Stormwater Master Plan - 2023

prepared for the

TOWN OF BROWNSBURG, IN

December 2023

TOWN OF Brownsburg

WESSLER ENGINEERING

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Wessler Project No. 266723.01.002

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LIST OF ABREVIATIONS

BMPs	best management practices
CFS	cubic feet per second
GIS	geographic information system
HGL	hydraulic grade line
IDDE	Illicit Discharge Detection and Elimination
IDEM	Indiana Department of Environmental Management
IDNR	Indiana Department of Natural Resources
LF	linear feet
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
SWPPP	Stormwater Pollution Prevention Plan
USDA	United States Department of Agriculture
WQCR	Water Quality Characterization Report

EXECUTIVE SUMMARY

The Stormwater Master Plan (Master Plan) outlines the Town of Brownsburg's (Town) stormwater improvement goals, analyzes project alternatives, and provides recommendations. This study was limited to the Town's corporate limits. The Master Plan considers the various users and stakeholders of the stormwater management system including the residential users, commercial and industrial businesses and other non-residential users, the general public, elected officials, and all others who live in, work in, or visit the Town. This Master Plan recommends improvements to GIS mapping and defines stormwater improvements for the Town over a 20-year planning period (2023-2043).

Project Methodology

The Town has identified problem areas through resident complaints and field investigation, which included ten priority areas. These areas include County Road 600 East, Maple Lane, Sunny Knoll, Hornaday Heights, Sugar Bush, Raccoon Court, Lowell Court, Whittington Ditch, Country Harmony Ditch, and College Avenue and Main Street Sewer Separation Phase II. For each area, improvement alternatives were sized for the peak flow during the 10-year design storm. Whittington Ditch, Country Harmony Ditch, and College Avenue and Main Street Sewer Separation Phase II were updated projects from previous studies.

Implementation Plan

The Town operates their own municipal separate storm sewer system (MS4) and maintains the stormwater infrastructure within Town limits. Capital projects are funded by the fees collected by the Town's stormwater utility. The revenue from the stormwater user fee collection is anticipated to fund all projects outlined in this Master Plan. Additional funding sources are recommended to be considered.

Summary of Total Project Costs

Project Area	*Cost of Recommended Alternative*	*Exhibit Number of Selected Alternative*
ST1: County Road 600 East	$131,000	Exhibit A-5
ST2: Maple Lane	$677,000	Exhibit A-6
ST3: Sunny Knoll (Alt. 1)	$568,000	Exhibit A-7
ST4: Hornaday Heights (Alt. 3)	$579,000	Exhibit A-8
ST5: Sugar Bush Lane	$521,000	Exhibit A-9
ST6: Raccoon Court	$52,000	Exhibit A-10
ST7: Lowell Court	$211,000	Exhibit A-11
ST8: Whittington Ditch	$703,000	Exhibit A-12
ST9: Country Harmony Ditch	$987,000	Exhibit A-13
ST10: College Ave and Main Sewer Separation Phase II	$8,789,000	Exhibit A-14
Total Project Costs	$13,218,000	-

1.0 INTRODUCTION

This Stormwater Master Plan (Master Plan) has been developed for the Town of Brownsburg (Town) to identify and assess stormwater management issues throughout the Town. The plan summarizes capital improvement projects, incorporates stormwater quality concepts, and serves as a planning document for Town's stormwater drainage system.

Effective stormwater management provides environmental, social, and economic benefits for residents, businesses, and visitors to the Town. When stormwater management is done well, streams and rivers are cleaner; flood risks are reduced; stormwater systems function properly; and it can result in an increased quality of life for the community.

The Master Plan is intended to be a living document that should be reviewed and updated regularly as projects are completed and new information is obtained.

1.1 Service Area

The Town is located in the northeast corner of Hendricks County and adjoins the northwest corner of Marion County in Indiana, northwest of Indianapolis.

The Town operates a municipal separate storm sewer system (MS4) and established a stormwater utility in 2009 that charges user fees to utility customers within the Town's corporate limits. The Town's stormwater service area is the corporate limits and is shown in **Exhibit A-1 in Appendix A**. The Town is required to comply with the Indiana MS4 General Permit (MS4GP) where the MS4 area boundaries are also the corporate limits.

The majority of the Town's combined sewers have been separated over time and new development has installed separate storm sewer systems. Two projects evaluated in this Master Plan address some of the few remaining combined sewers within the Town's sanitary sewer service area.

1.2 Study and Project Areas

The Study Area includes the Town corporate limits, which is the same as the stormwater service area previously defined and is located within Lincoln Township of Hendricks County on the Brownsburg Quadrangle Map, Township 16N, Range 1E, Section 11. Primary problem areas have been identified by Town officials and property owners as focal points of the Study Area.

Refer to **Exhibit A-1 in Appendix A** for an overview of the stormwater system and Study Area.

1.3 Environmental Resources

Environmental resources are discussed in the following paragraphs. Stormwater management directly impacts these environmental resources, and the impact is important to consider when making decisions about stormwater infrastructure.

1.3.1 Wetlands

Wetlands are areas that are inundated or saturated by water for a period that allows vegetation to grow that is adapted for such soil conditions. Wetlands are identified by having hydric soils, wetland hydrology, and hydrophytic vegetation. Wetlands are important because they provide a wildlife habitat, filter nutrients and sediments, and control flooding. Jurisdictional wetlands are protected by federal and state regulations. Refer to **Appendix A, Exhibit A-2** for a map that illustrates the National Wetlands Inventory in the Town.

1.3.2 Floodplains and Floodways

The 100-year floodplain is the land along a waterway that has a 1% chance of flooding in a year. Floodplains help reduce flooding impacts by holding flood waters and promote groundwater recharge. The floodplains within the Town of Brownsburg consist of the 100-year and 500-year floodplains of unnamed tributaries to White Lick Creek, White Lick Creek, and West Fork White Lick Creek, as well as the 100-year floodplains of Quinn Ditch and East Fork White Lick Creek. The Town's Chapter 152 is a Flood Hazard Area ordinance and regulates the local floodplain.

A floodway is the river and the adjacent land reserved to carry and discharge flood waters. The floodway must remain free from obstructions so that flood waters can be conveyed downstream. Any work performed in the floodway must obtain approval from the Indiana Department of Natural Resources (IDNR). Refer to **Appendix A, Exhibit A-2** for the mapped flood zones in the Town.

1.3.3 Soils

The soils within the Project Areas consist mostly of silt loam and silty clay loam according to the United States Department of Agriculture (USDA) Web Soil Survey, which are rated as "somewhat poorly drained" soils. The majority of the soils within the Project Areas are classified as hydrologic group D soils when the water table is high. Group D soils have very slow infiltration rates and high runoff potential.

These soil conditions affect the amount of stormwater runoff generated during a storm event, limit the amount of runoff pollution that is filtered into the ground, and increase the amount of runoff pollution that is concentrated in the stormwater system.

1.4 GIS Mapping Evaluation

The Town currently has stormwater mapping information in two separate locations: a CAD file last updated in 2007 and newer mapping in a geographical information system (GIS). It is recommended that the Town works to create a comprehensive map in GIS of all stormwater assets in order to comply with MS4 requirements, as well as provide efficiency in identification and location of assets, and an improved management of the overall system.

Asset management is the process of ensuring that there is sufficient investment in maintenance, repair, replacement, and upgrade of the physical components of the

stormwater system. The first step in an asset management plan is to have an accurate storm system map of the system as required by the MS4GP. It is important to know the location of pipes, manholes, inlets, catch basins, culvert pipes, and water quality best management practices (BMPs), as well as open ditches and swales.

1.4.1 Outfall Identification

The MS4 permit requires the Town to map the location of stormwater outfalls, which are defined as "a point source discharge via a conveyance of stormwater run-off into a receiving stream or other body of water". Outfalls had been identified in the Water Quality Characterization Report (WQCR) completed earlier in 2023. At that time, Wessler reviewed the Town's online GIS system and identified locations where the Town's stormwater system discharges into a waterway or county legal drain. A comprehensive list of MS4 outfalls that are owned and operated by the Town must be developed. This effort may require field work to gather information with GPS (global positioning system). It is recommended that all outfalls listed in the table below be verified for accurate location and proper labeling in the Town's GIS. Currently, there is one outfall mapped as an "MS4 outfall" in the Town's GIS layers. The remaining outfalls need to be relabeled to correspond to the correct GIS layer. As part of a GIS mapping project, the Town should ensure all outfalls are mapped according to the following MS4GP requirements:

1. Identify each MS4 outfall with an alphanumeric identifier.
2. Provide the longitude and latitude for each outfall in decimal degrees to 5 decimal place accuracy and a photograph of each discharge point.

Table 1-1 identifies the receiving water and predominant land use(s) tributary to each outfall within the Town. Refer to **Appendix A, Exhibit A-3** for the identified outfalls in the Town.

Table 1-1: Land Use by Outfall and Receiving Water

Outfall	*Receiving Water*	*Predominant Land Use*
Winding Creek Subdivision	White Lick Creek	Commercial, Residential
Maplehurst Drive	White Lick Creek	Commercial, Industrial
700 North Drainage Collection System	White Lick Creek	Commercial, Residential
Stonybrook Drive	White Lick Creek	Commercial, Residential
Near Twin Street and Cemetery	White Lick Creek	Commercial, Residential
Northside Drainage	White Lick Creek	Residential, Open Space
Near the South Swirl Concentrator	White Lick Creek	Residential
Williams Park	White Lick Creek	Open Space
Self-Storage Facility off US 267	White Lick Creek	Commercial
GSV-ST-045	Mary Gibbs Legal Drain	Residential
CSC2-ST-041, CSC2-ST-037	Timothy Quinn Legal Drain	Commercial
CSC2-ST-028	Timothy Quinn Legal Drain	Residential

Outfall	*Receiving Water*	*Predominant Land Use*
CSC3-ST-036	Timothy Quinn Legal Drain	Residential, Open Space
AON-ST-110	Joseph Holloway Legal Drain	Open Space
SRW-ST-192	West Fork White Lick Creek	Residential, Open Space
SRE-ST-153	West Fork White Lick Creek	Residential
HP-ST-011, CRL-ST-843, CRL-ST-830, SBF-ST-014A, CRL-ST-828, CRL-ST-824, HDW-ST-025	Chris Truckses Legal Drain	Residential
HP-ST-007, HP-ST-004, CNW-ST-122, MP-ST-056	Mary E. Wilson Legal Drain	Residential
IWL-ST-611, BRE-ST-122, BRE-ST-120, BRE-ST-114, HTC-ST-023, BCS-ST-210, BCS1-ST-127	John Garvey and Neal Legal Drain	Residential
HDP-ST-051	John Garvey and Neal Legal Drain	Commercial, Open Space
BCS1-ST-133	John Garvey and Neal Legal Drain	Residential, Open Space
BCS-ST-140	Tavner Neal Legal Drain	Residential
RWF-ST-025, RWF-ST-026	Pollard and Todd Legal Drain	Residential, Open Space
RWF-ST-028, HDP-ST-100	Pollard and Todd Legal Drain	Open Space
FC-ST-101, FC-ST-202	Pollard and Todd Legal Drain	Residential

Resources: IndianaMap and Town of Brownsburg GIS.

1.4.2 Stormwater Conveyances

The Town provided Wessler a copy of a CAD file that contains stormwater system locations, which was compared to the GIS layers. The stormwater conveyances layer currently in the Town's GIS is missing areas within Town when compared to the CAD file mapping and developed areas based on recent aerial photography. It was also found that attribute data such as pipe diameter, invert elevations, and ground elevations are also missing from some of the GIS mapping assets. It is recommended that the Town complete a mapping project prior to the end of the current MS4 permit term (December 17, 2026) to fill in the missing information. Refer to **Exhibit A-3 in Appendix A** for a map of areas assumed to be missing GIS stormwater infrastructure information.

1.4.3 MS4 Boundaries

The MS4GP requires the Town to map the MS4 boundaries (equivalent to the corporate limits) in a GIS compatible format. Based on evaluations, the MS4 boundaries are mapped and an exhibit is included in the WQCR. The Town should confirm that this GIS layer is currently in their GIS.

1.4.4 Municipal Property Locations

The Town is required to implement stormwater pollution prevention plans (SWPPPs) at municipal facilities that have the potential to pollute stormwater. At each facility, BMPs are

implemented, quarterly inspections completed, and municipal staff is trained as required by the SWPPP. The MS4GP requires the following: "Develop and/or maintain an inventory of MS4 owned and/or operated facilities. The inventory must, at a minimum include: (1) A facility location map. (2) The facility name or description of the facility and the street address or if an address is not available the latitude and longitude of each facility to a 5 decimal degree accuracy at the entrance to the facility."

In order to easily isolate this information and update it when municipal properties change, the Town should confirm that the GIS layer is currently in their GIS. The following table includes a list of the Town's municipal facilities and those that are considered a priority for a SWPPP.

Table 1-2: Municipal Facility List

Municipal Facility Name	*Location/Address*	*SWPPP*
Fleet Maintenance Department	221 South Mardale Drive	Yes
Parks Department (Arbuckle Acres Park)	326 North Green Street	Yes
Parks Department (Williams Park)	940 South Locust Lane	Yes
Parks Department (Cardinal Park)	3432 Hornaday Road	No
Parks Department (Stephens Park)	605 South Stephen Drive	No
Parks Department (Lincolnwood Park)	315 West Main Street	No
Parks Department (Virgil Park)	9145 East 300 North	No
Police Department	31 North Green Street	Yes
Police Department Training Facility	75 Whittington Drive	Yes
Street Department	200 South Green Street	Yes
Water Department Field Services Office	220 South Mardale Drive	Yes
Water Department Water Treatment Plant #1	Lucas Drive (Arbuckle Acres Park)	Yes
Water Department Water Treatment Plant #2	5752 East CR 700 North	Yes
Wastewater Treatment Plant	225 South Mardale Drive	Yes
Wastewater Combined Sewer Overflow Treatment	200 South Green Street	Yes
Town Hall	61 North Green Street	No

1.4.5 Industrial Land Uses

Industrial land uses areas and industrial properties can be a source of spills, waste generation, and stormwater pollution issues. It is important that the Town be aware of industrial activities so that the sites can be managed for pollution prevention initiatives. The MS4GP requires the Town to do the following:

1. Identify and map all active industrial facilities within the MS4 area that discharge into a MS4 conveyance. Identification must include the facility name, address, telephone number, and type of industrial activity.
2. Develop a map that identifies high priority areas for administering the illicit discharge detection and elimination program based on land use, prior history, and frequency of discharges.

The Town's GIS was reviewed for an Industrial Land Uses layer. There does not appear to be an existing isolatable GIS layer of industrial areas within the Town's MS4 boundary. This is recommended to be created for compliance with current MS4 requirements prior to the end of the current MS4 permit term (December 17, 2026). A list of industrial sites is included in the 2023 WQCR.

1.4.6 Illicit Discharge Tracking of Priority Areas

Illicit discharge tracking of priority areas is a new requirement for MS4 communities. At the end of the year, any repeat offenders are recommended to be mapped in the Town's GIS and updated regularly for compliance with current MS4 requirements. The MS4GP requires the following: "Develop or review and update a map that identifies high priority areas for administering the Illicit Discharge Detection and Elimination (IDDE) program based on land use, prior history, and frequency of discharges."

In addition to high priority areas, GIS can be used to keep track of illicit discharge recordkeeping information. If GIS is utilized, information can be easily compiled for annual reporting and regulatory audits. Consider including the following information about illicit discharges in the Town's GIS system:

1. Location (physical street address, parcel number, or GPS location)
2. Illicit discharge tracking forms and written documentation
3. Photographs of the incident and efforts made to eliminate the discharge

2.0 POPULATION AND LAND USE

The following paragraphs summarize the current and projected population of the Town in a 20-year planning period. The future development and land use is also discussed, as well as how the population projections and developments might impact future stormwater management and capacity demands.

2.1 Current Population

Based on recent United States Census Bureau data, the current population in the Town of Brownsburg is approximately 32,000.

2.2 Population Projection

The Master Plan is based on a 20-year planning period, from 2023 to 2043. The Town's growth is estimated at 10-year increments below. The historical data (1990-2020) below has been obtained from the United States Census Bureau. The current population and 10-year and 20-year population projections were calculated assuming linear increase in population between 2010 and 2022 and extrapolating this trend. This equates to a 52% population increase from the current population by 2043. Refer to **Table 2-1** below for the projected population totals.

Table 2-1: Population Projections

Year	*Population*
1990	Population
2000	7,628
2010	14,520
2020	21,285
2022	28,973
2023	31,193
2033	32,000
2043	40,300

2.3 Future Development and Land Use

In 2022, the Town's Parks Department completed a study (Recreation Zone Improvements Plan) to investigate future development and land use in the next 10 years. The study investigated land that is anticipated to be developed in the coming years, as well as reviewed zoning and future land use. This study is recommended to be utilized to plan for future extensions of the Town's stormwater system.

2.4 Impact on Stormwater Demands

The Town is expected to grow both in population and acreage, but this does not necessarily equate to an increase in stormwater runoff or increase in demand. In areas where new development is anticipated, the Town may evaluate and invest in providing a stormwater

outlet if none exist in the area. The Town's stormwater ordinance and standards require detention for new developments based on the amount of developed area. Land disturbances must detain developed stormwater flow to the following allowable release rates:

- 0.2 cubic feet per second (cfs) per acre of development for the 0-to-10-year return interval storms
- 0.4 cfs per acre of development for the 11-to-100-year return interval storms
- If the downstream receiving channel or pipe is inadequate to accommodate the post-developed flow, then the release rate must be further reduced.

The requirement is not dependent on the pre- or post-development runoff calculation. In all cases, the post-developed runoff flow rate will be reduced. This ensures that the stormwater runoff generated in new development or redevelopment areas will not increase the peak flow downstream and will not negatively impact existing stormwater system capacities assuming the development area remains in the same watershed.

The Hendricks County Drainage Board regulates detention within legal drain watersheds both inside and outside of the Town of Brownsburg corporate limits. The Drainage Board has studied the legal drain watersheds and developed similar release rates that are based on an allowable cfs per acre. Future developments to occur outside of the Town limits or areas to be annexed into the Town after being developed should not cause drainage problems or impact storm system capacities.

3.0 PROJECT ANALYSIS

The Town has identified problem areas through resident complaints and field investigation, which included ten priority areas. Three of the ten priority projects that are further discussed in **Chapter 4.0** were previously evaluated and, therefore, were reviewed and estimated costs were updated for this Master Plan. Seven new project areas were investigated, delineated, and evaluated using a consistent process to provide uniformity in the development and analysis of each project.

3.1 Methodology

The project identification and analysis process used the following methodology.

3.1.1 Field Investigation

The project areas provided by the Town were visited to gain a better understanding of the condition of stormwater structures and pavement, as well as to determine the accuracy of the GIS mapping and collect pipe sizes where no information was available.

The following areas were evaluated in the field:

- County Road 600 East
- Maple Lane
- Sunny Knoll
- Hornaday Heights
- Sugar Bush Lane
- Raccoon Court
- Lowell Court
- Whittington Ditch
- Country Harmony Ditch
- College Avenue and Main Street Sewer Separation Phase II

3.1.2 Drainage Area Delineation and Runoff Calculations

Drainage areas were delineated for each project area based on the existing stormwater infrastructure. Surface elevations were obtained from the Open Topography Spatial Data Portal using downloaded LiDAR Digital Elevation Data. Aerial photographs, topographical maps, and Town GIS maps were reviewed, and field inspections were performed to identify contributing areas.

Using the Natural Resources Conservation Service Technical Release 55 (TR-55) methodology for estimating runoff, the soil hydrologic groups and cover descriptions were utilized to determine curve numbers (CN) for stormwater runoff calculations in each drainage area. When analyzing hydrologic soils, the following conservative assumptions were made:

- Soils that fall into two groups were analyzed using the hydrologic soil group that has higher runoff potential. For example, soils classified as hydrologic soil group B/D were analyzed as hydrologic soil group D.
- The shortest depth to water table in the given range was assumed to determine effectiveness of infiltration technologies in the area.

3.1.3 Flow Estimation and Hydraulic Analysis

Existing pipe sizes and lengths were obtained from the Town's GIS maps. Time of concentration paths were defined, and the TR-55 method was used to determine the time of concentration for each drainage area. In accordance with Chapter 151 of Brownsburg's Code of Ordinances (Ch. 151), the peak 10-year storm was analyzed through each of the existing systems either with runoff calculation spreadsheets or Hydraflow stormwater system modeling software.

Proposed stormwater improvements were also sized to adequately convey the peak flow generated during the 10-year design storm by gravity. The priority projects were preliminarily designed to meet the design standards outlined in Ch. 151.

3.1.4 Prioritization

Each project area was evaluated for the type of conveyance, occurrence of street and property flooding including number of residents impacted, and estimated project costs to identify and compare the impact of each drainage issue. Refer to **Table 3-1** below for the evaluation matrix. Although the matrix below provides a ranking, the priority projects were not ranked nor are they listed in any specific order. Other factors may impact the order in which the Town decides to complete the priority projects, such as other utility or street projects planned in the same project area and age of existing infrastructure. **Chapter 5.2** summarizes the results of the prioritization evaluation.

Table 3-1: Evaluation Matrix Example

Conveyance Classification		Is the problem affecting a street and what type of conveyance? If more than one conveyance type or street type is present, select the highest ranking.				
		no conveyance/ conveyance needed 3	Open Channel 2	Culvert/Storm Pipe 2	no conveyance/ conveyance not needed 1	Ranking
High Traffic Street	4					
Local Street	3					
Off Street	2		X			4

Occurrence of Street Flooding		How often does flooding occur and does it affect a street?				
		Every Rain 4	6 per year 3	1-2 per year 2	1 per 5 years 1	Ranking
High Traffic Street	4					
Local Street	3					
Off Street	2	X				8

Occurrence of Property Flooding		What type of property is affected and how often?				
		Every Rain 4	6 per year 3	1-2 per year 2	1 per 5 years 1	Ranking
Homes	4					
Businesses	3					
Parking Lots	2					
Yards/Fields	1	X				4

Flooding/Erosion Impacts		How many properties are affected by flooding or erosion?				
		>50 impacted 8	26-50 impacted 6	11-25 impacted 4	1-10 impacted 2	Ranking
Homes	4					
Businesses	3					
Parking Lots	2					
Yards/Fields	1				X	2

Estimated Project Cost		What is the estimated construction cost of the project to remedy the problem?				
		< $50,000 4	up to $100,000 3	up to $500,000 2	> $500,000 1	Ranking
Estimated Cost	3		X			9

Priority Ranking **27**

4.0 PRIORITY PROJECTS

Ten priority projects are detailed below to address identified drainage issues within the Town. Each project includes a detailed description of findings, need, solutions considered, recommendations, and a summary of estimated costs. A map of all priority project areas is included as **Exhibit A-4 in Appendix A**.

4.1 ST1: County Road 600 East Drainage Improvements

The County Road 600 East study area is along the west side of County Road 600 East south of Midnight Pass. Refer to **Exhibit A-5 in Appendix A** for the location of the County Road 600 East study area.

4.1.1 Findings and Project Need

The swale along the west side of County Road 600 East does not appear to be draining properly and holds standing water. Upon investigation of the area, low spots were identified along the swale and ponding water was observed near both underdrains that cross below the sidewalk and connect to the storm sewer along the backyards of the properties along Raven Circle. The existing swale does not appear to be graded well. It is shallow with minimal slope.

The existing storm sewer infrastructure in the area consists of an 18-inch reinforced concrete pipe (RCP) storm sewer west of the swale that travels through the backyards of the homes on the east side of Raven Circle. The storm sewer begins as a 12-inch RCP pipe with two inlets on Midnight Pass and increases to an 18-inch pipe after connecting to a 12-inch pipe from the inlets on Raven Circle. There are three existing beehive inlets in the backyards as the storm sewer continues downstream. The existing storm sewer system drains to a retention pond located in the southeast corner of the subdivision.

View of the roadside swale along CR 600 E, facing south.

Evidence of ponding water within the underdrain pipe draining the swale.

4.1.2 Alternatives Considered

One alternative was considered to correct the drainage issues identified throughout the study area.

4.1.3 Recommendations

The field investigation conducted on October 19th, 2023, concluded that the swale directly in the backyards of homes on the east side of Raven Circle that leads to the retention pond appeared to be functioning properly. The swale along County Road 600 East appeared to be too shallow and improperly graded to serve the area draining to it. Proposed drainage improvements include regrading the swale to eliminate the low spots and improve capacity, and direct stormwater runoff to a new inlet that will connect to the system in the backyards along Raven Circle.

The recommended improvements project would:

- Regrade approximately 410 linear feet (LF) of swale
- Install two inlets at newly graded low areas of swale
- Install approximately 97 LF of 12-inch RCP storm sewer

Refer to **Exhibit A-5 in Appendix A** for a conceptual map of the recommended improvements.

Preliminary construction and non-construction costs provide a rough estimate of the probable costs for a project of this type and scale. **Table 4-1** provides a summary of the estimated construction and non-construction project costs. Refer to **Appendix B** for preliminary detailed cost estimates.

Table 4-1: Total Preliminary Estimated Project Costs for ST1

Cost Description	Costs
Engineering Fees *(Survey, Design, Bid, and CA)*	$30,000
Engineering Fees *(Permitting)*	$10,000
Construction	$75,000
Engineering *(Construction Observation)*	$16,000
Total Estimated Project Costs	$131,000

4.1.4 Regulatory Requirements

The following permits are expected for this project:

- County road right-of-way permit

4.1.5 Other Considerations

The following design factors should be considered and incorporated during the planning, design, and construction phases of this project:

- Soil borings to identify soil type and groundwater elevation
- Utility coordination
- Environmental impacts
- Stormwater quality treatment

4.2 ST2: Maple Lane Drainage Improvements

The Maple Lane study area is focused on the existing inlets along Maple Lane, south of Tilden Road. Refer to **Exhibit A-4 in Appendix A** for the location of the Maple Lane study area.

4.2.1 Findings and Project Need

The storm inlets along this section of Maple Lane are currently tied directly into the sanitary sewer system. There is storm sewer infrastructure nearby, east, and south of the storm inlets. A storm sewer and swale run parallel in the backyards of the homes on the east side of Maple Lane, and both seem to be adequately sized for the drainage area. Both conveyances flow south to dual box culverts that cross below Maple Lane and continue draining south.

4.2.2 Alternatives Considered

One alternative was considered to correct the drainage issues identified throughout the study area.

4.2.3 Recommendations

In order to separate the storm inlets from the sanitary sewer in the area, a new storm sewer is recommended along Maple Lane. The new storm sewer is proposed to provide a connection for new inlets and will tie into the existing 24-inch storm sewer near the dual box culverts. It is recommended that the existing inlets be inspected for condition prior to design. If the existing inlets are in poor condition, new inlets will replace them in the same location and the existing inlets will be disconnected from the sanitary sewer.

The recommended improvements project would:

- Install approximately 820 LF of 12-inch RCP storm sewer
- Replace curb inlets and separate from the combined sewer along alignment

Refer to **Exhibit A-6 in Appendix A** for a conceptual map of the recommended improvements.

Preliminary construction and non-construction costs provide a rough estimate of the probable costs for a project of this type and scale. **Table 4-2** provides a summary of the

estimated construction and non-construction project costs. Refer to **Appendix B** for preliminary detailed cost estimates.

Table 4-2: Total Preliminary Estimated Project Costs for ST2

Cost Description	Costs
Engineering Fees *(Survey, Design, Bid, and CA)*	$110,000
Construction	$503,000
Engineering *(Construction Observation)*	$64,000
Total Estimated Project Costs	**$677,000**

4.2.4 Regulatory Requirements

No permits are anticipated for this project.

4.2.5 Other Considerations

The following design factors should be considered and incorporated during the planning, design, and construction phases of this project:

- Soil borings to identify soil type and groundwater elevation
- Utility coordination
- Environmental impacts
- Stormwater quality treatment

4.3 ST3: Sunny Knoll Drainage Improvements

Sunny Knoll subdivision was established in the late 1950s into the 1960s and is located on the west side of Brownsburg, just west of White Lick Creek. The specific problem area is located on the block bound by West Willam Drive on the north and west, West Janet Drive on the south, and South Alpha Avenue on the east. Backyards on this block are poorly drained, resulting in standing water during and after rain events. Additionally, water ponds in the backyards east of the intersection of West Janet Drive and South Alpha Avenue.

There is existing storm sewer infrastructure located around the periphery of the block, specifically at the corners of William Drive and Alpha Avenue to the northeast, Janet Drive and Alpha Avenue to the southwest, and midblock on Willam Drive on the west. Refer to **Exhibit A-4 in Appendix A** for the location of the Sunny Knoll study area.

4.3.1 Findings and Project Need

The area topography and drainage patterns were studied to determine potential causes prior to a site visit by Wessler Engineering on September 27, 2023. Review of the topography and drainage did not find anything out of the ordinary, such as unaccounted for or unplanned tributary areas drainage through the problem site. The drainage area contributing to the area of concern appears to be limited to the backyards of the block and is approximately 2.4 acres.

The interior of the block is filled with privacy fences, sheds, mature trees, and other landscape features. This complicates the issue as a clear route for potential regrading or the placement of storm sewer is not available and would require coordination with property owners for feasibility.

Looking east from West William Drive into the interior of the block. Fences and other obstructions are prevalent in the problem area.

4.3.2 Alternatives Considered

Two alternatives to address the drainage issues were considered.

4.3.2.1 Alternative 1: Improvements in the Backyards

Alternative 1 involves installation of a new storm sewer and open ditch grading in the backyards along Janet Drive and behind 541 Alpha Avenue to provide a drainage outlet for connections by homeowners. The new storm sewer is proposed to connect to the existing storm sewer along Janet Drive midblock.

Advantages

- Alleviates standing water in backyards

Disadvantages

- Coordination with homeowners and utilities will require additional time and costs
- Potentially higher cost alternative because of conflicts with existing sheds, fencing, and vegetation
- Requires land acquisition

4.3.2.2 Alternative 2: Improvements in the Surrounding Streets

Alternative 2 includes new storm sewer infrastructure surrounding the properties experiencing drainage issues. The new storm sewer is proposed to be perforated pipe with stubs at all structures to provide a potential drainage connection for the affected homeowners.

Advantages

- Located within Town right-of-way
- Does not impact existing sheds, fencing, and vegetation
- Does not require land acquisition.

Disadvantages

- Does not alleviate drainage issues without homeowners installing a drainage connection
- High-cost alternative because of total length of storm sewer and pavement repair required

4.3.3 Recommendations

Alternative 1 is recommended because of the direct impact to the problem areas and lower overall project costs. Homeowner coordination will be required for this alternative and if ineffective, Alternative 2 may need to be considered.

The recommended improvements project would:

- Regrade approximately 240 LF of open ditch
- Install approximately 589 LF of 12-inch RCP storm sewer
- Install inlets in low areas along alignment

Refer to **Exhibit A-7 in Appendix A** for a conceptual map of the recommended improvements.

Preliminary construction and non-construction costs provide a rough estimate of the probable costs for a project of this type and scale. **Table 4-3** provides a summary of the estimated construction and non-construction project costs. Refer to **Appendix B** for detailed cost estimates.

Table 4-3: Total Preliminary Estimated Project Costs for ST3

Cost Description	Costs
Engineering Fees *(Survey, Design, Bid, and CA)*	$70,000
Engineering Fees *(Right-of-Way)*	$15,000
Land Acquisition *(Appraisal, Negotiation, & Legal)*	$30,000
Land Purchase	$80,000
Construction	$309,000
Engineering *(Construction Observation)*	$64,000
Total Estimated Project Costs	$568,000

4.3.4 Regulatory Requirements

No permits are anticipated for this project.

4.3.5 Other Considerations

The fact that the problem area is full of obstructions (trees, sheds, fences, etc.) adds to the complexity of the problem. Coordination with landowners is essential to establish drainage easements and extend drainage infrastructure into the interior of the block. Additionally, allowing private connections to a municipal storm sewer extension would require additional oversight and review by the Town.

The following design factors should be considered and incorporated during the planning, design, and construction phases of this project:

- Soil borings to identify soil type and groundwater elevation
- Utility coordination
- Environmental impacts
- Stormwater quality treatment

4.4 ST4: Hornaday Heights Drainage Improvements

Hornady Heights Subdivision was built in the 1960s and has limited internal drainage infrastructure. The subdivision is bound by East Main Street on the north, Hornaday Road on the west, Bulldog Way on the east, and Ironwood Lake subdivision on the south. The southern portion of the subdivision, adjacent to East Logan Street where it abuts Ironwood Lake Subdivision, has issues with stormwater drainage and ponding. This area is drained by a 12-inch end section structure located between the side yards of 606 and 1080 Thorne Drive. Runoff from this structure flows east to a larger 36-inch trunk line that runs on the east side of Hornaday Heights, Ironwood Lake, and Fairfield Heights subdivisions, eventually discharging to a channel located in the rear yards between Robinwood and Fairwood Drives to the south. Refer to **Exhibit A-4 in Appendix A** for the location of the Hornady Heights study area.

4.4.1 Findings and Project Need

The area topography and drainage patterns were studied to determine potential causes prior to a site visit by Wessler Engineering on September 27, 2023. Review of the topography and drainage did not find anything out of the ordinary, such as unaccounted for or unplanned tributary areas drainage through the problem site. The drainage area contributing to the area of concern appears to be limited to the backyards of the block bound by Hornaday Road, East Logan Street, Lakewood North Drive, and Thorne Drive, and is approximately 4.1 acres. There is a swale, albeit poorly defined on the west, in these backyards that does flow eastward towards the outlet just west of Thorne Drive. Portions of lots 1010 - 1040 Lakewood North Drive (Ironwood Lake Subdivision) are draining north onto Hornaday Heights properties, before draining east to the outlet. In an ideal situation, stormwater runoff from these subdivisions would have been kept separated, in their own swales, to the outlets. As one progresses east, towards Thorne Drive, separate drainage swales for the two subdivisions become more defined. However, the problem is further exacerbated by the fact that the Hornaday Heights swale does not have a defined path to the outlet structure. In other words, runoff from Ironwood Lake Subdivision comes onto Hornaday Heights, then stays on the Hornaday Heights side as it flows east and cannot reach the outlet, which is draining its portion of the Ironwood Lake Subdivision swale.

Looking east towards Thorne Drive. Ironwood Lake subdivision on the right, drains onto properties in Hornaday Heights subdivision, on the left.

View of 12-inch CPP outlet pipe that drains east to the 36-inch Robinwood trunk line.

4.4.2 Alternatives Considered

Three potential solutions for the drainage issues were considered.

4.4.2.1 Alternative 1: Open Ditch

Alternative 1 includes a simple clearing and regrading the existing swale along the backyards to the existing outlet located on the east side of the project area.

Advantages

- Lowest cost alternative

Disadvantages

- Minimal change in elevation may result in low areas to form along the alignment

4.4.2.2 Alternative 2: Storm Sewer

Alternative 2 includes installation of storm sewers and inlets along the backyards and connecting into the existing outlet located on the east side of the project area.

Advantages

- Provides an oulet below ground that is not impacted by potential future obstructions

Disadvantages

- Highest cost alternative

4.4.2.3 Alternative 3: Hybrid Ditch

Alternative 2 includes installation of a hybrid ditch system along the backyards and connecting into the existing outlet located on the east side of the project area.

Advantages

- Provide an outlet below ground that is not impacted by potential future obstructions
- Provides a conveyance route at the surface
- Water quality benefits
- Allows for conveyance at a lower slope

Disadvantages

- Requires more space than other alternatives

4.4.3 Recommendations

Alternative 3: Hybrid Ditch is recommended because of the water quality benefits and lower slope requirement. This alternative provides the most cost-effective solution.

The recommended improvements project would:

- Install approximately 907 LF of open ditch
- Install hybrid ditch inlets along alignment

Refer to **Exhibit A-8 in Appendix A** for a conceptual map of the recommended improvements.

Preliminary construction and non-construction costs provide a rough estimate of the probable costs for a project of this type and scale. **Table 4-4** provides a summary of the

estimated construction and non-construction project costs. Refer to **Appendix B** for detailed cost estimates.

Table 4-4: Total Preliminary Estimated Project Costs for ST4

Cost Description	Costs
Engineering Fees *(Survey, Design, Bid, and CA)*	$100,000
Engineering Fees *(Permitting)*	$10,000
Construction	$373,000
Engineering *(Construction Observation)*	$96,000
Total Estimated Project Costs	$579,000

4.4.4 Regulatory Requirements

The following permits are expected for this project:

- IDEM Construction Stormwater General Permit

4.4.5 Other Considerations

All these recommendations will require cooperation amongst the property owners involved. A drainage easement will need to be established along the backyard property lines to the existing outlet. The presence of overhead electric and utility lines along this corridor will require coordination with their respective utilities. Additionally, the placement of fences, sheds, and other rear yard landscaping, especially on the older and more established Hornaday Heights side will require additional planning and coordination with the stakeholders.

The following design factors should be considered and incorporated during the planning, design, and construction phases of this project:

- Soil borings to identify soil type and groundwater elevation
- Utility coordination
- Environmental impacts
- Stormwater quality treatment

4.5 ST5: Sugar Bush Lane Drainage Improvements

The Sugar Bush Lane study area is located between the homes on the east side of Holiday Lane East and the homes on the west side of both South Jefferson Street and Sugar Bush Lane South. Refer to **Exhibit A-4 in Appendix A** for the location of the Sugar Bush Lane study area.

4.5.1 Findings and Project Need

The existing swale between the homes east of Holiday Lane is not draining properly to the detention pond in the neighborhood as it appears it was intended. This results in standing water in the backyards of the study area. Upon investigation of the area, it was determined

that the southern half of the swale was not well defined and that several obstructions were present, such as fencing and other utilities.

The existing storm sewer infrastructure in the area consists of an unmapped underdrain located at the south end of the study area, a 12-inch RCP pipe that drains to the condo complex to the west, and an 18-inch RCP pipe that drains to the retention pond serving the neighborhood to the east.

View of utilities and vegetation within existing swale area.

View of 18-inch RCP pipe that drains to the retention pond.

4.5.2 Alternatives Considered

One alternative was evaluated to correct the drainage issues identified throughout the study area. Easements may need to be purchased along the proposed improvements path.

Drainage improvements include televising the three existing storm pipes that drain the swale. If the pipes are determined to be obstructed by sediment or other debris, it is recommended they are cleared to allow water to drain and prevent ponding water in the swale. Drainage calculations showed that the existing swale outlet pipes should be adequately sized for the contributing drainage area. The alternative only solves the issue if the outlets are obstructed, further investigation is required. Additionally, this does not address the fencing and trees within the flow line of the existing swale or the inconsistency in the grading. Regrading the southern half of the swale and removing and moving fencing, trees, and other obstructions from the flow path to direct water towards the existing underdrain near Airport Road is also recommended.

4.5.3 Recommendations

Drainage improvements include televising the three existing storm pipes that drain the swale. If the pipes are determined to be obstructed by sediment or other debris, it is recommended they are cleared to allow water to drain and prevent ponding water in the swale. Drainage calculations showed that the existing swale outlet pipes should be adequately sized for the contributing drainage area. The alternative only solves the issue if

the outlets are obstructed, further investigation is required. Additionally, this does not address the fencing and trees within the flow line of the existing swale or the inconsistency in the grading. Regrading the southern half of the swale and removing and moving fencing, trees, and other obstructions from the flow path to direct water towards the existing underdrain near Airport Road is also recommended.

Preliminary drainage calculations show a 10-year peak flow for the west bound 12-inch RCP of 3.11 cfs, 5.94 cfs for the west bound 12-inch CMP, and 3.29 cfs for the east bound 18-inch RCP. Based on these calculations, the RCP pipes are adequately sized for the drainage area, but the CMP pipe needs to be upsized.

The recommended improvements project would:

- Clean and televise approximately 610 LF of existing storm sewer
- Replace approximately 118 LF of 12-inch CMP storm sewer with 118 LF of 15-inch RCP storm sewer.
- Regrade approximately 1,034 LF of open ditch

Refer to **Exhibit A-9 in Appendix A** for a conceptual map of the recommended improvements.

Preliminary construction and non-construction costs provide a rough estimate of the probable costs for a project of this type and scale. **Table 4-5** provides a summary of the estimated construction and non-construction project costs. Refer to **Appendix B** for detailed cost estimates.

Table 4-5: Total Preliminary Estimated Project Costs for ST5

Cost Description	Costs
Engineering Fees *(Survey, Design, Bid, and CA)*	$50,000
Engineering Fees *(Permitting)*	$10,000
Engineering Fees *(Right-of-Way)*	$39,000
Land Acquisition *(Appraisal, Negotiation, & Legal)*	$78,000
Land Purchase	$92,000
Construction	$204,000
Engineering *(Construction Observation)*	$48,000
Total Estimated Project Costs	$521,000

4.5.4 Regulatory Requirements

The following permits are expected for this project:

- IDEM Construction Stormwater General Permit

4.5.5 Other Considerations

The following design factors should be considered and incorporated during the planning, design, and construction phases of this project:

- Soil borings to identify soil type and groundwater elevation
- Utility coordination
- Environmental impacts
- Stormwater quality treatment

4.6 ST6: Raccoon Court Drainage Improvements

The Raccoon Court study area consists of the backyards of the homes on the east side of Raccoon Court. Refer to **Exhibit A-4 in Appendix A** for the location of the Raccoon Court study area.

4.6.1 Findings and Project Need

The problem reported is that during rain events, stormwater runoff in the backyards of the homes on the east side of Raccoon Court drains downhill towards the property line east of the homes. There is a swale that travels across the backyards. A low point for the swale is present in the backyard of 25 Raccoon Court, which results in ponding water. A stormwater inlet is present in the backyard of 17 Raccoon Court, however, the inlet is not at a low spot where it could accept drainage.

Water in the backyards is unable to flow correctly through the swale due to grading changes that have taken place since the initial design of the swale. Originally, the swale would have directed water south towards the stormwater inlet at 17 Raccoon Court. However, standing water now ponds in the backyards and has nowhere to discharge. According to the design plans for the neighborhood, there is a 15-inch RCP storm sewer present within the drainage easement at the backyard property line. It is assumed that the stormwater inlet at 17 Raccoon Court drains into the storm sewer, but the inspection team was not able to gain access to the property.

View of the backyard swale facing southeast.

View of ponding water in the backyard of 25 Raccoon Court facing east.

4.6.2 Alternatives Considered

One alternative was considered to correct the drainage issues identified throughout the study area.

4.6.3 Recommendations

The swale is part of a 40-foot utility easement. Stormwater inlets can be installed at the low points along the backyards of Raccoon Court, which would alleviate the immediate drainage problems for the residents. The inlets would be connected to the 15-inch storm sewer underneath the swale.

Refer to **Exhibit A-10 in Appendix A** for a conceptual map of the recommended improvements.

Preliminary construction and non-construction costs provide a rough estimate of the probable costs for a project of this type and scale. **Table 4-6** provides a summary of the estimated construction and non-construction project costs. Refer to **Appendix B** for detailed cost estimates.

Table 4-6: Total Preliminary Estimated Project Costs for ST6

Cost Description	Costs
Engineering Fees *(Survey, Design, Bid, and CA)*	$30,000
Construction	$30,000
Engineering *(Construction Observation)*	$2,000
Total Estimated Project Costs	$52,000

4.6.4 Regulatory Requirements

No permits are anticipated for this project.

4.6.5 Other Considerations

The following design factors should be considered and incorporated during the planning, design, and construction phases of this project:

- Soil borings to identify soil type and groundwater elevation
- Utility coordination
- Environmental impacts
- Stormwater quality treatment

4.7 ST7: Lowell Court Drainage Improvements

The Lowell Court study area consists of the low area between the homes on the south side of the cul-de-sac of Lowell Court and the B&O Trail that runs behind the properties. Refer to **Exhibit A-4 in Appendix A** for the location of the Lowell Court study area.

4.7.1 Findings and Project Need

Flooding occurs frequently in residential yards on the south side of the Lowell Court cul-de-sac. The resident stated trees in the area have slowly died over time as a result of the water standing for extended periods of time.

The existing storm sewer infrastructure in the area consists of a few unmapped curb inlets on Lowell Court, an unmapped inlet in the backyard of 17 Lowell Court that is assumed to drain east, and an unmapped culvert pipe that runs under the B&O Trail. The culvert pipe shown in the picture on the right was measured to be 12-inches, however, its outlet point could not be field verified due to excessive vegetation growth on the south side of the trail.

View of backyard of 22 Lowell Court that frequently floods and has fallen trees.

View of culvert pipe that runs under the B&O Trail.

4.7.2 Alternatives Considered

One alternative was considered to correct the drainage issues identified throughout the study area.

4.7.3 Recommendations

Drainage improvements include regrading an open ditch starting in the backyard of 22 Lowell Court and ending at a new storm inlet. From there, it is recommended that a new storm sewer be installed to the south, under the B&O Trail and along the property of 562 Heartland Lane where it is proposed to connect to the existing curb inlet on the north side of Heartland Lane.

Preliminary drainage area calculations show a 10-year peak flow of 3.46 cfs reaching the culvert pipe. The culvert pipe slope was assumed based on the LiDAR elevation data on both sides of the B&O Trail. Based on that assumed slope, the pipe is adequately sized for the drainage area it serves. It is assumed these improvements will remain within the B&O Trail right-of-way, but a permanent drainage easement will be required for the storm sewer along the side yard of 562 Heartland Lane.

The recommended improvements project would:

- Regrade approximately 400 LF of open ditch
- Install approximately 215 LF of 12-inch RCP storm sewer

Refer to Exhibit **A-11 in Appendix A** for a conceptual map of the recommended improvements.

Preliminary construction and non-construction costs provide a rough estimate of the probable costs for a project of this type and scale. **Table 4-7** provides a summary of the estimated construction and non-construction project costs. Refer to **Appendix B** for detailed cost estimates.

Table 4-7: Total Preliminary Estimated Project Costs for ST7

Cost Description	Costs
Engineering Fees *(Survey, Design, Bid, and CA)*	$40,000
Engineering Fees *(Right-of-Way)*	$3,000
Land Acquisition *(Appraisal, Negotiation, & Legal)*	$6,000
Land Purchase	$20,000
Construction	$126,000
Engineering *(Construction Observation)*	$16,000
Total Estimated Project Costs	**$211,000**

4.7.4 Regulatory Requirements

No permits are anticipated for this project.

4.7.5 Other Considerations

The following design factors should be considered and incorporated during the planning, design, and construction phases of this project:

- Soil borings to identify soil type and groundwater elevation
- Utility coordination
- Environmental impacts
- Right-of-way and easement research
- Stormwater quality treatment

4.8 ST8: Whittington Ditch Drainage Improvements

The Whittington Ditch study area begins at the northeast corner of the intersection of Interstate 74 and SR 267 and proceeds north and east under Whittington Drive and continuing to Garner Road (CR 700N). This study area was previously described in the 2006 Brownsburg Storm Water Improvements Conceptual Plan. Costs estimates have been reviewed and updated to today's estimated prices. Refer to **Exhibit A-4 in Appendix A** for the location of the Whittington Ditch study area.

4.8.1 Findings and Project Need

Whittington Ditch has excessive silt accumulation and is currently overgrown with brush and trees hindering adequate drainage.

4.8.2 Recommendations

The ditch is approximately 2,500-feet in length and needs to be dredged and cleared of trees and brush. After cleaning, stabilization of the invert and banks of the ditch will be required to prevent erosion during storm events.

Refer to **Exhibit A-12 in Appendix A** for a conceptual map of the recommended improvements.

Preliminary construction and non-construction costs provide a rough estimate of the probable costs for a project of this type and scale. **Table 4-8** provides a summary of the estimated construction and non-construction project costs. Refer to **Appendix B** for detailed cost estimates.

Table 4-8: Total Preliminary Estimated Project Costs for ST8

Cost Description	Costs
Engineering Fees *(Survey, Design, Bid, and CA)*	$120,000
Engineering Fees *(Permitting)*	$30,000
Construction	$473,000
Engineering *(Construction Observation)*	$80,000
Total Estimated Project Costs	**$703,000**

4.8.3 Regulatory Requirements

The following permits are expected for this project:

- IDEM Construction Stormwater General Permit

4.8.4 Other Considerations

The following design factors should be considered and incorporated during the planning, design, and construction phases of this project:

- Environmental impacts
- Stormwater quality treatment

4.9 ST9: Country Harmony Ditch Drainage Improvements

The Country Harmony Ditch begins at the intersection of Stonybrook Drive and SR 267 and proceeds east to just east of Grant Street where a small branch splits to the north. The main ditch continues to the east to Patrick Place and the north fork extends to Northfield Drive. This study area was previously described in the 2006 Brownsburg Storm Water Improvements Conceptual Plan. Costs estimates have been reviewed and updated to today's estimated prices. Refer to **Exhibit A-4 in Appendix A** for the location of the Country Harmony Ditch study area.

4.9.1 Findings and Project Need

Like Whittington Ditch, Country Harmony Ditch has excessive silt accumulation and is currently overgrown with brush and trees hindering adequate drainage.

4.9.2 Recommendations

The main ditch is approximately 2,060-feet in length and needs to be dredged and cleared of trees and brush. After clearing, stabilization of the invert and banks of the ditch will be required to prevent erosion during storm events.

It is desired to install a storm sewer in the north branch of the ditch. It is estimated 1,110-feet of 24-inch sewer will be required from Northfield Drive to the main section of the Country Harmony Ditch.

Refer to **Exhibit A-13 in Appendix A** for a conceptual map of the recommended improvements.

Preliminary construction and non-construction costs provide a rough estimate of the probable costs for a project of this type and scale. **Table 4-9** provides a summary of the estimated construction and non-construction project costs. Refer to **Appendix B** for detailed cost estimates.

Table 4-9: Total Preliminary Estimated Project Costs for ST9

Cost Description	Costs
Engineering Fees *(Survey, Design, Bid, and CA)*	$140,000
Engineering Fees *(Permitting)*	$30,000
Construction	$721,000
Engineering *(Construction Observation)*	$96,000
Total Estimated Project Costs	**$987,000**

4.9.3 Regulatory Requirements

The following permits are expected for this project:

- IDEM Construction Stormwater General Permit

4.9.4 Other Considerations

The following design factors should be considered and incorporated during the planning, design, and construction phases of this project:

- Environmental impacts
- Stormwater quality treatment

4.10 ST10: College Avenue and Main Street Sewer Separation Phase II

The College Avenue and Main Street Sewer Separation Phase II study area is located east of Jefferson Street, mainly along College Avenue but along portions of Main Street as well, bound to the east by Odell Street. Phase I of the project is currently under construction and anticipated to be completed by Spring of 2025. Refer to **Exhibit A-4 in Appendix A** for the location of the College Avenue and Main Street study area.

4.10.1 Findings and Project Need

The study area currently has some areas served by the combined sewer system. Phase II of the project is proposed to separate the remaining combined sewer areas by providing a new storm sewer system. Additionally, the intersection of Odell Street and College Avenue floods frequently. The existing storm sewer system in this area is undersized for the contributing drainage area. There is an existing manhole located at the intersection of College Avenue and Grant Street with multiple connections. According to Town staff, this structure appears to be a bottleneck in the system as it has been overwhelmed by the addition of flow from stormwater pipes that have been connected to it over the years. The proposed project will address this drainage issue.

4.10.2 Recommendations

Recommended improvements include construction of a new storm sewer along College Avenue. The new storm sewer will connect to the existing 24-inch storm sewer at the College Avenue and Odell Street intersection. The new storm sewer will continue northwest on College Avenue until reaching Phase I of the project at Jefferson Street. A branch will pick up inlets along Main Street and will connect to the main interceptor installed during Phase I of the project. All existing inlets along the route will be replaced or reconnected to the new storm sewer. The recommended improvements will separate a majority of the remaining combined sewer system in the area, as well as address the flooding issues in the study area during design storm events.

Refer to **Exhibit A-14 in Appendix A** for a conceptual map of the recommended improvements.

Preliminary construction and non-construction costs provide a rough estimate of the probable costs for a project of this type and scale. **Table 4-10** provides a summary of the estimated construction and non-construction project costs. Refer to **Appendix B** for detailed cost estimates.

Table 4-10: Total Preliminary Estimated Project Costs for ST10

Cost Description	Costs
Engineering Fees *(Survey, Design, Bid, and CA)*	$700,000
Engineering Fees *(Permitting)*	$40,000
Funding Coordination Fees	$99,000
Construction	$7,710,000
Engineering *(Construction Observation)*	$240,000
Total Estimated Project Costs	**$8,789,000**

4.10.3 Regulatory Requirements

The following permits are expected for this project:

- IDEM Construction Stormwater General Permit
- INDOT State Highway Right-of-Way Occupancy Permit

4.10.4 Other Considerations

The following design factors should be considered and incorporated during the planning, design, and construction phases of this project:

- Soil borings to identify soil type and groundwater elevation
- Pavement cores to evaluate condition of existing pavement
- Utility coordination
- Environmental impacts
- Right-of-way and easement research
- Stormwater quality treatment

5.0 IMPLEMENTATION PLAN

The Town operates their own MS4 and maintains the stormwater infrastructure within Town limits. Capital projects are funded by the fees collected by the Town's stormwater utility.

5.1 Project Costs and Budget

The revenue from the stormwater user fee collection is anticipated to fund all projects outlined in this Master Plan. Refer to **Table 5-1** below for a summary of project cost for the Priority Projects described in **Chapter 4.0** of this report.

Table 5-1: Priority Projects Cost Summary

Project Location	*Total Project Cost*
ST1: County Road 600 East	$131,000
ST2: Maple Lane	$677,000
ST3: Sunny Knoll	$568,000
ST4: Hornaday Heights	$579,000
ST5: Sugar Bush Lane	$521,000
ST6: Raccoon Court	$52,000
ST7: Lowell Court	$211,000
ST8: Whittington Ditch	$703,000
ST9: Country Harmony Ditch	$987,000
ST10: College Ave and Main St Sewer Separation Phase II	$8,789,000
Total Project Costs	**$13,218,000**

5.2 Prioritization Considerations

The following **Table 5-2** shows the results of the prioritization evaluation of each priority project. These factors are provided to aid in determining the order in which the projects are completed. Other factors include the age of the existing stormwater infrastructure and the potential to combine a project with other planned utility or street repair projects in the area.

Table 5-2: Prioritization Evaluation

Project Location	*Conveyance Classification*	*Location of Flooding*	*Occurrence of Flooding*	*Number of Properties Affected*
ST1: County Road 600 E	Open Channel	Yards	Every Rain	N/A
ST2: Maple Lane	Combined Sewer/ Conveyance Needed	N/A	N/A	N/A

Project Location	*Conveyance Classification*	*Location of Flooding*	*Occurrence of Flooding*	*Number of Properties Affected*
ST3: Sunny Knoll	Backyards/ Conveyance Needed	Yards	Every Rain	28
ST4: Hornaday Heights	Backyards/ Conveyance Needed	Yards	Every Rain	21
ST5: Sugar Bush Lane	Backyards/ Open Channel	Yards	Every Rain	25
ST6: Raccoon Court	Backyards/ Open Channel	Yards	Every Rain	1
ST7: Lowell Court	Backyards/ Conveyance Needed	Yards	Every Rain	2
ST8: Whittington Ditch	Open Channel	N/A	N/A	N/A
ST9: Country Harmony Ditch	Open Channel	N/A	N/A	N/A
ST10: College Ave and Main St Sewer Separation Phase II	Combined Sewer/ Conveyance Needed	On Street/ Properties Affected	Every Rain	40+

5.3 Funding Sources

Securing adequate, sustainable sources of funding for stormwater management projects and MS4 regulatory requirements presents a significant challenge for municipalities across the United States. Financial constraints can hinder the implementation of effective programs and practices.

The Town currently collects a stormwater utility fee from utility customers. Revenues generated from the utility fees can be budgeted and used as a viable method of funding.

Other options are available in order to finance improvement cost that exceed the stormwater utility budget. Some funding options provide 20-year, low interest loans to allow for high construction cost to be more manageable. The Town may work with their rate consultant and bond counsel to investigate other financing options. **Table 5-3** on the next page summarizes a variety of funding sources for stormwater management.

Table 5-3: Funding Sources for Stormwater Management

Funding Source	*Description*
Stormwater utility fees	Similar to other utility fees, stormwater utility fees are assessed to utility customers and billed monthly for a consistent stream of revenue. The rate is typically based on a rate study and is established through a rate ordinance. Revenues can be used for stormwater management activities, operation and maintenance, and infrastructure rehabilitation and capital projects
Taxes	Taxes paid to the Town's general fund may be used for stormwater management. Typically, the general fund is tightly managed to pay for priorities within a community such as education and public safety. Priorities such as regulatory actions, emergency storm damage or flooding issues may be options for general funds
TIF (tax increment financing)	A tool used by municipal governments to stimulate economic development in areas that are targeted for development or redevelopment. TIFs may be used to finance infrastructure projects or other investments using the anticipation of future tax revenue resulting from new development. Communities can borrow against the incremental tax revenue expected to be received after completion of the improvements to provide initial funding of the investments.
Special assessments	If a stormwater construction project benefits only a portion of a municipality, it can be funded by fees assessed only to those properties within that area. In this instance utility customers may pay a higher rate if they are in the special assessment area
Connection fees	Connection fees are usually a one-time fee assessed to new customers within a designated area. The customer is reimbursing the municipality for the cost to construct the infrastructure. For stormwater infrastructure the fee is typically proportional to the area of the customer's property within the infrastructures' drainage area or. This might be applied to storm sewer conveyances, water quality treatment, flood control, or regional detention area projects.
Grants	In Indiana, there are some grant programs that can be used for stormwater studies and infrastructure projects. The Indiana Office of Rural Affairs (OCRA) has matching grants that are available to communities who qualify. The area served by the project must demonstrate low to moderate income based on Census data or an income survey. A grant administrator can help to determine if the Town might qualify.
Loans and Bonds	Stormwater projects that have a water quality benefit may qualify for low interest loans through the Indiana Finance Authority (IFA) State Revolving Fund (SRF) program. General obligation (secured by general revenues from the Town) and revenue bonds (secured the revenues of the stormwater utility) can be used to take on debt that will be paid back over time and with interest.
Town service fees	The Town may generate revenue by collecting fees for services provided by the Town. Example services include: plan review, construction inspection, post-construction water quality BMP inspections, and illicit discharge inspections.

6.0 STORMWATER MANAGEMENT AND FUTURE GROWTH

As the Town grows and the MS4 service boundary expands, GIS maps will need to be updated to incorporate additional illicit discharge areas to track. Consider total maximum daily loads (TMDLs) and known illicit discharge areas prior to annexation of new areas.

6.1 Impaired Waters

Surface water quality is important for healthy ecosystems, animal and fish habitat, recreation, irrigation, and drinking water sources. Many waterways in the Brownsburg are impaired due to the presence of pollutants. **Table 6-1** below summarizes impaired waters in the Brownsburg area.

- The primary purpose of the 303(d) list is to identify where Indiana's water quality problems exist and the impairments for which a TMDL study is needed.
- A TMDL identifies the maximum amount of pollutant that a waterbody can receive and still meet water quality standards and allocates pollutant loadings among point and non-point sources.
- A watershed management plan (WMP) is a strategy and a work plan for achieving water resource goals that provides assessment and management information for a geographically defined watershed.

Table 6-1: Impaired Waters and TMDLs

Receiving Water	303(d) List	TMDL
White Lick Creek	*E. coli*, Biological Integrity	None
Mary Gibbs Legal Drain	*E. coli*, Biological Integrity	None
Timothy Quinn Legal Drain	*E. coli*, Biological Integrity	None
Joseph Holloway Legal Drain	*E. coli*, Biological Integrity	None
West Fork White Lick Creek	*E. coli*	None
Chris Truckses Legal Drain	None	None
Mary E. Wilson Legal Drain	None	None
John Garvey Legal Drain	None	None
John Garvey and Neal Legal Drain	None	None
East Fork White Lick Creek	*E. coli*, Biological Integrity	None
Tavner Neal Legal Drain	None	None
Pollard and Todd Legal Drain	None	None
William Brown Legal Drain	*E. coli*, Biological Integrity	None
Ballard Creek	*E. coli*, Biological Integrity	None
Mario Creek	*E. coli*	None – Eagle Creek WMP
Tansel Branch	*E. coli*	None – Eagle Creek WMP

Resources: 2018 303(d) List of Impaired Waters Approved by USEPA, IDEM Online e303(d) Tool, and Total Maximum Daily Load Reports.

6.2 Preventing Pollution in Waterways

Since Brownsburg has a combined sewer overflow (CSO), it has implemented a Long Term Control Plan (LTCP) to reduce the instances of raw sewage overflowing into White Lick Creek. The implementation of the CSO LTCP will greatly reduce Brownsburg's E. coli contribution to waterways.

Since 2003, the town has required stormwater quality treatment for developments that are more than 1 acre in size. Chapter 151 of the Town's ordinances is the Stormwater Management Ordinance and requires the following treatment standard:

- 80% TSS removal
- Floatable control
- Gas stations and fueling area are also required to specifically treat for lead, copper, zinc, and polyaromatic hydrocarbons.

With the implementation of these water quality treatment standards, it will reduce the discharge of pollutants in local waterways.

6.3 Future Considerations

Sources of E. coli are from human or animal waste. Aside from CSOs, failing septic systems, confined feeding operations in agricultural areas, or pet waste could be other sources of E. coli in the streams. With E. coli being the primary impairment for waterways near Brownsburg, the Town should implement water quality best management practices to address this pollutant and incorporate it into the MS4 Stormwater Quality Management Plan. In addition to E. coli, TMDLs can be developed for a number of parameters including the following:

- Ammonia
- Dissolved Oxygen
- Impaired Biotic Communities
- Nutrients
- Nitrogen
- pH
- Phosphorus
- Total Suspended Solids

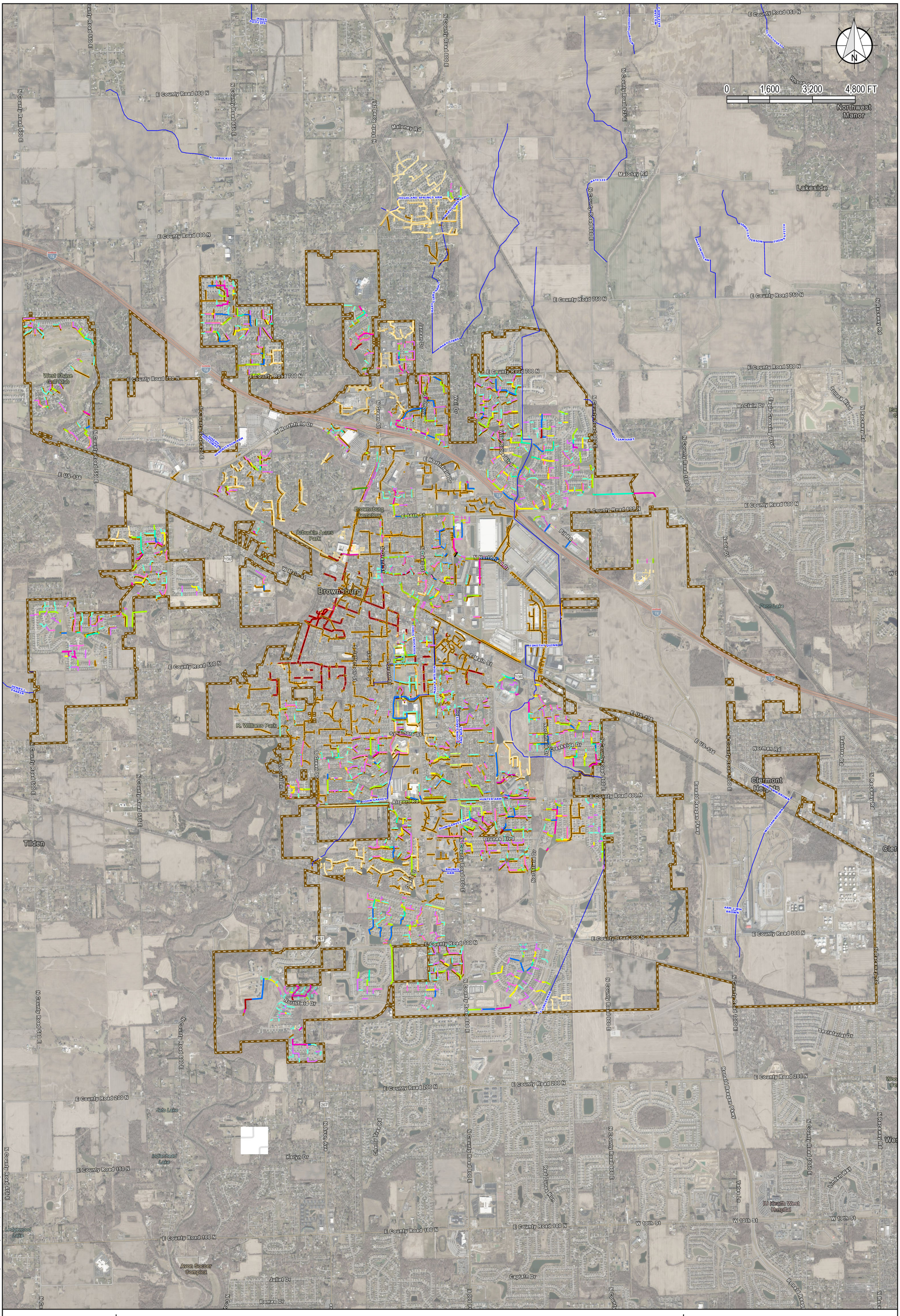
The State and Federal governments continually investigate and study pollutants of concern. Point dischargers are regulated through the National Pollutant Discharge Elimination System (NPDES) permitting program where limits can be set for target pollutants. The MS4 permitting program is an NPDES program where MS4s could be assessed a waste load allocation as a part of a TMDL study. With every MS4 permit renewal (5-year permit cycle),

the Town will be required to review impaired water and updated TMDL studies. The implementation of stormwater management and working to improve water quality into the future must remain a priority.

APPENDIX A

EXHIBITS

Table of Contents



WESSLER ENGINEERING
More than a Project™

Legend

Storm Lines (GIS file)
- Null
- 6"
- 8"
- 10"
- 12"
- 14"
- 15"
- 18"
- 20"
- 21"
- 24"
- 27"
- 30"
- 33"
- 36"
- 42"
- 48"
- <48"
- <all other values>

Storm Lines (CAD file)
Combo Lines (CAD file)
Legal Drains (Surveyor's Office)
Town Limits/MS4 Boundary

EXHIBIT A-1

SYSTEM OVERVIEW

Town of Brownsburg, Indiana
Stormwater Master Plan
December 2023
Project No. 266723

0 1,200 2,400 3,600 FT

N

West Fork White Lick Creek-Hughes Branch HUC-14 Watershed

White Lick Creek-Beamon Ditch HUC-14 Watershed

Eagle Creek Reservoir-School Branch HUC-14 Watershed

East Fork White Lick Creek-Headwaters HUC-14 Watershed

White Lick Creek-Tilden HUC-14 Watershed

White Lick Creek-Abner Creek HUC-14 Watershed

Brownsburg

Tilden

Legend

Storm Lines (GIS file)
- Null
- 6"
- 8"
- 10"
- 12"
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- 15"
- 18"
- 20"
- 21"
- 24"
- 27"
- 30"
- 33"
- 36"
- 42"
- 48"
- <48"
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- Storm Lines (CAD file)
- Combo Lines (CAD file)
- Legal Drains (Surveyor's Office)
- Town Limits/MS4 Boundary
- National Wetland Inventory
- Flood Zone A, AE

HUC14 Name
- Eagle Creek Reservoir-School Branch
- East Fork White Lick Creek-Headwaters
- West Fork White Lick Creek-Hughes Branch
- White Lick Creek-Abner Creek
- White Lick Creek-Beamon Ditch
- White Lick Creek-Tilden

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EXHIBIT A-2

ENVIRONMENTAL RESOURCES

Town of Brownsburg, Indiana
Stormwater Master Plan
December 2023
Project No. 266723

U:_GIS_Projects\Brownsburg\Client GIS\MAPS\266723 Brownsburg Master Plans MAPS\BrownsburgSWMP\BrownsburgSWMP aprx Layout A-2 Environmental Resources (12/14/2023, 12:05 PM) User: JohnH

N

0 1,200 2,400 3,600 FT

Winding Creek Subdivision
GSV-ST-045
Self Storage Facility off US 267
Maplehurst Drive
700 North Drainage Collection System
Stonybrook Drive
AON-ST-110
Near Twin Street and Cemetery
Arbuckle Southwest
Arbuckle Northridge
Northside Drainage
SRE-ST-153
SRW-ST-192
Near the South Swirl Concentrator
Near WWTP Outfall
Williams Park
Park Northside
MP-ST-056
CNW-ST-122
CSC2-ST-041
CSC2-ST-037
CSC2-ST-036
CSC2-ST-028
HP-ST-011
HP-ST-007
HP-ST-004
BRE-ST-122
IWL-ST-611
BRE-ST-120
BRE-ST-114
CRL-ST-843
CRL-ST-830
CRL-ST-828
CRL-ST-824
SBF-ST-014A
HDW-ST-025
HDP-ST-051
HDP-ST-100
HTC-ST-023
BCS-ST-127
BCS-ST-133
BCS-ST-210
FC-ST-202
FC-ST-101
BCS-ST-140
RWF-ST-026
RWF-ST-025
RWF-ST-028

WESSLER ENGINEERING
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Legend

- Out-Fall Structure (GIS)
- Other End Sections/Outlets (GIS)
- Outfalls (WQCR Exhibit A-3)
- Outfalls (WQCR Table)
- Potential Outfall Locations (Data Needed)
- Storm Lines (GIS)
- STORM (CAD)
- COMBO (CAD)
- HYDROLOGY (CAD)
- LEGAL DRAINS (Surveyor's Office)
- Town Limits/MS4 Boundary

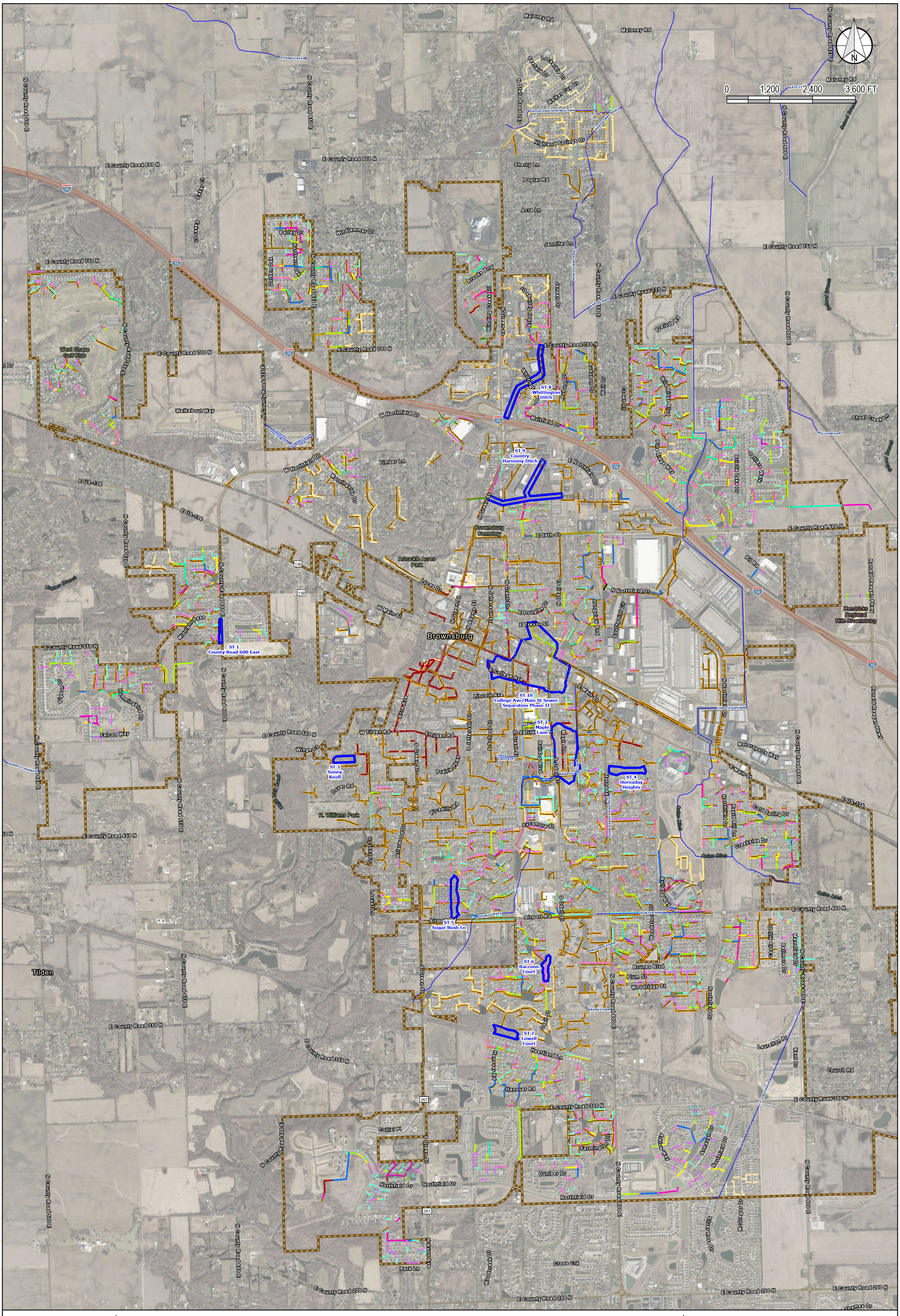
GIS Evaluation

- Area Missing GIS
- Area Missing GIS & CAD

EXHIBIT A-3

GIS Mapping Evaluation

Town of Brownsburg, Indiana
Stormwater Master Plan
December 2023
Project No. 266723



WESSLER ENGINEERING
More than a Project™

Legend

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- 42"
- 48"
- <48"
- <all other values>

- Priority Project Areas
- Storm Lines (CAD file)
- Combo Lines (CAD file)
- Legal Drains (Surveyor's Office)
- Town Limits/MS4 Boundary

EXHIBIT A-4

Priority Project Areas

Town of Brownsburg, Indiana
Stormwater Master Plan
December 2023
Project No. 266723

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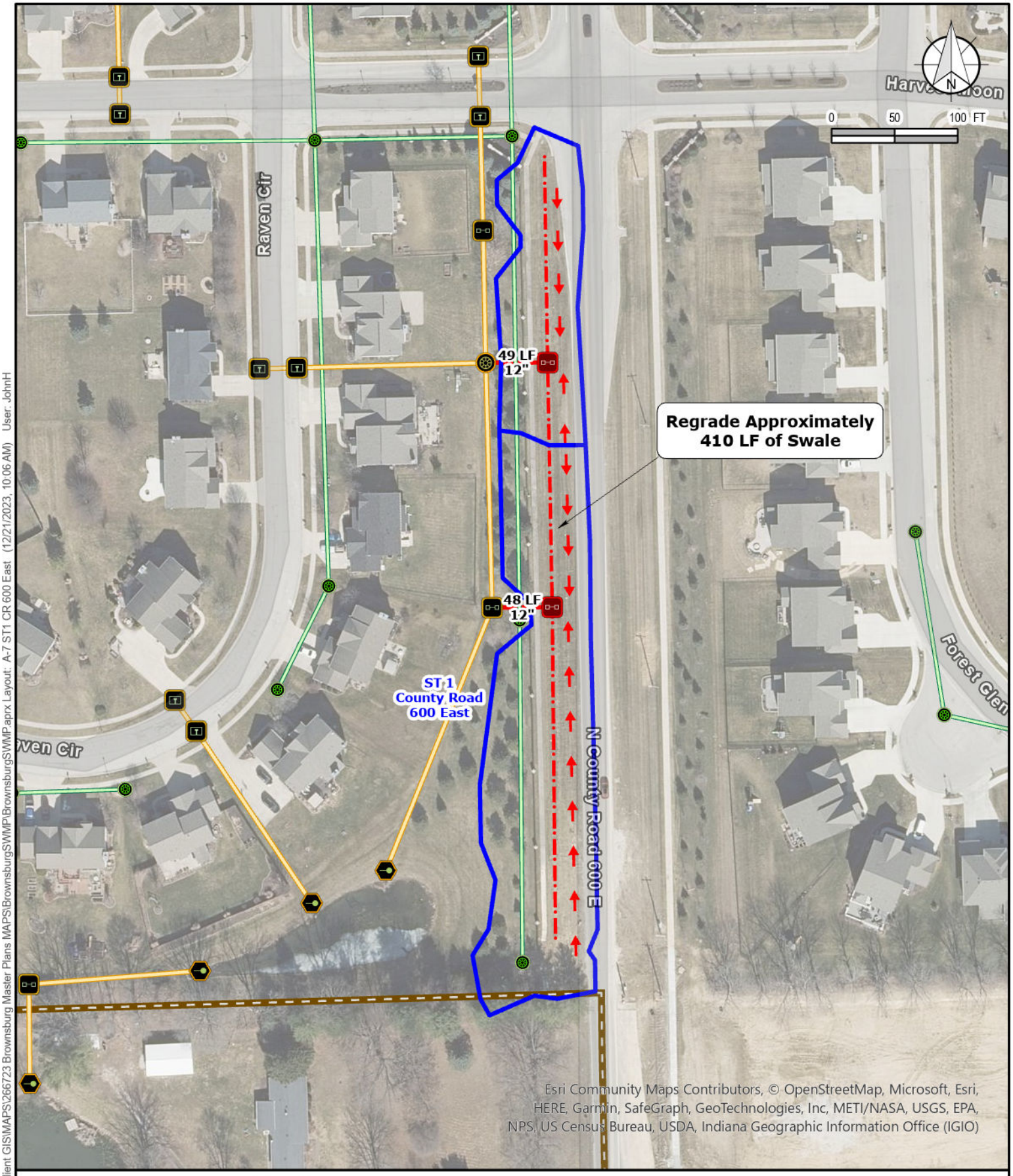

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WESSLER ENGINEERING
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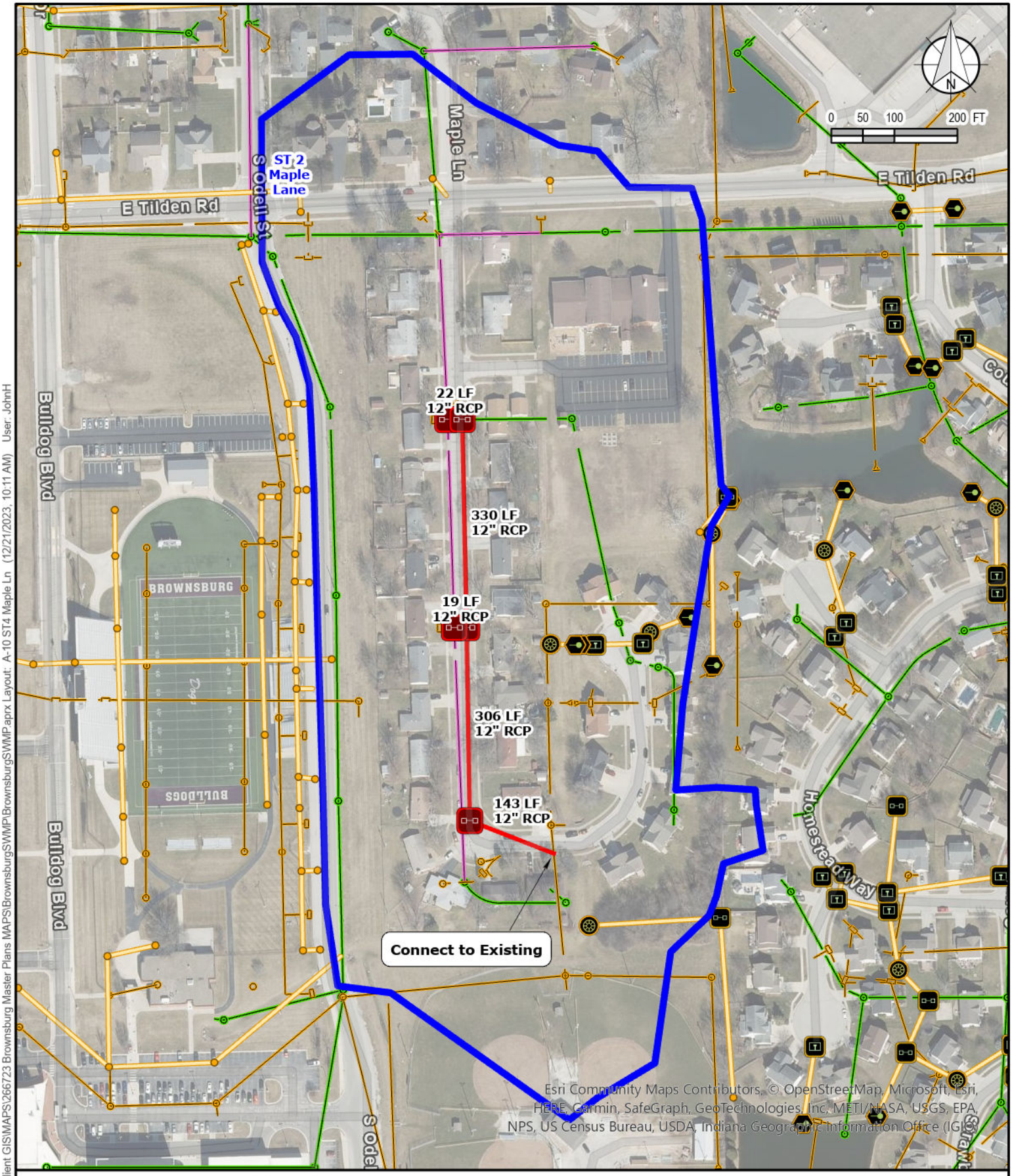
Legend

- Curb Inlets
- End Sections
- Inlets
- Manholes
- <other Structures in GIS>
- Storm Lines
- Sanitary Lines
- Sanitary Manholes
- Town Limits/MS4 Boundary
- Drainage Area
- New Storm Inlets
- New Storm Sewer
- Flow Arrows
- Swale

Exhibit A-5

ST1: County Road 600 East

Town of Brownsburg, Indiana
Stormwater Master Plan
December 2023
Project No. 266723



WESSLER ENGINEERING
More than a Project™

Legend

- Curb Inlets
- End Sections
- Inlets
- Storm Manholes
- Other Structures
- New Storm Inlets
- Storm Sewer (GIS)
- Storm Sewer (CAD)
- Combo Sewer (CAD)
- Sanitary Sewer (CAD)
- New Storm Sewer
- Drainage Area

Exhibit A-6
ST2: Maple Lane

Town of Brownsburg, Indiana
Stormwater Master Plan
December 2023
Project No. 266723

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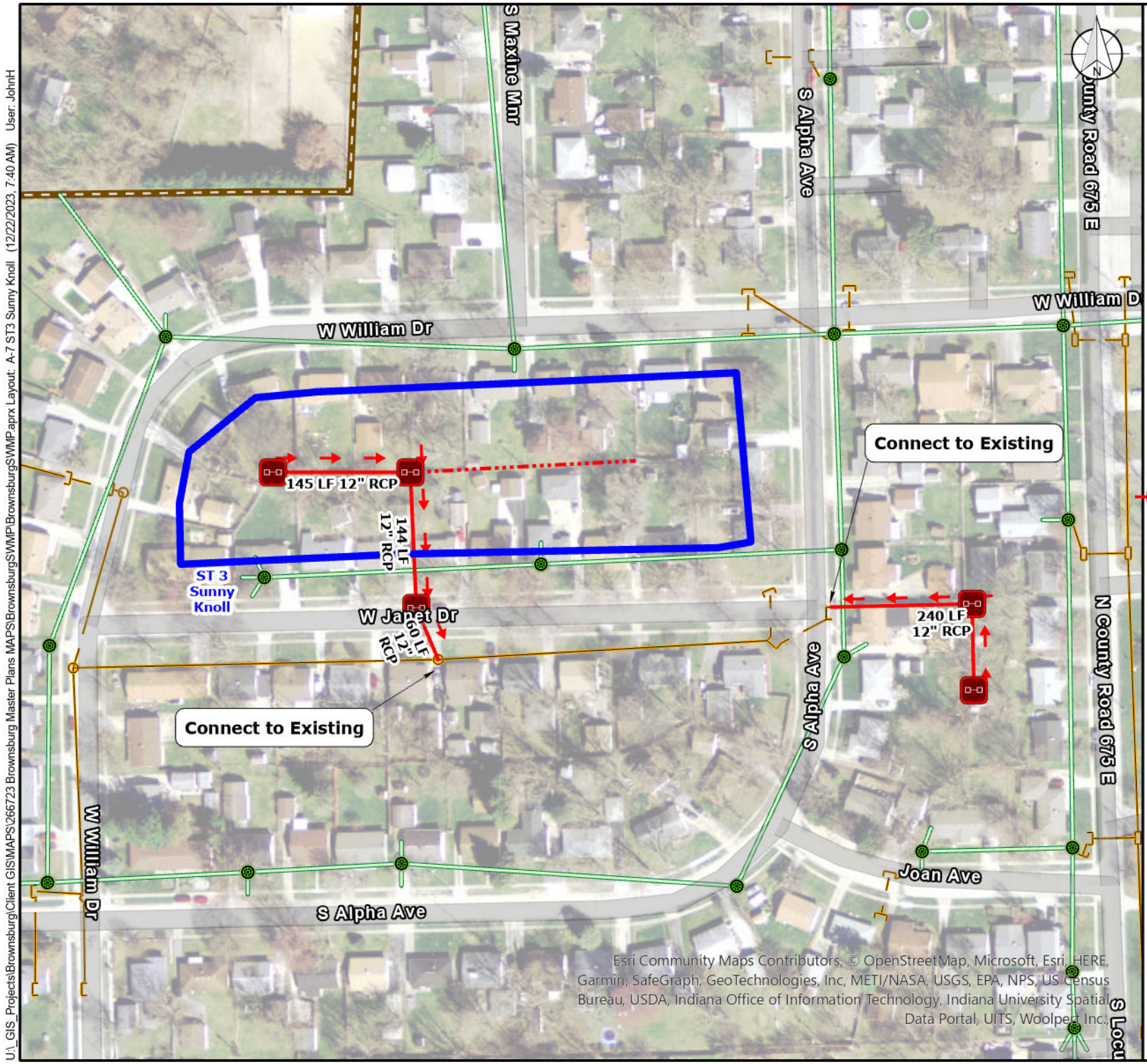

WESSLER ENGINEERING

More than a Project™

Legend

- Drainage Area
- Curb Inlets
- End Sections
- Inlets
- Storm Manholes
- Other Structures
- Sanitary Manholes
- New Storm Inlets
- New Storm Sewer
- Flow Arrows
- Open Ditch
- Sanitary Sewer
- Storm Sewer
- Storm Sewer (CAD)
- Town Limits/MS4 Boundary

0 70 140 FT

EXHIBIT A-7

ST 3: SUNNY KNOLL

Town of Brownsburg, Indiana
Stormwater Master Plan
December 2023
Project No. 266723

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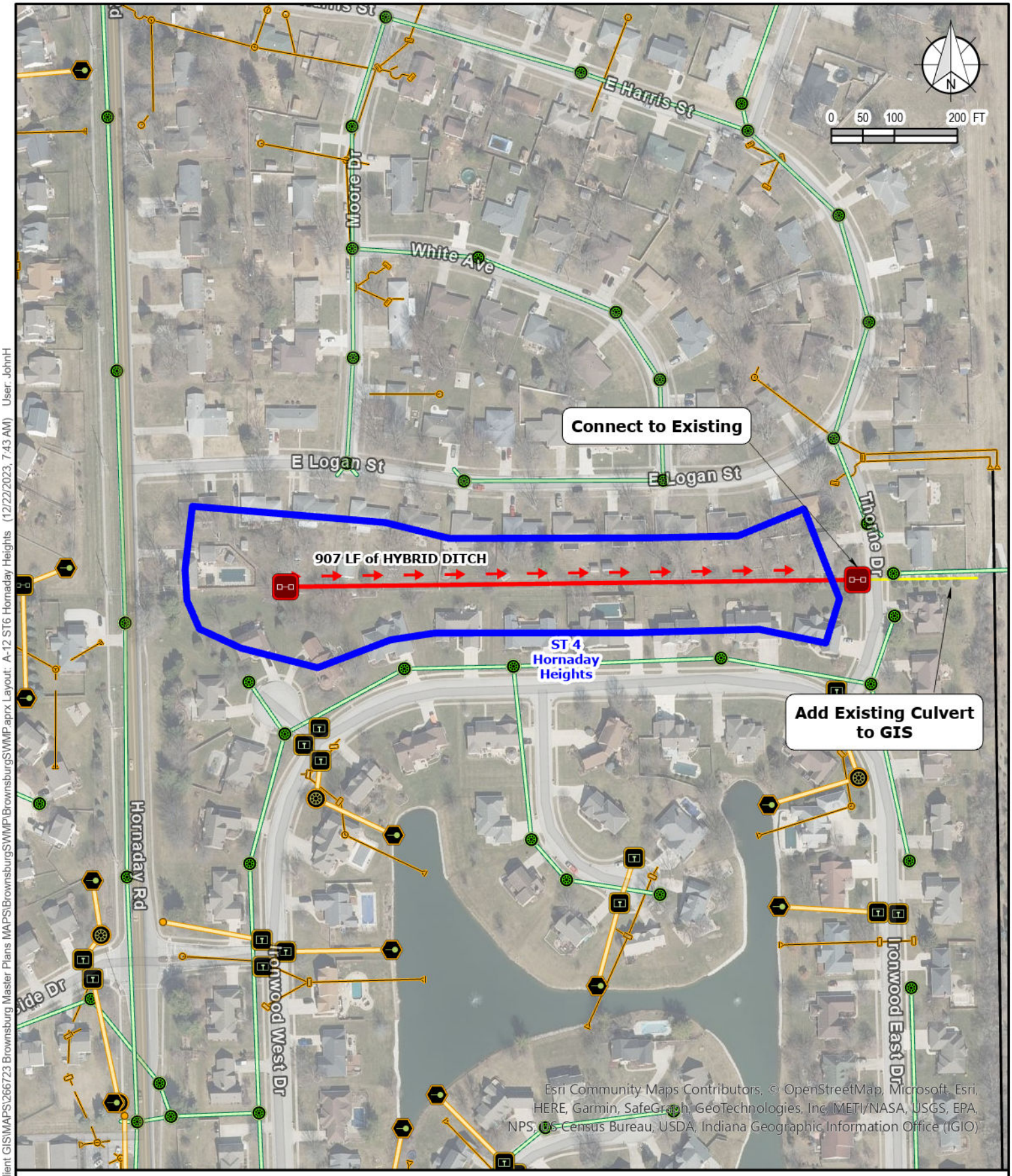

WESSLER ENGINEERING
More than a Project™

Legend

- Curb Inlets
- End Sections
- Inlets
- Storm Manholes
- Other Structures
- Storm Sewer
- Storm Sewer (CAD)
- Sanitary Manholes
- Sanitary Sewer
- Hydrology (CAD)
- Drainage Area
- New Storm Inlets
- New Storm Sewer
- Existing Culvert
- Flow Arrows

Exhibit A-8

ST4: Hornaday Heights

Town of Brownsburg, Indiana
Stormwater Master Plan
December 2023
Project No. 266723

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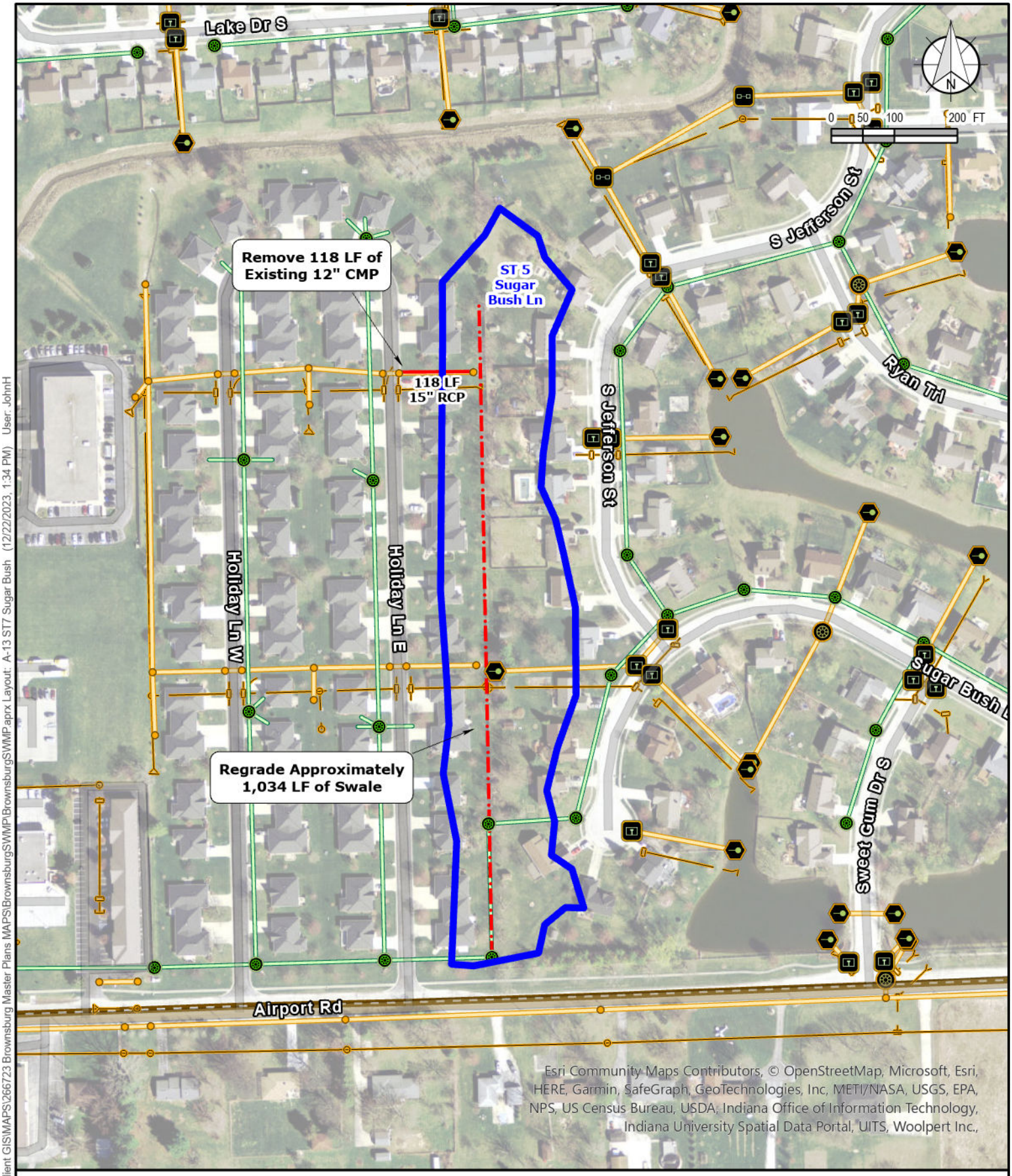

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WESSLER ENGINEERING
More than a Project™

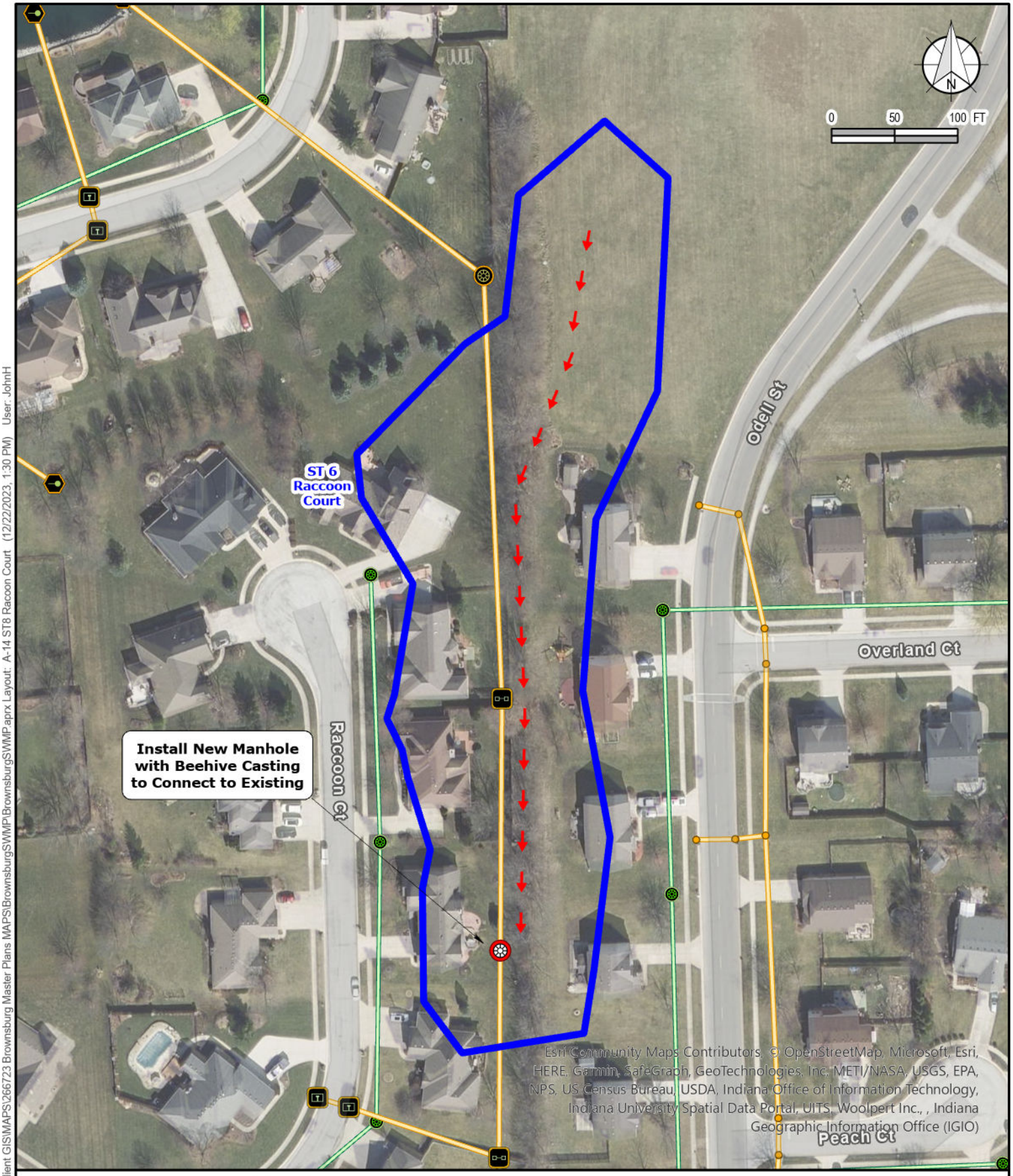
Legend

- Curb Inlets
- End Sections
- Inlets
- Storm Manholes
- Other Structures
- Storm Sewer
- Storm Sewer (CAD)
- Sanitary Manholes
- Sanitary Sewer
- New Storm Sewer
- Swale
- Drainage Area
- Town Limits/MS4 Boundary

Exhibit A-9

ST5: Sugar Bush Lane

Town of Brownsburg, Indiana
Stormwater Master Plan
December 2023
Project No. 266723



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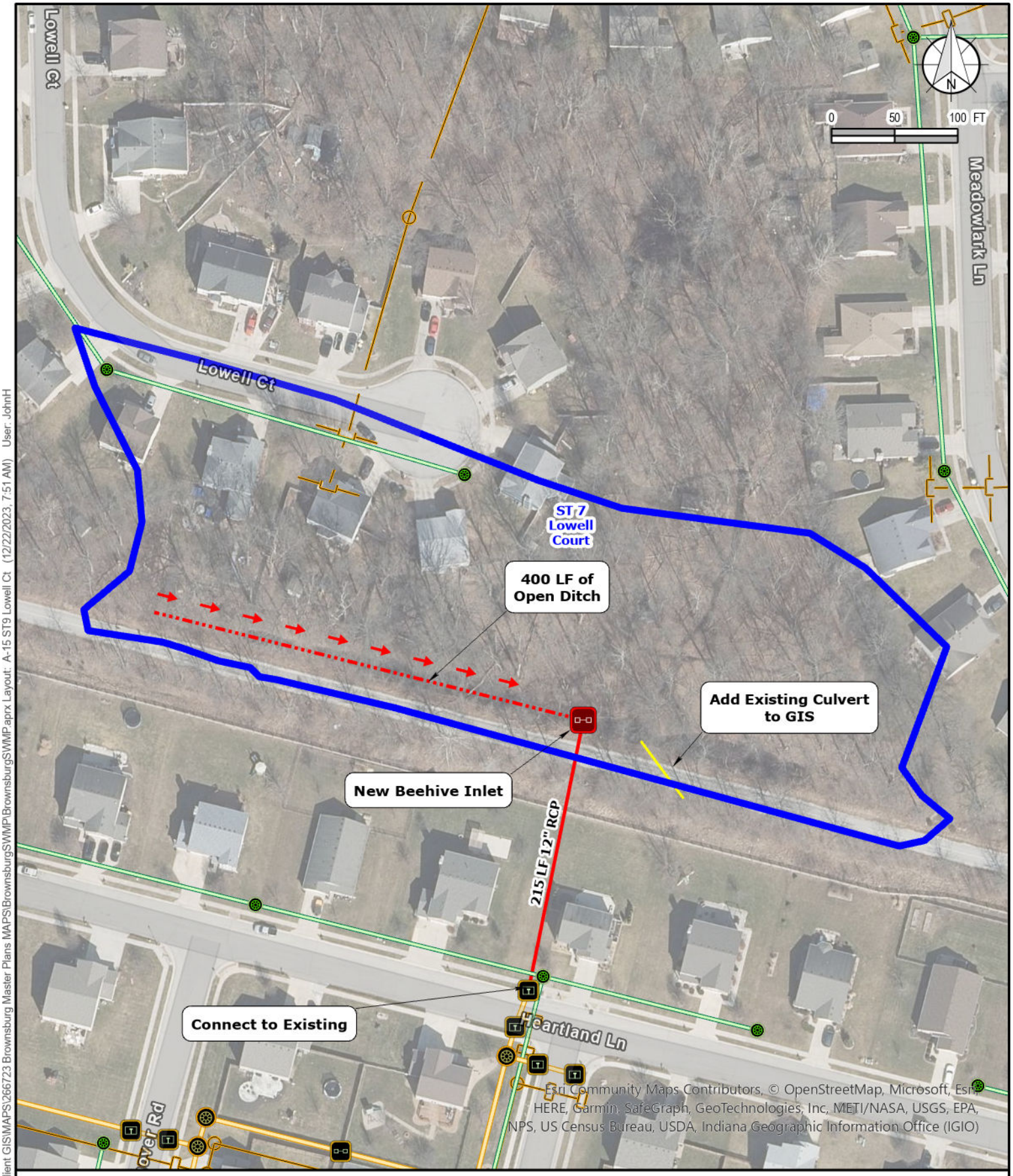
WESSLER ENGINEERING
More than a Project™

Legend

- Curb Inlets
- End Sections
- Inlets
- Storm Manholes
- Other Structures
- Storm Sewer
- Sanitary Sewer
- Drainage Area
- Flow Arrows
- New Storm Manholes
- Sanitary Manholes

Exhibit A-10
ST6: Raccoon Court

Town of Brownsburg, Indiana
Stormwater Master Plan
December 2023
Project No. 266723



WESSLER ENGINEERING
More than a Project™

Legend

- Curb Inlets
- Inlets
- Storm Manholes
- New Storm Inlets
- Sanitary Manholes
- Sanitary Sewer
- Storm Sewer (CAD)
- Storm Sewer (GIS)
- Drainage Area
- New Storm Sewer
- Flow Arrows
- Open Ditch
- Existing Culvert

Exhibit A-11
ST7: Lowell Court

Town of Brownsburg, Indiana
Stormwater Master Plan
December 2023
Project No. 266723

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WESSLER ENGINEERING
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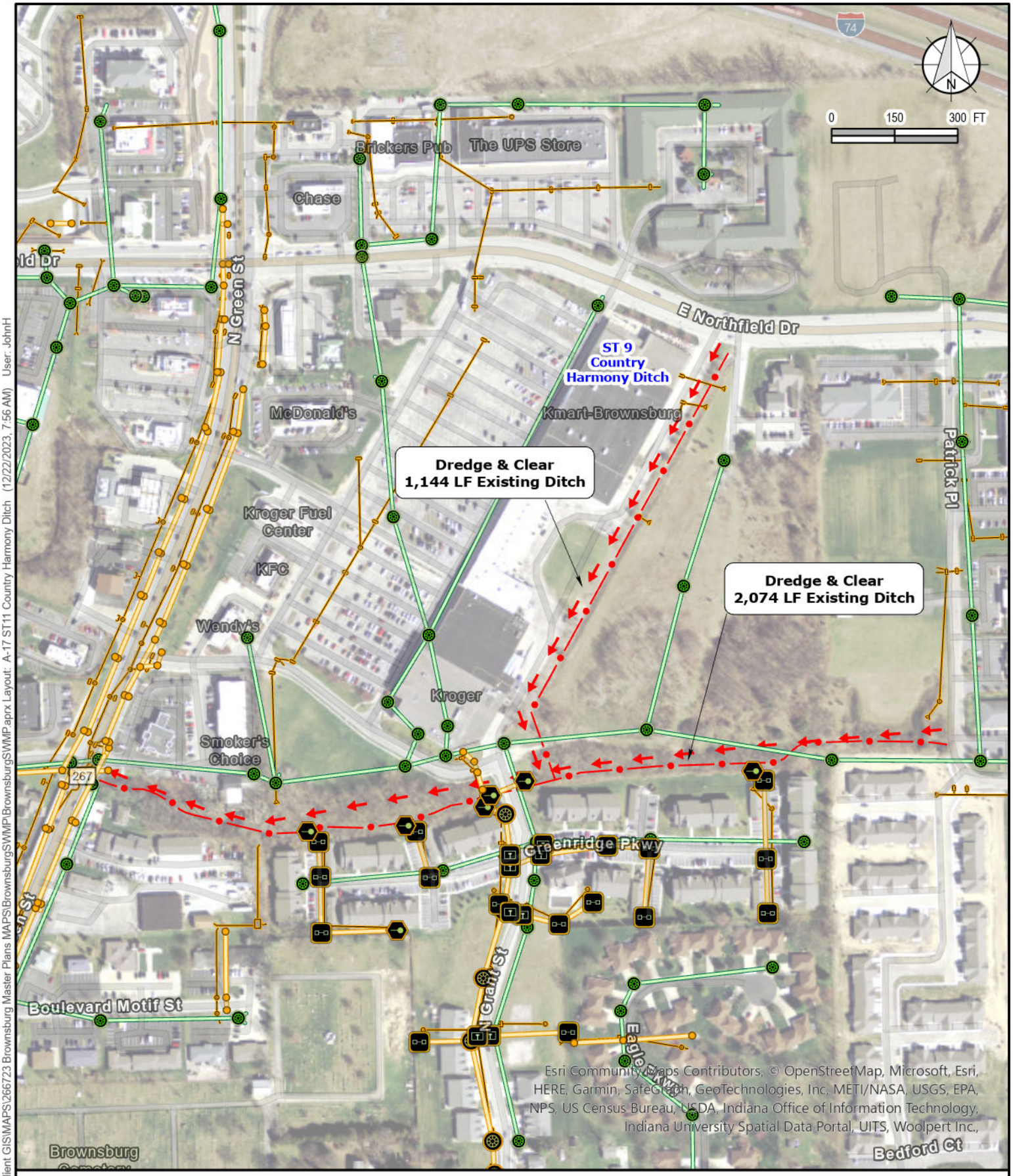
Legend

- Curb Inlets
- End Sections
- Inlets
- Storm Manholes
- Other Structures
- Sanitary Manholes
- Sanitary Sewer
- Storm Sewer (GIS)
- Storm Sewer (CAD)
- Town Limits/MS4 Boundary
- Dredge & Clear Existing Ditch
- Flow Arrows

Exhibit A-12
ST8: Whittington Ditch

Town of Brownsburg, Indiana
Stormwater Master Plan
December 2023
Project No. 266723



WESSLER ENGINEERING
More than a Project™

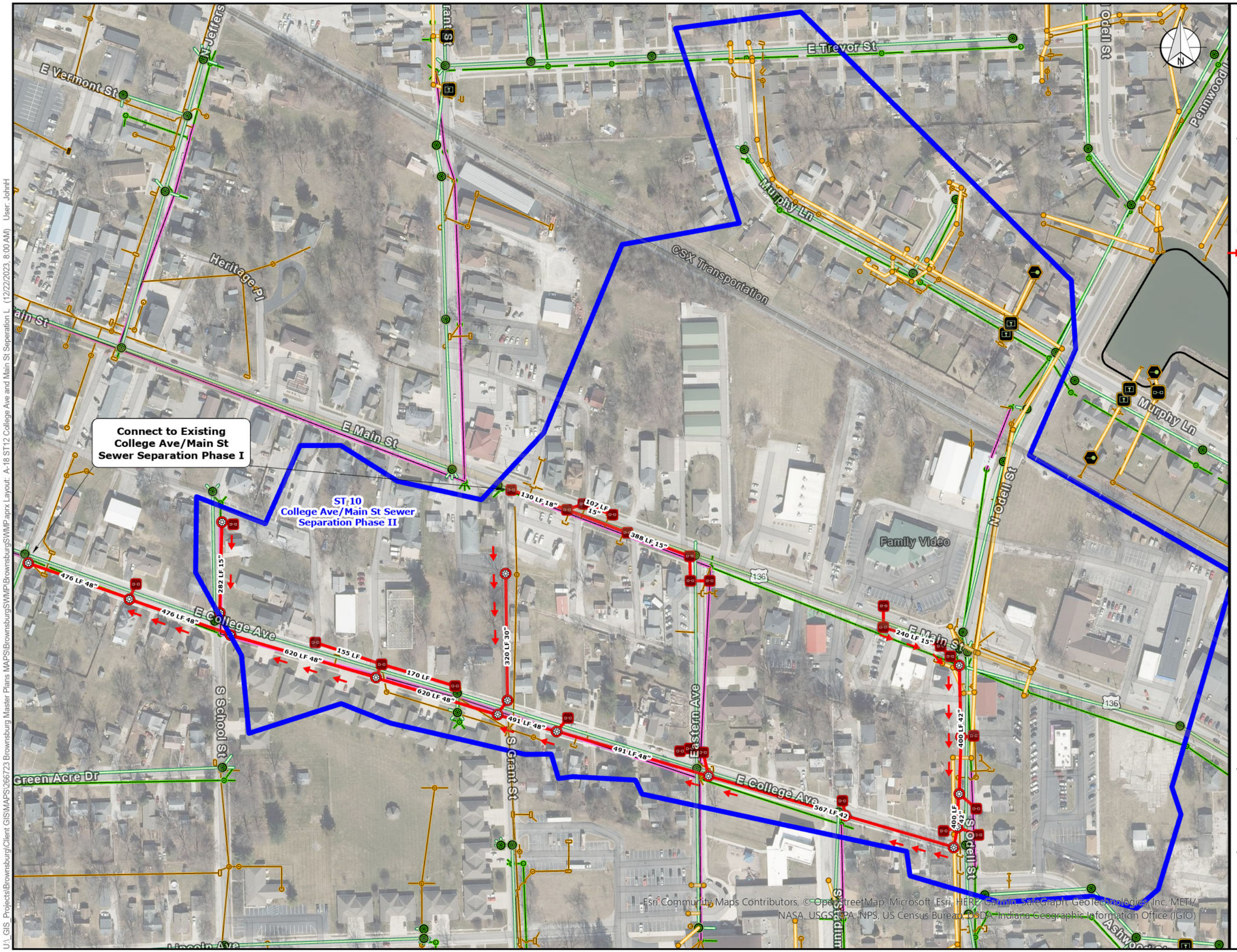
Legend

- Curb Inlets
- End Sections
- Inlets
- Storm Manholes
- Other Structures
- Sanitary Manholes
- Sanitary Sewer
- Storm Sewer (GIS)
- Storm Sewer (CAD)
- Dredge & Clear Existing Ditch
- Flow Arrows

Exhibit A-13
ST9: Country Harmony Ditch

Town of Brownsburg, Indiana
Stormwater Master Plan
December 2023
Project No. 266723

U:_GIS_Projects\Brownsburg\Client GIS\MAPS\266723 Brownsburg Master Plans MAPS\BrownsburgSWMP\BrownsburgSWMPaprx Layout: A-17 ST11 Country Harmony Ditch (12/22/2023, 7:56 AM) User: JohnH



WESSLER ENGINEERING

More than a Project™

Legend

- New Storm Inlets
- New Storm Manholes
- New Storm Sewer
- Flow Arrows
- Priority Project Areas

Existing

- Curb Inlets
- End Sections
- Inlets
- Storm Manholes
- Other Structures
- Sanitary Manholes
- Storm Sewer (GIS)
- Sanitary Sewer (GIS)
- Storm Sewer (CAD)
- Combo Lines (CAD)
- Sanitary (CAD)
- Hydrology (CAD)
- Town Limits/MS4 Boundary

0 100 200 400 FT

EXHIBIT A-14

ST10: College Ave/Main St Sewer Separation

Town of Brownsburg, Indiana
Stormwater Master Plan
December 2023
Project No. 266723

APPENDIX B

DETAILED COST ESTIMATES

Table of Contents

Table B-1: Preliminary Detailed Cost Estimate

ST1: County Road 600 East

Preliminary Engineer's Opinion of Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Mobilization, Demob, Bonds, & Insurance	1	LS	$ 4,600	$ 4,600
2	Erosion & Sediment Control	1	LS	$ 3,700	$ 3,700
3	Final Cleanup & Restoration	1	LS	$ 5,000	$ 5,000
4	Pipe, 12" RCP	97	LF	$ 190	$ 18,430
5	Storm Inlet, Type A	2	EA	$ 5,500	$ 11,000
6	Ditch Grading	410	LF	$ 40	$ 16,400
				Subtotal *(rounded)*	$ 60,000
				25% Contingency	$ 15,000
				Total Estimated Construction Costs	**$ 75,000**

Preliminary Engineer's Opinion of Non-Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Engineering Fees *(Survey, Design, Bid, & CA)*	1	LS	$ 30,000	$ 30,000
2	Engineering Fees *(Permitting)*	1	LS	$ 10,000	$ 10,000
3	Engineering Fees *(Construction Observation)*	1	LS	$ 16,000	$ 16,000
				Total Estimated Non-Construction Costs	**$ 56,000**

Total Preliminary Overall Project Costs	**$**	**131,000**

Table B-2: Preliminary Detailed Cost Estimate

ST2: Maple Lane

Preliminary Engineer's Opinion of Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Mobilization, Demob, Bonds, & Insurance	1	LS	$ 20,600	$ 20,600
2	Erosion & Sediment Control	1	LS	$ 13,700	$ 13,700
3	Final Cleanup & Restoration	1	LS	$ 24,000	$ 24,000
4	Remove, Pavement, All Types	911	SYS	$ 40	$ 36,444
5	Compacted Aggregate, No. 53	405	TON	$ 60	$ 24,272
6	HMA Surface, Type B	76	TON	$ 280	$ 21,174
7	HMA Intermediate, Type B	126	TON	$ 240	$ 30,176
8	HMA Base, Type B	200	TON	$ 200	$ 40,089
9	Storm Inlet, Type A	5	EA	$ 5,500	$ 27,500
10	Storm Manhole, Standard	1	EA	$ 7,500	$ 7,500
11	Pipe, 12" RCP	820	LF	$ 190	$ 155,800
				Subtotal *(rounded)*	$ 402,000
				25% Contingency	$ 101,000
				Total Estimated Construction Costs	**$ 503,000**

Preliminary Engineer's Opinion of Non-Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Engineering Fees *(Survey, Design, Bid, & CA)*	1	LS	$ 110,000	$ 110,000
2	Engineering Fees *(Construction Observation)*	1	LS	$ 64,000	$ 64,000
				Total Estimated Non-Construction Costs	**$ 174,000**

Total Preliminary Overall Project Costs	**$**	**677,000**

Table B-3: Preliminary Detailed Cost Estimate

ST3: Sunny Knoll (Alternative 1)

Preliminary Engineer's Opinion of Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Mobilization, Demob, Bonds, & Insurance	1	LS	$ 16,000	$ 16,000
2	Erosion & Sediment Control	1	LS	$ 12,800	$ 12,800
3	Final Cleanup & Restoration	1	LS	$ 17,600	$ 17,600
4	Clearing & Grubbing	1	LS	$ 40,000	$ 40,000
5	Remove, Pavement, All types	67	SYS	$ 40	$ 2,667
6	Compacted Aggregate, No. 53	30	TON	$ 60	$ 1,776
7	HMA Surface, Type B	6	TON	$ 280	$ 1,549
8	HMA Intermediate, Type B	9	TON	$ 240	$ 2,208
9	HMA Base, Type B	15	TON	$ 200	$ 2,933
10	Storm Inlet Type A	5	EA	$ 5,500	$ 27,500
11	Pipe, 12" RCP	589	LF	$ 190	$ 111,910
12	Ditch Grading	240	LF	$ 40	$ 9,600
				Subtotal *(rounded)*	$ 247,000
				25% Contingency	$ 62,000
				Total Estimated Construction Costs	**$ 309,000**

Preliminary Engineer's Opinion of Non-Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Engineering Fees *(Survey, Design, Bid, & CA)*	1	LS	$ 70,000	$ 70,000
2	Engineering Fees *(Right-of-Way)*	5	EA	$ 3,000	$ 15,000
3	Land Acquisition *(Appraisal, Negotiation, & Leg*	5	EA	$ 6,000	$ 30,000
4	Land Purchase	2,000	SYS	$ 40	$ 80,000
5	Engineering Fees *(Construction Observation)*	1	LS	$ 64,000	$ 64,000
				Total Estimated Non-Construction Costs	**$ 259,000**

Total Preliminary Overall Project Costs	**$**	**568,000**

Table B-4: Preliminary Detailed Cost Estimate

ST4: Hornaday Heights (Alternative 3)

Preliminary Engineer's Opinion of Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Mobilization, Demob, Bonds, & Insurance	1	LS	$ 21,500	$ 21,500
2	Erosion & Sediment Control	1	LS	$ 17,200	$ 17,200
3	Final Cleanup & Restoration	1	LS	$ 23,700	$ 23,700
4	Clearing & Grubbing	1	LS	$ 20,000	$ 20,000
5	Hybrid Ditch	907	LF	$ 220	$ 199,540
6	Hybrid Ditch Inlet	3	EA	$ 5,200	$ 15,600
				Subtotal *(rounded)*	$ 298,000
				25% Contingency	$ 75,000
				Total Estimated Construction Costs	**$ 373,000**

Preliminary Engineer's Opinion of Non-Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Engineering Fees *(Survey, Design, Bid, & CA)*	1	LS	$ 100,000	$ 100,000
2	Engineering Fees *(Permitting)*	1	LS	$ 10,000	$ 10,000
3	Engineering Fees *(Construction Observation)*	1	LS	$ 96,000	$ 96,000
				Total Estimated Non-Construction Costs	**$ 206,000**

Total Estimated Overall Project Costs	**$**	**579,000**

Table B-5: Preliminary Detailed Cost Estimate

ST5: Sugar Bush Lane

Preliminary Engineer's Opinion of Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Mobilization, Demob, Bonds, & Insurance	1	LS	$ 12,600	$ 12,600
2	Erosion & Sediment Control	1	LS	$ 10,000	$ 10,000
3	Final Cleanup & Restoration	1	LS	$ 13,800	$ 13,800
4	Clearing & Grubbing	1	LS	$ 28,000	$ 28,000
5	Clean & Televise	610	LF	$ 40	$ 24,400
6	Remove Pipe, All Types	118	LF	$ 50	$ 5,900
7	Pipe, 15" RCP	118	LF	$ 220	$ 25,960
8	Ditch Grading	1,034	LF	$ 40	$ 41,360
				Subtotal *(rounded)*	$ 163,000
				25% Contingency	$ 41,000
				Total Estimated Construction Costs	**$ 204,000**

Preliminary Engineer's Opinion of Non-Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Engineering Fees *(Survey, Design, Bid, & CA)*	1	LS	$ 50,000	$ 50,000
2	Engineering Fees *(Permitting)*	1	LS	$ 10,000	$ 10,000
3	Engineering Fees *(Right-of-Way)*	13	EA	$ 3,000	$ 39,000
4	Land Acquisition *(Appraisal, Negotiation, & Leg*	13	EA	$ 6,000	$ 78,000
5	Land Purchase	2,300	SYS	$ 40	$ 92,000
6	Engineering Fees *(Construction Observation)*	1	LS	$ 48,000	$ 48,000
				Total Estimated Non-Construction Costs	**$ 317,000**

Total Preliminary Overall Project Costs	**$**	**521,000**

Table B-6: Preliminary Detailed Cost Estimate

ST6: Raccoon Court

Preliminary Engineer's Opinion of Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Mobilization, Demob, Bonds, & Insurance	1	LS	$ 2,300	$ 2,300
2	Erosion & Sediment Control	1	LS	$ 1,600	$ 1,600
3	Final Cleanup & Restoration	1	LS	$ 2,100	$ 2,100
4	Storm Manhole, Standard	1	EA	$ 7,500	$ 7,500
5	Earthwork & Grading	1	LS	$ 10,000	$ 10,000
				Subtotal *(rounded)*	$ 24,000
				25% Contingency	$ 6,000
				Total Estimated Construction Costs	**$ 30,000**

Preliminary Engineer's Opinion of Non-Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Engineering Fees *(Survey, Design, Bid, & CA)*	1	LS	$ 20,000	$ 20,000
2	Engineering Fees *(Construction Observation)*	1	LS	$ 2,000	$ 2,000
				Total Estimated Non-Construction Costs	**$ 22,000**

Total Preliminary Overall Project Costs	**$**	**52,000**

Table B-7: Preliminary Detailed Cost Estimate

ST7: Lowell Court

Preliminary Engineer's Opinion of Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Mobilization, Demob, Bonds, & Insurance	1	LS	$ 7,700	$ 7,700
2	Erosion & Sediment Control	1	LS	$ 6,200	$ 6,200
3	Final Cleanup & Restoration	1	LS	$ 9,300	$ 9,300
4	Clearing & Grubing	1	LS	$ 10,000	$ 10,000
5	Remove, Sidewalk/Trail	28	SYS	$ 40	$ 1,120
6	Sidewalk, Concrete, 4"	6	SYS	$ 80	$ 480
7	Full Depth Pavement Patching	22	SYS	$ 150	$ 3,333
8	Storm Inlet, Type A	1	EA	$ 5,500	$ 5,500
9	Pipe, 12" RCP	215	LF	$ 190	$ 40,850
10	Ditch Grading	400	LF	$ 40	$ 16,000
				Subtotal *(rounded)*	$ 101,000
				25% Contingency	$ 25,000
				Total Estimated Construction Costs	**$ 126,000**

Preliminary Engineer's Opinion of Non-Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Engineering Fees *(Survey, Design, Bid, & CA)*	1	LS	$ 40,000	$ 40,000
2	Engineering Fees *(Right-of-Way)*	1	EA	$ 3,000	$ 3,000
3	Land Acquisition *(Appraisal, Negotiation, & Leg*	1	EA	$ 6,000	$ 6,000
4	Land Purchase	500	SYS	$ 40	$ 20,000
5	Engineering Fees *(Construction Observation)*	1	LS	$ 16,000	$ 16,000
				Total Estimated Non-Construction Costs	**$ 85,000**

Total Preliminary Overall Project Costs	**$**	**211,000**

Table B-8: Preliminary Detailed Cost Estimate

ST8: Whittington Ditch

Preliminary Engineer's Opinion of Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Mobilization, Demob, Bonds, & Insurance	1	LS	$ 19,000	$ 19,000
2	Erosion & Sediment Control	1	LS	$ 13,000	$ 13,000
3	Final Cleanup & Restoration	1	LS	$ 22,000	$ 22,000
4	Maintenance of Traffic	1	LS	$ 10,000	$ 10,000
5	Ditch Clearing & Grading	2,500	LF	$ 80	$ 200,000
6	Bank Stabilization	2,500	LF	$ 20	$ 50,000
7	Riprap, Revetment	316	TON	$ 200	$ 63,200
				Subtotal *(rounded)*	$ 378,000
				25% Contingency	$ 95,000
				Total Estimated Construction Costs	**$ 473,000**

Preliminary Engineer's Opinion of Non-Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Engineering Fees *(Survey, Design, Bid, & CA)*	1	LS	$ 120,000	$ 120,000
2	Engineering Fees *(Permitting)*	1	LS	$ 30,000	$ 30,000
3	Engineering Fees *(Construction Observation)*	1	LS	$ 80,000	$ 80,000
				Total Estimated Non-Construction Costs	**$ 230,000**

Total Preliminary Overall Project Costs	**$**	**703,000**

Table B-9: Preliminary Detailed Cost Estimate

ST9: Country Harmony Ditch

Preliminary Engineer's Opinion of Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Mobilization, Demob, Bonds, & Insurance	1	LS	$ 26,000	$ 26,000
2	Erosion & Sediment Control	1	LS	$ 16,000	$ 16,000
3	Final Cleanup & Restoration	1	LS	$ 26,000	$ 26,000
4	Ditch Clearing & Grading	3,218	LF	$ 40	$ 128,720
5	Bank Stabilization	3,218	LF	$ 20	$ 64,360
6	Riprap, Revetment	1,461	TON	$ 200	$ 292,200
7	Erosion Control Blanket	2,278	SYD	$ 10	$ 22,778
				Subtotal *(rounded)*	$ 577,000
				25% Contingency	$ 144,000
				Total Estimated Construction Costs	**$ 721,000**

Preliminary Engineer's Opinion of Non-Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Engineering Fees *(Survey, Design, Bid, & CA)*	1	LS	$ 140,000	$ 140,000
2	Engineering Fees *(Permitting)*	1	LS	$ 30,000	$ 30,000
3	Engineering Fees *(Construction Observation)*	1	LS	$ 96,000	$ 96,000
				Total Estimated Non-Construction Costs	**$ 266,000**

Total Preliminary Overall Project Costs	**$**	**987,000**

Table B-10: Preliminary Detailed Cost Estimate

ST10: College Avenue and Main Street

Preliminary Engineer's Opinion of Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Construction Engineering	1	LS	$ 110,000	$ 110,000
2	Utility Allowance	1	LS	$ 40,000	$ 40,000
3	Remove, Pavement, All Types	12,480	SYS	$ 40	$ 499,200
4	Remove, Pipe, All Types	2,260	LF	$ 50	$ 113,000
5	Remove, Curb	4,030	LF	$ 30	$ 120,900
6	Milling and Resurfacing	5,340	SYS	$ 40	$ 213,600
7	Full Depth Pavement Patching	1,280	SYS	$ 150	$ 192,000
8	Full Depth Pavement Replacement, 2 Lanes	9,760	SYS	$ 120	$ 1,171,200
9	Concrete Curb & Gutter	4,030	LF	$ 80	$ 322,400
10	Sidewalk, Concrete, 4"	1,440	SYS	$ 150	$ 216,000
11	Storm Inlet, Type A	25	EA	$ 5,500	$ 137,500
12	Storm Manhole, Standard	5	EA	$ 7,500	$ 37,500
13	Storm Manhole, 60"	1	EA	$ 9,000	$ 9,000
14	Storm Manhole, 84"	13	EA	$ 12,000	$ 156,000
15	Storm Manhole, 96"	3	EA	$ 17,000	$ 51,000
16	Pipe, 12" RCP	780	LF	$ 190	$ 148,200
17	Pipe, 15" RCP	990	LF	$ 210	$ 207,900
18	Pipe, 18" RCP	690	LF	$ 240	$ 165,600
19	Pipe, 24" RCP	210	LF	$ 280	$ 58,800
20	Pipe, 30" RCP	420	LF	$ 350	$ 147,000
21	Pipe, 42" RCP	1,370	LF	$ 420	$ 575,400
22	Pipe, 48" RCP	1,580	LF	$ 460	$ 726,800
23	Pipe, 54" RCP	470	LF	$ 480	$ 225,600
24	Mobilization, Demob, Bonds, & Insurance	1	LS	$ 165,000	$ 165,000
25	Temporary Erosion & Sediment Control	1	LS	$ 55,000	$ 55,000
26	Maintenance of Traffic	1	LS	$ 138,000	$ 138,000
27	Final Cleanup & Restoration	1	LS	$ 165,000	$ 165,000
				Subtotal *(rounded)*	$ 6,168,000
				25% Contingency	$ 1,542,000
				Total Estimated Construction Costs	**$ 7,710,000**

Preliminary Engineer's Opinion of Non-Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Engineering Fees *(Survey, Design, Bid, & CA)*	1	LS	$ 700,000	$ 700,000
2	Engineering Fees *(Permitting)*	1	LS	$ 40,000	$ 40,000
3	Engineering Fees *(Construction Observation)*	1	LS	$ 240,000	$ 240,000
4	Labor Standards	1	LS	$ 12,000	$ 12,000
5	Environmental Review	1	LS	$ 2,000	$ 2,000
6	Financial Consultant & Bond Counsel	1	LS	$ 85,000	$ 85,000
	Total Estimated Non-Construction Costs				**$ 1,079,000**

Total Preliminary Overall Project Costs	**$**	**8,789,000**

Notes:

1 *All probable construction costs are based upon 2023 dollars, and estimated project costs will likely increase with time. Construction costs are volatile and have increased significantly in recent years, due primarily to costs of fuel and raw materials. In providing these cost estimates, Wessler Engineering has no control over the costs of labor, equipment, and materials, or the contractors' methods of pricing. The cost estimates were made without the benefit of design plans and specifications and are provided on the basis of the Engineer's qualifications and experience. Wessler Engineering makes no warranty, expressed or implied, as to the accuracy of such cost estimates as compared to bids or actual costs.*

2 *The cost estimates are based on past similar projects and were made without the benefit of field survey, design plans and specifications. These estimates are provided on the basis of the Engineer's qualifications and experience. Wessler Engineering makes no warranty, expressed or implied, as to the accuracy of such cost estimates as compared to bids or actual costs.*

3 *The project area was not reviewed for compliance with ADA guidelines. Construction costs for ADA curb ramps and other ADA facilities are not included in these cost estimates.*

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