



## Anita Perry

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Tom Keelan  
Kudjo Fiakpui  
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Dear Messrs. Keelan and Fiakpui:

BP Canada Energy Group ULC (BP Canada) appreciates the opportunity to review and provide feedback on the Energy Resource and Conservation Board's (ERCB) draft of the directive titled Waste Disposal Limits and Measurement and Reporting Requirements for Thermal In Situ Oil Sands Schemes (the directive). The directive sets water disposal limits for oil sands projects that will require operators to recycle water efficiently. Disposal limits are set for fresh water (<4,000 TDS) relative to brackish or saline sources (>4,000 TDS).

BP Canada is supportive of the directive's objective of optimizing overall water use and energy efficiency for thermal in situ oil sands projects through efficient water treatment, recycling, and disposal. We would suggest that achieving this objective needs to be done in consideration of other environmental parameters and project economics. In addition, this objective needs to be coordinated with other environmental initiatives being considered by other regulatory agencies (e.g., development of emissions targets, water use policy) to ensure net environmental impacts are managed effectively.

To this end, we have two suggestions for strengthening the ERCB's goal of responsible development with respect to water disposal. First, BP believes that the definition of produced water should be expanded to include other forms of process affected water. We, along with others in industry, are evaluating the potential to use process affected water from neighbouring projects.

This limits additional water withdrawals from the environment, thereby reducing environmental impacts. However, each type of process affected water will have unique challenges that need to be considered. For example, tailings water is categorized as fresh water under the current definition. As such, disposal of water sourced from tailings is limited to 3% and this could prove to be a disincentive to the use of this water source, which has been identified as a preferred water source by Alberta Environment and Sustainable Resource Development.

Secondly, based on our review, we feel that the impact of water conservation measures on air emissions, including both greenhouse gases and NOx, needs to be carefully considered. A number of recent commercial scheme applications on the west side of the Athabasca River have identified fresh water aquifers as the primary make-up water source. The new disposal limits force these companies towards additional water treatment measures to meet the new disposal limits, resulting in increased greenhouse gas emissions and a potential cumulative effect on air quality.

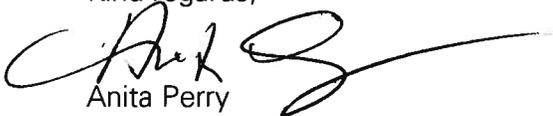
Caution needs to be taken in assuming that brackish water sources are available across the oil sands region. An Environmental Net Effects assessment and economic review should be used to determine the most appropriate water source for each project, regardless of disposal options. When fresh water has been proven as the water source with the smallest impact through an environmental net effects assessment, then capping fresh water disposal at 3% may not provide the optimal environmental outcome.

If the decision is made to favour optimizing water over other environmental parameters such as greenhouse gas emissions, then future policies will need to reflect this choice. It would not be reasonable for operators to be penalized for higher emissions because of incorporating additional water treatment measures into their facility design.

We feel that addressing the items identified above will result in a directive that more accurately meets the intent of conserving water and therefore minimize potential environmental impacts.

Again, BP would like to thank the ERCB for the opportunity to provide comment on the directive. If there are any questions please do not hesitate to contact BP.

Kind regards,

A handwritten signature in black ink, appearing to read 'Anita Perry', with a long horizontal flourish extending to the right.

Anita Perry

Cc:

John Drinkwater  
Director, RC&E / S&OR PP&L, S&OR  
BP Canada Energy Group ULC

Jordon Copping  
Director, Government Relations  
BP Canada Energy Group ULC

## BACKGROUND

Draft Directive: Waste Disposal Limits and Measurement and Reporting Requirements for Thermal In Situ Oil Sands Schemes

- Objective: Efficient water treatment, recycle, and disposal at thermal operations will optimize overall water use and energy efficiency Implications for other environmental parameters need to be weighed.
- Method: Sets water disposal limits and includes requirements for water measurement, water reporting, and facility water balances

Draft: Proponent Guidance on the Water Act Licensing Process and Requirements for Thermal In Situ Oil Sands Projects: An Addendum to the Water Conservation and Allocation Guideline for Oilfield Injection (2006)

- Objective: Conservation of non-saline water sources
- Methods: Requires the use of Environmental Net Effects when using non-saline water sources, including tailings pond water that was originally from the Athabasca River



CANADIAN ASSOCIATION  
OF PETROLEUM PRODUCERS

September 13, 2012

via e-mail: [thermalinsitu@ercb.ca](mailto:thermalinsitu@ercb.ca)

Mr. Tom Keelan  
Mr. Kudjo Fiakpui  
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Suite 1000, 250-5<sup>th</sup> Street  
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Dear Messrs. Keelan and Fiakpui

**Re: Draft Directive “Water Disposal Limits and Measurement and Reporting Requirements for Thermal In Situ Oil Sands Schemes”**

The Canadian Association of Petroleum Producers (CAPP) welcomes the opportunity to provide comments on the Energy Resources Conservation Board’s (ERCB/Board) Draft Directive “*Water Disposal Limits and Measurement and Reporting Requirements for Thermal In Situ Oil Sands Schemes*” (Draft Directive). The oil sands industry (Industry) appreciates regulatory tools that promote pragmatic water use and provide clear guidance on facility design to support future in-situ oil sands development.

- Industry supports a number of components of the Draft Directive including:
- utilization of a single equation approach to simplify the compliance assessment process;
- employment of a higher brackish (saline) water factor to allow use of elevated TDS sources;
- commitment to amending the disposal formula upon future policy changes (e.g. alternative water sources); and
- provision of an avenue for operators outside the reservoir retention range of 0.85 – 1.05 to assess alternative means to meet the intent of the Draft Directive.

Industry recognizes the importance of efficient water use in the oil sands in situ operations. As part of CAPP’s Guiding Principles for Oil Sands Development, Industry is committed to:

- Continue to reduce the amount of fresh water required per barrel equivalent of production by improving water recycle rates, using low quality water sources where feasible, and by developing new technologies.
- Safeguard the quality of regional surface and groundwater resources.

In this regard, Industry supports the responsible use of non-saline water where it has environmental and economic benefit.

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As a prelude to the comments below, it is important to recognize the achievements of Industry in continuing to reduce water use intensity and operational impact in a water-rich region of Alberta. These achievements are illustrated in the recent National Round Table on the Environment and the Economy (NRTEE) report *Charting a Course*, which identifies the oil and gas sector as having the lowest water use intensity of Canada's natural resource sectors. The present (<20 Mm<sup>3</sup>/yr) and projected future volume requirements (~25-50 Mm<sup>3</sup>/yr) for in situ thermal recovery are minor in terms of provincial allocation of consumptive water supply (measured in billions m<sup>3</sup>). Additionally, these allocations are sustainably withdrawn from river basins (<0.1% of the average flows of the Athabasca, Peace and Beaver Rivers) with abundant water supply, low overall water use and minimal water use conflicts.

As such, while the stated purpose of the Draft Directive is consistent with and supports current industry practices of efficient water use, the proposed prescriptions (i.e. disposal factors) within the Draft Directive are inconsistent with regional water availability and the guiding concepts of cumulative environmental effects management (i.e. balancing the tradeoffs between water use, energy consumption and emissions, waste generation and land disturbance when choosing a water treatment technology). Overall, the prescribed ERCB disposal factors should not discourage efficient utilization of local abundant non-saline water supplies in regions where no viable or economically justifiable alternatives exist, or promote adoption of inordinate water treatment technology that may result in increased emissions or waste generation profiles.

To illustrate, the 11.7 times differential between fresh (non-saline) (0.03) and brackish (saline) (0.35) disposal factors creates an underlying water hierarchy that serves to nullify attempts to efficiently utilize non-saline makeup water supply that minimizes environmental impacts (e.g. GHG emissions, waste generation, cycling up of salinity and/or increased land disturbance). The indirect establishment of a water source hierarchy, together with the elevated water recycle requirement if non-saline makeup is utilized as per the Draft Directive, will in some cases lead oil sands developers to seek a make-up water source that cumulatively increases overall environmental impact. While Industry agrees that the proposed disposal targets are in most circumstances technically achievable, compliance (and the envisioned benefits of reduced disposal) will come at the cost of increased emissions, increasingly concentrated waste products and an imbalanced approach to managing the total environmental impact of thermal in-situ projects. A balanced approach that enables consideration of the relative water availability, quality, distance to source/disposal zones, type and volume of waste, energy use, GHG emissions and long-term sustainability, should be applied.

Industry has identified the following areas where it is believed that the Draft Directive requires further clarification or development:

1. Section 3 - ERCB Requirements and Compliance Assurance
  - Grace Period for Scheme Expansions
  - Relaxation for Pilot projects
2. Section 6 - Formulas and Limits for Disposal at Thermal In Situ Schemes
  - Variations in Disposal Factors
  - Use of other water types and factors

### Section 3 – ERCB Requirements and Compliance Assurance

#### *Grace Period for Scheme Expansions*

The Draft Directive provides for a twelve month compliance grace period for scheme start-ups. During in situ facility start-up, for the initial plant and subsequent expansions, the water balance continually evolves as the facility comes up in production and the resource recovery process matures. During these start-up periods, the ratio of fresh/brackish/produced water fluctuates which can result in unintended non-compliance with the (Section 6) disposal formula. Furthermore, as technology and the processes for in-situ extraction evolve, the resultant water balance will adjust in response. Accordingly, CAPP submits that to address this variability, the Draft Directive should be modified to allow for a grace period for scheme expansions where it is specifically applied for and the appropriateness assessed by the ERCB.

#### *Relaxation for Experimental and Pilot Projects*

Some reservoirs are prone to higher reservoir retention, and may require make up water in excess of the 500,000 m<sup>3</sup>/a exemption provided for in the Draft Directive to adequately test the reservoir in an experimental project or prove the reservoir in a pilot project. Another situation that may present itself is where the produced water is highly saline (with associated elevated parameters, e.g. hardness) resulting in treating difficulty, especially when using brackish make up water. CAPP submits that the Draft Directive should be modified to provide for relaxations from compliance of the (Section 6) disposal formula for experimental and pilot projects where it is specifically applied for and the appropriateness assessed by the ERCB.

### Section 6 - Formulas and Limits for Disposal at Thermal In Situ Schemes

#### *Variations in Disposal Factors*

Section 3.1 of the Draft Directive states that the ERCB will consider variations of the disposal factors in Table 1 of Section 6 upon application in cases where high concentration of total dissolved solids (TDS) in make-up water or high produced water rates make it difficult to meet the disposal limit (e.g. TDS in excess of 15,000 mg/L or water-to-steam ratio exceeding 1.05). This is positive and enables the use of highly saline water. CAPP notes that these two scenarios are provided as examples, and requests that the language in Section 3.1 be amended to consider variations in other scenarios where it is difficult to meet the disposal limit due to the characteristics of the make-up water or the produced water, as discussed below.

The categories of fresh, brackish, and produced water do not capture the broad spectrum of treatment requirements within each of those categories. In TDS concentrations, produced waters span the spectrum from fresh (<4000 mg/L) to saline (brackish) (>4000mg/L). Many freshwater supplies (e.g. deep groundwater) are more similar in chemical profile to produced water and brackish water than surface freshwater. The disposal factors do not recognize this variation. Furthermore, there are

a number of other factors, beyond salinity, that are used to assess the appropriateness of water sources.

As one example, while tailings pond water is technically fresh (TDS < 4,000 mg/L), high total organic compounds (TOC) and fine tails make it difficult to treat; more difficult than many produced water or saline water types. As another example, elevated levels of difficult to treat contaminants such as boron, selenium, arsenic and/or fluoride that exist in native non-saline groundwater supplies effectively negates use of these waters outside of the oil and gas industry without adoption of expensive exotic treatment and disposal infrastructure. Recognition of these challenges within the Draft Directive is required in order to encourage the use of lower quality native waters and alternate waters that fall under the broad and indistinct category of 'freshwater'.

As presented, the Draft Directive designates a hierarchy of water sources. It identifies brackish (saline) water as a strongly preferable make-up water source with strong incentive for employment over non-saline makeup water by virtue of an 11.7x differential between makeup water disposal factors (0.03 vs. 0.35).

Industry submits there should not be a prescribed or inferred hierarchy; all suitable water sources of sufficient quantity, quality and reasonable proximity should be considered at the onset, and appropriate water sources and treatment facilities for thermal in situ projects should be determined pursuant to an environment net effects evaluation (ENE) and economic review.

Prescribing a hierarchy through regulation bypasses the pertinent environmental, operational and economic considerations of selecting a water source for a unique in situ development and results in unintended environmental consequences and misaligned policy outcomes (e.g., increased landscape impacts and carbon footprint).

The fresh water disposal factor of 0.03 is restrictive and may lead to unintended consequences. For a commonly-agreed upon benchmark level of warm lime softening (WLS) water treatment (77% steam quality, 55% blowdown recycle, 1.5% regeneration waste to disposal, produced water TDS = 2000 mg/L), compliance with this low fresh water disposal factor requires excessively high blowdown recycle (>75% which leads to frequent OTSG pigging intervals, unstable production and accelerated equipment wear), the adoption of additional technology to meet the disposal limit that increases emissions and/or incorporation of saline water (leading to additional equipment installation and increased/concentrated waste disposal).

Furthermore, an idealized warm lime softener/once-through-steam-generation (WLS/OTSG) facility (i.e. a plant that utilizes no makeup water and is fully sustained on produced water alone), requires a produced water disposal factor of 13% to achieve regulatory compliance (in absence of any plant upset conditions) under these benchmark conditions. Even if make-up is required, given that the majority of the water treated in a water treatment facility is produced water, the treatment facility is insensitive to the proportion of non-saline water make-up and both the fresh (non-saline) water and produced water factors should be equivalent at 0.13. It is acknowledged that a higher factor for

brackish (saline) water make-up is required to accommodate higher salinities and the related higher rate of water disposal.

As such, Industry proposes the ERCB disposal factors for fresh (non-saline) water and produced water be amended from 0.03/0.10 to 0.13/0.13 to enable Industry to employ environmentally responsible water management and treatment practices consistent with the findings of an ENE assessment. The proposed amendment of the disposal factors also provides some accommodation in fluctuations in the ratio of fresh/brackish/produced waters associated with water balance transitions as in-situ projects mature. Where the project infrastructure and operating practices are designed around a 0.35 saline water disposal factor, the transition from brackish (saline) water makeup (0.35) to produced water makeup (0.10) becomes exceedingly difficult to manage and may require extreme capital expenditure to meet regulatory requirements at a point of project maturity (i.e. disposal limits decrease). Conversely, a project that deploys additional water treatment technology (e.g. WLS + evaporators) in the early years to enable use of non-saline makeup water, may find that such equipment is rendered redundant (i.e. wasted capital expenditure) as the water balance (and disposal factors) shifts from fresh water (0.03) to produced water (0.10) and disposal limits increase as the project matures. As such, the disposal factors should not be tied to extreme differentials (11.7 times) that incent the choice of one water supply or technology adoption in the early stages of a project that results in a negative effect over the long-term. Increasing the fresh water disposal factor to 0.13 would reduce this differential to 2.7 times, allowing for greater design and operating flexibility.

#### *Use of other water types and factors*

Industry advocates the use of low quality water sources for use in in-situ projects where there is environmental and economic benefit; however, current legislation, policy and regulatory instruments (including the Draft Directive) essentially establishes a disincentive for the use of low quality water for in-situ projects. Although the Draft Directive states that it may revise requirements as a result of policy and regulatory changes introduced by other government agencies, CAPP recommends that the Draft Directive be expanded at this time to allow, in addition to variations in the factors for fresh, brackish and produced water (as discussed above), for the consideration of new categories of water and associated factors. The introduction of “alternative water sources” provides flexibility and encouragement to Industry to pursue low quality water supplies for in-situ oil sands schemes.

This broadened definition of “alternative water sources” should include:

- Tailings water and other industrial process-affected water (PAW)
- Unprocessed, impaired quality non-saline groundwater
  - i. Non-saline water in contact with petroleum (e.g., top/bottom water)
  - ii. Non-saline water with elevated persistent contaminants (e.g., boron, arsenic, fluoride, methane, H<sub>2</sub>S)
- Transferred produced water that currently could be classified as fresh water, saline water, or produced water depending on interpretation and salinity.

To incent the use of these low quality water sources, government should differentiate its approach to allocation of high competition, high quality (e.g., potable surface and/or shallow groundwater) non-saline water from low competition, impaired alternative water sources.

Characterizing low quality non-saline water as “fresh water” (i.e. implies it is fit for human consumption directly at the source) sends the wrong signals to industry and to the public. Given that there is significant capital and operating costs associated with treating low quality water, there is no incentive under the Draft Directive water disposal formula for industry to use low quality “fresh” water, or other alternative water sources.

CAPP submits that the ERCB can within the current (ESRD) legislative and policy framework (i.e. definition of saline water, the process to obtain water diversion permits for non-saline sources, including conducting a net environmental effects assessment) build in flexibility into the Draft Directive to accommodate alternative water sources in the water disposal formula, through the introduction of additional water sources and associated factors, or through utilizing the existing categories of fresh, brackish or produced water and allowing for variations in the corresponding factors. In any case, such variations would need to be specifically applied for and the appropriateness assessed by the ERCB.

Furthermore, given that there are significant process design, and by extension, capital and operating cost (and environmental) implications associated with the selection of water sources, the Draft Directive should include a statement that the characterization of water sources and factors, and any variations thereto, may be determined prior to, or as part of the scheme, expansion or modification application process.

Please contact the undersigned with any questions or comments you may have about this submission.

Yours truly,

A handwritten signature in black ink, appearing to read 'Emery Varga', with a stylized flourish at the end.

Emery Varga  
Manager, Oil Sands

cc: Terry Abel

CAPP EDMS 212332V11

September 12, 2012

Energy Resources Conservation Board  
Suite 1000, 250-5<sup>th</sup> Street SW  
Calgary, AB T2P 0R4

**Attention: Mr. Tom Keelan and Mr. Kudjo Fiakpui**

Dear Sirs:

**Re: Draft Directive “Water Disposal Limits and Measurement and Reporting Requirements for Thermal In Situ Oil Sands Schemes”**

Devon Canada Corporation (Devon) welcomes the opportunity to provide comments on the Energy Resources Conservation Board (ERCB) Draft Directive “*Water Disposal Limits and Measurement and Reporting Requirements for Thermal In Situ Oil Sands Schemes*” (Draft Directive).

Devon appreciates regulatory tools that promote efficient water use and provide clear guidance on facility design to support future in-situ oil sands development. Devon has remained an active participant in the industry discussions between the ERCB and CAPP on this issue, however, provides more limited comments with this separate submission.

Devon supports a number of components of the Draft Directive including:

- utilization of a single equation approach to simplify the compliance assessment process;
- employment of a higher brackish (saline) water factor to allow use of elevated total dissolved solids (TDS) sources;
- commitment to amend the disposal formula upon future policy changes (e.g. water types); and
- provision to vary the disposal factors in cases where high TDS in make-up water or high produced water rates make it difficult for operators to meet the disposal limit.

Devon recognizes the importance of efficient water use in the oil sands in-situ operations. Devon is committed to:

- safeguard the quality of regional surface and groundwater resources;
- continue the use of only brackish (saline) water for steam generation at its in-situ facilities; and
- identify opportunities to implement or improve technologies that will lead to a reduction in water use at Devon’s facilities.

Devon recommends that the Draft Directive be expanded in Section 3.1 to incorporate wording used by the ERCB in the April 19, 2011 version of the Draft Directive. The current Draft Directive provides for a twelve month compliance grace period for scheme start-ups but not for scheme expansions. During the start-up of an in-situ facility, regardless of whether it is the initial plant or a subsequent expansion, the ratio of fresh to brackish to produced water fluctuates, which may result in unintended non-compliance with the Section 6 disposal formula. To address this potential variability, Devon submits that the last sentence of the first paragraph of Section 3.1 be modified to include wording similar to that found in the earlier version of the Draft Directive. A revised sentence would potentially state that:

“The start-up grace period does not apply to scheme expansions unless relaxation is specifically requested and approved as part of the scheme expansion application and approval process.”

Following implementation of the directive, Devon would encourage the ERCB to work with Alberta Environment and Sustainable Resource Development (ESRD) to review and, where appropriate, update the classifications of water used in Alberta. Incorporating alternative water definitions into future directive updates may enhance the feasibility to use these low quality waters and further reduce the net environmental footprint of industry operations.

Overall, Devon is supportive of the current draft of the proposed Directive. Please contact the undersigned with any questions or concerns you have about this submission.

Yours truly,



Andrew Vink, P.Eng.  
Senior Reservoir Engineering Advisor  
Thermal Heavy Oil

September 7, 2012

Tom Keelan and Kudjo Fiakpui  
Energy Resources Conservation Board  
Suite 1000, 250 – 5<sup>th</sup> Street SW  
Calgary, AB, T2P 0R4

Dear Mr. Keelan and Mr. Fiakpui,

Husky Oil Operations Limited (Husky) would like to thank you for the opportunity to provide feedback on the Energy Resources Conservation Board (ERCB) Draft Directive “Water Disposal Limits and Measurement and Reporting Requirements for Thermal In Situ Oil Sands Schemes”.

Husky supports the intent of the Draft Directive and continues to undertake efforts to conserve and recycle water.

To minimize the use of non-saline water for production, Husky reviews alternatives to the use of fresh water, factoring in environmental, technical and economic feasibility. Husky continues to evaluate and implement various technologies to reduce fresh water consumption or to increase the efficiency of water used.

In addition, Husky is committed to responsible corporate citizenship. This includes the integration of social, environmental and economic considerations into its core businesses while engaging key stakeholders and conducting business in a manner that maximizes positive impacts on current and future generations.

Within the Draft Directive, Husky appreciates the recognition in Section 3.1 that variations to the disposal limit would be considered upon application where high Total Dissolved Solids (TDS) water (greater than 15,000 mg/L) or water to steam ratios exceeding 1.05 make it difficult to meet the disposal limit. Husky uses highly saline water at its Tucker Oil Sands Project and supports this consideration within the Draft Directive.

Husky also supports the use of alternative water sources at in situ facilities (e.g. tailings pond water and other process affected water types). While many of these alternative water sources are technically fresh (less than 4,000 mg/L), they can be difficult to treat due to high Total Organic Carbon (TOC) concentrations and the presence of Mature Fine Tailings (MFT), for example. The proposed disposal factors for these sources will make the disposal limit difficult to meet due to the challenges inherent with treatment of these water types.

Husky would like to see the use of alternative water sources encouraged at in situ facilities and suggests that a variance to the disposal factor be considered upon application when using alternative water sources.

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Carbonate reservoir development is emerging in Alberta and these reservoirs pose new challenges to operators. The produced water from carbonate reservoirs is typically quite saline and hard and thus can be difficult to treat, especially when using hard brackish make-up water from the same area. High reservoir retention can also be typical of carbonate reservoirs increasing the impact of the hard brackish make-up water. These challenges should be addressed in the Draft Directive to enable discussion on disposal factors for experimental reservoir production methods within these reservoirs.

Husky sincerely appreciates the opportunity to provide feedback to the ERCB in this regard. We hope that our comments are perceived as constructive and welcome the opportunity to provide a more detailed discussion in the future. Please call the undersigned if you have any questions regarding the content of this submission.

Sincerely,



John Myer  
Sr. Vice President, Oil Sands



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A.R. (Andrew) Teal  
Manager

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September 14, 2012

Tom Keelan and Kudjo Fiakpui  
Energy Resources Conservation Board  
Suite 1000, 250-5<sup>th</sup> Street  
Calgary, AB T2P0R4

**Re: Draft Directive “Water Disposal Limits and Measurement and Reporting Requirements for Thermal In Situ Oil Sands Schemes”**

Dear Mr. Keelan and Mr. Fiakpui:

Imperial Oil has had a long record of continuous improvement in water resource management for in situ thermal operations at its CSS operations in Cold Lake, Alberta. Some examples of Imperial’s success include pioneering produced water treatment and recycling, the first use of brackish water for in situ thermal operations, and a >90% reduction in freshwater use per barrel of bitumen since commercial operations began. With these experiences Imperial Oil appreciates the opportunity to provide comments on the Draft Directive – “Water Disposal Limits and Measurement and Reporting Requirements for Thermal In Situ Oil Sands Schemes.”

Imperial Oil recognizes the efforts that the ERCB has taken to develop a simple approach to minimizing disposal and make-up water volumes that can be applied to the entire in situ thermal industry. However, Imperial Oil has some concerns with the Draft and provides comments in four areas:

1. Selecting the best water source for a project should reflect a balance between environmental and economic benefits.

Under the ESRD *Water Conservation and Allocation Policy for Oilfield Injection (2006)*, it is recognized that an environmental and economic assessment should be conducted to determine the optimum water supply for a project. Imperial is concerned that the Draft Directive establishes a clear regulatory advantage for the use of brackish water (disposal factor of 0.35) over fresh water (disposal factor 0.03) in the absence of analysis to determine the optimum source. In light of emerging challenges in some in situ areas with respect to finding brackish water and disposal zones and the clear sustainability of current and forecast freshwater use in the Athabasca, Peace, and Beaver River Basins, Imperial is

concerned that the Draft Directive will result in selection of water sources that will result in non-optimal economic and environmental performance.

2. The equation and disposal factors result in different performance standards for otherwise similar projects.

Imperial Oil is concerned that the equation and factors in the Draft Directive result in different regulatory requirements for otherwise similar projects. Many of these concerns result from different produced water to steam injection ratios (WSR) for different reservoirs. WSR varies across the in situ industry over a large range from projects that produce more water than they inject to projects that produce less water than they inject. The equation and factors result in different produced water recycle requirements over the WSR range. This method in some cases will mandate a different water treatment scheme and therefore different capital cost requirements for otherwise similar projects. Ironically projects with higher WSR require less make-up water but will have the most difficult time meeting the Draft Directive.

A related concern arises from maturing operations which experience increasing WSR operations resulting in more produced water relative to steam requirements thus increasing disposal volumes. Some older facilities will have an increasingly difficult time maintaining compliance with the Draft Directive as WSR increases because of the operational water imbalance and the different recycle rate requirements over the WSR range. Thus the same facility that is in compliance in early life may become non-compliant late in life due to the WSR change. Imperial appreciates that the ERCB has indicated that they will work with companies that have this WSR situation if  $WSR > 1.05$ .

3. Regulatory uncertainty around the use of alternative water sources.

The absence of a method for dealing with alternative water sources (e.g. Industrial waste water, transferred produced water, tailings water, and poor quality non-saline groundwater) creates uncertainty for proponents regarding source water options for new developments. Many of these sources are preferable to high quality freshwater if they are locally available and have lower overall environmental impacts. However, these sources are often less than 4000 mg/L TDS and are considered freshwater in Alberta. The Draft Directive does not recognize these as distinctly different from freshwater which will discourage their use because of the very low disposal factor for freshwater. Imperial acknowledges that the ERCB does not set fresh water policy, but is concerned about the Directive that does not recognize the value in beneficial reuse of poor quality waters including industrial waste waters from oil and gas activities.

4. Duplication in measurement requirements between the Draft Directive and Directive-017.

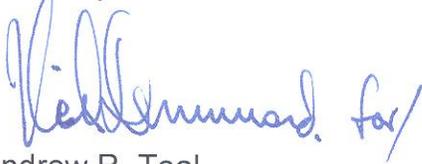
The directive is clear and is consistent with existing measurement requirements currently outlined in Directive 017, however the measurement requirements

stated in section 5 appear to be a duplication of similar requirements currently stated in Directive 017, section 12.4. Having duplicate requirements in two separate directives can lead to confusion and inconsistent application. Imperial Oil offers the following recommendations:

- Consider removing section 5.1 (Single-Point Measurement Uncertainties) and refer to Directive -017, section 12.4.5
- Consider removing section 5.2 (Water/Steam Primary and Secondary Measurement) and refer to Directive -017, section 12.4.6
- Consider removing section 5.3 (Steam Injection Proration Factors) and move to Directive -017, section 3.1.4.
- Consider adding the following definitions to Directive -017, Appendix 3 (Glossary): Boiler blowdown, Brackish water, Cold water equivalent, Freshwater, Primary measurement, Secondary measurement, Sound engineering practices.

In closing, Imperial appreciates the opportunity to provide feedback on the ERCB's Draft Directive. If there any questions or if the ERCB would like to meet with Imperial to further discuss the Draft Directive, please contact Stuart Lunn at 403-237-3716.

Sincerely,

A handwritten signature in blue ink, appearing to read "A. R. Teal for".

Andrew R. Teal  
Manager, Safety, Security, Health and Environment

ARTjjb



**MEG ENERGY**

September 12, 2012

Energy Resources Conservation Board  
Attn: Tom Keelan / Kudjo Fiakpui  
Suite 1000, 250 5th Street S.W.  
Calgary, AB T2P 0R4

Ref: ERCB Draft Directive on Water Disposal Limits

Gentlemen:

MEG Energy (MEG) appreciates the opportunity to provide comments on the ERCB draft directive "Water Disposal Limits and Measurement and Reporting Requirements for Thermal In Situ Oil Sands Schemes".

Directionally, we support the directive as it relates to reducing the amount of water required for a barrel of equivalent bitumen production and by promoting the use of low quality water resources. In this regard, MEG has made significant strides in terms of reducing the steam/oil ratio (SOR) at its Christina Lake Regional Project (CLRP). Furthermore, as you may be aware, MEG has also committed to the incorporation of saline water from the McMurray formation in conjunction with our Phase 3 expansion at the CLRP which was approved by the ERCB earlier this year.

The main concern we have with the draft directive as it currently stands, is that under s3.1, there is no provision for a "grace" period for project expansions. For the reasons set out below, we believe this section should be revised. Alternatively, s3.1 of the directive should be revised to clarify the grace period applies to 'project start-up and the start-up of new Central Processing Facilities (CPF) constructed as part of project expansions'.

As you know, project expansions can range from equipment additions at existing central processing facilities to an entirely new CPF at the existing CPF location or at separate locations entirely. It does not seem reasonable that operators who construct major CPF additions (new plants at existing sites) or construct new CPF sites at different locations, do not receive a "grace" period to get these facilities up to "steady-state" operations in order to have a reasonable opportunity to meet compliance requirements. We suggest a one-year "grace" period from CPF start-up is reasonable under these circumstances.

We would add that, not only is the "grace" period required to optimize facility operations, it is also required because a plant expansion typically includes new pads to "feed" that plant. The initial steaming of these new pads typically causes water balance problems in terms of high water retention and accordingly, a reduction in the volume of produced water returns. This makes regulatory compliance with respect to the proposed directive very difficult during the first year of operations and further supports the "grace" period provision.

Please advise if additional information is required.

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September 12, 2012

Energy Resources Conservation Board  
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Attn: Mr. Tom Keelan, P.Eng. and Mr. Kudjo Fiakpui, P.Eng.

**Re: Nexen's response to July 12, 2012 Draft Directive - Water Disposal Limits and Measurements and Reporting Requirements for Thermal In Situ Oil Sands Schemes**

**Background**

The Long Lake project is an integrated SAGD and Upgrader project where i) flash condensate from SAGD is sent to the Upgrader where it displaces freshwater make-up and ii) wastewater from the Upgrader is sent to SAGD for re-use which reduces SAGD make-up water requirements. This integration results in an efficient water operation that minimizes disposal volumes and wastewater treatment facility requirements. However, it results in difficulties in applying ERCB regulations related to water use in SAGD projects because:

- The total amount of freshwater sourced for the entire project is much larger than for standalone SAGD projects due to the Upgrader high quality source water requirements; and
- The Upgrader wastewater returns to SAGD, when combined with minor reservoir losses (or reservoir gains); result in excess water situations in the SAGD area. In these circumstances, excess water is sent to disposal.

**Concerns with the draft ERCB directive and proposed solutions**

***General***

This draft directive provides a disincentive to re-use wastewaters that originated from freshwater sources. For example, companies sourcing brackish groundwater for make-up would have a disposal factor of 0.35 while companies that re-use industrial wastewater, tailings water or treated municipal effluents would get the same disposal factor of 0.03 as companies directly withdrawing water from fresh sources.

## *Proposal*

Nexen proposes that, for the purpose of this directive, an Alternate Water category be created to include industrial wastewater, tailings water and treated municipal effluent, and for which a Disposal factor between 0.10 and 0.35 be applied. This would provide incentive to industry to re-use wastewater for SAGD, despite the possibility that additional water treatment facilities may be required and additional complexity and risk may be added to the process.

## *Long Lake Specific*

From the Q & A provided on the ERCB website (repeated below), it is unclear whether the draft directive applies to Long Lake.

Question:	What approach will be taken with thermal in situ oil sands schemes that have integrated upgraders?
Answer:	As only a few cases currently use or propose using integrated upgraders, they are not addressed in this edition of the directive. For the purpose of disposal and recycle, upgraders are considered separate at this time.

<http://www.ercb.ca/regulations-and-directives/directives/draftdirective/draftdirective-faqs>

It is our expectation that should this Draft Directive apply to Long Lake, a project specific Disposal Limit formula will be derived from the formula in the Draft Directive and that this formula will put the Long Lake project on equal footing with standalone SAGD projects.

However, based on the current Long Lake specific formula for the produced water recycle rate, Nexen is concerned that the Draft Directive does not provide an adequate framework to take into account:

1. Excess water periods in the SAGD area (due to the Upgrader returns): these periods are common and significantly increase the total disposal volumes which decreases our ability to meet the Disposal Limit. We propose that either 1) the excess water volumes to disposal be metered and subtracted from Total Disposal in the numerator of the Actual Disposal formula, or 2) a pseudo Water Steam Ratio be calculated – including the Upgrader returns – and when this pseudo WSR exceeds 1.05, the ERCB considers variations of the disposal factors as indicated at the top of page 4.
2. *Fresh In* in the numerator of the Disposal Limit formula should only include Fresh In to SAGD (excluding Fresh In to Upgrader).
3. There are two large industrial wastewater streams (from the Upgrader) used as SAGD make-up at Long Lake. Wastewater make-up sources are not considered in the draft directive and the ERCB previously indicated that these sources will be classified based on the origins of the water molecules, regardless of how contaminated and difficult it may be to treat these wastewaters. In our case, these wastewaters would be recognized as fresh due to their origin and a disposal factor of 0.03 applied although these waters are evidently quite different from freshwater. We propose that the disposal factor for these wastewater streams be between 0.10 and 0.35 – corresponding to the disposal factors for produced water and brackish water.

*Proposal*

If the Disposal formulas could not be modified to put the Long Lake project on equal footing with standalone SAGD projects, we propose that a clause be added to the Draft Directive clarifying that the scope of this directive only applies to standalone in-situ thermal oil sands schemes and excludes in-situ thermal schemes integrated with upgrading facilities.

*Draft Directive Appendix B*

*Proposal*

We suggest the following changes be made to Appendix B.

1. Table B1, page 13: Fresh Transfer REC should also include oil sands projects (AB OS) or a 3<sup>rd</sup> party such as a municipality.
2. Table B1, page 13: Brackish REC/PROD should also include non-ERCB licensed wells (brackish source wells <150m depth that are not licensed with ERCB nor ESRD)

Should you have any questions, please contact Will Hughesman (will\_hughesman@nexeninc.com) at 403 699-5496 or Yannick Champollion (yannick\_champollion@nexeninc.com) at (403) 699-6610.

We look forward to your consideration of the concerns presented above and to further discussions regarding the unique situation of the Long Lake project relative to this Draft Directive.

Best regards,



Kris Geekie  
Director - Community, Consultation and Regulatory Affairs  
Nexen Oil Sands

# PennWest

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September 14, 2012

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## **Re: Draft Directive “Water Disposal Limits and Measurement and Reporting Requirements for Thermal In Situ Oil Sands Schemes”**

Penn West Petroleum Ltd. (Penn West) has received the Energy Resources Conservation Board’s (ERCB/Board) Bulletin 2012-15 and Draft Directive “*Water Disposal Limits and Measurement and Reporting Requirements for Thermal In Situ Oil Sands Schemes*” (Draft Directive). Penn West supports the ERCB’s approach of consulting with industry as a whole through the Canadian Association of Petroleum Producers (CAPP). Penn West has been party to this consultation process and supports the submission(s) provided by CAPP to the ERCB with respect to the Draft Directive throughout the consultation process. Penn West is appreciative to have the opportunity to present its unique approach to in-situ development and water management on meeting the intent of the ERCB Draft Directive.

Penn West currently has oil sands lease holdings within the Peace River Oil Sands area. As indicated in our most recent pilot applications to the ERCB, we are exploring thermal development within the Bluesky Formation in the Peace River Oil Sands area. Penn West currently operates in situ Primary oilsands production wells in the area. Our produced water sampling program from these operations indicates that the Bluesky Formation contains connate water with an approximate salinity of 30,000 ppm TDS (Total Dissolved Solids). Further, based on results from our ongoing source water exploration program, potential non-saline and saline water sources have been identified within the Peace River Area. The Paddy-Cadotte member of the Peace River Formation has been determined to range from non-saline at approximately 3,700 ppm TDS to saline 4,700 ppm. In addition, the Notikewan-Falher member of the Spirit River Formation has been determined to be saline at approximately 14,000 ppm TDS in the Peace River area. Deeper ground water sources were identified but were found to have salinities exceeding 20,000 ppm TDS. Penn West is in the process of confirming deliverability and long term viability of these potential ground water sources.

Penn West has reviewed the proposed Draft Directive in regard to available source water options and potential produced water qualities. Penn West notes that within the Draft Directive the ERCB has made a clear separation between Cyclic Steam Stimulation (CSS) and Steam Assisted Gravity Drainage (SAGD) extraction processes and disposal factors. Penn West is concerned that the disposal factors proposed for typical CSS operations would have a significant negative effect on our future operations in the Peace River area. However, Penn West also notes that in Section 3.1 of the Draft Directive the ERCB states that it will consider variations of the disposal factors in Table 1 of Section 6 upon application in cases where high concentration of total dissolved solids (TDS) in make-up water or high produced water rates make it difficult to meet the disposal limit (e.g. TDS in excess of 15,000 mg/L or water-to-steam ratio exceeding 1.05). Due to the unique reservoir properties encountered within the Bluesky Formation Penn West will be proposing a unique combination of bitumen extraction and water management.

Due to the specific reservoir properties including reduced vertical permeability Penn West has selected Horizontal Cyclic Steam Stimulation as the chosen enhanced recovery technology for the Bluesky Formation. Penn West has identified high levels of TDS located within the Bluesky Formation as well as high salinity source water as having a potential to significantly impact operations. As part of our plan to mitigate the salinity effects 100% quality steam injection without blowdown concentrate, and with boiler blowdown recycle has been selected as part of our water management strategy. Boiler blowdown recycle is typical of SAGD operations and requires a higher volume of disposal to manage the buildup of concentrated TDS within the recycled water. Penn West's proposed CSS development has two conditions that are substantially different from other CSS developments. Penn West will be applying to use a blended saline/non-saline make up water source and limiting the injection of TDS into the reservoir to mitigate produced water TDS build up over time. As such Penn West believes that the directive disposal factors for CSS do not appropriately represent the water management scheme necessary to economically develop and operate Penn West's Projects. Penn West believes that in light of the high TDS source and produced water this unique combination of technology proposed should at a minimum be evaluated using the SAGD produced water disposal factors listed in any implemented version of the water disposal directive.

Penn West will be submitting an application for the above mentioned technology within the context of a new thermal in-situ scheme in the near future.

If you have any questions or require further information, please contact the undersigned at 403-539-6342.

Yours truly,  
PENN WEST PETROLEUM LTD

Pat Harrison, P. Eng.  
Senior Regulatory Advisor