

About NEWT (NorthEast Water Tool)

The BC Oil and Gas Commission ('Commission') has developed a hydrology tool (NEWT) to support the decision-making process for short term water use approvals. The Ministry of Forests, Lands and Natural Resource Operations (FLNRO) and Geoscience BC partnered with the Commission on the project.



NEWT has an underlying hydrological information database, developed through a hydrology modelling project (Chapman, et. al, 2012), and is designed to query locations on rivers or lakes throughout NorthEast BC to determine the monthly and annual average runoff at that location. This hydrology data represents the 30-year average (or "normal") runoff. In addition, NEWT is designed to query all short term water use approvals and all water licenses issued pursuant to the BC *Water Act*, to quantify how much water is already allocated.

NEWT contains an "environmental flow needs" (EFN) concept, based on environmental flow guidelines from Alberta (Locke and Paul, 2011), and modified to be consistent with the BC Ministry of Environment's "*Environmental Flow Needs*" policy, dated March 1, 2014. The general concept of the EFN approach is that a maximum of 15% of runoff is available for withdrawal for usage; with reduced water withdrawal in some streams during the winter period when flows are naturally low due to winter conditions. The MOE EFN policy is based on a risk assessment process derived from the calculated Average Annual Discharge (AAD) and Mean Winter Discharge (WINTER):

- EFN is 85% for each month, except:
 - If AAD is $<10 \text{ m}^3/\text{s}$, and WINTER is $<10\%$ of AAD, then EFN for December, January, February and March is 95% of each winter month;
 - If AAD is $<10 \text{ m}^3/\text{s}$, and WINTER is $\geq 10\%$ and $\leq 20\%$ of AAD, then EFN for December, January, February and March is 90% of each winter month;
 - If AAD $\geq 10 \text{ m}^3/\text{s}$ and WINTER is $<10\%$ of AAD, then EFN for December, January, February and March is 90% of each winter month.

The basic output from NEWT is guidance on natural water supply and water availability, to assist decision-makers with water allocation decisions. This is just one piece of information that can be considered by a Statutory Decision Maker in making a water allocation determination.

Limitations of NEWT

NEWT has some limitations that are important for users of NEWT to be aware of. The limitations derive, generally, from the underlying data and information on which NEWT is built:

1. **Hydrology Modelling:** The hydrology information is derived from hydrology modelling, and so has inherent uncertainties. The median error in the modelling was 3.7 percent, and 78 percent of the basins used for model calibration were modelled within ± 20 percent of their observed flow (Chapman et. al., 2012). In hydrology modelling literature, this level of uncertainty is considered to be quite good. Nevertheless, the hydrology values are estimates and have uncertainty.
2. **Water Allocation Data:** The short term water use information available at present from the Commission's database and the water license information available from the FLNRO database are limited, and result in total water allocations on a monthly time scale being over-estimated.
 - Data on short term water use approvals from the Commission's database are for daily maximum withdrawals and annual maximum withdrawals. To determine monthly withdrawals, as shown in NEWT, a value is calculated as the daily rates are multiplied by the number of days in the month. This represents an extreme theoretical maximum water

use. Although the total annual withdrawal already approved will be correct, the total monthly withdrawal shown in NEWT will be exaggerated (e.g., users will note that the sum of the monthly approval volumes exceeds the annual approval volumes substantially).

- Similarly, there are limitations with the FLNRO water license database for its use in NEWT. The water license information from the Ministry's database may be for daily, monthly or annual time periods, but usually requires NEWT to estimate a monthly allocation. Also, many water licenses have seasonal withdrawal approvals (e.g, a higher rate during spring high flow and a lower rate during winter low flow). The available digital data in the FLNRO database shows only the maximum rate, which, when applied in NEWT, over-estimates the amount of water licensed.

As a result of these data uncertainties, it should be expected that NEWT will almost always show greater monthly water allocation than what is actually approved. There may be some instances where NEWT may show some basins (particularly quite small basins) as being over-allocated, in relation to the Environmental Flow guidance. Decision-makers in the Commission and the Ministry have access to additional and more detailed information than is currently available in the digital databases, to review and evaluate to determine whether any additional water is available for allocation.

3. **Modelled Runoff vs. Actual Runoff:** NEWT is designed to present average monthly and annual runoff conditions, based on a 30-year "normal" period. However, at any point in time, actual runoff conditions will be different from average conditions. As examples, during the summer of 2012, actual runoff was significantly lower than average, while in other years, such as 2011, actual runoff during the summer period was greater than average. Where actual flow is significantly lower than normal, decision-makers may decided that approvals will not be issued for some river basins despite NEWT suggesting there is water available; conversely, in periods where actual flow is significantly higher than normal, decision-makers may decide to issue approvals for short term water use in situations where NEWT suggests a basin is fully allocated. Decision-makers may also choose to address unusual low flow and high flow situations by special conditions in the authorizations.
4. **Watershed Mapping:** NEWT is constructed using the Ministry of Environment's Freshwater Atlas (FWA) map coverage as the underlying basin or watershed mapping. The FWA is derived from 1:20,000 topographic mapping, with the heights of land separating one basin from an adjacent basin being interpreted from the topographic mapping. In some areas, particularly areas of low relief and for small basins of a few hundred hectares in area, the basin delineation may have some uncertainty.

References:

Chapman, A., Kerr, B. and Wilford, D. (2012): *Hydrological modelling and decision-support tool development for water allocation, northeastern British Columbia*; in Geoscience BC Summary of Activities 2011, Geoscience BC, Report 2012-1, p. 81–86.

(http://www.geosciencebc.com/i/pdf/SummaryofActivities2011/SoA2011_Chapman.pdf)

Locke, A., and Paul, A. (2011): *A Desk-top Method for Establishing Environmental Flows in Alberta Rivers and Streams*. Alberta Environment and Alberta Sustainable Resource Development.

(<http://www.environment.gov.ab.ca/info/library/8371.pdf>)

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