COUNCIL REPORT

COST BENEFIT ANALYSIS AND COST DRIVERS ON COMPARATIVE CAPITAL PROJECTS

Recommendation

That the June 25, 2025, Integrated Infrastructure Services report IIS02537rev, be received for information.

Requested Action		Information only	
ConnectEdmonton's Guiding Principle		**ConnectEdmonton Strategic Goals**	
CONNECTED This unifies our work to achieve our strategic goals.		**Urban Places**	
City Plan Values	LIVE, ACCESS		
City Plan Big City Move(s)	**A rebuildable city**	**Relationship to Council's Strategic Priorities**	Conditions for service success
Corporate Business Plan	Managing the corporation		
Council Policy, Program or Project Relationships	• C591 - Capital Project Governance Policy • C627A - Climate Resilience Policy • C602 - Accessibility for People with Disabilities Policy • C573A - Complete Streets Policy • C555A - Capital Infrastructure - Project Delivery Policy • C593D - Public Engagement Council Policy • C512 - Environmental Policy		
Related Council Discussions	• June 11, 2024, Financial and Corporate Services report FCS02362, Spring 2024 Supplemental Capital Budget Adjustment - 2023-2026 Capital Budget • January 30, 2024, Integrated Infrastructure Services report IIS02122, Major Capital Project Update • November 27, 2024, Integrated Infrastructure Services report IIS02538 Capital Project Planning and Design - Processes and Resources		

Previous Council/Committee Action

At the June 11, 2024, City Council meeting, the following motion was passed:

> That Administration provide a report with a cost benefit analysis and cost drivers that influence comparative capital projects including Codes, Policies, Bylaws, Program or other factors, with a focus on Facilities and Renewal Projects; including a direct cost breakdown comparison of current fire hall and recreation centre projects completed in Edmonton and within regional municipalities.

At the November 27, 2024, Executive Committee meeting, the following motion was passed:

> That the November 27, 2024, Integrated Infrastructure Services reports IIS02537, Cost Benefit Analysis and Cost Drivers on Comparative Capital Projects and IIS02538 - Capital Project Planning and Design - Processes and Resources be referred back to Administration to:
>
> - establish baseline operational and capital costs for the selected projects outlined in the November 27, 2024, Integrated Infrastructure Services report IIS02537;
> - provide the incremental cost and expected operational efficiencies associated with each cost driver outlined in Attachment 2 of the November 27, 2024, Integrated Infrastructure Services report IIS02537.

Executive Summary

- This report compares one facility using a basic design without applying any City policies or standards to a design using full policies and standards. It includes an operational analysis based on a 25-year review.
- Fire stations were chosen as a case study, or proxy, to represent other City facilities, as this asset type has generally consistent function program requirements, is built more frequently and has recent projects to draw experience and cost data.
- Four City policies, standards, practices and bylaws are estimated to represent 98 per cent of the cost difference between the station designs: Climate Resilience Policy C627A, Fire Rescue Service Delivery Policy C523A, City of Edmonton Facility Construction Standard and the Edmonton Design Committee process.
- The analysis indicated that City policies, standards and bylaws add cost to capital projects over and above a basic design that considers only building codes and legislated requirements.
- The analysis also identified potentially higher ongoing operational costs when applying the Climate Resilience Policy, which changes previously identified outcomes and challenges previous analyses of a financial payback period.
- Finally, the analysis did identify that energy consumption and greenhouse gas emissions have significant improvements (reductions) as intended through the Climate Resilience Policy application.

REPORT

The City of Edmonton has a long history of developing, planning, designing and delivering infrastructure to support the desired services on behalf of City Council, users, visitors and Edmontonians. Over time, the City has built a comprehensive and detailed set of policies, bylaws and standards that govern the design and construction of its facilities. These requirements help to ensure high-quality construction, achieve high standards for public safety, provide seamless transition into operations and maintenance, mitigate risk relating to climate adaptation, and ensure compliance with various regulatory requirements.

The capital cost of a facility represents a single dimension of the overall lifecycle or total cost of ownership related to a facility. Through its policy environment, the City of Edmonton has many priorities that largely influence the design approach, which focuses on durability, maintainability, operational effectiveness and a 75-year service life.

This approach brings value to Edmontonians by building infrastructure for longevity while minimizing the reinvestment needed throughout its lifecycle, service disruptions and overall operating costs.

Administration regularly consults with industry partners, associations and other large public and private owners to discuss best practices, industry trends and innovative methods for achieving better outcomes in the design and delivery of infrastructure projects.

Cost Drivers

Historically, many different external and internal cost drivers have influenced the overall budget for a capital project. In recent years, costs impacting the capital budget of a project have experienced significant fluctuations as supply chains and market inflation have been influenced by global events (e.g., pandemic, trade interruptions, international conflicts, etc.). While the types of cost drivers have remained stable, the ability to forecast and anticipate construction markets has become increasingly difficult.

To support the analysis requested by Council, Administration initially engaged a third-party consultant to conduct a comparative qualitative analysis of various facility projects of the City of Edmonton and other municipalities across Alberta. The key findings from this third-party analysis were presented to City Council on November 27, 2024, in the Integrated Infrastructure Services report IIS02537 Cost Benefit Analysis and Cost Drivers on Comparative Capital Projects. A summary of the original findings can be found in Attachment 1.

Fire Station Case Study Results

Administration selected fire stations as a case study, or proxy, to illustrate the steps taken to plan and design a facility that meets program requirements and the expectations of Council-approved guiding policies, is constructible, provides value for money and achieves the ultimate outcomes of The City Plan. Fire stations are a type of asset that has a robust and well-established functional program, along with detailed standards and legislative requirements that guide the design and construction of the facility. Fire stations are built more commonly and frequently than other facility types, resulting in more recent experiences to draw from.

COST BENEFIT ANALYSIS AND COST DRIVERS ON COMPARATIVE CAPITAL PROJECTS

To provide the incremental cost and expected ongoing operational requirements associated with each cost driver identified in the previous analysis, Administration engaged a third-party consultant with substantial experience designing fire stations in Edmonton and across Alberta.

The consultant completed a comparative analysis of two fire station designs with similar functional programs. This involved evaluating a station designed in accordance with the City of Edmonton's full range of bylaws, policies and associated cost drivers, against a station designed to meet only the minimum code requirements with a design focus on minimizing capital costs. This latter approach is typical for most rural and smaller civic clients. The full consultant report is available as Attachment 2.

The analysis aimed to determine which City policies influenced specific capital construction costs and their resultant operational cost impacts and compare these to those of a base design fire station. For this case study, the designs created by the consultant were their interpretation of the City's policy, bylaw and standard requirements. The results, in terms of construction costs, are aligned with the observations of Administration while working with the policies on active capital projects, such as the Walker and Wellington Fire Stations. The tables below illustrate the results of the analysis.

Table 1 - Estimated costs and GHG emissions of the theoretical fire station designs

	Basic Design	Full Policy Design
Direct Construction Cost (+/-10%)	$13,347,000	$21,039,000
Operational Costs Including utility cost (est. 25 years)	$3,944,000	$5,587,000
Gross Energy Consumption (est. yearly)	514,000 ekWh	272,000 ekWh
Greenhouse Gas Emissions (est. yearly)	76,000 kg CO2e	0 kg CO2e

The comparison of the Basic and Full Policy designs illustrates that City policies, bylaws and construction standards impact the direct construction costs of City facilities. In this instance, the additional cost is estimated at roughly $7.7 million. Each policy is intended to contribute to achieving the overall City vision and goals, which may have costs associated with these intended outcomes. A listing of the guiding documents can be found in Attachment 3.

While the analysis considered many policies, bylaws and standards, the four listed below are estimated to represent 98 per cent of the cost difference between the station designs.

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Table 2 - Estimated construction costs resulting from the four most significant policies, standards and bylaws

	Cost Difference (+/-10%)
Climate Resilience Policy C627A	$3,750,000
Fire Rescue Service Delivery Policy C523A	$1,738,000
City of Edmonton Facility Construction Standard	$1,192,000
Edmonton Design Committee Process	$876,000

Attachment 4 provides further details and analysis of how the noted numbers were derived and is summarized as follows:

- The Climate Resilience Policy C627A directs the facility design to be emissions neutral. Associated costs are primarily attributed to the elimination of natural gas as an energy source. This is also known as full electrification and leverages the City's completely green electrical utility supply and on-site Solar Photovoltaic generation. There are also elements of increased performance and efficiency of the building systems, such as building envelope insulation and other components.
- The Fire Rescue Service Delivery Policy C523A directs the facility design to incorporate additional requirements to support operational standards and efficiency. Incremental costs are primarily attributed to the requirement for in-slab heating in the gear room, apparatus bay and other locations and the additional mechanical systems to support individual temperature control for dorms, apparatus bay ventilation and vehicle exhaust.
- The City of Edmonton Facility Construction Standard incorporates items that contribute to health and safety and effective and efficient building operations and maintenance. Incremental costs are primarily attributed to locating the facility's backup generator and HVAC systems indoors and the related increased building footprint.
- The Edmonton Design Committee Bylaw was passed to encourage improvement of the city's urban design, including the design of City facilities. Given the City's commitment to design excellence, there can be incremental costs, primarily attributed to the building exterior and the context in which the facility is located.
- With respect to operational costs, a presumed financial payback has historically been projected and was expected to mitigate increased capital costs over the life cycle of the facility, particularly for sustainable design items. This analysis, however, forecasts increased lifecycle costs and does not support the notion of a financial payback. There are a number of major sources of this potential deficit:
    - Energy costs are higher in the Full Policy design (as compared to previously anticipated similar costs). This is largely due to relatively higher electricity costs compared to natural gas.

- Some program equipment and architectural elements are significantly more costly in the Full Policy design, such as apparatus bay doors and more complex roof membranes, which still require replacement within 25 years.
- While there are some preventative maintenance savings when incorporating more reliable hardware and equipment, they are also more costly and are forecast to have a similar replacement life compared to the Basic design. While it is possible that some of these program, architectural and performance items may last longer than the case study forecasts, with many of these components being relatively new this will only be validated over time.

Lessons Learned

Through this comparative analysis work, Administration has identified a number of lessons learned that are being applied to current and future projects. These include:

- Refinements to the program: The program for a facility informs its design and building size. As Administration undertakes developing new facilities, standard program requirements are being reviewed and opportunities for efficiencies are being identified. For example, the program for Walker Fire Station has reduced the number of bays from the standard of three to two. This decision was based on identifying the station's geographic location did not require three bays and service levels could be maintained with a two-bay station.
- Adjustments to design: Building designs are being simplified to allow for the use of locally sourced, robust and durable materials that align with the look and feel of the surrounding environment.
- Adjusting to the impacts of sustainability: Capital planning will be adjusted to include a more accurate understanding of sustainability's impact and will improve cost accuracy. As sustainability knowledge and technology improve, the need for system redundancies will be minimized, which will reduce this cost driver over time.
- The unquantifiable cost of policies: This exercise highlights that a number of construction costs can be directly attributed to certain policies. However, it also highlights that it is difficult to quantitatively capture the impact of policies on project timelines, which can also impact project costs.

Next Steps Addressing Major Cost Drivers

Climate Resilience Policy C627A: With this exercise and other recent experience in designing to an emissions neutral standard the full impact of significant capital and lifecycle costs has become apparent. The removal of carbon taxes has exacerbated this result leading to higher relative utility costs as well. Policy C627A is under review and, in particular, the prescriptive direction of emissions neutrality and the intent of the exemption process (technical versus financial) will be examined. It is also possible to consider an internal price on mitigated emissions to guide financial payback determinations.

Fire Rescue Service Delivery Policy C523A and City of Edmonton Facility Construction Standard: These two drivers have overlapping influence and Administration will review aspects of these costs that have no long term financial payback, operational benefit or safety implications and

refine requirements. In particular aspects that increase internal space requirements or direct costly construction elements without longevity benefits will be scrutinized. The Fire Rescue Services facility functional program is currently under review and Facility Construction Standards are regularly updated.

Edmonton Design Committee Process: These costs are those driven by more visually appealing materials, geometries, and elements to enhance the design of projects. The Edmonton Design Committee process is under review and geographical mandate could be clarified as well as the blanket application to civic infrastructure projects. Emphasis will be placed on Edmonton Design Committee architectural advice as directional and optional, not mandatory, and exemptions are available. While not part of the Edmonton Design Committee process, a standardized pallet of materials and forms for certain archetypes will also be explored.

Summary

While serving its intended purpose, this analysis offers only a glimpse into the design and choices that are made when delivering projects for the City. The designs created for the case study were those of the consultant and reflective of their interpretation of each policy, bylaw and standards' requirements. While fire stations offer a solid foundation from which to hypothesize, it is important to note that there will be exceptions to these findings if applying them broadly to a facility with specialized elements (e.g. a recreation centre with a cycle track or dive tank). The work for this comparison exercise validated and supports the trends seen on capital projects currently underway. Administration continually applies value engineering methodologies as part of capital project development to ensure that Edmonton is receiving value for money.

Community Insight

Administration continues to listen to and engage with the public and varied community stakeholders during the different phases of a capital project, including planning, design and construction. The feedback gathered through the engagement process helps Administration adjust designs and mitigate any potential impacts to reflect the needs of Edmontonians.

Feedback from Edmontonians has significantly influenced the City's policies and guidelines for infrastructure projects. The City Plan and other Council priorities provide key policy direction.

GBA+

Administration integrates GBA+ considerations into the planning and design phases of its infrastructure projects. City policies and Council priorities can also influence the functional program and design elements of projects, which can directly impact end users, particularly those facing unique barriers and challenges. Public engagement plans are designed to be inclusive, ensuring diverse groups and those whose voices are heard less often are given an opportunity to contribute their perspectives.

Environment and Climate Review

The City of Edmonton faces and will continue to face increasing climate change impacts over the coming decades, posing risks to infrastructure and potentially disrupting services, while raising safety concerns. Incorporating climate risk into financial decisions is a crucial lever for embedding climate resilience in public infrastructure investment decisions.[1] This investment results in climate resilient infrastructure that will support reliable and sustainable service delivery levels that Edmontonians expect, into the future.

Council declared a Climate Emergency in 2019 and invested significantly in the 2023-2026 municipal budget to activate and make progress in achieving the City's and community's energy transition goals. Policy C627A supports the implementation of The City Plan directives so that the City can mitigate climate impacts through various actions, including integrating climate risk into the development and management of City infrastructure, especially its building stock (facilities and others). This is especially critical as the Greenhouse Gas (GHG) emission inventory from 2023 demonstrates that the City's reduction targets for 2025, 2030 and 2050 will not be on track without a significant shift in how the City plans, designs and builds to achieve a climate-resilient future.[2] There are climate action implications of Policy C627A building procedure requirements in achieving The City Plan's climate goals in the following three main areas:

- Cost of Climate Resilient Infrastructure and Innovation
- Energy Transition
- Climate Leadership and Funding Options

Attachment 5 elaborates on these three areas in light of the comparative analysis findings as the City progresses toward implementing the climate goals of The City Plan.

Attachments

1. Summary of Findings from November 27, 2024, Integrated Infrastructure Services report IIS02537
2. S2 Report - The City of Edmonton Cost Benefit Analysis and Cost Drivers - Fire Stations
3. Policies, Bylaws, Standards and Regulatory
4. Analysis: Fire Station Case Study
5. Environment and Climate Review

[1]Infrastructure Canada. (August 2023). National Infrastructure and Buildings Climate Change Adaptation State of Play Report: 2023 Update. Prepared by Infrastructure Canada, Credit Valley Conservation and WSP Canada.
[2]City of Edmonton. (November 2024). Climate Strategies Annual Implementation Update 2024: Report. City of Edmonton.