



# Background Briefing

## Reservoir operations

December 2014

### The GRCA reservoir network

The GRCA's seven dams and reservoirs play a vital role in protecting the health and safety of residents of the watershed.

The reservoirs were built between 1942 and 1976 to address major, long-standing problems:

- A) frequent and severe floods,
- B) dried-up rivers in the summer, and
- C) poor water quality throughout the year.

#### A) Flood damage reduction

The reservoirs are managed to provide maximum flood storage when it is needed most – in the spring, to handle the spring melt, and in the fall to deal with remnants of tropical storms. However, major storms can strike at any time of the year so the reservoirs are operated year-round to reduce flood damages.

Water levels are lowest over the winter. The reservoirs are filled during the spring runoff and reach peak levels around June 1.

During the spring melt or after a heavy rain, river flows upstream of the reservoirs can rise quickly and dramatically – sometimes hundreds of times greater than normal.

As water flows into a reservoir, some of it is stored temporarily, depending on how much space is available. At these times, discharges from the reservoir will be less than the inflows so downstream flood peaks will be lower.

Discharges may continue for some time after the storm is over



Conestogo Dam and Reservoir.

to regain storage space and prepare for the next storm.

The reservoirs can reduce flood peaks significantly. For example, in December 2008, during a mid-winter melt, flood peaks were reduced 35 to 75 per cent. Without the reservoirs, flood levels would have matched, or exceeded, the levels of May 1974, one of the biggest floods on record.

#### B) Low flow augmentation: water supply

After the spring melt, the water stored in the reservoirs is slowly released to add to the natural flows in the river system.

Natural flows drop off in the summer and fall. In a dry year, natural flows can be only a fraction of normal – as low as 10 per cent. That means that 90 per cent or more of the water in the Grand River at Doon (Kitchener) can come from the reservoirs.

Augmenting natural flows with reservoir water ensures there is enough water for more than 500,000 people living in communities that get some or all of their drinking water from the Grand River: Waterloo Region, Brantford and Six Nations.

#### C) Low flow augmentation: water quality

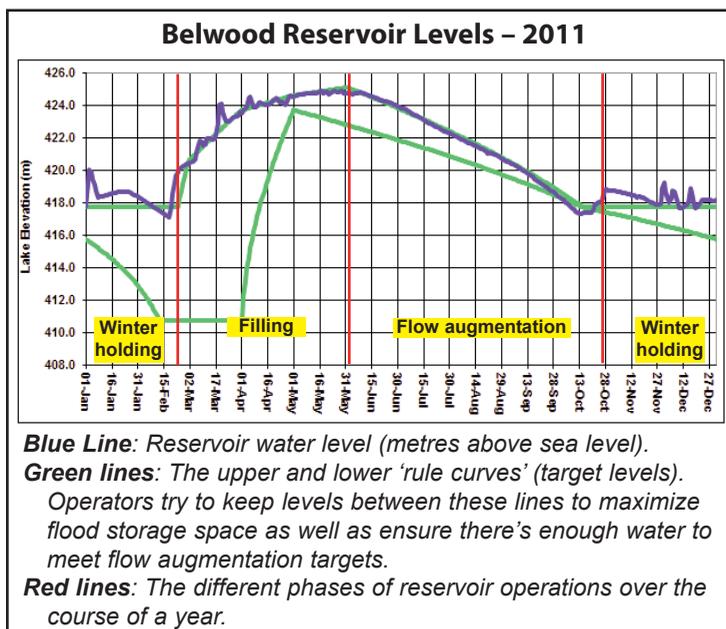
More than 15 sewage plants, treating 90 per cent of the sewage of the watershed, lie downstream of the reservoirs.

These sewage plants provide a high level of treatment. However, even the newest and most advanced plants release treated effluent containing residual amounts of pollutants.

Those residual pollutants are assimilated through natural processes in the river. However, there must be enough water in the river so that can happen.

Water discharged from the GRCA's reservoirs ensures there is enough flow to allow the river system to assimilate the treated effluent and protect water quality for people, aquatic life and the ecosystem.

The GRCA has committed to use the water stored in the reservoirs to meet the needs of the sewage plants.



## Finding the balance

The two principle functions of the reservoirs – flood damage reduction and flow augmentation – sometimes conflict with each other.

That requires careful managing of discharge rates by reservoir operators to find the right balance in an effort to meet both objectives.

The most challenging period is in late spring and early summer when reservoirs are fullest.

The GRCA has established daily reservoir target levels – called “rule curves” – to guide reservoir operators. (These are the green lines on the chart on Page 1)

These rule curves are based on decades of experience plus the use of sophisticated computer flow models.

The targets call for the reservoirs to be filled by about June 1. That means there will be enough water on hand to augment flows through the summer and fall.

However, that means the reservoirs have very little space left to handle runoff from a major storm. In fact, at that time of year the two major reservoirs – Conestogo and Belwood (Shand Dam) – have enough room to hold only 10 mm of runoff or less.

So when there is a storm, operators have to discharge high volumes of water to offset inflows. The ability to manage flows is limited.

Variations in the weather can pose challenges, too. In a wet year, operators may have to increase discharges more frequently to maintain flood storage capacity. In dry years it may be difficult to fill the reservoirs in the spring so discharges have to be managed to conserve water for flow augmentation.

In addition, there are constraints on how much water can be released without causing problems to downstream communities.

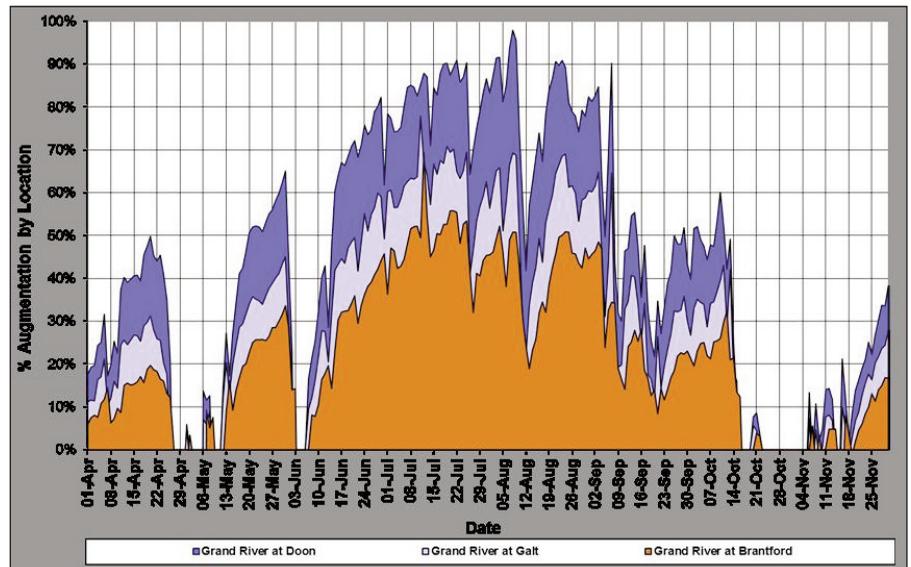
For example:

- discharges of more than 100 cubic meters per second from Shand Dam could flood out businesses in Elora or riverside trailer parks.
- discharges of more than 35 cubic meters per second from Conestoga Dam will flood out a bridge in the village of St. Jacobs.

(Normal summer discharges from these reservoirs are about four cubic metres per second.)

In normal summer conditions, reservoir operators will try to manage flows to support recreational activities (boating, fishing, etc.) on the reservoirs and the river. However, when conditions change, flood control and flow augmentation take precedence.

### Grand River Flow Augmentation - 2012



Water from GRCA reservoirs keeps the Grand River flowing even in dry weather. In August 2012, more than 95 per cent of the water in the Grand at Doon (Kitchener) came from GRCA reservoirs. Without the reservoirs, the river would have dried up to a trickle.

