

Section 7

Capital Improvement Projects

7.1 Introduction

The results of the hydrologic, geomorphic, water quality and special areas evaluations discussed in the previous sections of this report formed the foundation for identifying problem areas in the South Salt Creek Watershed Study Area. The Potential Capital Improvement Projects (CIP) addressing each problem area were evaluated based on design, economic feasibility, and overall efficiency of addressing systemic problems within the study area. Each CIP was then prioritized according to the City's Priority Ranking for Watershed Master Plan Projects.

The CIP identification and development process is detailed in the following subsections. The CIP Prioritization Worksheets are found in Appendix H, and the cost estimate worksheets for each project are found in Appendix I.

7.2 Problem Identification

The problem identification was based upon an evaluation of the South Salt Creek main stem and tributaries to identify areas which pose a serious public safety concern with respect to drainage infrastructure and stream erosion and/or threaten water quality or natural resources.

The geomorphic evaluation discussed in Section 5 was used to identify stream stability problems in the watershed study area. The stream processes driving instability identified in Section 5 are widening along the main stem and incision and plan form adjustment on the tributaries and along the Wagon Train Study Area main stem. All of these processes drive the widespread bank failures, mass wasting, and sediment generation identified in Section 5.

Channel widening generates massive amounts of sediment and debris as tall vertical banks fail and slump into the channel. Excess debris and sediment deposition cause the channel thalweg to split around center bars or shift erratically as the channel attempts to manage the sediment load and carve a new low flow channel and floodplain inside the deeper, widened cross section. Channel widening threatens structures and utilities near the channel by the outward migration of top of the bank caused by bank failures. Also, channel widening damages water quality and aquatic habitat through the generation of excessive sediment load and loss of stable habitat as the channel relocates.

Channel incision on the tributaries and on Wagon Train main stem threatens stable or un-incised reaches as well as bridges and culverts by eroding below the structure footing and removing the very soil on which these structures bear. Incision also threatens streamside utilities by day-lighting them and exposing the utility to channel shear forces. Bank failures and mass wasting resulting from incision threaten streamside infrastructure and structures at the top of bank.

The water quality evaluation discussed in Section 4 identified elevated levels of E. coli, total suspended solids, and other contaminants. All of these conditions stem from systemic watershed characteristics, land use and watershed management practices rather than specific localized water quality problems or contamination sources. As a result, no water quality CIPs were developed. Instead, the identified water quality problems led to watershed best management practice recommendations which are discussed in the Implementation section of this report.

7.3 Evaluation Approach

7.3.1 Stream Erosion Evaluation

The major drivers of instability in the South Salt Creek Watershed Study Area are widening and incision. While the dominant process on the South Salt Creek main stem is widening, the main stem also exhibits strong indication of potential future incision evidenced by the presence of knickpoints in the channel. There are no structures threatened by the widening and, therefore, no CIPs to address widening along the main stem. However, there are CIPs intended to address channel incision processes by constructing grade controls at existing knickpoints observed along the main stem to halt their upstream migration. Three such knickpoints were observed at the W Pioneers Blvd, Old Cheney Rd, and Wilderness Park Old Railroad Bridge crossings of the South Salt Creek main stem. Presently the channel gradient between the knickpoints observed at the three bridges is stable, as the bridges are serving to temporarily stabilize the channel bed, preventing the upstream propagation of the knickpoint.

Grade control projects for the tributaries and for Wagon Train main stem are included in the CIP to halt active incision and protect the reaches upstream of the grade control. Bank stabilization is also included in the CIPs to address bank erosion and mass wasting in areas where infrastructure is threatened. The old truism regarding streambanks – *It is impossible to stabilize a streambank on an unstable stream* – is as applicable here as anywhere in the region. Therefore, grade controls are also included in the bank stabilization CIPs to prevent future incision at the bank stabilization location. These grade controls are not included at sites where an existing nearby downstream grade control exists.

Nineteen recommended CIP's are developed for the South Salt Creek Watershed Study Area. These recommended projects are strategic in nature, focusing on protecting existing infrastructure and interrupting the cycle of degradation by arresting channel incision prior to its propagation into stable reaches. The CIP's do not address all of the stream erosion issues in the watershed study area, as a program to repair all of the problem sites would be cost prohibitive. However, each of the recommended improvements are designed to address both the local stability problem identified in addition to helping the entire stream system move closer to self-sustaining dynamic equilibrium.

7.3.2 Water Quality Considerations

Water quality impacts are included in the evaluation of potential CIP's. Project evaluation and development took into account the potential water quality impacts which may occur as a

result of project construction. Consideration was also given to the benefit grade-control and bank stabilization projects would provide in terms of reducing channel erosion and protecting stable reaches, therefore reducing sediment loading. For example, grade controls and bank stabilization projects designed to address stream erosion also assist in reducing sediment pollutants.

The stream erosion CIPs address channel erosion issues and thereby address associated water quality issues stemming from sediment generation caused by erosion. All of the stream erosion CIPs help water quality by reducing erosion, however, the stream erosion CIPs are not specifically water quality CIPs.

7.3.3 Special Area Considerations

The process of evaluating the potential CIP's also included a consideration of the potential impacts each project may have on the Special Areas. Consideration was given to both avoiding potential negative impacts during project construction as well as the benefits each project provides in terms of protecting the local Special Areas from unmanaged system instability.

7.3.4 Capital Improvement Project Types

The recommended projects generally fall into one of three categories of projects:

1. **Grade Control Projects** - construct grade controls along the main stem and tributaries at select locations to stop incision at these locations. The grade controls will eliminate incision and limit the propagation and depth of incision upstream of each grade control project. Grade control projects also include any localized bank stabilization necessary to construct a stable grade control. The bank stabilization should incorporate the use of native riparian vegetation. The grade control should be placed at grade on the channel bottom and formed in a manner to mimic the elevation and stable slopes of the existing channel banks. Where stabilizing a knickpoint, a ramp slope of 20H: 1V maximum should be used. The grade control should extend to the top of each bank or the 25 year flow depth, whichever is greater. Consideration should be given to soil erodability, piping and shear stresses along the grade control and at the edges.

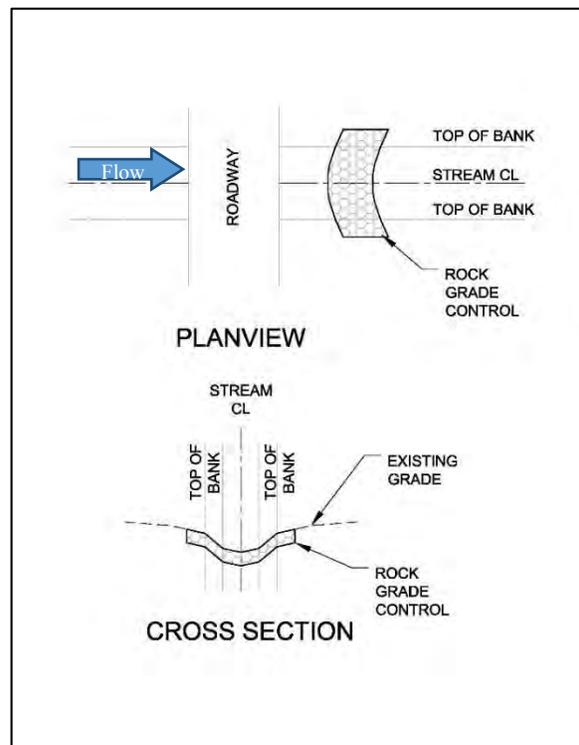


Figure 7-1: Rock Grade Control Structure Detail

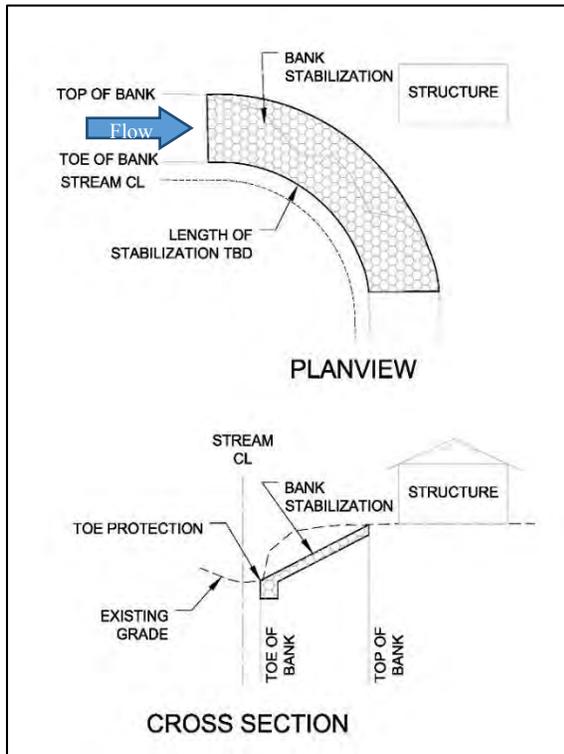


Figure 7-2: Bank Stabilization Structure Detail

3. **Outlet Stilling Basin and Scour Protection** – construct a stilling basin or scour protection at the pipe or culvert outfall to protect the pipe from erosion and undermining due to outfall scour. The limits of protection should extend to the top of each bank or the 25 year flow depth, whichever is greater. Consideration should be given to soil erodability, piping and shear stresses through the scour protection and at the edges. When using a stilling basin, consideration should be given to the depth of scour anticipated in the plunge pool for a variety of flow events. Due to tailwater influences, the greatest potential for scour may not occur at the largest flowrate.

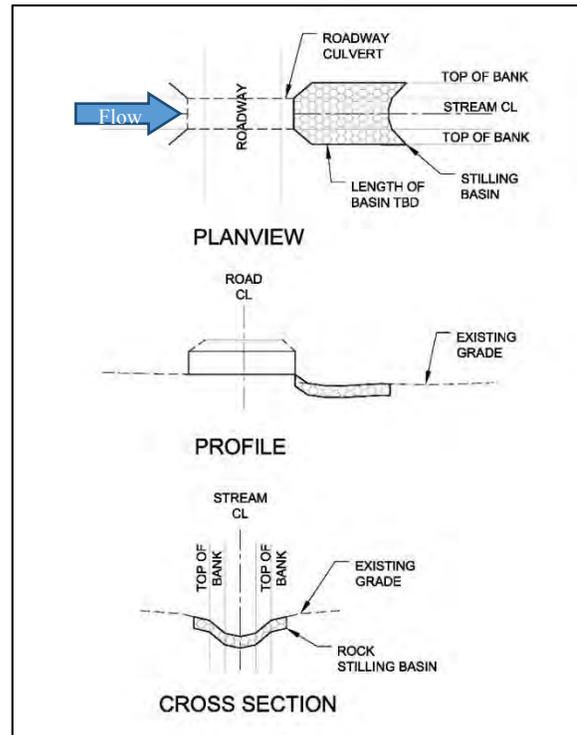


Figure 7-3: Stilling Basin Structure Detail

2. **Bank Stabilization Projects** -construct engineered bank stabilization to protect identified infrastructure or structures from continuing bank erosion threatening the structure. The bank stabilization measures vary in size based on flow parameters, bank height, bank slope, site-conditions and other parameters. Bank stabilization should extend through the entire bend, beginning and ending at a riffle. To the greatest extent practical, bank stabilization shall be bio-engineered, incorporating the use of native riparian vegetation. Each bank stabilization project includes grade controls at the project limits to protect the stabilized bank from potential future incision and add to the systemic stability of the watershed study area.

7.4 Capital Improvement Projects

The potential CIP's are discussed in the following pages and their locations illustrated in Figure 7-4.

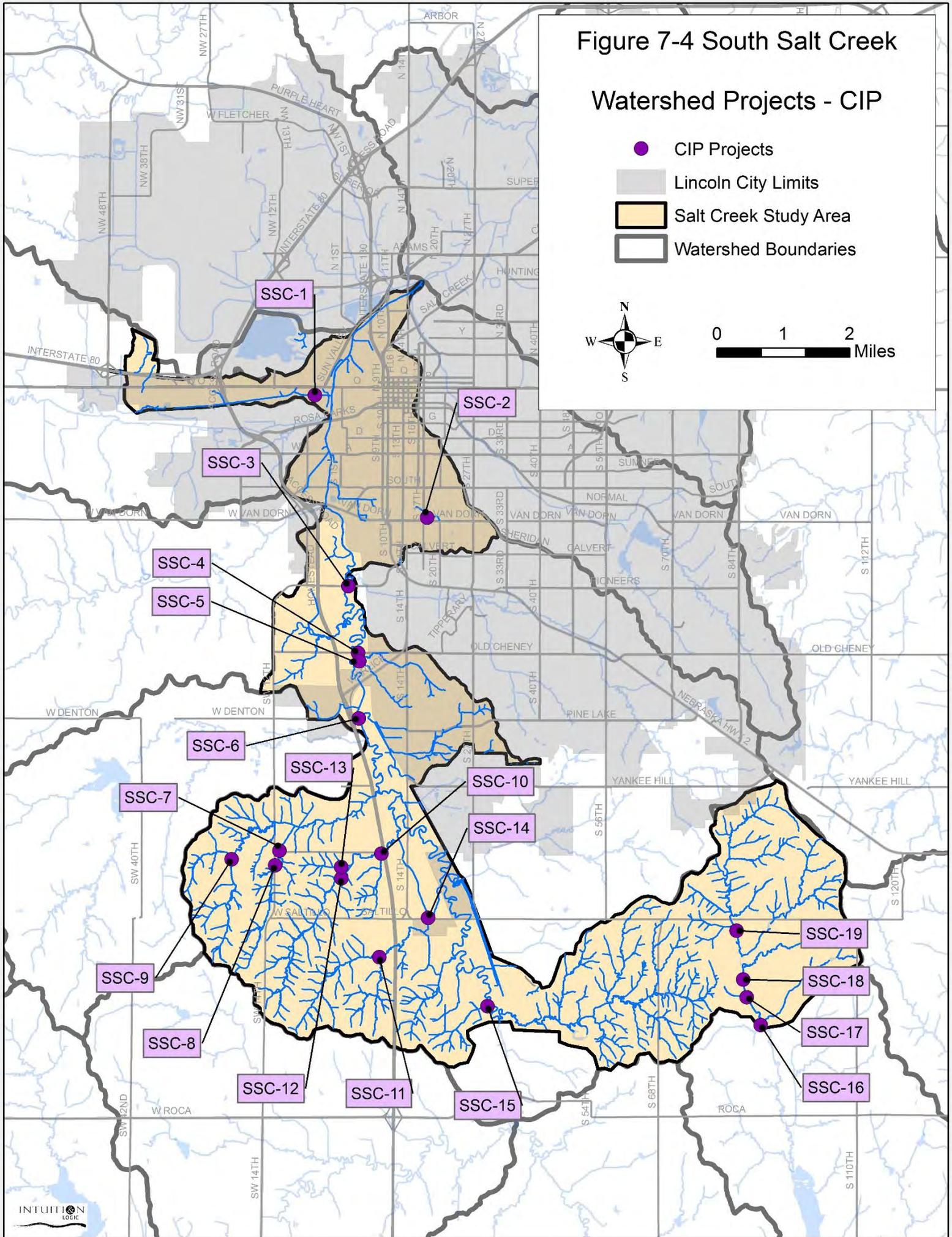
Figure 7-4 South Salt Creek

Watershed Projects - CIP

- CIP Projects
- Lincoln City Limits
- Salt Creek Study Area
- ▭ Watershed Boundaries



0 1 2 Miles



7.4.1 Project SSC-1: Grade Control Tributary SC005R005

Problem description: Incision is moving up tributary SC005R005 paralleling W O St north of Rosa Parks Way.

Recommendation: Recommend constructing grade controls along the upper reach at existing knickpoint locations and installing outlet protection below culvert outfalls to maintain the profile grade along this reach and protect the outfall structures.



Figure 7-5: Incision in channel

Impact to Special Areas and Water Quality: Project is located within the Salt Valley Greenway and near wetlands. Consideration during design and construction should be provided to minimize disturbance to these special areas and reduce impacts to water quality to the greatest extent practical.

Estimated Project Cost: \$239,000

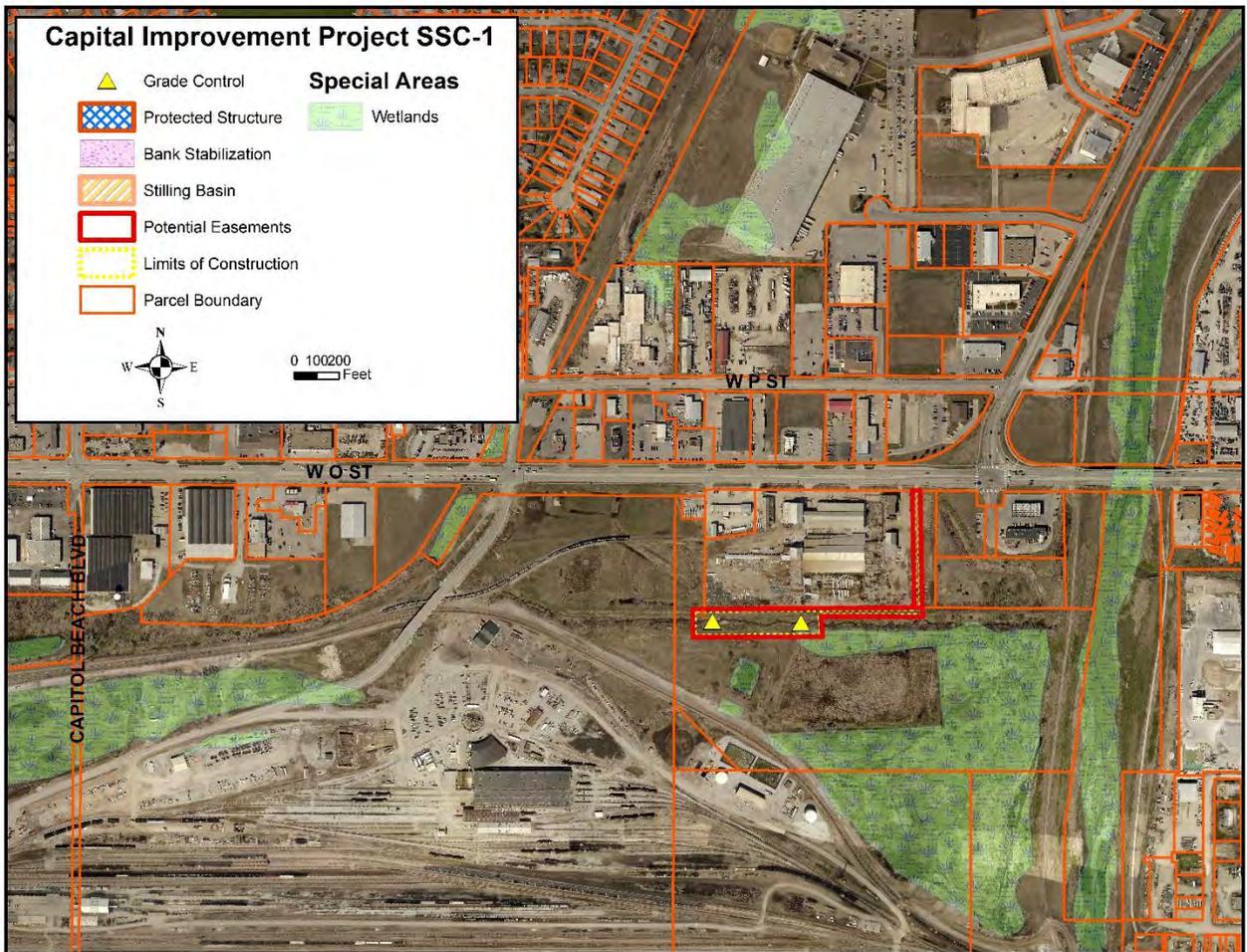


Figure 7-6: Conceptual Layout of SSC-1

7.4.2 Project SSC-2: Irvingdale Park Channel Improvements on Tributary SC015R015

Problem description: Stream incising and plan form adjustment on tributary SC015R015 is threatening Irvingdale Park infrastructure and one residential parcel. An existing rock grade control is failing upstream of the park pedestrian bridge over the tributary and bank erosion is threatening the park trail, one resident and a storm water outfall downstream of the pedestrian bridge.



Figure 7-7: Failing Grade Control

Recommendation: Recommend removing the failed grade control and replacing it with a new rock grade control structure and associated bank stabilization to stop incision and protect the parking lot and the project reach upstream of the pedestrian bridge. Recommend installation of grade controls and bank stabilization measures to protect the residential parcel, park infrastructure and storm water outfall along the project reach downstream of the pedestrian bridge.



Figure 7-8: Incising channel north of Irvingdale Park

Impact to Special Areas and Water Quality: Project is located within Irvingdale Park. Consideration during design and construction should be provided to minimize disturbance to the park and reduce impacts to water quality to the greatest extent practical.

Estimated Project Cost: \$370,000

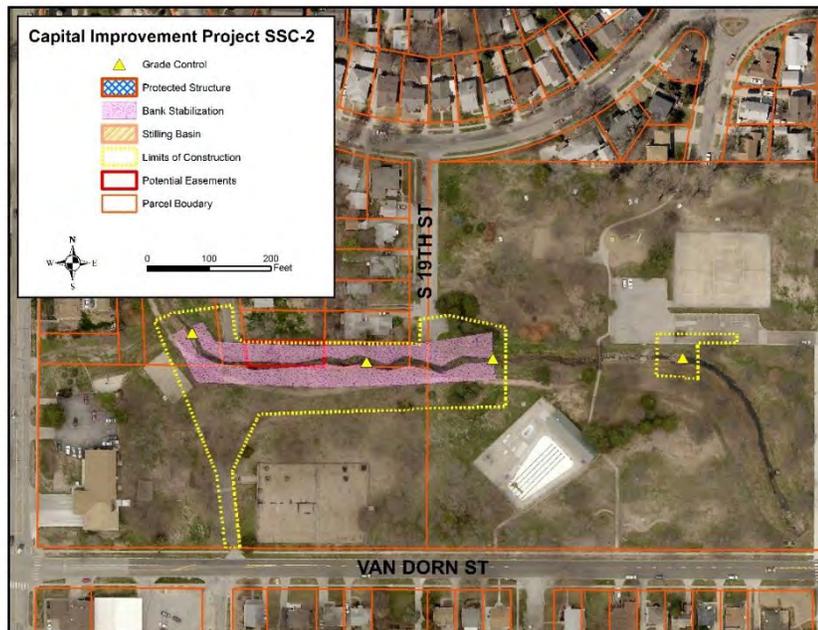


Figure 7-9: Conceptual Layout of SSC-2

7.4.3 Project SSC-3: Grade Control on Main Stem SCR010 at W Pioneers Blvd Bridge

Problem description: An existing rock armored knickpoint in the channel main stem SCR010 at W Pioneers Blvd Bridge (County Structure O-175) over the main stem (Located east of W Pioneer Blvd and S 1st St) is failing. Past incision has exposed the bridge pier foundation and the stream banks downstream of the bridge are eroding.



Figure 7-10: Knickpoint and Exposed Bridge Piers

Recommendation: Recommend constructing a rock grade control and stilling basin with associated bank revetment to protect the bridge piers and channel by preventing the knickpoint from propagating upstream. A USGS stream gauge is installed on the bridge at this location. The designed revetment must not interfere with the operation of the gauge. City GIS contour data indicates the channel flowline at elevation immediately upstream of the knickpoint at the W Pioneers Blvd Bridge is 1,136 feet AMSL.

Impact to Special Areas and Water Quality: Project is located in Salt Valley Corridor and within Wilderness Park. Consideration during design and construction should be provided to minimize disturbance to these special areas and reduce impacts to water quality to the greatest extent practical.

Estimated Project Cost: \$482,000

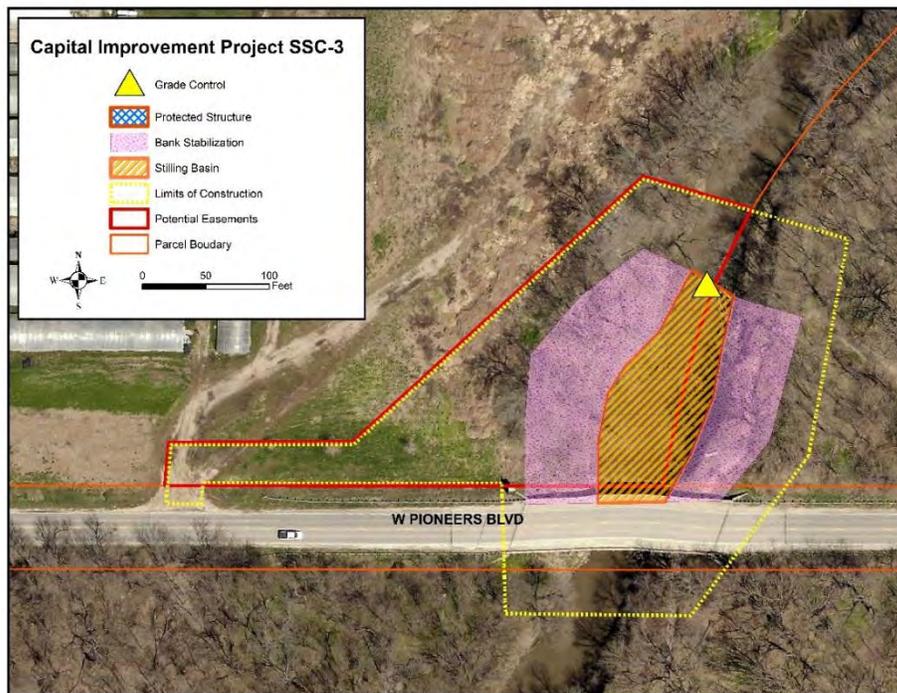


Figure 7-11: Conceptual Layout of SSC-3

7.4.4 Project SSC-4: Grade Control on Main Stem SCR020 at Old Cheney Rd Bridge

Problem description: A knickpoint on the main stem SCR020 is located at the Old Cheney Rd Bridge (County Structure O-37) west of the Old Cheney Rd and Hunts intersection. Past incision has exposed Old Cheney Rd Bridge piers and the stream banks downstream of the bridge are eroding.



Figure 7-12: Old Cheney Rd Bridge Piers Exposed

Recommendation: Recommend constructing a grade control and stilling basin with associated bank stabilization immediately downstream of the bridge to protect the bridge piers by preventing the knickpoint from propagating upstream. An evaluation of the bridge piers stability and any subsequent structure rehabilitation or replacement necessary to stabilize the structure is also included in this recommendation. City GIS contour data indicates the channel flowline at elevation immediately upstream of the knickpoint at the bridge is 1,146 feet AMSL.

Impact to Special Areas and Water Quality: This project is located in Salt Valley Corridor, Wilderness Park, and on the edge of a woodland. Consideration during design and construction should be provided to minimize disturbance to these special areas and reduce impacts to water quality to the greatest extent practical.

Estimated Project Cost: \$437,000



Figure 7-13: Conceptual Layout of SSC-4

7.4.5 Project SSC-5: Grade Control Incision and Knickzone on Tributary SC040R005

Problem description: Incision and a deep knickzone is actively eroding into the stable upper reach of tributary SC040R005 located approximately 600 feet south of the Old Cheney Rd Bridge over the main stem. The erosion is threatening walking trails in Wilderness Park at this location.



Figure 7-14: Headcut and Knickzone associated with Channel Incision

Recommendation: Recommend constructing a series of grade controls and associated bank stabilization to stop the incision, protect the existing pedestrian trails and upstream reach from erosion, and preserve the upstream natural resources. This project includes construction access from Old Cheney Rd along the park trail and crossing tributary SC035R005. The existing rock grade control at this location on tributary SC035R005 is failing and a new grade control at this location to protect the tributary and facilitate construction access is included in this project. In addition, the access route through wooded areas should vary to avoid a straight clear cut path and to minimize tree removal.

Impact to Special Areas and Water Quality: Project is located within Salt Valley Site, Wilderness Park, and in a woodland. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to these special areas and water quality to the greatest extent practical.

Estimated Project Cost: \$325,000

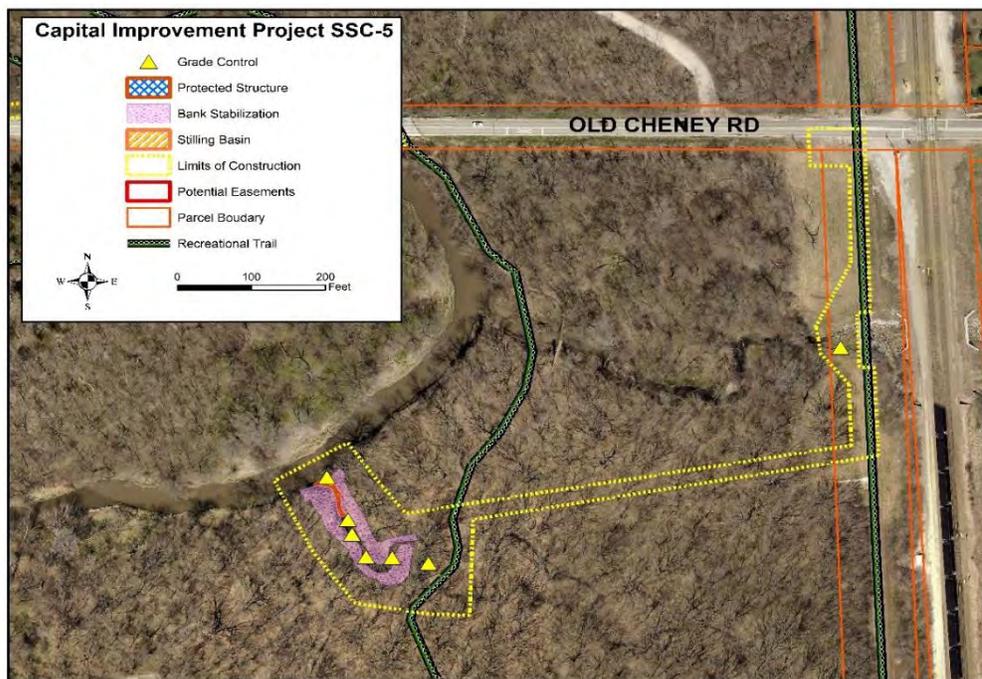


Figure 7-15: Conceptual Layout of SSC-5

7.4.6 Project SSC-6: Grade Control Main Stem SCR030 at Old Railroad Bridge and Knickpoint on Tributary SC050R005 at Wilderness Park Tail Bridge

Problem description: There is an existing rock rubble knickzone on the main stem SCR030 at the old railroad bridge located approximately 2,500 feet south of W Denton Rd and 450 feet east of Highway 77. The rubble does not appear to provide reliable stability of the knickzone. Also, incision along tributary SC050R005 is undermining the trail bridge piers and exposing a fiber optic line in channel bed. The bridge is located west of the northwest corner of Lincoln Southwest High School, about 275 feet west of the railroad tracks. MCI plans to lower the exposed cable line and the MCI construction plans are available with the City Parks Department.



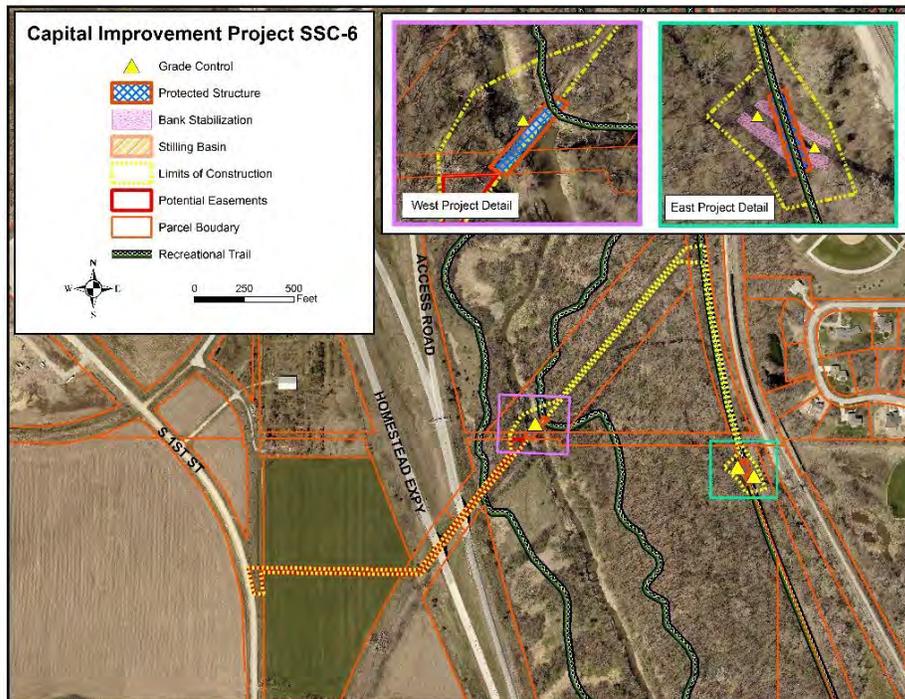
Figure 7-16: Knickpoint Downstream of old Railroad Bridge Knickpoint

Recommendation: Recommend constructing a grade control and associated bank stabilization on the main stem at the old railroad bridge to stop incision from propagating upstream. Also recommend grade controls and associated bank stabilization along approximately 150 feet of the tributary at the trail bridge to stop incision and protect the bridge. The tributary project reach should beginning downstream of the bridge and extending to a point upstream of the bridge to the knickpoint in the channel bed where the exposed fiber optic line is/was located in the channel.



Figure 7-17: Trail Bridge with exposed footings.

Impact to Special Areas and Water Quality: The project is located within Salt Valley Corridor, Wilderness Park, and within a woodland. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to the special areas and water quality to the greatest extent practical.



Estimated Project Cost:
\$447,000

Figure 7-18: Conceptual Layout of SSC-6.

7.4.7 Project SSC-7: Stilling Basin at Perched W Rokeby Rd Culvert Outfall on Tributary SC155R005

Problem description: The W Rokeby Rd culvert (County Structure O-48) outfall is perched and a debris jam in the tributary SC155R005 approximately 380 feet downstream of W Rokeby Rd is holding up a 2 foot tall knickpoint. The tributary crossing is located east of SW 12th St.



Figure 7-19: Perched Culvert at W Rokeby Rd.

Recommendation: Recommend constructing a stilling basin and grade control with associated bank stabilization at the perched culvert outfall to protect the culvert. The grade control will need to be deep enough to protect against the 2 foot knickpoint downstream of the culvert. Utility markers indicate the location of a pipeline downstream of the W Rokeby Rd crossing that will need to be considered during design and construction.

Impact to Special Areas and Water Quality: Project is located within a woodland. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to this special areas and water quality to the greatest extent practical.

Estimated Project Cost: \$190,000



Figure 7-20: Conceptual Layout of SSC-7

7.4.8 Project SSC-8: Stilling Basin at Perched SW 12th St Culvert Outfall on Tributary SC155R005

Problem description: The SW 12th St culvert (County Structure O-155) on tributary SC155R005 located 1070 feet south of W Rokeby Rd is perched.



Figure 7-21: Perched SW 12th St culvert outfall

Recommendation: Recommend constructing a stilling basin and grade control at the culvert outfall.

Impact to Special Areas and Water Quality: Project is located within a woodland. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to this special areas and water quality to the greatest extent practical.

Estimated Project Cost: \$162,000

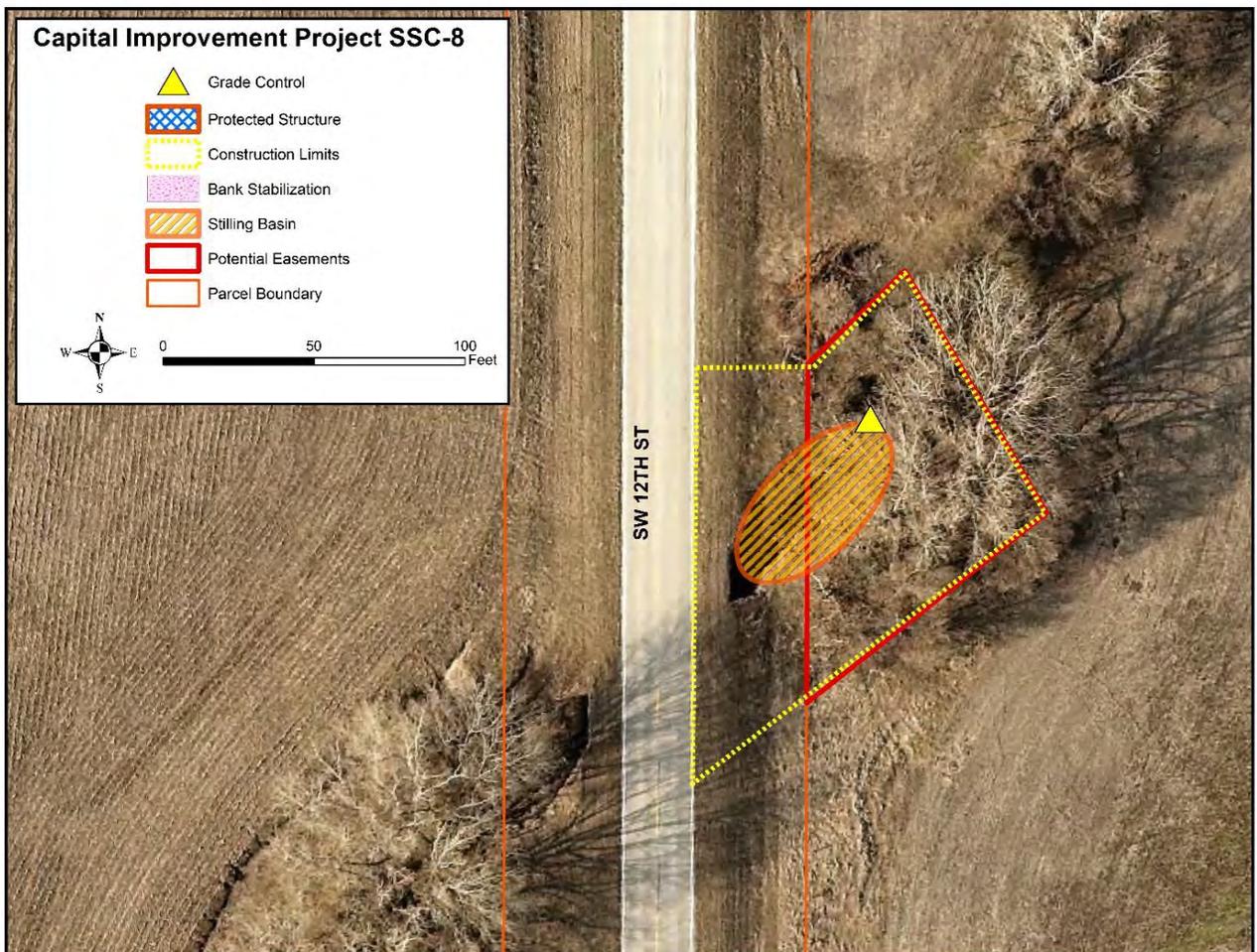


Figure 7-22: Conceptual Layout of SSC-8

7.4.9 Project SSC-9: Grade Control Farm Crossing Holding Up Knickpoint in Tributary SC055R025

Problem description: An eroding farm crossing is holding up a four foot tall knickpoint in the tributary SC055R025 located 750 feet upstream of W Rokeby Rd, east of W Rokeby Rd and SW 27th St.

Recommendation: Recommend replacing or reinforcing the dirt farm crossing with engineered erosion control and rock structure/grade control to prevent erosion of the crossing and stop the knickpoint from propagating upstream.



Figure 7-23: Eroding farm crossing holding up knickpoint

Impact to Special Areas and Water Quality: There are no special areas at this project location. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.

Estimated Project Cost: \$105,000

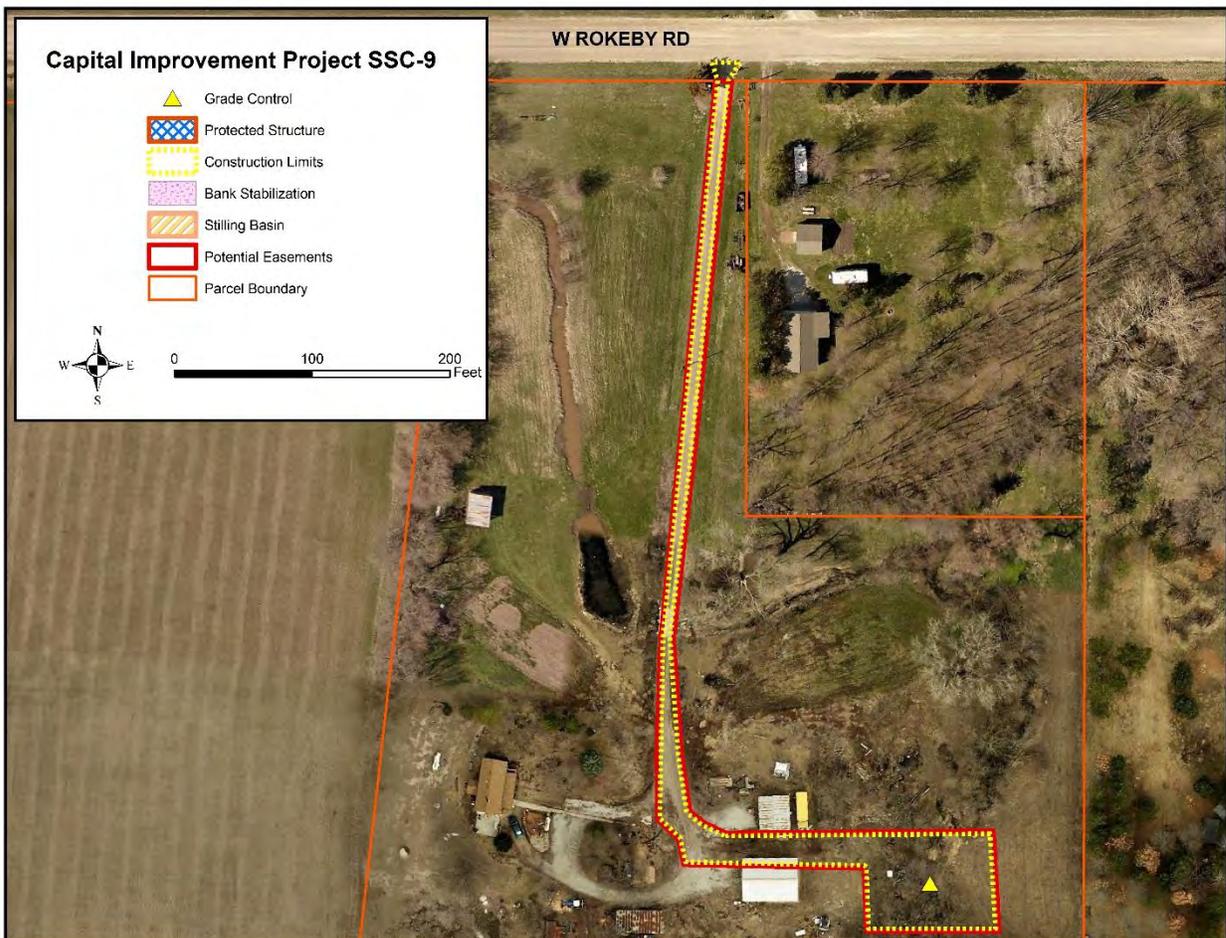


Figure 7-24: Conceptual Layout of SSC-9

7.4.10 Project SSC-10: Grade Control Knickpoint on Tributary SC265R005

Problem description: A 4 foot tall knickpoint is moving up the tributary SC265R005 located just west of Rokeby Rd and Homestead Expressway.



Figure 7-25: Headcut propagating into field.

Recommendation: Recommend grade controlling the knickpoint and associated bank stabilization to halt propagation of the knickpoint and to protect the upstream tributary. This project is in the location of the new beltway construction, will require access across State ROW and needs to be coordinated with the future South Beltway plans anticipated in 2020

Impact to Special Areas and Water Quality: Project is located in Salt Valley Corridor. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to this special areas and water quality to the greatest extent practical.

Estimated Project Cost: \$107,000

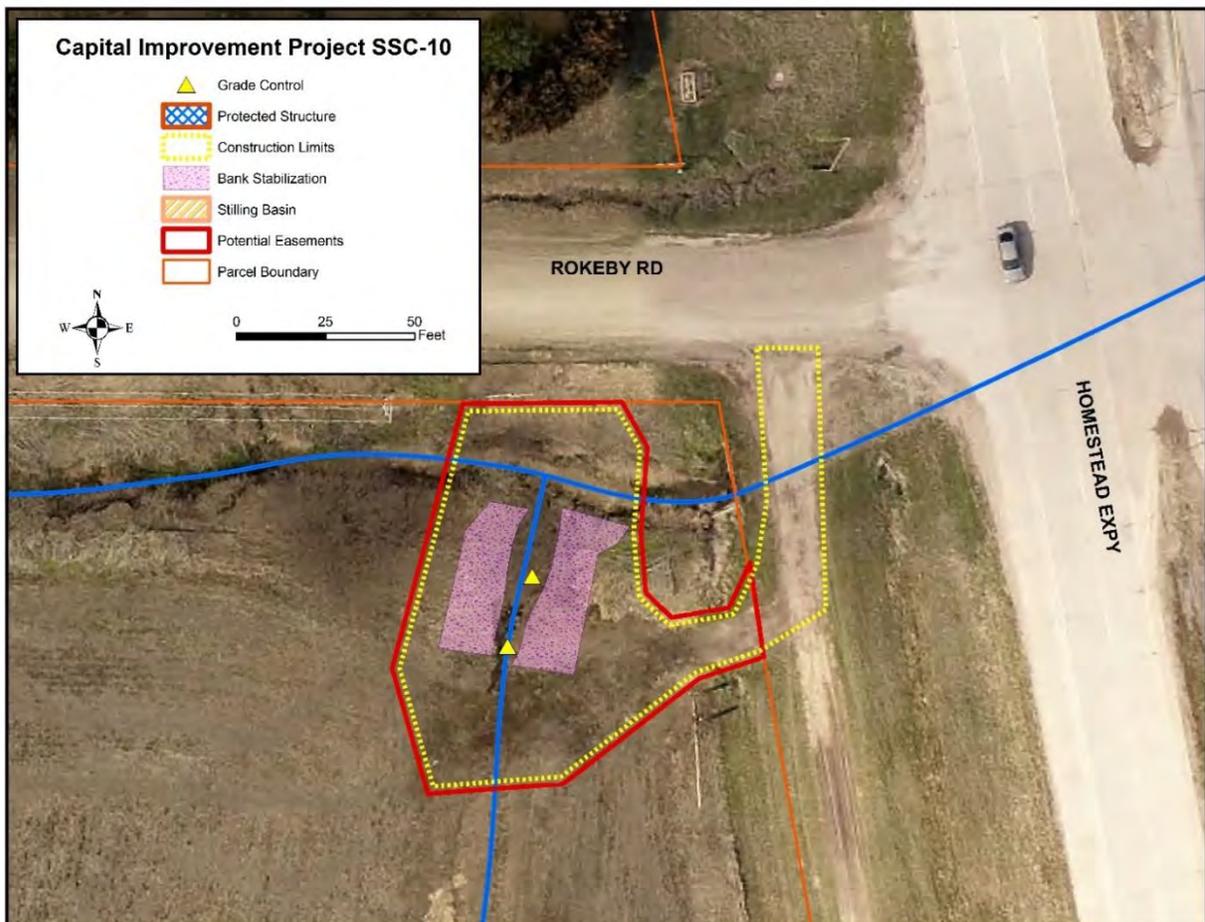


Figure 7-26: Conceptual Layout of SSC-10

7.4-11 Project SSC-11: Grade Control Knickzone in Tributary SC435R005

Problem description: A 4 foot tall knickzone in the tributary SC435R005 near the confluence is actively eroding into the un-incised upstream reach. The project is located approximately 1,300 feet west of Homestead Expressway and 2,300 feet north of Bennet Rd.



Figure 7-27: Knickpoint in channel

Impact to Special Areas and Water Quality: Project is located within a woodland and a potential wetland area. This project will protect potential wetlands from degradation of hydrology caused by channel incision. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.

Estimated Project Cost: \$201,000

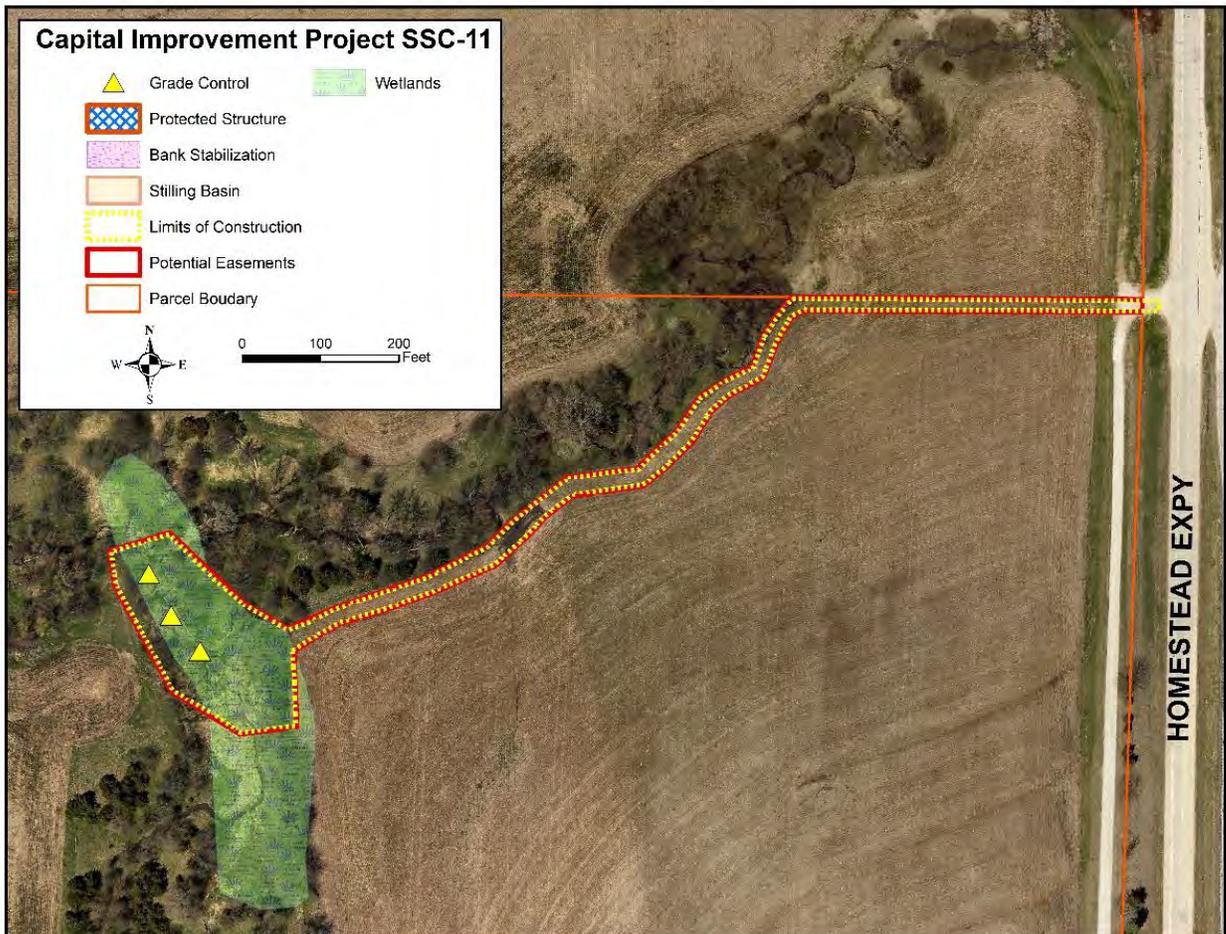


Figure 7-28: Conceptual Layout of SSC-11

7.4.12 Project SSC-12: Stilling Basin at Perched S 1st St Culvert on Tributary SC365R005

Problem description: The S 1st St culvert (County Structure O-204) is perched at the tributary SC365R005 crossing located approximately 1,150 feet south of Rokeby Rd.



Figure 7-29: Perched S 1st St Culvert

Recommendation: Recommend constructing a grade control, stilling basin and associated bank stabilization to protect the S 1st St culvert.

Impact to Special Areas and Water Quality: There are no special areas at this project location. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.

Estimated Project Cost: \$197,000

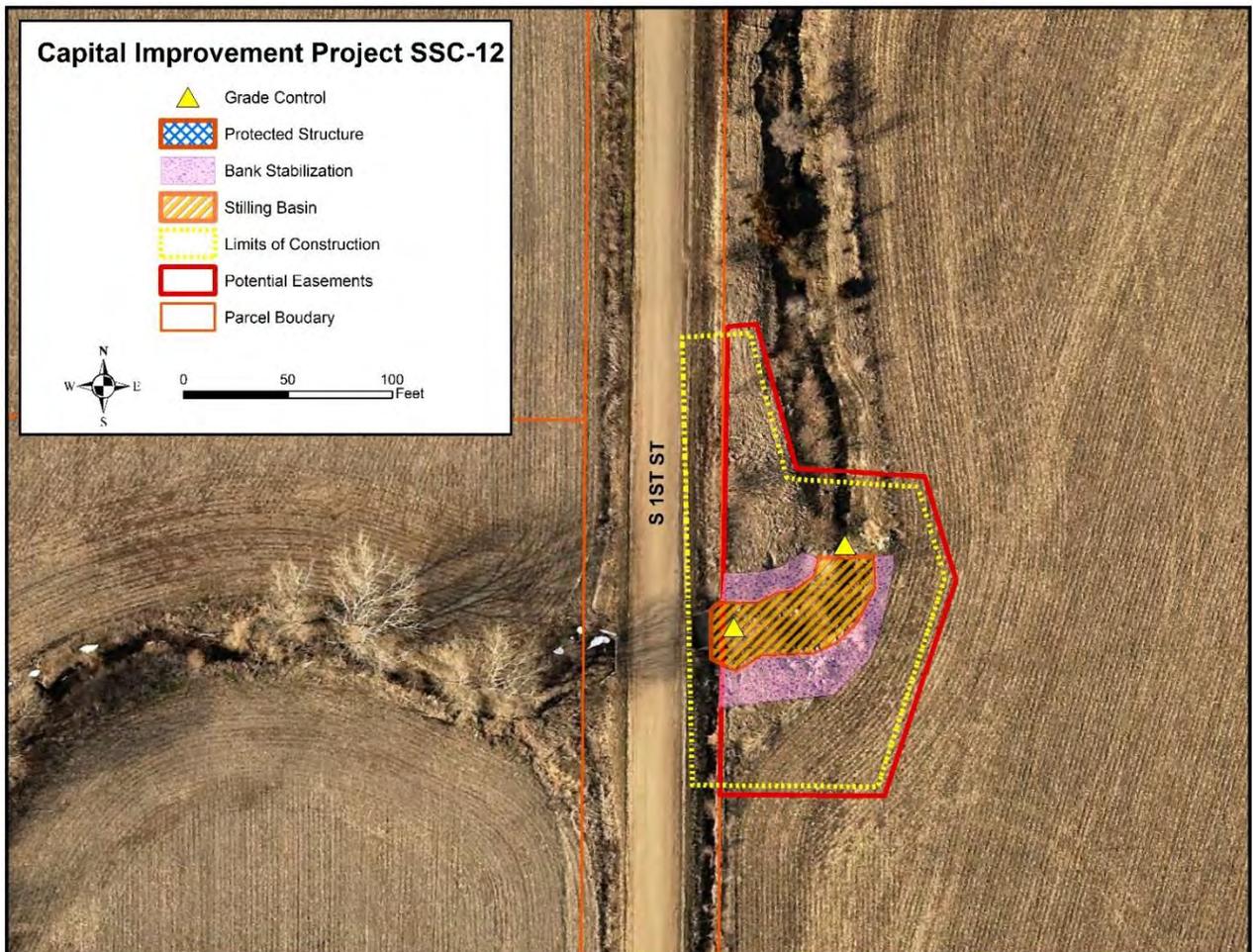


Figure 7-30: Conceptual Layout of SSC-12

7.4.13 Project SSC-13: Stilling Basin at Perched S 1st St Culvert on Tributary SC165R010

Problem description: The S 1st St culvert (County Structure O-203) on tributary SC165R010 located approximately 2,090 feet South of Rokeby Rd is perched.

Recommendation: Recommend removing dumped rubble and constructing a grade control, stilling basin and associated bank stabilization to protect the S 1st St culvert. This project will be a joint City, NRD and State (NDOR) project and will need participation of all entities.



Figure 7-31: Perched S 1st St culvert

Impact to Special Areas and Water Quality: There are no special areas at this project location. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.

Estimated Project Cost: \$156,000

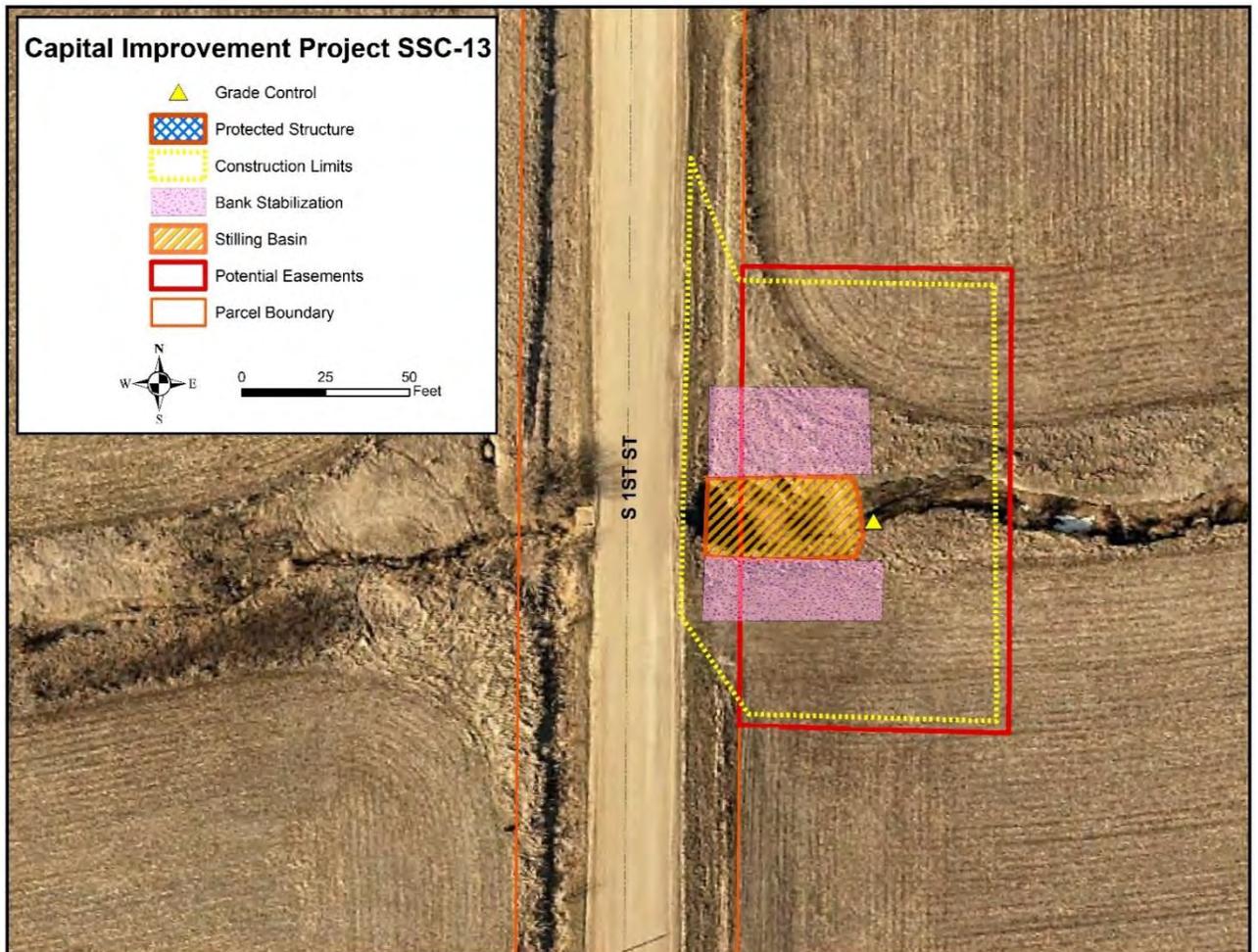


Figure 7-32: Conceptual Layout of SSC-13

7.4.14 Project SSC-14: Stilling Basin at Perched Saltillo Rd Culvert on Tributary SC065R010

Problem description: The Saltillo Rd culvert on tributary SC065R010 located approximately 1,270 feet east of the intersection of S 14th St is perched.

Recommendation: Recommend constructing a grade control, stilling basin and associated bank stabilization to protect the culvert.

Impact to Special Areas and Water Quality: There are no special areas at this project location. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.

Estimated Project Cost: \$137,000



Figure 7-33: Perched Saltillo Rd culvert

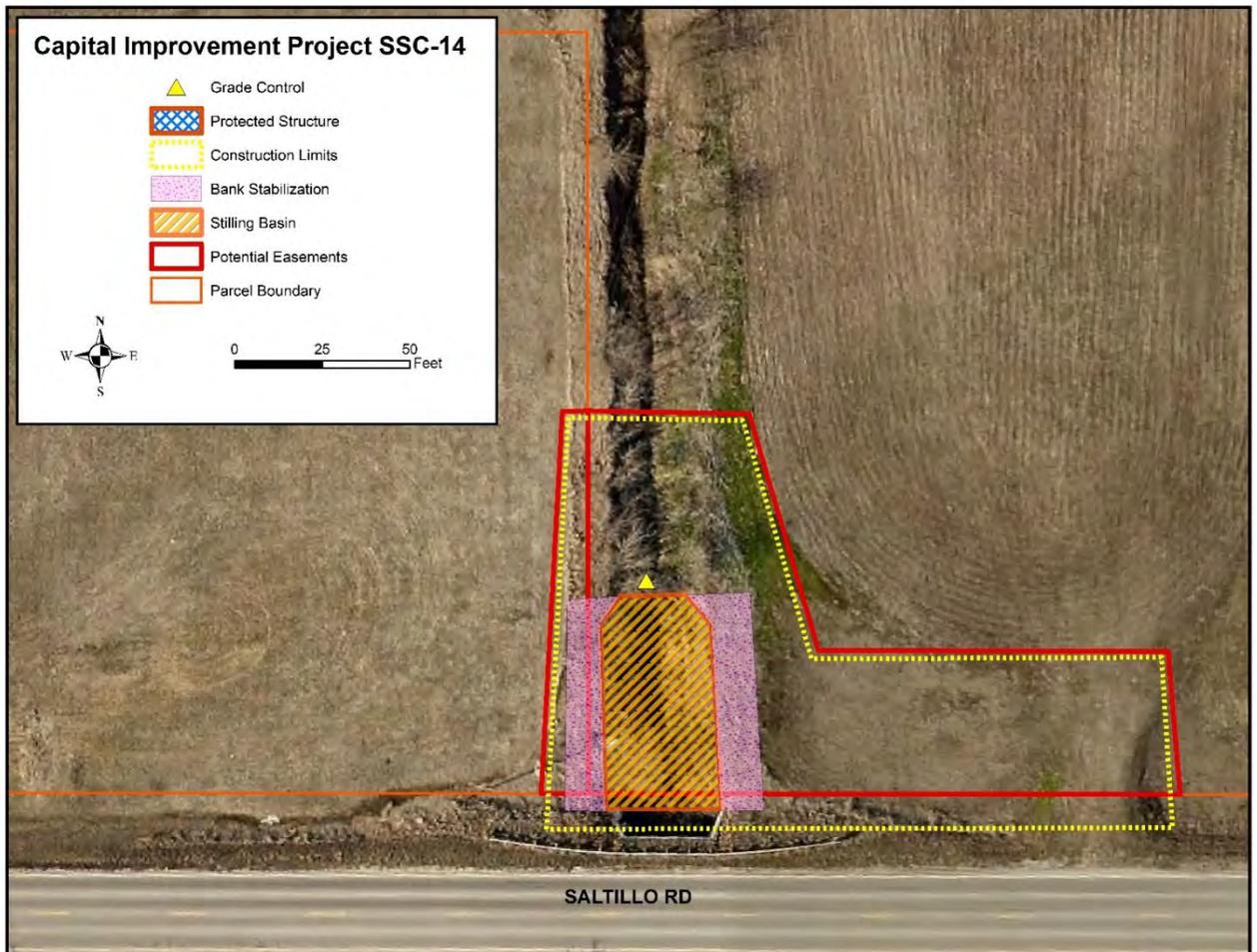


Figure 7-34: Conceptual Layout of SSC-14

7.4.15 Project SSC-15: Grade Control Incision on Tributary SC095R005 at Homestead Trail Bridge

Problem description: Tributary SC095R005 is incising beneath the existing Homestead trail bridge located 180 feet upstream of the tributary’s confluence with the main stem of South Salt Creek. The project site is approximately 4,200 feet northeast of the Wittstruck Rd and S 25th St intersection.

Recommendation: Recommend constructing grade control and associated bank stability to stop incision and protect the trail bridge.

Impact to Special Areas and Water Quality: Project is located within Salt Valley Corridor and a woodland. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to the special areas and water quality to the greatest extent practical.



Figure 7-35: Knickpoint Beneath Trail Bridge

Estimated Project Cost: \$129,000

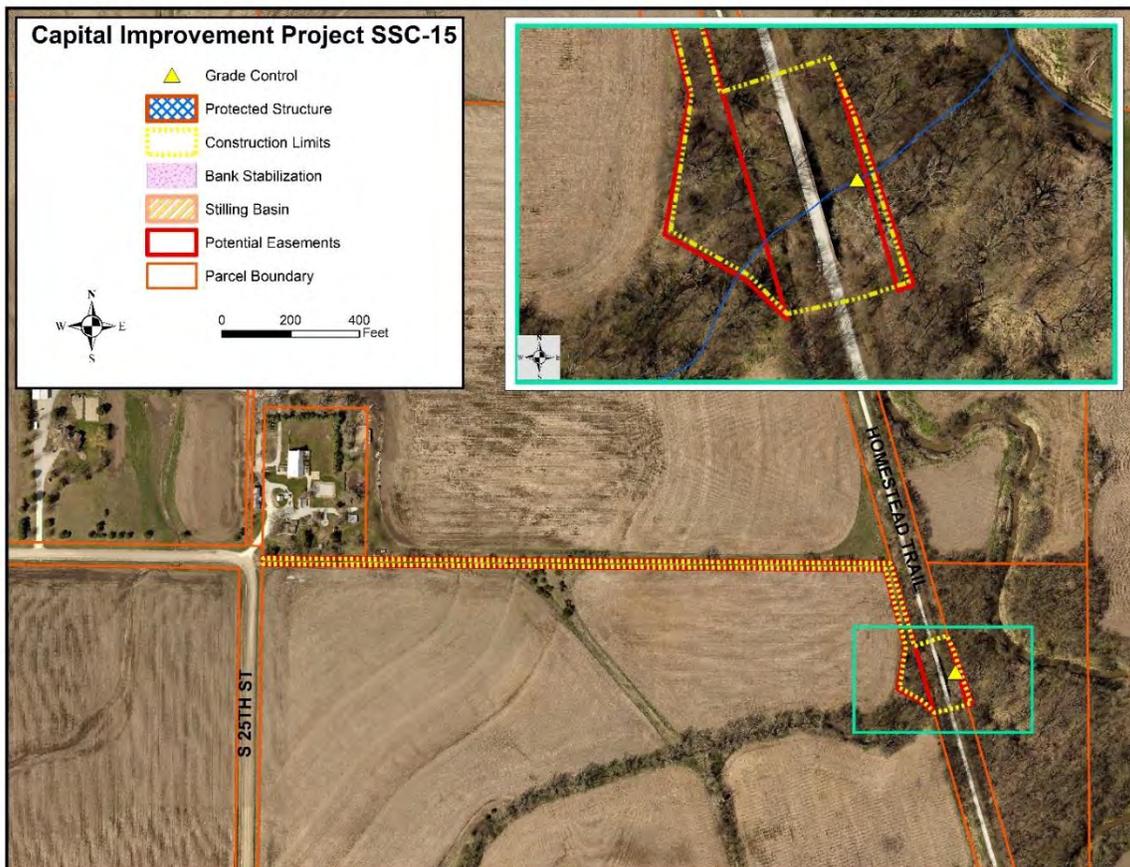


Figure 7-36: Conceptual Layout of SSC-15

7.4.16 Project SSC-16: Grade Control Knickpoints on Wagon Train Main Stem WTR005

Problem description: Existing tree root mass is holding up a 3 foot knickpoint on Wagon Train main stem WTR005 approximately 1,950 feet upstream of Wittstruck Rd between S 82nd St and S 96th St. At this location, the main stem is approximately 37 feet from an adjacent tributary and this tributaries flowline is approximately a foot deeper than the flowline of the main stem. Continued incision, potential lateral migration and flowline elevations of the tributary present the potential that the main stem may erode to the tributary and subsequently flow down the tributary.



Figure 7-37: Root mass holding up 3 foot knickpoint on main stem

Recommendation: Recommend constructing a grade control and stilling basin with associated bank stabilization immediately downstream of the root mass to stop the incision and protect the channel.

Impact to Special Areas and Water Quality: Project is located in Salt Valley Greenway and a woodland. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to these special areas and water quality to the greatest extent practical.

Estimated Project Cost: \$273,000

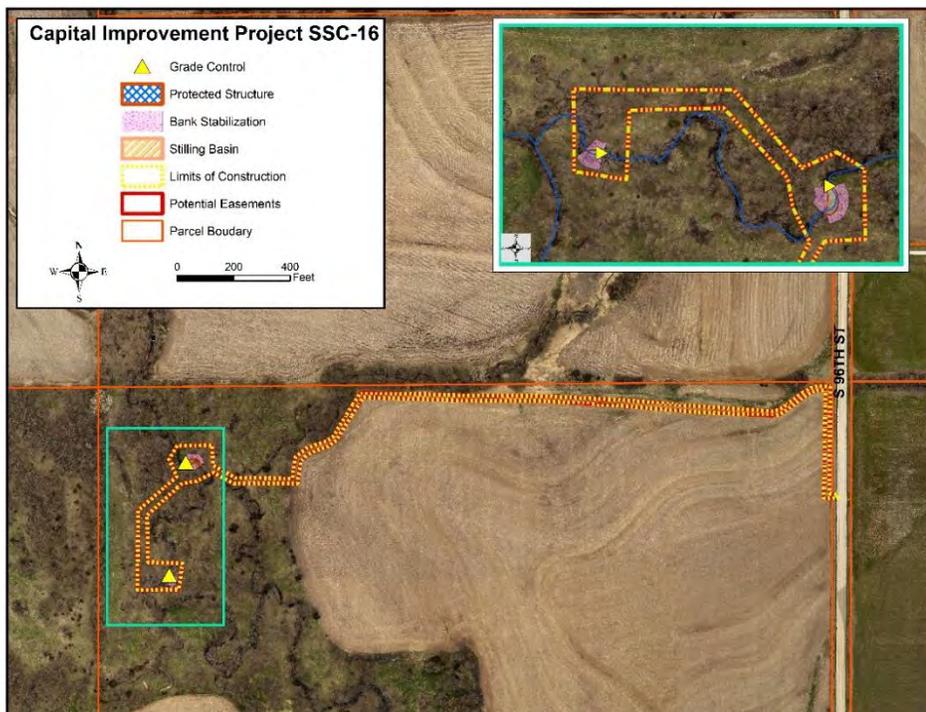


Figure 7-38: Conceptual Layout of SSC-16

7.4.17 Project SSC-17: Grade Control Knickpoint on Tributary WT010R005

Problem description: A 2 foot knickpoint is propagating up the tributary WT010R005 approximately 1,000 feet south of Saltillo Rd and east of S 82nd St.

Recommendation: Recommend installing a grade control to stop the propagation of incision and protect the tributary.

Impact to Special Areas and Water Quality: Project is located within the Salt Valley Corridor. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to this special areas and water quality to the greatest extent practical.

Estimated Project Cost: \$136,000



Figure 7-39: Knick at confluence

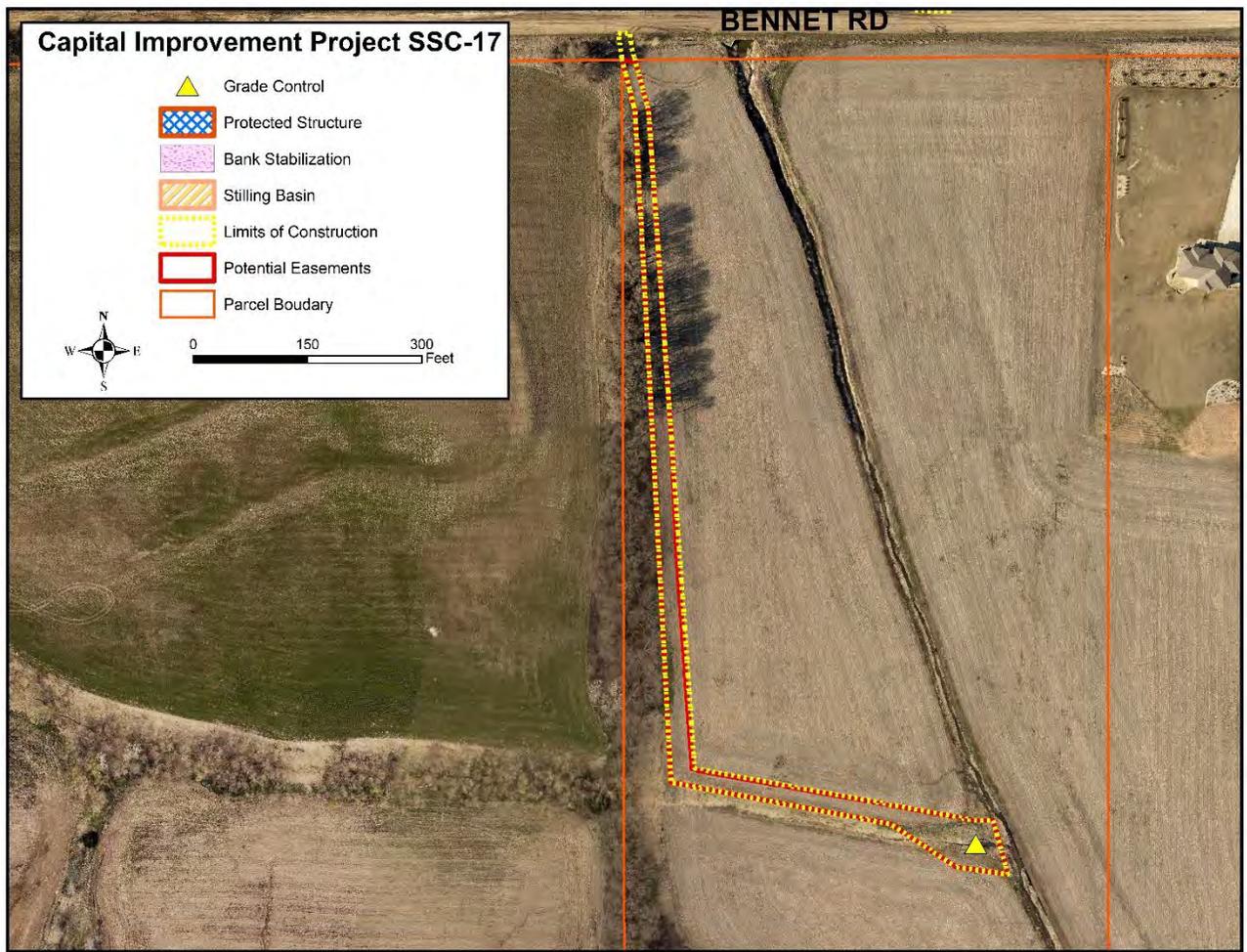


Figure 7-40: Conceptual Layout of SSC-17

7.4.18 Project SSC-18: Grade Control Knickpoint on Wagon Train Main Stem WTR010 Upstream of Bennet Rd

Problem description: A 1 foot knickpoint is held by tree roots on the main stem WTR010 upstream from Bennet Rd, approximately 0.3 miles east of Bennet Rd and S 82nd St.

Recommendation: Recommend installing a grade control and associated bank stabilization immediately downstream of the tree to stop incision and protect the upstream reaches.



Figure 7-41: 1 foot knickpoint held up by tree roots

Impact to Special Areas and Water Quality: Project is located within the Salt Valley Corridor. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to the special areas and water quality to the greatest extent practical.

Estimated Project Cost: \$78,000

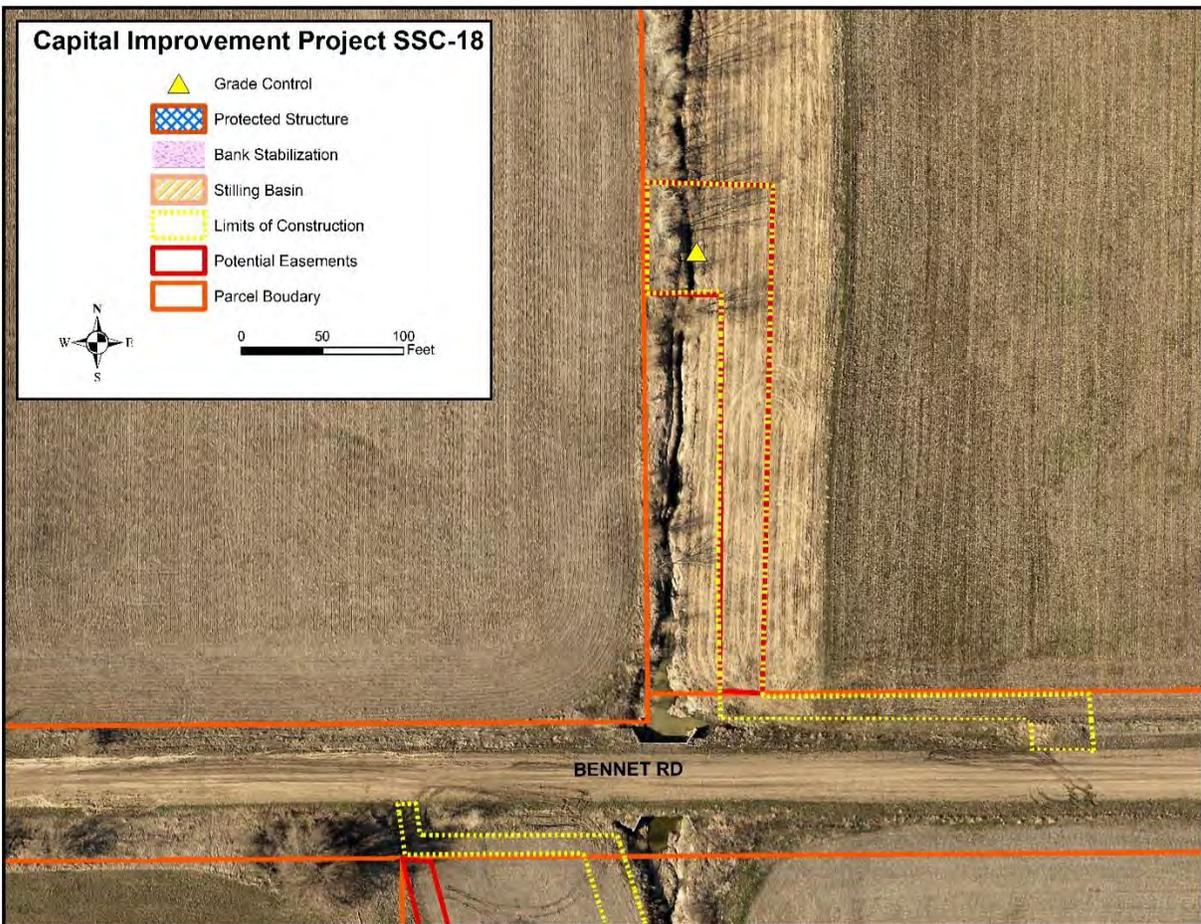


Figure 7-42: Conceptual Layout of SSC-18

7.4.19 Project SSC-19: Grade Control Knickpoint on Wagon Train Main Stem WTR015 Downstream of Saltillo Rd

Problem description: Debris jam holding up 2 foot knickpoint on main stem WTR015 located 960 feet downstream of Saltillo Rd.

Recommendation: Recommend removing the debris jam and installing a grade control and associated bank stabilization to stop incision and protect the upstream reaches.



Figure 7-43: Debris jam holding up knickpoint

Impact to Special Areas and Water Quality: There are no special areas at this project location. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.

Estimated Project Cost: \$85,000

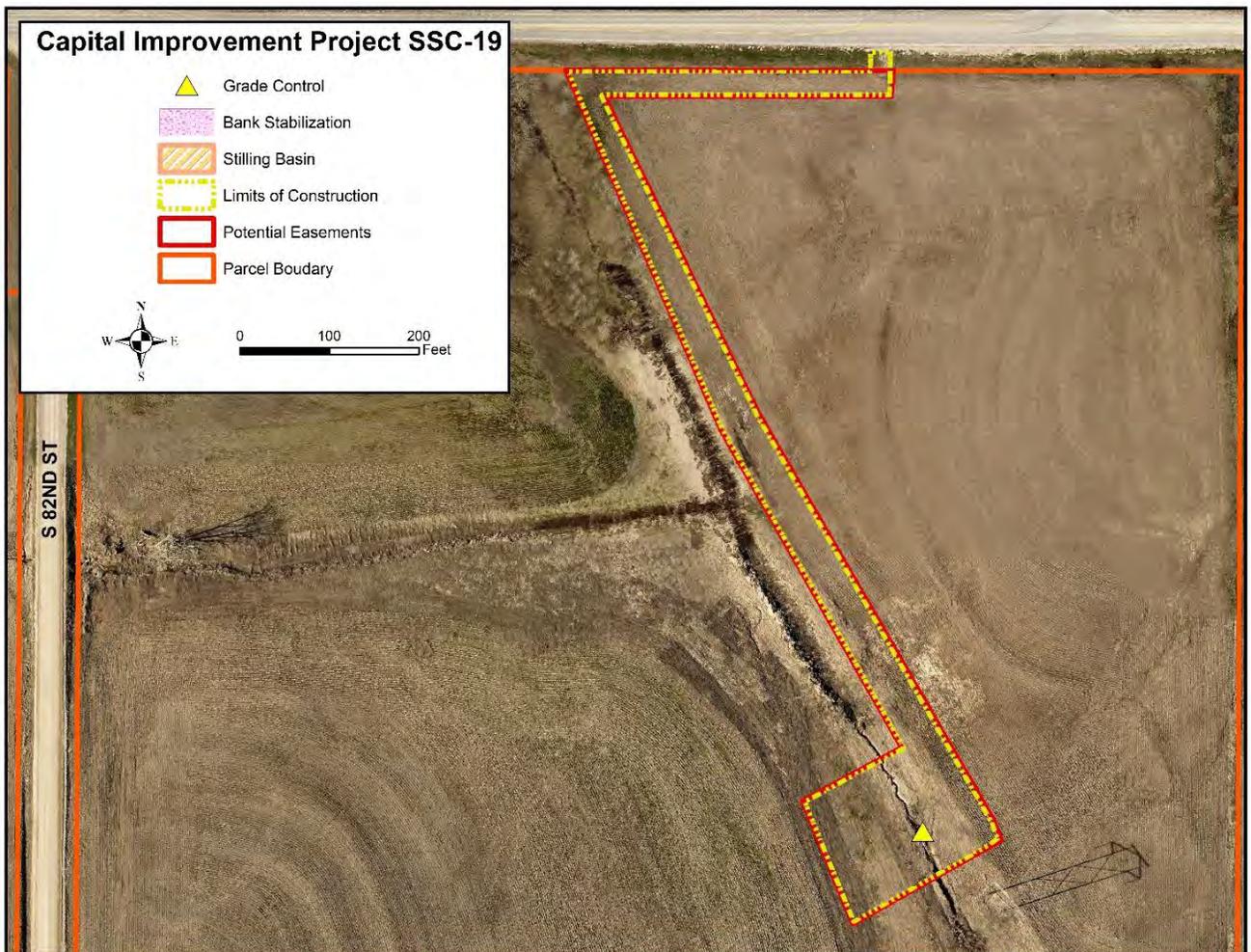


Figure 7-44: Conceptual Layout of SSC-19

7.5 Prioritization

The recommended CIP's were classified using the prioritization categories from the Prioritization Methodology Report for Watershed Master Planning Projects, City of Lincoln, Nebraska, 2006. The prioritization methodology was developed for the City of Lincoln to set priorities and implement Capital Improvement Programs for watershed master planning each year. A Flood Impacts Analysis was not included in this Watershed Master Plan, therefore, Flood Impact projects are not included in the CIP. The following prioritization categories were used for project ranking:

- **Flooding Impacts:** This category identifies the impact of floodwater encroachment on structures, public or private property, parking lots, public utilities or other infrastructure. The flooding potential can be identified through hydrologic and hydraulic analysis, study of topographic maps, field investigation and recorded historic problems. This category is further divided according to the frequency of the flooding, flooding that occurs at a more or less frequent rate than the ten-year storm event. Projects primarily intended to address structural or non-structural flooding will usually incorporate a high or low risk safety factor and may, if applicable, incorporate stream stability or water quality benefits.
- **Stream Stability:** This category identifies the impacts of channel erosion, the transport and undermining of soil by stream flow or overland flow. Channel erosion can threaten structures, public property, parking lots, public utilities or other public infrastructure. Channel erosion can also endanger streams, wetlands, lakes, conservation easements, buffer zones or other natural resources. The stream stability and erosion threat may be identified through visual observation, not strictly fluvial geomorphic assessment. This category is further divided according to the nature of the erosion, aggressive channel down cutting as compared to gradual channel widening. Projects primarily intended for stream stability typically will not incorporate flooding impact benefits, though will incorporate water quality benefits.
- **Water Quality:** This category identifies the impacts of water quality. A number of geomorphic mechanisms can adversely affect water quality through increased pollutant loading. The water quality benefits broken down in this category reflect the types of projects developed during watershed master planning efforts. This category is further divided according to the perceived scope of the project benefits, with greater emphasis place upon projects with broad-based impacts. Projects primarily intended for water quality typically will not incorporate flooding impact benefits, though may incorporate stream stability benefits.
- **Safety Factor:** This category identifies benefits to the potential threat to public health and safety. The potential for loss of life or bodily injury may include individuals trapped in structures during flooding or vehicles being swept away by floodwater. A safety factor is generally associated with projects addressing structural or non-structural flooding, though may be associated with stream stability or water quality projects.
- **Miscellaneous Factors:** This category identifies various other miscellaneous factors and additional considerations that have not been addressed in the previous four categories. Examples of other factors include but are not limited to: project location, development status, adjacent projects, complaints and outside funding opportunities.

This ranking system was specifically developed for Capital Improvement Projects proposed as part of the on-going watershed master planning efforts. Ranking worksheets were used to add points under each category, with the goal of developing an overall score. The projects with the highest point score are considered a higher priority. Appendix H provides a copy of each ranking worksheet.

Table 7.1 lists the priority score, ranking and cost by project for the capital improvement projects within the South Salt Creek Watershed. For projects with the same overall score, engineering judgment was used to finalize the ranking. The engineering judgment favored projects that provided broader based benefits over those projects that focused benefits to one area. The project costs are based on 2014 material and construction costs.

Table 7.1 Project Priority, Rank and Cost

Project Name	Project Description	Priority Score	Project Ranking	Project Cost
SSC 1	Grade Control Tributary SC005R005	200	9	\$ 239,000
SSC 2	Irvingdale Park Channel Improvements on Tributary SC015R015	230	4	\$ 370,000
SSC 3	Grade Control on Main Stem SCR010 at W Pioneers Blvd Bridge	230	6	\$ 482,000
SSC 4	Grade Control on Main Stem SCR020 at Old Cheney Rd Bridge	230	5	\$ 437,000
SSC 5	Grade Control Incision and Knickzone on Tributary SC040R005	330	1	\$ 325,000
SSC 6	Grade Control Main Stem SCR030 at Old Railroad Bridge and Knickpoint on Tributary SC050R005 at Wilderness Park Tail Bridge	290	3	\$ 468,000
SSC 7	Stilling Basin at Perched W Rokeby Rd Culvert Outfall on Tributary SC155R005	190	15	\$ 190,000
SSC 8	Stilling Basin at Perched SW 12 th St Culvert Outfall on Tributary SC155R005	200	10	\$ 162,000
SSC 9	Grade Control Farm Crossing Holding Up Knickpoint in Tributary SC055R025	190	16	\$ 105,000
SSC 10	Grade Control Knickpoint on Tributary SC265R005	190	18	\$ 107,000
SSC 11	Grade Control Knickzone in Tributary SC435R005	200	11	\$ 201,000
SSC 12	Stilling Basin at Perched S 1 st St Culvert on Tributary SC365R005	200	12	\$ 197,000
SSC 13	Stilling Basin at Perched S 1 st St Culvert on Tributary SC165R010	200	13	\$ 156,000
SSC 14	Stilling Basin at Perched Saltillo Rd Culvert on Tributary SC065R010	210	7	\$ 137,000

Table 7.1 Project Priority, Rank and Cost

Project Name	Project Description	Priority Score	Project Ranking	Project Cost
SSC 15	Grade Control Incision on Tributary SC095R005 at Homestead Trail Bridge	195	14	\$ 129,000
SSC 16	Grade Control Knickpoints on Wagon Train Main Stem WTR005	310	2	\$ 273,000
SSC 17	Grade Control Knickpoint on Tributary WT010R005	190	19	\$ 136,000
SSC 18	Grade Control Knickpoint on Wagon Train Main Stem WTR010 Upstream of Bennet Rd	210	8	\$ 78,000
SSC 19	Grade Control Knickpoint on Wagon Train Main Stem WTR015 Downstream of Saltillo Rd	190	17	\$ 85,000
Total				\$ 6,698,000

7.6 Other Improvement Recommendations

While the process for identifying problem areas in the South Salt Creek Watershed Study Area was primarily focused on identifying and evaluating potential CIP's, it inevitably identified other projects which are not eligible for consideration as a CIP given the detailed criteria used in this evaluation.

Generally these problem areas were classified into one of two potential categories.

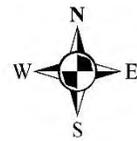
1. Other Projects – generally consisted of projects addressing problems identified to have measureable benefits, but do not qualify as Capital Improvement Projects or projects recommending monitoring of potential problem areas during future CIP planning. These projects and recommendations are included in this Master Plan as Other Improvement Recommendations for use with other programs.
2. Private Projects – generally consisted of problems identified in relation to privately owned and operated utility pipelines exposed in the channel bed or failed concrete channel lining and erosion protection that is being further threatened by channel erosion. Private projects have little to no measureable benefits to the public, and do not provide substantial flood reduction, stream stability, and water quality benefits. These project locations were provided to the City of Lincoln officials for their use in notifying the private utility or land owner of the threatened infrastructure. Private. Some of the pipelines appear abandoned or are no longer in service, so this should be evaluated further prior to proceeding with the project.

The projects categorized as Other are discussed in the following pages.

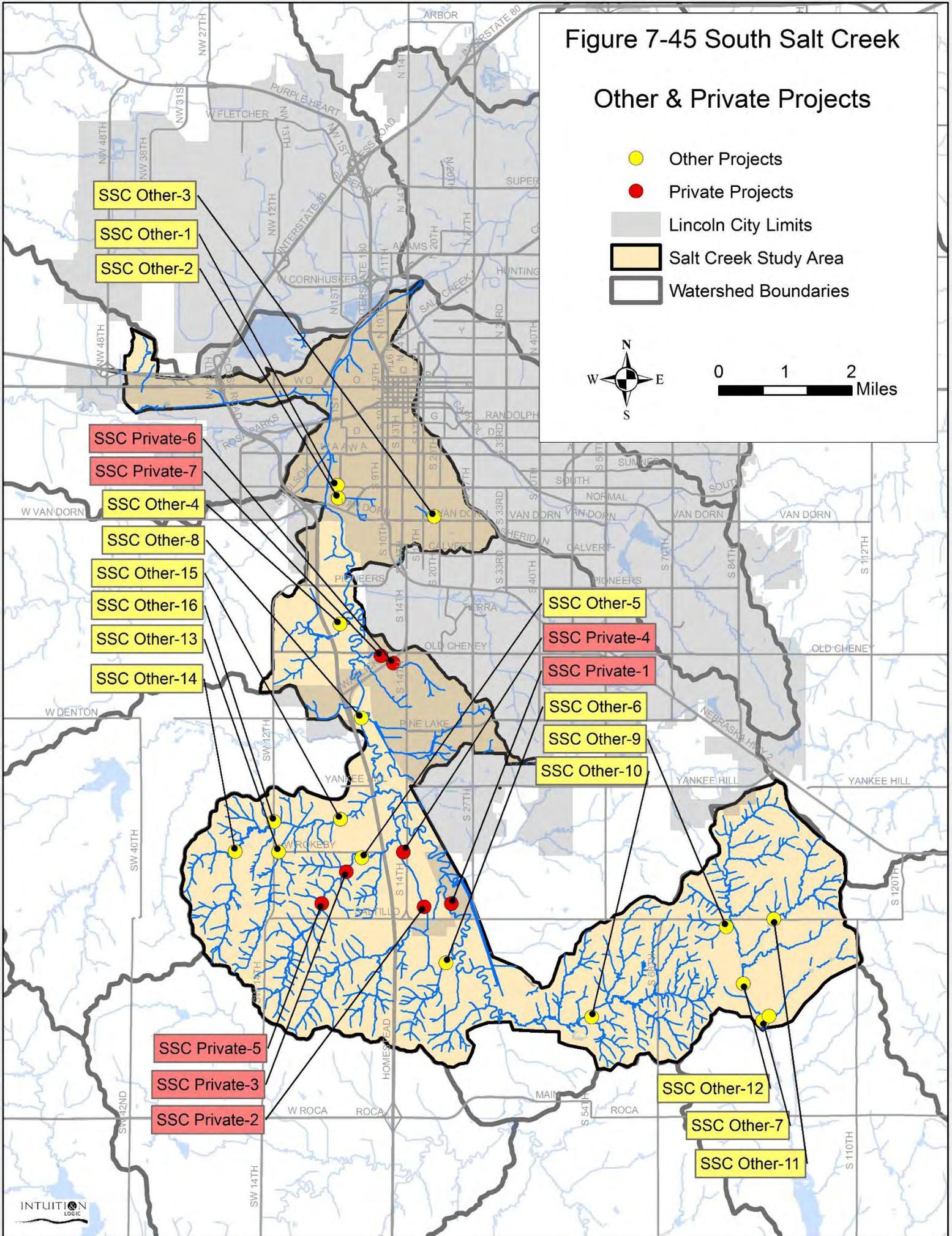
Figure 7-45 South Salt Creek

Other & Private Projects

- Other Projects
- Private Projects
- Lincoln City Limits
- Salt Creek Study Area
- Watershed Boundaries



0 1 2 Miles



7.6.1 Project SSC Other-1: Dumped Rubble Armor on Tributary SC015R005

Project Description: Dumped rubble armor has the potential to undercut trees and expose roots on tributary SC015R005 located downstream of W South St and west of S 1st St.

Recommendation: Monitor this location for potential problems to include in future CIP planning.

Impact to Special Areas and Water Quality: There are no special areas at this project location. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.

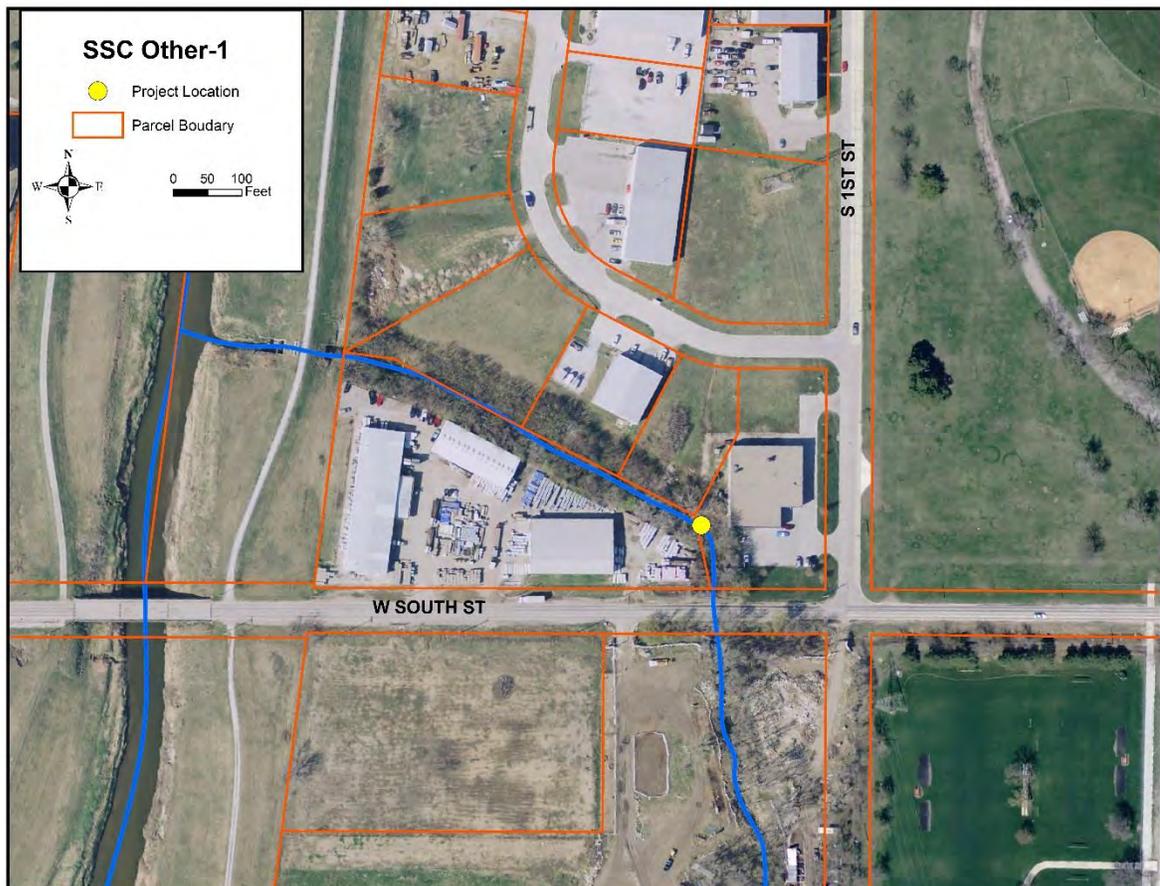


Figure 7-46: SSC Other-1 Project Location

7.6.2 Project SSC Other-2: Illegal Dam on Tributary SC015R005

Project Description: A resident has constructed a dam across the tributary SC015R005 located 950 feet upstream of W South St and 200 feet west of S 1st St.



Figure 7-47 – SC015R005 upstream of the dam

Recommendation: Notify the appropriate agency of violation.

Impact to Special Areas and Water Quality: There are no special areas at this project location. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.

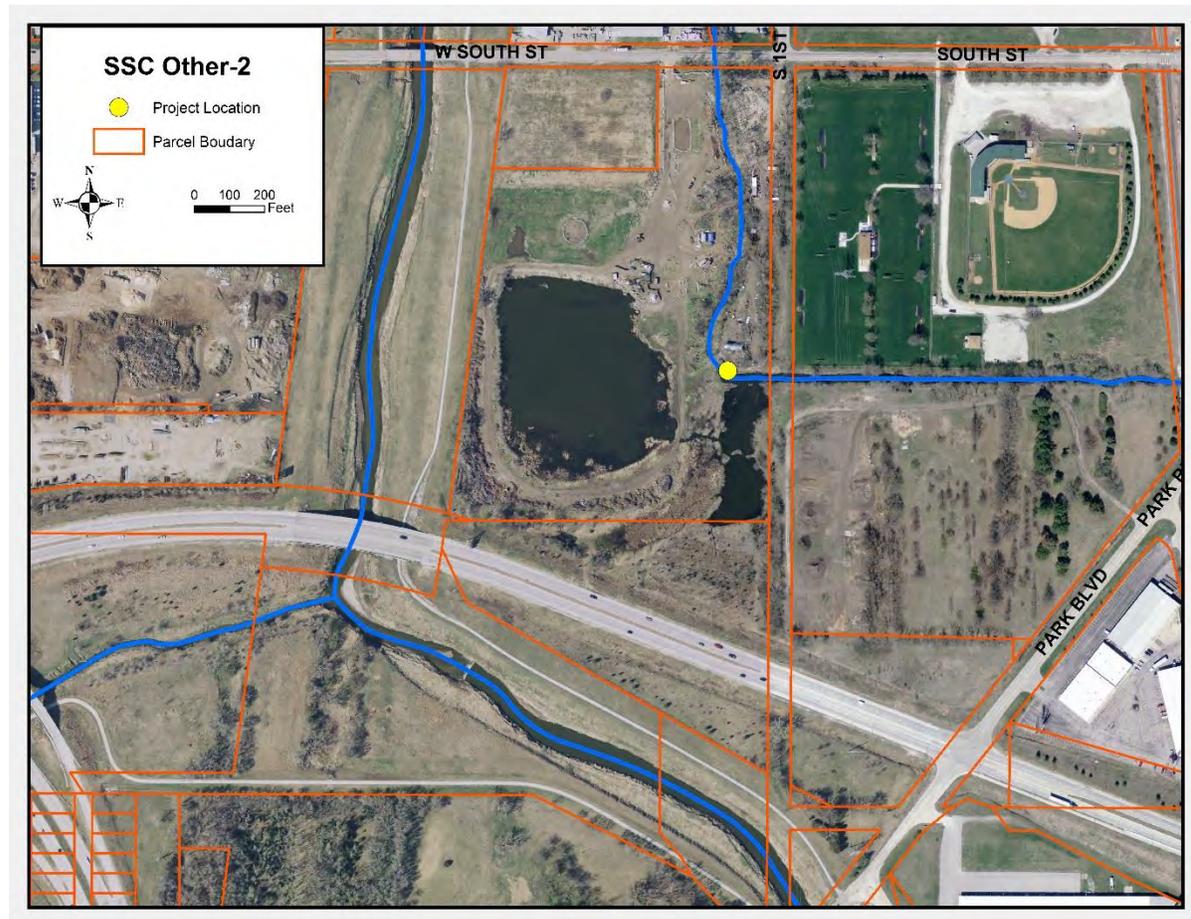


Figure 7-48: SSC Other-2 Project Location

7.6.3 Project SSC Other-3: Restoration of Irvingdale Park Tributary SC015R015

Problem description: The channel on tributary SC015R015 is mowed to top of bank with no established riparian buffer. All of the trees within the park are mature without younger trees present.

Recommendation: Consider riparian corridor restoration along the reach through Irvingdale Park, including planting of the next generation of trees.

Impact to Special Areas and Water Quality: There are no special areas at this project location. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.



Figure 7-49 – Tributary SC015R015

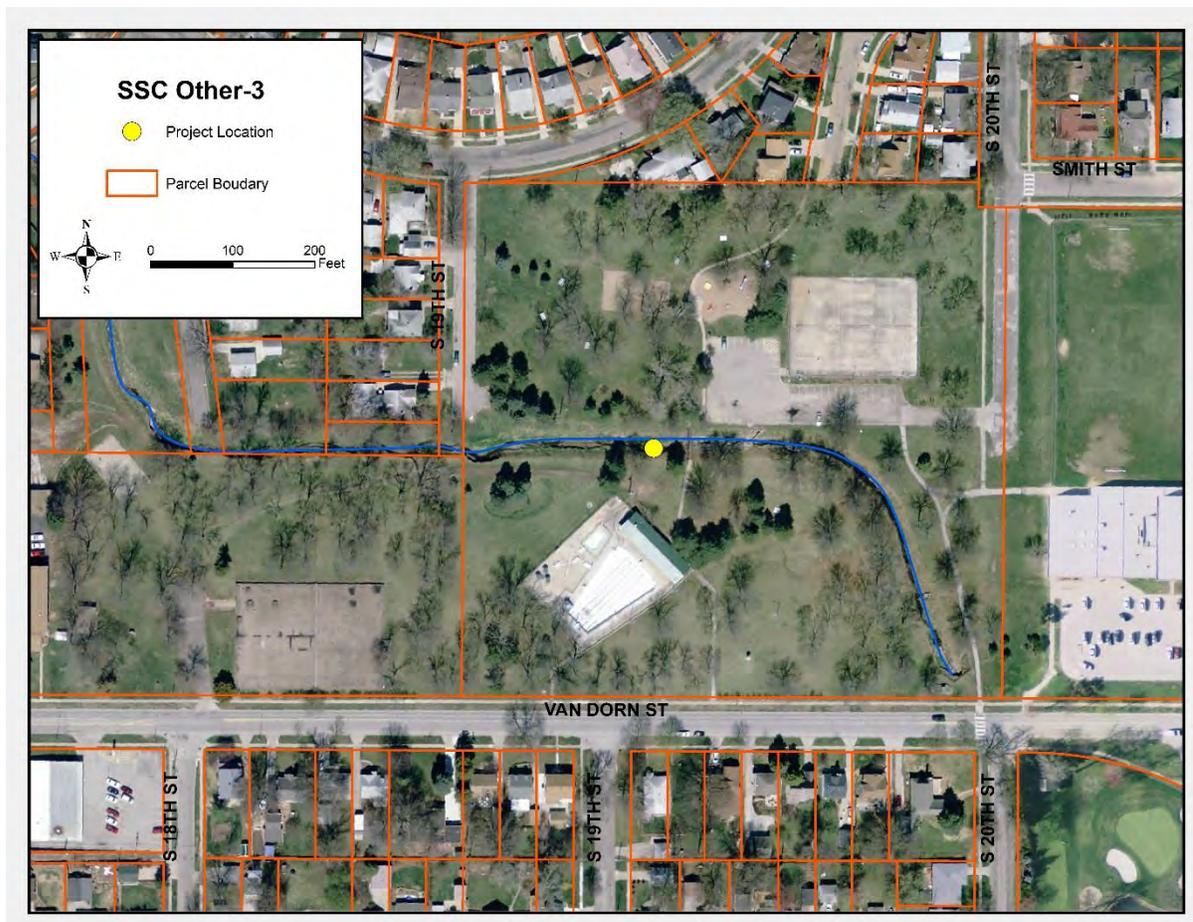


Figure 7-50: SSC Other-3 Project Location

7.6.4 Project SSC Other-4: Perched S 1st St Culvert on Tributary SC030R005

Problem description: A knickpoint on tributary SC030R005 is advancing towards the S 1st St culvert (County Structure O-32) approximately 2,300 feet north of Old Cheney Rd.

Recommendation: Monitor for knickpoint advancement in future CIP.

Impact to Special Areas and Water Quality: There are no special areas at this project location. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.



Figure 7-51 – SC015R005 upstream of the dam



Figure 7-52: SSC Other-4 Project Location

7.6.5 Project SSC Other-5: Knickpoint on Tributary SC165R005

Problem description: A farm crossing is holding up a 3 foot knickpoint on the tributary SC165R005 south of Rokeby Rd approximately 1800 feet west of Homestead. There is an advancing knickzone approximately 5 feet high downstream moving toward crossing.



Figure 7-53 – incised channel reach

Recommendation: Monitor for knickpoint advancement during next CIP cycle.

Impact to Special Areas and Water Quality:

There are no special areas at this project location. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.

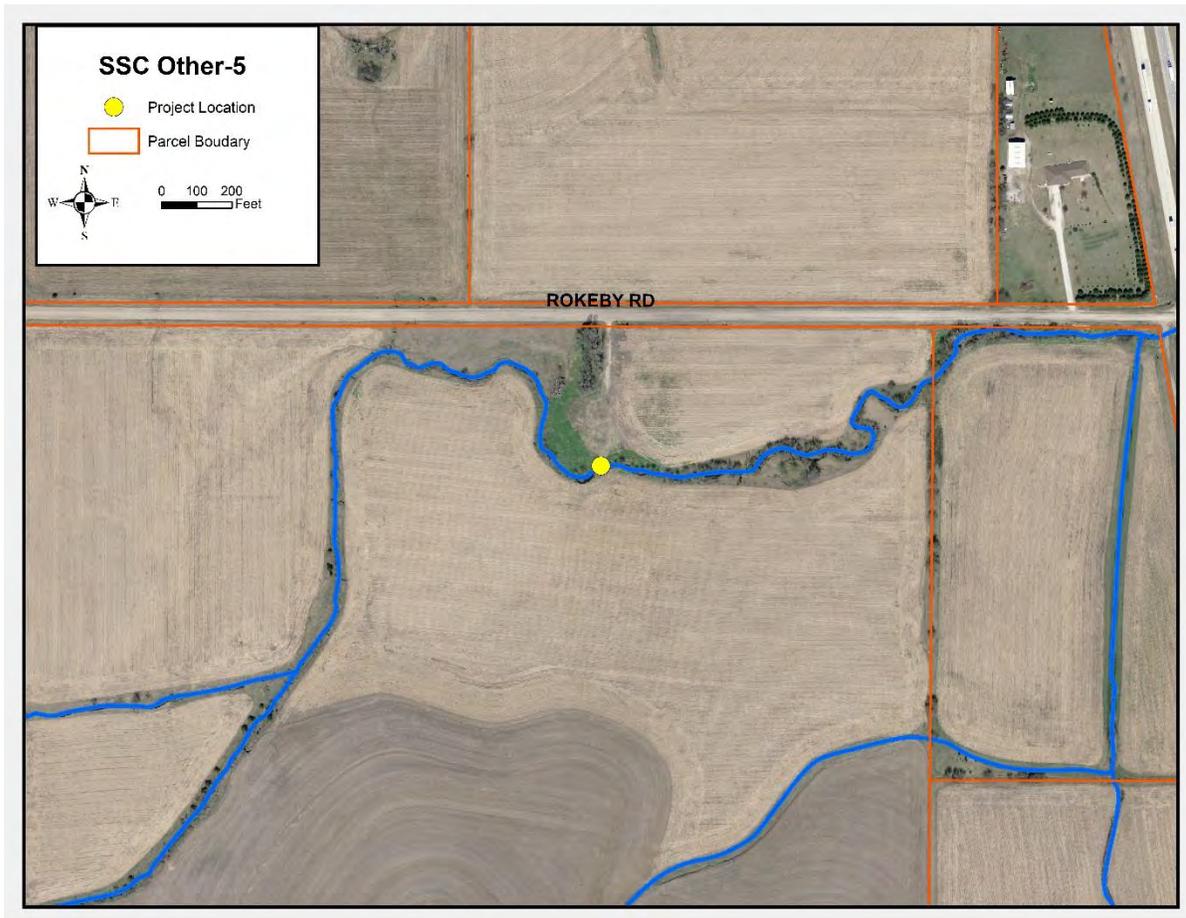


Figure 7-54: SSC Other-5 Project Location

7.6.6 Project SSC Other-6: Incision Downstream of S 25th St Culvert on Tributary SC080R005

Problem description: The channel downstream of this reach is incising with an active knickpoint located at the edge of the field 50 feet to the east of the S 25th St culvert (County Structure T-22). Tributary SC080R005 is located 1,800 feet north of Bennet Rd.



Figure 7-55 – Incised channel reach

Recommendation: Monitor knickpoint advancement in future CIP.

Impact to Special Areas and Water Quality: There are no special areas at this project location. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.

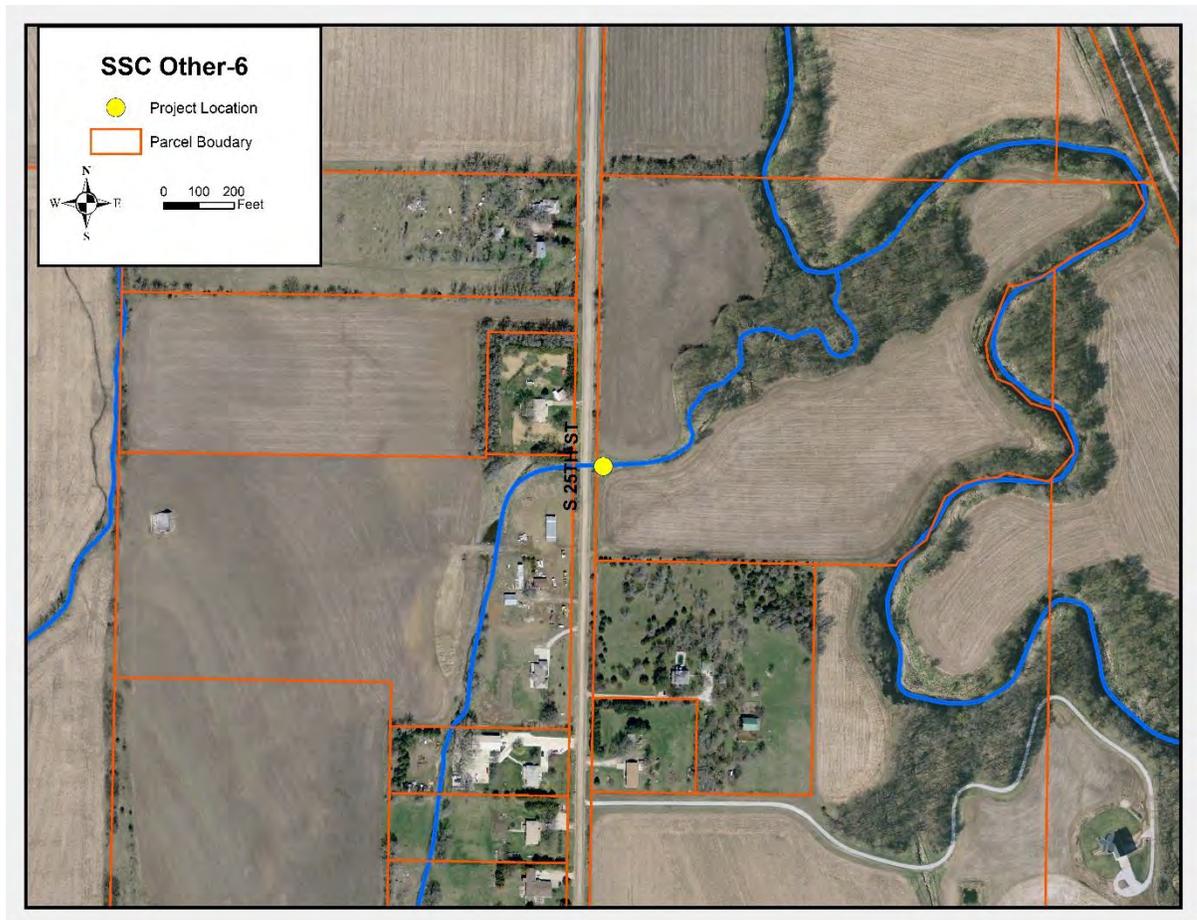


Figure 7-56: SSC Other-6 Project Location

7.6.7 Project SSC Other-7: Tributary WT005R005 Meander Close to Main Stem

Problem description: A meander on tributary WT005R005 located 2,300 feet north of Wittstruck Rd between S 82nd and S 96th St is approximately 50 feet from a meander on the main stem of Wagon Train. The tributary flow line at this point is deeper than the main stem flowline.

Recommendation: Monitor tributary erosion for possible cutoff with the main stem. This would potentially bypass the grade control project SSC-16.

Impact to Special Areas and Water Quality: There are no special areas at this project location. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.

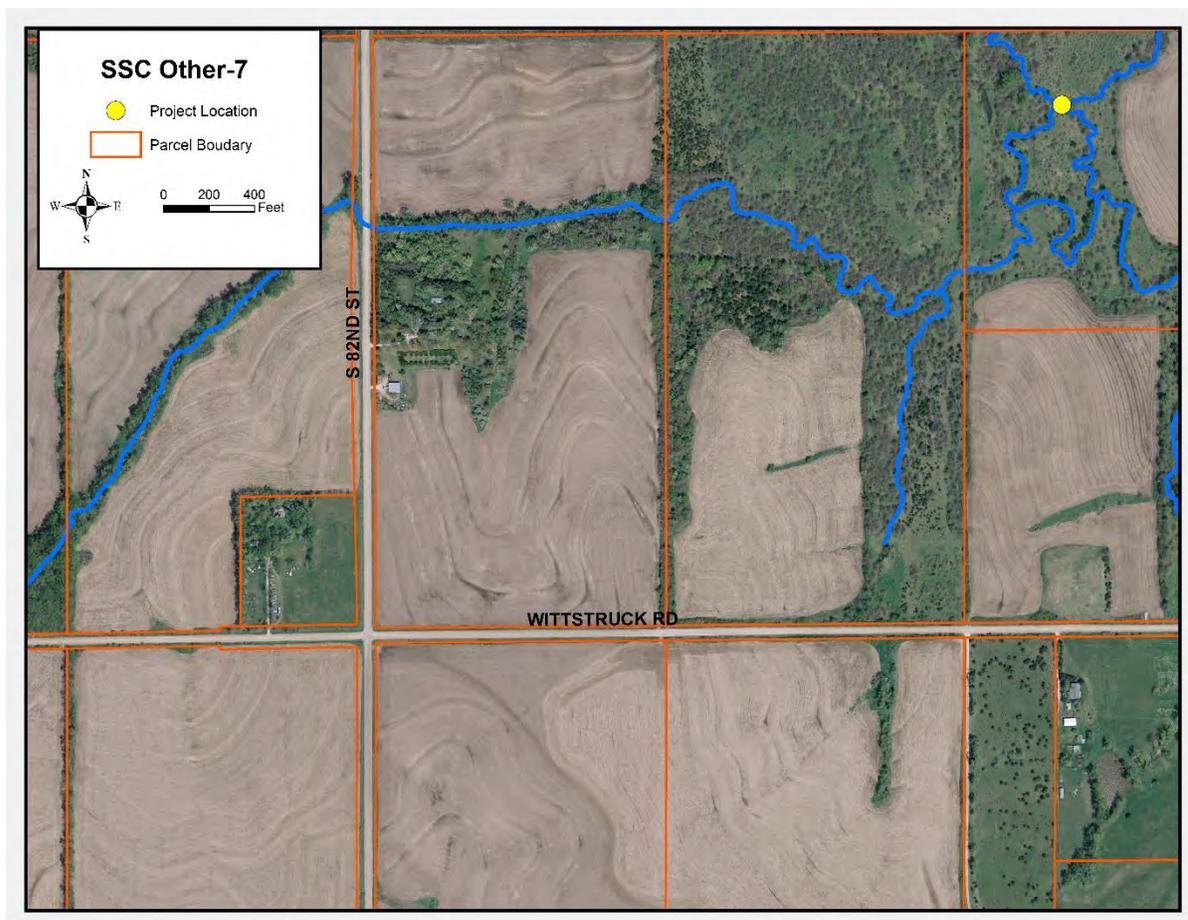


Figure 7-57: SSC Other-7 Project Location

7.6.8 Project SSC Other-8: Evaluate Trail Crossings of Streams on Tributary SC050R005 within Wilderness Park.

Problem description: Channel erosion poses a threat to both at-grade and bridged trail crossings in Wilderness Park on tributary SC050R005.

Recommendation: evaluate each trail and bridge crossing in Wilderness Park to determine if grade controls or other stream stabilization measures are necessary to protect bridge integrity or to prevent future incision which would require the installation of a bridge in the place of an at-grade crossing.

Impact to Special Areas and Water Quality: There are no special areas at this project location. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.

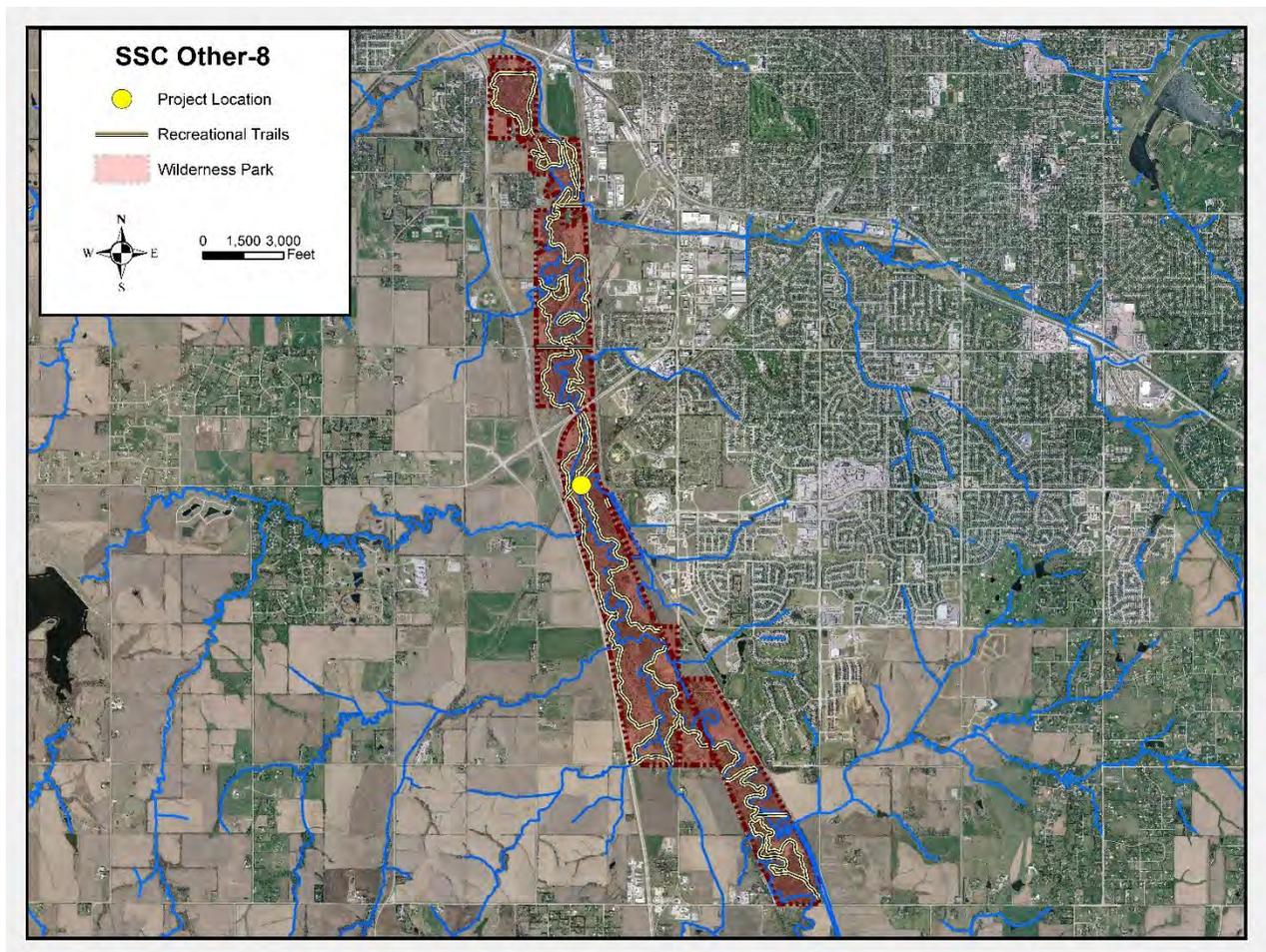


Figure 7-58: SSC Other-8 Project Location

7.6.9 Project SSC Other-9: Knickpoint on Tributary WT025R005

Problem description: A knickpoint on tributary WT025R005 is located downstream of the S 82nd St culvert (County Structure S-116) within the managed swale 170 feet east of S 82nd St and 600 feet south of Saltillo Rd.

Recommendation: Monitor for progression and possible threat to road culvert at S 82nd St. This project needs to be coordinated with the future South Beltway plans.

Impact to Special Areas and Water Quality: There are no special areas at this project location. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.

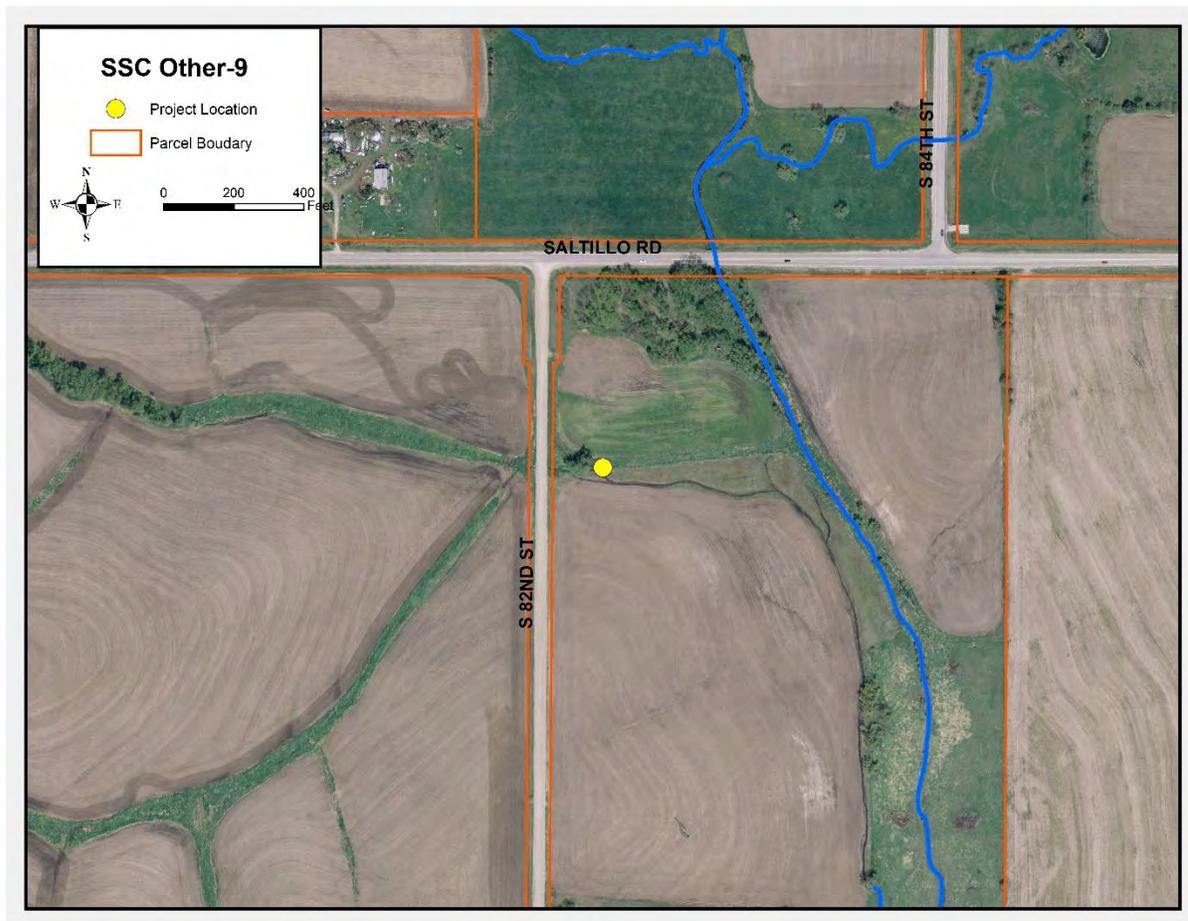


Figure 7-59: SSC Other-9 Project Location

7.6.10 Project SSC Other-10: S 54th St Culvert at Tributary SC097R010

Problem description: Hydraulic analysis based on available hydrologic and as-built data, indicates that roadway overtopping will occur at the S 54th St culvert (S86) on tributary SC097R010 during a 100-year flow event. Roadway overtopping at this location could be eliminated if the culvert capacity is increased. The channel capacity at this locations is sufficient to convey flood flow without overtopping the roadway.



Figure 7-60 – S 54th St culvert

Recommendation: Conduct further evaluation of the culvert crossing to augment prioritization for culvert replacement.

Impact to Special Areas and Water Quality: There are no special areas directly impacted by this project. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.

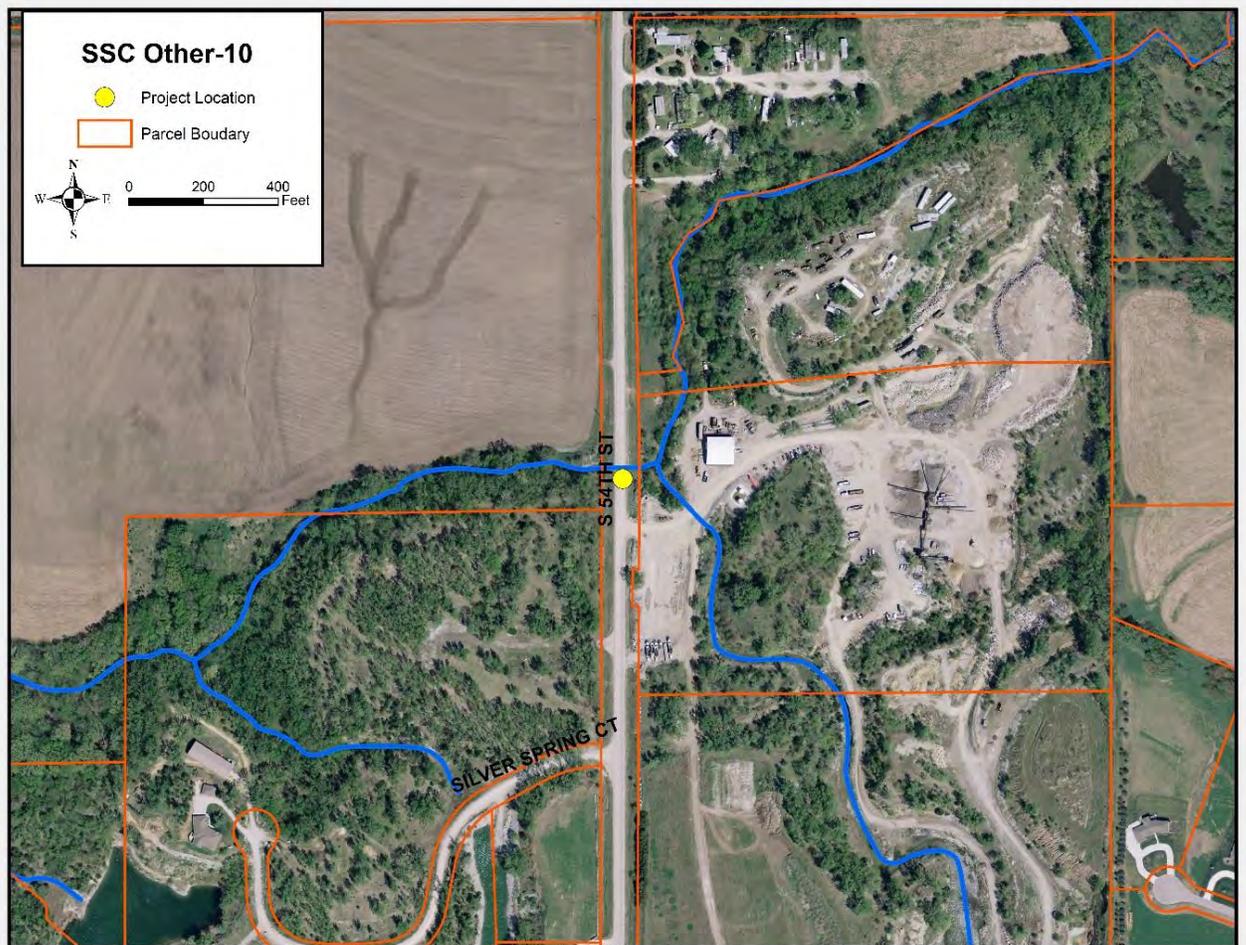


Figure 7-61: SSC Other-10 Project Location

7.6.11 Project SSC Other-11: Saltillo Rd Culvert at Tributary WT020R005

Problem description: Hydraulic analysis based on available hydrologic and as-built data, indicates that roadway overtopping will occur at the Saltillo Rd culvert (S38) on tributary WT020R005 during a 100-year flow event. Roadway overtopping at this location could be eliminated if the culvert capacity is increased. The channel capacity at this locations is sufficient to convey flood flow without overtopping the roadway.

Recommendation: Conduct further evaluation of the culvert crossing to augment prioritization for culvert replacment.

Impact to Special Areas and Water Quality: There are no special areas directly impacted by this project. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.

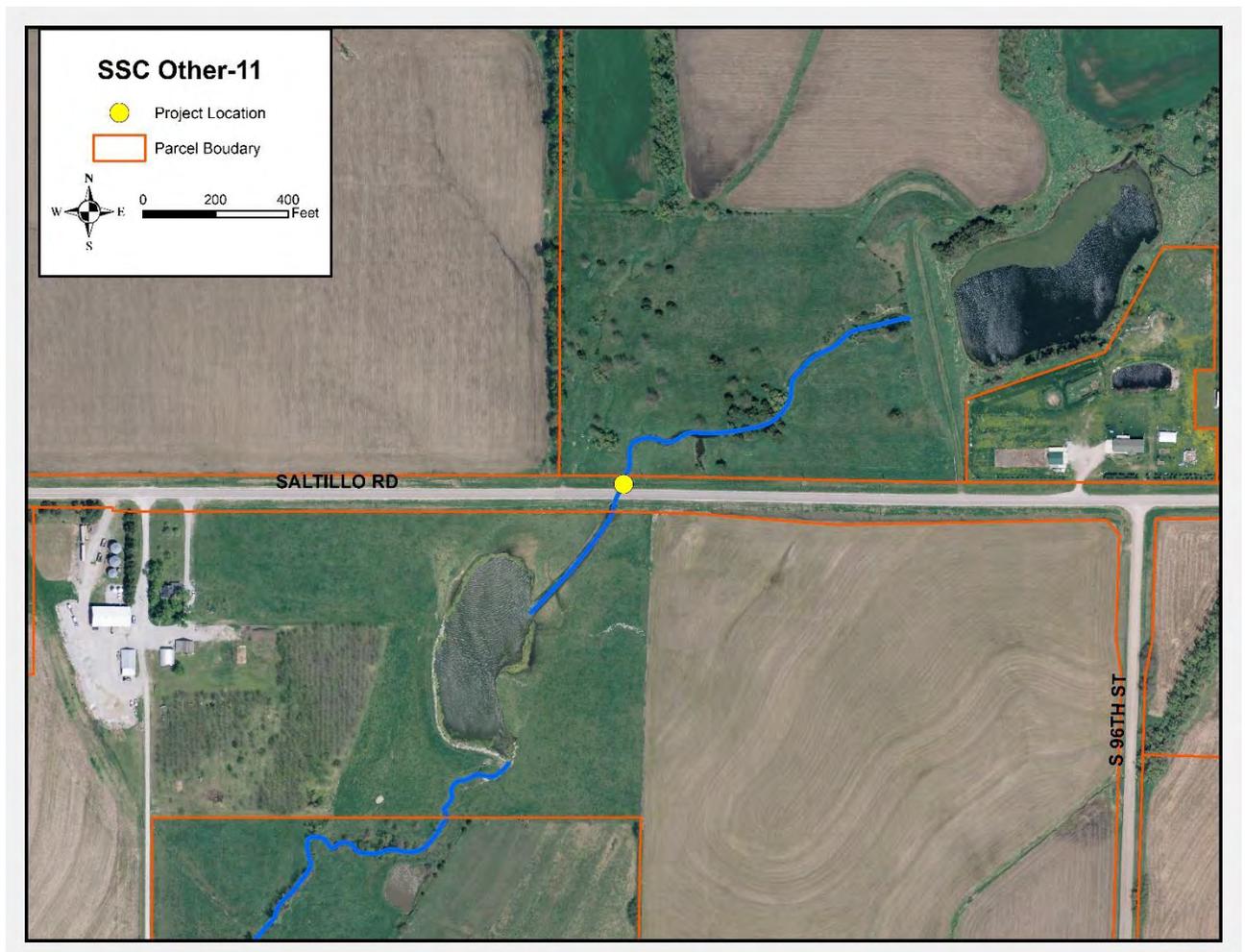


Figure 7-62: SSC Other-11 Project Location

7.6.12 Project SSC Other-12: Bennet Rd Culvert at Wagon Train Main Stem WTR010

Problem description: Hydraulic analysis based on available hydrologic and as-built data, indicates that roadway overtopping will occur at the Bennet Rd culvert (S206) on main stem WTR010 during a 100-year flow event. Roadway overtopping at this location could be eliminated if the culvert capacity is increased. The channel capacity at this locations is sufficient to convey flood flow without overtopping the roadway.



Figure 7-63 – Bennet Rd culvert

Recommendation: Conduct further evaluation of the culvert crossing to augment prioritization for culvert replacement.

Impact to Special Areas and Water Quality: Project is located within Salt Valley Greenway as well as the proposed Prairie Corridor.

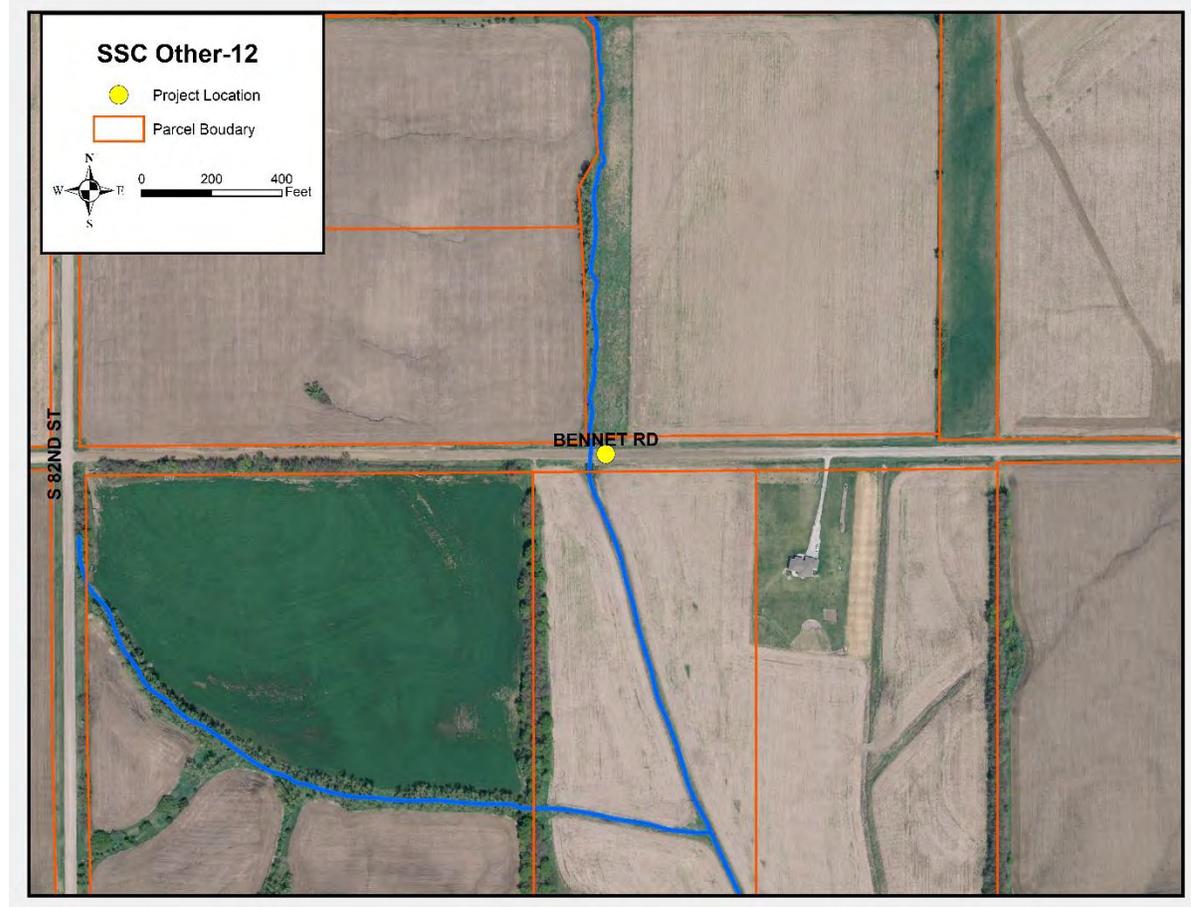


Figure 7-64: SSC Other-12 Project Location

7.6.13 Project SSC Other-13: W Rokeby Rd Culvert at Tributary SC155R005

Problem description: Hydraulic analysis based on available hydrologic and as-built data, indicates that roadway overtopping will occur at the W Rokeby Rd culvert (O48) on tributary SC155R005 during a 100-year flow event. Roadway overtopping at this location could be eliminated if the culvert capacity is increased. The channel capacity at this locations is sufficient to convey flood flow without overtopping the roadway.



Figure 7-65 – W Rokeby Rd culvert

Recommendation: Conduct further evaluation of the culvert crossing to augment prioritization for culvert replacement. If the further evaluation indicates that the culvert should be replaced, consider including its replacement in association with CIP-7.

Impact to Special Areas and Water Quality: There are no special areas directly impacted by this project. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.

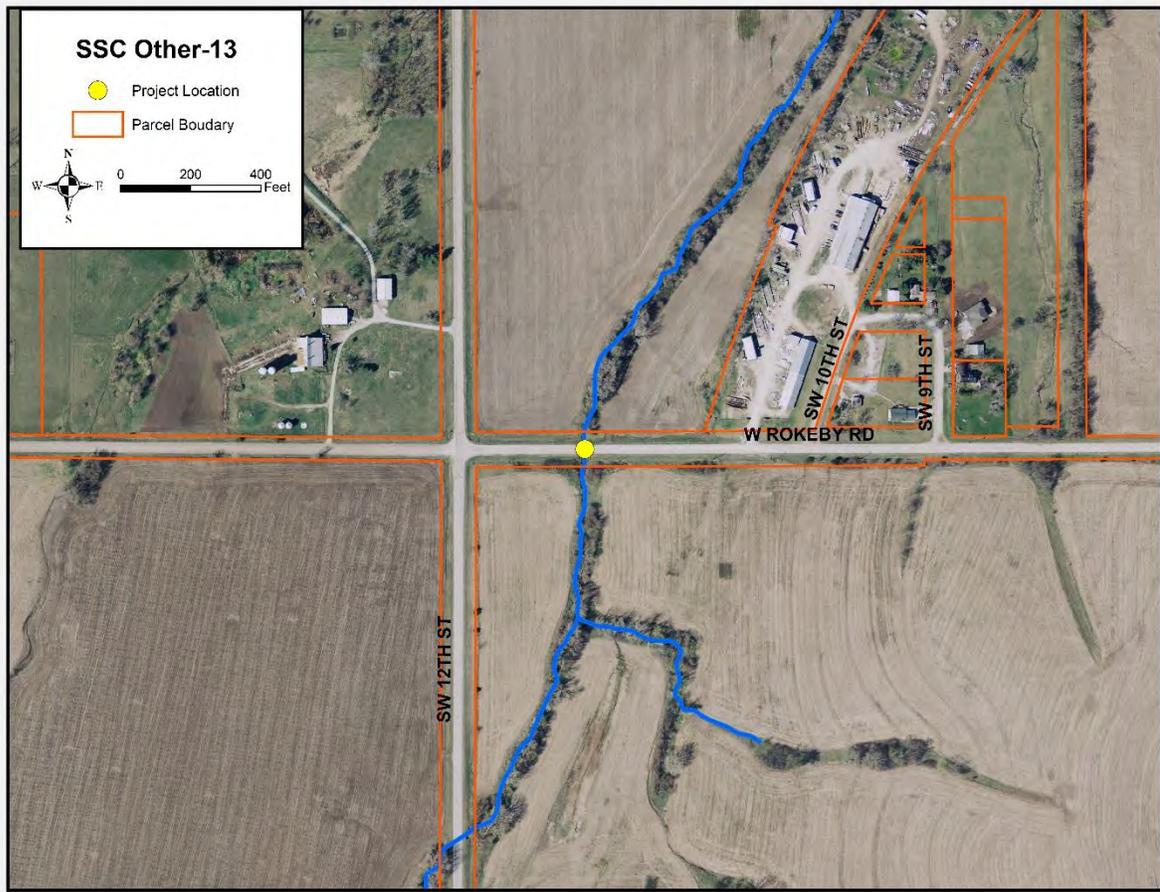


Figure 7-66: SSC Other-13 Project Location

7.6.14 Project SSC Other-14: W Rokeby Rd Culvert at Tributary SC055R020

Problem description: Hydraulic analysis based on available hydrologic and as-built data, indicates that roadway overtopping will occur at the W Rokeby Rd culvert (O192) on tributary SC055R020 during a 100-year flow event. Roadway overtopping at this location could be eliminated if the culvert capacity is increased. The channel capacity at this locations is sufficient to convey flood flow without overtopping the roadway.



Figure 7-67 – W Rokeby Rd culvert

Recommendation: Conduct further evaluation of the culvert crossing to augment prioritization for culvert replacment.

Impact to Special Areas and Water Quality: There are no special areas directly impacted by this project. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.

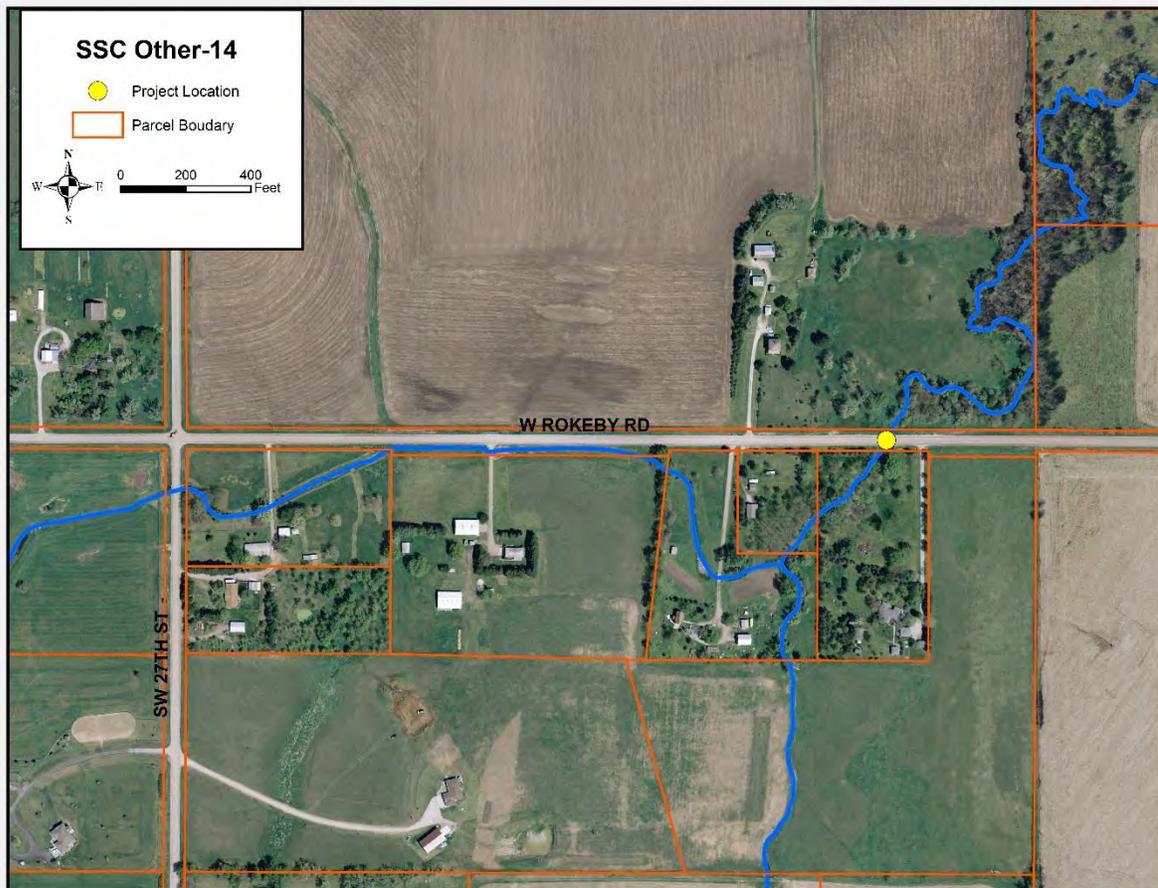


Figure 7-68: SSC Other-14 Project Location

7.6.15 Project SSC Other-15: S 1st St Culvert at Tributary SC055R005

Problem description: Hydraulic analysis based on available hydrologic and as-built data, indicates that roadway overtopping will occur at the S 1st St culvert (O206) on tributary SC055R005 during a 100-year flow event. Roadway overtopping at this location could be eliminated if the culvert capacity is increased. The channel capacity at this locations is sufficient to convey flood flow without overtopping the roadway.



Figure 7-69 – S 1st St culvert

Recommendation: Conduct further evaluation of the culvert crossing to augment prioritization for culvert replacement.

Impact to Special Areas and Water Quality: There are no special areas directly impacted by this project. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.

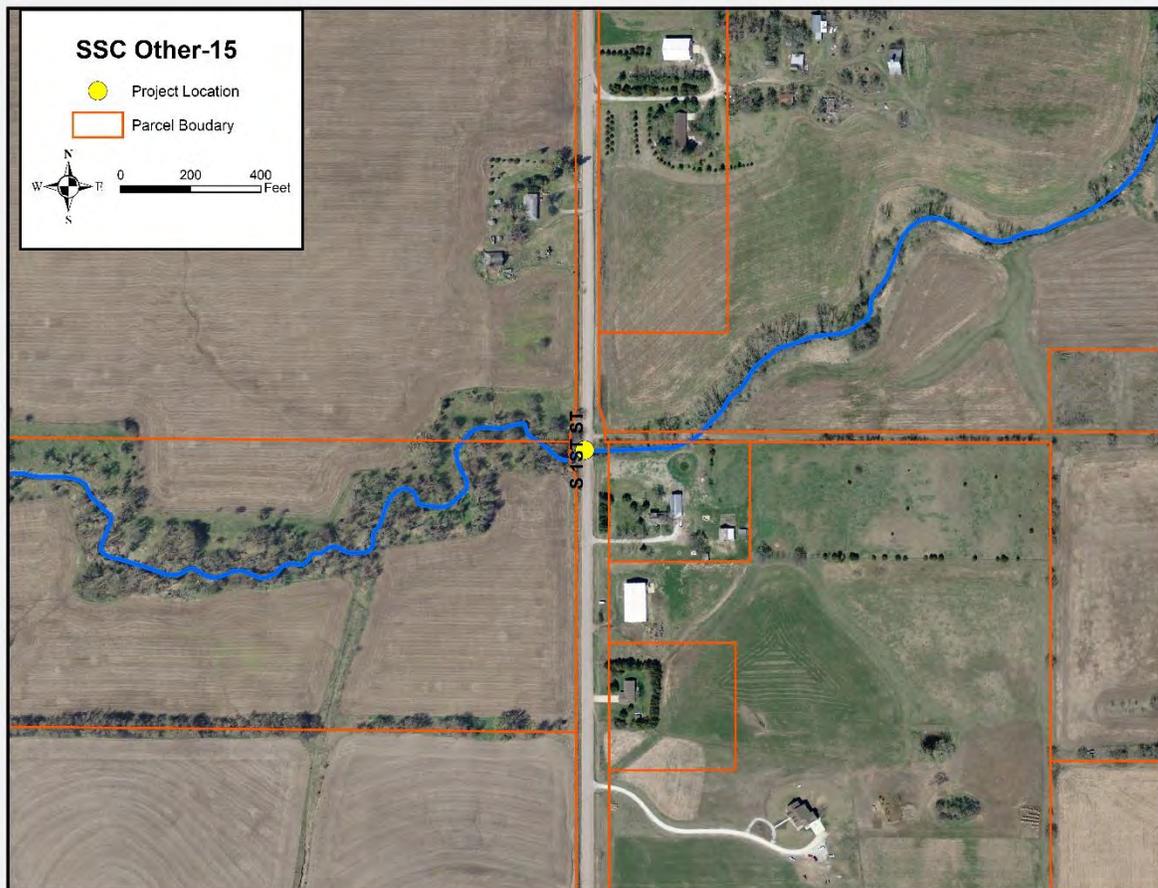


Figure 7-70: SSC Other-15 Project Location

7.6.16 Project SSC Other-16: SW 12th St Culvert at Tributary SC055R020

Problem description: Hydraulic analysis based on available hydrologic and as-built data, indicates that roadway overtopping will occur at the SW 12th St culvert (O153) on tributary SC055R020 during a 100-year flow event. Roadway overtopping at this location could be eliminated if the culvert capacity is increased. The channel capacity at this locations is sufficient to convey flood flow without overtopping the roadway.



Figure 7-71 – SW 12th St culvert

Recommendation: Conduct further evaluation of the culvert crossing to augment prioritization for culvert replacment.

Impact to Special Areas and Water Quality: There are no special areas directly impacted by this project. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.

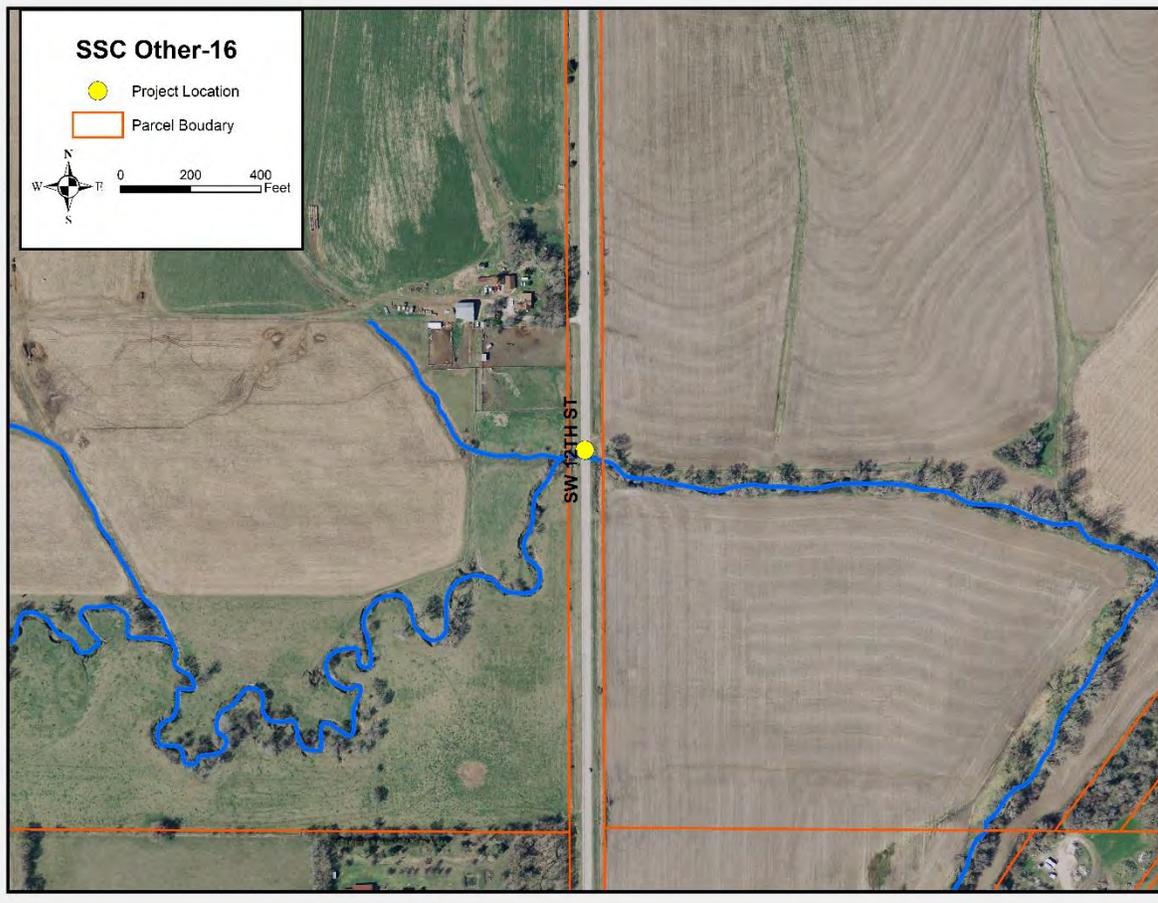


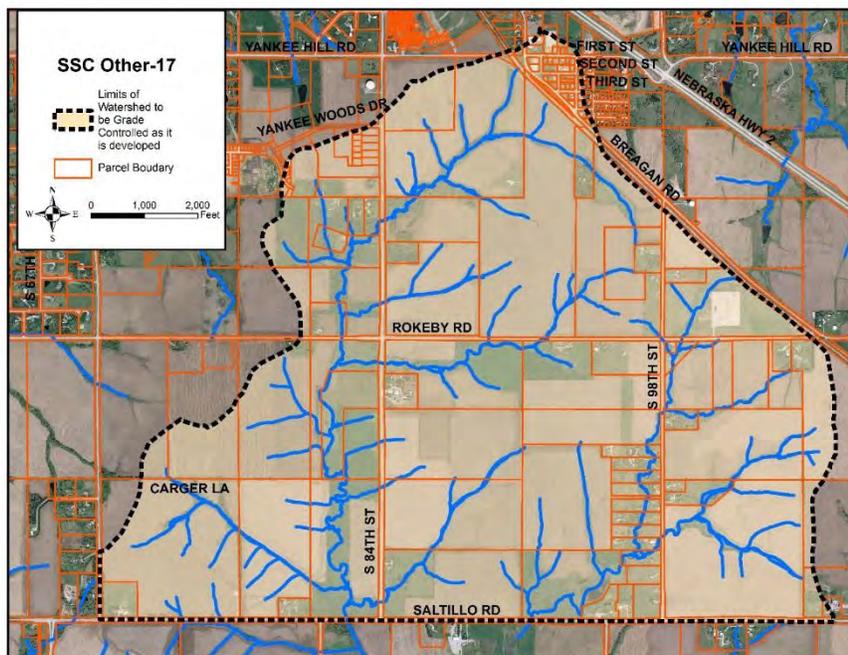
Figure 7-72: SSC Other-16 Project Location

7.6.17 Project SSC Other-17: Wagon Train Watershed Channel Grade Controls North of Saltillo Rd on Main Stem WTR020 and Tributaries WT030R005 and WT035R005

Problem description: The Mainstem and tributaries north of Saltillo Road in the Wagon Train Watershed are generally shallow and stable. This area is identified as possessing high potential for future development. The channels lower in the watershed are incising and this incision will predictably reach these developing areas. The planned new development may contribute to future channel incision similar to that observed elsewhere in the watershed. The cost of repairing channel incision and degradation in a developed area is on the magnitude of 10 times more expensive than the cost of installing protective measures before the degradation occurs. The high channel degradation repair cost is evident by the CIP estimates in this watershed Masterplan. It is less expensive for the citizens of Lincoln to pay for proactive measures when the stream is stable than pay the repair cost after a channel has incised.

Recommendation: The Mainstem and tributaries north of Saltillo Road in the Wagon Train Watershed are generally shallow and stable. This area is identified as possessing high potential for future development. The channels lower in the watershed are incising and this incision will predictably reach these developing areas. The planned new development may contribute to future channel incision similar to that observed elsewhere in the watershed. The cost of repairing channel incision and degradation in a developed area is on the magnitude of 10 times more expensive than the cost of installing protective measures before the degradation occurs. The high channel degradation repair cost is evident by the CIP estimates in this watershed Masterplan. It is less expensive for the citizens of Lincoln to pay for proactive measures when the stream is stable than pay the repair cost after a channel has incised.

Impact to Special Areas and Water Quality: There are Parks, Woodland, probable future Homeowners Associations, Wetlands and portions of the Salt Valley Greenway and Beltway Corridor Protection area within the Wagon Train Watershed north of Saltillo Road.



7.6.18 Project SSC Private 1: Petroleum Pipe Exposed on Channel SCR055

Problem description: Petroleum pipe exposed in main stem SCR055 located 3,100 feet downstream (north) of Saltillo Rd. The project location is 1,200 feet northwest on Jamaica North Trail, followed by 300 feet to the east to arrive at the channel.

Recommendation: Recommend grade control downstream of pipe crossing to raise the channel gradient and protect the pipe.

Impact to Special Areas and Water Quality: Project is located within Salt Valley Greenway, woodlands, and Wilderness Park. It also has close proximity to wetlands located to the east of the project location.



Figure 7-74: Petroleum pipe exposed in bed

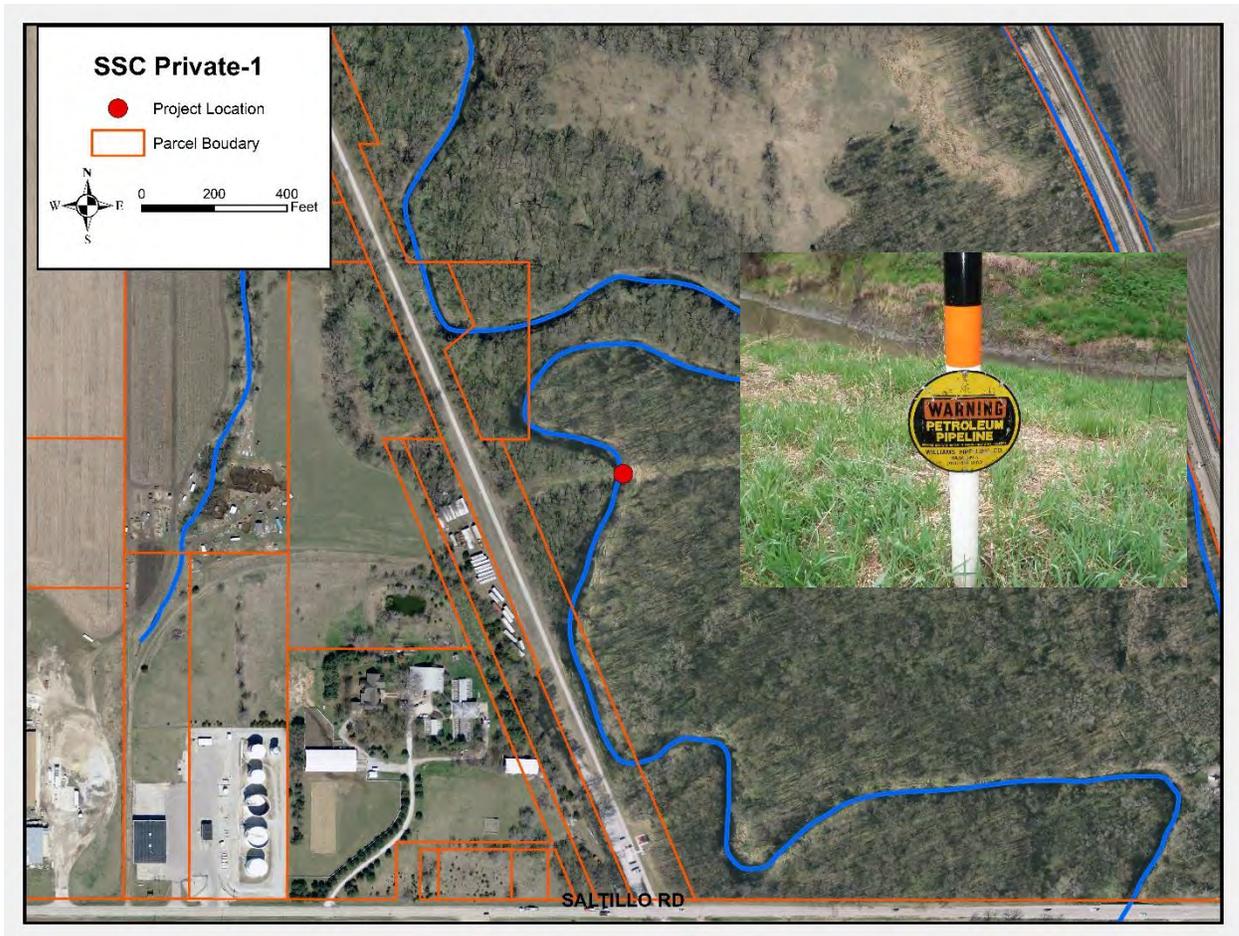


Figure 7-75: SSC Private-1 Project Location

7.6.19 Project SSC Private 2: Multiple Petroleum Pipes Exposed on Tributary SC065R010

Problem description: Multiple petroleum pipes exposed in bed of tributary SC065R010 1,050 feet downstream (north) approximately 1,200 feet east of S 14th St and Satillo intersection.

Recommendation: Recommend either deepen pipes and grade control, or grade control to raise grade and protect pipes.

Impact to Special Areas and Water Quality: NONE



Figure 7-76: Pipe exposed in bed

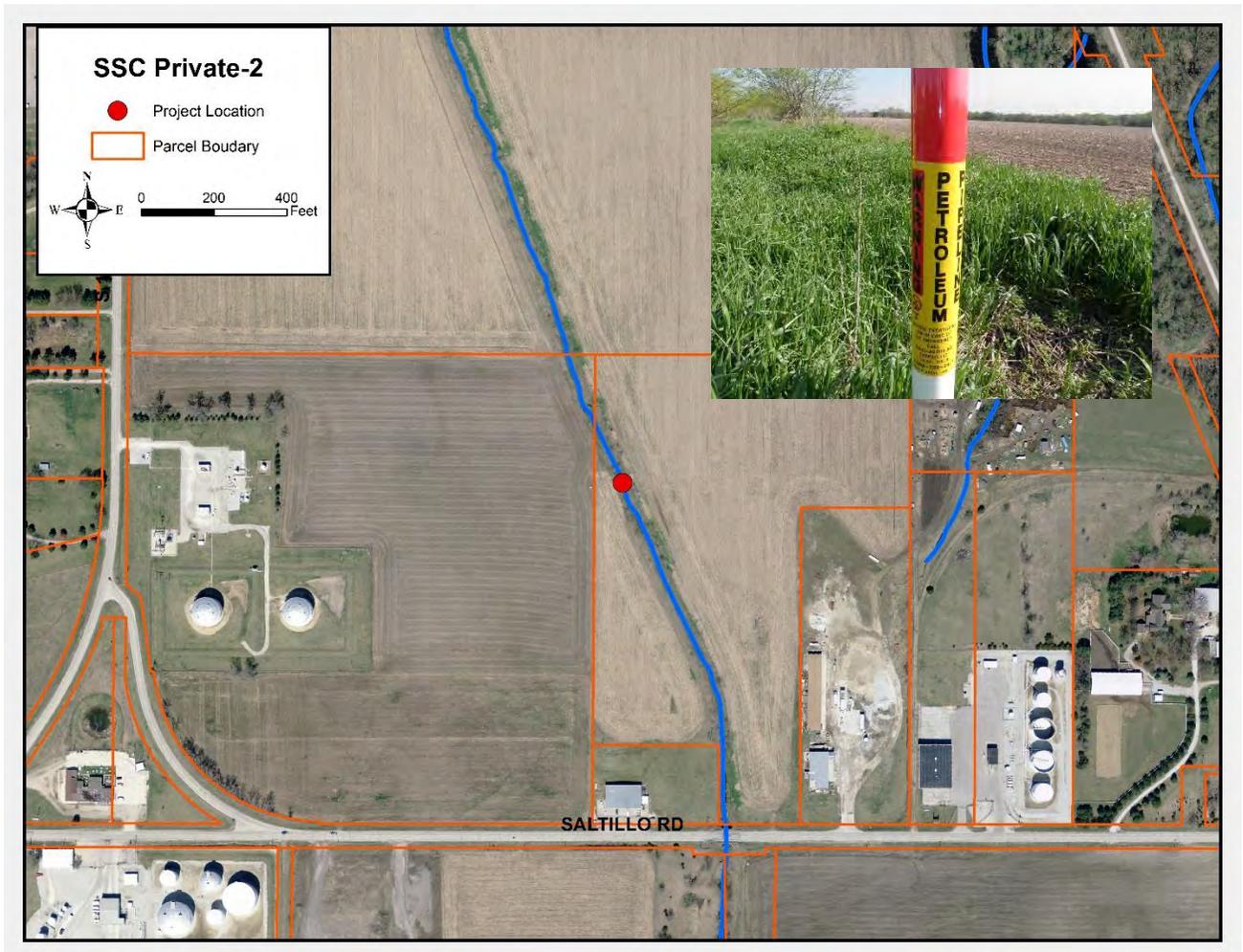


Figure 7-77: SSC Private-2 Project Location

7.6.20 Project SSC Private 3: Petroleum Pipe Exposed on Tributary SC165R010

Problem description: Petroleum pipe exposed in the channel bed of tributary SC165R010 approximately 800 feet downstream of S 1st St, 2,100 feet south of the Rokeby Rd and S 1st St intersection.

Recommendation: Recommend deepen pipe and grade control or grade control to raise grade. The pipe is currently an aerial crossing 4 feet above the channel bed.

Impact to Special Areas and Water Quality: NONE



Figure 7-78: Petroleum pipe exposed in bed

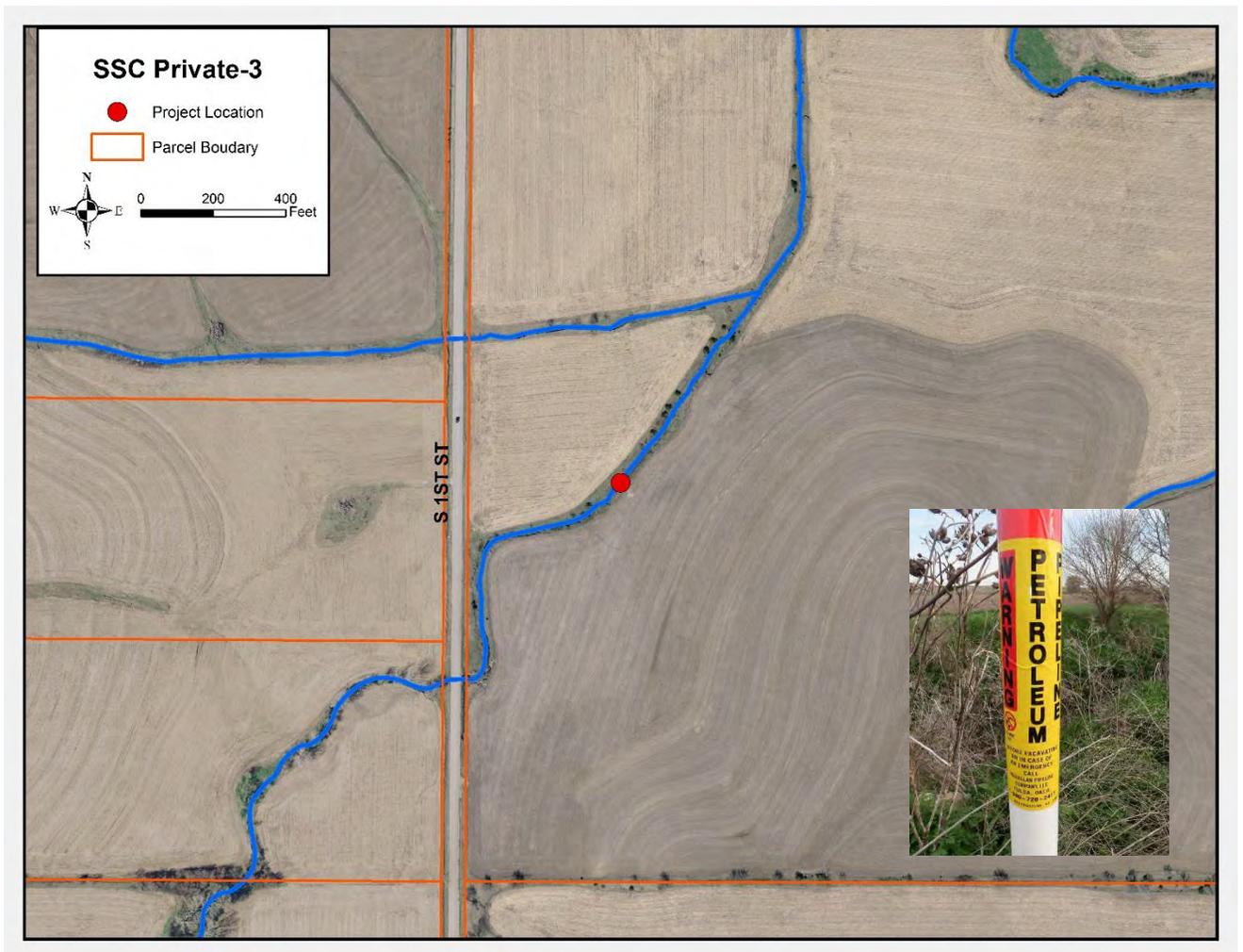


Figure 7-79: SSC Private-3 Project Location

7.6.21 Project SSC Private 4: Natural Gas Pipe Immediately Downstream of Rokeby Rd on Tributary SC065R005

Problem description: Natural gas pipe exposed in bed of tributary SC065R005 immediately downstream of Rokeby Rd, 300 feet east of S 14th St.

Recommendation: Recommend lowering the pipe and installing a grade control or alternatively installing a grade control to raise the channel gradient and protect the pipe. Additional grade controls should also be constructed to protect the Rokeby Rd.

Impact to Special Areas and Water Quality: Project is located in Salt Valley Greenway, Wilderness park, and a woodland.



Figure 7-80: Natural gas pipe exposed in bed

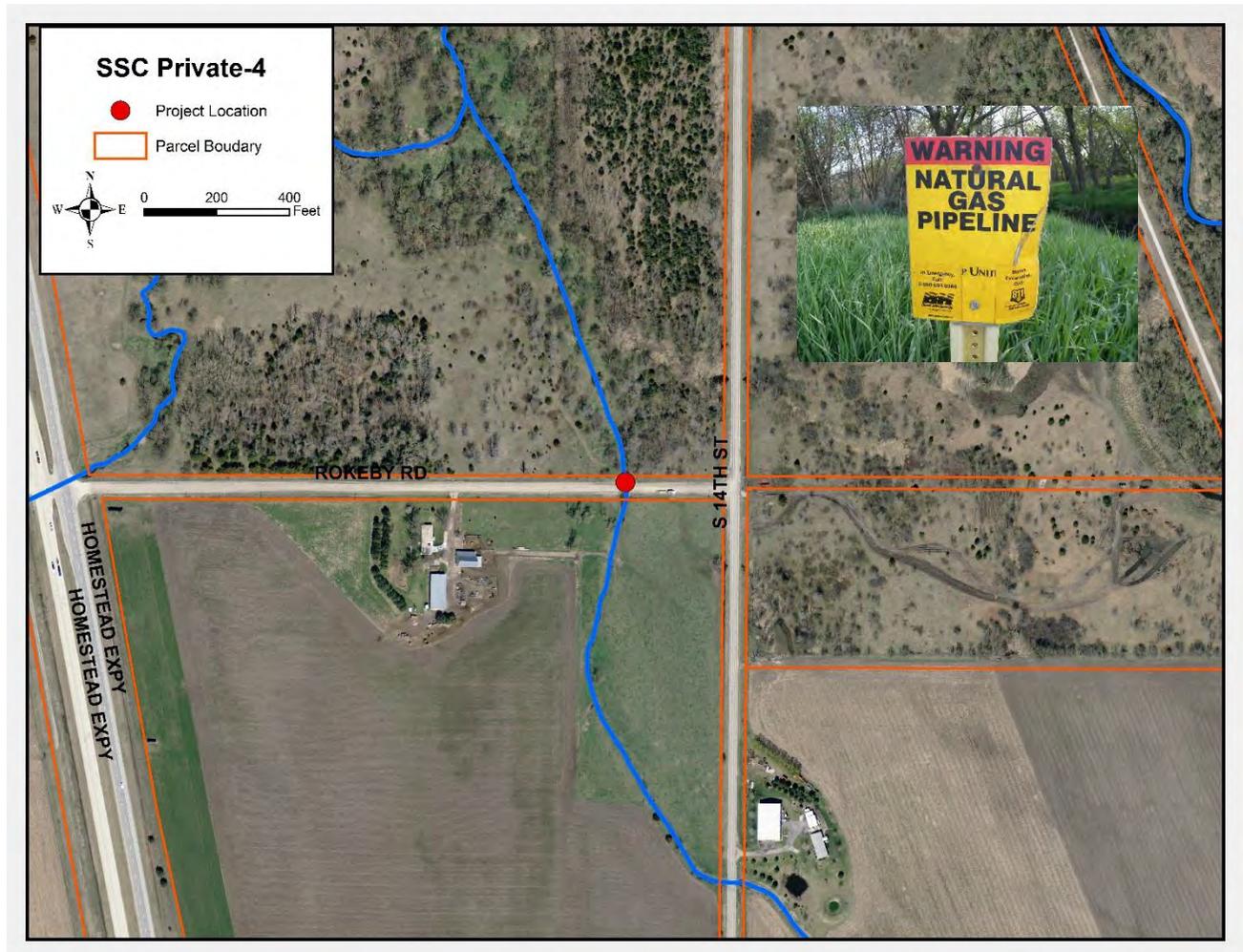


Figure 7-81: SSC Private-4 Project Location

7.6.22 Project SSC Private 5: Petroleum Pipe Exposed in Channel on Tributary SC165R010

Problem description: Petroleum pipe exposed in tributary SC165R010 approximately 1,190 feet north of the intersection of Saltillo Rd and Dakota Springs Dr. The tributary crosses under Saltillo Rd approximately 500 feet west of Dakota Springs Dr.

Recommendation: Recommend grade control to raise grade and protect pipe or lower pipe and grade control.

Impact to Special Areas and Water Quality: Project is located within a woodland.



Figure 7-82: Petroleum pipe exposed in channel

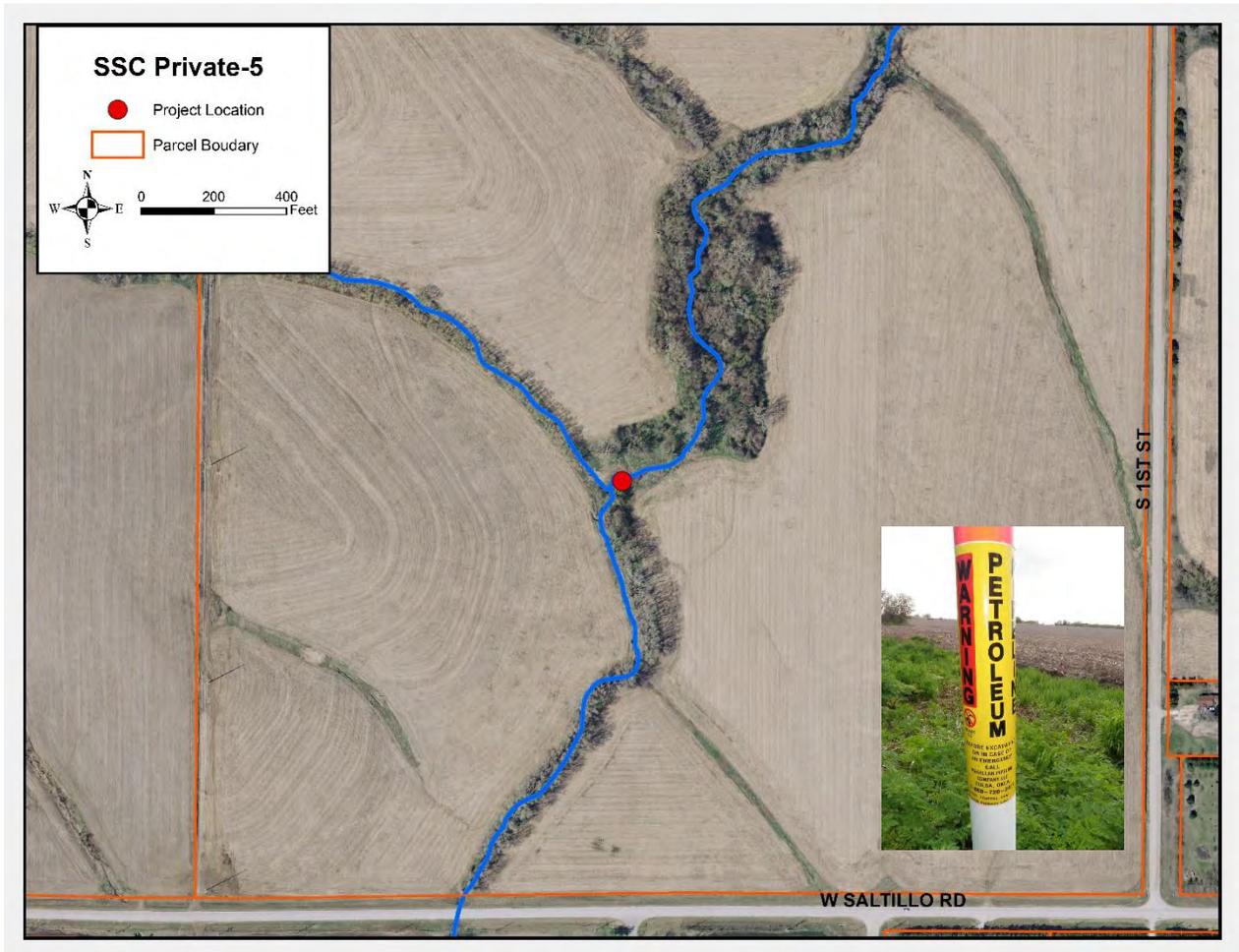


Figure 7-83: SSC Private-5 Project Location

7.6.23 Project SSC Private-6: Deteriorated Concrete Channel on Tributary SC035R010

Problem description: The existing concrete channel on tributary SC035R010 located on the private out-lot east of Limestone on Old Cheney Rd is severely deteriorated and failing. The private landowner at this location is responsible for maintenance of this channel.



Figure 7-84: Broken up and deteriorated concrete channel

Recommendation: Recommend removing the deteriorated concrete channel and installing a series of grade controls and/or channel armor with associated bank stabilization to stabilize this reach.

Impact to Special Areas and Water Quality: There are no special areas associated with this project. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.

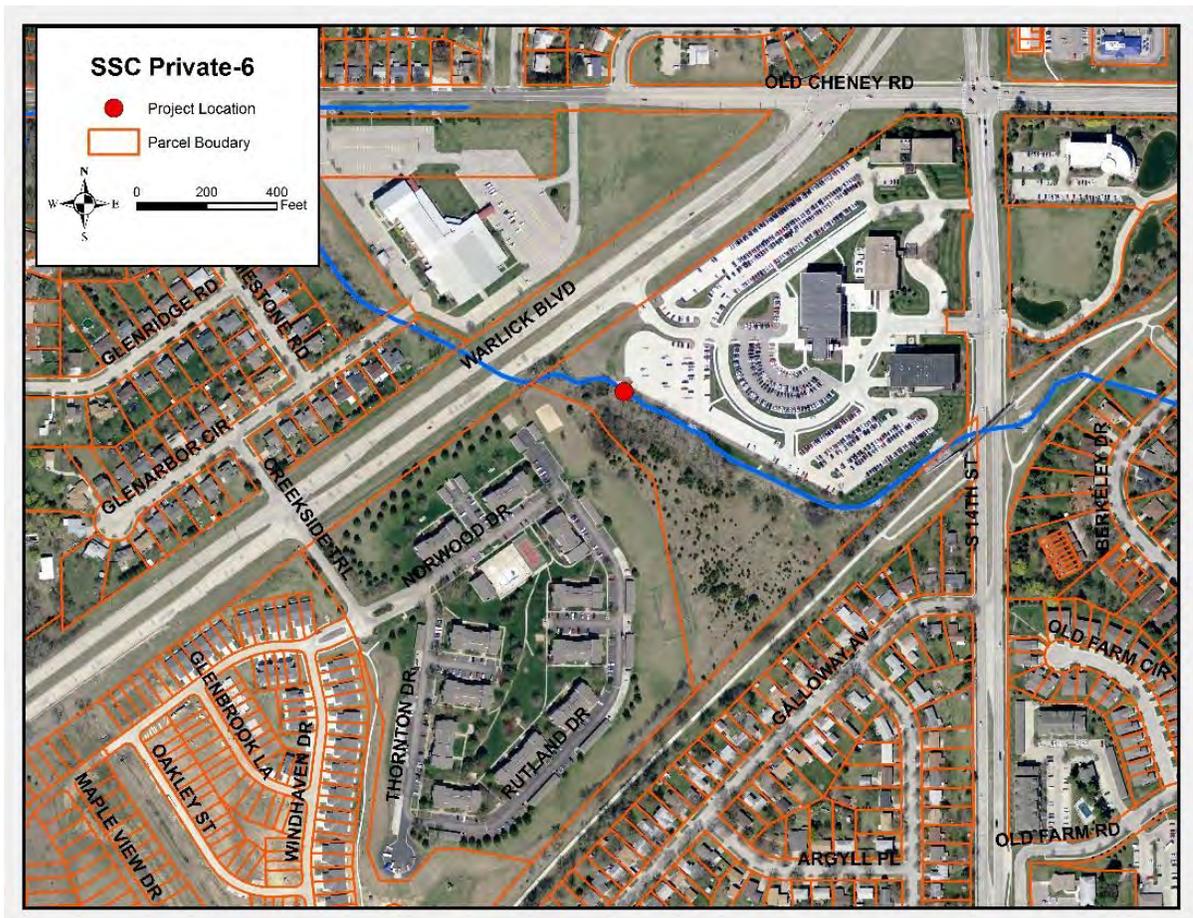


Figure 7-85: SSC Private-6 Project Location

7.6.24 Project SSC Private-7: Incision on Tributary SC035R010

Problem description: Incision and bank erosion along this reach of tributary SC035R010 is threatening a parking lot upstream of Warlick Blvd northeast of the intersection of Creekside and Warlick Blvd.



Figure 7-86: Bank Erosion and Incision Upstream of Warlick Blvd

Recommendation: Recommend constructing grade controls and bank stabilization along 400 feet of tributary to stop incision and bank erosion and protect parking lot.

Impact to Special Areas and Water Quality: There are no special areas associated with this project. Consideration during design and construction should be provided to minimize disturbance and reduce impacts to water quality to the greatest extent practical.

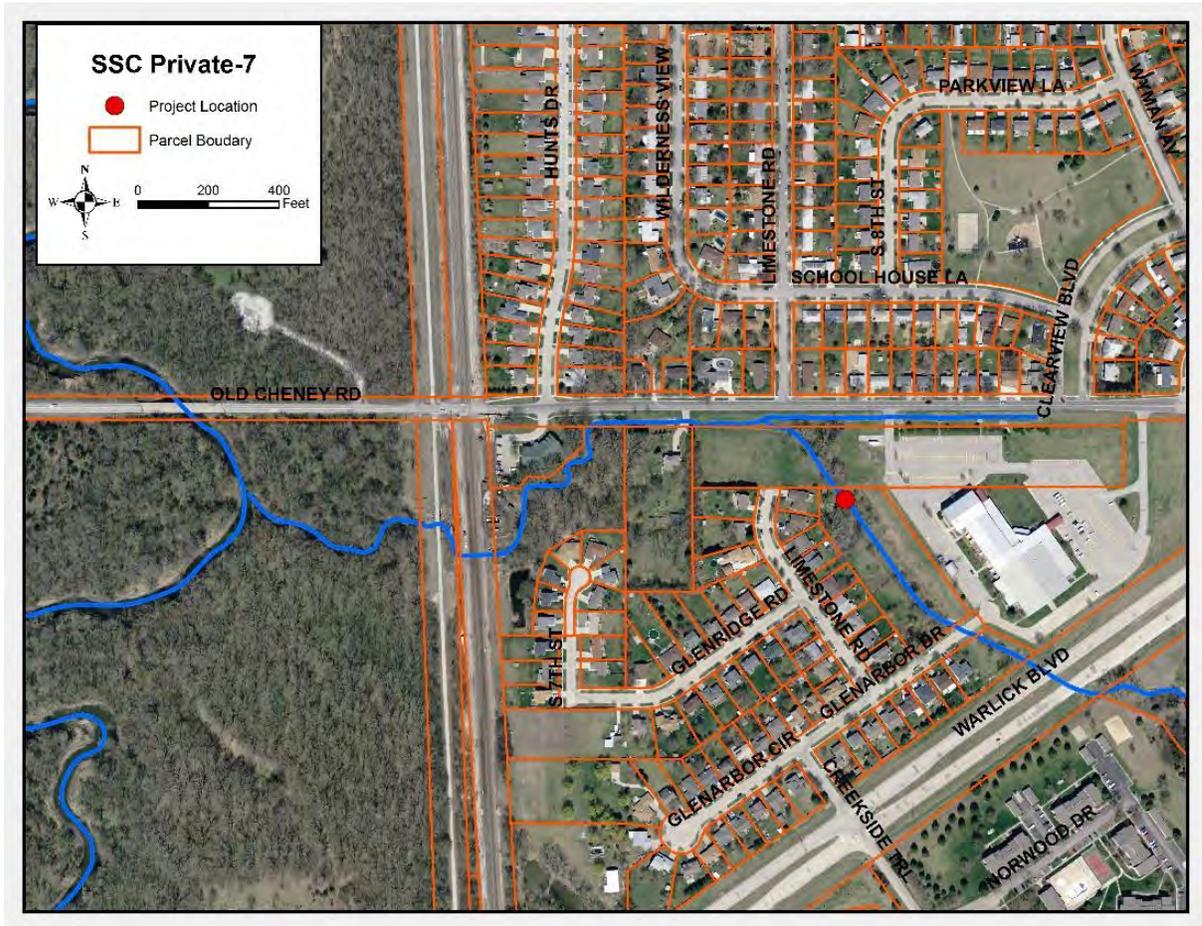


Figure 7-87: SSC Private-7 Project Location