CIORBA GROUP | Consulting Engineers

Quality Engineering Services for the Community

Fairmont Community

Flood Study Feasibility Report

Volume I

Prepared for

Will County Land Use Department

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FAIRMONT COMMUNITY FLOOD STUDY

Executive Summary

Ciorba Group conducted a flood feasibility study for the Fairmont residential community. The neighborhood is divided between two drainage areas, and storm sewer improvements have been implemented throughout the years on the perimeters of the project site. While these storm sewer systems appear to have provided flood relief for some portions of the Fairmont Community, the Project Site is very flat and does not have a positive flow path that allows the area to drain to these storm sewer systems.

Three alternatives have been developed for consideration. Alternatives 1A, 1B, and 2 propose storm sewer, ditches, and surface detention that connect into the existing storm sewer networks to improve the conveyance of stormwater run. Each alternative has measurable costs and benefits.

Alternative	Proposed Improvements	Level of Protection	Cost
1A	Storm Sewer and Ditches	For at least the 10-year storm event	$ 1,069,370
1B	Storm Sewer, Ditches, and Surface Detention	For at least the 10-year storm event	$ 1,400,135
2	Storm Sewer, Ditches, and Surface Detention	For at least the 50-year storm event	$ 3,271,465

Alternative 3 is to provide rain gardens or other small storage practices which can provide supplemental runoff storage to Alternatives 1A, 1B, and 2. These measures can be constructed in a number of locations, including parkways, residential yards, vacant lots, and public open space. The construction of rain gardens and other green infrastructure elements will not alone be able to provide the flooding protection levels as presented in Alternatives 1A, 1B, and 2, but incorporation of green infrastructure could help to downsize or eliminate portions of the grey infrastructure network.

FAIRMONT COMMUNITY FLOOD STUDY

This report presents the results of the drainage feasibility study performed by Ciorba Group for the Fairmont residential community. The report assesses the current drainage system capacity and flooding issues, develops and evaluates alternative approaches to alleviate the flooding, and presents the preferred alternatives.

Project Introduction

The Fairmont community (the Project Site) is located in unincorporated Lockport Township in Will County, Illinois. The study area incorporates the tributary area of approximately 340 acres, but focuses on providing solutions for the flooding issues located in the region bounded by Godfrey Avenue to the north, Brassel Street to the east, Oak Avenue to the south, and Barrett Street to the west. The site is located less than a half mile east of the Illinois and Michigan Canal, which runs parallel to the Des Plaines River / Chicago Sanitary and Ship Canal (Exhibit 1).

The Project Site covers four effective FIRM panels that are considered Preliminary: 17197C0170G, 17197C0154G, 17197C0158G, 17197C0162G. The majority of the site is in a Zone X, which is outside of the 0.2% annual chance floodplain (Exhibit 2). An existing drainage path through the neighborhood has been delineated as a Zone A, which is an area that has no base flood elevations determined but is subject to flooding by the 1% annual chance flood. This drainage path originates on the west side of Brassel Street between Nobes Avenue and Dellwood Avenue, then flows northwest until it crosses under Green Garden Place, just north of South Avenue. The drainage path then changes direction and begins to flow southwest and crosses under IL Route 171 (South State Street) at Fairmont Avenue.

The majority of the Project Site and its tributary area are comprised of soils classified by the NRCS Web Soil Survey as “Blount silt loam, 2 to 4 percent slopes” and “Ashkum silty clay loam, 0 to 2 percent slopes” (Exhibit 3). This mixed soil is classified as poorly drained, and can be designated in the D and C/D soil hydrologic soil groups.

The neighborhood consists of single family structures on average sized lots of about 0.25 acre, with some commercial / institutional facilities scattered along the western and northern perimeters. A number of residential structures have been demolished, resulting in vacant lots covered in grass or aggregate scattered through the neighborhood between existing residences. An elementary school is located on the eastern side of Green Garden Place between Nobes Avenue and South Avenue, with an additional parking lot for the school located at the southwestern corner of the intersection of Green Garden Place and North Avenue. The neighborhood is served by public sewer and water systems. Each of the houses has an individual driveway that is made of asphalt, concrete, or aggregate. The roadways are two-lane, asphalt paved residential streets. The streets vary in structure throughout the subdivision, and are described in more detail below:

Oak Avenue: This roadway borders the southern perimeter of the subdivision. It originates at IL Route 171 and runs to the east until it terminates at Gougar Road, a distance of about 3.3 miles. In the project area, the roadway has ditches on both the north and south sides of the street, with an existing storm sewer system constructed in 1987 that originates on Brassel Street and outlets to the north side of the road into a depression west of Barrett Street. The majority of the roadway has narrow aggregate shoulders that transition into grassed ditches (Figure 1), except between Green Garden Place and Barrett Street, where wide aggregate parking areas have been constructed along the northern and southern sides of the road. The northern side of Oak Avenue has a high density of residential structures, while the south side of the roadway has a sparser number of structures.

Figure 1: Looking west on Oak Avenue

Brassel Street: Brassel Street borders the eastern perimeter of the subdivision and connects Oak Avenue to Bruce Road. This roadway has very few driveway access points, but does intersect North Avenue, Nobes Avenue, Dellwood Avenue, and Fairmont Avenue. Within the project area, the western side of the roadway has a mixture of grass and wide aggregate shoulders. The east side has a vegetated ditch with grass up to the edge of pavement (Figure 2). A storm sewer system was constructed at the intersection of Dellwood Avenue and travels south along Brassel Street, where it connects into the Oak Avenue storm sewer line.

Figure 2: At intersection of Fairmont and Brassel, looking North on Brassel

Green Garden Place, May Street, and Barrett Street: Green Garden Place, May Street, and Barrett Street are north / south roadways. May Street starts at Oak Avenue and transitions to North Avenue. Green Garden Place extends north of Bruce Road and south of Oak Avenue into other subdivisions. Barrett Street connects South Avenue to Oak Avenue. The majority of the roadways either have narrow aggregate shoulders that transition into grassed parkways or wide aggregate parking areas have been constructed along the western and eastern sides of the road (Figure 3). There are some small sections with defined ditches, such as between North and South Avenue on Barrett and between Dellwood Avenue and Fairmont Avenue on May Street (Figure 4). A storm sewer was constructed in 2011 that conveys flow from the intersection of South Avenue and Barrett Street to an outlet at the western end of Dellwood Avenue.

Figure 3: At intersection of Nobes and May, looking south on May

Figure 4: At intersection of Fairmont and May, looking south on May

North Avenue, Nobes Avenue, Dellwood Avenue, and Fairmont Avenue: North Avenue, Nobes Avenue, Dellwood Avenue, and Fairmont Avenue are east / west roadways. North Avenue is a short stretch of roadway connecting May Street and Brassel Street. North Avenue also connects Green Garden Place to IL Route 171 west of the school. Dellwood Avenue extends from Brassel Street to the west, and then turns 90 degrees to the south just shy of IL Route 171 to connect to Fairmont Avenue. Nobes Avenue and Fairmont Avenue connect Brassel Street to IL Route 171. The majority of the roadways either have narrow aggregate shoulders that transition into grassed parkways or wide aggregate parking areas have been constructed along the northern and southern sides of the road. (Figures 5 and 6) There are some small sections with defined ditches, such as on Dellwood Avenue between May Street and Green Garden Place as well as on the south side of Nobes Avenue to the west of Green Garden Place. There are lines of shallow, small diameter, mixed material storm sewer constructed along Fairmont Avenue and a portion of Green Garden Place which appears to capture some street and rear yard flow.

Figure 5: At intersection of Nobes and May, looking east on Nobes Avenue

Figure 6: At bend of North Avenue and May Street, looking east

Drainage Patterns

The overall drainage pattern of the Project Site is to the west, into a series of box culverts that cross under IL Route 171 and drain towards the Illinois and Michigan Canal. The site is divided into a northern and a southern drainage area (Exhibit 4), but the outletting box culverts draining these areas merge together at a structure on the west side of IL Route 171 to create a single discharge point.

The north drainage area starts with a series of wetlands and agricultural fields on the east side of Brassel. The historical flow path, which is located in the rear yards between Dellwood Avenue and Nobes Avenue just west of Brassel Street, was interrupted by the construction of the subdivision roadways. There is now ponding on the east side of Brassel, which overtops during larger storm events into the rear yards of Nobes Avenue and North Avenue. The rear yards and streets are very flat and have a series of depressions. Segments of storm sewers and rear yard storm sewers, starting mid block on Nobes Avenue, attempt to maintain this historic path (Figures 7 and 8), but these areas act as depressions that fill and eventually overtop and flow to the intersection of North Avenue and May Street. Just north of this intersection is where an open channel with a permanent water level becomes visible. This open channel flows northwest to a series of double culverts under Green Garden Place, and

Figure 7: Storm sewer on Nobes Avenue to convey flow from yards

Figure 8: Side yard swale downstream of Nobes Avenue storm sewer

then continues southwest to the intersection of South Avenue and Barrett Street. The natural drainage path meandered southwest through the backyards, but was redirected into a recently constructed storm sewer system that runs down Barrett Street and outlets to the far western end of Dellwood Avenue. The outlet of the storm sewer drains into a heavily vegetated depressional area that extends south to Fairmont Avenue. On the northwestern corner of Fairmont Avenue and IL Route 171, a 4'x4' concrete box culvert captures the flow from this depression and conveys it under IL Route 171 to the final outlet near the Illinois and Michigan Canal. The total area tributary to the northern IL Route 171 outlet (North Outlet) is approximately 187 acres.

The southern drainage pattern does not follow a defined historical drainage path like the northern path, but instead has large open fields to the east of Brassel Avenue and south of Oak Avenue that sheet flow to the west. A depression exists on the east side of Brassel near the Fairmont Avenue intersection, which has standing water. The ditches and storm sewer along Oak Avenue capture this flow and convey it to an outlet located on the north side of Oak Avenue, just west of Barrett Street. The stormwater flows through a channel and into a heavily vegetated depression located at the southeast corner of Fairmont Avenue and IL Route 171. A 4'x6' concrete box culvert captures the flow from this depression and conveys it under IL Route 171 to the final outlet near the Illinois and Michigan Canal. The total tributary area to this southern IL Route 171 outlet (South Outlet) is approximately 154 acres.

Drainage Issues

In April 2012, the Will County Land Use Department and Chicago Metropolitan Agency for Planning (CMAP) developed the "Will County Fairmont Neighborhood Plan". In the section titled *Natural Environment*, the following issues were identified:

> *"Flooding is a significant problem in some areas of Fairmont. Some parcels are likely impacted by the existence of a floodplain that radiates from Faction Run Creek, and two wetlands near Fairmont Elementary School. Several areas outside of the designated floodplain are likely impacted by poor drainage or inadequate stormwater systems. In addition, flooding problems are compounded by the unimproved transportation system described in the previous section. Because no curbs or gutters exist on streets in the community, most streets are crowned to drain into the adjacent open ditches. At the first public meeting, a number of residents expressed concern regarding the flooding of residential properties adjoining the streets. According to residents, potential causes may be 1) that as streets were resurfaced over time the elevation of the streets has continued to rise, and 2) existing open ditches and culverts may become obstructed. Together these issues have compounded the flooding problems on adjacent residential parcels. Most county subdivisions have open ditches adjacent to roadways that adequately convey stormwater. However, in these types of older subdivisions, drainage problems are usually associated with years of poor maintenance on the ditch systems."*

Field visits and the collection of survey data confirmed that the majority of the Project Site area was lacking planned detention and infrastructure to convey the stormwater, either through ditches, storm sewer, or curbing.

A series of stormwater improvements have occurred over the years to help alleviate flooding issues in the area, and are as follows:

- *Oak Street Storm Sewer, 1987* – Mainline storm sewer that was constructed from Brassel Street to an outlet to the west of Barrett Street. This sewer line captures the flow from Oak Avenue and has a lateral line on Brassel Street that captures a large area of offsite flow.
- *Barrett Street Storm Sewer, 2011* – Storm sewer that conveys the open channel flow located at the intersection of Barrett and South Avenue to an outlet at the western end of Dellwood Avenue.
- *Fairmont Avenue / Green Garden Place Storm Sewer, date unknown* – There is a series of mixed material storm sewer and shallow inlet structures located on Fairmont Avenue, between May Street and Barrett Street that capture flow from Fairmont Avenue and the rear yards of the houses between Fairmont Avenue and Oak Avenue (Figure 9). The storm sewers appeared to be two separate lines capturing drainage from yards and streets. Their outlets were located in the rear yards between Fairmont Avenue and Oak Street, tributary to the South Outlet. Many of the structures were filled with

Figure 9: Portions of storm sewer network on Fairmont and Green Garden Place

dirt and debris (Figures 10 & 11). While some of the structures were holding water at the time of the field visit, they were not located in depressions or defined flow paths, reducing their effectiveness in capturing large amounts of runoff.

Figures 10 & 11: Shallow storm sewer along Fairmont and Green Garden Place, filled with debris

While these storm sewer systems appear to have provided flood relief for some portions of the Fairmont Community, the Project Site is very flat and does not have a positive flow path that allows the area to drain to these storm sewer systems.

Ditches and culverts in the flood problem areas were also not functioning to convey the stormwater runoff. It appears that ditches have been filled throughout the years as culverts are bulging out of driveway aprons with no ditches present (Figure 12). In areas where ditches and culverts were present, the systems were in poor repair. Culverts were often filled with debris, crushed, or blocked (Figure 13). Heavy erosion was visible in portions of the subdivision, contributing to the clogging of the storm sewer and ditch networks (Figure 14). The ditchlines that are present were shallow, narrow, and often times obstructed mid-block by the construction of a flat parkway or were filled in by a driveway with no culvert.

Figure 12: Bulging culvert with no ditches

Figure 13: Crushed and debris filled culverts

Figure 14: Erosion downstream of storm sewer culvert

Drainage Survey

In order to more precisely identify and characterize the residents' experience with stormwater and help better define drainage patterns, a survey was sent to the residents of the Fairmont Community (see Exhibit 5). The survey was structured with a series of multiple choice questions with the opportunity to provide more specific information in written sections. A total of 17 surveys were completed from the residents of the community and the results were compiled into an existing drainage flooding areas exhibit for the study area (see Exhibit 6). From this study, water ponding was identified in the region north of Oak Avenue, east of Green Garden Place, west of Brassel Street, in the rear yards of houses between Oak and Fairmont Avenues and south of Godfrey Avenue during both small and large rain events. The majority of respondents identified failed culverts / the lack of culverts and depressional areas the main cause for these issues. The identified ponding locations were incorporated into the existing conditions flow model.

Drainage Evaluation Methodology and Assumptions

The following methodology and assumptions were used to evaluate the existing and proposed condition drainage:

1. XP-SWMM hydrologic and hydraulic unsteady flow model has been used to conduct the flooding evaluation.
2. The 2, 5, 10, 50, and 100-year critical duration events were evaluated using the XP-SWMM unsteady flow analysis to define the existing conditions and analyze multiple alternatives for proposed conditions for the neighborhood.
3. The flow patterns were broken down into two different flow paths. The northern flow path consisted of overland and concentrated flow from the east end of the project area, passing through dual 24" RCP culverts under Green Garden Place, eventually reaching the inlet to the 36" RCP storm sewer system at South Avenue and Barrett Street. The storm sewer outfall is located at the very west end of Dellwood Avenue, where the stormwater flows shortly through a deep channel until it reaches a 4'x4' RCP box culvert that crosses under IL Route 171 that eventually discharges to the Illinois-Michigan Canal. The southern flow path involves the neighborhood and open land flow to the Oak Avenue storm sewer at the southern limits of the project. The Oak Avenue storm sewer is a 36" RCP storm sewer that flows from east to west starting at the intersection of Brassel Street and Oak Avenue continuing 2,200' west, where it outlets into a ditch south of Neil Court (Dellwood Avenue). The water is funneled into a 4'x6' RCP box culvert, west under IL Route 171, and eventually discharges to the Illinois-Michigan Canal.
4. The existing box culverts flowing under IL Route 171 were utilized as individual discharge points for the north and south drainage areas, but these two box culverts join at a structure on the west side of IL Route 171 and create a single discharge location. The existing release rates from the study area were determined by using XPSWMM as follows:

Table 1. Existing Release Rates

	10-Year Event	50-Year Event
North System	85.83 cfs	117.72 cfs
South System	67.58 cfs	109.27 cfs
Total	153.41 cfs	226.99 cfs

The above total existing condition release rates were utilized as maximum discharge limits to ensure that modifications made to the neighborhood drainage system would not significantly increase flows tributary to the railroad crossings downstream before the flow enters into the Illinois-Michigan Canal.

5 Due to the complaints about flooding in backyards, ditches and low-lying areas were modeled as storage areas with a weir elevation in the existing conditions analysis. The weir elevation was taken to be either the road overtopping elevation or was interpolated from the Will County 2-ft contours and point elevations.

6 In the proposed conditions, the backyards no longer pond but are instead drained by a proposed 15" diameter storm sewer, which will convey the flow to the proposed storm sewers.

7 Based off the soils map for the area, an infiltration rate of 0.06 in/hr was used from type D soils, while a 0.2 in/hr rate was used for Type C soils. The lowest rate of infiltration for each type of soil was assumed to provide the most conservative design.

8 All existing storm sewer was modeled at its full potential capacity assuming that it was not obstructed by debris. This assumes storm sewer cleaning and maintenance will be conducted.

Existing Conditions Analysis

Due to the extremely flat topography in the study area, localized ponding was identified as the main concern and the primary focus in the development of the existing conditions XP-SWMM model. The initial step to determine where the flooding was occurring was to input the existing storm sewer, ditch capacity, and channel capacity data gathered from field surveys and existing plans provided by the County. The model encompassed the overall tributary drainage area, but extra detail was provided at the Project Site and the outlet flow paths. The existing model confirmed that many of the locations identified as flooding areas by the residents did indeed have standing water. This was determined by modeling flooding areas as "storage nodes", which provides information on the volume of water that is trapped in a low area. The results of the model indicated that the lack of detention and minimal ability to convey the stormwater are creating the flooding issues. (Exhibit 7)

Detention

Properly located detention can provide many multiple benefits in a flood prone area. In general, detention basins collect and temporarily store runoff so it can be slowly released downstream. This controlled release helps to prevent flooding, maximize the downstream storm sewer and ditch capacity, promote infiltration in the basin area, and reduce erosion.

The existing Project Site does not have any constructed detention, either above ground in basins or in oversized subsurface drainage structures or pipes. Existing depressional areas, such as the fields on the east side of Brassel (Figure 15) or the rear yards of Fairmont Avenue, are currently holding water and acting as detention until they overtop or infiltrate.

Figure 15: Existing depressional area east of Brassel Street

Conveyance

Conveyance is the act of transporting water from one location to another. This is most commonly achieved by the use of underground storm sewer systems, ditches, or waterway channels (such as streams, rivers, etc.). Conveyance of water is extremely important to both communities and individuals in order to prevent flooding. Excess standing water that is not conveyed properly can lead to safety hazards, property damages, and can cause additional drainage problems if multiple storms happen in succession because there is already water taking up space from the previous rainfall event.

The existing storm sewer lines in the community were evaluated for their conveyance capacity. The Oak Street storm sewer line constructed in 1987, the Barrett Street storm sewer constructed in 2011, and the storm sewer along Fairmont Avenue and Green Garden Place were evaluated. Even though the Fairmont Avenue and Green Garden Place storm sewer was filled with debris, the model was developed assuming that it was clean and able to convey flow to its maximum potential. This assumes that the storm sewer will be cleaned and

maintained. The ditches in the flood prone areas were not incorporated into the model as they were fragmented and in many cases did not have positive outlets.

The existing storm sewers were modeled using XP-SWMM to determine their capacity in the 2, 5, 10, 50, and 100-year events. The existing model output for both the north system and south systems are attached in Appendix B. Tables 2 and 3 below, along with Exhibit 7, illustrate the storm capacity of the existing system:

Table 2. North System - Existing Conditions Storm Sewer Capacity

Node #	Location	Storm Sewer Capacity
33	Flared End Section at Barrett Street & South	> 10-YR to 50-YR
34	Barrett Street Mainline	> 50-YR to 100-YR
35	Barrett Street Mainline	> 50-YR to 100-YR
36	Barrett Street Mainline	> 50-YR to 100-YR
37	Barrett Street & Dellwood Avenue	> 50-YR to 100-YR
38	Dellwood Avenue Mainline	> 50-YR to 100-YR
39	Dellwood Avenue Mainline	> 50-YR to 100-YR

Table 3. South System - Existing Conditions Storm Sewer Capacity

Node #	Location	Storm Sewer Capacity
Oak Avenue Storm Sewer		
20	Brassel Street	> 2-YR to 5-YR
21	Brassel Street	> 10-YR to 50-YR
84	Brassel Street & Oak Avenue	> 50-YR to 100-YR
22	Oak Avenue Mainline	> 50-YR to 100-YR
24	Oak Avenue Mainline	> 50-YR to 100-YR
66	Oak Avenue & May Street	> 10-YR to 50-YR
25	Oak Avenue Mainline	> 50-YR to 100-YR
26	Oak Avenue Mainline	> 50-YR to 100-YR
27	Oak Avenue Mainline	> 50-YR to 100-YR
86	Oak Avenue Mainline	> 50-YR to 100-YR
Fairmont Avenue / Green Garden Place Storm Sewer		
30 to 31	Fairmont Avenue & Barrett Street	> 2-YR to 5-YR
100 to 107	Fairmont Avenue & Green Garden Place	> 2-YR to 5-YR

In general, both the Brassel Street (North) and Oak Street (South) mainline storm sewer systems have adequate capacity to handle between the 50-year to 100-year storm event. The Fairmont Avenue / Green Garden Place storm sewer system (South) has adequate capacity for only the 2-year to 5-year events, assuming it has been fully cleaned and functioning.

- North System - The model indicates that the study area will have frequent ponding at the east end of the project. The particular area of concern is the two block residential neighborhood bounded by May Street, North Avenue, Brassel Street, and Dellwood Avenue. The flat topography results in ponding on the east side of Brassel until it overtops the roadway, flowing in to the swales in the backyards of Fairmont Avenue and Dellwood Avenue. The water continues to pond in the rear yards and eventually overtops to the existing stormwater channel, which will then be tributary to the Brassel Street storm sewer system.
- South System – The model indicates that widespread ponding happens at the 5-year event. The Oak Street storm sewer on the east side of Brassel has flared end sections to capture the standing water in the open field areas near Fairmont, but the storm sewer line is not sized to handle an event larger than the 2-5 year storm. The two lines of existing storm sewer along Fairmont Avenue overtop, allowing water to freely flow onto adjacent properties. The flat topography and absence of ditches results in water ponding in the rear yards and streets of Fairmont and Dellwood Avenue, east of Green Garden Place.

Flood Damage Reduction Alternatives

Ciorba has reviewed and evaluated multiple alternatives to alleviate the neighborhood flooding, taking into account that the level of protection provided will impact the overall costs. Existing condition release rates for both the north and south systems were utilized as discharge limits for the proposed alternatives ensuring the box culverts under IL Route 171 will maintain its current capacity.

There is an existing residence located at the northwestern intersection of Oak Avenue and Central Park Place that is west of the Oak Avenue storm sewer outlet. The presence of sand bags during a field visit and an aerial photograph that shows the residence directly downstream of the defined flow path indicates that this property may be subject to flooding. While this property is outside of the Project Site area, considerations were made when developing the proposed alternatives to ensure flow at this location was not increased.

Localized Ponding

Each of the proposed alternatives described below propose methods to convey or store the stormwater runoff for an area the size of a block or more. The flat topography within these blocks will require some additional measures to ensure the localized ponding areas can convey stormwater runoff to the proposed systems.

Capturing rear yard drainage will depend upon the specific slope of each property, in addition to the type of solution the property owners will find acceptable. Alternatives for capturing this flow and conveying it to the street storm sewer may include the following:

- In rear yards with pocketed areas, smaller diameter storm sewer with inlet structures at the low points could be installed.
- In rear yards that do not pond in a specific low area, an open trench drain or perforated pipe system could be installed to capture the widespread ponding.
- When possible, swales are recommended to convey stormwater to either proposed or created ditchlines along the street. While long lengths of swales will not be possible, short side yard or rear yard swales the width of a lot or two could help convey some of the runoff to the new system.
- There is potential to utilize some of the existing blighted properties that have recently been demolished as locations to implement swales or install the connection points from the rear yard sewers / trenches to the proposed sewers.

The streets are at an even elevation with the front yards, and there is very little slope on the streets. Some alternatives to capture the flow from the front yards and streets to convey it to the proposed system may include the following:

- On streets with some slope, ditches excavated along the sides of the roadways with new culverts at each driveway crossing.
- Ditches and / or depressions excavated along the sides of the roadways with storm sewer structures placed at the bottom of the low points to connect into the mainline storm sewer or a nearby ditchline.
- Gutters along the edge of the roadway that could contain a series of inlet grates to capture the flow, convey drainage to inlet structures at the natural depressions in the roadway, and/or convey the flow to created ditches / depressions with storm sewer inlets on the bottom.
- Shallow ditches with trench drains could be placed along the sides of the roadways.

Maintenance and Minor Improvements:

Maintenance of the existing ditches and storm sewer systems, as well as future proposed systems, are important to ensure the conveyance capacity of the system is maintained. Below is a list of recommended actions for maintenance:

1. Prevent gravel from entering the open grates of the storm sewer system (Figure 16).
2. Remove obstructions and debris from ditches, culverts, and flow paths. This includes bushes, trees (Figure 17), and temporary litter.
3. Stabilize eroded ditchlines, flow paths, and areas tributary to the storm sewer inlets.
4. Clean the existing storm sewer systems to remove all sediment and debris.

Figure 16: Stone falling into storm sewer structure at Dellwood and Brassel

5. Install animal grates at all open flared end sections to prevent creatures and large debris from potentially obstructing the storm sewer lines (Figure 18).

Figure 17: Obstructed culverts at May Street and Dellwood Avenue

Figure 18: Open flared end sec ion on Brassel Road

There are several recommended improvements that can be implemented at relatively little cost and can be consistent across all potential alternatives:

1. Replace and upsize (when possible and practical) existing driveway and street culverts.
2. Widen existing ditches to improve conveyance and capacity.
3. Install swales / infiltration trenches / storm sewer to drain the rear yards to areas with existing ditchlines.
4. Implementation of green infrastructure elements such as rain barrels, rain gardens, and bioswales to reduce runoff tributary to the flooding area. In particular, replacing the wide aggregate shoulders with bioswales and / or rain gardens to provide storage and infiltration opportunities.
5. On roadways where existing sanitary or watermain will not allow the construction of green infrastructure over it, wide aggregate shoulders could be removed and vegetated (with an adequate depth of topsoil) to reduce impervious area and promote infiltration.
6. At Oak Avenue and May Street, there are storm sewer inlets on the northwestern and northeastern corners of the intersection in the grassed parkway. There are existing ditchlines flowing towards these structures that convey flow from the Fairmont Avenue and Dellwood Avenue flooding areas, but the ditchlines have been filled along May Street and block the flow path. The re-creation of these ditchlines on May Street will allow flow to the existing inlet structures at the intersection. A short pipe with a flared end section could be constructed at the end of each of these new ditchlines and tied into the existing inlet structures to provide protection for the 10-year storm event (Figure 19).

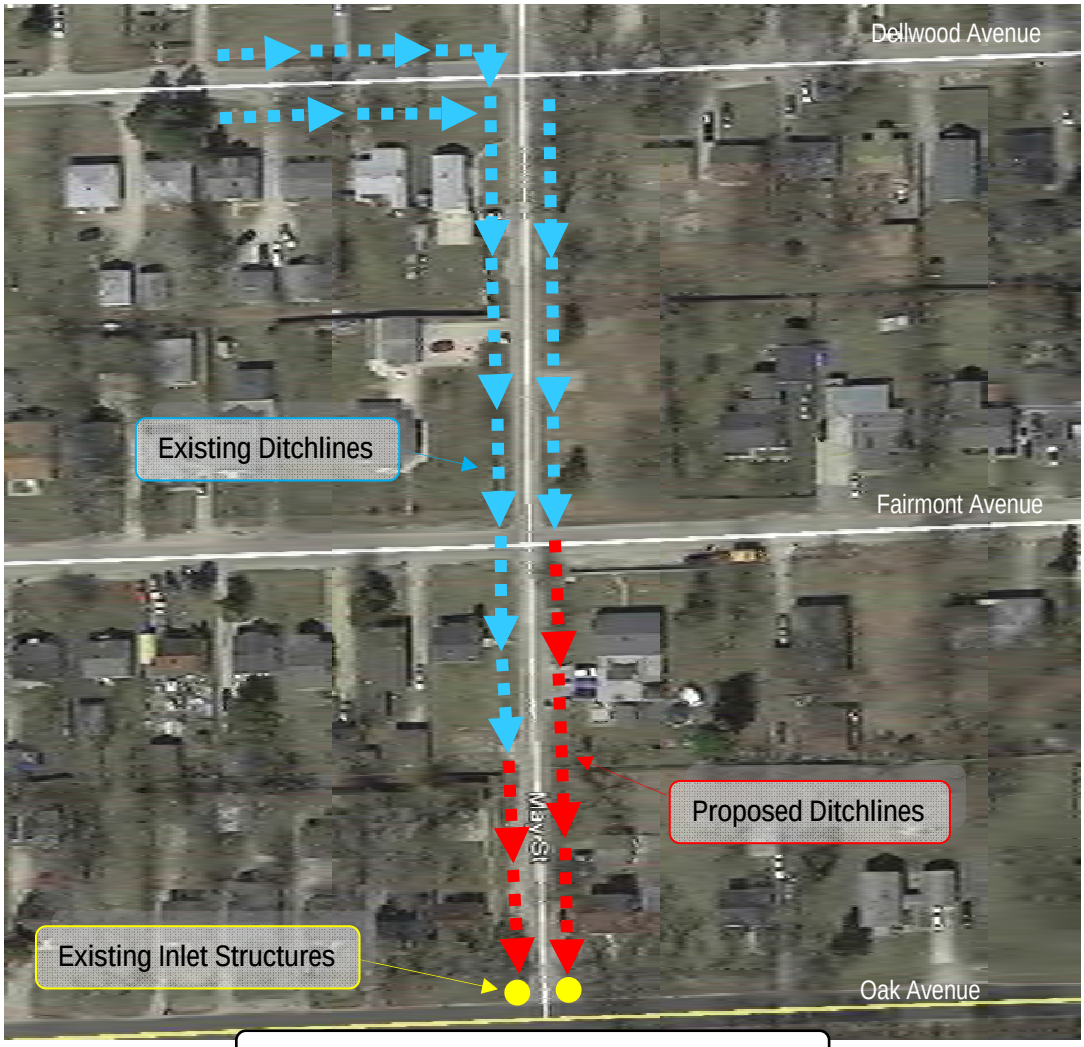


Figure 19: Potential Improvements on May Street

Alternative 1A:

10-Year Storm Event Protection – Storm Sewer Alternative

Alternative 1A, as shown in Exhibit 8, provides a level of protection for at least the 10-year storm event utilizing the construction of new storm sewer and reconstruction of existing storm sewer. This alternative consists of replacing the existing storm sewer networks along Fairmont Avenue and Green Garden Place with larger pipes to provide conveyance and subsurface detention capacity. The existing mixed material storm sewer ranges in size from 8" to 15" and can only capture a 2 to 5-year storm event. In the proposed alternative, the existing storm sewer would be replaced with larger reinforced concrete pipes (RCP) ranging in size from 18" to 36" in diameter. All manhole structures would be replaced, and restrictor structures would be installed to delay the release of the water into downstream storm sewer. The proposed storm sewer line connecting Node 30 to

Node 124 is directed to the North System storm sewer as to not increase the flows to the South System that outlet towards the residence with potential flooding issues on the north side of Oak Avenue.

In addition to replacing the storm sewer along Fairmont Avenue, increasing the pipe size of the storm sewer along Brassel Street that feeds into the Oak Avenue storm sewer is proposed. The proposed storm sewer will increase from an 21" to 48" diameter pipe. The replacement of this storm sewer line is important because the model shows overtopping from the eastern depressions along Brassel Street at the intersections of Fairmont Avenue and Dellwood Avenue as the 21" pipe does not have adequate capacity.

All manhole structures are to be replaced, and the last structure in each of the lines will have a restrictor structure to delay the release of the water into downstream storm sewer. Restrictors are proposed at the connection points to ensure the proposed release rate does not significantly exceed the existing flow rate, as shown in Table 4 below.

Table 4. Comparison of Release Rates to Outlet under IL Route 171 for Alternative 1A

	10-Year Event		50-Year Event	
	Existing	Proposed	Existing	Proposed
North System	85.83 cfs	89.6 cfs	117.72 cfs	126.0 cfs
South System	67.58 cfs	66.7 cfs	109.27 cfs	106.95 cfs
Total	153.41 cfs	156.3 cfs	226.99 cfs	232.95 cfs

The proposed storm sewers were modeled using XPSWMM to determine their capacity. Tables 5 and 6 below, along with Exhibit 8, illustrate the storm capacity of the Alternative 1A system:

Table 5. North System – Alternative 1A Storm Sewer Capacity

Node #	Location	Storm Sewer Capacity
33	Flared End Section at Barrett Street & South Avenue	> 10-YR to 50-YR
34	Barrett Street Mainline	> 100-YR
35	Barrett Street Mainline	> 100-YR
36	Barrett Street Mainline	> 100-YR
37	Barrett Street & Dellwood Avenue	> 100-YR
38	Dellwood Avenue Mainline	> 100-YR
39	Dellwood Avenue Mainline	> 100-YR

Table 6. South System – Alternative 1A Storm Sewer Capacity

Node #	Location	Storm Sewer Capacity
Oak Avenue Storm Sewer		
20	Brassel Street	> 10-YR to 50-YR
21	Brassel Street	> 10-YR to 50-YR
84	Brassel Street & Oak Avenue	> 50-YR to 100-YR
22	Oak Avenue Mainline	> 100-YR
24	Oak Avenue Mainline	> 100-YR
66	Oak Avenue & May Street	> 10-YR to 50-YR
25	Oak Avenue Mainline	> 100-YR
26	Oak Avenue Mainline	> 100-YR
27	Oak Avenue Mainline	> 100-YR
86	Oak Avenue Mainline	> 100-YR
Fairmont Avenue / Green Garden Place Storm Sewer		
30 to 31	Fairmont Avenue & Barrett Street	> 10-YR to 50-YR
100	Fairmont Avenue	> 10-YR to 50-YR
101	Fairmont Avenue	> 50-YR to 100-YR
103	Fairmont Avenue & Green Garden Place	> 100-YR
108	Green Garden Place	> 10-YR to 50-YR
125	Green Garden Place	> 10-YR to 50-YR

Localized flooding on North Avenue, in particular on the eastern end of the street, was identified by the flood survey respondents. The eastern 250' of the roadway is a flat area with some small depressions, creating standing water during rain events. To the west of this depression, the road slopes down at approximately 1.5% to 2% towards the intersection of May Street. A more detailed survey and engineering plan will be needed to present a solution for this area, but it appears feasible to implement one of the localized ponding solutions discussed earlier. For the purposes of developing a feasibility level estimate construction cost, it is assumed that ditches could be constructed on both sides of the ditch and 15" diameter culverts installed under the driveways.

The concept design of Alternative 1A is included in Exhibit 8. The detailed XP-SWMM analysis and output are included in Appendix C.

The feasibility level estimated construction cost for Alternative 1A is $1,069,370 and is included in Exhibit 11.

Alternative 1B:

10-Year Storm Event Protection – Storm Sewer and Detention

Alternative 1B, as shown in Exhibit 9, provides a level of protection for up to the 10-year storm event utilizing detention and the construction of new storm sewer and reconstruction of existing storm sewer. This alternative consists of replacing the existing storm sewer networks along Fairmont Avenue and Green Garden Place with larger pipes to provide conveyance and subsurface detention capacity. The existing mixed material storm sewer ranges in size from 8" to 15" and can only capture a 2 to 5-year storm event. In the proposed alternative, the existing storm sewer would be replaced with larger reinforced concrete pipes (RCP) ranging in size from 18" to 30" in diameter. All manhole structures would be replaced, and restrictor structures would be installed to delay the release of the water into downstream storm sewer. The proposed 18" storm sewer is smaller than that proposed in Alternative 1A, and in order to maintain the existing downstream flow rate, a restricted detention pond is proposed north of South Avenue. The detention would be adjacent to the existing creek allowing the creek to overflow into the pond and be discharged to the Barrett Street storm sewer via a restrictor structure. A volume of 1 acre-ft would be required. The proposed storm sewer line connecting Node 30 to Node 124 is directed to the North System storm sewer as to not increase the flows to the South System that outlet towards the residence with potential flooding issues on the north side of Oak Avenue.

This alternative also proposes a restricted release detention pond on the east side of Brassel Street, encompassing the areas of an existing agricultural field, a large residential backyard, and a recently vacated blighted property. Approximately 4 acre-ft of detention volume would be required and would eliminate the need to upsize the storm sewer on Brassel Street as shown in Alternative 1A. If portions of these properties are not available to construct a basin on the east side of Brassel, it is possible to distribute some of the detention volume to vacant lots on Fairmont Avenue, Dellwood Avenue, and Nobes Avenue to the west of May Street. This alternative reduces the flow tributary to the cross culvert under Nobes Avenue at Node 44, resulting in increased capacity to the >100-year storm event at this location. The proposed release rate for the system does not significantly exceed the existing flow rate, as shown in Table 7 below.

Table 7. Comparison of Release Rates to Outlet under IL Route 171 for Alternative 1B

	10-Year Event		50-Year Event	
	Existing	Proposed	Existing	Proposed
North System	85.83 cfs	83.5 cfs	117.72 cfs	121.33 cfs
South System	67.58 cfs	66.7 cfs	109.27 cfs	109.11 cfs
Total	153.41 cfs	150.20 cfs	226.99 cfs	230.44 cfs

The proposed storm sewers were modeled using XP-SWMM to determine their capacity. Tables 8 and 9 below illustrate the storm capacity of the Alternative 1B system:

Table 8. North System – Alternative 1B Storm Sewer Capacity

Node #	Location	Storm Sewer Capacity
33	Flared End Section at Barrett Street & South Avenue	> 10-YR to 50-YR
34	Barrett Street Mainline	> 100-YR
35	Barrett Street Mainline	> 100-YR
36	Barrett Street Mainline	> 100-YR
37	Barrett Street & Dellwood Avenue	> 100-YR
38	Dellwood Avenue Mainline	> 100-YR
39	Dellwood Avenue Mainline	> 100-YR

Table 9. South System – Alternative 1B Storm Sewer Capacity

Node #	Location	Storm Sewer Capacity
Oak Avenue Storm Sewer		
20	Brassel Street	> 10-YR to 50-YR
21	Brassel Street	> 10-YR to 50-YR
84	Brassel Street & Oak Avenue	> 100-YR
22	Oak Avenue Mainline	> 100-YR
24	Oak Avenue Mainline	> 100-YR
66	Oak Avenue & May Street	> 10-YR to 50-YR
25	Oak Avenue Mainline	> 100-YR
26	Oak Avenue Mainline	> 100-YR
27	Oak Avenue Mainline	> 100-YR
86	Oak Avenue Mainline	> 100-YR
Fairmont Avenue / Green Garden Place Storm Sewer		
30 to 31	Fairmont Avenue & Barrett Street	> 10-YR to 50-YR
100	Fairmont Avenue	> 10-YR to 50-YR
101	Fairmont Avenue	> 50-YR to 100-YR
103	Fairmont Avenue & Green Garden Place	> 100-YR
108	Green Garden Place	> 10-YR to 50-YR
125	Green Garden Place	> 10-YR to 50-YR

Localized flooding on North Avenue, in particular on the eastern end of the street, was identified by the flood survey respondents. The eastern 250' of the roadway is a flat area with some small depressions, creating standing water during rain events. To the west of this depression, the road slopes down at approximately 1.5% to 2% towards the intersection of May Street. A more detailed survey and engineering plan will be needed to present a solution for this area, but it appears feasible to implement one of the localized ponding solutions discussed earlier. For the purposes of developing a feasibility level estimate construction cost, it is assumed that ditches could be constructed on both sides of the ditch and 15" diameter culverts installed under the driveways.

The concept design of Alternative 1B is included in Exhibit 9. The detailed XPSWMM analysis and output are included in Appendix C.

The feasibility level estimated construction cost for Alternative 1B is $1,400,135 and is included in Exhibit 12.

Alternative 2:

50-Year Storm Event Protection

Alternative 2 proposes to increase the level of protection to the 50-year storm event utilizing detention and the construction of new storm sewer and reconstruction of existing storm sewer. This alternative consists of replacing the existing storm sewer networks along Fairmont Avenue and Green Garden Place with larger pipes to provide conveyance and subsurface detention capacity. The existing mixed material storm sewer ranges in size from 8" to 15" and can only capture a 2 to 5-year storm event. In the proposed alternative, the existing storm sewer would be replaced with larger, 36" diameter reinforced concrete pipes. All manhole structures would be replaced, and restrictor structures would be installed to delay the release of the water into downstream storm sewer. A restricted detention pond of approximately 4 acre-feet is also proposed on the north of South Avenue. The detention would be adjacent to the existing creek allowing the creek to overflow into the pond and be discharged to the Barrett Street storm sewer via a restrictor structure. The proposed detention volume could also be partially located on the east side of Green Garden Place along the creek. The proposed storm sewer line connecting Node 30 to Node 124 is directed to the North System storm sewer as to not increase the flows to the South System that outlet towards the residence with potential flooding issues on the north side of Oak Avenue.

This alternative also proposes a restricted release detention pond on the east side of Brassel Street, encompassing the areas of an existing agricultural field, a large residential backyard, and a recently vacated blighted property. Approximately 4 acre-ft of detention volume would be required. If portions of these properties are not available to construct a basin on the east side of Brassel, it is possible to distribute some of the detention volume to vacant lots on Fairmont Avenue, Dellwood Avenue, and Nobes Avenue to the west of May Street. Newly constructed storm sewer lines are also proposed throughout the Project Site. A new 36" diameter storm sewer line would be constructed on Fairmont Avenue and tie into the Oak Avenue storm sewer

via Green Garden Place. Another series of 24" to 36" diameter storm sewers are proposed on Dellwood Avenue and Nobes Avenue and drain to an outlet and newly graded ditch to provide positive slope to the drainage channel. The proposed release rate for the system does not exceed the existing flow rate, as shown in Table 10 below.

Table 10. Comparison of Release Rates to Outlet under IL Rte 171 for Alternative 2

	10-Year Event		50-Year Event	
	Existing	Proposed	Existing	Proposed
System 1 (North)	85.83 cfs	76.19 cfs	117.70 cfs	111.95 cfs
System 2 (South)	67.62 cfs	61.44 cfs	109.27 cfs	109.92 cfs
Total	153.41 cfs	137.64 cfs	226.99 cfs	221.87 cfs

The proposed storm sewers were modeled using XP-SWMM to determine their capacity. Tables 11 and 12 below illustrate the storm capacity of the existing system:

Table 11. North System – Alternative 2 Storm Sewer Capacity

Node #	Location	Storm Sewer Capacity
33	Flared End Section at Barrett Street & South	> 50-YR to 50-YR
34	Barrett Street Mainline	> 100-YR
35	Barrett Street Mainline	> 100-YR
36	Barrett Street Mainline	> 100-YR
37	Barrett Street & Dellwood Avenue	> 100-YR
38	Dellwood Avenue Mainline	> 100-YR
39	Dellwood Avenue Mainline	> 100-YR

Table 12. South System – Alternative 2 Storm Sewer Capacity

Node #	Location	Storm Sewer Capacity
Oak Avenue Storm Sewer		
20	Brassel Street	> 100-YR
21	Brassel Street	> 50-YR to 100-YR
84	Brassel Street & Oak Avenue	> 100-YR
22	Oak Avenue Mainline	> 100-YR
24	Oak Avenue Mainline	> 100-YR
66	Oak Avenue & May Street	> 10-YR to 50-YR
25	Oak Avenue Mainline	> 100-YR
26	Oak Avenue Mainline	> 100-YR
27	Oak Avenue Mainline	> 100-YR
86	Oak Avenue Mainline	> 100-YR
Fairmont Avenue / Green Garden Place Storm Sewer		
30 to 31	Fairmont Avenue & Barrett Street	> 100-YR
100	Fairmont Avenue	> 100-YR
101	Fairmont Avenue	> 100-YR
103	Fairmont Avenue & Green Garden Place	> 100-YR
108	Green Garden Place	> 100-YR
125	Green Garden Place	> 100-YR

The concept design of Alternative 2 is included in Exhibit 10. The detailed XP-SWMM analysis and output are included in Appendix C.

The feasibility level estimated construction cost for Alternative 2 is $3,217,515 and is included in Exhibit 13.

Alternative 3:

Green Infrastructure.

Alternative 3 can provide supplemental runoff storage to Alternatives 1A, 1B, and 2. The construction of rain gardens and other green infrastructure elements will not alone be able to provide the flooding protection levels as presented in these alternatives, but incorporation of green infrastructure could help to downsize or eliminate portions of the grey infrastructure network.

Green infrastructure is a stormwater management approach that emphasizes the minimization of stormwater runoff. As development occurs, the vegetated surfaces that once absorbed the rainfall are converted to impervious roofs, paved streets, and highly compacted soils beneath turf grass. When the rain falls on these impervious surfaces, it cannot be absorbed and washes off quickly, resulting in downstream properties seeing a larger volume of runoff reaching them at a faster rate. Green infrastructure aims to capture, filter, absorb, and reuse stormwater to maintain or mimic natural systems and treat runoff.

Distributed green infrastructure can include rain gardens (Figure 20), rain barrels, permeable pavement, and bioswales that provide detention capacity for smaller storm events. These elements provide a multitude of other benefits as well, such as improved water quality, increased groundwater recharge, reduction of the urban heat island, improved air quality, improved habitat, and numerous improvements to community livability.

Figure 20: Rain Garden Cross Section (photo courtesy of www.aces.edu)

Green infrastructure can be constructed as a standalone project or as a functioning part of a larger traditional grey infrastructure project. It can be implemented on varying scales in numerous locations, including, but not limited to, parkways, residential yards, alleys, vacant lots, and public open space. When determining the potential location of green infrastructure to maximize its effectiveness, the tributary drainage area, permeability of existing soils, existing water table elevation, vegetative growth conditions, and anticipated maintenance activities are a few of the items that must be considered.

With proper planning, the correct green infrastructure elements can potentially be implemented to help provide many community benefits, including the alleviation of flooding associated with small storm events on varying scales in public and private spaces.

Per our site visit, rain gardens and bioswales of varying sizes could be provided to reduce the stormwater runoff to the street from impervious surfaces in this neighborhood, such as rooftops. They could be constructed within the residential lots or some of the parkways if there are no underground utility conflicts. Converting the wide aggregate shoulders along the roadways to bioswales or rain gardens would not only reduce the amount of impervious surface contributing runoff to the flooding, but also provide stormwater storage. If parking in these areas cannot be eliminated, the shoulders could be replaced with permeable pavement to promote infiltration and reduce runoff.

This neighborhood provides a unique opportunity as there are many open lots and blighted properties due to foreclosures and abandonment. As identified in the "Will County Fairmont Neighborhood Plan", the community has expressed an interest in converting vacant lots to parks and community gardens. Green infrastructure elements could be interwoven with parks and community gardens to not only provide a reduction in stormwater runoff, but help improve community livability, improve local aesthetics, and enhance recreational opportunities.

One location that was identified as a potential location for green infrastructure, such as a wetland bottom basin or a series of rain gardens and bioswales, was the open lot at the southeastern corner of Nobes Avenue and Green Garden Place. This property is owned by the Fairmont Elementary School and has the potential to capture runoff from the impervious surfaces of the school roof and the school parking lot. The construction of this basin was not incorporated into the other proposed alternatives as it did not provide enough capacity to decrease the pipe size of the proposed storm sewer, and therefore did not provide a financial benefit. The implementation of green infrastructure on this lot could have many other benefits, such as cultivating public education opportunities and developing community awareness and understanding around the importance of sustainable water resource management.

To use rain gardens for stormwater runoff storage, the USEPA generally recommends the size of the rain garden be 20-30% of the impervious tributary area, with the bed depth of 2.5 feet.

Since the preliminary soil map investigations indicate that the soils have low permeability, we would recommend further soil permeability tests to determine the applicability of rain gardens and other green infrastructure. The costs of constructing a rain garden are approximately $10 per square foot, and the implementation of rain gardens could provide some cost savings compared to underground detention

Other Alternatives Considered

While developing these alternatives, there were some alternatives that were considered but were not explored in depth:

- Construct ditches along Nobes Avenue, Dellwood Avenue, and Fairmont Avenue that would drain the flow from the east towards the west. The flat topography of the Project Site, in combination with the amount of flow that would need to be conveyed in a ditchline, resulted in ditches that were deeper and wider than could fit in the existing street right of way.
- Subsurface detention vaults and other similar structures were not considered as their costs are generally higher than using oversized storm sewer and surface detention. This alternative could be considered if land for surface detention is not available or if there are unforeseen utility conflicts that restrict the potential storm sewer locations and sizes.
- Detention in the existing depressions adjacent to the release box culverts at the intersection of IL Route 171 and Fairmont Avenue was not considered for this study because providing detention near Brassel Street or South Avenue allowed the conveyance pipes to be smaller and more economically feasible. Detention in this area is possible, and it would be recommended that if used in the future, the area be analyzed for pollutants and contaminants prior to any excavation or improvements.

Conclusions and Recommendations

Based on the analyses presented herein, Alternatives 1A and 1B will provide a level of protection for at least the 10-year storm event, while Alternative 2 will provide a level of protection for at least the 50-year storm event. The table below summarizes the analysis in this report:

Alternative	Proposed Improvements	Level of Protection	Cost
1A	Storm Sewer and Ditches	For at least the 10-year storm event	$ 1,069,370
1B	Storm Sewer, Ditches, and Surface Detention	For at least the 10-year storm event	$ 1,400,135
2	Storm Sewer, Ditches, and Surface Detention	For at least the 50-year storm event	$ 3,271,465

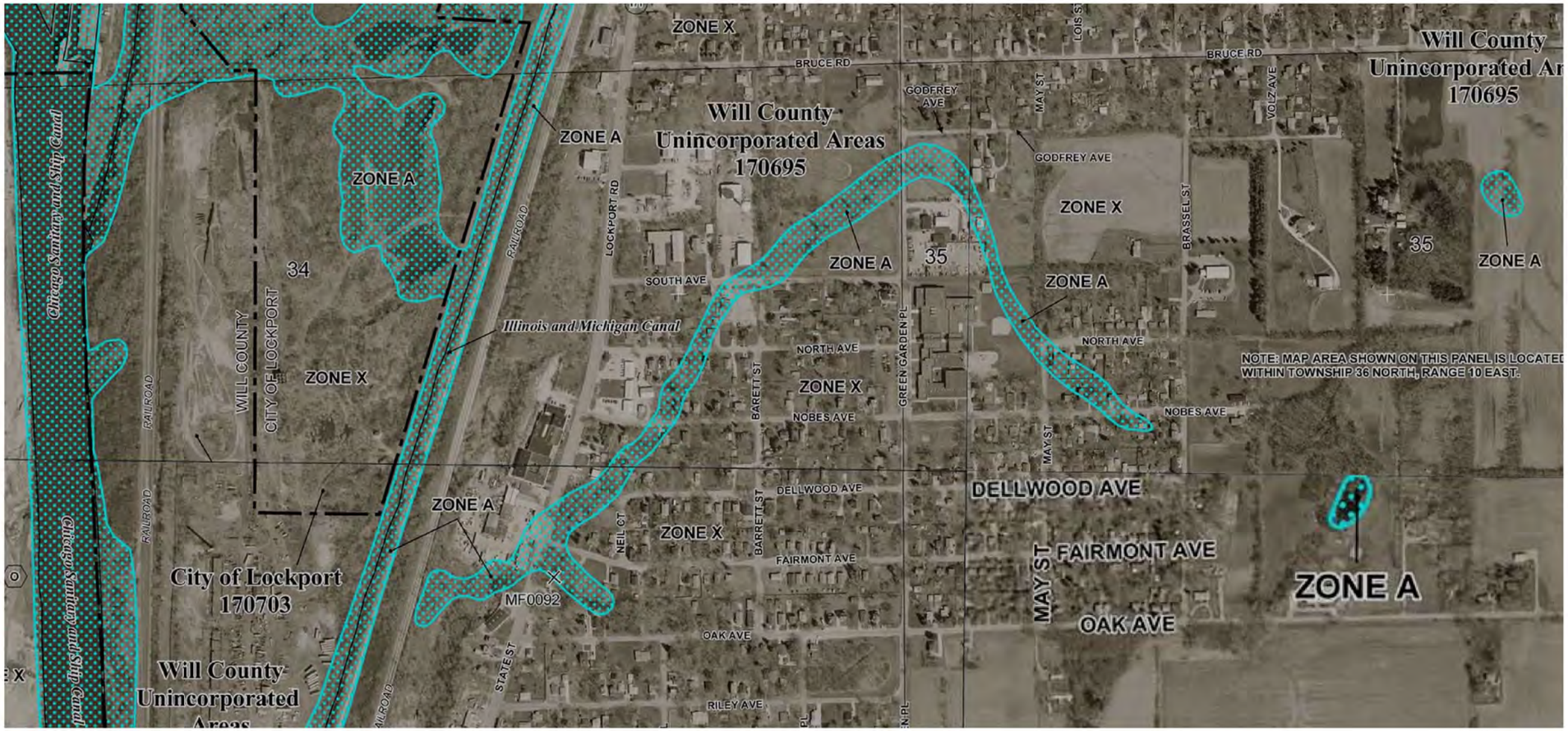
Based on the analysis presented in this report, the following recommendations are provided:

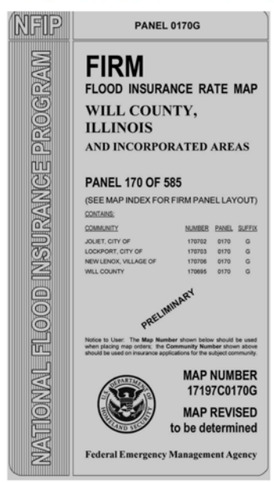
1. Maintenance of existing and proposed infrastructure is essential to conveyance of stormwater runoff.
2. Alternative 1A is the most economical alternative as it provides the lowest cost for protection up to at least the 10-year storm event.
3. Rain gardens and other green infrastructure should be considered to reduce the required runoff storage and to improve the system capacity. To determine the potential sizes of rain gardens, a soil investigation study with field soil permeability tests are recommended.
4. Low cost recommended improvements can be implemented to help improve conveyance and capacity, such as improving ditches, maintaining existing storm sewer lines, and reducing impervious areas.

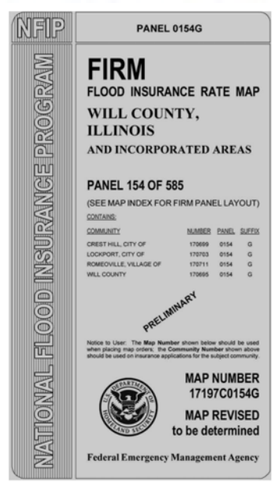
EXHIBITS

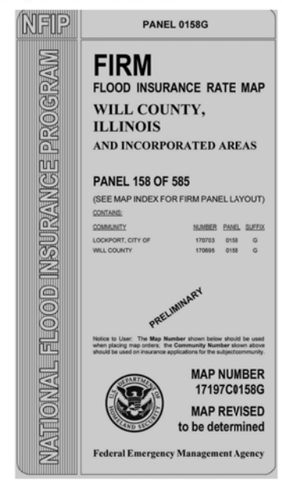
FILE NAME = N:\PROJ\0020242.01\Drainage\Exhibits\Existing\0020242.01 SiteLocationMap.dgn

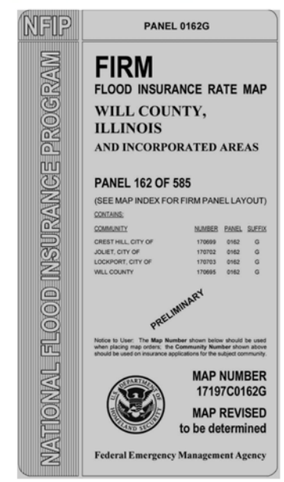
Ciorba Group, Inc. CONSULTING ENGINEERS 5507 North Cumberland Avenue, Suite 402 Chicago, Illinois 60656 Tel. 773.775.4009 Fax 773.775.4014	USER NAME = adow	DESIGNED - JM	REVISED -	WILL COUNTY	FAIRMONT FLOOD STUDY EXHIBIT 1 – PROJECT SITE AND STUDY AREA	SECTION	COUNTY	TOTAL SHEETS / SHEET NO.
		DRAWN - AMD	REVISED -				WILL	13 / 1
	PLOT SCALE = 500.0000 ' /	CHECKED - TW	REVISED -				CONTRACT NO. 200242	
	PLOT DATE = 4/7/2015	DATE - 4/1/2015	REVISED -		SCALE: SHEET OF SHEETS STA. TO STA.		ILLINOIS	











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Ciorba Group, Inc. CONSULTING ENGINEERS 5507 North Cumberland Avenue, Suite 402 Chicago, Illinois 60656 Tel 773.775.4006 Fax 773.775.4014	USER NAME = adam	DESIGNED - JM	REVISED -	WILL COUNTY	FAIRMONT FLOOD STUDY EXHIBIT 2 – FIRM MAP	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		DRAWN - AMD	REVISED -				WILL	13	2
	PLOT SCALE = 0.2000 ' / in.	CHECKED - TW	REVISED -				CONTRACT NO. 200242		
	PLOT DATE = 4/7/2015	DATE - 4/1/2015	REVISED -		SCALE: SHEET OF SHEETS STA. TO STA.		ILLINOIS		

Soil Map—Will County, Illinois
(Fairmont Community)

Map Scale: 1:8,140 if printed on B landscape (17" x 11") sheet.

N

Meters
0 100 200 400 600

Feet
0 350 700 1400 2100

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

Fairmont Flood Study
Exhibit 3 -Soils Map

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Will County, Illinois
Survey Area Data: Version 9, Sep 13, 2014

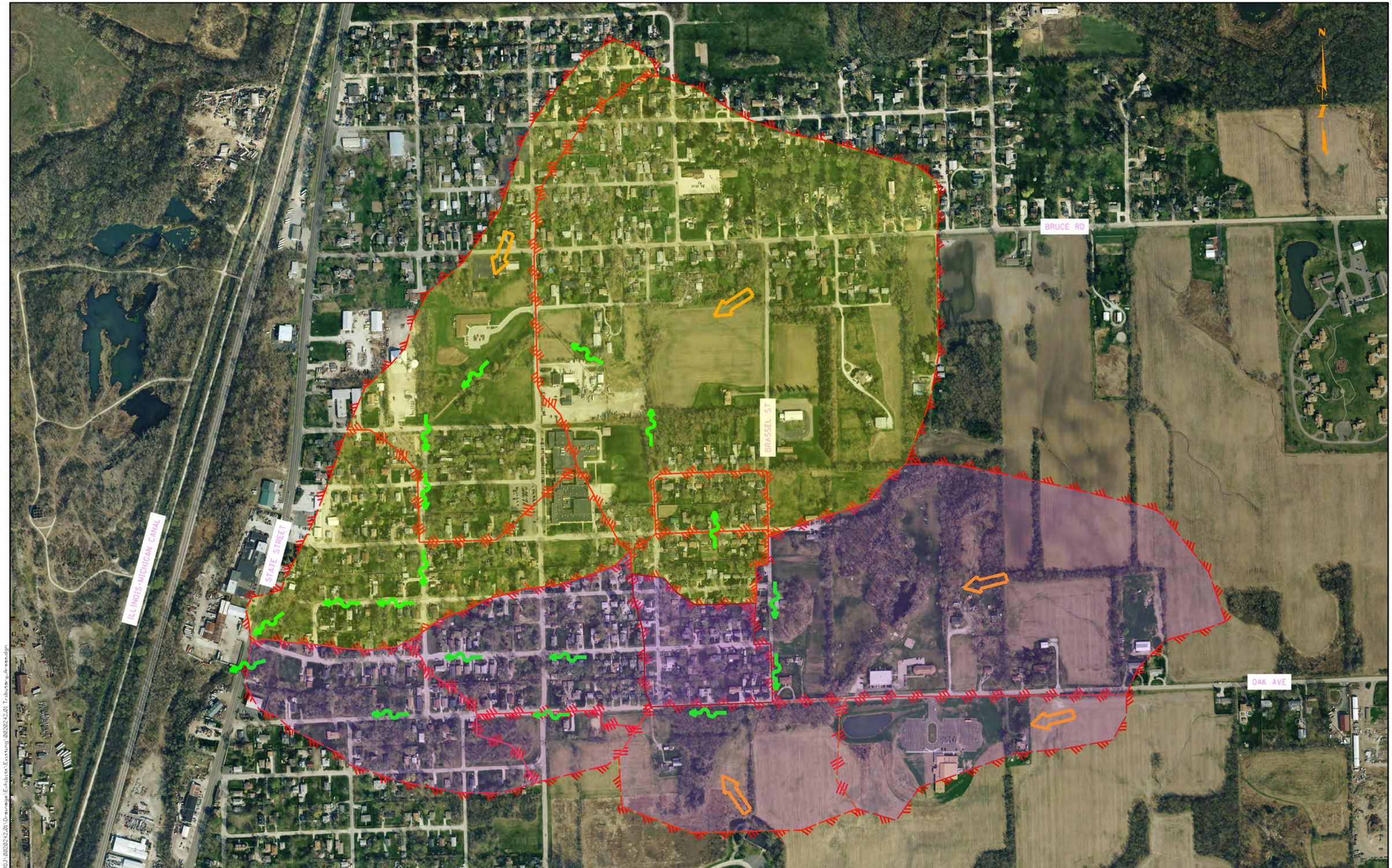
Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 13, 2011—Mar 28, 2012

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Will County, Illinois (IL197)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
23A	Blount silt loam, Lake Michigan Lobe, 0 to 2 percent slopes	21.1	6.2%
23B	Blount silt loam, 2 to 4 percent slopes	177.0	51.7%
232A	Ashkum silty clay loam, 0 to 2 percent slopes	88.8	25.9%
330A	Peotone silty clay loam, 0 to 2 percent slopes	6.4	1.9%
530C2	Ozaukee silt loam, 4 to 6 percent slopes, eroded	37.4	10.9%
530D2	Ozaukee silt loam, 6 to 12 percent slopes, eroded	5.7	1.7%
530E2	Ozaukee silt loam, 12 to 20 percent slopes, eroded	6.1	1.8%
Totals for Area of Interest		**342.6**	**100.0%**



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USER NAME = adow	DESIGNED - JM	REVISED -	
	DRAWN - AMD	REVISED -	
PLOT SCALE = 500.0000 ' /	CHECKED - TW	REVISED -	
PLOT DATE = 4/7/2015	DATE - 4/1/2015	REVISED -	

WILL COUNTY

FAIRMONT FLOOD STUDY
EXHIBIT 4 – EXISTING TRIBUTARY AREAS AND FLOW PATHS

SCALE: SHEET OF SHEETS STA. TO STA.

SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
	WILL	13	4
	CONTRACT NO. 200242		
	ILLINOIS		

Contact Info

This survey may be submitted anonymously, however if you provide us with your name and contact information below we will have the ability to follow up with you to learn more about your ideas or concerns (optional):

Answer Options	Response Percent	Response Count
Name	88.2%	15
Address	100.0%	17
Email Address	29.4%	5
Phone Number	64.7%	11

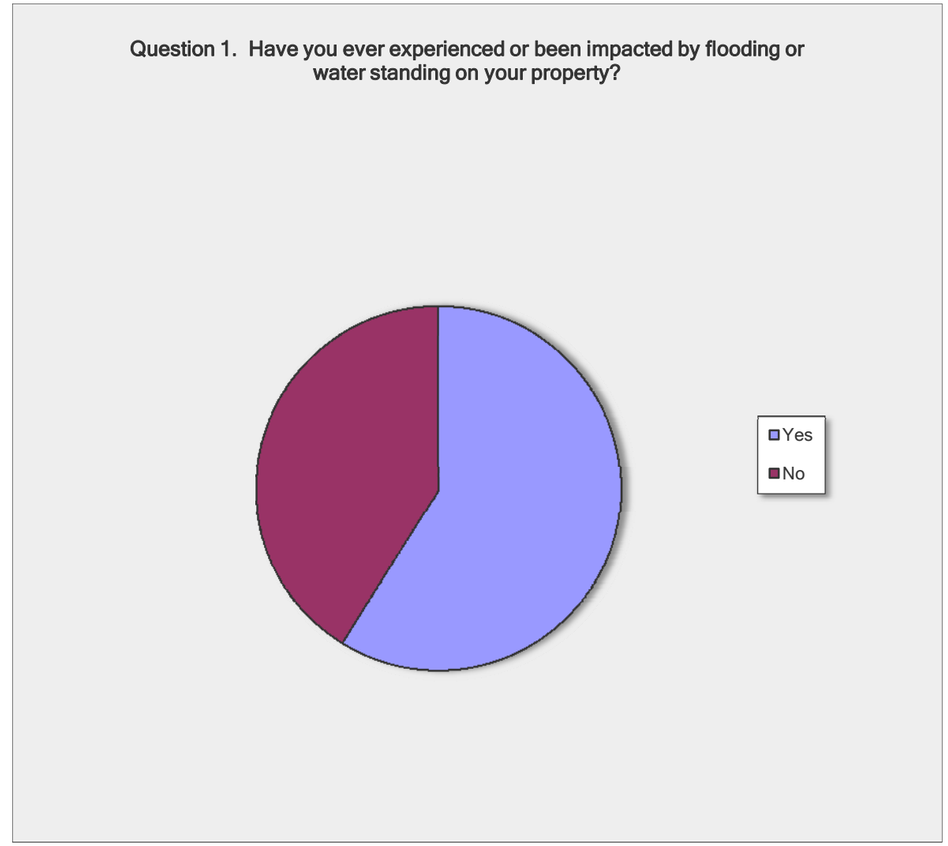
Number	Name	Address	Email Address
1		423 Oak Avenue	
2		306 Fairmont Avenue	
3		308 Bruce Road	
4		311 Fairmont Avenue	
5		312 Godfrey Avenue	
6		319 Fairmont Avenue	
7		323 Dellwood Avenue	
8		405 Nobes Avenue	
9		413 North Avenue	
10		416 North Avenue	
11		419 North Avenue	
12		420 Nobes Avenue	
13		421 Fairmont Avenue	
14		519 W. Oak Avenue	
15		Anonymous	
16		Anonymous	
17		311 Godfrey Avenue	
17	**15**	**17**	**5**	**11**	**= Number of Responses**

Fairmont Flood Study
Exhibit 5 -Survey Results

Question 1

Have you ever experienced or been impacted by flooding or water standing on your property?		
Answer Options	Response Percent	Response Count
Yes	58.8%	10
No	41.2%	7

Number	Yes	No	
1	x		
2		x	
3		x	
4	x		
5		x	
6	x		
7	x		
8		x	
9	x		
10	x		
11	x		
12		x	
13	x		
14	x		
15		x	
16	x		
17		x	
17	**10**	**7**	**= Number of Responses**



Question 1a

If "Yes" to Question 1:		
Answer Options	Response Percent	Response Count
What is the location?	58.8%	10
How often does it occur?	58.8%	10
What time of year does is occur?	52.9%	9
Does the flooding occur during certain rainfall events ?	58.8%	10
How long does it take for the water to drain?	35.3%	6
Are there any visible causes for flooding on your property?	35.3%	6
Do you have any pictures or documentation you could share with us?	35.3%	6
Are there any other details or information you can provide about flooding on your property?	17.6%	3

Question 1a

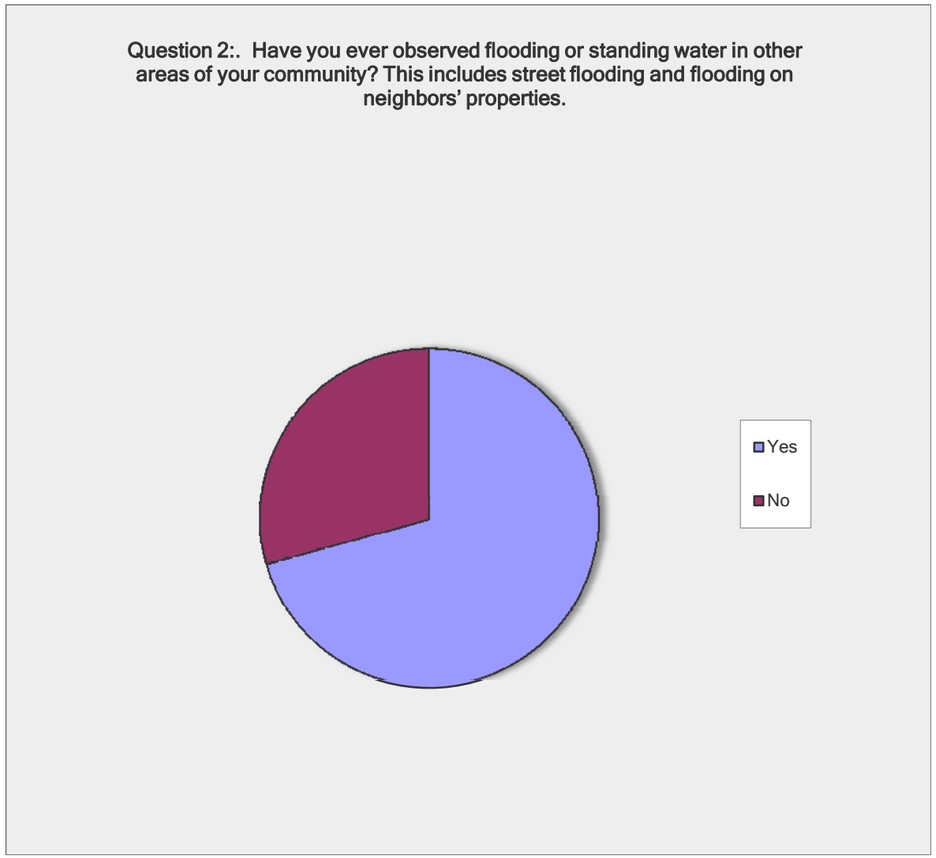
Survey Number	What is the location?	How often does it occur?	What time of year does is occur?	Does the flooding occur during certain rainfall events?	How long does it take for the water to drain?	Are there any visible causes for flooding on your property?	Do you have any pictures or documentation you could share with us?	Are there any other details or information you can provide about flooding on your property?
1	May Street & Oak Avenue	Not for like 20 years	Before new drainage system was put in	Yes	A few days	Not sure	No	
2								
3								
4	Block of Fairmont & May	Heavy rain, melting snow	Winter, fall	Yes - heavy rain	1-3 days	Yard (front & back) low spots	Maybe	Don't know where it should drain to
5								
6	Fairmont Avenue, and May Street	When it rains 1/2" or more	Rainy Season	Yes				
7	By driveway, in yard in some places	Every time a huge rain occurs, or after large amounts of snowmelts	Seasonal	Yes	Not sure	Yes: front yard low spot	No	No
8								
9	In middle of back yard	Every big rain	Spring	Yes	Couple of days	Yes: low spot, dead grass	Yes: will send.	Leaking around foundation
10	Front side of the house, yard & sidewalk, and street	When it rains 1/2" or more		Yes				
11	Behind the house, the whole yard is flooded	Every time when it rains	It doesn't matter what time of the year every time WHEN RAINS!	After 2 hours raining the water is standing!	If it is summy 2 days, if it is cold 4-5 days	not sure	More than welcome to come over after rainy day and see it yourself	
12								
13	In front of the house on Fairmont and on the side of the house on Brassel	Whenever it rains a lot (heavy)	Spring and Summer	Each time it rains a lot, over 1" or more, we get standing water in front of the house	1-2 days depending on how much	not sure	No	
14	W. Oak Avenue & Brassel	Every time we get heavy rain	Early summer & when snow melt	Not all the time				
15								
16	Driveway between 407 & 409 North Avenue	When it rains	Summer & Fall	Yes				
17								
17	**10**	**10**	**9**	**10**	**6**	**6**	**6**	**3**

Question 2

Have you ever observed flooding or standing water in other areas of your community? This includes street flooding and flooding on neighbors' properties.

Answer Options	Response Percent	Response Count
Yes	70.6%	12
No	29.4%	5

Number	Yes	No	
1	x		
2		x	
3		x	
4	x		
5		x	
6	x		
7		x	
8	x		
9	x		
10	x		
11		x	
12	x		
13	x		
14	x		
15	x		
16	x		
17	x		
17	**12**	**5**	**= Number of Responses**



Question 2a

If "Yes" to Question 2:		
Answer Options	Response Percent	Response Count
What is the location? A map has been provided on the first page for your reference.	64.7%	11
How often does it occur?	64.7%	11
What time of year does is occur?	58.8%	10
Does the flooding occur during certain rainfall events?	58.8%	10
How long does it take for the water to drain?	58.8%	10
Are there any visible causes for flooding ?	64.7%	11
Do you have any pictures or documentation you could share with us?	29.4%	5
Are there any other details or information you can provide about flooding in your neighborhood? Please list below:	23.5%	4

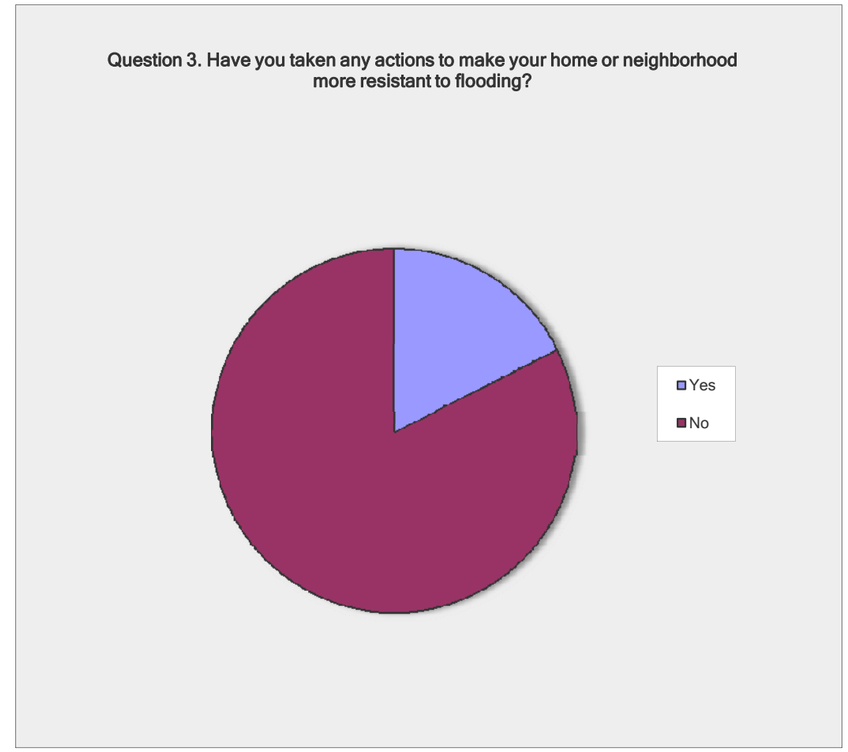
Question 2a

Number	What is the location? A map has been provided on the first page for your reference.	How often does it occur?	What time of year does is occur?	Does the flooding occur during certain rainfall events ?	How long does it take for the water to drain?	Are there any visible causes for flooding?	Do you have any pictures or documentation you could share with us?	Are there any other details or information you can provide about flooding in your neighborhood? Please list below:
1	May & Oak Avenue	It's been over 20 years	Summer	Yes	A few days	Not sure	No	No
2								
3								
4	Fairmont & S. State Street		Fall, winter	Heavy rain	Few Hours	Blocked culvert	Not sure of this area	It doesn't flow out, standing water
5								
6		When it rains 2" or more	Rainy season	Yes	2 days	Yes: no culvert, no drains, ditch		
7								
8	Open fields on east of Brassel & Delwood to the south to Oak	With heavy rains for week or so	This can occur any time when heavy rain is steady. It doesn't happen too often.	Yes	All depend on rain stop or slow down - if the heavy rain stop over night, then it clear up in 2-4 hour.	Heavy water from the field is routed to the drain system on Brassel via Oak Avenue.		Mr. Steven: This is a slap in the face for me, you guys have pictures. The consultant has study the area. Most of the people plus engineer know this. I don't know what you are looking for.
9	Middle of back yard and around foundation	Every rain 1" or more	Spring	Yes	Couple of days	Yes		
10	Across the street from my house and down the block in both directions	Every time it rains		Always when it rains	A day to several days	No	No	
11								
12	Across from Delwood & Brassel on open fields + existing drain system	3 days on week of rain	Does not matter - during any season of days a week heavy rain		If rains stop, a matter of overnight or few hours	Open fields & streets have been (?) built up too high.		
13	Brassel and Fairmont Streets	Whenever it rains heavy	Spring and Summer	Each time it rains heavy	1-2 days	No	No	
14	Fairmont Ave in back	Early summer & when all the snow melts	March and April	Sometimes but not all the time	Depends how hard it rains	Man on Brassel on corner of Oak Ave, that run off his land		
15	Green Garden St near Bery Avenue; Route 171 near the viaduct	Every time it rains	Spring and Fall	Each time it rains	Not sure, maybe the next day	Maybe a low spot	No	No
16	On Brassel across from North Ave	Yes	Summer to Fall, some spring					
17	Lots on SE corner of Green Garden Pl & Godfrey	Any measurable rain accumulation		? Maybe an inch or more?		Low, unoccupied lots		
17	**11**	**11**	**10**	**10**	**10**	**11**	**5**	**4**

Question 3

Have you taken any actions to make your home or neighborhood more resistant to flooding?		
Answer Options	**Response Percent**	**Response Count**
Yes	17.6%	3
No	82.4%	14
If "Yes", please specify how:		4

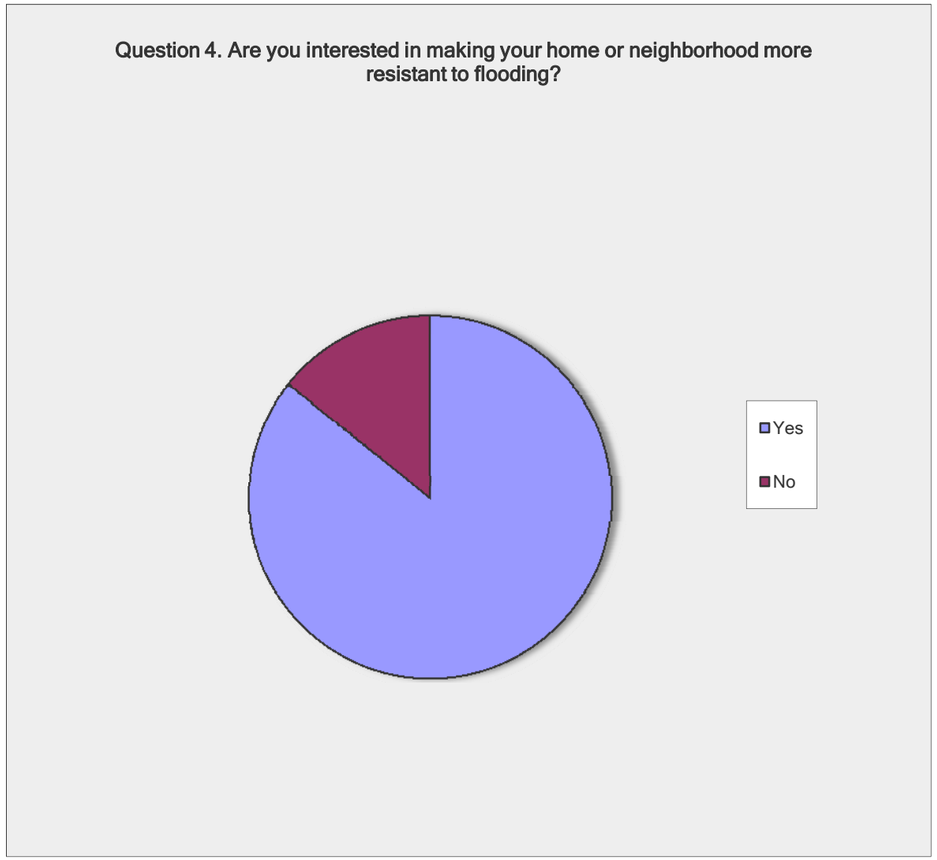
Number	Yes	No	If "Yes", please specify how:
1	x		checked area surrounding house patched/sealed up where needed
2		x	
3		x	
4	x		Pump in basement
5		x	
6		x	
7		x	
8		x	
9		x	
10		x	(just moved here)
11		x	
12	x		Streets (Brassel) elevation has been built up higher than part of property lot
13		x	
14		x	
15		x	
16		x	
17		x	
17	**3**	**14**	**4** = Number of Responses



Question 4

Are you interested in making your home or neighborhood more resistant to flooding?		
Answer Options	**Response Percent**	**Response Count**
Yes	70.6%	12
No	11.8%	2

Number	Yes	No	
1	x		
2	x		
3		x	
4	x		
5		x	
6	x		
7	x		
8	x		
9	x		
10	x		
11	x		
12	x		
13	x		
14			
15	x		
16			
17			
17	**12**	**2**	**= Number of Responses**



Question 5

In your opinion, what are some steps your local government could take to reduce the risk of flooding damages in your neighborhood?

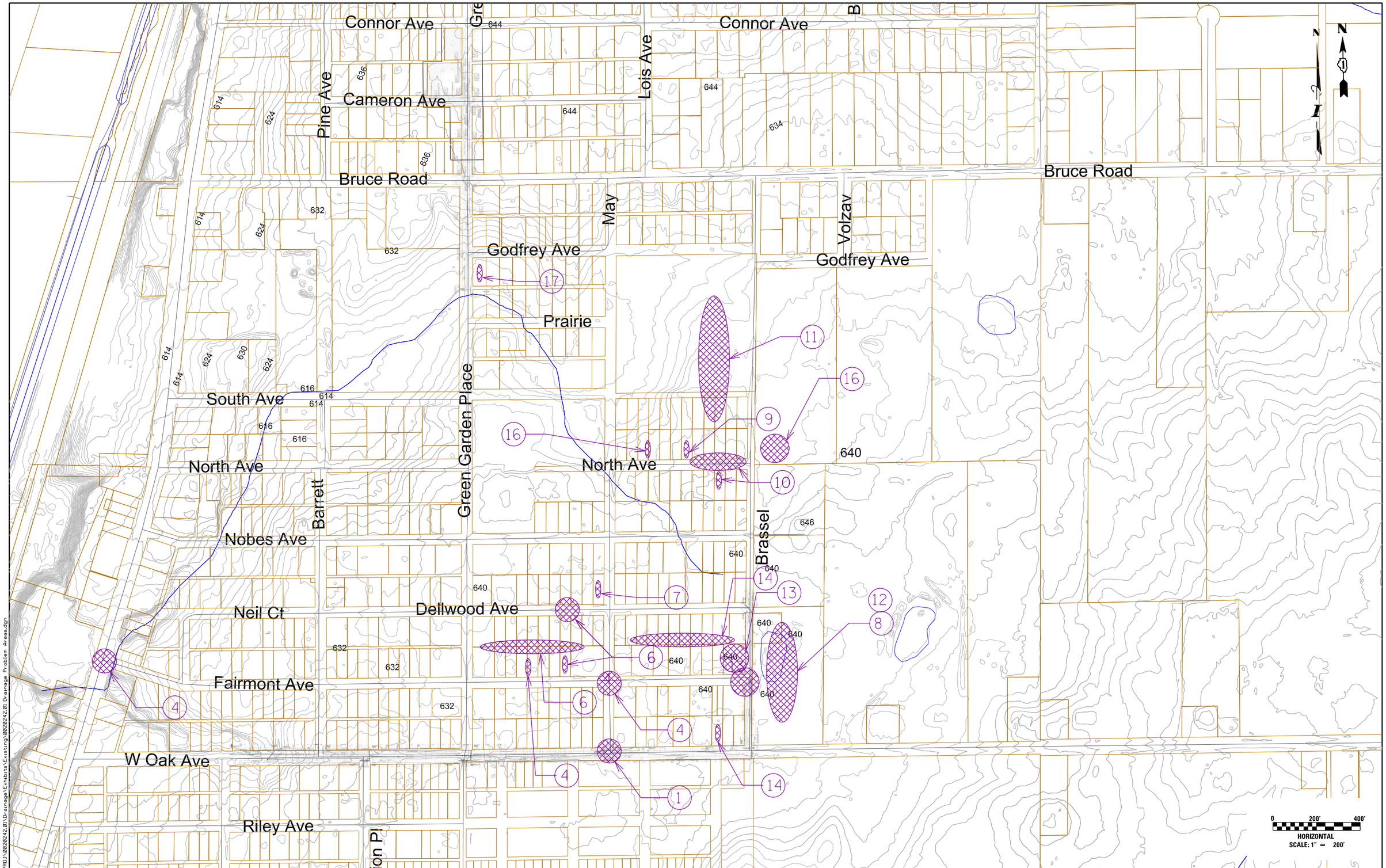
Answer Options	Response Count
	8

Number	Response Text
1	At this point leave well enough alone because it's been a while since I experienced flooding.
2	Organize a " green up" day every so often, encouraging members of the community to clean up trash on the roads and in yards to help keep it from getting into and clogging drainage pipes. Not to mention all the other reasons to clean up litter :)
3	
4	
5	Keep floodplain and culverts free of obstruction. Carefully review proposed construction plans with respect to storm water management.
6	Make drain ditch on both sides of street.
7	Not sure
8	In the early 70's this problem did not exist. The streets was all elevated below people home property lots.
9	
10	
11	The answer for that call (630) 696-5351
12	Stop increase of streets high (layers of 4" Blacktop) need to bring level down. *During the 70's there were no water problems.
13	
14	
15	
16	
17	
17	**8** = Number of Responses

Question 6

What is the most effective way for you to receive information about how to make your home and neighborhood more resistant to hazards?		
Answer Options	Response Percent	Response Count
Newspaper	0.0%	4
Television	0.0%	3
Radio	0.0%	1
Internet	0.0%	2
Mail	100.0%	9
Public Workshops	100.0%	3
School	0.0%	1
Meetings	50.0%	1
Other (please specify)	50.0%	2

Number	Newspaper	Television	Radio	Internet	Mail	Public Workshops	School	Meetings	Other (please specify)	
1					x	x			Email	
2					x	x				
3				x						
4					x					
5	x									
6	x									
7					x					
8										
9	x				x					
10		x								
11		x		x	x				Call (630) 696-5351	
12					x					
13					x					
14										
15	x	x	x		x	x	x	x		
16										
17										
17	**4**	**3**	**1**	**2**	**9**	**3**	**1**	**1**	**2**	**= Number of Responses**



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Ciorba Group, Inc.
CONSULTING ENGINEERS
5507 North Cumberland Avenue, Suite 402
Chicago, Illinois 60656
Tel. 773.775.4009 Fax 773.775.4014

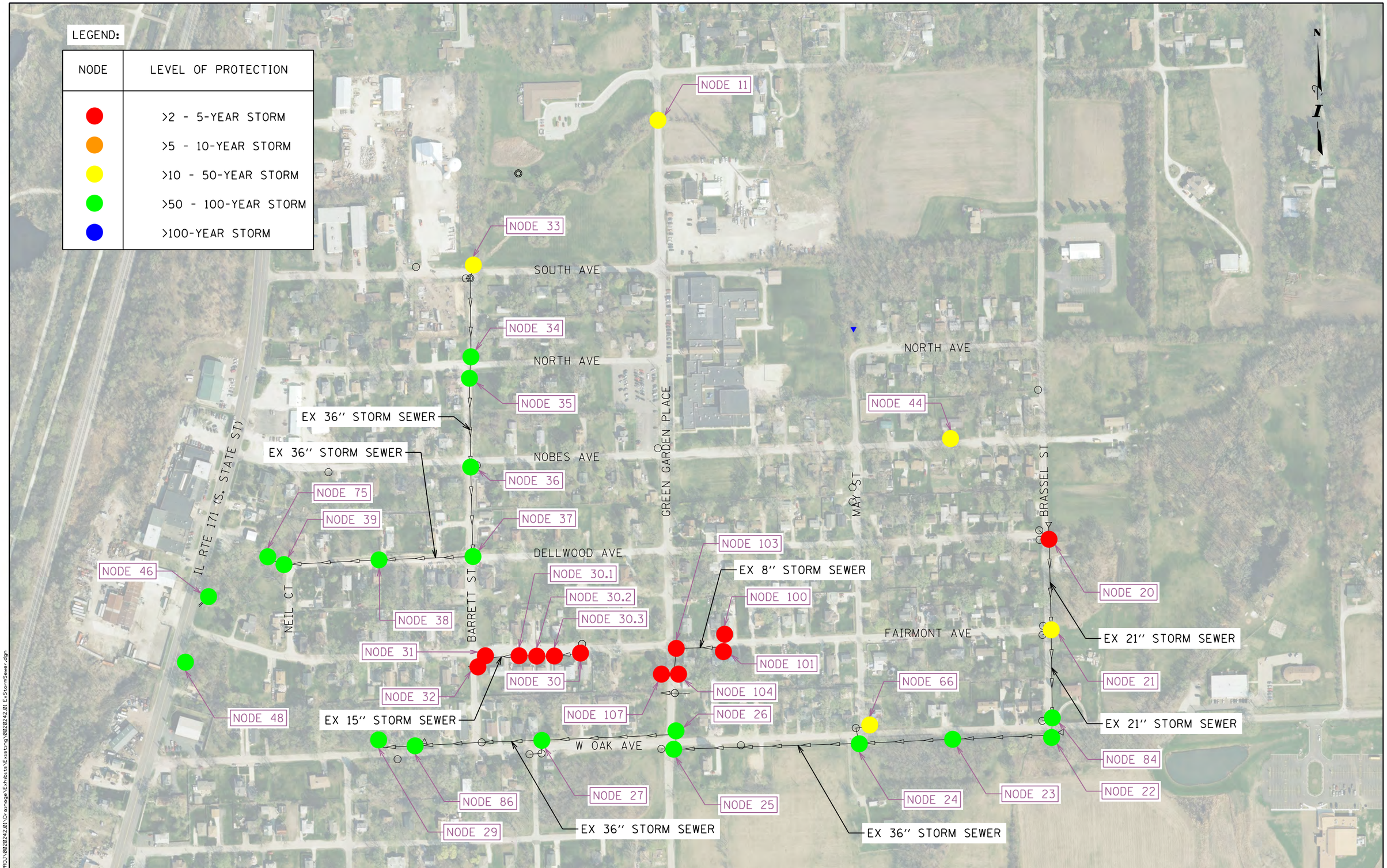
USER NAME = adow	DESIGNED - JM	REVISED -
	DRAWN - AMD	REVISED -
PLOT SCALE = 400.0000 ' /	CHECKED - TW	REVISED -
PLOT DATE = 4/7/2015	DATE - 4/1/2015	REVISED -

WILL COUNTY

FAIRMONT FLOOD STUDY
EXHIBIT 6 – IDENTIFIED DRAINAGE FLOODING AREAS

SCALE: | SHEET OF SHEETS | STA. TO STA.

SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
	WILL	13	6
	CONTRACT NO. 200242		
	ILLINOIS		



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Ciorba Group, Inc. CONSULTING ENGINEERS 5507 North Cumberland Avenue, Suite 402 Chicago, Illinois 60656 Tel. 773.775.4009 Fax 773.775.4014	USER NAME = adow	DESIGNED - JM	REVISED -	WILL COUNTY	FAIRMONT FLOOD STUDY EXHIBIT 7 – EXISTING STORM SEWER			SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		DRAWN - AMD	REVISED -						WILL	13	7
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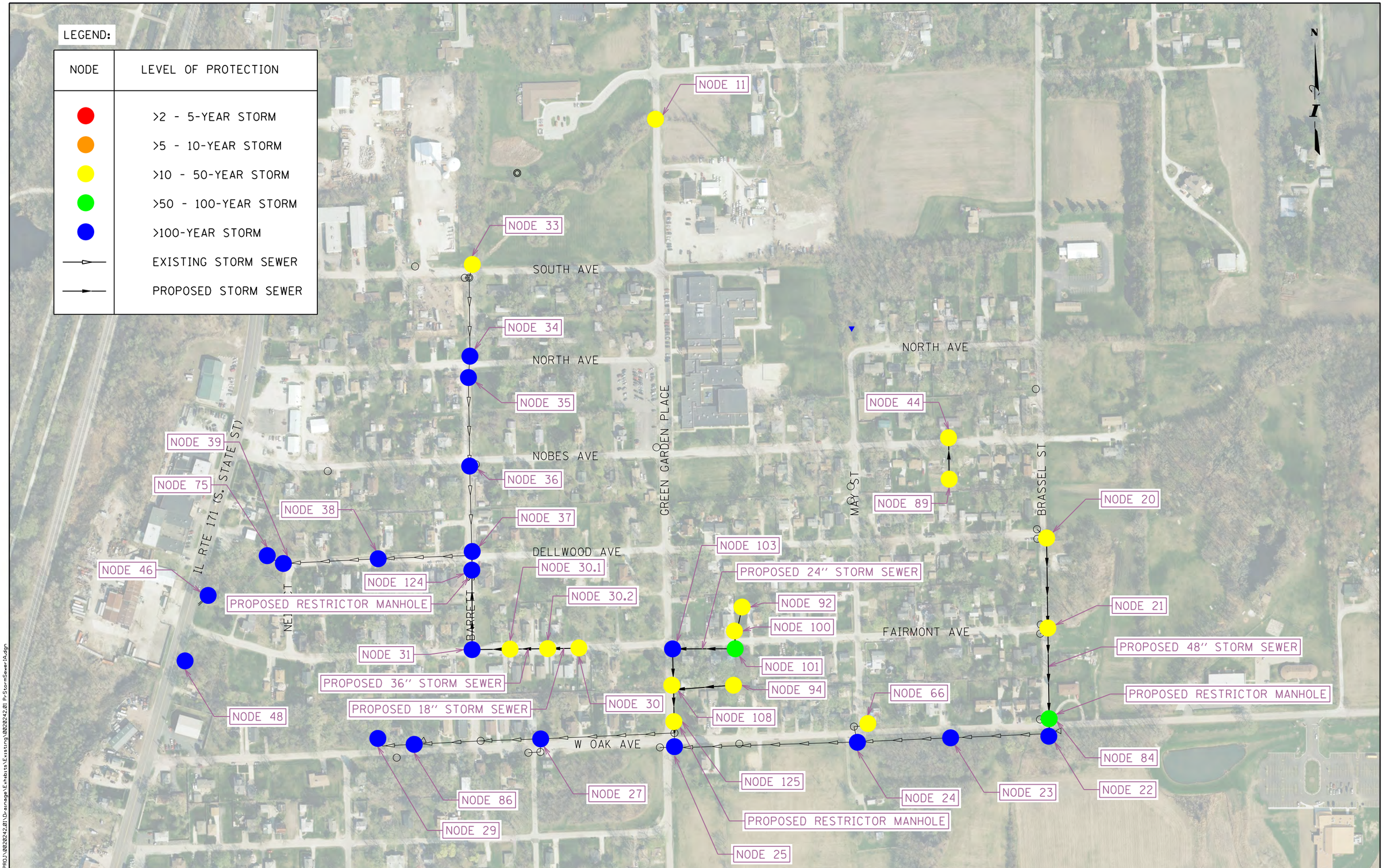

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Ciorba Group, Inc.
CONSULTING ENGINEERS
5507 North Cumberland Avenue, Suite 402
Chicago, Illinois 60656
Tel. 773.775.4009 Fax 773.775.4014

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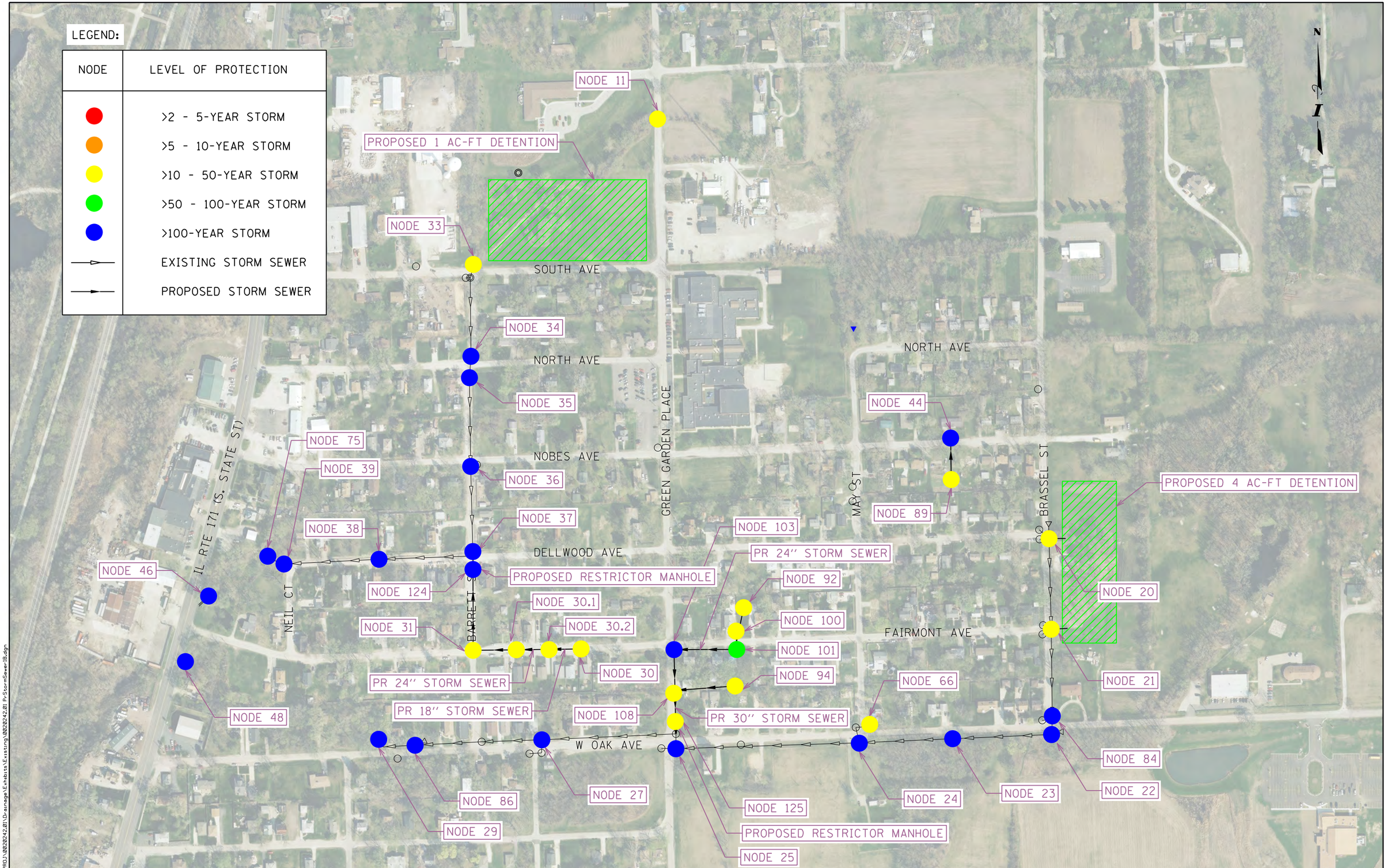
	DRAWN - AMD	REVISED -	
PLOT SCALE = 300.0000 ' / in.	CHECKED - TW	REVISED -	
PLOT DATE = 4/8/2015	DATE - 4/1/2015	REVISED -	

WILL COUNTY

FAIRMONT FLOOD STUDY
EXHIBIT 8 – PROPOSED ALTERNATIVE 1A

SCALE: SHEET OF SHEETS STA. TO STA.

SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
	WILL	13	8
	CONTRACT NO. 200242		
	ILLINOIS		



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Ciorba Group, Inc.
CONSULTING ENGINEERS
5507 North Cumberland Avenue, Suite 402
Chicago, Illinois 60656
Tel. 773.775.4009 Fax 773.775.4014

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	DRAWN - AMD	REVISED -	
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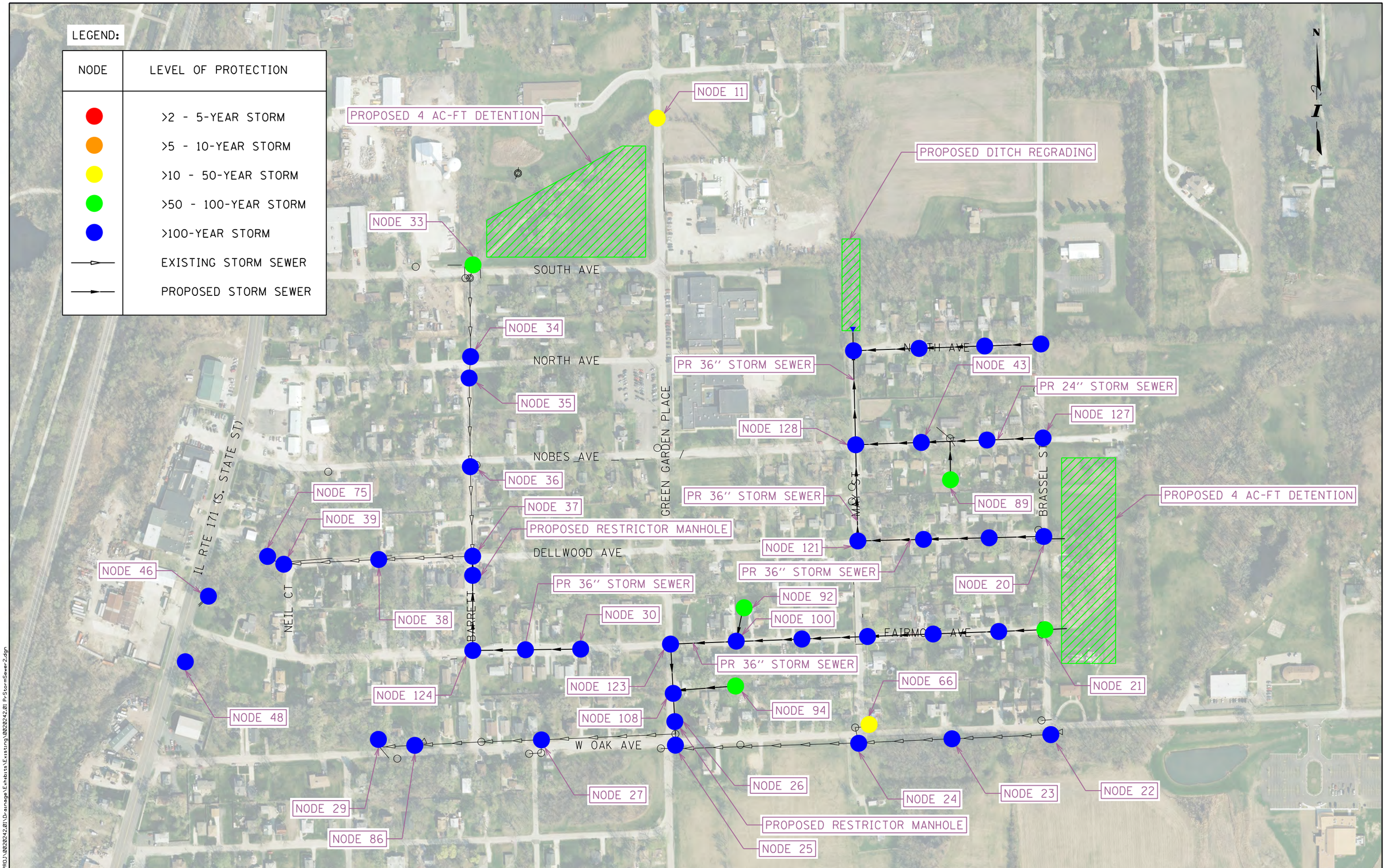
PLOT DATE = 4/8/2015	DATE - 4/1/2015	REVISED -	

WILL COUNTY

FAIRMONT FLOOD STUDY
EXHIBIT 9 – PROPOSED ALTERNATIVE 1B

SCALE: SHEET OF SHEETS STA. TO STA.

SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
	WILL	13	9
	CONTRACT NO. 200242		
	ILLINOIS		



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Ciorba Group, Inc. CONSULTING ENGINEERS 5507 North Cumberland Avenue, Suite 402 Chicago, Illinois 60656 Tel. 773.775.4009 Fax 773.775.4014	USER NAME = adow	DESIGNED - JM	REVISED -	WILL COUNTY	FAIRMONT FLOOD STUDY EXHIBIT 10 – PROPOSED ALTERNATIVE 2	SECTION
		DRAWN - AMD	REVISED -			COUNTY: WILL; TOTAL SHEETS: 13; SHEET NO.: 10
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	PLOT DATE = 4/8/2015	DATE - 4/1/2015	REVISED -		SCALE: SHEET OF SHEETS STA. TO STA.	ILLINOIS

CIORBA GROUP INC.
ENGINEER'S FEASIBILITY LEVEL OPINION
OF PROBABLE PROJECT COST

PROJECT: **Fairmont Flood Study** **EXHIBIT 11 - ALTERNATIVE 1A**
Will County
JOB NO.: **20242.01** **DATE:** **4/6/2015**

NO.	ITEM	APPROX. QUANTITY	UNIT	UNIT PRICE	AMOUNT
	ALTERNATIVE 1A				
I.	**SITE PREPARATION AND DEMOLITION**				
1	Mobilization / Demobilization	1	LS	$ 25,000.00	$ 25,000.00
2	Bituminous Pavement Removal & Disposal	2,110	SY	$ 12.00	$ 25,320.00
3	Existing Drainage Structure Removal	17	EA	$ 300.00	$ 5,100.00
4	Traffic Control During Construction	1	LS	$ 5,000.00	$ 5,000.00
5	Existing Storm Sewer Removal	1,500	LF	$ 18.00	$ 27,000.00
6	Tree Protection	10	EA	$ 20.00	$ 200.00
	Sub-Total Site Preparation and Demolition				**$ 87,620.00**
II.	**STORMWATER DRAINAGE IMPROVEMENTS**				
1	Storm Sewer, RCP, 15"	655	LF	$ 60.00	$ 39,300.00
2	Storm Sewer, RCP, 18"	110	LF	$ 65.00	$ 7,150.00
3	Storm Sewer, RCP, 24"	570	LF	$ 70.00	$ 39,900.00
4	Storm Sewer, RCP, 36"	600	LF	$ 90.00	$ 54,000.00
5	Storm Sewer, RCP, 48"	675	LF	$ 150.00	$ 101,250.00
6	Drainage Structure	15	EA	$ 5,500.00	$ 82,500.00
7	Drainage Structure with Restrictor	3	EA	$ 7,000.00	$ 21,000.00
8	Connection to Existing Sewer	3	EA	$ 2,500.00	$ 7,500.00
9	Water Service Line Adjustment	25	EA	$ 2,000.00	$ 50,000.00
10	Sanitary Sewer Service Line Adjustment	25	EA	$ 2,000.00	$ 50,000.00
11	Backflow Preventer	3	EA	$ 300.00	$ 900.00
12	Trench Backfill	1,660	CY	$ 40.00	$ 66,400.00
13	Inlet Filters	20	EA.	$ 160.00	$ 3,200.00
14	Erosion Control Blanket	1,090	SY	$ 2.00	$ 2,180.00
15	Seeding	0.2	AC	$ 5,000.00	$ 1,000.00
16	Earth Excavation and Removal - Ditches	960	CY	$ 35.00	$ 33,600.00
17	Erosion Control Blanket - Ditches	720	SY	$ 2.00	$ 1,440.00
18	Seeding - Ditches	0.1	AC	$ 5,000.00	$ 500.00
19	Driveway Culvert, 18"	12	EA	$ 1,250.00	$ 15,000.00
	Sub-Total Stormwater Drainage Improvements				**$ 576,820.00**
III.	**STREET PAVEMENT IMPROVEMENTS**				
1	Geotextile Fabric	2,110	SY	$ 3.50	$ 7,385.00
2	Aggregate Base Course, Type B, 12"	2,110	SY	$ 20.00	$ 42,200.00
3	Hot-Mix Asphalt Base Course, 4"	2,110	SY	$ 30.00	$ 63,300.00
4	Hot-Mix Asphalt Surface Course, Mix "C", N50, 2"	240	TON	$ 130.00	$ 31,200.00
	Sub-Total Street Pavement Improvements				**$ 144,085.00**

SUMMARY

I.	**Sub-Total Site Preparation and Demolition**	$ 87,620.00
II.	**Sub-Total Stormwater Drainage Improvements**	$ 576,820.00
III.	**Sub-Total Street Pavement Improvements**	$ 144,085.00
	ALTERNATIVE 1A - IMPROVEMENTS SUBTOTAL:	**$ 808,600.00**
	15% CONTINGENCY:	**$ 121,290.00**
	DESIGN AND CONSTRUCTION ENGINEERING COSTS (15%):	**$ 139,480.00**
	ALTERNATIVE 1A - IMPROVEMENTS TOTAL	**$ 1,069,370.00**

CIORBA GROUP INC.
ENGINEER'S FEASIBILITY LEVEL OPINION
OF PROBABLE PROJECT COST

PROJECT: **Fairmont Flood Study** **EXHIBIT 11 - ALTERNATIVE 1A**
Will County
JOB NO.: **20242.01** **DATE:** **4/6/2015**

Assumptions:

1 Pavement cross section of 2" HMA Surface on 4" HMA Base on 12" Aggregate Base taken from the "Barrett Street and Dellwood Avenue Drainage Improvements" plans dated 9/20/11, pages 4 and 5

2 Installation of storm sewer under pavement will result in a 10' wide pavement removal and replacment

3 Removal of existing storm sewer on Fairmont Avenue under the aggreage shoulder will be replaced with a 5' wide seeded area

4 Assume a 10' wide restoration area adjacent to the storm sewer on Brassel Street

5 Water and Sanitary line adjustements were assumed for each lot adjacent to proposed improvements and will need to be verified in the field

6 Costs for relocating existing utility lines not included

7 Costs of cleaning existing sewers not included

9 Proposed ditch grading on South Street assumes installing a 10' wide ditch that is 2'-4' deep on both sides of the street.

CIORBA GROUP INC.
ENGINEER'S FEASIBILITY LEVEL OPINION
OF PROBABLE PROJECT COST

PROJECT: **Fairmont Flood Study** **EXHIBIT 12 - ALTERNATIVE 1B**
Will County
JOB NO.: **20242.01** **DATE:** **4/6/2015**

NO.	ITEM	APPROX. QUANTITY	UNIT	UNIT PRICE	AMOUNT
	ALTERNATIVE 1B				
I.	**SITE PREPARATION AND DEMOLITION**				
1	Mobilization / Demobilization	1	LS	$ 25,000.00	$ 25,000.00
2	Bituminous Pavement Removal & Disposal	1,390	SY	$ 12.00	$ 16,680.00
3	Existing Drainage Structure Removal	14	EA	$ 300.00	$ 4,200.00
4	Traffic Control During Construction	1	LS	$ 5,000.00	$ 5,000.00
5	Existing Storm Sewer Removal	800	LF	$ 18.00	$ 14,400.00
6	Tree Protection	10	EA	$ 20.00	$ 200.00
7	Tree Removal	10	EA	$ 350.00	$ 3,500.00
	Sub-Total Site Preparation and Demolition				**$ 68,980.00**
II.	**STORMWATER DRAINAGE IMPROVEMENTS**				
	Detention Basins				
1	Topsoil Furnish and Place	16,940	SY	$ 4.50	$ 76,230.00
2	Earth Excavation and Removal	8,070	CY	$ 35.00	$ 282,450.00
3	Erosion Control Blanket	19,360	SY	$ 2.00	$ 38,720.00
4	Wetland Plantings	3.5	AC	$ 10,000.00	$ 35,000.00
5	Drainage Structure with Restrictor	3	EA	$ 7,000.00	$ 21,000.00
6	Stone Riprap	100	SY	$ 70.00	$ 7,000.00
7	Construction Entrance with Maintenance	2	EA	$ 6,500.00	$ 13,000.00
	Storm Sewer and Ditches				
8	Storm Sewer, RCP, 15"	700	LF	$ 60.00	$ 42,000.00
9	Storm Sewer, RCP, 18"	110	LF	$ 65.00	$ 7,150.00
10	Storm Sewer, RCP, 24"	600	LF	$ 70.00	$ 42,000.00
11	Storm Sewer, RCP, 30"	290	LF	$ 85.00	$ 24,650.00
12	Storm Sewer, RCP, 36"	280	LF	$ 90.00	$ 25,200.00
13	Flared End Section, 15"	8	EA	$ 335.00	$ 2,680.00
14	Drainage Structures	11	EA	$ 5,500.00	$ 60,500.00
15	Drainage Structure with Restrictor	2	EA	$ 7,000.00	$ 14,000.00
16	Connection to Existing Sewer	2	EA	$ 2,500.00	$ 5,000.00
17	Water Service Line Adjustment	23	EA	$ 2,000.00	$ 46,000.00
18	Sanitary Sewer Service Line Adjustment	23	EA	$ 2,000.00	$ 46,000.00
19	Backflow Preventer	2	EA	$ 300.00	$ 600.00
20	Trench Backfill	1,275	CY	$ 40.00	$ 51,000.00
21	Inlet Filters	15	EA	$ 160.00	$ 2,400.00
22	Erosion Control Blanket - Pipe Restoration Area	440	SY	$ 2.00	$ 880.00
23	Seeding - Pipe Restoration Area	0.1	AC	$ 5,000.00	$ 500.00
24	Earth Excavation and Removal - Ditches	960	CY	$ 35.00	$ 33,600.00
25	Erosion Control Blanket - Ditches	720	SY	$ 2.00	$ 1,440.00
26	Seeding - Ditches	0.1	AC	$ 5,000.00	$ 500.00
27	Driveway Culvert, 18"	12	EA	$ 1,250.00	$ 15,000.00
	Sub-Total Stormwater Drainage Improvements				**$ 894,500.00**
III.	**STREET PAVEMENT IMPROVEMENTS**				
1	Geotextile Fabric	1,390	SY	$ 3.50	$ 4,865.00
2	Aggregate Base Course, Type B, 12"	1,390	SY	$ 20.00	$ 27,800.00
3	Hot-Mix Asphalt Base Course, 4"	1,390	SY	$ 30.00	$ 41,700.00
4	Hot-Mix Asphalt Surface Course, Mix "C", N50, 2"	160	TON	$ 130.00	$ 20,800.00
	Sub-Total Street Pavement Improvements				**$ 95,165.00**

CIORBA GROUP INC.
ENGINEER'S FEASIBILITY LEVEL OPINION
OF PROBABLE PROJECT COST

PROJECT: **Fairmont Flood Study** **EXHIBIT 12 - ALTERNATIVE 1B**
Will County
JOB NO.: **20242.01** **DATE:** **4/6/2015**

SUMMARY

I.	**Sub-Total Site Preparation and Demolition**	$	68,980.00
II.	**Sub-Total Stormwater Drainage Improvements**	$	894,500.00
III.	**Sub-Total Street Pavement Improvements**	$	95,165.00
	ALTERNATIVE 1B - IMPROVEMENTS SUBTOTAL:	**$**	**1,058,700.00**
	15% CONTINGENCY:	**$**	**158,805.00**
	DESIGN AND CONSTRUCTION ENGINEERING COSTS (15%):	**$**	**182,630.00**
	ALTERNATIVE 1B - IMPROVEMENTS TOTAL	**$**	**1,400,135.00**

Assumptions:

1. Pavement cross section of 2" HMA Surface on 4" HMA Base on 12" Aggregate Base taken from the "Barrett Street and Dellwood Avenue Drainage Improvements" plans dated 9/20/11, pages 4 and 5
2. Installation of storm sewer under pavement will result in a 10' wide pavement removal and replacment
3. Removal of existing storm sewer on Fairmont Avenue under the aggreage shoulder will be replaced with a 5' wide seeded area
4. Water and Sanitary line adjustements were assumed and will need to be verified in the field
5. Costs for relocating existing utility lines not included
6. Costs of cleaning existing sewers not included
7. Detention is assumed as following:
   - At South Avenue and Green Garden Place, the proposed area is 1 acre at 1' deep
   - At Brassel Street and Fairmont Avenue, two ponds with a proposed area of 1.5 acres at 2' deep and 1 acre at 1' deep
8. Riprap is assumed for the overflow weir of each detention basin and the outlet pipe of its release structure
9. Proposed ditch grading on South Street assumes installing a 10' wide ditch that is 2'-4' deep on both sides of the street.

CIORBA GROUP INC.
ENGINEER'S FEASIBILITY LEVEL OPINION
OF PROBABLE PROJECT COST

PROJECT: **Fairmont Flood Study** **EXHIBIT 13 - ALTERNATIVE 2**
Will County
JOB NO.: **20242.01** **DATE:** **4/6/2015**

NO.	ITEM	APPROX. QUANTITY	UNIT	UNIT PRICE	AMOUNT
	ALTERNATIVE 2				
I.	**SITE PREPARATION AND DEMOLITION**				
1	Mobilization / Demobilization	1	LS	$ 25,000.00	$ 25,000.00
2	Bituminous Pavement Removal & Disposal	6,090	SY	$ 12.00	$ 73,080.00
3	Existing Drainage Structure Removal	18	EA	$ 300.00	$ 5,400.00
4	Traffic Control During Construction	1	LS	$ 5,000.00	$ 5,000.00
5	Existing Storm Sewer Removal	1,550	LF	$ 18.00	$ 27,900.00
6	Tree Protection	15	EA	$ 20.00	$ 300.00
7	Tree Removal	30	EA	$ 350.00	$ 10,500.00
	Sub-Total Site Preparation and Demolition				**$ 147,180.00**
II.	**STORMWATER DRAINAGE IMPROVEMENTS**				
	Detention Basins				
1	Topsoil Furnish and Place	21,780	SY	$ 4.50	$ 98,010.00
2	Earth Excavation and Removal	12,910	CY	$ 35.00	$ 451,850.00
3	Erosion Control Blanket	24,200	SY	$ 1.00	$ 24,200.00
4	Wetland Plantings	4.5	AC	$ 10,000.00	$ 45,000.00
5	Drainage Structure with Restrictor	3	EA	$ 7,000.00	$ 21,000.00
6	Stone Riprap	100	SY	$ 70.00	$ 7,000.00
7	Construction Entrance with Maintenance	2	EA	$ 6,500.00	$ 13,000.00
	Storm Sewer and Ditches				
8	Storm Sewer, RCP, 15"	200	LF	$ 60.00	$ 12,000.00
9	Storm Sewer, RCP, 18"	110	LF	$ 65.00	$ 7,150.00
10	Storm Sewer, RCP, 21"	250	LF	$ 68.00	$ 17,000.00
11	Storm Sewer, RCP, 24"	1,300	LF	$ 70.00	$ 91,000.00
12	Storm Sewer, RCP, 36"	3,625	LF	$ 90.00	$ 326,250.00
13	Flared End Section, 15"	8	EA	$ 335.00	$ 2,680.00
14	Drainage Structures	24	EA	$ 5,500.00	$ 132,000.00
15	Drainage Structure with Restrictor	3	EA	$ 7,000.00	$ 21,000.00
16	Connection to Existing Sewer	2	EA	$ 2,500.00	$ 5,000.00
17	Water Service Line Adjustment	112	EA	$ 2,000.00	$ 224,000.00
18	Sanitary Sewer Service Line Adjustment	112	EA	$ 2,000.00	$ 224,000.00
19	Backflow Preventer	2	EA	$ 300.00	$ 600.00
20	Trench Backfill	4,170	CY	$ 40.00	$ 166,800.00
21	Inlet Filters	30	EA.	$ 160.00	$ 4,800.00
22	Erosion Control Blanket - Pipe Restoration Area	830	SY	$ 2.00	$ 1,660.00
23	Seeding - Pipe Restoration Area	0.1	AC	$ 5,000.00	$ 500.00
24	Headwall for 36" Storm Sewer Ditch at North Ave	1	EA	$ 5,000.00	$ 5,000.00
25	Earth Excavation and Removal - Ditches	270	CY	$ 35.00	$ 9,450.00
26	Erosion Control Blanket - Ditches	410	SY	$ 2.00	$ 820.00
27	Seeding - Ditches	0.1	AC	$ 5,000.00	$ 500.00
	Sub-Total Stormwater Drainage Improvements				**$ 1,912,270.00**
III.	**STREET PAVEMENT IMPROVEMENTS**				
1	Geotextile Fabric	6,090	SY	$ 3.50	$ 21,315.00
2	Aggregate Base Course, Type B, 12"	6,090	SY	$ 20.00	$ 121,800.00
3	Hot-Mix Asphalt Surface Course, Mix "C", N50	6,090	SY	$ 30.00	$ 182,700.00
4	Hot-Mix Asphalt Base Course, 4"	680	TON	$ 130.00	$ 88,400.00
	Sub-Total Street Pavement Improvements				**$ 414,215.00**

CIORBA GROUP INC.
ENGINEER'S FEASIBILITY LEVEL OPINION
OF PROBABLE PROJECT COST

PROJECT: **Fairmont Flood Study** **EXHIBIT 13 - ALTERNATIVE 2**
Will County
JOB NO.: **20242.01** **DATE:** **4/6/2015**

SUMMARY

I.	**Sub-Total Site Preparation and Demolition**	$	147,180.00
II.	**Sub-Total Stormwater Drainage Improvements**	$	1,912,270.00
III.	**Sub-Total Street Pavement Improvements**	$	414,215.00
	ALTERNATIVE 2 - IMPROVEMENTS SUBTOTAL:	**$**	**2,473,700.00**
	15% CONTINGENCY:	**$**	**371,055.00**
	DESIGN AND CONSTRUCTION ENGINEERING COSTS (15%):	**$**	**426,710.00**
	ALTERNATIVE 2 - IMPROVEMENTS TOTAL	**$**	**3,271,465.00**

Assumptions:

1. Pavement cross section of 2" HMA Surface on 4" HMA Base on 12" Aggregate Base taken from the "Barrett Street and Dellwood Avenue Drainage Improvements" plans dated 9/20/11, pages 4 and 5
2. Installation of storm sewer under pavement will result in a 10' wide pavement removal and replacment and a 5' wide parkway restoration adjacent to the roadway
3. Removal of existing storm sewer on Fairmont Avenue under the aggreage shoulder will be replaced with a 5' wide seeded area
4. Water and Sanitary line adjustements were assumed and will need to be verified in the field
5. Costs for relocating existing utility lines not included
6. Costs of cleaning existing sewers not included
7. Detention is assumed as following:
   - At South Avenue and Green Garden Place, the proposed area is 2 acres at 2' deep
   - At Brassel Street and Fairmont Avenue, two ponds with a proposed area of 1.5 acres at 2' deep and 1 acre at 1' deep
8. Riprap is assumed for the overflow weir of each detention basin and the outlet pipe of its release structure
9. Proposed ditch grading at end of May Street assumes regrading a 10' wide drainage swale from the end of the street to the defined channel. Riprap is assumed at the proposed headwall