Sand Creek / Cumberland Road Flood Control

A presentation brought to you by: Fishers, Hamilton County, Christopher B. Burke Engineering, and American Structurepoint

CHRISTOPHER B. BURKE ENGINEERING, LLC

HAMILTON COUNTY INDIANA SURVEYOR'S OFFICE

Fishers Stormwater Utility — Soap Dirt Oil Paint — Protecting Our Waterways — Drainage · Floodplain · Water Quality

HAMILTON COUNTY HIGHWAY DEPT

AMERICAN STRUCTUREPOINT INC.

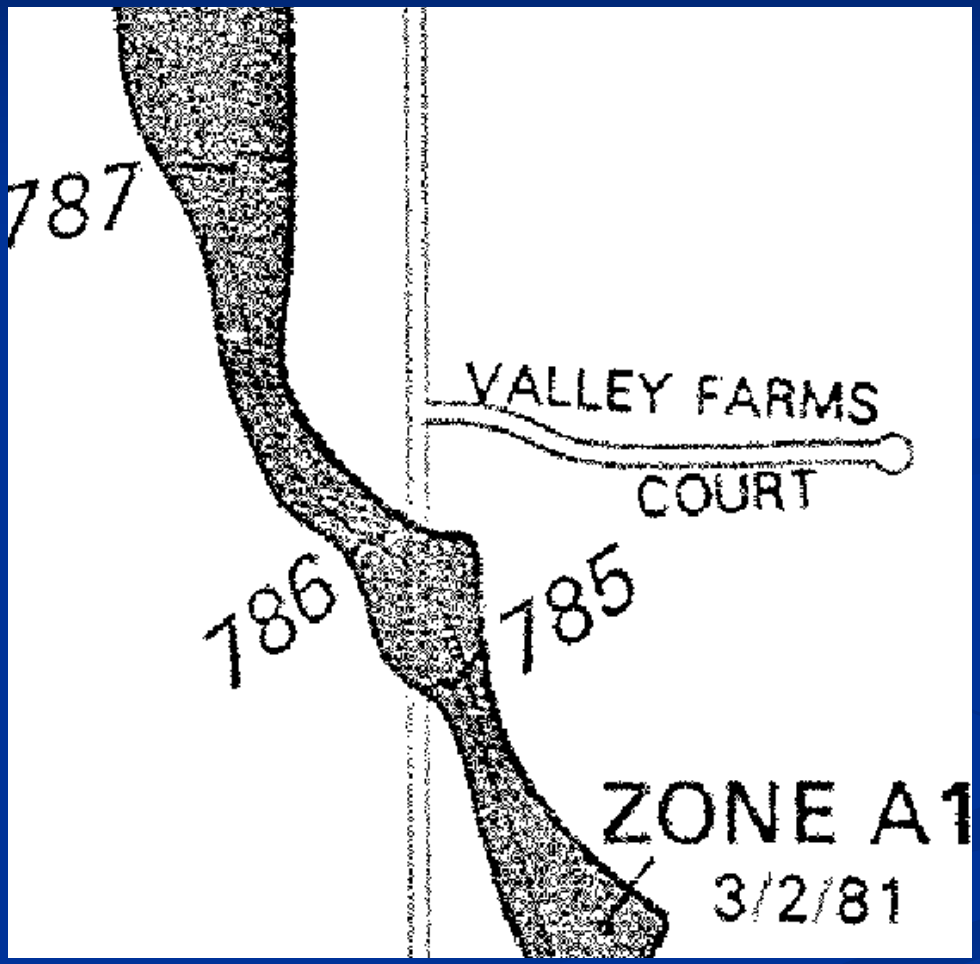
Outline

- Early Map History
- Project Background
- Timeline
- Roles
- Goals
- Flood Protection Study and Preliminary Modeling
- Solution Alternatives
- Preliminary Design
- Resident Meetings
- Final Design
- Construction
- Resident Feedback

Early Map History

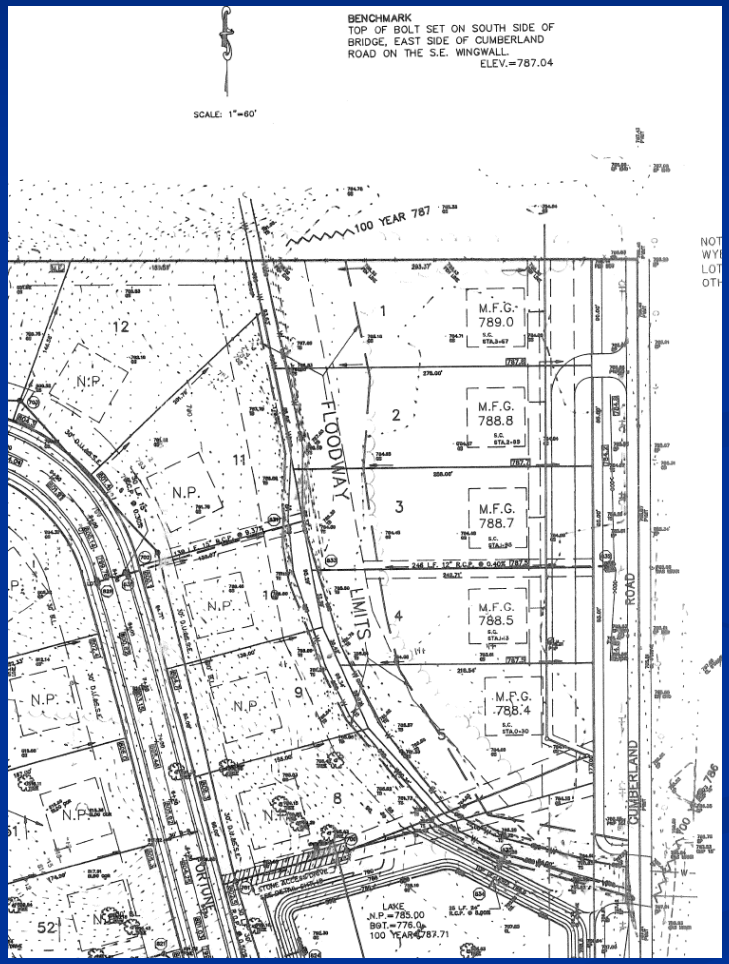
Early Map History

1983 FIRM Map



Early Map History

Walnut Creek Development Plan

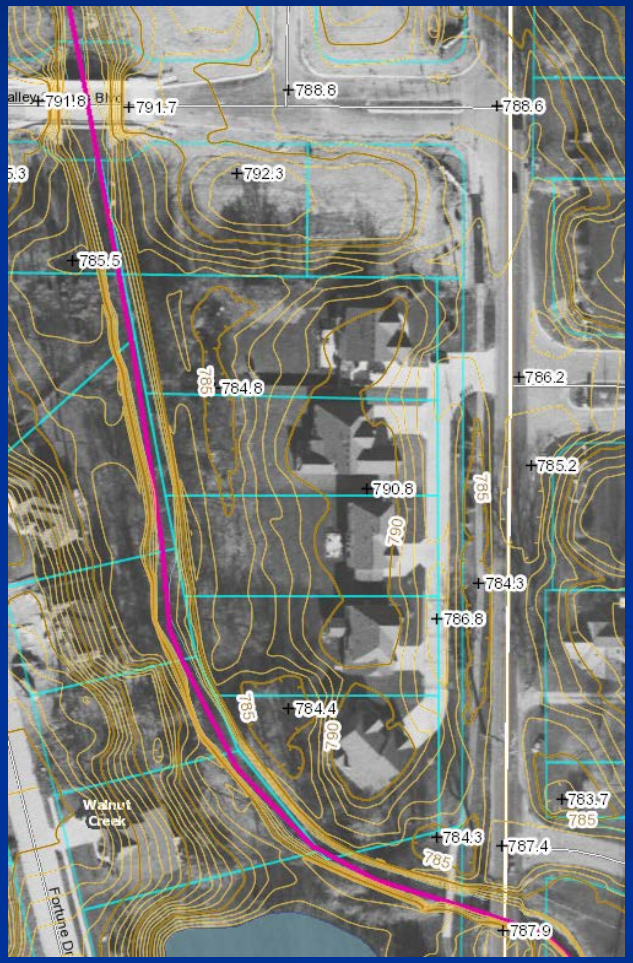


Early Map History

1996 Aerial Photo with 2011 Topo

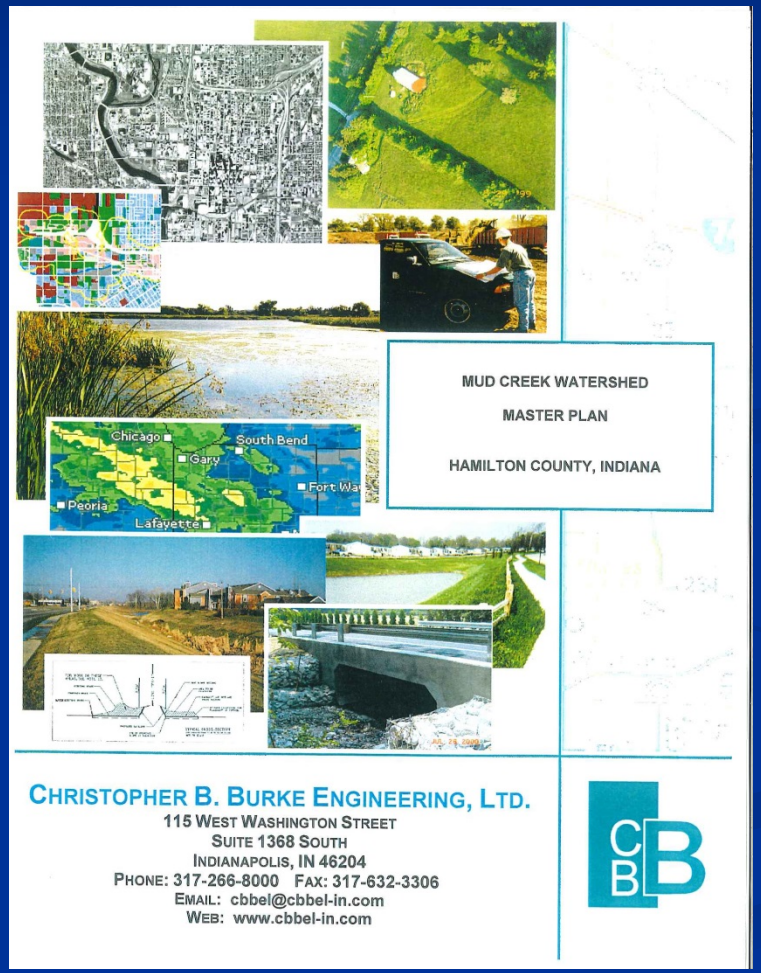
Early Map History

1998 Aerial Photo with 2011 Topo



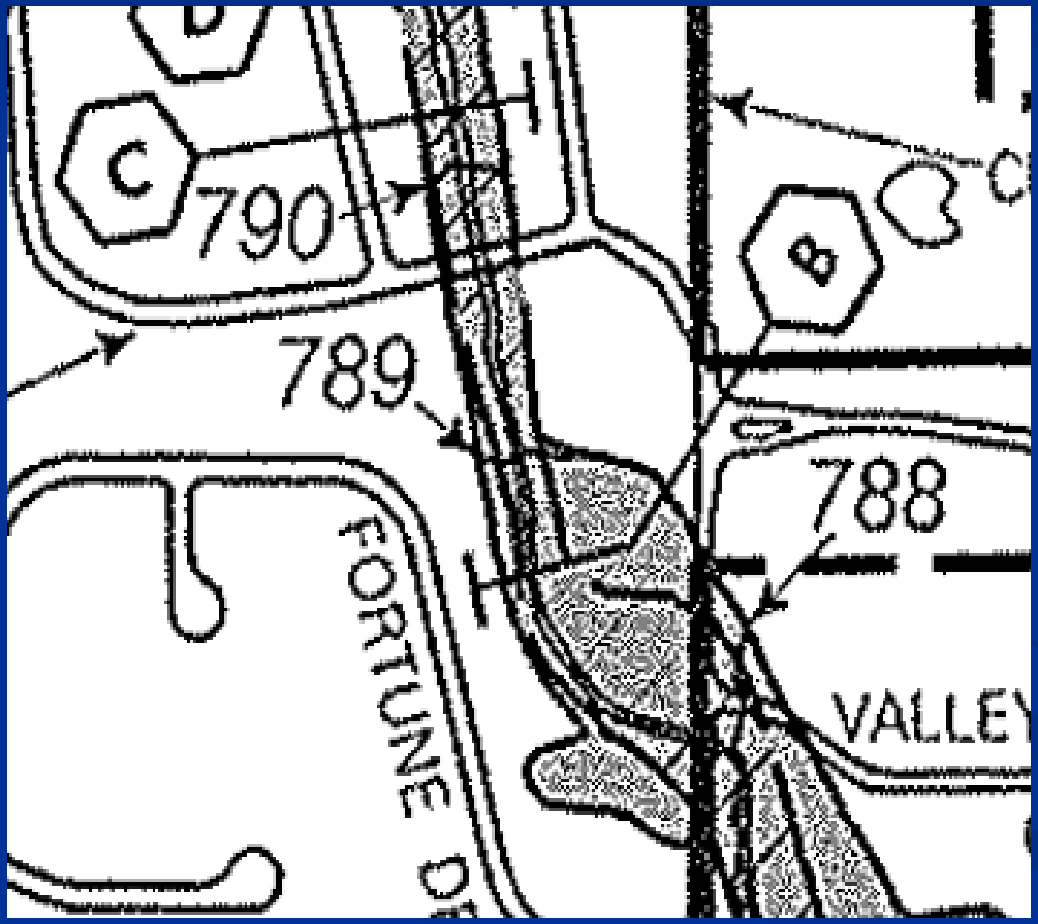
Early Map History

1997 Mud Creek Watershed Master Plan



Early Map History

2003 FIRM



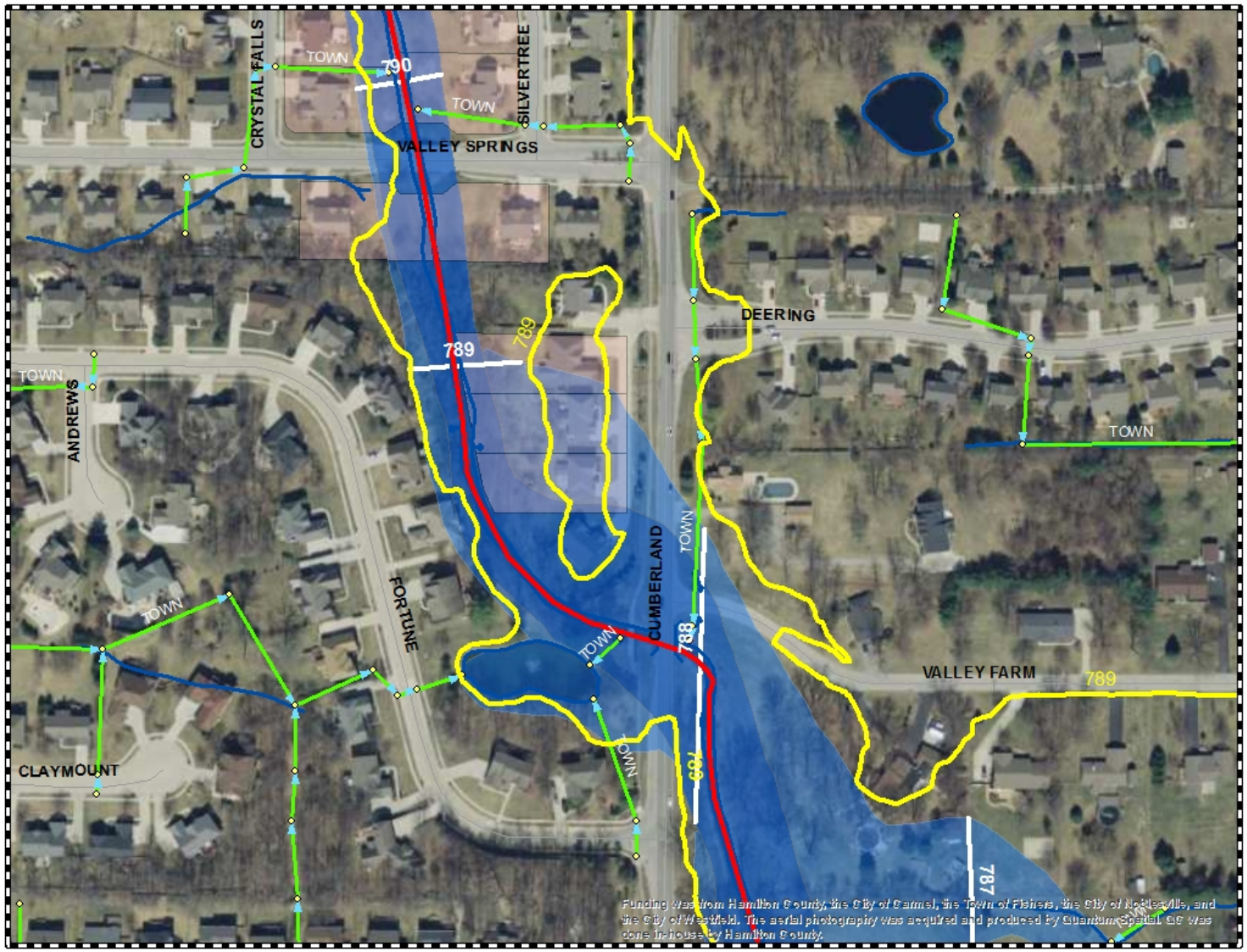
Project Background

- Project initiated from resident complaints
  - Frequent sump pump operation/basement flooding
  - Access to Cumberland Road from resident driveways not possible
  - Cumberland Road impassable between 10 and 25 year event
  - Bridge overtopping
  - Storm sewers undersized and backing up

- Reasons for Flood Issues
  - Road and portions of properties in the floodplain
  - Water short circuiting out of creek banks and through a backyard swale into road
  - Basements built too far into the groundwater table set by creek elevation
  - Bridge elevation below the floodplain elevation
  - Road elevation below the floodplain elevation
  - Increased high intensity storm frequencies recently caused this to be more of a concern than before

Project Background

Project Background



Timeline

- FEMA Map History begins (1983)
- Homes Constructed (~1998)
- 100 Year Plus Flood Levels (June 2003)
- County Commissioners Contacted by Residents (Spring 2010)
- County Commissioner Visits City of Fishers to Discuss (Spring 2010)
- 100 Year Flood Levels Reached due to Frozen Ground (February 2011)
  - Flood Photos on Nightly News
- Sand Creek Flood Protection Study Proposal (April 2011)
- Sand Creek Flood Protection Study (June 2011)
- County Drainage Board Initial Commitments (June-July 2011)
- Christopher B. Burke Engineering, Ltd. Contracted for 2-Stage Ditch Design by Hamilton County Surveyor's Office (October 2011)
- A&F Engineering Contracted for Road Elevating Design by Fishers (November 2011)
- Road Elevating Project Design Postponed Due to Funding Issues (February 2012)
- American Structurepoint Contracted for Bridge Replacement/Road Elevation Design Combined Project by Highway Dept. (Summer 2012)

Timeline-Continued

- Public Meeting (April 2013)
- Adjacent Property Owners Meeting (May 2013)
- Project Construction Delayed Due to Resident Related Design Concerns w/Berm Locations (July 2013)
- Adjacent Property Owners Update Meeting (September 2013)
- Adjacent Property Owners Update Meeting (December 2013)
- Interlocal Agreement Signed Between Hamilton County and Fishers for Bridge/Road Construction (February 2014)
- 2-Stage Bridge Construction Begins (April 2014)
- Bridge/Road Construction Begins (May 2014)
- 2-Stage Ditch Construction Substantial Completion (September 2014)
- Bridge/Road Construction Substantial Completion (November 2014)
- Bridge/Road Final Completion Date (2015 TBD)

Roles

- Hamilton County Commissioners and Drainage Board
  - Initial resident interaction
  - Commitment of funds for flood protection study and 2-stage ditch design/construction
- Hamilton County Surveyor's Office
  - Contracted with Christopher B. Burke Engineering for flood protection study and 2-stage ditch design
    - Flood protection study and flood depth mapping ($29,500)
    - Design and construction of 2-stage ditch ($151,255.97)
  - Resident interaction and management of 2-stage ditch

Goals

- Primary Goals
  - Cumberland Road Passable for 100 Year Flood Event
  - Resident Access to Cumberland Road for 100 Year Flood
  - Construction of Bridge and Road Above 100 Year Elevation
  - Eliminate Standing Water Along Roadway from Undersized Storm Sewers
- Secondary Goals
  - Lower overall flood elevations in the vicinity
  - Decrease the frequency of sump pump operation

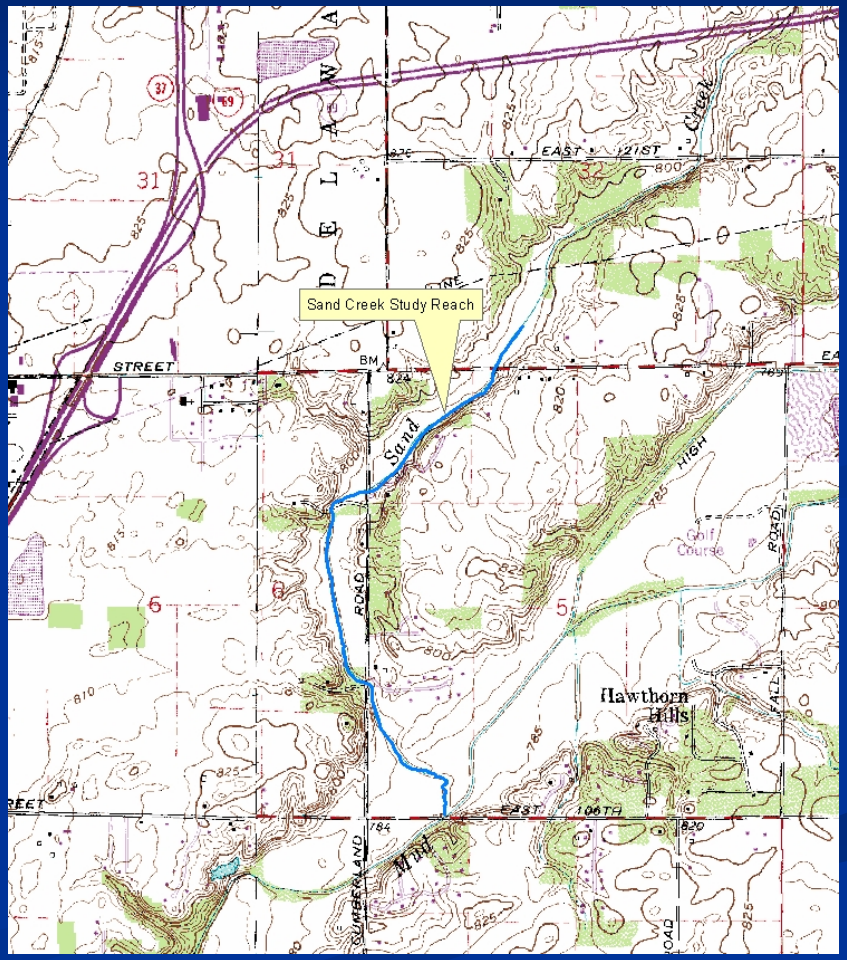
Roles

- Hamilton County Highway Dept.
  - Design and construction management of the bridge replacement and the road elevating portion of the project
  - Funding of the bridge replacement portion of project ($860,000)
  - Fielded resident interaction for bridge/road project
  - Contracted with American Structurepoint for bridge/road elevating project ($231,119)

- City of Fishers
  - Overall project management of all related project goals
  - Managed communication with residents until construction phase
  - Contracted with Christopher B. Burke Engineering for storm sewer analysis and design of east side storm sewer upgrades ($14,500)
  - Contracted with American Structurepoint for survey related work ($22,400)
  - Funding of the road elevating and eastern storm sewer upgrades construction through interlocal agreement with Highway Dept. ($400,000)

Drainage Study & Preliminary Modeling

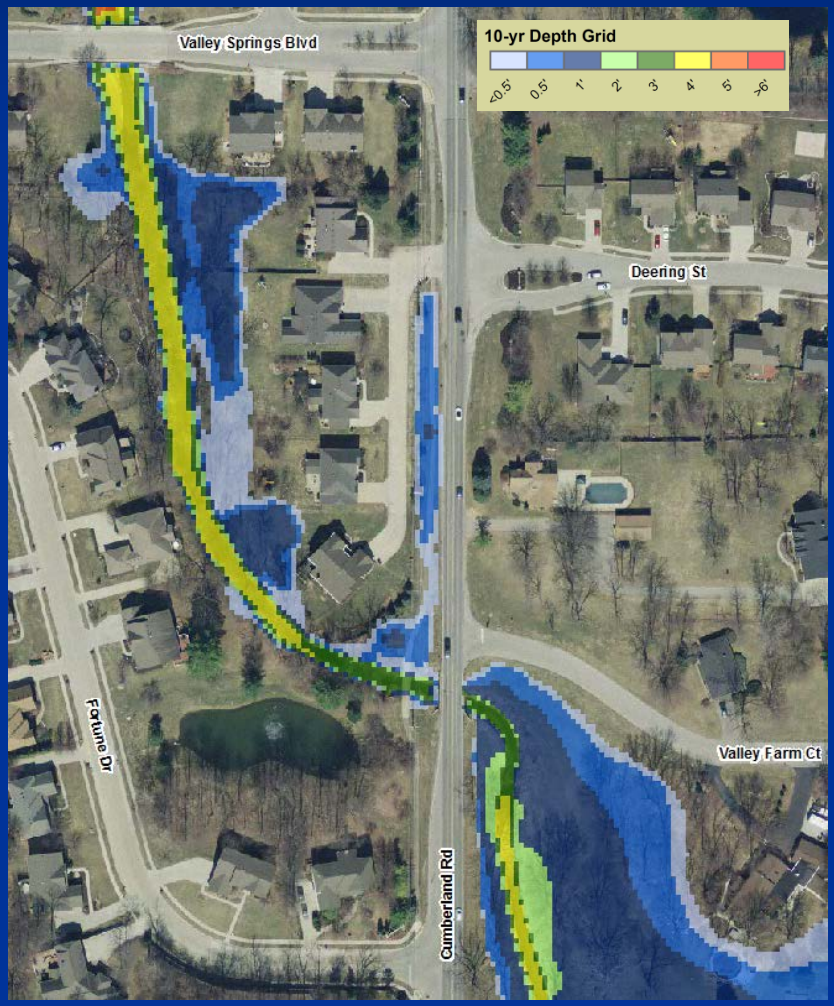
- CBBEL developed models to evaluate conditions
- Hydrologic model recalibrated based on 2003 and 2011 storm events
- Hydraulic model updated to reflect more detailed topographic data



Annotated McCordsville USGS Quadrangle Map

Drainage Study & Preliminary Modeling

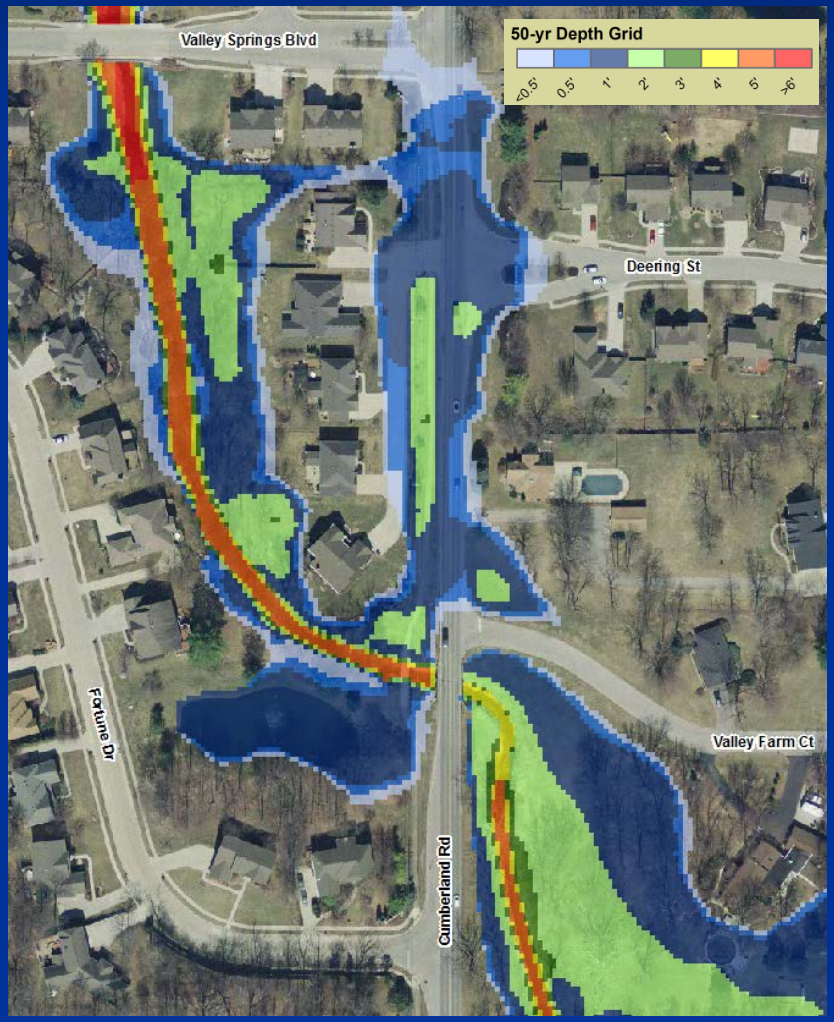
10-yr Event



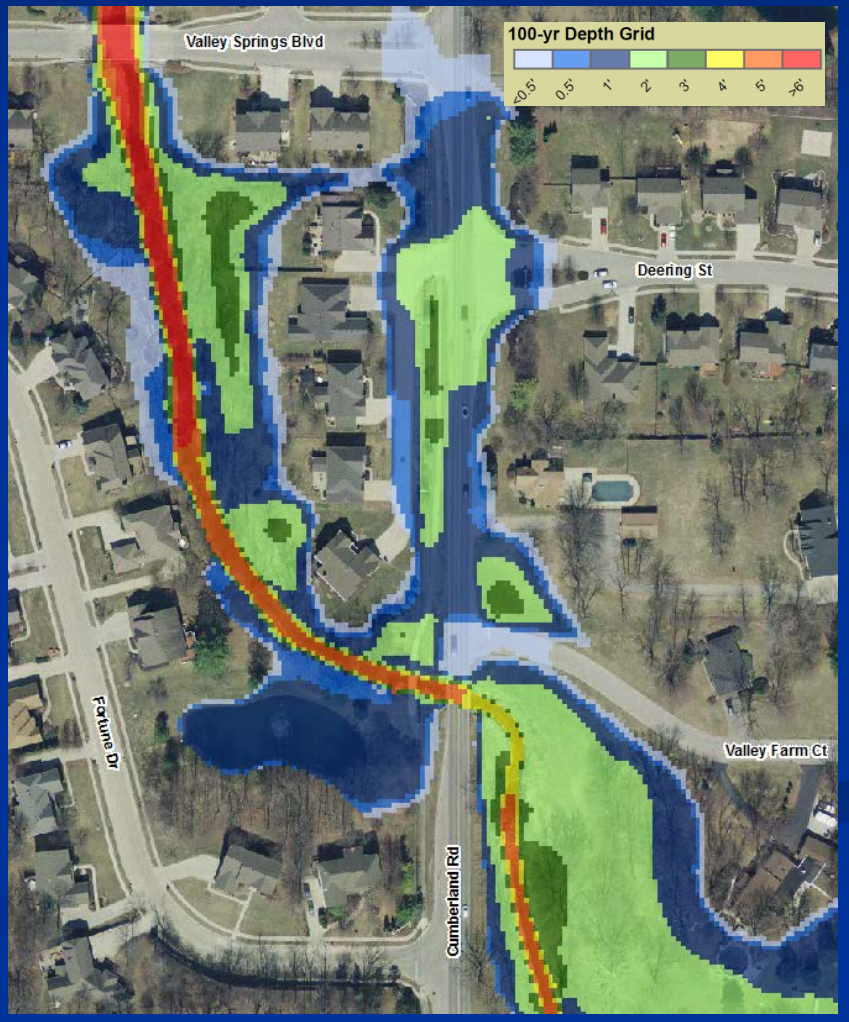
25-yr Event

Drainage Study & Preliminary Modeling

50-yr Event



100-yr Event



Drainage Study & Preliminary Modeling

June 2003 Event

February 2011 Event

Source: Fishers Indiana Flood Windermere - February 2011 - Houseman Production
https://www.youtube.com/watch?v=8oClVSN7YWk

Solution Alternatives

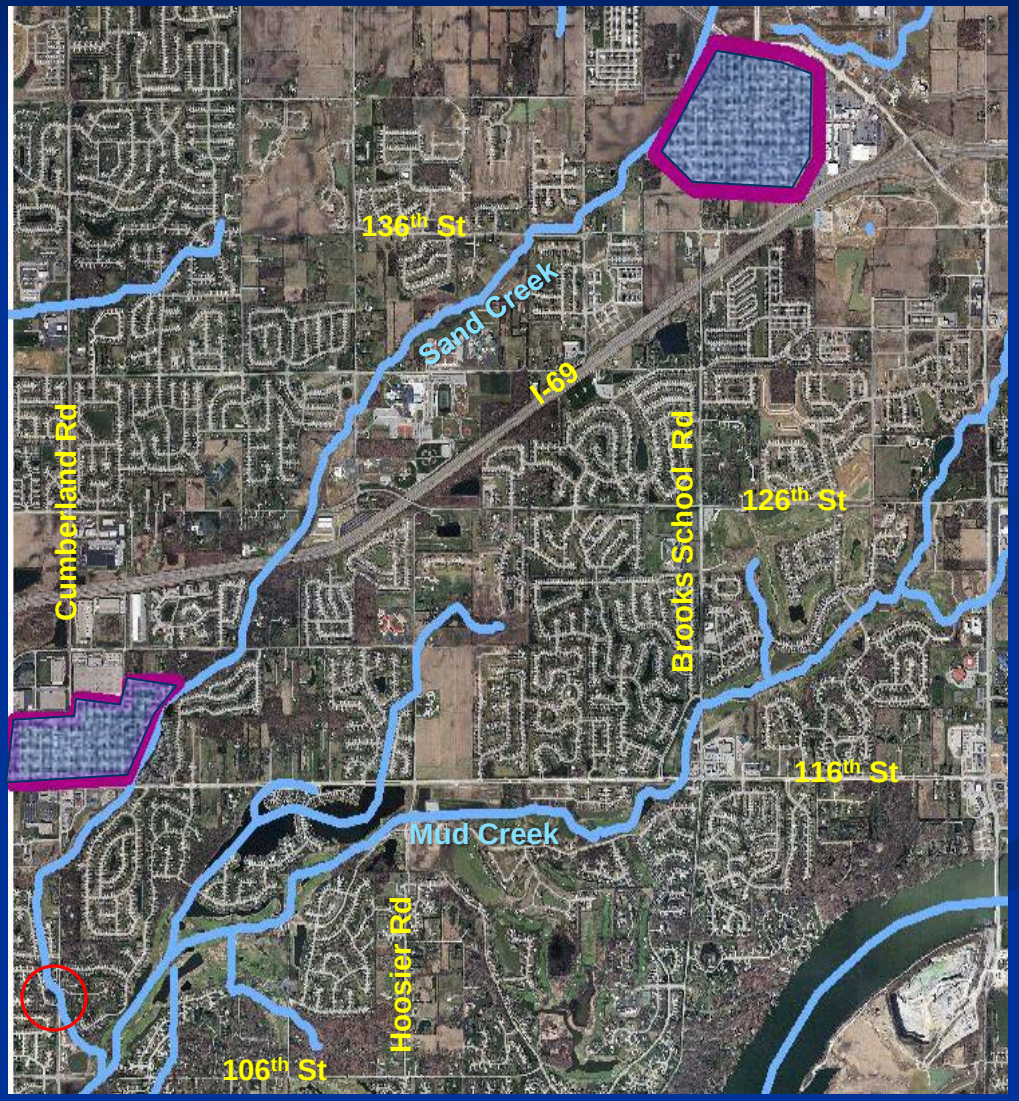
Alt. 1 - Off-line Detention

Conceptual off-line detention
- 425 Ac-ft basin
- 575 Ac-ft basin

Results:

- Cumberland Road protected to approximately 50-year level
- Minor benefits on Mud Creek
- Expensive **(>$25M)**

NOT RECOMMENDED



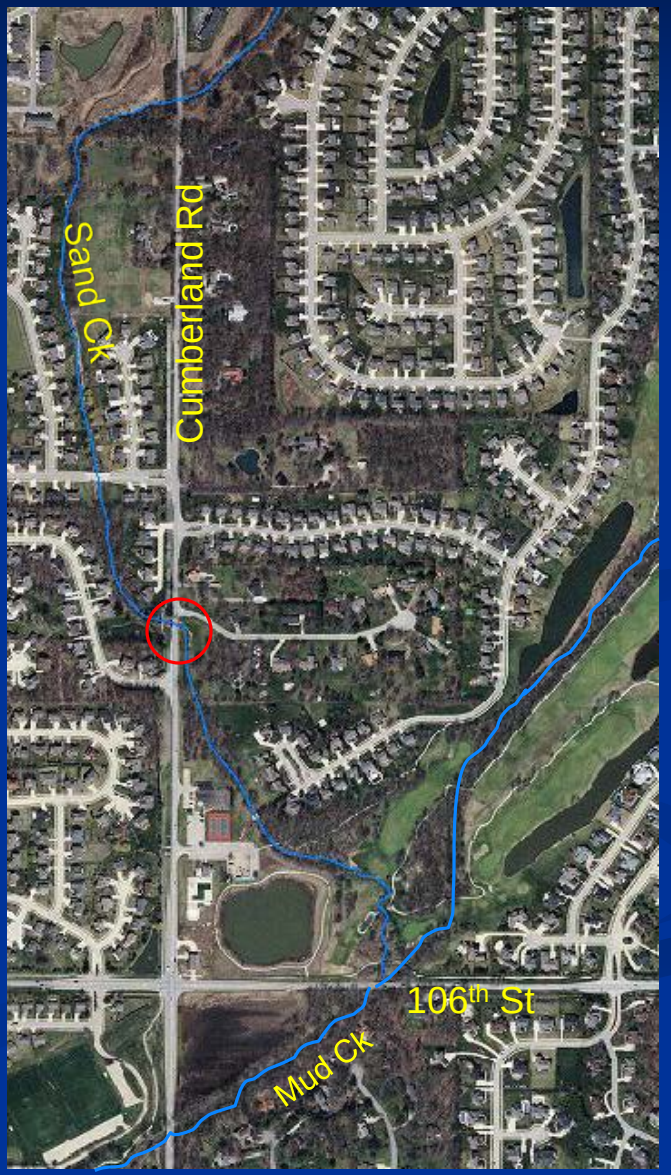
Solution Alternatives

Alt. 2 - Reduce Mud Creek Flood Elevations

Results:

- Maximum 0.2-foot flood reduction at Cumberland Road
- Larger flood reduction near Mud Creek

NOT RECOMMENDED



Solution Alternatives

Alt. 3 - Clear Trees & Brush along Sand Creek

Results:

- Maximum reduction for 100-yr flood of 0.1 foot
- Maximum reduction of 0.2 foot for smaller floods

NOT RECOMMENDED

Solution Alternatives

Alt. 4 - 2-Stage Ditch

- 1,000 linear feet
- 3:1 slidslopes with 25 foot shelf
- 100-foot top width
- Low flow channel undisturbed
- Within typical regulated drain easement

Results:

- ➢ Roadway flooding at 25-yr event
- ➢ 0.4-foot reduction for 100-yr event
- ➢ Road overtops by 1.0 foot during 100-yr event
- ➢ Estimated cost = $830,000

NOT RECOMMENDED

Solution Alternatives

Alt. 5 – Replace Bridge

- Replace with 50-ft x 7-ft Conspan arch
- Remove pedestrian bridge
- Widen channel to accommodate new larger bridge opening

Results:

- Roadway flooding at 25-year event
- 0.8-foot reduction for 100-year event
- Road overtops by 0.7 ft during 100-yr event
- Estimated cost: $650,000

NOT RECOMMENDED

Former Cumberland Road Bridge

Solution Alternatives

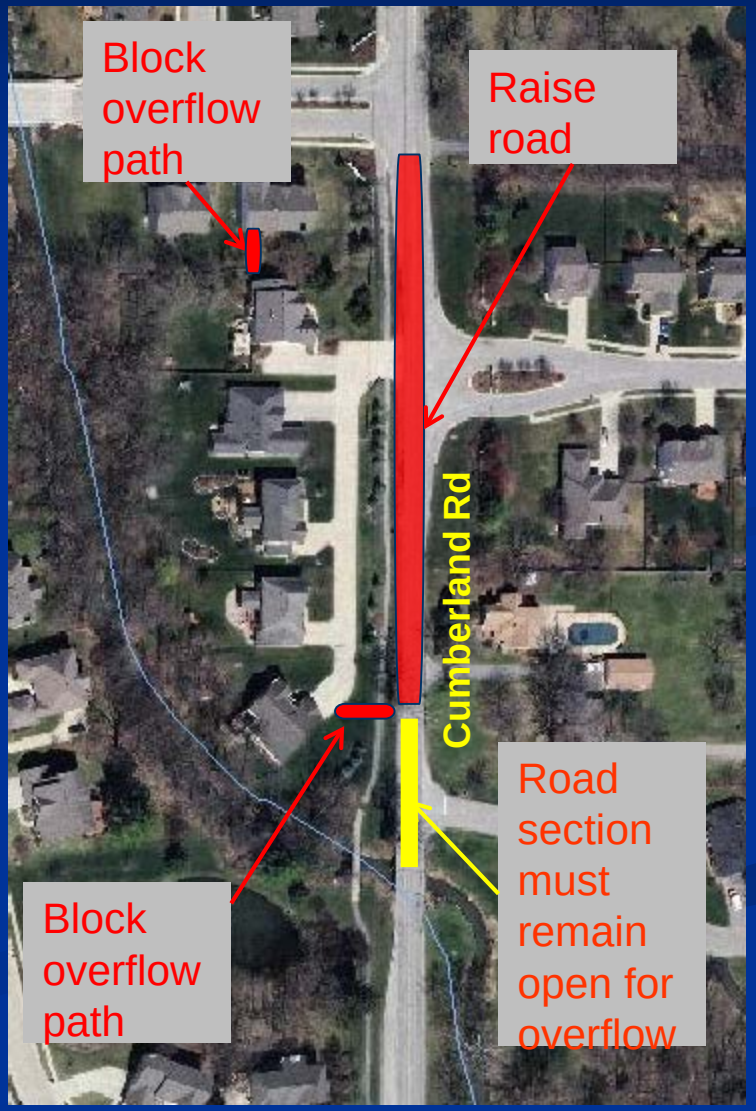
Alt. 6 – Raise Road and Block Overflow Paths

- Raise 525 feet of road above 100-yr elevation
- Block north and south overflow paths

Results:

- ➢ No impacts to flood elevations
- ➢ Road floods near bridge during 10-yr event
- ➢ 1.5 feet of overtopping during 100-yr event
- ➢ Access to the north for area residents
- ➢ Estimated cost: $170,000

NOT RECOMMENDED

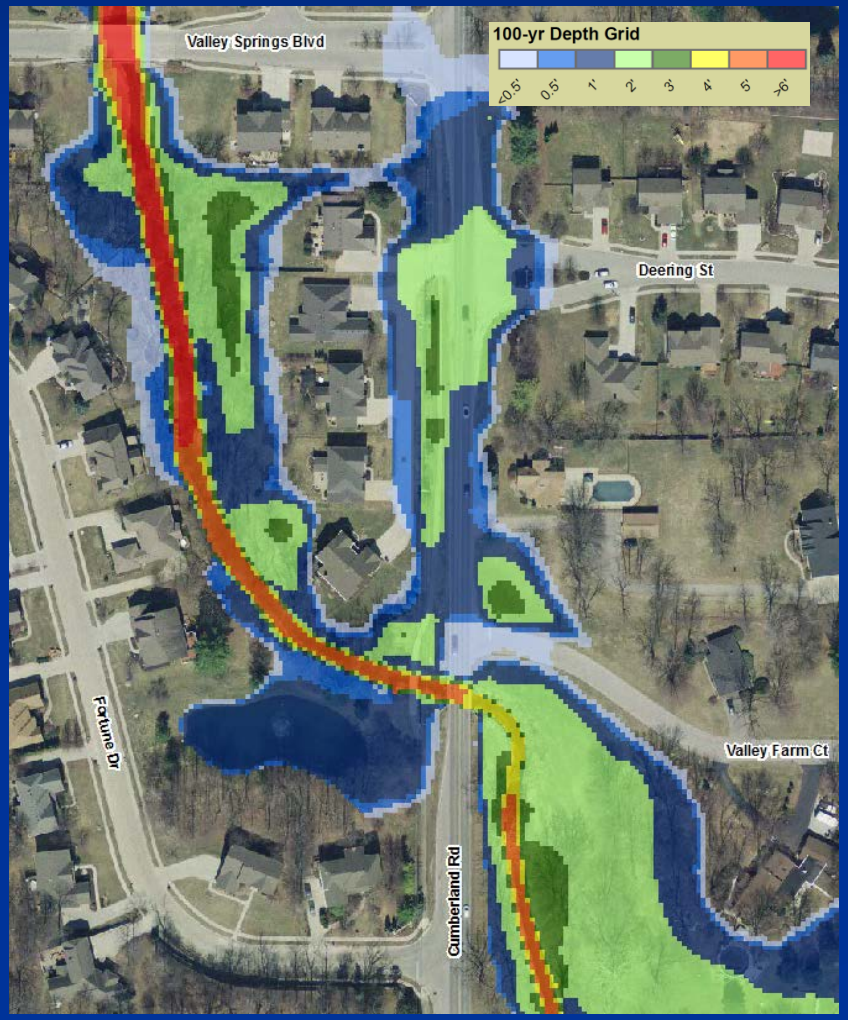


Solution Alternatives

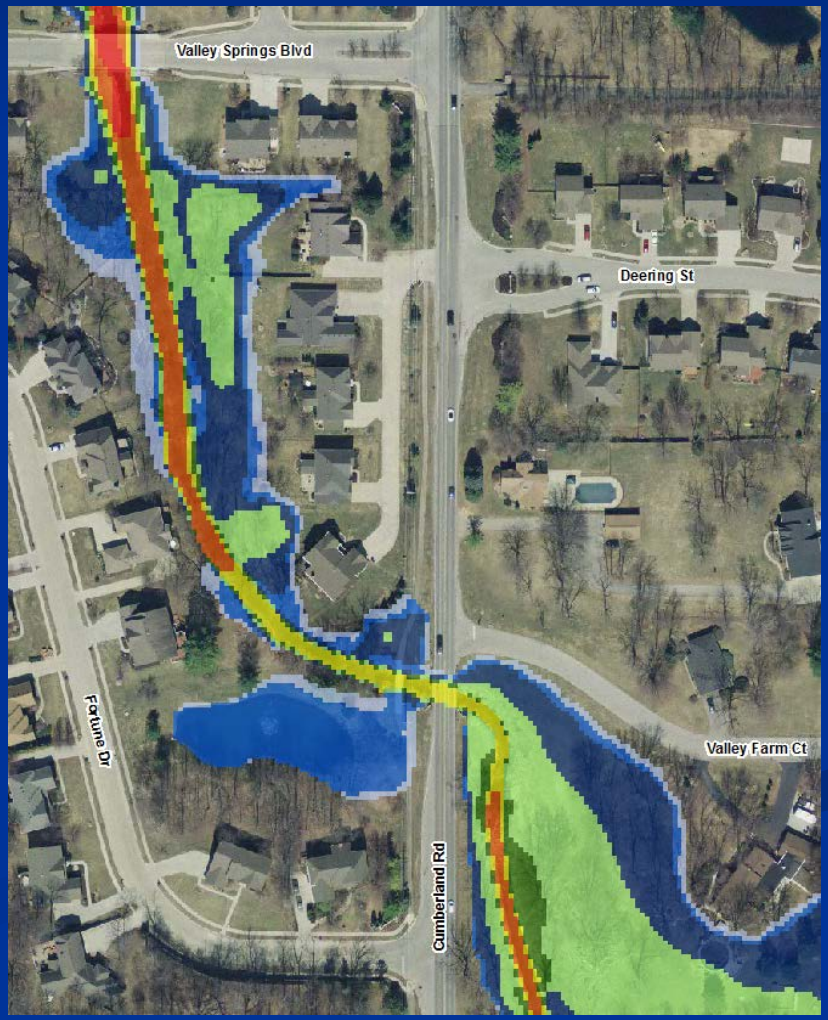
Alt.	Description	Results
7	• Raise Cumberland Road • Block overflow paths • Construct 2-stage ditch	• Cumberland Road floods at 25-yr event • 1.0 foot of overtopping during 100-yr event • Access to the north for area residents • Estimated cost = $1,000,000
8	• Raise Cumberland Road • Block overflow paths • Replace bridge	• Cumberland Road floods at 25-yr event • 0.7 foot of overtopping during 100-yr event • Access to the north for area residents • Estimated cost = $830,000
9	• Construct 2-stage ditch • Replace bridge	• Road nearly flood-free during 100-year event • Still vulnerable to backwater flooding • 1.4 feet of flood reduction for 100-yr event • Estimated cost = $1,560,000
10	• Raise Cumberland Road • Block overflow paths • Construct 2-stage ditch • Replace bridge	• Cumberland Road flood-free during 100-yr event • Estimated cost = $1,750,000

Solution Alternatives

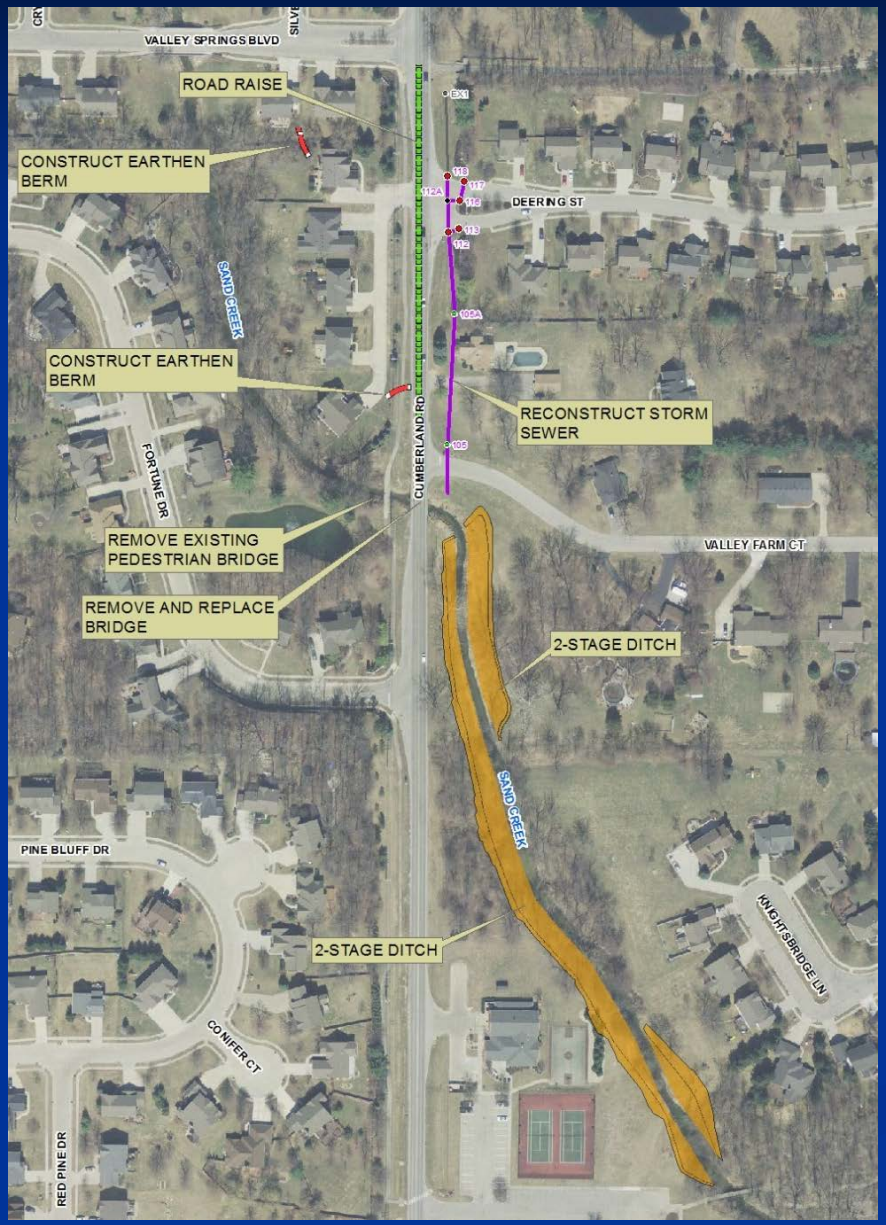
100-yr Event - Existing

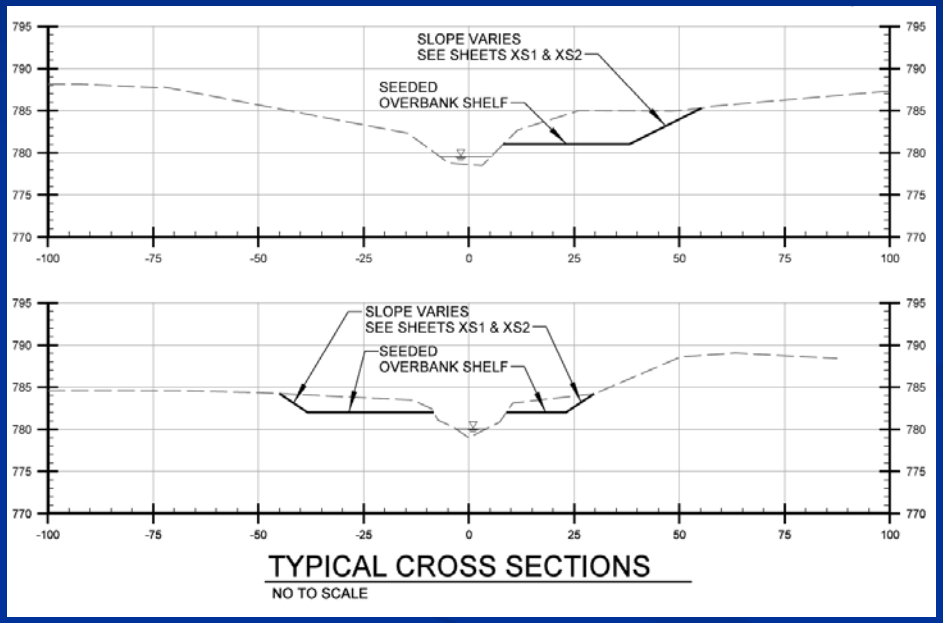


Alt. 10, 100-yr Event - Proposed



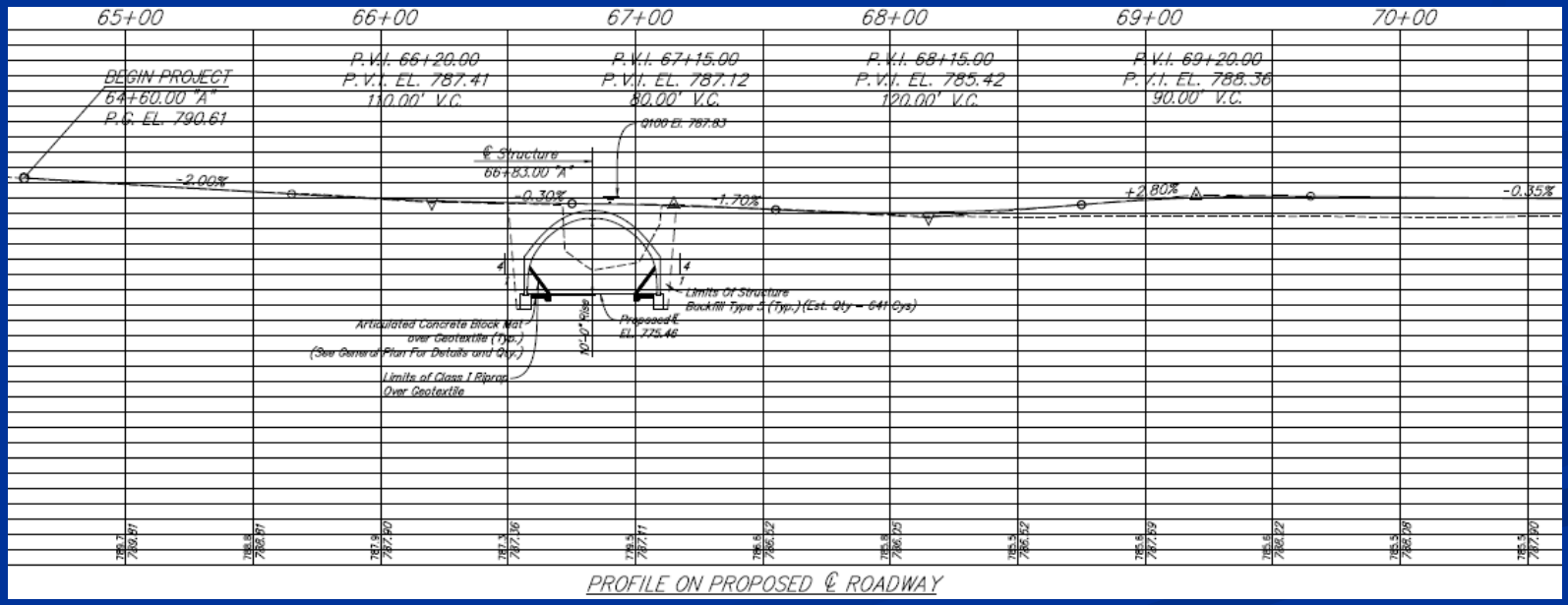
Preliminary Design





Preliminary Design

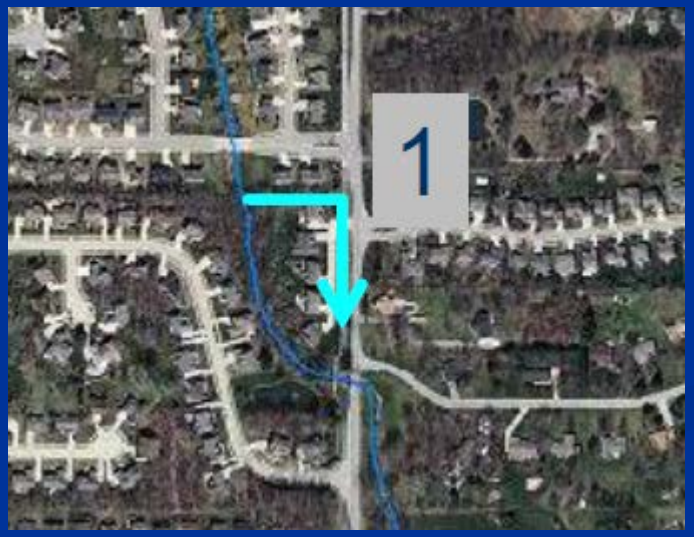
- American Structurepoint Contracted for the Bridge and Roadway Design and Plan Development in Summer of 2012
- Structure, Size, and Type Analysis Completed using Christopher B. Burke Hydraulic Analysis
  - Roadway Profile, Low Structure Elevation, and Waterway Opening taken into Consideration
  - Approximately 2' of Structure Depth Available – Conventional Bridge not an Option
  - Precast Reinforced Concrete Three-Sided Structure Arch Structure Chosen



- Preliminary Plans Created for Hamilton County, City of Fishers, and Christopher B. Burke Review

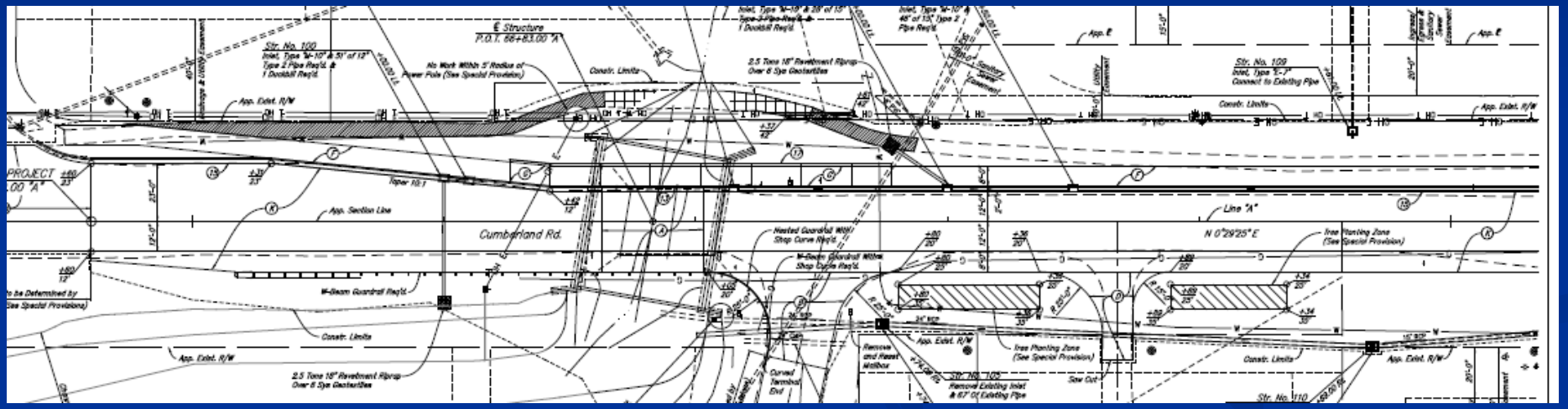
Public Meetings

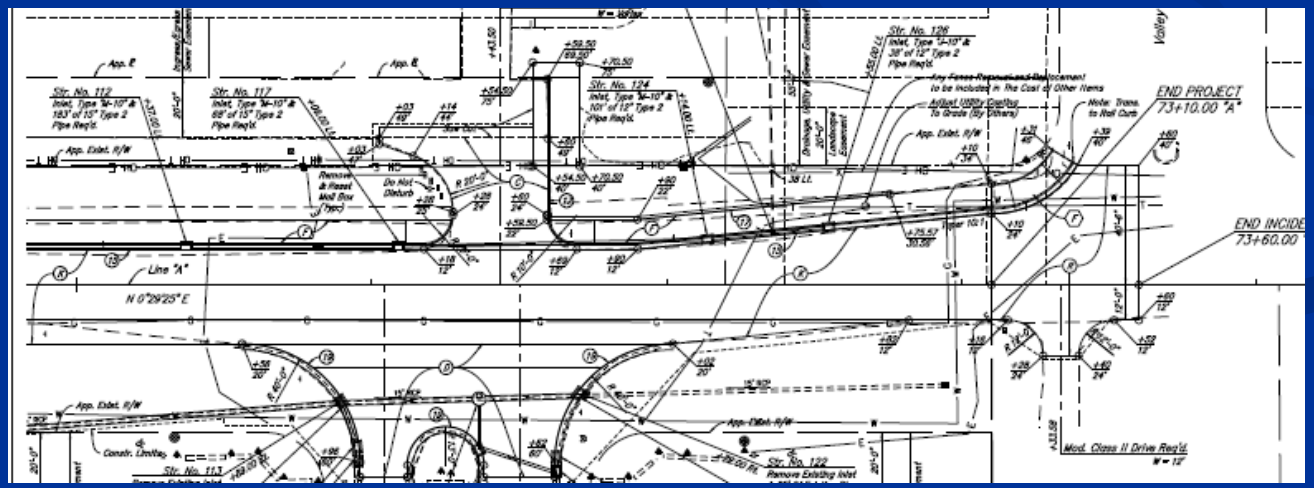
- Public Meeting held in April of 2013
- Adjacent Property Owner Meeting held in May of 2013
  - Preliminary Design and Schedule Explained
  - Homeowners' Concerns Expressed
    - Berm Construction
      - Right of Entry Agreements
      - Aesthetics
      - Maintenance
    - Hydraulic Adequacy of Proposed Design



Final Design

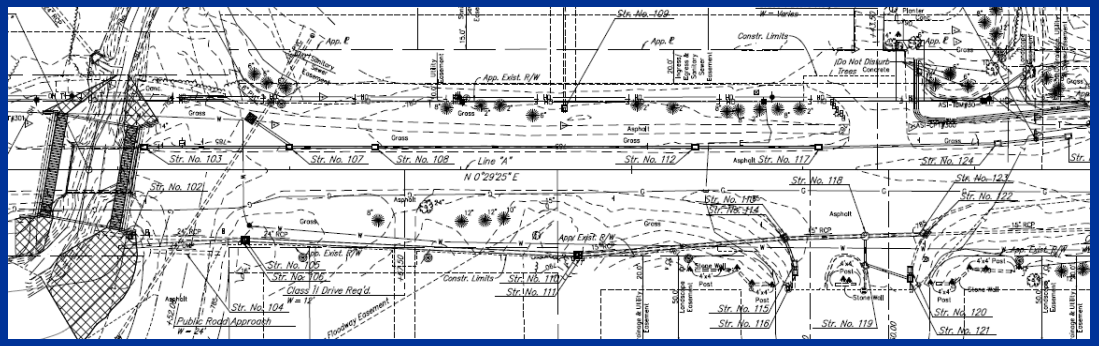
- Existing Right-of-Way Constraints
  - Wingwall Configuration
  - Sideslopes

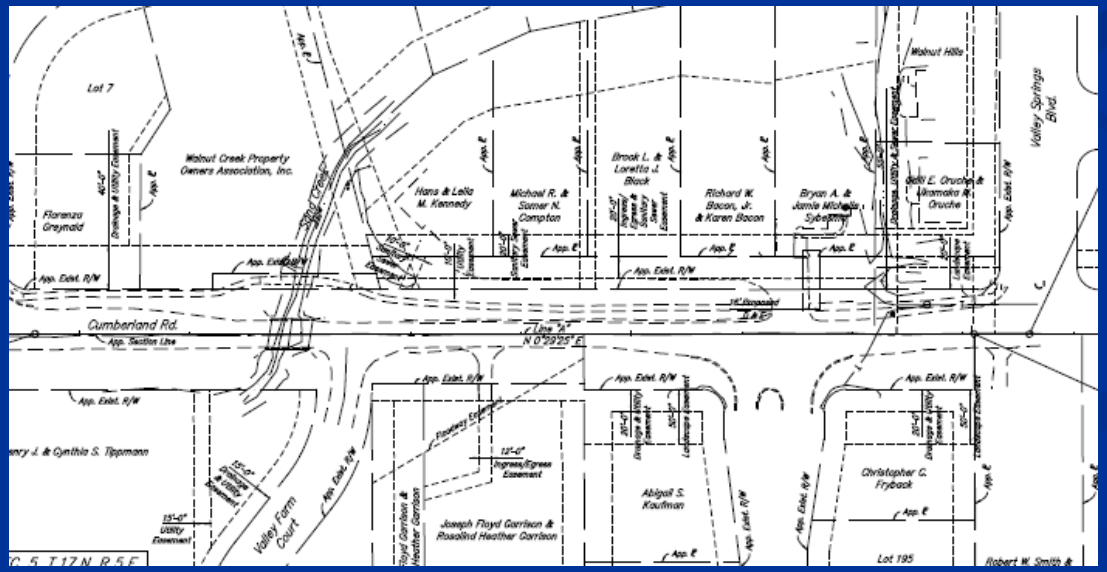




Final Design

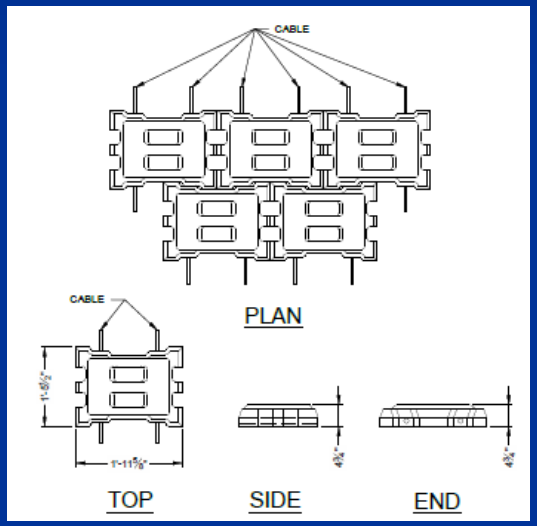
- Existing/Proposed Drainage
  - East Storm Sewer
  - West Storm Sewer
  - Pipe Between Properties

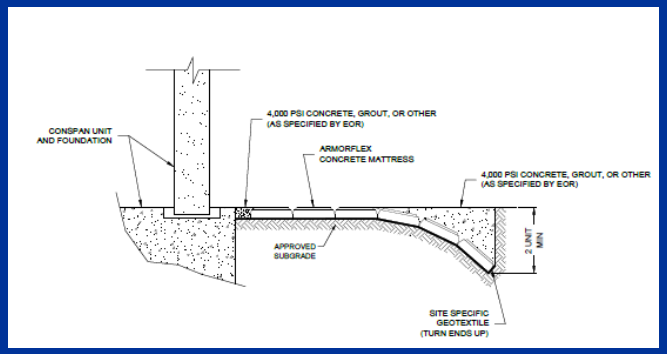


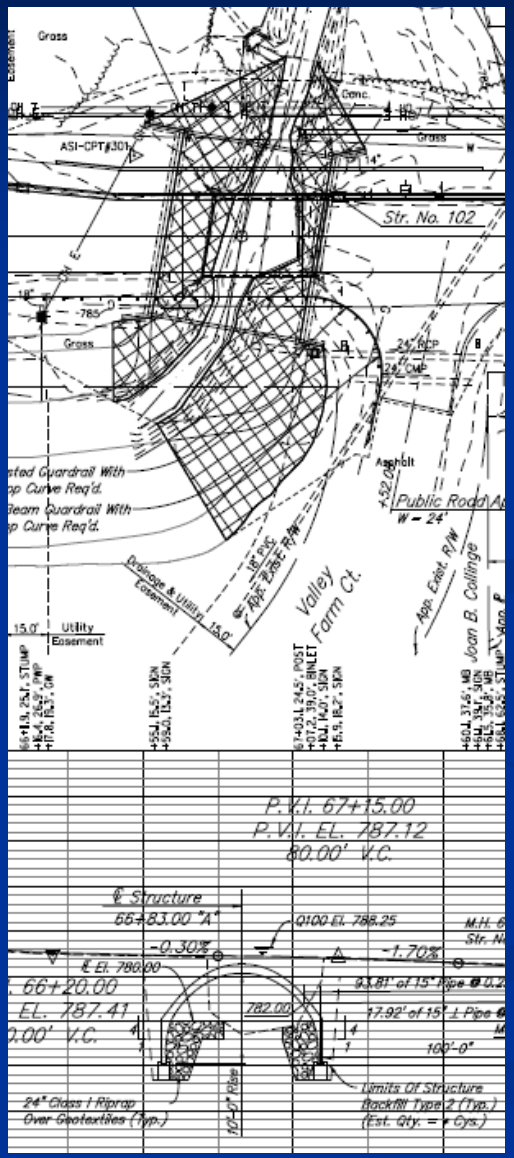


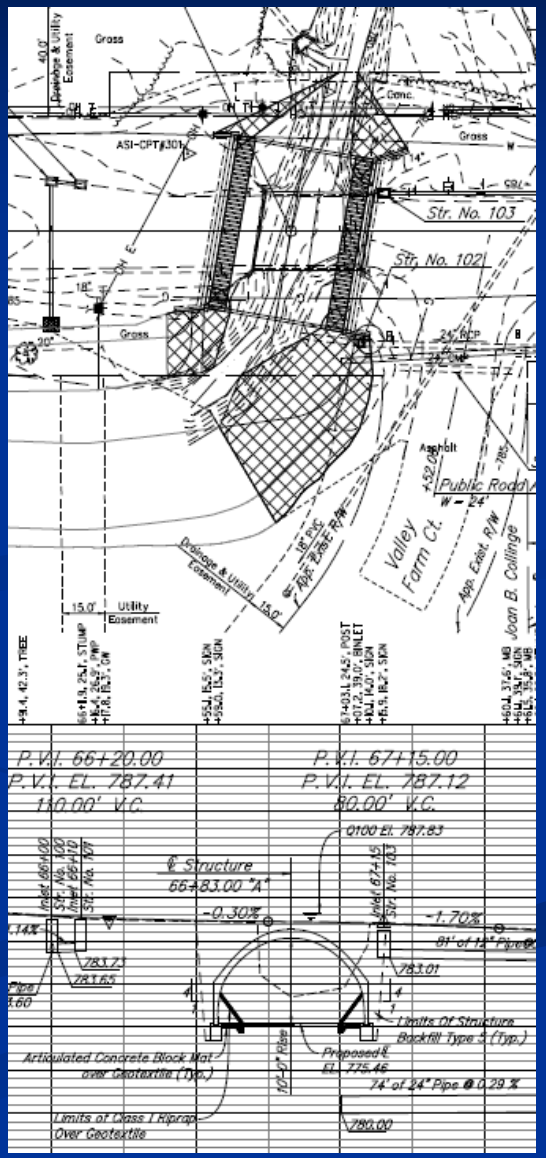
Final Design

- Structure Scour Protection
  - Class 1 Riprap
  - Articulated Concrete Block Mat



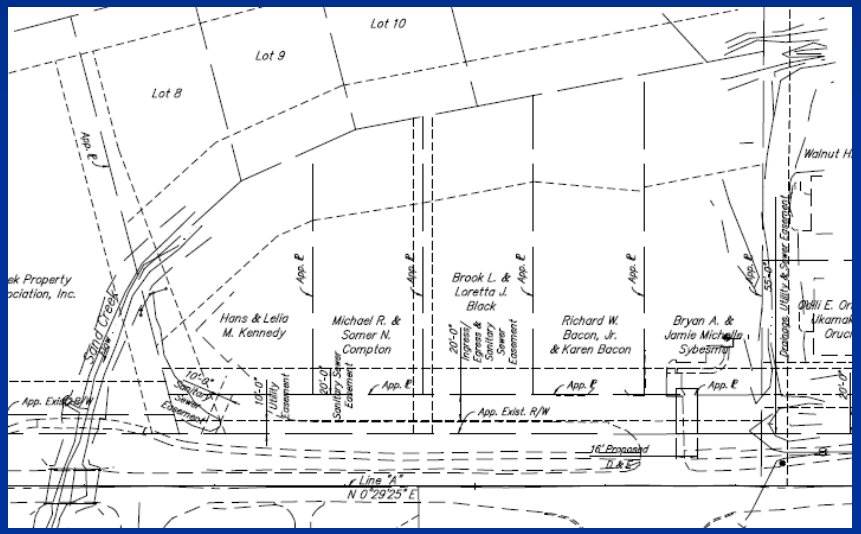


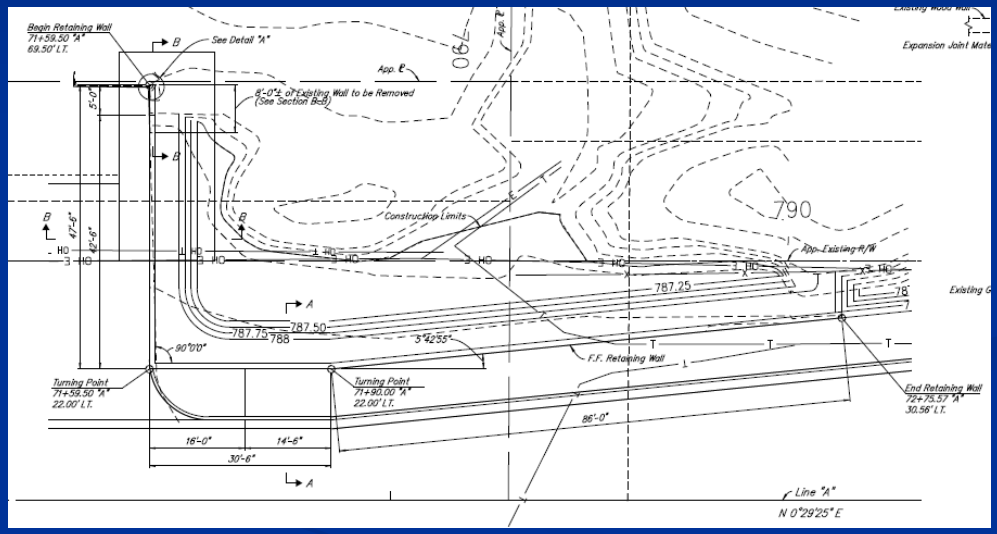


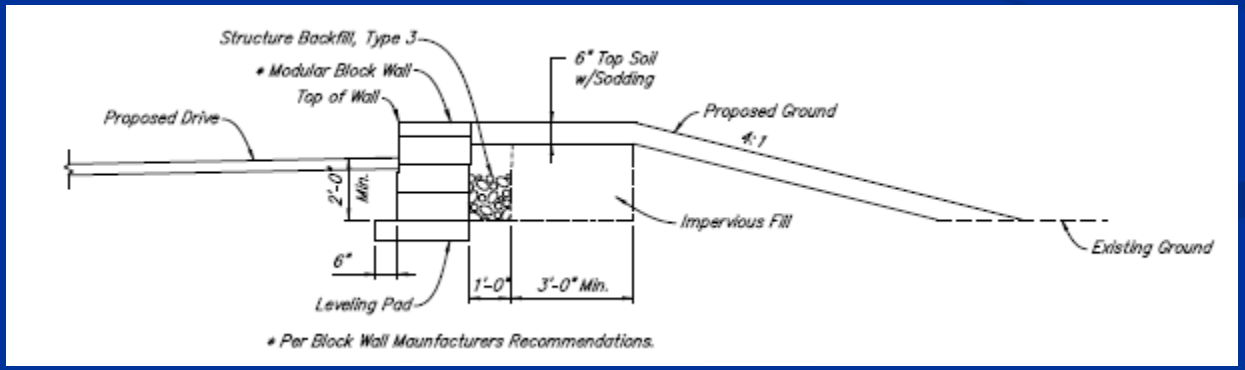


Final Design

- Flood Protection at North End
  - Berm Design
  - Retaining Wall Design







Construction

- Pump Around
  - Diesel Pump Initially Installed
  - Electric Pump Later Installed
- Dewatering
  - Contractor Chose Alternate Method
    - Delayed Construction Schedule
    - Consulted Cardno ATC for Geotechnical Expertise
  - Original Recommended Method Installed
    - French Drains Installed
    - Deep Well Points Installed
- Trench Drain

Construction

Construction

Construction

Construction

Before and After

Before and After








Resident Feedback

- Sump pumps operating less frequently
- Road has been passable for all storm events in 2015
- Previous standing water areas have been eliminated
- ***Most*** residents are generally happy and appreciative

The End

Kent Ward
Kenton.Ward@hamiltoncounty.in.gov
317-776-8495

Jason Armour, PE, LPG, CISEC, CFM
armourjt@fishers.in.us
317-595-3461

AJ Fricke, PE
africke@cbbel-in.com
317-266-8000

Alison Krupski, PE
Alison.Krupski@hamiltoncounty.in.gov
317-773-7770