



White Paper Series

Water may be the industry's most significant resource ...and business risk



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INTEGRATED SUSTAINABILITY

Through strategic consulting, we engage public and energy sector clients with comprehensive advisory services to solve their most challenging water, waste, and energy demands - taking them from early options analysis and front-end thinking right through the full project lifecycle. What's more, our employee-owned team is fueled by our passion for innovative, sustainable solutions.

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Inside

Current climate conditions are placing significant strain on water availability, especially in the water intensive oil and gas industry in British Columbia (B.C.) and Alberta (AB).

As water supply constraints become more prevalent, the need to understand the key drivers that impact water use has never been more crucial. This paper:

1 **Unravels** the issues facing the oil & gas industry from climate variability and change to its resulting water restrictions and regulations.

2 **Examines** the subsequent risks from project disruption and delay to its impact on cost and future governance.

3 **Provides** substantive insight based on real examples, not speculation.

4 **Presents** proactive solutions to tackling the issue while building resiliency and certainty for your business.



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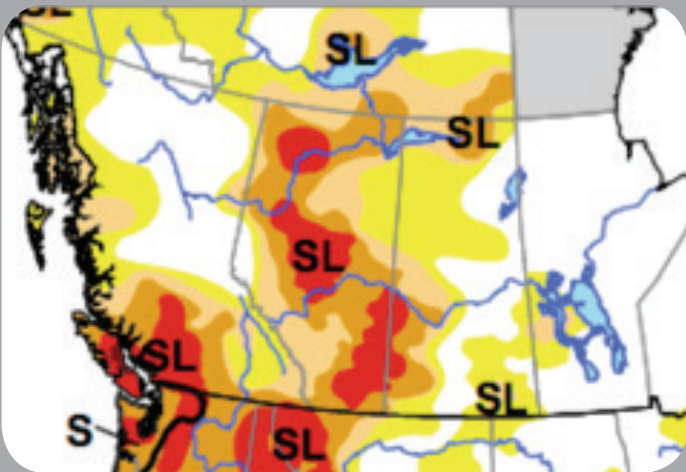
Water is essential to the Canadian economy

For many in Western Canada, this year has been one drastically influenced by the climate, with parts of the region struggling and coping with some of the driest conditions experienced in 50 to 100 years.

In the Rocky Mountains this past winter, snowpacks experienced a “dramatic decline”, accounting for as low as 25 per cent of normal measurements. With the early melting of this stored water, a significant reduction to river flows across the western provinces was realized, with some experiencing flows as low as 10% of normal. (*Globe and Mail, Jun 14 2015 - Signs of drought appear to be in Western Canada for the long term*).

In AB, large pockets of the province have experienced low rainfall since April, with many

The drought’s effects are causing many to take a more scrutinizing look at water use and consumption - in some regions, for the first time.



- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

Drought Impact Types
 ~ Delineates dominant impact
S = Short-term, typically <6 mth (eg. agricultural grasslands)
L = Long-term, typically >6 mth (eg. hydrology, ecology)

Source: North American Drought Monitor (July 2015)

areas receiving less than 40 per cent of normal precipitation (*Agriculture and Agri-Food Canada*). The extremely dry climate and low flow conditions in the province’s rivers and streams forced numerous counties to declare a state of “agricultural disaster”. Water restrictions have also been placed on many basins across the province.

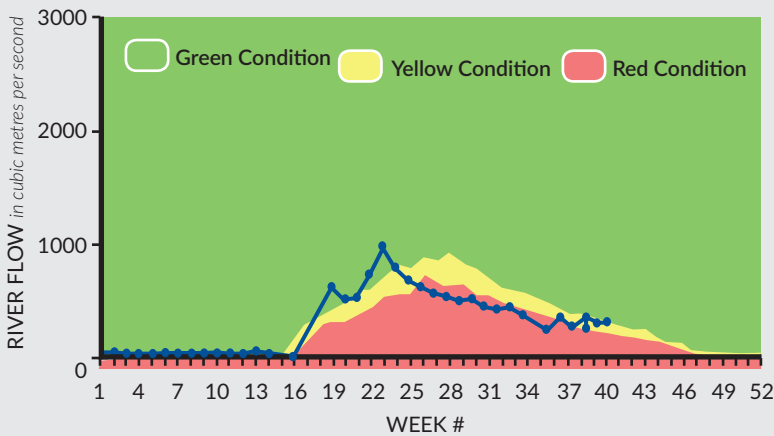
Such climate conditions place significant strain on the volume of water available, not only for food production but for all water users, with the current water shortage drawing attention to other water-intensive industries, such as B.C.’s and AB’s oil and gas sector.

2

Water restrictions on industry

In July and August of this year, Alberta’s Energy Regulator (AER) restricted applications by oil and gas operators to withdraw water from the upper Athabasca River. Under this restriction, temporary diversion licences (TDLs) were suspended and no new applications were accepted.

Athabasca River Flow

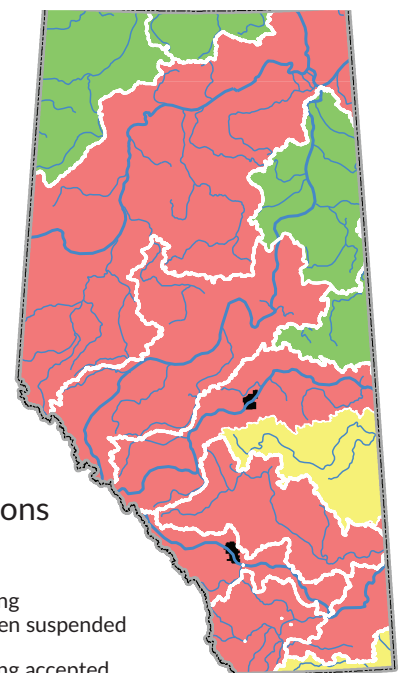


According to Alberta Environment and Parks (AEP), the Athabasca River, which is fed by glaciers and streams situated in the Rocky Mountains, requires approximately 900 cubic meters per second of water in the summer when the flow is at its peak in order to maintain healthy ecosystems. As shown in the figure to the left, the Athabasca River reached red conditions, requiring withdrawals to be restricted by July (Week 26).

(AEP Athabasca River Conditions and use, <http://environment.alberta.ca/apps/OSEM/ATHMCM.aspx>)

Earlier this year the following restrictions were placed on TDLs for watercourses in other river basins of the province.

- ▶ **Battle River basin:** no TDL applications are being accepted.
- ▶ **South Saskatchewan River basin:** no TDL applications are being accepted; in some sub-basins all TDLs have been suspended.
- ▶ **Milk River basin:** no TDL applications are being accepted.
- ▶ **Peace River basin:** no TDL applications are being accepted; in some sub-basins all TDLs have been suspended.
- ▶ **North Saskatchewan River basin:** no TDL applications are being accepted; in some sub-basins TDLs are in the process of being suspended.



Alberta Water Restrictions

- ▶ No restrictions present
- ▶ No TDL applications are being accepted and some have been suspended
- ▶ No TDL applications are being accepted

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El Niño is a climate event and is an anomalous, yet periodic, warming of the central and eastern equatorial Pacific Ocean.

El Niño contributes to extreme events like droughts and flooding.

This year’s event is the strongest since 1997-1998 and is potentially among the four strongest events since 1950, according to the latest update from the World Meteorological Organization.

With a large majority of oil and gas operations, especially unconventional oil and gas (UCOG) development, relying heavily on TDLs for their source needs, these types of restrictions and suspensions have increasingly made water risk a serious business risk.

Even in areas with no mandatory restrictions, AER requested that oil and gas companies reduce their consumption in order to protect ecological flows.

As of September 16th 2015, restrictions on Sheep River and Athabasca River have been lifted, with all remaining restrictions still in place. AER will continue to work with the AEP to analyze water flow information and will lift the current restrictions when flows return to “acceptable levels” or, if needed, impose additional restrictions in other basins.

However, with projections that the current El Niño has a 95 per cent chance of continuing through the winter of 2015-2016 (*National Oceanic and Atmospheric Administration (NOAA 2015)*), and signs of a potential long term drought in Western Canada due to data that shows glaciers vanishing at record rates this year, water-intensive industries may be a risk. As well, an enhanced level of scrutiny from regulators will likely continue.

Unlike term licences administered under the Water Act, TDLs do not have priority status, and can be subject to restrictions or even suspension at any time, particularly during unusually low flow conditions.

3

Water risk = business risk

In a period defined by climate change and extreme weather events, lack of water security can lead to water shortages, operational disruption, growth constraints, and increased costs if third party solutions are required (i.e. purchasing and trucking of water).

In addition to the water risks associated with climate change and variability, relying exclusively on TDLs and/or surface water sources, including dugout and borrow pits to meet hydraulic fracturing water needs, may pose future challenges due to the changing regulatory landscape; this includes the emerging Water Conservation Policy for Upstream Oil and Gas Operations (draft) and the Water Act Multi-stage Hydraulic Fracturing Guideline (draft) in AB. Although currently still in draft form, both documents emphasize the reduction or complete elimination of high-quality non-saline water in hydraulic fracturing operations. In the case of TDLs, the level of rigour required during the TDL application process is also expected to increase, with new TDLs anticipated to have a maximum term of one year, with no option to renew. In B.C., a new Water Sustainability Act is scheduled to take effect sometime in 2016. The act includes more stringent requirements for water use, including regulating and applying fees to groundwater.

The UCOG sector is particularly vulnerable to reliable water supplies to facilitate the hydraulic fracturing required to access gases and liquids from the tight formations.

Overall, application efforts for water diversion is becoming **more involved**. Equally, the importance of adequately understanding water flows and yields, and the cumulative effects on water basins and existing users of water withdrawal, is becoming **more critical**.

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The implications of submitting a deficient water application can be profound...

as was demonstrated earlier in September when B.C.’s Environmental Appeal Board (EAB) overturned a water licence in the Horn River Basin granted to Nexen Inc. for shale gas fracking. The ruling of the panel members indicated that the licence was based on inadequate science and bad faith on the part of government to properly consult local aboriginal groups. The Fort Nelson First Nation appeal of Nexen’s water licence raises issues of the government’s duty to consider cumulative effects.

The appeal panel found that the province’s conclusion that the water withdrawals would have no significant impacts on the environment, including fish, riparian wildlife, and their habitat, was based on incorrect, inadequate, and mistaken information and modelling results. (*The National Post*, 2015). Although this ruling may be subject to judicial review to the B.C. Supreme Court, the decision by EAB has sent a clear message for future water licence applications that:

- ▶ Aboriginal consultation must be meaningful;
- ▶ Decisions regarding adverse environmental effects must be based on valid, defensible, scientific models and adequate data to back up those models; and
- ▶ Public interest in preserving lakes, rivers, and land for future generations must be upheld.

Based on this ruling, Nexen is only able to use water already held in storage and can no longer withdraw water from the Tsea Lake. Without an adequate water supply, this could mean significant operational disruptions to Nexen’s hydraulic fracturing activities in the Horn River Basin, with the potential for permanent, long-term financial implications.

Setting Regulatory Precedent in the Peace River Basin

There has been significant UCOG development concentrated around the Fox Creek area.

A number of the largest UCOG operators in AB, including EnCana, Shell, and Chevron, (to name a few) have focused their AB asset development efforts in this area, which has amplified competition for water resources and has increased the level of regulatory scrutiny on water sourcing applications.

As a result, the AER has a keen eye on UCOG development in the Peace River Basin and has completed the first of two planned Play Based Regulation (PBR) pilot projects for this area. It is expected that the learnings from the two PBR pilots will drive future regulatory requirements applicable to other parts of the province.

Industry operators in the Fox Creek area are taking the initiative to collaborate and reduce their water consumption and overall footprint through implementation of the Fox Creek Operators Group (FCOG).

Numerous FCOG members are exploring water infrastructure and source sharing opportunities.

As development continues and intensifies, it will be critical for UCOG operators to spread the water demand load across the basin, and to adaptively manage withdrawals in a sustainable manner with consideration to all area water users.

4

Water security: building resiliency

into your business

As water supply constraints and basin pressures become more prevalent and threaten economic growth, the need to understand and address allocation, use, cost, and other key drivers that impact water use have never been more crucial.

As is the case within the agricultural industry, UCOG producers may need to build resiliency into the sector and find ways to adapt before they are forced to.

With this past year's drought conditions in the western provinces, a greater focus on climate change by political parties, and upcoming regulatory policy changes, it is only a matter of time before the UCOG sector will be pushed to demonstrate a more thorough understanding of its water profile and potential for cumulative effects within its resource plays.

In addition, based on the proposed restrictions and non-renewable conditions placed on TDLs under the draft Hydraulic Fracturing guidelines, operators may be unable to continuously obtain their water from the same source. Submitting a Water Act licence application to the AER in advance of the new policies and guidelines will mitigate the risk that TDLs will become 'non-renewable' while a Water Act licence application is under review. In an operating area of heavy development and water use, acquisition of a Water Act licence also guarantees "first in time, first in right" priority status.

As most UCOG operators are still heavily reliant on TDLs for their hydraulic fracturing operations, which typically have less restrictions on monitoring and reporting than Water Act licences, operators may need to consider planning preliminary water source assessments to better understand the basins in which they operate, and/or initiate steps to ensure a more secure solution to their water needs.

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How do you build

certainty into your business ?

Two words:
strategy
and
implementation

- ▶ **Understand** your water risk profile and how environmental, social, and regulatory considerations may impact your current and future water security. This may include:
 - Understanding emerging regulations and how they impact your business
 - Assessing your basin and determining potential cumulative effects of other water users
 - Knowing the water outlook for each year of operation, as well as the long-term trends
- ▶ **Develop** a water security strategy. Consider different risk scenarios and be prepared to respond to water restrictions or supply disruptions with an effective plan. This plan will include alternative water source options and/or storage and infrastructure solutions
- ▶ **Consider** groundwater sources, which are less responsive than surface water to climate variability. Potential sources include:
 - Deep, non-saline groundwater
 - Saline water sources which do not require a licence
 - Shallow groundwater
- ▶ **Increase** re-use of fracwater flowback and produced water on well pads and throughout operational areas, decreasing disposal costs as well as operators’ reliance on freshwater sources

The future of the UCOG industry is reliant on having water where and when it is needed. By developing a water security strategy and implementation plan, companies can rest at night knowing that their water future is more secure.