



# REGIONAL DISTRICT NORTH OKANAGAN

## 2020 GREATER VERNON WATER (GVW) WATER SHORTAGE MANAGEMENT PLAN (WSMP)



*Grizzly Reservoir and Dam*

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## PURPOSE

Greater Vernon Water (GVW), a service provided by the Regional District of North Okanagan (RDNO), has developed the *Water Shortage Management Plan* (WSMP) to provide staff with an operational framework based on sound, measurable triggers to direct the utility's response during water supply shortages.

## BACKGROUND

GVW's first Drought Management Plan (DMP) was developed in 2004, after the 2003 B.C. drought. A detailed review was completed again in 2011, following a drought in 2010 that determined the original DMP and restrictions were not appropriate. The 2011 update included an extensive community consultation process to develop restrictions based on the actual usage patterns by customer sectors: residential, commercial/industrial, agricultural, and civic/institutional. Another review was completed in 2017 to widen the scope to include non-drought supply shortages (i.e. major infrastructure projects or operational limitations where water needs to be severely restricted), as well as provisions for Environmental Flow Needs (EFNs) as required by provincial legislation.

This WSMP provides operational procedures and triggers only; it does not include the assessment, analysis, or details as to why the specific triggers were developed. For more information about the trigger factors used to monitor for supply shortages, please refer to the background report entitled *Water Shortage Management Review For Greater Vernon Water* (Associated Environmental, 2017) and the *GVW Drought Management Plan* (Clark Geoscience Ltd., 2011) posted at <https://www.rdno.ca/restrictions>.

The core elements of the WSMP include:

1. Decision Process (Staff Team, Critical Dates)
2. Water Shortage Triggers
3. Water Shortage Response (Restriction Stages)
4. Water Shortage Communications Plan
5. Debrief and Evaluation

## 1. DECISION PROCESS

The General Manager, Utilities (G.M.) has the designated authority to establish water restriction stages per [Greater Vernon Water Use and Regulation Bylaw No. 2545, 2014](#). To assist the G.M., a Supply Shortage Response Team (SSRT) composed of RDNO staff monitors the water shortage triggers. The SSRT (Figure 1) is an informal group that meets periodically at key times throughout the year, with an increase in frequency during times of water stress, to provide recommendations on changing the Restrictions Stage if required. The SSRT assesses the Restriction Stage Triggers using the WSMP Decision Tree framework (Appendix A).

The WSMP Decision Tree aids in determining the Restriction Stage required to manage sustainable supply levels for customer needs until either the drought has ended or infrastructure capacity is reinstated. Any change in Restrictions Stage will lead to changes in demand-side



management and operational control of the water supply via the directives of the SSRT. These actions are outlined in the Response Summary (Appendix B) and Communications Plan (Appendix C).

Figure 1 – Supply Shortage Response Team (SSRT):



## **2. WATER SHORTAGE TRIGGERS**

Four (4) key triggers are used to assess the current status of the supply, the supply forecast, and to determine if a shift in Restriction Stage is required:

- i. Current Water Storage,
- ii. Current Moisture Conditions,
- iii. Forecast Weather Conditions, and
- iv. Forecast Customer Water Demand.

These triggers are compared in the order listed against set metrics. The WSMP Decision Tree (Appendix A) is used to assess those metrics, determine whether there is a risk of a water shortage condition, and what Restriction Stage is required to manage water supplies.

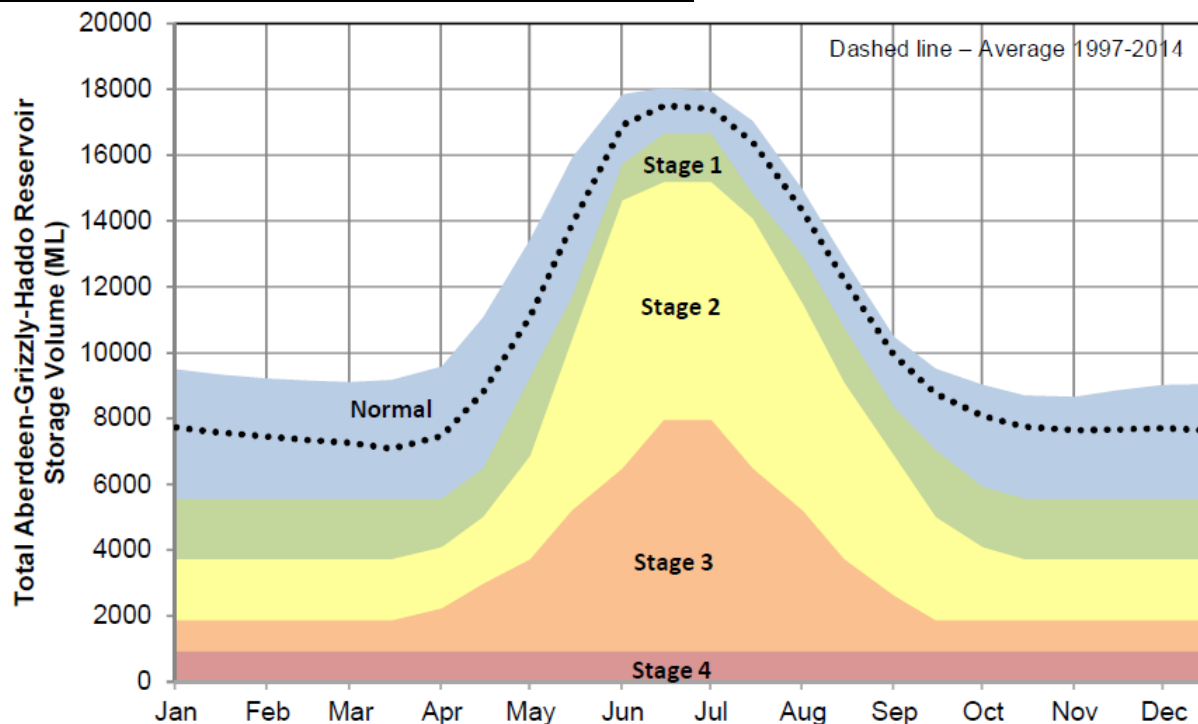
### i. Current Water Storage

GVW has two primary surface water sources: Duteau Creek, the primary agricultural source providing 70 to 80% of summer/peak flows and Kalamalka Lake, the primary domestic source. These sources are interconnected, and during peak summer flows, both are critical to meeting customer demands.



The **Duteau Creek** source relies on three (3) reservoirs (Aberdeen, Grizzly, and Haddo). The use of stored water throughout a year is reflected in the water storage curve (Figure 2). This curve represents the collective volume of these reservoirs. Based on historical use and watershed hydrology, five (5) stages (Normal, 1, 2, 3, and 4) have been developed to trigger the Restriction Stage needed to reduce the risk of further restrictions or supply loss.

Figure 2 – Duteau Creek Water Storage Trigger Graph

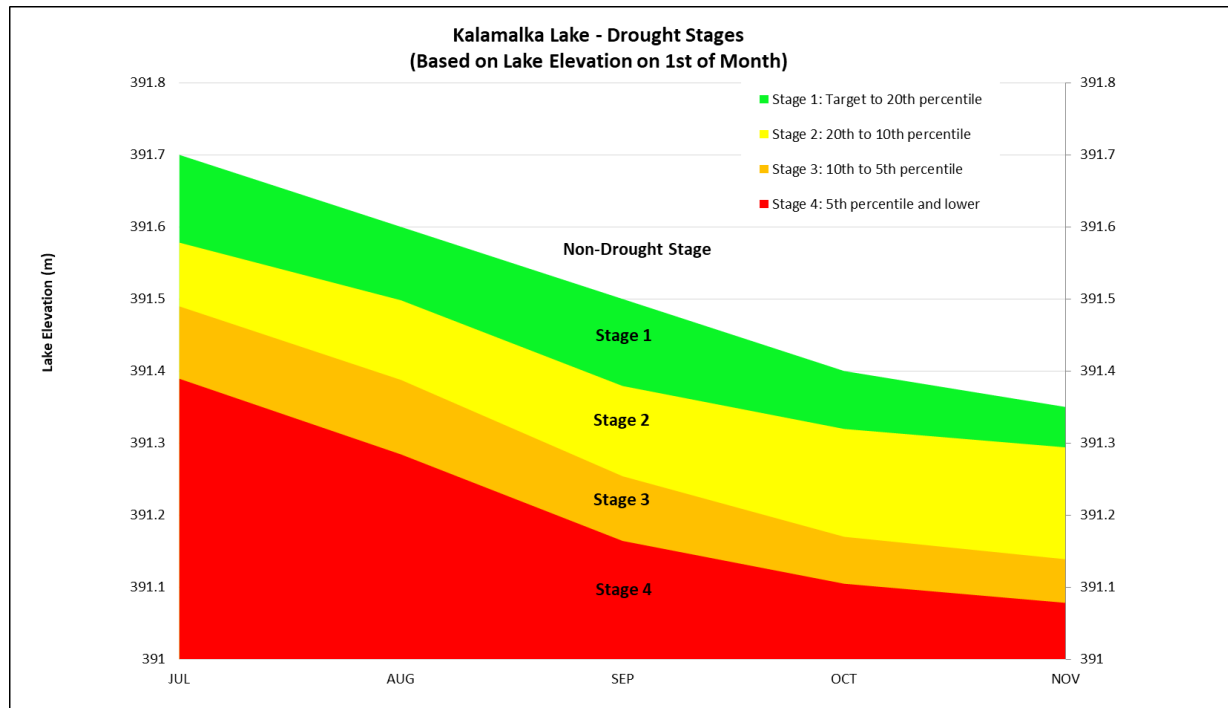


Reservoir storage is the first trigger used in the WSMP Decision Tree (Appendix A). Although storage appears to be of primary importance, the other triggers assist in making a balanced decision. For example, history has shown that a late high elevation snowmelt and significant June rains will fill the reservoirs to normal despite reservoir storage being at Stage 1 or Stage 2 in late May or early June.

The **Kalamalka Lake** drought stage trigger levels (Figure 3) were developed by the Okanagan Basin Water Board (OBWB) and the Ministry of Forests Lands and Natural Resource Operations (MFLNRO) in 2018. They recommended that the trigger levels be adopted into water purveyors' Water Shortage/Drought Management Plans, providing a common supply management framework for the Okanagan Basin. However, MFLNRO recognizes the proposed lake trigger levels will need to be assessed over several years to evaluate their operational impacts and should be considered as one of several factors that determine a purveyor's supply status. GVW will monitor the impact of the proposed trigger levels and assess how to implement over time.



Figure 3 – Kalamalka Lake Drought Stage Trigger Levels



The **King Edward Lake** source is a small reservoir used by a small number of GVW agricultural customers. Staff monitor water demand to forecast the lake drawdown rate carefully throughout the summer. Staff have committed to work one-on-one with the major water users on this source to ensure they are aware of the supply situation and can coordinate direct actions with these users to reduce the risk of source loss.

GVW supplies two (2) small population neighbourhoods from **Okanagan Lake**: the Outback Resort and Delcliffe Road area. These sources are more likely to be limited by infrastructure capacity than a hydrologic drought. In the event of a water shortage, these areas would be put on restrictions as appropriate for their source.

## ii. Moisture Conditions

Existing moisture conditions in the watershed are monitored via a review of snowpack levels from January to May, which then switches to rainfall for the remainder of the year. Monthly snowpack and snow water equivalency is measured at three (3) GVW snow courses (Sites 1F01A, 2701, 2702) and three (3) provincial monitoring sites (B.C. River Forecast Centre Sites: 2F10P-Silver Star Mountain, 2F19-Oyama Lake, 2F07-Postill Lake). The snow depth recorded each month is compared to the monthly average calculated from the years of data on record for each site. The results are used to select the Above Average, Average, or Below Average options in the WSMP Decision Tree (Appendix A) for this trigger.

Staff review seasonal weather records to assess conditions that led to positive or negative reservoir storage impacts. Seasonal rainfall and temperature data are assessed via a GVW weather station recently established at the Aberdeen Dam. GVW also monitors piezometers at





their snow course sites to assess soil moisture and groundwater conditions that may have led to unusual conditions, such as years with high snowpack, not resulting in full reservoirs.

iii. Forecast Weather Conditions

The purpose of this trigger is to monitor weather conditions that drive customer water demand. Weather records are collected from Environment Canada's Vernon area weather stations in addition to monitoring forecast weather conditions. Favourable conditions are determined as being at or above average for the time of year. Temperature and precipitation are the focus of this trigger, but run-off volume is also considered to relate weather to water inflows. The Kalamalka-Wood Lake run-off forecast by the B.C. River Forecast Centre provides a forecast assessment compared to historic normal run-off. A forecast of 80% of normal or higher is considered favourable.

iv. Forecast Customer Water Demands

Customer water usage, also referred to as demand, is highly correlated to weather conditions. For example, a weather forecast of hot and dry conditions mid-summer will likely increase water demand, whereas cooler temperatures and rain in a forecast will likely see a decrease in demand. Time of year is also a factor in this assessment. For example, if a water shortage was experienced in mid-September, demands would be expected to decrease with agricultural shutdown; however, this trigger may be elevated if current water use was exceeding the expected average water use. This is the last trigger used within the WSMP Decision Tree (Appendix A) to determine the Restriction Stage and is assessed as either High or Low demand.

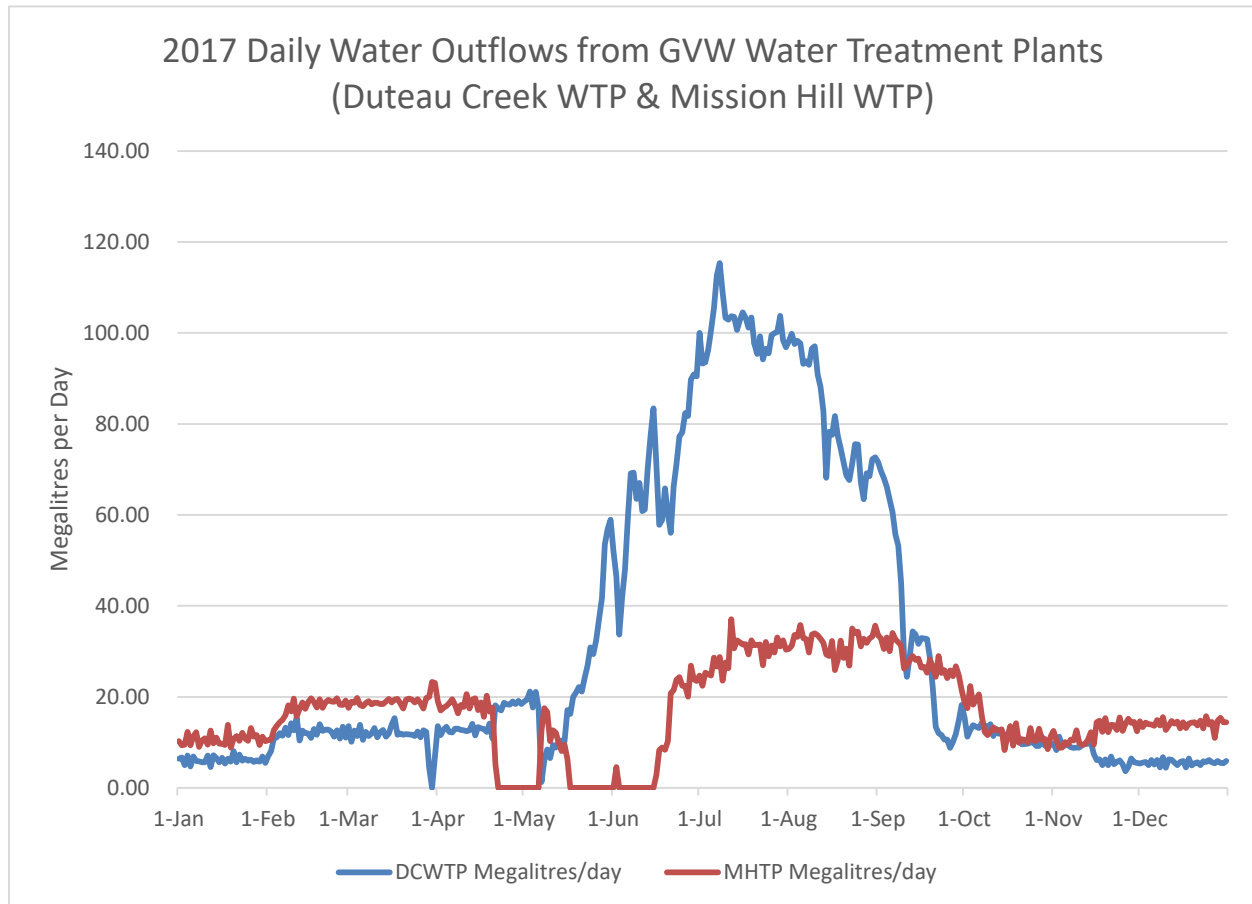
Total demands from the Duteau Creek source are compiled from the Duteau Creek Water Treatment Plant (DCWTP), the separated non-potable system, and the fisheries flows released to Duteau Creek for Environmental Flow Needs (EFN). An EFN calculator was developed in 2015, in partnership with the Province, for the purpose of supporting EFNs as required by the B.C. *Water Sustainability Act*. Metered flows from the Mission Hill Water Treatment Plant (MHWTP) represent demand on the Kalamalka Lake source. Water demand from the remaining non-potable GVW water sources are monitored at the point of entry to the distribution system.

Figure 4 illustrates the annual demands experienced in 2017, a recent peak demand year, for GVW's two (2) primary water sources. The flows represented by this graph are variable on a year to year basis and are highly dependent on weather. Water quality can impact the use of sources as highlighted in Figure 4 by the period of zero flow from MHWTP in May-June 2017, which reflects when the MHWTP was shut down due to high turbidity.

GVW's summer water demand is primarily driven by the agricultural sector, as shown by the DCWTP peak in Figure 4 of approximately 115 ML/day (higher peaks up to 120 to 140 ML/day are also possible). Domestic outdoor watering is the next highest use, as shown by the summer demand peak (30-35 ML/day) from the MHWTP being three (3) times the winter water demand (10-15 ML/day).



Figure 4 – 2017 Daily Duteau Creek and Mission Hill Treatment Plant Water Production



Customer demand rates (i.e. ML/week of use) are also used as a forecast tool to assess the potential rate of reservoir drawdown. This forecasts expected reservoir levels if current demand rates are maintained and if a new Restriction Stage on the Duteau Creek Water Storage Trigger Graph (Figure 2) will be reached. Typically this is only completed for a short term forecast on the order of days and is used in combination with the seven-day weather forecast.

### 3. WATER SHORTAGE RESPONSE

Water use restrictions are implemented to manage a supply shortage. The Restriction Stages include Normal, Stage 1 (dry), Stage 2 (very dry), Stage 3 (extremely dry) and Stage 4 (emergency). The level of response for each stage is detailed in the Restriction Stage Response Summary provided in Appendix B. It outlines the demand reduction goal for each Stage, the fisheries flow (EFN) targets, demand management response actions, and level of enforcement.

### 4. WATER SHORTAGE COMMUNICATIONS PLAN

The Water Shortage Communications Plan (Appendix C) provides detailed procedures, including schedules for messaging and message templates, for public outreach according to each Restrictions Stage. In addition to this Plan, which is primarily focused on residential and ICI





(Industrial/Commercial/Institutional) customers, a separate Agricultural Water Supply Communications Plan (Appendix D) was developed in partnership with the Okanagan Basin Water Board (OBWB). This Plan is focused on the shared agricultural text/email alert service managed by the OBWB. Both of these communication plans include key messages and graphic templates to aid staff in providing a consistent message that reflects the demand reduction goals of each Restriction Stage. As these plans have been shared with other water utilities in the Okanagan, it is hoped that the public will see the same messages whether they live in one community and work in another, making it easy to adopt demand reduction behaviours.

Key stakeholders will be contacted when staff forecast a change in Restriction Stage. The RDNO Board of Directors, through the Greater Vernon Advisory Committee, will be updated by the G.M. when the decision is made to move to a higher Restriction Stage. The Drought Stakeholder Working Group (DSWG) should be contacted annually to be informed of the forecast supply status, in addition to being contacted when any Restriction Stage changes are approved by the G.M. The DSWG Terms of Reference (online at <https://www.rdno.ca/restrictions>) outlines membership criteria and the group's mandate. The High Volume Water User List may also need to be contacted in the event of a change in Restriction Stage, as outlined in the Communications Plan.

The G.M. is responsible for delegating staff and GVW's authorized agents (City of Vernon and District of Coldstream operations crews) to non-standard work assignments, which may include:

- responding to customer calls/emails
- delivering notifications – including the distribution of temporary signage (sandwich board signs) as well as door-to-door notifications if needed in an emergency.

## **5. DEBRIEF AND EVALUATION**

The Water Sustainability Coordinator will arrange a Water Shortage Response Debrief following the implementation of Stage 1 or higher restrictions. This debrief will focus on an evaluation of:

- operational challenges that occurred
- water demand rates
- weather patterns
- hydrologic conditions
- media reach
- customer feedback
- communications with other jurisdictions
- budget impacts (from drought-related costs such as overtime, more proactive water main leak repair, water hauling or other costs).