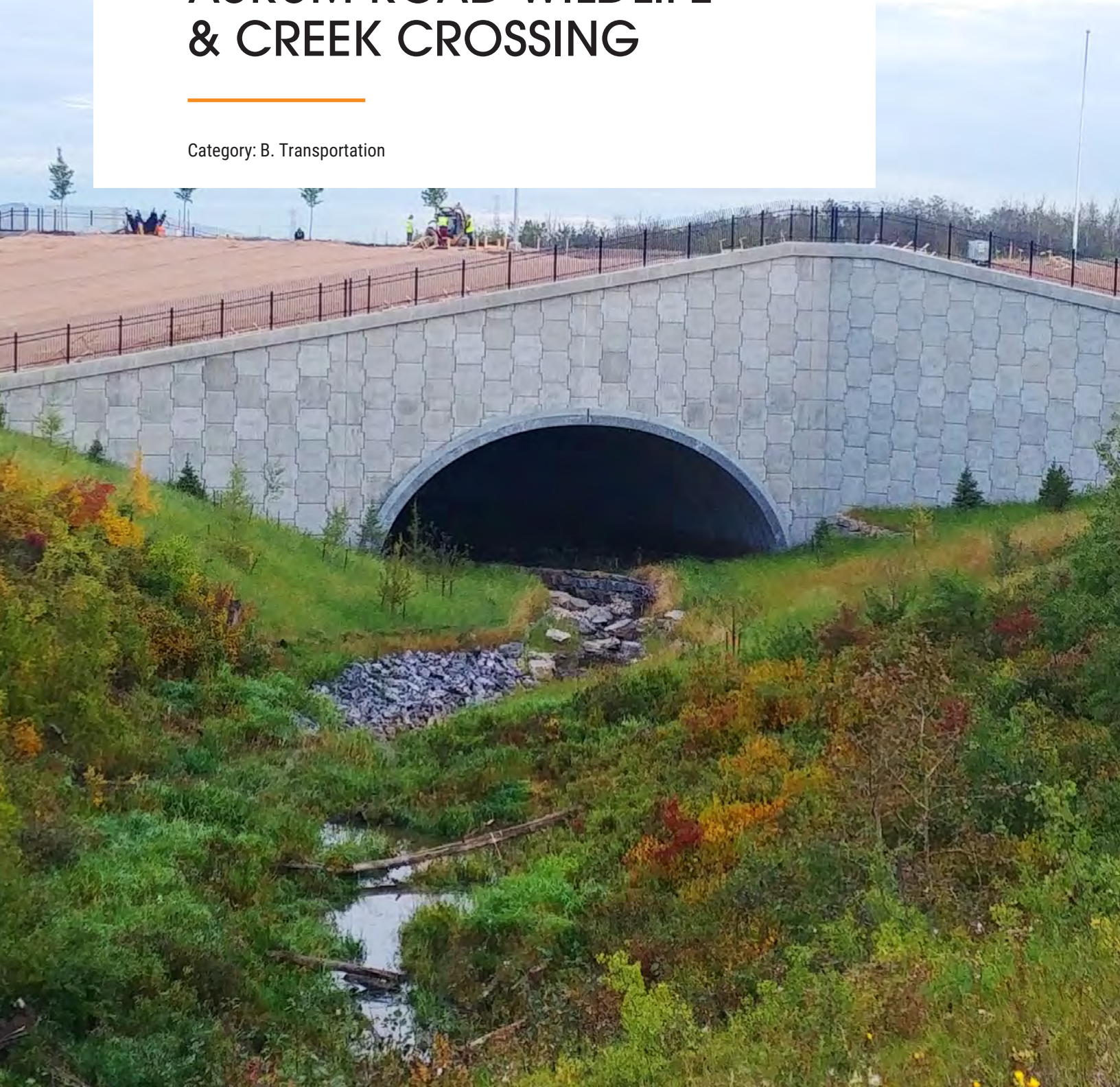


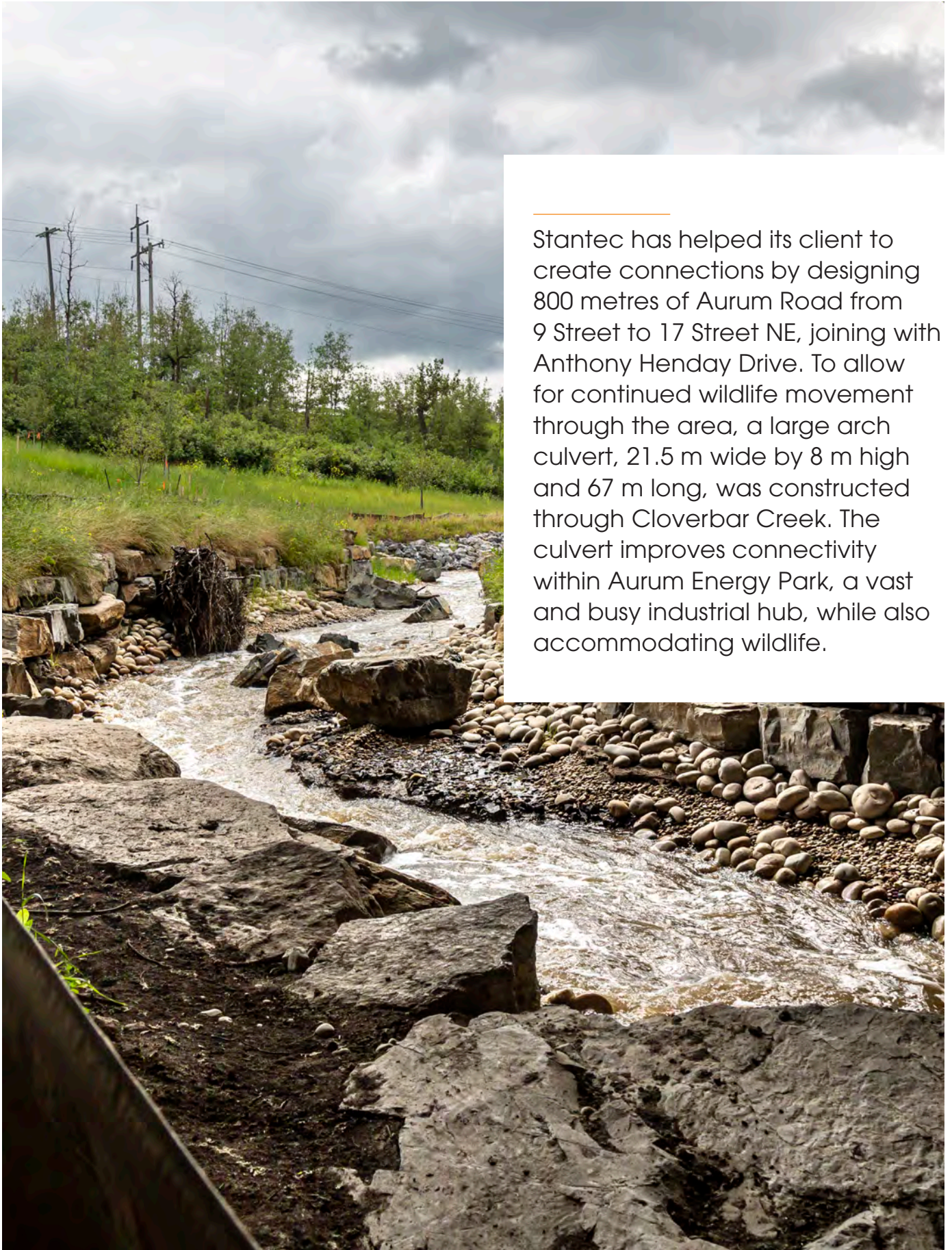


2020 CANADIAN CONSULTING ENGINEERING AWARDS

AURUM ROAD WILDLIFE & CREEK CROSSING

Category: B. Transportation





Stantec has helped its client to create connections by designing 800 metres of Aurum Road from 9 Street to 17 Street NE, joining with Anthony Henday Drive. To allow for continued wildlife movement through the area, a large arch culvert, 21.5 m wide by 8 m high and 67 m long, was constructed through Cloverbar Creek. The culvert improves connectivity within Aurum Energy Park, a vast and busy industrial hub, while also accommodating wildlife.



Project Highlights

Q.1 INNOVATION

Accommodating wildlife effectively was our biggest challenge. To do so, an arch culvert was designed to accommodate the creek flow and maintain wildlife passageways. The size and shape of the precast concrete arch forms were a first for the fabricator and required unconventional materials and methodologies. The compression joints were designed in such a manner for movement that welding was not required.

The complexity of the geotechnical site issues along with the sheer size of the structure made this project extremely challenging, driving innovation to the forefront. With the high MSE walls it was not possible to construct them on the existing valley bottom soils. This was mitigated by using gravel shear keys and 124 Continuous Flight Auger (CFA) piles of 1200 mm in diameter for the MSE walls and 154 CFA piles of 600 mm in diameter for the foundations, designed to counter the shear and horizontal forces. This is the first time that this type of foundation design has been implemented in Edmonton on a structure of this size.

The wall consisted of a mechanically stabilized earth design along with appropriate landscaping features that provided a more natural environment. In addition to the wall, 10 m of granular backfill was needed above the culvert structural integrity. Extensive testing, designed and directed by geotechnical specialists, was carried out during the construction to ensure that a safe structure of high quality was delivered.

Additionally, valuable insights were gained into understanding that our earthen walls would withstand additional stress loads of the infill and overland traffic.

We were also able to refine our design to ensure that our crossing would not only facilitate the passage of large animals, but also smaller animals, as well as provide protection to the aquatic habitat within the structure. To maximize the natural setting for wildlife, special skillsets were required to design creek realignment, creek bioengineered edges, wildlife corridor, creek stabilization, retaining walls, spillways, and a significant amount of planting, trees, and shrubs, to ensure a safe wildlife passageway. To attract additional wildlife species to the area, our team added debris piles consisting of brush, stone, and large woody debris along with other natural structures, such as wood mats, to accommodate small mammals like rabbits. Material was reused from pond excavation for the creek's slope stabilization, and culvert backfill resulting in savings of \$1.2 million.



Q.2 COMPLEXITY

The selected structure was a precast concrete arch, located on a 35-degree skew to the roadway—the first project of its kind in Alberta. There were several geotechnical challenges that required detailed investigations and assessments. Colluvium deposits with evidence of pre-sheared clay shale bedrock just below the creek's streambed indicated a history of slumping of the valley walls. The differential settlement was another challenge which was designed to ensure all structures be properly accommodated and supported.

The MSE walls were designed to minimize the length of the arch to meet daylighting standards for wildlife passage. Due to the height of the MSE walls, it was not possible to construct the walls on the existing soils in the valley bottom. This was mitigated using gravel shear keys and CFA piles. To minimize the differential settlement, the granular envelope around the arch was increased and compaction increased to 98% standard proctor. Our Geotechnical team recommended continuous monitoring of pore pressure during construction. This allowed the contractor to proceed with construction without any delays.

At first, we faced significant geotechnical and environmental challenges, which then were followed by a historical resource impact assessment (HRIA), underscored sensitive archeological and paleontological digging that was required for this project to move forward. We were fortunate to have experienced professionals who undertook the digging, testing, analysis, and reports for the HRIA in a timely fashion to gather the necessary approvals on time.





Q.3 SOCIAL AND/OR ECONOMIC BENEFITS

Aurum Energy Park continues to attract businesses and density as more employees commute to and connect within this thriving hub. This arch culvert is essential to the community. It allows workers to safely and efficiently commute to and from work and allows pedestrians to cross without having to walk on any rail lines. This project has impacted the community in a two-fold manner. It has re-routed an animal crossing to provide a natural environment that encourages animals to move through a culvert, while concurrently providing a safer road alternative for vehicles to move through.

Stantec's innovative design and selection for an alternative precast concrete arch culvert, instead of a bridge, saved our client \$26 million dollars and reduced the workers commute time by about an hour. The infrastructure provides a better connection between new industrial areas and makes growth in the region possible, increasing employment and future investment opportunities.

If this project disappeared tomorrow, it would impact industrial development in Edmonton, not to mention directly impacting our client's ability to serve and move resources to the industrial region. The transportation infrastructure and environmental enhancements from this culvert benefit the community at large, not only through sustaining industrial development, but through creating better connections between Edmonton and its surrounding communities. It joins a major metropolitan hub to a bustling logistics, fabrication, and transportation centre—the gateway for much of the over \$250 billion in energy sector investment and development activity in Northern Alberta.



Q.4 ENVIRONMENTAL BENEFITS

The arch culvert was built to facilitate wildlife movement and includes several fish habitat features and a wildlife movement bench at the bottom of the ravine. The approaches to the arch culvert are well landscaped to provide ample cover. Site drainage routed through box culverts underneath this bench provide unhindered passage of wildlife to and from the passage structure. The large size of the culvert itself was designed to allow the passage of large ungulates. Within the culvert, brush and pipes were placed to provide cover for medium and small mammals to assist them in traversing the wildlife passage. The creek realignment was also designed to incorporate several different kinds of fish habitat features, such as root wads, deep pools, and riffles.

The City of Edmonton has established a series of policies around maintaining and building natural area networks and habitat connectivity. This includes allowing for wildlife movement between different upland areas, ravines and the North Saskatchewan River (NSR) Valley.

This project involved construction of a major roadway across a ravine that would have severed connectivity between the upstream reaches of the ravine and the NSR Valley if constructed using a more traditional culvert crossing appropriate for the size of this creek. This would have created barriers to both terrestrial wildlife and fish movement. The innovative wildlife passage arch culvert and associated creek channel and landscaping design will achieve the City's objectives of maintaining connectivity and facilitate conservation of these ecosystems and wildlife for future generations to experience and enjoy.





Q.5 MEETING CLIENT'S NEEDS

The purpose of designing and constructing Aurum Road Wildlife/Creek crossing was to provide a physical connection from the Edmonton Ring Road, Anthony Henday Drive (AHD), to the east industrial area, Aurum Energy Park (the Park). This project helps the client with day-to-day operational goals by linking their home base to their industrial development projects east and west of 17 Street NE and north and south of Aurum Road. It combines the advantages of ideal location, access to major transportation routes, rapidly expanding services, and the infrastructure needed to perfectly position Aurum Energy Park in Alberta's burgeoning energy and resource economy. Through the Aurum Wildlife Creek Crossing, the Park is connected to key major transportation corridors: Highway 16 east-west and Highway 63, a major truck route north to Fort McMurray; Highway 21, a vital north-south commercial transport artery; and Anthony Henday Drive, a major ring road providing access around the City of Edmonton and beyond.

Project management, project coordination, and team selection for both design and construction were the key components of this project's success. Highly experienced professionals and experts from different sectors of Stantec were engaged right at the planning stage. The project team carefully reviewed the site specifics, hydrotechnical information, morphology, geotechnical issues, roadway geometrics, environmental constraints, and then began considering different structure alternatives for this project. This entire process helped in selecting the most economical alternative and to reduce overall risk during the construction to complete the project on time and within budget.