

Tips for building a sustainable backyard suite

Design a backyard suite that is comfortable, resilient and affordable to heat and power in Calgary.



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Program administration

The Backyard Suite Program (“Program”) is administered by The City of Calgary (“The City”). The City is responsible for overall Program management and administration. The City reserves the right to modify or cancel any component of the Program at any time without notice.

Program communications

All Program information, resources and application forms will be made available on the Program webpage at [**Building a Backyard Suite**](#). Program Terms and Conditions, timelines and other details are subject to change.



DISCLAIMER

This guide is not meant to provide specific technical advice for any property. We recommend that Program applicants consult with qualified professionals to ensure that any designs and operations to their property are completed in a technically feasible and safe way that complies with all applicable laws, bylaws, orders, ordinances, standards, codes and rules, requirements, licenses and permits of all lawful authorities, and manufacturer’s specifications.

None of The City or its officers, employees, contractors, consultants or agents will be liable under any theory of relief or recovery to the Participant for any damages of any kind or nature arising at law or in equity (whether in negligence, because of breach of contract, in tort or under any other provision of law) including, but not limited to, property damage, direct or consequential losses, economic loss, or personal injury, that arises from the information provided in this guide or is related to anything done under the Program.

Sustainable building technology is evolving quickly and best practices may change over time. The information in this document is considered current as of the time of publication, in April 2026. Industry best practices may change in the future.

Glossary

Affordable housing – is when shelter costs less than 30 per cent of total before-tax household income.

Airtightness – measures how much air leaks between the inside and outside of the home when there is a difference in pressure. This is a consideration for both energy efficiency and indoor air quality. Heat can be lost from inside the home, and outdoor particles and pollutants can come into the home.

Building code – the current building code used in Alberta: National Building Code 2023 Alberta Edition.

Building envelope – the assemblies of the building that separate the inside from the outside environment. The building's roof, walls, windows, doors and foundation make up the envelope. Its primary function is to manage heat, air and moisture transfer.

Design phase – the process up until the building permit is issued, where design and specifications of the building are being defined. This is the phase prior to the construction phase.

Electrification – is a term used to describe a building that uses electricity for all of the mechanical systems (e.g. domestic hot water, space heating, space cooling, ventilation, appliances). These buildings no longer use fossil fuels in building operations.

Embodied carbon – the carbon emissions produced during the creation, use and disposal of all construction materials in the building. Embodied carbon calculations for residential buildings typically account for the raw material extraction, transportation to the factory, and the manufacturing process of the building's construction materials.

Energy advisor – is a third-party professional who measures, models and can optimize a home's energy efficiency. Read more here: [How to become an NRCan-registered energy advisor - Natural Resources Canada.](#)

Energy inequity – is when a household is struggling to pay for their energy bills or making tradeoff decisions between paying for basic needs (like groceries) and energy bills.

Green buildings – or 'sustainable buildings' typically refer to buildings that go above the minimum building code requirements in terms of energy efficiency, water management, resiliency or other environmentally-focused building design aspects.

High-performance buildings – this typically refers to buildings that consume at least 20 per cent less energy than a typical code-built home of the same design.

Material carbon – see 'embodied carbon'.

Operation phase – this refers to the phase after construction where people are living in the home. During a building's operation, maintenance is required to extend its lifespan. After operation there is deconstruction or demolition of the building.

Operational carbon – this refers to the carbon emissions created during the day-to-day use of the building. Carbon emissions are generated through energy consumption – from all sources of energy. The way the Alberta grid produces electricity creates carbon emissions, and burning natural gas or other fuels on site will also generate carbon emissions.

Resiliency – refers to the capacity to withstand and recover from events.

Sustainable buildings – see 'green buildings'.

Introduction

This guidebook is for homeowners and builders of backyard suites who are curious about green buildings but are unsure where to start. Written in plain language, this guide provides information and resources to make informed decisions about:

- **energy efficiency,**
- **sustainable building materials,**
- **resiliency, and**
- **water management.**

This guidebook does not provide a comprehensive list of all green building topics, but represents tools and techniques already being used successfully in Calgary homes. Each section will provide resources where you can learn more.

Affordability

Sustainable suites can be more affordable to build and operate. In Calgary, 1 in 7 households struggle to heat, cool and power their homes. This is called “**energy inequity**” and it disproportionately affects renters, seniors and single-parent households in Calgary. Learn more about energy inequity at [Calgary.ca/ClimateEquity](https://calgary.ca/ClimateEquity)

Backyard suites are typically created for aging in-place, multi-generational living or additional income (renting out). Based on these targeted uses, backyard suites provide an opportunity to promote affordability through sustainable design.

Build it right the first time

Smart design choices can save you money and stress in the future. You can prevent future retrofits/renovations and lower your utility costs. You can also avoid costly repairs after extreme weather events, such as Calgary’s high wind, hailstorms and flooding events.



1 in 7 homes
struggle to heat,
cool and power their homes in Calgary.

Energy efficiency

Energy efficiency measures are simply measures that use less energy to heat, cool and power your home. Decreasing your home's energy use can lower energy costs, reduce carbon emissions and improve the home's resilience to extreme weather or other climate impacts. The design phase is the best time to implement sustainable building aspects, and this is especially true for energy efficiency. It often will cost significantly more to renovate your suite to add energy efficiency measures than it will to build the suite with those measures in the first place.

Note: due to the current Alberta grid conditions, electric systems can cost more money to operate and can emit more carbon emissions than natural gas systems. However, these concerns can be offset by adding a source of renewable energy (solar panels) to the suite. Discuss options with an energy advisor for more information.

Tips to improve energy efficiency through building design

You should first consider design elements like the shape and orientation of the suite. Then look at the building envelope (e.g., insulation, windows and doors). Next, you can upgrade to energy-efficient mechanical systems (e.g., heating and cooling systems for air and water). And as a final step, you should consider adding renewable energy generation to your building, such as solar panels.

1. Building design & envelope

- Look for ways to optimize roof slope for future solar panels or window placements for winter heating and summer cooling.
- Think about how passive design elements (i.e., orienting windows to increase natural lighting, increasing the overhang of eaves to maximize shade, etc.) could reduce the energy needed for heating, cooling and lighting your suite.
- Use existing trees in design for shading, cooling and wind protection.
- Design and construct your building to improve the building envelope from the start. Retrofitting the envelope later can be costly and difficult.
- Increase insulation in your walls, roof and foundation to minimize the amount of heat and cold that transfers in and out of the suite. This can significantly improve the comfort of the home.
- Consider getting the airtightness of the suite tested by an [energy advisor](#).

During the build, ensure that air tightness is prioritized. This is easiest to do before the drywall goes up. Leaky homes can cost more to heat, feel “drafty”, and bring in outside pollutants (car exhaust, wildfire smoke). A continuous air barrier is required by code and can help prevent future moisture issues.

2. Mechanical systems

- Ensure the space heating and cooling systems are properly sized for the suite.
- Ask your builder or mechanical contractor for the CSA F280:12 calculations for your suite and verify that your mechanical equipment's capacity matches. It is a building code requirement to have your furnace or heating appliance capacity calculated in accordance with CSA F280.
- Installing oversized mechanical systems is inefficient and can result in short cycling (the furnace or air conditioner turns on and off rapidly). This increases energy costs and reduces the lifespan of the equipment.
- Ensure the space heating, cooling and ventilation systems are balanced and commissioned prior to occupancy. This ensures that these systems are working as intended individually but also working together as a system.

3. Renewable energy production

- Reduce energy costs and carbon emissions of the suite with renewable energy production.
- Add renewable electricity with solar photovoltaic panels.
- Consider a solar thermal system, which produces heat for hot water and space heating systems.



Tips to improve energy efficiency in building operation

Even when a backyard suite is built to a high energy-performance standard, how you use the suite can significantly impact total energy use. These are simple ideas on how to improve energy efficiency when your suite is occupied.

- Install a smart thermostat or manage your thermostat to lower the temperature while you're sleeping or not at home.
- Lower the temperature of the hot water tank to 120°F (49°C).
- Replace or clean filters and conduct regular maintenance on space heating, cooling and ventilation systems. Check the manufacturer information for more details.
- Ensure windows and doors have adequate weatherstripping and sealing. This will also help with drafts.
- Wash your laundry in cold water.
- Hang dry laundry loads when possible.
- Turn off lights when not in use.

Consider energy management systems (EMS) as an option to avoid electrical service upgrades when you electrify mechanical systems and produce renewable energy. Check with your electrical professional for more information.

Who to talk to

Talk to a qualified builder or energy advisor for more information on energy efficiency. You may need to get quotes from several professionals to find a company that is aligned with your goals. Consider these resources to help you find a qualified professional that fits your goals:

- **CHBA Qualified Net Zero Professionals:** [Who to work with - Canadian Home Builders' Association](#)
- **Natural Resources Canada:** [Find a service provider for new homes | Natural Resources Canada](#)

Additional resources

- **Natural Resources Canada:** [Buying an energy-efficient new home - Natural Resources Canada](#)
- **City of Calgary:**
 - [Together we build](#)
 - [Home Energy Labelling](#)
- **Natural Resources Canada:**
 - [Windows, doors and skylights - Natural Resources Canada](#)
 - [LEEP NZE Wall Guides - Natural Resources Canada](#)
- **Canadian Home Builders Association:** [Net Zero - Canadian Home Builders' Association](#)

Case study information

- **Net Zero Energy Backyard Suite in Calgary:** [GBTN28 – Net zero all electric backyard suite – Smart Sustainable Resilient Infrastructure Association SSRIA](#)
- **The Hawktaill:** [ENBIX Case Study - the Hawktaill | ENBIX](#)

Sustainable building materials

The materials we use in building homes have impacts on the environment. Creating, using and disposing of building materials releases carbon emissions. This is called the building's **embodied carbon or material carbon**. The embodied emissions contribute about half of the total lifetime emissions of the building. If your goal is to reduce emissions, it is important to consider both the building materials and energy efficiency when designing a backyard suite.

In addition to embodied emissions, synthetic building materials can have environmental impacts. For example, hydrofluorocarbons (HFCs), usually used in air-conditioning and foam blowing agents (used for spray foam insulation), are being phased out of use in Canada due to their negative impacts on the ozone layer.

Synthetic building materials can also impact the indoor air quality of the suite. Off gassing of volatile organic compounds (VOCs) can happen from building materials such as varnishes and glues (and more). Some VOCs have known health effects, and it is best to limit your exposure to them.

Luckily, many natural materials can be used to improve embodied carbon, environmental impacts and indoor air quality. Typically, natural materials have a similar or higher thermal resistance (R-value).

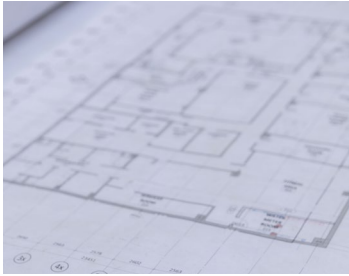


Tips for sustainable building materials in design

Similar to “reduce, reuse, then recycle”, the first step to reducing embodied carbon in building design is by reducing size, materials and maintenance efforts.

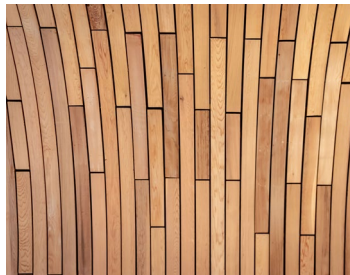
▪ Reduce is first!

- Reduce the size of your suite. Being more efficient in floor area can lower material, energy and maintenance costs while lowering your carbon emissions.
- Reduce concrete use. Concrete has high embodied carbon. Consider thinner slabs and concrete walls where possible (but make sure you still meet code requirements).
- Design for durability. Choose materials that reduce maintenance and don’t need to be replaced as often. See the resiliency section of this book for more information on climate-related durability.



▪ Consider sustainable and alternative materials

- For alternative insulation consider dense-packed and loose-fill cellulose, wood fiber or straw bale. These materials offer significant carbon savings and can still offer fire, moisture and pest-resistance.
- Ask your concrete trades/supplier for a low-carbon concrete mix.
- Look for forest certifications for your lumber. **FSC (Home | Forest Stewardship Council)** and **SFI (SFI Standards - forests)** are third-party certification programs for sustainable forestry practices.



Who to talk to

Talk to your architect, designer, builder or energy advisor for more information on sustainable building materials. If you are interested in non-conventional designs or materials, you may need to get quotes from several professionals to find a company that is aligned with your goals.

Talk to a professional in arboriculture from the planning phase to post-construction phase to ensure trees and soils are protected. For more information visit: [Protecting trees during construction and development](#).

Additional resources

- **City of Nelson:** Low Carbon Buildings | Nelson, BC
 - [Embodied Carbon Basics](#)
 - [10 Affordable Ways to Reduce Embodied Carbon on Building Projects for Builders & Homeowners](#)
- **Videos**
 - 6 minutes: Builders for Climate Action: [What is embodied carbon in buildings?](#)
 - 10 minutes: Builders for Climate Action: [Opportunities for Reducing Embodied Carbon in Home Building - Condensed](#)
- **Indoor air quality:** [Pollutants from furniture and building materials - Canada.ca](#)

- **Consider pre-fabricated or modular buildings**

- Pre-fabricated or modular buildings are constructed off-site at a shop or warehouse. They can be constructed as a whole building or in parts.
- Construction is faster, cheaper and produces less construction waste than conventional framing.
- Consider the materials used in the pre-fabricated or modular construction to ensure that carbon emissions are reduced.

- **Choose products that are labelled as “low emission” to improve indoor air quality.**

- Examples of certifications/ labels for products include: GREENGUARD GOLD, Floor Score, CRI Green Label Plus, Indoor Advantage Gold and CDPH Compliance.

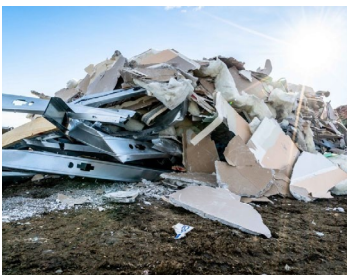


- **Reuse and recycle**

- Reuse wood, brick, old fixtures and anything else you can safely reuse. Talk to your builder about reusing materials.
- Recycle metal, glass, shingles, paint and drywall pieces during construction.

- **Strive for better, not perfect**

- Calculating embodied carbon emissions is relatively new in residential construction, so not all builders or consultants are knowledgeable.
- Even swapping a couple of products or reducing materials in the design phase is a great step.



Case study information

- **Low Embodied Carbon (straw insulation) Backyard Suite in Calgary:** [GBTN28 – Net zero all electric backyard suite – Smart Sustainable Resilient Infrastructure Association SSRIA](#)
- **Passive House Canada – Straw insulation and straw panels:** [Will Straw Grow up to Save the Planet? - Passive House Canada](#) | [Maison Passive Canada](#)
- **Carbon Leadership Forum – Embodied Carbon Reductions Built Project Case Study Collection:** [Embodied Carbon Project Case Study](#)
 - Justis Residence – Pages 51-53
 - Kaplan Williams Residence – Pages 54-57
 - Oceanspray Townhomes – Pages 58-62

Resiliency

Resiliency refers to the capacity to withstand and recover from events. These events might be natural disasters, severe weather events or a power outage. Resilient buildings will withstand or rapidly recover from these events. Resilient homes and suites sometimes provide support to the community when other homes are compromised by extreme events or blackouts.

Why is resiliency important for your backyard suite?

Extreme weather and climate-related hazards—such as hail, heavy rain, wildfire smoke and heat waves—are becoming more frequent and severe across Alberta. Homes built only to meet minimum code requirements may not withstand the increasing frequency of these hazards, leading to costly repairs and insurance challenges.

- Building your backyard suite to be resilient to Calgary’s climate hazards protects your investment. You can reduce damage, repair and maintenance costs, which safeguards rental income or family housing over the long term.
- Resilient materials and design could help maintain insurance availability and affordability.
- Resilient design features make your home more comfortable during extreme temperatures and smoke days. You can minimize disruption from storms and extend the lifespan of key building components.

Tips to incorporate resiliency in design

Consider resiliency measures in the design phase (roofing, siding, window types, shading, cooling, grading and drainage) so they can be coordinated with the structure, mechanical systems and site layout. Ask your designer or builder to reference [Calgary.ca/ClimateReadyHome](https://calgary.ca/ClimateReadyHome) and Alberta-specific severe weather guidance when selecting materials for the roof, exterior walls, windows and doors.

- Prioritize “high-exposure” elements first: impact-resistant roofing, durable cladding and robust water management.
- Consider backup ventilation and cooling options that maintain indoor comfort during heat or smoke events.
- Allow for clear access to downspouts, roofs and exterior walls. Gutters, caulking and grading should be inspected and maintained to preserve resilience over time.

How to build resilient homes in Calgary

- Consider using roofing products tested for hail to reduce damage from Calgary's severe hailstorms (e.g. class 4 impact rated shingles, rubber or other impact-resistant roofing).
- Use durable, noncombustible and hail-resilient siding, such as fiber cement board, brick, stone or metal. Standard vinyl is less durable and susceptible to hail damage.
- Design good water management: adhere to bylaws pertaining to [**lot grading and positive lot drainage**](#). Review the [**stormwater bylaw**](#) for more information.
- If you are planning on building in a flood zone, consider how the suite can be designed to minimize damage from river related flooding. See more information here: [**Be prepared for flooding**](#).
- Improve thermal performance and summer comfort. High-performance windows, exterior shading (e.g. overhangs, awnings), light-coloured roofing, and sufficient insulation and air sealing will help manage both winter cold and extreme heat.
- To reduce the impacts of wildfire smoke inside, seal all windows, doors and any other point of air entry (e.g. vents). Install heating, ventilation and air conditioning (HVAC) systems that can support MERV 13+ filters and controls temperature, relative humidity and air exchange rate.
- Where wildfire or grass fire risk is higher (e.g., edges of natural areas), choose noncombustible exterior materials, enclose soffits and underdeck areas and avoid storing combustible items close to the suite.



Who to talk to

- Insurance providers and brokers can advise on how specific resilient features (e.g. hail-resistant roofing) can affect coverage and premiums in Alberta.
- Registered architects or building designers with experience in secondary suites and resilient or high-performance homes in Calgary.
- Local builders and licensed contractors who have built backyard or garage suites in Calgary and are familiar with resilient roofing, siding and drainage solutions for hail and heavy rain.
- Talk to a professional in arboriculture and visit [Caring for our urban forest](#) for information on preventative tree maintenance and landscaping resiliency.

Additional resources

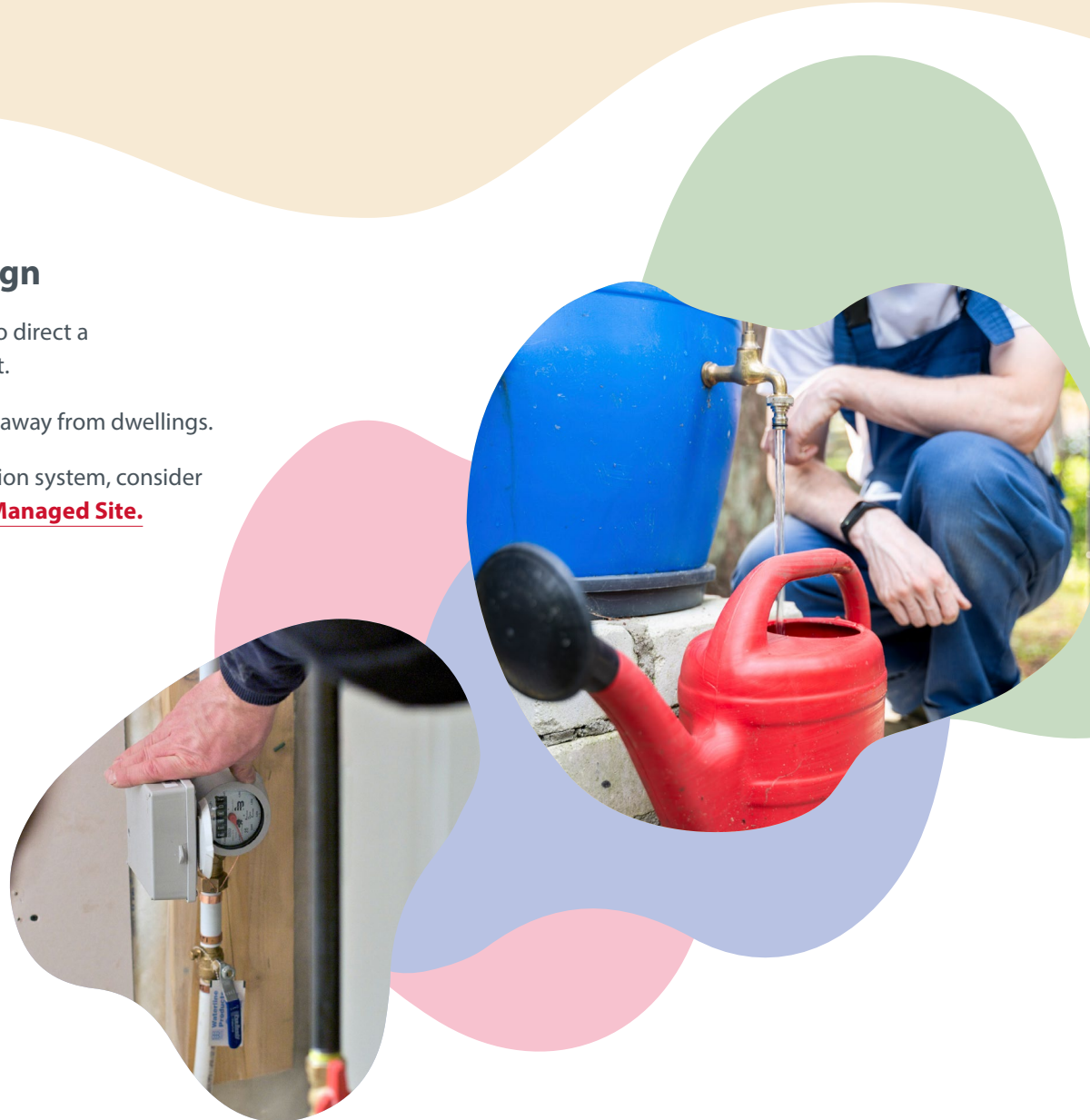
- **City of Calgary:**
 - [Climate Ready Home Guide for Calgarians](#)
 - [Climate ready measures for exterior walls, siding, and other home elements](#)
- **Resilient Homes Task Force:**
 - [Guidelines for Building Resilient Homes](#)
- **Natural Resources Canada:**
 - [Windows, doors and skylights - Natural Resources Canada](#)
 - [LEEP NZE Wall Guides - Natural Resources Canada](#)

Water management

There are many ways to improve both indoor and outdoor water management in building design and operation. Reducing your water consumption can also reduce your water bills.

Tips to incorporate water management in design

- Install WaterSense low flow/flush toilets, faucets and showerheads.
- Install WaterSense and Energy Star labelled clothes washers and dishwashers.
- Install rain barrels or totes.
- Build a rain garden to direct a downspout toward it.
- Extend downspouts away from dwellings.
- If you have an irrigation system, consider becoming a **Water Managed Site**.



Tips to incorporate water management in building operation

- Use your **water meters** to check for leaks every 6 months
- Repair leaks: **Water leaks and basic repairs**
- Minimize outdoor water use
 - Water wisely: **Watering 101 - New, Developing Landscaping**
 - Use landscaping and gardening tips: **Be YardSmart**
 - Collect and use rainwater: **YardSmart rain barrels**
 - Adhere to municipal water restrictions: **Understanding outdoor water restrictions**
- Check your sump pump and clean your backflow valve, if you have them: **Climate ready measures: Water management**
- Don't put fats, oils and grease down the drain: **Protect your pipes**
- Learn how to read your water utility bill: **Understanding your water utility bill and water rates**

Who to talk to

- Refer to the **calgary.ca** links and frequently asked questions (FAQs) referenced in this book
- Call 311 for additional information on water programs
- Call ENMAX (403-310-2010) for questions about your water utility bill

Additional resources

- City of Calgary's Homeowner Water Guide: **Homeowner Water Guides**
- City of Calgary Water, Wastewater and Stormwater programs: **Water, Wastewater, and Stormwater**
- City of Calgary's Flood Readiness: **Be prepared for flooding**
- City of Calgary's Climate Ready Water Measures: **Climate ready measures: Water management**