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REPORT TO: Saugeen Valley Conservation Authority Members
FROM: Gary Senior, Sr. Manager Flood Warning and Land Management
DATE: July 18, 2017
SUBJECT: June 2017 Flood Event

NOTE: The stream flows and rainfall values cited in this report are provisional at this time and are subject to change. Values cited are all from SVCA stream gauge stations and rain gauges unless indicated otherwise. The information is not intended to be used for any purpose beyond this Authority report.

This report summarizes the flood event that occurred on June 23rd and 24th, 2017. The rainfall that was the cause of the flooding also extended into other Conservation Authority Watersheds and caused serious flooding in those other areas including the need for evacuations. This report does not address flooding in those other jurisdictions.

1.0 Geographic Area Affected

Significant flooding occurred in the South Saugeen River watershed, located in the southeast portion of the SVCA's jurisdiction (see Fig. 1). Record-high flows occurred in that system. Portions of the following municipalities were affected: Wellington North, Minto, Southgate, West Grey, and South Bruce. Elsewhere in the SVCA Watershed flows were not nearly as significant; however, flooding did happen in the lower section of the Main Saugeen River downstream of Hanover.

The South Saugeen watershed is crescent-shaped and is 798 sq km in size. It is predominantly agricultural and has approximately 22% forest cover. Bank erosion is common along the main river channel in the west half of the watershed.

Compared to some other watercourses in southern Grey County the water in the South Saugeen River exhibits high turbidity, or murkiness due to suspended particles, during high flows events. The June 23-24 flood was no different, as muddy water was quite prevalent. There was also a large amount of floating debris, as material in the river flats became buoyant and moved into the channel. This turbid condition contrasted sharply to the April 1st flood last year in the Township of Chatsworth, as the North Saugeen River stayed relatively clear even during the height of the flood.



Watershed Member Municipalities

Municipality of Arran-Elderslie, Municipality of Brockton, Township of Chatsworth, Municipality of Grey Highlands, Town of Hanover, Township of Howick, Municipality of Morris-Turnberry, Municipality of South Bruce, Township of Huron-Kinloss, Municipality of Kincardine, Town of Minto, Township of Wellington North, Town of Saugeen Shores, Township of Southgate, Municipality of West Grey

2.0 Watershed Conditions Prior to the Flood

Despite the date being late June the soil conditions had not dried down much prior to June 23rd, due to above-average precipitation for the spring and early summer seasons and poor weather for evaporation. At Mount Forest for the time period of June 1 to June 22nd, prior to the flood, there had been 85.20 mm of rain. That amount already matched the average precipitation for the month of June.

Prior to the flood, stream flows in the SVCA Watershed were not overly high, although in general flows were higher than normal for June. There were no streams at bankfull stage prior to the flood.

3.0 Rain Event

The flooding on June 23rd and 24th was in response to an extreme rainfall event associated with thunderstorms over a period of about 11 hours. The maximum rainfall measured by the SVCA's rain gauges was at the streamflow monitoring station on Highway 89 located 4.5km west of the Town of Mount Forest. At that station 149 mm of rain fell (Fig. 2). Most of it fell over a 5 hour period between 11:00 pm June 22nd to 4:00 am June 23rd.

This one rainfall event was 1.8 times more than the average rainfall for the entire month of June.

The second-most rain amount was at the Cedarville stream gauge station located 14 km northeast of the Town of Mount Forest. At that rain gauge 115.20 mm was recorded.

The rainfall was concentrated in the very southerly portion of the SVCA area of jurisdiction. All of the SVCA Watershed received some quantity of rain from this event, but the amounts decreased substantially in the middle and northerly portions of the Watershed. For example, Walkerton recorded 23.40 mm, Paisley 12.0 mm, and Chesley 18.0 mm.

A series of four radar images from the event are shown in Figures 3 and 4. While rain covered a broad area of Southwestern Ontario it is also evident from these images that a narrower band of intense rain oriented in a west to east direction moved across the lower portion of the SVCA Watershed and beyond. This band extended from about Goderich to Newmarket. To the north of this band the rain amounts were much less.

Reports from other sources for locations in the southerly part of the SVCA Watershed and the northerly part of the MVCA Watershed showed rainfall in the following amounts: Mildmay 137.4 mm, Palmerston 121.9 mm, Lucknow 108.7 mm, Brussels 95 mm.

The maximum one-hour rainfall for this event, at SVCA rain gauges, was 51.60 mm. For Mount Forest this rate is close to the 100-year rainstorm for a one hour time period. This 51.60 mm of rain was followed five hours later by an additional 42.20 mm in one hour.

Figure 3

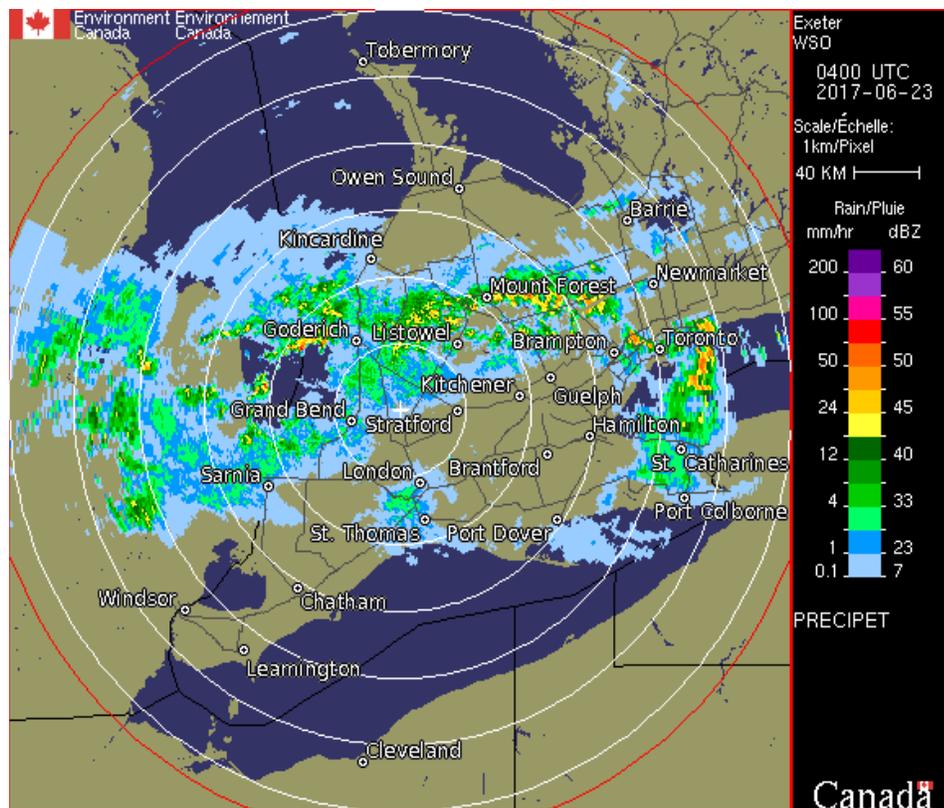
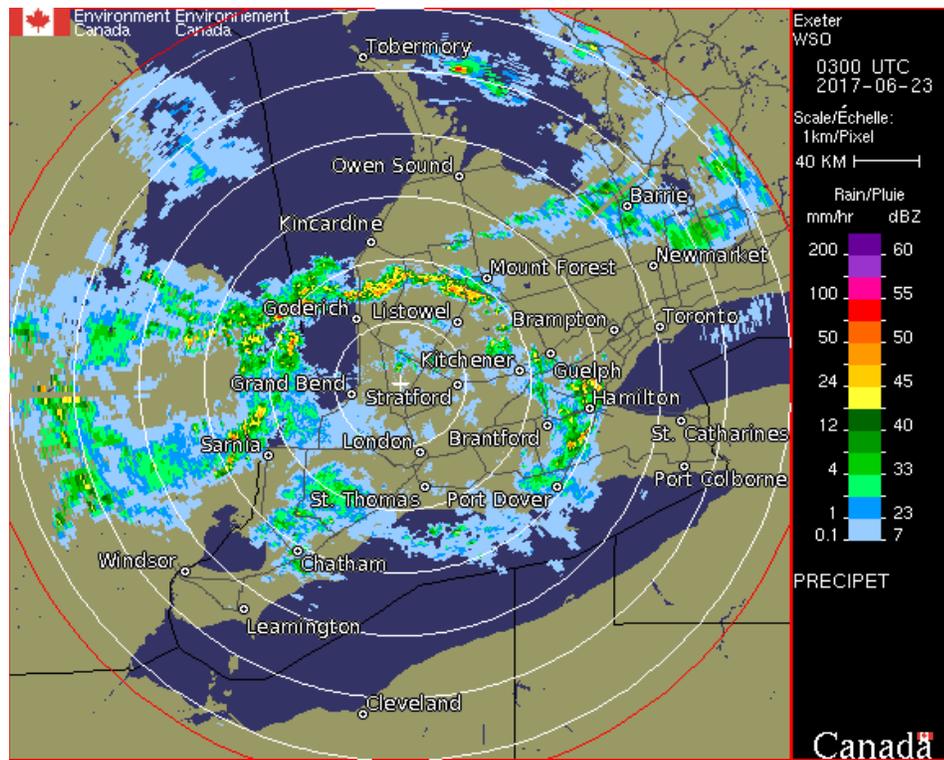
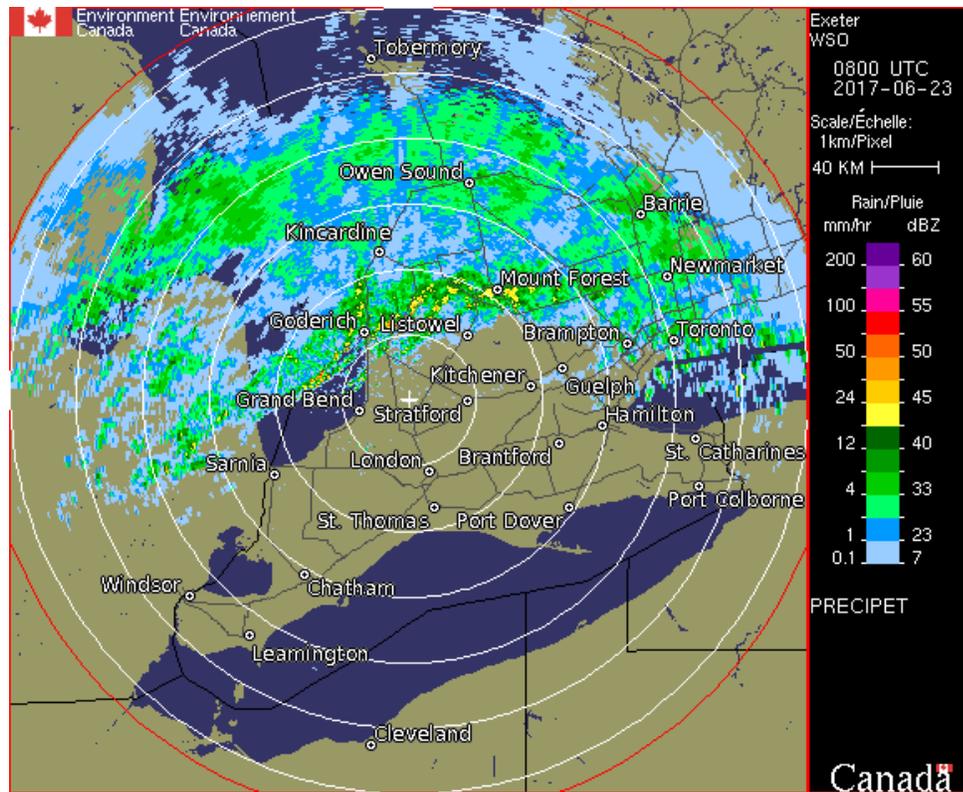
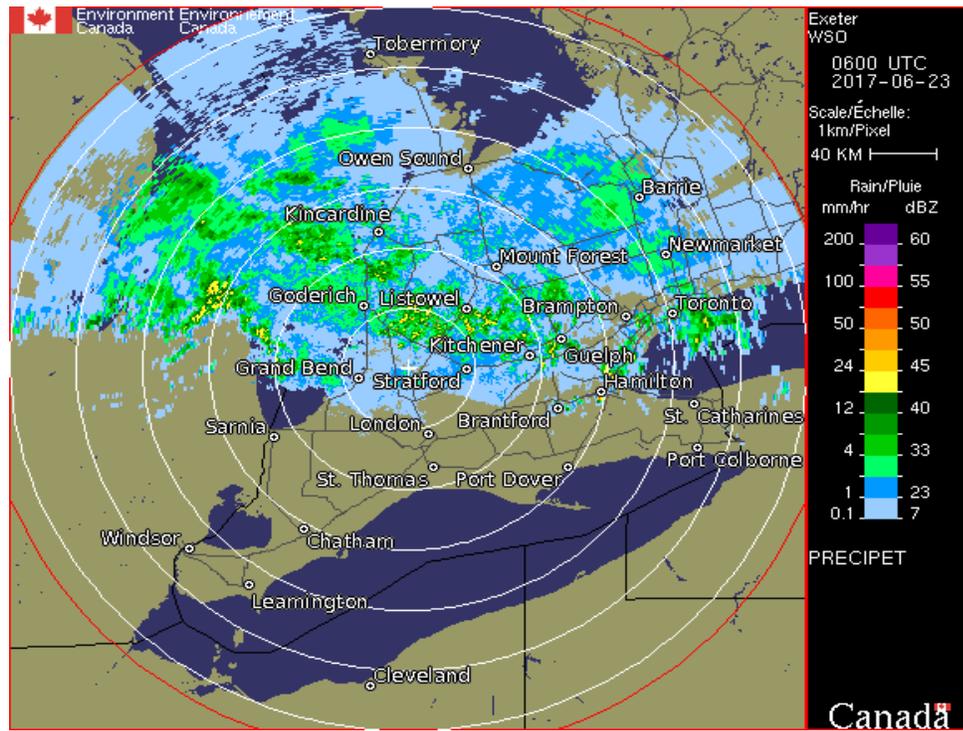


Figure 4



The amount over a 6 hour period was 143.40 mm. This quantity almost doubles the 100-year rainstorm of 76.3 mm for a 6-hour event. In fact, it easily exceeds the 100-year storm for a 24 hour period of 99.2 mm.

4.0 Flood Magnitude

The South Saugeen River watershed received the vast majority of the rain and it also experienced the severest flooding. There are three stream gauges on the South Saugeen River (Fig. 2). The “South Saugeen River below Mount Forest” gauge (or Mount Forest gauge in this report) is located west of the Town of Mount Forest, the “South Saugeen River at Cedarville” gauge located upstream of Mount Forest, and the “South Saugeen River above Hanover” gauge situated at Concession 16 just northeast of Neustadt (or Neustadt gauge in this report).

The Mount Forest gauge started operating in 1985 and is owned by the SVCA. The Cedarville gauge is owned by the SVCA but it was inoperative at the time, although the rain gauge functions. The Neustadt gauge is owned by Water Survey of Canada (WSC) and has been in use since 1972, although there are some years when data are missing.

The peak flows that occurred in this flood are the highest so far this year for five streamflow monitoring stations. If no larger floods occur for the rest of 2017 for these five watercourses, then it will be the first time since data has been recorded at these stations that the annual high flow occurred in the month of June. These five stations and the years they became operational are: Neustadt (1972), Mount Forest (1985), Paisley (1984), Teeswater (2007), and Walkerton (1915). Walkerton is especially noteworthy because there is over 100 years of data available.

The provisional peak flow at Mount Forest of 231.50 cubic metres per second (cms) occurred on June 23rd at 1:00 pm. This represents a maximum for the period of record of 31 years. That is to say this is the highest flow since the station has been in operation and not to imply that a higher flow has necessarily never occurred before.

This flood was 2.7 times larger than the average annual flood of 86 cms. It was also 38% larger than the previous peak flow of 168 cms measured in 2000. The normal June flow at Mount Forest is only 2.7 cms.

The provisional peak flow at the Neustadt gauge of 336 cms occurred about six hours later. While this is the maximum discharge measured since 1972 and it substantially exceeds the previous high of 251 cms in 1975, there are a few years of missing data. Also, the 336 cms is estimated by the SVCA, as WSC has not yet verified the raw data.

This flood on the South Saugeen River exceeded the 1 in 200 year flood. This estimated recurrence interval for the June 23rd flood is based on a relatively short period of data collection and so could be subject to revision in future years. The definition of a 200-year flood is a flood that has a 0.5% chance of being equaled or exceeded in any given year.

An additional noteworthy feature of this flood was the rapidity of the water level rise and quick time to peak. At one point the water level was increasing at 0.57 metres per hour at Mount Forest. The peak at Mount Forest was reached in only 13 hours from pre-flood flow condition, a very fast time. Moreover, the time between the start of the rain and the peak flow at Mount Forest was only 15 hours. The May 2000 flood, which was the largest flood for the South Saugeen at Mount Forest till now, took 23 hours to peak. While this river does react relatively quickly to rain events for a rural watershed, this particular flood was even more rapid than usual.

The hydrograph for the Mount Forest gauge (Fig. 5) shows the rapid rise in flow.

The South Saugeen River joins the Main Saugeen River just south of Hanover in Knappville. During the flood the excess flow from the South Saugeen entered the Main Saugeen and caused flooding on that river, although to a lesser extent. The peak flow at Walkerton was 381 cms and it arrived just 15 hours after the peak at Mount Forest. This flow at Walkerton was the highest so far this year, surpassing the flow of 223 cms back on February 25th. Although the June flood was higher than the average annual flood (294 cms), it represented a flood magnitude of just over a 5-year flood. There are 101 years of flow data for Walkerton and there are 20 annual flood events with higher flows than this June event.

The main damages from this flood appear to be mostly to municipal roads and culverts and private laneways. Numerous roads were overtopped in the North Wellington and Minto areas. There were no large areas of residential dwellings affected, although many rural properties were impacted. The South Saugeen River in Mount Forest is within a deep valley and there are relatively few residences in the flood plain, so fortunately flood damages there were not extensive.

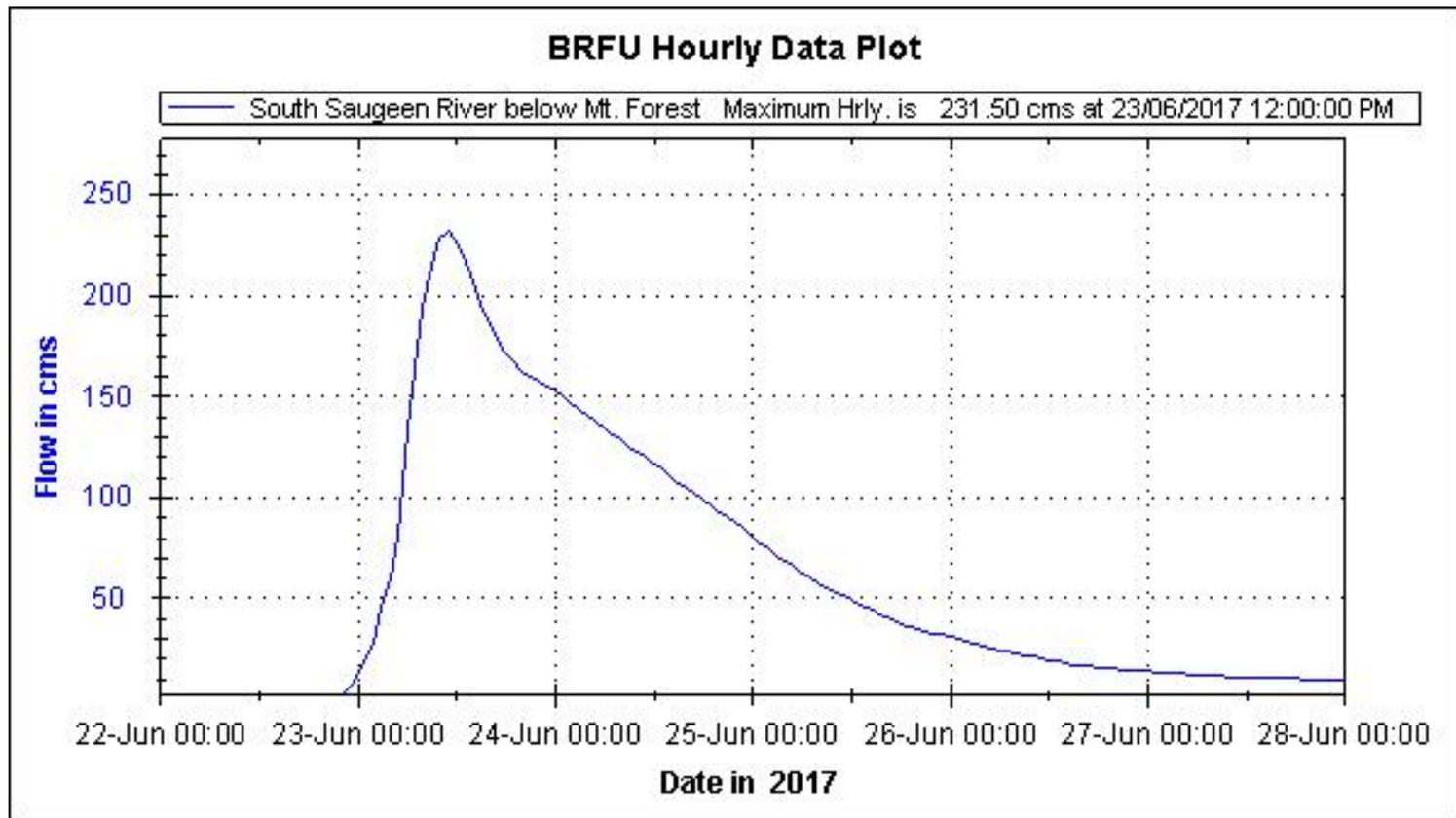
All watercourses in the SVCA Watershed were rising on June 23rd in response to the area-wide rainfall. As mentioned above, though, primarily it was only the South Saugeen and lower section of the Main Saugeen that had noteworthy flooding.

It was fortunate the heavy rainfall did not extend farther north than it did. If a large amount of rain had fallen in the Main Saugeen River watershed as well then flooding at Walkerton could have been very serious.

5.0 Flood Messages and Social Media

A total of three flood messages were issued by the SVCA Flood Forecast Centre. The first was on June 23rd at 11:30 am when a Flood Warning and Flood Watch statement was sent out. The Flood Warning applied to the South Saugeen River watershed, including the municipalities of Wellington North, Southgate, and Minto, and the Flood Watch applied to the remainder of the SVCA Watershed. The second message extended the Flood Warning to include West Grey and South Bruce, as the flood wave progressed downstream. The third message was early on June

Figure 5



24th and lifted the Flood Warning but kept the Watch in effect, as streamflows were still higher than normal.

The messages also advised the public not to use the Main Saugeen River for recreational activities such as canoeing. The high water, strong currents, turbidity, and floating debris posed an extreme risk to watercraft.

In addition to sending out flood messages, Authority staff also post the same information and frequent updates and photos on its social media platforms, such as Facebook. Remarkably the Flood Warning posting had 12,365 “people reached”, whereas a typical Authority posting has 300 to 600 “people reached”.

In the SVCA jurisdiction two municipalities declared states of emergency, the Town of Minto and the County of Wellington. The primary areas of concern were in the Maitland Valley Watershed.

6.0 Documentation

During much of the flood event SVCA staff was in the field taking photographs and reporting their observations back to the Flood Forecast Centre. After the flood, staff travelled the affected area photographing high water marks and debris lines for future reference.

Respectfully submitted,

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