Agenda – Workshop 4

Project:	CR STORM WATER MASTER PLAN
Subject:	Project Team Meeting
Date:	Wednesday, December 09, 2015
Attendees:	Garrett Prestegard, David Wallace, Jonathan Durst (copied), Sandy Pumphrey, Loren Snell, Ryan Bemrich, Bill Bogert (copied), Terry Tiedemann (copied), Michael Butterfield, David Dechant, Brice Stafne

Agenda

Objectives

- Review and discuss preliminary results of Kenwood basin-level model
- Initiate discussions of potential Kenwood basin improvements
- Initiate discussions of financial needs and future considerations

Stormwater Master Plan Development

- Refresh Master Plan Goals
    - Phase 1 - Prioritization criteria and list for FY2017
    - Phase 2 - Develop a model for broader analysis of problems and project solutions
    - Phase 3 - Develop a living document to be integrated with annual capital improvements planning
- TM Status
    - Final FY 2017 CIP Summary TM - complete.
    - TM 1.0 Existing System refined and resubmitted for City review.
    - TM 2.0 Asset Management submitted for City review.
    - TM 3.1 Macro Modeling submitted for City review.
    - TM 3.2 Basin Modeling anticipated late December.
    - TM 6.0 – Policy Recommendations anticipated early January
    - TM 7.0 – Future Considerations anticipated early January
    - TM 4.0 – Capital Improvements Plan anticipated early February
    - TM 5.0 – Financial Plan anticipated early February
- Kenwood Basin-level Model – Preliminary Results
    - Basin-level Modeling Approach
    - Kenwood Model Overview (Basin Characteristics, 1D Flow Network, 2D Surface, Rainfall Events)
    - Basin-Level Results & Discussion
- Kenwood Basin –Improvements Discussion
    - Discussion of CIP Project Areas
    - Grey vs. Green Improvement Applicability
    - Project Prioritization

- Financial Needs
    - Historical 671
    - FY16 671
    - Financial Plan
- Future Considerations
    - Implementation
    - Growth
    - Regulatory
    - Flood Control System
- Set Date for Workshop 5
    - Week of January 17 or January 24

Meeting Discussion

Kenwood Basin Model

The focus of the meeting was on the preliminary results of the Kenwood Basin modeling. HDR presented an overview of objectives and the modeling approach specific to the basin-level model, an overview of the Kenwood Basin, and maps of the basin showing the pipe networks, catchments, and projects currently in the CIP.

- The Kenwood Basin model includes approximately 27 miles of pipe, sized 12-inches and larger. This was contrasted against the approximately 40 miles of pipe, sized 48-inches and larger, that was included in the macro-level model.
- There are 17 projects on the CIP list located in the Kenwood Basin. The highest ranked projects currently are #11-14.
- The 100-year nested storm hyetograph was discussed and compared to the hyetograph from the June 30, 2014 storm. The date and times of that storm need to be verified; it was also noted that there was a second storm the following night. HDR will verify.
- Connections between the storm sewer and ponds on the Elmcrest Country Club golf course have not been verified; HDR will follow up with Elmcrest CC.
- HDR noted that it is important to consider how the model is showing / handling overland flow. In reality, some ponding may be recaptured but it is more difficult to recapture the overland flow in the model than it is for the flow to leave the 1D network. The downside to this is that it is possible that there are higher flows in some pipe segments than what is shown because the model is not recapturing all of the overland flow. The ponding areas should nevertheless be representative of areas that would experience ponding.
- Bottlenecks are pipes that are not capable of conveying the modeled flow; these result from too much flow, pipes that are too flat, pipes that are too small, or some combination of these factors.
- Head-losses through bends, deflections, and manholes are not reflected in the model. Numerous bottlenecks were observed at these areas.

- The model does not reflect losses of stormwater flow due to inflow and infiltration (I&I) into the sanitary sewers. In other words, the model shows what should be part of the storm system.

Results of the modeling, including maps of the 5-year and 100-year results, were presented and discussed.

- Case 114, near D Ave and 38th-39th Streets NE: Bottleneck near a proposed CIP project. City staff noted that the ponding was consistent with observed street flooding during intense rains.
- A 78-inch arch pipe north of Mt. Mercy University, along Mound Farm Drive NE, is a bottleneck and may warrant further investigation. There is ponding on both sides of the pipe. At 29th Street NE, the pipe turns to the southeast and becomes a box culvert.
- A 40-inch pipe near F Avenue NE just east of 21st Street (near the CEMAR Trail) is a bottleneck; little information was available during modeling. Additional field information will eventually be required.
- Case 20, near 15th Street and A & B Avenues NE, the project label was shown too far to the west and should be closer to 15th Street where ponding is deepest. The model predicted depths of around 5 feet or more, validating what was observed during the June 2014 flash flood.
- The model showed that the box culvert leading to Cedar Lake (18' x 10') had adequate capacity, with the exception of one area near E Avenue & 14th Street NE. This bottleneck caused a full pipe upstream.
- The project location of Case 20/Case 16 for Washington Ave SE needs to be verified.

Considerations for additional modeling possibilities were discussed for validating existing projects and identifying additional projects.

- Upsize the 78-inch sewer along 15th Street from 1st Ave to D Ave NE.
- There were also capacity issues noted in the model for the 66-inch sewer along 16th Street where City staff noted that the 66-inch sewer had previously been repaired using a shotcrete liner from C Ave NE to 1st Ave, which may have reduced the diameter and also roughened the pipe (both of which would reduce the capacity of the pipe) making the problem even worse than modeling suggests.
- Retrofitting detention ponds throughout the Kenwood Basin to reduce peak flows and downstream sewer capacity requirements. The City is looking for options. Neighborhood parks may seem an obvious option but can meet with opposition from neighbors as these are coveted areas.
    - Take out houses near A & B Avenues and deepen the existing low-spot.
    - Provide detention near 144-inch box near E Ave and 20th Street NE
    - The large impervious area south of Mt. Mercy, near E Ave and 20th Street NE, may be developed into ball fields reducing impervious surface area and providing an opportunity for incorporating some green infrastructure.

- Two businesses in the basin – Rockwell Collins' facility near Eastern Ave & 33rd Street NE and D.C. Taylor's parking lot near B Ave & 29th Street NE – have large impervious areas. Adding detention basins or bioswales could have water quantity and quality benefits. The City and HDR should strategize a public-private partnership with either or both businesses.
- Paving for Progress projects need to be checked for opportunities to incorporate storm water improvements, including underground storage beneath reconstructed roads and curbside bioswales. The City cautioned that benefits of green infrastructure may need to be quantified to gain broad approval.
- Consider stormwater pump stations to redirect runoff to an alternative sewer and/or catchment.
- Identify drainage area upstream of A & B Aves and how much detention would be required to shave peak flows.
- Incorporate the flexibility to modify the Cedar Lake weir outlet elevation during a storm event.
- Make modifications to divert McLoud Run to the Cedar River rather than Cedar Lake.
- Position the existing gate to divert storm sewers along Shaver Road to the Cedar River rather than McLoud Run

Financial Needs

HDR presented for discussion a summary of the 671 and 304 funds used for storm water activities.

- Sewer personnel costs are likely funded through operating transfers since there are no staff permanently assigned to stormwater. HDR will confirm with Jon Durst.
- Federal capital is generally grant funding, the majority of which is likely for E Avenue.
- State capital is generally grant funding, the majority of which is likely for Noelridge Park and some E Ave.
- Debt service for General Obligation Bonds is likely included under the "Operating Transfer In" line item.
- Public Works pays the Water Department $200,000 annually to administer the storm water utility fee – this is the "CC&B Admin Charges" in the 671 budget.

Future Considerations

- Under regulatory considerations, change "State Topsoil" to "City Topsoil".
- Roles and responsibilities related to stormwater for City staff – including maintenance, engineering, elected officials, and appointed officials – needs to be further defined. Garrett will develop this and send it to HDR.
- Funding for operation and maintenance of the flood control system has not been determined. Sewer maintenance staff has responsibility for deploying *current* flood protection measures, but it was noted that they do not have the equipment necessary for removable floodwalls and other future flood control systems. HDR will discuss future

O&M as part of work on the flood control system project and request that maintenance staff be involved in discussions on removable panels.

- It was noted that the City does not currently have the equipment required for removable flood walls based on experience with removable amphitheater flood wall.
- City maintenance expressed a desire for installation of a low flow channel in large diameter pipes and boxes to avoid significant sediment/debris maintenance issues.

Status of TMs & Next Steps

The status of TMs – listed on the first page of the agenda – was reviewed. The next submittal will be TM 3.2 Basin Modeling, anticipated in late December.

As TMs are completed, HDR will include appendices for documents that may be updated over time. For example, HDR will include copies of the 304 and 671 budgets in TM 5.0 Financial Plan, a copy of the Stormwater Commission charter in TM 7.0 Future Considerations, etc.

The model is at a point that data can be transferred to the City for populating the GIS databases. HDR will work with the City to facilitate data transfer.

The date for Workshop #5 was set to for January 27, 2016. Garrett will send a meeting invitation.

Action Items

1. **HDR (Brice S.)** – Verify date and times of storm commonly referred to as the June 30, 2014 event.
2. **HDR (Mike B.)** – Check on the geothermal system at Mt. Mercy University, specifically if there is an open loop to the storm sewer.
3. **HDR (Mike B.)** – Verify with Elmcrest Country Club if ponds are connected to the storm sewer.
4. **City** – Provide additional information on 40-inch pipe near 21st Street & F Ave NE.
5. **HDR (Brice S.)** – Adjust location of project label for • Case 20, near 15th Street and A & B Aves NE.
6. **HDR (Mike B.)** – Verify location of Case 20/Case 16 for Washington Ave SE
7. **City (Garrett)** – Verify intentions by Mt. Mercy to develop impervious area near E Ave and 20th Street NE into ball fields and contemplate the potential to incorporate some retention and/or green infrastructure.
8. **City (Loren)** – Check prior project records for documentation of shotcrete in 66-inch pipe in 14th Ave from C Ave to 1st Ave and report back.
9. **City** – Check and report back whether any Paving for Progress projects have opportunities to incorporate storm water improvements.
10. **City (Garrett)/HDR (Mike B.)** – Strategize a potential P-3 project with Rockwell Collins and/or DC Taylor Co. for capturing runoff from their parking lots.
11. **HDR (Dave, Mike, Brice)** – Consider stormwater pump stations to redirect runoff to an alternative sewer and/or catchment.

12. **HDR (Dave)** – Meet with Jon Durst to review finances in detail to get a better understanding of major components of 671 budget and changes that have occurred over time.
13. **HDR (Dave)** – Future regulatory considerations should reference “City Topsoil” rule not “State Topsoil” rule.
14. **HDR (Mike, Dave)** – Include appendices for various documents that may change (e.g. 304 & 671 budgets).
15. **City (Garrett)** – Document “Roles and Responsibilities” for City staff related to Stormwater.
16. **HDR (Mike B.)** – Discuss O&M needs for the flood control system as part of that project and incorporate into Future Considerations TM.
17. **City (Garrett)** – Draft stormwater related roles and responsibilities for City staff – including maintenance, engineering, elected officials, and appointed officials for inclusion in the Future Considerations TM.
18. **HDR (Mike B)** – Get copy of Stormwater Commission responsibilities for inclusion in the Future Considerations TM.
19. **City (Jeff)** – Identify additional equipment needed to install/remove flood wall based on experience with removable amphitheater flood wall.
20. **HDR/City (Brice S./Ryan B.**) – Initiate data transfers to populate GIS databases.
21. **City (Garrett)** – Send a meeting invitation for Workshop 5, set for January 27, 2016.

I. SCOPE OUTLINE

A. TASK SERIES 100 – PROJECT MANAGEMENT

Task 110 – Team Management and Project Control
Task 120 – Project Initiation
Task 130 – Project Management Plan
Task 140 – Quality Control

PHASE 1 – FY 2017 CIP Development

B. TASK SERIES 200 – PHASE 1 – FY 2017 CIP DEVELOPMENT

Task 210 – Collect and Review Available Information
Task 220 – Draft Stormwater Master Plan Outline
Task 230 – Workshop 1
Task 240 – Site Visits, Alternative Evaluation, Concept Refinement
Task 250 – Develop/Confirm Costs and Preliminary Priorities
Task 260 – Draft FY 2017 CIP TM
Task 270 – Workshop 2
Task 280 – Finalize FY 2017 CIP Summary TM

PHASE 2 – Stormwater Master Plan

C. TASK SERIES 300 – EXISTING SYSTEM

Task 310 – Compile and Review Existing Background Information
Task 320 – Regulatory Summary
Task 330 – Watershed Summary
Task 340 – Existing System TM

D. TASK SERIES 400 – ASSET MANAGEMENT

Task 410 – Summary of Stormwater Assets
Task 420 – Condition Assessment
Task 430 – Level of Service
Task 440 – Maintenance Levels
Task 450 – Asset Management Plan Improvement Recommendations
Task 460 – Asset Management TM

E. TASK SERIES 500 - HYDRAULIC INVESTIGATION

Task 510 – Model Selection
Task 520 – Critical Area Identification
Task 530 – Hydraulic Model Development
Task 531 – Data Cleanup
Task 532 – Macro-Scale Model Development
Task 533 – Identify System Deficiencies
Task 540 – Workshop 3
Task 550 – Critical Basin-Scale Model Development
Task 560 – Field Investigations
Task 570 – Model Validation
Task 580 – Alternatives Analysis
Task 590 – Workshop 4

F. TASK SERIES 600 – CIP IMPROVEMENTS PLAN

Task 610 – Recommended Projects
Task 620 – Project Prioritization
Task 630 – Workshop 5
Task 640 – Documentation

G. TASK SERIES 700 – TEN YEAR FINANCIAL PLAN

Task 710 – Summary of Expenses
Task 720 – Estimated Cash Flow Projection
Task 730 – Revenue Options
Task 740 – Financial Plan

H. TASK SERIES 800 – POLICY RECOMMENDATIONS

Task 810 – Current Policies and Planning Goals
Task 820 – Floodplain Management
Task 830 – Green Infrastructure BMPs
Task 840 – Future Policies
Task 850 –Policy TM

I. TASK SERIES 900 – FUTURE CONSIDERATIONS

Task 910 – Development and Growth
Task 920 – Regulatory/Water Quality Changes
Task 930 – Maintenance Procedures
Task 940 – Watershed Management Considerations
Task 950 – Stormwater Master Planning

J. TASK SERIES 1000 – STORMWATER MASTER PLAN

Task 1010 – Stormwater Recommendations Summary
Task 1020 – Executive Summary
Task 1030 – Draft Plan
Task 1040 – Workshop 6
Task 1050 – Final Plan

Stormwater Master Plan

Workshops

1 Kickoff Meeting Phase 1 and 2
2 Review Draft FY 2017 CIP TM
  Discuss Existing System
  Discuss Model Selection / Development
3 Macro Level Model Results
  Initiate Basin Level Model
  Discuss Asset Management
4 Basin Level Model Results
  Discuss Financial Planning
  Discuss Policy Consideration
  Discuss Future Considerations
5 FY18 Capital Improvements Plan
  Financial Plan
  Policy Consideration
  Future Considerations
6 Executive Summary
  Draft Plan

Stormwater Master Plan

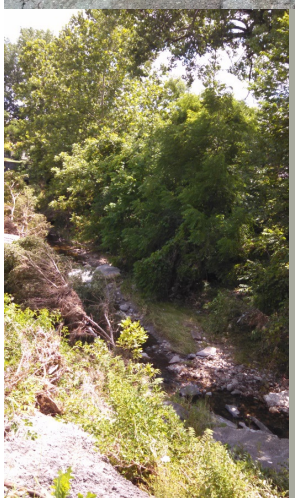
Table of Contents

Executive Summary
TM 1.0 – Existing System
TM 2.0 – Asset Management
TM 3.1 – Macro-Scale Model Results
TM 3.2 – Basin Scale Modeling Results
TM 4.0 – Capital Improvements Plan
TM 5.0 – Financial Plan
TM 6.0 – Policy Recommendations
TM 7.0 – Future Considerations

Stormwater Master Plan

Table of Contents

Contract Approval	June 9, 2015
Task Series 100 Project Management	June 24, 2016
Task Series 200 – Phase 1 – FY 2017 CIP Development Draft Technical Memorandum	**August 21, 2015**
Task Series 200 – Phase 1 – FY 2017 CIP Development Complete	**September 4, 2015**
Task Series 300 – Existing System Draft Technical Memorandum	September 25, 2015
Task Series 400 – Asset Management Draft Technical Memorandum	January 8, 2016
Task Series 500 – Hydraulic Investigation Draft Technical Memorandum	January 29, 2016
Task Series 600 – CIP Improvements Plan Draft Technical Memorandum	February 19, 2016
Task Series 700 – Ten Year Financial Plan Draft Technical Memorandum	February 19, 2016
Task Series 800 – Policy Recommendations Draft Technical Memorandum	February 5, 2016
Task Series 900 – Future Considerations Draft Technical Memorandum	February 5, 2016
Task Series 1000 – Stormwater Master Plan Draft Executive Summary	**March 4, 2016**
Task Series 1000 – Stormwater Master Plan Complete	**June 3, 2016**



Stormwater Master Plan Workshop 4

Kenwood Basin Stormwater Modeling
December 9, 2015

HDR

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01 OBJECTIVES

02 APPROACH

03 BASIN CHARACTERISTICS

04 1D FLOW NETWORK

05 2D FLOW SURFACE

06 RAINFALL EVENTS

07 KENWOOD RESULTS

08 IMPROVEMENTS DISCUSSION

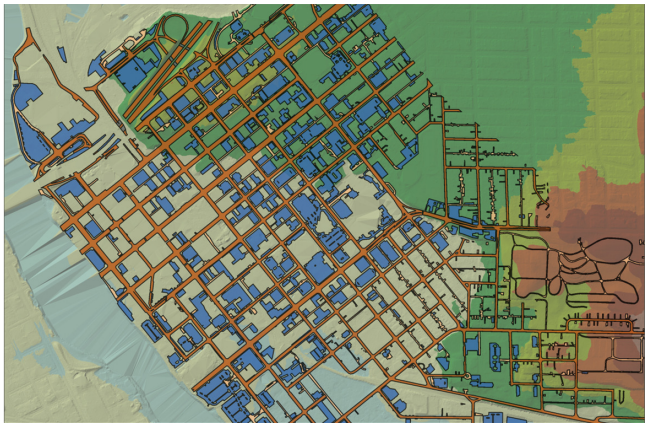
01 OBJECTIVES

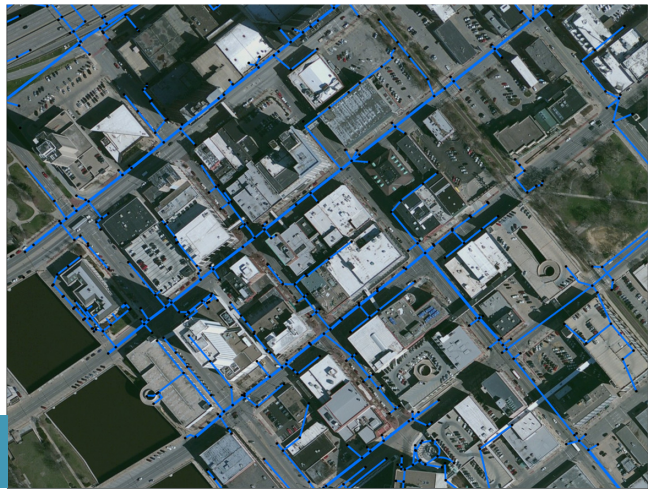
STORMWATER MASTER PLAN UPDATE TASKS

- Phase 1
  - FY 2017 CIP Development
- Phase 2
  - Existing System Summary
  - Asset Management
  - **Hydraulic Investigation**
  - CIP Improvement Plan
  - Ten Year Financial Plan
  - Policy Recommendations
  - Future Considerations

BASIN-LEVEL HYDRAULIC INVESTIGATION OBJECTIVES

- Build on macro basin model with increased detail
- Use the basin-level model to evaluate the City's stormwater system and overland flow
- Validate the model using available information
- Evaluate near-term improvements with model
- Additional modeling in subsequent years





02 APPROACH

MODELING APPROACH

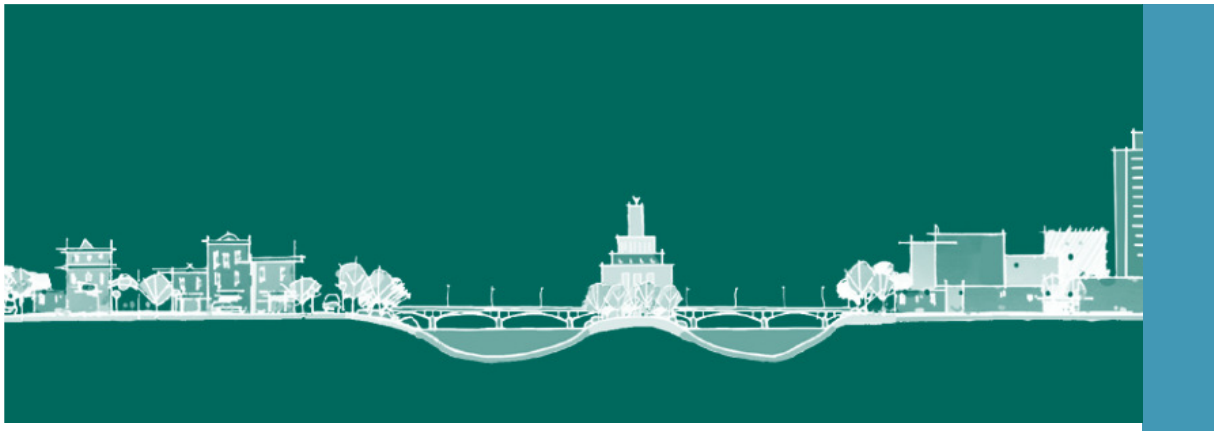
- 2 Steps of Model Development
  - Step 1: Macro-scale Modeling
    - Less detail
    - Large sewers and open channels – 48-inches and greater
    - Entire city
  - **Step 2: Critical Basin Scale Modeling**
    - More detail
    - Smaller sewers – 12-inches and greater
    - First critical basin – Kenwood
      - » Collection, conveyance, and detention issues causing local and area wide flooding

Macro-Scale Model

- Large pipes (greater than 48")
- Open channels
- Major detention facilities
- Broad-scale city overview
- Aggregate benefits of improvements and interaction between basins, creeks and Cedar River
- Major conveyance routes
- Provides foundation for basin-scale models

Kenwood Basin Model

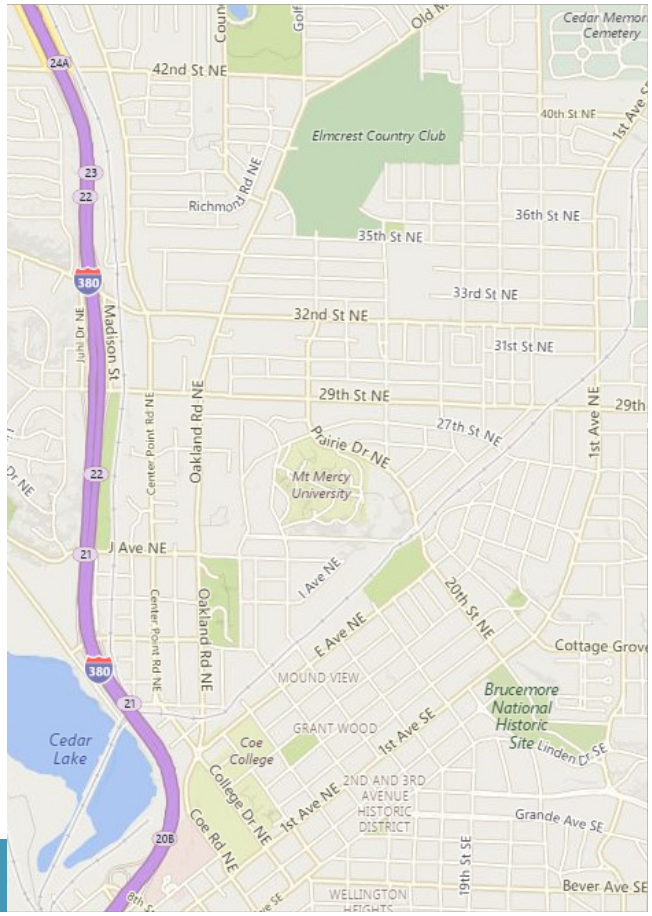
- More-detailed pipe network (greater than 12")
- Overland flow
- Ponding and detention
- Major and minor detention facilities
- Validation using storm information
- Project-scale evaluation
- Individual conveyance bottlenecks
- Tool for evaluating mitigation alternatives

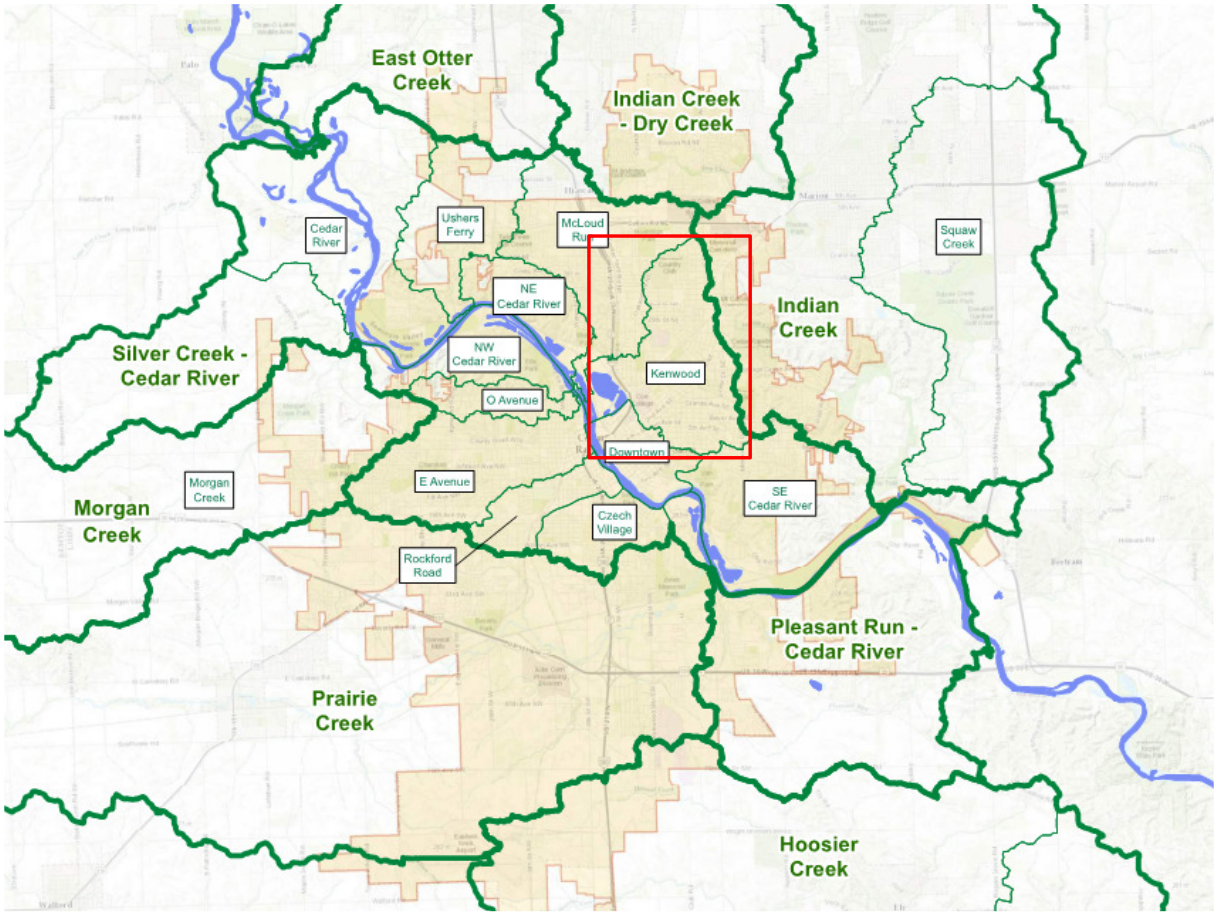


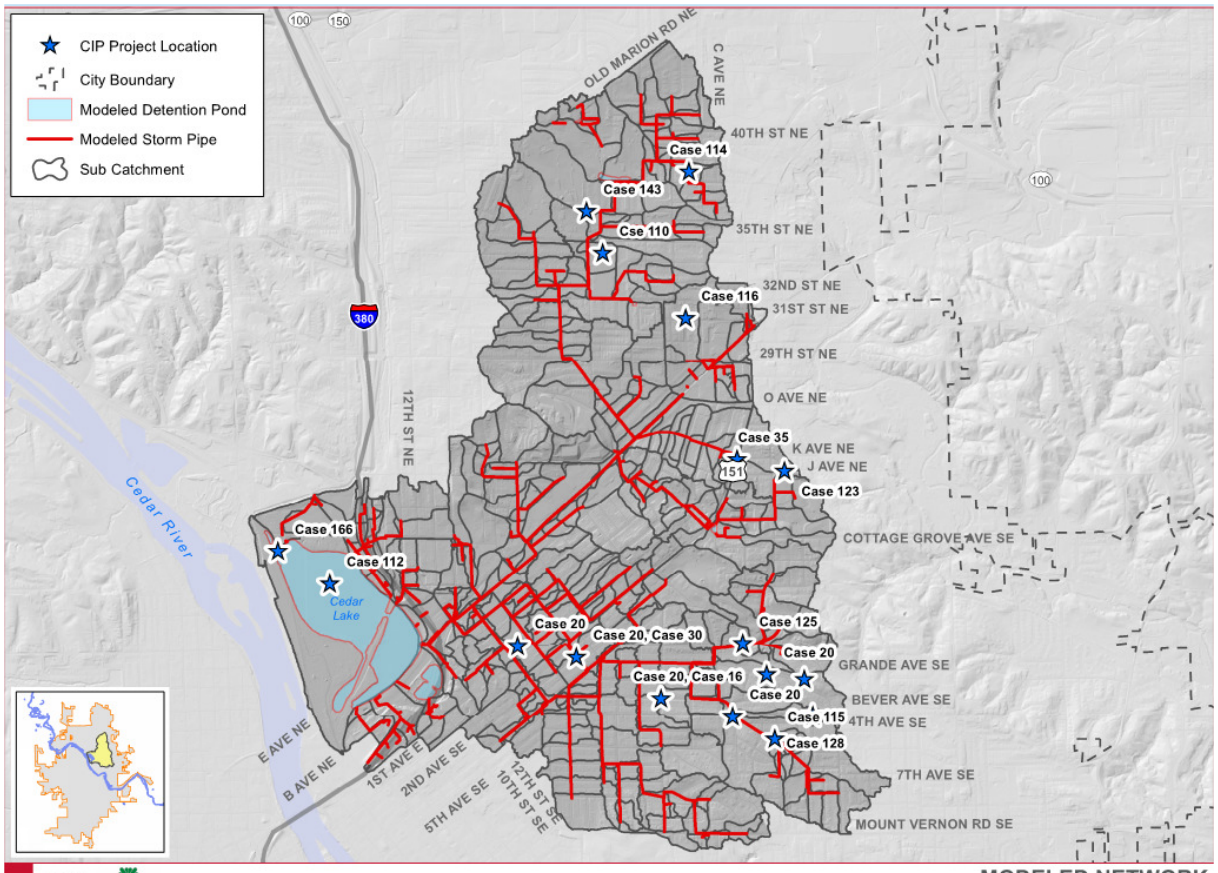
03 BASIN CHARACTERISTICS

SUMMARY OF KENWOOD BASIN

- Catchments – 379 developed within Kenwood basin around 12-inch and larger storm sewer network
- Average Catchment Size = 8.2 acres
- Average catchment slopes from 1.5 to 15.2 percent
- Residential, civic, commercial, parks, country clubs, Mt Mercy University



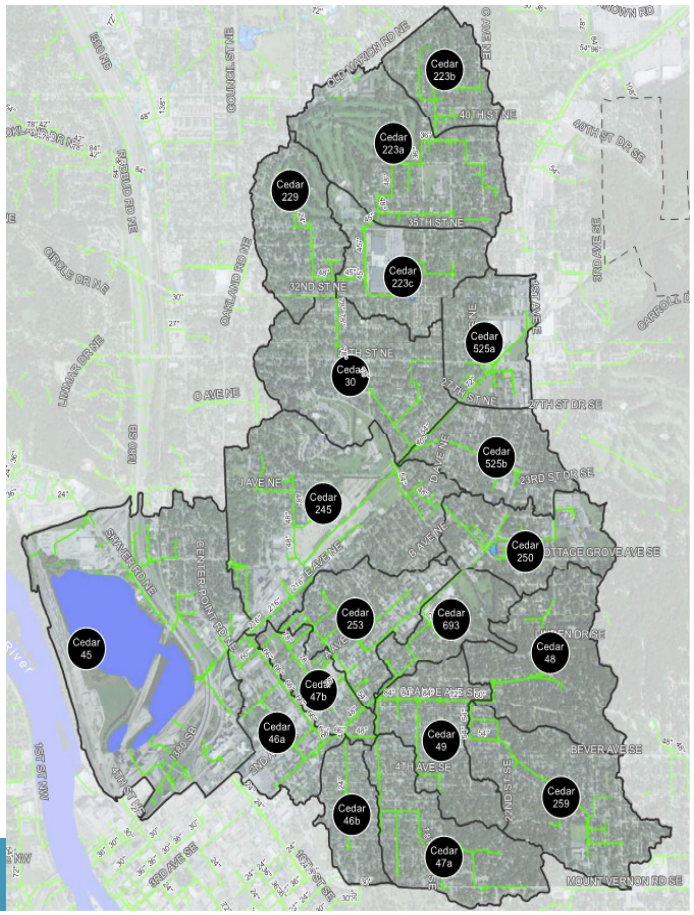




MODELED NETWORK
KENWOOD WATERSHED

INPUT DATA

- Kenwood Basin Boundary
- Topography (LiDAR)
- Soil Type (Hydraulic Soil Group)
- Cover Type (Imperviousness/Land Use)
- Channels (Open Channel Flow)



DATA CLEAN UP AND ASSUMPTIONS

- Catchments based on storm network
  - Time of concentration and time of travel developed using catchment slopes and flow path lengths
- Curve numbers based on Soil Type and Cover Type
  - Existing land use (GIS database)
  - Complete soils coverage for the planning area

BASIN HYDROLOGY – RUNOFF AND ROUTING

- Rainfall Runoff
  - Initial Abstraction
  - Land Use and Soil Type (Curve Number)
  - Time of Concentration
  - Time of Travel

RUNOFF METHOD

- SCS Runoff Curve Number Method (NRCS TR-55)
- Consistent with previous work, Iowa DNR guidance
- Based on NRCS soils data, planimetrics and land use

$$Q = \frac{(P - I_a)^2}{(P - I_a) + S} \quad \text{[eq. 2-1]} \qquad I_a = 0.2S \qquad S = \frac{1000}{CN} - 10$$

where

Q = runoff (in)
P = rainfall (in)
S = potential maximum retention after runoff begins (in) and
I_a = initial abstraction (in)

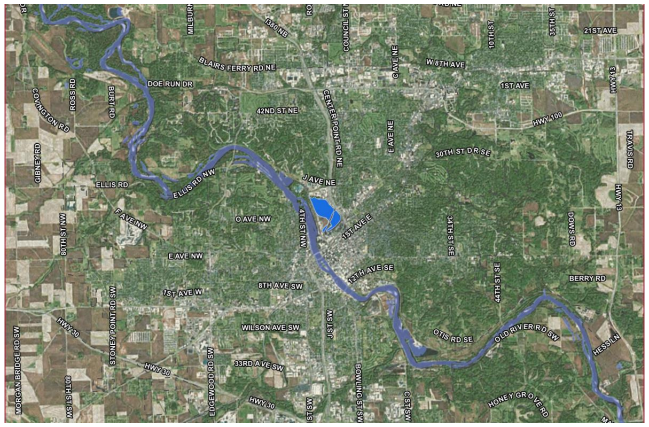
04 1D FLOW NETWORK

1D FLOW NETWORK SUMMARY

- Runoff gets routed from catchments to 1D network in the model
  - 27 miles of pipe 12-inches and greater in the Kenwood basin model
- Overland flow (2D) and ponding is routed to 1D network

INPUT DATA

- GIS Storm Sewer Layers (Sewer Network)
- Additional Survey Data from Anderson Bogert
- Channels (Open Channel Flow)
- Lakes and Large Pond Facilities (Detention)
  - Cedar Lake
  - 2 Public Ponds
  - 2 Private Ponds
- As-built / Design Drawings
- Field Confirmations

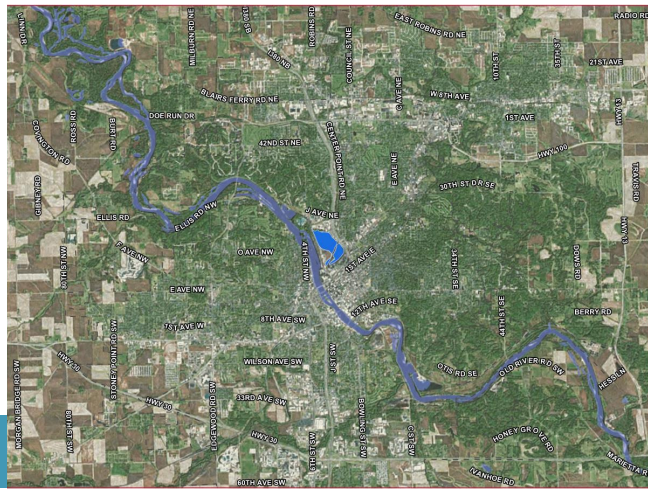


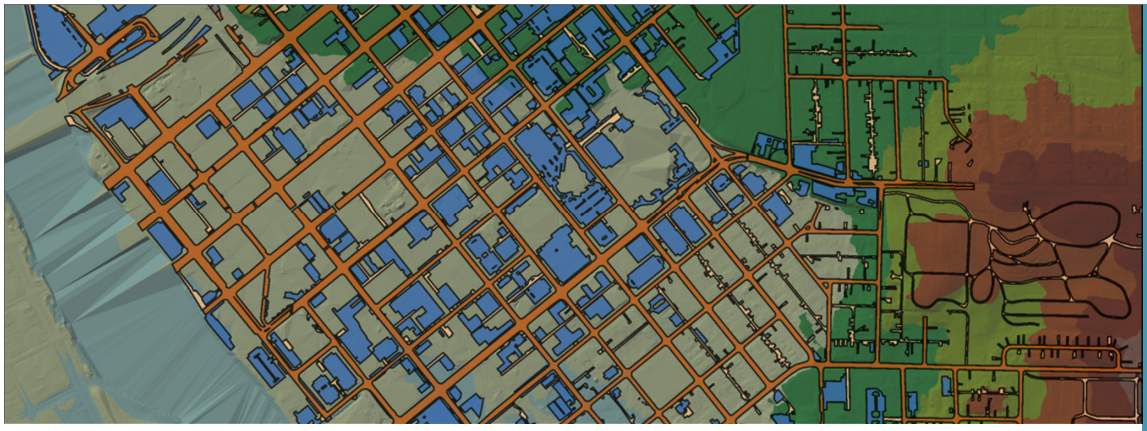
DATA CLEAN UP AND ASSUMPTIONS

- GIS Data Gap Analysis
  - To find missing data points (diameters and inverts mostly)
- Input Survey Data into GIS Network
  - To fill in gaps with field data collected points
- Validate Network
  - To fill in remaining gaps with pipe diameters and inverts
    - Inferred missing gaps not surveyed from upstream/downstream pipes
  - To maintain positive slopes
    - Resolved data issues (datum, etc.) by interpolating from upstream/downstream pipes
  - To rectify connectivity and pipe direction
    - Sometimes added pipes for connectivity

HYDRAULICS AND ASSUMPTIONS

- Manning's Equation
  - Pipes - Manning's Roughness Coefficients
  - Channels – treed lined, grassy swale, etc.
- Boundary Conditions
  - Free outfall into Cedar Lake
- Detention Facilities and Outlet Structures
  - Cedar Lake
  - 2 Public Ponds
  - 2 Private Ponds





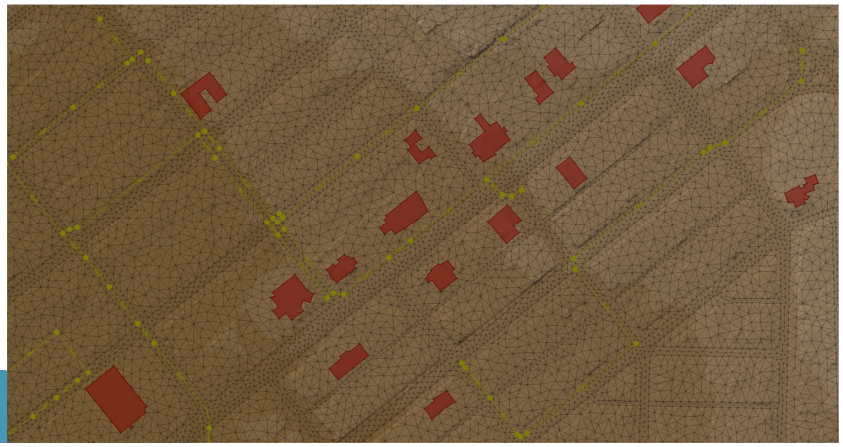
05 2D FLOW SURFACE

INPUT DATA

- LiDAR Data
- GIS Building Boundaries Layer
- GIS Road Pavement Layer

HYDRAULICS AND ASSUMPTIONS

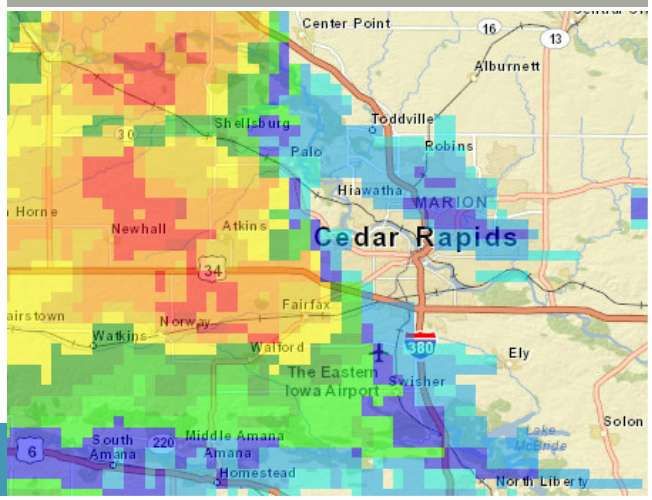
- 2D mesh is created from ground model (LiDAR TIN)
- 2D mesh conveys overland flow storm water and flooding
- Captured in 2D nodes and the 1D sewer network if capacity available
- Assumptions
  - Buildings are voids (no flow is allowed)
  - 2D drained conditions (initial depth = 0)

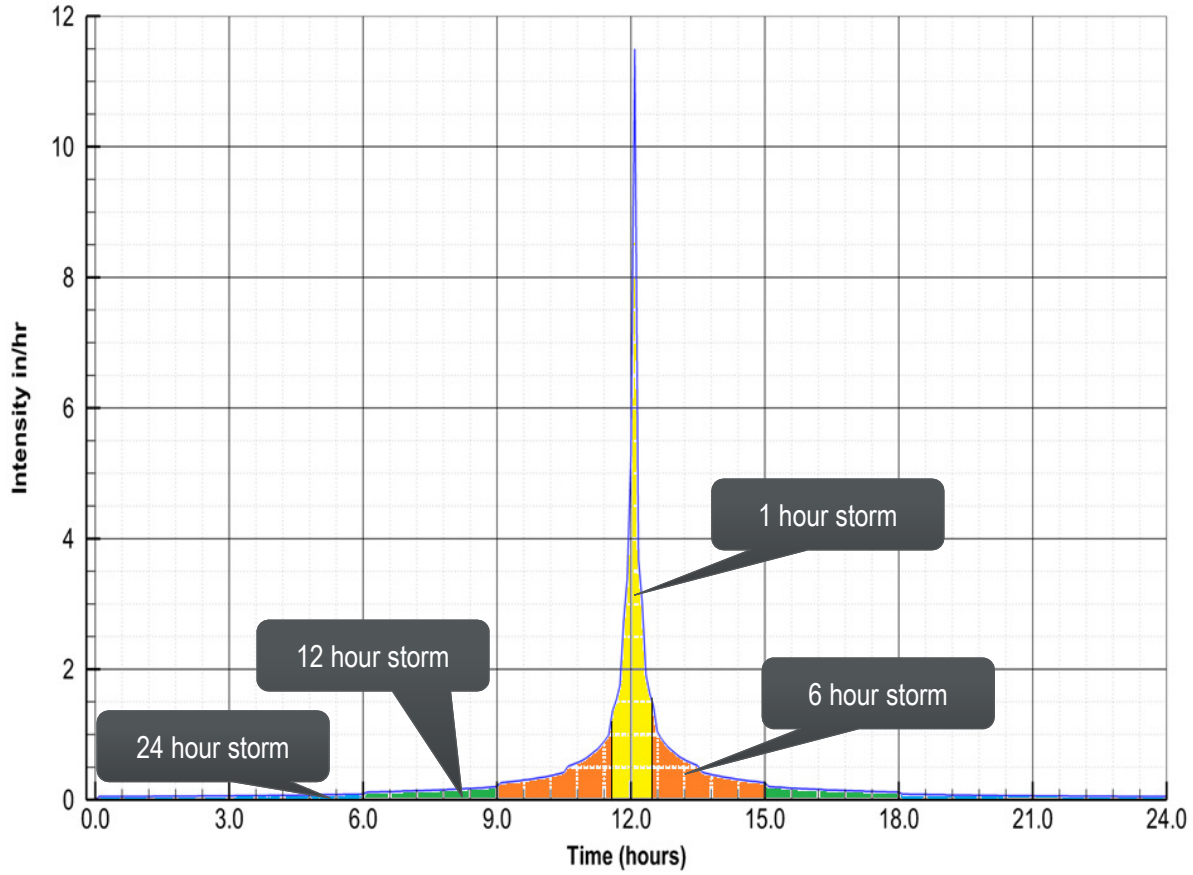


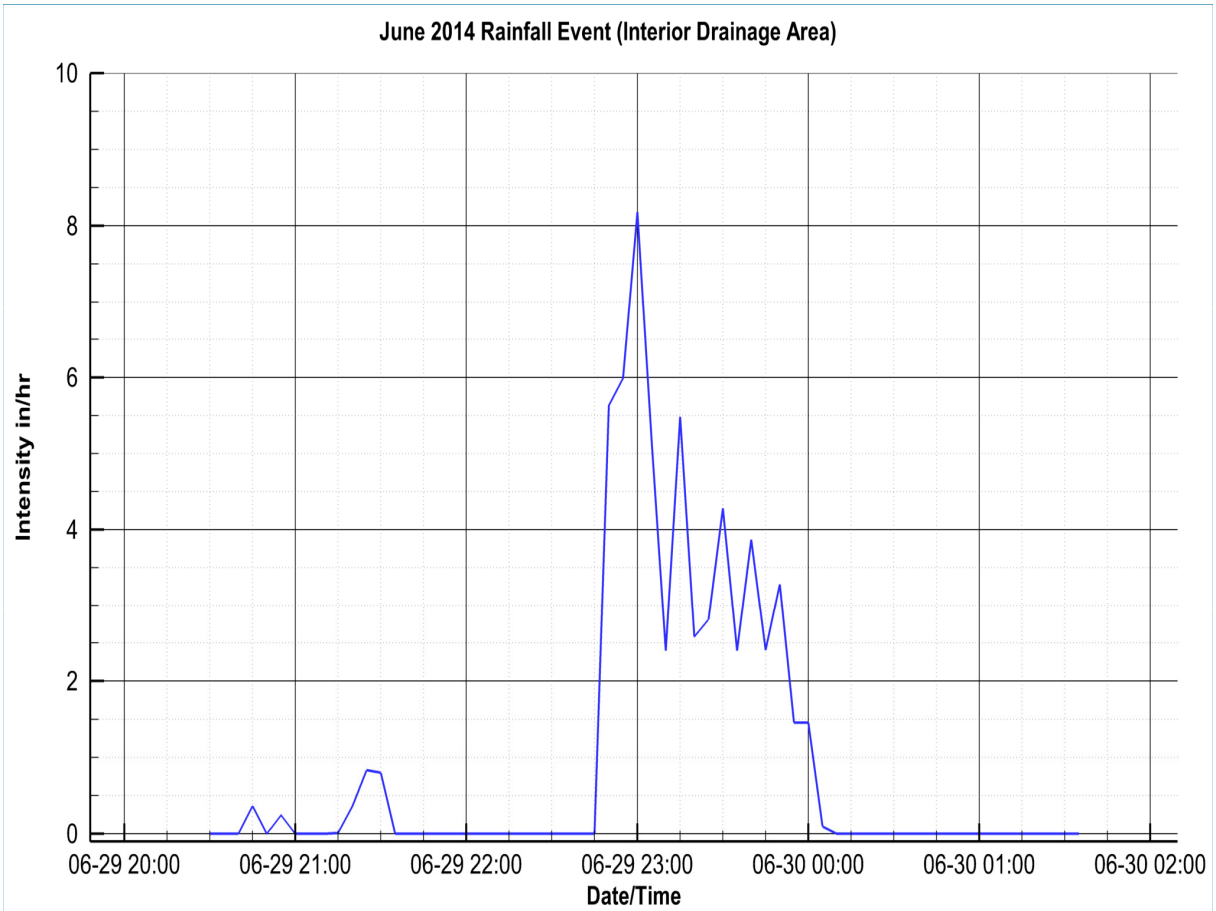
06 RAINFALL

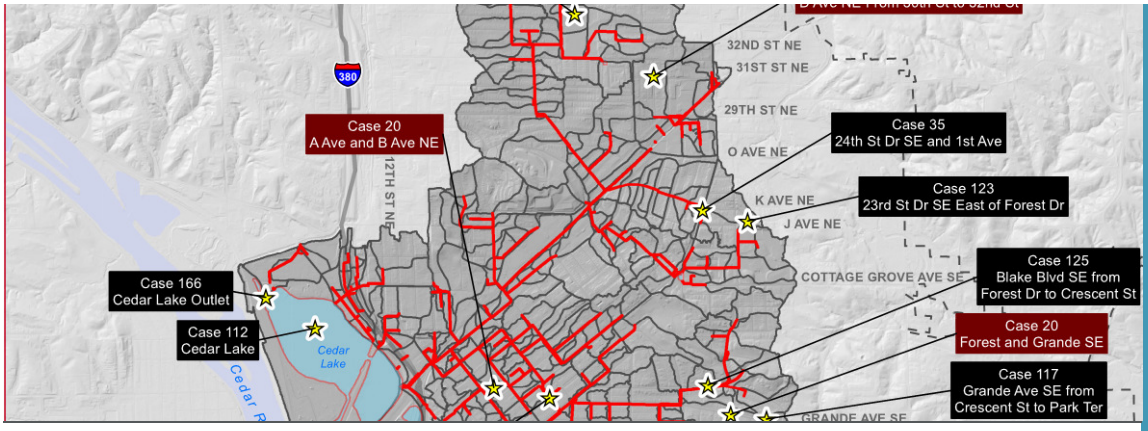
EVENTS

- 5-year Nested Design Storm
  - 24 hour run
  - NOAA Atlas 14
- 100-year Nested Design Storm
  - 24 hour run
  - NOAA Atlas 14
  - 1 hour storm intensity similar to June 2014 event




Intensity in/hr
Time (hours)
1 hour storm
12 hour storm
6 hour storm
24 hour storm
0
2
4
6
8
10
12
0.0
3.0
6.0
9.0
12.0
15.0
18.0
21.0
24.0

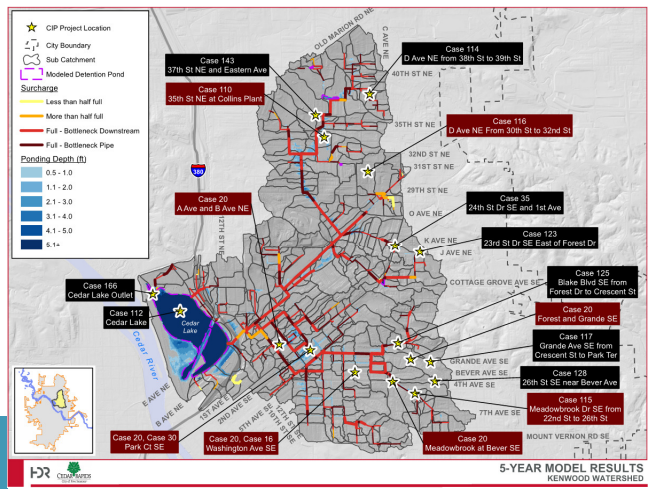

June 2014 Rainfall Event (Interior Drainage Area)
Intensity in/hr
Date/Time
0
2
4
6
8
10
06-29 20:00
06-29 21:00
06-29 22:00
06-29 23:00
06-30 00:00
06-30 01:00
06-30 02:00



07 KENWOOD RESULTS

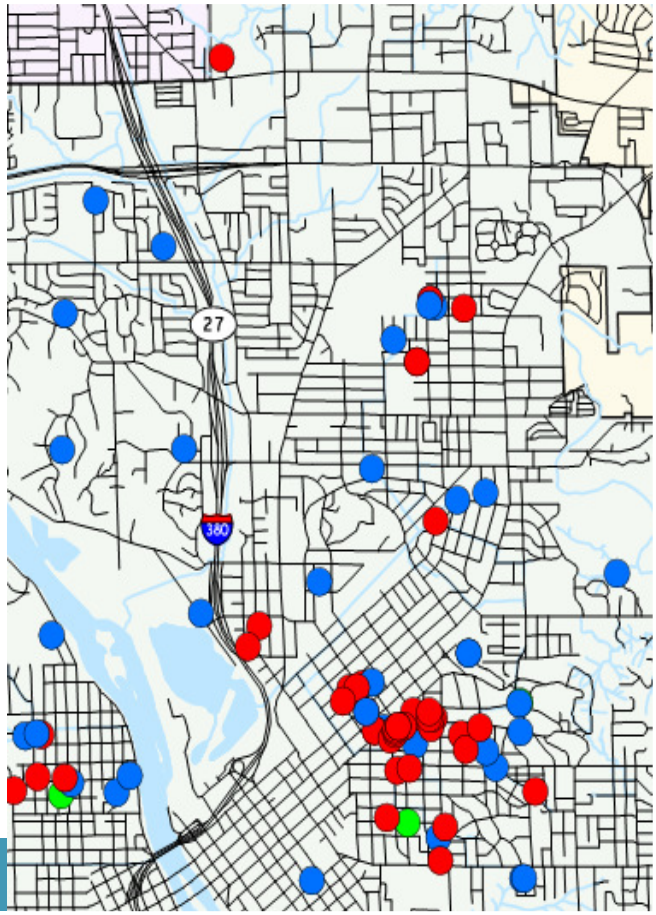
Scenarios Run

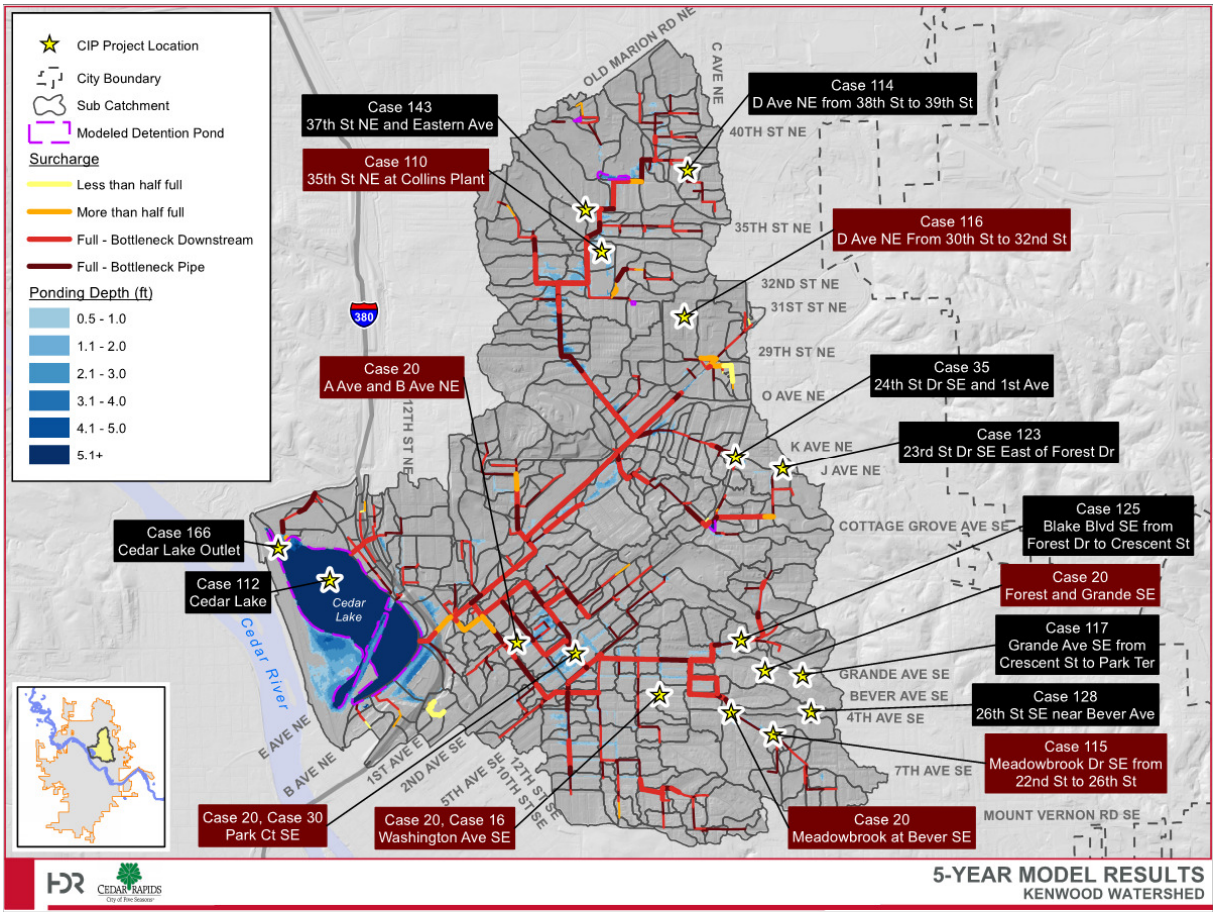
- 5 Year Design Rainfall Event
- 100 Year Design Rainfall Event

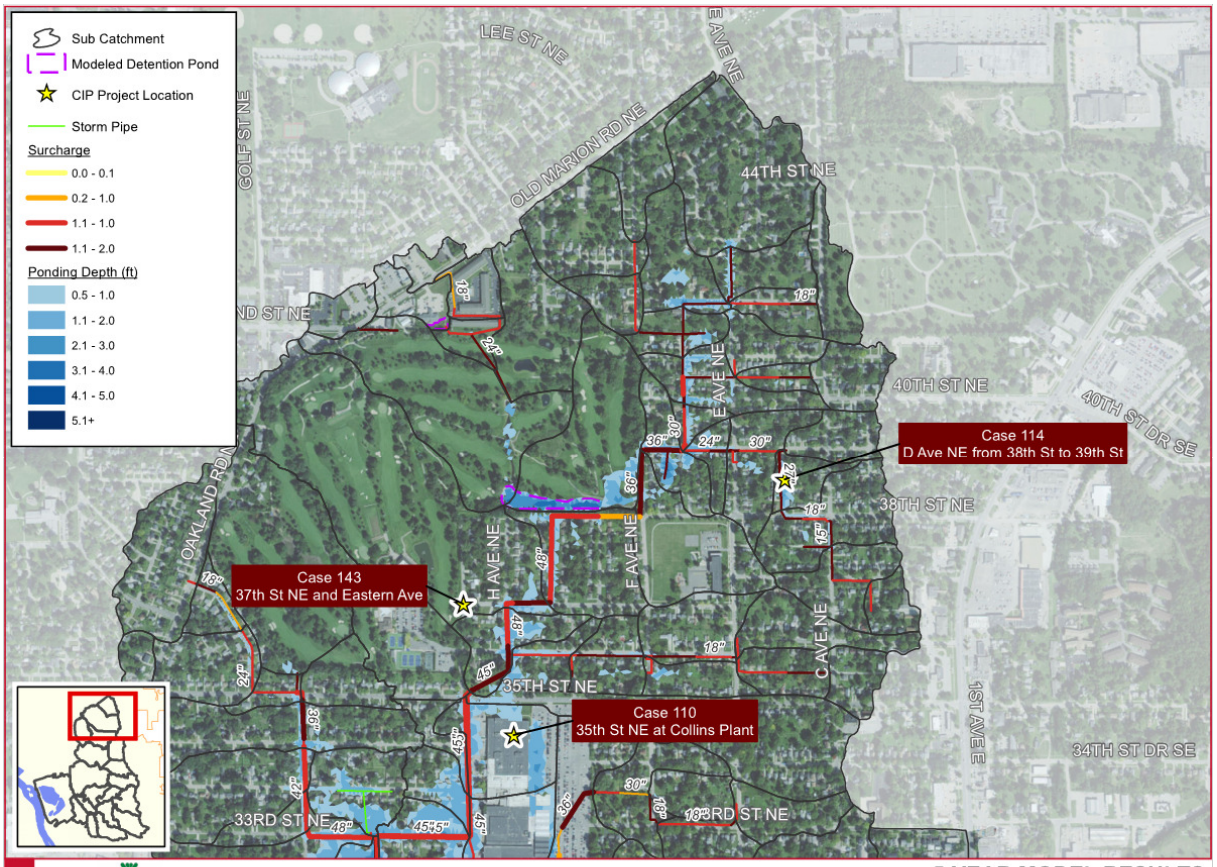


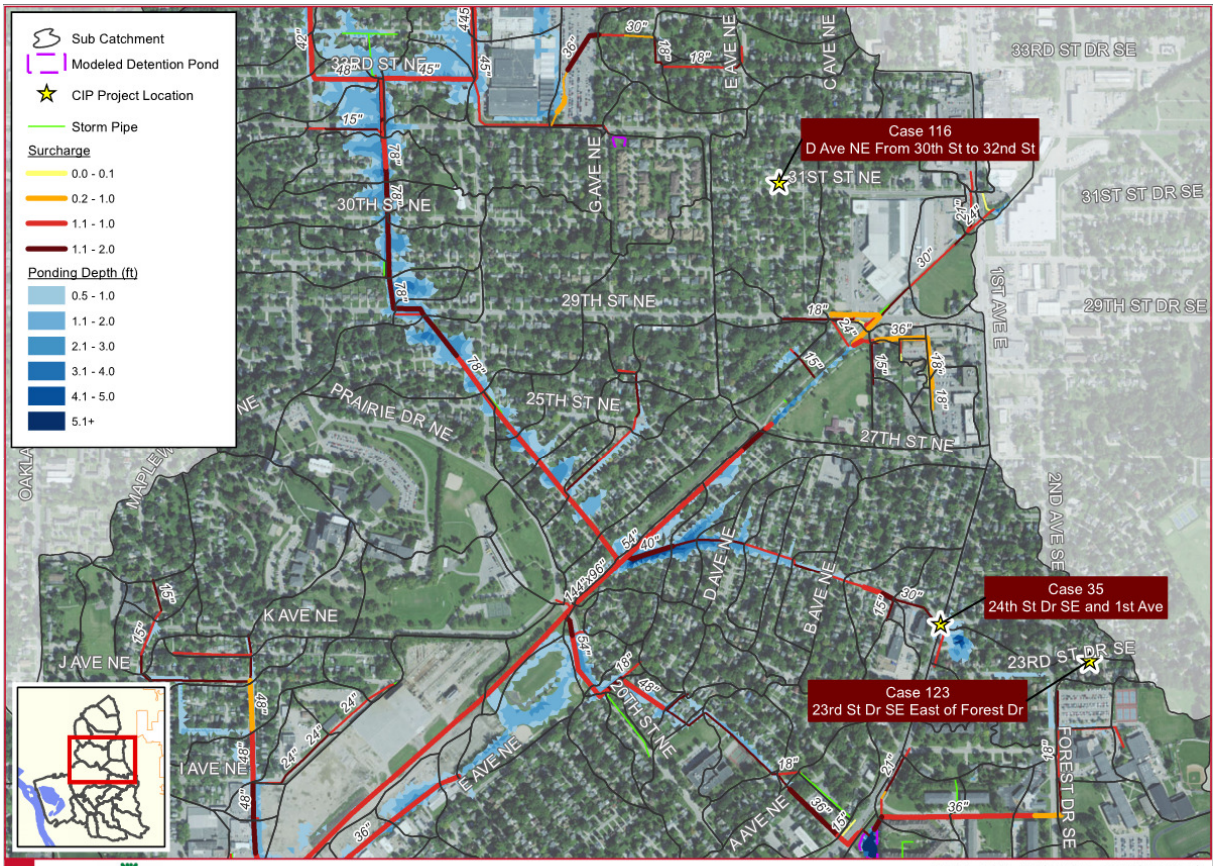
June 2014 Storm Event

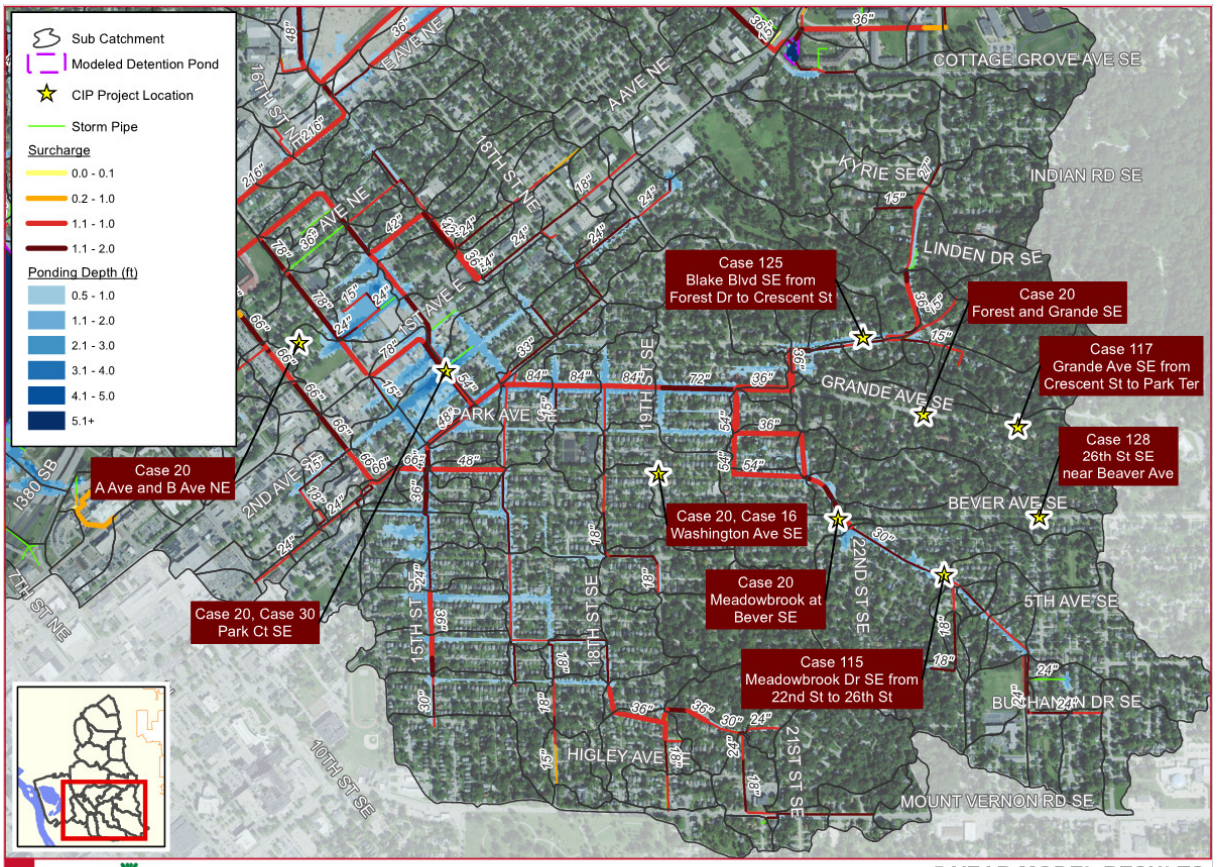
- Blue dots – storm water incidents
- Red dots – basement backups
- Green dots – sanitary sewer incidents

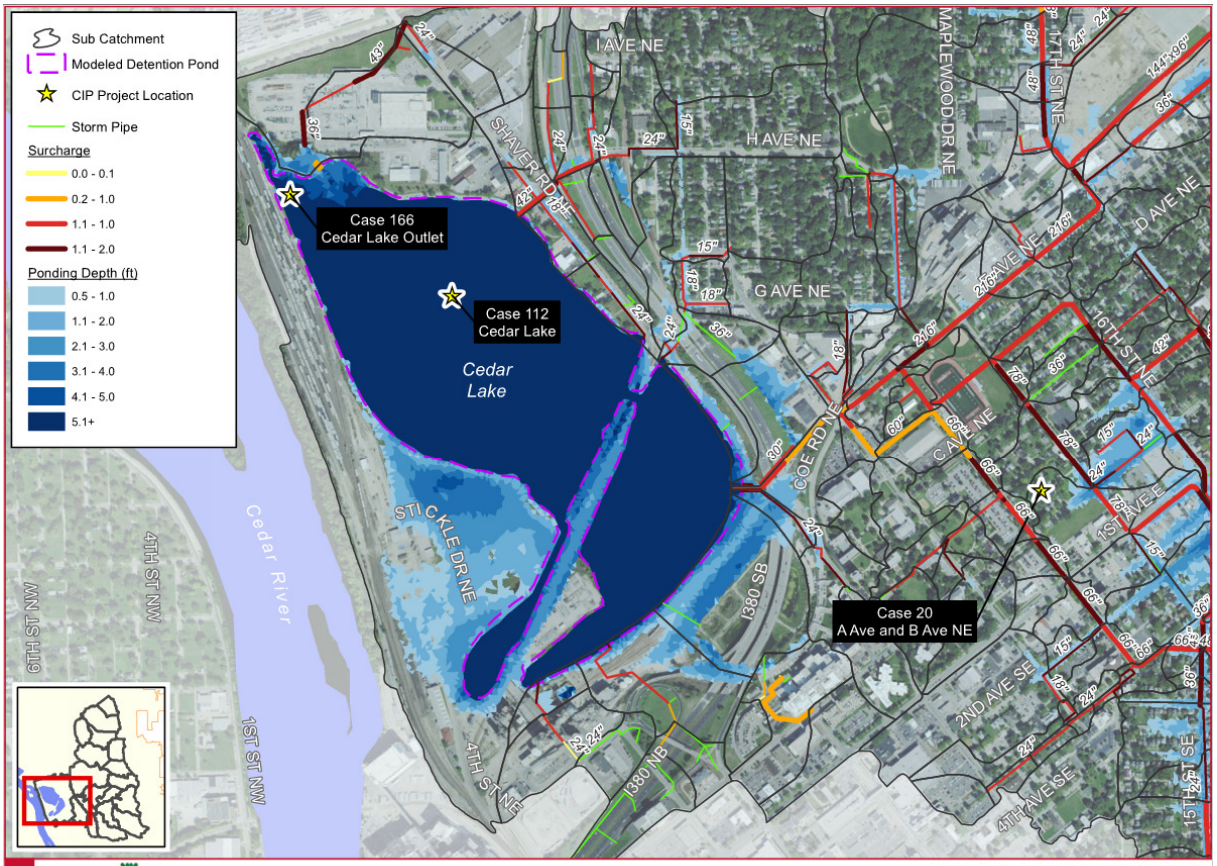


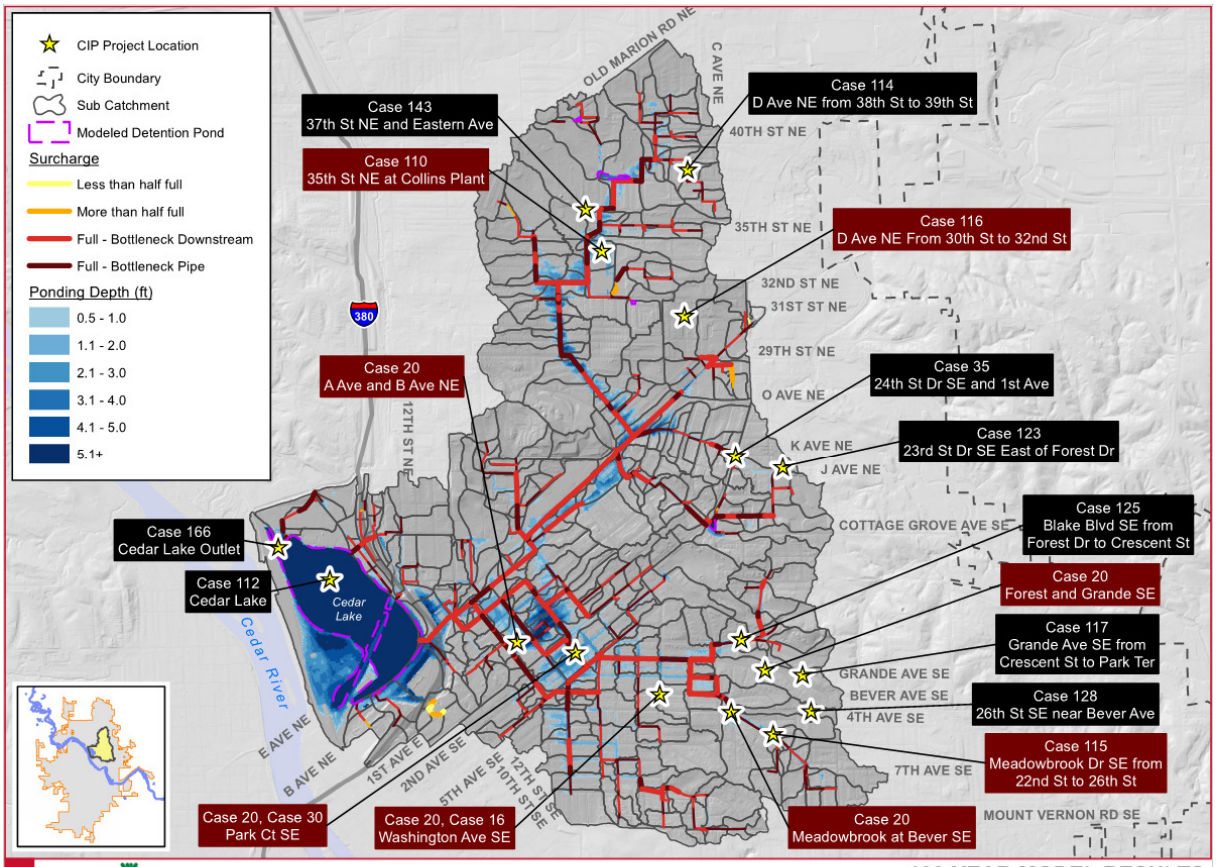


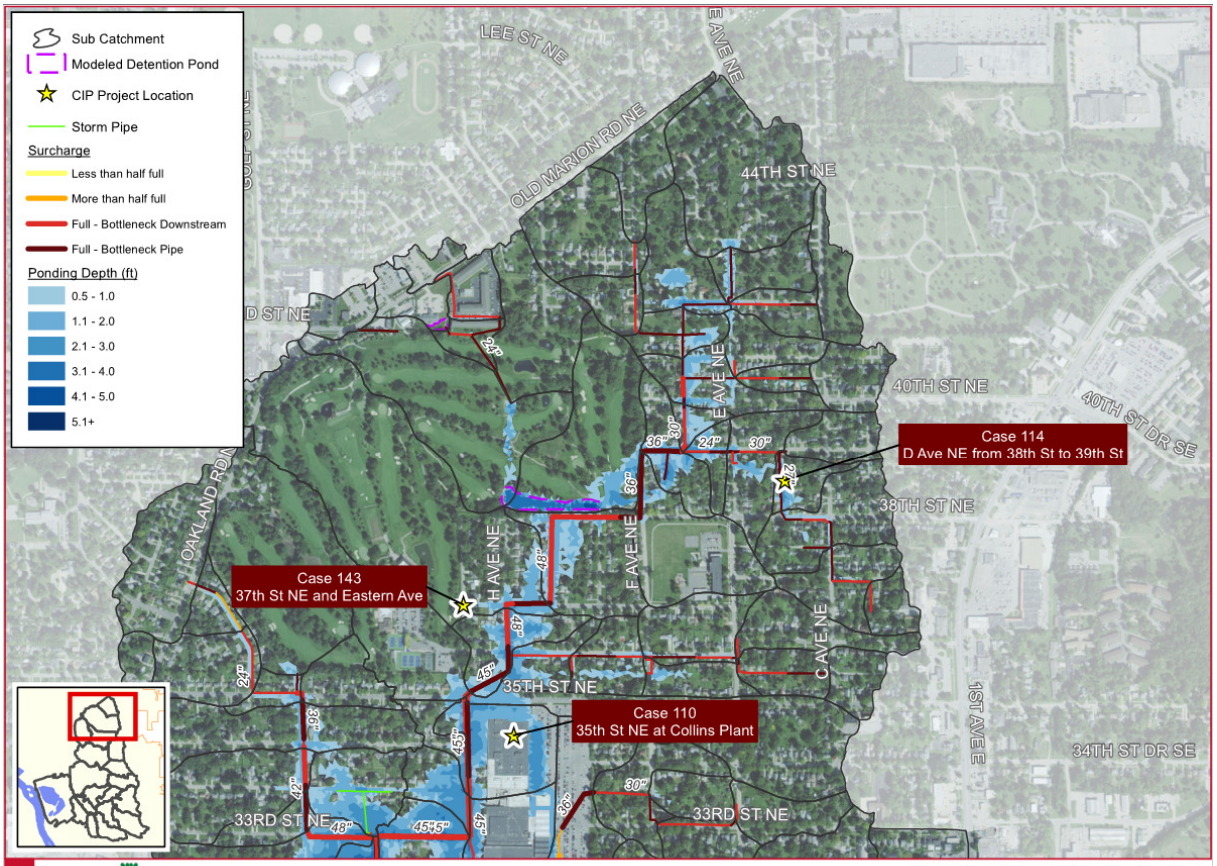

Sub Catchment
Modeled Detention Pond
CIP Project Location
Storm Pipe
Surcharge
0.0 - 0.1
0.2 - 1.0
1.1 - 1.0
1.1 - 2.0
Ponding Depth (ft)
0.5 - 1.0
1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1+
LEE ST NE
E AVE NE
OLD MARION RD NE
GOLF ST NE
44TH ST NE
40TH ST NE
40TH ST DR SE
38TH ST NE
OAKLAND RD
H AVE NE
F AVE NE
C AVE NE
35TH ST NE
33RD ST NE
33RD ST DR SE
1ST AVE E
34TH ST DR SE
Case 114
D Ave NE from 38th St to 39th St
Case 143
37th St NE and Eastern Ave
Case 110
35th St NE at Collins Plant
5-YEAR MODEL RESULTS
KENWOOD WATERSHED, NORTH


Sub Catchment
Modeled Detention Pond
CIP Project Location
Storm Pipe
Surcharge
0.0 - 0.1
0.2 - 1.0
1.1 - 1.0
1.1 - 2.0
Ponding Depth (ft)
0.5 - 1.0
1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1+
33RD ST NE
E AVE NE
C AVE NE
33RD ST DR SE
Case 116
D Ave NE From 30th St to 32nd St
31ST ST NE
31ST ST DR SE
30TH ST NE
G AVE NE
29TH ST NE
1ST AVE E
29TH ST DR SE
PRAIRIE DR NE
25TH ST NE
27TH ST NE
2ND AVE SE
D AVE NE
B AVE NE
K AVE NE
J AVE NE
Case 35
24th St Dr SE and 1st Ave
23RD ST DR SE
Case 123
23rd St Dr SE East of Forest Dr
20TH ST NE
I AVE NE
E AVE NE
A AVE NE
FOREST DR SE
5-YEAR MODEL RESULTS
KENWOOD WATERSHED, CENTRAL


Sub Catchment
Modeled Detention Pond
CIP Project Location
Storm Pipe
Surcharge
0.0 - 0.1
0.2 - 1.0
1.1 - 1.0
1.1 - 2.0
Ponding Depth (ft)
0.5 - 1.0
1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1+
Case 125
Blake Blvd SE from
Forest Dr to Crescent St
Case 20
Forest and Grande SE
Case 117
Grande Ave SE from
Crescent St to Park Ter
Case 128
26th St SE
near Beaver Ave
Case 20
A Ave and B Ave NE
Case 20, Case 16
Washington Ave SE
Case 20
Meadowbrook at
Bever SE
Case 20, Case 30
Park Ct SE
Case 115
Meadowbrook Dr SE from
22nd St to 26th St
COTTAGE GROVE AVE SE
INDIAN RD SE
LINDEN DR SE
GRANDE AVE SE
BEVER AVE SE
5TH AVE SE
BUCHANAN DR SE
MOUNT VERNON RD SE
HIGLEY AVE
PARK AVE
I380 SB
5-YEAR MODEL RESULTS
KENWOOD WATERSHED, SOUTHEAST


Sub Catchment
Modeled Detention Pond
CIP Project Location
Storm Pipe
Surcharge
0.0 - 0.1
0.2 - 1.0
1.1 - 1.0
1.1 - 2.0
Ponding Depth (ft)
0.5 - 1.0
1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1+
Case 166
Cedar Lake Outlet
Case 112
Cedar Lake
Cedar
Lake
Cedar River
Case 20
A Ave and B Ave NE
I380 SB
I380 NB
STICKLE DR NE
GOE RD NE
SHAVER RD NE
MAPLEWOOD DR NE
6TH ST NW
4TH ST NW
1ST ST NW
5-YEAR MODEL RESULTS
KENWOOD WATERSHED, CEDAR LAKE


CIP Project Location
City Boundary
Sub Catchment
Modeled Detention Pond
Surcharge
Less than half full
More than half full
Full - Bottleneck Downstream
Full - Bottleneck Pipe
Ponding Depth (ft)
0.5 - 1.0
1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1+
Case 143
37th St NE and Eastern Ave
Case 114
D Ave NE from 38th St to 39th St
Case 110
35th St NE at Collins Plant
Case 116
D Ave NE From 30th St to 32nd St
Case 20
A Ave and B Ave NE
Case 35
24th St Dr SE and 1st Ave
Case 123
23rd St Dr SE East of Forest Dr
Case 125
Blake Blvd SE from
Forest Dr to Crescent St
Case 166
Cedar Lake Outlet
Case 112
Cedar Lake
Case 20
Forest and Grande SE
Case 117
Grande Ave SE from
Crescent St to Park Ter
Case 128
26th St SE near Bever Ave
Case 115
Meadowbrook Dr SE from
22nd St to 26th St
Case 20, Case 30
Park Ct SE
Case 20, Case 16
Washington Ave SE
Case 20
Meadowbrook at Bever SE
OLD MARION RD NE
C AVE NE
40TH ST NE
35TH ST NE
32ND ST NE
31ST ST NE
29TH ST NE
O AVE NE
K AVE NE
J AVE NE
COTTAGE GROVE AVE SE
12TH ST NE
GRANDE AVE SE
BEVER AVE SE
4TH AVE SE
7TH AVE SE
MOUNT VERNON RD SE
Cedar Lake
Cedar River
E AVE NE
B AVE NE
1ST AVE E
2ND AVE SE
5TH AVE SE
10TH ST SE
12TH ST SE
380
100-YEAR MODEL RESULTS
KENWOOD WATERSHED


Sub Catchment
Modeled Detention Pond
CIP Project Location
Storm Pipe
Surcharge
Less than half full
More than half full
Full - Bottleneck Downstream
Full - Bottleneck Pipe
Ponding Depth (ft)
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1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1+
LEE ST NE
E AVE NE
OLD MARION RD NE
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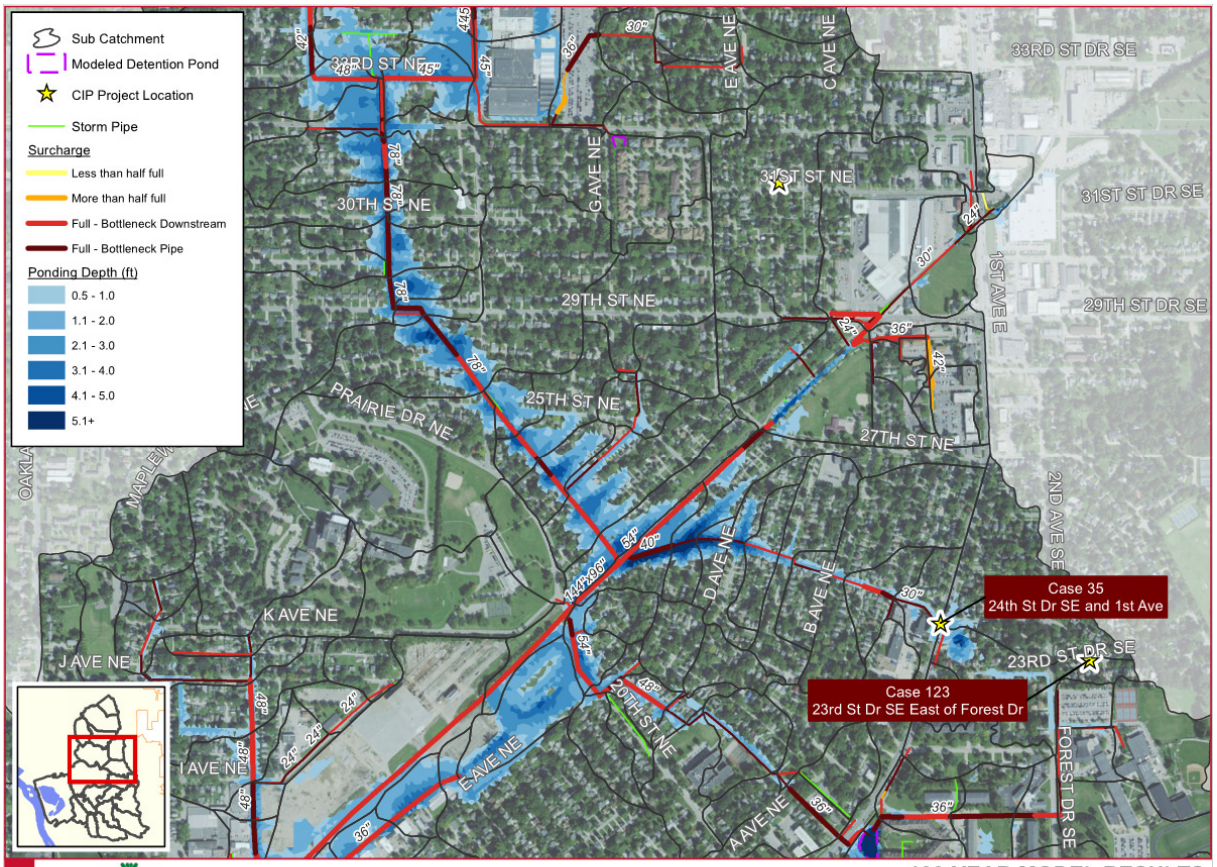
H AVE NE
F AVE NE
C AVE NE
35TH ST NE
Case 110
35th St NE at Collins Plant
18TH AVE E
34TH ST DR SE
33RD ST NE
100-YEAR MODEL RESULTS
KENWOOD WATERSHED, NORTH


Sub Catchment
Modeled Detention Pond
CIP Project Location
Storm Pipe
Surcharge
Less than half full
More than half full
Full - Bottleneck Downstream
Full - Bottleneck Pipe
Ponding Depth (ft)
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K AVE NE
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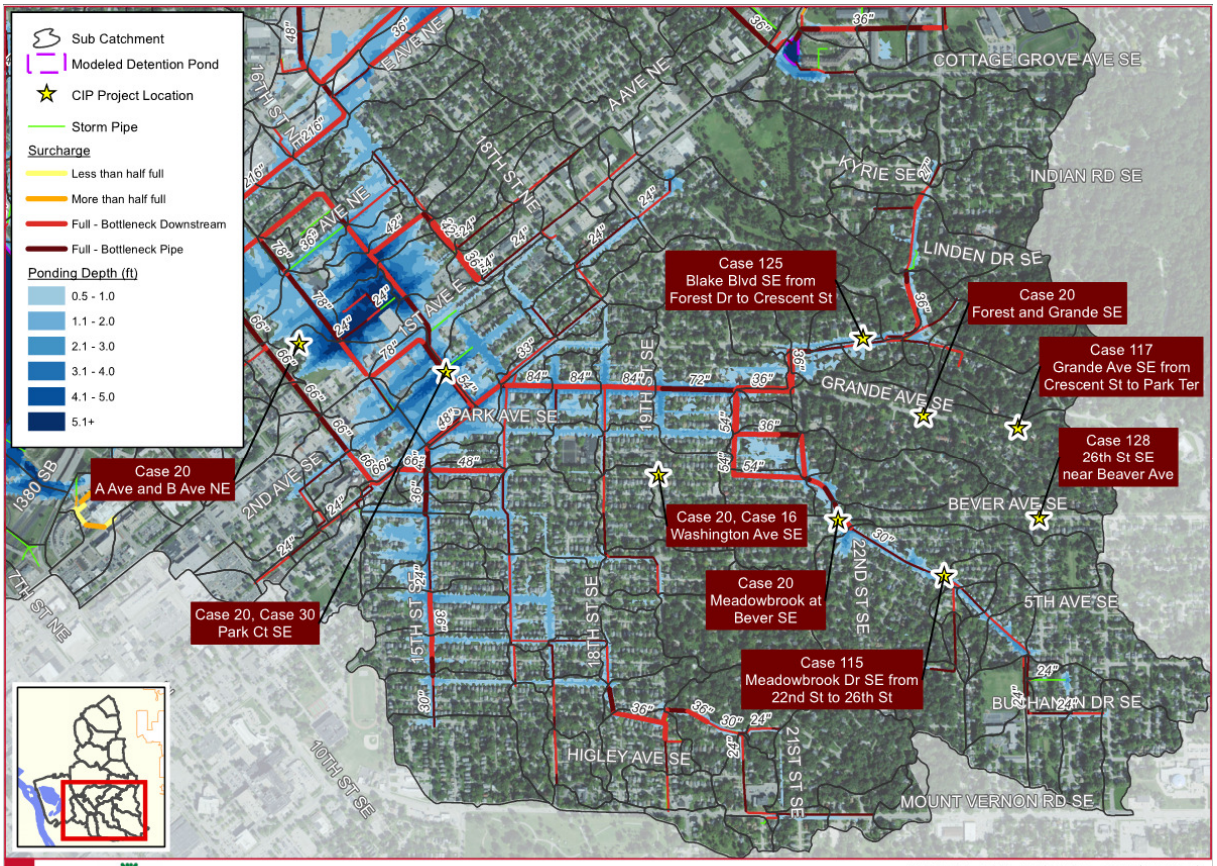
E AVE NE
D AVE NE
B AVE NE
A AVE NE
G AVE NE
F AVE NE
C AVE NE
1ST AVE E
2ND AVE SE
FOREST DR SE
23RD ST DR SE
Case 35
24th St Dr SE and 1st Ave
Case 123
23rd St Dr SE East of Forest Dr
100-YEAR MODEL RESULTS
KENWOOD WATERSHED, CENTRAL


Sub Catchment
Modeled Detention Pond
CIP Project Location
Storm Pipe
Surcharge
Less than half full
More than half full
Full - Bottleneck Downstream
Full - Bottleneck Pipe
Ponding Depth (ft)
0.5 - 1.0
1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1+
COTTAGE GROVE AVE SE
A AVE NE
E AVE NE
16TH ST NE
18TH ST NE
B AVE NE
1ST AVE E
KYRIE SE
INDIAN RD SE
LINDEN DR SE
GRANDE AVE SE
PARK AVE SE
19TH ST SE
2ND AVE SE
I380 SB
7TH ST NE
15TH ST SE
18TH ST SE
22ND ST SE
BEVER AVE SE
5TH AVE SE
BUCHANAN DR SE
HIGLEY AVE SE
21ST ST SE
MOUNT VERNON RD SE
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Case 125
Blake Blvd SE from
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26th St SE
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A Ave and B Ave NE
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Meadowbrook at
Bever SE
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Park Ct SE
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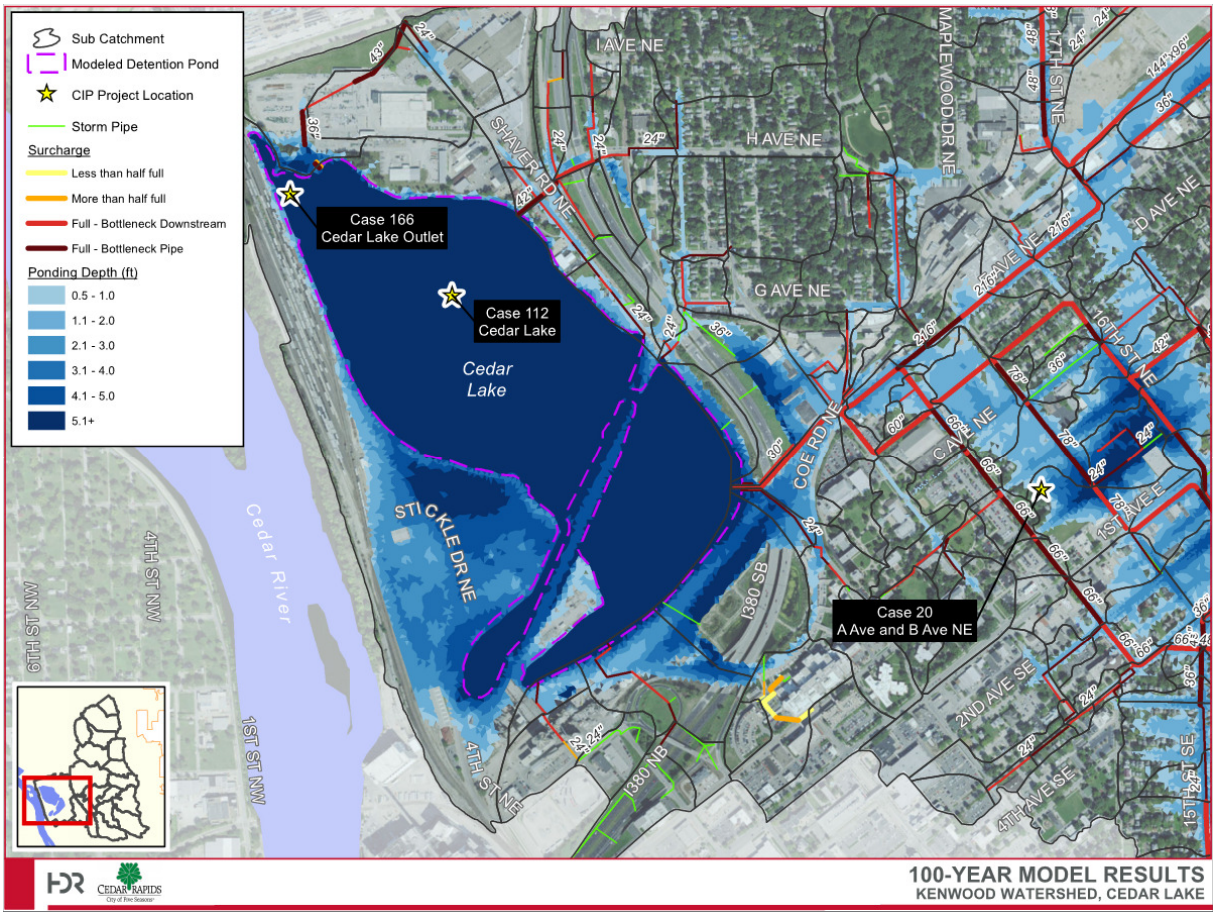
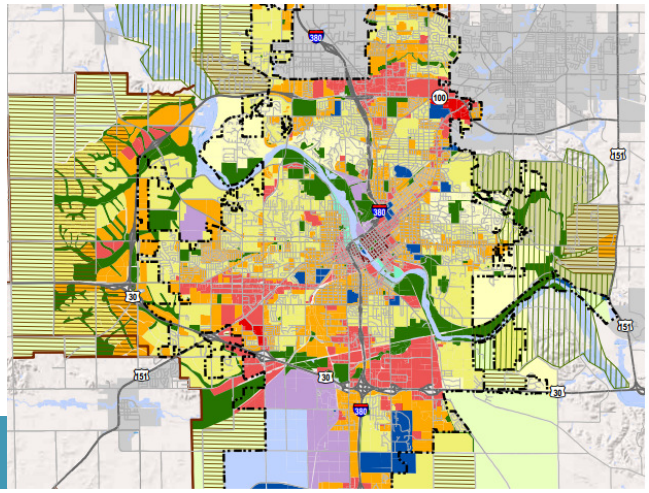
22nd St to 26th St
100-YEAR MODEL RESULTS
KENWOOD WATERSHED, SOUTHEAST



Results Discussion

- Overview
- Specific Observations
  - Storm System Limitations
  - Overland Flow / Ponding
- Review of priority project areas in the next 3-5 years



08 IMPROVEMENTS DISCUSSION

Kenwood Prioritized CIP Project Areas

1. **Forest and Grande SE (Case 20)**
   Conveyance capacity limited resulting in flooded neighborhood
2. **Meadowbrook at Bever SE (Case 20)**
   Flooding in yards
3. **Park Court SE (Case 20, 30)**
   Flooding at Park Ct caused by overland flow
4. **Washington Avenue SE (Case 20, 16)**
   Flooding at Washington Avenue SE caused by overland flow
5. **A Avenue and B Avenue NE (Case 20)**
   Extensive property damage from flash flooding
6. **35th Street NE at Collins Plant (Case 110)**
   Potential building flooding
7. **D Avenue NE from 38th St to 39th St (Case 114)**
   Localized flooding caused by undersized storm sewer
8. **Meadowbrook Drive SE from 22nd Street to 26th Street (Case 115)**
   Aging and undersized / no storm infrastructure. Overland flow caused road damage and flooding

Grey vs. Green Improvement Applicability

- Grey
  - Detention Ponds
  - Conveyance Upsizing / Extensions
  - Inlet Enlargement
  - Open Channels
- Green
  - Bioswales / Rain Gardens / Disconnected Downspouts
  - Permeable Pavement / Green Alleys
  - Right-of-Way Improvements

Master Plan Project Prioritization

- Kenwood improvement project prioritization discussion
  - 5-year vs. 100-year results
  - Detention versus new sewer
  - Highest downstream benefits
  - Green vs. grey benefits
  - Water quality benefits

Next Steps

Storm Sewer Master Plan Workshop 4 TM 5.0 Financial Needs

December 9, 2015

HDR

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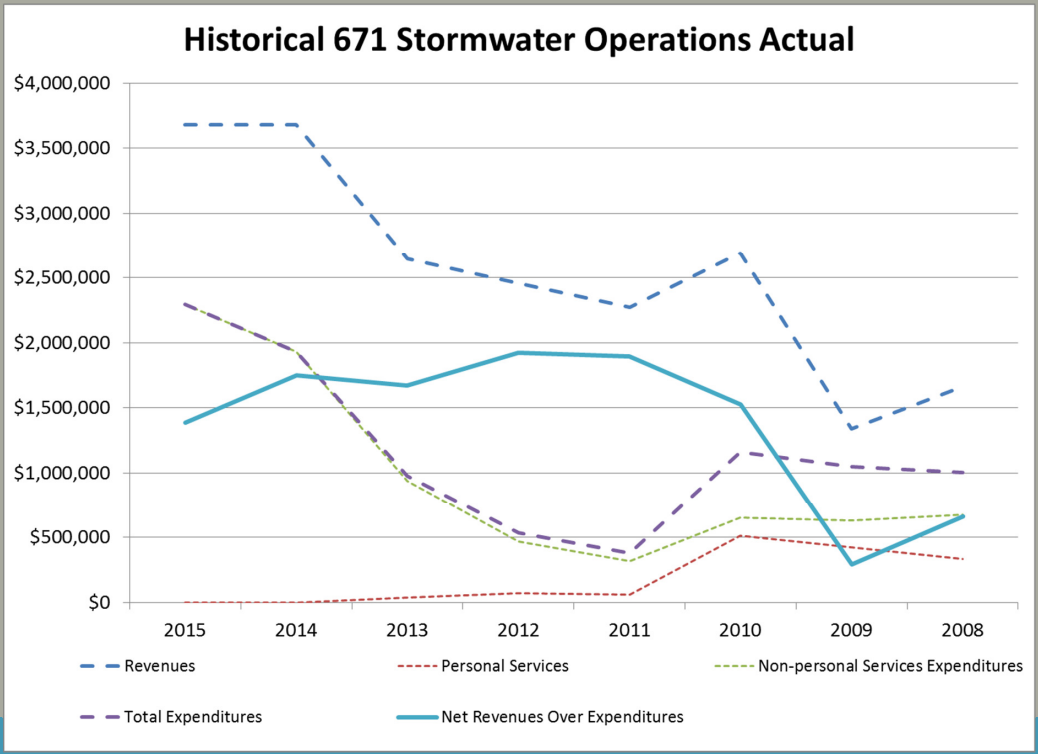
Historical 671 Storm Sewer Operations Actuals



Historical 671 Storm Sewer Operations Actuals

	Fiscal Year 2014	Fiscal Year 2013	Fiscal Year 2012	Fiscal Year 2011	Fiscal Year 2010	Fiscal Year 2009	Fiscal Year 2008
Revenues	$3,679,014	$2,646,960	$2,457,416	$2,269,668	$2,689,032	$1,340,460	$1,663,349
Personal Services	$0	$36,488	$67,524	$61,519	$512,365	$419,401	$332,804
Non-personal Services Expenditures	$1,927,816	$937,809	$467,073	$315,418	$648,829	$629,311	$671,850
Total Expenditures	$1,927,816	$974,297	$534,598	$376,937	$1,161,194	$1,048,712	$1,004,654
Net Revenues Over Expenditures	$1,751,197	$1,672,663	$1,922,819	$1,892,731	$1,527,837	$291,749	$658,695

Largest Non CIP Expenditures

		FY15 Actual*	FY08-15 Average
1	Admin Charges - Cty Mgr depts	$1,141,296	$348,517
2	Operating Transfer Out-Inter	$723,416	$146,593
3	Contribution-Other Agency	$176,000	$144,010
4	Regular Employees		$100,276
5	Street/Sewer Mat & Supplies	$49,108	$42,888
6	Op Transfer Out-Intra		$37,316
7	Group Insurance		$25,083
8	City Fleet Services	$27,336	$19,999
9	City Rental Charges - Fleet	$33,139	$16,063
10	Other Professional Services	$7,862	$14,437
11	Veh&Roll Stk-Parts & Materials	$121	$10,820
12	City Accounting Services	$19,741	$10,546
13	City IT Services	$26,432	$9,709
14	Equip/Furniture/Fixtures	$14,868	$9,208
15	Rental of Land & Bldgs	$528	$7,949
	Sum	$2,219,846	

* Total Non CIP Expenditures = $2,329,788

304 Revenues FY08-15

		FY 2015	FY 08-15
	Account	ACTUALS	ACTUALS
Federal Capital	421003	$385,504	$9,069,256
Capital Contributions	481003	$188,810	$6,164,567
GO Bond Proceeds	485001	$0	$4,617,292
Operating Transfer In - Inter	483001	$1,556,269	$2,919,161
Zoning & Subdivision Fees	431004	$54,187	$542,637
State Capital	422002	$0	$540,904
Interest/Div - Nonproprietary	451000	$3,719	$331,211
Admin Charges - City Mgr Depts	431007	$0	$109,947
Developer Cost Sharing	431009	$0	$55,101
Premiums on Bonds Sold	485005	$0	$46,881
TIF GO Bond Proceeds	485008	$0	$37,967
Contributions & Donations	471002	$0	$28,768
Federal Operating	421001	$0	$20,259
Damage Recoveries	471004	$0	$16,960
Gain (Loss) on Sale of Invest	451002	$0	$11,383
Other Miscellaneous Revenue	471005	$0	$1,322
Special Assessment Charges	471008	$0	$1,214
Sales Tax Refunds	471000	$0	$225
Revenues		$2,188,489	$24,515,053

671 Storm Sewer Operations FY 2016 Budget

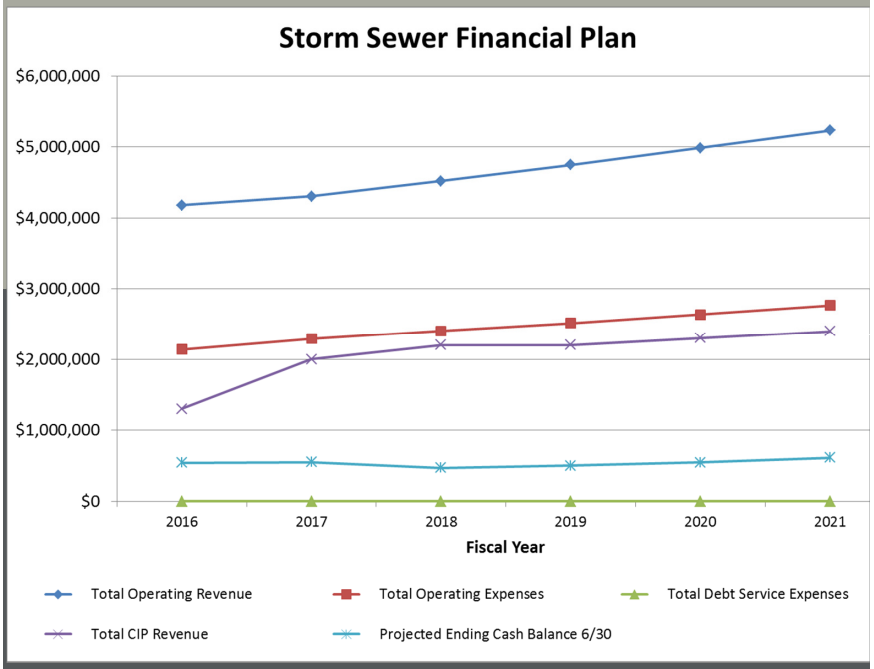
- **Total Revenue:** **$3.8 million**
  - $3.8 million from utility fees (proposed rate increase : 2.4%)
- **Total Expenditures:** **$3.6 million**
  - ***Personnel Services:*** ***None***
  - ***Discretionary:*** ***$0.4 million***
  - ***Non-discretionary – Fleet and Facilities:*** ***$0.2 million***
  - ***Non-discretionary – Other:*** ***$1.6 million***
    - $0.5 million for street sweeping
    - $0.4 million for five stormwater positions
    - $0.2 million for CC&B admin charges
    - $0.2 million for CIP services
    - $0.1 million for PW project engineer II
  - ***Non-discretionary – Capital:*** ***$0.1 million***
  - ***Transfers Out:*** ***$1.5 million***
    - $0.2 million transfer to CC&B updates CIP
    - $1.3 million to Storm CIP (304 Fund)
- **Net:** **+$0.2 million**

651 Sanitary Sewer Operations Challenges

- Projected storm CIP expenditures relating to the Flash Flood 2014 recovery efforts are estimated at $20 million. The storm sewer utility is on average able to support $1 to $1.5 million in CIP expenditures annually. If able to support $1.2 million in CIP annually and only expend half of the CIP budget on recurring programs, the total timeline for all Flash Flood 2014 projects would be 30 years. Again this is a funding challenge that will take more than percentage rate increases, but a mixture of approaches including grants and a storm sewer utility rate restructuring.
- Adapting to all of the Matrix report recommendations will also be a challenge. The total monetary impact of the report is yet unknown. Possible large fiscal items are: increased FTE's, capital equipment (Energov, storm line cleaning), and professional development (a focus on training, certification, and SOPs).

Financial Plan Assumptions

- 3% Revenue Increase in FY16
- 5% Revenue Increase FY17-FY21
- No Personal Services Costs
- 5% Nonpersonal Services Cost Increase FY16-21
- $200k to Water for CCB Upgrade FY16



Storm Sewer Master Plan Workshop 4 TM 7.0 Future Considerations

December 9, 2015

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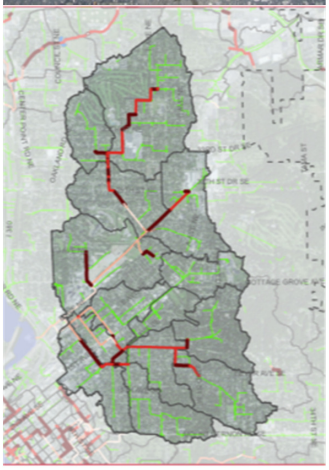
Future Considerations

- Implementation
  - Roles & Responsibilities
  - Updates
- Growth
  - From Envision CR
- Regulatory
  - National Stormwater Rule (vs Performance Requirements added to Individual Permits)
  - State Topsoil, Runoff Control, Discharge Water Quality
  - Infiltration/Runoff
- Flood Control System

Stormwater - Roles & Responsibilities

- Field Maintenance
  - Investigate and Respond to Public Feedback
  - Clean, Televise, Inventory, Locate, and Make Minor Repair *(and Otherwise Maintain System?)*
  - Perform Compliance Inspections and Outreach
  - *Prepare Budget and Manage Associated Costs?*
  - Identify Need for Capital Projects
- Engineering
  - Manage the Capital Improvements Plan
  - *Prepare & Implement the Stormwater Master Plan*
  - *Prepare Budget and Manage Overall Revenues and Costs?*
  - *Seek Outside Funding?*
  - Identify and Propose Policy Changes
  - *Identify and Propose Rate Changes?*
  - Interface with Elected & Appointed Officials to Enable Informed Decisions
- Elected & Appointed
  - Approve Budgets & Rates
  - Set and Approve Policy
- *Stormwater Commission?, Other?*

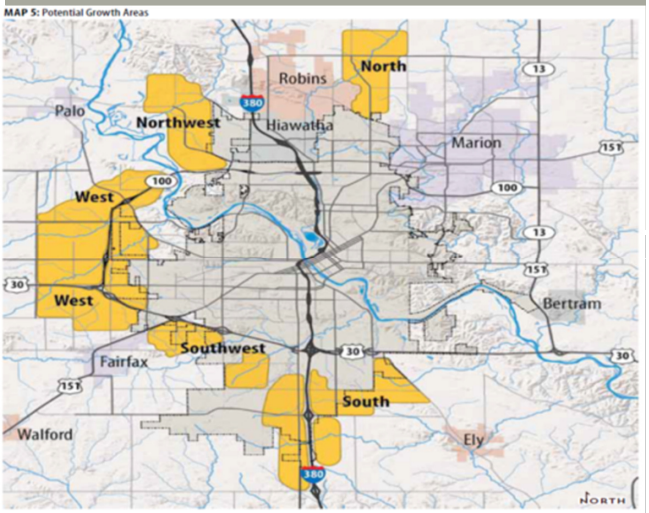


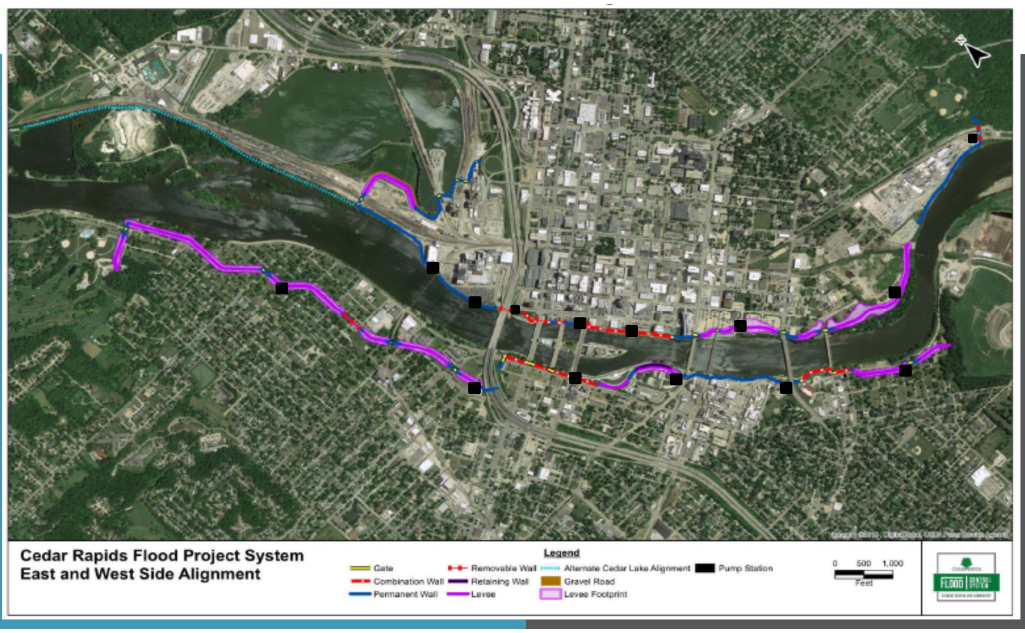
Updates

- Annual
  - Capital Improvements Plan
  - Fiscal Year Plan
  - Modeling and Studies *(Basin? and Project?)*
  - Policy
  - Field and Reactive Inputs
- 5 Year
  - Master Plan
  - Financial Plan
  - *Macro Modeling?*

EnvisionCR Growth

- West. In response to Highway 100 expansion & incorporating natural environment as an amenity.
- Southwest. For industrial projects and establishing a network of streets for emerging neighborhoods.
- South. For major employer & large parcel projects, while completing a network of projects relating to Kirkwood Boulevard & setting the stage for future growth past the southern ridgeline
- North. For residential development & accompanied by continuous parkway connecting neighborhoods & parks.
- Northwest. Complete the street network for neighborhoods & discourages development past the ridgeline.



Flood Control System

- Combination & Removable Walls
- Gate Closures
- Pump Stations