

Refinement Task 19 – South Interceptor Basin Search for Hybrid Alternatives

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Purpose

The purpose of this refinement task is to search for ways to enhance the benefits provided by the proposed Program alternative facilities identified in the Substantively Complete Long Term Control Plan (SCLTCP), while maintaining or increasing the overall cost-effectiveness of the controls, and by reducing Combined Sewer Overflow (CSO) rates and/or volumes.

TM Reviews

The PMT Refinement Task Team reviewed the *South Interceptor Basin Technology Screening TM dated December 28, 2006*, the *Alternatives Evaluation TM dated May 31, 2007*, and the *Sewer Backups & Street Flooding Recommended Approach TM dated July 23, 2008* to determine if any additional control technologies, not already incorporated in the Alternatives Evaluation TM or as part of the Program Alternative facilities, should be evaluated as part of this task. Consideration was also given to technologies that were previously eliminated by the South Interceptor (SI) Basin team, but that might be applicable to the Program Alternative facilities.

The Cross-Basin Alternative developed and incorporated into the SCLTCP by the PMT included Program facilities that had not been considered as part of the SI Basin alternatives. The incorporation of the deep tunnel, drop shafts, a new South Interceptor Forcemain, and a new Leavenworth Pump Station all impact how the SI Basin CSO areas will function in the future.

As a result of the PMT Refinement Team review and based on recommended projects by the SI Basin team, the following projects were identified for further evaluation by the SI Basin Team.

- CSO 112 – Coordination with Lauritzen Gardens and planned improvements to determine partial separation options compatible with the Lauritzen planned improvements that might affect sequencing of construction of the Program facilities.

- CSO 115 – Coordination with the Nebraska Department of Roads for potential stormwater detention facilities associated with the widening of Interstate 80 and potential impacts on future CSO Projects.
- CSO 115 – Coordination with the Henry Doorly Zoo and incorporation of stormwater detention facilities in proposed expansion projects for the Zoo. Evaluate potential stormwater detention options associated with conversion of the Rosenblatt site to parking facilities.
- CSO 117 – Evaluation of the Spring Lake Park Ponds alternative by preparing a layout of the proposed sanitary and storm systems required if the ponds are constructed. Evaluate the potential downsizing or cost savings of facilities not required downstream if the pond alternative is implemented.

Hybrid Alternatives Evaluations

HY-112-1 Lauritzen Gardens

A large portion of the Lauritzen Botanical Gardens site was constructed over an old balefill disposal site which has continuing settlement due to the introduction of water into the site from infiltration. The continuing settlement to the site has impacted proposed improvement/development projects to the site. The delays in the construction schedule for these Lauritzen Gardens projects will delay the need for construction of associated CSO sewer separation components in this SI sub-basin. However, continued regular dialog with Lauritzen Gardens personnel on their construction schedule will be required so that sewer separation components can be constructed ahead of planned Lauritzen Gardens improvements.

This entire sub-basin is identified for sewer separation. Due to the topographic relief and the existing full development of the non-Gardens area of the sub-basin, there is little opportunity for development of a hybrid alternative which would involve significant stormwater detention BMPs.

A green solution project has been included as part of the Refinement Task 2 – Green Solutions TM which includes the construction of a number of rain gardens along the lower reaches of the steep slopes in the southwest portion of the Gardens site to capture and detain overland storm flows in order to reduce soil erosion and to detain storm flows from reaching the existing combined sewers. Refer to the Refinement Task 2 – South Interceptor Basin Green Solutions TM for the discussion of the proposed rain gardens. These green solutions improvements will have insignificant impacts to the size of downstream facilities.

Meetings were held with Lauritzen Gardens on September 24, 2007 and September 4, 2008 to discuss potential projects being planned for the Gardens area that might affect the location and construction of CSO facilities planned or existing in the Gardens area.

The HY-112-1 hybrid alternative is not being carried forward as part of the CSO LTCP.

HY-115-1 Nebraska Department of Roads Interstate 80 Widening

The Nebraska Department of Roads (NDOR) is currently initiating the construction of the widening of Interstate 80 (I-80) through the South Interceptor Basin. The widening will increase the impervious surface area in the basin and will result in increased storm runoff to the combined sewer system (CSS). The City of Omaha Stormwater Design Manual requirements have recently been revised to require the capture and detention of the first one-half inch of rainfall for new development. The NDOR is incorporating detention facilities into the 13th Street interchange cloverleaf areas to comply with this requirement which will include a reconstruction of the storm sewer facilities to facilitate the revised drainage. In addition, discharge from the proposed detention facilities will be conveyed directly to the Missouri River via a new storm water conveyance sewer to be constructed as part of the I-80 project. As a result, approximately 50 acres of I-80 property and adjacent City drainage area will be removed from the CSS area. The tributary areas and the proposed storm sewer system facilities to be constructed by the NDOR project are identified in Figure 1.

A portion of the I-80 widening project is located within the Grover Street and Spring Street Sub-basins. However, the NDOR storm system in these areas is already a separated system so there is minimal effect on the existing combined sewer system. However, construction of the NDOR facilities and the associated reduction in flows will result in a reduction of the peak overflow rate from 271 mgd to 253 mgd during a ten-year, 24 hour storm event with an associated overflow volume reduction of 3.3 MG for the Riverview Park sub-basin 72-inch combined sewer located downstream of the current I-80 storm sewer system. Peak flow rate reduction and CSO volume reduction will also occur for smaller storm events as indicated for the following top five storm events occurring in the 1969 representative year.

	4/16/69	5/16/69	7/17/69	8/20/69	8/31/69
Peak Flow Reduction in MGD	18.34 to 12.94	34.39 to 25.22	81.08 to 60.23	89.09 to 66.54	86.71 to 64.57
Overflow Volume Reduction in MG	3.32 to 2.10	1.41 to 1.02	6.47 to 4.72	5.14 to 3.67	7.50 to 5.43

The costs associated with this project are included as part of the NDOR I-80 widening project. The benefit of this project to the LTCP is that the stormwater flows from the I-80 corridor are separated from the City's CSS facilities. This will result in a reduction of overflow peak flows and volume through the CSS and improved water quality.

Meetings were held with NDOR on February 27, 2008 and September 10, 2008 to discuss storm drainage facilities being proposed for the I-80 widening project to address stormwater design requirements of the City of Omaha and to assess the impacts to the downstream CSS facilities.

The HY-115-1 will be completed by the NDOR as part of their work. There are no construction costs to be incorporated into the CSO LTCP as the entire cost is borne by NDOR. Revisions to the InfoWorks Model will be required to revise the catchment areas to reflect the changed stormwater contributing areas. These changes are identified in Attachment 1.

HY-115-2 Rosenblatt / Henry Doorly Zoo

The Rosenblatt stadium site is anticipated to undergo redevelopment by the Henry Doorly Zoo when the Zoo takes over the site following the completion of the new downtown baseball stadium. Overland storm flow from the Rosenblatt stadium site currently enters the combined sewer system near the northeast corner of the current Rosenblatt parking lot.

Omaha By Design requirements for new parking lots include a number of requirements for green space, detention, and tree plantings that affect parking lot designs. A number of stormwater detention/retention opportunities exist for the Rosenblatt site when the existing stadium is removed and additional parking is added for the Zoo. Bioswales and bioretention facilities could be incorporated into the parking lot design to provide both water quality benefits and water quantity reduction. Rain gardens could be located in several areas and a large dry pond could be located on the current site of the State visitor's information center at 10th Street and Bob Gibson Boulevard. Some discussions have occurred concerning the relocation of the Visitor information facilities to an off-site location. A reduction in peak runoff flows could be achieved with an associated reduction of runoff volume. This would have a beneficial impact to the Riverview Park sub-basin existing downstream 72-inch diameter combined sewer located through the existing Zoo property. The tributary areas and the proposed facilities are identified in Figure 2.

For the Riverview Park sub-basin 72-inch combined sewer located downstream of the current storm system connection from the Rosenblatt site, the construction of the above referenced BMP facilities will result in a reduction of the peak overflow rate from 271 mgd to 240 mgd during a ten-year, 24 hour storm event with an associated overflow volume reduction of 0.1 MG. Peak flow rate reduction and CSO volume reduction will also occur for smaller storm events as indicated for the following top five storm events occurring in the 1969 representative year.

	4/16/69	5/16/69	7/17/69	8/20/69	8/31/69
Peak Flow	18.34	34.39	81.08	89.09	86.71
Reduction in MGD	to 17.31	to 31.54	to 76.24	to 83.14	to 81.38
Overflow Volume	3.32	1.41	6.47	5.14	7.50
Reduction in MG	to 3.12	to 1.33	to 6.13	to 4.95	to 7.18

Per the Refinement Task 2 – Green Solution cost estimating guidelines, the estimated Capital costs associated with the construction of the green solutions (Hybrid Alternative) might be constructed for less than \$2,000,000. This does not include the costs of any Henry Doorly

Zoo parking lot construction. The costs associated with this project may be able to be shared with the Henry Doorly Zoo as part of their parking lot expansion project.

A green solution project has been included as part of the Refinement Task 2 – Green Solutions TM which includes the construction of a number of detention/retention facilities for reducing the peak flows and volumes of storm runoff from the Rosenblatt/Zoo property. Refer to the Refinement Task 2 – South Interceptor Basin Green Solutions TM for the discussion of the proposed facilities.

The benefit of this project to the LTCP is that the proposed facilities will provide a reduction of combined sewer overflow peak flows and volume through the CSS and improved water quality.

Meetings were held with Henry Doorly Zoo personnel on February 1, 2008 and September 3, 2008 to discuss projects in the planning and design stage by the Zoo that might affect CSS facilities. Discussions also included potential uses for the Rosenblatt site following demolition of the stadium, and possible storm system improvements to address existing impacts on the CSS through the Zoo property.

If this Hybrid Alternative HY-115-2 is constructed, then the combined affect with Hybrid Alternative HY-115-1 on the Riverview Park sub-basin 72-inch combined sewer will result in a reduction of the peak overflow rate from 271 mgd to 215 mgd during a ten-year, 24 hour storm event with an associated overflow volume reduction of 3.4 MG. Peak flow rate reduction and CSO volume reduction will also occur for smaller storm events as indicated for the following top five storm events occurring in the 1969 representative year.

	4/16/69	5/16/69	7/17/69	8/20/69	8/31/69
Peak Flow	18.34	34.39	81.08	89.09	86.71
Reduction in MGD	to 11.85	to 22.21	to 55.36	to 60.15	to 59.10
Overflow Volume	3.32	1.41	6.47	5.14	7.50
Reduction in MG	to 1.90	to 0.89	to 4.38	to 3.48	to 5.06

This HY-115-2 hybrid alternative is not being carried forward as part of the CSO LTCP as this project will require future coordination with the Zoo. However, coordination with the Henry Doorly Zoo should continue as proposed redevelopment plans are prepared so that appropriate BMP facilities are incorporated to reduce the peak flow rates and overflow volumes from the system.

HY-117-1 Spring Lake Park Ponds

Spring Lake Park originally included a small lake when established in the 1800's, however the lake was drained in the 1930's. A plan to renovate the park was developed in 1939 as part of the Works Progress Administration (WPA) which included establishing a series of

three shallow “lagoons” along the drainage channel. Due to the start of World War II, the plan was never implemented.

The Spring Lake Park Community has been active in the development of options for improvements to the Park. Previous investigations have identified the potential for the wet ponds in the steep sloped ravines upstream of the existing landfill areas.

A conceptual plan was developed by the South Interceptor Basin Study Team and a report dated October 1, 2007 was completed that summarized the preliminary analysis for the establishment of two permanent wet ponds and one wetland area. Discharge from the wetland area would overflow into the middle pond. Discharge from the middle pond would overflow into the lower pond. Discharge from the lower pond would overflow into the downstream combined sewer or separate storm sewer for discharge to the river. Due to the topographic relief of the site, it was determined that overtopping of the impoundment structures would not occur for the 100-Year, 24-Hour storm event for the contributing area. Maximum depth variations within the ponds would range from 4.7 feet to 7.7 feet for the 100-year, 24-hour storm event. The tributary areas and the proposed facilities are identified in Figure 3.

For the downstream 60-inch combined sewer, the construction of the detention facilities will result in a reduction of the peak flow rate from 268 MGD to 210 MGD during a ten-year, 24 hour storm event. Peak flow rate reduction will also take place for the 1969 representative storm flows as a result of the proposed site improvements.

This project has been included as a green solution project as part of the Refinement Task 2 – Green Solutions TM. Refer to the Refinement Task 2 – South Interceptor Basin Green Solutions TM for the discussion of the proposed facilities.

The Missouri Avenue sub-basin of the South Interceptor Basin has been identified for sewer separation as part of the City of Omaha Long Term Control Plan. The estimated construction cost associated with the sewer separation is \$20,456,000. By incorporating the proposed Spring Lake Ponds Hybrid Alternative into the Missouri Avenue sub-basin, a reduction in flows downstream of the Ponds would result in reduced construction of downstream storm sewer facilities. The existing combined sewer could be converted to a storm sewer in conjunction with the construction of new parallel sanitary sewer facilities. Figures 1 of 5, 2 of 5, 3 of 5, 4 of 5, and 5 of 5 illustrate a preliminary sewer separation layout for the sub-basin for the Hybrid Alternative. If the Hybrid Alternative is constructed, the estimated construction cost for the sewer separation portion of the project is \$13,045,000. Per the Refinement Task 2 – Green Solution cost estimating guidelines, the green solutions (Hybrid Alternative) estimated construction costs are less than \$2,000,000. This does not include the costs of any other Park amenities that might be considered for this location such as trails, benches, picnic facilities, shelters, restroom facilities, etc.

Since the LTCP included sewer separation of the Missouri Avenue sub-basin, the Hybrid Alternative does not provide additional CSO flow rate or volume reduction to the LTCP. However, the benefits of the Hybrid Alternative are:

1. Reduction in cost of the sewer separation infrastructure.
2. Providing green solutions to Spring Lake Park along with enhancement of the Park.
3. Improved water quality of the storm water discharge to the Missouri River.

Revisions to the InfoWorks Model will not be required at this time. Subcatchment contributing areas in the Model are already set at the correct percentages.

Hybrid Alternative Summary

HY-112-1 Lauritzen Gardens

This project is not incorporated into the CSO LTCP.

HY-115-1 Nebraska Department of Roads Interstate 80 Widening

These stormwater facilities are being constructed by the NDOR at no cost to the CSO Program. InfoWorks Model changes will need to be incorporated. See Attachment 1.

HY-115-2 Rosenblatt / Henry Doorly Zoo

This project is not incorporated into the CSO LTCP, however continued coordination with the Henry Doorly Zoo should continue to monitor redevelopment plans for the area so that appropriate BMP facilities are incorporated.

HY-117-1 Spring Lake Park

This project and its associated costs for construction of the ponds has been included as a green solution project as part of the Refinement Task 2 – Green Solutions TM. Refer to the Refinement Task 2 – South Interceptor Basin Green Solutions TM for the discussion of the proposed facilities. InfoWorks Model changes will not be required at this time.

Acronym/Term	Definition
BMP	Best Management Practices
City	City of Omaha
CFS	Cubic Feet per Second
CSO	Combined Sewer Overflow
CSS	Combined Sewer System
GIS	Geographic Information System
LTCP	Long Term Control Plan
MG	Million Gallons
NDEQ	Nebraska Department of Environmental Quality
NDOR	Nebraska Department of Roads
PMT	Program Management Team
SCLTCP	Substantively Complete Long Term Control Plan
SI	South Interceptor
TM	Technical Memorandum

Figure 1 – HY-115-1 NDOR I-80 Widening



Figure HY-115-2 Rosenblatt / Henry Doorly Zoo



Figure 117-1 Spring Lake Park Ponds



ATTACHMENT 1
HY-115-1 I-80 STORMWATER
INFOWORKS MODEL REVISIONS

The differences between the NDOR Interstate 80 Widening scenario and the original Long Term Control Plan Model 15 are as follows:

Subcatchment	Node	Original(LTCP_v15) Contributing Area (Acres)	Modified Contributing Area (Acres)
233b	0511016	0.391	0.042
250	0541055B	59.696	18.905
251a	0521051	28.601	16.823
255b	0541029	16.942	5.914
266b	0543105	22.688	16.918
417a	0511016	0.934	0.500
417b	0511016	0.450	0.059