

Deputy City Manager's Office Report to
SPC on Utilities and Corporate Services
2019 May 15

ISC: UNRESTRICTED
UCS2019-0620

Response to NM2017-36 on Green Roofs

EXECUTIVE SUMMARY

Vegetated green roofs can provide multiple benefits to people and the local environment while supporting climate resiliency. In the right location, green roofs help capture and filter storm water, support a more biodiverse urban environment, improve building energy performance, and provide places that positively contribute to the social wellbeing of building occupants.

Facility design, stormwater engineering, and facility operations teams at The City have spent multiple years investigating the costs and benefits of green roofs as one of many design tools to achieve the above noted benefits.

The Sustainable Building Policy (the Policy) was recently revised to ensure that green roofs, along with a suite of other technologies and building techniques, will be considered by Project Sponsors, design teams and the Policy Steward. These measures will be evaluated for cost and technical effectiveness in addressing Council approved sustainability priorities. The assessment of various building design options, including green roofs, is completed during the early phases of project design, on a project-specific basis. This helps ensure that best-fit technologies are identified, are thoroughly evaluated, and viable, cost-effective options are implemented.

ADMINISTRATION RECOMMENDATION:

That the SPC on Utilities and Corporate Services recommends that Council receive this report for information.

PREVIOUS COUNCIL DIRECTION / POLICY

On 2017 September 11, Councillor Pincott presented a Notice of Motion that Council direct Administration to explore retrofitting all appropriate Municipally owned buildings with Green Roof systems as part of routine lifecycle maintenance and report back to Council through the SPC on Utilities and Corporate Services on this possibility no later than 2018 Q1 and that a policy be developed to allow for all new buildings constructed by The City of Calgary incorporate Green Roof systems into their design if the roof angle allows, and return to Council, through the SPC on Utilities and Corporate Services, no later than Q2 2018.

NM2017-36 was amended and referred to Administration, to bring back a business case and a potential strategy on green roofs and actions to move forward and return to Council through the SPC on Utilities and Corporate Services no later than Q2 2018.

On 2019 January 14, Council approved a deferral of a response to coincide with the recommended updates to the Sustainable Building Policy as a means by which to encourage the consideration and incorporation of green roof systems into design for new building construction and existing building retrofits.

On 2019 April 29, Council approved the proposed updates to the Sustainable Building Policy.

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BACKGROUND

Located on the 4th and 5th floor roof terraces of the Municipal Building, a green roof research project was initiated in the Spring of 2014 through a partnership between Corporate Analytics & Innovation, Facility Management, Environmental & Safety Management, Water Resources, and the University of Calgary. Plant species monitoring was conducted by local Calgary consultancy and Parks has supported maintenance. The data collection period for The City’s green roof pilot project located at the Municipal Building was completed in late 2018. This pilot project was intended to support local research on the benefits of green roofs, including determining capital costs in comparison to typical roofing products, measurement and monitoring of stormwater quantity and quality, impacts on local temperature and air quality, insulating factors, plant species selection, biodiversity, and maintenance scheduling and costs.

Concurrently, policy options to encourage the integration of green roofs and other green stormwater infrastructure alternatives at City-owned buildings have been reviewed with a team of internal and external experts and have been integrated into The City’s amended Sustainable Building Policy. The updated Policy was approved by Council on 2019 April 29.

INVESTIGATION: ALTERNATIVES AND ANALYSIS

Using the information collected from the municipal green roof research project, supplemented with information collected through a review of case studies from other Canadian and American jurisdictions, a cost/benefit analysis was compiled with the assistance of the University of Calgary, and a local green roof expert. The sources of supplemental information collected are primarily from cold climate green roof research and are conservative in nature.

The costs and benefits identified for green roofs include the following:

| Cost | Benefit |
|---|--|
| One-time <ul style="list-style-type: none"> • Installation | One-time <ul style="list-style-type: none"> • Potential deferred investment in storm infrastructure and equipment |
| Recurring <ul style="list-style-type: none"> • Maintenance • Irrigation • Reroofing | Recurring <ul style="list-style-type: none"> • Energy savings • GHG emissions reductions • Heat Island mitigation • Noise abatement • Biodiversity/habitat creation • Increase productivity and decreased absenteeism from work • Job creation • Real estate effects (improved value in rent, absorption, tenant retention, risk reduction) |

This analysis determined that over 25 years, the net present value (NPV) of the installation, maintenance, and replacement costs of a green roof was up to \$24 per square foot more than that of a conventional, asphalt roof, depending on the extent of the roofing specifications.

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The estimated NPV of the potential benefits over the same time period can be significant; stormwater management (\$10.30/SF); energy savings (\$1.30/SF); impact on occupant wellbeing and productivity (\$5.70/SF); real estate value (\$9.30/SF); and a number of environmental benefits (\$7.80/SF) including biodiversity, improved air quality, reduced urban heat island effect and acoustics. These benefits offset the initial cost premium for building owners and/or tenants, totalling \$34.40 per square foot in benefits. This means that for every dollar in incremental cost for implementing a green roof in comparison to an asphalt roofing product, approximately \$1.43 in potential benefits could be theoretically achieved over 25 years. Additional societal benefits associated with job creation and skills development would be achieved but were not quantified for this analysis.

The above noted cost/benefit analysis was compiled to provide a scale of the magnitude of the theoretical financial benefits that could be achieved by green roofs. However, achieving returns on this investment are subject to multiple weather and operational risks. For example, the municipal green roof was significantly impacted by the Municipal Complex’s structural upgrade project. In addition, green roofs are not applicable to all projects and require significant analysis as to the suitability of a project for a green roof in addition to mobilizing continuous maintenance resources. Green roofs also require technical experts in irrigation, landscaping, and potentially apiarists (beekeepers), depending on the project configuration.

In recognizing the potential merits of a green roof to complement a comprehensive sustainability strategy for new building construction and/or major renovation projects, the recent review of the Sustainable Building Policy included consultation with building owners and developers to identify performance specifications which could encourage consideration of green roofs as one tool in a large toolbox of potential design options.

In discussion with City facility operators, the possibility of retrofitting all appropriate City-owned buildings with green roof systems was explored. While there are no immediate reroofing projects identified in the near future that would be suitable candidates for a green roof system, recommendations were collected on policy options that would encourage the consideration of green roofs, on a case-by-case basis, as lifecycle reroofing projects are planned and implemented. These recommendations were integrated into the Sustainable Building Policy, with the scope of the Policy now extending to existing building operations and maintenance.

The Policy encourages the consideration of green roofs in design in the following manner:

| Sustainability Principle | Corresponding Minimum Sustainability Performance Specifications |
|----------------------------|--|
| Optimize energy efficiency | The 40 per cent improvement from National Energy Code for Buildings 2011 baseline building will encourage the consideration of green roofs as an option to increase the insulating factor of roof assemblies. |
| Reduce potable water use | A 35 per cent improvement from baseline for water use will encourage the consideration of green roofs combined with stormwater capture systems and diversion systems for use in flushing toilets and irrigation. |

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| Sustainability Principle | Corresponding Minimum Sustainability Performance Specifications |
|--|--|
| Encourage integration of green stormwater infrastructure | A target to manage the 90 th percentile of rainfall events onsite using green stormwater infrastructure has been established. Referencing historical Calgary weather, the specification encourages the consideration of green roofs as an option to meet an objective to retain water on site for a specified period for 90 per cent of all rainfall events within a year. Green roofs help retain water on site and improve the quality of eventual run-off. |
| Maintain and improve biodiversity | An objective has been set to encourage the use of native species to manage stormwater while encouraging biodiversity, which can be achieved by considering green roofs as a potential design option. |
| Maintain social wellbeing | Social wellbeing performance requirements are currently under development and will consider the impact of green roofs in providing places for gathering, health, and wellness. |

Strategic Alignment

City-owned and funded building projects, including renovations and new construction projects must adhere to The City's Sustainable Building Policy. The Policy aligns with many Council priorities including a commitment to creating and sustaining a vibrant, healthy, safe and caring community that works for all today and tomorrow. This commitment has been expressed through policies, plans and strategies including the Triple Bottom Line Policy Framework, proposed Calgary's Resilience Strategy, the imagine CALGARY plan and the 2020 Sustainability Direction. As such, the Policy addresses the intent of NM2017-36.

Social, Environmental, Economic (External)

Economic

Well-defined sustainability performance objectives help guide the development of cost-effective facilities that will provide long-term value to Calgarians.

Environmental

Green roofing technologies, in concert with other green building technologies, contribute to improving air quality, ensuring efficient land stewardship, protecting water resources, protecting open spaces, improving energy efficiency, and addressing climate resilience.

Social

Green roofs, contribute to an inclusive city by supporting a city of vibrant neighbourhoods by providing open green spaces within the site. Sustainable buildings provide improved interior environments and contribute to improved occupant comfort, wellbeing, health and productivity.

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Financial Capacity

Current and Future Operating Budget:

Mitigating impact on future budgets will be achieved by designing and constructing buildings with long-term resiliency and sustainability in mind. Supported by the Sustainable Building Policy, green roofs, along with many other green building technologies are evaluated early in project design. These options are evaluated by applying a lifecycle assessment. This ensures that capital costs and operating benefits are considered when making design decisions.

Ongoing maintenance and operation of the municipal green roof will continue to be funded within Corporate Analytics & Innovation's existing operating budget.

Current and Future Capital Budget:

The early establishment of building performance specifications in formal documents such as the Owner's Project Requirements, early in the project design process helps reduce the capital costs of implementing green roofs and other sustainable building technologies. Projects that identify sustainability related performance measures and targets early in the scoping process have historically had higher rates of successfully addressing performance specification in both design and construction and result in fewer changes that are associated with additional fees.

While there are capital costs on a project specific basis, these costs will be accounted for during the stage at which project capital costs are typically finalized and the request to allocate funds and approval to proceed to implementation is issued, as per City project management and stage gating frameworks.

Risk Assessment

No risks have been identified with respect to this report.

REASON(S) FOR RECOMMENDATION(S):

Green roofs are one option amongst many green building technologies to help encourage overall building sustainability. The effective application of green roofs is limited to specific building types, orientations, locations, and operating models, as such, deployment of the technology on all City buildings is not recommended. The Sustainable Building Policy has been developed to encourage the consideration of green roofs, where applicable, during project design and development, therefore, Administration recommends that the intent of NM2017-36 has been addressed through a policy mechanism.

ATTACHMENT(S)

1. Notice of Motion NM2017-36 Green Sheet