



## **Cold Spring Creek 2020 Annual Dike Inspection Report**

### **Background**

#### **2013**

Cold Spring Creek experienced a small debris flow event on June 20, 2013 that deposited material in the creek channel, the small mid-section debris trap and the lower debris trap. Debris material was also deposited behind the Cold Spring Creek Dam which is located upstream of the works. The Cold Spring Creek Dam is not part of the debris containment works and is not owned by the RDEK but debris is contained in the reservoir.

Material removals in 2013 were completed at the Cold Spring Creek Dam reservoir, small mid-section debris trap along the bank protection works, at the last culvert along the bank protected section and in the upstream half of the lower debris trap. All these locations were cleared of transported gravel from the debris flow and the front half of the lower debris trap was also cleared of material that had been deposited over several years. The funding for removal of the transported debris flow material was primarily from Emergency Management BC (EMBC) emergency response funds. The RDEK provided some funds for additional material removal on the lower debris trap.

#### **2015**

The July 15, 2012 Fairmont Creek debris flow and June 20, 2013 debris flow events on Fairmont Creek and Cold Spring Creek prompted the need to have a hazard and risk assessment completed for Cold Spring Creek. This assessment was completed by Clarke Geoscience in January 2015 and included some recommendations for debris flow mitigation along the channel.

#### **2016**

The downstream half of the lower debris trap and the culvert just upstream of the debris trap was cleared of sediment in August 2016 by the RDEK.

Some vegetation was removed around the debris pond in 2016 prior to the pond clean out to reduce the spread of noxious weeds.

#### **2017**

The Cold Spring Creek Dam reservoir was cleaned out again in May 2017 after a small debris flow event that completely filled the reservoir with debris flow material.

## **2018**

There were no events on Cold Spring Creek in 2018 and no maintenance was completed on the creek.

## **2019**

On August 10-12, 2019, a significant weather event (isolated heavy rain) occurred in the Fairmont area. As a result, a debris flood occurred on Cold Spring Creek. The Cold Spring Creek Dam reservoir was filled to capacity, the culverts at the crossings of Fairway Drive and Hot Spring Road were blocked by debris and the creek flowed over the roads and partially through private property before returning to the channel.

The lower debris trap was also filled with debris (gravels and fine grained material). The armouring along the creek channel was not damaged during the event.

## **2020**

On May 20, 2020 there was a small debris flood event that partially filled the reservoir with material. The lower channel was not impacted. On May 31, 2020 there was a significant debris flood event in response to heavy precipitation on snow following a few days of very warm weather. This event filled the upper reservoir to overflowing, caused some damage to the channel, blocked several culvert crossings and filled the lower debris trap. The precipitation event had a 10 year return period, the clear water flood event had a 10 to 20 year return period and the debris flood had a 5 year return period.

## **Cold Spring Creek Dike Inspections**

An inspection was completed on April 23, 2020 and was conducted by Kara Zandbergen, RDEK Engineering Technician. All sections of the dike were found to be in good condition at that time and ready for freshet. Subsequent inspections were completed after each event and as the cleanup progressed.

The infrastructure will be described from upstream to downstream and will include photos for each site showing the condition of the infrastructure pre-freshet, post-event and after clean up (where appropriate).

### **Upstream Conditions**

The channel conditions as far upstream as the Cold Spring Creek Dam are monitored and inspected at the same time as the dike/bank protection works. The dam is owned and operated by the Fairmont Hot Springs Resort. A small amount of material was removed from the reservoir in late 2015/early 2016 by the contractor that was working just upstream of the dam. The dam was cleaned out again in May 2017 after a small debris flow event that completely filled the reservoir with debris flow material.

The dam and reservoir were in good condition during the April 23, 2020 inspection. During the May 20, 2020 event it was approximately 60% filled with debris and during the May 31 event, it was filled to capacity and water flowed over the dam and caused some erosion. The debris was removed from the reservoir immediately after the May 31 event.



Photo 1: Cold Spring Creek Dam Reservoir partially filled with debris. May 22, 2020



Photo 2: Cold Spring Creek Reservoir after the May 31 event. June 1, 2020.



Photo 3: Erosion immediately downstream of the dam after the May 31 event. June 1, 2020.

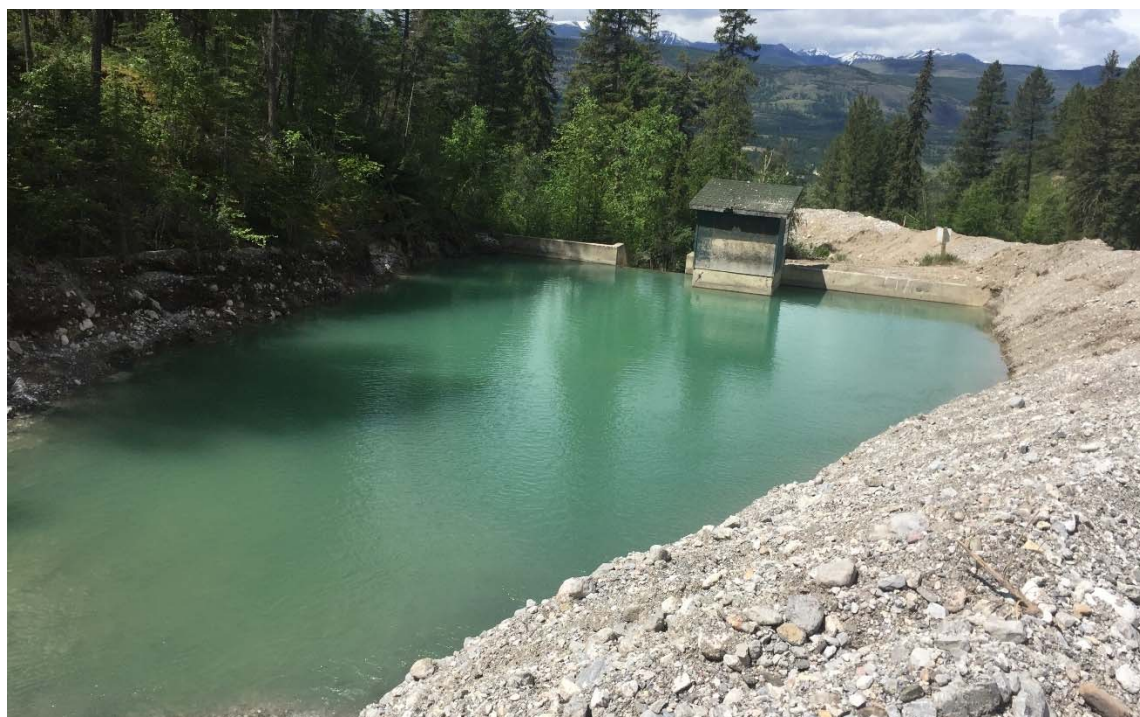


Photo 4: The reservoir with the debris removed. June 15, 2020.

### Culvert Conditions

All of the culverts between the dam and Highway 93/95 were functioning properly at the time of the April 23, 2020 inspection. Additional culvert capacity had been installed by MoTI through the installation of high water culverts at two road crossings.

The water level at the time of the inspection was low and contained in the creek channel however the channel is infilled with debris material and does not have much capacity. Creek avulsion is possible in a moderately high water situation.

The channel from Highway 93/95 to the debris trap (dike/bank protected area) was in good condition. The complete bank protection works were brushed in 2012 but will be required again in the near future.

The last culvert along Cold Spring Creek before the lower debris trap is experiencing some very minor underflow piping. The situation is being monitored. The same culvert was approximately 30% filled with gravels and was cleaned out in August 2016. Both upstream culverts along the bank protected works are in good condition and functioning properly.

During the May 31, 2020 event several of the culverts were blocked and overflowed:

- Fairmont Resort Road culvert was blocked and water flowed over the road.
- Fairway Drive culvert was not blocked and the flood flow was passed through the culvert.
- Hot Springs Road culvert was blocked and water flowed over the road.
- The Riverview Road Culvert was blocked and water flowed over the road.
- The culvert immediately upstream of the lower debris trap was partially blocked. This is the only culvert crossing on the creek that is not the responsibility of MOTI.



Photo 5: The culvert immediately upstream of the lower debris trap. June 10, 2020.



Photo 6: Culvert upstream of the debris trap after cleaning. November 30, 2020.

### **Debris Trap Conditions**

The upstream half of the debris trap was cleaned out in 2013. Some sediment and gravels had been deposited at the inlet to the pond since that time. The downstream half of the debris trap still had several years of sediment build up. The inlet to the pond and the lower half of the pond were both cleaned out in August 2016. The trap was cleaned again during the fall of 2019.

The debris trap was in good condition during the April 23 inspection. The trap was filled to capacity during the May 31 event and was cleaned in the fall of 2020.



Photo 7: The lower debris trap, April 23, 2020.



Photo 8: The lower debris trap after the May 31 event. June 9, 2020.



Photo 9: The lower debris trap near completion of debris removal. December 4, 2020.

### **Lower Channel Conditions**

The lower channel was in good condition during the April 23 inspection. Vegetation removal should be completed.



Photo 10: Channel immediately upstream of the lowest culvert. April 23, 2020.



During the May 31 event there was some minor damage to the bank protection behind 2025 Riverview Road. It was repaired to prevent additional bank erosion and property damage.



Photo 11: Bank erosion behind 2025 Riverview Road. June 3, 2020.



Photo 12: Repair of bank erosion. June 9, 2020.

## **2020 Maintenance**

A significant amount of maintenance as previously described was completed in 2020, all in response to the May 31 debris flood. This work was paid for with a combination of EMBC emergency funding, Disaster Financial Assistance funds and Fairmont Flood and Landslide Service area reserves.

The Cold Spring Creek debris flood infrastructure has been filled to capacity a number of times over the past several years. After the 2019 event, the RDEK asked Northwest Hydraulic Consultants to assess the creek and provide a conceptual design and cost estimate for additional debris flood mitigation on the creek. This report was used to apply for funding under the UBCM CEPF 2019 Structural Flood Mitigation funding stream. The funding application was successful.

McElhanney Ltd was retained for the engineering design and construction management of the debris flood mitigation project. As part of their proposal, they included BGC Engineering to complete an updated hazard assessment for the creek. The outcome of that assessment was that Cold Spring Creek has a significant large debris flow hazard. With this in mind, the project changed direction from debris flood to debris flow mitigation and a debris net is currently being designed.

The RDEK is planning to submit an application to the Adaptation, Resilience and Disaster Mitigation Fund for additional mitigation work on the creek.

## **Maintenance Planned for 2021**

At this time, the RDEK is planning to construct the debris net and associated works in 2021.

If we are successful in our latest funding application, we will begin the engineering and construction for that work in 2021.