City Infrastructure & Recent Storm Events: Data, Education, & Next Steps

Kevin Kothe, P.E., Director of Public Works

Committee of the Whole Meeting: August 16, 2021

Acknowledgments & Thank You!

What We Saw June 25-26

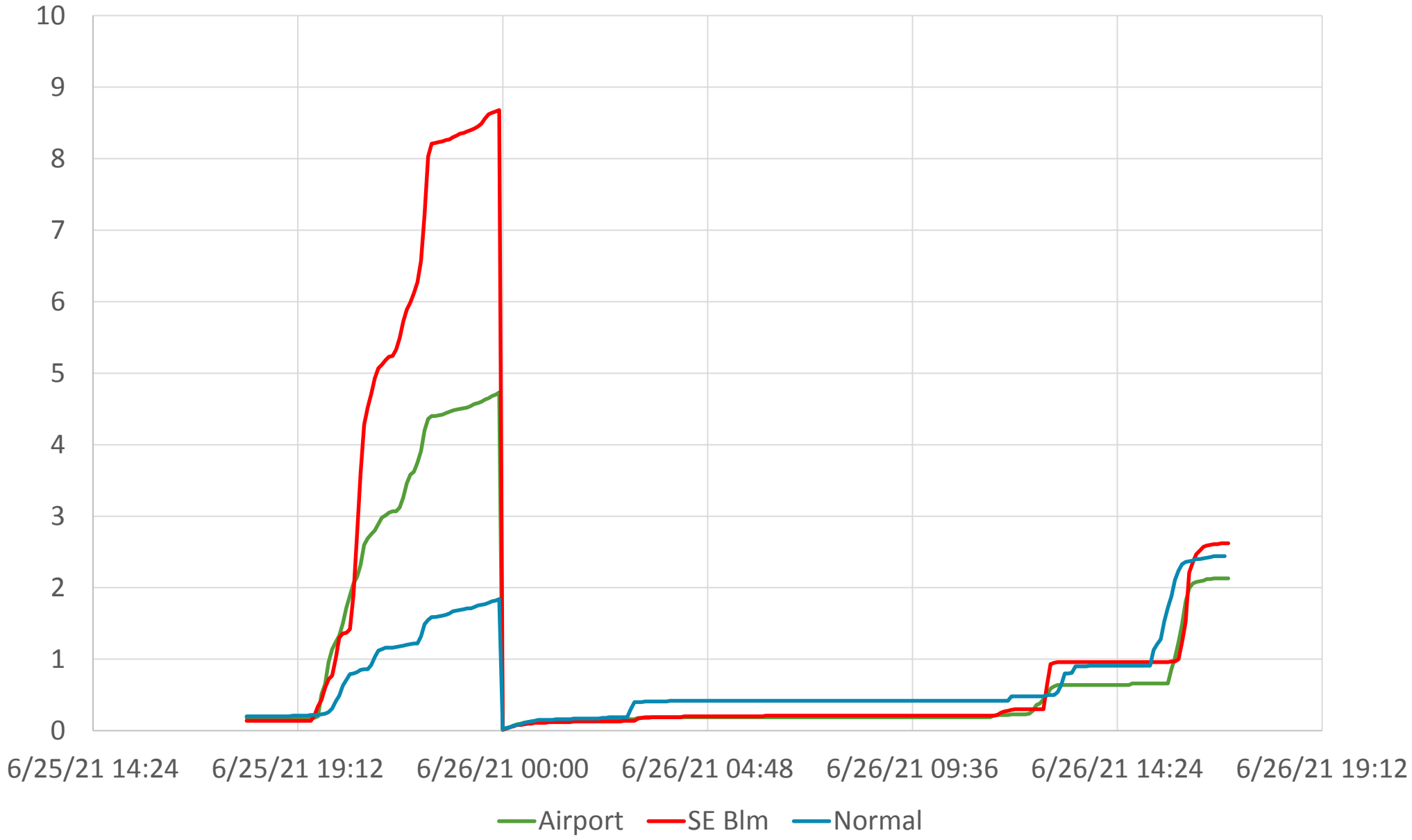
What We Saw June 25-26

Table 9. Rainfall (inches) for Given Recurrence Interval for Section 4 (Central)

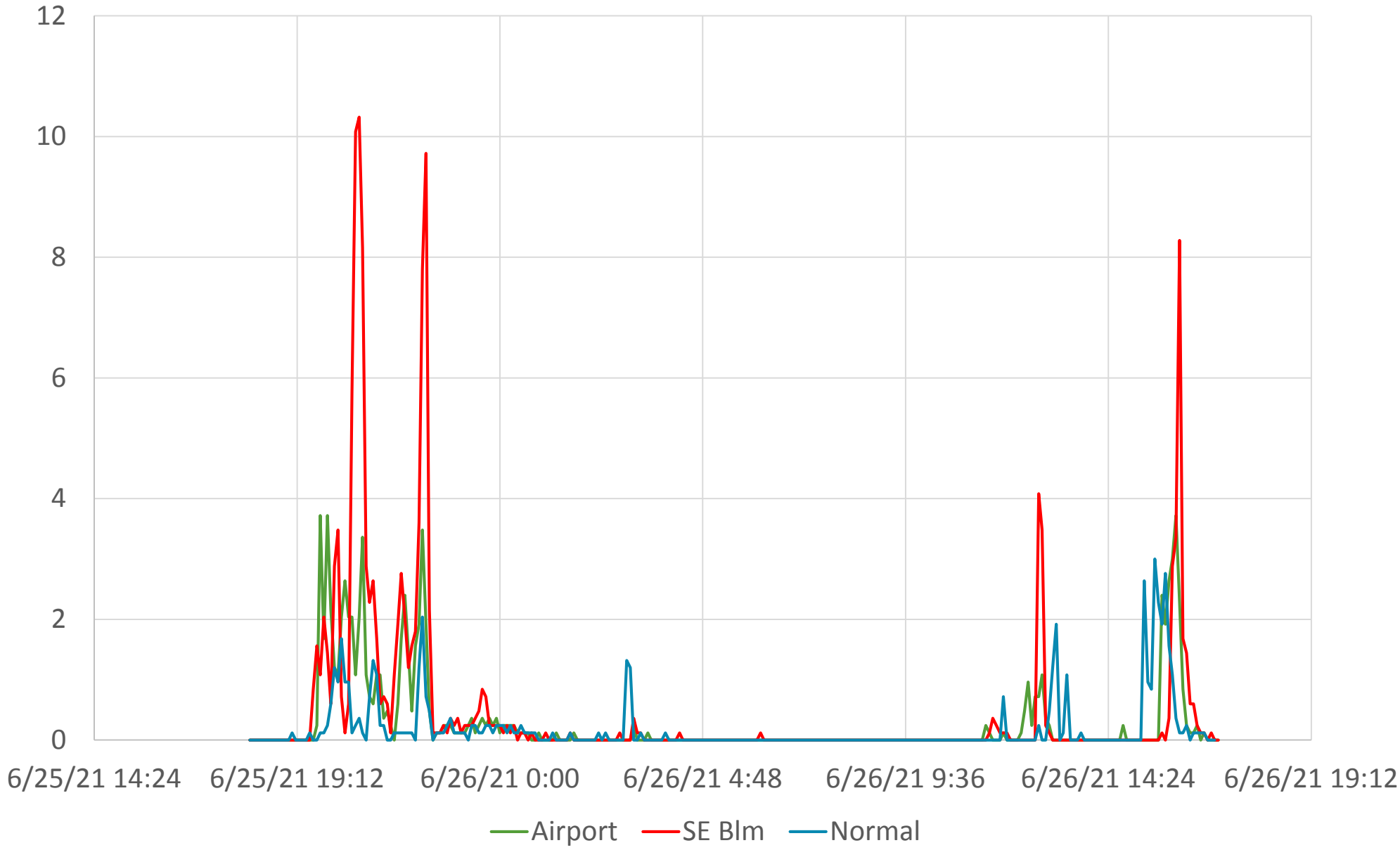
Storm Duration	2-month	3-month	4-month	6-month	9-month	1-year	2-year	5-year	10-year	25-year	50-year	100-year	500-year
5 minutes	0.19	0.21	0.24	0.27	0.30	0.33	0.40	0.52	0.61	0.74	0.85	0.94	1.14
10 minutes	0.33	0.38	0.41	0.47	0.53	0.58	0.70	0.90	1.07	1.30	1.48	1.65	2.00
15 minutes	0.42	0.48	0.53	0.60	0.68	0.74	0.90	1.16	1.38	1.67	1.90	2.12	2.57
30 minutes	0.58	0.66	0.72	0.83	0.94	1.02	1.23	1.59	1.89	2.29	2.61	2.90	3.53
1 hour	0.73	0.84	0.92	1.05	1.19	1.30	1.56	2.02	2.40	2.91	3.31	3.69	4.48
2 hours	0.91	1.04	1.14	1.29	1.47	1.60	1.93	2.49	2.96	3.60	4.09	4.55	5.53
3 hours	1.00	1.14	1.25	1.43	1.62	1.76	2.12	2.75	3.26	3.97	4.51	5.02	6.10
6 hours	1.17	1.34	1.47	1.67	1.90	2.07	2.49	3.23	3.83	4.65	5.29	5.89	7.15
12 hours	1.36	1.55	1.70	1.94	2.20	2.40	2.89	3.74	4.44	5.39	6.13	6.83	8.29
18 hours	1.47	1.68	1.84	2.10	2.38	2.59	3.12	4.04	4.79	5.83	6.63	7.38	8.96
24 hours	1.56	1.79	1.96	2.23	2.53	2.76	3.32	4.30	5.10	6.20	7.05	7.85	9.53
48 hours	1.69	1.93	2.12	2.41	2.73	2.98	3.59	4.61	5.47	6.65	7.55	8.40	10.21
72 hours	1.82	2.09	2.29	2.60	2.95	3.22	3.88	4.96	5.90	7.17	8.09	8.98	10.81
120 hours	2.01	2.30	2.52	2.87	3.26	3.55	4.27	5.42	6.42	7.75	8.72	9.60	11.54
240 hours	2.57	2.94	3.22	3.67	4.16	4.54	5.46	6.87	8.04	9.53	10.55	11.50	13.65

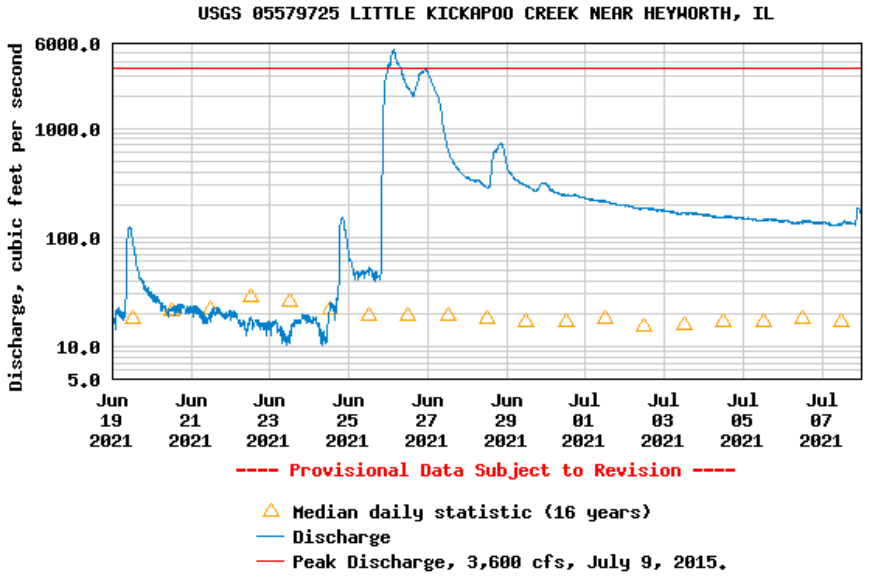
Source: ISWS Bulletin 75. https://www.ideals.illinois.edu/handle/2142/106653

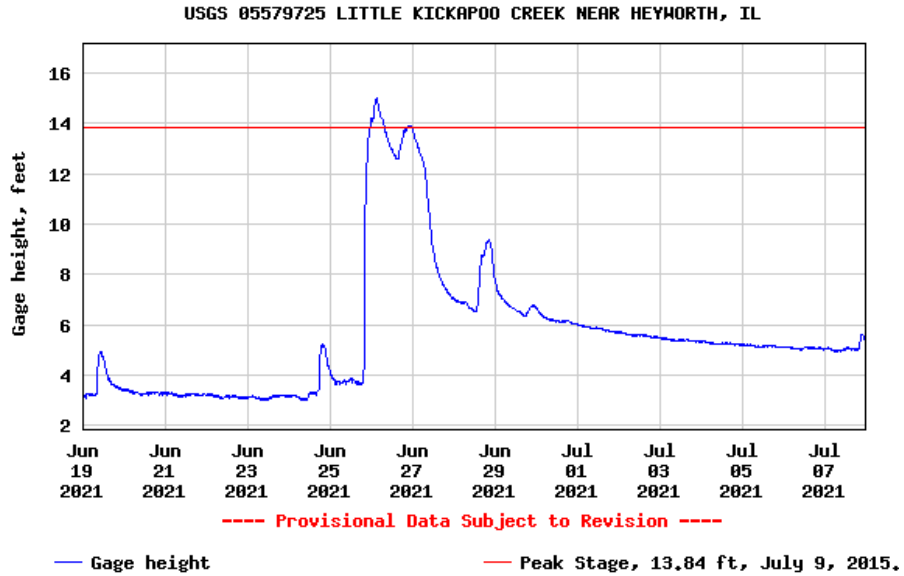
Rainfall Totals (inches)

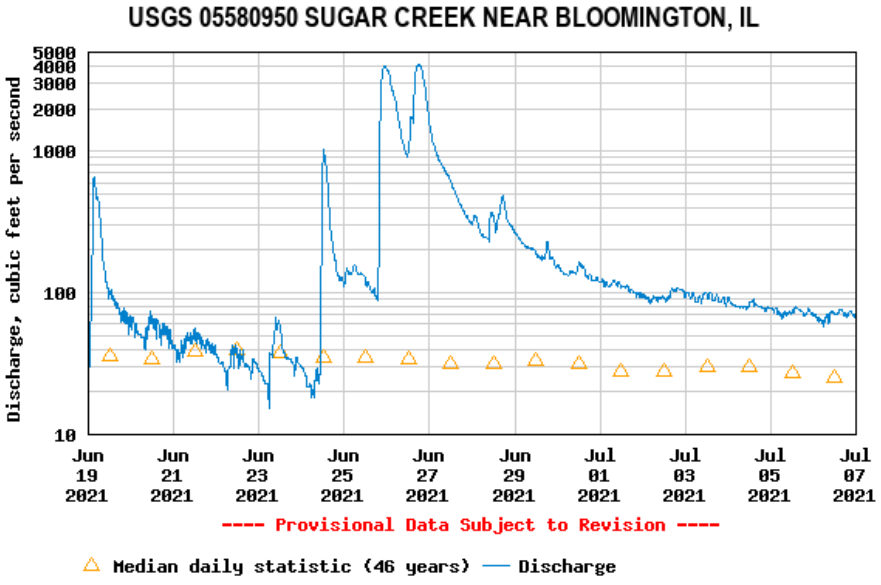


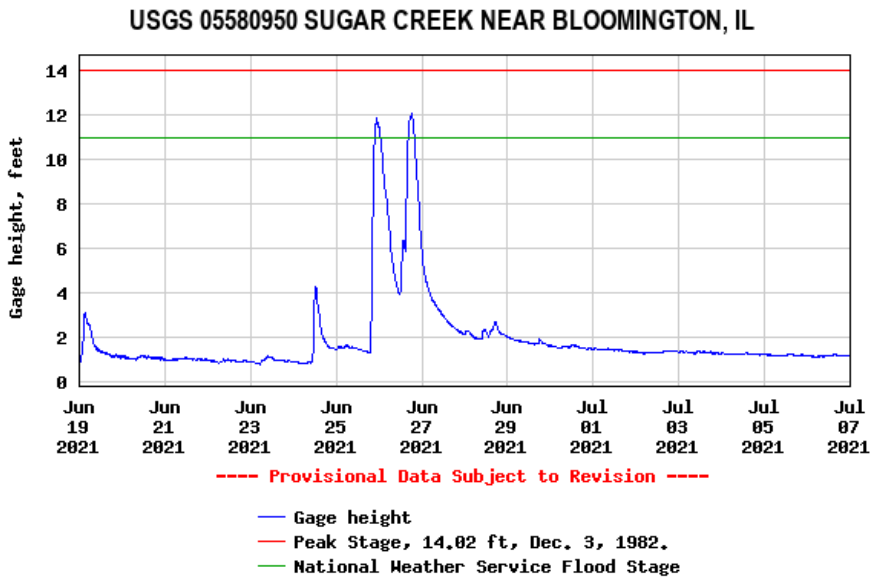
Rainfall Rates (inches per hour)




USGS 05579725 LITTLE KICKAPOO CREEK NEAR HEYWORTH, IL
Discharge, cubic feet per second
6000.0
1000.0
100.0
10.0
5.0
Jun 19 2021
Jun 21 2021
Jun 23 2021
Jun 25 2021
Jun 27 2021
Jun 29 2021
Jul 01 2021
Jul 03 2021
Jul 05 2021
Jul 07 2021
---- Provisional Data Subject to Revision ----
Median daily statistic (16 years)
Discharge
Peak Discharge, 3,600 cfs, July 9, 2015.


USGS 05579725 LITTLE KICKAPOO CREEK NEAR HEYWORTH, IL
Gage height, feet
16
14
12
10
8
6
4
2
Jun 19 2021
Jun 21 2021
Jun 23 2021
Jun 25 2021
Jun 27 2021
Jun 29 2021
Jul 01 2021
Jul 03 2021
Jul 05 2021
Jul 07 2021
---- Provisional Data Subject to Revision ----
Gage height
Peak Stage, 13.84 ft, July 9, 2015.


USGS 05580950 SUGAR CREEK NEAR BLOOMINGTON, IL
Discharge, cubic feet per second
5000
4000
3000
2000
1000
100
10
Jun 19 2021
Jun 21 2021
Jun 23 2021
Jun 25 2021
Jun 27 2021
Jun 29 2021
Jul 01 2021
Jul 03 2021
Jul 05 2021
Jul 07 2021
---- Provisional Data Subject to Revision ----
Median daily statistic (46 years)
Discharge


USGS 05580950 SUGAR CREEK NEAR BLOOMINGTON, IL
Gage height, feet
14
12
10
8
6
4
2
0
Jun 19 2021
Jun 21 2021
Jun 23 2021
Jun 25 2021
Jun 27 2021
Jun 29 2021
Jul 01 2021
Jul 03 2021
Jul 05 2021
Jul 07 2021
---- Provisional Data Subject to Revision ----
Gage height
Peak Stage, 14.02 ft, Dec. 3, 1982.
National Weather Service Flood Stage

What We Saw June 25-26

- Typically, non-paved surfaces absorb some of the rainfall
- The ground was already saturated, so it acts as an impervious surface and generates more runoff (as does frozen ground)
- For every 1,000 square feet of home receiving 6 inches of rain, 3,740 gallons were discharged
  - This equates to the average typical residential water usage per month or 68 rain barrels (55-gallon)
- A home on a 10,000 SF lot discharged 37,400 gallons of water
- A 6-inch rainfall across Bloomington's 27.3 square miles can discharge enough water to fill Lake Bloomington from empty

Source: commercialtrucktrader.com

HOW TIME FLIES

100 years ago

Aug. 12, 1921: A torrential rain flooded B-N streets and basements. Normal, in the Sugar Creek Valley, got the worst of it, as did the Big Four Valley and East Douglas Street in Bloomington. A sewer blew up under pressure. This was a 5-inch rainfall in a few hours.

Source: pantagraph.com

At least 200 evacuated in Gibson City flooding

BRENDAN DENISON
brendan.denison@lee.net

GIBSON CITY — Severe flooding resulting from thunderstorms on Thursday forced hundreds from their homes in Gibson City, officials said.

At least 200 people were evacuated by crews and brought to the Gibson City-Melvin-Sibley Middle School, said Superintendent Jeremy Darnell.

"We were pulling people out with boats before we got here," he said, adding that police officers, firefighters and neighbors assisted rescue efforts.

"The community showed up and the people who had the ability to help came to help," Darnell said.

BRENDAN DENISON, THE PANTAGRAPH

A neighborhood at Peregrine and Falcon streets is flooded in Gibson City Thursday afternoon.

ing happened "within minutes."

"It was scary because I was in the apartment when the water started rising," Reed said. "Stuff started floating away, and stuff started falling over.

"I couldn't drive away anyway, because I was having transmission problems," she said. "I was in the process of getting it fixed."

Her ex-husband and his father-in-law live in the same complex, she said, adding "they forgot their medication, too."

Reed said it was scary because her family lives out of state.

"People are kind of waiting here. They're trying to find out what's going to happen next," she said. "A lot of people here are hungry. They're tired."

Source: pantagraph.com

The Washington Post *Democracy Dies in Darkness*

Flooding rains keep hitting New York City. Another round is expected Monday night.

Parts of the subway were under a foot of water last week

By Matthew Cappucci

July 12, 2021 at 4:54 p.m. EDT

23

In the world of weather, some things don't mix, such as major cities and heavy rainfall. New York City has been slammed by multiple flooding rain events in the past week, and a third could target the Big Apple and bring additional problems on Monday night.

After a morning of heavy rain that tallied more than two inches in spots, New York is eyeing what the National Weather Service warns could be a "moderate risk" of excessive rainfall that will accompany severe thunderstorms during the evening hours. A flash flood watch is in effect.

"Conditions may develop that lead to flash flooding," wrote the Weather Service in New York. "Flash flooding is a very dangerous situation."

12NEWS

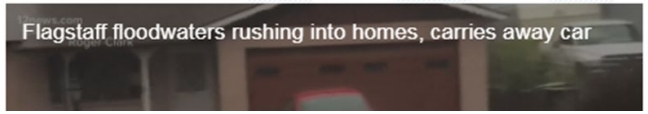
News Weather Sports Connect Watch

FORECAST TOKYO OLYMPICS GAS PRICES VACCINE ARIZONA MIDDAY CORONA

MONSOON

Gov. Ducey issues declaration of emergency due to monsoon flooding in Coconino County

The move comes after Coconino County and City of Flagstaff officials issued their own states of emergency Thursday night.



CNN World Africa Americas Asia Australia China Europe India Middle East United Kingdom LIVE TV Edition

Floods in London are the latest sign big cities aren't ready for climate change

By Ivana Kottasová, CNN

Updated 7:00 PM ET, Mon July 26, 2021

More from CNN

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Swimming with manta rays could help save them

The battle China's bla nosed mor

CHICAGO

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Water Management

DWM is committed to providing the highest level of professional services to meet our customers' needs now and for future generations

Home / Departments / Water Management / Supporting Info / Basement Flooding

Basement Flooding

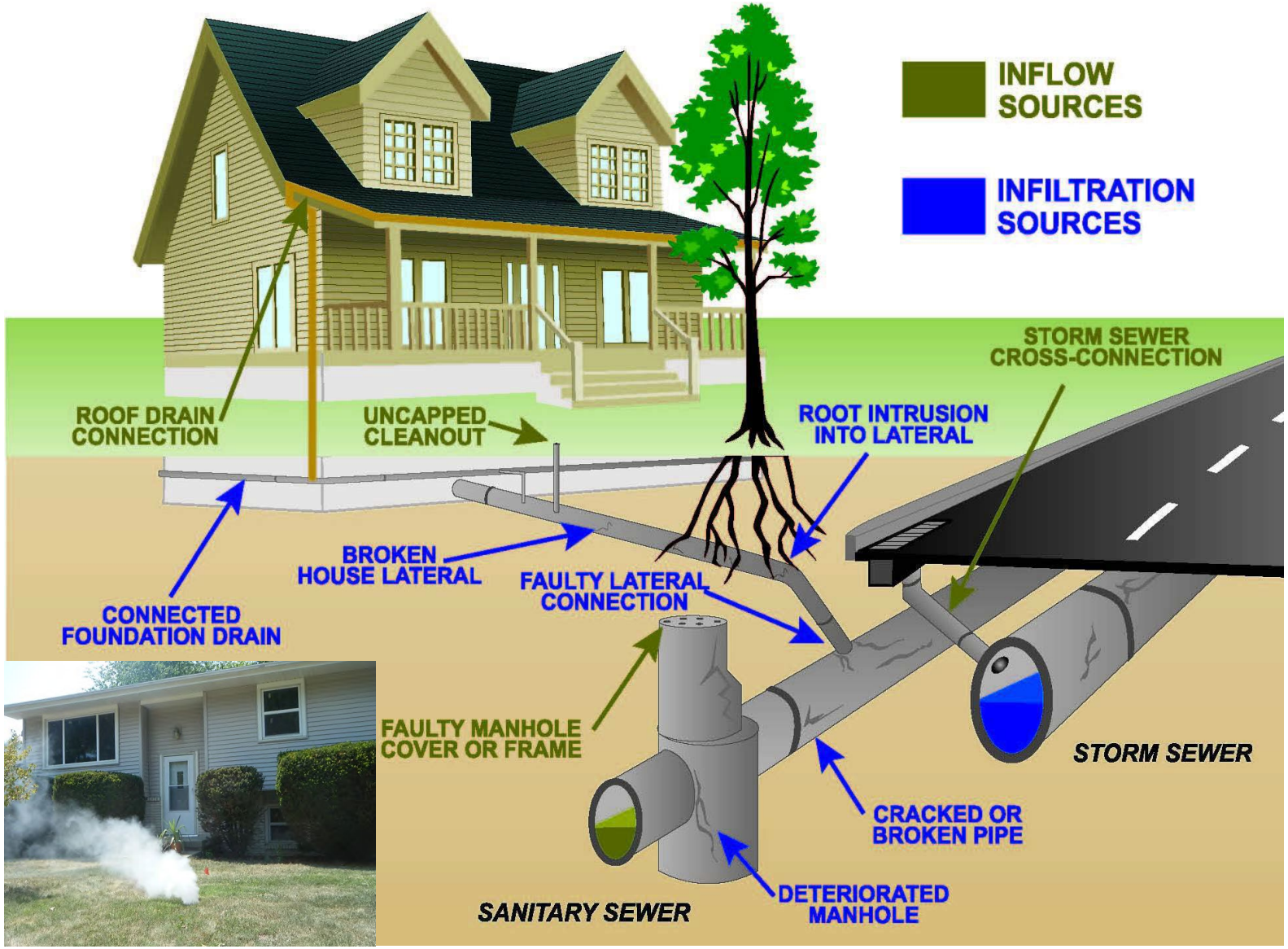
Tired of Basement Flooding? Want to Be a Good Neighbor?

It is important that you understand why flooding has increased in recent years. You also need to know the facts (rather than the myths) of basement flooding and Chicago sewers. Finally, you need to be willing to work with your neighbors on meaningful solutions.

It's Not Hard Or Expensive. But, You Have to Care.

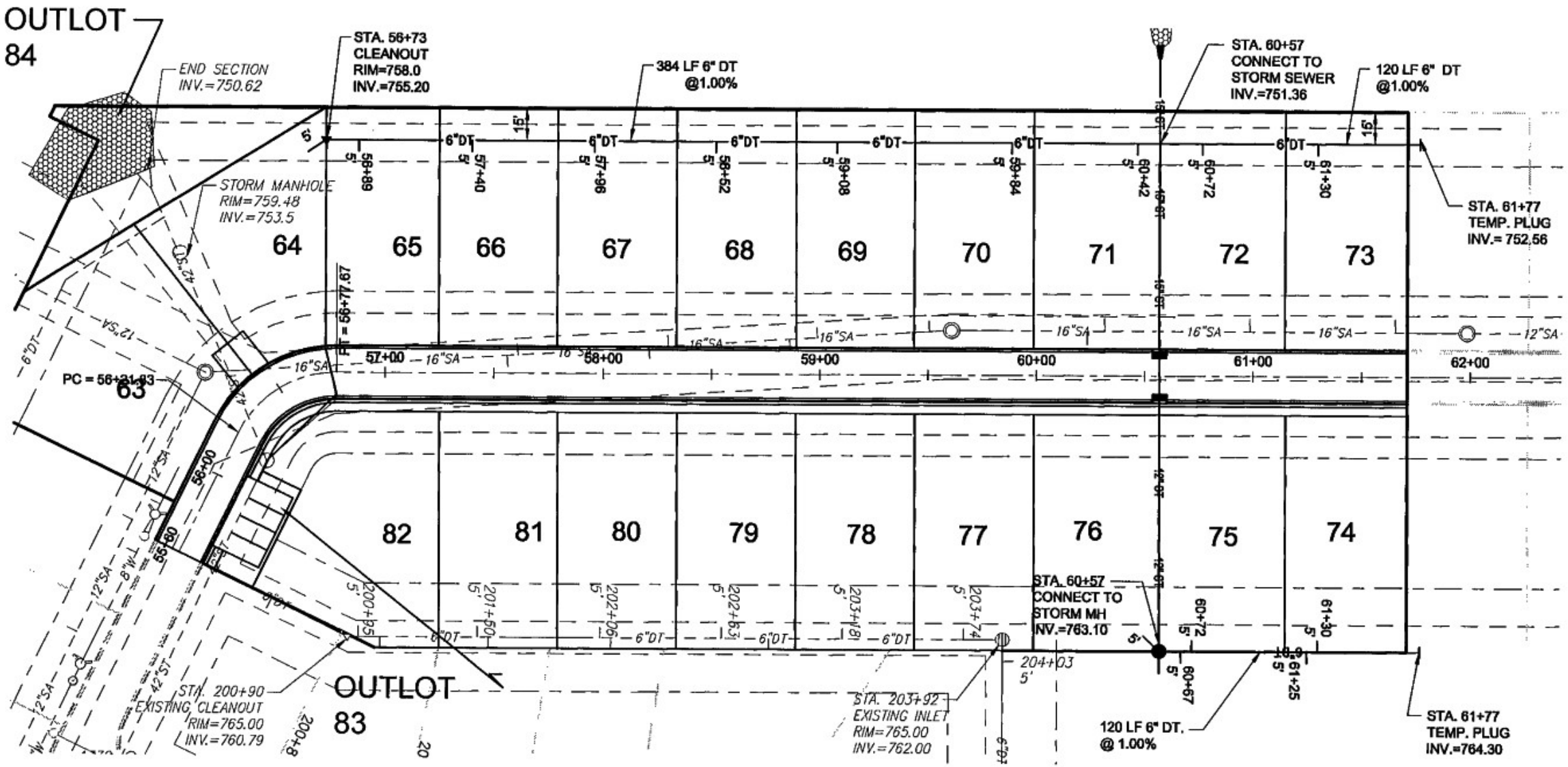
Storm Events Review

Inflow and Infiltration

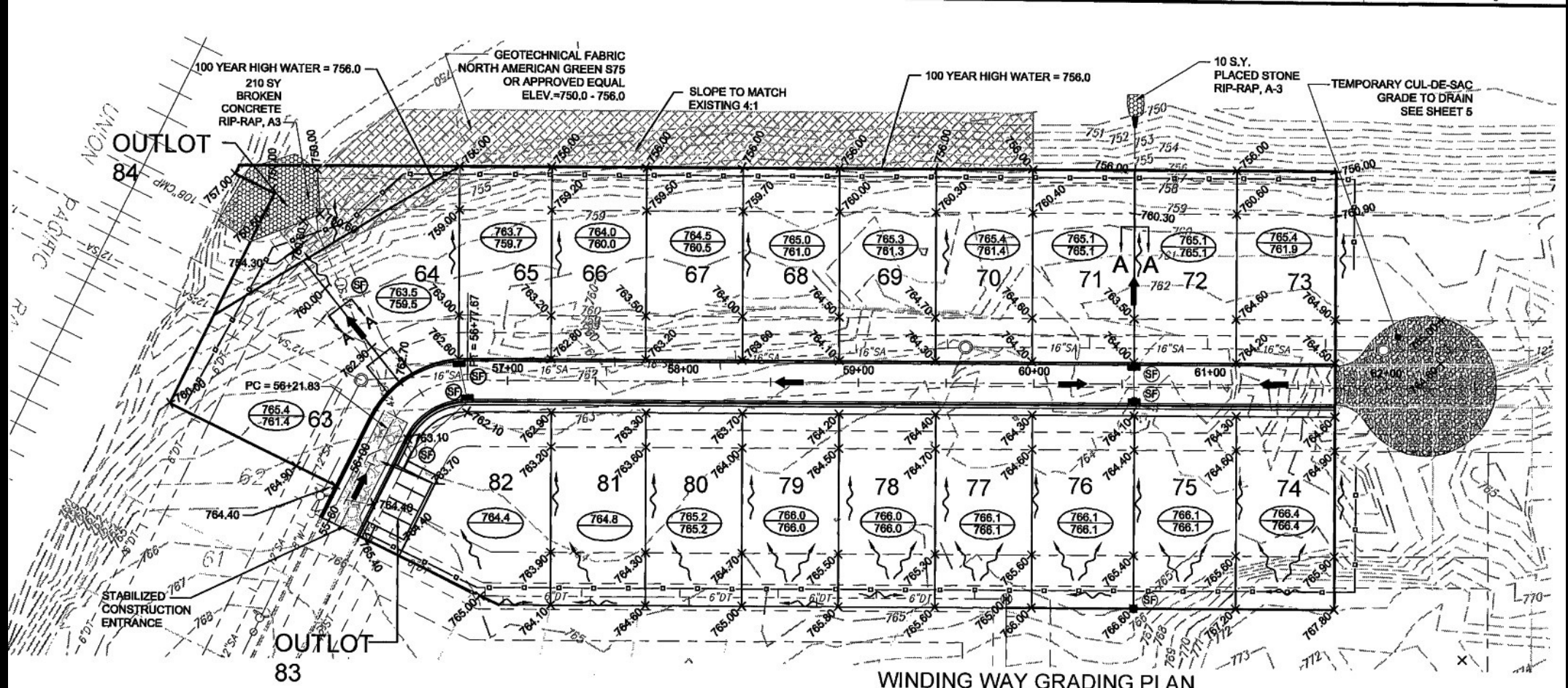


Source: www.oregonohio.org

- Cross connections
  - Footing tile tied into sewer service
  - Dye testing in the early 1980's found many homes in Fairway Knolls, Holiday Knolls and Broadmoor Subdivisions with this situation
    - External sump pits added to homes when footing tile was removed from sanitary service
    - I & I remains high in these areas

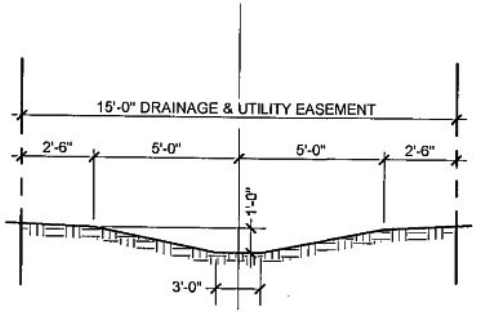


WINDING WAY DRAIN TILE PLAN



WINDING WAY GRADING PLAN

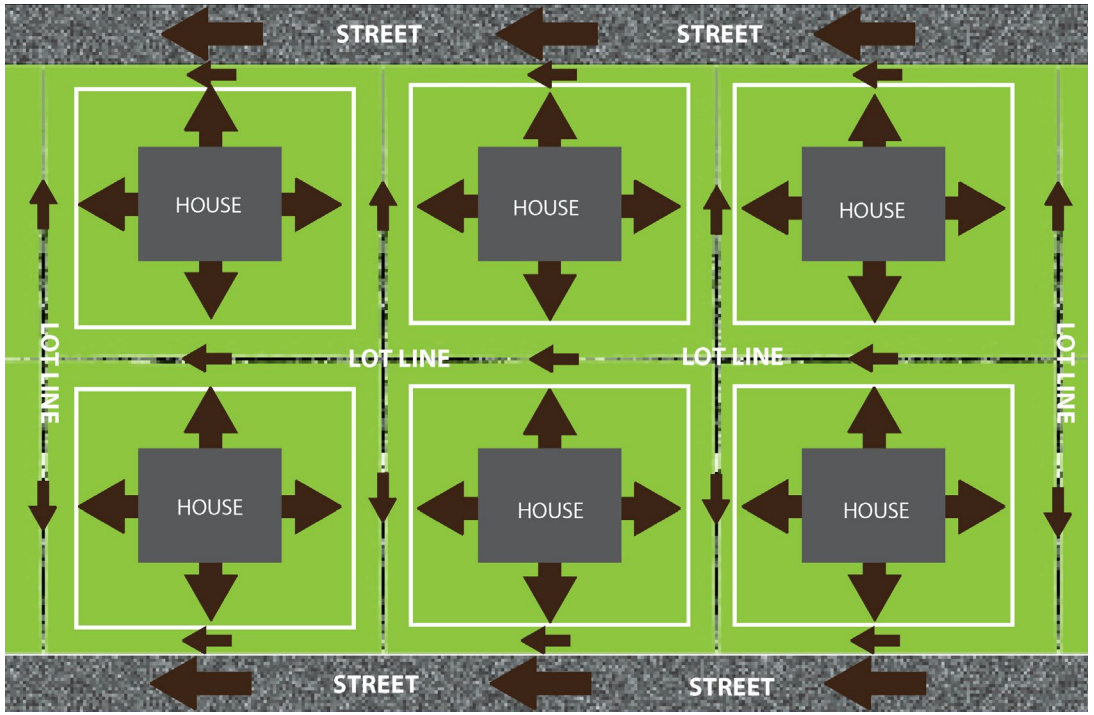
10	LOT NUMBER
825.5 / 818.5	MIN. FINISHED GROUND AT BUILDING SITE MIN. LOWEST OPENING ELEVATION (LOE)
● ▮	INLET
→	100 YR. FLOOD ROUTE
✳	DETAILED GRADING PLAN SUBMITTAL TO COB ENG. DEPT. REQUIRED PRIOR TO BUILDING CONSTRUCTION
	SILT FENCE
+816.0	GROUND ELEVATION
	DRAINAGE ARROW
—750—	GROUND CONTOUR
SF	INLET PROTECTION



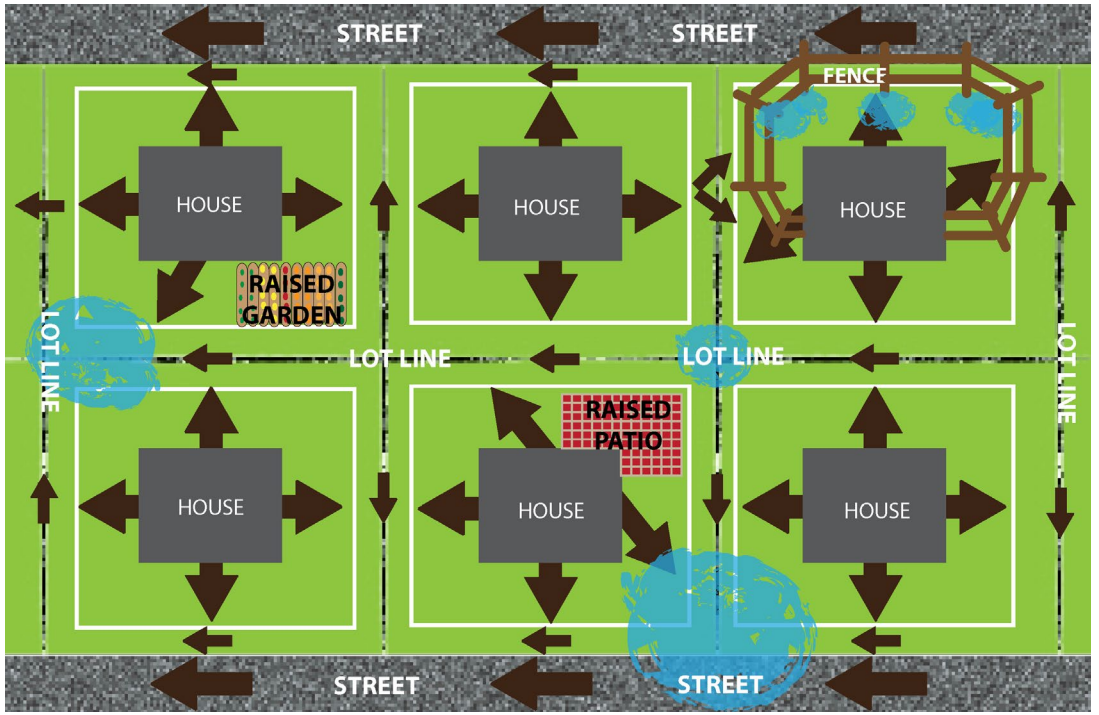
SECTION A-A

Drainage

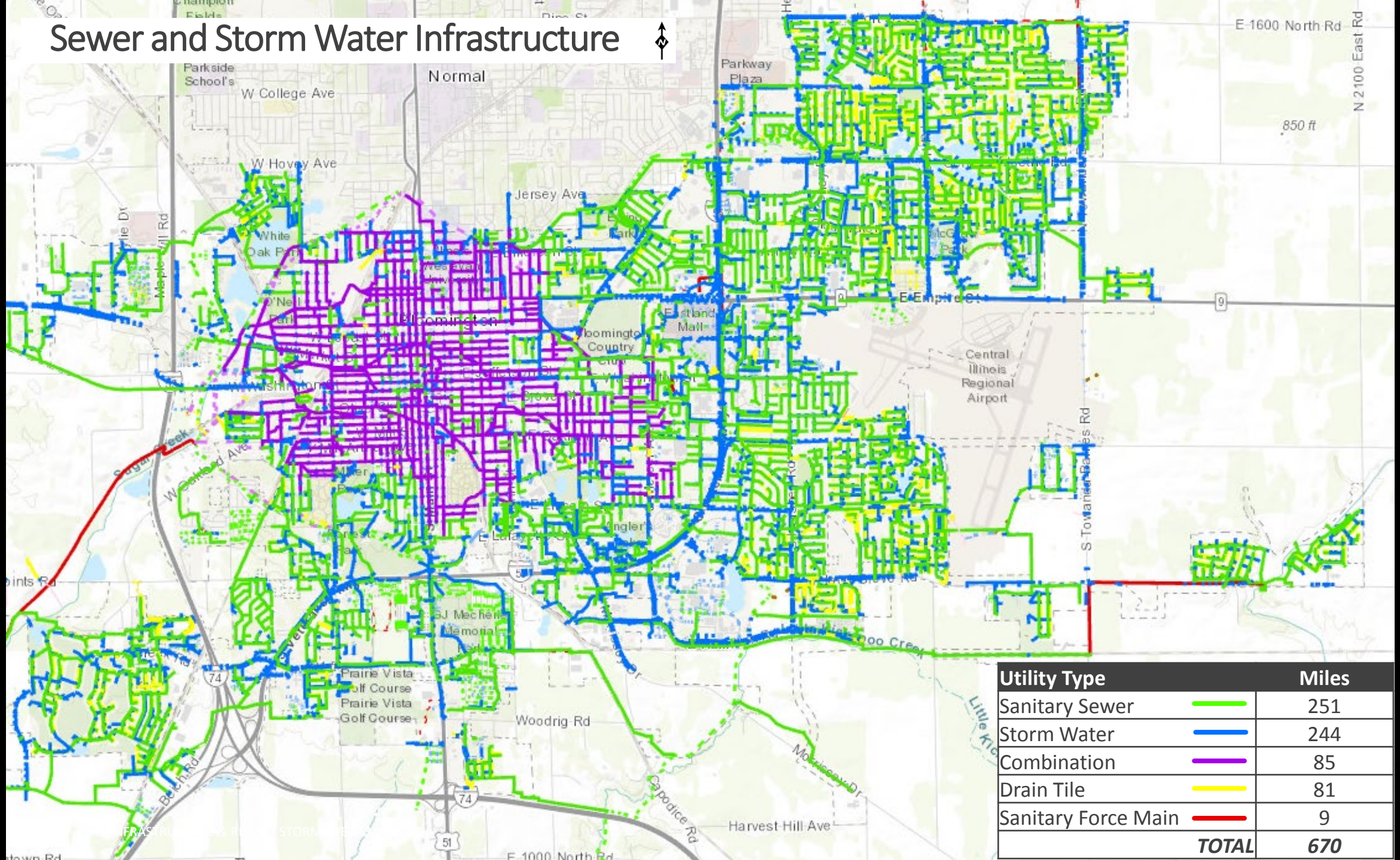
PROPER DRAINAGE



DISRUPTED DRAINAGE

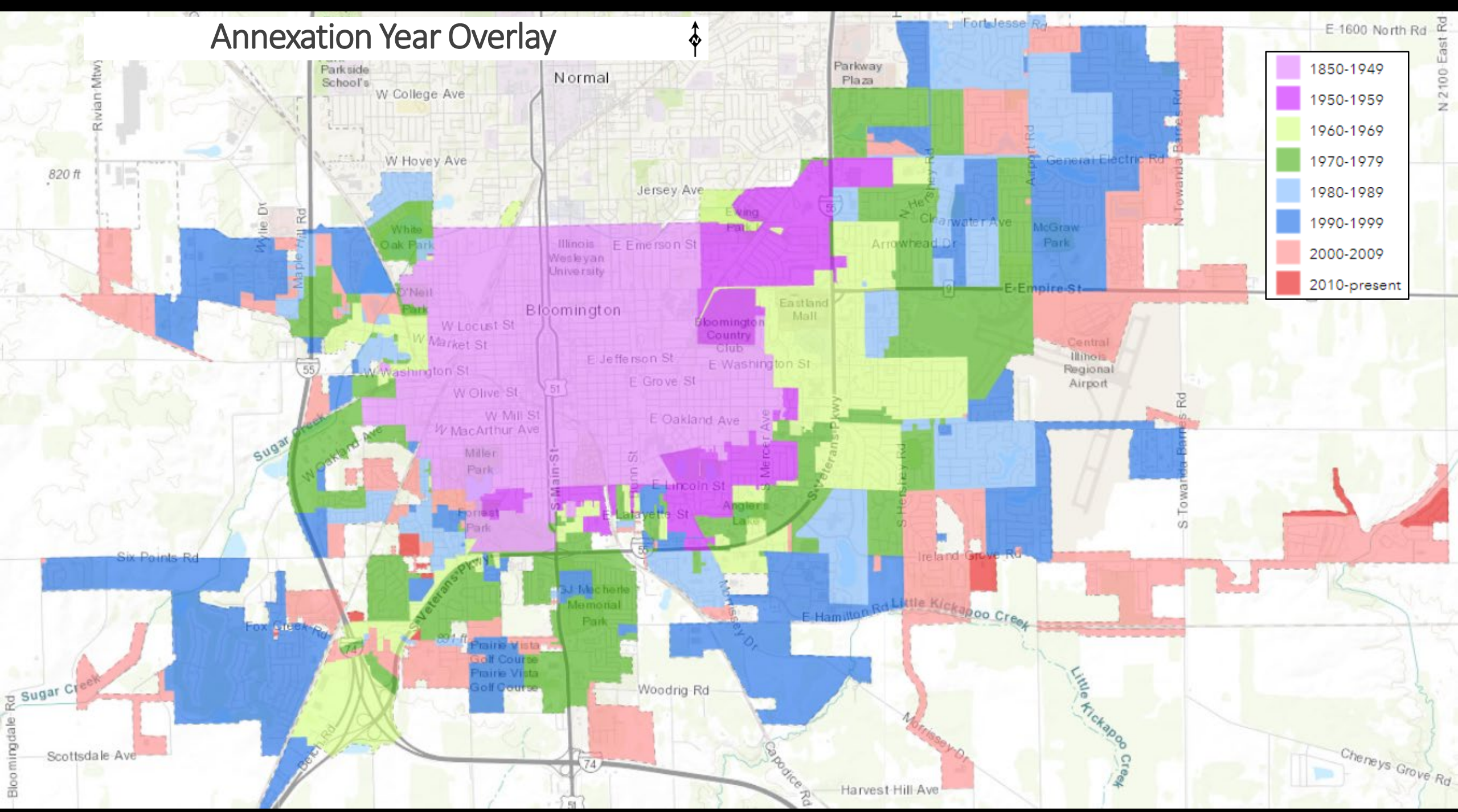


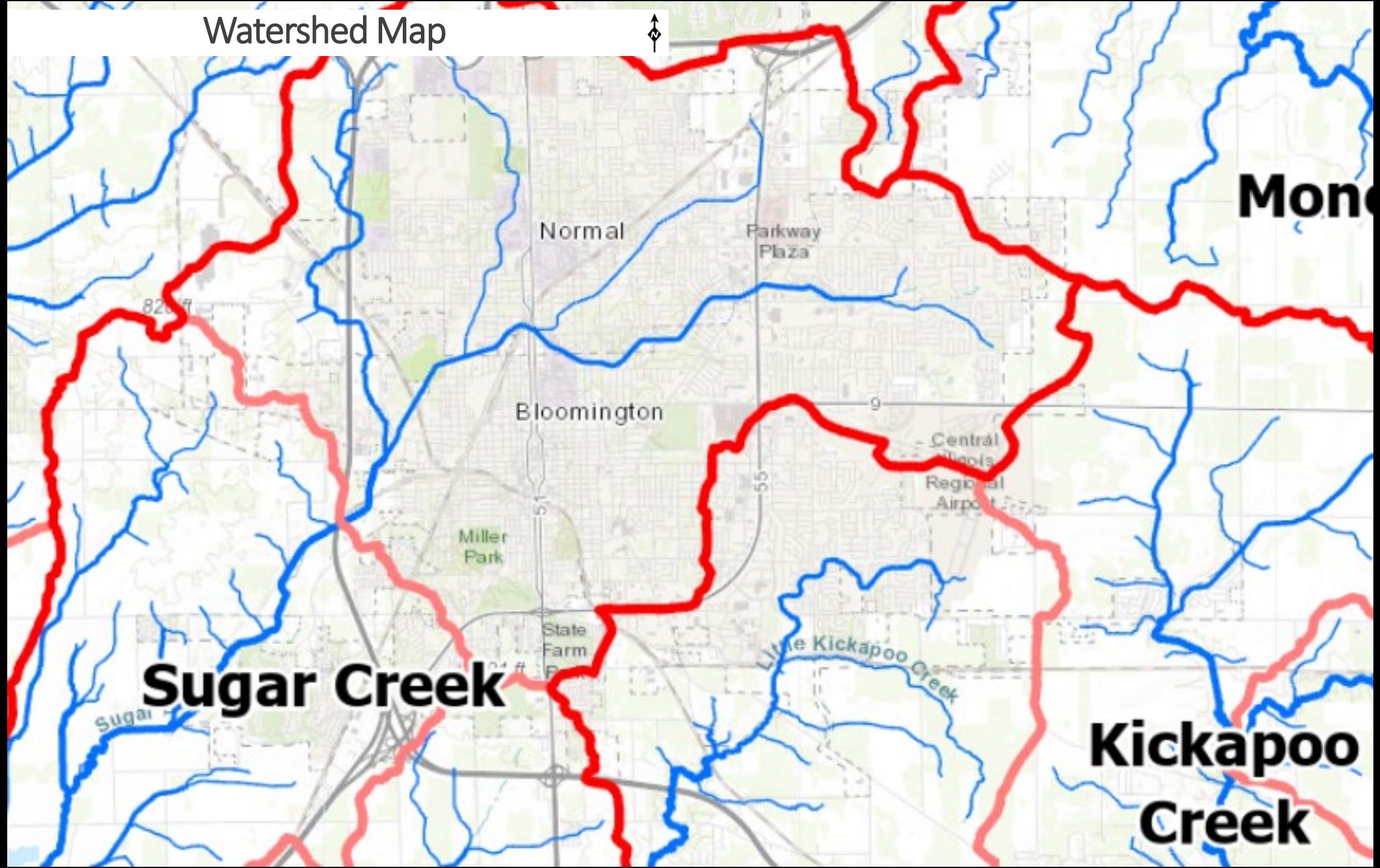
Sewer and Storm Water Infrastructure



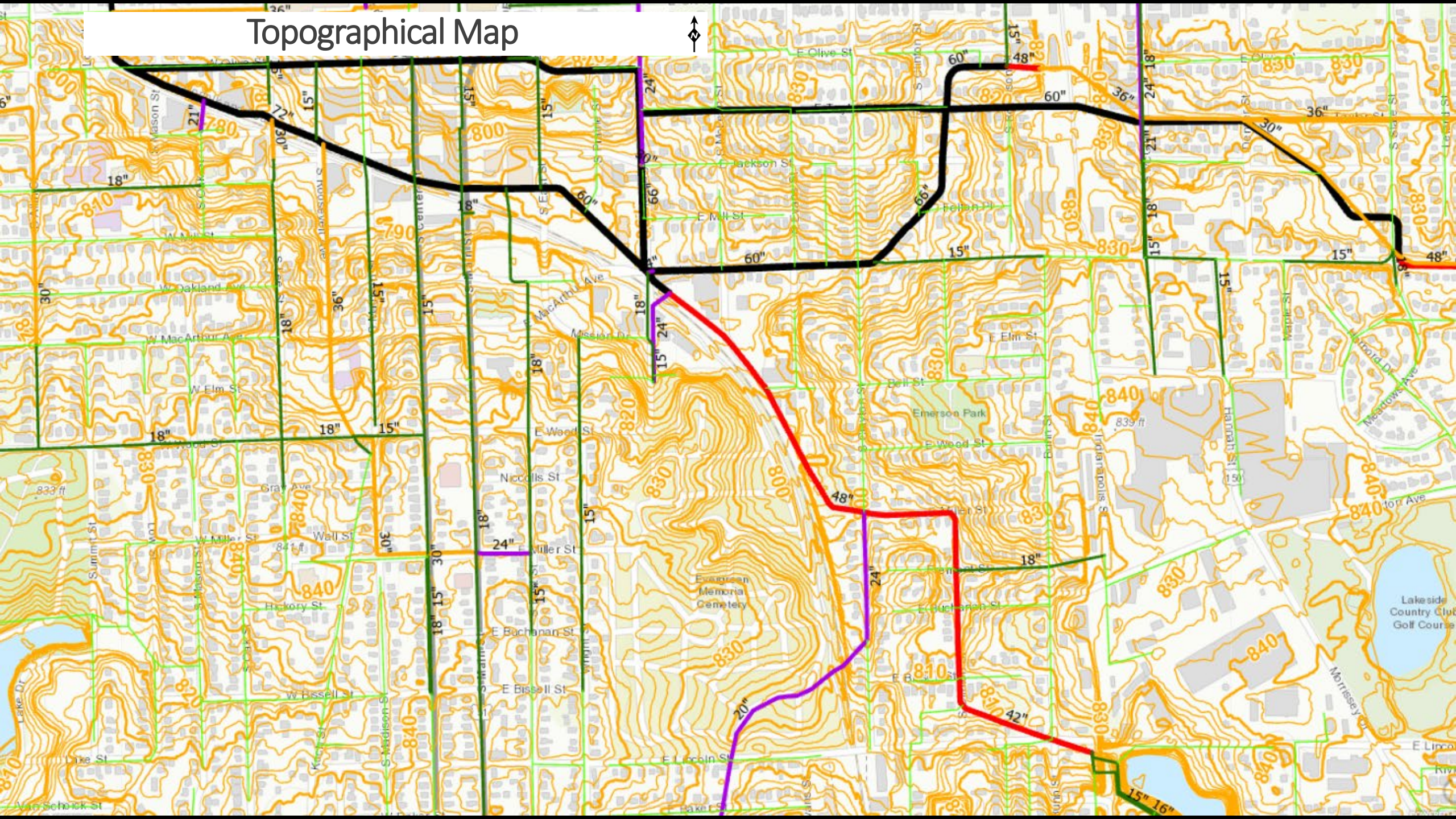
Utility Type	Miles
Sanitary Sewer	251
Storm Water	244
Combination	85
Drain Tile	81
Sanitary Force Main	9
TOTAL	***670***

Annexation Year Overlay



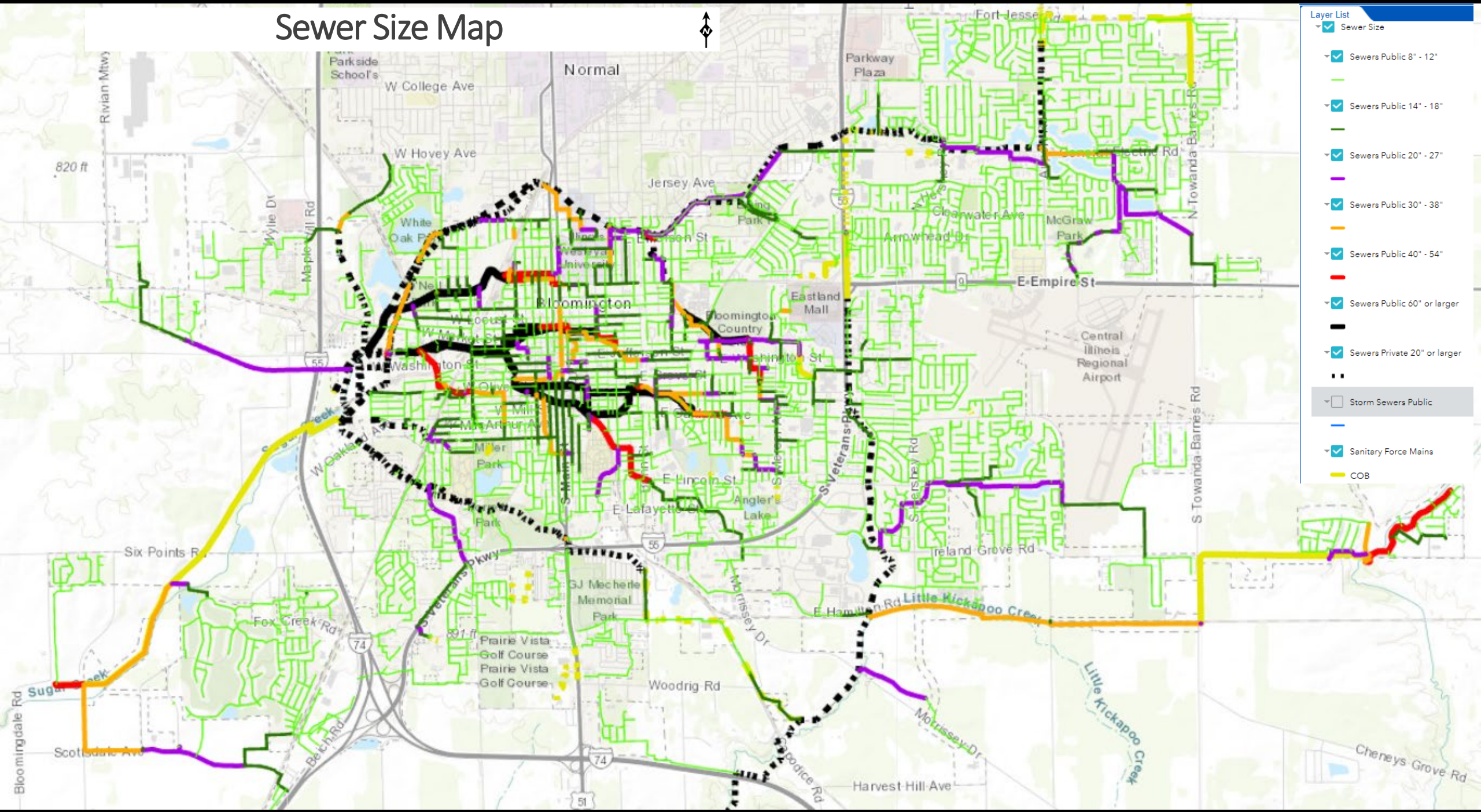

Watershed Map
Normal
Parkway Plaza
Bloomington
Central Illinois Regional Airport
Miller Park
State Farm
Little Kickapoo Creek
Sugar Creek
Kickapoo Creek
Mon
51
55
9

Topographical Map

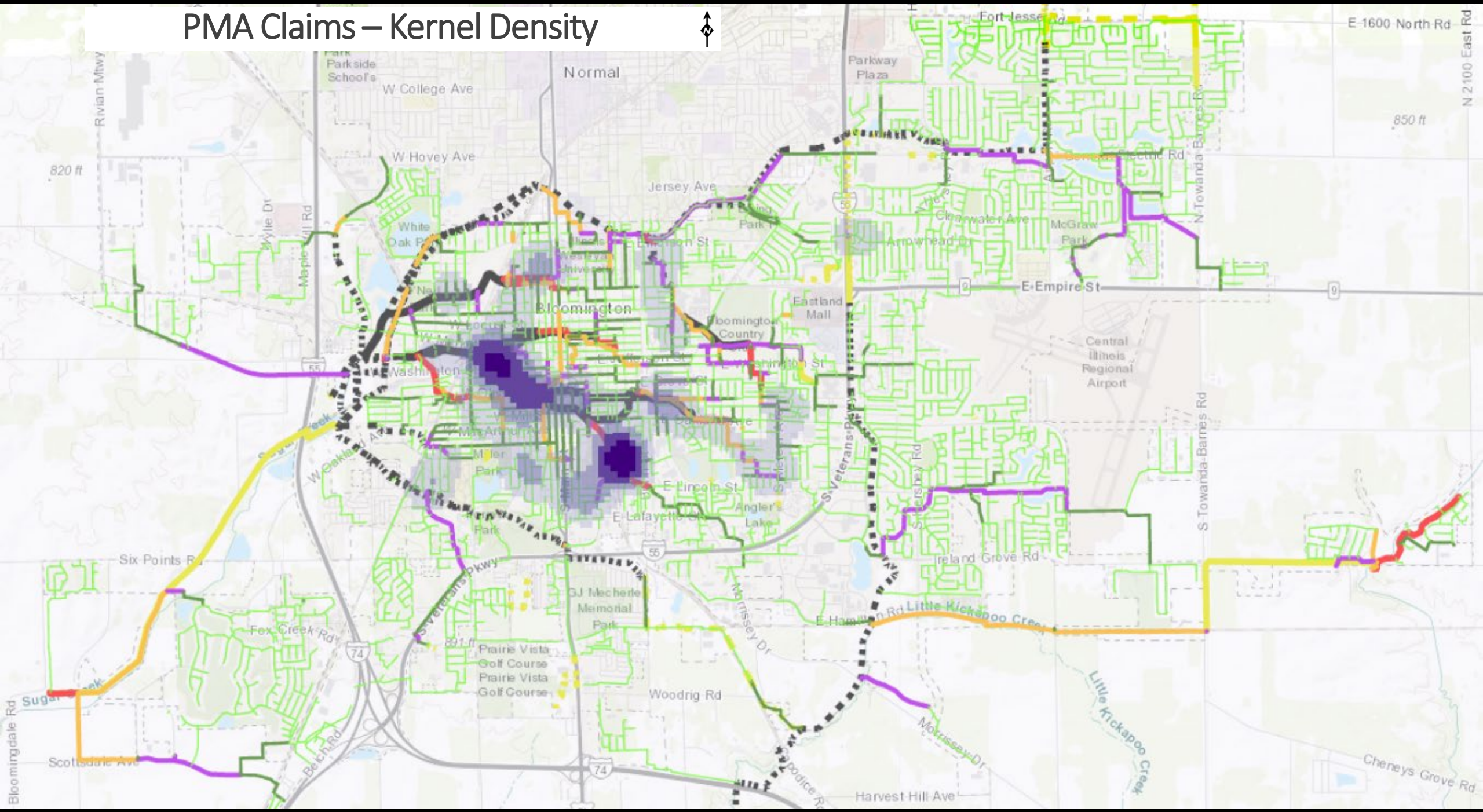


1867 Birdseye Map

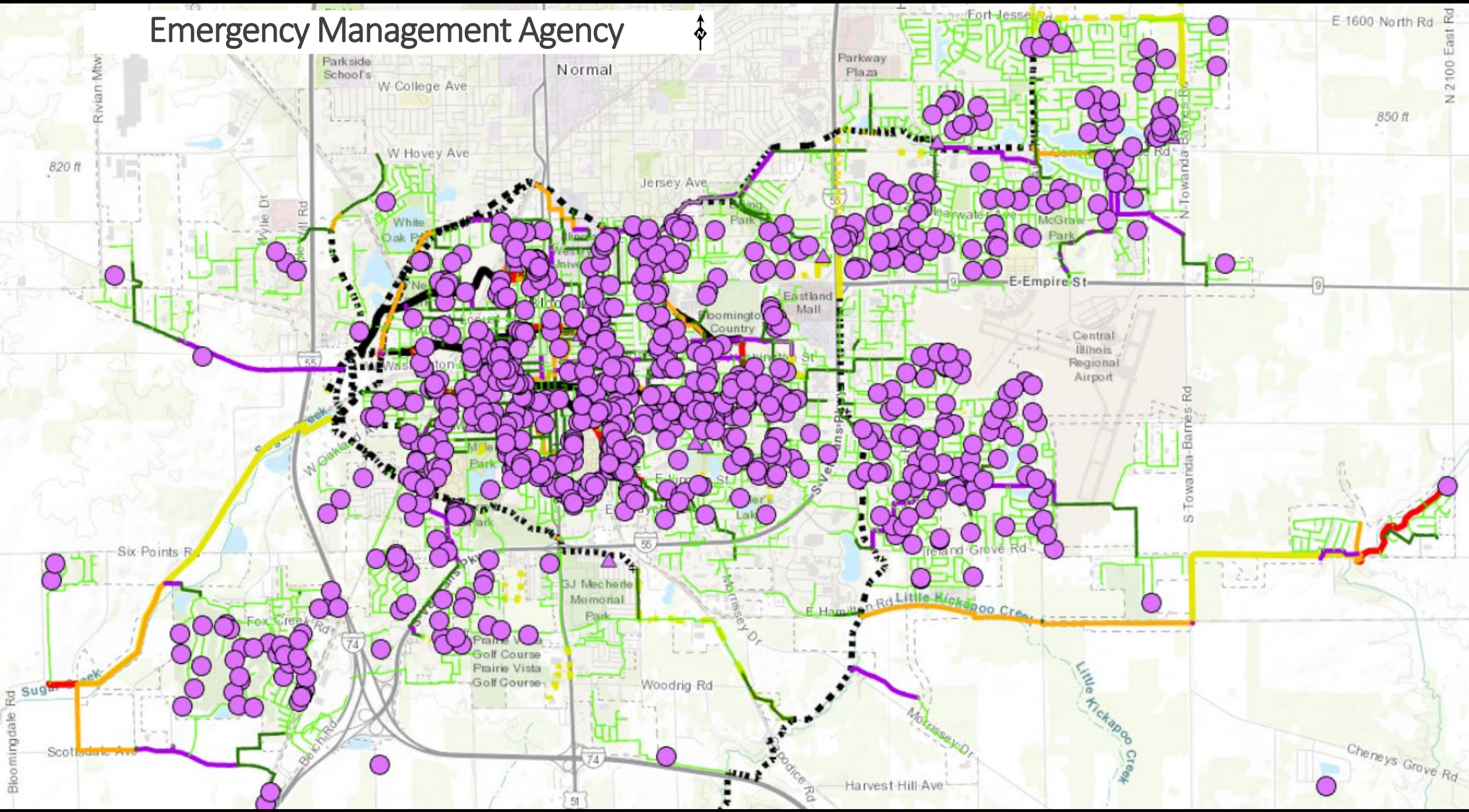
Sewer Size Map



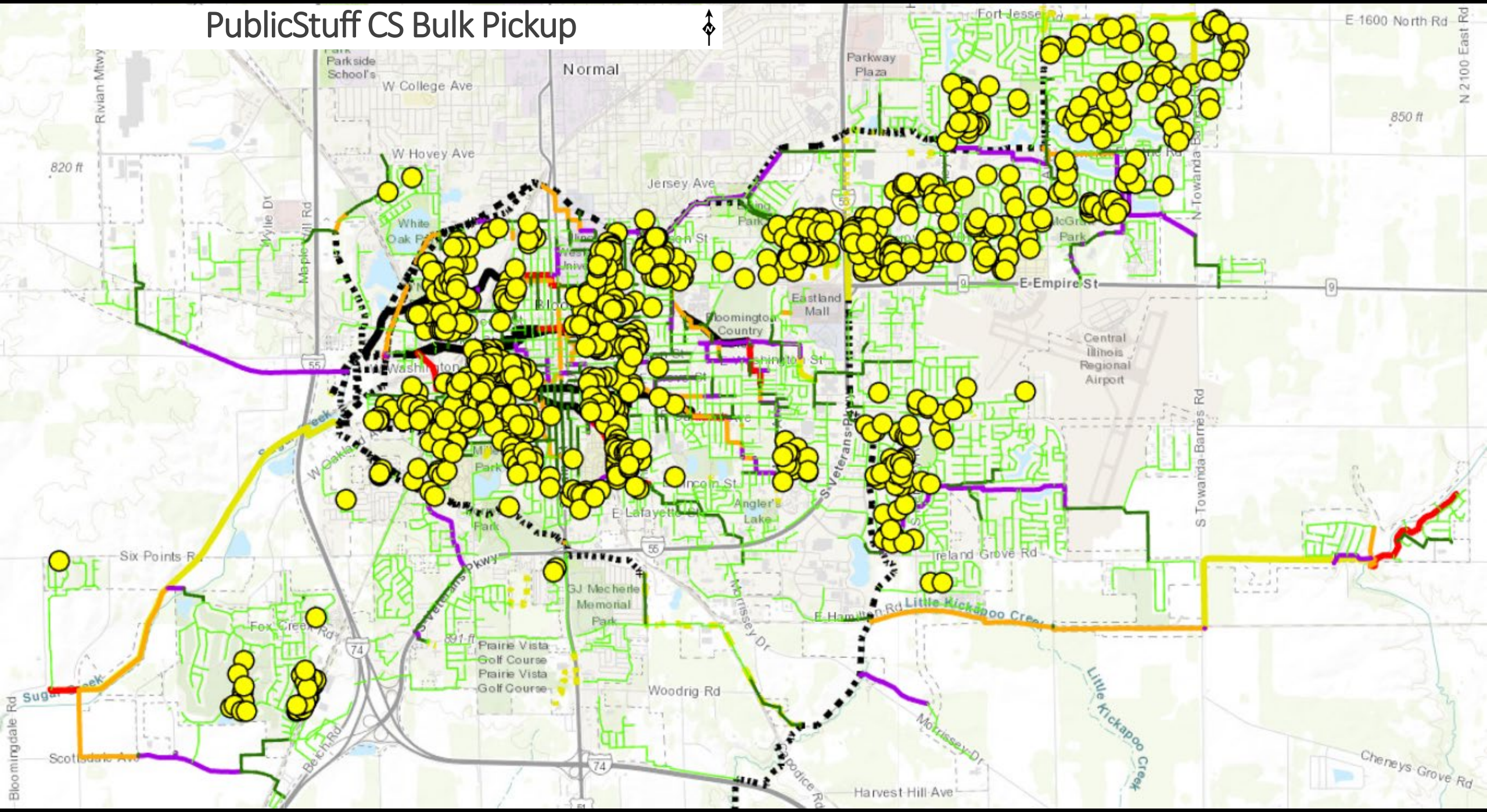
PMA Claims – Kernel Density



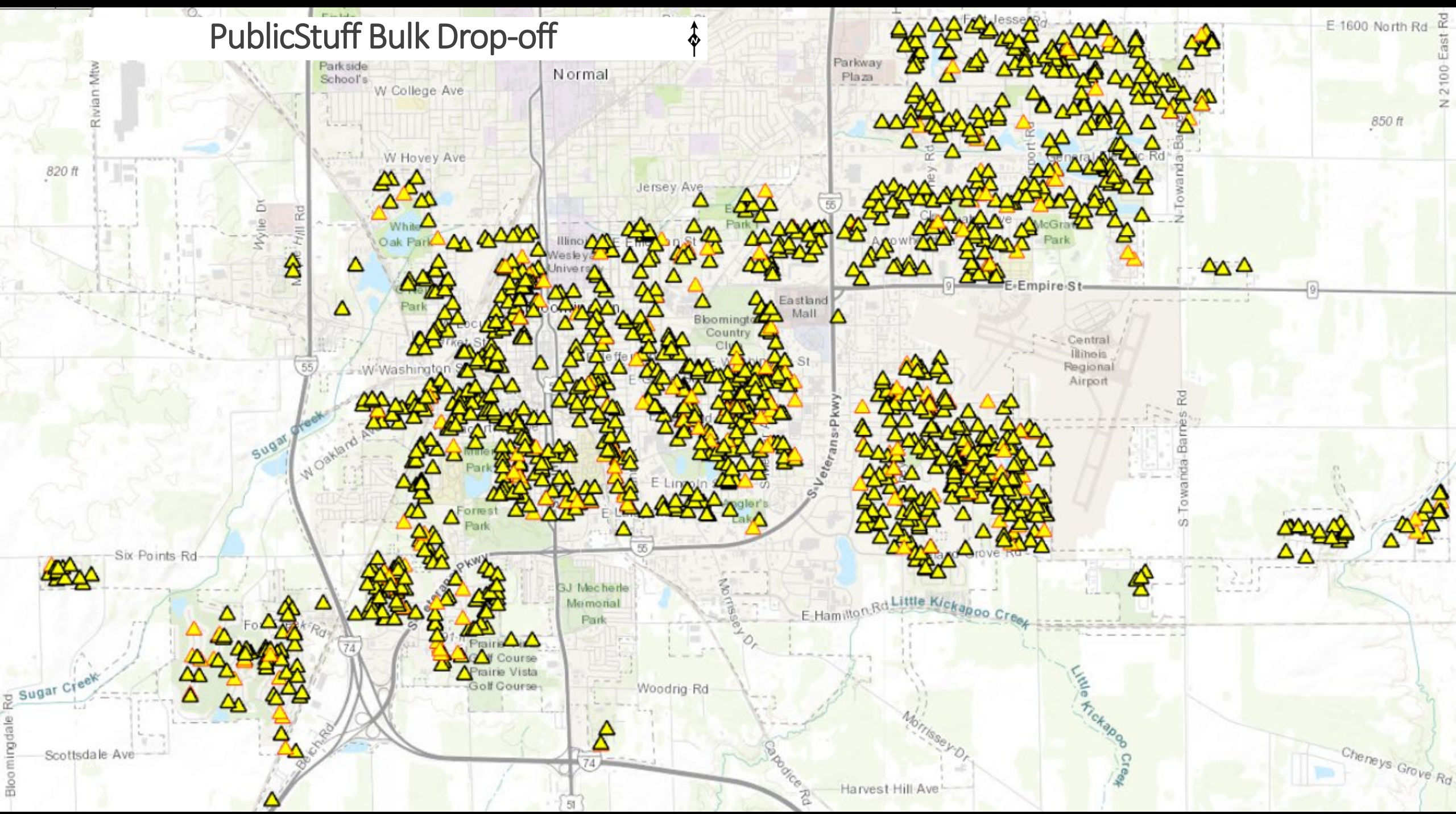
Emergency Management Agency



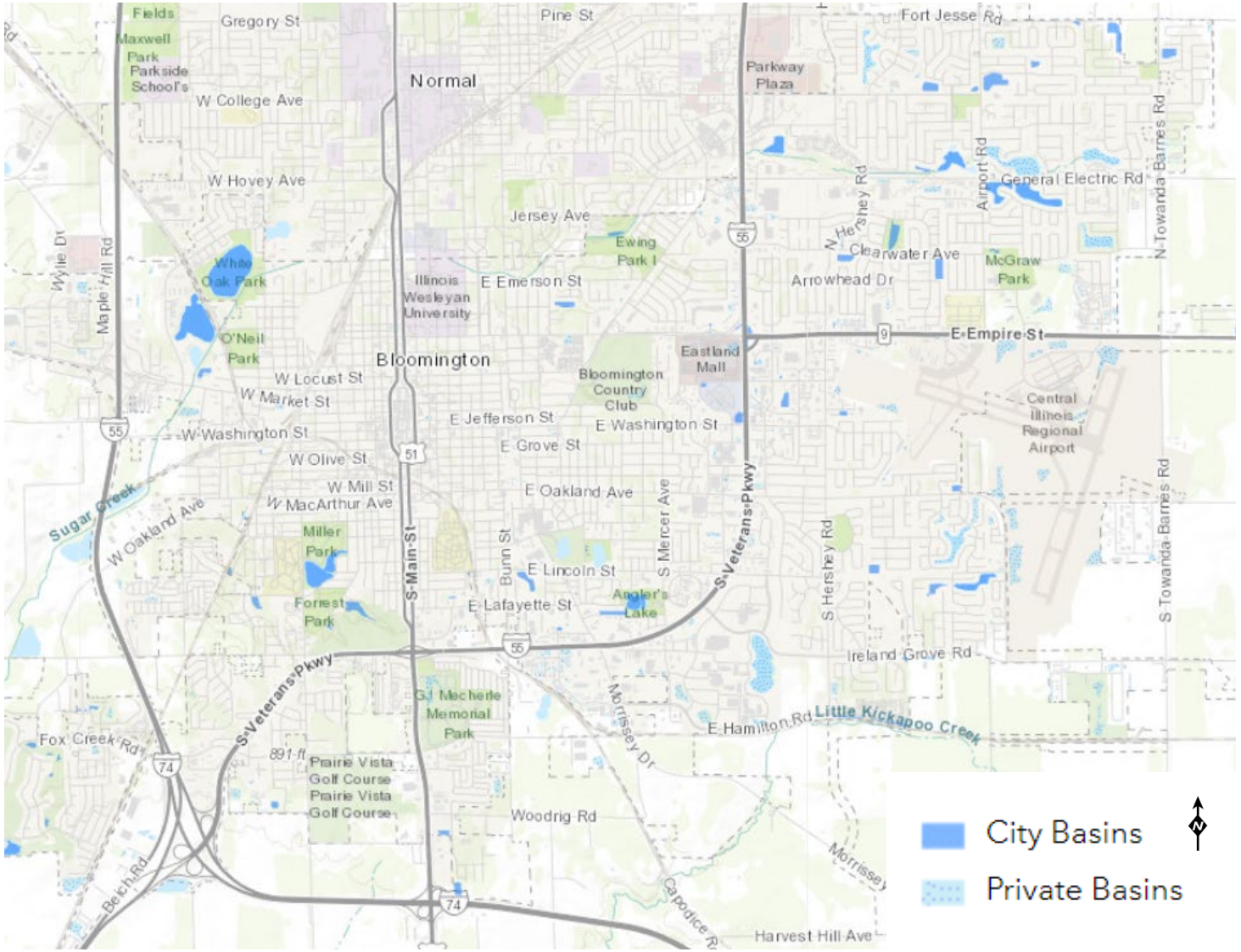
PublicStuff CS Bulk Pickup



PublicStuff Bulk Drop-off



Ongoing Work



Detention Basins

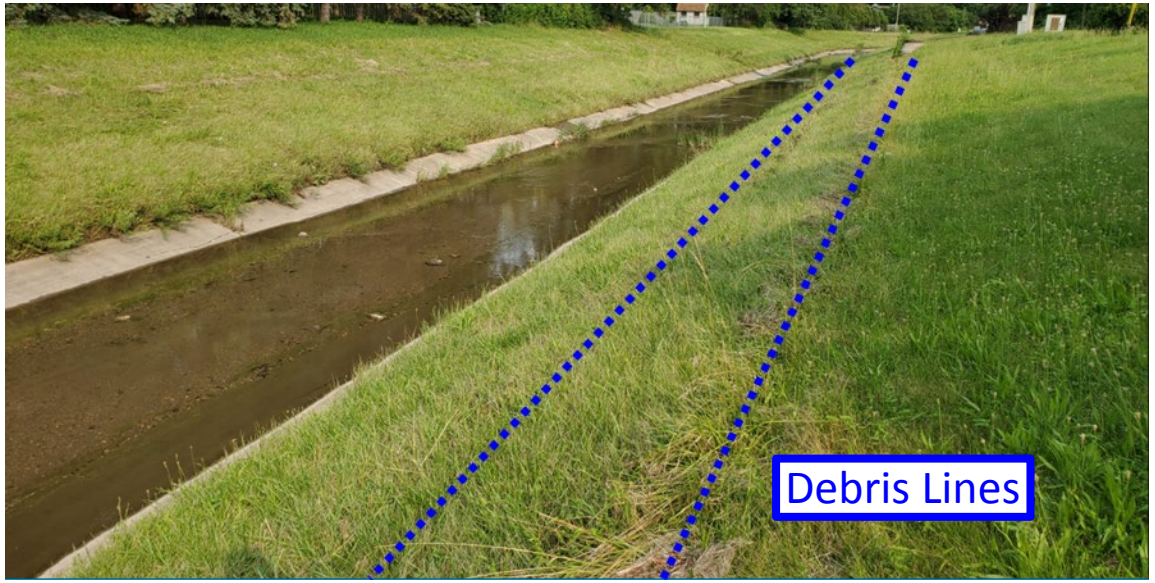
Detention basins make a difference

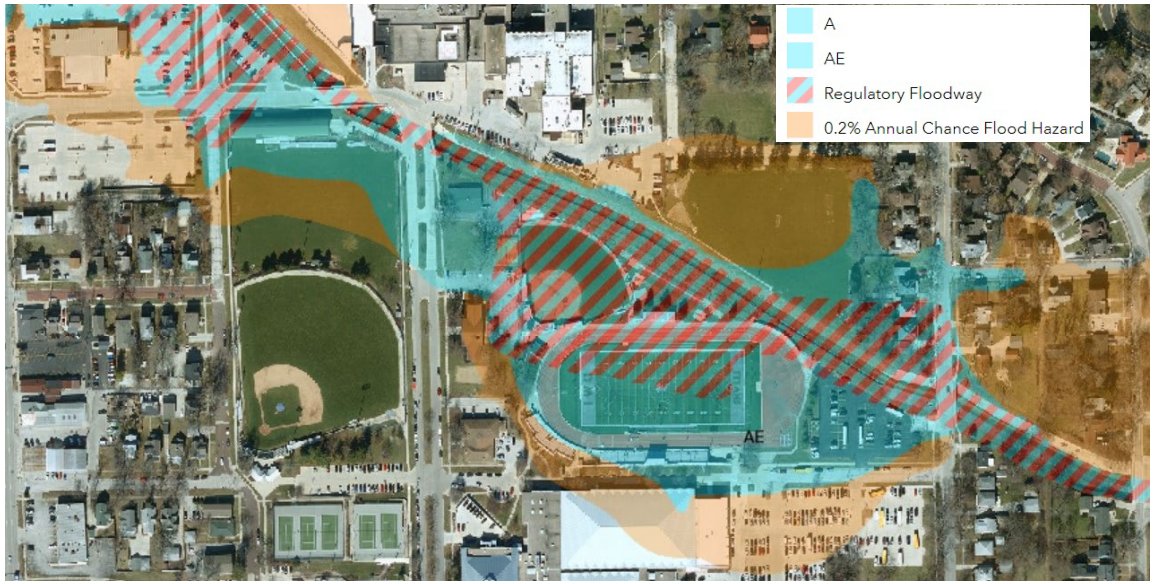
- City started with detention basins in the 1980's
- There are 397 private basins and 77 public basins
- Working together, they form a system that reduces flooding impacts downstream

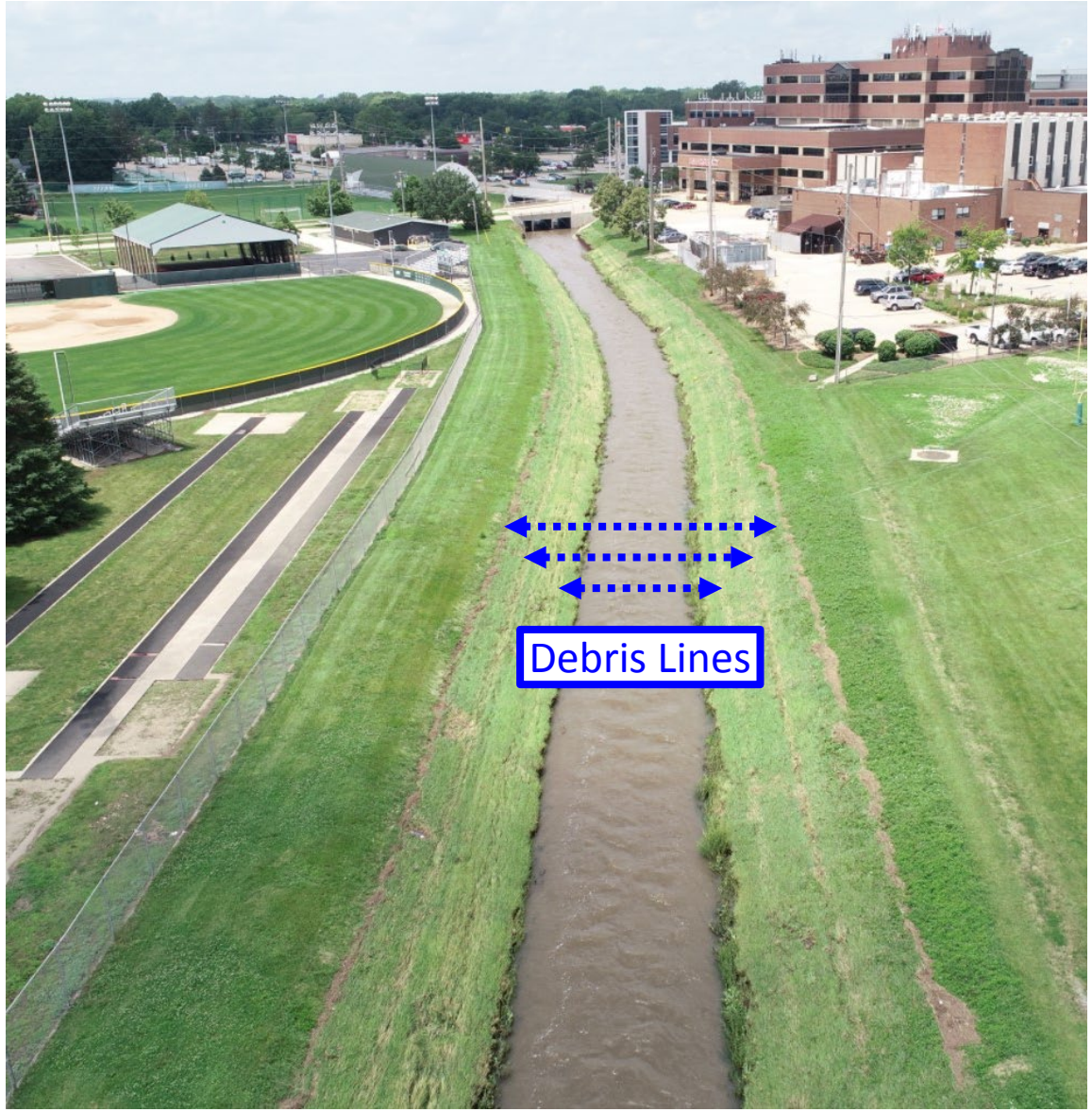
Baker Ash Basin

Pepper Ridge / Fox Creek Basin

Arcadia / Broadmoor Ditch and Sugar Creek







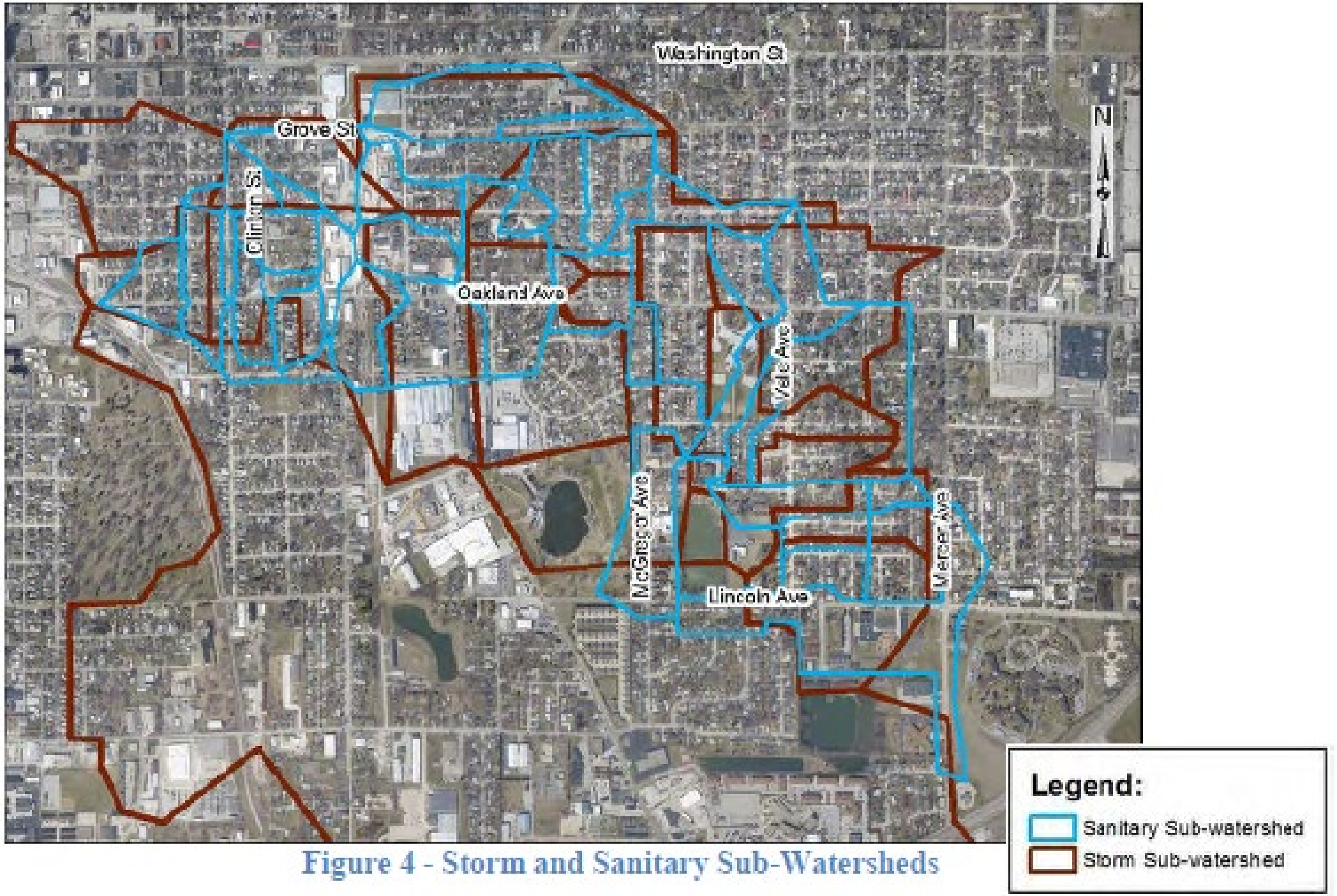
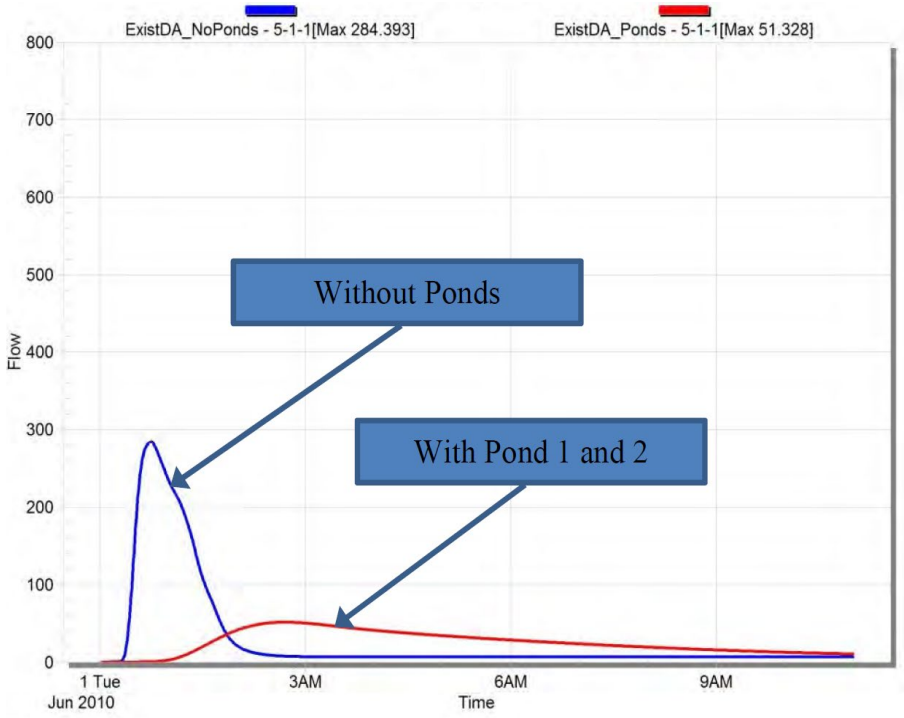


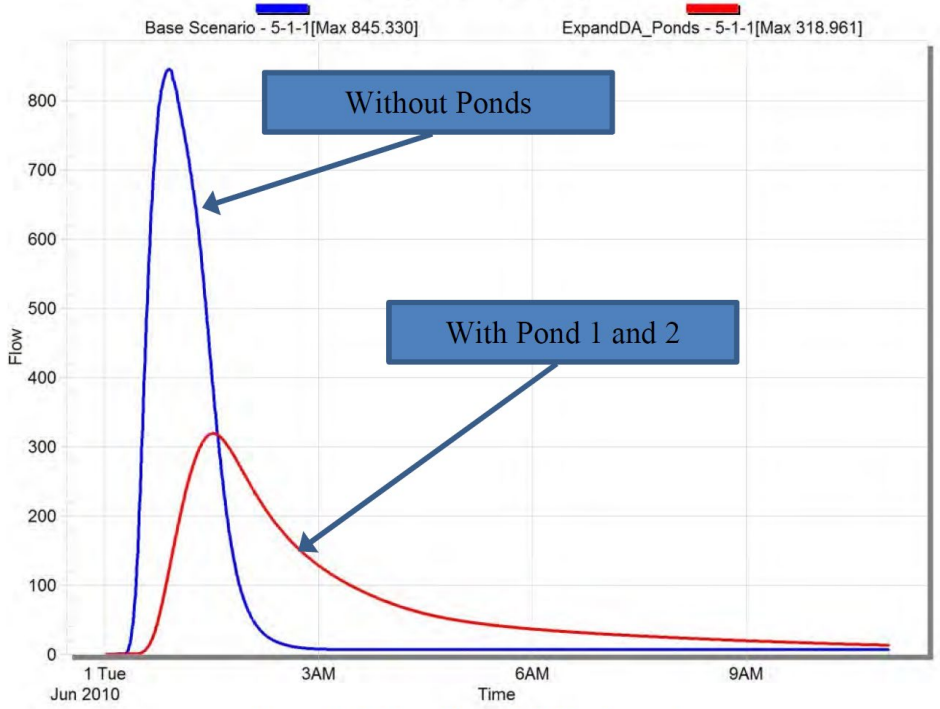
Figure 4 - Storm and Sanitary Sub-Watersheds

Figure 26 - Proposed Ponds and Conveyance Route

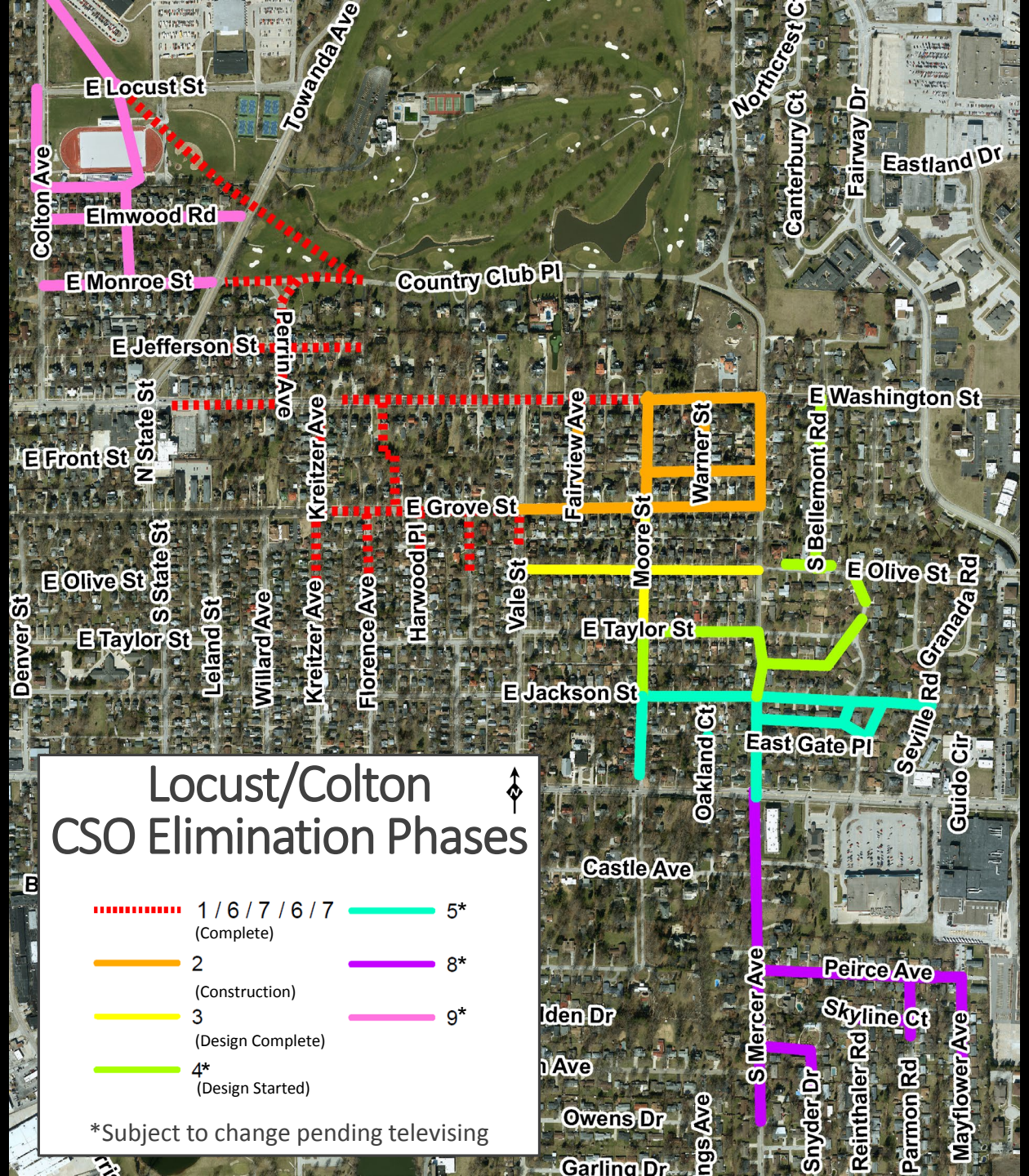
Master Plan Figure 27 - System Flows Adjacent to Sugar Creek



Existing Drainage Areas only



Expanded (Max. Potential) Drainage Area


Locust/Colton
CSO Elimination Phases
1 / 6 / 7 / 6 / 7
(Complete)
2
(Construction)
3
(Design Complete)
4*
(Design Started)
5*
8*
9*
*Subject to change pending televising
E Locust St
Towanda Ave
Northcrest Ct
Canterbury Ct
Fairway Dr
Eastland Dr
Colton Ave
Elmwood Rd
E Monroe St
Country Club Pl
Penn Ave
E Jefferson St
N State St
E Front St
Kreitzer Ave
E Grove St
Fairview Ave
Warner St
E Washington St
S Bellemont Rd
Moore St
Vale St
E Olive St
S State St
Denver St
E Taylor St
Leland St
Willard Ave
Florence Ave
Harwood Pl
E Jackson St
Granada Rd
Seville Rd
East Gate Pl
Oakland Ct
Guido Cir
Castle Ave
Peirce Ave
Skyline Ct
S Mercer Ave
Snyder Dr
Reinthaler Rd
Parmon Rd
Mayflower Ave
Owens Dr
Garling Dr

FY2022 Capital Projects
Sewer Fund and Storm Water Fund

Sewer Fund	FY2022
Multi-Year Sanitary Sewer Assessment	$400,000
Locust Colton CSO Elimination & Water Main Replacement - Construction- Phase 3 - IEPA SRF Loan Eligible	$1,661,000
Locust Colton CSO Elimination & Water Main Replacement - Construction- Phase 3 - IEPA SRF non-Loan Eligible	$50,000
Mutli-Year Sanitary Sewer Rehabilitation	$1,750,000
Miller Street Sanitary Sewer (800 East Block)	$200,000
Gray Avenue Sanitary Sewer (300 Block)	$200,000
Sugar Creek Forcemain Improvements - Construction	$1,600,000
TOTAL	**$5,861,000**

Storm Water Fund	FY2022
Locust Colton CSO Elimination & Water Main Replacement - Construction- Phase 3 - IEPA SRF Loan Eligible	$1,661,000
Locust Colton CSO Elimination & Water Main Replacement - Construction- Phase 3 - IEPA SRF non-Loan Eligible	$50,000
TOTAL	**$1,711,000**

FY2023 Capital Projects
Sewer Fund and Storm Water Fund

Sewer Fund	FY2023
Multi-Year Sanitary Sewer Assessment	$400,000
Locust Colton CSO Elim & WMR, Phase 4, IEPA SRF Loan Expense	$597,000
Locust Colton CSO Elim & WMR, Phase 4, IEPA SRF non-Loan Expense	$20,000
Locust Colton CSO Elim & WMR, Phase 5, Design, IEPA SRF non-Loan Expense	$175,000
Mutli-Year Sanitary Sewer Rehabilitation	$1,750,000
Cottage Avenue Sanitary Sewer (1400 Block)	$250,000
Strawberry Road Sewer Improvements	$40,000
Valley Sewer (Maizefield) CSO Elimination Phase 1 Design & Land	$80,000
TOTAL	**$3,312,000**

Storm Water Fund	FY2023
Locust Colton CSO Elim & WMR, Phase 4, IEPA SRF Loan Expense	$597,000
Locust Colton CSO Elim & WMR, Phase 4, IEPA SRF non-Loan Expense	$20,000
Locust Colton CSO Elim & WMR, Phase 5, Design, IEPA SRF non-Loan Expense	$175,000
Valley Sewer (Maizefield) CSO Elimination Phase 1 Design & Land	$80,000
TOTAL	**$872,000**

FY2024 Capital Projects
Sewer Fund and Storm Water Fund

Sewer Fund	FY2024
Multi-Year Sanitary Sewer Assessment	$400,000
Mutli-Year Sanitary Sewer Rehabilitation	$1,750,000
Valley Sewer (Maizefield) CSO Elimination Phase 1 Construction	$360,000
Strawberry Road Sewer Improvements	$400,000
Valley Sewer (Maizefield) CSO Elimination Phase 2 Design	$40,000
TOTAL	**$2,950,000**

Storm Water Fund	FY2024
Valley Sewer (Maizefield) CSO Elimination Phase 1 Construction	$360,000
TOTAL	**$360,000**

FY2025 Capital Projects
Sewer Fund and Storm Water Fund

Sewer Fund	FY2025
Multi-Year Sanitary Sewer Assessment	$400,000
Locust Colton CSO Elim & WMR, Phase 5, IEPA SRF Loan Expense	$1,957,000
Locust Colton CSO Elim & WMR, Phase 5, IEPA SRF non-Loan Expense	$60,000
Locust Colton CSO Elim & WMR, Phase 8, Design, IEPA SRF non-Loan Expense	$167,000
Valley Sewer (Maizefield) CSO Elimination Phase 2 Construction	$300,000
Mutli-Year Sanitary Sewer Rehabilitation	$1,750,000
TOTAL	**$4,634,000**

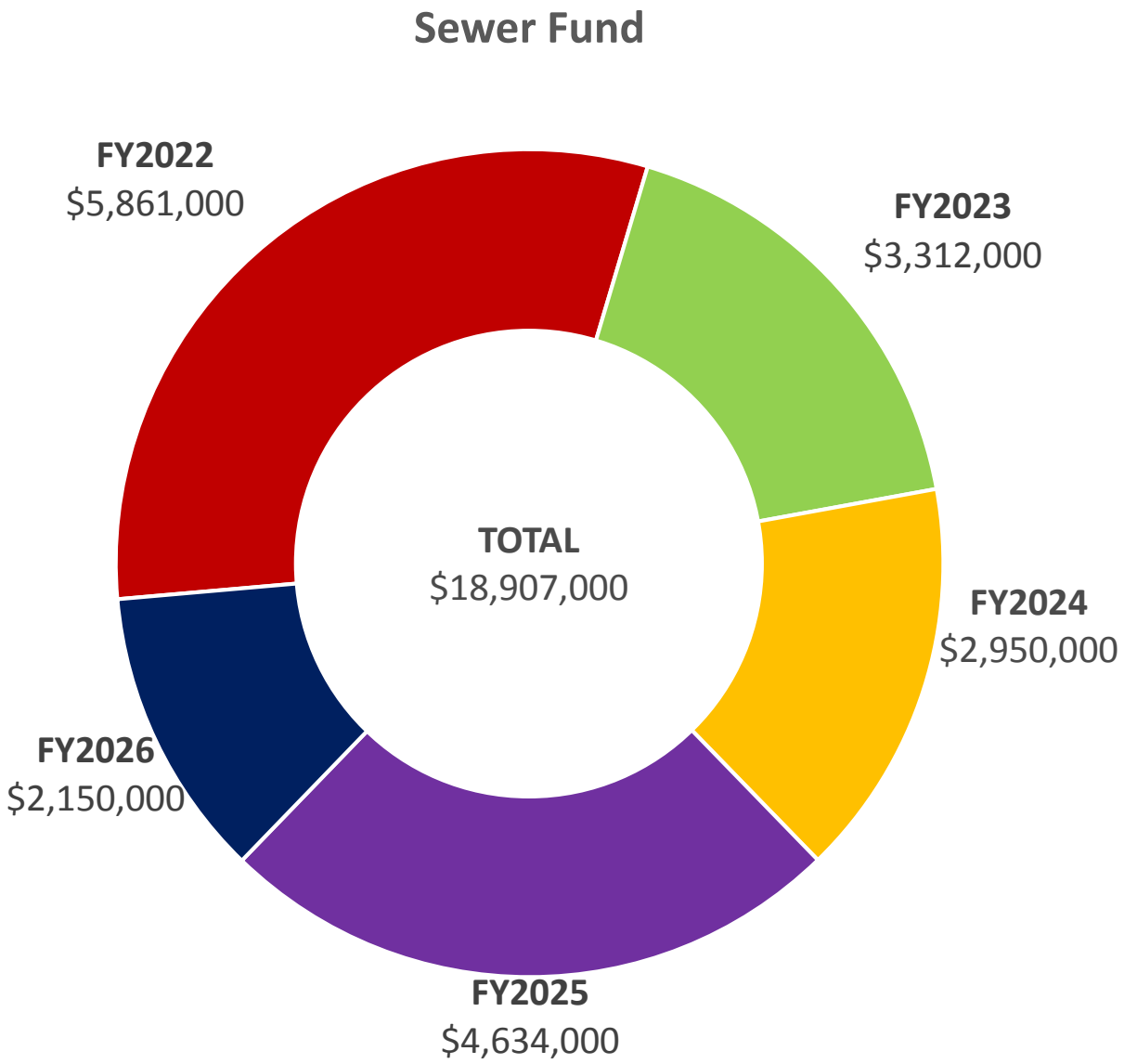
Storm Water Fund	FY2025
Locust Colton CSO Elim & WMR, Phase 5, IEPA SRF Loan Expense	$1,957,000
Locust Colton CSO Elim & WMR, Phase 5, IEPA SRF non-Loan Expense	$60,000
Locust Colton CSO Elim & WMR, Phase 8, Design, IEPA SRF non-Loan Expense	$167,000
Valley Sewer (Maizefield) CSO Elimination Phase 2 Design	$40,000
TOTAL	**$2,224,000**

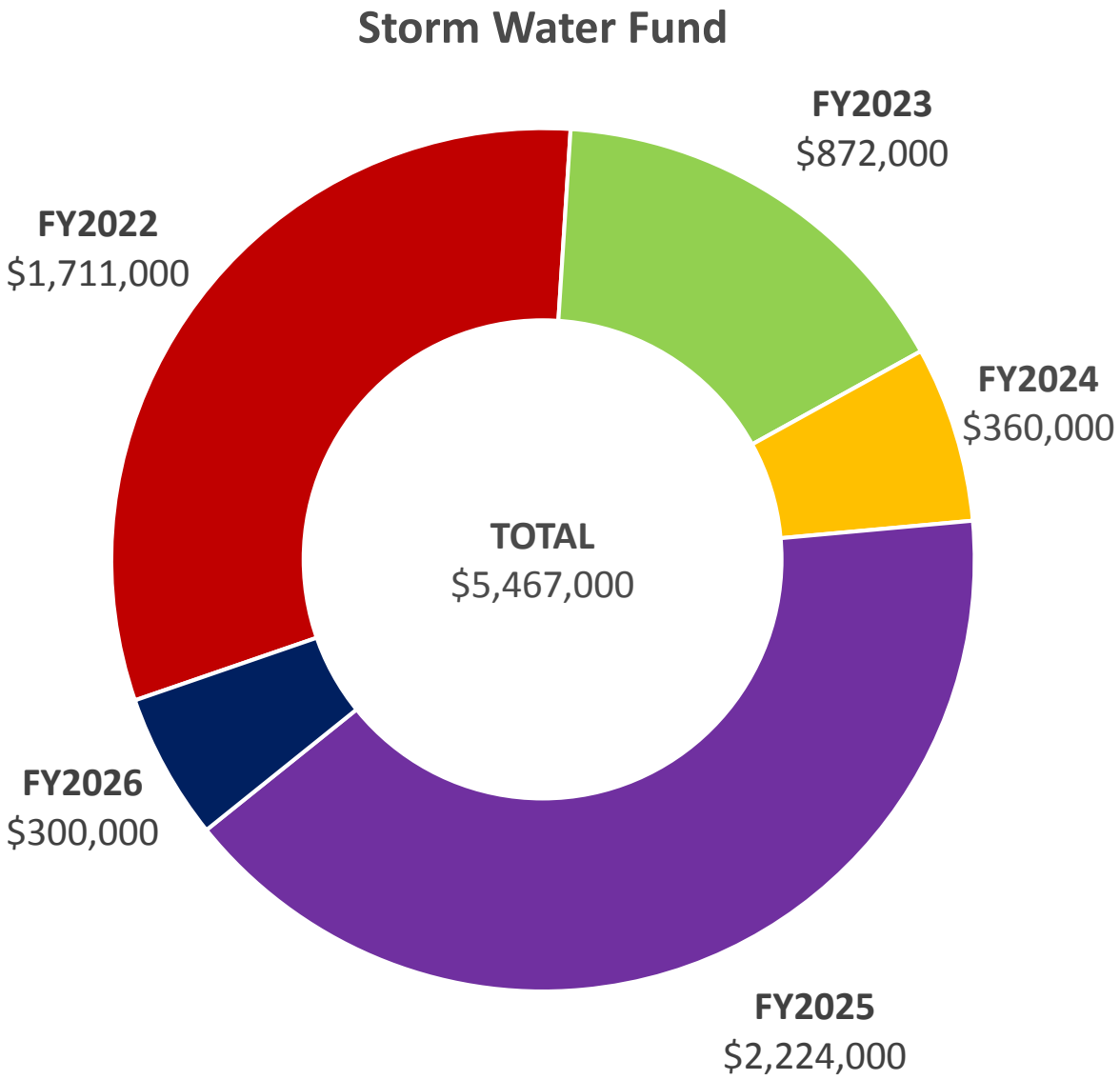
FY2026 Capital Projects
Sewer Fund and Storm Water Fund

Sanitary Sewer Fund	FY2026
Multi-Year Sanitary Sewer Assessment	$400,000
Mutli-Year Sanitary Sewer Rehabilitation	$1,750,000
TOTAL	**$2,150,000**

Storm Water Fund	FY2026
Valley Sewer (Maizefield) CSO Elimination Phase 2 Construction	$300,000
TOTAL	**$300,000**

FY22-FY26 Capital Projects: Sewer Fund and Storm water Fund





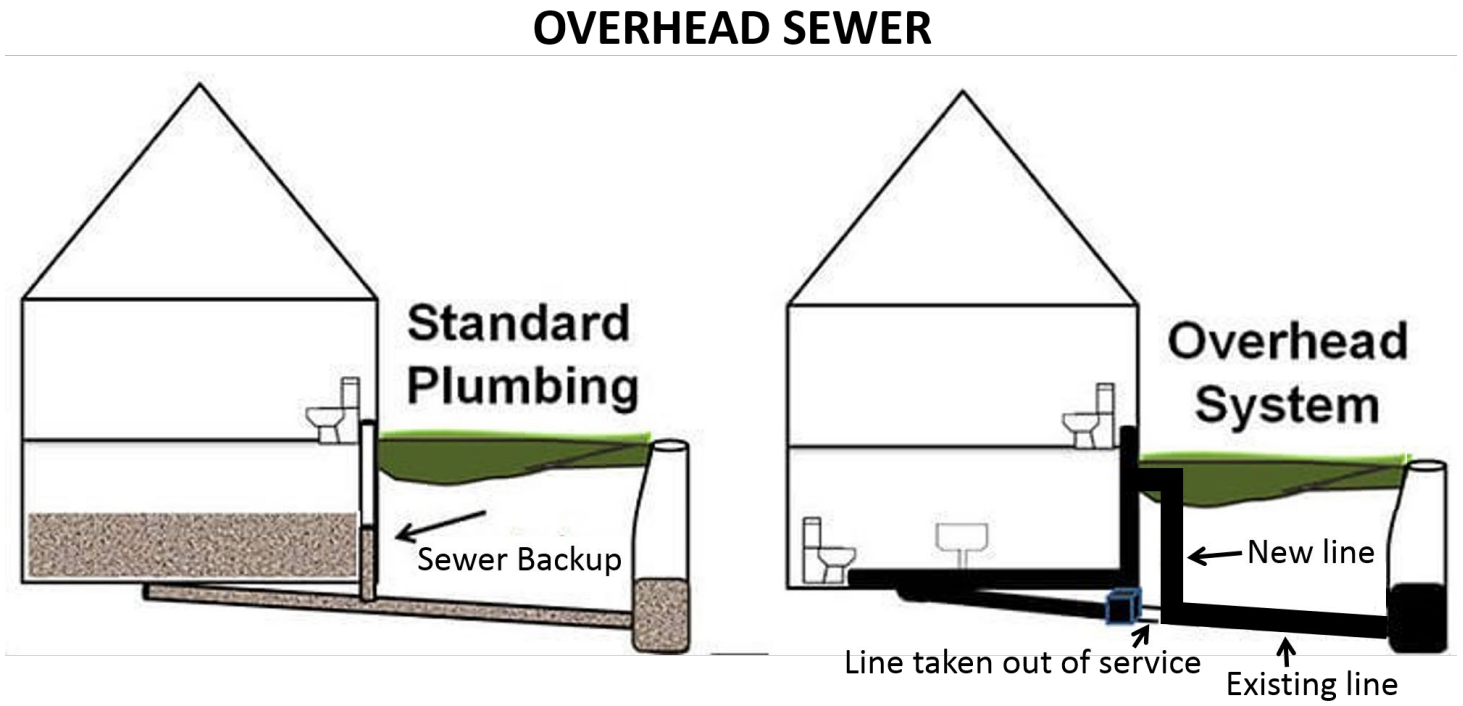
Sewer and Storm Water Maintenance and Assessment

- Making emergency cave-in repairs
- Cleaning sewers
- Performing smoke testing and dye testing
- Televising and evaluating
- Lining sewers
- Upgrading Supervisory Control and Data Acquisition (SCADA)
- Installing and maintaining sump pump drain lines
- Performing erosion control inspections and code enforcement
- Keeping lakes and streams clean
- Maintaining waterways to minimize erosion and damage to adjacent property
- Maintaining detention basins to reduce flooding and filter out pollution
- Maintaining and repairing manholes, inlets, and pump stations
- Street sweeping
- Cleaning select inlets before a storm
- Performing plan reviews and construction inspections

What can be done moving forward?

Preventing Sewer Backups

- Have sewer service cleaned and televised periodically
- Televise sewer services prior to purchase of property



Properties Served by Combined Sewers

- Overhead sewer program available through City for owner occupied single family
  - Up to $4,500 available per eligible home for eligible items
  - $40,000 per year currently budgeted
- Sewer backflow preventers

Helpful Hints

- Keep service lines clean and in good repair
- Remove obstructions in / side yard and back yard swales / flood routes / downhill areas
- Private lot grading and low isolated areas
- Most subdivisions built in the City after 1990 have a lot grading plan
  - Contact PW Engineering Division to get a copy for your property (434-2225 or engineer@cityblm.org)
- Make sure down spouts point away from the foundation
- Keep gutters and down spouts clean
- Make sure driveway, sidewalks, patios, etc., are sloped away from foundation

Helpful Hints

- Window wells
  - Make sure window wells are set high enough and have not settled over time
  - Keep window well free of debris
  - Consider covers over window to keep rain and debris out
- Sump pumps
  - Connect sump pump discharge to sump pump drain lines along street (where available)
  - Keep sump pump and gutter discharge points at least 15 feet away from front and rear property lines.
  - Sump pump connected to sanitary sewers – illegal

Helpful Hints

- Battery powered water alarms to alert you like a smoke detector
  - Some are “smart,” work with apps and smart home controls, and can send text or e-mails to alert you remotely
- Rain barrels
  - Available through the Ecology Action Center and others

Source: techhive.com

Source: nytimes.com


Source: ecologyactioncenter.org

Helpful Hints

- Supplemental insurance coverage options
  - Flood coverage
  - Sewer backup coverage
  - Sump pump coverage
  - Sewer lateral coverage
    - ServLine through the City and other options

City Code Review

- Code amendments to get sheds, fences, etc., out of swales
- Code amendments to disallow swimming, boating, gardens, boat docks, fire pits, etc., from public detention basins and other public drainage ways
- Add requirement for homes to be inspected for proper plumbing connections when home is sold
  - Sump pump, down spouts, footing tiles, and yard drains not connected to sanitary sewer

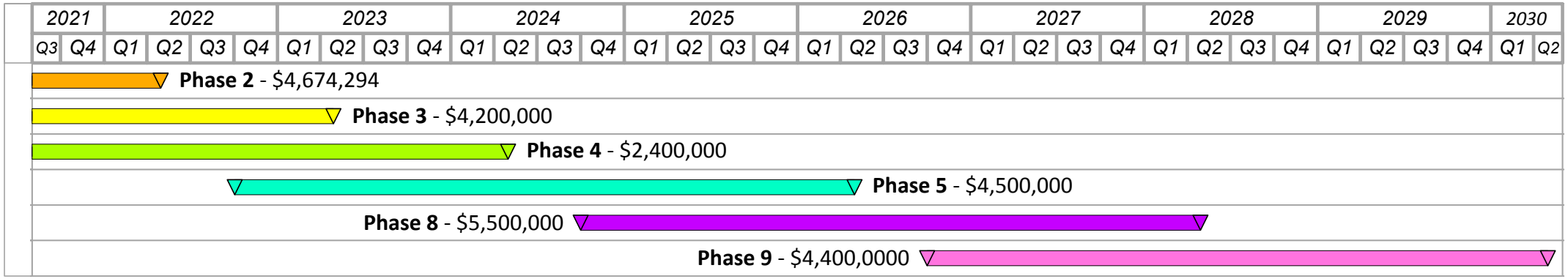
Additional Considerations

- Consider additional hydraulic modeling of select sewer sheds (storm and sanitary)
- Consider additional capital projects as an outcome of modeling
- Funding of additional capital projects
  - Cash, IEPA low interest loans, General Obligation (GO) Bonds
- Review sewer and storm water rates (user fees) to adequately support additional capital projects as needed

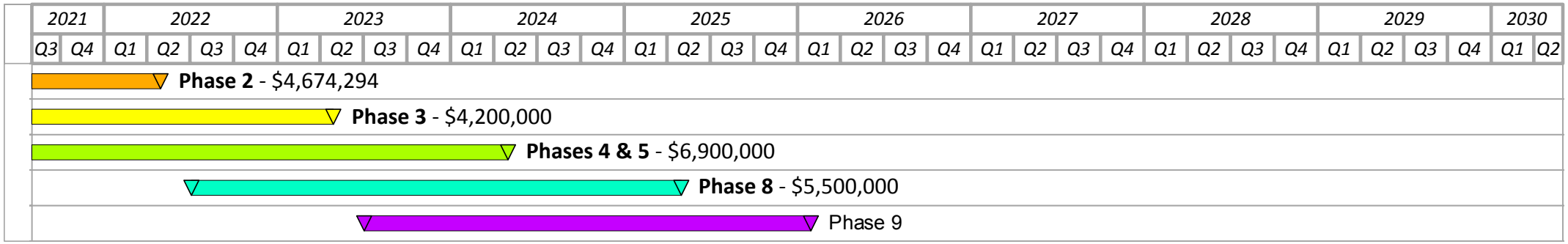
Future Council Possibilities

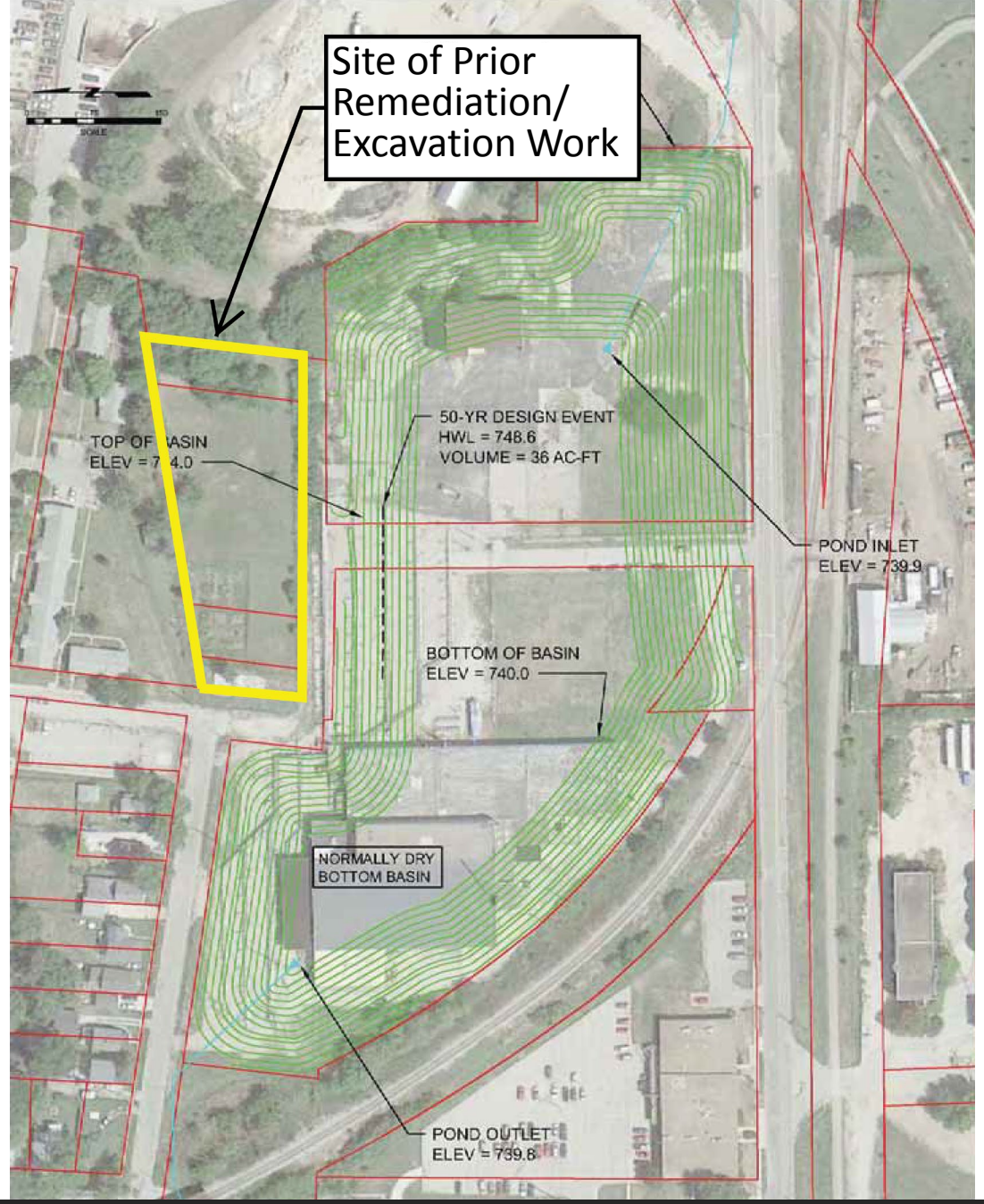
Locust/Colton CSO Elimination
All Phases Schedule

Schedule with IEPA Loan Funding (current schedule)



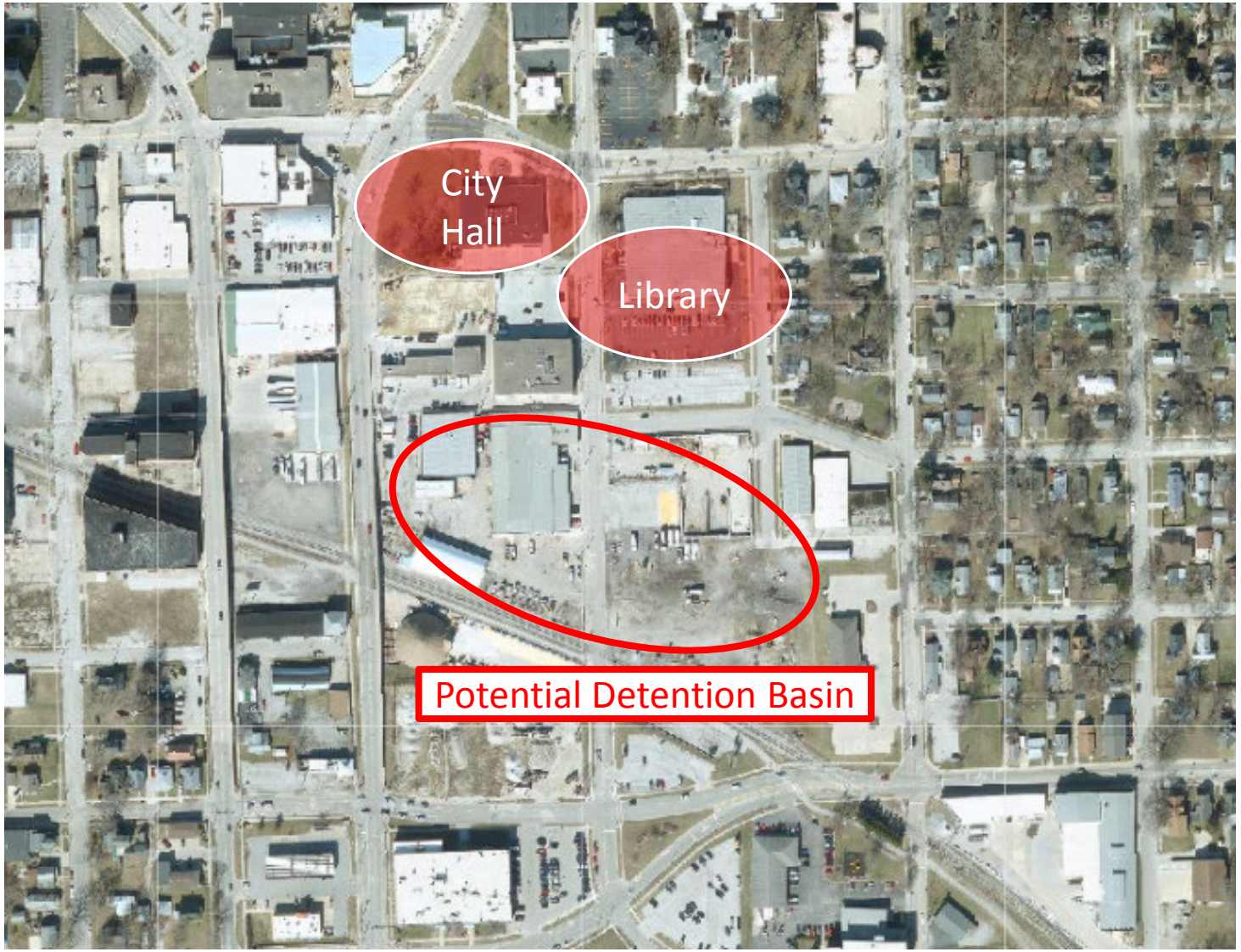
Possible Schedule with Local Funding





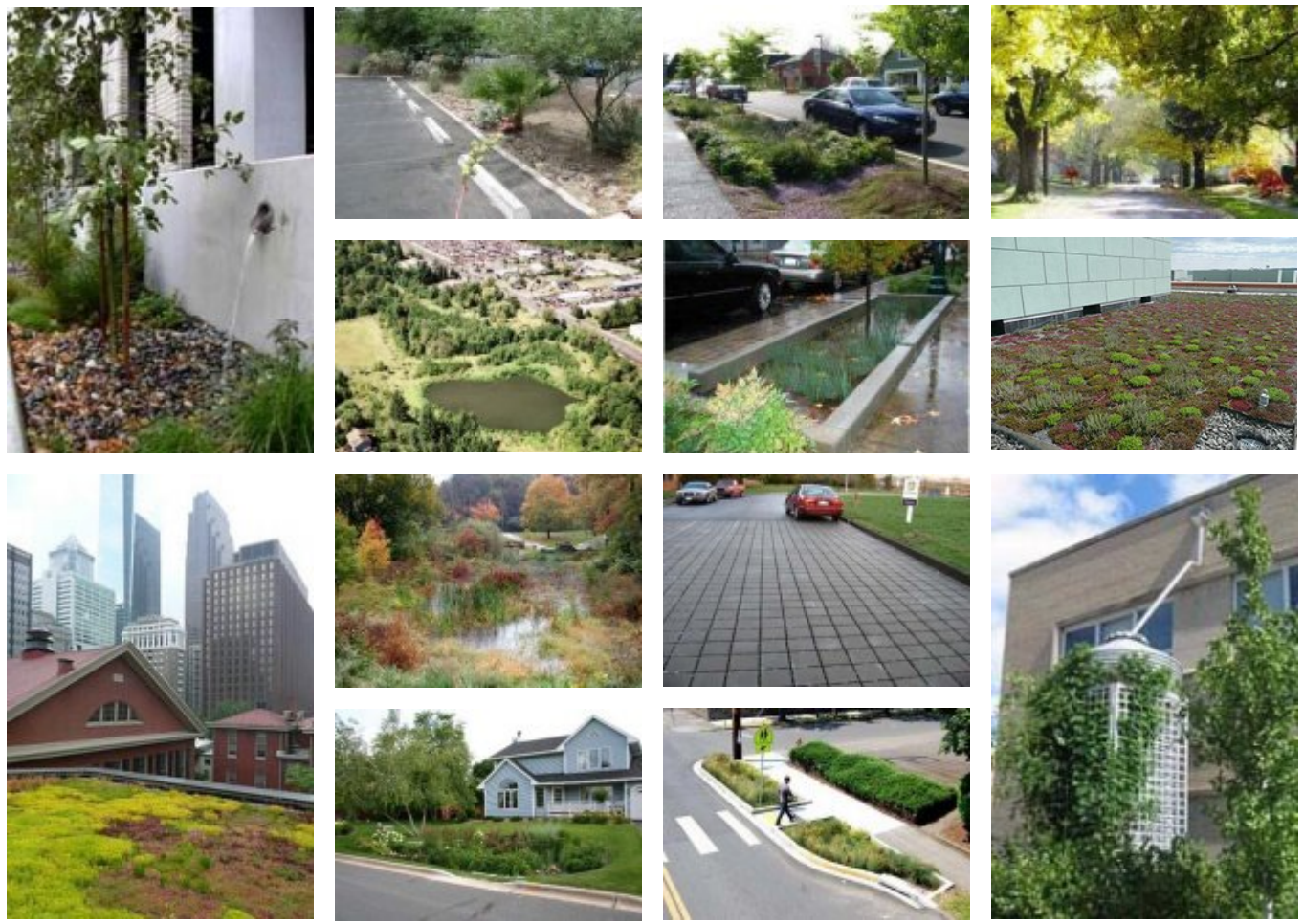
Future Council Possibilities

- Formal Pursuit of Nicor site for detention
  - Authorize letter of interest



Future Council Possibilities

- Evaluate facility relocation and detention near Downtown
- Authorize pursuit of system modeling



Source: epa.gov

Green Infrastructure

- Works for lesser events
  - Design standards consider pervious surfaces absorbing a portion of the rainfall which lessens the run-off in most cases
  - More runoff is generated when ground is frozen or fully saturated
  - Saturated earth is less cohesive and can put additional pressure on foundation walls
  - A high water table also impacts basements
  - Sump pumps run more often and sometimes for days or even weeks

Potential Next Steps

- Expedite Locust/Colton CSO Elimination schedule
- Increase funding for the overhead sewer program
- Perform additional hydraulic modeling of select storm and sewer sheds
- Evaluate additional projects resulting from hydraulic modeling
- Initiate formal discussions with Nicor regarding detention at their remediation site
- Evaluate facility relocation and detention near Downtown
- Review and update City code
- Evaluate funding sources and rate structures

Questions & Discussion