City of Courtenay

Flood Management Plan Appendix C – Hazard & Consequence Map Atlas

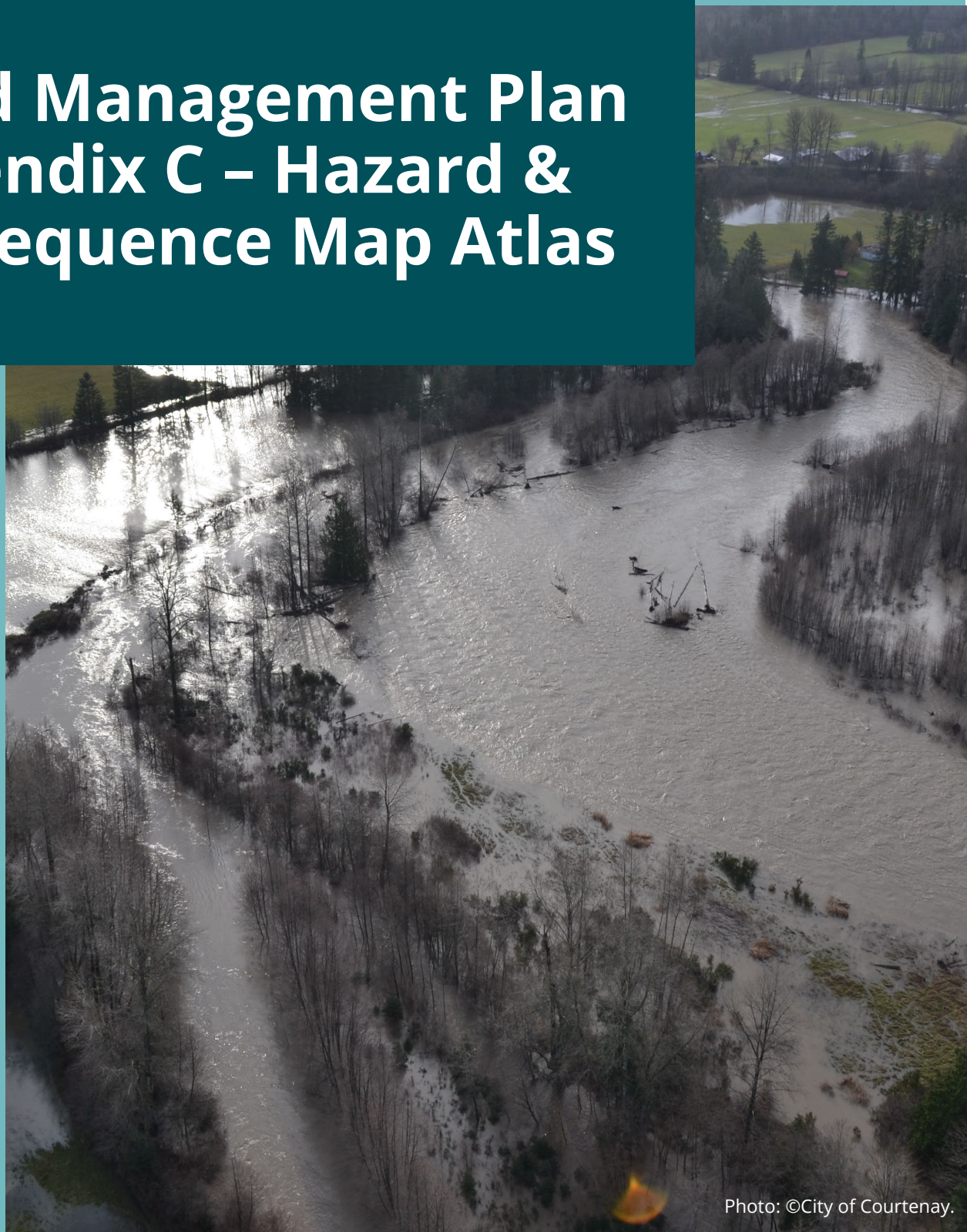
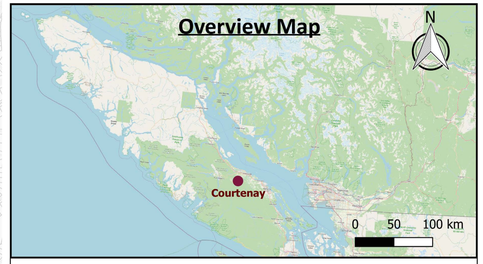


Photo: ©City of Courtenay.

Series	Hazard Layer	Exposure Layer
S1-1	Present-day - Likely Event	-
S1-2	Mid-term Future - Less Likely Event	-
S1-3	Long-term Future - Rare Event	-
S2-1	Present-day - Likely Event	Affected People
S2-2	Mid-term Future - Less Likely Event	Affected People
S3-1	Present-day - Likely Event	Critical Infrastructure
S3-2	Mid-term Future - Less Likely Event	Critical Infrastructure
S4-1	Present-day - Likely Event	Culture & Recreation
S4-2	Mid-term Future - Less Likely Event	Culture & Recreation
S5-1	Present-day - Likely Event	Economy
S5-2	Mid-term Future - Less Likely Event	Economy
S6-1	Present-day - Likely Event	Environment
S6-2	Mid-term Future - Less Likely Event	Environment

City of Courtenay
Flood Risk Assessment
Hazard Map
Present-day - Likely Event
Flood Depth

Overview Map



Map Notes
1. Map produced by Ebbwater Consulting Inc. on 31 July 2024.
2. The present-day scenario considers 0 m Sea Level Rise (SLR) and no increase in riverine flows compared to present-day (nominally 2020) conditions (i.e., climate change beyond present-day conditions is not included in this scenario). A likely event has a 5% Annual Exceedance Probability (AEP).
3. Inset map shows an indicative area. It is not meant to necessarily show areas of higher or lesser importance.
4. Depth classifications are based on Flood Hazard Mapping Guidelines for British Columbia (Ebbwater, 2022).
5. This map is intended to support an understanding of risk. IT SHOULD NOT BE RELIED ON FOR ENGINEERING DESIGN OR REGULATORY CONTROLS.

Data Sources
1. The flood hazard extents were received from CVRD on 28 May 2021 (KWL, 2021).
2. Parcel layer data was obtained from the City of Courtenay on 15 July 2022. Current Flood Protection Infrastructure locations were received from CoC on 20 December 2022 (2019/2020 Dike Crest Survey completed by WSP on behalf of the Province).
3. Base Layer (Main Map): OSM Humanitarian Data Model and CARTO's Positron, created using derivatives of OpenStreetMap data - openstreetmap.org (© OpenStreetMap contributors; cartography license CC BY-SA). Base Layer (Overview Map): OpenStreetMap data – openstreetmap.org (© OpenStreetMap contributors; cartography licence CC BY-SA).

References
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2. Kerr Wood Leidal Associates Ltd. (2021). Coastal Flood Mapping Project. Final Report. Prepared for Comox Valley Regional District.
3. Ebbwater Consulting Inc. (2022). Flood Hazard Mapping Guidelines for British Columbia. Draft Report. Prepared for the Province of British Columbia.

Legend

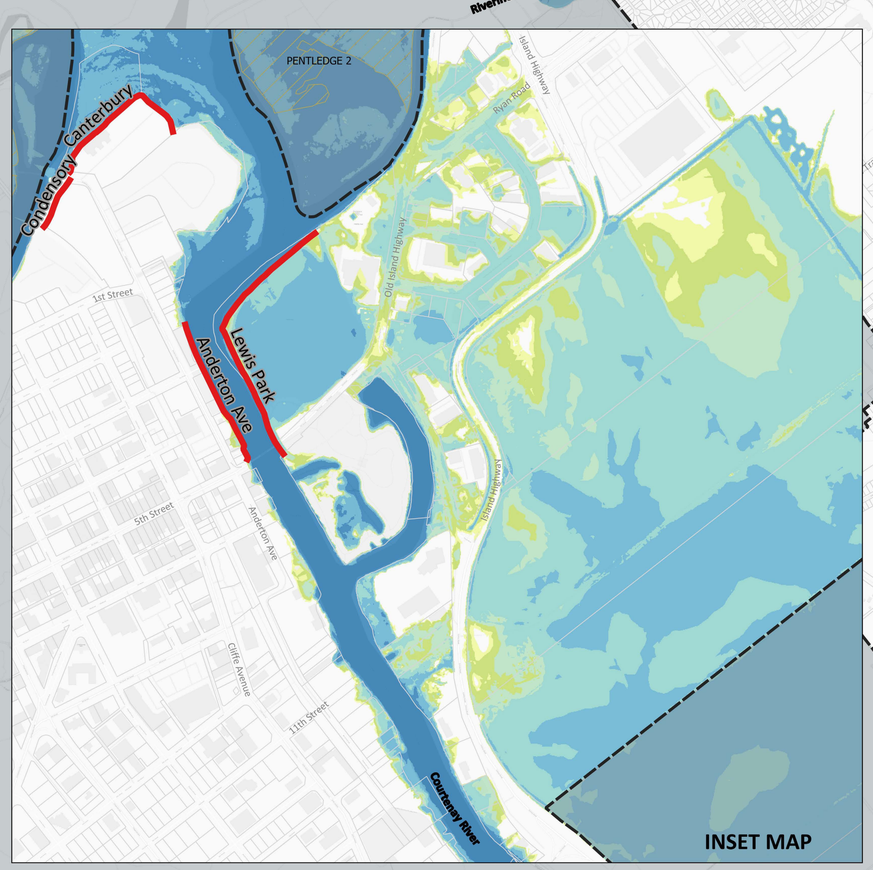
Background
- Current Flood Protection Infrastructure
- City Boundary
- Land Parcels
- K'ómoks First Nation Reserve Lands

Present-day - Likely Event
Flood Depths (m)
- 0.0 - 0.1: Most buildings expected to be dry; underground infrastructure and basements may be flooded.
- 0.1 - 0.3: Water may enter buildings at grade, but most expected to be dry; underground infrastructure and basements may be flooded.
- 0.3 - 0.5: Water may enter ground floor of buildings; underground infrastructure and basements may be flooded.
- 0.5 - 1.0: Water on ground floor; underground infrastructure & basements may be flooded; potential for electricity failure.
- 1.0 - 2.0: Ground floor flooded.
- > 2.0: First (ground) floor and higher levels covered by water.

Scale	
Main Map 1:12,000 (0 250 500 m)	Inset Map 1:5,000 (0 100 200 m)

Date Created: 31 July 2024	Coordinate System: NAD83, UTM 10N Vertical Datum: CGVD 2013
Prepared By: NS Reviewed By: SH Checked By: TL	ebbwater CONSULTING

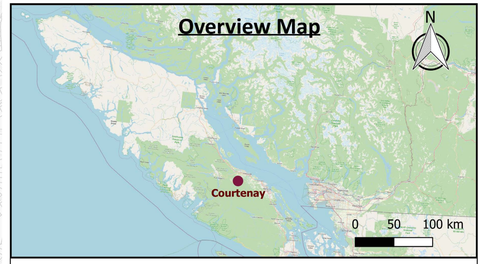
ANSI D - Map No. S1–1



City of Courtenay
Flood Risk Assessment
Hazard Map

Mid-Term Future - Less Likely Event
Flood Depth

Overview Map



Map Notes
1. Map produced by Ebbwater Consulting Inc. on 31 July 2024.
2. The mid-term future climate change scenario considers a 1 m Sea Level Rise (SLR) and a 15% increase in riverine flows compared to present-day (nominally 2020) conditions. A less likely event has a 0.5% Annual Exceedance Probability (AEP).
3. Inset map shows an indicative area. It is not meant to necessarily show areas of higher or lesser importance.
4. Depth classifications are based on Flood Hazard Mapping Guidelines for British Columbia (Ebbwater, 2022).
5. This map is intended to support an understanding of risk. IT SHOULD NOT BE RELIED ON FOR ENGINEERING DESIGN OR REGULATORY CONTROLS.

Data Sources
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Legend

Background
- Current Flood Protection Infrastructure
- City Boundary
- Land Parcels
- K'ómoks First Nation Reserve Lands

Mid-Term Future - Less Likely Event
Flood Depths (m)
- 0.0 - 0.1: Most buildings expected to be dry; underground infrastructure and basements may be flooded.
- 0.1 - 0.3: Water may enter buildings at grade, but most expected to be dry; underground infrastructure and basements may be flooded.
- 0.3 - 0.5: Water may enter ground floor of buildings; underground infrastructure and basements may be flooded.
- 0.5 - 1.0: Water on ground floor; underground infrastructure & basements may be flooded; potential for electricity failure.
- 1.0 - 2.0: Ground floor flooded.
- > 2.0: First (ground) floor and higher levels covered by water.

Scale	
Main Map 1:12,000 (0 250 500 m)	Inset Map 1:5,000 (0 100 200 m)
Date Created: 31 July 2024	Coordinate System: NAD83, UTM 10N Vertical Datum: CGVD 2013
Prepared By: NS Reviewed By: SH Checked By: TL	ebbwater CONSULTING

ANSI D - Map No. S1–2

City of Courtenay
Flood Risk Assessment
Hazard Map

Long-term Future - Rare Event
Flood Depth

Overview Map

Map Notes
1. Map produced by Ebbwater Consulting Inc. on 31 July 2024.
2. The long-term future climate change scenario considers 2 m Sea Level Rise (SLR) and a 30% increase in riverine flows compared to present-day (nominally 2020) conditions. A rare event has a 0.2% Annual Exceedance Probability (AEP).
3. Inset map shows an indicative area. It is not meant to necessarily show areas of higher or lesser importance.
4. Depth classifications are based on Flood Hazard Mapping Guidelines for British Columbia (Ebbwater, 2022).
5. This map is intended to support an understanding of risk. IT SHOULD NOT BE RELIED ON FOR ENGINEERING DESIGN OR REGULATORY CONTROLS.

Data Sources
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Legend

Background
- Current Flood Protection Infrastructure
- City Boundary
- Land Parcels
- K'ómoks First Nation Reserve Lands

Long-term Future - Rare Event
Flood Depths (m)
- 0.0 - 0.1: Most buildings expected to be dry; underground infrastructure and basements may be flooded.
- 0.1 - 0.3: Water may enter buildings at grade, but most expected to be dry; underground infrastructure and basements may be flooded.
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- 1.0 - 2.0: Ground floor flooded.
- > 2.0: First (ground) floor and higher levels covered by water.

Scale	
Main Map 1:12,000 (0 250 500 m)	Inset Map 1:5,000 (0 100 200 m)
Date Created: 31 July 2024	Coordinate System: NAD83, UTM 10N Vertical Datum: CGVD 2013
Prepared By: NS Reviewed By: SH Checked By: TL	ebbwater CONSULTING

ANSI D - Map No. S1–3

INSET MAP

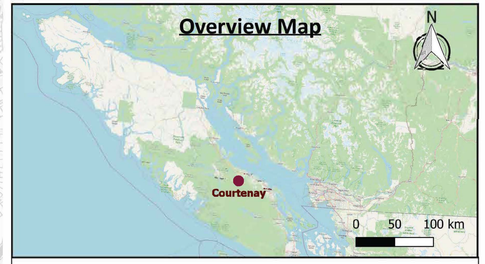
This map highlights the number and location of residents who would be affected in a likely flood (5% annual exceedance probability) in the present-day (nominally 2020). Residential buildings in the floodplain are coloured based on the number of residents assigned to each building (2021 Census). Note that affected people numbers are averaged across census dissemination areas.

Affected People	
Affected People in the Floodplain (#)	290
Affected Residential Buildings	25

City of Courtenay Flood Risk Assessment Consequence Map

Present-day - Likely Event
Affected People

Overview Map



Map Notes
1. Map produced by Ebbwater Consulting Inc. on 31 July 2024.
2. The affected people layer is associated with the likely event, present-day scenario and is shown on top of this hazard layer. Please refer to the Flood Risk Assessment Appendix (Ebbwater, 2024) for definitions of terms, and details on datasets, methodology and limitations.
3. Affected population is based on the census 2021 dissemination areas and building footprints within the project area boundary. The number of people per building is averaged within each census dissemination area, and its accuracy at a building level is limited by the available information.
4. The present-day scenario considers 0 m Sea Level Rise (SLR) and no increase in riverine flows compared to present-day (nominally 2020) conditions (i.e., climate change beyond present-day conditions is not included in this scenario). A likely event has a 5% Annual Exceedance Probability (AEP).
5. Inset map shows an indicative area. It is not meant to necessarily show areas of higher or lesser importance.
6. Depth classifications are based on Flood Hazard Mapping Guidelines for British Columbia (Ebbwater, 2022).
7. This map is intended to support an understanding of risk. IT SHOULD NOT BE RELIED ON FOR ENGINEERING DESIGN OR REGULATORY CONTROLS.

Data Sources
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2. Building footprints, parcel layer, and BC Assessment 2021 valuation and land data were obtained from the City of Courtenay on 15 July 2022. Current Flood Protection Infrastructure locations were received from CoC on 20 December 2022 (2019/2020 Dike Crest Survey completed by WSP on behalf of the Province).
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Legend

Affected People per Residential Building (#)
- 2 - 4
- 4 - 6
- 6 - 10
- >10

Present-day - Likely Event Flood Depths (m)
- 0.0 - 0.1: Most buildings expected to be dry; underground infrastructure and basements may be flooded.
- 0.1 - 0.3: Water may enter buildings at grade, but most expected to be dry; underground infrastructure and basements may be flooded.
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- 0.5 - 1.0: Water on ground floor; underground infrastructure & basements may be flooded; potential for electricity failure.
- 1.0 - 2.0: Ground floor flooded.
- > 2.0: First (ground) floor and higher levels covered by water.

Background
- Current Flood Protection Infrastructure
- City Boundary
- K'ómoks First Nation Reserve Lands
- Municipal & Commercial Buildings in Flood Hazard Extent
- Building Footprints outside of Flood Hazard Extent

Scale	
Main Map 1:12,000 (0 250 500 m)	Inset Map 1:5,000 (0 100 200 m)

Date Created: 31 July 2024	Coordinate System: NAD83, UTM 10N Vertical Datum: CGVD 2013
Prepared By: NS Reviewed By: SH Checked By: TL	ebbwater CONSULTING

ANSI D - Map No. S2–1

INSET MAP

City of Courtenay
Flood Risk Assessment
Consequence Map

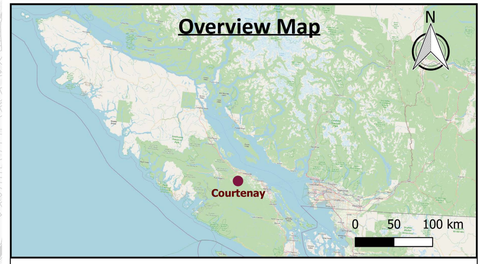
Mid-Term Future - Less Likely Event
Affected People

This map highlights the number and location of residents who would be affected in a less likely flood (0.5% annual exceedance probability) in the mid-term future (loosely linked to the 2100s). Residential buildings in the floodplain are coloured based on the number of residents assigned to each building (2021 Census). Note that affected people numbers are averaged across census dissemination areas.

Affected People

Affected People in the Floodplain (#)	898
Affected Residential Buildings	105

Overview Map



Map Notes
1. Map produced by Ebbwater Consulting Inc. on 31 July 2024.
2. The affected people layer is associated with the less likely event, mid-term future climate change scenario and is shown on top of this hazard layer. Please refer to the Flood Risk Assessment Appendix (Ebbwater, 2024) for definitions of terms, and details on datasets, methodology and limitations.
3. Affected population is based on the census 2021 dissemination areas and building footprints within the project area boundary. The number of people per building is averaged within each census dissemination area, and its accuracy at a building level is limited by the available information.
4. The mid-term future climate change scenario considers a 1 m Sea Level Rise (SLR) and a 15% increase in riverine flows compared to present-day (nominally 2020) conditions. A less likely event has a 0.5% Annual Exceedance Probability (AEP).
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6. Depth classifications are based on Flood Hazard Mapping Guidelines for British Columbia (Ebbwater, 2022).
7. This map is intended to support an understanding of risk. IT SHOULD NOT BE RELIED ON FOR ENGINEERING DESIGN OR REGULATORY CONTROLS.

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3. Ebbwater Consulting Inc. (2022). Flood Hazard Mapping Guidelines for British Columbia. Draft Report. Prepared for the Province of British Columbia.

Legend

Affected People per Residential Building (#)
- 2 - 4
- 4 - 6
- 6 - 10
- >10

Background
- Current Flood Protection Infrastructure
- City Boundary
- K'ómoks First Nation Reserve Lands
- Municipal & Commercial Buildings in Flood Hazard Extent
- Building Footprints outside of Flood Hazard Extent

Mid-Term Future - Less Likely Event Flood Depths (m)
- 0.0 - 0.1: Most buildings expected to be dry; underground infrastructure and basements may be flooded.
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- 1.0 - 2.0: Ground floor flooded.
- > 2.0: First (ground) floor and higher levels covered by water.

Scale

Main Map 1:12,000 (0 250 500 m)

Inset Map 1:5,000 (0 100 200 m)

Date Created: 31 July 2024

Coordinate System: NAD83, UTM 10N
Vertical Datum: CGVD 2013

Prepared By: NS
Reviewed By: SH
Checked By: TL

ebbwater CONSULTING

ANSI D - Map No. S2–2

INSET MAP

City of Courtenay
Flood Risk Assessment
Consequence Map

Present-day - Likely Event
Critical Infrastructure

This map highlights the number and location of critical infrastrure facilities, transmission structures, and the length and location of roads, which would be affected in a likely flood (5% annual exceedance probability) in the present-day (nominally 2020). Critical infrastructure in the floodplain is highlighted, and then coloured based on the type of the building or road it depicts.

Critical Infrastructure

Roads in the Floodplain (km)	3.1
CI Facilities in the Floodplain (#)	3
Transmission Structures in the Floodplain (#)	2

Overview Map

Map Notes
1. Map produced by Ebbwater Consulting Inc. on 31 July 2024.
2. The Critical Infrastructure (CI) layers are associated with the likely event, present-day scenario and is shown on top of this layer. Please refer to the Flood Risk Assessment Appendix (Ebbwater, 2024) for definitions of terms, and details on datasets, methodology and limitations.
3. Critical infrastructure facilities include emergency response and first responder facilities, hospitals and medical clinics, sanitary sewer lift stations, public administration buildings, water distribution systems, water tanks and pump stations, BC Hydro substations, as well as transportation hubs (airports and ports), and food banks.
4. Location of line/point features of basic services in hazard extent include BC Hydro and Fortis distribution poles and transmission structures, Telus and Shaw telecommunication facilities (pedestals), roads and railways. BC Hydro and Fortis distribution poles are not shown on the map for clarity but are included in the quantitative analysis and reporting.
5. The present-day scenario considers 0 m Sea Level Rise (SLR) and no increase in riverine flows compared to present-day (nominally 2020) conditions (i.e., climate change beyond present-day conditions is not included in this scenario). A likely event has a 5% Annual Exceedance Probability (AEP).
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Legend

Affected Critical Infrastructrure (CI)
- Transportation
- Water Distribution Systems
- Sanitary Sewer Lift Stations
- Transmission Structures (Electricity)

Affected Roads
- Local
- Moderate
- Major

Background
- Transmission Structures (Electricity)
- CI Facilities
- Current Flood Protection Infrastructure
- City Boundary
- Roads
- Train Tracks (not in service)
- Land Parcels & Building Footprints
- K'ómoks First Nation Reserve Lands

Present-day - Likely Event Flood Depths (m)
- 0.0 - 0.1: Most buildings expected to be dry; underground infrastructure and basements may be flooded.
- 0.1 - 0.3: Water may enter buildings at grade, but most expected to be dry; underground infrastructure and basements may be flooded.
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- > 2.0: First (ground) floor and higher levels covered by water.

Scale

Main Map 1:12,000 (0 250 500 m)

Inset Map 1:5,000 (0 100 200 m)

Date Created: 31 July 2024

Coordinate System: NAD83, UTM 10N
Vertical Datum: CGVD 2013

Prepared By: NS
Reviewed By: SH
Checked By: TL

ebbwater CONSULTING

ANSI D - Map No. S3-1

City of Courtenay
Flood Risk Assessment
Consequence Map

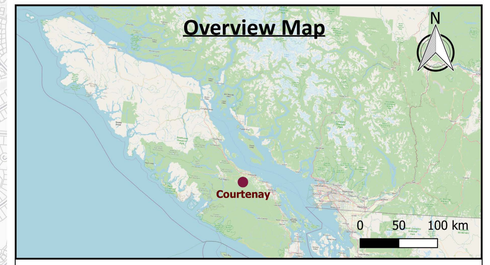
Mid-Term Future - Less Likely Event
Critical Infrastructure

This map highlights the number and location of critical infrastrure facilities, transmission structures, and the length and location of roads, which would be affected in a less likely flood (0.5% annual exceedance probability) in the mid-term future (loosely linked to the 2100s). Critical infrastructure in the floodplain is highlighted, and then coloured based on the type of the building or road it depicts.

Critical Infrastructure

Roads in the Floodplain (km)	6.5
CI Facilities in the Floodplain (#)	6
Transmission Structures in the Floodplain (#)	2

Overview Map



Map Notes
1. Map produced by Ebbwater Consulting Inc. on 31 July 2024.
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3. Critical infrastructure facilities include emergency response and first responder facilities, hospitals and medical clinics, sanitary sewer lift stations, public administration buildings, water distribution systems, water tanks and pump stations, BC Hydro substations, as well as transportation hubs (airports and ports), and food banks.
4. Location of line/point features of basic services in hazard extent include BC Hydro and Fortis distribution poles and transmission structures, Telus and Shaw telecommunication facilities (pedestals), roads and railways. BC Hydro and Fortis distribution poles are not shown on the map for clarity but are included in the quantitative analysis and reporting.
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3. Ebbwater Consulting Inc. (2022). Flood Hazard Mapping Guidelines for British Columbia. Draft Report. Prepared for the province of British Columbia.

Legend

Affected Critical Infrastructure (CI)
- Transportation
- Water Distribution Systems
- Sanitary Sewer Lift Stations
- Transmission Structures (Electricity)

Affected Roads
- Local
- Moderate
- Major

Background
- Transmission Structures (Electricity)
- CI Facilities
- Current Flood Protection Infrastructure
- City Boundary
- Roads
- Train Tracks (not in service)
- Land Parcels & Building Footprints
- K'ómoks First Nation Reserve Lands

Mid-Term Future - Less Likely Event Flood Depths (m)
- 0.0 - 0.1: Most buildings expected to be dry; underground infrastructure and basements may be flooded.
- 0.1 - 0.3: Water may enter buildings at grade, but most expected to be dry; underground infrastructure and basements may be flooded.
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- 0.5 - 1.0: Water on ground floor; underground infrastructure & basements may be flooded; potential for electricity failure.
- 1.0 - 2.0: Ground floor flooded.
- > 2.0: First (ground) floor and higher levels covered by water.

Scale

Main Map 1:12,000 (0 250 500 m)

Inset Map 1:5,000 (0 100 200 m)

Date Created: 31 July 2024

Coordinate System: NAD83, UTM 10N
Vertical Datum: CGVD 2013

Prepared By: NS
Reviewed By: SH
Checked By: TL

ebbwater CONSULTING

ANSI D - Map No. S3–2

INSET MAP

This map highlights the number and location of cultural facilities and trails and greenways, which would be affected in a likely flood (5% annual exceedance probability) in the present-day (nominally 2020). Cultural facilities and trails and greenways in the floodplain are highlighted, and then coloured based on the type of cultural facility or trail/ greenways they depict). Locations of archaeological sites are not included on the map, as it is sensitive information that cannot be distributed publicly.

Culture & Recreation

Cultural Facilities in the Floodplain (#)	14
Trails and Greenways in the Floodplain (km)	4.6
Publicly Documented Indigenous Archaeological Sites in the Floodplain (#)	11

City of Courtenay Flood Risk Assessment Consequence Map

Present-day - Likely Event
Culture & Recreation

Overview Map

Map Notes
1. Map produced by Ebbwater Consulting Inc. on 31 July 2024.
2. The culture layers are associated with the likely event, present-day scenario and are shown on top of this layer. Please refer to the Flood Risk Assessment Appendix (Ebbwater, 2024) for definitions of terms, and details on datasets, methodology and limitations.
3. Culture indicator layers include educational facilities (childcare, schools, post-secondary education buildings), related agricultural facilities, municipal buildings, recreational facilities such as cinemas, park buildings, aquatic centres, and youth centres, civic facilities such as museums, and community halls, religious centres, trails and greenways, and archaeological and heritage sites (including publicly documented Indigenous archaeological and traditional use sites and trails). Locations of archaeological sites are not included on the map, as it is sensitive information that cannot be distributed publicly. Parks and riverine areas were removed from the dataset to avoid double-counting areas.
4. The present-day scenario considers 0 m Sea Level Rise (SLR) and no increase in riverine flows compared to present-day (nominally 2020) conditions (i.e., climate change beyond present-day conditions is not included in this scenario). A likely event has a 5% Annual Exceedance Probability (AEP).
5. Inset map shows an indicative area. It is not meant to necessarily show areas of higher or lesser importance.
6. Depth classifications are based on Flood Hazard Mapping Guidelines for British Columbia (Ebbwater, 2022).
7. This map is intended to support an understanding of risk. IT SHOULD NOT BE RELIED ON FOR ENGINEERING DESIGN OR REGULATORY CONTROLS.

Data Sources
1. The flood hazard extents were received from CVRD on 28 May 2021 (KWL, 2021).
2. Trails, greenways, building footprints, parcel layer, and BC Assessment 2022 valuation and land data were obtained from the City of Courtenay on 15 July 2022. Current Flood Protection Infrastructure locations were received from CoC on 20 December 2022 (2019/2020 Dike Crest Survey completed by WSP on behalf of the Province).
3. Cultural Facilities were assembled from information received from the City of Courtenay on 15 July 2022, and BC Data Catalogue. Archaeological data received from the Archaeology Branch on 13 July 2022.
4. Base Layer (Main Map): OSM Humanitarian Data Model and CARTO's Positron, created using derivatives of OpenStreetMap data - openstreetmap.org (© OpenStreetMap contributors; cartography license CC BY-SA). Base Layer (Overview Map): OpenStreetMap data – openstreetmap.org (© OpenStreetMap contributors; cartography licence CC BY-SA).

References
1.Ebbwater Consulting Inc. (2024). City of Courtenay Flood Management Plan. Prepared for the City of Courtenay.
2. Kerr Wood Leidal Associates Ltd. (2021). Coastal Flood Mapping Project. Final Report. Prepared for Comox Valley Regional District.

Legend

Affected Culture
- Trails & Greenways

Affected Cultural Facilities
- Educational Facilities
- Municipal Buildings
- Recreational Facilities
- Heritage Sites

Background
- Current Flood Protection Infrastructure
- City Boundary
- Roads
- Heritage Sites & Cultural Facilities
- Building Footprints
- K'ómoks First Nation Reserve Lands

Present-day - Likely Event Flood Depths (m)
- 0.0 - 0.1: Most buildings expected to be dry; underground infrastructure and basements may be flooded.
- 0.1 - 0.3: Water may enter buildings at grade, but most expected to be dry; underground infrastructure and basements may be flooded.
- 0.3 - 0.5: Water may enter ground floor of buildings; underground infrastructure and basements may be flooded.
- 0.5 - 1.0: Water on ground floor; underground infrastructure & basements may be flooded; potential for electricity failure.
- 1.0 - 2.0: Ground floor flooded.
- > 2.0: First (ground) floor and higher levels covered by water.

Scale	
Main Map 1:12,000 (0 250 500 m)	Inset Map 1:5,000 (0 100 200 m)

Date Created: 31 July 2024	Coordinate System: NAD83, UTM 10N Vertical Datum: CGVD 2013
Prepared By: NS Reviewed By: SH Checked By: TL	ebbwater CONSULTING

ANSI D - Map No. S4-1

INSET MAP

This map highlights the number and location of cultural facilities and trails and greenways, which would be affected in a less likely flood (0.5% annual exceedance probability) in the mid-term future (loosely linked to the 2100s). Cultural facilities and trails and greenways in the floodplain are highlighted, and then coloured based on the type of cultural facility or trail/greenways they depict). Locations of archaeological sites are not included on the map, as it is sensitive information that cannot be distributed publicly.

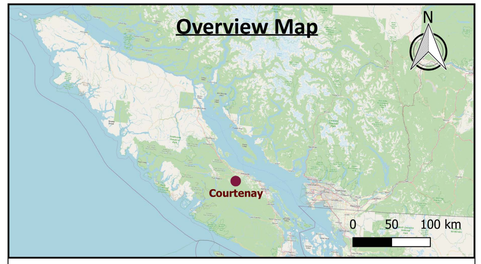
Culture & Recreation

Cultural Facilities in the Floodplain (#)	19
Trails and Greenways in the Floodplain (km)	8.3
Publicly Documented Indigenous Archaeological Sites in the Floodplain (#)	13

City of Courtenay Flood Risk Assessment Consequence Map

Mid-Term Future - Less Likely Event
Culture & Recreation

Overview Map



Map Notes
1. Map produced by Ebbwater Consulting Inc. on 31 July 2024.
2. The culture layers are associated with the less likely event, mid-term future climate change scenario and are shown on top of this layer. Please refer to the Flood Risk Assessment Appendix (Ebbwater, 2024) for definitions of terms, and details on datasets, methodology and limitations.
3. Culture indicator layers include educational facilities (childcare, schools, post-secondary education buildings), related agricultural facilities, municipal buildings, recreational facilities such as cinemas, park buildings, aquatic centres, and youth centres, civic facilities such as museums, and community halls, religious centres, trails and greenways, and archaeological and heritage sites (including publicly documented Indigenous archaeological and traditional use sites and trails). Locations of archaeological sites are not included on the map, as it is sensitive information that cannot be distributed publicly. Parks and riverine areas were removed from the dataset to avoid double-counting areas.
4. The mid-term future climate change scenario considers a 1 m Sea Level Rise (SLR) and a 15% increase in riverine flows compared to present-day (nominally 2020) conditions. A less likely event has a 0.5% Annual Exceedance Probability (AEP).
5. Inset map shows an indicative area. It is not meant to necessarily show areas of higher or lesser importance.
6. Depth classifications are based on Flood Hazard Mapping Guidelines for British Columbia (Ebbwater, 2022).
7. This map is intended to support an understanding of risk. IT SHOULD NOT BE RELIED ON FOR ENGINEERING DESIGN OR REGULATORY CONTROLS.

Data Sources
1. The flood hazard extents were received from CVRD on 28 May 2021 (KWL, 2021).
2. Trails, greenways, building footprints, parcel layer, and BC Assessment 2022 valuation and land data were obtained from the City of Courtenay on 15 July 2022. Current Flood Protection Infrastructure locations were received from CoC on 20 December 2022 (2019/2020 Dike Crest Survey completed by WSP on behalf of the Province).
3. Cultural Facilities were assembled from information received from the City of Courtenay on 15 July 2022, and BC Data Catalogue. Archaeological data received from the Archaeology Branch on 13 July 2022.
4. Base Layer (Main Map): OSM Humanitarian Data Model and CARTO's Positron, created using derivatives of OpenStreetMap data - openstreetmap.org (© OpenStreetMap contributors; cartography license CC BY-SA). Base Layer (Overview Map): OpenStreetMap data – openstreetmap.org (© OpenStreetMap contributors; cartography licence CC BY-SA).

References
1.Ebbwater Consulting Inc. (2024). City of Courtenay Flood Management Plan. Prepared for the City of Courtenay.
2. Kerr Wood Leidal Associates Ltd. (2021). Coastal Flood Mapping Project. Final Report. Prepared for Comox Valley Regional District.

Legend

Affected Culture
- Trails & Greenways

Affected Cultural Facilities
- Educational Facilities
- Municipal Buildings
- Recreational Facilities
- Heritage Sites

Background
- Building Footprints
- Current Flood Protection Infrastructure
- City Boundary
- Roads
- Heritage Sites & Cultural Facilities
- K'ómoks First Nation Reserve Lands

Mid-Term Future - Less Likely Event Flood Depths (m)
- 0.0 - 0.1: Most buildings expected to be dry; underground infrastructure and basements may be flooded.
- 0.1 - 0.3: Water may enter buildings at grade, but most expected to be dry; underground infrastructure and basements may be flooded.
- 0.3 - 0.5: Water may enter ground floor of buildings; underground infrastructure and basements may be flooded.
- 0.5 - 1.0: Water on ground floor; underground infrastructure & basements may be flooded; potential for electricity failure.
- 1.0 - 2.0: Ground floor flooded.
- > 2.0: First (ground) floor and higher levels covered by water.

Scale	
Main Map 1:12,000 (0 250 500 m)	Inset Map 1:5,000 (0 100 200 m)
Date Created: 31 July 2024	Coordinate System: NAD83, UTM 10N Vertical Datum: CGVD 2013
Prepared By: NS Reviewed By: SH Checked By: TL	ebbwater CONSULTING

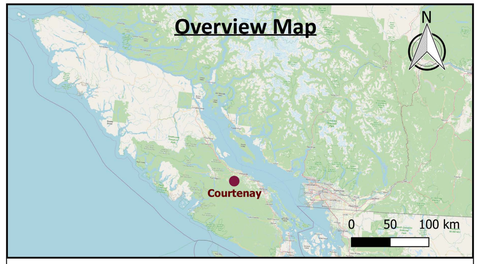
ANSI D - Map No. S4-2

City of Courtenay
Flood Risk Assessment
Consequence Map

Present-day - Likely Event
Economy

Economy	$
Total Building Value in the Floodplain (M$)	42.3
Total Buildings in the Floodplain (#)	96
Total Agriculture Area in the Floodplain (ha)	85.01

This map highlights the total building value and location of buildings, which would be affected in a likely flood (5% annual exceedance probability) in the present-day (nominally 2020). Buildings in the floodplain are highlighted, and then coloured based on the 2022 BC Assessment total building value assigned to the building.



Map Notes
1. Map produced by Ebbwater Consulting Inc. on 31 July 2024.
2. The economy layers are associated with the likely event, present-day scenario and is shown on top of this layer. Please refer to the Flood Risk Assessment Appendix (Ebbwater, 2024) for definitions of terms, and details on datasets, methodology and limitations.
3. Total building values are based on BC Assessment 2022 information (BCA, 2022) for the parcels and have been assigned to the respective building footprints within the parcels. The accuracy of the results at building level is limited by the available information.
4. The present-day scenario considers 0 m Sea Level Rise (SLR) and no increase in riverine flows compared to present-day (nominally 2020) conditions (i.e., climate change beyond present-day conditions is not included in this scenario). A likely event has a 5% Annual Exceedance Probability (AEP).
5. Inset map shows an indicative area. It is not meant to necessarily show areas of higher or lesser importance.
6. Depth classifications are based on Flood Hazard Mapping Guidelines for British Columbia (Ebbwater, 2022).
7. This map is intended to support an understanding of risk. IT SHOULD NOT BE RELIED ON FOR ENGINEERING DESIGN OR REGULATORY CONTROLS.

Data Sources
1. The flood hazard extents were received from CVRD on 28 May 2021 (KWL, 2021).
2. Building footprints, parcel layer, Agricultural Land Reserve (ALR), and BC Assessment 2022 valuation and land data were obtained from the City of Courtenay on 15 July 2022. Current Flood Protection Infrastructure locations were received from CoC on 20 December 2022 (2019/2020 Dike Crest Survey completed by WSP on behalf of the Province).
3. Base Layer (Main Map): OSM Humanitarian Data Model and CARTO's Positron, created using derivatives of OpenStreetMap data - openstreetmap.org (© OpenStreetMap contributors; cartography license CC BY-SA). Base Layer (Overview Map): OpenStreetMap data – openstreetmap.org (© OpenStreetMap contributors; cartography licence CC BY-SA).

References
1.Ebbwater Consulting Inc. (2024). City of Courtenay Flood Management Plan. Prepared for the City of Courtenay.
2. Kerr Wood Leidal Associates Ltd. (2021). Coastal Flood Mapping Project. Final Report. Prepared for Comox Valley Regional District.
3. BCA. (2022). 2022 BC Assessment data for Areas of Interest. Received via the City of Courtenay.

Legend

Total Affected Building Values (in M $)
- 0 - 2
- 2 - 4
- 4 - 10
- >10

Affected Agriculture
- Agricultural Land Reserve (ALR) Parcels

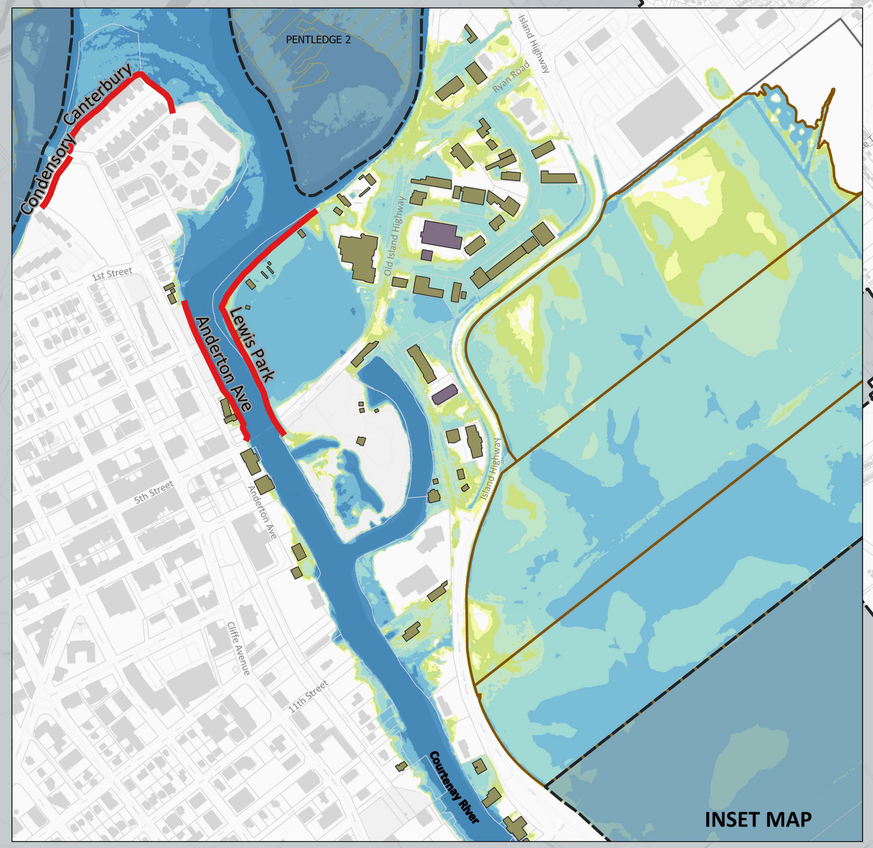
Background
- Current Flood Protection Infrastructure
- City Boundary
- Land Parcels
- Building Footprints
- Agricultural Land Reserve (ALR) Parcels
- K'ómoks First Nation Reserve Lands

Present-day - Likely Event Flood Depths (m)
- 0.0 - 0.1: Most buildings expected to be dry; underground infrastructure and basements may be flooded.
- 0.1 - 0.3: Water may enter buildings at grade, but most expected to be dry; underground infrastructure and basements may be flooded.
- 0.3 - 0.5: Water may enter ground floor of buildings; underground infrastructure and basements may be flooded.
- 0.5 - 1.0: Water on ground floor; underground infrastructure & basements may be flooded; potential for electricity failure.
- 1.0 - 2.0: Ground floor flooded.
- > 2.0: First (ground) floor and higher levels covered by water.

Scale	
Main Map 1:12,000 (0 250 500 m)	Inset Map 1:5,000 (0 100 200 m)

Date Created: 31 July 2024	Coordinate System: NAD83, UTM 10N Vertical Datum: CGVD 2013
Prepared By: NS Reviewed By: SH Checked By: TL	ebbwater CONSULTING

ANSI D - Map No. S5–1



City of Courtenay
Flood Risk Assessment
Consequence Map

Mid-Term Future - Less Likely Event
Economy

This map highlights the total building value and location of buildings, which would be affected in a less likely flood (0.5% annual exceedance probability) in the mid-term future (loosely linked to the 2100s). Buildings in the floodplain are highlighted, and then coloured based on the 2022 BC Assessment total building value assigned to the building.

Economy	$
Total Building Value in the Floodplain (M$)	139.5
Total Buildings in the Floodplain (#)	208
Total Agriculture Area in the Floodplain (ha)	91

Overview Map

Map Notes
1. Map produced by Ebbwater Consulting Inc. on 31 July 2024.
2. The economy layers are associated with the less likely event, mid-term future climate change scenario and is shown on top of this layer. Please refer to the Flood Risk Assessment Appendix (Ebbwater, 2024) for definitions of terms, and details on datasets, methodology and limitations.
3. Total building values are based on BC Assessment 2022 information (BCA, 2022) for the parcels and have been assigned to the respective building footprints within the parcels. The accuracy of the results at building level is limited by the available information.
4. The mid-term future climate change scenario considers a 1 m Sea Level Rise (SLR) and a 15% increase in riverine flows compared to present-day (nominally 2020) conditions. A less likely event has a 0.5% Annual Exceedance Probability (AEP).
5. Inset map shows an indicative area. It is not meant to necessarily show areas of higher or lesser importance.
6. Depth classifications are based on Flood Hazard Mapping Guidelines for British Columbia (Ebbwater, 2022).
7. This map is intended to support an understanding of risk. IT SHOULD NOT BE RELIED ON FOR ENGINEERING DESIGN OR REGULATORY CONTROLS.

Data Sources
1. The flood hazard extents were received from CVRD on 28 May 2021 (KWL, 2021).
2. Building footprints, parcel layer, Agricultural Land Reserve (ALR), and BC Assessment 2022 valuation and land data were obtained from the City of Courtenay on 15 July 2022. Current Flood Protection Infrastructure locations were received from CoC on 20 December 2022 (2019/2020 Dike Crest Survey completed by WSP on behalf of the Province).
3. Base Layer (Main Map): OSM Humanitarian Data Model and CARTO's Positron, created using derivatives of OpenStreetMap data - openstreetmap.org (© OpenStreetMap contributors; cartography license CC BY-SA). Base Layer (Overview Map): OpenStreetMap data – openstreetmap.org (© OpenStreetMap contributors; cartography licence CC BY-SA).

References
1.Ebbwater Consulting Inc. (2024). City of Courtenay Flood Management Plan. Prepared for the City of Courtenay.
2. Kerr Wood Leidal Associates Ltd. (2021). Coastal Flood Mapping Project. Final Report. Prepared for Comox Valley Regional District.
3. BCA. (2022). 2022 BC Assessment data for Areas of Interest. Received via the City of Courtenay.

Legend

Total Affected Building Values (in M $)
- 0 - 2
- 2 - 4
- 4 - 10
- >10

Affected Agriculture
- Agricultural Land Reserve (ALR) Parcels

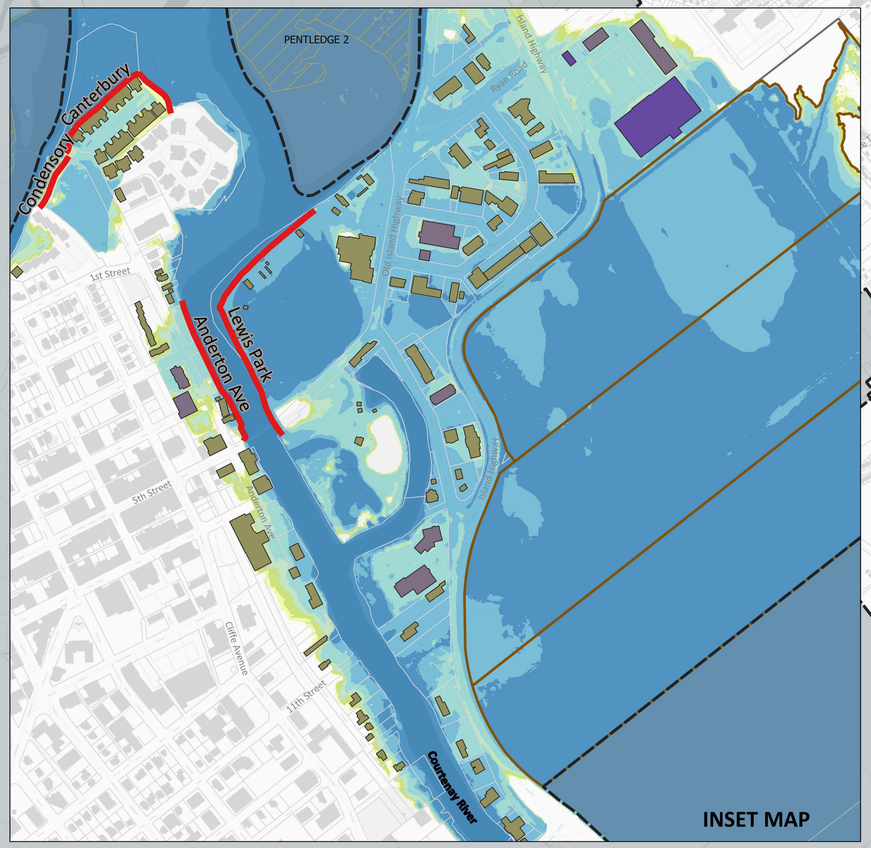
Background
- Current Flood Protection Infrastructure
- City Boundary
- Land Parcels
- Building Footprints
- Agricultural Land Reserve (ALR)
- K'ómoks First Nation Reserve Lands

Mid-Term Future - Less Likely Event Flood Depths (m)
- 0.0 - 0.1: Most buildings expected to be dry; underground infrastructure and basements may be flooded.
- 0.1 - 0.3: Water may enter buildings at grade, but most expected to be dry; underground infrastructure and basements may be flooded.
- 0.3 - 0.5: Water may enter ground floor of buildings; underground infrastructure and basements may be flooded.
- 0.5 - 1.0: Water on ground floor; underground infrastructure & basements may be flooded; potential for electricity failure.
- 1.0 - 2.0: Ground floor flooded.
- > 2.0: First (ground) floor and higher levels covered by water.

Scale	
Main Map 1:12,000 (0 250 500 m)	Inset Map 1:5,000 (0 100 200 m)

Date Created: 31 July 2024	Coordinate System: NAD83, UTM 10N Vertical Datum: CGVD 2013
Prepared By: NS Reviewed By: SH Checked By: TL	ebbwater CONSULTING

ANSI D - Map No. S5–2



This map highlights the number and location of contamination sources and the location of parks/sensitive ecosystems that could be affected by contamination of flood waters in a likely flood (5% annual exceedance probability) in the present-day (nominally 2020). Contamination sources and sensitive ecosystems in the floodplain are highlighted, and then coloured based on the type of contamination source or sensitive ecosystem.

Environment

Contamination Sources in the Floodplain (#)	26
Groundwater Wells in the Floodplain (#)	1
Species and Ecosystems at Risk in the Floodplain (ha)	2.1
Parks in the Floodplain (ha)	40.7
Conservation Areas in the Floodplain (ha)	6.8

City of Courtenay
Flood Risk Assessment
Consequence Map

Present-day - Likely Event
Environment

Overview Map

Map Notes
1. Map produced by Ebbwater Consulting Inc. on 31 July 2024.
2. The environment layers are associated with the likely event, present-day scenario and are shown on top of this layer. Please refer to the Flood Risk Assessment Appendix (Ebbwater, 2024) for definitions of terms, and details on datasets, methodology and limitations.
3. The maps shows potential contamination sources in the flood hazard extent (incl. auto dealers, repair shops, body shops or potential sites, former and present gasoline/diesel bulk plants, former and present gasoline/diesel outlets), along with assets in the flood hazard extent that could be negatively affected by contamination. This includes groundwater wells and sensitive ecosystems (incl. species and ecosystems at risk, conservation lands, and parks).
4. The present-day scenario considers 0 m Sea Level Rise (SLR) and no increase in riverine flows compared to present-day (nominally 2020) conditions (i.e., climate change beyond present-day conditions is not included in this scenario). A likely event has a 5% Annual Exceedance Probability (AEP).
5. Inset map shows an indicative area. It is not meant to necessarily show areas of higher or lesser importance.
6. Depth classifications are based on Flood Hazard Mapping Guidelines for British Columbia (Ebbwater, 2022).
7. This map is intended to support an understanding of risk. IT SHOULD NOT BE RELIED ON FOR ENGINEERING DESIGN OR REGULATORY CONTROLS.

Data Sources
1. The flood hazard extents were received from CVRD on 28 May 2021 (KWL, 2021).
2. Parks and sensitive areas were assembled from information received from the City of Courtenay on 15 July 2022, and BC Data Catalogue.
3. Contamination sources, building footprints, and parcel layer were obtained from the City of Courtenay on 15 July 2022. Current Flood Protection Infrastructure locations were received from CoC on 20 December 2022 (2019/2020 Dike Crest Survey completed by WSP on behalf of the Province).
4. Base Layer (Main Map): OSM Humanitarian Data Model and CARTO's Positron, created using derivatives of OpenStreetMap data - openstreetmap.org (© OpenStreetMap contributors; cartography license CC BY-SA). Base Layer (Overview Map): OpenStreetMap data – openstreetmap.org (© OpenStreetMap contributors; cartography licence CC BY-SA).

References
1.Ebbwater Consulting Inc. (2024). City of Courtenay Flood Management Plan. Prepared for the City of Courtenay.
2. Kerr Wood Leidal Associates Ltd. (2021). Coastal Flood Mapping Project. Final Report. Prepared for Comox Valley Regional District.

Legend

Affected Parks/Sensitive Areas
- Species and Ecosystems at Risk
- Conservation Areas
- Parks
- Groundwater Wells

Affected Potential Contamination Sources
- Auto Dealers, Repair Shops, Body Shops, or Potential Sites
- Gasoline/Diesel Bulk Plants (Former and Present)
- Gasoline/Diesel Outlets (Former and Present)
- Gas/Diesel Outlets and Auto Dealers, Repair Shops, Body Shops, or Potential Sites (Former)

Present-day - Likely Event Flood Depths (m)
- 0.0 - 0.1: Most buildings expected to be dry; underground infrastructure and basements may be flooded.
- 0.1 - 0.3: Water may enter buildings at grade, but most expected to be dry; underground infrastructure and basements may be flooded.
- 0.3 - 0.5: Water may enter ground floor of buildings; underground infrastructure and basements may be flooded.
- 0.5 - 1.0: Water on ground floor; underground infrastructure & basements may be flooded; potential for electricity failure.
- 1.0 - 2.0: Ground floor flooded.
- > 2.0: First (ground) floor and higher levels covered by water.

Background
- Land Parcels & Building Footprints
- Current Flood Protection Infrastructure
- City Boundary
- K'ómoks First Nation Reserve Lands
- Potential Contamination Sources
- Parks/Sensitive Areas

Scale

Main Map 1:12,000 (0 250 500 m)

Inset Map 1:5,000 (0 100 200 m)

Date Created: 31 July 2024

Coordinate System: NAD83, UTM 10N
Vertical Datum: CGVD 2013

Prepared By: NS
Reviewed By: SH
Checked By: TL

ebbwater CONSULTING

ANSI D - Map No. S6–1

This map highlights the number and location of contamination sources and the location of parks/sensitive ecosystems that could be affected by contamination of flood waters in a less likely flood (0.5% annual exceedance probability) in the mid-term future (loosely linked to the 2100s). Contamination sources and sensitive ecosystems in the floodplain are highlighted, and then coloured based on the type of contamination source or sensitive ecosystem.

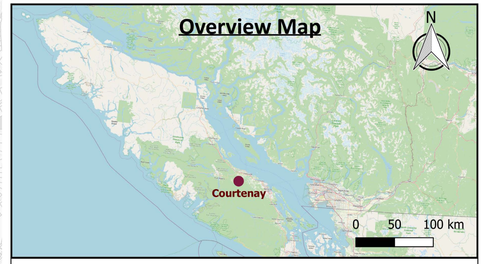
Environment

Contamination Sources in the Floodplain (#)	32
Groundwater Wells in the Floodplain (#)	2
Species and Ecosystems at Risk in the Floodplain (ha)	3
Parks in the Floodplain (ha)	47.8
Conservation Areas in the Floodplain (ha)	8.9

City of Courtenay
Flood Risk Assessment
Consequence Map

Mid-Term Future - Less Likely Event
Environment

Overview Map



Map Notes
1. Map produced by Ebbwater Consulting Inc. on 31 July 2024.
2. The environment layers are associated with the less likely event, mid-term future climate change scenario and are shown on top of this layer. Please refer to the Flood Risk Assessment Appendix (Ebbwater, 2024) for definitions of terms, and details on datasets, methodology and limitations.
3. The maps shows potential contamination sources in the flood hazard extent (incl. auto dealers, repair shops, body shops or potential sites, former and present gasoline/diesel bulk plants, former and present gasoline/diesel outlets), along with assets in the flood hazard extent that could be negatively affected by contamination. This includes groundwater wells and sensitive ecosystems (incl. species and ecosystems at risk, conservation lands, and parks).
4. The mid-term future climate change scenario considers a 1 m Sea Level Rise (SLR) and a 15% increase in riverine flows compared to present-day (nominally 2020) conditions. A less likely event has a 0.5% Annual Exceedance Probability (AEP).
5. Inset map shows an indicative area. It is not meant to necessarily show areas of higher or lesser importance.
6. Depth classifications are based on Flood Hazard Mapping Guidelines for British Columbia (Ebbwater, 2022).
7. This map is intended to support an understanding of risk. IT SHOULD NOT BE RELIED ON FOR ENGINEERING DESIGN OR REGULATORY CONTROLS.

Data Sources
1. The flood hazard extents were received from CVRD on 28 May 2021 (KWL, 2021).
2. Parks and sensitive areas were assembled from information received from the City of Courtenay on 15 July 2022, and BC Data Catalogue.
3. Contamination sources, building footprints, and parcel layer were obtained from the City of Courtenay on 15 July 2022. Current Flood Protection Infrastructure locations were received from CoC on 20 December 2022 (2019/2020 Dike Crest Survey completed by WSP on behalf of the Province).
4. Base Layer (Main Map): OSM Humanitarian Data Model and CARTO's Positron, created using derivatives of OpenStreetMap data - openstreetmap.org (© OpenStreetMap contributors; cartography license CC BY-SA). Base Layer (Overview Map): OpenStreetMap data – openstreetmap.org (© OpenStreetMap contributors; cartography licence CC BY-SA).

References
1.Ebbwater Consulting Inc. (2024). City of Courtenay Flood Management Plan. Prepared for the City of Courtenay.
2. Kerr Wood Leidal Associates Ltd. (2021). Coastal Flood Mapping Project. Final Report. Prepared for Comox Valley Regional District.

Legend

Affected
Parks/Sensitive Areas
- Species and Ecosystems at Risk
- Conservation Areas
- Parks
- Groundwater Wells

Background
- Land Parcels & Building Footprints
- Current Flood Protection Infrastructure
- City Boundary
- K'ómoks First Nation Reserve Lands
- Potential Contamination Sources
- Parks/Sensitive Areas

Affected Potential Contamination Sources
- Auto Dealers, Repair Shops, Body Shops, or Potential Sites
- Gasoline/Diesel Bulk Plants (Former and Present)
- Gasoline/Diesel Outlets (Former and Present)
- Gas/Diesel Outlets and Auto Dealers, Repair Shops, Body Shops, or Potential Sites (Former)

Mid-Term Future - Less Likely Event
Flood Depths (m)
- 0.0 - 0.1: Most buildings expected to be dry; underground infrastructure and basements may be flooded.
- 0.1 - 0.3: Water may enter buildings at grade, but most expected to be dry; underground infrastructure and basements may be flooded.
- 0.3 - 0.5: Water may enter ground floor of buildings; underground infrastructure and basements may be flooded.
- 0.5 - 1.0: Water on ground floor; underground infrastructure & basements may be flooded; potential for electricity failure.
- 1.0 - 2.0: Ground floor flooded.
- > 2.0: First (ground) floor and higher levels covered by water.

Scale

Main Map 1:12,000 (0 250 500 m)

Inset Map 1:5,000 (0 100 200 m)

Date Created: 31 July 2024

Coordinate System: NAD83, UTM 10N
Vertical Datum: CGVD 2013

Prepared By: NS
Reviewed By: SH
Checked By: TL

ebbwater CONSULTING

ANSI D - Map No. S6-2