Incorporating EFNs in Water Management

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BC Oil and Gas Commission

BC Oil & Gas COMMISSION

OGC Water Responsibility

Water Sustainability Act is the legal authority for water allocation and stream management:

The Commission has responsibility for:

- Water Licences – s.9
- Short term water use approvals (maximum 2 years) – s.10
- Changes In and About a Stream (for roads, pipelines, etc.) – s.11
- Permits over Crown Land (for temporary water lines) – s.24

- Where there is an "**oil and gas purpose**".

Water Management Overview

- How Water Licences (s.9 = 5-20 yrs) and Use Approvals (s.10 = <2 yrs) are issued?

- How we manage water for all needs?
  - Fish, environment, human consumption, First Nations, agriculture, and industry.

- How we transform data/information into decision making?

Decision Making Questions

1. Is there any water available for allocation?
2. How much water is required for the environment and other users?

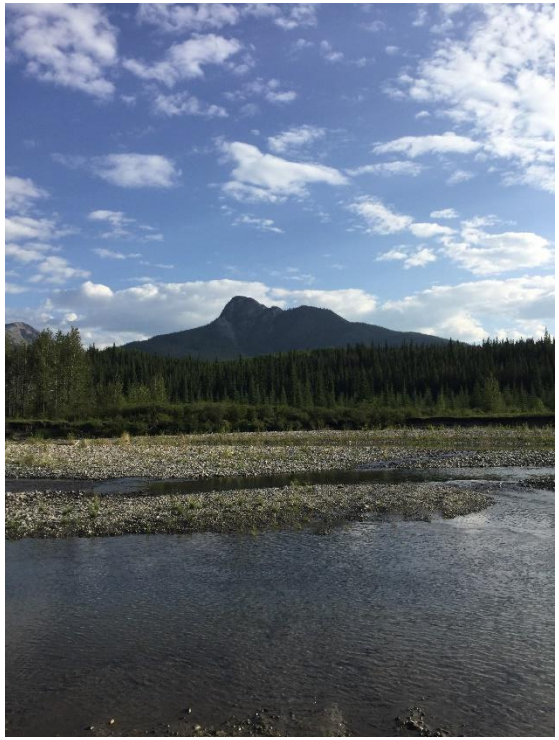
IT DEPENDS

- Natural variability
- Location (e.g. mountains, foothills or plains)
- Environmental sensitivity
- Other users
- Data/Information available
- Professional reliance

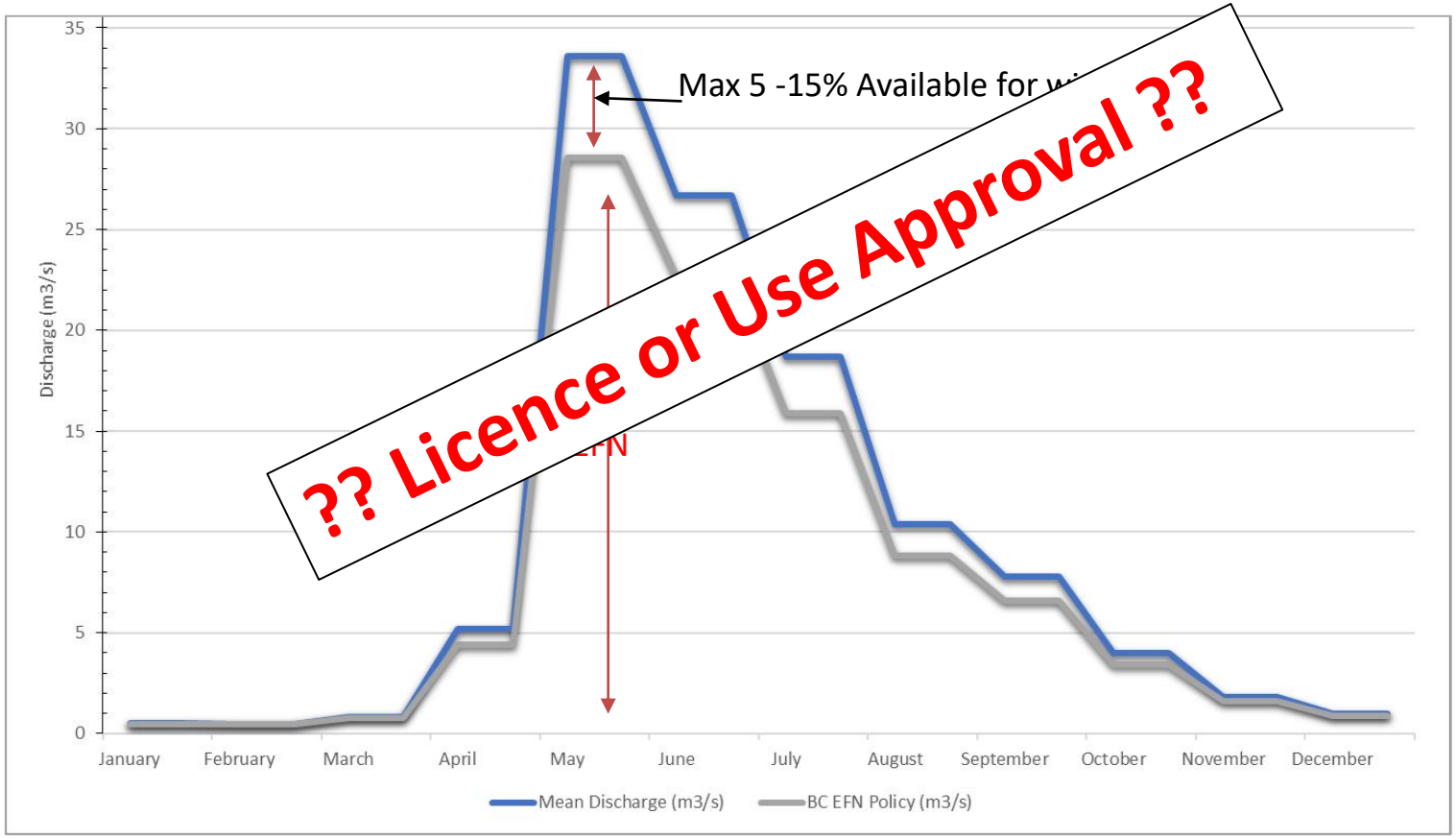
Available water

- **S. 15 of WSA –** decision maker must consider EFNs

- BC Environmental Flow Needs (EFN) Policy
  - All water users' withdrawals added together total 5 -20% of the water flow
  - OGC - Maintain minimum of at least 85% of natural flow (aim for 5-10% max)



Available water



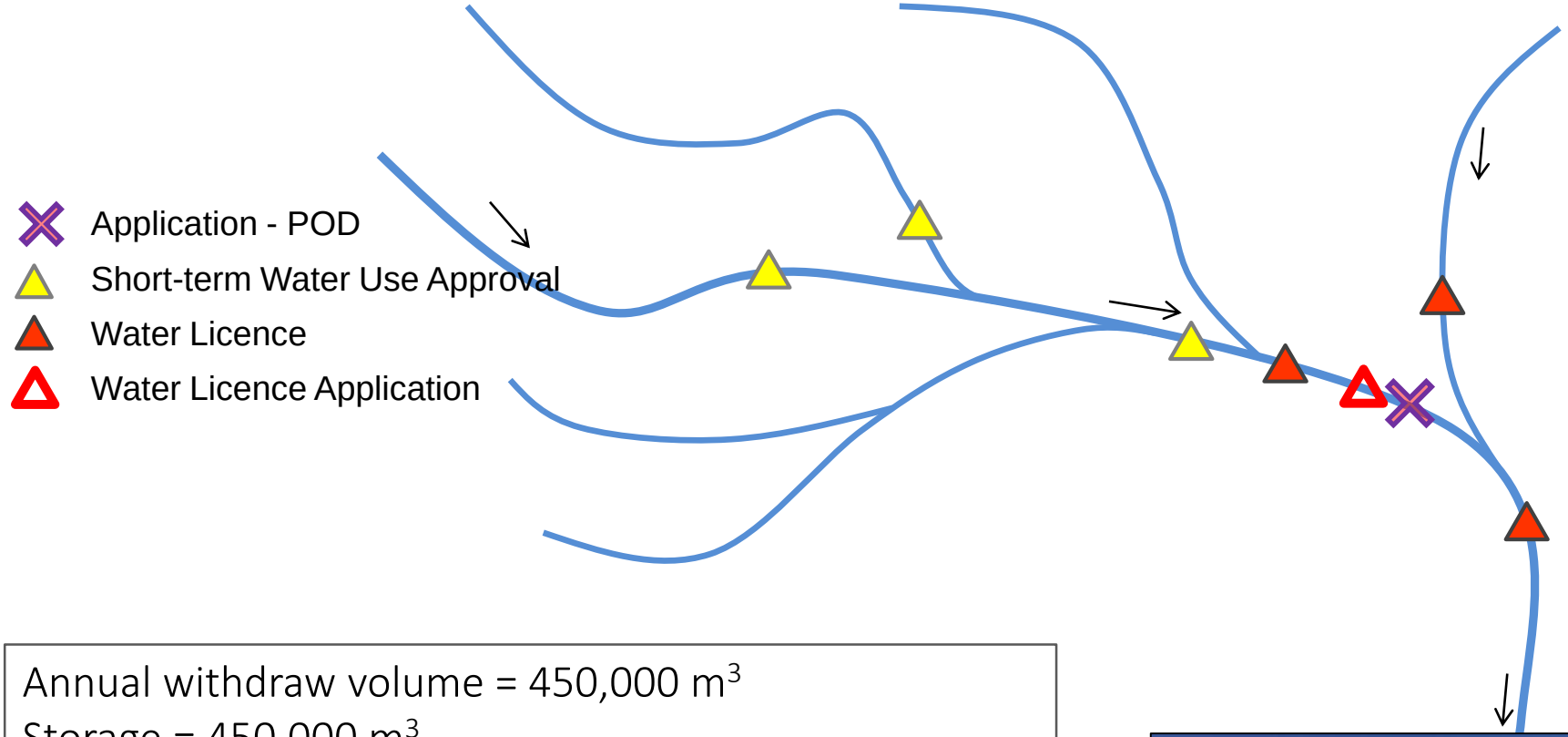
Example

S. Lapp Inc. Water Licence Application

S. Lapp Inc. Water Licence Application

- Point of diversion (e.g. stream name)
- Volume of water applied for (m^3) and pumping rate?
  - Annual, seasonal
  - Storage
- Other users upstream/downstream of POD
  - % of weekly/monthly average flows allocated
- Hydrologic analysis
  - Weekly/Monthly flows
  - Variability (high/low flows)
- Environmental Flow Needs assessment

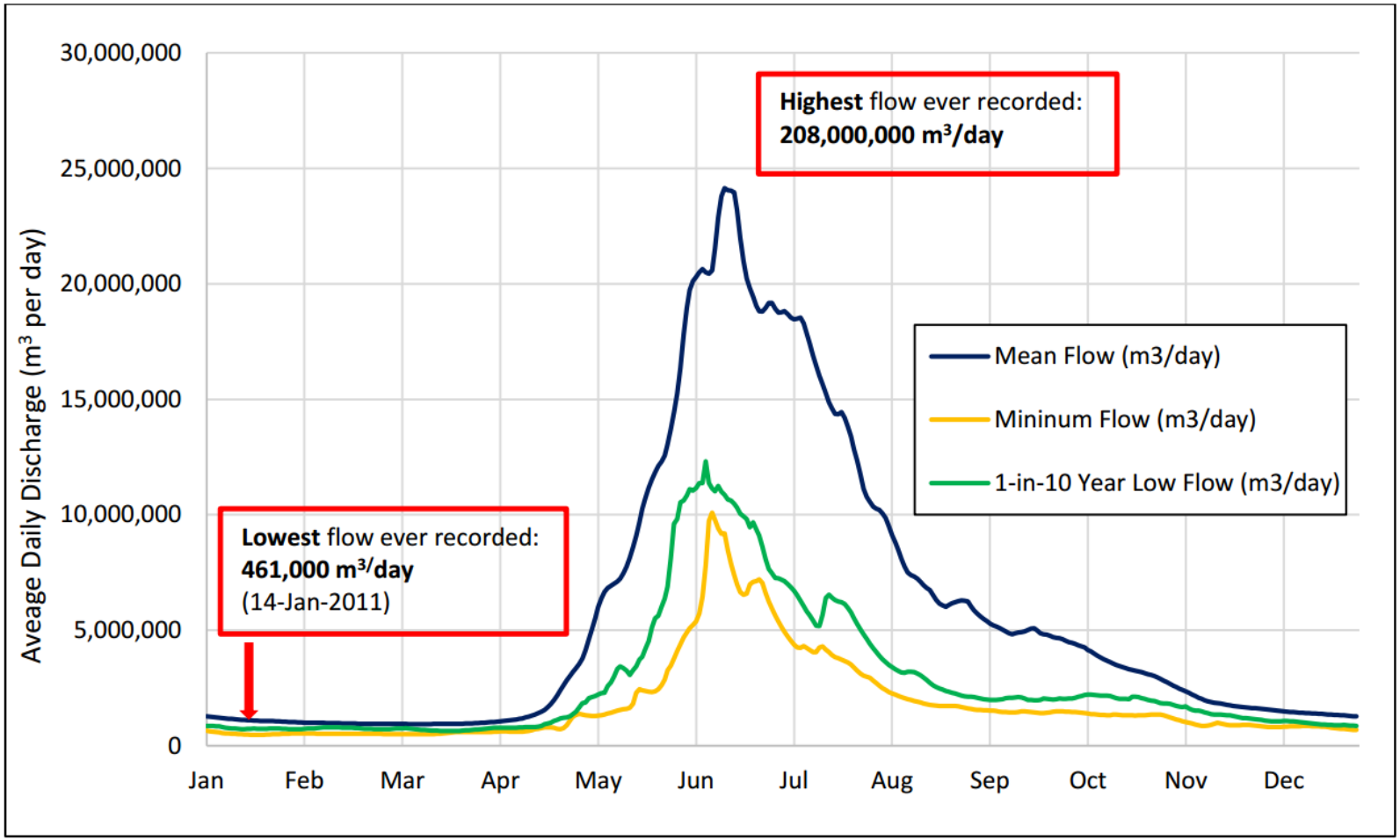
S. Lapp Inc. Water Licence Application



Annual withdraw volume = 450,000 m^3
Storage = 450,000 m^3
Withdrawal season = April 1 – July 31
Max pumping rate = 0.1 m^3/s
Current diversions at POD = 0.1 m^3/s (April 1 – July 31)
Total diversions at POD = 0.2 m^3/s

S. Lapp Inc. Hydrologic Review

Professional Reliance



S. Lapp Inc. Water Licence Request

Month	Avg. flow (m^3/s)	Total diversions (m^3/s)	SL pump rate (m^3/s)	% of avg. licenced	EFN Thresholds (m^3/s)
April	15	0.1	0.1	1.3%	8
May	20	0.1	0.1	1.0%	12
June	30	0.1	0.1	0.7%	17
July	18	0.1	0.1	1.1%	5
August	5	0.1	0.1	4.0%	2

- Assumes all water withdrawals/diversions occur all the time
- EFN thresholds based on natural range of variability
  - Varies for each system
  - No pumping
- Spring freshet withdrawals and storage

Water Licence (s.9) – Bissette Creek 2017-2027

e) The maximum quantity of water that may be held in storage is 450,000(m3/year. The maximum quantity of water which may be diverted and used for Oil &Gas purposes is 450,000m3/year. The license holder will employ a variable pumping rate to ensure that the rate of diversion does not exceed 0.15m3/s or 10% of discharge as measured per the requirements of Condition (j).

f) The period of the year during which water may be diverted into storage is April 1 to July 31, and the stored water may be used for Oil & Gas purposes the whole year.

k) The authorization holder is required to implement the following Environmental Flow Needs requirements:
Diversion must not occur when the measured discharge is equal to or less than the following Environmental Flow Needs thresholds.

- April 16 – April 29 – 0.15 m3/s
- April 30 – May 6 – 0.13 m3/s
- May 7 – May 13 – 0.11 m3/s
- Any other date not otherwise specified - 0.07 m3/s.

Water Diversions must never result in discharge immediately upstream of the POD to fall below these Environmental Flow Needs thresholds.

Decision Making Tools/Resources

- Northeast Water Tool (NEWT)
- Water Survey of Canada Hydrometric Data
- Independent Data (streamflow information)
- Hydrologic Modelling
- Climate change - PCIC
- Water Licence Query Tool

Northeast Water Tool (NEWT)

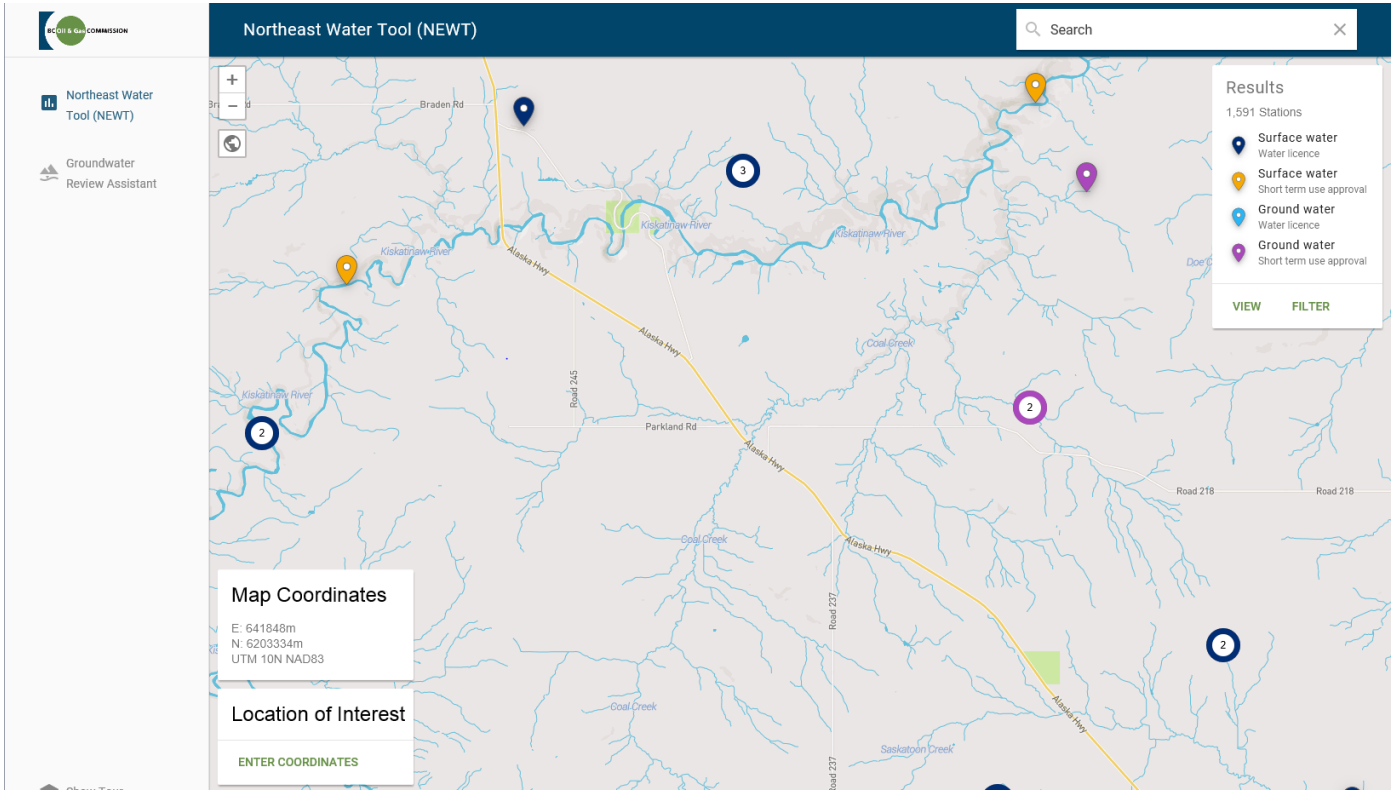
The Commission developed the NorthEast Water Tool (NEWT).

Hydrology based on “modelling” of Water Survey of Canada flow gauges.

Incorporates environmental flow protection.

The tool presents “cumulative effects” of water use. S9 & s10.

Provides high level overview of water availability



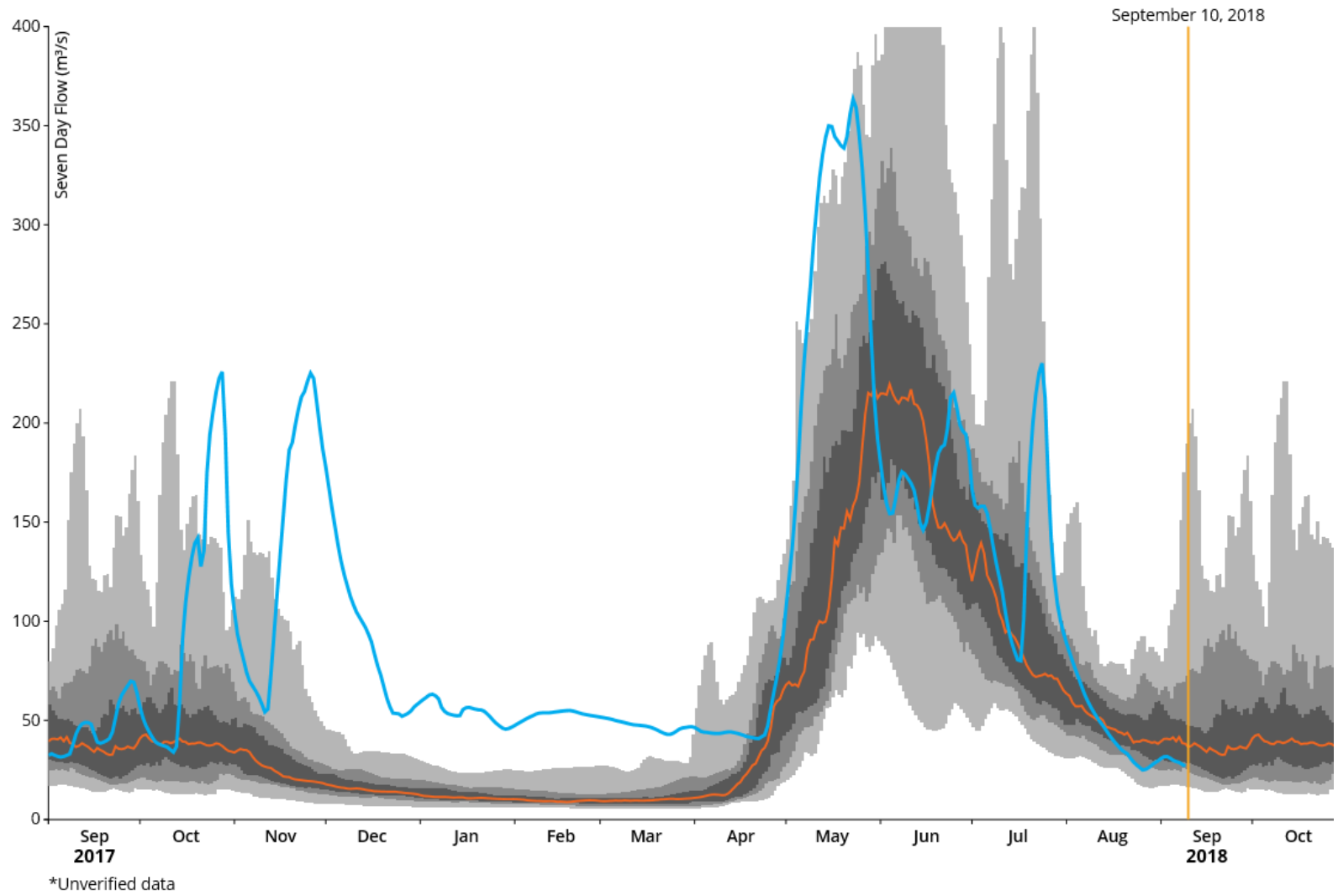
Northeast Water Tool (NEWT)

Month	Mean Runoff (mm)	Mean Discharge (m^3/s)	Mean Runoff (m^3)	% of MAD	Flow Sensitivity	Environmental Flow Needs (m^3)	Potential Max Allocation (m^3)	Existing Allocations (m^3)	Remaining Potential Allocation (m^3)
Jan	5.0	12.42	33,278,492	19.1%	Mod	28,286,718	4,991,774	8,316	4,983,458
Feb	4.2	11.41	27,856,218	17.5%	Mod	23,677,785	4,178,433	7,578	4,170,855
Mar	4.4	10.85	29,049,616	16.6%	Mod	24,692,174	4,357,442	8,316	4,349,126
Apr	11.1	28.45	73,730,042	43.6%	Low	62,670,535	11,059,506	8,048	11,051,459
May	40.9	101.88	272,875,152	156.2%	Low	231,943,879	40,931,273	8,766	40,922,507
Jun	87.2	224.43	581,714,625	344.2%	Low	494,457,431	87,257,194	344,418	86,912,776
Jul	61.5	153.12	410,115,763	234.8%	Low	348,598,398	61,517,364	344,686	61,172,679
Aug	35.1	87.35	233,958,981	134.0%	Low	198,865,134	35,093,847	344,686	34,749,161
Sep	24.7	63.47	164,524,905	97.3%	Low	139,846,169	24,678,736	120,171	24,558,565
Oct	19.5	48.60	130,162,718	74.5%	Low	110,638,310	19,524,408	8,316	19,516,092
Nov	8.4	21.66	56,147,448	33.2%	Low	47,725,331	8,422,117	8,048	8,414,070
Dec	6.7	16.56	44,359,919	25.4%	Low	37,705,931	6,653,988	8,316	6,645,672
Annual	**308.6**	**65.21**	**2,057,773,812**	-	-	**1,749,107,797**	**308,666,082**	**1,697,685**	**306,968,397**

Murray River – Above Wolverine River (WSC)

Murray River – Hydrometric Station

Seven Day Flow



*Unverified data

Hydrology Statistics

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1981	36,839,763	23,610,105	24,028,453	43,221,264	591,571,430	653,000,021	334,446,694	153,697,077	150,576,373	92,944,800	60,186,106	46,780,606	2,210,902,691
1982	32,793,476	26,165,604	28,244,785	48,431,777	374,821,645	653,512,086	391,266,691	184,169,831	123,707,403	97,157,267	64,369,588	51,411,421	2,076,051,574
1983	32,500,729	26,147,247	26,635,158	49,563,153	209,821,437	521,621,290	657,521,659	197,386,930	104,142,619	76,674,629	43,848,304	29,951,027	1,975,814,182
1984	23,074,851	23,608,172	30,248,605	40,886,050	178,726,474	1,086,574,952	328,321,226	149,455,625	166,923,837	153,866,155	67,976,271	51,901,265	2,301,563,484
1985	37,057,150	23,549,237	26,753,030	55,859,632	185,517,628	445,284,817	302,399,095	85,297,626	266,159,319	127,494,759	48,385,401	46,642,445	1,650,400,138
1986	37,214,634	25,148,235	27,422,581	43,516,910	204,944,250	367,518,425	562,973,030	275,974,560	131,127,529	183,145,699	84,713,098	55,366,889	1,999,065,840
1987	40,293,793	30,253,436	28,198,409	56,714,685	313,944,733	577,851,928	562,915,061	784,900,479	229,772,685	137,272,320	71,882,465	51,125,437	2,885,125,430
1988	32,640,822	26,682,500	30,031,218	100,932,063	474,723,778	569,465,640	318,765,882	146,402,552	77,673,641	75,079,495	47,242,431	40,079,305	1,939,719,330
1989	28,640,911	23,743,435	28,413,863	71,287,309	443,584,372	511,901,698	425,584,771	332,301,814	185,155,317	158,141,423	56,564,930	54,256,769	2,319,576,611
1990	43,129,479	29,877,599	36,497,742	64,816,921	431,961,441	949,708,421	388,484,144	135,224,056	80,004,024	63,480,719	41,209,715	30,322,033	2,294,716,293
1991	27,977,158	25,610,060	25,206,205	61,796,698	335,306,578	428,067,808	275,887,605	103,968,710	106,587,010	94,136,078	56,604,543	41,983,611	1,583,132,063
1992	31,230,226	25,965,608	34,451,410	96,364,048	254,873,578	578,615,196	238,516,453	86,664,746	71,400,350	128,151,749	53,953,394	31,929,727	1,632,116,485
1993	24,329,896	24,447,767	25,804,259	54,591,061	312,737,030	630,478,781	767,557,868	626,710,748	256,351,806	104,674,009	58,355,228	44,028,010	2,930,066,463
1994	35,181,829	30,086,290	37,202,074	108,606,289	389,691,846	537,920,445	711,056,705	299,065,836	155,716,356	117,021,561	62,959,957	44,100,472	2,528,609,660
1995	33,763,503	27,124,037	31,334,571	46,289,795	268,573,758	614,759,322	784,852,171	322,128,126	199,135,683	107,119,365	68,562,732	61,942,589	2,565,585,652
1996	41,850,814	31,302,508	37,868,859	66,643,648	338,194,724	1,338,543,362	1,455,652,207	285,354,885	149,440,215	131,852,903	82,632,268	53,847,436	4,013,183,828
1997	44,416,388	32,138,189	29,535,940	74,043,556	565,244,827	703,241,577	482,378,810	231,883,210	299,869,473	272,020,280	86,659,506	40,464,568	2,861,896,322
1998	31,589,567	31,564,413	52,028,435	157,724,370	581,152,284	339,822,291	203,211,128	99,919,414	65,098,879	74,906,741	42,510,817	36,827,790	1,716,356,130
1999	32,210,914	28,241,846	32,390,540	103,575,545	197,370,282	589,414,514	289,968,140	108,751,717	55,665,920	41,993,225	31,491,637	27,037,572	1,538,111,853
2000	20,605,105	19,004,152	21,851,202	37,823,906	110,181,698	637,613,598	636,611,038	237,961,862	236,781,759	109,582,832	65,373,194	41,580,261	2,174,970,607
2001	40,636,305	32,066,607	31,392,438	40,692,720	232,699,560	1,573,351,684	663,819,003	237,334,631	114,137,235	74,185,266	38,801,828	31,859,626	3,110,976,903
2002	26,326,165	23,676,393	24,054,590	47,207,187	430,158,424	778,879,422	328,527,003	176,105,843	133,978,641	95,603,186	51,499,753	37,492,367	2,153,508,975
2003	30,500,279	25,631,098	24,221,052	45,829,231	248,761,172	404,602,069	601,543,986	175,408,285	86,149,006	78,905,088	61,841,247	48,504,711	1,831,897,224
2004	39,980,870	25,860,560	29,627,188	52,900,759	197,762,389	327,708,045	409,764,905	189,867,164	515,469,025	222,841,524	81,887,160	56,259,289	2,149,928,878
2005	39,890,466	32,721,880	34,099,701	125,487,092	387,147,224	536,265,542	274,674,953	233,994,910	145,673,864	93,484,768	52,651,063	36,272,315	1,992,363,778
2006	30,860,795	26,891,192	23,925,056	46,044,903	200,721,844	296,544,777	121,234,183	67,620,502	45,929,965	42,625,893	29,604,301	26,800,655	958,804,066
2007	22,923,504	19,580,673	19,365,530	63,148,751	336,973,007	850,369,995	300,558,864	189,138,716	149,675,224	96,158,433	56,796,745	43,470,487	2,148,159,929
2008	39,114,839	26,081,203	24,809,507	31,458,582	429,059,410	493,778,303	230,838,621	303,742,387	132,267,788	81,233,500	51,032,381	36,057,813	1,879,474,334
2009	27,731,814	20,419,540	18,743,839	31,950,432	235,580,254	387,491,518	303,114,541	155,902,667	97,018,432	67,910,368	44,364,633	33,459,336	1,423,687,374
2010	27,612,423	22,613,886	25,462,355	84,120,635	230,522,747	258,705,630	123,496,292	65,932,405	63,112,160	86,618,254	45,746,732	27,197,365	1,061,140,885
2011	15,750,511	14,372,007	18,267,149	34,486,563	584,711,812	836,489,911	884,478,324	189,898,568	98,008,180	90,450,349	44,051,699	35,310,998	2,846,276,073
2012										64,607,264	70,688,288	88,421,229	
2013	70,467,037	61,475,932	65,085,514	43,995,160	381,942,260	834,812,416	403,218,117	253,144,148	99,814,213	106,258,515	55,894,413	35,711,286	2,411,819,011
2014	29,716,250	23,080,648	27,857,354	52,227,828	266,852,057	298,399,184	130,943,958	57,169,747	44,986,443	70,324,045	47,771,888	38,706,389	1,088,035,790
Mean (m^3/month)	**33,601,584**	**26,931,577**	**29,729,049**	**63,098,137**	**331,085,938**	**624,615,596**	**451,351,004**	**216,438,781**	**146,591,223**	**106,409,484**	**56,709,227**	**42,855,973**	**2,128,879,935**
Mean (m^3/day)	**1,083,922**	**961,842**	**959,002**	**2,103,271**	**10,680,192**	**20,820,520**	**14,559,710**	**6,981,896**	**4,886,374**	**3,432,564**	**1,890,308**	**1,382,451**	**5,832,548**
Mean (m^3/s)	**12.5**	**11.1**	**11.1**	**24.3**	**123.6**	**241.0**	**168.5**	**80.8**	**56.6**	**39.7**	**21.9**	**16.0**	**67.5**
Standard Deviation (% of mean)	**28%**	**28%**	**31%**	**46%**	**40%**	**47%**	**60%**	**69%**	**64%**	**45%**	**26%**	**29%**	**636,048,171**
Minimum (m^3/month)	**15,750,511**	**14,372,007**	**18,267,149**	**31,458,582**	**110,181,698**	**258,705,630**	**121,234,183**	**57,169,747**	**44,986,443**	**41,993,225**	**29,604,301**	**26,800,655**	**958,804,066**
Minimum (m^3/day)	**508,081**	**513,286**	**589,263**	**1,048,619**	**3,554,248**	**8,623,521**	**3,910,780**	**1,844,185**	**1,499,548**	**1,354,620**	**986,810**	**864,537**	**2,626,860**
1-in-10 Year Low Flow (m^3/month)	**23,325,860**	**20,858,409**	**22,265,973**	**38,397,669**	**197,448,703**	**330,130,894**	**208,736,627**	**85,571,050**	**63,509,504**	**65,598,195**	**41,600,046**	**30,062,329**	**1,446,572,269**
1-in-10 Year Low Flow (m^3/day)	**752,447**	**744,943**	**718,257**	**1,279,922**	**6,369,313**	**11,004,363**	**6,733,440**	**2,760,356**	**2,116,983**	**2,116,071**	**1,386,668**	**969,753**	**3,963,212**
Effect of withdrawing 10,000 m^3/day													
- Effect on mean flow	**0.92%**	**1.04%**	**1.04%**	**0.48%**	**0.09%**	**0.05%**	**0.07%**	**0.14%**	**0.20%**	**0.29%**	**0.53%**	**0.72%**	**0.17%**
- Effect on 1-in-10 year low flow	**1.33%**	**1.34%**	**1.39%**	**0.78%**	**0.16%**	**0.09%**	**0.15%**	**0.36%**	**0.47%**	**0.47%**	**0.72%**	**1.03%**	**0.25%**
- Effect on lowest flow of record	**1.97%**	**1.95%**	**1.70%**	**0.95%**	**0.28%**	**0.12%**	**0.26%**	**0.54%**	**0.67%**	**0.74%**	**1.01%**	**1.16%**	**0.38%**

Monitoring

Storage

Active and Engaged Water Management

- Suspend water withdrawals from streams and lakes due to drought.

BC Oil & Gas COMMISSION

20TH ANNIVERSARY

DIRECTIVE
2018-01

Aug. 20, 2018

Suspension of Water Diversions in the Peace River & Liard River Watersheds

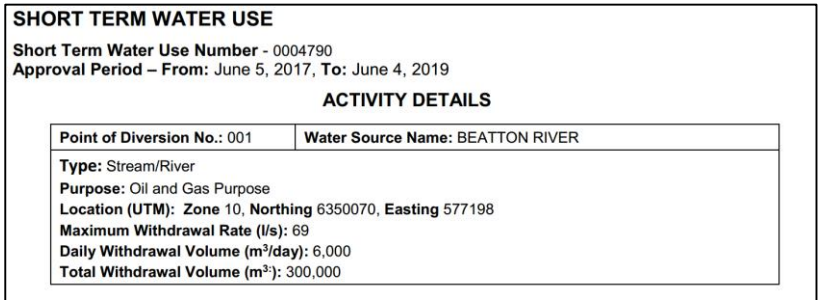
EFFECTIVE DATE: Immediately

The BC Oil and Gas Commission (Commission) is requiring the oil and gas industry to immediately suspend all previously approved water diversions under Section 10 of the *Water Sustainability Act*, due to drought conditions. This includes rivers, streams and lakes in the following basins within the Peace River and Liard River watersheds:

Peace River watershed **Liard watershed**

S. 10 Short Term Use Approvals

- Up to 24 months
- Smaller volume water requests
- Shorter time period
- Prior to water licence
  - Review conditions
  - Monitoring
- Drought conditions
  - Water Suspension Directive
  - EFN thresholds



SHORT TERM WATER USE

Short Term Water Use Number - 0004790
Approval Period – From: June 5, 2017, **To:** June 4, 2019

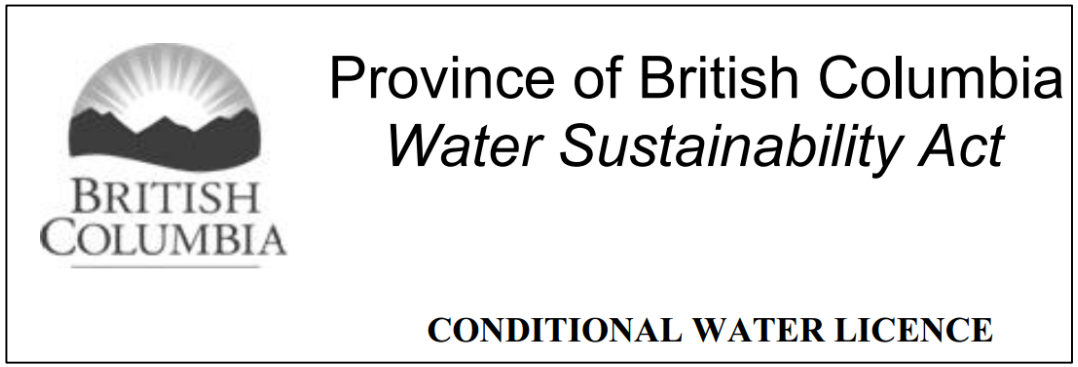
ACTIVITY DETAILS

Point of Diversion No.: 001	**Water Source Name:** BEATTON RIVER

Type: Stream/River
Purpose: Oil and Gas Purpose
Location (UTM): **Zone** 10, **Northing** 6350070, **Easting** 577198
Maximum Withdrawal Rate (l/s): 69
Daily Withdrawal Volume (m^3/day): 6,000
Total Withdrawal Volume (m^3): 300,000

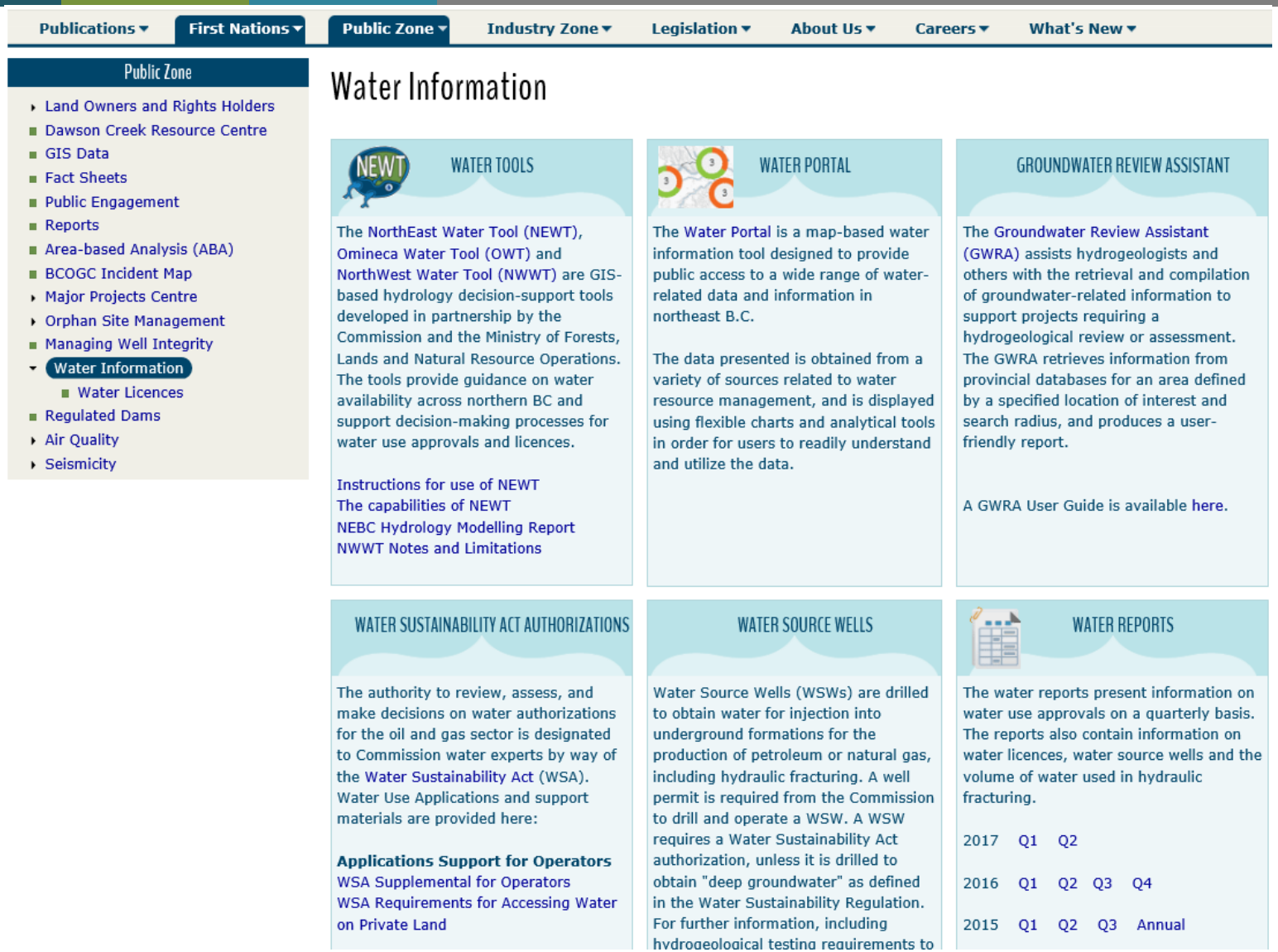
S. 9 Water Licences

- 5 – 20 year terms
- Long term development plans and guarantee
- Higher level of scrutiny and detail required
- Drought conditions
  - EFN thresholds



OGC Water Information

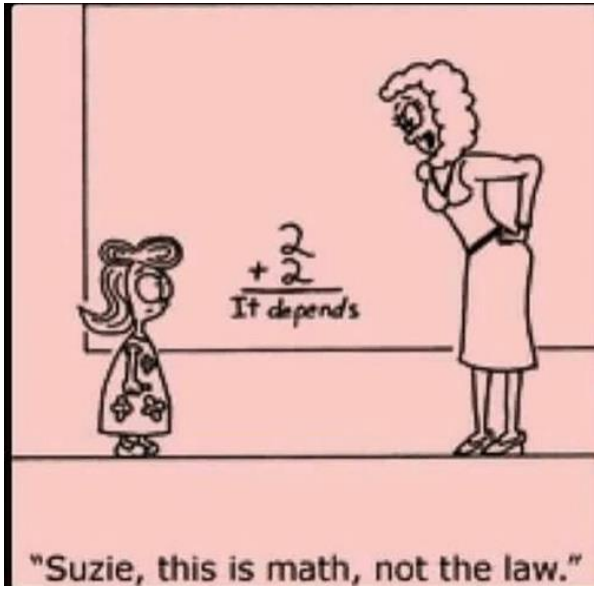
http://www.bcogc.ca/public-zone/water-information



Decision Making Questions

1. Is there any water available for allocation?
2. How much water is required for the environment and other users?

IT DEPENDS



Water Allocation Principles

- **Protect environmental flows for fish and wildlife**.
  - Limit cumulative withdrawals to maximum 15% of natural discharge at any time
- **Protect present and future water needs for all users and First Nations.**
- Understand and **manage for natural variability** and **future change**.
- **Recognize** and **respond** to unusual low flow conditions (e.g, drought).
- Be **fully transparent** with information and decisions.
- Collaborate, innovate.

Contact

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