January 5, 2015

Andre Corbould  
Deputy Minister  
Office of the Deputy Minister  
Transportation  
2nd fl Twin Atria Building  
4999 - 98 Avenue  
Edmonton, AB T6B 2X3

Dear Mr. Corbould:

Re: South West Ring Road – The City of Calgary Concerns

As Alberta Transportation wraps up your public consultation efforts and moves forward with more detailed work, we felt now was a good time to summarize our concerns.

The City of Calgary ("The City") has identified several areas of potential impact caused by the South West Ring Road ("SWRR") project in relation to our infrastructure, on emergency response operations and to City owned lands. Our concerns include:

1. Protection of our source drinking water and infrastructure;
2. Wetland and natural environment impacts;
3. Minimization of direct habitat loss;
4. Emergency access maintenance;
5. Responsibility for emergency response;
6. Community impacts and associated citizen requests;
7. Coordination with The City of Calgary road infrastructure;
8. Outstanding agreements.

These issues can be broken into three categories:

- **Outstanding Concerns**: Issues (items 1, 2, and 3 above specifically) that have been brought forward to Alberta Transportation in a number of communications over the last several months but have not been addressed to date by Alberta Transportation. The City requests a response from Alberta Transportation on these items.

- **Ongoing Discussions**: Issues that involve ongoing discussions which The City and Alberta Transportation are engaged in. The City is engaged and commits to continue to work with Alberta Transportation to resolve these issues.
- **Bring Forward Issues**: Issues that have more recently been brought forward, either through technical review or through public process, and require a discussion to be initiated. The City and Alberta Transportation need to conduct discussions on these issues with the goal being to resolve them.

In an effort to advance the conversation and resolve issues between The City and Alberta Transportation, The City has prepared a memo (attached) which outlines our key concerns in more detail, broken down into major subject areas.

We have also prepared the attached [Hydrotechnical Design Basis/Criteria for the South West Stoney Trail Ring Road](#). The intention of the design basis/criteria document is to highlight the minimum design criteria (and reference guides) as it relates to addressing our key concerns. This document will be useful to ensure that the appropriate factors are considered in addressing The City’s concerns in the design phase, and it is The City’s expectation that these criteria be included in the specification for the P3 contract, or if they cannot be included then an explanation be provided to that effect for further discussion.

Our comments are provided in the absence of a completed Environmental Impact Assessment (“EIA”) for the project; as such it is possible that additional concerns will be identified, and existing concerns may be addressed, once more design detail and environmental data is made available. We welcome the opportunity to review and comment upon the completed EIA and work with Alberta Transportation in addressing these concerns.

The protection of our source drinking water, natural areas and infrastructure adjacent to the SWRR is of utmost importance for us. Therefore, it is imperative that The City of Calgary and Alberta Transportation work together to prevent or mitigate adverse effects.

We request a written response with commitments and timelines to address all of the concerns listed as Outstanding Concerns by 2015 January 31. We want to work with you to arrive at solutions that suit the interest of all parties.
2014/12/15
Mr. Andre Corbould, Deputy Minister
South West Ring Road – The City of Calgary Concerns
ISC: Confidential

Should you have any specific questions, please contact myself or Julie Radke,
Manager, SWRR Integration Project, at (403) 268-1907 or julie.radke@calgary.ca.

Sincerely,

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ML/jr/cm/lh

Attachments (5)
1. City of Calgary Concerns for Discussion, West and South West Ring Road
2. Hydrotechnical Design Basis/Criteria for the South West Stoney Trail Ring Road
   (September, 2014)
3. Aggregated Large Mammal Strikes
4. Calgary Mitigation Locations Map
5. Habitat Issues (October, 2014)

cc:
Bill Werry, Deputy Minister, Alberta Environment and Sustainable Resource Development
Garry Lamb, Urban Construction Manager, Alberta Transportation
Rob Pritchard, General Manager, Utilities & Environmental Protection
Stuart Daigleish, General Manager, Community Services & Protective Services
Anne Charlton, Director, Parks
Rob Spackman, Director, Water Resources
Julie Radke, Manager, SWRR Integration Project
The City of Calgary Concerns for Discussion, West and South West Ring Road

A. WATERSHED, WATER INFRASTRUCTURE AND NATURAL/PARK AREAS

1. Elbow River Realignment and River Training Works Impacts to Downstream City-Owned Lands (Bring Forward Issue)

The current design proposed for the two Elbow River bridge crossings includes river channel realignment and river training structures. It was observed following the June 2013 flood in Calgary that hard armored river sections can generally withstand the design flood flows with minimal erosion. However, the erosive force can be transferred downstream of these sections due to changes in the river channel flow direction and velocity. Design of any river realignment and training works should be completed keeping the principles of river morphology in mind over the entire reach of the river.

Therefore, The City of Calgary ("The City") is concerned that under the currently proposed designs, the river channel downstream of the realignment within City lands will be subject to continuous erosion. Not only does this impact the surrounding environment but will create on-going maintenance issues of the riverbank for The City. The design must take into consideration potential solutions to mitigate the issues noted above and reduce potential future maintenance cost and environmental disruption.

Please see Attachment 2 - Hydrotechnical Design Basis/Criteria for the South West Stoney Trail Ring Road, sections 3.1 (on river hydrology), 3.2 (on hydraulic model creation), 3.3 (on design water levels), 3.4 (on bridge spans allowing room for river morphologic changes), and 3.5 (on river realignment and training structures design), for proposed specifications related to this issue.

2. Impacts to Glenmore Dam Safety (Bring Forward Issue)

The current proposed designs for the two Elbow River crossings both consist of a large embankment fill and narrow bridge span. There exists the potential for significant impoundment of water behind the bridge and embankment for larger return period events (> 1:100 year return period events). Consideration should be given in the embankment design to mitigate the potential for embankment failure (due to overtopping, abutment erosion, seepage or other failure mode). Failure of the embankment could result in the rapid release of significant volumes of water which could incrementally increase flood magnitude on the Elbow River at Glenmore Dam. This will impact the integrity of the dam and dam failure would have catastrophic consequences to the citizens of Calgary. These concerns are shared by Calgary Emergency Management Agency ("CEMA") and the Fire Department in relation to the impacts associated with diversion of the river, the strength of roadway being constructed and whether it is being built to dam strength for flood situations.
To this end, The City of Calgary requests that Alberta Transportation clarify if Provincial
dam experts have reviewed the proposal, and if so, what comments or input they have
provided to the proposed design.

Although the probably of the event occurring is low, the impact would be catastrophic.
Therefore, it is imperative that the design of the embankment fill include proper
measures to mitigate failure risks including monitoring and response plans.

Please see Attachment 2 - Hydrotechnical Design Basis/Criteria for the South West
Stoney Trail Ring Road, section 3.4.1 (on stability of crossing during PMF), section
3.4.2 (on embankment stability during large flood flows), and section 3.5.9.1 (on
installation of facilities for stream flow monitoring).

3. Water Quality Impacts to Glenmore Reservoir (Outstanding Concern)

There are several means by which the ring road may cause water quality issues for The
City:

- Channel realignment and channel constriction may result in increased localized
  velocities. This will cause accelerated channel erosion that leads to increased
  sediment mobilization;
- Vehicle collisions, hazardous materials spills and use of salt or gravel on the ring
  road may introduce harmful chemicals into the Elbow River;
- Potential for pollutant risk to native habitat through sedimentation, chemical or
  noise pollution associated with the freeway and associated stormwater systems
  immediately upstream;
- Hydrocarbons and heavy metals from the road runoff will be introduced into the
  Elbow River.

These issues would have a negative impact on the quality of the water in Glenmore
Reservoir. This translates to a risk to the source water and increased treatment
demands on the Glenmore Water Treatment Plant.

The design of the SWRR must include provision of stormwater management facilities
that can isolate, attenuate or sequester potential pollutants.

Please see Attachment 2 - Hydrotechnical Design Basis/Criteria for the South West
Stoney Trail Ring Road, section 4 (on stormwater management), and section 5 (on
construction) for proposed specifications related to this issue. Also, please refer to the
technical memo from Zhong Xiang titled SW Ring Road Draining and Crossings (March
14, 2014) that was provided to AT for further requirements related to stormwater quality.

4. Wetland and Natural Environment Impacts (Outstanding Concern)

SWRR Project-related impacts to the natural environment would contribute to
cumulative effects to the watershed. We have identified no positive (beneficial) effects
on the natural environment resulting from the project, but we can anticipate there being both direct adverse effects (e.g. habitat loss, increased wildlife-vehicle collisions) and indirect adverse effects (e.g. the establishment and spread of invasive plant species affecting local biodiversity) that will require well planned and executed impact avoidance and mitigation measures.

An overlay of the preliminary SWRR footprint with aerial photos presented in Attachment 4 identifies areas and features, including wetlands and forest habitats, where natural environment impacts are likely to be concentrated. The City welcomes an opportunity to review the SWRR environmental impact assessment (EIA) studies once they are completed, to engage in discussions on suitable impact avoidance and mitigation strategies and related monitoring programs in the context of our ongoing and future management of City lands, amenities and facilities.

One particular area of management has to do with wildlife movements and motorists. The City has identified numerous concerns with respect to the degree to which wildlife movement has been accommodated within the SWRR design. The City of Calgary is divided into two distinct ecosystems, with the west side being predominately foothills, and the east side predominately prairie, resulting in greater wildlife diversity on the west side of the city. Furthermore, the northwest segment of the SWRR (approximately from the Weaselhead Natural Environment Park to the Trans-Canada Highway) is unique in that the area has little urban development or agricultural conversion, both within Rockyview County and in the Tsuu T'ina First Nation lands. As such there is significant wildlife movement into the City in these areas, particularly associated with the Elbow River Valley and the Springbank to Paskapoo Area.

The SWRR project will pose a barrier to species movement within the city. There are six SWRR locations that have high incidences for wildlife collisions, and such incidences will increase with increased traffic. The cost implications of these impacts are significant to different parties including the insurance industry. The City has been working with the Miistakis Institute at Mount Royal University to better understand wildlife and road conflict areas (both existing and potential) within the city. Preliminary results indicate a number of wildlife movement areas confirmed by an analysis of road kill occurrence on the existing network. Maps of large mammal collision hotspots and areas of concern are attached for your reference (Attachment 3). This analysis reflects current conditions only. A predictive model used to assess risk in the SWRR can be made available when it is completed.

The economic cost of a vehicular white tail deer strike is estimated to be in the order of $6000 ($152 deer struck between 2005 and 2014) up to $30 000 for moose collisions (48 struck between 2005 and 2014). We strongly support any design options that could minimize risk, human safety concerns and economic impact to motorists.

A number of hotspot locations are worthy of investigation for mitigation (see Calgary Mitigation Locations Map (Attachment 4) for reference):
• Priddis Slough – Highway 22X and Macleod Trail SW;
• Radio Tower Creek – Highway 22X and Spruce Meadows Way;
• Fish Creek and 37 Street SW;
• Weaselhead Natural Environment Park;
• Elbow River Valley/Discovery Ridge - Highway 8 and 69th Street SW;
• Springbank and Paskapoo Slopes - TUC and 17th Avenue SW; TUC and Bow Trail SW; Paskapoo Slopes to Trans-Canada Highway.

While collisions between large mammals and vehicles need to be mitigated, vehicular collisions with other small/medium mammals, amphibians, reptiles and birds also occurs. One particular concern is birds of prey that hunt at headlight height making them highly susceptible.

A number of mitigation options can be considered throughout the SWRR alignment, including a number of relatively low cost measures to discourage or prevent access to the freeway by wildlife. However, it is our view that relying solely upon exclusionary measures will be ineffective and will also constitute a broader cumulative effect on natural environments in Calgary and on wildlife populations in general.

Appropriate mitigation for wildlife impacts should include the provision of crossing structures at key wildlife movement areas, as identified in Attachment 4. We would recommend following the Government of Alberta, Transportation Best Practice Guideline: Planning Considerations for Wildlife Passage in Urban Environments\(^1\) and the City of Edmonton Wildlife Passage Engineering Design Study\(^2\) which outlines more specific impacts of roads on wildlife and suggested to potential crossing structures for mitigation.

In resolving the issues surrounding environmental impact to the Parks and Elbow River, The City’s primary concern will be to:

i) minimise the land required for disposition; and
ii) minimise the environmental impact of the SWRR on the park, and
iii) consider the hydrotechnical advice provided.

As such, we would request that we have an opportunity to review the EIA, particularly with regards to the issues identified below:

• Loss of significant riparian and upland forest habitat associated with the Elbow River;

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\(^1\) [http://www.transportation.alberta.ca/Content/docType245/Production/PlanningConsiderationsforWildlifePassageinUrbanAreas.pdf](http://www.transportation.alberta.ca/Content/docType245/Production/PlanningConsiderationsforWildlifePassageinUrbanAreas.pdf)

Clarification on the required land for river realignment works, and the associated environmental impacts, including degradation or loss of native habitats;

The potential for increased erosive forces and asset risk within City lands, in Clearwater Park, Griffith Woods Special Protection Park, and Weaselhead Natural Area downstream;

Potential for pollutant risk to native habitat through sedimentation, chemical or noise pollution associated with the freeway and associated stormwater systems;

Impacts to creek systems, such as Cullen Creek, including the potential for ponding that may have downstream impacts to Griffith Woods Park;

Ensuring that there is appropriate recreational and wildlife connectivity between the communities of Discovery Ridge, Clearwater Park and Rockyview County.

Please see Attachment 2 - Hydrotechnical Design Basis/Criteria for the South West Stoney Trail Ring Road, section 3.4.4 (on wildlife crossing room), section 3.5.2 (on designing river training works using The City’s new guidelines), and section 3.5.8 (on vegetating river training works).

5. **Minimization of Habitat Loss** (Outstanding Concern)

A review of the SWRR alignment has identified a number of direct or indirect habitat loss areas as a result of the proposal (refer to Attachments 4 & 5). Direct habitat loss in this context is construction impacts fragmenting and removing native habitat and wildlife movement corridors. Indirect loss could include cumulative effects of degradation and loss of habitat due to several factors, some of which are listed as follows:

- noise and light pollution from the road;
- edge affect (introduction of generalist wildlife species that displace more sensitive species, nest predators and brood parasites for neotropical songbirds (i.e. brown headed cowbird));
- disruption of migration corridors and the isolation of wildlife populations;
- loss of large carnivores and the increase of small carnivores that can prey disproportionately on birds; and
- the reluctance of species to cross the road which could result in a complete habitat loss for that species, i.e. species like hummingbirds may be reluctant to cross the road and would no longer be present in the Weaselhead.

Please see Habitat Issues (Attachment 5) document for further details on specific locations of note.
B. **THE CITY OF CALGARY EMERGENCY RESPONSE**

1. **Emergency Access Maintenance** (Bring Forward Issue)

   The City recognizes the importance of ensuring that emergency access points remain passable in all conditions. This will be relevant in many locations along the ring road, where accesses are closing and emergency gates are proposed. We would like to pursue the inclusion of a clause in the maintenance/P3 contract to ensure emergency accesses from the Transportation Utility Corridor ("TUC") are passable in all weather.

2. **Responsibility for Emergency Response to the Area from Approximately South of Highway 8 to Highway 22x** (Bring Forward Issue)

   The City has a keen interest in this issue and in clarifying with AT the emergency response procedures for this section of the ring road. The majority of the existing ring road is Provincial TUC that is within The City’s limits. A portion of the SWRR will be Provincial TUC and within Tsuu T’ina First Nation land. At present, The City’s Emergency Services do not have a service level agreement with Tsuu T’ina First Nation for emergency response and Emergency Services do not respond within the Tsuu T’ina First Nation boundaries due to safety concerns associated with communication interoperability.

   The City’s Emergency Services is also interested in this issue because of the potential for a significant environmental incident resulting from the transportation of dangerous goods through the Weaselhead area and ultimately a potential impact to The City’s drinking water should there be a release of a substance that migrates into the Elbow River. While it is recognized that the likelihood is small, the impact to the city could be catastrophic should a significant release occur.


   AT has a policy for emergency response on provincial highway right-of-ways that contemplates all emergencies. The City requests clarification to determine if that is the means through which AT would like to approach cost recovery related to a City of Calgary response to incidents on the SWRR.

   The City also requests clarification from AT on the policy that outlines that all emergency responses within provincial highway right-of-ways are expected to be recovered. As per the guidelines agreed to by AT and the Alberta Fire Chiefs Association (Sept 2013), AT would reimburse if the Fire Department was not successful in recovering the costs from the responsible party or insurance company. What is the procedure to be followed?
C. **COMMUNITY IMPACTS AND REQUESTS**

1. **Noise Analysis Results, Anticipated Noise Wall Locations** (Ongoing Discussion)

   It is our understanding that AT is undertaking a noise analysis for the West and South West ring roads. In earlier discussions, it was indicated that there would be some comparative analysis between the AT standard and The City’s standards to see where any differences may exist. We request the opportunity to review these noise analysis results once they are available.

2. **Alignment of the Ring Road Adjacent to Discovery Ridge Community**
   (Ongoing Discussion)

   AT is in discussions and has agreed to revisit the ring road alignment as it will be built adjacent to the Discovery Ridge Community. The City is supportive of the current dialogue between AT and the Discovery Ridge community, and appreciates the thoughtful discussion that is occurring with respect to the proximity of the alignment of the outer lanes vs inner lanes, as well as options that can be considered, and the associated trade-offs of each option. In any scenario being considered, it is The City’s view that visual screening must be included in the design, and that any required noise attenuation is also included. We are hopeful that a resolution can be reached that is satisfactory to both AT and the communities adjacent to this section of the ring road.

3. **Underpass – with Wildlife Corridor under Highway 8, west of 69 St** (Bring Forward Issue)

   City representatives heard from a number of community residents at the West Calgary Ring Road information sessions about a desire to maintain a recreational connection between Discovery Ridge and Springbank along the existing natural area west of 69 Street. This should be pursued and could potentially be tied to a wildlife corridor or crossing in this vicinity (see section A4. above).

D. **COORDINATION WITH THE CITY OF CALGARY ROAD INFRASTRUCTURE**

1. **Tie-ins to The City of Calgary Roadways** (Ongoing Discussion)

   In general, there will be a need to coordinate construction of ring road connections by The City with construction of the ring road by AT and its representatives. There are a number of locations where projects will need to tie-in. The City is interested in ensuring all of these design and construction activities are coordinated and collaborative. To date, there has been steady progress on these interface issues. There are currently two key locations where design collaboration is ongoing, and one of note that involves the MD of Foothills.
Trans Canada Highway
The City of Calgary Transportation and Alberta Transportation project teams have been working together to develop a tie-in strategy for the Trans Canada Highway, where a gap exists between the east edge of the West Calgary Ring Road project and the west edge of the Bowfort Rd/Trans Canada Highway interchange project. This work is proceeding and will be finalized under separate cover.

Macleod Trail
The City of Calgary Transportation and Alberta Transportation project teams have been working together to develop a mutually agreeable design for Macleod Trail between the 162 Avenue interchange project and the South West Calgary Ring Road project. In order to ensure the most appropriate design to coordinate these two projects, work is underway to evaluate different design options. The City appreciates AT’s collaboration in this regard. This work is proceeding and will be finalized under separate cover.

37 Street SW / 96 Street
The City is aware of ongoing discussions between Alberta Transportation and the MD of Foothills regarding the elimination of the access from 37 Street / 96 Street to Highway 22X. The City requests to continue to be involved in these discussions as it relates to The City of Calgary roads.

2. Shawville Blvd Right In, Right Out Access (Ongoing Discussion)

The City has registered a concern with the closure of this access in previous work with AT. We understand the technical design reasons for the proposed closure. However, this access, along with the 6 Street SW access, provides an alternative to 162 Avenue access for the Shawnessy Towne Centre area. With the closure of the Shawville Blvd access as well as the access changes at 6 Street SW, 162 Avenue is now the only access for travellers to the Shawnessy commercial area from the north or east, placing additional pressure on the 162 Avenue corridor, which is already congested.

This creates significant design challenges for The City in the design of the Macleod Tr/162 Avenue interchange and the operation of the intersection of 162 Avenue & Shawville Blvd. This was also a commonly noted concern for residents who attended the public information sessions in October 2014. As a result, The City is reviewing options to maintain the Shawville Blvd right in access in some form, and alternative access proposals, for this area. We anticipate this review will be complete in Q1 2015. We request the opportunity to review these options with AT to allow for additional access capacity and/or options to the Shawnessy area for travellers from the north and east.
3. **6 Street / Sheriff King Street SW Access** (Ongoing Discussion)

Through the recent public information sessions, the elimination of the access to and from the east for 6 Street / Sheriff King Street SW was one of the most frequently raised issues in the southernmost part of the project. The City is currently reviewing alternative options to provide additional access to this area, which will become quite constrained with the changes here and as noted above in item D2. We anticipate this review will be complete in Q1 2015. We request the opportunity to review options with AT to allow for additional access options to 6 Street / Sheriff King Street SW for travelers from the north and east at that time.

4. **Lower Springbank Road Access** (Bring Forward Issue)

Through the recent public information sessions, the elimination of Lower Springbank Road access for the areas north of Highway 8 was a frequent topic of concern for the public, particularly in the area of 85 Street SW. As a result of this most recent public feedback, The City would like to clarify what options, if any, were explored to allow for continued use of Lower Springbank Road between 85 Street and 69 Street, and if Alberta Transportation would consider any options which The City would propose to improve accessibility in this area.

5. **Highway 8 Pathway** (Ongoing Discussion)

The City and Rocky View County have expressed a desire to create a pathway crossing of the Elbow River to allow for a continuous pathway connection toward the west. We recognize that this issue remains unresolved and we commit to continue to work with AT to develop a feasible option for this connection. The City will bring forward a proposal for Alberta Transportation’s consideration on this matter in Q1 2015.

6. **Downstream Impacts Report to Calgary City Council** (Ongoing Discussion)

You may be aware that The City of Calgary Administration was directed by City Council to review the downstream traffic impacts of the West and South West Ring Roads. This work has been underway for a few months, and a report was presented to Council on December 15. It is expected that the downstream impacts review will continue into 2015.
E. OUTSTANDING AGREEMENTS

1. **Highway Transfer Agreement** (Ongoing Discussion)

The City has not yet received the draft Highway Transfer Agreement. We understand that it is being prepared and we look forward to further discussions with the Province on this item.

2. **Weaselhead Land Purchase Agreement** (Ongoing Discussion)

The City and Alberta Transportation have discussed the need to clarify the total amount of land which AT will need to purchase from The City for ring road purposes. It is our understanding this is still being reviewed. We note that this process will take some time so it is important to receive the request as soon as possible.

3. **Clearwater Park Land Purchase Agreement** (Ongoing Discussion)

Alberta Transportation and The City of Calgary have been reviewing the land purchase requirements for Clearwater Park throughout 2014. We anticipate providing a package to Alberta Transportation in the near future on this land parcel to facilitate the discussion and clarify The City’s official position on the land purchase.

We trust that AT will take these items into consideration when completing the design stage for the SWRR Project and associated EIA. We also understand that a number of the comments related to environmental, water, and river concerns may be mitigated through Provincial or Federal requirements.
HYDROTECHNICAL DESIGN BASIS/Criteria FOR THE SOUTH WEST STONEY TRAIL RING ROAD

The City of Calgary ("The City") has prepared this document with the language as written because it is intended for use in contract documents for the design of the West and South West Calgary Ring Roads.

The information contained within this document draws from Federal, Provincial, and City standards and guidelines with respect to water quality, erosion control, wildlife passage, hydrotechnical design, stormwater management, and construction considerations.

The City also notes the Calgary Transportation Plan Appendix B – Principles and design considerations for river crossings is relevant to this project. This section of the Calgary Transportation Plan outlines 7 principles which should be considered whenever a new or expanded river or stream crossing is contemplated. We request that this document, which is linked to the Municipal Development Plan that meets the statutory requirements of the Municipal Government Act, be reviewed and used by Alberta Transportation in consideration of the river crossings included in this project.

1. GENERAL

1.1. This specification covers The City of Calgary’s design basis and criteria requirements for the South West Stoney Trail Ring Road (SWSTRR) project river and stream crossings.

1.2. This specification includes design basis data for both of the major Elbow River crossings as well as criteria for the smaller creek and ephemeral stream crossings impacted by the SWSTRR project.

2. REFERENCES

2.1. The following reports and documents shall be referenced in completing the hydrotechnical design of the SWSTRR crossings.


3. HYDROTECHNICAL DESIGN

3.1. **Design Flows**

3.1.1. Design flow shall be at a minimum a 1:100 year return period peak instantaneous flow as computed from all available recorded and estimated river and creek flow data (see 2.1.1).

3.1.2. Monthly flow duration curves shall be used to plan and implement in-stream construction.

3.1.3. Design flows used shall be "natural" flows with no impact or attenuation from upstream storage considered.

3.1.3.1. **Elbow River Crossings**

3.1.3.1.1. Alberta Transportation shall demonstrate that the conveyance capacity of the bridge and embankment structures during return periods higher than the design event, up to the probable maximum flood event to limit the extent of impoundment behind the embankments.
3.2. Hydraulic Modelling Analysis

3.2.1. Sufficient terrain, bathymetric and high water mark data shall be obtained to create and calibrate a detailed hydraulic model for each of the Elbow River Crossings.

3.2.2. The detailed hydraulic model shall be used to assess the design water levels and flow velocities for the proposed crossings.

3.2.3. In no case shall the modelled Froude number for the proposed crossing exceed a value of 1 (i.e. shall not design crossings to have supercritical flow).

3.3. Design Water Levels

3.3.1. The design water level for all crossing shall be based on the design flows as per Section 3.1.1.

3.3.2. The backwater elevation upstream of the crossings during the design flood event shall not cause any incremental upstream flooding, including inundation of existing or proposed storm water retention ponds and shall not exceed 0.3 m.

3.3.3. Bridge Crossings

3.3.3.1. Allowance shall be made for debris and/or ice accumulation and channel migration when setting the structure elevation.

3.3.3.2. Elbow River Crossing at Weaselhead Park

3.3.3.2.1. For bridge crossing design upstream of Weaselhead Park, the following Glenmore Reservoir elevations shall be used for back-water design calculations:

3.3.3.2.1.1. Worst case for bridge conveyance capacity— corresponding return period design level for bridge design flow (i.e. use reservoir 100-year event level for designing conveyance capacity of 100-year return period flood through bridge opening).

3.3.3.2.1.2. Worst case for high flow velocity/channel erosion — reservoir maximum pre-flood drawdown — El. 1071.35 m.

3.3.4. Creek Crossings

3.3.4.1. In locations with the potential for significant debris accumulation (i.e. Cullen Creek culvert crossing), consideration shall be given to adding significant freeboard to the proposed culvert barrel design, in addition to the design water surface elevation (i.e. 1 m or more) to account for blockage potential.

3.3.4.2. For culvert crossing on fish-bearing creeks or streams, culvert inverts should be buried at least one quarter of the rise below the average natural streambed up to a maximum depth of 1 m (as per Design Guidelines for Bridge Size Culverts, Section 2.1.5).
3.3.4.3. Cullen Creek

3.3.4.3.1. The design water level for the Cullen Creek culvert crossing shall not exceed the estimated or surveyed June 2013 flood event high water mark.

3.3.4.3.2. The structures at the Elbow River (Highway 8) bridge shall be designed so as to minimize differences in upstream water levels between the Cullen Creek culvert crossing and Elbow River bridge crossing such that the potential for increased water levels in Clearwater Park upstream of the Highway 8 crossing or increased flows and water levels in Griffith’s Woods Park on Cullen Creek downstream of the Highway 8 crossing are mitigated.

3.4. Elbow River Crossings Bridge Spans and Embankment Stability

3.4.1. Alberta Transportation shall demonstrate that the bridge crossings and embankment structures are stable during large magnitude return period events, including the probable maximum flood event.

3.4.2. Embankment structures which cause impoundment during large return period events (up to the probable maximum flood level) shall be designed so as to avoid failure due to overtopping, piping, or embankment erosion and subsequent incremental impacts to the downstream extreme consequence Glenmore Dam.

3.4.3. Bridge crossing spans shall be sufficiently wide to accommodate a reasonable amount of river morphological change (i.e. 1.5 to 4 times the Elbow River meander belt width) to accommodate some channel migration within the bridge span.

3.4.4. Consideration shall be given to providing a minimum opening width in the bridge span on either side of the river at normal flow to allow for wildlife passage on the floodplain terrace, as per the Planning Considerations for Wildlife Passage in Urban Environments (see Sections 2.1.3) and City of Edmonton Wildlife Passage Engineering Design Study (see Section 2.1.7).

3.5. River Realignment and River Training Structures

3.5.1. The designer shall evaluate alternative layouts and designs and demonstrate based on an evaluation of design, environmental, economic, social, schedule and construction factors, that the selected design minimizes the impact to riparian areas, City of Calgary Parks (including Clearwater Park, Griffith Woods Park and Weaselhead Park) and other natural areas to the fullest extent possible. Refer to The City of Calgary’s Triple Bottom Line Policy as required (available at: http://www.calgary.ca/CA/city-clerks/Documents/Council-policy-library/lup003-Triple-Bottom-Line-Policy.pdf). This evaluation shall consider life cycle costs for the alternatives examined, including maintenance costs for the river training works and bridge over the design life span, versus the initial construction costs alone.

3.5.2. River training structures shall be designed in accordance with the principles laid out in the City of Calgary Design Guidelines (see section 2.1.2).
3.5.3. River realignment and river training structures design shall take into consideration the potential for downstream river channel erosion and shall mitigate channel erosion and potential for increased sediment loading to Glenmore Reservoir.

3.5.4. The minimum bend radius for realigned channel sections shall be at least two times the stable channel width.

3.5.5. River training structures shall be stable for return period events up to the design flow (minimum 1:100 return period event).

3.5.6. Riprap channel lining material shall have a granular material filter to prevent piping of underlying materials. The granular filter material specification shall be designed or approved by a geotechnical engineer.

3.5.7. The design of river training structures shall take into account the potential for ice impact effects.

3.5.8. Armour material used on the river training structures shall be capped with topsoil and vegetated and planted to match natural riverbank conditions, as much as practical, to enhance public access to and use of the structures.

3.5.9. Elbow River Bridge Crossings

3.5.9.1. For the two bridge crossing engineered channel realignment sections, the design shall incorporate facilities to allow for installation of permanent water level monitoring stations, coincident with the installation of the river training and erosion protection structures. These facilities may include cable casing pipelines and data logger equipment poles or housings on the channel banks. Future installation of water level monitoring equipment (pressure transducers, data loggers and power source) to be supplied and operated by others (The City of Calgary, The Province or Environment Canada).

4. STORMWATER MANAGEMENT

4.1. Stormwater management facilities constructed adjacent the Elbow River or creeks shall be designed to mitigate against river or creek channel migration into the facility.

4.2. Stormwater drainage culverts shall be a minimum diameter of 600 mm for approach road crossings and 800 mm for centreline crossings, as per Alberta Transportations design bulletin (see 2.1.6).

4.3. Elbow River Bridge Crossings

4.3.1. Stormwater drainage from the Elbow River bridge crossings shall be directed to a secondary containment/treatment facility.

4.3.2. The secondary containment/treatment facility shall be designed with an isolation system in place such that the outflow to the Elbow River (and downstream Glenmore Reservoir and water treatment plant) may be stopped for a period of time, in the event of a hazardous material spill on the SWSTRR. Remote control (i.e. SCADA) operability of this isolation system is preferred.
5. CONSTRUCTION

5.1. The construction plan including care of water plan, schedule, laydown and staging areas plan, etc. shall be, where it affects The City of Calgary Parks property, approved in advance by The City of Calgary. Impacts to City of Calgary Parks shall be minimized to the fullest extent practical.