



Hart Ditch Improvements

Joint Project in Northwest Indiana



2-Stage Channel Improvements to Hart Ditch

- Plum Creek/Hart Ditch
- Flooding history
- Flood mitigation alternatives and measures
- Cooperative effort
- Design
- Construction
- Benefits





Plum Creek/Hart Ditch Watershed

Confluence with Little Calumet River in Munster, IN

71 mi² at confluence with Little Calumet River

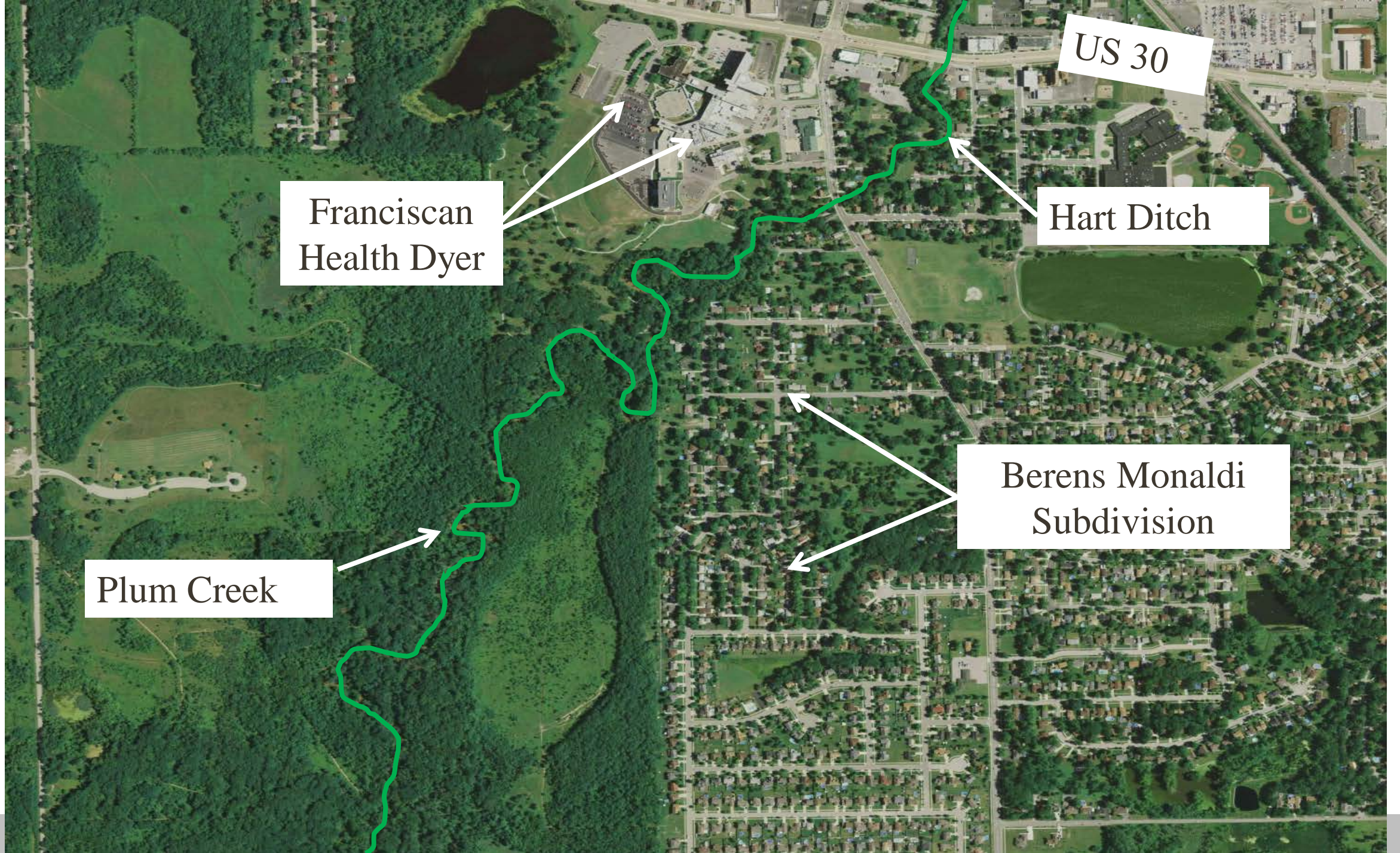


Plum Creek/Hart Ditch Watershed

71 mi² at confluence with Little Calumet River

36 mi² drainage area in Illinois before it enters Dyer, IN

Water knows no boundaries!



US 30

Franciscan
Health Dyer

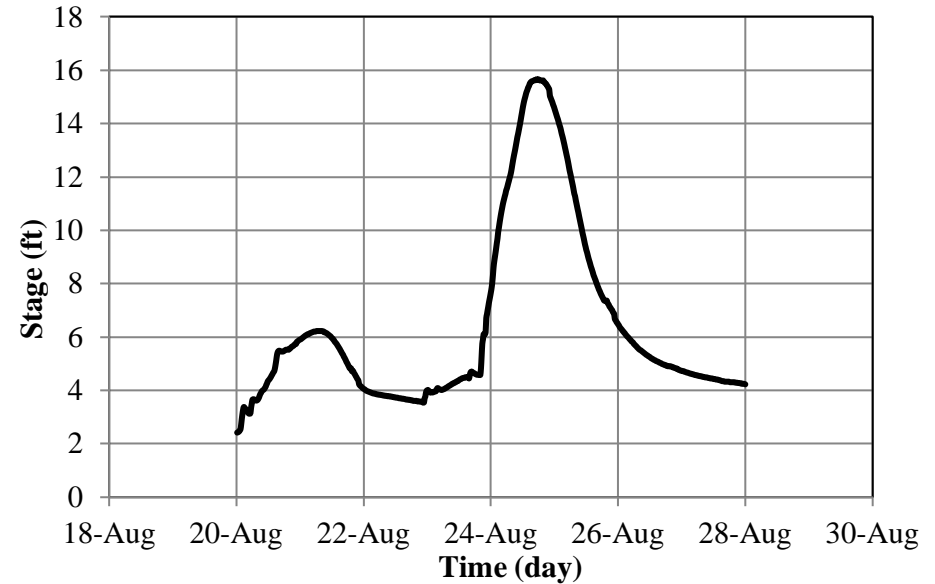
Hart Ditch

Berens Monaldi
Subdivision

Plum Creek

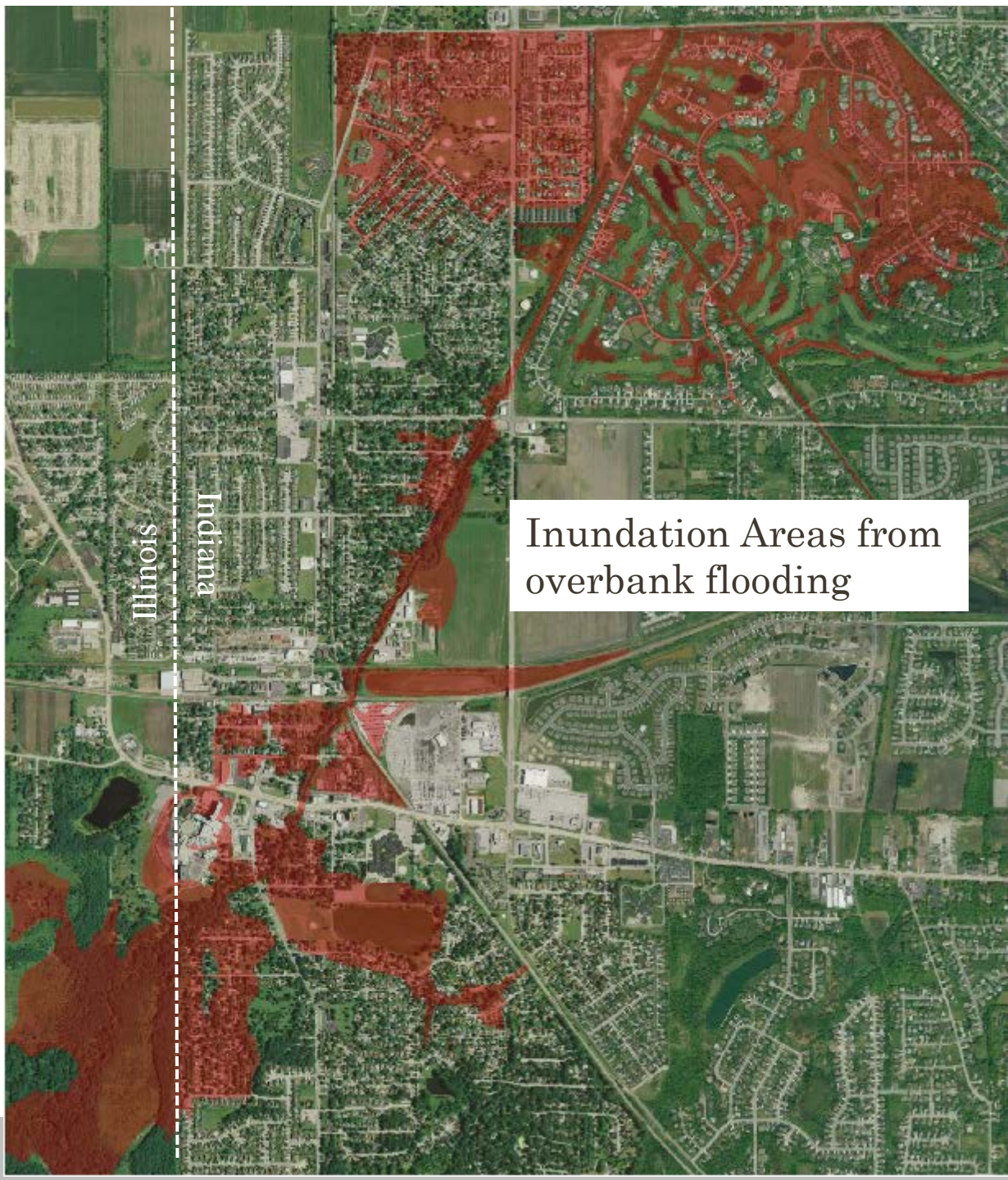
Flooding History

- November 1990
 - Significant flooding
 - 13 ft total rise
- August 2007 (saturated watershed)
 - 5" rain between 8/20 and 8/23
 - 1" in Dyer and 5" rain in Will Co. on 8/24
 - 9' rise in 18 hours
- September 2008 (Hurricane Ike)
 - 9" on the 13th and 14th
 - 8' rise in 18 hours



Event	Rainfall (in)	Peak Gage (ft)
Nov. 1990	~6"	13
Aug. 2007	10"	15.7
Sept. 2008	9"	16.8

Significant Flooding throughout Dyer from 2007 and 2008 events



- August 2007 had > \$4M in damages to homes
 - \$2.8M in Berens Monaldi subdivision
 - Cases of foundation collapses
 - Houses with 8 feet of water in the basement
 - \$33M in damages at Franciscan Health Dyer
 - Over 2' going through Emergency Room
- September 2008
 - More damages than Aug. 2007



Significant Flooding throughout Dyer from 2007 and 2008 events



Photos of the Year 2007

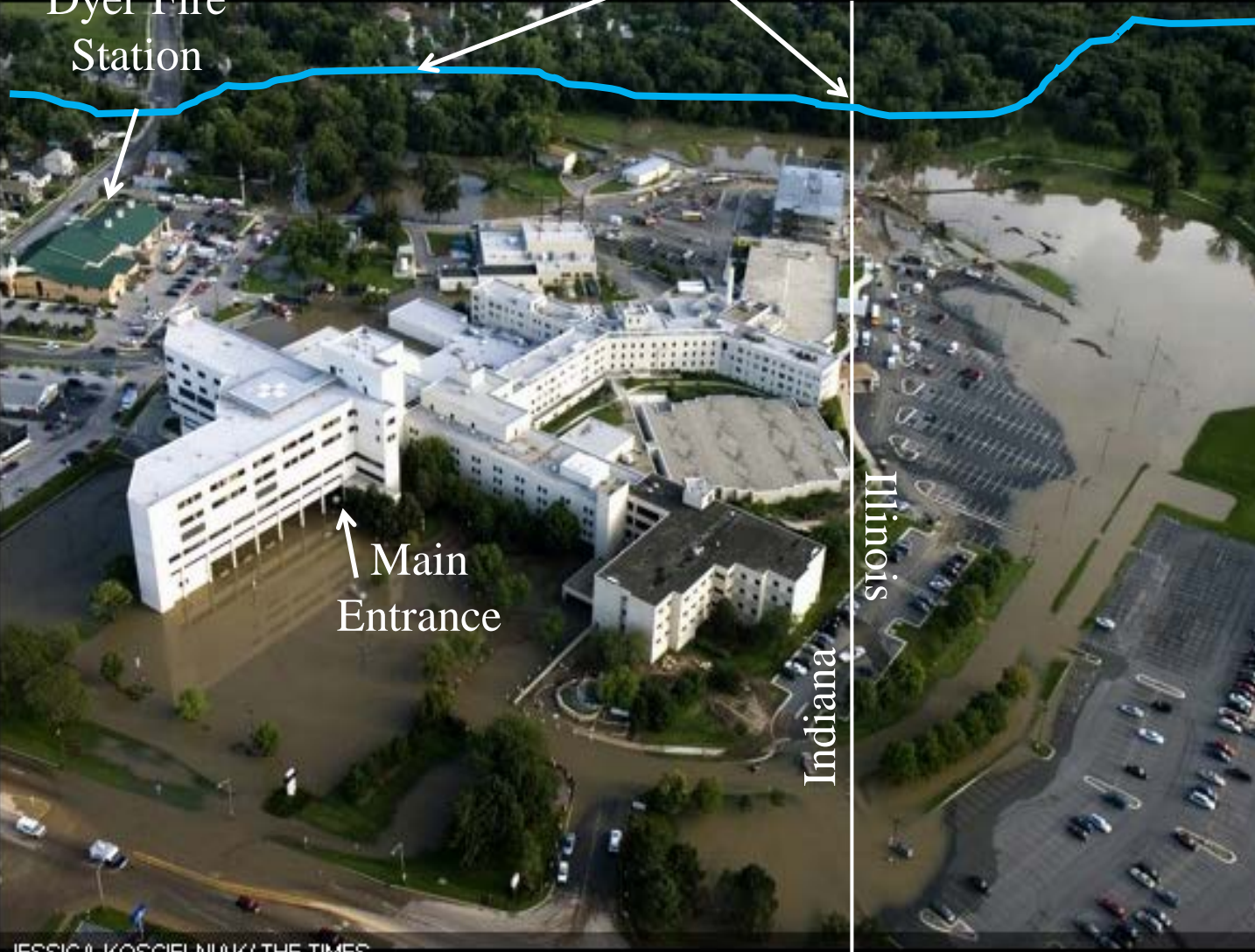
Hart Ditch

Dyer Fire Station

Main Entrance

Indiana

Illinois



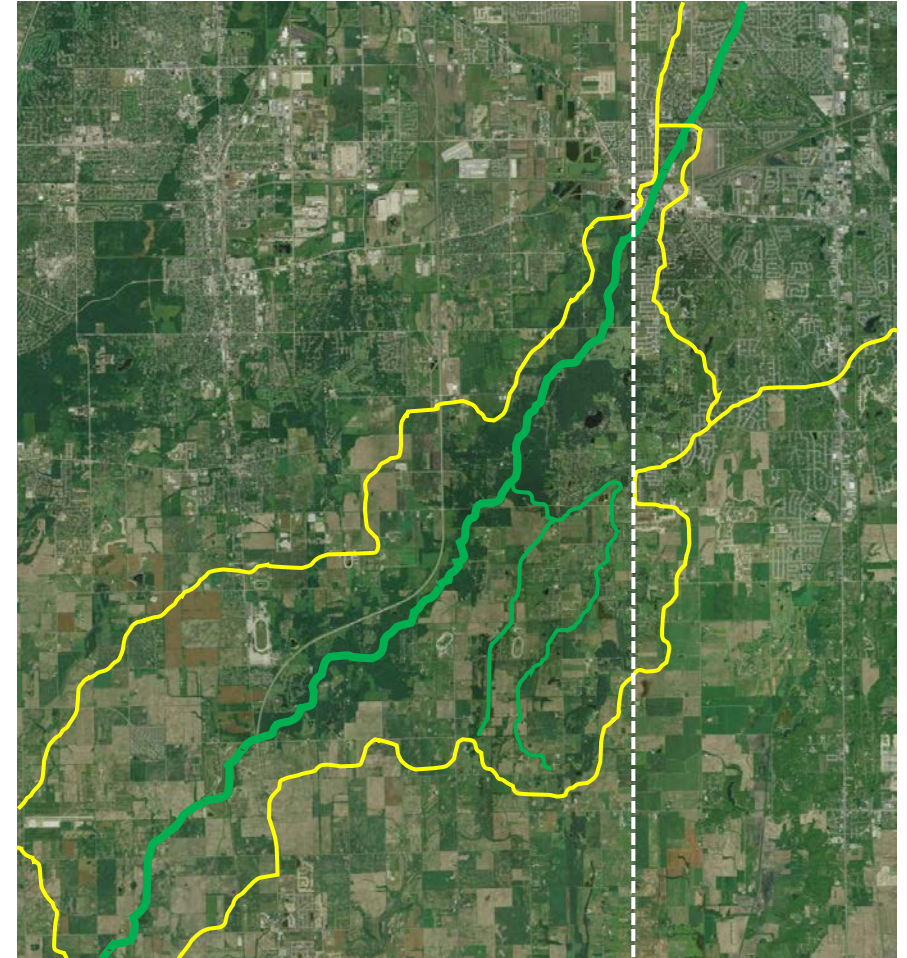
JESSICA KOSCIELNIAK/ THE TIMES
Flood waters at St. Margeret Mercy in Dyer , Indiana.

Photo is looking south from US 30



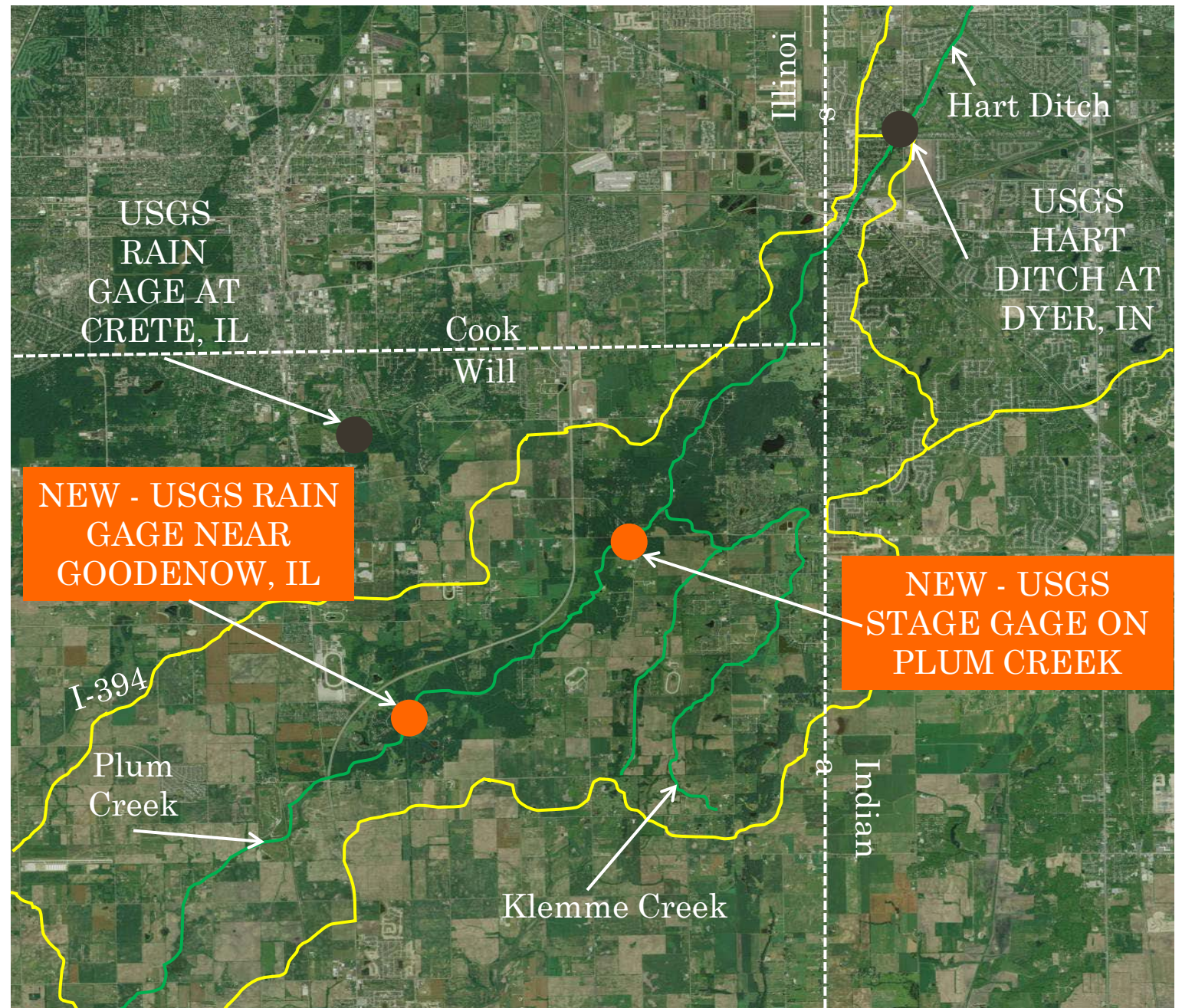
Flood Mitigation and Alternatives Measures

- Lake County Surveyor's Office commissioned a study of the watershed
 - Plum Creek Hart Ditch Watershed Study
 - Hydrologic and hydraulic models of the watershed
 - Calibrated to long and short duration events
 - Verified using Jan. 2008 and Sept. 2008 events
 - Used for predicting flood events on anticipated rainfall
 - Larger flows than regulatory flows (3389 cfs vs 1910 cfs)
- Added rain gage in Goodenow (2009)
- Added a stream gage on Plum Creek (2009)
- Emergency Action Plan

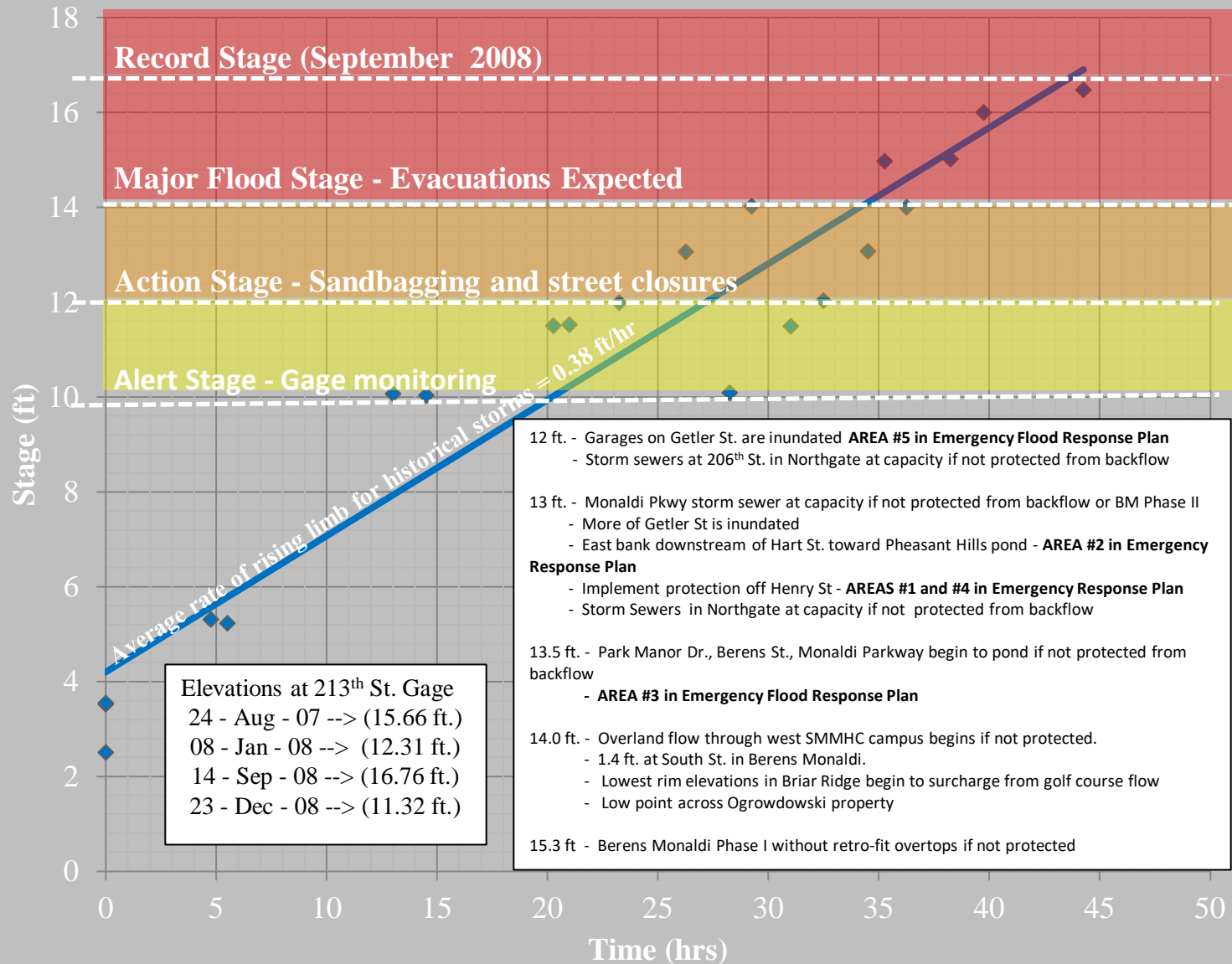


Gages Added in Plum Creek Watershed

- USGS Rain Gages
 - Hart Ditch at 213th Street in Dyer
 - Crete, IL
 - Goodenow, IL (new)
- USGS Stage Gages
 - Hart Ditch at 213th Street in Dyer
 - Plum Creek (new)



Warning Stage - 213th Street Gage, Dyer



Predictions and Emergency Response

Used for predictions

Correlation between stage gages

Time to prepare for floods and enact emergency actions

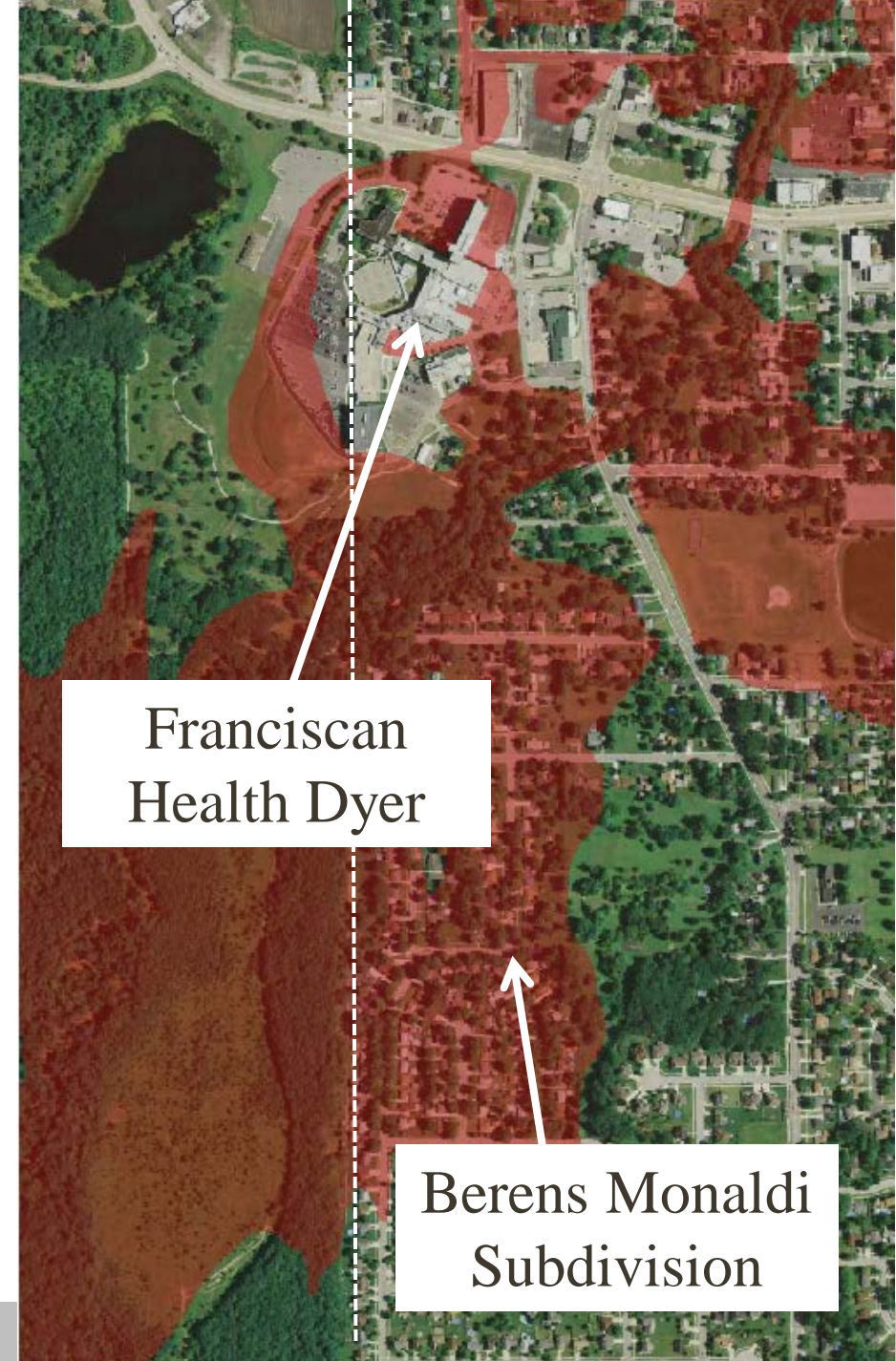
Flood Mitigation and Alternatives Measures



- Longwood Golf Course in NW corner of Will County
- Widen Hart Ditch
- Multiple smaller storage areas
- Berms to protect subdivision and hospital

Flood Mitigation and Alternatives Measures

- Longwood Golf Course in NW corner of Will County
- Widen Hart Ditch
- Multiple smaller storage areas
- **Berms to protect subdivision and hospital**



Franciscan
Health Dyer

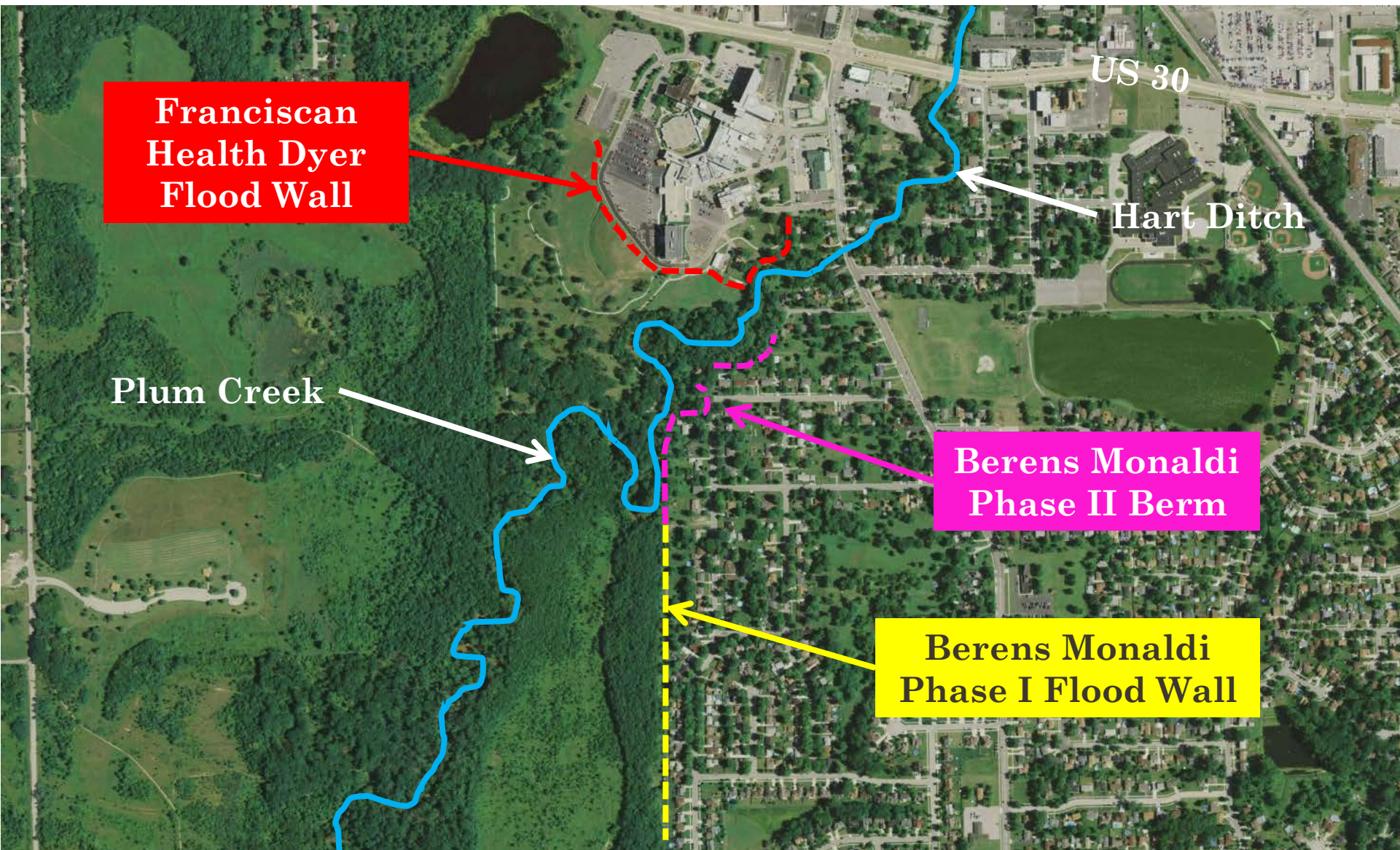
Berens Monaldi
Subdivision

Flood Mitigation and Alternatives Measures

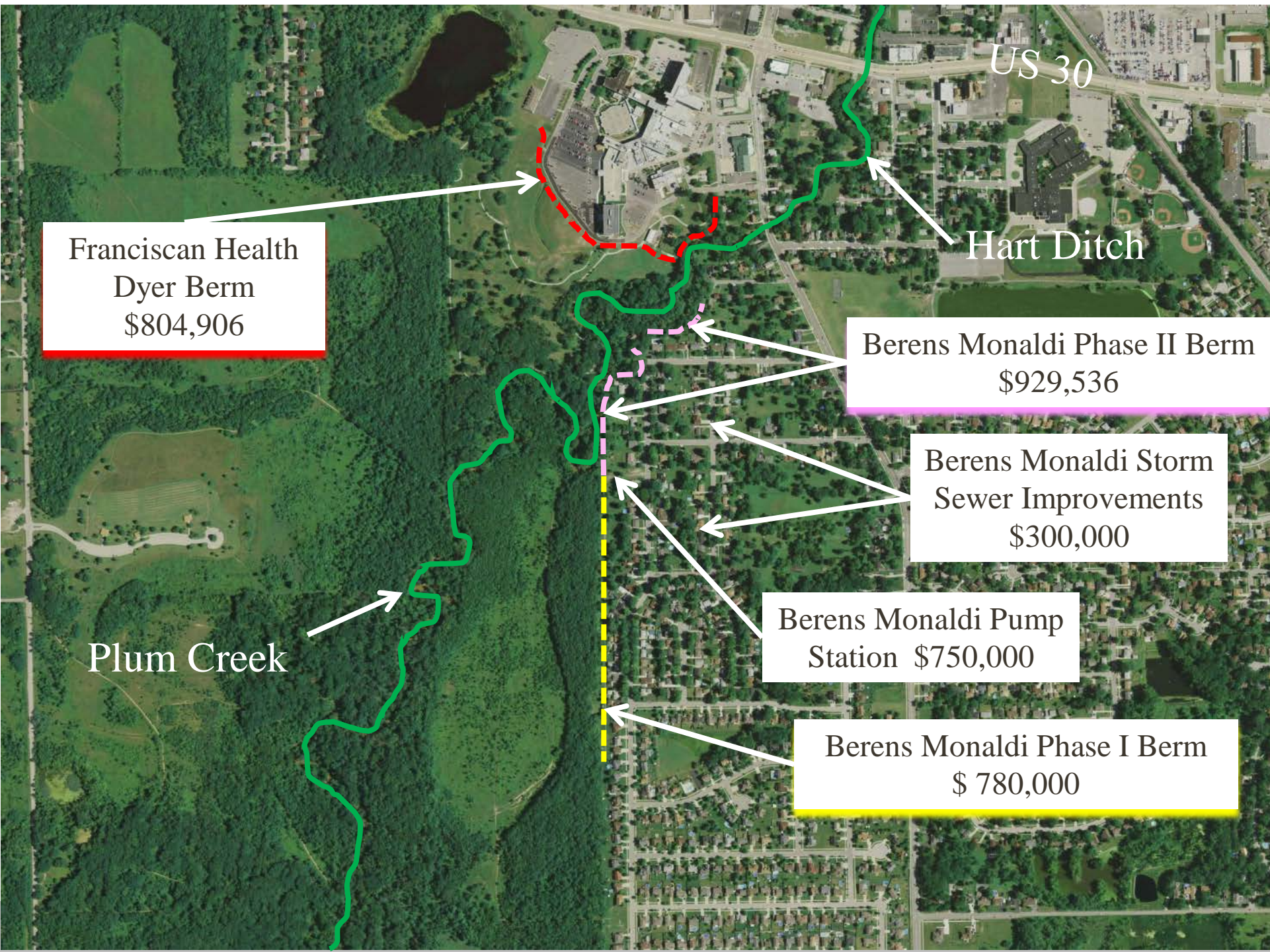
- Berens Monaldi Subdivision berms and pump station paid for by Town of Dyer
- Franciscan Health Dyer berms paid for by the hospital







- Flood protection elevations determined using calibrated modeling
- Flood walls provide protection elevation greater than the elevations from the September 2008 storm event



Franciscan Health
Dyer Berm
\$804,906

Berens Monaldi Phase II Berm
\$929,536

Berens Monaldi Storm
Sewer Improvements
\$300,000

Berens Monaldi Pump
Station \$750,000

Berens Monaldi Phase I Berm
\$ 780,000

US 30

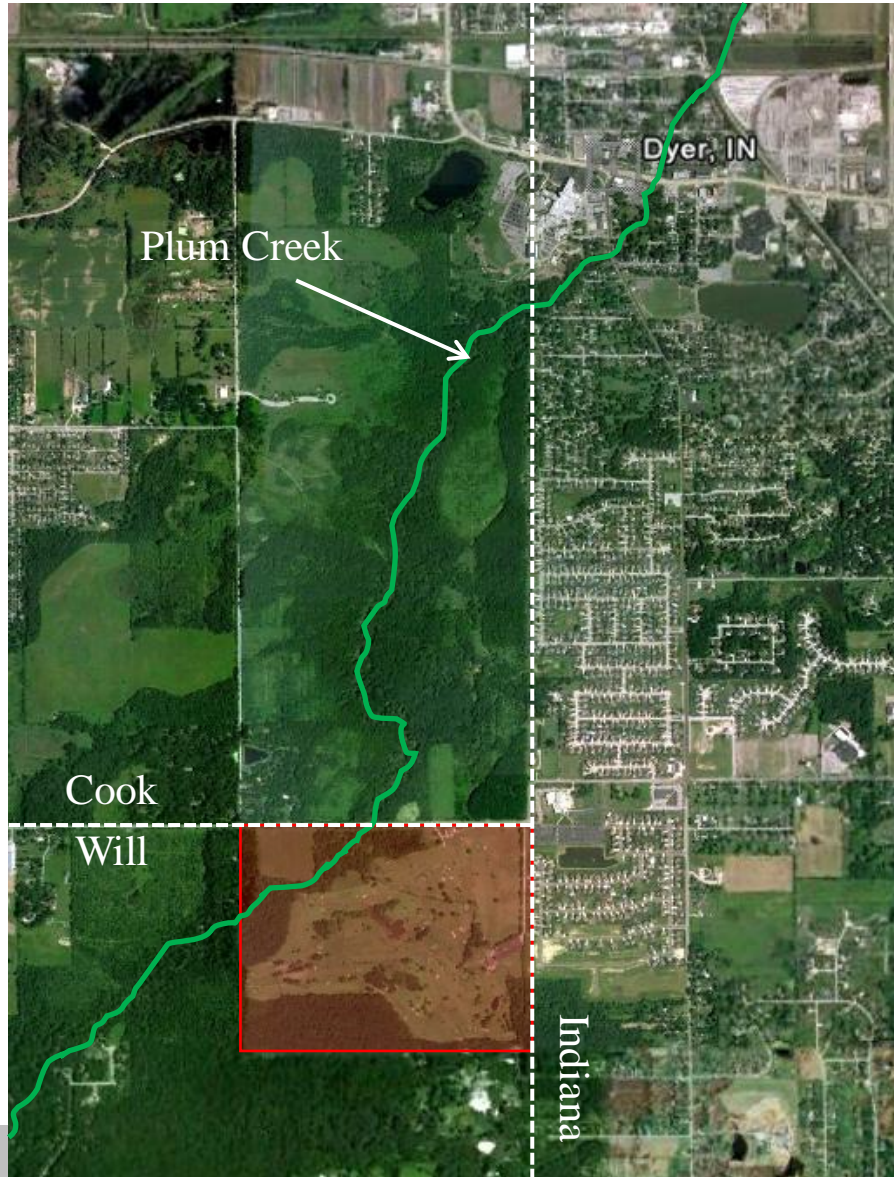
Hart Ditch

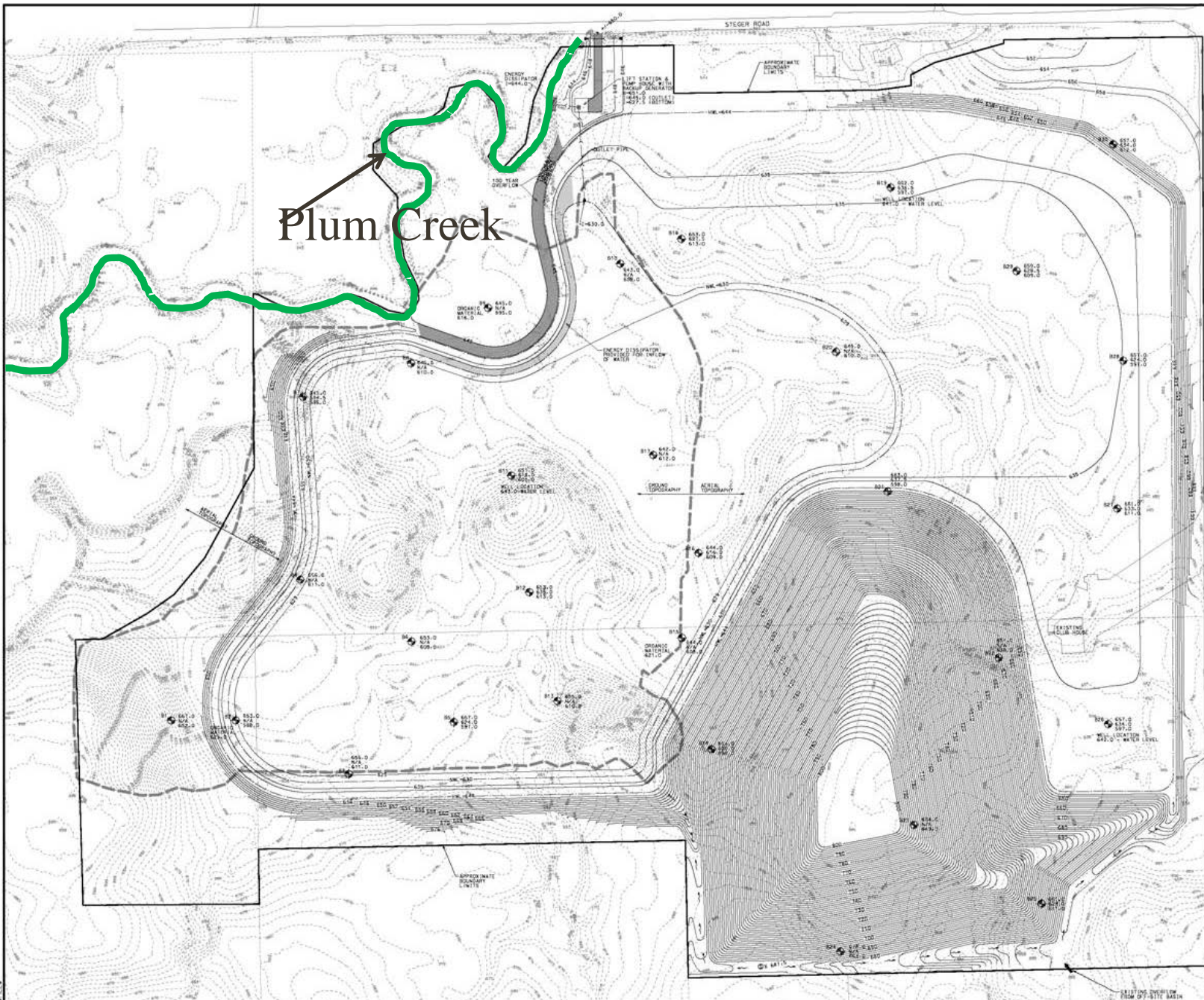
Plum Creek

Flood Mitigation and Alternatives Measures Implemented

- Town of Dyer
 - In excess of \$2,800,000
- Franciscan Health Dyer
 - In excess of \$1,000,000
- Updated Stormwater Ordinance
- Search for storage projects using “compensatory storage” requirements from berms
- Longwood golf course project was studied in detail

Flood Mitigation and Alternatives Measures





Plum Creek

LEGEND

- SOIL BORING NUMBER
- SOUNDING ELEVATION
- TOP OF SAND ELEVATION
- BOTTOM OF BORING ELEVATION
- PROPOSED CONTOUR
- EXISTING CONTOUR
- PROPOSED STORM STRUCTURE (TYPICAL TOP & AERIAL)
- PROPOSED STORM SEWER
- PROPOSED STORM PILE
- PROPOSED STORM STRUCTURE



NOTES

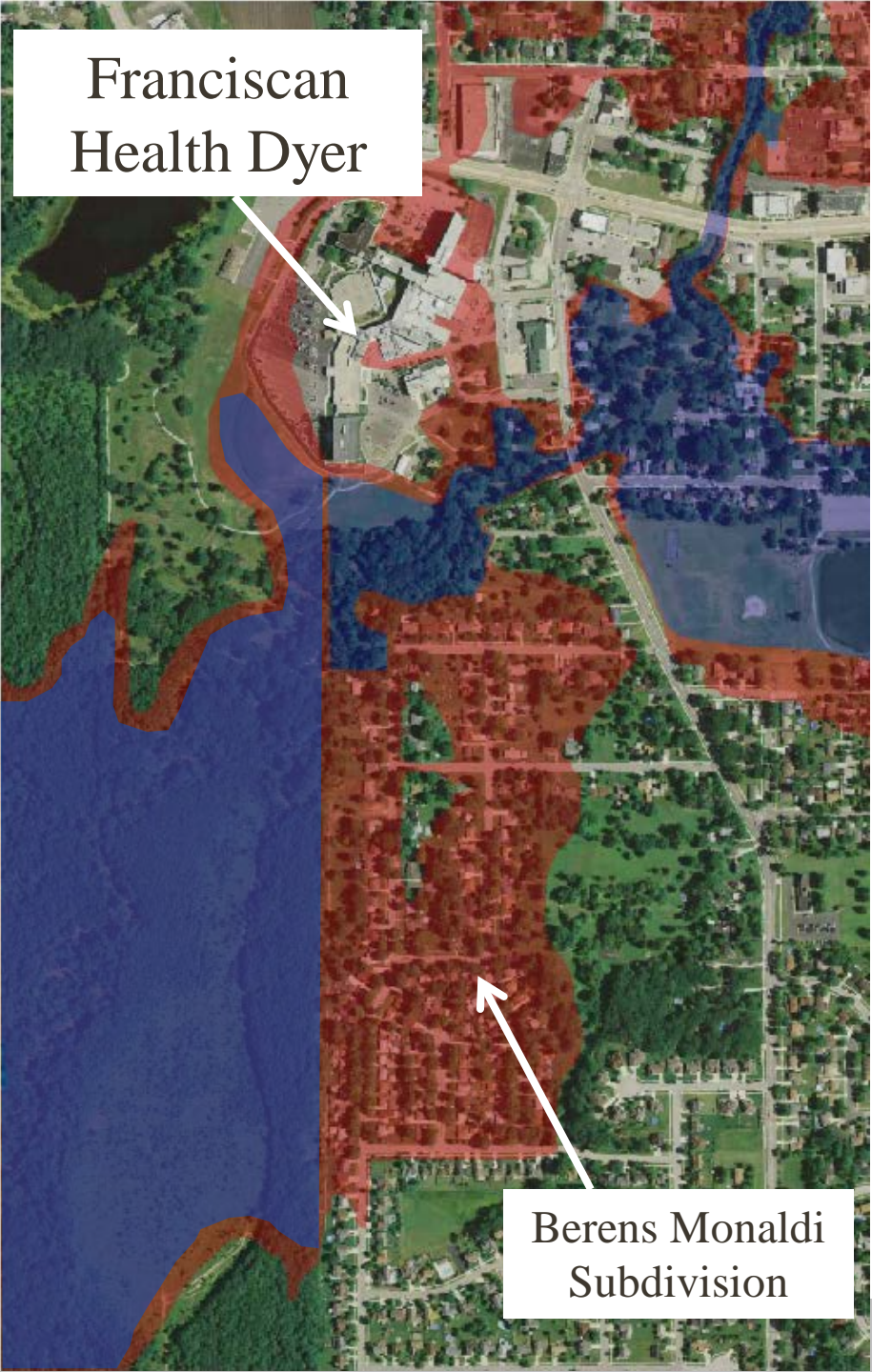
1. EXISTING SOUNDING TOPOGRAPHY SURVEY OBTAINED JANUARY 2009.
2. EXISTING AERIAL TOPOGRAPHY FROM WILL COUNTY, 2008.
3. PRELIMINARY SOIL BORINGS PROVIDED BY TESTING SERVICES CORP.
4. SIZE OF PUMP HOUSE, STORMWATER LET STATION AND BACK UP EXHAUSTION TO BE DETERMINED BY LOCATION AND INFORMATION SHOWN ON PLANNING PLOTS ONLY.
5. ALL DISTURBED AREAS TO BE RESEED WITH 1ST TOPSOIL.
6. ALL SLOPE SHOULD BE STABILIZED WITH EROSION CONTROL MEASURES WITH SEEDING.
7. BOTTOM OF BATHY SHOULD BE PLANTED WITH WETLAND VEGETATION SEEDING.
8. DETENTION BASIN SLOPE SHOULD BE SEEDS WITH A SOY WETLAND VEGETATION SEEDING.
9. SEE EXHIBIT SECTION OF REPORT FOR TYPICAL BASIN AND OVERFLOW DETAIL.

- **CHALLENGES**
 - Uncooperative sellers
 - Significant permitting issues
 - Will County FPD
 - Cost

Storage (ac-ft)	Cost (\$M)	Reduction at Hart St (ft)
330	7	0.4
670	12.8	1.3
1020	21	1.8

Could have provided great benefits!

-  2007/2008 Inundation Area
-  Inundation area with 670 ac-ft of storage



Flood Mitigation and Alternatives Measures

- Town of Dyer
 - In excess of \$2,800,000
- Franciscan Health Dyer
 - In excess of \$1,000,000
- Updated Stormwater Ordinance
- Search for storage projects using “compensatory storage” requirements from berms
- Longwood golf course project was studied in detail
- Identified 2-stage channel improvements

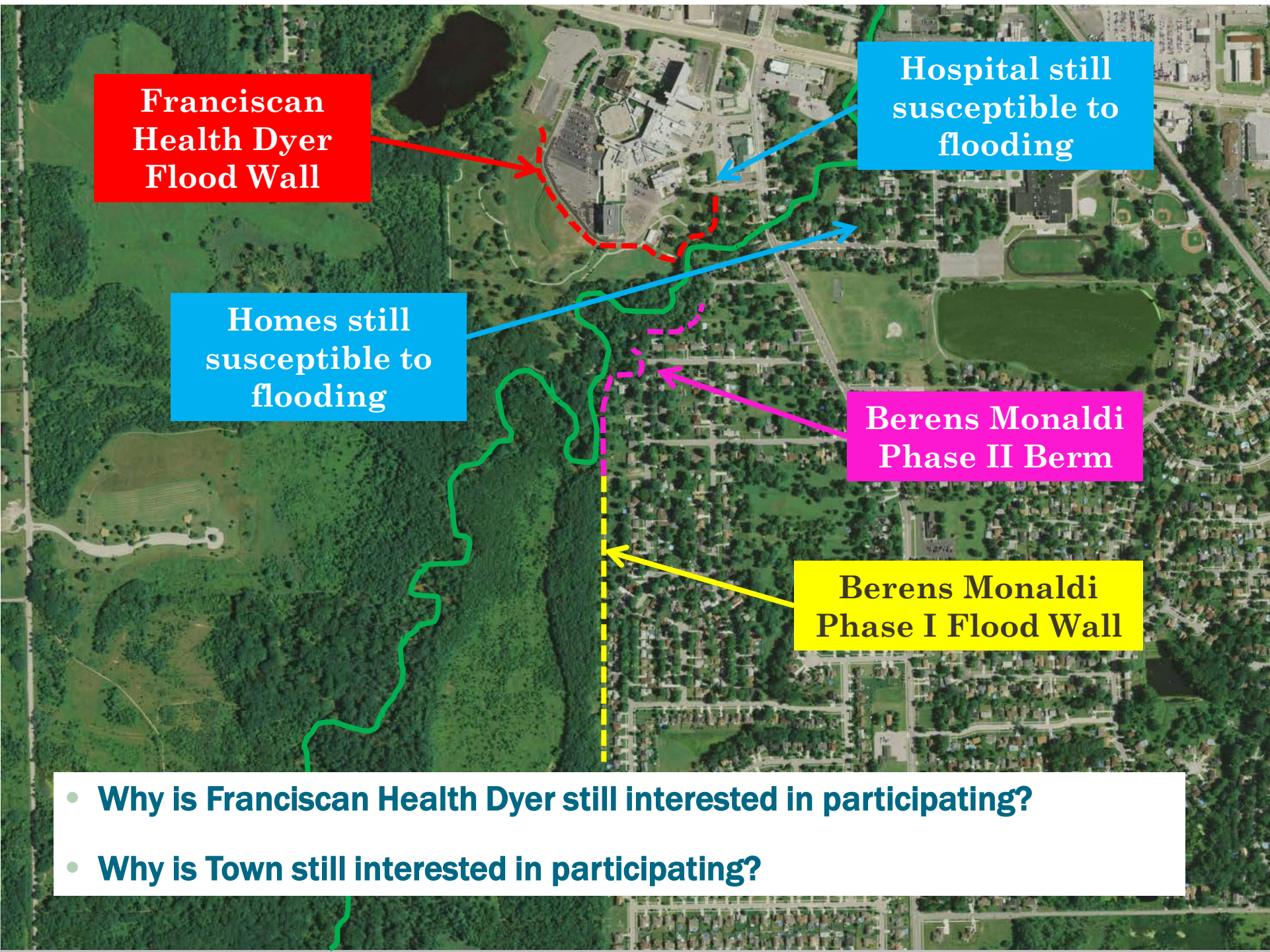
Cooperative Effort

- Town of Dyer
- Franciscan Health Dyer
- Lake County Drainage Board
- Little Calumet River Basin Development Commission
- Lake County Highway Department



Cooperative Effort

- Awarded bid - \$1,856,309.78 to Dyer Construction, with change orders about \$1.9M
- Town paid \$1,090,880 for purchase of houses and demolition and tree clearing
- Total Cost was approximately \$3.3M
- Franciscan Health Dyer contributed \$2,047,118.22 (agreement from 2010)
- Little Calumet River Basin Development Commission contributed \$600,000
- Received grant from DNR Lake Michigan Coastal Program for \$100,000
- 3 Houses removed and land dedicated to Town from Lake County Highway Department
- Lake County Surveyor's Office funded initial watershed study and various alternative studies



Franciscan Health Dyer Flood Wall

Hospital still susceptible to flooding

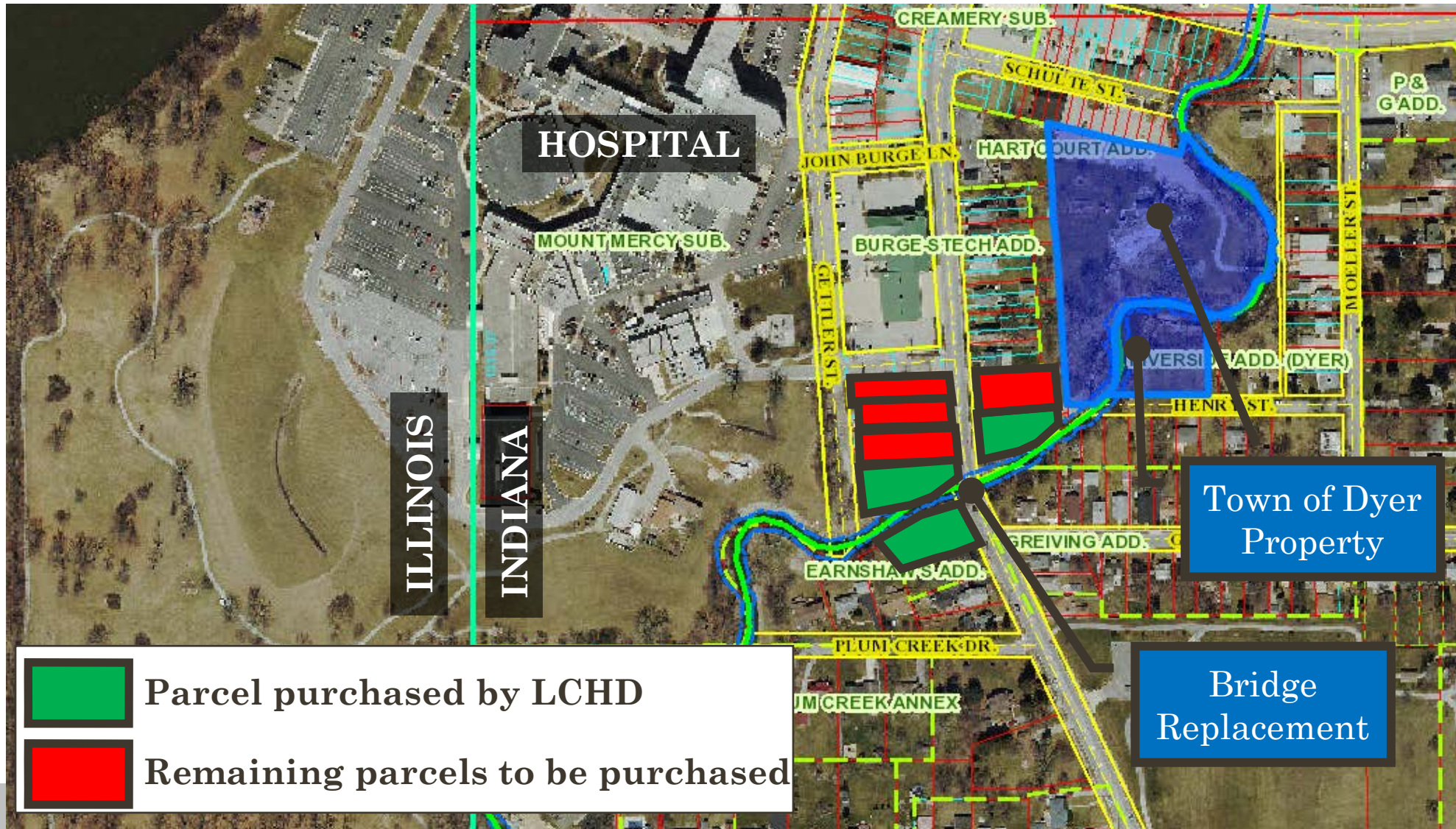
Homes still susceptible to flooding

Berens Monaldi Phase II Berm

Berens Monaldi Phase I Flood Wall

- **Why is Franciscan Health Dyer still interested in participating?**
- **Why is Town still interested in participating?**

Project Driver: Leveraging Resources with other projects – LCHD replacement of Hart Street Bridge



Concept Design



PROPOSED STREAMBANK STABILIZATION MEASURES

DETAILS FOR VEGETATED MECHANICALLY STABILIZED EARTH BANK

- SCOUR PROTECTION:** Edge of stream bed reinforced with revetment riprap and covered with native stream bed material.
- TOE PROTECTION:** Bottom 1' of toe protected with riprap.
- STRUCTURAL EROSION PROTECTION:** A 3-dimensional open structure geofabric Turf Reinforcing Mat (TRM) will be placed along the bottom 3 feet of the bank (above the riprap) to protect against erosion above and below the normal water level of Hart Ditch.
- VEGETATED EROSION PROTECTION:** A hydraulically applied flexible growth medium will be sprayed onto the geofabric to bond to the soil and promote rapid germination and accelerated plant growth for a superior level of erosion control.

SAMPLE GEOFABRIC TURF REINFORCING MAT (ENKAMAT 7020)

ENKAMAT 7020
 A 3-dimensional open structure geofabric Turf Reinforcing Mat (TRM) will be placed along the bottom 3 feet of the bank (above the riprap) to protect against erosion above and below the normal water level of Hart Ditch.

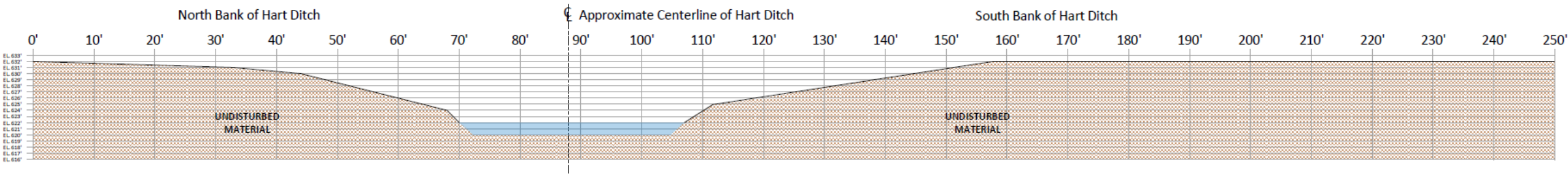
STRUCTURAL WEBSITE
 Geofabric Turf Reinforcing Mat (TRM) will be placed along the bottom 3 feet of the bank (above the riprap) to protect against erosion above and below the normal water level of Hart Ditch.

VEGETATED EROSION PROTECTION
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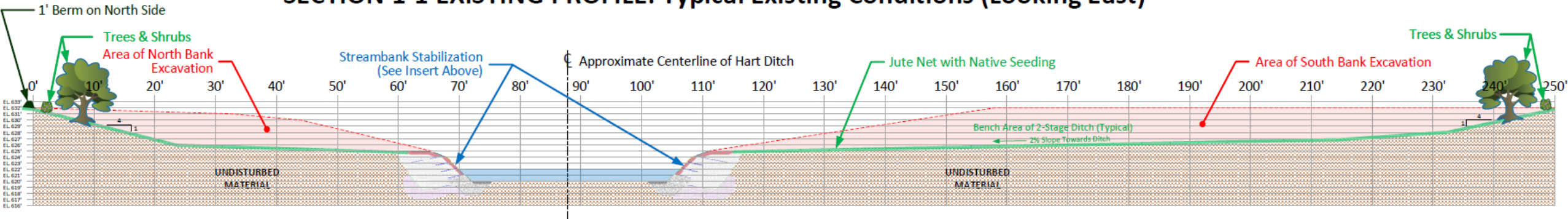
SOIL EROSION
 Geofabric Turf Reinforcing Mat (TRM) will be placed along the bottom 3 feet of the bank (above the riprap) to protect against erosion above and below the normal water level of Hart Ditch.

PROPOSED PROJECT PLAN

Creating a 2-Stage Ditch: Existing and Proposed Section Views



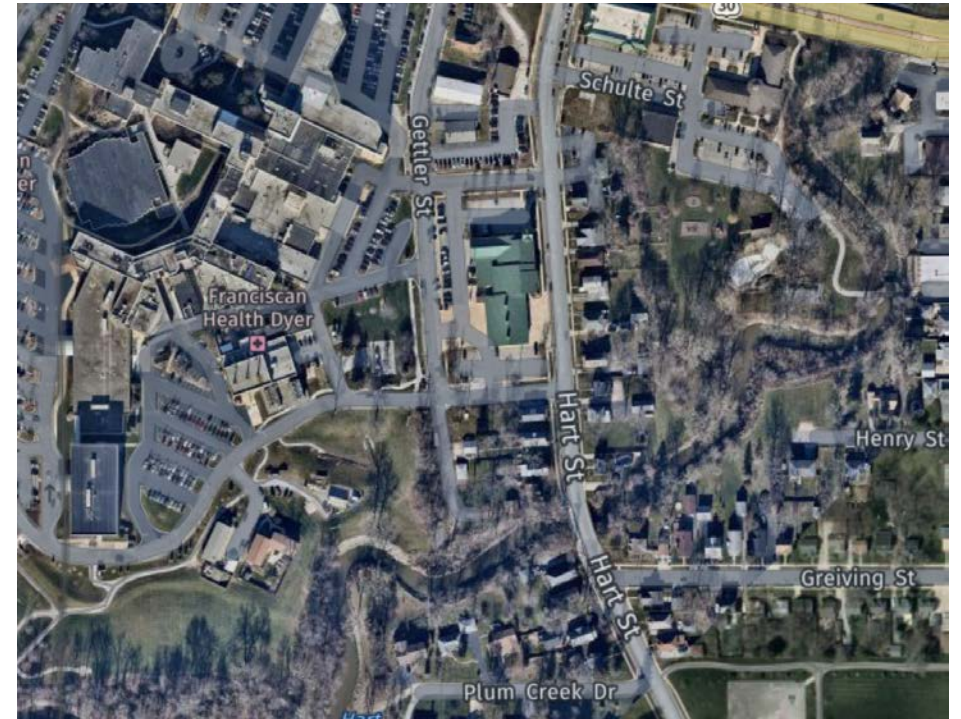
SECTION 1-1 EXISTING PROFILE: Typical Existing Conditions (Looking East)



SECTION 1-1 PROPOSED PROFILE: 2-Stage Ditch with Reinforced Stream Bank Edge (Typical Conditions -- Looking East)

Site Conditions prior to design

- Video from February 21, 2018 after storm event
 - Berm protecting hospital
 - First area to flood is behind homes on west side of Hart Street
 - Large trees throughout project site
 - Potential overtop locations to the south (left in video)
 - Hart Street bridge is a 2 lane bridge
- [Survae](#)





Pictures from December 2021









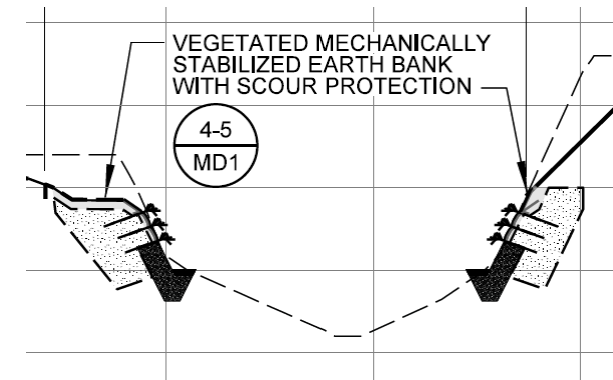
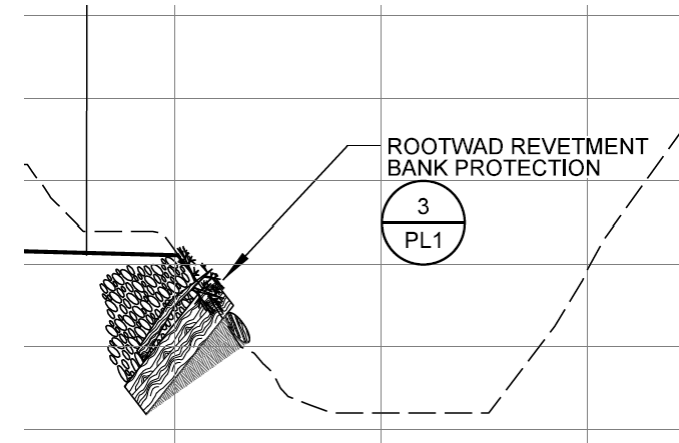






Expected Project Benefits

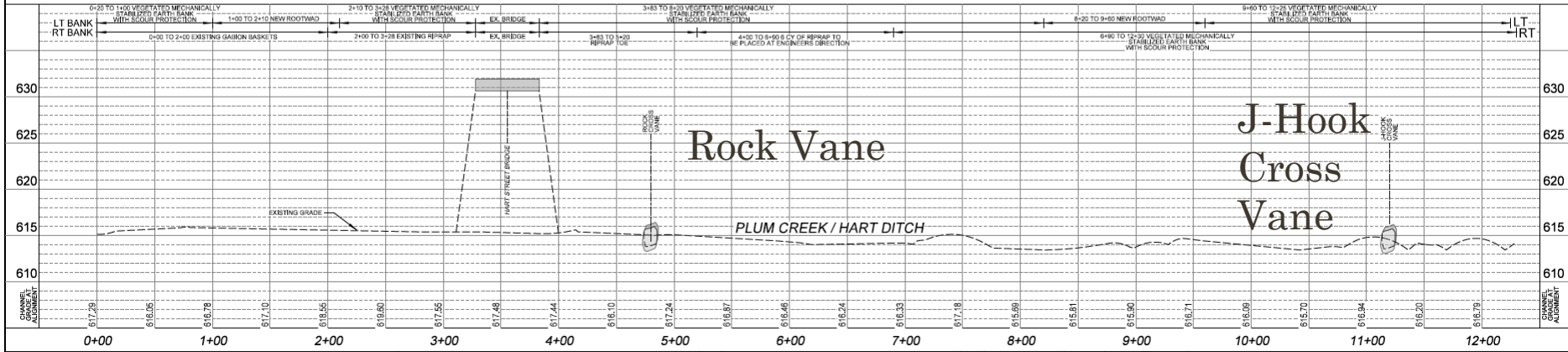
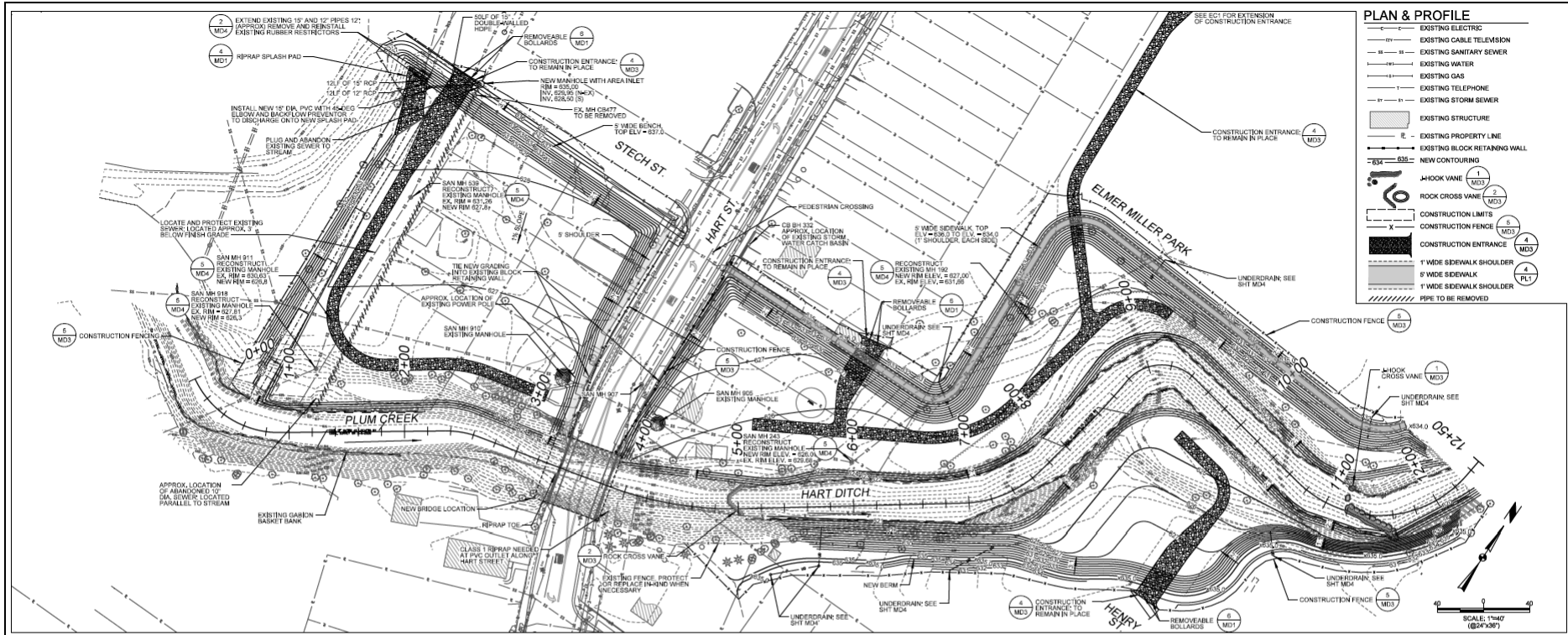
- Water Quality and Quantity Benefits
 - Significantly improved ditch stability:
 - Bench area to be sloped towards ditch at 2%
 - After bench, bank sloped at 2:1 to maximize storage area
 - Toe of the ditch reconstructed as a preventive scour measure (rootwads and riprap) with vegetated mechanically stabilized earth bank above toe
 - J-hook and rock vane
 - Sediment reduction
 - Finer sediment particles will settle out on the bench areas
 - Coarser particles will form ditch bed



Expected Project Benefits

- Environmental
 - Bio-uptake of nutrients by vegetation located within the bench areas
 - The bench areas will filter pollutants and provide groundwater recharge
 - Native seed mix will provide wildlife habitat and accommodate migrating birds
- Educational
 - Kahler Middle School is 2 blocks from the site and students can walk to site to observe the results of the environmental restoration with native plants
 - Demonstration that 2-stage channel restoration can work in highly urban areas
 - Signage being installed explaining the project
 - Walking path

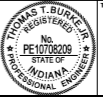
Design



CBEB CHRISTOPHER B. BURKE ENGINEERING, LTD.
 9575 W Higgins Rd Ste 600
 Rosemont, IL 60018
 Phone: 847.823.0500
 Fax: 847.823.0520
 Email: cbbei@cbbei.com

PROJECT: **HART DITCH BANK STABILIZATION**
 TOWN OF DYER, INDIANA

DESIGN	WH
DRAWN	DJW
CHECKED	TTB
SCALE	AS NOTED
DATE	4/20/22



TITLE: **GRADING PLAN AND PROFILE**

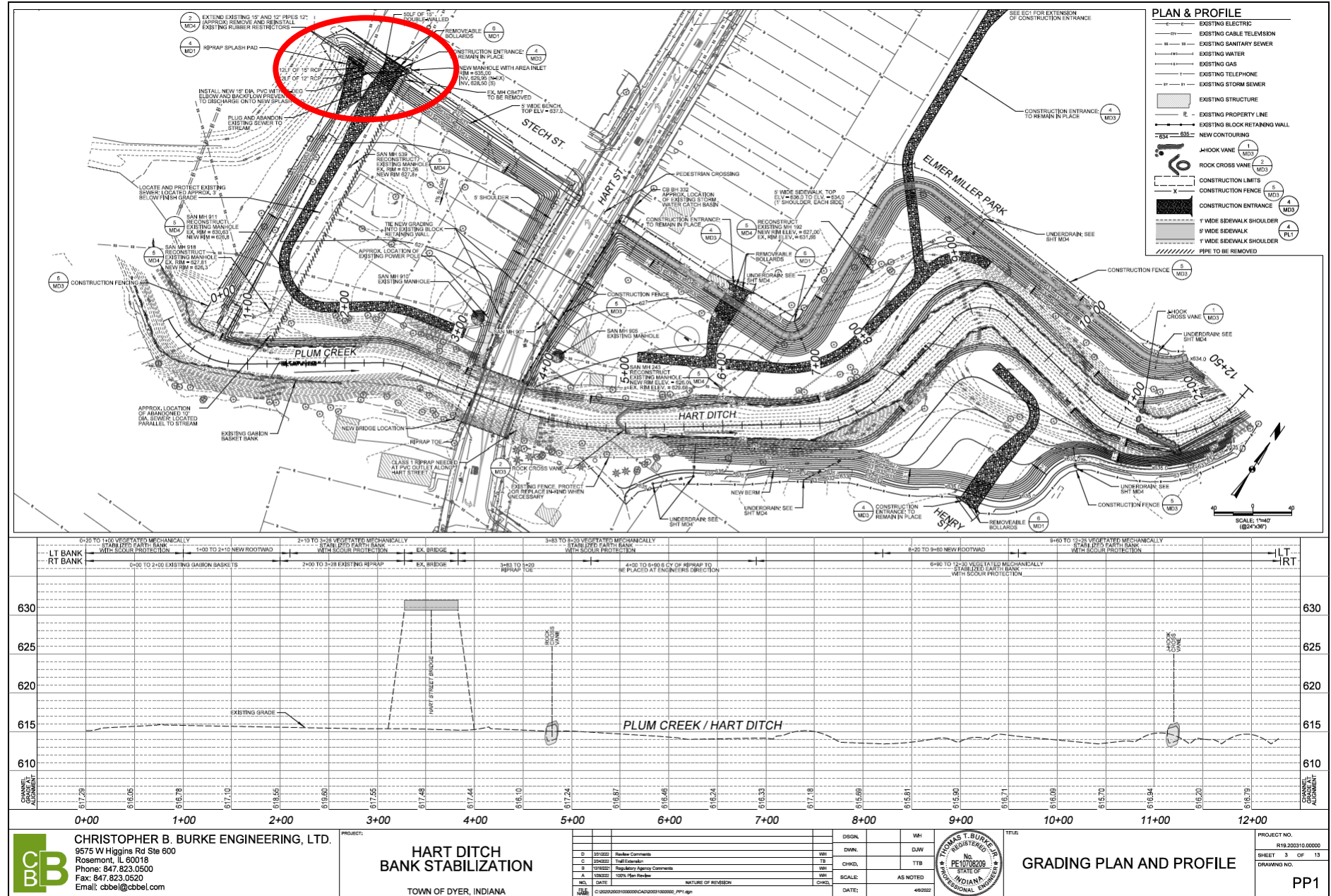
PROJECT NO. R18-202310-0000
 SHEET 3 OF 13
 DRAWING NO. PP1



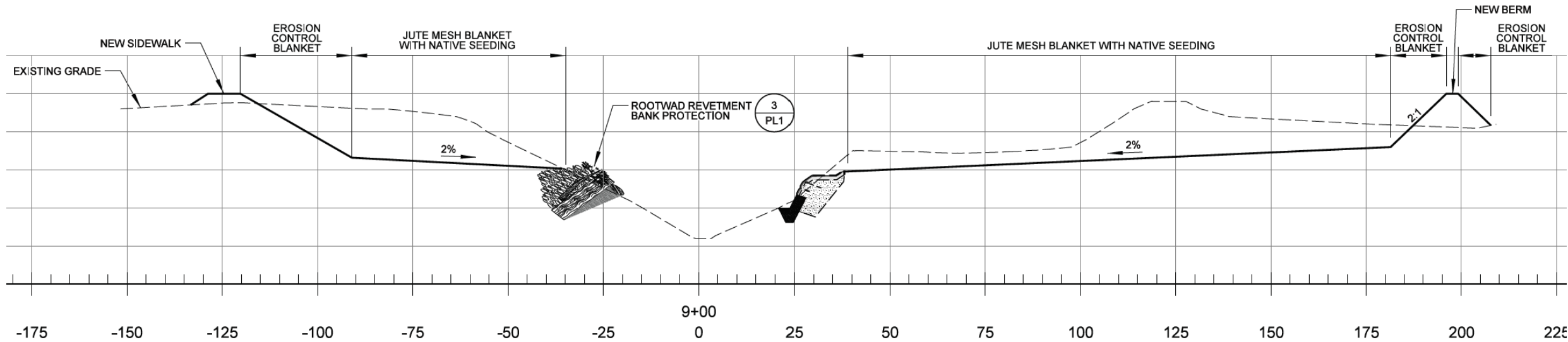
Alternative protection for hospital

Install emergency concrete jersey barriers each time a flood was possible across entrances

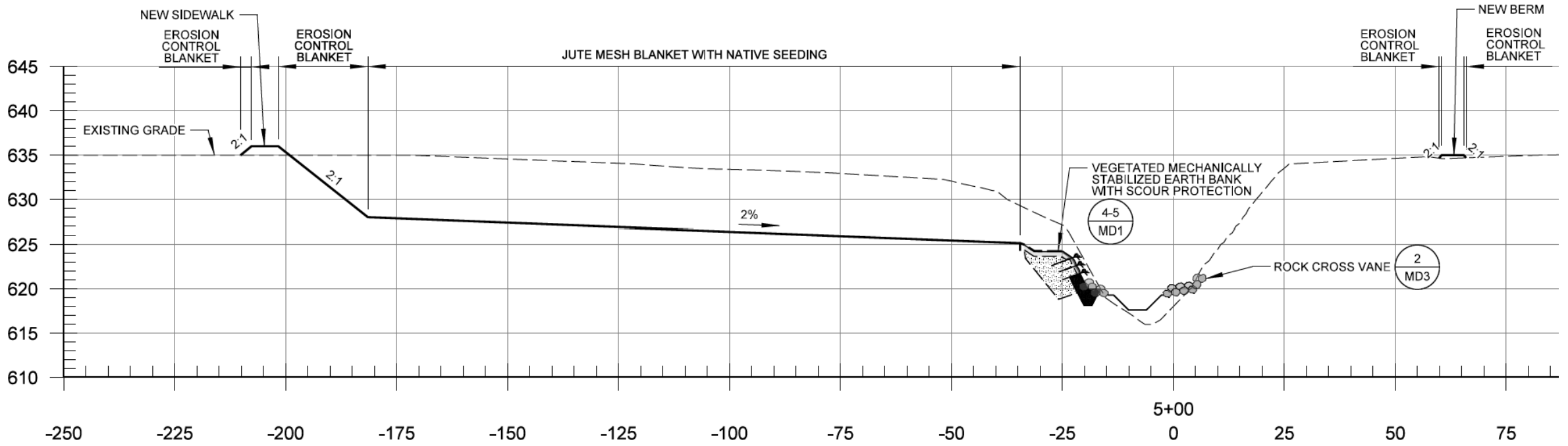
Design to tie into hospital berm



Design Cross-sections



Design Cross-sections



Tree removal in March 2022





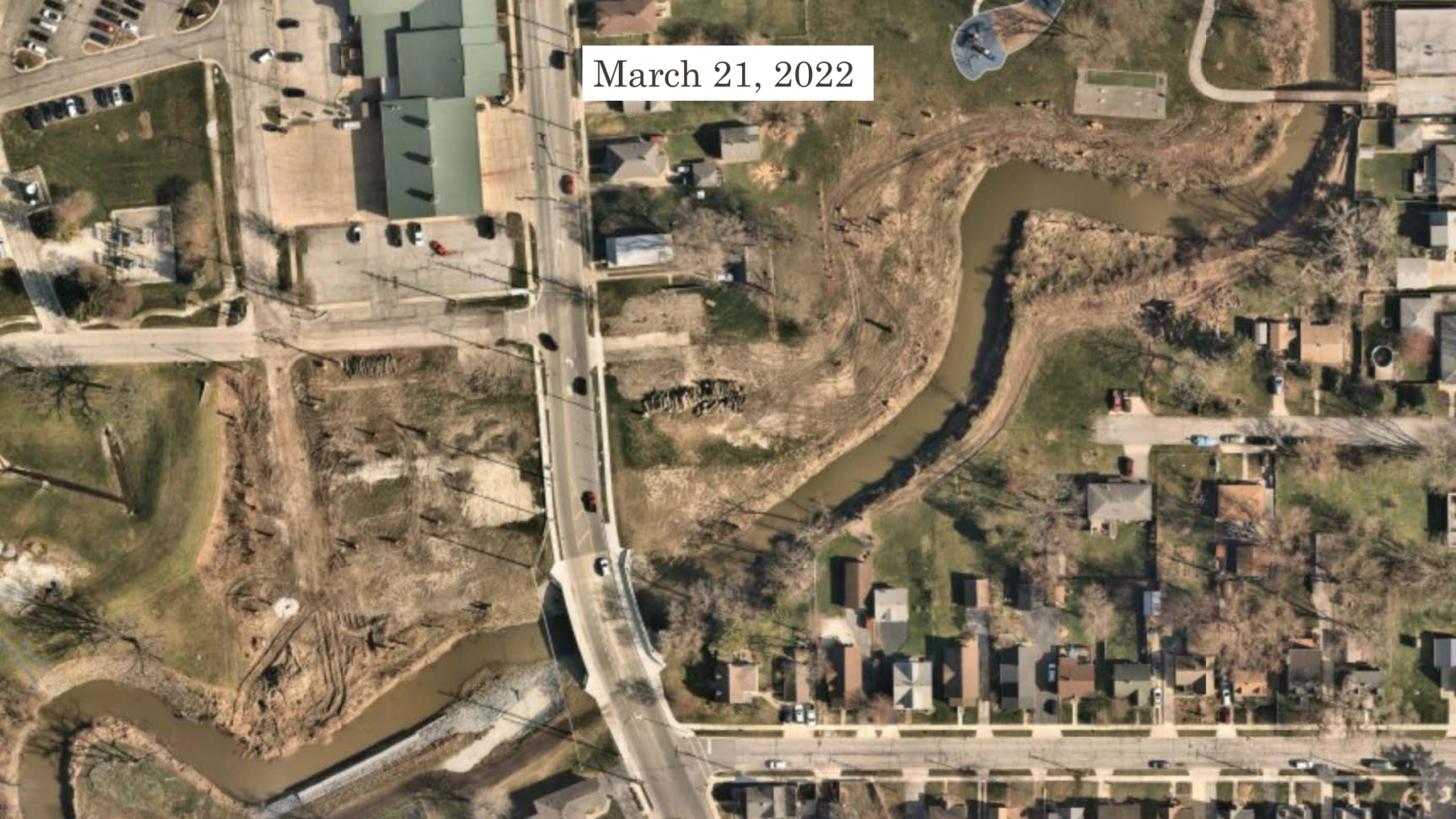
New 3 lane Hart Street Bridge







March 21, 2022



Construction begins June 2022





Early July 2022













DEERE

D17E
CONSTRUCTION

Surveying tripod

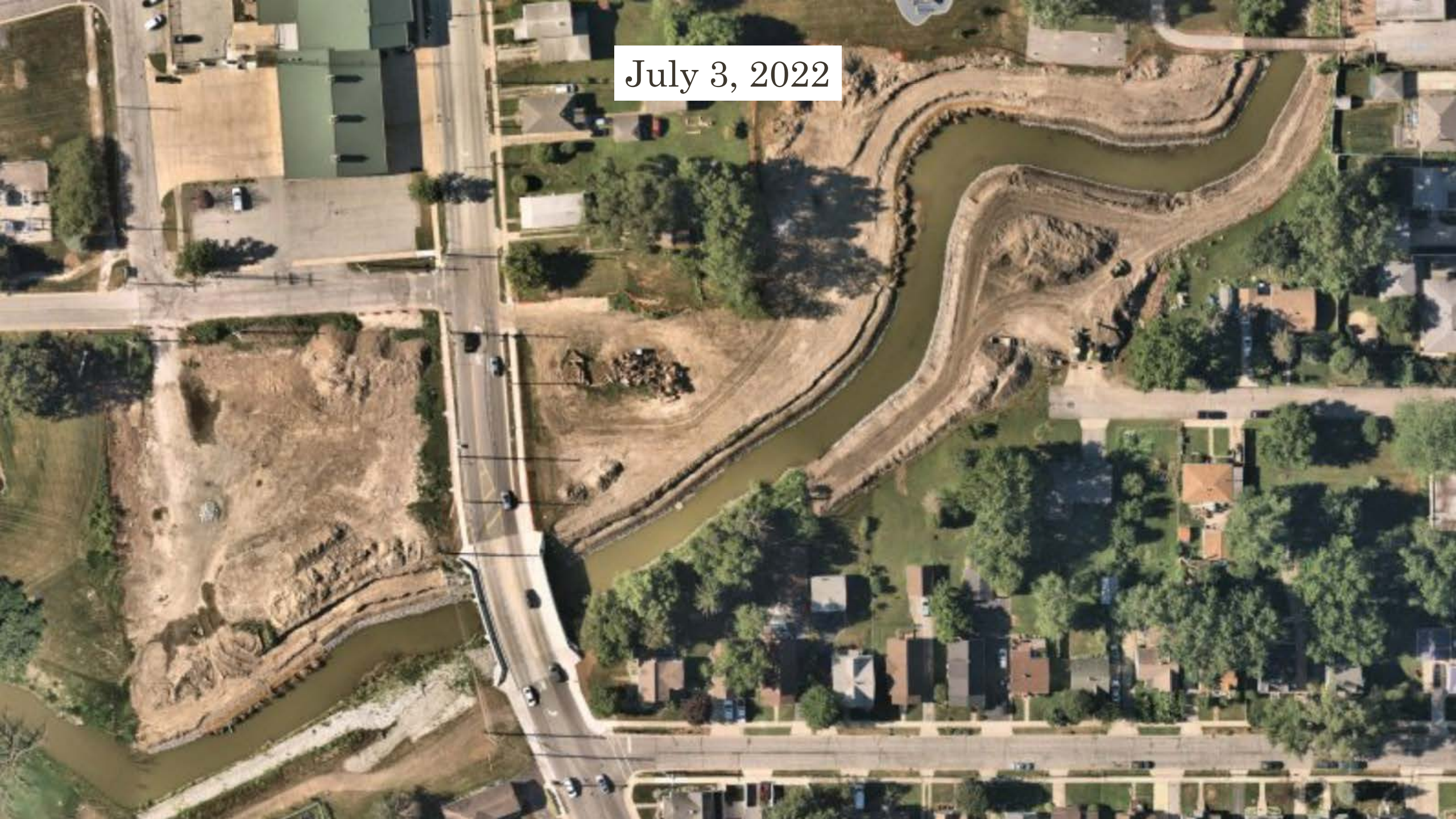
Worker in orange vest

Church steeple

Wooden bridge

Orange safety fence

July 3, 2022



Early August 2022















Rootwads

- Trees from site
- Easy installation



Video from August 14, 2022

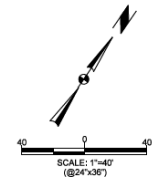
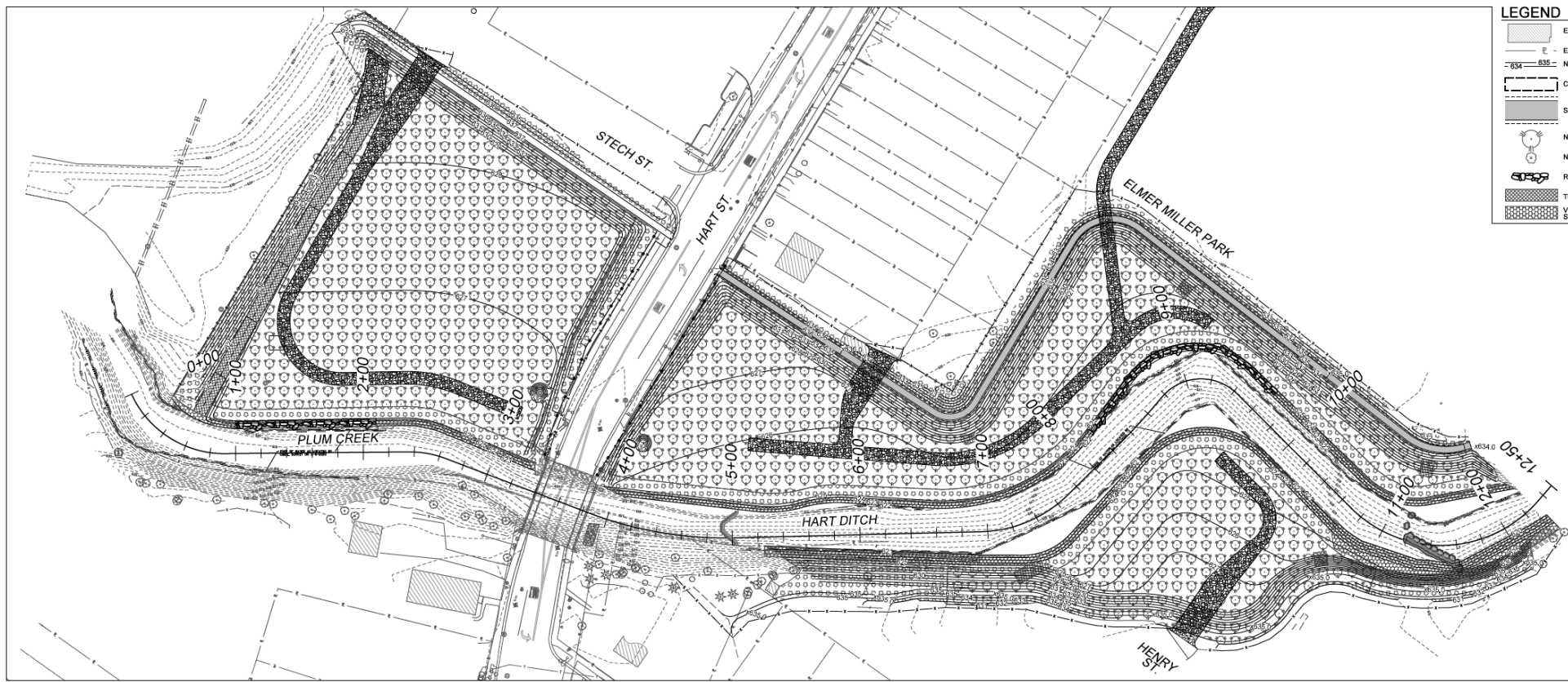




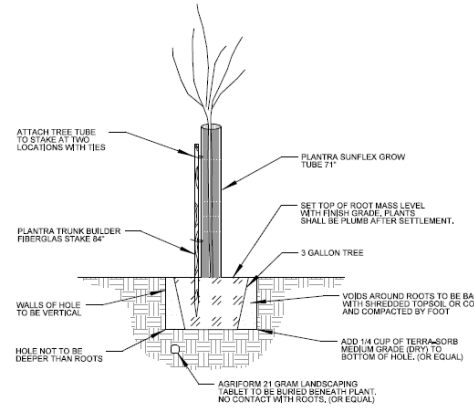
Sept. 28, 2022 Photos

- Backflow preventors on all storm sewers
- Landcaping
 - Trees - 775
 - Shrubs - 500
 - Live stakes - 1,167

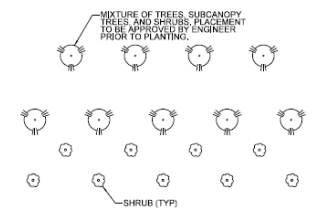
LEGEND	
	EXISTING STRUCTURE
	EXISTING PROPERTY LINE
	NEW CONTOURING
	CONSTRUCTION LIMITS
	SIDEWALK PAVEMENT
	NEW TREES AND SHRUBS, 12' O.C.
	NEW SHRUBS 12' O.C.
	ROOTWAD REVETMENT
	TURF REINFORCEMENT MATERIAL
	VEGETATED MECHANICALLY STABILIZED EARTH BANK



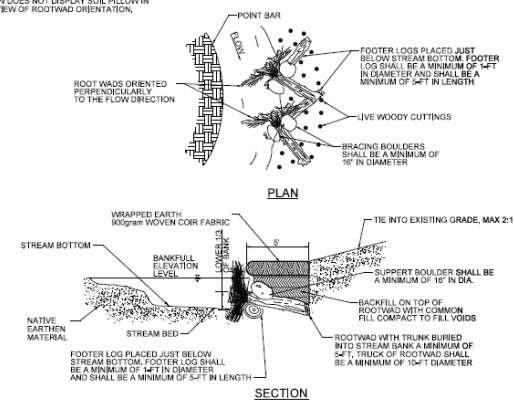
NOTE: ROOTWADS ARE ORIENTED PERPENDICULARLY TO THE FLOW DIRECTION. PLAN VIEW DOES NOT DISPLAY SOIL PILLOW IN ORDER TO PROVIDE VIEW OF ROOTWAD ORIENTATION.



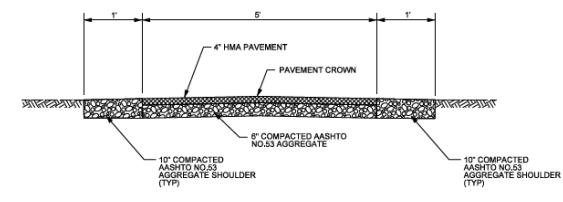
1 CONTAINER TREE PLANTING DETAIL
NOT TO SCALE



2 TREE AND SHRUB SPACING DETAIL
NOT TO SCALE



3 ROOTWAD DETAIL
NOT TO SCALE



4 SIDEWALK PAVEMENT DETAIL
NOT TO SCALE





















Sept 20, 2022



Live Stake Planting – Dec. 13, 2022













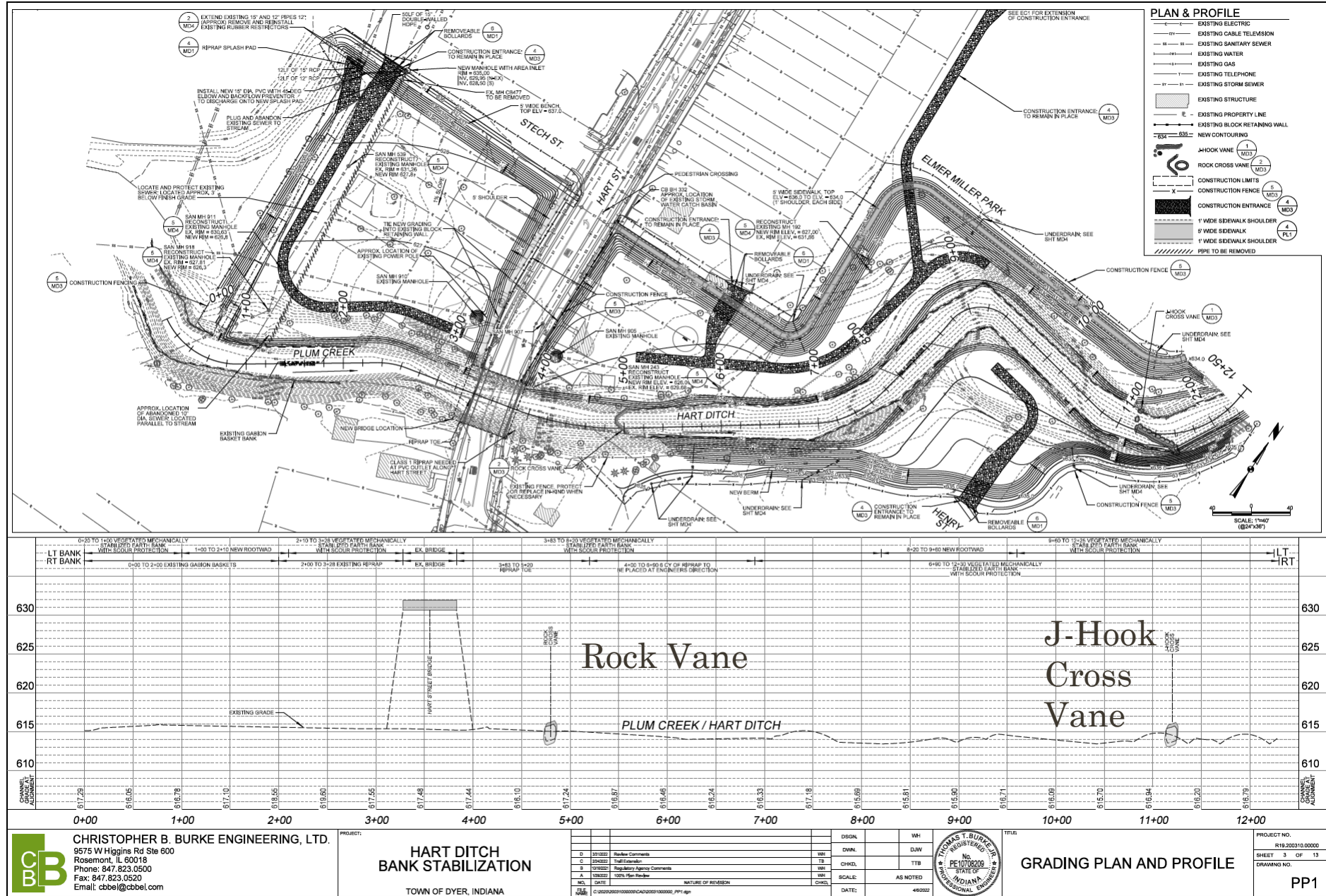
12.13.2022

Aerial video from Feb. 28, 2023

- <https://play.survae.com/?ll=41.49173550409626,-87.520862&z=17&mr=1&account=117&page=1&obj=BRbWjTOYpGnO&utc=1677608953842>

Benefits

- Walking path
- Access path for maintenance
- Stopped overtopping to the south
- Provided protection for the hospital
- Creates 14.5 acre-feet of online flood storage
- Lowers the WSEL up to 0.9 feet



Signage

Rootwads, J-Hooks, and Rock Vanes

What are they? Here are a few ways Hart Ditch/Plum Creek was transformed.

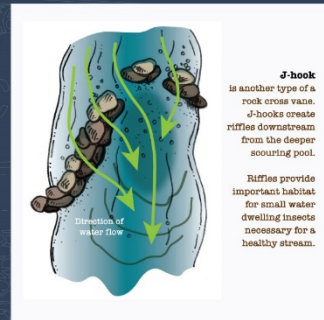
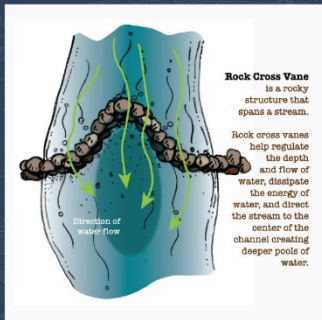
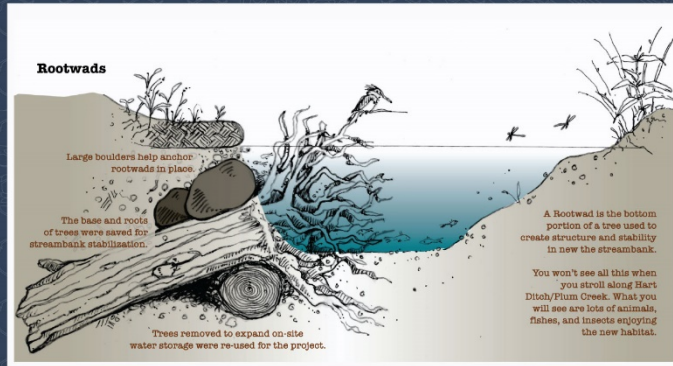
Water flowing through a community can be its most incredible beauty and a welcome asset.

Community leaders came together and embarked upon a multi-year project employing dozens of solutions and thousands of hours to transform Hart Ditch/Plum Creek into a beautiful natural asset.

A Do-Over

Top-to-bottom, side-to-side, Hart Ditch/Plum Creek needed a complete do-over. The earth along the creek was respalted to ensure a healthy flow of water. Hundreds of native trees, shrubs, grasses, and wildflowers were planted along the waterway.

Rootwads, J-hooks, rock vanes, and 2-stage benches are also some of the many solutions used for the urban stream restoration of Hart Ditch/Plum Creek.



Healthy Neighborhoods Need Healthy Environments

We all live in neighborhoods

Our neighborhoods include... food, shelter, water, and safe places for us to grow.

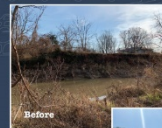
Birds, mammals, fishes, aquatic creatures,

A local long-term solution was needed

For most of its history, Hart Ditch/Plum Creek could have been a better asset in the Town of Dyer. Upstream issues caused problems the Town of Dyer had no control over.

Sediment washed downstream, thickly coating the creek bed prohibiting a healthy environment. The waterway constantly overflowed its banks, causing repeated flooding of nearby homes and roadways, impacting the hospital grounds and buildings. There was no public access to the waterway as the banks were nearly vertical.

A local long-term solution was designed and implemented.

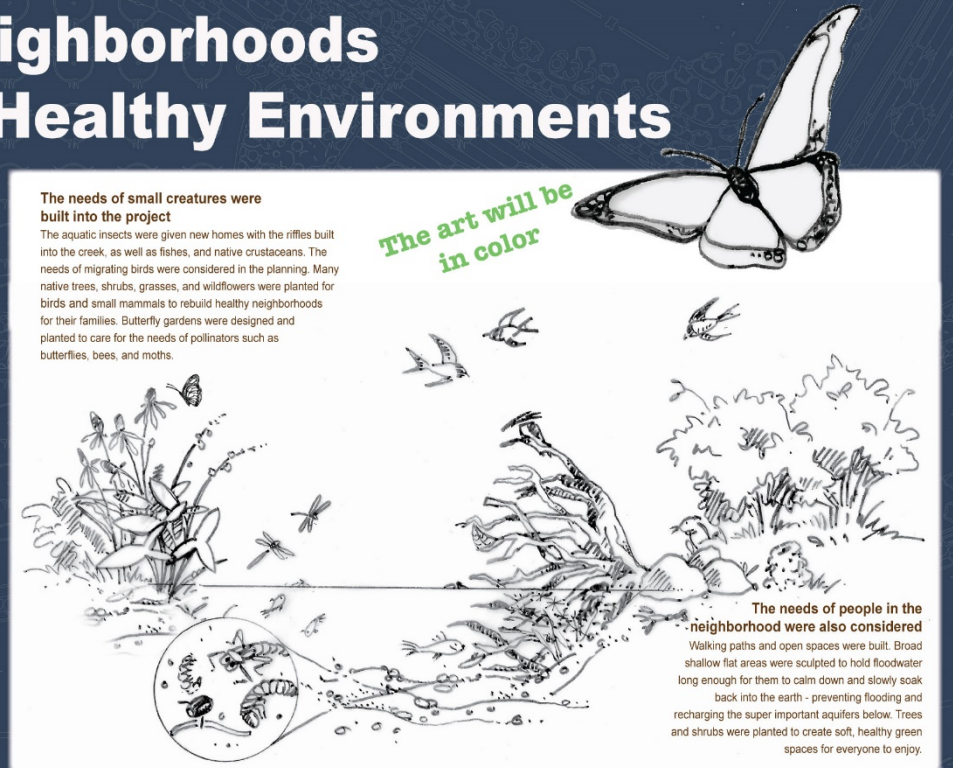


Project Partners:
Town of Dyer Stormwater Management Board
Lake County Surveyor's Office
Franciscan Hospital Dyer
Little Calumet River Basin Development Commission
Lake Michigan Coastal Program
Lake County Highway Department

The needs of small creatures were built into the project

The aquatic insects were given new homes with the riffles built into the creek, as well as fishes, and native crustaceans. The needs of migrating birds were considered in the planning. Many native trees, shrubs, grasses, and wildflowers were planted for birds and small mammals to rebuild healthy neighborhoods for their families. Butterfly gardens were designed and planted to care for the needs of pollinators such as butterflies, bees, and moths.

The art will be in color



The needs of people in the neighborhood were also considered

Walking paths and open spaces were built. Broad shallow flat areas were sculpted to hold floodwater long enough for them to calm down and slowly soak back into the earth - preventing flooding and recharging the super important aquifers below. Trees and shrubs were planted to create soft, healthy green spaces for everyone to enjoy.

Project Partners:
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Franciscan Hospital Dyer
Little Calumet River Basin Development Commission
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Lake County Highway Department



Questions?

Thomas Burke and Bryan Lane

