

CAPITAL PROJECT PLANNING AND DESIGN - PROCESSES AND RESOURCES

Recommendation

That the November 27, 2024, Integrated Infrastructure Services report IIS02538, 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.	Healthy City		
City Plan Values	Preserve and Create		
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	<ul style="list-style-type: none"> • C591 Capital Project Governance Policy • C578 Infrastructure Asset Management Policy • C627 Climate Resilience Policy • C602 Accessibility for People with Disabilities Policy • C538 Diversity and Inclusion Policy • C573A Complete Streets Policy • C544 Active Transportation Policy • C555 Private Public Partnership (P3) Policy • C593A Public Engagement Policy 		
Related Council Discussions	<ul style="list-style-type: none"> • January 30, 2024, Integrated Infrastructure Services report IIS02122, Major Capital Project Update • March 18, 2022, Office of the City Auditor report OCA01117, Project Management of Transportation Infrastructure Audit • March 18, 2022, Integrated Infrastructure Services report IIS01105, Administration Response Project Management of Transportation Infrastructure Audit 		

CAPITAL PROJECT PLANNING AND DESIGN - PROCESSES AND RESOURCES

- June 20, 2017, Integrated Infrastructure Services report CR_4269, Capital Project Advisory Committee - Benefits and Options
- April 18, 2017, Integrated Infrastructure Services report CR_4270, Capital Infrastructure Management Framework
- July 6, 2016, Integrated Infrastructure Services report CR_3346 Integrated Infrastructure Services Update

Previous Council/Committee Action

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

That Administration provide a report that includes the following:

1. A list of all projects in the planning and design phase (either underway or complete) where capital funds have not yet been committed for project delivery.
2. A general overview of a typical project governance structure, including references to the type of services and resources used to support the planning and design, and delivery of a project.
3. Available metrics and trends of the typical resources (cost and schedule) required to support the planning and design services required to progress a project through each of the PDDM checkpoints (1-3) in relation to the overall total project costs, including any available information relating to the cost drivers for these phases (i.e. public engagement, policies, etc.).
4. A general outline or typical cost breakdown of a facility and/or transportation capital project, estimate by % of construction value, during the planning and design phase, including but not limited to:
 - a. Internal Costs (Project Management, Public Engagement, Communication, Finance, Procurement, Legal, Design Services, Engineering Services, Land, etc.)
 - b. External Costs (Contractors, Material Vendors, Architects, Engineering Services, etc.)

Executive Summary

- This report provides an overview of the planning and design process undertaken in support of developing municipal infrastructure assets.
- An outline of typical project resources, examples of project governance, engagement requirements and cost drivers that impact a project's scope, budget and schedule are provided.
- The assessment of over 350 capital infrastructure projects between 2019 and 2023, measuring the performance of Checkpoint 1 to Checkpoint 3, confirmed that 90 per cent of projects fell within the acceptable budget tolerance and 77 per cent were completed under budget.
- The cost of the planning and design phase in relation to the overall project cost ranges from three per cent to eight per cent, depending on the asset. On average, the cost of planning and design across all assets is approximately five per cent of the overall project cost.

CAPITAL PROJECT PLANNING AND DESIGN - PROCESSES AND RESOURCES

- The project management effort for all phases of a project (Checkpoints 1 to 5), from initiation to completion, represents between two per cent and 12 per cent of the overall project cost. This range is aligned with industry benchmarks, even after considering the additional requirements of publicly funded projects such as public engagement and inquiry management.

REPORT

In April 2017, City Council approved the Capital Project Governance Policy C591, which established the administrative framework for the Project Development and Delivery Model (PDDM)¹. The policy commits the City to early investment in design work to support informed investment decision making based on the following:

- Investment in design at an early stage results in a higher degree of accuracy in budget estimates and schedules
- Moving the approval point further along the project development allows greater integration with strategy, operations and alignment of outcomes.

The Project Development and Delivery Model (see Attachment 1) was created through the creation of the Integrated Infrastructure Services department² and was built from:

- Research into past project management practices;
- An environmental scan of other jurisdictions;
- Exploring best practices; and
- A review of case studies of infrastructure projects of varying size and complexity.

Research into previous projects showed some project profiles were advanced for funding with a budget confidence level of plus or minus 100 per cent. The Capital Governance Policy C591, was developed and approved from which the administrative framework for the Project Development and Delivery Model (PDDM) was established to increase the scope and budget certainty ahead of capital budget approval. This provided a common framework to communicate with City Council and the public on project approvals and progress and to offer additional opportunities for City Council to give direction on infrastructure investment decisions (i.e. from one decision point at project initiation to two decision points, one to set the initial design budget for initiating the project and complete approximately 60 per cent of the design effort, and two setting the full capital budget to complete design and construct the project). This approach was established to allow for better project oversight, more effective decision making and more efficient resource use.

Key features of the PDDM are:

- Project Checkpoints: Consistent evaluations of project readiness, scope, funding and priority ensure a defined decision making process.
- Project Intake Process: Ensuring priority projects receive thorough evaluation early on.
- Enhanced Design Details: Developing detailed business cases and budget estimates to support better decision making.

¹ CR_4270 Capital Infrastructure Management Framework (Executive Committee, April 18, 2017)

² CR_3346 Integrated Infrastructure Services Update (Executive Committee, July 6, 2016)

CAPITAL PROJECT PLANNING AND DESIGN - PROCESSES AND RESOURCES

- Timely Budget Approvals: Ensuring design budgets are approved before full budget approval.
- Authorization for Expenditure: Adopting industry best practices for establishing budgets and scopes before final delivery.
- Outcome Evaluation: Comparing completed project outcomes against initial business cases and scope baselines.

The Capital Project Governance Policy C591 and the PDDM were supported by the findings of the IIS02122 Major Capital Project Update (City Council, January 30, 2024), which confirmed that the Integrated Infrastructure Services department *“adheres to industry best practices and standards for establishing an appropriate governance structure, proper delineation of roles, responsibilities, authorities, and accountabilities of different oversight stakeholders.”*³

Administration has engaged external consultants and industry experts throughout the creation, execution and validation of the PDDM methodology.

Overview of the Planning and Design Process

The Capital Project Governance Policy C591 strongly emphasizes managing risks from the start of project development. This approach equips project managers and decision-makers with the information to make sound investment decisions. PDDM combines a phased project process with the City's financial and budget procedures, creating a consistent, gated framework (identified as checkpoints) for all capital infrastructure projects, including roads, bridges, LRT, buildings and open spaces.

The City's capital project management strategy involves validation reviews through the checkpoints to ensure that projects are carefully analyzed and scoped before committing significant resources, similar to industry best practices. With this checkpoint process that enhances the City's ability to effectively deliver projects, it can require more time upfront for planning.

The Planning and Design phases occur between two key checkpoints: Project Initiation (1) and readiness for approval of the remaining Capital Budget (3).

Project Initiation (Checkpoint 1): At this stage, City Council approves a business case outlining why the infrastructure investment is needed and allocates funds for project planning and design. The initial project cost estimate has an accuracy range of minus 50 per cent to plus 100 per cent. It should be noted that in some cases (an example is the River Crossing strategy work) broader strategic level planning is completed in advance of project initiation of Checkpoint 1 beginning (an example where this progressed into PDDM is the Rosedale Transportation Network project).

Between Project Initiation and Authorization for Design Expenditure, Administration undertakes activities such as feasibility studies, technical assessments (e.g., geotechnical, topographical), functional program development, identification of user requirements, risk identification, procurement of a design consultant and engagement with stakeholders and the public. This phase is crucial for aligning the project with the business case's goals and developing the initial

³ IIS02122 Major Capital Project Update (City Council, January 30, 2024), Attachment 1, page 1.

CAPITAL PROJECT PLANNING AND DESIGN - PROCESSES AND RESOURCES

scope, cost, and schedule estimates. The concept design at this stage, about 10 per cent of the total design effort, starts translating the business case into an initial design.

Authorization for Design Expenditure (Checkpoint 2): Administration assesses the work completed to ensure the project meets its business case objectives. The project scope is now clearly defined, and the primary deliverable is either a functional program (facility assets) or a concept plan (transportation assets). The cost estimate accuracy at this stage ranges from minus 30 per cent to plus 50 per cent.

Further work is conducted, including on-site testing, Environmental Impact Assessments, scope validation, risk analysis, and ongoing stakeholder engagement. This work informs the design's development and refines cost and schedule estimates.

At this point, the project begins to take shape. Functional blocks evolve into sections and renderings for facilities, while transportation projects develop cross-sections. This stage, which accounts for around 60 per cent of the design effort, incorporates additional parameters like codes and bylaws.

Approval for Capital Budget (Checkpoint 3): Administration assesses the project's readiness and presents the detailed scope, schedule, and budget to Council. The project now clearly defines what will be built, how it aligns with the business case, and the parameters for delivery. The main deliverable is the development design report (facilities) or preliminary engineering plans and report (transportation). The cost estimate accuracy at this stage ranges from minus 20 per cent to plus 30 per cent.

Attachment 2 includes an outline of typical inputs that guide project development. Attachment 3 provides visual illustrations of the progression of the design of a transportation and facility infrastructure project.

Planning and Design Resources

The creation of Integrated Infrastructure Services and the implementation of the PDDM introduced a modernized approach to managing capital projects. This includes the organization of internal resources to support two distinct and specialized teams for each asset: one focused on project development outcomes (planning and design functions) and the other on project delivery outcomes (detailed design and build functions). This structure ensures that each team's unique skills and strengths are fully leveraged throughout the project's lifecycle.

In unique circumstances for highly complex, multi-service projects (such as a new recreation facility or river valley park redevelopment) an internal steering committee may also be formed to aid in project decision making. This committee includes project sponsors, strategy and operations partners, and key stakeholders. Details of project governance and roles can be found in Attachment 4.

Metrics and Trends of Planning and Design

The effort needed during the planning and design phase varies depending on the project's complexity and scale. Many factors influence the level of effort, many unique to municipal projects (Attachment 5). More broadly, the cost of planning and design is influenced by the

CAPITAL PROJECT PLANNING AND DESIGN - PROCESSES AND RESOURCES

conditions in the market at the time of the procurement, most notably by the availability of competent external resources to support the work. The availability of external resources can be influenced by the level of investment from all orders of government and the private sector (creating demand), as well as the capacity of vendors to build and maintain teams to deliver their services (creating offers). Administration works collaboratively with industry partners to provide consistency and predictability in our procurement processes and identify needs early.

Performance Measures

When comparing budget estimates at Checkpoint 1 with costs at Checkpoint 3, Administration generally uses a plus or minus 30 per cent confidence threshold. This was reviewed for over 350 projects undertaken from 2019 to 2023, findings related to budget estimate performance for the planning and design phase concluded that

- 90 per cent of projects fall within the acceptable budget tolerance.
- 77 per cent of projects were completed under budget.

For projects where performance was not within confidence thresholds, budget variances were attributed to various factors, such as unforeseen site conditions requiring additional investigation and scope changes.

Cost of Project Development

The cost of the planning and design phase in relation to the overall project cost ranges from **three per cent to eight per cent**, depending on the asset. On average, the cost of planning and design across all assets is approximately **five per cent of the overall project cost**.

There are many benefits to phased planning and design efforts. These costs provide the following support to the overall project management efforts such as:

- Reduce the risk of underestimating costs and schedule overruns during delivery.
- Enhanced transparency and accountability.
- Improved outcomes with better alignment to City policies and strategies.
- Provide efficiencies in long term planning.
- Enhanced stakeholder and public satisfaction.

Industry Benchmarks

While many other organizations may utilize a gated process such as the PDDM, no industry benchmarks, or metrics are available on the level of effort expected to complete each phase. It is difficult to compare municipal projects with private projects as the requirements of publicly funded projects do not apply to private projects, as discussed in Attachment 5.

Project management cost is one available metric supported by industry benchmarks published in several studies.

- The combined project management costs for all phases of a project total between seven and 11 per cent of the project's Total Investment Cost (TIC).⁴

⁴ Byrne, J. P. (1999). Project management: how much is enough? PM Network, 13(2), 49–52.

CAPITAL PROJECT PLANNING AND DESIGN - PROCESSES AND RESOURCES

- Project management can vary from two per cent to 15 per cent of the TIC.⁵
- Project management costs as a percentage of total project costs averaged six per cent and ranged from less than one per cent to almost 17 per cent.⁶

For projects completed by Administration between 2019 and 2023, the project management effort for all phases (Checkpoints 1 to 5), from initiation to completion, represents two per cent to 12 per cent of the overall project cost. This range of project management costs is aligned with industry benchmarks, even after considering the additional requirements of publicly funded projects such as public engagement and inquiry management.

Project management costs are mainly composed of staff time of the Project Managers, lead and support, as described in Attachment 4; to action the management of the project's scope, schedule, budget, stakeholders, risk, procurement, contract and resources, as well as duties related to communication, reporting, review and approval, all of which directly support the successful delivery of the project.

Planning and Design Cost Breakdown

The table below provides a typical cost breakdown for the planning and design of facilities and transportation projects as a percentage of the overall project costs. The breakdown is based on a sample of 12 Facility and 16 Transportation projects completed between 2019 and 2023 for each asset type.

Of note, shared services costs such as finance, procurement and legal services are not broken out as they are not charged to individual projects. Land is also not included in the planning and design costs as it is too variable to be representative. Many projects do not require land, others have land purchased through an independent project and few have land costs during the planning and design phase.

The below table represents the range of typical costs on a representative sampling of projects, though not all of the services or costs are applicable to every project nor are the ranges of costs standardized for all projects. Some projects are completed using in-house design resources and no external design services, while others are more complex and require a wider array of external design services. Some simpler projects may require little design or no public engagement.

Per cent of overall project costs	Facility Projects	Transportation Projects
Internal Costs		
Project Management	Up to 2.4%	Up to 4.5%
In-House Design	Not applicable	Up to 2.3%
Engineering Services	Up to 0.3%	Up to 1.6%
Quality Management	Up to 0.3%	Up to 1.3%

⁵ Harold Kerzner, Project Management—A Systems Approach, Von Nostrand Reinhold, 1998, 9–15

⁶ Benchmarking Project Management Organizations, PM Network, February 1998

CAPITAL PROJECT PLANNING AND DESIGN - PROCESSES AND RESOURCES

Communications and Public Engagement	Up to 0.2%	Up to 0.2%
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External Costs

Design Services	Up to 8.0%	Up to 12.2%
Pre-Construction Management	Up to 1.4%	Up to 0.8%
Communications and Public Engagement Services	Up to 0.9%	Up to 0.7%
Other External Services (ex., legal services, survey services, planning studies)	Up to 1.0%	Up to 0.7%

Projects Previously Designed or Funded for Design Only

Attachment 6 contains a list of projects in the planning and design phase (either underway or completed) where capital funds have not yet been committed for project delivery.

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+

Gender-Based Analysis Plus (GBA+) considerations, such as universal accessibility, are essential in the planning and design of infrastructure projects. As projects advance, best practices, public engagement, and other research will inform the requirements to ensure Administration considers equity in the design and construction of infrastructure. A detailed GBA+ review of Edmonton's infrastructure projects is commonly initiated during a project's planning and design phases.

GBA+ analysis is conducted to identify stakeholders through the development of public engagement plans and identify meaningful ways of connecting with those stakeholders to gather input to help shape the plans and designs. The process supports Administration in identifying stakeholders who may be interested or impacted by the project and those who may be less likely to participate in traditional engagement methods.

The input gathered often leads to the incorporation of equity measures that enhance the accessibility and usability of Edmonton's asset network.

CAPITAL PROJECT PLANNING AND DESIGN - PROCESSES AND RESOURCES

Environment and Climate Review

This report was reviewed for environment and climate risks. Based on the review completed, no significant interactions with the City's environmental and climate goals were identified within the scope of this report.

Attachments

1. Project Development and Delivery Model Overview
2. Guiding Input to Project Development
3. Progression of Design
4. Planning and Design Resources
5. Planning and Design Cost Drivers
6. Growth Projects Funded for Design (Completed or Underway)