



UPPER BOW RIVER HAZARD STUDY OPEN WATER FLOOD INUNDATION MAPPING

FINAL REPORT



Prepared for:



Alberta Environment and Parks



17 May 2018

NHC Ref. No. 3001178



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Prepared for:

Alberta Environment and Parks
Edmonton, Alberta

Prepared by:

Northwest Hydraulic Consultants Ltd.
North Vancouver, BC

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EXECUTIVE SUMMARY

Alberta Environment and Parks (AEP) retained Northwest Hydraulic Consultants Ltd. (NHC) in September 2015 to complete a river hazard study for the Bow River. The roughly 118 km long study reach extends from the Banff National Park boundary, located approximately 5 km upstream of the Town of Canmore, to Bearspaw Dam, near the City of Calgary western boundary. Within the Town of Canmore, the study area incorporates Policeman Creek, a channel roughly 6.5 km long situated on the Bow River floodplain and running parallel to the Bow River main channel. In addition, the study area includes three tributaries: the lower 1 km long reach of Exshaw Creek at the Hamlet of Exshaw; the lower 6 km of Bighill Creek at the Town of Cochrane; and the lower 5 km of Jumpingpound Creek at the Town of Cochrane.

The study is being conducted under the provincial Flood Hazard Identification Program (FHIP). Project stakeholders include the provincial government, local authorities, and the public.

The overall objectives of this project are to identify and assess river related hazards and enhance public safety along the Bow River and the three tributaries included in the study area. The intent is to reduce potential future flood damages and disaster assistance costs to the federal, provincial, and local governments, including First Nations. New floodplain maps will inform land use planning decisions, assist with developing flood mitigation options and facilitate emergency response planning.

The Upper Bow River Hazard Study has been structured into eight major project components. This report summarizes the work of the third component: Open Water Flood Inundation Mapping. The open water flood inundation map library is the key deliverable for this project component, and is included herein.

This report summarizes the available data and methodology used to prepare the flood inundation maps. A total of 13 flood scenarios, based on the calibrated open water flood frequency profiles, were mapped individually for the 2-, 5-, 10-, 20-, 35-, 50-, 75-, 100-, 200-, 350-, 500-, 750-, and 1000-year events.

Direct and indirect inundation areas are indicated on the flood inundation maps. Directly inundated areas are those that have hydraulic connectivity to the actively flowing channel, including areas behind flood control structures that are overtopped and rail embankments considered permeable due to the presence of culverts or porous fill. Indirectly inundated areas are those that may become inundated due to groundwater seepage, flooding of subsurface connections such as pipes and culverts, or potential failure of flood control structures prior to overtopping.

Inundation extents for the 13 flood scenarios were examined in relation to residential and non-residential structures, flood control structures, bridges, and culverts. The findings are summarized below.

In Canmore, some residential and non-residential structures may be impacted by Bow River floods having return periods of 100 years and greater. However, the Canmore Wastewater Treatment Plant could experience flooding at return periods as low as 5 years. Similarly, some residential structures, pedestrian bridges, and culverts could be impacted by Policeman Creek floods with return periods as low as 5 years.

Existing development within the M.D. of Bighorn is generally well-above flood levels. The Lafarge Exshaw Cement Plant is unlikely to experience flooding. The Exshaw Wastewater Treatment Facility is also unlikely to experience flooding, but a small adjacent pond would be affected at all of the return periods modelled.

Bow River floods would affect Cochrane at return periods of 500 years or greater. However, the Girl Guide Camp Jubilee, could be impacted at return periods of 100 years or greater. Along Bighill Creek, the pedestrian bridges are the most significant structures likely to be impacted. In addition, the George Fox Bridge across Jumpingpound Creek could be impacted at return periods of 100 years or greater. The Bow Meadows community, along the right bank of Jumpingpound Creek at the confluence of the Bow River, could be impacted at return periods of 50 years or greater.

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CREDITS AND ACKNOWLEDGEMENTS

Northwest Hydraulic Consultants Ltd. (NHC) would like to express appreciation to Alberta Environment and Parks (AEP) for initiating this project, making available extensive background information, and providing advice and support throughout the survey, modelling, and mapping work. Key AEP representatives were Jane Eaket, P.Eng. (Project Manager) and Peter Onyshko, P.Eng. (Alternate Project Manager).

The following NHC personnel were part of the study team and participated in the open water mapping component of the study. Monica Mannerström, P.Eng. (Project Manager) ensured the overall direction of the project and mapping work. Sarah North, GISP (GIS Specialist) was responsible for data management and documentation, conversion of hydraulic model results to flood extents, creation of base maps, and map production. Vanessa O'Connor, P.Eng. (Project Hydraulic Engineer) guided flood extent development and reviewed final maps. Robyn Andrishak (Hydraulic Engineer) provided technical advice on mapping.

This report was authored by Sarah North and Vanessa O'Connor. Robyn Andrishak and Monica Mannerström reviewed the report.

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1 INTRODUCTION

1.1 Project Background

Alberta Environment and Parks (AEP) retained Northwest Hydraulic Consultants Ltd. (NHC) in September 2015 to complete a river hazard study for the Bow River, along a reach extending from the Banff National Park boundary at the upstream end to Bearspaw Dam at the downstream end. The study is being conducted under the provincial Flood Hazard Identification Program (FHIP).

The Bow River has been exposed to severe flooding in the past, with three extreme events occurring from the late 1800s to early 1900s, two around 1930, and, more recently, in 2013.

For the Bow River reach within the current study limits, provincial flood hazard mapping was previously prepared for Cochrane (Alberta Environment, 1990), Canmore (W-E-R Agra, 1993), and Municipal District (M.D.) of Bighorn (Acres, 1996). The Cochrane study was completed by Alberta Environment in 1986 with an addendum issued in 1990 (Alberta Environment, 1986; Alberta Environment, 1990). The study reach covered 21 km of the Bow River (from Bearspaw Dam to upstream of the Town of Cochrane boundary) and the lower 4.5 to 5 km reaches of Jumpingpound and Bighill Creeks (two tributaries discharging to the Bow River within the Town of Cochrane limits). The M.D. of Bighorn study, completed by Acres International Ltd., includes a 15 km reach of the Bow River from the west boundary of Bow Valley Provincial Park to Dead Man Flats and includes the lower one kilometre reach of Exshaw Creek. The Canmore study completed by W-E-R Agra Ltd. covered a 20 km reach of Bow River from Dead Man's Flats, through the Town of Canmore (including Policeman Creek), to the Banff National Park boundary.

AEP identified a need to update and expand the coverage of this mapping following the 2013 floods. Stakeholders of the present project are the Government of Alberta, the Town of Canmore, the M.D. of Bighorn, Stoney Nakoda First Nation, Rocky View County, the Town of Cochrane, and the public.

1.2 Project Objectives

The overall objectives of this project are to identify and assess river related hazards and enhance public safety along the Bow River and three tributaries included in the study area. The intent is to reduce potential future flood damages and disaster assistance costs to the federal, provincial, and local governments, including First Nations. New floodplain maps will inform land use planning decisions, assist with developing flood mitigation options and facilitate emergency response planning.

Specific study components, as outlined in the AEP Upper Bow River Hazard Study Terms of Reference, are:

- survey and base data collection;
- hydraulic model development, calibration and validation;
- open water flood inundation map production;

- open water flood hazard identification;
- ice jam assessment and associated flood hazard identification;
- governing flood hazard map production;
- flood risk assessment and inventory; and
- channel stability investigation.

The results of each component will be summarized in individual stand-alone reports. This report describes the results from the open water flood inundation mapping phase of the project and forms the third of the Upper Bow River Hazard Study reports.

The main goal of this component is to prepare flood inundation maps for the 2-, 5-, 10-, 20-, 35-, 50-, 75-, 100-, 200-, 350-, 500-, 750-, and 1000-year open water floods throughout the study area. The primary tasks, services, and deliverables associated with this component are:

- open water flood inundation map production;
- flood water surface TIN development; and
- water surface elevation and flood depth grid creation.

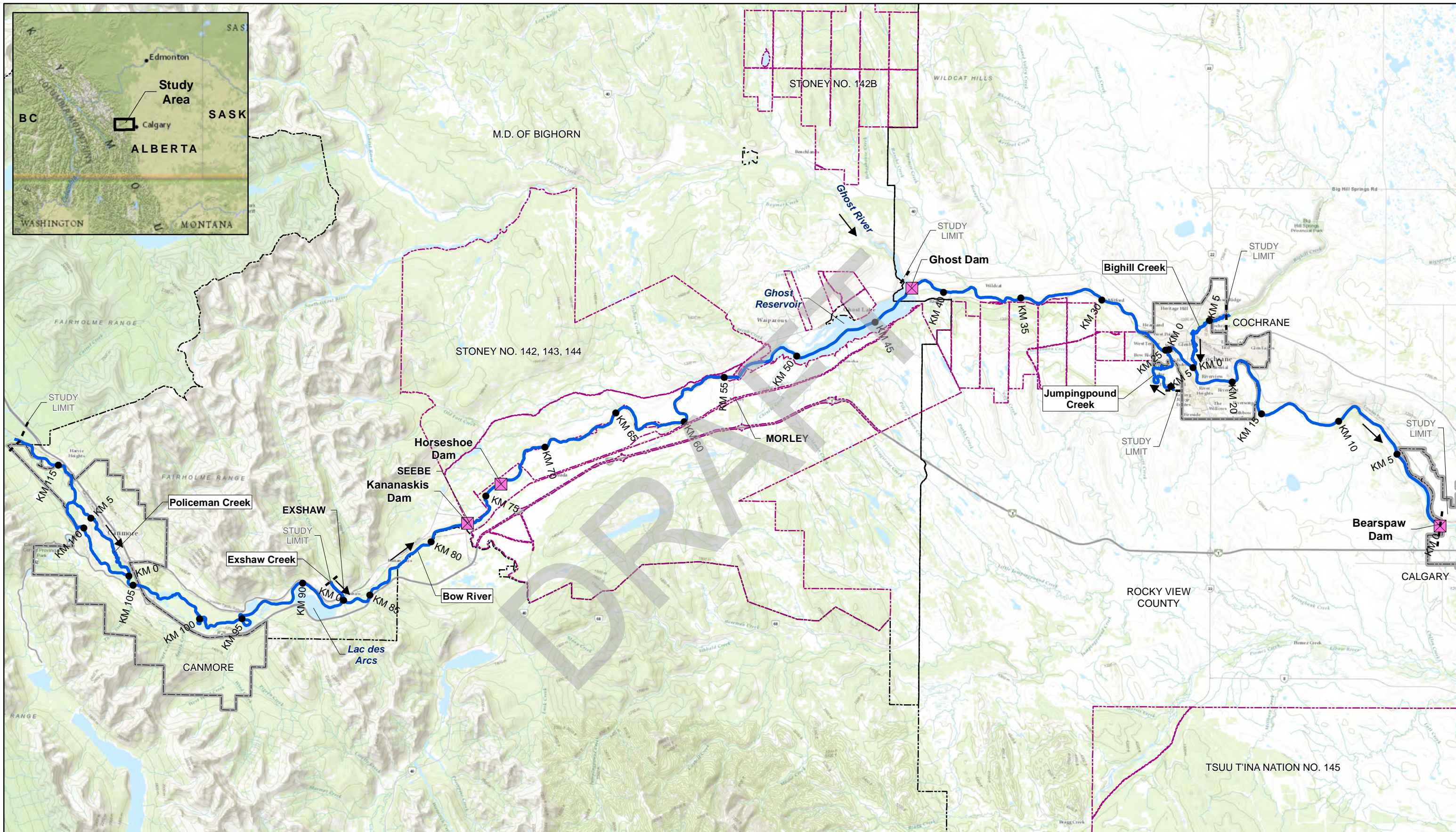
The open water flood inundation maps are a key component of the overall study and support the flood risk assessment and inventory.

1.3 Study Area and Reach

From the Bow River headwaters at Bow Lake (Elev. 1940 m), just north of Lake Louise, the river flows in a south-easterly to easterly direction over nearly 600 km before draining into the South Saskatchewan River. The Upper Bow River study area comprises a roughly 118 km long reach, extending from the Banff National Park boundary, located approximately 5 km upstream of the Town of Canmore, to Bearspaw Dam, near the City of Calgary western boundary. Within the Town of Canmore, the study area incorporates Policeman Creek, an inlet controlled high water channel roughly 6.5 km long situated on the floodplain and running parallel to the Bow River main channel. In addition, the study area includes three tributaries:

- the lower 1 km long reach of Exshaw Creek at the Hamlet of Exshaw;
- the lower 6 km of Bighill Creek at the Town of Cochrane; and
- the lower 5 km of Jumpingpound Creek at the Town of Cochrane.

Flow is regulated both on the Bow River main stem and on several tributaries. In addition to the Bearspaw Dam at the downstream end, the Ghost, Horseshoe Falls, and Kananaskis dams also impound the river. The study area is shown in Figure 1.



2 AVAILABLE DATA

The open water flood inundation maps were prepared using information compiled for previous components of the Upper Bow River Hazard Study. Descriptions of the data used for this flood inundation mapping study component are provided below.

2.1 Flood Frequencies

An open water hydrology assessment of the study area was completed by Golder Associates (2017). The *Bow, Elbow, Highwood, and Sheep River Hydrology Assessment* includes a summary of the flood hydrology and provides estimates of naturalized and regulated flows at key locations. For the modelling described in the Hydraulic Model Creation and Calibration Report (NHC, 2018a), natural and naturalized flood peaks were used when generating water surface profiles, in accordance with the terms of reference and FHIP guidelines. Details on the methods and distributions used to estimate the flood frequencies are provided by Golder Associates (2017). Table 1 summarizes the final natural and naturalized flood flows relevant to the current study. The location of the hydrometric stations listed in Table 1 are shown in Figure 2.

2.2 DTM & Aerial Imagery

2.2.1 LiDAR-Derived DTM

A digital terrain model (DTM) based on airborne LiDAR data was supplied by AEP for this study. The DTM was based on data collected for the study area by Airborne Imaging Inc. on September 10th and 11th and October 5th and 11th, 2015 (Airborne Imaging, 2016). The western portion of the study area was flown primarily on September 10th and 11th while the eastern portion of the study area was flown on October 5th and 11th. A complete description of the DTM data and its comparison to the ground survey data can be found in Section 2.8 of the Survey and Base Data Collection Report (NHC, 2017), provided under separate cover.

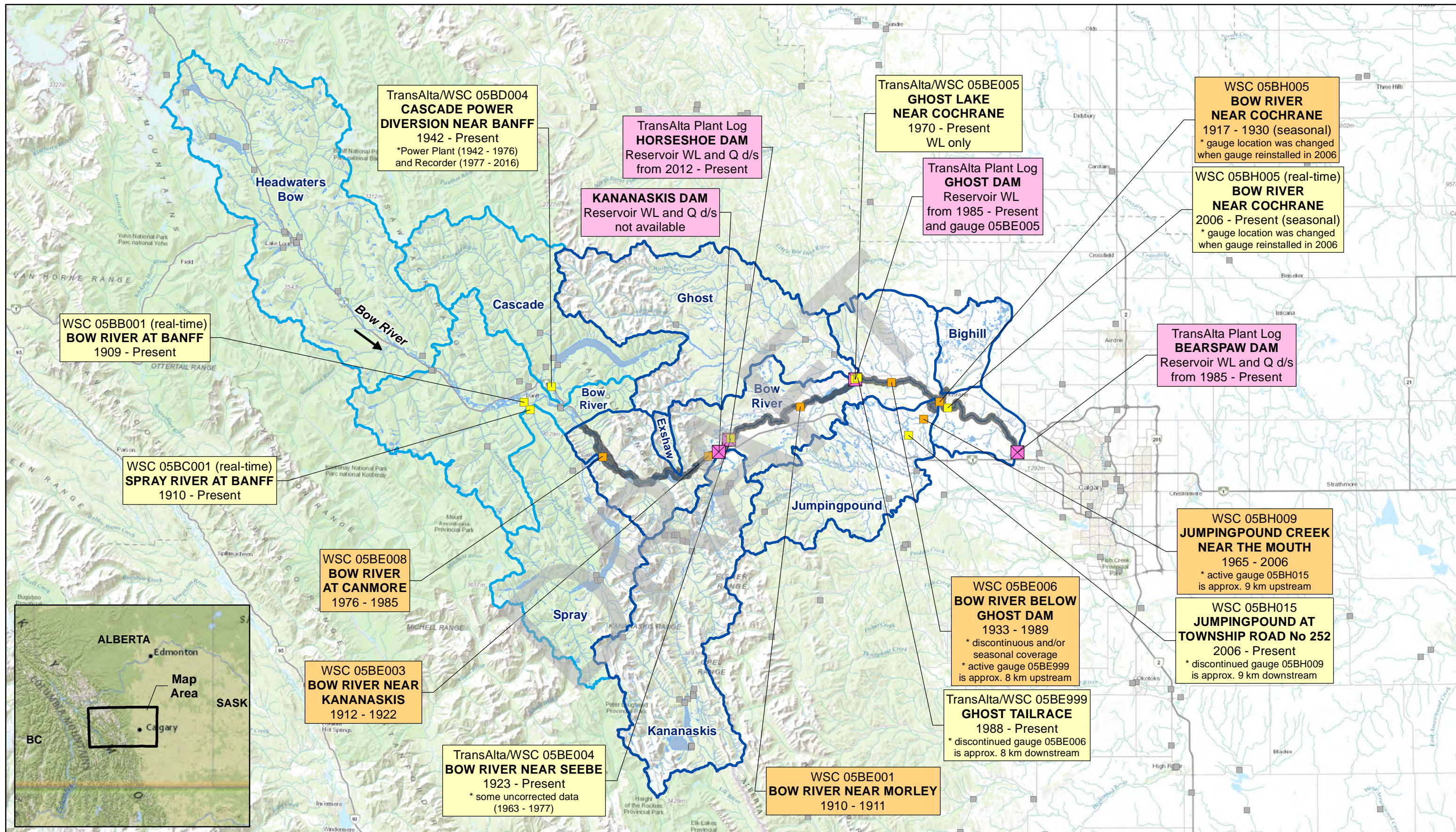
The DTM, supplied in GeOTIF format tiles, was used to derive flood depth grids, as described in Sections 3 and 5. LiDAR sensors have limited penetration of water, so the LiDAR-derived DTM does not represent bathymetric elevations for submerged portions of river beds or other water features.

2.2.2 Aerial Imagery

Orthoshop Geomatics Ltd. (OGL) collected colour aerial imagery for the study area on June 3rd, 2016 and used this imagery to generate colour-balanced ortho-rectified mosaics. A complete description of the aerial imagery acquisition and data processing procedures can be found in the Survey and Base Data Collection Report (NHC, 2017), provided under separate cover. The orthophoto imagery was used as a base image for production of the open water flood inundation map library.

Table 1 Natural and naturalized flood frequency discharges

WSC Station Name or Location of Interest	Peak Instantaneous Flood Frequency Discharge Estimates (m ³ /s)												
	1000-yr	750-yr	500-yr	350-yr	200-yr	100-yr	75-yr	50-yr	35-yr	20-yr	10-yr	5-yr	2-yr
Probability of Exceedance in Any Given Year (%)	0.1	0.13	0.2	0.29	0.5	1.0	1.3	2.0	2.9	5.0	10	20	50
Bow River at Canmore	1090	1050	993	940	861	770	734	684	642	577	499	425	323
Bow River above Kananaskis	1270	1210	1130	1060	957	843	798	738	689	614	527	446	338
Bow River below Kananaskis	1770	1660	1510	1400	1230	1050	983	894	822	719	606	505	380
Bow River near Seebe (05BE004)	1760	1650	1510	1400	1240	1060	994	906	834	731	616	513	384
Bow River Above Ghost Reservoir	1860	1750	1600	1480	1310	1120	1050	959	883	774	652	543	406
Bow River below Ghost Dam (Ghost Reservoir Outflow 05BE006)	2390	2230	2030	1850	1610	1350	1260	1130	1030	878	718	577	408
Bow River near Cochrane (05BH005)	3270	3020	2690	2420	2060	1680	1540	1360	1220	1010	800	619	413
Bearspaw Reservoir Inflow	3580	3290	2920	2620	2220	1790	1630	1440	1280	1060	829	634	415
Policeman Creek at Canmore	22.4	20.5	18.2	16.3	13.6	10.8	9.80	8.47	7.41	5.92	4.32	2.96	1.40
Exshaw Creek at Exshaw	67.9	62.1	54.9	48.9	40.6	31.9	28.7	24.7	21.4	16.9	21.1	8.18	3.82
Jumpingpound Creek at Cochrane	1030	936	815	711	568	425	374	310	260	193	127	76.8	30.0
Bighill Creek at Cochrane	48.4	45.6	41.8	38.4	33.3	27.4	25	21.8	19.1	15.1	10.5	6.55	2.29



TransAlta/WSC 05BD004
CASCADE POWER DIVERSION NEAR BANFF
1942 - Present
*Power Plant (1942 - 1976) and Recorder (1977 - 2016)

TransAlta Plant Log
HORSESHOE DAM
Reservoir WL and Q d/s from 2012 - Present

KANANASKIS DAM
Reservoir WL and Q d/s not available

TransAlta/WSC 05BE005
GHOST LAKE NEAR COCHRANE
1970 - Present
WL only

TransAlta Plant Log
GHOST DAM
Reservoir WL from 1985 - Present and gauge 05BE005

WSC 05BH005
BOW RIVER NEAR COCHRANE
1917 - 1930 (seasonal)
* gauge location was changed when gauge reinstalled in 2006

WSC 05BH005 (real-time)
BOW RIVER NEAR COCHRANE
2006 - Present (seasonal)
* gauge location was changed when gauge reinstalled in 2006

TransAlta Plant Log
BEARSPAW DAM
Reservoir WL and Q d/s from 1985 - Present

WSC 05BB001 (real-time)
BOW RIVER AT BANFF
1909 - Present

WSC 05BC001 (real-time)
SPRAY RIVER AT BANFF
1910 - Present

WSC 05BE008
BOW RIVER AT CANMORE
1976 - 1985

WSC 05BE003
BOW RIVER NEAR KANANASKIS
1912 - 1922

TransAlta/WSC 05BE004
BOW RIVER NEAR SEEBE
1923 - Present
* some uncorrected data (1963 - 1977)

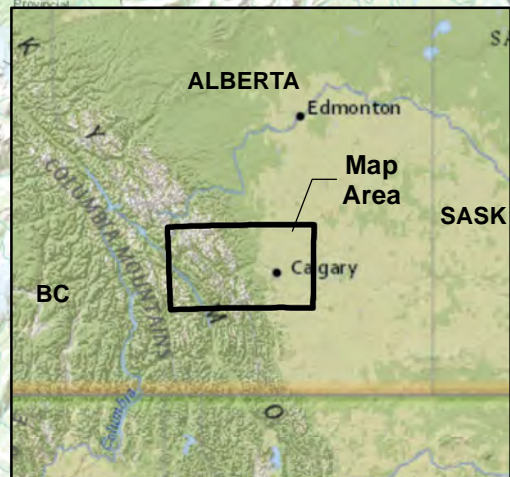
WSC 05BE001
BOW RIVER NEAR MORLEY
1910 - 1911

WSC 05BE006
BOW RIVER BELOW GHOST DAM
1933 - 1989
* discontinuous and/or seasonal coverage
* active gauge 05BE999 is approx. 8 km upstream

TransAlta/WSC 05BE999
GHOST TAILRACE
1988 - Present
* discontinued gauge 05BE006 is approx. 8 km downstream

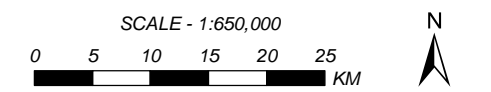
WSC 05BH009
JUMPINGPOUND CREEK NEAR THE MOUTH
1965 - 2006
* active gauge 05BH015 is approx. 9 km upstream

WSC 05BH015
JUMPINGPOUND AT TOWNSHIP ROAD No 252
2006 - Present
* discontinued gauge 05BH009 is approx. 9 km downstream



- | | | |
|----------------------------|-----------------------|--------------------|
| Hydrometric Station | Drainage Basin | Study Reach |
| ■ Active | ▭ Within Study Area | — Stream |
| ■ Discontinued | ▭ Outside Study Area | ⊠ Dam |
| ■ Not Referenced in Study | | |

DATA SOURCES: Basemap from Esri & NRCAN.
Stream network from National Hydro Network (NHN).
Watershed boundaries from NHN and NHC.
Hydrometric stations from Water Survey of Canada.



Coordinate System: NAD 1983 3TM 114
Units: METRES

Job: 3001178 Date: 02-FEB-2018

UPPER BOW RIVER HAZARD STUDY

LOCATION MAP

FIGURE 2

2.3 HEC-RAS Model

A calibrated HEC-RAS model was developed for the 118 km study reach of the Bow River. In addition, a 5 km reach of Jumpingpound Creek, a 6 km reach of Bighill Creek, and a 1 km reach of Exshaw Creek are included in the model. Policeman Creek is modelled as a separate branch in Canmore and connected to the Bow River. In total, 656 cross sections are specified in the model. For details see the Hydraulic Model Creation and Calibration Report (NHC, 2018a), provided under separate cover.

The calibrated hydraulic model was used to generate flood frequency profiles for the thirteen naturalized open water floods of varying magnitude listed in Table 1. The computed flood frequency water levels at each surveyed cross section on the Bow River and tributaries are provided in Appendix A.

During production of the inundation maps, it was determined that the Bighill Creek model reach needed to be extended upstream approximately one kilometre. Details of this model extension are provided in Appendix B. Information throughout this report and shown on the inundation maps is consistent with the extended, calibrated HEC-RAS model.

2.4 Flood Control Structures

There are two flood control structures (dikes) located along the Bow River in Canmore, one along the Bow River in Cochrane, and one along Jumpingpound Creek in Cochrane (Table 2).

In Canmore, the flood control dikes were constructed by Alberta Environment in 1977 in response to the flood of 1974. The Town Dike, located on the left (northeast) side of the river, protects a large portion of downtown Canmore, extending from the Canmore Golf and Curling Club to upstream of the wastewater treatment plant. The Mine Dike protects the area on the right (southwest) side of the river and extends from the TransAlta Rundle Plant outlet to West Canmore Park near the intersection of Rummel Place and Three Sisters Drive.

In Cochrane, the Jumpingpound Creek Dike was constructed in 2015 and runs along the right (east) bank of the creek downstream of the George Fox Trail Bridge. The Riverfront Park nature playground berm is a ring dike surrounding the playground located on the north side of the Bow River downstream of the Highway 22 bridge.

Table 2 Flood control structures

Name	Owner	Length (m)	Description
Riverfront Park nature playground berm	Cochrane	220	North side of Bow River, downstream of Hwy. 22 bridge, surrounding playground
Jumpingpound Creek Dike	Cochrane	168	East side of Jumpingpound Creek downstream of George Fox Trail Bridge
Canmore Mine Dike	AEP	1109	Southwest side of Bow River through Canmore
Canmore Town Dike	AEP	5176	Northeast side of Bow River through Canmore

2.5 Other Features

The majority of major infrastructure and populated areas within the study area are found in Canmore, Cochrane, and Exshaw. Other features of note within the study area include:

- The Canadian Pacific Railway (CPR) and Highway 1 and 1A parallel the river, and in some locations, the embankments and side slope armoring encroach on the river channel. There are many culverts through road or railway embankments.
- Four dams owned and operated by TransAlta are located within the study reach. Details of the dams are provided in Table 3.
- A 950 m long river training structure located approximately 200 m southwest of the Highway 1 bridge downstream of Canmore, tied into the highway embankment on the north. The structure includes a series of riprapped groynes and at least two culverts allow conveyance of low flows through the structure. The purpose of this structure is to direct flow through the Highway 1 bridge opening.
- A berm between Exshaw Creek and the cement plant west of the creek.
- Two dikes in Lac des Arcs, built in 1994, control the Lac des Arcs water level during the winter to reduce dust from blowing lake bed sediments when water levels are low.
- The Cochrane Riverfront Park berm is located on the left (north) bank of the Bow River downstream of the Highway 22 Bridge but is not a dedicated flood control structure.

Table 3 List of dams

NHC Dam ID	Name	Stream	River Station (m)	Year Built
1	Bearspaw Dam	Bow River	0	1954
2	Ghost Dam	Bow River	42,150	1929
3	Horseshoe Dam	Bow River	73,850	1911
4	Kananaskis Dam	Bow River	77,490	1913

3 FLOOD INUNDATION MAPS

Flood inundation mapping shows areas of ground that could be covered by water under one or more flood scenarios for existing conditions. For this study, one flood inundation map series was created for each of the flood frequency return period scenarios described in Section 2.1. Additional information concerning the flood inundation map production is provided below.

3.1 Methodology

The existing, calibrated HEC-RAS model was used to generate water surface elevations for each flood scenario to be mapped, and the supplied DTM was used to determine the inundated areas for each scenario. Cross section lines were prepared in ArcGIS as follows to support the flood inundation mapping:

- An attribute field containing the water surface elevation for each of the flood scenarios was populated using the flood frequency water levels found in Appendix A.
- Left and right endpoints were extended outward, as needed, so that straight lines connecting the endpoints of adjacent cross sections remained outside the 1000-year flood extents.

A boundary polygon was generated that enclosed all of the cross sections; this polygon defined the clipping extents for inundated areas. Automated routines were then used to complete the following tasks in ArcGIS for each of the flood scenarios:

- A triangular irregular network (TIN) representing a continuous water surface elevation (WSE) profile along the study reach was generated for each flood scenario, based on the computed WSE at each cross section; between cross sections, the WSE was linearly interpolated.
- The WSE TIN was converted to a tiled set of preliminary WSE grids. The WSE grid tiles matched the alignment and horizontal resolution of the LiDAR-derived bare earth DTM tiles supplied by AEP.
- Each bare earth DTM grid tile was subtracted from the corresponding WSE grid tile to generate a tiled set of flood depth grids. Grid cells with depth values less than 0 m, which represent dry areas, were assigned a value of *NoData*.
- Based on the depth grids, all areas with depths greater than 0 m were converted to inundation polygons. A simplification was applied in the raster to polygon conversion, so that the polygon boundaries do not exactly follow the edge of each raster cell.
- Filtering was used to remove isolated inundation areas smaller than 100 m². Holes in the inundation extent with areas less than 100 m² were also removed.

The resulting inundation polygons were then reviewed to identify direct overtopping in overbank areas, as described in Section 3.2. An adjusted version of the WSE TIN was created to reflect any edits made,

and the above steps were repeated to produce adjusted WSE grids, depth grids, and inundation polygons.

The adjusted inundation polygons were smoothed in ArcGIS. A *PAEK* smoothing algorithm was applied with a 20 m tolerance. This allowed for an inundation boundary that is smoothed, but remains very similar to the original inundation polygon output. The smoothed inundation polygons were further reviewed in ArcGIS and classified to identify inundation of isolated areas and areas of potential flood control structure failure.

The final smoothed inundation extent polygons were used to clip the WSE grid tiles. The resulting WSE grids have *NoData* values for all dry areas but retain WSE values wherever inundation is shown.

3.1.1 Water Surface Elevation TIN Modifications

Several complex areas were not adequately represented by the WSE TIN based directly on the computed water surface elevations at each cross section. TIN modifications, as described below, were required in these locations.

Jumpingpound Creek Confluence with Bow River

At the mouth of Jumpingpound Creek, on the right bank, some modifications were required to ensure a reasonable representation of the water surface once the Jumpingpound Creek Dike is overtopped, which occurs at the 50-year flood event. Additional water surface breaklines were inserted to guide the slope of the water surface between the right bank of Jumpingpound Creek and the right bank of the Bow River (Figure 3).

Bighill Creek Confluence with Bow River

At the confluence of Bighill Creek with Bow River, on the right bank of Bighill Creek, some modifications were required to account for flooding of a low lying area north of Griffin Road (Figure 4). The flooding of this area is expected to occur at and above the 100-year flood event. The area is connected to a ditch on the south side of Griffin Road via a culvert under the road. To the west, the low lying area ends at Highway 22; there is no culvert under the highway.

Water surface isolines along three Bow River cross sections (RS 23,415, RS 23,391, and RS 23,317) were extended to cover this low lying area. Additional breaklines were added to ensure that the water surface slopes from RS 23,317 to the Bighill Creek cross sections located upstream of Griffin Road. The TIN modifications were completed based on the expectation that Griffin Road will not overtop.

Canmore Floodplain

In the Canmore floodplain, there is a discontinuity between modelled water levels from the Bow River and those from Policeman Creek. In order to ensure a smooth sloping water surface between the Bow

River and Policeman Creek, a transition area was identified where water surface isolines were truncated slightly and water levels interpolated across the transition area (Figure 5).

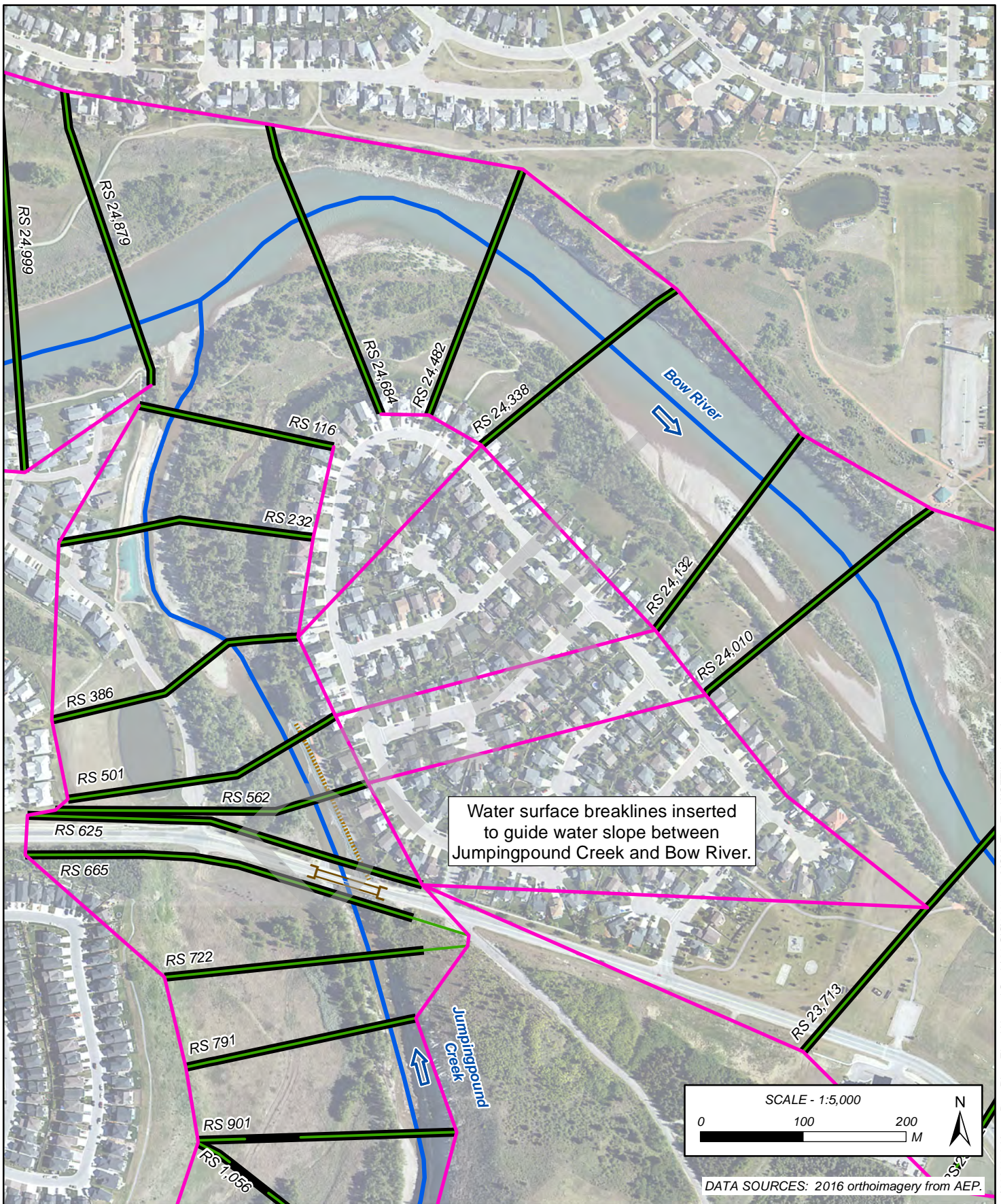
Areas Adjacent to Dams

Immediately upstream and downstream of each dam (Kananaskis Dam, Horseshoe Dam, Ghost Dam, and Bearspaw Dam), additional WSE isolines were inserted to ensure that the adjacent model cross section water surface elevation extended to the dam structure and to other nearby structures, such as spillways and powerhouses.

Tributary Backwater Inundation

The WSE TIN was adjusted to represent backwater inundation on both Ghost and Kananaskis rivers. The water surface elevation from the Bow River model cross section at the confluence was applied to the tributaries to identify the full backwater inundation extents. Adjustments were not required for other tributaries, as these were covered by the extents of the original WSE TIN surface.

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- Water Surface 3D Breakline
- Water Surface Isoline
- Cross Section
- ⋯ Flood Control Structure
- ⋯ Other Feature
- Model Stream Network

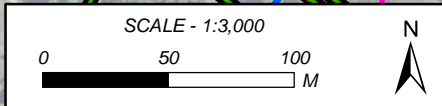
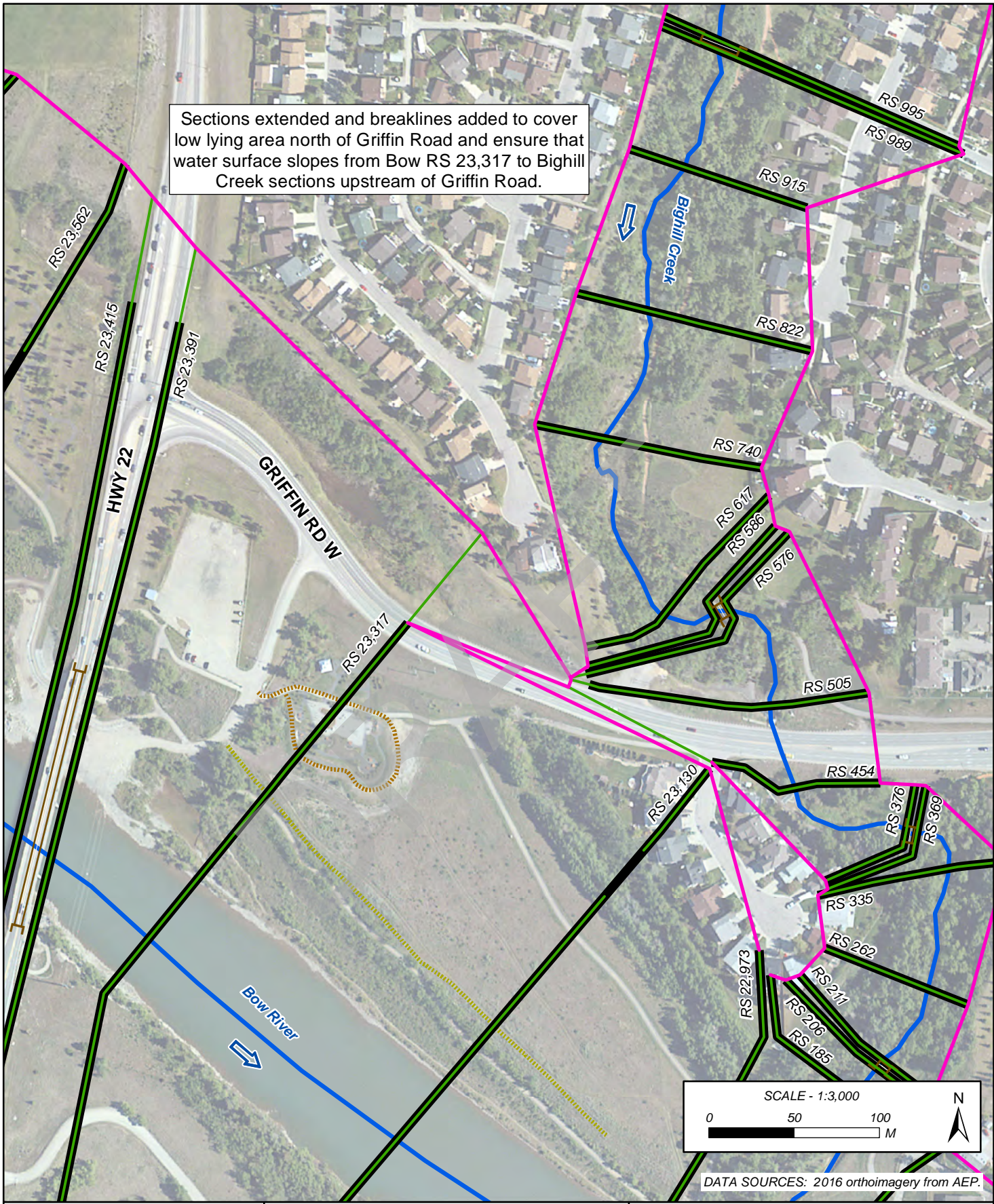
Job: 3001178

Date: 02-FEB-2018

UPPER BOW RIVER HAZARD STUDY
**WATER SURFACE
MODIFICATIONS AT
JUMPINGPOUND CREEK**

FIGURE 3

Sections extended and breaklines added to cover low lying area north of Griffin Road and ensure that water surface slopes from Bow RS 23,317 to Bighill Creek sections upstream of Griffin Road.



DATA SOURCES: 2016 orthoimagery from AEP.

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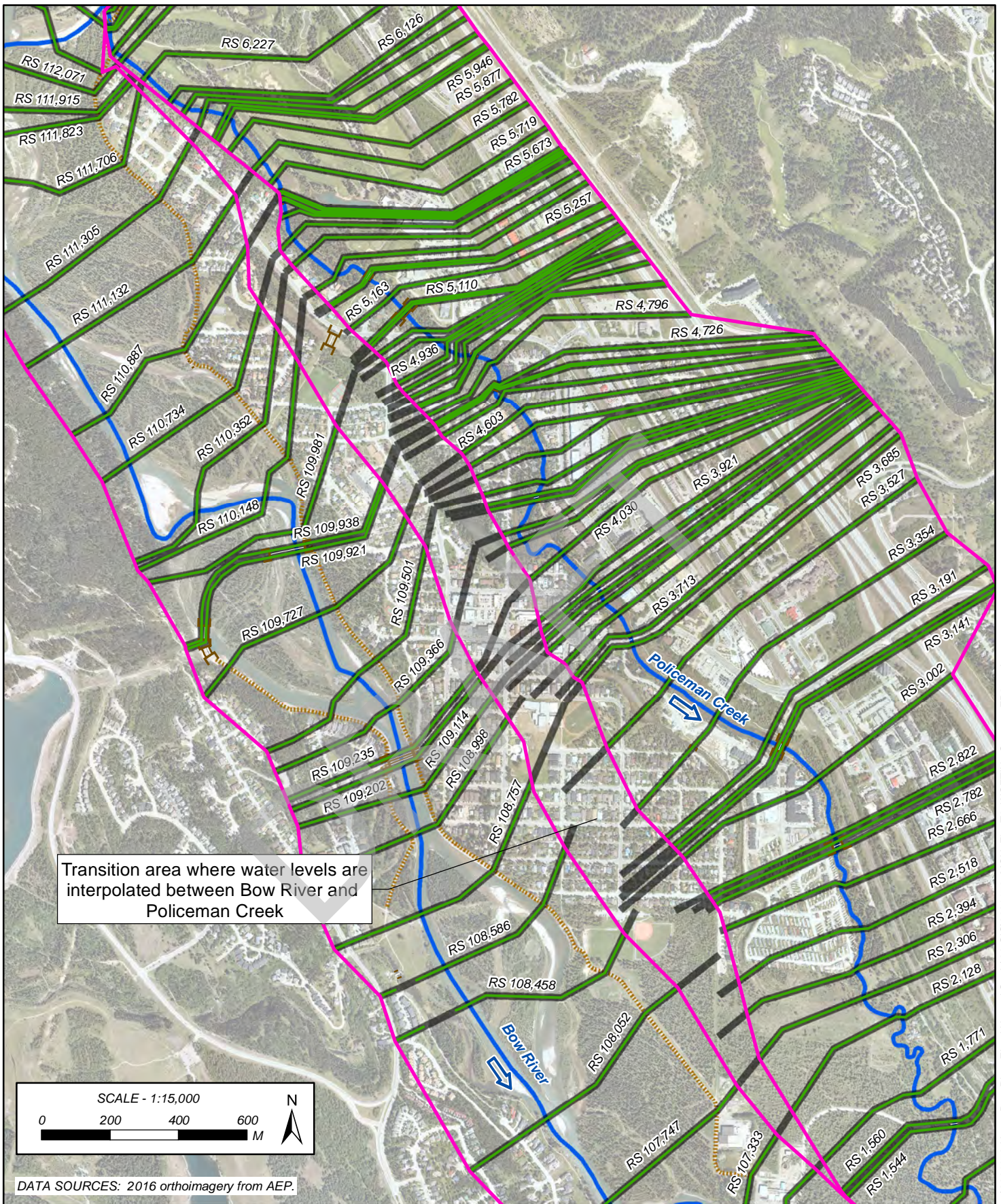
- Water Surface 3D Breakline
- Water Surface Isoline
- Cross Section
- - - Flood Control Structure
- - - Other Feature
- Model Stream Network

Job: 3001178

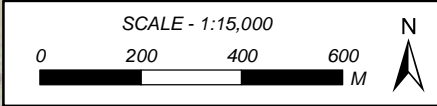
Date: 02-FEB-2018

UPPER BOW RIVER HAZARD STUDY
**WATER SURFACE
MODIFICATIONS AT
BIGHILL CREEK**

FIGURE 4



Transition area where water levels are interpolated between Bow River and Policeman Creek



DATA SOURCES: 2016 orthoimagery from AEP.

Alberta Government
nhc northwest hydraulic consultants

- Water Surface 3D Breakline
- Water Surface Isoline
- Cross Section
- Flood Control Structure
- Model Stream Network

Job: 3001178 Date: 02-FEB-2018

UPPER BOW RIVER HAZARD STUDY
**WATER SURFACE
MODIFICATIONS AT
CANMORE FLOODPLAIN**

FIGURE 5

3.1.2 Representation of Water Bodies

As the LiDAR-derived bare earth DEM has not been hydro-flattened, water bodies (rivers, streams, lakes, and ponds) may not be represented as consistently flat surfaces. In some cases, this means that mapped flood inundation extents derived from the flood depth grids are discontinuous over water bodies.

To compensate for this issue, polygons were digitized to represent some of the water bodies, as required. These polygons were merged into the flood extent polygons before final polygon smoothing. This approach ensured that inundation extents are complete over water bodies.

3.1.3 GIS Deliverables

GIS deliverables include (for each flood scenario):

- Model cross sections with computed open water flood frequency levels attached as attributes. Polyline layer in Esri file geodatabase format.
- WSE TIN – preliminary, based directly on calibrated HEC-RAS model results. Esri TIN format.
- WSE TIN – adjusted, including revisions to account for overtopping areas. Esri TIN format.
- Tiled flood depth grids. Esri file geodatabase grid feature class format.
- Smoothed flood inundation extent polygons, with polygons classified as inundation extents, isolated areas, or potential flood control structure failure areas. Polygon layer in Esri file geodatabase format.
- Tiled WSE grids, clipped to the inundation extent polygons. Esri file geodatabase grid feature class format.

3.2 Direct Flood Inundation Areas

Direct flood inundation areas were identified as either being part of the actively-flowing river channel or flooded overbank areas connected to the actively-flowing river channel. Areas showing extensive overbank flooding connected to the channel at one distinct location (overtopping point) were adjusted such that the water surface elevation across that area was set equal to the water surface elevation at the overtopping point. This generally reduced the size of the inundated area extending upstream of an overtopping point and increased the size of the inundated area extending downstream of the overtopping point. In a few instances, these adjustments resulted in a new overtopping point forming downstream. In these cases, the water surface elevations in the overbank area were re-adjusted such that they were interpolated linearly between the upstream overtopping point and the ground elevation at the new downstream overtopping point.

Railway embankments were considered to be permeable, due to the presence of culverts and porous fill material within them. Therefore, it was assumed that the water surface elevation behind railway embankments would be equal to that of the adjacent actively-flowing river channel in front of them. No

adjustments were made to the water levels or inundation extents for potential overtopping areas separated from the actively-flowing river channel by a railway embankment.

All adjustments were made to the water surface TINs so that inundation polygons could be re-generated from the data using the procedure described in Section 3.1 above.

3.3 Indirect Flood Inundation Areas

Indirect flood inundation areas were identified as having ground elevations below the water surface but no direct overland connection to the actively flowing river channel based on the surrounding topography. Two types of indirect flood inundation areas were identified for mapping purposes: isolated areas and areas of potential flooding due to flood control structure failure.

3.3.1 Inundation of Isolated Areas

Isolated areas, mapped using water surface elevations interpolated between cross sections, could potentially become inundated during a flood due to subsurface flow through porous media or flooding of buried pipes and culverts. Inundated areas behind embankments not identified as dedicated flood control structures or railways, such as roads and berms, were considered isolated areas.

3.3.2 Inundation Due to Potential Flood Control Structure Failure

The identified flood control structures provide protection for four key areas:

- The northeast side (left bank) of the Bow River through Canmore.
- The southwest side (right bank) of the Bow River through Canmore, near Rundle Drive.
- The Bow Meadows community in Cochrane, located along the right bank of Jumpingpound Creek near Bow Meadows Drive.
- The Riverfront Park nature playground in Cochrane, on the northeast side (left bank) of the Bow River.

For a given flood scenario, if water surface elevations overtopped portions of a flood control structure, then the areas behind the flood control structures were mapped as direct flood inundation areas. At lower return period floods, when water surface elevations did not indicate overtopping of a flood control structure, the area behind the flood control structure was shown as inundated due to potential failure of the structure. This does not imply failure of flood protection structures is expected to occur.

In either case, the inundation extent of the protected area was determined by extending the water surface elevation from the main channel into the protected area.

On the Canmore floodplain, there is a transition between Bow River water levels and Policeman Creek water levels (described in section 3.1.1, above). As a result, there were some cases where it was necessary to delineate a boundary between inundation from potential flood control structure failure and

direct inundation. Sources of direct inundation were either backwater from Policeman Creek or from overtopping of the Bow River dike. The boundary location was determined by first mapping the extent of direct inundation. The remaining area was classified as inundation due to potential flood control structure failure.

3.4 Areas Affected by Flooding

3.4.1 Flooding of Residential Areas

Residential areas in several communities have the potential to be impacted by flooding.

Canmore

- The Canmore Mine Dike is located along the right (southwest) bank of the Bow River in Canmore. Failure of this structure could result in flooding of numerous residences for the 5-year and larger return periods. For 200-year and larger return periods, the Canmore Mine Dike would be overtopped and numerous residences would be flooded.
- The Canmore Town Dike is located along the left (northeast) bank of the Bow River in Canmore. Failure of this structure could impact several residences at low return periods (e.g., 2-year). A significant number of residences would be flooded by a potential failure at return periods of 10 years to 350 years. Direct inundation via overtopping of the flood control structure at various locations would result in many flooded residences at return periods of 100 years and higher.
- Along Policeman Creek, residential properties would be impacted by direct inundation starting at the 5-year return period.
- At low return periods (2-year and 5-year), isolated inundation from the Bow River and Policeman Creek would impact several residences.

M.D. of Bighorn

- At Exshaw, no residences are expected to be impacted by direct inundation from open water flooding. However, at all return periods there are homes on the left bank of Exshaw Creek that could be impacted by isolated inundation, particularly at the eastern edge of town near Pigeon Mountain Drive and Mount McGillivray Drive, and near the Water Treatment Plant at Mount Lorette Drive. It is worth noting that Exshaw Creek, like other streams in the area, flows through an alluvial fan near its mouth and is prone to debris-floods and debris-flows that have the potential to result in more severe hazards than the clear-water floods considered in this study.

Morley

- At Morley no residences would be impacted by either direct or isolated inundation from the Bow River.

Cochrane

- Along Bighill Creek, no residences would be significantly affected by flooding, although there would be some minor isolated flooding in the Glenbrook Crescent area south of Highway 1A at higher return periods (200-year and greater).
- Along Jumpingpound Creek, the only residential area that would be affected by flooding is the Bow Meadows community, located at the confluence with the Bow River, on the right bank of Jumpingpound Creek. This area would experience some flooding from direct inundation starting at the 50-year return period, with about half the residences affected at the 500-year return period, and most residences affected at the 1000-year return period.
- At the upstream end of Cochrane, several residences along West Terrace Point, located on the left bank of the Bow River, would be impacted by flooding from direct inundation at the 1000-year return period.
- Towards the downstream end of Cochrane, a number of residences along Riverview Circle, located on the left bank of the Bow River, just upstream of River Avenue Bridge, would be impacted by flooding from direct inundation at return periods of 500 years and greater.
- Downstream of Highway 22, the Girl Guide Camp Jubilee recreational area is located in the right floodplain between the Bow River and Highway 22. This is a summer use area that would be impacted by flooding from direct inundation at return periods of 100 years and greater.

Outside of these areas, no residential buildings are anticipated to be affected by flooding due to direct inundation.

Potential flood impacts to flood control structures are summarized in Appendix C, Table C1. Further details regarding impacted structures are provided with the Flood Risk Assessment and Inventory Report (NHC, 2018b), provided under separate cover.

3.4.2 Flooding of Commercial & Industrial Areas

Commercial and industrial areas in several communities have the potential to be impacted by flooding.

Canmore

- Through Canmore, along the left bank of the Bow River, commercial properties may be affected by flooding from both the Bow River and Policeman Creek. The area is protected from flooding by the Canmore Town Dike. Potential failure of this structure would result in flooding of commercial properties at the 35-year to 100-year return periods. At return periods of 200 years and greater, a number of commercial properties are at risk of direct inundation resulting from overtopping of the dike.

- The Canmore Wastewater Treatment Plant (WWTP) would experience minor flooding from direct inundation at return periods as low as 5 years and flooding from the potential failure of the Canmore Town Dike at the 2-year and 5-year return periods.
- There is limited potential for flooding to impact other industrial properties in Canmore, except for a potential direct inundation of the building centre yard and adjacent building at 17th Street and 8th Avenue at return periods of 5 years and greater.

M.D. of Bighorn

- One commercial building in Dead Man's Flats may experience flooding from direct inundation at return periods of 500 years or greater.
- At return periods of 5 years and higher, several industrial sites on the left bank of the Bow River, downstream of Exshaw Creek, would experience direct inundation.
- The Lafarge Exshaw Cement Plant may experience isolated inundation from Exshaw Creek at all return periods, but no direct inundation.
- The large pond at the Exshaw Wastewater Treatment Facility would not experience flooding, but the small pond would experience direct inundation at return periods of 5 years and higher.
- There are no commercial properties within the floodplain in Exshaw.

Morley

- There are no commercial or industrial properties within the floodplain in Morley.

Cochrane

- There are very few commercial or industrial buildings within the floodplain in Cochrane. The exception is several industrial buildings near the Spray Lake Sawmills Family Sports Centre, located on the left bank of the Bow River, downstream of the River Avenue Bridge, which may experience flooding at the 1000-year return period.

Potential flood impacts to flood control structures are summarized in Appendix C, Table C1. Further details regarding impacted structures are provided with the Flood Risk Assessment and Inventory Report (NHC, 2018b), provided under separate cover.

3.4.3 Flooding of Bridges & Culverts

For the purposes of this study, bridges are assumed to experience impacts from flooding if flood levels reach the highest low chord of the bridge. Similarly, culverts are assumed to be impacted by flooding if the road surface above the culvert is inundated.

Canmore

- The Bridge Road bridge and adjacent Bow River pedestrian bridge across the Bow River would be impacted by flooding at the 500-year return period and higher. The Spur Line Trail (Engine) pedestrian bridge across the mainstem of the Bow River would not be impacted by flooding, but the Spur Line Trail pedestrian bridge across the Bow River side channel would be impacted at the 20-year return period and higher.
- There are twelve pedestrian and road bridges across Policeman Creek. Ten of these would be impacted by flooding at various return periods, starting at the 5-year return period.
- One Policeman Creek culvert would be impacted by flooding at the 35-year return period. At the 750-year and 1000-year return periods, several other culverts would be impacted.

M.D. of Bighorn

- The Highway 1 twin bridges across the Bow River, immediately downstream of Canmore, would not be impacted by flooding.
- Bridges across Exshaw Creek would not be impacted by flooding.
- The CPR and Highway 1X bridges across the Bow River, just upstream of Seebe and Kananaskis Dam, would not be impacted by flooding.
- The Bow Valley Trail/Highway 1A culvert on Exshaw Creek would be impacted by flooding during all flood events.
- Culverts through the Lac des Arcs dust control east dike would be impacted by flooding starting at the 5-year return period. The culvert through the dust control west dike would be impacted during all flood events.

Morley

- The Morley Road bridge would not be impacted by flooding.

Cochrane

- The River Avenue bridge across the Bow River would be impacted by flooding at the 750-year and 1000-year return periods. The Cowboy Trail/Highway 22 bridge across the Bow River would not be impacted by flooding. The CPR bridge across the Bow River just upstream of Cochrane would not be impacted by flooding.
- The George Fox Trail bridge across Jumpingpound Creek would be impacted by flooding at return periods of 100 years and greater.
- The Bow Valley Trail/Highway 1A bridge across Bighill Creek would be impacted by flooding at the 750-year and 1000-year return periods, whereas the adjacent CPR bridge would not be impacted by flooding. There are ten pedestrian bridges across Bighill Creek. Nine of these would be impacted by flooding starting at the 10-year return period.

- The three culverts on Bighill Creek would not be impacted by flooding.
- There is a culvert under a pedestrian bridge on a side channel on the north (left) bank of the Bow River, immediately upstream of the Highway 22 bridge. This culvert would be impacted by direct inundation at all flood levels.

Potential flood impacts to bridges and culverts are summarized in Table C2 and Table C3 of Appendix C.

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4 WATER SURFACE ELEVATION GRIDS

Water surface elevation grids were prepared for each flood scenario and provided with the GIS deliverables for this study component, along with the WSE TINs, flood depth grids, and inundation extent polygons. A description of the WSE grids is provided below.

4.1 Water Surface Elevation Grid Specifications

For each of the flood scenarios, the adjusted WSE TINs described in Section 3.1 were converted to a tiled set of WSE grids matching the alignment, horizontal resolution, and tiling boundaries of the LiDAR-derived DTM supplied by AEP. Water surface elevations in metres are provided as 32-bit floating point grid cell values. The WSE grids at this stage were used to compute the flood depth grids, as described in Section 5.1.

As a final step, the inundation extent polygons were used to clip the WSE grids such that a value of *NoData* is provided for all dry areas and the water surface elevation values are indicated only where inundation is shown.

4.2 General Comments

WSE grids are provided for information only. Grid values are based on linear interpolation between cross sections in the hydraulic model, and as such, should be considered approximate. Since the adjusted WSE grids have been clipped using the smoothed inundation extent polygons, water's edge boundaries implied by the raster WSE grids correspond to the inundation extent boundaries presented on the inundation maps.

5 FLOOD DEPTH GRIDS

Flood depth grids were prepared for each flood scenario and provided with the GIS deliverables for this study component, along with the WSE TINs, WSE grids, and inundation extent polygons. A description of the flood depth grids is provided below.

5.1 Flood Depth Grid Specifications

For each of the flood scenarios, each bare earth DTM grid tile was subtracted from the corresponding adjusted WSE grid tile (prior to clipping) to generate a set of flood depth grid tiles representing water depth in metres as 32-bit floating point values. All flood depth grids maintained the same alignment, horizontal resolution, and tiling boundaries as the LiDAR-derived bare earth DTM supplied by AEP. Grid cells with depth values less than 0 m, which represent dry areas, were assigned a value of *NoData*.

5.2 General Comments

The flood depth grids are provided for information only. Grid values are based on linear interpolation of water surface elevations between cross sections in the hydraulic model, and as such, should be considered approximate. Water's edge boundaries implied by the raster depth grids may deviate slightly from the inundation extent boundaries presented on the inundation maps. The depth grids are computed by subtracting the bare earth DTM grids from the adjusted water surface grids, whereas the mapped inundation extent boundaries, which were derived from the depth grids, have been further filtered and smoothed as discussed in Section 3.1.

Also, since the LiDAR-derived DTM indicates the approximate water surface elevation at the time of the LiDAR survey for submerged portions of river beds and other ground covered by water, depth values in those areas should not be considered accurate. Elsewhere, the depth grids may be used for many purposes, such as to identify areas in the floodplain that exceed a specified depth criteria. For example, these data were used to delineate the non-encroached 1 m depth contour to support the flood hazard identification component of this study.

6 CONCLUSIONS

The objectives of this study are to assess river flood-related hazards along a 118 km long reach of the Bow River (including Policeman Creek), 1 km of Exshaw Creek, 6 km of Bighill Creek, and 5 km of Jumpingpound Creek. The Upper Bow River Hazard Study was divided into eight major project components. This report summarizes the work of the open water flood inundation map production component, for which flood frequency water levels have been superimposed on the digital terrain model of the study area as described in this report. The reports for the two previous work components, (1) survey and base data collection and (2) hydraulic model creation and calibration, should be read in conjunction with this report, as they provide additional pertinent background information.

Along the right bank of the Bow River in Canmore, residential properties would experience flooding from direct inundation at return periods of 200 years and greater, as the Canmore Mine Dike would overtop at about the 200-year flood. At return periods of 5 to 100 years, residences would be flooded if the Canmore Mine Dike failed. There are no commercial or industrial structures, bridges, or culverts along the right bank of the Bow River at risk of flooding.

The area along the left bank of the Bow River in Canmore could experience flooding from either the Bow River or Policeman Creek. Many residences are protected from direct inundation by the Canmore Town Dike at return periods below 100 years but would be flooded if the dike failed. Residences would be flooded by direct inundation via overtopping of the dike at return periods of 100 years and higher. The Canmore Wastewater Treatment Plant (WWTP) would experience some flooding from direct inundation at return periods as low as 5 years. At return periods of 200 years and greater, a number of commercial properties are at risk of direct inundation. Ten of twelve pedestrian and road bridges across Policeman Creek would be impacted by flooding starting at the 5-year return period. Culverts along Policeman Creek would be impacted by flooding at the higher return periods.

The Bridge Road bridge and adjacent Old Railroad pedestrian bridge across the Bow River in Canmore would be impacted by flooding at the 500-year return period. The Spur Line Trail (Engine) pedestrian bridge across the mainstem of the Bow River would not be impacted by flooding, but the Spur Line Trail pedestrian bridge across the Bow River side channel would be.

In Exshaw, no residences would be impacted by direct inundation; however, residences along the left side of Exshaw Creek could experience isolated flooding at all return periods. Several industrial sites at Exshaw may experience isolated or direct flooding at low return periods. There are no commercial properties, culverts, or bridges at risk of flooding in Exshaw. Other bridges across the Bow River in M.D. of Bighorn are not impacted by flooding.

In Cochrane, residences at risk of flooding are limited to three main residential areas. In the Bow Meadows community, residences would experience flooding from direct inundation starting at the 50-year return period. At the upstream end of Cochrane, residences along West Terrace Point may experience flooding from direct inundation at the 1000-year return period. Towards the downstream

end of Cochrane, a number of residences along Riverview Circle, just upstream of River Avenue Bridge, would experience flooding at return periods of 500 years and greater. There would be minimal impact to commercial buildings, industrial buildings, and culverts in Cochrane.

The River Avenue bridge across the Bow River in Cochrane would be impacted by flooding at the 750-year and 1000-year return periods. Both the Cowboy Trail/Highway 22 bridge and the CPR bridge across the Bow River just upstream of Cochrane would not be impacted by flooding. The George Fox Trail bridge across Jumpingpound Creek would be impacted by flooding at return periods of 100 years and greater. The Bow Valley Trail/Highway 1A bridge across Bighill Creek would be impacted by flooding at the 750-year and 1000-year return periods, whereas the adjacent CPR bridge would not be impacted by flooding. There are ten pedestrian bridges across Bighill Creek. Nine of these would be impacted by flooding, starting at the 10-year return period.

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APPENDIX A
COMPUTED FLOOD FREQUENCY WATER LEVELS

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Table A1 Computed Flood Frequency Water Levels

River	HEC-RAS Model Sub-Reach	River Station (m)	Channel Thalweg Elevation (m)	Computed Water Surface Elevation (m)												
				1000-Year	750-Year	500-Year	350-Year	200-Year	100-Year	75-Year	50-Year	35-Year	20-Year	10-Year	5-Year	2-Year
Bow River	KM 112	118148	1323.34	1327.40	1327.36	1327.29	1327.22	1327.12	1326.99	1326.93	1326.85	1326.77	1326.63	1326.44	1326.24	1325.92
Bow River	KM 112	117852	1322.93	1326.55	1326.50	1326.43	1326.36	1326.26	1326.12	1326.07	1325.99	1325.92	1325.81	1325.66	1325.48	1325.18
Bow River	KM 112	117547	1322.32	1326.07	1326.02	1325.95	1325.89	1325.78	1325.65	1325.60	1325.52	1325.45	1325.34	1325.20	1325.05	1324.75
Bow River	KM 112	117241	1321.04	1325.56	1325.51	1325.45	1325.39	1325.29	1325.15	1325.10	1325.03	1324.97	1324.85	1324.71	1324.56	1324.26
Bow River	KM 112	116670	1319.30	1323.86	1323.82	1323.76	1323.71	1323.63	1323.52	1323.47	1323.41	1323.36	1323.27	1323.14	1323.00	1322.74
Bow River	KM 112	116188	1319.03	1322.84	1322.80	1322.75	1322.69	1322.61	1322.50	1322.46	1322.39	1322.34	1322.25	1322.13	1322.00	1321.78
Bow River	KM 112	115644	1318.21	1321.75	1321.71	1321.66	1321.62	1321.55	1321.47	1321.43	1321.38	1321.33	1321.25	1321.15	1321.04	1320.85
Bow River	KM 112	115415	1316.91	1320.93	1320.90	1320.86	1320.82	1320.76	1320.69	1320.66	1320.62	1320.57	1320.50	1320.41	1320.33	1320.17
Bow River	KM 112	115134	1317.94	1320.30	1320.27	1320.23	1320.19	1320.13	1320.04	1320.01	1319.96	1319.92	1319.83	1319.72	1319.60	1319.39
Bow River	KM 112	114700	1315.69	1319.52	1319.49	1319.44	1319.40	1319.33	1319.24	1319.21	1319.14	1319.09	1319.00	1318.88	1318.75	1318.52
Bow River	KM 112	114258	1314.97	1318.92	1318.89	1318.84	1318.80	1318.74	1318.66	1318.63	1318.57	1318.52	1318.44	1318.32	1318.18	1317.93
Bow River	KM 112	113821	1314.50	1318.06	1318.02	1317.97	1317.92	1317.84	1317.75	1317.71	1317.65	1317.60	1317.51	1317.40	1317.28	1317.04
Bow River	KM 112	113472	1313.89	1317.33	1317.29	1317.25	1317.20	1317.13	1317.04	1317.00	1316.94	1316.90	1316.82	1316.71	1316.60	1316.42
Bow River	KM 112	113065	1312.73	1316.59	1316.55	1316.50	1316.45	1316.39	1316.28	1316.24	1316.18	1316.13	1316.04	1315.93	1315.80	1315.55
Bow River	KM 112	112898	1312.71	1316.39	1316.35	1316.29	1316.24	1316.19	1316.09	1316.05	1315.99	1315.94	1315.86	1315.75	1315.64	1315.40
Bow River	KM 112	112726	1312.17	1316.19	1316.15	1316.10	1316.05	1315.98	1315.88	1315.84	1315.79	1315.73	1315.65	1315.55	1315.45	1315.21
Bow River	KM 112	112725	Lat Struct													
Bow River	KM 112	112580	1311.54	1315.96	1315.93	1315.87	1315.81	1315.73	1315.62	1315.57	1315.51	1315.45	1315.37	1315.25	1315.14	1314.93
Bow River	KM 106	112416	1311.86	1315.74	1315.69	1315.63	1315.57	1315.48	1315.35	1315.31	1315.24	1315.18	1315.08	1314.96	1314.84	1314.65
Bow River	KM 106	112279	1311.64	1315.60	1315.55	1315.49	1315.43	1315.33	1315.20	1315.15	1315.08	1315.02	1314.92	1314.80	1314.68	1314.49
Bow River	KM 106	112071	1310.67	1315.35	1315.31	1315.24	1315.18	1315.07	1314.94	1314.88	1314.80	1314.73	1314.62	1314.48	1314.33	1314.10
Bow River	KM 106	111915	1310.95	1315.14	1315.10	1315.03	1314.97	1314.87	1314.73	1314.67	1314.59	1314.52	1314.41	1314.26	1314.11	1313.88
Bow River	KM 106	111823	1310.66	1315.00	1314.96	1314.90	1314.84	1314.74	1314.61	1314.55	1314.47	1314.41	1314.30	1314.16	1314.02	1313.79
Bow River	KM 106	111706	1310.10	1314.90	1314.86	1314.80	1314.74	1314.64	1314.51	1314.45	1314.38	1314.31	1314.20	1314.06	1313.92	1313.70
Bow River	KM 106	111305	1310.04	1314.20	1314.16	1314.10	1314.03	1313.97	1313.83	1313.78	1313.69	1313.62	1313.51	1313.36	1313.21	1312.96
Bow River	KM 106	111132	1310.15	1313.81	1313.77	1313.71	1313.65	1313.63	1313.49	1313.43	1313.34	1313.27	1313.15	1313.00	1312.84	1312.58
Bow River	KM 106	110887	1309.12	1313.23	1313.18	1313.11	1313.04	1312.95	1312.84	1312.78	1312.70	1312.63	1312.52	1312.37	1312.22	1311.99
Bow River	KM 106	110886	Lat Struct													
Bow River	KM 106	110734	1309.32	1312.98	1312.94	1312.86	1312.79	1312.70	1312.61	1312.55	1312.48	1312.41	1312.30	1312.16	1312.01	1311.79
Bow River	KM 106	110352	1307.92	1312.65	1312.60	1312.50	1312.40	1312.30	1312.11	1312.03	1311.94	1311.85	1311.71	1311.54	1311.38	1311.16
Bow River	KM 106	110148	1307.71	1312.52	1312.47	1312.36	1312.25	1312.14	1311.93	1311.83	1311.73	1311.63	1311.48	1311.28	1311.08	1310.84
Bow River	KM 106	109981	1306.03	1312.39	1312.29	1312.17	1312.05	1311.90	1311.67	1311.54	1311.44	1311.31	1311.10	1310.83	1310.50	1310.03
Bow River	KM 106	109938	1305.83	1312.36	1312.29	1312.17	1312.05	1311.91	1311.69	1311.57	1311.46	1311.34	1311.13	1310.87	1310.58	1310.17
Bow River	KM 106	109929.1	Mult Open													
Bow River	KM 106	109921	1304.55	1312.24	1312.16	1312.03	1311.90	1311.76	1311.51	1311.41	1311.25	1311.13	1310.93	1310.67	1310.42	1310.02
Bow River	KM 106	109727	1307.03	1312.18	1312.10	1311.95	1311.82	1311.66	1311.40	1311.29	1311.14	1311.01	1310.79	1310.52	1310.24	1309.84
Bow River	KM 106	109501	1305.87	1312.02	1311.93	1311.77	1311.61	1311.34	1311.09	1310.99	1310.85	1310.72	1310.53	1310.28	1310.02	1309.64
Bow River	KM 106	109366	1305.94	1311.68	1311.58	1311.39	1311.22	1311.04	1310.81	1310.71	1310.58	1310.46	1310.28	1310.04	1309.81	1309.44
Bow River	KM 106	109235	1305.58	1311.31	1311.16	1310.91	1310.77	1310.63	1310.43	1310.35	1310.24	1310.14	1309.98	1309.77	1309.56	1309.23
Bow River	KM 106	109224.4	Bridge													
Bow River	KM 106	109202	1305.97	1310.90	1310.83	1310.75	1310.68	1310.53	1310.34	1310.26	1310.14	1310.05	1309.89	1309.69	1309.48	1309.16

River	HEC-RAS Model Sub-Reach	River Station (m)	Channel Thalweg Elevation (m)	Computed Water Surface Elevation (m)												
				1000-Year	750-Year	500-Year	350-Year	200-Year	100-Year	75-Year	50-Year	35-Year	20-Year	10-Year	5-Year	2-Year
Bow River	KM 106	109115	Lat Struct													
Bow River	KM 106	109114	1305.85	1310.54	1310.45	1310.35	1310.31	1310.18	1310.02	1309.95	1309.86	1309.78	1309.65	1309.48	1309.30	1309.02
Bow River	KM 106	108998	1306.04	1309.80	1309.78	1309.76	1309.73	1309.67	1309.58	1309.55	1309.49	1309.43	1309.34	1309.21	1309.07	1308.84
Bow River	KM 106	108757	1305.79	1309.56	1309.54	1309.50	1309.45	1309.36	1309.23	1309.18	1309.10	1309.03	1308.93	1308.79	1308.64	1308.43
Bow River	KM 106	108586	1305.56	1309.25	1309.22	1309.18	1309.14	1309.04	1308.91	1308.86	1308.77	1308.69	1308.58	1308.43	1308.23	1307.93
Bow River	KM 106	108458	1305.78	1309.07	1309.05	1309.01	1308.97	1308.87	1308.73	1308.67	1308.58	1308.50	1308.41	1308.26	1308.06	1307.73
Bow River	KM 106	108052	1304.17	1308.64	1308.63	1308.61	1308.58	1308.49	1308.36	1308.30	1308.21	1308.13	1308.06	1307.86	1307.64	1307.28
Bow River	KM 106	108051	Lat Struct													
Bow River	KM 106	107747	1303.84	1308.02	1308.02	1308.00	1307.97	1307.89	1307.78	1307.72	1307.64	1307.57	1307.52	1307.35	1307.17	1306.86
Bow River	KM 106	107333	1302.27	1307.34	1307.34	1307.33	1307.30	1307.22	1307.09	1307.02	1306.92	1306.83	1306.67	1306.48	1306.27	1305.96
Bow River	KM 106	107113	1302.41	1307.18	1307.18	1307.18	1307.15	1307.06	1306.92	1306.85	1306.73	1306.63	1306.46	1306.24	1306.00	1305.64
Bow River	KM 106	106702	1301.44	1305.98	1305.93	1305.86	1305.81	1305.73	1305.56	1305.52	1305.48	1305.44	1305.36	1305.24	1305.11	1304.87
Bow River	KM 087	106497	1301.98	1305.86	1305.80	1305.71	1305.68	1305.57	1305.42	1305.36	1305.28	1305.22	1305.11	1304.97	1304.83	1304.60
Bow River	KM 087	106143	1301.36	1305.62	1305.55	1305.45	1305.44	1305.32	1305.16	1305.09	1305.00	1304.93	1304.80	1304.63	1304.46	1304.20
Bow River	KM 087	105995	1301.19	1305.44	1305.36	1305.26	1305.28	1305.16	1304.99	1304.92	1304.83	1304.76	1304.62	1304.45	1304.28	1304.02
Bow River	KM 087	105742	1300.32	1305.27	1305.20	1305.09	1305.13	1304.97	1304.79	1304.72	1304.62	1304.55	1304.41	1304.23	1304.05	1303.77
Bow River	KM 087	105620	1297.49	1305.17	1305.10	1304.99	1304.93	1304.78	1304.61	1304.54	1304.45	1304.39	1304.26	1304.08	1303.92	1303.66
Bow River	KM 087	105224	1298.84	1304.99	1304.91	1304.79	1304.68	1304.52	1304.34	1304.27	1304.16	1304.12	1303.98	1303.80	1303.63	1303.38
Bow River	KM 087	104790	1298.71	1304.50	1304.41	1304.27	1304.15	1303.95	1303.73	1303.63	1303.50	1303.38	1303.20	1302.97	1302.74	1302.36
Bow River	KM 087	104631	1297.59	1303.88	1303.80	1303.68	1303.57	1303.41	1303.21	1303.13	1303.02	1302.92	1302.77	1302.57	1302.37	1302.05
Bow River	KM 087	104575	1297.83	1303.67	1303.59	1303.48	1303.38	1303.22	1303.04	1302.96	1302.86	1302.77	1302.62	1302.44	1302.26	1301.97
Bow River	KM 087	104500	Bridge													
Bow River	KM 087	104490	1298.14	1303.04	1302.99	1302.91	1302.84	1302.73	1302.60	1302.55	1302.47	1302.41	1302.30	1302.16	1302.02	1301.78
Bow River	KM 087	104338	1298.60	1302.70	1302.65	1302.58	1302.51	1302.41	1302.30	1302.25	1302.18	1302.12	1302.03	1301.91	1301.78	1301.57
Bow River	KM 087	104163	1298.87	1302.01	1301.97	1301.91	1301.86	1301.77	1301.67	1301.63	1301.57	1301.52	1301.44	1301.33	1301.22	1301.03
Bow River	KM 087	103697	1296.68	1300.43	1300.39	1300.33	1300.28	1300.21	1300.12	1300.08	1300.02	1299.98	1299.89	1299.79	1299.68	1299.50
Bow River	KM 087	103126	1297.33	1299.47	1299.43	1299.37	1299.32	1299.25	1299.16	1299.12	1299.06	1299.02	1298.94	1298.83	1298.72	1298.55
Bow River	KM 087	102497	1295.33	1298.43	1298.39	1298.33	1298.27	1298.19	1298.09	1298.05	1297.99	1297.94	1297.86	1297.74	1297.64	1297.46
Bow River	KM 087	101706	1293.17	1297.67	1297.62	1297.56	1297.50	1297.40	1297.29	1297.24	1297.17	1297.11	1297.01	1296.87	1296.72	1296.48
Bow River	KM 087	101260	1291.01	1296.92	1296.87	1296.80	1296.74	1296.65	1296.55	1296.50	1296.44	1296.38	1296.29	1296.17	1296.05	1295.84
Bow River	KM 087	100785	1292.35	1296.38	1296.31	1296.22	1296.15	1296.05	1295.95	1295.90	1295.85	1295.80	1295.71	1295.61	1295.50	1295.32
Bow River	KM 087	100276	1292.47	1296.06	1295.95	1295.83	1295.73	1295.60	1295.47	1295.43	1295.37	1295.31	1295.23	1295.12	1294.99	1294.76
Bow River	KM 087	99728	1291.59	1295.83	1295.70	1295.54	1295.40	1295.21	1295.01	1294.94	1294.84	1294.76	1294.64	1294.49	1294.33	1294.06
Bow River	KM 087	99027	1290.49	1295.74	1295.60	1295.42	1295.27	1295.05	1294.83	1294.74	1294.62	1294.53	1294.39	1294.22	1294.06	1293.76
Bow River	KM 087	98134	1287.90	1295.62	1295.47	1295.27	1295.10	1294.86	1294.60	1294.49	1294.36	1294.26	1294.09	1293.91	1293.74	1293.44
Bow River	KM 087	97769	1290.55	1295.56	1295.41	1295.20	1295.02	1294.77	1294.50	1294.39	1294.25	1294.14	1293.97	1293.77	1293.60	1293.27
Bow River	KM 087	97378	1289.89	1295.44	1295.28	1295.06	1294.87	1294.60	1294.30	1294.18	1294.02	1293.89	1293.70	1293.48	1293.29	1292.91
Bow River	KM 087	97076	1289.52	1295.36	1295.20	1294.97	1294.78	1294.49	1294.18	1294.06	1293.89	1293.76	1293.56	1293.32	1293.15	1292.74
Bow River	KM 087	96451	1288.84	1295.30	1295.13	1294.90	1294.70	1294.40	1294.08	1293.95	1293.78	1293.64	1293.42	1293.18	1293.01	1292.58
Bow River	KM 087	94012	1287.04	1295.24	1295.07	1294.83	1294.63	1294.33	1294.00	1293.86	1293.69	1293.55	1293.33	1293.08	1292.84	1292.39
Bow River	KM 087	93591	1286.51	1295.23	1295.06	1294.82	1294.62	1294.32	1293.98	1293.85	1293.68	1293.53	1293.32	1293.07	1292.83	1292.38
Bow River	KM 087	93261	1286.49	1295.23	1295.05	1294.82	1294.61	1294.31	1293.98	1293.85	1293.67	1293.53	1293.31	1293.06	1292.83	1292.37
Bow River	KM 087	92667	1285.47	1295.21	1295.03	1294.80	1294.59	1294.29	1293.96	1293.83	1293.65	1293.51	1293.29	1293.05	1292.81	1292.36

River	HEC-RAS Model Sub-Reach	River Station (m)	Channel Thalweg Elevation (m)	Computed Water Surface Elevation (m)												
				1000-Year	750-Year	500-Year	350-Year	200-Year	100-Year	75-Year	50-Year	35-Year	20-Year	10-Year	5-Year	2-Year
Bow River	KM 087	92367	1285.63	1295.14	1294.97	1294.74	1294.53	1294.23	1293.90	1293.77	1293.60	1293.46	1293.25	1293.01	1292.78	1292.33
Bow River	KM 087	92095	1287.55	1295.05	1294.88	1294.65	1294.44	1294.15	1293.82	1293.70	1293.53	1293.39	1293.18	1292.95	1292.73	1292.29
Bow River	KM 087	91818	1287.66	1295.01	1294.84	1294.61	1294.40	1294.10	1293.78	1293.65	1293.48	1293.34	1293.14	1292.91	1292.69	1292.26
Bow River	KM 087	91466	1287.66	1295.01	1294.83	1294.59	1294.38	1294.08	1293.75	1293.63	1293.45	1293.32	1293.11	1292.88	1292.67	1292.23
Bow River	KM 087	91102	1285.48	1294.99	1294.82	1294.58	1294.37	1294.07	1293.73	1293.60	1293.43	1293.29	1293.08	1292.85	1292.63	1292.19
Bow River	KM 087	90778	1285.58	1294.99	1294.81	1294.57	1294.36	1294.06	1293.72	1293.59	1293.41	1293.27	1293.05	1292.82	1292.59	1292.13
Bow River	KM 087	90350	1287.31	1294.98	1294.81	1294.57	1294.35	1294.05	1293.71	1293.57	1293.39	1293.25	1293.03	1292.78	1292.54	1292.06
Bow River	KM 087	89770	1285.67	1294.98	1294.80	1294.56	1294.34	1294.03	1293.69	1293.55	1293.37	1293.22	1292.99	1292.72	1292.45	1291.93
Bow River	KM 087	89451	1286.22	1294.97	1294.79	1294.55	1294.33	1294.02	1293.67	1293.53	1293.34	1293.19	1292.95	1292.67	1292.39	1291.88
Bow River	KM 087	89200	1286.52	1294.96	1294.78	1294.54	1294.32	1294.01	1293.65	1293.51	1293.32	1293.16	1292.92	1292.63	1292.34	1291.83
Bow River	KM 087	88802	1286.44	1294.95	1294.77	1294.52	1294.30	1293.99	1293.63	1293.48	1293.29	1293.12	1292.87	1292.56	1292.24	1291.75
Bow River	KM 087	88345	1287.46	1294.93	1294.75	1294.51	1294.28	1293.96	1293.60	1293.45	1293.25	1293.08	1292.81	1292.48	1292.15	1291.67
Bow River	KM 087	88021	1286.48	1294.91	1294.73	1294.48	1294.26	1293.93	1293.57	1293.42	1293.21	1293.04	1292.77	1292.43	1292.10	1291.61
Bow River	KM 087	87652	1286.62	1294.90	1294.72	1294.47	1294.24	1293.92	1293.55	1293.40	1293.19	1293.02	1292.74	1292.41	1292.07	1291.59
Bow River	KM 087	87519	1287.51	1294.89	1294.70	1294.46	1294.23	1293.91	1293.54	1293.39	1293.18	1293.01	1292.74	1292.40	1292.07	1291.58
Bow River	KM 087	87122	1286.84	1293.41	1293.26	1293.05	1292.85	1292.62	1292.38	1292.28	1292.14	1292.02	1291.83	1291.59	1291.34	1290.96
Bow River	KM 087	86899	1285.51	1292.17	1292.11	1292.02	1291.93	1291.81	1291.65	1291.58	1291.49	1291.41	1291.28	1291.10	1290.92	1290.61
Bow River	KM 025	86717	1287.28	1291.41	1291.36	1291.29	1291.23	1291.19	1291.06	1291.01	1290.95	1290.89	1290.80	1290.67	1290.52	1290.27
Bow River	KM 025	86352	1286.85	1290.41	1290.36	1290.29	1290.22	1290.10	1290.02	1289.95	1289.86	1289.78	1289.66	1289.50	1289.33	1289.09
Bow River	KM 025	86209	1284.03	1289.10	1289.02	1288.93	1288.88	1288.84	1288.68	1288.66	1288.64	1288.62	1288.58	1288.53	1288.44	1288.26
Bow River	KM 025	85929	1284.33	1288.87	1288.78	1288.65	1288.54	1288.37	1288.17	1288.09	1287.98	1287.89	1287.75	1287.58	1287.41	1287.19
Bow River	KM 025	85513	1284.39	1288.76	1288.66	1288.53	1288.41	1288.23	1288.02	1287.93	1287.81	1287.71	1287.56	1287.36	1287.16	1286.89
Bow River	KM 025	85060	1282.89	1288.60	1288.50	1288.36	1288.24	1288.05	1287.83	1287.74	1287.62	1287.51	1287.35	1287.14	1286.92	1286.60
Bow River	KM 025	84733	1282.70	1288.14	1288.05	1287.91	1287.79	1287.60	1287.39	1287.30	1287.18	1287.07	1286.91	1286.69	1286.45	1286.10
Bow River	KM 025	84602	1282.32	1287.69	1287.60	1287.48	1287.37	1287.20	1287.01	1286.93	1286.82	1286.72	1286.58	1286.38	1286.16	1285.84
Bow River	KM 025	84367	1281.74	1287.02	1286.93	1286.81	1286.69	1286.53	1286.32	1286.24	1286.14	1286.04	1285.90	1285.72	1285.54	1285.28
Bow River	KM 025	84072	1281.58	1286.52	1286.43	1286.31	1286.18	1286.01	1285.80	1285.72	1285.61	1285.52	1285.37	1285.19	1285.00	1284.70
Bow River	KM 025	83674	1279.16	1286.03	1285.93	1285.81	1285.69	1285.51	1285.26	1285.17	1285.06	1284.96	1284.80	1284.61	1284.40	1284.04
Bow River	KM 025	83328	1276.16	1285.53	1285.43	1285.28	1285.15	1284.95	1284.71	1284.62	1284.49	1284.37	1284.19	1283.96	1283.73	1283.35
Bow River	KM 025	82904	1277.75	1285.12	1285.02	1284.87	1284.75	1284.56	1284.33	1284.24	1284.12	1284.01	1283.85	1283.64	1283.44	1283.06
Bow River	KM 025	82575	1278.67	1285.01	1284.90	1284.76	1284.62	1284.42	1284.19	1284.10	1283.97	1283.86	1283.69	1283.48	1283.27	1282.88
Bow River	KM 025	82081	1279.51	1284.59	1284.48	1284.33	1284.19	1283.98	1283.73	1283.63	1283.49	1283.37	1283.19	1282.95	1282.72	1282.33
Bow River	KM 025	81556	1278.14	1284.26	1284.15	1284.00	1283.86	1283.65	1283.41	1283.31	1283.18	1283.06	1282.88	1282.65	1282.42	1282.08
Bow River	KM 025	81162	1276.92	1283.97	1283.87	1283.73	1283.61	1283.42	1283.20	1283.11	1282.99	1282.88	1282.71	1282.51	1282.30	1281.98
Bow River	KM 025	80811	1276.58	1283.82	1283.72	1283.59	1283.47	1283.29	1283.07	1282.99	1282.87	1282.77	1282.61	1282.41	1282.21	1281.91
Bow River	KM 025	80511	1277.96	1283.65	1283.56	1283.42	1283.31	1283.13	1282.92	1282.84	1282.72	1282.62	1282.47	1282.28	1282.08	1281.80
Bow River	KM 025	80146	1279.71	1283.23	1283.14	1283.00	1282.89	1282.71	1282.50	1282.42	1282.31	1282.21	1282.06	1281.88	1281.70	1281.44
Bow River	KM 025	79719	1278.88	1282.42	1282.32	1282.20	1282.08	1281.91	1281.71	1281.63	1281.52	1281.43	1281.30	1281.13	1280.97	1280.74
Bow River	KM 025	79688	1278.87	1282.29	1282.20	1282.07	1281.96	1281.79	1281.60	1281.53	1281.42	1281.33	1281.20	1281.03	1280.88	1280.67
Bow River	KM 025	79677.2	Bridge													
Bow River	KM 025	79662	1278.56	1282.13	1282.04	1281.93	1281.82	1281.66	1281.48	1281.41	1281.31	1281.23	1281.10	1280.95	1280.80	1280.61
Bow River	KM 025	79598	1278.73	1282.00	1281.91	1281.79	1281.68	1281.52	1281.34	1281.27	1281.17	1281.09	1280.97	1280.82	1280.68	1280.51
Bow River	KM 025	79245	1277.35	1281.64	1281.55	1281.44	1281.34	1281.20	1281.04	1280.97	1280.89	1280.82	1280.72	1280.61	1280.51	1280.39

River	HEC-RAS Model Sub-Reach	River Station (m)	Channel Thalweg Elevation (m)	Computed Water Surface Elevation (m)												
				1000-Year	750-Year	500-Year	350-Year	200-Year	100-Year	75-Year	50-Year	35-Year	20-Year	10-Year	5-Year	2-Year
Bow River	KM 025	78845	1276.49	1281.47	1281.39	1281.29	1281.19	1281.06	1280.91	1280.85	1280.78	1280.72	1280.63	1280.53	1280.45	1280.35
Bow River	KM 025	78451	1275.08	1281.30	1281.22	1281.12	1281.04	1280.92	1280.79	1280.74	1280.67	1280.62	1280.54	1280.46	1280.39	1280.32
Bow River	KM 025	78039	1274.49	1281.11	1281.04	1280.95	1280.87	1280.76	1280.65	1280.61	1280.55	1280.51	1280.45	1280.39	1280.34	1280.28
Bow River	KM 025	77716	1274.06	1280.63	1280.59	1280.54	1280.49	1280.44	1280.38	1280.36	1280.34	1280.32	1280.30	1280.27	1280.25	1280.23
Bow River	KM 025	77654	1272.02	1280.46	1280.43	1280.40	1280.38	1280.34	1280.31	1280.30	1280.28	1280.27	1280.26	1280.24	1280.23	1280.22
Bow River	KM 025	77638.7	Bridge													
Bow River	KM 025	77609	1274.12	1280.45	1280.42	1280.39	1280.36	1280.33	1280.30	1280.29	1280.28	1280.27	1280.25	1280.24	1280.23	1280.22
Bow River	KM 025	77494	1274.12	1280.20	1280.20	1280.20	1280.20	1280.20	1280.20	1280.20	1280.20	1280.20	1280.20	1280.20	1280.20	1280.20
Bow River	KM 025	77488	1263.10	1266.75	1266.60	1266.39	1266.23	1265.97	1265.68	1265.57	1265.43	1265.29	1265.10	1264.89	1264.68	1264.41
Bow River	KM 025	76811	1251.24	1261.03	1260.78	1260.45	1260.20	1259.82	1259.41	1259.26	1259.06	1258.89	1258.64	1258.37	1258.12	1257.80
Bow River	KM 025	76468	1254.28	1260.76	1260.50	1260.16	1259.90	1259.51	1259.10	1258.94	1258.74	1258.58	1258.34	1258.09	1257.87	1257.60
Bow River	KM 025	76158	1253.29	1260.59	1260.33	1259.97	1259.71	1259.30	1258.88	1258.72	1258.52	1258.36	1258.13	1257.89	1257.69	1257.46
Bow River	KM 025	75774	1251.92	1260.45	1260.18	1259.81	1259.54	1259.13	1258.70	1258.54	1258.34	1258.19	1257.97	1257.75	1257.57	1257.37
Bow River	KM 025	75465	1249.48	1258.65	1258.53	1258.37	1258.25	1258.05	1257.85	1257.77	1257.68	1257.60	1257.50	1257.39	1257.31	1257.22
Bow River	KM 025	75281	1248.77	1259.03	1258.86	1258.62	1258.45	1258.19	1257.94	1257.85	1257.73	1257.64	1257.52	1257.41	1257.32	1257.23
Bow River	KM 025	75120	1245.44	1258.44	1258.33	1258.18	1258.07	1257.89	1257.72	1257.65	1257.57	1257.51	1257.42	1257.33	1257.27	1257.20
Bow River	KM 025	74927	1246.86	1258.45	1258.31	1258.13	1258.00	1257.81	1257.63	1257.57	1257.49	1257.43	1257.36	1257.28	1257.23	1257.17
Bow River	KM 025	74746	1247.68	1257.89	1257.82	1257.71	1257.64	1257.53	1257.43	1257.39	1257.34	1257.31	1257.26	1257.22	1257.18	1257.15
Bow River	KM 025	74376	1251.90	1257.79	1257.71	1257.61	1257.54	1257.44	1257.35	1257.32	1257.28	1257.25	1257.22	1257.18	1257.16	1257.13
Bow River	KM 025	74053	1245.27	1257.13	1257.13	1257.12	1257.12	1257.12	1257.11	1257.11	1257.11	1257.11	1257.11	1257.10	1257.10	1257.10
Bow River	KM 025	73903	1249.68	1257.09	1257.09	1257.09	1257.09	1257.10	1257.10	1257.10	1257.10	1257.10	1257.10	1257.10	1257.10	1257.10
Bow River	KM 025	73863	1249.68	1257.10	1257.10	1257.10	1257.10	1257.10	1257.10	1257.10	1257.10	1257.10	1257.10	1257.10	1257.10	1257.10
Bow River	KM 025	73845	1237.80	1241.97	1241.79	1241.57	1241.39	1241.10	1240.77	1240.65	1240.49	1240.33	1240.11	1239.87	1239.63	1239.32
Bow River	KM 025	73571	1233.14	1239.23	1239.10	1238.94	1238.80	1238.57	1238.27	1238.15	1237.98	1237.84	1237.61	1237.34	1237.10	1236.66
Bow River	KM 025	73410	1232.61	1238.17	1237.95	1237.71	1237.53	1237.28	1237.01	1236.91	1236.77	1236.65	1236.47	1236.25	1236.03	1235.74
Bow River	KM 025	73134	1232.58	1237.88	1237.59	1237.25	1236.99	1236.64	1236.27	1236.14	1235.97	1235.82	1235.61	1235.37	1235.12	1234.77
Bow River	KM 025	72680	1230.55	1237.11	1236.76	1236.31	1235.97	1235.48	1234.93	1234.75	1234.52	1234.34	1234.09	1233.84	1233.63	1233.41
Bow River	KM 025	72441	1229.35	1236.80	1236.42	1235.92	1235.54	1234.96	1234.24	1233.99	1233.65	1233.37	1232.97	1232.50	1232.06	1231.43
Bow River	KM 025	71892	1218.32	1231.50	1231.12	1230.64	1230.17	1229.55	1229.43	1229.36	1229.24	1229.13	1228.94	1228.68	1228.39	1227.98
Bow River	KM 025	71726	1224.68	1229.35	1229.21	1229.03	1228.89	1228.67	1228.40	1228.29	1228.14	1228.01	1227.80	1227.55	1227.30	1226.95
Bow River	KM 025	71458	1222.56	1228.09	1227.91	1227.67	1227.48	1227.19	1226.85	1226.72	1226.55	1226.41	1226.20	1225.96	1225.73	1225.42
Bow River	KM 025	71322	1222.10	1227.53	1227.33	1227.07	1226.85	1226.53	1226.14	1225.99	1225.79	1225.61	1225.35	1225.05	1224.75	1224.36
Bow River	KM 025	70886	1217.99	1226.01	1225.83	1225.58	1225.38	1225.07	1224.69	1224.54	1224.33	1224.15	1223.88	1223.56	1223.25	1222.81
Bow River	KM 025	70342	1218.65	1224.95	1224.75	1224.49	1224.27	1223.95	1223.56	1223.41	1223.20	1223.02	1222.76	1222.44	1222.14	1221.72
Bow River	KM 025	69862	1218.12	1224.32	1224.11	1223.83	1223.61	1223.27	1222.87	1222.71	1222.50	1222.32	1222.05	1221.72	1221.40	1220.96
Bow River	KM 025	69341	1215.97	1222.72	1222.54	1222.31	1222.12	1221.84	1221.50	1221.38	1221.20	1221.05	1220.82	1220.52	1220.23	1219.83
Bow River	KM 025	69060	1215.25	1220.99	1220.78	1220.52	1220.30	1219.97	1219.58	1219.43	1219.22	1219.04	1218.78	1218.48	1218.18	1217.77
Bow River	KM 025	68797	1212.23	1220.21	1220.00	1219.73	1219.52	1219.18	1218.78	1218.63	1218.42	1218.24	1217.97	1217.65	1217.33	1216.88
Bow River	KM 025	68599	1205.03	1219.81	1219.64	1219.42	1219.24	1218.95	1218.61	1218.48	1218.30	1218.15	1217.91	1217.61	1217.32	1216.89
Bow River	KM 025	68516	1213.79	1219.78	1219.60	1219.36	1219.16	1218.86	1218.49	1218.35	1218.15	1217.98	1217.73	1217.43	1217.14	1216.71
Bow River	KM 025	68296	1212.08	1218.92	1218.78	1218.61	1218.46	1218.21	1217.91	1217.79	1217.62	1217.48	1217.26	1217.00	1216.73	1216.34
Bow River	KM 025	68089	1213.46	1218.63	1218.47	1218.25	1218.07	1217.81	1217.49	1217.37	1217.20	1217.06	1216.85	1216.59	1216.34	1215.97
Bow River	KM 025	67716	1212.30	1218.03	1217.86	1217.62	1217.43	1217.15	1216.81	1216.68	1216.50	1216.35	1216.13	1215.85	1215.59	1215.24

River	HEC-RAS Model Sub-Reach	River Station (m)	Channel Thalweg Elevation (m)	Computed Water Surface Elevation (m)												
				1000-Year	750-Year	500-Year	350-Year	200-Year	100-Year	75-Year	50-Year	35-Year	20-Year	10-Year	5-Year	2-Year
Bow River	KM 025	67419	1211.71	1217.45	1217.28	1217.05	1216.87	1216.60	1216.27	1216.14	1215.97	1215.82	1215.60	1215.31	1215.04	1214.67
Bow River	KM 025	67278	1211.62	1216.90	1216.76	1216.56	1216.40	1216.16	1215.87	1215.75	1215.59	1215.46	1215.25	1214.97	1214.71	1214.35
Bow River	KM 025	67115	1210.93	1216.61	1216.46	1216.27	1216.11	1215.86	1215.58	1215.47	1215.31	1215.18	1214.98	1214.68	1214.41	1214.02
Bow River	KM 025	66773	1209.94	1216.27	1216.10	1215.86	1215.67	1215.38	1215.04	1214.91	1214.73	1214.57	1214.34	1214.03	1213.76	1213.36
Bow River	KM 025	66431	1209.94	1215.74	1215.57	1215.36	1215.18	1214.91	1214.57	1214.45	1214.27	1214.12	1213.90	1213.64	1213.39	1213.02
Bow River	KM 025	66144	1209.20	1215.37	1215.20	1214.98	1214.79	1214.51	1214.16	1214.02	1213.84	1213.67	1213.43	1213.14	1212.85	1212.42
Bow River	KM 025	65921	1207.64	1214.21	1214.06	1213.86	1213.70	1213.46	1213.16	1213.05	1212.89	1212.75	1212.54	1212.28	1212.02	1211.63
Bow River	KM 025	65549	1208.02	1213.74	1213.57	1213.34	1213.16	1212.88	1212.53	1212.40	1212.21	1212.07	1211.81	1211.51	1211.23	1210.86
Bow River	KM 025	65150	1206.99	1213.13	1212.98	1212.77	1212.60	1212.33	1212.00	1211.87	1211.68	1211.55	1211.26	1210.91	1210.57	1210.07
Bow River	KM 025	64837	1205.34	1212.18	1212.06	1211.90	1211.77	1211.58	1211.32	1211.23	1211.07	1211.00	1210.75	1210.45	1210.14	1209.68
Bow River	KM 025	64628	1205.64	1211.92	1211.81	1211.67	1211.54	1211.35	1211.11	1211.02	1210.88	1210.73	1210.51	1210.23	1209.94	1209.51
Bow River	KM 025	64302	1205.72	1211.54	1211.43	1211.30	1211.18	1211.01	1210.78	1210.69	1210.56	1210.43	1210.20	1209.91	1209.60	1209.16
Bow River	KM 025	64027	1205.29	1210.92	1210.82	1210.67	1210.56	1210.38	1210.13	1210.04	1209.88	1209.74	1209.51	1209.24	1208.95	1208.48
Bow River	KM 025	63717	1204.73	1210.04	1209.92	1209.78	1209.66	1209.48	1209.26	1209.18	1209.06	1208.95	1208.79	1208.59	1208.34	1207.88
Bow River	KM 025	63212	1203.77	1209.39	1209.26	1209.09	1208.96	1208.77	1208.55	1208.47	1208.35	1208.23	1208.03	1207.75	1207.46	1207.00
Bow River	KM 025	62736	1201.68	1208.79	1208.61	1208.39	1208.21	1207.92	1207.57	1207.44	1207.27	1207.11	1206.88	1206.59	1206.30	1205.88
Bow River	KM 025	62402	1200.62	1208.02	1207.86	1207.64	1207.47	1207.21	1206.89	1206.77	1206.60	1206.46	1206.24	1205.98	1205.73	1205.35
Bow River	KM 025	61981	1200.90	1207.58	1207.40	1207.18	1206.99	1206.70	1206.35	1206.21	1206.02	1205.85	1205.61	1205.33	1205.03	1204.61
Bow River	KM 025	61281	1200.00	1206.30	1206.14	1205.95	1205.78	1205.54	1205.20	1205.07	1204.88	1204.73	1204.48	1204.19	1203.90	1203.50
Bow River	KM 025	60832	1200.17	1205.37	1205.24	1205.08	1204.95	1204.77	1204.45	1204.33	1204.15	1204.00	1203.77	1203.49	1203.21	1202.83
Bow River	KM 025	60261	1199.00	1204.22	1204.14	1204.05	1203.92	1203.77	1203.49	1203.38	1203.22	1203.08	1202.86	1202.59	1202.32	1201.95
Bow River	KM 025	59664	1198.20	1203.32	1203.15	1202.93	1202.75	1202.48	1202.16	1202.04	1201.88	1201.74	1201.52	1201.26	1201.01	1200.67
Bow River	KM 025	59198	1195.99	1202.27	1202.10	1201.87	1201.69	1201.40	1201.07	1200.94	1200.77	1200.62	1200.41	1200.15	1199.90	1199.56
Bow River	KM 025	58730	1195.94	1201.28	1201.08	1200.82	1200.61	1200.30	1199.92	1199.78	1199.59	1199.42	1199.18	1198.88	1198.59	1198.19
Bow River	KM 025	58375	1192.24	1200.34	1200.17	1199.94	1199.76	1199.48	1199.15	1199.02	1198.84	1198.68	1198.45	1198.17	1197.89	1197.50
Bow River	KM 025	57997	1194.29	1199.33	1199.17	1198.96	1198.80	1198.54	1198.22	1198.10	1197.94	1197.79	1197.58	1197.33	1197.08	1196.73
Bow River	KM 025	57624	1192.83	1197.90	1197.75	1197.56	1197.40	1197.16	1196.87	1196.76	1196.61	1196.48	1196.29	1196.07	1195.84	1195.53
Bow River	KM 025	57271	1192.13	1197.24	1197.07	1196.84	1196.66	1196.39	1196.06	1195.94	1195.77	1195.63	1195.42	1195.17	1194.94	1194.62
Bow River	KM 025	56775	1190.54	1196.29	1196.11	1195.88	1195.70	1195.41	1195.07	1194.94	1194.76	1194.61	1194.38	1194.10	1193.84	1193.47
Bow River	KM 025	56284	1189.54	1195.09	1194.91	1194.69	1194.51	1194.25	1193.94	1193.82	1193.66	1193.52	1193.32	1193.08	1192.85	1192.55
Bow River	KM 025	55904	1189.61	1194.66	1194.47	1194.23	1194.04	1193.76	1193.44	1193.31	1193.15	1193.02	1192.82	1192.60	1192.41	1192.19
Bow River	KM 025	55458	1188.00	1194.11	1193.92	1193.69	1193.51	1193.25	1192.96	1192.85	1192.71	1192.60	1192.45	1192.28	1192.15	1192.01
Bow River	KM 025	55088	1187.41	1193.43	1193.28	1193.09	1192.95	1192.76	1192.54	1192.47	1192.37	1192.29	1192.19	1192.09	1192.01	1191.92
Bow River	KM 025	54806	1186.24	1193.56	1193.39	1193.17	1193.01	1192.77	1192.54	1192.46	1192.36	1192.28	1192.18	1192.08	1191.99	1191.91
Bow River	KM 025	54585	1186.38	1193.50	1193.33	1193.11	1192.95	1192.73	1192.50	1192.43	1192.33	1192.25	1192.15	1192.05	1191.98	1191.90
Bow River	KM 025	54487	1185.78	1193.07	1192.93	1192.76	1192.63	1192.46	1192.29	1192.23	1192.16	1192.11	1192.04	1191.97	1191.92	1191.87
Bow River	KM 025	54458.2	Bridge													
Bow River	KM 025	54433	1184.57	1192.49	1192.42	1192.35	1192.28	1192.20	1192.11	1192.07	1192.03	1192.00	1191.96	1191.91	1191.88	1191.85
Bow River	KM 025	54283	1186.26	1192.55	1192.48	1192.39	1192.32	1192.23	1192.13	1192.09	1192.05	1192.01	1191.97	1191.92	1191.88	1191.85
Bow River	KM 025	54078	1185.21	1192.51	1192.44	1192.36	1192.29	1192.20	1192.10	1192.07	1192.03	1191.99	1191.95	1191.91	1191.88	1191.84
Bow River	KM 025	53802	1184.91	1192.42	1192.36	1192.28	1192.22	1192.14	1192.06	1192.03	1191.99	1191.96	1191.93	1191.89	1191.86	1191.84
Bow River	KM 025	53388	1184.23	1192.26	1192.21	1192.15	1192.11	1192.05	1191.98	1191.96	1191.94	1191.92	1191.89	1191.87	1191.85	1191.83
Bow River	KM 025	52796	1183.07	1192.13	1192.09	1192.05	1192.01	1191.97	1191.93	1191.91	1191.89	1191.88	1191.86	1191.84	1191.83	1191.82

River	HEC-RAS Model Sub-Reach	River Station (m)	Channel Thalweg Elevation (m)	Computed Water Surface Elevation (m)												
				1000-Year	750-Year	500-Year	350-Year	200-Year	100-Year	75-Year	50-Year	35-Year	20-Year	10-Year	5-Year	2-Year
Bow River	KM 025	52139	1182.64	1192.02	1192.00	1191.97	1191.94	1191.91	1191.88	1191.87	1191.86	1191.85	1191.84	1191.83	1191.82	1191.81
Bow River	KM 025	51427	1180.30	1191.90	1191.89	1191.88	1191.87	1191.85	1191.84	1191.83	1191.83	1191.82	1191.82	1191.81	1191.81	1191.81
Bow River	KM 025	50452	1181.18	1191.79	1191.79	1191.79	1191.79	1191.79	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80
Bow River	KM 025	49366	1179.02	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80
Bow River	KM 025	48977	1175.55	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80
Bow River	KM 025	47540	1171.71	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80
Bow River	KM 025	45971	1168.16	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80
Bow River	KM 025	44631	1165.58	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80
Bow River	KM 025	42928	1163.59	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80
Bow River	KM 025	42170	1163.59	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80	1191.80
Bow River	KM 025	42132	1158.00	1164.25	1164.06	1163.82	1163.61	1163.30	1162.92	1162.78	1162.53	1162.32	1162.00	1161.59	1161.18	1160.58
Bow River	KM 025	41824	1154.33	1163.47	1163.26	1162.99	1162.73	1162.36	1161.92	1161.76	1161.53	1161.34	1161.03	1160.67	1160.32	1159.84
Bow River	KM 025	41537	1156.09	1162.82	1162.65	1162.40	1162.17	1161.83	1161.44	1161.29	1161.07	1160.89	1160.60	1160.25	1159.91	1159.45
Bow River	KM 025	41361	1155.94	1162.34	1162.14	1161.89	1161.65	1161.32	1160.93	1160.79	1160.57	1160.39	1160.11	1159.77	1159.44	1158.99
Bow River	KM 025	40989	1155.19	1161.01	1160.81	1160.55	1160.31	1159.98	1159.61	1159.48	1159.28	1159.12	1158.87	1158.58	1158.30	1157.90
Bow River	KM 025	40712	1153.74	1160.83	1160.58	1160.25	1159.96	1159.57	1159.15	1159.01	1158.80	1158.63	1158.38	1158.10	1157.84	1157.49
Bow River	KM 025	40439	1154.47	1160.58	1160.32	1159.98	1159.67	1159.24	1158.77	1158.60	1158.35	1158.16	1157.87	1157.55	1157.27	1156.92
Bow River	KM 025	40129	1153.14	1159.91	1159.66	1159.32	1159.01	1158.58	1158.09	1157.91	1157.65	1157.44	1157.11	1156.74	1156.38	1155.92
Bow River	KM 025	39836	1152.38	1159.44	1159.17	1158.82	1158.48	1158.01	1157.47	1157.27	1156.97	1156.74	1156.36	1155.93	1155.52	1154.97
Bow River	KM 025	39478	1150.20	1158.11	1157.89	1157.60	1157.32	1156.93	1156.46	1156.29	1156.03	1155.82	1155.48	1155.09	1154.70	1154.18
Bow River	KM 025	39161	1149.88	1157.32	1157.13	1156.87	1156.61	1156.25	1155.83	1155.67	1155.43	1155.24	1154.93	1154.58	1154.24	1153.78
Bow River	KM 025	38875	1150.09	1156.83	1156.63	1156.35	1156.08	1155.71	1155.27	1155.10	1154.85	1154.66	1154.34	1153.99	1153.66	1153.25
Bow River	KM 025	38529	1149.55	1156.39	1156.16	1155.86	1155.57	1155.16	1154.67	1154.49	1154.21	1153.98	1153.61	1153.19	1152.80	1152.28
Bow River	KM 025	38248	1147.77	1155.51	1155.28	1155.00	1154.74	1154.36	1153.91	1153.75	1153.49	1153.28	1152.93	1152.54	1152.14	1151.60
Bow River	KM 025	38018	1146.99	1154.87	1154.66	1154.38	1154.11	1153.74	1153.29	1153.13	1152.89	1152.69	1152.36	1151.98	1151.61	1151.12
Bow River	KM 025	37774	1147.19	1154.64	1154.42	1154.13	1153.86	1153.48	1153.02	1152.85	1152.60	1152.39	1152.05	1151.65	1151.26	1150.73
Bow River	KM 025	37502	1145.24	1153.74	1153.53	1153.26	1153.01	1152.66	1152.26	1152.11	1151.89	1151.72	1151.43	1151.10	1150.77	1150.32
Bow River	KM 025	37086	1146.40	1152.89	1152.67	1152.39	1152.13	1151.78	1151.37	1151.22	1151.00	1150.83	1150.55	1150.24	1149.94	1149.55
Bow River	KM 025	36785	1145.87	1152.17	1151.95	1151.66	1151.40	1151.03	1150.61	1150.47	1150.24	1150.07	1149.79	1149.47	1149.17	1148.75
Bow River	KM 025	36450	1144.88	1151.41	1151.17	1150.86	1150.57	1150.16	1149.69	1149.52	1149.26	1149.05	1148.73	1148.37	1148.02	1147.56
Bow River	KM 025	36158	1143.81	1150.39	1150.18	1149.90	1149.64	1149.27	1148.85	1148.69	1148.45	1148.26	1147.95	1147.59	1147.24	1146.76
Bow River	KM 025	35863	1142.37	1149.37	1149.19	1148.96	1148.73	1148.42	1148.05	1147.91	1147.71	1147.54	1147.26	1146.94	1146.62	1146.16
Bow River	KM 025	35381	1142.19	1148.45	1148.22	1147.92	1147.66	1147.31	1146.91	1146.77	1146.56	1146.39	1146.13	1145.83	1145.54	1145.16
Bow River	KM 025	35009	1141.67	1147.47	1147.25	1146.97	1146.70	1146.33	1145.92	1145.77	1145.54	1145.36	1145.09	1144.78	1144.49	1144.12
Bow River	KM 025	34562	1140.94	1146.83	1146.60	1146.30	1146.02	1145.62	1145.16	1145.00	1144.75	1144.55	1144.23	1143.87	1143.53	1143.09
Bow River	KM 025	34140	1139.49	1146.02	1145.80	1145.51	1145.23	1144.84	1144.38	1144.22	1143.97	1143.77	1143.44	1143.08	1142.73	1142.24
Bow River	KM 025	33877	1138.96	1145.33	1145.10	1144.81	1144.55	1144.18	1143.74	1143.58	1143.35	1143.15	1142.85	1142.50	1142.16	1141.67
Bow River	KM 025	33609	1137.40	1144.66	1144.46	1144.20	1143.96	1143.60	1143.19	1143.04	1142.81	1142.63	1142.34	1142.01	1141.70	1141.22
Bow River	KM 025	33289	1137.84	1144.17	1143.96	1143.68	1143.42	1143.04	1142.60	1142.43	1142.19	1141.99	1141.67	1141.31	1140.96	1140.43
Bow River	KM 025	32977	1136.09	1143.22	1143.04	1142.80	1142.58	1142.24	1141.84	1141.69	1141.46	1141.28	1140.98	1140.64	1140.30	1139.82
Bow River	KM 025	32605	1136.77	1142.55	1142.36	1142.12	1141.89	1141.56	1141.15	1141.00	1140.78	1140.61	1140.32	1140.00	1139.67	1139.18
Bow River	KM 025	32220	1134.71	1141.87	1141.69	1141.43	1141.21	1140.83	1140.38	1140.21	1139.96	1139.75	1139.42	1139.03	1138.67	1138.18
Bow River	KM 025	31935	1134.82	1141.39	1141.21	1140.96	1140.75	1140.41	1139.99	1139.83	1139.59	1139.39	1139.08	1138.71	1138.36	1137.88

River	HEC-RAS Model Sub-Reach	River Station (m)	Channel Thalweg Elevation (m)	Computed Water Surface Elevation (m)												
				1000-Year	750-Year	500-Year	350-Year	200-Year	100-Year	75-Year	50-Year	35-Year	20-Year	10-Year	5-Year	2-Year
Bow River	KM 025	31588	1134.51	1140.80	1140.58	1140.30	1140.04	1139.69	1139.27	1139.12	1138.89	1138.70	1138.40	1138.05	1137.71	1137.27
Bow River	KM 025	31260	1133.78	1140.14	1139.94	1139.68	1139.44	1139.10	1138.66	1138.49	1138.24	1138.04	1137.72	1137.35	1137.01	1136.54
Bow River	KM 025	30935	1132.78	1139.60	1139.39	1139.10	1138.82	1138.44	1137.99	1137.84	1137.60	1137.41	1137.10	1136.74	1136.39	1135.92
Bow River	KM 025	30566	1132.33	1138.58	1138.38	1138.13	1137.88	1137.54	1137.14	1137.00	1136.77	1136.59	1136.28	1135.91	1135.54	1135.03
Bow River	KM 025	30214	1130.92	1138.10	1137.88	1137.59	1137.32	1136.94	1136.49	1136.33	1136.08	1135.89	1135.57	1135.19	1134.82	1134.32
Bow River	KM 025	29937	1130.72	1137.22	1137.06	1136.86	1136.67	1136.38	1136.02	1135.89	1135.66	1135.49	1135.20	1134.84	1134.48	1134.00
Bow River	KM 025	29563	1130.34	1136.75	1136.57	1136.34	1136.13	1135.81	1135.40	1135.26	1135.03	1134.85	1134.56	1134.19	1133.81	1133.32
Bow River	KM 025	29172	1129.51	1136.26	1136.06	1135.81	1135.57	1135.22	1134.77	1134.63	1134.35	1134.13	1133.76	1133.37	1133.00	1132.50
Bow River	KM 025	28925	1128.19	1135.69	1135.47	1135.18	1134.91	1134.51	1134.07	1133.98	1133.74	1133.55	1133.24	1132.88	1132.54	1132.07
Bow River	KM 025	28798	1128.25	1135.60	1135.39	1135.11	1134.85	1134.45	1133.97	1133.74	1133.49	1133.28	1132.96	1132.58	1132.23	1131.75
Bow River	KM 025	28448	1127.89	1134.87	1134.62	1134.31	1134.02	1133.62	1133.16	1132.99	1132.74	1132.54	1132.21	1131.84	1131.48	1130.99
Bow River	KM 025	27998	1126.66	1133.97	1133.73	1133.43	1133.15	1132.75	1132.29	1132.12	1131.87	1131.67	1131.34	1130.98	1130.63	1130.16
Bow River	KM 025	27701	1126.73	1133.64	1133.38	1133.04	1132.74	1132.31	1131.84	1131.67	1131.41	1131.20	1130.86	1130.49	1130.13	1129.66
Bow River	KM 025	27469	1125.55	1133.17	1132.90	1132.55	1132.23	1131.80	1131.32	1131.14	1130.88	1130.67	1130.33	1129.95	1129.59	1129.14
Bow River	KM 025	27386	1125.57	1132.50	1132.29	1132.01	1131.76	1131.40	1130.98	1130.83	1130.60	1130.41	1130.11	1129.76	1129.42	1128.99
Bow River	KM 025	27372.4	Bridge													
Bow River	KM 025	27359	1125.83	1132.12	1131.94	1131.70	1131.47	1131.15	1130.77	1130.63	1130.42	1130.25	1129.97	1129.63	1129.32	1128.91
Bow River	KM 025	27295	1126.05	1132.17	1131.97	1131.71	1131.46	1131.12	1130.72	1130.57	1130.35	1130.17	1129.88	1129.53	1129.20	1128.78
Bow River	KM 025	27116	1125.38	1131.76	1131.55	1131.28	1131.04	1130.69	1130.29	1130.14	1129.91	1129.73	1129.44	1129.04	1128.68	1128.19
Bow River	KM 025	26844	1124.09	1131.26	1131.04	1130.76	1130.50	1130.14	1129.73	1129.58	1129.37	1129.20	1128.94	1128.54	1128.19	1127.74
Bow River	KM 025	26671	1125.09	1131.22	1131.00	1130.71	1130.44	1130.07	1129.64	1129.49	1129.26	1129.09	1128.82	1128.39	1128.02	1127.56
Bow River	KM 025	26466	1123.93	1131.03	1130.79	1130.48	1130.20	1129.80	1129.34	1129.17	1128.92	1128.73	1128.43	1127.95	1127.57	1127.10
Bow River	KM 025	26203	1122.86	1130.16	1129.94	1129.65	1129.38	1128.99	1128.54	1128.38	1128.13	1127.93	1127.61	1127.26	1126.92	1126.47
Bow River	KM 025	25944	1122.94	1129.81	1129.56	1129.25	1128.97	1128.57	1128.10	1127.92	1127.66	1127.45	1127.12	1126.74	1126.38	1125.89
Bow River	KM 025	25748	1122.27	1129.48	1129.23	1128.90	1128.61	1128.20	1127.72	1127.54	1127.28	1127.07	1126.74	1126.36	1126.00	1125.51
Bow River	KM 025	25534	1122.50	1129.18	1128.92	1128.58	1128.28	1127.86	1127.35	1127.16	1126.88	1126.66	1126.30	1125.90	1125.54	1125.07
Bow River	KM 025	25343	1122.22	1129.03	1128.76	1128.43	1128.13	1127.70	1127.18	1126.98	1126.70	1126.46	1126.09	1125.66	1125.27	1124.76
Bow River	KM 025	25205	1121.93	1128.90	1128.62	1128.27	1127.96	1127.53	1127.01	1126.80	1126.51	1126.27	1125.88	1125.45	1125.04	1124.51
Bow River	KM 025	24999	1121.02	1128.53	1128.24	1127.86	1127.53	1127.07	1126.50	1126.27	1125.97	1125.73	1125.35	1124.93	1124.53	1124.00
Bow River	KM 025	24879	1120.60	1128.30	1128.01	1127.61	1127.28	1126.80	1126.25	1126.02	1125.72	1125.48	1125.08	1124.64	1124.22	1123.66
Bow River	KM 023	24684	1120.58	1127.99	1127.72	1127.34	1127.02	1126.57	1126.01	1125.77	1125.46	1125.20	1124.77	1124.31	1123.86	1123.27
Bow River	KM 023	24482	1118.84	1127.03	1126.76	1126.39	1126.07	1125.62	1125.11	1124.90	1124.63	1124.40	1124.05	1123.66	1123.27	1122.76
Bow River	KM 023	24338	1119.10	1126.65	1126.37	1125.99	1125.68	1125.24	1124.73	1124.54	1124.27	1124.06	1123.73	1123.36	1123.00	1122.52
Bow River	KM 023	24132	1119.53	1126.45	1126.16	1125.75	1125.41	1124.93	1124.38	1124.16	1123.88	1123.66	1123.31	1122.92	1122.55	1122.07
Bow River	KM 023	24010	1119.38	1126.31	1126.00	1125.58	1125.22	1124.71	1124.13	1123.90	1123.61	1123.38	1123.02	1122.62	1122.22	1121.69
Bow River	KM 023	23713	1118.09	1126.13	1125.81	1125.37	1124.99	1124.45	1123.81	1123.55	1123.21	1122.94	1122.53	1122.05	1121.56	1120.94
Bow River	KM 023	23562	1117.16	1125.90	1125.59	1125.14	1124.76	1124.20	1123.52	1123.24	1122.87	1122.57	1122.13	1121.65	1121.20	1120.59
Bow River	KM 023	23415	1116.59	1125.10	1124.85	1124.48	1124.17	1123.70	1123.13	1122.88	1122.56	1122.31	1121.90	1121.43	1120.97	1120.35
Bow River	KM 023	23401.3	Bridge													
Bow River	KM 023	23391	1116.61	1124.63	1124.43	1124.12	1123.85	1123.44	1122.90	1122.67	1122.36	1122.12	1121.72	1121.28	1120.83	1120.23
Bow River	KM 023	23317	1117.14	1124.55	1124.33	1123.99	1123.70	1123.31	1122.77	1122.52	1122.21	1121.95	1121.53	1121.05	1120.61	1120.03
Bow River	KM 023	23130	1116.68	1124.35	1124.13	1123.77	1123.48	1123.01	1122.43	1122.19	1121.87	1121.61	1121.19	1120.72	1120.27	1119.69
Bow River	KM 023	22973	1116.75	1124.17	1123.93	1123.55	1123.24	1122.77	1122.14	1121.87	1121.51	1121.22	1120.75	1120.26	1119.81	1119.23

River	HEC-RAS Model Sub-Reach	River Station (m)	Channel Thalweg Elevation (m)	Computed Water Surface Elevation (m)												
				1000-Year	750-Year	500-Year	350-Year	200-Year	100-Year	75-Year	50-Year	35-Year	20-Year	10-Year	5-Year	2-Year
Bow River	KM 000	22894	1116.77	1124.17	1123.94	1123.56	1123.25	1122.77	1122.16	1121.89	1121.51	1121.20	1120.72	1120.18	1119.69	1119.06
Bow River	KM 000	22726	1115.96	1123.76	1123.52	1123.08	1122.75	1122.27	1121.69	1121.44	1121.09	1120.81	1120.35	1119.83	1119.33	1118.68
Bow River	KM 000	22599	1115.22	1123.47	1123.19	1122.58	1122.22	1121.73	1121.18	1120.95	1120.64	1120.39	1119.97	1119.50	1119.05	1118.44
Bow River	KM 000	22340	1114.30	1123.24	1122.96	1122.27	1121.87	1121.32	1120.69	1120.46	1120.14	1119.89	1119.48	1119.02	1118.59	1118.00
Bow River	KM 000	22028	1114.08	1122.88	1122.62	1121.91	1121.52	1120.99	1120.38	1120.14	1119.82	1119.55	1119.12	1118.65	1118.19	1117.58
Bow River	KM 000	21803	1113.22	1121.82	1121.66	1120.70	1120.38	1119.95	1119.45	1119.26	1119.00	1118.78	1118.43	1118.04	1117.65	1117.13
Bow River	KM 000	21608	1113.34	1121.74	1121.58	1120.46	1120.11	1119.64	1119.12	1118.91	1118.64	1118.42	1118.07	1117.68	1117.30	1116.81
Bow River	KM 000	21421	1114.08	1121.58	1121.44	1120.17	1119.80	1119.31	1118.76	1118.55	1118.26	1118.04	1117.68	1117.29	1116.92	1116.46
Bow River	KM 000	21274	1114.14	1121.50	1121.36	1120.00	1119.62	1119.11	1118.53	1118.30	1118.01	1117.77	1117.40	1116.99	1116.61	1116.13
Bow River	KM 000	21235	1113.94	1121.41	1121.28	1119.82	1119.46	1118.97	1118.41	1118.18	1117.89	1117.66	1117.29	1116.88	1116.50	1116.03
Bow River	KM 000	21224.5	Bridge													
Bow River	KM 000	21217	1113.78	1120.34	1120.04	1119.64	1119.29	1118.82	1118.28	1118.06	1117.78	1117.55	1117.19	1116.79	1116.41	1115.95
Bow River	KM 000	21170	1113.43	1120.32	1120.02	1119.60	1119.25	1118.77	1118.22	1118.00	1117.71	1117.47	1117.10	1116.69	1116.30	1115.79
Bow River	KM 000	21030	1112.90	1120.19	1119.89	1119.47	1119.11	1118.61	1118.04	1117.81	1117.51	1117.26	1116.87	1116.42	1115.98	1115.39
Bow River	KM 000	20876	1111.95	1119.76	1119.45	1119.03	1118.68	1118.19	1117.59	1117.35	1117.03	1116.76	1116.34	1115.89	1115.47	1114.93
Bow River	KM 000	20666	1111.81	1119.37	1119.08	1118.68	1118.34	1117.85	1117.28	1117.04	1116.73	1116.47	1116.06	1115.62	1115.19	1114.64
Bow River	KM 000	20496	1111.64	1119.08	1118.79	1118.38	1118.03	1117.53	1116.95	1116.73	1116.42	1116.17	1115.77	1115.33	1114.91	1114.37
Bow River	KM 000	20329	1111.20	1118.82	1118.52	1118.11	1117.76	1117.26	1116.69	1116.46	1116.16	1115.91	1115.52	1115.09	1114.68	1114.16
Bow River	KM 000	20174	1111.53	1118.67	1118.37	1117.95	1117.60	1117.10	1116.51	1116.28	1115.97	1115.72	1115.31	1114.87	1114.46	1113.94
Bow River	KM 000	19933	1110.38	1118.46	1118.13	1117.67	1117.29	1116.77	1116.17	1115.93	1115.61	1115.34	1114.90	1114.42	1113.95	1113.36
Bow River	KM 000	19798	1110.05	1118.12	1117.81	1117.37	1117.00	1116.48	1115.88	1115.65	1115.32	1115.05	1114.60	1114.11	1113.64	1113.01
Bow River	KM 000	19603	1107.94	1116.66	1116.42	1116.08	1115.78	1115.37	1114.88	1114.69	1114.42	1114.20	1113.86	1113.48	1113.11	1112.57
Bow River	KM 000	19507	1107.64	1116.53	1116.20	1115.83	1115.52	1115.08	1114.59	1114.40	1114.17	1113.97	1113.66	1113.30	1112.95	1112.44
Bow River	KM 000	19342	1108.98	1116.14	1115.92	1115.55	1115.24	1114.80	1114.30	1114.11	1113.86	1113.67	1113.35	1113.01	1112.69	1112.21
Bow River	KM 000	19150	1109.59	1116.35	1116.05	1115.62	1115.25	1114.72	1114.16	1113.95	1113.67	1113.45	1113.12	1112.77	1112.46	1111.98
Bow River	KM 000	18984	1108.48	1116.26	1115.95	1115.52	1115.14	1114.61	1114.02	1113.79	1113.49	1113.25	1112.89	1112.52	1112.18	1111.63
Bow River	KM 000	18840	1108.47	1116.02	1115.72	1115.30	1114.92	1114.38	1113.76	1113.52	1113.21	1112.95	1112.56	1112.14	1111.77	1111.25
Bow River	KM 000	18709	1108.13	1115.86	1115.56	1115.13	1114.75	1114.20	1113.57	1113.33	1113.01	1112.74	1112.33	1111.89	1111.49	1110.98
Bow River	KM 000	18500	1107.46	1115.56	1115.25	1114.83	1114.46	1113.91	1113.28	1113.03	1112.70	1112.42	1111.98	1111.50	1111.05	1110.46
Bow River	KM 000	18270	1106.42	1114.00	1113.79	1113.46	1113.17	1112.76	1112.28	1112.08	1111.82	1111.60	1111.24	1110.83	1110.44	1109.90
Bow River	KM 000	17960	1106.36	1113.47	1113.20	1112.85	1112.55	1112.14	1111.66	1111.48	1111.23	1111.02	1110.69	1110.31	1109.95	1109.45
Bow River	KM 000	17680	1106.16	1113.48	1113.20	1112.81	1112.47	1112.00	1111.46	1111.25	1110.98	1110.74	1110.36	1109.93	1109.53	1108.99
Bow River	KM 000	17298	1105.17	1112.93	1112.64	1112.23	1111.87	1111.36	1110.74	1110.50	1110.17	1109.90	1109.47	1109.02	1108.59	1108.05
Bow River	KM 000	16969	1104.90	1112.45	1112.19	1111.81	1111.48	1110.98	1110.38	1110.14	1109.81	1109.54	1109.10	1108.60	1108.13	1107.50
Bow River	KM 000	16703	1103.38	1111.40	1111.19	1110.90	1110.64	1110.22	1109.68	1109.46	1109.16	1108.90	1108.50	1108.06	1107.64	1107.07
Bow River	KM 000	16437	1103.54	1111.11	1110.89	1110.58	1110.31	1109.89	1109.36	1109.15	1108.84	1108.59	1108.19	1107.76	1107.34	1106.80
Bow River	KM 000	16269	1104.13	1110.95	1110.71	1110.37	1110.06	1109.65	1109.12	1108.90	1108.59	1108.34	1107.94	1107.50	1107.09	1106.56
Bow River	KM 000	16024	1103.27	1110.53	1110.27	1109.92	1109.62	1109.21	1108.70	1108.49	1108.18	1107.93	1107.52	1107.09	1106.67	1106.14
Bow River	KM 000	15830	1102.65	1110.16	1109.92	1109.58	1109.30	1108.89	1108.39	1108.18	1107.87	1107.60	1107.18	1106.72	1106.29	1105.76
Bow River	KM 000	15648	1102.88	1110.10	1109.86	1109.53	1109.25	1108.82	1108.29	1108.07	1107.74	1107.46	1107.00	1106.50	1106.02	1105.41
Bow River	KM 000	15440	1101.72	1109.47	1109.22	1108.87	1108.57	1108.15	1107.62	1107.43	1107.12	1106.86	1106.45	1105.99	1105.55	1104.96
Bow River	KM 000	15224	1101.71	1109.23	1108.96	1108.60	1108.28	1107.83	1107.32	1107.12	1106.81	1106.56	1106.14	1105.68	1105.23	1104.64
Bow River	KM 000	14981	1101.06	1108.91	1108.62	1108.23	1107.89	1107.39	1106.84	1106.60	1106.31	1106.06	1105.67	1105.23	1104.80	1104.23

River	HEC-RAS Model Sub-Reach	River Station (m)	Channel Thalweg Elevation (m)	Computed Water Surface Elevation (m)												
				1000-Year	750-Year	500-Year	350-Year	200-Year	100-Year	75-Year	50-Year	35-Year	20-Year	10-Year	5-Year	2-Year
Bow River	KM 000	14763	1100.47	1108.41	1108.12	1107.72	1107.37	1106.87	1106.30	1106.09	1105.80	1105.57	1105.19	1104.76	1104.35	1103.80
Bow River	KM 000	14383	1099.61	1107.18	1106.95	1106.63	1106.34	1105.93	1105.44	1105.25	1104.99	1104.77	1104.42	1104.04	1103.68	1103.17
Bow River	KM 000	14213	1100.24	1106.92	1106.69	1106.35	1106.06	1105.63	1105.12	1104.93	1104.66	1104.44	1104.09	1103.71	1103.34	1102.82
Bow River	KM 000	13874	1098.60	1106.41	1106.15	1105.80	1105.48	1105.01	1104.46	1104.24	1103.95	1103.71	1103.31	1102.87	1102.44	1101.88
Bow River	KM 000	13626	1098.65	1105.78	1105.55	1105.22	1104.93	1104.49	1103.93	1103.72	1103.43	1103.19	1102.80	1102.38	1101.99	1101.46
Bow River	KM 000	13399	1098.17	1105.63	1105.39	1105.05	1104.76	1104.31	1103.75	1103.53	1103.23	1102.99	1102.58	1102.12	1101.70	1101.14
Bow River	KM 000	13018	1097.12	1104.67	1104.41	1104.06	1103.75	1103.32	1102.81	1102.61	1102.34	1102.13	1101.77	1101.37	1101.00	1100.51
Bow River	KM 000	12701	1096.70	1104.23	1103.94	1103.55	1103.22	1102.74	1102.19	1101.99	1101.72	1101.50	1101.12	1100.70	1100.29	1099.78
Bow River	KM 000	12451	1096.56	1103.89	1103.59	1103.18	1102.82	1102.32	1101.71	1101.47	1101.16	1100.90	1100.51	1100.07	1099.64	1099.13
Bow River	KM 000	12234	1095.15	1103.46	1103.16	1102.76	1102.41	1101.90	1101.31	1101.08	1100.78	1100.53	1100.15	1099.73	1099.33	1098.82
Bow River	KM 000	11894	1096.38	1103.15	1102.86	1102.46	1102.11	1101.59	1100.98	1100.74	1100.43	1100.15	1099.75	1099.29	1098.86	1098.31
Bow River	KM 000	11503	1094.24	1102.07	1101.81	1101.47	1101.16	1100.69	1100.14	1099.92	1099.65	1099.41	1099.04	1098.61	1098.19	1097.63
Bow River	KM 000	11230	1094.31	1101.43	1101.16	1100.80	1100.50	1100.08	1099.57	1099.37	1099.12	1098.89	1098.55	1098.15	1097.76	1097.23
Bow River	KM 000	10967	1093.98	1101.20	1100.92	1100.54	1100.22	1099.76	1099.21	1098.99	1098.73	1098.49	1098.14	1097.73	1097.34	1096.86
Bow River	KM 000	10591	1093.90	1100.82	1100.52	1100.12	1099.77	1099.28	1098.70	1098.48	1098.20	1097.94	1097.56	1097.13	1096.69	1096.15
Bow River	KM 000	10200	1092.02	1100.12	1099.82	1099.42	1099.07	1098.53	1097.87	1097.60	1097.28	1097.00	1096.60	1096.13	1095.68	1095.13
Bow River	KM 000	10063	1092.24	1100.09	1099.79	1099.38	1099.02	1098.47	1097.79	1097.51	1097.16	1096.86	1096.41	1095.91	1095.45	1094.90
Bow River	KM 000	9667	1090.48	1099.29	1099.00	1098.64	1098.33	1097.85	1097.21	1096.94	1096.61	1096.30	1095.82	1095.26	1094.72	1094.03
Bow River	KM 000	9467	1090.23	1099.01	1098.69	1098.28	1097.92	1097.38	1096.76	1096.51	1096.20	1095.91	1095.47	1094.94	1094.43	1093.74
Bow River	KM 000	9283	1089.22	1098.59	1098.23	1097.76	1097.37	1096.86	1096.29	1096.06	1095.78	1095.51	1095.12	1094.64	1094.17	1093.53
Bow River	KM 000	9041	1090.28	1098.57	1098.22	1097.75	1097.35	1096.78	1096.12	1095.86	1095.53	1095.25	1094.84	1094.35	1093.89	1093.26
Bow River	KM 000	8729	1089.02	1097.16	1096.91	1096.57	1096.28	1095.86	1095.35	1095.15	1094.89	1094.65	1094.28	1093.83	1093.40	1092.80
Bow River	KM 000	8459	1088.82	1096.64	1096.40	1096.08	1095.81	1095.42	1094.95	1094.75	1094.51	1094.29	1093.94	1093.51	1093.10	1092.51
Bow River	KM 000	8192	1088.20	1096.55	1096.28	1095.93	1095.63	1095.20	1094.69	1094.49	1094.23	1093.99	1093.61	1093.16	1092.73	1092.12
Bow River	KM 000	7916	1087.98	1095.95	1095.68	1095.32	1095.01	1094.57	1094.06	1093.85	1093.60	1093.37	1093.03	1092.63	1092.24	1091.74
Bow River	KM 000	7653	1088.09	1095.62	1095.35	1094.98	1094.66	1094.22	1093.70	1093.49	1093.24	1093.02	1092.70	1092.33	1091.96	1091.52
Bow River	KM 000	7469	1087.46	1095.17	1094.91	1094.57	1094.28	1093.87	1093.39	1093.19	1092.96	1092.76	1092.46	1092.12	1091.80	1091.41
Bow River	KM 000	7251	1087.35	1094.40	1094.21	1093.95	1093.73	1093.41	1093.03	1092.87	1092.68	1092.51	1092.25	1091.96	1091.67	1091.33
Bow River	KM 000	7027	1087.83	1094.26	1094.05	1093.76	1093.53	1093.19	1092.80	1092.65	1092.45	1092.29	1092.04	1091.77	1091.52	1091.24
Bow River	KM 000	6740	1085.52	1093.83	1093.62	1093.33	1093.10	1092.76	1092.39	1092.24	1092.06	1091.91	1091.69	1091.46	1091.27	1091.08
Bow River	KM 000	6416	1086.53	1093.37	1093.16	1092.88	1092.64	1092.32	1091.97	1091.83	1091.68	1091.55	1091.38	1091.21	1091.09	1090.99
Bow River	KM 000	6005	1086.14	1093.04	1092.83	1092.57	1092.35	1092.05	1091.74	1091.63	1091.50	1091.39	1091.25	1091.13	1091.04	1090.96
Bow River	KM 000	5633	1084.80	1092.82	1092.62	1092.37	1092.17	1091.90	1091.61	1091.51	1091.40	1091.31	1091.19	1091.08	1091.01	1090.95
Bow River	KM 000	5196	1084.61	1092.63	1092.45	1092.21	1092.02	1091.77	1091.51	1091.42	1091.32	1091.24	1091.14	1091.05	1090.99	1090.94
Bow River	KM 000	4675	1082.64	1092.31	1092.15	1091.94	1091.78	1091.57	1091.36	1091.29	1091.21	1091.15	1091.08	1091.01	1090.97	1090.93
Bow River	KM 000	4201	1082.20	1091.97	1091.84	1091.67	1091.54	1091.38	1091.23	1091.17	1091.12	1091.07	1091.02	1090.98	1090.94	1090.92
Bow River	KM 000	3744	1083.83	1091.76	1091.65	1091.50	1091.40	1091.27	1091.15	1091.11	1091.06	1091.03	1090.99	1090.96	1090.93	1090.91
Bow River	KM 000	3204	1080.68	1091.51	1091.42	1091.32	1091.24	1091.15	1091.06	1091.03	1091.01	1090.98	1090.96	1090.94	1090.92	1090.91
Bow River	KM 000	2677	1081.85	1091.47	1091.38	1091.28	1091.21	1091.13	1091.05	1091.02	1091.00	1090.98	1090.95	1090.93	1090.92	1090.91
Bow River	KM 000	2148	1079.94	1091.43	1091.35	1091.26	1091.19	1091.11	1091.04	1091.01	1090.99	1090.97	1090.95	1090.93	1090.92	1090.91
Bow River	KM 000	1302	1076.84	1091.37	1091.30	1091.21	1091.15	1091.08	1091.02	1091.00	1090.98	1090.96	1090.94	1090.93	1090.92	1090.91
Bow River	KM 000	329	1075.65	1091.33	1091.26	1091.19	1091.13	1091.07	1091.01	1090.99	1090.97	1090.96	1090.94	1090.92	1090.91	1090.91
Bow River	KM 000	12	1075.00	1090.90	1090.90	1090.90	1090.90	1090.90	1090.90	1090.90	1090.90	1090.90	1090.90	1090.90	1090.90	1090.90

River	HEC-RAS Model Sub-Reach	River Station (m)	Channel Thalweg Elevation (m)	Computed Water Surface Elevation (m)												
				1000-Year	750-Year	500-Year	350-Year	200-Year	100-Year	75-Year	50-Year	35-Year	20-Year	10-Year	5-Year	2-Year
Bighill Creek	KM 000	6520	1164.96	1167.61	1167.56	1167.49	1167.43	1167.33	1167.20	1167.15	1167.06	1166.99	1166.85	1166.67	1166.40	1165.93
Bighill Creek	KM 000	6401	1164.41	1166.65	1166.61	1166.55	1166.49	1166.40	1166.28	1166.22	1166.13	1166.06	1165.91	1165.74	1165.50	1165.17
Bighill Creek	KM 000	6300	1163.34	1165.55	1165.51	1165.46	1165.40	1165.32	1165.17	1165.11	1165.01	1164.93	1164.81	1164.62	1164.43	1164.02
Bighill Creek	KM 000	6133	1162.07	1164.27	1164.24	1164.20	1164.17	1164.11	1164.04	1164.00	1163.96	1163.90	1163.79	1163.65	1163.44	1162.94
Bighill Creek	KM 000	5995	1161.12	1163.33	1163.31	1163.27	1163.23	1163.17	1163.08	1163.06	1162.99	1162.93	1162.82	1162.62	1162.43	1162.11
Bighill Creek	KM 000	5798	1160.18	1162.09	1162.06	1162.04	1162.02	1161.98	1161.90	1161.87	1161.80	1161.74	1161.65	1161.55	1161.41	1161.13
Bighill Creek	KM 000	5618	1158.77	1160.59	1160.57	1160.53	1160.48	1160.42	1160.34	1160.32	1160.26	1160.22	1160.15	1159.91	1159.61	1159.22
Bighill Creek	KM 000	5483	1156.89	1159.36	1159.33	1159.29	1159.23	1159.17	1159.06	1159.01	1158.93	1158.85	1158.72	1158.55	1158.34	1157.86
Bighill Creek	KM 000	5403	1156.58	1158.58	1158.53	1158.46	1158.40	1158.28	1158.18	1158.14	1158.09	1158.04	1157.95	1157.82	1157.68	1157.39
Bighill Creek	KM 000	5281	Bridge	1157.67	1157.68	1157.67	1157.66	1157.55	1157.44	1157.39	1157.31	1157.23	1157.09	1156.90	1156.72	1156.43
Bighill Creek	KM 000	5185	1154.89	1156.97	1156.91	1156.82	1156.74	1156.67	1156.57	1156.55	1156.54	1156.52	1156.48	1156.38	1156.07	1155.51
Bighill Creek	KM 000	5129	1153.94	1156.77	1156.70	1156.60	1156.51	1156.38	1156.21	1156.13	1156.02	1155.91	1155.74	1155.40	1155.26	1154.90
Bighill Creek	KM 000	5092	1154.11	1156.62	1156.55	1156.46	1156.38	1156.25	1156.10	1156.02	1155.92	1155.82	1155.66	1155.46	1155.23	1154.81
Bighill Creek	KM 000	5087	Bridge													
Bighill Creek	KM 000	5082	1154.10	1155.94	1155.90	1155.87	1155.85	1155.81	1155.74	1155.68	1155.55	1155.45	1155.31	1155.12	1154.89	1154.52
Bighill Creek	KM 000	5064	1153.62	1155.84	1155.82	1155.79	1155.72	1155.72	1155.66	1155.55	1155.41	1155.33	1155.22	1155.06	1154.80	1154.34
Bighill Creek	KM 000	5062	Bridge													
Bighill Creek	KM 000	5060	1153.62	1155.65	1155.63	1155.60	1155.56	1155.36	1155.33	1155.30	1155.27	1155.23	1155.15	1155.02	1154.76	1154.31
Bighill Creek	KM 000	5030	1153.45	1155.35	1155.32	1155.28	1155.25	1155.23	1155.14	1155.11	1155.06	1154.99	1154.85	1154.66	1154.39	1153.90
Bighill Creek	KM 000	4966	1152.59	1154.64	1154.63	1154.60	1154.56	1154.44	1154.34	1154.29	1154.23	1154.17	1154.08	1153.90	1153.67	1153.40
Bighill Creek	KM 000	4883	1152.05	1153.98	1153.95	1153.91	1153.87	1153.80	1153.71	1153.67	1153.61	1153.55	1153.45	1153.27	1152.99	1152.47
Bighill Creek	KM 000	4810	1151.07	1153.60	1153.58	1153.55	1153.52	1153.46	1153.39	1153.35	1153.30	1153.24	1153.13	1152.96	1152.72	1152.20
Bighill Creek	KM 000	4715	1151.17	1153.03	1153.01	1152.97	1152.94	1152.88	1152.78	1152.74	1152.69	1152.64	1152.55	1152.42	1152.28	1151.90
Bighill Creek	KM 000	4639	1150.58	1152.47	1152.45	1152.42	1152.39	1152.35	1152.30	1152.28	1152.22	1152.18	1152.11	1151.98	1151.81	1151.49
Bighill Creek	KM 000	4527	1149.80	1151.83	1151.79	1151.74	1151.69	1151.61	1151.52	1151.48	1151.42	1151.37	1151.31	1151.24	1151.12	1150.81
Bighill Creek	KM 000	4461	1149.32	1151.61	1151.56	1151.48	1151.42	1151.32	1151.19	1151.13	1151.05	1150.98	1150.86	1150.70	1150.48	1149.96
Bighill Creek	KM 000	4363	1148.32	1151.03	1150.98	1150.90	1150.84	1150.73	1150.59	1150.53	1150.46	1150.37	1150.19	1149.93	1149.69	1149.33
Bighill Creek	KM 000	4359.6	Bridge													
Bighill Creek	KM 000	4357	1148.58	1150.95	1150.89	1150.80	1150.72	1150.60	1150.43	1150.36	1150.26	1150.17	1150.03	1149.84	1149.64	1149.30
Bighill Creek	KM 000	4295	1148.12	1150.61	1150.56	1150.48	1150.41	1150.28	1150.09	1150.01	1149.90	1149.80	1149.63	1149.42	1149.18	1148.87
Bighill Creek	KM 000	4203	1147.45	1149.74	1149.70	1149.64	1149.57	1149.47	1149.33	1149.27	1149.18	1149.09	1148.95	1148.74	1148.52	1148.11
Bighill Creek	KM 000	4129	1147.01	1148.72	1148.67	1148.61	1148.55	1148.47	1148.37	1148.32	1148.27	1148.21	1148.12	1148.01	1147.88	1147.61
Bighill Creek	KM 000	4055	1146.16	1148.31	1148.24	1148.16	1148.10	1147.99	1147.86	1147.81	1147.73	1147.66	1147.55	1147.41	1147.27	1147.03
Bighill Creek	KM 000	3915	1145.10	1147.49	1147.43	1147.36	1147.31	1147.21	1147.07	1147.01	1146.93	1146.85	1146.72	1146.54	1146.34	1145.95
Bighill Creek	KM 000	3851	1144.59	1146.56	1146.53	1146.49	1146.45	1146.39	1146.30	1146.26	1146.21	1146.16	1146.06	1145.93	1145.78	1145.47
Bighill Creek	KM 000	3797	1144.44	1146.14	1146.11	1146.07	1146.04	1145.98	1145.91	1145.88	1145.83	1145.78	1145.73	1145.62	1145.46	1145.08
Bighill Creek	KM 000	3793.4	Bridge													
Bighill Creek	KM 000	3790	1144.38	1146.05	1146.02	1145.97	1145.93	1145.87	1145.78	1145.74	1145.69	1145.63	1145.55	1145.45	1145.34	1145.03
Bighill Creek	KM 000	3675	1143.66	1145.46	1145.44	1145.40	1145.36	1145.29	1145.22	1145.18	1145.12	1145.07	1144.97	1144.82	1144.66	1144.33
Bighill Creek	KM 000	3563	1142.89	1144.68	1144.65	1144.63	1144.60	1144.57	1144.47	1144.45	1144.42	1144.37	1144.32	1144.22	1144.05	1143.70
Bighill Creek	KM 000	3388	1142.07	1144.02	1144.02	1143.98	1143.96	1143.92	1143.90	1143.87	1143.83	1143.80	1143.73	1143.58	1143.29	1142.76
Bighill Creek	KM 000	3384.6	Bridge													
Bighill Creek	KM 000	3382	1141.96	1143.98	1143.98	1143.94	1143.92	1143.88	1143.87	1143.84	1143.80	1143.75	1143.66	1143.51	1143.24	1142.73

River	HEC-RAS Model Sub-Reach	River Station (m)	Channel Thalweg Elevation (m)	Computed Water Surface Elevation (m)												
				1000-Year	750-Year	500-Year	350-Year	200-Year	100-Year	75-Year	50-Year	35-Year	20-Year	10-Year	5-Year	2-Year
Bighill Creek	KM 000	3263	1141.21	1143.55	1143.51	1143.51	1143.49	1143.47	1143.46	1143.44	1143.37	1143.28	1143.10	1142.85	1142.57	1142.15
Bighill Creek	KM 000	3094	1140.34	1143.33	1143.24	1143.13	1143.06	1142.98	1142.88	1142.79	1142.66	1142.53	1142.31	1142.00	1141.66	1141.08
Bighill Creek	KM 000	2960	1139.30	1143.27	1143.13	1142.94	1142.72	1142.57	1142.41	1142.32	1142.20	1142.08	1141.88	1141.61	1141.32	1140.83
Bighill Creek	KM 000	2905	1139.38	1143.26	1143.13	1142.94	1142.72	1142.56	1142.34	1142.25	1142.11	1141.97	1141.76	1141.49	1141.19	1140.71
Bighill Creek	KM 000	2848	1139.49	1143.24	1143.10	1142.90	1142.63	1142.39	1142.12	1142.01	1141.85	1141.72	1141.51	1141.24	1140.95	1140.45
Bighill Creek	KM 000	2826	1139.28	1143.19	1143.03	1142.84	1142.58	1142.36	1142.09	1141.98	1141.83	1141.69	1141.48	1141.21	1140.92	1140.41
Bighill Creek	KM 000	2814	Bridge													
Bighill Creek	KM 000	2804	1139.26	1142.12	1142.06	1141.97	1141.88	1141.75	1141.58	1141.51	1141.40	1141.31	1141.16	1140.95	1140.69	1140.22
Bighill Creek	KM 000	2792	1138.94	1142.11	1142.05	1141.95	1141.86	1141.73	1141.55	1141.47	1141.35	1141.25	1141.09	1140.87	1140.61	1140.13
Bighill Creek	KM 000	2780	1138.95	1141.95	1141.89	1141.79	1141.70	1141.57	1141.40	1141.32	1141.21	1141.10	1140.94	1140.70	1140.45	1140.02
Bighill Creek	KM 000	2761	1139.22	1141.82	1141.77	1141.68	1141.60	1141.48	1141.32	1141.24	1141.13	1141.03	1140.87	1140.63	1140.37	1139.89
Bighill Creek	KM 000	2754.5	Bridge													
Bighill Creek	KM 000	2748	1139.01	1141.66	1141.61	1141.54	1141.47	1141.37	1141.22	1141.14	1141.04	1140.95	1140.79	1140.56	1140.30	1139.79
Bighill Creek	KM 000	2729	1138.60	1141.18	1141.14	1141.12	1141.16	1141.03	1140.87	1140.81	1140.72	1140.63	1140.48	1140.30	1140.09	1139.67
Bighill Creek	KM 000	2676	1138.46	1141.19	1141.16	1141.08	1141.00	1140.88	1140.73	1140.67	1140.58	1140.49	1140.33	1140.11	1139.87	1139.38
Bighill Creek	KM 000	2631	1138.10	1141.13	1141.04	1140.92	1140.82	1140.66	1140.48	1140.40	1140.29	1140.20	1140.05	1139.86	1139.65	1139.22
Bighill Creek	KM 000	2573	1137.80	1141.05	1140.96	1140.85	1140.74	1140.58	1140.39	1140.31	1140.19	1140.09	1139.92	1139.71	1139.48	1139.06
Bighill Creek	KM 000	2543	1137.77	1140.83	1140.73	1140.60	1140.49	1140.31	1140.10	1140.01	1139.90	1139.80	1139.66	1139.51	1139.33	1138.96
Bighill Creek	KM 000	2517	1137.76	1140.80	1140.70	1140.56	1140.42	1140.22	1139.97	1139.86	1139.71	1139.58	1139.36	1139.04	1138.80	1138.43
Bighill Creek	KM 000	2497.6	Culvert													
Bighill Creek	KM 000	2482	1137.76	1139.42	1139.37	1139.30	1139.24	1139.12	1139.00	1139.01	1139.00	1138.97	1138.89	1138.73	1138.54	1138.27
Bighill Creek	KM 000	2387	1136.89	1139.15	1139.11	1139.06	1139.01	1138.93	1138.82	1138.77	1138.70	1138.63	1138.50	1138.29	1138.03	1137.57
Bighill Creek	KM 000	2267	1136.10	1138.45	1138.41	1138.37	1138.32	1138.22	1138.15	1138.13	1138.07	1138.03	1137.91	1137.67	1137.39	1136.90
Bighill Creek	KM 000	2161	1135.38	1137.87	1137.85	1137.82	1137.79	1137.77	1137.67	1137.61	1137.55	1137.44	1137.23	1136.98	1136.70	1136.23
Bighill Creek	KM 000	2157.6	Bridge													
Bighill Creek	KM 000	2154	1135.41	1137.69	1137.67	1137.63	1137.60	1137.54	1137.40	1137.39	1137.41	1137.33	1137.15	1136.92	1136.64	1136.18
Bighill Creek	KM 000	2106	1135.15	1137.24	1137.20	1137.18	1137.13	1137.11	1137.04	1136.98	1136.85	1136.81	1136.72	1136.54	1136.29	1135.87
Bighill Creek	KM 000	1937	1134.11	1136.88	1136.85	1136.81	1136.76	1136.69	1136.60	1136.55	1136.48	1136.40	1136.23	1135.99	1135.74	1135.35
Bighill Creek	KM 000	1769	1133.95	1136.35	1136.32	1136.28	1136.24	1136.19	1136.09	1136.04	1135.98	1135.92	1135.77	1135.45	1135.12	1134.57
Bighill Creek	KM 000	1723	1133.44	1136.11	1136.08	1136.04	1136.01	1135.89	1135.86	1135.82	1135.78	1135.74	1135.57	1135.27	1134.95	1134.40
Bighill Creek	KM 000	1721.9	Bridge													
Bighill Creek	KM 000	1720	1133.50	1135.94	1135.92	1135.87	1135.83	1135.74	1135.78	1135.74	1135.68	1135.61	1135.46	1135.22	1134.92	1134.38
Bighill Creek	KM 000	1606	1132.88	1135.85	1135.75	1135.63	1135.50	1135.33	1135.11	1135.01	1134.88	1134.76	1134.57	1134.34	1134.17	1133.85
Bighill Creek	KM 000	1536	1132.22	1135.64	1135.53	1135.39	1135.25	1135.05	1134.82	1134.71	1134.55	1134.41	1134.16	1133.82	1133.40	1132.84
Bighill Creek	KM 000	1518.8	Culvert													
Bighill Creek	KM 000	1501	1132.29	1134.88	1134.86	1134.83	1134.78	1134.70	1134.58	1134.51	1134.40	1134.29	1134.07	1133.77	1133.41	1132.92
Bighill Creek	KM 000	1484	1132.07	1134.57	1134.52	1134.43	1134.39	1134.29	1134.01	1133.92	1133.77	1133.64	1133.45	1133.17	1133.01	1132.69
Bighill Creek	KM 000	1395	1131.17	1132.70	1132.67	1132.63	1132.60	1132.54	1132.47	1132.45	1132.41	1132.38	1132.30	1132.20	1132.06	1131.71
Bighill Creek	KM 000	1212	1130.05	1132.09	1132.06	1132.01	1131.97	1131.90	1131.77	1131.68	1131.55	1131.38	1131.23	1131.05	1130.87	1130.60
Bighill Creek	KM 000	1206.9	Bridge													
Bighill Creek	KM 000	1202	1130.06	1131.83	1131.77	1131.70	1131.63	1131.50	1131.36	1131.29	1131.20	1131.13	1131.01	1130.85	1130.70	1130.47
Bighill Creek	KM 000	1168	1129.23	1131.48	1131.43	1131.34	1131.27	1131.15	1130.99	1130.93	1130.83	1130.75	1130.62	1130.44	1130.24	1129.94
Bighill Creek	KM 000	1095	1128.64	1130.72	1130.67	1130.60	1130.53	1130.43	1130.29	1130.22	1130.13	1130.05	1129.92	1129.74	1129.54	1129.22

River	HEC-RAS Model Sub-Reach	River Station (m)	Channel Thalweg Elevation (m)	Computed Water Surface Elevation (m)												
				1000-Year	750-Year	500-Year	350-Year	200-Year	100-Year	75-Year	50-Year	35-Year	20-Year	10-Year	5-Year	2-Year
Bighill Creek	KM 000	995	1127.88	1129.74	1129.69	1129.63	1129.57	1129.47	1129.37	1129.31	1129.23	1129.16	1129.03	1128.86	1128.67	1128.40
Bighill Creek	KM 000	991.8	Bridge													
Bighill Creek	KM 000	989	1127.77	1129.59	1129.57	1129.51	1129.45	1129.37	1129.28	1129.22	1129.14	1129.07	1128.95	1128.78	1128.60	1128.34
Bighill Creek	KM 000	915	1126.98	1128.77	1128.72	1128.69	1128.66	1128.60	1128.47	1128.38	1128.28	1128.20	1128.11	1127.98	1127.85	1127.60
Bighill Creek	KM 000	822	1126.02	1128.07	1127.93	1127.75	1127.62	1127.49	1127.44	1127.42	1127.41	1127.36	1127.20	1127.01	1126.82	1126.56
Bighill Creek	KM 000	740	1125.32	1127.96	1127.80	1127.57	1127.37	1127.06	1126.72	1126.59	1126.44	1126.37	1126.36	1126.31	1126.22	1125.87
Bighill Creek	KM 000	617	1124.19	1127.94	1127.77	1127.54	1127.33	1127.00	1126.62	1126.46	1126.23	1126.04	1125.76	1125.49	1125.24	1124.97
Bighill Creek	KM 000	586	1124.03	1127.94	1127.77	1127.53	1127.32	1127.00	1126.61	1126.45	1126.23	1126.03	1125.73	1125.41	1125.11	1124.75
Bighill Creek	KM 000	580.7	Bridge													
Bighill Creek	KM 000	576	1123.78	1127.94	1127.77	1127.53	1127.32	1127.00	1126.61	1126.45	1126.22	1126.03	1125.72	1125.35	1125.00	1124.61
Bighill Creek	KM 000	505	1123.35	1127.91	1127.74	1127.51	1127.30	1126.97	1126.58	1126.42	1126.19	1125.99	1125.67	1125.25	1124.84	1124.25
Bighill Creek	KM 000	481.6	Culvert													
Bighill Creek	KM 000	454	1122.41	1124.76	1124.58	1124.45	1124.45	1124.40	1124.27	1124.21	1124.13	1124.05	1123.91	1123.73	1123.49	1123.05
Bighill Creek	KM 000	376	1121.78	1124.80	1124.57	1124.21	1123.95	1123.80	1123.74	1123.70	1123.66	1123.62	1123.58	1123.32	1123.01	1122.57
Bighill Creek	KM 000	372.7	Bridge													
Bighill Creek	KM 000	369	1121.88	1124.79	1124.56	1124.19	1123.89	1123.57	1123.49	1123.47	1123.42	1123.38	1123.21	1122.91	1122.78	1122.45
Bighill Creek	KM 000	335	1121.20	1124.78	1124.54	1124.17	1123.86	1123.39	1122.79	1122.63	1122.59	1122.60	1122.60	1122.44	1122.27	1121.97
Bighill Creek	KM 000	262	1120.39	1124.77	1124.53	1124.15	1123.83	1123.34	1122.71	1122.45	1122.12	1121.89	1121.64	1121.45	1121.23	1120.86
Bighill Creek	KM 000	211	1119.40	1124.77	1124.53	1124.15	1123.83	1123.34	1122.70	1122.43	1122.07	1121.79	1121.37	1121.05	1120.81	1120.44
Bighill Creek	KM 000	208.2	Bridge													
Bighill Creek	KM 000	206	1119.65	1124.77	1124.53	1124.15	1123.83	1123.34	1122.70	1122.43	1122.06	1121.77	1121.26	1120.74	1120.65	1120.36
Bighill Creek	KM 000	185	1119.30	1124.77	1124.53	1124.15	1123.83	1123.34	1122.70	1122.43	1122.06	1121.77	1121.29	1120.73	1120.18	1119.78
Exshaw Creek	KM 000	1319	1341.28	1343.37	1343.29	1343.18	1343.07	1342.93	1342.75	1342.67	1342.57	1342.49	1342.36	1342.21	1342.06	1341.87
Exshaw Creek	KM 000	1182	1337.57	1339.45	1339.39	1339.30	1339.23	1339.11	1338.97	1338.89	1338.81	1338.73	1338.61	1338.48	1338.34	1338.15
Exshaw Creek	KM 000	1105	1334.72	1336.04	1335.99	1335.94	1335.88	1335.80	1335.69	1335.65	1335.60	1335.56	1335.49	1335.41	1335.33	1335.18
Exshaw Creek	KM 000	1014	1329.70	1332.16	1332.07	1331.96	1331.86	1331.71	1331.54	1331.46	1331.36	1331.26	1331.12	1330.94	1330.77	1330.54
Exshaw Creek	KM 000	922	1326.72	1328.70	1328.63	1328.55	1328.46	1328.34	1328.19	1328.13	1328.06	1328.00	1327.90	1327.78	1327.64	1327.39
Exshaw Creek	KM 000	838	1321.44	1323.78	1323.69	1323.58	1323.50	1323.33	1323.16	1323.09	1323.00	1322.92	1322.79	1322.64	1322.49	1322.25
Exshaw Creek	KM 000	708	1316.65	1318.38	1318.32	1318.23	1318.13	1318.03	1317.90	1317.85	1317.78	1317.71	1317.62	1317.49	1317.36	1317.20
Exshaw Creek	KM 000	593	1311.77	1313.60	1313.55	1313.47	1313.41	1313.29	1313.16	1313.11	1313.05	1312.99	1312.91	1312.82	1312.72	1312.57
Exshaw Creek	KM 000	475	1306.54	1308.20	1308.15	1308.08	1308.00	1307.93	1307.83	1307.79	1307.73	1307.68	1307.60	1307.49	1307.38	1307.20
Exshaw Creek	KM 000	454	1304.52	1307.14	1307.05	1306.90	1306.79	1306.56	1306.31	1306.23	1306.13	1306.04	1305.93	1305.77	1305.60	1305.32
Exshaw Creek	KM 000	451.7	Bridge													
Exshaw Creek	KM 000	449	1304.10	1306.56	1306.43	1306.38	1306.33	1306.26	1306.14	1306.09	1306.02	1305.96	1305.86	1305.73	1305.57	1305.30
Exshaw Creek	KM 000	434	1304.51	1306.32	1306.25	1306.15	1306.03	1305.88	1305.72	1305.67	1305.60	1305.54	1305.46	1305.35	1305.24	1305.05
Exshaw Creek	KM 000	352	1300.98	1302.87	1302.81	1302.74	1302.74	1302.69	1302.59	1302.54	1302.47	1302.41	1302.31	1302.17	1302.04	1301.84
Exshaw Creek	KM 000	233	1295.90	1298.73	1298.36	1298.05	1297.83	1297.55	1297.29	1297.20	1297.09	1296.99	1296.86	1296.71	1296.56	1296.35
Exshaw Creek	KM 000	219	1295.21	1298.66	1298.28	1297.96	1297.73	1297.43	1297.13	1297.02	1296.89	1296.77	1296.61	1296.43	1296.26	1296.04
Exshaw Creek	KM 000	208	Bridge													
Exshaw Creek	KM 000	198	1294.75	1296.80	1296.73	1296.63	1296.53	1296.38	1296.21	1296.14	1296.04	1295.95	1295.82	1295.66	1295.51	1295.30
Exshaw Creek	KM 000	190	1294.43	1296.23	1296.14	1296.03	1295.94	1295.80	1295.64	1295.57	1295.51	1295.44	1295.36	1295.25	1295.14	1294.97
Exshaw Creek	KM 000	171	1293.04	1294.84	1294.74	1294.63	1294.54	1294.39	1294.23	1294.17	1294.08	1294.01	1293.90	1293.76	1293.64	1293.48
Exshaw Creek	KM 000	161	1291.92	1295.10	1294.92	1294.73	1294.57	1294.35	1294.08	1293.98	1293.83	1293.71	1293.52	1293.29	1293.06	1292.73

River	HEC-RAS Model Sub-Reach	River Station (m)	Channel Thalweg Elevation (m)	Computed Water Surface Elevation (m)												
				1000-Year	750-Year	500-Year	350-Year	200-Year	100-Year	75-Year	50-Year	35-Year	20-Year	10-Year	5-Year	2-Year
Exshaw Creek	KM 000	151.4	Bridge													
Exshaw Creek	KM 000	147	1291.91	1295.00	1294.86	1294.68	1294.53	1294.30	1294.03	1293.93	1293.79	1293.67	1293.48	1293.25	1293.02	1292.69
Exshaw Creek	KM 000	133	1291.95	1294.84	1294.70	1294.53	1294.38	1294.15	1293.90	1293.80	1293.66	1293.55	1293.37	1293.15	1292.93	1292.62
Exshaw Creek	KM 000	118	1291.69	1294.56	1294.43	1294.27	1294.13	1293.93	1293.69	1293.59	1293.47	1293.35	1293.19	1292.98	1292.78	1292.47
Exshaw Creek	KM 000	110.5	Bridge													
Exshaw Creek	KM 000	104	1291.67	1293.84	1293.77	1293.66	1293.58	1293.45	1293.27	1293.20	1293.10	1293.02	1292.88	1292.72	1292.55	1292.29
Exshaw Creek	KM 000	89	1291.20	1293.07	1292.99	1292.89	1292.79	1292.62	1292.47	1292.40	1292.31	1292.23	1292.12	1291.98	1291.83	1291.66
Jumpingpound Cr	KM 000	5294	1151.11	1156.92	1156.98	1156.56	1156.12	1155.55	1154.88	1154.62	1154.30	1154.07	1153.69	1153.23	1152.80	1152.21
Jumpingpound Cr	KM 000	5202	1150.51	1156.42	1155.61	1155.14	1154.88	1154.47	1154.07	1153.92	1153.76	1153.63	1153.28	1152.87	1152.47	1151.91
Jumpingpound Cr	KM 000	5101	1150.40	1155.89	1155.55	1155.07	1154.68	1154.07	1153.46	1153.22	1152.87	1152.57	1152.28	1151.94	1151.60	1151.22
Jumpingpound Cr	KM 000	4984	1147.73	1154.47	1154.32	1154.09	1153.78	1153.35	1152.85	1152.65	1152.35	1152.09	1151.65	1151.10	1150.57	1149.88
Jumpingpound Cr	KM 000	4882	1147.92	1153.78	1153.54	1153.26	1153.04	1152.69	1152.25	1152.06	1151.79	1151.56	1151.18	1150.70	1150.22	1149.59
Jumpingpound Cr	KM 000	4791	1147.78	1153.24	1153.14	1152.93	1152.70	1152.33	1151.91	1151.69	1151.42	1151.18	1150.86	1150.41	1149.95	1149.33
Jumpingpound Cr	KM 000	4648	1147.33	1152.47	1152.13	1151.84	1151.59	1151.22	1150.63	1150.47	1150.23	1150.04	1149.64	1149.21	1148.81	1148.32
Jumpingpound Cr	KM 000	4550	1146.37	1151.75	1151.53	1151.21	1150.91	1150.47	1150.09	1149.95	1149.72	1149.51	1149.22	1148.84	1148.44	1147.91
Jumpingpound Cr	KM 000	4463	1146.48	1151.70	1151.47	1151.16	1150.86	1150.39	1149.85	1149.63	1149.33	1149.07	1148.70	1148.29	1147.94	1147.51
Jumpingpound Cr	KM 000	4369	1145.51	1150.96	1150.80	1150.56	1150.33	1149.92	1149.49	1149.27	1148.96	1148.69	1148.30	1147.85	1147.44	1146.94
Jumpingpound Cr	KM 000	4277	1145.13	1150.17	1149.94	1149.65	1149.43	1149.07	1148.43	1148.22	1147.96	1147.77	1147.45	1147.11	1146.78	1146.35
Jumpingpound Cr	KM 000	4168	1144.43	1150.18	1149.96	1149.65	1149.37	1148.99	1148.29	1148.02	1147.67	1147.39	1146.95	1146.47	1146.06	1145.56
Jumpingpound Cr	KM 000	4040	1143.71	1148.84	1148.65	1148.39	1148.13	1147.39	1147.04	1146.92	1146.72	1146.64	1146.19	1145.69	1145.26	1144.76
Jumpingpound Cr	KM 000	3915	1143.18	1148.13	1147.98	1147.78	1147.59	1147.29	1146.85	1146.64	1146.39	1146.28	1145.75	1145.19	1144.67	1144.05
Jumpingpound Cr	KM 000	3824	1141.95	1147.36	1147.24	1147.06	1146.91	1146.48	1145.98	1145.84	1145.56	1145.16	1144.88	1144.51	1144.13	1143.57
Jumpingpound Cr	KM 000	3672	1141.44	1147.02	1146.79	1146.46	1146.15	1145.71	1145.27	1145.10	1144.88	1144.69	1144.41	1144.05	1143.71	1143.25
Jumpingpound Cr	KM 000	3591	1142.11	1145.73	1145.53	1145.31	1145.12	1144.84	1144.53	1144.40	1144.23	1144.06	1143.78	1143.47	1143.16	1142.80
Jumpingpound Cr	KM 000	3503	1141.07	1145.33	1145.15	1144.90	1144.67	1144.32	1143.90	1143.75	1143.56	1143.42	1143.19	1142.94	1142.61	1142.16
Jumpingpound Cr	KM 000	3363	1140.02	1145.19	1144.99	1144.72	1144.47	1144.09	1143.57	1143.37	1143.10	1142.89	1142.57	1142.18	1141.81	1141.26
Jumpingpound Cr	KM 000	3202	1137.90	1143.92	1143.72	1143.44	1143.18	1142.82	1142.30	1142.10	1141.83	1141.60	1141.26	1140.86	1140.46	1139.90
Jumpingpound Cr	KM 000	3095	1138.21	1143.16	1142.96	1142.68	1142.43	1141.96	1141.43	1141.25	1141.01	1140.80	1140.48	1140.12	1139.77	1139.28
Jumpingpound Cr	KM 000	3006	1137.17	1142.55	1142.33	1142.02	1141.73	1141.30	1140.83	1140.65	1140.42	1140.19	1139.84	1139.46	1139.14	1138.84
Jumpingpound Cr	KM 000	2867	1136.77	1142.30	1142.07	1141.74	1141.43	1140.89	1140.28	1140.06	1139.76	1139.51	1139.15	1138.66	1138.17	1137.56
Jumpingpound Cr	KM 000	2745	1134.99	1141.45	1141.29	1140.97	1140.70	1140.39	1139.86	1139.64	1139.35	1139.11	1138.79	1138.33	1137.85	1137.20
Jumpingpound Cr	KM 000	2650	1135.15	1140.65	1140.43	1140.10	1139.87	1139.46	1139.11	1138.98	1138.80	1138.64	1138.48	1138.08	1137.65	1137.06
Jumpingpound Cr	KM 000	2557	1135.53	1139.64	1139.52	1139.35	1139.20	1138.95	1138.57	1138.48	1138.39	1138.28	1138.22	1137.87	1137.47	1136.93
Jumpingpound Cr	KM 000	2410	1135.35	1138.96	1138.80	1138.62	1138.46	1138.24	1137.99	1137.87	1137.69	1137.55	1137.26	1136.87	1136.59	1136.24
Jumpingpound Cr	KM 000	2301	1133.75	1138.46	1138.33	1138.19	1138.00	1137.73	1137.42	1137.31	1137.15	1136.88	1136.50	1136.07	1135.62	1135.04
Jumpingpound Cr	KM 000	2181	1133.18	1137.92	1137.75	1137.51	1137.29	1137.02	1136.72	1136.53	1136.20	1136.04	1135.73	1135.34	1134.97	1134.48
Jumpingpound Cr	KM 000	2081	1132.64	1137.80	1137.63	1137.39	1137.15	1136.78	1136.33	1136.17	1135.88	1135.66	1135.30	1134.87	1134.49	1134.02
Jumpingpound Cr	KM 000	1861	1130.75	1136.33	1136.14	1135.85	1135.60	1135.16	1134.61	1134.30	1134.03	1133.74	1133.37	1132.95	1132.56	1132.01
Jumpingpound Cr	KM 000	1733	1130.22	1136.07	1135.82	1135.49	1135.20	1134.77	1134.29	1134.10	1133.80	1133.54	1133.16	1132.76	1132.38	1131.87
Jumpingpound Cr	KM 000	1592	1130.60	1135.74	1135.50	1135.18	1134.89	1134.48	1134.02	1133.83	1133.51	1133.22	1132.77	1132.29	1131.87	1131.41
Jumpingpound Cr	KM 000	1455	1129.02	1134.89	1134.62	1134.25	1133.91	1133.43	1132.92	1132.71	1132.42	1132.20	1131.82	1131.35	1130.89	1130.28
Jumpingpound Cr	KM 000	1327	1128.41	1133.66	1133.52	1133.31	1133.13	1132.85	1132.33	1132.13	1131.85	1131.59	1131.22	1130.72	1130.27	1129.71
Jumpingpound Cr	KM 000	1224	1128.16	1133.12	1132.97	1132.72	1132.49	1131.94	1131.93	1131.74	1131.47	1131.22	1130.81	1130.28	1129.80	1129.18

River	HEC-RAS Model Sub-Reach	River Station (m)	Channel Thalweg Elevation (m)	Computed Water Surface Elevation (m)												
				1000-Year	750-Year	500-Year	350-Year	200-Year	100-Year	75-Year	50-Year	35-Year	20-Year	10-Year	5-Year	2-Year
Jumpingpound Cr	KM 000	1056	1127.01	1132.71	1132.51	1132.23	1131.96	1131.57	1131.01	1130.81	1130.55	1130.34	1130.07	1129.61	1129.17	1128.59
Jumpingpound Cr	KM 000	901	1126.67	1132.57	1132.36	1132.08	1131.81	1131.41	1130.65	1130.41	1129.97	1129.68	1129.22	1128.70	1128.23	1127.68
Jumpingpound Cr	KM 000	791	1125.66	1132.45	1132.24	1131.96	1131.67	1131.26	1130.52	1130.24	1129.17	1128.85	1128.39	1127.92	1127.45	1126.82
Jumpingpound Cr	KM 000	722	1125.47	1132.41	1132.21	1131.93	1131.65	1131.25	1130.51	1130.25	1129.28	1128.92	1128.39	1127.83	1127.30	1126.61
Jumpingpound Cr	KM 000	665	1125.01	1132.15	1131.94	1131.63	1131.31	1130.91	1130.29	1130.06	1129.07	1128.74	1128.25	1127.70	1127.17	1126.48
Jumpingpound Cr	KM 000	646.7	Bridge													
Jumpingpound Cr	KM 000	625	1124.93	1130.47	1130.31	1130.07	1129.84	1129.28	1128.93	1128.73	1128.47	1128.25	1127.84	1127.39	1126.93	1126.32
Jumpingpound Cr	KM 000	562	1124.81	1130.22	1130.03	1129.76	1129.49	1129.09	1128.76	1128.46	1128.20	1128.00	1127.56	1127.12	1126.71	1126.15
Jumpingpound Cr	KM 000	501	1124.78	1129.53	1129.38	1129.18	1129.01	1128.64	1127.91	1127.74	1127.50	1127.24	1127.05	1126.77	1126.49	1126.02
Jumpingpound Cr	KM 000	386	1124.13	1128.98	1128.72	1128.38	1128.10	1127.72	1127.34	1127.20	1127.02	1126.86	1126.64	1126.35	1126.01	1125.50
Jumpingpound Cr	KM 000	232	1123.21	1128.76	1128.47	1128.07	1127.74	1127.26	1126.76	1126.61	1126.46	1126.29	1125.99	1125.67	1125.26	1124.67
Jumpingpound Cr	KM 000	116	1122.94	1128.55	1128.24	1127.82	1127.46	1126.95	1126.27	1125.96	1125.58	1125.36	1125.09	1124.58	1124.17	1123.68
Policeman Cr	KM 000	6465	1312.84	1316.02	1316.00	1315.99	1315.97	1315.95	1315.92	1315.91	1315.90	1315.89	1315.86	1315.84	1315.80	1315.74
Policeman Cr	KM 000	6435	Inl Struct													
Policeman Cr	KM 000	6418	1312.25	1314.41	1314.27	1314.08	1313.96	1313.90	1313.76	1313.70	1313.61	1313.53	1313.42	1313.27	1313.11	1312.87
Policeman Cr	KM 000	6410	1312.21	1314.42	1314.28	1314.07	1313.94	1313.88	1313.73	1313.67	1313.59	1313.51	1313.40	1313.25	1313.10	1312.86
Policeman Cr	KM 000	6344	1312.17	1314.22	1314.11	1313.93	1313.81	1313.78	1313.64	1313.58	1313.50	1313.42	1313.31	1313.17	1313.02	1312.80
Policeman Cr	KM 000	6312	1312.18	1314.16	1314.05	1313.87	1313.76	1313.71	1313.57	1313.51	1313.43	1313.37	1313.26	1313.12	1312.97	1312.76
Policeman Cr	KM 000	6227	1312.07	1313.91	1313.79	1313.62	1313.51	1313.49	1313.37	1313.31	1313.24	1313.18	1313.07	1312.94	1312.80	1312.58
Policeman Cr	KM 000	6126	1311.77	1313.64	1313.52	1313.36	1313.26	1313.22	1313.11	1313.07	1313.01	1312.95	1312.86	1312.73	1312.58	1312.29
Policeman Cr	KM 000	6075	1311.59	1313.37	1313.28	1313.15	1313.08	1313.05	1312.98	1312.94	1312.90	1312.86	1312.78	1312.67	1312.52	1312.20
Policeman Cr	KM 000	6023	1311.46	1313.21	1313.13	1313.02	1312.98	1312.93	1312.88	1312.86	1312.83	1312.79	1312.72	1312.62	1312.47	1312.13
Policeman Cr	KM 000	5960	1311.50	1313.01	1312.94	1312.87	1312.78	1312.82	1312.81	1312.79	1312.78	1312.74	1312.68	1312.58	1312.44	1312.08
Policeman Cr	KM 000	5954.5	Culvert													
Policeman Cr	KM 000	5946	1311.34	1313.04	1312.97	1312.84	1312.78	1312.70	1312.66	1312.64	1312.64	1312.54	1312.40	1312.24	1312.08	1311.92
Policeman Cr	KM 000	5877	1311.46	1312.96	1312.90	1312.79	1312.74	1312.69	1312.65	1312.63	1312.63	1312.54	1312.40	1312.22	1312.04	1311.76
Policeman Cr	KM 000	5782	1311.20	1312.93	1312.88	1312.77	1312.73	1312.68	1312.64	1312.63	1312.63	1312.54	1312.39	1312.22	1312.03	1311.75
Policeman Cr	KM 000	5719	1311.15	1312.88	1312.84	1312.75	1312.72	1312.67	1312.64	1312.62	1312.62	1312.53	1312.39	1312.21	1312.03	1311.75
Policeman Cr	KM 000	5673	1311.02	1312.80	1312.77	1312.71	1312.69	1312.64	1312.60	1312.57	1312.38	1312.29	1312.17	1312.03	1311.88	1311.65
Policeman Cr	KM 000	5668.8	Bridge													
Policeman Cr	KM 000	5666	1310.84	1312.79	1312.75	1312.69	1312.67	1312.60	1312.30	1312.23	1312.15	1312.08	1311.97	1311.85	1311.72	1311.52
Policeman Cr	KM 000	5651	1310.87	1312.75	1312.71	1312.66	1312.65	1312.50	1312.15	1312.05	1311.97	1311.90	1311.80	1311.68	1311.57	1311.42
Policeman Cr	KM 000	5648.3	Bridge													
Policeman Cr	KM 000	5646	1310.89	1312.66	1312.64	1312.61	1312.11	1312.02	1311.93	1311.89	1311.84	1311.80	1311.73	1311.64	1311.55	1311.41
Policeman Cr	KM 000	5599	1310.79	1312.20	1312.07	1311.91	1311.83	1311.74	1311.68	1311.66	1311.63	1311.60	1311.54	1311.50	1311.43	1311.11
Policeman Cr	KM 000	5531	1310.48	1312.14	1312.04	1311.90	1311.81	1311.72	1311.67	1311.64	1311.62	1311.59	1311.53	1311.50	1311.43	1311.10
Policeman Cr	KM 000	5468	1310.41	1312.07	1311.97	1311.85	1311.77	1311.69	1311.64	1311.62	1311.60	1311.58	1311.52	1311.49	1311.43	1311.09
Policeman Cr	KM 000	5364	1310.36	1311.95	1311.87	1311.77	1311.71	1311.65	1311.61	1311.59	1311.57	1311.56	1311.51	1311.48	1311.42	1311.08
Policeman Cr	KM 000	5257	1310.08	1311.86	1311.80	1311.72	1311.67	1311.62	1311.59	1311.58	1311.56	1311.55	1311.50	1311.48	1311.42	1311.08
Policeman Cr	KM 000	5252.1	Bridge													
Policeman Cr	KM 000	5248	1310.14	1311.83	1311.78	1311.70	1311.66	1311.61	1311.58	1311.57	1311.56	1311.54	1311.49	1311.47	1311.42	1311.08
Policeman Cr	KM 000	5163	1310.00	1311.80	1311.75	1311.69	1311.65	1311.60	1311.58	1311.57	1311.55	1311.54	1311.49	1311.47	1311.42	1311.08
Policeman Cr	KM 000	5110	1310.06	1311.78	1311.74	1311.68	1311.64	1311.60	1311.58	1311.57	1311.55	1311.54	1311.49	1311.47	1311.42	1311.08

River	HEC-RAS Model Sub-Reach	River Station (m)	Channel Thalweg Elevation (m)	Computed Water Surface Elevation (m)												
				1000-Year	750-Year	500-Year	350-Year	200-Year	100-Year	75-Year	50-Year	35-Year	20-Year	10-Year	5-Year	2-Year
Policeman Cr	KM 000	5103.4	Bridge													
Policeman Cr	KM 000	5101	1309.97	1311.77	1311.73	1311.67	1311.64	1311.59	1311.57	1311.56	1311.55	1311.54	1311.49	1311.47	1311.42	1311.08
Policeman Cr	KM 000	5023	1309.75	1311.71	1311.68	1311.64	1311.62	1311.58	1311.56	1311.55	1311.54	1311.53	1311.49	1311.47	1311.41	1311.08
Policeman Cr	KM 000	5002.6	Culvert													
Policeman Cr	KM 000	4985	1309.73	1311.46	1311.39	1311.26	1311.22	1311.15	1311.10	1311.09	1311.06	1311.04	1311.00	1310.99	1310.85	1310.48
Policeman Cr	KM 000	4936	1309.60	1311.22	1311.16	1311.14	1311.04	1311.00	1311.00	1310.97	1310.97	1310.94	1310.94	1310.96	1310.81	1310.42
Policeman Cr	KM 000	4923.7	Culvert													
Policeman Cr	KM 000	4907	1309.28	1311.14	1311.09	1310.92	1310.87	1310.82	1310.77	1310.73	1310.66	1310.61	1310.50	1310.35	1310.19	1309.93
Policeman Cr	KM 000	4880	1309.24	1310.97	1310.89	1310.81	1310.76	1310.64	1310.51	1310.48	1310.45	1310.43	1310.34	1310.22	1310.08	1309.86
Policeman Cr	KM 000	4855	1309.19	1310.68	1310.63	1310.55	1310.49	1310.45	1310.42	1310.41	1310.36	1310.37	1310.16	1309.96	1309.90	1309.74
Policeman Cr	KM 000	4854	Bridge													
Policeman Cr	KM 000	4852	1309.16	1310.59	1310.51	1310.48	1310.34	1310.25	1310.20	1310.18	1310.13	1310.06	1309.99	1309.88	1309.86	1309.72
Policeman Cr	KM 000	4796	1308.87	1310.58	1310.52	1310.41	1310.34	1310.18	1310.08	1310.04	1309.99	1309.95	1309.88	1309.80	1309.72	1309.59
Policeman Cr	KM 000	4726	1308.86	1310.55	1310.48	1310.38	1310.31	1310.15	1310.05	1310.01	1309.95	1309.91	1309.83	1309.75	1309.66	1309.52
Policeman Cr	KM 000	4720	1308.96	1310.53	1310.47	1310.37	1310.29	1310.12	1310.01	1309.98	1309.93	1309.88	1309.81	1309.73	1309.64	1309.51
Policeman Cr	KM 000	4716.9	Bridge													
Policeman Cr	KM 000	4714	1308.96	1310.51	1310.44	1310.33	1310.24	1310.09	1310.00	1309.96	1309.91	1309.86	1309.79	1309.71	1309.63	1309.50
Policeman Cr	KM 000	4675	1308.93	1310.42	1310.36	1310.27	1310.19	1310.04	1309.95	1309.91	1309.86	1309.81	1309.74	1309.66	1309.57	1309.44
Policeman Cr	KM 000	4603	1308.97	1310.18	1310.11	1310.02	1309.94	1309.81	1309.72	1309.68	1309.63	1309.59	1309.53	1309.45	1309.37	1309.24
Policeman Cr	KM 000	4544	1308.55	1310.09	1309.87	1309.77	1309.68	1309.56	1309.47	1309.44	1309.38	1309.34	1309.27	1309.18	1309.10	1308.95
Policeman Cr	KM 000	4463	1308.21	1310.08	1309.84	1309.39	1309.31	1309.17	1309.08	1309.04	1308.99	1308.95	1308.89	1308.82	1308.75	1308.64
Policeman Cr	KM 000	4380	1307.92	1310.07	1309.83	1309.28	1309.10	1308.93	1308.81	1308.77	1308.71	1308.66	1308.59	1308.50	1308.41	1308.29
Policeman Cr	KM 000	4337	1307.91	1310.07	1309.83	1309.25	1309.07	1308.89	1308.78	1308.73	1308.67	1308.62	1308.54	1308.45	1308.36	1308.22
Policeman Cr	KM 000	4328.9	Mult Open													
Policeman Cr	KM 000	4320	1307.77	1309.37	1309.23	1309.06	1308.87	1308.72	1308.62	1308.59	1308.54	1308.50	1308.44	1308.36	1308.28	1308.16
Policeman Cr	KM 000	4220	1307.72	1309.34	1309.20	1309.01	1308.79	1308.61	1308.50	1308.46	1308.40	1308.36	1308.29	1308.21	1308.14	1308.02
Policeman Cr	KM 000	4184	1307.69	1309.33	1309.19	1309.00	1308.77	1308.58	1308.47	1308.42	1308.37	1308.32	1308.25	1308.17	1308.10	1307.97
Policeman Cr	KM 000	4030	1307.28	1309.29	1309.14	1308.94	1308.68	1308.46	1308.32	1308.27	1308.20	1308.15	1308.07	1307.99	1307.91	1307.79
Policeman Cr	KM 000	3921	1307.29	1309.26	1309.11	1308.91	1308.63	1308.39	1308.24	1308.19	1308.11	1308.05	1307.96	1307.85	1307.75	1307.62
Policeman Cr	KM 000	3888	1307.13	1309.21	1309.06	1308.87	1308.56	1308.33	1308.18	1308.12	1308.05	1307.99	1307.89	1307.79	1307.68	1307.54
Policeman Cr	KM 000	3875.5	Bridge													
Policeman Cr	KM 000	3862	1307.09	1308.82	1308.77	1308.66	1308.37	1308.15	1308.00	1307.94	1307.87	1307.81	1307.72	1307.61	1307.51	1307.36
Policeman Cr	KM 000	3835	1306.73	1308.87	1308.80	1308.68	1308.40	1308.16	1308.01	1307.96	1307.88	1307.82	1307.73	1307.62	1307.51	1307.36
Policeman Cr	KM 000	3784	1307	1308.85	1308.78	1308.67	1308.39	1308.15	1308.00	1307.95	1307.87	1307.81	1307.72	1307.61	1307.50	1307.34
Policeman Cr	KM 000	3713	1306.94	1308.80	1308.74	1308.64	1308.33	1308.10	1307.95	1307.90	1307.82	1307.76	1307.67	1307.57	1307.46	1307.30
Policeman Cr	KM 000	3698.7	Bridge													
Policeman Cr	KM 000	3685	1306.66	1308.32	1308.21	1308.03	1307.86	1307.65	1307.53	1307.51	1307.49	1307.48	1307.45	1307.41	1307.35	1307.21
Policeman Cr	KM 000	3527	1306.59	1308.30	1308.20	1308.02	1307.84	1307.61	1307.40	1307.31	1307.24	1307.18	1307.10	1307.00	1306.90	1306.79
Policeman Cr	KM 000	3354	1306.18	1308.25	1308.15	1307.98	1307.82	1307.58	1307.36	1307.27	1307.19	1307.12	1307.03	1306.92	1306.82	1306.68
Policeman Cr	KM 000	3191	1306.01	1308.22	1308.12	1307.95	1307.79	1307.56	1307.34	1307.24	1307.16	1307.10	1307.00	1306.89	1306.79	1306.66
Policeman Cr	KM 000	3154	1306.29	1308.20	1308.10	1307.94	1307.78	1307.54	1307.31	1307.22	1307.14	1307.07	1306.97	1306.86	1306.76	1306.64
Policeman Cr	KM 000	3147.6	Bridge													
Policeman Cr	KM 000	3141	1306.32	1308.18	1308.08	1307.91	1307.75	1307.51	1307.29	1307.20	1307.12	1307.05	1306.95	1306.83	1306.72	1306.60

River	HEC-RAS Model Sub-Reach	River Station (m)	Channel Thalweg Elevation (m)	Computed Water Surface Elevation (m)												
				1000-Year	750-Year	500-Year	350-Year	200-Year	100-Year	75-Year	50-Year	35-Year	20-Year	10-Year	5-Year	2-Year
Policeman Cr	KM 000	3002	1305.82	1308.09	1307.97	1307.78	1307.61	1307.37	1307.14	1307.05	1306.96	1306.88	1306.75	1306.60	1306.45	1306.23
Policeman Cr	KM 000	2822	1305.06	1307.92	1307.79	1307.58	1307.44	1307.21	1306.99	1306.91	1306.84	1306.76	1306.63	1306.50	1306.37	1306.19
Policeman Cr	KM 000	2804	1305.24	1307.85	1307.72	1307.54	1307.41	1307.19	1306.96	1306.88	1306.81	1306.73	1306.61	1306.48	1306.36	1306.18
Policeman Cr	KM 000	2791.3	Bridge													
Policeman Cr	KM 000	2782	1305.70	1307.74	1307.63	1307.47	1307.38	1307.17	1306.95	1306.87	1306.80	1306.72	1306.60	1306.46	1306.34	1306.17
Policeman Cr	KM 000	2666	1305.58	1307.67	1307.53	1307.31	1307.14	1306.84	1306.67	1306.64	1306.59	1306.50	1306.36	1306.21	1306.07	1305.91
Policeman Cr	KM 000	2518	1305.08	1307.62	1307.47	1307.24	1307.05	1306.79	1306.54	1306.56	1306.50	1306.36	1306.15	1305.99	1305.81	1305.54
Policeman Cr	KM 000	2394	1304.63	1307.60	1307.45	1307.22	1307.03	1306.77	1306.50	1306.34	1306.37	1306.24	1306.05	1305.89	1305.72	1305.42
Policeman Cr	KM 000	2306	1304.71	1307.59	1307.44	1307.21	1307.02	1306.76	1306.49	1306.39	1306.37	1306.24	1306.05	1305.88	1305.70	1305.38
Policeman Cr	KM 000	2128	1304.07	1307.06	1306.95	1306.78	1306.63	1306.43	1306.25	1306.18	1306.10	1306.02	1305.90	1305.76	1305.59	1305.30
Policeman Cr	KM 000	1771	1303.82	1306.84	1306.74	1306.60	1306.49	1306.34	1306.19	1306.13	1306.06	1305.99	1305.88	1305.74	1305.57	1305.29
Policeman Cr	KM 000	1560	1303.17	1306.72	1306.65	1306.54	1306.44	1306.32	1306.18	1306.13	1306.05	1305.99	1305.88	1305.73	1305.57	1305.28
Policeman Cr	KM 000	1552.3	Bridge													
Policeman Cr	KM 000	1544	1303.07	1306.70	1306.63	1306.53	1306.43	1306.31	1306.18	1306.12	1306.05	1305.99	1305.88	1305.73	1305.57	1305.28
Policeman Cr	KM 000	1373	1303.99	1306.64	1306.58	1306.49	1306.41	1306.30	1306.18	1306.12	1306.05	1305.99	1305.88	1305.73	1305.57	1305.28

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**APPENDIX B
MEMORANDUM –
HEC-RAS MODEL EXTENSION ALONG BIGHILL CREEK**

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MEMORANDUM

From: Robyn Andrishak, M.Sc., P.Eng. Date: 11-Apr-2018
To: Jane Eaket, M.Sc., P.Eng., CFM NHC Ref. No. 3001178
Via email: jane.eaket@gov.ab.ca
Company: Alberta Environment and Parks
Re: **HEC-RAS Model Extension Along Bighill Creek – Upper Bow River Hazard Study**

This memorandum provides a summary of work done to extend the calibrated, open water flood frequency HEC-RAS hydraulic model to the east boundary of NW 11-26-4 W5M on Bighill Creek. The 1.2 km long extension consists of sixteen additional cross sections and two bridges (Range Road 42 and one pedestrian trail crossing Bighill Creek) above RS 5,030, which was the previous upstream model limit. The extension was completed in February 2018, following the finalization of the calibrated hydraulic model, and was reviewed by Alberta Environment and Parks.

Cross section geometry was assembled from the ground survey and LiDAR data collected for this study in 2015. The Survey and Base Data Collection Report¹, Survey Results Map (Sheet 9 of 10) shows the survey point locations that were used to develop cross sections for the hydraulic model extension. Design drawings for the Range Road 42 bridge (BF941) were used to supplement the survey data defining the structure geometry. Since design drawings were not available for the pedestrian bridge, site photos and survey data were used to develop geometry for the structure.

No open water flood calibration data exists for Bighill Creek in the extended reach, so calibrated channel and floodplain roughness values from the downstream reach were adopted. The existing flood frequency discharge estimates at the upstream boundary of Bighill Creek were also deemed to be applicable to the extended reach.

The extended model was run for all thirteen open water flood scenarios. For the original downstream reach, it was confirmed that the extended model produced identical water surface elevations to the previous model. Along the extended reach, the water surface profiles for each flood scenario were compared, and no anomalous crossovers between water surface profiles were noted. The results were then used to update and extend the open water flood inundation mapping on Bighill Creek, following the standard methodology described in the Open Water Flood Inundation Mapping Report².

¹ Northwest Hydraulic Consultants Ltd. (2017). Survey and Base Data Collection Report. Report for Alberta Environment and Parks, June 2017.

² Northwest Hydraulic Consultants Ltd. (2018). Open Water Flood Inundation Mapping Report. Report for Alberta Environment and Parks, April 2018.

A complete list of all computed flood frequency water levels from the final, extended model is provided in Appendix A of the aforementioned report.

We trust that this information meets your needs. Should any further clarification be required, please contact the undersigned.

Sincerely,

Northwest Hydraulic Consultants Ltd.

APEGA Permit to Practice - P654



Robyn Andrishak, M.Sc., P.Eng.
Principal

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APPENDIX C
FLOOD IMPACTS TO STRUCTURES

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APPENDIX C FLOOD IMPACTS TO STRUCTURES

Table C1	Flood impacts to flood control structures from naturalized open water floods.....	C2
Table C2	Flood impacts to bridges from naturalized open water floods.....	C3
Table C3	Flood impacts to culverts from naturalized open water floods	C5

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Table C1 Flood impacts to flood control structures from naturalized open water floods

Flood Control Structure	Location	Potential Flood Impact													
		2-Year	5-Year	10-Year	20-Year	35-Year	50-Year	75-Year	100-Year	200-Year	350-Year	500-Year	750-Year	1000-Year	
Riverfront Park nature playground berm	Cochrane	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	impact	impact	impact	impact	impact
Jumpingpound Creek Dike	Cochrane	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	impact	impact	impact	impact	impact	impact
Canmore Mine Dike	Canmore	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	impact	impact	impact	impact	impact
Canmore Town Dike	Canmore	no impact	no impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact

Notes:

1. "impact" indicates flood control structure is overtopped.
2. "no impact" indicates flood control structures is not overtopped.

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Table C2 Flood impacts to bridges from naturalized open water floods

Stream Name	River Station (m)	Location	Road/Trail	Potential Flood Impact													
				2-Year	5-Year	10-Year	20-Year	35-Year	50-Year	75-Year	100-Year	200-Year	350-Year	500-Year	750-Year	1000-Year	
Bow River	21,225	Cochrane	River Avenue	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	impact	impact
Bow River	23,403	Cochrane	Cowboy Trail/Hwy 22	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact
Bow River	27,374	near Cochrane	CP Rail	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact
Bow River	54,457	Morley	Morley Road	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact
Bow River	77,639	Seebe	Hwy 1X	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact
Bow River	79,676	Seebe	CP Rail	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact
Bow River	104,509	Canmore	Hwy 1 East	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact
Bow River	104,549	Canmore	Hwy 1 West	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact
Bow River	109,212	Canmore	Bow River Pedestrian Bridge	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	impact	impact	impact
Bow River	109,223	Canmore	Bridge Road	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	impact	impact	impact
Bow River	109,929	Canmore	Spur Line Trail (Engine Bridge)	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact
side channel (Bow River)	109,929	Canmore	Spur Line Trail	no impact	no impact	no impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact
Bighill Creek	208	Cochrane	Walking Trail	no impact	no impact	no impact	no impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact
Bighill Creek	372	Cochrane	Walking Trail	no impact	no impact	no impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact
Bighill Creek	581	Cochrane	Walking Trail	no impact	no impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact
Bighill Creek	992	Cochrane	Walking Trail	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact
Bighill Creek	1,207	Cochrane	Walking Trail	no impact	no impact	no impact	no impact	no impact	impact	impact	impact	impact	impact	impact	impact	impact	impact
Bighill Creek	1,722	Cochrane	Walking Trail	no impact	no impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact
Bighill Creek	2,158	Cochrane	Walking Trail	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	impact	impact	impact	impact	impact	impact
Bighill Creek	2,754	Cochrane	CP Rail	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact
Bighill Creek	2,814	Cochrane	Bow Valley Trail/Hwy 1A	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	impact	impact
Bighill Creek	3,385	Cochrane	Walking Trail	no impact	no impact	no impact	no impact	no impact	impact	impact	impact	impact	impact	impact	impact	impact	impact
Bighill Creek	3,794	Cochrane	Walking Trail	no impact	no impact	no impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact
Bighill Creek	4,360	Cochrane	Walking Trail	no impact	no impact	no impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact
Jumpingpound Creek	647	Cochrane	George Fox Trail	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	impact	impact	impact	impact	impact	impact
Exshaw Creek	111	Exshaw	Diamond Drive	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact
Exshaw Creek	155	Exshaw	CP Rail	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact
Exshaw Creek	451	Exshaw	Walking Trail	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact
Policeman Creek	1,552	Canmore	Wastewater Treatment Plant Road	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	impact	impact	impact
Policeman Creek	2,793	Canmore	Spring Creek Gate	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact
Policeman Creek	3,147	Canmore	Walking Trail	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact
Policeman Creek	3,699	Canmore	8 Street	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	impact	impact	impact

Stream Name	River Station (m)	Location	Road/Trail	Potential Flood Impact													
				2-Year	5-Year	10-Year	20-Year	35-Year	50-Year	75-Year	100-Year	200-Year	350-Year	500-Year	750-Year	1000-Year	
Policeman Creek	3,876	Canmore	10 Street	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	impact	impact
Policeman Creek	4,328	Canmore	Walking Trail	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	impact	impact
Policeman Creek	4,717	Canmore	Walking Trail	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	impact	impact	impact	impact
Policeman Creek	4,853	Canmore	Walking Trail	no impact	no impact	no impact	no impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact
Policeman Creek	5,103	Canmore	Walking Trail	no impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact
Policeman Creek	5,252	Canmore	Walking Trail	no impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact
Policeman Creek	5,648	Canmore	Walking Trail	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	impact	impact	impact	impact	impact	impact
Policeman Creek	5,668	Canmore	Golf Course	no impact	no impact	no impact	no impact	no impact	no impact	no impact	impact	impact	impact	impact	impact	impact	impact

Notes:

1. "impact" indicates that the flood level is equal to or greater than the highest low chord of the bridge.
2. "no impact" indicates that the flood level is less than the highest low chord of the bridge.

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Table C3 Flood impacts to culverts from naturalized open water floods

Stream Name	River Station (m)	Location	Road / Trail	Potential Flood Impact													
				2-Year	5-Year	10-Year	20-Year	35-Year	50-Year	75-Year	100-Year	200-Year	350-Year	500-Year	750-Year	1000-Year	
Bow River	87,721	near Exshaw	Lac Des Arcs Dike	no impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact
Bow River	87,904	near Exshaw	Lac Des Arcs Dike	no impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact
Bow River	88,087	near Exshaw	Lac Des Arcs Dike	no impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact
Bow River	88,251	near Exshaw	Lac Des Arcs Dike	no impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact
Bow River	88,420	near Exshaw	Lac Des Arcs Dike	no impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact
Bow River	91,122	near Exshaw	Lac Des Arcs proposed inlet structure	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact
side channel (Bow River)	23,505	Cochrane	Walking trail	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact
side channel (Bow River)	96,000	Lac Des Arcs	Gravel Road	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	impact	impact	impact	impact	impact	impact
side channel (Bow River)	105,661	near Canmore	Trans-Canada Highway - Hwy 1	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	impact from isolated flooding	impact from isolated flooding	impact from isolated flooding	impact
side channel (Bow River)	105,880	near Canmore	Trans-Canada Highway - Hwy 1	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact
Bighill Creek	480	Cochrane	Griffin Road West	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact
Bighill Creek	1,519	Cochrane	Glenpatrick Road	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact
Bighill Creek	2,498	Cochrane	Glenbow Drive	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact
Exshaw Creek	206	Exshaw	Bow Valley Trail - Hwy 1A	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact
Policeman Creek	4,923	Canmore	8 Avenue	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	impact
Policeman Creek	5,003	Canmore	17 Street	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	impact
Policeman Creek	5,957	Canmore	Golf course	no impact	no impact	no impact	no impact	impact	impact	impact	impact	impact	impact	impact	impact	impact	impact
Policeman Creek	6,435	Canmore	Canmore Town Dike	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact
side channel (Policeman Creek)	4,159	Canmore	7 Avenue	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact
side channel (Policeman Creek)	4,256	Canmore	Pedestrian pathway	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	impact	impact
side channel (Policeman Creek)	4,877	Canmore	8 Avenue	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact	no impact

Notes:

1. "impact" indicates that the flood level is equal to or greater than the road surface elevation above the culvert.
2. "impact from isolated flooding" indicates that the culvert is located in an area of isolated flooding, and the flood level is equal to or greater than the road surface elevation above the culvert.
3. "no impact" indicates that the flood level is less than the road surface elevation above the culvert.

APPENDIX D
DIGITAL FILES

Digital files supplied via FTP

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Table D1. Open Water Inundation Mapping - Digital Data Deliverables

Category	Title	Description	Key Attribute Description	Folder or GDB	File
OPEN WATER FLOOD INUNDATION MAPPING					
	Water Surface Elevation TINs - first draft	Water surface elevation (WSE) TINs for each of thirteen naturalized open water flood scenarios: 2-, 5-, 10-, 20-, 35-, 50-, 75-, 100-, 200-, 350-, 500-, 750-, and 1000-year floods. Created from model sections and perimeter breaklines. Esri TIN format.	All values are water surface elevations in metres.	UpperBowRHS_OpenWaterInundationWSTINs\	tWL????y
	Water Surface Elevation TINs - final draft, including overtopping areas	WSE TINs for each of thirteen naturalized open water flood scenarios: 2-, 5-, 10-, 20-, 35-, 50-, 75-, 100-, 200-, 350-, 500-, 750-, and 1000-year floods. Created from model sections, perimeter breaklines, and additional breaklines for overtopping areas. Esri TIN format.	All values are water surface elevations in metres.	UpperBowRHS_OpenWaterInundationWSTINs\	tWL????y_2
	Water Surface Elevation Grids	WSE grids for each of thirteen naturalized open water flood scenarios: 2-, 5-, 10-, 20-, 35-, 50-, 75-, 100-, 200-, 350-, 500-, 750-, and 1000-year floods. Created from WSE TINs (final draft), tiled, and clipped to flood inundation extents. There is a separate WSE grid for each flood scenario and each DEM tile. Esri file geodatabase grid feature class format.	All values are water surface elevations in metres.	UpperBowRHS_OpenWaterInundationWSGrids.gdb\	gWL????y2_DEMTile
<p>Note: Water surface elevation TINs and grids are based on existing conditions, available data, and assumptions applicable to the Upper Bow River Hazard Study at the time these data were generated. Water surface elevation TINs and grids are provided for information only. Use of or reliance upon this information for any other purpose, including but not limited to future flood inundation mapping updates, is the sole responsibility of the user and is not recommended by Northwest Hydraulic Consultants Ltd.</p>					
	Flood Depth Grids	Flood depth grids for thirteen naturalized open water flood scenarios: 2-, 5-, 10-, 20-, 35-, 50-, 75-, 100-, 200-, 350-, 500-, 750-, and 1000-year floods. Based on final WSE TINs and the digital elevation model (DEM). There is a separate depth grid for each flood scenario and each DEM tile. Esri file geodatabase grid feature class format.	All values are flood depths in metres.	UpperBowRHS_OpenWaterInundationDepths.gdb\	gDP????y2_DEMTile
	Flood Inundation Extents	Flood inundation extents, isolated areas, and potential flood control structure failure areas for thirteen naturalized open water flood scenarios: 2-, 5-, 10-, 20-, 35-, 50-, 75-, 100-, 200-, 350-, 500-, 750-, and 1000-year floods. Derived from flood depth grids, with polygon simplification and smoothing applied. Esri file geodatabase polygon feature class format.	DESCRIP = flood inundation scenario description;SCENARIO = flood inundation scenario number.Mapped flood inundation scenarios include: 0 - X-year Flood Inundation Extent [direct inundation]; 1 - X-year Flood Inundation Extent (Isolated Area); 5 - X-year Flood Inundation Extent (Potential Flood Control Structure Failure).	UpperBowRHS_OpenWaterInundation.gdb\FloodExtents\	OWFloodExtent????Y

Category	Title	Description	Key Attribute Description	Folder or GDB	File
	Model Sections	Model cross sections, attributed with computed open water flood frequency levels for each of thirteen naturalized open water flood scenarios: 2-, 5-, 10-, 20-, 35-, 50-, 75-, 100-, 200-, 350-, 500-, 750-, and 1000-year floods. Esri file geodatabase polyline feature class format.	River = stream name; Reach = reach name; RS = river station value to nearest metre; ModelXS = merge of River, Reach and RS; WSE_????Y = computed water level for each flood scenario.	UpperBowRHS_OpenWaterInundation.gdb\	OW_XSLines

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