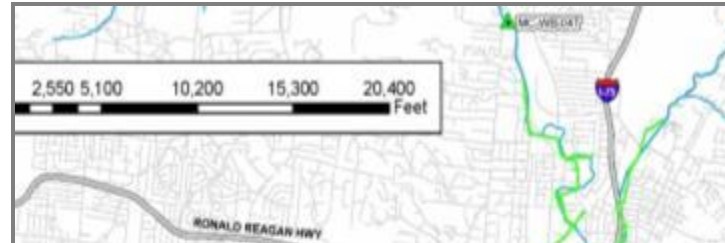
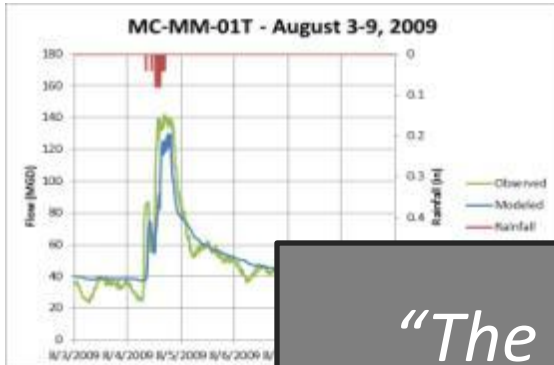
MSD utilizes flow monitoring data for planning and monitoring efforts throughout the service area.





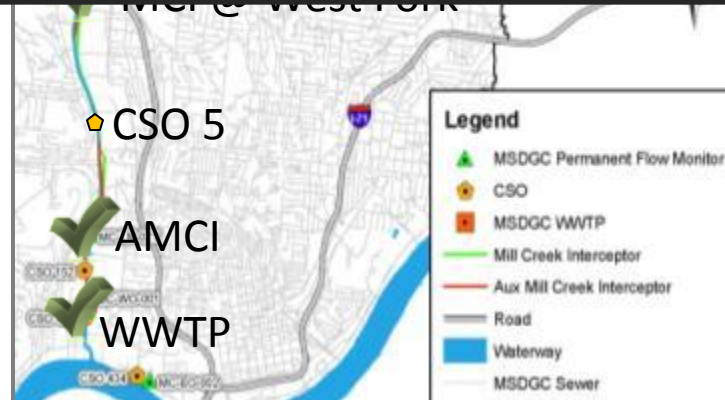
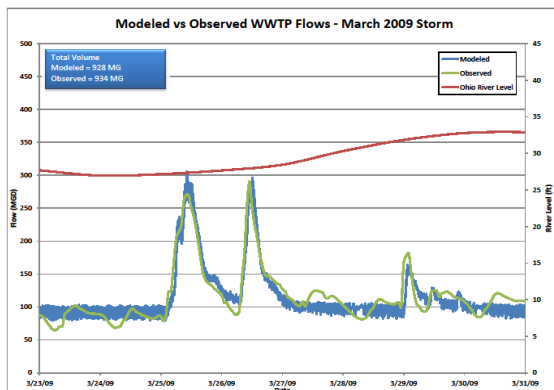
# Local Data – Confirm Results

## Flow Monitoring



*“The main differences in the levels of verification will be in the number of points at which the model is verified rather than the exactness of the fit.”*

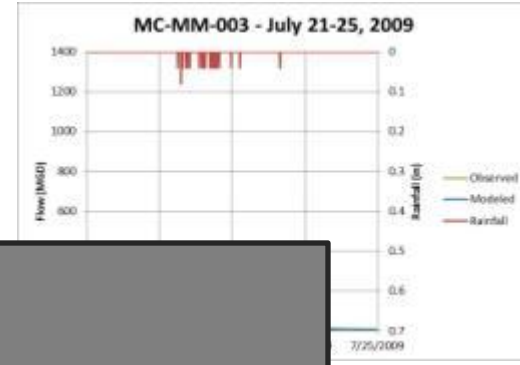
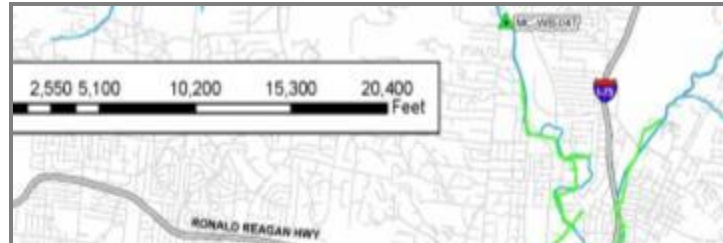
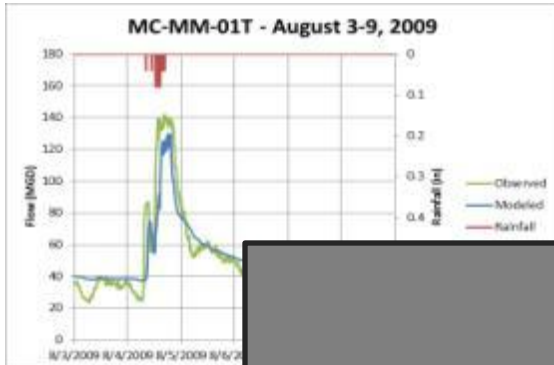
Wastewater Planning Users Group (WaPug)  
Code of Practice for Hydraulic Modeling of Sewer Systems





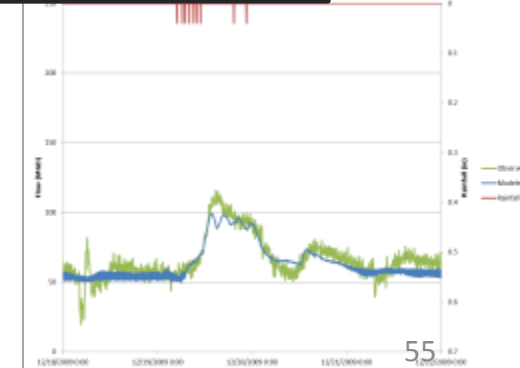
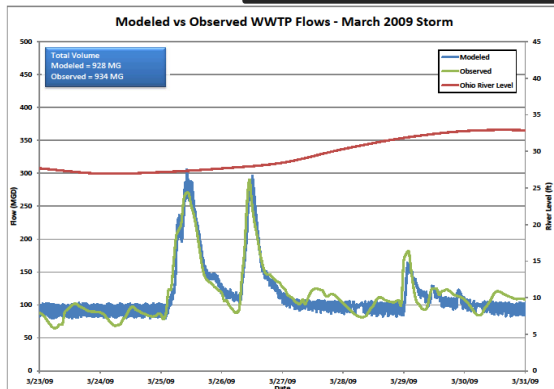
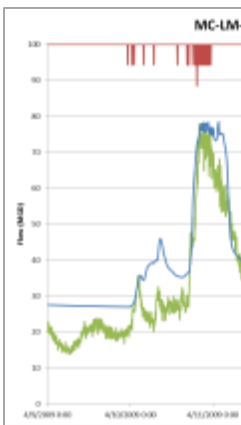
# Local Data – Confirm Results

## Flow Monitoring



**REGULATOR FEEDBACK**

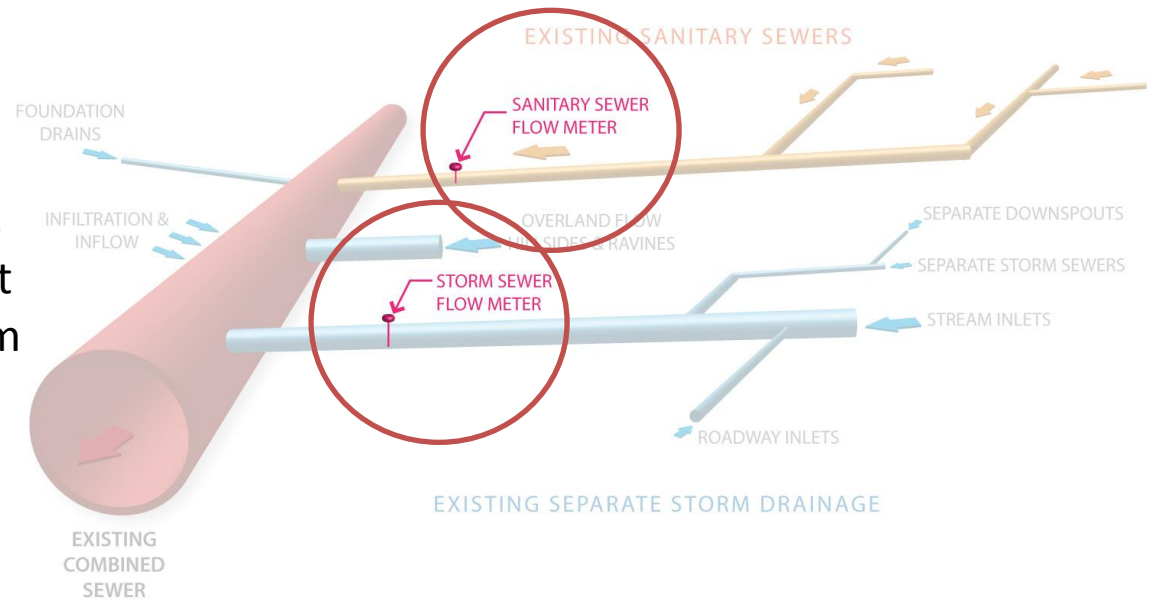
The Regulators have articulated the approach MSD used to model separation is the accepted method and they have confidence MSD's CSO model is effectively capturing the sewer separation.



# Local Data – Lick Run Flow Monitoring 2011

## Lick Run Sanitary and Storm Sewer Flow Monitoring

- Collected data from 11 sites
  - 7 storm sewers
  - 4 sanitary sewers
- Collected during storm events over 10 months
- Data supported the model's assumptions for the amount of rainfall entering the storm and combined sewers
- Results within 1% of MSD's stormwater removal assumptions



CONFIGURATION OF THE COLLECTIONS SYSTEM  
**EXISTING CONDITIONS**  
IMAGE NOT TO SCALE HUMAN NATURE, INC.

LEGEND  
— EXISTING SEPARATE STORM DRAINAGE  
— EXISTING COMBINED SEWER  
— EXISTING SEPARATE SANITARY

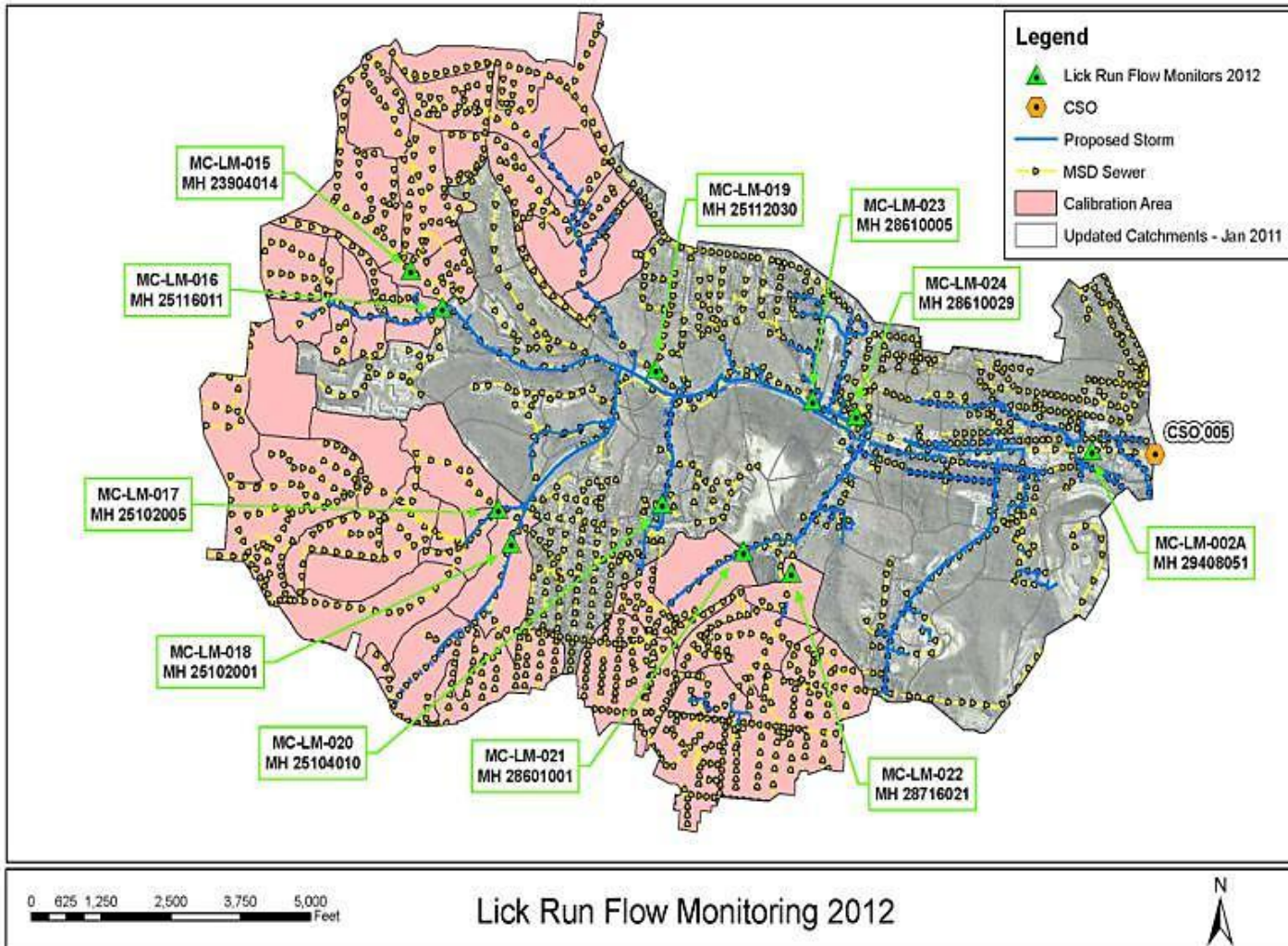
# Flow Monitoring – 2012 Lick Run

## □ MSD's Current Flow Monitoring Plan:

- Takes into account slope, debris, pipe size, velocity
- Underwent refinement and verification through field inspection
- Sites have smaller pipes and slower velocities
- Will monitor flows in the upstream areas of the watershed in pipes no greater than 66-inch diameter and maximum velocities no greater than 12 feet per second

# Flow Monitoring – 2012 Lick Run

Since modeling is an iterative process, MSD is continuing to collect flow monitoring data and has refined the locations to improve data reliability.



# Confidence in Results

The risk associated with limited flow monitoring data at CSO 5 is minimized through the collective wealth of local data and sophistication of the current modeling technology that has been deemed a rational tool by the Regulators.

## Confidence in Stormwater Removal Volumes

Existing local data provides good understanding of quantities to be removed

## Lick Run Model is Correct

Reasonable assumption due to validation of up and downstream sections

## Model Input Fully Vetted

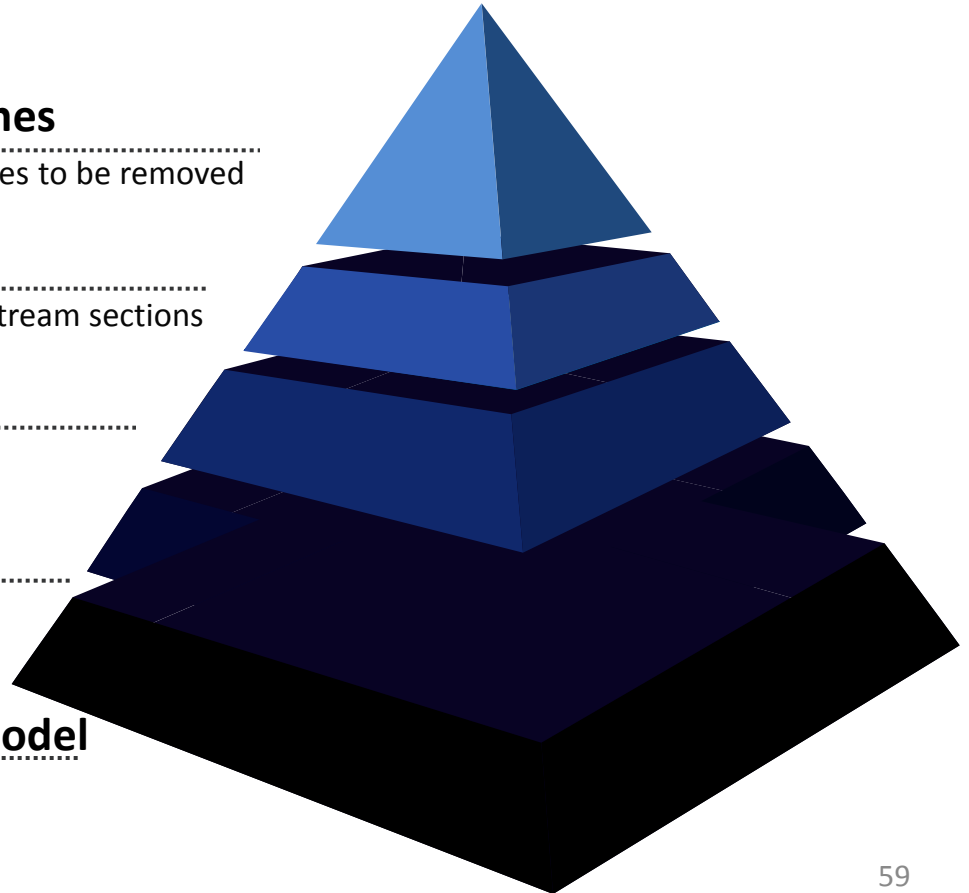
Leading industry experts and Regulators agree with inputs and assumptions

## MSD has made Comprehensive Effort

Visual review of every pipe, manhole, parcel drainage pattern for all 87 sub catchments

## LMCPR is Based on Results from USEPA Model

Regulators have indicated "NO RED FLAGS"





# Regulator Feedback

**MSD and the County team have been discussing the sewer separation approach, model update, and local data with the Regulators for the past four months.**

- The Regulators have articulated the approach MSD used to model separation is the **accepted method.**
- The Regulators **have confidence** MSD's CSO model is effectively capturing the sewer separation.
- The Regulators have stated MSD's model leaves the infiltration & inflow component of stormwater in the combined sewer system. They said this a **conservative approach** and can be refined in the future if pipes are lined or more data is collected.
- The Regulators said for the alternatives analysis, MSD has a model that **can be relied on** to predict what will happen to a **reasonable degree of accuracy.**
- Both the Regulators and MSD are comfortable the information produced by the model is **adequate for making decisions.**
- The Regulators said they are not aware of any on-going discussions regarding changes at the state level for MS4 permits.

# Lower Mill Creek Partial Remedy

QUESTIONS?

