



City of Fishers
STORMWATER MASTER PLAN



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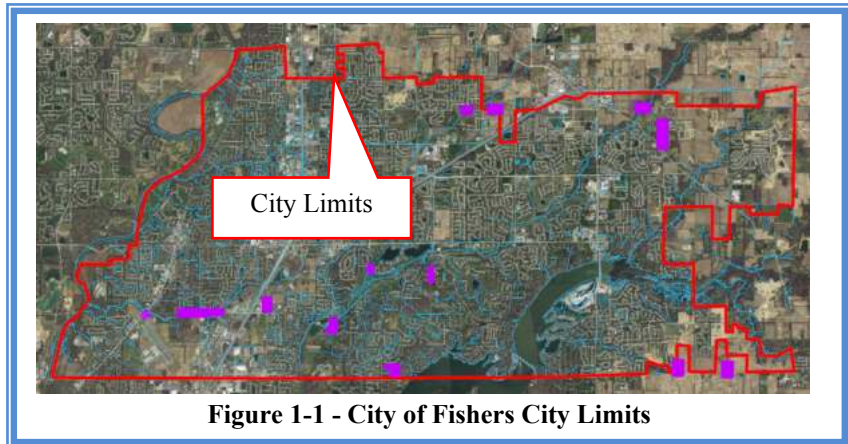
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1 EXECUTIVE SUMMARY

This master plan provides documentation, review, analysis, and recommendations for the City of Fisher’s Stormwater Utility for maintaining and improving their stormwater system. This master plan was developed as a guide to assist the City in creating a comprehensive plan to provide sustainable funding for their water quality control, operation and maintenance activities, and capital project and flood control projects that affect the City’s current stormwater infrastructure.

The City of Fishers is located within Hamilton County, Delaware and Fall Creek Townships, and has approximate corporate limits of 136th Street to the north; Atlantic Road to the east; 96th Street to the south; and the White River to the west. The corporate limits extend slightly north of 136th Street in some



areas, as detailed in **Figure 1-1**. In addition, there are still various areas around and within the approximate limits that are unincorporated. The zoning within the City of Fishers limits consists of a mix of residential, commercial, industrial, and agricultural properties. The overall land use is approximately 64% residential, 11% commercial, 6% agricultural, 3% industrial and 16% public, which includes schools and parks.

The City staff, including the Departments of Engineering, Planning and Zoning, Public Works and Transportation, has identified several areas based upon knowledge of drainage problems throughout the City as well as reported flooding issues. Most of the drainage issues consist of standing water issues, and some rear yard swale issues that could be alleviated with routine maintenance. The main goals of this master plan are to identify projects that are potential capital projects and identify smaller problematic areas that can be completed through yearly operation and maintenance (O&M) practices.

To assist with a prioritization of the preliminary capital projects that were identified as part of this plan, an initial priority rating (IPR) was developed to assist the City in ranking the projects recommended within this master plan. Priorities were based upon factors including, but not limited to; severity of issues, type of structures affected, and solution to the drainage problems. These IPRs were developed through a standard form, which is seen below in **Figure 1-2**. Larger versions of the IPR form are included in **Appendix B**.

City of Fishers Stormwater Problem Area		Stormwater Capital Program Initial Priority Rating Evaluation Sheet				
Street Address: 106th Street between Shellbourne Rd and Hague Rd						
Nearest address or intersection of problem: 106th Street - Cheesney Creek						
Rating By: BD		Date:		Revision Date: 05-16-2018		
INSTRUCTIONS: Fill in only "X" per Group Rating as applicable						
STREET FLOODING	STREET CLASSIFICATION	Every Rain	Once/2 Yr	Once/10 Yr	Once/10-25 Yr	Rating
	Primary Arterial	4	X			12
	Secondary Arterial	3				9
	Collector	2				6
	Local Street or Place	1				3
PUBLIC INFRASTRUCTURE TYPE	MAJOR FAILURE POSSIBLE WITHIN	Immediate	1-2 Years	3-5 Years	5-10+ Years	Rating
	Arterial/Secondary to Major Tributary	4	X			12
	Collector/Storm/Sanitary Collector/Stream	3				9
	Local Storm/Sanitary Main/Road Drainage	2				6
	Sanitation Maintenance	1				3
PROPERTY OR FACILITY CLASSIFICATION	FLOODING CONCERN	Every Rain	Once/2 Yr	Once/10 Yr	Once/10-25 Yr	Rating
	Homes	4	X			12
	Business/Industry	3				9
	Parking Lots	2				6
	Yards / Parks	1				3
PROPERTY CLASSIFICATION	NUMBER OF STRUCTURES AFFECTED	> 50	26 - 50	11 - 25	1 - 10	Rating
	Homes	4	X			12
	Business/Industry	3				9
	Other	2				6
	Other	1				3
FLOODING IMPACT	EROSION	> 500	251 - 500	101 - 250	10 - 100	Rating
	Observed Erosion	1	X			3
	(AREA TYPE)	Specific Areas	Roading	Sanitary	Other	Rating
	Area Type	1	X			3
	Resolution Type	Open Channel	Bridge Culvert	Structural BMP	Storm Sewer	Rating
COST SHARE	COST SHARE (When Private money or Federal/State Money is being used)	> 75%	26 - 75%	6 - 25%	0 - 5%	Rating
	% by Developer/Owner/Other Agency	1	X			3
	SATISFIES REGULATORY REQUIREMENT FOR WSA PERMIT	YES	NO			Rating
	Public or Private Benefit?	Public	X	Private		IPR RATING
						108

Figure 1-2 - Fishers IPR Form

It is important to note that the IPR is not the overall deciding “go-no go” factor; but merely one element that will allow the City to quickly identify an individual project’s rank within the Stormwater Capital Improvement Program.

In addition to the IPR, the City staff also assigned priority values for projects of 1 and 2 based on known severity of the drainage and flooding issues and potential impact on life safety issues. The severity of the drainage and flooding issues was determined by historical observations from City staff and drainage complaints received.

IPR's and priority values were determined for sixteen (16) areas within the city limits. These areas are shown below in **Table 1-1**, in order of priority ranking. It should be noted that some of the projects have a higher priority ranking than other projects with a higher IPR score. Whereas, the IPR form ranks road issues or those issues affecting multiple residential

properties higher, than those affecting a large, single, off-street property, the priority assigned by City staff was based on historical information, drainage complaints and possible economic impact. Opinions of probable costs for each project are provided in 2018 dollars. Maps of these areas are provided in **Appendix C**, and photos for each project area are shown in **Appendix D**.

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Table 1-1 - Summary of Capital and Maintenance Projects

Priority	IPR	Drainage Area Description	Opinion of Probable Total City of Fishers Portion (2018 Dollars)	Opinion of Probable Total Project Costs (2018 Dollars)
1	108	Cheeneey Creek - 106th Street Between Hague Road and Railroad Tracks	\$500,000 #	\$1,435,000 #
1	108	Cheeneey Creek - 106th Street Between Sherborne Road and Hague Road	\$465,000 #	\$625,000 #
1	71	136th Street West of Marilyn Road at Sand Creek Flooding Improvements	\$180,000 #	\$505,000 #
1	71	136th Street West of Prairie Baptist Road at Mud Creek	\$325,000 #	\$1,635,000 #
1	69	97th and 98th Street Drainage Improvements	\$217,000	\$217,000
1	60	Prairie Baptist South of Silverleaf Blvd. Drainage Improvements	\$353,000	\$353,000
2	79	Cumberland Road Bridge Replacement	\$826,500 #	\$6,681,000 #
2	79	136th Street Culvert Improvements at Limestone Springs	\$95,000	\$95,000
2	79	Airport Property Drainage at Allisonville Road and 106th Street	\$214,000	\$214,000
2	70	10307 Cumberland Road Storm Sewer Upgrade in Bradford Knoll **	\$235,000	\$294,000
2	64	Lake Stonebridge Dam Overtopping *	\$23,600 #	\$23,600 #
2	62	Lantern Road and USA Parkway Drainage Improvements *	\$13,000 #	\$25,100 #
2	58	Hoosier Road South of S-Curve and Cemetery Ditch Improvements *	\$26,200	\$26,200
2	54	Georgia Road North of 96th Street Drainage Improvements	\$113,700	\$113,700
2	54	121st Street between Cross Road Lane and Blue Springs Lane *	\$45,000	\$45,000
2	44	96th Street and Cyntheanne Road Drainage Improvements	\$93,900	\$93,900
		Misc. City-Wide Projects / Maintenance	\$107,800	\$119,900
		Above Capital Projects (excluding Maintenance Projects)	\$3,618,100	\$12,261,600
		Additional projects/studies identified in Master Plan Capital List ++	\$3,694,000	
Total			\$7,419,900	\$12,381,500
<p>* Denotes potential Maintenance Projects ** Project costs will be determined by impact of the selected alternative. # Project would include a cost share with Hamilton County Surveyor's Office or Hamilton County Highway Dept. ++ Refer to Master Plan Capital List and Policy Analytics Stormwater Fee Analysis Note: Refer to the Section 5 and Appendix G for detailed project costs.</p>				

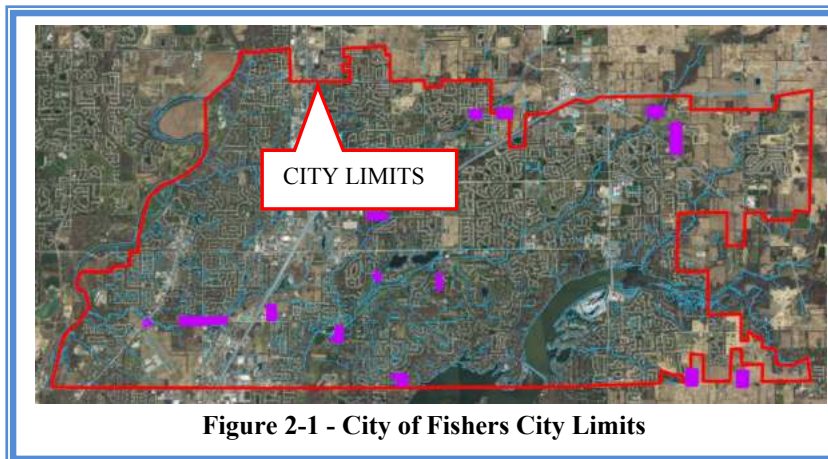
Implementation of this master plan will not only help in alleviating flooding occurrences and drainage issues, it will provide a basis for the future integration of other city projects and will also work toward improving the quality of life for the residents in the City of Fishers.

The remainder of the report is divided up into eleven sections as detailed below:

- Section 2: Background Information
 - Provides the history of the area in regard to the storm sewer system, the waterways and the physical characteristics of the area (i.e. soil types, wetlands, etc.).
- Section 3: Potential Project Areas
 - Details the problems with specific project areas throughout Fishers and breaks down the scope of solutions into Capital or Maintenance costs.
- Section 4: Hydrologic/Hydraulic Modeling
 - Describes the modeling process and the parameters used to develop the detention facilities. The section will also describe the physical attributes that were included as part of the City of Fisher’s Stormwater Management System.
- Section 5: Capital Improvement Alternatives
 - Provides a summary of the capital improvement alternatives being proposed based on the technical, environmental, and financial feasibility.
- Section 6: Maintenance Alternatives
 - Provides a summary of the maintenance alternatives being proposed based on the technical, environmental, and financial feasibility.
- Section 7: Floodplain / Drainage Studies and Outfall Modifications
 - Provides a summary of the floodplain studies, drainage studies and outfall modification projects to be evaluated.
- Section 8: Dual Purpose Facilities
 - Provides a summary of the areas that could potentially serve additional purposes beyond providing stormwater detention/retention.
- Section 9: Implementation
 - Provides a summary of the recommended schedule to implement the proposed improvements.
- Section 10: Future Needs and Goals
 - Provides a summary of items that should be addressed in the future.
- Section 11: References
 - Provides a list of references used to help develop this Master Plan Document.

2 BACKGROUND INFORMATION

The City of Fishers has corporate limits that are approximately; 136th Street to the north, Atlantic Road to the east; 96th Street to the south, and the White River to the west. The corporate limits do extend slightly north of 136th Street in some areas, which are detailed in **Figure 2-1** below. In addition, there are still various areas around and within the city limits that are still unincorporated areas. This map, and all the maps presented in this section, can be viewed in **Appendix C**.



According to the 2010 census there are approximately 27,218 households within Fishers accounting for a total population of 76,794 people. Much of the City is comprised of single family residential homes. In addition to the single family residential units, there are several apartment and condominium complexes, schools, and a multitude of

commercial and industrial properties located within the City of Fishers.

Fishers was classified as a town until the passage of a referendum in November 2012 that transitioned Fishers into a traditional “second-class” city. Fishers fully transitioned to a City government on January 1, 2015.

Since the passage of the referendum in 2012, the City has been rapidly expanding in both population and area through development and annexation of unincorporated areas. With the City of Noblesville north of Fishers and the Hamilton County lines to the east and south, the overall city limits are clearly defined; however the City still contains some unincorporated areas to the west as well as some unincorporated areas within the town limits.

Due to the presence of the unincorporated areas, the City has worked closely with the Hamilton County (HC) Surveyor’s Office and the HC Highway Department to provide solutions to drainage and flooding issues.

2.1 History of City of Fishers MS4 Program

The City of Fishers entered into its first NPDES Stormwater permit in August 2005 as Ordinance 081505. This permit established requirements for formulating and implementing a Stormwater Quality Management Program and Stormwater Management Ordinance to meet IDEM 327 IAC 15-13 (Rule 13) and IDEM 327 IAC 15-5 (Rule 5) requirements. As part of this permit, the City voted to establish a stormwater user rate in November 2007 to provide revenue for the stormwater program as part of Ordinance 110707A. In March and April of 2009 Resolutions SW032409 and 030209F were passed to establish a schedule of rates and user fees for the Stormwater Utility.

This Stormwater Utility is responsible for the storm sewer maintenance and upgrades, drainage and flood control projects, street sweeping, water quality improvement projects, waterway clean-ups, community recycling, public outreach and education, and National Flood Insurance Program management. The Stormwater Utility works closely with the Hamilton County Surveyor's Office and the Hamilton County Highway Department on maintenance responsibilities and project development. The program educated local schools and community groups, and provided further education to contractors, developers, utility companies, and others through workshops. These educational efforts have been directed toward informing the public, their involvement in keeping waterways clean, and how to be better stewards of natural resources.

The City has made efforts to improve the water quality within their MS4 boundary, which they have done by implementing specifications & standards required by their NPDES permit. The Town of Fishers Stormwater Management Ordinance was revised in November of 2008 under Ordinance 081808B and again in July of 2018 when it was converted to the Stormwater Management Resolution R070918. This Ordinance was established to regulate stormwater and non-stormwater discharges to the City's drainage system as it pertains to new development and redevelopment projects. All developments disturbing land within the City limits are required to develop and follow a stormwater pollution prevent plan (SWPPP), which is reviewed by the City's Engineering staff. These plans help to limit the amount of sediment leaving sites during construction and establish practices after construction to protect water quality. This is completed through the establishment of stormwater best management practices (BMPs), which control either stormwater quality or quantity. The City has made great efforts to enforce these requirements and has legislated a fine schedule to meet those needs.

The City has also been proactive about improving water quality and has established a detailed O&M program that included street sweeping, storm sewer cleaning and repair, best management practice cleaning, water quality improvement projects and maintenance, as well as a robust public education program. The City of Fishers is furthering this effort through the development and implementation of this Stormwater Master Plan.

2.2 General Condition of Stormwater Infrastructure

The City's stormwater infrastructure is comprised of a mix of conventional storm sewers, open ditches, detention basins, and natural features (e.g. rivers, streams, etc.). Much of the system has been expanded by development since the original construction and has also seen various forms of repair. The City has also inherited storm sewer systems when previous areas were annexed into the corporate limits, along with any existing drainage issues within that system.

The repairs within the storm sewer system range from complete reconstruction to minor site repairs. It is common that older storm water infrastructure system have problems such as deterioration of pipes or joints as well as severe root intrusion. These problems could lead to sinkholes forming within the yards or under pavement, or lack of capacity in the pipe. The emergence of sinkholes indicate that the pipe has been infiltrated in some way, and the soil surrounding the pipe is being washed away resulting in a void. In addition to the deterioration of the system, several areas do not appear to have sufficient capacity to convey frequent storm events.

Based upon the feedback received during the initial field visits with City staff, it was indicated that there were several areas with poor drainage. These areas mainly consisted of residential neighborhoods that were constructed prior to the stormwater ordinance revision in 2008, as described above, or areas that have been annexed into the system. These areas received minimal storm infrastructure, and were not designed to the more stringent stormwater management standards currently in place by the City. The stormwater systems with poor capacity could lead to flooding and standing water on roads, which causes to the infrastructure failing prior to its intended service life. This could potentially lead to additional costs to the City because of the decreased time between repairing or replacing road infrastructure.

2.3 Watersheds and Storm Sewer Sub-basins

The City of Fishers is located within multiple watersheds. A review of the United States Geological Survey (USGS) Hydraulic Mapping was completed to identify the hydraulic unit codes (HUC) and the sub-watershed for the HUC watershed areas. Overall, the City was located within eight (8) different sub-watershed per the USGS mapping; however, it should be noted that the City was only partially located in two (2) of the watersheds. The western portion of the City is located within the Carmel Creek – White River Watershed (HUC 051202011003), Vestal Ditch – White River Watershed (HUC 051202011002), and Mallory Granger Ditch – White River Watershed (HUC 051202010705). A small portion, approximately 150 acres of the City's northern limits are located within the William Lehr Ditch – Stony Creek Watershed (HUC 051202010704). The center portion of the City is located mainly within two (2) watersheds identified as the Sand Creek – Mud Creek Watershed (HUC 051202010903) and the Headwaters Mud Creek Watershed (HUC

051202010901). The eastern portion of the City is mainly located within the Thorpe Creek – Geist Reservoir Watershed (HUC 051202010809), with the remainder located in the Flatfork Creek – Fall Creek Watershed (HUC 051202010808). These watersheds are identified in **Appendix A**.

The western portion of the City, which contains most of the drainage area west of I-69, ultimately discharges to the White River via various creeks and ditches. The central portion of the City mainly drains to either Sand Creek or Mud Creek via various creeks and ditches. Sand Creek flows into Mud Creek just north of the City limits near 106th Street and Cumberland Road. Mud Creek continues to flow south ultimately discharging to Fall Creek. The eastern portion of the City drains to the Geist Reservoir which ultimately discharges to Fall Creek.

2.4 Soil Data

The soils vary throughout the City limits based upon a review of the available United States Department of Agriculture (USDA) information, but there are three (3) prevailing soil types that account for seventy percent (70%) of the soils. These soils are Brookston silty clay loam (Br), Crosby silt loam (CrA), and Miami silt loam (MmB2). Brookston and Crosby loams are poorly drained and are generally not suitable for infiltrative practices per the USDA information. These two (2) soil groups account for fifty-eight percent (58%) of the overall soils. The Miami loam is more suitable for infiltrative practices but is generally not recommended for infiltrative practices. The Miami soil accounts for approximately twelve percent (12%) of the overall soils. Soil amendments can be made to increase the capacity of infiltration but will still be limited by the shallow groundwater table depths. Soil information for the northwest, northeast, southeast and southwest quadrants of the City are shown in **Figure 2-8**, **Figure 2-9**, **Figure 2-10** and **Figure 2-11** respectively. The soils are summarized in **Table 2-1**. The figures and table may be seen at the end of this section

2.5 Wetlands

Figure 2-12, shown at the end of this section, depicts wetlands based upon the United States Fish and Wildlife Service (USFWS) National Wetland Inventory GIS mapping data. It is not anticipated that any wetlands will be present within any of the project locations; however, individual projects should be evaluated by the engineer of record at the time of design to verify this statement.

2.6 Floodplains

Figure 2-13, **Figure 2-14**, **Figure 2-15** and **Figure 2-16** show the general floodplains located in the Northwest through the Southwest quadrants of the city limits. The FEMA special flood hazard area for each project area is also included in the project area maps located in **Appendix C**. The following Hamilton County FEMA Firm maps were also referenced throughout this report;

1804230233G, 1804230234G, 184230252G, 180230253G, 1804230254G, 1804230257G, 1804230261G, 1804230267G. In addition, two (2) projects were located on or near the Hamilton County/Hancock County line therefore the following Hancock County FEMA Firm map was also referenced; 1804190017D.

2.7 County Regulated Drains

The Hamilton County Drainage Board currently has jurisdiction over all regulated drains within the City of Fishers. According to the Hamilton County Surveyor’s Office the regulated drains within the City limits are;

RJ Craig Drain, including Cheeney Creek	Bartholomew Irwin Drain
Loma Ind. PK II Drain	Mud Creek – Sand Creek Drainage Area
Margaret O’Brien Drain	Nancy Kimberlin Drain,
Castetter and Randall Drain	William McKinstry Drain
Lynnwood Hills Drain	Russell Johnson Drain
Oliver Shoemaker Drain	Tremont Drain
New Britton Industrial Park Drain	John Beaver Drain
Krause and Klepfer Drain	Beaver & Brooks Drain
Henry Ebbert Drain	Sarah Morgan Drain
Margaret Goodwin Drain	Booth Snead Drain
TJ Patterson Drain (Noblesville)	Mud Creek Drain
Sand Creek Open Ditch Drain	
Tamenend Drain	Flat Fork Drain
Sail Place Drain	Thomas West Drain
Springs of Cambridge Bee Camp Creek	Thor Run Drain
Johnathan Stansbury Drain	Thorpe Creek Drain
James D. McCarty Drain	Martha Ford Drain
Exit Ten Drain	AJ Meyers Drain
George Burke Drain	

Currently, property owners residing within a regulated drain watershed are required to pay an assessment to maintain these regulated drains. These assessments are set by The Hamilton County Drainage Board and are based on the recommendation of the Hamilton County Surveyor’s Office. Using these assessments, the surveyor is to provide for periodic maintenance and repair for each regulated drain.

2.8 Other Applicable Regulations

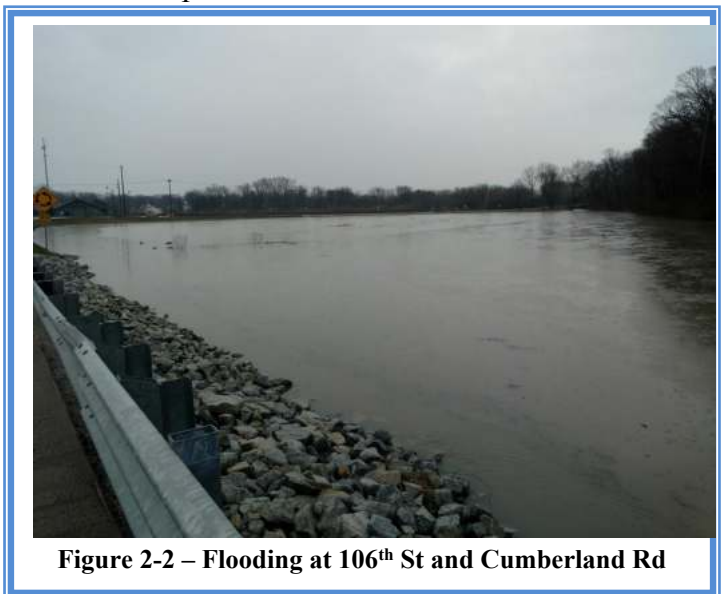
The United States Army Corps of Engineers (USACOE), Indiana Department of Environmental Management (IDEM) have regulating authority over the ditches and creeks, as they may be

considered waters of the United States. They generally carry with them Ordinary High-Water Marks (OHWMs), which need to be delineated by a local agency and confirmed by the USACOE. Any activities involving cleaning, dredging, culvert replacement or obstruction removal within the ditches and creeks will require the appropriate 404 and 401 permits.

In addition, the Indiana Department of Natural Resources (IDNR) permits improvements within the floodway. Any improvements within the floodway for major streams with a drainage area greater than 1 square mile will require a Construction in a Floodway permit from IDNR.

2.9 Historical Flooding

There have been several flooding events in the history of Fishers; however, the largest event in recent history occurred in June 2017. This flooding was a result of several factors throughout the state. Preceding the flooding the central and southern portions of the State were hit hard with precipitation, and as a result streams were at or near capacity. Then during the middle of June, the area experienced seven (7) straight days of rainfall resulting in the flooding of several streams. Over the seven (7) days nearly eight (8) inches of rainfall was recorded. According to National Weather Service (NWS) historical data, this rain event created the highest known flood crest elevation for several stream gauges. A stream gauge located near the Cumberland Road Bridge over Mud Creek in the City of Fishers recorded a crest elevation of 9.15 feet on June 24,



2017. For comparison purposes, the photo in **Figure 2-2** was taken on April 3, 2018 when the crest elevation was approximately 8 feet. The following day the crest elevation of Mud Creek at this location was recorded at 8.41 feet. The area upstream of the Cumberland Road Bridge near 106th Street as well as Cumberland Park located downstream of the bridge have a history of flooding.

Per the NWS website, the stream gauge at Cumberland Park has five (5) flood notification markers. The initial flood stage is at a crest elevation of five (5) feet which is noted as the point when Mud Creek is approaching bankfull elevations. The second marker is at a crest elevation of seven (7) feet which is the point where flooding begins along Mud Creek in the Fishers area. At 7.5 feet, Cumberland Park is closed and the parking lot and road in the park are flooded by as much as a

foot of water. **Figure 2-3** shows flooding from Mud Creek within Cumberland Park when the elevation was approximately 8 feet.

Since January 2013 there have been sixteen (16) rain events that have exceeded the 7.5-foot crest elevation including six (6) flood events in 2017 and three (3) flood events thus far in 2018. The fourth marker is at crest elevation of nine (9) feet which is when Cumberland Road at Cumberland Park begins to flood. Since 2013, there have been two (2) storm events where Mud Creek has reached the nine (9) foot crest elevation, although the NWS website indicates five (5) additional storm events between with a crest elevation between 8.85 feet and 9 feet. The fifth flood marker is at an elevation of eleven (11) feet which is when extensive flooding of the park and nearby roads



Figure 2-3 - Cumberland Park – Downstream of Cumberland Rd Bridge

and possible flooding of adjacent residential areas may occur.

According to the National Weather Service (NWS), the stream gauge at Cumberland Park is one of two stream gauges within the City of Fishers. The second stream gauge is located near the 116th Street Bridge over Sand Creek. Sand Creek joins with Mud Creek just upstream of the Cumberland Road Bridge. At this location, Sand Creek has a much smaller watershed and shorter time-of-concentration than Mud Creek, therefore the peak of the two creeks may occur at different

points and Sand Creek may be more affected by localized rain events. The highest crest elevation for Sand Creek at the 116th Street stream gauge was 7.45 feet, which was recorded on April 3, 2014, which resulted in less flooding impacts as described below.

Similar to the stream gauge at Cumberland Park, the 116th Street over Sand Creek stream gauge has six (6) flood notification markers. The initial flood stage is at a crest elevation of 3.5 feet, which indicates that the water elevation is nearing the trail along Sand Creek under 116th Street. The second flood marker is at 4.5 feet. At this elevation the water level is more over the trail along Sand Creek, and in some locations more than a foot deep. At 5.5 feet, which is the third flood marker, Sand Creek begins to overflow its banks. Since 2013, there have been only nine (9) storm events where the crest elevation at Sand Creek has exceeded the 5.5 foot level. The fourth flood marker is at 7.5 feet, which is the level where moderate flooding occurs, and the water level begins approaching Cumberland Road south of 116th Street. It should be noted that since 2013 there have been no flood events that have reached the 7.5 foot crest level, although there have been four (4) flood events that were between 7.3 feet and 7.5 feet. The closest elevation was the 7.45 feet described above in April 2014. The fifth flood marker is at 9.5 feet where Sand Creek has

overtopped Cumberland Road and major flooding starts to occur. At 10.6 feet, which is the last flood marker, extreme flooding occurs, and Cumberland Road is impassable downstream of the 116th Street. As noted above, based on the information from the stream gauge, flooding along Sand Creek frequently occurs, however although the portions of the approach roadways may be flooded, the bridges at 116th Street and Cumberland Road have sufficient freeboard and do not overtop.

The stream gauges assist in reporting the amount of rain received during particular rainfall events, however not all stream have stream gauges present to report rainfall and identify flood elevations. Outside of the two (2) areas where National Weather Service (NWS) stream gauges are located, there have been numerous reports of localized flooding along other streams based on staff reports. The 2017 rain event which resulted in a crest elevation of 9.15 feet along Mud Creek also caused significant flooding along 106th Street where Cheeney Creek runs parallel to the roadway as well as at the 136th Street Bridge over Mud Creek.

According to information provided by the City of Fishers staff, the portion of 106th Street between the railroad tracks, owned by Hoosier Heritage Port Authority, and Sherborne Road southwest of the downtown area has seen significant flooding over the years in two (2) locations. One location is east of Hague Road between the Blackthorn Court and the railroad tracks. At this location Cheeney Creek crosses 106th Street from the north to the south and then turns abruptly west and runs parallel to 106th Street. High water elevations have been reported within the adjacent yards and water from Cheeney Creek has overflowed the banks and entered the roadway. The 2017 rain event referenced above caused temporary closures of the roadway due to flooding.

The other location is a section west of Hague Road along 106th Street. Cheeney Creek crosses Hague Road just south of the intersection with 106th Street. At this point the creek passes near a sanitary lift station and then runs parallel to 106th Street. Similar to the other section above, Cheeney Creek will overtop the banks and inundate 106th Street causing roadway closures. In addition, the flood waters have caused issues at the sanitary lift station including sanitary sewer overflows into the creek. **Figure 2-4** shows some flood waters within Cheeney Creek as well as the flooding at 106th Street. Since 106th Street is located just above the bank elevation of Cheeney Creek, the roadway will start to flood once the banks of the creek start to overflow.



Figure 2-4 - Cheeney Creek along 106th Street



Figure 2-5 - 136th Street Bridge over Mud Creek

Mud Creek near 136th Street is another location where flooding has occurred. The watershed upstream of the 136th Street Bridge has seen significant development over the years as both the City of Fishers and the City of Noblesville have expanded. Although detention systems have been installed upstream of the bridge location, the frequency of high intensity storm events and localized flooding appear to have increased over the years. Many flood events have occurred over the years where water levels have approached the roadway level of 136th Street. The April

2017 rain event documented flood levels above the low chord of the bridge and water near the edge of the roadway. **Figure 2-5** to the right shows flooding of the field just upstream of the 136th Street Bridge structure.

Outside of the stream flooding that has occurred over the years, there are many other instances of localized flooding that have occurred due to large storm events overwhelming undersized or deteriorating storm sewer systems. Whereas streams are affected over larger storm events that have occurred over a large watershed, many other localized flooding issues have occurred due to shorter duration, but high intensity storm events. These events are typically concentrated in specific areas around the City and tend to occur more often than long duration with low intensity storms. The highly intense, short duration storms can cause greater impact to residences or daily traffic patterns by overwhelming pipe systems, inlets and culvert pipes, roadside ditches and internal swales within subdivisions and commercial developments. In addition, a lack of maintenance within small swales or drainage conveyances hinders normal flow patterns. Some examples of areas impacted by these short duration, high intensity storm events were observed during the April 2 and 3, 2018 storm event.

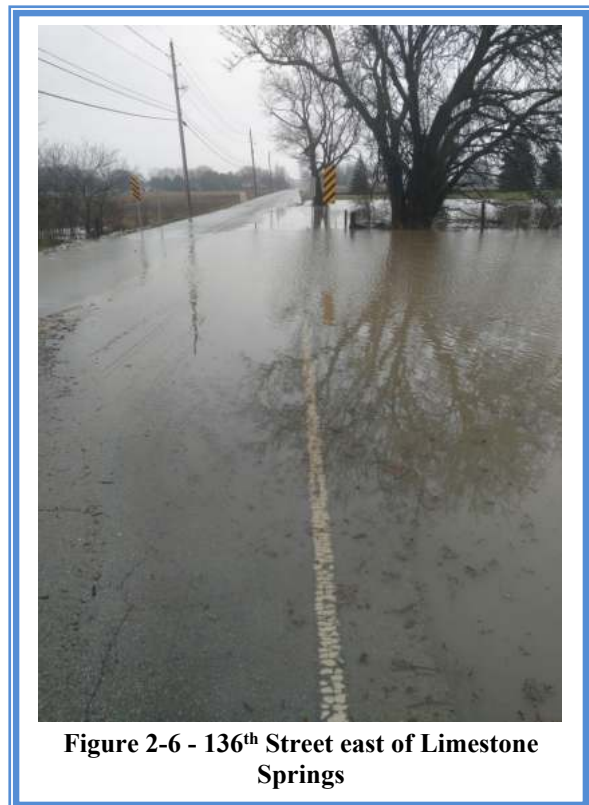
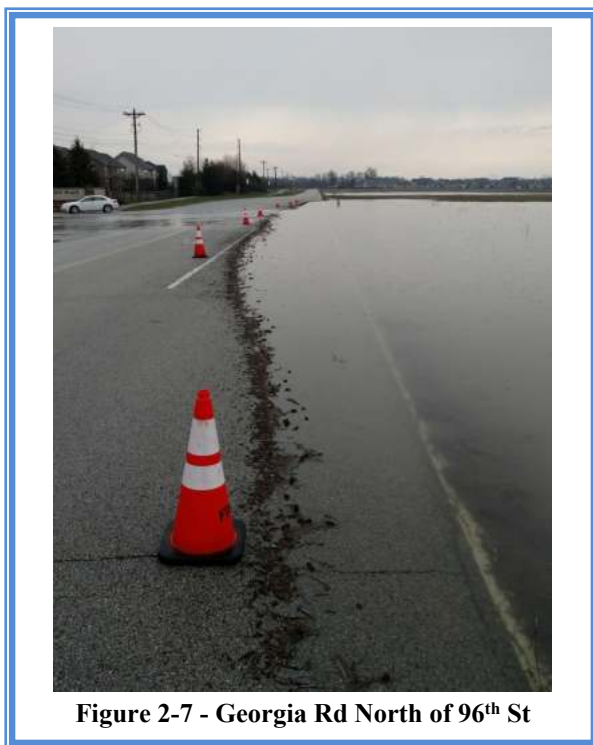


Figure 2-6 - 136th Street east of Limestone Springs

136th Street near the Limestone Springs subdivision is a primary example of the impact of these rain events. **Figure 2-6** shows the flooding

of the eastbound traffic lane of 136th Street as well as the rear yards and fields on the south side of the roadway. The culvert pipe under 136th Street was overwhelmed by runoff from the adjacent fields and yards to the south. In addition, the downstream conveyance ditch is not capable of conveying the runoff through the field due to overgrown vegetation and sedimentation blocking the flows within the natural drainage swale.

In the case of this area, the driving conditions were unsafe as portions of the roadway were impassable causing eastbound traffic to cross into the on-coming westbound traffic to avoid the flooded lane. This can create traffic safety issues in heavily traveled roadways. The standing water within the fields and rear yards of the residents can also create safety and/or health issues for the nearby residents. Standing water is a cause for concern due to mosquitos being able to breed quickly in large areas of standing water. Although, no residential homes were directly flooded during these storm events, larger storm events could cause closure of the entire road or flooding of homes due to the inadequate culvert pipes and downstream conveyance system.



Another site impacted by the short duration, high intensity storm event was Georgia Road north of 96th Street. At this location the northbound traffic lane of Georgia Road was inundated with flows from the farm field to the east. **Figure 2-7** shows the flooding of the northbound traffic lane. In the case of this site, there is no drainage infrastructure located in the immediate vicinity to collect runoff from the field. Portions of the field drain to a large culvert pipe under 96th Street to the south; however, a large portion of the field drains directly to a low spot along Georgia Street. Since the field is used for row crops it is possible that some drainage patterns within the field are altered from year to year, and deterioration along the edge of the roadway indicates that the roadway has been subject to periods of flooding in the past.

Overall, the City of Fishers has been impacted in many different ways ranging from long duration, low intensity storms as well as short duration, high intensity storm events. The City has been affected by flooding within major roadways due to stream overflows and inadequate drainage collection systems. Flood damage has increased capital improvement costs from the need to repair deteriorating roadways due to standing water, increasing capacity of inadequate drainage systems and repairing flood damaged structures and pipes. In addition, the flooding of roadways causes

increased traffic congestion on roadways not intended to handle heavy traffic that leads to safety issues.

The areas presented within this section are only a small portion of the total area affected by the historical flooding and specifically the rain event in April 2018, and do not depict the entirety of the flooding the City of Fishers has received. The areas that were presented within this section only help to present a small portion of the total damage to the City of Fishers and future impacts that rain events could have on the City's infrastructure.

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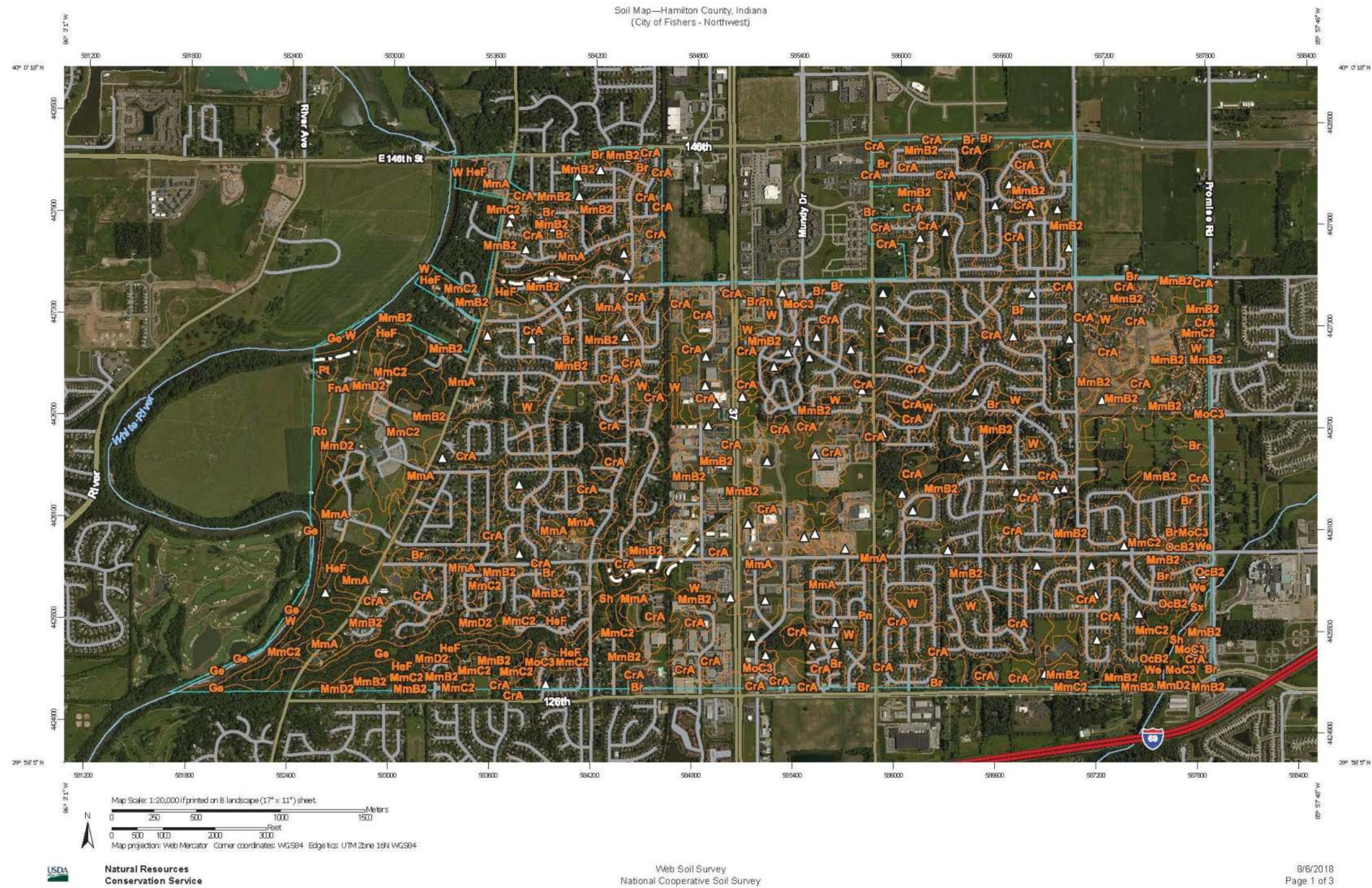


Figure 2-8 - City of Fishers Soils Map - Northwest

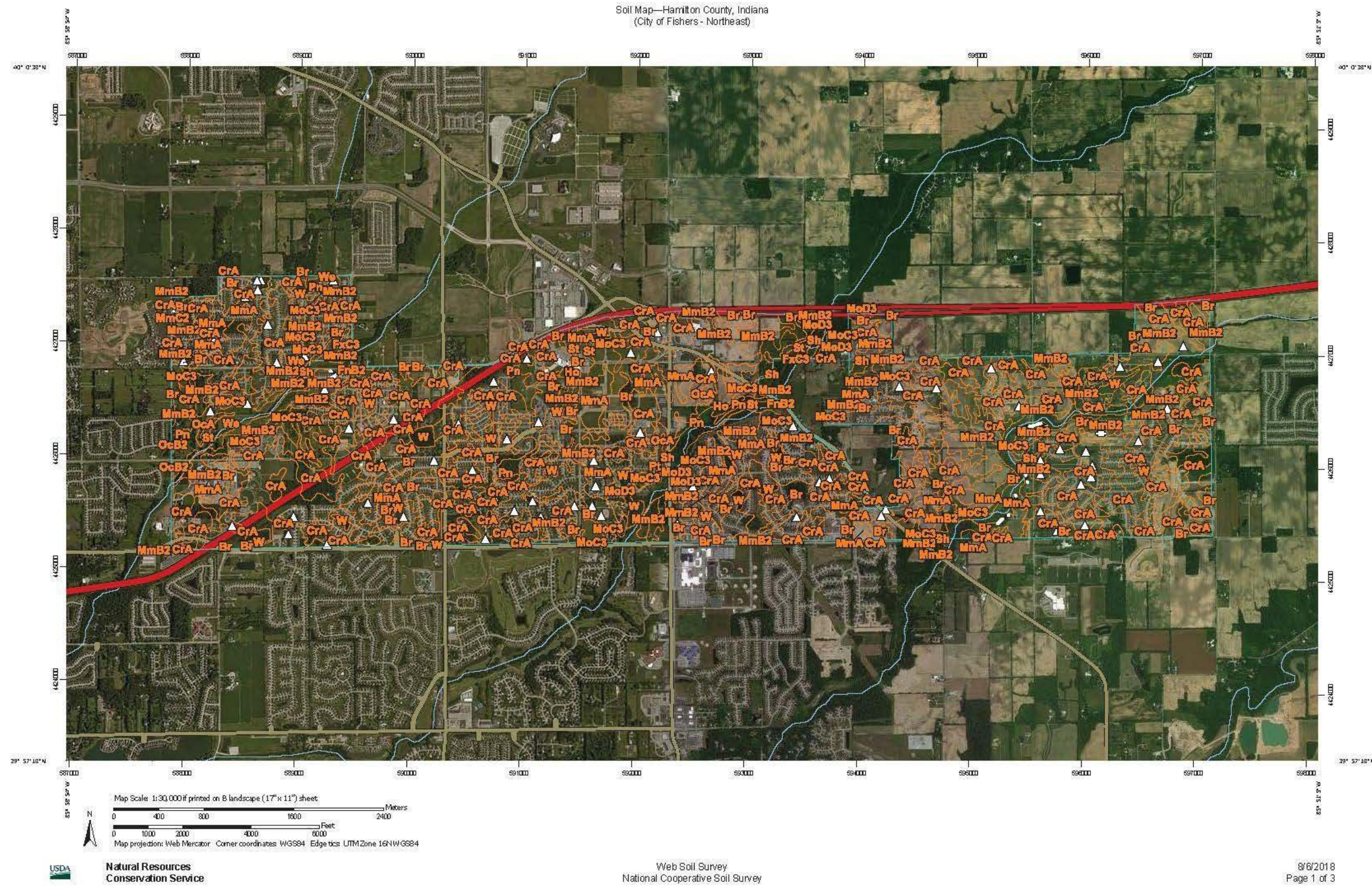


Figure 2-9 - City of Fishers Soils Map - Northeast

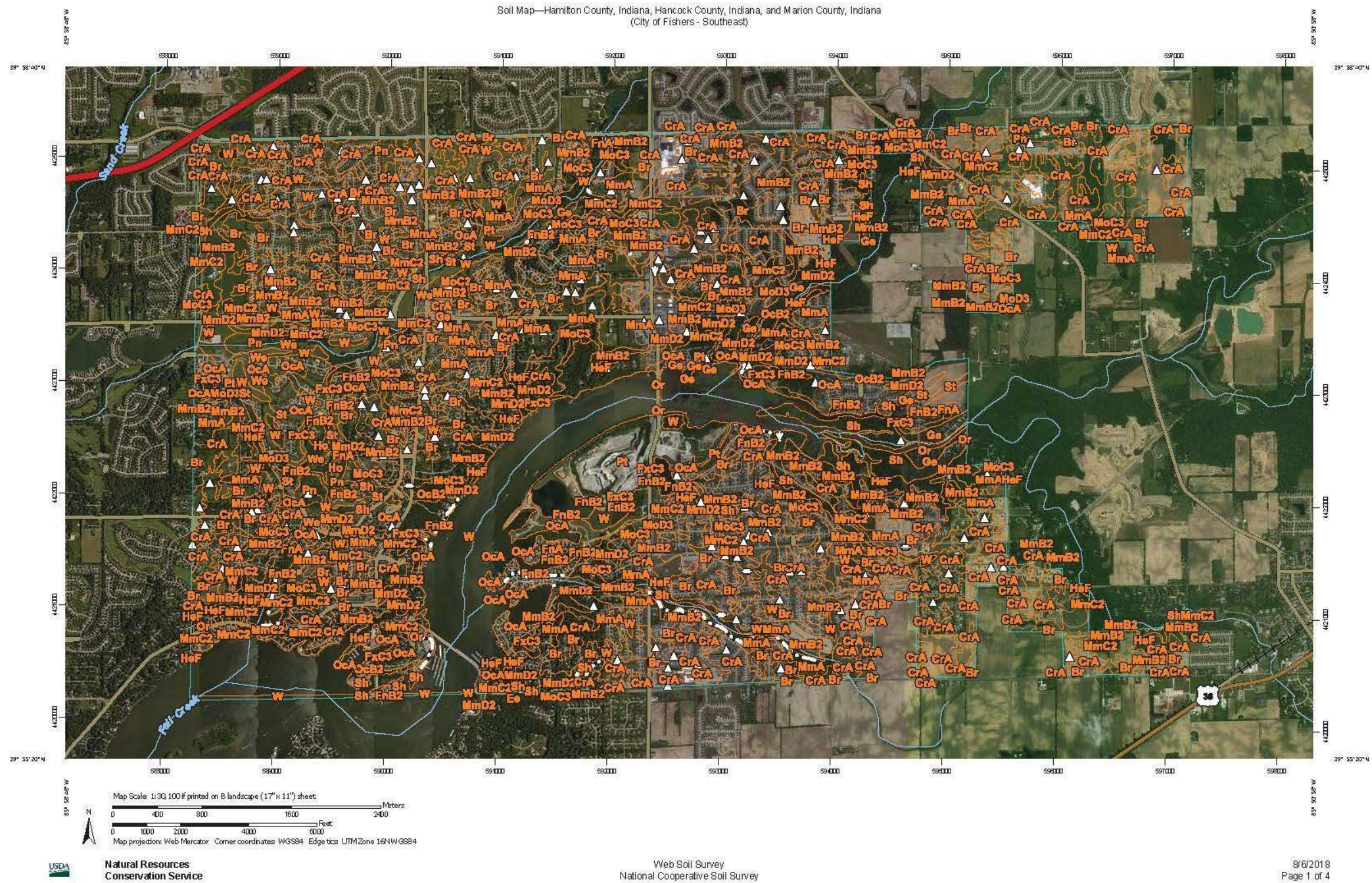


Figure 2-10 - City of Fishers Soils Map - Southeast

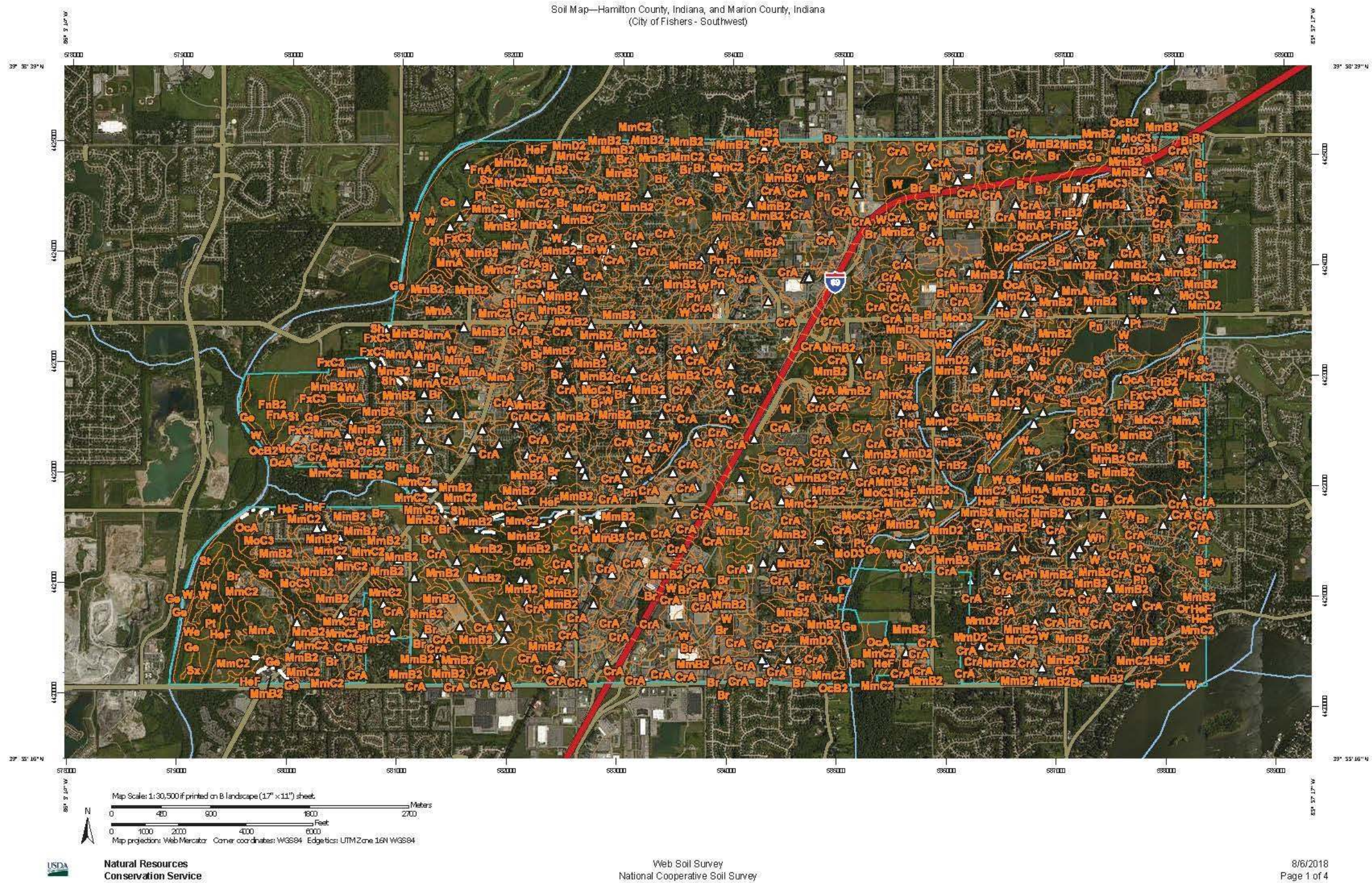


Figure 2-11 - City of Fishers Soils Map - Southwest

Map Unit Symbol	Map Unit Name	Southwest		Northwest		Northeast		Southeast		Combined	
		Acres in AOI	Percent of AOI	Acres in AOI	Percent of AOI	Acres in AOI	Percent of AOI	Acres in AOI	Percent of AOI	Acres in AOI	Percent of AOI
Br	Brookston silty clay loam	2299.3	23.7%	1056.9	29.6%	1403.1	33.6%	1339.9	15.2%	6099.2	23.2%
CrA	Crosby silt loam, 0 to 2 percent slopes	3489.2	36.0%	1460.1	40.9%	1727.4	41.3%	2498.6	28.4%	9175.3	34.9%
FnA	Fox loam, 0 to 2 percent slopes	64.7	0.7%	18.6	0.5%		0.0%	11.1	0.1%	94.4	0.4%
FnB2	Fox loam, 2 to 4 percent slopes	59.5	0.6%			1	0.0%	79.4	0.9%	139.9	0.5%
FxC3	Fox complex, 8 to 18 percent slopes, eroded	36.8	0.4%			6.8	0.2%	44	0.5%	87.6	0.3%
Ho	Houghton muck					3.1	0.1%	9.7	0.1%	12.8	
Ge	Genesee silt loam, 0 to 2 percent slopes, frequently flooded	198.8	2.0%	60.1	1.7%		0.0%	81.6	0.9%	340.5	1.3%
HeF	Hennepin loam, 25 to 50 percent slopes	237.4	2.4%	114	3.2%		0.0%	331.5	3.8%	682.9	2.6%
MmA	Miami silt loam, 0 to 2 percent slopes	362.8	3.7%	122.3	3.4%	127	3.0%	362.7	4.1%	974.8	3.7%
MmB2	Miami silt loam, 2 to 6 percent slopes, eroded	1169.8	12.1%	466.6	13.1%	364.9	8.7%	942.7	10.7%	2944.0	11.2%
MmC2	Miami silt loam, 6 to 12 percent slopes, eroded	287.3	3.0%	82.9	2.3%	2.2	0.1%	207.7	2.4%	580.1	2.2%
MmD2	Miami silt loam, 12 to 18 percent slopes, eroded	110.8	1.1%	19	0.5%		0.0%	182.9	2.1%	312.7	1.2%
MoC3	Miami clay loam, 6 to 12 percent slopes, severely eroded	96.2	1.0%	15.4	0.4%	176	4.2%	166.8	1.9%	454.4	1.7%
MoD3	Miami clay loam, 12 to 18 percent slopes, severely eroded	40.4	0.4%			26.6	0.6%	50.9	0.6%	117.9	0.4%
OcA	Ockley loam, 0 to 2 percent slopes	160.4	1.7%			14.6	0.3%	490.6	5.6%	665.6	2.5%
OcB2	Ockley loam, 2 to 6 percent slopes, eroded	9.1	0.1%	8.4	0.2%	0.9	0.0%	29.2	0.3%	47.6	0.2%
Or	Orthents	6.6	0.1%	0.3	0.0%	4.4	0.1%	10.8	0.1%	22.1	0.1%
Pn	Patton silty loam, 0 to 2 percent slopes	49.5	0.5%	21	0.6%	13.4	0.3%	48.4	0.5%	132.3	0.5%
Pt	Pits	57.8	0.6%	3.8	0.1%	1.4	0.0%	216.3	2.5%	279.3	1.1%
Ro	Ross loam, 0 to 2 percent slopes, occasionally flooded			12.7	0.4%		0.0%			12.7	
Sh	Shoals silt loam, 0 to 2 percent slope, frequently flooded	344.8	3.6%	26.7	0.7%	151.3	3.6%	435.3	4.9%	958.1	3.6%
St	Sleeth loam	35	0.4%	3.2	0.1%	17.6	0.4%	50.8	0.6%	106.6	0.4%
Sx	Sloan silty clay loam, sandy substratum	10.9	0.1%	4.6	0.1%	4.3	0.1%			19.8	0.1%
W	Water	318.5	3.3%	65.2	1.8%	77.8	1.9%	1057.2	12.0%	1518.7	5.8%
We	Westland silty clay loam, 0 to 2 percent slopes	256.6	2.6%	5.9	0.2%	56.6	1.4%	156.9	1.8%	476.0	1.8%
Wh	Whitaker silt loam	2.8	0.0%							2.8	0.0%
Total		9705.0	100.0%	3567.7	100.0%	4180.4	100.0%	8805	100.0%	26258.1	99.9%

Table 2-1 - City of Fishers - Soils Descriptions

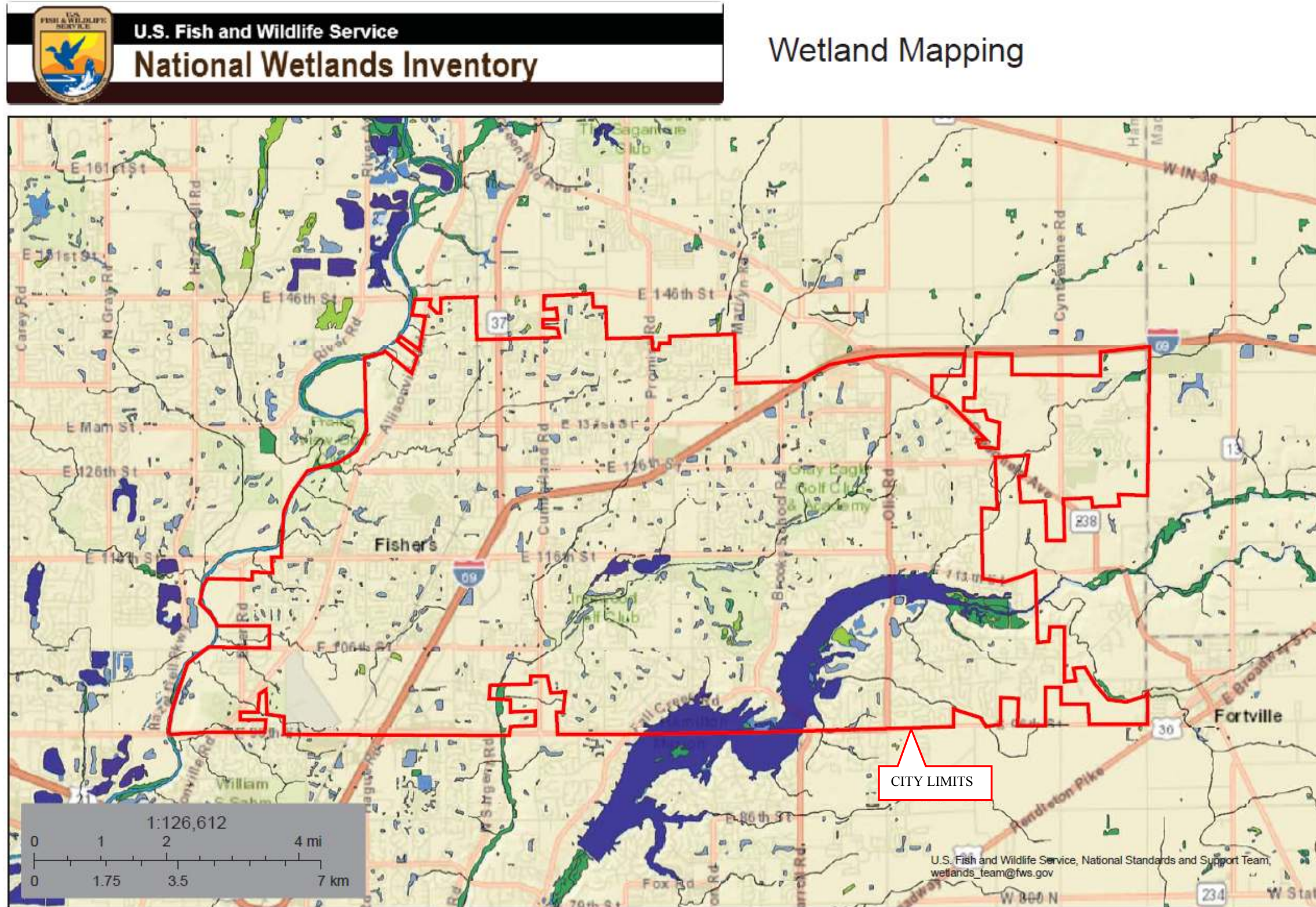


Figure 2-12 - National Wetland Inventory Map

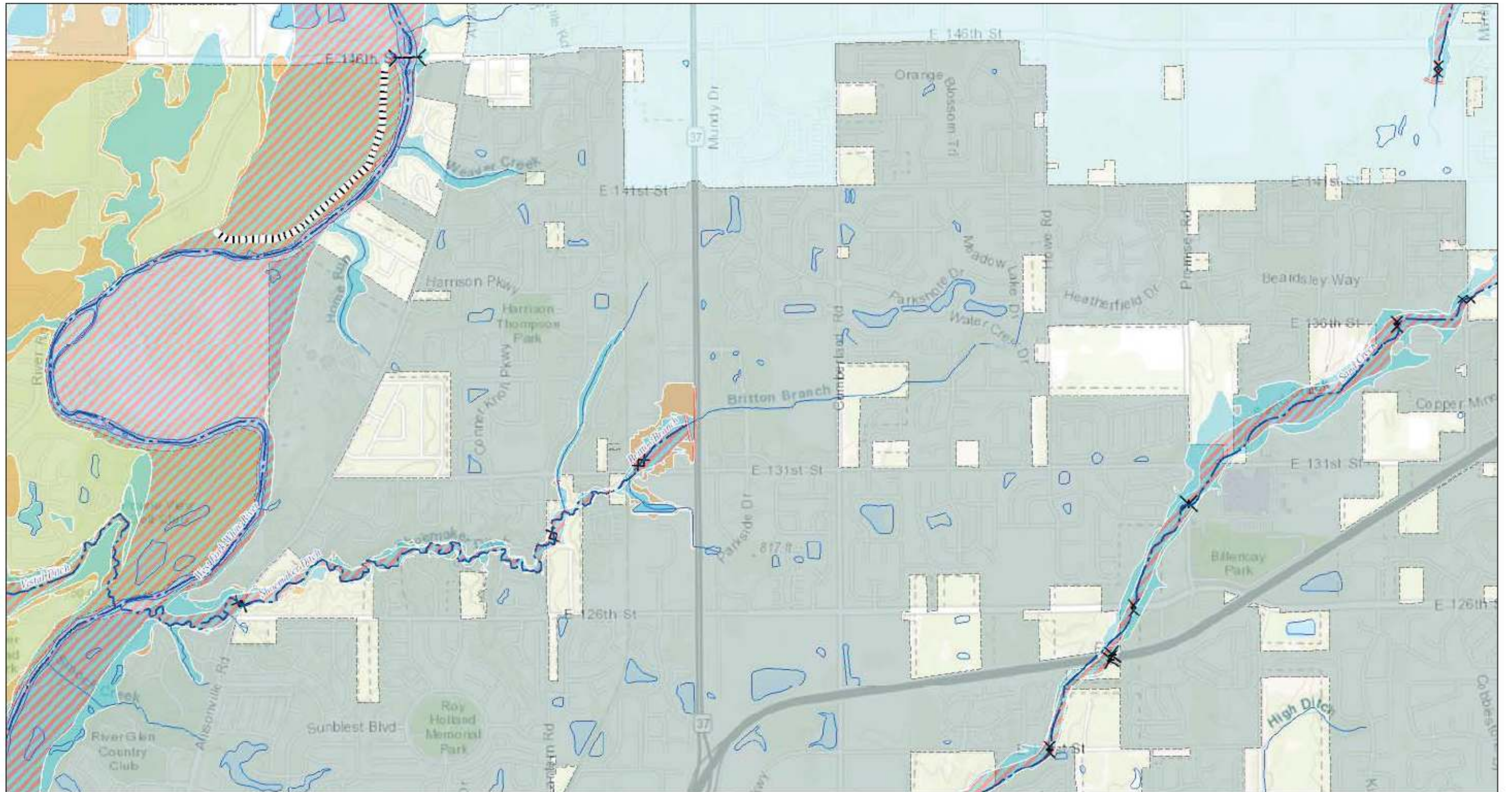


Figure 2-13 – City of Fishers Flood Zones – Northwest

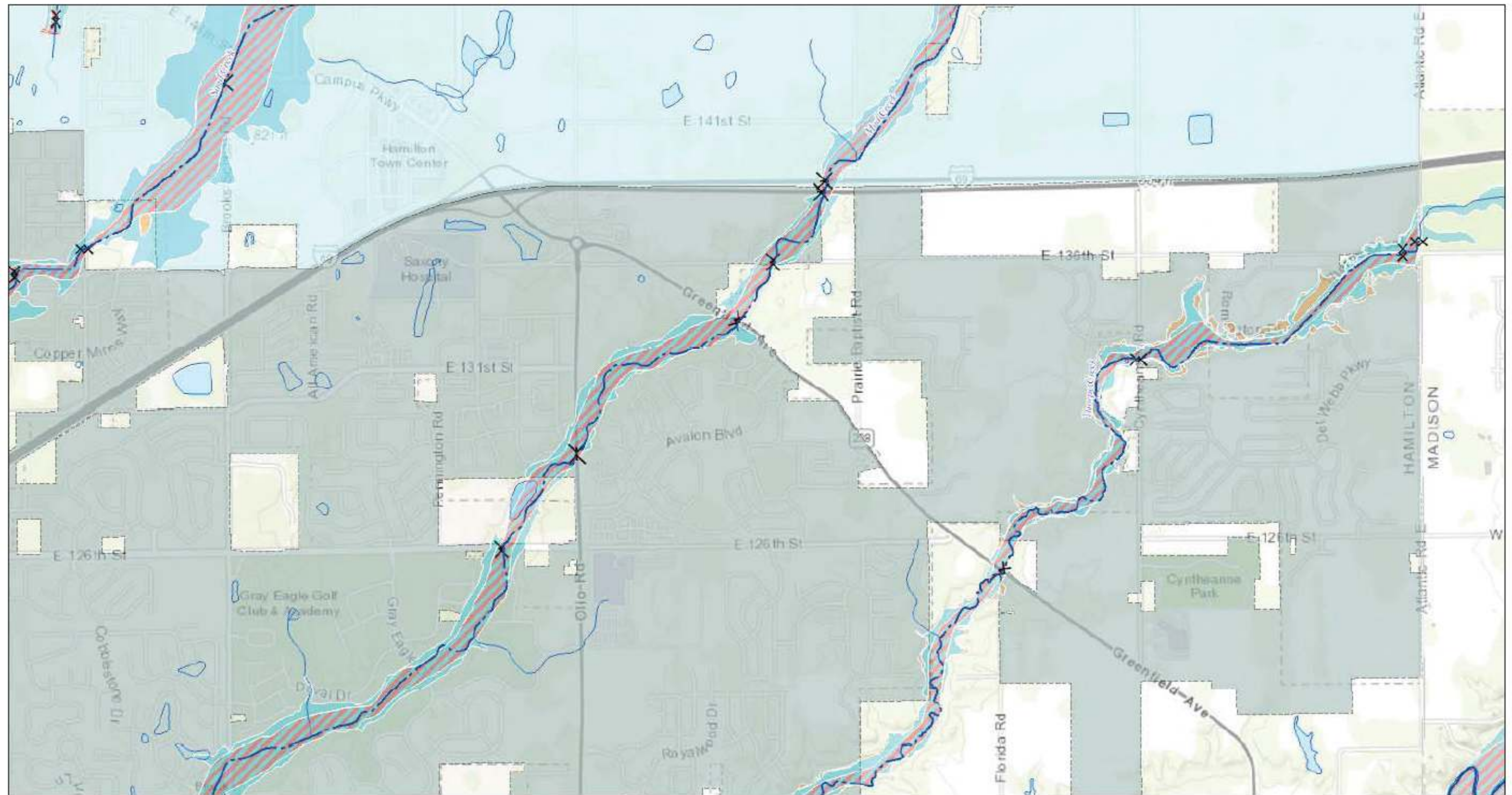


Figure 2-14 - City of Fishers Flood Zones – Northeast

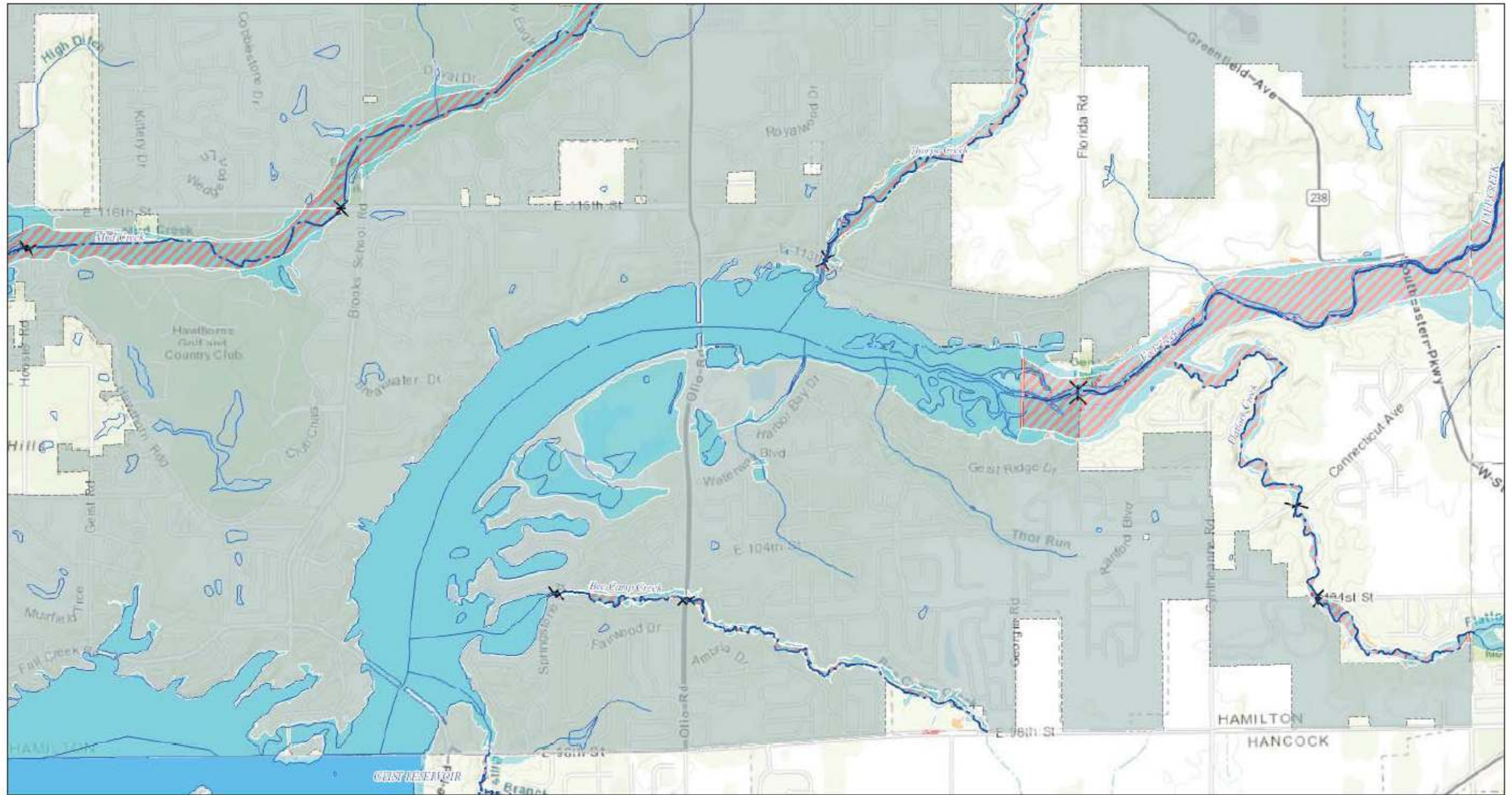


Figure 2-15 - City of Fishers Flood Zones – Southeast

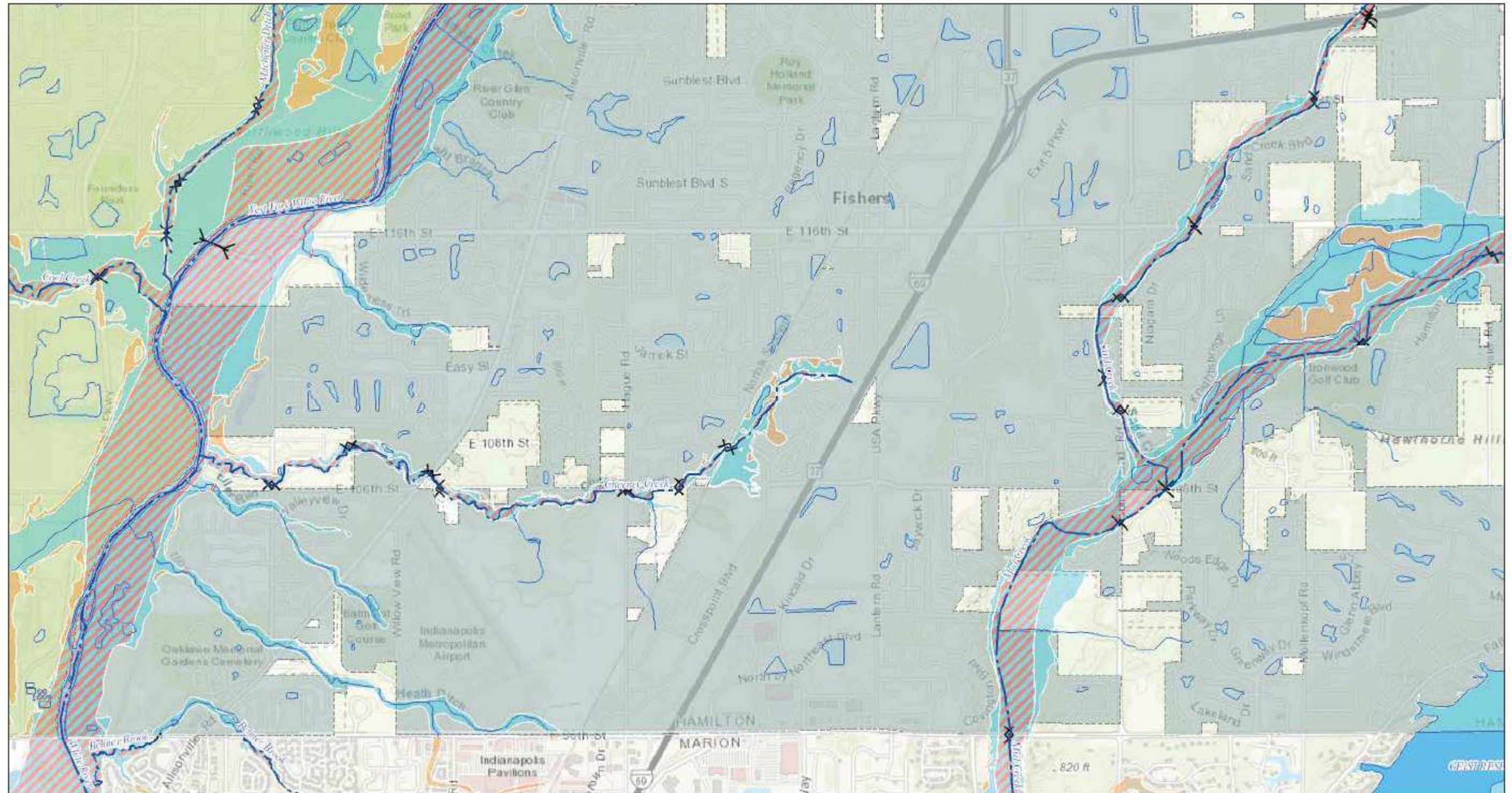


Figure 2-16 - City of Fishers Flood Zones – Southwest

3 DRAINAGE IMPROVEMENT PROJECT AREAS

Staff from the City of Fishers Engineering and Stormwater Departments provided DLZ with a master plan project list at the initial kick off meeting. This list included projects from previous master planning as well as newer project areas that were discovered over the past few years based upon previous customer complaints and known drainage and flooding problems. This list was further expanded to include “high water” areas, floodplain and drainage study areas and potential Dual-Purpose Development areas within the City limits. Dual-Purpose areas are potential land development or redevelopment sites that the City has identified during the Comprehensive Plan. This initial list was reviewed to determine what projects have been previous completed and whether any projects overlap.

DLZ and City staff then visited these sites to discuss the current drainage problems facing the areas, and the possible solutions to these problems. During the site visits an initial engineering assessment was completed of the project to discuss needs and potential solutions. A few of the areas were removed from consideration in the Master Plan list because no defined issues existed, or projects had previously been completed that resolved the drainage problems. Upon completion of the site visits and a preliminary evaluation of the drainage areas, the masterplan list was revised to include a total of thirty (30) drainage projects, eight (8) drainage/floodplain studies, four (4) maintenance projects, and two (2) Dual-Purpose Redevelopment projects.

The following sections generally describe the drainage problems as they were observed during the site visits and from input from the City staff. **Table 3-1** is a list of the projects to be discussed in the following sections, and also provides the priority ranking that was developed from the Initial Priority Rating’s (IPR’s) and feedback from City Staff. **Figure 3-1** provides a graphical description of where all the projects are located at. **Figure 3-2** provides a general legend with the project areas numbers identified. Full tabloid sized (11” by 17”) figures are included in **Appendix C**, and photos from the field visits can be seen in **Appendix D**.

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Table 3-1 – City of Fishers Projects

City of Fishers Project Areas		
Project #	Project Name	Initial Priority Ranking
1	Cheeny Creek - 106th Street Between Hague Road and Railroad Tracks	108
2	Cheeny Creek - 106th Street Between Sherborne Road and Hague Road	108
3	136th Street West of Marilyn Road at Sand Creek Flooding Improvements	71
4	136th Street West of Prairie Baptist Road at Mud Creek	71
5	97th and 98th Street Drainage Improvements	69
6	Prairie Baptist South of Silverleaf Blvd. Drainage Improvements	60
7	Cumberland Road and 106 th Street Bridge Replacement	79
8	136th Street Culvert Improvements at Limestone Springs	79
9	Airport Property Drainage at Allisonville Road and 106th Street	79
10	10307 Cumberland Road Storm Sewer Upgrade in Bradford Knoll	70
11	Lake Stonebridge Dam Overtopping	64
12	Lantern Road and USA Parkway Drainage Improvements	62
13	Hoosier Road South of S-Curve Cemetery Ditch Improvements	58
14	Georgia Road North of 96th Street Drainage Improvements	54
15	121st Street between Cross Road Lane and Blue Springs Lane	54
16	96 th Street and Cyntheanne Road Drainage Improvements	44

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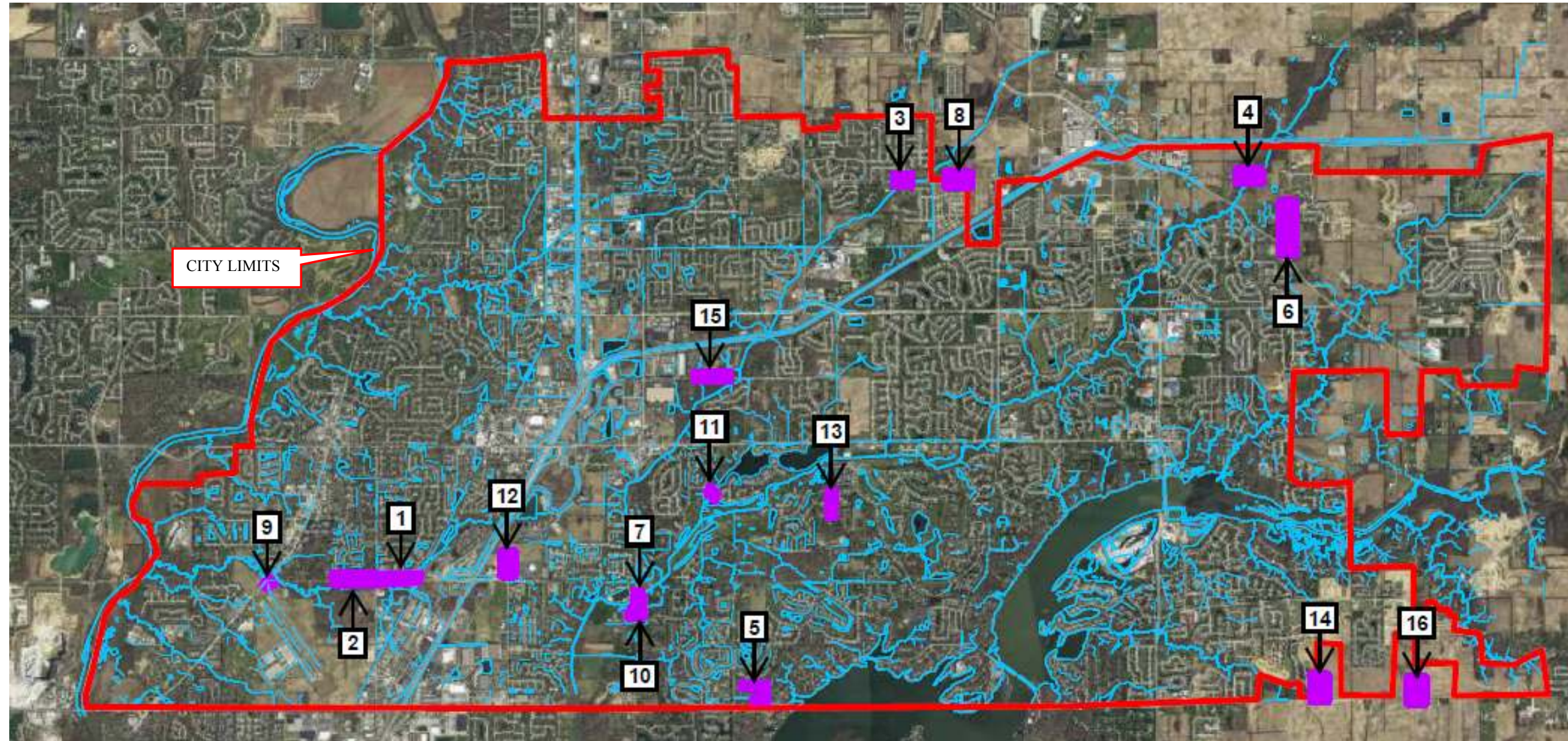


Figure 3-1 - Overall Project Locations

Project Locations:

Legend

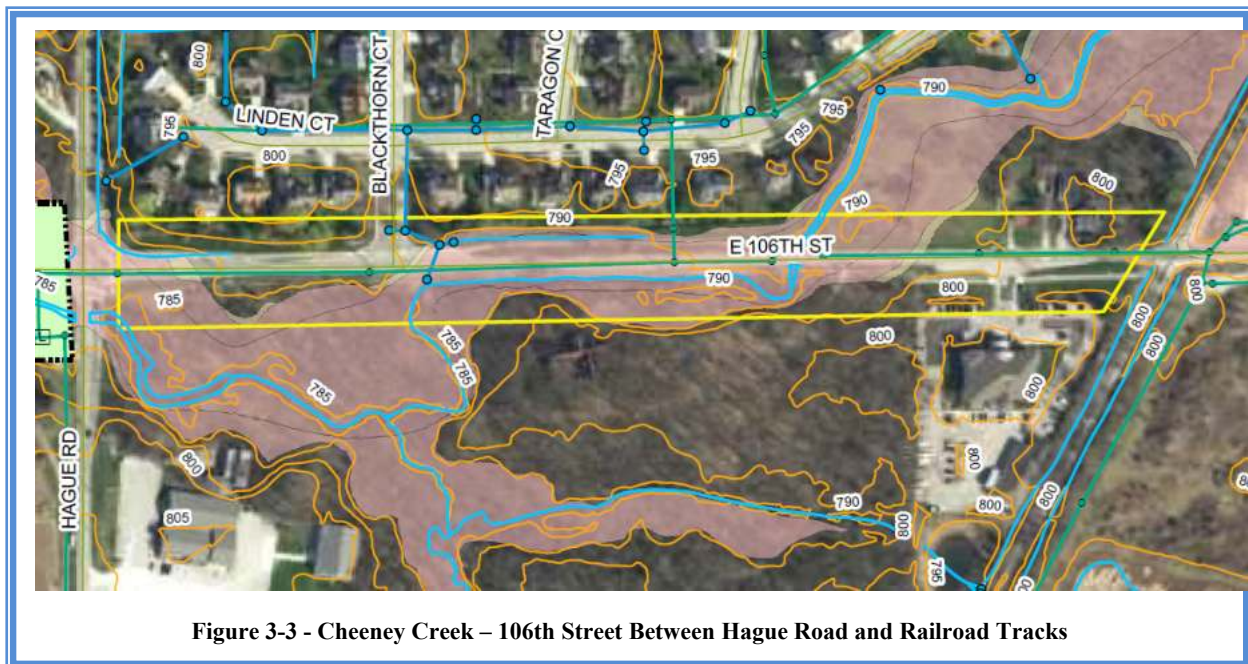
- █ Fishers Corporate Limits
- █ Hydrology
- █ Project Area

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Cheeney Creek – 106th Street Between Hague Road and Railroad Tracks 2. Cheeney Creek – 106th Street Between Sherborne Road and Hague Road 3. 136th Street West of Marilyn Road at Sand Creek 4. 136th Street West of Prairie Baptist Road at Mud Creek 5. 97th and 98th Street Drainage Improvements 6. Prairie Baptist Road South of Silverleaf Boulevard Drainage Improvements 7. Cumberland Road and 106th Street Bridge Replacement 8. 136th Street Culvert Improvements at Limestone Springs | <ol style="list-style-type: none"> 9. Airport Property Drainage at Allisonville Road and 106th Street 10. 10307 Cumberland Road Storm Sewer Upgrade in Bradford Knoll 11. Lake Stonebridge Dam Overtopping 12. Lantern Road and USA Parkway Drainage Improvements 13. Hoosier Road South of S-Curve – Cemetery Ditch Improvements 14. Georgia Road North of 96th Street Drainage Improvements 15. 121st Street Between Cross Road Lane and Blue Springs Lane 16. 96th Street and Cyntheanne Road Drainage Improvements |
|---|--|

Figure 3-2 - General Figure Legend

3.1 Cheeney Creek – 106th Street Between Hague Road and Railroad Tracks

This project is located along 106th Street between Hague Road and the Railroad Tracks, just southeast of the downtown area. The need for this project resulted from numerous flooding events that have occurred throughout the years, which have inundated the roadway and many of the adjacent yards. According to FEMA flood mapping, this section of 106th street as well as several residential parcels located north of 106th Street are located in the FEMA special flood hazard area. **Figure 3-3** shows the project limits with the sanitary sewer, storm sewers and stream shown as well as the floodway/floodplain limits within the project area.



The major concern for this project is the frequency of flooding that 106th Street experiences. As the City of Fishers has continued to grow, 106th Street has become a major thoroughfare between the commercial developments at I-69 and Allisonville Road. In addition, many homeowners rely on this stretch of roadway for their daily work commutes. Since the roadway is subject to frequent flooding, many homeowners and businesses are adversely affected by having to adjust daily commutes to roadways that are not capable of handling the increased traffic flow. In addition, the frequent flooding has led to roadway deterioration and storm and sanitary sewer backups that affect the local residents.

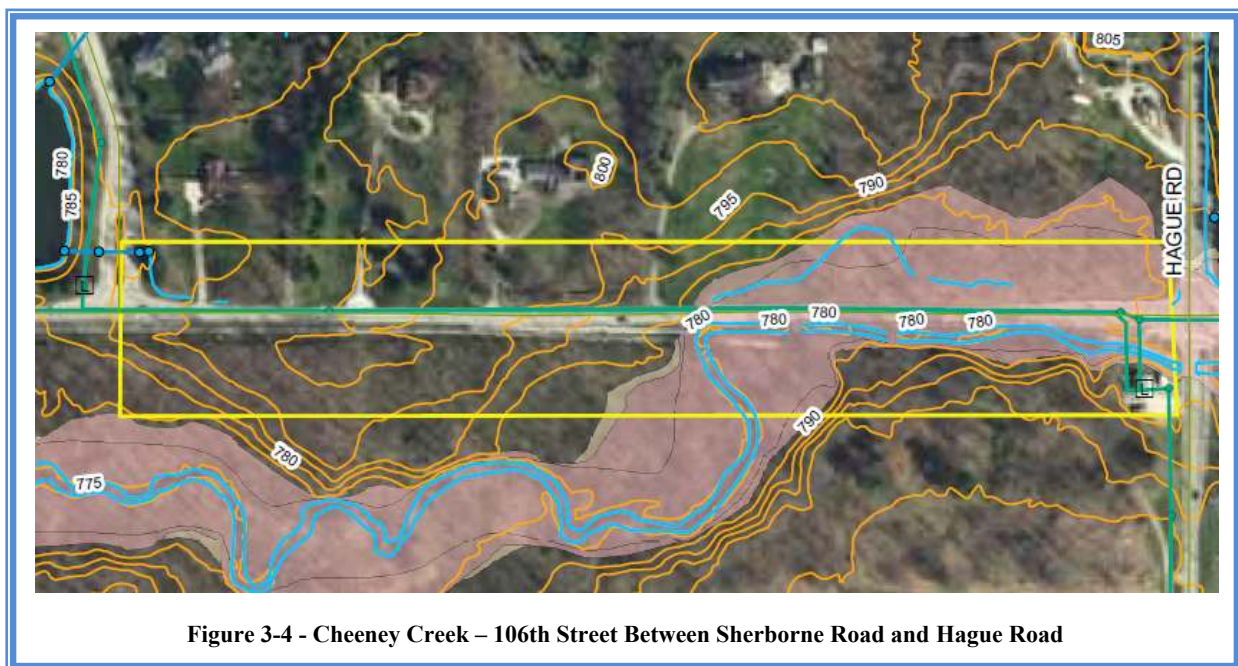
Roadway elevations in this area range between 792' east of the Cheeney Creek crossing to 789' near Blackthorn Ct. to the west. Based on the FEMA mapping the 100-yr base flood elevation (BFE) ranges from 792' to 790'.

A site visit was conducted on April 3, 2018 to observe the area during a rain event. During the site visit the water level within Cheeney Creek was within 2 feet of the roadway elevation and about one (1) foot below the low chord elevation of the bridge (see project photos in **Appendix D**).

Based upon the problems affecting the area, it is recommended that this project be part of the Capital Improvements Projects. Refer to **Section 5.2** for further discussion on the recommendations and opinion of probable project costs.

3.2 Cheeney Creek – 106th Street Between Sherborne Road and Hague Road

This project is located along 106th Street between Sherborne Road and Hague Road, just southeast of the downtown area. The project is also located just west of the previously discussed project in **Section 3.1**. Similar to the previous project, the need for this project resulted from numerous flooding events that have occurred, which has inundated the roadway and many of the adjacent yards. This project area also includes a sanitary sewer lift station that is subject to frequent flooding and back-ups. According to FEMA flood maps, this section of 106th Street as well as residential parcels north side 106th Street are located within the floodway and floodplain limits. **Figure 3-4** shows the project limits with the sanitary sewer, storm sewers and stream shown as well as the floodway/floodplain limits within the project area.



The major concern for this project is the frequent flooding of 106th Street and the effect of this flooding on the adjacent homeowners. This project is also magnified by the presence of the sanitary sewer lift station at the southwest corner of Hague Road and 106th Street. The frequent flooding has caused occasional sanitary sewer overflows at the lift station which have polluted the

stream. Access to both residents and commercial developments are affected by the roadway flooding. The site visit on April 3, 2018 indicated that the water level within Cheeney Creek was within about one (1) foot of the roadway elevation and in one area was near the roadway elevation (Refer to the project photos in **Appendix D**).

Roadway elevations in this area range from about 787' at Hague Road to a low elevation of 783' approximately 570 feet west of Hague Road. Based on the FIRM mapping the 100-yr base flood elevation (BFE) ranges from 788' to 784'.

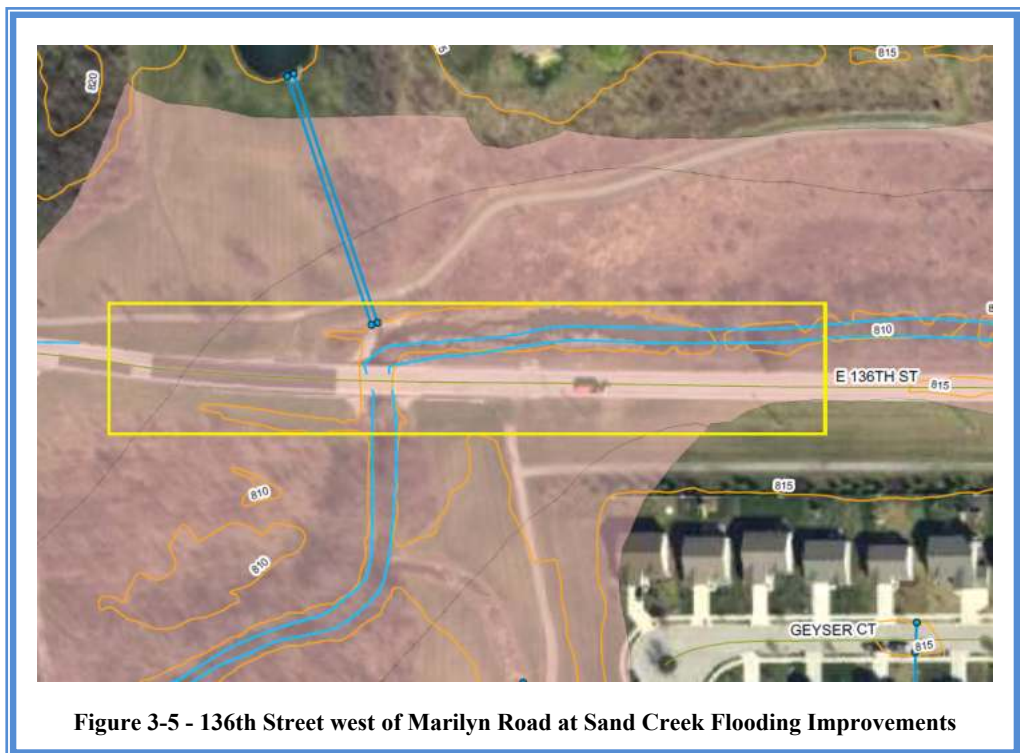
Based upon the problems affecting the area, it is recommended that this project be part of the Capital Improvements Projects. See **Section 5.3** for further discussion of the recommendations and opinion of probable project costs.

3.3 136th Street west of Marilyn Road at Sand Creek Flooding Improvements

The 136th Street project at Sand Creek is located just west of Marilyn Road. The bridge located at this site is identified as Hamilton County Bridge #185. The project is located in the northern portion of the city limits, just northeast of the downtown area. The project is mostly surrounded by residential subdivisions as well as some agricultural area to the north west. Overall, this area has seen significant growth with many of the surrounding subdivisions between built between 2005 and 2010 causing major changes in the watershed. Per City staff, this project is included in the Capital Plan due to 136th Street being subject to flooding during a 100-year storm event. The City's goal is to

remove as many roadways from the 100-year floodplain / floodway and have sufficiently sized bridges to eliminate overtopping.

Based on mapping and field visits, Sand Creek runs parallel to 136th Street between Marilyn Road and the bridge.



The creek has an immediate 90 degree turn to the south flowing through Bridge #185 where it continues flowing south. **Figure 3-5** shows the project area with Sand Creek and the floodway/floodplain limits.

Based on the FEMA mapping, portions of 136th Street are located within the floodway and floodplain between Marilyn Road and the bridge structure.

This section of 136th Street is not frequently flooded, however if the roadway does flood this would have a major impact on the adjacent residents as 136th Street and Marilyn Road are both heavily traveled roadways used for daily commuting to I-69. Flooding would also create safety hazards for vehicles driving into the waters.

Roadway elevations in this area range from about 822' at the Marilyn Road roundabout to a low elevation of 813' just east of the bridge structure. Based on the FIRM mapping the 100-year BFE ranges from 815' near Marilyn Road to 813'.

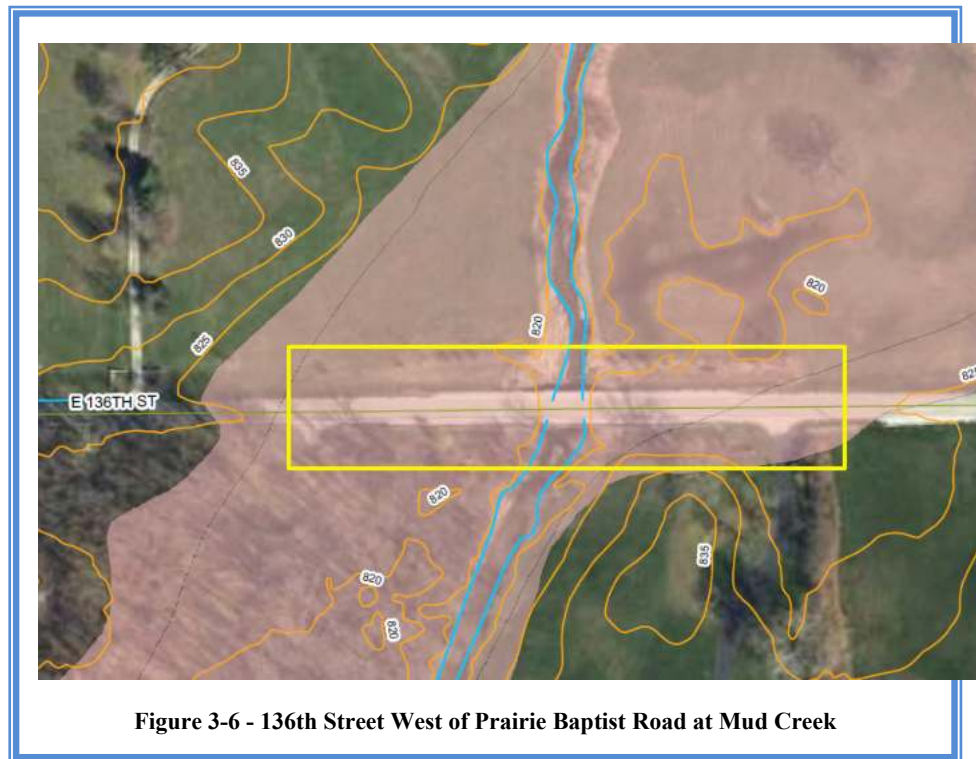
Based upon the potential flooding problems affecting the area, it is recommended that this project be part of the Capital Improvements Projects. See **Section 5.4** for further discussion of the recommendations and opinion of probable project costs.

3.4 136th Street West of Prairie Baptist Road at Mud Creek

The 136th Street project at Mud Creek is located just west of Prairie Baptist Road. The bridge located at this site is identified as Hamilton County Bridge #176. Overall this project is mostly surrounded by agricultural areas, however the area west of the bridge is currently being developed into a heavy commercial / health care complex. In addition, some residential subdivisions are being constructed to the east of the development. It is anticipated that the area west of the bridge will continue to see heavy commercial and industrial development due to the location near the I-69 interchange and expansion within the City of Noblesville northwest of I-69. Additional residential developments east of the bridge are also anticipated. **Figure 3-6** shows the project area with Mud Creek and the floodway/floodplain limits.

Per City staff, this project is included in the Capital Plan due to 136th Street being subject to flooding during a 100-year storm event. The City's goal is to remove as many roadways from the 100-year floodplain / floodway and have sufficiently sized bridges to reduce occurrences of overtopping. Based on mapping and field visits, Mud Creek has a large watershed from the north and drains from the north to the south under 136th Street. There are two (2) large bends within the creek just upstream on the bridge which results in a wide floodway/floodplain upstream of the structure. Field visits on April 3, 2018 showed that entire field upstream area of the bridge was flooded.

This section of 136th Street is not frequently flooded, however during the site visit the water level was observed to be located approximately 1 to 2 feet below the low chord elevation. With the anticipation of future development around the bridge, providing a bridge structure that safely passes rain events up to the 100-yr storm event is imperative.



Roadway elevations in this area range from about 825' approximately 300 feet to the east and west of the bridge with the bridge at an approximate elevation of 825' as well. The roadway dips down to approximately 824'. immediately east and west of the bridge before the grade increase to the 825' elevation. Based on the FIRM mapping the 100-year BFE ranges from 826'. upstream of the bridge and 825' downstream of the bridge.

Based upon the potential flooding problems affecting the area, it is recommended that this project be part of the Capital Improvements Projects. See **Section 5.5** for further discussion of the recommendations and opinion of probable project costs.

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3.5 97th and 98th Street Drainage Improvements

The 97th and 98th Street Drainage improvements project is located on the east side of the City limits. The subdivision is located on the east side of Mollenkopf Road just north of 96th Street / Hamilton County line. This project is the extension of a previously completed drainage project that was completed within the western half of the subdivision. **Figure 3-7** shows the project location with the existing storm sewers previously constructed in the prior section west of the project area.

The 97th and 98th Street project is unique as it is located at the divide between two (2) different watersheds. Most of 97th and 98th Street is located within the Mud Creek – Sand Creek Watershed. The north-south roadway between 97th and 98th Street is located within the Geist Reservoir Watershed. In addition, there is an existing inlet and drain at the east end of 97th Street at the bend that is part of the Geist Woods Regulated Drain. A storm inlet and pipe system with swales was previously constructed that drains north into another storm sewer system.



Figure 3-7 - 97th and 98th Street Drainage Improvements

During site visits and prior public input, standing water was observed within the swales and yards due a lack of defined drainage facilities. Many driveway culverts were silted full or in poor condition with crushed ends that impede the flow. Roadside swales are either silted full or do not have sufficient slope to drain to existing culverts/pipes.

A culvert pipe and small inlet/pipe system were located at the southeast corner of the subdivision where 97th Street turns to the north; however, it does not appear that the yards/swales were properly graded to drain to this system.

Depending on how the existing drainage system at the southeast corner of the subdivision is affected, some coordination with the Hamilton County Surveyor's Office may be required.

Based upon the nature of the problem, it is recommended that this project be part of the Capital Improvements Projects. See **Section 5.6** for further discussion of the recommendations and opinion of probable project costs.

3.6 Prairie Baptist South of Silverleaf Boulevard Drainage Improvements

The Prairie Baptist South of Silverleaf Boulevard project is located on the northeast area of the City limits. The project is along Prairie Baptist Road between 136th Street and Greenfield Avenue. The project area is shown in **Figure 3-8**.

This project was the result of high water reported along Prairie Baptist Road just south of Silverleaf Blvd. The edge of roadway shows signs of deterioration which appears to be result of runoff from the adjacent field to the west encroaching onto the roadway. A small roadside swale appears to be present, however the swale has been silted in over the years or blocked by sediment/debris build-up that collects along the roadway.

A field visit was completed on April 3, 2018 which confirmed pockets of standing water at the edge of the roadway. During the field visit it was also observed that yard flooding was occurring along the east side of Prairie Baptist further south. A large area of standing water was observed encroaching into the edge of the roadway. Upon reviewing available GIS mapping, it was noted that this area was in an unincorporated area outside the City of Fishers corporate limits. The division between the city limits and unincorporated area is along the south edge of the subdivision. Upon discussing with City of Fishers staff, the project area was expanded to include the area since the area could be annexed in the future.



Figure 3-8 - Prairie Baptist South of Silverleaf Blvd.
Drainage Improvements

A lack of defined swales, culvert pipes and storm sewers within the area contribute to the standing water and roadway deterioration from the flooding conditions. Since the area is fairly flat, any swales that were previously present have been silted in or blocked by sediment build-up. As noted above, since a portion of the site is in an unincorporated area, coordination with the Hamilton County Surveyor's Office would be required.

Based upon the nature of the problem, it is recommended that this project be part of the Capital Improvements Projects. See **Section 5.7** for further discussion of the recommendations and opinion of probable project costs.

3.7 Cumberland Road and 106th Street Bridge Replacement

The Cumberland Road Bridge is located just south of the 106th Street and Cumberland Road roundabout. This site is located east of the downtown area and is near the entrance to Cumberland Park. The bridge is identified as Hamilton County Bridge #164. **Figure 3-9** shows the bridge location with Mud Creek. This project is also located just north of the 10307 Cumberland Road Storm Sewer Upgrade project, which is described in greater detail in **Section 3.10**.



Figure 3-9 - Cumberland Road and 106th Street Bridge Replacement

The project area is mostly located within the floodway/floodplain limits of Mud Creek with residential areas located to the north and south. The bridge is located downstream of the Sand Creek confluence with Mud Creek. The open field upstream of the bridge (southeast corner of the 106th Street and Cumberland Road roundabout) floods frequently and is located entirely within the floodway. The Cumberland Park downstream of the bridge also floods frequently. The upstream field and the park were completely inundated with water during the April 3, 2018 field visit. Photos of the site are provided in **Appendix D**.

Per City staff, this project is included in the Capital Plan due to portions of 106th Street and Cumberland Road being

subject to flooding during a 100-year storm event. The City's goal is to remove as many roadways from the 100-year floodplain / floodway and have sufficiently sized bridges to eliminate overtopping. As noted above, based on mapping and field visits, Mud Creek has a large watershed from the north and the area is subject to frequent flooding.

Roadway elevations in this area appear to show that the bridge is located near an elevation of 785' with the area near the roundabout near an elevation of 783'. Based on the FIRM mapping the 100-year base flood elevation (BFE) ranges from 784' at Cumberland Road and 785' at 106th Street.

Due to the flooding problems affecting the area, it is recommended that this project be part of the Capital Improvements Projects. See **Section 5.8** for further discussion of the recommendations and opinion of probable project costs.

3.8 136th Street Culvert Improvements at Limestone Springs

The 136th Street Culvert Improvements project at Limestone Springs is located within the north central portion of the City limits. The south side of 136th Street is located within the City of Fishers corporate limits and the north side of the 136th Street is part of the City of Noblesville corporate limits. The project site is located between Marilyn Road and Brooks School Road and just east of the Limestone Springs Subdivision. The project is the result of an insufficiently sized culvert pipe and deteriorating drainage facilities that cause yard flooding and frequent overtopping of the roadway. **Figure 3-10** shows the project area.



Currently runoff from the subdivision and field to the south of 136th Street flows north towards 136th Street where the runoff is conveyed under 136th Street via a small CMP culvert pipe. The culvert pipe drains into a field located north of 136th Street. No conveyance swales to carry flows were present as any swales were either overgrown with trees or silted in due to on-going farming of the adjacent land. The CMP pipe appears to be undersized and in deteriorating condition. Based

on the April 3, 2018 field visit, flood waters were overtopping the roadway causing the south (eastbound) lane to be closed. The adjacent field and subdivision area upstream of the culvert pipe were also inundated with water.

Although the culvert pipe is not conveying flows from a regulated drain, the runoff from the culvert eventually drains to the TJ Patterson Drain to the north. Depending on the selected design alternative to remediate the drainage issues, coordination with the City of Noblesville and/or the Hamilton County Surveyors Office may be required.

Based on the nature of the problem and possible coordination other governmental agencies, it is recommended that this project be part of the Capital Improvements Projects. See **Section 5.9** for further discussion of the recommendations and opinion of probable project costs.

3.9 Airport Property Drainage at Allisonville Road and 106th Street

The Indianapolis Metropolitan Airport manages an airport between 96th Street and 106th Street within the City of Fishers corporate limits. The northern portion of the airport facility, including the runway drains, north into the existing storm sewer system at the intersection of 106th Street and Allisonville Road. **Figure 3-11** shows the intersection as well as the storm and sanitary sewer facilities near the intersection.

The project is due to the runoff from the airport coming off the steep slope into the right-of-way inlets. During larger storm events, runoff from the airport will overwhelm the inlet and drain into the roadway causing flooding and lane closures. In addition, debris will build-up along the airport fence at the right-of-way causing additional erosion issues and maintenance problems for the airport facility.

An investigation completed at the site on

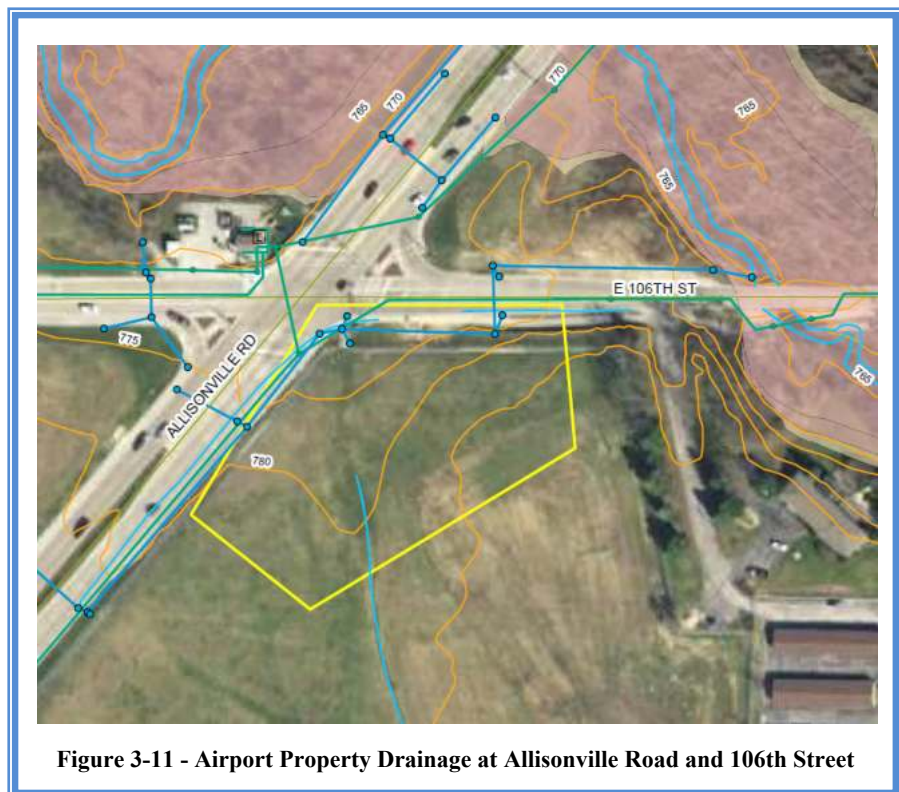


Figure 3-11 - Airport Property Drainage at Allisonville Road and 106th Street

April 3rd, documented that the inlet has insufficient inlet capacity during large storm events to collect the high velocities and flows off the slope. Photos of the site are provided in **Appendix D** that show the runoff from the bank entering the inlet from the airport site. The pipe system appears to be sufficient to handle design storm events, however the inlet casting appears to lack the capacity to handle the flows.

Based upon the nature of the flooding problem, it is recommended that this project be part of the Capital Improvements Projects. See **Section 5.10** for further discussion of the recommendations and opinion of probable project costs.

3.10 10307 Cumberland Road Storm Sewer Upgrade in Bradford Knoll

This project is located on the east side of Cumberland Road across from the Bradford Knoll Subdivision. The project area is south of 106th Street, just south of the Cumberland Road Bridge Replacement project previously discussed in **Section 3.7** above. The project is due to flooding of the residence at 10307 Cumberland Road as well as the adjacent yards around the parcel.

A small stream from the east flows through the parcel towards Cumberland Road. The stream enters a 36-inch pipe under Cumberland Road towards the Bradford Knoll Subdivision. On the west side of the Cumberland Road, the 36-inch culvert pipe enters the Bradford Knoll storm sewer system which consists of 24" pipes and various curb inlets. The Bradford Knoll storm sewer conveys runoff to a detention pond with an ultimate discharge to Mud Creek. **Figure 3-12** shows the project area and estimated project limits (yellow polygon). The 10307 Cumberland Road parcel and culvert pipe is at the bottom end of the project limits. The blue line represents the incoming stream with the green lines depicting the 24" storm sewer system.



Figure 3-12 - 10307 Cumberland Road Storm Sewer Upgrade in Bradford Knoll

The parcel noted above has a long history of flooding during large storm events. Although the 36” pipe appears to have sufficient capacity, the 24” pipe system downstream appears undersized causing back-ups within the system. In addition, during the field visits with City staff it appears that the invert of the 36” CMP has started to corrode which over time would lead to pipe failures and possible sink holes under Cumberland Road.

It should be noted that based on the corporate limits mapping, the 10307 Cumberland Road Parcel is located outside the City of Fishers corporate limits; however, the 36” culvert pipe and Bradford Knoll storm sewer system are within the City limits.

Based on the nature of the problem and possible coordination required with Hamilton County, it is recommended that this project be part of the Capital Improvements Projects. See **Section 5.11** for further discussion of the recommendations and opinion of probable project costs.

3.11 Lake Stonebridge Dam Overtopping

This project is located in the center of City of Fishers, just east of the downtown area. Lake Stonebridge is on the south side of 116th Street west of Hoosier Road. The project was put in the capital plan due to the overtopping of the dam during very large storm events and the concerns with roadway closures as a result of the overtopping. **Figure 3-13** shows the area of the dam at Brixton Lane.

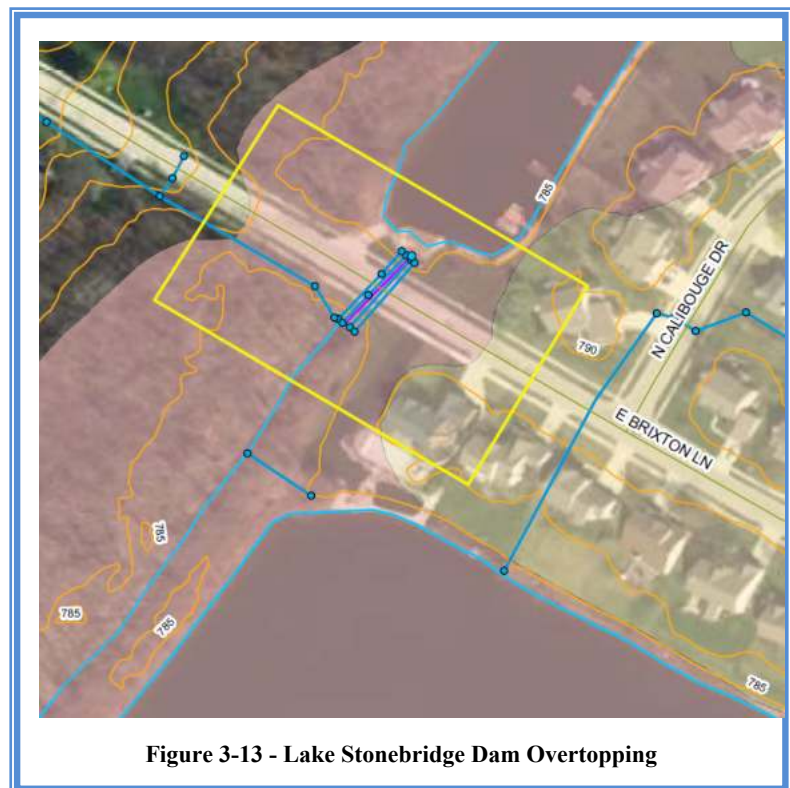


Figure 3-13 - Lake Stonebridge Dam Overtopping

The lake collects runoff from the Lake Stonebridge Subdivision as well as conveying flows from the Russell Johnson Drain and William McKinstry Drain. The regulated drains collect flows from an area north of 116th Street and conveys the flows to / through the lake. The water elevation with the lake is controlled by the dam’s control structure, which sends flow into High Ditch and Mud Creek. The Lake Stonebridge Dam control structure consists of four 30-inch pipes under Brixton Road with a small concrete approach pad on the upstream side of the dam.

Per FEMA flood mapping, the dam / Brixton Road is below the 100-year flood elevation and the City of Fishers has noted overtopping of the dam in the past which floods Brixton Road at the top of the dam. During field investigations, it was observed that the concrete spillway at the upstream side of the dam has numerous cracks that could eventually lead to a structural failure if not appropriately remediated. In addition, evidence of nuisance animals was observed around the concrete dam in the form of burrows. These burrows could cause the soils to wash out under the roadway. Photos of the site are provided in **Appendix D** that show the concrete cracking within the dam and the dam's inundation during the April 3, 2018 rain event.

Based upon the nature of the problem, it is recommended that this project be part of the Maintenance Projects. See **Section 6.1** for further discussion of the recommendations and opinion of probable project costs.

3.12 Lantern Road and USA Parkway Drainage Improvements



This project area is just north of the 106th Street and Lantern Road/USA Parkway roundabout. USA Parkway is a heavily travelled corridor that leads to the commercial development along 116th Street, which includes the recently completed IKEA Home Furnishings and Topgolf. Much of the drainage issues are located near the entrance to the Eastern Star Church, which is located just north of 106th Street. This area has been targeted for future development due to its proximity of the current commercial development and I-69.

The project is the result of failing culvert pipes and the sediment build up within the RJ Craig Regulated Drain on the east side of USA Parkway. **Figure 3-14** shows the area of the project limits as well the existing storm and sanitary sewers in the vicinity of the project.

A field inspection noted that standing water was present along the west side of USA Parkway as well as in the regulated drain along the east side of USA Parkway. The culvert pipe that flows west to east under USA Parkway near the Eastern Star Church

entrance was crushed impeding flows from the farm field and causing flooding. Runoff overtopping the roadway has been reported during large rain events in the past. The RJ Craig drain north of the Eastern Star Church property was silted and contained many trees, shrubs and brush within the drain that prevents the free passage of flow. The damaged culvert and lack of drain maintenance causes flooding within the adjacent farm fields and portion of the street during large storm events. Since this area is targeted for future development in an expanding commercial development area, improving the drainage to eliminate flooding is a major priority.

Based upon the nature of the flooding problem, it is recommended that this project be part of the Maintenance Projects. See **Section 6.2** for further discussion of the recommendations and opinion of probable project costs.

3.13 Hoosier Road South of S-Curve / Cemetery Ditch Improvements

The project site is located along Hoosier Road just north of 111th Street just inside the City of Fishers Corporation limits. The project has been reported as a high-water location indicating that runoff has encroached on the roadway causing flooding/high water concerns. This section of Hoosier Road is not a heavily traveled roadway, however there are many residents that rely on the roadway for access to their homes. The project area limits can be found in **Figure 3-15**.

The reason for the roadway flooding appears to be the build-up of sediment and debris within the roadside swale over a period of time. A lack of maintenance within the swales and culvert pipes as well as the shallow slope of the swale have caused runoff to enter the roadway. Portions of the roadside swale have overgrown trees, brush, etc. that are prohibiting the conveyance of runoff.

Based upon the problems affecting this project area, it is recommended that this project be part of the Maintenance Projects. See **Section 6.3** for further discussion of the recommendations and opinion of probable project costs.



Figure 3-15 - Hoosier Road South of S-Curve / Cemetery Ditch Improvements

3.14 Georgia Road North of 96th Street Drainage Improvements

The Georgia Road Drainage Improvements project is just north 96th Street on Georgia Road approximately 1.25 miles east of Olio Road. The project area can be found in **Figure 3-16**.



This project is the result of flows from the farm field on the east side of Georgia Road flooding the roadway due to a lack of drainage infrastructure to collect and convey the runoff. The area currently consists of a farm field on the east side of Georgia Road with a subdivision on the west side of Georgia Road. The roadway flooding occurs near the entrance of the subdivision. The farm field currently drains toward a low spot along the edge of Georgia Road. Portions of the field also flow to a culvert pipe near the intersection of 96th Street and Georgia Road. Flooding as well as pavement deterioration was observed in both locations during the field inspection

Bee Camp Creek is located on the south side of 96th Street within Hancock County. Bee Camp Creek is eventually part of the Johnathan Stansbury Drain further downstream of the project site.

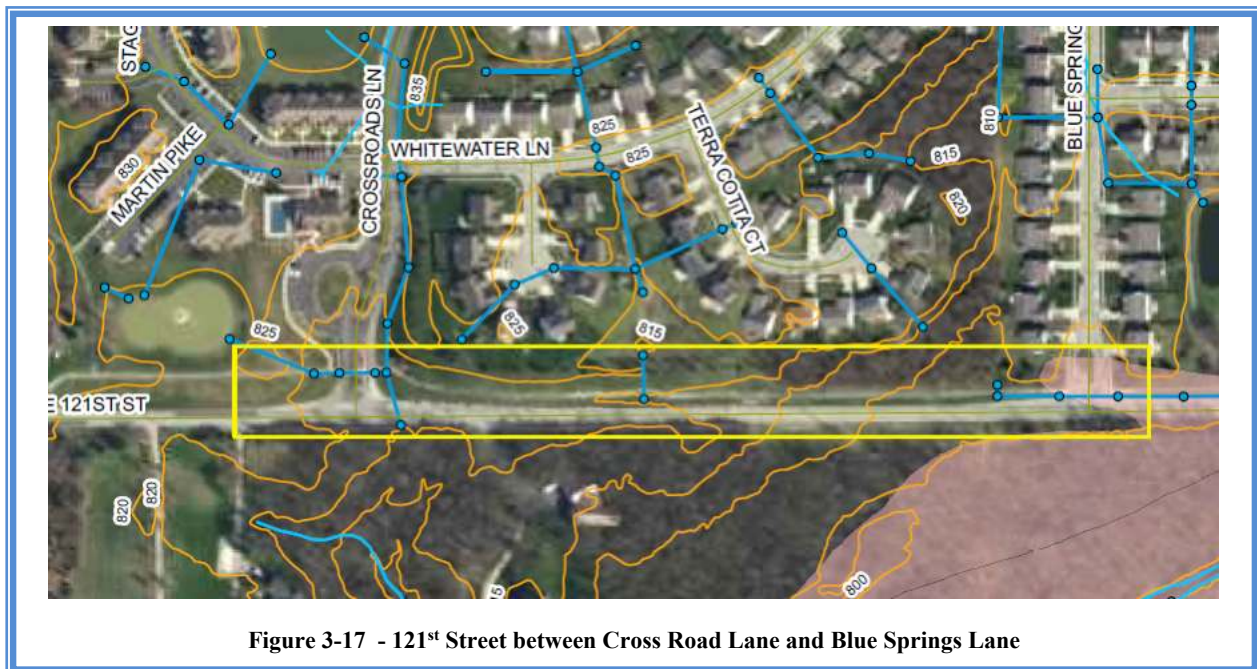
It should be noted that the field east of Georgia Road is currently an unincorporated area outside the City of Fishers corporate limits. In addition, the

project is near the Hamilton County/Hancock County line. The field could eventually be annexed when developed as all areas surrounding the project are within the City of Fishers.

Based upon the problems affecting this project area, it is recommended that this project be part of the Maintenance Projects. See **Section 6.4** for further discussion of the recommendations and opinion of probable project costs.

3.15 121st Street between Crossroads Lane and Blue Springs Lane

121st Street is a well-traveled collector roadway between Cumberland Road and Hoosier Road along the north side of the City of Fishers. The project is more specifically located between Crossroads Lane and Blue Spring Lane. This area includes mostly residential subdivisions with business development at the 121st Street and Cumberland Road. The project limits are indicated in **Figure 3-17**.



The project is the result of standing water along the edge of the roadway that does not drain to the roadside swales causing pavement deterioration along the north side of 121st Street. High water has been reported within the area during large rain events in the past.

During the field inspection it was noted that standing water was present along the edge of the road despite the presence of inlets and swales. Some swales were shallow with little fall or showed signs of being silted in over time. Standing water along curbs was observed at the subdivision entrances. The grassy open area along the roadway appeared to be slightly elevated preventing runoff from draining off the roadway to the swales and inlets.

Based upon the nature of the problem area, it is recommended that this project be included in Maintenance Projects. See **Section 6.5** for further discussion of the recommendations and opinion of probable project costs.

3.16 96th Street and Cyntheanne Road Drainage Improvements

The 96th Street and Cyntheanne Road Drainage Improvements project is located at the intersection of 96th Street and Cyntheanne Road in the southeast corner of Hamilton County. The site is two (2) miles east of Olio Road and just east of the Georgia Road project described above in **Section 3.14**. The project area is part of the unincorporated area outside the City of Fishers Corporation limits, however the City of Fishers has previously annexed areas around the site. It is anticipated that as development expands this area will be annexed as well. The project limits are indicated in **Figure 3-18**.

Similar to the project at Georgia Road, the area currently consists of farm fields on the east and west sides of Cyntheanne Road. The farm fields currently drain toward the intersection or to swales along 96th Street. The roadside swales have been silted and the culvert pipes conveying runoff across 96th Street to Bee Camp Creek have been crushed and/or silted full causing the fields and roadway to flood. Continued development of the area will also require that the roadway and intersection be improved to accommodate larger traffic loads anticipated by development.

Since this area could be annexed and eventually developed, improving the drainage by mitigating roadway flooding is a priority. Improving the drainage conveyances would also provide an outfall for any future development of the adjacent properties.



Figure 3-18 - 96th Street and Cyntheanne Road Drainage Improvements

Based upon the nature of the problem area, it is recommended that this project be included in Maintenance Projects. See **Section 6.6** for further discussion of the solutions and opinion of probable project costs.

4 HYDROLOGIC/HYDRAULIC MODELING

This section will discuss the investigation of the hydrologic and hydraulic within the Capital Project Areas as well as Dual-Purpose Facilities identified by City Staff. General watershed delineations and calculations were completed to determine preliminary sizing of proposed pipes and potential detention needs within the project areas as necessary.

Preliminary hydraulic/hydrologic modeling was provided for the “Allisonville and 106th Street Drainage from Airport Property” project as well as the two (2) Dual Purpose Facilities located at the “Airport Property” and “Downtown Redevelopment” areas. A summary of the modeling is noted below. A copy of the modeling printout/documentation is included in **Appendix H**.

Allisonville and 106th Street Drainage from Airport Property

The potential solution for this site is outlined in **Section 5.10**. Part of the solution includes the installation of a berm to create a dry detention facility. To estimate the size of the detention, a delineation of the watershed from the Airport Property that drains to the 106th Street and Allisonville Road intersection was determined. The overall drainage area was approximately 54 acres. Based on the watershed delineation, an estimated CN value 65 and time-of-concentration of approximately 64 minutes was utilized.

The detention size was estimated using a 12 inch outlet pipe that could be adjusted as necessary to control the rate to a desired level. The existing downstream pipe per GIS is 18 inches at the intersection. Using the 12 inch outlet, an overall detention volume of 91,500 cft (2.10 ac-ft) of storage was determined. By using the existing hill/grade of the ground, a berm can be constructed near the northwest corner of the airport property to control runoff. An approximate height of the berm was determined to be 6.5 feet to create the required storage volume.

Downtown Redevelopment – Village Center

The City of Fishers is looking into possible redevelopment opportunities for the existing Village Center area located just south of downtown. The development concepts are discussed in further detail in **Section 8.1**. At the current time there are not defined layouts proposed for the area, however the City is anticipating that the area would be a prime spot for redevelopment in the future as the City continues to grow. As part of a possible redevelopment, the City may explore cost sharing opportunities or alternative funding measures to promote redevelopment and lure developers to the area.

As part of the study, an approximate detention area needed to detain runoff from the redevelopment area was required. The total redevelopment area was estimated at approximately 50 acres with a CN value of 96, which was based on the area being 95% impervious. Based on the location of the site and the discharge to the R.J. Craig Legal Drain, the detention release rate would be based on

Hamilton County Surveyor's Office (HCSO) regulations that would provide a release rate for the proposed 10 year storm at 0.1 c.f.s. per acre and the proposed 100 year storm at 0.3 c.f.s. per acre. Using the proposed conditions and the HCSO release rate regulations, the required storage is approximately 738,000 cft (16.9 ac-ft).

Airport Property Dual Purpose Facility

The City of Fishers is looking into development opportunities for a parcel of land located on the north side of 96th Street near the Indianapolis Metropolitan Airport site. The development concepts for this site are further discussed in **Section 8.2**. Throughout the years there has been interest in the development of the site with some conceptual plans being created. Similar to the Downtown Redevelopment area, the city is looking at possible cost sharing opportunities or alternative funding measures to promote development of the area.

A study of the potential 62-acre parcel was completed to determine approximate detention storage requirements needed for development of the site. A CN value of 85 with a 10 minute time-of-concentration was utilized for the proposed development. The release rates were based on the release rates of 0.1 c.f.s. per acre for the 10-yr storm event. and 0.3 c.f.s. per acre for the 100-yr storm event. Using the proposed conditions and above release rate regulations, the required storage was determined as approximately 825,000 cft (18.9 ac-ft).

Please refer to **Appendix H** for more detailed calculations and supporting documentation.

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5 CAPITAL IMPROVEMENT PROJECTS

The following section provides a summary of the capital improvement alternatives recommended for further action. The main goal of these alternatives is to increase conveyance capacity, alleviate localized drainage problem areas and reduce the risk of flooding. Capital improvement projects (CIP) are presented in order based upon their initial priority ratings, which were developed during the initial field visit and subsequently revised based upon City input. **Appendix E** provides a full-sized detail of each project, with each individual description in this section providing smaller “snapshots”. Opinion of Probable Project Costs are located within each individual section, with **Appendix G** providing a preliminary breakdown of the probable costs. It should be noted that no land costs were developed for the majority of these alternatives, because it was assumed that the City possessed easements within the project areas. Any projects or alternatives that would require land acquisition would include land costs of approximately \$45,000 per acre of land.

5.1 Green Infrastructure Considerations

Several projects presented in the following sections will make considerations that involve various green infrastructure items. One such item is the hybrid ditch system, which acts similar to a French drain. These hybrid ditch systems have been used throughout the City of Indianapolis and other local municipalities with positive results.

Hybrid ditches look like a typical open ditch on the surface with topsoil and grass; however, underneath there is perforated pipe surrounded by pervious stone and sand that operates like a French drain. This section of clean stone and sand creates storage for stormwater while simultaneously filtering the runoff as it seeps into the ditch and flows toward an outlet. See **Figure 5-1** for an example of a hybrid ditch section. This system could potentially eliminate the requirements for a water quality structure, which is also known as a best management practice (BMP).

Because the City is within an MS4 district, certain water quality criteria must be met when constructing storm sewers. This criterion mainly deals with the reduction of sedimentation entering surface waters and control the rate at which runoff enters these surface waters. The hybrid ditch system meets all these criteria and is very successful at controlling the amount of volume that discharges from the system. In addition, the hybrid ditch is not completely dependent on the infiltration capabilities of the existing soils present at the site, so the proposed hybrid ditch system can be used in a variety of soil conditions and locations.

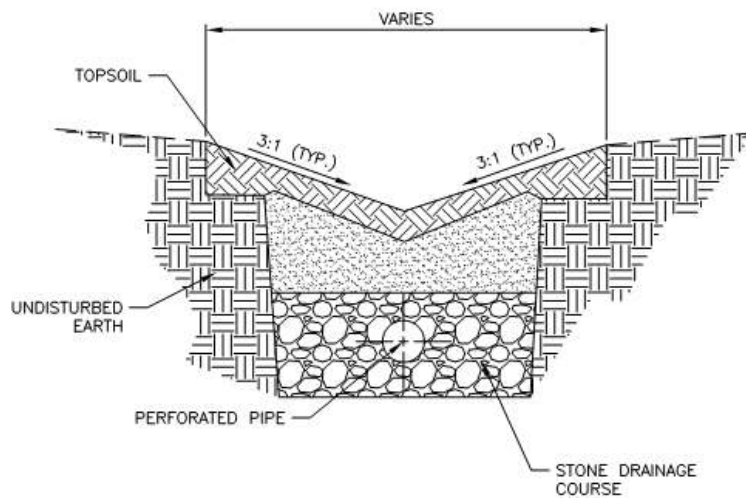


Figure 5-1 - Typical Hybrid Ditch Cross-Section

Another green infrastructure option that may be considered for some of project areas is the use of a vegetated dry detention basin. Vegetated basins work similarly to the hybrid ditches, but do not typically have an underdrain system. This design can be easily modified to include underdrains to further increase the effectiveness of the basins and add underground storage, but it is typically not needed. **Figure 5-2** below provides a typical section of a vegetated basin, with the dimensions varying depending on the location of the basin.

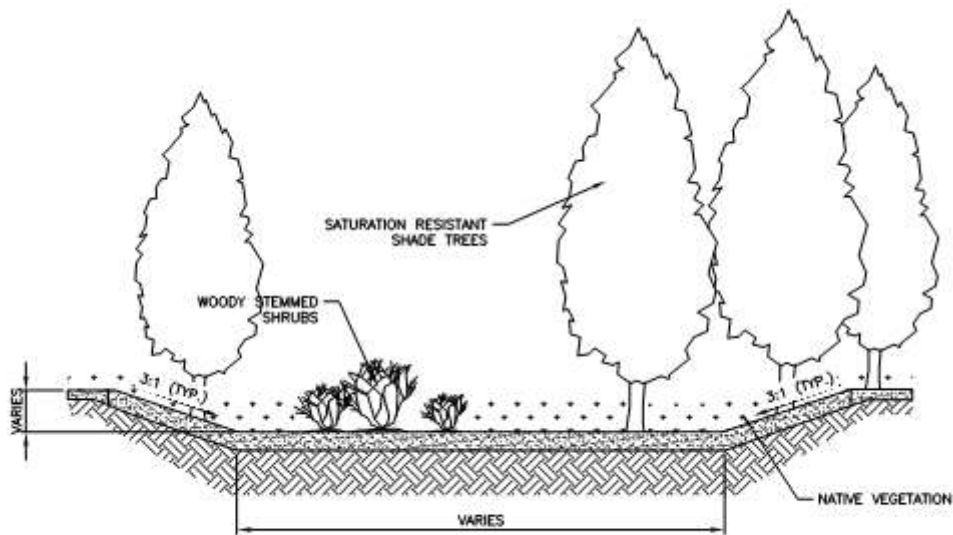


Figure 5-2 - Typical Vegetated Basin

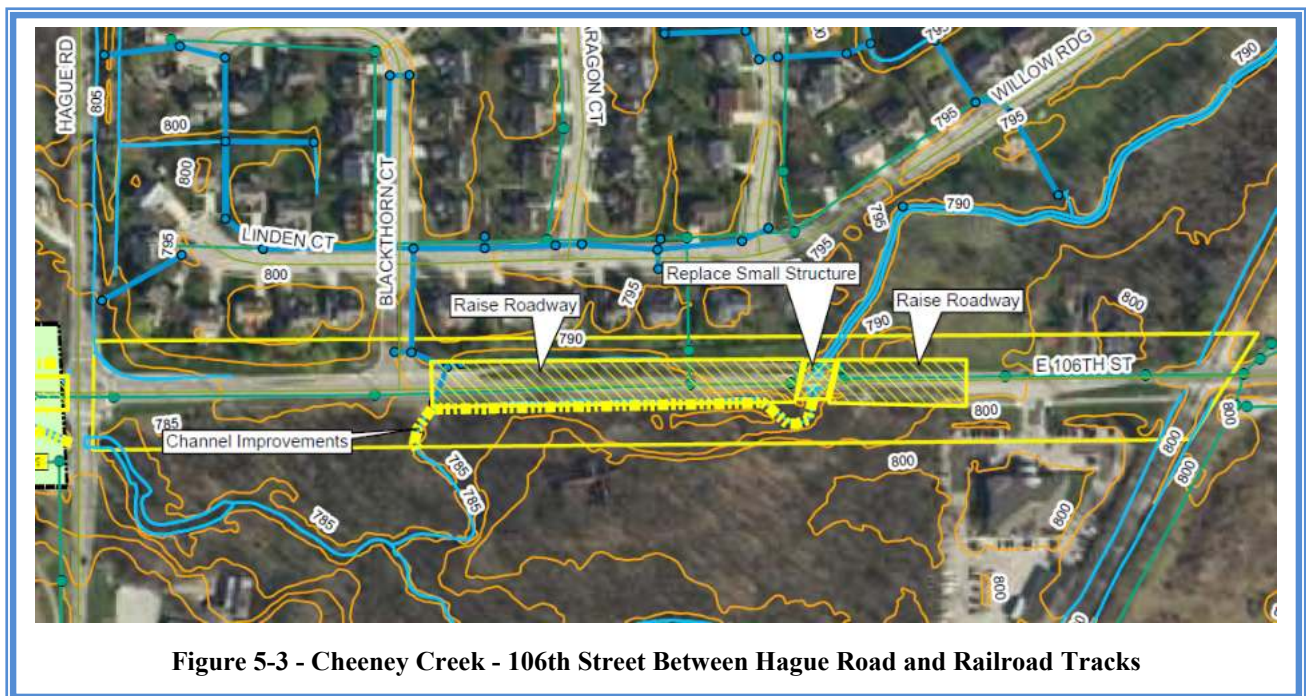
5.2 Cheeney Creek - 106th Street Between Hague Road and Railroad Tracks

As previously discussed in **Section 3.1**, this project will deal with necessary improvements along Cheeney Creek to reduce the flooding occurrences of 106th Street.

This portion of 106th Street between Hague Road and the railroad tracks detailed in **Figure 5-3** below includes a small bridge structure just west of the railroad that conveys Cheeney Creek from the north to the south under 106th Street. Cheeney Creek then flows west parallel to 106th Street. There is only about five (5) feet horizontally between the roadway and top of bank along the south side of 106th Street.

106th Street has been impacted by floodwaters from Cheeney Creek frequently over the years due to the relation of the stream to the roadway as the elevation of the roadway is at or just above the bank elevation. A large portion of 106th Street is located within the floodway of Cheeney Creek. The City's goal is to remove 106th Street from the floodway / floodplain and reduce flooding occurrences that cause temporary road closures and high-water concerns.

Two (2) alternatives were discussed with the City of Fishers to assist in reducing the flood occurrences along 106th Street.



The 1st alternative is to raise the roadway approximately 8" to 10" on average within the project limits to an elevation that is approximately 6 inches below the 100-yr BFE for Cheeney Creek. This alternative would include fill to raise 106th Street as well as the replacement of the small

bridge structure carrying 106th Street over Cheeney Creek. This alternative would still allow the 100-yr storm event to overflow onto 106th Street, however the flooding occurrences during events less than a 50-yr storm event would be mitigated. By allowing the larger storm events to still overflow onto 106th Street, a complete revision of the floodway/floodplain limits would not be mandatory thus requiring less mitigation and permitting requirements for the revised modeling. It is anticipated that this alternative would have less of an environmental impact and impacts on the surrounding properties.

The 2nd alternative is to raise the roadway approximately 12” to 15” on average within the project limits to an elevation above the 100-yr BFE of Cheeney Creek. This would mitigate flood occurrences up to and including the 100-yr storm. This alternative would meet the City’s desire to have all roadways and bridges above the 100-yr BFE. Due to the desire to elevate the roadway above the BFE, this alternative would potentially include more mitigation impacts and permitting requirements to remove the roadway from the floodway. A larger bridge structure would be required since the roadway overflow would be eliminated in the modeling with channel improvements within Cheeney Creek along 106th Street.

The recommended alternative used for the masterplan is Alternative 2 which is to raise the roadway elevation of 106th Street above the BFE to mitigate roadway flooding and overflows. The existing bridge structure will be replaced with an appropriately sized bridge structure to offset the flow area lost within the floodway due to raising the roadway. In this recommendation the proposed bridge will replace both the existing 106th Street culvert and pedestrian bridge structure immediately upstream. Channel and bank improvements along Cheeney Creek will also be completed to improve the available flow area and fix the bank erosion where appropriate.

As noted above, this portion of the 106th Street is located within the floodway which would require IDNR, FEMA and IDEM permitting and includes significant environmental / mitigation issues for any proposed resolution. In addition, this section of Cheeney Creek is part of the R.J. Craig regulated drain, therefore permitting and project coordination with the Hamilton County Surveyor’s Office would be required. Since the alternatives also include raising the roadway elevations, coordination would be required with the Hamilton County Highway Department as well.

This project may also require additional coordination with the Cheeney Creek project described in **Section 5.3** depending on the project timing and it is recommended that these projects be completed simultaneously if possible. A detailed study of Cheeney Creek would also be required to determine the impacts and changes to the floodway and floodplain limits. Capital cost for the hydraulic modeling of Cheeney Creek is also included separately in the Capital Plan and is addressed in **Section 7.2**.

5.2.1 Opinion of Probable Project Costs

Costs were developed for the Cheeney Creek project between Hague Road and the railroad tracks for the Capital Improvement Plan based on Alternative 2 as recommended above. The total opinion of probable project cost including design, construction and inspection is estimated at approximately \$1,435,000. This includes a construction cost of approximately \$1,200,000 which accounts for roadway raising and a proposed bridge structure. Based on discussions with the City of Fisher's, it is anticipated that the total project costs would be shared between the city, the Hamilton County Surveyor's Office and the Hamilton County Highway Dept. A breakdown of the probable cost is included in **Appendix G**. **The anticipated cost for the City of Fishers is estimated as \$500,000 for the total project with the City's Capital Plan.** These numbers are for budgetary purposes only and should not be considered final.

5.3 Cheeney Creek – 106th Street Between Sherborne Road and Hague Road

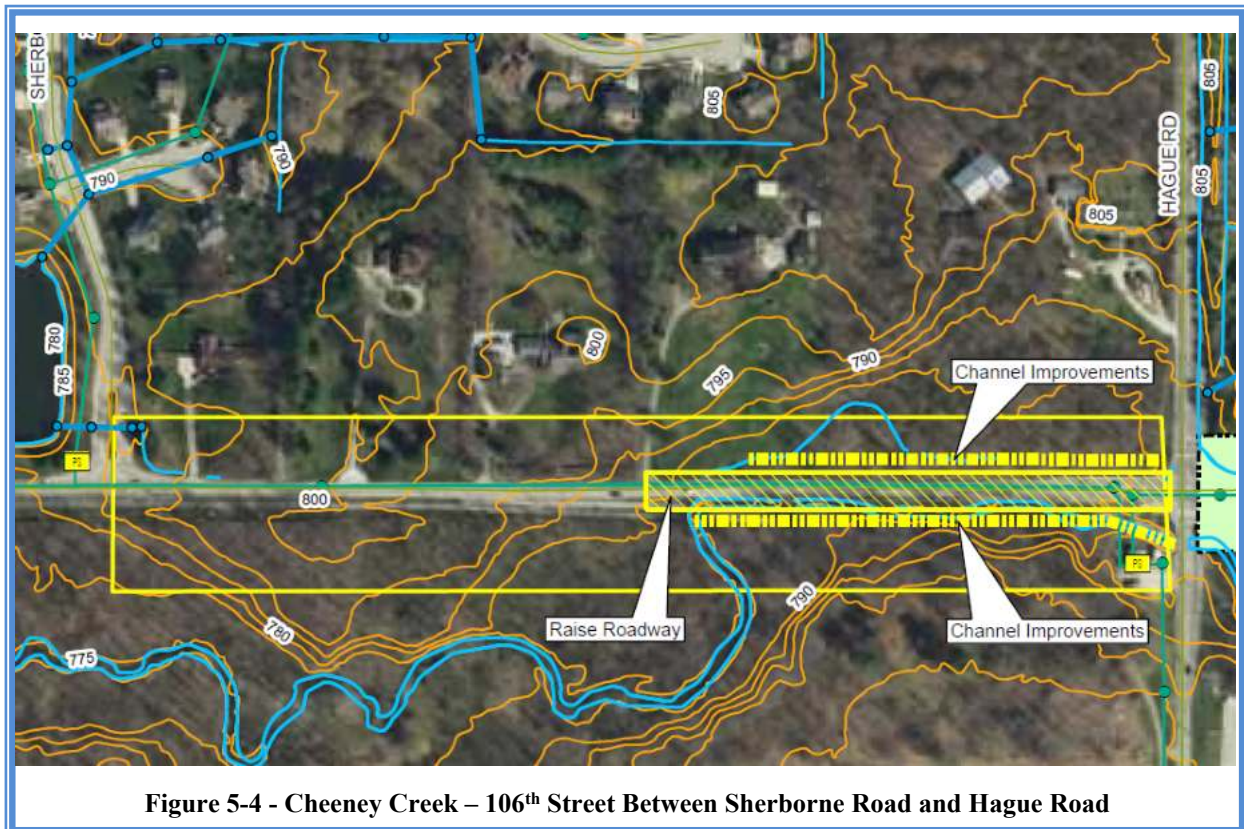
Previously discussed in **Section 3.2**, the intent of the project is to deal with necessary improvements along Cheeney Creek between Sherborne Road and Hague Road to reduce the flooding occurrences of 106th Street.

Cheeney Creek flows on the south side of 106th Street parallel to the roadway. The current plan is to raise the roadway elevation of 106th Street to reduce roadway flooding and overflows. Channel and bank improvements along Cheeney Creek will be completed to improve the creek capacity to offset the flow area lost from the road raising. **Figure 5-4** shows the project area between Hague Road and Sherborne Road with the proposed improvements.

Similar to the project above, two alternatives were studied at a feasibility level, when looking at the roadway raising to remove 106th Street from the floodway/floodplain. The 1st alternative is to raise the roadway approximately one (1) foot on average within the project limits. This will prevent the roadway from flooding during the smaller storm events, however flooding would still occur during the 100-year storm event. Since the option allows some road overflow during the 100-year event, 106th Street would still remain in the floodway, however it is anticipated the permitting of the improvements would be more less involved.

The 2nd alternative would be to raise the roadway approximately 1.5 feet on average within the project limits. The intent of this alternative is to meet the City's desire to remove 106th Street from the floodway/floodplain, by raising the roadway above the BFE of Cheeney Creek. This option would cost more and require more intensive permitting requirements from IDNR, FEMA and IDEM due to environmental and mitigation factors to remove 106th Street from the floodway/floodplain.

The recommended alternative used for the masterplan is Alternative 2 which is to raise the roadway elevation of 106th Street above the BFE to mitigate roadway flooding and overflows. Channel and bank improvements along Cheeney Creek will be completed to improve the available flow area and fix the bank erosion where appropriate. Flood Easements may need to be considered due to changes in the floodway and floodplain due to mitigation requirements.



As noted above, this portion of the 106th Street is located within the floodway which would require IDNR, FEMA and IDEM permitting and includes significant environmental / mitigation issues for any proposed resolution. Since the alternatives also include raising the roadway elevations, coordination would be required with the Hamilton County Highway Department as well. Since the Richie Woods Nature Preserve is located next to / south of Cheeney Creek coordination with the Fishers Park and Recreation Department would be required.

It is important to note that a sanitary sewer lift station is located within the project limits. The alternatives discussed did not evaluate any flood protection measures required for the lift station. In addition, this portion of Cheeney Creek is not classified as a Regulated Drain therefore permitting and coordination with the Hamilton County Surveyor's Office is not anticipated to be required.

This project may also require additional coordination with the Cheeney Creek project described in **Section 5.2** depending on the project timing and it is recommended that these projects be completed simultaneously if possible. A detailed study of Cheeney Creek would also be required to determine the impacts and changes to the floodway and floodplain limits. Capital cost for the hydraulic modeling of Cheeney Creek is also included separately in the Capital Plan and is addressed in **Section 7.2**.

5.3.1 Opinion of Probable Costs

Costs were developed for the Cheeney Creek project between Sherborne Road and Hague Road for the Capital Improvement Plan based Alternative 2 as recommended above. The total opinion of probable project cost including design, construction and inspection is estimated at approximately \$625,000. This includes a construction cost of approximately \$520,000 which accounts for roadway raising and channel improvements. Based on discussions with the City of Fisher’s, it is anticipated that the total project costs would be shared between the city, the Hamilton County Surveyor’s Office and the Hamilton County Highway Dept. A breakdown of the probable cost is included in **Appendix G**. **The anticipated cost for the City of Fishers is estimated as \$465,000 for the total project with the City’s Capital Plan.** These numbers are for budgetary purposes only and should not be considered final.

5.4 136th Street West of Marilyn Road at Sand Creek Flooding Improvements

This project, which was previously discussed in **Section 3.3**, is designed to remove 136th Street from the 100-year floodplain and protect the roadway during larger storm events to reduce the

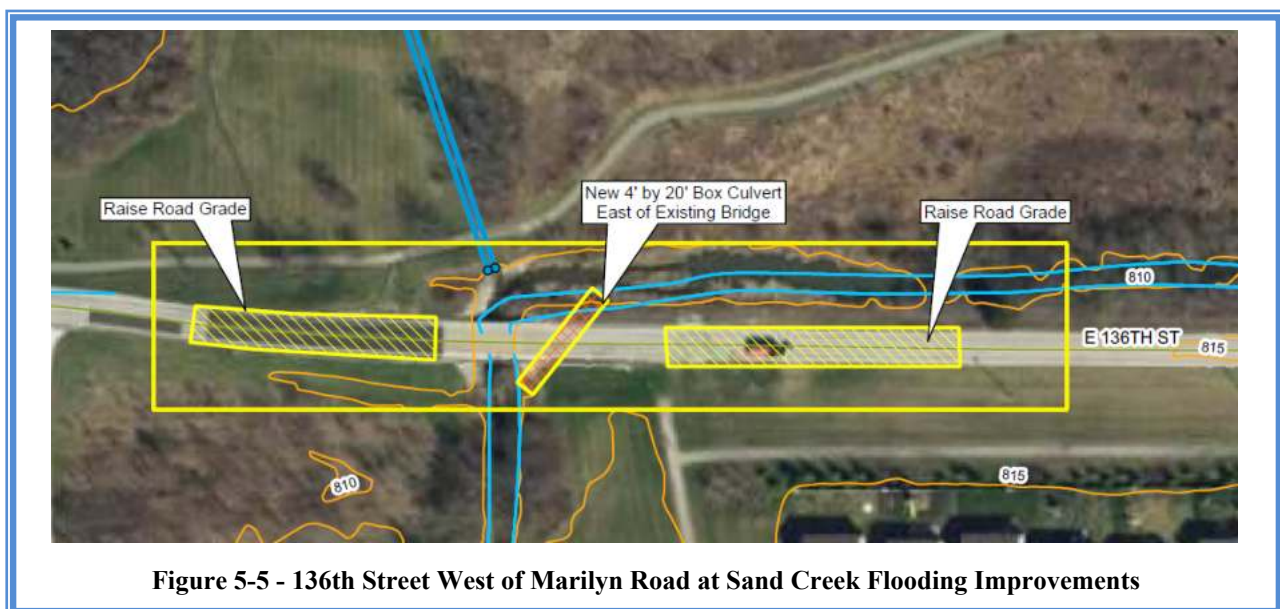


Figure 5-5 - 136th Street West of Marilyn Road at Sand Creek Flooding Improvements

likelihood 136th Street will be closed during larger storm events. The project is located at Hamilton County Bridge #185 just west of Marilyn Road on 136th Street. The project is due to a portion of 136th Street east and west of the bridge being located within the 100-yr floodplain and the City's goal to have all major roadways above the 100-yr base flood elevation (BFE). Per FEMA flood mapping and a review of the Hamilton County topography, 136th Street includes some roadway segments located below the BFE near the bridge structure, however the bridge high chord is above the BFE. The proposed project improvements are shown in **Figure 5-5** below.

The proposed project plan would be to raise the roadway elevations above the BFE to eliminate any road overflows during the 100-year storm event. To offset the elimination of the road overflow and loss of flow area, an approximate 4'x20' culvert would be installed just east of the existing bridge structure. The relief culvert is required so that the road raising does not impact the upstream flood elevations within Sand Creek.

Since this portion of the roadway is located within the floodway, permitting and environmental issues would need to be addressed with IDNR for the culvert and roadway improvements. It is also noted per the regulated drain mapping that this section of Sand Creek is classified as the Sand Creek Open Ditch Drain, therefore permitting and project coordination with the Hamilton County Surveyor's Office as well as the Hamilton County Highway Department would be required. It is anticipated that permitting with IDEM and the Army Corps of Engineers (ACOE) would also be required due to the impacts on Sand Creek and work within the Ordinary High Water Mark (OHWM).

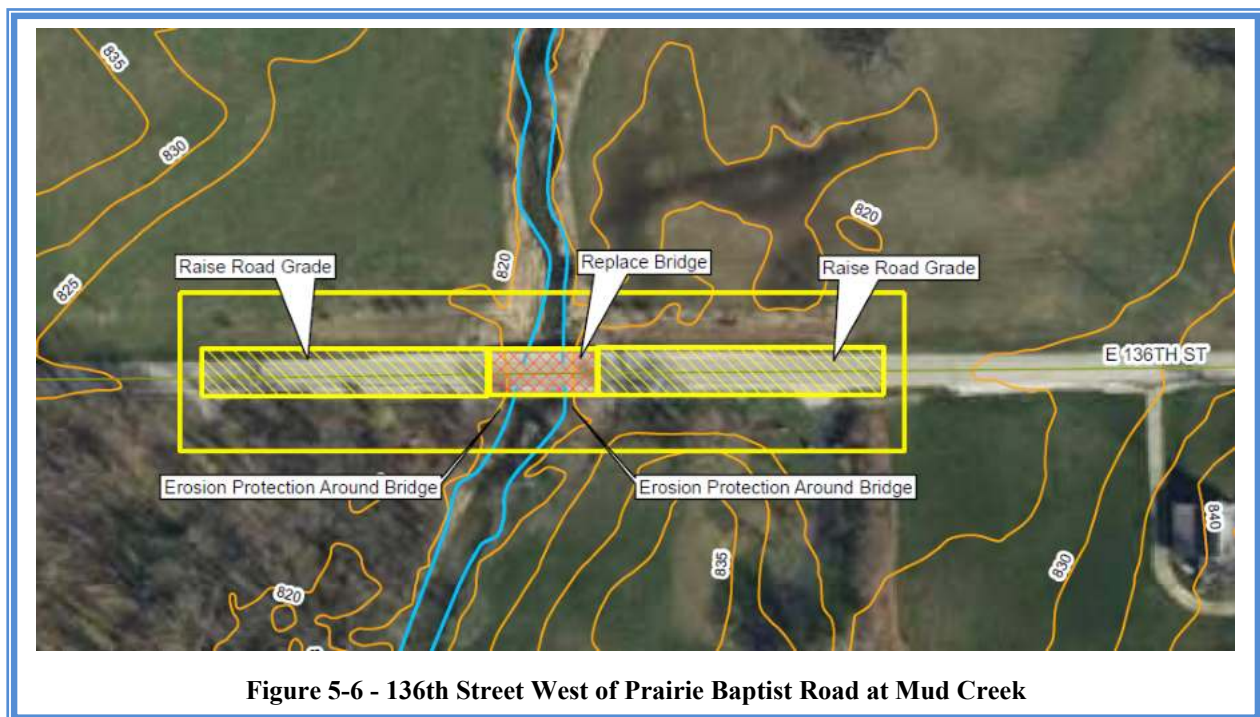
5.4.1 Opinion of Probable Costs

Costs were developed for the roadway raising east and west of the bridge structure as well as the installation of a new culvert structure parallel to the bridge. The total opinion of probable project cost including design, construction and inspection is estimated at approximately \$505,000. This includes a construction cost of approximately \$420,000 which accounts for roadway raising and a culvert structure. Based on discussions with the City of Fisher's, it is anticipated that the total project costs would be shared between the city, the Hamilton County Surveyor's Office and the Hamilton County Highway Dept. A breakdown of the probable cost is included in **Appendix G**. **The anticipated cost for the City of Fishers is estimated as \$180,000 for the total project with the City's Capital Plan.** These numbers are for budgetary purposes only and should not be considered final.

5.5 136th Street West of Prairie Baptist Road at Mud Creek

The goal of this project, which was discussed previously in **Section 3.4**, is to remove 136th Street from the 100-year floodplain and protect the roadway during larger storm events to prevent roadway closures due to flooding.

The project is located at Hamilton County Bridge #176 located just west of Prairie Baptist Road on 136th Street. The project is due to a portion of 136th Street east and west of the bridge being located within the 100-year floodplain and the City's goal to have all major roadways above the 100-yr base flood elevation (BFE). Per FEMA flood mapping and a review of the Hamilton County topography, the roadway elevations at the bridge as well as segments of the roadway to the east and west of the bridge are below the 100-yr BFE. The proposed project improvements are shown in **Figure 5-6** below.



The proposed project plan would be to replace the existing Hamilton County Bridge structure with a larger bridge opening and to raise the bridge high chord and roadway elevations above the BFE to mitigate any road overflows during the 100-yr storm event. A large single span bridge or three-span bridge structure would be required to convey flood waters through the bridge. One driveway east of the bridge could potentially be impacted by the road raising.

Since this portion of the roadway is located within the floodway, permitting and environmental issues would need to be addressed with IDNR for the bridge replacement. Hydraulic modeling of

Mud Creek and the proposed bridge would be required to determine the exact size of the bridge structure. It is also noted per the regulated drain mapping that this section of Mud Creek is part of the Mud Creek – Sand Creek Drainage Area Regulated Drain, therefore permitting and project coordination with the Hamilton County Surveyor’s Office as well as the Hamilton County Highway Department would be required. It is also anticipated that permitting with IDEM and the ACOE would also be required due to the impacts on Mud Creek and work within the Ordinary High Water Mark (OHWM).

5.5.1 Opinion of Probable Costs

Costs were developed for the roadway raising east and west of the bridge structure as well as the installation of a new bridge structure. The total opinion of probable project cost including design, construction and inspection is estimated at approximately \$1,635,000. This includes a construction cost of approximately \$1,360,000 which accounts for roadway raising and a proposed bridge structure. Based on discussions with the City of Fisher’s, it is anticipated that the total project costs would be shared between the city, the Hamilton County Surveyor’s Office and the Hamilton County Highway Dept. A breakdown of the probable cost is included in **Appendix G**. **The anticipated cost for the City of Fishers is estimated as \$325,000 for the total project with the City’s Capital Plan.** These numbers are for budgetary purposes only and should not be considered final.

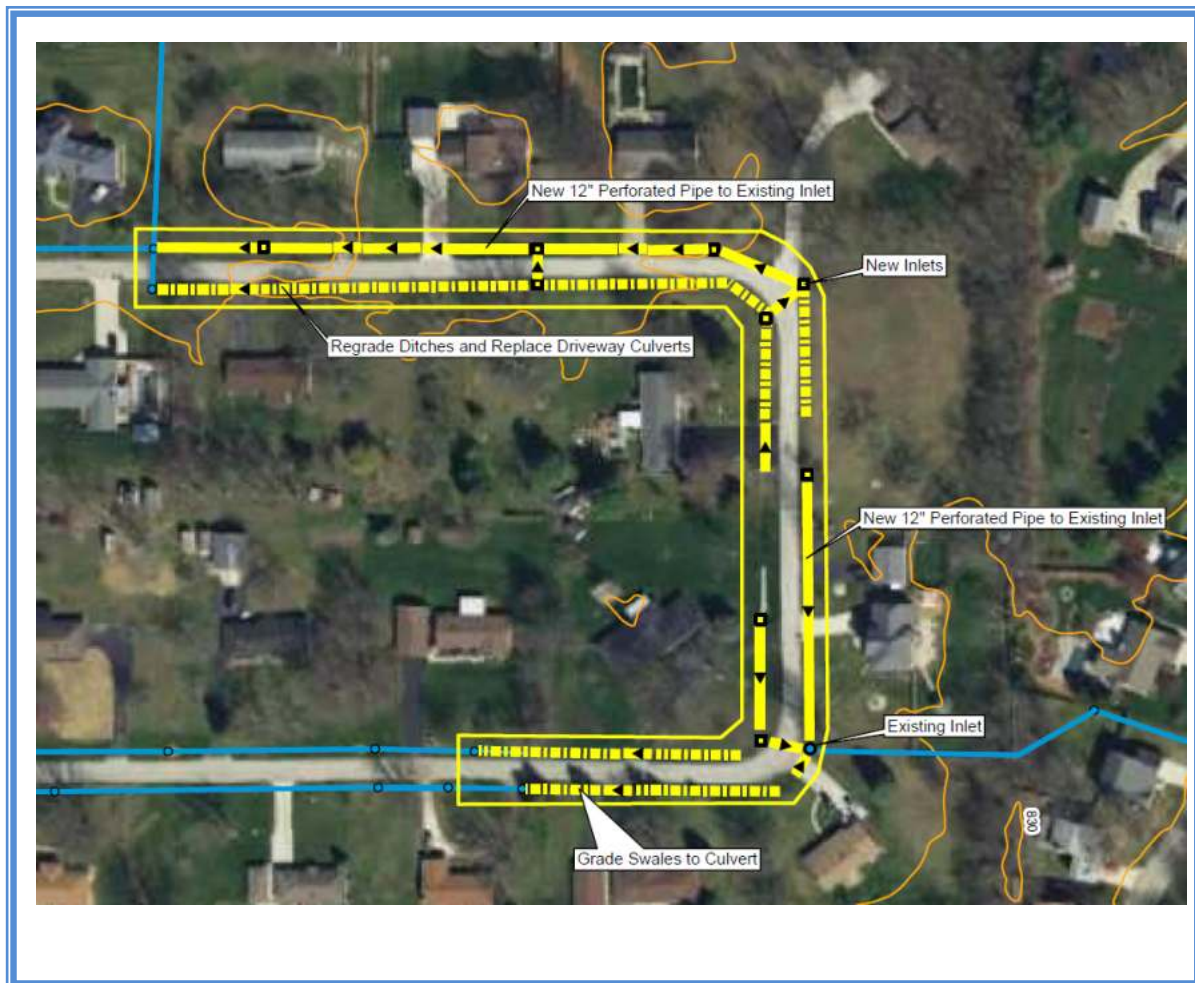
5.6 97th and 98th Street Drainage Improvements

This project, which was previously discussed in **Section 3.5**, will be a continuation of the previously constructed storm sewer system.

The 97th Street and 98th Street Drainage Improvements project consists of a small subdivision just north of 96th Street and east of Mollenkopf Road. Drainage improvements were previously completed for the west side of the subdivision; however, no drainage improvements were completed to the eastern half. This project would continue the storm sewer improvements east along 97th Street and 98th Street to alleviate standing water and street flooding.

The area consists of swales and culvert pipes that have been silted in over time. A small storm sewer system exists at the east end of 97th Street, however the swales do not sufficiently convey runoff to the system. In addition, the improvements to the west side of the subdivision included a pipe that flows north from 98th Street, however the runoff along 98th Street does not sufficiently drain to this system.

This project will include additional inlets and a pipe system along 97th Street that connects to the existing storm sewer. The roadside swales will be regraded to drain to the inlets and driveway culverts will be eliminated or replaced as necessary based on grading patterns. The existing inlet at the bend in 97th Street is part of the Geist Woods Regulated Drain.



98th Street will have a separate inlet and pipe system that drains west to the pipe system that was previously installed. The roadside swales along 98th Street will be regraded to drain to the new inlets and the driveway culverts will be eliminated or replaced based on the grading patterns. **Figure 5-7**, shows the existing drainage system as well as the proposed improvements. The roadside swales would be constructed as a hybrid ditch system, per **Figure 5-1**, due to the flat topography within the area.

Based on the location of the existing swales, it is anticipated that all work will be completed outside of the pavement except pipe crossings and within existing right-of-way limits. The existing pavement is in good condition with minor asphalt cracking. The pavement condition would be

evaluated during design to determine if any pavement replacement is required. At a minimum, milling and resurfacing should be considered for the roadway within the project limits.

This project may require coordination with the Hamilton County Surveyor's office depending on the impacts to the system at the end of 97th Street since this pipe system is part of the Geist Woods Regulated Drain system.

5.6.1 Opinion of Probable Costs

Costs were developed for the proposed storm sewer and ditch improvements. The total opinion of probable project cost including design, construction and inspection is estimated at approximately \$217,000. This includes a construction cost of approximately \$180,000. A breakdown of the probable cost is included in **Appendix G**. **The anticipated cost for the City of Fishers is estimated as \$217,000 for the total project with the City's Capital Plan.** These numbers are for budgetary purposes only and should not be considered final.

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5.7 Prairie Baptist South of Silverleaf Blvd. Drainage Improvements

This project, which was previously discussed in **Section 3.6**, could potentially be completed in multiple phases due to the nature of the project.

The project area is located along Prairie Baptist Road south of Silverleaf Blvd. The project is the result of two (2) different drainage issues with one issue being within the City of Fishers corporate limits and the other area being in an unincorporated area that could be annexed in the future. The project is the result of a lack of drainage collection facilities and silted roadside swales that cause yard flooding and high water within the roadway during large storm events.

The area within the City of Fishers is located just south of the Silverleaf Blvd entrance. Currently water drains off the farm field on the west side of Prairie Baptist into the roadway causing standing water and pavement deterioration. The existing roadside swale has been silted in and is non-existent in some areas. The edge of the roadway is used at the drainage conveyance system. The 2nd area is further south along Prairie Baptist and just north of Southeastern Pkwy. This area is within the unincorporated area outside the City of Fishers limits. Runoff from the field and large residential parcels flows towards Prairie Baptist Road flooding portion of the roadway and yards/fields. Shallow and flat roadside swales are present with no defined drainage system.



This project could be completed as a whole or as two (2) separate phases due to the one area being outside the current corporation limits. The initial project would include the installation of a pipe

with inlets along the west side of Prairie Baptist Road that conveys runoff north to the George Burke Drain. Some pavement replacement and/or milling and resurfacing may be required to repair deteriorated pavement sections. The 12-inch pipe and inlets would mitigate flooding within the 1st area. The pipe and inlet system would be continued south along Prairie Baptist Road to the current unincorporated area. Inlets with a hybrid ditch system, as shown in **Figure 5-1** would be installed along the east side of Prairie Baptist Road to alleviate yard and roadway flooding.

This project may require coordination with the Hamilton County Surveyor's office due to the outfall at the George Burke Drain. If improvements are proposed within the unincorporated area prior to annexation, additional coordination with Hamilton County may also be required.

5.7.1 Opinion of Probable Costs

Costs were developed for the proposed storm sewer improvements. The total opinion of probable project cost including design, construction and inspection is estimated at approximately \$353,000. This includes a construction cost of approximately \$300,000. As noted above, the project could be completed in phases due to the unincorporated area, however it is recommended that the project completed as one project to save potential construction cost. A breakdown of the probable cost is included in **Appendix G**. **The anticipated cost for the City of Fishers is estimated as \$353,000 for the total project with the City's Capital Plan.** These numbers are for budgetary purposes only and should not be considered final.

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5.8 Cumberland Road and 106th Street Bridge Replacement

This project, which was discussed previously in **Section 3.7**, is a proposed replacement of the existing Hamilton County Bridge #164 located just south of 106th Street. This site is located east of the downtown limits and is near the entrance to Cumberland Park. **Figure 5-9** shows the bridge location over Mud Creek. It should be noted that this project is just north of the 10307 Cumberland Road Storm Sewer Upgrade project described later in **Section 5.11**.

The project area is mostly located within floodway/floodplain with residential areas located in the higher areas to the south. The bridge is located downstream of the Sand Creek confluence with Mud Creek. The open field upstream of the bridge (southeast corner of the 106th Street and Cumberland Road roundabout) floods frequently and is located entirely within the floodway.

The City's goal is to remove as many roadways from the 100-yr floodplain / floodway and have sufficiently sized bridges to eliminate overtopping. A roundabout was recently constructed at 106th Street and Cumberland Road just north of the bridge structure in 2014/2015 that raised the intersection of the roadway. The approach roads were not raised and remained at existing grade. In addition, an IDNR permit (FW-27917) was obtained in July 2015 for improvements along Mud Creek upstream of the bridge in anticipation of the proposed Cumberland Road bridge. The bridge was included in previous masterplan studies. The proposed project would be to replace the bridge and existing approach roadway as necessary to elevation Cumberland Road above the 100-year BFE and eliminate roadway overflows.

Since this portion of the roadway is located within the floodway, permitting and environmental issues would need to be addressed. It is also noted per the regulated drain mapping that this section of Mud Creek is part of the Mud Creek – Sand Creek Shed Regulated Drain, therefore permitting and project coordination with the Hamilton County Surveyor's Office as well as the Hamilton County Highway Department would be required for completion of the project.

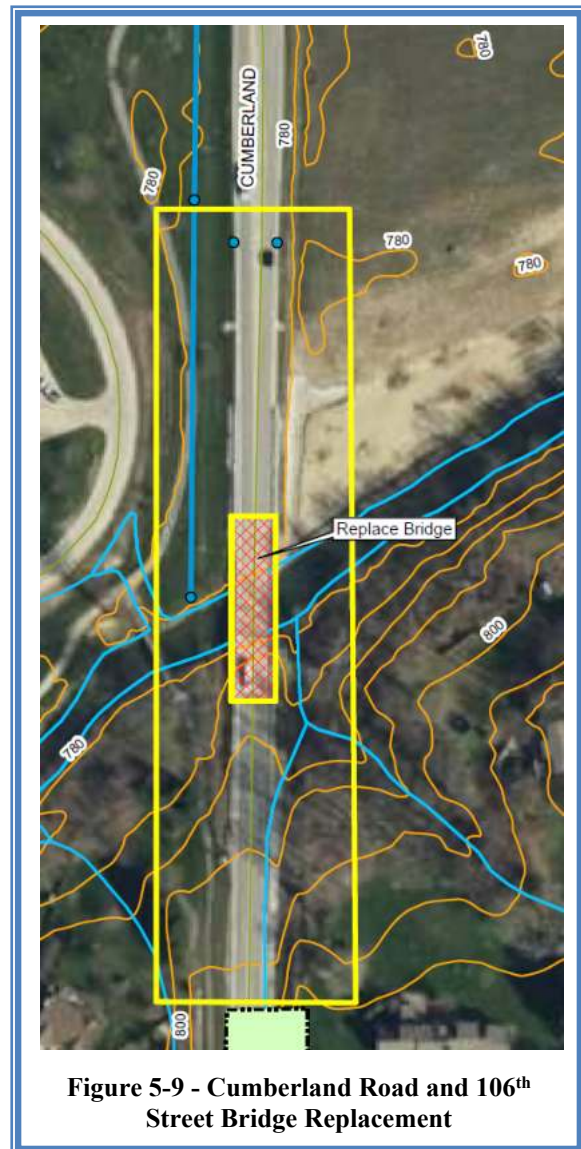


Figure 5-9 - Cumberland Road and 106th Street Bridge Replacement

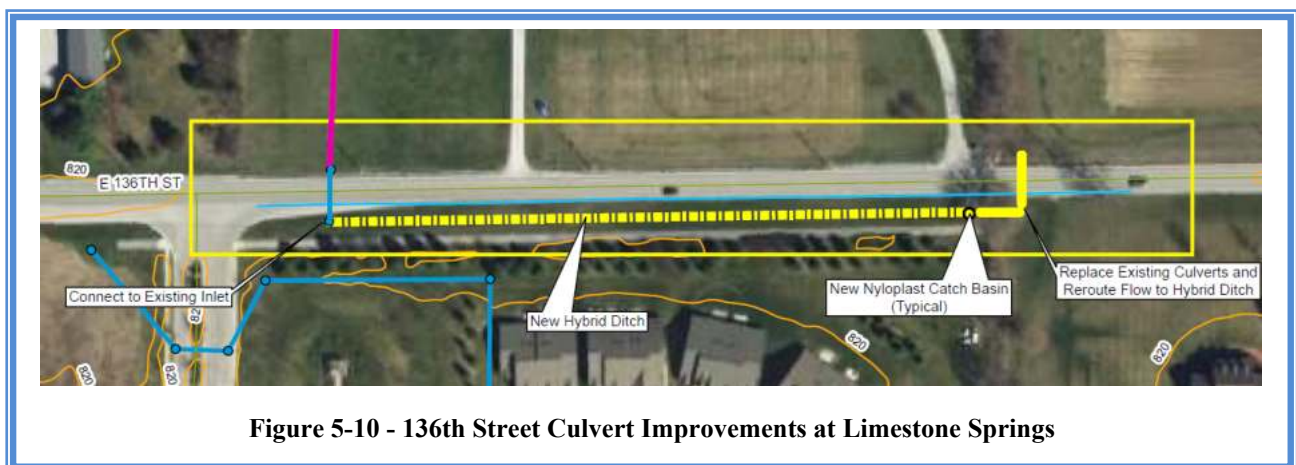
5.8.1 Opinion of Probable Costs

Costs were developed for the bridge structure replacement and associated work as part of a prior masterplan by Christopher B. Burke Engineering. The costs were reviewed and revised as appropriate based on potential work needs noting that the prior estimates were before the roundabout improvements and upstream channel improvements. The total cost for the project was estimated at approximately \$6,681,000. however due to the nature of the project the total project cost would be shared between the Hamilton County Surveyor's Office, the Hamilton County Highway Dept. and the City of Fishers. **The anticipated cost for the City of Fishers was estimated as \$826,500 within the City's Capital Plan.** These numbers are for budgetary purposes only and should not be considered final.

5.9 136th Street Culvert Improvements at Limestone Springs

This project, which was previously discussed in **Section 3.8**, is designed to prevent 136th Street from flooding due to inadequate drainage collection and conveyance system and to provide safe passage for daily traffic by mitigating flood events.

The project area is located on 136th Street between Marilyn Road and Brooks School Road. The project is the result of flooding at the eastern end of Limestone Springs Subdivision on the south side of 136th Street. The City of Fishers is located on the south side of 136th Street and the City of Noblesville is on the north side. Flooding within the subdivision is due to an undersized culvert under 136th Street and the lack of a defined drainage swale north of 136th Street between the culvert and the TJ Patterson Drain. The project area is shown in **Figure 5-10**.



During large rainfall events the northeast corner of the subdivision and northwest corner of the future I-Town Church property floods. Water also flows over 136th Street causing road closures

and/or high-water concerns. Improvements north of 136th Street would be difficult and/or costly as no existing easements are present and the area is within the City of Noblesville.

The plan for the project is to utilize the right-of-way along the south side of 136th Street as well as the existing Margaret Goodwin Drain pipe to the west. The existing culvert pipe under 136th Street would be replaced and upsized to provide additional capacity, however since there is no defined channel downstream of the culvert, the improved culvert would provide little relief. The culvert would be installed to provide capacity in case the downstream conveyance is improved by the homeowner or during future development of the farm field. To relieve the current flooding situation, an additional relief culvert would be directed west into a hybrid ditch system along 136th Street. As previously discussed and shown in **Figure 5-1**, the hybrid ditch system utilizes above ground and underground storage utilizing a perforated pipe system which will help mitigate standing water in the area. Regrading of the lawn areas and redirection of culvert pipes into the hybrid ditch system would also be completed. The use of storage within the hybrid ditch would limit flows into the 12" regulated drain pipe that flows north to the TJ Patterson Drain.

Coordination with the Hamilton County Surveyor's office would be required since the project will connect to the Margaret Goodwin and TJ Patterson Regulated Drain systems. The above option should not require easements since all work is within existing right-of-way and no coordination with the City of Noblesville is anticipated if no changes to the system north of 136th Street are completed.

5.9.1 Opinion of Probable Costs

Costs were developed for the proposed storm sewer and hybrid ditch improvements. The total opinion of probable project cost including design, construction and inspection is estimated at approximately \$95,000. This includes a construction cost of approximately \$80,500. A breakdown of the probable cost is included in **Appendix G**. **The anticipated cost for the City of Fishers is estimated as \$95,000 for the total project with the City's Capital Plan.** These numbers are for budgetary purposes only and should not be considered final.

5.10 Airport Property Drainage at Allisonville Road and 106th Street

This project, which was previously discussed in **Section 3.9**, is a project that will deal with roadway flooding caused by runoff from the adjacent airport property.

The corner of the airport property near 106th Street and Allisonville Road has caused storm flooding at the intersection over the years during large rainfall events. A pipe system currently drains the portions 106th Street and Allisonville Road as well as some discharge from the airport

property. During rain events, runoff from the steep slope on the airport property flows to the inlets near the intersection and overwhelms in the inlets causing flooding. During large storm events the inlet(s) cannot handle the high velocity and flow from the steep slope and the runoff will cause roadway flooding and temporary lane closures. In addition, debris buildup will accumulate at the fence line along the airport property causing erosional concerns.

The proposed project will include the construction of a berm at the corner of the airport property to temporarily detain runoff and reduce flows to the inlet as shown in **Figure 5-11**. Since the

project is at the airport, a dry detention facility will be constructed with underdrains in the dry basin to keep the area as dry as possible. Any detention systems must be constructed as a dry basin or underground to prevent the birds from gathering near the runways. A vegetative type detention basin with an underdrain as shown in **Figure 5-2** would be utilized. Large storm events will be temporarily detained behind the berm and released at a controlled rate to not overwhelm the existing inlet(s). The berm will be constructed to tie into existing

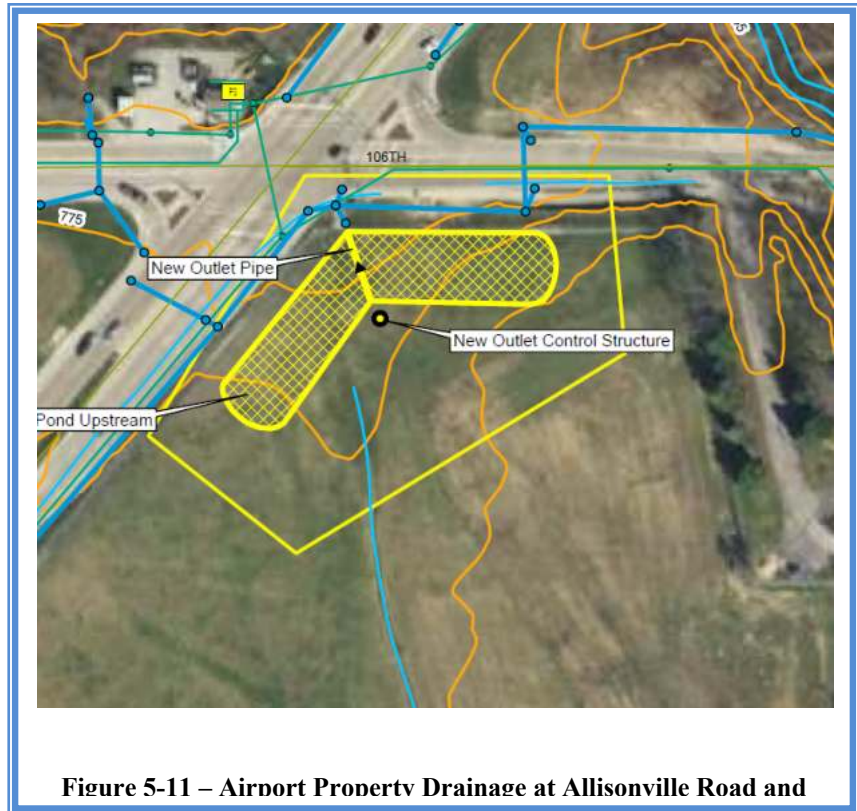


Figure 5-11 – Airport Property Drainage at Allisonville Road and

contours around the site to have as little impact as possible on the airport property.

Since the work will be completed on the airport property, coordination and permitting will be required with the Federal Aviation Authority (FAA) to verify the detention area meets current standard requirements. Easements may be required on the property for the detention area to complete the proposed improvements.

Preliminary hydraulic calculations were completed to approximate the size of the detention facility and height of the berm. These preliminary calculations are included in **Appendix H**. The analysis was based on GIS topography and current aerial images for the site area and should be used for reference purposes only. A detailed survey and watershed analysis would be required to better design the required detention volume.

5.10.1 Opinion of Probable Costs

Costs were developed for the approximate detention layout based on current GIS information. These costs include construction costs for the berm, outlet piping and underdrain system within the basin area. The total opinion of probable project cost including design, construction and inspection is estimated at approximately \$214,000. This includes a construction cost of approximately \$182,000. A breakdown of the probable cost is included in **Appendix G**. **The anticipated cost for the City of Fishers is estimated as \$214,000 for the total project with the City's Capital Plan.** These numbers are for budgetary purposes only and should not be considered final.

5.11 10307 Cumberland Road Storm Sewer Upgrade in Bradford Knoll

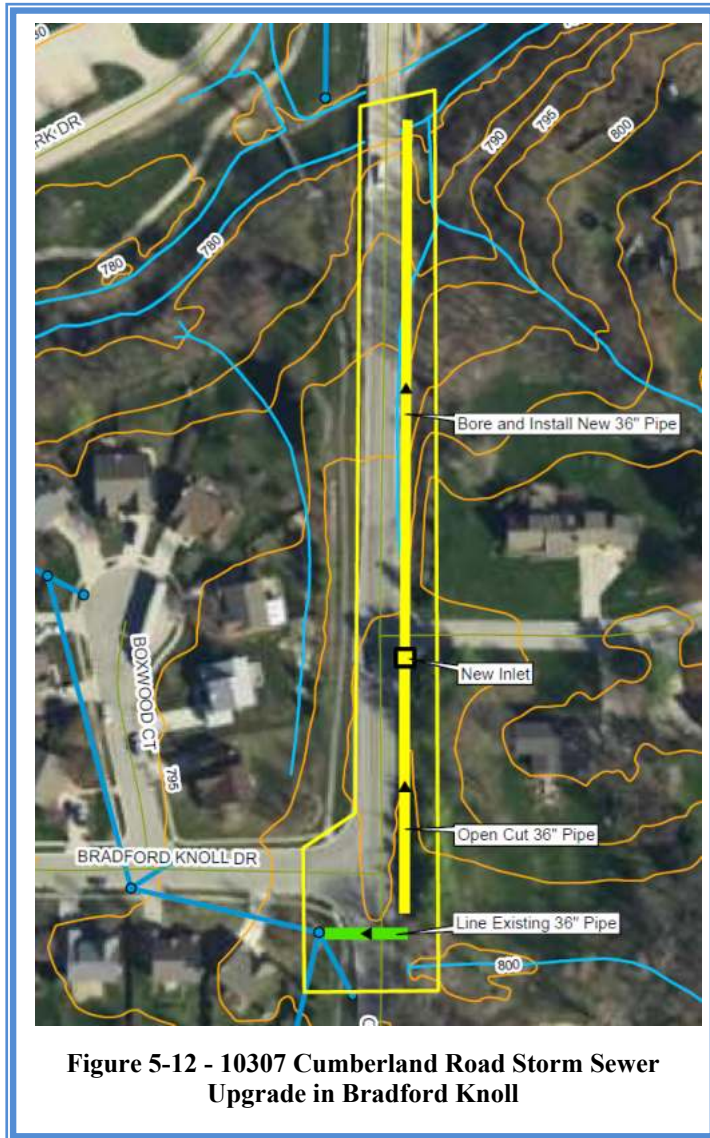
This project, which was previously discussed in **Section 3.10**, will be the construction of a diversion and relief pipe system and pipe remediation. The 10307 Cumberland Road project is located approximately 0.25 miles south of the 106th Street and Cumberland Road roundabout. The project is also in close proximity to the Cumberland Road Bridge Replacement project outlined in **Section 5.8** above.

This project is the result of the downstream storm sewer within the Bradford Knoll subdivision having insufficient capacity for the upstream flows. Currently, a 36" CMP culvert under Cumberland Road drains the drainage area west of Cumberland Road into a 24" pipe system within the Bradford Knoll Subdivision. During large storm events, the 24" pipe lacks sufficient capacity and causes flooding at the 10307 Cumberland Road property as well as adjacent residential properties. In addition, field inspection indicated that the 36" CMP had signs of rusting and flowline degradation.

Three (3) alternatives are available to alleviate flooding and upgrade the system. These three (3) alternatives were reviewed and discussed with City staff. The 1st Alternative is to increase the 24" pipe system within Bradford Knoll from Cumberland Road to the pond. This alternative would include replacing the 24" pipe system throughout the subdivision to the existing detention pond near Mud Creek. Based on preliminary field investigations, upsizing the existing pipe would be feasible, however the pipe would require major impacts at the main entrance roadway and cul-de-sac. Significant pavement and curb replacement costs would be required since most of the pipe is within or near the edge of the roadway.

Alternative 2 is to provide a relief pipe and swale within existing easements along the west side of Cumberland Road within the subdivision. The residential lots within Bradford Knoll that back up to Cumberland Road each have an existing drainage easement within the rear yards. The

alternative would be to utilize the existing easement to construct a new diversion pipe and swale to Mud Creek. This alternative would also be feasible, however it would have major impacts on many of the residences. During field visits it was observed that the proposed rear yard swale would be installed within 10'-15' of some residential structures. The proximity of the swale to the residence would potentially cause other flooding concerns and impacts.



Alternative 3, as shown in **Figure 5-12**, is to install a new 36" relief sewer along the west side of Cumberland Road up to Mud Creek. This alternative is the recommended alternative as this would provide the required relief with the least amount of impact on the adjacent residences. The relief pipe would be installed at a slightly higher elevation than the existing CMP pipe to allow for the initial smaller storm events to utilize the existing system. Larger flow would be directed to the new relief system. The system could be installed by open cut up for most of the length, however a jack and bore installation may be required due to the presence of a hill between Bradford Knoll and Mud Creek.

It should be noted that the condition of the existing CMP culvert would also need to be addressed in all three options. In Alternatives 1 and 2 the culvert pipe may need to be replaced in order to maintain the necessary capacity to convey flows from the upstream

watershed. This pipe replacement would require the closure of Cumberland Road to replace the pipe as well as pavement replacement cost. In Alternative 3, the existing CMP culvert would be lined to prevent further deterioration of the pipe. This option would not involve impacts to Cumberland Road thus saving on road closures and pavement cost which would offset cost of the large diameter jack and bore and pipe lining.

The existing culvert pipe is not conveying flows from a regulated drain, but possible solutions may involve pipe connections into Mud Creek which may require coordination with the Hamilton County Surveyors Office. Improvements within the Cumberland Road may also require permitting with the Hamilton County Highway Dept.

5.11.1 Opinion of Probable Construction Costs

Upon discussing with the City of Fishers and reviewing alternatives, Option 3 is the preferred alternative for this project and was used for the Capital Plan analysis. Costs were developed for the proposed storm sewer relief pipe and the pipe lining. The total opinion of probable project cost including design, construction and inspection is estimated at approximately \$294,000. This includes a construction cost of approximately \$250,000. A breakdown of the probable cost is included in **Appendix G**. **The anticipated cost for the City of Fishers is estimated as \$294,000 for the total project with the City's Capital Plan.** These numbers are for budgetary purposes only and should not be considered final.

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6 POTENTIAL MAINTENANCE PROJECTS

The projects presented within the following sections are small, maintenance projects that can be remediated easily. The projects mainly arise from customer complaints, but also can come from known utility information from City staff. These types of projects are yearly and are can be completed by City maintenance staff as they are encountered. These projects are only a small portion of what could potentially be completed once the final rates have been implemented.

6.1 Lake Stonebridge Dam Overtopping

This project, as discussed previously in **Section 3.11**, will deal with the necessary improvements at the Lake Stonebridge Dam. Lake Stonebridge is a residential lake along 116th Street just west of Hoosier Road. The lake collects runoff from the Lake Stonebridge Subdivision as well as the two (2) regulated drains that collect runoff from areas north of 116th Street. The lake is currently controlled by a dam along Brixton Lane that regulates the lake elevations and controls flow into High Ditch and Mud Creek. The Lake Stonebridge Dam consist of four 30-inch pipes under Brixton Road with an approach concrete pad on the upstream side of the dam. The project location is indicated in **Figure 6-1**.

The initial plan was to elevate the dam to reduce overflows onto Brixton Lane during large storm events. However, since the dam is a regulated structure that controls flows upstream of Lake Stonebridge major improvements to the dam, including raising the roadway, would be difficult due permitting issues.

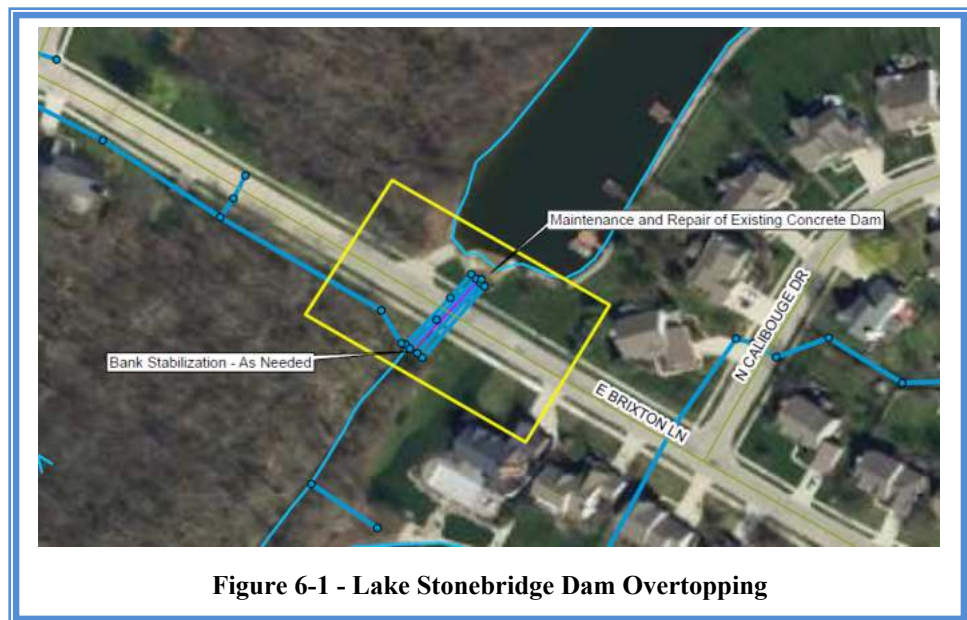


Figure 6-1 - Lake Stonebridge Dam Overtopping

The proposed plan is to repair the cracking in the concrete dam by grouting and filling in the current cracks and fissures. The burrows around the concrete will be filled in using flowable fill. Televising of the existing pipes should be completed to determine if any additional pipe maintenance or repairs are required. Bank stabilization at the outlet would be evaluated and provided as necessary.

Since the project is mainly maintenance of the dam, this project could be completed as a general maintenance project or as a City-Wide drainage improvements project when combined with other small maintenance projects. An Indiana Department of Natural Resources (IDNR) permit may be required for any work beyond minor maintenance. Since the dam is also part of a regulated drain, permitting and coordination with the Hamilton County Surveyors Office would also be required.

6.1.1 Opinion of Probable Costs

Costs were developed for proposed maintenance of the dam which includes flowable fill and grout. The total opinion of probable project cost including design, construction and inspection is estimated at approximately \$23,600. This includes a construction cost of approximately \$19,900. A breakdown of the probable cost is included in **Appendix G. The anticipated cost for the City of Fishers is estimated as \$23,600 for the total project with the City's Capital Plan**, however since the dam is part of a regulated drain the Hamilton County Surveyor's Office could share the cost. These numbers are for budgetary purposes only and should not be considered final.

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6.2 Lantern Road and USA Parkway Drainage Improvements

This project, as previously discussed in **Section 3.12**, will help to mitigate road overflow occurrences along USA Parkway and increase the capacity of the storm sewer systems in order to convey runoff from larger storm events. The project area is just north of the 106th Street and Lantern Road/USA Parkway roundabout. USA Parkway is a heavily travelled roadway that leads to large commercial development areas along 116th Street. The project is the result of failing culvert pipes and a lack of maintenance within the RJ Craig Regulated Drain on the east side of USA Parkway. The proposed maintenance activities are detailed in **Figure 6-2**.

The proposed maintenance activities would include replacing the existing CMP culvert pipe under USA Parkway with a slightly larger RCP culvert pipe. The areas upstream and downstream of the pipe would be regraded to provide positive flow.



Figure 6-2 - Lantern Road and USA Parkway Drainage

The replacement of the culvert pipe would be sufficient to help reduce roadway flooding near the church's entrance, however it is recommended that coordination with the Hamilton County Surveyor's Office be completed in order to clean and dredge the existing RJ Craig drain to the north the collects and convey runoff from the culvert pipe. The existing regulated drain has overgrown vegetation which traps debris and sediment thus impeding larger flows from being conveyed through the drain.

Since the project is mainly a culvert replacement and ditch maintenance, this project could be completed as a general maintenance project or as a City-Wide drainage improvements project when combined with other small maintenance projects. Coordination with the Hamilton County Surveyor's office would be required due to the recommended regrading and clearing of the RJ Craig Regulated Drain.

6.2.1 Opinion of Probable Costs

Costs were developed for proposed culvert replacement as well as the cleaning and dredging of the existing regulated drain. The total opinion of probable project cost including design, construction and inspection is estimated at approximately \$25,100. This includes a construction cost of approximately \$21,200. A breakdown of the probable cost is included in **Appendix G**. **The anticipated cost for the City of Fishers is estimated as \$13,000 for the total project with the City’s Capital Plan.** These numbers are for budgetary purposes only and should not be considered final.

6.3 Hoosier Road South of S-Curve/Cemetery Ditch Improvements

This project, as previously discussed in **Section 3.13**, will involve ditch restoration and native plantings to protect the ditch from erosion and silting in.

The project site is located along Hoosier Road just north of 111th Street just inside the City of Fishers Corporation limits. The project has been reported as a high-water location indicating that runoff has encroached on the roadway causing flooding/high water concerns. This section of Hoosier Road is not a heavily travelled roadway, however there are many residents that rely on the roadway for access to and from their homes.

The project plan is to provide ditch regrading along the east side of the roadway to reestablish the flowline as shown in **Figure 6-3**. Existing trees and brush within the swale will be removed and the swale regraded as well on the north end of the site near the S-Curve. Native plantings would be provided as necessary to prevent siltation and erosion of the banks.

Since the project mainly includes ditch regrading and clearing, this project could be completed as a general maintenance project or as a City-Wide drainage improvements project when combined



Figure 6-3 - Hoosier Road South of S-Curve/Cemetery Ditch Improvements

with other small maintenance projects. No major pavement deterioration was observed at the time of the field inspection. The project also does not include a regulated drain; therefore, no permitting is anticipated with other agencies.

6.3.1 Opinion of Probable Costs

Costs were developed for proposed restoration of the existing roadside swale. The total opinion of probable project cost including design, construction and inspection is estimated at approximately \$26,200. This includes a construction cost of approximately \$21,700. A breakdown of the probable cost is included in **Appendix G**. **The anticipated cost for the City of Fishers is estimated as \$26,200 for the total project with the City's Capital Plan.** These numbers are for budgetary purposes only and should not be considered final.

6.4 Georgia Road North of 96th Street Drainage Improvements

This project, which was previously discussed in **Section 3.14**, includes pipe installation and ditch grading within an area of ponding along Georgia Road.

The project is the result of flows from the farm field on the east side of Georgia Road flooding the roadway due to no drainage collection facilities to collect and convey the runoff.

As shown in **Figure 6-4**, the project would include the installation of an inlet and pipe system along the east edge of Georgia Road to collect the standing water. The pipe system would be connected to an existing inlet on the west side of Georgia Road south of the subdivision entrance. In addition, an underdrain would be installed/extended to the south along the west side of Georgia Road to alleviate standing water at the intersection.



It is also recommended that the existing culvert pipe(s) located near the northeast corner of the 96th Street and Georgia Road be analyzed and cleaned. Based on field investigation, the existing pipes appears to be clogged due to sediment or riprap prohibiting flow into the culverts.

Since the project mainly includes ditch regrading and a small pipe extension, this project could be completed as a general maintenance project or as a City-Wide drainage improvements project when combined with other small maintenance projects. The project could also be completed as a Capital Improvement project by itself depending on the scope of the improvements. The project does not include a regulated drain, therefore no permitting is anticipated with other agencies, however, if any work is completed within the culvert pipe under 96th Street coordination with Hancock County may be required.

6.4.1 Opinion of Probable Costs

Costs were developed for proposed pipe and inlet as well as the extension of the underdrain. The total opinion of probable project cost including design, construction and inspection is estimated at approximately \$113,700. This includes a construction cost of approximately \$96,400. A breakdown of the probable cost is included in **Appendix G. The anticipated cost for the City of Fishers is estimated as \$113,700 for the total project with the City's Capital Plan.** These numbers are for budgetary purposes only and should not be considered final.

6.5 121st Street between Cross Road Lane and Blue Springs Lane

This project, which was previously discussed in **Section 3.15**, will involve ditch restoration, minor grading and native plantings to protect the ditch from erosion and silting in. Some pavement replacement / resurfacing may be required. The project improvements are shown in **Figure 6-5**. 121st Street is a well-traveled collector roadway between Cumberland Road and Hoosier Road along the north side of the City of Fishers. The area includes mostly residential subdivisions with business development at the 121st Street and Cumberland Road. The project is the result of standing water along the edge of the roadway that does not drain to the roadside swales causing pavement deterioration along the north side of 121st Street.

The plan would include regrading the swales and grass areas along the north side of 121st Street to provide positive drainage to the existing inlets. Replacement of the deteriorated pavement sections and/or milling and resurfacing of the subdivision entrances would be completed to provide positive drainage.

Since the project mainly includes ditch regrading and clearing, this project could be completed as a general maintenance project or as a City-Wide drainage improvements project when combined with other small maintenance projects. Per mapping, the project does not include a regulated drain, therefore no permitting is anticipated with other agencies.



6.5.1 Opinion of Probable Costs

Costs were developed for proposed swale restoration, grading and pavement milling/resurfacing. The total opinion of probable project cost including design, construction and inspection is estimated at approximately \$45,000. This includes a construction cost of approximately \$38,000. A breakdown of the probable cost is included in **Appendix G**. **The anticipated cost for the City of Fishers is estimated as \$45,000 for the total project with the City’s Capital Plan.** These numbers are for budgetary purposes only and should not be considered final.

6.6 96th Street and Cyntheanne Road Drainage Improvements

This project, which was previously discussed in **Section 3.16**, swale regrading/restoration and the installation of culvert pipes at the intersection of 96th Street and Cyntheanne Road. The proposed improvements are shown in **Figure 6-6**.

The 96th Street and Cyntheanne Road Drainage Improvements project is located at the intersection of 96th Street and Cyntheanne Road in the southeast corner of Hamilton County. The site is two (2) miles east of Olio Road. The project area is part of the unincorporated area outside the City of Fishers Corporation limits, however the City of Fishers has previously annexed areas around the site. It is anticipated that as development expands this area will be annexed as well.



Figure 6-6 - 96th Street and Cyntheanne Road Drainage Improvements

Since this area could be annexed and eventually developed, improving the drainage conveyance system and eliminating flooding is a priority. The project will include the installation of new 36” culvert pipes under Cyntheanne Road as well as a culvert pipe under 96th Street on the east side of Cyntheanne Road to Bee Camp Creek. Swales along Cyntheanne Road will be regraded to provide positive drainage within the area. Some improvements to the intersection may eventually be completed to provide better turning radii and bank protection between the roadway and the creek as the area development, therefore any improvements should account for the possibility of intersection improvements.

Since Bee Camp Creek is located within Hancock County, coordination with the Hancock County Surveyor would be required for the improvements and outlet. In addition, some coordination with the Hamilton County Surveyor’s Office and Hamilton County Highway Dept. may be required for the roadway improvements of the intersection, especially if improvements are proposed prior to annexation.

Since the project mainly includes ditch regrading and clearing, this project could be completed as a general maintenance project or as a City-Wide drainage improvements project when combined with other small maintenance projects. Per mapping, the project does not include a regulated drain, therefore no permitting is anticipated for regulated drain improvements, unless Bee Camp Creek is classified as a regulated drain by Hancock County.

6.6.1 Opinion of Probable Costs

Costs were developed for proposed culvert pipes as well swale grading along Cyntheanne Road. The total opinion of probable project cost including design, construction and inspection is estimated at approximately \$93,900. This includes a construction cost of approximately \$79,600. A breakdown of the probable cost is included in **Appendix G**. **The anticipated cost for the City of Fishers is estimated as \$93,900 for the total project with the City's Capital Plan.** These numbers are for budgetary purposes only and should not be considered final.

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7 FLOODPLAIN / DRAINAGE STUDIES AND OUTFALL MODIFICATIONS

The projects presented within the following sections are drainage studies for existing developed areas, floodplain studies for unstudied streams within the corporate limits or updating existing floodplain studies based on current topographic data and possible outlet modifications for ponds.

The drainage studies have resulted based on either past customer complaints or historical reports on possible drainage issues. It is possible that past drainage issues may have been resolved by maintenance activities that were previously completed by homeowners or City staff as these areas have not had recent complaints or flooding issues. Since a project area cannot be clearly defined based on current information, a drainage study would be implemented to evaluate current infrastructure and possible future project needs.

The floodplain studies are based on updating current Flood Insurances Study (FIS) reports based on current topography and/or structure information or completing a FIS model for streams that are not currently studied within the City of Fishers corporate limits. The City desires to have up-to-date modeling for all streams with the City to better establish floodplain boundaries and floodway limits.

The pond outfall modifications are the result of historical reports on pond flooding issues due to outfall structures or changes in development. As development has occurred over the past 10-15 years, new residential developments have been constructed with numerous detention ponds. In some cases the detention ponds work in series, however original designs may have not accounted for this scenario due to numerous years between the development. Other ponds may have been constructed prior to current drainage standards and may lack debris capture devices or adjustments to meet current standards. The City would like to further evaluate these ponds to determine what modifications or needs are required at each location and update the pond routing as necessary to determine how the pond(s) function.

7.1 Drainage Studies

Quaker Ridge Storm Drain / Pipe Study: The Quaker Ridge Subdivision is located along the north side of 106th Street just west of Cumberland Road. The existing subdivision consist of approximately 65 houses and a total of 40 acres. The streets have roll curbs with street inlet and a pipe system to drain flows within the subdivision. The existing pipe system outfall to the west into the Golf Course along Mud Creek. The subdivision is located near the confluence of Sand Creek and Mud Creek just upstream of 106th Street. A review of the storm sewer system and outfall would be provided to determine the extent of any drainage issues. Since the storm system outfall into the Mud Creek floodplain limits, drainage issues may be the result of flood elevations

backing up into the storm sewer system prevent the local flows from exiting the pipe system during flood conditions. **The cost of the drainage study was estimated as \$6,500.**

Sunblest Farms Drainage Study: Sunblest Farms Subdivision is one of the largest subdivisions areas within the City of Fishers. The subdivision is located northeast of the downtown area and is bounded by 116th Street to the south, Allisonville Road to the west, 126th Street to the north and Lantern Road to the east. Overall, the subdivision contains approximately 610 acres and 1,830 homes. The Roy G. Holland Memorial Park is located within the subdivision area. The streets consist of roll curbs with street inlets and a pipe system. A tributary to Shoemaker Ditch is located through the northwest portion of the subdivision and Smock Creek is located at the west / central part of the subdivision.

Based on discussion with the City it is unclear where drainage issues have been reported within the subdivision and the extent of any drainage issues is unknown. Due to the age of the subdivision, any drainage issues may be result of deteriorating infrastructure or lack of maintenance. An evaluation of the subdivision drainage patterns and storm sewer system would be completed to determine what types of issues may exists. **The cost of the drainage study was estimated at \$90,000.**

7.2 Floodplain Studies

106th Street and Cheeney Creek Floodplain Improvements Study: Cheeney Creek impacts a significant portion of the City of Fishers just south of the downtown area. Currently portions of 106th Street are located within the floodway and floodplain of Cheeney Creek. The City would like to mitigate flooding along 106th Street. As noted above there are two (2) potential Capital Improvement projects that would include elevating the 106th Street and improving Cheeney Creek to revise the floodway/floodplain limits. These projects could impact current bridge structures along Cheeney Creek. In addition, the Cheeney Creek watershed has been impacted upstream by development along I-69 including the recently built I-KEA store and Top Golf complex. It is anticipated the floodplain study would be completed in coordination with the Capital Improvements projects. **The cost of the floodplain study was estimated to be \$30,000**, which could include possible cost sharing with the Hamilton County Surveyor's Office since portions of Cheeney Creek are considered a regulated drain.

Geist Reservoir Floodplain Restudy: Based on FEMA mapping, Geist Reservoir is currently an Unstudied Zone A. Fall Creek has been studied both upstream and downstream of the reservoir. The City would like to establish a 100-yr floodplain for the Geist Reservoir based on appropriate modeling and updating previous studies on Fall Creek to establish floodplains for the properties around Geist Reservoir. **The cost of the floodplain study was estimated to be \$30,000**, which could include possible cost sharing with other governmental agencies including Hamilton County

and Marion County agencies. It is possible that the study of the reservoir could be coordinated with the Indiana Department of Natural Resources as well.

Sand Creek Floodplain Restudy: Sand Creek is one of the major streams that flows through the City of Fishers. The last Flood Insurance Study (FIS) model on Sand Creek was completed in 2003. Since 2003, the watershed for Sand Creek has significantly changed due to the development within the City of Fishers and the City of Noblesville. Various bridge replacement projects have also taken place since the 2003 FIS modeling. The City would like to update the FIS model based on current information to verify that the flood modeling and mapping along the stream is correct. Based on a review of the GIS database a total of thirteen (13) bridge crossings along Sand Creek are present within the City of Fishers. **The cost of the floodplain study was estimated to be \$50,000**, which could include possible cost sharing with the Hamilton County Surveyor's Office since Sand Creek is considered a regulated drain.

Mud Creek Floodplain Restudy: Similar to the Sand Creek study above, Mud Creek is another major stream that flows through the City and carries a large floodplain that affects many residents, businesses and parks. Sand Creek actually flows into Mud Creek just upstream of 106th Street and east of Cumberland Road. Like Sand Creek, the Flood Insurance Study (FIS) model for Mud Creek was completed in 2003. Mud Creek has also had many changes to model due to bridge replacement projects. The Cumberland Road at 106th Street bridge replacement project proposed as a possible Capital Improvement Project would also affect Mud Creek. Based on a review of the GIS database a total of eighteen (18) bridge crossings along Mud Creek are present within the City of Fishers. **The cost of the floodplain study was estimated to be \$60,000**, which could include possible cost sharing with the Hamilton County Surveyor's Office since Mud Creek is considered a regulated drain.

116th Street and Hoosier Road Floodplain Improvements Study: It was noted that the bridge carrying Hoosier Road over Mud Creek just south of 116th Street may be undersized. A study of the area and potential improvements to possibly remove the roadway from flood would be included within a study. Since this area is within the Mud Creek watershed, the study could be combined with the update of the Mud Creek FIS model, however the City also wanted to look at a separate study for this area individually. Recent projects have been completed within the area and a potential developed along 116th Street just upstream of the bridge was elevated and removed from the floodplain. The area along the stream was converted into a park and used as compensatory storage and mitigation. **The cost of the floodplain study was estimated to be \$15,000**, which could include possible cost sharing with the Hamilton County Surveyor's Office since Mud Creek is considered a regulated drain.

8 DUAL-PURPOSE FACILITIES

As part of the stormwater master plan, the City's stormwater needs, as part of their overall development plan, must be evaluated in the form of potential dual-purpose facilities. These dual-purpose facilities will assist with creating regional and/or localized areas that will provide possible water quality benefits as well as stormwater quantity management for potential future development. When looking at potential redevelopment and/or commercial development expansion areas, a necessity for regional detention facilities and the requirements for additional stormwater capacity must be taken into account. The City of Fishers has identified two (2) sites for potential dual-purpose facilities to be evaluated as part of the Masterplan. A third dual-purpose facility is included in this section to complete a MOU commitment as part of a previously roadway design project near the Sunbeam Development at 126th Street and Cumberland Road.

8.1 Downtown Redevelopment – Village Center

As the City has reviewed their current development plan for the downtown area, the City of Fishers created an evaluation of the Nickel Plate District within the downtown area. The City subsequently adopted Ordinance #111813A, called the Nickel Plate District Code in 2014. This document was an expansion of the Downtown 2030 Masterplan. The City has identified four (4) zones in the downtown area which includes the Downtown Core, Highway Center, Municipal Center and the Village Center. Over the years continued development has occurred within the Highway, Municipal and Downtown Core areas, however little expansion within the Village Center area has happened.

The Village Center area mainly consists of older single family residential homes or apartment complexes as well as an aging storm sewer infrastructure. As part of the City's development plan, this area is identified as a potential population center to support the downtown area. The Village Center area would be developed to include multi-family developments, townhomes and new single-family developments. In addition, civic functions such as light commercial storefronts, schools, community centers and churches were identified as possible uses. Trails and pedestrian access to the downtown area would be vital to promote connectivity to the downtown corridor.



Figure 8-1 – Downtown Redevelopment – Village Center

For the purposes of the Stormwater Masterplan, the City has indicated that Village Center area south of 116th Street needs evaluated for stormwater quality and quantity due to capacity issues within the existing area drains. **Figure 8-1** shows the Village Center area identified for stormwater needs. The area is bordered by South Street to the north, I-69 to the east, Fishers Point Blvd to the south and the RJ Craig Drain to the west.

Based on preliminary meetings and field visits, the RJ Craig drain does not have sufficient capacity for runoff from potential developments, therefore the runoff from the site must be detained to the requirements set forth by the Hamilton County Surveyors Office. Per the Surveyor's Office the release rate for the proposed 10-yr storm event must be limited to 0.1 cfs per acre and the 100-yr storm event must be limited to 0.3 cfs per acre. Using the potential service area, a watershed of approximately 50.0 acres was determined for the development. In addition, by using the potential development uses identified in the Nickel Plate District Code, an estimated impervious coverage of 42.5 acres (85% impervious coverage) was calculated. By using the approximate drainage area of 50 acres, a CN value of 96, as well as the required release rates per the Surveyor's Office, an estimated detention volume of 738,000 cuft was determined. Preliminary hydraulic calculations can be found in **Appendix H**.

Due to the potential uses and the desire to maximize the developable area, alternatives for an above ground detention as well as an underground pipe detention facility were explored for cost. The use of an above ground area would be much more cost effective; however this would significantly impact the area that could be developed. A park area south of Fishers Pointe Blvd could be explored as a potential area for an above ground detention facility. Use of this area would require land acquisition from the City's Parks Department.

The total opinion of probable project cost including design, construction and inspection is estimated at approximately \$9,335,000. This includes a construction cost of approximately \$7,920,000, which is based on the more expensive underground detention facility. A breakdown of the probable cost is included in **Appendix G**. **The anticipated cost for the City of Fishers is estimated as \$1,400,000 for the total project within the City's Capital Plan, which is based on a cost share component with potential future developers.** These numbers are for budgetary purposes only and should not be considered final.

8.2 Airport Development

A 2nd Dual Purpose area identified by the City was the Airport along 96th Street. This area has been expanding over the years and the City would like to attract potential development to the parcel along 96th Street next to the Airport property. There has been interest in the property over the

years, however floodplain concerns due to the Heath Ditch flowing through the site has provided concern.

The proposed project is located just west of the 96th Street and Masters Road Intersection within the Airport Property. **Figure 8-2** shows a conceptual layout of a potential development for the area.

As part of this dual purpose facility, the City wanted to look at potential needs and cost to provide sufficient stormwater infrastructure for future development of the Parcel. Similar to the downtown redevelopment parcel, a drainage area of 61.9 acres and impervious cover of 51.6 acres (85% impervious coverage) was determined based on the potential uses for the development. Using this information as well as required release rates based on the City of Fishers Stormwater requirements, an estimated detention volume of 823,500 cuft was calculated for the development.



Figure 8-2 – Airport Development

The release rate requirements are based on the pre-developed outflow from the project area. Preliminary hydraulic calculations can be found in **Appendix H**.

For the airport development, the main concern is not having a permanent pool or standing water due to the development in relation to the airport runways. For this reason, the detention must be limited to a dry detention facility with an underdrain system or an underground detention facility. Cost analysis were completed for both alternatives for consideration in the masterplan.

The total opinion of probable project cost including design, construction and inspection is estimated at approximately \$8,484,000. This includes a construction cost of approximately \$7,200,000, which is based on the more expensive underground detention facility. This option was chosen due to the City's concern of the surface detention in relation to the runway. A breakdown of the probable cost is included in **Appendix G**. **The anticipated cost for the City of Fishers is estimated as \$600,000 for the total project with the City's Capital Plan, which is based on a cost share component with potential future developers.** These numbers are for budgetary purposes only and should not be considered final.

8.3 Reynolds Industrial Park – (Sunbeam Development - Memorandum of Understanding)

A third site analyzed in this section is the Reynolds Industrial Park located at 126th Street and Cumberland Road. This project consists of the completion of a Memorandum of Understanding (MOU) agreement that was agreed upon in 2011 between the Sunbeam Development and the Town of Fishers. In 2010, a project was designed by Beam, Longest and Neff, LLC (BLN) to complete drainage improvements along 126th Street. These improvements were completed between 126th Street and Cumberland Road to account for future commercial and industrial developments within the corridor. The intent of the project was to utilize an existing pond on the Sunbeam Development property located south of 126th Street. The project site is shown in **Figure 8-3**.

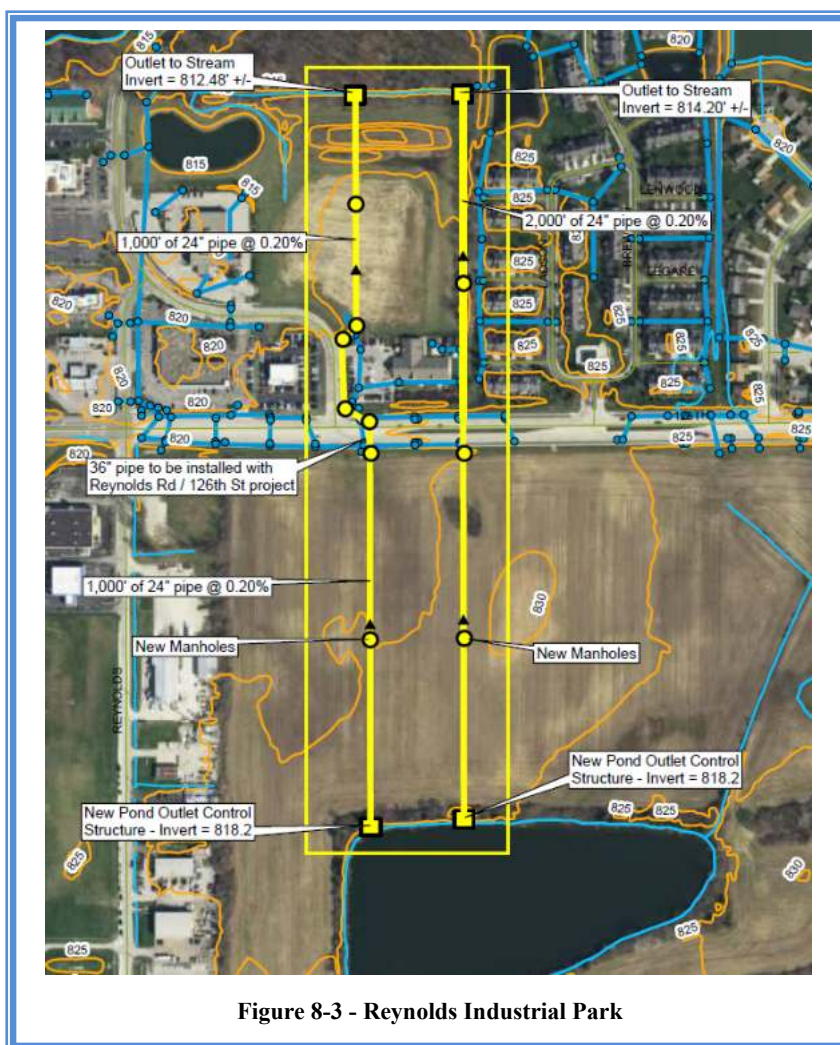


Figure 8-3 - Reynolds Industrial Park

As part of the project, a Memorandum of Understanding (MOU) was completed with the Sunbeam Development to lower the existing pond elevation to be no higher than 818.20'. In order to complete the MOU, an outlet pipe or possible expansion of the pond would be required.

A possible solution was designed by BLN in 2010 showing three (3) alternatives for the outlet pipe. These alternatives included out outlet pipe to the west to a swale within the SR 37 right-of-way and two (2) alternatives with an outlet pipe directed to the stream north of 126th Street. Since that time, the property to the west has been developed and

INDOT/City of Fishers is proposing modifications to SR 37 making this outlet configuration either infeasible or uncertain based on potential changes to the swale. For this reason, the two (2) alternatives routing the outlet to the north were analyzed.

Alternative 1 would include the construction of a 24” outlet pipe from the west end of the existing pond. The 24” pipe would extend north at a slope of approximately 0.20% to the intersection of 126th Street and Parkside Drive. Based on the City of Fishers, a proposed project currently in design to improve the above intersection. As part of this project a 36” casing pipe will be installed to provide for the pipe outlet from the Reynolds Development pond. The proposed 24” pipe would be installed under 126th Street using the above 36” pipe as a carrier. The 24” pipe would continue north along Parkside Drive and then between the commercial development parcels to the stream. It is noted that based on the Parkside Drive and 126th Street design plans a 4” water main and AT&T Fiber ducts would need to be relocated. In addition, there are various utilities located along the east side of Parkside Drive. The proposed route along Parkside Drive may require the storm sewer to be within the roadway to avoid utilities and additional right-of-way. Pavement and curb replacement along Parkside Drive is anticipated.

The total opinion of probable project cost for Alternative 1 including design, construction and inspection is estimated at approximately \$391,000. This includes a construction cost of approximately \$332,000. A breakdown of the probable cost is included in **Appendix G**. **The anticipated cost for the City of Fishers is estimated as \$391,000 for the total project.** These numbers are for budgetary purposes only and should not be considered final.

Alternative 2 would also include the construction of a 24” pipe, however this pipe would outlet near the center of the pond. The 24” pipe would extend north at a slope of approximately 0.20% to the stream that is north of 126th Street. The pipe crossing 126th Street would require some pavement and curb replacement. Since the pipe will cross 126th Street away from the intersection, it is anticipated that utility relocations could be avoided or possible utility conflicts avoided by adjusting the pipe slope. The pipe north of 126th Street would be installed along the parcel lines of the developments, however tree removals may be required for the pipe installation.

The total opinion of probable project cost for Alternative 2 including design, construction and inspection is estimated at approximately \$313,000. This includes a construction cost of approximately \$265,500. A breakdown of the probable cost is included in **Appendix G**. **The anticipated cost for the City of Fishers is estimated as \$313,000 for the total project.** These numbers are for budgetary purposes only and should not be considered final.

After looking over the two alternatives, Alternative 2 is recommended to be constructed. It is anticipated that this alternative would require less utility relocation and less pavement and curb replacement which would result in a lower cost.

9 IMPLEMENTATION

Proper implementation of the selected alternatives from this plan requires the coordination of design, permitting, land acquisition, finances, accessibility, stakeholders, and scheduling aspects of each project.

9.1 Design Considerations

Each of the projects requires some level of design to ensure proper sizing of facilities, proper coordination between utilities, and proper coordination between the various agencies involved in these projects. Some of the projects, specifically much of the capital improvement projects, will require a significant amount of design. These projects will require further computer modeling of flows, pipe sizing, utility locations, and numerous other design activities.

9.2 Permitting Considerations and Project Coordination

Permitting will be required for all the capital projects and for some of the maintenance projects as well. These permits will vary from project to project, but most will deal with permits relating to water quality and erosion control through Indiana Department of Environmental Management's (IDEM) Rule 5 program. Local permits will also be required on the projects that may interrupt local traffic patterns and require partial or full street closures. There will be some permits required from the Department of Natural Resources, especially the projects that will be dealing with modifying flow patterns and flood mitigation. Any projects that affect wetland areas or are within the Ordinary High Water Mark (OHWM) of streams will require an Army Corps of Engineers (ACOE) 404 Permit and Indiana Department of Environmental Management (IDEM) 401 Permit.

It is also noted that many of the projects include work within or around regulated drains. Any work involving regulated drains would require permitting and coordination with the Hamilton County Surveyor's Offices. In addition, bridge replacement projects or work along county roadways would require permitting and coordination with the Hamilton County Highway Department. Some cost share may be included between the City of Fishers and the appropriate entities for the design and construction of some projects.

There are also various projects that are located near unincorporated areas, the Marion County and Hancock County lines and the City of Noblesville. Some coordination may be required with other governmental agencies for outlet locations or temporary work.

9.3 Financial Considerations

Implementing the projects will greatly depend upon the availability of funds, and the means with which to raise the funds. Each project will have a unique set of circumstances surrounding the project, and which funds can be used to design and construct it. The detailed opinions of probable costs were generated to help establish a base line, which will allow the City to obtain funding. No costs for easements or land acquisition were included, but generally residential parcels cost around \$45,000 per acre. Based on initial plan layouts, most of the projects are within existing public right-of-way limits so minimal easements from private parcels will be needed. The assumptions for all projects also did not include any unusual/unexpected poor soil conditions, environmental issues (i.e. soil contamination), or unusually high water tables requiring dewatering. These detailed opinions of probable costs are provided in **Appendix G**.

9.4 Stakeholders

There will be numerous stakeholders involved with this the capital improvement plan. The majority will be home/private property owners that may be affected by the proposed projects including if easements are required for construction.

9.5 Scheduling

Scheduling of projects is an important factor in developing any implementation plan. Scheduling projects before or after certain projects could be the result of several different considerations. Some of the considerations are as follows:

- The development of downstream conveyance (i.e. storm sewers, channels) alternatives generally precedes that of upstream conveyance alternatives;
- Development of detention & retention alternatives generally precedes that of conveyance alternatives;
- One particular project may address more critical and eminent problems within the system;
- Project development may depend on easement acquisitions, permitting, concurrent CIP projects from other Departments/ Agencies and other factors.

10 FUTURE NEEDS AND GOALS

The alternatives presented in this report provide relief from the current surface flooding. Additionally, the proposed maintenance alternatives will help to preserve the system elements that are not replaced by any of the capital improvements. These improvements both capital and maintenance will greatly improve stormwater related issues within the City limits. However, these improvements should not be considered the end of improvements to the community.

10.1 Stormwater Asset Inventory & Management

As the City of Fishers begins to move forward with the Master Plan, and receive additional monies, the City should continue to build a system that would keep an inventory of their current stormwater assets. This inventory should keep a detailed account of pipe material, size, and condition; any detention basins currently operated and maintained by the City; and any regulated drains currently operated and maintained by the City. This inventory will be another tool that the City can use to develop and maintain their stormwater infrastructure and will allow City staff to more accurately project infrastructure needs.

10.2 Conclusions

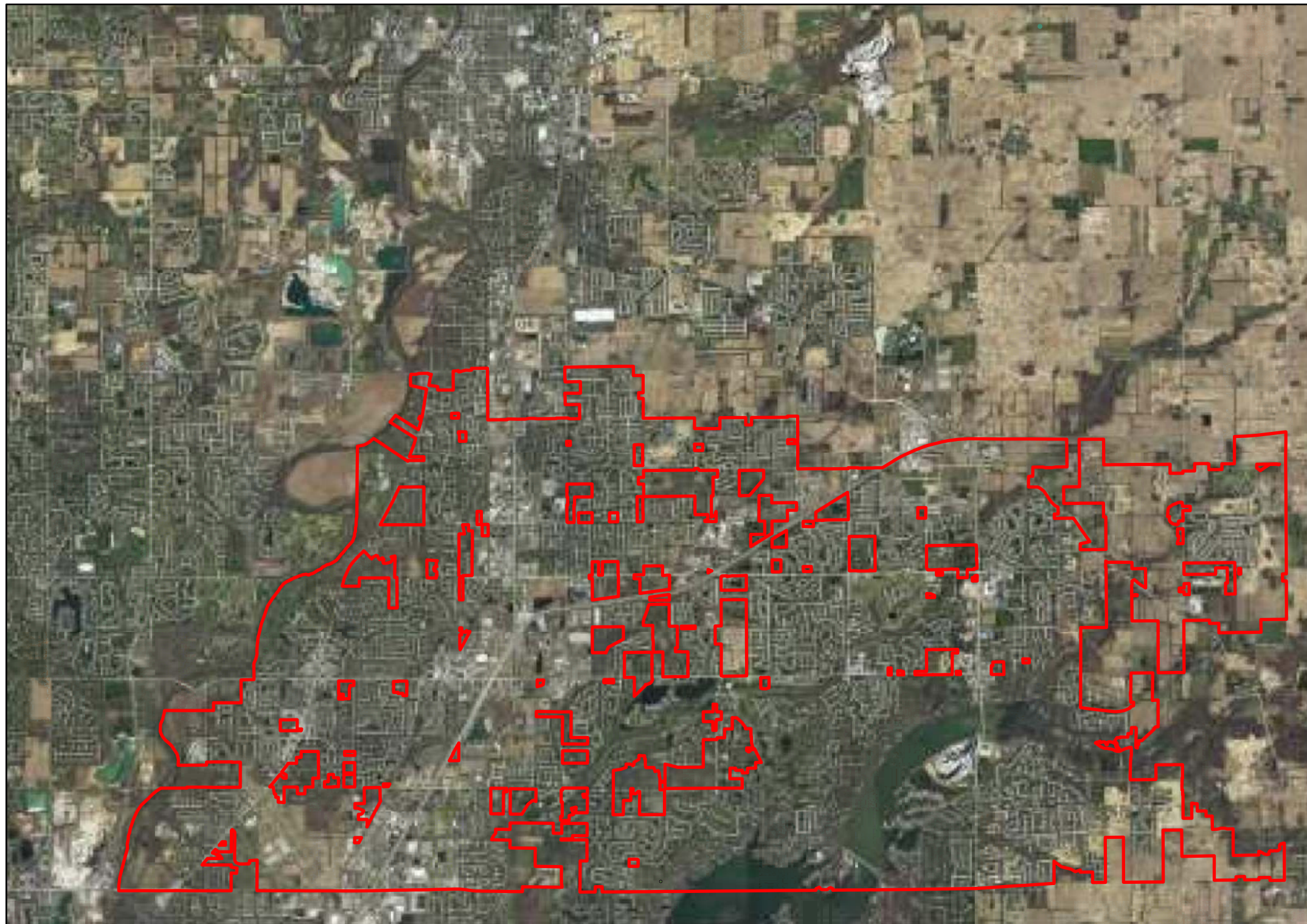
The work and cooperative effort that went into this Master Plan have identified numerous projects within the City of Fishers Stormwater Management System that need additional measures to resolve drainage and flooding problems. These project areas have varying impacts on the City of Fishers residents where it be through financial impacts from loss of property, safety concerns from standing water, flooding and sewer back-up or time impacts due road closures and property repairs. The improvement alternatives, both the capital and maintenance, presented in this report provide a guideline on how to potentially resolve the current drainage issues within the City. It should be noted that the issues in this plan are not static, and new issues may come up that will need to be incorporated into the program as the City continues to expand and annex existing unincorporated areas.

11 REFERENCES

- ¹ City of Fishers, Indiana (March 2016). Fishers 2040 A Framework for Our Future Comprehensive Plan.
- ² Cardno JFNew, (January 2015). Geist Reservoir Restoration Long-Term Capital Maintenance Plan
- ³ City of Fishers, Indiana (February 2018 – latest Amendment). Nickel Plate District Code
- ⁴ City of Fishers, Indiana. (August 2011). Memorandum of Understanding – Sunbeam Corporation
- ⁵ City of Fishers, Indiana. GIS Database

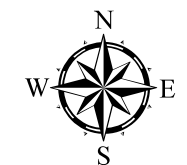
Appendix A

General Conditions Mapping



Legend

 Fishers Corporate Limits



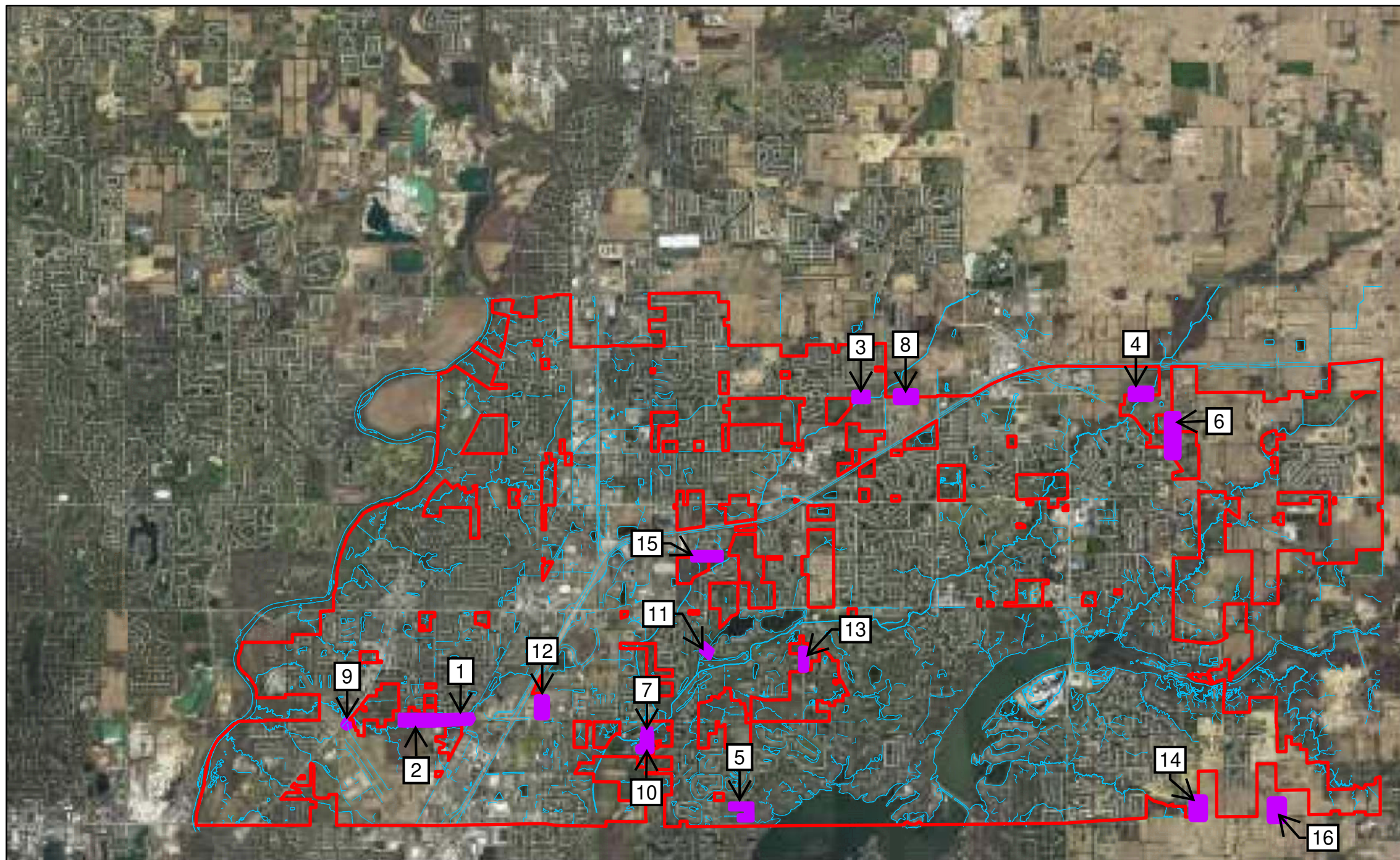
1 inch = 6,000 feet

City of Fishers Aerial Map

**CITY OF FISHERS
STORMWATER MASTERPLAN**

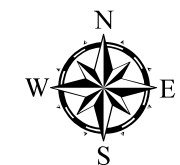


Date: October 2018
Produced By: DLZ Indiana, LLC
Data Source: Hamilton County, IN
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Legend

- ▬ Fishers Corporate Limits
- ▬ Rivers / Streams / Ponds
- ▬ Project Limits



1 inch = 6,000 feet

Overall Project Location Map

**CITY OF FISHERS
STORMWATER MASTERPLAN**

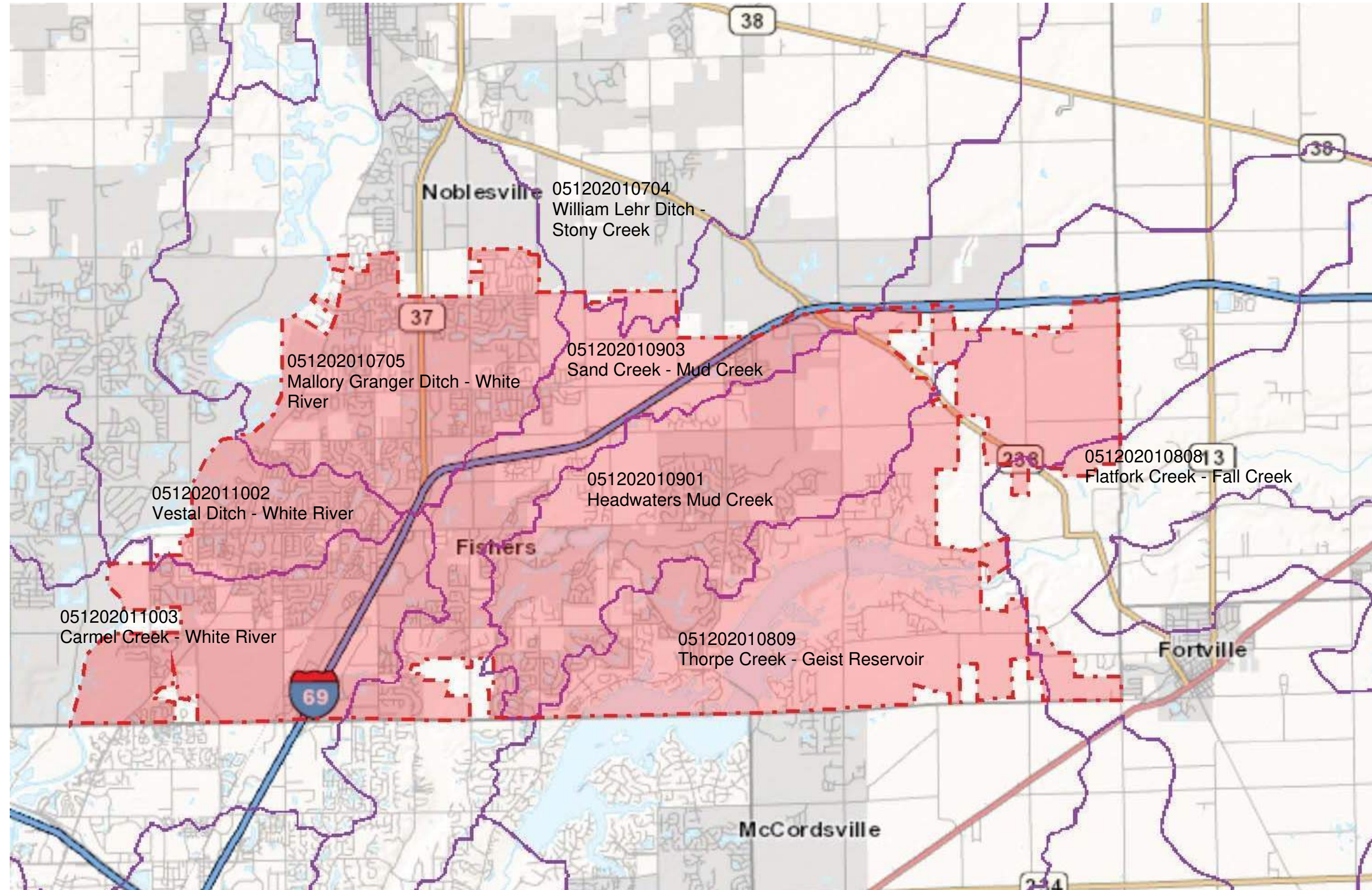


Date: October 2018
 Produced By: DLZ Indiana, LLC
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 This map does not represent a legal document. It is intended to serve as a graphical aid only. Information shown on this map is not warranted for accuracy or merchantability.

Project Locations:

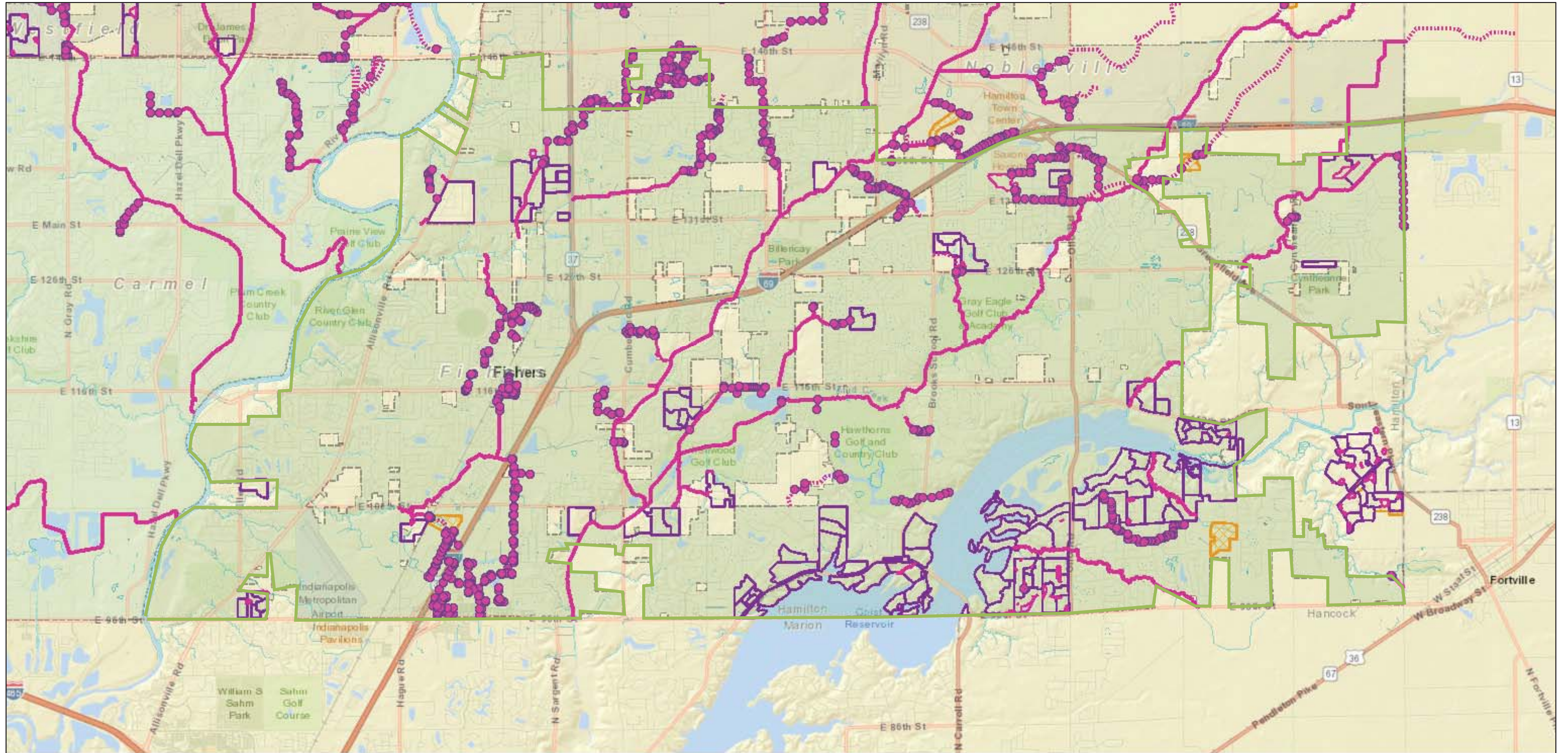
- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Cheeney Creek – 106th Street Between Hague Road and Railroad Tracks 2. Cheeney Creek – 106th Street Between Sherborne Road and Hague Road 3. 136th Street West of Marilyn Road at Sand Creek 4. 136th Street West of Prairie Baptist Road at Mud Creek 5. 97th and 98th Street Drainage Improvements 6. Prairie Baptist Road South of Silverleaf Boulevard Drainage Improvements 7. Cumberland Road and 106th Street Bridge Replacement 8. 136th Street Culvert Improvements at Limestone Springs | <ol style="list-style-type: none"> 9. Airport Property Drainage at Allisonville Road and 106th Street 10. 10307 Cumberland Road Storm Sewer Upgrade in Bradford Knoll 11. Lake Stonebridge Dam Overtopping 12. Lantern Road and USA Parkway Drainage Improvements 13. Hoosier Road South of S-Curve – Cemetery Ditch Improvements 14. Georgia Road North of 96th Street Drainage Improvements 15. 121st Street Between Cross Road Lane and Blue Springs Lane 16. 96th Street and Cyntheanne Road Drainage Improvements |
|---|--|

City of Fishers Watershed Area Map



□ Watersheds HUC12 - 2009

City of Fishers - Regulated Drains (Overall)



August 6, 2018

Drainage Structures

- All Other Structures
- ⊕ MUNICIPAL MANHOLE

Regulated Drains

- ⋯ CLOSED DRAIN
- MUNICIPAL DRAIN
- OPEN DRAIN

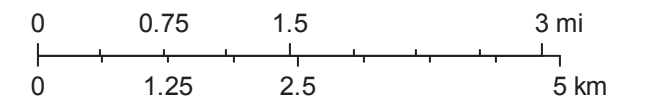
- SSD
- Regulated Drains Waterways
- Regulated Drains Drainage Pool
- Subdivision Drain Waterway
- Subdivision Drain Drainage Pool
- Regulated Subdivision Boundary
- ⊠ Drains Under Construction

Hydroline (2016)

- Culvert Headwall
- Double Ditch
- Double Ditch under road
- Double Stream-River under bridge
- Double Stream-River under road
- Drainage ditch
- Hydro centerline
- Large Pipe end
- Paved drainage ditch
- Single ditch under bridge
- Single ditch under road
- Single Hydro connector
- Single Stream-River under bridge

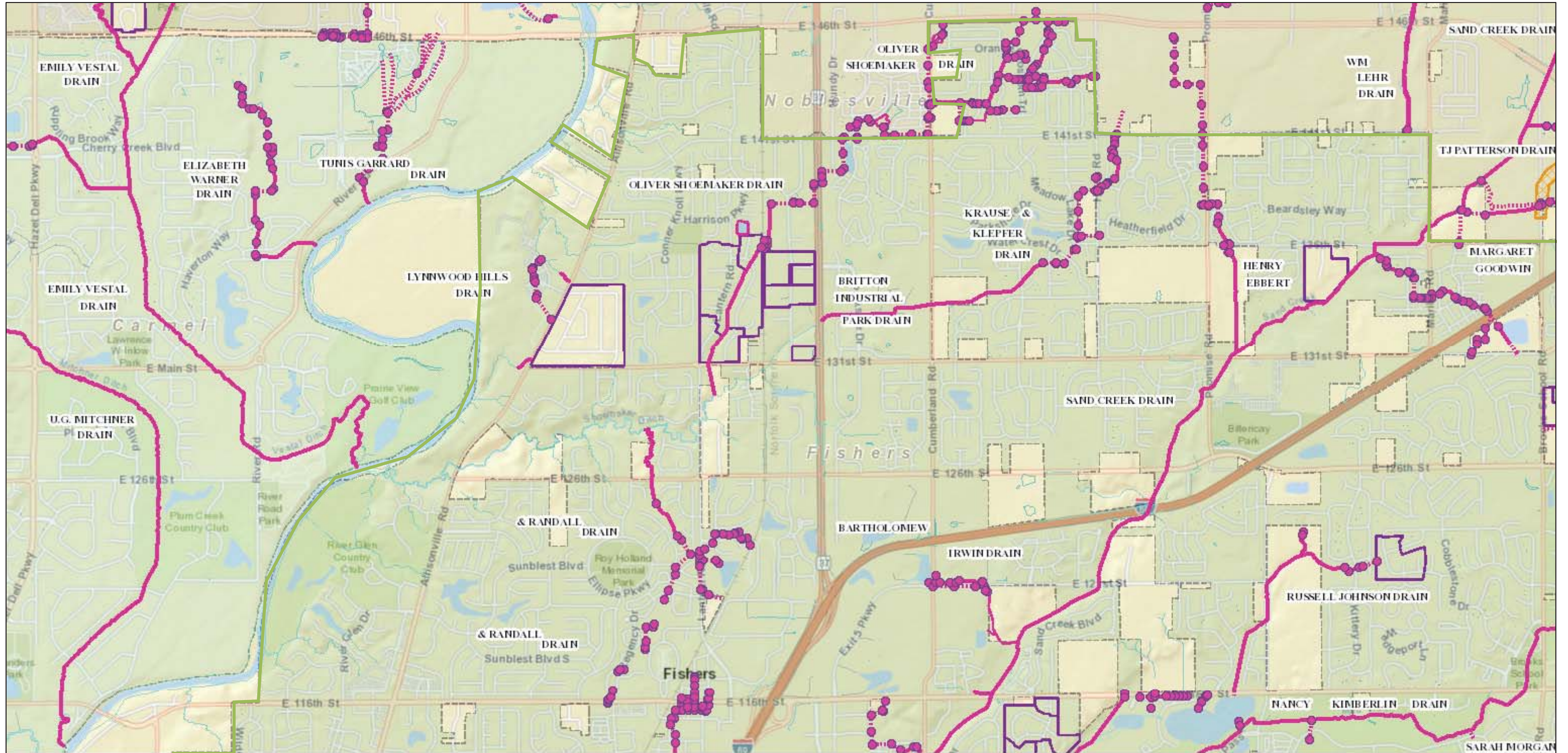
- Stream-River double line
- Stream-River single line
- Swamp-Marsh outline
- Swamp-Marsh symbol
- Swamp-Marsh under bridge

1:72,224



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City of Fishers - Regulated Drains (Northwest)



August 6, 2018

Drainage Structures

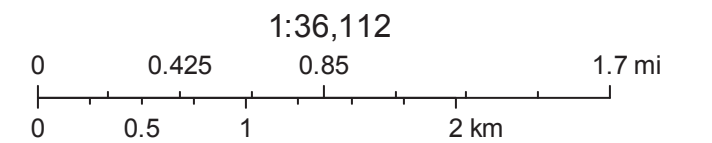
- All Other Structures
- ⊕ MUNICIPAL MANHOLE
- Drain Name
- Regulated Drains**
- ⋯ CLOSED DRAIN
- MUNICIPAL DRAIN
- OPEN DRAIN
- - - SSD
- Regulated Drains Waterways
- Regulated Drains Drainage Pool
- Subdivision Drain Waterway
- Subdivision Drain Drainage Pool
- Regulated Subdivision Boundary

Drains Under Construction

- Drains Under Construction
- Hydroline (2016)**
- Culvert Headwall
- Double Ditch
- Double Ditch under road
- Double Stream-River under bridge
- Double Stream-River under road

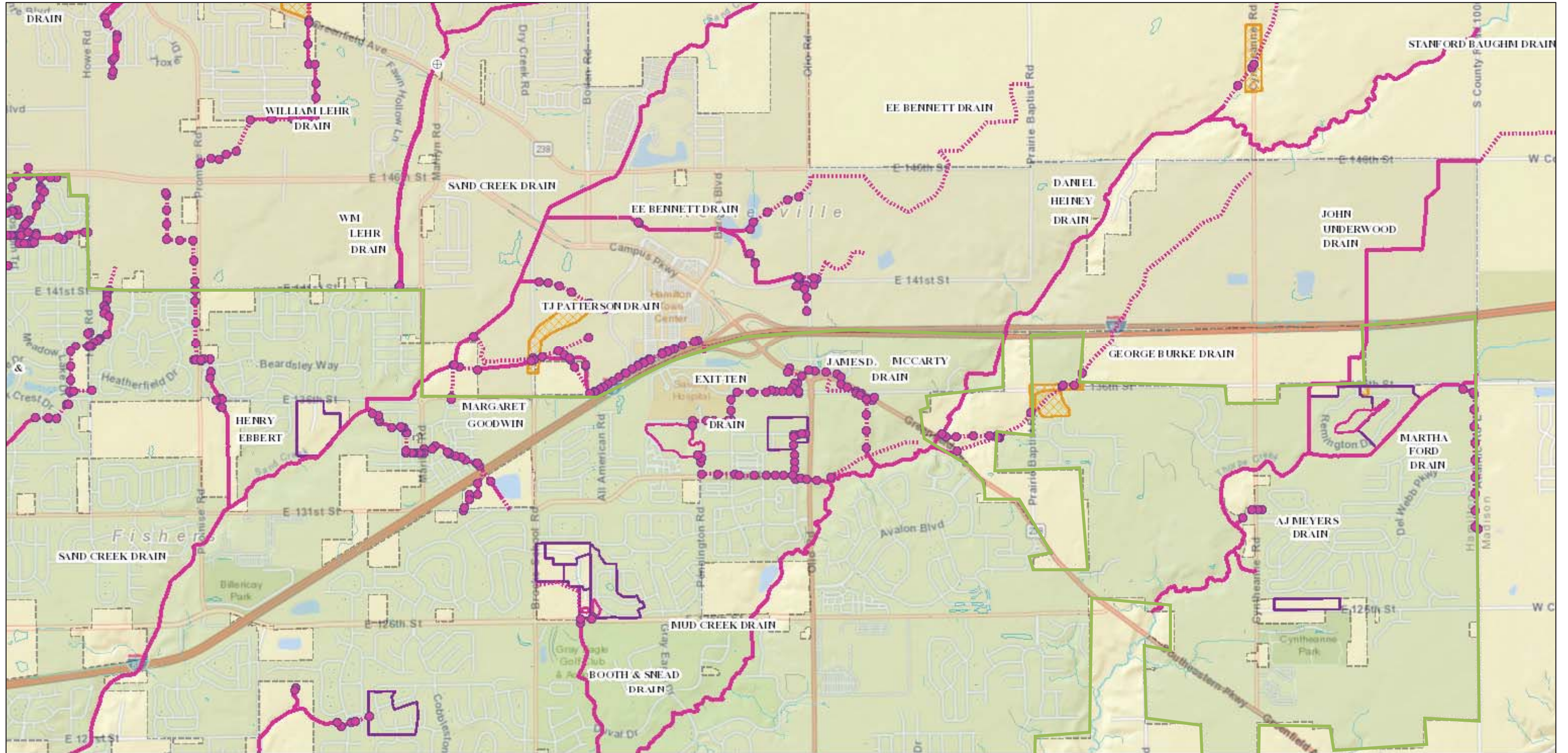
- Drainage ditch
- Hydro centerline
- Large Pipe end
- Paved drainage ditch
- Single ditch under bridge
- Single ditch under road
- Single Hydro connector

- Single Stream-River under bridge
- Stream-River double line
- Stream-River single line
- Swamp-Marsh outline
- Swamp-Marsh symbol
- Swamp-Marsh under bridge



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City of Fishers - Regulated Drains (Northeast)



August 6, 2018

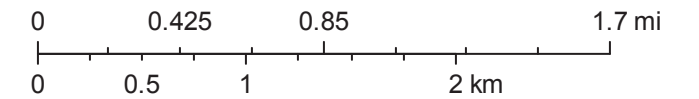
Drainage Structures

- All Other Structures
- ⊕ MUNICIPAL MANHOLE
- Drain Name
- Regulated Drains**
- ⋯ CLOSED DRAIN
- MUNICIPAL DRAIN
- OPEN DRAIN
- SSD
- Regulated Drains Waterways
- Regulated Drains Drainage Pool
- Subdivision Drain Waterway
- Subdivision Drain Drainage Pool
- Regulated Subdivision Boundary

Hydroline (2016)

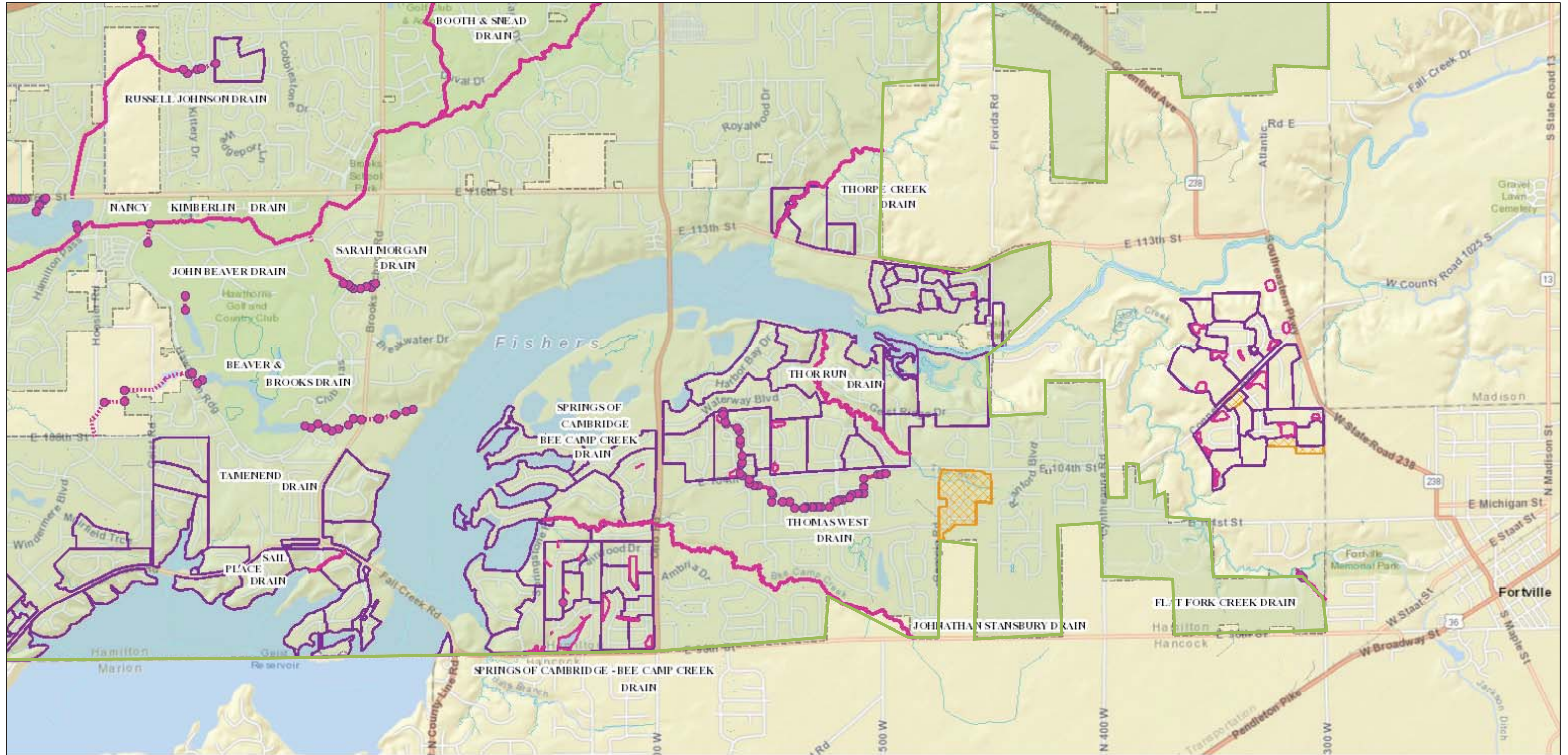
- ⊗ Drains Under Construction
- Drainage ditch
- Hydro centerline
- Large Pipe end
- Paved drainage ditch
- Single ditch under bridge
- Single ditch under road
- Single Hydro connector
- Culvert Headwall
- Double Ditch
- Double Ditch under road
- Double Stream-River under bridge
- Double Stream-River under road
- Single Stream-River under bridge
- Stream-River double line
- Stream-River single line
- Swamp-Marsh outline
- Swamp-Marsh symbol
- Swamp-Marsh under bridge

1:36,112



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City of Fishers - Regulated Drains (Southeast)



August 6, 2018

Drainage Structures

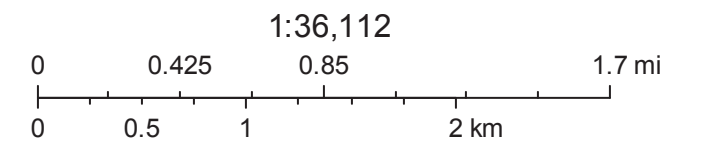
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- ⊕ MUNICIPAL MANHOLE
- Drain Name
- Regulated Drains**
- CLOSED DRAIN
- MUNICIPAL DRAIN
- OPEN DRAIN
- SSD
- Regulated Drains Waterways
- Regulated Drains Drainage Pool
- Subdivision Drain Waterway
- Subdivision Drain Drainage Pool
- Regulated Subdivision Boundary

Drains Under Construction

- Drains Under Construction
- Hydroline (2016)**
- Culvert Headwall
- Double Ditch
- Double Ditch under road
- Double Stream-River under bridge
- Double Stream-River under road

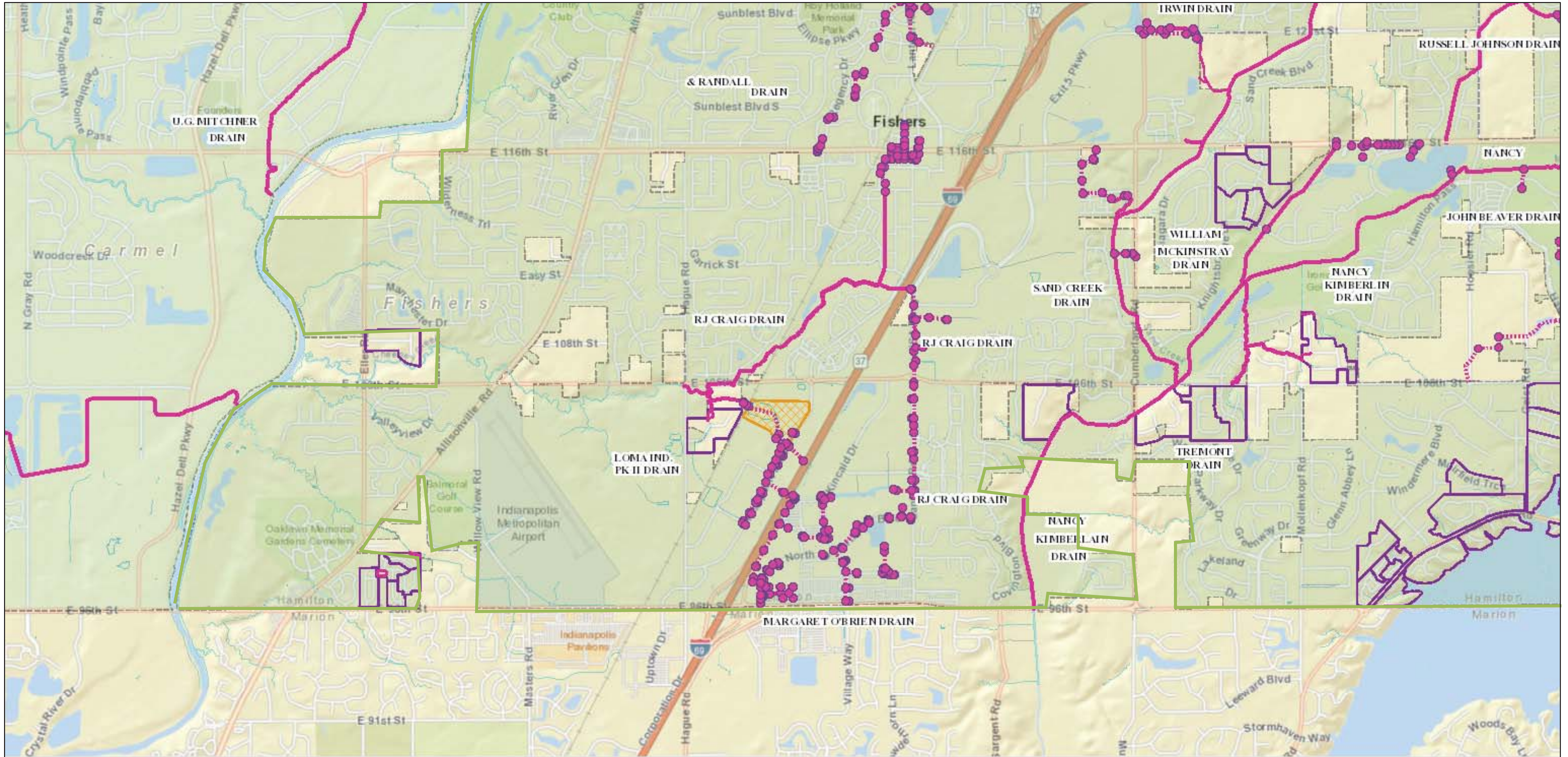
- Drainage ditch
- Hydro centerline
- Large Pipe end
- Paved drainage ditch
- Single ditch under bridge
- Single ditch under road
- Single Hydro connector

- Single Stream-River under bridge
- Stream-River double line
- Stream-River single line
- Swamp-Marsh outline
- Swamp-Marsh symbol
- Swamp-Marsh under bridge



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City of Fishers - Regulated Drains (Southwest)



August 6, 2018

Drainage Structures

- All Other Structures
- ⊕ MUNICIPAL MANHOLE

Regulated Drains

- ▬ CLOSSED DRAIN
- ▬ MUNICIPAL DRAIN

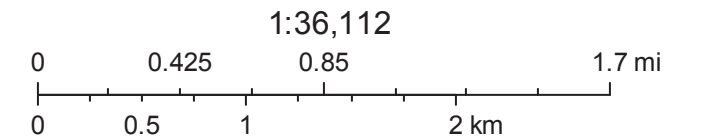
- ▬ OPEN DRAIN
- ▬ SSD
- ▬ Regulated Drains Waterways
- ▬ Regulated Drains Drainage Pool
- ▬ Subdivision Drain Waterway
- ▬ Subdivision Drain Drainage Pool
- ▭ Regulated Subdivision Boundary

Hydroline (2016)

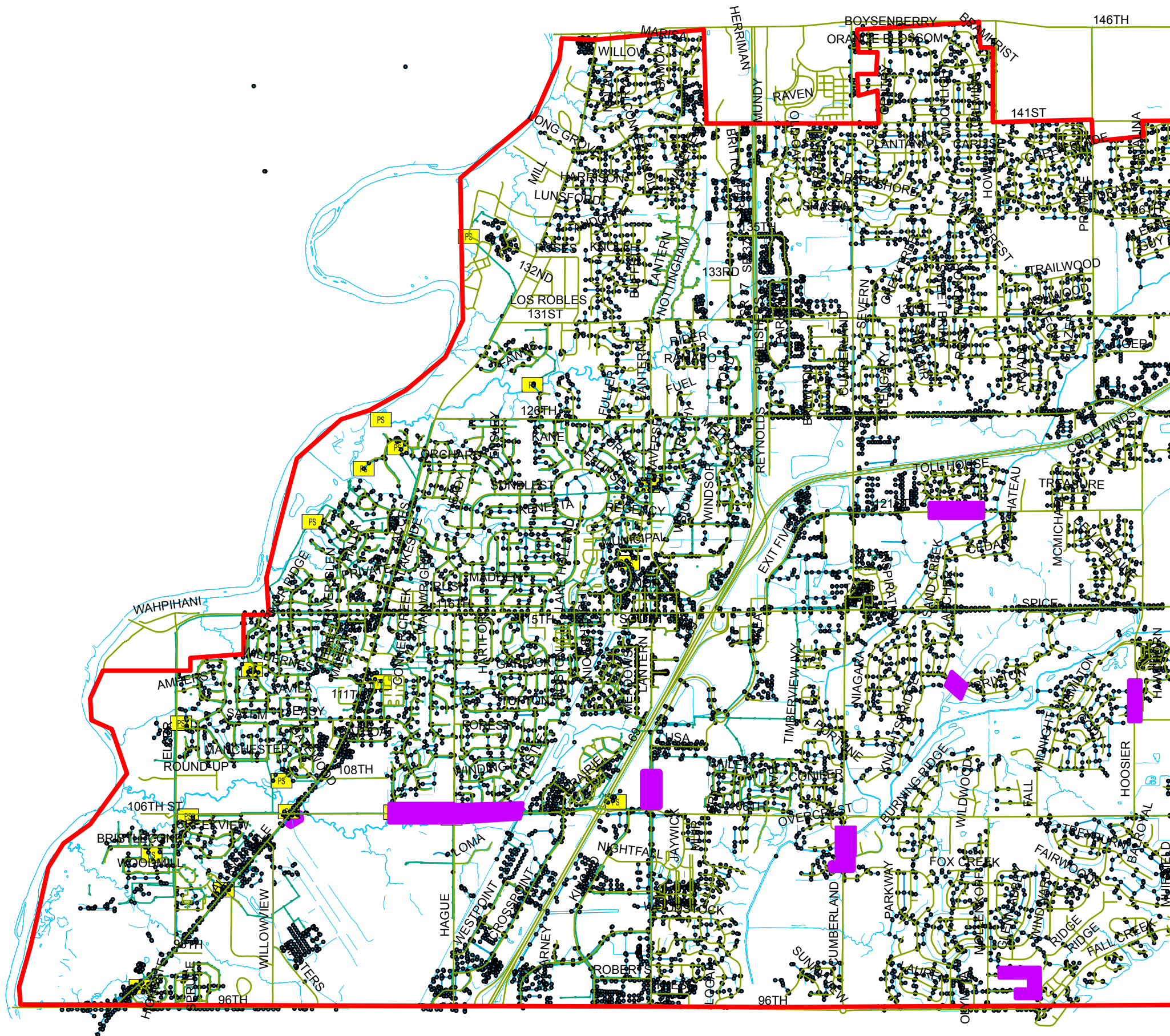
- ▬ Culvert Headwall
- ▬ Double Ditch
- ▬ Double Ditch under road
- ▬ Double Stream-River under bridge
- ▬ Double Stream-River under road

- ▬ Drainage ditch
- ▬ Hydro centerline
- ▬ Large Pipe end
- ▬ Paved drainage ditch
- ▬ Single ditch under bridge
- ▬ Single ditch under road
- ▬ Single Hydro connector

- ▬ Single Stream-River under bridge
- ▬ Stream-River double line
- ▬ Stream-River single line
- ▬ Swamp-Marsh outline
- ▬ Swamp-Marsh symbol
- ▬ Swamp-Marsh under bridge



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Legend

- Fishers_Corp_Limits
- Road Centerline
- Storm Structures
- Storm Sewers
- Hamilton County Drainage Structures
- PS Sanitary Lift Stations
- Sanitary Manholes
- Sanitary Sewers
- Rivers / Streams / Ponds
- Project Limits



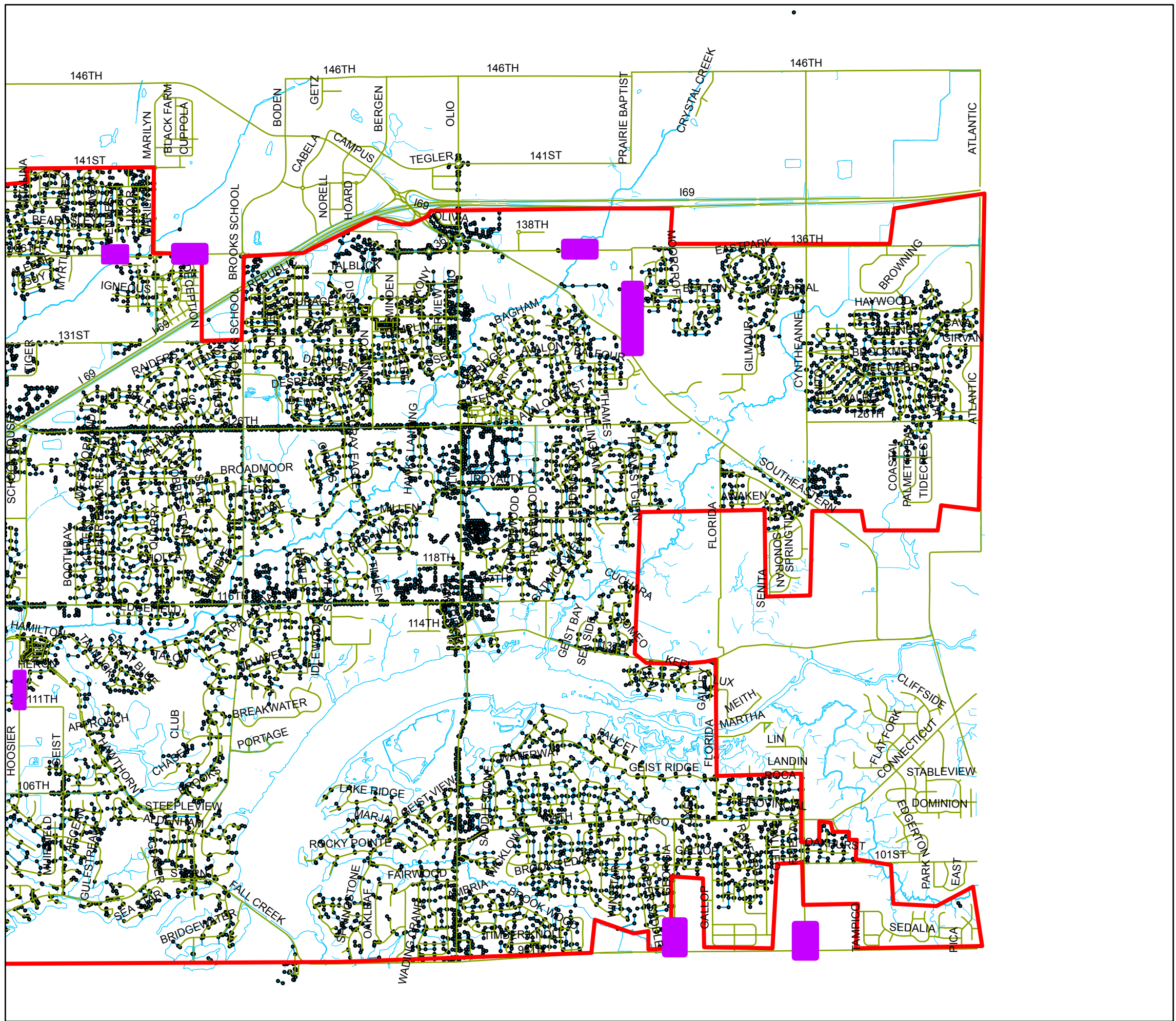
1 inch = 3,000 feet

City of Fishers Infrastructure Map West

**CITY OF FISHERS
STORMWATER MASTERPLAN**



Date: October 2018
 Produced By: DLZ Indiana, LLC
 Data Source: Hamilton County, IN
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Legend

- █ Fishers_Corp_Limits
- Road Centerline
- Storm Structures
- Storm Sewers
- Hamilton County Drainage Structures
- PS Sanitary Lift Stations
- Sanitary Manholes
- Sanitary Sewers
- Rivers / Streams / Ponds
- █ Project Limits



1 inch = 3,000 feet

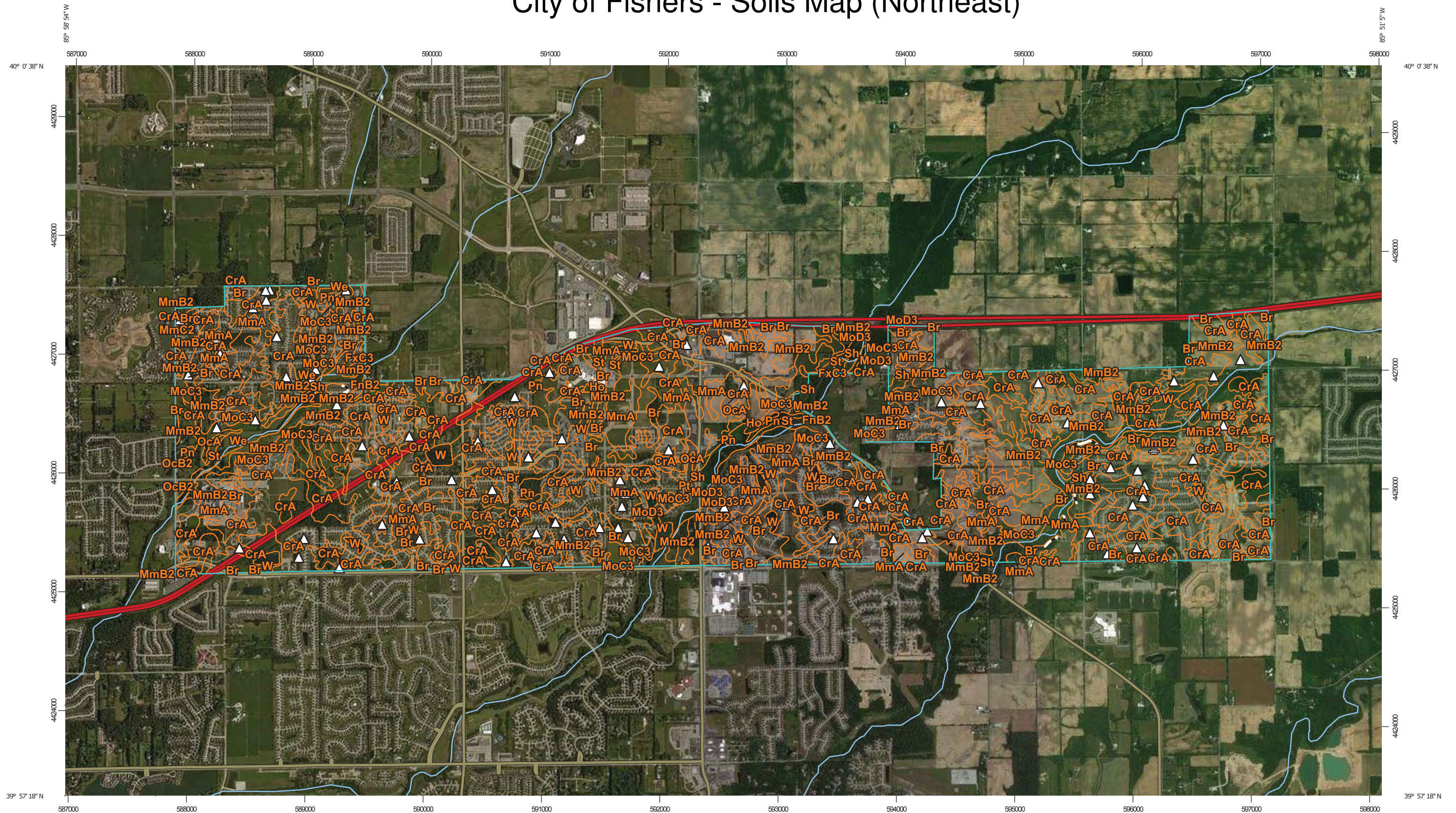
City of Fishers Infrastructure Map East

**CITY OF FISHERS
STORMWATER MASTERPLAN**



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 Produced By: DLZ Indiana, LLC
 Data Source: Hamilton County, IN
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City of Fishers - Soils Map (Northeast)



Map Scale: 1:30,000 if printed on B landscape (17" x 11") sheet.

0 400 800 1600 2400 Meters

0 1000 2000 4000 6000 Feet

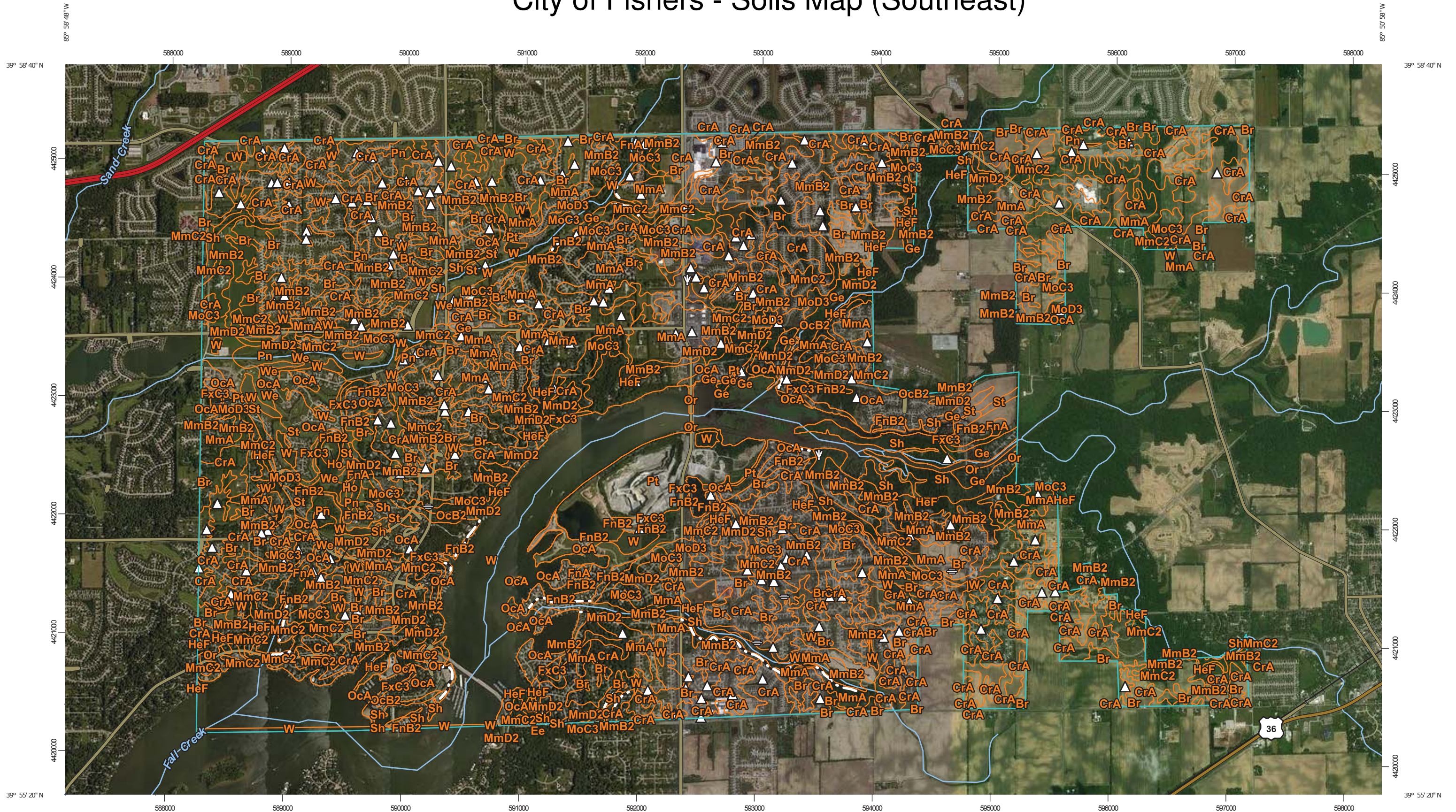
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Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

City of Fishers - Soils Map (Southeast)



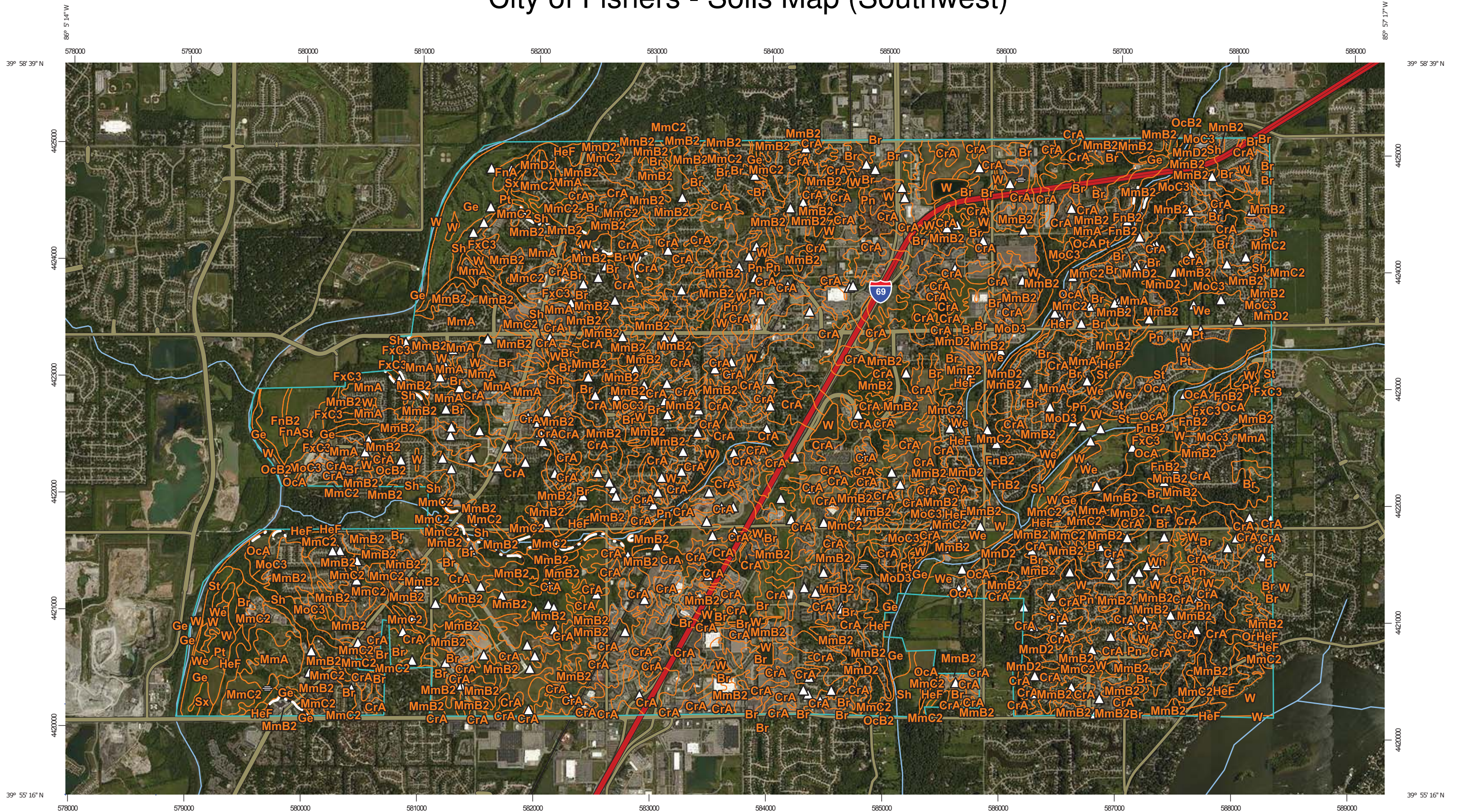
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Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

City of Fishers - Soils Map (Southwest)

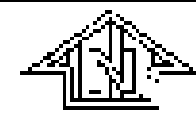
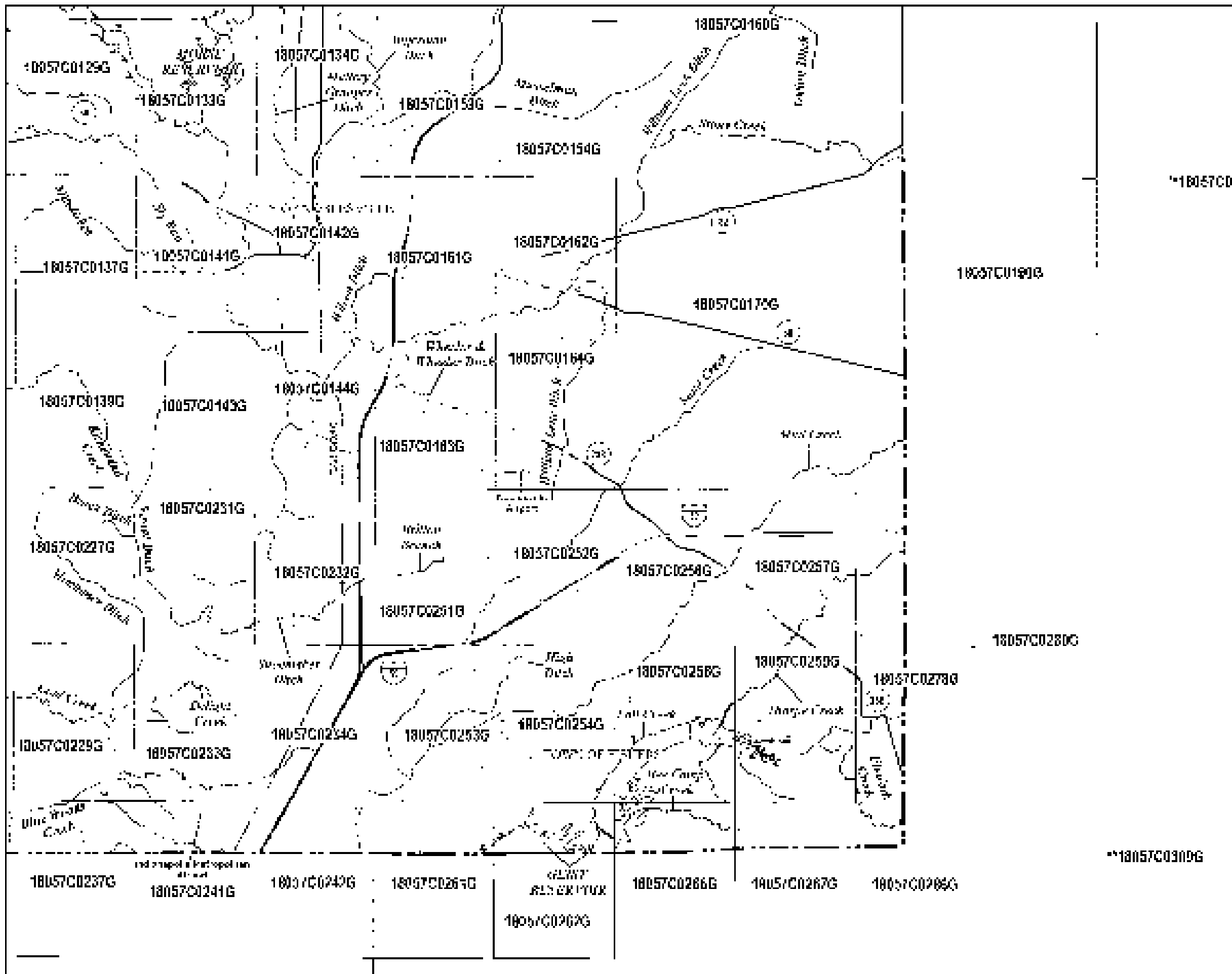


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Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey



FIRM
 FLOOD INSURANCE RATE MAP
 HAMILTON COUNTY,
 INDIANA
 AND INCORPORATED AREAS
 SELECTED BY LOCAL GOVERNMENT

MAP INDEX

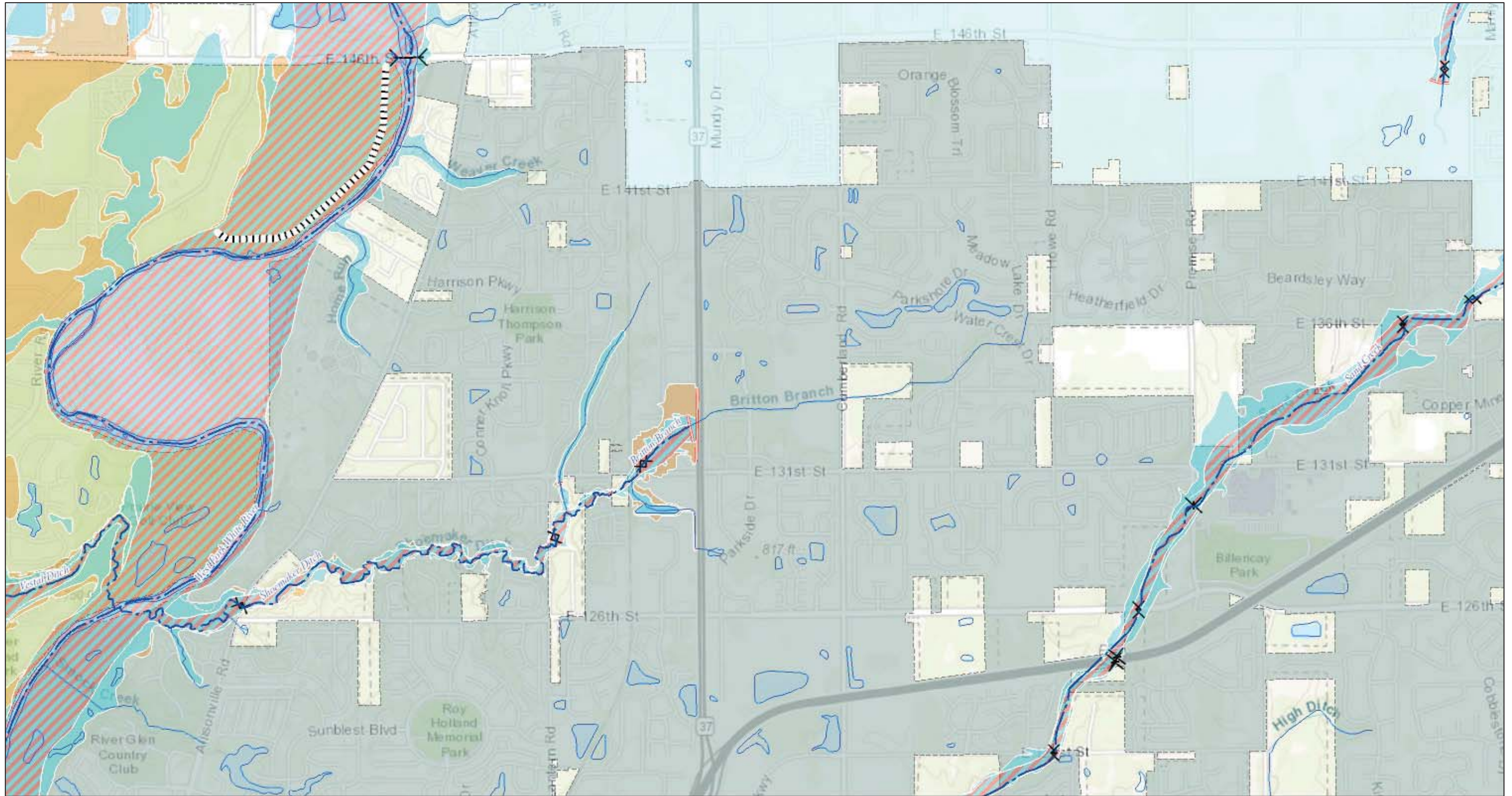
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 MAP REVISED
 NOVEMBER 15, 2014

Federal Emergency Management Agency
 4800 Marking Road
 Hialeah, Florida 33010

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City of Fishers - Flood Hazard Areas (Northwest)



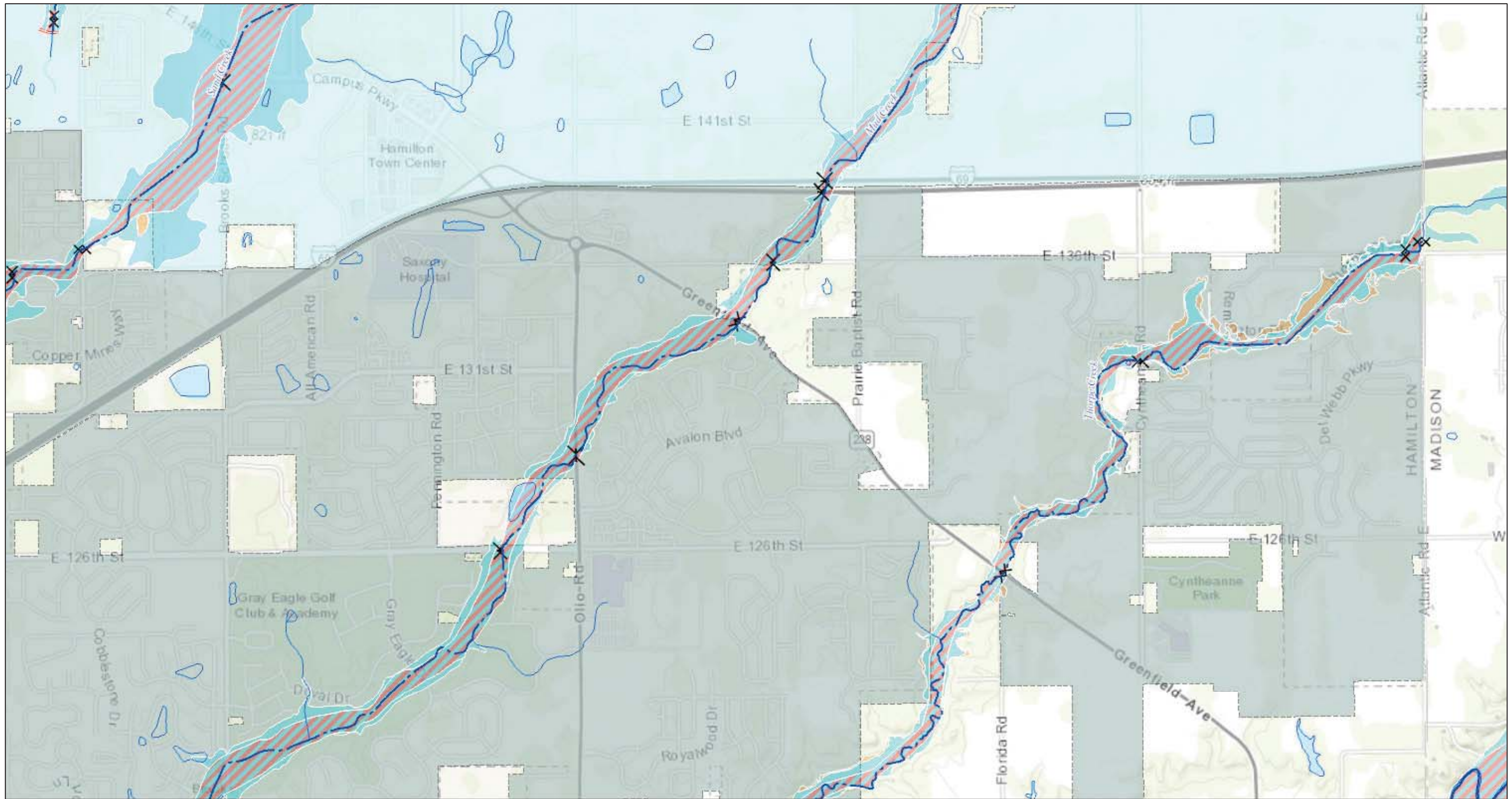
August 7, 2018

1:28,000

▲ High Water Marks	✕ Bridge	— Limit Lines	■ Area of Undetermined Flood Hazard	Corporate Limits	▬ NOBLESVILLE	0	0.35	0.7	1.4 mi
— Profile Baselines	— Dam, Weir, Jetty	— SFHA / Flood Zone Boundary	■ 0.2% Annual Chance Flood Hazard	▬ ARCADIA	▬ SHERIDAN	0	0.5	1	2 km
— Water Lines	— Other Structure	Flood Hazard Zones	■ Future Conditions 1% Annual Chance Flood Hazard	▬ ATLANTA	▬ WESTFIELD				
Levees	— Hydrologic Reaches	■ 1% Annual Chance Flood Hazard	■ Area with Reduced Risk Due to Levee	▬ CARMEL					
General Structures	Flood Hazard Boundaries	▨ Regulatory Floodway	■ Water Areas	▬ CICERO					
--- Flood Structure	— Other Boundaries	▨ Special Floodway		▬ FISHERS					

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

City of Fishers - Flood Hazard Areas (Northeast)



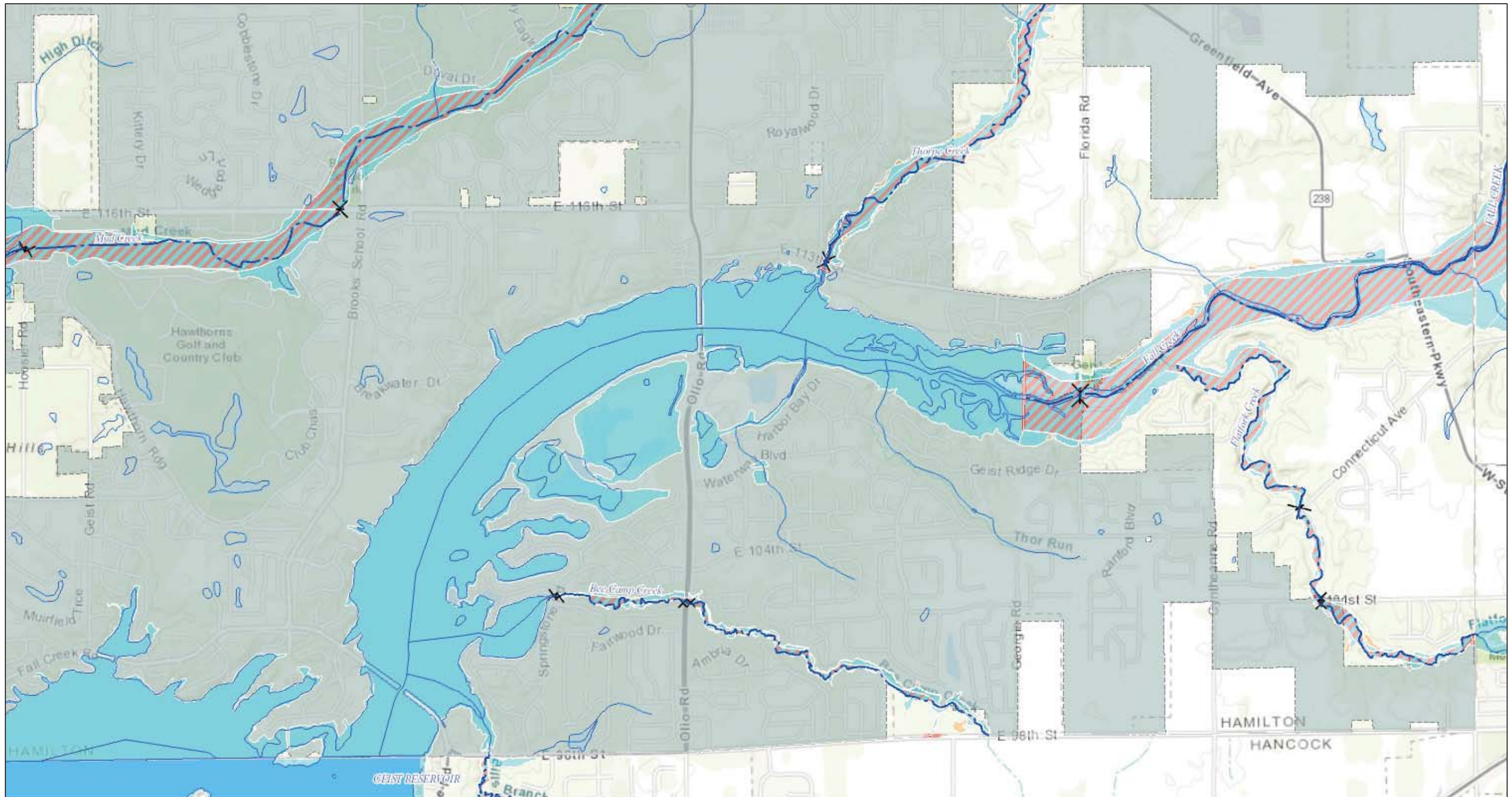
August 7, 2018

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▲ High Water Marks	✕ Bridge	— Limit Lines	■ Area of Undetermined Flood Hazard	Corporate Limits	— NOBLESVILLE	0	0.35	0.7	1.4 mi
— Profile Baselines	— Dam, Weir, Jetty	— SFHA / Flood Zone Boundary	■ 0.2% Annual Chance Flood Hazard	— ARCADIA	— SHERIDAN	0	0.5	1	2 km
— Water Lines	— Other Structure	Flood Hazard Zones	■ Future Conditions 1% Annual Chance Flood Hazard	— ATLANTA	— WESTFIELD				
Levees	— Hydrologic Reaches	■ 1% Annual Chance Flood Hazard	■ Area with Reduced Risk Due to Levee	— CARMEL					
General Structures	Flood Hazard Boundaries	■ Regulatory Floodway	■ Water Areas	— CICERO					
--- Flood Structure	— Other Boundaries	■ Special Floodway		— FISHERS					

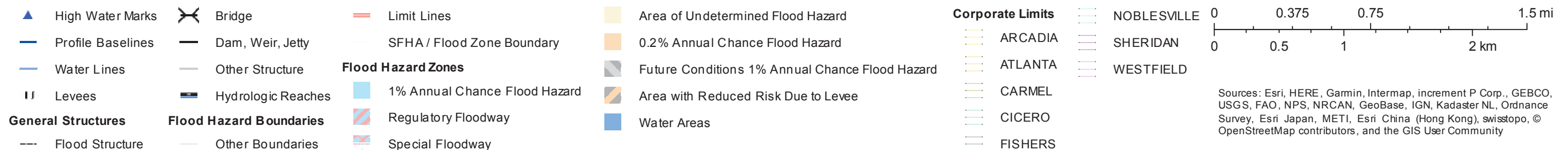
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City of Fishers - Flood Hazard Areas (Southeast)



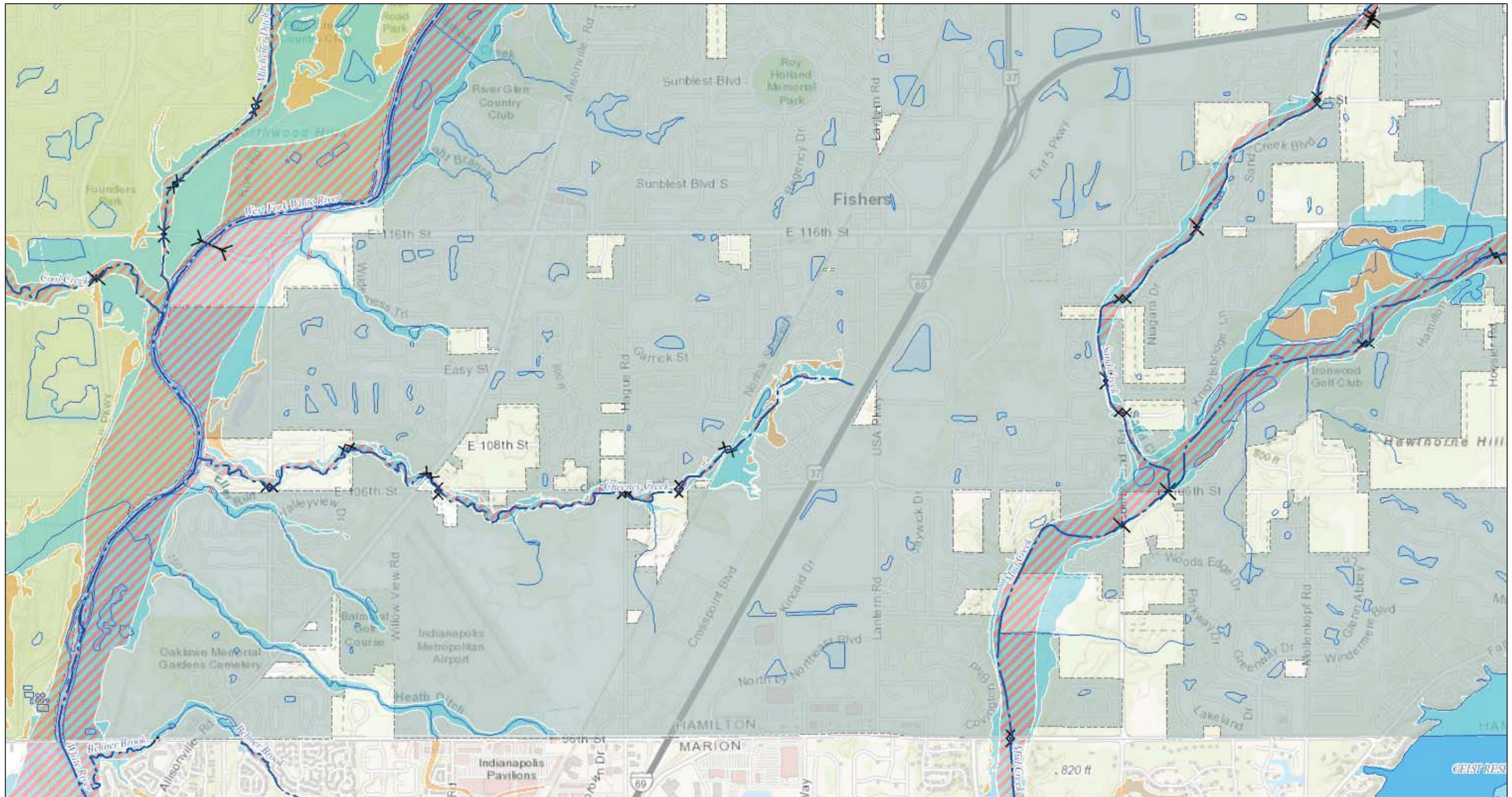
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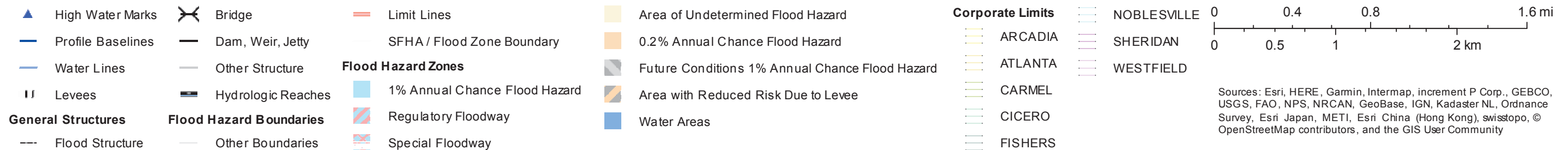
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City of Fishers - Flood Hazard Areas (Southwest)



August 7, 2018

1:32,000



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Appendix B

Initial Priority Rankings (IPR)

City of Fishers		Stormwater Capital Program				
Stormwater Problem Area			Initial Priority Rating Evaluation Sheet			
Street Address: Cheeney Creek - 106th Street between Hague Rd and Railroad Tracks						
Nearest address or intersection of problem: 106th Street and Hague Road						
Rating By: BD		Date: 5/10/2018				
INSTRUCTIONS: Fill in only 1 "X" per Group Rating as applicable				Revision Date: 05-1-2018		
STREET FLOODING	STREET CLASSIFICATION	STREET FLOODING OCCURRENCES				Rating
		Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr	
		4	3	2	1	
	Primary Arterial	4	X			12
	Secondary Arterial	3				0
Collector	2				0	
Local Street or Place	1				0	
INFRASTRUCTURE DETERIORATION	PUBLIC INFRASTRUCTURE TYPE	MAJOR FAILURE POSSIBLE WITHIN				Rating
	(as applicable)	Immediate	1-2 Years	3-5 Years	6-10+ Years	
		4	3	2	1	
	Arterial/Sanitary Int./Major Tributary	4	X			12
	Collector/Storm/Sanitary Collector/Stream	3				0
Local Storm/Sanitary Main/Road Drainage	2				0	
Sedimentation Maintenance	1				0	
FLOODED	PROPERTY OR FACILITY CLASSIFICATION	FLOODING FREQUENCY				Rating
		Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr	
		4	3	2	1	
	Homes	4		X		8
	Business/Industry	3				0
Parking Lots	2				0	
Yards / Fields	1				0	
NUMBER IMPACTED	PROPERTY CLASSIFICATION	NUMBER OF STRUCTURES AFFECTED				Rating
		> 50	26 - 50	11 - 25	1 - 10	
		4	3	2	1	
Homes	4		X		8	
Business/Industry	2				0	
FLOODING IMPACT	FLOODING CONCERN	Water in Structure	Standing water > 1 wk	Standing water 2-7 d	Standing water < 48 hr	Rating
	Observed Impact	15	10	5	0	5
EXTENT OF EROSION	EROSION	LINEAL FEET OF EROSION				Rating
		> 500	251 - 500	101 - 250	10 - 100	
		40	30	20	10	
Observed Erosion	1		X		30	
WATER QUALITY	(AREA TYPE)	Septic Area	Erosion Effecting Water Quality	Sanitary Sewer Area		Rating
	Area Type	15	10	1		10
SOLUTIONS	RESOLUTION TYPE	Open Channel	Bridge/ Culvert	Structural BMP	Storm Sewer	Rating
	Solution	8	6	4	2	8
PUBLIC INVOLVE.	COST SHARE (When Private money or Federal/State Money is being used)	> 75%	26 - 75%	6 - 25%	0 - 5%	Rating
		15	10	5	0	
	% by Developer/Owner/Other Agency	1	X			10
MS4 REQ'NT	SATISFIES REGULATORY REQUIREMENT FOR MS4 PERMIT	YES		NO		Rating
		5		0		
		X				5
					Subtotal	108
Public or Private Benefit?		Public	X	Private	IPR RATING	108

City of Fishers		Stormwater Capital Program				
Stormwater Problem Area			Initial Priority Rating Evaluation Sheet			
Street Address: Cheeney Creek - 106th Street between Shellbourne Rd and Hague Rd						
Nearest address or intersection of problem: 106th Street and Hague Road						
Rating By: BD		Date: 5/10/2018				
INSTRUCTIONS: Fill in only 1 "X" per Group Rating as applicable				Revision Date: 05-1-2018		
STREET FLOODING	STREET CLASSIFICATION	STREET FLOODING OCCURRENCES				Rating
		Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr	
		4	3	2	1	
	Primary Arterial	4	X			12
	Secondary Arterial	3				0
Collector	2				0	
Local Street or Place	1				0	
INFRASTRUCTURE DETERIORATION	PUBLIC INFRASTRUCTURE TYPE	MAJOR FAILURE POSSIBLE WITHIN				Rating
	(as applicable)	Immediate	1-2 Years	3-5 Years	6-10+ Years	
		4	3	2	1	
	Arterial/Sanitary Int./Major Tributary	4	X			12
	Collector/Storm/Sanitary Collector/Stream	3				0
Local Storm/Sanitary Main/Road Drainage	2				0	
Sedimentation Maintenance	1				0	
FLOODED	PROPERTY OR FACILITY CLASSIFICATION	FLOODING FREQUENCY				Rating
		Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr	
		4	3	2	1	
	Homes	4		X		8
	Business/Industry	3				0
Parking Lots	2				0	
Yards / Fields	1				0	
NUMBER IMPACTED	PROPERTY CLASSIFICATION	NUMBER OF STRUCTURES AFFECTED				Rating
		> 50	26 - 50	11 - 25	1 - 10	
		4	3	2	1	
Homes	4		X		8	
Business/Industry	2				0	
FLOODING IMPACT	FLOODING CONCERN	Water in Structure	Standing water > 1 wk	Standing water 2-7 d	Standing water < 48 hr	Rating
	Observed Impact	15	10	5	0	5
EXTENT OF EROSION	EROSION	LINEAL FEET OF EROSION				Rating
		> 500	251 - 500	101 - 250	10 - 100	
		40	30	20	10	
Observed Erosion	1		X		30	
WATER QUALITY	(AREA TYPE)	Septic Area	Erosion Effecting Water Quality	Sanitary Sewer Area		Rating
		15	10	1		
Area Type	1		X		10	
SOLUTIONS	RESOLUTION TYPE	Open Channel	Bridge/ Culvert	Structural BMP	Storm Sewer	Rating
		8	6	4	2	
Solution	1	X			8	
PUBLIC INVOLVE.	COST SHARE (When Private money or Federal/State Money is being used)	> 75%	26 - 75%	6 - 25%	0 - 5%	Rating
		15	10	5	0	
% by Developer/Owner/Other Agency	1		X		10	
MS4 REQ'NT	SATISFIES REGULATORY REQUIREMENT FOR MS4 PERMIT	YES		NO		Rating
		5	0			
		X				5
					Subtotal	108
	Public or Private Benefit?	Public	X	Private	IPR RATING	108

City of Fishers			Stormwater Capital Program				
Stormwater Problem Area			Initial Priority Rating Evaluation Sheet				
Street Address: 136th Street West of Marilyn Road at Sand Creek							
Nearest address or intersection of problem: 136th Street and Marilyn Road							
Rating By: BD			Date: 5/11/2018				
INSTRUCTIONS: Fill in only 1 "X" per Group Rating as applicable					Revision Date: 5/1/2018		
STREET FLOODING	STREET CLASSIFICATION		STREET FLOODING OCCURRENCES				Rating
			Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr	
			4	3	2	1	
	Primary Arterial	4					0
	Secondary Arterial	3			X		6
Collector	2					0	
Local Street or Place	1					0	
INFRASTRUCTURE DETERIORATION	PUBLIC INFRASTRUCTURE TYPE		MAJOR FAILURE POSSIBLE WITHIN				Rating
			Immediate	1-2 Years	3-5 Years	6-10+ Years	
			4	3	2	1	
	Arterial/Sanitary Int./Major Tributary	4			X		8
	Collector/Storm/Sanitary Collector/Stream	3					0
Local Storm/Sanitary Main/Road Drainage	2					0	
Sedimentation Maintenance	1					0	
FLOODED	PROPERTY OR FACILITY CLASSIFICATION		FLOODING FREQUENCY				Rating
			Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr	
			4	3	2	1	
	Homes	4					0
	Business/Industry	3					0
Parking Lots	2					0	
Yards / Fields	1			X		2	
NUMBER IMPACTED	PROPERTY CLASSIFICATION		NUMBER OF STRUCTURES AFFECTED				Rating
			> 50	26 - 50	11 - 25	1 - 10	
			4	3	2	1	
Homes	4				X	4	
Business/Industry	2					0	
FLOODING IMPACT	FLOODING CONCERN		Water in Structure	Standing water > 1 wk	Standing water 2-7 d	Standing water < 48 hr	Rating
			15	10	5	0	
Observed Impact	1				X	0	
EXTENT OF EROSION	EROSION		LINEAL FEET OF EROSION				Rating
			> 500	251 - 500	101 - 250	10 - 100	
			40	30	20	10	
Observed Erosion	1			X		20	
WATER QUALITY	(AREA TYPE)		Septic Area	Erosion Effecting Water Quality	Sanitary Sewer Area		Rating
			15	10	1		
	Area Type	1		X			10
SOLUTIONS	RESOLUTION TYPE		Open Channel	Bridge/ Culvert	Structural BMP	Storm Sewer	Rating
			8	6	4	2	
	Solution	1		X			6
PUBLIC INVOLVE.	COST SHARE (When Private money or Federal/State Money is being used)		> 75%	26 - 75%	6 - 25%	0 - 5%	Rating
			15	10	5	0	
	% by Developer/Owner/Other Agency	1		X			10
MS4 REQ'NT	SATISFIES REGULATORY REQUIREMENT FOR MS4 PERMIT		YES		NO		Rating
			5	0			
			X				5
						Subtotal	71
	Public or Private Benefit?	Public	X	Private		IPR RATING	71

City of Fishers		Stormwater Capital Program					
Stormwater Problem Area			Initial Priority Rating Evaluation Sheet				
Street Address: 136th Street west of Prairie Baptist Road at Mud Creek							
Nearest address or intersection of problem: 136th Street and Prairie Baptist Road							
Rating By: BD			Date: 5/11/2018				
INSTRUCTIONS: Fill in only 1 "X" per Group Rating as applicable					Revision Date: 5/1/2018		
STREET FLOODING	STREET CLASSIFICATION		STREET FLOODING OCCURRENCES				Rating
			Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr	
			4	3	2	1	
	Primary Arterial	4					0
	Secondary Arterial	3			X		6
Collector	2					0	
Local Street or Place	1					0	
INFRASTRUCTURE DETERIORATION	PUBLIC INFRASTRUCTURE TYPE		MAJOR FAILURE POSSIBLE WITHIN				Rating
			Immediate	1-2 Years	3-5 Years	6-10+ Years	
			4	3	2	1	
	Arterial/Sanitary Int./Major Tributary	4			X		8
	Collector/Storm/Sanitary Collector/Stream	3					0
Local Storm/Sanitary Main/Road Drainage	2					0	
Sedimentation Maintenance	1					0	
FLOODED	PROPERTY OR FACILITY CLASSIFICATION		FLOODING FREQUENCY				Rating
			Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr	
			4	3	2	1	
	Homes	4					0
	Business/Industry	3					0
Parking Lots	2					0	
Yards / Fields	1			X		2	
NUMBER IMPACTED	PROPERTY CLASSIFICATION		NUMBER OF STRUCTURES AFFECTED				Rating
			> 50	26 - 50	11 - 25	1 - 10	
			4	3	2	1	
Homes	4				X	4	
Business/Industry	2					0	
FLOODING IMPACT	FLOODING CONCERN		Water in Structure	Standing water > 1 wk	Standing water 2-7 d	Standing water < 48 hr	Rating
			15	10	5	0	
Observed Impact	1				X	0	
EXTENT OF EROSION	EROSION		LINEAL FEET OF EROSION				Rating
			> 500	251 - 500	101 - 250	10 - 100	
			40	30	20	10	
Observed Erosion	1			X		20	
WATER QUALITY	(AREA TYPE)		Septic Area	Erosion Effecting Water Quality	Sanitary Sewer Area		Rating
			15	10	1		
	Area Type	1		X			10
SOLUTIONS	RESOLUTION TYPE		Open Channel	Bridge/ Culvert	Structural BMP	Storm Sewer	Rating
			8	6	4	2	
	Solution	1		X			6
PUBLIC INVOLVE.	COST SHARE (When Private money or Federal/State Money is being used)		> 75%	26 - 75%	6 - 25%	0 - 5%	Rating
			15	10	5	0	
	% by Developer/Owner/Other Agency	1		X			10
MS4 REQ/MT	SATISFIES REGULATORY REQUIREMENT FOR MS4 PERMIT		YES		NO		Rating
			5	0			
			X				5
						Subtotal	71
Public or Private Benefit?			Public	X	Private	IPR RATING	71

City of Fishers			Stormwater Capital Program				
Stormwater Problem Area			Initial Priority Rating Evaluation Sheet				
Street Address: 97th Street and 98th Street Drainage Improvements							
Nearest address or intersection of problem: 97th Street and Mollenkopf Road							
Rating By: BD			Date: 5/10/2018				
INSTRUCTIONS: Fill in only 1 "X" per Group Rating as applicable					Revision Date: 5/1/2018		
STREET FLOODING	STREET CLASSIFICATION		STREET FLOODING OCCURRENCES				Rating
			Every Rain 4	Once/1-2 Yr 3	Once/2-10 Yr 2	Once/10-25 Yr 1	
	Primary Arterial	4					0
	Secondary Arterial	3					0
	Collector	2		X			6
Local Street or Place	1					0	
INFRASTRUCTURE DETERIORATION	PUBLIC INFRASTRUCTURE TYPE		MAJOR FAILURE POSSIBLE WITHIN				Rating
			Immediate 4	1-2 Years 3	3-5 Years 2	6-10+ Years 1	
	(as applicable)						
	Arterial/Sanitary Int./Major Tributary	4					0
	Collector/Storm/Sanitary Collector/Stream	3			X		6
Local Storm/Sanitary Main/Road Drainage	2					0	
Sedimentation Maintenance	1					0	
FLOODED	PROPERTY OR FACILITY CLASSIFICATION		FLOODING FREQUENCY				Rating
			Every Rain 4	Once/1-2 Yr 3	Once/2-10 Yr 2	Once/10-25 Yr 1	
	Homes	4					0
	Business/Industry	3					0
	Parking Lots	2					0
Yards / Fields	1	X				4	
NUMBER IMPACTED	PROPERTY CLASSIFICATION		NUMBER OF STRUCTURES AFFECTED				Rating
			> 50 4	26 - 50 3	11 - 25 2	1 - 10 1	
	Homes	4					0
Business/Industry	2					0	
FLOODING IMPACT	FLOODING CONCERN		Water in Structure 15	Standing water > 1 wk 10	Standing water 2-7 d 5	Standing water < 48 hr 0	Rating
	Observed Impact	1			X		
EXTENT OF EROSION	EROSION		LINEAL FEET OF EROSION				Rating
			> 500 40	251 - 500 30	101 - 250 20	10 - 100 10	
Observed Erosion	1				X		10
WATER QUALITY	(AREA TYPE)		Septic Area 15	Erosion Effecting Water Quality 10	Sanitary Sewer Area 1		Rating
	Area Type	1		X			
SOLUTIONS	RESOLUTION TYPE		Open Channel 8	Bridge/ Culvert 6	Structural BMP 4	Storm Sewer 2	Rating
	Solution	1	X				
PUBLIC INVOLVE.	COST SHARE (When Private money or Federal/State Money is being used)		> 75% 15	26 - 75% 10	6 - 25% 5	0 - 5% 0	Rating
	% by Developer/Owner/Other Agency	1	X				
MS4 REQ'NT	SATISFIES REGULATORY REQUIREMENT FOR MS4 PERMIT		YES		NO		Rating
			5	0			
			X				5
						Subtotal	69
	Public or Private Benefit?	Public	X	Private		IPR RATING	69

City of Fishers		Stormwater Capital Program				
Stormwater Problem Area			Initial Priority Rating Evaluation Sheet			
Street Address: Prairie Baptist south of Silverleaf Blvd Drainage Improvements						
Nearest address or intersection of problem: Prairie Baptist Road and Silverleaf Blvd.						
Rating By: BD		Date: 5/11/2018				
INSTRUCTIONS: Fill in only 1 "X" per Group Rating as applicable				Revision Date: 5/1/2018		
STREET FLOODING	STREET CLASSIFICATION	STREET FLOODING OCCURRENCES				Rating
		Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr	
		4	3	2	1	
	Primary Arterial	4				0
	Secondary Arterial	3				0
Collector	2	X			6	
Local Street or Place	1				0	
INFRASTRUCTURE DETERIORATION	PUBLIC INFRASTRUCTURE TYPE	MAJOR FAILURE POSSIBLE WITHIN				Rating
	(as applicable)	Immediate	1-2 Years	3-5 Years	6-10+ Years	
		4	3	2	1	
	Arterial/Sanitary Int./Major Tributary	4				0
	Collector/Storm/Sanitary Collector/Stream	3	X			9
Local Storm/Sanitary Main/Road Drainage	2				0	
Sedimentation Maintenance	1				0	
FLOODED	PROPERTY OR FACILITY CLASSIFICATION	FLOODING FREQUENCY				Rating
		Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr	
		4	3	2	1	
	Homes	4				0
	Business/Industry	3				0
Parking Lots	2				0	
Yards / Fields	1	X			4	
NUMBER IMPACTED	PROPERTY CLASSIFICATION	NUMBER OF STRUCTURES AFFECTED				Rating
		> 50	26 - 50	11 - 25	1 - 10	
		4	3	2	1	
Homes	4		X		8	
Business/Industry	2				0	
FLOODING IMPACT	FLOODING CONCERN	Water in Structure	Standing water > 1 wk	Standing water 2-7 d	Standing water < 48 hr	Rating
	Observed Impact	15	10	5	0	5
EXTENT OF EROSION	EROSION	LINEAL FEET OF EROSION				Rating
		> 500	251 - 500	101 - 250	10 - 100	
		40	30	20	10	
Observed Erosion	1			X	10	
WATER QUALITY	(AREA TYPE)	Septic Area	Erosion Effecting Water Quality	Sanitary Sewer Area		Rating
	Area Type	15	10	1		0
SOLUTIONS	RESOLUTION TYPE	Open Channel	Bridge/ Culvert	Structural BMP	Storm Sewer	Rating
	Solution	8	6	4	2	
		X				8
PUBLIC INVOLVE.	COST SHARE (When Private money or Federal/State Money is being used)	> 75%	26 - 75%	6 - 25%	0 - 5%	Rating
	% by Developer/Owner/Other Agency	15	10	5	0	
			X			5
MS4 REQ'NT	SATISFIES REGULATORY REQUIREMENT FOR MS4 PERMIT	YES		NO		Rating
		5	0			
		X				5
					Subtotal	60
Public or Private Benefit?		Public	X	Private	IPR RATING	60

City of Fishers **Stormwater Capital Program**
Stormwater Problem Area **Initial Priority Rating Evaluation Sheet**

Street Address: Cumberland Road / 106th Street Bridge Replacement
 Nearest address or intersection of problem: Cumberland Road / 106th Street

Rating By: BD Date: 5/10/2018

INSTRUCTIONS: Fill in only 1 "X" per Group Rating as applicable Revision Date: 5/1/2018

STREET FLOODING	STREET CLASSIFICATION	STREET FLOODING OCCURRENCES				Rating
		Every Rain 4	Once/1-2 Yr 3	Once/2-10 Yr 2	Once/10-25 Yr 1	
	Primary Arterial	4				
	Secondary Arterial	3	X			
	Collector	2				
Local Street or Place	1				0	
INFRASTRUCTURE DETERIORATION	PUBLIC INFRASTRUCTURE TYPE (as applicable)	MAJOR FAILURE POSSIBLE WITHIN				Rating
		Immediate 4	1-2 Years 3	3-5 Years 2	6-10+ Years 1	
	Arterial/Sanitary Int./Major Tributary	4		X		
	Collector/Storm/Sanitary Collector/Stream	3				
	Local Storm/Sanitary Main/Road Drainage	2				
Sedimentation Maintenance	1				0	
FLOODED	PROPERTY OR FACILITY CLASSIFICATION	FLOODING FREQUENCY				Rating
		Every Rain 4	Once/1-2 Yr 3	Once/2-10 Yr 2	Once/10-25 Yr 1	
	Homes	4				
	Business/Industry	3				
	Parking Lots	2	X			
Yards / Fields	1				0	
NUMBER IMPACTED	PROPERTY CLASSIFICATION	NUMBER OF STRUCTURES AFFECTED				Rating
		> 50 4	26 - 50 3	11 - 25 2	1 - 10 1	
	Homes	4		X		
Business/Industry	2				0	
FLOODING IMPACT	FLOODING CONCERN	Water in Structure 15	Standing water > 1 wk 10	Standing water 2-7 d 5	Standing water < 48 hr 0	Rating
	Observed Impact	1	X			
EXTENT OF EROSION	EROSION	LINEAL FEET OF EROSION				Rating
		> 500 40	251 - 500 30	101 - 250 20	10 - 100 10	
	Observed Erosion	1				
WATER QUALITY	(AREA TYPE)	Septic Area 15	Erosion Effecting Water Quality 10	Sanitary Sewer Area 1	Rating	
	Area Type	1	X			
SOLUTIONS	RESOLUTION TYPE	Open Channel 8	Bridge/ Culvert 6	Structural BMP 4	Storm Sewer 2	Rating
	Solution	1	X			
PUBLIC INVOLVE.	COST SHARE (When Private money or Federal/State Money is being used)	> 75% 15	26 - 75% 10	6 - 25% 5	0 - 5% 0	Rating
	% by Developer/Owner/Other Agency	1	X			
MS4 REQ'NT	SATISFIES REGULATORY REQUIREMENT FOR MS4 PERMIT	YES 5		NO 0		Rating
			X			
					Subtotal	79
Public or Private Benefit?		Public	X	Private	IPR RATING	79

City of Fishers			Stormwater Capital Program				
Stormwater Problem Area			Initial Priority Rating Evaluation Sheet				
Street Address: 136th Street and Limestone Springs Culvert Improvement							
Nearest address or intersection of problem: 136th Street and Travertine Way							
Rating By: BD			Date: 5/10/2018				
INSTRUCTIONS: Fill in only 1 "X" per Group Rating as applicable					Revision Date: 5/1/2018		
STREET FLOODING	STREET CLASSIFICATION		STREET FLOODING OCCURRENCES				Rating
			Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr	
			4	3	2	1	
	Primary Arterial	4		X			12
	Secondary Arterial	3					0
Collector	2					0	
Local Street or Place	1					0	
INFRASTRUCTURE DETERIORATION	PUBLIC INFRASTRUCTURE TYPE		MAJOR FAILURE POSSIBLE WITHIN				Rating
			Immediate	1-2 Years	3-5 Years	6-10+ Years	
			4	3	2	1	
	Arterial/Sanitary Int./Major Tributary	4			X		8
	Collector/Storm/Sanitary Collector/Stream	3					0
Local Storm/Sanitary Main/Road Drainage	2					0	
Sedimentation Maintenance	1					0	
FLOODED	PROPERTY OR FACILITY CLASSIFICATION		FLOODING FREQUENCY				Rating
			Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr	
			4	3	2	1	
	Homes	4					0
	Business/Industry	3					0
Parking Lots	2					0	
Yards / Fields	1		X			3	
NUMBER IMPACTED	PROPERTY CLASSIFICATION		NUMBER OF STRUCTURES AFFECTED				Rating
			> 50	26 - 50	11 - 25	1 - 10	
			4	3	2	1	
Homes	4					0	
Business/Industry	2			X		4	
FLOODING IMPACT	FLOODING CONCERN		Water in Structure	Standing water > 1 wk	Standing water 2-7 d	Standing water < 48 hr	Rating
			15	10	5	0	
Observed Impact	1			X		5	
EXTENT OF EROSION	EROSION		LINEAL FEET OF EROSION				Rating
			> 500	251 - 500	101 - 250	10 - 100	
			40	30	20	10	
Observed Erosion	1			X		20	
WATER QUALITY	(AREA TYPE)		Septic Area	Erosion Effecting Water Quality	Sanitary Sewer Area		Rating
			15	10	1		
	Area Type	1		X			10
SOLUTIONS	RESOLUTION TYPE		Open Channel	Bridge/ Culvert	Structural BMP	Storm Sewer	Rating
			8	6	4	2	
	Solution	1				X	2
PUBLIC INVOLVE.	COST SHARE (When Private money or Federal/State Money is being used)		> 75%	26 - 75%	6 - 25%	0 - 5%	Rating
			15	10	5	0	
	% by Developer/Owner/Other Agency	1		X			10
MS4 REQ'NT	SATISFIES REGULATORY REQUIREMENT FOR MS4 PERMIT		YES		NO		Rating
			5	0			
			X				5
						Subtotal	79
Public or Private Benefit?			Public	X	Private	IPR RATING	79

City of Fishers		Stormwater Capital Program				
Stormwater Problem Area			Initial Priority Rating Evaluation Sheet			
Street Address: Airport Drainage Improvements at 106th Street and Allisonville Road						
Nearest address or intersection of problem: 106th Street and Allisonville Road						
Rating By: BD		Date: 5/10/2018				
INSTRUCTIONS: Fill in only 1 "X" per Group Rating as applicable				Revision Date: 5/1/2018		
STREET FLOODING	STREET CLASSIFICATION	STREET FLOODING OCCURRENCES				Rating
		Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr	
		4	3	2	1	
	Primary Arterial	4	X			
	Secondary Arterial	3				
Collector	2				0	
Local Street or Place	1				0	
INFRASTRUCTURE DETERIORATION	PUBLIC INFRASTRUCTURE TYPE	MAJOR FAILURE POSSIBLE WITHIN				Rating
	(as applicable)	Immediate	1-2 Years	3-5 Years	6-10+ Years	
		4	3	2	1	
	Arterial/Sanitary Int./Major Tributary	4		X		
	Collector/Storm/Sanitary Collector/Stream	3				
Local Storm/Sanitary Main/Road Drainage	2				0	
Sedimentation Maintenance	1				0	
FLOODED	PROPERTY OR FACILITY CLASSIFICATION	FLOODING FREQUENCY				Rating
		Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr	
		4	3	2	1	
	Homes	4				
	Business/Industry	3				
Parking Lots	2				0	
Yards / Fields	1	X			3	
NUMBER IMPACTED	PROPERTY CLASSIFICATION	NUMBER OF STRUCTURES AFFECTED				Rating
		> 50	26 - 50	11 - 25	1 - 10	
		4	3	2	1	
Homes	4				0	
Business/Industry	2		X		4	
FLOODING IMPACT	FLOODING CONCERN	Water in Structure	Standing water > 1 wk	Standing water 2-7 d	Standing water < 48 hr	Rating
	Observed Impact	15	10	5	0	
Observed Impact	1		X		5	
EXTENT OF EROSION	EROSION	LINEAL FEET OF EROSION				Rating
		> 500	251 - 500	101 - 250	10 - 100	
		40	30	20	10	
Observed Erosion	1		X		20	
WATER QUALITY	(AREA TYPE)	Septic Area	Erosion Effecting Water Quality	Sanitary Sewer Area		Rating
		15	10	1		
Area Type	1	X			10	
SOLUTIONS	RESOLUTION TYPE	Open Channel	Bridge/ Culvert	Structural BMP	Storm Sewer	Rating
		8	6	4	2	
Solution	1			X	2	
PUBLIC INVOLVE.	COST SHARE (When Private money or Federal/State Money is being used)	> 75%	26 - 75%	6 - 25%	0 - 5%	Rating
		15	10	5	0	
% by Developer/Owner/Other Agency	1		X		10	
MS4 REQ'NT	SATISFIES REGULATORY REQUIREMENT FOR MS4 PERMIT	YES		NO		Rating
		5		0		
		X				
					Subtotal	79
	Public or Private Benefit?	Public	X	Private	IPR RATING	79

City of Fishers		Stormwater Capital Program					
Stormwater Problem Area			Initial Priority Rating Evaluation Sheet				
Street Address: 10307 Cumberland Road Flooding Improvements							
Nearest address or intersection of problem: Cumberland Road and Bradford Knoll Drive							
Rating By: BD			Date: 5/11/2018				
INSTRUCTIONS: Fill in only 1 "X" per Group Rating as applicable					Revision Date: 5/1/2018		
STREET FLOODING	STREET CLASSIFICATION		STREET FLOODING OCCURRENCES				Rating
			Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr	
			4	3	2	1	
	Primary Arterial	4					0
	Secondary Arterial	3			X		6
Collector	2					0	
Local Street or Place	1					0	
INFRASTRUCTURE DETERIORATION	PUBLIC INFRASTRUCTURE TYPE		MAJOR FAILURE POSSIBLE WITHIN				Rating
	(as applicable)		Immediate	1-2 Years	3-5 Years	6-10+ Years	
			4	3	2	1	
	Arterial/Sanitary Int./Major Tributary	4					0
	Collector/Storm/Sanitary Collector/Stream	3			X		6
Local Storm/Sanitary Main/Road Drainage	2					0	
Sedimentation Maintenance	1					0	
FLOODED	PROPERTY OR FACILITY CLASSIFICATION		FLOODING FREQUENCY				Rating
			Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr	
			4	3	2	1	
	Homes	4			X		8
	Business/Industry	3					0
Parking Lots	2					0	
Yards / Fields	1					0	
NUMBER IMPACTED	PROPERTY CLASSIFICATION		NUMBER OF STRUCTURES AFFECTED				Rating
			> 50	26 - 50	11 - 25	1 - 10	
			4	3	2	1	
Homes	4				X	4	
Business/Industry	2					0	
FLOODING IMPACT	FLOODING CONCERN		Water in Structure	Standing water > 1 wk	Standing water 2-7 d	Standing water < 48 hr	Rating
			15	10	5	0	
Observed Impact	1	X				15	
EXTENT OF EROSION	EROSION		LINEAL FEET OF EROSION				Rating
			> 500	251 - 500	101 - 250	10 - 100	
			40	30	20	10	
Observed Erosion	1				X	10	
WATER QUALITY	(AREA TYPE)		Septic Area	Erosion Effecting Water Quality	Sanitary Sewer Area		Rating
			15	10	1		
Area Type	1		X			10	
SOLUTIONS	RESOLUTION TYPE		Open Channel	Bridge/ Culvert	Structural BMP	Storm Sewer	Rating
			8	6	4	2	
Solution	1		X			6	
PUBLIC INVOLVE.	COST SHARE (When Private money or Federal/State Money is being used)		> 75%	26 - 75%	6 - 25%	0 - 5%	Rating
			15	10	5	0	
	% by Developer/Owner/Other Agency	1				X	0
MS4 REQ'NT	SATISFIES REGULATORY REQUIREMENT FOR MS4 PERMIT		YES		NO		Rating
			5	0			
			X				5
						Subtotal	70
	Public or Private Benefit?		Public	X	Private	IPR RATING	70

City of Fishers		Stormwater Capital Program				
Stormwater Problem Area			Initial Priority Rating Evaluation Sheet			
Street Address: Lake Stonebridge Dam						
Nearest address or intersection of problem: 116th Street and Hoosier Road						
Rating By: BD		Date: 5/11/2018				
INSTRUCTIONS: Fill in only 1 "X" per Group Rating as applicable				Revision Date: 5/1/2018		
STREET FLOODING	STREET CLASSIFICATION	STREET FLOODING OCCURRENCES				Rating
		Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr	
		4	3	2	1	
	Primary Arterial	4				0
	Secondary Arterial	3				0
Collector	2	X			6	
Local Street or Place	1				0	
INFRASTRUCTURE DETERIORATION	PUBLIC INFRASTRUCTURE TYPE	MAJOR FAILURE POSSIBLE WITHIN				Rating
	(as applicable)	Immediate	1-2 Years	3-5 Years	6-10+ Years	
		4	3	2	1	
	Arterial/Sanitary Int./Major Tributary	4				0
	Collector/Storm/Sanitary Collector/Stream	3		X		6
Local Storm/Sanitary Main/Road Drainage	2				0	
Sedimentation Maintenance	1				0	
FLOODED	PROPERTY OR FACILITY CLASSIFICATION	FLOODING FREQUENCY				Rating
		Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr	
		4	3	2	1	
	Homes	4				0
	Business/Industry	3				0
Parking Lots	2				0	
Yards / Fields	1	X			3	
NUMBER IMPACTED	PROPERTY CLASSIFICATION	NUMBER OF STRUCTURES AFFECTED				Rating
		> 50	26 - 50	11 - 25	1 - 10	
		4	3	2	1	
Homes	4		X		8	
Business/Industry	2				0	
FLOODING IMPACT	FLOODING CONCERN	Water in Structure	Standing water > 1 wk	Standing water 2-7 d	Standing water < 48 hr	Rating
	Observed Impact	15	10	5	0	5
EXTENT OF EROSION	EROSION	LINEAL FEET OF EROSION				Rating
		> 500	251 - 500	101 - 250	10 - 100	
		40	30	20	10	
Observed Erosion	1			X	10	
WATER QUALITY	(AREA TYPE)	Septic Area	Erosion Effecting Water Quality	Sanitary Sewer Area		Rating
	Area Type	15	10	1		10
SOLUTIONS	RESOLUTION TYPE	Open Channel	Bridge/ Culvert	Structural BMP	Storm Sewer	Rating
	Solution	8	6	4	2	6
PUBLIC INVOLVE.	COST SHARE (When Private money or Federal/State Money is being used)	> 75%	26 - 75%	6 - 25%	0 - 5%	Rating
		15	10	5	0	
	% by Developer/Owner/Other Agency	1		X		5
MS4 REQ'NT	SATISFIES REGULATORY REQUIREMENT FOR MS4 PERMIT	YES		NO		Rating
		5		0		
		X				5
					Subtotal	64
Public or Private Benefit?		Public	X	Private	IPR RATING	64

City of Fishers		Stormwater Capital Program					
Stormwater Problem Area		Initial Priority Rating Evaluation Sheet					
Street Address: Lantern Road and USA Parkway Drainage Improvements							
Nearest address or intersection of problem: 106th Street and USA Pkwy/Lantern Road							
Rating By: BD		Date: 5/10/2018					
INSTRUCTIONS: Fill in only 1 "X" per Group Rating as applicable				Revision Date: 5/1/2018			
STREET FLOODING	STREET CLASSIFICATION	STREET FLOODING OCCURRENCES				Rating	
		Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr		
	Primary Arterial	4	3	2	1	0	
	Secondary Arterial	3		X		6	
	Collector	2				0	
Local Street or Place	1				0		
INFRASTRUCTURE DETERIORATION	PUBLIC INFRASTRUCTURE TYPE	MAJOR FAILURE POSSIBLE WITHIN				Rating	
	(as applicable)	Immediate	1-2 Years	3-5 Years	6-10+ Years		
	Arterial/Sanitary Int./Major Tributary	4		X		8	
	Collector/Storm/Sanitary Collector/Stream	3				0	
	Local Storm/Sanitary Main/Road Drainage	2				0	
Sedimentation Maintenance	1				0		
FLOODED	PROPERTY OR FACILITY CLASSIFICATION	FLOODING FREQUENCY				Rating	
		Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr		
	Homes	4				0	
	Business/Industry	3				0	
	Parking Lots	2				0	
Yards / Fields	1		X		3		
NUMBER IMPACTED	PROPERTY CLASSIFICATION	NUMBER OF STRUCTURES AFFECTED				Rating	
		> 50	26 - 50	11 - 25	1 - 10		
	Homes	4	3	2	1	0	
Business/Industry	2			X	2		
FLOODING IMPACT	FLOODING CONCERN	Water in Structure	Standing water > 1 wk	Standing water 2-7 d	Standing water < 48 hr	Rating	
	Observed Impact	15	10	5	0		5
EXTENT OF EROSION	EROSION	LINEAL FEET OF EROSION				Rating	
		> 500	251 - 500	101 - 250	10 - 100		
Observed Erosion	1	40	30	20	10	X	10
WATER QUALITY	(AREA TYPE)	Septic Area	Erosion Effecting Water Quality	Sanitary Sewer Area		Rating	
	Area Type	15	10	1			10
SOLUTIONS	RESOLUTION TYPE	Open Channel	Bridge/Culvert	Structural BMP	Storm Sewer	Rating	
	Solution	1	X	4	2		8
PUBLIC INVOLVE.	COST SHARE (When Private money or Federal/State Money is being used)	> 75%	26 - 75%	6 - 25%	0 - 5%	Rating	
	% by Developer/Owner/Other Agency	1	15	10	5		0
MS4 REQ'NT	SATISFIES REGULATORY REQUIREMENT FOR MS4 PERMIT	YES		NO		Rating	
		5	0				5
						Subtotal	62
	Public or Private Benefit?	Public	X	Private		IPR RATING	62

City of Fishers		Stormwater Capital Program					
Stormwater Problem Area			Initial Priority Rating Evaluation Sheet				
Street Address: Hoosier Road south of S-Curve Drainage Improvements							
Nearest address or intersection of problem: Hoosier Road and 111th Street							
Rating By: BD			Date: 5/11/2018				
INSTRUCTIONS: Fill in only 1 "X" per Group Rating as applicable					Revision Date: 5/1/2018		
STREET FLOODING	STREET CLASSIFICATION	STREET FLOODING OCCURRENCES				Rating	
		Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr		
		4	3	2	1		
	Primary Arterial	4					0
	Secondary Arterial	3					0
Collector	2		X		4		
Local Street or Place	1				0		
INFRASTRUCTURE DETERIORATION	PUBLIC INFRASTRUCTURE TYPE	MAJOR FAILURE POSSIBLE WITHIN				Rating	
		Immediate	1-2 Years	3-5 Years	6-10+ Years		
		4	3	2	1		
	Arterial/Sanitary Int./Major Tributary	4					0
	Collector/Storm/Sanitary Collector/Stream	3		X			6
Local Storm/Sanitary Main/Road Drainage	2				0		
Sedimentation Maintenance	1				0		
FLOODED	PROPERTY OR FACILITY CLASSIFICATION	FLOODING FREQUENCY				Rating	
		Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr		
		4	3	2	1		
	Homes	4					0
	Business/Industry	3					0
Parking Lots	2				0		
Yards / Fields	1		X		2		
NUMBER IMPACTED	PROPERTY CLASSIFICATION	NUMBER OF STRUCTURES AFFECTED				Rating	
		> 50	26 - 50	11 - 25	1 - 10		
		4	3	2	1		
Homes	4			X	4		
Business/Industry	2				0		
FLOODING IMPACT	FLOODING CONCERN	Water in Structure	Standing water > 1 wk	Standing water 2-7 d	Standing water < 48 hr	Rating	
		15	10	5	0		
Observed Impact	1		X			5	
EXTENT OF EROSION	EROSION	LINEAL FEET OF EROSION				Rating	
		> 500	251 - 500	101 - 250	10 - 100		
		40	30	20	10		
Observed Erosion	1		X			20	
WATER QUALITY	(AREA TYPE)	Septic Area	Erosion Effecting Water Quality	Sanitary Sewer Area	Rating		
		15	10	1			
Area Type	1		X			10	
SOLUTIONS	RESOLUTION TYPE	Open Channel	Bridge/ Culvert	Structural BMP	Storm Sewer	Rating	
		8	6	4	2		
Solution	1				X	2	
PUBLIC INVOLVE.	COST SHARE (When Private money or Federal/State Money is being used)	> 75%	26 - 75%	6 - 25%	0 - 5%	Rating	
		15	10	5	0		
	% by Developer/Owner/Other Agency	1			X		0
MS4 REQ'NT	SATISFIES REGULATORY REQUIREMENT FOR MS4 PERMIT	YES		NO		Rating	
		5		0			
		X					5
Subtotal						58	
Public or Private Benefit?		Public	X	Private	IPR RATING	58	

City of Fishers			Stormwater Capital Program				
Stormwater Problem Area			Initial Priority Rating Evaluation Sheet				
Street Address: Georgia Road north of 96th Street Drainage Improvements							
Nearest address or intersection of problem: Georgia Road and 96th Street							
Rating By: BD			Date: 5/10/2018				
INSTRUCTIONS: Fill in only 1 "X" per Group Rating as applicable					Revision Date: 5/1/2018		
STREET FLOODING	STREET CLASSIFICATION		STREET FLOODING OCCURRENCES				Rating
			Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr	
			4	3	2	1	
	Primary Arterial	4					0
	Secondary Arterial	3					0
Collector	2	X				8	
Local Street or Place	1					0	
INFRASTRUCTURE DETERIORATION	PUBLIC INFRASTRUCTURE TYPE		MAJOR FAILURE POSSIBLE WITHIN				Rating
			Immediate	1-2 Years	3-5 Years	6-10+ Years	
			4	3	2	1	
	Arterial/Sanitary Int./Major Tributary	4					0
	Collector/Storm/Sanitary Collector/Stream	3					0
Local Storm/Sanitary Main/Road Drainage	2		X			6	
Sedimentation Maintenance	1					0	
FLOODED	PROPERTY OR FACILITY CLASSIFICATION		FLOODING FREQUENCY				Rating
			Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr	
			4	3	2	1	
	Homes	4					0
	Business/Industry	3					0
Parking Lots	2					0	
Yards / Fields	1	X				4	
NUMBER IMPACTED	PROPERTY CLASSIFICATION		NUMBER OF STRUCTURES AFFECTED				Rating
			> 50	26 - 50	11 - 25	1 - 10	
			4	3	2	1	
Homes	4			X		8	
Business/Industry	2					0	
FLOODING IMPACT	FLOODING CONCERN		Water in Structure	Standing water > 1 wk	Standing water 2-7 d	Standing water < 48 hr	Rating
			15	10	5	0	
Observed Impact	1			X		5	
EXTENT OF EROSION	EROSION		LINEAL FEET OF EROSION				Rating
			> 500	251 - 500	101 - 250	10 - 100	
			40	30	20	10	
Observed Erosion	1					0	
WATER QUALITY	(AREA TYPE)		Septic Area	Erosion Effecting Water Quality	Sanitary Sewer Area		Rating
			15	10	1		
	Area Type	1		X			10
SOLUTIONS	RESOLUTION TYPE		Open Channel	Bridge/ Culvert	Structural BMP	Storm Sewer	Rating
			8	6	4	2	
	Solution	1	X				8
PUBLIC INVOLVE.	COST SHARE (When Private money or Federal/State Money is being used)		> 75%	26 - 75%	6 - 25%	0 - 5%	Rating
			15	10	5	0	
	% by Developer/Owner/Other Agency	1				X	0
MS4 REQ'NT	SATISFIES REGULATORY REQUIREMENT FOR MS4 PERMIT		YES		NO		Rating
			5	0			
			X				5
						Subtotal	54
Public or Private Benefit?			Public	X	Private	IPR RATING	54

City of Fishers		Stormwater Capital Program				
Stormwater Problem Area			Initial Priority Rating Evaluation Sheet			
Street Address: 121st Street between Cross Lane and Blue Springs Lane Drainage Improvement						
Nearest address or intersection of problem: 121st Street and Blue Springs Lane						
Rating By: BD		Date: 5/10/2018				
INSTRUCTIONS: Fill in only 1 "X" per Group Rating as applicable				Revision Date: 5/1/2018		
STREET FLOODING	STREET CLASSIFICATION	STREET FLOODING OCCURRENCES				Rating
		Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr	
		4	3	2	1	
	Primary Arterial	4				0
	Secondary Arterial	3				0
Collector	2		X		4	
Local Street or Place	1				0	
INFRASTRUCTURE DETERIORATION	PUBLIC INFRASTRUCTURE TYPE	MAJOR FAILURE POSSIBLE WITHIN				Rating
	(as applicable)	Immediate	1-2 Years	3-5 Years	6-10+ Years	
		4	3	2	1	
	Arterial/Sanitary Int./Major Tributary	4				0
	Collector/Storm/Sanitary Collector/Stream	3		X		6
Local Storm/Sanitary Main/Road Drainage	2				0	
Sedimentation Maintenance	1				0	
FLOODED	PROPERTY OR FACILITY CLASSIFICATION	FLOODING FREQUENCY				Rating
		Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr	
		4	3	2	1	
	Homes	4		X		8
	Business/Industry	3				0
Parking Lots	2				0	
Yards / Fields	1				0	
NUMBER IMPACTED	PROPERTY CLASSIFICATION	NUMBER OF STRUCTURES AFFECTED				Rating
		> 50	26 - 50	11 - 25	1 - 10	
		4	3	2	1	
Homes	4			X	4	
Business/Industry	2				0	
FLOODING IMPACT	FLOODING CONCERN	Water in Structure	Standing water > 1 wk	Standing water 2-7 d	Standing water < 48 hr	Rating
	Observed Impact	15	10	5	0	5
EXTENT OF EROSION	EROSION	LINEAL FEET OF EROSION				Rating
		> 500	251 - 500	101 - 250	10 - 100	
		40	30	20	10	
Observed Erosion	1			X	10	
WATER QUALITY	(AREA TYPE)	Septic Area	Erosion Effecting Water Quality	Sanitary Sewer Area		Rating
	Area Type	15	10	1		10
SOLUTIONS	RESOLUTION TYPE	Open Channel	Bridge/ Culvert	Structural BMP	Storm Sewer	Rating
	Solution	8	6	4	2	2
		1			X	
PUBLIC INVOLVE.	COST SHARE (When Private money or Federal/State Money is being used)	> 75%	26 - 75%	6 - 25%	0 - 5%	Rating
		15	10	5	0	
	% by Developer/Owner/Other Agency	1			X	0
MS4 REQ/MT	SATISFIES REGULATORY REQUIREMENT FOR MS4 PERMIT	YES		NO		Rating
		5		0		
		X				5
					Subtotal	54
	Public or Private Benefit?	Public	X	Private	IPR RATING	54

City of Fishers		Stormwater Capital Program					
Stormwater Problem Area			Initial Priority Rating Evaluation Sheet				
Street Address: 96th Street and Cyntheanne Road Drainage Improvements							
Nearest address or intersection of problem: 96th Street and Cyntheanne Road							
Rating By: BD			Date: 5/10/2018				
INSTRUCTIONS: Fill in only 1 "X" per Group Rating as applicable					Revision Date: 5/1/2018		
STREET FLOODING	STREET CLASSIFICATION		STREET FLOODING OCCURRENCES				Rating
			Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr	
			4	3	2	1	
	Primary Arterial	4					0
	Secondary Arterial	3					0
Collector	2					0	
Local Street or Place	1	X				4	
INFRASTRUCTURE DETERIORATION	PUBLIC INFRASTRUCTURE TYPE		MAJOR FAILURE POSSIBLE WITHIN				Rating
			Immediate	1-2 Years	3-5 Years	6-10+ Years	
			4	3	2	1	
	Arterial/Sanitary Int./Major Tributary	4					0
	Collector/Storm/Sanitary Collector/Stream	3					0
Local Storm/Sanitary Main/Road Drainage	2		X			6	
Sedimentation Maintenance	1					0	
FLOODED	PROPERTY OR FACILITY CLASSIFICATION		FLOODING FREQUENCY				Rating
			Every Rain	Once/1-2 Yr	Once/2-10 Yr	Once/10-25 Yr	
			4	3	2	1	
	Homes	4				X	4
	Business/Industry	3					0
Parking Lots	2					0	
Yards / Fields	1					0	
NUMBER IMPACTED	PROPERTY CLASSIFICATION		NUMBER OF STRUCTURES AFFECTED				Rating
			> 50	26 - 50	11 - 25	1 - 10	
			4	3	2	1	
Homes	4			X		8	
Business/Industry	2					0	
FLOODING IMPACT	FLOODING CONCERN		Water in Structure	Standing water > 1 wk	Standing water 2-7 d	Standing water < 48 hr	Rating
			15	10	5	0	
Observed Impact	1			X		5	
EXTENT OF EROSION	EROSION		LINEAL FEET OF EROSION				Rating
			> 500	251 - 500	101 - 250	10 - 100	
			40	30	20	10	
Observed Erosion	1					0	
WATER QUALITY	(AREA TYPE)		Septic Area	Erosion Effecting Water Quality	Sanitary Sewer Area		Rating
			15	10	1		
	Area Type	1		X			10
SOLUTIONS	RESOLUTION TYPE		Open Channel	Bridge/ Culvert	Structural BMP	Storm Sewer	Rating
			8	6	4	2	
	Solution	1				X	2
PUBLIC INVOLVE.	COST SHARE (When Private money or Federal/State Money is being used)		> 75%	26 - 75%	6 - 25%	0 - 5%	Rating
			15	10	5	0	
	% by Developer/Owner/Other Agency	1				X	0
MS4 REQ'NT	SATISFIES REGULATORY REQUIREMENT FOR MS4 PERMIT		YES		NO		Rating
			5	0			
			X				5
						Subtotal	44
Public or Private Benefit?			Public	X	Private	IPR RATING	44

Appendix D

Project Photos

PHOTOGRAPHS

Site No. 1



Photograph No. 1

Looking West along the Northside of 106th St



Photograph No. 2

Looking West along the Southside of 106th St

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PHOTOGRAPHS

Site No. 1



Photograph No. 3

Looking West along Northside of 106th St between 106th St Bridge and Pedestrian Bridge



Photograph No. 4

Looking Northeast along Cheney Creek from 106th St

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PHOTOGRAPHS

Site No. 2



Photograph No. 5

Looking East along the Northside of 106th St between Sherborne Rd and Hague Rd



Photograph No. 6

Looking East along the Northside of 106th St between Sherborne Rd and Hague Rd

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Photograph No. 7

Looking Southeast from the Northside of 106th St between Sherborne Rd and Hague Rd

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Photograph No. 8

Looking East along the centerline of 106th St between Sherborne Rd and Hague Rd



Photograph No. 9

Looking Southeast from the Northwest side of the 136th St bridge over Sand Creek



Photograph No. 10

Looking East along the South side of the 136th St bridge over Sand Creek

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Photograph No. 11

Looking West along the South side of 136th St, standing West of the bridge over Sand Creek

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Photograph No. 12

Looking West along the North side of 136th St, standing East of the bridge over Sand Creek



Photograph No. 13

Looking Northeast of 136th St bridge over Mud Creek



Photograph No. 14

Looking West along the North side of 136th St, standing at the Northeast corner of the bridge over Mud Creek

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Photograph No. 15

Looking East along the South side of 136th St, standing at the Southwest corner of the bridge over Mud Creek



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Photograph No. 16

Looking Northeast from the West side of the 136th St Bridge over Mud Creek

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Photograph No. 17

Looking Northeast from the West side of the 136th St Bridge over Mud Creek

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Photograph No. 18

Looking South along the East side of Prairie Baptist Rd just North of Silverleaf Blvd

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Photograph No. 19

Loking North along the East side of Prarie Baptist Rd just South of Silverleaf Blvd

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Photograph No. 20

Loking North along the East side of Prarie Baptist Rd just South of Silverleaf Blvd



Photograph No. 21

Looking North along the West side of Prarie Baptist Rd just South of Silverleaf Blvd



Photograph No. 22

Looking South along the East side of 98th St just before it turns into 97th St

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Photograph No. 23

Looking South along the East side of 98th St just before it turns into 97th St



Photograph No. 24

Looking North along the East side of 98th St

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Photograph No. 25

Looking West along the East side of 98th St



Photograph No. 26

Looking North along Mud Creek from pedestrain bridge just West of the Cumberland Rd bridge

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Photograph No. 27

Looking Southwest from the entrance to Cumberland Park on the southside of Cumberland Rd



Photograph No. 28

Looking Northwest from the entrance to Cumberland Park on the southside of Cumberland Rd

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Photograph No. 29

Looking East from the North side of the Cumberland Rd bridge over Mud Creek

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Photograph No. 30

Looking Southwest from the North side of the Cumberland Rd bridge over Mud Creek

PHOTOGRAPHS

Site No. 8



Photograph No. 31
Looking East along the South side of 136th St



Photograph No. 32
Looking East along the South side of 136th St

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Photograph No. 33

Looking Southeast along the North side of 136th St

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Photograph No. 34

Looking East along the North side of 136th St

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Photograph No. 35

Looking East along the South side of 136th St

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Photograph No. 36

Looking South along the North side of 136th St

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Photograph No. 37

Looking South from the Southeast corner of the intersection of 106th St and Allisonville Rd

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Photograph No. 38

Looking South from the Southeast corner of the intersection of 106th St and Allisonville Rd

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Photograph No. 39

Looking North from the East side of Cumberland Rd

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Photograph No. 40

Looking East from the East side of Cumberland Rd



Photograph No. 41

Looking East from the East side of Cumberland Rd



Photograph No. 42

Looking North from the East side of Cumberland Rd

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Photograph No. 43

Looking east along the East side of Brixton Ln at the Lake Stonebridge overflow structure

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Photograph No. 44

Looking Southeast along the East side of Brixton Ln at the Lake Stonebridge overflow structure



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Photograph No. 45

Looking Northeast along the East side of Brixton Ln at the Lake Stonebridge overflow structure



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Photograph No. 46

Looking Southwest along the West side of Brixton Ln across the street from the Lake Stonebridge overflow structure

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Photograph No. 47

Looking North along the East side of USA pkwy

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Photograph No. 48

Looking Northwest from the East side of USA pkwy

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Photograph No. 49

Looking North along the West side of USA pkwy

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Photograph No. 50

Looking Northwest from the West side of USA pkwy



Photograph No. 51

Looking South along the East side Hoosier Rd just North of 111th St



Photograph No. 52

Looking North along the East side Hoosier Rd just North of 111th St

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Photograph No. 53

Looking North along the East side Hoosier Rd at the intersection of 111th St



Photograph No. 54

Looking South along the East side Hoosier Rd at the intersection of 111th St

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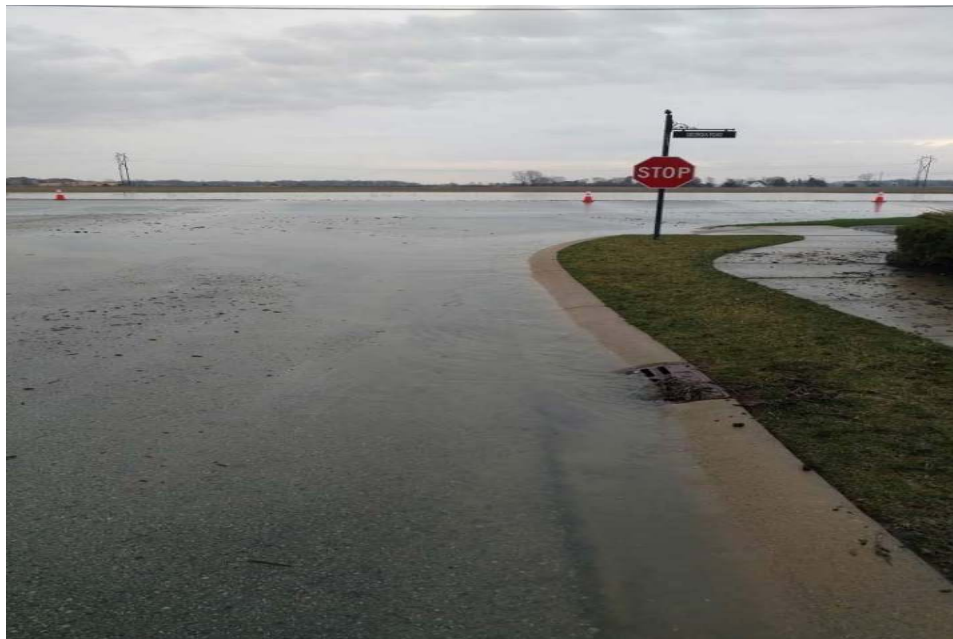
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Photograph No. 55

Looking South along the East side of Georgia Rd at the intersection with Stable Stone Terrace

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Photograph No. 56

Looking East along the South side of Stable Stone Terrace at the intersection with Georgia Rd

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Photograph No. 57

Looking North along the East side of Georgia Rd at the intersection with Stable Stone Terrace

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Photograph No. 58

Looking South along the East side of Georgia Rd at the intersection with 96th St

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Photograph No. 59

Looking South along the West side of Georgia Rd at the intersection with 96th St

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Photograph No. 60

Looking East along the North side of 121st St at the intersection with Cross Roads Ln



Photograph No. 61

Looking East along the North side of 121st St just east of the intersection with Cross Roads Ln



Photograph No. 62

Looking West along the North side of 121st St just north of the intersection with Blue Springs Ln

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Photograph No. 63

Looking Northeast from the intersection of 96th St and Cyntheanna Rd

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Photograph No. 64

Looking Northeast from the intersection of 96th St and Cyntheanna Rd

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Photograph No. 65

Looking West along the South side of 96th St at the intersection with Cyntheanna Rd

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Photograph No. 66

Looking North along the East side of Cyntheanna Rd just North of the intersection with 96th St



Photograph No. 67

Looking Northwest from the East side of Cyntheanna Rd just North of the intersection with 96th St

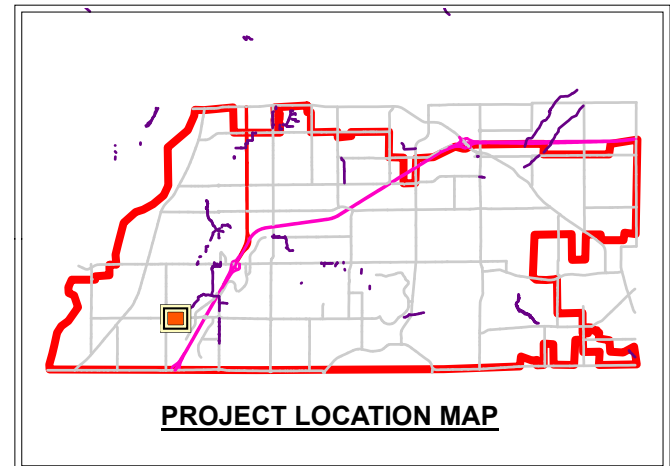
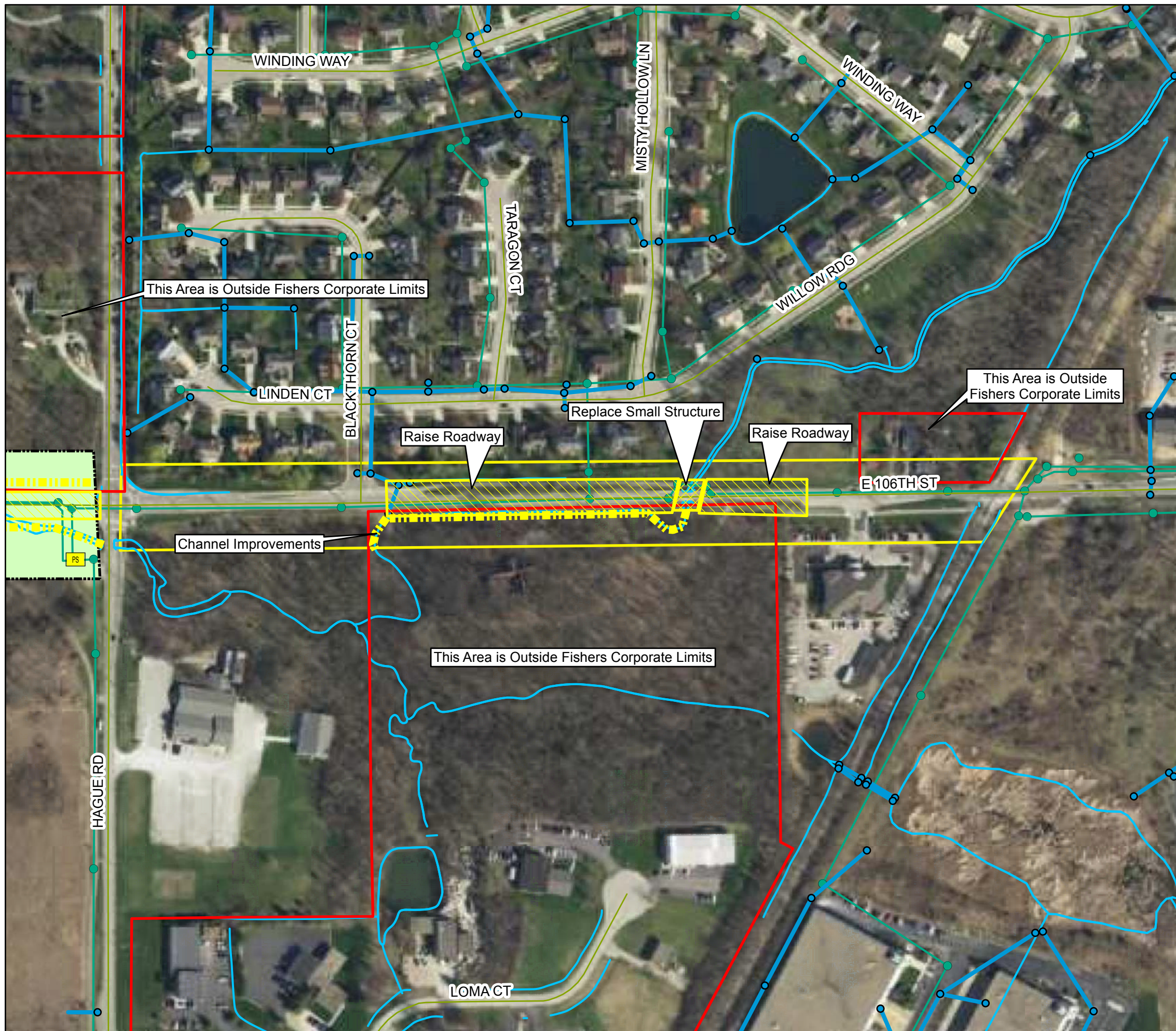
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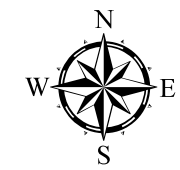
Appendix E

Capital Improvement Projects

Cheaney Creek - 106th Street Between Hague Road and Railroad Tracks



- Legend**
- Fishers Corporate Limits
 - Road Centerline
 - Storm Structures
 - Storm Sewers
 - PS Sanitary Lift Stations
 - Sanitary Manholes
 - Sanitary Sewers
 - Rivers / Streams / Ponds
- Project Areas**
- Adjacent Project Limits
 - Project Limits
 - Raise Roadway
 - Replace Small Structure
 - Channel Improvements



1 inch = 200 feet

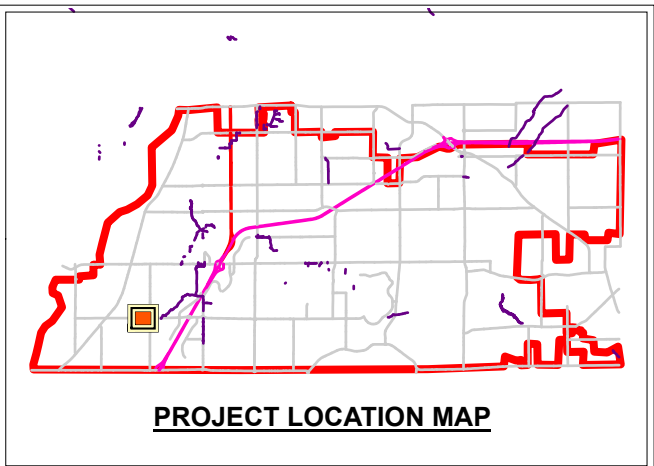
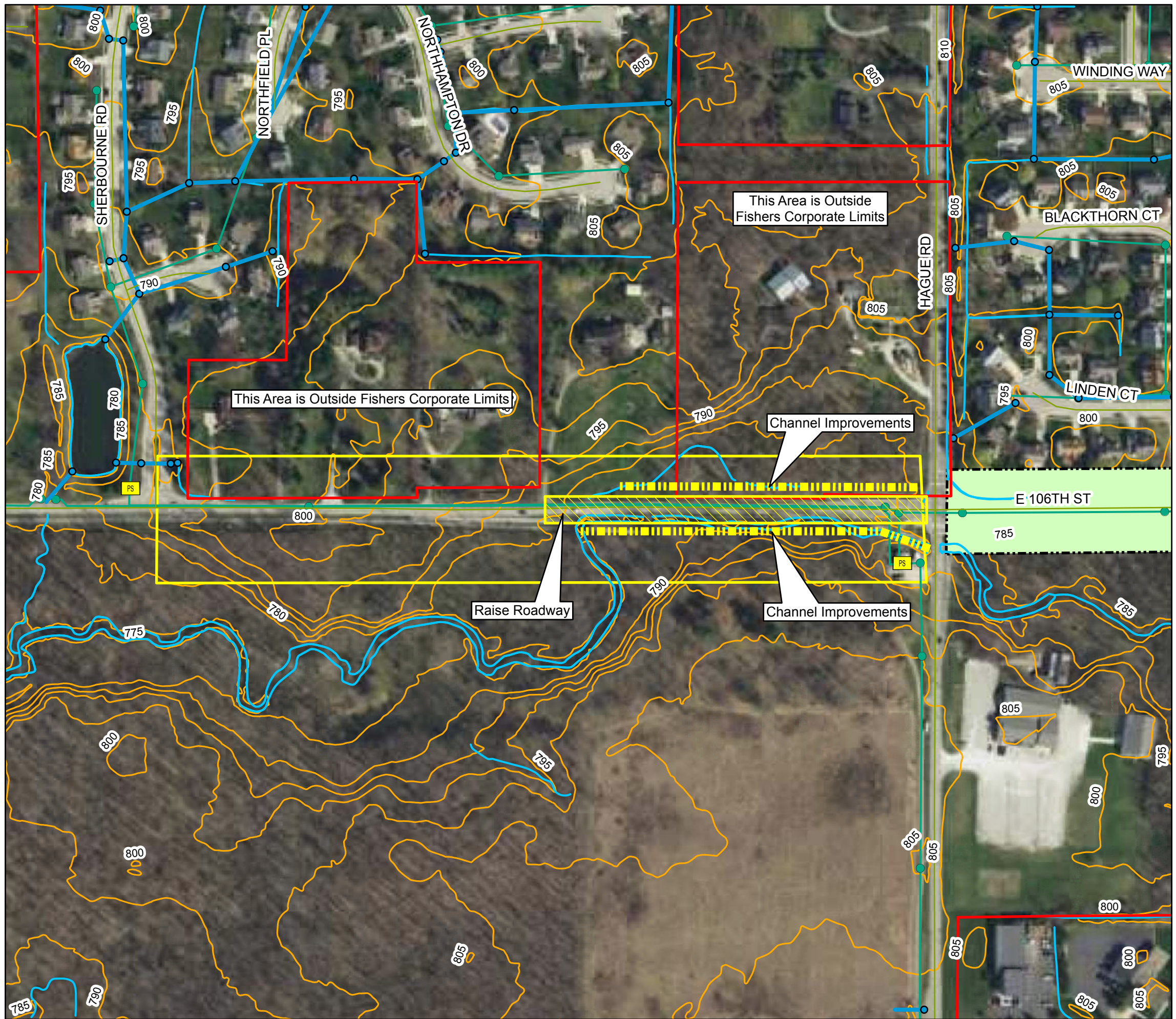
**Aerial Map
106th St between Hague Rd
and Railroad Tracks
High Water**

**CITY OF FISHERS
STORMWATER MASTERPLAN**

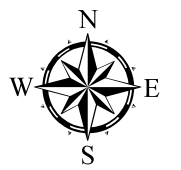


Date: October 2018
 Produced By: DLZ Indiana, LLC
 Data Source: Hamilton County, IN
 This map does not represent a legal document. It is intended to serve as a graphical aid only. Information shown on this map is not warranted for accuracy or merchantability.

Cheaney Creek - 106th Street Between Sherborne Road and Hague Road



- Legend**
- Fishers Corporate Limits
 - Road Centerline
 - Storm Structures
 - Storm Sewers
 - PS Sanitary Lift Stations
 - Sanitary Manholes
 - Sanitary Sewers
 - Rivers / Streams / Ponds
- Project Areas**
- Project Limits
 - Adjacent Project Limits
 - Major Contours Delaware Township
 - Raise Roadway
 - Channel Improvements



1 inch = 200 feet

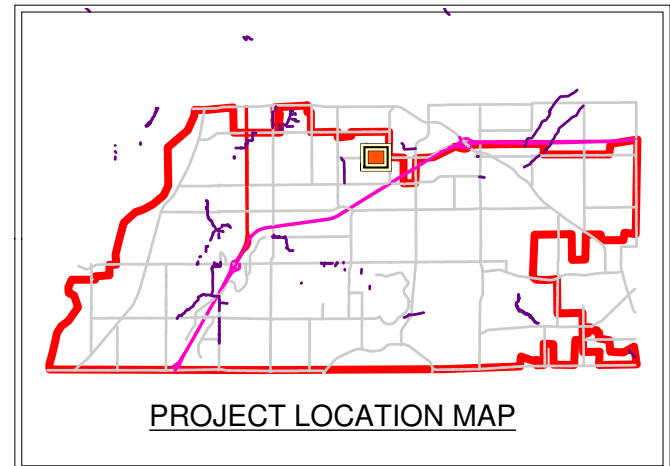
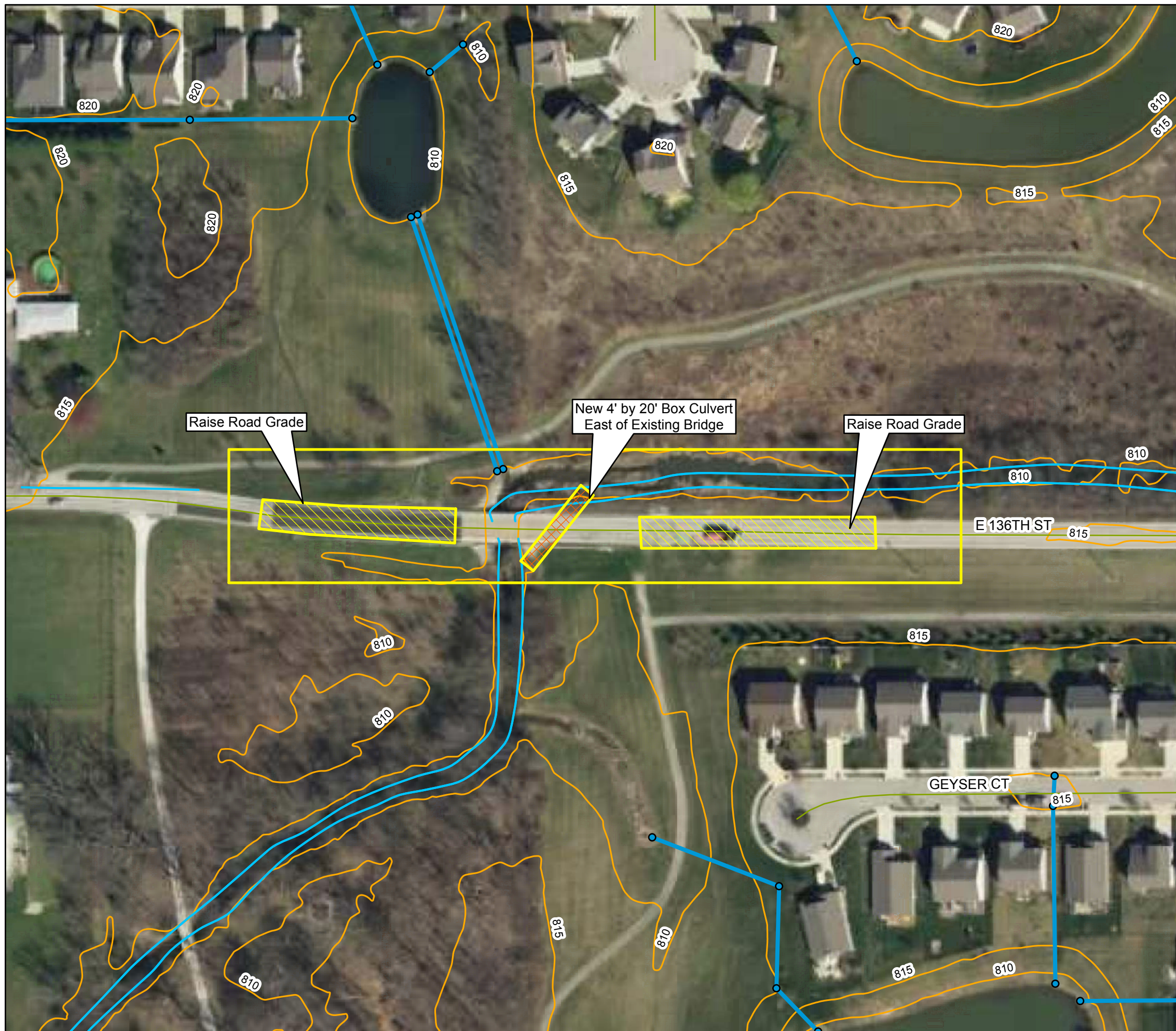
**Aerial Map
106th St between Sherborne Rd
and Hague Rd
High Water**

**CITY OF FISHERS
STORMWATER MASTERPLAN**

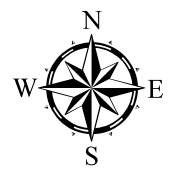


Date: October 2018
 Produced By: DLZ Indiana, LLC
 Data Source: Hamilton County, IN
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136th Street West of Marilyn Road at Sand Creek Flooding Improvements



- Legend**
- Road Centerline
 - Hamilton County Drainage Structures
 - Storm Structures
 - Storm Pipe
 - Sanitary Manholes
 - Sanitary Sewers
 - Rivers / Streams / Ponds
 - Project Limits
 - Major Contour
 - ▨ Raise Road Grade
 - ▨ New Box Culvert



1 inch = 100 feet

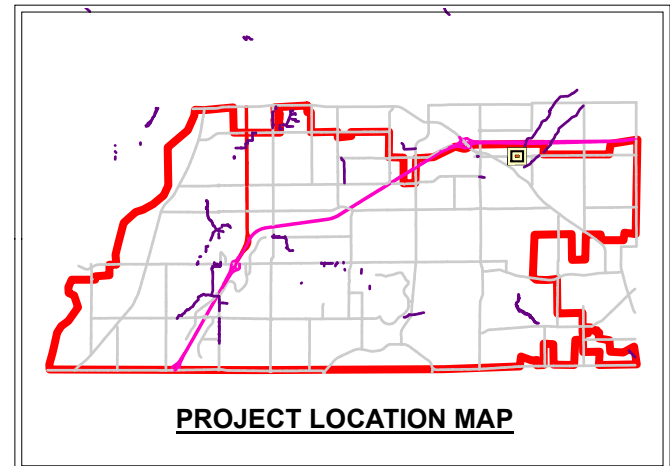
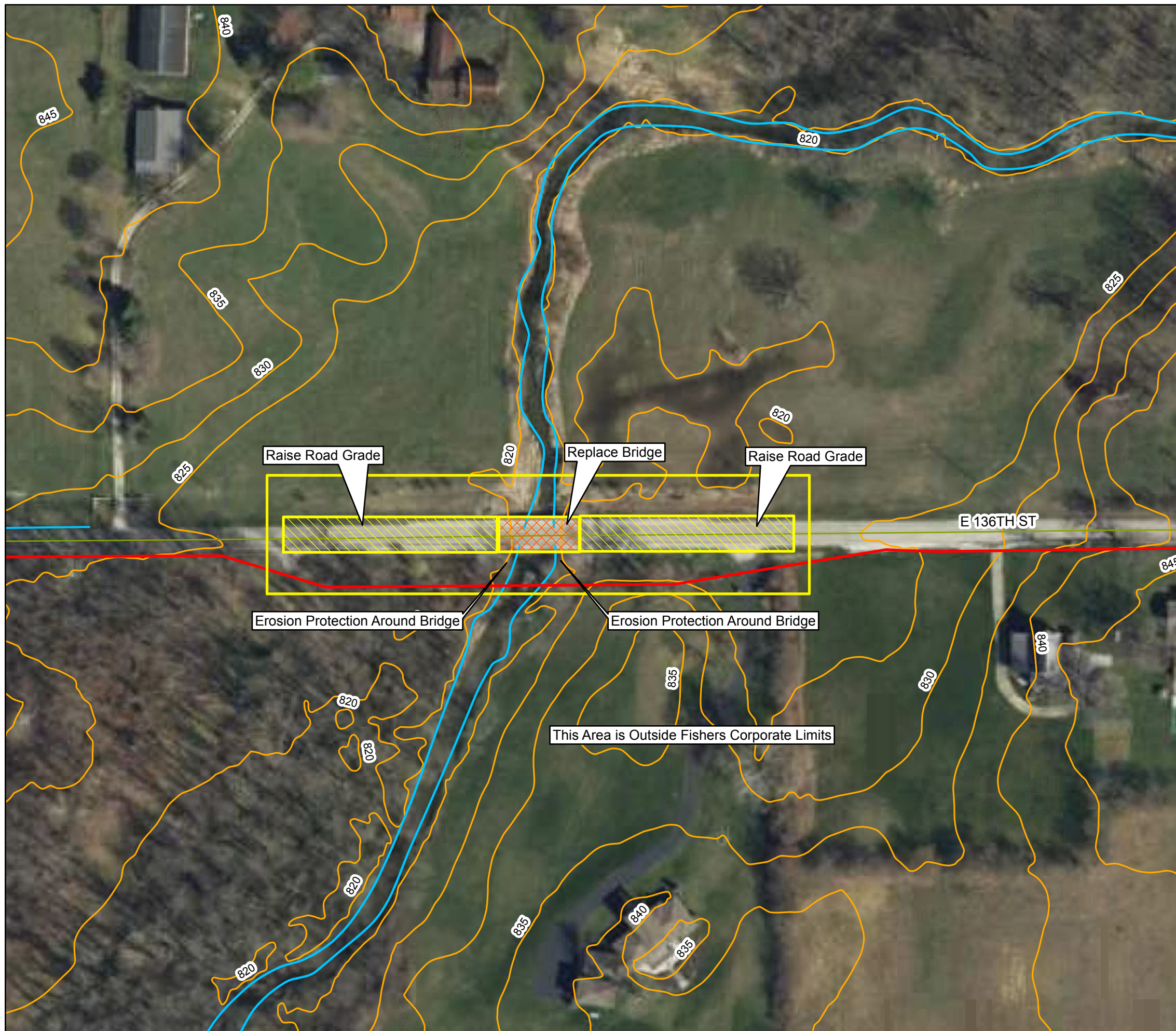
**Aerial Map
136th St West of Marilyn Rd at Sand Creek
Flooding Improvements**

**CITY OF FISHERS
STORMWATER MASTERPLAN**



Date: October 2018
 Produced By: DLZ Indiana, LLC
 Data Source: Hamilton County, IN
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136th Street West of Prairie Baptist Road at Mud Creek



- Legend**
- Fishers Corporate Limits
 - Road Centerline
 - Hamilton County Drainage Structures
 - Storm Structures
 - Storm Pipe
 - Sanitary Manholes
 - Sanitary Sewers
 - Hamilton County Regulated Drains Waterways
 - Rivers / Streams / Ponds
 - Project Limits
 - Major Contour
 - Raise Road Grade
 - Replace Bridge

1 inch = 100 feet

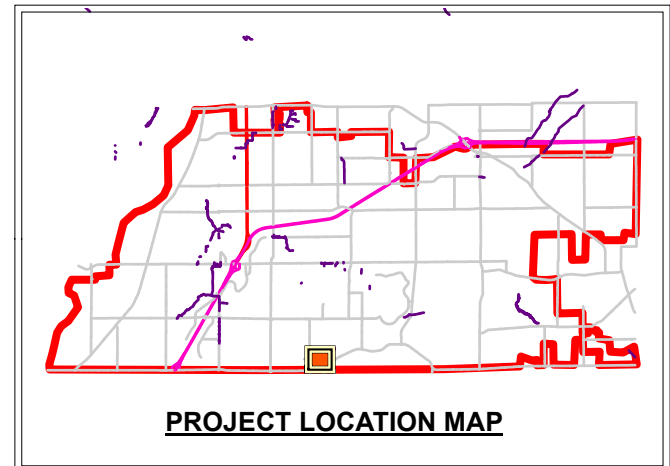
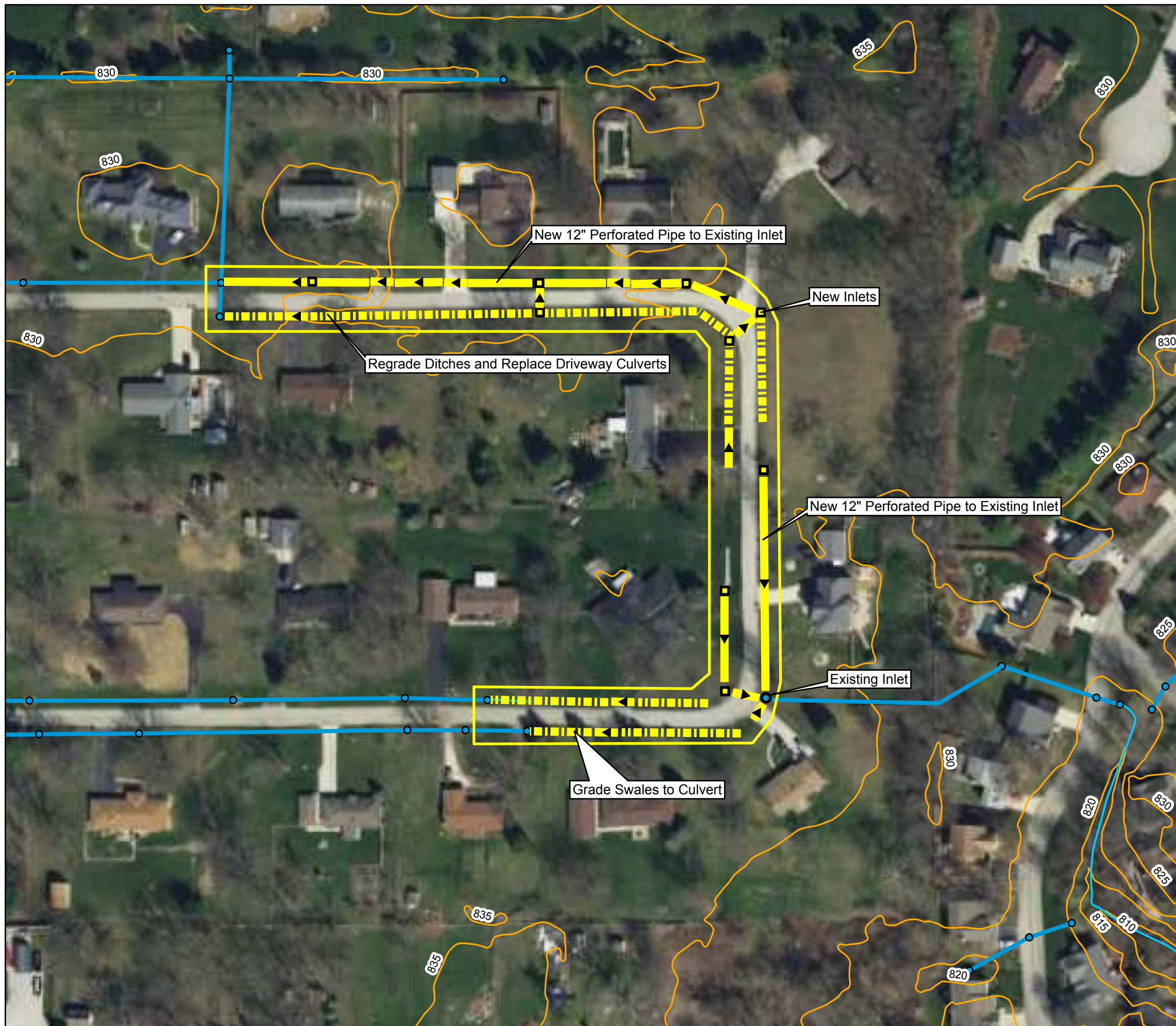
**Aerial Map
136th St West of Prairie Baptist at Mud Creek
Bridge Replacement**

**CITY OF FISHERS
STORMWATER MASTERPLAN**

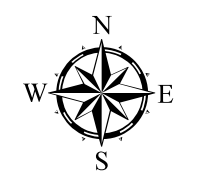


Date: October 2018
 Produced By: DLZ Indiana, LLC
 Data Source: Hamilton County, IN
 This map does not represent a legal document. It is intended to serve as a graphical aid only. Information shown on this map is not warranted for accuracy or merchantability.

97th and 98th Street Drainage Improvements



- Legend**
- Storm Drains
 - Storm Sewers
 - PS Sanitary Lift Stations
 - Sanitary Manholes
 - Sanitary Sewers
 - Rivers / Streams / Ponds
- Project Areas**
- ▬▬▬ Adjacent Project Limits
 - ▬▬▬ Project Limits
 - Major Contours
 - ▬▬▬ New Culvert Pipes
 - ▬▬▬ Regrade Ditches and Swales
 - ▬▬▬ New Inlet Structures



1 inch = 100 feet

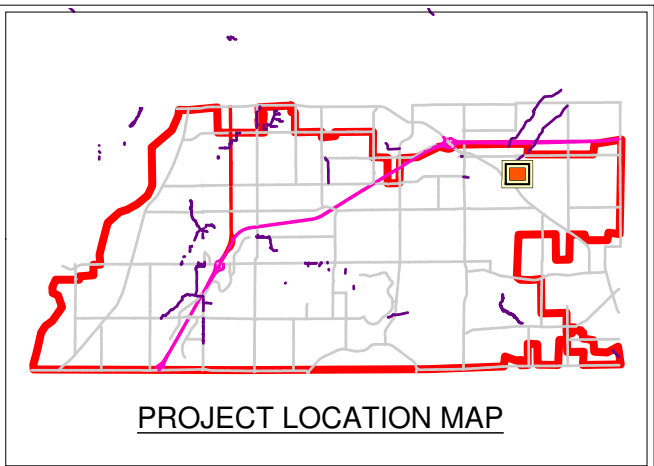
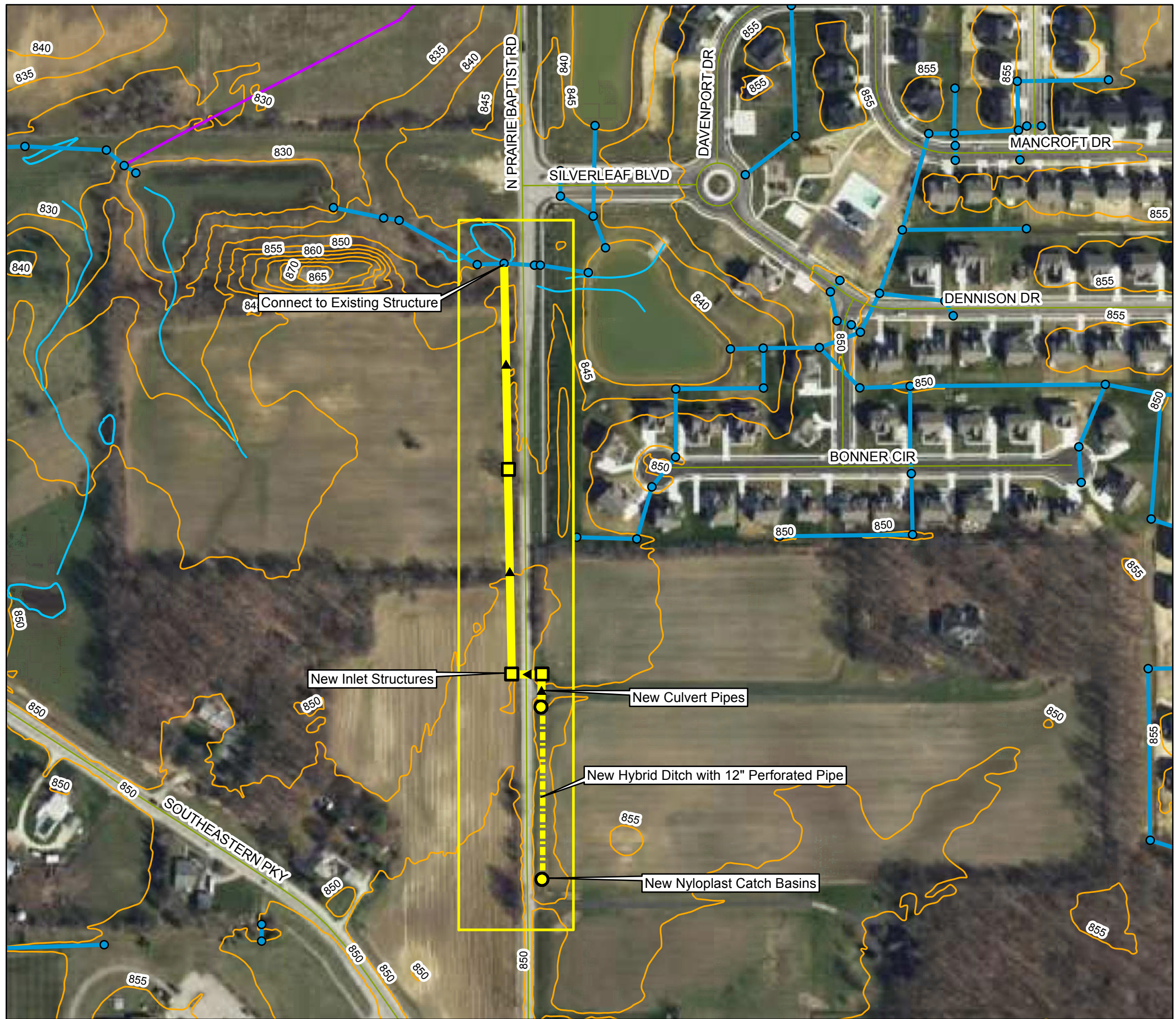
**Aerial Map
97th and 98th St
Drainage Improvements**

**CITY OF FISHERS
STORMWATER MASTERPLAN**



Date: October 2018
 Produced By: DLZ Indiana, LLC
 Data Source: Hamilton County, IN
 This map does not represent a legal document. It is intended to serve as a graphical aid only. Information shown on this map is not warranted for accuracy or merchantability.

Prairie Baptist South of Silverleaf Boulevard Drainage Improvements



- Legend**
- Road Centerline
 - Hamilton County Drainage Structures
 - Storm Structures
 - Storm Pipe
 - Sanitary Manholes
 - Sanitary Sewers
 - Hamilton County Regulated Drains
 - Rivers / Streams / Ponds
 - ▭ Project Limits
 - Major Contour
 - ▬ New Culvert Pipe
 - ▬ New Hybrid Ditch with 12" Perforated Pipe
 - New Nyloplast Catch Basin
 - ▭ New Inlet Structure

1 inch = 200 feet



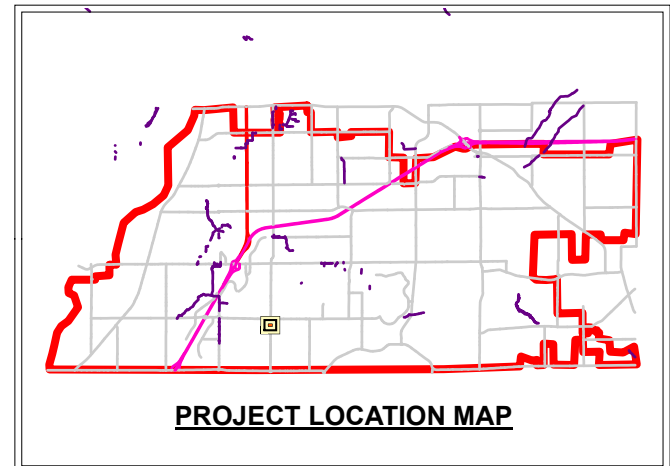
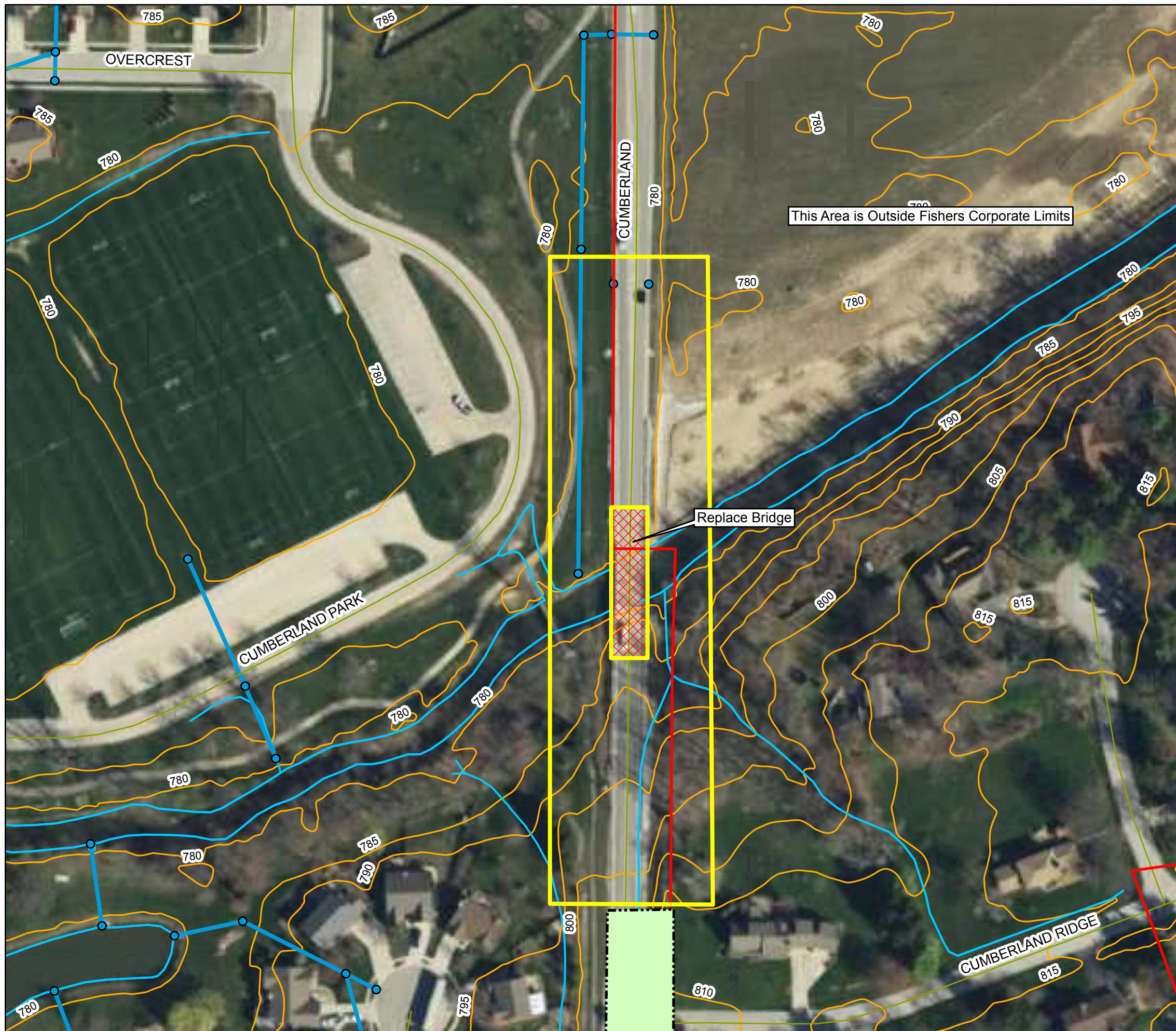
**Aerial Map
Prairie Baptist Rd South of Silverleaf Blvd
Drainage Improvements**

**CITY OF FISHERS
STORMWATER MASTERPLAN**



Date: October 2018
 Produced By: DLZ Indiana, LLC
 Data Source: Hamilton County, IN
 This map does not represent a legal document. It is intended to serve as a graphical aid only. Information shown on this map is not warranted for accuracy or merchantability.

Cumberland Road and 106th Street Bridge Replacement



- Legend**
- Fishers Corporate Limits
 - Road Centerline
 - Hamilton County Drainage Structures
 - Storm Structures
 - Storm Sewers
 - Sanitary Manholes
 - Sanitary Sewers
 - Hamilton County Regulated Drains
 - Rivers / Streams / Ponds
- Project Areas**
- Adjacent Project Limits
 - Project Limits
 - Major Contours Delaware Township
 - Major Contours Fall Creek Township
 - Replace Bridge

1 inch = 100 feet

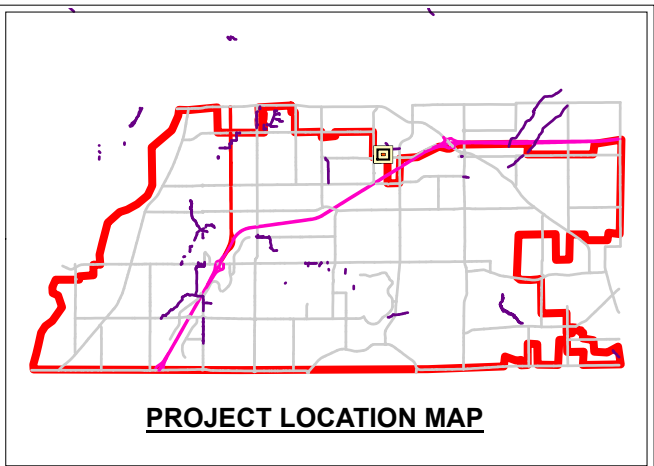
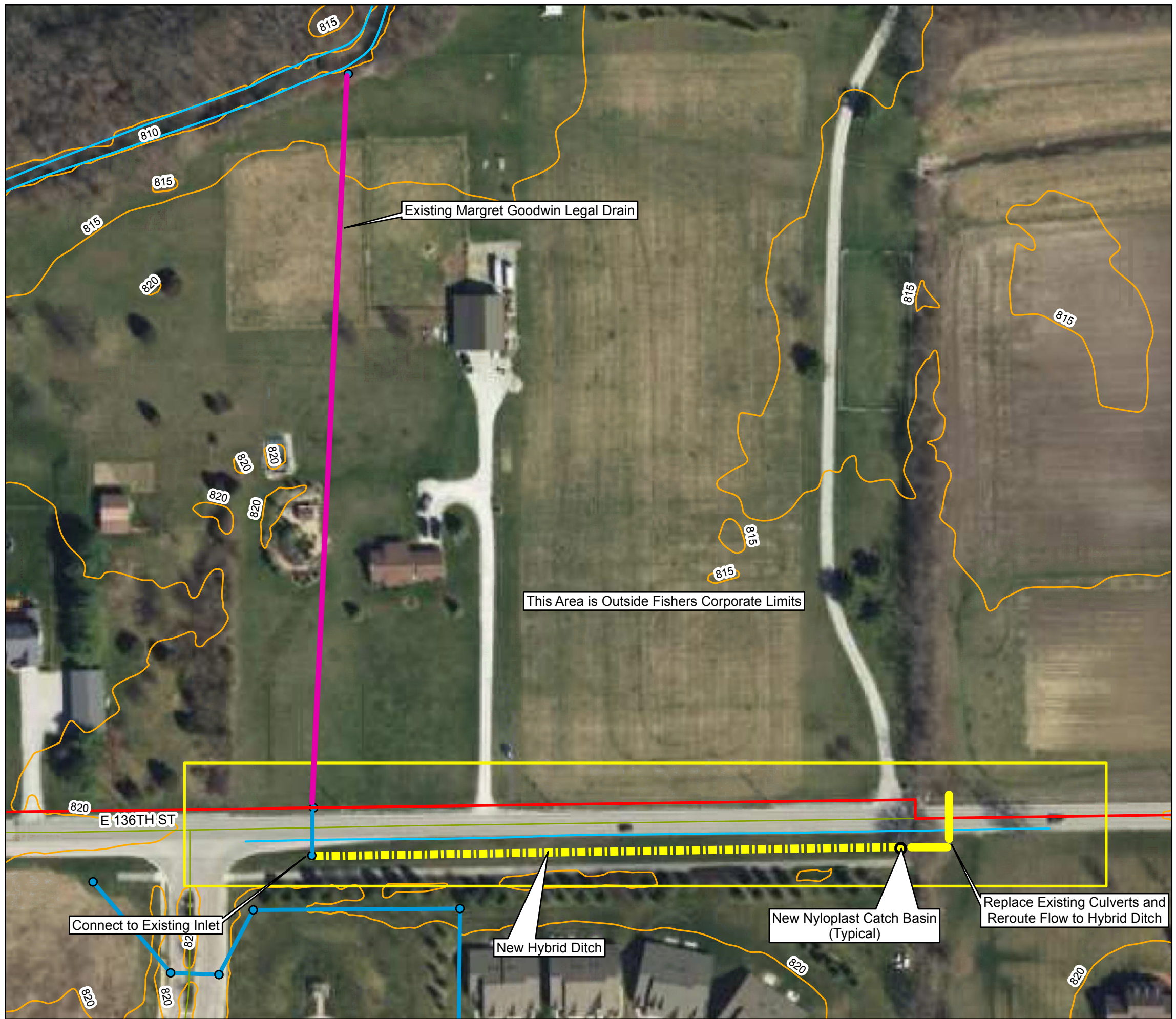
**Aerial Map
Cumberland Road / 106th Street
Bridge Replacement**

**CITY OF FISHERS
STORMWATER MASTERPLAN**



Date: October 2018
 Produced By: DLZ Indiana, LLC
 Data Source: Hamilton County, IN
 This map does not represent a legal document. It is intended to serve as a graphical aid only. Information shown on this map is not warranted for accuracy or merchantability.

136th Street Culvert Improvements at Limestone Springs



- Legend**
- Fishers Corporate Limits
 - Road Centerline
 - Hamilton County Drainage Structures
 - Storm Structures
 - Storm Pipe
 - Sanitary Manholes
 - Sanitary Sewers
 - Hamilton County Regulated Drains Waterways
 - Rivers / Streams / Ponds
 - Project Limits
 - Major Contour
 - Replace Culvert
 - New Hybrid Ditch
 - New Catch Basin

1 inch = 100 feet



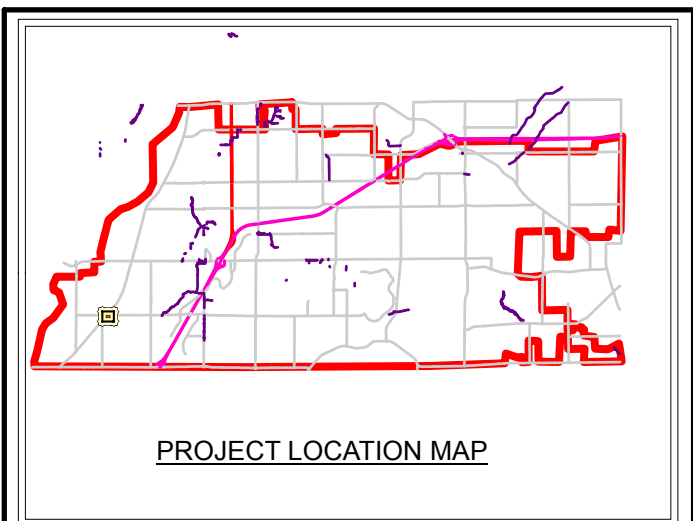
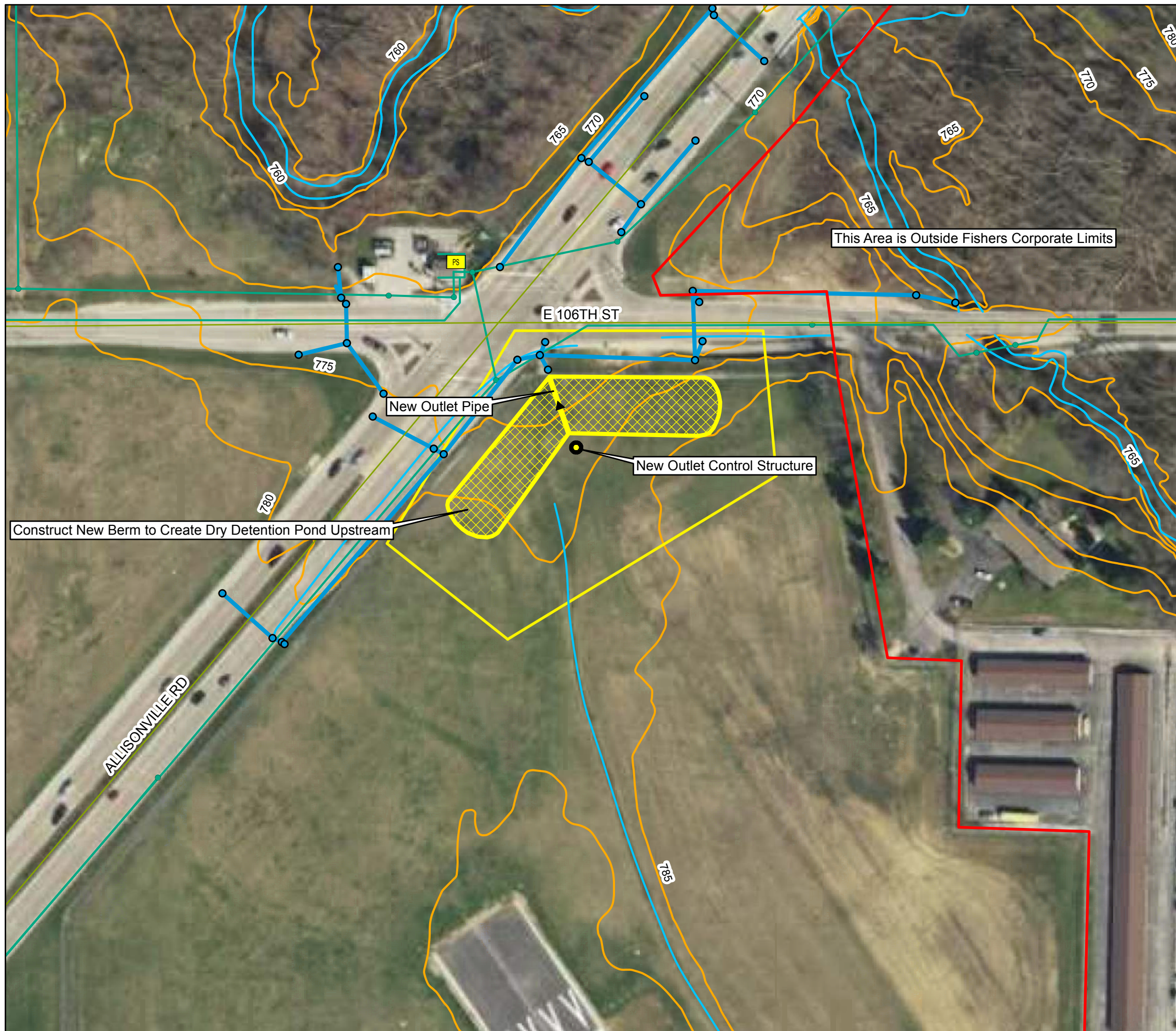
**Aerial Map
136th St at Limestone Springs
Culvert Replacement and
Hybrid Ditch**

**CITY OF FISHERS
STORMWATER MASTERPLAN**



Date: October 2018
 Produced By: DLZ Indiana, LLC
 Data Source: Hamilton County, IN
 This map does not represent a legal document. It is intended to serve as a graphical aid only. Information shown on this map is not warranted for accuracy or merchantability.

Airport Property Drainage at Allisonville Road and 106th Street



Legend

- Fishers Corporate Limits
- Road Centerline
- Hamilton County Drainage Structures
- Storm Drains
- Storm Pipe
- PS Sanitary Lift Stations
- Sanitary Structures
- Sanitary_Pipe
- Rivers / Streams / Ponds
- Project Limits
- Major Contour



1 inch = 100 feet

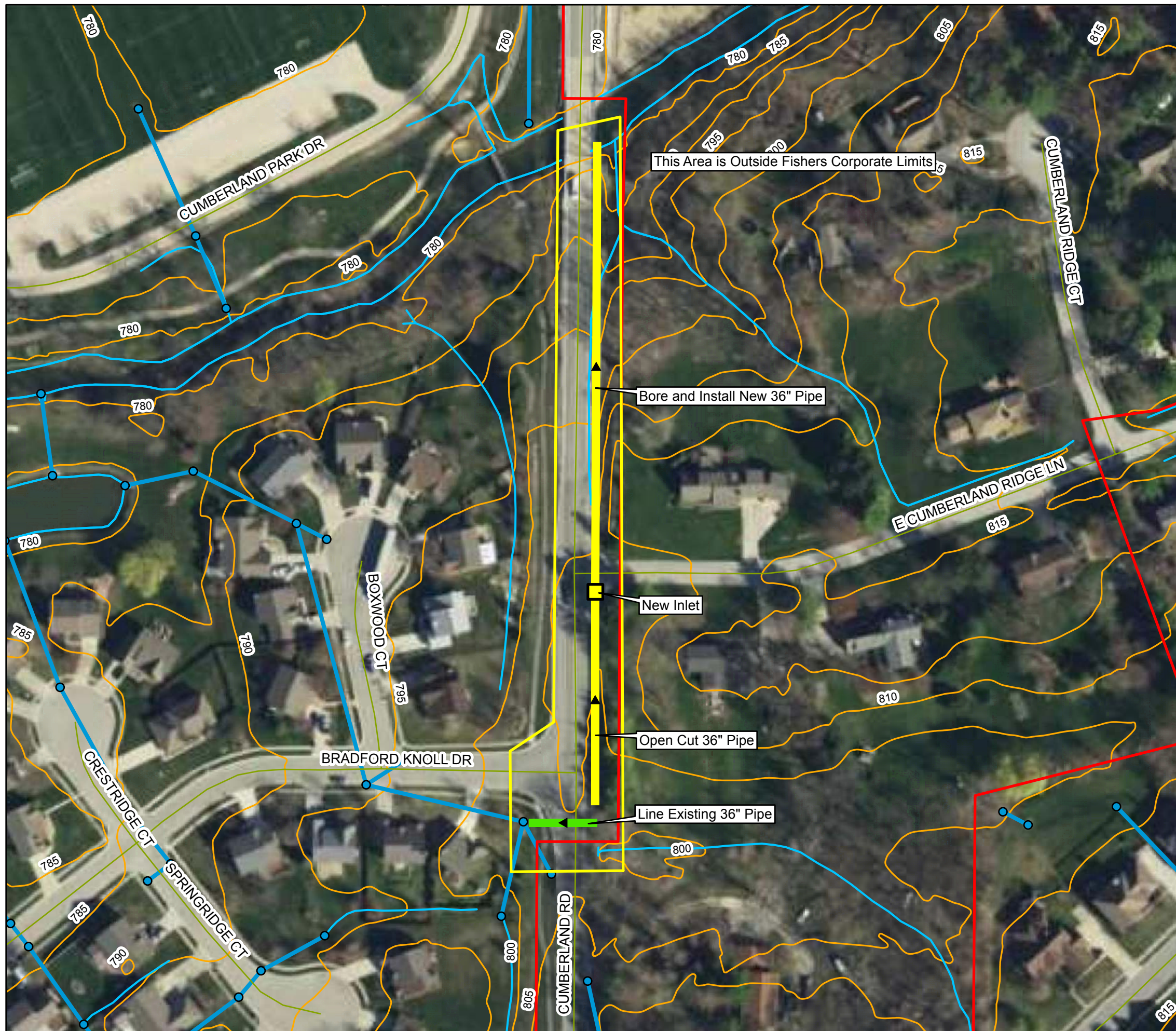
**Aerial Map
Airport Property Drainage
at Allisonville Rd and 106th St**

**CITY OF FISHERS
STORMWATER MASTERPLAN**



Date: October 2018
 Produced By: DLZ Indiana, LLC
 Data Source: Hamilton County, IN
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10307 Cumberland Road Storm Sewer Upgrade in Bradford Knoll



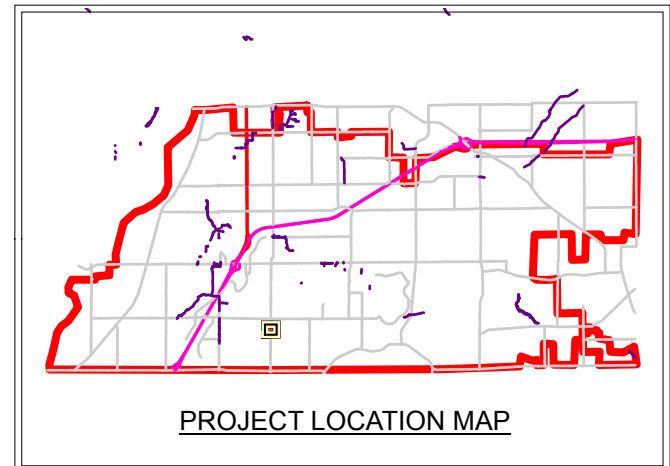
This Area is Outside Fishers Corporate Limits

Bore and Install New 36" Pipe

New Inlet

Open Cut 36" Pipe

Line Existing 36" Pipe



- Legend**
- Fishers Corporate Limits
 - Road Centerline
 - Storm Structures
 - Storm Sewers
 - PS Sanitary Lift Stations
 - Sanitary Manholes
 - Sanitary Sewers
 - Hamilton County Regulated Drains
 - Rivers / Streams / Ponds
 - Major Contours Delaware Township
 - Major Contours Fall Creek Township
 - Project Limits
 - New Inlet
 - New 36" Pipe
 - Line Existing 36" Pipe



1 inch = 100 feet

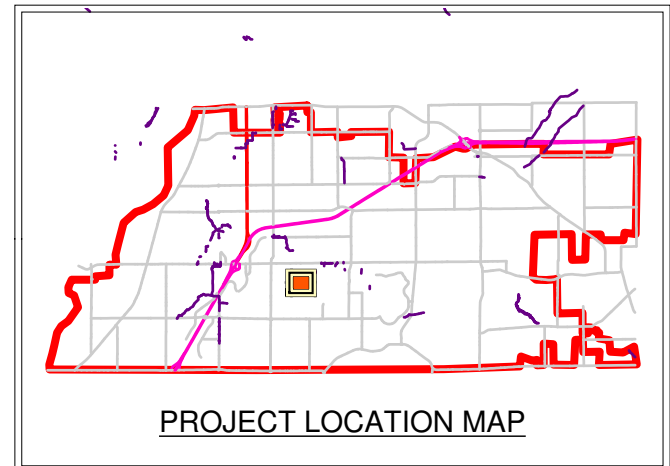
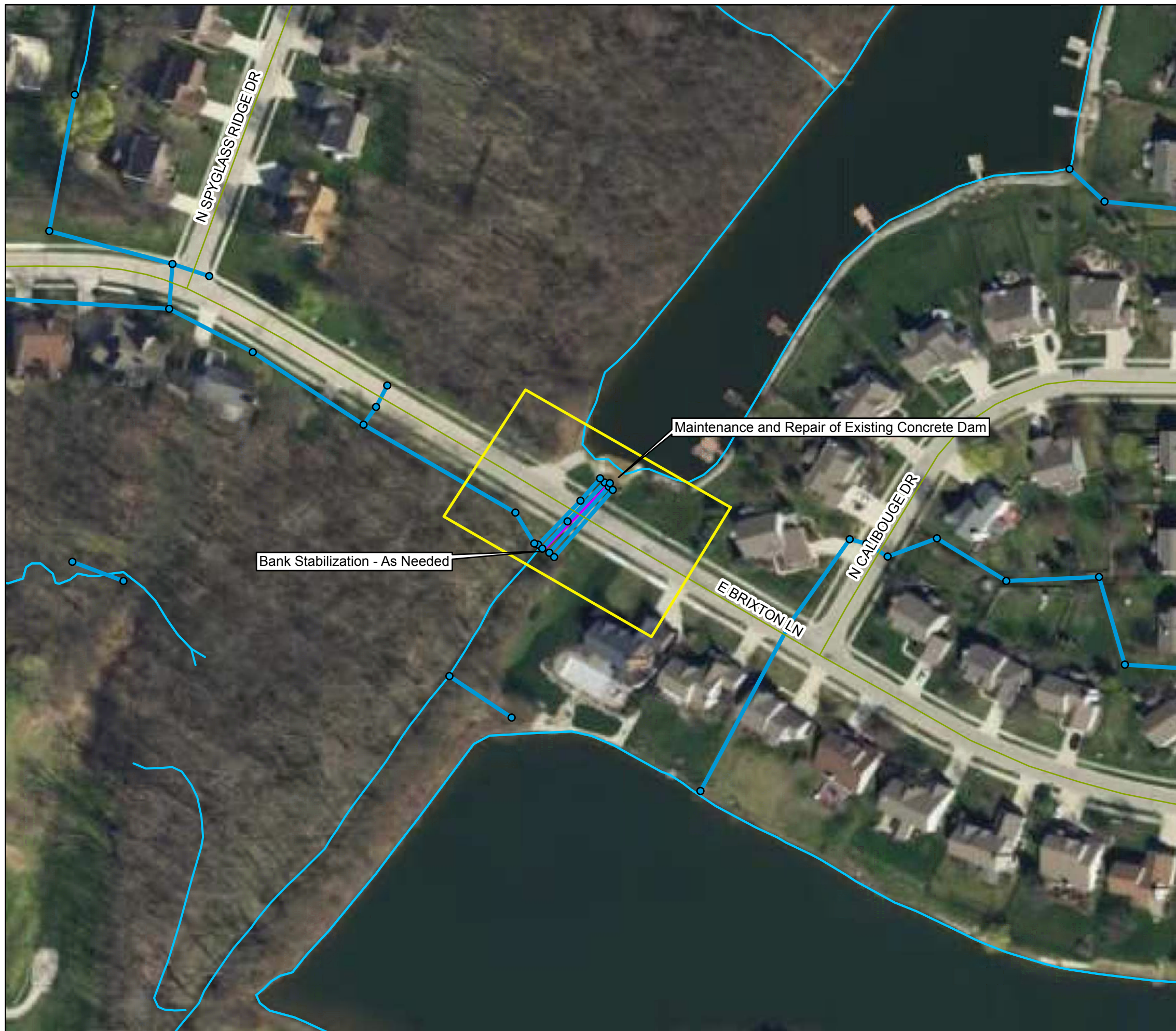
Aerial Map
10307 Cumberland Rd
Storm Sewer Upgrades in Bradford Knoll

CITY OF FISHERS
STORMWATER MASTERPLAN



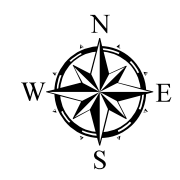
Date: October 2018
 Produced By: DLZ Indiana, LLC
 Data Source: Hamilton County, IN
 This map does not represent a legal document. It is intended to serve as a graphical aid only. Information shown on this map is not warranted for accuracy or merchantability.

Lake Stonebridge Dam Overtopping



Legend

- Road Centerline
- Hamilton County Drainage Structures
- Storm Structures
- Storm Sewer
- Sanitary Manhole
- Sanitary Sewers
- Hamilton County Regulated Drains
- Rivers / Streams / Ponds
- Project Limits



1 inch = 100 feet

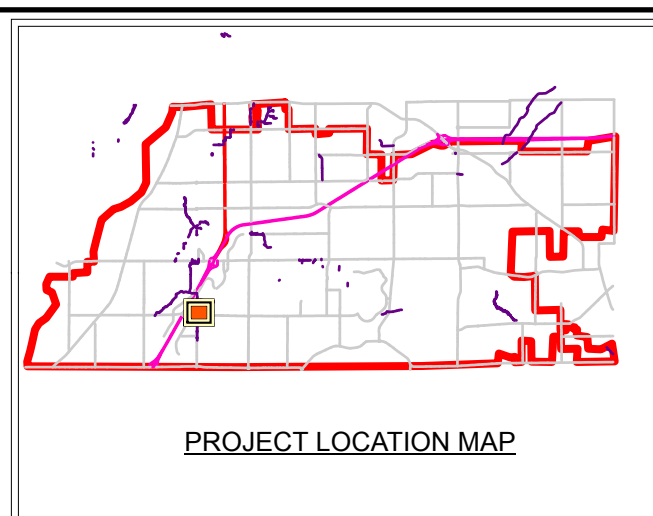
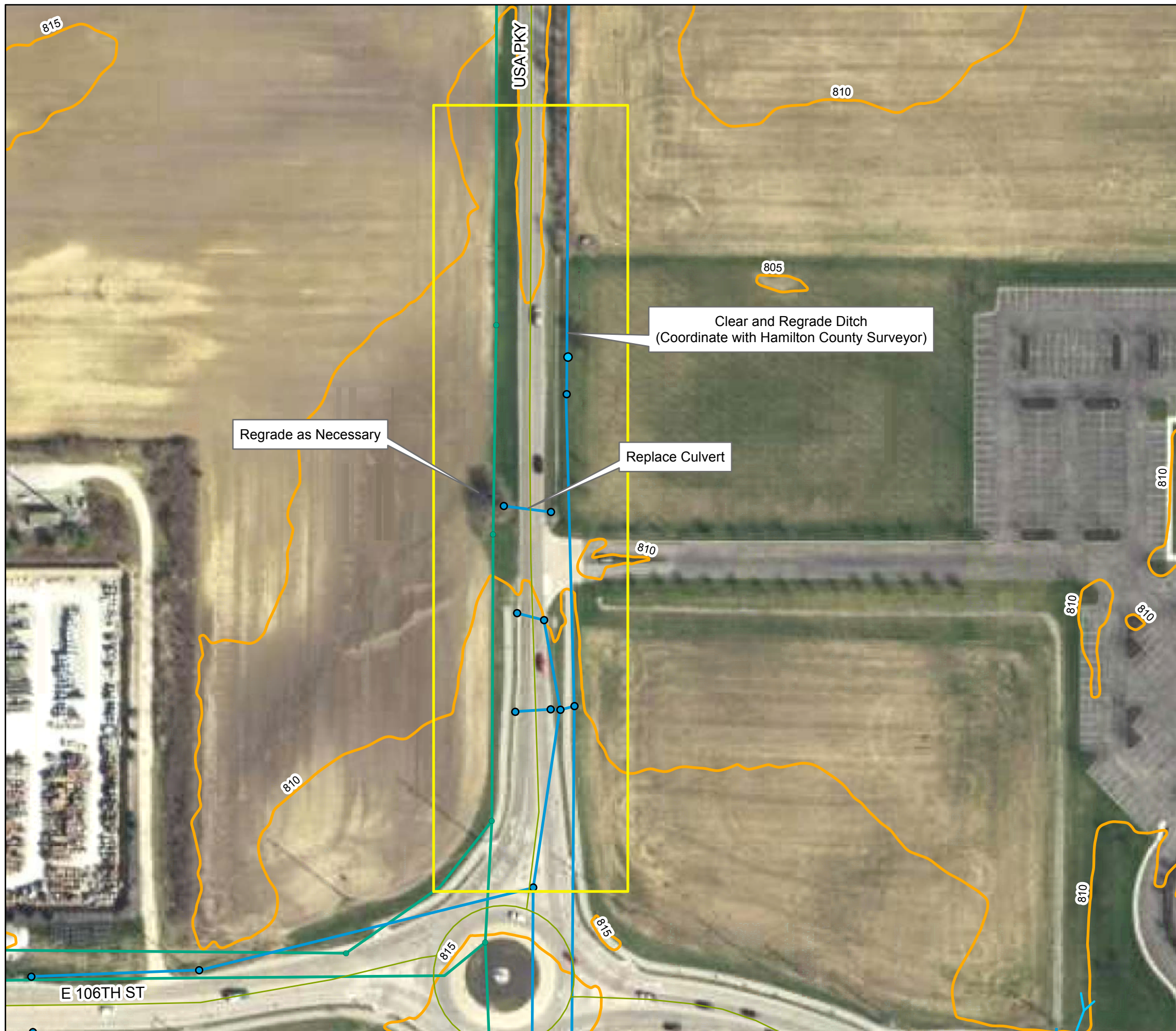
**Aerial Map
Lake Stonebridge
Dam Overtopping**

**CITY OF FISHERS
STORMWATER MASTERPLAN**



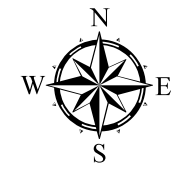
Date: October 2018
 Produced By: DLZ Indiana, LLC
 Data Source: Hamilton County, IN
 This map does not represent a legal document. It is intended to serve as a graphical aid only. Information shown on this map is not warranted for accuracy or merchantability.

Lantern Road and USA Parkway Drainage Improvements



Legend

- Roads
 - Hamilton County Structures
 - Storm Structures
 - Storm Sewers
 - Sanitary Manholes
 - Sanitary Sewers
 - Rivers / Streams / Ponds
- Project Areas**
- ▬▬▬▬▬▬ Adjacent Project Limits
 - ▭ Project Limits
 - Major Contour



1 inch = 100 feet

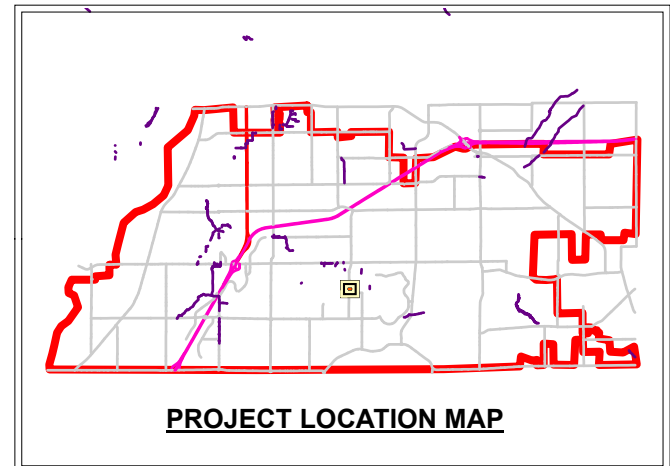
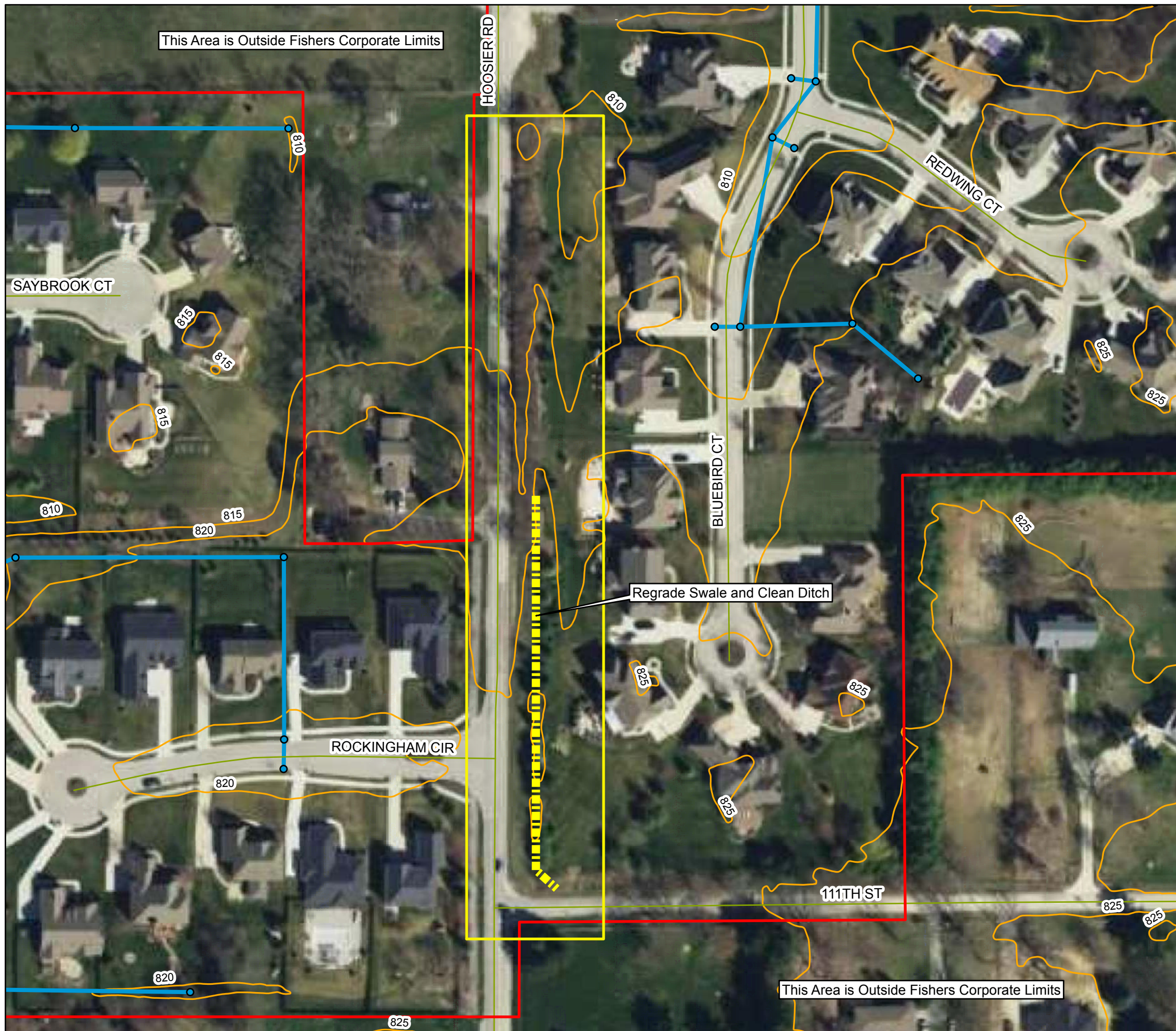
Aerial Map
Lantern Road and USA Pkwy
Drainage Improvements

CITY OF FISHERS
STORMWATER MASTERPLAN

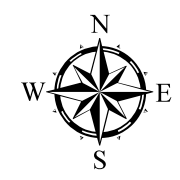


Date: October 2018
 Produced By: DLZ Indiana, LLC
 Data Source: Hamilton County, IN
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Hoosier Road South of S-Curve Cemetery Ditch Improvements



- Legend**
- ▬ Fishers Corporate Limits
 - ▬ Road Centerline
 - Hamilton County Drainage Structures
 - Storm Structures
 - ▬ Storm Sewer
 - Sanitary Manhole
 - ▬ Sanitary Sewers
 - ▬ Hamilton County Regulated Drains
 - ▬ Rivers / Streams / Ponds
 - ▬ Project Limits
 - ▬ Major Contour
 - ▬▬▬ Regrade Swale and Clean Ditch



1 inch = 100 feet

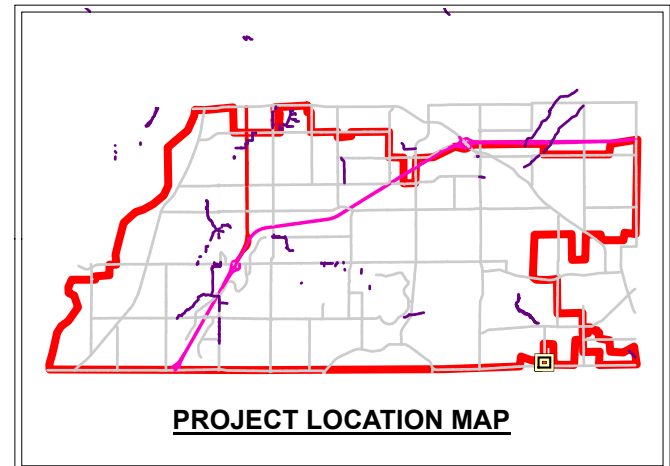
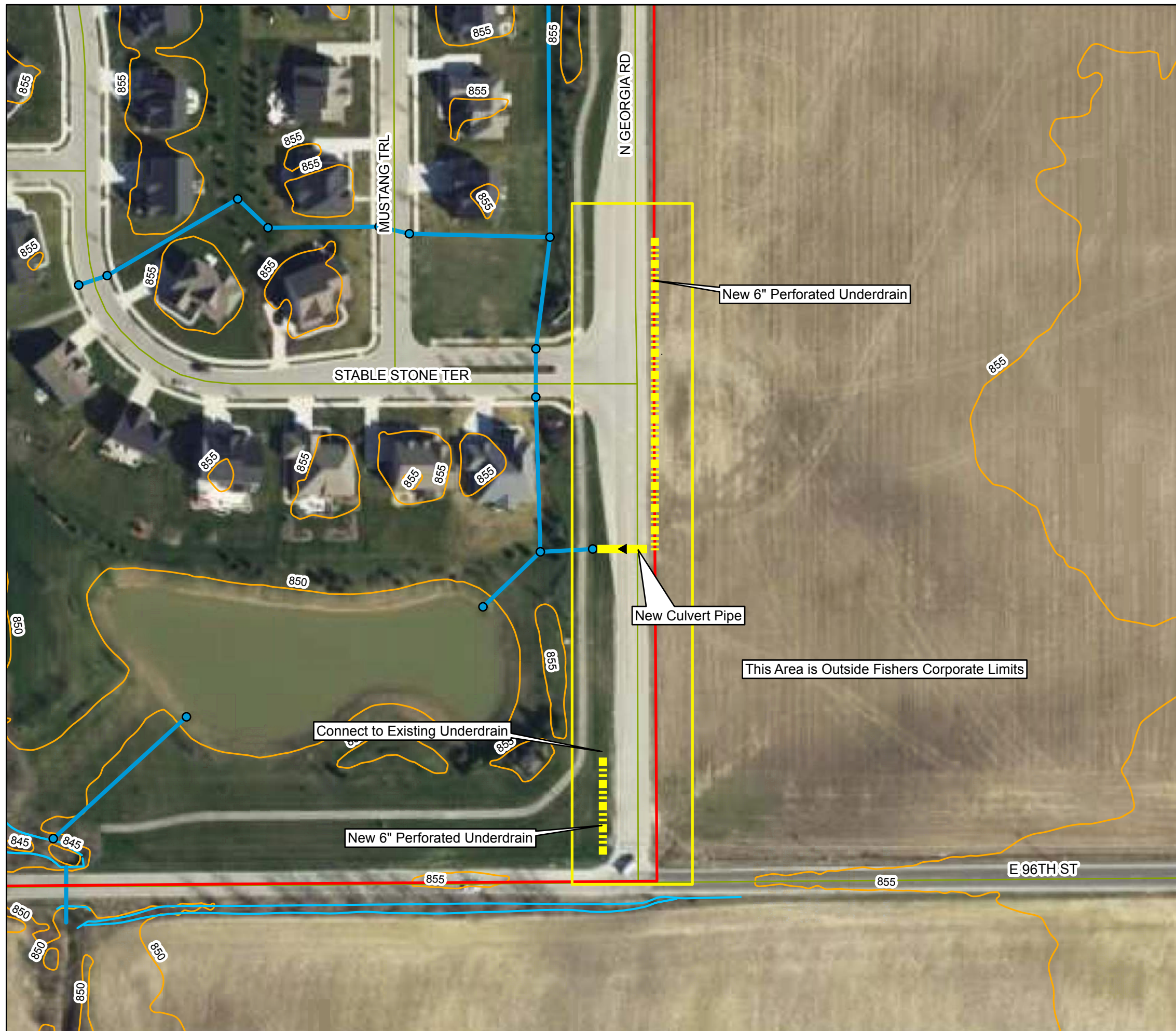
**Aerial Map
Hoosier Rd South of the S-Curve / Cemetery
Ditch Improvements**

**CITY OF FISHERS
STORMWATER MASTERPLAN**



Date: October 2018
 Produced By: DLZ Indiana, LLC
 Data Source: Hamilton County, IN
 This map does not represent a legal document. It is intended to serve as a graphical aid only. Information shown on this map is not warranted for accuracy or merchantability.

Georgia Road North of 96th Street Drainage Improvements



- Legend**
- Fishers Corporate Limits
 - Road Centerline
 - Hamilton County Drainage Structures
 - Storm Structures
 - Storm Pipe
 - Sanitary Manholes
 - Sanitary Sewers
 - Hamilton County Regulated Drains
 - Rivers / Streams / Ponds
 - Project Limits
 - Major Contour
 - ▶ New Culvert Pipe
 - New 6" Perforated Underdrain

1 inch = 100 feet



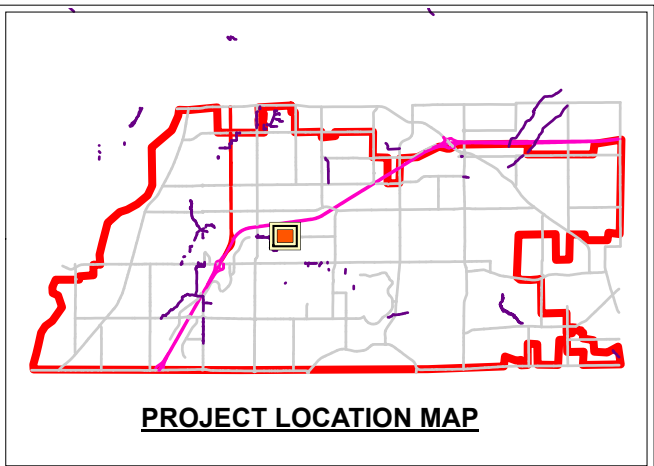
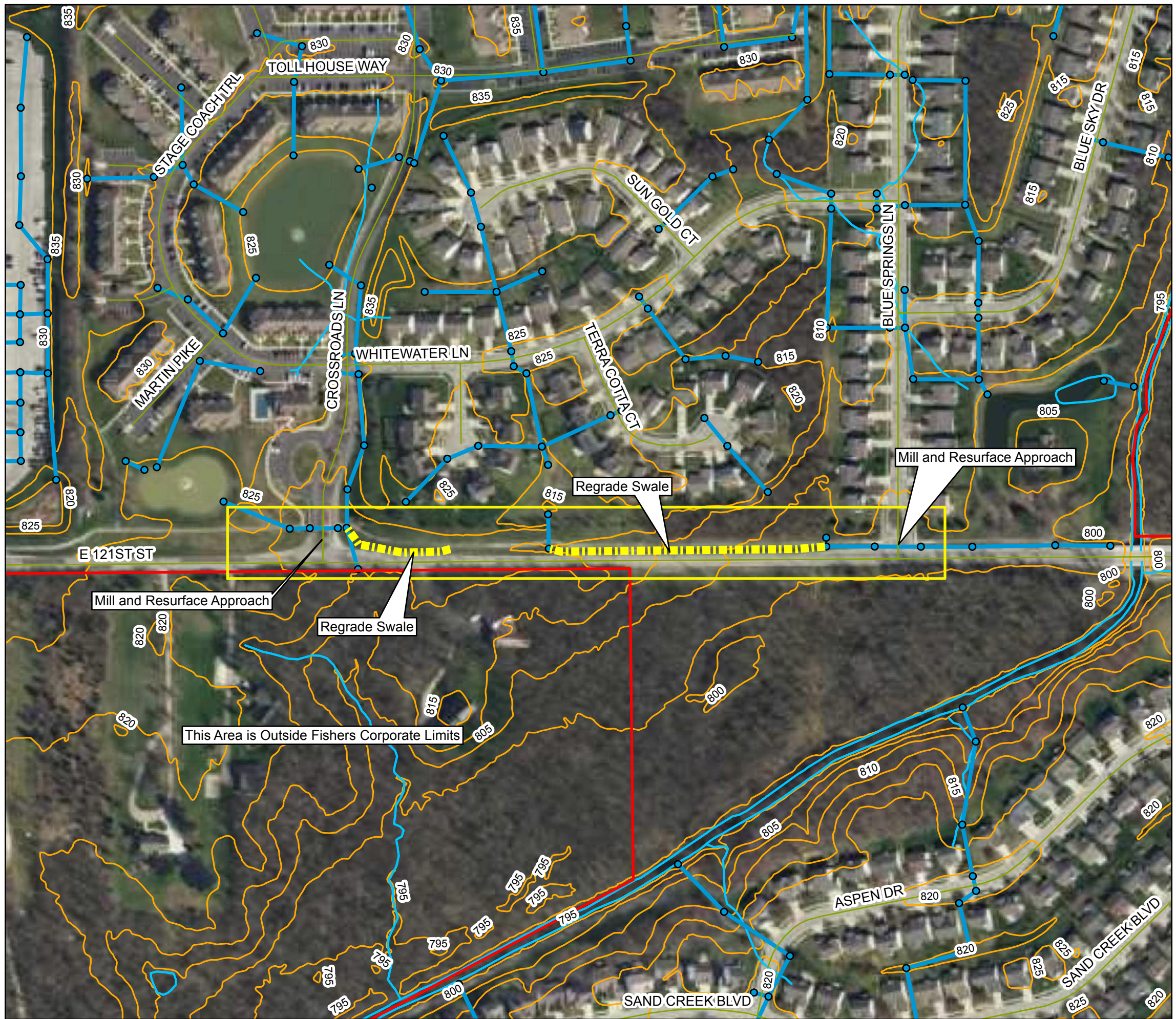
**Aerial Map
Georgia Rd North of 96th St
Drainage Improvements**

**CITY OF FISHERS
STORMWATER MASTERPLAN**



Date: October 2018
 Produced By: DLZ Indiana, LLC
 Data Source: Hamilton County, IN
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121st Street Between Cross Road Lane and Blue Springs Lane



- Legend**
- Fishers Corporate Limits
 - Road Centerline
 - Storm Structures
 - Storm Sewers
 - PS Sanitary Lift Stations
 - Sanitary Manholes
 - Sanitary Sewers
 - Rivers / Streams / Ponds
- Project Areas**
- Adjacent Project Limits
 - Project Limits
 - Major Contours Fall Creek Township
 - Major Contours Delaware Township
 - Regrade Swale



1 inch = 200 feet

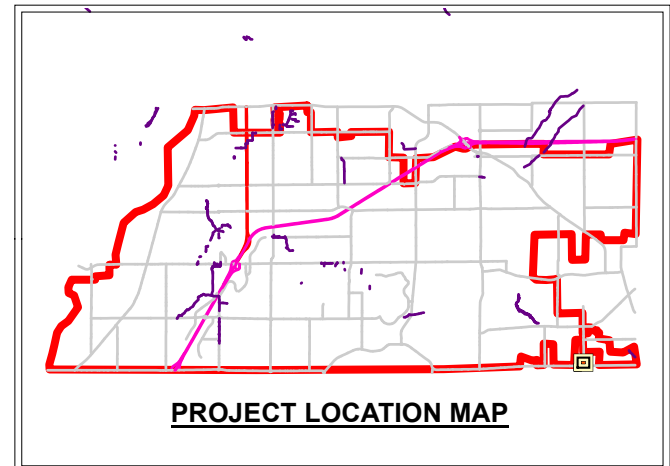
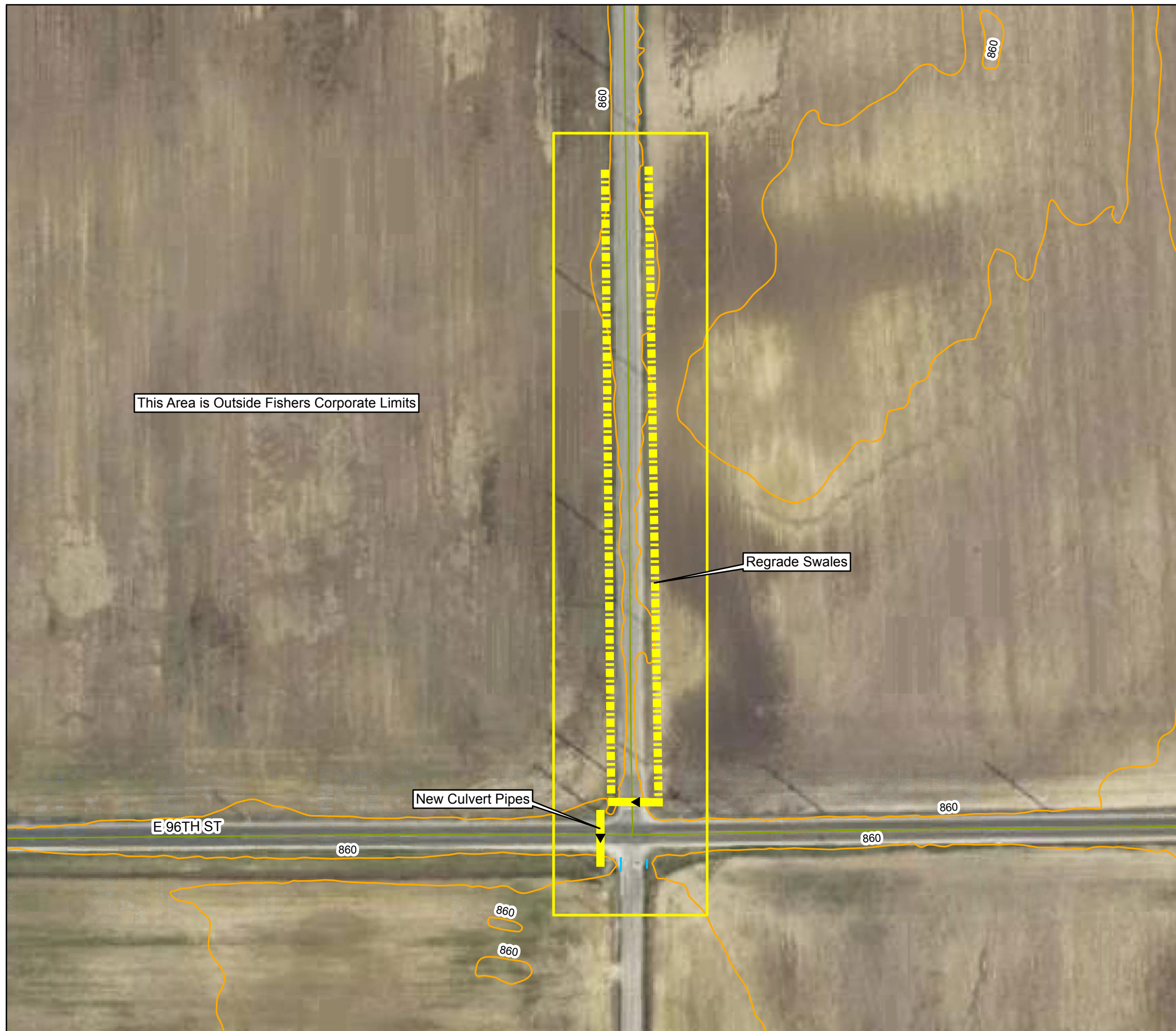
**Aerial Map
121st St between
Cross Road Ln and
Blue Springs Ln
High Water**

**CITY OF FISHERS
STORMWATER MASTERPLAN**



Date: October 2018
 Produced By: DLZ Indiana, LLC
 Data Source: Hamilton County, IN
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96th Street and Cyntheanne Road Drainage Improvements



- Legend**
- ▬ Fishers Corporate Limits
 - ▬ Road Centerline
 - Hamilton County Drainage Structures
 - Storm Structures
 - ▬ Storm Pipe
 - Sanitary Manholes
 - ▬ Sanitary Sewers
 - ▬ Hamilton County Regulated Drains
 - ▬ Rivers / Streams / Ponds
 - Project Limits
 - Major Contour
 - New Culvert Pipe
 - Regrade Swale

1 inch = 100 feet



**Aerial Map
96th St and Cyntheanne Rd
Drainage Improvements**

**CITY OF FISHERS
STORMWATER MASTERPLAN**



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 Data Source: Hamilton County, IN
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Appendix F

Dual Purpose Facilities

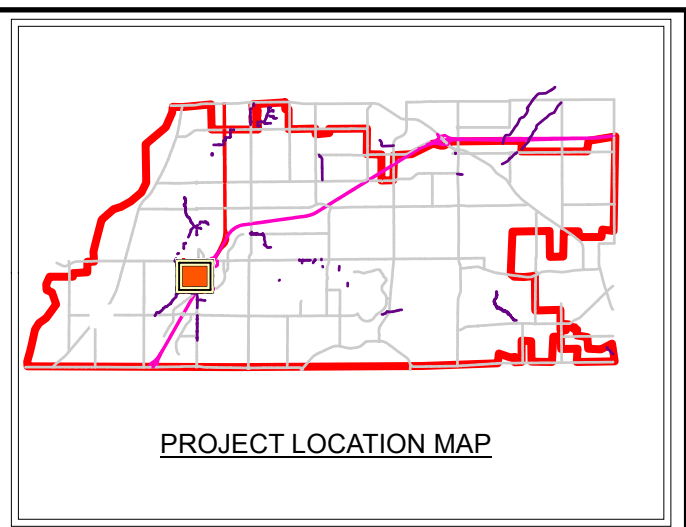
Downtown Redevelopment – Village Center



Possible Underground Detention System
 - Discharge to Regulated Drain
 - Location of system under roads and parking lots to be determined by development layout.

**Downtown Redevelopment
 Dual Purpose Facility**

Possible Detention Pond Facility
 - Discharge to Regulated Drain



- Legend**
- Road Centerline
 - Hamilton County Drainage Structures
 - Storm Structures
 - Storm Sewers
 - Sanitary Manholes
 - Sanitary Sewers
 - Hamilton County Regulated Drains
 - Rivers / Streams / Ponds
 - Major Contour
 - Study Limits
 - ▨ Underground Detention
 - ⊗ Detention Pond

1 inch = 300 feet

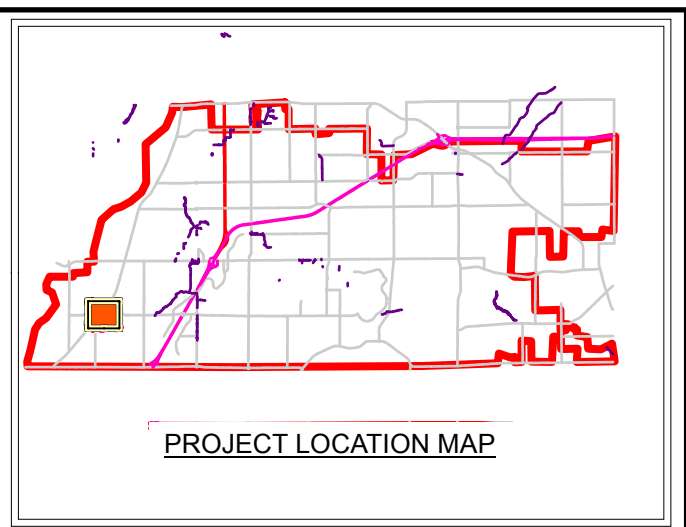
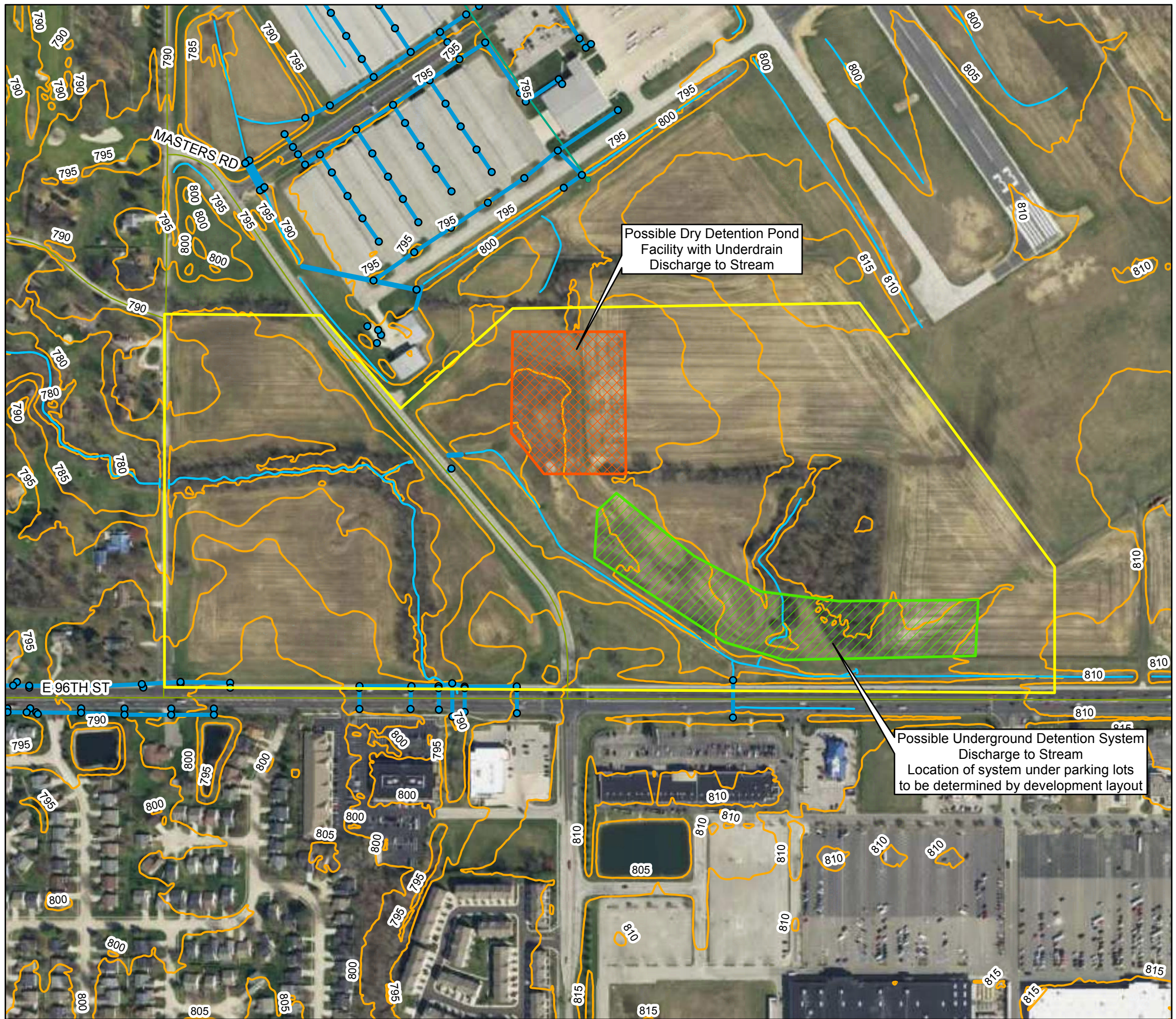
**Proposed Alternative Map
 Downtown Redevelopment
 Dual Purpose Facility**

**CITY OF FISHERS
 STORMWATER MASTERPLAN**



Date: October 2018
 Produced By: DLZ Indiana, LLC
 Data Source: Hamilton County, IN
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Airport Development



- Legend**
- Road Centerline
 - Hamilton County Drainage Structures
 - Storm Structures
 - Storm Sewers
 - Sanitary Manholes
 - Sanitary Sewers
 - Hamilton County Regulated Drains
 - Rivers / Streams / Ponds
 - Major Contour
 - Study Limits
 - ▨ Underground Detention
 - ▨ Dry Detention Pond With Underdrain

1 inch = 300 feet

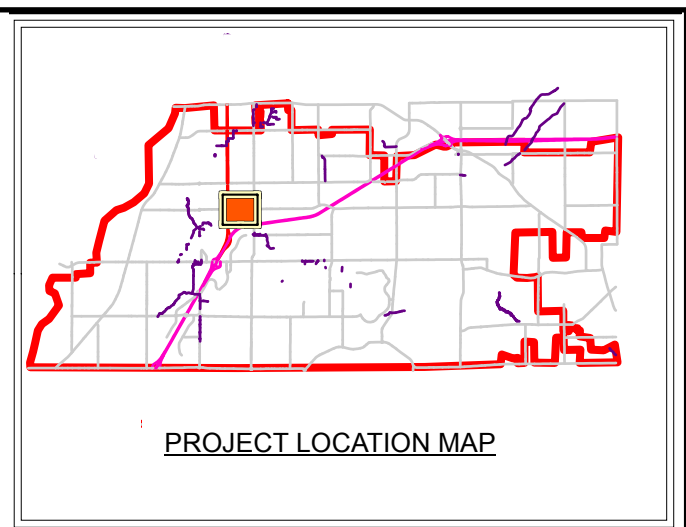
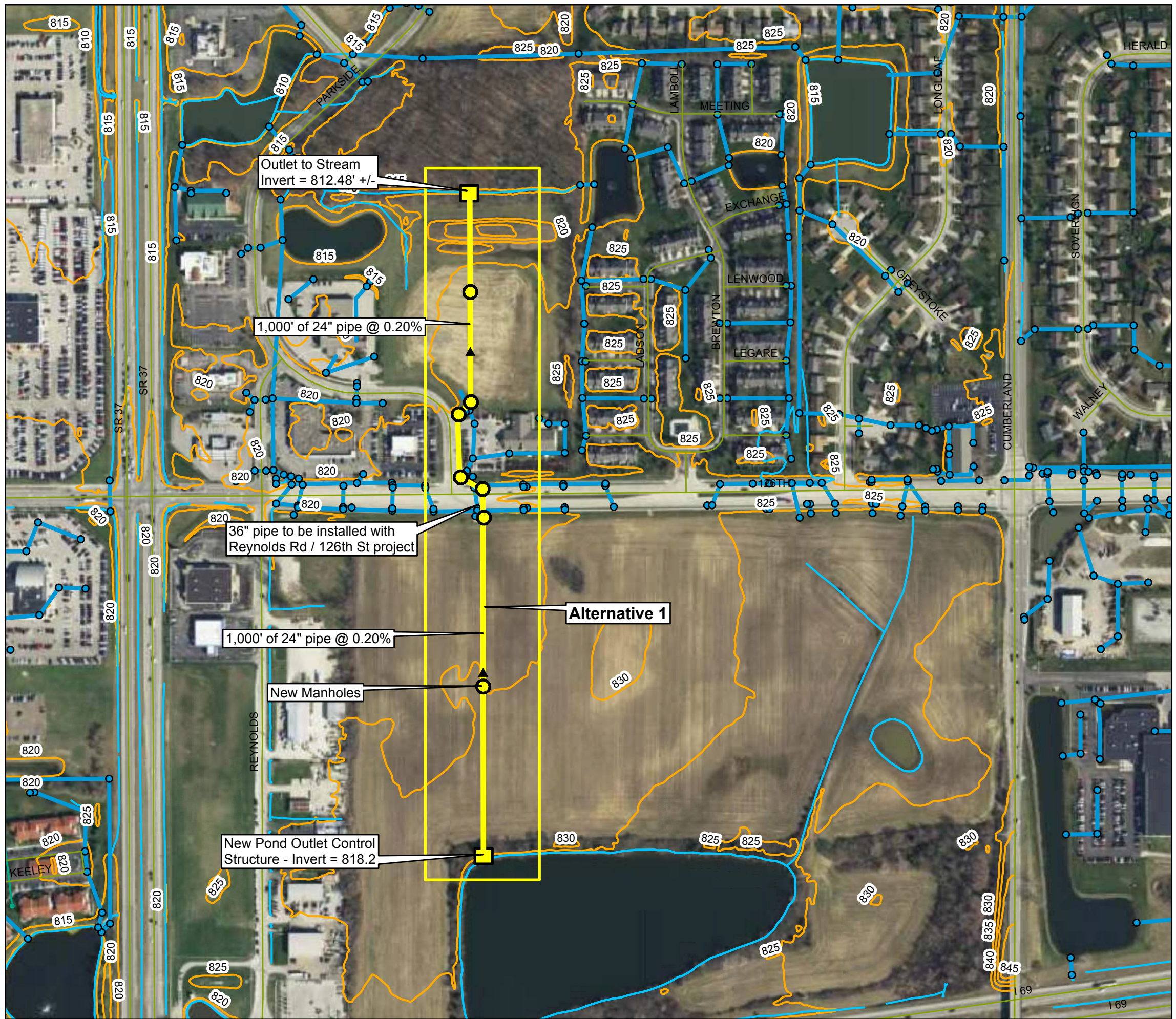
**Proposed Alternative Map
Airport Development
Dual Purpose Facility**

**CITY OF FISHERS
STORMWATER MASTERPLAN**



Date: October 2018
 Produced By: DLZ Indiana, LLC
 Data Source: Hamilton County, IN
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Reynolds Industrial Park – Sunbeam Development



- Legend**
- Road Centerline
 - Hamilton County Drainage Structures
 - Storm Structures
 - Storm Sewers
 - Sanitary Manholes
 - Sanitary Sewers
 - Rivers / Streams / Ponds
 - Major Contour
 - Study Limits
 - New 24" Pipe
 - New Manholes
 - New Inlet/Outlet Structure

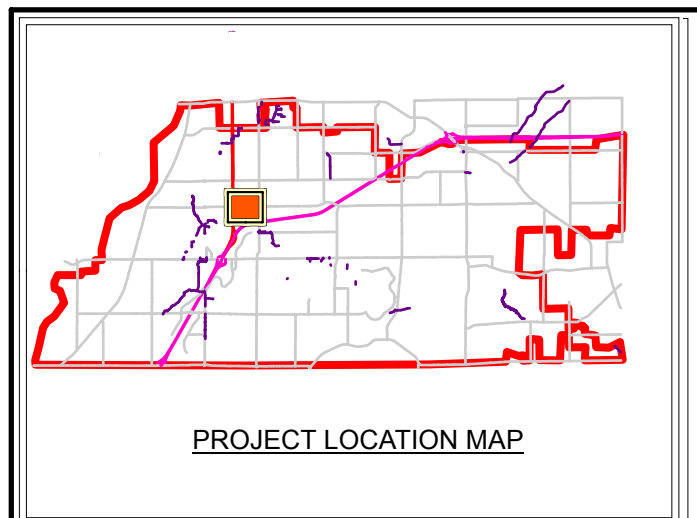
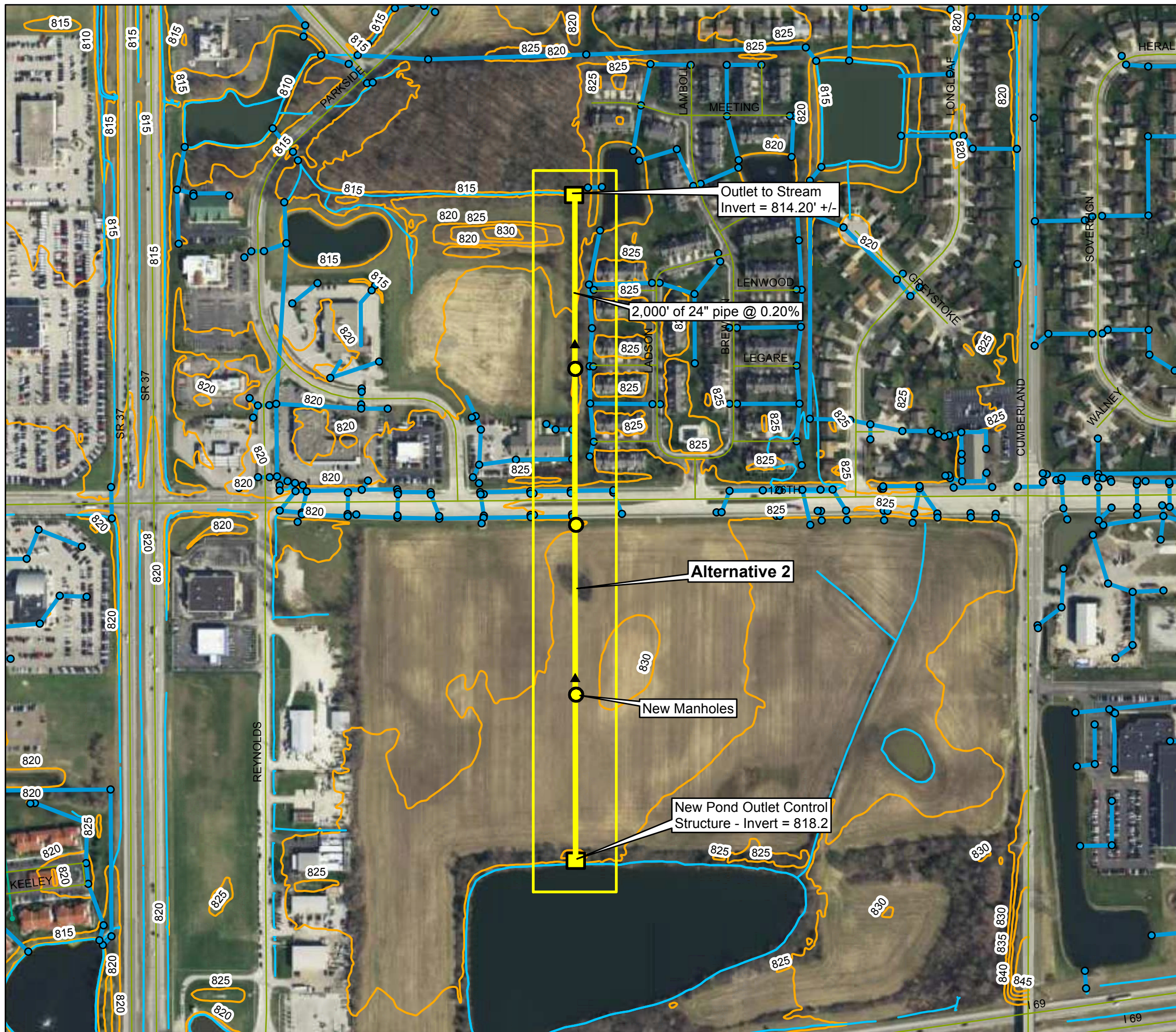
1 inch = 300 feet

**Proposed Alternative 1 Map
Reynolds Industrial Park
Sunbeam Pond Study**

**CITY OF FISHERS
STORMWATER MASTERPLAN**



Date: October 2018
 Produced By: DLZ Indiana, LLC
 Data Source: Hamilton County, IN
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- Legend**
- Road Centerline
 - Hamilton County Drainage Structures
 - Storm Structures
 - Storm Sewers
 - Sanitary Manholes
 - Sanitary Sewers
 - Rivers / Streams / Ponds
 - Major Contour
 - Study Limits
 - New 24" Pipe
 - New Manholes
 - New Inlet/Outlet Structure

1 inch = 300 feet



**Proposed Alternative 2 Map
Reynolds Industrial Park
Sunbeam Pond Study**

**CITY OF FISHERS
STORMWATER MASTERPLAN**



Date: October 2018
 Produced By: DLZ Indiana, LLC
 Data Source: Hamilton County, IN
 This map does not represent a legal document. It is intended to serve as a graphical aid only. Information shown on this map is not warranted for accuracy or merchantability.

MEMORANDUM OF UNDERSTANDING

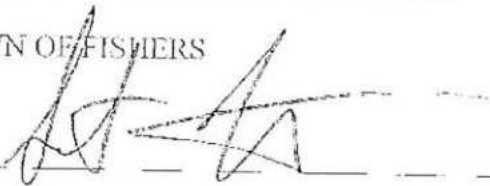
The Town of Fishers, Hamilton County, Indiana, an Indiana Municipal Corporation, (hereafter "TOF") and Sunbeam Development Corporation, (hereafter "Sunbeam") enter into this Memorandum of Understanding on the date set out below for the purpose of defining certain understanding and undertakings relative to property owned by Sunbeam and certain public infrastructure improvements contemplated by TOF. It is the further understanding of the parties hereto that the substantive elements outlined in this MOU shall be further documented as required in order to achieve the purposes outlined herein.

1. Right of Way Acquisition. Sunbeam owns certain real property adjacent to 126th St. consisting of approximately 78 acres (hereafter SDC Property). TOF is in the process of expanding the right of way (hereafter "ROW") and making significant improvements to 126th Street. TOF has made an offer of \$122,700 for 1.636 acres of land for the ROW to Sunbeam based upon appraisals for the acquisition of portions of the SDC Property needed for the 126th Street ROW and related improvements. Sunbeam agrees to the offer amount and to cause the conveyance of such ROW to TOF in the form required in order to facilitate the construction contemplated by TOF. Attached hereto and marked Exhibit A is a legal description and drawing of the proposed acquisition. In conjunction with this ROW dedication by Sunbeam, TOF, as part of its improvement plans, shall construct access openings and related turn lanes to serve the SDC Property and the property of others as follows:
 - Parkside Drive: Full median opening with traffic signal when warranted.
 - Brewton Street: Full median opening.
 - Longleaf Lane: Full median opening. If a full median opening cannot be provided at this location due to the length left turn lane on 126th Street to northbound Cumberland Road, TOF will allow right in/right out access to the SDC Property at this location.
 - Cumberland Road: Approximately 600' south of 126th street at existing entry drive on east side of Cumberland, a full median opening.
2. Parkside Drive Extension. TOF anticipates the creation of a new public thoroughfare that will be located in part on SDC Property. It is the intent of TOF to construct a road south of 126th Street that shall align with the existing Parkside Drive on the north side of 126th Street with the expectation that a signal may be placed at that intersection when warranted and a median will be added to eliminate left hand or westbound turns for north bound traffic on Reynolds Drive to 126th Street. This new road shall permit traffic exiting Reynolds Drive access to 126th Street. Sunbeam agrees to cooperate with TOF to provide the ROW on and across the real estate owned by Sunbeam as needed to facilitate this project. The parties shall agree on the appropriate value of the acquisition without prejudice to Sunbeam's rights to negotiate said value. The Parkside Drive improvements shall generally conform to the drawing attached hereto, made part hereof and marked Exhibit B.
3. Drainage Issues. TOF acknowledges that by virtue of the design and construction of the 126th Street improvements and the Parkside Drive

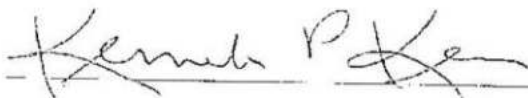
improvements that there will be an impact on the drainage to, from and across the Sunbeam Property. Exhibit "C" (attached hereto and prepared by Beam, Longest and Neff) suggests preliminary designs of several alternative methods of dealing with these drainage issues. TOF agrees to refine the suggested preliminary designs and prepare final design and construction plans for improvements that would cause the normal pool elevation of the existing pond on the SDC Property to be no higher than 818.2 and make necessary improvements to satisfactorily resolve the drainage impacts on the Sunbeam Property resulting from the TOF construction of improvements for 126th Street and Parkside Drive. TOF agrees to construct these improvements at the same time as TOF constructs the improvements to 126th Street or as soon as possible in coordination with the 126th Street improvements, but in no event later than December 31, 2013. These improvements may include both onsite and offsite infrastructure and TOF shall assume the entire cost associated with these infrastructure improvements including, but not limited to, the cost of pipe, construction, engineering, surveying, land acquisition as needed and the like. Sunbeam agrees to provide appropriate easements for any drainage structures on and across its real property as it relates to the lowering of the normal pool elevation without charge to TOF.

All of which is agreed to subject to formal and complete documentation of each element of this MOU as stated heretofore.

TOWN OF FISHERS



SUNBEAM DEVELOPMENT CORPORATION



Dated this 24 day of August, 2011

EXHIBIT A

PROJECT: STP-9929-1

PARCEL NO.: 3- Fee Simple

A part of the Northeast Quarter of Section 31, Township 18 North, Range 5 East, Hamilton County, Indiana, and being that part of the grantor's land lying within the right of way lines depicted on the attached Right of Way Parcel Plat, marked Exhibit "B", described as follows: Commencing at the northeast corner of said quarter section designated as point "42" on said plat; thence South 89 degrees 30 minutes 23 seconds West 2,035.00 feet along the north line of said quarter section to the northwest corner of the grantor's land; thence South 0 degrees 00 minutes 12 seconds East 50.00 feet along the west line of the grantor's land to the point of beginning of this description, which point of beginning is on the south boundary of 126th Street and is designated as point "110" on said plat; thence North 89 degrees 30 minutes 23 seconds East 2,000.04 feet along the boundary of 126th Street to a point on the west boundary of Cumberland Road designated as point "111" on said plat; thence South 0 degrees 03 minutes 21 seconds East 750.10 feet along the boundary of Cumberland Road to point "224" on said plat; thence South 5 degrees 10 minutes 54 seconds West 271.58 feet along said boundary to point "2068" on said plat; thence North 0 degrees 08 minutes 41 seconds East 975.86 feet to point "1365" on said plat; thence North 75 degrees 45 minutes 34 seconds West 41.24 feet to point "1363" on said plat; thence South 89 degrees 12 minutes 23 seconds West 300.00 feet to point "1352" on said plat; thence North 79 degrees 29 minutes 01 second West 50.99 feet to point "1361" on said plat; thence South 39 degrees 12 minutes 23 seconds West 300.00 feet to point "1360" on said plat; thence North 86 degrees 30 minutes 16 seconds West 200.56 feet to point "1359" on said plat; thence South 89 degrees 12 minutes 23 seconds West 500.00 feet to point "1355" on said plat; thence South 84 degrees 55 minutes 00 seconds West 200.55 feet to point "1354" on said plat; thence South 89 degrees 12 minutes 23 seconds West 33.95 feet to point "2395" on said plat; thence Westerly 188.18 feet along an arc to the right having a radius of 6,570.00 feet and subtended by a long chord having a bearing of North 89 degrees 58 minutes 23 seconds West and a length of 188.18 feet to point "2392" on said plat; thence North 89 degrees 09 minutes 09 seconds West 166.40 feet to a point on the west line of the grantor's land designated as point "1345" on said plat; thence North 0 degrees 00 minutes 12 seconds West 27.44 feet along said west line to the point of beginning and containing 1.636 acres, more or less.

Appendix G

Opinions of Probable Cost

Capital Improvement and Maintenance Projects

Cheaney Creek - 106th Street Between Hague Road and Railroad Tracks

PROBABLE COSTS:

Initial Project Cost and Design

ITEM	Description	QTY	Unit	Unit Price	Cost
-	DESIGN (12% of Construction Cost)	1	LS	\$ 143,600.00	\$ 143,600.00
-	CONSTRUCTION				
1	Mob./Demob. (5%)	1	LS	\$ 48,700.00	\$ 48,700.00
2	Construction Engineering	1	LS	\$ 10,000.00	\$ 10,000.00
3	Excavation, Common	450	CYS	\$ 20.00	\$ 9,000.00
4	Borrow	1,450	CYS	\$ 20.00	\$ 29,000.00
5	SWQCP Preparation and Implementation, Lvl 1	1	LS	\$ 15,000.00	\$ 15,000.00
6	Subgrade Treatment, Type II	2,300	SYS	\$ 14.00	\$ 32,200.00
7	Milling Asphalt 1 1/2 IN	345	SYS	\$ 5.00	\$ 1,725.00
8	QC/QA-HMA Surface, 9.5mm	150	TON	\$ 60.00	\$ 9,000.00
9	QC/QA-HMA Intermediate, 19.0mm	320	TON	\$ 45.00	\$ 14,400.00
10	QC/QA-HMA Base, 19.0mm	385	TON	\$ 65.00	\$ 25,025.00
11	Guardrail, W-Beam, 6 FT 3 IN. Spacing	600	LFT	\$ 75.00	\$ 45,000.00
12	Curb, Concrete	350	LFT	\$ 30.00	\$ 10,500.00
13	Maintenance of Traffic	1	LS	\$ 35,000.00	\$ 35,000.00
14	Signs and Striping	1	LS	\$ 10,000.00	\$ 10,000.00
15	Ditch Regrading/Dredging	900	LFT	\$ 30.00	\$ 27,000.00
16	Cheaney Creek Culvert Replacement	1	LS	\$ 700,000.00	\$ 700,000.00
17	Erosion Control (8%)	1	LS	\$ 77,900.00	\$ 77,900.00
18	30% Contingency	1	LS	\$ 96,500.00	\$ 96,500.00
	TOTAL CONSTRUCTION COST				\$ 1,195,950.00
-	INSPECTION (8% of Construction Cost)	1	LS	\$ 95,700.00	\$ 95,700.00
				TOTAL COSTS:	\$ 1,435,250.00

Cheaney Creek - 106th Street Between Sherborne Road and Hague Road

PROBABLE COSTS:

Initial Project Cost and Design

ITEM	Description	QTY	Unit	Unit Price	Cost
-	DESIGN (12% of Construction Cost)	1	LS	\$ 62,400.00	\$ 62,400.00
-	CONSTRUCTION				
1	Mob./Demob. (5%)	1	LS	\$ 14,300.00	\$ 14,300.00
2	Construction Engineering	1	LS	\$ 10,000.00	\$ 10,000.00
3	Excavation, Common	550	CYS	\$ 20.00	\$ 11,000.00
4	Borrow	1,700	CYS	\$ 20.00	\$ 34,000.00
5	SWQCP Preparation and Implementation, Lvl 1	1	LS	\$ 15,000.00	\$ 15,000.00
6	Subgrade Treatment, Type II	1,900	SYS	\$ 14.00	\$ 26,600.00
7	Milling Asphalt 1 1/2 IN	320	SYS	\$ 5.00	\$ 1,600.00
8	QC/QA-HMA Surface, 9.5mm	150	TON	\$ 60.00	\$ 9,000.00
9	QC/QA-HMA Intermediate, 19.0mm	290	TON	\$ 45.00	\$ 13,050.00
10	QC/QA-HMA Base, 19.0mm	340	TON	\$ 65.00	\$ 22,100.00
11	Guardrail, W-Beam, 6 FT 3 IN. Spacing	500	LFT	\$ 75.00	\$ 37,500.00
12	Curb, Concrete	600	LFT	\$ 30.00	\$ 18,000.00
13	Maintenance of Traffic	1	LS	\$ 35,000.00	\$ 35,000.00
14	Signs and Striping	1	LS	\$ 10,000.00	\$ 10,000.00
15	Ditch Regrading/Dredging	1,400	LFT	\$ 30.00	\$ 42,000.00
16	Environmental / Stream Mitigation	1	LS	\$ 100,000.00	\$ 100,000.00
17	Pipe, Type 3, 30 IN.	100	LFT	\$ 75.00	\$ 7,500.00
18	Erosion Control (8%)	1	LS	\$ 22,800.00	\$ 22,800.00
19	30% Contingency	1	LS	\$ 89,800.00	\$ 89,800.00
	TOTAL CONSTRUCTION COST				\$ 519,250.00
-	INSPECTION (8% of Construction Cost)	1	LS	\$ 41,600.00	\$ 41,600.00
				TOTAL COSTS:	\$ 623,250.00

136th Street West of Marilyn Road at Sand Creek Flooding Improvements

PROBABLE COSTS:

Initial Project Cost and Design

ITEM	Description	QTY	Unit	Unit Price	Cost
-	DESIGN (12% of Construction Cost)	1	LS	\$ 50,500.00	\$ 50,500.00
-	CONSTRUCTION				
1	Mob./Demob. (5%)	1	LS	\$ 17,500.00	\$ 17,500.00
2	Construction Engineering	1	LS	\$ 10,000.00	\$ 10,000.00
3	Excavation, Common	330	CYS	\$ 20.00	\$ 6,600.00
4	Borrow	350	CYS	\$ 20.00	\$ 7,000.00
5	SWQCP Preparation and Implementation, Lvl 1	1	LS	\$ 5,000.00	\$ 5,000.00
6	Subgrade Treatment, Type II	1,200	SYS	\$ 14.00	\$ 16,800.00
7	Milling Asphalt 1 1/2 IN	200	SYS	\$ 5.00	\$ 1,000.00
8	QC/QA-HMA Surface, 9.5mm	80	TON	\$ 60.00	\$ 4,800.00
9	QC/QA-HMA Intermediate, 19.0mm	165	TON	\$ 45.00	\$ 7,425.00
10	QC/QA-HMA Base, 19.0mm	195	TON	\$ 65.00	\$ 12,675.00
11	Maintenance of Traffic	1	LS	\$ 10,000.00	\$ 10,000.00
12	Signs and Striping	1	LS	\$ 5,000.00	\$ 5,000.00
13	Ditch Regrading/Dredging	50	LFT	\$ 30.00	\$ 1,500.00
14	4'x20' Concrete Box Culvert (~60 lft)	1	LS	\$ 261,000.00	\$ 261,000.00
15	Erosion Control (8%)	1	LS	\$ 28,000.00	\$ 28,000.00
16	25% Contingency	1	LS	\$ 26,000.00	\$ 26,000.00
	TOTAL CONSTRUCTION COST				\$ 420,300.00
-	INSPECTION (8% of Construction Cost)	1	LS	\$ 33,700.00	\$ 33,700.00
	TOTAL COSTS:				\$ 504,500.00

136th Street West of Prairie Baptist Road at Mud Creek Flood Improvements

PROBABLE COSTS:

Initial Project Cost and Design

ITEM	Description	QTY	Unit	Unit Price	Cost
-	DESIGN (12% of Construction Cost)	1	LS	\$ 163,300.00	\$ 163,300.00
-	CONSTRUCTION				
1	Mob./Demob. (5%)	1	LS	\$ 58,000.00	\$ 58,000.00
2	Construction Engineering	1	LS	\$ 10,000.00	\$ 10,000.00
3	Excavation, Common	370	CYS	\$ 20.00	\$ 7,400.00
4	Borrow	400	CYS	\$ 20.00	\$ 8,000.00
5	SWQCP Preparation and Implementation, Lvl 1	1	LS	\$ 10,000.00	\$ 10,000.00
6	Subgrade Treatment, Type II	1,350	SYS	\$ 14.00	\$ 18,900.00
7	Milling Asphalt 1 1/2 IN	250	SYS	\$ 5.00	\$ 1,250.00
8	QC/QA-HMA Surface, 9.5mm	90	TON	\$ 60.00	\$ 5,400.00
9	QC/QA-HMA Intermediate, 19.0mm	190	TON	\$ 45.00	\$ 8,550.00
10	QC/QA-HMA Base, 19.0mm	225	TON	\$ 65.00	\$ 14,625.00
11	Maintenance of Traffic	1	LS	\$ 15,000.00	\$ 15,000.00
12	Signs and Striping	1	LS	\$ 10,000.00	\$ 10,000.00
14	3-Span Bridge Structure of Mud Creek	1	LS	\$ 1,050,000.00	\$ 1,050,000.00
15	Erosion Control (8%)	1	LS	\$ 92,800.00	\$ 92,800.00
16	30% Contingency	1	LS	\$ 50,200.00	\$ 50,200.00
	TOTAL CONSTRUCTION COST				\$ 1,360,125.00
-	INSPECTION (8% of Construction Cost)	1	LS	\$ 108,900.00	\$ 108,900.00
				TOTAL COSTS:	\$ 1,632,325.00

97th and 98th Street Drainage Improvements

PROBABLE COSTS:

Initial Project Cost and Design

ITEM	Description	QTY	Unit	Unit Price	Cost
-	DESIGN (12% of Construction Cost)	1	LS	\$ 21,700.00	\$ 21,700.00
-	CONSTRUCTION				
1	Mob./Demob. (5%)	1	LS	\$ 6,500.00	\$ 6,500.00
2	Construction Engineering	1	LS	\$ 10,000.00	\$ 10,000.00
3	Excavation, Common	245	CYS	\$ 20.00	\$ 4,900.00
4	Borrow	180	CYS	\$ 20.00	\$ 3,600.00
5	Milling Asphalt 1 1/2 IN	200	SYS	\$ 5.00	\$ 1,000.00
6	Pavement, Remove, Asphalt	150	SYS	\$ 10.00	\$ 1,500.00
7	Type A Inlet	9	EACH	\$ 2,000.00	\$ 18,000.00
8	Pipe, 12" Perforated PVC	900	LFT	\$ 40.00	\$ 36,000.00
9	Ditch Regrading/Dredging	950	LFT	\$ 30.00	\$ 28,500.00
10	QC/QA-HMA Surface, 9.5mm	60	TON	\$ 60.00	\$ 3,600.00
11	QC/QA-HMA Intermediate, 19.0mm	120	TON	\$ 45.00	\$ 5,400.00
12	QC/QA-HMA Base, 19.0mm	145	TON	\$ 65.00	\$ 9,425.00
13	Maintenance of Traffic	1	LS	\$ 5,000.00	\$ 5,000.00
14	Signs and Striping	1	LS	\$ 2,500.00	\$ 2,500.00
15	Erosion Control (8%)	1	LS	\$ 10,400.00	\$ 10,400.00
16	25% Contingency	1	LS	\$ 34,000.00	\$ 34,000.00
	TOTAL CONSTRUCTION COST				\$ 180,325.00
-	INSPECTION (8% of Construction Cost)	1	LS	\$ 14,500.00	\$ 14,500.00
				TOTAL COSTS:	\$ 216,525.00

Prairie Baptist South of Silverleaf Blvd Drainage Improvements

PROBABLE COSTS:

Initial Project Cost and Design

ITEM	Description	QTY	Unit	Unit Price	Cost
-	DESIGN (12% of Construction Cost)	1	LS	\$ 32,100.00	\$ 32,100.00
-	CONSTRUCTION				
1	Mob./Demob. (5%)	1	LS	\$ 8,000.00	\$ 8,000.00
2	Construction Engineering	1	LS	\$ 5,000.00	\$ 5,000.00
3	Common Excavation	1,500	CYS	\$ 20.00	\$ 30,000.00
4	Pavement, Remove, Asphalt	35	SYS	\$ 10.00	\$ 350.00
5	HMA Patching, Type A	20	TON	\$ 200.00	\$ 4,000.00
6	Compacted Aggregate, No. 53 Base	120	TON	\$ 25.00	\$ 3,000.00
7	Pipe, 12" RCP	1,450	LFT	\$ 30.00	\$ 43,500.00
8	Inlet, A-2	4	EACH	\$ 2,000.00	\$ 8,000.00
9	Aggregate for Underdrain	1,550	CYS	\$ 40.00	\$ 62,000.00
10	Nyloplast Inlet	3	EACH	\$ 800.00	\$ 2,400.00
11	Hybrid Ditch w/12" perf pipe and Washed #8's	500.0	LFT	\$ 70.00	\$ 35,000.00
12	Erosion Control (8%)	1	LS	\$ 12,700.00	\$ 12,700.00
13	25% Contingency	1	LS	\$ 53,500.00	\$ 53,500.00
	TOTAL CONSTRUCTION COST				\$ 299,550.00
-	INSPECTION (8% of Construction Cost)	1	LS	\$ 21,400.00	\$ 21,400.00
				TOTAL COSTS:	\$ 353,050.00

Cumberland Road Bridge Replacement

PROBABLE COSTS:

Initial Project Cost and Design

ITEM	Description	Unit Price	Cost
-	CONSTRUCTION		
1	Demolition	\$ 221,000.00	\$ 221,000.00
2	Bridge	\$ 2,500,000.00	\$ 2,500,000.00
3	Road and Parking Lot	\$ 637,000.00	\$ 637,000.00
4	Miscellaneous	\$ 2,140,000.00	\$ 2,140,000.00
5	Professional Services	\$ 820,000.00	\$ 820,000.00
6	Channel Work	\$ 363,000.00	\$ 363,000.00
	TOTAL PROJECT COST		\$ 6,681,000.00
		TOTAL COSTS:	\$ 6,681,000.00

Notes:

- Project Cost were based on previous cost studies by Christopher B. Burke Engineering
- Per the Cost Analysis the City of Fishers would be responsible for 18% of the project cost (\$826,500)

136th Street Culvert Improvements at Limestone Springs

PROBABLE COSTS:

Initial Project Cost and Design

ITEM	Description	QTY	Unit	Unit Price	Cost
-	DESIGN (12% of Construction Cost)	1	LS	\$ 8,700.00	\$ 8,700.00
-	CONSTRUCTION				
1	Mob./Demob. (5%)	1	LS	\$ 1,400.00	\$ 1,400.00
2	Construction Engineering	1	LS	\$ 5,000.00	\$ 5,000.00
3	Common Excavation	600	CYS	\$ 20.00	\$ 12,000.00
4	Pavement, Remove, Asphalt	20	SYS	\$ 10.00	\$ 200.00
5	HMA Patching, Type A	15	TON	\$ 200.00	\$ 3,000.00
6	Compacted Aggregate, No. 53 Base	75	TON	\$ 25.00	\$ 1,875.00
7	Pipe, 12" RCP	80	LFT	\$ 30.00	\$ 2,400.00
8	Connection to Existing Inlet	1	EACH	\$ 1,000.00	\$ 1,000.00
9	Nyloplast Inlet	2	EACH	\$ 800.00	\$ 1,600.00
10	Hybrid Ditch w/12" perf pipe and Washed #8's	310	LFT	\$ 70.00	\$ 21,700.00
11	Utility Relocation	1.0	LS	\$ 5,000.00	\$ 5,000.00
12	Erosion Control (8%)	1	LS	\$ 2,200.00	\$ 2,200.00
13	25% Contingency	1	LS	\$ 14,400.00	\$ 14,400.00
	TOTAL CONSTRUCTION COST				\$ 80,475.00
-	INSPECTION (8% of Construction Cost)	1	LS	\$ 5,800.00	\$ 5,800.00
	TOTAL COSTS:				\$ 94,975.00

Airport Property Drainage at Allisonville Road and 106th Street

PROBABLE COSTS:

Initial Project Cost and Design

ITEM	Description	QTY	Unit	Unit Price	Cost
-	DESIGN (12% of Construction Cost)	1	LS	\$ 19,500.00	\$ 19,500.00
-	CONSTRUCTION				
1	Mob./Demob. (5%)	1	LS	\$ 5,800.00	\$ 5,800.00
2	Construction Engineering	1	LS	\$ 5,000.00	\$ 5,000.00
3	Common Excavation	2,500	CYS	\$ 20.00	\$ 50,000.00
4	Control of Water	1	LS	\$ 2,500.00	\$ 2,500.00
5	Site Restoration	1	LS	\$ 2,500.00	\$ 2,500.00
6	Embankment, clay layer (Berm)	670	CYS	\$ 55.00	\$ 36,850.00
7	Pipe, 12" RCP	60	LFT	\$ 30.00	\$ 1,800.00
8	Inlet, A-2 (Control Structure)	1	EACH	\$ 2,000.00	\$ 2,000.00
9	Aggregate for Underdrain	20	CYS	\$ 40.00	\$ 800.00
10	Riprap, 18", with filter fabric	150	SYS	\$ 60.00	\$ 9,000.00
11	Pipe, Underdrain, 6"	200	LFT	\$ 20.00	\$ 4,000.00
12	Erosion Control (8%)	1	LS	\$ 9,200.00	\$ 9,200.00
13	25% Contingency	1	LS	\$ 32,400.00	\$ 32,400.00
	TOTAL CONSTRUCTION COST				\$ 181,350.00
-	INSPECTION (8% of Construction Cost)	1	LS	\$ 13,000.00	\$ 13,000.00
				TOTAL COSTS:	\$ 213,850.00

10307 Cumberland Road Storm Sewer Upgrade in Bradford Knoll

PROBABLE COSTS:

Initial Project Cost and Design

ITEM	Description	QTY	Unit	Unit Price	Cost
-	DESIGN (12% of Construction Cost)	1	LS	\$ 26,700.00	\$ 26,700.00
-	CONSTRUCTION				
1	Mob./Demob. (5%)	1	LS	\$ 2,600.00	\$ 2,600.00
2	Construction Engineering	1	LS	\$ 5,000.00	\$ 5,000.00
3	Common Excavation	350	CYS	\$ 20.00	\$ 7,000.00
4	B Borrow for Fill	120	CYS	\$ 20.00	\$ 2,400.00
5	Tree Removal, 18"	10	EACH	\$ 500.00	\$ 5,000.00
6	Utility Coordination	1	LS	\$ 4,500.00	\$ 4,500.00
7	Outlet Structure with Headwall	1	LFT	\$ 3,500.00	\$ 3,500.00
8	Pipe, Type 3, 36"	300	LFT	\$ 70.00	\$ 21,000.00
9	End Section, 36"	1	EACH	\$ 3,500.00	\$ 3,500.00
10	Manhole, C-4	2	EACH	\$ 3,000.00	\$ 6,000.00
11	Structure Backfill	230	CYS	\$ 25.00	\$ 5,750.00
12	Steel Boring, 36"	365	LFT	\$ 260.00	\$ 94,900.00
13	Pipe Lining, 36"	70	LFT	\$ 180.00	\$ 12,600.00
14	Erosion Control (8%)	1	LS	\$ 4,200.00	\$ 4,200.00
15	25% Contingency	1	LS	\$ 44,500.00	\$ 44,500.00
	TOTAL CONSTRUCTION COST				\$ 249,150.00
-	INSPECTION (8% of Construction Cost)	1	LS	\$ 17,800.00	\$ 17,800.00
	TOTAL COSTS:				\$ 293,650.00

Lake Stonebridge Dam Overtopping

PROBABLE COSTS:

Initial Project Cost and Design

ITEM	Description	QTY	Unit	Unit Price	Cost
-	DESIGN (12% of Construction Cost)	1	LS	\$ 2,200.00	\$ 2,200.00
-	CONSTRUCTION				
1	Mob./Demob. (5%)	1	LS	\$ 700.00	\$ 700.00
2	Construction Engineering	1	LS	\$ 2,500.00	\$ 2,500.00
3	Grout	9	CYS	\$ 1,000.00	\$ 9,000.00
4	Flowable Backfill	10	CYS	\$ 90.00	\$ 900.00
5	Erosion Control (8%)	1	LS	\$ 1,000.00	\$ 1,000.00
6	25% Contingency	1	LS	\$ 3,600.00	\$ 3,600.00
	TOTAL CONSTRUCTION COST				\$ 19,900.00
-	INSPECTION (8% of Construction Cost)	1	LS	\$ 1,500.00	\$ 1,500.00
				TOTAL COSTS:	\$ 23,600.00

Lantern Road and USA Parkway Drainage Improvements

PROBABLE COSTS:

Initial Project Cost and Design

ITEM	Description	QTY	Unit	Unit Price	Cost
-	DESIGN (12% of Construction Cost)	1	LS	\$ 2,300.00	\$ 2,300.00
-	CONSTRUCTION				
1	Mob./Demob. (5%)	1	LS	\$ 700.00	\$ 700.00
2	Construction Engineering	1	LS	\$ 2,500.00	\$ 2,500.00
3	Common Excavation	15	CYS	\$ 20.00	\$ 300.00
4	Pavement, Remove, Asphalt	10	SYS	\$ 10.00	\$ 100.00
5	HMA Patching, Type A	5	TON	\$ 200.00	\$ 1,000.00
6	Pipe, 15" RCP	60	LFT	\$ 40.00	\$ 2,400.00
7	Pipe End Section, 15"	2	EACH	\$ 500.00	\$ 1,000.00
8	Ditch Regrading/Dredging	200	LFT	\$ 30.00	\$ 6,000.00
9	Erosion Control (8%)	1	LS	\$ 1,100.00	\$ 1,100.00
10	25% Contingency	1	LS	\$ 3,800.00	\$ 3,800.00
	TOTAL CONSTRUCTION COST				\$ 21,200.00
-	INSPECTION (8% of Construction Cost)	1	LS	\$ 1,600.00	\$ 1,600.00
				TOTAL COSTS:	\$ 25,100.00

Hoosier Road South of S-Curve and Cemetery Ditch Improvements

PROBABLE COSTS:

Initial Project Cost and Design

ITEM	Description	QTY	Unit	Unit Price	Cost
-	DESIGN (12% of Construction Cost)	1	LS	\$ 2,700.00	\$ 2,700.00
-	CONSTRUCTION				
1	Mob./Demob. (5%)	1	LS	\$ 800.00	\$ 800.00
2	Construction Engineering	1	LS	\$ 2,000.00	\$ 2,000.00
3	Ditch Regrading/Dredging	300	LFT	\$ 30.00	\$ 9,000.00
4	Ditch Restoration & Stabilization	300	LFT	\$ 15.00	\$ 4,500.00
5	Erosion Control (8%)	1	LS	\$ 1,300.00	\$ 1,300.00
6	25% Contingency	1	LS	\$ 4,100.00	\$ 4,100.00
	TOTAL CONSTRUCTION COST				\$ 21,700.00
-	INSPECTION (8% of Construction Cost)	1	LS	\$ 1,800.00	\$ 1,800.00
				TOTAL COSTS:	\$ 26,200.00

Georgia Road North of 96th Street Drainage Improvements

PROBABLE COSTS:

Initial Project Cost and Design

ITEM	Description	QTY	Unit	Unit Price	Cost
-	DESIGN (12% of Construction Cost)	1	LS	\$ 10,400.00	\$ 10,400.00
-	CONSTRUCTION				
1	Mob./Demob. (5%)	1	LS	\$ 3,000.00	\$ 3,000.00
2	Construction Engineering	1	LS	\$ 5,000.00	\$ 5,000.00
3	Common Excavation	850	CYS	\$ 20.00	\$ 17,000.00
4	B Borrow for Fill	850	CYS	\$ 20.00	\$ 17,000.00
5	Pavement, Remove, Asphalt	60	SYS	\$ 10.00	\$ 600.00
6	HMA Patching, Type A	50	TON	\$ 200.00	\$ 10,000.00
7	Pipe, 12" RCP	55	LFT	\$ 40.00	\$ 2,200.00
8	Pipe, Underdrain, 6"	300	EACH	\$ 20.00	\$ 6,000.00
9	Inlet, Type A-2	1	EACH	\$ 2,000.00	\$ 2,000.00
10	Connect to existing structure	1	LS	\$ 1,000.00	\$ 1,000.00
11	Cleanout	1	EACH	\$ 200.00	\$ 200.00
12	Erosion Control (8%)	1	LS	\$ 4,800.00	\$ 4,800.00
13	25% Contingency	1	LS	\$ 17,200.00	\$ 17,200.00
	TOTAL CONSTRUCTION COST				\$ 96,400.00
-	INSPECTION (8% of Construction Cost)	1	LS	\$ 6,900.00	\$ 6,900.00
	TOTAL COSTS:				\$ 113,700.00

121st Street Between Cross Road Lane and Blue Springs Lane

PROBABLE COSTS:

Initial Project Cost and Design

ITEM	Description	QTY	Unit	Unit Price	Cost
-	DESIGN (12% of Construction Cost)	1	LS	\$ 4,100.00	\$ 4,100.00
-	CONSTRUCTION				
1	Mob./Demob. (5%)	1	LS	\$ 1,200.00	\$ 1,200.00
2	Construction Engineering	1	LS	\$ 2,500.00	\$ 2,500.00
3	Milling, Transition	300	SYS	\$ 20.00	\$ 6,000.00
4	Ditch Regrading/Dredging	400	LFT	\$ 30.00	\$ 12,000.00
5	HMA Type A, Surface	58	TON	\$ 60.00	\$ 3,480.00
6	Erosion Control (8%)	1	LS	\$ 2,000.00	\$ 2,000.00
7	25% Contingency	1	LS	\$ 6,800.00	\$ 6,800.00
	TOTAL CONSTRUCTION COST				\$ 38,080.00
-	INSPECTION (8% of Construction Cost)	1	LS	\$ 2,800.00	\$ 2,800.00
	TOTAL COSTS:				\$ 44,980.00

96th Street and Cyntheanne Road Drainage Improvements

PROBABLE COSTS:

Initial Project Cost and Design

ITEM	Description	QTY	Unit	Unit Price	Cost
-	DESIGN (12% of Construction Cost)	1	LS	\$ 8,600.00	\$ 8,600.00
-	CONSTRUCTION				
1	Mob./Demob. (5%)	1	LS	\$ 2,600.00	\$ 2,600.00
2	Construction Engineering	1	LS	\$ 2,500.00	\$ 2,500.00
3	Common Excavation	500	CYS	\$ 20.00	\$ 10,000.00
4	B Borrow for Fill	500	CYS	\$ 20.00	\$ 10,000.00
5	Pavement, Remove, Asphalt	55	SYS	\$ 10.00	\$ 550.00
6	HMA Patching, Type A	45	TON	\$ 200.00	\$ 9,000.00
7	Pipe, 36" RCP	80	LFT	\$ 75.00	\$ 6,000.00
8	End Section, 36"	4	EACH	\$ 3,000.00	\$ 12,000.00
9	Erosion Control (8%)	1	LS	\$ 4,100.00	\$ 4,100.00
10	25% Contingency	1	LS	\$ 14,200.00	\$ 14,200.00
	TOTAL CONSTRUCTION COST				\$ 79,550.00
-	INSPECTION (8% of Construction Cost)	1	LS	\$ 5,700.00	\$ 5,700.00
				TOTAL COSTS:	\$ 93,850.00

Dual Purpose Projects

Downtown Redevelopment - Village Center

PROBABLE COSTS:

Initial Project Cost and Design

ITEM	Description	QTY	Unit	Unit Price	Cost
-	DESIGN (12% of Construction Cost)	1	LS	\$ 848,500.00	\$ 848,500.00
-	CONSTRUCTION				
1	Mob./Demob. (5%)	1	LS	\$ 250,300.00	\$ 250,300.00
2	Construction Engineering	1	LS	\$ 10,000.00	\$ 10,000.00
3	Parking Lot	40,000	CYS	\$ 14.00	\$ 560,000.00
4	Pipe, RCP, 15"	100	LFT	\$ 40.00	\$ 4,000.00
5	End Section, 15"	2	EACH	\$ 500.00	\$ 1,000.00
6	Manhole, C-4	1	EACH	\$ 2,500.00	\$ 2,500.00
7	Underground Detention	738,000	CFT	\$ 6.00	\$ 4,428,000.00
8	Erosion Control (8%)	1	LS	\$ 400,500.00	\$ 400,500.00
9	25% Contingency	1	LS	\$ 1,414,100.00	\$ 1,414,100.00
	TOTAL CONSTRUCTION COST				\$ 7,918,900.00
-	INSPECTION (8% of Construction Cost)	1	LS	\$ 565,700.00	\$ 565,700.00
	TOTAL COSTS:				\$ 9,333,100.00

Airport Property Development

PROBABLE COSTS:

Initial Project Cost and Design

ITEM	Description	QTY	Unit	Unit Price	Cost
-	DESIGN (12% of Construction Cost)	1	LS	\$ 771,300.00	\$ 771,300.00
-	CONSTRUCTION				
1	Mob./Demob. (5%)	1	LS	\$ 227,500.00	\$ 227,500.00
2	Construction Engineering	1	LS	\$ 10,000.00	\$ 10,000.00
3	Parking Lot	30,000	CYS	\$ 14.00	\$ 420,000.00
4	Pipe, RCP, 15"	400	LFT	\$ 40.00	\$ 16,000.00
5	End Section, 15"	4	EACH	\$ 500.00	\$ 2,000.00
6	Manhole, C-4	4	EACH	\$ 2,500.00	\$ 10,000.00
7	Underground Detention	682,000	CFT	\$ 6.00	\$ 4,092,000.00
8	Erosion Control (8%)	1	LS	\$ 364,000.00	\$ 364,000.00
9	25% Contingency	1	LS	\$ 1,285,400.00	\$ 1,285,400.00
	TOTAL CONSTRUCTION COST				\$ 7,198,200.00
-	INSPECTION (8% of Construction Cost)	1	LS	\$ 514,200.00	\$ 514,200.00
	TOTAL COSTS:				\$ 8,483,700.00

Reynolds Industrial Property - Sunbeam Development Alternative 1

PROBABLE COSTS:

Initial Project Cost and Design

ITEM	Description	QTY	Unit	Unit Price	Cost
-	DESIGN (12% of Construction Cost)	1	LS	\$ 35,600.00	\$ 35,600.00
-	CONSTRUCTION				
1	Mob./Demob. (5%)	1	LS	\$ 5,000.00	\$ 5,000.00
2	Construction Engineering	1	LS	\$ 10,000.00	\$ 10,000.00
3	Common Excavation	1,600	CYS	\$ 20.00	\$ 32,000.00
4	B Borrow for Fill	1,600	CYS	\$ 20.00	\$ 32,000.00
5	Utility Relocation	1	EACH	\$ 15,000.00	\$ 15,000.00
6	HMA Patching, Type A	40	TON	\$ 200.00	\$ 8,000.00
7	Curb, Concrete	100	LFT	\$ 20.00	\$ 2,000.00
8	Sidewalk, Concrete, 4"	100	LFT	\$ 45.00	\$ 4,500.00
9	Pipe, RCP, 24"	2,000	LFT	\$ 50.00	\$ 100,000.00
10	End Section, 24"	1	EACH	\$ 500.00	\$ 500.00
11	Manhole, C-4	8	EACH	\$ 2,500.00	\$ 20,000.00
13	Erosion Control (8%)	1	LS	\$ 8,000.00	\$ 8,000.00
14	25% Contingency	1	LS	\$ 59,300.00	\$ 59,300.00
	TOTAL CONSTRUCTION COST				\$ 331,900.00
-	INSPECTION (8% of Construction Cost)	1	LS	\$ 23,800.00	\$ 23,800.00
	TOTAL COSTS:				\$ 391,300.00

Reynolds Industrial Property - Sunbeam Development

Alternative 2

PROBABLE COSTS:

Initial Project Cost and Design

ITEM	Description	QTY	Unit	Unit Price	Cost
-	DESIGN (12% of Construction Cost)	1	LS	\$ 28,500.00	\$ 28,500.00
-	CONSTRUCTION				
1	Mob./Demob. (5%)	1	LS	\$ 3,300.00	\$ 3,300.00
2	Construction Engineering	1	LS	\$ 10,000.00	\$ 10,000.00
3	Common Excavation	1,200	CYS	\$ 20.00	\$ 24,000.00
4	B Borrow for Fill	1,200	CYS	\$ 20.00	\$ 24,000.00
5	Tree Removal	5	EACH	\$ 500.00	\$ 2,500.00
6	HMA Patching, Type A	20	TON	\$ 200.00	\$ 4,000.00
7	Curb, Concrete	30	LFT	\$ 20.00	\$ 600.00
8	Sidewalk, Concrete, 4"	8	LFT	\$ 45.00	\$ 360.00
9	Pipe, RCP, 24"	2,000	LFT	\$ 50.00	\$ 100,000.00
10	End Section, 24"	1	EACH	\$ 500.00	\$ 500.00
11	Manhole, C-4	4	EACH	\$ 2,500.00	\$ 10,000.00
12	Utility Relocation	1	LS	\$ 5,000.00	\$ 5,000.00
13	Erosion Control (8%)	1	LS	\$ 5,300.00	\$ 5,300.00
14	25% Contingency	1	LS	\$ 47,400.00	\$ 47,400.00
	TOTAL CONSTRUCTION COST				\$ 265,460.00
-	INSPECTION (8% of Construction Cost)	1	LS	\$ 19,000.00	\$ 19,000.00
				TOTAL COSTS:	\$ 312,960.00

Appendix H

Preliminary Hydraulic Calculations

Airport Property Drainage
at
Allisonville Road and 106th Street
(Detention Berm)

Stormwater Management Design Calculations

Storm Runoff - Site Drainage Areas - Time of Concentration

PROJECT: Airport Property
 LOCATION: Hamilton Co., Fishers, IN PROJ. NO.: 1863-5000-70
 PREPARER: Ronald E. Hull DATE: 22-Feb-2018

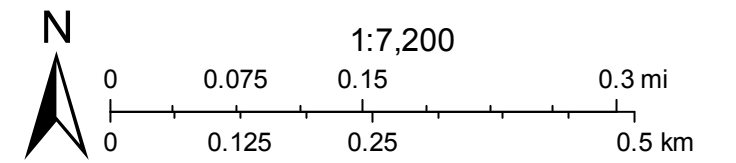
UNDEVELOPED SITE

			Sub Area	Sub Area	Sub Area	Sub Area	Sub Area	SITE
			Existing					TOTAL
SHEET FLOW	dT	= $[0.007 \times 60 \times (N \times L)^{0.8}] / [P^{0.5} \times S^{0.4}]$						
RUN 1	dT	(min)	15.35	0.00	0.00	0.00	0.00	
Ground Cover			Grass					
Flow Length	L	ft	100.0					
Roughness Coefficient	N		0.150					
Average Slope	S	ft/ft	0.0082					
2-Yr. 24-Hr. Rainfall	P	in	2.66					
SHALLOW FLOW	dT	= $L / (60 \times V)$						
	V	= $C \times S^{0.5}$			C = 20.3282 paved / 16.1345 unpaved			
RUN 2	dT	(min)	49.05	0.00	0.00	0.00	0.00	
Velocity	V	ft/ sec	1.46	0.00	0.00	0.00	0.00	
Ground Cover	Paved / U npaved		U					
Flow Length	L	ft	4300					
Slope	S	ft/ ft	0.0082					
CHANNEL FLOW	dT	= $L / (60 \times V)$						
	V	= $[1.49 \times (A / Wp)^{(2/3)} \times S^{(1/2)}] / N$						
RUN 3	dT	(min)	0.00	0.00	0.00	0.00	0.00	
Velocity	V	fps	0.00	0.00	0.00	0.00	0.00	
Flow Length	L	ft						
Cross Sec. Area	A	sf						
Wetted Perimeter	Wp	ft						
Slope	S	ft/ ft						
Manning's Coefficient	N							
Sub Area Time of Concentartion		(min)	64.40	0.00	0.00	0.00	0.00	64.40

Hamilton County Map



February 27, 2018



Basemap information here

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	SCS Runoff	-----	-----	6.181	-----	13.39	21.77	37.73	53.86	74.26	Existing - SCS

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	21.77	3	756	182,157	---	-----	-----	Existing - SCS

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	74.26	3	753	529,906	---	-----	-----	Existing - SCS

Stormwater Management Design Calculations

INLET CONTROL - STAGE / DISCHARGE RATINGS

Basin Orifice / Riser Pipe

PROJECT: Fishers SWU - Airport Property **POND #1**
 LOCATION: Fishers, Hamilton County, Indiana PROJ. NO.: 1863-5000-70
 PREPARER: Ronald E. Hull DATE: 2/26/20018

RISER PIPE	Rim Elev. _____	Orifice	Row 1	Row 2	Row 3
Riser Casting L x W / D. (ft): _____		Dia. (in):	12		n/a
Casting Model: _____		Invert:	774.00		n/a
Casting Open Area (s.f.): _____		Qty:	1.00		
Casting Perimeter (ft): _____		Coeffic.	0.60		
Casting Weir Coef: _____					

PRIMARY BASIN DISCHARGE FLOW CONTROL STRUCTURE

Elevation of	Orifice Row 1	Orifice Row 2	Orifice Row 3	Structure Casting Discharge				Total Structure Discharge (cfs)
	1.00 774.50		n/a	Head (ft)	Orifice Flow (cfs)	Weir Flow (cfs)	Riser Flow (cfs)	
774.00				774.00				
774.25	0.63			774.25				0.63
774.50	1.26			774.50				1.26
774.75	1.89			774.75				1.89
775.00	2.67			775.00				2.67
775.25	3.28			775.25				3.28
775.50	3.78			775.50				3.78
775.75	4.23			775.75				4.23
776.00	4.63			776.00				4.63
776.25	5.00			776.25				5.00
776.50	5.35			776.50				5.35
776.75	5.67			776.75				5.67
777.00	5.98			777.00				5.98
777.50	6.55			777.50				6.55
778.00	7.07			778.00				7.07
778.50	7.56			778.50				7.56
779.00	8.02			779.00				8.02
779.50	8.46			779.50				8.46

Stormwater Management Design Calculations

INLET CONTROL - STAGE / DISCHARGE RATINGS

Basin Orifice / Riser Pipe

PROJECT: Fishers SWU - Airport Property **POND #1**
 LOCATION: Fishers, Hamilton County, Indiana PROJ. NO.: 1863-5000-70
 PREPARER: Ronald E. Hull DATE: 2/26/20018

RISER PIPE	Rim Elev. _____	Orifice	Row 1	Row 2	Row 3
	Riser Casting L x W / D. (ft): _____	Dia. (in):	12		n/a
	Casting Model: _____	Invert:	774.00		n/a
	Casting Open Area (s.f.): _____	Qty:	1.00		
	Casting Perimeter (ft): _____	Coeffic.	0.60		
	Casting Weir Coef: _____				

PRIMARY BASIN DISCHARGE FLOW CONTROL STRUCTURE

Elevation of	Orifice	Orifice	Orifice	Structure Casting Discharge				Total Structure Discharge (cfs)
	Row 1	Row 2	Row 3	Head	Orifice Flow	Weir Flow	Riser Flow	
	1.00 774.50		n/a	(ft)	(cfs)	(cfs)	(cfs)	
780.00	8.87			780.00				8.87
780.50	9.26			780.50				9.26
781.00	9.64			781.00				9.64
781.25	9.83			781.25				9.83
781.50	10.01			781.50				10.01
781.75	10.18			781.75				10.18
782.00	10.36			782.00				10.36

* Least of Orifice or Weir type overflow of Riser Pipe

Riser Structure Equations:

ORIFICE FLOW EQUATION

$Q = CA(2gH)^{1/2}$
 $C = \underline{0.6}$ for casting; see above for orifices
 A = Opening Area (sf)
 H = Head of Water Level (ft)
 g = Gravity (32.2 ft/sec²)

WEIR FLOW EQUATION

$Q = CL(H)^{3/2}$
 $C = \underline{\hspace{2cm}}$
 L = Casting Perimeter (ft):
 H = Head of Water Level (ft)

Downtown Redevelopment – Village Center



Units: **Imperial**

Project: **Downtown Redevelopment**
 By: **REH**
 Point of Contact: _____
 Date: **2/23/2018**

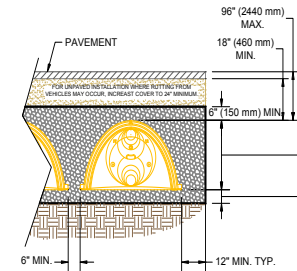
System Requirements

Required Storage Volume **738,000** CF
 Select Stormtech Chamber System **SC-740**
 Stone Porosity (Industry Standard = 40%) **40%**

Stone Foundation Depth **6** Inches
 Storage Volume Per Chamber 74.90 CF
 Avg Cover over Chambers (18 in min. & 96 in max.) **18** Inches

Number of Chambers Required - 9,854

Approximate Bed Size Required 336,268 SF
 Tons of Stone Required 37,574 Tons
 Volume of Excavation 56,045 CY
 Area of Filter Fabric 86,978 SY
 # of End Caps Required **252** Each
 Length of ISOLATOR ROW **562.48** FT
 ISOLATOR FABRIC **312** SY



30 in (762 mm)
 6 in (150 mm)

Is the limiting dimension for the bed the width or length? **width**

Controlled by Width (Rows)

Width **600** FT
 # of Chambers Long 79 EA
 # of Rows 126 EA
 Actual Length 566.08 FT
 Actual Width 600.00 FT

Controlled by Length

Length **300** FT
 # of Chambers long - EA
 # of Rows - EA
 Actual Length - FT
 Actual Width - FT

100 of the chambers rows will contain only **78** chambers

Material Estimate

To use this sheet: Please enter data into the blue and green cells. If switching between Imperial and Metric units please check the correct units and data is input in the green cells.

Please call StormTech @ 888-892-2694 for conceptual cost estimates.

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	SCS Runoff	-----	-----	88.37	-----	-----	131.28	-----	-----	226.46	Proposed - SCS Detention Pond
2	Reservoir	1	-----	3.226	-----	-----	4.112	-----	-----	16.53	

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	131.28	3	732	626,941	---	-----	-----	Proposed - SCS
2	Reservoir	4.112	3	1029	620,272	1	807.71	466,038	Detention Pond

Downtown Redevelopment.gpw

Return Period: 10 Year

Friday, Oct 26 2018, 12:09 PM

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Friday, Oct 26 2018, 12:9 PM

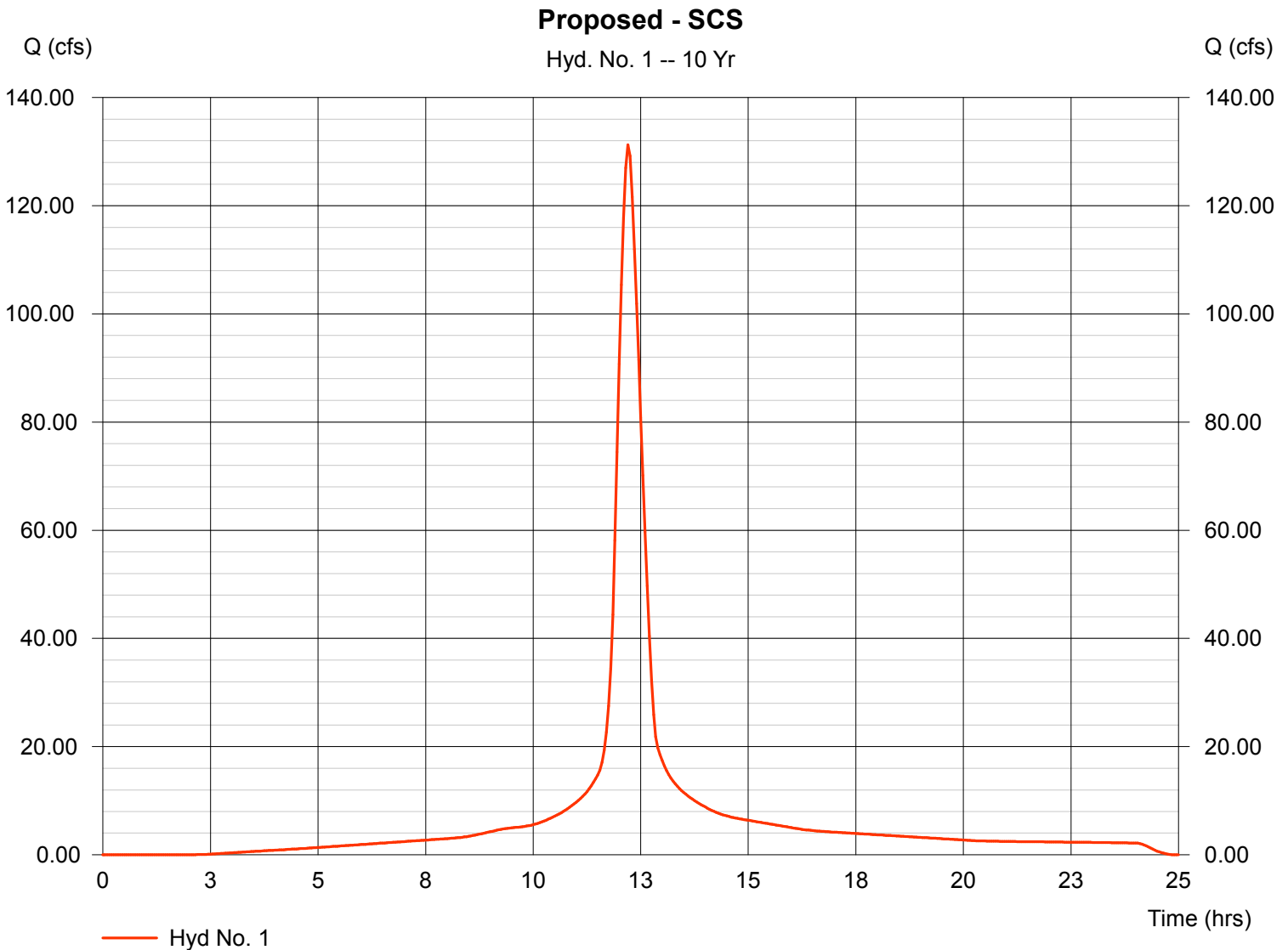
Hyd. No. 1

Proposed - SCS

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Drainage area = 50.000 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 3.83 in
Storm duration = 24 hrs

Peak discharge = 131.28 cfs
Time interval = 3 min
Curve number = 96.2
Hydraulic length = 0 ft
Time of conc. (Tc) = 30.50 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 626,941 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Friday, Oct 26 2018, 12:9 PM

Hyd. No. 2

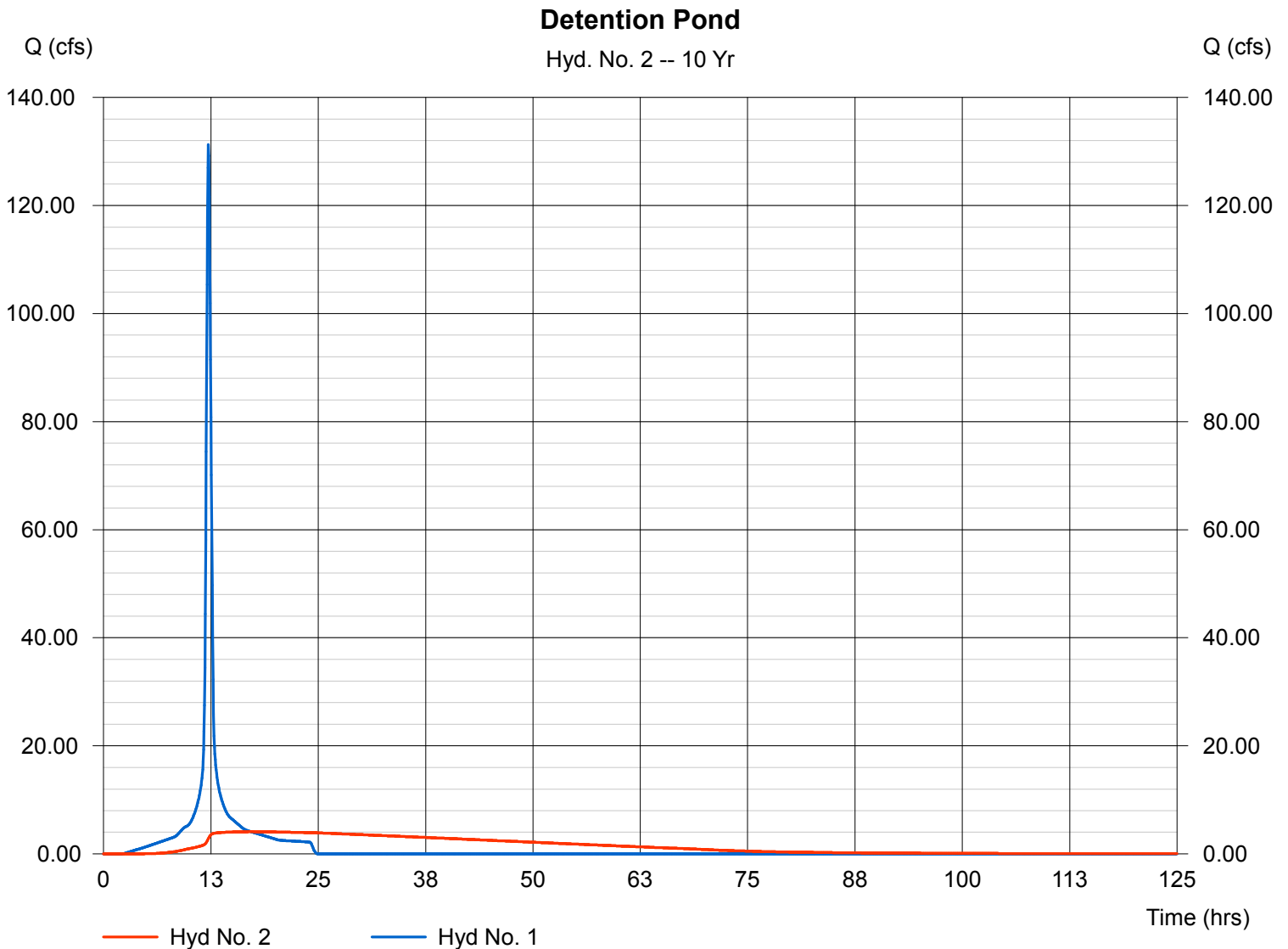
Detention Pond

Hydrograph type = Reservoir
Storm frequency = 10 yrs
Inflow hyd. No. = 1
Reservoir name = Detention Pond

Peak discharge = 4.112 cfs
Time interval = 3 min
Max. Elevation = 807.71 ft
Max. Storage = 466,038 cuft

Storage Indication method used.

Hydrograph Volume = 620,272 cuft



Pond Report

Pond No. 1 - Detention Pond

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	802.00	72,000	0	0
1.00	803.00	75,276	73,638	73,638
2.00	804.00	78,624	76,950	150,588
3.00	805.00	82,044	80,334	230,922
4.00	806.00	85,536	83,790	314,712
5.00	807.00	89,100	87,318	402,030
6.00	808.00	92,444	90,772	492,802
7.00	809.00	96,444	94,444	587,246
8.00	810.00	100,224	98,334	685,580
9.00	811.00	104,076	102,150	787,730
10.00	812.00	108,000	106,038	893,768
11.00	813.00	111,996	109,998	1,003,766

Culvert / Orifice Structures

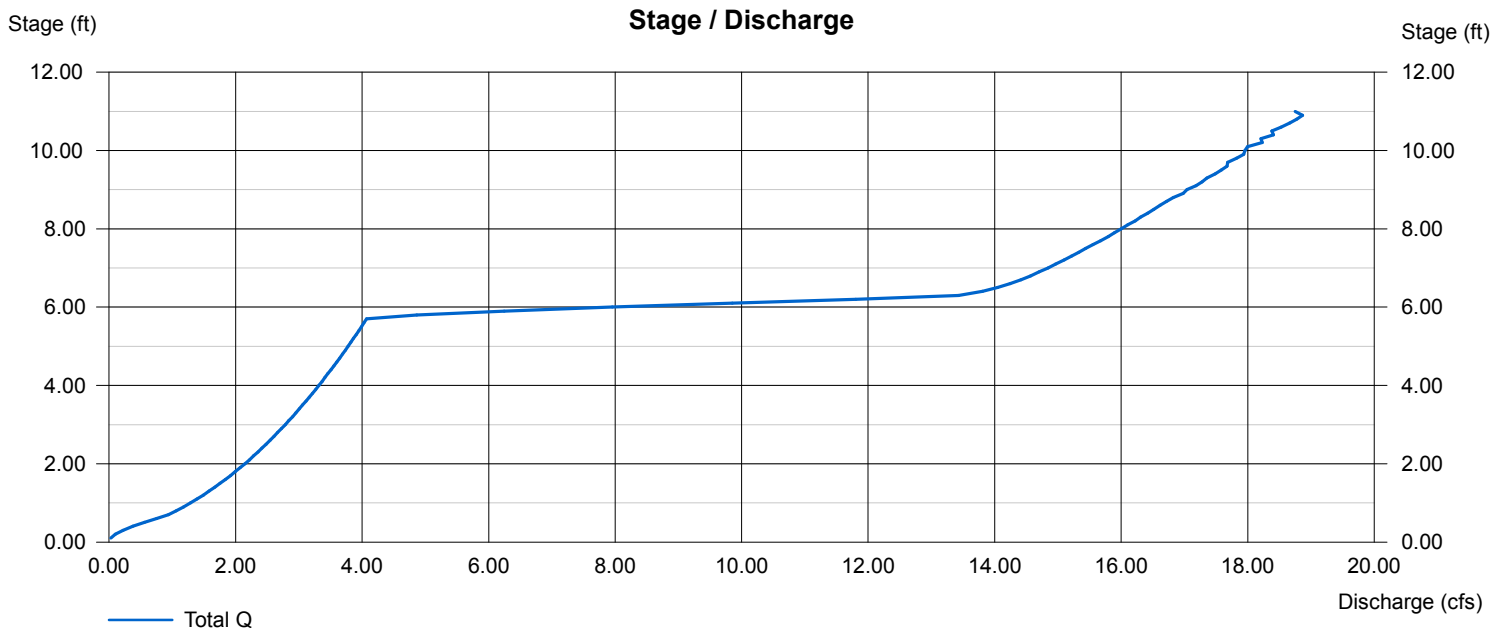
	[A]	[B]	[C]	[D]
Rise (in)	= 15.00	8.50	0.00	0.00
Span (in)	= 15.00	8.50	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 802.00	802.01	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	0.00
N-Value	= .013	.013	.013	.013
Orif. Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 8.00	0.00	0.00	0.00
Crest El. (ft)	= 807.70	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	0.00	0.00
Weir Type	= Riser	---	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	226.46	3	732	1,110,112	---	-----	-----	Proposed - SCS
2	Reservoir	16.53	3	828	1,103,199	1	810.51	737,797	Detention Pond

Downtown Redevelopment.gpw

Return Period: 100 Year

Friday, Oct 26 2018, 12:09 PM

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Friday, Oct 26 2018, 12:9 PM

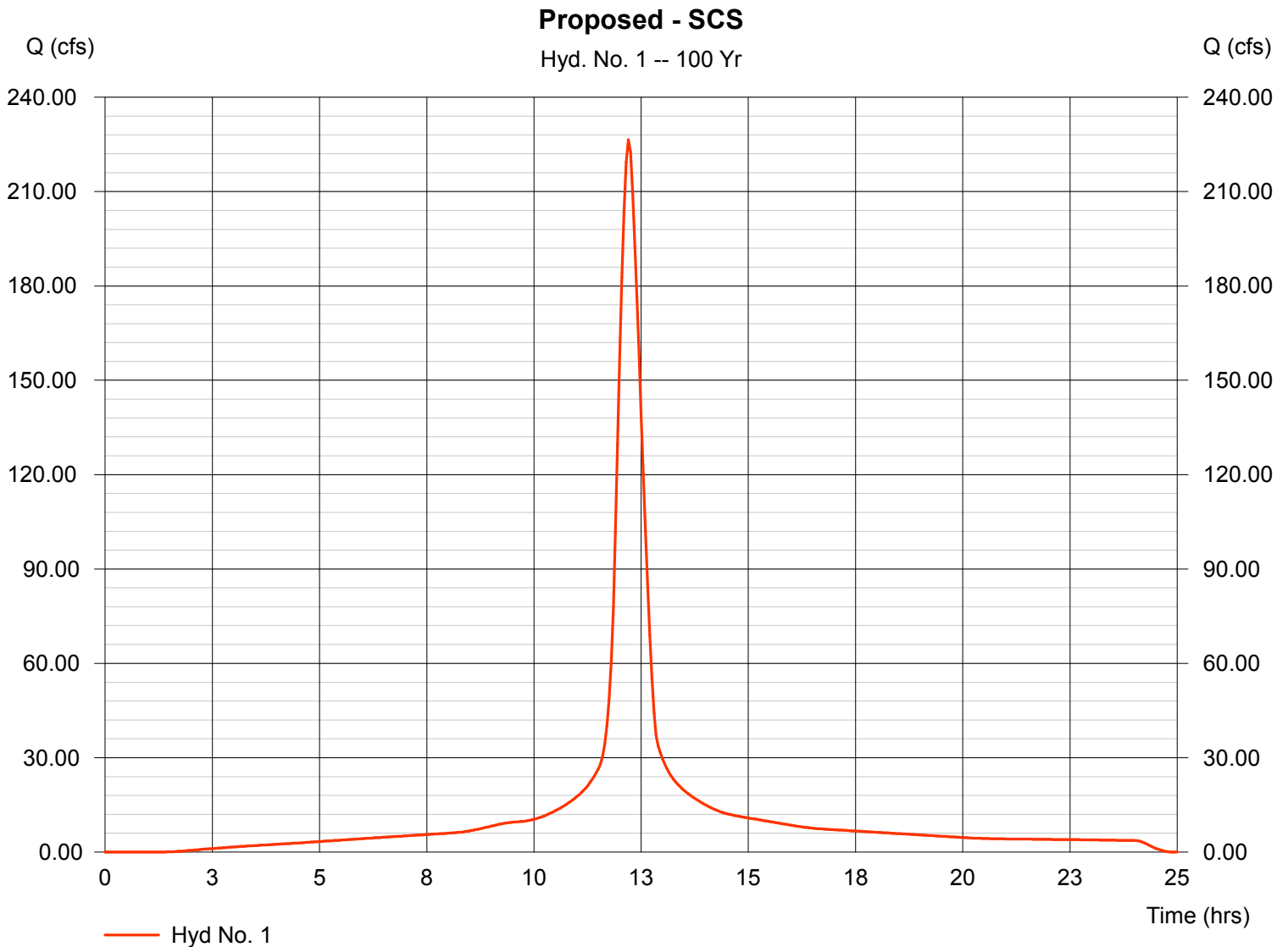
Hyd. No. 1

Proposed - SCS

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Drainage area = 50.000 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 6.46 in
Storm duration = 24 hrs

Peak discharge = 226.46 cfs
Time interval = 3 min
Curve number = 96.2
Hydraulic length = 0 ft
Time of conc. (Tc) = 30.50 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 1,110,112 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Friday, Oct 26 2018, 12:9 PM

Hyd. No. 2

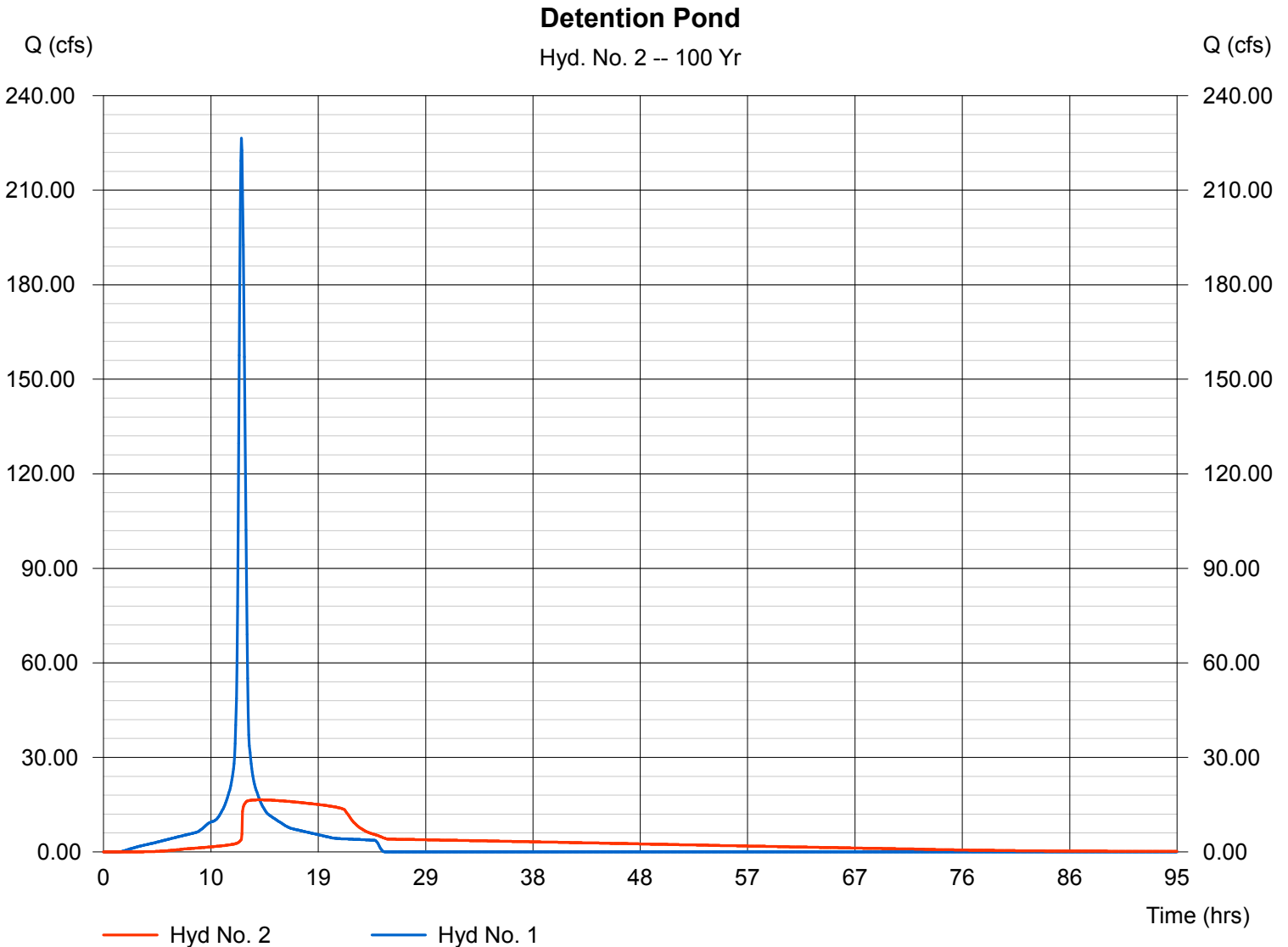
Detention Pond

Hydrograph type = Reservoir
Storm frequency = 100 yrs
Inflow hyd. No. = 1
Reservoir name = Detention Pond

Peak discharge = 16.53 cfs
Time interval = 3 min
Max. Elevation = 810.51 ft
Max. Storage = 737,797 cuft

Storage Indication method used.

Hydrograph Volume = 1,103,199 cuft



Pond Report

Pond No. 1 - Detention Pond

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	802.00	72,000	0	0
1.00	803.00	75,276	73,638	73,638
2.00	804.00	78,624	76,950	150,588
3.00	805.00	82,044	80,334	230,922
4.00	806.00	85,536	83,790	314,712
5.00	807.00	89,100	87,318	402,030
6.00	808.00	92,444	90,772	492,802
7.00	809.00	96,444	94,444	587,246
8.00	810.00	100,224	98,334	685,580
9.00	811.00	104,076	102,150	787,730
10.00	812.00	108,000	106,038	893,768
11.00	813.00	111,996	109,998	1,003,766

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise (in)	= 15.00	8.50	0.00	0.00
Span (in)	= 15.00	8.50	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 802.00	802.01	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	0.00
N-Value	= .013	.013	.013	.013
Orif. Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

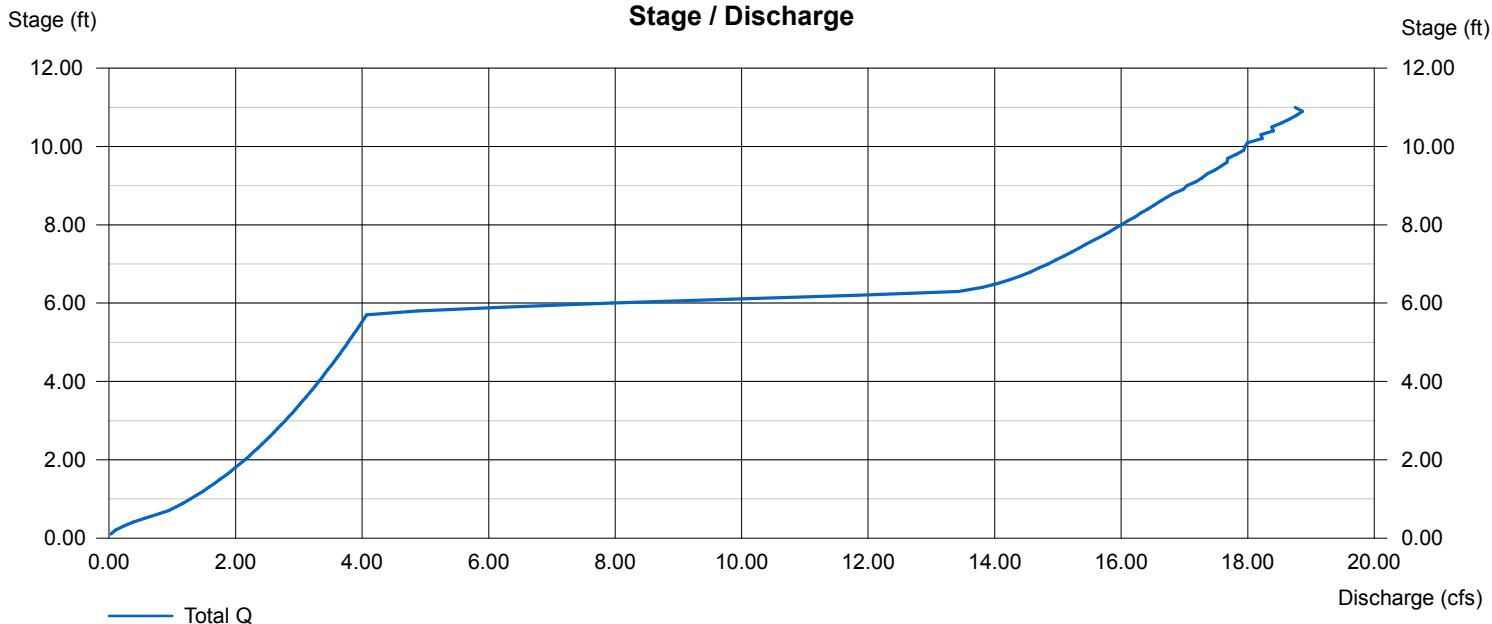
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 8.00	0.00	0.00	0.00
Crest El. (ft)	= 807.70	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	0.00	0.00
Weir Type	= Riser	---	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.

Stage / Discharge



Airport Development

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	SCS Runoff	-----	-----	8.138	-----	-----	42.30	-----	-----	162.25	Existing - SCS
2	SCS Runoff	-----	-----	108.02	-----	-----	190.82	-----	-----	383.59	Proposed - SCS
3	Reservoir	2	-----	1.743	-----	-----	2.543	-----	-----	7.719	Detention Pond

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	42.30	3	726	168,468	---	-----	-----	Existing - SCS
2	SCS Runoff	190.82	3	720	517,837	---	-----	-----	Proposed - SCS
3	Reservoir	2.543	3	1320	494,386	2	102.77	409,580	Detention Pond

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Friday, Oct 26 2018, 12:14 PM

Hyd. No. 1

Existing - SCS

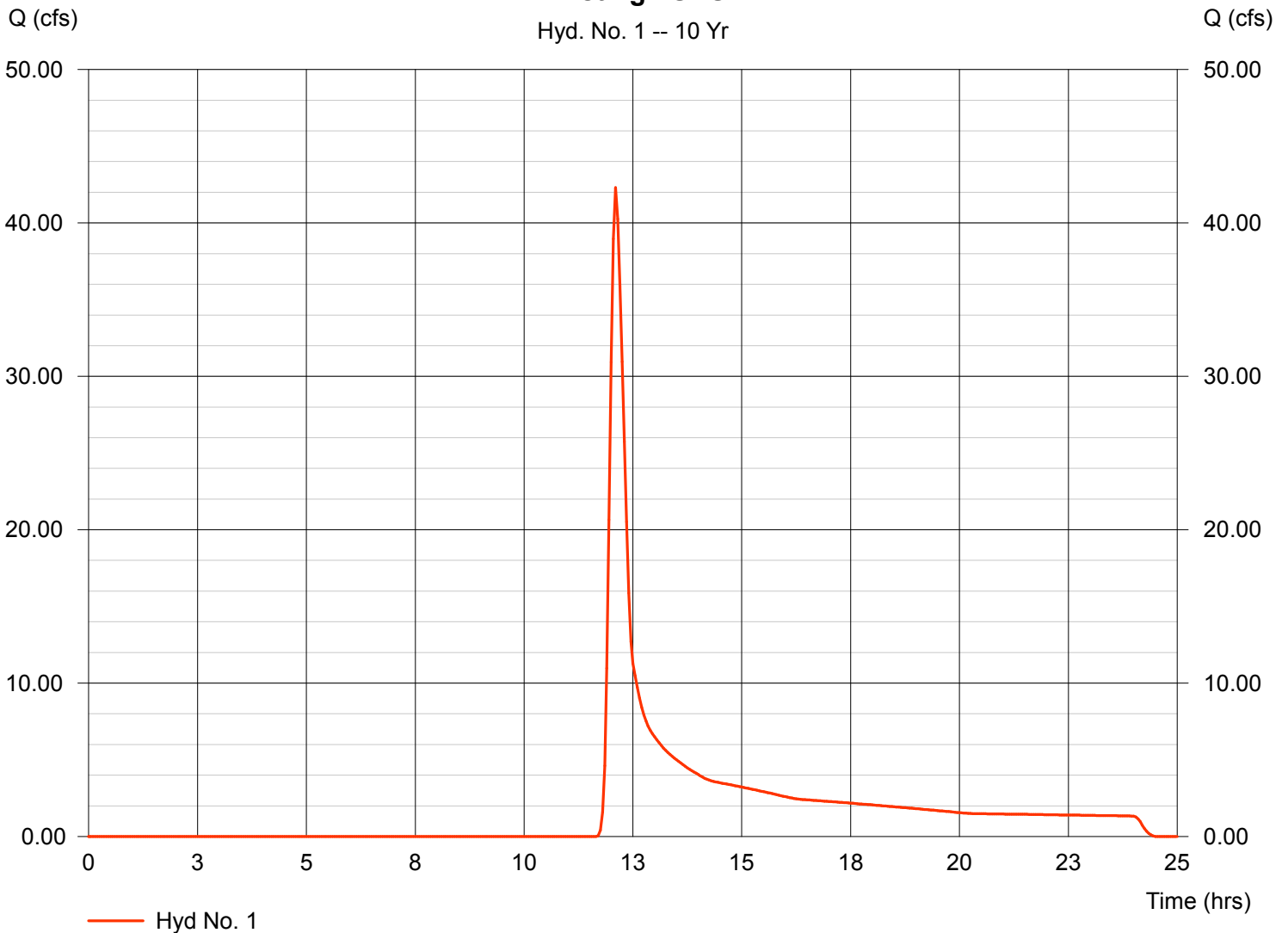
Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Drainage area = 61.850 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 3.83 in
Storm duration = 24 hrs

Peak discharge = 42.30 cfs
Time interval = 3 min
Curve number = 61
Hydraulic length = 0 ft
Time of conc. (Tc) = 15.00 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 168,468 cuft

Existing - SCS

Hyd. No. 1 -- 10 Yr



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Friday, Oct 26 2018, 12:14 PM

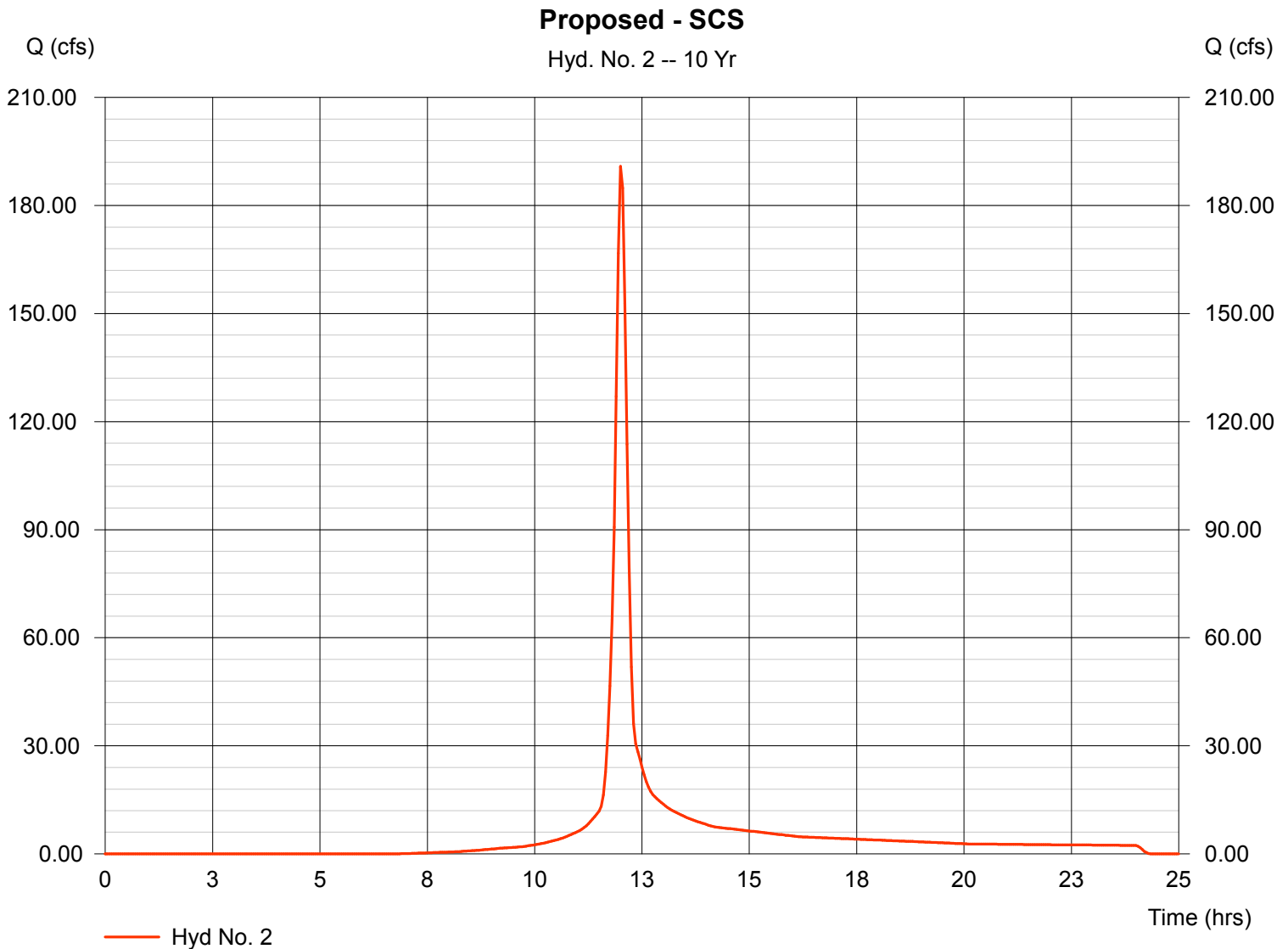
Hyd. No. 2

Proposed - SCS

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Drainage area = 61.850 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 3.83 in
Storm duration = 24 hrs

Peak discharge = 190.82 cfs
Time interval = 3 min
Curve number = 85
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 517,837 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Friday, Oct 26 2018, 12:14 PM

Hyd. No. 3

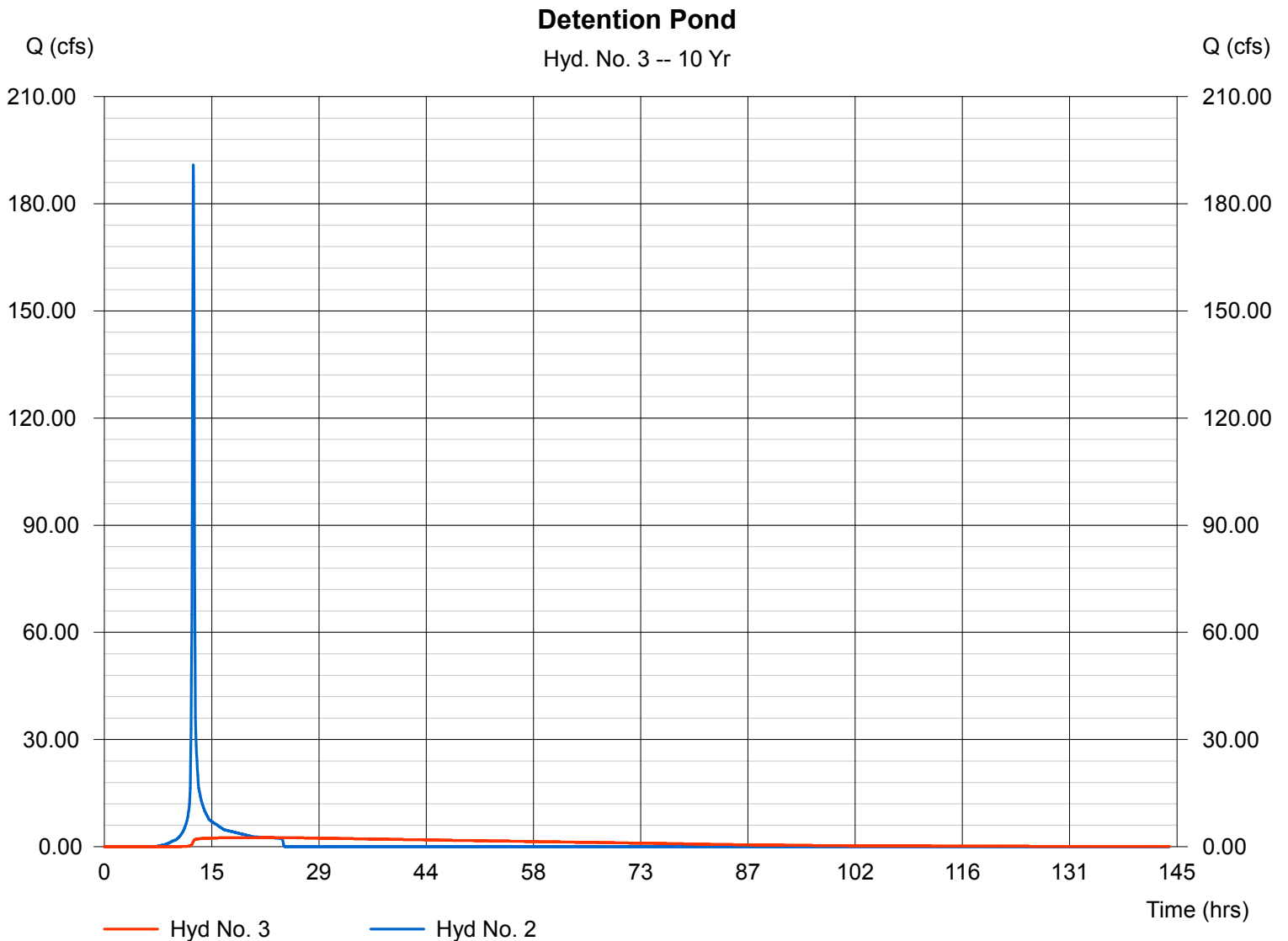
Detention Pond

Hydrograph type = Reservoir
Storm frequency = 10 yrs
Inflow hyd. No. = 2
Reservoir name = Detention Pond

Peak discharge = 2.543 cfs
Time interval = 3 min
Max. Elevation = 102.77 ft
Max. Storage = 409,580 cuft

Storage Indication method used.

Hydrograph Volume = 494,386 cuft



Pond Report

Hydraflow Hydrographs by Intelisolve

Friday, Oct 26 2018, 12:14 PM

Pond No. 1 - Detention Pond

Pond Data

Bottom LxW = 834.8 x 167.0 ft Side slope = 3.0:1 Bottom elev. = 100.00 ft Depth = 7.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	139,374	0	0
0.35	100.35	141,482	49,150	49,150
0.70	100.70	143,599	49,889	99,039
1.05	101.05	145,725	50,632	149,671
1.40	101.40	147,859	51,377	201,048
1.75	101.75	150,003	52,126	253,174
2.10	102.10	152,155	52,878	306,052
2.45	102.45	154,316	53,632	359,684
2.80	102.80	156,486	54,390	414,074
3.15	103.15	158,664	55,151	469,226
3.50	103.50	160,852	55,915	525,141
3.85	103.85	163,048	56,683	581,824
4.20	104.20	165,253	57,453	639,276
4.55	104.55	167,467	58,226	697,502
4.90	104.90	169,690	59,002	756,505
5.25	105.25	171,921	59,782	816,287
5.60	105.60	174,162	60,565	876,851
5.95	105.95	176,411	61,350	938,202
6.30	106.30	178,669	62,139	1,000,341
6.65	106.65	180,936	62,931	1,063,272
7.00	107.00	183,211	63,725	1,126,997

Culvert / Orifice Structures

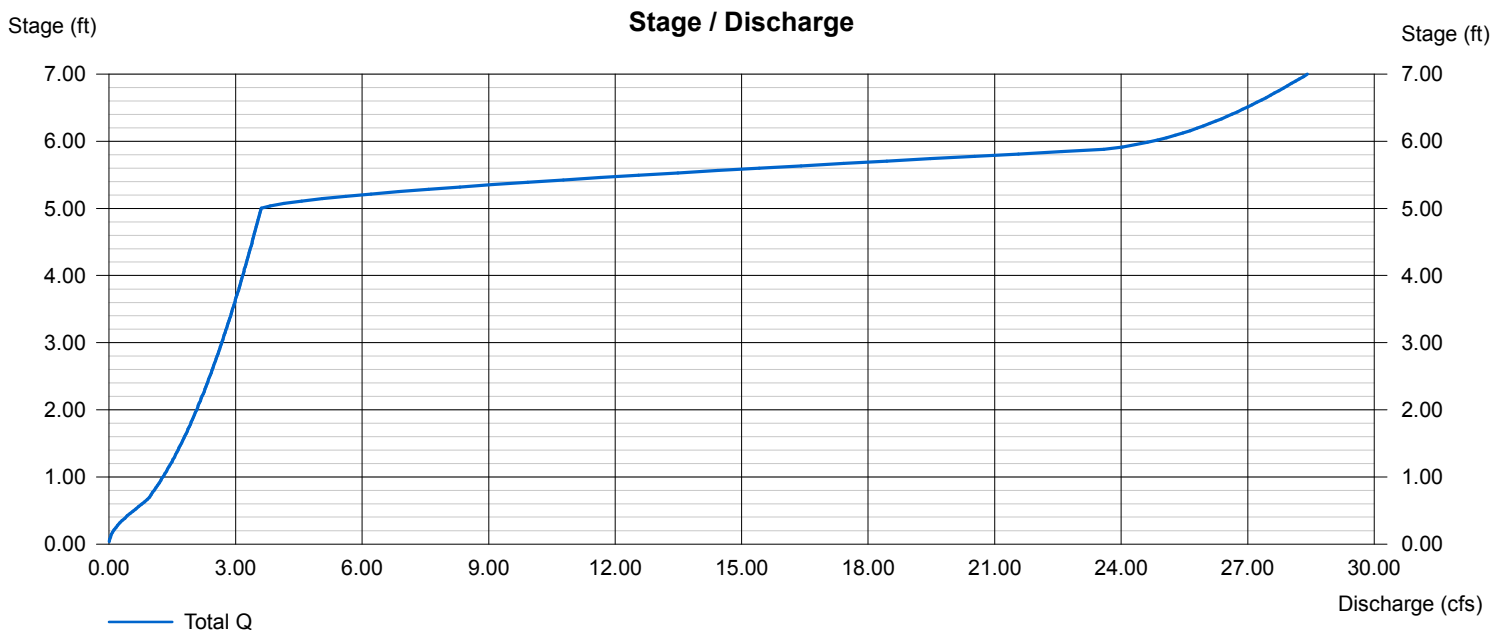
	[A]	[B]	[C]	[D]
Rise (in)	= 21.00	8.20	0.00	0.00
Span (in)	= 21.00	8.20	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 100.00	100.01	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	0.00
N-Value	= .013	.013	.013	.013
Orif. Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 8.00	0.00	0.00	0.00
Crest El. (ft)	= 105.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	0.00	0.00
Weir Type	= Riser	---	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Wet area) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	162.25	3	726	537,003	---	-----	-----	Existing - SCS
2	SCS Runoff	383.59	3	720	1,063,747	---	-----	-----	Proposed - SCS
3	Reservoir	7.719	3	1032	1,024,808	2	105.29	823,481	Detention Pond

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Friday, Oct 26 2018, 12:14 PM

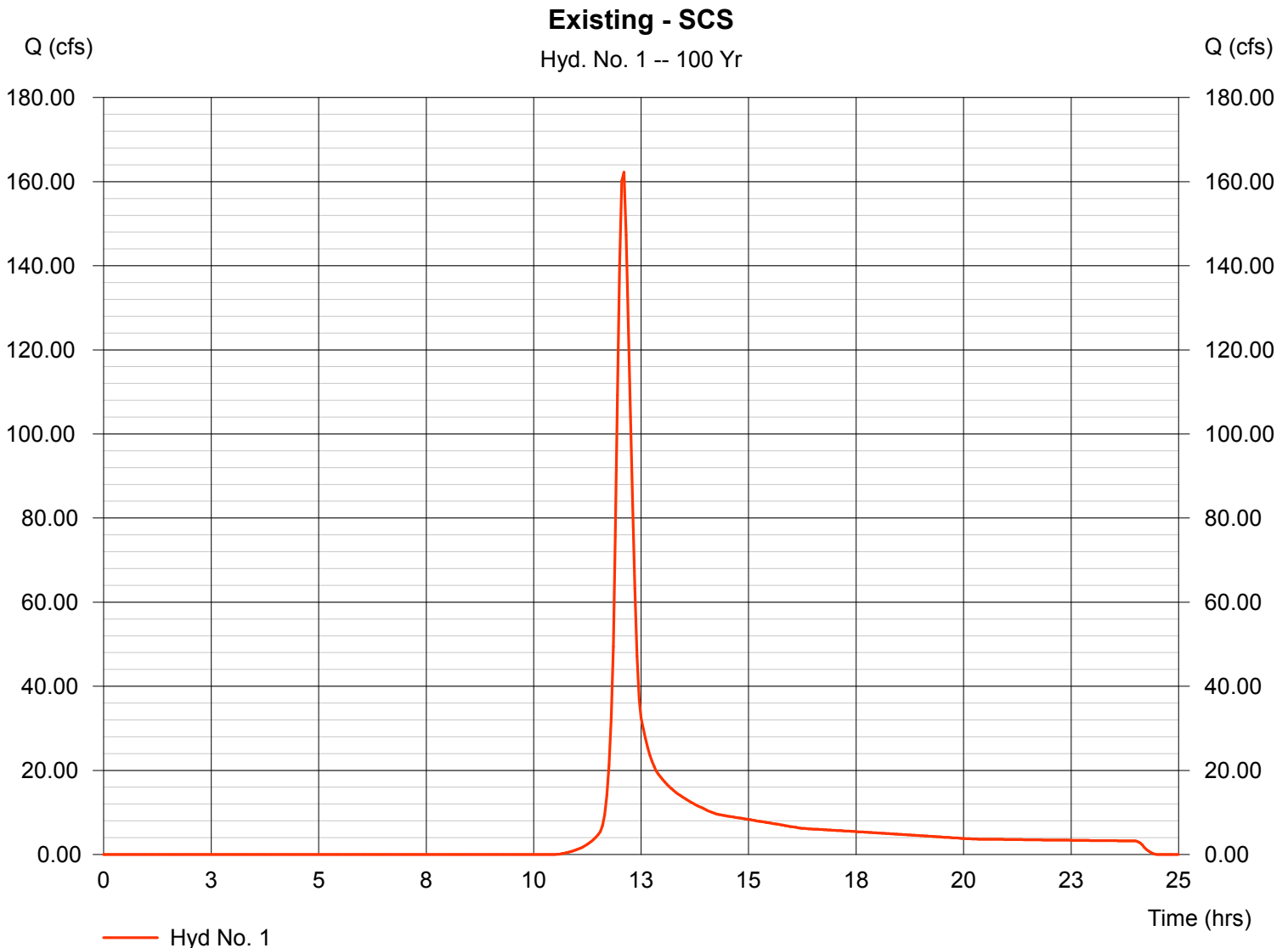
Hyd. No. 1

Existing - SCS

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Drainage area = 61.850 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 6.46 in
Storm duration = 24 hrs

Peak discharge = 162.25 cfs
Time interval = 3 min
Curve number = 61
Hydraulic length = 0 ft
Time of conc. (Tc) = 15.00 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 537,003 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Friday, Oct 26 2018, 12:14 PM

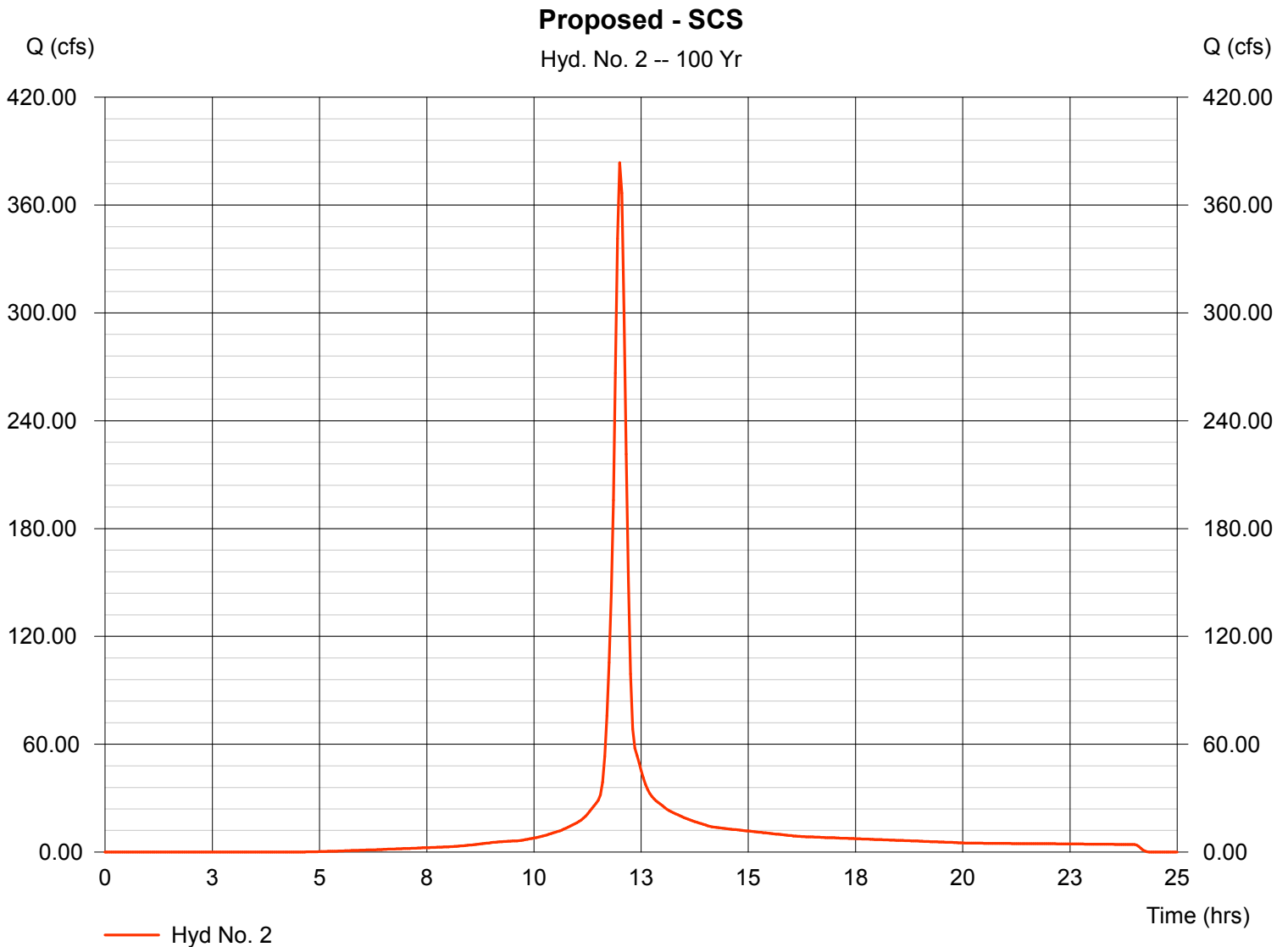
Hyd. No. 2

Proposed - SCS

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Drainage area = 61.850 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 6.46 in
Storm duration = 24 hrs

Peak discharge = 383.59 cfs
Time interval = 3 min
Curve number = 85
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 1,063,747 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Friday, Oct 26 2018, 12:14 PM

Hyd. No. 3

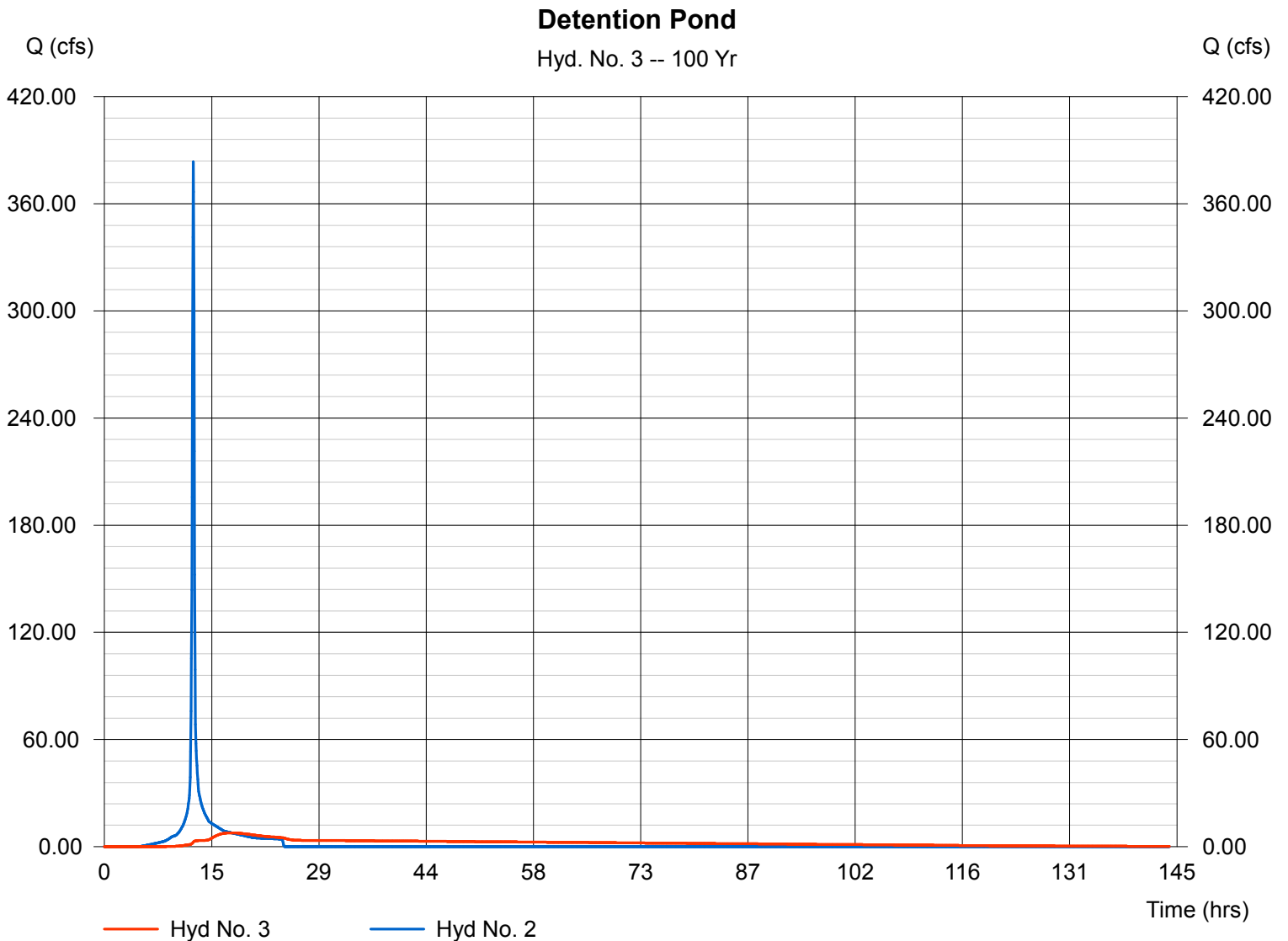
Detention Pond

Hydrograph type = Reservoir
Storm frequency = 100 yrs
Inflow hyd. No. = 2
Reservoir name = Detention Pond

Peak discharge = 7.719 cfs
Time interval = 3 min
Max. Elevation = 105.29 ft
Max. Storage = 823,481 cuft

Storage Indication method used.

Hydrograph Volume = 1,024,808 cuft



Pond Report

Hydraflow Hydrographs by Intelisolve

Friday, Oct 26 2018, 12:14 PM

Pond No. 1 - Detention Pond

Pond Data

Bottom LxW = 834.8 x 167.0 ft Side slope = 3.0:1 Bottom elev. = 100.00 ft Depth = 7.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	139,374	0	0
0.35	100.35	141,482	49,150	49,150
0.70	100.70	143,599	49,889	99,039
1.05	101.05	145,725	50,632	149,671
1.40	101.40	147,859	51,377	201,048
1.75	101.75	150,003	52,126	253,174
2.10	102.10	152,155	52,878	306,052
2.45	102.45	154,316	53,632	359,684
2.80	102.80	156,486	54,390	414,074
3.15	103.15	158,664	55,151	469,226
3.50	103.50	160,852	55,915	525,141
3.85	103.85	163,048	56,683	581,824
4.20	104.20	165,253	57,453	639,276
4.55	104.55	167,467	58,226	697,502
4.90	104.90	169,690	59,002	756,505
5.25	105.25	171,921	59,782	816,287
5.60	105.60	174,162	60,565	876,851
5.95	105.95	176,411	61,350	938,202
6.30	106.30	178,669	62,139	1,000,341
6.65	106.65	180,936	62,931	1,063,272
7.00	107.00	183,211	63,725	1,126,997

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise (in)	= 21.00	8.20	0.00	0.00
Span (in)	= 21.00	8.20	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 100.00	100.01	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	0.00
N-Value	= .013	.013	.013	.013
Orif. Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 8.00	0.00	0.00	0.00
Crest El. (ft)	= 105.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	0.00	0.00
Weir Type	= Riser	---	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Wet area) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.

