Village of Lincolnshire

May 26, 2020

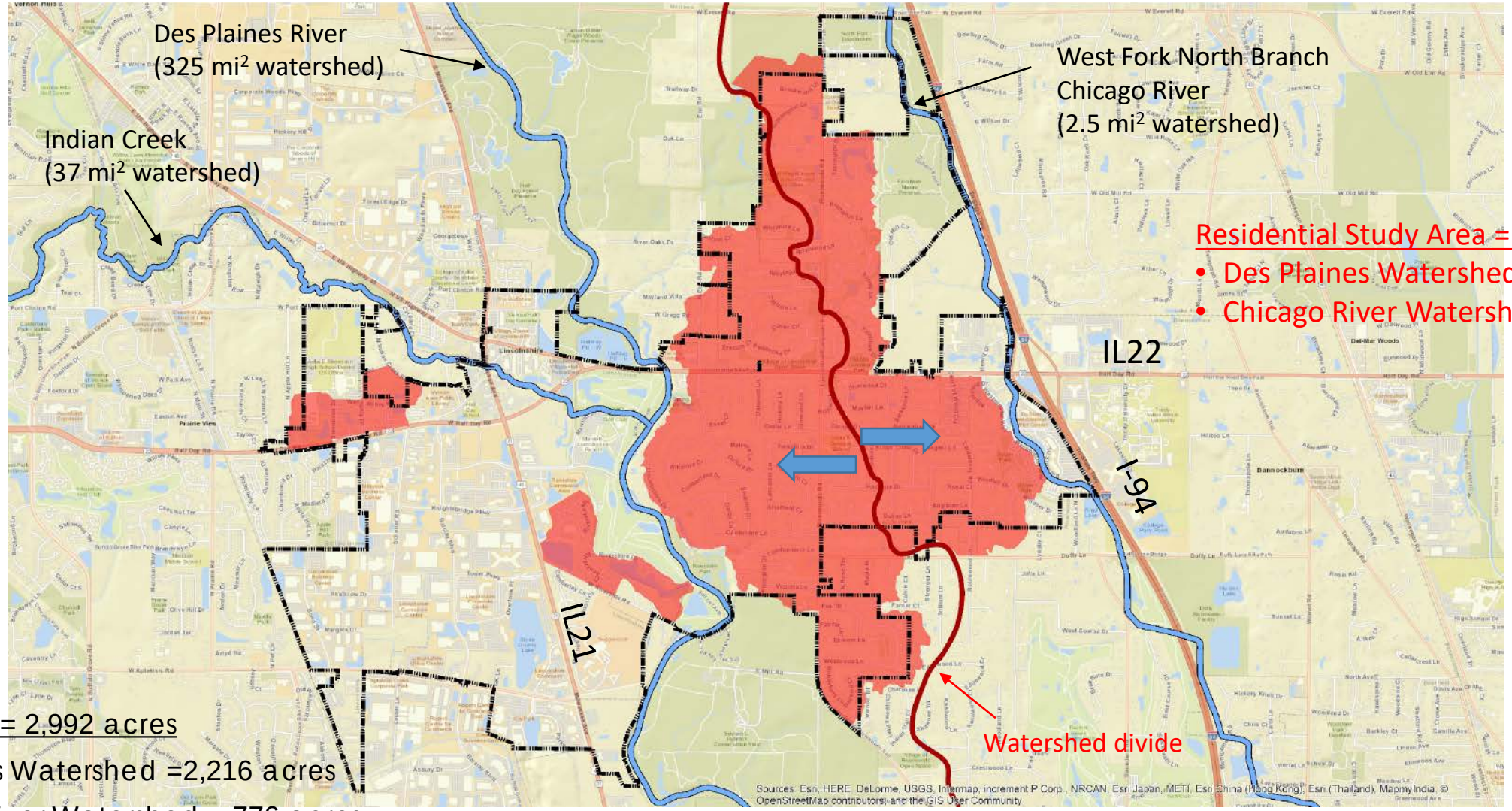
Village-wide Stormwater Study
Presentation of Results

Outline of Presentation

- Scope of Village-Wide Stormwater Study
- Data Collection and Engineering Analysis
- Review Causes of Flooding
- Preview of Potential Drainage Improvements
  - Village Capital Improvements
  - Existing Detention Basins
  - Yard Drainage Problems
- Summary and Next Steps

Scope of Village-Wide Stormwater Study

Scope of Village-Wide Drainage Study



Residential Study Area = 1,510 acres

- Des Plaines Watershed = 952 Acres
- Chicago River Watershed = 558 acres

Village Area = 2,992 acres

- Des Plaines Watershed =2,216 acres
- Chicago River Watershed = 776 acres

Data Collection and Engineering Analysis

Data Collection and Engineering Analysis

- Data Collection
  - Flood Questionnaires
    - Online for 42 days
    - 130 survey responses
  - July 30 2019 Open House
    - 60 attendees
  - Total of 250 responses
  - Previous Village studies
    - Lincolnshire Drive Berm
    - Lincolnshire Creek Study
    - Queen's Way Study
  - Lake County SMC Drainage Information
  - Village Storm Sewer Atlases, Survey and Field Inspections

Data Collection and Engineering Analysis

- Reconnaissance during September 2019 and May 2020 flood events

September 14, 2019 Flooding at IL22

Wiltshire Drive Flooding May 2020

September 14, 2019 High Water Mark

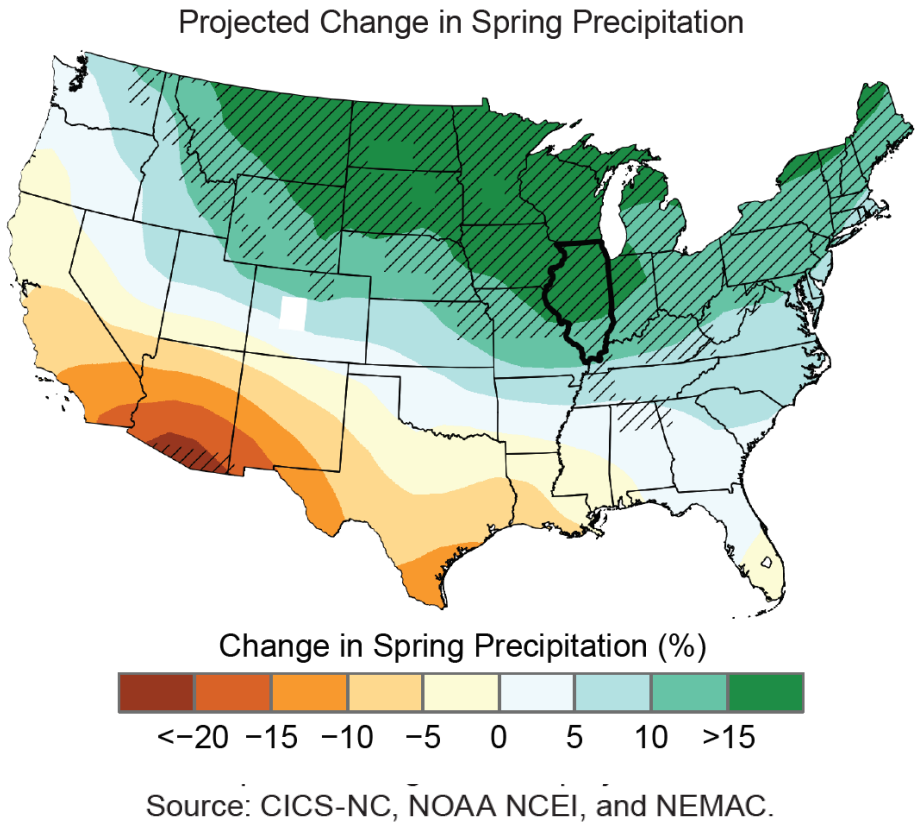
Data Collection and Engineering Analysis

- Aggregate Data in GIS Database
- Develop Study Areas
  - Based on hydrology and storm sewer network
  - Total of 11 study areas
- Analyze existing stormwater system using hydrologic and hydraulic models
  - XP-SWMM model based on USEPA
  - New Illinois State Water Survey rainfall data
  - Identify areas subject to flooding
  - Determine existing level of service & cause of flooding
  - Model calibrated to September 2019 storm event High Water Marks

Causes of Flooding

Causes of Flooding

- Increased Rainfall
- Average May Rainfall = 3.7 Inches
  - May 2018: 7.81 Inches
  - May 2019: 7.49 Inches
  - May 2020: 8.14 inches
- May 10-18, 2020
  - Lake County average = 5.6 in
  - Lincolnshire rainfall*
    - May 17th = 1.05 in. over 1 hour
    - May 23rd = 1.22 in. over 2 hours
  - Des Plaines River
    - 15.73 ft crest (645.7 ft NAVD)
    - >10-year event



*with saturated ground conditions, runoff similar to a 10-year storm event

Causes of Flooding – South of IL22

- The History and Development of Lincolnshire

- Prior to Modern Stormwater Practices
  - Storm sewer capacity < 2-year (based on XP-SWMM model analysis)
  - Limited “safe” overland flow paths
  - Limited stormwater storage
  - No Floodplain regulations
- No Mass Grading
- Tree Preservation

1946: Pre-Development

1961: Development in Progress

Causes of Flooding

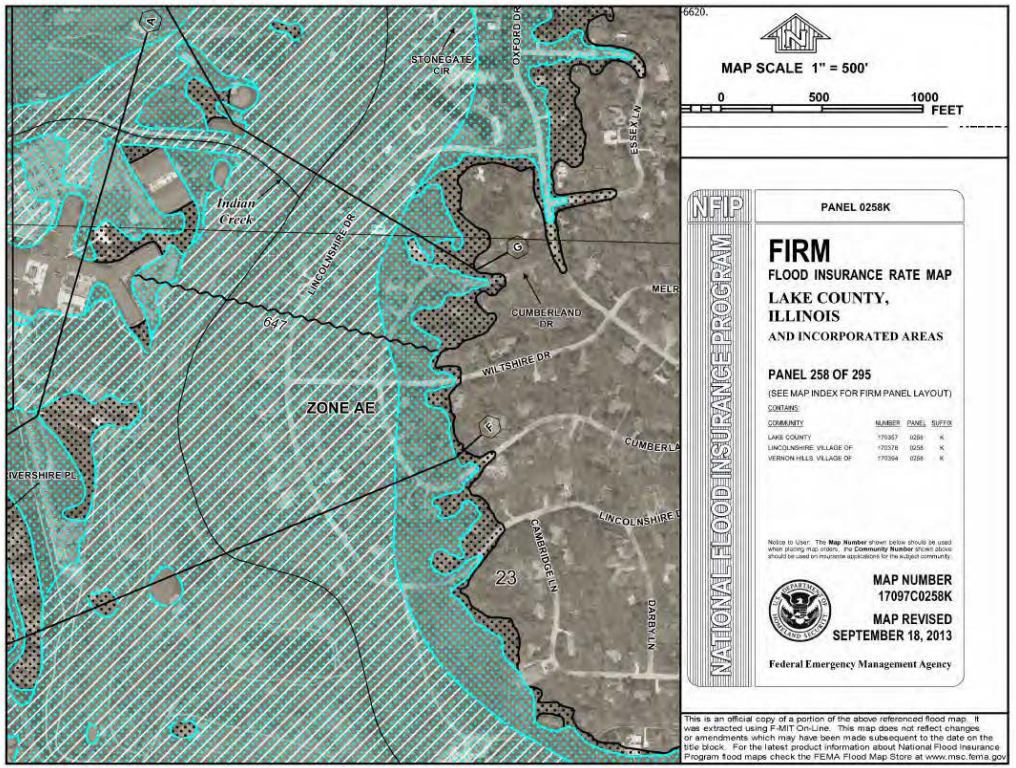
- Typical Subdivision Development
  - Large Detention Basins
  - Engineered Green Infrastructure
  - Heavily storm sewers
  - Dedicated open space maintenance
  - Engineered lot drainage
  - Less overgrowth and accumulation of debris
- Lincolnshire Development
  - Prior to modern stormwater practices
  - Large wooded lots
  - Open ditches within drainage system

Causes of Flooding – Lincolnshire Drive & Cumberland Drive

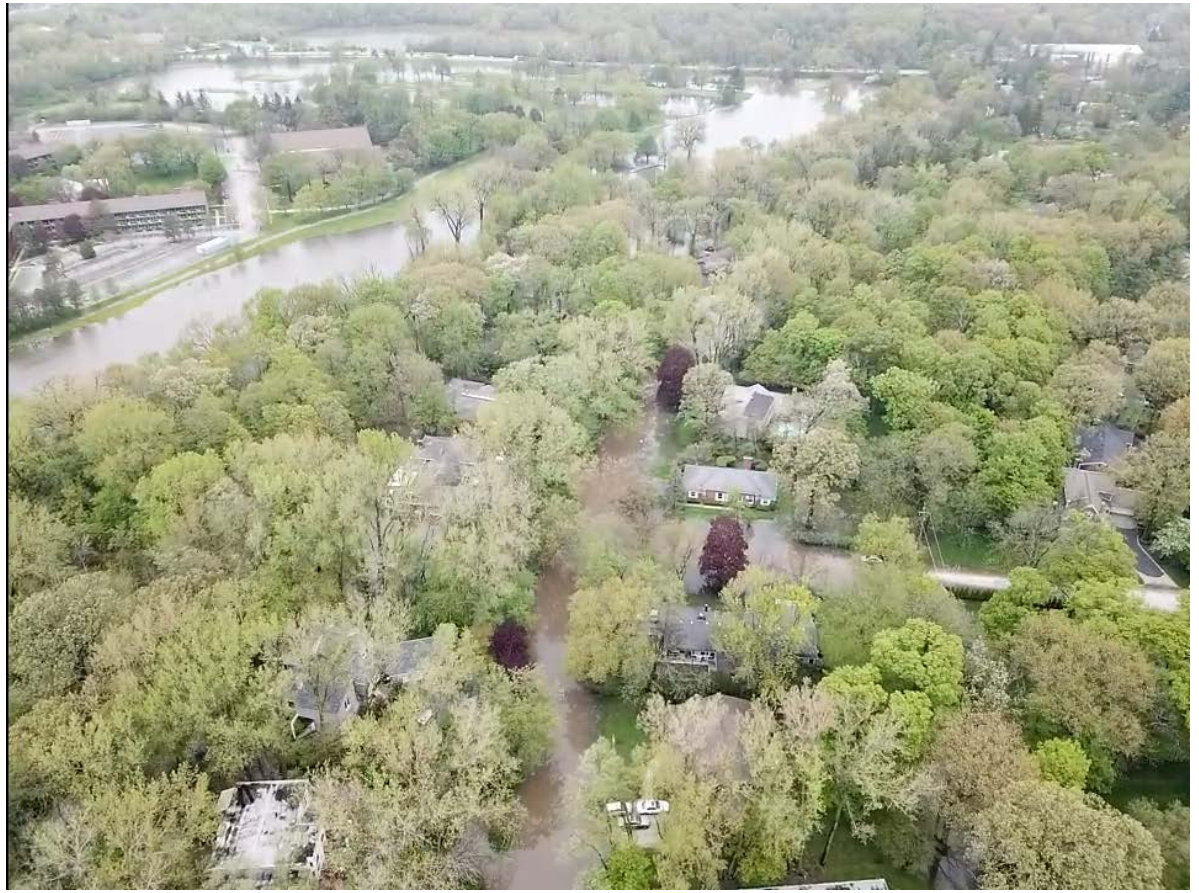
Des Plaines River Drainage Area = 325 mi^2 at Lincolnshire

≈125 mi^2 in Wisconsin

≈200 mi^2 in Illinois

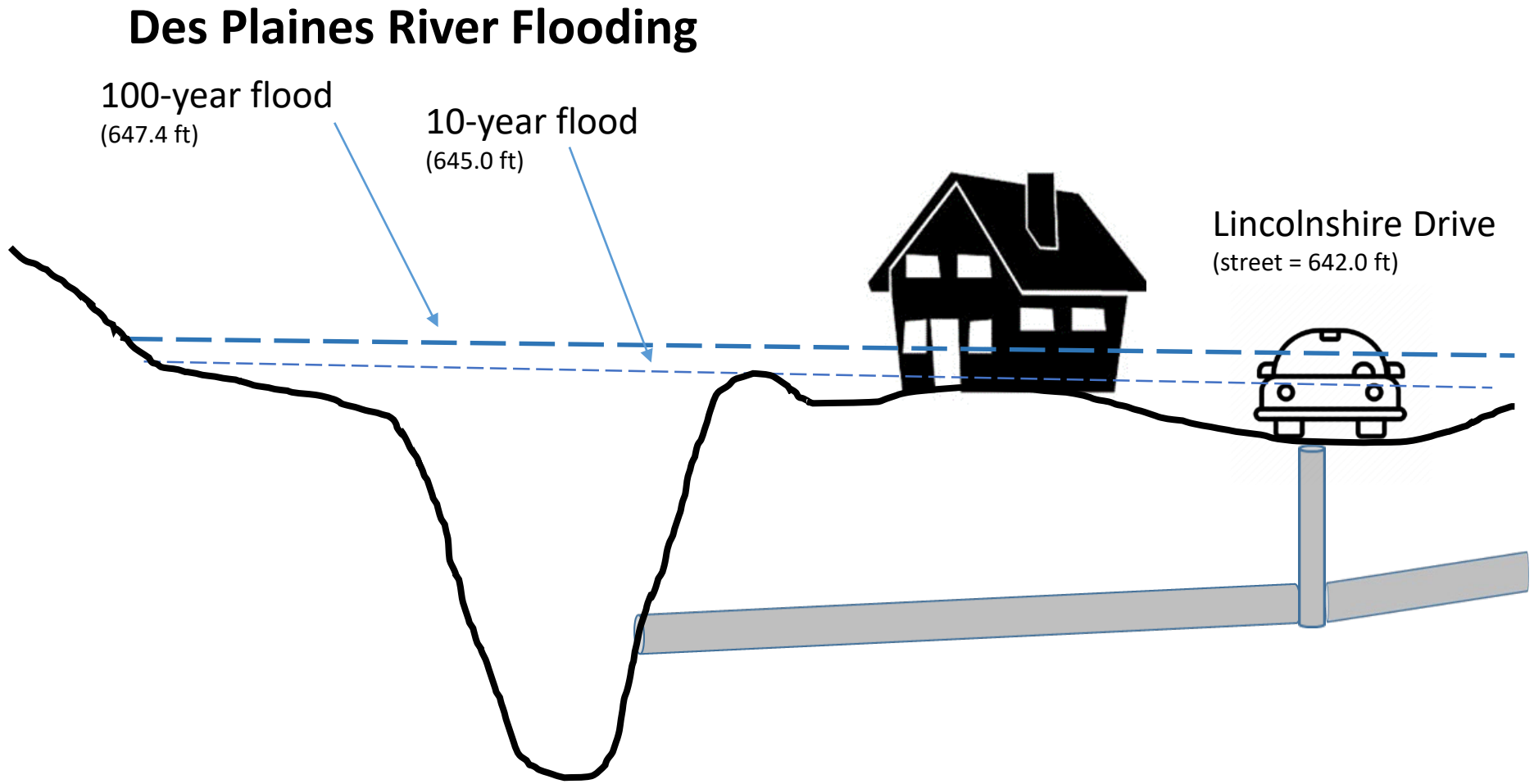


Des Plaines River Floodplain and Floodway



May 18 2020 Aerial Photo of Lincolnshire Drive and Marriott

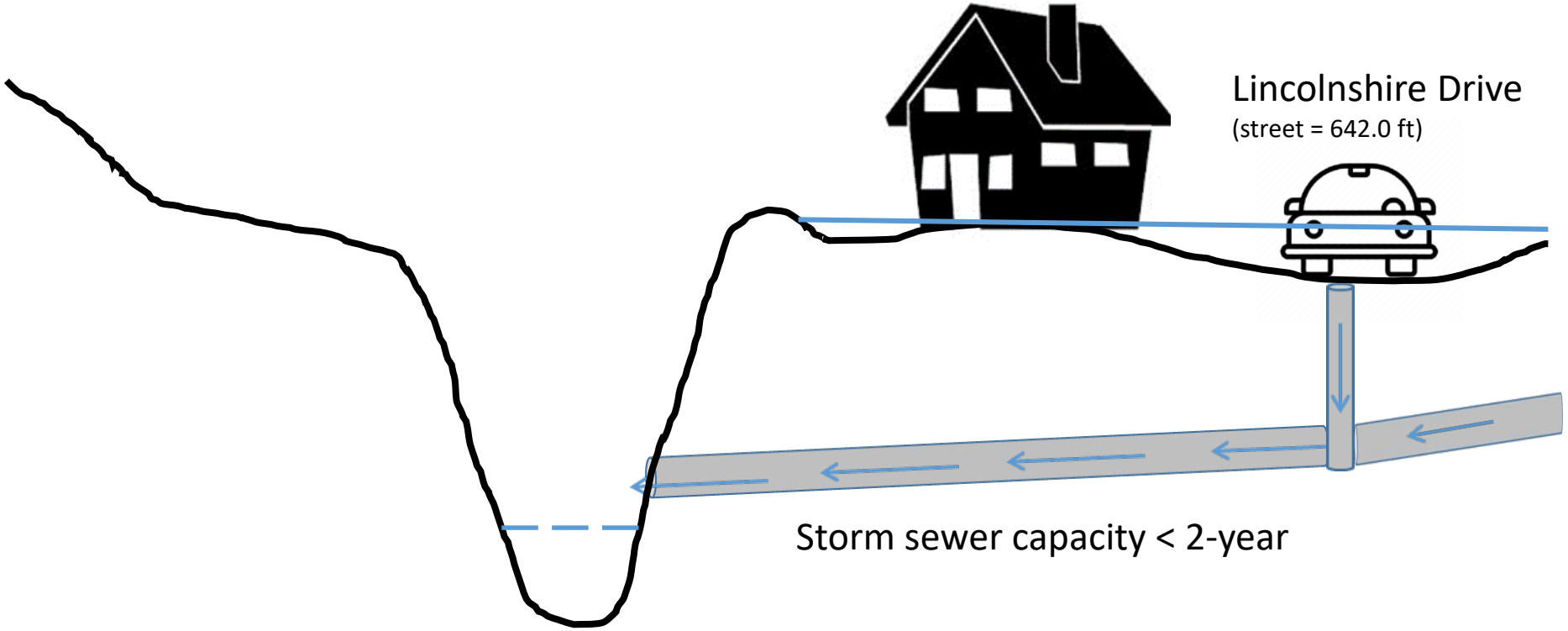
Causes of Flooding – Lincolnshire Drive & Cumberland Drive



Exaggerated Cross-Section of Des Plaines River and Lincolnshire Drive

Causes of Flooding – Lincolnshire Drive & Cumberland Drive

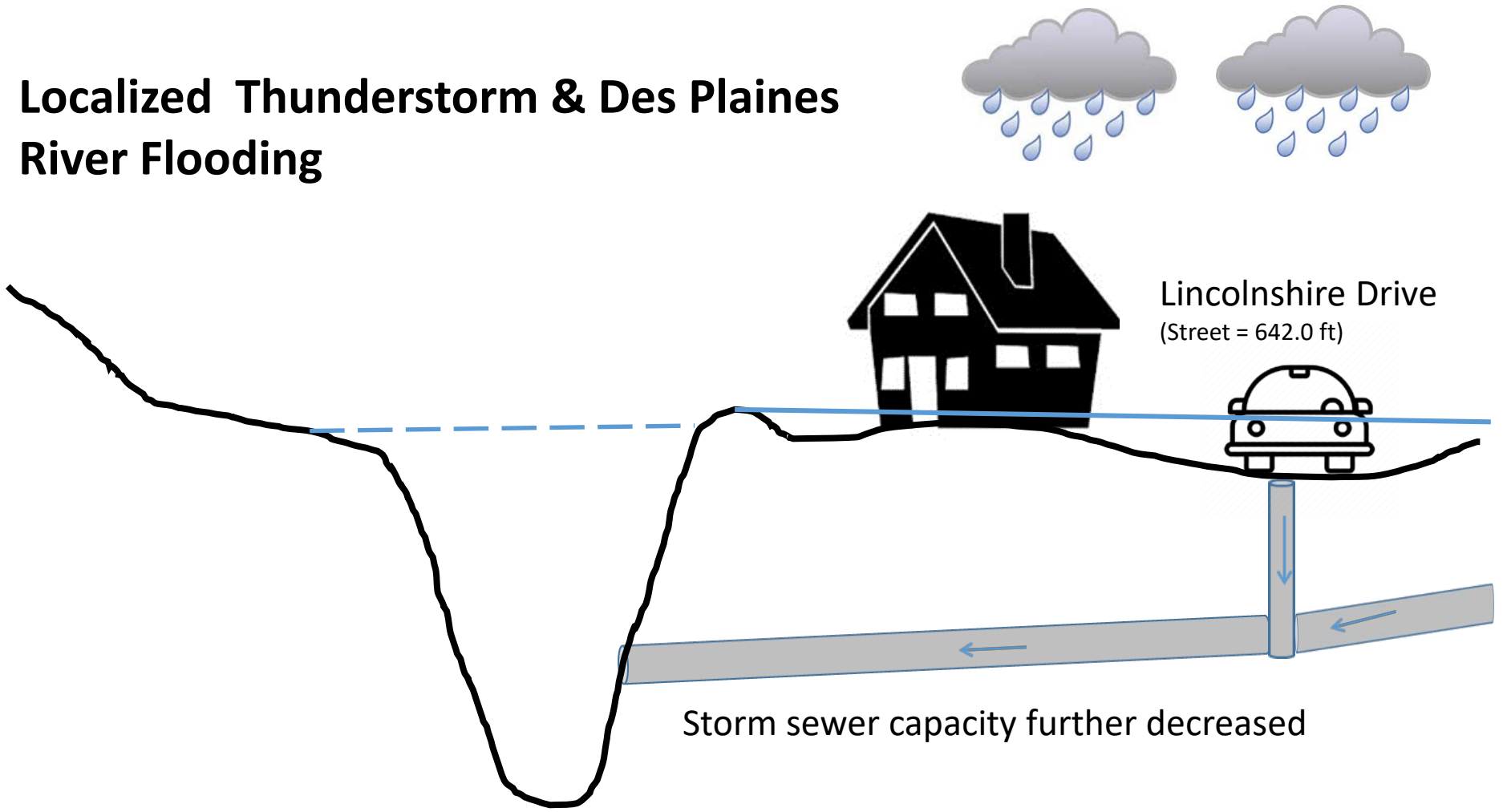
Localized Thunderstorm



Exaggerated Cross-Section of Des Plaines River and Lincolnshire Drive

Causes of Flooding – Lincolnshire Drive & Cumberland Drive

Localized Thunderstorm & Des Plaines River Flooding



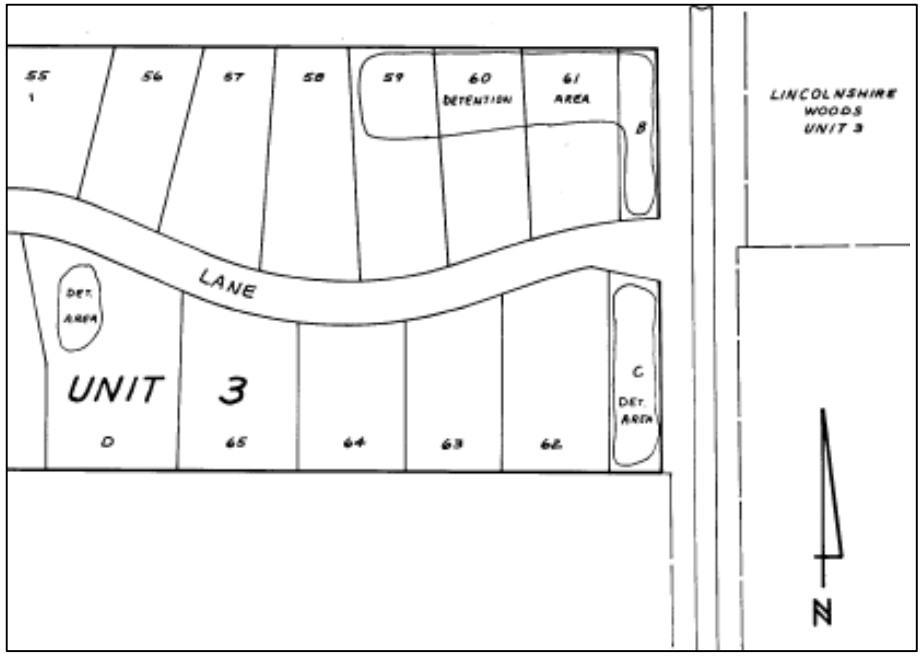
Exaggerated Cross-Section of Des Plaines River and Lincolnshire Drive

Causes of Flooding – Private Yard Drainage

- Dense vegetation and large lots
- Lots designed to follow natural topography
- Lot grades change over time
  - Accumulated debris
  - Landscaping
- Toolbox for residents
  - Green Infrastructure
  - Flood protection
  - Nuisance drainage

Causes of Flooding – Existing Detention Basins

- Nearly 130 detention basins within Village
- Many designed prior to modern stormwater practices
- Complaints include standing water, overflow, etc.
- Detention basin ownership not clearly defined
- Maintenance history and responsibility uncertain



Typical Subdivision Plat prior to modern stormwater management practices

Review of Potential Drainage Improvements

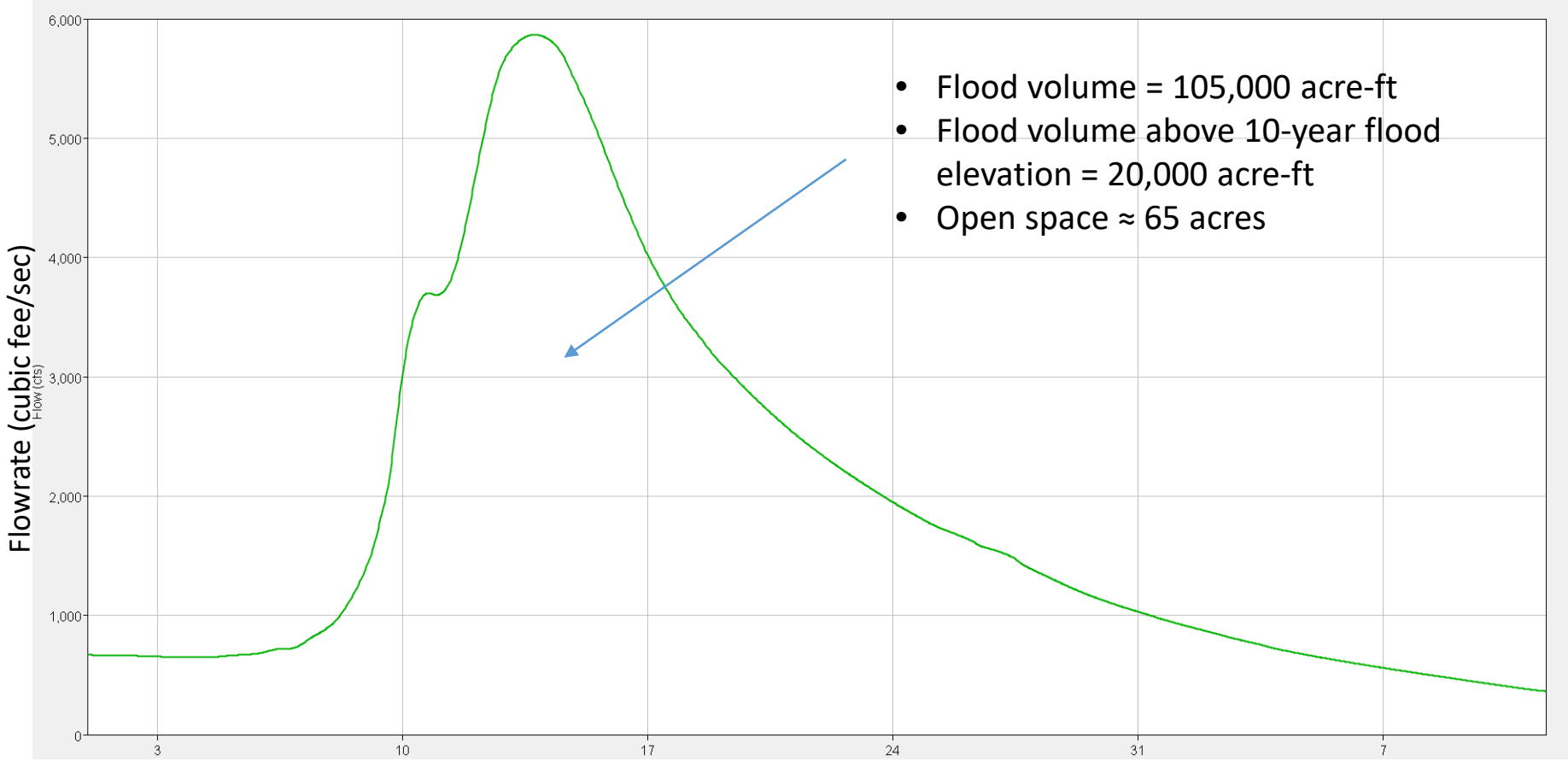
Potential Drainage Improvements

- Capital Improvement Projects
  - Locations generally south of IL22
    - Lincolnshire Drive South
    - Lincolnshire Drive North
    - Lincolnshire Creek – Coventry Lane
    - Southeast – Windsor Drive
    - Surrey Lane East of Riverwoods Rd
  - Proposed storm sewers in roadways
    - Increase to 10-year storm sewer capacity
    - Roads will store and convey water in larger events
  - Designed to accept drainage from private property
- Existing Detention Basin Retrofits
- Private Property Drainage Improvements
- Other Improvements
  - Green Infrastructure
  - Residential Structure Improvements

Capital Improvements – Lincolnshire Drive

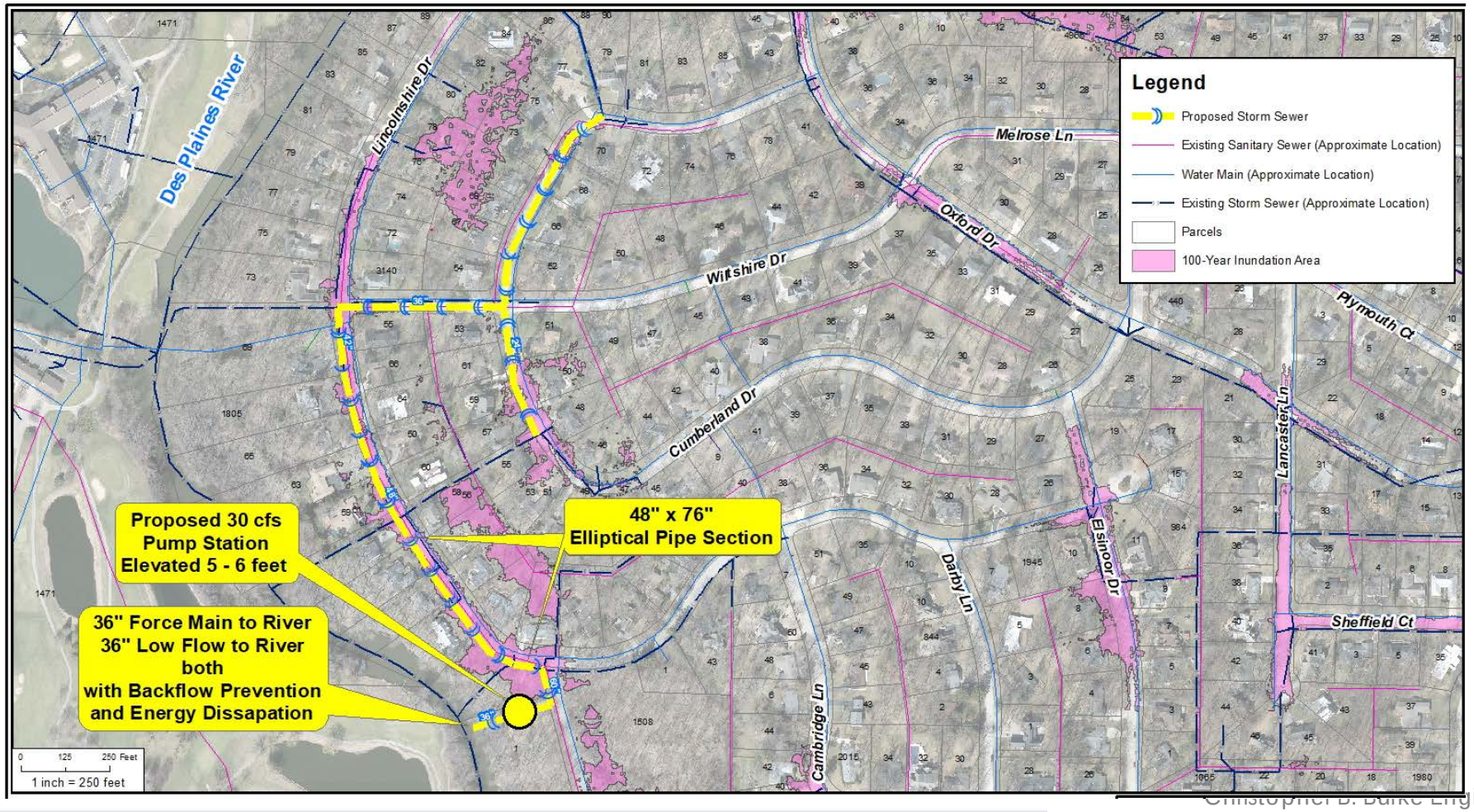
Solving Des Plaines River Flooding is beyond scope of this study

100-year Des Plaines River Flood hydrograph entering Village of Lincolnshire



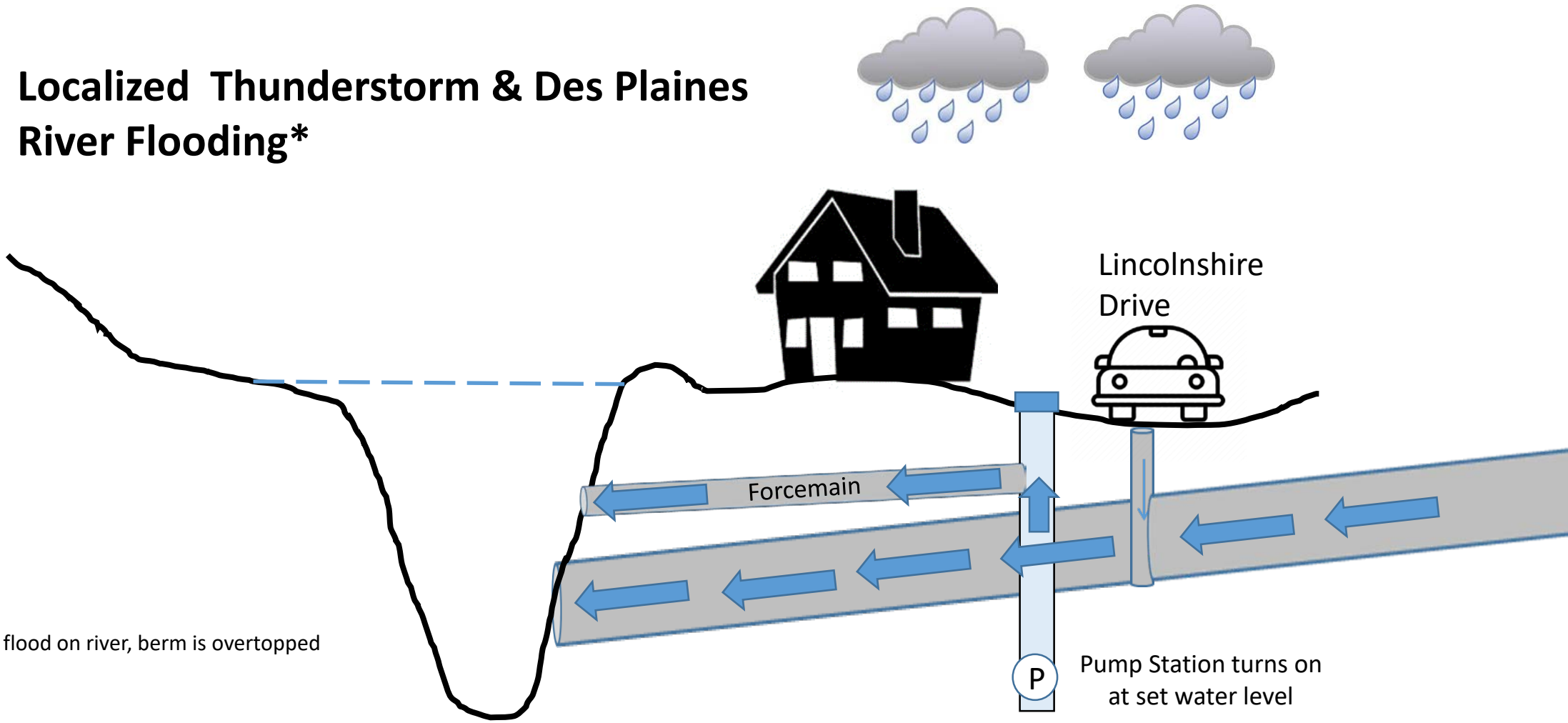
Capital Improvements – Lincolnshire Drive South

- Proposed 10-year level of service (similar to new subdivision standards)
- Engineer's Estimate of Probable Cost = $7.6M
- Pump station with single river discharge location
- Will function under river conditions up to ≈ 10-year flood elevation
- Large diameter Elliptical storm sewers
- Pump capacity = 30 cfs
- Current PW pumps = 6-7 cfs
- Properties benefitted = 83



Proposed Drainage Improvement - Lincolnshire Drive & Cumberland Drive

Localized Thunderstorm & Des Plaines River Flooding*

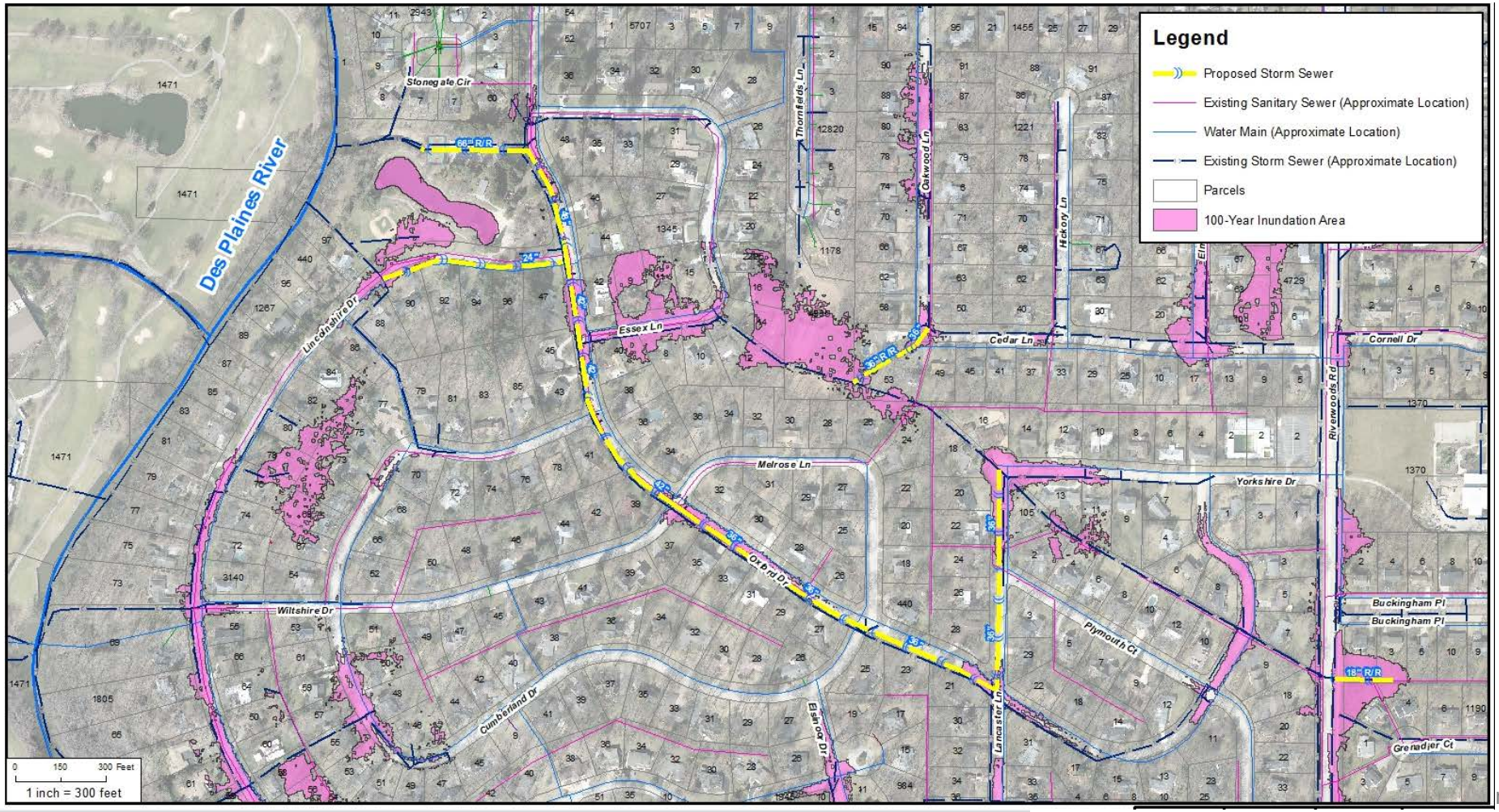


* Near 10-year flood on river, berm is overtopped

Exaggerated Cross-Section of Des Plaines River and Lincolnshire Drive

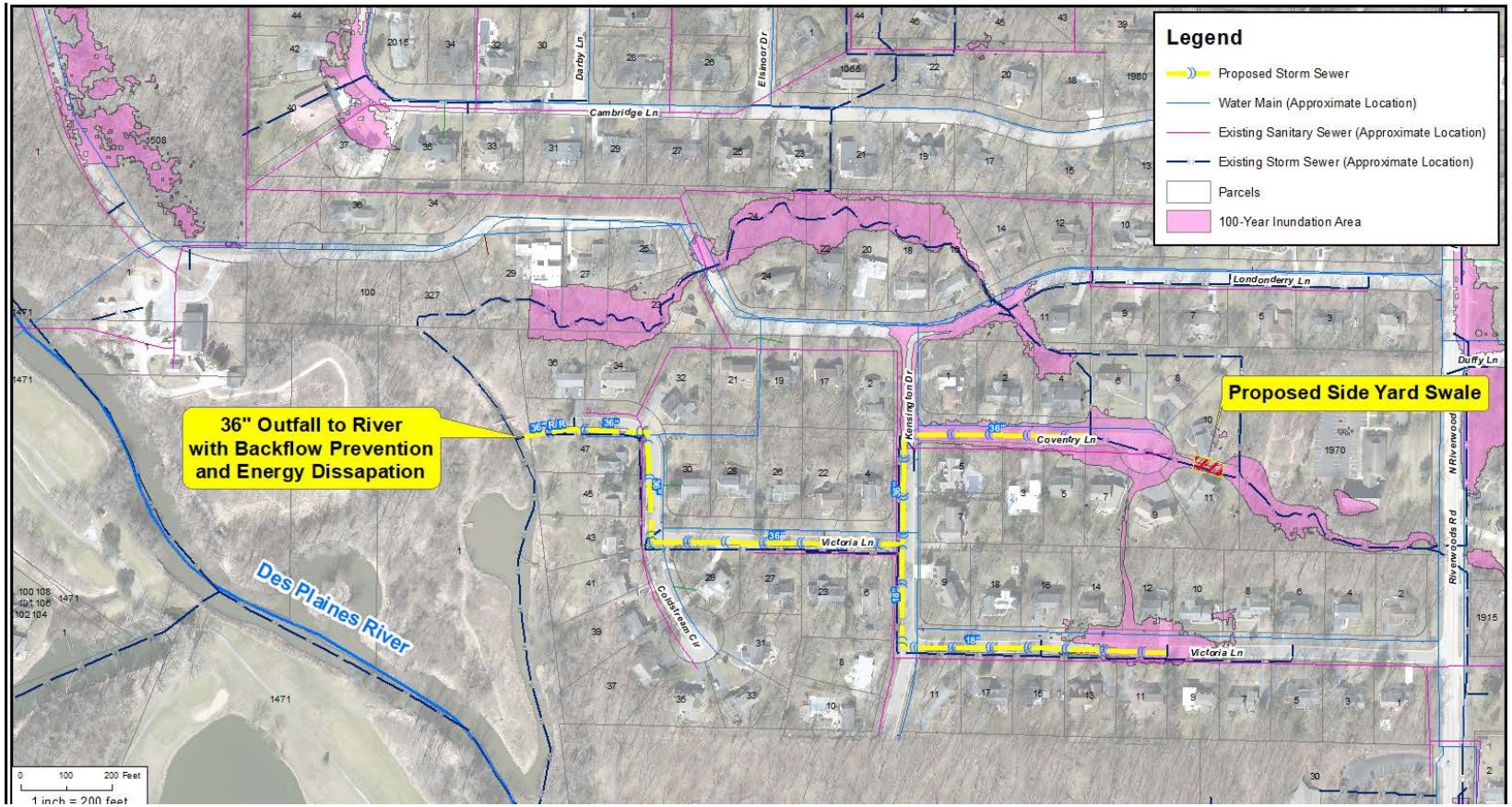
Capital Improvements – Lincolnshire Drive North

- 10-year level of service
- Large diameter storm sewers (66-inch diameter)
- Will function under river conditions up to 10-year flood elevation
- Engineer's Estimate of Probable Cost = $4.3M
- Properties benefitted = 111



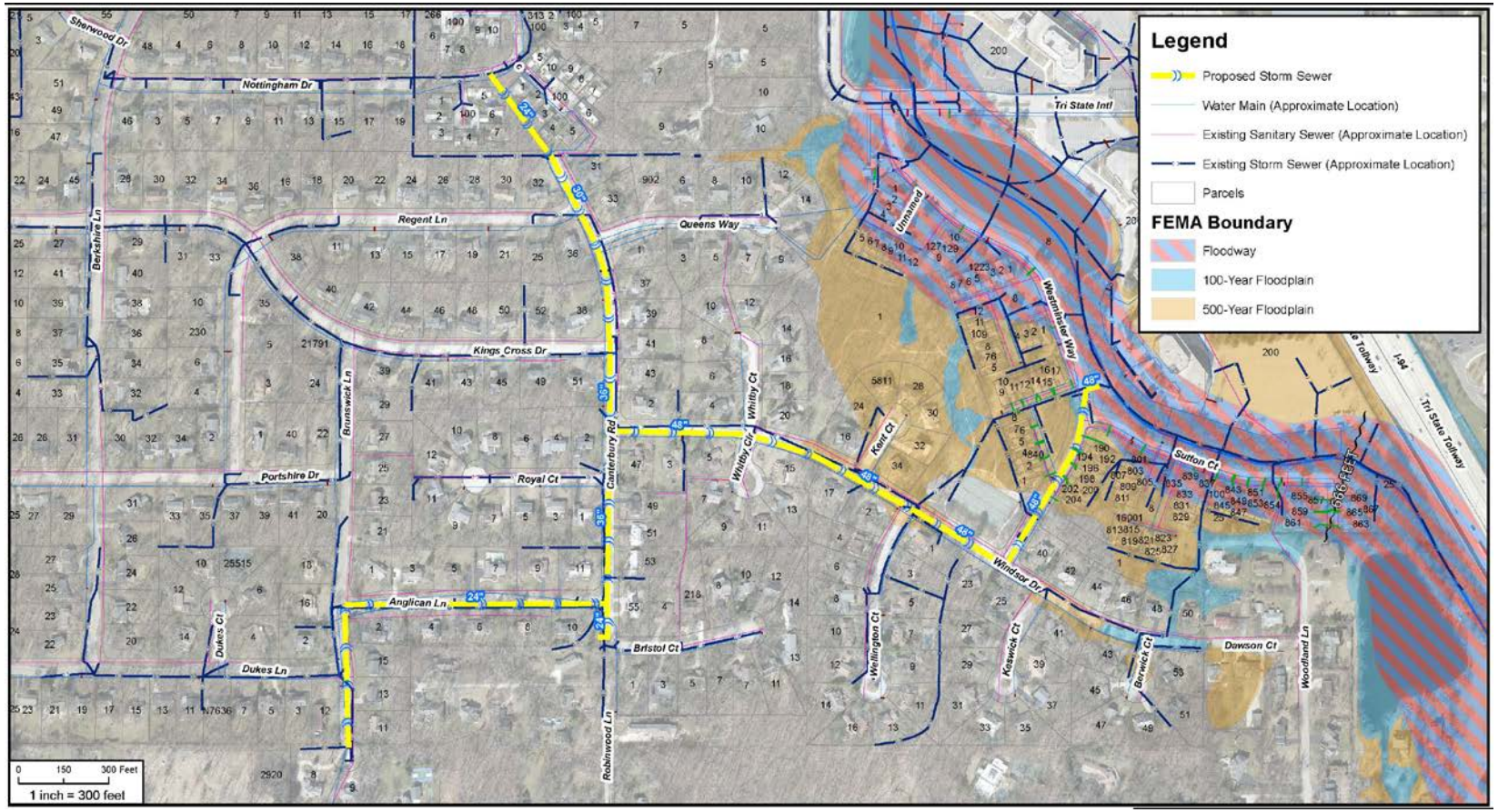
Capital Improvements – Lincolnshire Creek & Coventry Ln

- 10-year level of service
- Large diameter storm sewers (36-inch diameter)
- Side yard drainage swale
- Will function under river conditions up to 10-year flood elevation
- Engineer's Estimate of Probable Cost = $2.1M
- Properties benefitted = 38



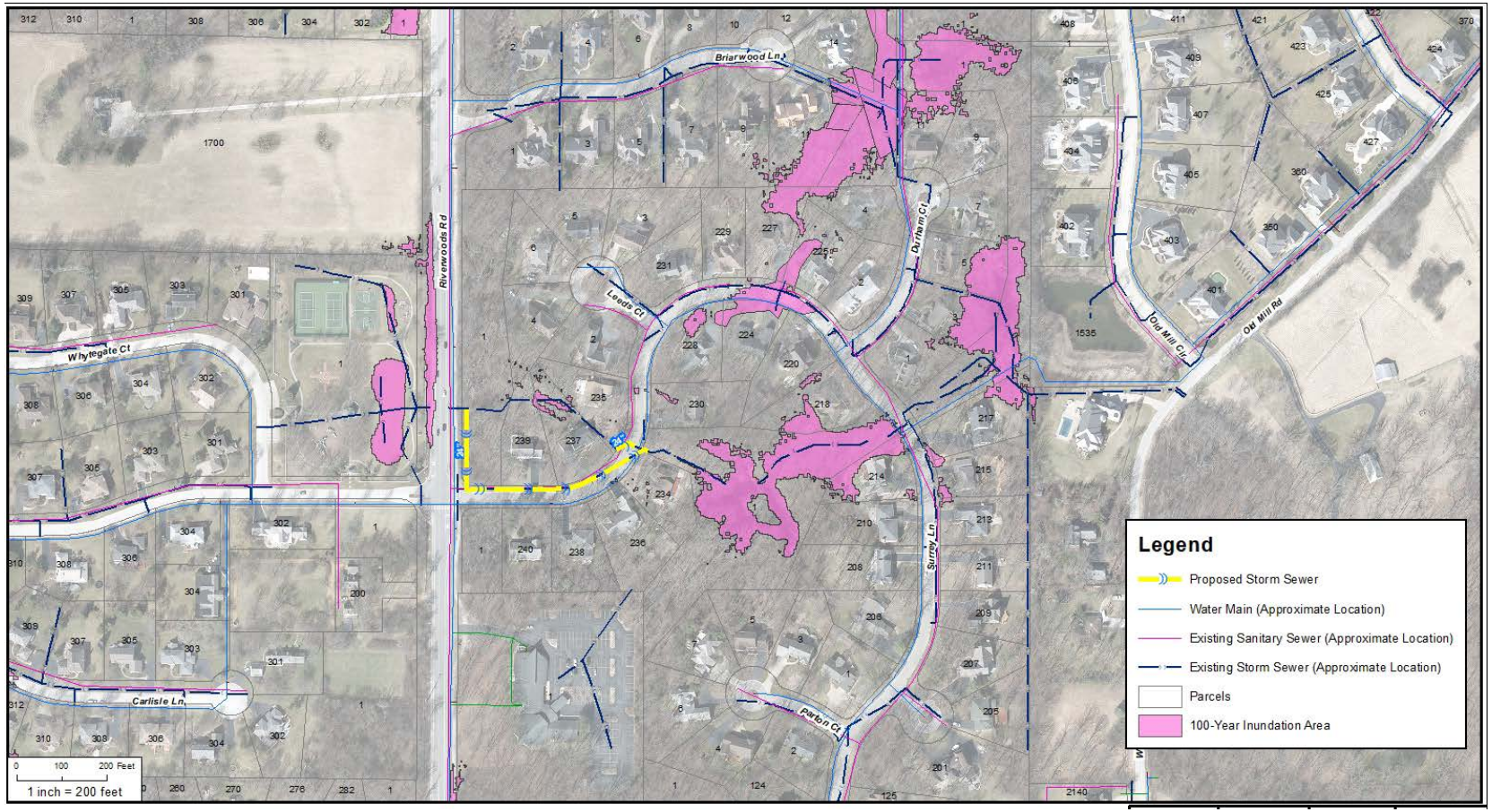
Capital Improvements – Southeast/Windsor Drive

- 10-year level of service
- Large diameter storm sewers (48-inch diameter)
- Will function under river conditions up to 10-year flood elevation
- Engineer's Estimate of Probable Cost = $4.2M
- Properties benefitted = 101



Capital Improvements – Surrey Lane East of Riverwoods Rd

- 10-year level of service
- 24-inch diameter storm sewers
- Engineer's Estimate of Probable Cost = $546,000
- Properties benefitted = 10



Summary of Capital Improvements

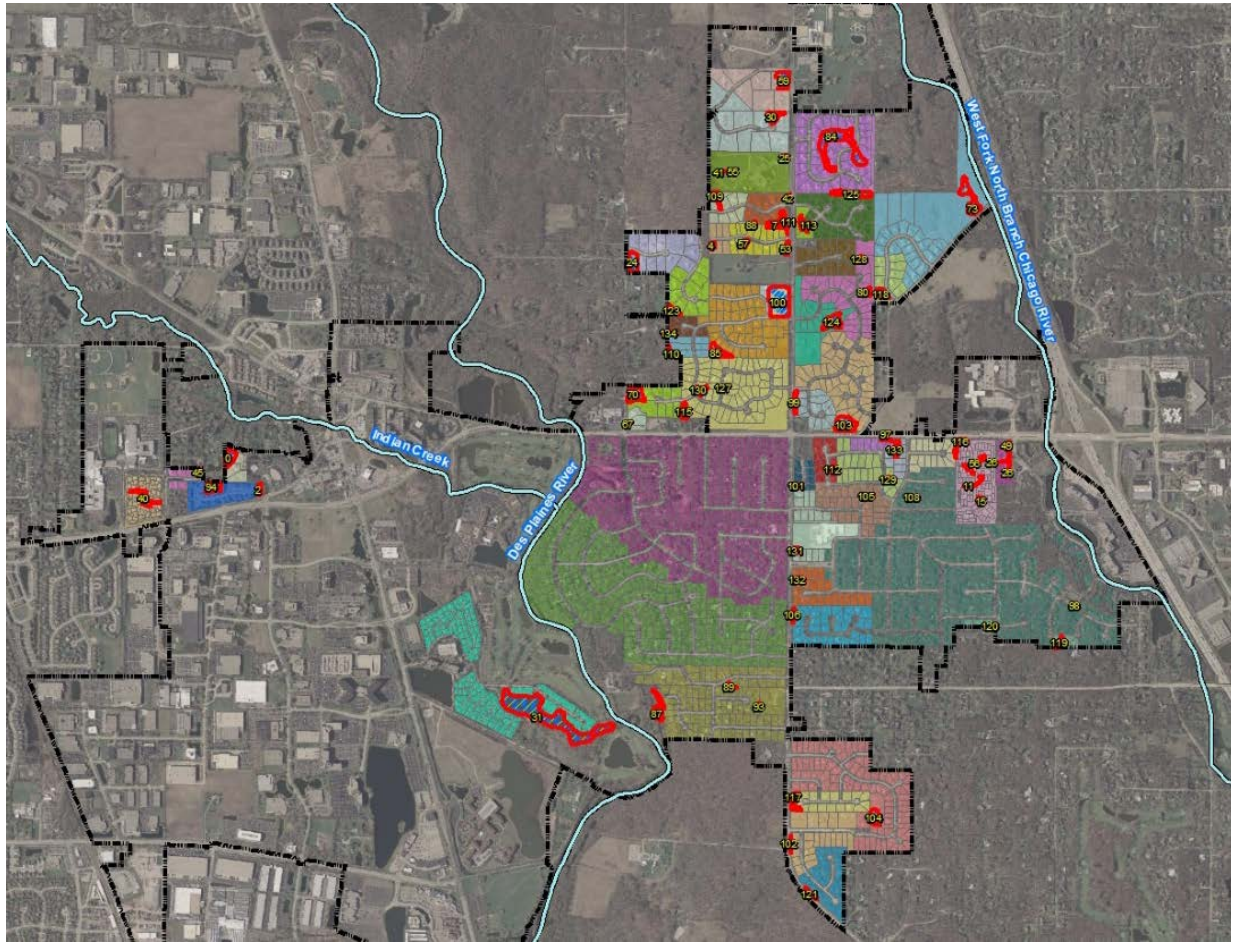
Flood Study Area	Engineer's Estimate of Probable Cost (2020 Dollars)*	Number of Properties Benefitted**
Lincolnshire Drive South	$7,600,000	83
Lincolnshire Drive North	$4,300,000	111
Lincolnshire Creek – Coventry Lane	$2,200,000	38
Southeast – Windsor Drive	$4,200,000	101
Surrey Lane – East of Riverwoods Road	$546,000	10
Capital Improvement Total	**$18,846,000**	**343**

*Cost includes design, permitting and contingency
**based on 10-year storm event

Existing Detention Basins

- 130 detention basins within Village
- 69 within residential areas
  - Village Property – 17
  - Private Property - 52
    - Detention – 37
    - Natural Storage - 15

- Improvements Include:
  - Tree removal
  - Debris clearing
  - Sediment removal
  - Vegetation restoration
  - Side slope repair
  - Underdrains
  - Outlet improvements
  - Ongoing maintenance



Existing Detention Basins

- One time construction cost and on-going maintenance
- Developed **range of costs** based on detention basin size
- Per Village Code 13-2-8 property owner is responsible for detention basin maintenance
- Various options for detention basin repair

	Quantity	Construction Cost	Total Cost with 5 Years Maintenance	Total Cost with 10 Years Maintenance
Designed Detention on Village Property	17	$674,000	$962,000	$1,250,000
Designed Detention on Private Property	37	$1,150,000	$1,807,000	$2,476,000
DETENTION BASIN TOTAL	54	$1,824,000	$2,769,000	$3,726,000
Natural Stormwater Storage Areas on Private Property	15	$537,000	$742,000	$948,000
TOTAL	69	$2,361,000	$3,511,000	$4,674,000

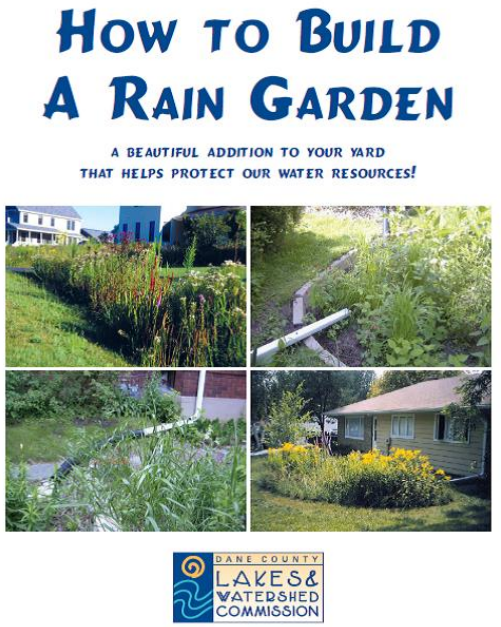
Residential Detention Basin Summary Table

Private Property Drainage Improvements

- 140 yard drainage complaints from survey
- Likely more based on survey response rate
- Proposed Improvements included:
  - Storm sewers ($80/linear foot)
  - Underdrain ($30/linear foot)
  - Inlets ($5,000/structure)
  - Vegetation restoration ($11/square yard)
- Developed **range of costs** per property based on several scenarios
  - Limited engineering
  - 25% Contingency
  - Prevailing wage rates
  - Range:
    - Low end: $10,700 per property
    - High end: $47,700 per property
  - Assuming median of $20,000: Total cost = $3M

Private Property Drainage Improvements

- Per Illinois Drainage Law drainage must be maintained by property owner
- Potential Village Actions
  - Develop web page specifically addressing private property drainage
  - Provide list of private property improvements and details on Village website
    - Underdrains
    - Rain gardens
    - Yard Inlets
  - Provide list of engineers and contractors on Village website
  - Allocate limited staff time to work with residents and provide recommendations
  - Develop cost share program



Other Drainage Improvements

- Residential Structure Drainage Improvements
  - Sump pump and battery backup
  - Overhead sewers
  - Raising window wells
  - Homeowner responsibility – Village can provide details on website
- Green Infrastructure
  - Can be included in capital improvements, detention basin retrofits and private property work
  - Potential grant funding
  - Large water quality benefits
  - Limited flood reduction benefits
  - Rain gardens, rain barrels, permeable pavements
  - Village can provide details on website

Summary and Next Steps

Proposed Projects Summary

Flood Study Area	Engineer's Estimate of Probable Cost (2020 Dollars)	Number of Properties Benefitted
Lincolnshire Drive South	$7,600,000	83
Lincolnshire Drive North	$4,300,000	111
Lincolnshire Creek – Coventry Lane	$2,200,000	38
Southeast – Windsor Drive	$4,200,000	101
Surrey Lane – East of Riverwoods Road	$546,000	10
Capital Improvement Total	$18,846,000	343
Detention Basin Improvements	$4,700,000	N/A
Yard Flooding Improvements	$3,000,000	N/A
Total	26,546,000[1]	

[1]Includes all detention basin improvements and 10-year maintenance costs. 2020 Engineering costs and 20% contingency.

Funding

- Village Funding
  - Capital Budgeting
  - Bonding
- Stormwater Utility Fee
  - Fee based on land use, size, imperviousness or other
  - Other communities that have implemented stormwater utilities:
    - Wilmette
    - Mundelein
    - Buffalo Grove
    - Palatine
- Outside Funding Sources
  - Grants
    - Lake County SMC, IEPA, FEMA
    - Scarce resources and competitive process
  - State and Federal Funding

Next Steps

- Obtain feedback on study and recommended projects
- Finalize Report

Questions?

Thank you for your time….