Flood mapping FAQ

General questions about the flood study project

What was the purpose of the flood study project?

Following significant flooding events in 2017 and again in 2018, the City sought to better understand the flood risk that our community faces along our two main creeks, Vernon Creek and BX Creek, as well as the interaction with Okanagan Lake. The project completed detailed flood mapping, risk analysis and a list of prioritized mitigation measures to help the community become more flood resilient in a changing climate.

A flood resilient community is one where flooding occurs, but causes minimal social and economic disruption.

What information is included in the report?

The report includes the following information:

- Floodplain maps which will form part of future floodplain bylaws. Detailed floodplain maps are the result of detailed hydraulic modelling of the design flood event including impacts of climate change + freeboard. “Freeboard is a 0.6m vertical offset from the design flood event to account for unexpected channel blockages during a flooding event and unpredictability regarding hydraulic, hydrologic and geomorphologic properties. Floodplain maps are meant to guide development within the floodplain.
- Detailed hazard maps which indicate depth and velocity of the design flood event. Hazard maps are the result of detailed hydraulic modelling of the design flood event including impacts of climate change (does not include Freeboard). These maps provide the basis for the risk analysis to identify and prioritize mitigation measures to reduce flood risk.
- A Flood Risk Assessment to show where flooding may have high consequences. This helps prioritize future flood mitigation work.
- A Flood Mitigation Plan to identify and prioritize future flood prevention projects.
- Planning and bylaw recommendations to allow the City to better manage development in our floodplain areas.

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How will the project help make the community more flood resilient?

The report identifies areas of the community that are vulnerable to flooding along Vernon Creek and BX Creek. The risk analysis identifies where flooding is expected to be of high consequence on the flood hazard maps. The report recommends future projects and strategies to reduce flooding and the consequences of flooding. Planning and bylaw recommendations have also been included in the report's recommendations for better managing land re-development within the floodplain using the floodplain maps developed through this project.

Flood maps have been produced and are available to the public. The public could use this information to prepare plans to protect their property from flooding. Emergency services within the City of Vernon will also use the maps for planning during flood emergencies. For more information, please see the City of Vernon's Flood Story.

Will the maps and report be public information?

Yes, the maps and report are intended for the community, to raise flood awareness and promote personal emergency preparedness.

What are the next steps after the flood study is completed?

The flood study will help inform future decisions about construction projects, infrastructure upgrades, maintenance programs, land development, public education and to increase flood resiliency within our community. The next step is to begin planning and implementing the recommendations made in the report.

Who paid for this project and who completed the work?

The project was made possible with funding from a number of partner agencies, including: Emergency Management BC, Public Safety Canada (through the National Disaster Mitigation Program), and the Province of B.C. (through the Community Emergency Preparedness Fund, administered by the Union of BC Municipalities). The flood study project was undertaken by Northwest Hydraulic Consultants Ltd. (NHC), and the project was managed by the City of Vernon.

The project is similar to many other flood mapping projects that are taking place in communities throughout the Okanagan, including the Okanagan Mainstem Floodplain Mapping project by the Okanagan Basin Water Board (OBWB).

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Who is responsible for regulations related to the floodplain?

Regulations about land use or construction within the floodplain are the responsibility of local governments, and in our case, the City of Vernon.

Can I get insurance for flooding from lakes, rivers and creeks?

For information on available insurance for your property, you must contact your insurance provider for details.

Traditionally, overland flood insurance has not been available in Canada; however, this is starting to change with the increased availability of improved information on potential flooding. See page 24 of the Building Climate Resilience in the Okanagan brochure for more information.

Information about how flood insurance relates to disaster financial assistance is also provided on the Vernon Flood Story and at the Provincial emergency management disaster financial assistance webpage.

The Federal Government is also looking into options to make insurance more attainable for people located in floodplains. That work is underway at the time of writing this FAQ (October 2021). More information can be found here.

What can be done to prepare for flooding as a property owner?

Property owners who have been identified within the floodplain, or who have experienced flooding and high water in the past – and even those who haven't – may experience flooding in the future. The Canadian Government provides a helpful list of things to do before a flood, including specific information about how to protect your property. The BC Government provides resources on how to Get Prepared for a Flood in British Columbia.

What is the City of Vernon doing to mitigate flooding along BX Creek and Vernon Creek, within its boundary?

Work is well underway by the City of Vernon to become more flood resilient and reduce the impact of future flood events in the community.

The recommended highest priority is to create a City Flood Response Plan that will guide Vernon through the response stage of a future flood event. Pre-planning the response to potential flooding can help ensure an efficient, safe, and effective response. The following suggestions to be included in the Emergency Flood Response Plan include: identifying key locations to

monitor flows / water levels to trigger emergency plan actions; pre-plan locations for temporary community flood barriers and operational activities during high-water events; refine evacuation routes and plans based on updated flood hazard mapping; and recovery planning for the post flood event.

As part of its efforts to mitigate future flooding, the City will be constructing a sediment pond on Upper BX Creek. The design of the pond is complete and construction will soon commence. Sedimentation is a natural process and expected to continue, especially along Upper BX Creek. The sediment pond is designed to intercept sediment to reduce the risk associated with sedimentation along critical crossings downstream.

Based on the recommendations of the Flood Mapping study, the City is moving toward floodplain bylaws to regulate development within the floodplain. The City is also planning on assessing six critical crossings that may need to be increased in size to allow the design flood event to pass without restriction.

A total of six City project recommendations are included in the Detailed Flood Mapping, Risk Analysis and Mitigation report, all of which the City plans to pursue.

General flood awareness and preparation

Where can I get information about forecasted floods in BC?

If you want to know if a flood is forecasted in your area, check the B.C. River Forecast Centre. You can also view the additional links and information provided on the Vernon's Flood Story

What should I do to prepare for a flood?

Long before a flood is forecasted, you can prepare yourself, your household and your property for the possibility of facing a flood by following the tips on Vernon's Flood Story.

If I live in a floodplain, what can I do to reduce my risk?

There are several strategies available to reduce flood risk for a property. Visit Vernon's Flood Story to learn about some of the options. Strategies range from temporary measures to implement in advance of a flood, to long-term risk reduction strategies that should be considered prior to new construction or as part of building renovations.

Flood mapping FAQ

How do dams and their operation affect flooding?

Dams help reduce flooding in the valley. They 'attenuate' (store and slowly release) river flows by providing storage during large inflows and reduce the amount of water which flows downstream. Dams have a maximum water level they can reach before they must release flows and convey water downstream without storage. When inflows exceed the attenuation that dams can provide, flooding may occur.

Who operates the dams that affect Vernon?

The dams at Swan Lake and Kalamalka Lake are managed by the provincial government's Ministry of Forests, Lands, and Natural Resource Operations and Rural Development.

What are some of the considerations when it comes to managing dams?

Water management along the Okanagan valley-bottom (mainstem) lakes balances the needs of many stakeholders including lakefront property owners and downstream property owners. Dam operations (storage and releases) in the Okanagan are managed by a set of criteria which have been developed to balance First Nations, fishery, agricultural, recreational interests, flooding and others.

Using the Flood Maps

How is climate change predicted to impact flooding?

Vernon's Flood Story provides information about expected changes to flooding due to climate change. These changes include:

- Freshet may occur a month or more earlier than historically experienced;
- The highest water levels may no longer be due to snow melt, but due to heavy rainstorms; and
- The ability to forecast water flows will decrease. This means the ability to regulate water flow, such as dam operations, will become more difficult and perhaps less effective.

Flood mapping FAQ

How do land use changes like logging, further development, or forest fires impact flooding?

Changes to land use can affect the speed and amount of runoff experienced in a region. These changes can result in less water being absorbed by the soil and an increase in the potential for flooding. Development that increases the impermeable surface of an area (e.g. roads, paved parking lots, houses) also decreases the amount of water that can be absorbed by the soil and can increase flooding potential.

What is the difference between the different map layers (Flood Construction Level (FCL), extents, depths, and hazards)?

There are two different maps developed through the Detailed Flood Mapping project. Its important to note that the modelling assumes no mitigation efforts have taken place (sand bagging, emergency dredging etc.) Floodplain maps, which are the result of the modelled design event + climate change + freeboard, are used to guide future development in the floodplain. The floodplain maps include setbacks, Flood Construction Levels, Flood Fringe and Floodway.

Hazard maps, which are the result of the modelled design event + climate change, were developed to complete a flood risk assessment. The hazard maps do not include freeboard. These maps include modelled depths of flood water and velocities.

My property is in the floodplain. Now what?

My property is in the floodplain. What does that mean?

If your property is located within the identified floodplain, it doesn't mean that your property *will* flood, but rather that there is a chance your property will be impacted during the modelled design flood event. Using the information provided, you can review the likelihood of flooding, the depth of floodwaters, and infrastructure (such as dikes or crossing upgrades), that may reduce the flood's impact. If you're planning renovations or other changes on your property and want to reduce flood risk, consider home improvement options to increase flood resilience like those listed on the Intact Centre on Climate Adaption website. Contacting a Professional Engineer to complete a site-specific engineering analysis to assess flood hazard and identify site specific mitigation options can also be completed.

Flood mapping FAQ

I want to develop in an area identified on one of the maps as within a floodplain. Is that okay?

Are you prepared to accept potential flood risk on your property? If so, you should familiarize yourself with the floodplain maps. Many local governments in the Okanagan have floodplain management plans and guidelines for developments. The City of Vernon is moving towards implementing floodplain bylaws that will provide further guidance and regulations for developing within the floodplain. Depending on the site, options like flood-proofing or raising buildings may be feasible. A site-specific flood hazard assessment should be considered in your development plans.

My property is in the mapped floodplain but I have never seen flooding. Why?

The mapped floodplain identifies areas where flooding *may* occur, which means there's a possibility of flooding on your property. The required conditions may not have occurred to flood your property in the past, however, they could in the future.

My property is in the floodplain. How does this affect my property value?

Many communities in BC are built on floodplains near lakes, rivers and oceans. Potential flooding is a hazard on many properties across the province and an accepted risk for many homeowners. You may want to talk to your real estate agent about property value considerations related to the potential flood hazard. You may also want to discuss what you can do to reduce flood risk and enhance your property value with a qualified professional.

http://www.ebbwater.ca/wp/update-the-impact-of-flood-hazard-on-real-estate-values/

My property is in the floodplain. How does this affect my insurance?

You will have to contact your insurance provider for details related to your insurance policy. Overland flood insurance is a relatively new product in Canada, and is different from the typical home insurance coverage related to flooding from sewer or sump pump backup (which does not cover overland flooding).

Updated flood mapping can help insurance companies assess risks when offering overland flood insurance and may lead to increased availability of flood insurance. See page 24 of the Building Climate Resilience in the Okanagan guidebook for more information.

Flood mapping FAQ

Additional information about how flood insurance relates to disaster financial assistance is provided on Vernon's Flood Story and at the following link: Provincial Government Explanation, Disaster Financial Assistance

Understanding flood lingo

What is freeboard?

A 0.6 metre vertical distance from the design flood water surface to account for uncertainties and unpredictability in the creek such as blockages, vegetation and stream geomorphology (gravel, sediment).

What does 'design flood' mean and how should it be used?

A *design flood* is the event selected for establishing design criteria and defined by some form of magnitude. This design flood has a likelihood that matches society's tolerance for risk.

How was the recommended design flood selected?

In BC, design floods are generally adopted from either the 1-in-200 year Average Recurrence Interval (ARI) flood or the highest recorded flood. For BX Creek, the 1996 flood of record is the highest recorded flood and, with adjustment for climate change, is used as the recommended design event. For Vernon Creek, the 1-in-200 year flood with climate change was used.

What is the likelihood of the recommended design flood happening?

The likelihood of the design flood is based on the event used to develop it. For areas where the design flood is the 1-in-200 year flood, the likelihood of that flood occurring is approximately 0.5% each year. For areas where the design flood is the 1996 flood of record, the likelihood of that flood is 0.2% each year.

Generally, for all areas, the likelihood of flooding is increasing due to climate change. These likelihoods are expected to increase over the next 50-80 years.

Flood mapping FAQ

How do you use the Flood Construction Level (FCL)?

Flood Constructions Levels Refer to the elevation above which habitable space is recommended, after incorporating freeboard over the design flood water level. Future bylaw regulations will provide clarity on how the FCL's would apply within the floodplain.

Is flooding in the Okanagan a recent phenomenon?

Flooding is an important and natural process that has always been an important part of the Okanagan's physical history. Flooding provides many benefits such as fertilization of agricultural land and replenishing lakes used for vital water supply or recreation. That said, flooding is a powerful process that can present risk to people and infrastructure within flood-prone areas.

To learn more about previous flooding in this region and ongoing mitigation projects in the Okanagan Valley, visit Vernon's Flood Story or the 'History' tab on the Okanagan Basin Water Board flood story.

What does a shift in vertical datum mean?

A shift in the vertical datum means that the way elevations are measured and recorded have changed, but it does not mean that the physical elevations have changed. The vertical datum used across Canada was changed from Canadian Geodetic Vertical Datum 1928 (CGVD1928) to Canadian Geodetic Vertical Datum 2013 (CGVD2013) to improve accuracy and facilitate GPS measurements. An adjustment or shift can be applied to elevations in the old datum to convert them to the new datum.

This shift is not constant throughout the Okanagan Valley. For example, the difference between the older datum (CGVD1928) and the newer datum (CGVD2013) at Kelowna General Hospital is 24 cm, and in Oliver at the Highway 97 bridge, the difference between the datums is 29 cm.

Flood Construction Levels (FCLs) and lake levels commonly referenced prior to this project used the old datum (CGVD1928). While the FCLs increased due to the new mapping, some of this increase is due to their reporting in a new datum. The new mapping shows FCLs in both the new and old datums.

See the project report for more details and sample conversions.

Flood mapping FAQ

Is flooding from Okanagan Lake included in this mapping?

Flooding from Okanagan Lake is **not** included in the City of Vernon Detailed Flood Mapping, Risk Analysis and Mitigation project other than how Vernon Creek interacts with Okanagan Lake under the recommended design elevation from the recent Okanagan Mainstem Floodplain Mapping report 2020. However, Vernon's Flood Story has been updated to include the flood mapping layers completed under the Okanagan Basin Water Board flood mapping work. You can find additional information from that study here:

Flood Maps (Tab) | Okanagan Flood Portal (arcgis.com)

Flood modelling questions

Why are there isolated areas mapped as if in the floodplain?

Low-lying areas that may not be visibly connected to the remainder of the floodplain are identified as within the floodplain using a filtering approach. The filtering was used to remove isolated areas smaller than 100 m2. Holes in the inundation extent with areas less than 100 m2 were also removed. Isolated areas larger than 100 m2 were retained for mapping if they were within 40 metres of direct inundation or within 40 metres of other retained polygons. This is to account for high water tables and potential water movement through culverts and channels, and also seepage through permeable material such as soil, road beds, and railway beds.

Is flow control by the dams considered?

Yes, flow control from the dams is considered in the analysis for flood modelling. As described in the project report and based on guidelines, the *Gates Open Scenario* under normal operation was included in the development of the design event to represent the potential for upstream reservoir inoperability.

How is climate change incorporated?

Potential climate change effects are incorporated into the hydrologic modelling, as detailed in the project report. Large climate models with predicted changes to regional weather patterns were downscaled to the Okanagan basin. Many simulations of dam operations were run with inputs adjusted for climate changes to develop data for a frequency analysis.

Flood mapping FAQ

How accurate are these maps?

These maps and the underlying analysis are comprehensive and based on state of the art modelling and analysis; however, they are subject to limitations as described in the project report. The maps meet all applicable professional standards and were developed based on provincial guidelines. The mapped recommended design flood includes freeboard – a 0.6 metre vertical distance added to represent local variations in water level and uncertainty in estimates from the science and engineering analysis.

Who can I contact if I have more questions?

You can contact the City of Vernon at Floodstory@vernon.ca or by calling 250-550-3634.

Flood mapping FAQ

References:

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