



Fairmont Creek 2021 Annual Dike Inspection Report

Background

2012

Fairmont Creek experienced a significant debris flow event on July 15, 2012 which deposited approximately 65,000 m³ of debris in the creek channel, over the debris fan and along subdivision roadways and drainage ditches. Disaster Financial Assistance funds were used to reconstruct the previously existing section of dike and protected bank just below Marble Canyon. This work was completed by April 2013. In addition to reconstructing the creek channel and protecting the bank, a series of nine grade controls were constructed along this section. The engineering consultant for this work was Kerr Wood Leidal and the contractor was Max Helmer Construction.

After the 2012 debris flow, Emergency Management BC (EMBC) funds were obtained to have a debris flow hazard and risk assessment completed on Fairmont Creek. Clarke Geoscience was retained for the assessment. It was completed in January 2013 and included a series of recommendations that could be implemented to help mitigate debris flow risk.

2013

On June 20, 2013, Fairmont Creek experienced another debris flow event caused by a significant rain event on saturated soils. The magnitude of this event was approximately 6,000 m³ and the material was mostly contained in the channel and the golf course pond. The golf course pond, a few sites along the creek channel and material impacting the time share condominiums were cleaned out and repaired through EMBC Emergency Response funding. The newly constructed bank protection was not damaged in the event but six of the nine grade controls were significantly damaged or completely destroyed.

The RDEK commissioned an overview inspection of Fairmont Creek following the 2013 event. The inspection and report were funded through EMBC, and completed by Clarke Geoscience. The inspection occurred on July 29, 2013 and confirmed the findings of the January 2013 Debris Flow Hazard and Risk Assessment, which states that unlimited material available for mobilization exists in the Fairmont Creek watershed and can mobilize given the right conditions.

2014 - 2015

In 2014, the RDEK was awarded funding through the Building Canada Fund Flood Protection Program for Phase 1 of the Fairmont Creek Debris Flow Mitigation Project. Engineering for this work was completed in Fall of 2014 and construction was completed in early May 2015. The project included widening the

creek through the golf course to the pond in order to increase storage capacity. The banks were sloped appropriately and armoured and berms were constructed on both sides of the creek to further contain material in the event of a debris flow. The engineering consultant for this work was Urban Systems and the contractor was Max Helmer Construction.

2016

In 2016, the RDEK was awarded additional funding through the EMBC Flood Protection Program in order to complete Phases 2 and 3 of the Fairmont Creek Debris Flow Mitigation Project. Phase 3 consists of the installation of a weather station at the ski hill and was completed in November 2016. The weather station will be used to develop an early warning system for the community.

2017-2018

On May 12, 2017, a small amount of debris came down Fairmont Creek to the debris trap pond. An estimated 1,200 m³ of debris material was deposited in the pond and additional debris was deposited upstream along the creek bed. Removal of the debris was planned for 2019 following completion of the Fairmont Creek Debris Flow Project Phase 2 works. This was not completed because of the costs associated with the August 12, 2019 event (see below). It will be completed when funding permits. The extensive debris storage that was constructed upstream on Fairmont Creek makes this work less urgent.

Phase 2 of the Fairmont Creek Debris Flow Mitigation Project involved the construction of two large sediment basins containing three large riprap weirs upstream of the Fairmont Hot Springs Resort. Construction was started in September 2017 and was completed Fall 2018 and has added approximately 17,000 cubic metres of debris capture and storage capacity.

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 Fairmont Creek and the uppermost of the three newly constructed debris traps was filled to capacity (1,225 cubic metres). Minor erosion between the first and second weir deposited a small amount of material in front of weir #2. There was moderate erosion in the channel below the second weir with material being deposited between the area of erosion and the third weir. The weirs successfully contained the debris flood material originating from above the project area and prevented it from being transported downstream.

2020

On May 20, 2020 there was a small debris flood event that filled the Wier 1 basin with material. 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 three containment basins to capacity, deposited a significant amount of material in the channel through the golf course and filled the pond on Hole 12 to capacity. There was damage in a few locations along the infrastructure that will be described in detail and two of the downstream culverts were blocked causing the water to flow over the roads and outside of the channel causing minor property damage. 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 35 year return period. Upon review and with the information from this event, the 2012 event was reclassified from a 500 year event to a 165 year event.

2021

On May 24, 2021 there was a significant precipitation event. The event was less intense than the 2020 event but had a longer duration and resulted in sediment being deposited in the three upper sediment basins. Basin 1 was filled to capacity and Basins 2 and 3 experienced lesser amounts of infilling. The three basins were cleared of debris as soon as practical to restore storage capacity. There was some minor channel infilled in the golf course channel and minimal deposition in the Hole 12 pond.

Fairmont Creek Dike Inspections

An inspection was completed on May 5, 2021 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 the event and as the cleanup progressed and in early October.

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).

Weir 1 and Debris Basin 1



Photo 1: The uppermost weir in the system, Weir #1. May 5, 2021.



Photo 2: Weir 1, filled with debris material from the May 24 event. May 27, 2021.



Photo 3: Weir 1 with debris flood material was removed. October 21, 2021.

Weir 2 and Debris Basin 2



Photo 4: Weir 2 in good condition looking downstream. May 5, 2021.



Photo 5: Weir 2 looking upstream. The basin is partially filled with debris flood material. May 29, 2021.



Photo 6: Weir 2 basin with debris flood material removed. October 21, 2021.

Weir 2 Downstream Scour



Photo 7: Weir 2 downstream face and scour that occurred primarily during the May 31 event. This was to be repaired in 2021 but was deferred due to the DFA funding not being approved. The armouring on the right bank was not damaged and the damage has not progressed significantly since the May 31, 2020 event. October 21, 2021.

Weir 3 and Debris Basin 3



Photo 8: Weir 3 and basin in good condition. May 5, 2021.



Photo 9: Weir 3 and basin after the May 24 event. May 28, 2021.



Photo 10: Weir 3 and basin after the debris material was removed. October 21, 2021.

Channel Through the Golf Course



Photo 11: Golf course channel looking downstream from the cart path bridge. Channel is in good condition. The dike on the right hand side of the channel (red arrow) is in good condition. May 5, 2021.



Photo 12: The left hand dike is in good condition. May 5, 2021.



Photo 13: Golf course channel looking downstream from the cart path bridge on May 26, 2021. There was minimal debris deposition, flow was contained in the channel and the dikes were not impacted.



Photo 14: Golf course channel. October 21, 2021.



Photo 15: Lower portion of the golf course channel looking upstream from the pedestrian bridge near the Hole 12 pond. The channel and dikes were in good condition. May 5, 2021.



Photo 16: Lower portion of the golf course channel. There is a small area of settlement on the dike slope at the arrow. See Photo 17. October 21, 2021.



Photo 17: Area of settlement on the dike. This will be monitored in early 2022 and repaired pre-freshet if required. October 21, 2021.



Photo 18: Hole 12 Pond with no material deposition at the inlet and good condition with lots of capacity. May 5, 2021.



Photo 19: Hole 12 pond inlet with minimal deposition at the inlet. May 26, 2021.



Photo 20: Hole 12 pond taken from near the inlet. Some material deposition has occurred through the summer. This will be evaluated in early April and some material may be removed. October 21, 2021.

Culverts Downstream of the Pond

The culverts downstream of the debris flow infrastructure were well maintained by Mainroad (MOTI contractor) through 2021 and were able to pass the high flows.

2021 Maintenance

A significant amount of maintenance was completed in 2021 as response and recovery to the May 24, 2021 debris flood event. To summarize:

- 4,200 cubic meters of debris were removed from Debris Basins 1, 2 and 3.

This work was paid for with a combination of EMBC emergency funding and Fairmont Flood and Landslide Service area reserves.

Maintenance Planned for 2022

At this time, potential maintenance work planned for 2022 includes:

- Weir 2 scour repairs;
- Material removal from Pond 12; and
- Repair of minor dike slump upstream of Pond 12.

In 2022, the RDEK will be working with the Fairmont Hot Spring Resort to establish statutory rights of ways for all of the works that have been constructed over the last several years. Discussions have already been initiated and this work has been included in the 2022 budget.