St Joseph River Bank Stabilization Feasibility Study
Riverside Drive at Yukon Street, South Bend, Indiana.
June 14, 2019
Document Information

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Executive Summary

Cardno was selected by the City of South Bend to complete a feasibility study on the stabilization of 300 feet of the St Joseph River west riverbank located adjacent to Riverside Drive in the vicinity of Yukon Street St Joseph County, Indiana. The project was funded by the Indiana Lake and River Enhancement program through the Division of Fish and Wildlife with 20 percent matching funds by the City of South Bend.

A survey of the river bottom and embankment in the project vicinity was performed to start the discussion of why the erosion was occurring. We documented a 17 feet deep thalweg off the most severely eroded reach of the embankment comparing that to an average maximum of 10 feet deep or less elsewhere in the river. Cardno believes that the depth of this thalweg within 15 feet of the edge of water is a major cause of the eroding embankment. Upon further investigation upstream, we noted the current being deflected from a gravel bar in the river which was located just downstream of a combined sewer overflow (CSO), into the right downstream bank adjacent to North Shore Drive near Iroquois Street. This reach of the embankment had been previously repaired with rock riprap but severe erosion was occurring just downstream of the riprap on the same bank. The current was then reflected off that embankment directly toward the project site of concern.

After further inquiry, we learned that the CSO collapsed in 1984 sending bricks from the 90 inch diameter sewer, constructed in 1894, into the river. The bar thus formed reaches 65% across the river making it a large obstruction to normal flows. Cardno incorporated both the bar removal and the additional eroding embankment into this feasibility study.

Stabilizing the primary site at Riverside and Yukon could be completed by stabilizing the toe of slope at a cost of approximately $240,000 along 500 feet of the embankment or more completely by sloping above the installed rock toe, applying seed, erosion control fabrics and trees at a cost of approximately $307,000 or applying rock to an entire graded slope at an approximate cost of $803,000. The cost of removing a portion of the bar in the river that may be a cause of the erosion is approximately $128,000.00. The secondary site downstream is more accessible, has a much shorter slope length, and less length to the eroding area at approximately 100 feet. Stabilizing this area with riprap was not estimated during this study.

The probable costs of design and permitting at the primary site is approximately $40,000.00 while the design and permitting of the secondary site is approximately $20,000.00. The cost of designing and permitting the partial removal of the gravel bar would add another $15,000 to $22,000 to the above costs. Cardno recommends addressing all three projects in the design phase of the project and prioritizing where limited construction money should be applied.
1.0 Project Location, Description, and Purpose

1.1 Project Location

The primary project site is located along the western bank of the St. Joseph River south of the intersection Angela Boulevard and adjacent to Riverside Drive, in South Bend, St. Joseph County Indiana (Figure 1). A secondary site is located just upstream on the right downstream bank of the river adjacent to North shore Drive. The 12 digit Hydrologic Unit is Pinhook Lake- St Joseph River Hydrologic Unit Code (HUC) 040500012207. The center of the primary study site is at Latitude 41.691572 and longitude -86.263288 and the center of the secondary site is Latitude 41.690243 and Longitude -86.258990 (Figure 2).
1.2 Project Description

The City of South Bend, Division of Engineering received an Indiana Department of Natural Resources, Division of Fish and Wildlife, Lake and River Enhancement (LARE) Grant in 2018 to complete a feasibility study on the stabilization of approximately 300 feet of severely eroding embankment. The goal of this feasibility study was to determine the feasibility of different conceptual bank stabilization treatments, with consideration for improvements to fish and wildlife habitat. A feasible project is one...
that can be:

1) Physically constructed considering access and other physical limitations;
2) Economically justified;
3) Permitted by local, state and federal agencies having jurisdiction and;
4) Approved by the landowner(s) and adjacent land owners.

1.3 Project Purpose

The purpose of this Engineering Feasibility Study is to prepare a report that addresses all of the pertinent issues associated with design and implementation of a potential stabilization project. When completed the City of South Bend should have confidence that when a design is completed the project will be implemented on a timely and economical basis.

2.0 Preliminary Engineering

2.1 Site Investigation

Cardno obtained a topographic survey of the site to document existing conditions within the primary area of interest between Yukon and Vasser Avenue (Figure 3 and Appendix A). The survey documented a thalweg elevation of 648 MSL and a top of bank elevation of 705 MSL. The waters elevation on the survey date was at approximately 665 MSL. The water depth was 17 feet at 30 feet from the waters’ edge on the left downstream bank below the steepest area of bank erosion. The average slope of the eroded bank was 1:1 above the water line and 1.4:1 from the top of bank to the thalweg. The more gradual slope below the water line is due to the slump that had occurred.

2.2 Data Analysis

The embankment soils are loamy sand over sand with a sandy clay lens at an elevation of approximately 664 to 666. The USDA web soil survey lists the soils for this embankment as Tyner loamy sand with a depth to water table of greater than 80 inches (Appendix B). No water was observed seeping from the embankment; however, it can generally be assumed that ground water flows toward the river from the west.

The surface flow past the site comes from a drainage area of approximately 3600 square miles and has a mean annual discharge over the last 10 years ranging from a low of 3305 Cubic Feet per second (CFS) to a high of 5564 CFS and an average of 4010 CFS (Appendix B). Peak flows vary widely but the USGS gage downstream in Niles recorded maximum daily mean values for peak flow of 16,400 CFS for March 11, from 2007 to 2018 (Appendix B.) According to the Regional Curve produced by Robinson (2013) for the northern till plains the bankfull mean width should be approximately 180 feet and bankfull mean depth should be 5.75 feet. The river in the primary project vicinity is over 220 feet wide at bankfull and mean depth at bankfull is over 10 feet. At the secondary site a cross section was not completed but is suspected to have a significantly lower mean depth.

The base flood elevation according to the Indiana DNR website is 675.1 MSL at the upstream end and 674.9 MSL at the downstream end of the 500 feet long primary study reach. The base flood elevation at the secondary site upstream is 675.4. These elevations are the upper elevation limit of DNR jurisdiction. The low bank height on the east side of the river according to our topographic survey is between 677 and 678. We estimated the Ordinary High Water Mark at an approximate elevation of 670 MSL based on field signatures and scour on the banks. Below this level the U. S. Army Corps of Engineers (USACE) and the Indiana Department of Environmental Management (IDEM) have jurisdiction. There is no agency having regulatory jurisdiction above the elevation of 675.1 at the primary site or 675.4 at the secondary site.
2.3 Aerial Photographic Analysis
Aerial photographs from 2003, and from 2006 to 2010 show a sand and gravel bar that takes up more than half of the river width just downstream from the combined sewer overflow (CSO #6) at the intersection of Leland Avenue and Riverside Drive approximately 1500 feet upstream. The exposed portion of the bar measured 180 feet from east to west and 170 feet from south to north occurring just downstream of the scour hole created by the underwater discharge of the CSO (Figure 4). The 90 inch diameter CSO was constructed in 1894 using hand laid bricks which are now part of the substrate in the gravel bar (Appendix B).
2.4 Problem Statement
Approximately 500 feet of the river bank slope at the primary site that is 40 feet above normal water levels underwent a rotational failure of approximately 10 feet of embankment. The rotational failure has continued on downstream during the period of study. The current erosion of the embankment stretches from Vasser Avenue on the south to Hudson Avenue on the north and threatens Riverside Drive and adjacent utilities. The direct cause of the embankment collapse is that the river bed is scoured to a depth of 17 feet or approximately 7 feet deeper than the average depth of the thalweg along this reach of the river. The scour likely undermined the embankment below the water line, which set up the rotational failure. The cause of the scour may be related to the 1984 collapse of CSO #6 which resulted in, or at least increased the size of, the sediment bar extending more than half way across the river. This sediment bar appears to cause the river to meander directly into the east bank toward the secondary site, where in 2006 and 2015 emergency riprap bank stabilization measures took place, and where additional protection measures have become necessary to protect North Shore Drive. The river thalweg then traverses the river to the west bank just upstream at the identified project location of Riverside Drive and Yukon Street.

The bar downstream of CSO #6 extends 65% of the way across the river which sets up the meander of the thalweg against the east bank near Iroquois Street. The bank at that location is approximately 10 feet above normal water levels. The thalweg then crosses to the left downstream bank along Riverside Drive between Vasser Street and Yukon Street. A bank collapse occurred on the embankment closer to Vasser Street in 2002-2003 but that scar has since healed. The mass of material in the river from that collapse likely set up the downstream scour hole that occurs at present. During this study, the undermining and subsequent bank collapse continued to move downstream. The pending design project should focus on 500 feet from Vasser Avenue to Hudson Avenue and 100 feet along North Shore Drive north of Iroquois Street in addition to potential removal of the bar downstream of CSO #6.

3.0 Public meetings and land ownership
Cardno arranged and facilitated three public meeting during the feasibility study. All 32 property owners and adjacent property owners including those on the opposite side of the river were invited with a letter to the first public meetings. There are six landowners along the east side of Riverside Drive within the 500 feet of project reach identified for treatment. A direct mailing to these six property owners was sent for the second meeting and the direct mailing was expanded to seven additional owners upstream along
the same bank for the final meeting Meetings were held Wednesday evenings on January 16, February 20, and April 17, 2019. Notes from each meeting are included in Appendix C. Two of the property owners attended the first public meeting. Five of the property owners attended the second public meeting and the sixth one called and talked with the author of this report prior to the meeting. Concerns brought up at the meeting included the cost of the project, the permanent vegetation type, and how soon the project could be implemented. All of the owners expressed some level of support for the project and none objected to the project. The secondary site along North Shore Drive at Iroquois is not platted into lots and thus the City of South Bend retains ownership.

The final meeting had five residents present. The potential for easements was discussed if public funding is used to repair the bank. The affected residents were made aware that any potential construction on their property would at a minimum require an informal letter of support from them but could also result in the need for a permanent conservation type easement. There was no opposition voiced to a potential easement.

In summary, no opposition to the project was voiced; however it was made clear that the landowners preferred trees for a final vegetative treatment of the slope.

4.0 Conceptual Drawings

4.1 Alternatives Discussion
Cardno has developed three conceptual project alternatives for the primary project site to stabilize that reach of the embankment. The same treatments could apply to the secondary site. A fourth alternative is to do nothing. Like the upper end of the primary site, it is possible that the bank will stabilize at its current angle of repose, and the erosion will continue to migrate downstream, collapsing the next section of the embankment into the river with another rotational failure of the bank. However, it is also possible that another rotational failure on the current spot will occur taking the failure plane up to Riverside Drive. These failures typically occur during receding floods as saturated banks are exposed and ground water is draining back to the river.

4.2 Riprap Alternative
The most common method of stabilizing banks along rivers in general, and recently along downstream reaches of the St. Joseph River, is to armor the entire embankment with rock (Figure 5). Rock prevents the direct scour, and undermining of the embankment, and holds the finer sand particles to the bank when the soils would otherwise be exposed during rising and receding floods. Other than designing and installing the rock at the toe of the slope to be at or below the depth of maximum scour, rock treatments are relatively easy to design and install.

The rock must be sized to resist movement under the maximum shear forces generated by the river flows, but also must incorporate finer material to fill the voids created by larger rocks, or bank materials may migrate into those voids weakening the bank. Previously completed stabilization work on the river has used a variety of sizes from standard 6 to 8 inch diameter riprap up to 18 to 24 inch INDOT Class 1 riprap. Just upstream of the primary site eroded embankment is a short section of the river bank that appears stable with a layer of paving bricks (Figure 6).

The IDNR generally requires a 2:1 slope; however, a 2:1 slope would require an excessive amount of fill in the river or excavation of the top of bank up to the edge of Riverside Drive. By excavating the top of bank approximately 15 feet toward Riverside Drive a 1.6:1 slope can be obtained. A 1.6:1 slope would be 96 feet long extending to the thalweg depth. The thickness of applied rock should exceed 2 times the average diameter of the rock used. An estimated 12,800 tons of rock would be required for the 500 ft. reach.
4.3 Riprap Toe Protection with Vegetated Upper Slope Alternative

Toe of slope protection is the most critical component of stabilizing banks that are being undermined by a migrating river thalweg. The protection should extend up to the elevation of flood events that are likely to occur approximately every two years (50% chance of an annual occurrence), because these bankfull flooding events do the most to move channels and erode banks with high shear stress when water is contained within river embankments. Less frequent, higher elevation flooding events, overtop lower banks on the inside bends and reduce shear stress on outside bends of river banks, allowing permanent vegetative treatments to successfully stabilize embankments at or above this bankfull elevation. Because the bankfull elevation is an element that is critical to the design, additional effort should be expended during the design phase to confirm the bankfull elevation.

Installing adequate toe of slope protection would require a 2 ft. thick layer of riprap from elevation of 648 to 670 at the primary site along an approximate 25 ft. long slope (Figure 7). This would utilize approximately 2200 tons of rock along 500 feet of embankment. Above the rock the slope could be graded to a 2:1 slope or steeper, seeded with native herbaceous vegetation, and the slope protected with a surface applied erosion control mats secured with anchors such as those shown in Figure 8. Herbaceous vegetation appropriate for the existing sand dominated embankment would include little bluestem, Indian grass, big blue stem, side oats gramma, compass plant, lead plant and rosinweed. These plants are native to St Joseph County and develop thick deep root masses that penetrate upward of 15 feet into the embankment helping to stabilize the soil. However, deep and broadly rooted tree species such as burr oak, shagbark hickory, and sugar maple, once roots are well established, could also serve as long term protection for the upper bank.
4.4 Rock Toe only Alternative

A least cost but still adequate alternative to the examples presented above would be merely to establish the toe of slope protection and allow the upper bank to erode to its natural angle of repose over time. Once the toe-of slope is protected there is unlikely to be another rotational failure of the embankment.

Installing adequate toe of slope protection would require a minimum two foot thick layer of riprap from elevation of 648 to 670 along an approximate 25 ft. long slope (Figure 9). This would utilize approximately 2200 tons of rock along 500 feet of embankment.

5.0 Preliminary Design and Construction Cost Estimates

The following tables (Tables 1 through 4) represent Cardno’s opinion of probable costs associated with construction options discussed in this feasibility study. Additionally, Table 5 is a summary of probable costs for combined engineering design and permitting work on the recommended projects. The values associated with individual units are based on Cardno’s recent experience on projects of this type and limited web research.

Figure 7. Typical bank protection using riprap toe protection and vegetation treatment.

Figure 8. Typical anchor disk for turf reinforcement matting (American Earth Anchors).

Figure 9. Typical toe of slope protection
### Table 1: Probable cost for removal of the gravel bar

<table>
<thead>
<tr>
<th>Task</th>
<th>Unit</th>
<th># of Units</th>
<th>Cost/Unit</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobilization/Demobilization</td>
<td>Lump Sum</td>
<td>1</td>
<td>$10,000.00</td>
<td>$10,000.00</td>
</tr>
<tr>
<td>Temporary Erosion Control</td>
<td>Linear Ft.</td>
<td>600</td>
<td>$20.00</td>
<td>$12,000.00</td>
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<tr>
<td>Construct River Access Road (200' x 30')</td>
<td>Acre</td>
<td>0.5</td>
<td>$15,000.00</td>
<td>$7,500.00</td>
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<tr>
<td>Excavation and hauling</td>
<td>Cubic Yard</td>
<td>2200</td>
<td>$25.00</td>
<td>$55,000.00</td>
</tr>
<tr>
<td>Restore Access Road</td>
<td>Acre</td>
<td>0.5</td>
<td>$15,000.00</td>
<td>$7,500.00</td>
</tr>
<tr>
<td>Engineering Inspections</td>
<td>Each</td>
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<td>$1,000.00</td>
<td>$3,000.00</td>
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<tr>
<td><strong>Sub Total for Construction</strong></td>
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<td>Contingency</td>
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<td>20%</td>
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<tr>
<td><strong>Total</strong></td>
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<td></td>
<td><strong>$133,000.00</strong></td>
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### Table 2: Probable cost for riprapping 500 feet of embankment on a 96 feet long slope.

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<th># of Units</th>
<th>Cost/Unit</th>
<th>Total</th>
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<td>Mobilization/Demobilization</td>
<td>Lump Sum</td>
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<td>Temporary Erosion Control</td>
<td>Linear Ft.</td>
<td>600</td>
<td>$20.00</td>
<td>$12,000.00</td>
</tr>
<tr>
<td>Clearing and Grubbing Slope</td>
<td>Acre</td>
<td>0.5</td>
<td>$30,000.00</td>
<td>$15,000.00</td>
</tr>
<tr>
<td>Toe of Slope Excavation</td>
<td>Cubic Yard</td>
<td>1000</td>
<td>$15.00</td>
<td>$15,000.00</td>
</tr>
<tr>
<td>Riprap Placement (96' slope length)</td>
<td>Ton</td>
<td>12500</td>
<td>$45.00</td>
<td>$562,500.00</td>
</tr>
<tr>
<td>Engineering Inspections</td>
<td>Each</td>
<td>5</td>
<td>$1,000.00</td>
<td>$5,000.00</td>
</tr>
<tr>
<td><strong>Sub Total for Construction</strong></td>
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<td></td>
<td></td>
<td><strong>$617,500.00</strong></td>
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<tr>
<td>Site Engineering and Permitting</td>
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<td>Contingency</td>
<td>Lump Sum</td>
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<td>20%</td>
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<tr>
<td><strong>Total</strong></td>
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<td></td>
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<td><strong>$802,750.00</strong></td>
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### Table 3: Probable cost for riprap toe protection, geo-turf reinforced vegetation

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<th>Unit</th>
<th># of Units</th>
<th>Cost/Unit</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>Mobilization/Demobilization</td>
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<td>$10,000.00</td>
</tr>
<tr>
<td>Temporary Erosion Control</td>
<td>Linear Ft.</td>
<td>600</td>
<td>$20.00</td>
<td>$12,000.00</td>
</tr>
<tr>
<td>Clearing and Grubbing Slope</td>
<td>Acre</td>
<td>0.5</td>
<td>$30,000</td>
<td>$15,000.00</td>
</tr>
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<td>Riprap Placement (25’ slope length)</td>
<td>Ton</td>
<td>3250</td>
<td>$45.00</td>
<td>$146,250.00</td>
</tr>
<tr>
<td>Seed/Turf Reinforcement Matting (TRM) above riprap</td>
<td>SYD</td>
<td>740</td>
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<td>Permanent Seeding/Erosion Control Mat (above TRM)</td>
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<td>1,000</td>
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### Table 4: Probable cost for rock toe along 500 feet of embankment

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<th>Unit</th>
<th># of Units</th>
<th>Cost/Unit</th>
<th>Total</th>
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<tbody>
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<td>Mobilization/Demobilization</td>
<td>Lump Sum</td>
<td>1</td>
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<tr>
<td>Temporary Erosion Control</td>
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<tr>
<td>Riprap Placement (25’ slope length)</td>
<td>Ton</td>
<td>3250</td>
<td>$45.00</td>
<td>$146,250.00</td>
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<td>Engineering Inspections</td>
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Table 5: Probable Costs for combined Design and Permitting of Recommended Actions

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<th>Task</th>
<th>Unit</th>
<th>Total</th>
</tr>
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<tr>
<td>Engineering Design and permitting of 500 feet of bank stabilization at Riverside and Yukon</td>
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<td>Engineering Design and permitting for 100 feet of bank stabilization at North Shore Drive at Iroquois</td>
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</tr>
<tr>
<td>Engineering Design and permitting for Gravel Bar removal at CSO#6</td>
<td>Lump Sum</td>
<td>$15,000.00*</td>
</tr>
<tr>
<td>Engineering Design and permitting for Gravel Bar removal as a stand along project</td>
<td>Lump Sum</td>
<td>$22,000.00</td>
</tr>
</tbody>
</table>

* Additional cost if scope added to design work along North Shore Drive at Iroquois due to overlap on survey and permitting

6.0 Unusual Physical and Social Costs of Project

Unusual Physical and Social Costs of construction projects usually involve culturally or environmentally sensitive sites or sites with difficult access or difficult construction requirements. The site is neither culturally significant nor is it an environmentally sensitive site. The construction access; however, may pose a bit of difficulty at this site. Because even the natural slope angle along this reach is approximately 1.6 horizontal to 1 vertical, construction equipment cannot operate on the slope. This project will either need to utilize barges for access to the toe of slope, or the construction company would need to build a ramp down the slope form some distance to the south, affecting more trees and causing more bank stabilization requirements than proposed within this report.

Another concern that could drive pricing up from the estimates in Section 5.0 above are the restrictions that permit agencies may put on any permits issued for the project discussed in Section 11.0 below. Typical IDNR restrictions may include fish spawning season restrictions to working in the water, siltation controls in the water and tree replacement for any larger trees removed. Federal agency restrictions may include bat habitat disturbance date restrictions, migratory bird date restrictions, and areal limits to the temporary disturbance area.

Based on the feedback from public meetings the most likely concern of residents is the removal of trees. There may be additional costs associated with in-kind tree replacement (for example- larger trees) then budgeted for in the cost estimates for each project approach.

7.0 Proposed Project Functionality

The EPA Region 5 model was used to estimate the amount of nutrients and sediment load reductions by the proposed projects. The embankment at the primary site is 57 feet high from the top of bank to the thalweg. The estimated annual load reductions with 80% efficiency of treatment along 500 feet of embankment are: 627.0 tons of sediment, 533 pounds of Phosphorus, and 1066 pounds of Nitrogen. The estimated annual load reductions at the secondary site along 100 feet of embankment with a 15 foot high bank is 66 tons of sediment, 56.1 pounds of phosphorus and 112.2 pounds of nitrogen (Appendix D).
8.0 Wetland and Vegetation Assessment

The US Fish and Wildlife Service (USFWS) National Wetland inventory map shows only the St Joseph River as an aquatic environment (Figure 10).

Based on the fact that there are no hydric soils on the site, the site is well drained, and there is no wetland vegetation growing on the site, a wetland delineation was not performed. The St. Joseph River is a jurisdictional waters of the United States below the Ordinary High Water (OHWM) of approximately 670 MSL at the primary project site.

The site is partially within Floodway of the St Joseph River at elevations on the embankment below 675 MSL. There are mature trees on this embankment that will need to be inventoried during the design phase for permitting. Trees over 10 inches in diameter, dead or alive, native or non-native, that are below the 100 year flood elevations and will be removed for the project will need to be inventoried during the design project replaced at a ratio of 5:1 following construction.

9.0 Environmental Assessment

For the purpose of this study the environmental assessment is a summary of the potential impacts to air and water quality, potential impacts on fish, wildlife and botanical resources and any other special concerns affecting the human or natural environment that the project may affect.

St Joseph County is in compliance with State Air Quality Standards although occasionally Ozone Action alert days are declared during warm summer days. The project should have no effect on air quality with the exception that work conducted with gas or diesel powered machinery should not continue on Ozone action alert days during the project.

Water quality may decline due to increased turbidity in the vicinity of the project for the period when work is conducted below the water line, which should last no more than one or two days. Turbidity can be
mitigated by the use of a silt curtain that floats on the surface and hangs in the water column to keep suspended sediments in a confined area. However, silt curtains are difficult to maintain and the cost of installing and maintaining them may not offset the temporary impact of silt.

There will be temporary impacts to fish, wildlife, and botanical resources during the construction of the project. Vegetation and habitat will be removed from the surface within the project limits, and that same area will be filled and graded with either rock or soil or both. Temporary impacts are limited to the project limits and will be mitigated by the establishment of new vegetation and new habitat on the slope and below the water line. The Indiana Department of Natural Resources, Division of Nature Preserves was consulted on the potential of endangered, threatened, and rare species of plants and animals that may be present within ½ mile of the primary project site (Appendix E). There were no species of concern noted within ½ mile of the project site.

All three conceptual plans include rock which provides voids for shelter and escape from predators, both above and below the water line. Rock also provides a surface for the establishment of periphyton, the basis of the aquatic food chain, and traps leaf and branch litter providing more habitat for aquatic organisms. At least one of the conceptual plans include a native plant component on the majority of the slope. The vegetation proposed is native prairie and or woodland plantings which provide vertical diversity from ground level up providing habitat for wildlife ranging from insects to small mammals and song birds. The vegetative component should provide greater habitat than the bare eroded slope that exist at present.

10.0 Potential Funding Sources for Design and Construction

Funding for the City of South Bend is available for the design and implementation of bank stabilization projects on the St. Joseph River through several Federal, state, and local organizations.

10.1 LARE GRANTS

The Indiana Department of Natural Resources (IDNR) Lake and River Enhancement (LARE) program is managed by the IDNR Division of Fish and Wildlife. The goals of the LARE Program are to protect and enhance aquatic habitat for fish and wildlife, and to insure the continued viability of Indiana’s publicly accessible lakes and streams for multiple uses, including recreational opportunities. This is accomplished through measures that reduce non-point sediment and nutrient pollution of surface waters to a level that meets or surpasses state water quality standards. To accomplish this goal, the LARE Program provides technical and financial assistance for qualifying projects. Grant funding may be used for one or more of the following purposes:

1) Investigations (Diagnostic studies) to determine what problems are affecting a lake or stream.
2) Evaluations (Feasibility studies) of identified problems that result in effective recommendations.
3) Engineering designs and construction of remedial measures.
4) Water quality monitoring of public lakes.
5) Management of invasive aquatic vegetation.
6) Sediment removal from qualifying lakes.
7) Logjam removal from qualifying rivers.
8) Partnering with local Soil and Water Conservation District (SWCD) to offer Cost-sharing with landowners in the watershed for installation or application of sediment and nutrient reducing practices on their land.

The LARE program funding requests are due January 31 of each calendar year and grants are awarded between March and August of that same year. Grants are available to fund 80% of project costs up to a maximum of $100,000.00 with local cost share of 20%.
10.2 Great Lakes Commission Sediment and Nutrient Reduction program

The Great Lakes Commission is funded through the Great Lakes Restoration Initiative (GLRI). Under the 2019 program, grants are available for implementation projects focused on nutrient management or reducing sediment and phosphorus runoff into the Great Lakes through the installation of long-term practices. Projects may take either a watershed scale or site-specific approach to these objectives. It is anticipated that roughly $2.2 million in funding will be awarded for projects in 2019. Applicants must be nonfederal units of government, tribes, or incorporated nonprofit organizations. A 25% match will be required of each project. Applications will be reviewed and assessed by the Sedimentation and Nutrient Reduction Task Force, with final decisions anticipated in early summer 2019. Selected projects should begin on October 1, 2019, and may be up to three years in duration. For more information, contact Nicole Zacharda at nzacharda@glc.org or 734-971-9135.

10.3 NIPSCO/NISOURCE GRANTS

The Northern Indiana Public Service Corporation (NIPSCO) has a “Trees for Energy Conservation Grant Program” and its parent company NiSource has a charitable foundation. NIPSCO in partnership with the Indiana DNR, Community and Urban Forestry Program (CUF) will award maple trees as part of the NIPSCO Trees mean Cool Communities grant program. The awarded trees must be planted around public buildings to demonstrate energy conservation. The intent of funded projects is to decrease energy consumption by strategically selecting sites where the trees will provide shade, decrease wind speed, and let winter sunlight in. Program details include:

1) Trees provided by NIPSCO must be planted on public property (not for residential use)
2) The property where the planting will take place must receive NIPSCO electric service
3) Schools, libraries, cities, towns, and local non-profits are invited to apply
4) Applications must be received by Sept. 30

The NiSource Charitable Foundation provides smaller grants to communities to match employee support in the community. For example the web site states that it will provide $500.00 cash to a local government to match a day of community volunteer work by a NIPSCO employee.

10.4 NFWF GRANTS

The National Fish and Wildlife Foundation (NFWF) consolidates and manages corporate giving for multiple environmental grant programs. One of the grant programs managed by NFWF is the Five Star and Urban Waters Restoration Program (5-Star) which seeks to develop nation-wide-community stewardship of local natural resources, preserving these resources for future generations and enhancing habitat for local wildlife. Projects should address water quality issues in priority watersheds, such as erosion due to unstable streambanks, pollution from stormwater runoff, and degraded shorelines caused by development. The program focuses on the stewardship and restoration of coastal, wetland and riparian ecosystems across the country. Its goal is to meet the conservation needs of important species and habitats, providing measurable and meaningful conservation and educational outcomes. The program requires the establishment and/or enhancement of diverse partnerships and an education/outreach component that will help shape and sustain behavior to achieve conservation goals. More information can be found at the following link:
http://www.nfwf.org/fivestar/Pages/home.aspx.

A second grant offered by NFWF is the Sustain Our Great Lakes (SOGL) program to benefit fish, wildlife, wildlife habitat, and water quality in the Great Lakes basin. The program will award grants in 2019 to improve and enhance stream and riparian habitat, coastal wetland habitat, and water quality in the Great Lakes and its tributaries. Approximately $8.2 million is expected to be available for grant awards of 100,000 to 1 million in 2019. The program is administered by the National Fish and Wildlife Foundation (NFWF) in partnership with ArcelorMittal, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, U.S. Forest Service, National Oceanic and Atmospheric Administration, and
Early coordination with permitting agencies resulted in an onsite meeting on March 26, 2019. Sarah Ogden represented the Indiana Department of Natural Resources (IDNR), Division of Fish and Wildlife. Jason Randolph represented the Indiana Department of Environmental Management (IDEM), and Barbara Anderson represented the US Army Corps of Engineers (USACE). We visited both the primary and secondary bank stabilization locations. No follow up correspondence was received from any of the agencies, so the following summarizes the discussions on site.

Items discussed included the necessity of armoring the toe of slope, fish restrictions, tree cutting restrictions, jurisdictional limits, and methods of upper bank stabilization. The IDNR jurisdiction is limited at the primary site to a few feet west of the water’s edge because while the floodway limit is 675 +/- 0.1 and the normal water levels are around 665, the slope is nearly 1:1 so the Floodway limits are only approximately 10 feet west of the water’s edge. At the secondary site on North Shore Drive the Floodway limit of 674.4 exceeds the top of bank height and, therefore, the entire project would be in DNR jurisdiction. IDEM and USACE jurisdictional limits are at the Ordinary High Water Mark (OHWM) which can be approximated at 670 on the primary site and top of bank on the secondary site.

The IDNR Construction in a Floodway permit will be required from the Division of Water. The permit applications get reviewed by the Division of Fish and Wildlife for detrimental impacts to fish, wildlife, and botanical resources. The Division of Fish and Wildlife generally requires mitigation for all trees over 10” in diameter at breast height (DBH) at five replacements trees for every tree removed in an urban area within the Floodway limits. Since the floodway area on the bank is fairly limited and required mitigation can be completed by planting new trees within the same floodway limits, it should be easy to accommodate the required tree mitigation on site at the toe of slope within the floodway elevation. The St. Joseph River is considered a salmonid stream. Generally the IDNR restricts when work can occur within the river to seasons outside of the spawning period for salmon and trout. In the St Joseph River there are spring and fall spawning salmonids present which usually means a permit condition restricting work in the stream from March 15 to June 15 and again from July 15 through November 30 without prior written approval from the Division of Fish and Wildlife. Exceptions can be made for several weeks, but should not be counted on when trying to time construction. A determination will have to be made on the percent of impact to the cross sectional area of the floodway. If the impact (fill) exceeds five percent of the cross sectional area, a floodway model will become necessary. Other than addressing the above items there should be no significant issues for obtaining the Floodway permit from IDNR.

The IDEM and USACE generally work together to issue 401 Water Quality Certification and a 404 Clean Water Act permit for the work below the OHWM. As long as clean fill is used, the fill is kept to a minimum, the fill does not exceed two cubic yards per lineal feet of stream bank, and the project is less than 500 feet, Nationwide Permit 13 would apply to these projects. Over 500 feet of bank stabilization or fill in excess of 2 cubic yards per lineal feet would require a pre-discharge notification to the USACE.

Project Schedule and Reporting

The feasibility project was started in December of 2018 with a goal of completing the study by May 2019. Monthly updates and public meetings held as scheduled. A LARE grant request to move this project into the design phase was submitted in January 2019 with the goal of continuing the project development and ultimately construction in 2020. Monthly updates are included in Appendix F.
13.0 References


APPENDIX A

Topographic Survey
Custom Soil Resource Report for
St. Joseph County, Indiana
St Joseph River bank Feasibility Study

January 4, 2019
The soil surveys that comprise your AOI were mapped at 1:12,000.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: St. Joseph County, Indiana
Survey Area Data: Version 22, Sep 7, 2018

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

Date(s) aerial images were photographed: Jun 3, 2015—Jul 4, 2015

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

<table>
<thead>
<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>AahAK</td>
<td>Abscota loamy sand, 0 to 2 percent slopes, occasionally flooded, brief duration</td>
<td>34.7</td>
<td>15.6%</td>
</tr>
<tr>
<td>TxCuC</td>
<td>Tyner loamy sand, 5 to 10 percent slopes</td>
<td>23.1</td>
<td>10.4%</td>
</tr>
<tr>
<td>UeqA</td>
<td>Urban land-Gilford complex, 0 to 1 percent slopes</td>
<td>3.6</td>
<td>1.6%</td>
</tr>
<tr>
<td>UgvA</td>
<td>Urban land-Tyner complex, 0 to 1 percent slopes</td>
<td>139.0</td>
<td>62.7%</td>
</tr>
<tr>
<td>UgvD</td>
<td>Urban land-Tyner complex, 10 to 18 percent slopes</td>
<td>0.9</td>
<td>0.4%</td>
</tr>
<tr>
<td>W</td>
<td>Water</td>
<td>19.1</td>
<td>8.6%</td>
</tr>
<tr>
<td>WcnAI</td>
<td>Waterford loam, 0 to 2 percent slopes, frequently flooded, long duration</td>
<td>1.3</td>
<td>0.6%</td>
</tr>
<tr>
<td><strong>Totals for Area of Interest</strong></td>
<td></td>
<td><strong>221.7</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit.
descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a soil series. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into soil phases. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A complex consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An association is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An undifferentiated group is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include miscellaneous areas. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.
St. Joseph County, Indiana

AahAK—Abscota loamy sand, 0 to 2 percent slopes, occasionally flooded, brief duration

Map Unit Setting
- National map unit symbol: 6qfj
- Elevation: 580 to 1,540 feet
- Mean annual precipitation: 34 to 40 inches
- Mean annual air temperature: 47 to 50 degrees F
- Frost-free period: 140 to 170 days
- Farmland classification: Not prime farmland

Map Unit Composition
- Abscota and similar soils: 80 percent
- Minor components: 20 percent
- Estimates are based on observations, descriptions, and transects of the map unit.

Description of Abscota

Setting
- Landform: Flood plains
- Landform position (two-dimensional): Backslope, shoulder, summit
- Down-slope shape: Convex
- Across-slope shape: Convex
- Parent material: Sandy alluvium

Typical profile
- A - 0 to 5 inches: loamy sand
- Bw - 5 to 14 inches: loamy sand
- C - 14 to 60 inches: sand

Properties and qualities
- Slope: 0 to 2 percent
- Depth to restrictive feature: More than 80 inches
- Natural drainage class: Moderately well drained
- Runoff class: Negligible
- Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
- Depth to water table: About 30 to 42 inches
- Frequency of flooding: Occasional
- Frequency of ponding: None
- Available water storage in profile: Low (about 4.0 inches)

Interpretive groups
- Land capability classification (irrigated): None specified
- Land capability classification (nonirrigated): 4s
- Hydrologic Soil Group: A
- Other vegetative classification: Trees/Timber (Woody Vegetation)
- Hydric soil rating: No

Minor Components

Cohoctah
- Percent of map unit: 10 percent
- Landform: Flood plains on till plains
**Landform position (two-dimensional):** Toeslope, footslope  
**Down-slope shape:** Linear  
**Across-slope shape:** Concave  
**Other vegetative classification:** Mixed/Transitional (Mixed Native Vegetation)  
**Hydric soil rating:** Yes

**Waterford**  
**Percent of map unit:** 7 percent  
**Landform:** Flood plains  
**Landform position (two-dimensional):** Toeslope, footslope  
**Down-slope shape:** Linear  
**Across-slope shape:** Concave  
**Other vegetative classification:** Trees/Timber (Woody Vegetation)  
**Hydric soil rating:** Yes

**Gravelton**  
**Percent of map unit:** 3 percent  
**Landform:** Depressions on flood plains, drainageways on flood plains  
**Landform position (two-dimensional):** Footslope, toeslope  
**Down-slope shape:** Linear  
**Across-slope shape:** Concave  
**Other vegetative classification:** Trees/Timber (Woody Vegetation)  
**Hydric soil rating:** Yes

**TxC—Tyner loamy sand, 5 to 10 percent slopes**

**Map Unit Setting**  
**National map unit symbol:** 6qfw  
**Elevation:** 570 to 1,540 feet  
**Mean annual precipitation:** 34 to 40 inches  
**Mean annual air temperature:** 47 to 50 degrees F  
**Frost-free period:** 140 to 170 days  
**Farmland classification:** Not prime farmland

**Map Unit Composition**  
**Tyner and similar soils:** 85 percent  
**Minor components:** 15 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Tyner**

**Setting**  
**Landform:** Outwash plains  
**Landform position (two-dimensional):** Backslope  
**Landform position (three-dimensional):** Side slope  
**Down-slope shape:** Linear  
**Across-slope shape:** Linear  
**Parent material:** Sandy outwash

**Typical profile**  
**Ap - 0 to 12 inches:** loamy sand
Bw1 - 12 to 20 inches: loamy sand
Bw2 - 20 to 41 inches: sand
Bw3 - 41 to 80 inches: sand

Properties and qualities
Slope: 5 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.7 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Minor Components
Coloma
Percent of map unit: 5 percent
Landform: Outwash plains, moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Bristol
Percent of map unit: 5 percent
Landform: Kames, outwash plains, outwash terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Osolo
Percent of map unit: 5 percent
Landform: Outwash terraces, outwash plains
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No
UeqA—Urban land-Gilford complex, 0 to 1 percent slopes

Map Unit Setting
National map unit symbol: nk2t
Elevation: 360 to 1,200 feet
Mean annual precipitation: 34 to 40 inches
Mean annual air temperature: 47 to 50 degrees F
Frost-free period: 140 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition
Urban land: 50 percent
Gilford and similar soils: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land
Setting
Landform: Outwash plains

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: Unranked

Description of Gilford
Setting
Landform: Depressions on outwash plains, drainageways on outwash plains
Landform position (two-dimensional): Footslope, toeslope
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Loamy outwash over sandy outwash

Typical profile
A - 0 to 14 inches: sandy loam
Bg - 14 to 32 inches: sandy loam
BCg - 32 to 38 inches: loamy sand
Cg - 38 to 80 inches: sand

Properties and qualities
Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 30 percent
Available water storage in profile: Moderate (about 6.1 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A/D
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: Yes

Minor Components

Sebewa
Percent of map unit: 5 percent
Landform: Depressions on outwash plains, depressions on till plains
Landform position (two-dimensional): Footslope, toeslope
Down-slope shape: Linear
Across-slope shape: Concave
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: Yes

Rensselaer
Percent of map unit: 3 percent
Landform: Depressions on outwash plains, depressions on till plains
Landform position (two-dimensional): Footslope, toeslope
Down-slope shape: Linear
Across-slope shape: Concave
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: Yes

Brady
Percent of map unit: 2 percent
Landform: Outwash terraces, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

UgvA—Urban land-Tyner complex, 0 to 1 percent slopes

Map Unit Setting
National map unit symbol: nk2s
Elevation: 570 to 1,540 feet
Mean annual precipitation: 34 to 40 inches
Mean annual air temperature: 47 to 50 degrees F
Frost-free period: 140 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition
Urban land: 50 percent
Tyner and similar soils: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land
Setting
Landform: Outwash plains
Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: Unranked

Description of Tyner
Setting
Landform: Outwash plains
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy outwash

Typical profile
Ap - 0 to 12 inches: loamy sand
Bw1 - 12 to 20 inches: loamy sand
Bw2 - 20 to 41 inches: sand
Bw3 - 41 to 80 inches: sand

Properties and qualities
Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.7 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Minor Components
Osolo
Percent of map unit: 5 percent
Landform: Outwash terraces, outwash plains
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Bristol
Percent of map unit: 3 percent
Landform: Outwash plains, outwash terraces
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Coloma
Percent of map unit: 2 percent
Landform: Outwash plains, moraines
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

UgvD—Urban land-Tyner complex, 10 to 18 percent slopes

Map Unit Setting
National map unit symbol: nk2z
Elevation: 570 to 1,540 feet
Mean annual precipitation: 34 to 40 inches
Mean annual air temperature: 47 to 50 degrees F
Frost-free period: 140 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition
Urban land: 50 percent
Tyner and similar soils: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the map unit.

Description of Urban Land
Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: Unranked

Description of Tyner

Setting
Landform: Outwash plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy outwash

Typical profile
Ap - 0 to 12 inches: loamy sand
Bw1 - 12 to 20 inches: loamy sand
Bw2 - 20 to 41 inches: sand
Bw3 - 41 to 80 inches: sand

Properties and qualities
Slope: 10 to 18 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.7 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Minor Components

Bristol
Percent of map unit: 5 percent
Landform: Outwash plains, outwash terraces, kames
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Coloma
Percent of map unit: 3 percent
Landform: Outwash plains, moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Osolo
Percent of map unit: 2 percent
Landform: Outwash plains, outwash terraces
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

W—Water

Map Unit Composition
Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Water
Interpretive groups
Land capability classification (irrigated): None specified
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

WcnAI—Waterford loam, 0 to 2 percent slopes, frequently flooded, long duration

Map Unit Setting
National map unit symbol: 6qg7
Elevation: 580 to 1,540 feet
Mean annual precipitation: 34 to 40 inches
Mean annual air temperature: 47 to 50 degrees F
Frost-free period: 140 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition
Waterford and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Waterford
Setting
Landform: Flood plains
Landform position (two-dimensional): Toeslope, footslope
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Loamy alluvium over sandy alluvium

Typical profile
- A - 0 to 8 inches: loam
- Bw - 8 to 41 inches: fine sandy loam
- 2C - 41 to 46 inches: loamy sand
- 3Ab - 46 to 50 inches: loamy sand
- 3Cb - 50 to 80 inches: gravelly coarse sand

Properties and qualities
- Slope: 0 to 2 percent
- Depth to restrictive feature: 40 to 70 inches to strongly contrasting textural stratification
- Natural drainage class: Somewhat poorly drained
- Runoff class: Very low
- Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
- Depth to water table: About 6 to 18 inches
- Frequency of flooding: Frequent
- Frequency of ponding: None
- Calcium carbonate, maximum in profile: 25 percent
- Available water storage in profile: Low (about 5.7 inches)

Interpretive groups
- Land capability classification (irrigated): None specified
- Land capability classification (nonirrigated): 5w
- Hydrologic Soil Group: A/D
- Other vegetative classification: Trees/Timber (Woody Vegetation)
- Hydric soil rating: Yes

Minor Components

Abscota
- Percent of map unit: 10 percent
- Landform: Flood plains
- Landform position (two-dimensional): Backslope, shoulder, summit
- Down-slope shape: Convex
- Across-slope shape: Convex
- Other vegetative classification: Trees/Timber (Woody Vegetation)
- Hydric soil rating: No

Gravelton
- Percent of map unit: 5 percent
- Landform: Depressions on flood plains, drainageways on flood plains
- Landform position (two-dimensional): Toeslope, footslope
- Down-slope shape: Linear
- Across-slope shape: Concave
- Other vegetative classification: Trees/Timber (Woody Vegetation)
- Hydric soil rating: Yes

Adrian, undrained
- Percent of map unit: 5 percent
- Landform: Depressions on outwash plains, depressions on till plains, depressions on lake plains
Landform position (two-dimensional): Toeslope, footslope
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: Yes
September 21, 1984

CHAMBER #006

Special Note

This note is being written in order to document the serious wash out that occurred in the spring of this year, 1984. This wash out was located in the steep part of the line located between Riverside Drive and the river. A tremendous amount of soil and gravel was washed into the river creating a rather impressive crater.

Dye Plumbing & Heating was awarded the contract to do the repair work. The cost was approximately $70,000.

Prints of this outfall can be found in the out fall section of the print file.

Morgan Peck has recommended that the section of this line between the Diversion Chamber and the repaired section be gunnited in order to avoid future trouble.
USGS Annual Statistics for the Nation

The statistics generated from this site are based on approved daily-mean data and may not match those published by the USGS in official publications. The user is responsible for assessment and use of statistics from this site. For more details on why the statistics may not match, click here.

USGS 04101500 ST. JOSEPH RIVER AT NILES, MI

Water Year | 00060, Discharge, cubic feet per second
--- | ---
1931 | 1,523
1932 | 2,356
1933 | 3,300
1934 | 1,946
1935 | 2,164
1936 | 2,371
1937 | 3,518
1938 | 3,352
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** No Incomplete data have been used for statistical calculation
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**USGS 04101500 ST. JOSEPH RIVER AT NILES, MI**

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**Output formats**
- HTML table of all data
- Tab-separated data
- Reselect output format

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00060, Discharge, cubic feet per second,

Maximum of daily mean values for each day for 10 - 11 years of record in, ft³/s (Calculation Period 2007-10-01 -> 2018-09-30)

Period-of-record for statistical calculation restricted by user

https://waterdata.usgs.gov/nwis/dvstat?referred_module=sw&site_no=04101500&por_04101500_70407=891426,00060,70407,1...
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</table>
Two residents, City of South Bend Council Member Tim Scott, and two representatives of the City, Sue Ellen Doudrick and Kara Boyles, attended the meeting hosted by John Richardson and Tom Estrem of Cardno.

The purpose of the project and funding sources were presented by Sue Ellen Doudrick for the City of South Bend who introduced Tim Scott. Mr. Scott presented a brief review of the history of the area and the previous ideas about the river walk proposed along this reach. One resident spoke up about the river walk and was relieved that it was not part of this project study.

John provided a description of the LARE program and his overall description of the project as well as other projects constructed or under design along the river in South Bend. John also presented his thoughts on the project area and what he perceived as the problem with a downstream riffle setting up potential erosion first on the right bank and then on the left bank at the study site. He described the profile and cross sections of the river in the reach and the elevations of the eroding bank and river thalweg. He talked about the dimensions of the artificial bar thought to be created from sediment accumulating downstream of the CSO at Leland Avenue and Riverside Drive. He also mentioned the water main along Riverside Drive that was threatened by further erosion and the risk of a no action alternative.

One of the residents present mentioned that the CSO collapsed 10-20 years ago and had to be repaired in an emergency which may have contributed to the bricks in the bar that have been witnessed.

Mr. Scott presented his thoughts on the project vicinity from the view of a fly fisherman who frequently fishes in this reach of the river. He talked about riffles and pools in the reach relative to the CSO #6 at Leland and how he frequently fishes in the area of the study. Mr. Scott thought it might be appropriate to lower the bar created by collapsed CSO from 1-3 feet to allow the water to flow over the bar during low water instead of being deflected to the right downstream bank at Iroquois. He did not want to lose the fishing potential from the bar area.

John spoke about other projects Cardno has completed covering potential solutions for this embankment. Potential solutions included rock toe with soil lifts, sheet pile, riprap and gabion baskets coupled with bioengineering above the flood limits. John and Mr. Scott got into a conversation about potential for a large J-Hook structure in the reach to bring the thalweg back to the center of the channel.

One resident inquired about what permits would be required and who would obtain them. John responded with a conversation about DNR, Corps and IDEM permit requirements and that it would be included in the design stage of the project. Sue Ellen ended the meeting thanking those who attended and asking them to bring their neighbors to the next meeting.
Meeting Notes
Public Meeting Number 2 – February 20, 2019

Prior to the meeting one of the landowners who would be affected called me to tell me he could not make the meeting but asked me to explain what was happening. After describing the project to him he was satisfied that the project would be good for him and asked me to keep up the communication so that he could support the project.

Five adjacent residents involved in the project attended the meeting along with Sue Ellen Doudrick and Alicia Czarnecki representing the City of South Bend and John representing Cardno.

John presented three options for consideration along 500 feet of embankment necessary to stabilize this reach with rough cost estimates for each option:

1) Riprap the entire embankment - approximately $750,000
2) Riprap with sheet pile landward of the riprap - approximately 1.2 million
3) Riprap with geo-turf on the upper section above the OHWM - approximately $300,000

We had a lively discussion about final vegetation on the upper bank with John presenting his choice of prairie grasses known for their extensive rooting ability and the residents present desiring trees as currently exist on stable portions of the bank. It was clear that the residents preferred trees over prairie grass for a final vegetative cover.

Sue Ellen brought up the fact that LARE staff had been enthusiastic about using the Bio-D blocks used at the St Mary’s project downstream years earlier because of the vegetation that has since filled the embankment. I explained that the cost of that treatment over 70 feet (about $70,000 installed) would likely be unrealistic at this site, which is seven times the distance on an outside embankment with a deeper thalweg. This type of treatment would exceed $500,000.00 at the subject site.

Sue Ellen suggested considering a less expensive alternative to the suggested fixes above, with a riprap toe only to stabilize the embankment and allow the upper bank to heal itself. There was no argument from the residents present about pursuing that as a feasible alternative and so Cardno agreed to remove the sheet pile alternative from the report and replace it with a riprap toe only option to be presented at the next meeting.

In summary, the residents seemed in favor of continuing on with no one expressing any opposition to the feasibility study and potential designs.
The meeting was attended by five owners and adjacent residents, Sue Ellen Doudrick and Alicia Czarnecki representing the City of South Bend, and City Council member Tim Scott. A summary of the project funding, goals and objectives was given by Sue Ellen Doudrick followed by John presenting the project status and the next steps.

John presented the costs of the potential alternatives again:

1) Gravel bar removal (1 ft of material or about 2200 CYS) – $105,000
2) Riprap the entire embankment - approximately $800,000
3) Riprap with geo-turf on the upper section above the OHWM - approximately $280,000
4) Riprap toe of slope only – $220,000

One of the residents provided an impassioned plea to replant trees on the embankment to which the other residents agreed. All tended to agree that the project was worth pursuing even if only the toe of slope could be stabilized so that more trees would not be lost.

Tim Scott inquired again about the status of removing the bricks that form a bar in the river downstream of the CSO #6 at Leland Avenue which forces the current into the right downstream bank at Iroquois and then deflects to the left downstream bank at the primary project area. John explained that even though he felt strongly about this artificial riffle setting up the erosion issues at both sites, the regulators and Rod Edgell were not enthusiastic about supporting the idea of sediment bar removal or even agreeing that it was part of the problem with removal of spawning habitat being the biggest concern. Tim countered that the spawning he has observed as a frequent fisherman in the reach is not on the “brick bar” but upstream in the finer sediments above the CSO. He felt strongly that the brick bar was a major concern and should be removed or at least addressed again in a design study. He was asked to draft a letter stating his thoughts on the gravel bar for the study.

John asked that the residents take and pass around his card to neighbors to send him letters or emails of support for the City to continue with the design phase.
APPENDIX

REGION 5 MODEL RESULTS
Bank Stabilization

If estimating for just one bank, put "0" in areas for Bank #2.

Please select a soil textural class:

- Sands, loamy sands
- Sandy loam
- Fine sandy loam
- Loams, sandy clay loams, sandy clay
- Silt loam
- Silty clay loam, silty clay
- Clay loam
- Clay
- Organic

Please fill in the gray areas below:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Bank #1</th>
<th>Bank #2</th>
<th>Example</th>
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</thead>
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<td>Height (ft)</td>
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<td>Soil Weight (tons/ft³)</td>
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<td>Soil N Conc (lb/lb soil)**</td>
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** If not using the default values, users must provide input (in red) for Total P and Total N soil concentrations

*Lateral Recession Rate (LRR) is the rate at which bank deterioration has taken place and is measured in feet per year. This rate may not be easily determined by direct measurement. Therefore best professional judgement may be required to estimate the LRR. Please refer to the narrative descriptions in Table 1.

Estimated Load Reductions

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<th>Example</th>
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<td>Nitrogen Load Reduction (lb/yr)</td>
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* BMP efficiency values should be between 0 and 1, and 1 means 100% pollutant removal efficiency.
St. Joseph River Bank
Stabilization Engineering
Feasibility Study: Riverside
Drive at Yukon Street,
South Bend, Indiana

APPENDIX

ETR REQUEST RESULTS
February 15, 2019

John Richardson
Sr. Consultant, Practice Lead
Principal - Wetlands Science
CARDNO
708 Roosevelt Road
Walkerton, Indiana 46574

Dear John Richardson:

I am responding to your request for information on the endangered, threatened, or rare (ETR) species, high quality natural communities, and natural areas for the St. Joseph River Bank Stabilization project at Riverside Drive at Yukon, St. Joseph County, Indiana. The Indiana Natural Heritage Data Center has been checked and there are no ETR species and significant areas documented within 0.5 mile of the project area.

The information I am providing does not preclude the requirement for further consultation with the U.S. Fish and Wildlife Service as required under Section 7 of the Endangered Species Act of 1973. If you have concerns about potential Endangered Species Act issues you should contact the Service at their Bloomington, Indiana office.

U.S. Fish and Wildlife Service
620 South Walker St.
Bloomington, Indiana 47403-2121
(812)334-4261

At some point, you may need to contact the Department of Natural Resources' Environmental Review Coordinator so that other divisions within the department have the opportunity to review your proposal. For more information, please contact:

Department of Natural Resources
Attn: Christie Stanifer
Environmental Coordinator
Division of Fish and Wildlife
402 W. Washington Street, Room W273
Indianapolis, IN 46204
(317)232-8163
Please note that the Indiana Natural Heritage Data Center relies on the observations of many individuals for our data. In most cases, the information is not the result of comprehensive field surveys conducted at particular sites. Therefore, our statement that there are no documented significant natural features at a site should not be interpreted to mean that the site does not support special plants or animals.

Due to the dynamic nature and sensitivity of the data, this information should not be used for any project other than that for which it was originally intended. It may be necessary for you to request updated material from us in order to base your planning decisions on the most current information.

Thank you for contacting the Indiana Natural Heritage Data Center. You may reach me at (317)232-3517 if you have any questions or need additional information.

Sincerely,

Teresa L. Clark
Indiana Natural Heritage Data Center
### Indiana County Endangered, Threatened and Rare Species List

**County:** St. Joseph

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*Indiana Natural Heritage Data Center*

*Division of Nature Preserves*

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### Indiana County Endangered, Threatened and Rare Species List

**County:** St. Joseph

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<td>Meadow Spike-moss</td>
<td>WL</td>
<td>G5</td>
<td>S1</td>
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<tr>
<td>Silene regia</td>
<td>Royal Catchfly</td>
<td>ST</td>
<td>G3</td>
<td>S2</td>
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<tr>
<td>Sorbus decora</td>
<td>Northern Mountain-ash</td>
<td>SX</td>
<td>G5</td>
<td>SX</td>
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<td>Sparganium androcladum</td>
<td>Branching Bur-reed</td>
<td>ST</td>
<td>G4G5</td>
<td>S2</td>
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<tr>
<td>Strophostyles leiosperma</td>
<td>Slick-seed Wild-bean</td>
<td>ST</td>
<td>G5</td>
<td>S2</td>
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<tr>
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<td>False Asphodel</td>
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<td>G5</td>
<td>S2</td>
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<td>Marsh Arrow-grass</td>
<td>SR</td>
<td>G5</td>
<td>S2</td>
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<td>Utricularia cornuta</td>
<td>Horned Bladderwort</td>
<td>ST</td>
<td>G5</td>
<td>S2</td>
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<tr>
<td>Utricularia minor</td>
<td>Lesser Bladderwort</td>
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<td>G5</td>
<td>S1</td>
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<tr>
<td>Utricularia purpurea</td>
<td>Purple Bladderwort</td>
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<tr>
<td>Vaccinium oxyccos</td>
<td>Small Cranberry</td>
<td>ST</td>
<td>G5</td>
<td>S2</td>
<td></td>
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<tr>
<td>Valeriana uliginosa</td>
<td>Marsh Valerian</td>
<td>SE</td>
<td>G4</td>
<td>S1</td>
<td></td>
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<tr>
<td>Valerianella chenopodiifolia</td>
<td>Goose-foot Corn-salad</td>
<td>SE</td>
<td>G4</td>
<td>S1</td>
<td></td>
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<tr>
<td>Viburnum cassinoides</td>
<td>Northern Wild-raisin</td>
<td>SE</td>
<td>G5T5</td>
<td>S1</td>
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<tr>
<td>Viola primulifolia</td>
<td>Primrose-leaf Violet</td>
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<td>G5</td>
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<td>Wolffia gladiata</td>
<td>Sword Bogmat</td>
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<td>G5</td>
<td>S1</td>
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<td>Xyris difformis</td>
<td>Carolina Yellow-eyed Grass</td>
<td>ST</td>
<td>G5</td>
<td>S2</td>
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</tbody>
</table>

### High Quality Natural Community

**Forest - floodplain wet-mesic**
- Wet-mesic Floodplain Forest: SG | G3? | S3

**Forest - upland dry-mesic Northern Lakes**
- Northern Lakes Dry-mesic Upland Forest: GNR | S1

**Forest - upland mesic Grand Prairie**
- Grand Prairie Mesic Upland Forest: GNR | S1

**Forest - upland mesic Northern Lakes**
- Northern Lakes Mesic Upland Forest: GNR | S1

**Lake - pond**
- Pond: SG | GNR | SNR

**Prairie - wet**
- Wet Prairie: SG | G3 | S1

**Wetland - fen**
- Fen: SG | G3 | S3

**Wetland - flat muck**
- Muck Flat: SG | G2 | S2

**Wetland - marsh**
- Marsh: SG | GU | S4

---

**Footnotes:**
- **Fed:** LE = Endangered; LT = Threatened; C = candidate; PDL = proposed for delisting
- **State:** SE = state endangered; ST = state threatened; SR = state rare; SSC = state species of special concern;
- **GRANK:** Global Heritage Rank: G1 = critically imperiled globally; G2 = imperiled globally; G3 = rare or uncommon globally; G4 = widespread and abundant globally but with long term concerns; G5 = widespread and abundant globally; G? = unranked; GX = extinct; Q = uncertain rank; T = taxonomic subunit rank
- **SRANK:** State Heritage Rank: S1 = critically imperiled in state; S2 = imperiled in state; S3 = rare or uncommon in state; G4 = widespread and abundant in state but with long term concern; G5 = widespread and abundant in state; G? = unranked; GX = extinct; Q = uncertain rank; T = taxonomic subunit rank

**Indiana Natural Heritage Data Center**
- Division of Nature Preserves
- Indiana Department of Natural Resources

This data is not the result of comprehensive county surveys.
### Indiana County Endangered, Threatened and Rare Species List

**County:** St. Joseph

<table>
<thead>
<tr>
<th>Species Name</th>
<th>Common Name</th>
<th>FED</th>
<th>STATE</th>
<th>GRANK</th>
<th>SRANK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wetland - meadow sedge</td>
<td>Sedge Meadow</td>
<td>SG</td>
<td>G3?</td>
<td>S1</td>
<td></td>
</tr>
<tr>
<td>Wetland - swamp forest</td>
<td>Forested Swamp</td>
<td>SG</td>
<td>G2?</td>
<td>S2</td>
<td></td>
</tr>
<tr>
<td>Wetland - swamp shrub</td>
<td>Shrub Swamp</td>
<td>SG</td>
<td>GU</td>
<td>S2</td>
<td></td>
</tr>
</tbody>
</table>

**State:** SE = state endangered; ST = state threatened; SR = state rare; SSC = state species of special concern; SX = state extirpated; SG = state significant; WL = watch list

**GRANK:** Global Heritage Rank: G1 = critically imperiled globally; G2 = imperiled globally; G3 = rare or uncommon globally; G4 = widespread and abundant globally but with long term concerns; G5 = widespread and abundant globally; G7 = unranked; GX = extinct; Q = uncertain rank; T = taxonomic subunit rank

**SRANK:** State Heritage Rank: S1 = critically imperiled in state; S2 = imperiled in state; S3 = rare or uncommon in state; G4 = widespread and abundant in state but with long term concern; SG = state significant; SH = historical in state; SX = state extirpated; B = breeding status; S? = unranked; SNR = unranked; SNA = nonbreeding status unranked
St. Joseph River Bank Stabilization Engineering Feasibility Study: Riverside Drive at Yukon Street, South Bend, Indiana

APPENDIX F
MONTHLY UPDATES
December 21, 2018

Subject: Property Access for Riverbank Study

Dear Property Owner:

The City of South Bend has contracted with Cardno, Inc. to produce an Engineering Feasibility Study that will examine alternative methods to stabilize the eroding embankment along the east side of Riverside Drive near Yukon Street.

Based on the study, a final design will be determined in late 2019 with potential construction in 2020, pending availability of future grant funding. The study will be funded in part by a grant from the Indiana Department of Natural Resources Lake and River Enhancement (LARE) program, with matching funds provided by the City of South Bend. There will be no cost to you as an adjacent property owner for the study or resulting improvements.

Our team will be accessing your property along the riverbank during this study for information gathering purposes. You might have already seen surveyors on the site taking topographic data. This is needed to create a scaled drawing of the problem areas.

During the study, three public meetings will be held to update the adjacent property owners on the process. **All meetings will start at 5:30 p.m. at the Near Northwest Neighborhood, Inc. office, located at 1007 Portage Avenue.** Our team will be available until 7:30 p.m. to address individual concerns. **The meeting dates are:**

- **Wednesday, January 16,**
- **Wednesday, February 20,**
- **Wednesday, April 17.**

If you have any concerns that you’d like to share about property access or a potential solution to the erosion, please attend these meetings or contact me directly at one of the numbers listed below. Thank you in advance for your cooperation.

Sincerely,

John B. Richardson  
Senior Consultant  
Cardno, Inc.  
Direct Line: 574.586.4218  
Mobile 574.229.8750

CC: Alicia Czarnecki, City of South Bend
January 04, 2019

Alicia Czarnecki  
Project Engineer  
City of South Bend  
Department of Public Works

Re: Monthly LARE update  
St Joseph River Bank Stabilization Feasibility Study

Alicia:

This letter serves as our first official monthly update and will continue to be sent monthly with our invoices, if any, and other documents showing steady progress on the site. Thank you for officially awarding the project to Cardno, Inc. If you have any concerns about project progress or activity please contact me at any time using the numbers below.

To date, we subcontracted survey work to Territorial Engineering to obtain an accurate topography of the bank as well as the river bottom in the vicinity of the project site. The topographic survey results are attached to this update.

We sent out letters to 32 property owners who have property adjacent to either the east or west sides of the river in the vicinity of the project. The letters introduce them to the project and invite them to a series of open house meetings at the Near Northwest Side Neighborhood, Inc., Mary Grace room. The letter is attached for your records.

During the next month, we will be preparing presentation boards showing different stabilization methods used along the St Joseph River in St Joseph County, as well as some other project sites in the Midwest, to present at the first meeting on January 16th. Following the meeting, we will be having a design meeting in house to start drafting alternative concept plans to fit this site. We hope to present the actual concept drawings at the scheduled February meeting.

Please let me know if you have any additional questions or concerns.

Sincerely,

John B. Richardson,  
Cardno, Inc.  
Direct Line: 574-586-4218; Mobile 574-229-8750

CC: Rod Edgell, LARE (via email)  
Sue Ellen Doudrick  
Cardno File 17x607100
February 01, 2019

Alicia Czarnecki  
Project Engineer  
City of South Bend  
Department of Public Works

Re: Monthly LARE update  
St Joseph River Bank Stabilization Feasibility Study

Alicia:

We held our first public meeting on January 16th, 2018 at the Near Northwest Side Neighborhood Association, Mary Grace room. While it was not well attended the two adjacent residents and the City council member that were there were very helpful in their discussions about the river. Of particular note were the comments received on the river structure from a fisherman’s view and on the history of the combined sewer outfall upstream.

I have summarized my thoughts to date on the project in the one page attachment to this monthly update. Please review this attachment and let me know if you have any issues with where we are headed with this study.

We have another open house meeting at the Near Northwest Side Neighborhood Association, Mary Grace room on Wednesday February 20th from 5:30 to 7:30 pm. It is our goal to present three concept drawings at this meeting.

I have also attached our January invoice. Please let me know if you have any questions or concerns to date.

Sincerely,

John B. Richardson,  
Cardno, Inc.  
Direct Line: 574-586-4218; Mobile 574-229-8750

Attachments: Invoice  
Interim Feasibility Summary

CC: Rod Edgell, LARE (via email)  
Sue Ellen Doudrick  
Cardno File 17x607100
March 5, 2019

Alicia Czarnecki  
Project Engineer  
City of South Bend  
Department of Public Works

Re: Monthly LARE update  
St Joseph River Bank Stabilization Feasibility Study

Alicia:

We held our second public meeting on February 20, 2019 at the Near Northwest Side Neighborhood Association, Mary Grace room. All six of the property owners whose land the potential project impacts were sent a personal invitation the week prior to the meeting. Five of the owners attended the meeting and 6th one called me prior to the meeting to let me know he supported the project. The meeting turned into a discussions about what type of project was affordable and practical from the city’s standpoint as none of the owners demanded a certain type of project; however, they were all in concurrence that something be done.

Of note: at the meeting it was in general agreement that we remove sheet pile installation as one of the options in the feasibility study due to cost. The replacement alternative would be a simple riprap toe of slope protection from further erosion, and the project would not address the upper bank erosion that has occurred above flood limits.

We have a scheduled early coordination permit meeting with representatives from IDNR, IDEM and US Army Corps of Engineers on Tuesday March 26th at the project site. We will update the draft feasibility report prior to that meeting. Another open house meeting at the Near Northwest Side Neighborhood Association, Mary Grace room is scheduled for Wednesday April 17th from 5:30 to 7:30 pm. It is our goal to present the final three concepts with construction cost estimates at this meeting.

I have also attached our February invoice. Please let me know if you have any questions or concerns to date.

Sincerely,

John B. Richardson,  
Cardno, Inc.  
Direct Line: 574-586-4218; Mobile 574-229-8750

Attachments: February Invoice

CC: Rod Edgell, LARE (via email)  
Sue Ellen Doudrick  
Cardno File 18X465600
April 5, 2019

Alicia Czarnecki  
Project Engineer  
City of South Bend  
Department of Public Works

Re: Monthly LARE update  
St Joseph River Bank Stabilization Feasibility Study

Alicia:

During March we held our early coordination permit meeting with representatives from IDNR, IDEM and US Army Corps of Engineers at the project site. We discussed the options available at the site as well as the erosion occurring off North Shore Drive across from the combined sewer overflow at the Leland Avenue and Riverside Drive intersection. We have received no written comments from agencies from that visit yet, but the general consensus was that both projects could be permitted. There was not much support for removal of the gravel bar at the outfall; however, Jason Randolph from IDEM did say he would consider permitting partial removal.

There was a discussion with Rod Edgell about incorporating the Northshore Drive erosion into the design study. Cardno will include information about the Northshore Drive erosion in the current feasibility study so that it does get addressed in the design phase. Rod responded later that the LARE application for design funding was adequate to allow for this design to occur. There is no parcels plotted along the river in this reach so it is assumed that the City of South Bend owns the frontage along the river on that side. Therefore, landowner permission is not required for that project.

Our final open house meeting for the feasibility project will occur at the Near Northwest Side Neighborhood Association, Mary Grace room on Wednesday April 17th from 5:30 to 7:30 pm. It is our goal to present the final three concepts with construction cost estimates at this meeting. During the final two weeks of April it is our goal to produce the final draft of the feasibility study and present it to the City and the LARE program for final editing with the next monthly update.

I have attached our March invoice. Please let me know if you have any questions or concerns.

Sincerely,

John B. Richardson,  
Cardno, Inc.  
Direct Line: 574-586-4218; Mobile 574-229-8750

Attachments: March Invoice

CC: Rod Edgell, LARE (via email)  
Sue Ellen Doudrick  
Cardno File 18X465600
May 3, 2019

Alicia Czarnecki
Project Engineer
City of South Bend
Department of Public Works

Re: Monthly LARE update
     St Joseph River Bank Stabilization Feasibility Study

Alicia:

Our final public meeting was held on April 17th. Five of the landowners or adjacent residents attended the meeting. The two issues raised at the meeting that we spent the most time on were the fact that residents want to see trees on the final restoration plan and that removal of the bar downstream of CSO #6 should remain in the report for further study.

The draft feasibility report has been completed and is being delivered via email along with this update. Also attached to the email with this update is an invoice for April work on the project.

Upon your review and per the contract, I will send two hard copies of the draft report to your office and two to Mr. Edgell at the LARE office for review. Upon receipt of written comments on the draft from both your office and the LARE office we will complete the final design report. Please let me know if you have any questions or concerns.

Sincerely,

John B. Richardson,
Cardno, Inc.
Direct Line: 574-586-4218; Mobile 574-229-8750

Attachments: April Invoice

CC: Rod Edgell, LARE (via email)
    Sue Ellen Doudrick
    Cardno File 18X465600
About Cardno
Cardno is an ASX-200 professional infrastructure and environmental services company, with expertise in the development and improvement of physical and social infrastructure for communities around the world. Cardno’s team includes leading professionals who plan, design, manage, and deliver sustainable projects and community programs. Cardno is an international company listed on the Australian Securities Exchange [ASX:CDD].

Cardno Zero Harm
At Cardno, our primary concern is to develop and maintain safe and healthy conditions for anyone involved at our project worksites. We require full compliance with our Health and Safety Policy Manual and established work procedures and expect the same protocol from our subcontractors. We are committed to achieving our Zero Harm goal by continually improving our safety systems, education, and vigilance at the workplace and in the field. Safety is a Cardno core value and through strong leadership and active employee participation, we seek to implement and reinforce these leading actions on every job, every day.

www.cardno.com