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Appendix A

Flood and Geomorphic Issues Highwood River Upstream of Woman's Coulee Canal Inlet



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MD OF FOOTHILLS NO.31

Scoping Study - Flood-Related Areas of Concern on the Highwood River and Little Bow River within the Municipal District of Foothills

Desktop Review of Upper Highwood River

307074-02030 – WW-REP-0001

20 May 2016

DRAFT

Advisian

Suite 500, 151 Canada Olympic Rd SW
Calgary, AB T3B 6B7 CANADA

Phone: +1 403 247 0200

Toll-Free: 1 800 668 6772

Facsimile: +1 403 247 4811

www.advisian.com

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MD OF FOOTHILLS NO.31

**SCOPING STUDY - FLOOD-RELATED AREAS OF CONCERN ON THE HIGHWOOD RIVER AND LITTLE
BOW RIVER WITHIN THE MUNICIPAL DISTRICT OF FOOTHILLS
DESKTOP REVIEW OF UPPER HIGHWOOD RIVER**

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PROJECT 307074-02030 - SCOPING STUDY - FLOOD-RELATED AREAS OF CONCERN ON THE HIGHWOOD RIVER AND LITTLE BOW RIVER WITHIN THE MUNICIPAL DISTRICT OF FOOTHILLS

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1. INTRODUCTION

In response to the 2013 flood event, the Municipal District of Foothills No. 31 (MD) requested Amec Foster Wheeler Environment & Infrastructure (Amec Foster Wheeler) and WorleyParsons Canada Services Ltd., operating as Advisian¹ (Advisian), to undertake a Scoping Study to identify flood-related areas of concerns in the Highwood River and Little Bow River catchments within the MD limits (i.e. the Study Area).

Phase 1 of the Study identifies, in the catchments of the Highwood River and the Little Bow River, flood-related risk locations inside the MD boundary. In order to assist in scope refinement and funding application preparation, Phase 1 has been divided further into geographical areas based on perceived risk, MD residents, identified flood mitigation works that could affect MD residents and infrastructure, and other identified areas of concern.

This report focuses on a portion of the overall Study Area that includes the Upper Highwood River from approximately the MD western limits at the Kananaskis Country boundary to Woman's Coulee Canal (Mosquito Creek) inlet (i.e. the Upper Highwood). The catchment of the Highwood River at the Woman's Coulee Canal inlet is shown in Figure 1. An additional supporting document, similar in format to this one, has been prepared for Pekisko Creek-Stimson Creek, which are major tributaries in the Highwood River watershed. The main report is focused on the area downstream of Woman's Coulee Canal inlet.

This report summarizes the information gathered for the Upper Highwood, and it will be used to identify future data requirements and studies for this area. The report presents general watershed characteristics for the Upper Highwood River and its hydrology, infrastructure information from Alberta Transportation, existing studies and flood projects, local communities affected, a review of licences, and additional notes.

¹ As of July 1, 2015, Advisian became the independent consulting business line of WorleyParsons.



2. METHODOLOGY-REVIEW OF EXISTING INFORMATION

The methods used to develop this report focused on a desk-top review of existing information, as well as field visit information from other projects and key informant information. The following information was reviewed during report preparation:

- hydrometric and flow data for the Upper Highwood River, as defined for this study;
- air photographs of the Upper Highwood Area pre- and/or post-2013 flood;
- databases of the major hydraulic structures which may have been affected at the transportation crossings along the Highwood River;
- key findings of the MD gathered through assessment surveys that investigated both structures and landowner property damaged during the June 2013 flood;
- existing studies involving the Upper Highwood River catchment and projects which are part of the Alberta Environment and Parks (AEP) Flood Recovery Erosion Control (FREC) Program;
- information regarding the June 2013 flood peak flow estimates and other peak flows data;
- a summary of reported damages and concerns following the 2013 events from local communities which were contacted; and
- water license records for the Highwood River basin.

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3. GENERAL WATERSHED CHARACTERISTICS

The Highwood River originates in the Front Ranges of the Canadian Rockies (including Highwood, Elk, High Rock, and Livingston sub-ranges) and the Rocky Mountain Foothills. The watershed's headwaters are at about 2,600 m. Etherington and Cataract creeks are major tributaries originating south of the main channel and upstream of the Upper Highwood River as defined herein. Trap and Sullivan creeks are major northern tributaries located within the Upper Highwood River. Bull, Pekisko, and Stimson creeks are major southern tributaries. There also are several minor steep tributaries, which likely contribute large coarse sediment loads.

In the headwater reach and just downstream, the main channel of the Highwood River flows southeast for approximately 36 km before turning east to northeast toward Longview AB at the Highway 40-Highway 542 junction. The MD boundary is located approximately 4 km east of the highway junction. At the upstream MD boundary, the river is still located in the Front Ranges but gives way to the Rocky Mountain Foothills just downstream. The river is re-directed to a southeast flow path approximately 9 km upstream of Longview and continues in this direction for another 10 km to the confluence with Pekisko Creek. At this point the river turns back to the northeast past the Woman's Coulee Canal inlet to the Town of High River downstream. The river transitions from the Rocky Mountain Foothills Region to the Southern Alberta Uplands (Interior Plains) just downstream of Longview and continues in the physiographic region until the downstream Upper Highwood River boundary where it transitions to Western Alberta Plains (Interior Plains) for the remainder of its downstream watershed. The Upper Highwood River has a drainage area of 1,200 km² at Water Survey of Canada (WSC) Station 05BL008 Highwood River at Brown's Ranch (Village of Longview), increasing to approximately 1,650 km² at the Woman's Coulee Canal inlet.

The irregular meandering planform of the Upper Highwood River within the MD is partially governed by canyon-valley bedrock confinement. The majority of residents along this river segment live on raised terraces or outside the confined canyon, and hence were outside the 2013 flood zone.

Pool-riffle morphology can be found throughout this river segment, which is likely sediment-load limited. However, the river bottom strata is associated with significant quantities of gravel and cobble, as well as boulders in some areas. The river west of the MD boundary is less confined with active flood plains and a more regular meandering planform interspersed between wandering channel reaches. Further upstream, in the headwaters, the Highwood River and its tributaries transition to step-pool and cascade morphologies due to increased slopes.

Photographs 1 to 4 show examples of different Upper Highwood River morphology.



4. HYDROLOGY

The hydrology of the Highwood River is characterized by low fall and winter flows transitioning to significant freshet and rain on snow peak flow events in spring, as well as rainfall-driven flow increases associated with some peak flow events in summer. Freshet, rain-on-snow, and rainfall driven events can result in flows 20 to over 100 times greater than baseflows. Flows tend to stay elevated through spring and early-summer before receding in late-summer and fall. Local snow-melt in early-spring in the foothills and plains regions result in local flow increases in the lower parts of the watershed before melting and flow increases in the mountainous regions begin.

Additional quantitative information pertaining to the Upper Highwood River flood flow information is provided below.

4.1 Water Survey of Canada Information

WSC regularly updates an extensive database of hydrometric data for the stations located along the Highwood River and its tributaries. Figure 2A shows the Highwood River catchment at its confluence with the Bow River and the location of the WSC hydrometric stations. The total High River catchment area is estimated at 3,952 km²,

The set of maps (shown as Figures 2, 3, 4) and the Table 1 provide location, information and data collection history of 11 WSC hydrometric stations along the Highwood River going downstream until the Town of High River. WSC hydrometric stations on Cataract Creek, Trap Creek, Pekisko Creek, Stimson Creek, and the Highwood Diversion Canal also are summarized.

4.2 Historical Peak Flows and Unit Flow Rates

In addition to station information, flood hydrology (years with greatest magnitudes and unit area runoff rates for comparison purposes) for the Upper Highwood's stations including estimates for the 2013 flood are provided in Table 2 in terms of instantaneous peak flows. It is worth noting that all water level recorders were lost during the 2013 flood.

The overview of the studies and reports listed in this document's bibliography was used to update the estimated peak flows and unit area peak flow relative to the June 2013 event at various location in the Highwood Upper Basin, as detailed in the Tables.

WSC has provided a preliminary flow estimate of 980 m³/s at Diebel's Ranch located within the Upper Highwood River. From this value, a summary of estimated 2013 flood flows for the Upper Highwood River, estimated using a watershed area relationship, is as follows,

- 540 m³/s at Highwood House (Hwy 542) Bridge (above Etherington Creek);
- 980 m³/s at Diebel's Ranch (05BL019); and
- 1,320 m³/s at Longview (05BL008).

The preceding values were verified through a HECRAS modelling exercise (WorleyParsons 2014).

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In the period of operation, from 1912 to 1920, for Highwood River at Brown's Ranch (05BL008) instantaneous peak flows were not registered.

In the period of operation, from 1909 to 1931, for Pekisko Creek at Pekisko (05BL006) instantaneous peak flows were not registered.

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5. FLOOD DAMAGES

5.1 Alberta Transportation Information

The Alberta Transportation (AT) database was interrogated for the characteristics of all the major bridges on the Upper Highwood River. The results are listed in Appendix 1.

AT Bridge Information System Coding Guide to interpret some of the acronyms can be found at: http://www.transportation.alberta.ca/Content/docType30/Production/bis_v2_05.pdf.

The Hydrotechnical Information System (HIS) is AT's primary tool to dynamically access the flood observation documents, hydrotechnical file histories and summaries, inspection and survey data, and stream profiles based on digital elevation map (DEM) data.

For the Highwood River, Pekisko Creek, and Stimson Creek, the database of the bridges listed in Table A can be consulted. The first six bridges listed belong to the Upper Highwood River area. Appendix 2 provides the flood inspection reports relative to the 2013 event.

Table A Bridges file ID for Highwood River, Pekisko Creek, and Stimson Creek

HIGHWOOD RIVER		STIMSON CREEK		PEKISKO CREEK	
Bridge Number	Legal	Bridge Number	Legal	Bridge Number	Legal
77498 ¹	NE29-16-5-5	73976	NW20-15-2-5	08241	SE3-17-3-5
81779BXL ¹	NW35-16-5-5	73611	SE17-16-2-5	08241	SE3-17-3-5
73641 ¹	NE14-17-4-5	77700	SW16-16-2-5	13108	NE1-17-3-5
01741 ^{1,2}	NE17-18-2-5	73521	NW16-16-2-5	01970	NW8-17-2-5
70425 ¹	SW9-18-1-5	73389 ²	NW33-16-2-5	78527 ²	SE20-17-2-5
06570 ¹	NW24-18-1-5	01308 ²	SE14-17-2-5	75732	NE20-17-2-5
00221	SW6-19-28-4			01126	NE25-17-2-5
00589	NW6-19-28-4				
84550	SW17-19-28-4				
81703	SW5-20-28-4				
74458N ²	NE6-20-28-4				
74458S ²	NE6-20-28-4				

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HIGHWOOD RIVER		STIMSON CREEK		PEKISKO CREEK	
Bridge Number	Legal	Bridge Number	Legal	Bridge Number	Legal
01733	SW8-20-28-4				
00223 ²	NE18-20-28-4				
00599 ²	NE16-21-28-4				

Notes:

¹ Bridge located in the Upper Highwood River area as defined in this Report.

² Flood inspection report available in Appendix 2.

In addition to the information presented above, the following information was gleaned from the AT's HIS system:

- a) Figures 5A and 5B show the location of the major bridges along the profile and plan view of Highwood River.
- b) In bridge 01741 on Highway 22, the 2013 high water mark was estimated at about 1 to 1.5 ft. above the gabions on the north headslope. A full flood inspection report for the structure also is included in Appendix 2: the bridge reported no visible flood damage or embankment erosion.
- c) No other damages were registered in the remaining four bridges (81779BXL, 73641, 70425 and 06570) in the AT database for the Upper Highwood River.
- d) Figure 5C and 5D show the location of the AT major bridges along the profile and plan view of Stimson Creek.
- e) Figure 6A and 6B show the location of the AT major bridges along the profile and plan view of Pekisko Creek.

Additional information pertaining to bridge infrastructure damaged during the 2013 event is provided in Section 6.

5.2 Municipal District Landowners Survey and Damaged Bridges and Roads Database

Advisian has summarized the general findings of the MD's survey conducted after the June 2013 flood event.

Reported damages returned to the assessors through their survey, range from acres of land lost to feet of water in the house.



Table 3 provides MD identifier (Roll Number) and legal location of damages collected during the survey campaign. In the Legal Land locations of Table 3 various instances of damage types (residential basement, land only, etc.) were reported along the Highwood River upstream of the Coulee Canal Inlet, the Pekisko Creek or the Stimson Creek.

The MD Public Work Department informed that all of the damaged roads within the Upper Highwood came from small tributary streams overwhelming the culverts.

For each item in the map, a detailed database has been provided by the MD. Detailed design and construction information for repaired bridges is available, but not included in this report.

Table B summarizes the damaged bridges relative to the Upper Highwood River from the more extensive database provided by the MD. Some of the structures were already present, with less details, in Table A of the previous section and obtained from the AT database. In these cases, the structure has the same Bridge Number.

Table B 2013 Flood-Damaged Bridges inside the MD limits of the Upper Highwood Basin

Bridge Number	River	Damage	Road	Owner	Status
77700	Stimson	Damage	786 Ave W	MD	Repaired
73389	Stimson	Reports of Damage	HWY 22	Province	Unknown
01308	Stimson	Damage	HWY 540	Province	Repaired
01126	Stimson	Damage	642 St. W	MD	Repaired
75732	Pekisko	Destroyed	160 St. W	MD	Removed
01970	Pekisko	Damaged	2698 Dr. W	MD	Repaired
SW 6-18-3 W5	Highwood	Destroyed	Private Drive	Private	Not replaced
NW 7-18-3 W5	Highwood	Destroyed	Private Drive	Private	Replaced

As an example of the photographic evidence collected during the survey process, Photo A shows bridge 75732 on the Pekisko Creek, destroyed during the June 2013 flood.

Photo A Bridge 75732 on the Pekisko Creek, Destroyed During the June 2013 Flood



Provincial inspections have been carried out as well on the bridges damaged by the 2013 flood. Appendix 2 provides the available provincial bridge damage inspection reports for the Upper Highwood River, Pekisko Creek and Stimson Creek areas.

Table C summarizes the damaged roads items in the Upper Highwood River catchment from the database provided by the MD.



Table C 2013 Flood Damaged Roads inside the MD Limits of the Upper Highwood Basin

Full Street	Surface	Owner	Structure	Location
2698 Dr. W ²	Chip Seal	MD	Dirt	2698 Dr. W (169 St -176 St.)
2698 Dr. W ²	Chip Seal	MD	Dirt	2698 Dr. W (176 St - 179 St.)
2698 Dr. W ²	Gravel	MD	Dirt	2698 Dr. W (179 St - 192 St.)
2698 Dr. W ²	Gravel	MD	Dirt	2698 Dr. W (200 St - 208 St.)
2698 Dr. W ²	Gravel	MD	Dirt	2698 Dr. W (192 St - 200 St.)
2698 Dr. W ²	Gravel	MD	Dirt	2698 Dr. W (208 St - 224 St.)
594 Ave W ¹	Gravel	MD	Dirt	594 Ave W (288 St - 304 St.)
594 Ave W ¹	Gravel	MD	Dirt	594 Ave W (280 St - 288 St.)

Notes:

¹ Roads located along the Highwood River and upstream of the Woman's Coulee Inlet

² Roads located along the Pekisko Creek

Figure 7A shows the 2013 flood-affected areas (in orange) in the Upper Highwood River, Pekisko Creek, and Stimson Creek as registered in the MD database and updated at the time of writing this Report. It is susceptible to modifications and represents a compendium of first hand reports, imagery, dam breach reports, assessment surveys, provincial surveys, assessment notes and comments, survey reports, and staff pictures. However, in Figure 7B are shown specific observations of maximum water extents from the MD agriculture fieldsman. The fieldsman was directly collecting his information during the entire day of June 20, 2013, and the figure shows specific field observations in disagreement with, or in addition to, the overall flood-affected areas obtained in an indirect way, shown in Figure 7A.

6. EXISTING STUDIES AND POST-FLOOD PROJECTS

This section lists and briefly describes the major studies and reports relative to the Upper Highwood River catchment completed in the recent years:

- Upper Highwood River Water Management Plan by Alberta Environment, previous to the 2013 flood events (Alberta Environment 2008a and 2008b);
- Southern Alberta Flood Mitigation Feasibility Study prepared by AECOM for the Alberta Flood Recovery Task Force created immediately after the June 2013 floods (AECOM 2014); and
- projects belonging to the FREC Program, which provided funding to address immediate repairs and long-term community mitigation projects in response to major erosion damages from the June 2013 floods.

6.1 Upper Highwood River Water Management Plan (Pre-2013 Flood)

In 2008, Alberta Environment issued the *Water Management Plan for the Watersheds of the Upper Highwood and Upper Little Bow Rivers (Volume 1)* and the *Highwood Diversion Plan (Volume 2)*.

The Management Plan's scope included the entire portion of the Highwood River upstream of the confluence with the Sheep River.

As these documents were published a few years before the 2013 destructive events, they represent an important benchmark to evaluate objectives and directives as given at the time and to update water issues for surface and groundwater quality, quantity and effects of land use on the water bodies of the Highwood Basin. They also provide an important source of information about the operating periods of the diversions with maximum and minimum rates, target environmental flows and minimum operation flows in the basin. Of particular interest are the Highwood River instream minimum flow requirements versus the diversion flow limits and how the flood mitigation measures implemented or to be designed after 2013 may affect them. The flows regimes produced by the mitigation measures will in fact alter the split ratios between Highwood River and Little Bow River downstream of the Woman's Coulee intake during high flow events, as will be detailed in the main body of the Scoping Study. The mitigation measures may change the morphology of the Highwood River such that the minimum instream flow requirements should be re-evaluated. The Management Plan's therefore represent a historical baseline to assess alterations to diverted flows against the 2008 minimum flow requirements.

During future flood condition, flow through the diversions will have to be optimized and operated to minimize downstream stress and damages wherever possible. As well, the receiving reservoirs and their operation will need careful consideration in re-establishing diversion flows immediately before, during and immediately after future flood events.



6.2 Southern Alberta Flood Mitigation Feasibility Study

The Study was completed in 2014 in response to the June 2013 floods, to review and evaluate flood mitigation proposals put forward by the Southern Alberta Flood Recovery Task Force, developing a set of selection criteria and identifying a water management strategy for future flood mitigation.

It covers fundamental feasibility criteria for a design flood event with 1-in-100 year probability which includes technical viability, cost-benefit analysis, stakeholders interests, and potential environmental effects. Based on these criteria, a number of flood mitigation alternatives and schemes are evaluated. Even though the Study does not include the complete and final set of flood mitigation structures completed in 2014, particularly in the Town of High River, it offers important support information for future analyses aimed at alleviating flood issues and mitigating damage in the Highwood River catchments.

6.3 Flood Recovery Erosion Control Program

The FREC projects within the Upper Highwood study area in or surrounding the Village of Longview (see also Figure 7C), are located as follows:

- on SW 16-18-2 W5. The location is on the Highwood just south (downstream) of Longview. The erosion protection was installed in late 2015. The location of this project is provided in Figure 7C; and
- on SW 17-18-2 W5 and NW 20-18-2 W5, the Village of Longview Water Well and Outfall Flood Protection, designed by MPE Engineering Ltd. (MPE).

Also, parts of the FREC framework are three completed project in the Woman's Coulee and Hoeh Dyke areas, downstream of the Upper Highwood River area:

- on NW 29-18-29 W5. The Woman's Coulee Project Location 1 (Figure 7D);
- on NW 29-18-29 W5. The Woman's Coulee Project Location 2 (figure 7D); and
- on NW 30-18-29 W5. The Hoeh Dyke DRP Repair 2014.

Figure 7D shows the above FREC project locations.

7. LOCAL COMMUNITIES REVIEW AND RECOMMENDATIONS

Major local communities in the Upper Highwood River whose water sources were impacted by the June 2013 flood were contacted for an update on water source damages and concerns of future flood risks.

7.1 Village of Longview

The village has two wells hydraulically connected to the Highwood River for raw water supply. They both were inundated by sediment during the June 2013 flood. After their electrical equipment was repaired they resumed pumping, but high turbidity remained an issue during spring surface run-off (AECOM 2014).

The Water Well and Stormwater Outfall Flood Protection design was completed by MPE (2014). The design includes extending the well head upward to prevent sediment entering the wells from above during flood conditions.

The Chief Administrative Officer of the Village of Longview (e-mail from Vicky Adamson, June 22, 2015) expressed concern about the water wells of the project mentioned above being located within the flood and erosion risk area. The well heads currently are being raised to mitigate the risk, but the issue remains a concern. Similarly, the outfall infrastructure is located within the flood and erosion risk area. This area also is being protected by the design provided by MPE.

7.2 Eden Valley

The Stoney Tribal Administration (Stoney) was contacted as part of the current due diligence process with particular regard to the Eden Valley Indian Reservation No 216 on the Upper Highwood River area.

The Reservation draws raw water from the Highwood River through an intake, and distributes it to a portion of its residents after it is treated in a local water treatment plant. The remaining residents obtain water from private wells or have water trucked in (AECOM 2014).

The Administration, via its Consultation Manager (e-mail from William Snow, June 19, 2015) communicated that Stoney Tribe is planning to complete a Water Needs Assessment Report by fall 2015. A flood plan will be part of the Assessment Report.

The Administration also expressed concern about the exclusion of most Indian Reserves from flood hazard mapping programs to date, and interest in coordinating with the MD scope of flood hazard mapping work and in promoting a Cultural Awareness session with the Stoney Tribe, particularly regarding Stoney Water Rights.



8. LICENSES REVIEW

Appendix 3 includes a collection of Surface Diversion Licenses and Well Diversion Licenses, as available from AEP License Viewer. The Appendix includes a license review of the entire Highwood River basin for this due diligence review.

Surface Diversion Licenses and Well Diversion Licenses are mapped in Figure 8A and Figure 8B, respectively.

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9. PUSH-UP DAMS

A number of push-up dams have been identified from a satellite photos review in the agricultural area of the upper Highwood River and are mapped here (Figure 9) for future reference.

Push-up dams are minor barriers built by private owners to form small pond volumes on minor diversions or drainages to be used mainly for irrigation purposes. They are not always licensed and, while they do not collect large volumes individually, they can cause significant impacts if cascade failure occurs during a flood event.

Figure 9A shows, for example, the detail of a push-up dam whose tailwater discharges into Stimson Creek

In Figure 9B are shown all the push-up dams identified in the Highwood River, Pekisko, and Stimson Creeks basins.

The push-up dams geographic coordinates are reported in Table D.

Table D Push-Up Dams coordinates

ID	latitude	longitude
1	50°30'9.72"N	114° 8'53.48"W
2	50°28'20.35"N	114°14'4.70"W
3	50°29'15.72"N	114°13'15.60"W
4	50°25'30.18"N	114° 8'13.27"W
5	50°25'27.84"N	114°10'42.60"W
6	50°27'5.04"N	114°10'15.24"W
7	50°19'12.00"N	114°13'39.00"W



10. SUMMARY

The Upper Highwood River is defined as the segment of the Highwood River downstream of the MD Boundary (located approximately 33 km upstream of Longview) to the Woman's Coulee Canal Inlet on the Highwood River. This Report describes the Highwood River and the major tributaries in this area (i.e. Pekisko Creek and Stimson Creek) and discusses the flood issues identified for the mainstem of the Upper Highwood River

Flood issues as well as flood risk changes in this area, located upstream of the proposed or realized measures of flood control following the 2013 flood event, are limited to:

- a) Bridge damages: The bridge on Highway 22 (01741) reported no visible flood damage or embankment erosion. No other damages were registered in the remaining four bridges in the Alberta Transportation database for this section of the Highwood River. Two private bridges were destroyed within sections 6 and 7 of 18-03 W4M. Given the unchanged conditions relative to river hydraulics, it is reasonable to assume that flood issues and risks will be similar in the future.
- b) Road damages: Two localized road washouts were reported in Eden Valley area or immediately downstream. The same considerations on unchanged river hydraulics and flood risk level apply.
- c) Landowner damages: Six instances of various damage types (residential basement, land only, etc.) were reported in quarter sections between Longview and the Pekisko Creek confluence.
- d) Few minor barriers built by private owners to form small pond volumes on minor drainage paths for irrigation purposes (push-up dams) have been located in the agricultural areas immediately upstream of the Pekisko Creek confluence. Similar considerations apply to these small man-made barriers.

The Upper Highwood River includes the river segment from the Pekisko Creek confluence downstream to Woman's Coulee Canal inlet. In general, impacts associated with this area in the MD were limited to damages to the Hogg Park Campground and some basement flooding and land damage. Twelve residents reported damage between Pekisko Creek confluence and Woman's Coulee Inlet. Although some bank erosion occurred throughout this river segment, residential buildings were located mainly on elevated terraces above the 2013 flood levels.

11. CLOSURE

We trust that this report satisfies your current requirements and provides suitable documentation for your records. If you have any questions or require further details, please contact the undersigned at any time.

Report Prepared by

Andrea Pipinato, M.Sc., M.Eng.
Senior Water Resources Specialist

Senior Review by

M.V. Thompson, M.A.Sc.
Senior Water Resource Consultant

12. BIBLIOGRAPHY

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Tables

DRAFT

Table 1
Water Survey of Canada Stream Gauges: Station Information and Data Collection History

Number	05BL021	05BL019	05BL008	05BL003
Name	Highwood River Below Picklejar Creek	Highwood River at Diebel's Ranch	Highwood River at Brown's Ranch	Highwood River at High River
Active or discontinued	Discontinued	Active	Discontinued	Discontinued
Latitude	50° 29' 55" N	50° 24' 18" N	50° 31' 44" N	50° 35' 00" N
Longitude	114° 49' 02" W	114° 30' 02" W	114° 14' 14" W	113° 52' 20" W
Gross drainage area	132 km ²	773.6 km ²	1200 km ²	1980 km ²
Effective drainage area	N/A	N/A	N/A	N/A
Record length	21 Years	66 Years	9 Years	15 Years
Period of record	1965-1985	1950-2015	1912-1920	1908-1986
Regulation type	Natural	Natural	Natural	Regulated
Regulation length	N/A	N/A	N/A	N/A
Real-time data available	No	Yes	No	No
Sediment data available	Yes	Yes	No	No
Type of water body	River	River	River	River
EC Regional Office	CALGARY	CALGARY	CALGARY	CALGARY
Data contributed by	N/A	N/A	N/A	N/A
Datum of published data	ASSUMED DATUM	ASSUMED DATUM	N/A	ASSUMED DATUM
Period of operation	1965-1985	2012-2015	1920-1920	1983-1986
Type	Flow	Flow & Level	Flow	Flow
Operation schedule	Seasonal	Seasonal	Seasonal	Continuous
Gauge type	Recorder	Recorder	Manual	Recorder

Table 1
Water Survey of Canada Stream Gauges: Station Information and Data Collection History

Number	05BL004		05BL022			05BL027		05BL006		
Name	Highwood River Below Little Bow Canal		Cataract Creek Near Forestry Road			Trap Creek Near Longview		Pekisko Creek at Pekisko		
Active or discontinued	Active		Active			Active		Discontinued		
Latitude	50° 35' 08" N		50° 17' 06" N			50° 28' 38" N		50° 25' 40" N		
Longitude	113° 52' 09" W		114° 35' 19" W			114° 25' 34" W		114° 13' 30" W		
Gross drainage area	1953.4 km²		165.5 km²			137.4 km²		203 km²		
Effective drainage area	N/A		N/A			N/A		N/A		
Record length	30 Years		50 Years			37 Years		20 Years		
Period of record	1986-2015		1966-2015			1979-2015		1909-1931		
Regulation type	Regulated		Natural			Natural		Natural		
Regulation length	N/A		N/A			N/A		N/A		
Real-time data available	Yes		Yes			Yes		No		
Sediment data available	No		Yes			No		No		
Type of water body	River		River			River		River		
EC Regional Office	CALGARY		CALGARY			CALGARY		CALGARY		
Data contributed by	N/A		N/A			N/A		N/A		
Datum of published data	ASSUMED DATUM		ASSUMED DATUM			ASSUMED DATUM		N/A		
Period of operation	2012-2015	1986-2011	2012-2015	1972-2011	1966-1971	2012-2015	1979-2011	1923-1931	1911-1919	1909-1910
Type	Flow & Level	Flow	Flow & Level	Flow	Flow	Flow & Level	Flow	Flow	Flow	Flow
Operation schedule	Continuous	Continuous	Continuous	Continuous	Seasonal	Seasonal	Seasonal	Seasonal	Seasonal	Miscellaneous
Gauge type	Recorder	Recorder	Recorder	Recorder	Recorder	Recorder	Recorder	Manual	Manual	Manual

Table 1
Water Survey of Canada Stream Gauges: Station Information and Data Collection History

Number	05BL023				05BL007				05BL025	
Name	Pekisko Creek near Longview				Stimson Creek near Pekisko				Highwood Diversion Canal Near Headgates	
Active or discontinued	Active				Active				Active	
Latitude	50° 33' 07" N				50° 25' 48" N				50° 33' 07" N	
Longitude	113° 59' 23" W				114° 10' 01" W				113° 59' 23" W	
Gross drainage area	231.9 km²				236 km²				N/A	
Effective drainage area	N/A				N/A				N/A	
Record length	39 Years				87 Years				39 Years	
Period of record	1977-2015				1911-2015				1977-2015	
Regulation type	Regulated				Regulated				Regulated	
Regulation length	N/A				N/A				N/A	
Real-time data available	Yes				Yes				Yes	
Sediment data available	No				Yes				No	
Type of water body	River				River				River	
EC Regional Office	CALGARY				CALGARY				CALGARY	
Data contributed by	N/A				N/A				N/A	
Datum of published data	ASSUMED DATUM				ASSUMED DATUM				ASSUMED DATUM	
Period of operation	2012-2015	1977-2011	1966-2011		2012-2015	1960-2011	1938-1959	1911-1919	2012-2015	1977-2011
Type	Flow & Level	Flow	Flow		Flow & Level	Flow	Flow	Flow	Flow & Level	Flow
Operation schedule	Seasonal	Seasonal	Seasonal		Seasonal	Seasonal	Seasonal	Seasonal	Seasonal	Seasonal
Gauge type	Recorder	Recorder	Recorder		Recorder	Recorder	Manual	Manual	Recorder	Recorder

Table 2
Largest Instantaneous Peak Flow and Flow Rate by WSC station in the Upper Highwood River

Station	05BL021	Highwood River Below Picklejar Creek - Area 132 km ²	05BL019	Highwood River at Diebel's Ranch – Area 773.6 km ²	05BL022	Cataract Creek Near Forestry Road – Area 165.5 km ²
Year	Peak Flow (m ³ /s)	Flow Rate (m ³ /s/km ²)	Peak Flow (m ³ /s)	Flow Rate (m ³ /s/km ²)	Peak Flow (m ³ /s)	Flow Rate (m ³ /s/km ²)
2013	- ¹	-	980 ²	1.2668	-	-
1995	-	-	661	0.8455	198	1.1964
1932	-	-	-	-	-	-
1942	-	-	-	-	-	-
2005	-	-	173	0.2236	39	0.2356
1923	-	-	-	-	-	-
1929	-	-	-	-	-	-
1953	-	-	283	0.3658	-	-
1974	52.7	0.3992	143	0.1849	48.1	0.2906
1972	44.5	0.3371	134	0.1732	39.6	0.2393
1967	41.6	0.3152	258	0.3335	39.4	0.2381
2008	-	-	225	0.2908	78.9	0.4767
1990	-	-	214	0.2766	56	0.3384
1998	-	-	187	0.2417	107	0.6465
1963	-	-	186	0.2404	-	-
1975	30.6	0.2318	174	0.2249	56.6	0.3420
2002	-	-	161	0.2081	43.9	0.2653
1981	36.8	0.2788	148	0.1913	48.8	0.2949
1965	-	-	138	0.1784	-	-

Table 2
Largest Instantaneous Peak Flow and Flow Rate by WSC station in the Upper Highwood River

Station	05BL027	Trap Creek Near Longview– Area 137.4 km²	05BL023	Pekisko Creek near Longview - Area 231.9 km²	05BL007	Stimson Creek near Pekisko - Area 236 km²
Year	Peak Flow (m³/s)	Flow Rate (m³/s/km²)	Peak Flow (m³/s)	Flow Rate (m³/s/km²)	Peak Flow (m³/s)	Flow Rate (m³/s/km²)
2013	-	-	147	0.6339	227	0.9619
1995	-	-	99.8	0.4304	98.6	0.4178
1932	-	-	-	-	-	-
1942	-	-	-	-	-	-
2005	54.7	0.3981	119	0.5132	135	0.5720
1923	-	-	-	-	-	-
1929	-	-	-	-	-	-
1953	-	-	-	-	53.2	0.2254
1974	-	-	13.2	0.0569	12.3	0.0521
1972	-	-	13.5	0.0582	14.8	0.0627
1967	-	-	53.8	0.2320	23.3	0.0987
2008	36.5	0.2656	64.6	0.2786	42.9	0.1818
1990	40	0.2911	37.6	0.1621	15.4	0.0653
1998	31.9	0.2322	85.3	0.3678	77.5	0.3284
1963	-	-	-	-	44.2	0.1873
1975	-	-	29.7	0.1281	26.2	0.1110
2002	18.4	0.1339	24.9	0.1074	45.2	0.1915
1981	33.8	0.2460	24.8	0.1069	18.9	0.0801
1965	-	-	-	-	-	-

Notes

¹ “-” indicates missing data or data not available

² Preliminary WSC Estimate (maximum instantaneous using slope-area methodology)



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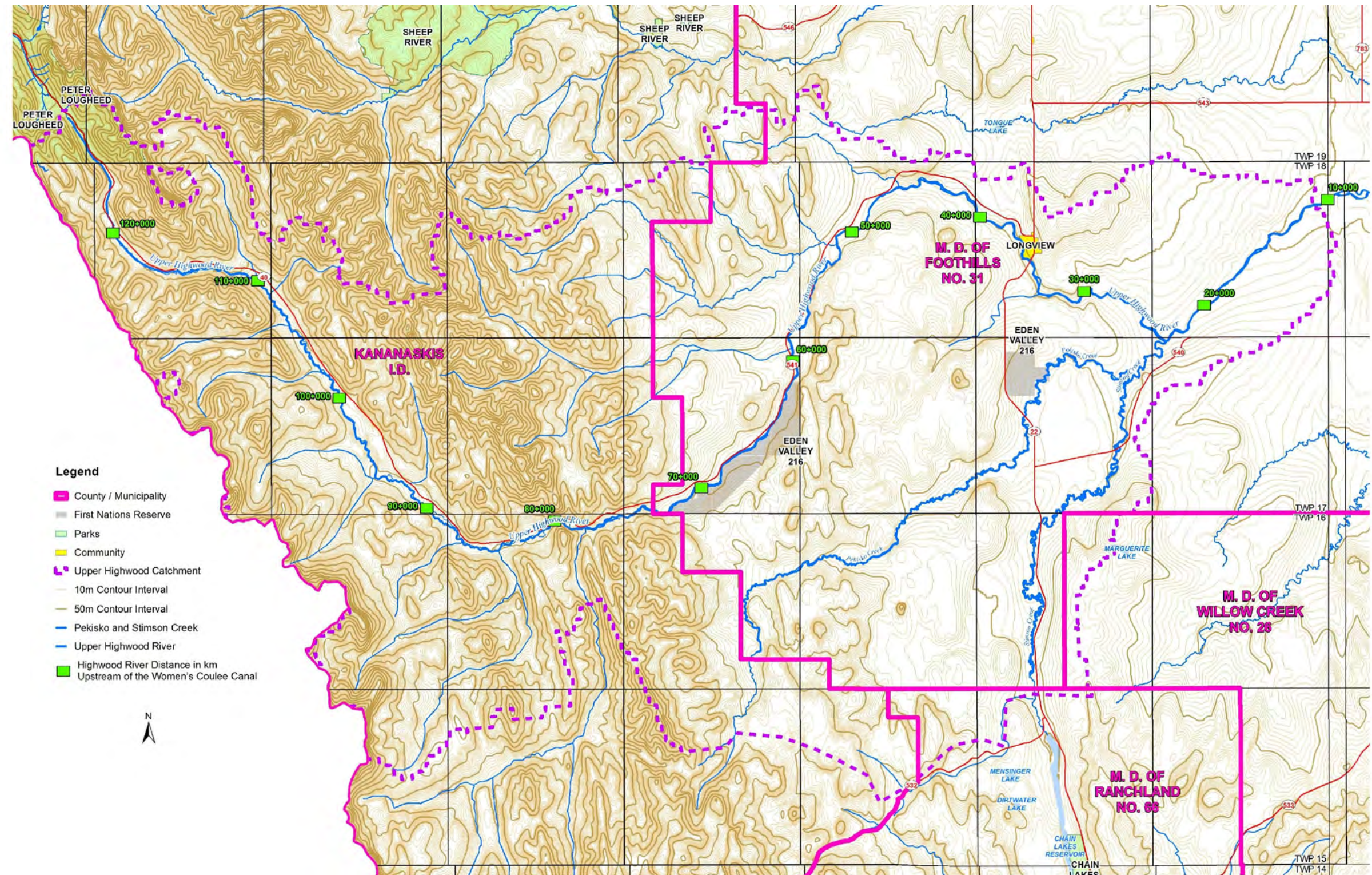
Table 3

**2013 Municipal District Flood Landowners Damages Survey Locations in
the Upper Highwood River Area**

Roll Number	Legal Land	Roll Number	Legal Land
1801157500	NE 15-18-1 W5	1802090000	SE 9-18-2 W5
1801157510	NE 15-18-1 W5	1801155010	W 15-18-1 W5
1702070000	SE 7-17-2 W5	1801097500	NE 9-18-1 W5
1802102500	SW 10-18-2 W5	1802177510	NE 17-18-2 W5
1801220000	SE 22-18-1 W5	1702132510	SW 13-17-2 W5
1702075000	NW 7-17-2 W5	1801160000	SE 16-18-1 W5
1801080000	SE 8-18-1 W5	1802122500	SW 12-18-2 W5
1801160010	SE 16-18-1 W5	1702077500	NE 7-17-2 W5
1802162500	SW 16-18-2 W5	1802205000	NW 20-18-2 W5
1702360000	SE 36-17-2 W5	1702330000	SE 33-17-2 W5
1801237510	NE 23-18-1 W5	000033893579	SE 22-18-1 W5
1801092520	SW 9-18-1 W5	000020899381	SE 8-18-1 W5
1801152500	SW 15-18-1 W5	000021460936	NE 25-18-1 W5
1801060000	SE 6-18-1 W5	000021243191	SW 16-18-2 W5
1801052500	SW 5-18-1 W5	000034956350	SW 15-18-1 W5
1702267500	NE 26-17-2 W5	000013895900	NW 25-17-2 W5
1801235010	NW 23-18-1 W5	000023327489	SW 12-18-2 W5
1702255000	NW 25-17-2 W5		

Figures

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Upper Highwood River Drainage Basin at the Women's Coulee Canal Inlet



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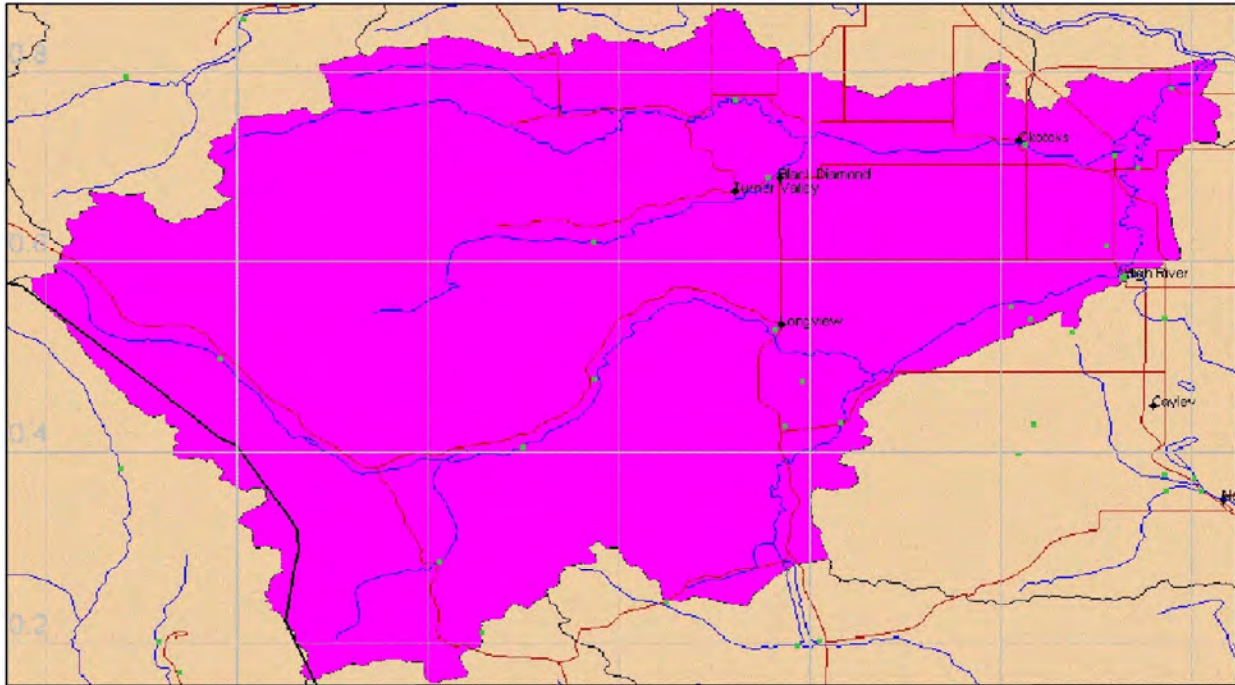


FIGURE 2A : WSC DRAINAGE BASIN FOR THE HIGHWOOD RIVER AT THE CONFLUENCE INTO THE BOW RIVER
NTS

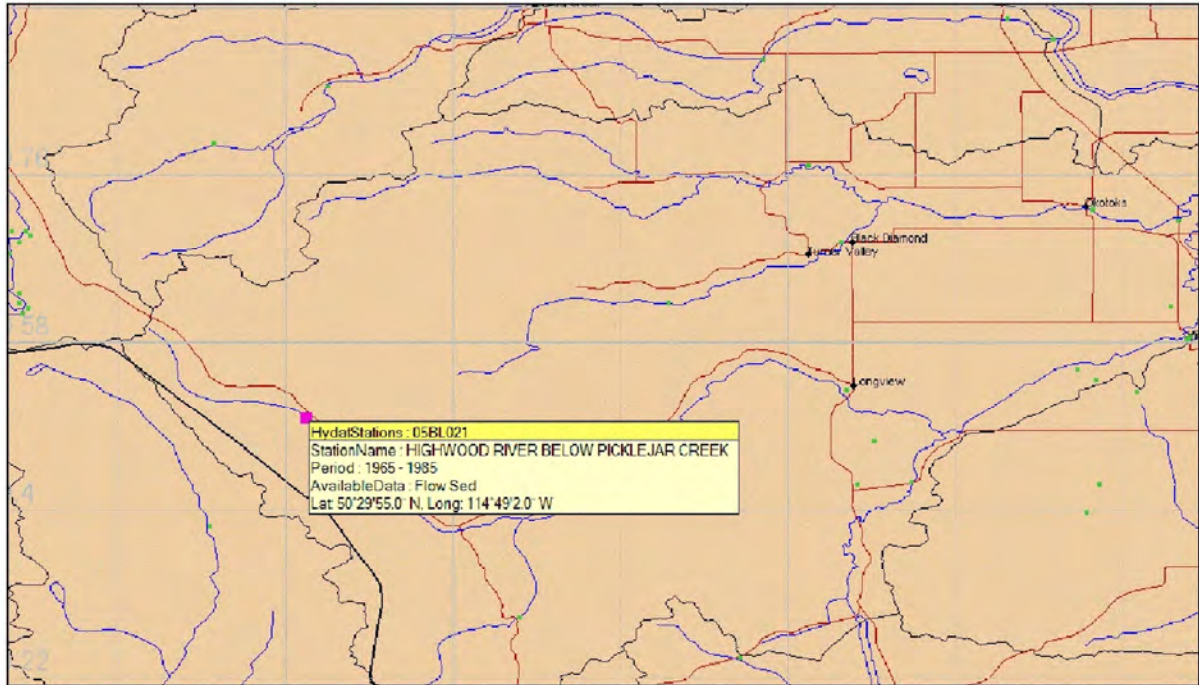


FIGURE 2B: LOCATION OF HIGHWOOD RIVER BELOW PICKLEJAR CREEK (05BL021)
NTS

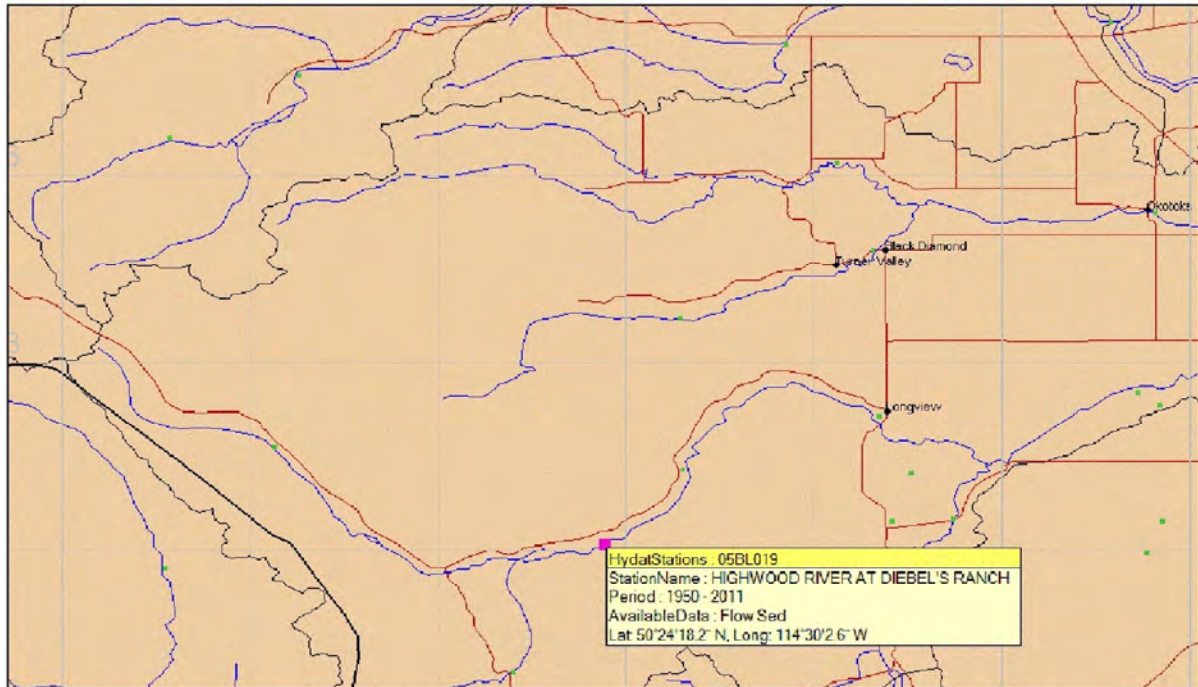


FIGURE 2C: LOCATION OF HIGHWOOD RIVER AT DIEBEL'S RANCH (05BL019)
NTS

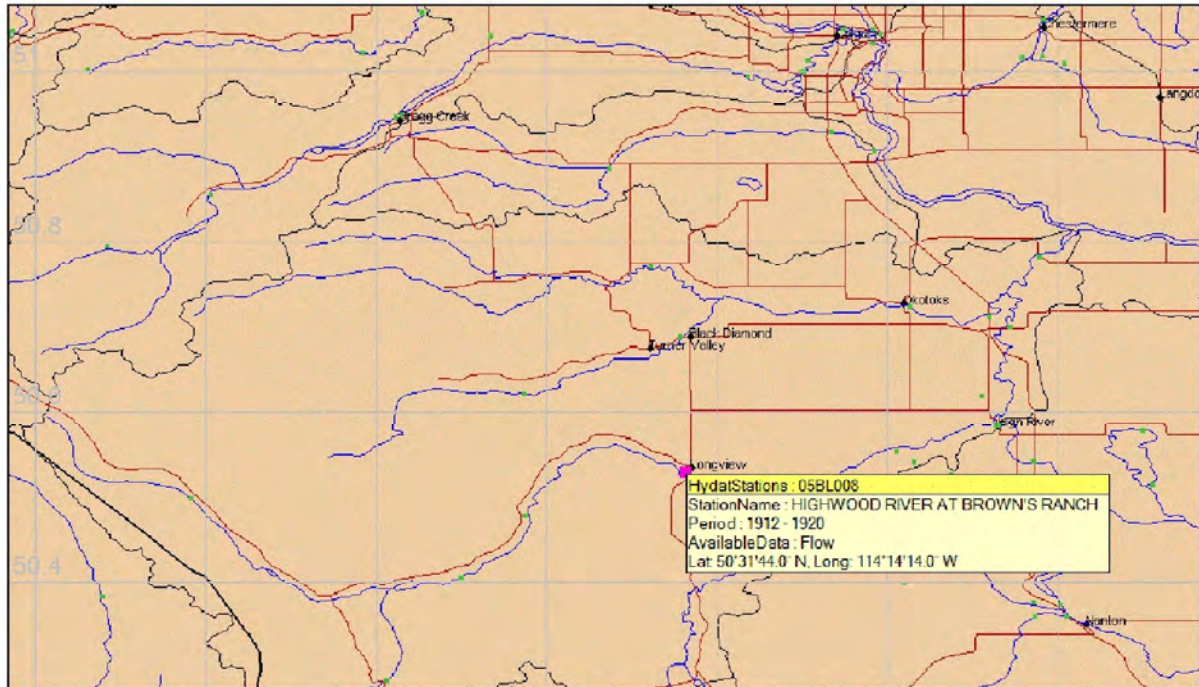


FIGURE 2D: LOCATION OF HIGHWOOD RIVER AT BROWN'S RANCH (05BL008)
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Water Survey of Canada – Highwood River Catchment and Stations



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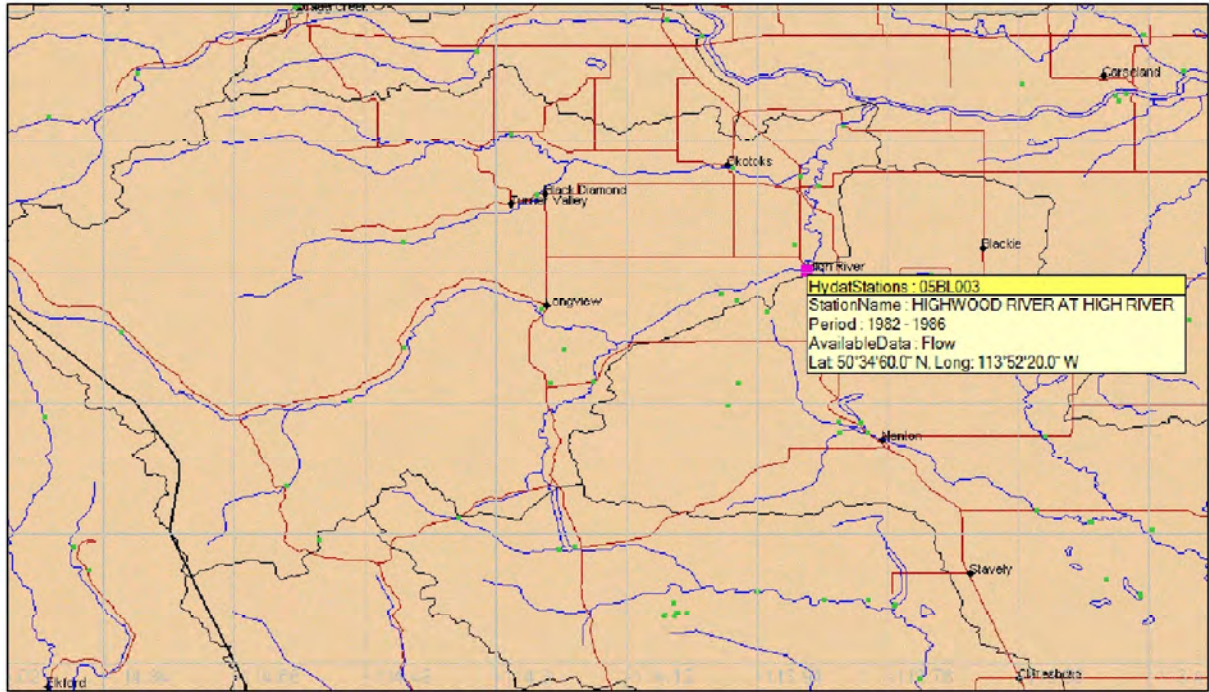


FIGURE 3A: LOCATION OF HIGHWOOD RIVER AT HIGH RIVER (05BL003)
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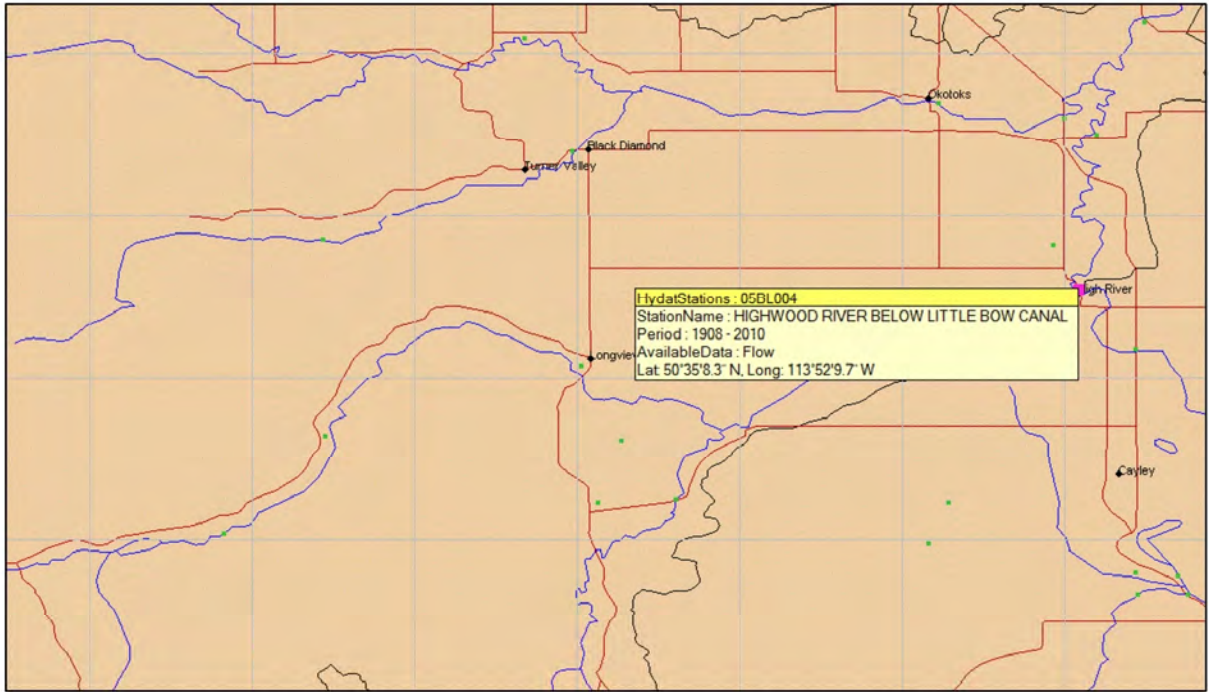


FIGURE 3B: LOCATION OF HIGHWOOD RIVER BELOW LITTLE BOW CANAL (05BL004)
NTS

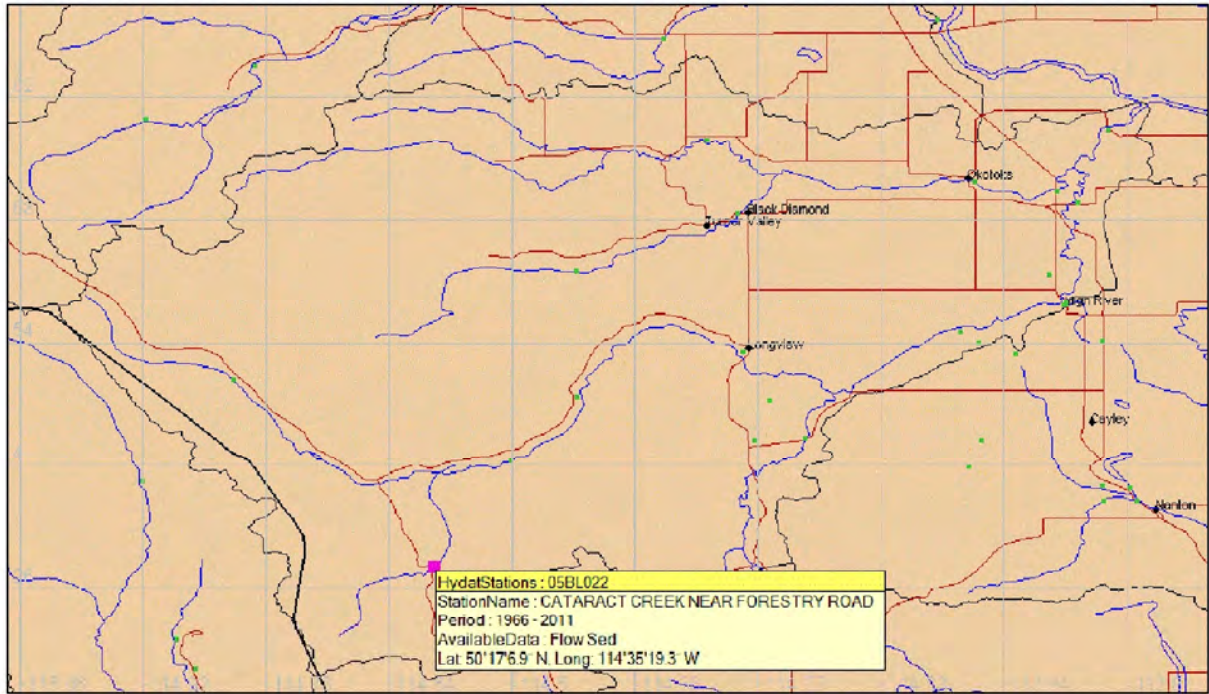


FIGURE 3C: LOCATION OF CATARACT CREEK NEAR FORESTRY ROAD (05BL022)
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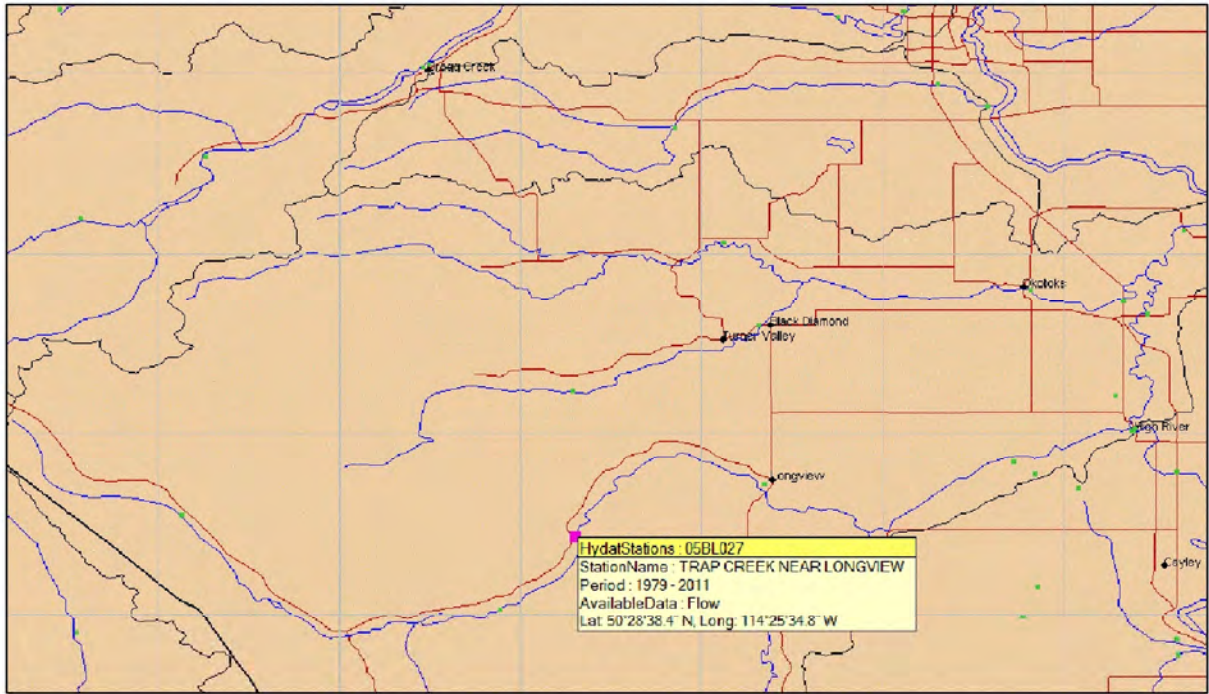
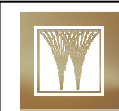


FIGURE 3D: LOCATION OF TRAP CREEK NEAR LONGVIEW (05BL027)
NTS



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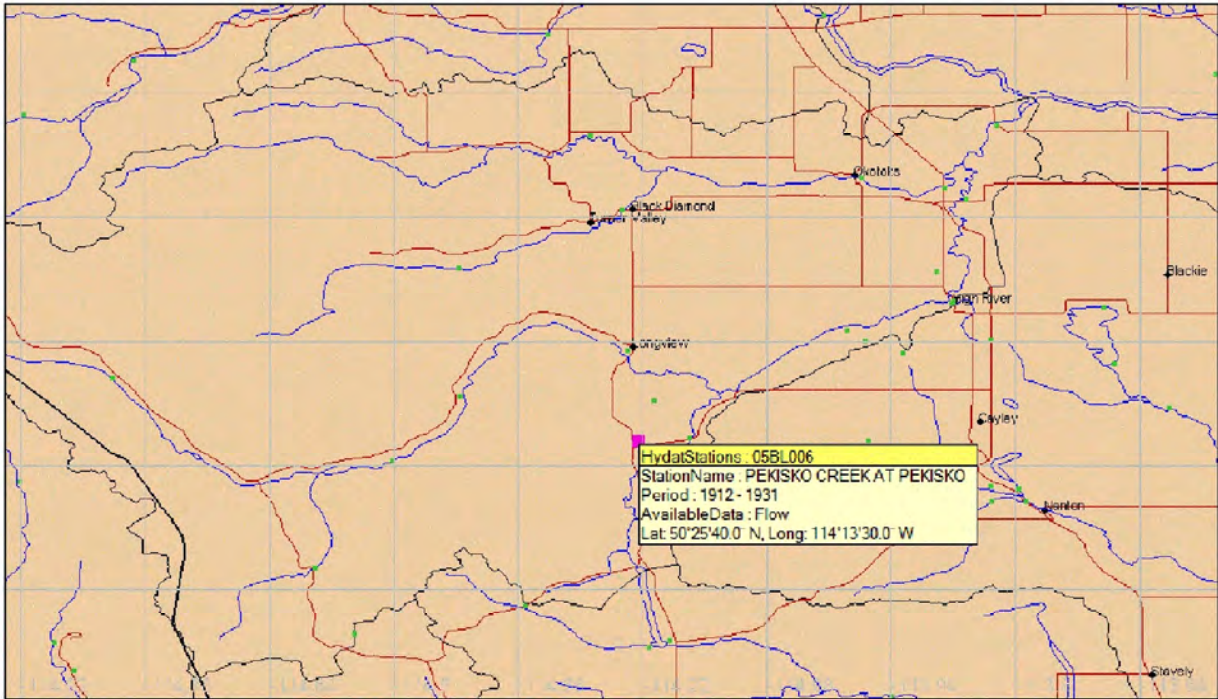


FIGURE 4A: LOCATION OF PEKISKO CREEK AT PEKISKO (05BL006)
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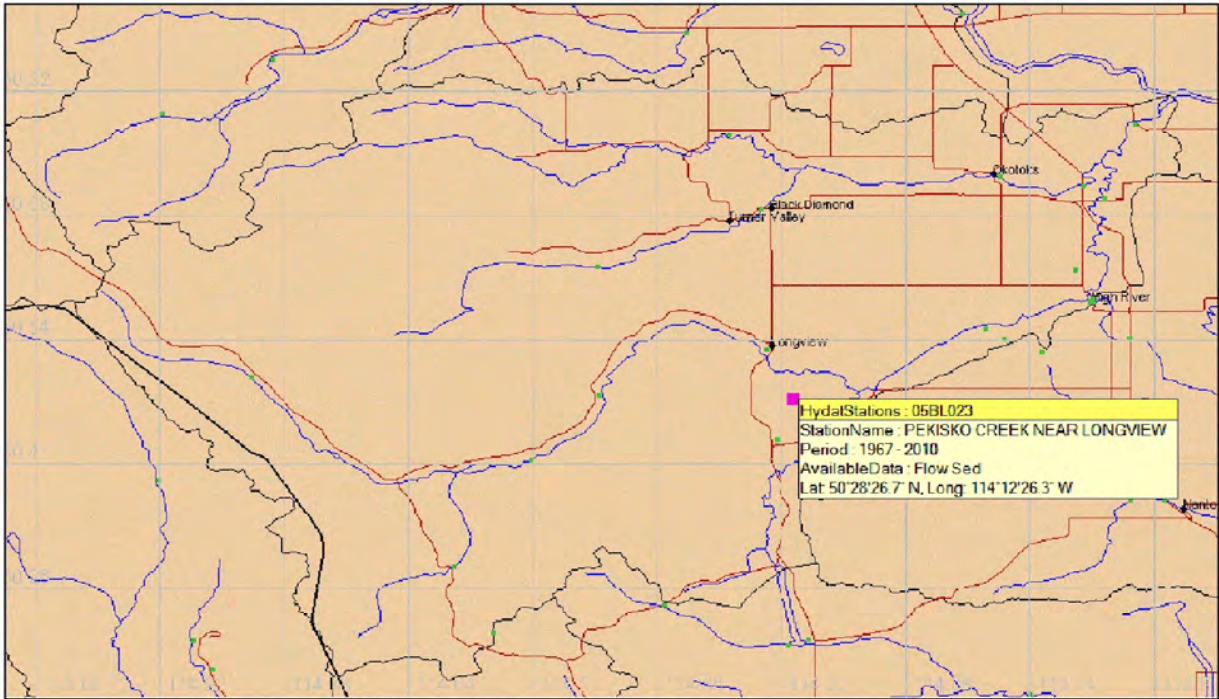


FIGURE 4B: LOCATION OF PEKISKO CREEK NEAR LONGVIEW (05BL023)
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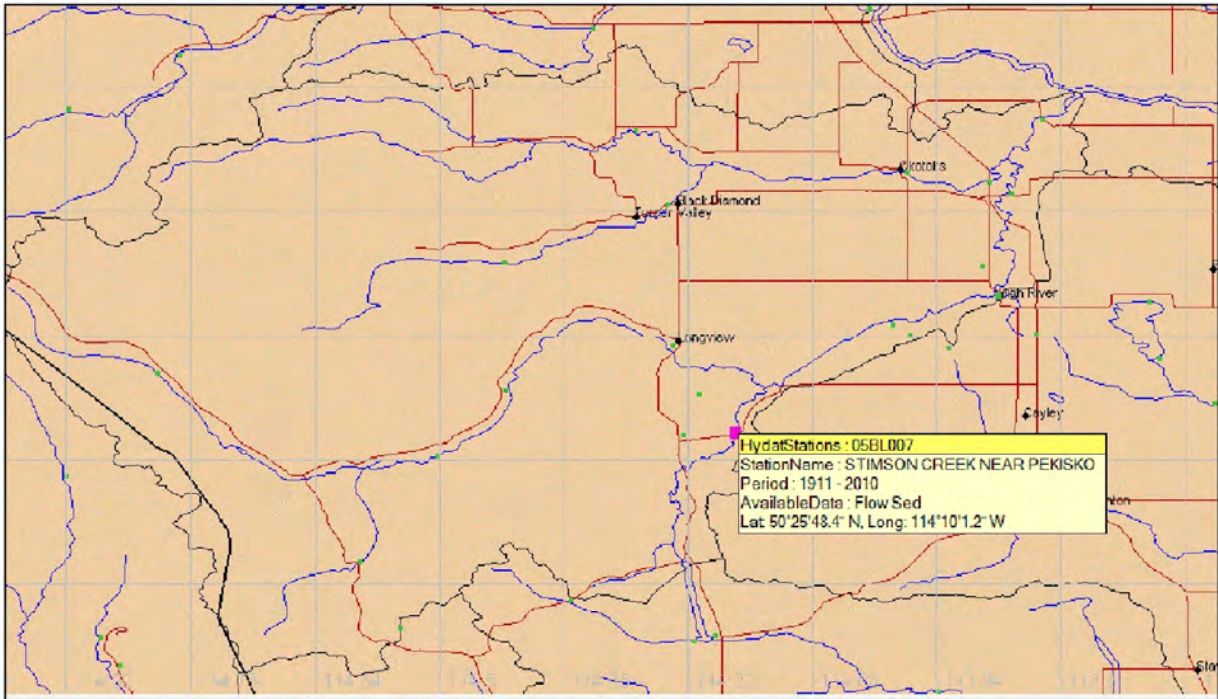


FIGURE 4C: LOCATION OF STIMSON CREEK NEAR PEKISKO (05BL007)
NTS

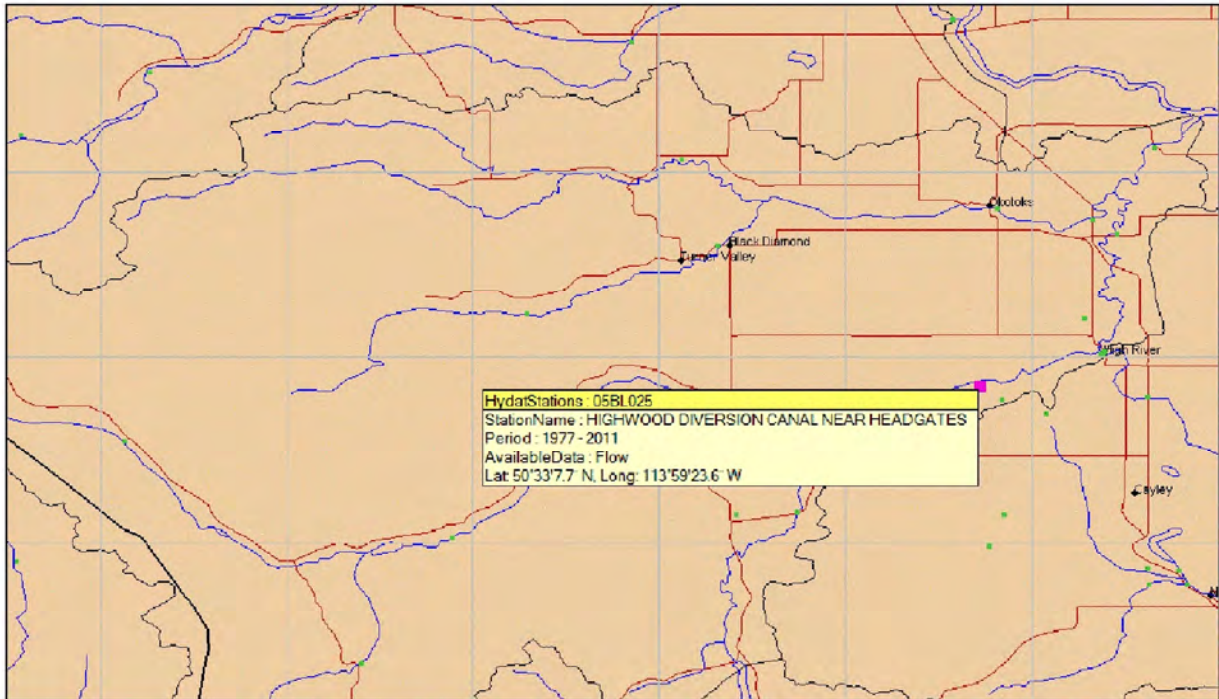



FIGURE 4D: LOCATION OF HIGHWOOD DIVERSION CANAL NEAR HEADGATES (05BL025)
NTS

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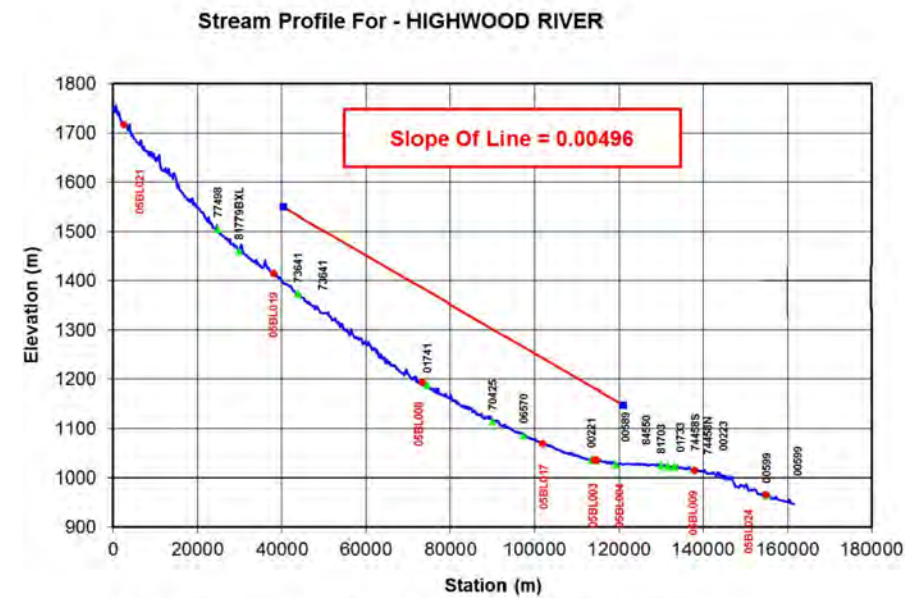


FIGURE 5A: STREAM PROFILE FOR HIGHWOOD RIVER.
BRIDGES IN GREEN,
WSC HYDROMETRIC STATIONS IN RED.

NTS



FIGURE 5B: STREAM PLAN FOR HIGHWOOD RIVER.
BRIDGES IN GREEN,
WSC HYDROMETRIC STATIONS IN RED.
LATITUDE AND LONGITUDE ARE IN DEGREE
FOR PROJECTION UTM, ZONE 12, DATUM NAD 83

NTS

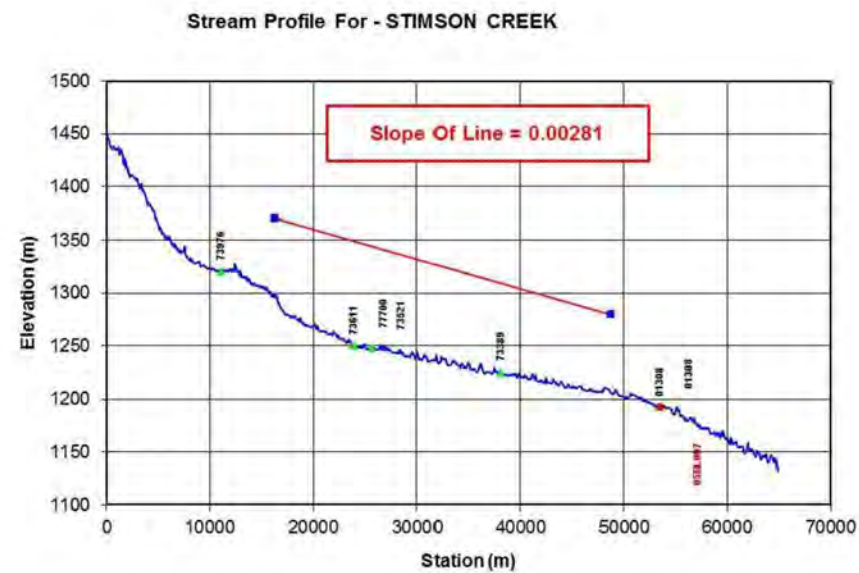


FIGURE 5C: STREAM PROFILE FOR STIMSON CREEK.
BRIDGES IN GREEN,
WSC HYDROMETRIC STATIONS IN RED.

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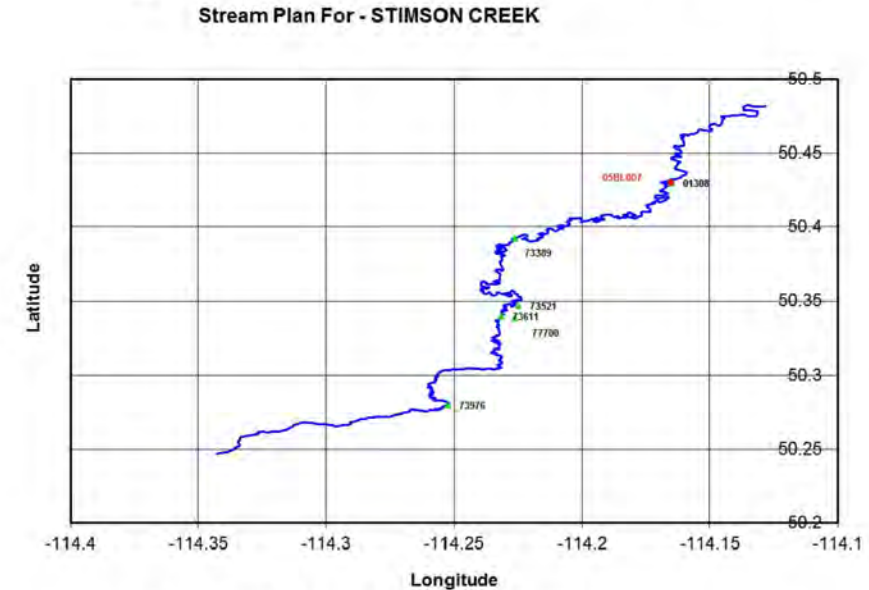


FIGURE 5D: STREAM PLAN FOR STIMSON CREEK.
BRIDGES IN GREEN,
WSC HYDROMETRIC STATIONS IN RED.
LATITUDE AND LONGITUDE ARE IN DEGREE
FOR PROJECTION UTM, ZONE 12, DATUM NAD 83.

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Stream Profiles and Plans



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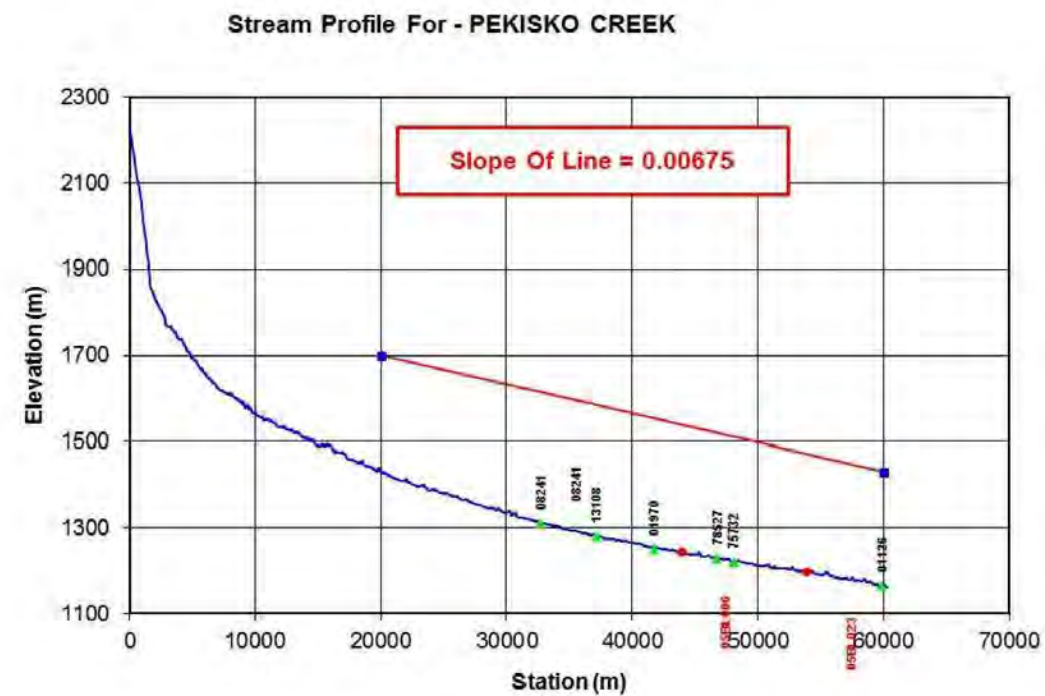


FIGURE 6A: STREAM PROFILE FOR PEKISKO CREEK.
BRIDGES IN GREEN,
WSC HYDROMETRIC STATIONS IN RED.
NTS

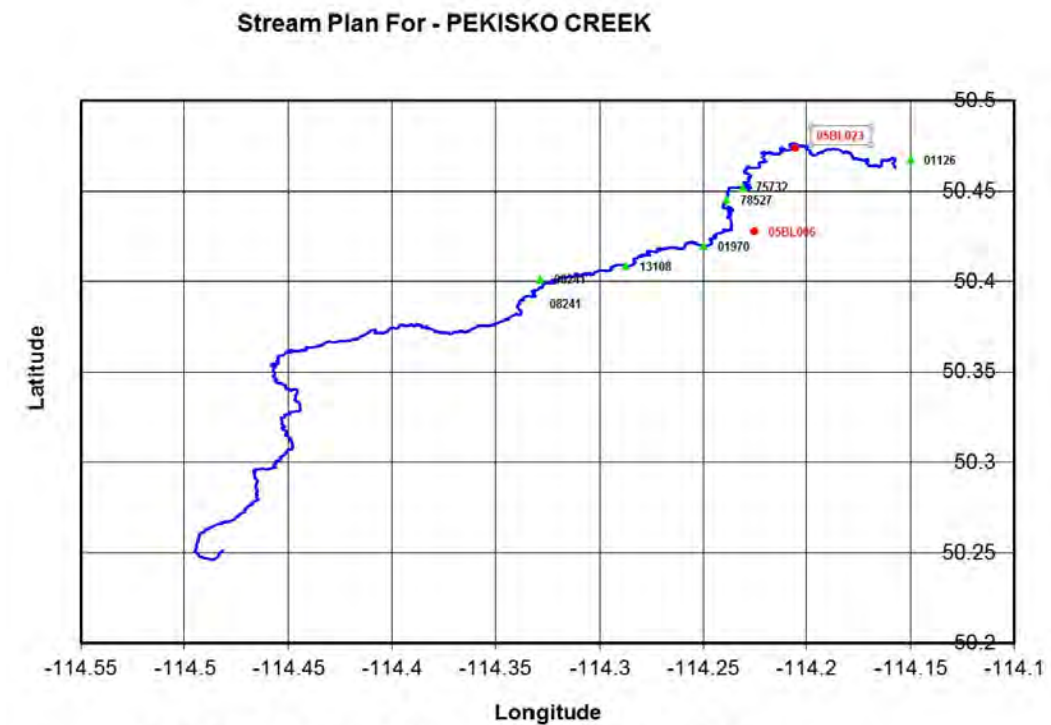



FIGURE 6B: STREAM PLAN FOR PEKISKO CREEK.
BRIDGES IN GREEN,
WSC HYDROMETRIC STATIONS IN RED.
LATITUDE AND LONGITUDE ARE IN DEGREE
FOR PROJECTION UTM, ZONE 12, DATUM NAD 83.
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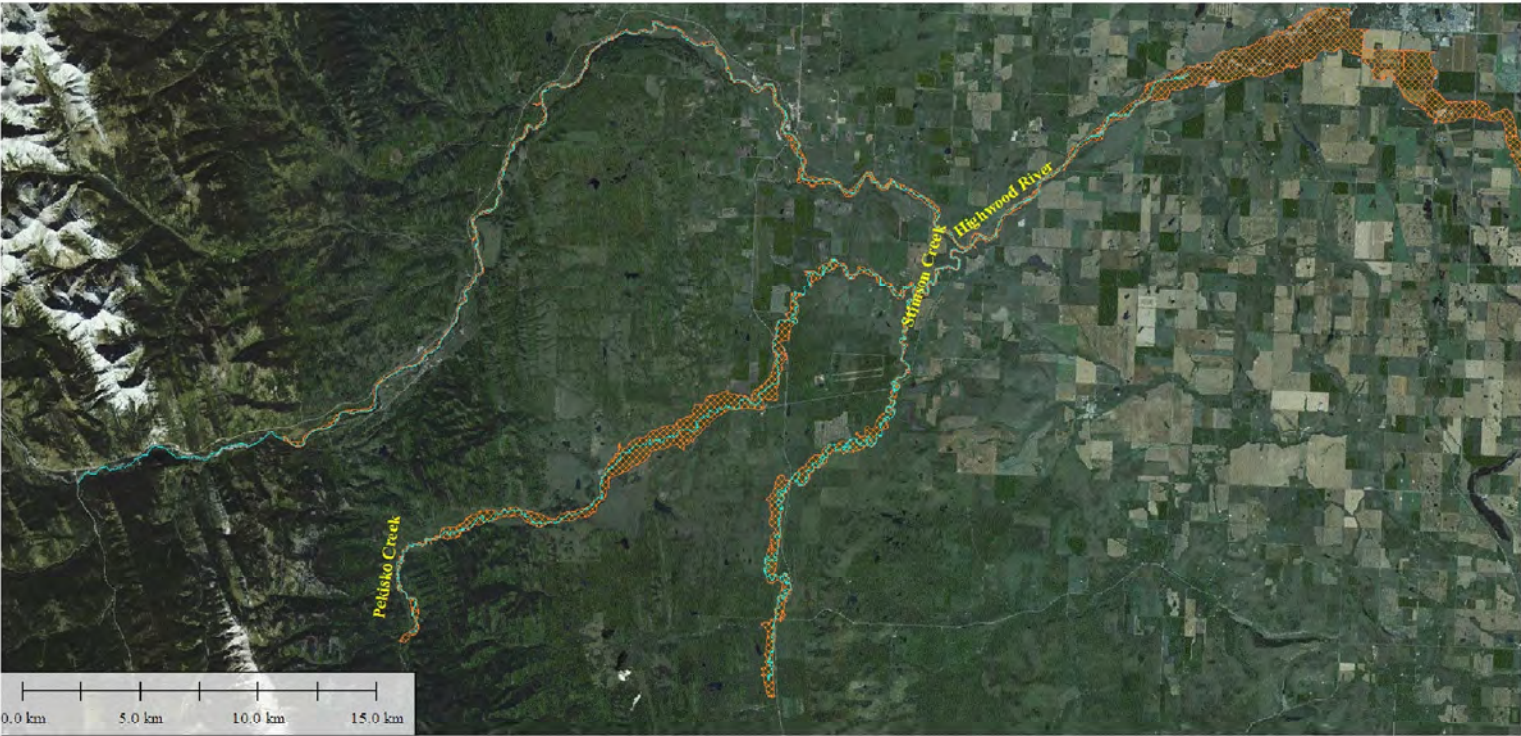


FIGURE 7A: FLOOD AFFECTED AREAS IN THE UPPER HIGHWOOD RIVER, PEKISKO CREEK AND STIMSON CREEK
NTS

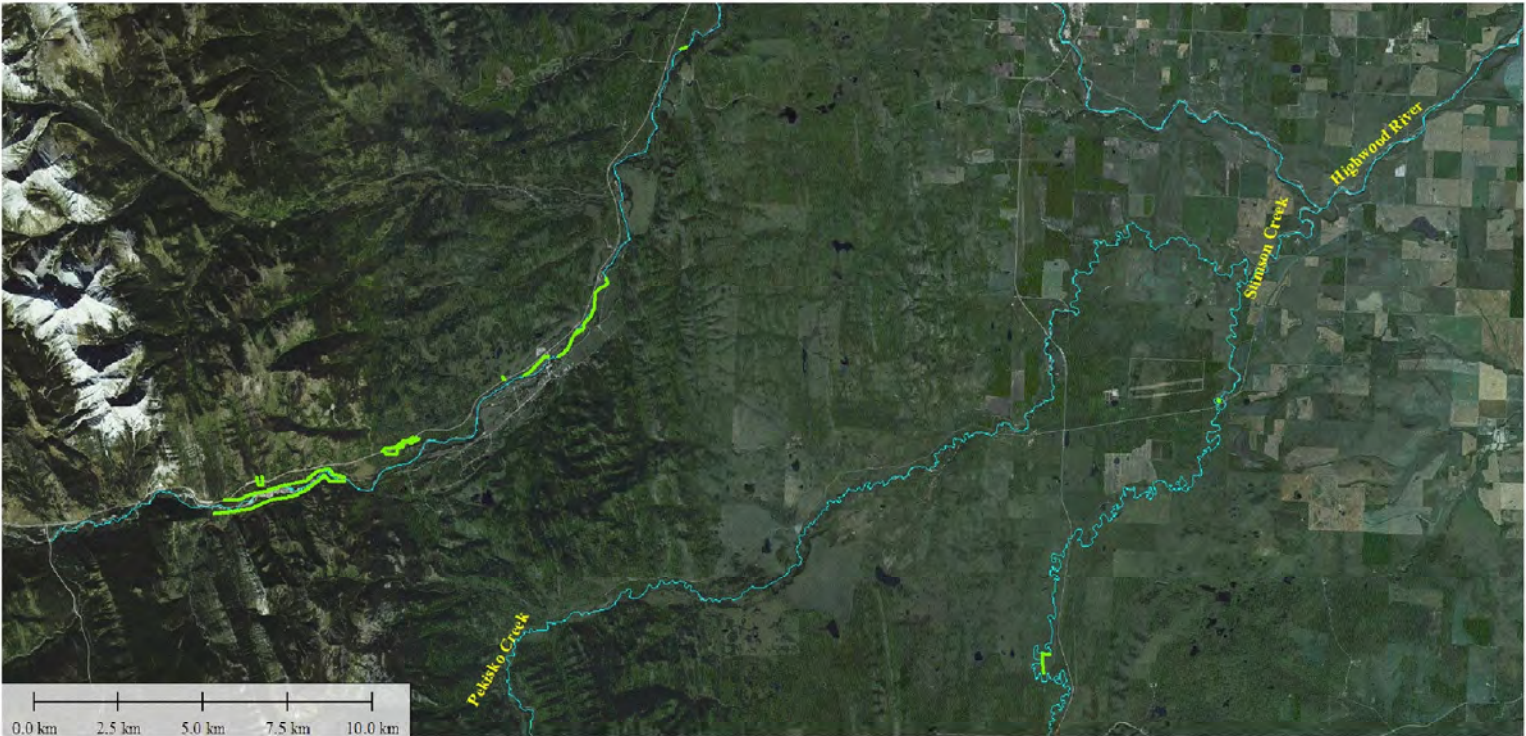



FIGURE 7B: OBSERVED WATER LINES DURING THE JUNE 2013 FLOODING OCCURRENCE
NTS



FIGURE 7C: LOCATION AND COORDINATES OF LONGVIEW FREC PROJECT
NTS



FIGURE 7D: LOCATION AND COORDINATES OF THE WOMEN'S COULEE AND HOEH DYKE FREC PROJECTS
NTS

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Flood Affected Areas and FREC Projects				
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		Rev: A		

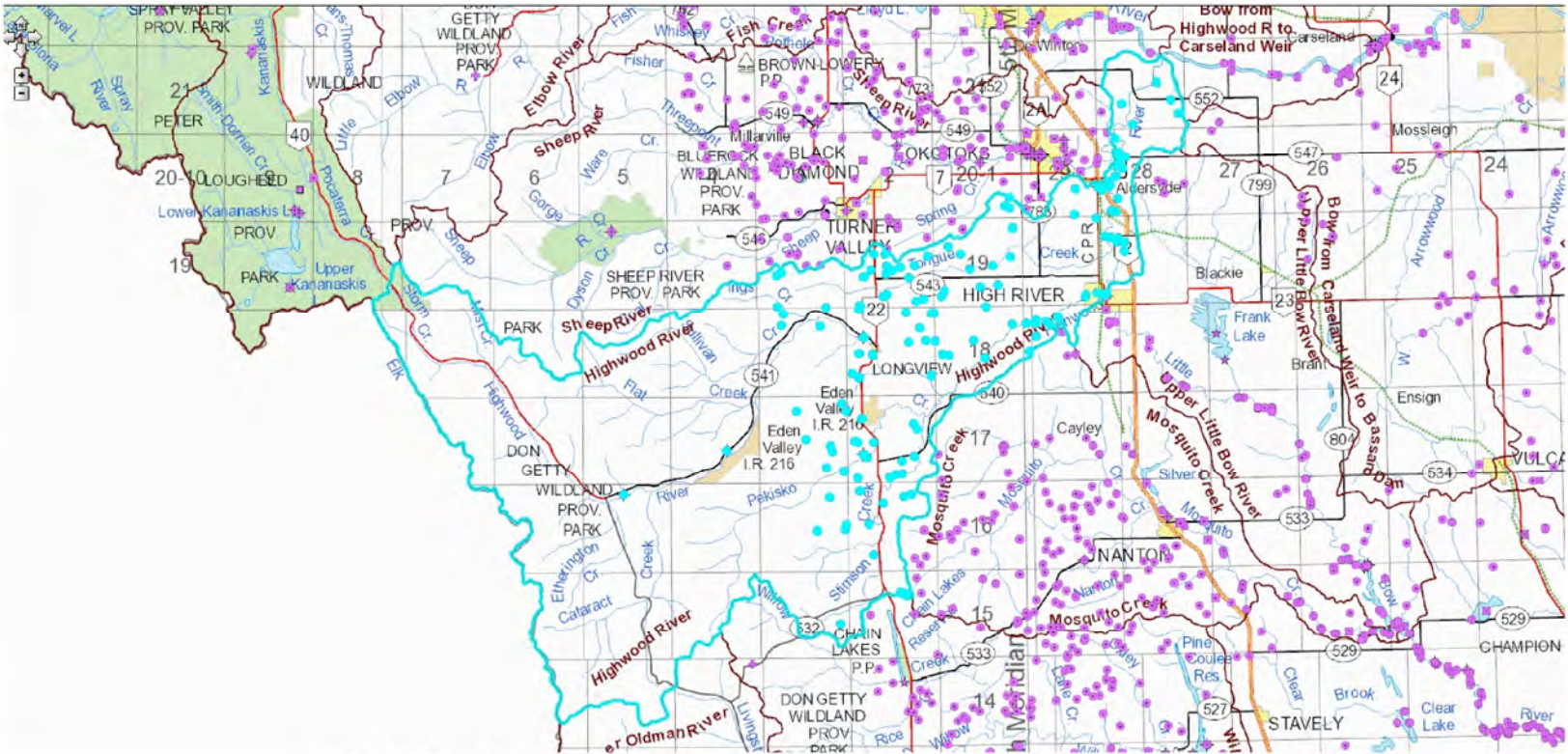


FIGURE 8A: LOCATION OF THE SURFACE DIVERSION LICENSES FOR THE HIGHWOOD RIVER BASIN

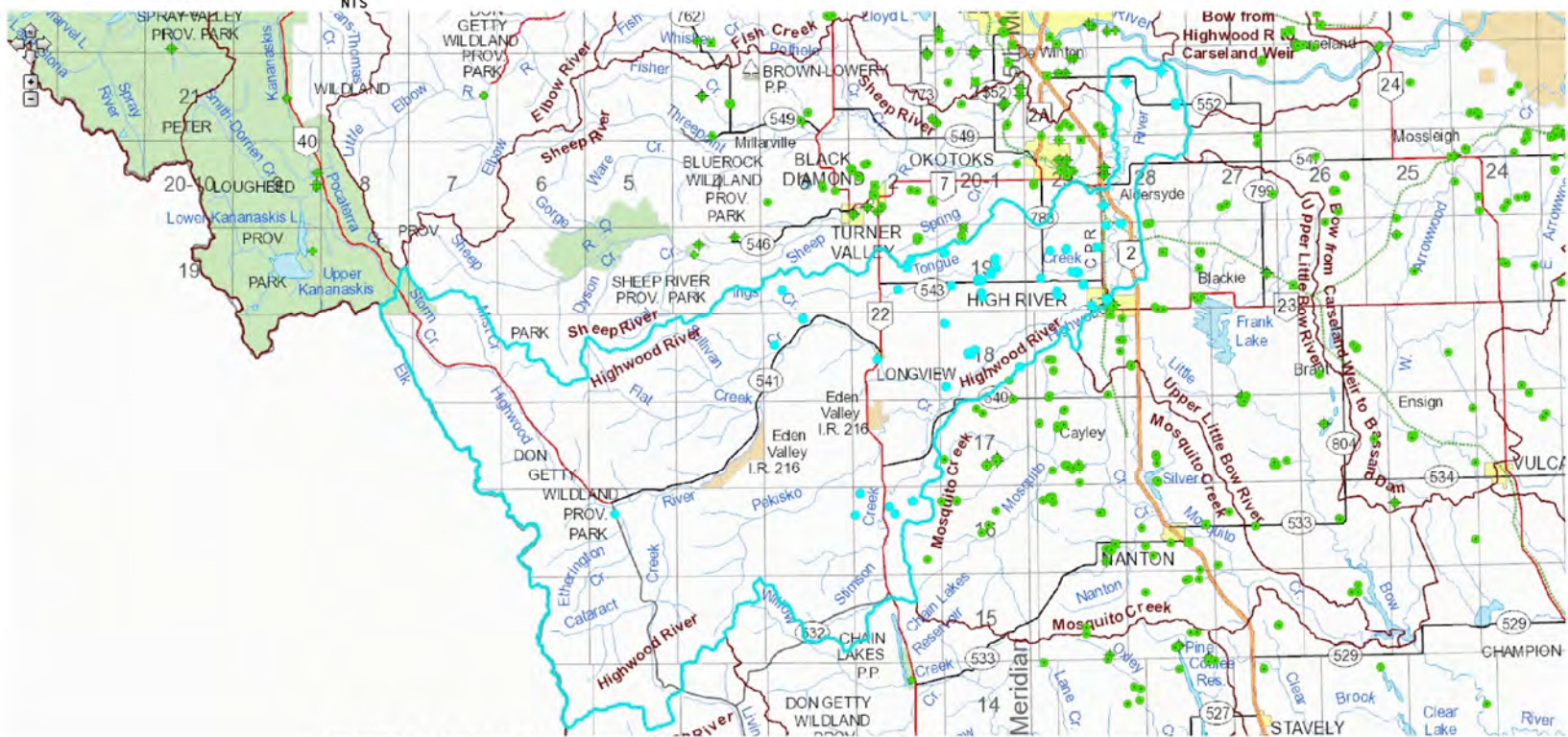



FIGURE 8B: LOCATION OF THE WELL DIVERSION LICENSES FOR THE HIGHWOOD RIVER BASIN
NTS

Municipal District of Foothills No. 31 – Upper Highwood River Desktop Review				
Diversion Licenses				
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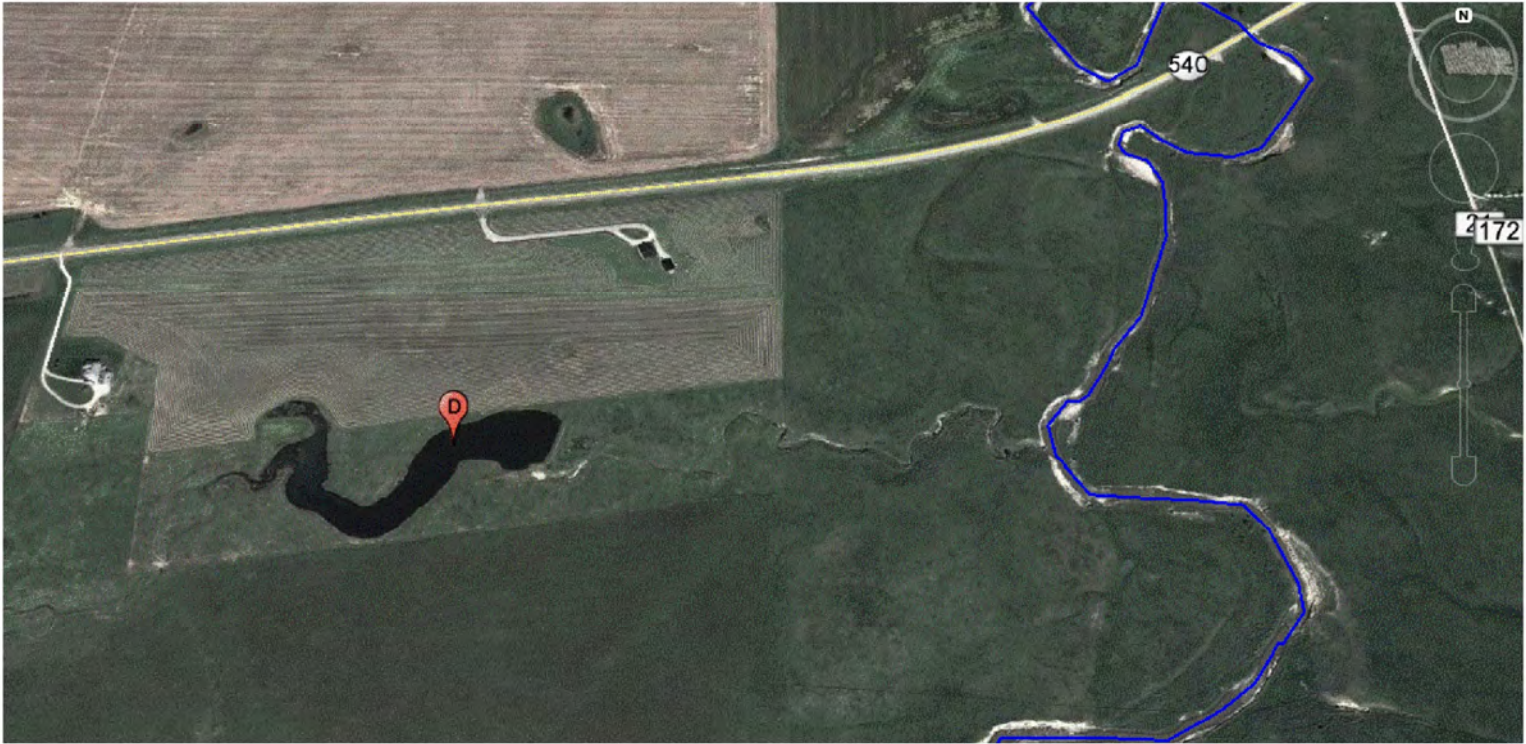


FIGURE 9A: DETAIL OF PUSH-UP DAM 5 IN THE STIMSON CREEK
NTS

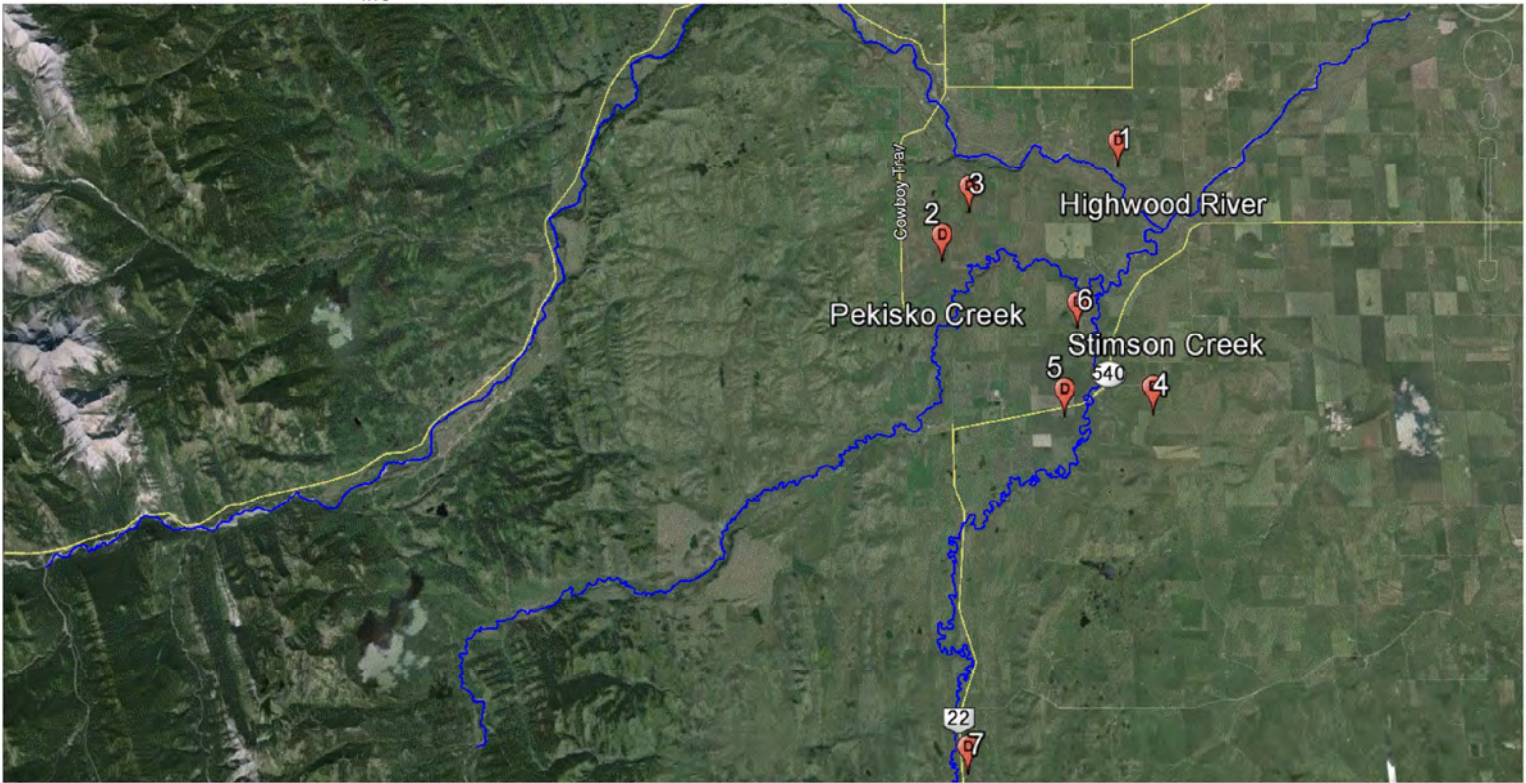


FIGURE 9B: LOCATION OF THE IDENTIFIED PUSH-UP DAMS FOR THE HIGHWOOD RIVER BASIN, PEKISKO AND STIMSON CREEKS
NTS

Municipal District of Foothills No. 31 – Upper Highwood River Desktop Review				
Push-Up Dams				
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MD OF FOOTHILLS NO.31

SCOPING STUDY - FLOOD RELATED AREAS OF CONCERN ON THE HIGHWOOD RIVER AND LITTLE BOW RIVER WITHIN THE MUNICIPAL DISTRICT OF FOOTHILLS

DESKTOP REVIEW OF UPPER HIGHWOOD RIVER

Photo 1 Clearing and Recontouring Of Highwood River Floodplain Adjacent To Hwy 40, Just West Of the MD Boundary





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DESKTOP REVIEW OF UPPER HIGHWOOD RIVER

Photo 2 Example of Bedrock Valley Confinement at Upper Highwood





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DESKTOP REVIEW OF UPPER HIGHWOOD RIVER

Photo 3 Example of Narrow Valley Of Upper Highwood





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DESKTOP REVIEW OF UPPER HIGHWOOD RIVER

Photo 4 Highwood River Downstream Of Highwood House Bridge before Entering Lower Valley



Appendices

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Appendix 1 Infrastructures on the Highwood River, Pekisko Creek and Stimson Creek

DRAFT

Sorted By: Crossing Type, Stream Name, Legal Land Location

Structure ID	Legal Land Location Structure Name Location Description	Region District Municipality	Managed By CMA Constituency	Span Types Located On Located Over	Structure Type	Primary Usage In Service Yr Superstr. Yr	No Spans\Pipes Max Span Len. (m) Max Pipe Dia. (mm)	Clr Roadway (m) Nom. Len. (m) Skew	Single (t) Semi (t) Train (t)	Cond. Rat. % Suff. Rat. % Insp. Date	Deck Height Drainage Area	Design Discharge 1in25 Design Discharge 1in50 Design Discharge 1in100
Crossing Type: WATERCRS-ST												
Watercourse Crossing: HELLS CREEK												
76998 -1	SW SEC 29 TWP 57 RGE 8 W6M GRANDE CACHE HELLS CREEK CULVERT ON HIGHWAY 40, 7 KM NOF GRANDE CACHE	PEACE REGION GRANDE PRAIRIE MD GREENVIEW	Alberta Transportation (AIT) CMA05 CS085	RPE 40:36 C1 7.323 HELLS CREEK (WATERCRS-ST)	BRIDGE CULV	RV 1997	1 5137.0	12.4 10.0		88.9 63.4 09-04-2014	6.5 5	
Watercourse Crossing: HENDERSON CREEK												
72957 -1	SW SEC 5 TWP 79 RGE 10 W6M GORDONDALE HENDERSON CREEK CULVERT ON LOCAL ROAD NEAR GORDONDALE	PEACE REGION GRANDE PRAIRIE CT SADDLE HILLS	SADDLE HILLS COUNTY UNDEFINED CMA CS001	SPE LOCAL ROAD HENDERSON CREEK (WATERCRS-ST)	BRIDGE CULV	RV 1970	1 4616.0	7.9 15.0		44.4 55.3 22-08-2012	6.7 70	
72616 -2	SE SEC 7 TWP 79 RGE 10 W6M GORDONDALE HENDERSON CREEK CULVERT ON LOCAL ROAD, 1 KM S OF GORDONDALE	PEACE REGION GRANDE PRAIRIE CT SADDLE HILLS	SADDLE HILLS COUNTY UNDEFINED CMA CS001	SP LOCAL ROAD HENDERSON CREEK (WATERCRS-ST)	BRIDGE CULV	RV 2002	1 4610.0	8.0 -20.0	28.0 49.0 62.0	83.3 80.9 22-08-2012	11.1 90	33
73032 -2	NW SEC 17 TWP 79 RGE 11 W6M GORDONDALE HENDERSON CREEK BRIDGE ON LOCAL ROAD NEAR GORDONDALE	PEACE REGION GRANDE PRAIRIE CT SADDLE HILLS	SADDLE HILLS COUNTY UNDEFINED CMA CS001	SC LOCAL ROAD HENDERSON CREEK (WATERCRS-ST)	STANDARD BRIDGE	RV 2005 2005	3 12.0 12.0	10.1 28.0 .0	28.0 49.0 62.0	83.3 80.9 22-08-2012	169	
72279 -1	SW SEC 15 TWP 79 RGE 11 W6M GORDONDALE HENDERSON CREEK BRIDGE ON HIGHWAY 49, 6 KM W OF GORDONDALE	PEACE REGION GRANDE PRAIRIE CT SADDLE HILLS	Alberta Transportation (AIT) CMA05 CS001	RD 49:02 C1 25.512 HENDERSON CREEK (WATERCRS-ST)	MAJOR BRIDGE	RV 1977 1977	3 15.2 15.2	9.8 45.6 .0	28.0 49.0 62.0	50.0 52.1 27-06-2013	6.7 171	71
71643 -1	SE SEC 23 TWP 79 RGE 13 W6M BAY TREE HENDERSON CREEK BRIDGE ON LOCAL ROAD, 4 KM N OF BAY TREE	PEACE REGION GRANDE PRAIRIE CT SADDLE HILLS	SADDLE HILLS COUNTY UNDEFINED CMA CS001	TH, TT LOCAL ROAD HENDERSON CREEK (WATERCRS-ST)	MAJOR BRIDGE	RV 1951 1950	2 45.7 45.7	7.4 51.8 .0	35.7 57.4 78.4	50.0 50.5 28-02-2012	9.7 370	155
73982 -2	NE SEC 29 TWP 79 RGE 12 W6M BONANZA HENDERSON CREEK BRIDGE ON PROVINCIAL HIGHWAY 719 NEAR BONANZA	PEACE REGION GRANDE PRAIRIE CT SADDLE HILLS	Alberta Transportation (AIT) CMA05 CS001	WG 719:02 C1 4.581 HENDERSON CREEK (WATERCRS-ST)	MAJOR BRIDGE	RV 2009 2009	3 31.0 31.0	10.0 83.0 83.0	28.0 49.0 62.0	77.8 68.5 28-02-2012	334	
Watercourse Crossing: HENDRICKSON CREEK												
77277 -1	SW SEC 31 TWP 55 RGE 3 W6M MUSKEG RIVER HENDRICKSON CULVERT ON PROVINCIAL HIGHWAY 40 NEAR MUSKEG RIVER	NORTH CENTRAL REGION EDSON CT YELLOWHEAD	Alberta Transportation (AIT) CMA05 CS085	SPE;SPE 40:32 C1 25.082 HENDRICKSON CREEK (WATERCRS-ST)	BRIDGE CULV	RV 1971	2 1502.0	8.1 -30.0		55.6 40.8 07-05-2014	9.1 13	
Watercourse Crossing: HIGHLAND CREEK												
09889 -1	SW SEC 28 TWP 31 RGE 5 W5M BERGEN BERGAN CREEK CULVERT ON LOCAL ROAD NEAR BERGEN	CENTRAL REGION RED DEER CT MOUNTAIN VIEW	MOUNTAIN VIEW COUNTY UNDEFINED CMA CS077	SPE LOCAL ROAD HIGHLAND CREEK (WATERCRS-ST)	BRIDGE CULV	RV 1962	1 2134.0	7.9 7.9		77.8 72.5 09-07-2014	3.7 31	
Watercourse Crossing: HIGHTOWER CK												
75135 -2	SW SEC 16 TWP 55 RGE 27 W5M ENTRANCE LOCAL ROAD BRIDGE OVER HIGH TOWER CREEK NEAR ENTRANCE	NORTH CENTRAL REGION EDSON CT YELLOWHEAD	Unknown Private Organization or Individ UNDEFINED CMA CS085	WG LOCAL ROAD HIGHTOWER CK (WATERCRS-ST)	MAJOR BRIDGE	RV 2001 2001	1 24.4 24.4	4.8 24.4 24.4	28.0 49.0 62.0	77.8 63.1 23-10-2004	13.7 10	
Watercourse Crossing: HIGHWOOD RIVER												
74458 N-2	NE SEC 6 TWP 20 RGE 28 W4M ALDERSYDE HIGHWOOD RIVER BRIDGE ON HIGHWAY 2, 1 KM SE OF ALDERSYDE	SOUTHERN REGION CALGARY MD FOOTHILLS	Alberta Transportation (AIT) CMA27 CS070	WG 2:12 R1 11.802 HIGHWOOD RIVER (WATERCRS-ST)	MAJOR BRIDGE	RV 1997 1997	3 35.0 35.0	12.4 91.0 -20.0	28.0 49.0 62.0	83.3 63.9 28-02-2015	11.6 2310	1150
74458 S-1	NE SEC 6 TWP 20 RGE 28 W4M ALDERSYDE HIGHWOOD RIVER BRIDGE ON HIGHWAY 2, 1 KM SE OF ALDERSYDE	SOUTHERN REGION CALGARY MD FOOTHILLS	Alberta Transportation (AIT) CMA27 CS070	CT 2:12 L1 11.749 HIGHWOOD RIVER (WATERCRS-ST)	MAJOR BRIDGE	RV 1957 1957	4 25.0 25.0	15.2 85.4 85.4	28.0 49.0 62.0	44.4 42.5 28-02-2015	8.8 2310	1150
01741 -1	NE SEC 17 TWP 18 RGE 2 W5M LONGVIEW HIGHWOOD RIVER BRIDGE ON HIGHWAY 22, 1 KM S OF LONGVIEW	SOUTHERN REGION CALGARY MD FOOTHILLS	Alberta Transportation (AIT) CMA27 CS071	CS, PO 22:10 C1 37.818 HIGHWOOD RIVER (WATERCRS-ST)	MAJOR BRIDGE	RV 1961 1961	5 26.8 26.8	7.9 105.1 105.1	41.0 48.8 61.9	77.8 58.6 06-02-2014	19.5 1162	
00589 -1	NW SEC 6 TWP 19 RGE 28 W4M HIGH RIVER HIGHWOOD RIVER BRIDGE ON HIGHWAY 2A, AT N BOUNDARY OF HIGH RIVER	SOUTHERN REGION CALGARY HIGH RIVER	Alberta Transportation (AIT) CMA27 CS063	RB 2A:03 C1 2.869 HIGHWOOD RIVER (WATERCRS-ST)	MAJOR BRIDGE	RV 1964 1964	2 26.5 26.5	8.5 53.0 53.0	28.0 49.0 62.7	55.6 48.9 25-06-2014	6.7 1930	
84550 -1	SW SEC 17 TWP 19 RGE 28 W4M HIGHRIVER BRIDGE STRUCTURE OVER THE HIGHWOOD RIVER LOCATED ON LOCAL ROAD	SOUTHERN REGION CALGARY NMD FOOTHILLS	M.D. OF FOOTHILLS NO. 31 UNDEFINED CMA CS063	WG PROP. HWY 543 HIGHWOOD RIVER (WATERCRS-ST)	MAJOR BRIDGE	RV 2011 2011	2 60.0 60.0	13.4 97.0 97.0	28.0 49.0 62.0			
77498 -1	NE SEC 29 TWP 16 RGE 5 W5M LONGVIEW HIGHWOOD RIVER BRIDGE ON LOCAL ROAD, 43 KM SW OF LONGVIEW	SOUTHERN REGION CALGARY ID KANANASKIS	Alberta Transportation (AIT) CMA27 CS071	DBT LOCAL ROAD HIGHWOOD RIVER (WATERCRS-ST)	MAJOR BRIDGE	RV 1986 1986	3 23.9 23.9	12.5 60.1 -10.0	28.0 49.0 62.0	66.7 68.6 10-11-2014	5.4 371	200

Sorted By: Crossing Type, Stream Name, Legal Land Location

Structure ID	Legal Land Location Structure Name Location Description	Region District Municipality	Managed By CMA Constituency	Span Types Located On Located Over	Structure Type	Primary Usage In Service Yr Superstr. Yr	No Spans\Pipes Max Span Len. (m) Max Pipe Dia. (mm)	Clr Roadway (m) Nom. Len. (m) Skew	Single (t) Semi (t) Train (t)	Cond. Rat. % Suff. Rat. % Insp. Date	Deck Height Drainage Area	Design Discharge 1in25 Design Discharge 1in50 Design Discharge 1in100
Crossing Type: WATERCRS-ST												
Watercourse Crossing: STEEN RIVER												
73410 -1	NW SEC 3 TWP 122 RGE 19 W5M STEEN RIVER STEEN RIVER BRIDGE ON HIGHWAY 35, 3 KM S OF STEEN RIVER	PEACE REGION PEACE RIVER CT MACKENZIE	Alberta Transportation (AIT) CMA01 CS074	RB 35:20 C1 0.001 STEEN RIVER (WATERCRS-ST)	MAJOR BRIDGE	RV 1961 1961	3 21.9	11.0 59.1	70.7 95.8 123.7	38.9 59.8 24-10-2013	10.1	
Watercourse Crossing: STEEP CREEK												
73394 -1	NW SEC 17 TWP 72 RGE 19 W5M SUNSET HOUSE STEEP CREEK CULVERT ON PROVINCIAL HIGHWAY 747 NEAR SUNSET HOUSE	PEACE REGION PEACE RIVER CT BIG LAKES	Alberta Transportation (AIT) CMA06 CS002	SP 747:02 C1 18.172 STEEP CREEK (WATERCRS-ST)	BRIDGE CULV	RV 1981	1 1800.0	9.0 -46.0		55.6 51.5 16-01-2014	10.5 13	
Watercourse Crossing: STEEPHILL CREEK												
75206 -1	NW SEC 9 TWP 104 RGE 16 W5M LA CRETE STEEP HILL CREEK BRIDGE ON HIGHWAY 697, 15 KM W OF BUFFALO HEAD PRAIFCT MACKENZIE	PEACE REGION PEACE RIVER CT MACKENZIE	Alberta Transportation (AIT) CMA01 CS074	SM 697:04 C1 0.007 STEEP HILL CREEK (WATERCRS-ST)	STANDARD BRIDGE	RV 1985 1985	3 10.0	9.0 30.0	28.0 49.0 62.0	44.4 56.6 11-06-2013	5.8 240	77
Watercourse Crossing: STEEPROCK CREEK												
70677 -2	NW SEC 27 TWP 72 RGE 12 W6M LYMBURN STEEPCREEK CREEK BRIDGE ON LOCAL ROAD NEAR LYMBURN	PEACE REGION GRANDE PRAIRIE CT GRANDE PRAIRIE	COUNTY OF GRANDE PRAIRIE NO. 1SC UNDEFINED CMA CS062	LOCAL ROAD STEEPCREEK CREEK (WATERCRS-ST)	STANDARD BRIDGE	RV 2008 2008	3 12.0	8.9 28.0 .0		88.9 78.4 16-06-2014		
76345 -1	SW SEC 23 TWP 72 RGE 13 W6M GOODFARE STEEPCREEK CREEK BRIDGE ON LOCAL ROAD NEAR GOODFARE	PEACE REGION GRANDE PRAIRIE CT GRANDE PRAIRIE	COUNTY OF GRANDE PRAIRIE NO. 1TT UNDEFINED CMA CS062	LOCAL ROAD STEEPCREEK CREEK (WATERCRS-ST)	STANDARD BRIDGE	RV 1949 1949	1 7.9	6.1 7.9	21.3 37.3 53.2	44.4 47.3 11-09-2014	3.0	
72193 -1	NW SEC 30 TWP 72 RGE 12 W6M GOODFARE STEEPCREEK CREEK BRIDGE ON LOCAL ROAD NEAR GOODFARE	PEACE REGION GRANDE PRAIRIE CT GRANDE PRAIRIE	COUNTY OF GRANDE PRAIRIE NO. 1TT UNDEFINED CMA CS062	LOCAL ROAD STEEPCREEK CREEK (WATERCRS-ST)	STANDARD BRIDGE	RV 1961 1961	3 8.5	6.2 25.5	29.4 51.5 73.5	44.4 58.2 28-08-2008	5.2	
71300 -1	SW SEC 25 TWP 72 RGE 13 W6M GOODFARE STEEPCREEK CREEK CULVERT ON HWY 671, 9 KM W OF GOODFARE	PEACE REGION GRANDE PRAIRIE CT GRANDE PRAIRIE	Alberta Transportation (AIT) CMA05 CS062	RPA 671:02 C1 3.400 STEEPCREEK CREEK (WATERCRS-ST)	BRIDGE CULV	RV 1986	1 7150.0	10.2 10.0		55.6 61.6 12-09-2013	5.4 277	65
Watercourse Crossing: STERNE CREEK												
76530 -1	NE SEC 16 TWP 57 RGE 7 W6M GRANDE CACHE STERNE CREEK CULVERT ON HWY 40, 11 KM E OF GRANDE CACHE	PEACE REGION GRANDE PRAIRIE MD GREENVIEW	Alberta Transportation (AIT) CMA05 CS085	SP 40:34 C1 19.966 STERNE CREEK (WATERCRS-ST)	BRIDGE CULV	RV 1968	1 4300.0	8.2		55.6 53.9 08-04-2014	8.2 34	
Watercourse Crossing: STETSON CREEK												
79006 -1	NW SEC 7 TWP 62 RGE 12 W6M GROVEDALE STETSON CREEK CULVERT ON LOCAL ROAD NEAR GROVEDALE	PEACE REGION GRANDE PRAIRIE MD GREENVIEW	Unknown Private Organization or Individ UNDEFINED CMA CS062	SP LOCAL ROAD STETSON CREEK (WATERCRS-ST)	BRIDGE CULV	RV 1977	1 4300.0	7.3		44.0 44.5 01-11-1988	77	
Watercourse Crossing: STEWART CREEK												
74664 -1	NW SEC 14 TWP 24 RGE 10 W5M CANMORE STEWART CREEK CULVERT ON HIGHWAY 1, AT E BOUNDARY OF CANMORE	SOUTHERN REGION CALGARY MD BIGHORN	Alberta Transportation (AIT) CMA28 CS049	FP-BP 1:02 L1 12.026, 1:02 R1 12.090 STEWART CREEK (WATERCRS-ST)	BRIDGE CULV	RV 1957	1 1765.0	26.0		66.7 60.3 27-11-2013	2.8 10	
Watercourse Crossing: STIMSON CREEK												
77700 -1	SW SEC 16 TWP 16 RGE 2 W5M LONGVIEW STIMSON CREEK BRIDGE ON LOCAL ROAD NEAR LONGVIEW	SOUTHERN REGION CALGARY MD FOOTHILLS	M.D. OF FOOTHILLS NO. 31 UNDEFINED CMA CS071	HH LOCAL ROAD STIMSON CREEK (WATERCRS-ST)	STANDARD BRIDGE	RV 1961 1961	3 8.5	8.2 25.5 30.0	28.0 49.0 67.2	44.4 48.4 31-07-2013	3.7 153	
73976 -1	NW SEC 20 TWP 15 RGE 2 W5M LONGVIEW STIMSON CREEK BRIDGE ON PROVINCIAL HIGHWAY 532 NEAR LONGVIEW	SOUTHERN REGION LETHBRIDGE MD RANCHLAND	Alberta Transportation (AIT) CMA27 CS071	HC 532:02 C1 22.782 STIMSON CREEK (WATERCRS-ST)	STANDARD BRIDGE	RV 1965 1965	3 6.1	7.3 18.3 -15.0	28.0 49.0 65.5	44.4 57.2 17-05-2013	3.7 34	
01308 -1	SE SEC 14 TWP 17 RGE 2 W5M PEKISKO STIMSON CREEK BRIDGE ON PROVINCIAL HIGHWAY 540, 17 KM SE OF LONGVIEWMD FOOTHILLS	SOUTHERN REGION CALGARY MD FOOTHILLS	Alberta Transportation (AIT) CMA27 CS071	HC 540:02 C1 4.817 STIMSON CREEK (WATERCRS-ST)	STANDARD BRIDGE	RV 1969 1969	3 8.5	8.2 25.5	30.1 52.8 75.4	33.3 58.0 08-03-2013	3.7 122	
73389 -1	NW SEC 33 TWP 16 RGE 2 W5M LONGVIEW STIMSON CREEK BRIDGE ON HIGHWAY 22, 16 KM S OF LONGVIEW	SOUTHERN REGION CALGARY MD FOOTHILLS	Alberta Transportation (AIT) CMA27 CS071	DBT 22:10 C1 21.953 STIMSON CREEK (WATERCRS-ST)	MAJOR BRIDGE	RV 1984 1984	1 32.0	10.1 32.0	28.0 49.0 62.0	66.7 56.2 06-02-2014	5.0 202	
Watercourse Crossing: STONE CREEK												
00818 -1	SE SEC 3 TWP 40 RGE 24 W4M CLIVE STONE CREEK CULVERT ON LOCAL ROAD NEAR CLIVE	CENTRAL REGION RED DEER CT LACOMBE	LACOMBE COUNTY UNDEFINED CMA CS066	MP LOCAL ROAD STONE CREEK (WATERCRS-ST)	BRIDGE CULV	RV 1998	1 2000.0	9.0		44.4 64.7 23-10-2007	3.0	

Appendix 2 Provincial Bridge Inspection Schedules for the MD of Foothills No. 31

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Post Flood Bridge Inspection Form

Bridge File Number	00223-1	Inspector Name	T CAREY
Location Description	HIGHWOOD RIVER BRIDGE ON HIGHWAY 547, 5 KM SE OF OKOTOKS	Assistant Name	
		Inspection Date	JULY 10/13
Legal Land Location	NE SEC 18 TWP 20 RGE 28 W4M		
Longitude; Latitude	-113.865053;50.697073		
Unique Span Types	PO		

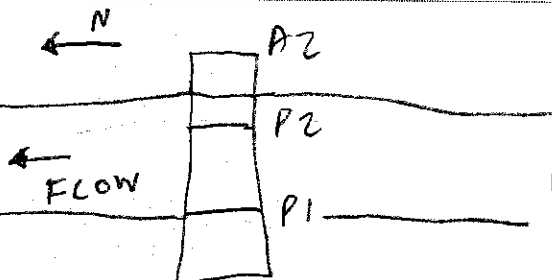
Approach Road	- NO FLOOD DAMAGE VISIBLE
Approach Guardrail	- NO FLOOD DAMAGE VISIBLE - FLEX BEAM ALL CORNERS
Approach Embankment	- NO FLOOD DAMAGE VISIBLE

Vertical Alignment	- O.K. - VA IS GOOD AT APPROACHES AND BRIDGE
Horizontal Alignment	- O.K. - HA IS GOOD - NO SIGNS OF DISPLACEMENT

Superstructure General	- NO FLOOD DAMAGE VISIBLE - GIRDERS ALIGNED WITH BEARINGS - NO SIGNS OF SETTLEMENT
------------------------	--

Abutment Backwall	- NO FLOOD DAMAGE VISIBLE
Abutment Wingwall	- NO FLOOD DAMAGE VISIBLE
Abutment Piles	- NOT SEEN - NO FLOOD DAMAGE SEEN - NO DISPLACEMENT SEEN
Abutment Stability	- O.K. - - NO DISPLACEMENT

Abutment Scour/Erosion	- NO FLOOD DAMAGE SEEN - CONCRETE SCOPE PROTECTION INTACT
Pier Piles	- NOT SEEN - NO MISALIGNMENT SEEN - NO DISPLACEMENT SEEN
Pier Stability	- O.K. - NO DEFLECTION SEEN - MASSIVE CONCRETE - NO SIGNS OF INSTABILITY
Pier Scour/Erosion	- WATER TOO DEEP TO SEE. - PIERS IN OR PARTIALLY IN RIVER WAS SEEN - NO SCOUR ON WHAT
Pier Bracing/Struts/Sheathing	- N/A



Post Flood Bridge Inspection Form

Bridge File Number	00223-1	Inspector Name	T. CAREY
Location Description	HIGHWOOD RIVER BRIDGE ON HIGHWAY 547, 5 KM SE OF OKOTOKS	Assistant Name	
		Inspection Date	JULY 10/13
Legal Land Location	NE SEC 18 TWP 20 RGE 28 W4M		
Longitude; Latitude	-113.865053;50.697073		
Unique Span Types	PO		

Channel Alignment	- ENTERS STRAIGHT AND CURVES EAST AT D/S, - FLOWS S TO N
High Water Mark	- 4.720 M TO BOTTOM OF STRAENS @ EAST BRIDGE - 7.300 M TO BOTTOM OF GARDEN @ WEST - ON GRADE
Bank Stability	- SCOURED ALL ALONG EAST BANK - SCOURED TO BEDROCK @ N.W.
Drift/Debris	- TREE @ P2
Slope Protection	- CONCRETE - SCOURED DOWN TO CONCRETE @ TOE @ EAST
Guidebank/Spurs	- N/A
Drainage	- O.K. - NO DAMAGE FROM OTHER DRAINAGE
Adequacy of Opening	- O.K. - BRIDGE PASSED FLOOD WITH NO SERIOUS SCOUR

Other Item	
Other Item	
Other Item	
General Comment	- BRIDGE PASSED FLOOD WATER - SCOUR DOWN TO CONCRETE SLOPE PROTECTION APRON AT P2 - SCOUR ALONG ALL OF EAST BANK - REMOVE DRIFT AT P2.

File No.	223
Date	July 10/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Hwy 547/Okotoks



2

Photo 1 Looking d/s at south side of bridge from s.e. bank.



Photo 2 Looking u/s at north side of bridge from n.w. bank.

File No.	223
Date	July 10/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Hwy 547/Okotoks



Photo 3 Looking d/s at south side of bridge.



Photo 4 Drift at P2.

File No.	223
Date	July 10/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Hwy 547/Okotoks



Photo 5 East bank scoured down to concrete slope protection under bridge.



Photo 6 Looking west along north side.

File No.	223
Date	July 10/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Hwy 547/Okotoks

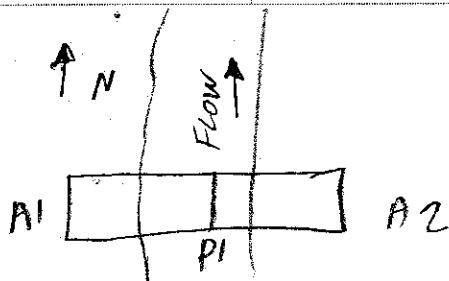


Photo 7 Looking east along south side.

Post Flood Bridge Inspection Form

Bridge File Number	00599-1	Inspector Name	TCAREY
Location Description	HIGHWOOD RIVER BRIDGE ON HIGHWAY 552, 18 KM NE OF OKOTOKS	Assistant Name	
		Inspection Date	JULY 10/13
Legal Land Location	NE SEC 16 TWP 21 RGE 28 W4M		
Longitude; Latitude	-113.821685; 50.784023		
Unique Span Types	TH		

Approach Road	- NO FLOOD DAMAGE VISIBLE
Approach Guardrail	- FLEX BEAM AT ALL CORNERS - NO FLOOD DAMAGE VISIBLE
Approach Embankment	- NO FLOOD DAMAGE VISIBLE
Vertical Alignment	- O.K. - VA IS GOOD AT APPROACHES AND BRIDGE
Horizontal Alignment	- O.K. - HA IS GOOD - NO SIGNS OF DISPLACEMENT
Superstructure General	- NO FLOOD DAMAGE VISIBLE - TRUSS ALIGNED WELL WITH BRG'S. - NO SIGNS OF SETTLEMENT
Abutment Backwall	- NO FLOOD DAMAGE VISIBLE
Abutment Wingwall	- NO FLOOD DAMAGE VISIBLE
Abutment Piles	- SEEN - NO FLOOD DAMAGE VISIBLE - NO DISPLACEMENT SEEN
Abutment Stability	- O.K. - NO DEFLECTION SEEN
Abutment Scour/Erosion	- NONE SEEN - CONCRETE SCOPE PROTECTION INTACT
Pier Piles	- NOT SEEN - NO MISALIGNMENT SEEN - NO DISPLACEMENT SEEN
Pier Stability	- O.K. - NO DEFLECTION SEEN - NO SIGNS OF INSTABILITY
Pier Scour/Erosion	- WATER TO RAMP TO SEE - PIER IN RIVER
Pier Bracing/Struts/Sheathing	- N/A



Post Flood Bridge Inspection Form

Bridge File Number	00599-1	Inspector Name	T. CAREY
Location Description	HIGHWOOD RIVER BRIDGE ON HIGHWAY 552, 18 KM NE OF OKOTOKS	Assistant Name	
		Inspection Date	JULY 10/13
Legal Land Location	NE SEC 16 TWP 21 RGE 28 W4M		
Longitude; Latitude	-113.821685; 50.784023		
Unique Span Types	TH		

Channel Alignment	- GOOD - STRAIGHT THROUGH - FLOWS S TO N
High Water Mark	- 6M BELOW BOTTOM CHORD
Bank Stability	- ROCK WALL AT EAST BANK - CUT BANK N.W. BANK
Drift/Debris	- DRIFT ON PIER
Slope Protection	- O.K. - ROCK WALL @ EAST - CONCRETE @ WEST
Guidebank/Spurs	- N/A
Drainage	- O.K. - NO DAMAGE FROM DRAINAGE
Adequacy of Opening	- GOOD OPENING - HIGH WATER ONLY TO 6M OF BOTTOM CHORD - BRIDGE UNAFFECTED BY FLOOD
Other Item	
Other Item	
Other Item	
General Comment	- FLOOD WATER PASSED UNDER BRIDGE - GOOD HEIGHT OF SUPERSTRUCTURE - CLEAR DRIFT FROM PIER

File No.	599
Date	July 10/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Hwy 552/Okotoks



Photo 1 Looking d/s at south side of bridge.



Photo 2 Looking d/s at bridge from s.e. bank.

File No.	599
Date	July 10/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Hwy 552/Okotoks



Photo 3 Looking u/s at bridge from n.w. bank- cut bank at n.w.



Photo 4 Looking d/s along east bank- rock wall runs all along east bank.

File No.	599
Date	July 10/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Hwy 552/Okotoks



Photo 5 Drift at pier.



Photo 6 Looking west along north side.

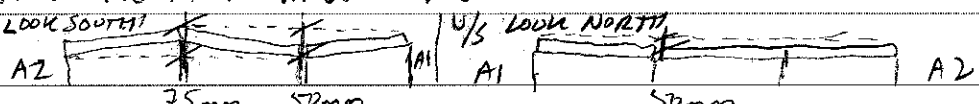
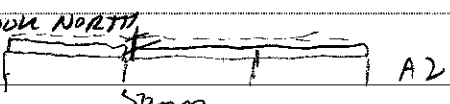
File No.	599
Date	July 10/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Hwy 552/Okotoks



Photo 7 Looking east along south side.

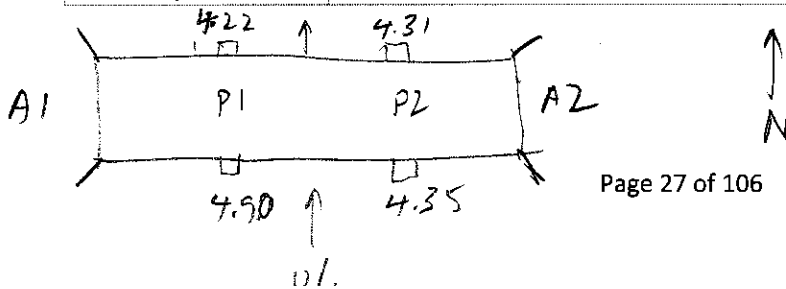
Post Flood Bridge Inspection Form

Bridge File Number	01308-1	Inspector Name	J. RUSO
Location Description	STIMSON CREEK BRIDGE ON PROVINCIAL HIGHWAY 540, 17 KM SE OF LONGVIEW	Assistant Name	
		Inspection Date	15-JUNE-2013
Legal Land Location	SE SEC 14 TWP 17 RGE 2 W5M		
Longitude; Latitude	-114.165077; 50.430037		
Unique Span Types	HC		

Approach Road	HIGHWAY OVERTOPPED WEST APPROACH ROAD. EROSION VISIBLE AT NORTH SHOULDER
Approach Guardrail	16 GUARDRAIL POSTS AT NORTHWEST HAVE BEEN UNDERMINED BUT ALL POSTS AND GUARDRAIL ARE STILL IN PLACE
Approach Embankment	EMBANKMENT GRANULAR FILL AROUND 16 POST AT NORTHWEST HAS BEEN WASHED DOWNSLOPE 4 METERS - REPLACE AND RE-TAMP AROUND POSTS
Vertical Alignment	D/S LOOK SOUTH A2  U/S LOOK NORTH A1  A2
Horizontal Alignment	SPAN ONE SHIFTED 30mm SOUTH OVER PIER ONE

Superstructure General Amount	SOME INSTABILITY NOTED, UNCERTAIN IF FROM RECENT FLOODS, OF ACCUMULATION OF DRIFT ON BRIDGE INDICATES. WATER FLOWED OVER THE DECK FROM EITHER RIVER CHANNEL FLOW OR WEST APPROACH DRAINAGE/OVERLAND FLOW.
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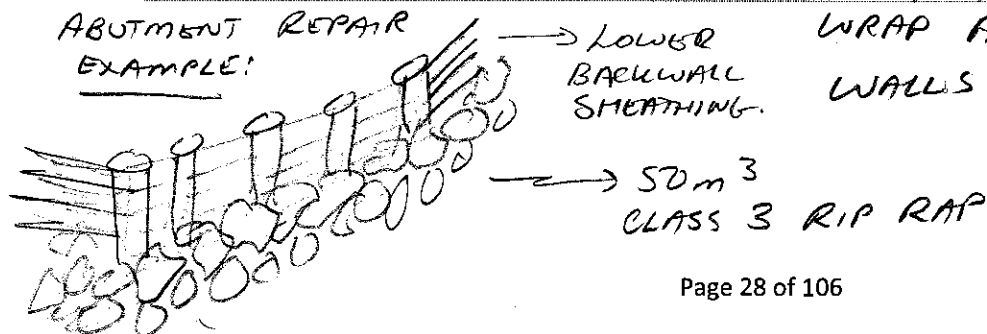
Abutment Backwall	NO VISIBLE FLOOD DAMAGE
Abutment Wingwall	NO VISIBLE FLOOD DAMAGE
Abutment Piles	NO VISIBLE FLOOD DAMAGE
Abutment Stability	EAST ABUTMENT CAPS SLIGHTLY ROTATED TOWARDS BACKWALL - O.K. - NO VISIBLE FLOOD DAMAGE
Abutment Scour/Erosion	BOTH ABUTMENT HEADSLOPES + SLOPE PROTECTION WASHED AWAY 75% AT WEST, 90% AT EAST
Pier Piles	4 PIER PILES NOT ALIGNED OR PLUMB IN ONE PLANE. PIER PILES APPEAR TO BE IN GOOD CONDITION.
Pier Stability	NO VISIBLE FLOOD DAMAGE
Pier Scour/Erosion	PIER SCOUR HEIGHTS: 4.22m AT N.W. PIER, 4.31 AT N.E PIER 4.90m AT S.W. PIER, 4.35 AT S.E. PIER
Pier Bracing/Struts/Sheathing	NO VISIBLE FLOOD DAMAGE



Post Flood Bridge Inspection Form

Bridge File Number	01308-1	Inspector Name	J. RUSO
Location Description	STIMSON CREEK BRIDGE ON PROVINCIAL HIGHWAY 540, 17 KM SE OF LONGVIEW	Assistant Name	
		Inspection Date	15-JUNE-2013
Legal Land Location	SE SEC 14 TWP 17 RGE 2 W5M		
Longitude; Latitude	-114.165077; 50.430037		
Unique Span Types	HC		

Channel Alignment	GOOD - NO VISIBLE FLOOD DAMAGE
High Water Mark TO	TOP OF CURB - DEBRIS ON S.W. FENCING AND PACKED IN DECK DRAINS
Bank Stability	VERTICAL BANKS SOM D/S - MINOR
Drift/Debris	DEBRIS FIELD AT S.W. FLOOD PLAIN. DRIFT ON PIERS
Slope Protection	ALMOST ALL SCOUR PROTECTION AT HEADSLOPES AND U/S OF BRIDGE IS DISPLACED D/S.
Guidebank/Spurs	NONE / N/A
Drainage	HIGHWATER SPILLED BANKS AND WASHED OVER WEST APPROACH ROAD AND ONTO BRIDGE.
Adequacy of Opening	ADEQUACY IMPROVED SINCE HEADSLOPES HAVE WASHED OUT - APPEARS TO STILL BE UNDERSIZED FOR RECENT FLOWS. LOCAL RESIDENTS REPORT CROSSING CLOSURE DURING FLOODS.
Other Item	
Other Item	
Other Item	
General Comment	<p><u>ABUTMENT REPAIRS!</u> - LOWER BACKWALL SHEATHING TO STREAMBED (IF NOT ALREADY IN PLACE)</p> <p>- PLACE SUM 3 CLASS 3 RIP RAP AT FOOT OF ABUTMENTS AND WRAP AROUND U/S/D/S WING WALLS</p>



File No.	01308
Date	July 14, 2013
Photos By	J. Rusu
Stream/Highway/Location	Stimson Creek/ Hwy 540/ Longview



Photo 1
Every deck drain plugged with tightly packed debris.



Photo 2
From NW abutment looking east showing north (D/S) girder line vertical misalignment. Approx. 75mm between span 2 and 3 and 50mm between Sp. 1 and 2.

File No.	01308
Date	July 14, 2013
Photos By	J. Rusu
Stream/Highway/Location	Stimson Creek/ Hwy 540/ Longview



Photo 3
From U/S looking north (D/S) at bridge. Note vertical misalignment between spans 2 and 3.



Photo 4
From U/S SE bank looking NW at U/S girder fascia .
Vertical misalignment seen at this angle also.

File No.	01308
Date	July 14, 2013
Photos By	J. Rusu
Stream/Highway/Location	Stimson Creek/ Hwy 540/ Longview



Photo 5
Washed out headslope at east abutment. Note slightly rotating abutment cap – 15mm. 50m³ class 2 rock along the base of the back wall and wrapping around U/S and D/S wing walls is recommended.



Photo 6
Washed out headslope at west abutment. Requires rip rap.

File No.	01308
Date	July 14, 2013
Photos By	J. Rusu
Stream/Highway/Location	Stimson Creek/ Hwy 540/ Longview



Photo 7
Looking northeast showing drift elevation relative to bridge deck elevation and west approach road.



Photo 8
Looking east at NW approach guardrail post erosion from SW overflow.

File No.	01308
Date	July 14, 2013
Photos By	J. Rusu
Stream/Highway/Location	Stimson Creek/ Hwy 540/ Longview

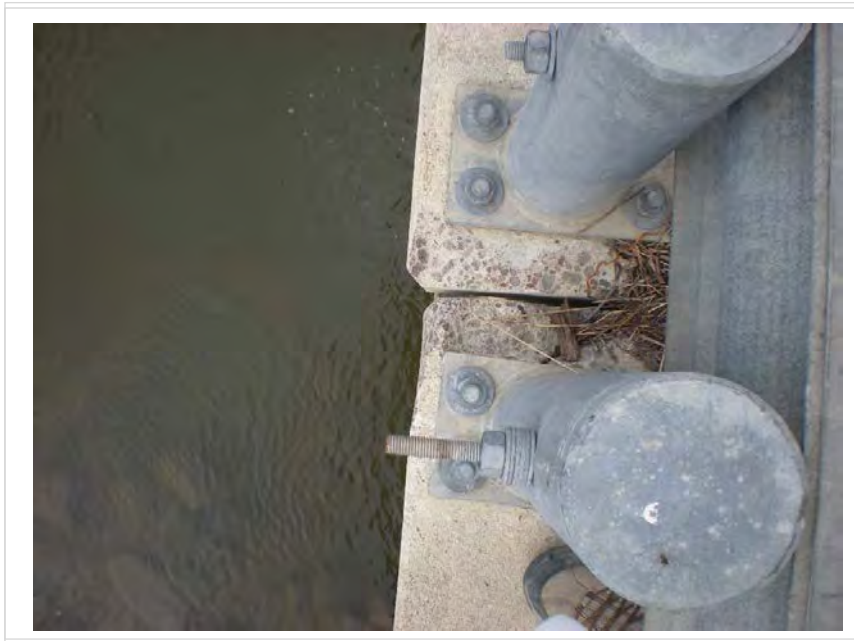


Photo 9
30mm horizontal misalignment between span 1 and 2.

Post Flood Bridge Inspection Form

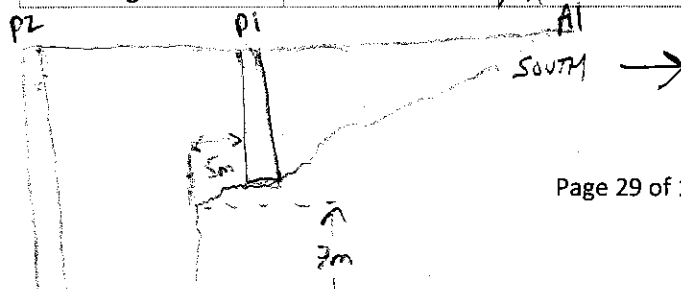
Bridge File Number	01741-1 ✓	Inspector Name	J. RUSSO
Location Description	HIGHWOOD RIVER BRIDGE ON HIGHWAY 22, 1 KM S OF LONGVIEW ✓	Assistant Name	
		Inspection Date	13-JULY-2013
Legal Land Location	NE SEC 17 TWP 18 RGE 2 W5M ✓		
Longitude; Latitude	-114.234062; 50.522899 ✓		
Unique Span Types	PO, CS ✓		

Approach Road	NO VISIBLE FLOOD DAMAGE
Approach Guardrail	NO VISIBLE FLOOD DAMAGE
Approach Embankment	NO SIGNS OF EMBANKMENT EROSION DUE TO FLOODING

Vertical Alignment	H/V BRIDGE ALIGNMENT IS GOOD.
Horizontal Alignment	

Superstructure General	BEARINGS / GIRDER ALIGNMENT APPEAR UNAFFECTED FROM FLOOD
------------------------	--

Abutment Backwall	NO VISIBLE DAMAGE
Abutment Wingwall	NO VISIBLE DAMAGE
Abutment Piles	NOT VISIBLE
Abutment Stability	STABLE ABUTMENTS. NO SIGNS OF FLOOD RELATED INSTABILITY.
Abutment Scour/Erosion	EROSION AT NORTH HEADSLOPES - NOT FLOOD RELATED AND APPEARS STABLE
Pier Piles	NOT VISIBLE
Pier Stability	NO LEANING OR TIPPING. PIER STABILITY LOOKS O.K.
Pier Scour/Erosion	EROSION AT SOUTH PIER (PIER 1) IS SEVERE SEE PHOTOS + SKETCH BELOW.
Pier Bracing/Struts/Sheathing	N/A



APPROX. 50m LONG & ALIGNED W/ CHAN
 APPROX. 25m LONG U/S + SOUTH OF BRIDGE.

Post Flood Bridge Inspection Form

Bridge File Number	01741-1	Inspector Name	J. RUSU
Location Description	HIGHWOOD RIVER BRIDGE ON HIGHWAY 22, 1 KM S OF LONGVIEW	Assistant Name	
		Inspection Date	13 JULY 2013
Legal Land Location	NE SEC 17 TWP 18 RGE 2 W5M		
Longitude; Latitude	-114.234062; 50.522899		
Unique Span Types	PO, CS		

Channel Alignment	CHANNEL ALIGNMENT IS O.K.: OVERBANK FLOW HITS S.W. ABUTMENT EMBANKMENT TOE.
High Water Mark	DEBRIS CAUGHT ON PIER AND GABION BASKET MESH GIVES AN APPROX. H.W.M. OF 12m BELOW T.O.C.
Bank Stability	UNSTABLE BANKS AT NORTH BOTH U/S + D/S
Drift/Debris	LARGE DEBRIS/DRIFT LINE D/S TO S/E.
Slope Protection	GABION BASKET AT BASE OF NORTH ABUTMENT SLOPE IS O.K. EROSION + NO PROTECTION AT TOE OF SOUTH SLOPE.
Guidebank/Spurs	GABION BASKET AT NORTH.
Drainage	NO OVERLAND/DITCH DRAINAGE PROBLEMS
Adequacy of Opening	ADEQUATE

Other Item	
Other Item	
Other Item	
General Comment	PROTECTION BE AND REPAIR OF SOUTH PIER SLOPE RECOMMENDED.

File No.	01741
Date	July 13, 2013
Photos By	J. Rusu
Stream/Highway/Location	Highwood River / Hwy 22 / Longview



Photo 1
From NW abut. embankment looking south at west girder line. Horizontal and vertical alignments are good.



Photo 2
From NE embankment looking west (u/s) at bridge.

File No.	01741
Date	July 13, 2013
Photos By	J. Rusu
Stream/Highway/Location	Highwood River / Hwy 22 / Longview



Photo 3: From SE abut. embankment looking north at east d/s girder line. Horizontal and vertical alignments are good. Gabions in place at north headslope but may be missing riprap at U/S end.



Photo 4
From SW bank looking d/s at bridge. Vertical alignment looks good.

File No.	01741
Date	July 13, 2013
Photos By	J. Rusu
Stream/Highway/Location	Highwood River / Hwy 22 / Longview



Photo 5
Looking u/s from NE bank at P1 and P2, note erosion under P1.



Photo 6
Looking d/s from SW bank at erosion at south headslope - beneath P1.

File No.	01741
Date	July 13, 2013
Photos By	J. Rusu
Stream/Highway/Location	Highwood River / Hwy 22 / Longview



Photo 7
Looking d/s from SW bank at extent of erosion around
SW corner.

Post Flood Bridge Inspection Form

Bridge File Number	73389-1	Inspector Name	J. RUSV
Location Description	STIMSON CREEK BRIDGE ON HIGHWAY 22, 16 KM S OF LONGVIEW	Assistant Name	
		Inspection Date	14-JUL-2013
Legal Land Location	NW SEC 33 TWP 16 RGE 2 WSM		
Longitude; Latitude	-114.226219; 50.392101		
Unique Span Types	DBT		

Approach Road	NO VISIBLE DAMAGE
Approach Guardrail	NO VISIBLE FLOOD DAMAGE
Approach Embankment	NO VISIBLE FLOOD DAMAGE

Vertical Alignment	GOOD V/M BRIDGE ALIGNMENT
Horizontal Alignment	- NO ABUTMENT SETTLEMENT / SHIFTING WHICH WOULD AFFECT ALIGNMENTS

Superstructure General	NO VISIBLE FLOOD DAMAGE. BRIDGE APPEARS STABLE
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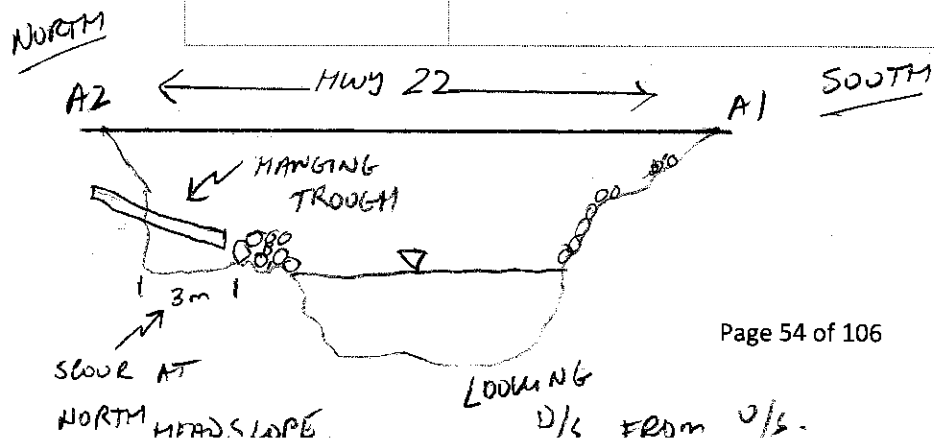
Abutment Backwall	NO VISIBLE FLOOD DAMAGE
Abutment Wingwall	NO VISIBLE FLOOD DAMAGE
Abutment Piles	NOT ACCESSIBLE
Abutment Stability	STABLE ABUTMENTS
Abutment Scour/Erosion	SCOUR DUE TO HIGH WATER AND/OR CATTLE TRACKING AT NORTH HEADSLOPES. NE + NW DRAIN TROUGHS COMPLETELY UNDERMINED.
Pier Piles	NO PIERS
Pier Stability	N/A
Pier Scour/Erosion	N/A
Pier Bracing/Struts/Sheathing	N/A

Post Flood Bridge Inspection Form

Bridge File Number	73389-1	Inspector Name	J. RUSSO
Location Description	STIMSON CREEK BRIDGE ON HIGHWAY 22, 16 KM S OF LONGVIEW	Assistant Name	
		Inspection Date	14-JULY-2013
Legal Land Location	NW SEC 33 TWP 16 RGE 2 W5M		
Longitude; Latitude	-114.226219; 50.392101		
Unique Span Types	DBT		

Channel Alignment	O.K. NO PROBLEMS OR VISIBLE FLOOD DAMAGE
High Water Mark	1.8m BELOW T.O.C. - GRASS CAUGHT ON S.W. FENCING AT U/S
Bank Stability	SOME EROSION @ U/S + D/S BANKS - STABLE
Drift/Debris	DRIFT LINE AND DEBRIS CAUGHT ON U/S FENCING
Slope Protection	ADD 50m ³ OF CLASS II RIP RAP TO NORTH HEADSLOPE & INCLUDE CATTLE TRACK TO ALLOW FOR CATTLEPASS
Guidebank/Spurs	NONE AT THIS BRIDGE.
Drainage	NO VISIBLE FLOOD DAMAGE.
Adequacy of Opening	ADEQUATE.

Other Item	
Other Item	
Other Item	
General Comment	EROSION REPAIRS AT DRAIN TROUGHS AND ADDITION OF SCOUR PROTECTION AT NORTH ABUTMENT HEADSLOPE RECOMMENDED.



File No.	73389-1
Date	July 14, 2013
Photos By	J. Rusu
Stream/Highway/Location	Stimson Creek/ Hwy 22/ Longview



Photo 1
Looking south from NE embankment along east girder line.



Photo 2
Looking d/s (east) from NW u/s bank.

File No.	73389-1
Date	July 14, 2013
Photos By	J. Rusu
Stream/Highway/Location	Stimson Creek/ Hwy 22/ Longview



Photo 3
Looking north from SW embankment along west girder line.



Photo 4
Looking u/s (west) from SE d/s bank.

File No.	73389-1
Date	July 14, 2013
Photos By	J. Rusu
Stream/Highway/Location	Stimson Creek/ Hwy 22/ Longview



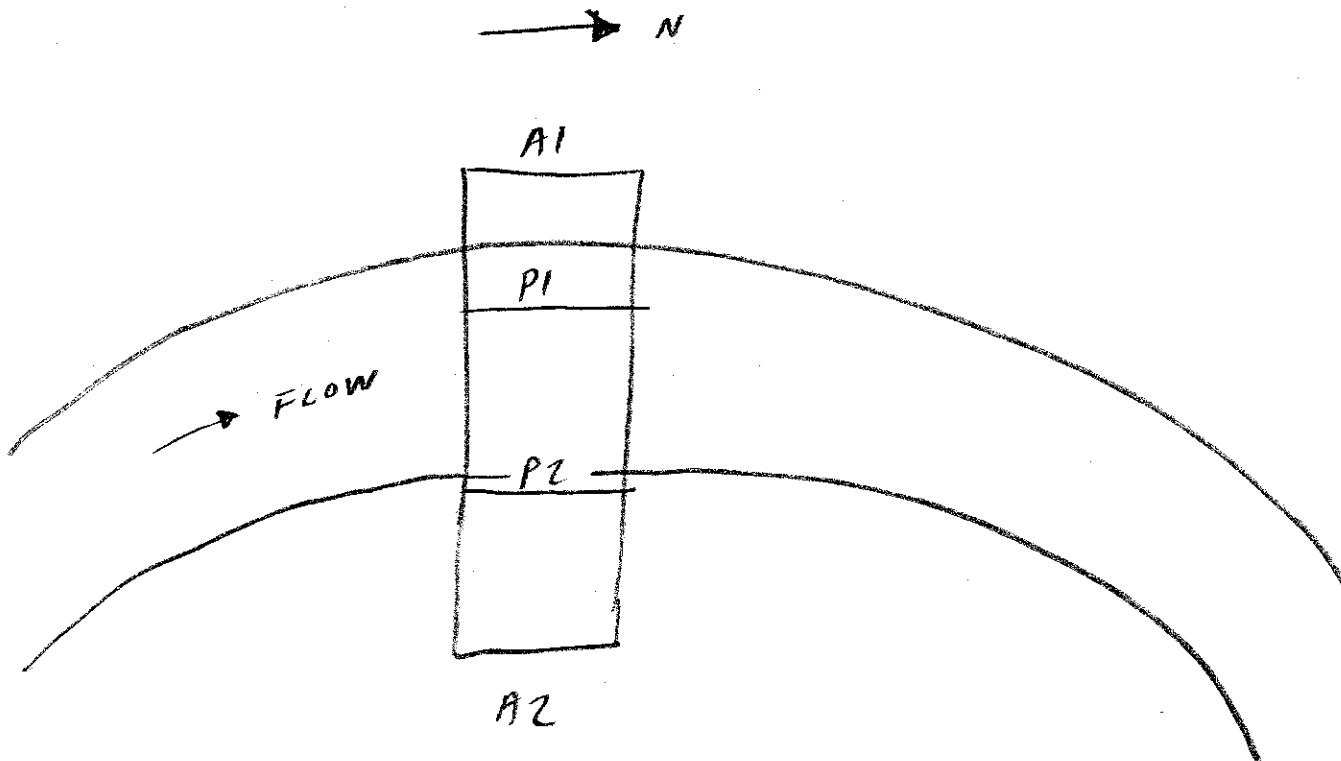
Photo 5
North headslope erosion and hanging drain troughs -
replacement fill and scour protection required.

Bridge Inspection									
Bridge File Number	74458 N-2 Bridge				Form Type	SG			
Year Built/Year Supstr	1997/1997				Lot No.	2			
Bridge or Town Name	ALDERSYDE				Inspector Name	T. CAREY			
Located Over	HIGHWOOD RIVER, 2.13.27, WATERCROSS ST				Inspector Class	A			
Located On	2:12 R1 11.802				Assistant Name				
Water Body Cl./Year					Assistant Class				
Navigabil. Cl./Year					Inspection Date	09/29/11			
Legal Land Location	NE SEC 6 TWP 20 RGE 28 W4M				Data Entry By				
Longitude, Latitude					Data Entry Date				
Road Authority	Alberta Transportation (AIT)				Reviewer Name				
Contract Main. Area	CMA27				Review Date				
Clear Roadway/Skew	12.4 / -20 deg. (LHF)				Dept. Reviewer Name				
AADT/Year	15,240 / 2011 (A)				Dept. Review Date				
Road Classification	RFD-412.4-130				Follow-Up By				
Detour Length (km)	1								
Allowable Load (t):	Single	CS1 28	Semi	CS2 49	Train	CS3 62	--> On Critical Spans		
Design Loading:	CS750						--> Critical Member		
							--> Primary Span		
Posting Information									
Required Load Posting (t)	Single		Semi		Truck Train				
Posted Loading (t)	Single		Semi		Truck Train				
Posted:	Lane	NB	At Junction (Y/N)	No	In Advance (Y/N)	No	At Bridge (Y/N)	No	
Posted:	Lane	SB	At Junction (Y/N)		In Advance (Y/N)		At Bridge (Y/N)		
Remarks	Not required								
Hazard Marker At Bridge (Y/N)	No								
Remarks									
Other Sign Types	CURVE,								
Utilities (Located at)									
Utility Attachments									
Telephone	@ NORTH R/W				Gas				
Power					Municipal				
Others					Problem (Y/N)	No			
Remarks									
Approach Road									
		Last	Now	Explanation of Condition					
Horizontal Alignment		7	7	Curve to West					
Vertical Alignment		8	8						
Roadway Width (m)	13.000								
Approach Bump		6	6						
Guardrail (Y/N)	Yes			4.2m @ West					
Guardrail		4	4	Insufficient posts @ 1.9m spacing					
Length (m)	68.000			Flare end @ West					
Current Standard (Y/N)	No			Wrong lap at both West end wing ends					
Termination Type	TURNDOWN			- NOT THREE BEAM					
Drainage		7	7						
Approach Road General Rating		7	7						

Superstructure				
Bridge Component	Last	Now	Explanation of Condition	
(Primary Span : WG, 3 Spans, Lengths(m): 28-35-28, A-Ident Number: A1278-01)				
Special Features				
Special Feature		X		
(Type :)				
Special Feature		X		
(Type :)				
Wearing Surface/Deck Top Detail Ratings				
	N (%)	1 (%)	2 (%)	3 (%)
Last	0	0	0	0
Now	0	0	0	0
Wearing Surface		7	7	Chipcoat on 50mm ACP ✓
(Material Type : ACP - CONVENTIONAL CHIP SEAL COAT) ✓				
(Thickness(mm) : 50) ✓				
Deck Top		N	N	Paved Over.
Deck Rideability		7	7	
Deck Joints		7	7	Staining at abut. seats previous to deck pour ✓
Temperature (deg. C) 22 22°C				
(Expansion Type :) GLAND				
(Fixed Type :) GLAND				
Gap Size (mm)		Gap Location		
70		W ABUT ✓		
75 ✓		E ABUT ✓		
Deck Drainage		7	7	
Drains Clogged (Y/N)		No ✓		
Curbs/Median		7	7	TRANSVERSE NARROW & MED CRACKS @ 1 m SPACING ✓
(Curb Type : Standard) ✓				
Scaling (Percent Area)		0		
Bridge Rail		8	8	
(Type : BRIDGE TUBE) ✓				
Bridge Rail Posts		8	8	
(Type : GALVANIZED POST STEEL; GALVANIZED POST STEEL) ✓				
Bridge Rail/Posts Coating		5	5	Galvanized rail. Pigmented sealer peeling at curb exterior ✓
(Type :) GALVANIZED				
Sidewalk		X	X	
Girder/Beam				
Cover Plate		X	X	
Flange		7	7	
Web		7	7	
Stiffeners		7	7	
Splice		7	7	
Weld		7	7	
Diaphragms/Cross Frame		7	7	

Superstructure				
Bridge Component	Last	Now	Explanation of Condition	
(Primary Span : WG, 3 Spans, Lengths(m): 28-35-28, A-Ident Number: A1278-01)				
Paint Condition	X	X	WEATHERING STEEL ✓	
(Colour Description :)				
(Colour Code :)				
Touchup Required (Y/N)	No	✓		
Bearings	7	7	A/B are too high and missing 6 nuts at A2 ✓	
Temperature (deg. C)		10 + 22°C		
(Expansion Type : REINFORCED NEOPRENE BEARING WITH TEFLON AND STAINLESS STEEL)		✓		
(Fixed Type : ROCKER BEARING)		✓		
Coating Adequate (Y/N)	Yes	✓		
Functioning (Y/N)	Yes	✓		
Deck Underside	7	7	HAIRLINE TRANSVERSE CRACKS WITH EFFLORESCENCE @ EXTERIOR. ✓	
Stains (Percent Area)	2	✓		
Span Alignment Problems				
Vertical (Y/N)	No	✓		
Horizontal (Y/N)	No	✓		
Superstructure General Rating	7	7		
Substructure				
Bridge Component	Last	Now	Explanation of Condition	
Abutments				
Bearing Seats/Caps	8	8		
(Type : CONCRETE)				
Backwalls/Breastwalls	8	8		
Wingwalls	7	7		
Piles	N	N	Buried. ✓	
Paint/Coating	7	7		
Abutment Stability	8	8		
Scour/Erosion	8	8		
Piers/Bents				
(Type : PIER-COLUMN)		✓		
Bearing Seats/Caps	8	8		
(Type : CONCRETE)		✓		
(Total Number of Bearing Piles : 4:4)		✓		
Pier Shaft/Piles	8	8		
Bracing/Struts/Sheathing	8	8	Concrete blocks ✓	
Nose Plate	X	X		
Paint/Coating	6	6	Galvanized ✓	
(Colour Description :)				
(Colour Code :)				
Pier Stability	8	8		
Scour	7	N	- LOCALIZED SCOUR @ ENDS OF P2 - WATER TOO DEEP TO SEE	
Debris (Y/N)	IN YES		- MINOR SCOUR	

Substructure			
Bridge Component	Last	Now	Explanation of Condition
Substructure General Rating	8	8	
Structure Usage			
	Last	Now	Explanation of Condition
Channel			
(U/S Direction : S) ✓			
(D/S Direction : N) ✓			
Alignment	6	6	
Bank Stability	5	3	Steep cut @ North D/S - VERTICAL + UNSTABLE N.E. - SEVERE SCOUR ALL ALONG N.E. BANK
HWM (m below Top of Curb)	At 3.7		Markable HWM
Drift (Y/N)	No		- 1.5 m FROM BOTTOM OF GIRDERS
Slope Protection	7	3	Class 2 @ West ✓ - SCOURED 50 mm Dia @ East ✓ N.E.
(Type : RIP RAP : RIP RAP) ✓			
Guidebank/Spurs	X	X	RIP RAP @ BRIDGE @ A1 STAYED IN PLACE DURING 2013 FLOOD.
Adequacy of Opening	7	5	
(Fish Compensation Measure 1 : NONE) ✓			
(Fish Compensation Measure 2 : NONE) ✓			
Channel General Rating	6	3	



Maintenance Recommendations						
Inspector Recommendations	Year	Inspector Comments	Department Comments	Target Year	Est. Cost	Cat #
REPAIR/REPLACE BRIDGE RAIL						
GALVANIZE/PAINT BRIDGE RAIL						
RETROFIT BRIDGE RAIL						
SEAL CURBS						
PATCH DECK						
SEAL DECK						
OVERLAY DECK						
REPAIR/REPLACE DECK JOINTS						
RESET/ PAINT BEARINGS						
REPAINT SUPERSTRUCTURE						
STRAIGHTEN/REPLACE MEMBERS						
WASHING						
SHOTCRETE REPAIRS						
REPAIR ABUTMENT SCOUR/EROSION						
PLACE ADDITIONAL RIP RAP	2014	- GROOM + RIP RAP N.E. BANK				
REMOVE DRIFT ACCUMULATION	2014					
OTHER ACTION						
OTHER ACTION						
OTHER ACTION						
OTHER ACTION						
Structural Condition Rating (Last/Now) (%)	83.3/	Sufficiency Rating (Last/Now) (%)	67.2/	Est. Repl. Yr	2073	Maint. Req'd. (Y/N)
Special Comments for Next Inspection			Department Comments			
Maintenance Reviewed By			Date	Estimated Total 0		
Proposed Long-Term Strategy						
On 3-Year Program (Y/N)						
Proposed Action						
Previous Inspector's Name	Garry Roberts		Previous Assistant's Name			
Next Inspection Date	03-Jan-2015		Previous Inspection Date	03-Oct-2011		
Inspection Cycle (Default) (months)	39					
Comment						

File No.	74458N
Date	July 11/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Hwy 2/Aldersyde



Photo 1 Looking west.



Photo 2 Looking north d/s.

File No.	74458N
Date	July 11/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Hwy 2/Aldersyde



Photo 3 Looking east.



Photo 4 Looking south u/s.

File No.	74458N
Date	July 11/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Hwy 2/Aldersyde



Photo 5 Looking d/s at bridge from s.e. bank.



Photo 6 Looking north at south side of bridge.

File No.	74458N
Date	July 11/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Hwy 2/Aldersyde



Photo 7 Looking u/s at bridge from n.w. bank- scour at n.w. bank.



Photo 8 Scour at n.w. bank looking south towards bridge.

File No.	74458N
Date	July 11/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Hwy 2/Aldersyde



Photo 9 Scour at n.w. bank looking north from bridge.



Photo 10 Looking west along south side.

File No.	74458N
Date	July 11/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Hwy 2/Aldersyde



Photo 11 Localized scour at ends of P2.



Photo 12 Intact rip rap at A1.

File No.	74458N
Date	July 11/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Hwy 2/Aldersyde



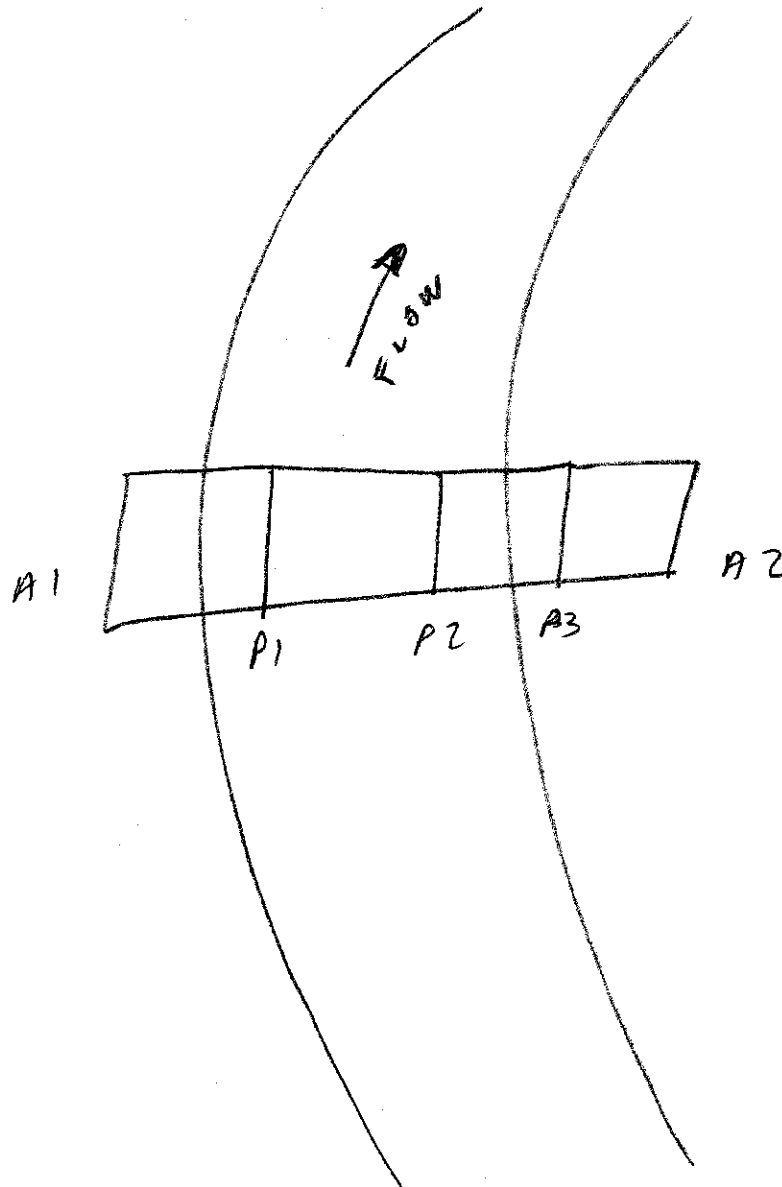
Photo 13 Drift at P1.

Bridge Inspection									
Bridge File Number	74458 S-1 Bridge				Form Type	CON			
Year Built/Year Supstr	1957/1957				Lot No.	2			
Bridge or Town Name	ALDERSYDE				Inspector Name	T CAREY			
Located Over	HIGHWOOD RIVER, 2.13.27, WATERCROSS ST				Inspector Class	A			
Located On	2:12 L1 11.749				Assistant Name				
Water Body Cl./Year					Assistant Class				
Navigabil. Cl./Year					Inspection Date	JULY 11/13			
Legal Land Location	NE SEC 6 TWP 20 RGE 28 W4M				Data Entry By				
Longitude, Latitude					Data Entry Date				
Road Authority	Alberta Transportation (AIT)				Reviewer Name				
Contract Main. Area	CMA27				Review Date				
Clear Roadway/Skew	15.2 /				Dept. Reviewer Name				
AADT/Year	15,240 / 2011 (A)				Dept. Review Date				
Road Classification	RFD 412.4-130				Follow-Up By				
Detour Length (km)	1								
Allowable Load (t): Single	CS1 28	Semi	CS2 49	Train	CS3 62	--> On Critical Spans			
						--> Critical Member			
Design Loading:	HS20					--> Primary Span			
Posting Information									
Required Load Posting (t)	Single		Semi		Truck Train				
Posted Loading (t)	Single		Semi		Truck Train				
Posted: Lane	HPW ✓	At Junction (Y/N)		In Advance (Y/N)		At Bridge (Y/N)			
Posted: Lane	SB ✓	At Junction (Y/N)	No ✓	In Advance (Y/N)	No ✓	At Bridge (Y/N)	No ✓		
Remarks	Not required								
Hazard Marker At Bridge (Y/N)	No ✓								
Remarks									
Other Sign Types	HIGHWOOD RIVER RIGHT LANE ENDS. ✓								
Utilities (Located at)									
Utility Attachments									
Telephone	At South side overhead and South row ✓				Gas				
Power					Municipal				
Others					Problem (Y/N)	No ✓			
Remarks									
Approach Road									
		Last	Now	Explanation of Condition					
Horizontal Alignment		5	5	Curve West ✓					
Vertical Alignment		8	8						
Roadway Width (m)	17.000 ✓			Road is higher than approach slab ✓					
Approach Bump		4	4						
Guardrail (Y/N)	Yes ✓			Wrong lap at East end both sides ✓					
Guardrail		4	4	Not thriebeam ✓					
Length (m)	76.000 ✓								
Current Standard (Y/N)	No ✓								
Termination Type	TURNED DOWN END ✓								
Drainage		7	7						
Approach Road General Rating		6	5						

Superstructure					
Bridge Component	Last	Now	Explanation of Condition		
(Primary Span: CT, 4 Spans, Lengths(m): 17.7-25-25-17.7, A-Ident Number:)					
Special Features					
Special Feature	7	7	EXTERNAL STRENGTHENING RODS. ✓		
(SType: EXT SHEAR STIRRUP) ✓					
Special Feature					
(Type:)					
Wearing Surface/Deck Top Detail Ratings					
	N (%)	1 (%)	2 (%)	3 (%)	
Last	0	0	0	0	
Now	0	0	0	0	
Wearing Surface	5	4	Deck has holes drilled through for strengthening. Chip seal 80% worn- Rating concrete deck ✓ - B DECK SPALLS @ CORE HOLES Numerous 0.5mm wide transverse cracks ✓		
(Material Type: CONCRETE - CONVENTIONAL CHIP SEAL COAT) ✓					
(Thickness(mm): 50) ✓					
Deck Top	5	5			
Deck Rideability	7	7			
Deck Joints	7	7			
Temperature (deg. C)	+22 °C				
(Expansion Type: GLAND (WABO-MAUER, TRANSFLEX, ETC))					
(Fixed Type:)					
Gap Size (mm)	Gap Location				
70	W ABUT ✓				
70	E ABUT ✓				
Deck Drainage	7	7			
Drains Clogged (Y/N)	No				
Curbs/Median	6	6	TRANSVERSE NARROW CRACKS @ 1m SPACING ✓		
(Curb Type: Standard) ✓					
Scaling (Percent Area)	1 ✓				
Bridge Rail	7	3	- N.W. RAIL BROKEN OUT @ PARAPET 21 A/B nuts not fully engaged ✓		
(Type: GALVANIZED STEEL BRIDGE TUBE) ✓					
Bridge Rail Posts	4	4			
(Type: GALVANIZED POST STEEL; GALVANIZED POST STEEL) ✓					
Bridge Rail/Posts Coating	5	5			
(Type: GALVANIZED) ✓					
Sidewalk	X	X			
Girders	5	5	Shear cracks @ piers abutment @ girders 0.35mm. @ West span & 0.77mm @ East span @ South fascia girder strengthened ✓ Vertical cracks 1mm wide @ girder @ piers ✓		
Diaphragms/Cross Frame	6	6	2 mm wide vertical cracks in several diaphragms. ✓		
Bearings	7	7	Roller brgs @ abuts ✓ Rockers on East & West pier. ✓ Pinned at center pier on a pedestal. ✓		
Temperature (deg. C)	+22 °C				
(Expansion Type: ROLLER BEARING; ROCKER BEARING) ✓					
(Fixed Type: PINNED BEARING)					
Coating Adequate (Y/N)	Yes ✓				
Functioning (Y/N)	Yes ✓				

Superstructure				
Bridge Component	Last	Now	Explanation of Condition	
(Primary Span : CT, 4 Spans. Lengths(m): 17.7-25-25-17.7, A-Ident Number:)				
Deck Underside	5	5	Numerous patches and moderate cracks ✓	
Stains (Percent Area)	1		some efflorescence @ cracks ✓	
Span Alignment Problems				
Vertical (Y/N)	No	✓		
Horizontal (Y/N)	No	✓		
Superstructure General Rating	5	5		
Substructure				
Bridge Component	Last	Now	Explanation of Condition	
Abutments				
Bearing Seats	7	7		
Backwalls/Breastwalls	7	5	- WIDE CRACK IN EAST	
Wingwalls	7	7		
Piles	N	N	Buried.	
Paint/Coating	X	X		
Abutment Stability	7	7		
Scour/Erosion	7	5		
Piers/Bents				
(Type : PIER-SOLID)	✓			
Bearing Seats/Caps	7	7		
(Type : CONCRETE)	✓			
Pier Shaft/Piles	6	6		
Nose Plate	4	4	Loose @ center pier ✓	
Paint/Coating	4	4	Paint @ nose plates 90% Gone ✓	
(Colour Description :)	PAIN			
(Colour Code :)	SILVER			
Pier Stability	7	7		
Scour	6	4	- SCOUR BEHIND P3	
Debris (Y/N)	Yes	✓	(Old piles under span 3) ✓ DRIFT @ PIERS	
Substructure General Rating	7	6		
Structure Usage				
Channel	Last	Now	Explanation of Condition	
(U/S Direction : S)	✓			
(D/S Direction : N)	✓			
Alignment	6	6		
Bank Stability	5	4	steep cut @ West + EAST - SCOURED @ N.W.	
HWM (m below Top of Curb)	1.5		No visible HWM - DRIFT ON PIER SEATS 300 mm HIGH	
Drift (Y/N)	No	✓		
Slope Protection	5	4	- STEEP CUT @ WEST	
(Type : NATURAL; NATURAL)				

Structure Usage				
	Last	Now	Explanation of Condition	
Guidebank/Spurs	X	X		
Adequacy of Opening	6	5	- WATER ABOVE PIER SEATS BUT BRIDGE PASSED FLOOD WATER	
(Fish Compensation Measure 1: NONE)	✓			
(Fish Compensation Measure 2: NONE)	✓			
Channel General Rating	5	4		



Maintenance Recommendations						
Inspector Recommendations	Year	Inspector Comments	Department Comments	Target Year	Est. Cost	Cat #
REPAIR/REPLACE BRIDGE RAIL	2013	- REPAIR N.W. BRIDGE RAIL				
GALVANIZE/PAINT BRIDGE RAIL						
RETROFIT BRIDGE RAIL						
SEAL CURBS						
PATCH DECK	2014	PATCH CONE HOLE SPACES				
SEAL DECK						
OVERLAY DECK	2014	✓	Chip coat deck for skid resistance ✓			
REPAIR/REPLACE DECK JOINTS						
RESET/PAINT BEARINGS						
WASHING						
SHOTCRETE REPAIRS						
REPAIR ABUTMENT SCOUR/EROSION						
PLACE ADDITIONAL RIP RAP	2014	- CONSIDER RIP RAP				
REMOVE DRIFT ACCUMULATION	2014	INSTALL ALL ALONG				
OTHER ACTION		WEST BANK BETWEEN				
OTHER ACTION		BOTH BRIDGES				
OTHER ACTION						
OTHER ACTION						
Structural Condition Rating (Last/Now) (%)	66.7/	Sufficiency Rating (Last/Now) (%)	58.9/	Est. Repl. Yr	2025 ✓	Maint. Req'd. (Y/N) 4
Special Comments for Next Inspection			Department Comments			
Maintenance Reviewed By			Date			Estimated Total 0
Proposed Long-Term Strategy						
On 3-Year Program (Y/N)						
Proposed Action						
Previous Inspector's Name	Garry Roberts		Previous Assistant's Name			
Next Inspection Date	03-Jan-2015		Previous Inspection Date	03-Oct-2011		
Inspection Cycle (Default) (months)	39					
Comment						

File No.	74458S
Date	July 11/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Aldersyde



Photo 1 Looking west.



Photo 2 Looking north d/s.

File No.	74458S
Date	July 11/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Aldersyde



Photo 3 Looking east.



Photo 4 Looking south u/s.

File No.	74458S
Date	July 11/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Aldersyde



Photo 5 Looking south at north side of bridge.



Photo 6 Looking u/s at bridge from n.w. bank.

File No.	74458S
Date	July 11/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Aldersyde



Photo 7 Looking north d/s at bridge from s.e. bank.



Photo 8 Patched core hole spalls in deck.

File No.	74458S
Date	July 11/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Aldersyde



Photo 9 Parapet broken at n.w.



Photo 10 Scour behind P3.

File No.	74458S
Date	July 11/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Aldersyde



Photo 11 Looking west along south side- HWM drift on pier seat- 300mm high.



Photo 12 Minor scour at east bank under bridge.

File No.	74458S
Date	July 11/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Aldersyde



Photo 13 Looking east along north side.



Photo 14 West bank cut under bridge at P1.

File No.	74458S
Date	July 11/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Aldersyde



Photo 15 Cut bank at s.e.



Photo 16 Scour at n.w. bank.

File No.	74458S
Date	July 11/13
Photos By	T Carey
Stream/Highway/Location	Highwood River/Aldersyde



Post Flood Bridge Inspection Form

Bridge File Number	78527-1	Inspector Name	J. RUSU
Location Description	PEKISKO CREEK BRIDGE ON HIGHWAY 22, 10 KM S OF LONGVIEW	Assistant Name	
		Inspection Date	14 JULY 2013
Legal Land Location	SE SEC 20 TWP 17 RGE 2 W5M		
Longitude; Latitude	-114.238646; 50.445370		
Unique Span Types	DBT		

Approach Road	NO VISIBLE FLOOD DAMAGE.
Approach Guardrail	NO VISIBLE FLOOD DAMAGE.
Approach Embankment	NO VISIBLE FLOOD DAMAGE

Vertical Alignment	GOOD V/M BRIDGE ALIGNMENT.
Horizontal Alignment	NO INDICATION BRIDGE AFFECTED BY FLOODING

Superstructure General	NO VISIBLE FLOOD DAMAGE
------------------------	-------------------------

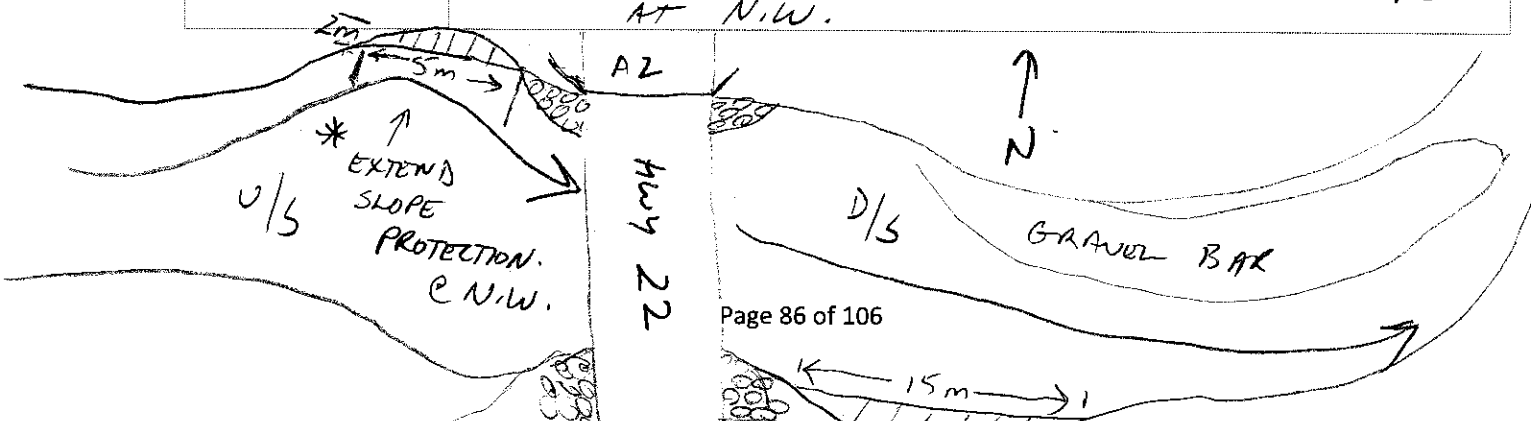
Abutment Backwall	NO VISIBLE FLOOD DAMAGE.
Abutment Wingwall	NO VISIBLE FLOOD DAMAGE
Abutment Piles	NOT VISIBLE / NOT ACCESSIBLE.
Abutment Stability	STABLE ABUTMENTS. - NO VISIBLE INSTABILITY
Abutment Scour/Erosion	MINOR ROCK DISPLACEMENT - STILL ADEQUATE.
Pier Piles	N/A - NO PIERS PROTECTION.
Pier Stability	N/A
Pier Scour/Erosion	N/A
Pier Bracing/Struts/Sheathing	N/A

Post Flood Bridge Inspection Form

Bridge File Number	78527-1	Inspector Name	T. RUSU
Location Description	PEKISKO CREEK BRIDGE ON HIGHWAY 22, 10 KM S OF LONGVIEW	Assistant Name	
		Inspection Date	14-JULY-2013
Legal Land Location	SE SEC 20 TWP 17 RGE 2 W5M		
Longitude; Latitude	-114.238646; 50.445370		
Unique Span Types	DBT		

Channel Alignment	POOR U/S ALIGNMENT - RIVER ERODING N.W. CHANNEL EMBANKMENT - WELL AWAY FROM APPROACH ROAD EMBANKMENT
High Water Mark	5.5 m BELOW TOP OF CURB
Bank Stability	UNSTABLE BANKS U/S AT N.W. AND D/S AT S.E.
Drift/Debris	1% DRIFT AND DEBRIS CAUGHT IN U/S FENCING.
Slope Protection	PROTECT U/S CHANNEL BANKS WITH 20-30 m ³ /s CLASS 2 RIP RAP AT N.W.*
Guidebank/Spurs	RIP RAP GUIDE BANK AT N.W. RECOMMENDED.
Drainage	NO VISIBLE FLOOD DAMAGE.
Adequacy of Opening	OPENING APPEARS ADEQUATE.

Other Item	
Other Item	
Other Item	
General Comment	OVERALL ASSESSMENT OF BRIDGE IS: 1) NO SIGNIFICANT FLOOD DAMAGE. 2) EXTEND CHANNEL ARMOUR 5-10m U/S AT N.W.



File No.	78527-1
Date	July 14, 2013
Photos By	J. Rusu
Stream/Highway/Location	Pekisko Creek/ Hwy 22/ Longview



Photo 1
Looking d/s (east) from u/s channel.



Photo 2
Looking north from SW embankment along west girder line.

File No.	78527-1
Date	July 14, 2013
Photos By	J. Rusu
Stream/Highway/Location	Pekisko Creek/ Hwy 22/ Longview



Photo 3
Looking u/s (west) from d/s channel.



Photo 4
Looking south from NE abutment embankment along east girder line.

File No.	78527-1
Date	July 14, 2013
Photos By	J. Rusu
Stream/Highway/Location	Pekisko Creek/ Hwy 22/ Longview



Photo 5
Scour at NW embankment 30m upstream of bridge.

Appendix 3 Highwood River Water Allocation Licenses

DRAFT

Appendix 3A Surface-Diversions-Licences

DRAFT

Surface-Diversions-Licences

APPROVAL ID	PRIORITY ¹	LICENSEE	POINT OF DIVERSION ²	SOURCE ³	VOLUME ⁴	DIVERSION RATE ⁵	TYPE	PURPOSE ⁵
25179	1992-09-21-001	BAR S RANCH	SE-27-015-02-5	Tributary to Meinsinger Creek	1230		Surface	Agricultural
26162	1991-04-23-011	BASIN LAND & CATTLE LTD.	NE-10-017-02-5	Tributary to Stimson Creek	2460		Surface	Agricultural
26225	1991-04-03-021	Harty, Theodore & Barbara	NW-28-016-02-5	Tributary to Stimson Creek	11090		Surface	Agricultural
26728	1990-10-01-002	BAKER, ALLEN	SE-14-017-03-5	Tributary to Pekisko Creek	3690		Surface	Agricultural
26804	1990-08-15-001	GARDNER, HARVEY	NW-27-015-02-5	Tributary to Meinsinger Creek	3690		Surface	Agricultural
26805	1990-08-15-002	BAKER, ALLEN	NE-14-017-03-5	Tributary to Pekisko Creek	2460		Surface	Agricultural
27000	1990-04-30-001	SPACKMAN, LAWRENCE	SW-04-021-28-4	Tributary to Highwood River	3700		Surface	Agricultural
27222	1990-02-01-003	SPRUCE RANCHING CO-OPERATIVE LIMITED	NE-15-016-03-5	Tributary to Sheppard Creek	8630		Surface	Agricultural
27518	1989-07-31-006	ROSEBURN RANCHES LTD	NE-15-019-01-5	Tongue Creek	35770.98	0.054	Surface	Agricultural
27639	1989-06-06-007	THOMSON, JORDIE	SW-17-019-02-5	Tributary to Tongue Creek	2460		Surface	Agricultural
27847	1989-03-17-008	DAVIS, REX	SW-13-015-03-5	Tributary to Stimson Creek	2460		Surface	Agricultural
27871	1989-03-10-003	Looy, Dick & Barbara	SW-12-020-01-5	Tributary to Sheep River	2460		Surface	Agricultural
28348	1953-12-01-002	O H RANCH LTD	SE-17-019-03-5	Tributary to Tongue Creek	2460		Surface	Agricultural
28518	1988-01-15-008	McPherson, Roy & Hugh	SE-06-017-02-5	Tributary to Stimson Creek	2460		Surface	Agricultural
28655	1987-09-28-005	AUGUSTINA FARMING LTD.	SW-23-021-28-4	Highwood River	17270	0.002	Surface	Agricultural
28703	1987-06-25-013	Riehs, Carl & William	SE-34-016-02-5	Tributary to Stimson Creek	1240		Surface	Agricultural
29172	1973-08-20-002	ALBERTINA FARMING LTD.	NW-12-021-28-4	Blizzard Lake	3700		Surface	Agricultural
29238	1986-03-10-003	Kendall, William & Joan	NE-17-019-02-5	Tributary to Tongue Creek	6160		Surface	Agricultural
29288	1986-02-18-003	PARADIS, JAMES	SW-26-017-02-5	Tributary to Stimson Creek	17270		Surface	Agricultural
29608	1985-05-21-004	HERRIMAN, WILLIAM	SE-06-019-02-5	Tributary to Tongue Creek	3700		Surface	Agricultural
29859	1985-01-08-007	COLWELL FARMS LTD.	SW-32-020-28-4	Sheep River	291100	0.01	Surface	Agricultural
30167	1984-04-03-007	STEPHENSON, R.	NW-26-018-03-5	Tributary to Highwood River	1240		Surface	Agricultural
31075	1982-04-20-002	MORRISON, ARTHUR	NE-24-019-02-5	Tributary to Tongue Creek	4930		Surface	Agricultural
31183	1982-02-04-011	Botero, Arturo & Blanco	NW-04-019-02-5	Tributary to Tongue Creek	4930		Surface	Agricultural
31258	1988-12-02-007	BELL & OCZKOWSKI, BARBARA	SW-08-020-28-4	Highwood River	9870	0.005	Surface	Agricultural
31489	1980-06-20-003	KIENTZ, ALPHONSE	SE-30-019-01-5	Tributary to Tongue Creek	2460		Surface	Agricultural
31530	1980-05-06-008	KIEMELE, DON	NE-04-019-02-5	Tributary to Tongue Creek	3700		Surface	Agricultural
31562	1981-01-05-001	PEKISKO CATTLE (1983) LTD.	NE-18-017-02-5	Tributary to Pekisko Creek	1240		Surface	Agricultural
31901	1979-07-20-007	CLARKE, DANIEL	NE-02-020-01-5	Tributary to Tongue Creek	1240		Surface	Agricultural
32120	1979-03-09-003	KINGSFORD, DOUGLAS	NW-23-018-02-5	Tributary to Highwood River	4930		Surface	Agricultural
32187	1979-02-14-001	WESTERN FEEDLOTS LTD.	SE-32-018-29-4	Highwood River	518060	0.025	Surface	Agricultural
33232	1977-04-15-003	HERRIMAN, ALVIN	NW-34-018-01-5	Tributary to Highwood River	9860		Surface	Agricultural
33335	1977-01-12-002	Owens, Michael & Jean	SW-36-019-01-5	Tributary to Tongue Creek	7400		Surface	Agricultural
33682	1976-03-29-005	NELSON, LLOYD	NW-19-018-29-4	Tributary to Highwood River	16030		Surface	Agricultural
33963	1975-07-07-003	STEELE, HOWARD	NE-20-019-02-5	Tributary to Tongue Creek	3700		Surface	Agricultural
34029	1982-02-04-012	KENNEDY, SHELDON and SPRINGBANK INVESTMENT CORPORATION	NW-07-020-28-4	Tributary to Highwood River	2460		Surface	Agricultural
34078	1975-04-28-002	WYATT, JAMES	SE-02-019-02-5	Tributary to Tongue Creek	1240		Surface	Agricultural
34130	1975-02-28-002	HERRIMAN, ELIZABETH	NE-18-018-01-5	Tributary to Highwood River	2460		Surface	Agricultural
34132	1975-02-28-001	SORKILMO, GEORGE	NW-18-018-01-5	Tributary to Highwood River	2460		Surface	Agricultural
34133	1975-02-28-004	PEKISKO CATTLE (1983) LTD.	NE-21-018-01-5	Tributary to Highwood River	3700		Surface	Agricultural
34519	1975-01-30-002	Looy, Dick & Barbara	NW-01-020-01-5	Tributary to Tongue Creek	4930		Surface	Agricultural
35064	1986-07-10-005	MILLER, JOHN	NE-36-018-02-5	Tributary to Highwood River	2460		Surface	Agricultural



Advisian

WorleyParsons Group

Appendix 3A

Surface-Diversions-Licences

APPROVAL ID	PRIORITY ¹	LICENSEE	POINT OF DIVERSION ²	SOURCE ³	VOLUME ⁴	DIVERSION RATE ⁵	TYPE	PURPOSE ⁵
35594	1972-10-23-002	HIGHWOOD VALLEY RANCH LTD	NE-13-018-30-4	Tributary to Highwood River	3700		Surface	Agricultural
35650	1972-09-25-003	CLIFFORD, RAYMOND	NW-11-017-02-5	Tributary to Stimson Creek	9860		Surface	Agricultural
35742	1981-03-16-004	SPRUCE RANCHING CO-OPERATIVE LIMITED	SE-24-016-03-5	Tributary to Stimson Creek	3700		Surface	Agricultural
35743	1981-03-16-003	SPRUCE RANCHING CO-OPERATIVE LIMITED	NE-13-016-03-5	Tributary to Stimson Creek	4930		Surface	Agricultural
35830	1980-12-31-004	MOUNT SENTINAL RANCH LTD	SE-08-016-02-5	Tributary to Stimson Creek	18500		Surface	Agricultural
35931	1972-08-29-002	PARKER, RALPH	SW-10-019-01-5	Tributary to Tongue Creek	2460	0.001	Surface	Agricultural
35932	1972-09-08-001	TEE-H FARM & RANCH LTD	NE-34-018-02-5	Tributary to Tongue Creek	3700		Surface	Agricultural
36622	1971-08-12-004	JENNINGS, REG and WOLFE, FRANK	SW-02-020-29-4	Tributary to Unnamed Stream	6160		Surface	Agricultural
36716	1973-08-13-003	NELSON, JOHN	SE-36-017-03-5	Tributary to Bull Creek	1240		Surface	Agricultural
37351	1969-01-09-001	LEBBERT, W.	SE-29-020-28-4	Tributary to Highwood River	4930		Surface	Agricultural
37902	1966-02-10-001	DEASE, CLEO	SE-12-018-02-5	Tributary to Highwood River	3700		Surface	Agricultural
37941	1965-11-02-003	SHEPPARD, HERBERT	SW-07-018-02-5	Bull Creek	3700		Surface	Agricultural
38247	1964-06-29-002	SMITH WYATT, IRENE	NW-01-019-02-5	Tributary to Tongue Creek	7400		Surface	Agricultural
38426	1963-10-10-004	ROWLAND, WILLIAM	NE-01-021-28-4	Tributary to Blizzard Lake	3700		Surface	Agricultural
38548	1964-01-03-002	76 LAND & CATTLE INC.	SE-04-017-02-5	Tributary to Stimson Creek	7400		Surface	Agricultural
38549	1963-07-09-001	MESABI RANCHES INC.	NE-23-017-02-5	Tributary to Stimson Creek	11100		Surface	Agricultural
38692	1963-02-19-004	BOKVIST, VERNER	NW-24-018-02-5	Tributary to Highwood River	3700		Surface	Agricultural
38693	1963-02-19-003	BOKVIST, VERNER	NE-24-018-02-5	Tributary to Highwood River	4930		Surface	Agricultural
38727	1963-01-24-001	ROGERS, CARSON	SE-07-019-01-5	Tributary to Tongue Creek	2460	0.001	Surface	Agricultural
38814	1962-11-26-002	DEPAOLI, AMELIO	SW-35-016-02-5	Tributary to Stimson Creek	6160		Surface	Agricultural
38872	1962-10-23-005	CARTWRIGHT, GORDON	SE-11-017-03-5	Tributary to Pekisko Creek	8630		Surface	Agricultural
38873	1904-02-11-001	CARTWRIGHT, HELEN ET AL	SE-35-016-03-5	Tributary to Pekisko Creek	101140		Surface	Agricultural
38956	1962-08-29-002	WYATT, JAMES	NW-06-019-01-5	Tributary to Tongue Creek	2460		Surface	Agricultural
39218	1962-08-07-004	OH RANCH LTD	SW-05-019-03-5	Tributary to Ings Creek	4930		Surface	Agricultural
39284	1961-10-12-006	Veilleux, Bruce & Annie	NE-14-019-02-5	Tributary to Tongue Creek	3700		Surface	Agricultural
39448	1961-03-10-001	STEAD, RONALD	NW-11-020-29-4	Tributary to Highwood River	3700		Surface	Agricultural
39878	1959-02-19-001	KING & SONS RANCHES LTD.	NE-20-019-01-5	Tributary to Tongue Creek	4930		Surface	Agricultural
39912	1958-10-30-002	Nelson, Ralph & A.	SE-31-016-02-5	Tributary to Stimson Creek	1240		Surface	Agricultural
39953	1958-09-08-003	GOING, GERALD	SE-30-017-02-5	Tributary to Pekisko Creek	4930		Surface	Agricultural
39962	1958-08-20-001	GRAHAM, PETRONELLA	NE-18-018-02-5	Tributary to Highwood River	4930		Surface	Agricultural
39982	1958-07-25-003	OH RANCH LTD.	NW-29-018-03-5	Tributary to Highwood River	56740		Surface	Agricultural
39999	1958-06-19-001	OH RANCH LTD	NE-32-018-03-5	Tributary to Ings Creek	4930		Surface	Agricultural
40135	1957-06-26-001	WIGHT, VERNON	NE-31-018-02-5	Tributary to Tongue Creek	14800	0.008	Surface	Agricultural
40181	1957-02-28-001	Schuhmann, Willi & Maria	NE-08-021-28-4	Tributary to Highwood River	3700		Surface	Agricultural
40324	1955-03-07-001	GARDNER, KATHERYN	SW-20-016-02-5	Tributary to Stimson Creek	2460		Surface	Agricultural
40425	1954-09-20-001	DEINES	NE-36-019-29-4	Tributary to Highwood River	3700		Surface	Agricultural
40452	1953-12-01-001	O H RANCH LTD	SW-17-019-03-5	Tributary to Tongue Creek	2460		Surface	Agricultural
40658	1951-06-27-001	CANDOR INVESTMENTS LTD.	SE-02-019-03-5	Tributary to Highwood River	3700		Surface	Agricultural
41768	1944-12-14-002	BROCKLEBANK, DAN	SW-24-019-01-5	Tributary to Tongue Creek	7400		Surface	Agricultural
42524	1941-04-28-014	GOING, GERALD	NE-25-017-03-5	Tributary to Bull Creek	7400		Surface	Agricultural
42525	1941-04-28-013	ROBERTSON, ALEXANDER	NE-18-017-02-5	Tributary to Pekisko Creek	38230		Surface	Agricultural
42528	1941-04-28-011	NELSON, MELVIN	SW-22-017-03-5	Tributary to Bull Creek	33300		Surface	Agricultural

Surface-Diversions-Licences

APPROVAL ID	PRIORITY ¹	LICENSEE	POINT OF DIVERSION ²	SOURCE ³	VOLUME ⁴	DIVERSION RATE ⁵	TYPE	PURPOSE ⁵
42529	1941-04-28-010	BAKER, ALLEN	NW-28-017-03-5	Bull Creek	8630		Surface	Agricultural
42560	1940-10-11-001	ROBERTSON, ALEXANDER	SE-07-018-02-5	Tributary to Bull Creek	6160		Surface	Agricultural
42568	1940-10-07-002	GOSS, DONALD	NW-15-019-02-5	Tributary to Tongue Creek	2460		Surface	Agricultural
42569	1940-10-07-001	GOSS, ELMER	SE-16-019-02-5	Tributary to Tongue Creek	4933.93		Surface	Agricultural
42622	1940-02-21-002	BROCKLEBANK RANCHES	SW-11-019-01-5	Tributary to Tongue Creek	4930		Surface	Agricultural
42927	1939-05-22-005	WYATT, JAMES	NE-16-019-02-5	Tributary to Tongue Creek	4930		Surface	Agricultural
42934	1939-05-17-001	LOCKHART, SAMUEL	NE-15-019-02-5	Tributary to Tongue Creek	1240		Surface	Agricultural
42935	1939-05-09-002	LOCKHART, SAMUEL	SW-14-019-02-5	Tributary to Tongue Creek	3700		Surface	Agricultural
42955	1939-04-06-001	MILLER, JOHN	NE-36-018-02-5	Tributary to Highwood River	2460		Surface	Agricultural
43466	1938-06-13-002	HARTLEY, ROBERT	NE-26-018-02-5	Tributary to Highwood River	2460		Surface	Agricultural
146853	1997-09-09-003	BAKER, J.	NW-08-017-02-5	Pekisko Creek	1234	0.001	Surface	Commercial
264157	1985-02-27-002	ALBERTA ENVIRONMENT AND SUSTAINABLE RESOURCE DEVELOPMENT	NW-17-020-28-4	Highwood River	20352		Surface	Government Holdback
309315	1974-10-29-005	ALBERTA ENVIRONMENT AND SUSTAINABLE RESOURCE DEVELOPMENT	NW-01-019-29-4	Highwood River	32194		Surface	Government Holdback
27770	1989-05-09-009	MUNICIPAL DISTRICT OF FOOTHILLS NO. 31	SW-29-019-28-4	Sewage Lagoon	3717720	0.119	Surface	Habitat Enhancement
219840	1988-11-23-002	DUCKS UNLIMITED CANADA, EDMONTON	SE-29-019-28-4	Highwood River	1233482		Surface	Habitat Enhancement
39969	1974-04-16-005	LEGACY OIL + GAS INC.	NE-17-018-02-5	Highwood River	1184142.97	0.059	Surface	Industrial
39969	1958-08-05-002	LEGACY OIL + GAS INC.	NE-17-018-02-5	Highwood River	468723.1	0.059	Surface	Industrial
29776	1985-03-07-005	NELSON, RALPH and DENNEY, NORM	NE-30-018-29-4	Highwood River	28370	0.05	Surface	Irrigation
29785	1985-02-27-004	BARRETT, BERNARD	SE-18-020-28-4	Highwood River	70310	0.038	Surface	Irrigation
29787	1985-02-27-001	550030 ALBERTA LTD	NW-17-020-28-4	Highwood River	54270	0.025	Surface	Irrigation
31148	1982-02-22-005	510546 ALBERTA LTD.	SW-29-020-28-4	Highwood River	30840	0.013	Surface	Irrigation
31417	1980-06-24-003	RANDLE FARMS LTD	NW-29-019-28-4	Highwood River	372510	0.101	Surface	Irrigation
31611	1980-03-10-001	Lockhart, John & May	NE-21-019-02-5	Tributary to Tongue Creek	23440		Surface	Irrigation
31641	1980-01-03-005	RICHARD & JAN ROENISCH	SW-15-018-01-5	Highwood River	128280	0.05	Surface	Irrigation
32103	1979-03-29-002	TONGUE CREEK FEEDERS LTD.	NW-16-019-01-5	Tongue Creek	39470	0.038	Surface	Irrigation
32886	1978-02-21-010	NELSON, RALPH	NW-29-018-29-4	Mosquito Creek	205990	0.05	Surface	Irrigation
33022	1977-10-18-005	1042682 ALBERTA LTD.	NW-01-019-29-4	Highwood River	135680	0.038	Surface	Irrigation
33727	1976-03-05-002	HILTON, CINDY	NE-20-020-28-4	Highwood River	27140	0.049	Surface	Irrigation
33863	1978-09-19-001	SCHMAUTZ, EMIL	SE-20-020-28-4	Highwood River	65370	0.05	Surface	Irrigation
33994	1975-07-07-001	MESABI RANCHES INC & 76 LAND & CATTLE INC	NW-03-017-02-5	Stimson Creek	185020	0.091	Surface	Irrigation
34240	1975-01-27-001	LEHIGH HANSON MATERIALS LIMITED	SE-06-020-28-4	Highwood River	60440	0.038	Surface	Irrigation
34343	1975-01-15-001	MISCULIANCE ENTERPRISE LTD.	SE-18-020-28-4	Highwood River	129520	0.032	Surface	Irrigation
34664	1981-10-09-021	WESTERN FEEDLOTS LTD.	SE-32-018-29-4	Highwood River	219560	0.106	Surface	Irrigation
34700	1981-09-10-014	SPARROW, ALBERT	SW-20-020-28-4	Highwood River	85110	0.038	Surface	Irrigation
35213	1973-08-13-002	76 LAND & CATTLE, MESABI RANCHES, BASIN LAND & CATTLE	NE-03-017-02-5	Stimson Creek	262730	0.072	Surface	Irrigation
35306	1973-05-14-001	HIGHWOOD GOLF & COUNTRY CLUB	NE-01-019-29-4	Highwood River	123350	0.045	Surface	Irrigation
37634	1968-01-10-001	Jewell, Alan & Connie	NW-30-019-28-4	Highwood River	74010	0.05	Surface	Irrigation
38530	1968-01-31-001	1552277 ALBERTA LTD.	NE-30-019-28-4	Highwood River	103610	0.05	Surface	Irrigation
38950	1962-08-29-003	BUSSER, EMIL	SW-20-019-28-4	Highwood River	123350	0.054	Surface	Irrigation
45177	1921-05-14-001	ALBERTA ENVIRONMENT AND SUSTAINABLE RESOURCE DEVELOPMENT	NW-06-019-28-4	Highwood River	18500		Surface	Irrigation
45742	1907-10-03-001	76 LAND & CATTLE INC., HUGH & SUSAN MCPHERSON, and BARKLEY, WAYN	SW-07-017-02-5	Pekisko Creek	185022.28	0.03	Surface	Irrigation
46187	1893-10-30-001	WESTERN FEEDLOTS LTD.	NW-30-018-29-4	Highwood River	177630	0.5	Surface	Irrigation

APPROVAL ID	PRIORITY ¹	LICENSEE	POINT OF DIVERSION ²	SOURCE ³	VOLUME ⁴	DIVERSION RATE ⁵	TYPE	PURPOSE ⁵
78563	1978-03-30-008	WESTERN FEEDLOTS LTD.	NW-25-018-01-5	Highwood River	268900	0.088	Surface	Irrigation
208430	1962-07-24-002	CANADA FINANCE CORPORATION LIMITED	SW-05-020-28-4	Highwood River	61467	0.005	Surface	Irrigation
208436	1962-07-24-002	DARCY, SMITH	SW-05-020-28-4	Highwood River	8531	0.005	Surface	Irrigation
33863	1977-08-25-002	SCHMAUTZ, EMIL	SE-20-020-28-4	Highwood River	117180.77	0.05	Surface	Irrigation
33863	1975-11-10-005	SCHMAUTZ, EMIL	SE-20-020-28-4	Highwood River	44405.35		Surface	Irrigation
264156	1985-02-27-002	HIGHFIELD STOCK FARMS INC.	SE-18-020-28-4	Highwood River	183172	0.06	Surface	Irrigation
309312	1974-10-29-005	CHINOOK FEEDERS LTD.	NW-06-019-28-4	Highwood River	289744	0.06	Surface	Irrigation
327782	1975-11-10-005	KLASSEN, JOHN	SE-20-020-28-4	Highwood River	11101.33	0.436	Surface	Irrigation
327783	1975-11-10-005	TERRY, RANDY & FRED SCHMAUTZ	SE-20-020-28-4	Highwood River	33304.01	1.34	Surface	Irrigation
328070	1978-06-16-003	LAFARGE CANADA INC.	NW-30-018-29-4	Sqauw Coulee	30838	0.005	Surface	Irrigation
328071	1978-06-16-003	HIGHWOOD VALLEY RANCH LTD	NW-30-018-29-4	Sqauw Coulee	28371	0.045	Surface	Irrigation
327783	1977-08-25-002	TERRY, RANDY & FRED SCHMAUTZ	SE-20-020-28-4	Highwood River	88810.69	1.34	Surface	Irrigation
327783	1978-09-19-001	TERRY, RANDY & FRED SCHMAUTZ	SE-20-020-28-4	Highwood River	49339.27	1.34	Surface	Irrigation
327782	1977-08-25-002	KLASSEN, JOHN	SE-20-020-28-4	Highwood River	28370.08	0.436	Surface	Irrigation
327782	1978-09-19-001	KLASSEN, JOHN	SE-20-020-28-4	Highwood River	16035.26	0.436	Surface	Irrigation
45742	1907-10-03-001	76 LAND & CATTLE INC., HUGH & SUSAN MCPHERSON, and BARKLEY, WAYN	NE-01-017-03-5	Pekisko Creek	121411.62	0.019	Surface	Irrigation
45742	1907-10-03-001	76 LAND & CATTLE INC., HUGH & SUSAN MCPHERSON, and BARKLEY, WAYN	NE-17-017-02-5	Pekisko Creek	618677.49	0.084	Surface	Irrigation
45742	1907-10-03-001	76 LAND & CATTLE INC., HUGH & SUSAN MCPHERSON, and BARKLEY, WAYN	NE-01-017-03-5	Pekisko Creek	0		Surface	Irrigation
309312	2014-10-02-001	CHINOOK FEEDERS LTD.	NW-06-019-28-4	Highwood River	0	0.12	Surface	Irrigation
22052	1995-11-23-001	ALBERTA TOURISM, PARKS AND RECREATION	SE-33-016-05-5	Stony Creek	1230		Surface	Municipal
35873	1986-07-10-003	THE RIVERBEND RANCH TRUST	NW-20-018-02-5	Highwood River	1230		Surface	Municipal
38629	1963-04-19-001	MUNICIPAL DISTRICT OF FOOTHILLS NO. 31	SW-18-020-28-4	Highwood River	148017.82	0.061	Surface	Municipal
81044	1995-03-30-002	PARKS CANADA	NW-08-017-02-5	Pekisko Creek	1233.5	0.002	Surface	Municipal
142323	1986-11-10-001	STONEY BAND	SE-15-017-04-5	Highwood River	75243	0.008	Surface	Municipal
264532	1974-10-24-001	HIGHFIELD STOCK FARMS INC.	SE-18-020-28-4	Highwood River	416307	0.03	Surface	Other Purpose Specified by the Director
264532	2011-08-03-002	HIGHFIELD STOCK FARMS INC.	SE-18-020-28-4	Highwood River	0	0.03	Surface	Other Purpose Specified by the Director
44553	1933-10-05-001	WATER OPERATIONS BRANCH, LETHBRIDGE	NE-25-018-30-4	Highwood River	4933930	0.71	Surface	Water Management
44553	1979-07-26-001	WATER OPERATIONS BRANCH, LETHBRIDGE	NE-25-018-30-4	Highwood River	22212000	0.99	Surface	Water Management
48060	1997-09-02-003	ALBERTA INFRASTRUCTURE	NW-06-019-28-4	Highwood River	68600000	5.7	Surface	Water Management
NOTES: (1) Priority - first in time first in right, based on the date of a complete application (YYYY-MM-DD-00X); e.g. 1958-11-03-001 = 1958(year), 11(month), 03(day), 001(database generated) (2) Point of Diversion - the legal land location of the works; e.g. 12 or NE 08-007-06-4 = 12 or NE (legal subdivision and/or quarter section), 08 (section), 007(township), 06(range), 4(meridian) (3) Source - Refer to the licence document for the approved source (4) Volume - maximum annual quantity that may be diverted; units are in cubic metres (5) Diversion Rate - maximum instaneous diversion rate; units for surface water diversion rate are cubic metres/second; units for an aquifer diversion rate are cubic metres/day (6) Purpose - purposes are grouped into a classification system within a database. Refer to the licence document for approved purpose								
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Appendix 3B Well-Diversions-Licences

Appendix 3B

Well-Diversions-Licences

APPROVAL ID	PRIORITY ¹	LICENSEE	POINT OF DIVERSION ²	SOURCE ³	VOLUME ⁴	DIVERSION RATE ⁵	TYPE	PURPOSE ⁵
24624	1993-12-13-027	Harty, Theodore & Barbara	14-06-018-01-5	Unnamed Aquifer	4320	130.92	Well	Agricultural
24625	1993-12-13-025	Harty, Theodore & Barbara	11-28-016-02-5	Unnamed Aquifer	1230	196.39	Well	Agricultural
24625	1993-12-13-026	Harty, Theodore & Barbara	01-28-016-02-5	Unnamed Aquifer	1230	13.09	Well	Agricultural
24626	1993-12-13-024	Harty, Theodore & Barbara	03-31-018-01-5	Unnamed Aquifer	2470	0.07	Well	Agricultural
24627	1993-12-13-023	Harty, Theodore & Barbara	16-07-019-01-5	Unnamed Aquifer	3080	98.19	Well	Agricultural
25900	1991-08-06-010	KIENTZ, ALPHONSE	03-30-019-01-5	Unnamed Aquifer	8630	130.92	Well	Agricultural
25900	1991-08-06-011	KIENTZ, ALPHONSE	03-30-019-01-5	Unnamed Aquifer	0	130.92	Well	Agricultural
26004	1991-06-07-002	Scott, James & Helen	13-08-021-28-4	Unnamed Aquifer	2470	130.92	Well	Agricultural
26099	1991-04-08-008	NOBLE, FRANK	08-09-019-29-4	Unnamed Aquifer	3700	32.73	Well	Agricultural
26099	1991-04-08-009	NOBLE, FRANK	01-09-019-29-4	Unnamed Aquifer	2470	65.46	Well	Agricultural
26099	1991-04-08-010	NOBLE, FRANK	01-09-019-29-4	Unnamed Aquifer	0	39.28	Well	Agricultural
26127	1991-04-08-005	MACKILLOP, LLOYD	11-14-019-29-4	Unnamed Aquifer	1230	26.18	Well	Agricultural
26127	1991-04-08-006	MACKILLOP, LLOYD	11-14-019-29-4	Unnamed Aquifer	6170	26.18	Well	Agricultural
26127	1991-04-08-007	MACKILLOP, LLOYD	11-14-019-29-4	Unnamed Aquifer	0	3.27	Well	Agricultural
26128	1991-04-08-013	McIntyre, Blaine & Helen	09-15-019-29-4	Unnamed Aquifer	4930	98.19	Well	Agricultural
26129	1991-04-08-011	McIntyre, Blaine & Helen	02-27-019-29-4	Unnamed Aquifer	1230	26.18	Well	Agricultural
26129	1991-04-08-012	McIntyre, Blaine & Helen	02-27-019-29-4	Unnamed Aquifer	3700	65.46	Well	Agricultural
26130	1991-04-08-004	TEE-H FARM & RANCH LTD	03-28-019-29-4	Unnamed Aquifer	2470	45.82	Well	Agricultural
26486	1989-10-20-008	ROSEBURN RANCHES LTD	09-22-019-01-5	Unnamed Aquifer	3700	52.37	Well	Agricultural
26487	1989-10-20-007	ROSEBURN RANCHES LTD	09-22-019-01-5	Unnamed Aquifer	2470	32.73	Well	Agricultural
26488	1989-10-20-004	ROSEBURN RANCHES LTD	10-15-019-01-5	Unnamed Aquifer	12330	45.82	Well	Agricultural
26488	1989-10-20-005	ROSEBURN RANCHES LTD	10-15-019-01-5	Unnamed Aquifer	13570	52.37	Well	Agricultural
26488	1989-10-20-006	ROSEBURN RANCHES LTD	10-15-019-01-5	Unnamed Aquifer	16040	65.46	Well	Agricultural
26488	1989-10-20-009	ROSEBURN RANCHES LTD	15-15-019-01-5	Unnamed Aquifer	11100	39.28	Well	Agricultural
27727	1989-04-17-005	CANDOR INVESTMENTS LTD.	11-08-019-03-5	Unnamed Aquifer	1230	39.28	Well	Agricultural
27728	1989-04-17-003	O H RANCH LTD	10-33-018-03-5	Unnamed Aquifer	3700	19.64	Well	Agricultural
27728	1989-04-17-004	O H RANCH LTD	10-33-018-03-5	Unnamed Aquifer	3700	26.18	Well	Agricultural
27909	1988-09-29-018	RALPH L NELSON RANCHES LTD	11-31-016-02-5	Unnamed Aquifer	3700	19.64	Well	Agricultural
28115	1988-09-29-004	DIEBEL, MARY	01-22-019-02-5	Unnamed Aquifer	1230	104.75	Well	Agricultural
28115	1988-09-29-005	DIEBEL, MARY	12-23-019-02-5	Unnamed Aquifer	1230	104.75	Well	Agricultural
28593	1987-11-13-009	Kinnear, D. & Sandra	12-10-019-02-5	Unnamed Aquifer	8260	130.92	Well	Agricultural
30769	1984-11-28-003	FORT MACLEOD-HIGHWOOD AUCTION	13-32-019-28-4	Unnamed Aquifer	4930	52.37	Well	Agricultural
30769	1984-11-28-004	FORT MACLEOD-HIGHWOOD AUCTION	14-32-019-28-4	Unnamed Aquifer	0	26.18	Well	Agricultural
31376	1993-11-15-002	MEDICINE TREE LAND & CATTLE CO. LTD.	04-21-018-01-5	Unnamed Aquifer	6780	65.46	Well	Agricultural
31376	1993-11-15-003	MEDICINE TREE LAND & CATTLE CO. LTD.	06-21-018-01-5	Unnamed Aquifer	11720	78.55	Well	Agricultural
31376	1993-11-15-004	MEDICINE TREE LAND & CATTLE CO. LTD.	04-21-018-01-5	Unnamed Aquifer	11100	78.55	Well	Agricultural
31376	1993-11-15-005	MEDICINE TREE LAND & CATTLE CO. LTD.	01-20-018-01-5	Unnamed Aquifer	3700	45.82	Well	Agricultural
31376	1993-11-15-006	MEDICINE TREE LAND & CATTLE CO. LTD.	01-20-018-01-5	Unnamed Aquifer	0	45.82	Well	Agricultural
31708	1968-09-30-002	TONGUE CREEK FEEDERS LTD.	01-16-019-01-5	Unnamed Aquifer	8630	65.46	Well	Agricultural
31708	1979-06-19-003	TONGUE CREEK FEEDERS LTD.	01-16-019-01-5	Unnamed Aquifer	9870	6.55	Well	Agricultural
31708	1979-06-19-004	TONGUE CREEK FEEDERS LTD.	02-16-019-01-5	Unnamed Aquifer	16040	65.46	Well	Agricultural
31708	1979-06-19-007	TONGUE CREEK FEEDERS LTD.	02-16-019-01-5	Unnamed Aquifer	8630	32.73	Well	Agricultural
31708	1979-06-19-008	TONGUE CREEK FEEDERS LTD.	01-16-019-01-5	Unnamed Aquifer	17270	78.55	Well	Agricultural

Appendix 3B

Well-Diversions-Licences

APPROVAL ID	PRIORITY ¹	LICENSEE	POINT OF DIVERSION ²	SOURCE ³	VOLUME ⁴	DIVERSION RATE ⁵	TYPE	PURPOSE ⁵
31709	1979-06-19-005	TONGUE CREEK FEEDERS LTD.	08-09-019-01-5	Unnamed Aquifer	7400	0.65	Well	Agricultural
32022	1978-07-10-001	Earl, William & Elsie	03-13-018-01-5	Unnamed Aquifer	1230	0.65	Well	Agricultural
32465	1964-12-31-002	WEBB VALLEY STOCK FARM LTD	01-17-019-29-4	Unnamed Aquifer	18500	130.8	Well	Agricultural
34352	1986-11-12-001	ALBERTINA FARMING LTD.	04-13-021-28-4	Unnamed Aquifer	6170	32.73	Well	Agricultural
49122	1997-11-20-004	BIG FIRE RANCH LTD.	NW-26-016-02-5	Unnamed Aquifer	12217		Well	Agricultural
68298	1998-04-17-006	TONGUE CREEK FEEDERS LTD.	SE-09-019-01-5	Unnamed Aquifer	179091		Well	Agricultural
69788	1998-07-22-001	ROSEBURN RANCHES LTD	07-22-019-01-5	Unnamed Aquifer	59725.6	163.6	Well	Agricultural
225854	2005-11-16-001	STONEY TRAIL HOLDINGS LTD	NE-19-018-03-5	Unnamed Aquifer	307		Well	Agricultural
310364	1997-12-16-013	BLADES, ERNEST	SW-30-016-02-5	Unnamed Aquifer	1234	32.727	Well	Agricultural
28480	1988-06-10-001	CARGILL MEAT SOLUTIONS	NW-06-019-28-4	Highwood River	1180909	0.65	Well	Commercial
28636	1988-02-15-001	SADDLEBROOK INDUSTRIAL PARK LTD.	NW-31-019-28-4	Unnamed Aquifer	14800	0.65	Well	Commercial
29115	1986-11-12-002	ALBERTINA FARMING LTD.	13-12-021-28-4	Unnamed Aquifer	2470	32.73	Well	Commercial
209918	2004-06-28-002	ELDRIDGE, JOE	NE-11-019-29-4	Unnamed Aquifer	110.9		Well	Commercial
211371	2004-06-28-003	D.S. WHITFORD TRUCK SYSTEMS LTD.	NE-11-019-29-4	Unnamed Aquifer	65.5		Well	Commercial
248036	2008-04-25-002	NLC EQUIPMENT & REAL ESTATE INC.	SE-25-019-29-4	Unnamed Aquifer	400	95	Well	Commercial
211572	2004-06-28-002	ELDRIDGE, JOE	NE-11-019-29-4	Unnamed Aquifer	65.5	4.6	Well	Commercial
28125	1990-01-31-003	MUNICIPAL DISTRICT OF FOOTHILLS NO. 31	SW-06-019-28-4	Unnamed Aquifer	119650	327.31	Well	Municipal
31154	1982-12-10-001	VILLAGE OF LONGVIEW	15-17-018-02-5	Unnamed Aquifer	98680	733.19	Well	Municipal
33364	1977-01-21-001	ESTATES 552 CO-OPERATIVE LTD.	NE-20-021-28-4	Unnamed Aquifer	7400	52.32	Well	Municipal
45675	1984-02-13-002	TOWN OF HIGH RIVER	11-06-019-28-4	Unnamed Aquifer	1386614	3600.5	Well	Municipal
45675	1984-02-13-003	TOWN OF HIGH RIVER	11-06-019-28-4	Unnamed Aquifer	247930	3600.5	Well	Municipal
45675	1984-02-13-004	TOWN OF HIGH RIVER	12-06-019-28-4	Unnamed Aquifer	247930	3600.5	Well	Municipal
45676	1972-07-07-001	TOWN OF HIGH RIVER	12-06-019-28-4	Unnamed Aquifer	237816	3600	Well	Municipal
45676	1977-03-02-002	TOWN OF HIGH RIVER	SW-06-019-28-4	Unnamed Aquifer	3944	2421.8	Well	Municipal
152546	2002-05-15-004	NATURE'S HIDEAWAY CAMPGROUND LTD.	SW-26-021-28-4	Unnamed Aquifer	3600	38.2	Well	Municipal
45674	1995-01-27-012	TOWN OF HIGH RIVER	SW-01-019-29-4	Unnamed Aquifer	0	3756.5	Well	Municipal
45674	1995-01-27-012	TOWN OF HIGH RIVER	SW-01-019-29-4	Unnamed Aquifer	0	4123.6	Well	Municipal
45674	1995-01-27-012	TOWN OF HIGH RIVER	SW-01-019-29-4	Unnamed Aquifer	0	2978.2	Well	Municipal
45675	1984-02-13-004	TOWN OF HIGH RIVER	SW-01-019-29-4	Unnamed Aquifer	0	3756.5	Well	Municipal
45675	1984-02-13-004	TOWN OF HIGH RIVER	SW-01-019-29-4	Unnamed Aquifer	0	4123.6	Well	Municipal
45675	1984-02-13-004	TOWN OF HIGH RIVER	SW-01-019-29-4	Unnamed Aquifer	0	2978.2	Well	Municipal
45676	1978-03-15-003	TOWN OF HIGH RIVER	SW-01-019-29-4	Unnamed Aquifer	0	3756.5	Well	Municipal
45676	1978-03-15-003	TOWN OF HIGH RIVER	SW-01-019-29-4	Unnamed Aquifer	0	4123.6	Well	Municipal
45676	1978-03-15-003	TOWN OF HIGH RIVER	SW-01-019-29-4	Unnamed Aquifer	0	2978.2	Well	Municipal
23906	1995-11-08-001	ALBERTA TOURISM, PARKS AND RECREATION	02-29-016-05-5	Unnamed Aquifer	1230	0.65	Well	Recreation

NOTES:

- (1) Priority - first in time first in right, based on the date of a complete application (YYYY-MM-DD-00X); e.g. 1958-11-03-001 = 1958(year), 11(month), 03(day), 001(database generated)
- (2) Point of Diversion - the legal land location of the works; e.g. 12 or NE 08-007-06-4 = 12 or NE (legal subdivision and/or quarter section), 08 (section), 007(township), 06(range), 4(meridian)
- (3) Source - Refer to the licence document for the approved source
- (4) Volume - maximum annual quantity that may be diverted; units are in cubic metres
- (5) Diversion Rate - maximum instantaneous diversion rate; units for surface water diversion rate are cubic metres/second; units for an aquifer diversion rate are cubic metres/day
- (6) Purpose - purposes are grouped into a classification system within a database. Refer to the licence document for approved purpose

Disclaimer

Appendix 3B

Well-Diversions-Licences

APPROVAL ID	PRIORITY ¹	LICENSEE	POINT OF DIVERSION ²	SOURCE ³	VOLUME ⁴	DIVERSION RATE ⁵	TYPE	PURPOSE ⁵
Licence Information								
<div>The water allocation licence information provided on this website is for the convenience of individuals researching the potential of arranging a water allocation transfer, or for other purposes.</div> <div>Alberta Environment endeavors to provide accurate information, but does not guarantee any part of the site is accurate or up-to-date. The information provided on the website should not be relied upon, and all data should be verified by examining the original paper documents in an Alberta Environment office prior to making any decisions or commitments. Water allocation licences are public information.</div> <div>Alberta Environment does not accept responsibility for any damages that may result from eliance on any information found on this website.</div>								



Advisian

WorleyParsons Group



amec
foster
wheeler

Appendix B

Review of Flood Issues on Pekisko Creek and Stimson Creek

Memo

To: Hugh Pettigrew
Company: MD of Foothills No. 31
From: Amec Foster Wheeler
Date: 10 July 2015
CC: Joal Borggard
Ref: CW2167.03
Re: Desktop Review of Pekisko and Stimson Creeks Flood and Geomorphic Issues

1.0 INTRODUCTION

The study contained herein is a component of the 'Scoping Study of Flood Related Areas of Concern on the Highwood River and Little Bow River within the Municipal District of Foothills'.

Pekisko Creek and Stimson Creek are significant tributaries to the Highwood River. An understanding of flood issues on these streams is important for the following reasons: (1) a significant length of these streams drains through land that is owned by MD residents and is subject to flood and erosion; and (2) the flow, sediment and debris conveyed by these streams has an important bearing on the hydrology and morphology of the Highwood River, downstream of their respective confluences.

This report summarizes the information gathered and identifies future data requirements and studies.

1.1 Review of Existing Information

The following information was reviewed:

- ▶ Previous reports, flood discharge data from streamflow monitoring stations;
- ▶ Coarse level topographic information in order to plot a profile (elevation versus distance) of the basin;
- ▶ Field photographs available from other studies in the project area;
- ▶ Historic air photo imagery; and

Amec Foster Wheeler Environment & Infrastructure
a Division of Amec Foster Wheeler Americas Limited
140 Quarry Park Blvd. SE
Calgary, Alberta T2C 3G3
Tel +1 403 248 4331
Fax +1 403 248 2188
amecfw.com

- Discussions with MD personnel on known flood issues affecting residents or MD infrastructure.

2.0 GENERAL WATERSHED CHARACTERISTICS

Pekisko Creek and Stimson Creek are significant tributaries to the Highwood River. The headwaters for both streams are located southwest of the MD of Foothills No. 31 (the MD). However, a large proportion of the watersheds are contained within the MD boundaries.

The majority of the MD's southwest area is located in the Pekisko and Stimson Creek watersheds (Figures 1 and 2). The Pekisko Creek confluence with the Highwood River is approximately 12 km downstream of Longview. Stimson Creek drains into Pekisko Creek approximately 3.7 km upstream of the confluence with the Highwood River. The Pekisko Creek confluence with the Highwood River is located 9 km southeast of Longview. Pekisko Creek is the last significant tributary to the Highwood River, upstream of the Town of High River. Table 1 below contains a summary of watershed areas. On a drainage area basis, Pekisko Creek at the confluence with The Highwood River represents about 28.6% of the entire watershed.

2.1 Summary of Watershed Areas

Location	Drainage Area (km ²)	Proportion of Highwood River Watershed Downstream of Pekisko Creek Confluence
Stimson Creek at Confluence with Pekisko Creek	249	13.5%
Pekisko Creek Above Confluence with Stimson Creek	244	13.3%
Pekisko Creek at Confluence with Highwood River	526	28.6%
Highwood River Upstream of Pekisko Creek Confluence	1315	71.4%
Highwood River Downstream of Pekisko Creek Confluence	1841	100.0%

The Pekisko Creek headwaters are located between the Highwood and Livingston Ranges of the Rocky Mountains approximately 10.5 km upstream of the MD boundary. Within the MD, Pekisko Creek drains northeast for 36 km to the Stimson Creek confluence and another 3.7 km to its confluence with the Highwood River. The watershed elevation ranges from approximately 1857 m to 1132 m. **Figure 3** shows the longitudinal channel profile.

The Stimson Creek headwaters are located between the Highwood and Livingston Ranges of the Rocky Mountains approximately 11 km upstream of the MD boundary. Within the MD, Stimson Creek drains northwards 26 km to the Pekisko Creek confluence. The watershed elevation ranges from 1419 km to 1132 km as shown in **Figure 3**.

A portion of the Chain Lakes Reservoir is located within the Stimson Creek watershed. The reservoir intercepts Meinsinger Creek, which is a tributary to Stimson Creek. The primary purpose of the Chain Lakes Reservoir is storage for the adjoining Willow Creek watershed and the majority of storage is from Willow Creek and not Stimson Creek. The low level flow outlet

from the Chain Lakes Reservoir North Dam drains into Meinsinger Creek, which flows north approximately 8 km to its confluence with Stimson Creek. The outlet is controlled by an auxiliary gate that maintains constant year round flows that support the riparian environment of Meinsinger Creek and further downstream on Stimson Creek. The Chain Lakes reservoir is primarily controlled through the South Dam which drains into Willow Creek. In flood conditions, excess flow passes through the spillway and emergency spillway at the South Dam, leaving the outfall at the North Dam largely unaffected. The following summary of recent floods and improvements to the structures is based on discussions with Amec Foster Wheeler engineers (Ken Kress and Steve Vaivada) who were involved in the design and construction of recent upgrades.

During the flood of 2005, there was a risk of the South Dam overtopping due to volume of floodwaters draining into the reservoir. The North Dam was at less risk of failure as the crest of the North Dam was built higher than the crest of the South Dam (the South Dam would fail first, reducing the water levels at the North Dam). Improvements to both the North and South Dams were undertaken as a result of the 2005 flooding and the near failure of the South Dam. These improvements included additional spillway capacity at the South Dam and raising the North Dam. The North Dam Improvements Project, which was constructed between November 2011 and July 2012, raised the crest of the North Dam to 1301.6 m. The increased spillway capacity at the South Dam reduces the risk of damage to the dam structures.

During the flood of 2013, the reservoir elevation again came close to overtopping the South Dam. At this time, the North Dam Improvements project was already completed, resulting in more freeboard compared to previous flood events. The South Dam Improvements Project, which started construction in September 2013 and is currently ongoing, will result in the crest of the South Dam being raised to 1301.3 m. Other improvements to the South Dam include the infill of the emergency spillway on the north side of the South Dam and the construction of a new spillway designed to handle much larger flow volumes. In flood conditions, the reservoir is designed to fail at the South Dam as a result of the Improvements Project.

Within the Pekisko and Stimson Creek watersheds, there are at least three push-up dams on tributaries that are visible in recent aerial imagery. A push-up dam is a water diversion structure reconstructed from river gravel and cobbles each spring. Using heavy machinery, river rock is "pushed-up" to raise the river level enough to divert irrigation water into a ditch. There are two on Stimson Creek and one on Pekisko Creek with legal land locations of NE 23-17-2 W5M, NW 11-17-2 W5M, and NW 17-17-2 W5M. Further information should be acquired for these and any other push-up dams within the Pekisko and Stimson watersheds to evaluate impacts resulting from a failure.

Several large scale reservoir studies have also been conducted for Pekisko and Stimson Creeks. One potential site was identified on Pekisko Creek and two were identified on Stimson Creek (AECOM-G 2014). None of the potential sites are preferential due to unreliable water supplies and no further action has occurred other than initial identification and preliminary design.

2.2 Sub-Watershed Delineation

The sub-watershed delineation contained below is based on the channel profile shown on Figure 3.

2.2.1 Lower Watershed

The 10 km of both creeks upstream of the Highwood confluence have similar characteristics. Both creeks have large radius meander bends and a similar channel gradient of 0.005 m/m. The Lower Watershed Drainage Areas are similar for the two creeks.

2.2.2 Middle Watershed

The Pekisko Creek middle watershed includes approximately 32 km of creek from the 10 km station to the 42 km station. This section of creek is a steeper gradient section than the lower watershed, with an average slope of approximately 0.01 m/m. The channel is relatively unconfined and quite mobile and has higher velocities due to the steeper channel gradient.

The Stimson Creek middle watershed's mainstem channel length includes approximately 16 km of creek between the 10 km and 26 km stations. This section also includes the Stimson Creek connection to Chain Lakes. This section of creek is very similar to the lower watershed as it also has a 0.005 m/m gradient. This section is slower moving than the middle watershed section of Pekisko Creek and as a result has a significantly less mobile channel with stable meanders that are partially confined by the valley wall.

2.2.3 Upper Watershed

Pekisko Creek in the upper watershed is a fast moving mountainous stream with a length of approximately 8.5 km. The headwaters are located between the Highwood and Livingston Ranges of the Rocky Mountains. The upper watershed is located in the Kananaskis Improvement District and includes the section of channel that extends from the source at the 50.5 km station up to the 42 km station. This section of creek has an average gradient of 0.035 m/m. The high topographic relief results in a well-developed drainage pattern with the channel confined to gullies and valleys. The Pekisko Creek upper watershed's elevation ranges from 1857 m to 1551 m.

The Stimson Creek headwaters extend to 1,419 m, which is significantly lower than the Pekisko Creek watershed. The mainstem channel length is approximately 10.5 km in the upper watershed, and extends from the source at the 36.7 km station to the 26 km station. The upper watershed is located within the Kananaskis Improvement District. The headwaters are located in between the Highwood and Livingston Ranges of the Rocky Mountains. The channel has a relatively steep gradient of 0.015 m/m. As a result this section of creek is significantly different than the rest of Stimson Creek with a more mobile channel rather than the stable meanders in the middle and lower watersheds.

2.3 Land Use

The middle and lower Pekisko and Stimson Creek watersheds that are located in the MD have a long history of ranching, as described in the Pekisko Valley Study (SALT 2011). Ranching continues to dominate the area, primarily through privately owned ranches, but also through Crown Land grazing leases. Figure 2 shows the property boundaries and ownership for this area. On Stimson Creek, all but the 1.5 km downstream of the southern MD border is privately owned land. On Pekisko Creek, approximately 18 km downstream from the MD border is crown owned grazing leased land. The remaining downstream length of Pekisko Creek is privately owned land. The approximate percentage breakdown for grazing leased land within the MD is 35% on Pekisko, 5% on Stimson, and 22.5% for both creeks together. The remaining percentage of land is privately owned.

3.0 HYDROLOGY

Hydrometric station 05BL023 Pekisko Creek near Longview is located 6.5 km southeast of Longview, just south of the 626 Ave and 144 St intersection. The station has a gross drainage area of 231.9 km² which covers the majority of the entire watershed upstream of the confluence with Stimson creek. The station is active with data extending back to 1967.

Hydrometric station 05BL007 Stimson Creek near Pekisko is located approximately 6 km southeast of station 05BL023 Pekisko Creek near Longview. The station is just north of HWY- 540 approximately 4.5 km east of the intersection with HWY- 22. The Stimson Creek station has a gross drainage area of 236 km² and has been active since 1911. However, no data was recorded between 1919 and 1938.

Hydrological data compiled from the above noted hydrometric stations is summarized in **Figures 4 and 5** (EnvCan 2015 & AECOM-B 2014). **Figure 6** contains a peak flow comparison of Pekisko Creek and Stimson Creek with 05BL019 Highwood River at Diebel's Ranch and Hogg Park. Diebel's Ranch is located on the Highwood River upstream of the Pekisko Creek confluence. The tributaries draining into the Highwood River between this station and the Pekisko confluence are minor therefore the flows recorded at this station represent the Highwood River flows upstream of Pekisko Creek. Hogg Park is located approximately 4.5 km downstream of the Highwood/Pekisko confluence on the Highwood River. Hence, Highwood River at Hogg Park flows include Pekisko and Stimson flows. Some general observations based on the hydrometric data are listed below:

- ▶ Pekisko & Stimson watersheds are of similar size, although Pekisko is somewhat larger and its headwaters are at a higher elevation;
- ▶ Pekisko peak flow discharges relative to Stimson are generally similar. Most years, the difference in flow between the two stations is minor. However, the differences in peak discharge can be significant in some years. During the 2013 flood, Stimson Creek saw a peak discharge of 227 m³/s which was much higher than the Pekisko discharge of 147 m³/s, however in 1976 the opposite was the case; and
- ▶ Peak flow discharges for Pekisko Creek at confluence with Highwood River can be estimated by adding the Pekisko and Stimson peak flow discharges that are recorded at the respective streamflow monitoring stations. The total Pekisko Creek peak discharge is

generally 50% of the Highwood River at Diebel's Ranch (i.e. Pekisko contributes approximately one third of the peak Highwood River discharge at Hogg Park). There are several years in which this is not the case, and the total Pekisko Creek discharge is higher than the Highwood River at Diebel's Ranch (2005 & 2011).

During the 2013 flood, both Pekisko Creek and Stimson Creek saw significant discharges, as noted above. As seen in Figures 4 and 5, the discharge for both creeks was the highest on record. In the comparison of Figure 6, the discharge for Pekisko and Stimson in 2013 was greater than the entire discharge of the Highwood River at Hogg Park in several previous years. In 2013, the combined discharge for Pekisko and Stimson was approximately 400 m³/s. The 2013 Highwood River at Hogg Park peak discharge of just over 1800 m³/s (AECOM-B 2014). That is the Pekisko and Stimson watersheds contributed approximately 25% of the peak discharge (assuming the peaks for the Upper Highwood, Pekisko and Stimson are relatively coincident). In the large flood of 1995, the proportion of the peak flow from the two creeks was approximately 20%. 2005 was the third largest recorded flood event and the proportion of the peak Highwood River at Hogg Park discharge represented by Pekisko and Stimson Creeks was closer to 40%.

4.0 COMPARATIVE AIR PHOTO REVIEW

The review of historic watershed and channel conditions was based on a comparison of air photos from 1948, 2012, and 2014. **Figures 7 and 8** provide some of this imagery. In all cases, the air photos did not cover the full extents of Pekisko and Stimson mainstem channels, but all three years did cover most of the extents of the channels within the MD. The 1948 imagery is from the National Airphoto Library and is at a scale of 14,000. Due to scale and lack of colour, the interpretation of channel changes is limited in comparison to 2012 and 2014 imagery. The 2012 imagery is from the MD and the 2014 imagery is from Google Earth. Both are high quality images that offer the ability to view the channel in detail.

The Stimson Creek 1948 aerial imagery included everything from the confluence with Pekisko Creek to approximately 5 km north (downstream) of the MD border. The 2012 imagery included the channel extents within the MD and the 2014 imagery covered the entire creek except for the downstream most 14 km.

In general, there hasn't been any major change in channel changes along Stimson Creek. In the areas that a 2012 and 2014 comparison could be made, there was very little change in channel location. Comparison between the 1948 and 2012/14 imagery shows some differences in channel location. Most of these differences included slight erosion on the outside of meander bends, and a few meander bend cutoffs. The most noticeable difference was a meander bend cutoff just east of the HWY- 22 crossing.

1948 imagery for Pekisko Creek covered the majority of channel within the MD. The portions missing included approximately 6 km just upstream of the Stimson confluence and 6.5 km downstream of the MD boundary. The 2012 imagery covers the entire mainstem channel within the MD and the 2014 imagery covers the entire mainstem channel within the MD with the exception of the 9.5 km section upstream of the Highwood River confluence and a 3 km section downstream of the MD boundary.

As described below, Pekisko Creek is a highly mobile stream channel, based on the historical aerial images.

- ▶ The only portion of the stream channel that didn't change markedly was the reach downstream of the Stimson Creek confluence up to the Highwood River confluence.
- ▶ Significant channel movement has occurred within a treed floodplain area upstream of the Stimson confluence. There are several sections of channel that shift between 1948 and 2012 and again between 2012 and 2014. There are several sections of creek where new channels have formed which have cut off the old channel from flowing.
- ▶ The most active reach of creek can be seen in the 9 km upstream of the HWY-22 crossing that includes the Bar U Ranch.
- ▶ In some cases, Pekisko Creek channel changes due to the 2013 flood were of a greater scale than those seen between 1948 and 2012. An example of this can be found in the NE 24-16-4-W5, where the channel shows some movement between 1948 and 2012 but completely changes path between 2012 and 2014.

5.0 ISSUES IDENTIFIED BY MD AND OTHER INFORMATION

- ▶ Post 2013 Flood MD Site Assessment (MD 2014) – Sonnet Residence – NW 25- 17- 2- W5 (further information required).
- ▶ Post 2013 Flood Bridge Damages (MD 2014):
 - Pekisko Creek:
 - BF 01126 – 642 Ave W – damages have been repaired
 - BF 75732 – 160 St W – destroyed bridge has been removed
 - BF 01970 – 2698 Dr W – damages have been repaired
 - Stimson Creek:
 - BF 01308 – HWY-540 – damages have been repaired (Post Flood Inspection)
 - BF 77700 – 786 Ave W – damages have been repaired
 - BF 73389 – HWY-22 – damages reported (Post Flood Inspection)
- ▶ Post 2013 Flood Road Damages (MD 2014) – 2698 Dr W from the Bar-U Ranch to 200 St. W (includes the crossing of Pekisko Creek) – Road washed out and ditches full of silt.
- ▶ Eleven Riparian Health Assessments (SALT 2011) were completed for the Hanen Property on Pekisko Creek (27, 28, & 34-16-3-W5). Each site included riparian area for approximately 250 m of streambank. Nine of the 11 sites (82%) scored higher than 80% and were deemed “Healthy”. The remaining two sites scored 78% and were categorized as “Healthy but with Problems”. Categories that in general saw lower scores were in vegetative cover, browse utilization, and streambank root mass protection. See pages 143 to 150 and Appendices D and E from the Southern Alberta Land Trust Pekisko Valley Study (SALT 2011) for more detail.

- Issues associated with Ranching (primary use of land) – cattle grazing and watering has significant impacts on riparian vegetation and bank integrity. Grazing prevents naturally occurring plants from growing and other vegetation from reaching full growth potentials. As a result, bank integrity is compromised due to the lack of supporting root structure. Both riparian vegetation and bank integrity are also impacted by the movement of cattle over the land which also reduces riparian vegetation growth ability.

5.1 Aquatic Resources

- Pekisko Creek has historically been identified as a valuable fish stream (SALT 2011 pg. 84-91); and
- Pekisko Creek is a Class C stream that has moderately sensitive fish habitat areas. It also supports sport fishing with confirmation of all life stages of Bull (Salvelinus Confluentus), Cutthroat (Oncorhynchus Clarki), Rainbow Trout (O. Mykiss), and Mountain Whitefish (Prosopium Williamsoni). (AMEC 2001).

5.2 Chain Lakes North Dam

As previously discussed, the north portion of the Chain Lakes Reservoir is located within the Stimson Creek watershed. Therefore it is important to understand the impacts of a potential failure of the North Dam. In 2003, Northwest Hydraulic Consultants (NHC) modeled and reviewed various North Dam failure scenarios. The following is an excerpt from the final report (NHC 2013) submitted by NHC summarizing the worst case scenario.

An overtopping failure during the Probable Maximum Flood (PMF) is estimated to result in a peak discharge immediately below the dam of 2100 m³/s. Impacted in the first 36 km below the dam (the reach subject to detailed analysis) would be four permanent residences, two summer cabins, farm buildings, several bridges and farmland in the creek valley. The leading edge of the flood wave would arrive at the first of the impacted residences in 2.7 to 3.0 hours after the initiation of the dam failure and peak in another 1.0 hours. Due to large tributary inflows and little floodplain storage, the flood wave does not attenuate as it moves downstream but rather increases in magnitude such that by the time the flood wave reaches a point just upstream from the Highwood River, the peak flow has increased to 2800 m³/s.

An approximate analysis extends the work some 15 km down the Highwood River to a point about 8 km above the Town of High River. The flood wave reaches this point from 4.4 to 4.9 hours after initiation of dam failure, reaching a peak flow of about 3000 m³/s some 6.3 hours after initiation of dam failure. A flow of this magnitude would result in significant breakout of flows from the Highwood River and cause severe flooding in and around the Town of High River.

NHC also recommended the creation of an Emergency Preparedness Plan (EPP) due to the severity of these impacts. The other failure scenario that NHC looked into was a piping dam failure, this would result in peak flows equivalent to a 50 year return period flood at High River (NHC 2003).

6.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions are based on the desktop review contained herein:

- ▶ Pekisko Creek and Stimson Creek are similar sized watersheds and are significant tributaries to the Highwood River. On a drainage area basis, both streams combined represent about 28.6% of the Highwood River watershed (measured at the confluence with Pekisko Creek);
- ▶ The headwaters of both streams are located in Rocky Mountains between the Highwood and Livingstone Ranges. Compared to Stimson Creek, the Pekisko Creek mainstem channel length is 14 km longer and headwater elevation is approximately 450 m higher;
- ▶ Pekisko Creek is a very mobile creek in the upper and middle portions of the watershed, whereas Stimson Creek in comparison is relatively stable. The majority of both watersheds are located within the MD of Foothills and the primary land use is ranching, that is either located on deeded or crown leased land. The infrastructure located in proximity to the stream channels is relatively restricted and consists of road and pipeline crossings and the North Chain Lakes Dam. This in-part explains the relatively few 2013 flood issues documented in these watersheds. Following the 2013 flood, there was only one residence that was assessed for flood damages and 6 bridges that were damaged. Other infrastructure found along the creeks includes three or more push-up dams; and
- ▶ Three potential reservoirs have been identified between the two creeks, but no further action has occurred.

The following recommendations are based on this study.

- ▶ No issues or data gaps were identified on Peksiko and Stimson Creeks that would have a significant impact on the Highwood River downstream of the confluence with Pekisko Creek; and
- ▶ There are several push-up dams located within the Pekisko and Stimson watersheds. The performance of these structures during the 2013 flood is uncertain. However, it appears there were no significant issues related to push-up dams resulting from the 2013 flood. There may be some merit to further evaluate these structures to determine impacts resulting from a failure.

Yours truly,

**Amec Foster Wheeler Environment & Infrastructure
a Division of Amec Foster Wheeler Americas Limited**

Reviewed by:

Greg Courtice, MSc., E.I.T.
Water Resources Engineer
Direct Tel.: (403) 387-1620
E-mail: gregory.courtice@amecfw.com

Liv Hundal, M.Eng., P.Eng.
Senior Associate Engineer
Direct Tel.: (403) 387-1669
E-mail: liv.hundal@amecfw.com

Scott Wagner, E.I.T.
Water Resources Engineer
Direct Tel.: (403) 387-1765
E-mail: scott.wagner@amecfw.com

SW/GC/LSH/bm

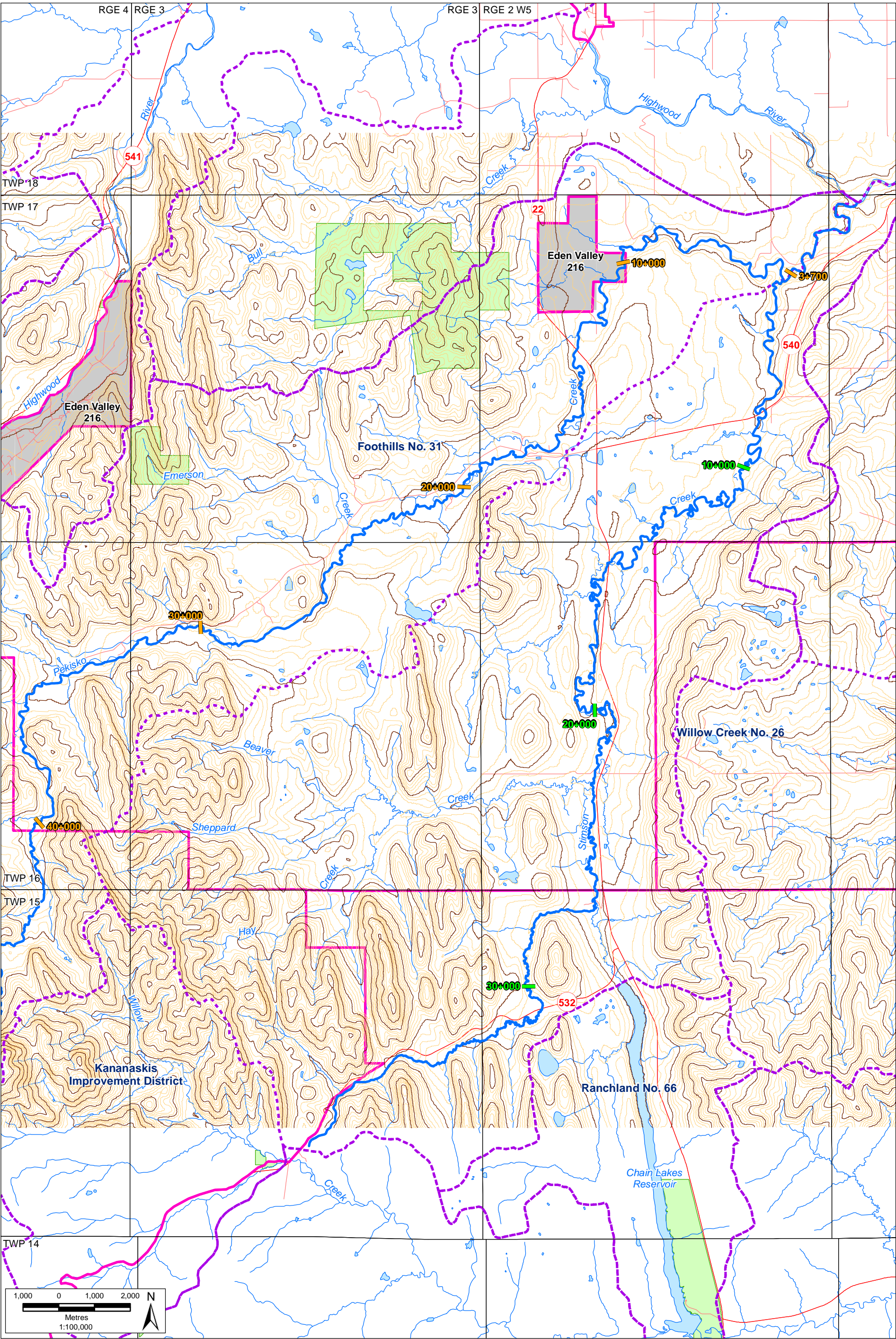
Attach.

Permit to Practice No. P-4546

7.0 REFERENCES

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- Southern Alberta Land Trust, 2011. Pekisko Valley Study. October 2011. Downloaded from http://www.salts-landtrust.org/docs/research/pekisko_valley_study_final.pdf (SALT 2011)

Figures



- Legend**
- Municipal District / Improvement District

Indian Reserve

Park or Protected Area

Watershed Boundary

10 Contour Interval

50m Contour Interval

Pekisko and Stimson Creek

Pekisko Creek Channel Distance in km Upstream of Highwood River Confluence

Stimson Creek Channel Distance in km Upstream of Highwood River Confluence
- Stations Along Pekisko
and Stimson Creeks
- MD of Foothills No. 31
Scoping Study
- Figure 1**

DATE:
July 2015

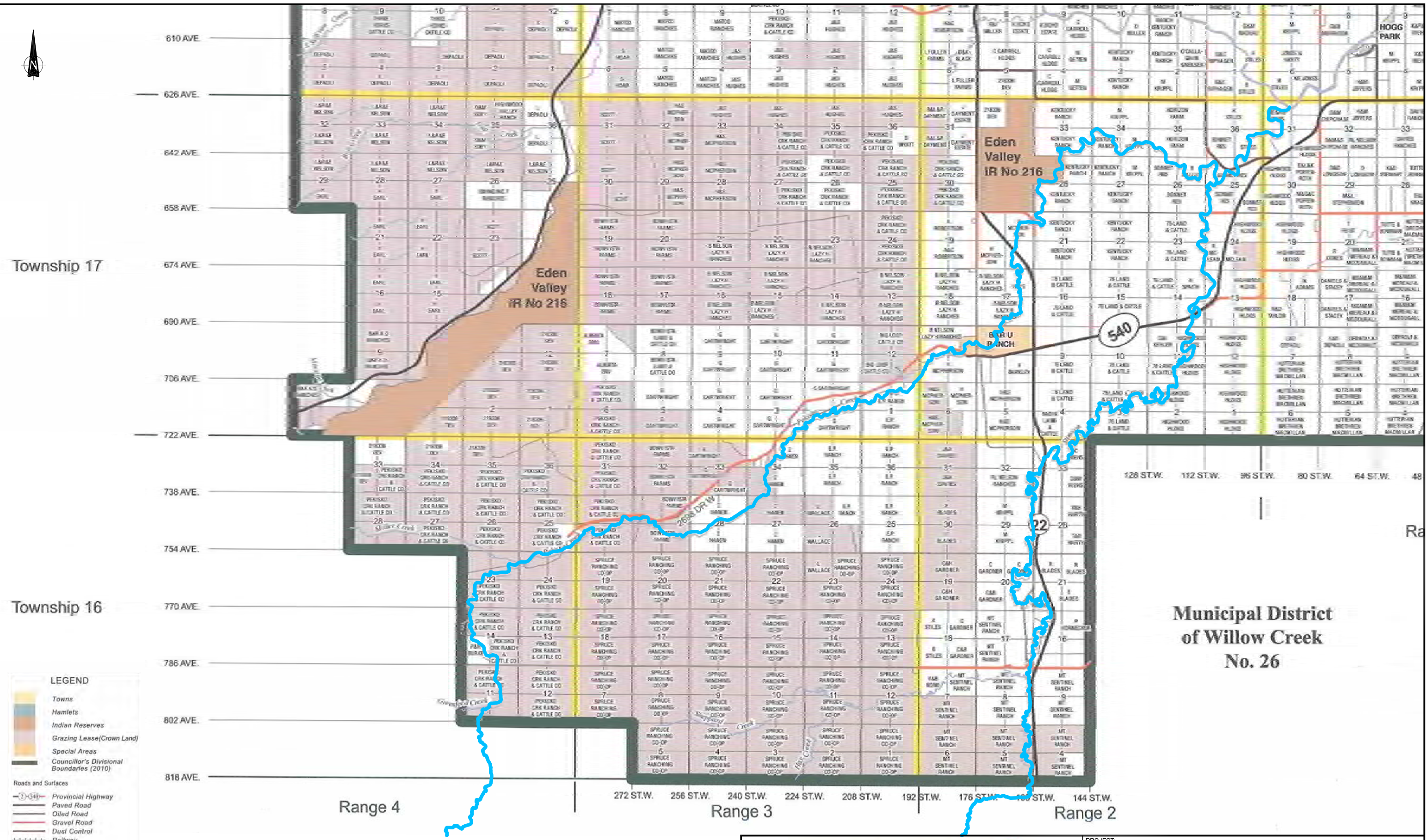
PROJECT:
CW216703

Pekisko and Stimson Creek Stations

15-07-08
-
- Projection: 10TM Zone NAD83
Source: GeoBase®, Spatial Data Warehouse Ltd.,

PLOT 11-B (U)

INCUV2167-2167-N05.dwg - FIGURE 2 - Jul. 06, 2015 4:38pm - corey.ferrets



PROJECT: FOOTHILLS SCOPING STUDY	
TITLE: PROPERTY BOUNDARIES AND OWNERSHIP	
CLIENT: MD OF FOOTHILLS NO. 31	
DATE: JULY 2015	JOB No.: CW216703
CAD FILE: 2167-N05.dwg	FIGURE No.: 2
REV. A	

Figure 3:

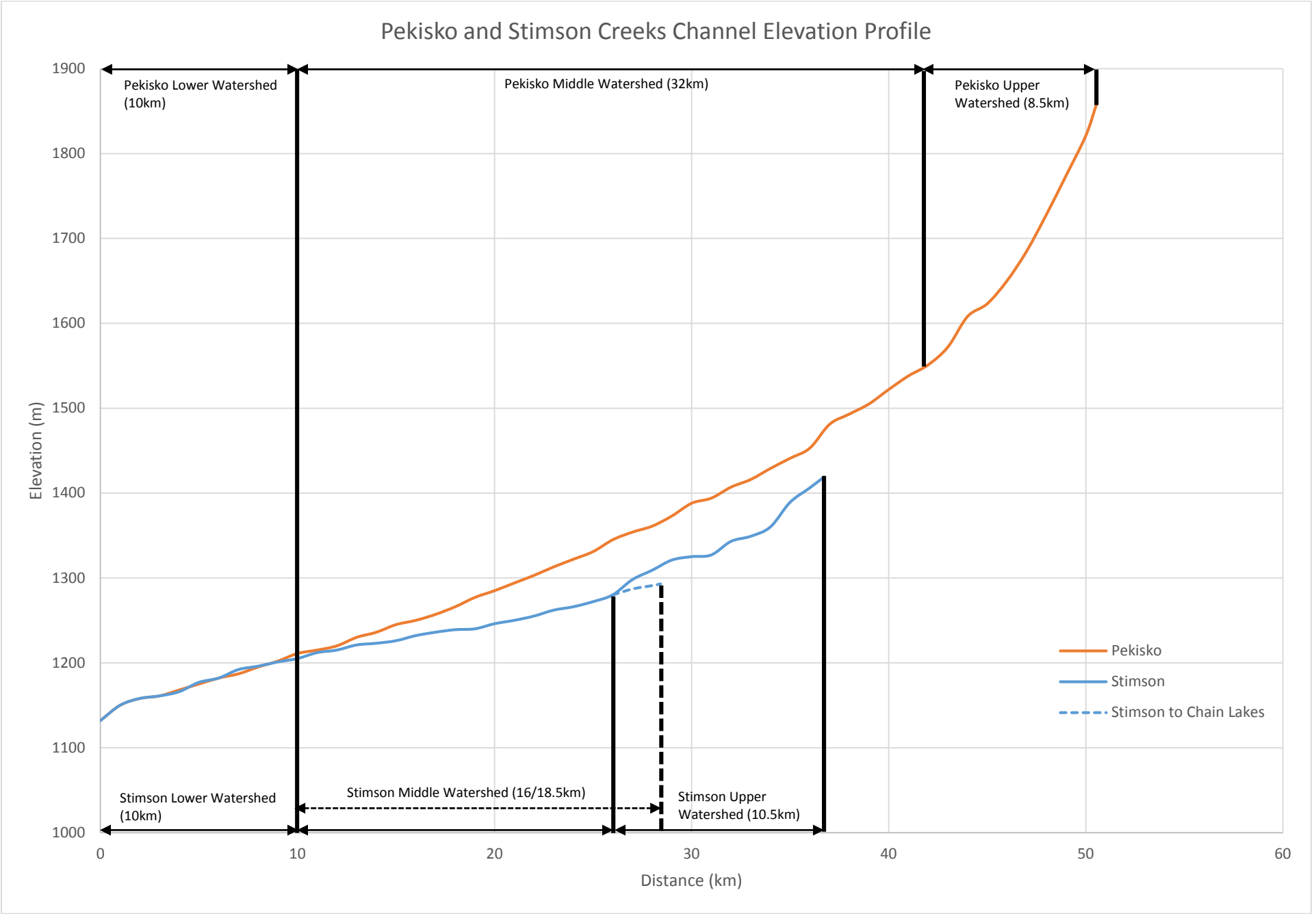


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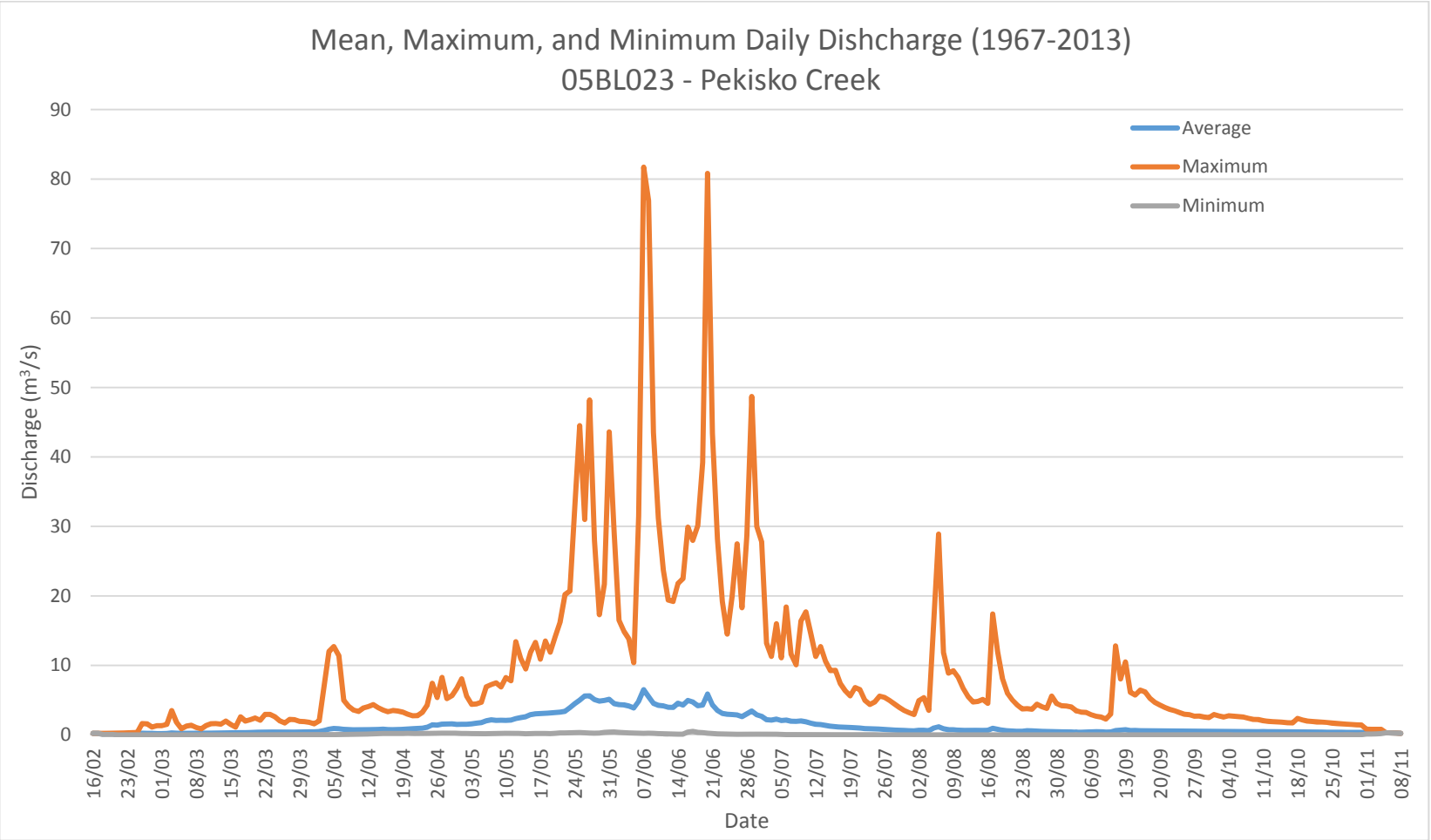
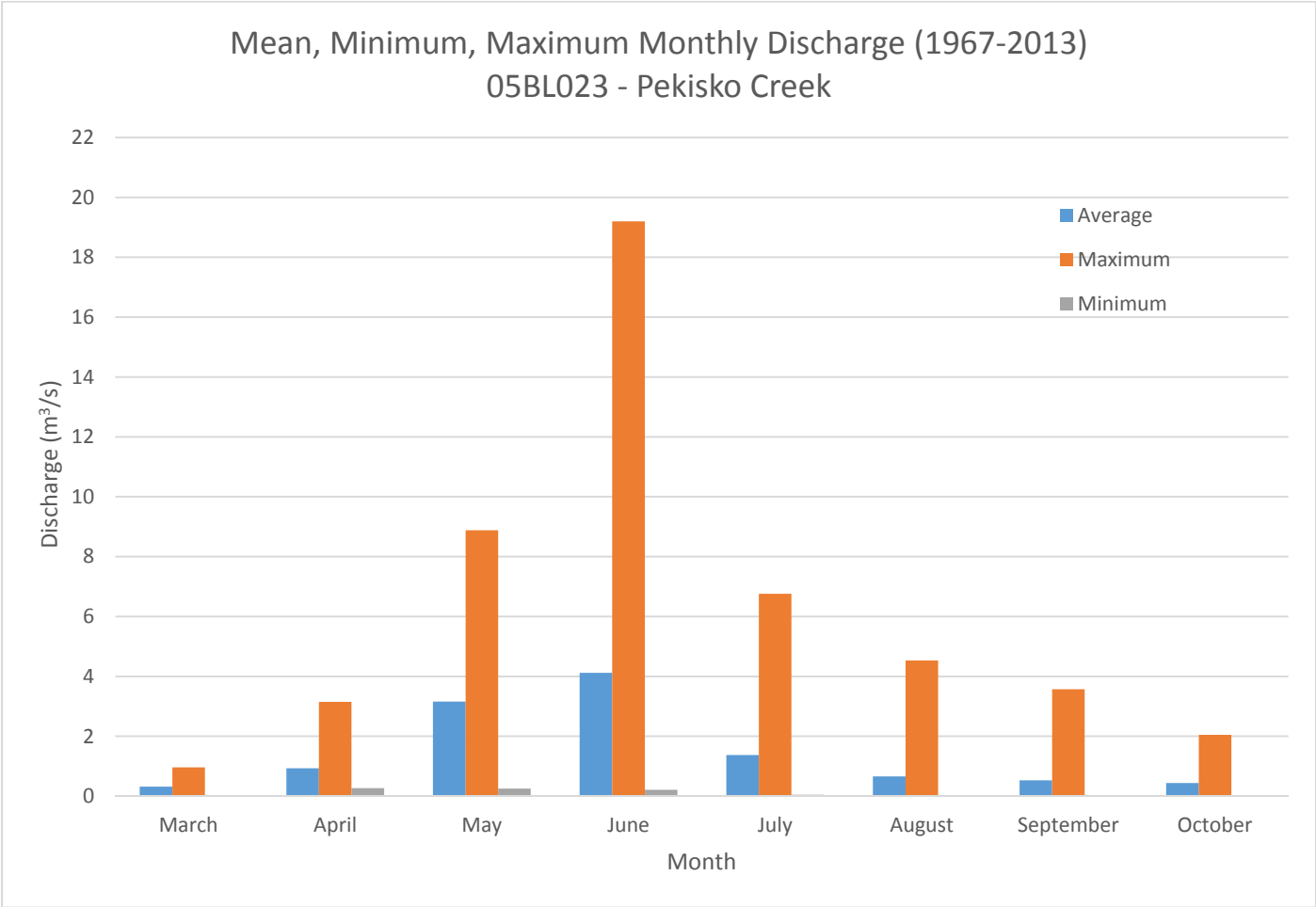
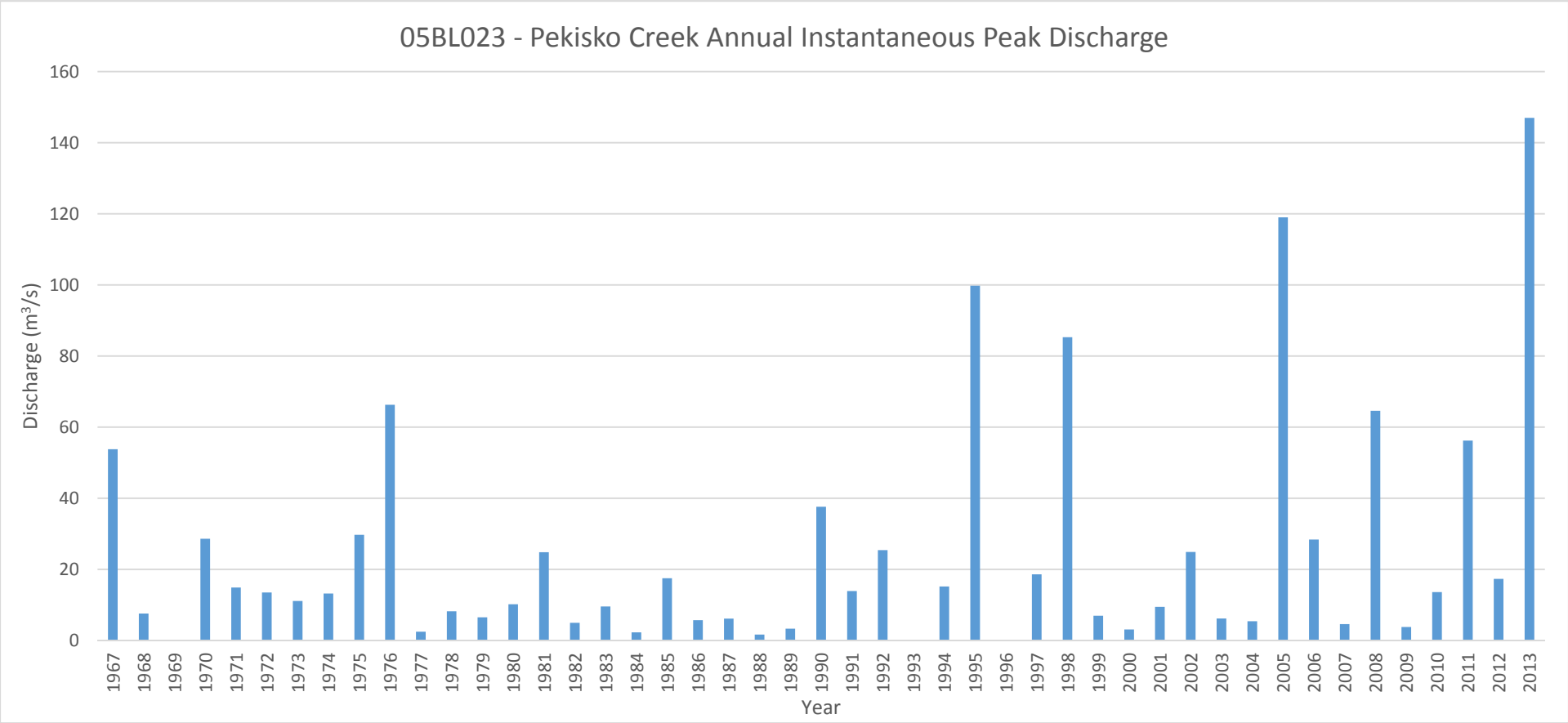


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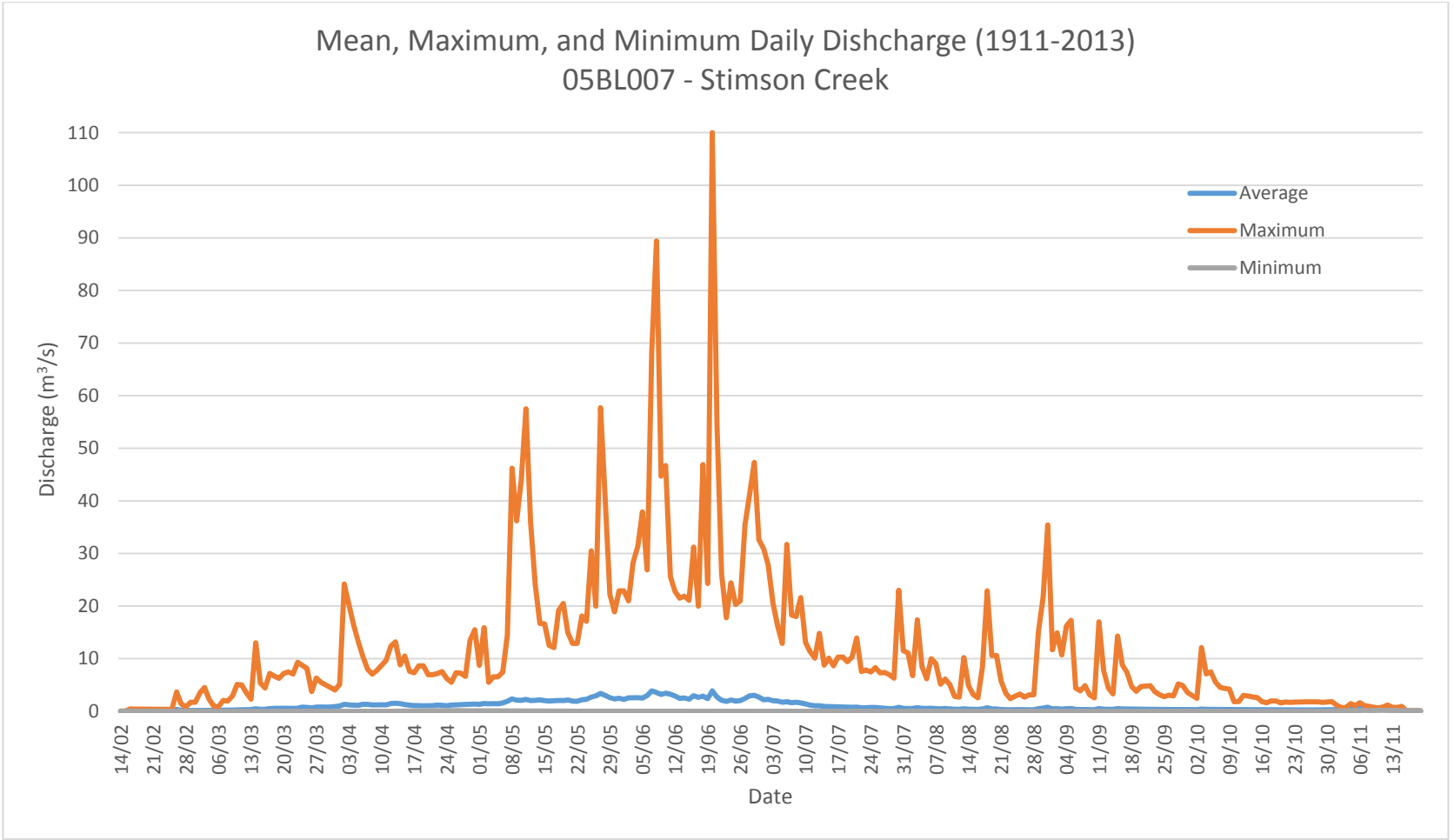
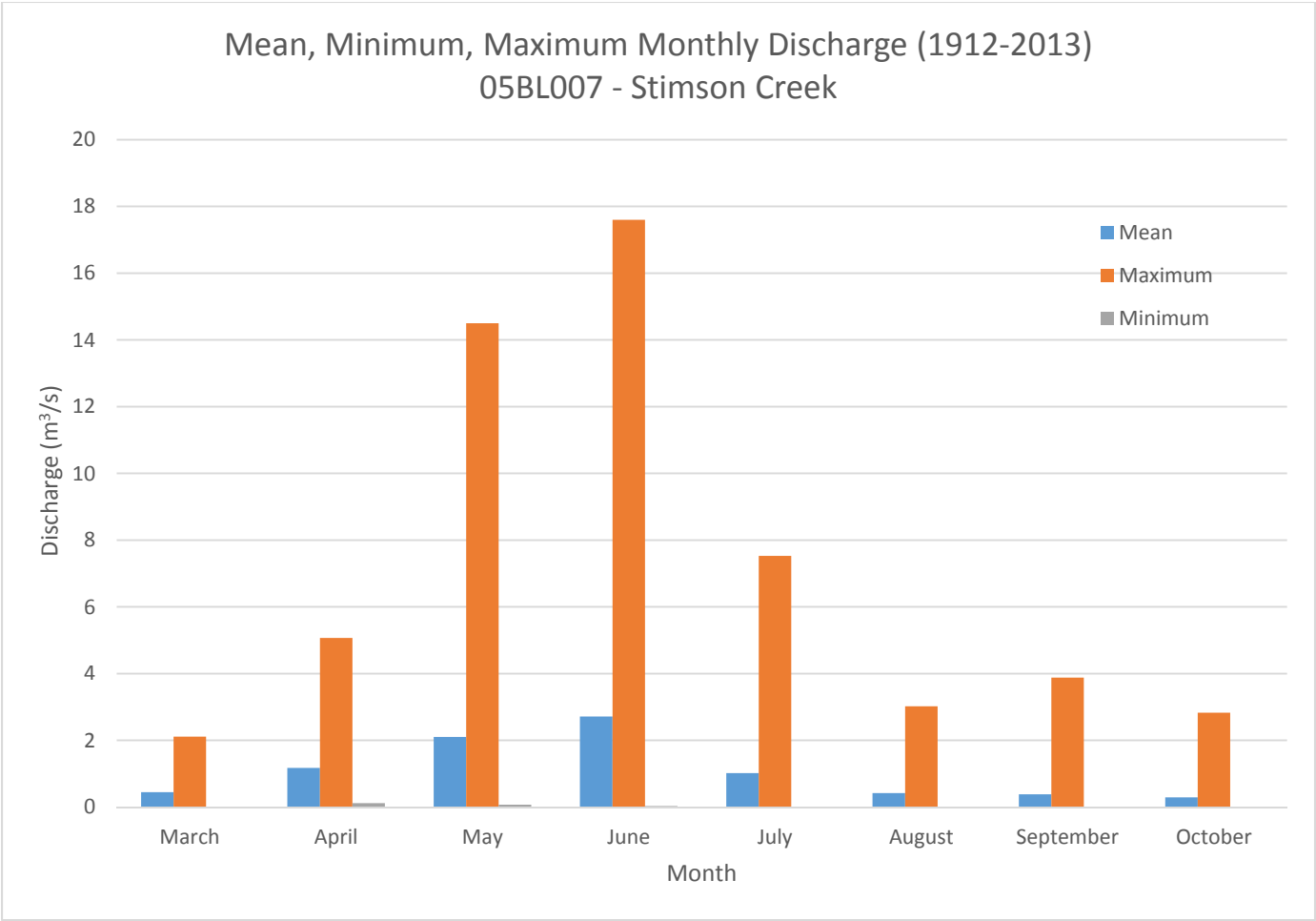
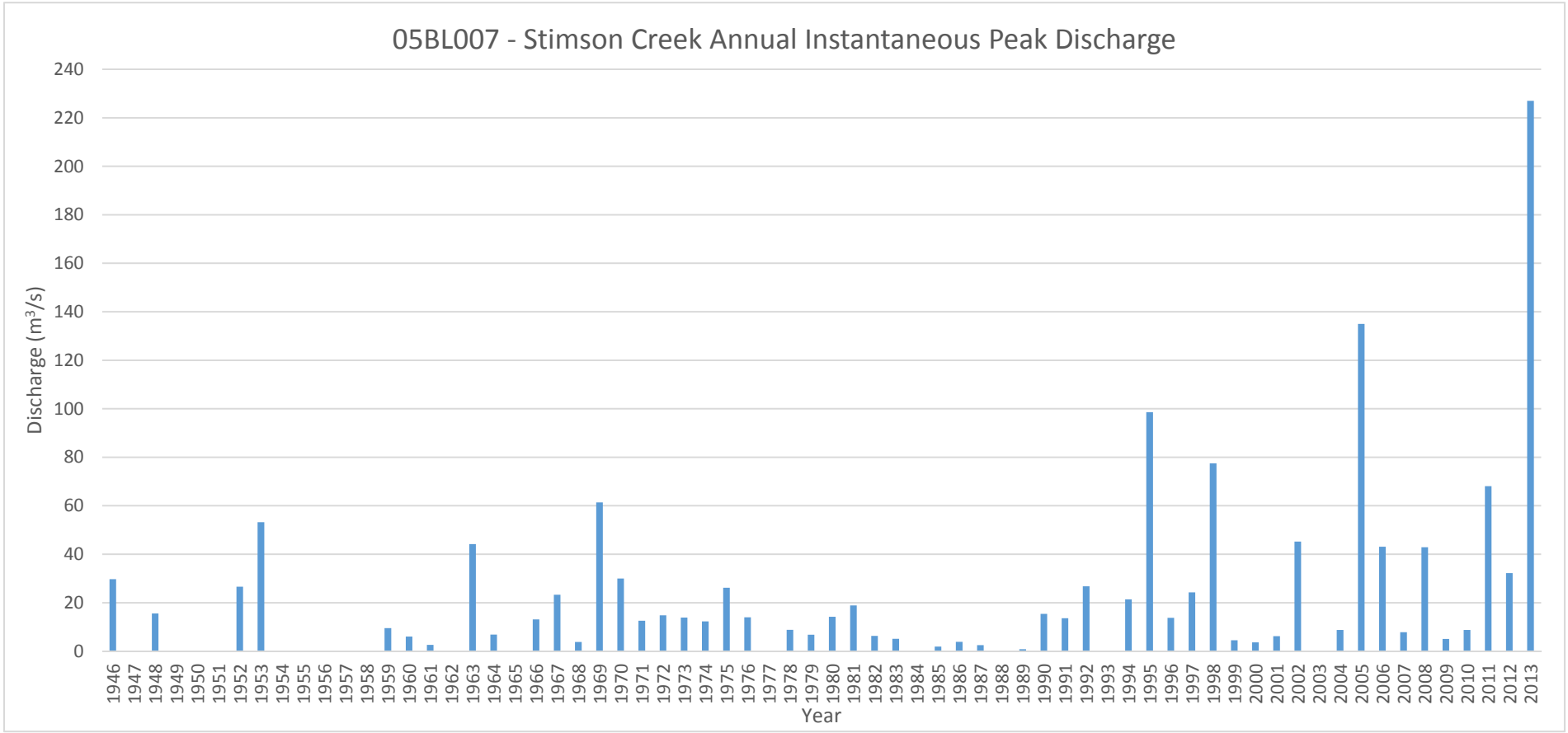
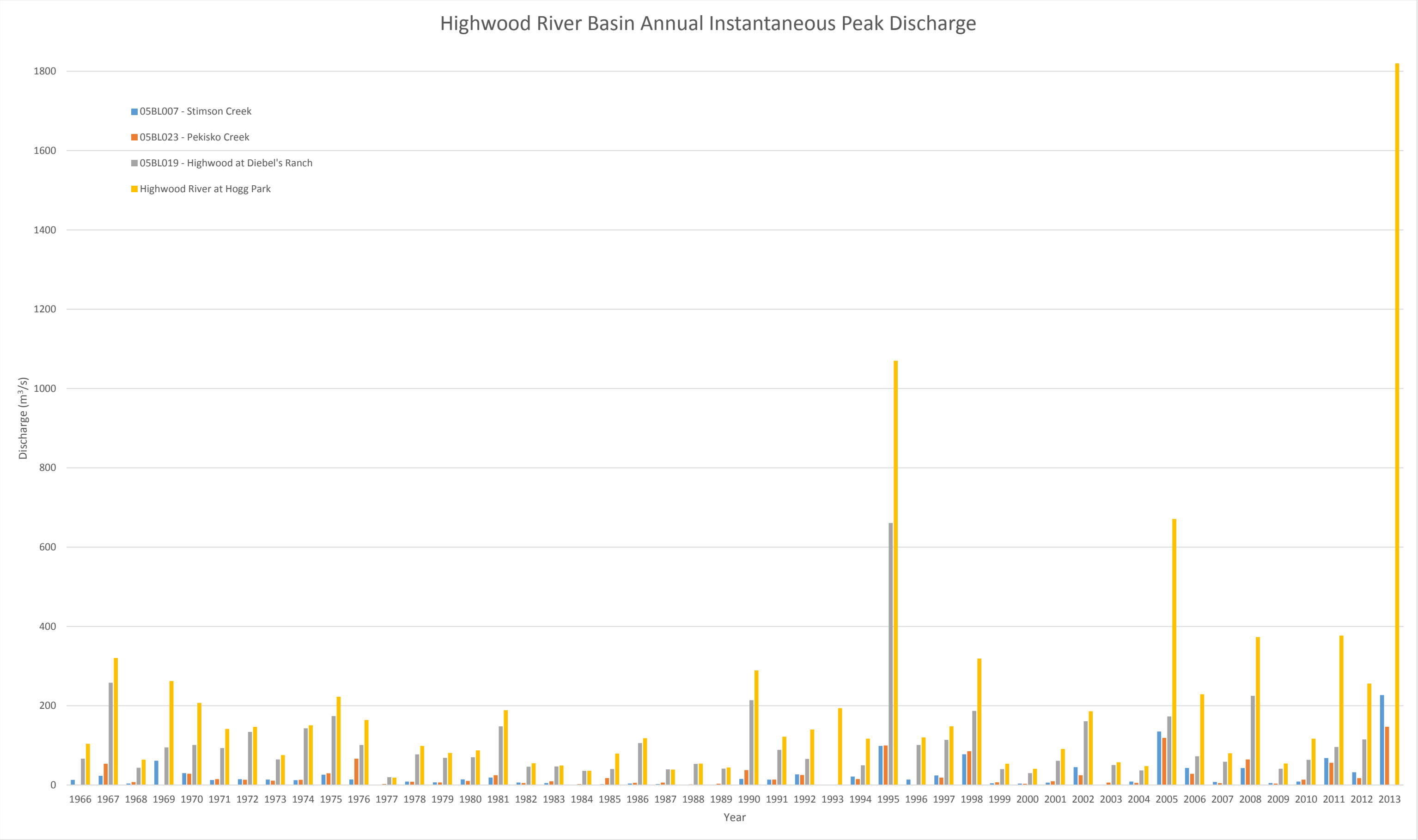


Figure 6:



Note: Highwood River at Hogg Park Data from AECOM Highwood Basin Studies Appendix B - Climatic and Hydrometric Data, July 2014

*PLOT 1:1=B (L)

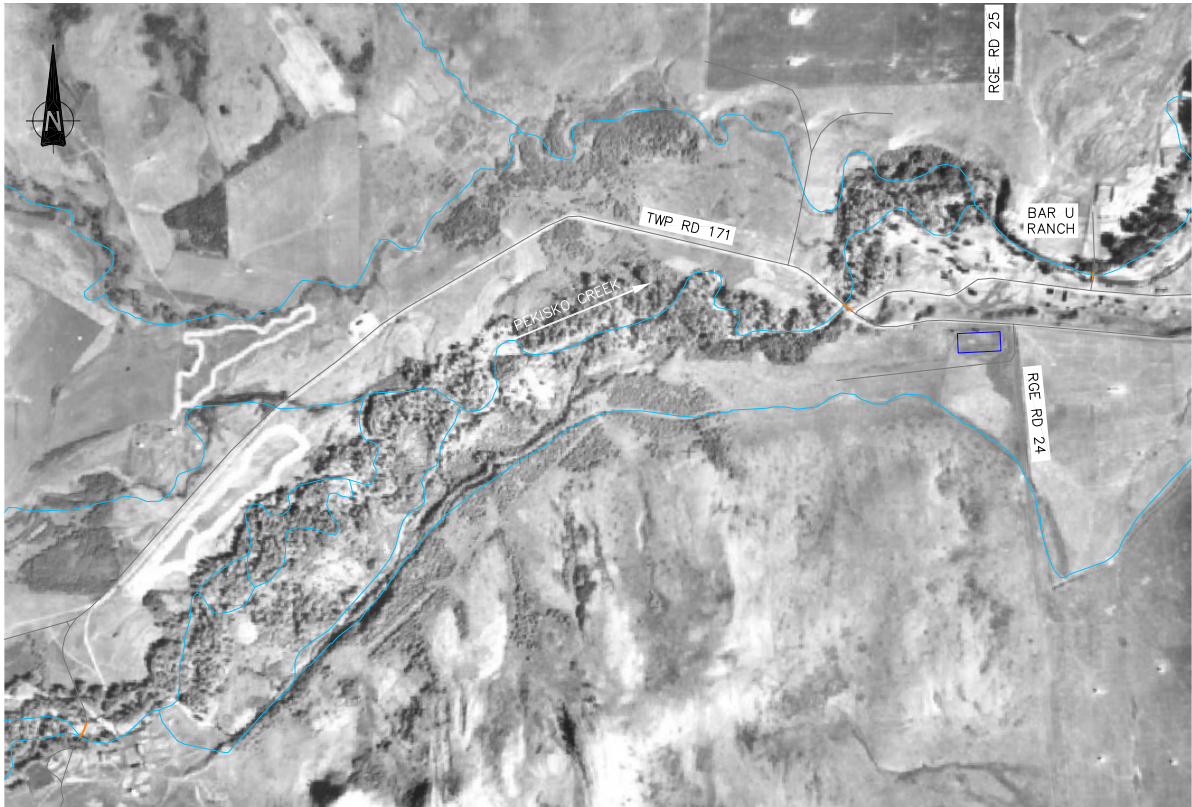


PHOTO 1: PEKISKO CREEK 1948

SCALE 1:10000

IMAGE REFERENCE: NATIONAL AIRPHOTO LIBRARY, 1948



PHOTO 2: PEKISKO CREEK 2014

SCALE 1:10000

IMAGE REFERENCE: GOOGLE EARTH, 2014

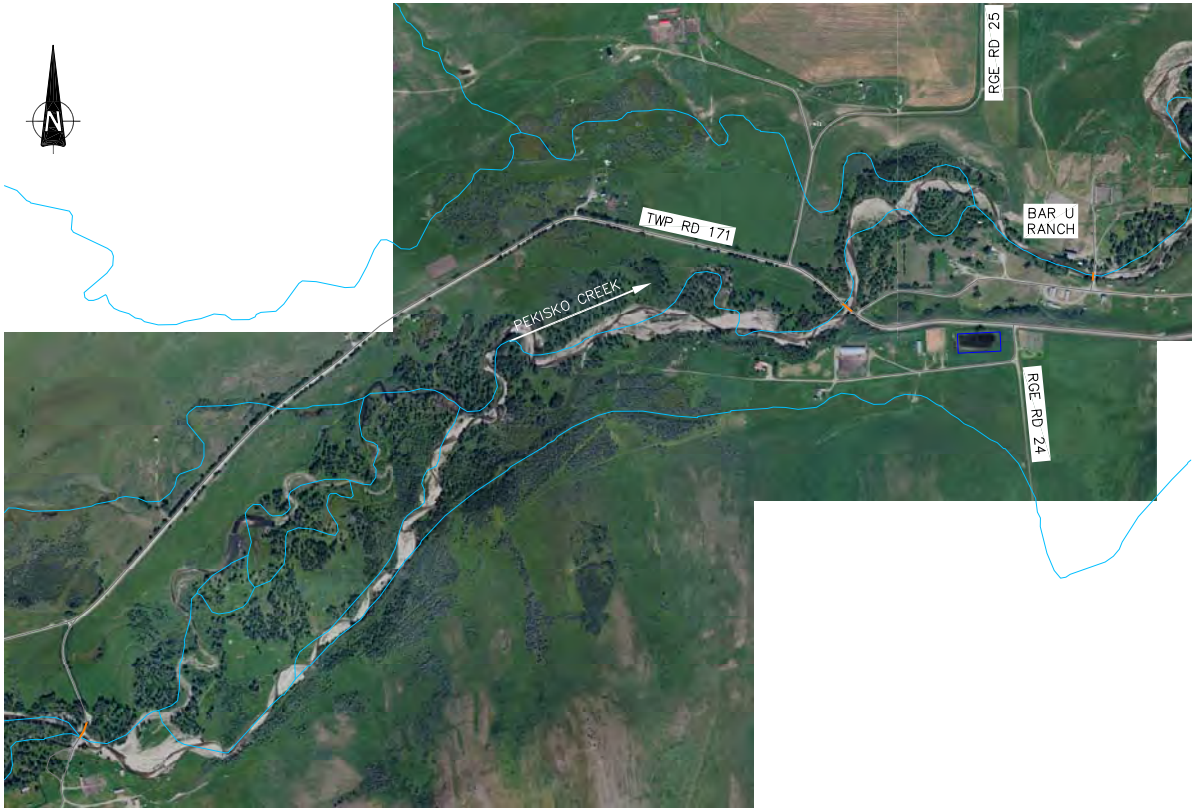


PHOTO 2: PEKISKO CREEK 2012

SCALE 1:10000

IMAGE REFERENCE: M.D. OF FOOTHILLS NO. 31, 2012

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THIS DRAWING MAY HAVE BEEN REDUCED. ALL SCALE NOTATIONS INDICATED (i.e. 1:1000 etc.) ARE BASED ON 22" X 34" FORMAT DRAWINGS

I:\CW\216703\216703-F03.dwg - Figure 7 - Jul. 23, 2015 11:39am - corey.ferrets

amec foster wheeler



CLIENT:

M.D.OF FOOTHILLS NO. 31

PROJECT: DESKTOP REVIEW OF FLOOD ISSUES ON PEKISKO AND STIMSON CREEK

TITLE: COMPARATIVE AIR PHOTOS OF PEKISKO CREEK

DATE:	JULY 2015	JOB No.:	CW216703	CAD FILE:	216703-F03.dwg	FIGURE No.:	7	REV.	A
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PLOT 1:1=B (L)

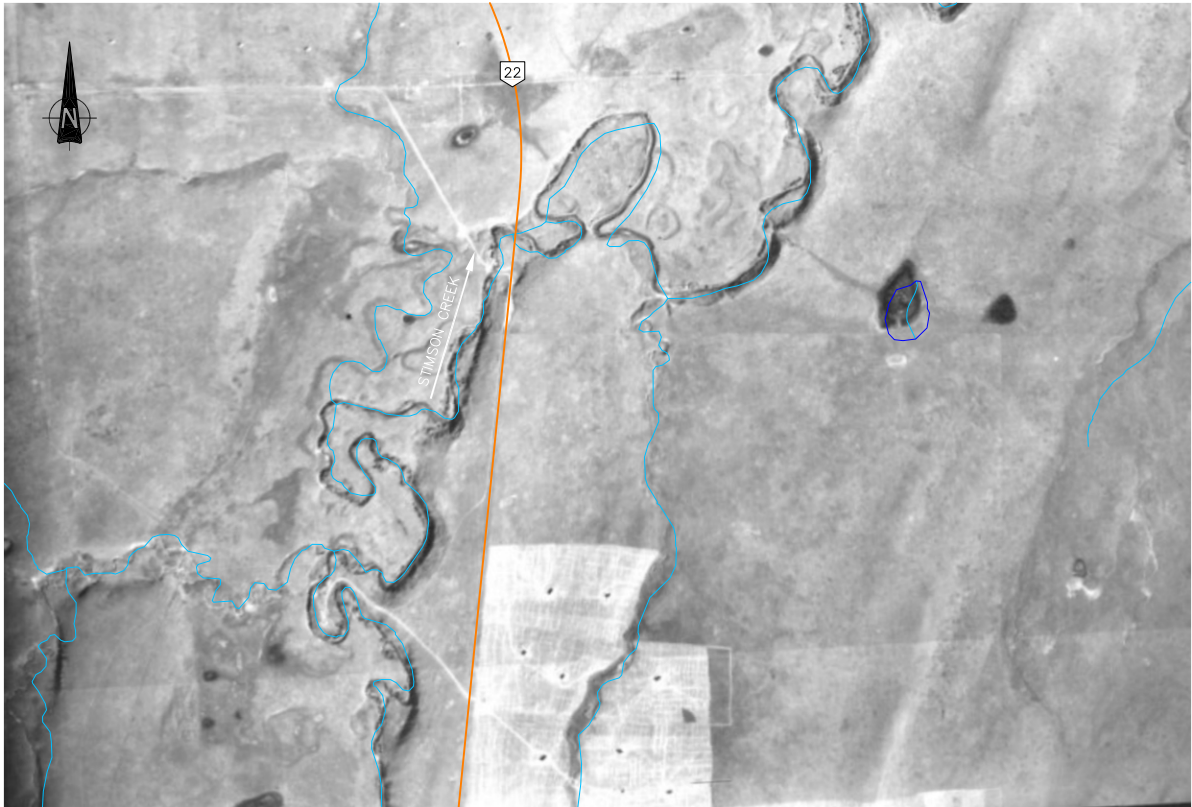


PHOTO 1: STIMSON CREEK 1948
SCALE 1:10000

IMAGE REFERENCE: NATIONAL AIRPHOTO
LIBRARY, 1948

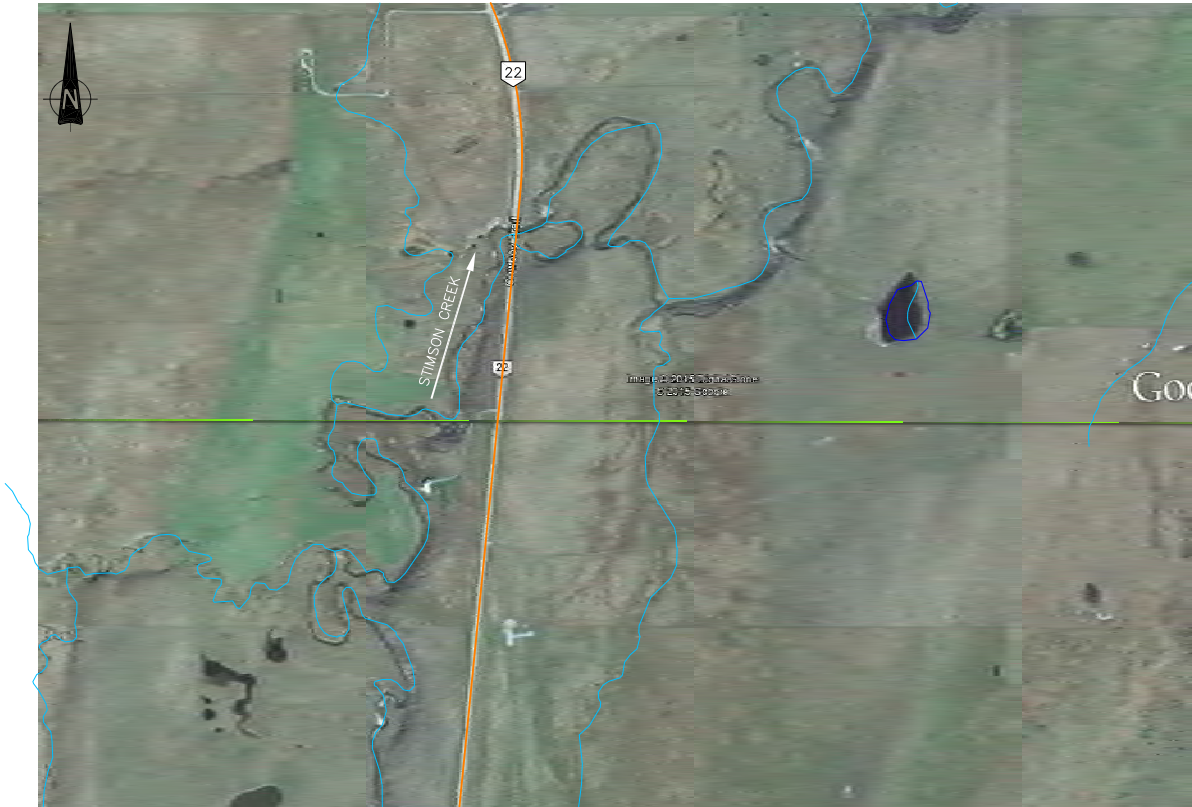


PHOTO 2: STIMSON CREEK 2014
SCALE 1:10000

IMAGE REFERENCE: GOOGLE EARTH, 2014

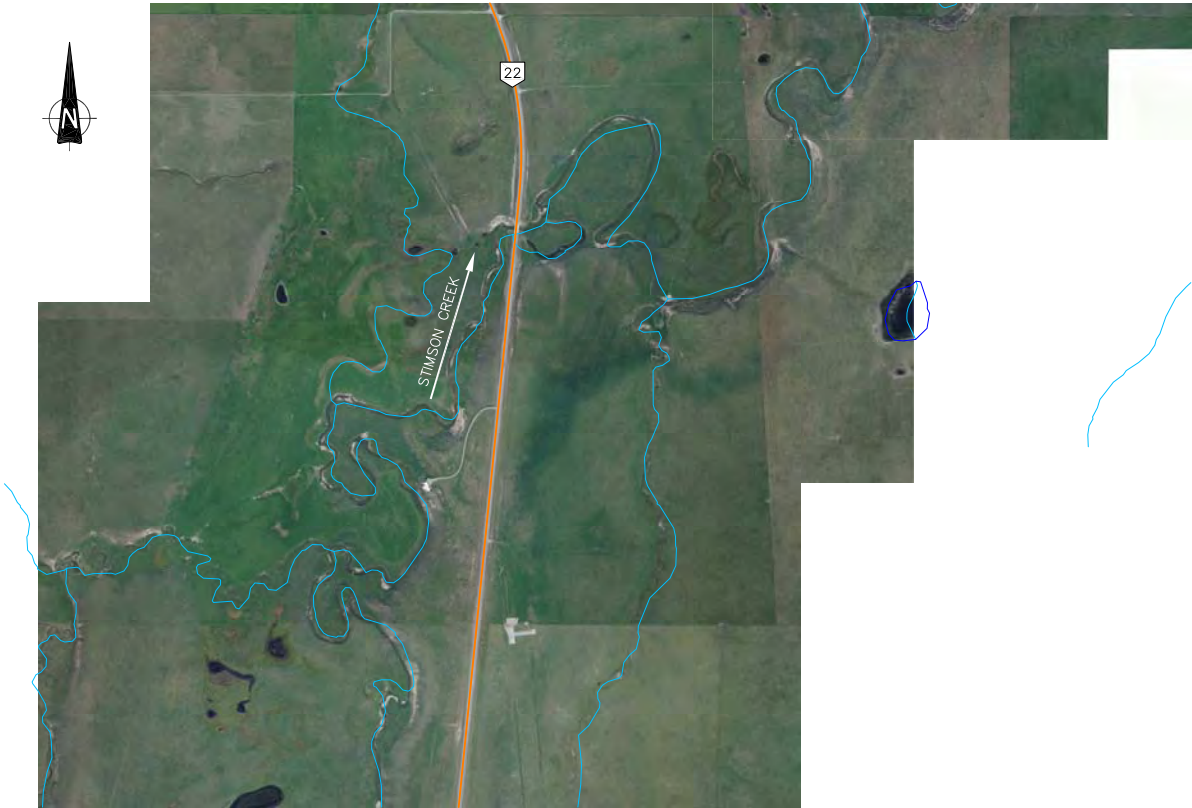


PHOTO 2: STIMSON CREEK 2012
SCALE 1:10000

IMAGE REFERENCE: M.D. OF FOOTHILLS
NO. 31, 2012

SCALE
1:10 000
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THIS DRAWING MAY HAVE BEEN REDUCED. ALL
SCALE NOTATIONS INDICATED (i.e. 1:1000 etc.)
ARE BASED ON 22" X 34" FORMAT DRAWINGS

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amec foster wheeler



CLIENT:

M.D.OF FOOTHILLS NO. 31

PROJECT: DESKTOP REVIEW OF FLOOD ISSUES ON
PEKISKO AND STIMSON CREEK

TITLE: COMPARATIVE AIR PHOTOS OF
STIMSON CREEK

DATE:	JULY 2015	JOB No.:	CW216703	CAD FILE:	2167-F04.dwg	FIGURE No.:	FIGURE 8	REV.	A
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