

## Conceptual Development Report: Active Transportation/Utility Bridge Over South Saskatchewan

### EXECUTIVE SUMMARY

The City of Saskatoon (City) is investigating the feasibility and cost of developing a utility/active transportation bridge across the South Saskatchewan River located near the existing Wastewater Treatment Plant in order to service future development in the North East Sector with an ultimate service population in the range of 300,000 people. A previous study was initially focused on using open cut and trenchless technologies to install a siphon style crossing across the South Saskatchewan River but was expanded to explore a utility/pedestrian bridge that could utilize a gravity-based crossing. This additional option was proposed by Associated Engineering (AE) following discussions with the City.

The purpose of this report is to provide the City with a conceptual development study to investigate potential bridge types for the crossing along with improved cost estimates. This report summarizes the findings of the study and provides a decision matrix to allow the City to select a preferred bridge concept.

This study looked at several general considerations for the bridge including design criteria for the sanitary gravity sewer, design standards for the active transportation/utility bridge, bridge users, bridge geometry (both horizontal and vertical alignment/clearances), barriers, bridge vibration, lighting, utilities, trails, geotechnical, residences, topography, and loading.

A proposed location for the utility bridge had been identified based on the previous 2015 study. The proposed location was also identified for a dedicated Active Transportation Crossing in Appendix B of the June 2016 City of Saskatoon Active Transportation Plan Final Report. In addition to a structure at this proposed location satisfying the requirements for a new sanitary connection to the WWTP, this location would support access from the Evergreen, Aspen Ridge and UH3 neighbourhoods to the major employment area in the north. Neither the Circle Dr North of North Commuter Parkway bridges provide direct connections to this area.

However, the exact location, alignment and connections needed to be refined. Using current knowledge of the site, the required sewer inverts, and the maximum grade requirements in the City's Active Transportation Design Standards for connections to existing networks a conceptual plan and profile for the bridge were developed. In terms of location, the bridge is in a very similar location to the alignment developed for the trenchless sewer installation. The study found that the recommended crossing location would be a perpendicular crossing immediately south of the Wastewater Treatment Plant (WWTP). The bridge elevation and slope are largely dictated by the required invert elevations of the sanitary piping at each embankment. The resultant deck elevations at east abutment and west abutment are approximately 481.7 m and 478.7 m respectively. This results in a bridge deck/pipe average grade of 0.6%.

The report assessed three bridge options including a 350 m cable stayed bridge, a 335 m suspension bridge, and a 340 m steel plate girder bridge. As a summary of the main distinguishing points of each option, and to aid the City in their decision of a preferred option, a decision matrix was developed to evaluate the three options. The criterion used in the evaluation included cost and constructability, environmental impact, suitability and convenience for users, and bridge features. The design team presented the conceptual development findings and decision matrix to the City on June 17, 2019. As the cable-stayed bridge and suspension bridge options were similar in both overall capital cost (\$22.6M) and the decision matrix criteria selected, the City completed a pairwise comparison analysis using the decision matrix criteria and capital costs. Based on the presentation and the City's own pairwise comparison analysis of the decision criteria, the City confirmed that the suspension bridge was the most favourable for the City's objectives and that it is the City's preferred option to develop further.

Following the selection of the suspension bridge as the preferred option, a more refined capital cost was developed based on preliminary sizing of main structural members. The estimate also included general risks identified for the successful completion of the project, including a risk sensitivity and estimated capital cost associated with each risk. The risk evaluated included construction, geotechnical, and material risks. In addition to the refined capital cost estimate prepared, a life cycle costs estimate was also developed. The life cycle cost analysis is based on a 75-year analysis period that will consider the requirements of the different treatments to maintain the service life of the bridge structure. An evaluation of staged construction for the bridge and an outline of required regulatory approvals were also discussed for the suspension bridge.

Based on the bridge option comparison analysis and input from the City, the suspension bridge was identified as the preferred option. This was followed by a refined analysis, initial risk evaluation, and life cycle costing of the suspension bridge option.

- The total conceptual capital cost estimate, including risk allowances is approximately **\$25.1M**.
- If including life cycle costs the conceptual net present value is in the range of **\$25.2M – \$25.5M** in 2019 dollars depending on discount rate.
- A conceptual cost estimate for staged construction is an increase of approximately **\$1.5M – \$2.5M**.

We anticipate the following planning and design steps as the project proceeds:

- Presentation of report to City of Saskatoon.
- Consultation with stakeholders.
- Decision to proceed with project.
- Coordinate with City of Saskatoon.
- Public consultation.
- Detailed geotechnical field investigation.
- Environmental assessment.
- Initial Permit Applications.
- Utility and agency liaison and coordination.
- Confirm loading criteria, sanitary flow requirements and sanitary connection criteria with City Staff.
- Confirm structural response/provisions to avoid wind cables.
- Preliminary design and updated cost estimate (Class B).
- Detailed design, tender documentation and updated cost estimate (Class A).
- Finalize Permitting.
- Tendering.
- Construction.