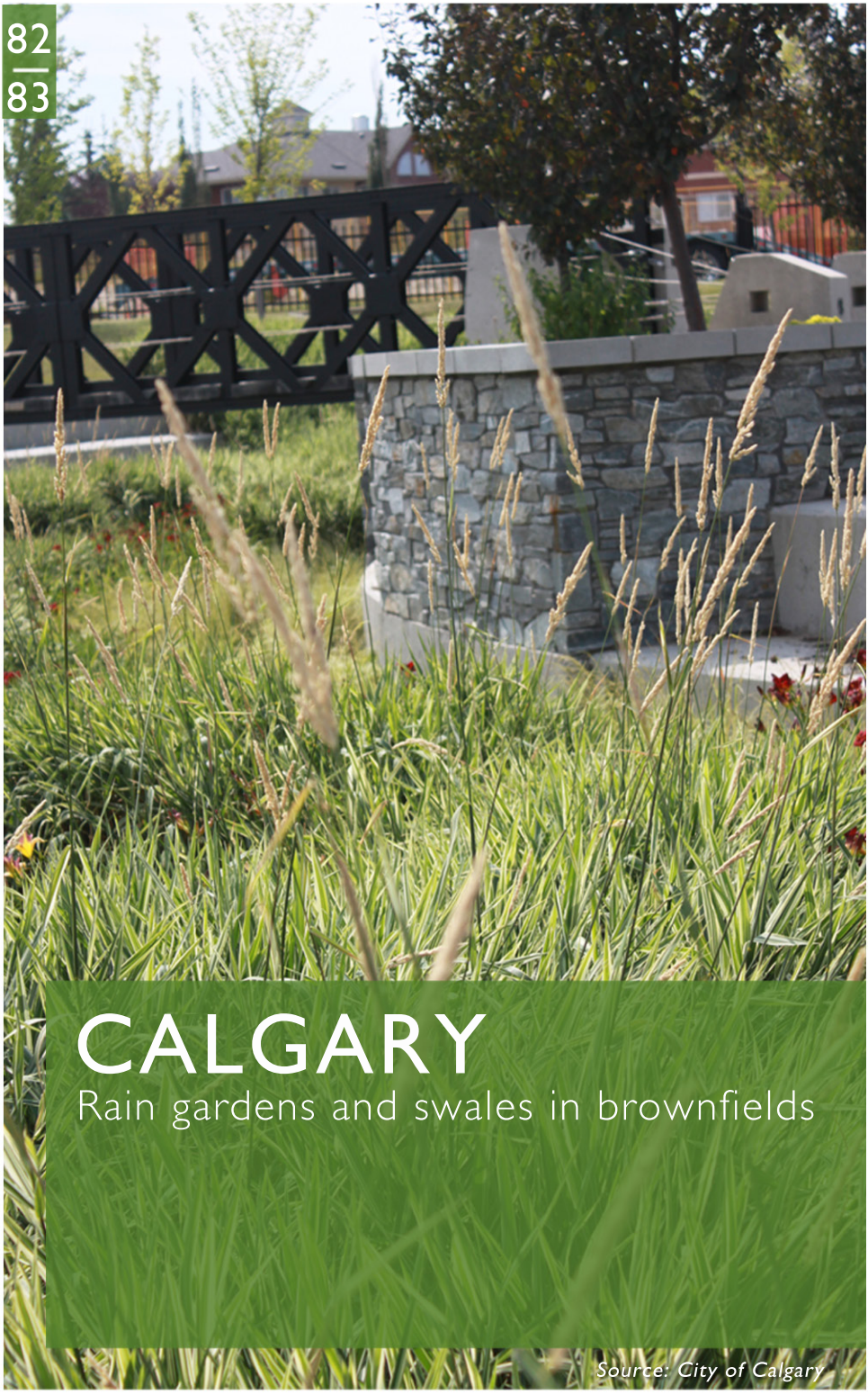

CALGARY

Rain gardens and swales in brownfields

Source: City of Calgary

THE SCIENCE

Many communities across Canada have brownfield lands with potential for development if specific environmental challenges are successfully addressed. These are often former industrial sites requiring treatment of contaminated soils before development can proceed. Stormwater management is often an important dimension of successful brownfield redevelopment, particularly for large projects.

During development of brownfield sites, and later when the lands are returned to active use, it is essential that contaminated runoff does not pollute nearby streams, lakes and rivers. Moreover, redevelopment has the potential to significantly alter the rate and volume of stormwater flows but can be designed to avoid or at least reduce increasing the risk of damage to existing and future homes and other dwellings in the area during extreme rainfall events.

The Low Impact Development (LID) approach to stormwater management and site development is becoming popular as a mechanism to provide localized, small-scale source water control. This approach uses natural features like rain gardens, retention basins and swales, as an alternative or supplement to traditional stormwater management infrastructure like underground piping, gutters or curbs.

THE TRIGGER

Six storms in Canada have each resulted in more than one billion dollars in damage to homes, businesses and infrastructure. Half of these events were in Calgary, in 2005, 2010 and 2013. The City has also experienced a number of other damaging extreme rainfall events over the past few decades, with losses affecting the cost of providing municipal services, the price of insurance and ultimately, the cost of living in Calgary.

Currie Barracks presents a novel approach to urban flooding. Local awareness of the potential adverse impact of severe weather has been particularly evident in Calgary after the many extreme events experienced in the city, events that oriented the approaches taken to enhance this re-development project.

THE APPROACH

Canada Lands Company and the City of Calgary were looking to redevelop Currie Barracks, a former military site near the downtown of the City. This brownfield site was to become a medium- to high-density residential development. Calgary was seeking an innovative approach to stormwater management because of restrictions in the capacity of the downstream storm sewer system stormwater systems to accept the projected increases in runoff from the site.

The consulting engineer for this project developed a Low Impact Development design to ensure that the rate of the runoff leaving the site would not exceed the capacity of the downstream stormwater system. In particular, abandoned fields were converted into rain gardens, vegetated swales and gravel infiltration trenches were incorporated at strategic locations as part of the green space in the new urban fabric.

Figure 25 : *The pictures above show an infiltration trench built in the Currie Barracks Brownfield re-development project. An infiltration trench is an excavated trench backfilled with stones to create a narrow underground reservoir. Stormwater runoff diverted into the trench drains from the bottom of the trench into the subsoil and eventually to the water table.*
(Source: City of Calgary)

The rain gardens were designed with topsoil blended with compost and drywall surplus materials with a thickness of over 1.0 m compared to 10 to 15 cm of topsoil in a traditional development. This type of soil combined with the use of vegetated swales made it possible for the area to accumulate most of the rainwater long enough for it to seep and replenish groundwater. The amount of hard area in Currie Barracks is similar to, or actually even higher than pre-development conditions because of the higher density. However, it is dealt with in a better way by making the landscaped areas act as a sponge. The water is then distributed around the site and does not overwhelm the city's stormwater system.

THE OUTCOME

The Currie Barracks brownfield project was successful in retaining most peak rainfall on site, meeting the design challenge of limiting discharge from the property. The project also addressed concerns about the functionality of the design feature

during winter freeze-thaw events. Low Impact Development projects rely on soil moisture, evapotranspiration and infiltration to absorb heavy rainfall but these natural processes may not perform as well in cold climates. In addition, traditional catch basins tend to clog during Chinook conditions, common in Calgary, due to the bottom outlet design being at risk of clogging and freezing. This problem was addressed in the project with the design of a raised outlet with a non-clogging tie-in to the storm sewer system.

During the approval process of the project, several meetings were held that included various stakeholders such as the design team, approvals departments and senior management. Together they worked through the specific differences between the proposed Low Impact Development design and more traditional stormwater management designs. In addition, multiple meetings as well as weekly site meetings were held with the entire team to ensure that the principles and goals behind the design of the Currie Barracks brownfield project were properly understood by everyone. In parallel, the City of Calgary developed a Stormwater Source Control Handbook to address design criteria for Low Impact Development applications within the city. Before releasing the Handbook, the City of Calgary made sure that the personnel assessing the design and granting approval were well trained and had a good understanding of Low Impact Development principles.

The Currie Barracks brownfield re-development project was also used as a pilot project in Canada for LEED Neighbourhood Development, a rating system that integrates the principles of smart growth, urbanism and green building into a system for neighborhood design. The approved site plan of the project has received a Stage 2 Gold rating. The project also received the Consulting Engineers of Alberta award for progressive engineering for its Low Impact Development stormwater design.

A WORD FROM CALGARY

At the time the Currie Barracks brownfield project was developed, the concept of Low Impact Development was fairly new to the City of Calgary. For this reason, the approval process was more challenging since City staff was not familiar with the specificities of Low Impact Development as many of the proposed features were not standard. Currently, the City of Calgary continues to develop Low Impact Development applications throughout the City. "Any upcoming greenfield development and redevelopment will need to be very Low Impact Development intensive to meet new stormwater targets and guidelines," said Bert Van Duin, Senior Development Engineer for the City of Calgary. Mr. Van Duin concluded by mentioning that as long as Low Impact Development features are used appropriately, they should be implemented on all future projects.