

Water Use for Oil and Gas Activity



2013 Annual Report



PURPOSE

The purpose of the *2013 Annual Report on Water Use for Oil and Gas Activity* is to present data and information on water approvals, water withdrawal and water use related to the oil and gas industry, including hydraulic fracturing.

This report contains short-term water use data from the 2013 calendar year, including the cumulative volume of water approved for use and the volume reported as actually used by permit holders. It includes similar data on water licences in northeast British Columbia, which are valid for periods greater than two years. Information on water source wells, a well drilled to obtain water for the purpose of injection into underground formations to enhance oil and natural gas recovery, is included in the report. Finally, details on the volume of water used specifically for hydraulic fracturing are summarized.



Previous annual water reports and quarterly updates are available on the Commission's website at:
<http://www.bcogc.ca/public-zone/water-information>

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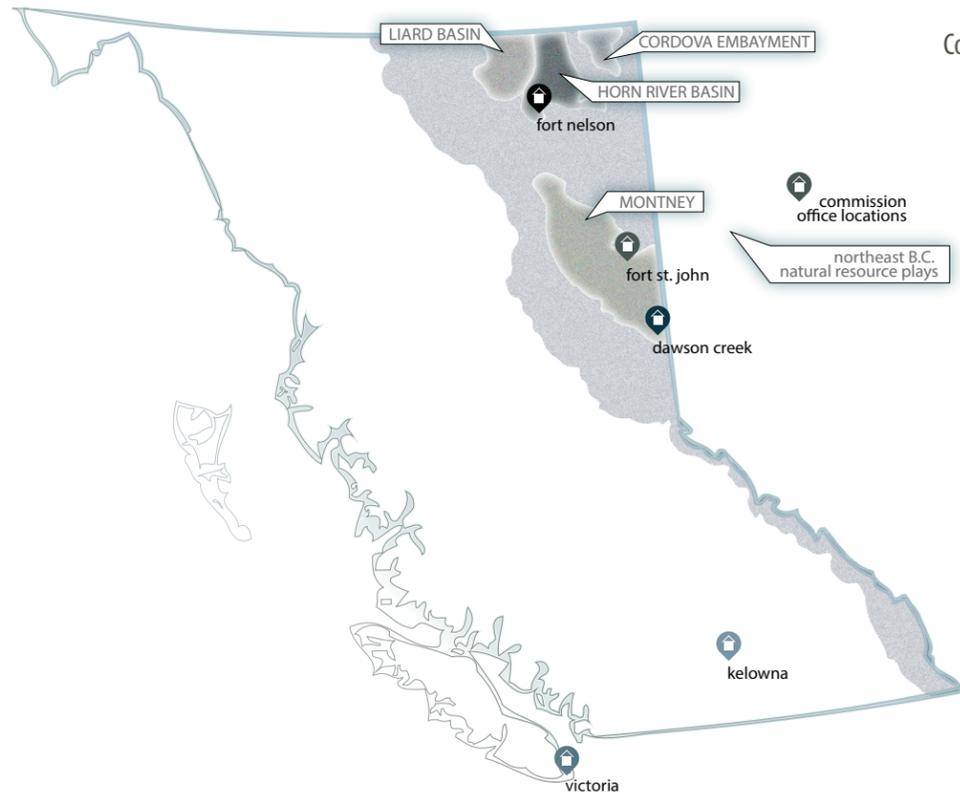
BC OIL AND GAS COMMISSION

The [BC Oil and Gas Commission](#) (Commission) is a single-window Crown corporation that regulates oil and gas activity in the Province of British Columbia.

The Commission regulates industry by way of the administration of the [Oil and Gas Activities Act \(OGAA\)](#), the [Petroleum and Natural Gas \(PNG\) Act](#), and associated regulations. Specified enactments provide the Commission additional authorities to permit oil and gas activities related to forestry, heritage conservation, roads, land and water use, and other natural resources. This consolidated authority allows the Commission to monitor activity in a comprehensive and effective manner where oil and gas activities occur, including on Crown land, privately held land, and the Agricultural Land Reserve.

The Commission is responsible for reviewing, assessing, and making decisions on water authorizations from both surface and subsurface water sources. The Commission has the expertise and tools to make informed water allocation decisions; protecting and maintaining environmental and community water needs are its first priorities.

Where water authorization is granted, the Commission becomes responsible for regulating the permissions by which oil and gas companies operate.



Commission Office Locations Throughout B.C.

The Commission's workforce operates out of Fort Nelson, Fort St. John, Dawson Creek, Kelowna and Victoria, with the largest number of employees concentrated in Fort St. John, the heart of oil and gas activity in the province. The offices in Fort Nelson and Dawson Creek ensure the Commission's presence in communities of the Horn River Basin and Montney gas plays respectively.

The Commission manages water use with a specific focus on environmental values at every opportunity, monitoring the water withdrawal and enforcing compliance with applicable legislation where required.

HOW WATER IS USED

Water is used for various purposes in the oil and gas industry.



The largest use of water for oil and gas activities is for hydraulic fracturing.

However, water is used for other purposes, such as:



Seismic or geophysical exploration



Drilling



Machine washing



Dust control



Water floods (to enhance oil recovery)



Ice road freezing



Hydrostatic testing of pipelines

HOW WATER IS ACCESSED

There are different ways the oil and gas industry in British Columbia may access water. Some methods are managed through provincial legislation, including:

- **Water licences** issued under the Water Act. The Commission has staff designated as Regional Water Managers with authority for issuing and administering long-term water licences.
- **Short-term surface water use or diversion approvals** issued under Section 8 of the Water Act. Short-term water use is administered by the Commission.
- **Water source wells** authorized by the Commission under OGAA. Water source wells are a specific type of well where the water withdrawn is intended for the purpose of injection into an underground formation to enhance oil or natural gas recovery.
- **Flowback water** that returns to the surface after being injected for hydraulic fracturing.
- **Produced water** that flows to the surface as a by-product of oil and gas production.

The oil and gas industry can also access water by means currently outside of regulatory oversight:



- **Private agreements** can be made with landowners or others who have a source of surface water supply such as a dugout or a groundwater well.
- **Groundwater wells** for oil and gas use where the activity does not involve water injection (hydraulic fracturing) into the subsurface. These purposes include road maintenance, geophysical exploration, and other possible uses.

COMMISSION AUTHORITY FOR WATER

The [Water Act](#) is the primary provincial statute regulating water resources in B.C. Currently, only surface water in a “stream” is vested to the Crown for allocation through the Water Act. A “stream” includes a natural watercourse or source of water supply, whether usually containing water or not, and a lake, river, creek, spring, ravine, swamp and gulch.

Surface water use under the Water Act is regulated by the Commission through two processes:

- Section 8 of the Water Act allows for the issuance of permits for short-term water use, for a maximum 24 month period.
- Part 2 of the Water Act allows for the issuance of water licences, generally for terms of 5+ years.

Through OGAA, the Commission has authority to issue water use permits under Section 8 of the Water Act to manage short-term water use by the oil and gas industry.

Approvals under Section 8 authorize the diversion and use of water for a term not exceeding two years. Short-term water use approvals are typically used by industry during the exploration phase of development of natural gas or oil leases. Upon expiry, subsequent short-term water use approvals can be issued to applicants should further use of a short-term nature be required.

In March 2013, specific Commission staff were designated as Regional Water Managers under the Water Act, giving the Commission authority to issue and

Regional Water Managers and hydrologists serve to protect and conserve water resources and further public knowledge surrounding oil and gas water use through information sharing and transparent reporting.

administer water licences, generally for terms of five years or more, to the oil and gas sector.

As well as regulating surface water used for oil and gas activities, the Commission regulates aspects of subsurface water resources. OGAA provides the Commission authority for groundwater management of water source wells. A water source well is used to acquire water for injection to enhance oil or gas recovery. Water-related definitions are available on page 22.

The Commission has natural resource specialists trained to review and adjudicate applications for water use associated with oil and gas activities. The water used by industry is carefully monitored by knowledgeable geologists, hydrologists, hydrogeologists and engineers with the Commission. These specialists have expertise in northeast B.C.'s water resources and apply scientific and technical rigour to manage and protect the province's water resources.

WATER USE REPORTING

For surface water sources managed under short-term water use approvals, operators must report monthly water withdrawals from each approved withdrawal location on a quarterly basis to the Commission. Companies failing to report water usage are referred to the Commission's Compliance and Enforcement team. The role of this team is to investigate non-compliance, ensure operators comply with laws and permit conditions, and conduct follow-up inspections.



For water production from water source wells, operators are also required to report water withdrawal data on a monthly basis.

Since January 2014 the Commission has required mandatory reporting of water licences for oil and gas use. This change is a result of the Commission taking over administration of oil and gas water use licences. In the past, most water use authorized by way of a water licence did not have a requirement for mandatory reporting.

TOOLS FOR WATER MANAGEMENT

The Commission manages water approvals and use with specific focus on environmental values.



Methods and tools include:

- Seismic or geophysical exploration.
- The development of [OGC Watershed Management Basins](#) for northeast B.C. (derived from the Ministry of Environment's Freshwater Atlas base map).
- The review of water use applications on a watershed basis with an understanding of cumulative effects to ensure withdrawals do not exceed environmental limits and environmental flows are maintained.
- The production of [publicly available reports](#) on water approvals and use.
- The management of special or unique situations, and the ability to take action if necessary, such as [suspending oil and gas water use](#) during the 2010 and 2012 summer droughts in northeast B.C.
- [The NorthEast Water Tool](#), a GIS-based hydrology decision-support tool.
- The development of a [Water Information Portal](#) to display available surface water and groundwater quantity and quality data throughout northeast B.C.
- Cooperation with water stewardship staff from [FLNRO](#) to ensure decisions are fully informed and coordinated.
- The transparent publication of all chemicals included in fracturing fluids and the total amount of water injected for hydraulic fracturing on [FracFocus.ca](#).

EXECUTIVE SUMMARY - 2013 SNAPSHOT

In 2013, there were 50 companies with 381 active Section 8 approvals from 1,489 points-of-diversion (Table 1). The total annual volume of water approved for withdrawal was 19,423,842 m³, which represents 0.016 per cent of the total mean annual runoff in northeast B.C. The total volume of extracted water reported was 2,896,865 m³, which corresponded to 0.002 per cent of the total mean annual runoff in northeast B.C. (Figure 1).

A total of 24 water licences associated with oil and gas activities, comprising 38 points-of-diversion, were active in 2013. The total licenced approval of water use for 2013 was 16,226,511 m³, which accounts for 0.013 per cent of the mean annual runoff. Data for actual water use was not available for most water licences for 2013, however, the water licences were amended to require mandatory reporting of water use, beginning January 2014.

Eight companies reported withdrawing 683,528 m³ of water from 31 water source wells in 2013.

A total of 5,341,635 m³ of water was used by 31 companies for hydraulic fracturing of 433 wells in 2013. The majority of wells hydraulically fractured were in the Montney Play (North and Heritage).

The NorthEast Water Tool (NEWT), a GIS-based hydrology decision support tool that provides guidance on water

availability across northeast B.C., was released for use in 2012. NEWT was acknowledged with a Premier's Award for innovation in 2013.

The Commission, in partnership with FLNRO, [Geoscience BC](#) and the [Science and Community Environmental](#)

[Knowledge \(SCEK\) Fund](#), has recently developed a map-based [Water Information Portal](#), to provide public access to a wide range of water-related data and information in northeast B.C.

TABLE 1:
WATER APPROVAL AND USE FOR OIL AND GAS ACTIVITIES IN 2013

SHORT-TERM	Companies with Active Section 8 Approvals	50
	Active Section 8s	381
	Approved Withdrawal Locations for Section 8s	1,489
	Volume Available for Use for Section 8s (m ³)	19,423,842
WATER LICENCE	Volume Reported Withdrawn for Section 8s (m ³)	2,896,865
	Companies with Active Water Licences	10
	Active Water Licences	24
WATER SOURCE WELLS	Licenced Withdrawal Locations	38
	Volume Available for Use for Water Licence (m ³)	16,226,511
	Companies Reporting Water Source Wells	8
HYDRAULIC FRACTURING	Water Source Wells	31
	Volume of Water Extracted from Water Source Wells (m ³)	683,528
	Companies that Hydraulically Fractured Wells	31
HYDRAULIC FRACTURING	Hydraulically Fractured Wells	433
	Volume of Water Injected for Hydraulic Fracturing (m ³)	5,341,635

FIGURE 1: COMPARISON OF ANNUAL RUNOFF, WATER APPROVALS AND VOLUMES REPORTED WITHDRAWN IN 2013

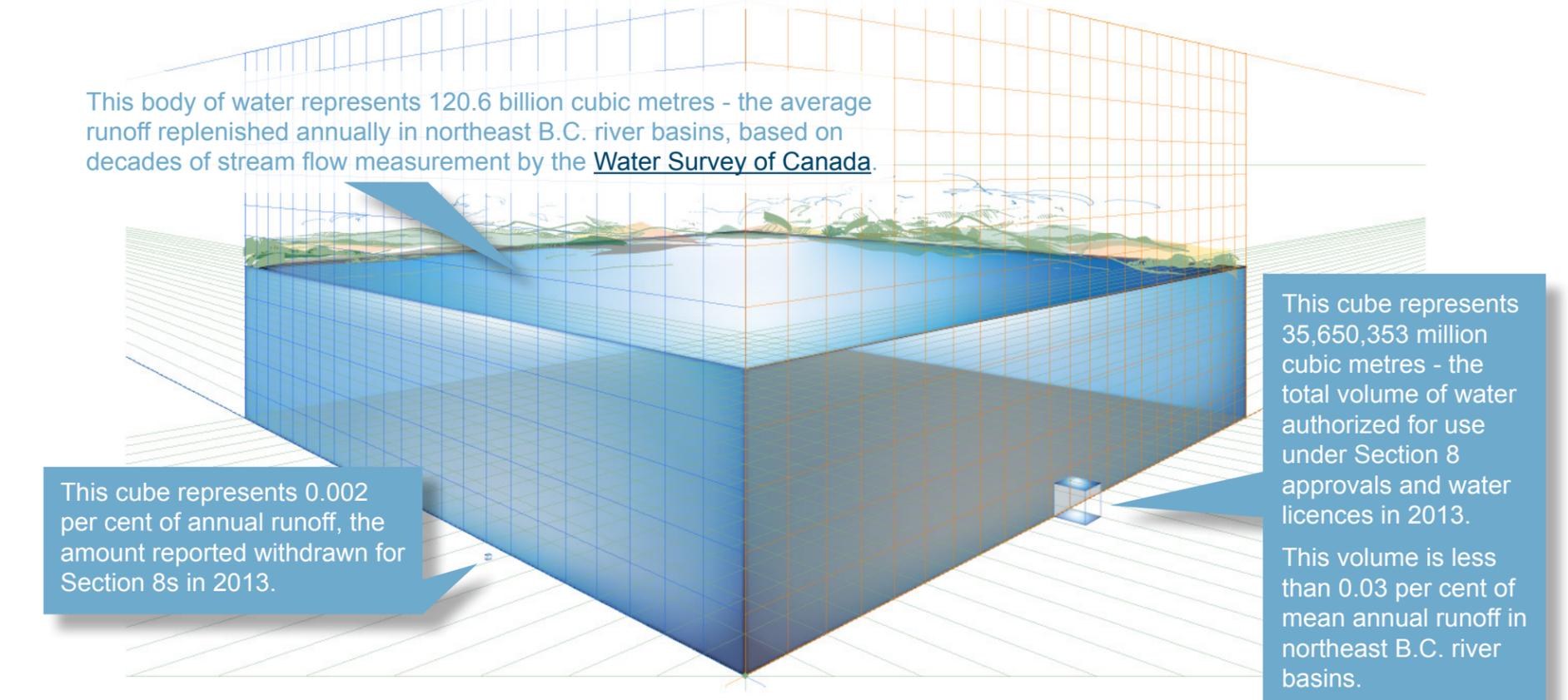


Figure 1 provides a comparison of the average volume of annual runoff in northeast B.C. river basins against Section 8 and licenced water volumes approved for use, and actual volumes reported withdrawn.

Table 2 provides comparative data on total volumes withdrawn each quarter by way of Section 8 approvals for the years 2011 through 2013.

TABLE 2 - QUARTERLY WATER WITHDRAWALS FROM SECTION 8 APPROVALS, 2011 - 2013

	Q1	Q2	Q3	Q4	SUM
2011	782,388	662,767	1,266,317	1,100,613	3,812,085
2012	1,345,289	982,376	1,088,192	340,607	3,756,464
2013	1,061,417	482,054	605,408	747,986	2,896,865

SECTION 8 WATER APPROVALS

SHORT-TERM WATER USE

OGAA provides authority to the Commission to issue short-term water use permits under Section 8 of the Water Act:

WATER ACT

Short-term use of water (Section 8)

8 (1) If diversion or use of water is required for a term not exceeding 24 months, the comptroller or a regional water manager may, without issuing a licence, grant an approval in writing, approving the diversion or use, or both, of the water on the conditions the comptroller or regional water manager considers advisable.

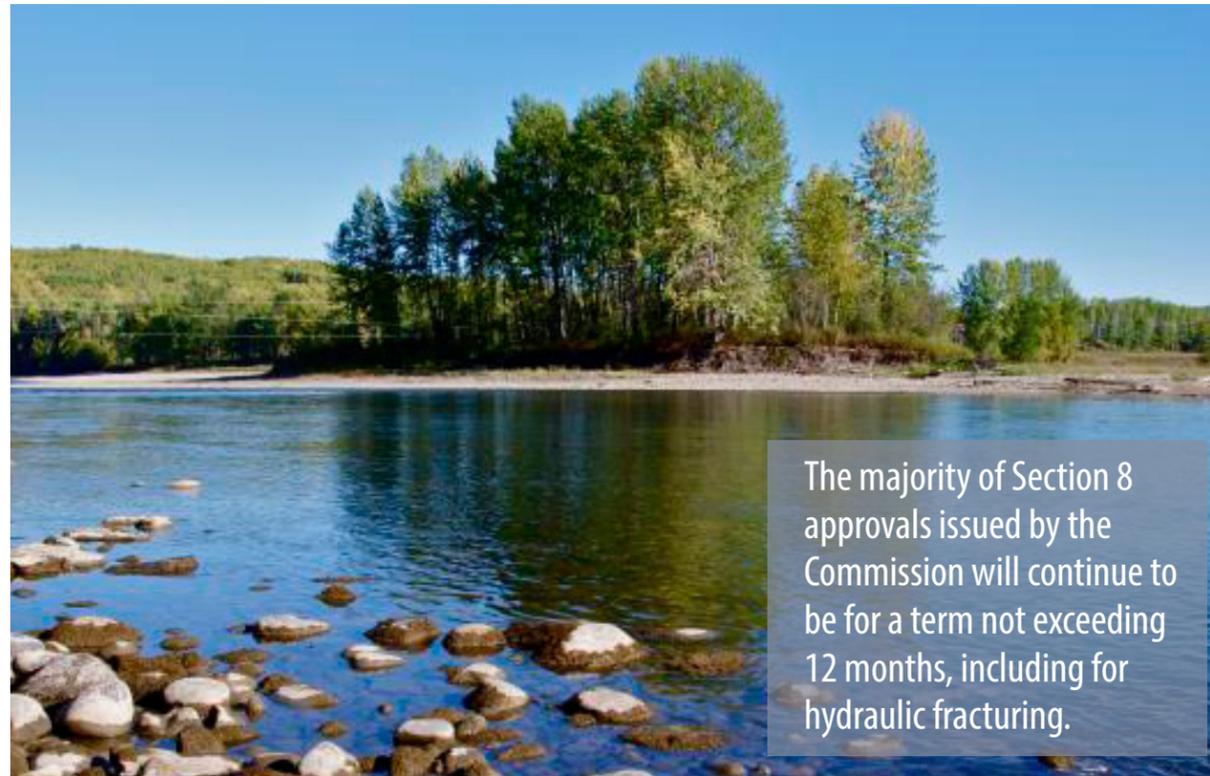
(2) Even though a licence has not been issued, a person is not prohibited from diverting or using water in accordance with an approval given under this section or in accordance with the regulations.

(3) The provisions respecting a licence, except Section 7, apply to a diversion or use of water under an approval under subsection (1) of this section or under the regulations.

In March 2011, the Commission issued [Directive 2011-02](#) requiring oil and gas companies holding Section 8 water use approvals to submit monthly water withdrawal data to the Commission on a quarterly basis. Water withdrawal data is reported for each approved withdrawal location (lake, stream, water source dugout, etc.), commonly known as a point-of-diversion. In the case of a "Basin

Section 8", the cumulative total for each approved basin is submitted. Basin Section 8s are further described in the glossary on page 22.

In April 2013 the Province of British Columbia brought into force a 2010 amendment to the Water Act to allow short-term water use approvals (Section 8) to be issued



The majority of Section 8 approvals issued by the Commission will continue to be for a term not exceeding 12 months, including for hydraulic fracturing.

for a period not exceeding 24 months (a change from the previous maximum term of 12 months).

The majority of Section 8 approvals issued by the Commission will continue to be for a term not exceeding 12 months, including for hydraulic fracturing. However, some may be issued for a term of up to 24 months - these generally include approvals for geophysical activity, winter road construction, or water source dugouts.

In addition, Section 8 applications for greater than 200 m³/day, or greater than 10,000 m³/year, or for a purpose of Oil Field Injection (which includes hydraulic fracturing), require a Water Supply/Demand Analysis to

be submitted to better manage the water supply in northeast B.C. The Water Supply/Demand Analysis is a report that provides detail on the water demand, a rationale to support the volume of water requested, and detail on the hydrology of the applicable water body or water bodies. The rationale and data is used by the Commission's decision-maker, as well as providing valuable context for other parties, such as First Nations.

In 2013, there were 50 companies with 381 active Section 8 approvals from 1,489 points-of-diversion (Table 1 on page 8). The total annual volume of water approved for withdrawal was 19,423,842 m³. The total volume of extracted water reported was 2,896,865 m³

(14.9 per cent of the approved volume). Section 8 water withdrawals for 2013 were slightly less than withdrawals in 2011 (3,812,085 m³) and 2012 (3,756,464 m³) as shown in Table 2 on page 9.

In most river basins in northeast B.C., the total approved short-term water use was a small fraction of the mean annual runoff (Appendix 2, page 24). The basins with the largest total approved volumes as a percentage of mean annual runoff for 2013 are listed in Table 3, below.

For all the remaining basins, the approved short-term water use corresponded to less than 0.20 per cent of mean annual runoff.

TABLE 3:
SHORT-TERM
WATER USE
APPROVALS AND
WITHDRAWALS
AS A PERCENTAGE
OF MEAN ANNUAL
RUNOFF IN 2013

BASINS WITH THE LARGEST TOTAL APPROVED VOLUMES AS A PERCENTAGE OF MEAN ANNUAL RUNOFF

OGC WATER MANAGEMENT BASIN	PERCENTAGE
East Kiskatinaw	0.71
Middle Kiskatinaw	0.43
Kiskatinaw River Total	0.40
Cameron River	0.35
Kiwigana River	0.24
Capot-Blanc Creek	0.24
Sahdoanah River	0.24
West Kiskatinaw	0.20

BASINS WITH THE LARGEST WATER WITHDRAWAL AS A PERCENTAGE OF MEAN ANNUAL RUNOFF

OGC WATER MANAGEMENT BASIN	PERCENTAGE
Cameron River	0.09
Upper Sikanni Chief River	0.09
West Kiskatinaw	0.05
Middle Sikanni Chief River Total	0.04
Middle Kiskatinaw River	0.04
East Kiskatinaw River	0.04
Upper Beatton River	0.04

Actual water withdrawal in individual basins is a small fraction of the approved water use. The basins with the largest actual volume of water withdrawn as a percentage of mean annual runoff for 2013 are listed in Table 3 on page 11.

For all the remaining basins, the actual volume of water withdrawn corresponded to less than 0.04 per cent of mean annual runoff.

The mean annual runoff for the various rivers and streams across northeast B.C. is about 120.6 billion m³ (based on data collected by the [Water Survey of Canada](#)).

TABLE 4: SECTION 8 WATER SOURCE TYPES IN 2013

	NUMBER OF APPROVED WITHDRAWAL LOCATIONS		WATER APPROVAL VOLUME (m ³)		WATER WITHDRAWAL VOLUME (m ³)	
		%		%		%
STREAM/RIVER	216	14.5	7,468,564	38.5	1,978,444	68.3
LAKE	97	6.5	563,635	2.9	41,000	1.4
WATER SOURCE DOUGOUT	1,057	71.0	10,437,505	53.8	854,161	29.5
BASIN	74	5.0	352,677	1.8	16,235	0.6
OTHER	45	3.0	601,460	3.1	7,025	0.2
GRAND TOTAL	1,489	100.0	19,423,842	100.0	2,896,865	100.0

The cumulative total of all Section 8 water approvals in 2013 represents 0.016 per cent of the mean annual runoff. The cumulative total of actual water withdrawals in 2013 represents 0.002 per cent of the mean annual runoff (Figure 1, page 9).

In 2013, water source dugouts comprised the most points-of-diversion at 1,057 (71.0 per cent) as shown in Table 4. Rivers accounted for 216 (14.5 per cent) points-of-diversion. Water source dugouts had the highest annual approval at 10,437,505 m³ (53.8 per cent), while rivers had the second highest with an approval volume of 7,468,564 m³ (38.5 per cent). Conversely, the highest

volume of water withdrawn was from rivers at 1,978,444 m³ (68.3 per cent), compared to water source dugouts at 854,161 m³ (29.5 per cent).

A summary of Section 8 data for individual oil and gas companies is shown in Table 5 on page 13.

In 2013, Encana Corporation had the most active points-of-diversion at 290 (19.5 per cent). Canadian Natural Resources Limited (192 points-of-diversion; 12.9 per cent) and ConocoPhillips Canada Operations Ltd. / ConocoPhillips Canada Resources Corp (186 points-of-diversion, 12.5 per cent) had second and third highest number of water withdrawal locations.

Progress Energy Canada had the greatest total approval volume at 5,119,157 m³ (26.4 per cent). Encana Corporation (3,246,864 m³, 16.7 per cent) and ConocoPhillips Canada Operations Ltd. / ConocoPhillips Canada Resources Corp (1,709,894 m³, 8.8 per cent) had the second and third highest Section 8 approval volume.

Three companies, Progress Energy Canada Ltd. (1,210,801 m³, 41.8 per cent), Encana Corporation (828,667 m³, 28.6 per cent) and Canadian Natural Resources Limited (310,512 m³, 10.7 per cent) accounted for about four-fifths of all water extracted under Section 8 approvals.

TABLE 5 - 2013 SECTION 8 WATER APPROVALS AND USE DATA ORGANIZED BY COMPANY

COMPANY	NUMBER OF APPROVED WITHDRAWAL LOCATIONS	TOTAL VOLUME APPROVED (m ³)	TOTAL VOLUME WITHDRAWN (m ³)	COMPANY	NUMBER OF APPROVED WITHDRAWAL LOCATIONS	TOTAL VOLUME APPROVED (m ³)	TOTAL VOLUME WITHDRAWN (m ³)
Apache Canada Ltd.	93	1,306,009	109,714	Northpoint Energy Ltd.	1	967	0
Arc Resources Ltd.	10	110,804	125	Nova Gas Transmission Ltd.	17	89,473	0
Arcis Seismic Solutions Corp.	6	3,190	739	Nuvista Energy Ltd.	13	31,844	4,220
Artek Exploration Ltd.	2	1,512	0	Olympic Seismic Ltd.	4	20,000	0
Baytex Energy Ltd.	6	17,038	0	Pacific Trail Pipelines Mgmt Inc.	22	5,000	3
Black Swan Energy Ltd.	5	102,149	47,443	Painted Pony Petroleum Ltd.	3	234,850	3,126
Bonavista Energy Corp.	3	9,150	2,308	Paramount Resources Ltd.	59	485,617	32,184
Canadian Natural Resources Ltd.	192	1,454,766	310,512	Pengrowth Energy Corp.	14	69,900	0
Canbriam Energy Inc.	3	206,472	0	Penn West Petroleum Ltd.	77	433,404	19,978
Carmel Bay Exploration Ltd.	2	19,000	2,514	Plateau Pipe Line Ltd.	1	1,100	0
Challenger Geophysical Ltd.	1	5,000	0	Polar Star Canadian Oil and Gas, Inc.	6	32,200	0
Coastal Gaslink Pipeline Ltd.	27	8,807	232	Prince Rupert Gas Transmission Ltd.	5	600	0
ConocoPhillips Canada Operations Ltd.	182	1,703,219	28,441	Progress Energy Canada Ltd.	71	5,119,157	1,210,801
ConocoPhillips Canada Resources Corp.	4	6,675	1,587	Quicksilver Resources Canada Ltd.	5	460,079	0
Delphi Energy Corp.	1	250	0	Saguaro Resources Ltd.	3	300,000	0
Devon Canada Corp.	37	93,433	27,097	Shell Canada Limited	33	610,542	14,080
Devon NEC Corp.	17	59,037	14,163	SMR Oil & Gas Ltd.	3	7,655	0
Divestco Inc.	1	5,000	0	Storm Resources Ltd.	13	59,310	0
Encana Corp.	290	3,246,864	828,667	STX Energy Canada Inc.	17	70,600	0
Endurance B.C. Gas Ltd.	7	74,200	18,617	Suncor Energy Inc.	9	27,429	2,678
Enerplus Corp.	18	35,570	6,582	Talisman Energy Inc.	13	26,150	9,929
Harvest Operations Corp.	16	94,378	28,352	Taq North Ltd.	67	533,890	3,114
Husky Oil Operations Ltd.	25	164,232	35,369	Tourmaline Oil Corp.	3	315,000	0
Imperial Oil Resources Ltd.	7	672,727	4,285	UGR Blair Creek Ltd.	1	405	0
Ish Energy Ltd.	23	301,396	0	Westcoast Energy Inc.	10	210,620	384
Nexen Energy Ulc	32	549,875	128,911	Yoho Resources Inc.	9	27,300	710
				GRAND TOTAL	1,489	19,423,842	2,896,865

WATER LICENCES

LONG-TERM WATER USE

In March 2013, FLNRO designated specific Commission staff as Regional Water Managers under the Water Act, giving them authority to issue and administer water licences for the oil and gas sector. In total, 24 active water licences, comprising 38 points-of-diversion were transferred to the Commission (Table 1 on page 8). The total licenced approval of water use for 2013 was 16,226,511 m³, which accounts for 0.014 per cent of the mean annual runoff (Appendix 2, page 24).

Mandatory reporting of water use under water licences has generally not been a requirement. As a result, this report does not include data on the actual water use associated with the licences. Since assuming responsibility for the water licences, the Commission amended the licences to require water use reporting and will begin reporting data on actual use in the first quarter of 2014.

The basin with the highest percentage of oil and gas related water licence approval compared to mean annual runoff was the Doig River at 2,321,800 m³ representing 0.72 per cent of mean annual flow. Canadian Natural Resources Limited has four water licences from 1 point-of-diversion on the Doig River. The licences have priority statuses from the 1960s.

In 2013, four water licences, representing 5 points-of-diversion, expired. Further details on active oil and gas related water licences can be found in Table 6.



Flow through surface water allocations do not have water removed from the system; the water is used in place, and remains within the specific river or lake that is the licence's source.

Flow Through Water Licences:

	m ³ / yr
Hydropower Generation	124.6 billion
Hydropower Storage	39.5 billion
Cooling	87.1 million
Fire Prevention	41.5 million
Conservation	16.6 million

TABLE 6: OIL AND GAS RELATED WATER LICENCES ACTIVE IN 2013 AND TRANSFERRED TO THE RESPONSIBILITY OF THE COMMISSION

There are currently 377 water licences, representing 783 points-of-diversion currently held by other parties for a variety of water use purposes, including domestic and municipal water supply, pulp mills, industrial, forestry, agriculture, and a number of others. These non-oil and gas water licences authorize the withdrawal of 184,677,818 m³/yr (excluding hydropower generation and storage).

A breakdown of licenced water use in northeast British Columbia as at October 2013 is shown below. Flow through surface water allocations do not have water removed from the system; the water is used in place and remains within the specific river or lake that is the licence's source. Consumptive surface water allocations remove water from the system and the water is not returned.

Consumptive Use Water Licences:

	m ³ / yr
Oil and Gas	16.2 million
Domestic & Waterworks	15.4 million
Forestry	11.2 million
Mining	8.2 million
Agriculture & Range	3.6 million
Road Maintenance	0.6 million

LICENCE NUMBER	LICENCEE	PRIORITY DATE (yyyy.mm.dd)	LICENCE STATUS DATE (yyyy.mm.dd)	EXPIRY DATE (yyyy.mm.dd)	SOURCE	NUMBER OF POINTS OF DIVERSION	OGC WATER MANAGEMENT BASIN	DAILY APPROVAL (m ³ /day)	ANNUAL APPROVAL (m ³ /yr)	PURPOSE	PERIOD OF USE
C030560	CNRL	1963.09.19	1966.01.03	N/A	Doig River	1	Doig River	3,181	1,160,900	Oil Field Injection (OFI)	Whole Year
C032839	CNRL	1966.10.07	1967.12.15	N/A	Doig River	1	Doig River	3,181	1,160,900	OFI	Whole Year
C033691	CNRL	1967.06.22	1968.10.01	N/A	Doig River	1	Doig River	N/A	N/A	OFI	Whole Year
C033692	CNRL	1967.06.22	1968.10.01	N/A	Doig River	1	Doig River	N/A	N/A	Storage-Non Power	Whole Year
C111413	Shell Canada Energy	1996.08.20	1998.03.25	2027.04.28	Kiskatinaw River	1	Lower Kiskatinaw Rvr	1,080	400,000	"OFI; Storage-Non Power"	Whole Year
C112155	Imperial Oil Resources Ltd	1970.09.04	1998.03.18	N/A	Peace River	1	Lower Peace River	5,000	1,825,000	OFI	Whole Year
C113187	CNRL	1970.01.08	1998.08.26	N/A	Inga Lake & Coplin Creek	2	Cache Creek	507	185,000	"OFI; Storage-Non Power"	Whole Year
C113545	Tervita Corp	1998.07.16	1999.06.23	N/A	Rudiger One Lake & Rudiger Two Lake	2	Blueberry River	100	15,100	Industrial (drilling oil and gas activity)	Nov 1 - Mar 31
C117683	TAQA North Ltd	1964.09.16	2002.10.31	N/A	Hogg Creek	1	Lower Peace River		892,469	"OFI; Storage-Non Power"	Whole Year
C122399	Encana Corp	2006.11.27	2007.03.13	N/A	Tupper River	1	Pouce Coupe River	230	2,000	Industrial (processing)	Apr 1 - Dec 31
C122423	Encana Corp	2006.12.13	2007.03.13	N/A	Steepprock Creek	1	Smoky River	115	2,500	Industrial (processing)	Whole Year
C122523	Encana Corp	2007.01.25	2008.11.27	2013.11.27	Twin Lakes (Upper) & BP-48 Creek	2	Smoky River	1,000	25,000	Industrial (mining equipment)	Whole Year
C122524	Encana Corp	2007.01.25	2008.11.03	2013.11.03	Wasp Lake	1	Murray River	1,000	8,500	Industrial (mining equipment)	Nov 1 - Apr 30
C123577	Encana Corp	2007.03.16	2008.06.27	2013.06.27	Two Island Lake	1	Kiwigana River	2,600	100,000	Industrial (Mining)	Whole Year
C123616	Devon Canada Corp	2008.02.12	2008.07.04	2013.07.04	Tsea River	1	Tsea River	various	50,976	OFI	Apr 16 - Nov 30: 0.0058m ³ /s & Dec 1 - Apr 15: 0.0012 m ³ /s
C125903	Encana Corp	2007.04.02	2011.02.18	2016.12.31	Lower Trail Lake, Tightfit Lake, and Trail Lake	3	Tsea River	500	40,000	"OFI; Mining Equipment; Road Maintenance"	Whole Year
C125925	Encana Corp	2007.04.02	2011.02.18	2016.12.31	Yesshadle Creek	2	Middle Petitot Rvr	250	26,666	"OFI; Mining Equipment; Road Maintenance"	Whole Year
C125934	Encana Corp	2007.03.16	2011.02.18	2016.12.31	5 ZZ Lakes	5	Kiwigana	500	42,500	"OFI; Cooling; Road Maintenance"	Nov 1 - Mar 31
C126000	Encana Corp	2007.01.25	2011.03.14	2016.12.31	Coldstream Creek, Salt Creek, Skunk Creek, Tepee Creek, & 3 ZZ Creek (80570)	7	Murray River	240	25,000	"OFI; Cooling; Road Maintenance"	Whole Year
C126023	Encana Corp	2007.04.02	2011.02.18	2016.12.31	Komie Lake, South Texaco Lake	2	Sahtaneh River	500	40,000	"OFI; Mining Equipment; Road Maintenance"	Apr 1 - Oct 31
C126568	Talisman Energy Inc	2010.10.26	2011.07.25	2031.12.31	South Texaco Lake	1	Lower Petitot Rvr	500	30,000	As above	Apr 1 - Oct 31
C126877	Devon Canada Corp	1979.06.08	2011.12.09	2021.12.31	Charlie Lake	1	Lower Beaton Rvr	1,079	394,000	OFI	Whole Year
C127223	Canbriam Energy Inc	2011.02.15	2012.01.12	2031.12.31	Williston Lake	1	Peace Arm	10,000	3,650,000	OFI	Whole Year
C127986	Nexen Inc	2009.04.06	2012.03.11	2017.12.31	North Tsea Lake	1	Tsea River	60,000	2,500,000	OFI	Apr 1 - Oct 31

WATER SOURCE WELLS

The Commission has authority through OGAA for groundwater management and the regulation of water source wells. Water Source Wells are defined in the Petroleum and Natural Gas Act as:

“[A] hole in the ground drilled to obtain water for the purpose of injecting water into an underground formation in connection with the production of petroleum or natural gas.”

All water source wells require a well authorization from the Commission. A permit holder must measure and record the quantity and rate of water produced from the permit holder's water source well, and report

water production to the Commission monthly. Under Section 72 of the Drilling and Production Regulation:

“A permit holder must not operate a water source well in a manner that injuriously affects the use of the water source for domestic or agricultural purposes.”

“A well permit holder must report the quantity of water production from a water source well to the commission no later than 25 days after the end of the month in which the production occurred.”

TABLE 7:
COMPARISON
OF WATER
SOURCE WELL
WITHDRAWALS
FOR 2013

DEPTH OF WATER SOURCE WELL	VOLUME OF WATER WITHDRAWN			TOTAL WELLS
	0 - 10,000 m ³	10,000 - 100,000 m ³	>100,000 m ³	
20 - 200 m	5	15	0	20
201 - 500 m	4	4	0	8
>500 m	3	0	0	3
TOTAL WELLS	12	19	0	31

TABLE 8:
REPORTED WATER SOURCE WELL
WITHDRAWALS FOR 2013

In 2013, eight companies reported withdrawing 683,528 m³ of water from 31 water source wells (Table 1). The OGC Water Management Basins with the greatest groundwater extraction were Lower Sikanni Chief River (four wells, 171,201 m³) and Milligan Creek (six wells, 131,965 m³).

The location of active water source wells in 2013 in relation to unconventional gas play trends is provided in Appendix 1 on page 23. Several companies' wells were outside the play trends. These companies include Ish Energy, Harvest Operations and Dejour Energy. They inject water into the subsurface for enhanced oil recovery. The three companies withdrew 266,635 m³ of water from water source wells (Table 6).

The rest of the water produced from water source wells in 2013 (416,893 m³) was used for hydraulic fracturing.

The depths of the water source wells ranged from 46 to 2,600 metres (Table 7). The median depth was 135 metres. The majority of wells (64.5 per cent) were located in shallow formations of 20 metres to 200 metres depth, and were likely extracting fresh water (516,255 m³). Eight wells (25.8 per cent) were located at an intermediary depth of 201 metres to 500 metres, and were likely extracting a mix of brackish water and saline water (156,783 m³). Three water source wells (9.7 per cent) extracted deep, saline water from depths greater than 500 metres (10,490 m³).

MAJOR and Sub-Basin Name	WELL NUMBER	COMPANY	DEPTH OF WELL (m)	EASTING	NORTHING	2013 WATER WITHDRAWAL (m ³)
BEATTON RIVER						
Upper Beatton River	26846	Progress Energy Ltd	80	525002	6325277	17,667
Upper Beatton River	26848	Progress Energy Ltd	46	543348	6319308	3,170
Upper Beatton River	26849	Progress Energy Ltd	105	542509	6319625	3,287
Upper Beatton River	26864	Progress Energy Ltd	98	543626	6318982	14,316
Upper Beatton River	27413	Progress Energy Ltd	49	538320	6323888	18,665
Milligan Creek	25370	Canadian Natural Resources Ltd	91	643081	6303882	17,635
Milligan Creek	25371	Canadian Natural Resources Ltd	152	641831	6305985	25,568
Milligan Creek	25373	Canadian Natural Resources Ltd	165	640056	6335748	35,786
Milligan Creek	26952	Dejour Energy Ltd	305	650759	6338188	6,953
Milligan Creek	27214	Dejour Energy Ltd	305	650809	6338207	26,536
Milligan Creek	27281	Dejour Energy Ltd	316	650723	6338251	19,487
Lower Beatton River	26962	Canadian Natural Resources Ltd	250	646044	6296253	14,621
Lower Beatton River	16332	Pengrowth Energy Corporation	140	637357	6262984	39,756
Lower Beatton River	25556	Pengrowth Energy Corporation	135	626822	6259069	21,841
BEATTON TOTAL						265,287
HALFWAY RIVER						
Cameron River	26240	Progress Energy Ltd	124	547270	6313457	800
Cameron River	27142	Progress Energy Ltd	49	555758	6303639	3,547
Cameron River	27813	Progress Energy Ltd	500	555087	6304225	18,543
HALFWAY TOTAL						22,890
HAY RIVER						
Hay River	12650	Harvest Operations Corp	116	666470	6508531	6,289
Hay River	12663	Harvest Operations Corp	263	666017	6508914	6,894
Hay River	25318	Harvest Operations Corp	55	663881	6499732	67,104
Hay River	25319	Harvest Operations Corp	103	665729	6507088	44,590
HAY RIVER TOTAL						124,877
KISKATINAW RIVER						
Lower Kiskatinaw River	7779	Shell Canada Ltd	1473	637696	6198391	220
KISKATINAW RIVER TOTAL						220
PEACE RIVER						
Cache Creek	3164	Harvest Operations Corp	66	585296	6268197	25,033
Pouce Coupe River	23533	Tourmaline Oil Corp	2600	669073	6205390	8,160
PEACE TOTAL						33,193
PETITOT RIVER						
Sahdoanah River	14893	Ish Energy Ltd	232	628010	6568548	61,381
Sahdoanah River	17557	Ish Energy Ltd	255	627989	6568704	2,368
Tsea River	25945	Nexen Inc	749	551298	6587792	2,111
PETITOT TOTAL						65,860
SIKANNI CHIEF RIVER						
Lower Sikanni Chief River	11449	Canadian Natural Resources Ltd	92	628676	6379191	14,322
Lower Sikanni Chief River	11499	Canadian Natural Resources Ltd	96	628415	6379606	67,485
Lower Sikanni Chief River	11500	Canadian Natural Resources Ltd	183	628004	6379264	47,537
Lower Sikanni Chief River	14995	Canadian Natural Resources Ltd	104	628436	6380161	41,857
SIKANNI CHIEF RIVER						171,201
TOTAL						683,528

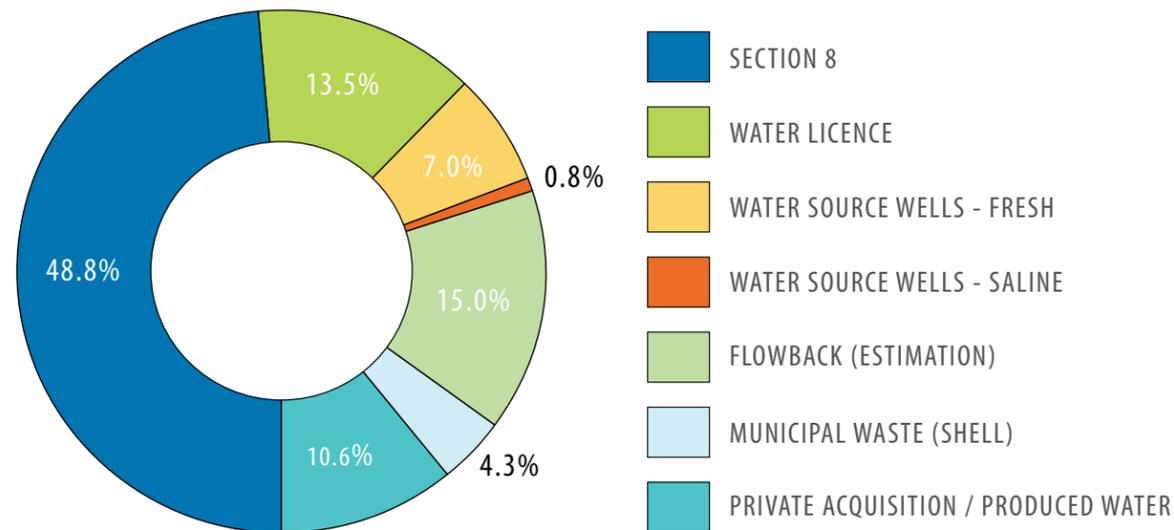
HYDRAULIC FRACTURING

WATER SOURCES AND REPORTING

On Jan. 1, 2012 British Columbia implemented the mandatory disclosure of ingredients used in hydraulic fracturing fluids. The website FracFocus.ca was launched to provide public access to information on fluids and ingredients used for the hydraulic fracturing of individual natural gas wells, as well as information on the process of hydraulic fracturing and the total volumes of water injected into the subsurface.

Hydraulic fracturing operations are closely monitored with related well data reported to the Commission; protection of surface water and groundwater are key priorities in the regulation of hydraulic fracturing.

FIGURE 2: SOURCES FOR ACQUISITION OF WATER USED FOR HYDRAULIC FRACTURING



In 2013, 31 companies used a total volume of 5,341,635 m³ of water to hydraulic fracture 433 wells (Table 1 on page 8).

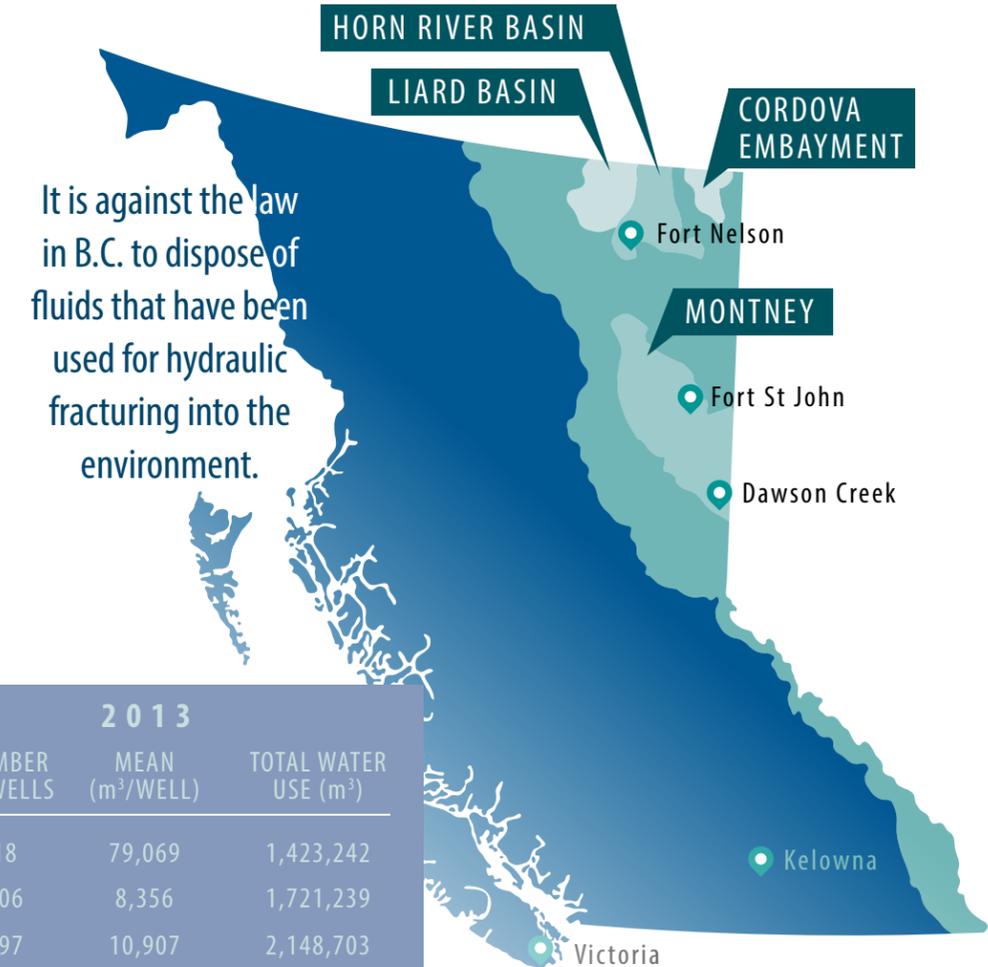
The OGC Management Basin with the highest total volume of water used for hydraulic fracturing in 2013 was the Tsea River, which is located in the Horn River Basin (Appendix 2, page 24), with 732,631 m³ used for hydraulic fracturing of 10 wells. The next highest basins for hydraulic fracturing water use were the Kiwigana River (668,623 m³; seven wells) located in the Horn River Basin and the Cameron River (570,709 m³; 43 wells) which is located in the north Montney.

The amount of water used for hydraulic fracturing varies considerably across northeast B.C., with the lowest use per well in the Heritage Basin of the Montney Play (south of the Peace River) and the highest use in the Horn River Basin (Table 9 on page 19). The varying water requirements are largely dependent on the geology of the formation being fractured.

In 2013, the average water use was 8,356 m³/well (206 wells) in the Heritage Basin, 10,907 m³/well (197 wells) in the north Montney, 79,069 m³/well (18 wells) in the Horn River Basin, and 20,106 m³/well (1 well) in the Liard Basin. There were no hydraulically fractured wells in the Cordova Basin.

In previous years, watersheds in the Horn River Basin had the highest volume of water injected for hydraulic fracturing. There were significantly fewer hydraulically fractured wells in the Horn River Basin in 2013 (18 wells) as compared to 2012 (50 wells). The total volume of water used in hydraulic fracturing dropped by nearly one quarter from 2012 to 2013.

Approximately two-thirds of the water used for hydraulic fracturing in 2013 came from surface sources (rivers, lakes, water source dugouts). A further 31 per cent came from non-fresh water sources, including flowback reuse, municipal waste water reuse, and saline groundwater. The remaining seven per cent came from fresh water wells (Figure 2 on page 18).



It is against the law in B.C. to dispose of fluids that have been used for hydraulic fracturing into the environment.

PLAY	2012			2013		
	NUMBER OF WELLS	MEAN (m ³ /WELL)	TOTAL WATER USE (m ³)	NUMBER OF WELLS	MEAN (m ³ /WELL)	TOTAL WATER USE (m ³)
HORN RIVER BASIN	50	76,923	3,846,142	18	79,069	1,423,242
MONTNEY - HERITAGE	205	6,684	1,370,235	206	8,356	1,721,239
MONTNEY - NORTH	136	10,053	1,367,177	197	10,907	2,148,703
LIARD BASIN	1	144	144	1	20,106	20,106
CORDOVA EMBAYMENT	15	36,739	551,080	0	0	0
OTHER	12	221	2,651	11	2,577	28,345
TOTAL	419	17,034	7,137,429	433	12,336	5,341,635

TABLE 9: WATER USED FOR HYDRAULIC FRACTURING IN 2012 AND 2013

COMMISSION INNOVATION

NORTHEAST WATER TOOL (NEWT)

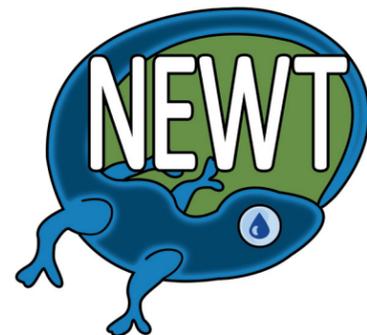
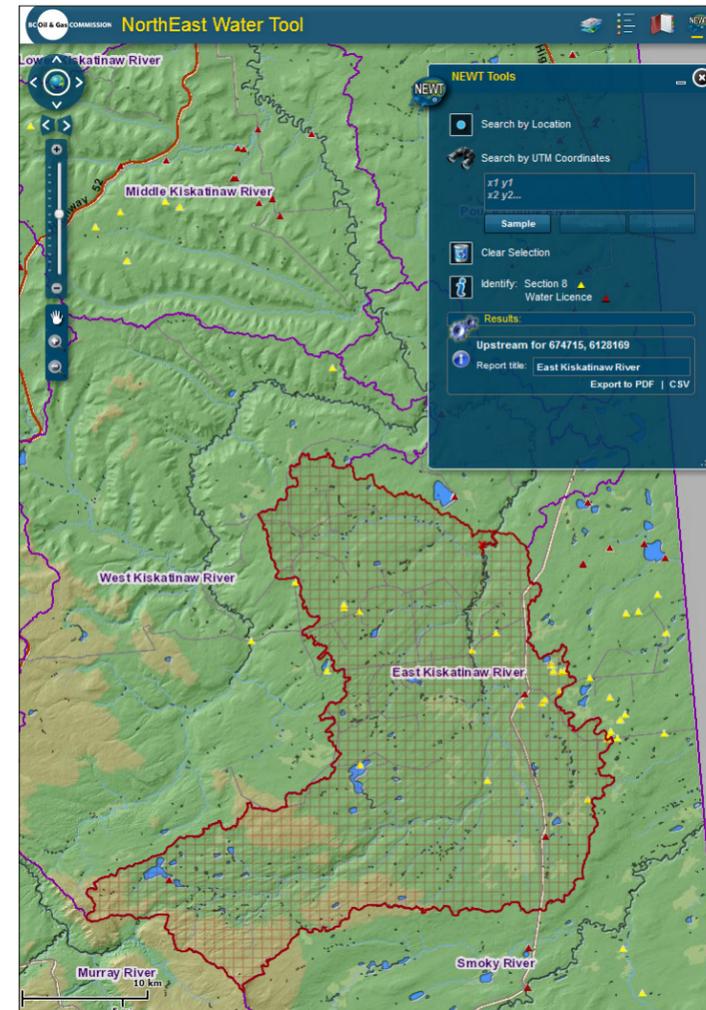
The [NorthEast Water Tool \(NEWT\)](#) is a GIS-based hydrology decision-support tool developed by the Commission. It provides guidance on water availability across northeast B.C., and supports the decision-making process for water use approvals and licences. The Ministry of Forests, Lands and Natural Resource Operations, Foundry Spatial Ltd. and Geoscience BC partnered with the Commission on the project. It became publically available for use in October 2012.

NEWT has an underlying hydrological information database, developed through a hydrology modelling project, and is designed to query locations on rivers or lakes throughout northeast B.C. 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 spatially displays and queries all active Section 8 approvals

and water licences issued pursuant to the Water Act, to quantify how much water is already allocated.

NEWT contains an “environmental flow” assessment, to ensure that all water allocation decisions do not impact environmental flow needs.

The basic output from NEWT is guidance on natural water supply and water availability, to assist decision-makers with water allocation determinations; it is just one piece of information that can be considered by a Statutory Decision Maker in making a water allocation determination. NEWT is publically accessible online for any interested parties and was acknowledged with a Premier’s Award for innovation in 2013.

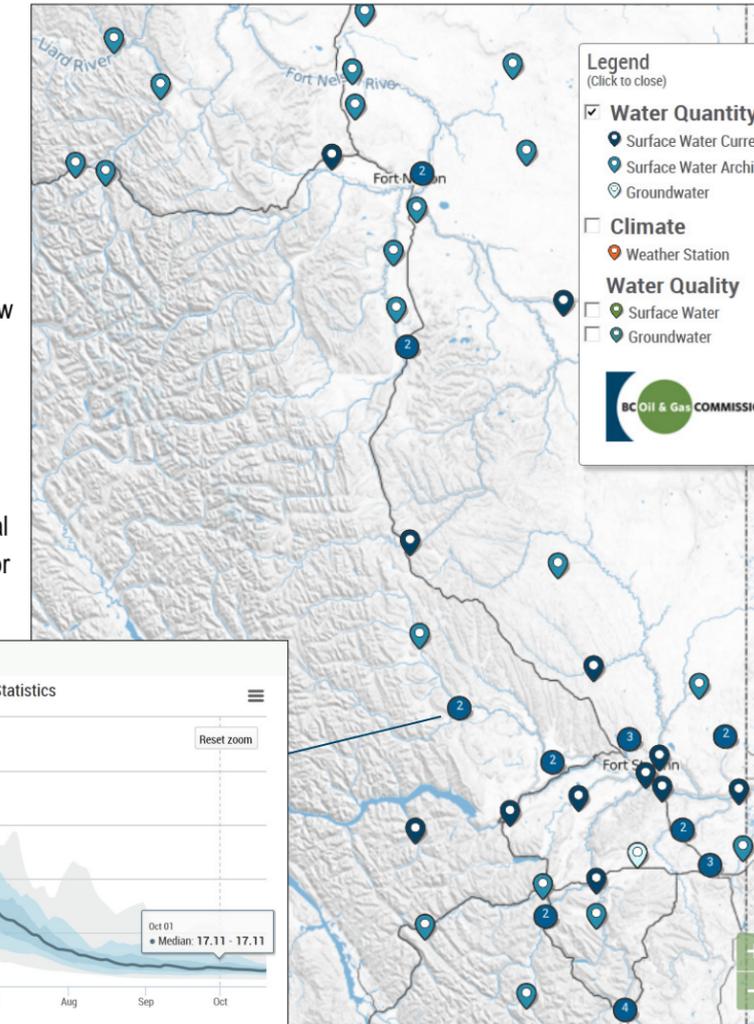


WATER INFORMATION PORTAL

The Commission in partnership with BC Ministry of Forests, Lands and Natural Resource Operations, Geoscience BC and the Science & Community Environmental Knowledge (SCEK) Fund, has recently developed a map-based [Water Information Portal](#).

This large repository of water monitoring information used by Commission decision-makers was mostly inaccessible and unknown to the public. The portal now offers the public access to relevant water information and provides enhanced knowledge of a wide range of water-related data from northeast B.C. to interested parties.

The data is displayed with flexible charts and analytical tools to assist users to understand and use the data for a variety of purposes.



The water-related data and information includes:

- **Streamflow information** collected by the Water Survey of Canada (and others, such as the Horn River Basin Producers Group).
- **Groundwater level** observation well data.
- **Climate information** collected by Environment Canada, Ministry of Transportation and Highways (from road weather stations), Ministry of Forests, Lands and Natural Resource Operations (from fire weather stations), BC Hydro, and others.
- **Surface water quality** data collected by government that is contained in the Provincial Environmental Monitoring System database.
- **Groundwater quality data** (from Northern Health, Ministry of Environment, and others).
- Data collected as a **permit requirement** from the Commission, or through investigations (streamflow, water quality).

GLOSSARY

Aquifer: An underground layer of permeable rock that can contain groundwater.

Basin Section 8: A Section 8 approval not for a specific point-of-diversion. Instead, it allows for withdrawals of up to 45 m³/day, to a maximum of 5,000 m³/year, specific to a drainage basin.

Brackish or Briny Water: Water with a salinity level between fresh water and saline water.

Dugout (Water Source Dugout): A pit used as a source of water that has naturally accumulated (from snowmelt, rainfall, or groundwater inflow).

Flowback Water: Water that returns to the surface after being injected for hydraulic fracturing.

Fresh Water: Water containing low concentrations of dissolved salts that may be suitable for drinking (before or after treatment).

Groundwater: Water located beneath the Earth's surface.

Groundwater Well: A well drilled for the purpose of obtaining water.

Hydraulic Fracturing: The injection of liquid at high pressure into the subsurface to fracture rock for the purpose of extracting oil or gas.

Hydrogeology: (hydro - meaning water, and - geology meaning the study of the Earth) is the area of geology that deals with the distribution and movement of groundwater in the soil and rocks of the Earth's crust (commonly in aquifers).

Hydrology: The study of the movement, distribution, and quality of water on Earth, including water resources and cycles, and environmental watershed sustainability.

m³: A measure of volume - cubic metres; 1m x 1m x 1m; 1,000 litres.

OGAA: The Oil and Gas Activities Act.

Points-of-Diversion: A location on the natural channel of a stream where an applicant proposes, or a licensee is authorized, to divert water from the stream.

Produced Water: Water that flows to the surface as a by-product of oil and gas production.

Runoff: The draining of water over a land surface.

Saline Water: Water containing a significant concentration of dissolved salts that is non-potable (not safe for consumption).

Section 8 Approval: A short-term water use approval issued under Section 8 of the Water Act for up to 24 months.

Stream: A natural watercourse or source of water supply, whether usually containing water or not, and a lake, river, creek, spring, ravine, swamp and gulch.

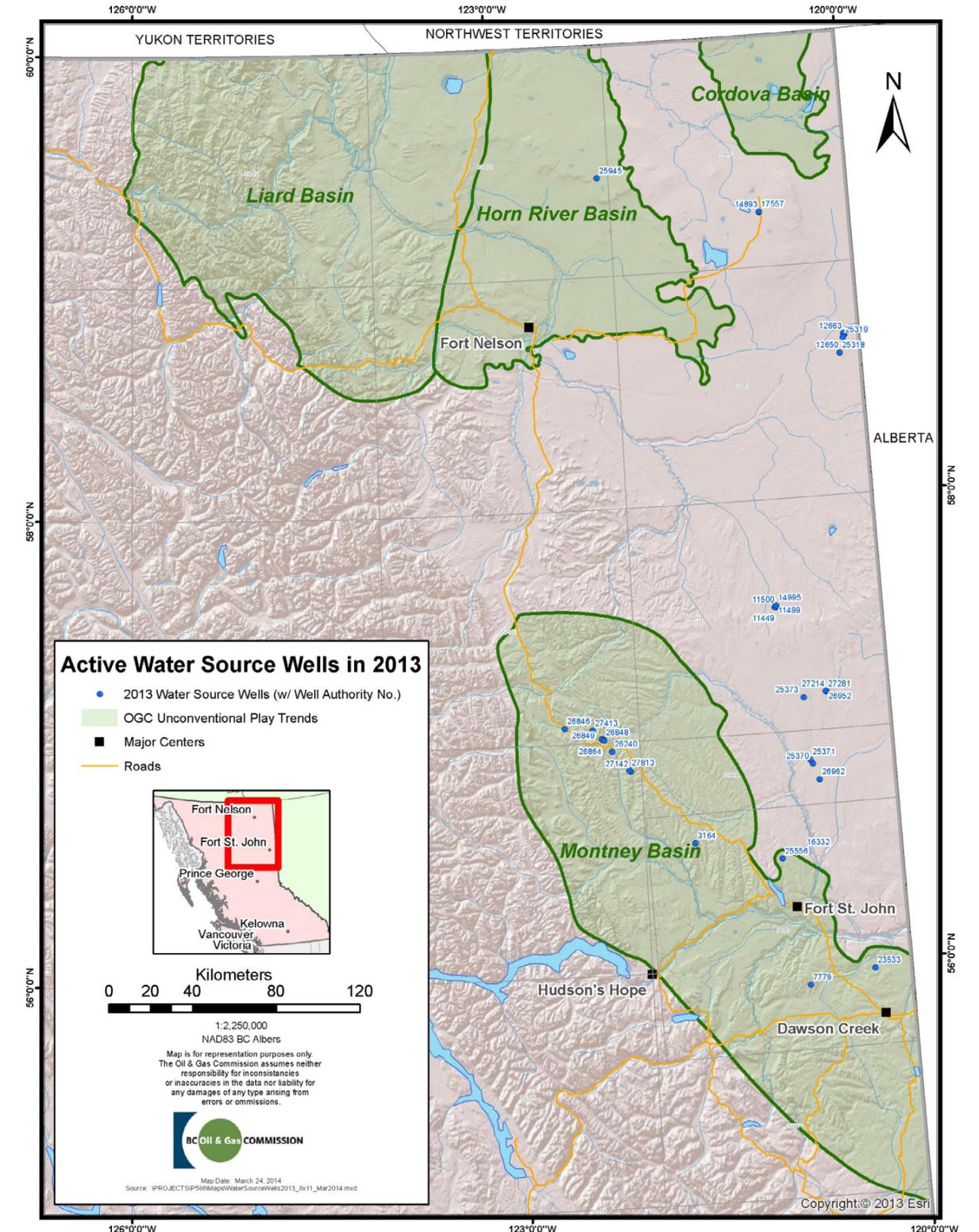
Water Act: The provincial legislation that establishes the provincial government as the "owner" of the water. Rights to use the water are established under licences or approvals issued under the Act.

Water Licence: The long-term authority to divert and use surface water in accordance with the statutory requirements of the Water Act.

Water Source Wells: A hole in the ground drilled to obtain water for the purpose of injecting water into an underground formation in connection with the production of petroleum or natural gas.

APPENDIX 1

MAP - ACTIVE WATER SOURCE WELLS IN 2013



APPENDIX 2

WATER APPROVAL AND USE FOR OIL AND GAS ACTIVITIES, ORGANIZED BY OGC WATER MANAGEMENT BASIN, IN 2013

Page 1 of 5

MAJOR and Sub-Basin Name	SECTION 8 WATER USE APPROVALS BC OIL AND GAS COMMISSION					OIL AND GAS RELATED WATER LICENCES			NON OIL AND GAS WATER LICENCES - FLNRO				WATER SOURCE SOURCE WELLS		HYDRAULIC FRACTURING	
	NUMBER OF APPROVED WITHDRAWAL LOCATIONS	TOTAL VOLUME APPROVED (m ³)	TOTAL VOLUME APPROVED AS % of MEAN ANNUAL	TOTAL VOLUME WITHDRAWN (m ³)	TOTAL VOLUME WITHDRAWN AS % OF MEAN ANNUAL RUNOFF	NUMBER OF LICENSED WITHDRAWAL LOCATIONS	TOTAL VOLUME LICENSED (m ³)	TOTAL VOLUME LICENSED AS % of MEAN ANNUAL RUNOFF	NUMBER OF LICENSED WITHDRAWAL LOCATIONS	TOTAL VOLUME LICENSED (m ³)	TOTAL VOLUME LICENSED as % of MEAN ANNUAL	MEAN ANNUAL RUNOFF (m ³)	NUMBER OF WELLS	TOTAL VOLUME WITHDRAWN (m ³)	NUMBER OF WELLS	TOTAL VOLUME INJECTED (m ³)
BEATTON RIVER (sub-basin of Peace River)																
Upper Beatton River	37	794,354	0.160%	190,412	0.040%	0			0			499,408,440	5	57,104	40	473,522
Middle Beatton River	22	60,541		4,526		0			0			249,152,995	0		1	4,723
Middle Beatton Total (incl. Upper Beatton)	59	854,895	0.114%	194,938	0.026%	0	0	0.000%	0	0	0.000%	748,561,435				
Milligan Creek	17	271,326	0.140%	565	0.000%	0			0			191,536,686	6	131,965	1	0
Blueberry River	58	474,485	0.160%	15,091	0.010%	2	15,100	0.010%	37	151,376	0.050%	293,278,540	0		21	113,600
Doig River	7	50,022	0.020%	0	0.000%	1	2,321,800	0.719%	18	52,478	0.020%	323,069,523	0		0	
Lower Beatton River	3	10,110		0		1	394,000		101	4,497,971		138,262,629	3	76,219	0	
BEATTON TOTAL	144	1,660,837	0.098%	210,594	0.012%	4	2,730,900	0.161%	156	4,701,825	0.277%	1,694,708,813	14	265,287	63	591,845
HALFWAY RIVER (sub-basin of Peace River)																
Chowade River	0					0			0			327,027,527	0		0	
Upper Halfway River	10	287,980		9,057		0			15	142,707		795,962,409	0		1	9,699
Upper Halfway Total (includes Chowade)	10	287,980	0.026%	9,057	0.001%	0	0	0.000%	15	142,707	0.013%	1,122,989,936				
Graham River	5	1,213,475	0.140%	95,774	0.010%	0			4	3,319	0.000%	860,627,172	0		0	
Cameron River	23	777,386	0.350%	203,951	0.090%	0			3	7,467	0.000%	223,679,567	3	22,890	43	570,709
Lower Halfway River	28	1,955,204		33,331		0			26	1,040,751		151,526,991	0		18	241,969
HALFWAY TOTAL	66	4,234,044	0.179%	342,113	0.015%	0	0	0.000%	48	1,194,243	0.051%	2,358,823,666	3	22,890	62	822,377
MOBERLY RIVER (sub-basin of Peace River)																
Moberly River	0					0			21	83,165	0.020%	391,714,995	0		0	
MOBERLY TOTAL	0	0	0.000%	0	0.000%	0	0	0.000%	21	83,165	0.020%	391,714,995	0	0	0	0
PINE RIVER (sub-basin of Peace River)																
Burnt River	3	5,770	0.000%	52	0.000%	0			5	35,038	0.000%	737,930,022	0		0	
Sukunka River	7	6,172		1,864		0			11	121,502		1,047,282,572	0		0	
Sukunka River Total (includes Burnt)	10	11,942	0.001%	1,916	0.000%	0	0	0.000%	16	156,540	0.009%	1,785,212,594				
Upper Pine River	3	1,500	0.000%	384	0.000%	0			29	2,455,557	0.170%	1,466,884,035	0		0	
Murray River	41	584,739	0.020%	28,973	0.000%	8	33,500	0.000%	85	28,382,851	1.050%	2,698,285,017	0		3	22,654
Lower Pine River	40	535,003		292,353		0			36	5,576,562		137,619,889	0		67	552,323
PINE TOTAL	94	1,133,184	0.019%	323,626	0.005%	8	33,500	0.001%	166	36,571,509	0.601%	6,088,001,535	0	0	70	574,977

WATER APPROVAL AND USE FOR OIL AND GAS ACTIVITIES, ORGANIZED BY OGC WATER MANAGEMENT BASIN, IN 2013

Page 2 of 5

MAJOR and Sub-Basin Name	SECTION 8 WATER USE APPROVALS BC OIL AND GAS COMMISSION					OIL AND GAS RELATED WATER LICENCES			NON OIL AND GAS WATER LICENCES - FLNRO				WATER SOURCE SOURCE WELLS		HYDRAULIC FRACTURING	
	NUMBER OF APPROVED WITHDRAWAL LOCATIONS	TOTAL VOLUME APPROVED (m ³)	TOTAL VOLUME APPROVED AS % of MEAN ANNUAL	TOTAL VOLUME WITHDRAWN (m ³)	TOTAL VOLUME WITHDRAWN AS % OF MEAN ANNUAL RUNOFF	NUMBER OF LICENSED WITHDRAWAL LOCATIONS	TOTAL VOLUME LICENSED (m ³)	TOTAL VOLUME LICENSED AS % OF MEAN ANNUAL RUNOFF	NUMBER OF LICENSED WITHDRAWAL LOCATIONS	TOTAL VOLUME LICENSED (m ³)	TOTAL VOLUME LICENSED as % of MEAN ANNUAL	MEAN ANNUAL RUNOFF (m ³)	NUMBER OF WELLS	TOTAL VOLUME WITHDRAWN (m ³)	NUMBER OF WELLS	TOTAL VOLUME INJECTED (m ³)
KISKATINAW RIVER (sub-basin of Peace River)																
West Kiskatinaw River	17	231,000	0.200%	57,293	0.050%	0			0			117,515,115	0		3	54,892
East Kiskatinaw River	82	744,700	0.710%	45,934	0.040%	0			10	4,530,497	4.300%	105,452,962	0		3	11,320
Middle Kiskatinaw River	27	230,336		11,385		0			23	2,060,382		56,347,972	0		8	123,702
Middle Kiskatinaw Total (incl. West & East)	126	1,206,036	0.432%	114,612	0.041%	0	0	0.000%	33	6,590,879	2.360%	279,316,049				
Lower Kiskatinaw River	9	279,772		4,386		1	400,000		43	1,154,815		89,659,847	1	220	62	480,537
KISKATINAW TOTAL	135	1,485,808	0.403%	118,998	0.032%	1	400,000	0.108%	76	7,745,694	2.099%	368,975,896	1	220	76	670,451
PEACE RIVER																
Peace Arm	0					2	7,300,000	N/A	15	84,004	N/A	N/A	0		0	
Upper Peace River	0					0			56	2,654,858	0.010%	36,423,413,429	0		4	55,579
Lynx Creek	1	1,500	0.000%	0	0.000%	0			9	259,970	0.850%	30,436,635	0		3	35,109
Farrell Creek	5	9,000	0.010%	3,060	0.000%	0			16	7,466	0.010%	91,018,843	0		21	227,189
Cache Creek	4	1,940	0.000%	364	0.000%	2	185,000	0.250%	12	1,794,026	2.400%	74,603,546	1	25,033	9	1,623
Pouce Coupe River	2	6,400	0.000%	0	0.000%	1	2,000	0.000%	104	2,942,189	1.150%	255,686,202	1	8,160	41	350,956
Lower Peace River	3	550,000		0		2	2,717,469		62	123,642,746		114,470,012	0		17	117,627
PEACE TOTAL (incl. Kisk/Pine/Moberly/Half/Beatton)	454	9,082,713	0.019%	998,755	0.002%	20	13,368,869	0.028%	741	181,681,695	0.379%	47,891,853,572	20	321,590	366	3,447,733
SMOKY RIVER																
Smoky River	63	533,800	0.020%	2,920	0.000%	3	27,500	0.000%	15	69,944	0.000%	2,669,506,123	0		2	7,228
SMOKY TOTAL	63	533,800	0.020%	2,920	0.000%	3	27,500	0.000%	15	69,944	0.000%	2,669,506,123	0	0	2	7,228
MUSKWA RIVER (sub-basin of Fort Nelson River)																
Upper Muskwa River	0					0			0			1,725,201,511	0		0	
Middle Muskwa River	0					0			1	830		1,973,711,816	0		0	
Middle Muskwa Total (incl. Upper Muskwa)	0	0	0.000%	0	0.000%	0	0	0.000%	1	830	0.000%	3,698,913,327				
Lower Muskwa River	0					0			10	1,839,377	0.280%	646,841,560	0		0	
MUSKWA TOTAL	0	0	0.000%	0	0.000%	0	0	0.000%	11	1,840,207	0.042%	4,345,754,887	0	0	0	0

WATER APPROVAL AND USE FOR OIL AND GAS ACTIVITIES, ORGANIZED BY OGC WATER MANAGEMENT BASIN, IN 2013

MAJOR and Sub-Basin Name	SECTION 8 WATER USE APPROVALS BC OIL AND GAS COMMISSION					OIL AND GAS RELATED WATER LICENCES			NON OIL AND GAS WATER LICENCES - FLNRO				WATER SOURCE WELLS		HYDRAULIC FRACTURING	
	NUMBER OF APPROVED WITHDRAWAL LOCATIONS	TOTAL VOLUME APPROVED (m³)	TOTAL VOLUME APPROVED AS % of MEAN ANNUAL	TOTAL VOLUME WITHDRAWN (m³)	TOTAL VOLUME WITHDRAWN AS % OF MEAN ANNUAL RUNOFF	NUMBER OF LICENCED WITHDRAWAL LOCATIONS	TOTAL VOLUME LICENCED (m³)	TOTAL VOLUME LICENCED AS % of MEAN ANNUAL RUNOFF	NUMBER OF LICENCED WITHDRAWAL LOCATIONS	TOTAL VOLUME LICENCED (m³)	TOTAL VOLUME LICENCED as % of MEAN ANNUAL	MEAN ANNUAL RUNOFF (m³)	NUMBER OF WELLS	TOTAL VOLUME WITHDRAWN (m³)	NUMBER OF WELLS	TOTAL VOLUME INJECTED (m³)
PROPHET RIVER (sub-basin of Fort Nelson River)																
Upper Prophet River	5	65,357	0.000%	24,502	0.000%	0			0			1,470,271,289	0		9	89,157
Middle Prophet River	9	12,411		5,208		0			0			621,428,680	0		0	
Middle Prophet Total (incl. Upper Prophet)	14	77,768	0.004%	29,710	0.001%	0	0	0.000%	0	0	0.000%	2,091,699,969				
Lower Prophet River	5	19,196		1,045		0			0			272,262,427	0		0	
PROPHET TOTAL	19	96,964	0.004%	30,755	0.001%	0	0	0.000%	0	0	0.000%	2,363,962,396	0	0	9	89,157
SIKANNI CHIEF RIVER (sub-basin of Fort Nelson R.)																
Upper Sikanni Chief River	6	892,577	0.110%	708,387	0.088%	0			2	64,488	0.008%	807,771,692	0		5	69,317
Middle Sikanni Chief River	37	357,197		19,597		0			2	5,808		949,755,794	0		22	256,507
Middle Sikanni Chief Total (incl. Upper Sikanni Chief)	43	1,249,774	0.071%	727,984	0.041%	0	0	0.000%	4	70,296	0.004%	1,757,527,486				325,824
Lower Sikanni Chief	42	111,884		2,882		0			0			875,678,142	4	171,201	0	
SIKANNI CHIEF TOTAL	85	1,361,658	0.052%	730,866	0.028%	0	0	0.000%	4	70,295	0.003%	2,633,205,628	4	171,201	27	325,824
FORT NELSON RIVER																
Kahntah River	65	244,654	0.060%	20,733	0.010%	0			0			400,582,903	0		0	
Fontas River	36	184,032		18,719		0			0			591,531,903	0		0	
Fontas Total (includes Kahntah)	101	428,686	0.043%	39,452	0.004%	0	0	0.000%	0	0	0.000%	992,114,806				
Klua River	8	34,000	0.010%	2,894	0.000%	0			0			402,135,448	0		0	
Upper Fort Nelson River	15	67,729		4,563		0			0			276,181,026	0		6	9,459
Upper Fort Nelson Total (incl. Sikanni Chief Total, Kahntah, Fontas, Klua)	209	1,892,073	0.044%	777,775	0.018%	0	0	0.000%	4	70,295	0.002%	4,303,636,908				
Snake River	21	84,550	0.030%	9,802	0.000%	0			0			310,763,522	0		0	
Sahtaneh River	57	461,239	0.100%	9,050	0.000%	2	40,000	0.010%	0			474,904,729	0		0	
Middle Fort Nelson River	56	2,055,200		729,328		0			7	1,001,848		515,348,901	0		0	
Mid Ft Nelson Total (incl. Upper Ft. Nelson total, Muskwa Total, Prophet Total, Snake, Sahtaneh)	362	4,590,026	0.037%	1,556,710	0.013%	2	40,000	0.000%	22	2,912,350	0.024%	12,314,371,343				
Kiwigana River	52	1,058,305	0.240%	4,449	0.000%	6	142,500	0.030%	0			441,657,543	0		7	668,623
Lower Fort Nelson River	27	363,659		32,734		0			0			312,768,938	0			
FORT NELSON TOTAL	441	6,011,990	0.046%	1,593,893	0.012%	8	182,500	0.001%	22	2,912,350	0.022%	13,068,797,824	0	0	49	1,093,063

WATER APPROVAL AND USE FOR OIL AND GAS ACTIVITIES, ORGANIZED BY OGC WATER MANAGEMENT BASIN, IN 2013

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MAJOR and Sub-Basin Name	SECTION 8 WATER USE APPROVALS BC OIL AND GAS COMMISSION					OIL AND GAS RELATED WATER LICENCES			NON OIL AND GAS WATER LICENCES - FLNRO				WATER SOURCE SOURCE WELLS		HYDRAULIC FRACTURING	
	NUMBER OF APPROVED WITHDRAWAL LOCATIONS	TOTAL VOLUME APPROVED (m ³)	TOTAL VOLUME APPROVED AS % of MEAN ANNUAL	TOTAL VOLUME WITHDRAWN (m ³)	TOTAL VOLUME WITHDRAWN AS % OF MEAN ANNUAL RUNOFF	NUMBER OF LICENSED WITHDRAWAL LOCATIONS	TOTAL VOLUME LICENSED (m ³)	TOTAL VOLUME LICENSED AS % of MEAN ANNUAL RUNOFF	NUMBER OF LICENCED WITHDRAWAL LOCATIONS	TOTAL VOLUME LICENCED (m ³)	TOTAL VOLUME LICENCED as % of MEAN ANNUAL	MEAN ANNUAL RUNOFF (m ³)	NUMBER OF WELLS	TOTAL VOLUME WITHDRAWN (m ³)	NUMBER OF WELLS	TOTAL VOLUME INJECTED (m ³)
LIARD RIVER																
Muncho River	0					0					551,551,360					
Upper Liard River	0					0			3	7,190	0.000%	33,125,817,465	0		0	
Upper Liard Total (incl. Muncho)	0	0	0.000%	0	0.000%	0	0	0.000%	3	7,190	0.000%	33,677,368,825	0	0	0	0
Grayling River	0					0			0		630,833,914	0		0		
Upper Toad River	0					0			0		1,521,055,576	0		0		
Racing River	0					0			0		1,488,336,681	0		0		
Lower Toad River	0					0			0		419,472,722	0		0		
Beaver River	0					0			0		10,862,659,426	0		0		
Middle Liard River	0					0			0		463,652,312	0		0		
Middle Liard (incl. Upper Liard Total, Grayling, Upper Toad, Racing, Lower Toad, Beaver)	0	0	0.000%	0	0.000%	0	0	0.000%	3	7,190	0.000%	49,063,379,456	0	0	0	0
Capot-Blanc Creek	23	447,708	0.240%	4,203	0.000%	0			0		183,879,851	0		1	20,106	
Dunedin Rlver	38	207,949	0.030%	1,908	0.000%	0			0		820,464,167	0		0		
Lower Liard River	29	723,600		119,578		0			0		1,236,634,664	0		0		
LIARD TOTAL (incl. Fort Nelson)	531	7,391,247	0.011%	1,719,582	0.003%	8	182,500	0.000%	25	2,919,540	0.005%	64,373,155,962	0	0	50	1,113,169
PETITOT RIVER																
Sahdoanah River	71	606,395	0.240%	5,814	0.000%	0			1	830	0.000%	252,625,362	2	63,749	0	
Upper Petitot River	81	245,716	0.020%	23,816	0.000%	0			0		1,476,579,488	0		0		
Tsea River	28	115,902	0.030%	29,891	0.010%	4	2,590,976	0.600%	0		434,062,484	1	2,111	10	732,631	
Middle Petitot River	19	55,050		13,832		2	26,666		0		698,562,753	0		0		
Middle Petitot Total (incl. Sahdoanah, Upper Petitot, Tsea)	199	1,023,063	0.036%	73,353	0.003%	6	2,617,642	0.091%	1	830	0.000%	2,861,830,087				
Lower Petitot River	36	619,534		23,583		1	30,000		0		904,314,069	0		1	21,988	
PETITOT TOTAL	235	1,642,596	0.044%	96,936	0.003%	7	2,647,642	0.070%	1	830	0.000%	3,766,144,156	3	65,860	11	754,619

WATER APPROVAL AND USE FOR OIL AND GAS ACTIVITIES, ORGANIZED BY OGC WATER MANAGEMENT BASIN, IN 2013

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MAJOR and Sub-Basin Name	SECTION 8 WATER USE APPROVALS BC OIL AND GAS COMMISSION					OIL AND GAS RELATED WATER LICENCES			NON OIL AND GAS WATER LICENCES - FLNRO			WATER SOURCE SOURCE WELLS		HYDRAULIC FRACTURING		
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HAY RIVER																
Upper Kotcho River	19	55,007	0.020%	2,034	0.000%	0			0		311,519,217	0		0		
Kyklo River	29	179,016	0.120%	5,574	0.000%	0			1	5,808	0.000%	145,897,691	0		0	
Shekilie River	42	104,079	0.020%	4,392	0.000%	0			0		450,747,494	0		3	1,369	
Lower Kotcho River	11	44,400		441		0			0		311,519,217	0		0		
Lower Kotcho Total (includes Upper Kotcho, Kyklo, Shekilie)	101	382,502	0.031%	12,441	0.001%	0	0	0.000%	1	5,808	0.000%	1,219,683,619				
Hay River	33	224,806		63,089		0			0		538,672,352	4	124,877	1	17,517	
HAY TOTAL	134	607,308	0.035%	75,530	0.004%	0	0	0.000%	1	5,808	0.000%	1,758,355,971	4	124,877	4	18,886
CHINCHAGA RIVER																
Chinchaga River	31	157,212	0.140%	3,114	0.000%	0			0		109,492,680	0		0		
CHINCHAGA TOTAL	31	157,212	0.140%	3,114	0.000%	0	0	0.000%	0	0	0.000%	109,492,680	0	0	0	0
OTHER (outside Northeast B.C.)	41	8,965		28		0	0		0	0	0	0	0	0	0	0
GRAND TOTAL	1,489	19,423,842	0.016%	2,896,865	0.002%	38	16,226,511	0.013%	783	184,677,818	0.160%	120,568,508,464	31	683,528	433	5,341,635