CHERYL DRIVE STORMWATER STUDY

Public Information Meeting #2 – August 26, 2021

EOR water ecology community

THE CITY OF Fitchburg WISCONSIN

INTRODUCTIONS

Claudia Guy, P.E., Environmental Engineer at the City of Fitchburg

Nick Hayden, P.E., Water Resources Engineer at Emmons & Olivier Resources

PROJECT SCOPE

Cheryl Drive Stormwater Study

- **Task 1 – Flash Flooding Analysis Cheryl Drive**
  - Feasibility study to determine options to improve flash flooding along Cheryl Drive near Charleston and Jacquelyn
- **Task 2 – Citywide Backyard Drainage Program**
  - Research what other local governments do to aid in private backyard drainage issues.
  - Put together a recommendation for a potential new backyard drainage program. If approved by Council, this would be a citywide program.

Florann Drive and Lyman Lane (Separate Project)

- This is a separate project to install a sump pump collection system in areas along Florann Dr and Lyman Ln.

PRESENTATION OUTLINE

1. Project Overview
2. Data Collection
3. Background Concepts
4. Analysis and Modeling
5. Street Flooding Causes
6. Alternatives Testing
7. Costs and Recommendations
8. Next Steps

HOUSEKEEPING – HOW TO ASK QUESTIONS

We will stop periodically throughout the presentation to address questions. We will get through as many questions as we can during our time, and may need to follow up with folks after the meeting if time does not allow.

Attending via Zoom:

- Please type your questions into the chat box.

Attending in Person:

- When we ask for questions, please line up at the microphone to ask your question.

After the Meeting:

- Direct questions to Claudia at claudia.guy@fitchburgwi.gov or 608-270-4262.

PROJECT RESOURCES

http://www.fitchburgwi.gov/2704/Cheryl-Drive-Stormwater-Project

- Recording of Public Information Meeting #1 (June 3, 2021)
- Resident Responses to the “Cheryl Drive Stormwater and Background Drainage Survey” (June 11, 2021)
- Link to the “Notify Me” email list for this project
- Future recordings and project deliverables will be made available on this site

PROJECT OVERVIEW

STUDY BACKGROUND

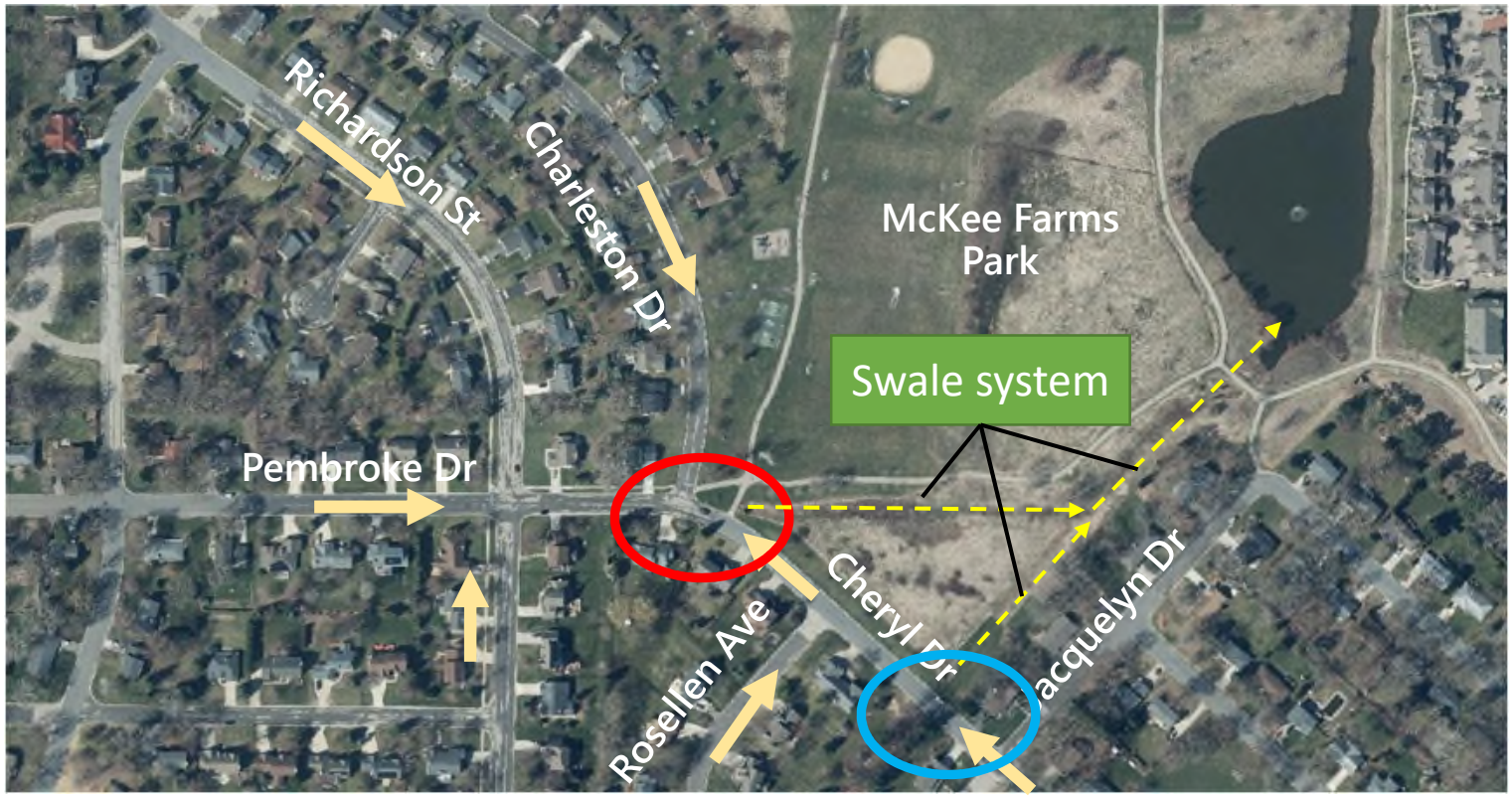
This project includes two distinct but related components:

Task 1 – Cheryl Drive Flooding Feasibility Study

Task 2 – Feasibility of a Citywide Backyard Drainage Program

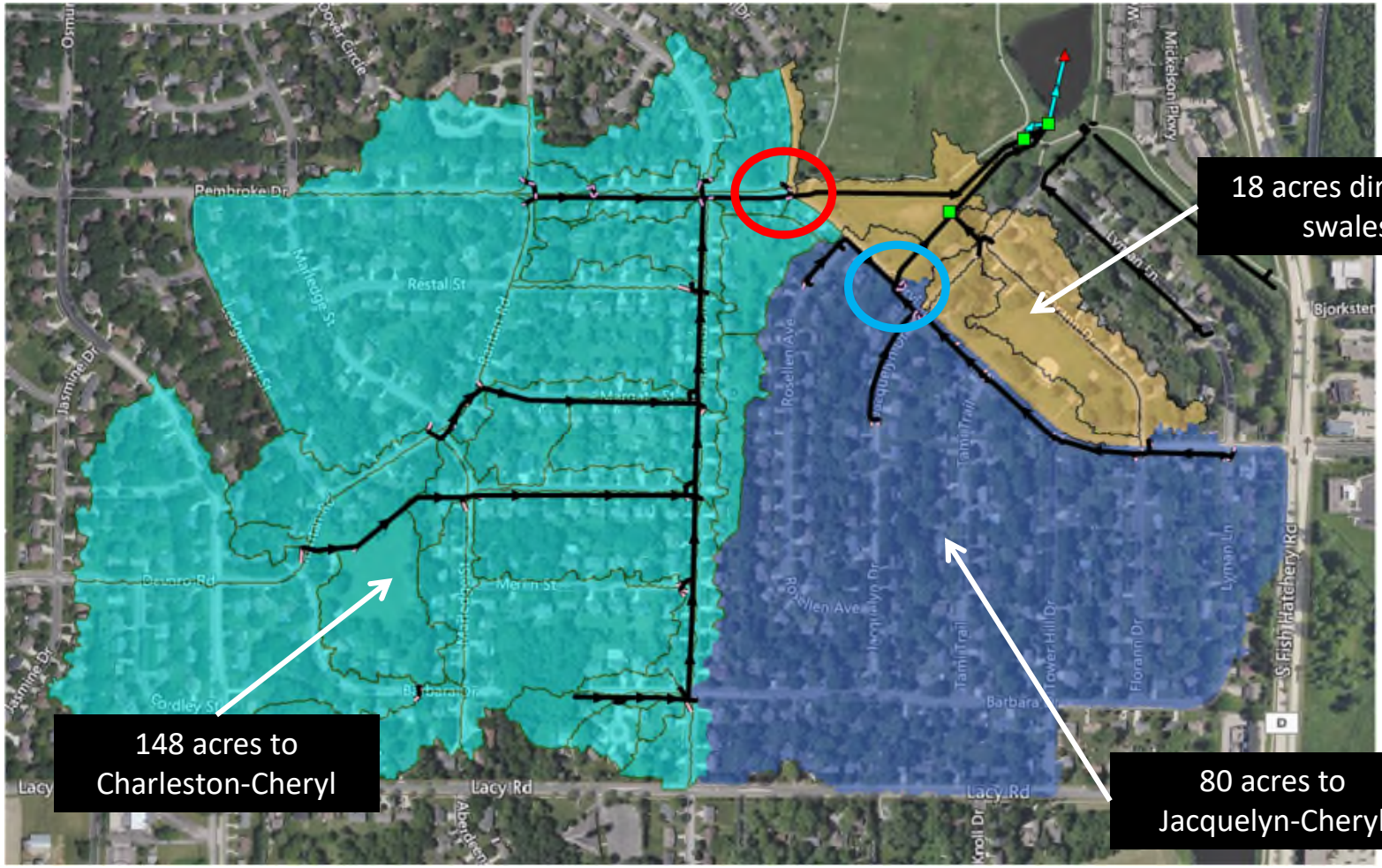
Tonight's presentation is focused only on Task 1. The results of Task 2 will be presented to Common Council.

LOCATION OVERVIEW



- Two significant street flooding problem areas have been observed and reported:
  - Intersection of Charleston Dr and Cheryl Dr (red)
  - Intersection of Jacquelyn Dr and Cheryl Dr (blue)

DRAINAGE AREA OVERVIEW



Key Takeaways

- Residential drainage area
- Largely developed

DATA COLLECTION

DATA COLLECTION

- Resident Input
  - PIM 1, phone calls, emails, responses to the “Cheryl Drive Stormwater and Background Drainage Survey”
- Review existing data
  - GIS Data (storm sewer network, topographic data, building footprints, land cover datasets, etc.)
  - Previous models, CAD drawings, plan sets, as-built documents
  - Original design documents (1992)
- On-site observations and survey

CHERYL DRIVE AND JACQUELYN DRIVE

Photos from Monday, June 7th, 2021

At SE corner of Cheryl-Jacquelyn, looking west

- Water pouring out of inlet at intersection (no capacity in storm sewer)
- 1.2" rain in 1 hour*

**Per nearest Weather Underground station*

CHERYL DRIVE AND JACQUELYN DRIVE

Photos from Monday, June 7th, 2021

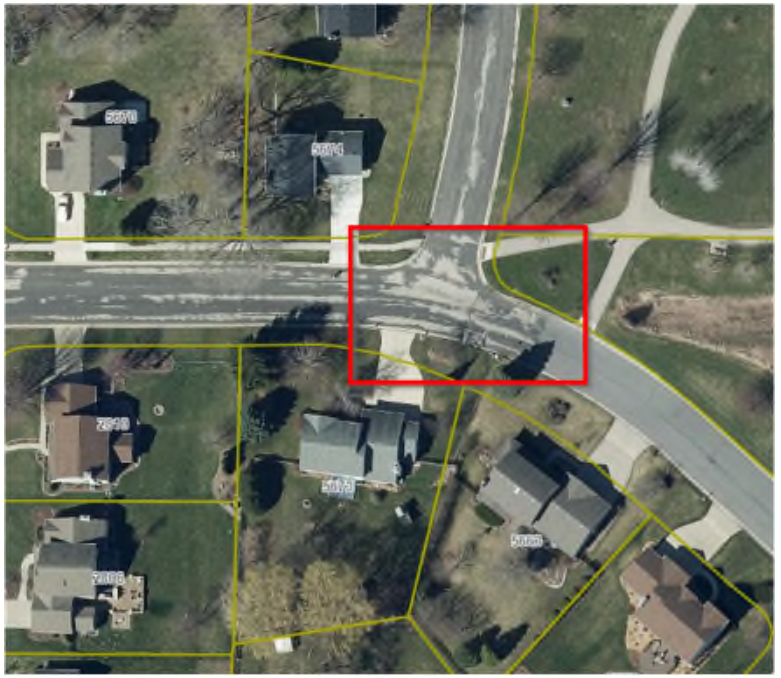
At top of eastern swale in McKee Farms Park, looking north

- Swale full but not overflowing
- 1.2" rain in 1 hour* *(~1-year event)*

**Per nearest Weather Underground station*

CHERYL DRIVE AND CHARLESTON DRIVE

Photos from Saturday, August 7, 2021



- Standing water over the top of the curb and excessive depths in driving lanes.
- 1.64" rain in 2 hours on August 6th *(~2-yr event*) follow by 0.98" rain in 1 hour, 20 minutes on August 7th*

**Per nearest Weather Underground station*

ORIGINAL STORMWATER DESIGN FOR MCKEE FARMS PARK (1992)

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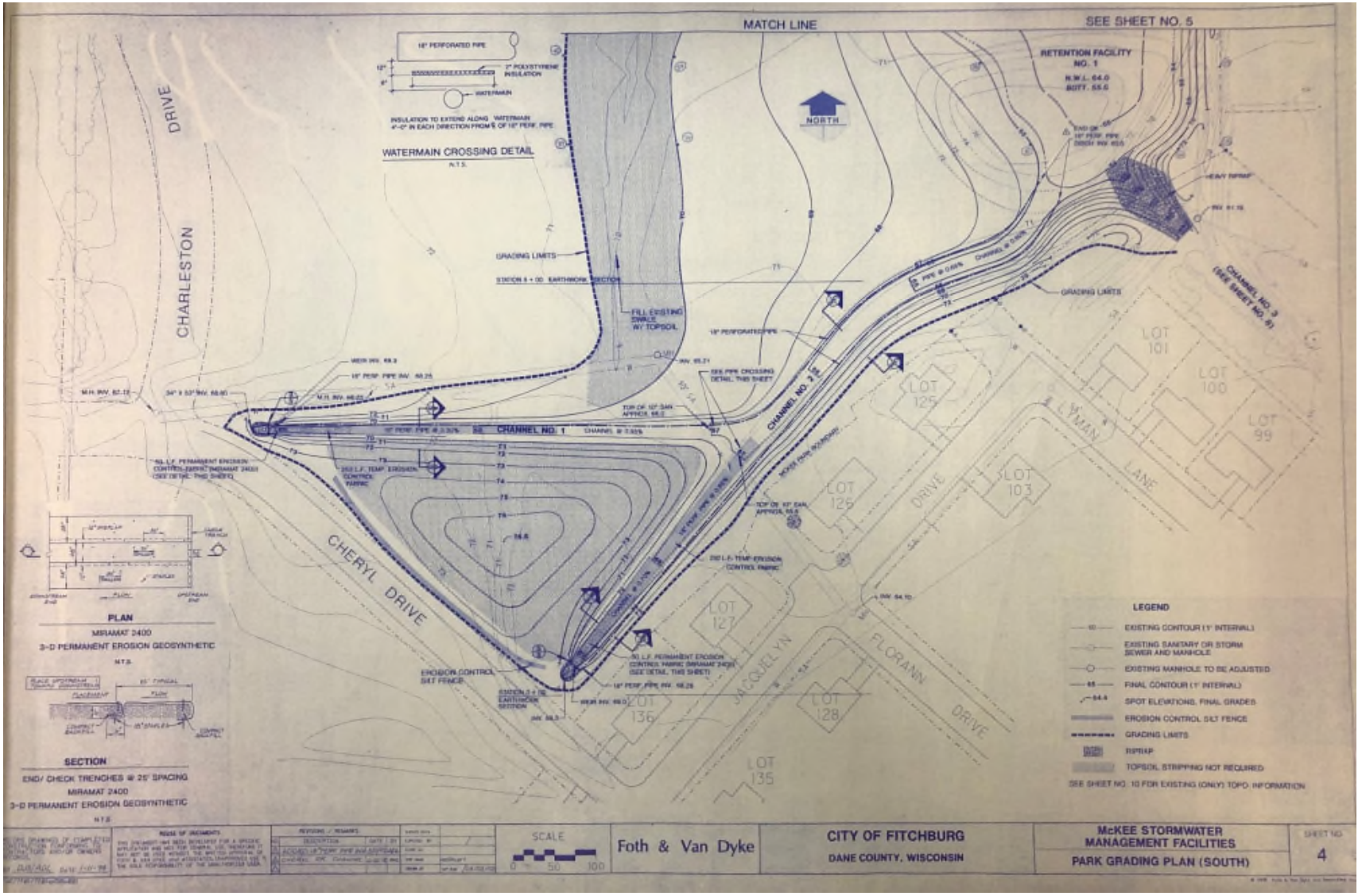
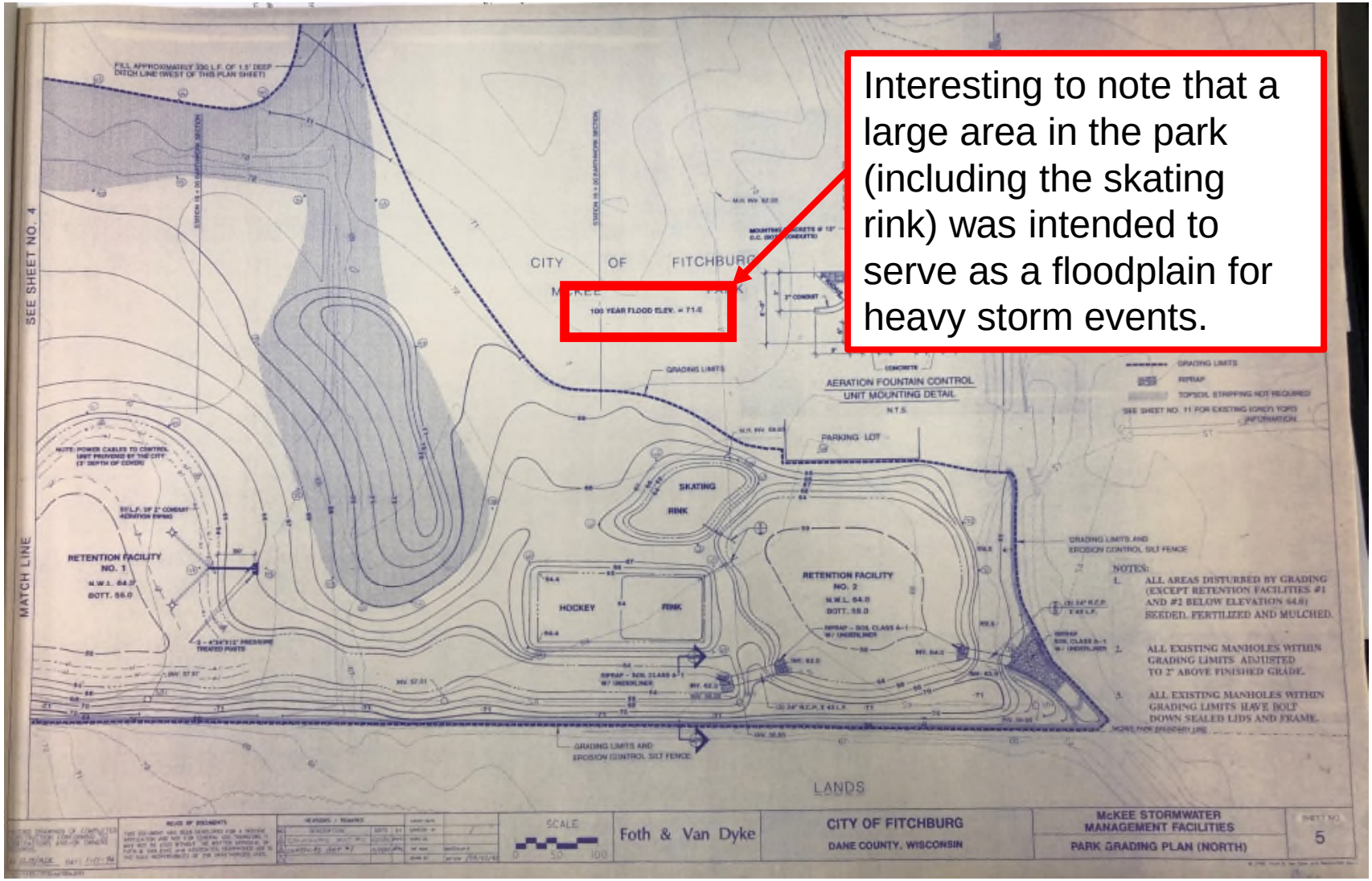


ORIGINAL STORMWATER DESIGN FOR MCKEE FARMS PARK (1992)



FIELD SURVEY

KEY OBSERVATIONS

Western swale (near Cheryl-Charleston intersection)

There is a considerable mound of sediment on top of the weir and downstream, along with thick vegetation.

KEY OBSERVATIONS

Top of eastern swale (near Cheryl-Jacquelyn intersection)

Less sediment build-up than the western swale, but still overgrown in some areas

KEY OBSERVATIONS

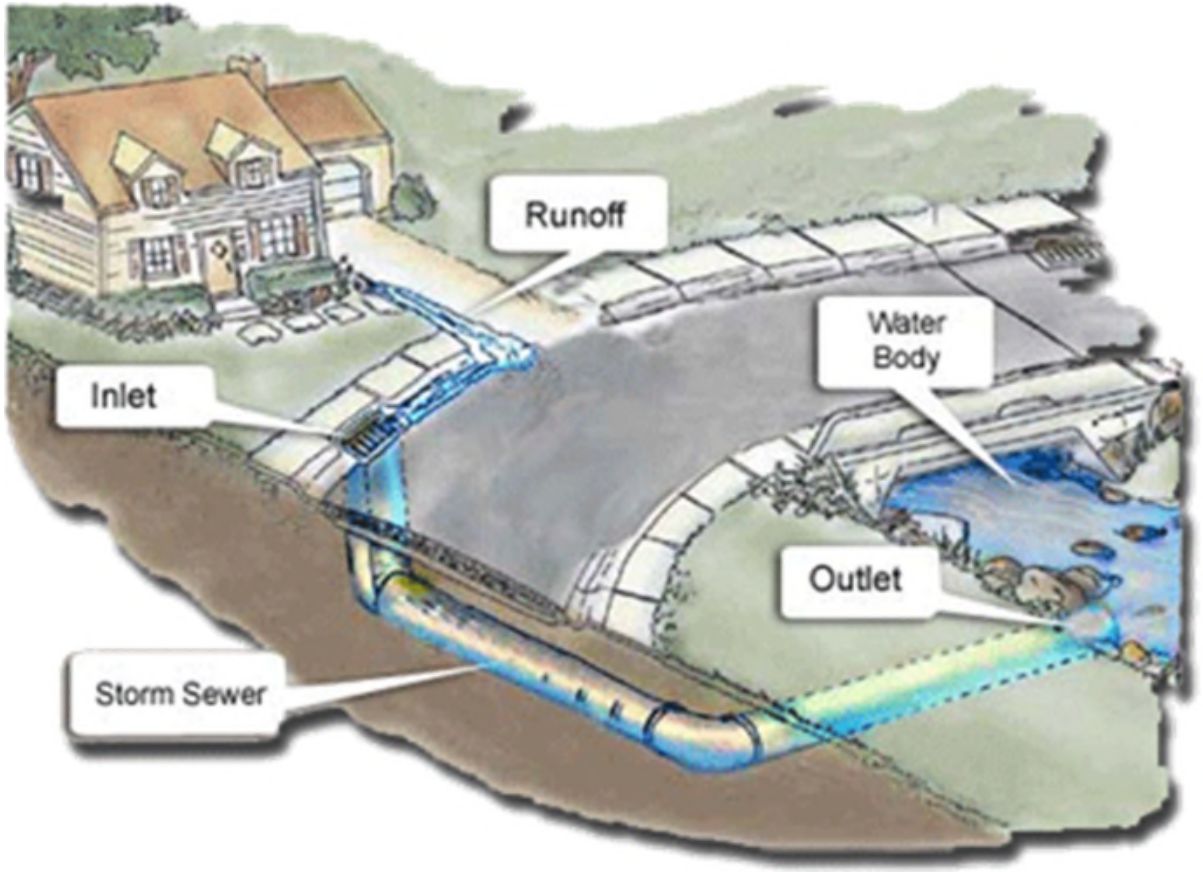
- Sediment near the pond inlet doesn't likely affect Cheryl Drive but should be cleaned to prevent future problems
- Thick willow stands in swale should be removed

KEY OBSERVATIONS

The pipe connecting the inlet to the main storm sewer at Cheryl-Charleston has slipped, likely reducing drainage capacity

BACKGROUND CONCEPTS

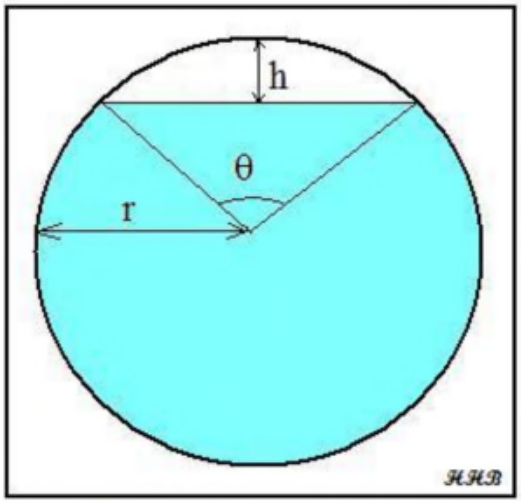
STORM SEWER SYSTEM



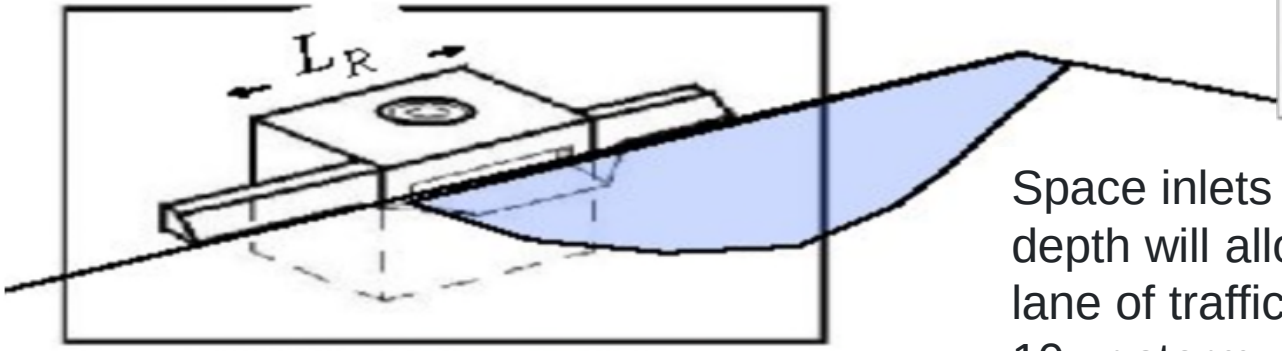
Stom sewer system consists of

- Curb and gutter
- Inlets
- Underground Pipe Network
- Greenways & Ponds

HOW DO WE DESIGN NEW STORM SEWER SYSTEMS?



The 10-year storm should be conveyed within the underground pipe network



Space inlets so that ponding width and depth will allow the safe passage of one lane of traffic through center of street for 10-yr storm

HOW DO WE DESIGN NEW STORM SEWER SYSTEMS?

For larger storms, overflow that exceeds the storm sewer should ideally flow downstream in a controlled way, without impacting structures (homes). Ideally, water will be contained within the right-of-way. Note that streets and gutters become part of the stormwater conveyance system, by design, for large storms.

HOW DO WE RETROFIT EXISTING STORM SEWER SYSTEMS?

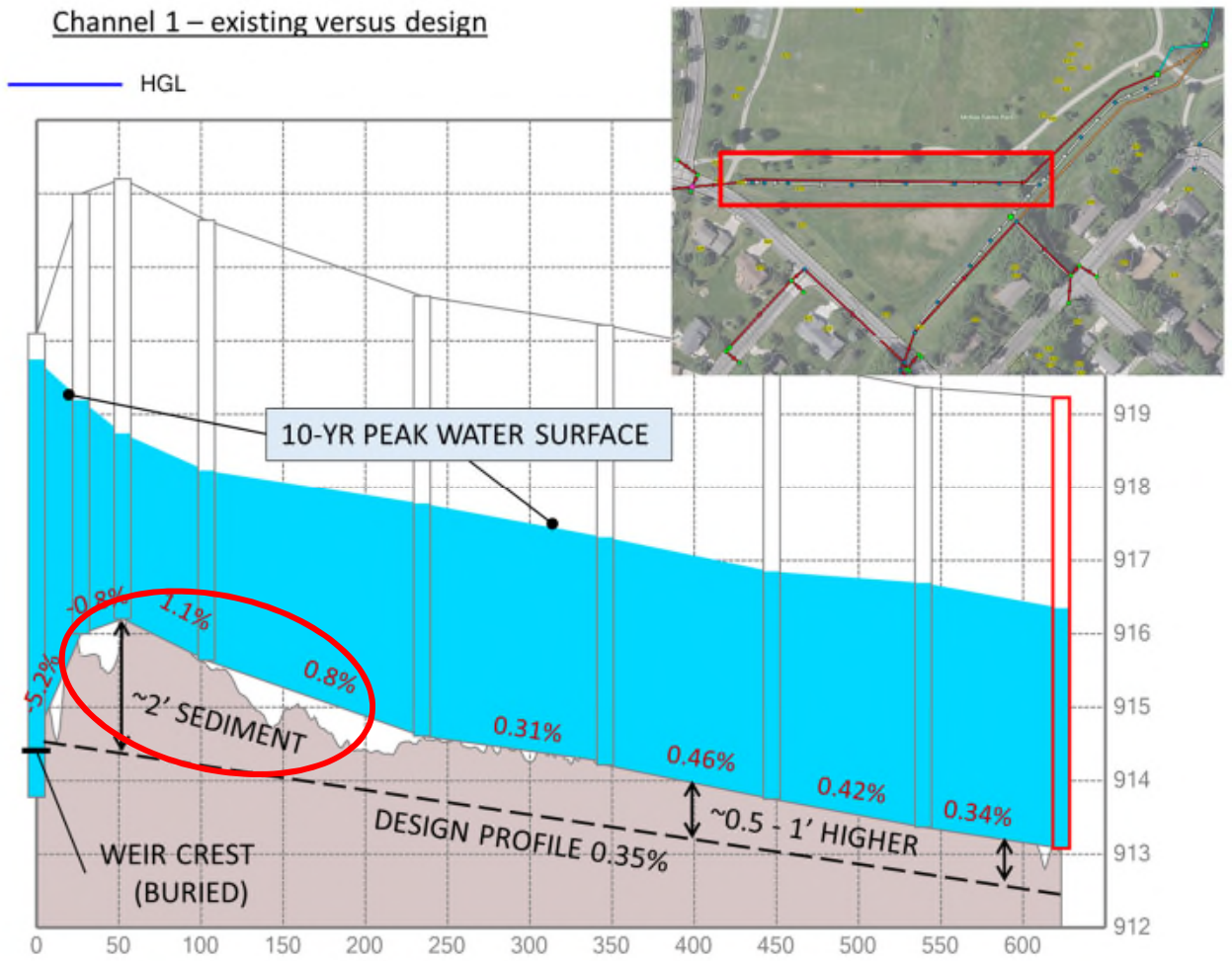
- We use the 10-yr design storm as a starting point, but older systems built before modern stormwater standards usually do not meet this design goal, especially considering increasing rainfall trends.

- Stormwater systems in fully developed watersheds like Cheryl Drive are harder to modify due to existing road and pipe slopes and elevations, downstream channel elevations, and the lack of open space in the upper reaches of the watershed for stormwater management.

- We use models to look for targeted changes that improve drainage performance and especially reduce hazardous conditions during heavier rains. We then look at the feasibility of these changes (constructability, cost).

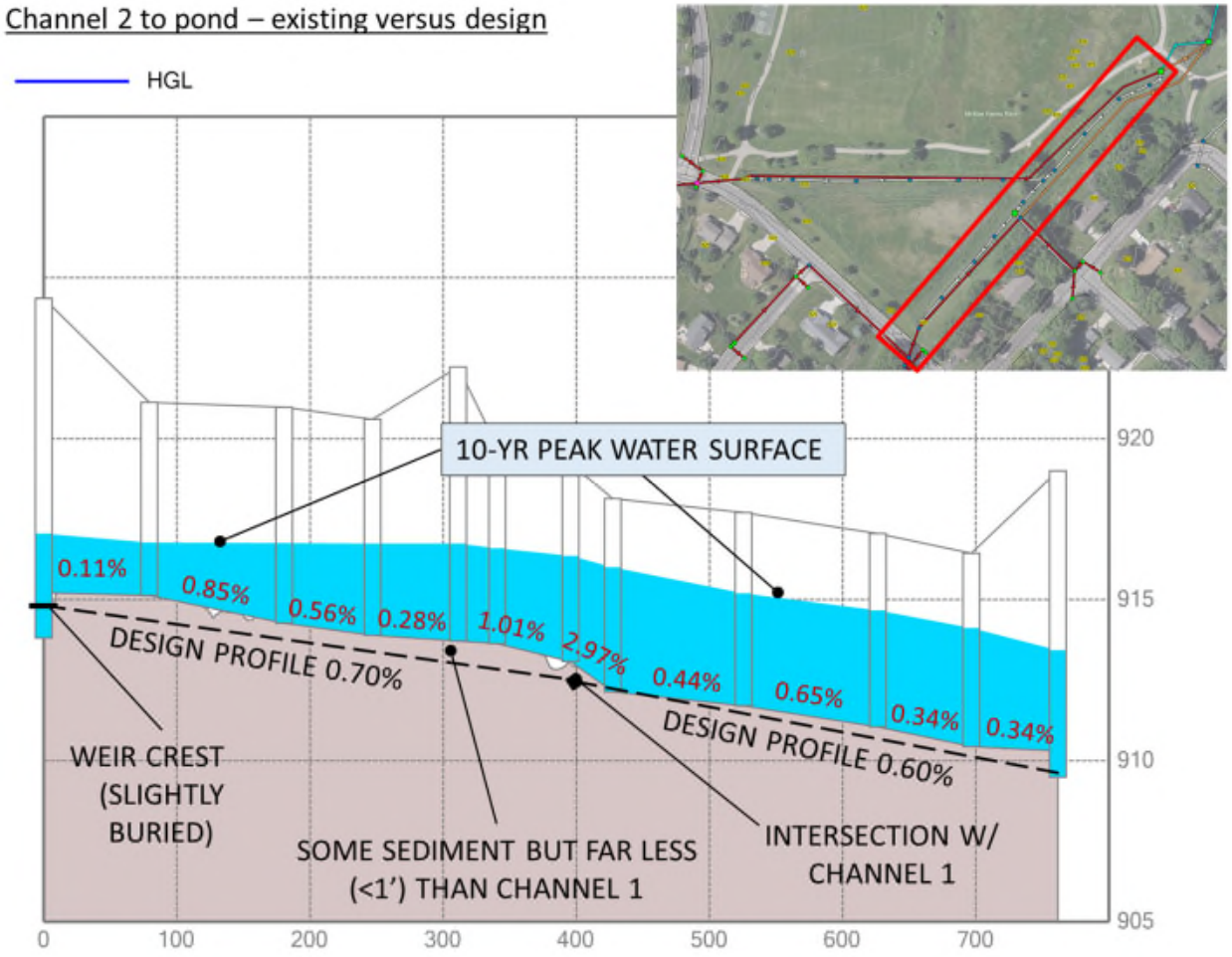
ANALYSIS AND MODELING

MCKEE FARMS PARK SWALE SYSTEM ANALYSIS



- Western swale has filled in and is up to 2 feet higher near the storm sewer outlet
- Sediment and vegetation impacts drainage from intersection

MCKEE FARMS PARK SWALE SYSTEM ANALYSIS



Sediment has filled in the eastern channel up to 1 foot compared to the design profile.

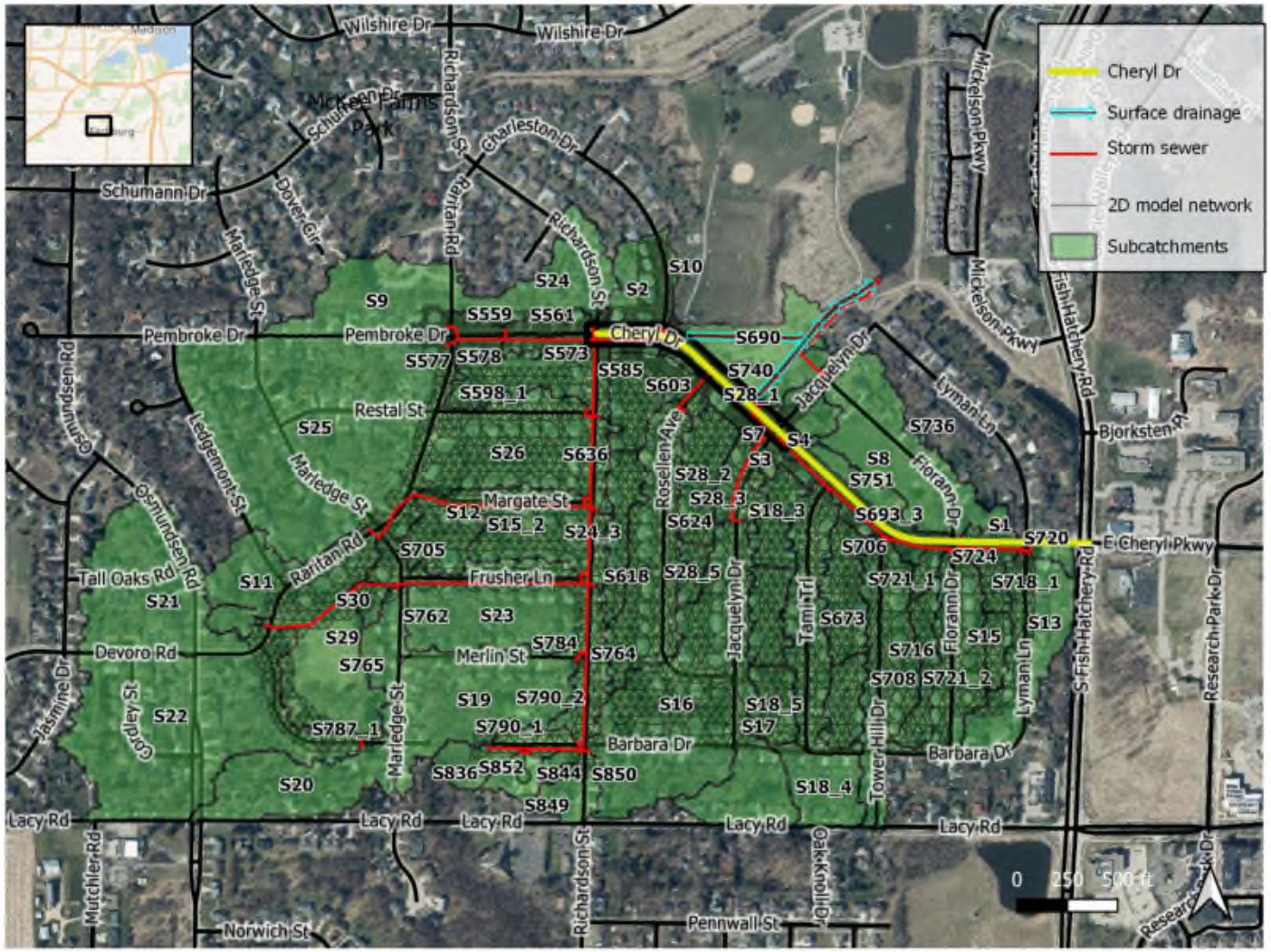
MODELING BACKGROUND

Why do we use stormwater models?

Stormwater models show how well a storm sewer system handles rain events, and where water goes when the storm sewer system is overloaded.

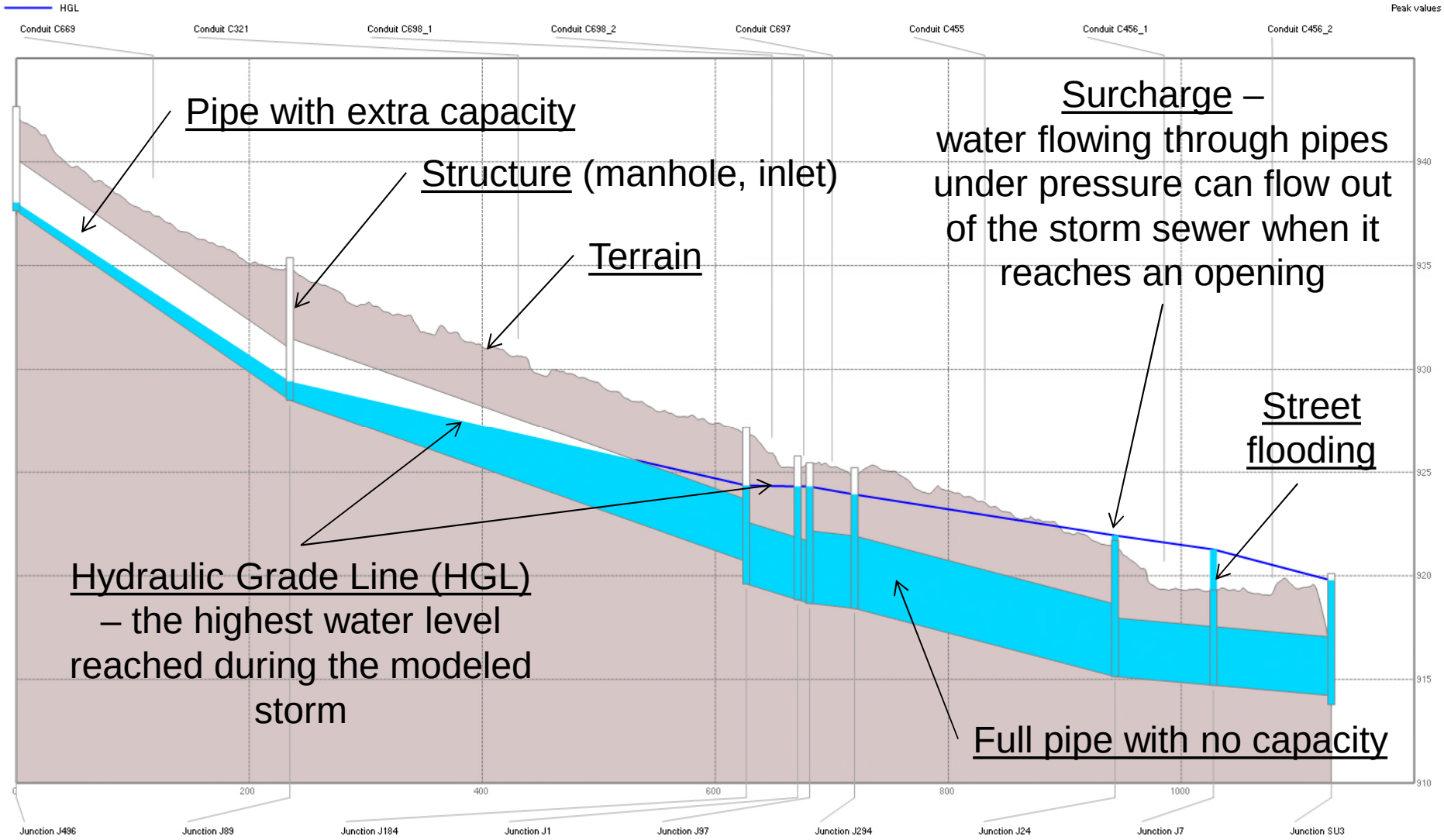
They are very useful for identifying weak points in a system (drainage constrictions) and comparing possible improvements to the existing condition.

MODEL OVERVIEW



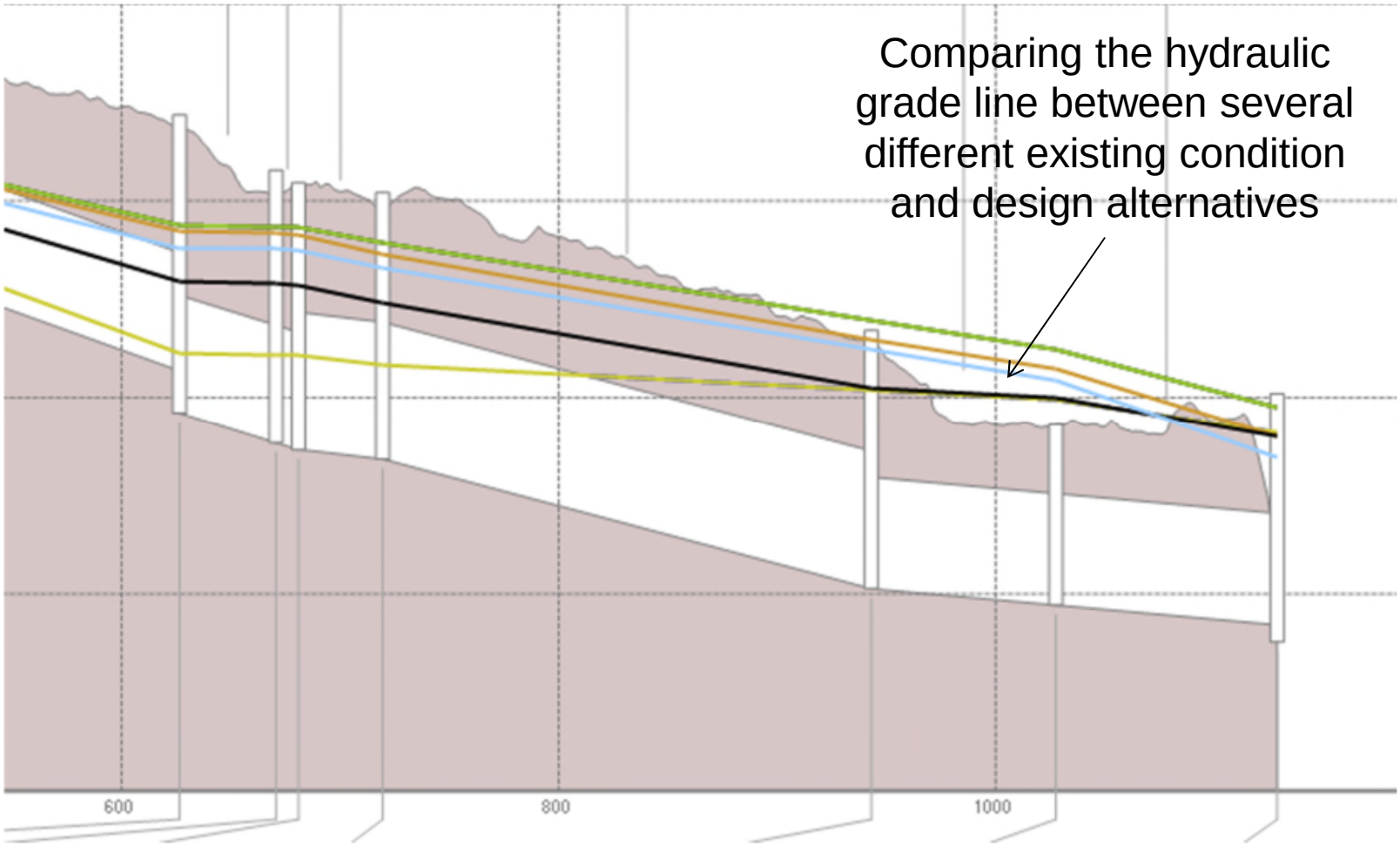
The model covers 222 acres of mostly residential areas that drain to Cheryl Drive. Impervious surfaces (roads, driveways, roofs, etc.) cover approximately 32% of the watershed.

MODEL OUTPUT – DRAINAGE PROFILES



Profiles views are a powerful tool for analyzing storm sewer and surface drainage response to storms.

MODEL OUTPUT – DRAINAGE PROFILES



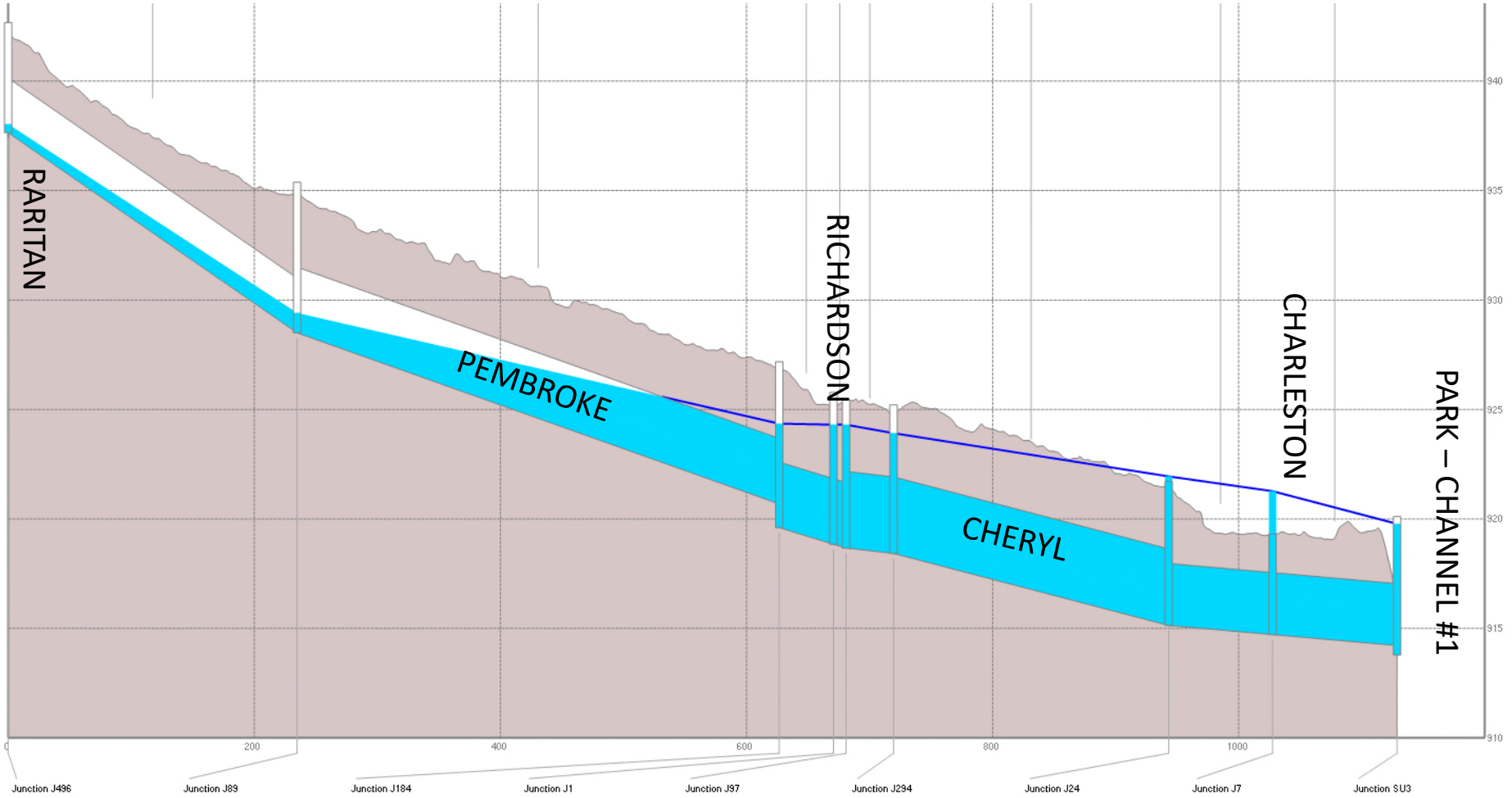
The HGLs of existing and proposed alternatives are compared. 2D results, pipe calculations, and other methods are also used.

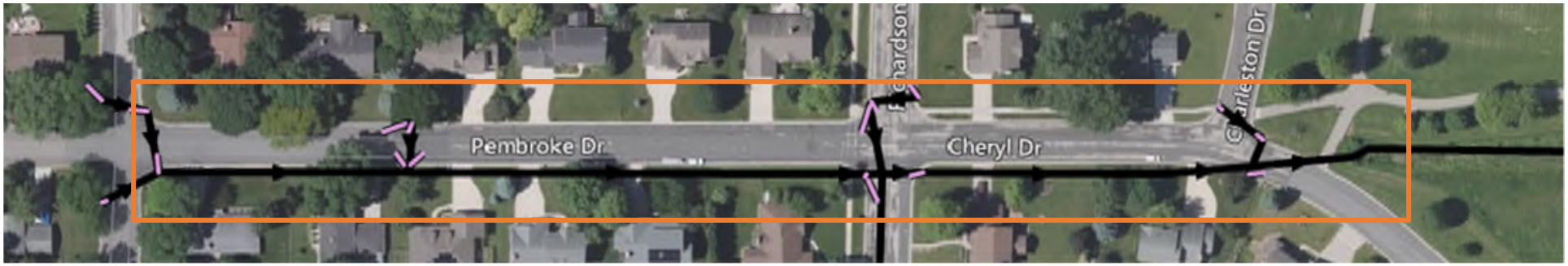
CHERYL DRIVE STREET FLOODING CAUSES

STREET FLOODING DIAGNOSTICS

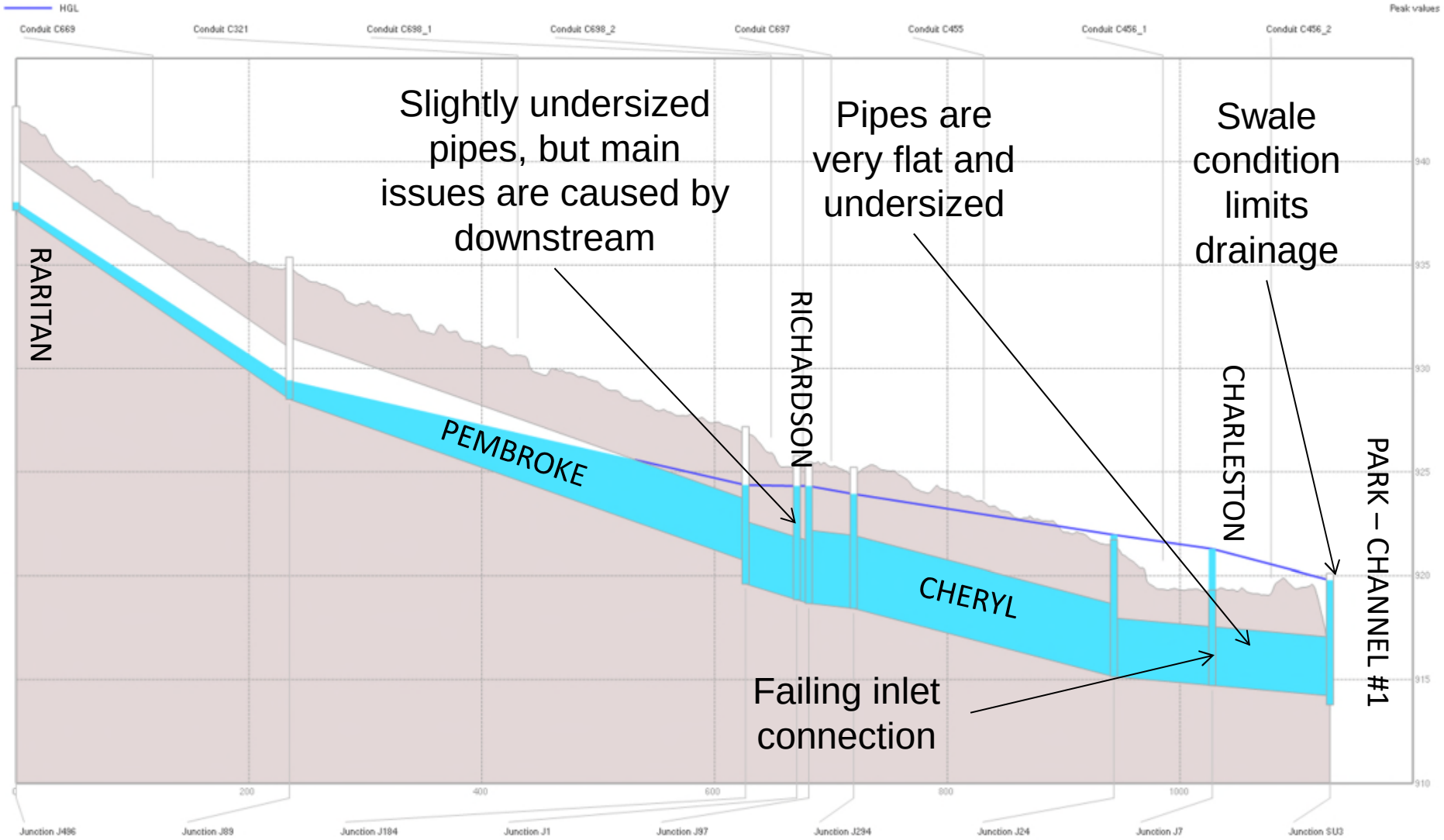
Detailed analysis was conducted at each numbered location. We assessed pipe and inlet capacity, swale capacity, and impacts of the swale and ponds on the storm sewer.

WESTERN AREA (CHERYL & CHARLESTON)





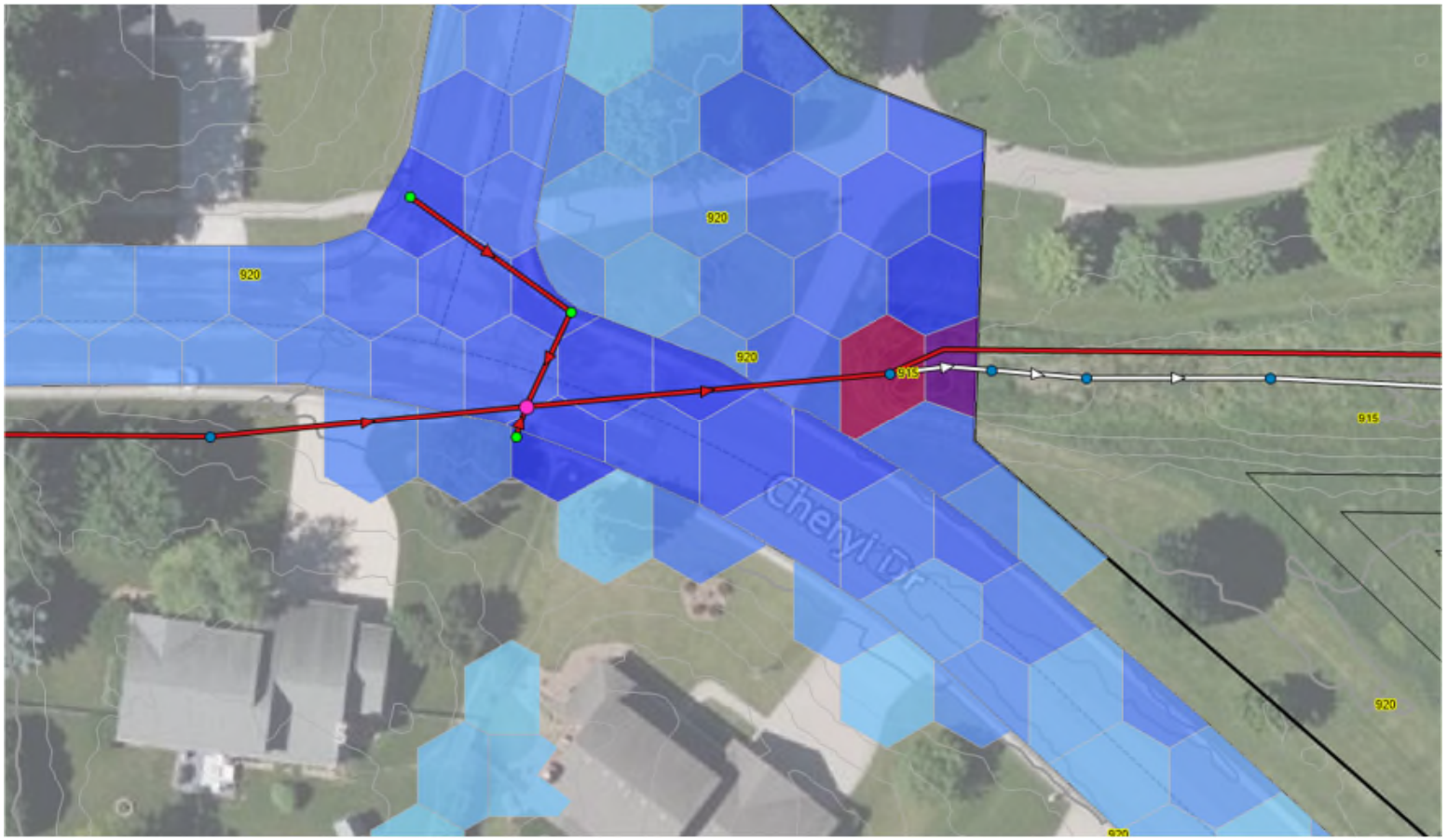
WESTERN AREA (CHERYL & CHARLESTON)



Modeling the 10-yr (and other) storms revealed factors contributing to street flooding near Cheryl and Charleston.

WESTERN AREA (CHERYL & CHARLESTON)

Water in the intersection is nearly 2 ft deep in places for the 10-yr design storm, with numerous front yards and driveways impacted. Fortunately, water flowing over the curb to the swale limits the maximum flood levels.



PROBLEMS IDENTIFIED AT CHERYL-CHARLESTON

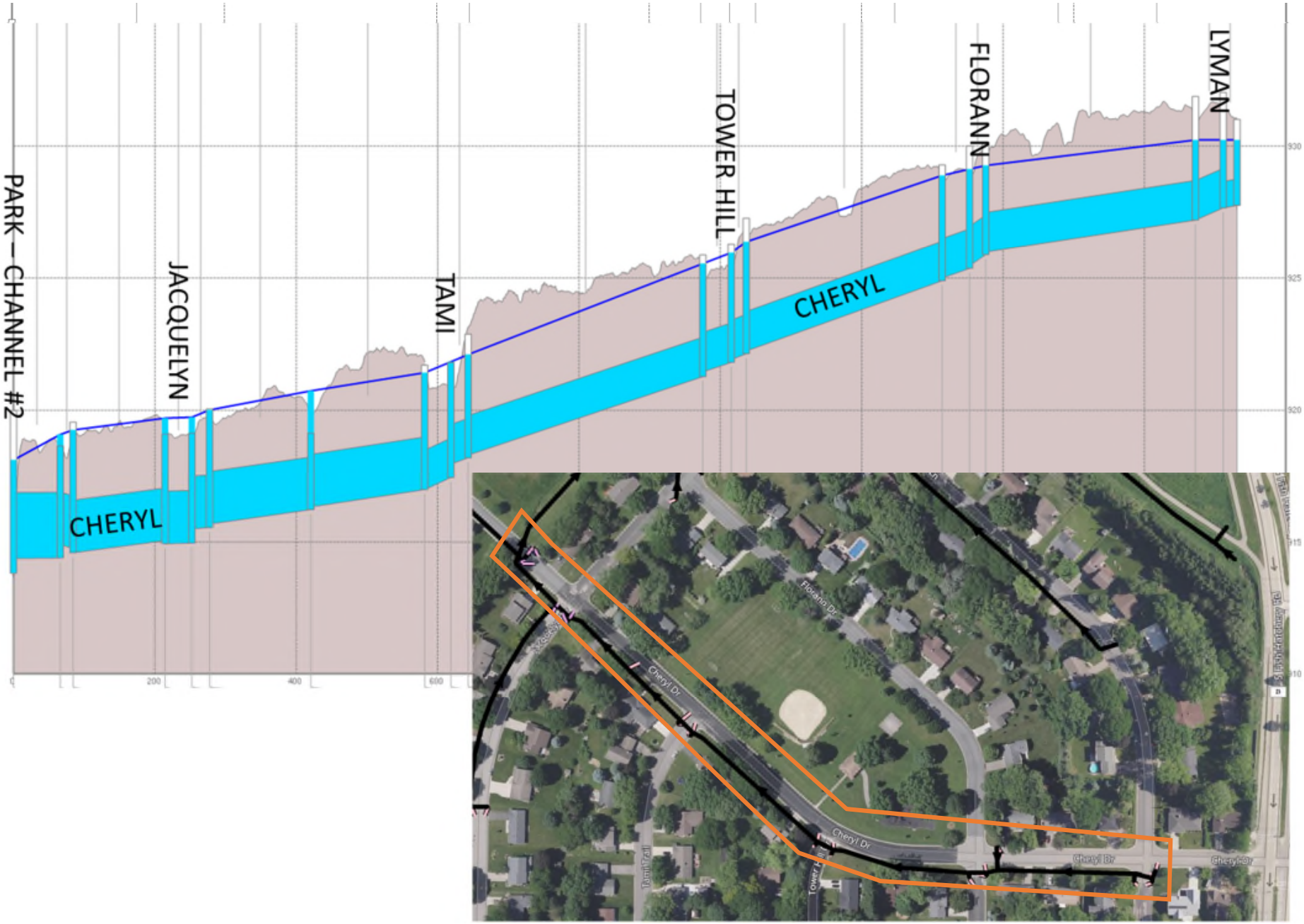
1. The sediment and vegetation in the swale is restricting drainage from the storm sewer and intersection.

2. The elliptical pipes at the intersection are nearly flat and undersized for relatively-common rain events. These restrict drainage here and uphill to the west.

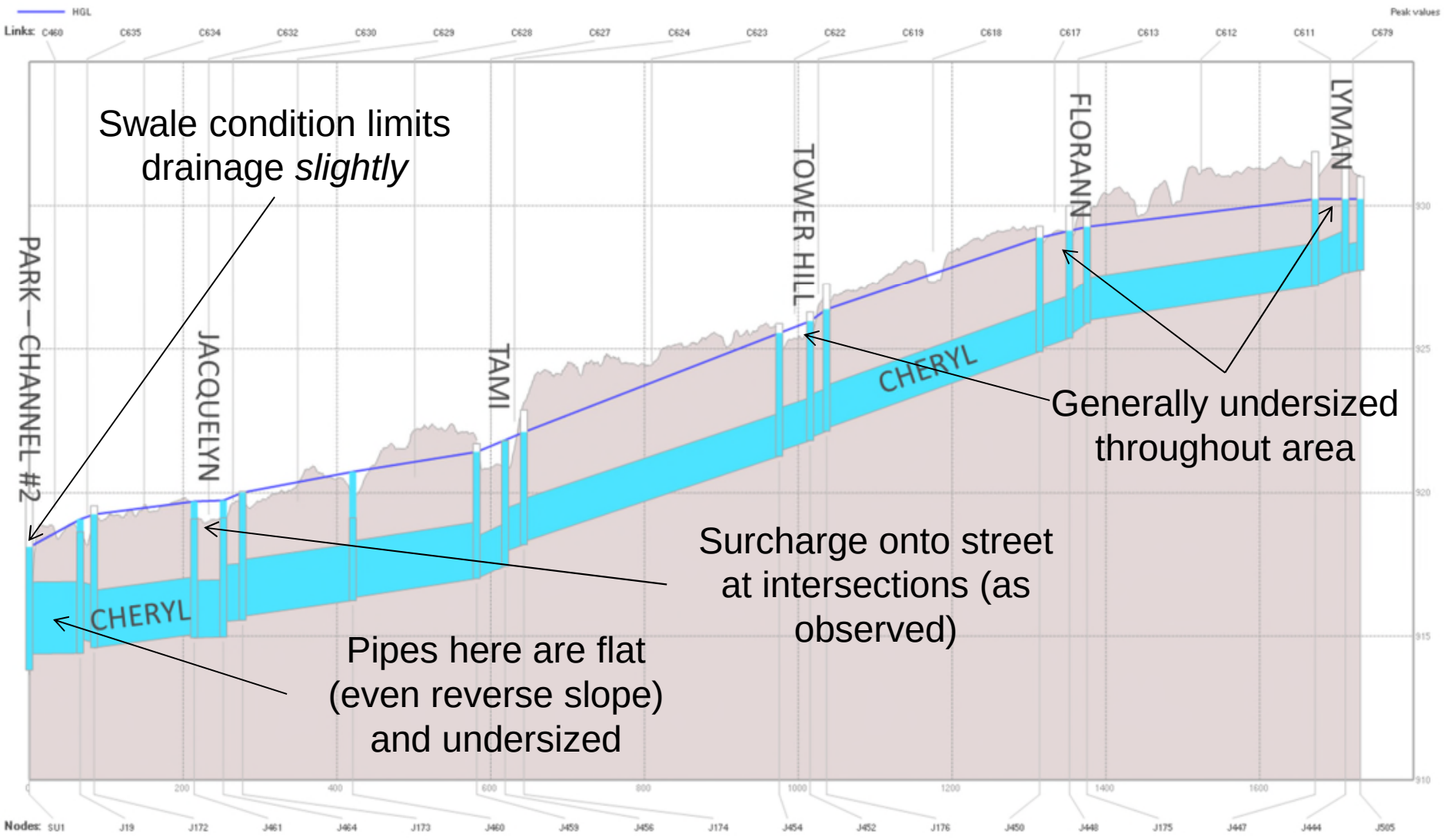
3. Smaller lateral pipes are also undersized, both at this intersection and at Pembroke-Cheryl-Richardson.

4. The connection between the southern inlet and the elliptical pipe is failing.

EASTERN AREA (CHERYL & CHARLESTON)



EASTERN AREA (CHERYL & JACQUELYN)



Modeling the 10-yr (and other) storms revealed factors contributing to street flooding near Cheryl and Jacquelyn.

PROBLEMS IDENTIFIED AT CHERYL-JACQUELYN

1. The sediment and vegetation in the swale is slightly restricting drainage from the storm sewer and intersection.

2. The bottommost pipes of the pipe network are nearly flat and undersized for relatively-common rain events. These restrict drainage in the street by the start of the swale and at the Cheryl-Jacquelyn intersection.

3. Flow from the lateral pipe on Jacquelyn surcharges onto street (no capacity along main storm sewer)

4. The entire run of pipe to the east is generally undersized but higher slope, seemingly limiting problems. Upsizing those pipes would make conditions at Jacquelyn worse.

ALTERNATIVE TESTING

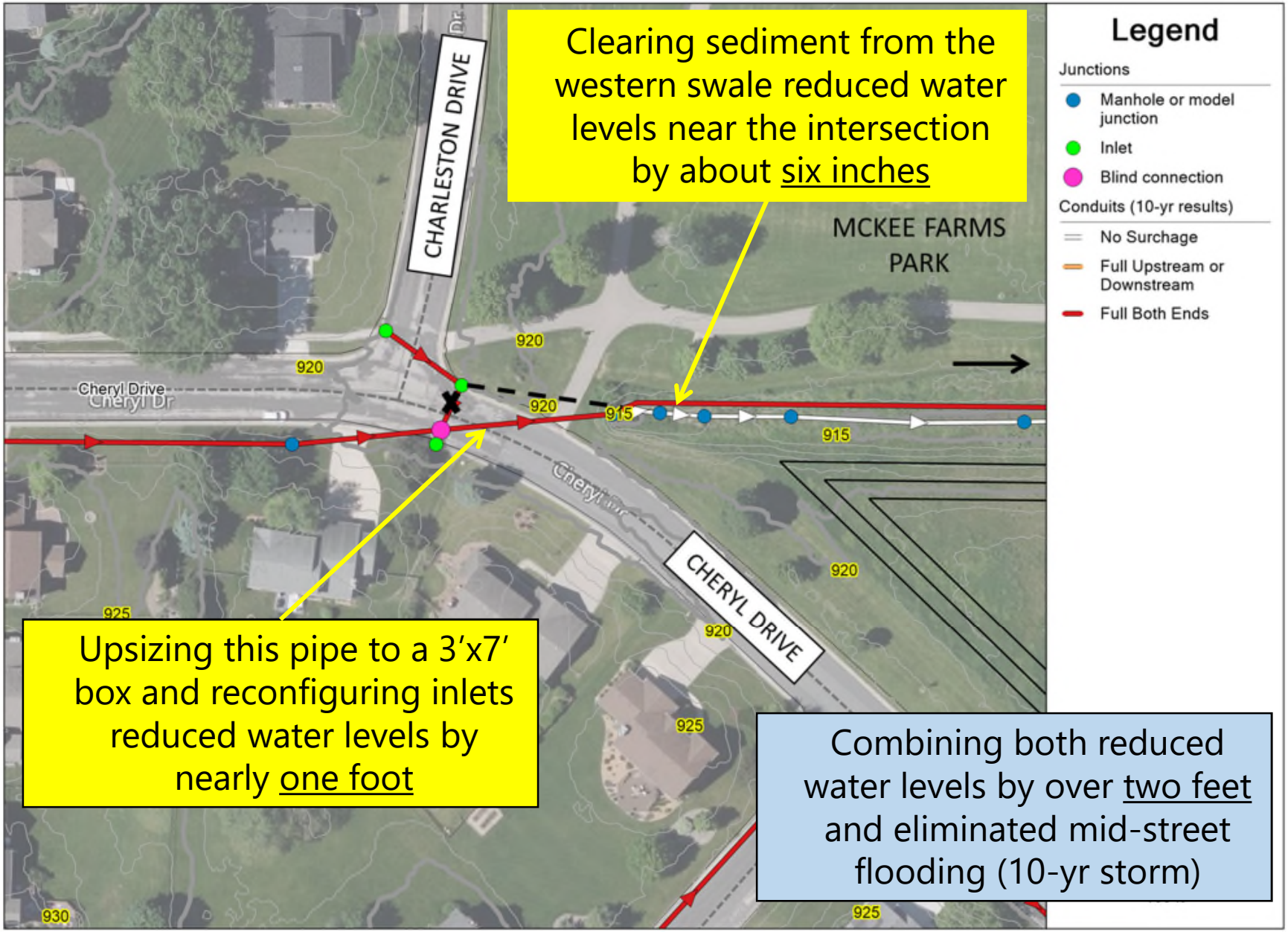
ALTERNATIVE TESTING

Based on the diagnostics, the following alternatives were tested:

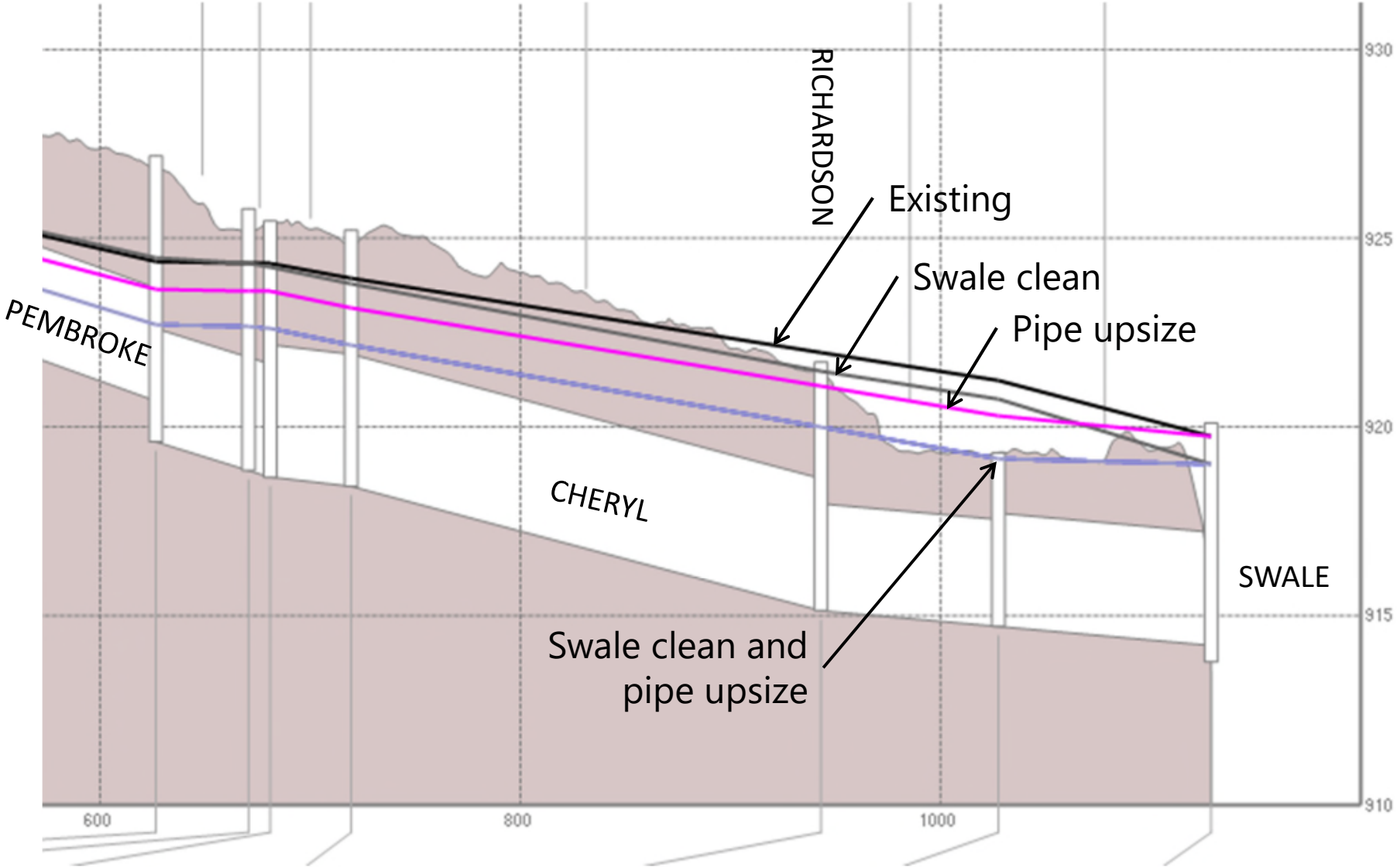
1. Cleaning sediment from the western swale
2. Cleaning sediment from both swales
3. Upsizing elliptical pipe(s) at Cheryl-Charleston
4. Upsizing pipes near Cheryl-Jacquelyn
5. Creating an offline storage area in the Park (the “triangle”)
6. Cleaning sediment and widening eastern swale
7. Changing levels in the downstream pond system

Changes were tested individually and in combination.

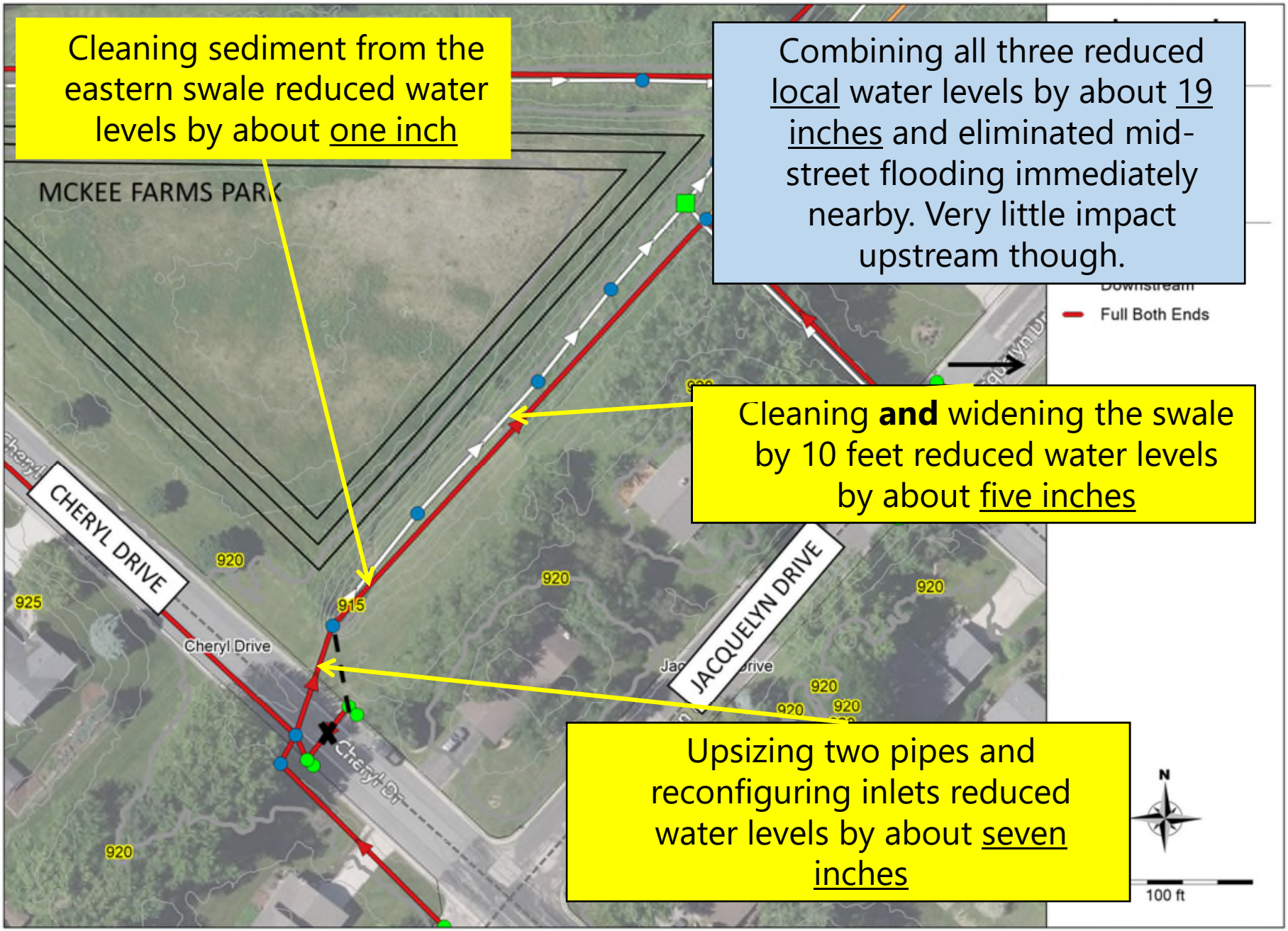
10-YR STORM RESULTS – WESTERN AREA



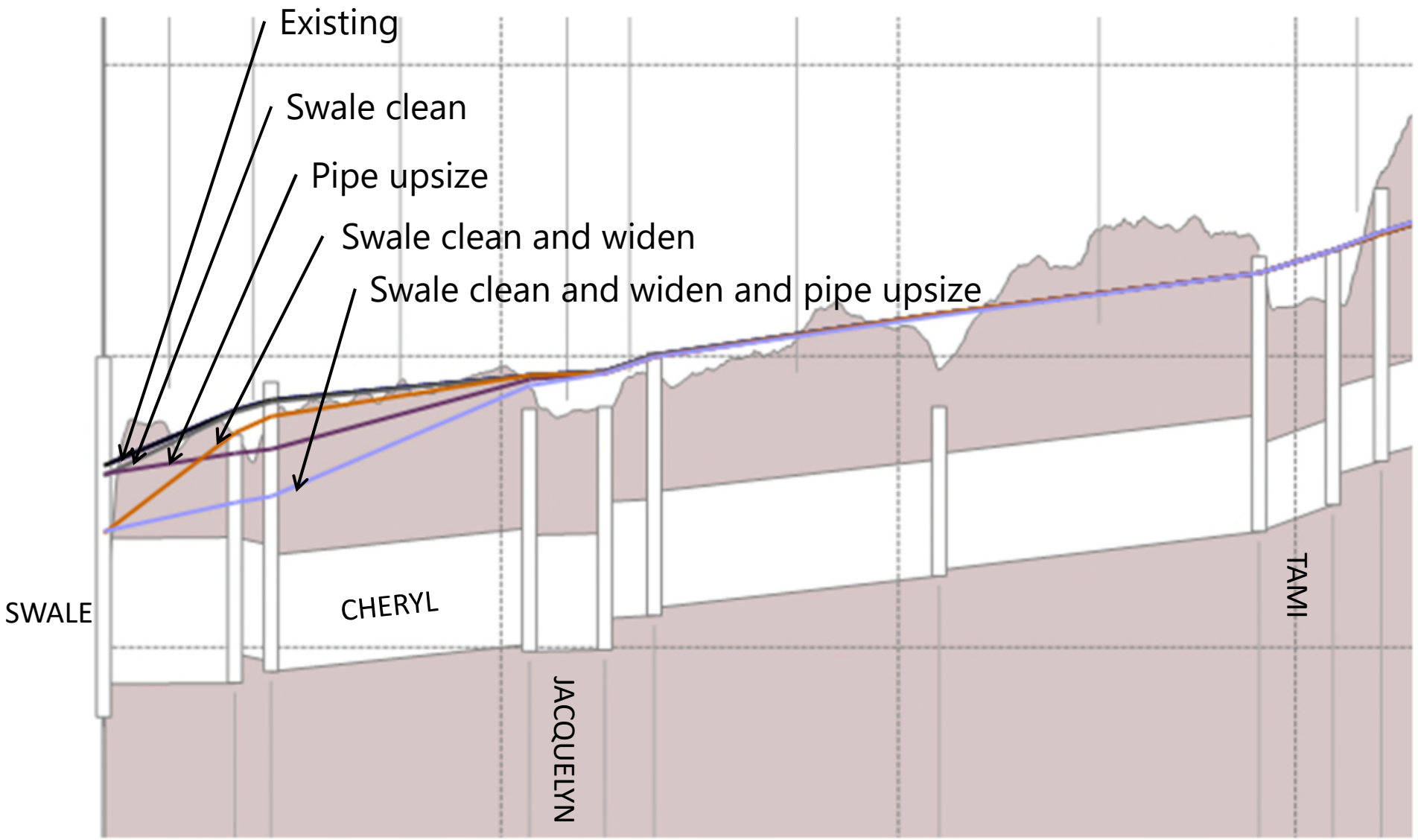
ALTERNATIVES COMPARISON – WESTERN AREA



10-YR STORM RESULTS – EASTERN AREA



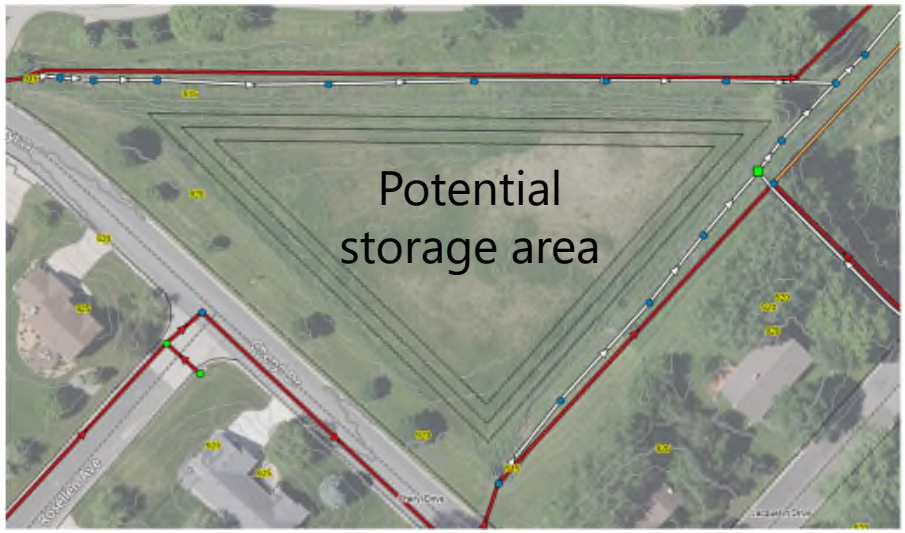
ALTERNATIVES COMPARISON – EASTERN AREA



OFFLINE STORAGE

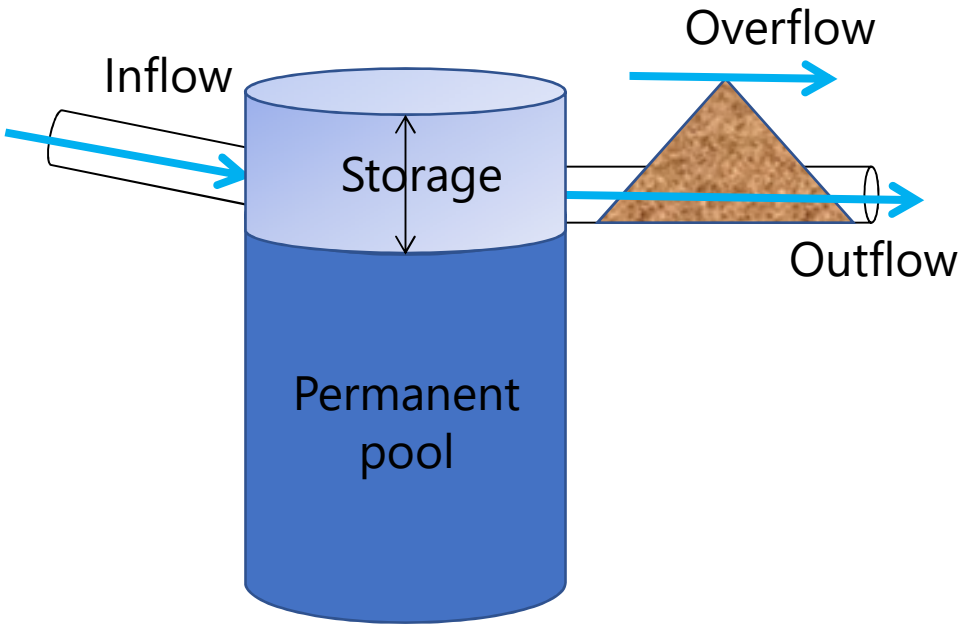
New offline storage in park

- Offline stormwater storage (dry or wet) could potentially be built in the park.
- Preliminary modeling showed that the benefits were relatively minor, especially compared to the very expensive cost to dig and haul away soils.
- Worth considering for future, especially as dual-purpose area.

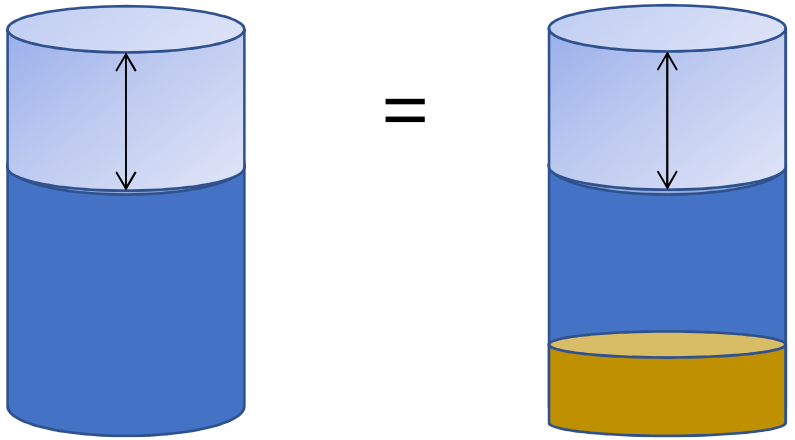


POND CONDITIONS

Would "dredging the ponds" help?



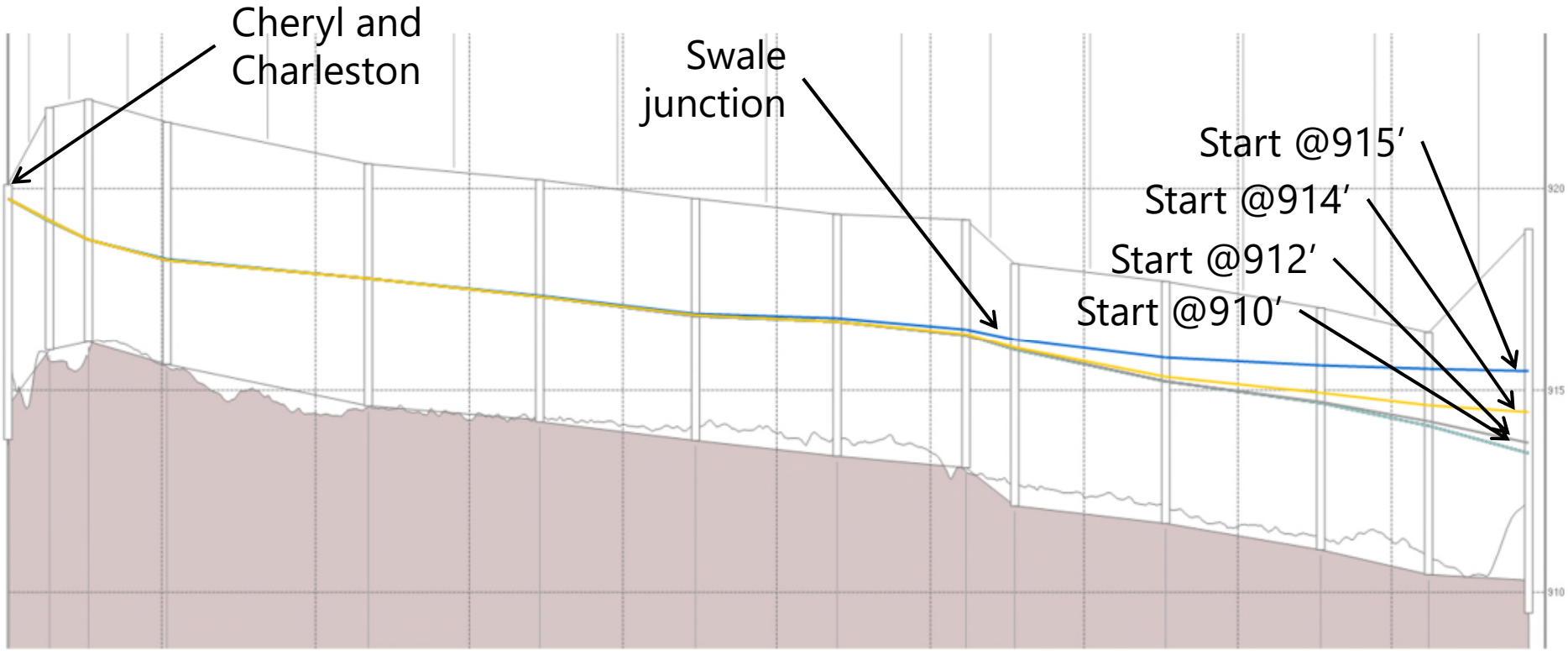
No – "live" storage is the same regardless of sediment in the water unless the sediment is higher than the outflow pipe (islands in the ponds)



POND CONDITIONS

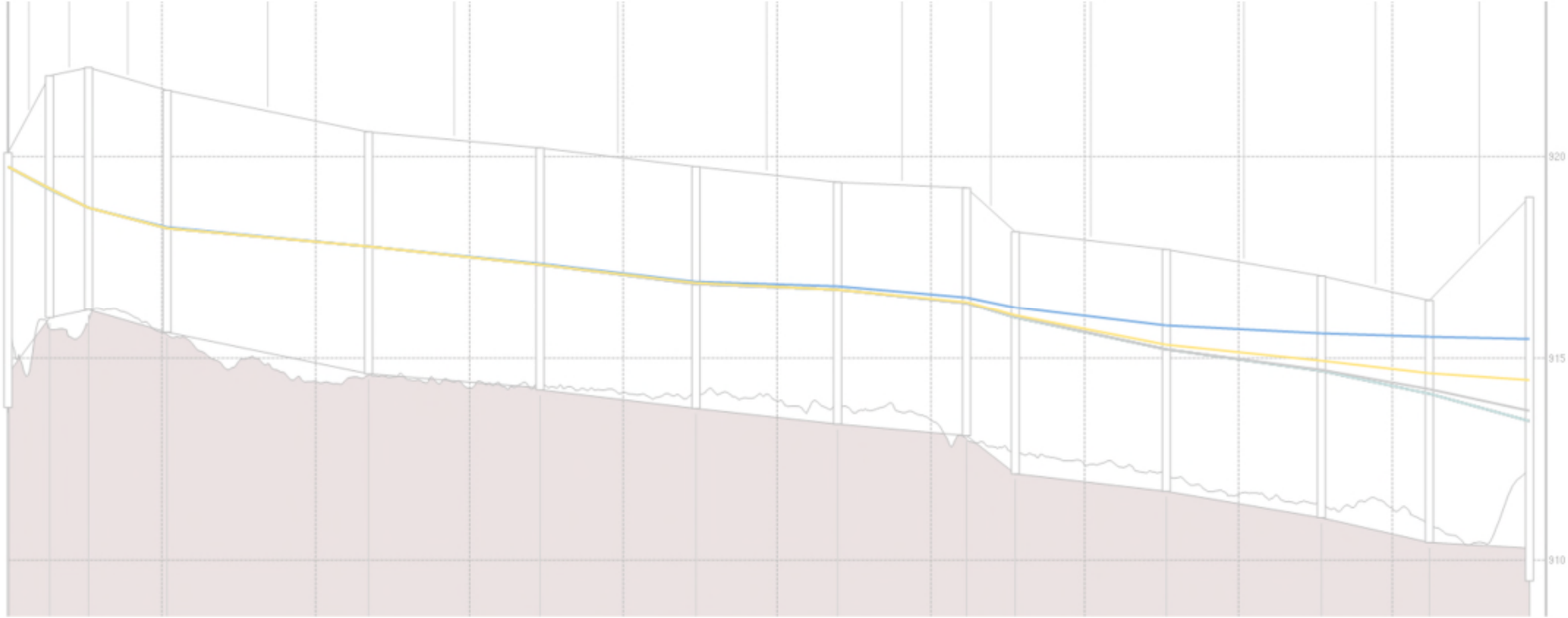
Would "lowering the ponds" help?

Adjusting the outlet pipes could set the permanent pool lower or make it drain faster during storms. Testing showed no impact upstream of the swale junction, and there would be negative water quality and downstream flooding impacts.



POND CONDITIONS

The same hydraulic results imply that it is unlikely that development east of Fish Hatchery or south of Lacy Rd (many of which have rate control ponds) are contributing to Cheryl Drive flooding. The McKee Farms Park ponds overflow to the north at 915’ elevation and there is a large area adjacent to the ponds where water can spread out rather than build up to restrict the swale.



COSTS AND RECOMMENDATIONS

ALTERNATIVE COSTS

A conceptual cost estimate was generated for each improvement based on typical construction activities, estimated quantities, and current unit costs for materials and labor.

Alternative	Cost including design, permitting, construction, and 10% contingency
Cleaning sediment from both swales	$50,000
Cleaning both swales and widening eastern swale	$75,000
Storm sewer work at Charleston	$140,000
Storm sewer work at Jacquelyn	$95,000
Offline storage	$300,000

The swale modifications are relatively inexpensive. The storm sewer upgrades are more costly, and the offline storage area is much more expensive due to excavation and haul-off costs.

RECOMMENDATIONS

The following draft recommendations were provided for the City's review:

1. As soon as feasible:

- Swale work (~$75,000)
  - *Remove the excess sediment in both swales to return them to their original profile (~$50,000)*
  - *Recommend widening the eastern channel by 10 ft during sediment removal (~$25,000)*
  - *Revegetate with low-grow native vegetation, and regularly monitor swale sediment and remove as needed*
- Storm sewer video inspection (~$7,500)

  Recommend video inspection of entire length of storm sewer along Cheryl Drive to detect other problems if present, and to inform proposed improvements

RECOMMENDATIONS

The following draft recommendations were provided for the City's review:

2. Near-term:

- Cheryl-Charleston Storm Sewer Upgrades (~$140,000)
  - *Replace the failing pre-formed cross and elliptical pipe with a 3' x 7' box*
  - *Reconfigure and increase inlet capacity*
- Cheryl-Jacquelyn Storm Sewer Upgrades (~$95,000)
  - *Potentially complete storm sewer upsizing near top of eastern swale. May be less urgent because inlet connections are not currently failing (unless video inspection proves otherwise), especially assuming that the swale is dredged and widened.*
  - *No easy fix, and apparently less complete intersection flooding.*

RECOMMENDATIONS

The following draft recommendations were provided for the City's review:

3. Long-term:

- Re-evaluate entire storm sewer system along Cheryl Drive when street resurfacing is pending. If possible, any further upsizing of pipes should be accompanied by increased storage, or the problem may just get worse in the low areas.

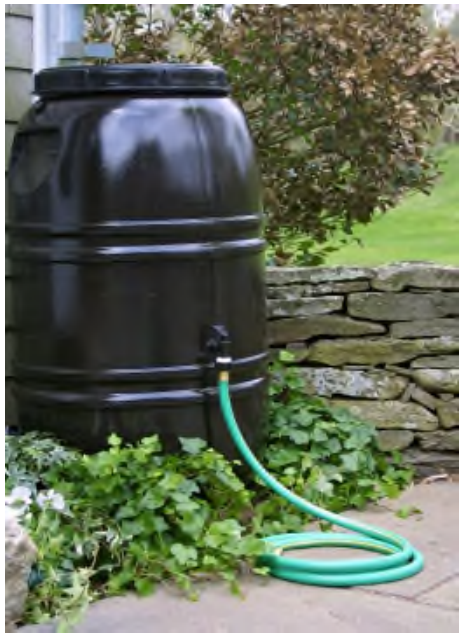
- Potentially construct the offline storage area in McKee Farms Park, especially if the upstream storm sewer network is upsized further. Seek out mutual uses of land (playfield, etc.) to have shared benefits with park use.

- Consider implementing green infrastructure as opportunities are available. This watershed has a large amount of impervious coverage for the population density due to road and driveway widths. There may be opportunities to intercept and infiltrate more water in the upper watershed areas.

RECOMMENDATIONS

Additionally, the City should continue to promote upstream watershed practices including:

- Rain barrels
- Soil quality restoration
- Rain gardens
- Downspouts routed to pervious areas when possible



NEXT STEPS

NEXT STEPS

- Finalize Cheryl Drive Stormwater Study Report
- Work with DNR to determine permitting requirements for proposed solutions
- Proposed Schedule
  - 2021 – Cut willow stands within swales, and clear out sediment buildup immediately around culverts
  - 2022 – Storm sewer televising, engineering/permitting effort for swale grading (sediment buildup removal)
  - 2023 – Conduct swale grading project
  - Future – Storm sewer upgrades

NEXT STEPS

- Presentation to Common Council regarding Task 2 (Potential Backyard Assistance Program)
- Letter to residents with additional information regarding the Florann Drive and Lyman Lane project

PROJECT RESOURCES

- The following webpage will be used to post recordings of meetings, as well as final reports:
  - http://www.fitchburgwi.gov/2704/Cheryl-Drive-Stormwater-Project
- Please sign up for the "Cheryl Drive Stormwater Project" notification list to receive updates regarding this project:
  - http://www.fitchburgwi.gov/list.aspx

QUESTIONS?

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