



Green Infrastructure & Stormwater Management CASE STUDY

Municipal Land Use Planning to Protect Water Resources

Location: Calgary, Alberta, Canada

Client: City of Calgary Water Resources, Strategic Services

Design Firm(s): O2 Planning + Design Inc.

Landscape architect/Project contact: Douglas Olson/George Roman

Email: george.roman@o2design.com

ASLA Chapter:None

Project Specifications

Project Description: Best practices for watershed protection were reviewed and distilled at three scales: the urban watershed, communities, and sites. Best practices included planning considerations such as the amount and pattern of open space, riparian and wetland conservation, greenfield density, infill and intensification, transit-oriented development, parking ratios, fiscal incentives, and education. Low Impact Development (LID) practices reviewed included absorbent landscaping, erosion control, rain gardens, bioswales, green roofs, pervious paving, stormwater reuse, and integrated systems of green infrastructure. For each practice, the current performance of The City of Calgary was rated. Modelling of alternative futures within the Nose Creek watershed was then conducted to create maps and charts for visioning, discussion, and policy analysis purposes. Alternative scenarios included "Conventional", "Low Impact Development", and "Low Impact Development + Retrofits".

Project Type:

Part of a new development

- This project reviewed best practices at multiple scales, and conducted future scenario modelling using a build-out development model coupled with a hydrologic model.

Design features: Bioretention facility, rain garden, bioswale, green roof, cistern, rain barrels, downspout removal, porous pavers, and curb cuts.

The following stormwater management design practices were also examined in this project (but not designed or built):

- soil conservation and absorbent landscaping

- xeriscaping
- improved street network designs
- irrigation of sports fields from stormwater ponds

In addition to LID stormwater management designs, this project looked at planning practices to minimize the generation of stormwater from development in the first place, including:

- More open space to minimize impervious areas
- Locating open spaces strategically to conserve pre-development hydrology
- Higher density in remaining developable greenfield parcels
- Infill and intensification
- Transit-oriented development to minimize demand for road infrastructure
- District overlay zoning to prioritize areas for watershed protection measures

This project was designed to meet the following specific requirements or mandates:

Developer/client preference, help to analyze requirements within the Nose Creek Watershed Management Plan as well as urban planning implications

Impervious area managed: greater than 5 acres

Amount of existing green space/open space conserved or preserved for managing stormwater on site: In the "LID" scenario, a total of 24 square kilometres (almost 10 square miles) of greenfield area was preserved as open space to help maintain pre-development hydrology. This represented over 2.5 times the amount of total open space compared to the "Conventional" scenario.

The regulatory environment and regulator was supportive of the project.

Did the client request that other factors be considered, such as energy savings, usable green space, or property value enhancements? Yes, ancillary environmental, social, and economic benefits were also considered in the report as part of the discussion.

Cost & Jobs Analysis

Estimated Cost of Stormwater Project: <\$5,000,000 (Public funding: Local - City of Calgary funding)

Related Information: Generally this is not applicable – detailed costing of alternatives was not a component of the project scope. However, the cost of stormwater management across an entire watershed over a 30-60 year development time frame will exceed \$5,000,000 by a considerable margin.

Was a green vs. grey cost analysis performed? No, note that in Calgary, current regulations do not allow reduced pipe sizes or reduced stormwater pond sizes if LID practices are

implemented on developed lands. This is primarily due to Calgary's unique climate, which includes extensive freeze-thaw dynamics during October to May inclusive, frequent major multi-day floods particularly in June, and intense prairie thunderstorms. LID is positioned as an additional benefit to stormwater quality for minor to moderate events, but currently LID practices are not allowed to replace conventional infrastructure which will continue to be sized to deal with more extreme hydrologic events.

Cost impact of conserving green/open space to the overall costs of the site design/development project: Not applicable

Cost impact of conserving green/open space for stormwater management over traditional site design/site development approaches (grey infrastructure)? In principle it should save costs in most instances (less clearing required, less roads required, less pipes required). Although you are probably already aware of this resource, the EPA has compiled some existing case studies here showing typical cost savings of 15%-80%:

<http://www.epa.gov/owow/NPS/lid/costs07/>

Number of jobs created: About 0.7 person years of work total to conduct the analysis

Job hours devoted to project:

Planning and Design: Not applicable

Construction: Not applicable

Annual Maintenance: Not applicable

Other: 1600 hours total for research, analysis, modelling, mapping, consultation, and reporting

Performance Measures

Stormwater reduction performance analysis:

For the future scenario model, the following results were obtained for the indicators (Values are calculated based on the area of the Nose Creek Watershed within The City of Calgary limits, which is approximately 241 square km): IMPERVIOUS AREAS: Baseline (2008)=26% Conventional Scenario=47% LID Scenario=36% LID + Retrofits Scenario=34% TOTAL ANNUAL RUNOFF VOLUME (mm/ha): Predevelopment Hydrology=8 mm/ha Baseline (2008)=116 mm/ha Conventional Scenario=193 mm/ha LID Scenario=120 mm/ha LID + Retrofits Scenario=104 mm/ha

Community & economic benefits that have resulted from the project: Our study is being used as an information source by the City of Calgary Water Resources and has helped to encourage more cross-departmental understanding and collaboration in urban planning. Additional community and economic benefits that seem to be resulting from the project include:

- More outdoor recreational opportunities as well as related health benefits
- Improved urban aesthetics and viewsheds
- Improved sense of place and community pride
- Higher land values in proximity to high value open spaces
- Potentially less hard infrastructure capital costs
- Amenities can help to attract and retain a skilled work force
- Biodiversity conservation

Note that, due to the recent release of the study and the generally slow pace of urban planning and development, many of these benefits are somewhat intangible and unquantifiable at the moment.

Additional Information

Links to images: <https://fileshare.o2design.com/>

Username: ASLA Password: PH4sPuf6