



# Next Step Study Phase 1 South Area

August 31, 2020



**GeoVelo**  
Geospatial Forensics

Benjamin Ross, P.E.  
Vice-President

Scott Hanlon, P.E.  
Project Engineer

# NEXT STEP STUDY PHASE 1 SOUTH AREA

FLOOD & DRAINAGE STUDY

PREPARED FOR:  
CITY OF HOLDEN  
101 WEST 3<sup>RD</sup> STREET  
HOLDEN, MO 64040

JULY 6, 2020

PREPARED BY:  
**ENGINEERING SURVEYS & SERVICES**  
1113 FAY STREET  
COLUMBIA, MO 65201  
(573) 449-2646

MISSOURI ENGINEERING CORPORATION NUMBER 2004005018  
COLUMBIA ♦ JEFFERSON CITY ♦ SEDALIA ♦ WILDWOOD

## Engineering Surveys & Services

Consulting Engineers, Land Surveyors, and Geoprosessionals  
Analytical and Materials Laboratories

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Columbia, Missouri 65201  
Telephone: 573-449-2646

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July 6, 2020

Sent Via E-mail

Mr. Travis Kiefer, P.E.  
City Engineer  
101 West 3<sup>rd</sup> Street  
Holden, MO 64040

RE: Next Step Drainage Study  
Phase 1 South Area  
Holden, Missouri

Dear Mr. Kiefer:

Please find the attached report for the referenced project. This report includes comments received during the stakeholder meeting and through the Public Virtual Input Portal. The report contains the results of our preliminary storm water modeling and improvement alternatives analysis. Estimated construction costs for the proposed alternatives are presented along with our recommendations.

We have identified several viable alternatives which we believe the City will have confidence going forward with. The alternatives include:

- achievable alternatives to improve the existing storm water management system;
- both traditional infrastructure and more natural storm water management features that offer sustainable options that provide a good fit for the community;
- a clear understanding of the benefits that are received from the investment of resources.

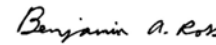
Please contact us if you have any questions concerning this report. We look forward to working with you as the City implements these alternatives.

Prepared By,



Scott M. Hanlon, P.E.  
Project Engineer

Reviewed By,



Benjamin A. Ross, P.E., PTOE  
Vice-President - Engineering



Enclosures

cc: 1 - File ESS Job # 14492

Other Offices  
Jefferson City ♦ Sedalia ♦ Wildwood

## Next Step Study Report

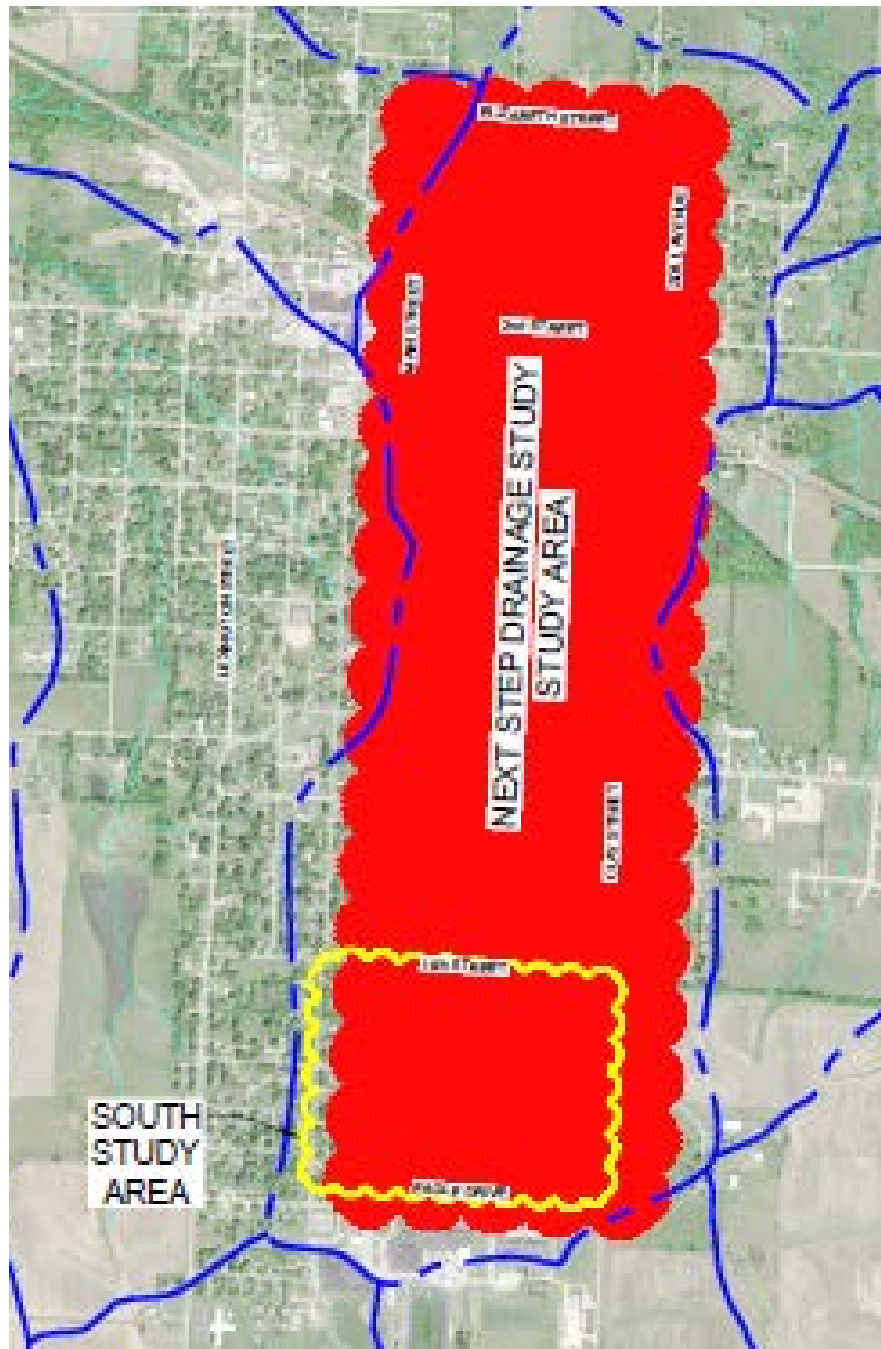
Draft Report Reviewed by  
Stormwater Committee

Comments addressed and Final  
Report Submitted July 6, 2020

348 Pages

Appendixes include:

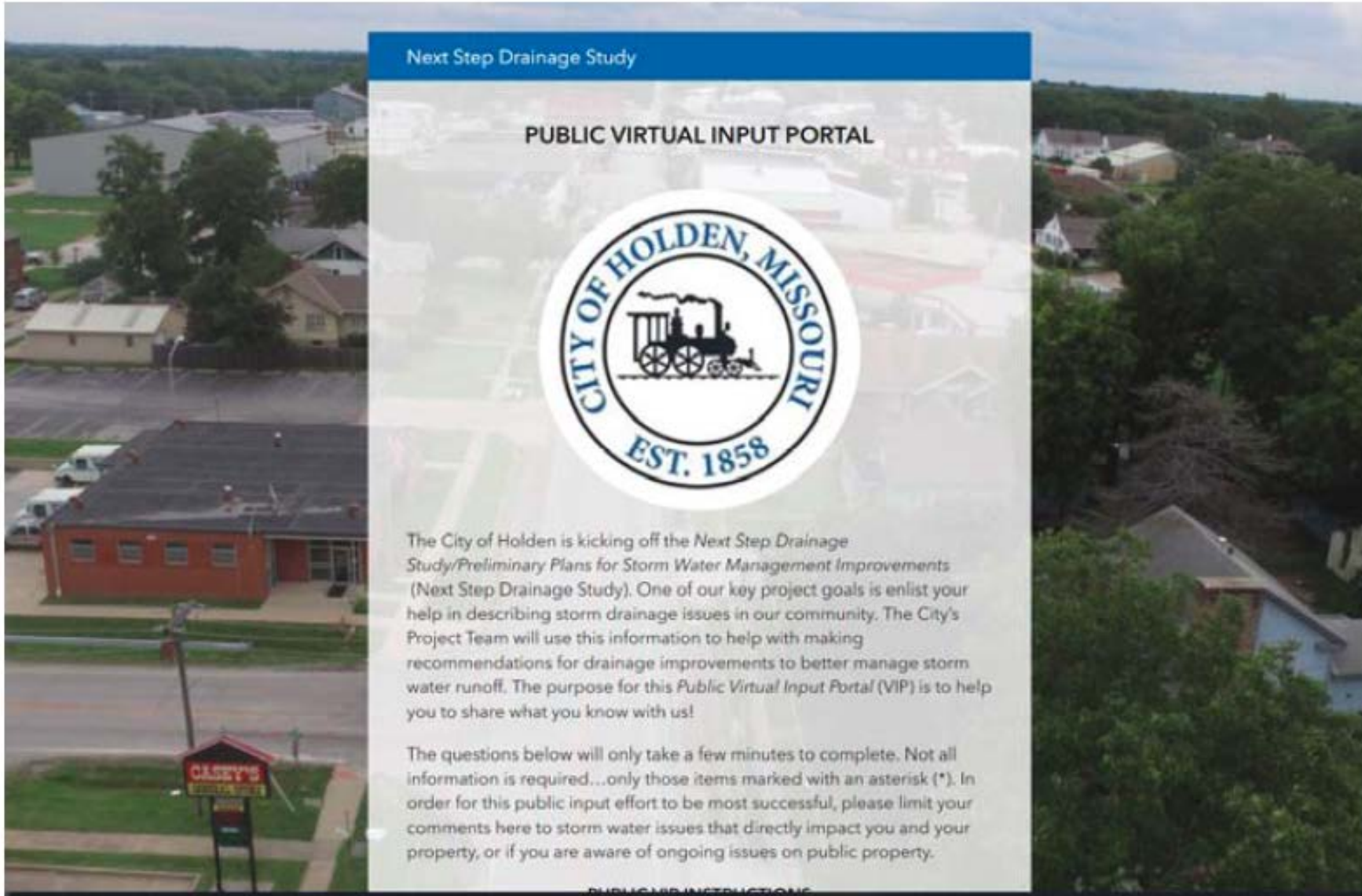
- VIP Comments
- Construction Cost Estimates
- Supporting Documentation
- Calculations



Phase 1 South Area




# January 28, 2020 Stakeholder Meeting & VIP



Next Step Drainage Study

**PUBLIC VIRTUAL INPUT PORTAL**



The City of Holden is kicking off the *Next Step Drainage Study/Preliminary Plans for Storm Water Management Improvements* (Next Step Drainage Study). One of our key project goals is enlist your help in describing storm drainage issues in our community. The City's Project Team will use this information to help with making recommendations for drainage improvements to better manage storm water runoff. The purpose for this *Public Virtual Input Portal* (VIP) is to help you to share what you know with us!

The questions below will only take a few minutes to complete. Not all information is required...only those items marked with an asterisk (\*). In order for this public input effort to be most successful, please limit your comments here to storm water issues that directly impact you and your property, or if you are aware of ongoing issues on public property.

**PUBLIC INPUT INSTRUCTIONS**

## Comments From Virtual Input Portal

Comment	Narrative	Location / Street Address	The problem I am reporting is:
1	<p>My residence has experienced water coming in from floor drains in my basement which are tied to the Sewer. At the time the house was built 1964/65 this was to code but it is no longer. As we experienced higher rain falls for multiple days sewer is being inundated with stormwater water.</p> <p>The picture that I have attached is from October of 2017 and it is looking South at the intersection of 16th Street and South Lexington Street. You can see the leaves that were left after the water went down.</p> <p>The water was above the two culverts that run underneath the 16th Street.</p> <p>As I serve on the stormwater committee as a council member. I know that storm water control will also help take some of the strain off of our sewer plant / utility. I think it's important that later in the conversation we educate the citizens how stormwater is also affecting sewer plant.</p>	1601 South Lexington Street	house_structure_flooding
2	Every time we have a heavy rain, my property experiences: House /structure flooding, Street flooding, Yard Flooding, and back up of sewer into basement. All of which are caused by Damaged or Inadequate Drainage Structure at the intersection of Fourth and Lexington Street. That drainage system is totally blocked and the water cannot get away.	400 south lexington holden mo.64040	damaged_or_inadequate_drainage_
3	Over the past ten years I have witnessed, measured, calibrated the non-point surface storm problems of Holden because I do work on many of the structures that have been impacted. I was the lead on the down town repairs under the 5-year Jerusalem Project and photo documented the "storm rain water" problems. I slaps worked with Holden Street and Parks and Recreation Departments. I did the white-board presentation of this problem two years ago+ in a city hall council meeting. I also did the door to door canvassing to obtain input form the effected properties. Later that evolved into doing current work with MoDOT. You may have any photos information etc I have. This is good what is taking place.	Yes: Start at R-III School first. Do this as it ic concise and likely the least expensive mitigation that we can get done. I have aerial photos I took of this area.	other
4		1008 S Main St., Holden, MO 64040	yard_flooding
5	Water is building up on Pine street and flowing north into the city, causing a larger issue. The issue starts at the school with the water run off, it floods 1/2 of my .3 acre lot, the water then pours over the street and becomes a raging river next to my neighbor across the street running into the creek that runs parallel to vine and pine Street. The storm drain system needs to start at the school. I have also had water in my basement.	1600 S Pine St. Holden Mo 64040	yard_flooding
6	During heavy rains we have street flooding, yard flooding and the ditch behind our house has serious erosion issues from constant flooding.	1400 to 1600 South Pine Holden, MO 64040	yard_flooding
7	No drainage ditch in front of my house so water runs from street into my front yard. My backyard has a ditch that is blocked by debris so my yard and street behind my house floods 4th and Niagara. My backyard is eroding along with a sink hole in Niagara side of	607 w 4th st., Holden, MO 64040	yard_flooding

## Challenges Mentioned:

- Yard Flooding,
- Street Flooding,
- Channel Erosion,
- Roadway Overtopping And Potholes,
- House Flooding,
- Debris In Channels Blocking Flow,
- Sanitary Sewer Back-ups





## GIS Portal – Including Existing Drainage Structures

14<sup>th</sup> Street

### 30"Hx42"W

OBJECTID	53
PIPE_DIAMETER	30"Hx42"W
PIPE_MATERIAL	MAP
UPSTREAM_FL	884.6199951171875
DOWNSTREAM_FL	884.22998046875
Shape__Length	15.756254624267084

[Zoom to](#)



-93.985 38.707 Degrees

300ft



# Drainage Area Map

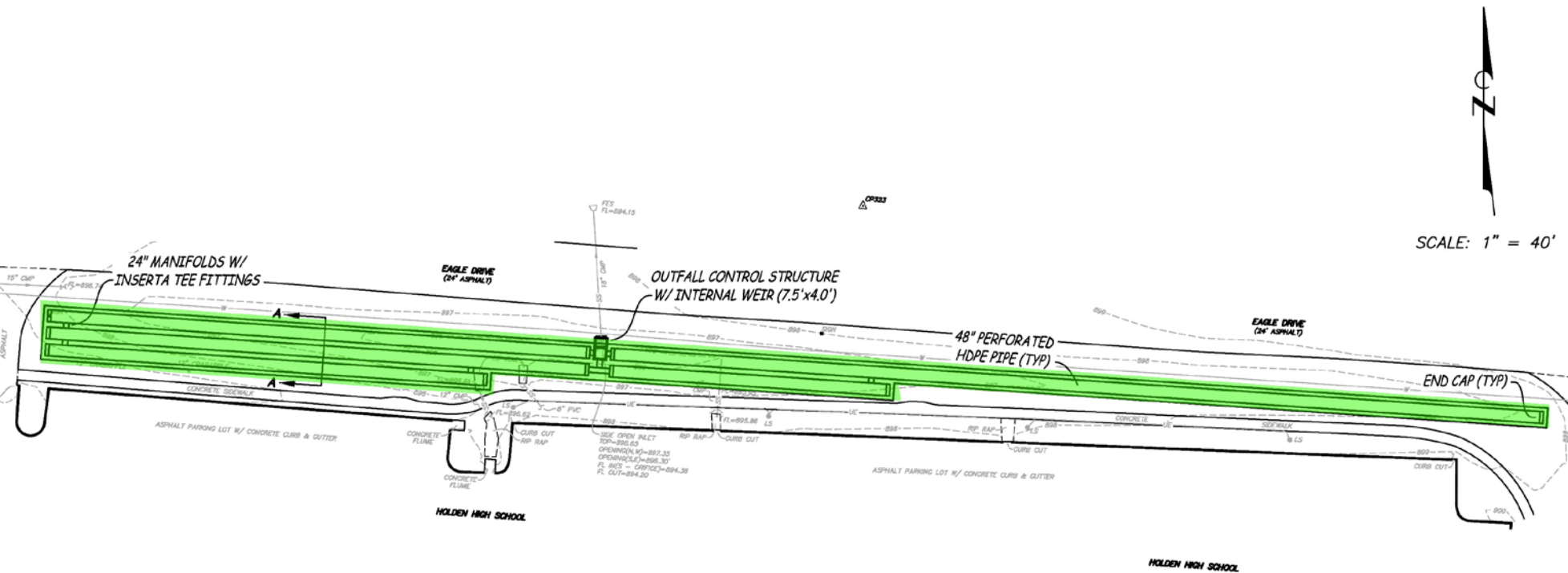




# Existing High School Detention Basin







High School Detention

Cost = \$191,000

Benefits:

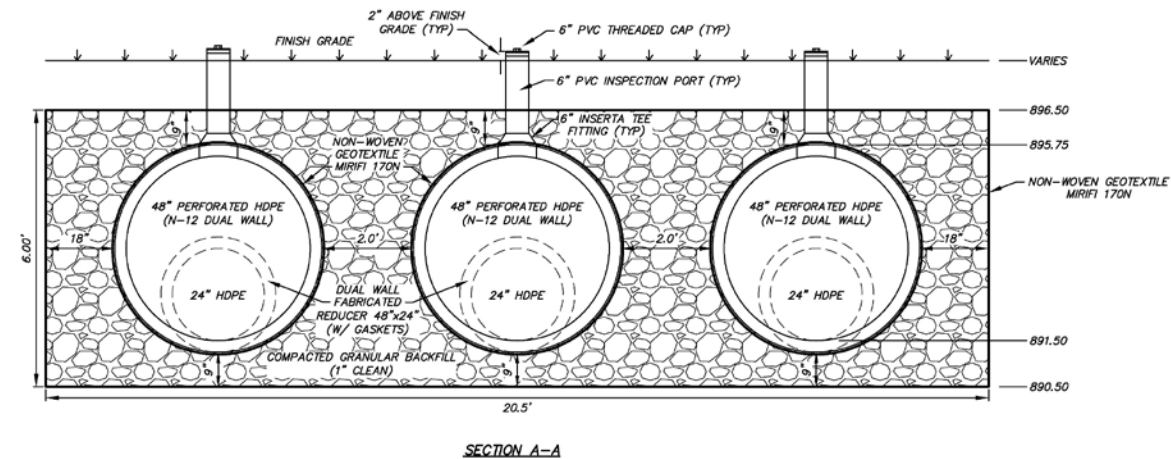
68% Flow Reduction at Eagle Drive (1-year rain)

1.3% Flow Reduction at 14<sup>th</sup> Street (1-year rain)

#### UNDERGROUND DETENTION SUMMARY

1. 48-INCH PERFORATED HDPE PIPES WITH GRANULAR BACKFILL.
2. SHOWN AT 1,045 LF, 48 INCH PIPES, 24 INCH MANIFOLDS, AND END CAPS.
3. PROVIDES APPROXIMATELY 30,000 CF OF DETENTION STORAGE.
4. DETENTION COST APPROXIMATELY \$200K, PLUS.

**HIGH SCHOOL DETENTION - ALTERNATE #2**  
**NEXT STEP STUDY - PHASE 1 SOUTH AREA**  
 HOLDEN, JOHNSON COUNTY, MISSOURI  
 APRIL 14, 2020  
 SHEET 1 OF 2



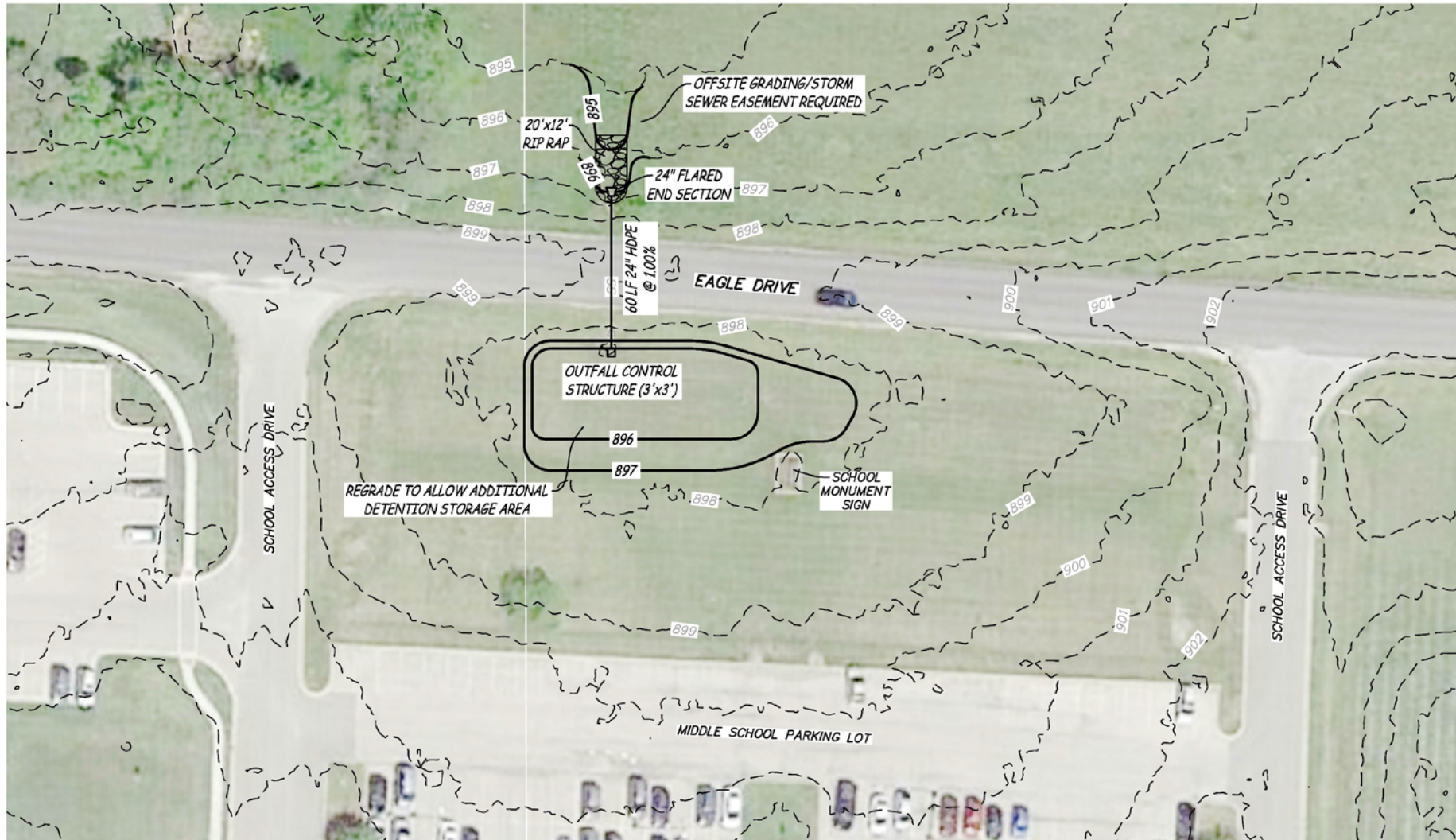
# Existing Middle School Front Yard



18-inch CMP



SCALE: 1" = 40'



## Middle School Detention

Cost = \$30,000

Benefits:

48% Reduction at  
Eagle Drive (1-year rain)

19% Reduction at  
14<sup>th</sup> Street (1-year rain)

Water Quality Feature  
could be incorporated.  
Cost = \$25,000

Could be constructed on  
north side of Eagle Drive

**MIDDLE SCHOOL DETENTION  
NEXT STEP STUDY - PHASE 1 SOUTH AREA**  
HOLDEN, JOHNSON COUNTY, MISSOURI  
APRIL 14, 2020

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Missouri Engineering Corporation # 2004005018





# ES&S Sedalia Office Dry Detention





# Example Dry Detention Basin

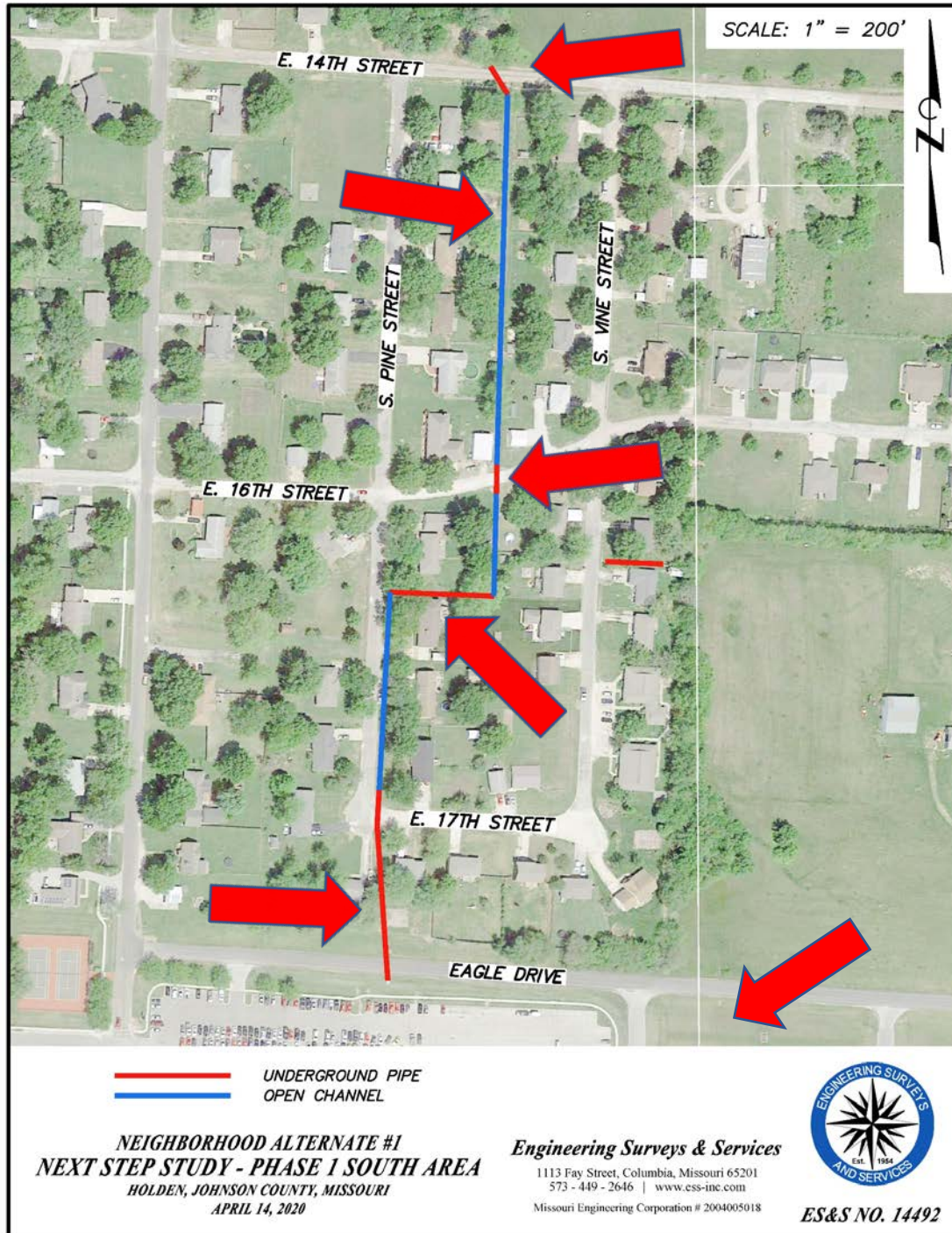




# Newly Constructed Dry Detention Basin



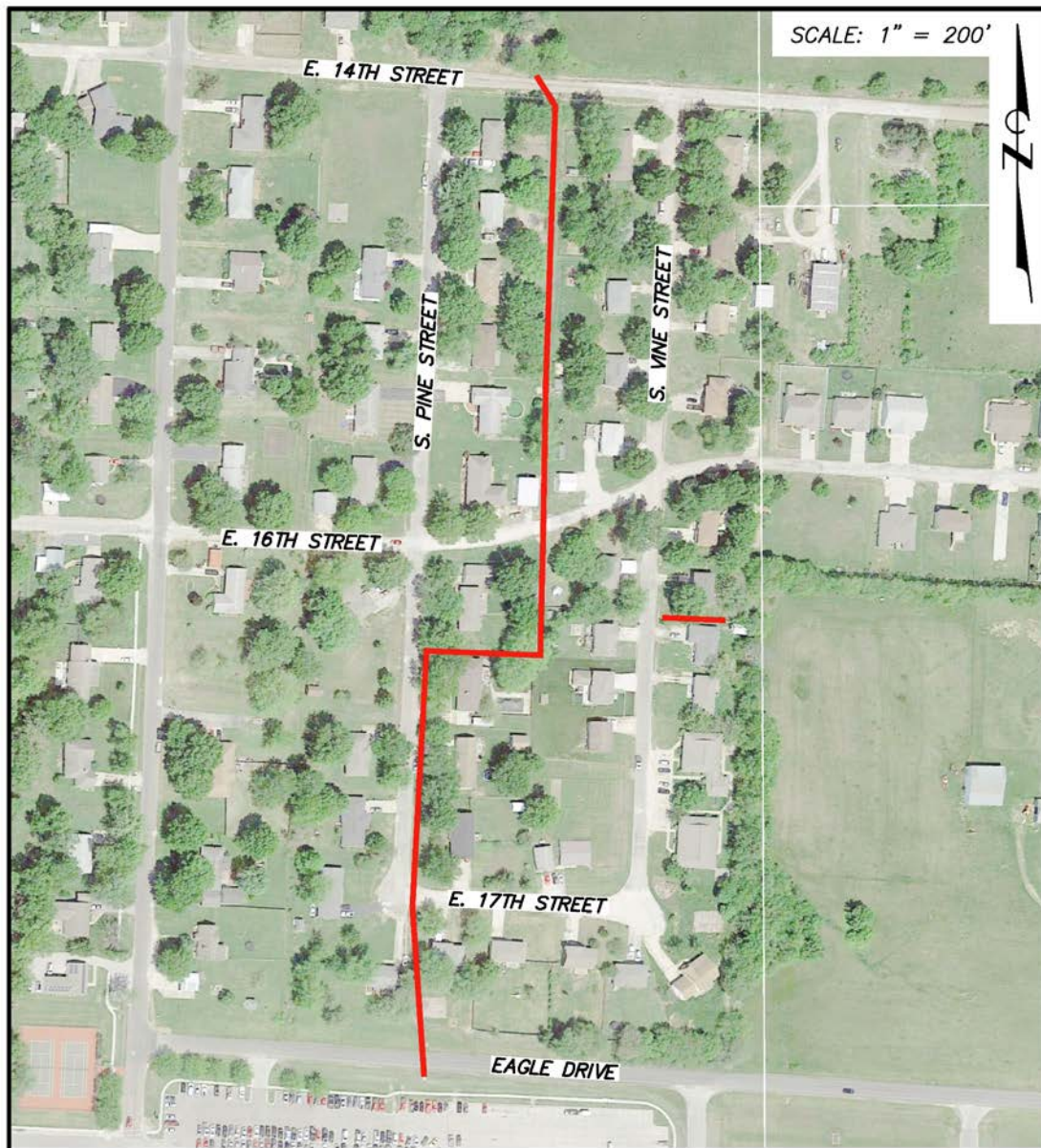




## Stormwater Conveyance Improvements Alternate #1 – Recommendations

1. Middle School detention basin - Estimated cost \$30,000
2. New storm sewer pipe from Pine Street, between 1601 and 1603 Pine Street, to the rear lot line - Estimated cost \$35,000
3. New 24-inch storm sewer pipe from the south side of Eagle Drive to the north side of 17<sup>th</sup> Street - Estimated cost \$50,000
4. Construct a reinforced turf grass channel in the rear lot lines from 1601 Pine Street to 14<sup>th</sup> Street - Estimated cost \$72,000
5. New box culverts for the main stream channel at 14<sup>th</sup> Street and 16<sup>th</sup> Street. The 14<sup>th</sup> Street culvert should be constructed with future improvements to the north. - Estimated cost \$35,000
6. Total Cost (not including MS Detention) = \$192,000





SCALE: 1" = 200'

## Stormwater Conveyance Improvements Alternate #2

Construct storm sewer pipe entire length of  
Phase 1 Study Area

Total Cost = \$284,000

Challenges with both Alternates #1 and #2:

1. Utility relocations
2. Tree impacts
3. Disturbance to neighborhood
4. Work at 14<sup>th</sup> Street is recommended to take place with the future work north of 14<sup>th</sup> Street

— UNDERGROUND PIPE

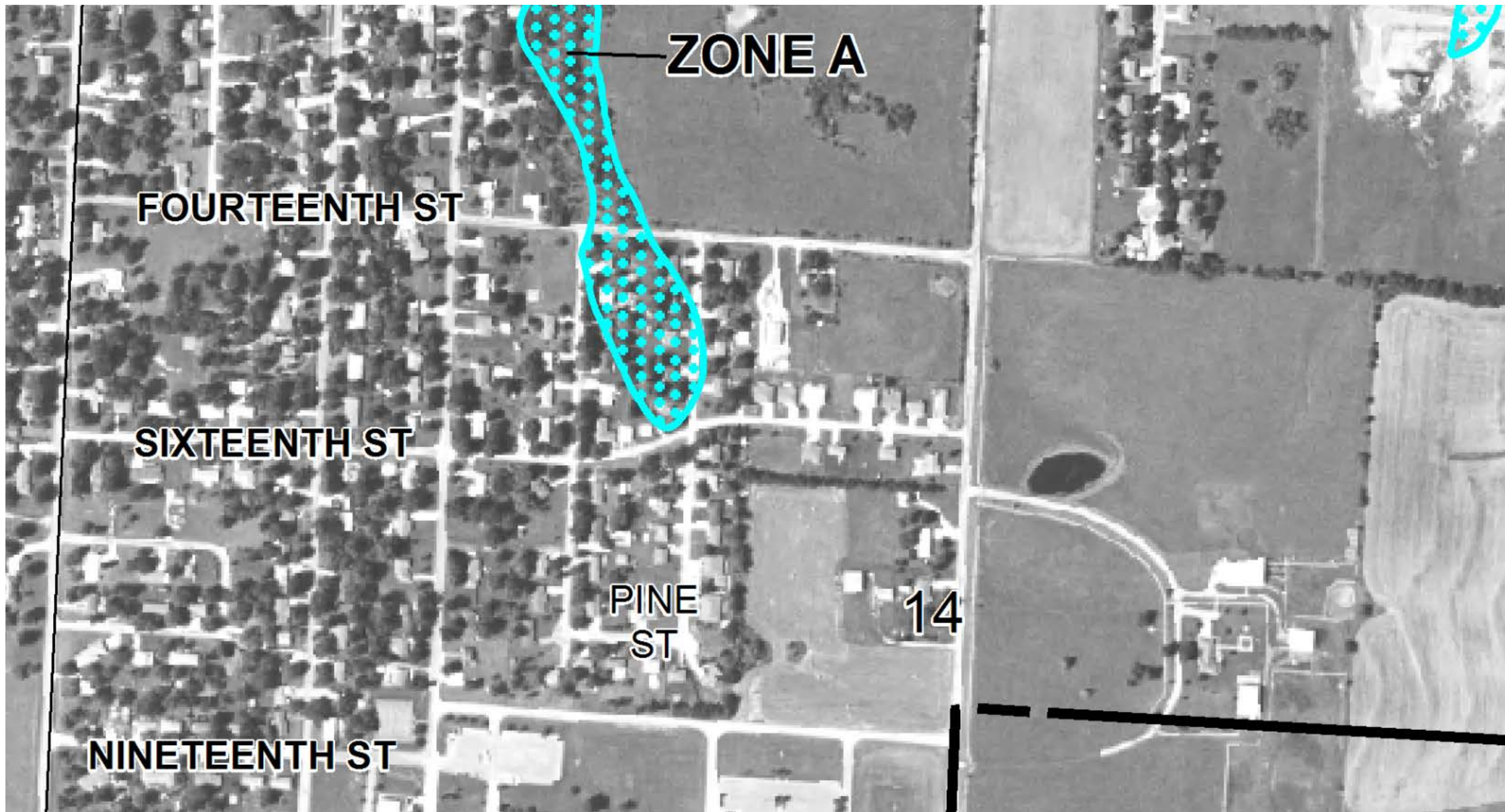
**NEIGHBORHOOD ALTERNATE #2**  
**NEXT STEP STUDY - PHASE 1 SOUTH AREA**  
HOLDEN, JOHNSON COUNTY, MISSOURI  
APRIL 14, 2020

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**ES&S NO. 14492**





**ZONE A**

**FOURTEENTH ST**

**SIXTEENTH ST**

**PINE  
ST**

**14**

**NINETEENTH ST**



FEMA – Approximate Zone A  
In GIS Portal

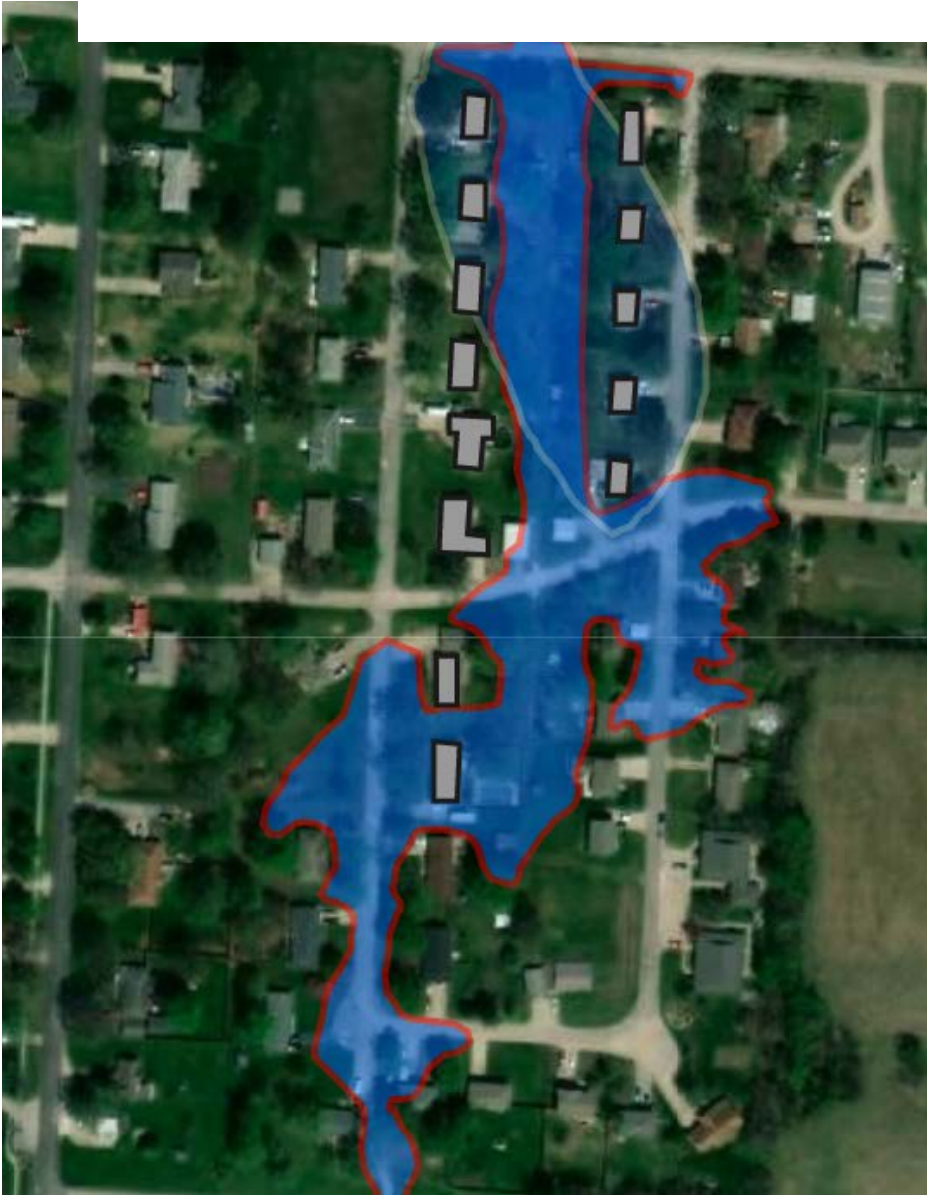


ES&S – Calculated 100-year Floodplain  
In GIS Portal





ES&S – Calculated 100-year Floodplain



ES&S – Calculated 100-year Floodplain  
with 10-year Storm Sewer Pipes





ES&S – Calculated 100-year Floodplain  
with 10-year Storm Sewer Pipes



ES&S – Calculated 100-year Floodplain  
with 25-year Storm Sewer Pipes





## Discussion Topics:

### Initial Recommended Projects:

1. Middle School detention basin - Estimated cost \$30,000
2. New storm sewer pipe from Pine Street, between 1601 and 1603 Pine Street, to the rear lot line - Estimated cost \$35,000
3. New 24-inch storm sewer pipe from the south side of Eagle Drive to the north side of 17<sup>th</sup> Street - Estimated cost \$50,000
4. Construct a reinforced turf grass channel in the rear lot lines from 1601 Pine Street to 14<sup>th</sup> Street - Estimated cost \$72,000

### Stormwater Committee Decisions

1. 10-year vs 25-year storm sewer conveyance design?
2. Smaller 10-year pipes will save about 15% of construction cost



# QUESTIONS?



**GeoVelo**  
Geospatial Forensics





08/03/2020