

STORMWATER MASTER PLAN

CITY OF SEDALIA, MO

APRIL 2013



Prepared by:  **OLSSON**[®]
ASSOCIATES

Stormwater Master Plan for Sedalia, MO

TABLE OF CONTENTS

Part A: Introduction and Background

- A-1. *Overview and Purpose of Plan*
- A-2. *Existing Conditions*
 - A-2.1. *Public Surveys and Input*
 - Figure A1: Watershed Map*
 - Figure A2: Problem Summary Map*
 - A-2.2. *Mapping Review*
 - A-2.3. *Field Investigations*
- A-3. *Solution Development*
 - A-3.1. *Hydrology and Hydraulics Methodology and Criteria*

Part B: Recommended Action Plan

- B-1. *Capital Projects*
 - B-1.1. *Prioritization Methodology and Rationale*
 - B-1.2. *Prioritized Project Listing*
 - Figure B1: Recommended Project Locations*
 - B-1.3. *Detailed Project Descriptions, Maps and Estimates*
- B-2. *Detention Strategies*
 - B-2.1. *Stream Assessment*
 - B-2.2. *Private Development Detention Strategies by Watershed*
 - Figure B2: Detention Strategies and Stream Assessments*

Appendices

- A. *Individual Project Rating Sheets*

A-1. Overview and Purpose of Plan

This Stormwater Master Plan is designed to provide the City a clear road map to address current and future stormwater management needs for flood control, stream stability and water resource protection. The plan will:

- Help the City prioritize, budget and address immediate and long-term stormwater problems in a systematic manner.
- Allow the City to proactively forecast, evaluate, and manage the stormwater-related impacts that result from future development or other changes in the city's watersheds.
- Help the City achieve financial savings through comprehensive watershed-based planning and coordination with other City projects and infrastructure master planning.
- Support the City's compliance with EPA stormwater program.

As development occurs in the City and the stormwater system ages it is important to correct stormwater problems and protect the City's existing natural resources from degradation resulting from development. In addition, this plan should be used in conjunction with the City's wastewater collection system improvements to identify overlapping storm and sanitary sewer projects and realize potential cost savings.

A-2. Existing Conditions Overview

The City of Sedalia is located on a ridge with several drainage areas splitting the town into five major drainage areas. The watersheds of the City can be seen in Figure A1. Land use throughout Sedalia is widely varied. Land use includes residential, commercial, industrial, and undeveloped land. The age of the stormwater system is also greatly varied throughout the City, in many sections of the City no stormwater system exists and water flows overland or in streets. Surface water inflow into the City's sanitary sewer system is also a problem throughout the City, and this plan identifies some drainage improvements that overlap planned sanitary sewer improvements, thereby reducing both flooding and sewer inflows in those areas. Several portions of the City contain good quality streams that provide habitat for wildlife and enhance water quality.

A-2.1. Public Surveys and Input

Several methods were used to identify flooding and erosion problems throughout the City of Sedalia. One of the first ways that potential flooding areas were identified was through the use of a citizen survey developed by Olsson and mailed by the City to all households in the monthly water bill.

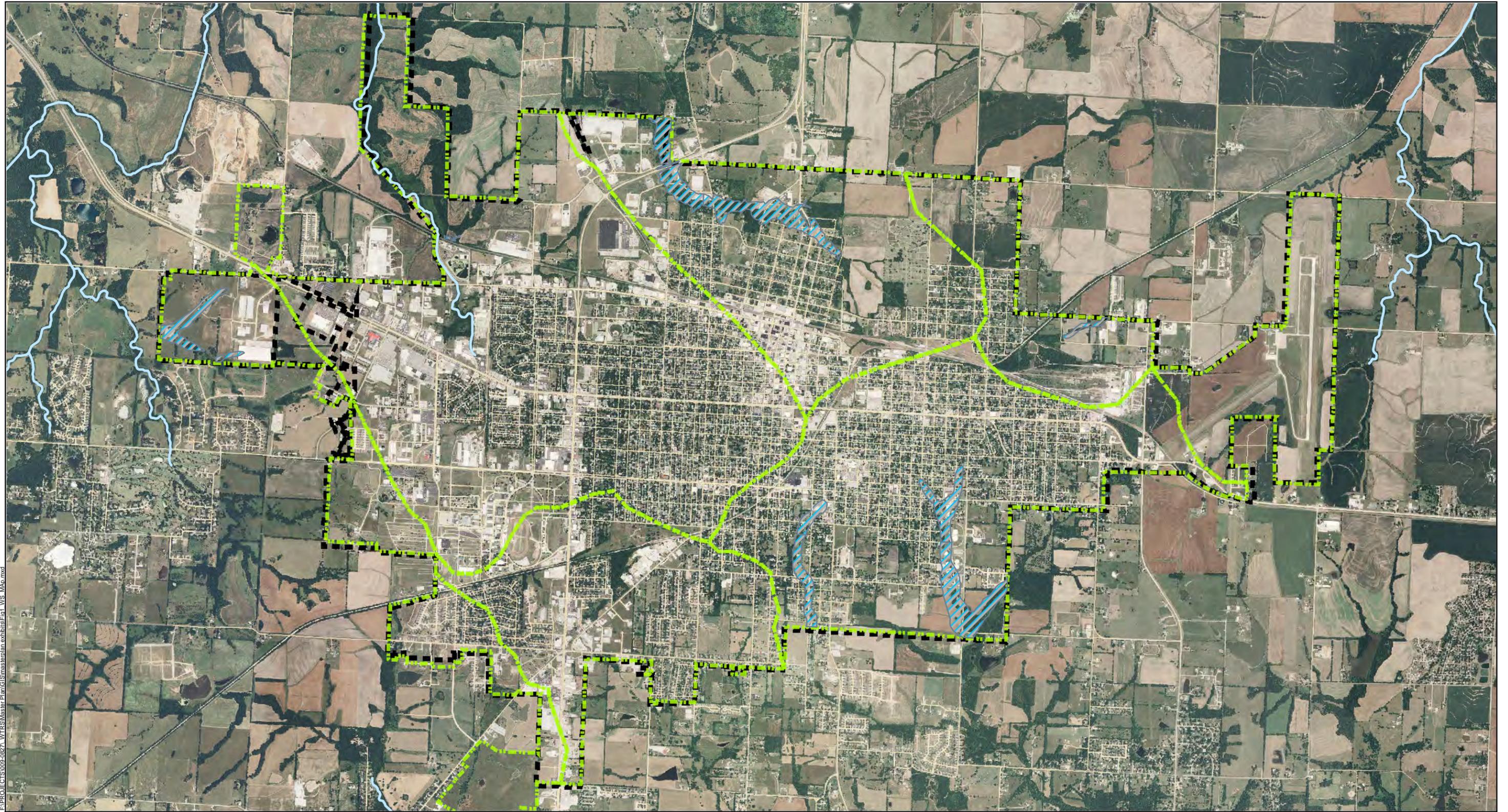
On the questionnaire residents were asked to report on experienced or observed home and street stormwater flooding, sanitary sewer backups, and erosion caused by stormwater. The residents also reported the frequency of flooding at their residence and where the water was entering the residence. The source and duration of the flooding was also requested from the residents.

The complete form can be seen in the Appendix. Out of the estimated total of approximately 5,500 addresses, 1086 households responded for a return rate of roughly 20%.

The responses from the survey were mapped and categorized by type of flooding and severity of flooding. The citizen responses can be seen in Figure A2 Problem Summary Map. From the resident responses:

- 27 households reported surface and ground water flooding and sanitary sewer backups.
- 3 households reported surface flooding and sanitary sewer backups.
- 30 households reported ground and surface water flooding.
- 129 households reported surface water flooding.
- 84 households reported ground water flooding.
- 39 households reported ground water and sanitary sewer backups.
- 50 households reported sanitary sewer backups.
- 724 households returned questionnaires with no major issues.

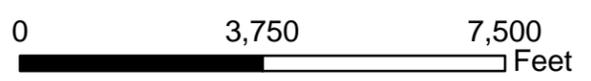
Areas where several residents had responded were identified as problem areas. Once these general problem areas were identified the citizen responses were further investigated. Problem areas provided by the City of Sedalia staff were also used to identify flooding and erosion problem areas.

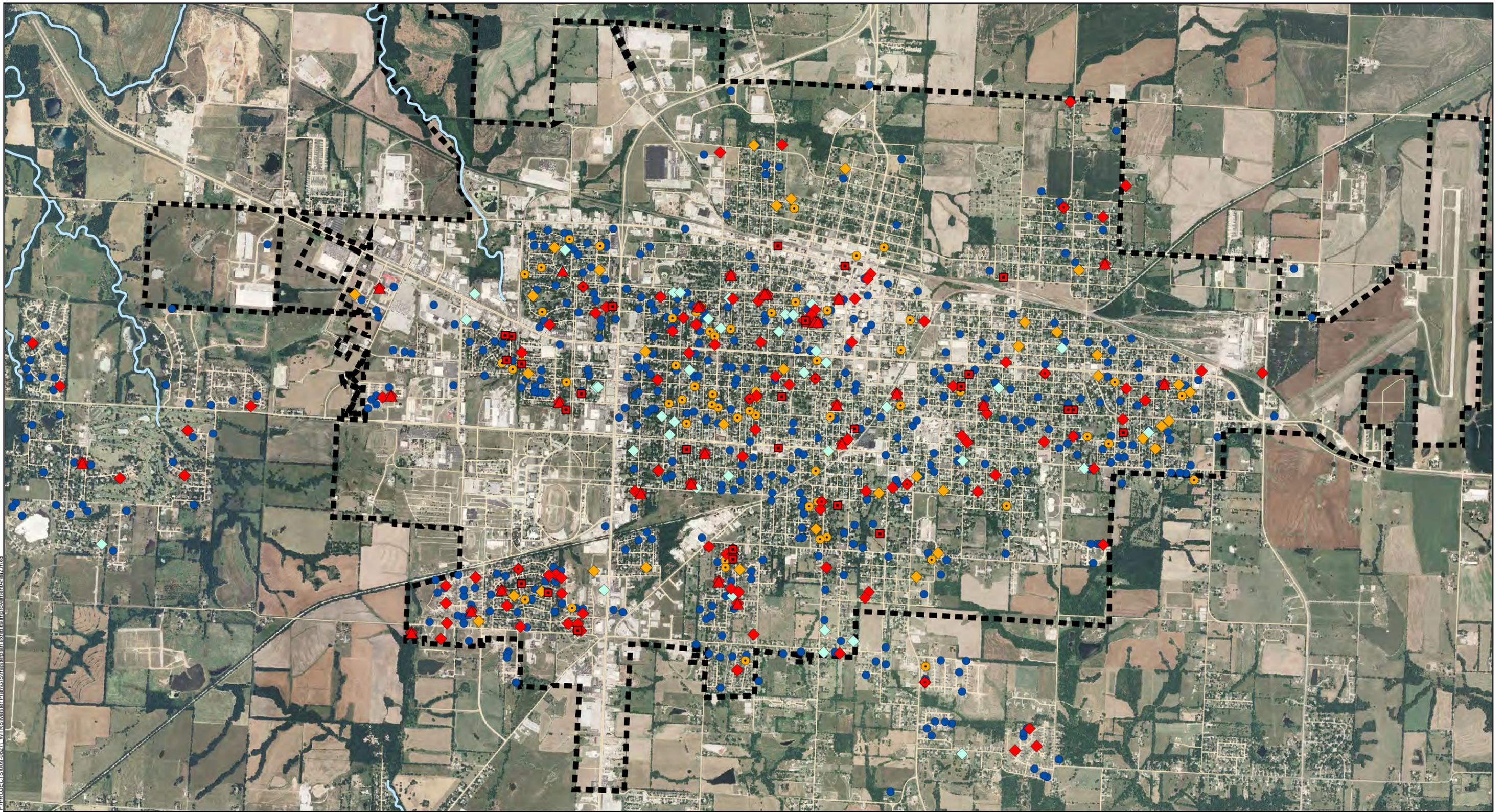


E:\PROJECTS\009-09271_WTRSMasterPlan\GIS\workspace\in\output\Fig1_VIS_Maps.mxd

- Legend**
-  100-yr Floodplain
 -  City Limits
 -  Watersheds
 -  Stream Centerline
 -  City Roads

**Figure A1 - Watershed Map
Stormwater Master Plan
City of Sedalia, MO**



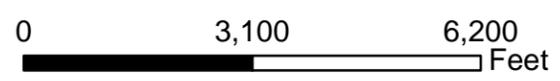


E:\PROJECTS\009-09271_WTRSS\Master Plan\GIS\Stormwater\mxd\citylimits\mxd\citylimits.mxd

Legend

-  City Limits
-  Stream Centerline
-  City Roads
-  Returned Questionnaires with No Major Issues
-  Sanitary Sewer Backup
-  Ground Water Flooding and Sanitary Sewer Backup
-  Ground Water Flooding
-  Surface Flooding
-  Ground and Surface Water Flooding
-  Surface Flooding and Sanitary Sewer Backup
-  Surface Water, Ground Water and Sanitary Sewer Backup

Figure A2 - Problem Summary Map
Stormwater Master Plan
City of Sedalia, MO



A-2.2. Mapping Review

Once the problem areas were identified from the citizen surveys and City Staff reports, a mapping review of the drainage areas and potential sources of flooding was completed.

The mapping review utilized storm sewer system mapping provided by the City of Sedalia. Problem areas identified through the citizen surveys and City data were overlaid with the existing stormwater system to determine if the existing system was undersized or if flooding and erosion problems resulted from the lack of a stormwater system. The mapping review also utilized the 100-year floodplain data from FEMA to identify areas that could have the potential for flooding but did not have any citizen complaints.

The review of the problem areas also revealed areas within the City that were interdependent and could be grouped together as one project area. Several of the stormwater problem areas could also be linked to problems downstream or upstream of the reported problem.

A-2.3. Field Investigations

Once the stormwater problem areas were identified from the resident surveys, City data and mapping review a field visit was conducted to determine planning level solution alternatives.

For every problem area identified a site visit was conducted to determine the source of erosion or flooding and to develop potential solutions to the stormwater problem. The site visit did not include survey data of the existing stormwater system or surrounding homes with flooding problems. The site visit was beneficial to gather more information about problem areas that could be caused by maintenance issues or resident lack of knowledge. Since survey information was not collected, the site visits also brought to light complicated stormwater issues that would require solutions greater larger than the immediate area around the stormwater problem. During the field visit the sites were evaluated to identify unreported flooding locations near problem areas and to develop potential solutions to the flooding problems.

A-3. Solution Development

Several solution alternatives for each problem area were developed using the GIS data, field investigations, and approximate hydrologic and hydraulic analyses. Stormwater solutions as developed account for full carry of the design storm. A reduction in the stormwater flows by inflow and infiltration into the sanitary system was not considered. Each alternative was evaluated for effectiveness and cost before final solutions were developed. Types of improvements considered included open channels, enclosed system, and regional detention. For each individual problem area the existing system and type of problem was taken into account before solutions were developed. If an existing stormwater system was in place the downstream system was evaluated with rules of thumb to determine if the replacement of the downstream system would assist in alleviating the flooding problem. If enclosed system improvements were deemed necessary to prevent flooding the downstream system was proposed to be replaced to an outlet of the enclosed system or to a break in the system. Where no existing stormwater system was in place open channels were first evaluated to limit the

impact on the neighborhoods. If open channel improvements were not possible to prevent flooding problems enclosed improvements were proposed.

Regional detention solutions were considered for flooding problems throughout Sedalia. The majority of the flooding problems within the City were not located along major stream ways that would benefit from regional detention. The City also lacks large green space along drainage ways that could be converted to regional detention basins. Detention within the City is still plausible; however the detention basins would be smaller. Detailed hydrologic and hydraulic modeling of the stormwater system could determine the impact of smaller detention basins on the flooding problems throughout the City.

The final solutions were developed by determining the most cost effective solution while still providing flooding protection for each flooding location.

A-3.1. Hydrology and Hydraulics Methodology and Criteria

City criteria were used in the evaluation of the stormwater system in the stormwater master plan. The goals for the stormwater master plan were to eliminate street and roadway flooding in the 100-yr / 1% chance event. Actual final solutions may require different pipe sizes than noted here in to achieve required protection levels when detailed field survey is used to conduct final design modeling and analysis. In coordination with the sanitary sewer improvements, the stormwater system near the sanitary improvements should be evaluated to determine if the removal of inflow and infiltration to the sanitary system will cause adverse impacts on the existing stormwater system. If the increased surface flow causes enough flood level rise to cause flooding of homes or streets (>7"), improvements to the drainage system should be made with the sanitary sewer improvements.

For the stormwater master plan hydrology and hydraulics were used to develop solutions to stormwater problems. Hydrology could be calculated accurately, but system hydraulics were approximated because no system elevations were surveyed and assumed slopes and elevations were used where appropriate.

B-1. Capital Projects

B-1.1. Prioritization Methodology and Rationale

The City of Sedalia experiences rainfall that causes flooding throughout the city several times a year. Several flooding locations throughout the City occur annually while some locations only occur during extreme events. In reaction to the flooding problems the City has responded to complaints as they occur. In order to provide a more strategic and cost effective approach a capital improvement plan that outlines and prioritizes improvement projects based on severity and cumulative cost-benefit was developed as a part of this Stormwater Master Plan. The Stormwater Master Plan will provide a guide for the City to pursue stormwater improvements efficiently and in a cost effective manner.

Several alternatives were considered before final solutions were developed. The final solutions were developed by determining the most cost effective solution while still providing flooding protection for each flooding location. Thirty eight 38 capital improvement projects were recommended for addressing flooding problems. When final solutions were developed planning level cost estimates were calculated for each improvement area. The cost estimates were based on current construction costs for the type of improvement that was recommended. The recommended improvements have a total estimated cost of \$11.4 million.

Projects were given a score based on the factors below and using a simplified scoring system:

- Flooding homes were given a point value of 200 points per flooding home
- Flooding arterial streets were given a point value of 150 points per flooding block
- Flooding collector streets were given a point value of 100 points per flooding block
- Flooding residential streets were given a point value of 50 points per flooding block
- Nuisance and erosion issues were given a point value of 10 points per issue

B-1.2. Prioritized Project Listing

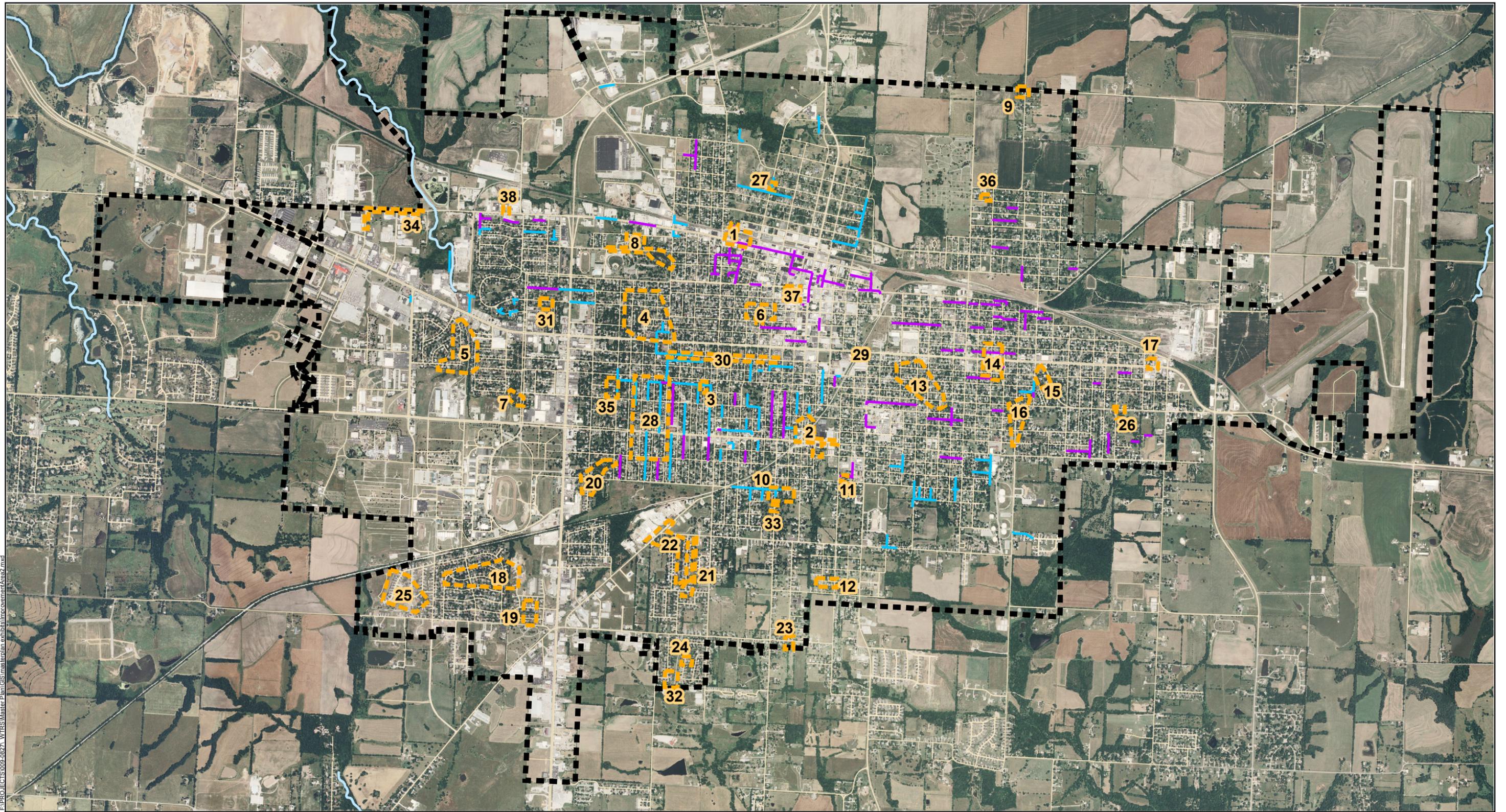
After solutions were developed for problem areas throughout the City and costs were calculated for the recommended improvements the capital improvement projects were ranked using a cost-benefit scoring system that quantifies a project's benefit potential relative to cost. The benefit score is based on meeting key criteria related to home flooding, street flooding, and synergy with other City projects such as wastewater improvements. The prioritized projects can be seen in Table 1. A map of the recommended project locations can be seen in Figure B1.

B-1.3. Detailed Project Descriptions, Maps and Estimates

Detailed project descriptions and maps were generated for every project area. The detailed project description gives a summary of the flooding problem and a conceptual solution summary. A detailed project description and project map for each improvement area follows.

**Capital Improvement Project List - Ranked by PRIORITY SCORE ONLY
Sedalia, MO**

Project Number	Project Location	100-yr Flood Impacts Homes	Street Flooding	(A) Benefit Score	(B) Project Costs	Cumulative Project Costs	(C) Added 25-Yr. Maint. Costs	(D) Project + Maint. Costs	Priority Score B/A	Overlaps Planned Sanitary Sewer Project
11	E. 19th St & S. Washington Ave	200	0	200	\$2,450	\$2,450	\$0	\$2,450	12	Yes - Phase 1
19	Highway Dr & Golf Dr	800	0	800	\$10,625	\$13,075	\$0	\$10,625	13	No
7	S. State Fair Blvd and Herold Ave	400	100	500	\$7,625	\$20,700	\$0	\$7,625	15	No
36	E. Jackson St	600	0	600	\$10,125	\$30,825	\$0	\$10,125	17	No
31	2101 W. 5th St	200	0	200	\$3,825	\$34,650	\$0	\$0	19	No
33	2120 S. Kentucky Ave	200	0	200	\$4,063	\$38,713	\$0	\$4,063	20	No
24	Brentwood Ave	200	0	200	\$4,545	\$43,258	\$0	\$4,545	23	No
25	Katy Cir & Anderson Ave	600	0	600	\$19,075	\$62,333	\$0	\$19,075	32	No
22	W. 24th St & Clinton Rd	800	0	800	\$30,284	\$92,616	\$0	\$30,284	38	No
23	32nd St & S. Ohio Ave	200	100	300	\$45,025	\$137,641	\$1,775	\$46,800	150	No
17	S. Merriam Ave & E. Broadway Blvd	200	0	200	\$30,250	\$167,891	\$3,450	\$33,700	151	No
38	2410 W. Main St	200	0	200	\$30,800	\$198,691	\$3,850	\$34,650	154	No
26	E. 12th St and S. Madison Ave	200	100	300	\$50,000	\$248,691	\$2,425	\$52,425	167	No
3	S. Prospect Ave & W. 11th St	200	50	250	\$43,838	\$292,529	\$4,175	\$48,013	175	Yes - Phase 2
9	Griessen Rd & Cedar Dr	200	0	200	\$36,875	\$329,404	\$3,475	\$40,350	184	No
12	E. 27th St & S. Massachusetts Ave	200	0	200	\$39,150	\$368,554	\$2,475	\$41,625	196	No
20	W. 20th St & S. Warren Ave	600	100	700	\$147,300	\$515,854	\$0	\$147,300	210	No
18	Highland Ave & Southwest Blvd	1000	50	1050	\$232,175	\$748,029	\$6,850	\$239,025	221	No
6	S. Vermont Ave & W. 5th St	1200	100	1300	\$302,513	\$1,050,541	\$9,325	\$311,838	233	No
32	W. 35th St & S. Stewart Ave	200	50	250	\$61,388	\$1,111,929	\$3,750	\$65,138	246	No
5	Sue Ln & Royal Blvd	600	250	850	\$226,850	\$1,338,779	\$22,075	\$248,925	267	No
10	S. Knetuck St & W. 20th St	0	100	100	\$34,175	\$1,372,954	\$2,975	\$37,150	342	Yes - Phase 2
27	N. Missouri Ave & W. Morgan St	0	100	100	\$59,925	\$1,432,879	\$6,275	\$66,200	599	No
4	S. Park Ave & W. 4th St	600	150	750	\$454,875	\$1,887,754	\$44,000	\$498,875	607	Yes - Phase 2
13	E. 11th St & S. Montgomery Ave	1000	0	1000	\$665,125	\$2,552,879	\$54,425	\$719,550	665	No
21	S. Quincy Ave & W. 28th St	400	50	450	\$302,175	\$2,855,054	\$28,900	\$331,075	672	No
29	E. Broadway Blvd & Katy Trail Overpass	0	150	150	\$124,425	\$2,979,479	\$474	\$124,899	830	No
2	S. Ohio St & W. 16th St	400	150	550	\$465,525	\$3,445,004	\$50,325	\$515,850	846	Yes - Phase 2
14	S. Center Ave & E. Broadway Blvd	200	50	250	\$306,988	\$3,751,991	\$3,050	\$310,038	1,228	Yes - Phase 1
28	W. 16th St & S. Park Ave	400	300	700	\$1,164,525	\$4,916,516	\$120,975	\$1,285,500	1,664	Yes - Phase 2
30	W. 9th St	0	450	450	\$749,475	\$5,665,991	\$70,500	\$819,975	1,666	Yes - Phase 2
37	S. Kentucky St & E 3rd St	200	0	200	\$338,100	\$6,004,091	\$0	\$338,100	1,691	No
8	Liberty Park Blvd & S. Park Ave	0	200	200	\$495,525	\$6,499,616	\$23,175	\$518,700	2,478	No
35	W. 13th St	0	50	50	\$196,275	\$6,695,891	\$18,650	\$214,925	3,926	Yes - Phase 2
16	S. New York Ave & E. 12th St	400	150	550	\$2,515,125	\$9,211,016	\$10,000	\$2,525,125	4,573	No
1	W. Main St.	200	100	300	\$1,697,600	\$10,908,616	\$9,000	\$1,706,600	5,659	Yes - Phase 1
15	Crescent Dr & Ware Ave	0	20	20	\$15,250	\$10,923,866	\$0	\$15,250	15,250	No
34	Winchester Dr & W. Main St	0	0	10	\$466,125	\$11,389,991	\$11,875	\$478,000	46,613	No
TOTALS					\$11,389,991		\$518,224	\$11,904,390		

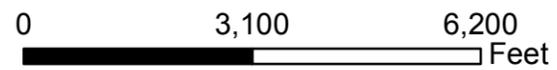


E:\PROJ\EGIS\009-09271_WTRSMasterPlan\GIS\Stormwater\exhibit\mapdocument\Map2.mxd

Figure B1 - Recommended Project Locations Map
Stormwater Master Plan
City of Sedalia, MO

Legend

- Potential System Improvements
- City Limits
- Stream Centerline
- Sanitary Sewer Rehab, Phase 1
- Sanitary Sewer Rehab, Phase 2
- City Roads



Improvement Area 1 - West Main Street



Location Map

Benefit Point Total	300
Project Cost	\$1,697,600
Cost/Benefit Score	5659

Project Problem and Solution Summary

The stormwater problem in this area is located on West Main Street between Grand Avenue and Missouri Avenue. This area is located in a sump and drains approximately 195 acres to the south. The collected water travels under the railroad and continues in an enclosed system to the north. Water collects in the sump on West Main Street and the existing stormwater system is overwhelmed which causes the street and building to flood. The cause of this flooding is the result of insufficient storm pipes and inlets. The street flooding in this location is greater than 7 inches and could restrict emergency vehicles.

The conceptual improvement for this area is to increase the size of the existing stormwater system. The grate inlets on the north side of West Main Street should be replaced with curb inlets for more efficient capture of stormwater. The existing pipe system should also be upgraded to increase capacity. The enclosed system should be upgraded to the north of the existing railroad. Downstream of the proposed improvements an adequate overflow channel exists to carry the excess stormwater that cannot be carried in the existing enclosed system. The increased system capacity and increased capture efficiency will prevent street and building flooding. For final design survey information will be needed for building low openings, utility information, and more detailed topographic data.

Cost Estimate				
<u><i>Item Description</i></u>	<u><i>Quantity</i></u>	<u><i>Qty. Units</i></u>	<u><i>Unit Cost</i></u>	<u><i>Total Cost</i></u>
Pipe 21" and Smaller - Street	256	LF	\$180	\$46,080
Concrete Box	656	LF	\$2,000	\$1,312,000
			Subtotal	\$1,358,080
			Utilities and Misc. Contingency (25%)	\$339,520
			Total	\$1,697,600

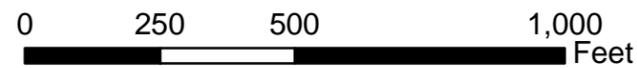
F:\PROJECTS\009\0827_WTRRS\Master Plan\GIS\masterplan_exhibits\ImprovementArea1.mxd



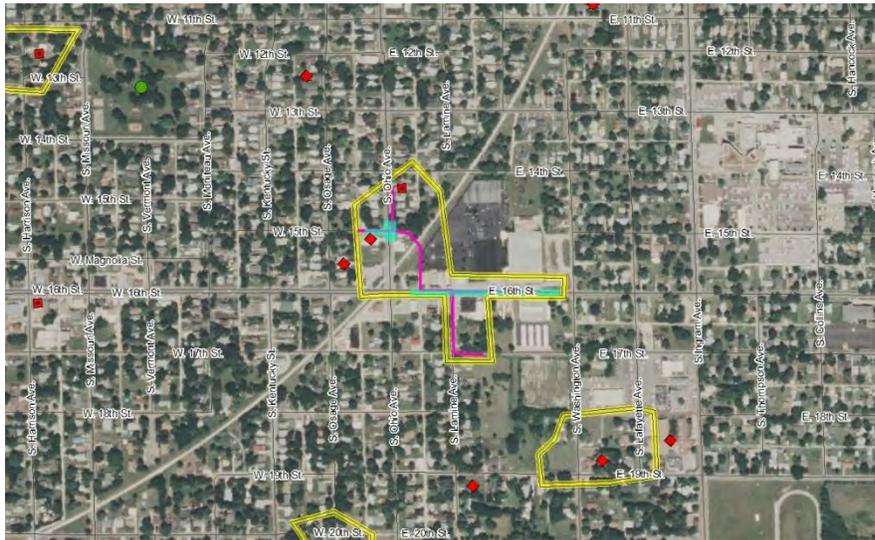
Legend

- Proposed Pipes
- StreetFlood
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- Surface Flooding and Sanitary Sewer Backup
- ▲ Ground and Surface Water Flooding
- ◆ Ground Water Flooding
- Ground Water Flooding and Sanitary Sewer Backup
- ◆ Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues

City of Sedalia, MO
Potential System Improvements
Project ID #1 & #6



Improvement Area 2 - South Ohio Street and West 16th Street



Location Map

Benefit Point Total	550
Project Cost	\$465,525
Cost/Benefit Score	846

Project Problem and Solution Summary

The flooding problem in this area is the result of insufficient storm sewer and a home in close elevation proximity to a sump. The stormwater flows from the north on S. Ohio Street and from the west on W. 15th Street. The stormwater collects at the intersection of S. Ohio Street and W. 15th Street before it travels under the Katy Trail. The stormwater infrastructure in this area is insufficient and allows water to collect in the sump area at the intersection and floods the adjacent home. The stormwater also collects in the street and could restrict the access of emergency vehicles. The stormwater then flows over 16th Street where it gathers and eventually flows south.

The conceptual improvement for this area includes adding storm sewer to route the water around the flooding homes. The increased capacity of the storm sewer will also allow water to be intercepted before it collects in the street. The downstream side of the storm sewer system will begin at the open channel on the south side of 17th Street. The system will then parallel Lamine Avenue and will connect into the existing system along 16th Street. The system will then pass under the Katy Trail and connect into the existing new storm sewer system that will extend onto 15th Street and Ohio Avenue. For final design survey information will be needed for home low openings, Katy Trail clearance, utility information and existing ditch elevations to provide more accurate alignment and pipe sizing.

Cost Estimate				
<u><i>Item Description</i></u>	<u><i>Quantity</i></u>	<u><i>Qty. Units</i></u>	<u><i>Unit Cost</i></u>	<u><i>Total Cost</i></u>
Pipe 21" and Larger - Yard	772	LF	\$180	\$138,960
Pipe 21" and Smaller - Street	905	LF	\$180	\$162,900
Pipe 21" and Larger - Street	336	LF	\$210	\$70,560

Subtotal \$372,420

Utilities and Misc. Contingency (25%) \$93,105

Total \$465,525

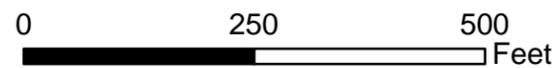


E:\PROJECTS\009-09271_WTSS\Mapstar_Plan\GIS\Mapstar\plan\output\improvements\map2.mxd

Legend

- Proposed Pipes
- Street Flooding
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- Surface Flooding and Sanitary Sewer Backup
- Ground and Surface Water Flooding
- Ground Water Flooding
- Ground Water Flooding and Sanitary Sewer Backup
- Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues

**City of Sedalia, MO
Potential System Improvements
Project ID #2**



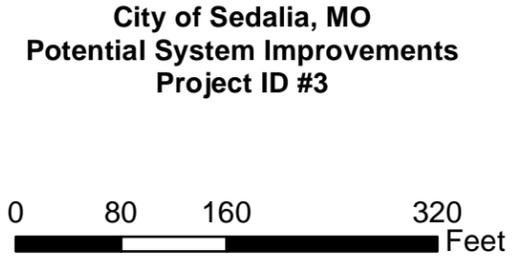
Cost Estimate				
<u><i>Item Description</i></u>	<u><i>Quantity</i></u>	<u><i>Qty. Units</i></u>	<u><i>Unit Cost</i></u>	<u><i>Total Cost</i></u>
Pipe 21" and Larger - Street	167	LF	\$210	\$35,070
Subtotal				\$35,070
Utilities and Misc. Contingency (25%)				\$8,768
Total				\$43,838



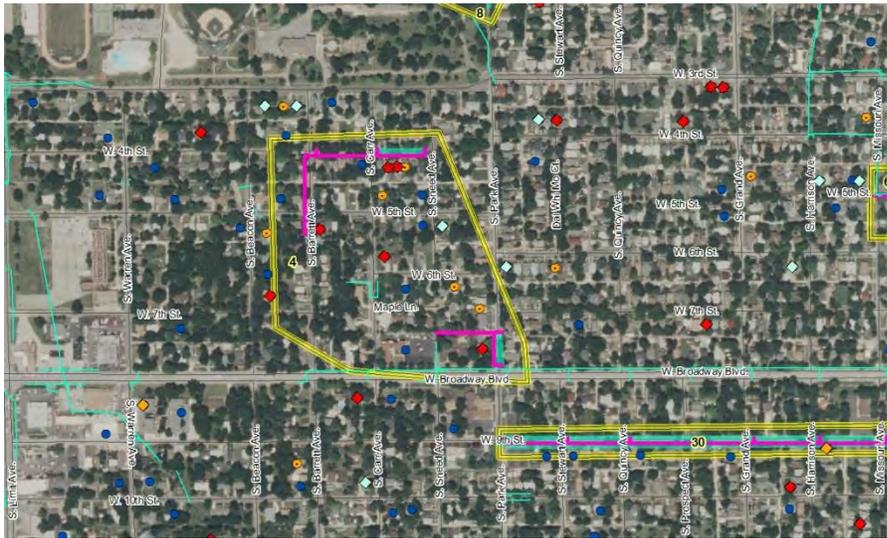
F:\PROJECTS\09-0827_WTRIS\Master Plan\GIS\masterplan_exhibits\ImprovementArea3.mxd

Legend

- Proposed Pipes
- StreetFlood
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- Surface Flooding and Sanitary Sewer Backup
- ▲ Ground and Surface Water Flooding
- ◆ Surface Flooding
- ◆ Ground Water Flooding
- Ground Water Flooding and Sanitary Sewer Backup
- ◆ Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues



Improvement Area 4 - South Park Avenue and West 4th Street



Benefit Point Total	750
Project Cost	\$454,875
Cost/Benefit Score	607

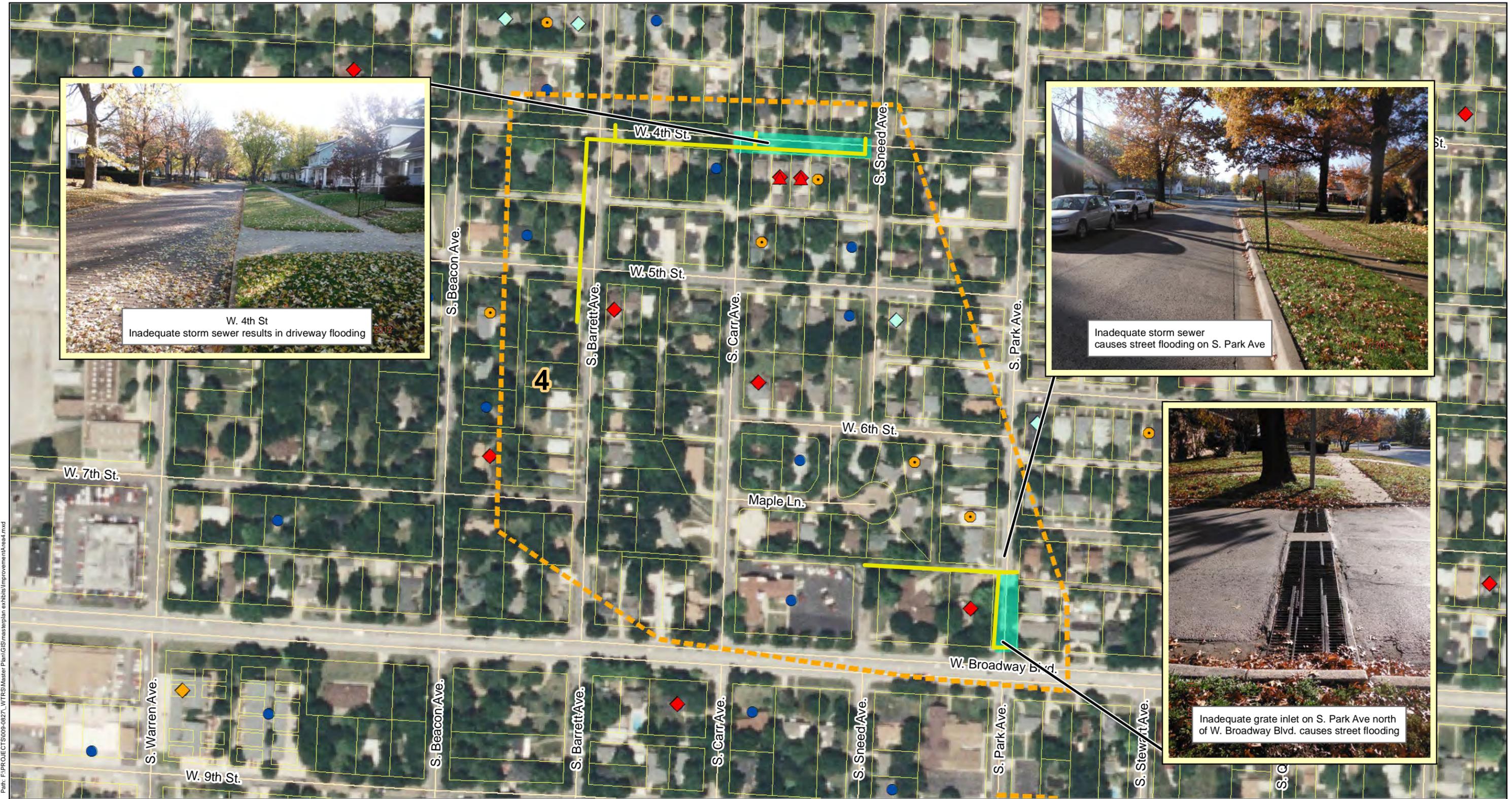
Location Map

Project Problem and Solution Summary

The flooding problem in this area is the result of the lack of storm sewer that causes street and home flooding. The project area and the site around the project area consists of curb and gutter with no additional stormwater conveyance system. A large open channel is the outlet for the stormwater in this area and generally runs from West Broadway Boulevard to the northwest. The stormwater flows from the south from West Broadway Boulevard and onto South Park Street and pools near 1200 West Broadway flooding the street and the home. Two existing grate inlets are undersized for the flow in the area. The grate inlets are also prone to clogging. The other flooding problem in this area is on West 4th Street between South Snead Avenue and South Carr Avenue. Stormwater flows from the east down West 4th Street. The stormwater is carried in the street due to the lack of an enclosed conveyance system. 1307 and 1309 West 4th Street have both reported street and home flooding. The stormwater collects in this location and causes street and home flooding.

The conceptual improvement for this area includes adding storm sewer to route the water around the flooding homes and to alleviate street flooding. The proposed storm sewer will begin south of West Broadway Boulevard on South Park Avenue. New curb inlets will capture the water and route it to the north and to the open channel. The existing grate inlets should be abandoned in place. The new curb inlets and storm sewer will prevent home and street flooding on South Park Avenue. To prevent street and home flooding on West 4th Street additional curb inlets and storm sewer will need to be capture water before it can collect in the street and flood homes. The stormwater will then be routed through an enclosed system to the existing open channel. For final design survey information will be needed for home low openings, utility information and existing channel elevations to provide more accurate alignment and pipe sizing

Cost Estimate				
<u><i>Item Description</i></u>	<u><i>Quantity</i></u>	<u><i>Qty. Units</i></u>	<u><i>Unit Cost</i></u>	<u><i>Total Cost</i></u>
Pipe 21" and Smaller - Street	190	LF	\$180	\$34,200
Pipe 21" and Larger - Street	1570	LF	\$210	\$329,700
			Subtotal	\$363,900
			Utilities and Misc. Contingency (25%)	\$90,975
			Total	\$454,875

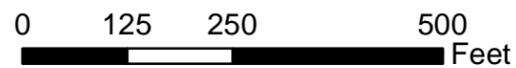


Path: F:\PROJECTS\009-0827\WTRIS\Master Plan\GIS\masterplan exhibits\Improvement\res4.mxd

Legend

- Proposed Pipes
- Street Flooding
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- ◆ Ground Water Flooding
- Ground Water Flooding and Sanitary Sewer Backup
- ▲ Ground and Surface Water Flooding
- Returned Questionnaires with No Major Issues
- ◆ Surface Flooding
- ◆ Sanitary Sewer Backup

**City of Sedalia, MO
Potential System Improvements
Project ID #4**



907 Royal Boulevard and on Royal Boulevard between Leone Avenue and Ruth Ann Drive storm sewer will need to be added on Leone Avenue and Royal Boulevard. The additional storm sewer will capture the stormwater before it has a chance to flood the street and 907 Royal Boulevard. The storm sewer will outlet to the existing open channel east of Royal Boulevard. For final design survey information will be needed for home low openings, utility information, railway crossing information, and existing channel elevations to provide more accurate alignment and pipe sizing.

Cost Estimate				
<u><i>Item Description</i></u>	<u><i>Quantity</i></u>	<u><i>Qty. Units</i></u>	<u><i>Unit Cost</i></u>	<u><i>Total Cost</i></u>
Channel	287	LF	\$20	\$5,740
Pipe 21" and Smaller - Yard	294	LF	\$160	\$47,040
Pipe 21" and Larger - Yard	127	LF	\$180	\$22,860
Pipe 21" and Smaller - Street	588	LF	\$180	\$105,840
			Subtotal	\$181,480
			Utilities and Misc. Contingency (25%)	\$45,370
			Total	\$226,850

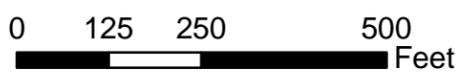


Path: F:\PROJECTS\009-0827_VTTRS\Master Plan\GIS\masterplan_exhibits\ImprovementArea5.mxd

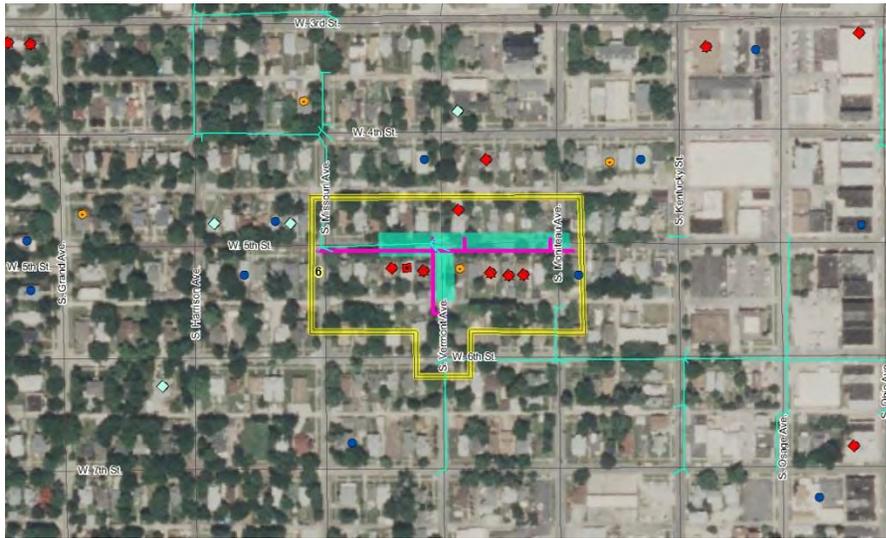
Legend

- Proposed Channel
- Proposed Pipes
- Street Flooding
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- Ground and Surface Water Flooding
- Surface Flooding
- Surface Flooding and Sanitary Sewer Backup
- Ground Water Flooding
- Ground Water Flooding and Sanitary Sewer Backup
- Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues

**City of Sedalia, MO
Potential System Improvements
Project ID #5**



Improvement Area 6 – South Vermont Avenue and West 5th Street



Location Map

Benefit Point Total	1300
Project Cost	\$302,513
Cost/Benefit Score	233

Project Problem and Solution Summary

The flooding problem in this area is the result of the lack of adequate storm sewer and homes close to the street elevation. Stormwater flows from the south and east and collects on West 5th Street and on South Moniteau Avenue and South Vermont Avenue. The stormwater causes street flooding on South Vermont Avenue, South Moniteau Avenue and West 5th Street. Stormwater flooding was also reported at 508 South Vermont, 409, 511, 405, 411, and 507 West 5th Street. The existing stormwater system is undersized and constructed of brick. Several of the flooding homes experience excess stormwater from the rear alley way. The curb and gutter in this area is also in poor condition and cannot adequately convey the stormwater in the street.

The stormwater solution for this area includes the addition of storm sewer and curb inlets. The storm sewer will begin at on West 5th Street and on South Moniteau Avenue and will continue to the west where it will connect into the existing storm system on South Missouri Avenue. The storm sewer will also extend south on South Vermont Street to capture stormwater before it flows down the alley south of West 5th Street. The entrance to the alley should also be reconstructed to prevent the stormwater from the street from flowing down the alley. The downstream enclosed system is undersized and constructed of brick. This system due to its material has the potential to be very old. The condition of the pipe is unknown. The City should consider replacing the entire enclosed brick system to West 3rd Street. For final design survey information will be needed for home low openings, and utility information to provide more accurate alignment and pipe sizing.

Cost Estimate				
<u><i>Item Description</i></u>	<u><i>Quantity</i></u>	<u><i>Qty. Units</i></u>	<u><i>Unit Cost</i></u>	<u><i>Total Cost</i></u>
Pipe 21" and Smaller - Street	102	LF	\$180	\$18,360
Pipe 21" and Larger - Street	1065	LF	\$210	\$223,650
			Subtotal	\$242,010
			Utilities and Misc. Contingency (25%)	\$60,503
			Total	\$302,513

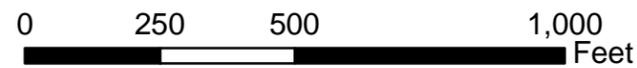
F:\PROJECTS\009\0827_WTRRS\Master Plan\GIS\masterplan_exhibits\ImprovementArea1.mxd



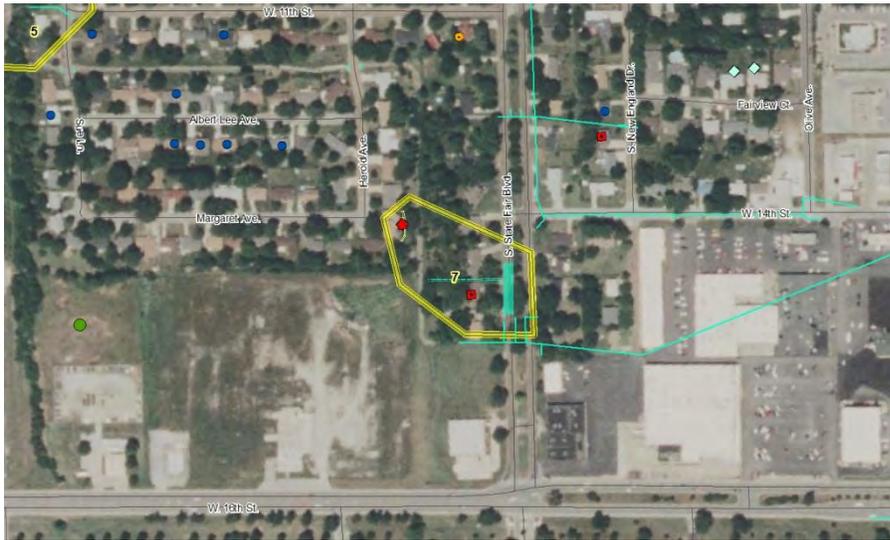
Legend

- Proposed Pipes
- StreetFlood
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- Surface Flooding and Sanitary Sewer Backup
- ▲ Ground and Surface Water Flooding
- ◆ Ground Water Flooding
- Ground Water Flooding and Sanitary Sewer Backup
- ◆ Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues

City of Sedalia, MO Potential System Improvements Project ID #1 & #6



Improvement Area 7 – South State Fair Boulevard and Herold Avenue



Benefit Point Total	500
Project Cost	\$7,625
Cost/Benefit Score	15

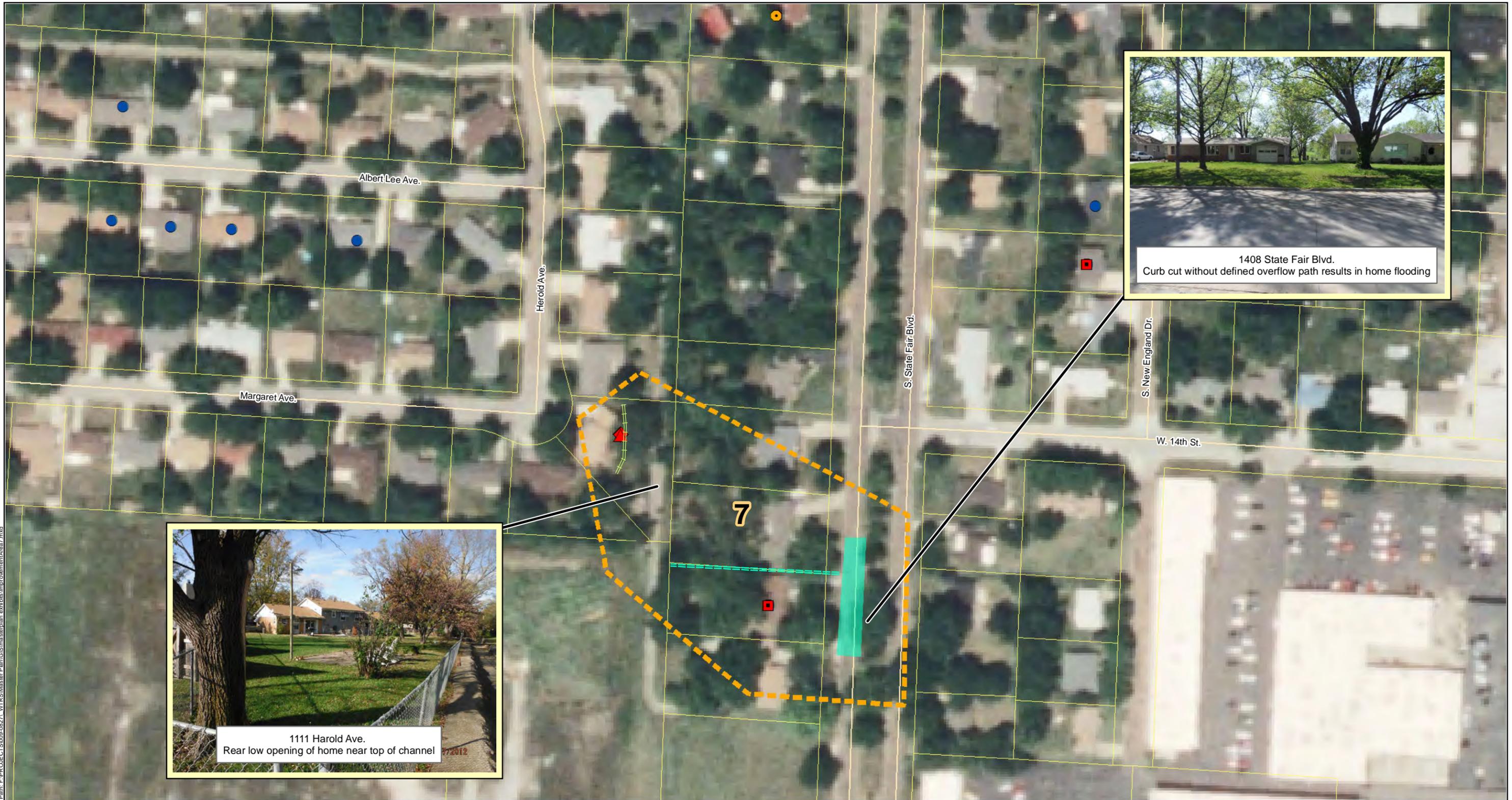
Location Map

Project Problem and Solution Summary

The home and street flooding in this area are the result of improper grades around two homes. The first home that reported flooding is 1408 South State Fair Boulevard. Stormwater flows on South State Fair Boulevard and enters a curb inlet in front of 1420 South State Fair Boulevard. Street flooding is also reported on South State Fair Boulevard as can be seen in the figure. There is also a curb cut located between 1404 and 1408 South State Fair Boulevard that allows water to travel between 1404 and 1408 South State Fair Boulevard. There is no defined channel between 1404 and 1408 South State Fair Boulevard. The second reported flooding location is 1111 Herold Avenue. The flooding at this location occurs when the channel to the east of the home comes out of the banks and water flows into the home.

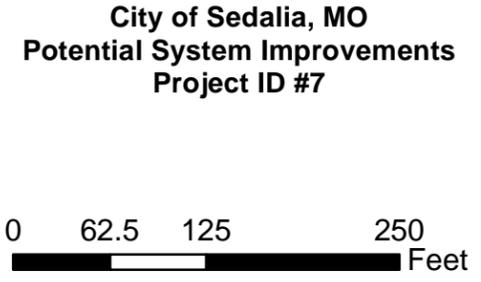
The solution to the flooding problems in this area involves grading around the flooding homes. The solution to the flooding problem on South State Fair Boulevard involves grading a small channel between 1404 and 1408 South State Fair Boulevard. This channel will provide a path for excess stormwater that does not flow into the existing curb inlet. The channel will also provide a path for water that falls near the homes. The solution to the flooding at 1111 Herold Avenue involves the placement of a berm in the rear of the home. This berm will prevent stormwater from the channel in the rear of the home from flooding the home. It is assumed that the channel has adequate capacity since no other flooding was reported in the area. For final design survey information will be needed for home low openings, utility information, more detailed topographic information and existing storm sewer information to provide more accurate alignment and pipe sizing.

Cost Estimate				
<u>Item Description</u>	<u>Quantity</u>	<u>Qty. Units</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Channel	215	LF	\$20	\$4,300
Berm	90	LF	\$20	\$1,800
			Subtotal	\$6,100
			Utilities and Misc. Contingency (25%)	\$1,525
			Total	\$7,625



Legend

-  Proposed Berm
-  Proposed Channel
-  StreetFlood
-  Potential System Improvements
-  Stormwater Problem Areas
-  Surface Water, Ground Water and Sanitary Sewer Backup
-  Surface Flooding
-  Ground Water Flooding
-  Surface Flooding and Sanitary Sewer Backup
-  Ground and Surface Water Flooding
-  Ground Water Flooding and Sanitary Sewer Backup
-  Sanitary Sewer Backup
-  Returned Questionnaires with No Major Issues



Path: F:\PROJECTS\09-0827\WFRS\Master Plan\GIS\masterplan_exhibits\ImprovementArea7.mxd

Cost Estimate				
<u><i>Item Description</i></u>	<u><i>Quantity</i></u>	<u><i>Qty. Units</i></u>	<u><i>Unit Cost</i></u>	<u><i>Total Cost</i></u>
Pipe 21" and Smaller - Street	170	LF	\$180	\$30,600
Pipe 21" and Larger - Street	1742	LF	\$210	\$365,820
			Subtotal	\$396,420
			Utilities and Misc. Contingency (25%)	\$99,105
			Total	\$495,525

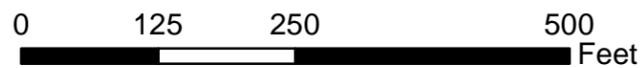


Path: F:\PROJECTS\009-0827-WTRSS\Water Plan\GIS\masterplan_exhibits\improvementArea8.mxd

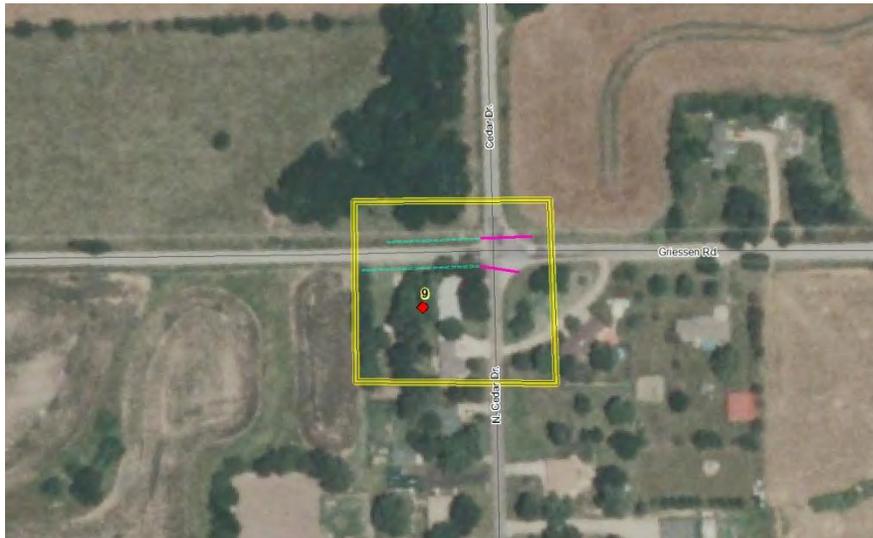
Legend

- Proposed Pipes
- Street Flood
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- Surface Flooding and Sanitary Sewer Backup
- ▲ Ground and Surface Water Flooding
- Ground Water Flooding
- Ground Water Flooding and Sanitary Sewer Backup
- Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues

**City of Sedalia, MO
Potential System Improvements
Project ID #8**



Improvement Area 9 – Griessen Road and Cedar Drive



Benefit Point Total	200
Project Cost	\$36,875
Cost/Benefit Score	184

Location Map

Project Problem and Solution Summary

The flooding problem in this area is the result of inadequate road side ditching and cross road pipes. Stormwater flows from the south and east and comes together at the intersection of Cedar Drive and Griessen Road. Once the stormwater converges at the intersection the stormwater flows over the intersection and into the attached garage of 1517 Cedar Drive. The existing ditches and cross road pipes are inadequate to convey the stormwater without flooding the home.

The solution for this area includes improved road side ditches and new cross road pipes. The existing road side ditches should be improved to convey stormwater away from the flooding home. New cross road pipes should also be installed to direct the stormwater into the improved ditches. The improved ditches and new cross road pipes will prevent the flooding of 1517 Cedar Drive. For final design survey information will be needed for home low openings, utility information, more detailed topographic data and existing storm sewer information to provide more accurate alignment and pipe sizing.

Cost Estimate				
<u><i>Item Description</i></u>	<u><i>Quantity</i></u>	<u><i>Qty. Units</i></u>	<u><i>Unit Cost</i></u>	<u><i>Total Cost</i></u>
Channel	215	LF	\$20	\$4,300
Pipe 21" and Smaller - Street	140	LF	\$180	\$25,200
			Subtotal	\$29,500
			Utilities and Misc. Contingency (25%)	\$7,375
			Total	\$36,875

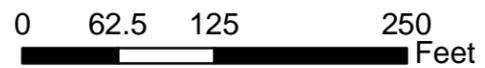
F:\PROJECTS\009\0827\WTRIS\Master Plan\GIS\masterplan_exhibits\ImprovementArea9.mxd



Legend

- Proposed Channel
- Proposed Pipes
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- Surface Flooding and Sanitary Sewer Backup
- ▲ Ground and Surface Water Flooding
- ◆ Surface Flooding
- ◆ Ground Water Flooding
- Ground Water Flooding and Sanitary Sewer Backup
- ◆ Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues

**City of Sedalia, MO
Potential System Improvements
Project ID #9**



Improvement Area 10 – South Kentucky Street and West 20th Street



Benefit Point Total	100
Project Cost	\$34,175
Cost/Benefit Score	342

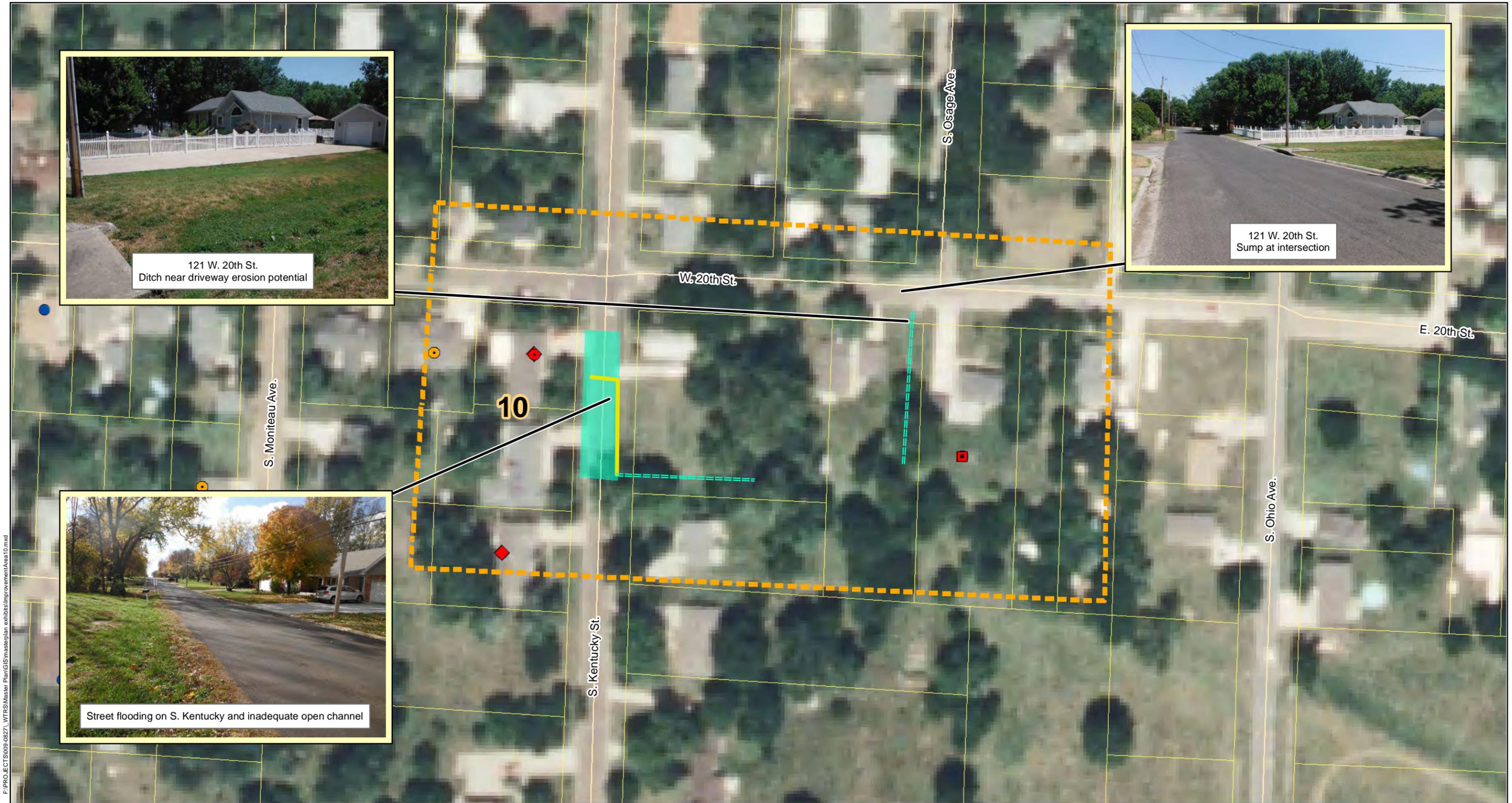
Location Map

Project Problem and Solution Summary

The flooding problem in this area is the result of inadequate stormwater channels and storm sewer. One reported problem in the project area is at 121 West 20th Street. An open channel is located to the west of the home and is causing erosion. This erosion could cause the channel to threaten the home if allowed to continue. The second reported problem in this project area is street flooding on South Kentucky Street. The reported street flooding is caused by the lack of storm sewer and insufficient existing storm sewer. The stormwater flows from the south and west and enters a curb inlet and an open channel east of South Kentucky Street. The open channel east of South Kentucky Street is also causing a unfavorable backwater condition for the existing stormwater system.

The solution to the flooding and erosion issues in this project are consist of improved stormwater channels and additional storm sewer system. The channel to the west of 121 West 20th Street should be stabilized with rip-rap. The street flooding on South Kentucky Street will be addressed with improving conveyance in the downstream channel and the addition of storm sewer and curb inlets. With the channel conveyance improved and the additional curb inlets capturing stormwater the street flooding will be reduced. For final design survey information will be needed for home low openings, utility information, more detailed topographic data and existing storm sewer information to provide more accurate alignment and pipe sizing.

Cost Estimate				
<u>Item Description</u>	<u>Quantity</u>	<u>Qty. Units</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Channel	287	LF	\$20	\$5,740
Pipe 21" and Smaller - Street	120	LF	\$180	\$21,600
			Subtotal	\$27,340
			Utilities and Misc. Contingency (25%)	\$6,835
			Total	\$34,175

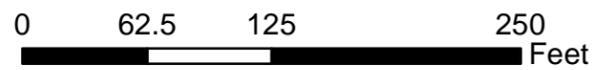


F:\PROJECTS\009-0827\WTRRS\Master Plan\GIS\masterplan exhibits\Improvement\Area10.mxd

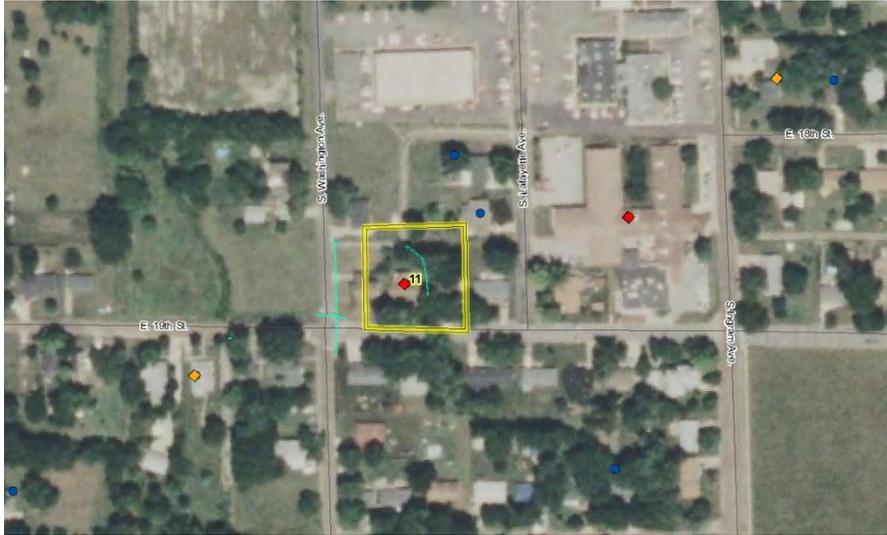
Legend

- Proposed Channel
- Proposed Pipes
- Street Flooding
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- Surface Flooding
- Surface Flooding and Sanitary Sewer Backup
- Ground Water Flooding
- Ground and Surface Water Flooding
- Ground Water Flooding and Sanitary Sewer Backup
- Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues

**City of Sedalia, MO
Potential System Improvements
Project ID #10**



Improvement Area 11 – East 19th Street and South Washington Avenue



Benefit Point Total	200
Project Cost	\$2,450
Cost/Benefit Score	12

Location Map

Project Problem and Solution Summary

The flooding problem in this area is caused grades near a home directing stormwater into a home. The home that has reported flooding is located at 403 East 19th Street. The stormwater flows from the east and runs into the east side of 403 East 19th Street.

The solution for this area involves the construction of a channel between 403 and 405 East 19th Street. The channel will capture water before it runs into the side of 403 East 19th Street. The channel will continue to the existing open channel to the north of 403 East 19th Street. For final design survey information will be needed for home low openings, utility information, more detailed topographic data and existing channel information to provide more accurate alignment and channel sizing.

Cost Estimate				
<u>Item Description</u>	<u>Quantity</u>	<u>Qty. Units</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Channel	98	LF	\$20	\$1,960
			Subtotal	\$1,960
			Utilities and Misc. Contingency (25%)	\$490
			Total	\$2,450



F:\PROJECTS\009-0827_VTRS\Master Plan\GIS\masterplan_exhibits\Improvement\Area11.mxd

Legend

- Proposed Channel
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- ◆ Surface Flooding
- Surface Flooding and Sanitary Sewer Backup
- ◆ Ground Water Flooding
- ▲ Ground and Surface Water Flooding
- Ground Water Flooding and Sanitary Sewer Backup
- ◆ Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues

**City of Sedalia, MO
Potential System Improvements
Project ID #11**



Improvement Area 12 – East 27th Street and South Massachusetts Avenue



Location Map

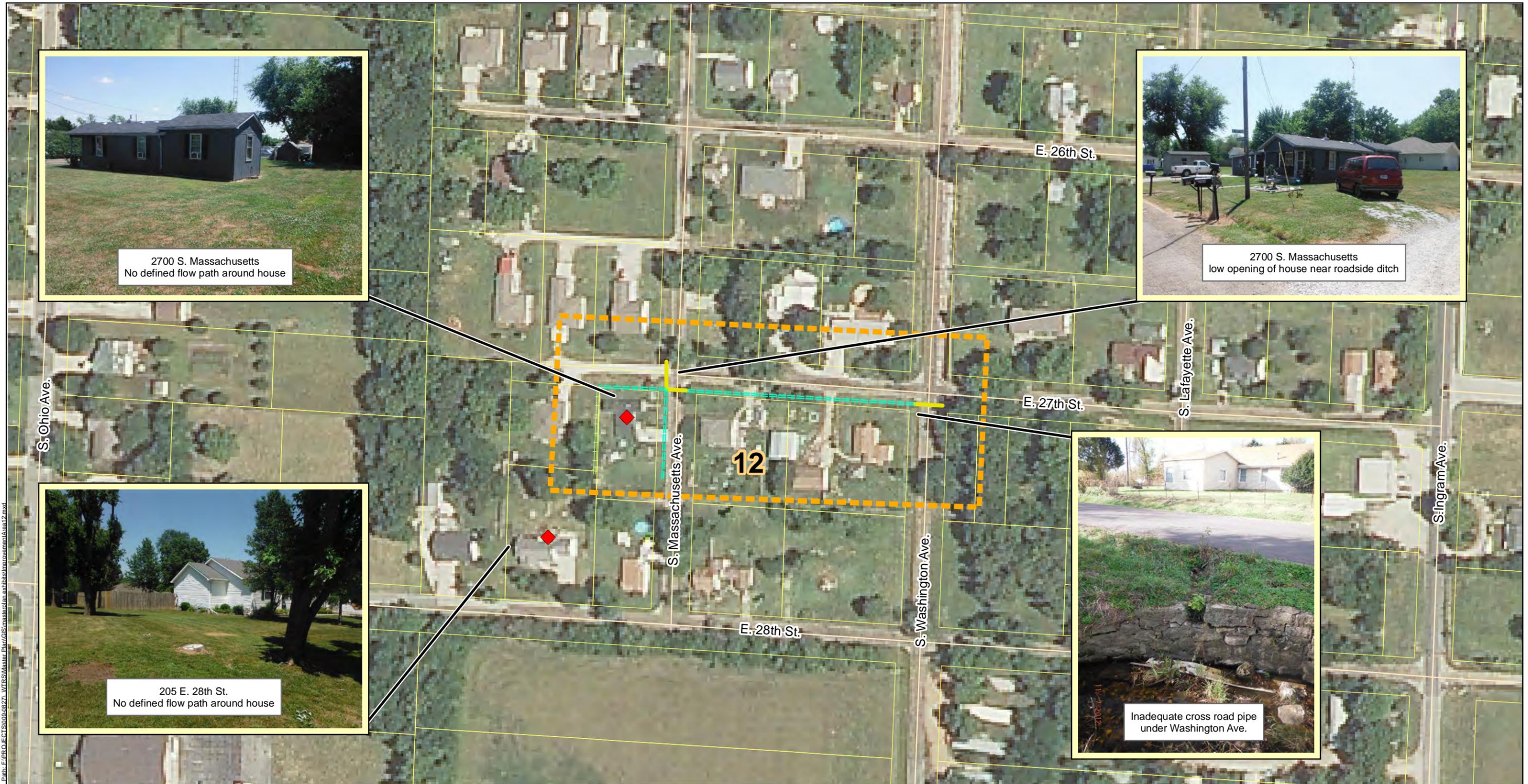
Benefit Point Total	200
Project Cost	\$39,150
Cost/Benefit Score	196

Project Problem and Solution Summary

The flooding problem in this project area is the result of inadequate ditches and the elevation of a home close to the surrounding ground. The stormwater in this area flows overland from the west. The stormwater flows into 2700 South Massachusetts due to the lack of ditching and the homes low opening close to the surrounding ground. The stormwater then continues in a ditch parallel to East 27th Street over South Washington Avenue and into an open channel.

The solution to prevent the flooding of 2700 South Massachusetts requires berms, ditches, and cross road sewer pipes. To prevent stormwater from flowing into 2700 South Massachusetts a berm will be constructed on the west side of the home. The berm will direct stormwater into newly constructed ditch along the alley. Another ditch should be constructed west of South Massachusetts to direct water around 2700 South Massachusetts. Cross road pipes should be installed under the alley and under South Massachusetts Avenue. The roadside ditch from South Massachusetts Avenue to South Washington Avenue along East 27th Street should be improved to allow for greater conveyance. A cross road culvert should also be installed under South Washington Avenue to prevent overtopping on South Washington Avenue. For final design survey information will be needed for home low openings, utility information, more detailed topographic data and existing storm sewer information to provide more accurate alignment and channel and pipe sizing.

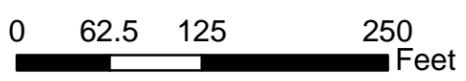
Cost Estimate				
<u><i>Item Description</i></u>	<u><i>Quantity</i></u>	<u><i>Qty. Units</i></u>	<u><i>Unit Cost</i></u>	<u><i>Total Cost</i></u>
Berm	115	LF	\$20	\$2,300
Pipe 21" and Larger - Street	36	LF	\$210	\$7,560
Pipe 21" and Smaller - Street	63	LF	\$180	\$11,340
Channel	506	LF	\$20	\$10,120
			Subtotal	\$31,320
			Utilities and Misc. Contingency (25%)	\$7,830
			Total	\$39,150



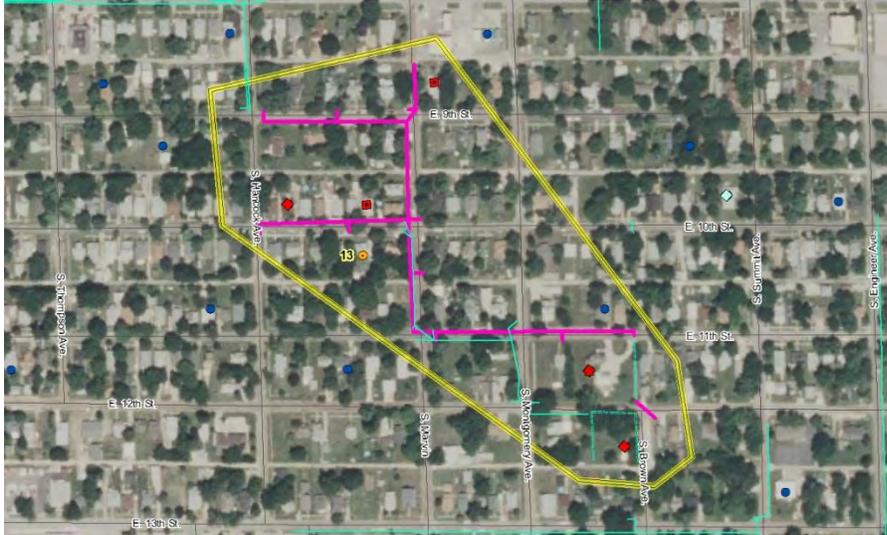
Legend

- Proposed Berm
- Proposed Channel
- Proposed Pipes
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- ◆ Surface Flooding
- ▲ Ground and Surface Water Flooding
- ◆ Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues
- Surface Flooding and Sanitary Sewer Backup
- Ground Water Flooding and Sanitary Sewer Backup
- ◆ Ground Water Flooding

**City of Sedalia, MO
Potential System Improvements
Project ID #12**



Improvement Area 13 – East 11th Street and South Montgomery Avenue



Benefit Point Total	1000
Project Cost	\$665,125
Cost/Benefit Score	665

Location Map

Project Problem and Solution Summary

The flooding problems in this project area are the result of the lack of adequate storm sewer. The stormwater generally flows from the northwest to the southeast. Several homes flood throughout the project area. The home at 801 East 9th Street floods from water ponding near the home. 705 and 725 East 10th Street both flood from water flowing from the alley way in the rear of the homes. 914 East 11th Street also floods from an open channel that is adjacent to the home. The lack of a defined ditch causes 1202 South Brown to flood. Also contributing to the flooding problem at 1202 South Brown is stormwater that flows from the west into the home.

The solution to the flooding problems in this project area involves new storm sewer and the modification of existing channels. The storm sewer begins near the intersection of East 9th Street and South Marvin. The storm sewer will continue south on South Marvin with legs from East 9th and 10th Streets draining to the main line. The main line will continue south on Marvin Street and will turn east on East 11th Street.

For final design survey information will be needed for home low openings, utility information, more detailed topographic data and existing storm sewer information to provide more accurate alignment and channel and pipe sizing.

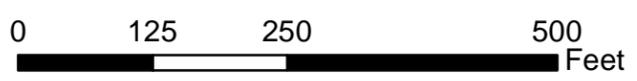
Cost Estimate				
<u><i>Item Description</i></u>	<u><i>Quantity</i></u>	<u><i>Qty. Units</i></u>	<u><i>Unit Cost</i></u>	<u><i>Total Cost</i></u>
Pipe 21" and Larger - Street	2266	LF	\$210	\$475,860
Pipe 21" and Smaller - Street	248	LF	\$180	\$44,640
Channel	580	LF	\$20	\$11,600
			Subtotal	\$532,100
			Utilities and Misc. Contingency (25%)	\$133,025
			Total	\$665,125



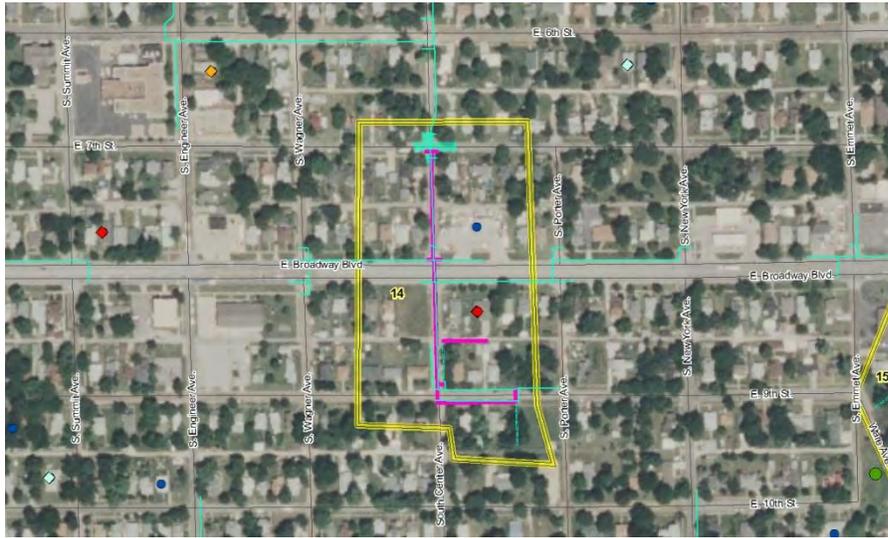
Legend

- Proposed Channel
- Proposed Pipes
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- ◆ Surface Flooding
- ▲ Ground and Surface Water Flooding
- Returned Questionnaires with No Major Issues
- Surface Flooding and Sanitary Sewer Backup
- Ground Water Flooding and Sanitary Sewer Backup
- ◆ Ground Water Flooding

**City of Sedalia, MO
Potential System Improvements
Project ID #13**



Improvement Area 14 – South Center Avenue and East Broadway Boulevard



Benefit Point Total	250
Project Cost	\$306,988
Cost/Benefit Score	1228

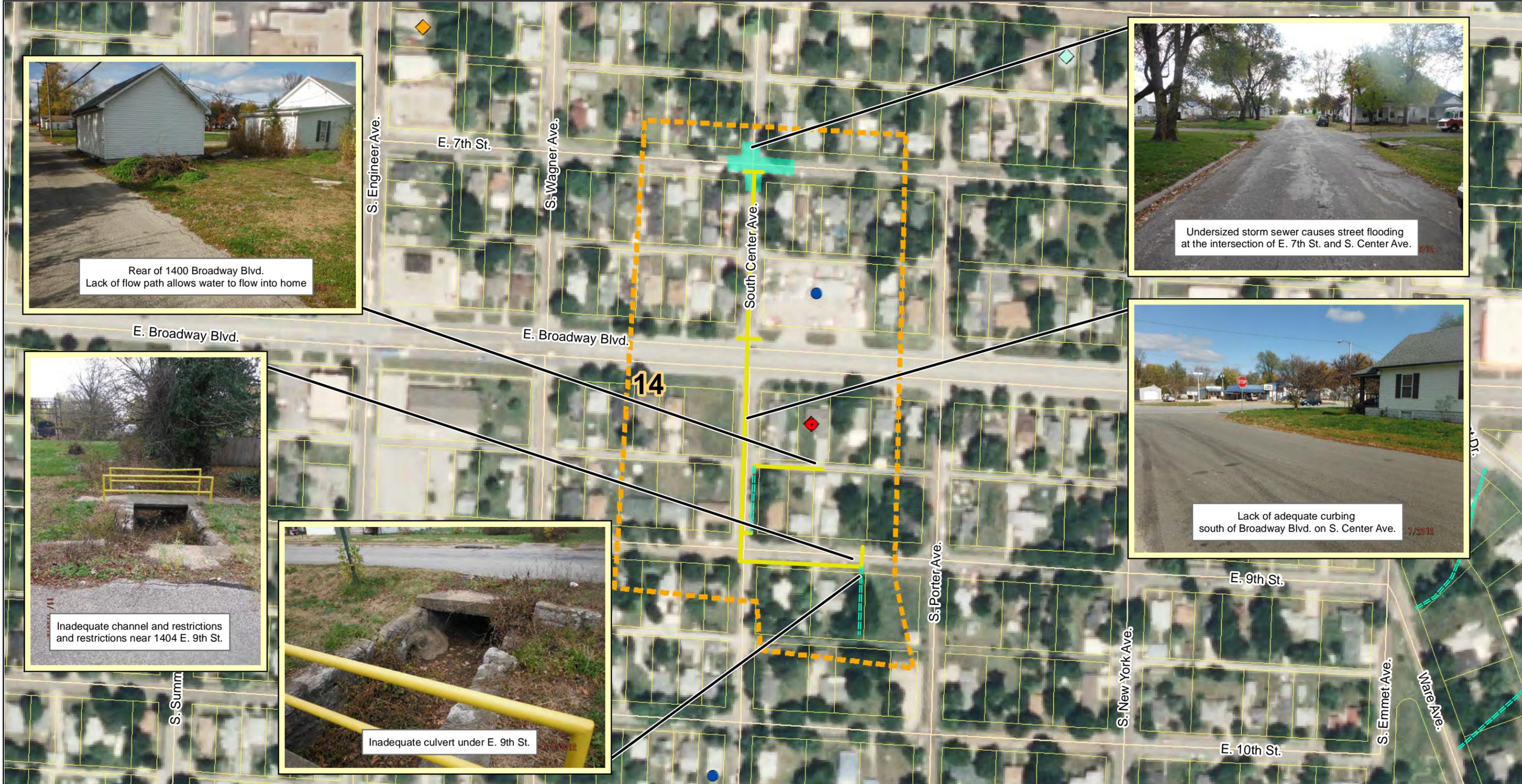
Location Map

Project Problem and Solution Summary

Street flooding and home flooding are reported in this project area by both the City and residents. Stormwater flows from the north collecting on South Center Avenue. An existing stormwater system is in place in this area but is undersized. The stormwater then flows to the south over East Broadway Boulevard. The stormwater system in this area turns to the east on East 9th Street and empties into an open channel. The home at 1410 East Broadway Boulevard floods when stormwater pools in the alley behind the home and floods the attached garage.

The solution for this project area includes an upgraded stormwater system and improved open channels. The new stormwater system will begin at the intersection of East 7th Street and South Center Avenue. The new stormwater system will then continue to the south along South Center Avenue. The upgraded stormwater system will follow the alignment of the existing stormwater system along East 9th Street. To prevent 1410 East Broadway from flooding a inlet and storm sewer will be added in the alley to capture stormwater and direct it to an improved ditch along South Center Avenue. The open channel south of East 9th Street will also need to be altered to improve conveyance. This improved channel will prevent the backup of water into the proposed stormwater system. For final design survey information will be needed for home low openings, utility information, more detailed topographic data and existing storm sewer information to provide more accurate alignment and channel and pipe sizing.

Cost Estimate				
<u><i>Item Description</i></u>	<u><i>Quantity</i></u>	<u><i>Qty. Units</i></u>	<u><i>Unit Cost</i></u>	<u><i>Total Cost</i></u>
Pipe 21" and Larger - Street	1023	LF	\$210	\$214,830
Pipe 21" and Smaller - Street	144	LF	\$180	\$25,920
Channel	242	LF	\$20	\$4,840
Subtotal				\$245,590
Utilities and Misc. Contingency (25%)				\$61,398
Total				\$306,988

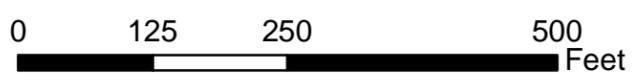


Path: F:\PROJECTS\009-0827_VFRS\Master Plan\GIS\masterplan_exhibit\improvement\area14.mxd

**City of Sedalia, MO
Potential System Improvements
Project ID #14**

Legend

- | | |
|--|---|
|  Proposed Channel |  Ground and Surface Water Flooding |
|  Proposed Pipes |  Sanitary Sewer Backup |
|  Street Flood |  Returned Questionnaires with No Major Issues |
|  Potential System Improvements |  Surface Flooding and Sanitary Sewer Backup |
|  Surface Water, Ground Water and Sanitary Sewer Backup |  Ground Water Flooding and Sanitary Sewer Backup |
|  Surface Flooding |  Ground Water Flooding |



Improvement Area 15 – Crescent Drive and Ware Avenue



Benefit Point Total	20
Project Cost	\$15,250
Cost/Benefit Score	763

Location Map

Project Problem and Solution Summary

The projects in this project area consist of unstable channels that have eroding banks. The channel erosion is threatening property near 800 and 908 Crescent Drive. Two open channels are present in this project area both are beginning to cut side banks and are a constant maintenance problem for the City and property owners.

The solution for this project area involves the re-grading of the channels. The channel improvements could also include the placement of rock rip-rap if the velocities in the channels are high. The channels could also be populated with native plants that will increase channel stability and provide water quality benefits. For final design survey information will be needed for home low openings, utility information, more detailed topographic data and existing storm sewer information to provide more accurate alignment and channel sizing.

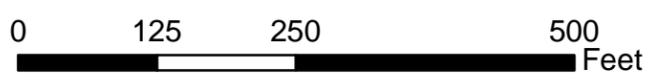
Cost Estimate				
<u>Item Description</u>	<u>Quantity</u>	<u>Qty. Units</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Channel	610	LF	\$20	\$12,200
			Subtotal	\$12,200
			Utilities and Misc. Contingency (25%)	\$3,050
			Total	\$15,250



Legend

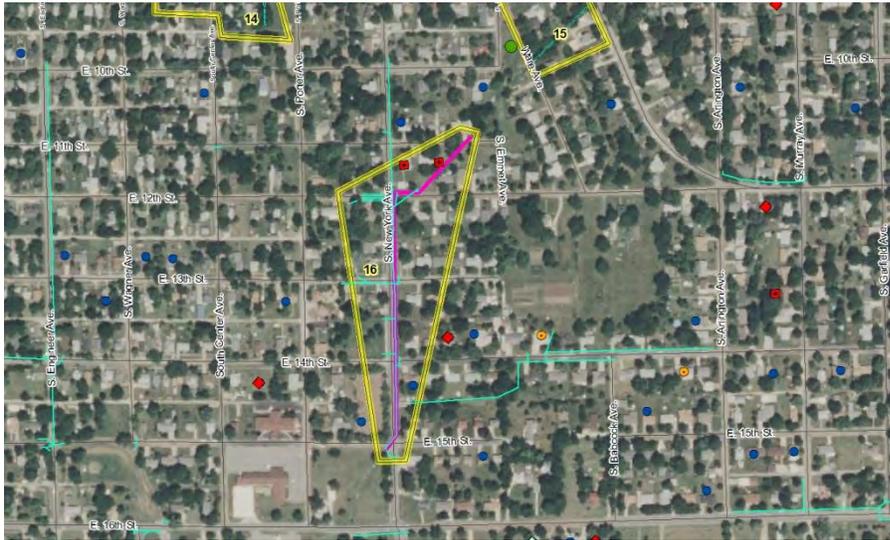
- Proposed Channel
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- ◆ Surface Flooding
- ▲ Ground and Surface Water Flooding
- ◆ Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues
- Surface Flooding and Sanitary Sewer Backup
- Ground Water Flooding and Sanitary Sewer Backup
- ◆ Ground Water Flooding

**City of Sedalia, MO
Potential System Improvements
Project ID #15**



Path: F:\PROJ\ECTS\090827\VTRES\MasterPlan\GIS\masterplan\exhibits\map\government\Area15.mxd

Improvement Area 16 – South New York Avenue and East 12th Street



Benefit Point Total	550
Project Cost	\$2,515,125
Cost/Benefit Score	4573

Location Map

Project Problem and Solution Summary

Home flooding was reported at two locations in this project area. The two homes that reported home flooding also reported problems with erosion occurring on their property. An existing natural channel begins northeast of East 11th Street and flows to the southwest it enters an enclosed system and continues under East 12th Street and crosses under South New York Avenue and continues south in an enclosed system. The natural channel causes flooding and erosion problems for 1619 and 1600 East 12th Street. The flow from the natural channel can enter into the homes near the natural channel. Street ponding also occurs on East 12th Street west of South New York Avenue. The street ponding allows water to enter the driveway and the home of 1508 East 12th Street.

The solution for this project area involves the installation of an enclosed system from East 11th Street to the natural channel south of East 15th Street. The enclosed system will prevent erosion and provide capacity for the flows that now flood the homes. The restoration of the channel in this area is not easily accomplished due to the close proximity of the adjacent homes. The existing system is undersized for the 10-year event. To allow stormwater flows north of 12th Street to effectively be carried the entire system from East 12th Street to East 15th Street must be enlarged. A modified driveway approach will also be required for 1508 East 12th Street to prevent stormwater from entering the driveway and home. For final design survey information will be needed for home low openings, utility information, more detailed topographic data and existing storm sewer information to provide more accurate alignment and channel and pipe sizing.

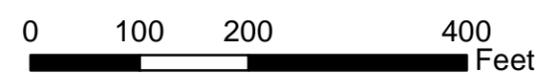
Cost Estimate				
<u>Item Description</u>	<u>Quantity</u>	<u>Qty. Units</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Large RCB	1050	LF	\$1,800	\$1,890,000
RCB	407	LF	\$300	\$122,100
			Subtotal	\$2,012,100
			Utilities and Misc. Contingency (25%)	\$503,025
			Total	\$2,515,125



**City of Sedalia, MO
Potential System Improvements
Project ID #16**

Legend

- | | |
|---|---|
| Proposed Pipes | Sanitary Sewer Backup |
| Potential System Improvements | Returned Questionnaires with No Major Issues |
| Surface Water, Ground Water and Sanitary Sewer Backup | Surface Flooding and Sanitary Sewer Backup |
| Surface Flooding | Ground Water Flooding and Sanitary Sewer Backup |
| Ground and Surface Water Flooding | Ground Water Flooding |



Path: F:\PROJECTS\009-0827 - WTRSS Master Plan\GIS\masterplan_exhibits\improvementArea16.mxd

Improvement Area 17 – South Merriam Avenue and East Broadway Boulevard



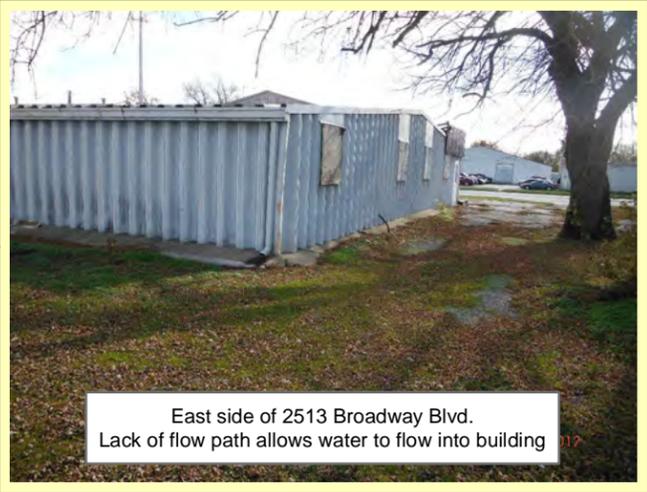
Benefit Point Total	200
Project Cost	\$30,250
Cost/Benefit Score	151

Project Problem and Solution Summary

Business flooding was reported at 2513 East Broadway Boulevard. The stormwater in this area flows from the northwest and north and flows down the alley east of South Merriam Avenue and to the north of 2513 East Broadway Boulevard. Once the water enters the alley it continues to flow towards the south and enters into 2513 East Broadway Boulevard. The stormwater then enters a enclosed system on East Broadway Boulevard.

The solution to the flooding in this area involves channelization and storm sewer. The channel will begin on the north side of 2513 East Broadway Boulevard and will capture stormwater flowing from the north. The stormwater will then enter an enclosed stormwater system that will connect into the existing system on East Broadway Boulevard. For final design survey information will be needed for home low openings, utility information, and more detailed topographic data to provide more accurate alignment and pipe sizing.

Cost Estimate				
<u>Item Description</u>	<u>Quantity</u>	<u>Qty. Units</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Pipe 21" and Smaller - Yard	140	LF	\$160	\$22,400
Channel	90	LF	\$20	\$1,800
			Subtotal	\$24,200
			Utilities and Misc. Contingency (25%)	\$6,050
			Total	\$30,250

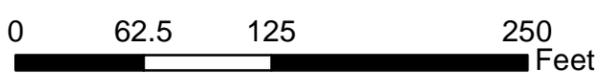


Path: F:\PROJECTS\009-0827_ WTRIS\Master Plan\GIS\mstexpln exhibits\ImprovementArea 17.mxd

Legend

- Proposed Channel
- Proposed Pipes
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- ◆ Surface Flooding
- ▲ Ground and Surface Water Flooding
- ◆ Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues
- Surface Flooding and Sanitary Sewer Backup
- Ground Water Flooding and Sanitary Sewer Backup
- ◆ Ground Water Flooding

**City of Sedalia, MO
Potential System Improvements
Project ID #17**



Improvement Area 18 – Highland Avenue and Southwest Boulevard



Location Map

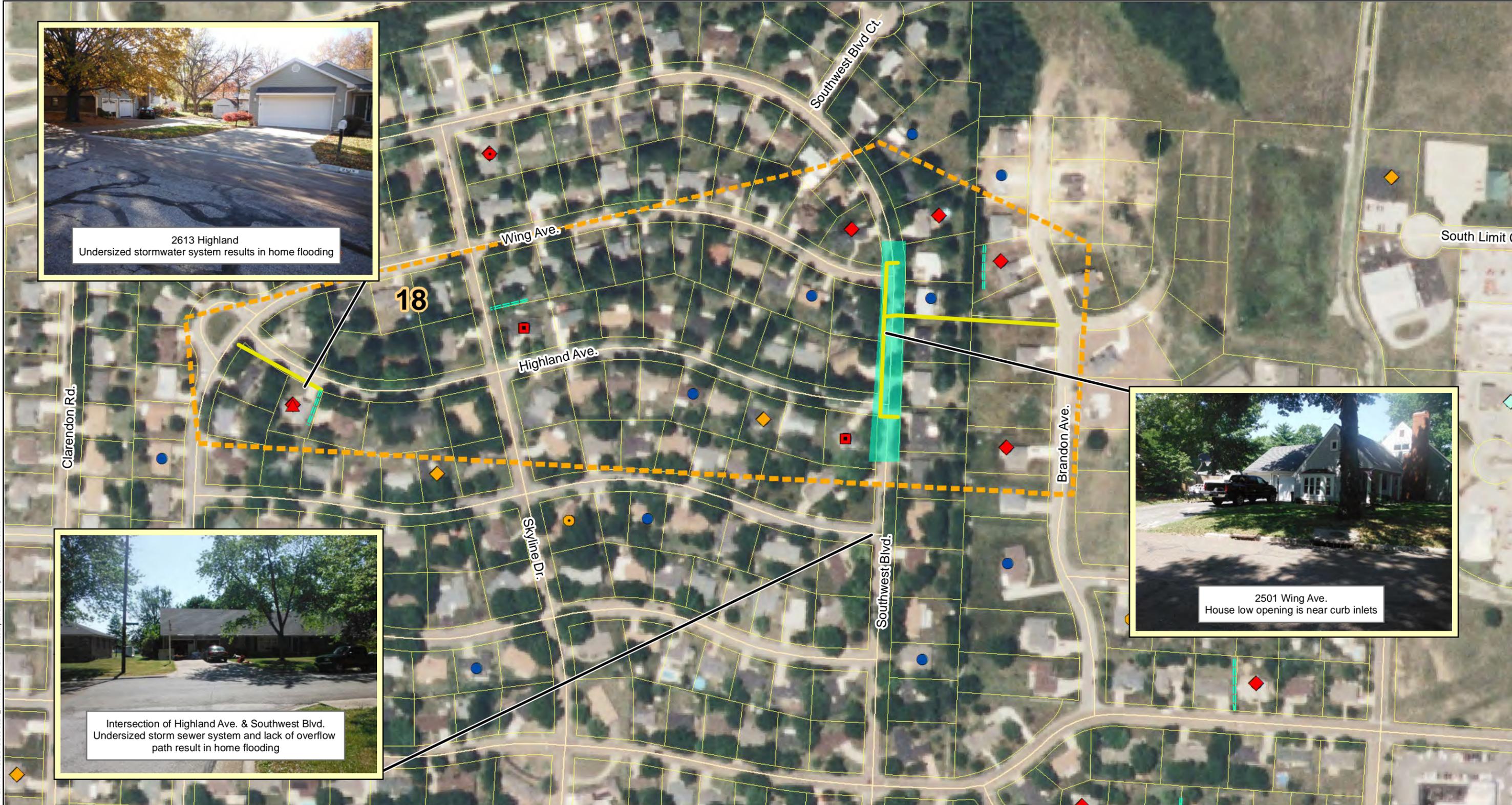
Benefit Point Total	1050
Project Cost	\$232,175
Cost/Benefit Score	221

Project Problem and Solution Summary

The problems in this area consist of reported home and street flooding. The majority of the problems in the project area consist of inadequate storm sewer and conditions that allow stormwater to flow into homes. At 2613 Highland Avenue stormwater flows from the east on Highland Avenue and flows over the curb and into the attached garage of 2613 Highland Avenue. At 2516 Highland Avenue the stormwater from the surrounding properties flows into 2516 Highland Avenue. Two street flooding and one home flooding location were reported on Southwest Boulevard. The flooding results from an inadequate storm system. The stormwater collects at two sumps near 2609 and 2801 Southwest Boulevard. At these sumps the existing collection system is inadequate and causes flooding in the streets. The ponding water also causes flooding at 2800 Southwest Boulevard. Once the stormwater ponds in the streets and reaches greater than curb depth the stormwater begins to flow to the east and causes flooding at 2804 and 2702 Brandon Avenue. The stormwater flows down the hill and floods both of the properties.

The stormwater improvements in this area consist of pipe improvements and channelization. The improvements on Southwest Boulevard consist of additional storm sewer to provide adequate conveyance and not allow the homes downstream to flood. A channel will also need to be constructed near 2702 Brandon Avenue to direct stormwater in the enclosed system and not allow the home to flood. A channel will also need to be constructed near 2516 Highland Avenue. This channel will direct stormwater away from the home and into the stream where it can be captured by the enclosed system. The extension of the existing enclosed system will be necessary to prevent the flooding of 2613 Highland Avenue. The enclosed system will capture stormwater before it floods 2613 Highland Avenue. A channel will also need to be constructed to direct stormwater to the enclosed system. For final design survey information will be needed for home low openings, utility information, and more detailed topographic data to provide more accurate alignment and pipe sizing.

Cost Estimate				
<u>Item Description</u>	<u>Quantity</u>	<u>Qty. Units</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Channel	269	LF	\$20	\$5,380
Pipe 21" and Larger - Yard	728	LF	\$180	\$131,040
Pipe 21" and Smaller - Street	274	LF	\$180	\$49,320
			Subtotal	\$185,740
			Utilities and Misc. Contingency (25%)	\$46,435
			Total	\$232,175

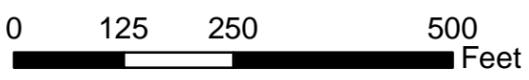


Path: F:\PROJECTS\009-0027_VTR\GIS\masterplan_exhibits\ImprovementArea18.mxd

Legend

- Proposed Channel
- Proposed Pipes
- Street Flood
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- Surface Flooding and Sanitary Sewer Backup
- ▲ Ground and Surface Water Flooding
- ◆ Surface Flooding
- ◆ Ground Water Flooding
- Ground Water Flooding and Sanitary Sewer Backup
- ◆ Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues

**City of Sedalia, MO
Potential System Improvements
Project ID #18**



Improvement Area 19 – Highway Drive and Golf Drive



Benefit Point Total	800
Project Cost	\$10,625
Cost/Benefit Score	13

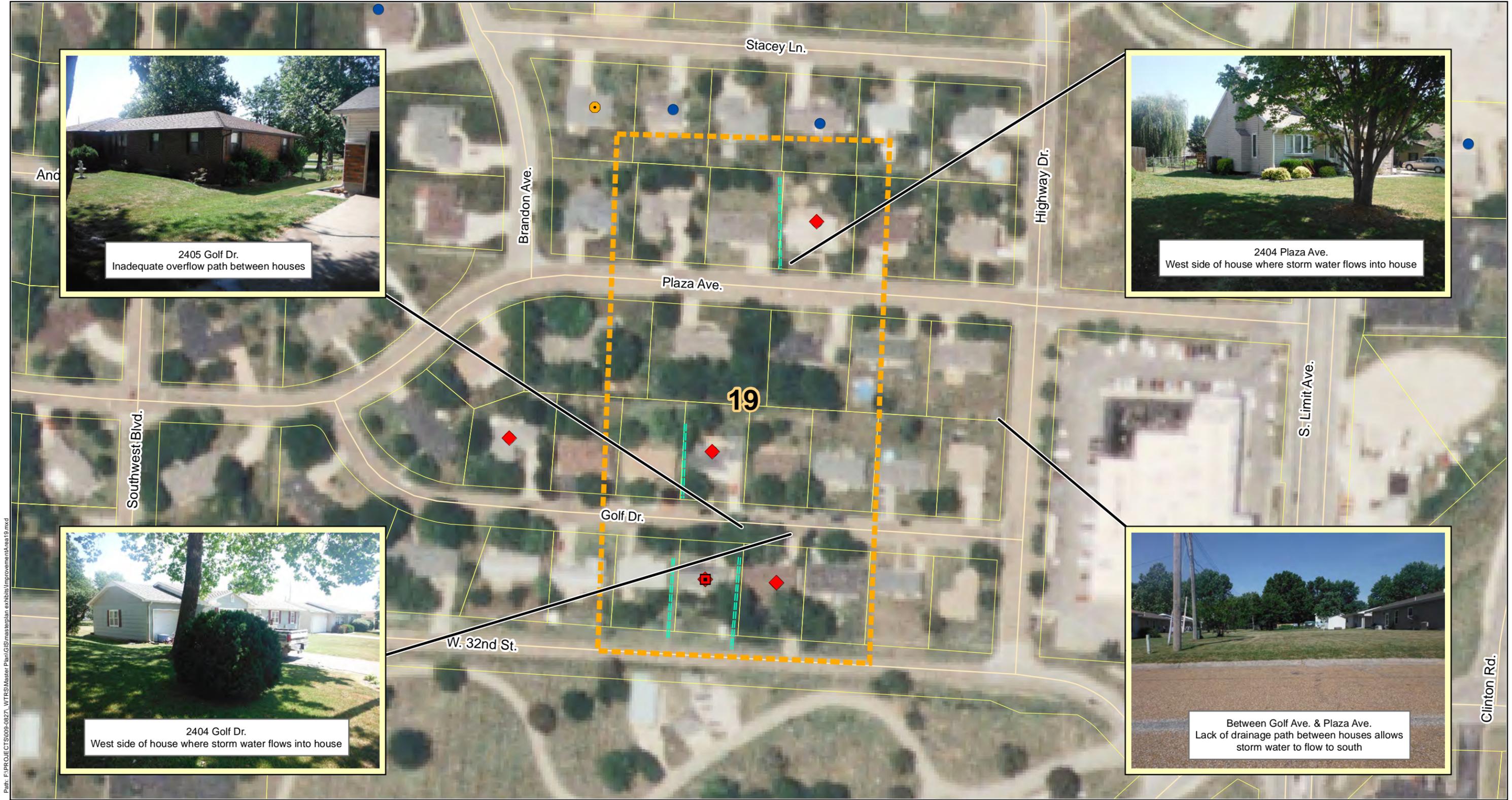
Location Map

Project Problem and Solution Summary

In this project area four residents reported flooding. The majority of the flooding occurs from stormwater directed at homes due to poor grades around homes. No enclosed stormwater system exists within the neighborhood. The stormwater is conveyed in the street curb and flows to two curb inlets located near Highway Drive and West 32nd Street.

The stormwater improvements for this area consist of channelization. The construction of channels near homes in the neighborhood would direct stormwater away from the homes and into the street. For final design survey information will be needed for home low openings, utility information, more detailed topographic data and existing storm sewer information to provide more accurate alignment and pipe sizing.

Cost Estimate				
<u>Item Description</u>	<u>Quantity</u>	<u>Qty. Units</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Channel	425	LF	\$20	\$8,500
			Subtotal	\$8,500
			Utilities and Misc. Contingency (25%)	\$2,125
			Total	\$10,625

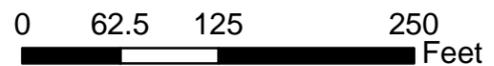


Path: F:\PROJECTS\009-0827A_WTFS\Master Plan\GIS\masterplan_exhibits\improvements\area19.mxd

Legend

- Proposed Channel
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- Surface Flooding and Sanitary Sewer Backup
- ◆ Surface Flooding
- ▲ Ground and Surface Water Flooding
- ◆ Ground Water Flooding
- Ground Water Flooding and Sanitary Sewer Backup
- ◆ Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues

**City of Sedalia, MO
Potential System Improvements
Project ID #19**



Improvement Area 20 – West 20th Street and South Warren Avenue



Location Map

Benefit Point Total	700
Project Cost	\$147,300
Cost/Benefit Score	210

Project Problem and Solution Summary

In this project area three homeowners reported flooding and street flooding in two locations. The flooding results from a lack of adequate storm sewer and grades around homes directing water into homes. One flooding problem occurs on South Beacon Avenue. The flooding problem at this location occurs due to the fact that water flows from the east and collects on South Beacon Avenue. Two curb inlets collect the water and convey it to the west to the rear of 1820 South Beacon Avenue. These inlets are undersized and cause flooding at 1820 South Beacon Avenue and street flooding near the home and curb inlets. The other flooding problem in this area is located on South Warren Avenue. Stormwater flows from the east and collects on West 20th Street and flows onto South Warren Avenue. Once on South Warren Avenue the stormwater flows over the curb and into 1603 West 20th Street. Stormwater flowing overland from the east flows into 2001 South Warren Avenue due to the lack of adequate grading around the home. The stormwater in this area enters two curb inlets on South Warren Avenue and is carried to the west where it outlets to an open channel.

To alleviate flooding in this area storm sewer pipes, channels and berms will be required. New storm sewer on South Beacon Avenue will be required to capture the water and convey it to the west to the existing open channel. The new storm sewer pipe and inlets will prevent home flooding at 1820 South Beacon Avenue and street flooding on South Beacon Avenue. To prevent the flooding problems near West 20th Street and South Warren Avenue storm sewer channels and berms will be required. A new storm sewer pipe will be constructed from West 20th Street to South Warren Avenue. The new storm sewer will continue to the west and outlet into the existing open channel. A new berm and channel should also be constructed to protect 2001 South Warren Avenue. The grading near the home will direct water to the street and the upgraded storm sewer. The improved storm sewer system will also prevent street flooding on South Warren Avenue. For final design survey information will be needed for home low

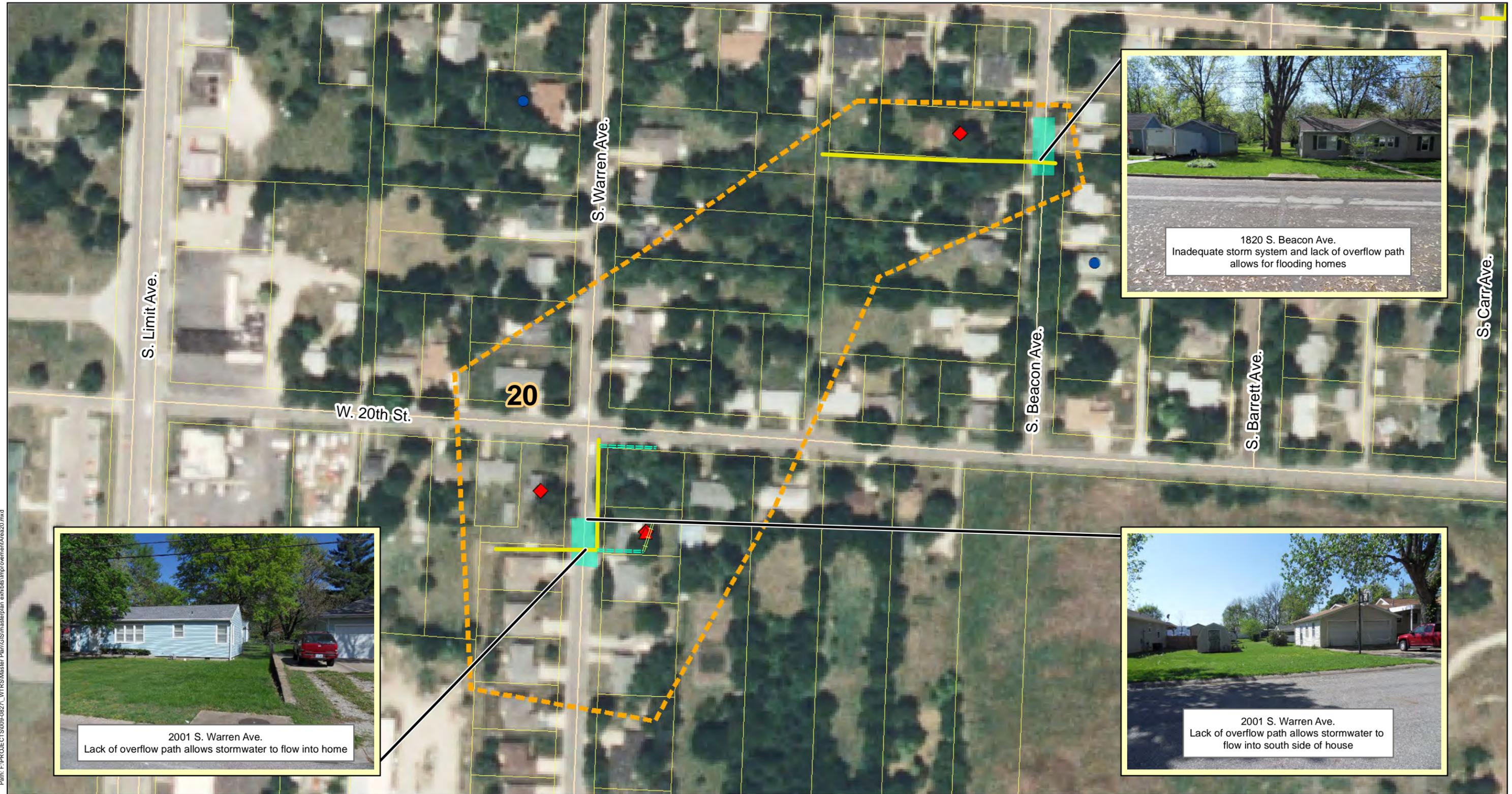
openings, utility information, and more detailed topographic data to provide more accurate alignment and pipe sizing.

Cost Estimate				
<u>Item Description</u>	<u>Quantity</u>	<u>Qty. Units</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Channel	133	LF	\$20	\$2,660
Berm	50	LF	\$21	\$1,050
Pipe 21" and Smaller - Yard	313	LF	\$160	\$50,080
Pipe 21" and Larger - Yard	280	LF	\$180	\$50,400
Pipe 21" and Smaller - Street	35	LF	\$180	\$6,300
Pipe 21" and Larger - Street	35	LF	\$210	\$7,350

Subtotal \$117,840

Utilities and Misc. Contingency (25%) \$29,460

Total \$147,300

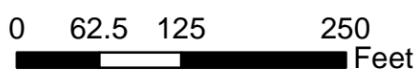


Path: F:\PROJECTS\009-0827\WTRIS\Master Plan\GIS\mapalrplan_exhibits\ImprovementArea20.mxd

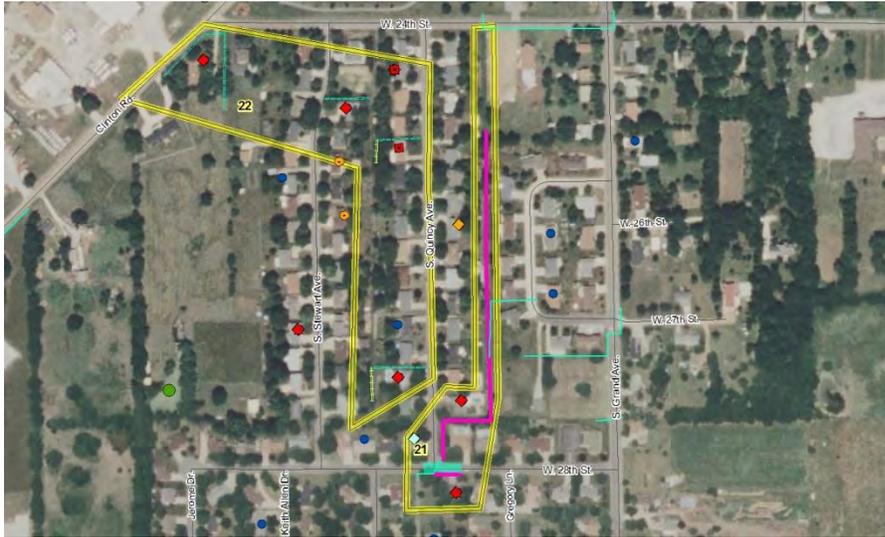
Legend

- Proposed Berm
- Proposed Channel
- Proposed Pipes
- Street Flood
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- Surface Flooding and Sanitary Sewer Backup
- ▲ Ground and Surface Water Flooding
- ◆ Surface Flooding
- ◆ Ground Water Flooding
- Ground Water Flooding and Sanitary Sewer Backup
- ◆ Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues

**City of Sedalia, MO
Potential System Improvements
Project ID #20**



Improvement Area 21 - South Quincy Avenue and West 28th Street



Location Map

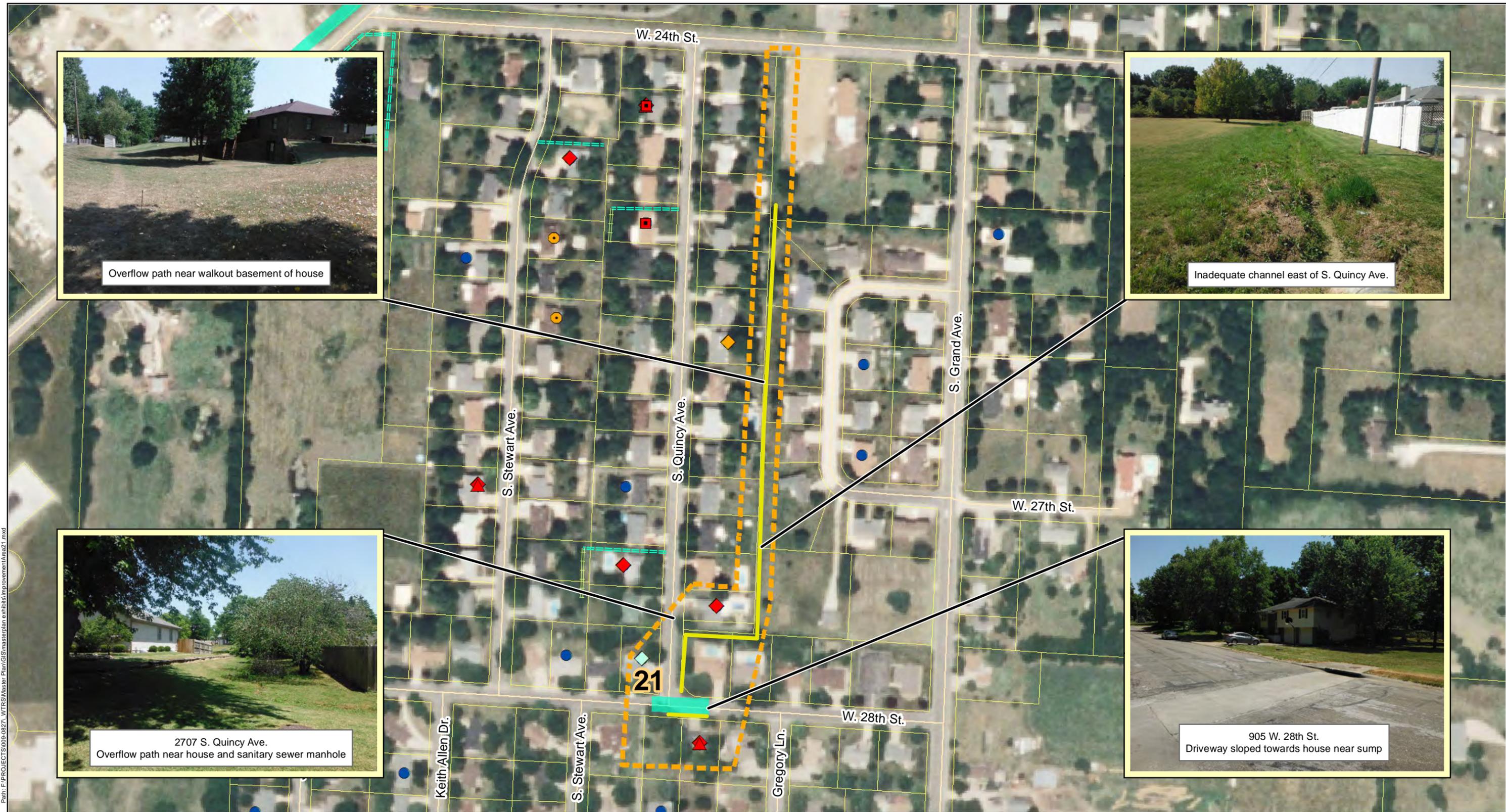
Benefit Point Total	450
Project Cost	\$302,175
Cost/Benefit Score	672

Project Problem and Solution Summary

The flooding problem in this area is the result of insufficient storm sewer and inadequate open channel. The stormwater flows from the north east of S. Quincy Avenue. The stormwater enters a CMP pipe and then empties into an open channel where it flows around 908 W. 28th Street. The stormwater then flows into the enclosed system. 905 W. 28th Street also experiences flooding from the stormwater flowing from the east down W. 28th Street. Stormwater also collects in the street and could restrict the access of emergency vehicles.

The conceptual improvement for this area includes adding storm sewer to route the stormwater from W. 24th Street to south of W. 28th Street. The additional enclosed system will allow stormwater to be routed around the homes that routinely flood. On field visits it was also noted that the rear of many homes on La Grand Drive had low opening elevations very close to the inlet elevations of the existing enclosed system and could flood in larger events. The storm sewer system will begin at the downstream end at the intersection of 28th Street and Quincy Avenue. The storm sewer will then lay around 908 W. 28th Street and will then travel north to the east of Quincy Avenue. The storm sewer inlet will then terminate at the open channel approximately 340 feet south of W. 24th Street. For final design survey information will be needed for home low openings, roadway clearance, utility information, existing stormwater system information and existing ditch elevations to provide more accurate pipe sizing and flood protection.

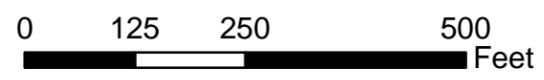
Cost Estimate				
<u>Item Description</u>	<u>Quantity</u>	<u>Qty. Units</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Pipe 21" and Larger - Yard	1257	LF	\$180	\$226,260
Pipe 21" and Smaller - Street	86	LF	\$180	\$15,480
			Subtotal	\$241,740
			Utilities and Misc. Contingency (25%)	\$60,435
			Total	\$302,175



Legend

- ▬▬▬ Proposed Berm
- ▬▬▬ Proposed Channel
- ▬▬▬ Potential System Improvements
- ▬▬▬ Proposed Pipes
- Street Flooding
- Surface Water, Ground Water and Sanitary Sewer Backup
- Surface Flooding and Sanitary Sewer Backup
- ▲ Ground and Surface Water Flooding
- ◆ Surface Flooding
- ◆ Ground Water Flooding
- Ground Water Flooding and Sanitary Sewer Backup
- ◆ Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues

**City of Sedalia, MO
Potential System Improvements
Project ID #21**



Path: F:\PROJECTS\1009-08271_WTRIS\Master Plan\GIS\masterplan_exhibits\ImprovementArea21.mxd

Improvement Area 22 – West 24th Street and Clinton Road



Location Map

Benefit Point Total	800
Project Cost	\$30,284
Cost/Benefit Score	38

Project Problem and Solution Summary

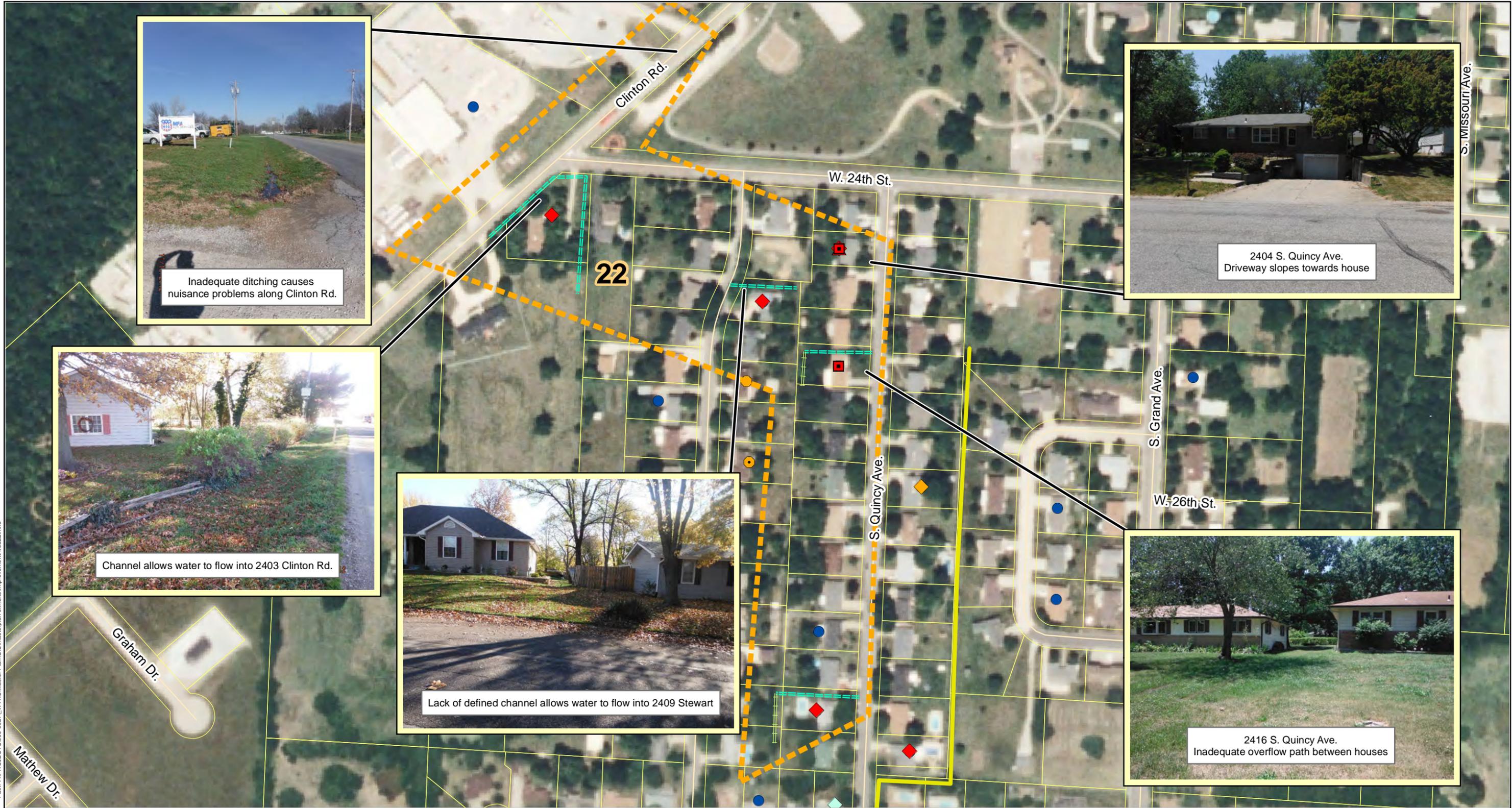
The problems in this area consist of reported home flooding and street flooding. The flooding near the homes is a result of inadequate grading near the homes. One of the homes flooding in this area is 2403 Clinton Road. The flooding at this location occurs due to inadequate ditching around the home. The undersized ditches allow stormwater to flow overland from the north and into 2403 Clinton Road. The next flooding location is 2409 South Stewart Avenue. This location floods when overland flows from the north flow into the side of the home. 2416 South Quincy Avenue also floods when stormwater flowing from the north and east flows into the home due to inadequate grades around the home. The final flooding home, 2704 South Quincy Avenue also floods due to grades directing stormwater into the home. The street flooding occurs on Clinton Road. No storm sewer system exists in the area and no defined roadside ditch exists. The lack of a storm sewer system and defined ditch cause street flooding and maintenance issues with ponding water along Clinton Road.

To prevent flooding in this project area the grading of channels and berms will be required to direct water away from homes. At 2403 Clinton Road the channel will need to be re-graded along Clinton Road and south of West 24th Street. The new channel will capture water flowing from the north and will direct water away from the home. A new channel will also be required to capture water at 2409 South Stewart Avenue flowing from the north and to direct towards the street. A berm and channel will also be required at 2416 and 2704 South Quincy Avenue. The berms and channels will direct stormwater away from the homes and into the street where it can be conveyed to the south. To prevent flooding and ponding along Clinton Road ditches should be grated alongside the road. For final design survey information will be needed for home low openings, utility information, more detailed topographic data and existing storm sewer to provide more accurate alignment and channel sizing.

Stormwater Master Plan for Sedalia, MO

Part B: Recommended Action Plan

Cost Estimate				
<u><i>Item Description</i></u>	<u><i>Quantity</i></u>	<u><i>Qty. Units</i></u>	<u><i>Unit Cost</i></u>	<u><i>Total Cost</i></u>
Channel	1015	LF	\$20	\$20,300
Berm	187	LF	\$21	\$3,927
			<i>Subtotal</i>	\$24,227
			<i>Utilities and Misc. Contingency (25%)</i>	\$6,057
			<i>Total</i>	\$30,284

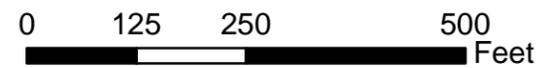


Path: F:\PROJECTS\009-0027\WTRIS\Master Plan\GIS\masterplan exhibits\ImprovementArea22.mxd

Legend

- ▬▬▬ Proposed Berm
- ▬▬▬ Proposed Channel
- ▬▬▬ Proposed Pipes
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- Surface Flooding and Sanitary Sewer Backup
- ▲ Ground and Surface Water Flooding
- ◆ Surface Flooding
- ◆ Ground Water Flooding
- Ground Water Flooding and Sanitary Sewer Backup
- ◆ Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues

**City of Sedalia, MO
Potential System Improvements
Project ID #22**



Improvement Area 23 –32nd Street and South Ohio Avenue



Benefit Point Total	300
Project Cost	\$45,025
Cost/Benefit Score	150

Location Map

Project Problem and Solution Summary

The problems in this area consist of reported home and street flooding. The stormwater flows south on South Ohio Avenue and from the east and west on 32nd Street. The stormwater collects at the intersection of South Ohio Avenue and 32nd Street. Two curb inlets and a grate inlet collect the stormwater and direct it to an open channel south of 32nd Street. The stormwater pools on the street and causes street flooding and home flooding at 102 East 32nd Street. The home flooding is caused by water flowing down 32nd Street and down the driveway of 102 East 32nd Street. The channel adjacent to the home is eroding and has the potential to migrate and threaten 102 East 32nd Street.

The addition of storm sewer and channel grading will prevent street and home flooding at the intersection of 32nd Street and South Ohio Avenue. The stormwater improvements include additional inlets at the intersection. The storm sewer should also be extended east of 102 East 32nd Street to capture stormwater before it flows down the driveway of 102 East 32nd Street. The open channel south of 32nd Street should also be improved to prevent further channel migration. For final design survey information will be needed for home low openings, utility information, more detailed topographic data and existing storm sewer information to provide more accurate alignment and pipe sizing.

Cost Estimate				
<u>Item Description</u>	<u>Quantity</u>	<u>Qty. Units</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Channel	160	LF	\$20	\$3,200
Pipe 21" and Larger - Street	50	LF	\$210	\$10,500
Pipe 21" and Smaller - Street	124	LF	\$180	\$22,320
			Subtotal	\$36,020
			Utilities and Misc. Contingency (25%)	\$9,005
			Total	\$45,025

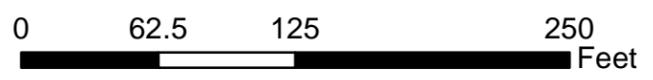


Path: F:\PROJECTS\009-0827\WTRIS\Master Plan\GIS\masterplan exhibits\ImprovementArea23.mxd

Legend

- ▬▬▬ Proposed Channel
- ▬▬▬ Proposed Pipes
- Street Flood
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- Surface Flooding and Sanitary Sewer Backup
- ▲ Ground and Surface Water Flooding
- ◆ Surface Flooding
- ◆ Ground Water Flooding
- Ground Water Flooding and Sanitary Sewer Backup
- ◆ Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues

**City of Sedalia, MO
Potential System Improvements
Project ID #23**



Improvement Area 24 – Brentwood Avenue



Benefit Point Total	200
Project Cost	\$4,545
Cost/Benefit Score	23

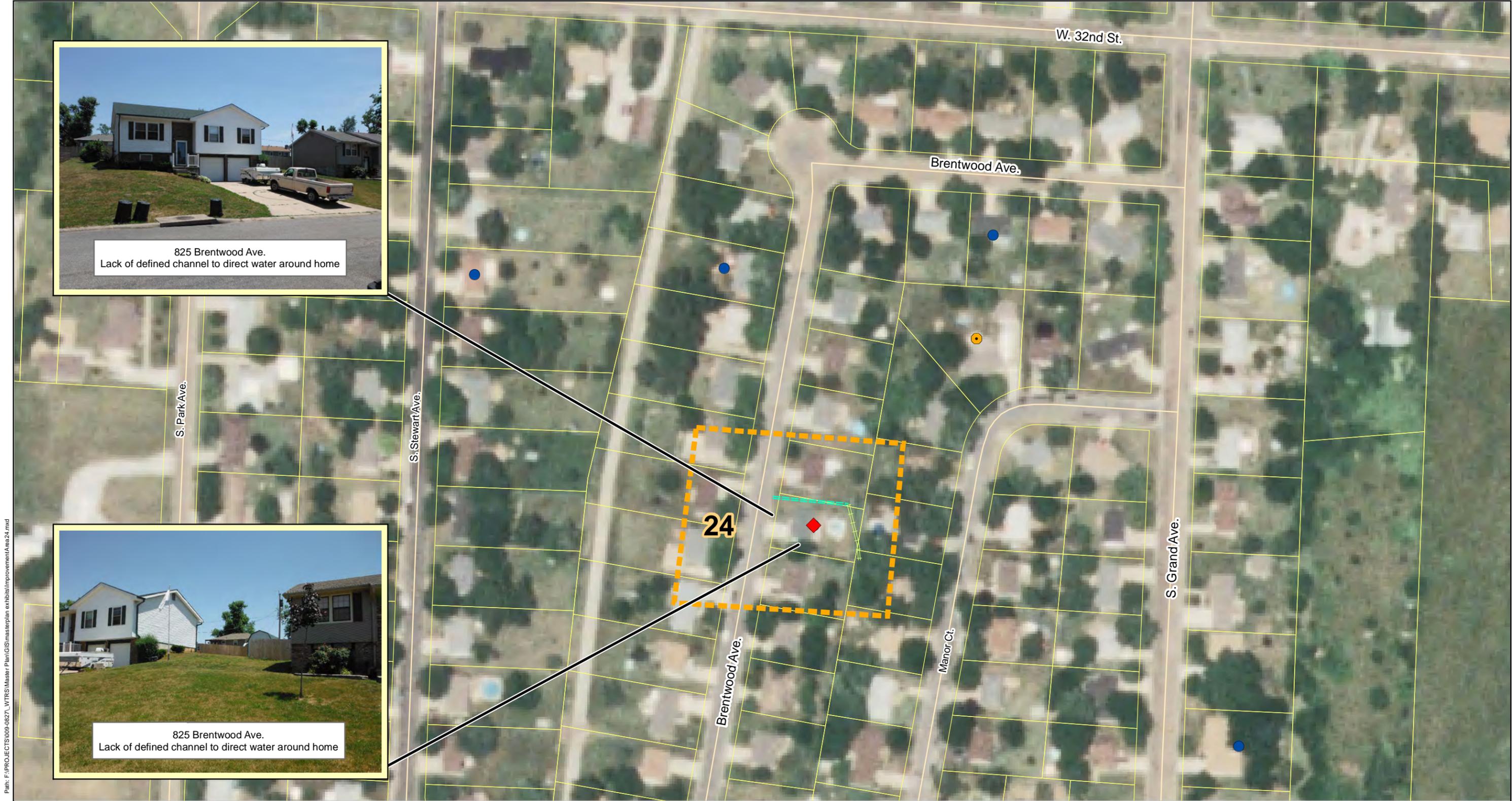
Location Map

Project Problem and Solution Summary

The problems in this area consist of reported home flooding. Stormwater flows overland from the northeast and into the rear of 825 Brentwood Avenue. No upland system exists for this area.

To prevent flooding at 825 Brentwood Avenue the construction of a berm and channel will be necessary. The construction of a berm in the rear of the home will direct water to a newly constructed channel that will direct water to the street. Once in the street the stormwater will be conveyed to the south and into the existing enclosed system. For final design survey information will be needed for home low openings, utility information, and more detailed topographic data to provide more accurate alignment and channel sizing.

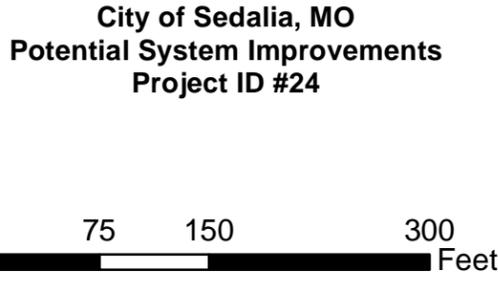
Cost Estimate				
<u>Item Description</u>	<u>Quantity</u>	<u>Qty. Units</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Channel	102	LF	\$20	\$2,040
Berm	76	LF	\$21	\$1,596
			Subtotal	\$3,636
			Utilities and Misc. Contingency (25%)	\$909
			Total	\$4,545



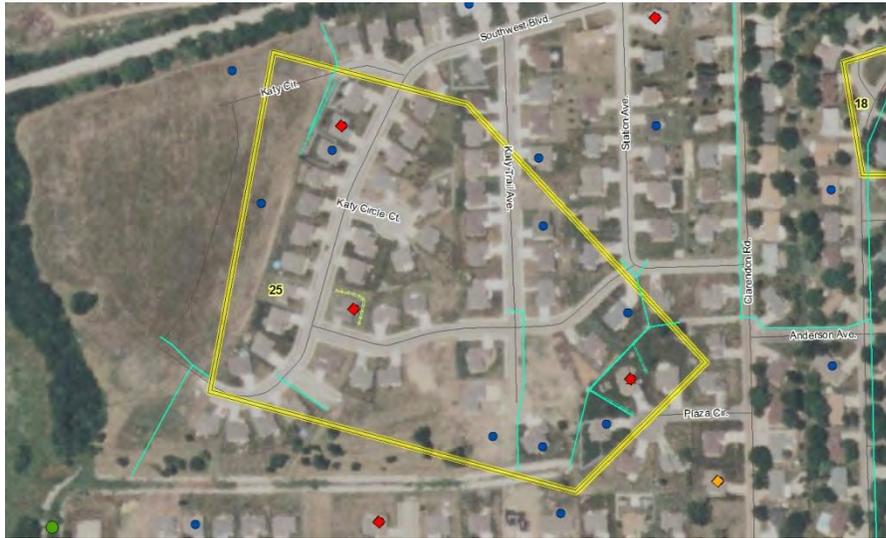
Path: F:\PROJECTS\09-0827_WTRSMasterPlan\GIS\masterplan_exhibits\ImprovementArea24.mxd

Legend

- ▬▬▬ Proposed Berm
- ▬▬▬ Proposed Channel
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- Surface Flooding and Sanitary Sewer Backup
- ▲ Ground and Surface Water Flooding
- ◆ Surface Flooding
- ◆ Ground Water Flooding
- Ground Water Flooding and Sanitary Sewer Backup
- ◆ Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues



Improvement Area 25 – Katy Circle and Anderson Avenue



Location Map

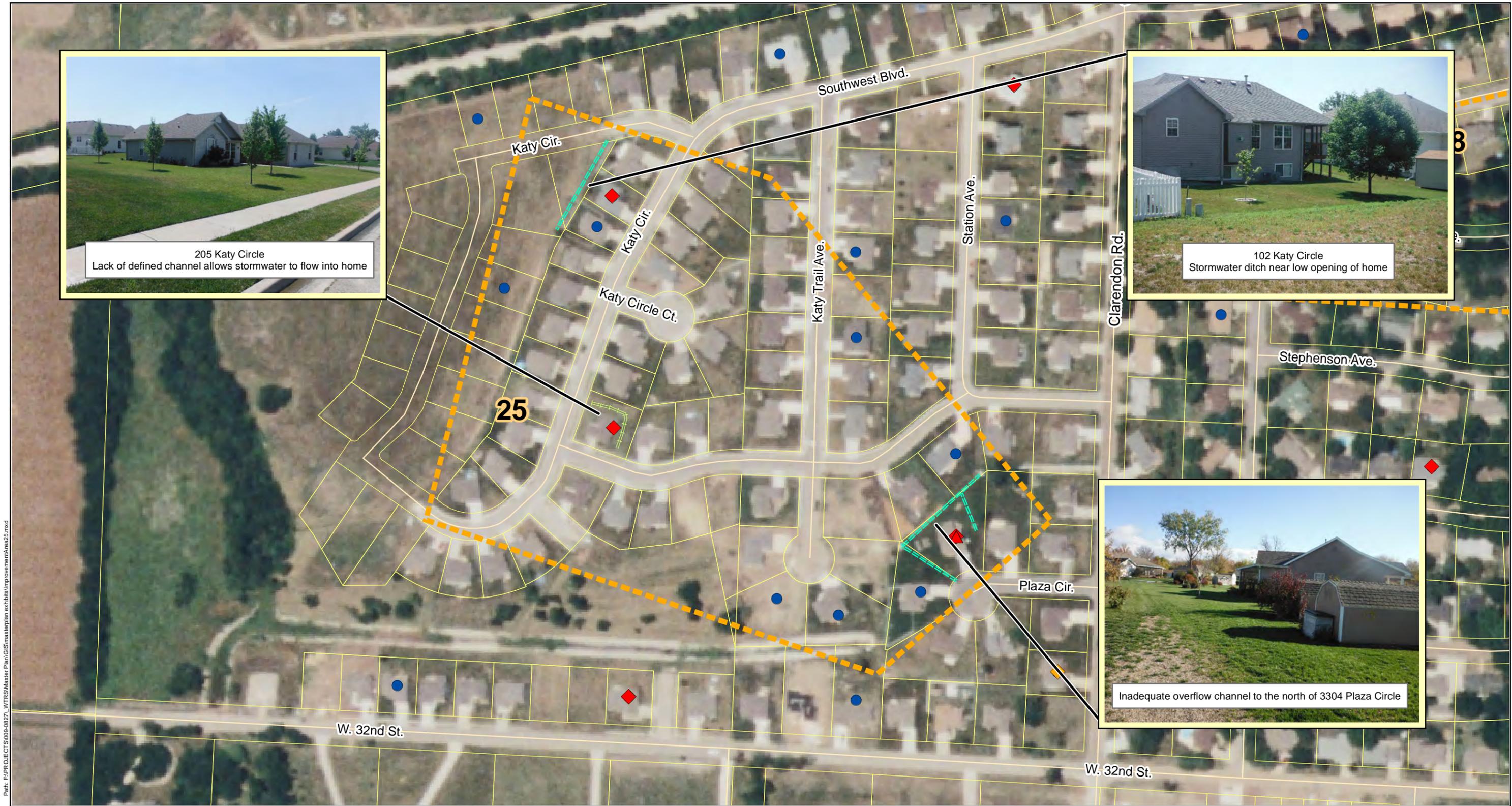
Benefit Point Total	600
Project Cost	\$19,075
Cost/Benefit Score	32

Project Problem and Solution Summary

Three home owners reported flooding in this project area. The flooding is caused by grades directing water towards a home and inadequate open channel conveyance near homes. One flooding problem in this area is at 3304 Plaza Circle. The flooding problem at this residence is most likely caused by water flowing in the rear of the home and along the sides of the home. The water enters the home as it flows near it. An existing enclosed system flows from the northeast to the southwest behind the home. The capacity of the existing system is unknown. Another flooding problem in this area is at 205 Katy Circle. At this residence stormwater flows from the northeast and into the rear of 205 Katy Circle. The home lacks adequate grades to direct the water away from the home. Another home flooding problem in this area is located at 102 Katy Circle. To the rear of the home a drainage channel exists to carry stormwater from the surrounding homes. The home at 102 Katy Circle has a window well very close to the flowline of the channel. The small difference in elevation between the opening in the home and the channel allows water to enter the home.

The prevent flooding in this area channels and berms will be required. At 3304 Plaza Circle channels will be required around the home to convey water around the home. Analysis of the existing enclosed system should be completed to determine if adequate capacity exists. At 205 Katy Circle a berm should be constructed on the north and east side of the home. This berm will direct water away from the home and into the street where it can be captured by the existing enclosed system. Behind the home of 102 Katy Circle the existing channel should be altered to increase capacity and prevent stormwater from flowing into the home. For final design survey information will be needed for home low openings, utility information, more detailed topographic data and existing storm sewer information to provide more accurate alignment and channel sizing.

Cost Estimate				
<u>Item Description</u>	<u>Quantity</u>	<u>Qty. Units</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Channel	616	LF	\$20	\$12,320
Berm	140	LF	\$21	\$2,940
			Subtotal	\$15,260
			Utilities and Misc. Contingency (25%)	\$3,815
			Total	\$19,075

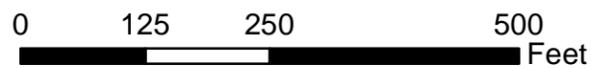


Path: F:\PROJECTS\009-0827\WTRIS\Master Plan\GIS\masterplan exhibits\improvements\Area25.mxd

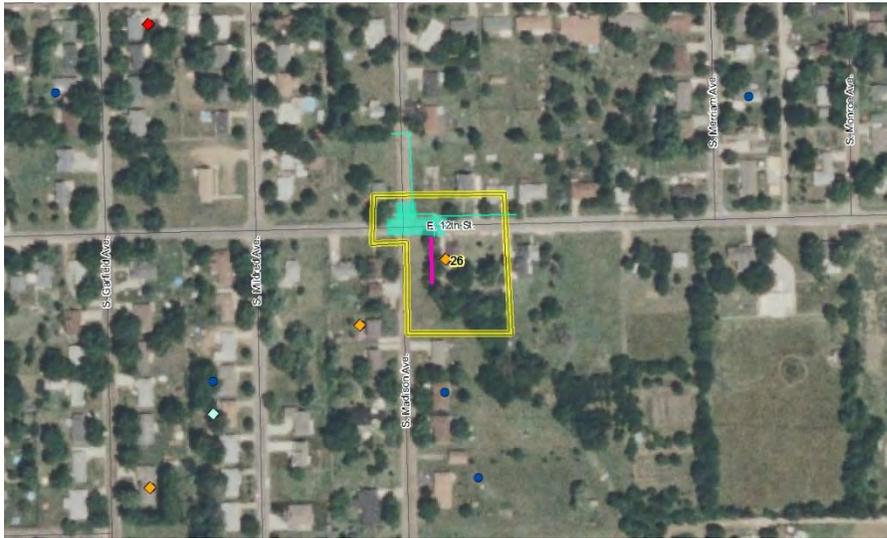
Legend

- Proposed Berm
- Proposed Channel
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- Surface Flooding and Sanitary Sewer Backup
- Ground and Surface Water Flooding
- Surface Flooding
- Ground Water Flooding
- Ground Water Flooding and Sanitary Sewer Backup
- Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues

**City of Sedalia, MO
Potential System Improvements
Project ID #25**



Improvement Area 26 – East 12th Street and South Madison Avenue



Benefit Point Total	300
Project Cost	\$50,000
Cost/Benefit Score	167

Location Map

Project Problem and Solution Summary

Street flooding and home flooding were reported in this project area. This area was also identified as a problem area by the City of Sedalia. In this location stormwater flows from the north and enters a concrete box north of East 12th Street. The box parallels South Madison Avenue and empties east of South Madison Avenue near the driveway of 2304 East 12th Street. The water exiting the box has caused scour and is threatening the driveway of 2304 East 12th Street. The open channel near the home also floods 2304 East 12th Street. The street flooding at the intersection of East 12th Street and South Madison Avenue is caused by flow from the west, east and north collecting at the intersection. Once the water collects at the intersection the existing curb inlets do not have adequate capacity to capture the water and prevent street flooding.

To prevent street and home flooding in this area additional concrete box should be added to the downstream portion of the enclosed system to allow the stormwater to pass by the home without flooding the structure. Additional curb inlets would also prevent street flooding. A home buyout should also be investigated due the close proximity of the home to the open channel. For final design survey information will be needed for home low openings, utility information, more detailed topographic data and existing storm sewer information to provide more accurate alignment and pipe sizing.

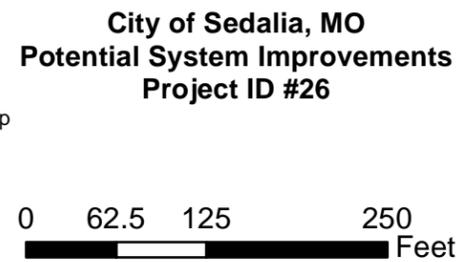
Cost Estimate				
<u>Item Description</u>	<u>Quantity</u>	<u>Qty. Units</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Pipe 21" and Larger - Yard	100	LF	\$400	\$40,000
			Subtotal	\$40,000
			Utilities and Misc. Contingency (25%)	\$10,000
			Total	\$50,000

F:\PROJECTS\1009-0827-WTRIS\Master Plan\GIS\masterplan_exhibits\ImprovementArea26.mxd



Legend

- Proposed Pipes
- StreetFlood
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- Surface Flooding and Sanitary Sewer Backup
- ▲ Ground and Surface Water Flooding
- ◆ Surface Flooding
- ◆ Ground Water Flooding
- ◆ Ground Water Flooding and Sanitary Sewer Backup
- ◆ Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues



Improvement Area 27 - North Missouri Avenue and West Morgan Street



Benefit Point Total	100
Project Cost	\$59,925
Cost/Benefit Score	599

Location Map

Project Problem and Solution Summary

The flooding problem and damage to the park in this area is the result of insufficient storm sewer and an entry to the park from the street. The stormwater flows from the east down W. Morgan Street and from the north on N. Missouri Avenue. The stormwater converges at the intersection and gathers in the street and then flows into the park. Damage to the park and maintenance issues arise from the stormwater entering the park. The stormwater also collects in the street and could restrict the access of emergency vehicles.

The conceptual improvement for this area includes adding storm sewer to route the water into the existing system. The increased capacity of the storm sewer will also allow water to be intercepted before it collects in the street and flows into the park and causes damage. The proposed system will connect to the existing stormwater system and will travel north along Missouri Avenue and then to the east onto Morgan Street. The system should include several inlets to capture the stormwater. For final design survey information will be needed for home low openings, roadway clearance, utility information and existing stormwater system information to provide more accurate pipe sizing and flood protection.

Cost Estimate				
<u><i>Item Description</i></u>	<u><i>Quantity</i></u>	<u><i>Qty. Units</i></u>	<u><i>Unit Cost</i></u>	<u><i>Total Cost</i></u>
Pipe 21" and Larger - Yard	124	LF	\$180	\$22,320
Pipe 21" and Smaller - Street	35	LF	\$180	\$6,300
Pipe 21" and Larger - Street	92	LF	\$210	\$19,320
			Subtotal	\$47,940
			Utilities and Misc. Contingency (25%)	\$11,985
			Total	\$59,925

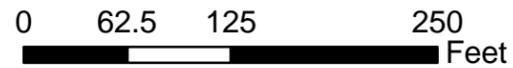


Path: F:\PROJECTS\009-0927_VTR\GIS\masterplan_exhibits\improvement\Area27.mxd

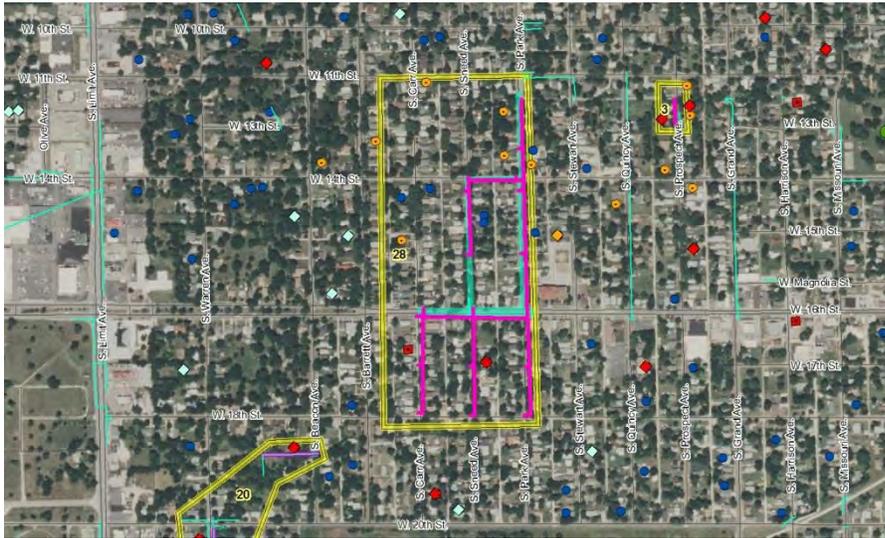
Legend

- Proposed Pipes
- Potential System Improvements
- Street Flooding
- Surface Water, Ground Water and Sanitary Sewer Backup
- Surface Flooding and Sanitary Sewer Backup
- Ground and Surface Water Flooding
- Surface Flooding
- Ground Water Flooding
- Ground Water Flooding and Sanitary Sewer Backup
- Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues

**City of Sedalia, MO
Potential System Improvements
Project ID #27**



Improvement Area 28 – West 16th Street and South Park Avenue



Benefit Point Total	700
Project Cost	\$1,164,525
Cost/Benefit Score	1664

Location Map

Project Problem and Solution Summary

Two home flooding locations and multiple street flooding locations were reported in this area by homeowners and the City of Sedalia. Stormwater flows from the south to the north in this area. The stormwater is conveyed in the curb and gutter street from south of West 18th Street to South Park Avenue south of West 11th Street where it outlets into an existing open channel. The flow conveyed in the streets causes numerous problems in this area. One problem is the flooding of two homes. Another major problem is this area is the flooding of streets that restricts vehicles and causes accelerated wear on the streets. West 16th Street is an arterial road for the City and should remain passable in flood events for emergency vehicles.

The home and street flooding in this area can be addressed with the construction of an enclosed system. The enclosed system would begin north of West 18th Street. The system would be installed on South Carr Avenue, South Snead Avenue, and South Park Avenue. The system would travel north and also be constructed on West 16th Street to capture stormwater. The main line of the storm sewer would continue north on South Park Avenue. Additional storm sewer would be added on South Snead Avenue and would connect to the main trunk line on West 14th Street. The main trunk line would then continue to the north and outlet into the existing open channel south of West 11th Street on South Park Avenue. For final design survey information will be needed for home low openings, utility information, more detailed topographic data and existing storm sewer information to provide more accurate alignment and pipe sizing.

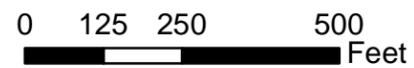
Cost Estimate				
<u><i>Item Description</i></u>	<u><i>Quantity</i></u>	<u><i>Qty. Units</i></u>	<u><i>Unit Cost</i></u>	<u><i>Total Cost</i></u>
Pipe 21" and Smaller - Street	2819	LF	\$180	\$507,420
Pipe 21" and Larger - Street	2020	LF	\$210	\$424,200
			Subtotal	\$931,620
			Utilities and Misc. Contingency (25%)	\$232,905
			Total	\$1,164,525



Legend

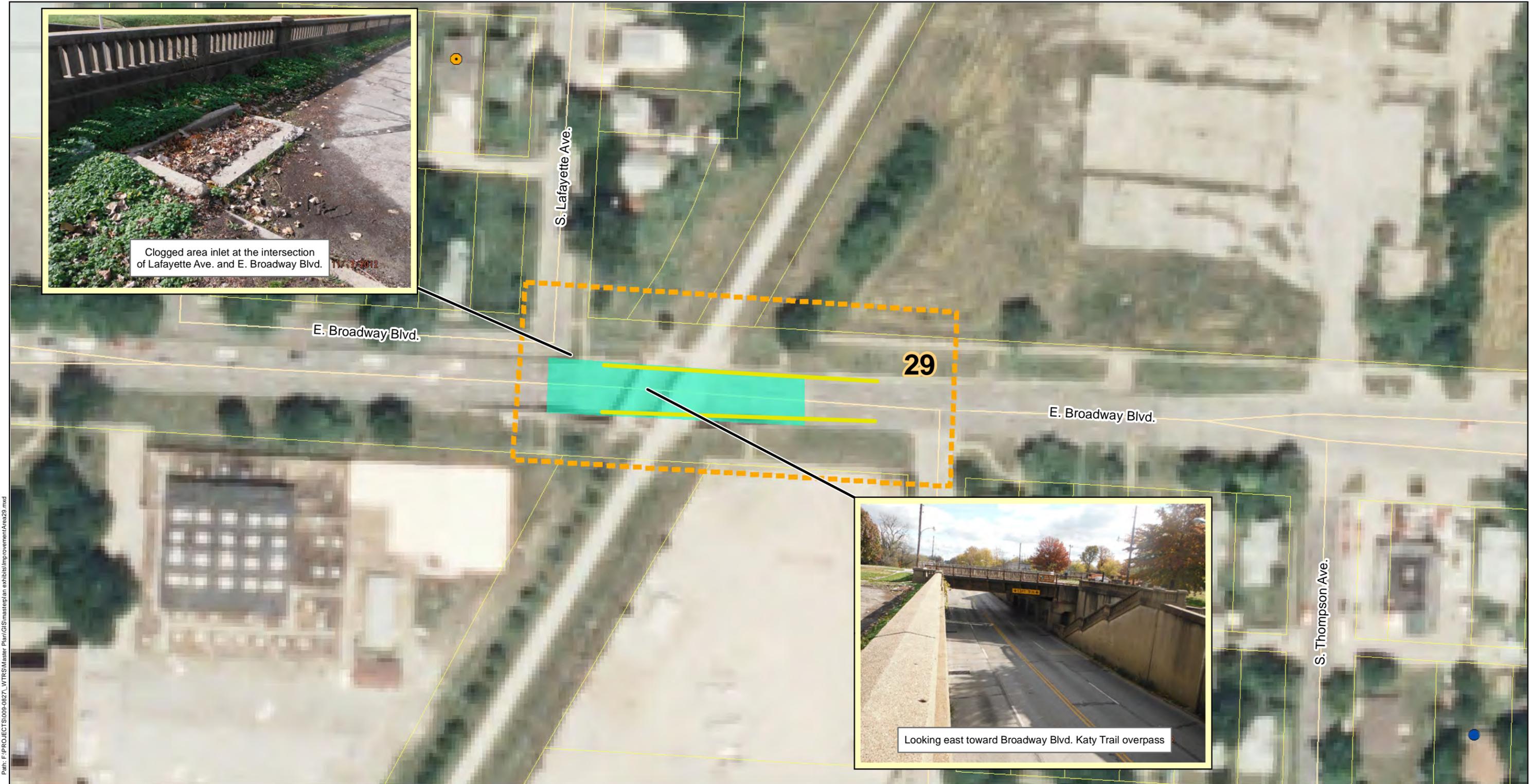
- Proposed Pipes
- StreetFlood
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- Surface Flooding and Sanitary Sewer Backup
- ▲ Ground and Surface Water Flooding
- ◆ Ground Water Flooding
- Ground Water Flooding and Sanitary Sewer Backup
- ◆ Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues

**City of Sedalia, MO
Potential System Improvements
Project ID #28**



F:\PROJECTS\09-0827_WTRRS\Master Plan\GIS\masterplan_exhibits\ImprovementArea28.mxd

Cost Estimate				
<u>Item Description</u>	<u>Quantity</u>	<u>Qty. Units</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Pipe 21" and Larger - Street	474	LF	\$210	\$99,540
			Subtotal	\$99,540
			Utilities and Misc. Contingency (25%)	\$24,885
			Total	\$124,425



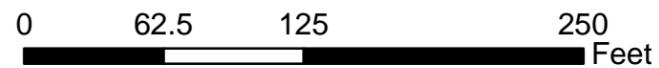
Path: F:\PROJECTS\009-08271_WTRSMaster Plan\GIS\masterplan exhibits\ImprovementArea29.mxd

Legend

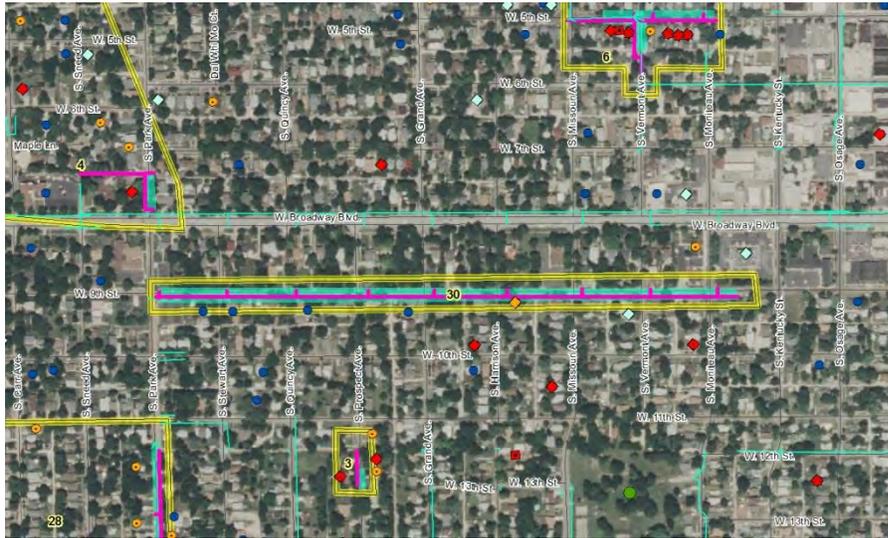
- Proposed Pipes
- Street Flood
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- ◆ Surface Flooding
- ▲ Ground and Surface Water Flooding
- ◆ Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues
- Surface Flooding and Sanitary Sewer Backup
- Ground Water Flooding and Sanitary Sewer Backup
- ◆ Ground Water Flooding

Note: Inadequate grate inlets cause street flooding at Broadway Blvd. and the Katy Trail overpass.

**City of Sedalia, MO
Potential System Improvements
Project ID #29**



Improvement Area 30 – West 9th Street



Location Map

Benefit Point Total	450
Project Cost	\$749,475
Cost/Benefit Score	1666

Project Problem and Solution Summary

Along West 9th Street flooding of the street occurs in rain events from South Moniteau Avenue to South Park Avenue. Street flooding in this area was identified as a problem by the City of Sedalia. Stormwater flows from the east and is conveyed in West 9th Street. Portions of West 9th Street are curbed and in several locations the curb is in poor condition. The stormwater enters an existing open channel at the intersection of South Park Avenue and West 9th Street. Because the stormwater is conveyed in the street flooding occurs along West 9th Street and could restrict vehicles.

To prevent street flooding on West 9th Street an enclosed system should be installed to collect and convey the stormwater. The system will begin between South Moniteau Avenue and South Kentucky Street and parallel West 9th Street to South Park Street where it will outlet into an existing open channel. Several cross road pipe should also be installed to capture water on both portions of the street. For final design survey information will be needed for home low openings, utility information, more detailed topographic data and existing storm sewer information to provide more accurate alignment and pipe sizing.

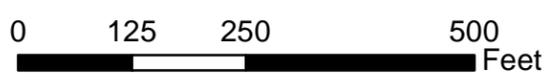
Cost Estimate				
<u><i>Item Description</i></u>	<u><i>Quantity</i></u>	<u><i>Qty. Units</i></u>	<u><i>Unit Cost</i></u>	<u><i>Total Cost</i></u>
Pipe 21" and Smaller - Street	41	LF	\$180	\$7,380
Pipe 21" and Larger - Street	2820	LF	\$210	\$592,200
			Subtotal	\$599,580
			Utilities and Misc. Contingency (25%)	\$149,895
			Total	\$749,475



Legend

- Proposed Channel
- Proposed Pipes
- Street Flood
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- Surface Flooding
- Ground and Surface Water Flooding
- Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues
- Surface Flooding and Sanitary Sewer Backup
- Ground Water Flooding and Sanitary Sewer Backup
- ◇ Ground Water Flooding

**City of Sedalia, MO
Potential System Improvements
Project ID #30**



Path: F:\PROJECTS\009-0827\WTRIS\Master Plan\GIS\masterplan_exhibits\ImprovementArea30.mxd

Improvement Area 31 – 2101 West 5th Street



Benefit Point Total	200
Project Cost	\$3,825
Cost/Benefit Score	19

Location Map

Project Problem and Solution Summary

Flooding in this location occurs when flows travel overland from the south and flow into the rear of 2101 West 5th Street. No defined drainage path exists in the upland area.

To prevent home flooding at 2101 West 5th Street a channel should be constructed to the south of the home. The proposed channel will outlet into an existing concrete ditch. By capturing the stormwater before it is able to enter 2101 West 5th Street the flooding of the home will be prevented. For final design survey information will be needed for home low openings, utility information, more detailed topographic data and existing storm sewer information to provide more accurate alignment and channel sizing.

Cost Estimate				
<u>Item Description</u>	<u>Quantity</u>	<u>Qty. Units</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Channel	153	LF	\$20	\$3,060
			Subtotal	\$3,060
			Utilities and Misc. Contingency (25%)	\$765
			Total	\$3,825

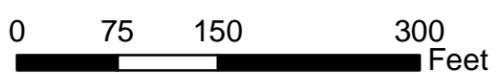


Path: F:\PROJECTS\009-08271_WTRSMaster Plan\GIS\masterplan exhibits\ImprovementArea31.mxd

**City of Sedalia, MO
Potential System Improvements
Project ID #31**

Legend

- | | |
|--|---|
|  Proposed Channel |  Sanitary Sewer Backup |
|  Potential System Improvements |  Returned Questionnaires with No Major Issues |
|  Surface Water, Ground Water and Sanitary Sewer Backup |  Surface Flooding and Sanitary Sewer Backup |
|  Surface Flooding |  Ground Water Flooding and Sanitary Sewer Backup |
|  Ground and Surface Water Flooding |  Ground Water Flooding |



Improvement Area 32 – West 35th Street and South Stewart Avenue



Benefit Point Total	250
Project Cost	\$61,388
Cost/Benefit Score	246

Location Map

Project Problem and Solution Summary

The flooding in this area occurs when stormwater flows south on South Stewart Avenue. The stormwater flows to the intersection of West 35th Street and South Stewart Avenue. At the intersection a curb inlet collects the stormwater flowing from the north. The existing curb inlet is overwhelmed and the excess stormwater floods 1101 West 35th Street. The stormwater also causes street flooding at the intersection of West 35th Street and South Stewart Avenue.

To prevent the flooding of 1101 West 35th Street and the intersection of West 35th Street and South Stewart Avenue an upgraded pipe system will need to be installed. Two curb inlets and the associated pipes will be placed on South Stewart Avenue. The enclosed system will continue to the south and follow the alignment of the existing storm sewer pipe. For final design survey information will be needed for home low openings, utility information, more detailed topographic data and existing storm sewer information to provide more accurate alignment and channel sizing.

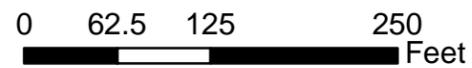
Cost Estimate				
<u><i>Item Description</i></u>	<u><i>Quantity</i></u>	<u><i>Qty. Units</i></u>	<u><i>Unit Cost</i></u>	<u><i>Total Cost</i></u>
Pipe 21" and Larger - Yard	105	LF	\$180	\$18,900
Pipe 21" and Smaller - Street	43	LF	\$180	\$7,740
Pipe 21" and Larger - Street	107	LF	\$210	\$22,470
			Subtotal	\$49,110
			Utilities and Misc. Contingency (25%)	\$12,278
			Total	\$61,388



Legend

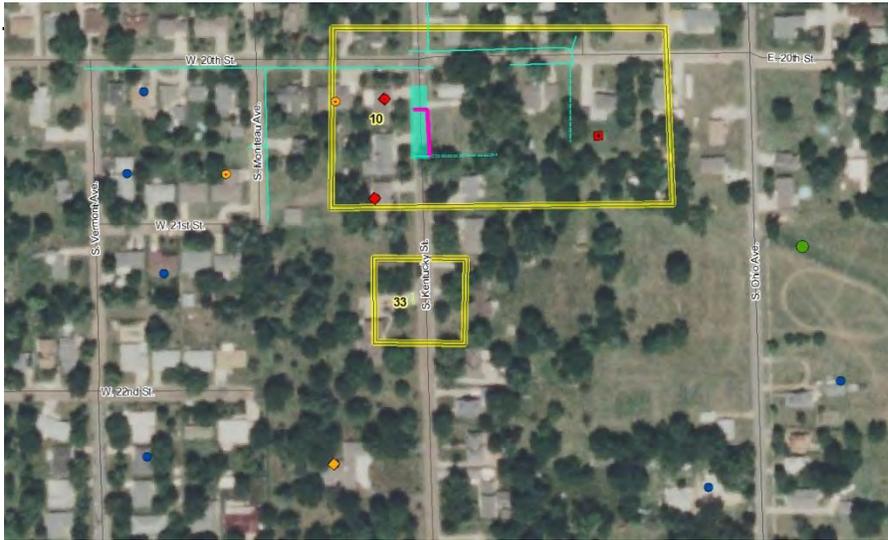
- Proposed Pipes
- Street Flood
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- ◆ Surface Flooding
- ▲ Ground and Surface Water Flooding
- ◆ Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues
- Surface Flooding and Sanitary Sewer Backup
- Ground Water Flooding and Sanitary Sewer Backup
- Ground Water Flooding

**City of Sedalia, MO
Potential System Improvements
Project ID #32**



Path: F:\PROJECTS\009-0827\WTRSMaster Plan\GIS\masterplan\exhibits\improvementArea32.mxd

Improvement Area 33 – 2120 South Kentucky Avenue



Benefit Point Total	200
Project Cost	\$4,063
Cost/Benefit Score	20

Location Map

Project Problem and Solution Summary

The flooding occurs at 2120 South Kentucky Avenue when water flows to the north down the street in the gutter and enters the driveway and flows into the home of 2120 South Kentucky Avenue. A curb cutout and concrete channel connected to the driveway at 2120 South Kentucky Avenue allows a portion of the stormwater that flows into the driveway to return to the street. However this system is undersized and does not divert all of the stormwater away from the home.

To prevent the flooding of 2120 South Kentucky Avenue a section of raised concrete should be installed in the driveway near the street to prevent stormwater from flowing into the driveway and home. The existing curb cut and concrete channel should be removed. For final design survey information will be needed for home low openings, utility information, and more detailed topographic data to provide more design.

Cost Estimate				
<u>Item Description</u>	<u>Quantity</u>	<u>Qty. Units</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Driveway	50	SY	\$65	\$3,250
			Subtotal	\$3,250
			Utilities and Misc. Contingency (25%)	\$813
			Total	\$4,063



Legend

-  Proposed Berm
-  Proposed Channel
-  Proposed Pipes
-  Street Flood
-  Potential System Improvements
-  Surface Water, Ground Water and Sanitary Sewer Backup
-  Surface Flooding
-  Ground and Surface Water Flooding
-  Sanitary Sewer Backup
-  Returned Questionnaires with No Major Issues
-  Surface Flooding and Sanitary Sewer Backup
-  Ground Water Flooding and Sanitary Sewer Backup
-  Ground Water Flooding

**City of Sedalia, MO
Potential System Improvements
Project ID #33**



Improvement Area 34 – Winchester Drive and West Main St



Benefit Point Total	10
Project Cost	\$466,125
Cost/Benefit Score	46,613

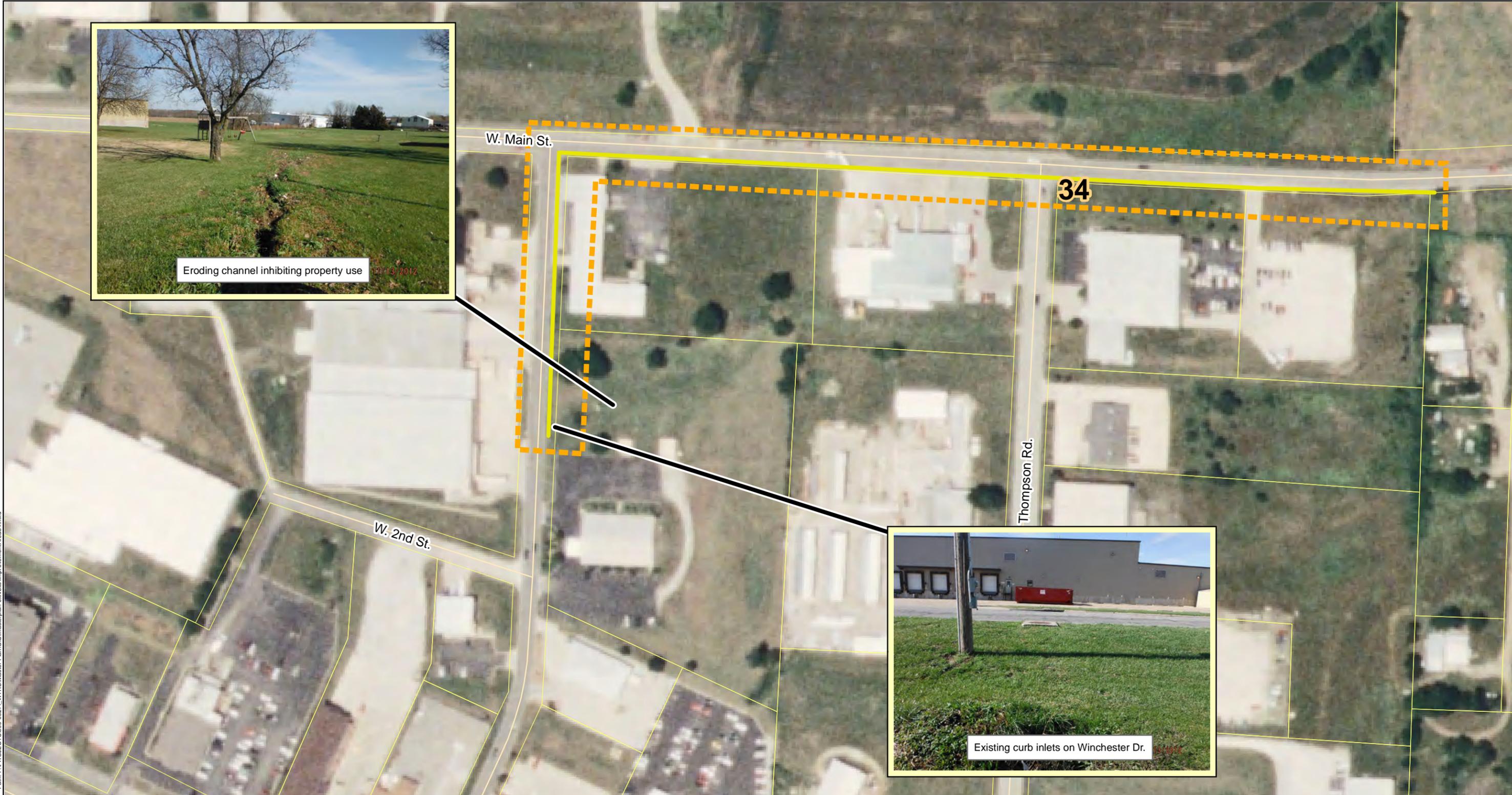
Location Map

Project Problem and Solution Summary

The stormwater problems associated with this area include a public stormwater system discharging onto private property and the stormwater causing an inconvenience to the owner and affecting their use of the property. The existing stormwater system on Winchester Drive collects street runoff and runoff from surrounding properties. The stormwater from Winchester Drive is then discharged into an open channel north of 119 Winchester Drive. The open channel is an inconvenience to the owner and is affecting their use of the property.

The solution to the stormwater problem in this area is to construct a piping system to capture the stormwater and convey it to an existing stormwater system. The new piping system will begin at the existing curb inlets on Winchester Drive. The system will then continue to the north and tie into the existing stormwater system. However, the existing stormwater system is undersized for the 10-year event and should be upsized to convey the 10-year event. The existing system should be upsized to the east of Thompson Road where the enclosed system outlets to an open channel. For final design survey information will be needed for building low openings, utility information, and more detailed topographic data to provide more accurate pipe sizing, alignment and flood protection.

Cost Estimate				
<u>Item Description</u>	<u>Quantity</u>	<u>Qty. Units</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Pipe 21" and Larger - Yard	1213	LF	\$180	\$218,340
Pipe 21" and Larger - Street	736	LF	\$210	\$154,560
			Subtotal	\$372,900
			Utilities and Misc. Contingency (25%)	\$93,225
			Total	\$466,125

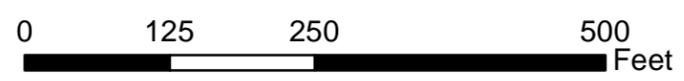


Path: F:\PROJECTS\009-08271_WTRIS\Master Plan\GIS\masterplan_exhibits\ImprovementArea34.mxd

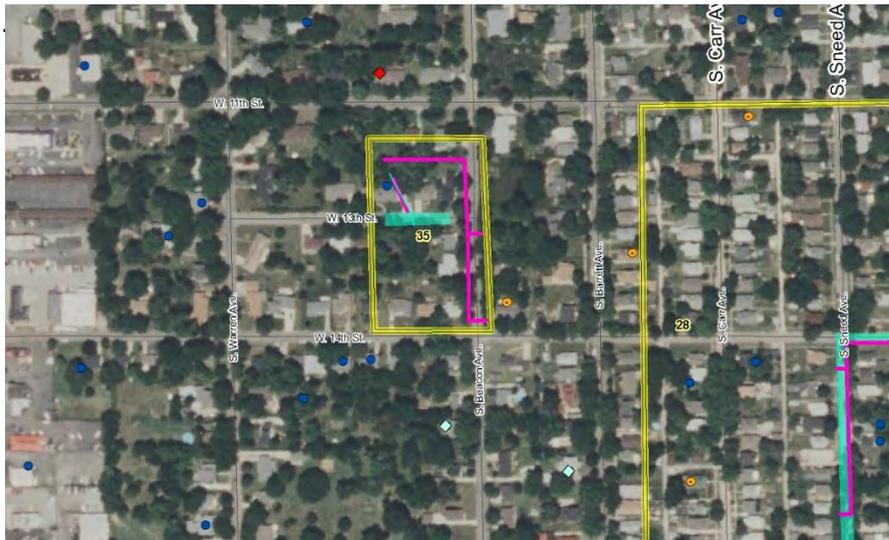
City of Sedalia, MO
Potential System Improvements
Project ID #34

Legend

- Proposed Pipes
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- Surface Flooding
- Ground and Surface Water Flooding
- Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues
- Surface Flooding and Sanitary Sewer Backup
- Ground Water Flooding and Sanitary Sewer Backup
- Ground Water Flooding



Improvement Area 35 – West 13th Street



Benefit Point Total	50
Project Cost	\$196,275
Cost/Benefit Score	3926

Location Map

Project Problem and Solution Summary

This project area experiences street flooding in small and significant storm events. Stormwater flows from the south and collects on South Beacon Avenue and South Warren Avenue. The stormwater then flows onto West 13th Street. Once on West 13th Street the stormwater flows into a grate inlet and curb inlet in the sump near 1610 West 13th Street. The stormwater then flows through a 30" Corrugated Metal Pipe (CMP) and empties into an open channel in the rear of 1610 West 13th Street. The existing stormwater system is undersized and causes street flooding on West 13th Street. No home flooding was reported in the area, however if the grate inlet were to become clogged home flooding is possible.

To prevent flooding on West 13th Street and potential home flooding a new stormwater system should be constructed. The stormwater system will begin on South Beacon Avenue and will continue to the north where it empties into the existing open channel. The new stormwater system will capture water before it is able to flow onto West 13th Street. The existing CMP near 1610 West 13th Street should also be lined to increase capacity and prevent the pipe from collapsing. The combination of the new system and an improved existing pipe will reduce street flooding and the potential for home flooding. For final design survey information will be needed for home low openings, utility information, and more detailed topographic data to provide more accurate channel sizing alignment and flood protection.

Cost Estimate				
<u>Item Description</u>	<u>Quantity</u>	<u>Qty. Units</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Pipe 21" and Larger - Yard	96	LF	\$180	\$17,280
Pipe 21" and Smaller - Street	325	LF	\$180	\$58,500
Pipe 21" and Larger - Yard	218	LF	\$180	\$39,240
Pipe 21" and Larger - Street	200	LF	\$210	\$42,000

Subtotal \$157,020

Utilities and Misc. Contingency (25%) \$39,255

Total \$196,275

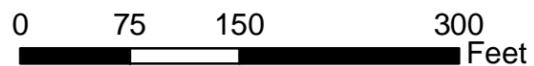


Path: F:\PROJECTS\009-08271_WTRIS\Master Plan\GIS\masterplan_exhibits\ImprovementArea35.mxd

Legend

- Proposed Pipes
- Street Flood
- Potential System Improvements
- Surface Water, Ground Water and Sanitary Sewer Backup
- ◆ Surface Flooding
- ▲ Ground and Surface Water Flooding
- ◆ Sanitary Sewer Backup
- Returned Questionnaires with No Major Issues
- Surface Flooding and Sanitary Sewer Backup
- Ground Water Flooding and Sanitary Sewer Backup
- ◆ Ground Water Flooding

**City of Sedalia, MO
Potential System Improvements
Project ID #35**



Improvement Area 36 – East Jackson Street



Benefit Point Total	600
Project Cost	\$10,125
Cost/Benefit Score	17

Location Map

Project Problem and Solution Summary

Three homes on East Jackson Street flood due to grading around the homes that directs stormwater runoff into the homes. The stormwater flows from the north into the alleyway and into the homes along East Jackson Street. The lack of a defined flow path between the homes causes the stormwater to flow into the homes.

To prevent flooding of the homes on East Jackson Street the grading of channels between the homes is necessary. Channels between the homes would direct the stormwater from the alleyway north of the homes to East Jackson Street south of the homes. Once the stormwater reaches East Jackson Street it can be safely conveyed downstream. For final design survey information will be needed for home low openings, utility information, and more detailed topographic data to provide more accurate channel sizing, alignment and flood protection.

Cost Estimate				
<u>Item Description</u>	<u>Quantity</u>	<u>Qty. Units</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Channel	405	LF	\$20	\$8,100
			Subtotal	\$8,100
			Utilities and Misc. Contingency (25%)	\$2,025
			Total	\$10,125

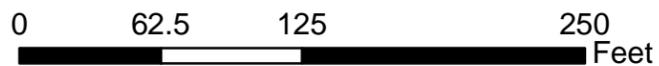


Path: F:\PROJECTS\009-08271_WTRIS\Master Plan\GIS\masterplan_exhibits\ImprovementArea36.mxd

**City of Sedalia, MO
Potential System Improvements
Project ID #36**

Legend

- | | |
|--|---|
|  Proposed Channel |  Sanitary Sewer Backup |
|  Potential System Improvements |  Returned Questionnaires with No Major Issues |
|  Surface Water, Ground Water and Sanitary Sewer Backup |  Surface Flooding and Sanitary Sewer Backup |
|  Surface Flooding |  Ground Water Flooding and Sanitary Sewer Backup |
|  Ground and Surface Water Flooding |  Ground Water Flooding |



Improvement Area 37 – South Kentucky Street & West 3rd Street



Benefit Point Total	200
Project Cost	\$338,100
Cost/Benefit Score	1691

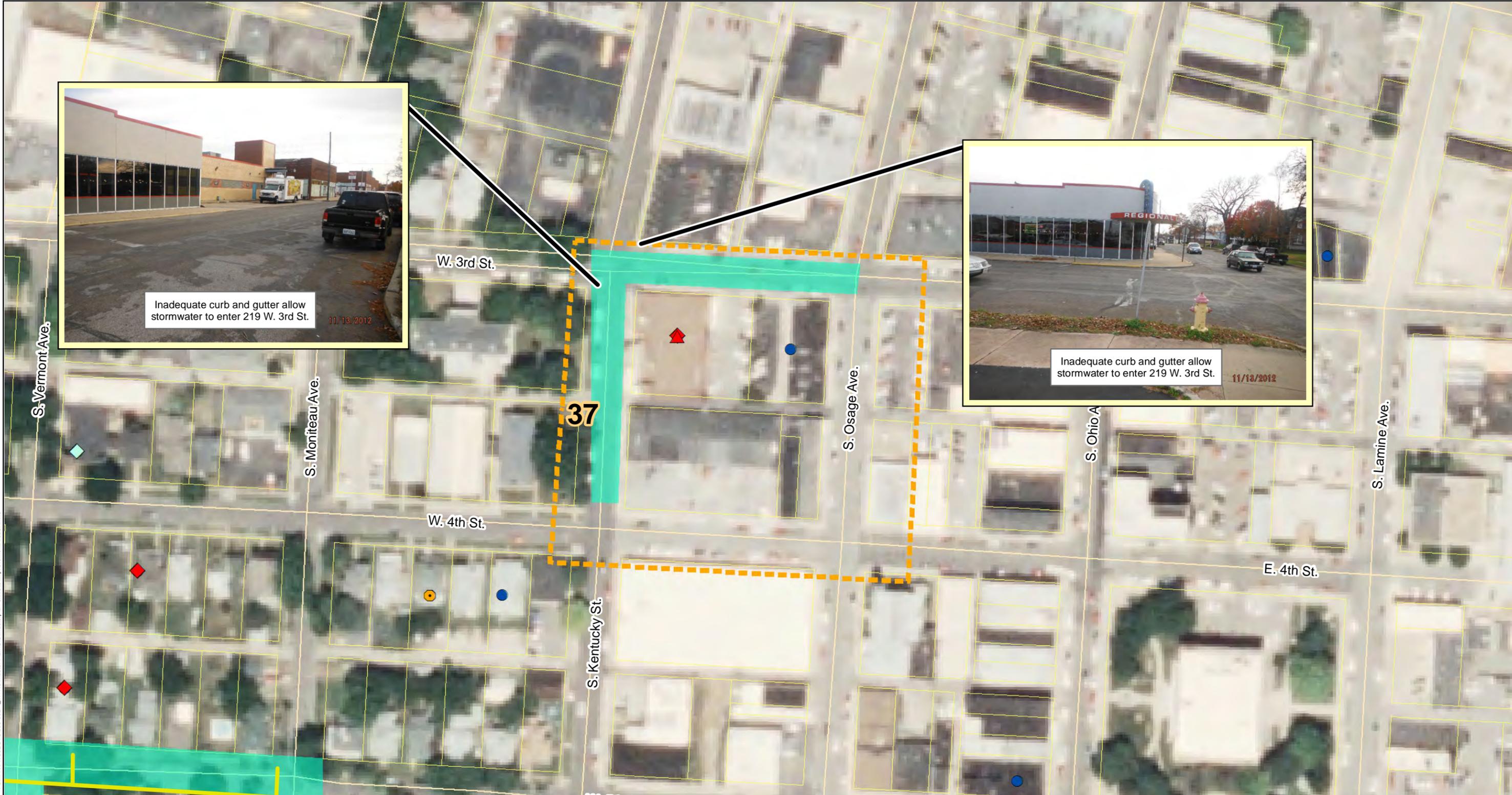
Location Map

Project Problem and Solution Summary

Flooding occurs in this area as a result of the lack of adequate roadway conveyance. 219 West 3rd Street floods due to stormwater flowing north on South Kentucky Street and into the west side of the building. Stormwater also pools on West 3rd Street in front of the building. The stormwater is able to enter the building due to the lack of adequate curb and the building low opening near the gutter elevation.

To prevent street and building flooding in this area a rebuild of the road is required. The roadway should be rebuilt on South Kentucky Street from West 4th Street to West 3rd Street. West 3rd Street should also be rebuilt from South Kentucky Street to South Osage Avenue. It appears the roadway has experienced several mill and overlays which has added roadway height while not raising the curb elevation. Raising the curb is undesirable due to the low openings on the adjacent buildings. The best solution to the flooding problem is to totally replace the street and curb to provide adequate street conveyance for the stormwater and to protect the surrounding buildings. The new street and curb and gutter will also lessen the impact of street flooding. For final design survey information will be needed for building low openings, utility information, and more detailed topographic data to provide more accurate roadway design and flood protection.

Cost Estimate				
<u>Item Description</u>	<u>Quantity</u>	<u>Qty. Units</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Street Repair	2352	SY	\$115	\$270,480
			Subtotal	\$270,480
			Utilities and Misc. Contingency (25%)	\$67,620
			Total	\$338,100



Legend

-  Proposed Pipes
-  Potential System Improvements
-  Street Flood
-  Surface Water, Ground Water and Sanitary Sewer Backup
-  Surface Flooding
-  Ground and Surface Water Flooding
-  Sanitary Sewer Backup
-  Returned Questionnaires with No Major Issues
-  Surface Flooding and Sanitary Sewer Backup
-  Ground Water Flooding and Sanitary Sewer Backup
-  Ground Water Flooding

City of Sedalia, MO
Potential System Improvements
Project ID #37

0 62.5 125 250
 Feet



Path: F:\PROJECTS\009-0827\WTRIS\Master Plan\GIS\masterplan_exhibits\ImprovementArea37.mxd

Improvement Area 38 – West Main Street



Benefit Point Total	200
Project Cost	\$30,800
Cost/Benefit Score	154

Location Map

Project Problem and Solution Summary

Flooding in this area is caused by a pipe outlet near a building at 2410 West Main Street. The existing pipe empties into a parking lot and drains directly towards an existing building. The stormwater enters the building causing flooding.

To prevent flooding in this area additional storm sewer should be constructed to route the stormwater to the north of the existing building. The additional storm sewer will prevent the stormwater from flowing into the building. For final design survey information will be needed for building low openings, utility information, and more detailed topographic data to provide more accurate pipe sizing, alignment and flood protection.

Cost Estimate				
<u>Item Description</u>	<u>Quantity</u>	<u>Qty. Units</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Pipe 21" and Smaller - Yard	154	LF	\$160	\$24,640
			Subtotal	\$24,640
			Utilities and Misc. Contingency (25%)	\$6,160
			Total	\$30,800



Path: F:\PROJECTS\009-08271_WTRIS\Master Plan\GIS\masterplan_exhibits\ImprovementArea38.mxd

**City of Sedalia, MO
Potential System Improvements
Project ID #38**

Legend

- | | |
|---|---|
|  Proposed Pipes |  Sanitary Sewer Backup |
|  Potential System Improvements |  Returned Questionnaires with No Major Issues |
|  Surface Water, Ground Water and Sanitary Sewer Backup |  Surface Flooding and Sanitary Sewer Backup |
|  Surface Flooding |  Ground Water Flooding and Sanitary Sewer Backup |
|  Ground and Surface Water Flooding |  Ground Water Flooding |



B-2. Detention Strategies

B-2.1. Stream Assessment

A rapid stream assessment was conducted for the majority of the open channels in Sedalia. Streams that were evaluated were placed in four different categories based on the ecological benefit of the streams. The factors in the stream evaluation included:

- Buffer width
- Channel meander
- Appearance that the channel has not been significantly altered
- The amount of degradation of the channel
- The amount of development surrounding the channel

The streams were evaluated using aerial maps and a field evaluation to determine the category of the stream. The stream evaluations were entered in the ArcGIS database.

B-2.2. Private Development Detention Strategies by Watershed

The City of Sedalia is in various stages of development throughout the City. Due to the varying stages of development flooding problems differ throughout the City, four different detention strategies are recommended to provide stormwater management on new development that will address City-wide issues while not causing undue hardship on property owners. Several factors were considered for each section of the City when determining the appropriate detention strategy. Some of the major factors considered were runoff from a site may be limited by the need to minimize downstream flood damage, prevent erosion, and/or minimize impacts to the ecology and water quality of the downstream drainage system. For detention controls to be effective they must be applied on a watershed based system. To evaluate the need to minimize downstream flood damage the results of the resident questionnaires and staff comments were utilized. The need to prevent erosion through detention was evaluated based on resident questionnaires, staff comments, and the rapid stream assessment that was completed as part of this master plan. Minimizing impacts to the ecology and water quality of the downstream drainage system was based on the rapid stream assessment and aerial mapping. The four strategies are explained below and the locations where each should be applied are shown in Figure B2.

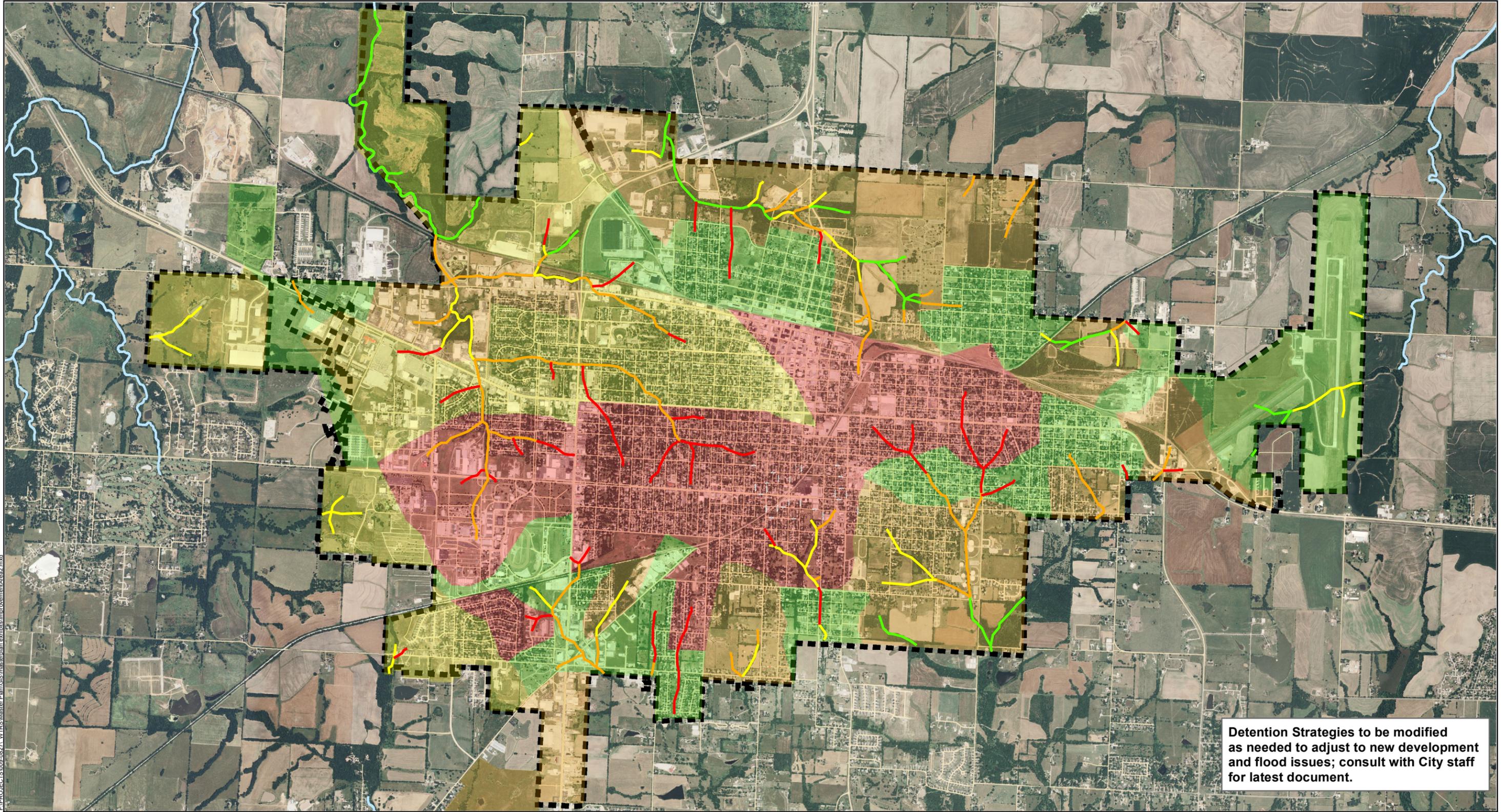
Comprehensive – This is the default strategy and covers the approximately 23%, of the City. This strategy provides peak runoff control for the 1%, 10% and 50% chance storms and volumetric and/or extended detention control of the 90% mean annual event storm for broad protection of the receiving system, including channel erosion protection and flood peak reductions over a range of return periods. This strategy should also be utilized for new land annexations to the City.

Frequent - This strategy provides runoff control for the 10% and 50% chance storms and volumetric and/or extended detention control of the 90% mean annual event storm in order to protect downstream channels from erosion. This strategy is appropriate for largely undeveloped

watersheds containing natural streams where downstream flooding of existing structures is not present and would not occur under future upstream full-development conditions. This strategy covers approximately 29% of the City.

Extreme - Under this strategy, detention is provided solely to reduce peak runoff rates for the 10% and 1% storm events. Over-detention of the peak release rates at the discharge point (i.e. requiring the post-development rate to be less than the pre-development rate) is used to ensure a cumulative benefit for a reasonable distance downstream. This strategy is not effective at protecting stream channels and banks from erosion. It is most applicable in certain redevelopment and in-fill situations where flooding problems are known, existing downstream stream conditions are already poor, and economic barriers to redevelopment preclude more extensive control. This strategy covers approximately 23% of the City.

None – Under this strategy, no detention would be required. The area within the City that is not required to provide detention is currently developed. No downstream flooding problems or streams that are at risk for erosion exist within the areas or are immediately downstream. This strategy also includes areas such as the airport and cemeteries where no future development is planned.



F:\PROJECTS\009-0021 WTRSS\Master Plan\GIS\masterplan\exhibit\mapdocument\map2.mxd

Figure B2 - Detention Strategies and Stream Assessments Map
Stormwater Master Plan
City of Sedalia, MO

Legend		Stream Centerline
Detention Zones	Stream Assessments	
 Comprehensive	 1	 Stream Centerline
 Frequent	 2	 City Roads
 Extreme	 3	 City Limits
 None	 4	

0 3,100 6,200
 Feet



Appendix A

Individual Project Rating Sheets

Area 1 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding Structure	1	200	200
Flooding Collector Street	1	100	100
Benefit Point Total			300
Project Cost			\$1,697,600
Cost/Benefit Score			5659

Area 2 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	2	200	400
Flooding Collector Street	1	100	100
Flooding Residential Street	1	50	50
Benefit Point Total			550
Project Cost			\$465,525
Cost/Benefit Score			846

Area 3 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	1	200	200
Flooding Residential street	1	50	50
Benefit Point Total			250
Project Cost			\$43,838
Cost/Benefit Score			175

Area 4 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	3	200	600
Flooding Residential street	1	50	50
Flooding Collector street	1	100	100
		Benefit Point Total	750
		Project Cost	\$454,875
		Cost/Benefit Score	607

Area 5 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding Homes	3	200	600
Flooding Residential Street	5	50	250
Benefit Point Total			850
Project Cost			\$226,850
Cost/Benefit Score			267

Area 6 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding Homes	6	200	1200
Flooding Residential Street	2	50	100
Benefit Point Total			1300
Project Cost			\$302,513
Cost/Benefit Score			233

Area 7 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	2	200	400
Flooding Collector Street	1	100	100
Benefit Point Total			500
Project Cost			\$7,625
Cost/Benefit Score			15

Area 8 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	0	200	0
Flooding Collector Street	2	100	200
Benefit Point Total			200
Project Cost			\$495,525
Cost/Benefit Score			2478

Area 9 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	1	200	200
Flooding streets	0	150	0
Benefit Point Total			200
Project Cost			\$36,875
Cost/Benefit Score			184

Area 10 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	0	200	0
Flooding Collector Street	1	100	100
Benefit Point Total			100
Project Cost			\$34,175
Cost/Benefit Score			342

Area 11 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	1	200	200
Flooding streets	0	150	0
Benefit Point Total			200
Project Cost			\$2,450
Cost/Benefit Score			12

Area 12 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	1	200	200
Flooding streets	0	150	0
Benefit Point Total			200
Project Cost			\$39,150
Cost/Benefit Score			196

Area 13 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	5	200	1000
Flooding streets	0	150	0
Benefit Point Total			1000
Project Cost			\$665,125
Cost/Benefit Score			665

Area 14 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	1	200	200
Flooding Residential Street	1	50	50
Benefit Point Total			250
Project Cost			\$306,988
Cost/Benefit Score			1228

Area 15 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Nuisance	2	10	20
		Benefit Point Total	20
		Project Cost	\$15,250
		Cost/Benefit Score	763

Area 16 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	2	200	400
Flooding streets	1	150	150
Benefit Point Total			550
Project Cost			\$2,515,125
Cost/Benefit Score			4573

Area 17 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	1	200	200
Flooding streets	0	150	0
Benefit Point Total			200
Project Cost			\$30,250
Cost/Benefit Score			151

Area 18 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	5	200	1000
Flooding Residential Street	1	50	50
Benefit Point Total			1050
Project Cost			\$232,175
Cost/Benefit Score			221

Area 19 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	4	200	800
Flooding streets	0	150	0
Benefit Point Total			800
Project Cost			\$10,625
Cost/Benefit Score			13

Area 20 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	3	200	600
Flooding Residential Street	2	50	100
Benefit Point Total			700
Project Cost			\$147,300
Cost/Benefit Score			210

Area 21 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	2	200	400
Flooding Residential Street	1	50	50
Benefit Point Total			450
Project Cost			\$302,175
Cost/Benefit Score			672

Area 22 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	4	200	800
Flooding streets	0	150	0
Benefit Point Total			800
Project Cost			\$30,284
Cost/Benefit Score			38

Area 23 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	1	200	200
Flooding Collector Street	1	100	100
Benefit Point Total			300
Project Cost			\$45,025
Cost/Benefit Score			150

Area 24 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	1	200	200
Flooding streets	0	150	0
Benefit Point Total			200
Project Cost			\$4,545
Cost/Benefit Score			23

Area 25 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	3	200	600
Flooding streets	0	150	0
Benefit Point Total			600
Project Cost			\$19,075
Cost/Benefit Score			32

Area 26 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	1	200	200
Flooding Collector Street	1	100	100
Benefit Point Total			300
Project Cost			\$50,000
Cost/Benefit Score			167

Area 27 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	0	200	0
Flooding Collector Street	1	100	100
Benefit Point Total			100
Project Cost			\$59,925
Cost/Benefit Score			599

Area 28 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	2	200	400
Flooding Collector Street	1	100	100
Flooding Residential Street	4	50	200
Benefit Point Total			700
Project Cost			\$1,164,525
Cost/Benefit Score			1664

Area 29 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	0	200	0
Flooding Arterial Street	1	150	150
Benefit Point Total			150
Project Cost			\$124,425
Cost/Benefit Score			830

Area 30 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	0	200	0
Flooding Residential Street	9	50	450
Benefit Point Total			450
Project Cost			\$749,475
Cost/Benefit Score			1666

Area 31 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	1	200	200
Flooding streets	0	150	0
Benefit Point Total			200
Project Cost			\$3,825
Cost/Benefit Score			19

Area 32 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	1	200	200
Flooding Residential Street	1	50	50
Benefit Point Total			250
Project Cost			\$61,388
Cost/Benefit Score			246

Area 33 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	1	200	200
		Benefit Point Total	200
		Project Cost	\$4,063
		Cost/Benefit Score	20

Area 34 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Nuisance	1	10	10
Benefit Point Total			10
Project Cost			\$466,125
Cost/Benefit Score			46613

Area 35 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	0	200	0
Flooding Residential Street	1	50	50
Benefit Point Total			50
Project Cost			\$196,275
Cost/Benefit Score			3926

Area 36 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	3	200	600
Flooding Residential Street	0	50	0
Benefit Point Total			600
Project Cost			\$10,125
Cost/Benefit Score			17

Area 37 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	1	200	200
Flooding Residential Street	0	50	0
Benefit Point Total			200
Project Cost			\$338,100
Cost/Benefit Score			1691

Area 38 - Cost Benefit

Description of Problem	Number of Locations	Points	Total Points
Flooding homes	1	200	200
Flooding Residential Street	0	50	0
Benefit Point Total			200
Project Cost			\$30,800
Cost/Benefit Score			154