



**STORMWATER PLANNING STUDY
CITY OF GREENCASTLE, INDIANA**

Prepared for:

City of Greencastle, Indiana
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CBBEL Project Number 17-0135



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The City of Greencastle is a small, vibrant city of approximately 10,500 people in west-central Indiana and is within an hour drive of several larger urban centers including Terre Haute, Lafayette, Bloomington, and Indianapolis. The city is home to DePauw University and Ivy Tech Community College. With the assistance of Indiana Office of Community and Rural Affairs (OCRA) Stellar Communities Initiative, Greencastle is working toward becoming the “next great college town in the Midwest” through several streetscaping, façade, and redevelopment projects.

Coupled with these enhancements, the city recognized the need to prioritize and fund stormwater capital projects throughout the city. These include:

- Inflow and infiltration (I&I) areas - where stormwater and/or groundwater enters the sanitary sewers through cracked pipes, leaky manholes, improperly connected storm drains and sump pumps adding to the volume and cost of water treated through the wastewater treatment process
- Low-lying areas with poor drainage – stormwater infrastructure (pipes, culverts, inlets, etc.) may be undersized, clogged with debris, or not present at all
- Aging infrastructure – areas where known stormwater infrastructure needs repaired and/or replaced
- Road and railroad interference – areas where the natural flow path for overland stormwater runoff is interrupted by the elevation of a road or railroad

This chapter outlines the purpose and approach as well as the overall organization of this report.

1.1 STUDY PURPOSE AND APPROACH

The purpose of this stormwater planning study is to better understand stormwater and I&I problems throughout the City of Greencastle, evaluate of the city’s stormwater management program, and establish a long-term and sustainable stormwater funding mechanism.

The City of Greencastle retained Christopher B. Burke Engineering, LLC (CBBEL) to review their existing stormwater program and budget and recommend an assessment rate and structure to meet current and future stormwater needs. Under the same agreement, Etica Group (Etica) identified capital improvement projects to address stormwater problem areas. This information was used to develop the stormwater program costs included in this stormwater planning study.

The city formed a project team representing elected officials (Mayor, City Council), city staff (Planning, GIS, Engineering, Public Works/Stormwater, Utility Billing, Attorney, Water/Wastewater Utilities) and DePauw University (Facilities). The role of the project team was to guide the planning process, identify problem areas, assemble city-owned data, prioritize capital improvement projects, and set the stormwater utility rate structure. The OCRA grant administrator was also invited to participate to oversee the process. Members of the project team met nine times in various forms from January 2018 through December 2018.

Funding for this study was made available through a Community Development Block Grant (CDBG) Planning Grant from OCRA and matching funds from the City of Greencastle.

1.2 ORGANIZATION OF DOCUMENT

The stormwater planning study is divided into the following chapters, with appendices of supporting data and analysis.

Chapter 1: Introduction – provides an overall introduction to the city, stormwater and I&I problems, and the study purpose and approach.

Chapter 2: Existing Facilities – summarizes existing stormwater and I&I infrastructure, targeted growth areas for redevelopment and new development.

Chapter 3: Need for a Stormwater Utility – provides justification and support for a stormwater utility.

Chapter 4: Capital Project Recommendations – identifies and prioritizes recommended capital improvement projects to address stormwater and I&I problem areas.

Chapter 5: Operation Recommendations – provides a summary of the management and staffing for the stormwater program and stormwater utility.

Chapter 6: Stormwater Utility Implementation Recommendations – includes a summary of the stormwater program costs used to establish the stormwater utility fee, the proposed rate structure, and factors affecting revenue.

Chapter 7: Summary/Conclusions – an overview of the study, summary of recommendations and next steps.

CHAPTER 2

EXISTING FACILITIES

This chapter provides an overview of known stormwater and I&I problem areas, a list of recently completed and scheduled projects, and a discussion on future growth and development areas.

2.1 OVERVIEW OF KNOWN PROBLEM AREAS

City staff have identified several stormwater problems throughout the city that fall into the following general categories:

- Low areas with poor drainage and standing water
- Natural stormwater flow obstructed by road and/or railroad
- Suspected infiltration and inflow problems
- Infrastructure that is old and needs replaced or repair
- Lack of, or insufficiently sized, stormwater infrastructure
- Missing mapping information and critical infrastructure attributes
- Streambank erosion

The specific problem areas are shown in **Figure 2-1** and discussed below.

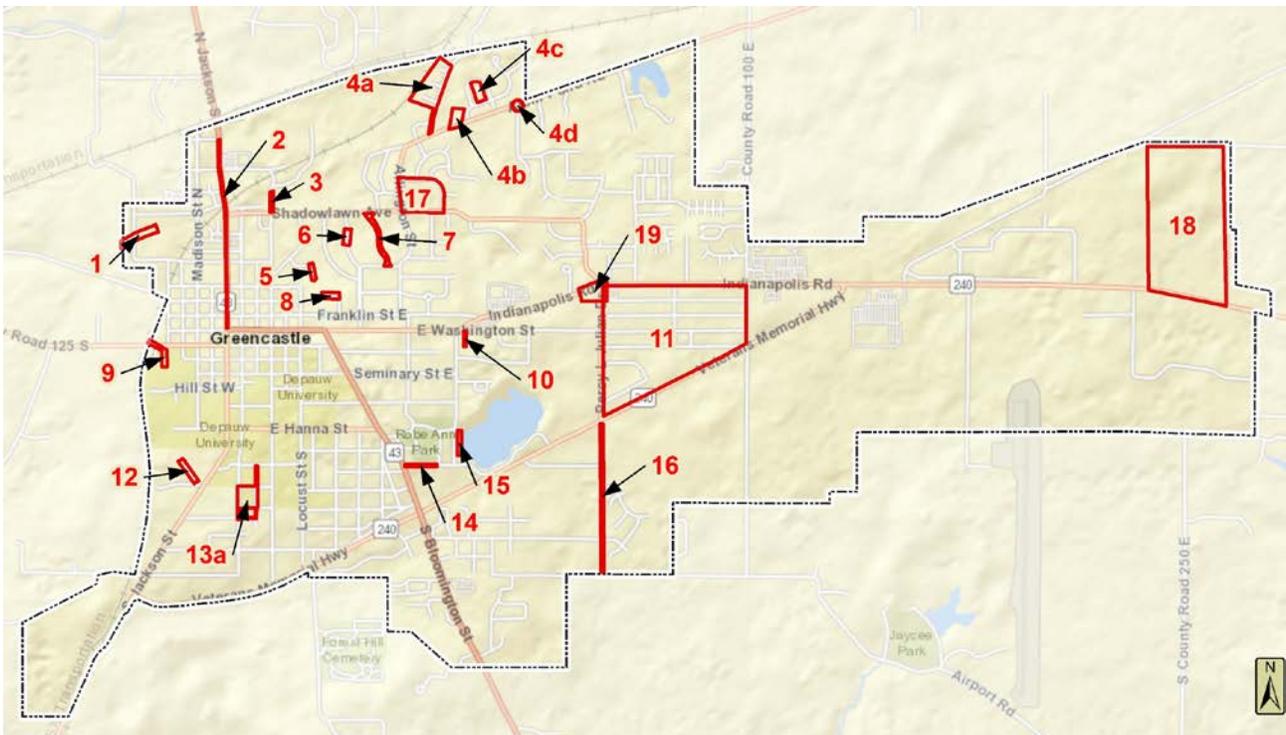


Figure 2-1 Stormwater problem areas identified by city staff

1. **Rockville Road** – there is a low area where Rockville Road, just north of Jacob Street, crosses a utility easement and abandoned railroad right-of-way. The side ditches of the right-of-way have silted in overtime causing water to pond during rain events. There is not a culvert under Rockville Road.
2. **North Jackson Street (SR 231)** – most of the existing stormwater conveyance along this stretch of road is silted in, collapsed or has become plugged. Standing water is a problem especially as Jackson Street passes under the railroad bridge. INDOT is proposing to reconstruct this road and as the design moves forward, the city will need to assist in locating a route and outlet for stormwater.
3. **College Avenue** – water ponds on College Avenue north of Shadowlawn Avenue. The road has a rolled gutter and is graded to the drain to the east toward an existing building and away from the ditch on the west side of the street.
4. **Eagle Valley Subdivision (4a – 4d)** – the Eagle Valley Subdivision is in a wooded, low-lying area that lacks sufficient stormwater infrastructure. The neighborhood is bisected by several waterways that converge before crossing under the railroad. The culvert under the railroad is undersized and impedes stormwater flow. Water backs up and restricts access to several of the homes in the area. A sanitary lift station as well as homes along Houck Road and on the three adjoining cul-de-sacs (4a) are impacted the most.
5. **Cassada Drive** – the Cassada Drive cul-de-sac frequently floods. This wooded residential neighborhood is bisected by a small meandering creek. The volume and velocity of stormwater runoff into this creek as well as encroachment from neighboring land uses causes the creek to overtop and its banks to erode. A block culvert also contributes to the flooding in this neighborhood.
6. **Greenwood Avenue** – a low-lying street with inadequate stormwater infrastructure. Water collects on the street and in adjacent residential yards.
7. **Highfall Avenue** – a low area between two ridges with residential development. The stormwater infrastructure is not adequately sized to capture the volume of stormwater draining to it. During heavy rain, a sanitary manhole floats due to surcharge in the sanitary line. The school to the north of the neighborhood has built a diversion wall to prevent water from entering their building.
8. **Paradise Lane** – the stormwater infrastructure in the Paradise Lane cul-de-sac is not sufficiently sized to handle the volume of stormwater directed to it. This area impacts the Cassada Drive and College Avenue problem areas.
9. **Walnut Street** – the stormwater infrastructure under Walnut Street is unable to convey the volume of runoff from the adjacent baseball field, downtown Greencastle, and DePauw campus. Fill in the area may be contributing to flooding as well.

10. **Washington Street and Wood Street Intersection** – standing water collects in the intersection of Washington and Wood Streets and adjacent low-lying area. Washington Street is elevated and breaks the natural flow path for the stormwater.
11. **The Avenues** – this neighborhood is poorly drained and has a possible I&I problem. The yards in this area are substantially lower than the streets causing stormwater to collect with nowhere to drain.
12. **Jackson Boulevard** – a residential street built in a low-lying area. Stormwater collects on the street and yards where it eventually drains to the neighboring stream to the west. DePauw is looking at the stormwater infrastructure in this area and proposing drainage improvements once their study is complete.
13. **Park and Pine Streets (13a)** – this area has poor drainage and limited stormwater infrastructure.
14. **Tennessee Street** – low-lying area in adjacent Robe Ann Park causes street to flood
15. **Quarry Pond** – stormwater runoff from the adjacent gravel parking lot may be connected to erosion along the bank of Quarry Pond.
16. **Zinc Mill Road** – this area has poor drainage and is being addressed as part of a state funded LPA project. The project is currently in the engineering phase and construction is scheduled for 2022.
17. **National Guard Armory** – stormwater runoff from the Armory roof, parking lot and ballfield floods nearby homes and surcharges inlets. A swale on the Armory property that was designed to convey stormwater away from the homes has been filled in.
18. **Fillmore Road** – the road and several industrial properties flood during heavy rains. A sinkhole has formed in the area and continues to grow larger.
19. **Indianapolis Road/Percy Julian Drive Intersection** - the stormwater infrastructure in this intersection is inadequate to carry the runoff during heavy rains. The slope of the road contributes to the problem.

2.2 RECENTLY COMPLETED AND SCHEDULED STORMWATER PROJECTS

The following is a list of recently completed and scheduled stormwater projects compiled by city staff.

- **South Street** – improvements from Zinc Mill Road to US 231 incorporated storm drainage throughout the length of the project.
- **West Washington Street** – replaced storm drainage line on the south side of the street as part of the Community Crossings project. Added new pipe and inlet at the alley on Madison Street, just south of Washington.

- **Ritter and Tacoma Streets** – added new pipe and inlets at this intersection.
- **Jackson Street** (south of Veterans Memorial Highway) - improved storm drainage and added curb and gutter south to the city limits.
- **Robe Ann Park** – added inlets and field tile in the low area of the park to help dry out the area after heavy rains. This mitigates the flooding on Tennessee Street
- **Zinc Mill Road** – proposed work from SR 240 to South Street will include storm drainage and curb and gutter. Funding is from an INDOT LPA project, funded with federal funds.
- **Locust Street** – proposed work on Locust Street from Seminary to Franklin will include storm drainage in anticipation of the future US 231 reconstruction project. Funding is from an INDOT LPA project, funded with state funds.
- **North Jackson Street** – proposed road reconstruction by INDOT. The city will coordinate on needed stormwater improvements
- **Jackson Boulevard** – proposed study (DePauw University) investigating drainage problems in neighborhood as well as the size of the culvert under the railroad.
- **Olive Street and College Avenue** – proposed study by DePauw University to mitigate flooding at this intersection. This is part of a larger drainage study.

2.3 ANTICIPATED FUTURE GROWTH

The 2001 City of Greencastle Comprehensive Plan shows future growth and development primarily on the east side of the city. This includes single family residential, general business, and light and general industrial development. The Big Walnut Creek floodplain limits opportunities for the city to grow to the west. Future development will place additional demand on the already stressed stormwater infrastructure.

The Comprehensive Plan acknowledges that public infrastructure represents a significant cost for local governments and the quality of that infrastructure impacts the public welfare and quality of life. As such the city's Comprehensive Plan includes a "Managed Infrastructure" goal to maintain and improve the infrastructure of Greencastle in a way that promotes cost-effective quality, provides a tool for managing growth, and ensures the welfare of the community. It further states, the city resolves to repair its deteriorated infrastructure and provide consistent maintenance.

Like many Indiana cities, the City of Greencastle is faced with the challenge of paying for increased costs to comply with state and federal stormwater quality mandates as well as ongoing maintenance of and improvement to the existing drainage system. Greencastle currently pays for their stormwater program using the general fund. This means the stormwater program competes directly for funding with all the other important and popular services provided by the city.

This chapter summarizes Greencastle's stormwater needs and introduces the idea of a stormwater utility as a long-term funding mechanism.

3.1 STORMWATER PROGRAM NEEDS

The city needs a funding source to pay for the long-term, on-going costs to implement an overall stormwater program. This includes paying for items such as:

- **Stormwater Capital Projects** – this includes maintenance, replacement, and repair of the separate storm conveyance system (e.g. pipes, inlets, ditches, etc.).
- **Capital Equipment Costs** – the city needs equipment like a street sweeper and vacuum truck that work to keep and remove solids and pollutants out of the storm system.
- **Staff Salaries and Benefits** – personnel are needed to implement the overall stormwater program.
- **General Operating Costs** – various items are needed for day to day operations such as paying for vehicles, proper disposal of street sweeping materials, software, etc.
- **MS4 Program Costs** – the MS4 or Municipal Separate Storm Sewer System program is discussed in detail in Sections 5.1 and 5.2. This program is mandated by EPA and administered through the Indiana Department of Environmental Management (IDEM).
- **MS4 Training and Technical Assistance** – staff working on this program must be trained according to the IDEM program requirements. Also, it is common for MS4 regulated entities to need on-call technical assistance in the form of contracted engineering services.
- **Administrative Salaries** – oversight, management, and clerical personnel are needed to execute the overall stormwater program.
- **Administrative General** – items are needed to be able to collect funds for the stormwater program such as billing software, databases, and mapping information.

3.2 STORMWATER UTILITY AS A FUNDING MECHANISM

The stormwater utility is a proven method of providing a reliable funding source for the management of stormwater programs. This funding source is provided through a user fee like the fees collected for public water and wastewater services. The stormwater utility is unique (when compared with water and wastewater utilities) in that the service cannot be disconnected for nonpayment, service is provided to all citizens without choice, and the actual service to a property is difficult to quantify. Consequently, the successful implementation of a stormwater utility requires a good stormwater management program with well-defined deliverables as well as public support through education and outreach.

This type of funding mechanism has been coined Stable, Adequate, Flexible, and Equitable (SAFE).

- **Stable** – a stormwater utility is stable because it is separated from the annual budget process and does not compete with other public services and programs such as roads, schools, public safety, and solid waste. This stable revenue source allows stormwater managers to effectively implement their stormwater program and complete drainage projects.
- **Adequate** – a stormwater utility is adequate because the user fee is calculated based on a detailed evaluation of program needs and the capital improvement plan.
- **Flexible** – a stormwater utility is flexible because the rate structure can include any number of modifiers such as caps, economic incentives to reduce user fees, variables for land use types (vacant land, special use or tax-exempt properties), and secondary funding methods to meet the stormwater management program objectives.
- **Equitable** – a stormwater utility is equitable because the user fee is proportional to the rate of stormwater runoff from each parcel and demand put on the city-owned and maintained drainage system.

3.3 BENEFITS OF A STORMWATER UTILITY

The following summarizes the stormwater utility benefits for the elected official and senior city staff responsible for annual funding of the stormwater program, the benefits from the perspective of staff responsible for the daily operations of the stormwater program, and the benefits to the public.

1. Benefits from the perspective of the elected officials and seniors staff responsible for annual funding of the stormwater program:
 - **Dedicated Funding Source** – revenues generated by stormwater utilities can be used as a dedicated source of funding.

- **Supplemental Funding Source** – stormwater utility revenues can be used to replace current general fund/ad valorem tax funding which enables the tax-based funding to be used for other community needs.
 - **Sustainable Revenues** – revenues generated by stormwater utilities are constant and tend to gradually increase with the community's growth.
 - **Bondable Revenue Stream** – bonds for capital improvements can be issued to facilitate constructing stormwater management facilities because the revenues generated by stormwater utilities can be used to pay back bonds.
2. Benefits from the perspective of staff responsible for the daily operations of the stormwater program:
- **Programmatic Stability** – the community's stormwater management program will operate on a stable basis which supports staff stability, continued levels of maintenance operations, and continuity in Capital Improvement Project (CIP) programs since stormwater utilities have stable revenues.
 - **Long-Term View** – stormwater managers can adopt a longer view in planning for capital investments, undertaking maintenance enhancement, and developing staff since they are not operating in a year-to-year funding environment with no certainty of funding in successive years.
 - **Facilitation of NPDES Compliance** – communities that are regulated under the Federal NPDES Stormwater Permitting Program, such as City of Greencastle, are more readily able to comply with the specific permit conditions requiring the development of funding for annual operation of the Stormwater Management Program that is contained in their MS4 Permits.
3. Benefits from the perspective of the public:
- **Improvements to the Drainage System** - everybody benefits from the maintenance and improvements provided by the stormwater utility, through reduced flooding and improved public safety.
 - **Improved Water Quality for Recreation** – activities that involve direct human interaction with water such as swimming, boating, and sport-fishing.
 - **Improved Livability and Quality of Life** – national surveys conducted about the factors that are most important in choosing a place to live consistently include “clean water”. Clean rivers, streams, and lakes

benefit the livability of a community and the standard of living for current and future generations.

3.4 ITEMS TYPICALLY FUNDED BY A STORMWATER UTILITY

A stormwater utility can generate revenue to fund a variety of structural and non-structural activities if they specifically relate to or support the community's stormwater management program. The following summarizes the stormwater activities that are typically funded through a utility:

- **Rule 13 (327 IAC 15-13) Compliance** – including annual reports, illicit connections, construction inspections, public information, and dry weather screening to meet permit requirements
- **Planning** – including stormwater master plans, watershed hydrologic analysis and stream studies, stormwater ordinances and technical standards, floodplain management plans, and land use planning
- **Operation and Maintenance** – including street sweeping, inlet/pipe cleaning, ditch maintenance, mowing and litter control, stormwater pond maintenance, and minor repair and construction of stormwater infrastructure
- **Capital Improvement Projects** – including major construction projects and/or rehabilitative maintenance of flood control structures or stormwater infrastructure
- **Vehicles and Equipment** – purchase and/or maintenance of vehicles and equipment (street sweepers, vacuum trucks, etc.), and program supplies and software
- **Training** – including erosion and sediment control, good housekeeping and pollution prevention, illicit discharge detection and elimination, and developer and contractor training
- **Administration** – including staff necessary for the coordination and implementation of the stormwater program

3.5 STATE AUTHORITY FOR MUNICIPALITIES TO COLLECT STORMWATER FEES

Indiana law allows municipalities to collect user fees necessary to manage the capital improvement and operational expenses associated with stormwater management. This can be done by either creating a new Department of Stormwater Management or expanding the scope of services of the existing Municipal Sewage Works.

Department of Stormwater Management (IC 8-1.5-5)

IC 8-1.5-5 was established in 1988 as a specific tool for cities and towns to improve their ability to manage stormwater. Under this law, municipalities must, by ordinance:

1. Establish a Department of Stormwater Management. The Department is governed by 3-member board appointed by the executive of the municipality
2. Define the district that is considered to receive a special benefit from the collection and disposal of stormwater, identify the method for determining the fee, how the stormwater funds may be used, and collection method
3. Establish the rate structure and user fee for rate payers of the stormwater utility

Municipal Sewage Works (IC 36-9-23)

Stormwater user fees may be collected under the 1981 statute IC 36-9-23 that authorizes municipalities to operate sewage works. While the focus of this statute is sewage, the language includes storm sewers and storm drainage as part of that system. A municipal Board of Public Works is responsible for the construction, acquisition, improvement, operation, and maintenance of sewage works.

Under this option, the stormwater utility may be administered under the existing municipal Utility Board or Board of Public Works. Expanding the existing Board's responsibility requires an amendment to the ordinance that establishes their authority.

RECOMMENDATION #1

It is recommended that the city establish a stormwater utility and a Stormwater Management Division within the existing Department of Public Works.

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CHAPTER 4

CAPITAL PROJECT RECOMMENDATIONS

Of the 19 problem areas identified in Chapter 2, the city selected nine of these areas for further analysis and recommended capital projects (**Figure 4-1**). This chapter includes the project location, description of the problem, proposed solutions, and general estimates for cost. Two-page summaries for each problem area studied in detail is available in **Appendix 1**.

City staff met to review each project and prioritized projects for implementation based on social, environmental, and economic considerations. A summary is at the end of this chapter.

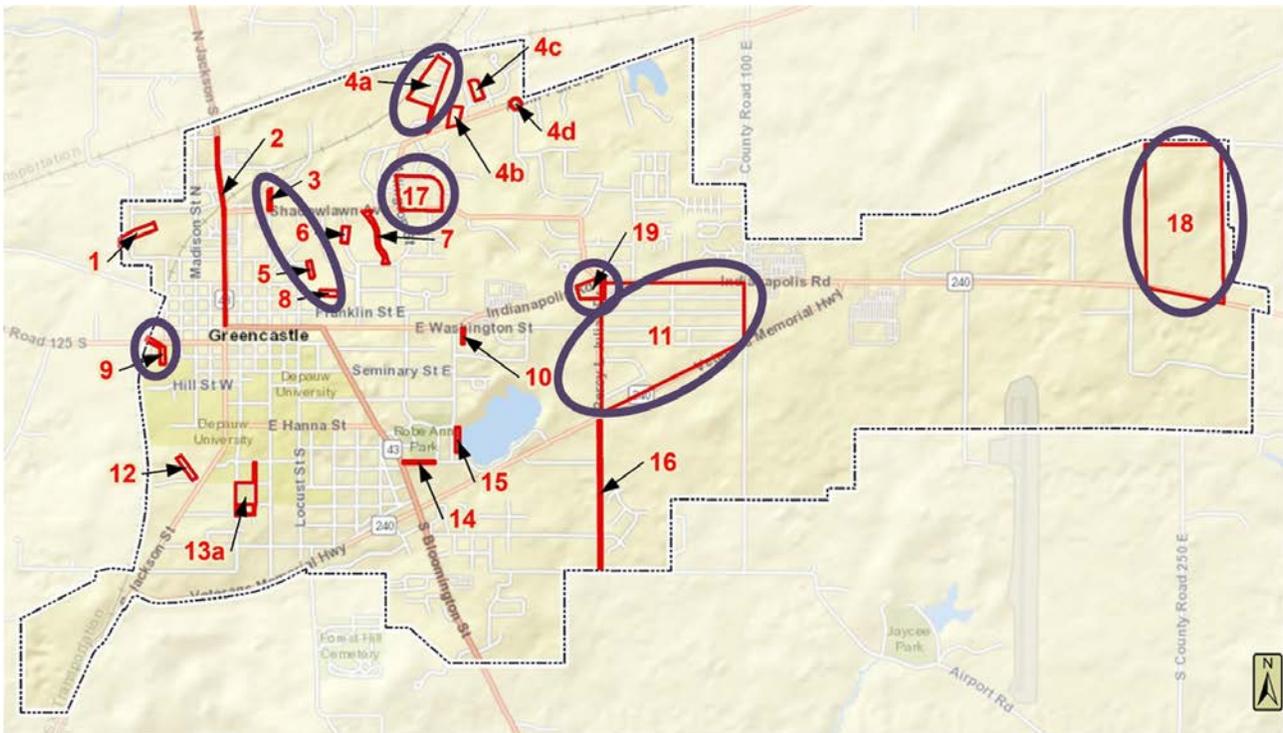


Figure 4-1 Problem areas selected for further study and capital project recommendations

4.1 COLLEGE AVENUE, CASSADA DRIVE AND PARADISE LANE

1. **Mapped Problem Area Number** – 3, 5 & 8
2. **Project Location** – College Street, Cassada Drive, and Paradise Lane – between Shadowlawn Avenue and E Franklin Street

3. **Issue/Problem** – Paradise Lane and Cassada Drive are both experiencing flooding on the cul-de-sacs. The entire area is downstream of an upcoming large-scale road project which is expected to exacerbate any existing issues. Runoff from the nearly 100-acre watershed (mostly residential lots and streets, moderately sloped) all travels through a low area also used as a dumping site adjacent to some railroad tracks near the intersection of College Street and Shadowlawn Avenue. In addition, ditches in the watershed are suffering from eroded banks.
4. **Proposed Solution** – Updated culvert beneath the railroad, street drains on Cassada Drive and Paradise Lane, intercepting the existing ditch behind Paradise Lane before it crosses through backyards, and more defined (erosion resistant) channels for flow behind Paradise Lane and Cassada Drive (**Figure 4-2**).

Basic modeling of the watershed suggests that the culvert under the railroad tracks requires capacity for 12.3 ft³/sec of flow. South of the tracks is private property used as a dumping site and cannot be accessed. A 30-inch culvert in this location would have the necessary capacity for the watershed though it may be the case that a large enough culvert is already installed and blocked by dumped materials.

No problems were mentioned concerning slow-moving water on the upstream sides of culverts under Cassada, Melrose, or College so they are likely properly sized, but it is evident that the stream banks are being eroded. When development occurs in the watershed without specific stormwater management practices such as Channel Protection Volume retainage, it increases the runoff and therefore contributes to higher bankfull flows downstream which can erode channels. An update to the existing City Stormwater standards is needed and should include provisions for Channel Protection Volume retainage is expected to reduce bank erosion resulting from the impacts of increase in bankfull flows typically associated with new development or redevelopment, and therefore recommended.

Properly sized street inlets on Paradise Lane and Cassada Drive can mitigate their flooding issues and the pipe necessary for those drains could also be used to intercept flow from the eastern ditch before it starts to run right behind houses east of Cassada Drive. The right-of-way only extends 3-5 feet off the road, so permission would have to be acquired from all landowners for non-street work.

5. **General Cost Estimate** – \$240,000 (detailed cost breakdown in Appendix 1)

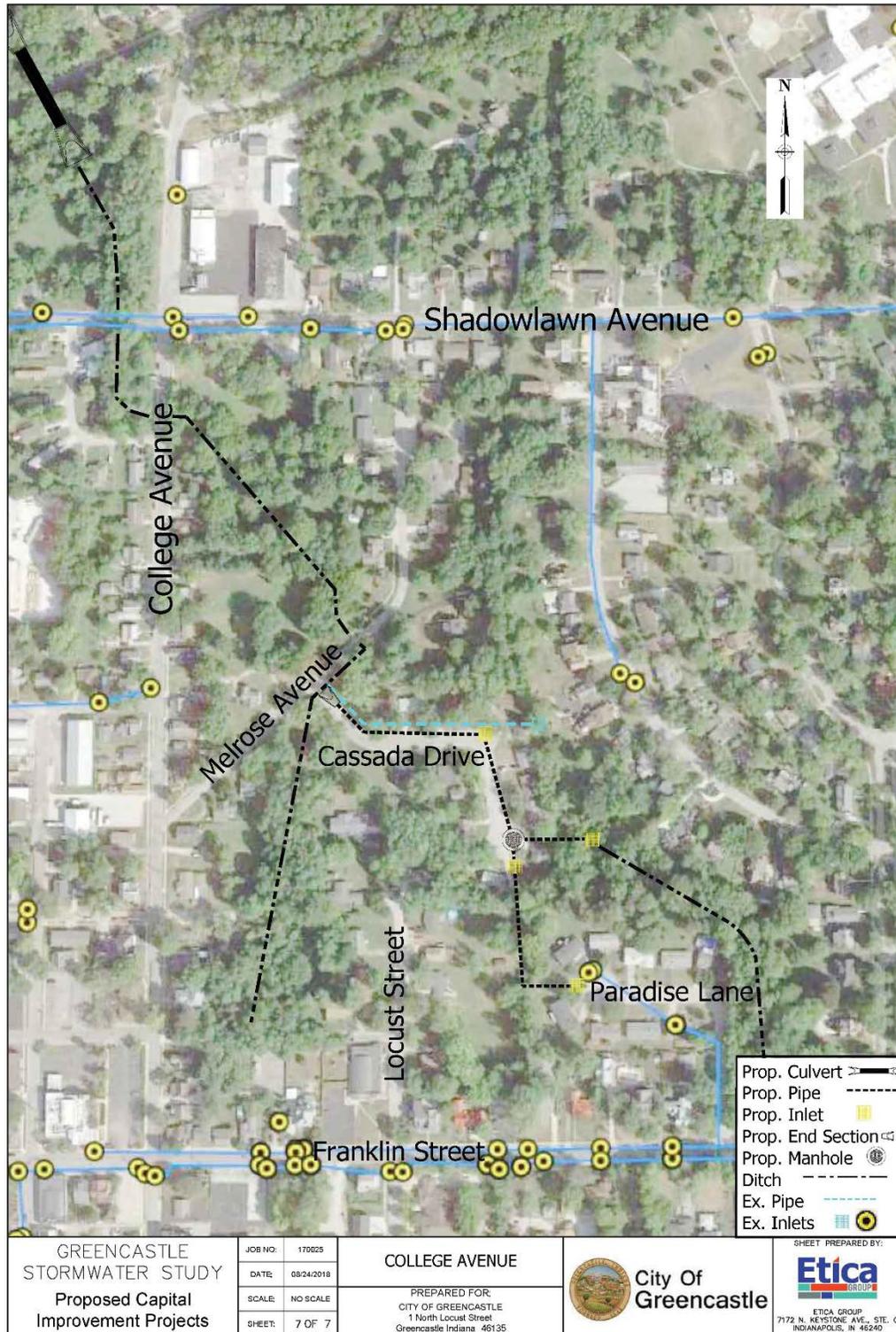


Figure 4-2 College Avenue, Cassada Drive and Paradise Lane problem area

4.2 WALNUT STREET

1. **Mapped Problem Area Number** – 9
2. **Project Location** – Drainage issues occur in the low area on the south side of Walnut Street, between Gillespie Street and the Railroad Tracks, directly north of the DePauw University baseball field
3. **Issue/Problem** – The City of Greencastle reported flooding in the low area along the south side of Walnut Street due to surface runoff coming around the baseball field. Based on available data, this area receives runoff from a 40+ acre watershed; the majority of which is coming from the downtown/residential/campus area. However, there does not appear to be adequate infrastructure to allow flow beneath Walnut Street.
4. **Proposed Solution** – Upgrade/install a properly sized inlet, pipe network, and culvert around the baseball field and under Walnut Street. Connect the reported 30-inch pipe under the baseball field to the new pipe. The 60-inch culvert crossing under the railroad tracks may need to be repaired or cleaned out as well (**Figure 4-3**).

The problem area was identified on the south side of Walnut Street, which potentially indicates the railroad culvert has adequate capacity. Preliminary hydraulic modeling indicates a flow of approximately 13 ft³/sec, which would necessitate a 30-inch culvert crossing beneath Walnut Street. Per information from the City, there is a 36-inch pipe that would connect into this pipe, making it necessary to use that size.

Putnam county GIS shows enough right-of-way along Madison Street and Poplar Street that continues west along the baseball field. Land acquisition may be necessary for the stretch between the baseball field and Walnut Street. Utility conflicts are likely along Madison and Walnut streets and would require further coordination. Erosion control measures should be installed on the property between the proposed Walnut Street culvert and the existing railroad culvert.

5. **General Cost Estimate** – \$320,000 (detailed cost breakdown in Appendix 1)



Figure 4-3 Walnut Street problem area

4.3 NATIONAL GUARD ARMORY

1. **Mapped Problem Area Number** – 17
2. **Project Location** – Armory on the northeast corner of Shadowlawn Avenue and Arlington Street
3. **Issue/Problem** – Water flowing across the Armory property is flooding homes along Hillcrest Drive and surcharging inlets to the north/downhill towards Tacoma Drive.
4. **Proposed Solution** – Subsurface water detention under a newly paved parking area on the armory grounds along with some curb and inlets/storm pipe around the perimeter of the block. (**Figure 4-4**).

The parking area next to the baseball field is gravel and sits on or near an existing storm pipe of unknown size. A subsurface detention system intercepting that pipe under a new parking lot addresses the stormwater issue without impacting existing land use. Subsurface detention provides a mechanism for groundwater recharge through layers of stone and geotextiles in addition to lowering peak flows in pipe networks. Optional water quality structures could be added in-line with the detention to filter additional pollutants from the water. Water quality units require annual maintenance, but they will reduce the amount of maintenance necessary on the detention chambers.

Added curb, inlets, and pipe at the southeast corner of the Armory property along Shadowlawn Avenue and Meadow Drive can help direct upstream flow from the watershed around the problem area. Further analysis would be needed to determine best location for inlets, feasibility of running the pipe into the ditch to the east, and more exact details on existing infrastructure on the Armory property.

Improvements to solve this problem will require the National Guard's permission as well as opportunity to cost-share for funding.

5. **General Cost Estimate** – \$530,000 (detailed cost breakdown in Appendix 1)



Figure 4-4 National Guard Armory problem area

4.4 INDIANAPOLIS ROAD/PERCY JULIAN DRIVE INTERSECTION

1. **Mapped Problem Area Number** – 19
2. **Project Location** – Intersection of Indianapolis Road and Percy Julian Drive
3. **Issue/Problem** – The City reports a lot of water gathers at this intersection. This intersection is the low point for a 20+ acre watershed. It seems that the path the runoff would take is impeded by the slopes of the roads and surrounding buildings causing it to gather in the area. The lowest point appears to be on the west side of the intersection right in front of McDonald's.
4. **Proposed Solution** – Redirecting/capturing water upstream of the problem area (**Figure 4-5**).

GIS data shows that there are storm inlets scattered throughout the parking lots and approaches in the area but there are relatively few curb inlets. Some new curb inlets on Indianapolis Road east of Percy Julian Drive can capture water before it reaches the low area on the west side of Percy Julian. Also, new inlets on Percy Julian Drive south of Indianapolis Road can catch water before it gets stuck in the low area. The stretch of Indianapolis Road to the west of Percy Julian Drive all slopes toward the intersection; by adding some curb and inlets along here water could be captured before reaching the low spot.

All this work can be accomplished within the apparent existing road right-of-way, but further coordination would be needed to determine if utility conflicts would require a different layout or if the reported existing pipe is in a different location.

5. **General Cost Estimate** – \$110,000 (detailed cost breakdown in Appendix 1)



Figure 4-5 Indianapolis Road/Percy Julian Drive Intersection problem area

4.5 FILLMORE ROAD

1. **Mapped Problem Area Number** – 18
2. **Project Location** – Fillmore Road between 240 and E CR 50 S
3. **Issue/Problem** – Industrial properties on Fillmore Road experience flooding which extends out to the road and sometimes across it. A sinkhole has formed in the area which continues to grow larger.
4. **Proposed Solution** – Installing an inlet, culvert, drop structure, and field tile near the sinkhole along Fillmore Road and reshaping the spillways around the buildings as well as the ditches along Fillmore Road. Consider bioretention areas in front of the IAC and Crown Equipment buildings as well as near the sinkhole. Restore the bioretention area north of the sinkhole (**Figure 4-6**).

The study performed for Crown Equipment in May of 2018 suggests reconstructing their northern spillway which is too low and contributes to the flooding at their loading docks. Reinforcing the berm in front of the northern spillway can prevent water from flowing over during heavier events and displace it to the southern edge of their property which does not have the same issues. Shaping/deepening the ditches along the west side of Fillmore road will help direct the water to existing culverts and mitigate flooding across the roadway. The Crown study indicates that the culvert under Fillmore Road is not adequately sized and needs enlarged to roughly a 2x4 box culvert. Lastly, constructing/restoring bioretention areas can help slow down the water to give it time to infiltrate into the ground and alleviate burden on the inundated areas. Conflicts with buried utilities are likely and would require coordination to determine possible excavation limits.

The sinkhole presents a unique challenge and opportunity. It is a natural groundwater recharge point but in heavy storms cannot handle all the water and floods across the road. It is reportedly also growing larger which is a safety concern for the city. The watershed draining towards the sinkhole is almost 90 acres and is a mix of farm ground, industrial space, woods, and pavement. Modeling for the watershed without the effects of the sinkhole indicates a need for 12.5 ft³/sec capacity at that location which necessitates a 30-inch culvert. The reason there is not already a culvert at the location is because of elevation issues on the east side of Fillmore Road. Therefore, it is recommended to install a drop structure to a subsurface drain pipe from where the proposed culvert crosses the road approximately 1,700 feet across the farm field to the ditch. This pipe would also need to be at least 30 inches and possibly larger if there are existing field tiles which would have to connect. Further study would be necessary to determine feasibility for the outlet in the ditch though it appears there is plenty of elevation change across the field. Some of the ditch work could be accomplished within the rights-of-

way but cooperation with landowners would be necessary for the field tile and bioretention areas. Future expansion of the IAC will require an increase in stormwater detention.

5. General Cost Estimate – \$510,000 (detailed cost breakdown in Appendix 1)

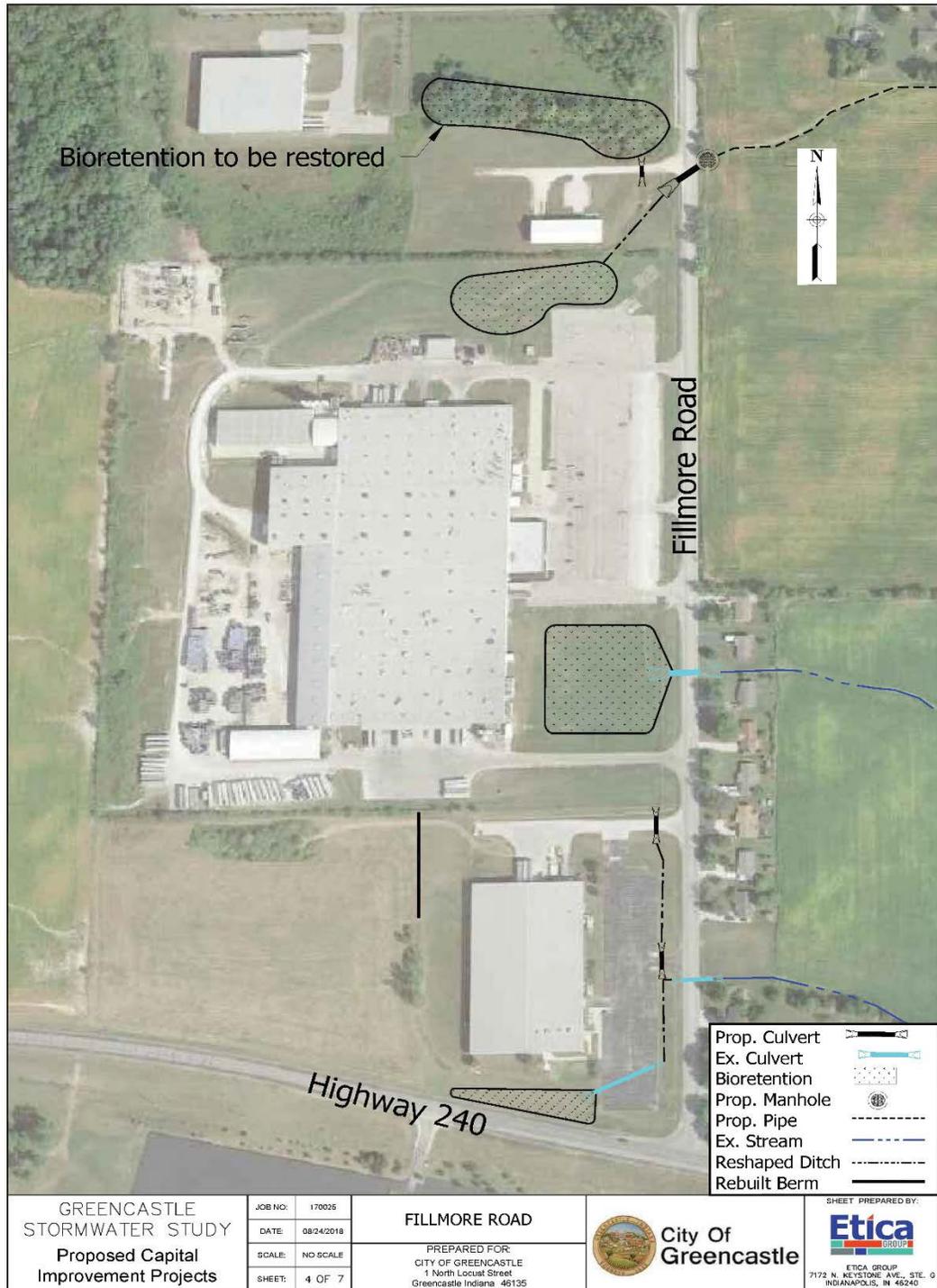


Figure 4-6 Fillmore Road problem area

4.6 THE AVENUES NEIGHBORHOOD

1. **Mapped Problem Area Number** – 11
2. **Project Location** – Avenues B, C, D, E, and F between Percy Julian Drive and Warren Drive, north of Highway 240 and south of Indianapolis Road.
3. **Issue/Problem** – Yards in the neighborhood are all substantially lower than the roads. The city has received some reports of minor standing water in yards at various locations.

Reportedly this area has a lot of infiltration and inflow problems but there was no concrete information available to evaluate this claim. Allegedly there were also issues with pipe elevations during construction but there was no way to verify this claim with information provided.

4. **Proposed Solution** – Adding curb to the edge of streets and turnouts at existing inlets (**Figure 4-7**)

GIS shows 100+ inlets in the neighborhood and there are many more that are unmarked by GIS but visible in satellite/street view imagery. In one or two locations in the neighborhood there are 10-15 feet of curb flanking individual inlets but nothing running the entire length of the street. Running curb and gutter the full length of the street with turnouts at the storm inlets could help keep water from soaking yards and instead keep it on the road until reaching an inlet. Avenue B and C have no curbs but have inlets in almost every yard. Avenue D has a full curb and sidewalk down the south side of the street but nothing along the north side. 5th street was improved this summer with additional inlets and new curb and gutter. Also, a sidewalk was added to the east side of the street.

In most of the neighborhood the right-of-way extends about 5 feet off the road into yards which should be enough for installing curb. Conflicts with buried utilities are possible but unlikely due to the typical depth of buried utilities being greater than that of curb. Further study would need to be conducted to determine how any proposed curb might be impacted by ADA standards and could affect locations where it intersects with existing sidewalk around the perimeter of the neighborhood.

Another possible solution is to have lot owners raise the elevation of their lots as new construction occurs so the lot drains properly to the street, existing swales, or existing inlets.

5. **General Cost Estimate** – \$310,000 (detailed cost breakdown in Appendix 1)



Figure 4-7 Avenues Neighborhood problem area

4.7 EAGLE VALLEY SUBDIVISION – HOUCK ROAD

1. **Mapped Problem Area Number** – 4a
2. **Project Location** – Houck Road cul-de-sacs (Golden, Talon, and Eagle Courts) north of Albin Pond Road
3. **Issue/Problem** – The City of Greencastle reported flooding along the western edge of the neighborhood encompassed by the cul-de-sacs, most notably along the railroad tracks and the wooded area to the south.
4. **Proposed Solution** – Clean the existing railroad culvert, install a curb inlet along Tacoma Drive, and clear some of the overgrown brush in the swale between Houck Road and the railroad tracks (**Figure 4-8**)

Modeling for the approximately 25 acres of mostly residential lots indicates a flow of approximately 6 ft³/sec of water is necessary at the existing railroad culvert which calls for a 21-inch pipe. In images provided by the city shows that the culvert is almost completely blocked and indistinguishable from the rip rap around it. Greencastle reports that the railroad company contacted residents in the neighborhood about cleaning the culverts which may considerably reduce the problem. At the very least they will be able to determine the size of the existing culvert. Satellite images from the last 10-12 years (Google Earth) show the flow path leading from Houck Road towards the railroad culvert has become overgrown with vegetation which may be restricting flow. Putnam County GIS shows this area as private property, but the city has indicated the property owner is willing to work with them on improving drainage through the site.

Tacoma drive has curbs down both sides of the road but only has inlets on the south (high) side of the street. Adding an inlet to the northwest corner of the intersection of Houck and Tacoma/Albin Pond Road and connecting it to the pipes that run east behind the church can direct some upstream road runoff around the problem area.

5. **General Cost Estimate** – \$85,000 (detailed cost breakdown in Appendix 1)

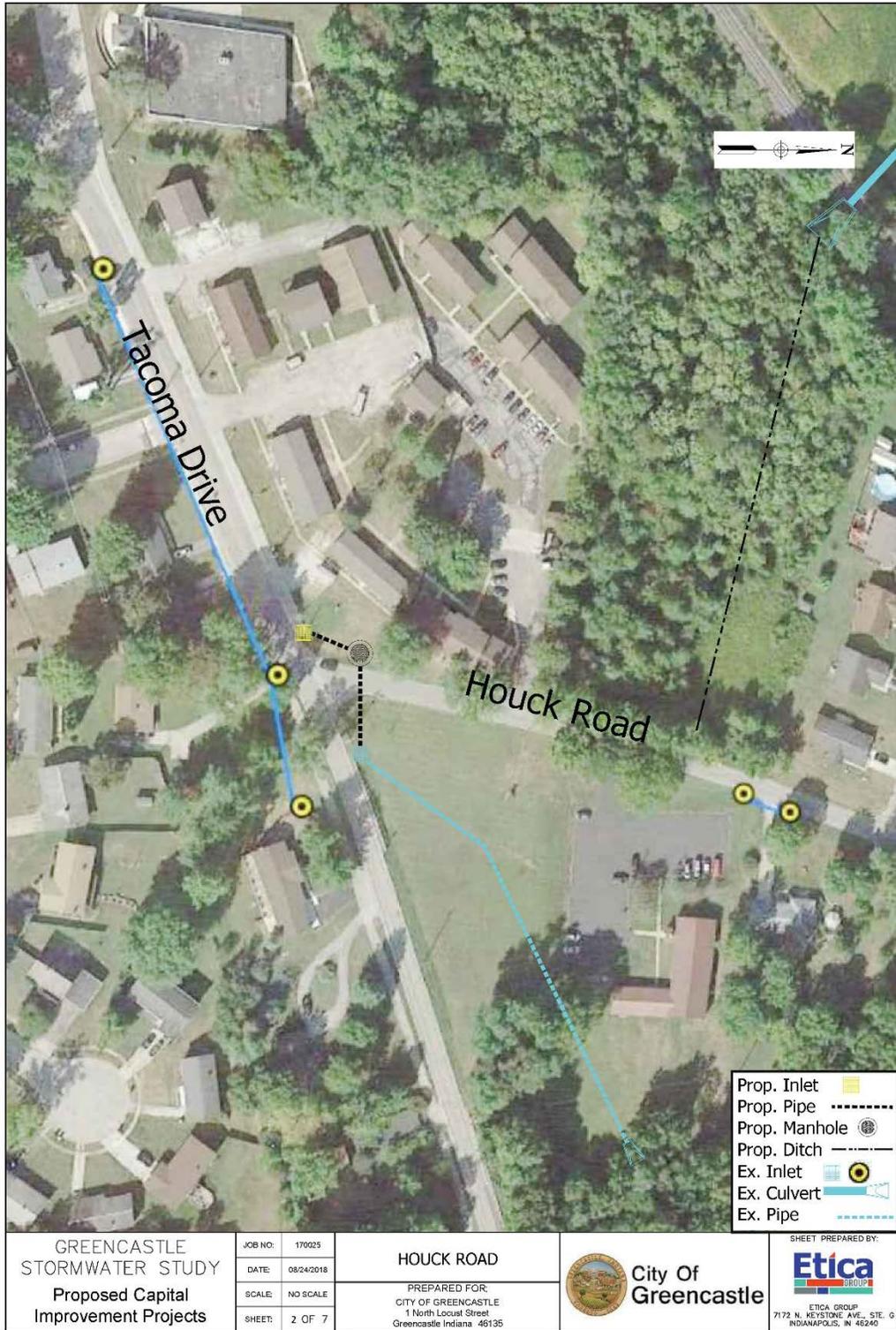


Figure 4-8 Eagle Valley Subdivision problem area

RECOMMENDATION #2

It is recommended that \$250,000 is budgeted annually for large capital projects. The city may need to accumulate funds over two or more years to implement larger projects.

4.8 PRIORITIZATION OF RECOMMENDED CAPITAL PROJECTS

To ensure the greatest public benefit, the following set of economic, environmental, and social performance criteria and evaluation metrics were developed to screen and prioritize the recommended capital projects. This is also referred to as the triple bottom line (TBL) evaluation. The weighting factors and ratings were determined by city staff.

4.8.1 Economic Criteria

- Proposed solutions should provide the greatest total value to the community by benefiting a relatively large percentage of people
- Proposed solutions should be economically feasible and cost effective

Table 4-1 Economic performance criteria and evaluation metrics

Evaluation Metric	Definition	Weighting Factor	Rating
Capital Cost	Estimated/planning level costs	0.45	0 = > \$10M 1 = > \$5M < \$10M 2 = > \$1M < \$5M 3 = > \$500K < \$1M 4 = > \$100K < \$500K 5 = < \$100K
Lifecycle Operation and Maintenance (O&M) Cost	Magnitude of cost for operation and maintenance based on typical lifecycle	0.20	0 = Very High 1 = High 2 = Moderate to High 3 = Moderate 4 = Low to Moderate 5 = Low
Other Funding Opportunities and/or Shared Resources	Source of project funding includes City, Stormwater Utility (SWU), other City Departments/Programs, County/DePauw (DPU), or other funding sources such as a grant, low-interest loan, charitable gift (Other)	0.35	0 = City 1 = City/SWU 2 = SWU 3 = SWU/County/DPU 4 = County/DPU 5 = Other

4.8.2 Environmental Criteria

- Proposed solutions should not have any significant and/or permanent negative impacts on the environment, recreational opportunities, and/or fish and wildlife resources

- Proposed solutions should be consistent with the City’s Stormwater Quality Management Plan (SWQMP) and address water quality impairments identified in the plan and those anticipated from existing and future land use

Table 4-2 Environmental performance criteria and evaluation metrics

Evaluation Metric	Definition	Weighting Factor	Rating
Treat Pollutants of Concern	Effectiveness to treat pollutants of concern carried by stormwater runoff	0.40	0 = No Removal 1 = 1% to 20% 2 = 21% to 40% 3 = 41% to 60% 4 = 61% to 80% 5 = > 80%
Improve and/or Protect Stream Habitat	Ability to improve and/or protect riparian and instream habitat	0.30	0 = No Change 1 = Limited 2 = Limited to Moderate 3 = Moderate 4 = Moderate to High 5 = High
Recharge Groundwater	Promote infiltration of stormwater to recharge aquifer	0.30	0 = No Change 1 = Limited 2 = Limited to Moderate 3 = Moderate 4 = Moderate to High 5 = High

4.8.3 Social Criteria

- Proposed solutions should improve public health, well-being, and community livability
- Proposed solutions should reduce stormwater and/or I&I problems
- Proposed solutions should address public safety and allow for flood-free emergency access
- Proposed solutions should be socially and politically acceptable to residents and, to the extent practical, to other interest groups and be permittable under existing federal, state, and local permit programs

Table 4-3 Social performance criteria and evaluation metrics

Evaluation Metric	Definition	Weighting Factor	Rating
Widespread Benefit	Number of properties that will benefit	0.25	0 = 0 properties 1 = 1 to 10 2 = 11 to 30 3 = 31 to 100 4 = 101 to 300 5 = 300+
Reduce Stormwater and/or I&I Problems	Ability to reduce current or anticipated future flooding, drainage and/or I&I problem	0.25	0 = No Change 1 = Limited 2 = Limited to Moderate 3 = Moderate 4 = Moderate to High 5 = High
Benefit to Public Health and Safety	Ability to improve public health and safety concerns related to flooding, drainage issues and water quality	0.25	0 = No Change 1 = Limited 2 = Limited to Moderate 3 = Moderate 4 = Moderate to High 5 = High
Promotes Revitalization, Quality of Life (QOL) and Publicly Acceptable	Consistent with City’s growth and development goals; improves quality of life; generally accepted by the public	0.25	0 = No Change 1 = Limited 2 = Limited to Moderate 3 = Moderate 4 = Moderate to High 5 = High

Using the above TBL criteria, the scoring for the recommended capital improvement projects is as follows. The completed worksheet is in **Appendix 2**.

1. National Guard Armory (TBL score = 9)
2. Fillmore Road (TBL score = 8)
3. Eagle Valley Subdivision – Houck Road (TBL score = 8)
4. The Avenues Neighborhood (TBL score = 8)
5. Walnut Street (TBL score = 7)
6. Indianapolis Road/Percy Julian Drive Intersection (TBL score = 6)
7. College Avenue, Cassada Drive and Paradise Lane (TBL score = 6)

The city may need to adjust the implementation of these projects based on availability of funds, opportunities to include improvements with other project such as street paving, and the availability of any required easements.

A tool such as the TBL should be used to evaluate all future city capital projects, regardless of their scale, to assess the economic, environmental and social benefit.

4.9 FUTURE CAPITAL PROJECTS AND STORMWATER MANAGEMENT

An outcome of the identification and detailed analysis of the capital projects discussed above is that Greencastle needs a citywide stormwater master plan and a comprehensive stormwater ordinance and technical standards.

The purpose of a stormwater master plan is to develop a long-term plan for the safe and effective management of stormwater runoff with cohesive city-wide strategies to address current and anticipated future flooding, drainage, and water quality problems. Future capital projects are the primary outcome of the stormwater master plan.

The current city stormwater ordinance needs to be updated to better management stormwater runoff from new development and redevelopment projects. This update should include site-specific post-development maximum allowable release rates, channel protection volume requirements, and the option to use green infrastructure.

RECOMMENDATION #3

It is recommended that \$150,000 is budgeted to prepare a citywide Stormwater Master Plan.

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This chapter provides an overview of the federal stormwater program regulatory mandate, a summary of the City of Greencastle's stormwater program elements to meet these requirements, and a discussion on the city's stormwater program staffing needs and organization.

5.1 STORMWATER PROGRAM REGULATORY MANDATE & PENALTIES FOR NONCOMPLIANCE

As part of the 1987 amendments to the Federal Clean Water Act (CWA), the United States Congress added Chapter 402(p) to the CWA to address the water quality impacts of stormwater discharges from industrial facilities and large to medium municipal separate storm sewer systems (MS4s). Large to medium MS4s were defined as communities serving populations of 100,000 or more and are regulated by the Environmental Protection Agency (EPA) under the National Pollutant Discharge Elimination System's (NPDES) Storm Water Phase I MS4 Permit Program.

In addition to these amendments, Congress directed the EPA to issue further regulations to identify and regulate additional stormwater discharges that were contributing to national water quality impairments. On December 8, 1999, the EPA issued regulations that expanded the existing NPDES Storm Water Program to include discharges from small MS4s in "urbanized areas" serving populations of less than 100,000 and stormwater discharges from construction activities that disturb more than one acre of land. These regulations are referred to as the NPDES Storm Water Phase II MS4 Permit Program.

In the State of Indiana, the Indiana Department of Environmental Management (IDEM) is responsible for the development and oversight of the NPDES Phase II MS4 Program. The IDEM initiated adoption of the Phase II Rules that were ultimately codified as 327 IAC 15-13 (Rule 13). Rule 13 became effective on August 6, 2003 and requires designated MS4 entities to apply for permit coverage by submitting a Notice of Intent (NOI) and developing Storm Water Quality Management Plans (SWQMPs) through a phased submittal process. The IDEM's phased submittal requirements for the SWQMP include the following 3 components:

1. Part A: Initial Application
2. Part B: Baseline Characterization Report
3. Part C: Program Implementation Plan

To deal with potential violations, EPA has 3 types of enforcement actions. These include Administrative Orders, Civil Penalties, and Criminal Prosecutions. Depending on the severity of the violation, monetary fines may range from \$2,500/day/violation not to exceed as much as \$157,500/day/violation. The

most severe individual penalty is imprisonment for not more than 15 years and/or a fine of \$250,000. Organizations, including governmental entities subject to Phase I and Phase II Programs, may be subject to fines of not more than \$1,000,000. In addition to federal enforcement and penalties, Indiana may issue a civil fine not to exceed \$25,000/day/violation. The City of Greencastle became a designated MS4 entity in 2003.

5.2 CITY OF GREENCASTLE STORMWATER PROGRAM

The city's plan for implementing Rule 13 requirements is contained in their SWQMP Part C: Program Implementation Report that includes several best management activities identified in each of the following 6 Minimum Control Measures (MCMs).

MCMs #1 & #2: Public Education, Outreach, Participation, & Involvement

- The City must implement and/or participate in the following activities to meet their Rule 13 requirements:
 - BMP Code Enforcement
 - Canine Park
 - City Personnel Training
 - Clean Community Challenge
 - Contractor/Developer Education
 - Environmental Hotline
 - Facility Inspections
 - Newspaper Articles
 - Rockicki Park
 - Sampling/Monitoring
 - Storm Drain Marking
 - Street Signs
 - Tox-A-Way Day
 - TV Programs
 - Unassigned 4-H Activities
 - Unassigned Community Projects
 - Unassigned DePauw Student Activities
 - Unassigned Litter/Vermin Problems
 - Unassigned School Activities
 - University Personnel Education
 - Utility Bills
 - Website

MCM #3: Illicit Discharge Detection & Elimination (IDDE)

- Defined by EPA as identifying and eliminating illicit discharges and spills from storm drain systems
- The city must implement the following activities to meet their Rule 13 permit requirements:
 - BMP Code Enforcement
 - Canine Park
 - City Personnel Training
 - Clean Community Challenge
 - Department of Health
 - *E. coli* Investigations
 - Environmental Hotline
 - Facility Inspections
 - Mapping
 - Sampling/Monitoring
 - Storm Drain Marking
 - Tox-A-Way Day
 - Unassigned Community Projects
 - Unassigned School Activities
 - University Personnel Education
 - Utility Bills
 - Website

MCMs #4 & #5: Construction and Post-Construction Runoff Control

- Defined by EPA as addressing stormwater runoff from active construction sites and after construction activities have ended
- The city must implement the following activities to meet their Rule 13 requirements:
 - Stormwater Management Ordinance
 - BMP Code Enforcement
 - City Personnel Training
 - Clean Community Challenge
 - Contractor/Developer Education
 - Environmental Hotline
 - Stormwater Policy

MCM #6: Good Housekeeping & Pollution Prevention

- Defined by EPA as addressing stormwater runoff from MS4 owned facilities and activities
- The city must implement the following activities to meet their Rule 13 requirements:
 - Canine Park

- City Personnel Training
- Clean Community Challenge
- Deicing Activities
- Mapping
- Storm Drain Marking
- Unassigned City Activities
- Unassigned Community Projects
- University Personnel Education

Although the city has attempted to implement some of these activities, they have not had the consistency, unity, coordination, or completeness needed for longevity and success. In addition, some activities which are required by Rule 13 (but are not included in the city's current Part C) do not currently appear to be implemented and may be missing from the city's Rule 13 program.

5.3 PROGRAM STAFFING NEEDS AND ORGANIZATION

The Mayor is designated by law as the overall MS4 Operator. Rule 13 mandates that the highest ranking elected official is ultimately responsible for the development, implementation, or enforcement of the MCMs for the city. The noted Rule 13 program responsibilities have been delegated to the City Planner who serves as the city's MS4 Coordinator.

The existing Board of Public Works would serve as the Stormwater Utility Board assuming the stormwater utility is established using Municipal Sewage Works discussed in Section 3.5 of this report. This board would make decisions about the city's overall stormwater management program, and the City Council would approve the stormwater utility program costs. A Stormwater Management Division would be created within the Department of Public Works for providing for and managing the collection, treatment, drainage, and disposal of city storm and surface water.

The MS4 Coordinator is responsible for coordinating the 6 MCMs and the contracted City Engineer provides CIP management and review, as well as, reviews the stormwater drainage for private and residential projects. A new seasonal Stormwater Intern could assist with all of the 6 MCMs as needed and directed by the MS4 Coordinator. The city has an interlocal agreement with the Putman County Soil and Water Conservation District.

Revenue generated from the stormwater utility would be used to fund 40% of the MS4 Coordinator, 20% of the GIS Tech, 10% of the Building and Stormwater Inspector, 30% of the Street Sweeper Operator, 30% of the Dump Truck Operator, 20% of the Catch Basin Cleaning Staff, and 100% of the new Seasonal Stormwater Intern position.

For all the MCMs listed below, the city has a Memorandum of Understanding with DePauw University for the city to also implement their Rule 13 program.

MCMs #1 & #2: Public Education, Outreach, Participation, & Involvement are led by the MS4 Coordinator with support from the Big Walnut Creek Watershed Alliance. In addition, help to either directly or indirectly fulfill Rule 13 program requirements is provided by the city's Water and Wastewater Utilities, the city's Solid Waste and Recycling Services, the West Central Solid Waste District office, as well as, the Putnam County Soil and Water Conservation District office.

MCM #3: Illicit Discharge Detection and Elimination tasks are led by the MS4 Coordinator. In addition, help to either directly or indirectly fulfill Rule 13 program requirements is provided by the city's Pre-treatment Program, Water and Wastewater Utilities, GIS Technician, the city's Solid Waste and Recycling Services, and the West Central Solid Waste District office.

MCMs #4 & #5: Construction and Post-Construction Runoff Control are led by the MS4 Coordinator with support from a Building Inspector to handle permitting, review of Stormwater Pollution Prevention Plans and O&M Plans, inspections, compliance, and enforcement. The Putnam County SWCD also provides input on this program. The INAFSM Inspectors' Group is a networking forum for all MS4 entities throughout the state to learn and share stormwater program knowledge. Applicable city staff pays annual dues to INAFSM.

MCM #6: Good Housekeeping & Pollution Prevention for City Operations is led by the MS4 Coordinator with support from the staff at each of the city's facilities; however, this MCM includes items such as facility management at city-owned properties and on-going maintenance of the separate storm conveyance system. Therefore, several city departments are affected by these Rule 13 requirements, so the MS4 Coordinator works effectively with them to cooperatively implement the program. For example, the Street Department and Wastewater Utility provides services such as Street Sweeping, Catch Basin Grate Cleaning, and Vacuum Truck Operation which help to maintain and keep pollutants out of the separate storm sewer system conveyance.

Additional Stormwater Quality and Quantity issues would be completed by "Capital Improvement Project (CIP) Support" staff including the MS4 Coordinator, Contracted City Engineer, Clerk-Treasurer, and Building Inspector.

CBBEL met with key city staff and officials and researched similar MS4 organizational structures to recommend staffing for the stormwater program. This information was used to create the "Organizational Chart for City of Greencastle Stormwater Utility" provided in **Appendix 4**.

RECOMMENDATION #4

It is recommended that the city use funds generated from a stormwater utility fee to implement and meet the goals of their Rule 13 Program and to position the city to meet increasing expectations and requirements.

STORMWATER UTILITY IMPLEMENTATION RECOMMENDATIONS

This chapter provides a breakdown of the city’s stormwater program costs and the methodology used to establish the stormwater utility rate structure.

6.1 STORMWATER PROGRAM COSTS

CBBEL reviewed the City’s Storm Water Quality Management Plan (SWQMP) Part C and Annual Reports, conducted interviews with key city staff and officials, and researched costs from other similar Phase II MS4 regulated entities to determine program costs.

The current annual stormwater program is paid for with general funds which cannot sustain the \$850,000 that the city needs to adequately meet their required stormwater program requirements.

The stormwater program costs prepared as part of this Rate Study includes a 5-year projection that allows for the successful implementation of the 6 MCMs required by Rule 13.

Appendix 3 provides a tabulation of the noted 5-year program costs and Figure 6-1 graphically illustrates the distribution of the program cost categories. The costs shown in the 5-year program cost table in Appendix 1 are for the base year (“Year 1” is a representation of the first full year of implementation) and unless otherwise stated, a 3% annual inflation rate is assumed to derive costs for the subsequent years. Additional explanations are provided below for the following categories that make up the program costs.

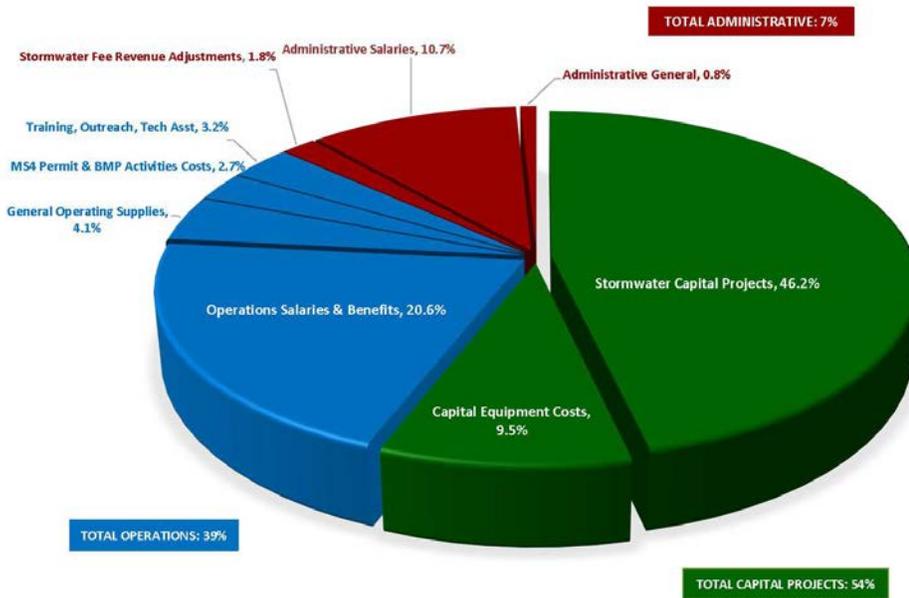


Figure 6-1 Distribution of funds within the stormwater program costs

Stormwater Capital Projects

This category includes new projects, plans and studies to address stormwater problems including:

- Small scale maintenance/Capital Costs
- Large scale Capital Projects Costs

The estimated first-year cost is \$557,500.

Capital Equipment Costs

This category includes ongoing costs of operating and maintaining:

- New street sweeper (1)
- New vacuum truck (1)

The estimated first-year cost (sinking fund to work towards new equipment purchase) is \$81,250.

Operations Related Salaries and Benefits

The stormwater program staff will consist of the:

- Existing MS4 Coordinator (40%)
- Existing GIS Tech (20%)
- Existing Building Inspector (10%)
- Existing Street Sweeper Operator (30%)
- Existing Dump Truck Operator (30%)
- Existing Catch Basin Cleaning Staff (20%)
- New Seasonal Stormwater Intern (100%)

The estimated first-year cost is \$166,280.

General Operating Costs

This category includes staff vehicles, as well as, administrative and miscellaneous office supplies including:

- Vehicles Operation and/or Maintenance
- MS4 Dumpster (including fees for proper disposal of collected street sweeping material)
- Mileage reimbursement
- Inspection and Maintenance of Stormwater Best Management Practices
- GIS Computer software and printing supplies

The estimated first-year cost is \$46,760.

MS4 Program Costs

This category includes items that Greencastle pays for that are specifically needed for permit compliance, including the following:

- Local public education and outreach materials and related fees
- Illicit Discharge Detection and Elimination (IDDE) mapping and screening
- Inspection Program Tools and Supplies

- Spill Kits and Response Equipment/Stormwater Controls

The estimated first-year cost is \$21,500.

MS4 Training and Technical Assistance

This category includes training and conferences to help staff be informed on regulatory and compliance issues and provide professional development in stormwater regulations and utility management as well as provides for professional engineering on-call services as needing; including:

- Staff Training
- Stormwater and MS4 Engineering On-call

The estimated first year cost is \$25,000.

Administrative Related Salaries and Benefits

The administrative staff in support of the stormwater program will consist of the:

- Existing Billing Staff (25%)
- Oversight Costs including a portion of the compensation for the Board of Works, Mayor, Clerk-Treasurer, and City Attorney

The estimated first-year cost is \$86,000.

Administrative General Costs

Greencastle will create a billing system to generate the stormwater utility bills.

This cost will pay for:

- Utility Billing Software and Mailing
- Annual Update and Revisit Fee Structure

The estimated first-year cost is \$25,000.

Stormwater Fee Revenue Adjustments

This category includes an allowance for stormwater credits and non-payments, including:

- Customer Credit for Impact Reductions
- Customer Delinquencies

The estimated first-year adjustment is \$15,000.

RECOMMENDATION #5

It is recommended that the city adopt an average annual stormwater program cost of \$850,000 to meet their Rule 13 Program requirements, maintain existing stormwater infrastructure, and implement capital projects.

6.2 STORMWATER UTILITY RATE AND RATE STRUCTURE

Stormwater runoff carries with it pollutants to streams and lakes, and pollutant loads vary depending on land use. For example, nutrients (nitrogen and phosphorus) are higher in residential areas whereas metals (zinc, cadmium, and lead) are higher in runoff from highways and industrial areas. Impervious areas like rooftops, roads, and parking lots increase volume and velocity of stormwater runoff.

Stormwater fees are designed to share the costs in a community to cover stormwater expenses that may include program costs, infrastructure costs, and capital project costs. Those community shared costs include stormwater that comes from shared public infrastructure like roads and thoroughfares. Even though each parcel is billed an amount due to the characteristics of their specific parcel, a community's utility rate structure is designed to share the entire stormwater expense which includes expenses that are beyond individual properties. Billing is done per parcel to provide for user fees that are deemed overall fair and equitable to everyone within a user class, without preference to any one user or considering special characteristics of that user, knowing that all users must contribute and will benefit from the community's stormwater infrastructure and program.

There are predominantly two stormwater utility rate types, flat fee and variable fee.

1. **Flat Fee** – the fee is the same for each parcel regardless of land use, acreage, imperviousness, stormwater improvements, etc. This method is simple since everyone pays the same amount. Collection is tied to an existing database which reduces billing costs and duplication errors. However, this method can be difficult to justify and is not considered fair or equitable among rate payers since it does not consider differences of parcel size, land use, and stormwater runoff from impervious area.
2. **Variable Fee** – the fee varies depending on the parcel based on acreage, assessed value, land use, impervious area, or a combination of these.
 - a. Acreage Based – a flat rate per acre. This method is simple since everyone pays something and it is based on readily available acreage data. However, it can be difficult to justify and is not considered fair or equitable among rate payers since it does not consider differences in land use and stormwater runoff.
 - b. Assessed Value – equivalent to a percent of assessed property value. This method is simple since everyone pays something and it is based on readily available assessment data. However, it can be difficult to justify and is not considered fair or equitable among rate payers since it does not consider differences in land use and there is no direct correlation between a property's assessed value and stormwater runoff.

- c. Land Use – tiered flat rate or runoff coefficient. Both land use methods can be effective since they consider land use and its correlation to stormwater runoff. Although collection can be based on an existing database of land use codes, the rate assigned to each code is an average for typical land use and will not reflect actual imperviousness and its impact on stormwater runoff.
- d. Impervious Area – average impervious area, actual impervious area for all land use types, or actual impervious area for only a particular land use type. Each of these methods takes into consideration either the average or actual impervious area for each land use. Since impervious area is directly correlated to the quantity and quality of stormwater runoff, the impervious methods are the most fair and equitable of all the rate types. However, since impervious area data may not be readily available, developing the initial database can be labor-intensive making it more expensive and time-consuming than methods based on land-use. Using a typical impervious area size for residential properties (known as “Equivalent Residential Unit” – ERU”) that normally constitute a large percentage of parcels in a community, instead of determining actual imperviousness of each residential parcel, would greatly reduce the initial engineering fees and also future ongoing administrative costs of database maintenance and is therefore a very popular and common procedure for utilities that set the user fees based on imperviousness. Additionally, areas with no impervious areas still generate runoff and contribute stormwater volume and pollutants to some degree. These unimproved parcels also benefit from the overall stormwater program. Therefore, the impervious area method may be modified to collect a nominal flat fee from unimproved parcels (with no impervious area), typically set as a fraction of 1 ERU.

Assessing fees based on impervious area is the most common stormwater utility rate method throughout Indiana and the United States. Since it is the best indicator of amount and quality of stormwater runoff, it is considered the most defensible, fair, and equitable for rate payers. Once the initial impervious area database has been developed for non-residential units, new impervious areas may be easily added to ensure the database is accurate.

RECOMMENDATION #6

It is recommended that the city implement a variable stormwater utility fee that is based on the impervious area.

6.3 UTILITY RATE STRUCTURE ASSUMPTIONS

To estimate potential revenues needed to be generated to meet the program costs, a rate structure database was created. Aside from its main purpose, the database was created in a way to enable the user to change some parameters and instantly see its effects on the required fee per ERU and how a given scenario may change the share of revenue generated from each land use property type. The following assumptions were made when developing the different scenarios in the rate structure database.

1. The Study Area (**Figure 6-2**) was defined as the entire jurisdiction of the City of Greencastle government.

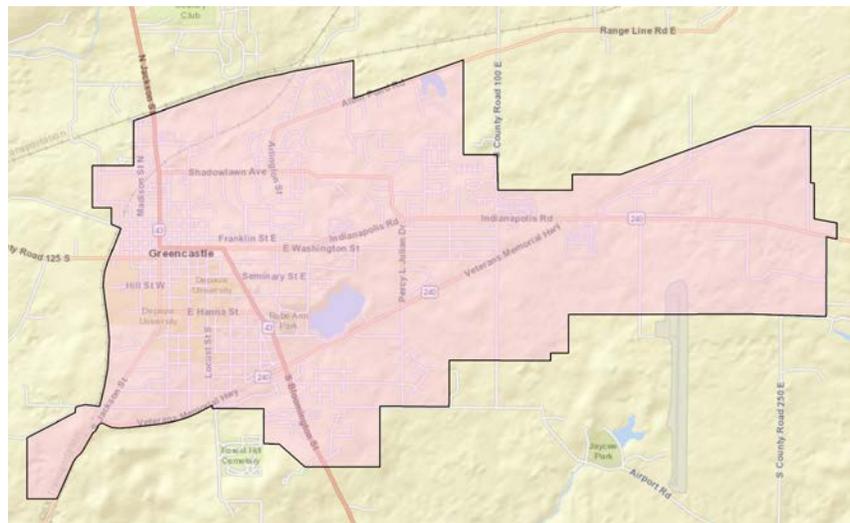


Figure 6-2 City of Greencastle stormwater utility service area

2. The parcel data provided by City of Greencastle included a field classifying each parcel into a property class. The entries in this field were the property class codes used by the State of Indiana's Property Tax Management System. Of the 3,842 parcels, there were 92 parcels that were not attributed with a property class code. For those parcels, CBBEL assigned property class codes based on a visual inspection of the 2016 aerial photography, Google Earth, the property class of the surrounding parcels, and professional judgment.
3. Digitization for a representative sample of residential structures was undertaken for establishing an ERU (see Section 6.3)
4. The impervious area of 784 non-residential parcels were digitized individually. Note that:
 - a. Apartment Complexes were treated as non-residential properties, and charged based on the total amount of impervious area

- b. Roads were digitized if the road was contained within a parcel and charged based on the total amount of impervious area. Railroad properties were treated as unimproved areas and charged as such.

6.4 PARCEL DATABASE SUMMARY AND STATISTICS

At the time of preparing this Rate Study there were 3,842 parcels within the study area in City of Greencastle. **Figure 6-3** and **Figure 6-4** depict the percentages of parcels and their total acreage categorized by generalized property class. **Table 6-1** includes these percentages and the total number of parcels and land areas categories by detailed property class.

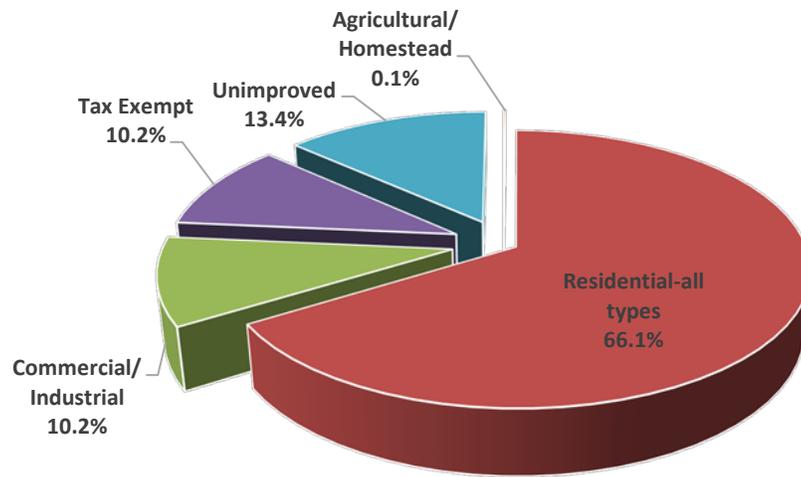


Figure 6-3 Percentage of parcels in study area

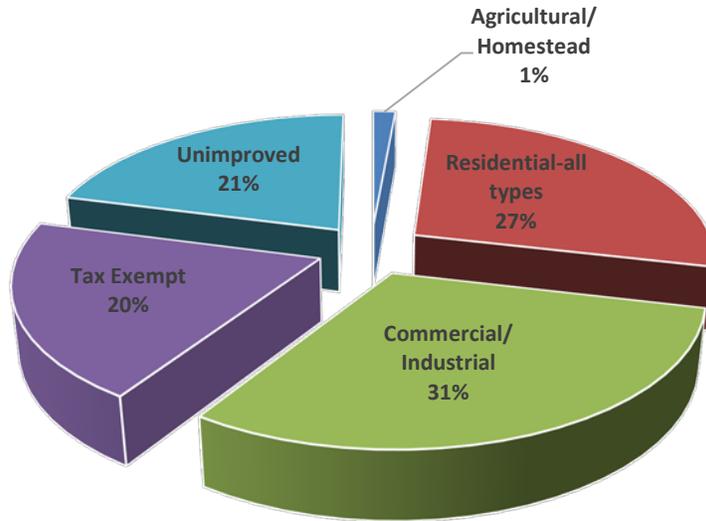


Figure 6-4 Percentage of acres by property class

Table 6-1 Parcel summary in study area

Property Class	No. of Parcels	Percentage of Parcels	No. of Acres	Percentage of Acres
Agricultural	5	0.13%	42.35	1.41%
Agricultural – Unimproved	24	0.62%	313.26	10.42%
Commercial	366	9.53%	404.40	13.45%
Commercial - Unimproved	16	0.42%	10.07	0.33%
Industrial	26	0.68%	513.67	17.08%
Industrial – Unimproved	5	0.13%	14.68	0.49%
Municipal	81	2.11%	228.17	7.59%
Municipal – Unimproved	84	2.19%	135.54	4.51%
Residential – Common Area	5	0.13%	20.28	0.67%
Residential – Condominiums	221	5.75%	17.91	0.60%
Residential – Duplex	42	1.09%	10.26	0.34%
Residential – Mobile Home	97	2.52%	32.66	1.09%
Residential – Single Family	2,159	56.19%	734.53	24.42%
Residential – Triplex	16	0.42%	4.27	0.14%
Residential – Unimproved	311	8.09%	124.12	4.13%
Tax Exempt	296	7.70%	351.49	11.69%
Tax Exempt – Unimproved	71	1.85%	26.68	0.89%
Utilities	14	0.36%	18.74	0.62%
Utilities – Unimproved	3	0.08%	4.31	0.14%
TOTALS:	3,842	100%	3007.40	100%

Note: Municipal = City of Greencastle owned parcels as identified by the Assessor’s property class

6.5 ERU CALCULATION FOR RESIDENTIAL PARCELS

The Equivalent Residential Unit (ERU) is the average area of impervious cover on a single family residential (SFR) parcel. The direct impact to the public storm sewer system is undoubtedly different from one residence to the other, but due to the sheer number of residential units and their typical sizes, the impacts are assumed to be within a close range and each unit is charged a nominal rate. The greater value of the ERU is that it serves as a unit for determining non-residential rates.

The ERU was calculated as follows:

1. 117 SFR parcels were selected from around the City of Greencastle (shown in red on **Figure 6-5**), which equate to 5.5% of the total number of SFRs in the city. CBBEL's previous research has determined that digitizing the impervious areas from a 2% sample of SFR properties yields nearly the same results as digitizing higher percentages of SFR properties.

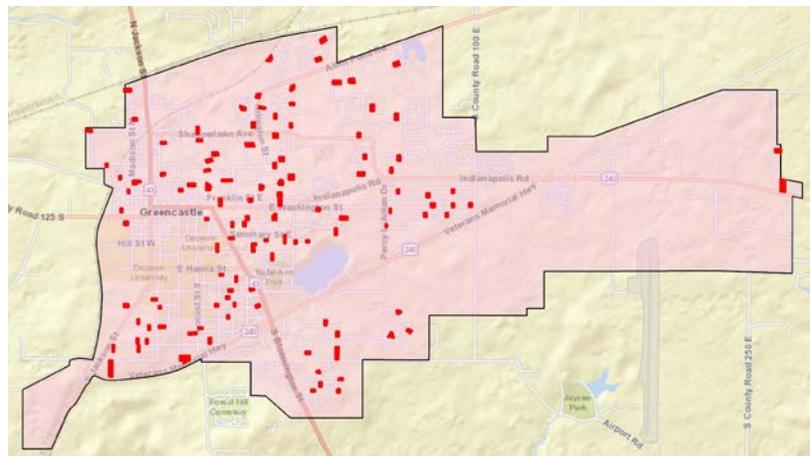


Figure 6-5 Location of representative SFR samples to determine ERU

2. Impervious areas from the selected sample of 117 SFR properties were digitized. The upper and lower 2.5% of the sample was discarded to prevent outliers from skewing the data. Averaging the impervious areas of the resulting sample, using a 95% confidence interval, provided a result of 2,993 square feet. To facilitate calculations and quickly determine the number of ERUs, the value of 1 ERU was set at 3,000 square feet.

Each SFR property is typically assessed a minimum of 1 ERU, regardless of the size of impervious area on each property. Condominiums, duplexes, triplexes, mobile homes, and agricultural homesteads are also typically assessed a minimum of 1 ERU each.

RECOMMENDATION #7

It is recommended that the city use an ERU value set at 3,000 square feet.

6.6 IMPERVIOUS AREA CALCULATION FOR NON-RESIDENTIAL PROPERTIES

The actual impervious area was digitized for all non-residential parcels. These include commercial, industrial, tax exempt, residential common areas, and apartment property classes as coded in the Putnam County Assessor's data. In the instances where no property class information was available, property classes were assigned based on visual inspection of 2016 aerial photography and professional judgment.

Figure 6-6 is an example of the impervious area that was digitized for non-residential parcels and the reasonable care that was taken when tracing around edges of impervious areas. The resolution of the best available aerial photography limited the accuracy in these efforts.

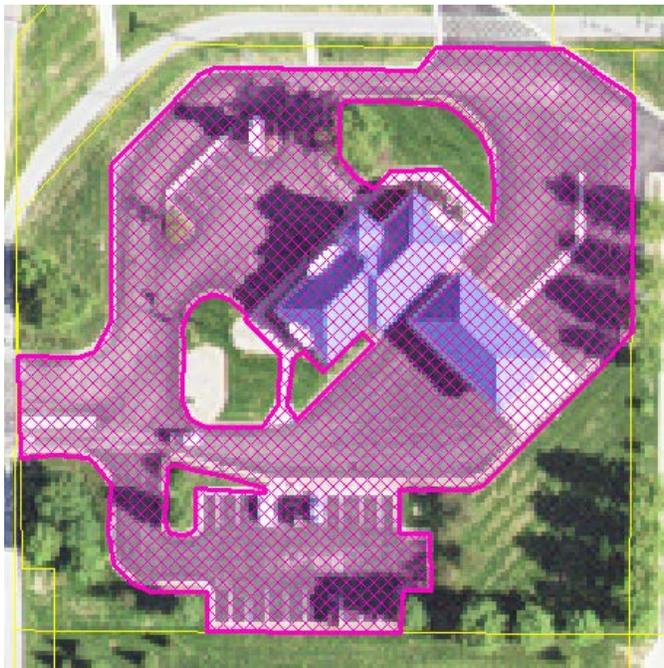


Figure 6-6 Example of impervious area digitized from a non-residential

The status of properties with property class codes that included “vacant” were scrutinized in more detail. Residential properties with a class code that included “Vacant” were assumed to be unimproved (no impervious area). However, the aerial photography for all non-residential properties were visually examined and

parcels with any impervious area (such as a private access road) were digitized, with those parcels having no impervious area classified as “unimproved”.

6.7 UTILITY RATE STRUCTURE

Multiple scenarios were explored to determine the most appropriate stormwater rate structure for the city. This was accomplished by performing “what-if” scenarios in the database and adjusting ERU Multipliers for specific property classes. The following scenarios were considered:

1. **Scenario 1** – This rate structure attempts to focus the assessment of utility fees (based on anticipated stormwater impacts) to those properties that have impervious areas, with a nominal flat fee charged to each unimproved parcel to recognize that all parcels contribute to stormwater to some degree.
2. **Scenario 2** – This rate structure is like Scenario 1, in that it attempts to focus the assessment of utility fees (based on anticipated stormwater impacts) to those properties that have impervious areas, with a nominal flat fee charged to unimproved parcels to recognize that all parcels contribute to stormwater to some degree. In addition, this option charged municipally-owned properties only 0.5 ERU.
3. **Scenario 3** – This rate structure is also like Scenario 1, in that it attempts to focus the assessment of utility fees (based on anticipated stormwater impacts) to those properties that have impervious areas, with a nominal flat fee charged to unimproved parcel to recognize that all parcels contribute to stormwater to some degree. However, each parcel would be charged a base rate in addition to the calculated ERU.

Based on discussions with the project team, Scenario 1 (**Table 6-2**) was selected by the city to be the most fair and equitable scenario for the stormwater utility rate structure, which assesses a fee to every parcel, regardless of tax exemption status.

Table 6-2 Proposed stormwater utility rate structure

Classification	General Property Class	Proposed Rate
Class I	Residential (SFR, Duplex, Triplex, Condominiums, Mobile/MF Homes)	1.0 ERU (Flat Fee)
	Agricultural Homestead	1.0 ERU (Flat Fee)
Class II	Tax Exempt (Municipal)	Multiples of 1.0 ERU based on the actual amount of impervious area, but subject to 1.0 ERU minimum
Class III	Unimproved Properties (all property classes)	0.33 ERU (Flat Fee)

	Commercial, Industrial, Tax Exempt (excluding Municipal), Residential Common Areas, Apartments	Multiples of 1.0 ERU based on the actual amount of impervious area, but subject to 1.0 ERU minimum
--	--	--

This rate structure attempts to focus the assessment of utility fees (based on anticipated stormwater impacts) to those properties that have impervious areas, with a nominal flat fee charged to unimproved parcel to recognize that all parcels contribute to stormwater to some degree. Based on this proposed utility rate structure and impervious area calculations described earlier, there are a total of 11,781 stormwater ERUs within Greencastle.

To determine the appropriate fee for each ERU, the needed revenue from the stormwater utility source (\$850,000) was divided by the total number of ERUs (11,781), resulting in an ERU value of \$6.01. This number was rounded down to \$6.00 to facilitate ERU calculations and billing procedures.

Based on these results, the monthly flat fee for a Residential unit (equal to 1 ERU) would be \$6.00 per month or \$72.00 annually. Properties that are being charged based on amount of impervious areas would be charged accordingly (multiples of ERU, with a minimum ERU set at 1). **Figure 6-7** shows the percentage of total revenue that would be collected from each land use type.

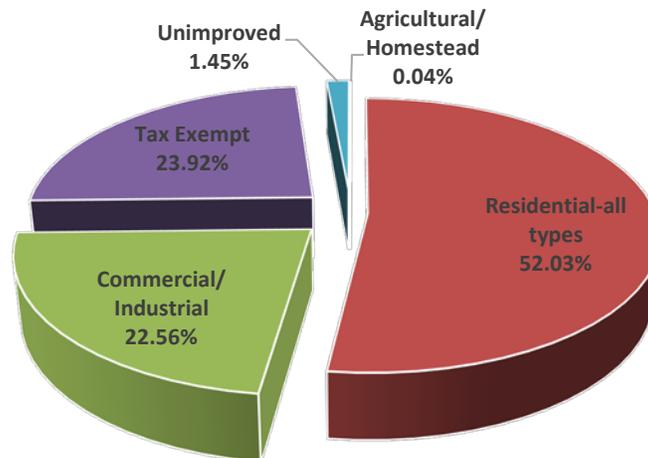


Figure 6-7 Percentage of revenue by land use

A more detailed summary is included in **Appendix 5**. The summary sheet provides:

- Parcel breakdown by generalized land use, showing number of parcels, number of ERUs, annual and monthly revenues, and percent of the total revenue.
- Charts to provide a quick view of the number of parcels and total revenue by generalized land use.

Interactive fields (highlighted in yellow in the exhibit in Appendix 5) were used by the city to explore the impacts of “what-if” scenarios.

RECOMMENDATION #8

It is recommended that the city adopt a stormwater utility rate structure based on charging residential properties a flat fee of \$6 for 1 ERU and charging non-residential properties multiples of ERU based on their actual impervious area.

6.8 FACTORS AFFECTING THE REVENUE

Several factors may influence the overall generation of revenue which may include, but not be limited to, the following:

- **Rate of Non-Payment** – Based on conversations with other Indiana Stormwater Utilities, it can be expected that as much as 10% of those receiving a utility bill will be delinquent in their payment or may not pay at all, at least in the first few years. The program costs and scenarios considered include an allowance for the noted potential loss of revenue.
- **Administrative/Enforcement** – The Stormwater Management Board should expect to receive several inquiries from residents, once the residents receive their initial stormwater bills. Responding to these inquiries via telephone calls or emails will require paid administrative staff. Administrative or enforcement costs that are associated with the actual collection of unpaid or delinquent utility bills may further reduce the revenue. These have not been included in the current rate calculations.
- **Parcel Database Cleanup** – There may be errors in the city’s parcel database that affect the accuracy of billings. Upon taking the time to correct errors in the parcel database, one may discover that contiguous parcels which were once being charged multiple fees, have now been consolidated into one parcel, and therefore, one fee. Additionally, any other inaccuracies discovered during this cleanup process may result in changing revenues.
- **Razed Structures** – Non-residential property owners who remove structures after the creation of the Rate Study may bring this to the administrator’s attention. If the impervious area is reduced (building slab/foundation removed along with the structure), their fee should be recalculated to reflect the new, reduced impervious area.
- **New Structures** – New residential on previously unimproved parcels should be added to the rate structure and billing database. Non-residential properties with structures built or impervious areas added after the creation of the Rate Study should have their fee recalculated to reflect the new or larger impervious area.
- **Credits** – The economic incentives the city is offering to reduce non-residential user fees will reduce the overall revenue generated (Appendix

8). The current program costs and scenarios considered include an allowance for the noted potential loss of revenue from credits as well as the cost associated with administering a system of credits.

6.9 UTILITY RATE COMPARISON WITH OTHER JURISDICTIONS

Based on a national survey conducted by the EPA; the typical rate payer fee for a stormwater utility is between \$3 and \$7 per household per month. This range is below the normal customer willingness to pay for a moderate stormwater management program according to the survey. For this reason, a stormwater utility is considered adequate to fund a stormwater program.

Based on the detailed rate study performed as part of this study, a utility rate per ERU per month for City of Greencastle is determined to be \$6.00. Compared to several other communities in Indiana (**Appendix 6**), this utility rate value falls in the lower half of the scale.

6.10 USING THE RATE STUDY DATABASE TO DEVELOP A BILLING DATABASE

Using the data provided in the Rate Study Database to develop an actual Billing Database should be exercised with caution. The Rate Study Database is typically based on the best available data at the time of the study, without much correction or validation, and serves only as a tool to develop a fair and equitable method for calculating stormwater user fees for the general population. The parcel data provided by the Putnam County staff may have inherent errors that must be addressed before proceeding with the creation of an updated billing database. While many of these issues may be minor, the issues may raise points of contention among the Rate Payers. The points listed below may provide additional insight regarding the potential discrepancies that were discovered during the creation of the Rate Study Database.

- **New Development** – Impervious areas were digitized based on the property classes attributed to each parcel in the supplied parcel data. Although a visual investigation of the best available orthophotography was performed, there may be areas where development has occurred on parcels after the visual inspection; in this case, the property classes were not updated to reflect this development. Therefore, digitization of new impervious areas would not have occurred on these parcels.
- **Duplicate Parcel Numbers** - More than 1 parcel may share the same parcel number. In some cases, the duplicate parcels are contiguous and have the same owner. The parcel numbers should be resolved as the parcel number serves as the unique identifier when constructing the Billing Database.
- **Municipal Boundary** – There are a few parcels that are on the edge of the boundary of unincorporated City of Greencastle. To avoid incorrectly

charging these parcels, one must determine which jurisdiction is responsible for these parcels.

- **Structures Occupying More than One Parcel** – There are instances where a property owner, who owns 2 or more contiguous parcels, has built a structure spanning across 2 or more of these parcels. Because fees are determined by parcel, the property owner will be charged separately for each parcel of land upon which the structure spans.

Appendix 7 includes procedures to update and maintain the stormwater utility billing database.

6.11 CAPS AND CREDITS

Caps are used to set a maximum amount that any one rate payer would pay per parcel. This is often viewed by the general population as an unfair distribution of the stormwater fee. There are few communities in Indiana that have included caps in their stormwater utility. Credits (sometimes called economic incentives) are more common than caps in stormwater utilities.

Appendix 8 includes a Credit Manual that details the practices allowed by the City of Greencastle for non-residential properties owners to reduce their stormwater utility fee.

RECOMMENDATION #9

It is recommended that the city not establish caps but establish a basis for credits for non-residential properties.

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This chapter provides an overview of the study and the planning process, a summary of the study recommendations, and next steps for implementation.

7.1 OVERVIEW OF THE STUDY AND PROCESS

The purpose of this stormwater planning study is to help city staff better understand stormwater and I&I problems throughout Greencastle, evaluate the city's stormwater management program, and establish a long-term and sustainable stormwater funding mechanism.

The process was led by a project team representing elected officials (Mayor, City Council), city staff (Planning, GIS, Engineering, Public Works/Stormwater, Utility Billing, Attorney, Water/Wastewater Utilities) and DePauw University (Facilities). Members of this project team identified problem areas, assembled city-owned data, prioritized capital improvement projects, and set the stormwater utility rate structure. The OCRA grant administrator was also invited to participate to oversee the process. Members of the project team met nine times in various forms from January 2018 through December 2018.

7.2 SUMMARY OF FINDINGS

Like many Indiana cities, the City of Greencastle is faced with the challenge of paying for increased costs to comply with state and federal stormwater quality mandates as well as ongoing maintenance of and improvement to the existing drainage system. Greencastle currently pays for their stormwater program using the general fund. This means the stormwater program competes directly for funding with all the other important and popular services provided by the city.

A stormwater utility is a dedicated funding source that is a stable, affordable, fair and equitable funding mechanism. This stormwater utility rate structure is based on impervious surface and focuses the utility fees (based on their anticipated stormwater impact) to those properties that have impervious areas, with a nominal fee charged to each unimproved parcel to recognize that all parcels contribute to stormwater to some degree.

Greencastle's overall stormwater program was evaluated. This included stormwater capital improvements, stormwater program operations and maintenance costs, and stormwater administrative costs. The estimated annual program costs for the City of Greencastle is \$850,000. Of that, \$250,000 should be dedicated annually for large scale capital project costs. The city staff identified 19 stormwater and I&I problem areas. From this list, nine problem areas were selected for further analysis and recommended capital projects including: College

Avenue, Cassada Drive and Paradise Lane; Walnut Street; National Guard Armory; Indianapolis Road/Percy Julian Drive Intersection; The Avenues Neighborhood; and Eagle Valley Subdivision-Houck Road.

The following summarized the recommendations from this study:

Recommendation #1

It is recommended that the city establish a stormwater utility and Stormwater Management Division within the existing Department of Public Works.

Recommendation #2

It is recommended that \$250,000 is budgeted annually for large capital projects. The city may need to accumulate funds over two or more years to implement larger projects.

Recommendation #3

It is recommended that \$150,000 is budgeted to prepare a citywide Stormwater Master Plan.

Recommendation #4

It is recommended that the city use funds generated from a stormwater utility fee to implement and meet the goals of their Rule 13 Program and to position the city to meet increasing expectations and requirements.

Recommendation #5

It is recommended that the city adopt an average annual stormwater program cost of \$850,000 to meet their Rule 13 Program requirements, maintain existing stormwater infrastructure, and implement capital projects.

Recommendation #6

It is recommended that the city implement a stormwater utility fee that is based on the impervious area.

Recommendation #7

It is recommended that the city use an ERU value set at 3,000 square feet.

Recommendation #8

It is recommended that the city adopt a stormwater utility rate structure based on charging residential properties a flat fee of \$6 for 1 ERU and charging non-residential properties multiples of ERU based on their actual impervious area.

Recommendation #9

It is recommended that the city not establish caps but consider establishing a basis for credits for non-residential properties.

7.3 NEXT STEPS

This Stormwater Planning Study is a critical step for City of Greencastle to identify and prioritize capital improvement projects and establish an appropriate funding mechanism to meet the city's stormwater management needs. The following are the recommended steps to successfully establish a stormwater utility.

Create Project Fact Sheets – a summary of the new items that could be funded with the stormwater utility including special projects such as capital improvement projects. Each fact sheet would include background on the problem, description of the solution, estimated cost, and benefits.

Public Information and Stakeholder Engagement – the continued support of the public and key stakeholders is essential to the successful implementation of the stormwater program and utility. This includes:

- Raise awareness of the cost to manage stormwater and regulatory requirements,
- Illustrate the benefits of a dedicated funding source,
- Establish a method to disseminate information and answer questions
- Meet with key stakeholders, organized groups, and the media to diffuse opposition and dispel myths

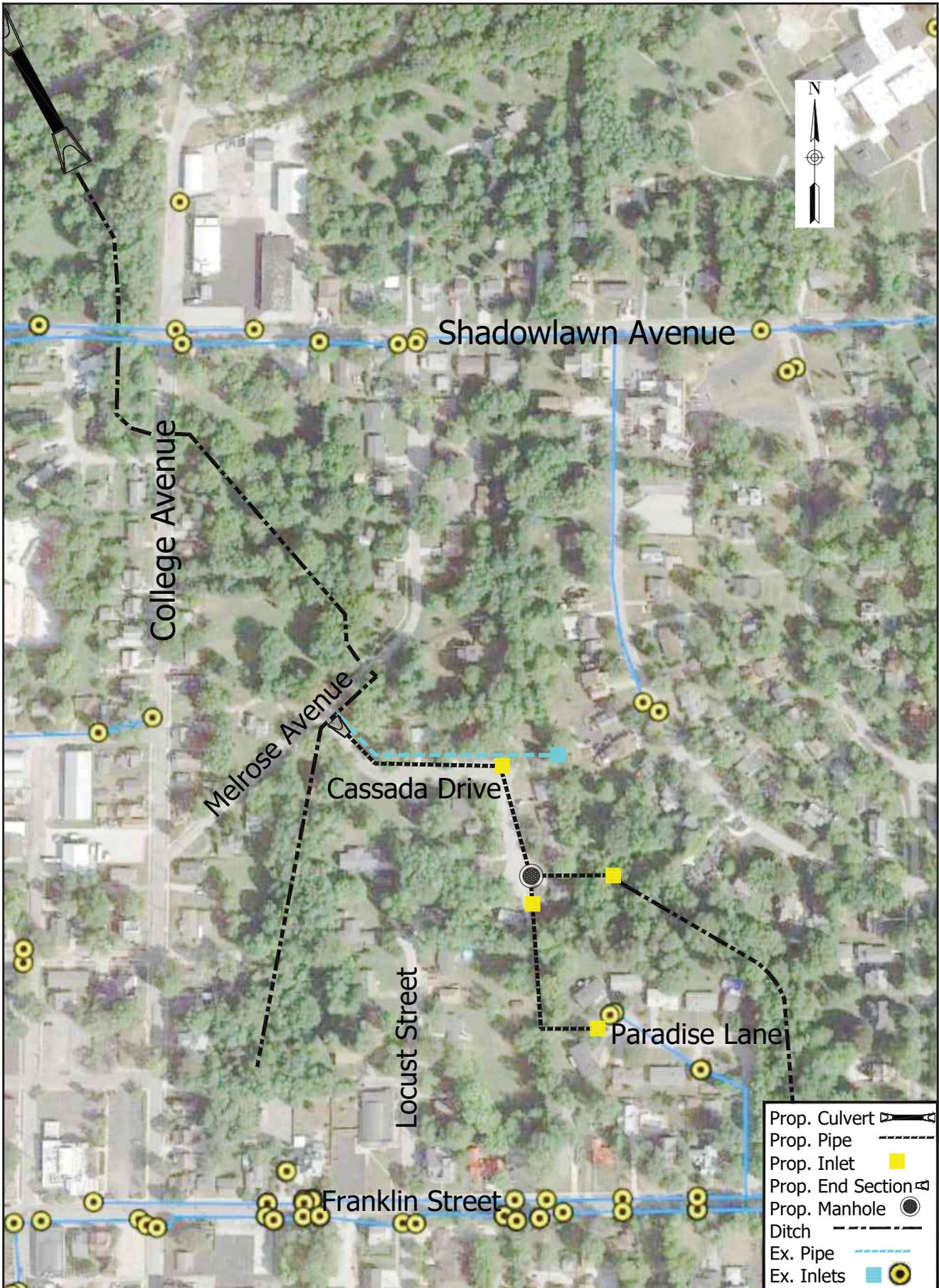
Create a Stormwater Management Division – this division, within the existing Department of Public Works, would provide for and manage the collection, treatment, drainage, and disposal of city storm and surface water

Pass Ordinance – to adopt the rate structure recommended in this study

Update the Billing Database – update the utility billing database to include the rate structure recommended in this study to collect stormwater fees

APPENDIX 1

CAPITAL PROJECTS SUMMARIES



GREENCASCADE
STORMWATER STUDY
Proposed Capital
Improvement Projects

JOB NO:	170025
DATE:	08/24/2018
SCALE:	NO SCALE
SHEET:	7 OF 7

COLLEGE AVENUE

PREPARED FOR:
CITY OF GREENCASCADE
1 North Locust Street
Greencastle Indiana 46135



SHEET PREPARED BY:

ETICA GROUP
7172 N. KEYSTONE AVE., STE. G
INDIANAPOLIS, IN 46240

Location: College Street, Cassada Drive, and Paradise Lane – between Shadowlawn Avenue and E Franklin Street.

Issue: Paradise Lane and Cassada Drive are both experiencing flooding on the cul-de-sacs. The entire area is downstream of an upcoming large-scale road project which is expected to exacerbate any existing issues. Water from the nearly 100-acre watershed (mostly residential lots and streets, moderately sloped) all travels through a low area also used as a dumping site adjacent to some railroad tracks near the intersection of College Street and Shadowlawn Avenue. Ditches in the watershed are suffering from eroded banks.

Proposed Solution: Updated culvert beneath the railroad, street drains on Cassada Drive and Paradise Lane, intercepting the existing ditch behind Paradise Lane before it crosses through backyards, and more defined (erosion resistant) channels for flow behind Paradise Lane and Cassada Drive.

Basic modeling of the watershed suggests that the culvert under the railroad tracks requires capacity for 12.3 ft³/sec of flow. It has been mentioned several times that the area just south of the tracks is private property used as a dumping site and cannot be accessed. A 30-inch culvert in this location would have the necessary capacity for the watershed though it may be the case that a large enough culvert is already installed and blocked by dumped materials.

No problems were mentioned concerning slow-moving water on the upstream sides of culverts under Cassada, Melrose, or College so they are likely properly sized but from the pictures provided it was clear the stream banks are being eroded. When development occurs in the watershed without stormwater management practices it increases the runoff and therefore contributes to higher flows downstream which can erode channels. Implementing building codes that define acceptable stormwater runoff for new construction will require developers to control release rates from their sites therefore reducing the high-volume flows downstream that cause erosion. Protecting stream banks by paving the ditch, installing riprap, maintaining a properly shaped grass-bottomed ditch, or a combination of the three abets water movement and prevents further erosion.

Properly sized street inlets on Paradise Lane and Cassada Drive can mitigate their flooding issues and the pipe necessary for those drains provides could also be used to intercept flow from the eastern ditch before it starts to run right behind houses east of Cassada Drive. The right-of-way only extends 3-5 feet off the road, so permission would have to be acquired from all landowners for non-street work.

Pay Items	Unit	Unit Price	Quantity	Total Price
RAILROAD CULVERT	EA	\$ 20,000.00	1.00	\$ 20,000.00
MANHOLE	EA	\$ 3,000.00	1.00	\$ 3,000.00
DITCH SHAPING/STABILIZATION	LFT	\$ 35.00	1500.00	\$ 52,500.00
PIPE END SECTION	EA	\$ 3,000.00	1.00	\$ 3,000.00
15" PIPE	LFT	\$ 70.00	1250.00	\$ 87,500.00
INLETS	EA	\$ 2,000.00	4.00	\$ 8,000.00
CONSTRUCTION ENGINEERING	LS	\$ 17,400.00	1.00	\$ 17,400.00
MOBILIZATION AND DEMOBILIZATION	LS	\$ 8,700.00	1.00	\$ 8,700.00
TEMPORARY EROSION CONTROL	LS	\$ 8,700.00	1.00	\$ 8,700.00
			Subtotal	\$ 208,800.00
			Contingency (15%) ⁽¹⁾	\$ 31,320.00
			TOTAL	\$ 240,120.00



GREENCASCADE
STORMWATER STUDY
Proposed Capital
Improvement Projects

JOB NO:	170025
DATE:	08/24/2018
SCALE:	NO SCALE
SHEET:	1 OF 7

WALNUT STREET

PREPARED FOR:
CITY OF GREENCASCADE
1 North Locust Street
Greencastle Indiana 46135



SHEET PREPARED BY:

Etica
GROUP

ETICA GROUP
7172 N. KEYSTONE AVE., STE. G
INDIANAPOLIS, IN 46240

Location: Walnut Street – Drainage issues occur in the low area on the south side of Walnut Street, between Gillespie Street and the Railroad Tracks, directly north of the DePauw University baseball field

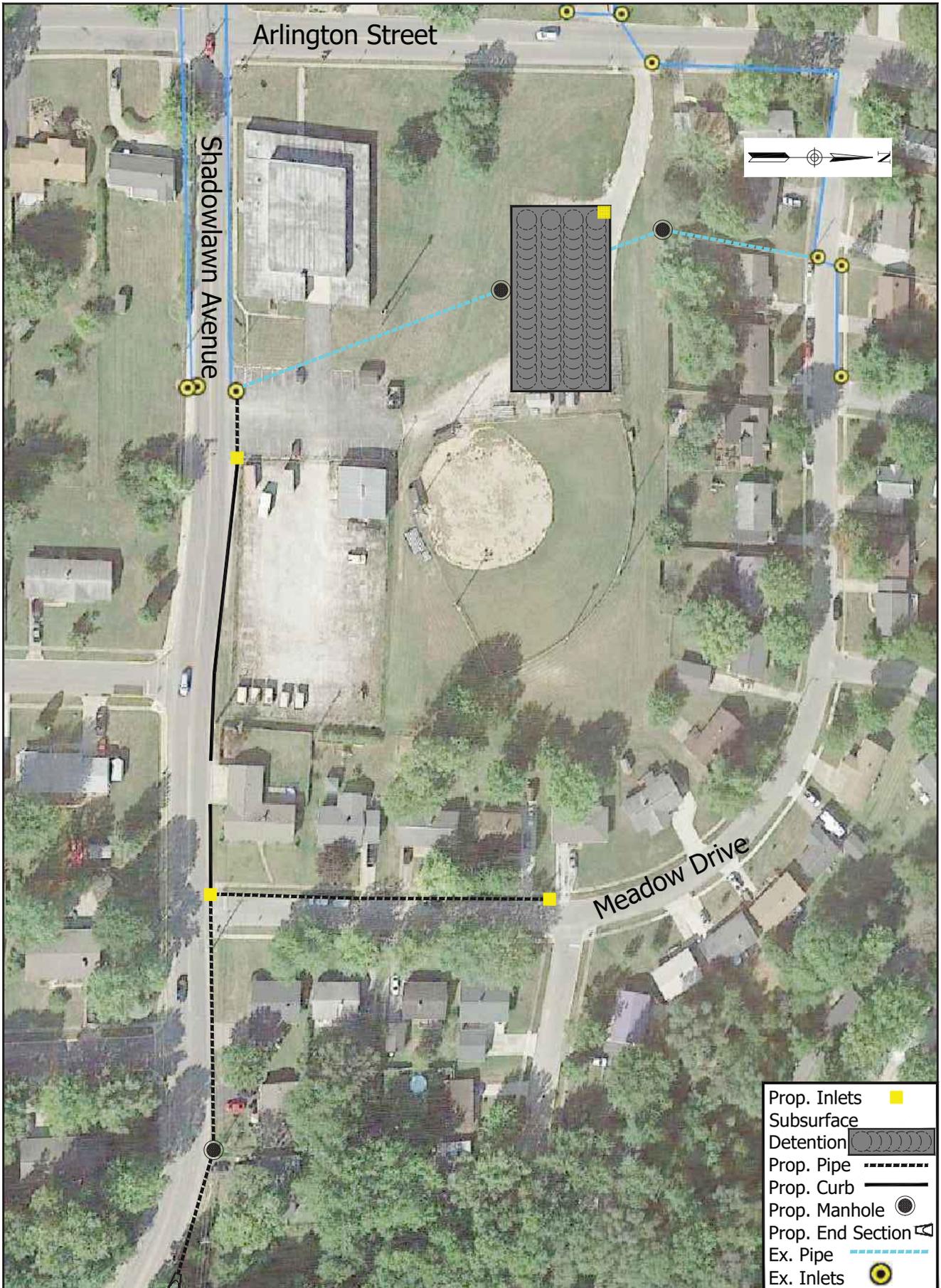
Issue: The City of Greencastle reported flooding in the low area along the south side of Walnut Street due to surface runoff coming around the baseball field. Based on available data, this area receives runoff from a 40+ acre watershed; the majority of which is coming from the downtown/residential/campus area. However, there does not appear to be adequate infrastructure to allow flow beneath Walnut Street.

Proposed Solution: Upgrade/install a properly sized inlet, pipe network, and culvert around the baseball field and under Walnut Street. Connect the reported 30-inch pipe under the baseball field to the new pipe. The 60-inch culvert crossing under the railroad tracks may need to be repaired or cleaned out as well.

The problem area was identified on the south side of Walnut Street, which potentially indicates the railroad culvert has adequate capacity. Preliminary hydraulic modeling indicates a flow of approximately 13 ft³/sec, which would necessitate a 30-inch culvert crossing beneath Walnut Street. Per information from the City, there is a 36-inch pipe that would connect into this pipe run, making it necessary to use that size.

Putnam County GIS shows enough right-of-way along Madison Street and Poplar Street that continues west along the baseball field. Land acquisition may be necessary for the stretch between the baseball field and Walnut Street. Utility conflicts are likely along Madison and Walnut streets and would require further coordination. Erosion control measures should be installed on the property between the proposed Walnut Street culvert and the existing railroad culvert.

Pay Items	Unit	Unit Price	Quantity	Total Price
INLET/DROP STRUCTURE	EA	\$ 2,500.00	2	\$ 5,000.00
MANHOLE	EA	\$ 3,000.00	4	\$ 12,000.00
36" PIPE	LFT	\$ 170.00	1150	\$ 195,500.00
REVTMENT RIPRAP/DITCH	LFT	\$ 48.00	100	\$ 4,800.00
ROAD CULVERT (30")	LFT	\$ 400.00	40	\$ 16,000.00
CONSTRUCTION ENGINEERING	LS	\$ 23,330.00	1	\$ 23,330.00
MOBILIZATION AND DEMOBILIZATION	LS	\$ 11,665.00	1	\$ 11,670.00
TEMPORARY EROSION CONTROL	LS	\$ 11,665.00	1	\$ 11,670.00
			Subtotal	\$ 279,970.00
			Contingency (15%) ⁽¹⁾	\$ 42,000.00
			TOTAL	\$ 321,970.00



Prop. Inlets	■
Subsurface Detention	▤
Prop. Pipe	----
Prop. Curb	—
Prop. Manhole	●
Prop. End Section	◁
Ex. Pipe	----
Ex. Inlets	⊙

GREENCASCADE
STORMWATER STUDY
Proposed Capital
Improvement Projects

JOB NO:	170025
DATE:	08/24/2018
SCALE:	NO SCALE
SHEET:	3 OF 7

ARMORY
PREPARED FOR:
CITY OF GREENCASCADE
1 North Locust Street
Greencastle Indiana 46135



SHEET PREPARED BY:

Location: National Guard Armory on the northeast corner of Shadowlawn Avenue and Arlington Street

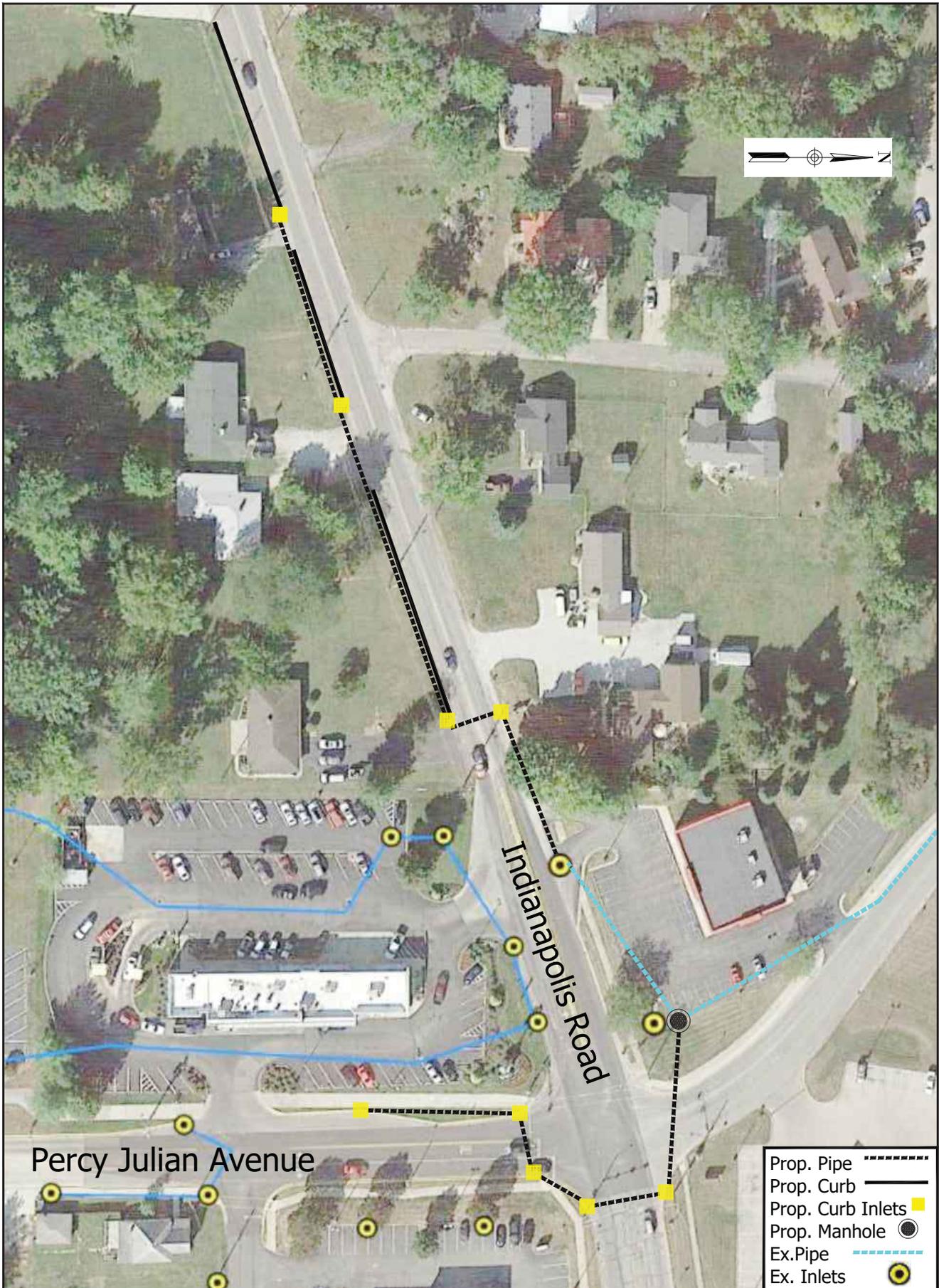
Issue: Water flowing across the Armory property is flooding homes along Hillcrest Drive and surcharging inlets to the north/downhill towards Tacoma Drive.

Proposed Solution: Subsurface water detention under a newly paved parking area on the armory grounds along with some curb and inlets/storm pipe around the perimeter of the block.

The parking area next to the baseball field is gravel and sits on or near an existing storm pipe of unknown size. A subsurface detention system intercepting that pipe under a new parking lot addresses the stormwater issue without impacting existing land use. Subsurface detention provides a mechanism for groundwater recharge through layers of stone and geotextiles in addition to lowering peak flows in pipe networks. Optional water quality structures could be added in-line with the detention to filter additional pollutants from the water. Water quality units require annual maintenance, but they will reduce the amount of maintenance necessary on the detention chambers.

Added curb, inlets, and pipe at the southeast corner of the Armory property along Shadowlawn Avenue and Meadow Drive can help direct upstream flow from the watershed around the problem area. Further analysis would be needed to determine best location for inlets, feasibility of running the pipe into the ditch to the east, and more exact details on existing infrastructure on the Armory property.

Pay Items	Unit	Unit Price	Quantity	Total Price
MANHOLE	EA	\$ 3,000.00	3.00	\$ 9,000.00
PARKING LOTS	ACRE	\$ 110,000.00	0.35	\$ 38,500.00
DETENTION	ACRE	\$ 800,000.00	0.35	\$ 280,000.00
15" PIPE	LFT	\$ 70.00	650.00	\$ 45,500.00
CURB	LFT	\$ 20.00	300.00	\$ 6,000.00
CURB INLET	EA	\$ 1,500.00	4.00	\$ 6,000.00
CONSTRUCTION ENGINEERING	LS	\$ 38,500.00	1.00	\$ 38,500.00
MOBILIZATION AND DEMOBILIZATION	LS	\$ 19,250.00	1.00	\$ 19,250.00
TEMPORARY EROSION CONTROL	LS	\$ 19,250.00	1.00	\$ 19,250.00
			Subtotal	\$ 462,000.00
			Contingency (15%) ⁽¹⁾	\$ 69,300.00
			TOTAL	\$ 531,300.00



GREENCASCADE
STORMWATER STUDY
Proposed Capital
Improvement Projects

JOB NO:	170025
DATE:	08/24/2018
SCALE:	NO SCALE
SHEET:	5 OF 7

**INDIANAPOLIS ROAD
INTERSECTION**
PREPARED FOR:
CITY OF GREENCASCADE
1 North Locust Street
Greencastle Indiana 46135



SHEET PREPARED BY:

ETICA GROUP
7172 N. KEYSTONE AVE., STE. G
INDIANAPOLIS, IN 46240

Location: Intersection of Percy Julian Drive and Indianapolis Road

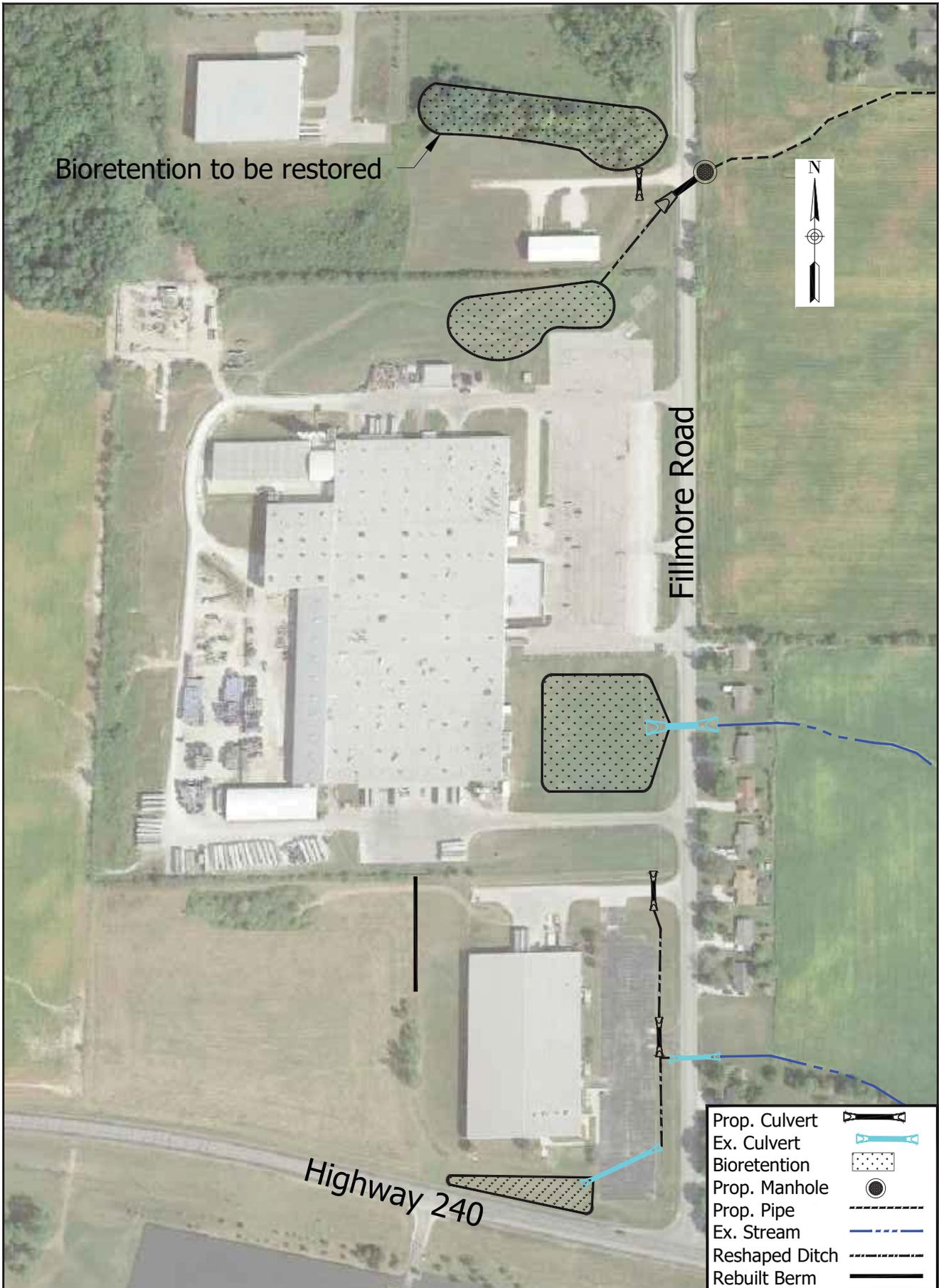
Issue: The City reports “A lot of water gathers at this intersection”. This intersection is the low point for a 20+ acre watershed. It seems that the path the runoff would take is impeded by the slopes of the roads and surrounding buildings causing it to gather in the area. The lowest point appears to be on the west side of the intersection right in front of McDonald’s.

Proposed Solution: Redirecting/capturing water upstream of the problem area.

GIS data shows that there are storm inlets scattered throughout the parking lots and approaches in the area but there are relatively few curb inlets. Some new curb inlets on Indianapolis Road east of Percy Julian can capture water before it reaches the low area on the west side of Percy Julian. Also, new inlets on Percy Julian south of Indianapolis Road can catch water before it gets stuck in the low area. The stretch of Indianapolis road to the west of Percy Julian all slopes toward the intersection; by adding some curb and inlets along here water could be captured before reaching the low spot.

All this work can be accomplished within the apparent existing road right-of-way, but further coordination would be needed to determine if utility conflicts would require a different layout or if the reported existing pipe is in a different location.

Pay Items	Unit	Unit Price	Quantity	Total Price
CURB	LFT	\$ 20.00	450.00	\$ 9,000.00
CURB INLETS	EA	\$ 1,500.00	9.00	\$ 13,500.00
MANHOLE	EA	\$ 3,000.00	1.00	\$ 3,000.00
12" PIPE	LFT	\$ 60.00	880.00	\$ 52,800.00
CONSTRUCTION ENGINEERING	LS	\$ 7,830.00	1.00	\$ 7,830.00
MOBILIZATION AND DEMOBILIZATION	LS	\$ 3,915.00	1.00	\$ 3,920.00
TEMPORARY EROSION CONTROL	LS	\$ 3,915.00	1.00	\$ 3,920.00
			Subtotal	\$ 93,970.00
			Contingency (15%) ⁽¹⁾	\$ 14,100.00
			TOTAL	\$ 108,070.00



Bioretention to be restored

Fillmore Road

Highway 240

Prop. Culvert	
Ex. Culvert	
Bioretention	
Prop. Manhole	
Prop. Pipe	
Ex. Stream	
Reshaped Ditch	
Rebuilt Berm	

<p>GREENCASCADE STORMWATER STUDY</p> <p>Proposed Capital Improvement Projects</p>	JOB NO: 170025	<p>FILLMORE ROAD</p> <p>PREPARED FOR: CITY OF GREENCASCADE 1 North Locust Street Greencastle Indiana 46135</p>	<p>City of Greencastle</p>	<p>SHEET PREPARED BY:</p> <p>ETICA GROUP 7172 N. KEYSTONE AVE., STE. G INDIANAPOLIS, IN 46240</p>
	DATE: 08/24/2018			
	SCALE: NO SCALE			
	SHEET: 4 OF 7			

Location: Fillmore Road – between Highway 240 and E County Road 50 S

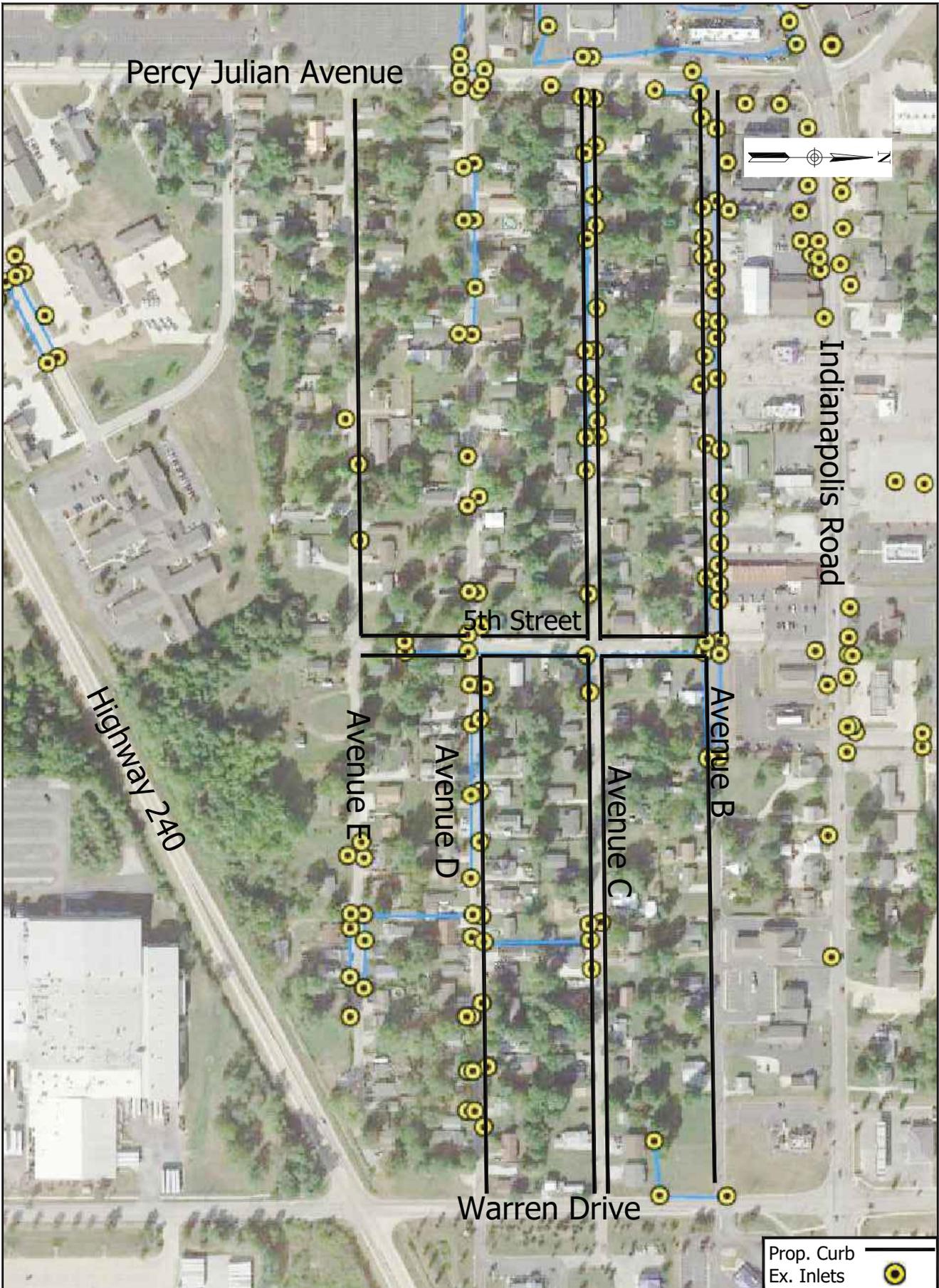
Issue: Commercial properties on west side of Fillmore road experience flooding around their grounds which extends out to the road and sometimes across it. A sinkhole has formed in the area which continues to grow larger.

Proposed Solution: Installing an inlet, culvert, drop structure, and field tile near the sinkhole along Fillmore Road and reshaping the spillways around the buildings as well as the ditches along Fillmore Road. Consider bioretention areas in front of the IAC and Crown Equipment buildings as well as near the sinkhole. Restore the bioretention area north of the sinkhole

The study performed for Crown Equipment in May of 2018 suggests reconstructing their northern spillway which is too low and contributes to the flooding at their loading docks. Reinforcing the berm in front of the northern spillway can prevent water from flowing over during heavier events and displace it to the southern edge of their property which does not have the same issues. Shaping/deepening the ditches along the west side of Fillmore road will help direct the water to existing culverts and mitigate flooding across the roadway. Lastly, constructing/restoring bioretention areas can help slow down the water to give it time to infiltrate into the ground and alleviate burden on the inundated areas. Conflicts with buried utilities are likely and would require coordination to determine possible excavation limits.

The sinkhole presents a unique challenge and opportunity. It is a natural groundwater recharge point but in heavy storms cannot handle all the water and floods across the road. It is reportedly also growing larger which is a safety concern for the City. The watershed draining towards the sinkhole is almost 90 acres and is a mix of farm ground, industrial space, woods, and pavement. Modeling for the watershed without the effects of the sinkhole indicates a need for 12.5 ft³/sec capacity at that location which necessitates a 30-inch culvert. The reason there is not already a culvert at the location is because of elevation issues on the east side of Fillmore Road. Therefore, it is recommended to install a drop structure to a subsurface drain pipe from where the proposed culvert crosses the road approximately 1,700 feet across the farm field to the ditch. This pipe would also need to be at least 30 inches and possibly larger if there are existing field tiles which would have to connect. Further study would be necessary to determine feasibility for the outlet in the ditch though it appears there is plenty of elevation change across the field. Some of the ditch work could be accomplished within the rights-of-way but cooperation with landowners would be necessary for the field tile and bioretention areas.

Pay Items	Unit	Unit Price	Quantity	Total Price
30" CULVERT	LFT	\$ 400.00	60.00	\$ 24,000.00
BIORETENTION	ACRE	\$ 30,000.00	4.50	\$ 135,000.00
RECONSTRUCTED BERM	LFT	\$ 7.50	250.00	\$ 1,880.00
DROP STRUCTURE/MANHOLE	EA	\$ 3,000.00	1.00	\$ 3,000.00
RESHAPED DITCHES	LFT	\$ 10.00	550.00	\$ 5,500.00
30" FIELD TILE	LFT	\$ 85.00	1700.00	\$ 144,500.00
21" ROAD CULVERTS	LFT	\$ 325.00	160.00	\$ 52,000.00
CONSTRUCTION ENGINEERING	LS	\$ 36,588.00	1.00	\$ 36,590.00
MOBILIZATION AND DEMOBILIZATION	LS	\$ 18,294.00	1.00	\$ 18,300.00
TEMPORARY EROSION CONTROL	LS	\$ 18,294.00	1.00	\$ 18,300.00
			Subtotal	\$ 439,070.00
			Contingency (15%) ⁽¹⁾	\$ 65,870.00
			TOTAL	\$ 504,940.00



Prop. Curb	
Ex. Inlets	

GREENCASTLE
STORMWATER STUDY
Proposed Capital
Improvement Projects

JOB NO:	170025
DATE:	08/24/2018
SCALE:	NO SCALE
SHEET:	6 OF 7

THE AVENUES

PREPARED FOR:
CITY OF GREENCASTLE
1 North Locust Street
Greencastle Indiana 46135



City Of
Greencastle

SHEET PREPARED BY:



ETICA GROUP
7172 N. KEYSTONE AVE., STE. G
INDIANAPOLIS, IN 46240

Location: “The Avenues Neighborhood” – Avenues B, C, D, E, and F between Percy Julian and Warren Drive. North of Highway 240 and south of Indianapolis Road.

Issues: Yards in the neighborhood are all substantially lower than the roads. No specific mentions of standing water or eroding swales.

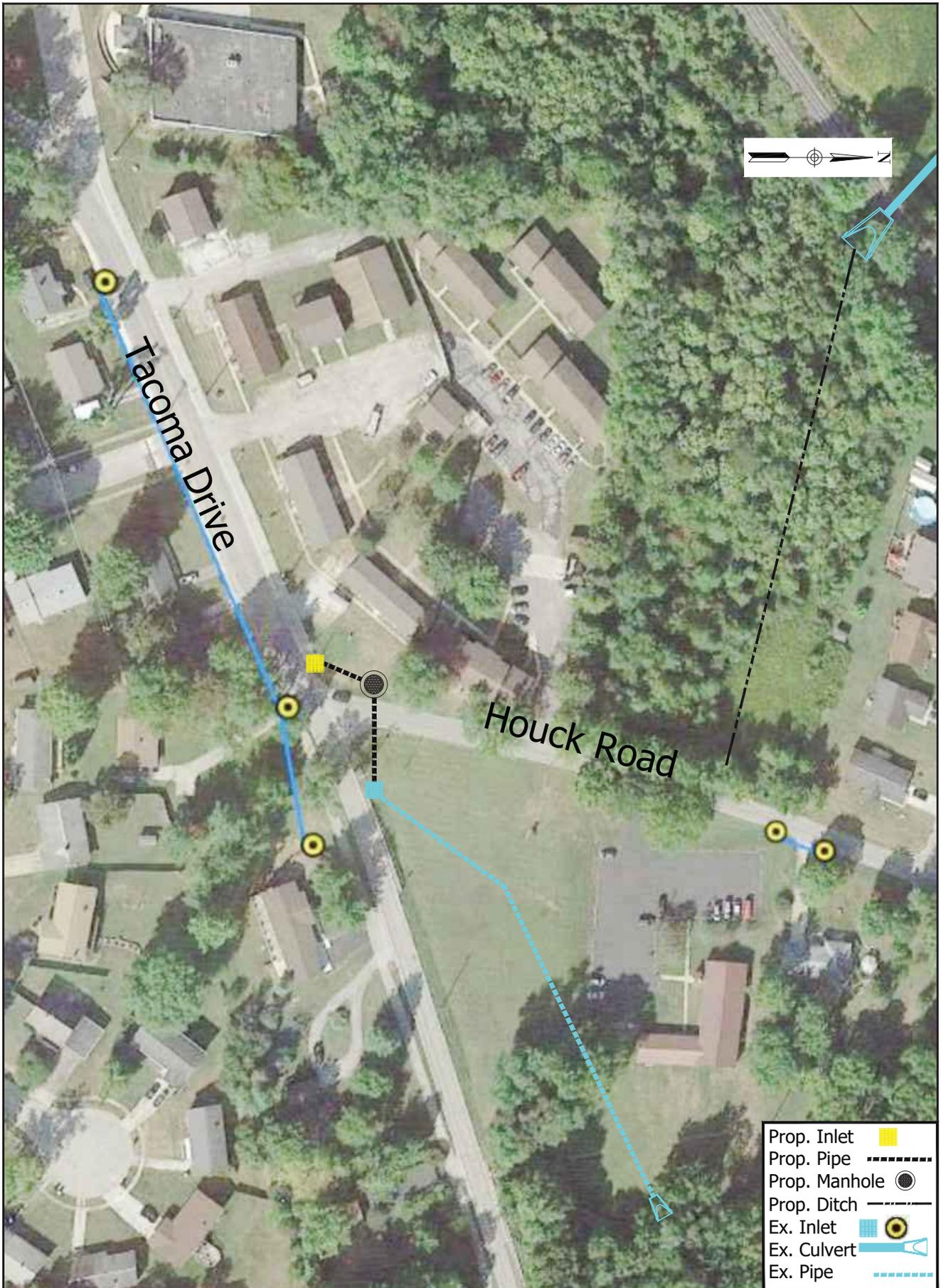
Reportedly this area has a lot of infiltration and inflow problems but there was no concrete information available to evaluate this claim. Allegedly there were also issues with pipe elevations during construction but there was no way to verify this claim with information provided.

Potential Solutions: Adding curb to the edge of streets and turnouts at existing inlets.

GIS shows 100+ inlets in the neighborhood and there are many more that are unmarked by GIS but visible in satellite/street view imagery. In one or two locations in the neighborhood there are 10-15 feet of curb flanking individual inlets but nothing running the entire length of the street. Running curb the full length of the street with turnouts at the storm inlets could help keep water from soaking yards and instead keep it on the road until reaching an inlet. Avenue B and C have no curbs but have inlets in almost every yard. Avenue D has a full curb and sidewalk down the south side of the street but nothing along the north side. 5th street has some curb work but nothing running the full length as of the date of the last Google street view image.

In most of the neighborhood the right-of-way extends about 5 feet off the road into yards which should be enough for installing curb. Conflicts with buried utilities are possible but unlikely due to the typical depth of buried utilities being greater than that of curb. Further study would need to be conducted to determine how any proposed curb might be impacted by ADA standards and could affect locations where it intersects with existing sidewalk around the perimeter of the neighborhood.

Pay Items	Unit	Unit Price	Quantity	Total Price
CURB	LFT	\$ 20.00	11000.00	\$ 220,000.00
CURB TURNOUTS	EA	\$ 90.00	75.00	\$ 6,750.00
CONSTRUCTION ENGINEERING	LS	\$ 22,675.00	1.00	\$ 22,680.00
MOBILIZATION AND DEMOBILIZATION	LS	\$ 11,337.50	1.00	\$ 11,340.00
TEMPORARY EROSION CONTROL	LS	\$ 11,337.50	1.00	\$ 11,340.00
			Subtotal	\$ 272,110.00
			Contingency (15%) ⁽¹⁾	\$ 40,820.00
			TOTAL	\$ 312,930.00



GREENCASTLE
STORMWATER STUDY
Proposed Capital
Improvement Projects

JOB NO:	170025
DATE:	08/24/2018
SCALE:	NO SCALE
SHEET:	2 OF 7

HOUCK ROAD
PREPARED FOR:
CITY OF GREENCASTLE
1 North Locust Street
Greencastle Indiana 46135



SHEET PREPARED BY:

ETICA GROUP
7172 N. KEYSTONE AVE., STE. G
INDIANAPOLIS, IN 46240

Location: Eagle Valley Subdivision – Houck Road Cul-de-Sacs (Golden, Talon, and Eagle Courts) north of Albin Pond Road

Issue: The City of Greencastle reported flooding along the western edge of the neighborhood encompassed by the Cul-de-Sacs, most notably along the railroad tracks and the wooded area to the south.

Proposed Solution: Clean the existing railroad culvert, install a curb inlet along Tacoma Drive, and clear some of the overgrown brush in the swale between Houck Road and the railroad tracks.

Modeling for the approximately 25 acres of mostly residential lots indicates a flow of approximately 6 ft³/sec of water is necessary at the existing railroad culvert which calls for a 21-inch pipe. In images provided by the City the culvert is almost completely blocked and indistinguishable from the rip rap around it. Greencastle reports that the railroad company contacted residents in the neighborhood about cleaning the culverts later this year which may considerably reduce the problem. At the very least they will be able to determine the size of the existing culvert. Satellite images from the last 10-12 years (Google Earth) show the flow path leading from Houck Road towards the railroad culvert has become overgrown with vegetation which may be restricting flow. Putnam County GIS shows this area as private property, but the City has indicated the property owner is willing to work with them on improving drainage through the site.

Tacoma Drive has curbs down both sides of the road but only has inlets on the south (high) side of the street. Adding an inlet to the northwest corner of the intersection of Houck/Tacoma and connecting it to the pipes that run east behind the church can direct some upstream road runoff around the problem area.

Pay Items	Unit	Unit Price	Quantity	Total Price
CLEARING/SHAPING/SEEDING DITCH	LFT	\$ 85.00	550	\$ 46,750.00
CURB INLET	EA	\$ 1,750.00	1	\$ 1,750.00
MANHOLE	EA	\$ 3,000.00	1	\$ 3,000.00
12" PIPE	LFT	\$ 60.00	170	\$ 10,200.00
CONSTRUCTION ENGINEERING	LS	\$ 6,170.00	1	\$ 6,170.00
MOBILIZATION AND DEMOBILIZATION	LS	\$ 3,085.00	1	\$ 3,090.00
TEMPORARY EROSION CONTROL	LS	\$ 3,085.00	1	\$ 3,090.00
		Subtotal		\$ 74,050.00
		Contingency (15%) ⁽¹⁾		\$ 11,110.00
		TOTAL		\$ 85,160.00

APPENDIX 2

TRIPLE BOTTOM LINE SUMMARY

PROMISING SOLUTIONS

		Cummulative Score (15)	ECONOMIC				ENVIRONMENTAL				SOCIAL				
			Capital Cost	Lifecycle O&M Cost	Shared Funding	Score (5)	Treat Pollutants of Concern	Improve/ Protect Stream Habitat	Groundwater Recharge	Score (5)	Widespread Benefit (#properties)	Reduce Stormwater and/or I&I Problems	Benefit to Public Health & Safety	Revitalization QOL Acceptability	Score (5)
Weighting Factor=			0.45	0.20	0.35	1.00	0.40	0.30	0.30	1.00	0.25	0.25	0.25	0.25	1.00
0=	> \$10M		very high	City	1.00	no removal	no change	no change	1.00	0	no change	no change	no change	1.00	
1=	>\$5M <\$10M		high	City/SWU		1%-20%	limited	limited		1-10	limited	limited	limited		
2=	>\$1M <\$5M		mod-high	SWU		21%-40%	limited-mod	limited-mod		11-30	limited-mod	limited-mod	limited-mod		
3=	>\$500K <\$1M		moderate	SWU/County/DPU		41%-60%	moderate	moderate		31-100	moderate	moderate	moderate		
4=	>\$100K <\$500K	low-mod	County/DPU	61%-80%		mod-high	mod-high	101-300		mod-high	mod-high	mod-high			
5=	<\$100K	low	Other	>80%		high	high	300+		high	high	high			
1	College Avenue, Cassada Drive and Paradise Lane	6	4	2	2	3	1	3	0	1	3	3	1	1	2
2	Walnut Street	7	4	4	3	4	0	3	0	1	1	5	1	2	2
3	National Guard Armory	9	3	3	3	3	3	0	1	2	3	5	5	4	4
4	Indianapolis Road/Percy Julian Drive Intersection	6	4	4	2	3	0	0	0	0	1	3	4	4	3
5	Fillmore Road	8	3	2	1	2	3	1	1	2	1	5	5	4	4
6	The Avenues Neighborhood	8	4	3	2	3	0	0	0	0	4	4	5	5	5
7	Eagle Valley Subdivision - Houck Road	8	5	2	2	3	1	2	0	1	2	5	3	4	4

APPENDIX 3
STORMWATER PROGRAM COSTS

CITY OF GREENCASTLE STORMWATER PROGRAM COSTS

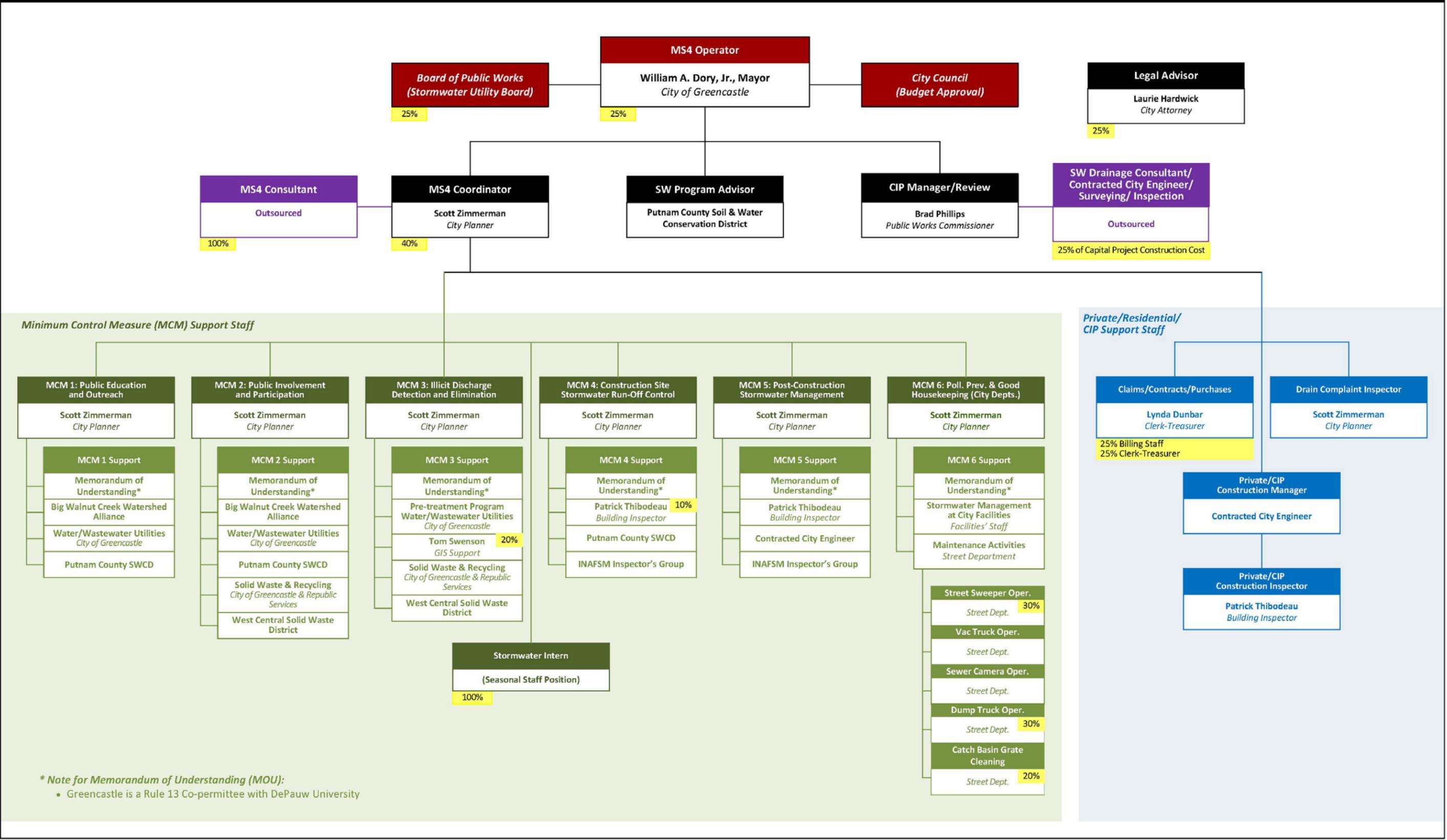
Category	Item	MCM ¹	2019	2020	2021	2022	2023	Total 5 Year Cost	Notes		
CAPITAL IMPROVEMENTS (54% of Total Revenue Requirements)	STORMWATER CAPITAL PROJECTS										
		Small Scale Maintenance/Capital Costs									
		Replacement of Castings/Inlets	6	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	\$75,000	10/yr @ \$1,500 unit cost	
		Small Scale Pipe Repairs	6	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$250,000		
		Large Scale Capital Projects Costs									
		Construction	6	\$250,000	\$250,000	\$250,000	\$250,000	\$250,000	\$1,250,000	Includes land and/or easement acquisitions	
		Engineering, Surveying, Inspection	6	\$62,500	\$25,000	\$25,000	\$25,000	\$25,000	\$162,500	Assumes Engineering and Inspection services are each 10% of construction costs and Surveying is 5%	
		Update Stormwater Infrastructure Asset Database	3	\$30,000	\$5,000	\$5,150	\$5,305	\$5,464	\$50,918	GIS mapping and attribute update of all stormwater infrastructure including location, type, size, elevation, etc.	
		Capital Project Stormwater Master Plan	ALL	\$150,000	\$0	\$0	\$0	\$40,000	\$190,000	Assumes 1-year planning effort (Year 1) and an update in Year 5	
		Total for Capital Projects:		\$557,500	\$345,000	\$345,150	\$345,305	\$385,464	\$1,978,418		
CAPITAL EQUIPMENT COSTS	CAPITAL EQUIPMENT COSTS										
		Street Sweeper replacement (2026)	6	\$31,250	\$31,250	\$31,250	\$31,250	\$31,250	\$156,250	Sinking fund to replace 2014 Street Sweeper in 2026	
		Vacuum Truck purchase (20XX)	6	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$250,000	Sinking fund to purchase Vactor Truck in 20XX	
		Total for Capital Equipment Costs:		\$81,250	\$81,250	\$81,250	\$81,250	\$81,250	\$406,250		
	STORMWATER PROGRAM OPERATING & MAINTENANCE COSTS (39% of Total Revenue Requirements)	OPERATIONS RELATED SALARIES AND BENEFITS									
			MS4 Coordinator (40%)	ALL	\$34,622	\$35,661	\$36,730	\$37,832	\$38,967	\$183,813	Assumes 35% of time on inspection of stormwater infrastructure and 5% of time on BMP compliance on private property ; includes benefits and 3% cost of living increase
			GIS Tech (20%)	ALL	\$16,108	\$16,591	\$17,089	\$17,602	\$18,130	\$85,520	Assumes 20% of time on stormwater mapping/database updates; includes salary, benefits and 3% cost of living increase
			Building Inspector (10%)	ALL	\$7,628	\$7,857	\$8,093	\$8,335	\$8,585	\$40,498	Assumes 10% of time on stormwater construction inspections; includes salary, benefits and 3% cost of living increase
			Street Sweeper Operator (30%)	ALL	\$19,730	\$20,322	\$20,932	\$21,560	\$22,206	\$104,749	Assumes 30% of time sweeping streets for stormwater benefit; includes salary, benefits and 3% cost of living increase
			Dump Truck Operator (30%)	ALL	\$19,730	\$20,322	\$20,932	\$21,560	\$22,206	\$104,749	Assumes 30% of time hauling street sweeping debris for stormwater benefit; includes salary, benefits and 3% cost of living increase
		Catch Basin Cleaning Staff (20%)	ALL	\$60,710	\$62,531	\$64,407	\$66,339	\$68,330	\$322,318	Assumes 20% of 4 staff clearing catch basin inlets of debris; includes salary, benefits and 3% cost of living increase	
		Seasonal Stormwater Intern (100%)	ALL	\$7,751	\$7,984	\$8,223	\$8,470	\$8,724	\$41,151	Assumes up to \$15/hr for 40 hrs/wk for 12 wks	
		Total for Operations Salaries and Benefits:		\$166,279	\$171,267	\$176,405	\$181,698	\$187,148	\$882,798		
		GENERAL OPERATING COSTS									
		Vehicles Operation and/or Maintenance	3,4,5	\$10,400	\$10,712	\$11,033	\$11,364	\$11,705	\$55,215	Fuel for sweeper and dump trucks; maintenance and insurance for sweeper truck	
		MS4 Dumpster	3,4,5	\$8,100	\$8,100	\$8,100	\$8,100	\$8,100	\$40,500	Dumpster and associated fees for street sweeper debris	
		Mileage Reimbursement	ALL	\$1,500	\$1,545	\$1,591	\$1,639	\$1,688	\$7,964	Assumes mileage reimbursement at the current IRS Standard Mileage Rates per mile when employees drive their personally owned vehicles for City business	
		Inspection & Maintenance of Stormwater BMPs	5	\$25,000	\$10,000	\$10,000	\$10,000	\$10,000	\$65,000	Assumes development of O&M program (year 1) and annual inspection and maintenance for BMP compliance	
		GIS Software and Printing Supplies	ALL	\$1,760	\$1,760	\$1,760	\$1,760	\$1,760	\$8,800	Includes software license, cloud storage fee, and printing supplies	
		Total for Operations General Supplies Costs:		\$46,760	\$32,117	\$32,485	\$32,863	\$33,254	\$177,479		
		MS4 PROGRAM COSTS									
		Public Education & Outreach Materials	ALL	\$3,000	\$3,090	\$3,183	\$3,278	\$3,377	\$15,927	Includes stormwater educational giveaways, rain gauges, pet waste bag dispensers, brochures, table covers, tent canopy & supplies, pre-con package, signage, etc.	
		Illicit Discharge Mapping & Screening	3	\$12,000	\$12,360	\$12,731	\$13,113	\$13,506	\$63,710	Cost of Field Kit, monitoring equipment, etc. including new purchases, maintenance &/or repair costs; E coli testing costs from WWTP lab	
		Inspection Program Tools & Supplies	3, 4, 5, & 6	\$3,500	\$3,605	\$3,713	\$3,825	\$3,939	\$18,582	Safety vests, traffic cones, steel-toed boots, waders, protective/seasonal work clothing, etc.; depth finder, sludge judge, manhole remover, camera, etc.	
	Spill Kits & Response Equipment/Stormwater Controls	6	\$3,000	\$3,090	\$3,183	\$3,278	\$3,377	\$15,927	Stationary & portable spill kits needed to control spills at city-owned projects; as needed for other facilities		
	Total for Operations Individual Rule 13 Costs:		\$21,500	\$22,145	\$22,809	\$23,494	\$24,198	\$114,146			
	MS4 TRAINING AND TECHNICAL ASSISTANCE										
	Staff Training	ALL	\$5,000	\$5,150	\$5,305	\$5,464	\$5,628	\$26,546	Assumes MS4 Coordinator attending courses, classes, and/or conferences		
	Stormwater & MS4 Engineering On Call	ALL	\$20,000	\$21,000	\$22,050	\$23,153	\$24,310	\$110,513	Provide technical support for Rule 13/MS4 program implementation; assumes 5% annual fee increase		
	Total for Operations Related Rule 13/MS4:		\$25,000	\$26,150	\$27,355	\$28,616	\$29,938	\$137,058			
ADMINISTRATIVE (2% of Total Revenue Requirements)	ADMINISTRATIVE SALARIES										
		Billing Staff (25%)	ALL	\$15,074	\$15,526	\$15,992	\$16,472	\$16,966	\$80,030	Assumes 25% of billing staff time for stormwater utility billing	
		Oversite Costs									
		Board of Works	ALL	\$1,076	\$1,108	\$1,142	\$1,176	\$1,211	\$5,713	Split 4 ways among General, Water, Wastewater and Stormwater utilities; includes salary, benefits and 3% cost of living increase	
		Mayor	ALL	\$19,889	\$20,486	\$21,100	\$21,733	\$22,385	\$105,593	Split 4 ways among General, Water, Wastewater and Stormwater utilities; includes salary, benefits and 3% cost of living increase	
		Clerk-Treasurer	ALL	\$20,452	\$21,066	\$21,698	\$22,348	\$23,019	\$108,582	Split 4 ways among General, Water, Wastewater and Stormwater utilities; includes salary, benefits and 3% cost of living increase	
		City Attorney	ALL	\$29,806	\$30,700	\$31,621	\$32,570	\$33,547	\$158,244	Split 4 ways among General, Water, Wastewater and Stormwater utilities; includes salary, benefits and 3% cost of living increase	
		Total for Administrative Salaries:		\$86,297	\$88,886	\$91,552	\$94,299	\$97,128	\$458,162		
		ADMINISTRATIVE GENERAL									
		Utility Billing Software and Mailing	ALL	\$20,050	\$20,652	\$21,271	\$21,909	\$22,566	\$23,243	Billing software start-up costs, annual fees; bill preparation, mailing and postage; assumes a 3% increase	
	Annual Update and Revisit Structure	ALL	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$35,000	Annual update impervious layer and billing database; revisit fee structure (year 5) and make adjustments as needed		
	Total for Administrative General:		\$25,050	\$5,000	\$5,000	\$5,000	\$15,000	\$35,000			
	STORMWATER FEE REVENUE ADJUSTMENTS										
	Customer Credit for Impact Reductions	5	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$25,000	Allowance for 10% non-residential parcels receive 20% stormwater credits		
	Customer Delinquencies	ALL	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$50,000	Allowance for 5% due to residential customer delinquencies		
	Total for Stormwater Fee Revenue Adjustments:		\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	\$75,000			
	TOTAL		\$1,024,636	\$786,815	\$797,006	\$807,524	\$868,380	\$4,284,362			
	Total Program Costs for 5-year Permit Term								\$4,284,362		
	Estimated Annual Program Cost								\$856,872		
	Rounded								\$850,000		

¹ Minimum Control Measures (MCMs): 1=Public Education & Outreach; 2=Public Participation/Involvement; 3=Illicit Discharge Detection & Elimination; 4=Construction Site Runoff Control; 5=Post-Construction Runoff Control; 6=Pollution Prevention/Good Housekeeping.

APPENDIX 4

STAFFING ORGANIZATION CHART

Organizational Chart for Proposed City of Greencastle Stormwater Utility



* Note for Memorandum of Understanding (MOU):
 • Greencastle is a Rule 13 Co-permittee with DePauw University

APPENDIX 5

**STORMWATER UTILITY RATE STRUCTURE
SUMMARY**

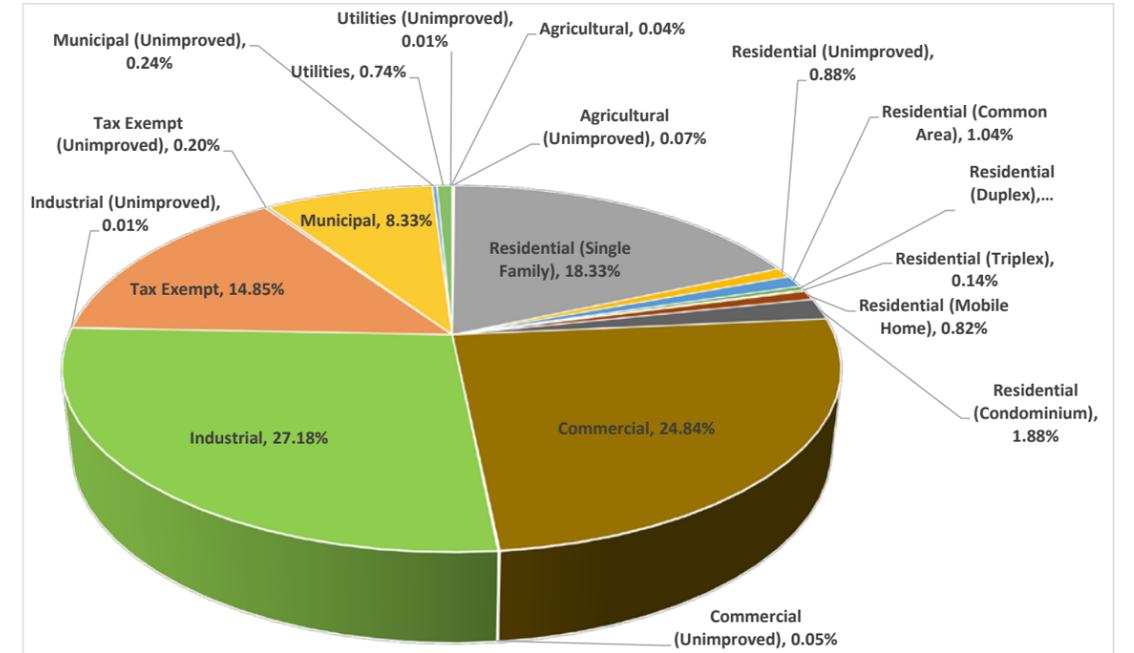
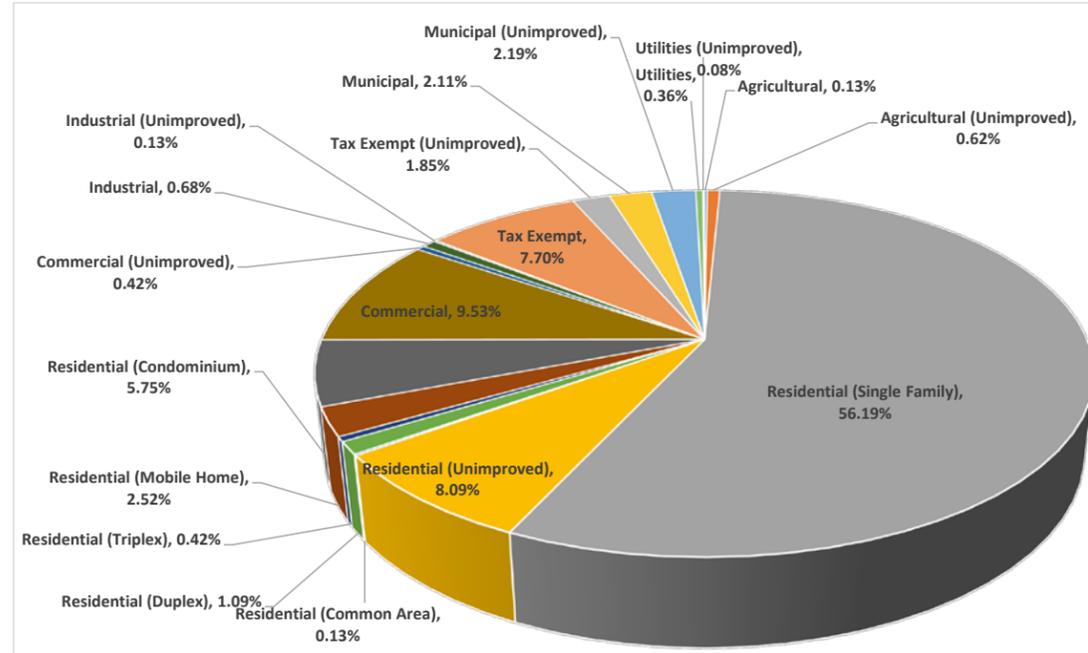
Greencastle Stormwater Utility Rate Structure

ONLY CHANGE VALUES COLORED IN YELLOW

1 ERU	3,000
Monthly Base Rate	\$ -
Annual Budget	\$ 850,000
Annual Fees Generated by Base Rate	\$ -
Annual Fees Generated by Stormwater Utility	\$ 850,000
Total ERUs	11,781
No. of parcels	3,842
Annual SFR Fee	\$ 72.15
Annual SFR Fee (with Base Rate)	\$ 72.15
Monthly SFR Fee	\$ 6.01
Monthly SFR Fee (with Base Rate)	\$ 6.01

Property Class	No. of Parcels	Percentage of Parcels	Acres (parcels)	Percentage of Acres (parcels)	No. of ERUs	Minimum ERU	Maximum ERU	Average ERU	Median ERU	Annual ERU Revenue	Annual Base Rate Revenue	Total Annual Revenue	Monthly ERU Revenue	% of Total Annual Revenue
Agricultural	5	0.13%	42	1.41%	5	1.00	1.00	1.00	1.00	\$ 361	\$ -	\$ 361	\$ 30.06	0.04%
Agricultural (Unimproved)	24	0.62%	313	10.42%	8	0.33	0.33	0.33	0.33	\$ 577	\$ -	\$ 577	\$ 48.10	0.07%
Residential (Single Family)	2,159	56.19%	735	24.42%	2,159	1.00	1.00	1.00	1.00	\$ 155,778	\$ -	\$ 155,778	\$ 12,981.49	18.33%
Residential (Unimproved)	311	8.09%	124	4.13%	104	0.33	0.33	0.33	0.33	\$ 7,480	\$ -	\$ 7,480	\$ 623.32	0.88%
Residential (Common Area)	5	0.13%	20	0.67%	122	1.00	52.28	24.43	25.44	\$ 8,812	\$ -	\$ 8,812	\$ 734.32	1.04%
Residential (Duplex)	42	1.09%	10	0.34%	42	1.00	1.00	1.00	1.00	\$ 3,030	\$ -	\$ 3,030	\$ 252.53	0.36%
Residential (Triplex)	16	0.42%	4	0.14%	16	1.00	1.00	1.00	1.00	\$ 1,154	\$ -	\$ 1,154	\$ 96.20	0.14%
Residential (Mobile Home)	97	2.52%	33	1.09%	97	1.00	1.00	1.00	1.00	\$ 6,999	\$ -	\$ 6,999	\$ 583.24	0.82%
Residential (Condominium)	221	5.75%	18	0.60%	221	1.00	1.00	1.00	1.00	\$ 15,946	\$ -	\$ 15,946	\$ 1,328.81	1.88%
Commercial	366	9.53%	404	13.45%	2,927	1.00	233.05	8.00	3.45	\$ 211,173	\$ -	\$ 211,173	\$ 17,597.76	24.84%
Commercial (Unimproved)	16	0.42%	10	0.33%	5	0.33	0.33	0.33	0.33	\$ 385	\$ -	\$ 385	\$ 32.07	0.05%
Industrial	26	0.68%	514	17.08%	3,202	1.00	1,167.58	123.17	33.47	\$ 231,057	\$ -	\$ 231,057	\$ 19,254.74	27.18%
Industrial (Unimproved)	5	0.13%	15	0.49%	2	0.33	0.33	0.33	0.33	\$ 120	\$ -	\$ 120	\$ 10.02	0.01%
Tax Exempt	296	7.70%	351	11.69%	1,750	1.00	128.20	5.91	1.99	\$ 126,248	\$ -	\$ 126,248	\$ 10,520.63	14.85%
Tax Exempt (Unimproved)	71	1.85%	27	0.89%	23	0.33	0.33	0.33	0.33	\$ 1,691	\$ -	\$ 1,691	\$ 140.88	0.20%
Municipal	81	2.11%	228	7.59%	981	1.00	195.70	12.11	2.49	\$ 70,768	\$ -	\$ 70,768	\$ 5,897.34	8.33%
Municipal (Unimproved)	84	2.19%	136	4.51%	28	0.33	0.33	0.33	0.33	\$ 2,020	\$ -	\$ 2,020	\$ 168.35	0.24%
Utilities	14	0.36%	19	0.62%	88	1.00	28.47	6.27	2.35	\$ 6,330	\$ -	\$ 6,330	\$ 527.51	0.74%
Utilities (Unimproved)	3	0.08%	4	0.14%	1	0.33	0.33	0.33	0.33	\$ 71	\$ -	\$ 71	\$ 5.95	0.01%
Totals:	3,842	100%	3,007	100%	11,781					\$ 850,000	\$ -	\$ 850,000	\$ 70,833	100%

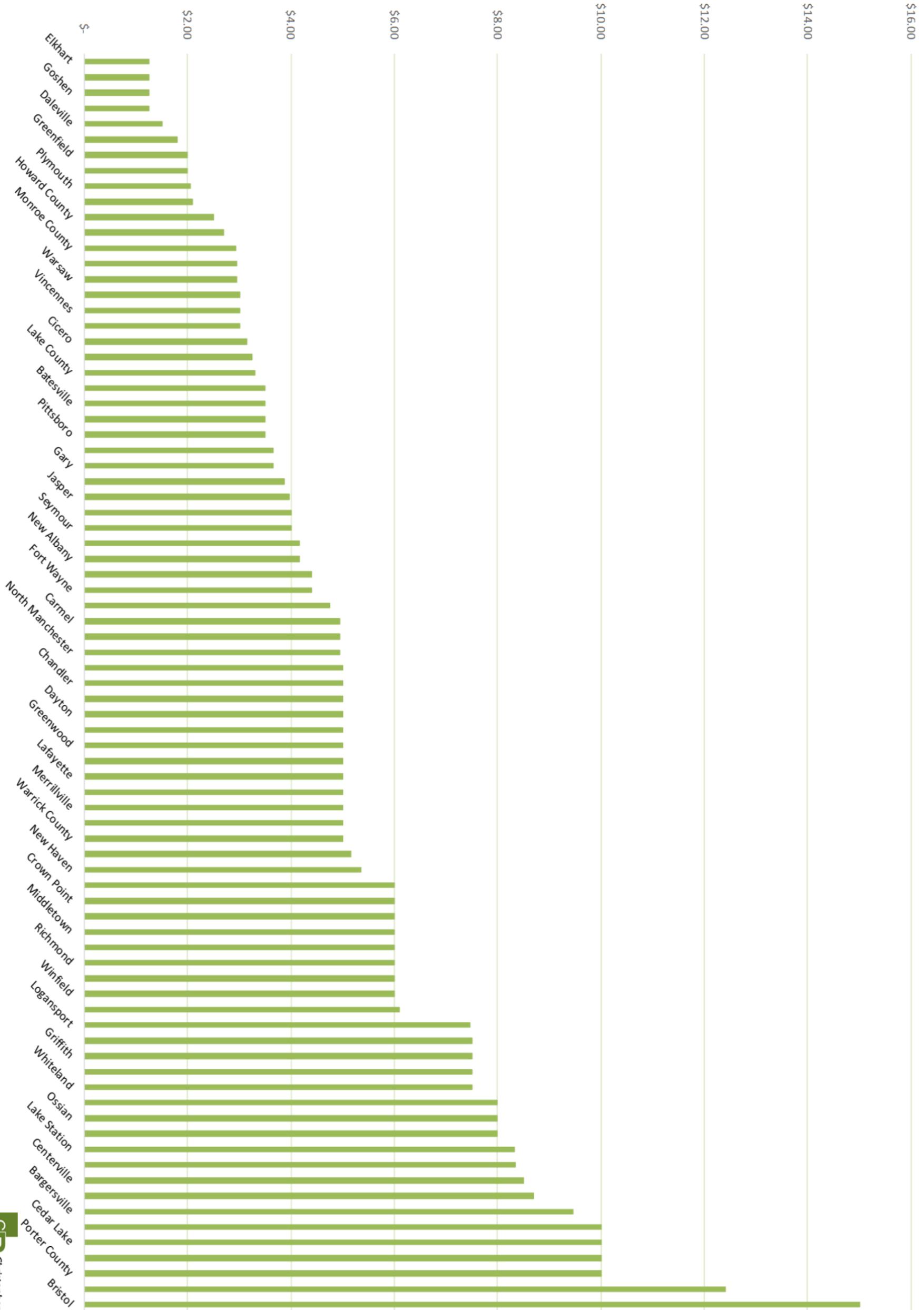
Property Class	ERU Multiplier
Agricultural	1.00
Agricultural (Unimproved)	0.33
Residential (Single Family)	1.00
Residential (Unimproved)	0.33
Residential (Common Area)	1.00
Residential (Duplex)	1.00
Residential (Triplex)	1.00
Residential (Mobile Home)	1.00
Residential (Condominium)	1.00
Commercial	1.00
Commercial (Unimproved)	0.33
Industrial	1.00
Industrial (Unimproved)	0.33
Tax Exempt	1.00
Tax Exempt (Unimproved)	0.33
Municipal	1.00
Municipal (Unimproved)	0.33
Utility	1.00
Utility (Unimproved)	0.33



APPENDIX 6

**COMPARISON OF EXISTING INDIANA
STORMWATER UTILITIES**

Indiana Stormwater Utilities



Updated June 2018

Community	ERU	Fee	Population
Albany		\$ 12.40	2,368
Anderson	2,500	\$ 3.50	59,734
Angola	2,350	\$ 2.08	7,344
Bargersville	2,350	\$ 9.46	2,120
Batesville		\$ 3.50	6,541
Berne		\$ 10.00	4,114
Bloomington		\$ 2.70	69,291
Bristol	3,600	\$ 15.00	1,672
Brownsburg	2,900	\$ 5.00	14,520
Carmel	4,150	\$ 4.95	85,927
Cedar Lake	2,903	\$ 10.00	12,183
Centerville	3,536	\$ 8.50	2,624
Chandler		\$ 5.00	3,500
Chesterton	3,585	\$ 6.10	11,139
Cicero		\$ 3.15	4,303
Clarksville	2,527	\$ 2.95	21,400
Connersville	2,662	\$ 5.15	15,411
Crawfordsville		\$ 6.00	15,243
Crown Point		\$ 6.00	19,806
Cumberland		\$ 7.50	5,389
Daleville		\$ 1.50	1,598
Danville	3,700	\$ 5.00	9,767
Dayton		\$ 5.00	1,618
Decatur	2,840	\$ 1.80	9,524
Dyer	4,343	\$ 6.00	15,941
East Chicago	2,500	\$ 3.65	28,418
Edinburgh	3,225	\$ 3.00	4,577
Elkhart	3,600	\$ 1.25	52,221
Elkhart County	3,600	\$ 1.25	2,008
Fishers	3,318	\$ 4.95	79,127
Floyd County	3,700	\$ 3.25	70,832
Fort Wayne	2,500	\$ 4.40	264,448
Fortville		\$ 8.00	3,444
Franklin		\$ 5.00	23,712
Gary	2,500	\$ 3.65	76,424
Goshen	2,800	\$ 1.25	29,383
Greendale	3,000	\$ 4.39	4,296
Greenfield	2,250	\$ 2.00	14,600
Greenwood	2,800	\$ 5.00	51,584
Griffith		\$ 7.50	17,334
Hammond		\$ 5.00	77,134
Highland		\$ 8.69	64,322
Howard County		\$ 2.50	84,964
Indianapolis/ Marion	2,800	\$ 1.25	791,926
Jasper	5,000	\$ 3.96	12,100
Jeffersonville	2,500	\$ 3.50	27,362
Lafayette	3,200	\$ 5.00	56,397
Lake County		\$ 3.30	484,564
Lake Station		\$ 8.33	12,572
Lebanon	3,000	\$ 4.75	15,259
Logansport		\$ 7.47	19,684
Marion		\$ 5.00	31,320
McCordsville	2,250	\$ 7.50	1,134
Merrillville		\$ 5.00	32,147
Middletown		\$ 6.00	2,357
Monroe County	5,200	\$ 2.93	137,974
Munster		\$ 10.00	22,346
New Albany	2,500	\$ 4.17	37,603
New Castle		\$ 6.00	17,780
New Haven	2,534	\$ 5.35	12,406
North Manchester	2,650	\$ 4.95	5,932
Ossian		\$ 8.00	2,943
Peru	3,497	\$ 4.00	12,994
Pittsboro		\$ 3.50	1,588
Plainfield	3,000	\$ 8.34	18,396
Plymouth	12,000	\$ 2.05	9,840
Porter County		\$ 10.00	164,343
Richmond	2,980	\$ 6.00	39,124
Seymour	2,840	\$ 4.00	19,384
Shelbyville		\$ 6.00	19,048
Sheridan	3,400	\$ 5.00	3,004
Vincennes	2,800	\$ 3.00	18,701
Warrick County	3,100	\$ 5.00	52,383
Warsaw	3,550	\$ 2.95	14,662
Washington	2,558	\$ 3.00	11,380
West Lafayette	3,200	\$ 8.00	30,419
Westfield	3,500	\$ 4.16	9,293
Whiteland	3,704	\$ 7.50	4,169
Winfield	4,343	\$ 6.00	5,560
Yorktown	2,500	\$ 2.00	4,785
Zionsville	4,400	\$ 3.86	24,159

APPENDIX 7

**PROCEDURES FOR UPDATING &
MAINTAINING THE BILLING DATABASE**

PROCEDURES FOR UPDATING & MAINTAINING THE BILLING DATABASE

The following maintenance procedures for non-residential property classes (including residential common areas) should be completed to ensure accurate billing of parcels in the City of Greencastle. The existing utility billing database should capture all residential development assigned a value of 1 ERU.

ANNUALLY

1. Compare the most recent aerial photography (flown annually by Putnam County) with the non-residential impervious GIS shapefile originally used to develop the Stormwater Utility Rate Study.
2. Using the same protocol to establish the rate structure (see Section 6.6 of the Rate Study), digitize new impervious areas, calculate the square footage of impervious area, and determine the number of ERUs.
3. Update the billing database for each parcel where there is a change in impervious area or land use.
4. In the billing database, update location addresses, and identify accounts that are no longer active so that they can be removed from the billing database.

AS-BUILT/LAND IMPROVEMENT PERMIT IMPERVIOUS AREA

1. When occupancy is established for new development or redevelopment projects, the square footage of impervious areas should be calculated and ERUs determined.
2. Update the billing database for each parcel where there is a change in impervious area or land use.

APPENDIX 8

STORMWATER UTILITY USER FEE CREDIT MANUAL

TO BE ADDED LATER

APPENDIX 9
STORMWATER UTILITY ORDINANCE AND
PUBLIC NOTICE

TO BE ADDED LATER