

Water Use for Oil and Gas Activity



2014 Annual Report



PURPOSE

The purpose of the *2014 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.



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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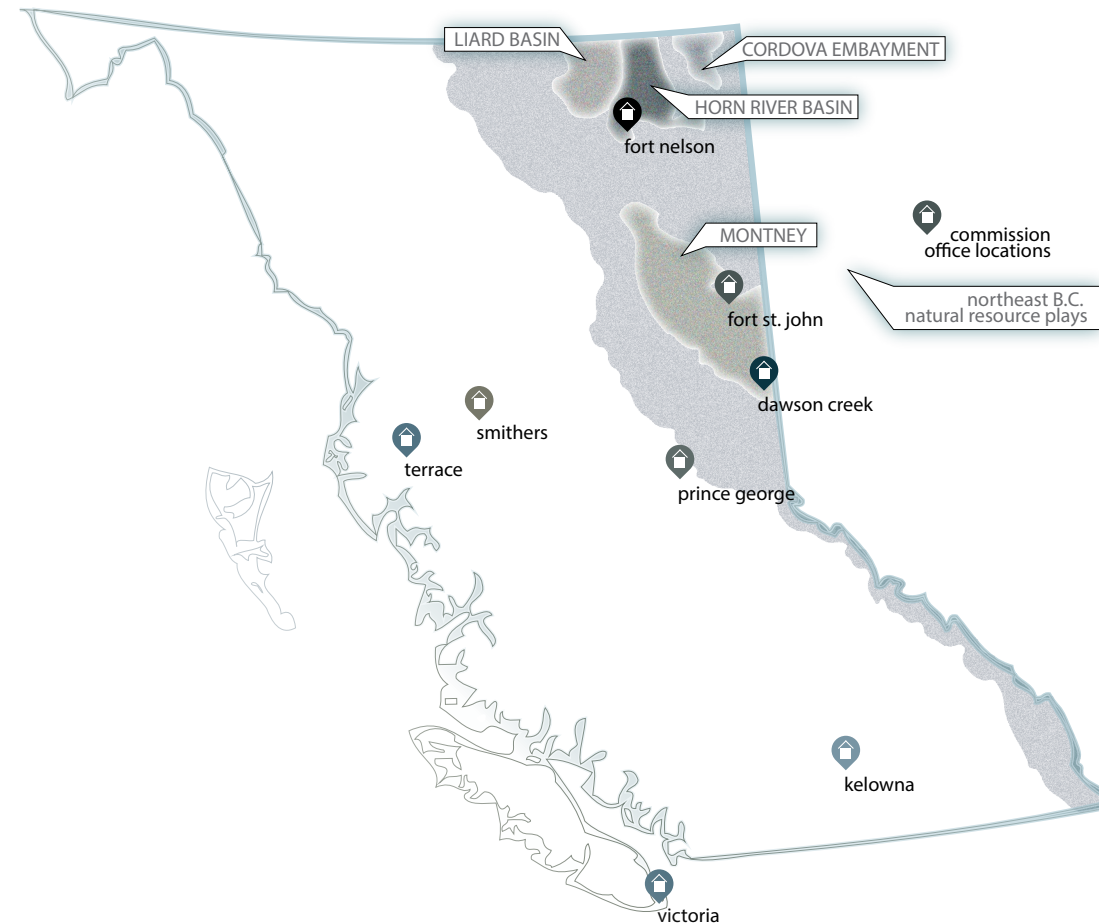
BC OIL AND GAS COMMISSION

The [BC Oil and Gas Commission](#) (Commission) is the provincial regulatory agency with responsibilities for regulating oil and gas activities in British Columbia, including exploration, development, pipeline transportation and reclamation.

The Commission's core services include reviewing and assessing applications for industry activity, consulting with First Nations, cooperating with partner agencies, and ensuring industry complies with provincial legislation and all regulatory requirements. The public interest is protected by ensuring public safety, respecting those affected by oil and gas activities, conserving the environment, and ensuring equitable participation in production.

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, and 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.

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 may access water in British Columbia. 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 the oil and Gas Activities Act (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.

Specific Commission staff are designated as Regional Water Managers under the Water Act, giving the Commission authority to issue and administer water licences, generally for terms of five years or more, to the oil and gas sector.

Through the Oil and Gas Activities Act (OGAA), the Commission has authority to issue water use permits under Section 8 of the Water Act to manage short-term water use. 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.

B.C. has a new Water Sustainability Act (WSA) that will replace the Water Act and is expected to go into effect in early 2016. Major changes in the WSA for oil and gas related water users include: water use associated with the “percolation or flow” of groundwater will require a licence or an approval; the definition of a stream will be modified to replace the word ‘swamp’ with the broader classification of ‘wetland’; and a new water use purpose called “hydraulic fracturing” will be established. To learn more about the new WSA, visit <http://engage.gov.bc.ca/watersustainabilityact/>.

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.

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 31.

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 hydrologists, hydrogeologists, geologists and engineers with the Commission. These specialists have expertise in northeast B.C.’s (NEBC) 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.



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 licences. In the past, most water use authorized by way of a water licence did not have a requirement for mandatory reporting.

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

TOOLS FOR WATER MANAGEMENT

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



Methods and tools include:

- The development of [OGC Water Management Basins](#) for NEBC (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, 2012 and 2014 summer droughts in NEBC.
- [The NorthEast Water Tool](#) and [NorthWest Water Tool](#), GIS-based hydrology decision-support tools.
- The development of a [Water Portal](#) to display available surface water and groundwater quantity and quality data throughout NEBC.
- Cooperation with water stewardship staff from Ministry of Forests, Lands and Natural Resource Operations ([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 - 2014 SNAPSHOT

In 2014, there were eight companies holding 18 water licences, representing 33 points-of-diversion, associated with oil and gas activities (Table 1). The annual total licenced volume for water use was 20,048,135 m³, which represents 0.017 per cent of the total mean annual runoff in NEBC. Beginning January 2014, oil and gas related water licence holders were required to submit actual water withdrawals. A total of 2,798,560 m³ representing 0.002 per cent of total mean annual runoff in NEBC was withdrawn for the year.

In 2014, the Commission was responsible for approving two water licences, cancelling five water licences, and transferring three water licences between companies. In addition, the Commission took over responsibility for 18 water licence applications that had been made to the Ministry of Forests, Lands and Natural Resource Operations (FLNRO). Of these, three water licence applications were withdrawn by the applicant, 10 applications were denied by the Commission upon review, and five water licence applications remain active.

There were 59 companies with 401 active short-term approvals from 1,554 points-of-diversion in 2014 (Table 1). The total annual volume of water approved for withdrawal was 25,881,977 m³, which represents 0.021 per cent of the total mean annual runoff in NEBC.

The total volume of extracted water reported was 2,510,673 m³, which corresponded to 0.002 per cent of the total mean annual runoff in NEBC. (Figure 1).

Water Source Wells are used to source groundwater for enhanced oil recovery or hydraulic fracturing. Eight companies reported withdrawing 785,278 m³ of water

from 31 water source wells in 2014. The wells were either accessing fresh water near the surface, a mix of brackish/saline water at an intermediary depth, or saline water extracted very deep below the surface.

A total of 8,258,192 m³ of water was used by 33 companies for hydraulic fracturing of 643 wells

TABLE 1: WATER ALLOCATION AND USE FOR OIL AND GAS ACTIVITIES IN 2014

WATER LICENCE	Companies with Active Water Licences	8
	Active Water Licences	18
	Licensed Withdrawal Locations	33
	Volume Available for Use for Water Licence (m³)	20,048,135
	Volume Reported Used for Water Licence (m³)	2,798,560
SHORT-TERM	Companies with Active Section 8 Approvals	59
	Active Section 8s	401
	Approved Withdrawal locations for Section 8s	1,554
	Volume Available for Use for Section 8s (m³)	25,881,977
	Volume Reported Withdrawn for Section 8s (m³)	2,510,673
WATER SOURCE WELLS	Companies Reporting Water Source Wells	8
	Water Source Wells	31
	Volume of Water Extracted from Water Source Wells (m³)	785,278
HYDRAULIC FRACTURING	Companies that Hydraulically Fractured Wells	33
	Hydraulically Fractured Wells	643
	Volume of Water Injected for Hydraulic Fracturing (m³)	8,258,192

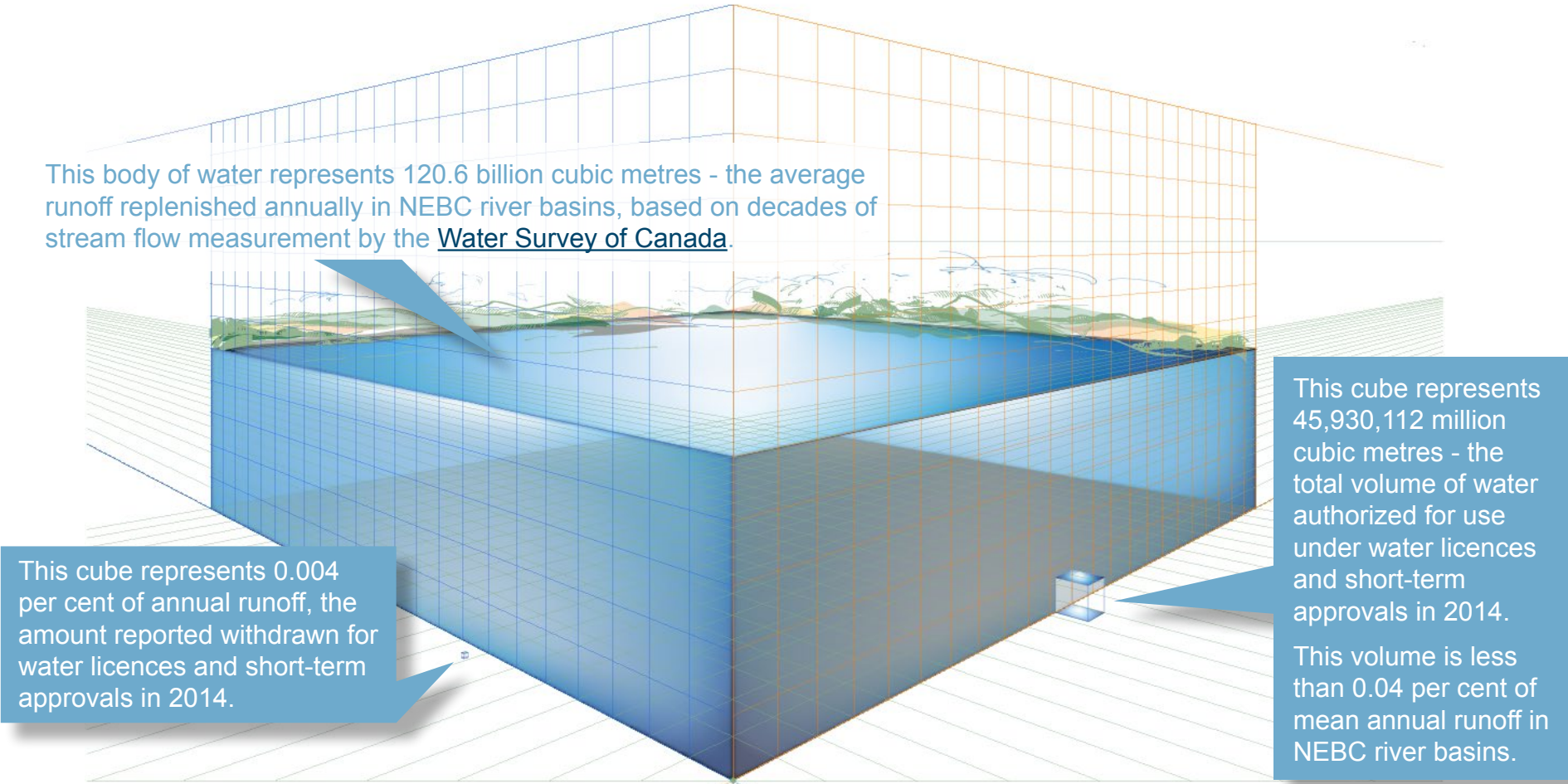


FIGURE 1: COMPARISON OF ANNUAL RUNOFF, WATER ALLOCATION AND VOLUMES REPORTED WITHDRAWN IN 2014

in 2014. The majority of wells hydraulically fractured were in the Montney Play (North and Heritage). Water for hydraulic fracturing was sourced by way of water licences, short-term Section 8 approvals, water source wells, reuse of flowback water, treatment of municipal wastewater and private acquisition.

New to the 2014 Annual Report are watershed summary maps (pages 23-27) displaying the volume of water in an OGC Water Management Basin that was allocated, withdrawn, or injected for hydraulic fracturing. Each map shows either the location of water licence and short-term approval points-of-diversion, the actual location of water withdrawals, or the sites of hydraulic fracturing wells.

Figure 1 provides a comparison of the average volume of annual runoff in NEBC river basins against water licence and short-term approval volumes, and actual volumes reported withdrawn.

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. Active oil and gas-related water licences (Table 4) and water licence applications were transferred to the Commission. Below is a summary of the Commission's water licence management activity from 2014.

2014 WATER USE DATA

At the beginning of the year, the Commission issued Orders to oil and gas-related water licence holders requiring mandatory reporting of daily water withdrawal data on a quarterly basis. In 2014, there were 18 active water licences, representing 33 points-of-diversion. The total annual volume of water licenced for 2014 was 20,048,135 m³. The total volume of extracted water reported was 2,798,560 m³ (14 per cent of the total licenced volume).

2014 WATER USE - BY SOURCE

Under the current Water Act, a water licence can be issued for streams. 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. Currently, there are only two categories of water sources licenced for oil and gas purposes: rivers and lakes.

River and lake water licences were very similar with respect to the number of active water licences, number of points-of-diversion, licenced volumes and withdrawal volumes (Table 2).

TABLE 4: OIL AND GAS RELATED WATER LICENCES
ACTIVE IN 2014

TABLE 2: SOURCES OF WATER LICENCES IN 2014

SOURCE	# of WATER LICENCES	# of POINTS OF DIVERSION	APPROVAL VOLUME (m³)	%	WITHDRAWN VOLUME (m³)	%
Rivers	11	18	9,701,635	48.4	1,517,713	54.2
Lakes	7	15	10,346,500	51.6	1,280,847	45.8
Total	18	33	20,048,135	100	2,798,560	100

2014 WATER USE - BY COMPANY

Encana Corporation had the greatest number of water licences (8) and points-of-diversion (23) (Table 3), however, no water was withdrawn under these licences in 2014. Five of Encana's water licences, representing 20 points-of-diversion, are scheduled to expire Dec. 31, 2016. Progress Energy had the highest licenced volume (6,643,000 m³) and total water withdrawal (1,117,429 m³). The highest withdrawal from a single point-of-diversion was Nexen's water licence on North Tsea Lake (1,026,149 m³).

TABLE 3: COMPANIES WITH WATER LICENCES IN 2014

COMPANY	# of WATER LICENCES	# of POINTS OF DIVERSION	LICENCED VOLUME (m³)	%	WITHDRAWN VOLUME (m³)	%
Canbriam	1	1	3,650,000	18.2	141,704	5.5
CNRL	2	2	579,000	2.9	7,371	0.3
Encana	8	23	3,208,666	16.0	0	0.0
Nexen	1	1	2,500,000	12.5	1,026,149	39.9
Progress Energy	2	2	6,643,000	33.1	1,117,429	43.5
Shell	2	2	750,000	3.7	4,244	0.2
TAQA North	1	1	892,469	4.5	0	0.0
Whitecap Resources*	1	1	1,825,000	9.1	501,663	10.7
Total	18	33	20,048,135	100	2,798,560	100

*Imperial Oil Resources Ltd. withdrew 233,703 m³ before the licence was transferred to Whitecap Resources.

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 (m³/day)	ANNUAL APPROVAL (m³/yr)	2014 WATER USE (m³/yr)	PURPOSE	PERIOD OF USE
C111413	Shell	1996.08.20	1998.03.25	2027.04.28	Kiskatinaw River	1	Lower Kiskatinaw River	1,080	400,000	0	Oil Field Injection (OFI)	Whole Year
C112155	Whitecap Resources	1970.09.04	1998.03.18	N/A	Peace River	1	Lower Peace River	5,000	1,825,000	501,663	OFI	Whole Year
C113187	CNRL	1970.01.08	1998.08.26	N/A	Coplin Creek	1	Cache Creek	507	185,000	0	OFI	Whole Year
C117683	TAQA North Ltd	1964.09.16	2002.10.31	N/A	Hogg Creek	1	Lower Peace River		892,469	0	OFI	Whole Year
C122399	Encana Corp	2006.11.27	2007.03.13	N/A	Tupper River	1	Pouce Coupe River	230	2,000	0	Industrial (processing)	Apr. 1 - Dec. 31
C122423	Encana Corp	2006.12.13	2007.03.13	N/A	Steeprock Creek	1	Smoky River	115	2,500	0	Industrial (processing)	Whole Year
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	0	OFI, Mining Equipment, Road Maintenance	Whole Year
C125925	Encana Corp	2007.04.02	2011.02.18	2016.12.31	Yesshadle Creek	2	Middle Petitot River	250	26,666	0	OFI, Mining Equipment, Road Maintenance	Whole Year
C125934	Encana Corp	2007.03.16	2011.02.18	2016.12.31	5 unnamed lakes	5	Kiwigana River	500	42,500	0	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, Teepee Creek, & 3 unnamed creeks	7	Murray River	240	25,000	0	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	0	OFI, Mining Equipment, Road Maintenance	Apr. 1 - Oct. 31
"	"	"	"	"	South Texaco Lake	1	Lower Petitot River	500	30,000	0	"	"
C126568	Progress Energy Ltd.	2010.10.26	2011.07.25	2031.12.31	Williston Lake	1	Peace Arm	10,000	3,650,000	105,623	OFI	Whole Year
C126877	CNRL	1979.06.08	2011.12.09	2021.12.31	Charlie Lake	1	Lower Beatton River	1,079	394,000	7,371	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	141,704	OFI	Whole Year
C127986	Nexen Inc	2009.04.06	2012.05.11	2017.12.31	North Tsea Lake	1	Tsea River	60,000	2,500,000	1,026,149	OFI	Apr. 1 - Oct. 31
C129170	Encana Corp	2010.10.25	2014.03.27	2024.12.31	Fort Nelson River	1	Middle Fort Nelson River	10,000	3,000,000	0	OFI	Whole Year
C131230	Progress Energy Ltd.	2013.02.15	2014.02.28	2029.12.31	Sikanni Chief River	1	Upper Sikanni Chief River	8,000/ 12,000	2,993,000	1,011,806	OFI	Apr. 16 - Oct. 31 12,000 m³/day, Nov. 1 - Apr. 15 8,000 m³/day
C131594	Shell	2014.04.10	2014.07.09	2029.12.31	Peace River	1	Lower Peace River	5,000	350,000	4,244	OFI	Whole Year

2014 WATER USE - PURPOSE

Oil and gas-related water licences are issued for the purpose of Oil Field Injection (OFI), which includes hydraulic fracturing, except C122399 and C122423 (smaller volume water licences issued to Encana for the purpose of industrial processing). All water reported as withdrawn from water licences was for the purpose of OFI.

WATER LICENCE ADMINISTRATION

APPROVED WATER LICENCES

TABLE 5: WATER LICENCES ISSUED TO OIL AND GAS COMPANIES IN 2014

ISSUE DATE	WATER LICENCE #	COMPANY	RIVER	VOLUME (m³/YR)	ISSUED BY
Feb. 27, 2014	C131230	Progress Energy	Sikanni Chief	2,993,000	OGC
Mar. 27, 2014	C129170	Encana	Fort Nelson	3,000,000	FLNRO
Jul. 19, 2014	C131594	Shell	Peace	350,000	OGC

Table 5 shows three licences issued in 2014. Prior to issuance, each company had an active short-term water use approval at the respective point-of-diversion. In total, 801,401m³ was withdrawn under the short-term approvals. Since the issuance of the licences, a volume of 1,016,050 m³ was withdrawn under licence. The Commission encourages companies with large volume Section 8 approvals on rivers and lakes to apply for water licences. As a condition of permit, the holders of the two licences approved by the Commission are required to operate a water monitoring program to sample, analyze and submit surface water quality data to the Commission. The data are uploaded to the [Water Portal](#).

CANCELLED WATER LICENCES

Five active water licences were cancelled at the request of the licence holder. Canadian Natural Resources Limited cancelled four licences (C030560, C032839, C0339691, C033692) on the Doig River having a cumulative total volume of 2,321,800 m³. Tervita Corporation cancelled one licence (C113545) for

Rudiger One Lake and Rudiger Two Lake, located within the Blueberry River watershed, with a cumulative volume of 15,100 m³.

TRANSFERRED WATER LICENCES

Under the Water Act, a water licence appurtenant to any land, mine or undertaking and any rights and obligations granted and imposed under the licence can be transferred during the sale of an appurtenancy. Three licences were transferred in 2014 (Table 6).

TABLE 6: WATER LICENCES TRANSFERRED BETWEEN OIL AND GAS COMPANIES IN 2014

WATER LICENCE #	OLD LICENCEE	NEW LICENCEE	SOURCE	VOLUME (m³/YR)
C126568	Talisman	Progress Energy	Williston Lake	3,650,000
C126877	Devon Canada Corp.	CNRL	Charlie Lake	394,000
C112155	Imperial Oil Resources Ltd.	Whitecap Resources	Peace River	1,825,000

WATER LICENCE APPLICATIONS

Upon assuming responsibility for the issuance of oil and gas-related water licences, 18 water licence applications were transferred to the Commission. The following tables summarize active, withdrawn, and refused applications.

ACTIVE APPLICATIONS

There were five active water licence applications currently under review by the Commission at the end of 2014 (Table 7) with a combined total annual volume request of 1.0 million m³.

FILE #	PRIORITY DATE (YYYY/MM/DD)	COMPANY	SOURCE	VOLUME (m³/YR)
7002123	2011/01/26	Quicksilver	Emile Creek	250,000*
7002127	2011/01/26	Quicksilver	Unnamed Lake	250,000*
7002129	2011/01/26	Quicksilver	4 unnamed Lakes	250,000*
7002137	2011/05/03	Quicksilver	Coles Lake	250,000*
7002110	2010/04/27	Crew Energy	Pine River	40,000*

TABLE 7:
ACTIVE OIL
AND GAS
WATER LICENCE
APPLICATIONS

*Purpose: Oil Field Injection

WITHDRAWN APPLICATIONS

Five applications, requesting a combined annual volume of 3.9 million m³, were withdrawn by the applicant (Table 8).

TABLE 8: WITHDRAWN OIL AND GAS WATER LICENCE APPLICATIONS

FILE #	APPLICATION DATE (YYYY/MM/DD)	COMPANY	SOURCE	VOLUME (m³/YR)	PURPOSE
7002001	2009/10/01	Nexen	Trail Lake, Lower Trail Lake, unnamed lake	1,604,200	OFI
7002000	2009/10/01	Nexen	7 unnamed lakes	1,507,200	OFI
7002117	2010/09/30	Apache	Two Island Lake	200,000	OFI, Road Maintenance
9000027	2014/04/10	Shell	2 unnamed creeks	300,000	OFI, Cooling
9000028	2014/04/30	Shell	1 unnamed creek	300,000	OFI, Cooling

DENIED APPLICATIONS

Upon review by the Commission, 10 applications, requesting a combined annual volume of 7.6 million m³ were denied (Table 9).

TABLE 9: DENIED OIL AND GAS WATER LICENCE APPLICATIONS

FILE #	APPLICATION DATE (YYYY/MM/DD)	COMPANY	SOURCE	VOLUME (m³/YR)	PURPOSE
7002108	2010/05/11	TAQA	Fort Nelson River	2,000,000	OFI
7002128	2011/02/11	Spectra Energy	Courvoisier Creek	200,000	Industrial (Processing)
7002003	2010/01/21	Spoke	Emile Creek	438,000	OFI
7002004	2010/01/21	Spoke	Unnamed lake	876,000	OFI
7002005	2010/01/21	Spoke	Unnamed lake	876,000	OFI
7002006	2010/01/21	Spoke	Unnamed lake	438,000	OFI
7002150	2011/06/07	Devon	Klenteh Creek	500,000	OFI
7002149	2011/06/07	Devon	Kiwigana River	800,000	OFI
7002143	2011/05/11	Devon	Tsea River	600,000	OFI
7002114	2010/06/02	Ramshorn	2 unnamed lakes, Emile Creek	914,300	OFI, Domestic

WATER LICENCES IN NORTHEAST B.C.

There are 381 water licences representing 708 points-of-diversion within NEBC for a variety of non-oil and gas water use purposes, including domestic and municipal water supply, pulp mills, industrial, forestry, agriculture, and others. These non-oil and gas related water licences authorized the withdrawal of 187.7 million m³/yr (excluding hydropower generation and storage).

A breakdown of licenced water use in NEBC as of November 2014 is shown in Table 10. Flow through surface water licences 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 licences remove water from the system and the water is not returned.

TABLE 10: NEBC WATER LICENCE ALLOCATION BY SECTOR

Flow Through Water Licences:	m³ / yr
Hydropower Generation	124.6 billion
Hydropower Storage	39.5 billion
Cooling	87.5 million
Fire Prevention	41.5 million
Conservation	17.3 million
Consumptive Use Water Licences:	m³ / yr
Oil and Gas*	20.0 million
Domestic & Waterworks	15.1 million
Mining	12.6 million
Forestry	9.8 million
Agriculture and Range	3.6 million
Road Maintenance	0.6 million
*Actual water withdrawal by oil and gas industry: 2.8 million m³.	

SECTION 8 WATER APPROVALS

SHORT-TERM WATER USE

O GAA provides authority to the Commission to issue short-term water use approvals under Section 8 of the Water Act:

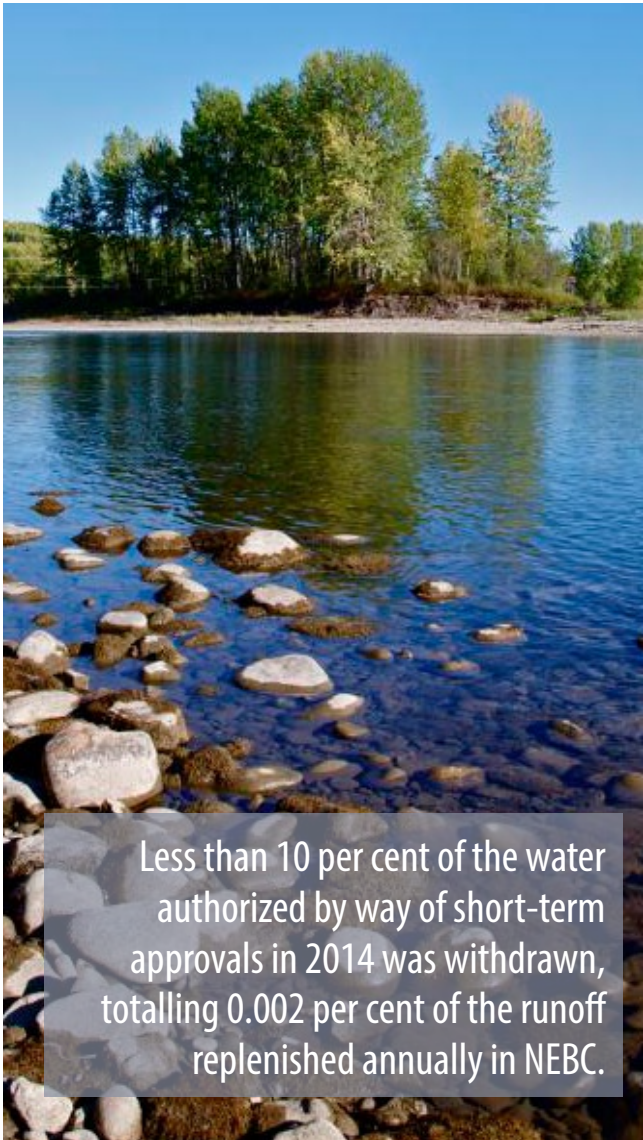
WATER ACT

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.



Less than 10 per cent of the water authorized by way of short-term approvals in 2014 was withdrawn, totalling 0.002 per cent of the runoff replenished annually in NEBC.

2014 WATER USE DATA

In 2014, there were 59 companies with 401 active Section 8 approvals from 1,554 points-of-diversion (Table 1, page 8). The total annual volume of water approved for withdrawal was 25,881,977 m³. The total volume of extracted water reported was 2,510,673 m³ (9.7 per cent of the approved volume).

Section 8 water withdrawals for 2014 were slightly less than withdrawals in 2011 (3,812,085 m³), 2012 (3,756,464 m³), and 2013 (2,900,519 m³), respectively (Table 11).

A possible contributing factor to the decline in Section 8 withdrawals was the issuance of three water licences to oil and gas companies. Before these licences were issued, each of the companies had an active short-term water use approval for the same point-of-diversion associated with the water licence. In total, 801,401 m³ was withdrawn under the short-term approvals. Since the issuance of the licences, a volume of 1,016,050 m³ was withdrawn under licence.

2014 DROUGHT

On Jul. 28, 2014, the Commission issued [Directive 2014-01](#) suspending short-term water withdrawal from several basins in the Peace River watershed due to significant drought conditions. The suspension was expanded Aug. 8, 2014 and Aug. 21, 2014 to include most of NEBC.

The suspension ended for the Peace River watersheds on Oct. 28, 2014 and for the rest of NEBC on Dec. 2, 2014. Several larger rivers and lakes were exempted from the suspension because they were less affected by the drought. Withdrawals from water source dugouts were not suspended.

Of the 1,554 points-of-diversion approved, 1,005 (64.7 per cent) reported zero withdrawals.

2014 WATER USE - BY SOURCE

In 2014, water source dugouts comprised the most points-of-diversion at 1,177 (75.7 per cent) as shown in Table 12. Rivers accounted for 235 (15.1 per cent) points-of-diversion. Water source dugouts had the highest annual approval volume at 15,377,785 m³ (59.4 per cent), while rivers had the second highest with an approval volume of 9,721,255 m³ (37.6 per cent). Conversely, the highest volume of water withdrawn was from rivers at 1,209,038 m³ (48.2 per cent), compared to water source dugouts at 1,096,840 m³ (43.7 per cent). Of the 1,209,038 m³ withdrawn from rivers/streams, 801,401 m³ (66.2 per cent) was withdrawn from short-term Section 8 approvals that were later issued as water licences.

TABLE 11 - QUARTERLY WATER WITHDRAWALS (m³) FROM SECTION 8 APPROVALS, 2011 - 2014

YEAR	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	1,077,316	482,054	612,542	728,607	2,900,519
2014	1,136,552	568,342	627,318	178,461	2,510,673

TABLE 12: SECTION 8 WATER SOURCE TYPES IN 2014

SOURCE	NUMBER OF APPROVED WITHDRAWAL LOCATIONS		WATER APPROVAL VOLUME (m ³)		WATER WITHDRAWAL VOLUME (m ³)	
		%		%		%
STREAM/RIVER	235	15.1	9,721,255	37.6	1,209,038	48.2
LAKE	55	3.5	374,287	1.4	182,219	7.3
WATER SOURCE DUGOUT	1,177	75.7	15,377,785	59.4	1,096,840	43.7
BASIN	87	5.6	408,650	1.6	22,576	0.9
GRAND TOTAL	1,554	100.0	25,881,977	100	2,510,673	100

2014 WATER USE - BY COMPANY

A summary of Section 8 data for individual oil and gas companies is shown in Table 15.

In 2014, Encana Corporation had the most active points-of-diversion at 200 (12.9 per cent). ConocoPhillips Canada Operations Ltd. / ConocoPhillips Canada Resources Corp (193 points-of diversion, 12.4 per cent) and Canadian Natural Resources Limited (172 points-of-diversion; 11.1 per cent) had second and third highest number of water withdrawal locations. Progress Energy Canada had the greatest total approval volume at 7,050,074 m³ (27.3 per cent). Encana Corporation (2,888,700 m³, 11.2 per cent) Canadian Natural Resources Limited (2,084,930 m³, 8.1 per cent) had the second and third highest Section 8 approval volume.

Four companies, Encana Corporation (705,141 m³, or 28.1 per cent), Progress Energy Canada (646,082 m³, or 25.7 per cent), Nexen Energy ULC (272,724 m³, or 10.9 per cent) and Canadian Natural Resources Limited (215,821 m³, or 8.6 per cent) accounted for nearly three quarters of all water withdrawn under Section 8 approvals.

2014 WATER USE - BY PURPOSE

For short-term approvals, the majority of water was approved and withdrawn for the purpose of OFI, which includes hydraulic fracturing.

NORTHEAST BC WATER ALLOCATION

The mean annual runoff for the various rivers and streams across NEBC is about 120.6 billion m³ (based on data collected by the Water Survey of Canada) as shown in Figure 1. The OGC Water Management Basins with the largest oil and gas-related total water allocation, combining water licences and short-term approvals, as a percentage of mean annual runoff for 2014 are listed in Table 13.

TABLE 13: BASINS WITH THE LARGEST OIL AND GAS RELATED ALLOCATION VOLUMES AS A PERCENTAGE OF MEAN ANNUAL RUNOFF

OGC WATER MANAGEMENT BASIN	PERCENTAGE
Cameron River	0.89
East Kiskatinaw River	0.73
Tsea River	0.62
Upper Sikanni Chief River	0.48
Kiskatinaw River	0.47
Upper Beaton River	0.43
Blueberry River	0.42
Capot-Blanc Creek	0.41
Middle Kiskatinaw River	0.40

TABLE 15: 2014 SECTION 8 WATER APPROVALS AND USE DATA ORGANIZED BY COMPANY

For all the remaining basins, the combined oil and gas-related water allocation corresponded to less than 0.40 per cent of mean annual runoff.

Actual water withdrawal in individual basins is a small fraction of the allocated water use. The basins with largest actual volume of water withdrawn as a percentage of mean annual runoff for 2014 are listed in Table 14.

TABLE 14: BASINS WITH THE LARGEST OIL AND GAS RELATED WITHDRAWAL VOLUMES AS A PERCENTAGE OF MEAN ANNUAL RUNOFF

OGC WATER MANAGEMENT BASIN	PERCENTAGE
Tsea River	0.24
Upper Sikanni Chief River	0.17
Cameron River	0.12
Middle Sikanni Chief River	0.05
Middle Petitot River	0.04
Blueberry River	0.04

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

COMPANY	NUMBER OF APPROVED WITHDRAWAL LOCATIONS	TOTAL VOLUME APPROVED (m³)	TOTAL VOLUME WITHDRAWN (m³)	COMPANY	NUMBER OF APPROVED WITHDRAWAL LOCATIONS	TOTAL VOLUME APPROVED (m³)	TOTAL VOLUME WITHDRAWN (m³)
Apache Canada Ltd.	78	1,317,575	60,191	Nexen Energy ULC.....	38	939,950	272,724
Arc Resources Ltd.	3	84,875	0	Norcan Energy Corporation.....	1	10,000	0
Arcis Seismic Solutions Corp.	1	750	0	Northpoint Energy Ltd.....	2	1,080	0
Artek Exploration Ltd.	2	1,512	0	Nova Gas Transmission Ltd.....	27	69,905	418
Baytex Energy Ltd.	5	14,148	241	Nuvista Energy Ltd.....	13	63,688	510
Black Swan Energy Ltd.	6	148,500	8,000	Pacific Northern Gas Ltd.....	8	99	0
Bonavista Energy Corp.....	10	99,950	9,260	Pacific Trail Pipelines Mgmt Inc.....	33	13,199	166
Canadian Natural Resources Ltd.	172	2,084,930	215,821	Painted Pony Petroleum Ltd.....	3	322,456	0
Canbriam Energy Inc.	3	412,944	1,566	Paramount Resources Ltd.....	83	1,004,953	66,260
Carmel Bay Exploration Ltd.	2	19,000	0	Pengrowth Energy Corp.....	13	56,055	13,712
Cequence Energy Ltd.	1	1,120	250	Penn West Petroleum Ltd.....	74	467,347	12,220
Chinook Energy (2010) Inc.	22	178,644	7,585	Plateau Pipe Line Ltd.....	2	2,550	61
Coastal Gaslink Pipeline Ltd.	16	6,261	73	Polar Star Canadian Oil and Gas, Inc.	9	11,995	0
ConocoPhillips Canada Operations Ltd.	186	1,971,701	31,626	Prince Rupert Gas Transmission Ltd.....	13	1,175	25
ConocoPhillips Canada Resources Corp.....	7	34,610	1,912	Progress Energy Canada Ltd.....	83	7,050,074	646,082
Crew Energy Inc.	4	760,000	56,115	Quattro Exploration and Production Ltd.....	1	4,000	1,269
Devon Canada Corp.	16	53,300	1,584	Quicksilver Resources Canada Ltd.....	5	348,000	35,989
Devon NEC Corp.	10	46,479	4,396	Saguaro Resources Ltd.....	7	816,500	76,781
Encana Corp.	200	2,888,700	705,141	Seitel Canada Ltd.....	5	25,000	352
Endurance B.C. Gas Ltd.	132	929,766	67,006	Shell Canada Limited.....	39	1,135,688	90,136
Enerplus Corp.	18	128,897	1,130	Spyglass Resources Corp.....	1	4,000	240
Explor Geophysical Ltd.....	4	18,000	0	Storm Resources Ltd.....	21	282,450	30,350
FortisBC Energy (Vancouver Island) Inc.	2	450	0	Sukunka Natural Resources Inc.....	1	10,000	20
FortisBC Energy Inc.	1	2,100	0	Suncor Energy Inc.....	2	67,500	17,748
GS E&R Canada Inc.	17	70,600	1,530	Talisman Energy Inc.....	5	20,300	0
Harvest Operations Corp.....	22	77,445	12,195	Taqa North Ltd.....	51	560,869	8,385
Husky Oil Operations Ltd.....	48	368,975	40,585	Tourmaline Oil Corp.....	2	175,000	0
Imperial Oil Resources Ltd.....	7	295,250	0	UGR Blair Creek Ltd.....	10	298,250	2,061
Murphy Oil Company Ltd.....	2	50,000	8,145	Westcoast Energy Inc.....	2	12,055	0
Nabors Drilling Canada Limited.....	3	21,357	812				
				GRAND TOTAL	1,554	25,881,977	2,510,673

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.

TABLE 16:
COMPARISON
OF WATER
SOURCE WELL
WITHDRAWALS
FOR 2014

DEPTH OF WATER SOURCE WELL	VOLUME OF WATER WITHDRAWN			TOTAL WELLS
	0 - 10,000 m³	10,000 - 100,000 m³	> 100,000 m³	
20 - 200 m	5	13	0	18
201 - 500 m	2	6	0	8
>500 m	0	4	1	5
TOTAL WELLS	7	23	1	31

In 2014, eight companies reported withdrawing 785,278 m³ of water from 31 water source wells (Table 1). The OGC Water Management Basins with the greatest groundwater extraction were Tsea River (one well, 132,271 m³), Upper Beatton River (five wells, 100,528 m³), and Milligan Creek (six wells, 99,704 m³) Table 17.

The depths of the water source wells ranged from 46 to 1,000 metres (Table 17). The majority of wells (58.1 per cent) were located in shallow formations of 20 metres to 200 metres depth, and were likely extracting fresh water (391,304 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 (175,581 m³). Five water source wells (16.1 per cent) extracted deep, saline water from depths greater than 500 metres (218,393 m³) Table 16.

TABLE 17:
REPORTED WATER SOURCE WELL
WITHDRAWALS FOR 2014

The location of active water source wells in 2014 in relation to unconventional gas play trends is provided in Appendix 1. Several companies’ wells were outside the play trends. These companies include Ish Energy, Dejour Energy and the majority of Canadian Natural Resources Limited’s wells. These wells are used to source water to inject into the subsurface for enhanced oil recovery. The three companies withdrew 314,889 m³ of water from these water source wells (Table 17).

The rest of the water produced from water source wells in 2014 (470,389 m³) was likely used for hydraulic fracturing for natural gas development. Saline or brackish water source wells contributed to 279,267 m³ for hydraulic fracturing, while shallower fresh water source wells contributed to 191,122 m³.

MAJOR and Sub-Basin Name	WELL NUMBER	COMPANY	DEPTH OF WELL (m)	EASTING	NORTHING	2014 WATER WITHDRAWAL (m³)
BEATTON RIVER						
Upper Beatton River	26846	Progress Energy Ltd	80	525002	6325277	26,926
Upper Beatton River	26848	Progress Energy Ltd	46	543348	6319308	530
Upper Beatton River	26849	Progress Energy Ltd	105	542509	6319625	1,616
Upper Beatton River	26864	Progress Energy Ltd	98	543626	6318982	25,602
Upper Beatton River	27413	Progress Energy Ltd	49	538320	6323888	45,855
Milligan Creek	25370	Canadian Natural Resources Ltd	91	643081	6303882	13,419
Milligan Creek	25371	Canadian Natural Resources Ltd	152	641831	6305985	33,323
Milligan Creek	25373	Canadian Natural Resources Ltd	165	640056	6335748	23,651
Milligan Creek	26952	Dejour Energy Ltd	305	650759	6338188	5,338
Milligan Creek	27214	Dejour Energy Ltd	305	650809	6338207	12,580
Milligan Creek	27281	Dejour Energy Ltd	316	650723	6338251	11,393
Blueberry River	27364	Artek Exploration Ltd	254	587707	6291012	10,841
Lower Beatton River	26962	Canadian Natural Resources Ltd	250	646044	6296253	18,920
Lower Beatton River	16332	Pengrowth Energy Corporation	140	637357	6262984	26,545
Lower Beatton River	25556	Pengrowth Energy Corporation	135	626822	6259069	10,812
BEATTON RIVER TOTAL						267,350
HALFWAY RIVER						
Cameron River	26240	Progress Energy Ltd	124	547270	6313457	1,476
Cameron River	27142	Progress Energy Ltd	49	555758	6303639	5,313
Cameron River	27813	Progress Energy Ltd	500	555087	6304225	50,034
HALFWAY RIVER TOTAL						56,823
KISKATINAW RIVER						
Middle Kiskatinaw	29739	Encana Corporation	995	654337	6184880	14,182
Middle Kiskatinaw	29740	Encana Corporation	985	654347	6184880	11,088
Lower Kiskatinaw	28495	Encana Corporation	1,000	654386	6186970	30,826
Lower Kiskatinaw	28496	Encana Corporation	1,000	654377	6186970	30,026
KISKATINAW RIVER TOTAL						124,877
PEACE RIVER						
Cache Creek	3164	Canadian Natural Resources Ltd	66	585296	6268197	3,790
Cache Creek	29801	Artek Exploration Ltd	67	586123	6273247	42,657
PEACE RIVER TOTAL						46,447
PETITOT RIVER						
Sahdoanah River	14893	Ish Energy Ltd	232	628010	6568548	65,386
Sahdoanah River	17557	Ish Energy Ltd	255	627989	6568704	1,091
Tsea River	25945	Nexen Inc	749	551298	6587792	132,271
PETITOT RIVER TOTAL						198,747
SIKANNI CHIEF RIVER						
Lower Sikanni Chief River	11449	Canadian Natural Resources Ltd	92	628676	6379191	13,141
Lower Sikanni Chief River	11499	Canadian Natural Resources Ltd	96	628415	6379606	59,933
Lower Sikanni Chief River	11500	Canadian Natural Resources Ltd	183	628004	6379264	19,863
Lower Sikanni Chief River	14995	Canadian Natural Resources Ltd	104	628436	6380161	36,853
SIKANNI CHIEF RIVER TOTAL						129,789
GRAND TOTAL						785,278

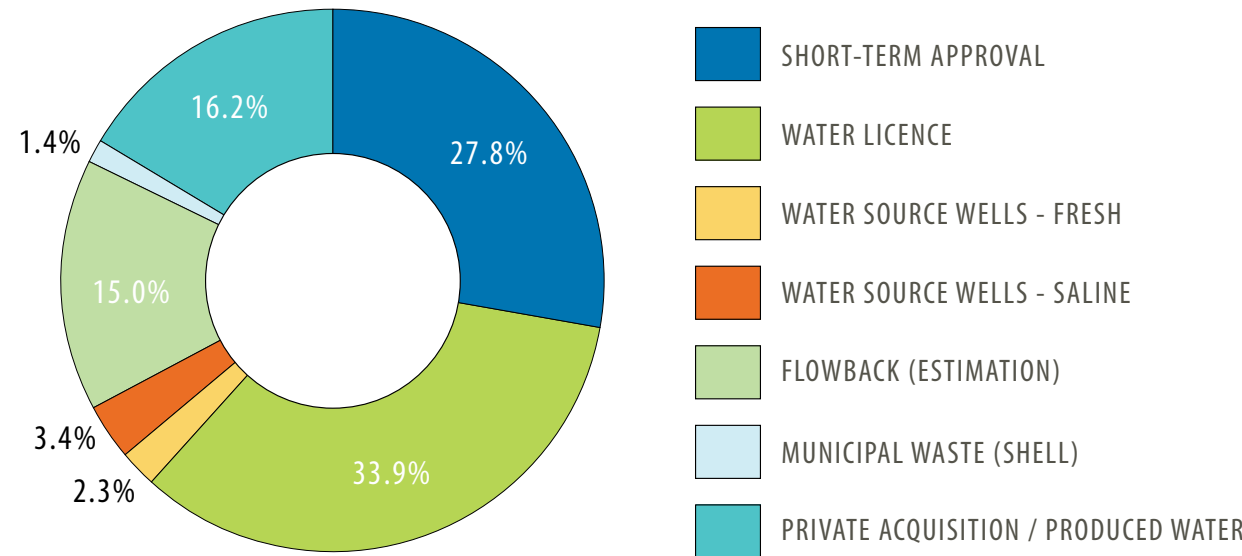
HYDRAULIC FRACTURING

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

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



injected into the subsurface. Hydraulic fracturing operations are closely monitored and related well data is reported to the Commission.

In 2014, 33 companies used a total volume of 8,258,192 m³ of water for hydraulic fracturing of 643 wells (Table 1 on page 8).

The OGC Water Management Basin with the highest total volume of water used for hydraulic fracturing in 2014 was the Lower Kiskatinaw River, which is located in the Heritage Montney gas play (page 2 of Appendix 2), with 1,111,622 m³ used for hydraulic fracturing of 108 wells. The next highest basins for hydraulic fracturing water use were the Upper Beaton River (1,015,632 m³; 75 wells, page 1 of Appendix 2) located in the North Montney and the Kiwigana River (934,792 m³; 11 wells, page 3 of Appendix 2) located in the Horn River Basin.

The amount of water used for hydraulic fracturing varies considerably across NEBC, with the lowest use per well in the Heritage Basin of the Montney Play (south of the Peace River) and the highest use per well in the Horn River Basin (Table 18). The varying water requirements are largely dependent on the geology of the formation being fractured.

In 2014, the average water use was 10,383 m³/well in the Heritage Basin (275 wells), 11,953 m³/well in the North Montney (319 wells), 88,634 m³/well in the Horn River Basin (17 wells), and 7,166 m³/well in the Liard Basin (2 wells). The data for the Liard does not represent multi-stage hydraulic fracturing. There were significantly more wells drilled in the Montney (North and Heritage) in 2014 compared to the previous two years. There were no hydraulically fractured wells in the Cordova Embayment.

The majority of the 8,258,192 m³ of water accessed for hydraulic fracturing came from fresh surface water sources (rivers, lakes, dugouts) through water licences (33.9 per cent) and short-term Section 8 approvals (27.8 per cent) or fresh groundwater sources (2.3 per cent), Figure 2. A further 19.8 per cent came from non-fresh water sources like flowback (15.0 per cent), saline water source wells (3.4 per cent) and municipal waste treatment (1.4 per cent). The remaining water was sourced from private acquisition or produced water.

TABLE 18: WATER USED FOR HYDRAULIC FRACTURING FROM 2012 TO 2014

PLAY	2012			2013			2014		
	NUMBER OF WELLS	MEAN (m ³ /WELL)	TOTAL WATER USE (m ³)	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	17	88,634	1,506,770
MONTNEY - HERITAGE	205	6,684	1,370,235	206	8,356	1,721,239	275	10,383	2,855,351
MONTNEY - NORTH	136	10,053	1,367,177	197	10,907	2,148,703	319	11,953	3,812,909
LIARD BASIN	1	144	144	1	20,106	20,106	2	7,166	14,331
CORDOVA EMBAYMENT	15	36,739	551,080	0		0	0		0
OTHER	12	221	2,651	11	2,577	28,345	30	2,294	68,831
TOTAL	419	17,034	7,137,429	433	12,336	5,341,635	643	12,843	8,258,192

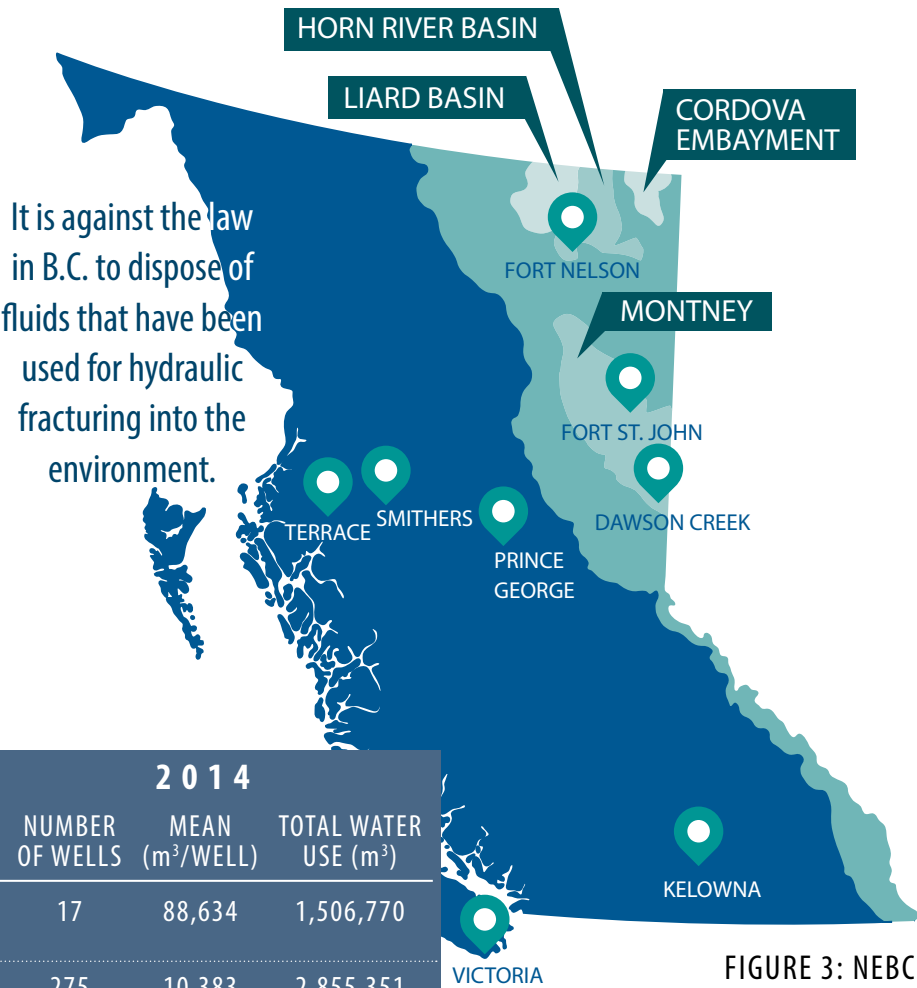


FIGURE 3: NEBC NATURAL GAS PLAYS AND COMMISSION OFFICE LOCATIONS

HYDRAULIC FRACTURING WATER USE - COMPANY

Progress Energy Canada Ltd. used the most water and completed the highest number of wells for hydraulic fracturing in 2014. Progress Energy injected 2,624,425 m³ of water to hydraulic fracture 188 wells (Table 19). All of Progress Energy's wells were completed in the North Montney.

The next highest water volumes used by companies for hydraulic fracturing injection were Encana Corporation (injected 1,770,719 m³ for 58 wells in the Heritage and Horn), Shell Canada Limited (injected 619,895 m³ for 69 wells in the Heritage and North Montney), Arc Resources Ltd (injected 609,010 m³ for 61 wells in the Heritage), and Nexen Energy ULC (injected 586,309 m³ for 11 wells in the Horn and Liard).

Several companies used very little water for their hydraulic fracturing operations and may have used propane as the carrier fluid. Some companies may have only fractured one stage of a multi-stage horizontal well to maintain ownership of a particular gas lease.

TABLE 19: SUMMARY OF 2014 HYDRAULIC FRACTURING WATER INJECTION BY COMPANY

COMPANY	NUMBER OF WELLS	TOTAL WATER VOLUME INJECTED (m ³)	COMPANY	NUMBER OF WELLS	TOTAL WATER VOLUME INJECTED (m ³)
Albright Flush Systems Ltd.	1	126	Nexen Energy ULC	11	586,309
Arc Resources Ltd.	61	609,010	Northpoint Resources Ltd.	1	0
Artek Exploration Ltd.	13	83,125	Painted Pony Petroleum Ltd.	19	237,003
Black Swan Energy Ltd.	6	70,497	Paramount Resources Ltd.	3	46,994
Bonavista Energy Corp.	2	17,722	Pengrowth Energy Corp.	6	10,966
Canadian Natural Resources Ltd.	28	264,484	Polar Star Canadian Oil and Gas, Inc.	1	72
Canbriam Energy Inc.	9	133,781	Progress Energy Canada Ltd.	188	2,624,425
Carmel Bay Exploration Ltd.	2	22,563	Saguaro Resources Ltd.	10	85,831
Chinook Energy (2010) Inc.	2	17,541	Shell Canada Ltd.	69	619,895
ConocoPhillips Canada Operations Ltd.	1	60	Spyglass Resources Corp.	1	9,065
Crew Energy Inc.	21	238,203	Storm Resources Ltd.	13	65,386
Encana Corp.	58	1,770,719	Suncor Energy Inc.	4	65,313
Endurance B.C. Gas Ltd.	22	38,279	Terra Energy Corp.	12	1,179
GS E&R Canada Inc.	4	0	Tervita Corp.	1	78
Husky Oil Operations Ltd.	2	30,545	Tourmaline Oil Corp.	39	329,413
Leucrotta Exploration Inc.	2	13,711	UGR Blair Creek Ltd.	8	132,956
Murphy Oil Company Ltd.	23	132,941	TOTAL	643	8,258,192

OGC WATER MANAGEMENT BASINS SUMMARY MAPS

The following four pages present summary maps of the OGC Water Management Basins (WMB). The WMBs were established using the Ministry of Environment's Freshwater Atlas mapping and developed for the purpose of managing oil and gas-related water activities.

The maps provide coverage of the NEBC river basins, summarizing 2014 water use in the Montney, Liard Basin, Horn River Basin, and Cordova Embayment gas plays.

The water volume colour scheme is the same for all the maps. Specific data for the individual watersheds is found in Appendix 2.

MAP LEGEND

The maps present three sets of information:



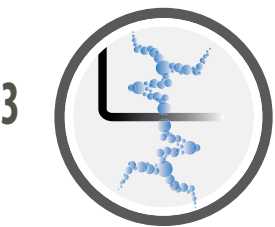
TOTAL VOLUME OF WATER LICENCED AND APPROVED

The first maps display the total volume of water licenced and approved under short-term approvals for 2014. The yellow circles show the individual points-of-diversion for water licences and the white circles represent the points-of-diversion for short-term approvals.



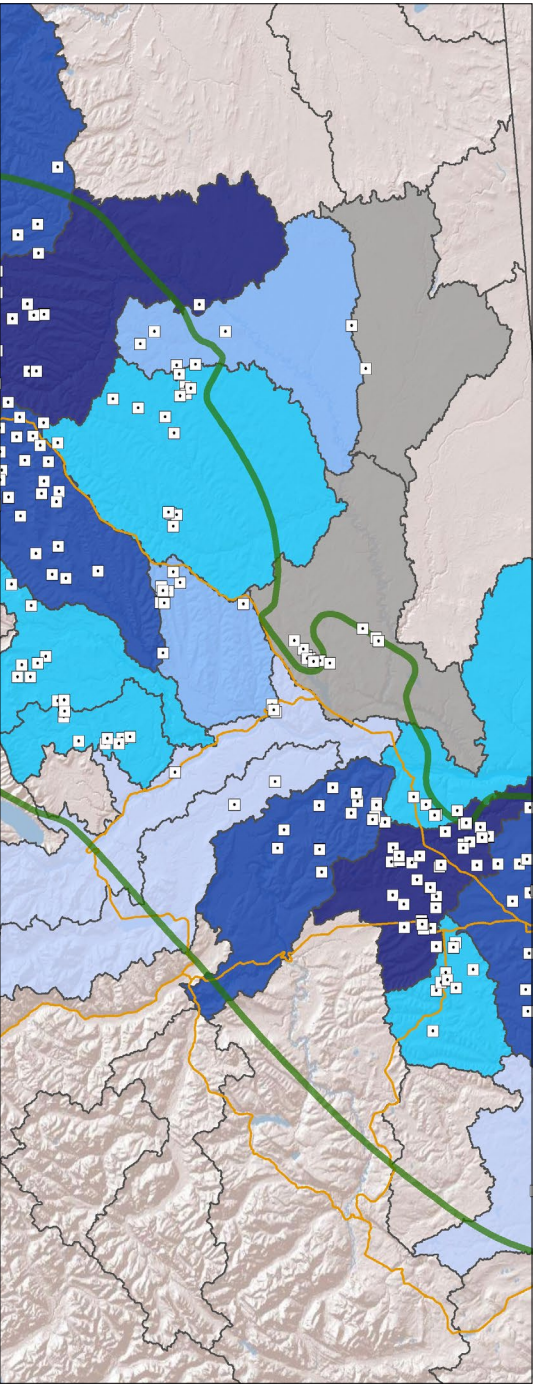
TOTAL VOLUME OF WATER WITHDRAWN FROM LICENCES AND APPROVALS

The second maps show the actual cumulative amount of water withdrawn from water licences and short-term approvals in 2014. The yellow circles with black dots represent water licence points-of-diversion that had water withdrawn. The white circles with black dots are the short-term approval points-of-diversion that had water withdrawn. Nearly two-thirds of the short-term approvals reported zero withdrawals from the approved locations.

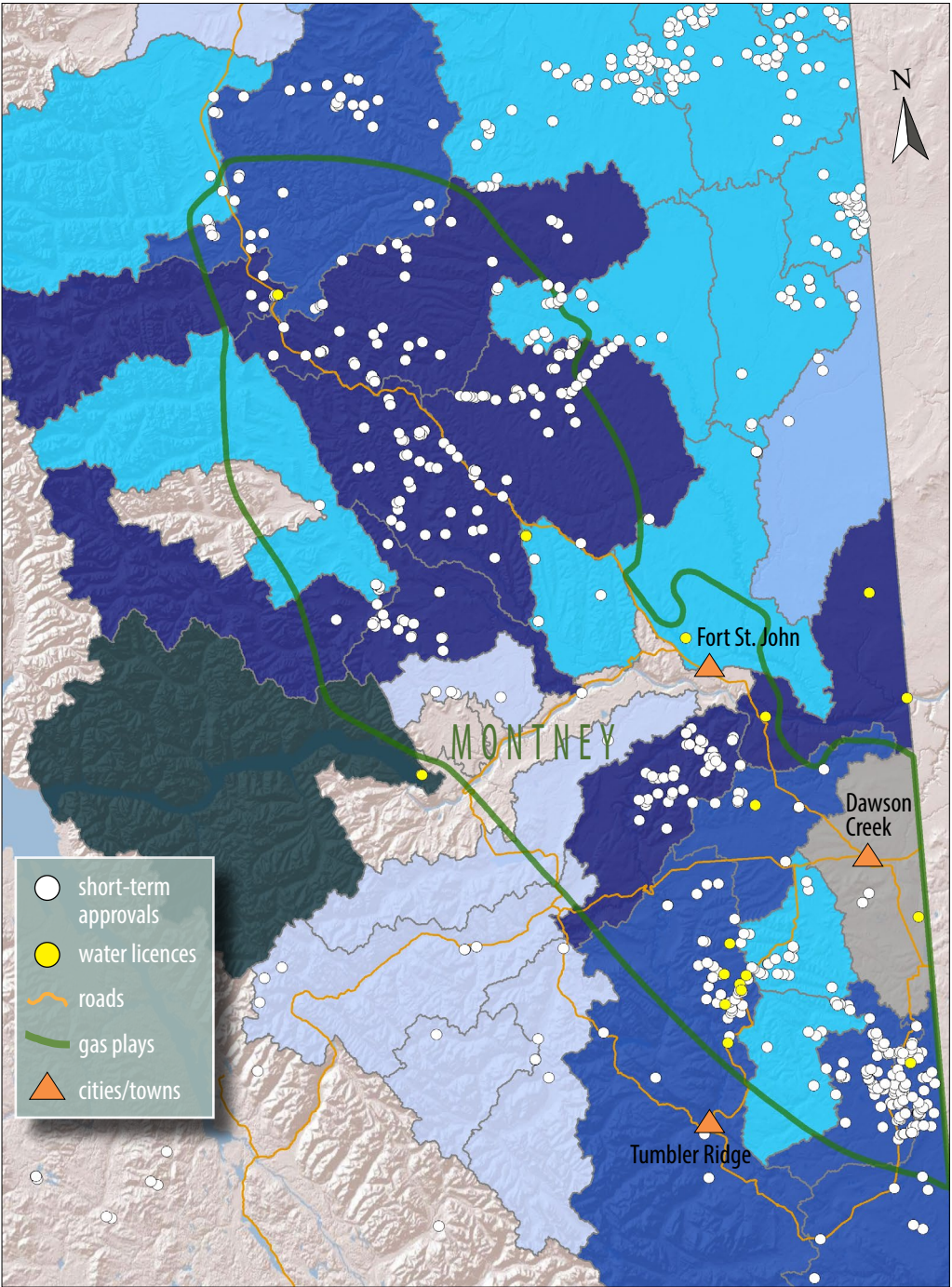


TOTAL VOLUME OF WATER INJECTED FOR HYDRAULIC FRACTURING

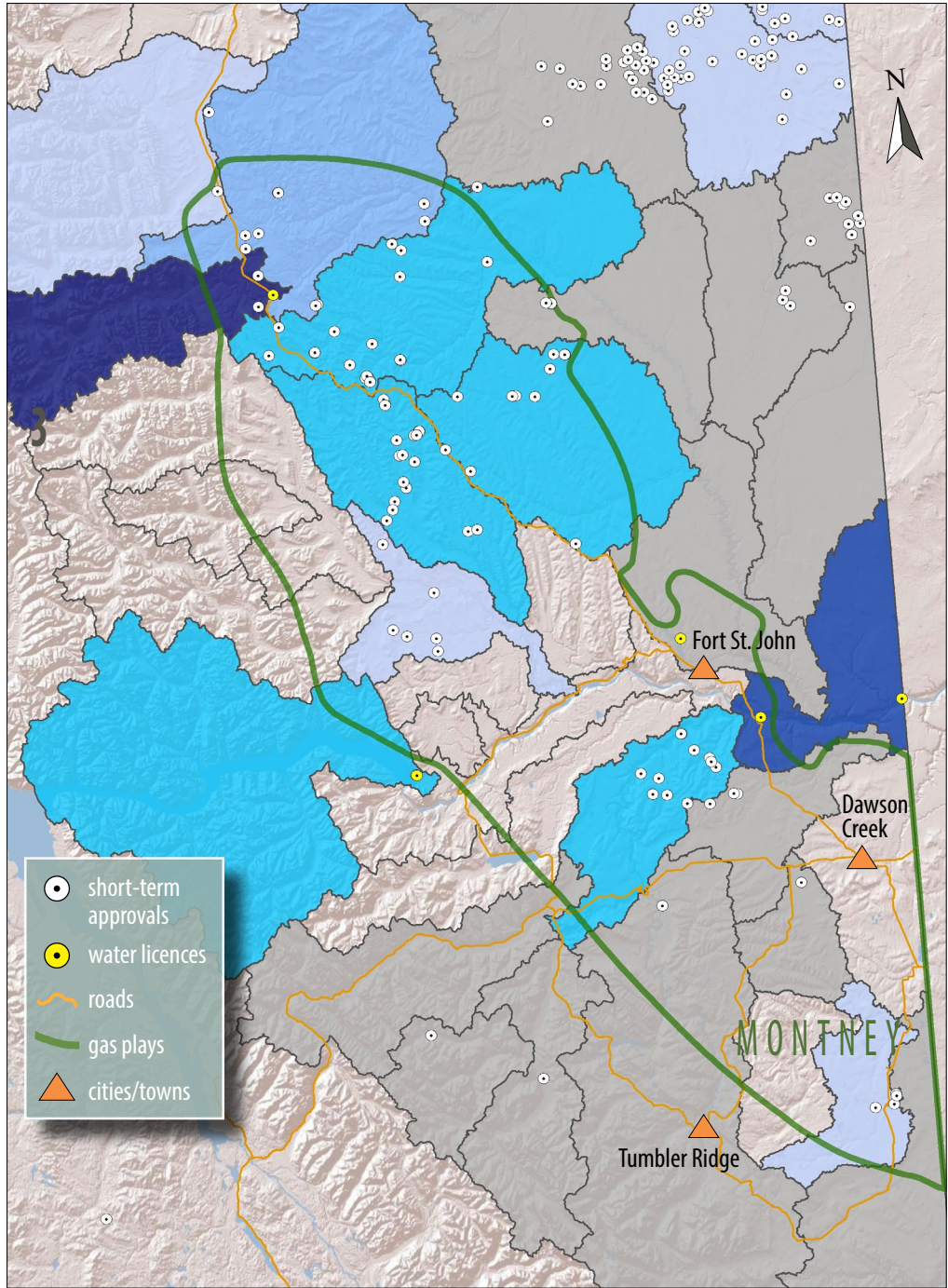
The third and final maps display the total volume of water injected for hydraulic fracturing in 2014 within an OGC WMB. The white squares with dots inside represent the location of a hydraulic fracturing well. Wells may be located on multi-well pads, so several wells may appear to be located at a single point on the map (e.g. Tsea River, page 27).



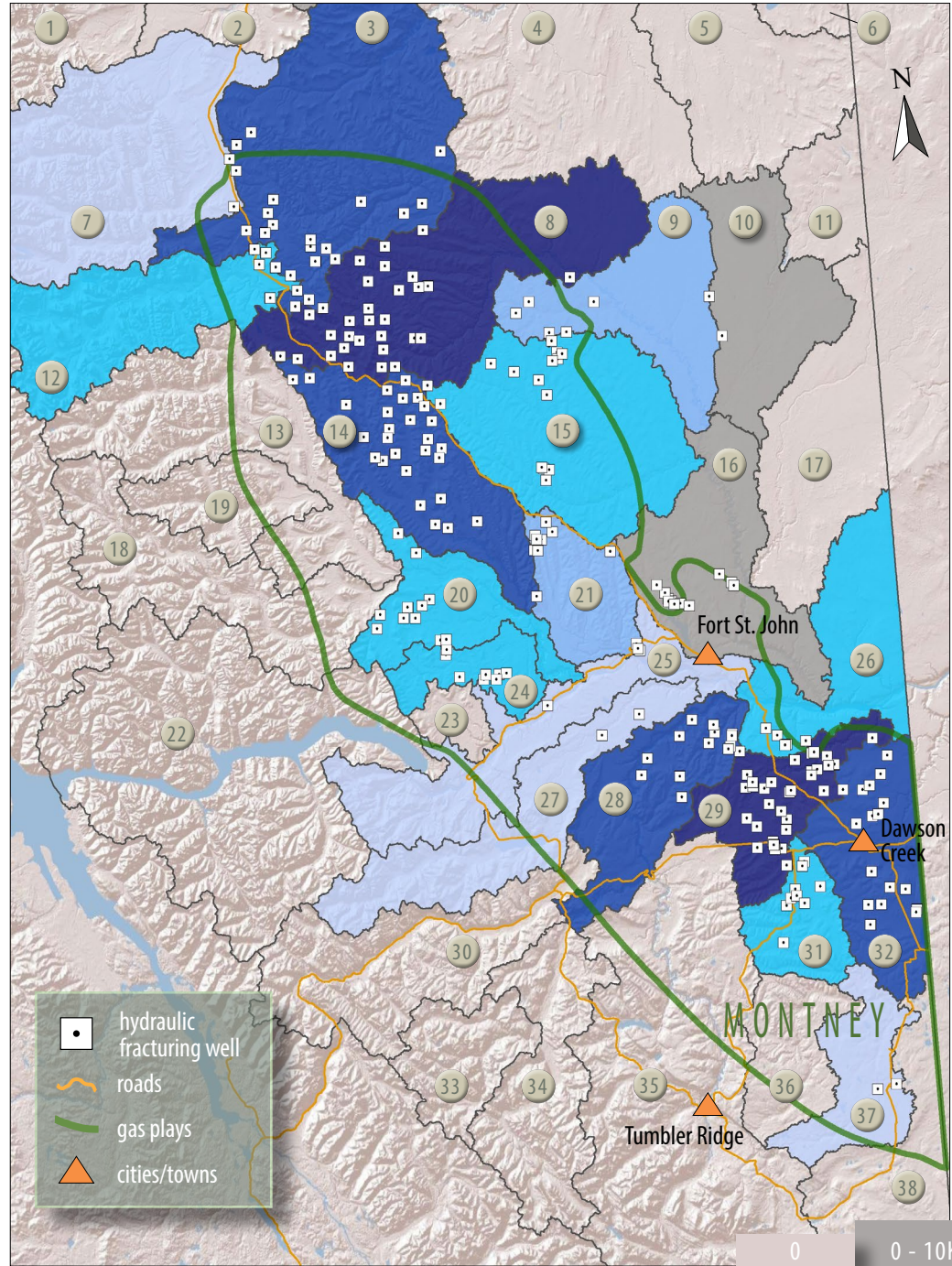
VOLUME OF WATER LICENCED AND APPROVED UNDER SHORT-TERM FOR 2014



VOLUME OF WATER WITHDRAWN FROM LICENCES AND APPROVALS IN 2014



VOLUME OF WATER INJECTED FOR HYDRAULIC FRACTURING IN 2014

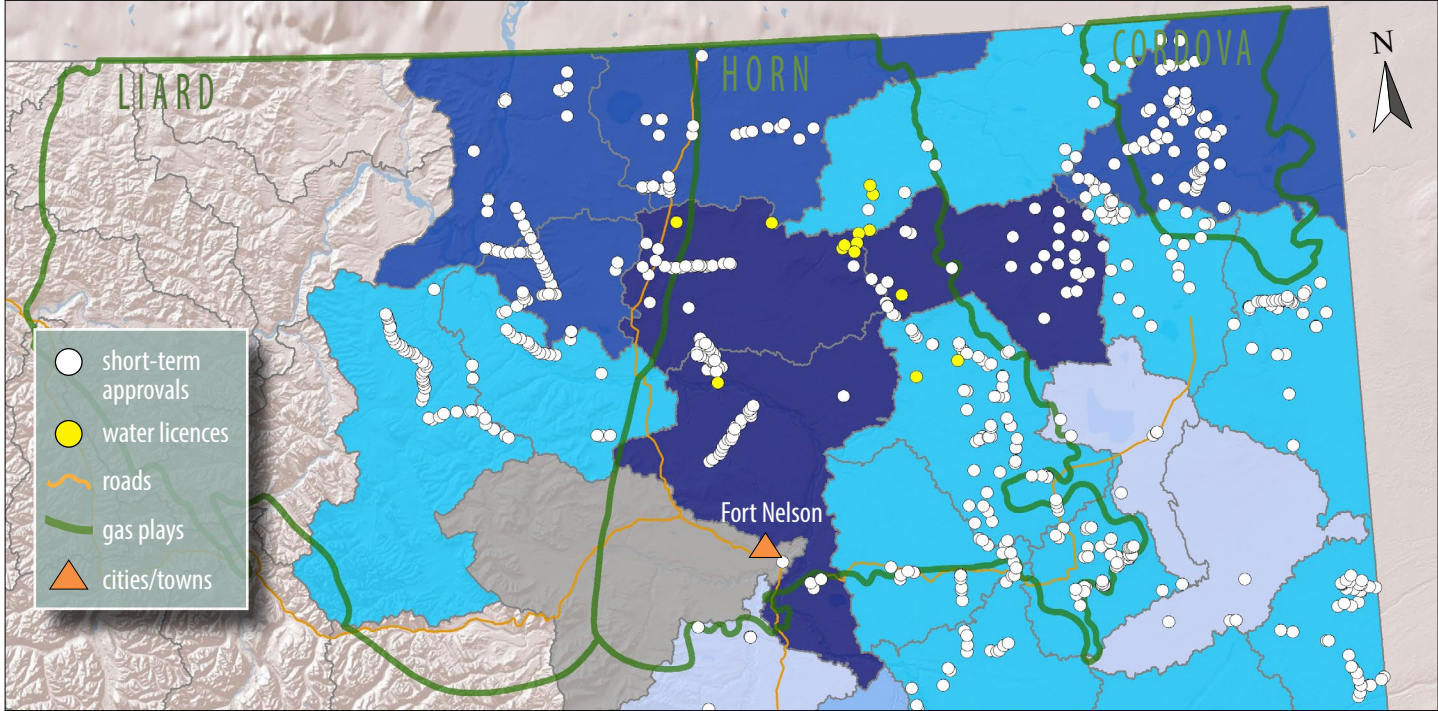


MONTNEY WATERSHEDS

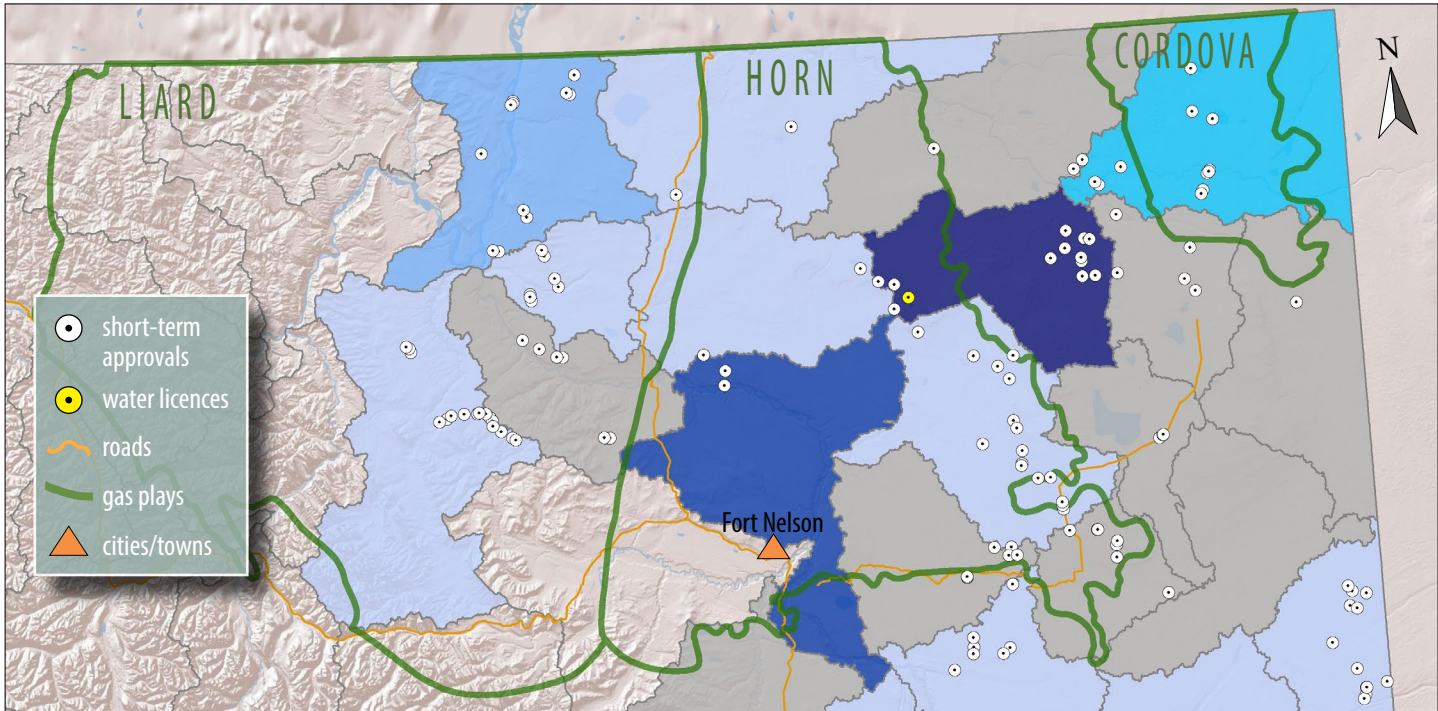
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| 1 Upper Muskwa River | 23 Lynx Creek |
| 2 Middle Prophet River | 24 Farrell Creek |
| 3 Middle Sikanni Chief River | 25 Upper Peace River |
| 4 Lower Sikanni Chief River | 26 Lower Peace River |
| 5 Kahntah River | 27 Moberly River |
| 6 Fontas River | 28 Lower Pine River |
| 7 Upper Prophet River | 29 Lower Kiskatinaw River |
| 8 Upper Beaton River | 30 Upper Pine River |
| 9 Middle Beaton River | 31 Middle Kiskatinaw |
| 10 Milligan Creek | 32 Pouce Coupe River |
| 11 Chinchaga River | 33 Burnt River |
| 12 Upper Sikanni Chief River | 34 Sukunka River |
| 13 Upper Halfway River | 35 Murray River |
| 14 Cameron River | 36 West Kiskatinaw River |
| 15 Blueberry River | 37 East Kiskatinaw River |
| 16 Lower Beaton River | 38 Smoky River |
| 17 Doig River | |
| 18 Graham River | |
| 19 Chowade River | |
| 20 Lower Halfway River | |
| 21 Cache Creek | |
| 22 Peace Arm | |





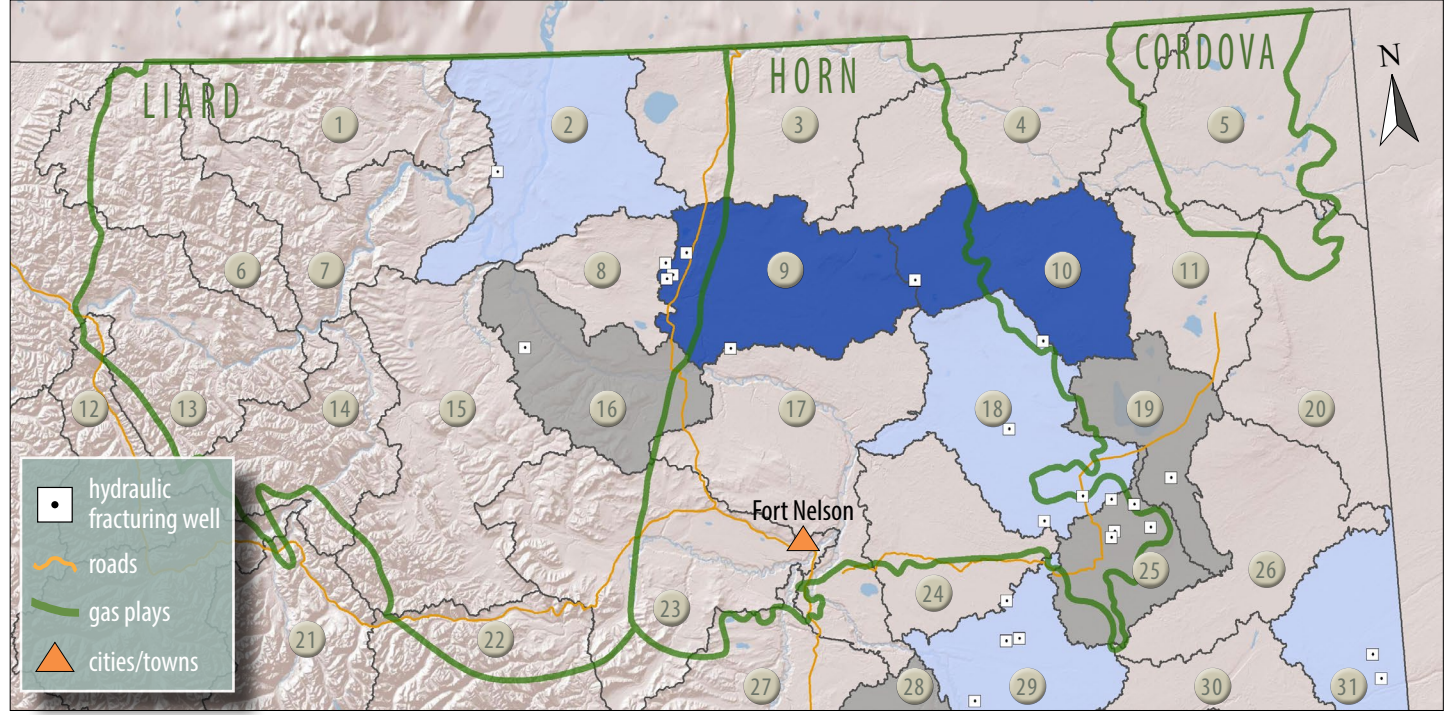
1
TOTAL VOLUME OF WATER
LICENCED AND APPROVED
FOR 2014



2
TOTAL VOLUME OF WATER
WITHDRAWN FROM
LICENCES AND APPROVALS
IN 2014

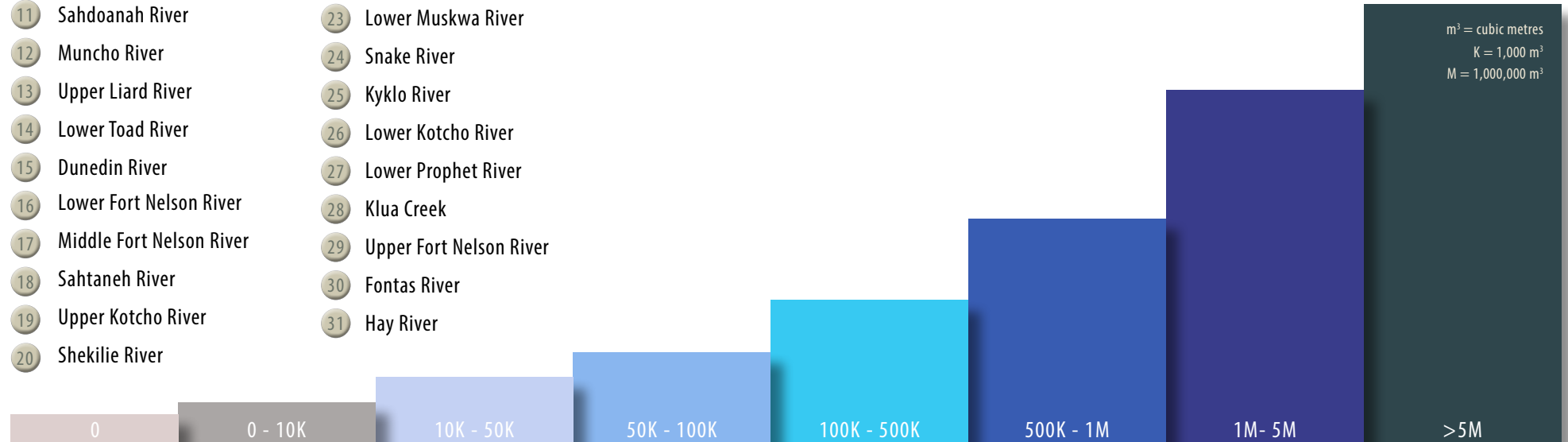
LIARD BASIN, HORN RIVER BASIN, & CORDOVA EMBAYMENT WATERSHEDS

scale 1:1,500,000



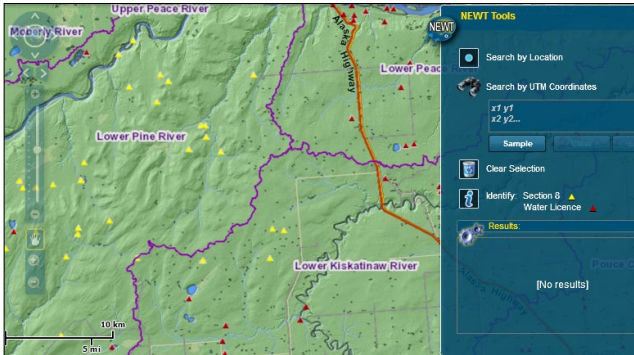
3 TOTAL VOLUME OF WATER INJECTED FOR
HYDRAULIC FRACTURING IN 2014

- 1 Beaver River
- 2 Lower Liard River
- 3 Lower Petitot River
- 4 Middle Petitot River
- 5 Upper Petitot River
- 6 Grayling River
- 7 Middle Liard River
- 8 Capot-Blanc Creek
- 9 Kiwigana River
- 10 Tsea River
- 11 Sahdoanah River
- 12 Muncho River
- 13 Upper Liard River
- 14 Lower Toad River
- 15 Dunedin River
- 16 Lower Fort Nelson River
- 17 Middle Fort Nelson River
- 18 Sahtaneh River
- 19 Upper Kotcho River
- 20 Shekilie River
- 21 Racing River
- 22 Middle Muskwa River
- 23 Lower Muskwa River
- 24 Snake River
- 25 Kyklo River
- 26 Lower Kotcho River
- 27 Lower Prophet River
- 28 Klua Creek
- 29 Upper Fort Nelson River
- 30 Fontas River
- 31 Hay River



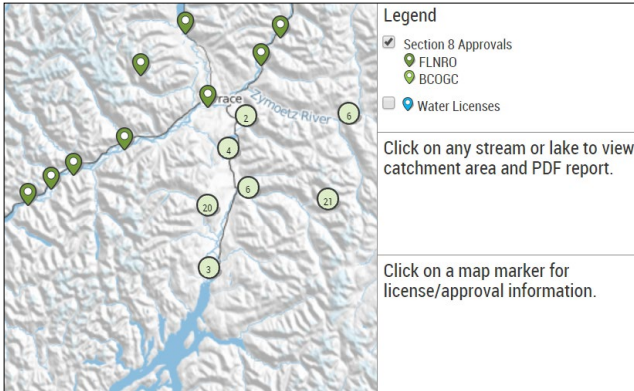
COMMISSION INNOVATION

WATER TOOLS



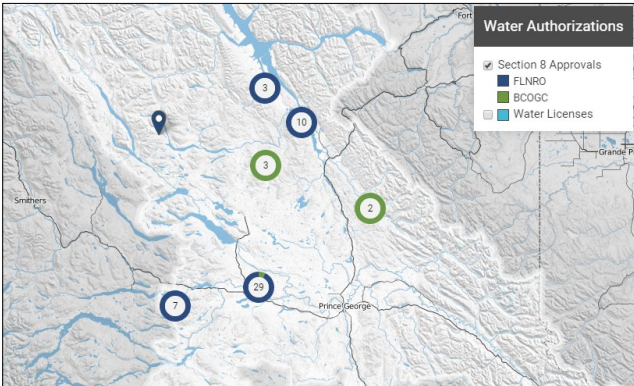
NORTHEAST WATER TOOL

The [NorthEast Water Tool \(NEWT\)](#) is a GIS-based hydrology decision-support tool developed by the Commission, FLNRO, Geoscience BC, and Foundry Spatial Ltd in 2012. NEWT provides guidance on water availability across NEBC and supports the decision-making process for water use approvals and licences. NEWT was recently upgraded to include enhanced environmental flow management during winter months in smaller watersheds to be consistent with updated Ministry of Environment policy.



NORTHWEST WATER TOOL

The [NorthWest Water Tool \(NWWT\)](#) was developed in 2014 by FLNRO, in collaboration with the Ministry of Environment and the Commission. The NWWT followed a similar approach to NEWT, however, it contains several enhancements, including: addition of short-term approvals issued by FLNRO, land cover data, climate change scenarios and improved downstream management.



OMINECA WATER TOOL

The [Omineca Water Tool \(OWT\)](#) is now available online and was developed by FLNRO. It includes many of the enhanced features of the NWWT. Several short-term approvals issued by the Commission are displayed on the OWT.

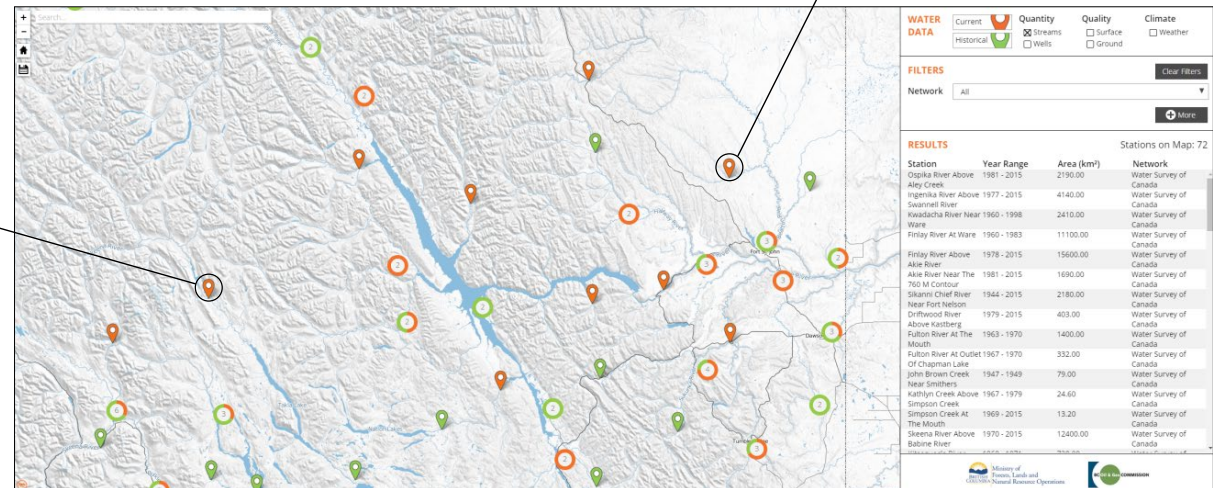
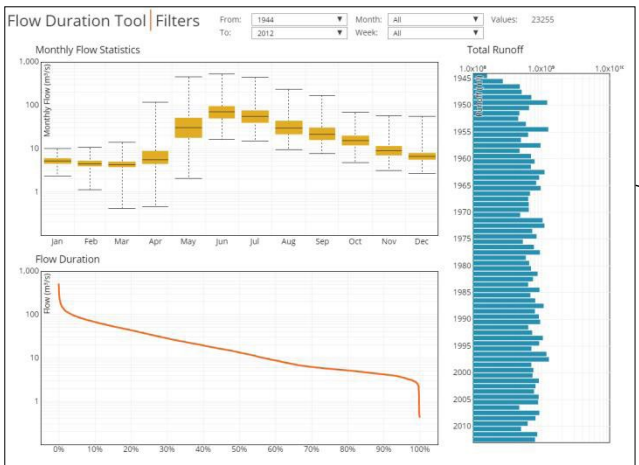
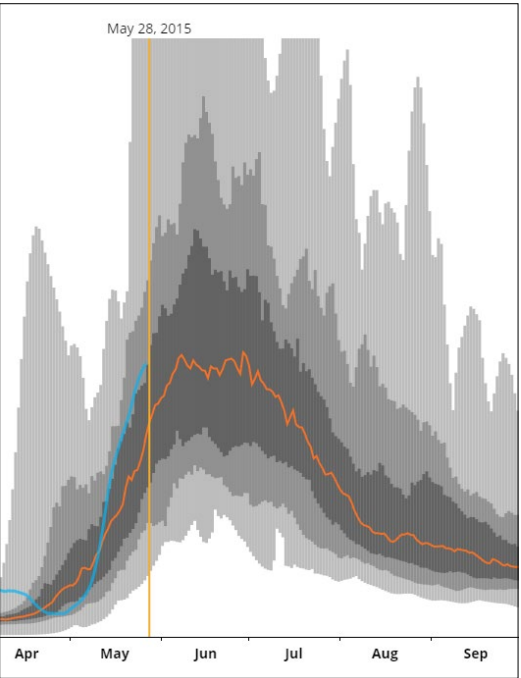
WATER PORTAL V2

An updated version of the [Water Portal](#) was recently released. An abundance of water-related data and information has been collected over many decades, but is stored in multiple databases and formats and is often difficult to access. The Water Portal centralizes this data into one easy to use source, and currently incorporates data from more than 19 networks including:

- Water Survey of Canada
- Ministry of Environment's Environmental Monitoring System (EMS)
- Provincial Snow Survey
- Northern Health Authority Water System Samples
- BC Hydro
- Environment Canada
- Third party-collected data (industry and academia)

The updated version of the Water Portal features new and upgraded capabilities. These include:

- **Monitoring stations** for all of NEBC (Peace, Liard, Omineca, Skeena regions).
- **Added accuracy and intuitive labelling** of monitoring stations based on their current status.
- **The ability to search** by location, station, name, or keyword.
- **Filtering capabilities** based on monitoring network, years of record, station status, parameters, etc.
- **Saving map filter templates** and the ability to **download** the data.
- **Enhanced charts and analytic tools.**



SECTION 9 MANUAL - CHANGES IN AND ABOUT A STREAM

In December 2014, the Commission released a new manual titled, *Changes In and About a Stream Application and Operations Manual* to ensure clarity of requirements and consistency of application for changes in and about a stream (Section 9 of the Water Act).

Changes in and about a stream are defined in the Water Act as:

- (a) any modification to the nature of stream including the land, vegetation,natural environment or flow of water within a stream, or
- (b) any activity or construction within the stream channel that has or may have an impact on a stream.

In situations in which an operator wishes to divert water from a stream into a dugout, or where an operator wishes to install works in a stream for the purpose of extracting water, an approval under Section 9 of the Water Act is required.

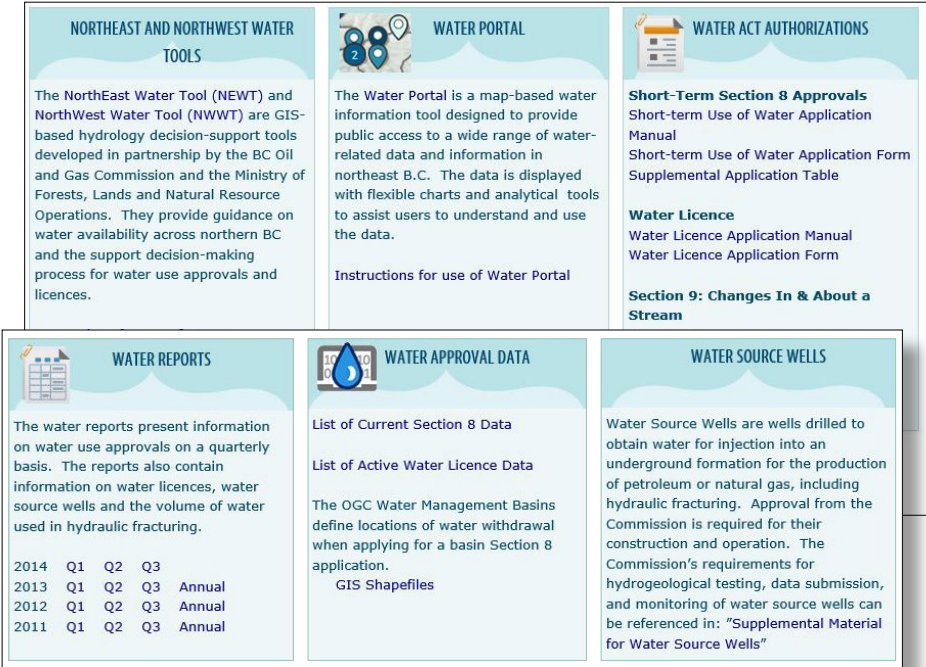
B.C. SUPREME COURT RULING

On Oct. 10, 2014, the Supreme Court of British Columbia dismissed a challenge from the Western Canada Wilderness Committee and Sierra Club of Canada. The Court agreed the way in which the Commission permits short-term water use for industry – which ensures the protection of environmental flows for fish, future supplies for communities and can be rescinded in times of drought – is sound. To read the full judgement, go to: <http://www.courts.gov.bc.ca/jdb-txt/SC/14/19/2014BCSC1919.htm>

WATER WEBPAGE

In 2014, the Commission created a webpage specifically for water information, data, tools, reports, applications forms and manuals.

The water webpage can be found at: <https://www.bcogc.ca/public-zone/water-information>.



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.

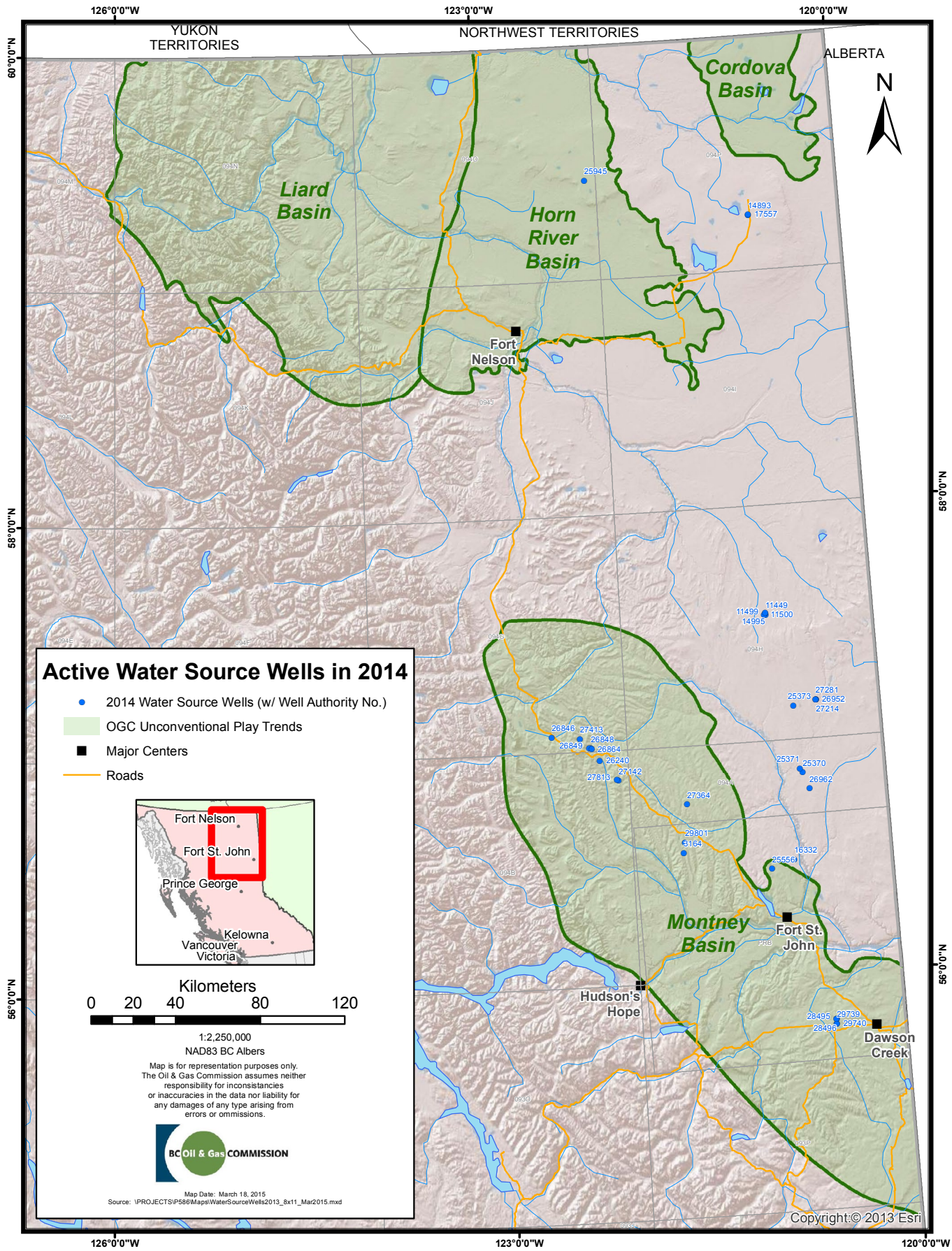
Water Act: The provincial legislation that establishes the provincial government as the “owner” of the water. Rights to use the water are established under licences or approvals issued under the Act.

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 2014



APPENDIX 2

WATER ALLOCATION AND USE FOR OIL AND GAS ACTIVITIES, ORGANIZED BY OGC WATER MANAGEMENT BASIN, IN 2014

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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 (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	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	MEAN ANNUAL RUNOFF (m³)	NUMBER OF WELLS	TOTAL VOLUME WITHDRAWN (m³)	NUMBER OF WELLS	TOTAL VOLUME INJECTED (m³)
BEATTON RIVER (sub-basin of Peace River)																		
Upper Beatton River	50	2,147,943	0.430%	136,313	0.027%	0					0			499,408,440	5	100,528	75	1,015,632
Middle Beatton River	24	248,370		7,965		0					0			249,152,995	0		9	59,961
Middle Beatton Total (incl. Upper Beatton)	74	2,396,313	0.320%	144,278	0.019%	0	0	0.000%	0	0.000%	0	0	0.000%	748,561,435				
Milligan Creek	13	405,614	0.212%	1,155	0.001%	0					0			191,536,686	6	99,704	1	7
Blueberry River	67	1,222,460	0.417%	102,875	0.035%	0					33	154,631	0.053%	293,278,540	1	10,841	18	140,559
Doig River	6	53,914	0.017%	40	0.000%	0					18	25,929	0.008%	323,069,523	0		0	
Lower Beatton River	3	10,110		0		1	394,000		7,371		96	4,530,328		138,262,629	3	56,277	11	821
BEATTON TOTAL	163	4,088,411	0.241%	248,348	0.015%	1	394,000	0.023%	7,371	0.000%	147	4,710,888	0.278%	1,694,708,813	15	267,350	114	1,216,980
HALFWAY RIVER (sub-basin of Peace River)																		
Chowade River	0					0					0			327,027,527	0		0	
Upper Halfway River	7	187,271		0		0					15	141,983		795,962,409	0		0	
Upper Halfway Total (includes Chowade)	7	187,271	0.017%	0	0.000%	0	0	0.000%	0	0.000%	15	141,983	0.013%	1,122,989,936				
Graham River	5	1,291,475	0.150%	0	0.000%	0					4	3,319	0.000%	860,627,172	0		0	
Cameron River	41	1,989,544	0.889%	269,293	0.120%	0					3	7,467	0.003%	223,679,567	3	56,823	65	830,012
Lower Halfway River	27	2,420,453		21,897		0					23	1,040,390		151,526,991	0		22	307,086
HALFWAY TOTAL	80	5,888,743	0.250%	291,190	0.012%	0	0	0.000%	0	0.000%	45	1,193,159	0.051%	2,358,823,666	3	56,823	87	1,137,098
MOBERLY RIVER (sub-basin of Peace River)																		
Moberly River	1	40,000		0		0					21	83,165	0.021%	391,714,995	0		3	25,054
MOBERLY TOTAL	1	40,000	0.010%	0	0.000%	0	0	0.000%	0	0.000%	21	83,165	0.021%	391,714,995	0	0	3	25,054
PINE RIVER (sub-basin of Peace River)																		
Burnt River	4	15,880	0.002%	32	0.000%	0					5	35,038	0.005%	737,930,022	0		0	
Sukunka River	4	18,160		20		0					11	72,163		1,047,282,572	0		0	
Sukunka River Total (includes Burnt)	8	34,040	0.002%	52	0.000%	0	0	0.000%	0	0.000%	16	107,201	0.006%	1,785,212,594				
Upper Pine River	6	12,500	0.001%	61	0.000%	0					27	2,455,557	0.167%	1,466,884,035	0		0	
Murray River	41	521,619	0.019%	30	0.000%	7	25,000	0.001%	0	0.000%	70	32,313,720	1.198%	2,698,285,017	0		0	
Lower Pine River	45	1,794,257		270,469		0					36	5,576,562		137,619,889	0		83	777,783
PINE TOTAL	100	2,362,416	0.039%	270,612	0.004%	7	25,000	0.000%	0	0.000%	149	40,453,040	0.664%	6,088,001,535	0	0	83	777,783

WATER ALLOCATION AND USE FOR OIL AND GAS ACTIVITIES, ORGANIZED BY OGC WATER MANAGEMENT BASIN, IN 2014

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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	
MAJOR and Sub-Basin Name	NUMBER OF 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	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	MEAN ANNUAL RUNOFF (m³)	NUMBER OF WELLS	TOTAL VOLUME WITHDRAWN (m³)	NUMBER OF WELLS	TOTAL VOLUME INJECTED (m³)
KISKATINAW RIVER (sub-basin of Peace River)																		
West Kiskatinaw River	14	110,000	0.094%	0	0.000%	0					0			117,515,115	0	0	0	
East Kiskatinaw River	78	767,700	0.728%	15,368	0.015%	0					8	4,530,497	4.296%	105,452,962	0	2	26,801	
Middle Kiskatinaw River	24	248,836		8,145		0					21	2,060,382		56,347,972	2	25,270	17	125,951
Middle Kiskatinaw Total (incl. West & East)	116	1,126,536	0.403%	23,513	0.008%	0	0	0.000%	0	0.000%	29	6,590,879	2.360%	279,316,049				
Lower Kiskatinaw River	10	198,519		7,627		1	400,000		0		38	966,567		89,659,847	2	60,852	108	1,111,622
KISKATINAW TOTAL	126	1,325,055	0.359%	31,140	0.008%	1	400,000	0.108%	0	0.000%	67	7,557,446	2.048%	368,975,896	4	86,122	127	1,264,374
PEACE RIVER																		
Peace Arm	0					2	7,300,000	N/A	247,327	N/A	12	52,468	N/A	N/A	0		0	
Upper Peace River	0					0					47	1,677,242	0.005%	36,423,413,429	0	2	15,719	
Lynx Creek	0					0					8	259,970	0.854%	30,436,635	0	0	0	
Farrell Creek	5	45,706	0.050%	0	0.000%	0					15	7,466	0.008%	91,018,843	0	31	396,491	
Cache Creek	3	22,250	0.030%	0	0.000%	1	185,000	0.248%	0	0.000%	11	1,793,664	2.404%	74,603,546	2	46,447	12	57,047
Pouce Coupe River	2	6,400	0.003%	0	0.000%	1	2,000	0.001%	0	0.000%	92	3,135,158	1.226%	255,686,202	0		48	593,671
Lower Peace River	2	605,000	0.529%	0		3	3,067,469		505,907		55	123,641,300		114,470,012	0		14	194,469
PEACE TOTAL (incl. Kisk/Pine/Mob/Half/Beatt)	482	14,383,981	0.030%	841,290	0.002%	16	11,373,469	0.024%	760,605	0.001%	669	184,564,966	0.385%	47,891,853,572	24	456,742	521	5,678,686
SMOKY RIVER																		
Smoky River	57	533,750	0.020%	1,485		1	2,500	0.000%	0		9	69,944	0.003%	2,669,506,123	0		0	
SMOKY TOTAL	57	533,750	0.020%	1,485	0.000%	1	2,500	0.000%	0	0.000%	9	69,944	0.003%	2,669,506,123	0	0	0	0
MUSKWA RIVER (sub-basin of Fort Nelson River)																		
Upper Muskwa River	0		0.000%			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%	0	0.000%	1	830	0.000%	3,698,913,327				
Lower Muskwa River	1	2,100		0		0					10	1,839,377	0.280%	646,841,560	0		0	
MUSKWA TOTAL	1	2,100	0.000%	0	0.000%	0	0	0.000%	0	0.000%	11	1,840,207	0.042%	4,345,754,887	0	0	0	0

WATER ALLOCATION AND USE FOR OIL AND GAS ACTIVITIES, ORGANIZED BY OGC WATER MANAGEMENT BASIN, IN 2014

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PROPHET RIVER (sub-basin of Fort Nelson River)																		
Upper Prophet River	6	231,070	0.016%	14,059	0.001%	0					0			1,470,271,289	0	3	30,359	
Middle Prophet River	7	48,690		0		0					0			621,428,680	0	0	0	
Middle Prophet Total (incl. Upper Prophet)	13	279,760	0.013%	14,059	0.001%	0	0	0.000%	0	0.000%	0	0	0.000%	2,091,699,969				
Lower Prophet River	6	39,055		1,269		0					0			272,262,427	0	0	0	
PROPHET TOTAL	19	318,815	0.013%	15,328	0.001%	0	0	0.000%	0	0.000%	0	0	0.000%	2,363,962,396	0	0	3	30,359
SIKANNI CHIEF RIVER (sub-basin of Fort Nelson R.)																		
Upper Sikanni Chief River	7	850,820	0.105%	323,792	0.040%	1	2,993,000	0.371%	1,011,806	0.125%	2	64,488	0.008%	807,771,692	0	9	114,206	
Middle Sikanni Chief River	42	615,717		70,762		0					2	5,808		949,755,794	0	63	845,016	
Middle Sikanni Chief Total (incl. Upper Sikanni)	49	1,466,537	0.083%	394,554	0.022%	1	2,993,000	0.170%	1,011,806	0.058%	4	70,296	0.004%	1,757,527,486				
Lower Sikanni Chief	51	147,953		9,992		0					0			875,678,142	4	129,789	0	
SIKANNI CHIEF TOTAL	100	1,614,490	0.061%	404,546	0.015%	1	2,993,000	0.114%	1,011,806	0.038%	4	70,296	0.003%	2,633,205,628	4	129,789	72	959,222
FORT NELSON RIVER																		
Kahntah River	65	278,507	0.070%	11,447	0.003%	0					0			400,582,903	0	0	0	
Fontas River	45	300,515		10,426		0					0			591,531,903	0	0	0	
Fontas Total (includes Kahntah)	110	579,022	0.058%	21,873	0.002%	0	0	0.000%	0	0.000%	0	0	0.000%	992,114,806				
Klua Creek	11	73,000	0.018%	15,629	0.004%	0					0			402,135,448	0	3	8,282	
Upper Fort Nelson River	24	150,800		19,294		0					0			276,181,026	0	8	10,638	
Upper Fort Nelson Total (incl. Sikanni Chief Total, Kahntah, Fontas, Klua)	245	2,417,312	0.056%	461,342	0.011%	1	2,993,000	0.070%	1,011,806	0.024%	4	70,296	0.002%	4,303,636,908				
Snahe River	21	124,780	0.040%	5,627	0.002%	0					0			310,763,522	0	0	0	
Sahtaneh River	69	400,940	0.084%	20,431	0.004%	2	40,000	0.010%	0	0.000%	0			474,904,729	0	6	10,714	
Middle Fort Nelson River	44	1,905,850		670,513		1	3,000,000		0		6	1,001,848		515,348,901	0	0	0	
Mid Ft Nelson Total (incl. Upper Ft. Nelson total, Muskwa Total, Prophet Total, Snahe, Sahtaneh)	399	5,169,797	0.042%	1,173,241	0.010%	4	6,033,000	0.049%	1,011,806	0.008%	21	2,912,350	0.024%	12,314,371,343				
Kiwigana River	41	1,016,650	0.230%	20,906	0.005%	5	42,500	0.010%	0	0.000%	5	128,480	0.029%	441,657,543	0	11	934,792	
Lower Fort Nelson River	27	223,617		6,295		0					0			312,768,938	0	1	4,198	
FORT NELSON TOTAL	467	6,410,064	0.049%	1,200,442	0.009%	9	6,075,500	0.046%	1,011,806	0.008%	26	3,040,830	0.023%	13,068,797,824	4	129,789	104	1,958,205

WATER ALLOCATION AND USE FOR OIL AND GAS ACTIVITIES, ORGANIZED BY OGC WATER MANAGEMENT BASIN, IN 2014

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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 (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	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	MEAN ANNUAL RUNOFF (m³)	NUMBER OF WELLS	TOTAL VOLUME WITHDRAWN (m³)	NUMBER OF WELLS	TOTAL VOLUME INJECTED (m³)
LIARD RIVER																		
Muncho River	0					0								551,551,360				
Upper Liard River	0					0					3	6,829		33,125,817,465	0		0	
Upper Liard Total (incl. Muncho)	0	0	0.000%	0	0.000%	0	0	0.000%	0	0.000%	3	6,829		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%	0	0.000%	3	6,829	0.000%	49,063,379,456	0	0	0	0
Capot-Blanc Creek	37	753,222	0.410%	20,730	0.011%	0					0			183,879,851	0		1	0
Dunedin River	50	320,350	0.039%	25,674	0.003%	0					0			820,464,167	0		0	
Lower Liard River	29	882,630		87,680		0					0			1,236,634,664	0		1	10,133
LIARD TOTAL (incl. Fort Nelson)	583	8,366,266	0.013%	1,334,526	0.002%	9	6,075,500	0.009%	1,011,806	0.002%	29	3,047,659	0.005%	64,373,155,962	4	129,789	106	1,968,338
PETITOT RIVER																		
Sahdoanah River	30	174,317	0.069%	5,926	0.002%	0					1	830	0.000%	252,625,362	2	66,476	0	
Upper Petitot River	79	529,518	0.036%	178,223	0.012%	0					0			1,476,579,488	0		0	
Tsea River	31	152,343	0.035%	31,222	0.007%	4	2,540,000	0.585%	1,026,149	0.236%	0			434,062,484	1	132,271	9	571,978
Middle Petitot River	16	93,088		1,306		2	26,666		0		0			698,562,753	0		0	
Middle Petitot Total (incl. Sahdoanah, Upper Petitot, Tsea)	156	949,266	0.033%	216,667	0.008%	6	2,566,666	0.090%	1,026,149	0.036%	1	830	0.000%	2,861,830,087				
Lower Petitot River	26	521,972		41,488		1	30,000		0		0			904,314,069	0		0	0
PETITOT TOTAL	182	1,471,238	0.039%	258,165	0.007%	7	2,596,666	0.069%	1,026,149	0.027%	1	830	0.000%	3,766,144,156	3	198,747	9	571,978

WATER ALLOCATION AND USE FOR OIL AND GAS ACTIVITIES, ORGANIZED BY OGC WATER MANAGEMENT BASIN, IN 2014

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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 (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	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	MEAN ANNUAL RUNOFF (m³)	NUMBER OF WELLS	TOTAL VOLUME WITHDRAWN (m³)	NUMBER OF WELLS	TOTAL VOLUME INJECTED (m³)
HAY RIVER																		
Upper Kotcho River	6	34,275	0.011%	3,510	0.001%	0					0			311,519,217	0		1	57
Kyklo River	48	301,665	0.207%	7,761	0.005%	0					1	5,808	0.004%	145,897,691	0		4	8,588
Shekilie River	46	240,314	0.053%	2,431	0.001%	0					0			450,747,494	0		0	
Lower Kotcho River	5	29,500		3,522		0					0			311,519,217	0		0	
Lower Kotcho Total (includes Upper Kotcho, Kyklo, Shekilie)	105	605,754	0.050%	17,224	0.001%	0	0	0.000%	0	0.000%	1	5,808	0.000%	1,219,683,619				
Hay River	48	286,745		49,271		0					0			538,672,352	0		2	30,545
HAY TOTAL	153	892,499	0.051%	66,495	0.004%	0	0	0.000%	0	0.000%	1	5,808	0.000%	1,758,355,971	0		7	39,190
CHINCHAGA RIVER																		
Chinchaga River	29	199,369		8,460	0.000%	0					0			109,492,680	0		0	
CHINCHAGA TOTAL	29	199,369	0.182%	8,460	0.000%	0	0	0.000%	0	0.000%	0	0	0.000%	109,492,680	0	0	0	0
OTHER (outside northeast B.C.)	68	34,874		252		0	0				0	0		0	0	0	0	0
GRAND TOTAL	1,554	25,881,977	0.021%	2,510,673	0.002%	33	20,048,135	0.017%	2,798,560	0.002%	708	187,689,207	0.156%	120,568,508,464	31	785,278	643	8,258,192