

RIBBON OF STEEL

A MULTI-USE TRAIL AND STREETCAR CORRIDOR DOWNTOWN EDMONTON, ALBERTA

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ABSTRACT

The Ribbon of Steel is a multi-modal transportation corridor along an abandoned rail line servicing Downtown Edmonton. It includes a 3.0 metre wide, asphalt multi-use trail for pedestrians, cyclists and other active modes. An historic streetcar runs parallel to the trail, similar to many European scenes. An access to the underground Light Rail Transit station is also incorporated with the design.

Edmonton's *Transportation Master Plan* (1999) highlighted the importance of providing a mix of travel options – exclusively building more roadways is unsustainable mobility management. An accessibility priority was to develop non-motorised facilities along rail and utility rights-of-way.

City Council has since approved a 62-kilometre Multi-use Trail Corridor Network servicing all quadrants of Edmonton. The Ribbon of Steel is the primary trail route through the urban centre, connecting to existing off-road trail systems at either end.

'Ribbon of Steel' alludes to past railway operations, the unique streetcar and contemporary binding of Downtown with surrounding neighbourhoods. Stylised design captures historic aspects of the corridor while complementing the vibrant commercial and residential communities.

Key activities during project planning and design included an independent safety audit, successful infrastructure funding application (\$2.3M) and extensive public consultation. Integrating the trail and streetcar with the surrounding roadway network required considerable attention, and a firm design position ensured disabled access guidelines were achieved.

Construction of the Ribbon of Steel occurred between May and October 2003. The volunteer-operated streetcar resumed service in May 2004, accompanied by the official opening. Numerous Edmontonians are using the facility year-round, aided by the City of Edmonton's commitment to clear snow along the trail corridor network.



1. INTRODUCTION

1.1. *Ribbon of Steel Overview*

The Ribbon of Steel (ROS) project entailed constructing a 3.0 metre wide, asphalt multi-use trail along an abandoned rail line for self-propelled modes such as walking, cycling and skating. Parallel to the trail, the volunteer-run Edmonton Radial Railway Society's historic streetcar tracks were extended from a basic terminus at 98 Avenue to a stylish plaza just south of Jasper Avenue, significantly raising the profile of, and access to, the streetcar service.

Constructed along former Canadian Pacific Rail lands, the ROS multi-use corridor runs adjacent to 109 Street and the western boundary of Downtown Edmonton. The ROS corridor extends 600 metres south from Edmonton's core thoroughfare, Jasper (101) Avenue. At the southern end, the ROS connects to 97 Avenue and the High Level Bridge crossing of the North Saskatchewan River Valley.

Edmonton's Light Rail Transit (LRT) operates beneath the corridor and Grandin Station is located underground between 98 and 99 Avenues. The former streetcar terminus was redeveloped as a seating plaza and streetcar stop with a formal link to both the LRT entrance on 109 Street and the residential Oliver community by 110 Street. The underground Pedway to the Province of Alberta's Legislature Building can also be accessed from the station entrance.

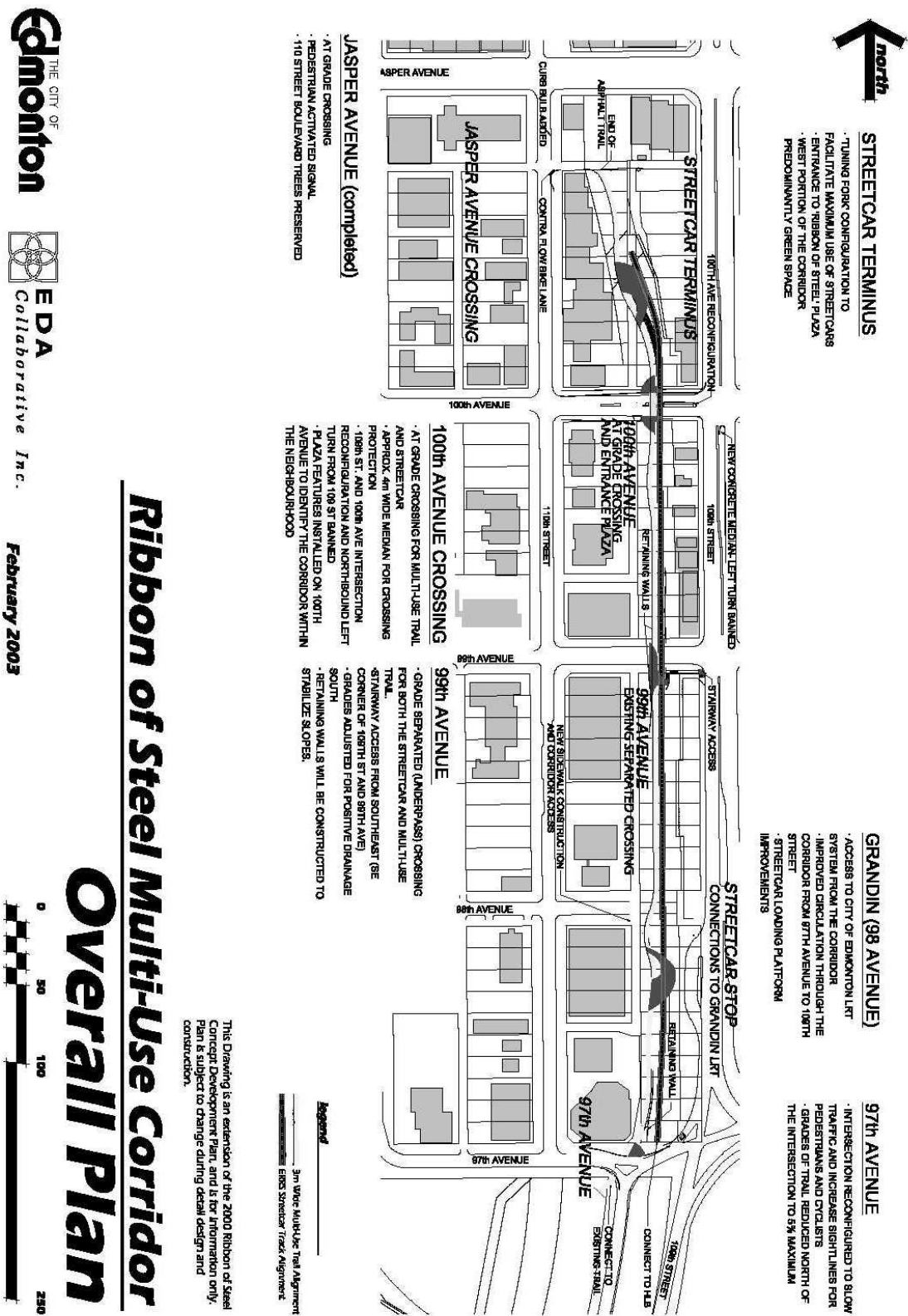
Traditional trail user needs were enhanced to include lighting, landscaping and seating areas. Distinctive surface treatments denote approaches to roadway crossings and the streetcar plazas. These various elements integrate historic aspects of the corridor as well as complement the surrounding commercial and residential communities, including the majestic Legislature Building to the south.

An aerial view of the Ribbon of Steel project area is shown below, and the Concept Plan presented in Figure 1.2 on the following page.

Figure 1.1 Project Area



Figure 1.2 Ribbon of Steel Concept Plan



1.2. Facilities for Self-Propelled Modes in Edmonton

Edmonton offers predominately flat topography, clearly advantageous for self-propelled travel. The North Saskatchewan River Valley and Ravine System extends throughout the city, with the river up to a maximum of approximately 60 metres below grade.

Along road right-of-way and urban areas, active Edmontonians can utilise:

- 85 km of wide (2.5 m+) shared-use sidewalks
- 105 km of designated on-road cycling routes
- 30 km of hard surfaced and 10 km of granular trails along rail/utility rights-of-way
- 5 km of contra-flow bicycle lanes along one-way streets
- 6 km of bus/taxi cab/bicycle only lanes.

Within the North Saskatchewan River Valley there are:

- 55 km of hard surfaced multi-use trails
- 80 km of granular multi-use trails
- 15 km of wood chipped trails.

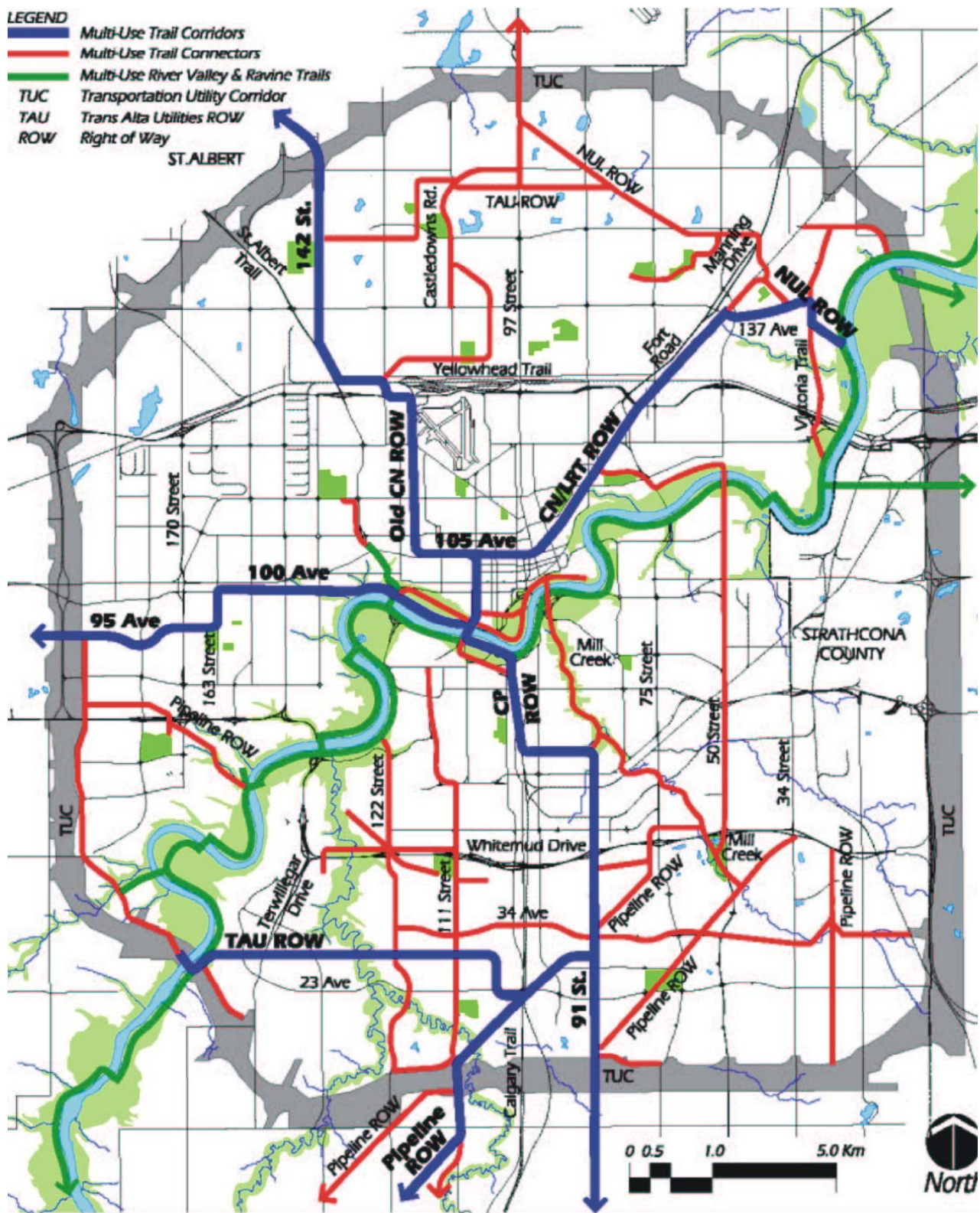
1.3. Policies Supporting Active Transportation

The City of Edmonton's *Bicycle Transportation Plan* (BTP) was approved in 1992. The principles of Planning, Engineering, Education, Encouragement and Enforcement were adopted⁽¹⁾. For the oft snow-covered roadway network, wide curb lanes (typically 4.2 metres) have since been implemented to accommodate cyclists in on-road situations. An update of the BTP is scheduled for fall 2004, together with a sidewalk plan.

In 1999, the Transportation and Streets Department updated its *Transportation Master Plan* (TMP), referencing consistency with the BTP principles and policies to provide well-integrated, safe and convenient accessibility throughout the City of Edmonton by bicycle⁽²⁾. As a twenty-year strategy, the TMP clearly strives to provide and support a balanced transportation system for automobiles, cyclists, pedestrians and public transit.

A ten-year accessibility goal of the TMP was to develop non-motorised transportation facilities along abandoned/active railway, pipeline and utility rights-of-way. City Council subsequently approved the *Multi-use Trail Corridor Study*⁽³⁾ in 2002, including a 62-kilometre network and a ten-year implementation plan. The Network diagram is presented in Figure 1.3 on the following page. The blue lines denote the trail corridors, supplemented by the red, secondary connector routes. To date, a total of 16 km of the trail corridors have been completed as well as 40% of the 110 km connector system.

The trail corridors connect quadrants of Edmonton to the Downtown core and the North Saskatchewan River Valley. Just as arterial roadways are the prime routes for motorised travel, the trail corridors form the backbone to Edmonton's citywide active transportation and recreation system. The Ribbon of Steel multi-use corridor is the primary link between north and south Edmonton and through the urban centre, depicted in the centre of the Network diagram.

Figure 1.3 Multi-use Trail Corridor Network

1.4. Relationship to Municipal Strategies

In addition to approved policy documents such as the *Bicycle Transportation Plan* and the *Transportation Master Plan*, the Ribbon of Steel was also the product of several core City of Edmonton stratagems. Corporately, *Plan Edmonton* (1998) is City Council's framework to provide direction for Edmonton's physical, economic and social development. Priorities for planned growth include an attractive, dynamic Downtown and reinvesting in mature neighbourhoods. Infrastructure development goals specify safe, efficient movement of people and goods while protecting the environment⁽⁴⁾.

A pedestrian/cycling corridor was specifically identified in the *Capital City Downtown Plan* (1996) along the abandoned rail lands⁽⁵⁾. This plan also recommended gateway features for all approaching roadways into Downtown, including Jasper Avenue at the northern limit of the ROS.

The City's Office of the Environment coordinates interdepartmental participation through the *Environmental Strategic Plan* (1999). Climate change, sustainable development and both light and noise pollution are identified as corporate issues in this strategy⁽⁶⁾. These aspects are inherent to the ROS and the project is one example of the City's ongoing commitment to environmental protection.

1.5. Project Timeline & Key Activities

In response to approved policies, a strategic level investigation was completed during 2000 that supported a funding application for the Infrastructure Canada-Alberta Program. \$2.3M was allocated from this program comprising shared financial contributions from federal, provincial and municipal government sources.

Concept planning began in fall 2001 and progressed through detailed design to construction from May to October of 2003. Preliminary design activities included site reviews, environmental testing, geotechnical evaluations and concept development.

Prior to detailed design, an independent team of experts conducted a safety audit. The audit reviewed the design, considering trail users, the streetcar and the surrounding roadway network. Increasingly, road safety audits are becoming standard components of major roadway design projects, including the relationship with pedestrians and cyclists. The ROS audit was novel as the primary focus was non-motorised travel and interaction with the adjacent streetcar and surrounding roadway network.

Stakeholder involvement occurred throughout the project and included two open houses, several newspaper articles and radio interviews. Two information bulletins, introducing and, later, updating project development, were also delivered to over 3500 surrounding residences and businesses. City Councillors were briefed on progress and accompanied City staff at Community League meetings for the Oliver and Downtown neighbourhoods. Presentations were also made to the Downtown Business Association and Urban Design Review Panel to ensure compatibility with city centre revitalisation.

2. SITE CONDITIONS

2.1. Corridor Outline

Canada Pacific (CP) Rail ceased operations in Edmonton's downtown core almost fifteen years ago. The rail right-of-way was purchased by the Province of Alberta and subsequently leased to the City of Edmonton in 1994 to maintain the lands and, specifically, to construct a cycling and pedestrian facility.

Along the four-block length of the Ribbon of Steel (97 to 101 Avenue), the corridor is mostly below grade, with a road closure at 98 Avenue and an overpass at 99 Avenue assisting grade-separated passage. The corridor is accessed by at-grade crossings at either end, and a new mid-block trail crossing was introduced at 100 Avenue. Extensive traffic engineering was applied during the design process, both internal to the City of Edmonton and through an independent safety audit. After investigating several crossing options, a mid-block crossing that prioritises the multi-use corridor was adopted. Refer to Section 4.3, Roadway Integration, on page 14 for further discussion.

To accommodate the dual trail and rail facilities, dilapidated wood retaining walls were removed and new walls constructed further apart to widen the corridor. Debris and overgrown vegetation was cleared from the abandoned rail line to provide uncluttered sightlines and discourage loitering.

Construction and operation features include use of specialised aggregate concrete and materials, mainly in the retaining walls, to overcome grade differences along the project area. For visual interest, curvilinear rather than straight retaining walls were constructed that feature an inlaid ribbon motif along their length. A firm design position ensured that disabled access guidelines were achieved, with maximum trail slope of 2 to 5%, even at the expense of constructing additional retaining walls.

2.2. Surrounding Transportation Network

A grid network of roadways, the underground Light Rail Transit (LRT) and Edmonton Transit low-floor buses service the project area. Two of the adjacent bus routes are outfitted with racks that carry bicycles. At the northern end of the ROS corridor, Downtown Edmonton's main thoroughfare, Jasper Avenue, carries almost 32,000 vehicles per day. 109 Street along the eastern edge is also a primary arterial, with a daily volume of 37,000 vehicles.

To the south lies the North Saskatchewan River Valley, where the CP Rail lands and roadway network funnel to the one-way (southbound) High Level Bridge. Cyclists and pedestrians are accommodated in both directions on multi-use trails on either side of the bridge, recording Edmonton's highest daily use by self-propelled modes. Even during cool fall weather, the average is more than 1200 cyclists and 600 pedestrians per day.

2.2. *Surrounding Transportation Network - continued*

On the south side of the High Level Bridge is the University of Alberta, accompanied by a popular shopping and entertainment district. City of Edmonton monitoring in 1995 determined that 65% of cycling trips in the Downtown/University area are for work or school purposes. The remainder are for recreation, shopping and social activities.

Stairways and trails connect the High Level Bridge to the extensive River Valley trail system – Edmonton’s Ribbon of Green – some 50 metres below. Parallel to the High Level Bridge, a low level river crossing for pedestrians and cyclists is suspended beneath the Menzies (LRT) Bridge.

North of the Ribbon of Steel corridor and Jasper Avenue is another trail system through a mixed-use residential and commercial development, described below in Section 2.3. Prior to the ROS, trail users were left stranded between the various trail systems, and access to Downtown required negotiating one-way streets and the busy 109 Street arterial roadway.

Thus, completing the trail connection addressed a critical need as well as advanced the ten-year Multi-use Trail Corridor Network depicted in Figure 1.3 on page 4. The ROS is the gateway to Downtown and north Edmonton for self-propelled transportation and links south to the University of Alberta area via the High Level Bridge.

2.3. *Adjacent Land Uses*

The flanking Downtown properties to the east are comprised of commercial sites, offices, parking lots and two petroleum stations. Land use in the neighbourhood of Oliver to the west was predominantly older, run-down homes and vacant lands. North of Jasper Avenue, the former rail yards and dairy operation had been abandoned and remained unoccupied.

Late in 1999, a large scale mixed commercial and residential development called Railtown opened on the former rail yards to the north of the project area. The development consists of a large supermarket, several businesses and restaurants, and medium and high-density housing, including residences for seniors. The City of Edmonton required that the central corridors of the lands, both north-south and east-west, be dedicated as Municipal Reserve. The developer constructed public multi-use trail connections and landscaped the area.

The Railtown development triggered considerable activity in the area, both commercial and residential. The Ribbon of Steel corridor is now bounded by several high-density apartments and upgraded commercial sites. In the past decade, the population in Downtown Edmonton and Oliver neighbourhood has increased considerably.

3. DETAILED CORRIDOR DESCRIPTION

3.1. 97 Avenue Southern Access

97 Avenue is the transition area whereby a trail user leaves the North Saskatchewan River Valley trail system and enters the Ribbon of Steel, or vice versa. Highly utilised trails on the High Level Bridge across the River Valley provide direct access to the University area and southern neighbourhoods. The volunteer-run Edmonton Radial Railway Society (ERRS) streetcar continues across the top deck of the Bridge to an historic shopping and entertainment district. The view from atop the Bridge is spectacular, renowned as the world's highest streetcar river crossing.

The geometrics of the 97 Avenue intersection were modified to improve pedestrian and cyclist protection. The northern curb was extended to reduce speeds of westbound vehicles, decrease the crossing distance and to provide a larger storage area behind the ramp for trail users. Sightlines for both trail users and vehicles have also improved. Oversized pedestrian crossing signs as well as advance cyclist/pedestrian warning signs were installed.

Extensive regrading of the Ribbon of Steel trail approach to 97 Avenue was required to meet project design guidelines of 2 to 5%, requiring approximately 60 metres of retaining wall installation. The storage area behind the curb ramp was limited to 2% to maximise visibility of trail users and encourage reduced speeds into the crosswalk.

Construction at 97 Avenue included:

- Reconfigured intersection for traffic calming
- Improved crosswalk protection through reduced crossing distance and signage
- Grade reductions on the trail to improve trail user safety

Figure 3.1 97 Avenue – Before & After



Westbound along 97 Avenue. The Ribbon of Steel access is to the right of each photo.

3.2. 98 Avenue/Grandin LRT & Streetcar Stop

The ERRS formerly terminated streetcar operations at a stop by the Grandin Light Rail Transit (LRT) station at 98 Avenue. The ERRS had expressed an interest in extending service beyond the station closer to Jasper Avenue.

Extending the streetcar tracks north towards Jasper Avenue allowed redevelopment of the former terminus to a stylish plaza and streetcar stop. A vast improvement from the temporary platform, colour graded concrete was used to provide interesting detail in the large plaza surface. Seating, landscaping and feature lighting has been installed, all with the backdrop of the Province of Alberta's Legislature Building. A connecting trail between 109 and 110 Streets was also constructed.

The Grandin Streetcar Stop features the following:

- Hard surfaced plaza
- Streetcar loading/unloading platform
- Universal access from both 109 and 110 Streets

Figure 3.2 98 Avenue Streetcar Plaza – Before & After



The former streetcar terminus was a temporary wooden structure; shown top left looking east. The new Grandin plaza was constructed to the south as depicted below left and right. The plaza features colour-graduated concrete, seating, landscaping and feature lighting. A fine vista of the Province of Alberta Legislature Building to the southeast can be enjoyed from the plaza.



3.3. 99 Avenue Overpass

The streetcar and the multi-use trail both utilise the grade-separated underpass at this location. A stairway from 99 Avenue, 7.0 metres above the corridor, was constructed on the southeast side of the overpass. An allowance has also been made for a future stairway on the northwest corner. The stairway includes a ramp for cyclists to push their bicycles up and down. The ROS is fully accessible one block north at 100 Avenue and less than one block south at the Grandin LRT Station.

Beneath the overpass, approximately 1.0 metre of fill was placed to limit the onward slope as it climbs towards 100 Avenue. The City collaborated with the Art & Design in Public Places society to add murals to the overpass walls.

In the area of 99 Avenue, the Ribbon of Steel entails:

- A stairway access on the south side of the overpass
- Raising of grades beneath the overpass
- Construction of new concrete retaining walls

Figure 3.3 99 Avenue Overpass – Before & After



The overgrown rail corridor was widened to accommodate the trail and streetcar rails. Landscaping and an art mural beneath the overpass augment the corridor.



3.4. 100 Avenue Crossing

CP Rail originally crossed this location using an underpass. The underpass, however, was removed after rail operations ceased and compacted fill placed within the corridor to match the corridor to roadway grade.

Following numerous traffic engineering exercises and an independent safety audit, an at-grade, mid-block trail crossing at 100 Avenue was recommended. The advantage to this approach was that a linear corridor was maintained and the streetcar permitted to extend north towards Jasper Avenue.

The configuration of the 100 Avenue crossing includes:

- At-grade, mid-block zebra crossing for the trail and streetcar track
- A mid-crossing refuge median for pedestrian protection and traffic calming
- Hand rails in the median offer support to trail users, particularly cyclists
- Elimination of the left turn bay onto 100 Avenue from 109 Street northbound
- Realignment of the north curb and sidewalk on 100 Avenue
- Entry plaza and features on 100 Avenue

Further discussion about the 100 Avenue crossing and roadway modification is included in Section 4.3.

Figure 3.4 100 Avenue Crossing – Before & After



Looking east along 100 Avenue, a mid-block zebra crosswalk was installed for linear passage of both trail users and the streetcar. The signalised 109 Street intersection is approximately 40 metres in the background.

3.5. Jasper Avenue Streetcar Terminus

The streetcar extension to and across Jasper Avenue is not feasible at this time, as the lands required are privately owned. However, the streetcar terminus was relocated to connect to an alley just south of Jasper Avenue. Trail users continue along 110 Street, a one-way northbound roadway, on the shared use sidewalk or a contra flow bike lane.

The new terminus has a tuning fork rail configuration to allow multiple streetcars to be stored and operated on this line.

Figure 3.5 100 Avenue to Jasper Avenue – Before & After



Looking north from 100 Avenue, a comparison can be viewed of the previous grassed area and the new trail, crossing and streetcar track extension to the new terminus.



The streetcar terminus, left, matches the 98 Avenue plaza design, with colour-graduated concrete indicating to trail users that they are entering a different use area.

North from the ROS terminus, right, a 25-metre long sidewalk and onroad bike lane along 110 Street complete the connection to the signalised crossing of Jasper Avenue. The onward trail through Railtown can be seen in the background.



4. IMPORTANT DESIGN CONSIDERATIONS

4.1. *Delineation*

The streetcar operates at low speeds (maximum 20 kilometres/hour) and the tracks are offset at least 3.0 metres from the edge of the trail. Ballast surface treatment beneath and adjacent to the tracks offers a less attractive travel surface than the asphalt trail, discouraging non-streetcar usage. The trail is elevated to ensure ballast does not spill onto it and create a hazard. The 2% cross fall of the trail towards the tracks also facilitates drainage.

An independent safety audit reviewed case studies of rail-with-trail facilities, concluding that the low streetcar speeds and horizontal separation facilitated adjacent operations. Erecting a continuous fence between the trail and streetcar was reviewed. Such a fence would significantly constrict available space for trail users to approximately 5.0 metres and create a greater sense of entrapment. Crime Prevention Through Environmental Design (CPTED) principles were considered and it was deemed important to develop an inviting and comfortable space, maximising personal security.

The streetcar drivers are trained to operate within the multi-use corridor, functioning adjacent to and with trail users and passengers. The drivers are also trained in roadway operations to conduct flag protected roadway crossings.

4.2. *Linear Continuity*

Along the length of the Ribbon of Steel corridor, there is one at-grade roadway crossing at 100 Avenue. For the multi-use trail to cross 100 Avenue, extensive consideration was given to routing the trail approximately 40 metres east to the existing 109 Street signalised intersection and terminating the streetcar service south of 100 Avenue.

It was considered highly unlikely that trail users would readily detour to the signalised crossing if the onward trail were clearly visible and accessible straight ahead across four lanes of traffic with a refuge median. High fencing would be required to prohibit illegal crossings, an unattractive barrier within the Ribbon of Steel corridor. Such a fence would also need to extend at least the same distance in the opposite direction, which was not possible due to maintaining all-directional access to 100 Avenue from an alley just west of the corridor.

Thus, it was deemed more functional to maintain the linear continuity of the trail and extend the streetcar closer to Edmonton's main thoroughfare, Jasper Avenue.

4.3. Roadway Integration

Varying levels of pedestrian protection were reviewed for the 100 Avenue mid-block crossing, ranging from a marked crosswalk to a pedestrian actuated signal. The proximity of the crossing to 109 Street (30 metres) precluded installing a new signal to avoid driver confusion. After extensive traffic engineering and review, a zebra marked pedestrian crosswalk was selected, accompanied by a left turn ban from 109 Street.

Previously, an advance left turn signal permitted northbound to westbound traffic from 109 Street to access 100 Avenue. VISSIM traffic network modelling indicated that the 260 vehicles/hour during both the morning and afternoon peak hours were predominately generated from the 105 Street/Walterdale Bridge and were travelling through the residential Oliver neighbourhood to the west end of Edmonton. An alternate arterial, River Valley Road, was rehabilitated in 2002 and modelling indicated that additional traffic could be accommodated on this more direct route.

Concurrent with the Ribbon of Steel construction in 2003, 100 Avenue was also scheduled for roadway rehabilitation. The road closure was extremely effective for familiarising motorists to the new route. Resurfacing also permitted new lane markings and 100 Avenue's three substandard width lanes (two westbound away from and one eastbound towards Downtown) were reconfigured to a single, wide lane in each direction.

Before and after traffic monitoring has demonstrated that 3400 vehicles per day (25%) have been redirected from the 100 Avenue residential route to the alternate arterial alongside a golf course. Also, lane sharing on 100 Avenue was greatly improved for motorists and cyclists accessing the Ribbon of Steel.

5. RIBBON OF STEEL EXCELLENCE

5.1. *Innovation*

Developing a 62-kilometre **citywide network of multi-use trails** free of automobiles is a modern approach to encouraging self-propelled transportation and recreation. The trail corridors are the equivalent of arterial roadways, a dedicated system that connects all quadrants of Edmonton to the Downtown and the North Saskatchewan River Valley. The Ribbon of Steel is the central, linking trail between north and south Edmonton, connecting across the River Valley via the High Level Bridge.

Coupled with the parallel streetcar service and the underground Light Rail Transit, the Ribbon of Steel is a **multi-modal transportation** route. Numerous low-floor buses service the area, including two routes equipped with racks that carry bicycles.

Integrating the corridor with the surrounding roadway network also resulted in significant changes to traffic operations to give **priority to trail users** and the streetcar. For example, to facilitate the trail and streetcar crossing at 100 Avenue, a zebra marked crosswalk was installed and the vehicular left turn onto 100 Avenue banned from nearby 109 Street. 100 Avenue also underwent a lane reconfiguration or a “Road Diet” whereby three narrow traffic lanes were reduced to one in each direction. Before and after monitoring indicates that daily traffic volumes have decreased 25% through the residential neighbourhood, with most traffic diverted along a recently rehabilitated parallel arterial. Lane sharing between motorists and cyclists improved dramatically.

Developing the unused rail lands to create an **urban park** is extremely valued by the high-density inner city population and work force. The Ribbon of Steel corridor offers excellent vistas of the Downtown skyline, the North Saskatchewan River Valley and the Province of Alberta’s Legislature Building.

5.2. *Best Practices*

The model to create trail corridors throughout the city affords and **encourages non-motorised transportation and recreation**. Sustainable urban centres can no longer rely solely on building roadways for vehicle use, but should aim to provide a balance of transportation options. Importantly, the City of Edmonton has committed to clear these trail corridors of snow to facilitate year-round usage.

Another valuable aspect of the design process was the **safety audit** conducted by an independent consulting team. Road safety audits are increasingly popular for transportation design projects where all roadway users, including pedestrians and cyclists, are considered during the review. Performing a safety audit on the Ribbon of Steel project was unique, since while vehicles were of course taken into account, the primary focus of the audit was non-motorised modes and the streetcar activities.

5.2 Best Practices - continued

Design standards used along the Ribbon of Steel met and, where possible, exceeded guidelines suggested by the Transportation Association of Canada. For example, prior to construction, the CP Rail bed climbed in elevation south to north between 97 and Jasper Avenues. The trail connection to 97 Avenue at the southern end of the Ribbon of Steel was very steep, with an approximate vertical grade difference of 5 metres over a horizontal distance of 45 metres.

Disabled access guidelines specify a maximum grade of 8% on trails and sidewalks, however, the project team adopted a design grade of 5% for the trail approach to 97 Avenue. This required considerable excavation and re-grading of the slope for over 100 metres, as well as installing a 60 metre long retaining wall, a significant cost. Before and after photos of the southbound approach to 97 Avenue are shown below.



In addition, the intersection of the trail and 97 Avenue was reconfigured to achieve a 2% approach to the crossing. This provides a large storage area for pedestrians and cyclists before entering the 97 Avenue crosswalk and enhances visibility of trail users preparing to cross. Reconfiguring the intersection to a tighter corner radius and extending the curb also encourages vehicles to reduce speeds through the crossing.

Crime Prevention Through Environmental Design (**CPTED**) principles were applied, such as providing public spaces that are easily accessed/exited, uncluttered and lit. Luminaires on light standards installed along the corridor are covered on top, shown right. Light is directed downward and upward light pollution reduced as part of the '**dark-sky**' philosophy to preserve the nighttime environment. The lamps used are metal halide which cast a white light, well-suited to pedestrian areas as peoples faces are rendered better by white lighting than yellow light from standard high pressure sodium globes.



5.2 Best Practices - continued

To **improve aesthetics** and avoid a plain expanse of concrete on the retaining walls at 97 Avenue and throughout the corridor, a ribbon motif was inlaid along the walls. The walls were constructed with both curvilinear depth and to varying heights to mimic a ribbon along the corridor. A specialised fluid concrete, agelia, used to produce a smooth finished texture.



The stairs at the 99 Avenue overpass include ramps for cyclists.

The concrete streetcar plazas, right, are formed in differing shades of grey to create patterns and to indicate areas of mixed use by trail and streetcar activities.



5.2 **Best Practices - continued**



Other **hard landscaping** includes historic look seating and garbage receptacles, and colour coordinated railings on stair accesses and atop the retaining walls.

Feature lighting columns at the streetcar plazas also include the ribbon motif.



During the concept planning phase, **environmental testing** and analysis was conducted to ascertain contamination from the former rail operations, particularly PAH (poly-aromatic hydrocarbons) and heavy metals. Isolated pockets of residue were identified then handled and disposed of appropriately, managing any risk to the public.

6. RESULTS AND LESSONS LEARNED

6.1. *Environmental Benefits/Reduced Resource Consumption*

Convenient and well-designed infrastructure for non-motorised transportation and recreation provides an alternative to vehicle use and attracts new users. The streetcar extension now links Edmonton's Downtown core across the North Saskatchewan River Valley to Old Strathcona, a popular destination for shopping and entertainment with scarce vehicle parking. Fewer vehicle trips protects fuel reserves, reduces combustion pollutants emitted and lowers noise pollution.

6.2. *Social Benefits*

The abandoned CP Rail lands have been converted to an aesthetic and vibrant corridor for residents, trail users, commuters, workers and tourists. Better access to physical activity and attractive environments improve well-being and quality of life for Edmontonians.

The higher profile of the Edmonton Radial Railway Society (ERRS) and riding the streetcar offers the opportunity to explore Edmonton's history. The ERRS is a volunteer-run organisation that has fund-raised tens of thousands of dollars to develop a functional streetcar operation. It was important to recognise their contribution to Edmonton and over 40% of the ROS project costs were for streetcar amenities and to widen of the corridor to accommodate both the multi-use trail and the streetcar rails.

6.3. *Financial Benefits*

The City of Edmonton recognises that investing in infrastructure such as the Ribbon of Steel provides transportation options and attracts new users, reducing ongoing roadway maintenance and rehabilitation costs.

The public's well-being resulting from physical activity and reduced auto-related stress is difficult to quantify, however should correlate to long-term health care system savings.

For the private sector, adjacent commercial properties are thrilled with Ribbon of Steel potential. Two restaurants are planning rear-facing patios to overlook the corridor, and a developer is proposing to transform a flanking surface parking lot to a mixed-use commercial and residential site. The market value of residential apartments with a view of and access to the Ribbon of Steel is expected to increase.

6.4. *Elimination, Reduction or Management of a Problem*

Prior to the Ribbon of Steel, multi-use trails on the High Level Bridge and through the Railtown development were unconnected. Pedestrians could utilise sidewalks and cross three roadways, however inline skaters were limited on the narrow sidewalks and cyclists restricted to on-road routes on inconvenient one-way streets.

Providing the 600 metre Ribbon of Steel connection completed the trail system and because of the below-grade level of the CP Rail lands, eliminated two roadway crossings by utilising an underpass and a road closure. Separating trail users from passing vehicles and traffic noise also minimises exposure.

6.5. *Human Resource Requirements*

In the initial strategic planning phase, three senior planners and an engineer worked with a team of three consultants to define the functional project scope. The consulting team continued to work with two engineers throughout concept design, along with two designers and guidance from geotechnical and environmental engineers. As detailed design commenced, a third project engineer joined the team and greater interaction with the construction engineer and construction manager began. Consultants were engaged for the safety audit, geotechnical design, landscape design and railway engineering.

Volunteers from the Edmonton Radial Railway Society (ERRS) were involved from project inception through to construction, as well as stakeholder input from non-motorised advisory groups and the public at large at Open House evenings.

6.6. *Project Evaluation*

Construction of the Ribbon of Steel was completed in fall 2003, and the simple evidence throughout winter of many footprints and tire tracks in the subsequent snow was extremely pleasing! A formal, comprehensive monitoring program to gauge trail usage is being undertaken during spring/summer 2004. Anecdotal reports from the public are also very positive, and the Downtown and Oliver communities have expressed their excitement about the new facility.

ERRS commences their summer streetcar service on the May long weekend, and the official opening followed on May 13, 2004. Participants included ERRS volunteers, the project team, dignitaries and school children from nearby École Grandin, as shown right.

ERRS is grateful for the enhanced streetcar plazas and amenities, and anticipate increased ridership due to the improved service and public presence.



6.6 *Project Evaluation - continued*

Internal to the City of Edmonton, an enduring gain for staff from the Ribbon of Steel project is the acknowledgement and support of non-motorised transportation. The complexity of the project challenged planning, design and construction personnel, generating considerable job satisfaction. For example, long-term roadway designers enjoyed the innovative work and realised that designing for pedestrians and cyclists can be as detailed and intricate as for vehicular traffic. The construction team who typically supervise roadway and transportation projects were exposed to new techniques, particularly installation of the streetcar rails, and expanded their expertise.

The principal constraint of the Ribbon of Steel project was available funding. At the strategic planning level, preliminary budget estimates exceeded the Infrastructure Canada-Alberta Program allocation therefore design decisions to reduce project scope were required throughout the venture. For example, installation of one stairway access was deferred and a staged landscaping program developed. However, the integrity of the overall project was fully retained. Complete and functional multi-use trail and streetcar operations were achieved rather than constructing partial connections with higher cost materials and accessories. Thus, an important project management lesson learned was to balance project goals with project products.

6.7. *Integrated Planning*

It was highly beneficial to have had continual human interaction between the planning, design and construction disciplines throughout the project, supplemented by regular communication with operations and maintenance personnel and other stakeholders. This fostered a close working team to direct the project and make unified decisions.

The multi-disciplinary project team, below, also enabled a broader range of project criteria to be considered and incorporated. Clearly, the Ribbon of Steel was an environmentally and socially friendly project intended to increase mobility. However, contrasting issues and interests had to be addressed and managed, such as the constraints of funding and even the urban setting.



7. COLLABORATION AND COMMUNICATION

7.1. *Partnerships*

The primary collaboration for the Ribbon of Steel project was with the Infrastructure Canada-Alberta Program (ICAP), the federal, provincial and municipal government funding plan. \$2.3M was allocated to the project, which entailed considerable communication with administrators to detail the project scope and supply ongoing updates. ICAP hosted a media conference for the entire funding program at the Ribbon of Steel construction site on August 27, 2003.

Notaries in attendance included the Hon. Anne McLellan (Deputy Prime Minister, then Minister of Health), the Hon. Ed Stelmach (Minister of Alberta Transportation), John Trefanenko (Alberta Urban Municipalities Association), and City of Edmonton Councillors Allan Bolstad and Michael Phair.

The other important relationship formed was working closely with the Edmonton Radial Railway Society (ERRS), the volunteer organisation that operates the streetcar. ERRS members were consulted throughout the project, understandably for their rail expertise.

7.2. *Community Engagement*

Municipal staff attended several meetings with both the Downtown and the Oliver residential Community Leagues, providing project materials and follow up written communication. These meetings were in addition to two public Open Houses for the greater residential and business communities where the concept level and detailed design proposals were presented respectively.

The two Open House invitations and information bulletins were delivered to over 3500 adjacent residences and properties. To reach the broader public, articles appeared in Edmonton's newspapers and Community League newsletters. Presentations were made to the Downtown Advisory Board and concept plans provided to the Urban Design Review Panel to ensure compatibility with city centre initiatives.

As previously indicated, ongoing communication occurred with the prime stakeholder, the Edmonton Radial Railway Society. Round table discussions also took place with other interest groups like Alberta TrailNet, the Running Room, the Cyclists Advisory Committee and Community Greenways.

7.3. *Council/Municipal Staff Communication*

Prior to detailed design, the Ribbon of Steel concept design was formally presented to the Transportation and Public Works Committee, a sub-committee of City Council comprising four Councillors. A presentation and photographic site tour was shown, and members of the ERRS and other stakeholder groups spoke about the project. The entire City Council subsequently approved the Ribbon of Steel.

8. CONTACT INFORMATION

To discuss the Ribbon of Steel project or for additional project information, please contact Claire Stock, Transportation Engineer with the City of Edmonton at (780) 496-2407 or claire.stock@edmonton.ca

9. REFERENCES

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