

# Bridge Street Basin Combined Sewer Backup and Major Street Flooding Recommended Approach

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DATE: April 25, 2008

FILE CODE: BS.07.02

## Executive Summary

On October 1, 2007, the City of Omaha (City) submitted a Substantively Complete Long Term Control Plan (SCLTCP) to the Nebraska Department of Environmental Quality (NDEQ). The overall cost for this program is estimated at \$1.5 billion (2006 dollars). A portion of these funds is planned for the separation of combined sewers, which can reduce sewer backup (SB) and street flooding (SF) problems. In addition to the sewers identified to be separated as part of the SCLTCP, the City plans to continue its on-going sewer separation program (known as the RNC Program) that is intended to specifically address SBs into basements.

An investigation was completed for the Bridge Street (BS) Basin to evaluate approaches to addressing SB and SF problems known to date within the Basin. This Technical Memorandum (TM) provides a summary of the data to allow the City to clearly identify the separation plan for the BS Basin as it relates to both the combined sewer overflow (CSO) and RNC programs and also to allow the City to establish a preliminary cost for these two programs. In addition to those costs, the information compiled provides the City with the following:

- Information on reported sewer-related problems, if any, that will require additional investigation;
- Identification of known areas, if any, of major street flooding; and
- A basin map that indicates the areas that will be separated upon completion of the proposed work.

Table ES-1 summarizes the costs for sewer separation included in the SCLTCP for the BS Basin.

**Table ES-1. Summary of SCLTCP, RNC Program, and Additional Sewer Separation Costs**

<b>Location</b>	<b>Estimated Costs (\$)</b>
SCLTCP Projects	6,793,000
Current RNC Program (less any overlap with the SCLTCP)	None Identified
Additional Sewer Separation Areas	None Identified
<b>TOTAL</b>	<b>6,793,000</b>

## Special Conditions

There are no reported major street flooding issues that were left unresolved with projects designated for sewer separation to relieve sewer backup issues in this TM.

There are no other special issues related to the BS Basin.

## Purpose

The purpose of this Technical Memorandum (TM) is to identify methods for addressing the sewer backup (SB) and major street flooding (SF) problems within the combined sewer overflow (CSO) basins. This TM addresses only those SB/SF problems that have been reported to date and that are the result of storm events and related combined sewer overloading. This TM includes a description of areas identified for sewer separation as part of the CSO controls proposed in the Substantively Complete Long Term Control Plan (SCLTCP).

Potential solutions to address the SB/SF problems areas may include:

- Sewer Separation
  - City-identified sewer separation study areas for the RNC program
  - Sewer separation as part of the CSO Control Program
  - Basin Consultant (BC)-identified sewer separation study areas to be added to the existing RNC program
  - Additional sewer separation projects required for the CSO program that do not provide sewer backup relief
- Backflow prevention valves
- Green solutions (stormwater management projects)
- Hybrid projects (projects that include both sewer separation and other CSO technologies)

This TM discusses the relative impact, if any, that the proposed projects have on CSO volume and rates.

Verification and validation of identified problems will be done as part of the preliminary design stage for sewer separation. If at any time prior to or during design of RNC projects further investigation of the identified SB/SF problems shows that inconsistent and/or significant problems cannot be validated, then the proposed separation project area may be modified or eliminated.

## Project Background

The City of Omaha (City) contains over 1,950 miles of sanitary sewers. In the eastern portion of the City, most of the storm and sanitary sewers are combined. This combined sewer system (CSS) area encompasses approximately 51 square miles in two watersheds: the Missouri River and the Papillion Creek watersheds. The entire CSS area has been divided into ten basins for evaluation as part of the Omaha CSO Program. The Bridge Street (BS) Basin is one of these basins that are being simultaneously evaluated by a separate engineering team. The overall goal of data analysis is to develop a Final Basin Plan, which will be incorporated into the Program Long Term Control Plan (LTCP) for the City's CSS.

## Review of BS Sewer Backup and Street Flooding Issues

In addition to the implementation of the City's LTCP, the City intends to minimize the SB/SF problems in the combined sewer service area through the continuation of its Sewer Separation/Sewer Relief program, referred to as the RNC program, and additional separation projects that are not part of the CSO program. The *Bridge Street Basin – Sewer Backup and Street Flooding Existing Conditions TM* (December 20, 2007) documented current knowledge of sewer backup and street flooding issues in the basin. Data was gathered from the City of Omaha's Geographic Information System (GIS), previous sewer reports and RNC projects completed to date.

In order to get a more complete picture of the historical SB/SF problems, reported SB and SF problems are illustrated on the Figures in the Attachments. The SB/SF problems have been sorted into three categories. The categories are listed and defined below:

1. Flood of 1999: A problem labeled in this manner indicates that it was reported as a result of the August 6, 1999 flood. This was a large storm and exceeded the level of protection that that City can economically afford to resolve with sewer improvement projects. Therefore, these problems may well be legitimate SB and SF issues; however, no sewer improvement projects will be recommended solely because of their existence.
2. Reports not Addressed to Date: A problem labeled in this manner indicates that it appears to be unresolved and not addressed by an already completed RNC project. Problems classified in this manner (and located in clusters) indicate areas in need of additional sewer improvement projects. Most of these reports in the BS Basin that fall into this category are isolated incidents. These outliers are discussed in more detail later in this TM.
3. Reports Addressed to Date: A problem labeled in this manner indicates that it appears to have already been resolved by a completed RNC project. Problems classified in this manner indicate that the surrounding area, most likely, does not need additional sewer improvement projects.

Twenty-six problems in the BS Basin were recorded. These are listed in a table in the Attachments and are graphically depicted in the figures in the Attachments. A general pattern can be observed from the complaints. There is a concentration of complaints reported in the area of 36<sup>th</sup> and State Streets. The remaining complaints are scattered throughout the basin and appear to be one-time reports without clear and consistent problems. They were further investigated with a windshield survey that is discussed later in this TM.

The City has completed one combined sewer separation project near the BS Basin. This project (RNC Project Number 5632) was located on 36<sup>th</sup> and State Streets and was constructed in 1999/2000. Approximately 75 percent of the complaints reported were located near this sewer project; they were also reported prior to the completion of the project. Since there have not been any sewer backup or street flooding complaints in this area following completion of the project, it is assumed that this project addressed the concentration of complaints in this area.

## Categorization for Addressing SB/SF Issues

The categories for addressing the BS Basin SB/SF issues are identified in this section. These categories represent the progression of analysis to minimize/eliminate the SB/SF issues.

**Category 1 - Completed RNC/Sewer Improvement Projects:** This category includes all the SB/SF issues that have been addressed to date by work already completed or currently under construction in the BS Basin. SB/SF issues in this category have been addressed through City RNC projects or various other sewer separation projects that were completed prior to the start of the RNC program in 1990. These older projects were classified as SOS, STS, or with other various identifiers. These completed projects can be further categorized into either “separation” or “conveyance relief” projects as defined below:

Separation - Projects that separated combined sewers within the right-of-way by either: (1) providing a dedicated sanitary sewer that conveys the sanitary flows downstream, or, (2) providing a dedicated storm sewer to convey the storm sewer flows downstream, leaving the existing sewer for sanitary flows only. Separation within the right-of-way does not include separation of any private sewer laterals or taps.

Conveyance Relief - Projects that provided relief for the existing combined system to address SB/SF issues. In most cases, these projects provided a new sewer that gave relief to the existing combined system. The new sewers were sized to provide only the additional required storm flow capacity.

**Category 2 - Planned Sewer Separation in Existing City RNC Program:** This category includes all the SB/SF issues that were previously identified by the City to be addressed by planned sewer separation projects through the RNC program. A portion of the planned RNC projects provide water quality benefits and are listed under the CSO program. The summary data and costs for such projects are included under Category 4 or 5.

**Category 3 - Additional Sewer Separation Projects, Identified by Basin Consultant, and Not Part of CSO Program:** This category includes all the SB/SF issues that have been proposed to be addressed by additional sewer separation projects identified in this TM. The projects in this category are intended solely to address SBs and do not provide water quality benefits for the receiving streams.

**Category 4 - Sewer Separation included in the Substantively Complete LTCP:** This category includes all the SB/SF issues that have been proposed to be addressed by sewer separation through the CSO program as part of the SCLTCP. These projects can be shown to produce water quality benefits for the receiving streams.

**Category 5 -Additional Sewer Separation Projects, Added to the CSO Program:** This category includes the following:

- Additional combined sewer separation projects beyond the areas identified in the SCLTCP because they provide water quality benefits; and
- Projects previously listed under Category 2 that, because they have been determined to provide water quality benefits, have been reclassified to be a part of the CSO LTCP.

## Costs

Costs for projects in the five categories, where applicable, are presented in the following sections. The costs for Category 1 projects were based on completed construction costs. The costs for projects in Categories 2 through 5 are based on engineer's estimates. The project costs presented in this TM were taken from separation costs identified in the *Bridge Street Basin Implementation Plan TM* (October 18, 2007). The pipe segments from each project area were taken out of the previously completed separation cost estimate and tabulated. They include:

- a) construction cost;
- b) 67% soft cost markup per page 1 of the Cost Tool;
- c) 30% contingency and inflation factor; and
- d) the addition of Metropolitan Utilities District (MUD) costs for the length of sanitary sewer reconstruction included in the study area.

### Category 1 – Completed RNC/Sewer Separation Projects.

The City has been implementing a sewer separation program since 1990 for some portions of the combined sewer area of the City, including one area near the BS Basin (this project is identified in the *Minne Lusa Basin Combined Sewer Backup and Major Street Flooding Recommended Approach TM*). These projects have generally been implemented in order of importance as determined in previous reports. The sewer separation projects identified as RNC projects have been designed to relieve the existing combined system and not necessarily to achieve complete sewer separation.

In general, the City believes that in the areas of RNC projects, the sewer backup and street flooding problems have been addressed. Evidence of this can be found by comparing the dates of the reported problems in the area to the dates of the RNC projects. In general, there are few, if any, complaints in the RNC project areas after the completion of the RNC projects.

*There are no City of Omaha Completed RNC/Sewer Separation projects identified as being recently completed in the BS Basin.*

### Category 2 – Planned Sewer Separation in Existing City RNC Program

*The City has not identified any planned sewer separation in the existing City RNC Program for the BS Basin.*

### Category 3 – Additional Sewer Separation Projects, Identified by Basin Consultant, and Not Part of CSO Program

There do not appear to be any significant SB/SF problem areas that have not been addressed either by past sewer separation projects or proposed sewer separation projects identified in the Substantively Complete LTCP. *Therefore, there are no additional sewer separation projects proposed.*

## Category 4 – Sewer Separation Included in the Substantively Complete LTCP

The SCLTCP identified separation and conveyance improvements and lift station improvements as the CSO Control technologies to eliminate CSO Outfall 103 in the BS Basin. These projects are summarized below.

### Separation – 36<sup>th</sup> Street from McKinley to State Streets (SA-103-1)

This project consists of constructing new storm sewer and inlets along 36<sup>th</sup> Street between McKinley Street on the north and State Street on the south. It involves approximately 2,280 feet of new storm sewer, 16 inlets to be abandoned and installation of 14 new inlets. The existing gravel road has inlets which drain to the existing combined sewer that will need to be removed and the sewer lines will need to be plugged.

### Conveyance Improvements – McKinley Street Trunk Sewer (SA-103-2)

The proposed conveyance improvements include constructing a new sanitary sewer parallel to the existing line. This was estimated to be 307 feet of 36-inch diameter sanitary sewer.

### Separation – Bridge Street Lift Station (SA-103-3)

This project includes removal of the sanitary overflow connection to the storm sewer at the lift station diversion structure. This will be done by plugging the connected pipe.

### Replacement of Lift Station – Bridge Street Lift Station (SA-103-4)

This project includes improvements to the lift station to handle sanitary flows and prevent backups as a result of rags clogging the influent screens and to allow for future expansion as the basin develops. Improvements include a new 8 mgd lift station and 12-inch force main 990 feet in length.

A summary of each project's capital cost is identified in Table 1. These are further detailed in the Attachments.

**Table 1. Summary of CSO SCLTCP Separation Costs**

ID	Location	Length of New Storm Sewer (ft)	Length of New San. Sewer (ft)	Street Length of Separation (ft)	Project Cost (\$)
SA-103-1	36 <sup>th</sup> Street – Sewer Separation	2,280	0	2,280	\$768,000
SA-103-2	McKinley Street Trunk Sewer – Conveyance Improvements	0	307	307	\$216,000
SA-103-3	Bridge Street Lift Station – Separation	NA	NA	NA	\$9,000
SA-103-4	Bridge Street Lift Station – Improvements	0	990	990	\$5,800,000
	<b>Total</b>				<b>\$6,793,000</b>

## Category 5 – Additional Sewer Separation Projects Added to the CSO Program

*There have not been any additional CSO sewer separation projects identified in the BS Basin.*

## Remaining SB/SF and Other Problem Areas

Isolated problem areas (outliers) are any problems reported in the City's GIS database that fall outside the sewer separation areas previously described in this TM. These outliers can be a single complaint or a few scattered complaints. A windshield survey was conducted on February 29, 2008, to investigate possible causes of these outlying complaints. The weather at the time of investigation was sunny and cool (approximately 40 degrees Fahrenheit) with snow on the ground. There were seven outlying SB complaints. The results of the windshield survey are summarized in Table 2. Completed windshield survey forms are included in the Appendix.



**Table 2. Summary of Windshield Survey of Outlying SB Complaints**

Address of Report	Date of Report	General Description of Area	Relationship to Street and Surrounding Properties	Basement on Property?	Potential Sources of Inflow	Other Notes	Conclusion
9517 North 31 <sup>st</sup> Street (Section NW 21-16-13)	5/27/1987	Residential	<ul style="list-style-type: none"> <li>On steep grade (sewer is at 8%)</li> <li>Steep grade with retaining wall behind house</li> <li>Large trees in front yard and behind house</li> </ul>	Yes	<ul style="list-style-type: none"> <li>Perforated manhole covers</li> <li>Storm sewer may drain to lot</li> </ul>	<ul style="list-style-type: none"> <li>Easement on north and east sides of property</li> </ul>	Likely tree roots in sewer
3600 McKinley Street (Section NE 20-16-13)	3/19/1982	Area appears to be redeveloped since report, urban with few buildings	<ul style="list-style-type: none"> <li>Area appears to be redeveloped since report, urban with few buildings; Omaha Tree business sits near property that reported; new grading, paving and building</li> </ul>	No	<ul style="list-style-type: none"> <li>Large drainage area flowing to property</li> </ul>	None	Inconclusive
8705 Mormon Bridge Road (Section NE 30-16-13)	9/7/1989	Rural acreages	<ul style="list-style-type: none"> <li>Rural acreages/barns along rolling roadway</li> </ul>	No	<ul style="list-style-type: none"> <li>Rainfall</li> </ul>	Missing manhole cover	Inconclusive
6915 Mormon Bridge Road (Section SW 30-16-13)	7/22/1993	Residential	<ul style="list-style-type: none"> <li>On fairly steep grade (sewer is at 6-7%)</li> <li>3 large trees in front yard close to street, along ditch line</li> <li>Ditch is washed out</li> </ul>	Yes	<ul style="list-style-type: none"> <li>Manhole located 2 houses to the south; this manhole appears to be near the high point of the system</li> </ul>	None	Likely tree roots in sewer
9029 Raven Oaks Drive (Section SW 19-16-13)	8/6/1999	Residential	<ul style="list-style-type: none"> <li>House is sitting 4 or 5 feet below sidewalk</li> <li>Grate drain across driveway</li> <li>Deep sewer in front of houses</li> <li>On sump</li> <li>Downspout goes into the ground and no outlet was found</li> </ul>	Yes, low basement grade	<ul style="list-style-type: none"> <li>Flooding</li> <li>Inlet in front of house</li> <li>Large trees around property</li> </ul>	<ul style="list-style-type: none"> <li>Reported after 1999 Flood</li> <li>Easement on west side of house with sewer running through</li> </ul>	Possible seepage from street, as house sits much lower than street
5327 Tucker Street (Section SW 19-16-13)	8/6/1999	Residential	<ul style="list-style-type: none"> <li>Corner lot</li> <li>On grade</li> <li>No large trees in yard</li> <li>Large grade difference on lot</li> </ul>	Yes	<ul style="list-style-type: none"> <li>Flow of water from street seeping into basement from high part of lot</li> </ul>	<ul style="list-style-type: none"> <li>Reported after 1999 Flood</li> <li>Sewer running along east side of lot</li> </ul>	Probable seepage into basement from higher part of lot during large storm event
5405 Reynolds Street (Section NW 30-16-13)	8/6/1999	Residential	<ul style="list-style-type: none"> <li>Corner lot</li> <li>Fairly flat grade</li> <li>Large spruce trees and other trees in yard</li> </ul>	Yes, shallow grade basement	<ul style="list-style-type: none"> <li>Manholes are located on 2 sides of the house</li> </ul>	<ul style="list-style-type: none"> <li>Reported after 1999 Flood</li> <li>Sewer easement along south side of lot</li> </ul>	Possible tree roots in sewer

During the Basin Advisory Panel (BAP) meetings held in 2007, no additional areas in BS Basin were identified as having major street flooding.

## Green Solutions

This section discusses which sewer backup areas, if any, could benefit from Green Solutions in the BS Basin. In general, it appears that the sewer backup issues can be resolved through sewer separation projects. Although green solutions may have an added benefit in problem areas, no green solutions are recommended at this time to specifically address any problem areas. Green solutions will be investigated further as part of another 2008/2009 refinement task.

## Hybrid Projects

This section discusses which sewer backup areas, if any, could benefit from hybrid projects in the BS Basin. No hybrid projects are recommended at this time. Further evaluation for hybrid projects is to be accomplished as part of another 2008/2009 refinement task.

## Impacts to CSO Flow Rates

This section estimates the impacts that the projects recommended in this TM might have on CSO rates, in addition to the CSO controls already identified in the SCLTCP. Estimates for reduction in flow rates for the CSO Projects included in the SCLTCP were included in the SCLTCP document. Refined estimates of the reductions in volume and flow rate will be calculated in late 2008 using the updated InfoWorks Model. Since there were no additional RNC projects proposed for the BS Basin, no additional volume or rate reductions are identified.

## CSO Area Priorities

Each of the CSO sewer separation areas will be subdivided into individual projects. These projects will be scheduled as part of the Final LTCP. In general, the projects will be completed to address the most significant problem areas first. They will also generally be completed downstream to upstream.

The project sequence for the Bridge Street Basin will be: 1) Separation Project on 36<sup>th</sup> Street from McKinley to State Streets (SA-103-1); 2) Replacement of Bridge Street lift station (SA-103-4); 3) Separation Project (plug at overflow) at the Bridge Street lift station (SA-103-2); and 4) Conveyance Improvements to the McKinley Street trunk sewer (SA-103-2). SA-103-1 was selected to be completed first because it is a separation project that can be quickly implemented. SA-103-3 takes the next priority since it removes the overflow. Before it can be completed, however, SA-103-4 needs to be completed so the lift station can handle the flows that might result from plugging of the overflow. SA-103-2 was selected to be the last project because the flows for which it is designed have not been occurring historically.

## Acronym/Term      Definition

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BAP	Basin Advisory Panel
BC	Basin Consultant
BS	Bridge Street
City	City of Omaha
CSO	Combined Sewer Overflow
CSS	Combined Sewer System
GIS	Geographic Information System
LTCF	Long Term Control Plan
MUD	Metropolitan Utilities District
NDEQ	Nebraska Department of Environmental Quality
PMT	Program Management Team
RNC	Combined Sewer Renovation/Separation (Project)
TM	Technical Memorandum
SB	Sewer Backup
SCLTCP	Substantively Complete Long Term Control Plan
SF	Street Flooding
SOS, STS	Sewer Improvement Projects

# Attachments – Tables and Figures

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**Sewer Back-Up Summary Log**

<b>Date</b>	<b>Address</b>	<b>Complaint Type</b>
8/2/1981	8325 North 37 <sup>th</sup> Street	N/A
5/27/1987	9517 North 31 <sup>st</sup> Street	N/A
8/2/1981	3606 State Street	N/A
8/6/1999	5405 Reynolds Street	99 Flood
8/6/1999	9029 Raven Oaks Drive	99 Flood
9/7/1989	8705 Mormon Bridge Road	Missing Cover
7/22/1993	6915 Mormon Bridge Road	Sewer Back-up
3/19/1982	3600 McKinley Street	N/A
1/20/1997	3604 State Street	Sewer Overload
12/17/1998	3602 State Street	Postcard
12/17/1998	3624 State Street	Postcard
12/17/1998	3630 State Street	Postcard
12/17/1998	3405 State Street	Postcard
12/17/1998	3501 State Street	Postcard
5/30/1999	8322 North 37 <sup>th</sup> Street	Sewer Overload
5/30/1999	8309 North 37 <sup>th</sup> Street	Sewer Overload
8/6/1999	8325 North 37 <sup>th</sup> Street	99 Flood
8/6/1999	3435 State Street	99 Flood
8/6/1999	5327 Tucker Street	99 Flood
8/6/1999	8322 North 37 <sup>th</sup> Street	99 Flood
7/98	3604 State Street	Sewer Overload
5/30/1999	3604 State Street	Sewer Overload
6/3/1999	3602 State Street	Postcard
6/98	3606 State Street	N/A
12/17/98	8325 North 37 <sup>th</sup> Street	N/A
5/30/99	8325 North 37 <sup>th</sup> Street	N/A

**Bridge Street Basin Sewer Separation Cost Breakdown - Separation at 36th from McKinley to State**

Activity	Percentage	Cost	Task 1	%	Task 2	%	Task 3	%	Task 4	%	Task 5	%	Task 6	%	Total \$	Total %
<b>Construction Cost (Cost Tool)</b>		<b>\$444,000</b>									\$421,800	95%	\$22,200	5%	\$444,000	100%
Eng, Legal, Admin	5%	\$22,200	\$1,110	5%	\$2,220	10%	\$6,660	30%	\$4,440	20%	\$6,660	30%	\$1,110	5%	\$22,200	100%
Contingencies	30%	\$133,200					\$6,660	5%			\$126,540	95%			\$133,200	100%
Interest	5%	\$22,200									\$22,200	100%			\$22,200	100%
PTI, Test Bore, ECI	4%	\$17,760	\$3,552	20%	\$14,208	80%									\$17,760	100%
Field Eng/Inspection	5%	\$22,200									\$19,980	90%	\$2,220	10%	\$22,200	100%
Design & Eng. Services	15%	\$66,600					\$59,940	90%	\$6,660	10%					\$66,600	100%
Program Management	2%	\$8,880	\$444	5%	\$888	10%	\$2,664	30%	\$1,776	20%	\$2,664	30%	\$444	5%	\$8,880	100%
Planning & Prelim Design	5%	\$22,200	\$6,660	30%	\$15,540	70%									\$22,200	100%
Performance Bond	1%	\$4,440									\$4,440	100%			\$4,440	100%
<b>Capital Cost</b>		<b>\$763,680</b>	<b>\$11,766</b>	<b>1.5%</b>	<b>\$32,856</b>	<b>4.3%</b>	<b>\$75,924</b>	<b>9.9%</b>	<b>\$12,876</b>	<b>1.7%</b>	<b>\$604,284</b>	<b>79.1%</b>	<b>\$25,974</b>	<b>3.4%</b>	<b>\$763,680</b>	<b>100.0%</b>
MUD Utility Relocation		\$0							\$0						\$0	
Construction Performance Incentive		\$4,000									\$4,000				\$4,000	
<b>TOTAL Capital Cost</b>		<b>\$768,000</b>	<b>\$11,766</b>	<b>1.5%</b>	<b>\$32,856</b>	<b>4.3%</b>	<b>\$75,924</b>	<b>9.9%</b>	<b>\$12,876</b>	<b>1.7%</b>	<b>\$608,284</b>	<b>79.2%</b>	<b>\$25,974</b>	<b>3.4%</b>	<b>\$767,680</b>	<b>100.0%</b>

<b>Task 1 - Additional Study</b>	<b>\$12,000</b>	<b>1.6%</b>
<b>Task 2 - Prelim Design</b>	<b>\$33,000</b>	<b>4.3%</b>
<b>Task 3 - Final Design</b>	<b>\$76,000</b>	<b>9.9%</b>
<b>Task 4 - Utility Relocations</b>	<b>\$13,000</b>	<b>1.7%</b>
<b>Task 5 - Construction</b>	<b>\$608,000</b>	<b>79.2%</b>
<b>Task 6 - Start-up and Close-out</b>	<b>\$26,000</b>	<b>3.4%</b>
<b>Total Capital Cost</b>	<b>\$768,000</b>	<b>100.0%</b>

50-Year PW from Cost Tool	\$12,015
MUD Utility Relocation Fee	\$0
<b>Revised 50-Year PW Cost</b>	<b>\$12,015</b>

Direct Entry Cells from Cost Tool

### Bridge Street Basin Sewer Separation Cost Breakdown - McKinley Street Trunk Sewer Conveyance Improvements

Activity	Percentage	Cost	Task 1	%	Task 2	%	Task 3	%	Task 4	%	Task 5	%	Task 6	%	Total \$	Total %
<b>Construction Cost (Cost Tool)</b>		<b>\$72,000</b>									\$68,400	95%	\$3,600	5%	\$72,000	100%
Eng, Legal, Admin	5%	\$3,600	\$180	5%	\$360	10%	\$1,080	30%	\$720	20%	\$1,080	30%	\$180	5%	\$3,600	100%
Contingencies	35%	\$25,200					\$1,260	5%			\$23,940	95%			\$25,200	100%
Interest	5%	\$3,600									\$3,600	100%			\$3,600	100%
PTI, Test Bore, ECI	4%	\$2,880	\$576	20%	\$2,304	80%									\$2,880	100%
Field Eng/Inspection	5%	\$3,600									\$3,240	90%	\$360	10%	\$3,600	100%
Design & Eng. Services	15%	\$10,800					\$9,720	90%	\$1,080	10%					\$10,800	100%
Program Management	2%	\$1,440	\$72	5%	\$144	10%	\$432	30%	\$288	20%	\$432	30%	\$72	5%	\$1,440	100%
Planning & Prelim Design	5%	\$3,600	\$1,080	30%	\$2,520	70%									\$3,600	100%
Performance Bond	1%	\$720									\$720	100%			\$720	100%
<b>Capital Cost</b>		<b>\$127,440</b>	<b>\$1,908</b>	<b>1.5%</b>	<b>\$5,328</b>	<b>4.2%</b>	<b>\$12,492</b>	<b>9.8%</b>	<b>\$2,088</b>	<b>1.6%</b>	<b>\$101,412</b>	<b>79.6%</b>	<b>\$4,212</b>	<b>3.3%</b>	<b>\$127,440</b>	<b>100.0%</b>
MUD Utility Relocation		\$88,000							\$88,000						\$88,000	
Construction Performance Incentive		\$1,000									\$1,000				\$1,000	
<b>TOTAL Capital Cost</b>		<b>\$216,000</b>	<b>\$1,908</b>	<b>0.9%</b>	<b>\$5,328</b>	<b>2.5%</b>	<b>\$12,492</b>	<b>5.8%</b>	<b>\$90,088</b>	<b>41.7%</b>	<b>\$102,412</b>	<b>47.4%</b>	<b>\$4,212</b>	<b>2.0%</b>	<b>\$216,440</b>	<b>100.2%</b>

<b>Task 1 - Additional Study</b>	<b>\$2,000</b>	<b>0.9%</b>
<b>Task 2 - Prelim Design</b>	<b>\$5,000</b>	<b>2.3%</b>
<b>Task 3 - Final Design</b>	<b>\$12,000</b>	<b>5.6%</b>
<b>Task 4 - Utility Relocations</b>	<b>\$90,000</b>	<b>41.7%</b>
<b>Task 5 - Construction</b>	<b>\$102,000</b>	<b>47.2%</b>
<b>Task 6 - Start-up and Close-out</b>	<b>\$4,000</b>	<b>1.9%</b>
<b>Total Capital Cost</b>	<b>\$216,000</b>	<b>100.0%</b>

50-Year PW from Cost Tool	\$131,000
MUD Utility Relocation Fee	\$88,000
<b>Revised 50-Year PW Cost</b>	<b>\$219,000</b>

Direct Entry Cells from Cost Tool

### Bridge Street Basin Sewer Separation Cost Breakdown - Separation at Bridge Street Lift Station

Activity	Percentage	Cost	Task 1	%	Task 2	%	Task 3	%	Task 4	%	Task 5	%	Task 6	%	Total \$	Total %
<b>Construction Cost (Cost Tool)</b>		<b>\$5,020</b>									\$4,769	95%	\$251	5%	\$5,020	100%
Eng, Legal, Admin	5%	\$251	\$13	5%	\$25	10%	\$75	30%	\$50	20%	\$75	30%	\$13	5%	\$251	100%
Contingencies	35%	\$1,757					\$88	5%			\$1,669	95%			\$1,757	100%
Interest	5%	\$251									\$251	100%			\$251	100%
PTI, Test Bore, ECI	4%	\$201	\$40	20%	\$161	80%									\$201	100%
Field Eng/Inspection	5%	\$251									\$226	90%	\$25	10%	\$251	100%
Design & Eng. Services	15%	\$753					\$678	90%	\$75	10%					\$753	100%
Program Management	2%	\$100	\$5	5%	\$10	10%	\$30	30%	\$20	20%	\$30	30%	\$5	5%	\$100	100%
Planning & Prelim Design	5%	\$251	\$75	30%	\$176	70%									\$251	100%
Performance Bond	1%	\$50									\$50	100%			\$50	100%
<b>Capital Cost</b>		<b>\$8,885</b>	\$133	1.5%	\$371	4.2%	\$871	9.8%	\$146	1.6%	\$7,071	79.6%	\$294	3.3%	\$8,885	100.0%
MUD Utility Relocation		\$0							\$0						\$0	
Construction Performance Incentive		\$0									\$0				\$0	
<b>TOTAL Capital Cost</b>		\$9,000	\$133	1.5%	\$371	4.1%	\$871	9.7%	\$146	1.6%	\$7,071	78.6%	\$294	3.3%	\$8,885	98.7%

<b>Task 1 - Additional Study</b>	<b>\$0</b>	<b>0.0%</b>
<b>Task 2 - Prelim Design</b>	<b>\$0</b>	<b>0.0%</b>
<b>Task 3 - Final Design</b>	<b>\$1,000</b>	<b>11.1%</b>
<b>Task 4 - Utility Relocations</b>	<b>\$0</b>	<b>0.0%</b>
<b>Task 5 - Construction</b>	<b>\$7,000</b>	<b>77.8%</b>
<b>Task 6 - Start-up and Close-out</b>	<b>\$0</b>	<b>0.0%</b>
<b>Total Capital Cost</b>	<b>\$9,000</b>	<b>100.0%</b>

50-Year PW from Cost Tool	\$9,090
MUD Utility Relocation Fee	\$0
<b>Revised 50-Year PW Cost</b>	<b>\$9,090</b>

Direct Entry Cells from Cost Tool



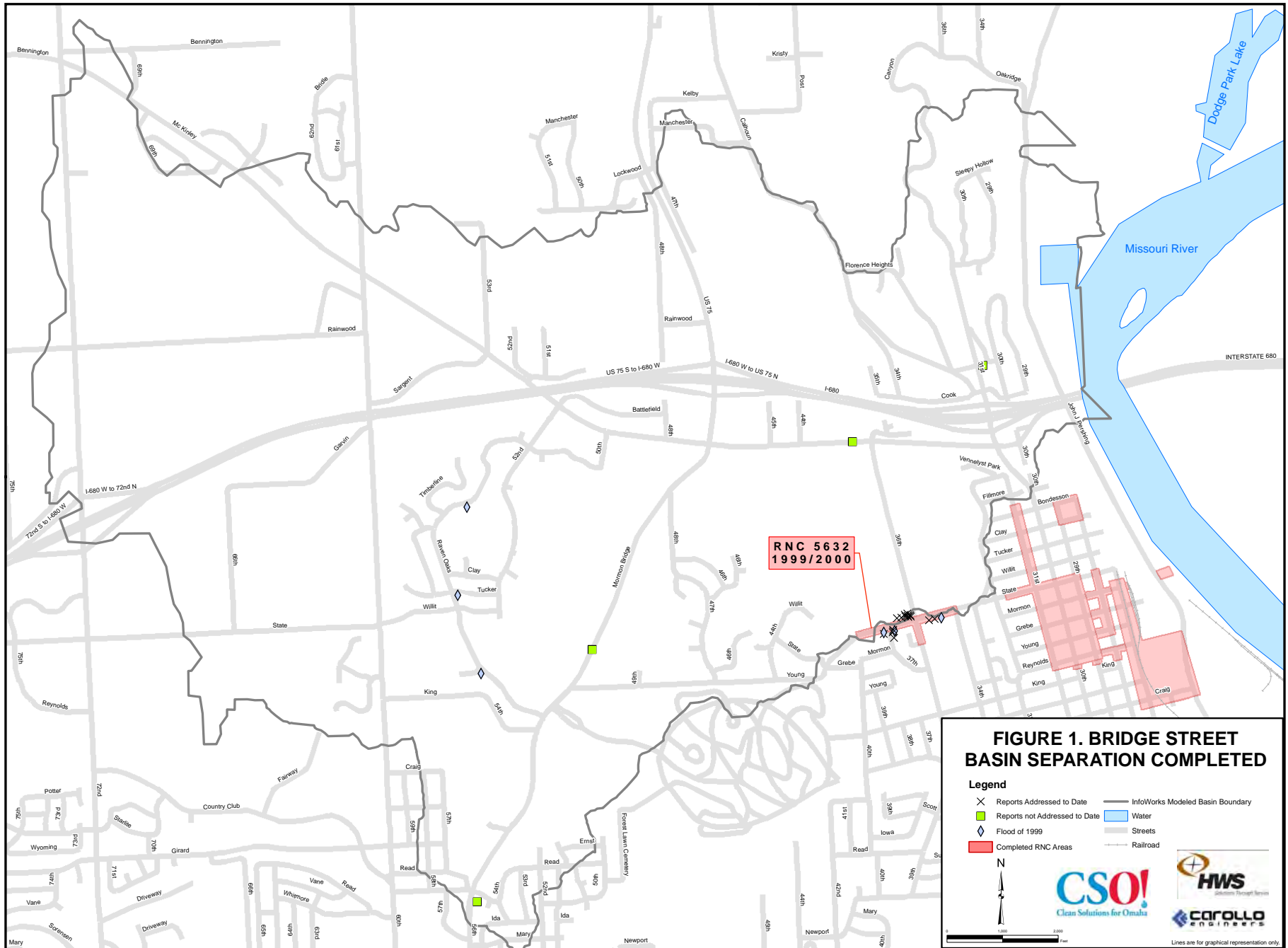
**Bridge Street Basin Sewer Separation Cost Breakdown - Replacement of Lift Station Alternative 1**

Activity	Percentage	Cost	Task 1	%	Task 2	%	Task 3	%	Task 4	%	Task 5	%	Task 6	%	Total \$	Total %
<b>Construction Cost (Cost Tool)</b>		<b>\$3,403,000</b>									\$3,232,850	95%	\$170,150	5%	\$3,403,000	100%
Eng, Legal, Admin	5%	\$170,150	\$8,508	5%	\$17,015	10%	\$51,045	30%	\$34,030	20%	\$51,045	30%	\$8,508	5%	\$170,150	100%
Contingencies	25%	\$850,750					\$42,538	5%			\$808,213	95%			\$850,750	100%
Interest	5%	\$170,150									\$170,150	100%			\$170,150	100%
PTI, Test Bore, ECI	4%	\$136,120	\$27,224	20%	\$108,896	80%									\$136,120	100%
Field Eng/Inspection	5%	\$170,150									\$153,135	90%	\$17,015	10%	\$170,150	100%
Design & Eng. Services	15%	\$510,450					\$459,405	90%	\$51,045	10%					\$510,450	100%
Program Management	2%	\$68,060	\$3,403	5%	\$6,806	10%	\$20,418	30%	\$13,612	20%	\$20,418	30%	\$3,403	5%	\$68,060	100%
Planning & Prelim Design	5%	\$170,150	\$51,045	30%	\$119,105	70%									\$170,150	100%
Performance Bond	1%	\$34,030									\$34,030	100%			\$34,030	100%
<b>Capital Cost</b>		<b>\$5,683,010</b>	<b>\$90,180</b>	<b>1.6%</b>	<b>\$251,822</b>	<b>4.4%</b>	<b>\$573,406</b>	<b>10.1%</b>	<b>\$98,687</b>	<b>1.7%</b>	<b>\$4,469,841</b>	<b>78.7%</b>	<b>\$199,076</b>	<b>3.5%</b>	<b>\$5,683,010</b>	<b>100.0%</b>
MUD Utility Relocation		\$142,000							\$142,000						\$142,000	
Construction Performance Incentive		\$29,000									\$29,000				\$29,000	
<b>TOTAL Capital Cost</b>		<b>\$5,854,000</b>	<b>\$90,180</b>	<b>1.5%</b>	<b>\$251,822</b>	<b>4.3%</b>	<b>\$573,406</b>	<b>9.8%</b>	<b>\$240,687</b>	<b>4.1%</b>	<b>\$4,498,841</b>	<b>76.9%</b>	<b>\$199,076</b>	<b>3.4%</b>	<b>\$5,854,010</b>	<b>100.0%</b>

<b>Task 1 - Additional Study</b>	<b>\$90,000</b>	<b>1.5%</b>
<b>Task 2 - Prelim Design</b>	<b>\$252,000</b>	<b>4.3%</b>
<b>Task 3 - Final Design</b>	<b>\$573,000</b>	<b>9.8%</b>
<b>Task 4 - Utility Relocations</b>	<b>\$241,000</b>	<b>4.1%</b>
<b>Task 5 - Construction</b>	<b>\$4,499,000</b>	<b>76.9%</b>
<b>Task 6 - Start-up and Close-out</b>	<b>\$199,000</b>	<b>3.4%</b>
<b>Total Capital Cost</b>	<b>\$5,854,000</b>	<b>100.0%</b>

50-Year PW from Cost Tool	\$7,095,000
MUD Utility Relocation Fee	\$142,000
<b>Revised 50-Year PW Cost</b>	<b>\$7,237,000</b>

Direct Entry Cells from Cost Tool

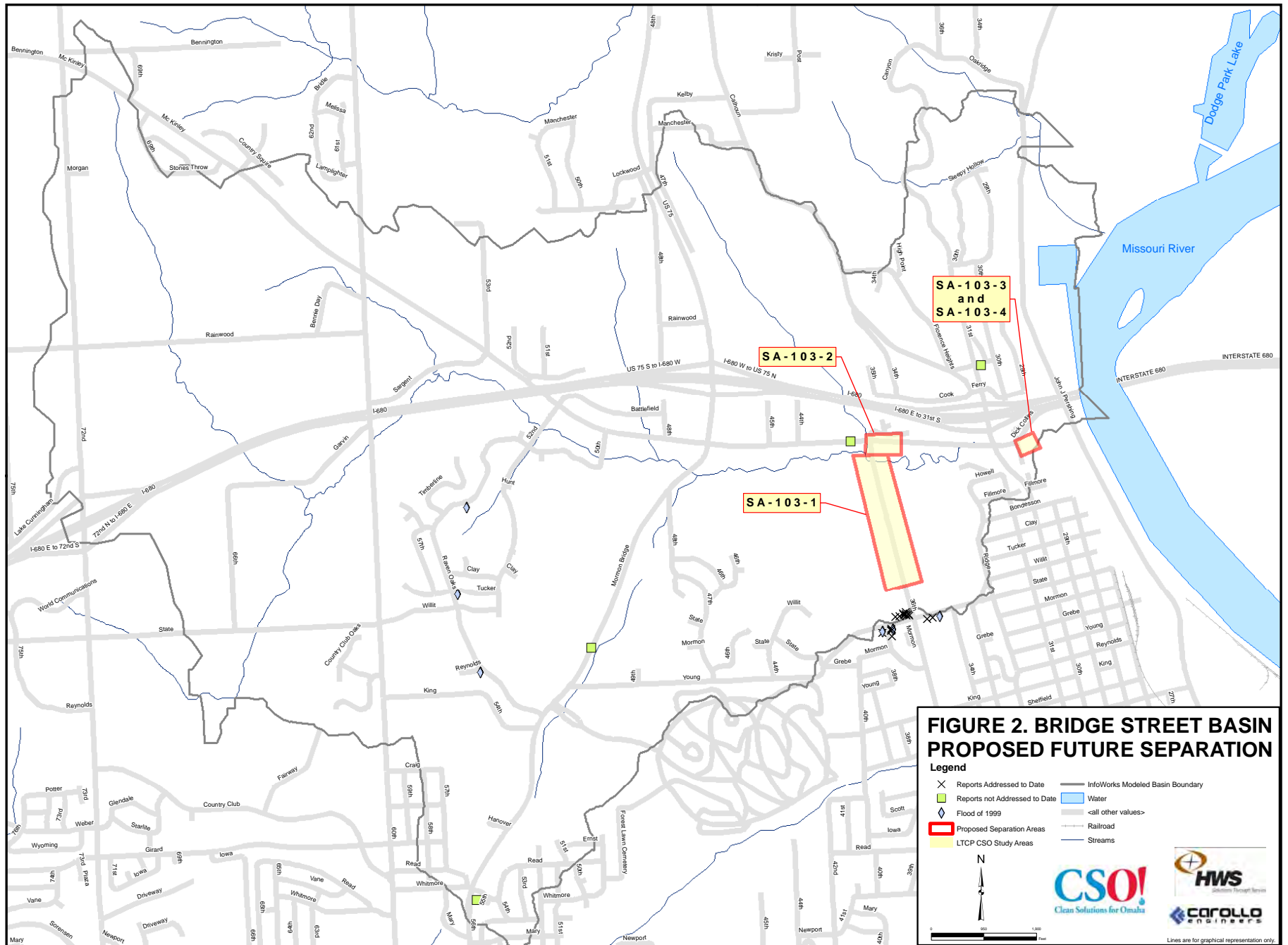


**FIGURE 1. BRIDGE STREET BASIN SEPARATION COMPLETED**

**Legend**

- ✕ Reports Addressed to Date
- Reports not Addressed to Date
- ◇ Flood of 1999
- Completed RNC Areas
- InfoWorks Modeled Basin Boundary
- Water
- Streets
- Railroad

Lines are for graphical representation only.

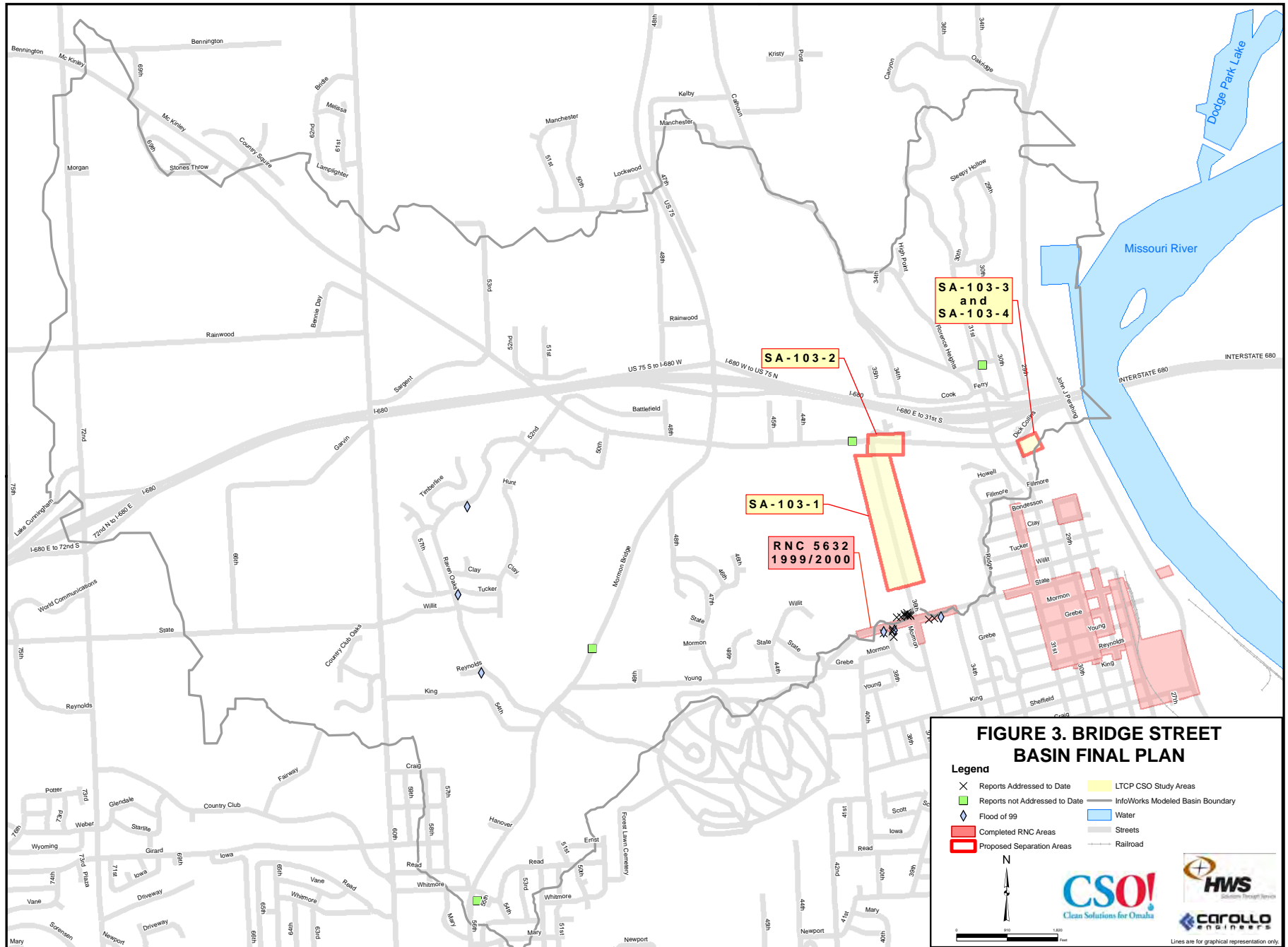


**FIGURE 2. BRIDGE STREET BASIN PROPOSED FUTURE SEPARATION**

**Legend**

- X Reports Addressed to Date
- Reports not Addressed to Date
- ◇ Flood of 1999
- Proposed Separation Areas
- LTCP CSO Study Areas
- InfoWorks Modeled Basin Boundary
- Water
- - - <all other values>
- Railroad
- Streams

Lines are for graphical representation only.



**FIGURE 3. BRIDGE STREET BASIN FINAL PLAN**

- Legend**
- ✕ Reports Addressed to Date
  - Reports not Addressed to Date
  - ◇ Flood of 99
  - Completed RNC Areas
  - Proposed Separation Areas
  - LTCP CSO Study Areas
  - InfoWorks Modeled Basin Boundary
  - Water
  - Streets
  - Railroad



Lines are for graphical representation only.

# Appendix

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**ISOLATED BACKUP FIELD INVESTIGATION REPORT**

Backup Location (street address): 9517 North 31st Street (Section NW 21-16-13)

Date of Report(s): 5/27/1987

Date of Investigation: 2/29/08

Weather at Time of Investigation: Cool and sunny, snow on ground, approximately 40 degrees F

Brief General Description of Area (Include land use and other features):

Residential

Relationship of Property to Street and Surrounding Properties (relation to street grade and other properties, sump location, steep/flat area, overland flow path, etc):

On steep grade (sewer is at 8%), steep grade and retaining wall behind house, large trees in front yard and behind house

Basement on Property (Yes, No, Unknown): yes

Potential Sources of Inflow (roof drains, perforated manhole covers, inlet, cave-ins, other sources or unknown):

Perforated manhole covers, storm sewer may drain to lot

Other Notes Regarding the Property or Backup Event:

Easement on north and east sides of property, appears to be a sewer easement.

Likely tree roots in sewer

**Note: Attach sketches, maps, 1/8 section maps, photos, and other relevant information to the report.**

**ISOLATED BACKUP FIELD INVESTIGATION REPORT**

Backup Location (street address): 3600 McKinley Street (Section NE 20-16-13)

Date of Report(s): 3/9/1982

Date of Investigation: 2/29/08

Weather at Time of Investigation: Cool and sunny, snow on ground, approximately 40 degrees F

Brief General Description of Area (Include land use and other features):

Area appears to be redeveloped since report, urban with few buildings

Relationship of Property to Street and Surrounding Properties (relation to street grade and other properties, sump location, steep/flat area, overland flow path, etc):

Area appears to be redeveloped since report, urban with few buildings, but Omaha Tree business sitting near property that reported, new grading, paving and building

Basement on Property (Yes, No, Unknown): NA

Potential Sources of Inflow (roof drains, perforated manhole covers, inlet, cave-ins, other sources or unknown):

Large drainage area flowing to property

Other Notes Regarding the Property or Backup Event:

Conclusion: Inconclusive

**Note: Attach sketches, maps, 1/8 section maps, photos, and other relevant information to the report.**

**ISOLATED BACKUP FIELD INVESTIGATION REPORT**

Backup Location (street address): 8705 Mormon Bridge Road (Section NE 30-16-13)

Date of Report(s): 9/7/1989

Date of Investigation: 2/29/08

Weather at Time of Investigation: Cool and sunny, snow on ground, approximately 40 degrees F

Brief General Description of Area (Include land use and other features):

Rural acreages

Relationship of Property to Street and Surrounding Properties (relation to street grade and other properties, sump location, steep/flat area, overland flow path, etc):

Acreages and barns along rolling roadway

Basement on Property (Yes, No, Unknown): NA

Potential Sources of Inflow (roof drains, perforated manhole covers, inlet, cave-ins, other sources or unknown):

Rainfall

Other Notes Regarding the Property or Backup Event:

Missing manhole cover

Conclusion: Inconclusive

**Note: Attach sketches, maps, 1/8 section maps, photos, and other relevant information to the report.**



**ISOLATED BACKUP FIELD INVESTIGATION REPORT**

Backup Location (street address): 6915 Mormon Bridge Road (Section SW 30-16-13)

Date of Report(s): 7/22/1993

Date of Investigation: 2/29/08

Weather at Time of Investigation: Cool and sunny, snow on ground, approximately 40 degrees F

Brief General Description of Area (Include land use and other features):

Residential

Relationship of Property to Street and Surrounding Properties (relation to street grade and other properties, sump location, steep/flat area, overland flow path, etc):

On fairly steep grade (sewer is at 6-7%), 3 large trees in front yard, along ditch line, ditch is washed out

Basement on Property (Yes, No, Unknown): Yes

Potential Sources of Inflow (roof drains, perforated manhole covers, inlet, cave-ins, other sources or unknown):

Manhole located 2 houses to the south; this manhole appears to be near the high point of the system

Other Notes Regarding the Property or Backup Event:

Conclusion: Likely tree roots in sewer.

**Note: Attach sketches, maps, 1/8 section maps, photos, and other relevant information to the report.**

**ISOLATED BACKUP FIELD INVESTIGATION REPORT**

Backup Location (street address): 9029 Raven Oaks Drive (Section SW 19-16-13)

Date of Report(s): 8/6/1999

Date of Investigation: 2/29/08

Weather at Time of Investigation: Cool and sunny, snow on ground, approximately 40 degrees F

Brief General Description of Area (Include land use and other features):

Residential

Relationship of Property to Street and Surrounding Properties (relation to street grade and other properties, sump location, steep/flat area, overland flow path, etc):

House is sitting 4 or 5 feet below sidewalk, grate drain across driveway, deep sewer in front of house, on sump, Downspout goes into the ground and no outlet was found

Basement on Property (Yes, No, Unknown): Yes, low grade basement

Potential Sources of Inflow (roof drains, perforated manhole covers, inlet, cave-ins, other sources or unknown):

Flooding, inlet in front of house, large trees around property

Other Notes Regarding the Property or Backup Event:

Reported after 99 Flood

Easement on west side of house with sewer running through

Conclusion: Possible seepage from street as house sits much lower than the street.

**Note: Attach sketches, maps, 1/8 section maps, photos, and other relevant information to the report.**

**ISOLATED BACKUP FIELD INVESTIGATION REPORT**

Backup Location (street address): 5327 Tucker Street (Section SW 19-16-13)

Date of Report(s): 8/6/1999

Date of Investigation: 2/29/08

Weather at Time of Investigation: Cool and sunny, snow on ground, approximately 40 degrees F

Brief General Description of Area (Include land use and other features):

Residential

Relationship of Property to Street and Surrounding Properties (relation to street grade and other properties, sump location, steep/flat area, overland flow path, etc):

Corner lot, on grade, no large trees in yard, large grade difference on lot

Basement on Property (Yes, No, Unknown): Yes

Potential Sources of Inflow (roof drains, perforated manhole covers, inlet, cave-ins, other sources or unknown):

Flow of water from street likely seeping into basement from higher part of lot.

Other Notes Regarding the Property or Backup Event:

Reported after 99 Flood

Sewer running along east side of lot

Conclusion: Probable seepage into basement from higher part of lot during large flood event.

**Note: Attach sketches, maps, 1/8 section maps, photos, and other relevant information to the report.**

**ISOLATED BACKUP FIELD INVESTIGATION REPORT**

Backup Location (street address): 5405 Reynolds Street (Section NW 30-16-13)

Date of Report(s): 8/6/1999

Date of Investigation: 2/29/08

Weather at Time of Investigation: Cool and sunny, snow on ground, approximately 40 degrees F

Brief General Description of Area (Include land use and other features):

Residential

Relationship of Property to Street and Surrounding Properties (relation to street grade and other properties, sump location, steep/flat area, overland flow path, etc):

Corner lot, fairly flat grade, large spruce trees and other trees in yard

Basement on Property (Yes, No, Unknown): yes, shallow grade basement

Potential Sources of Inflow (roof drains, perforated manhole covers, inlet, cave-ins, other sources or unknown):

Manholes are located on 2 sides of house

Other Notes Regarding the Property or Backup Event:

Reported after 99 Flood

Sewer easement along south side of lot

Conclusion: Possible tree roots in sewer

**Note: Attach sketches, maps, 1/8 section maps, photos, and other relevant information to the report.**