

# Montney Water Operators Group: Water Sharing Initiative

Stephen Marcil  
March 30<sup>th</sup> 2017



## **Black Swan Energy Ltd.**

- Short overview of Black Swan Energy operations in British Columbia (BC) Canada

## **Montney Unconventional Play in Marcellus Terms**

- Comparing metrics of each play
  - Regional Area
  - Reserves
  - Production

## **Trends in Completion Design**

- Volume of water being used for the purpose of fracing
- Sources for frac water

## **NEBC Montney Water Operators Initiative**

- Origin of the initiative
- Mandate of the group of companies
- Specifics of terms of the agreements
- Mutual Benefits

# North Montney: Scale, Growth and Value

## High Quality Asset

- Recent wells indicate 7-11 Bcf EUR at low cost
- Liquids yield of 35-50 bbl/MMcf

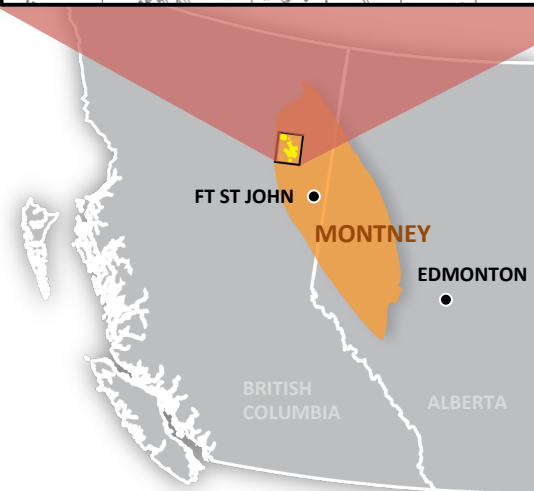
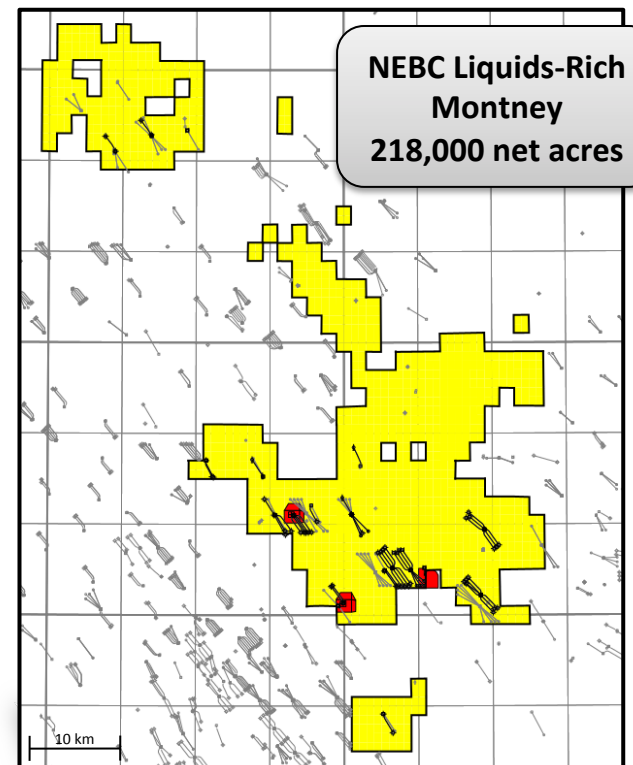
## Material Position

- 341 sections of Montney rights<sup>1</sup>
- Contiguous, 100% WI with liquids-rich potential

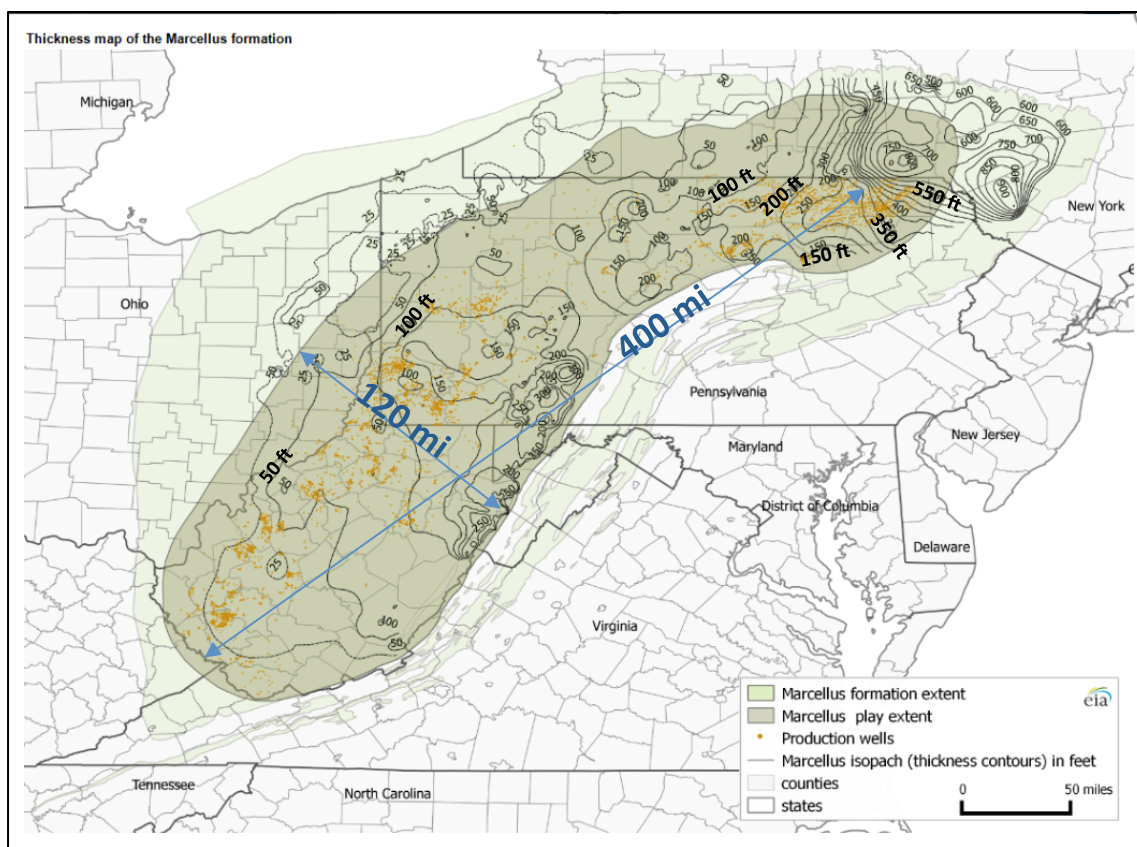
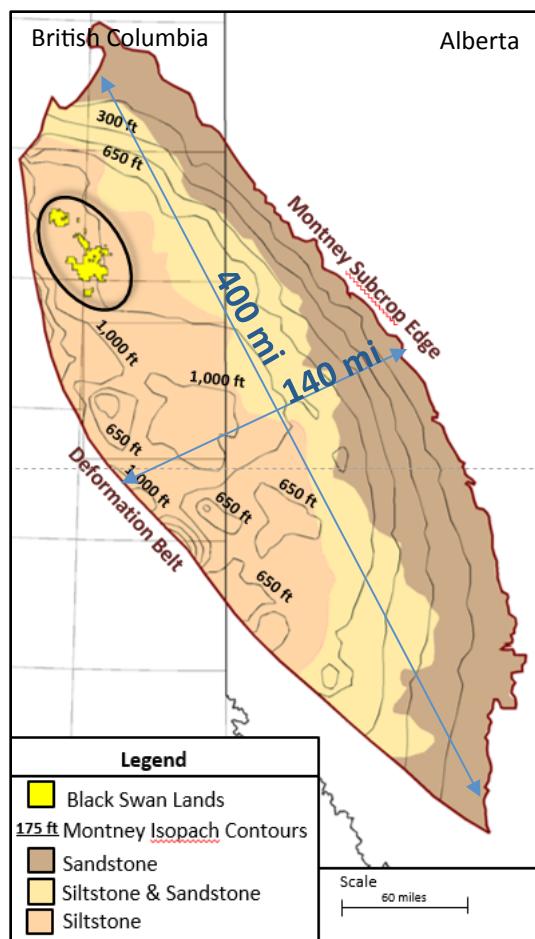
1. 312 net DSUs where one DSU = 700 acres

## High Growth Potential

- Capable of achieving 100,000 boe/d in five years
- Inventory of over 2,800 Hz locations



# Montney and Marcellus the Top-Tier North American Plays



Source: EIA 2014

Source: Montney facies base map modified after Canadian Discovery Ltd. (2008)

## Regional Trend Similar to Marcellus

- Montney and Marcellus are similar in regional size and scale
- On average the Montney is much thicker than the Marcellus (more than 3x the thickness)



## Compared to 4 large shale natural gas plays in the U.S

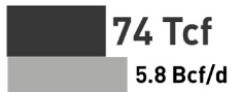
### Montney



### Marcellus



### Haynesville



### Utica



### Eagle Ford



Tcf: Trillion cubic feet  
Bcf/d: Billion cubic feet per day

NEB, FirstEnergy, EIA, USGS

## Reserves

- Estimated Reserves related to Montney vs. Marcellus/Utica almost identical (Source NEB, First Energy, EIA, USGS)

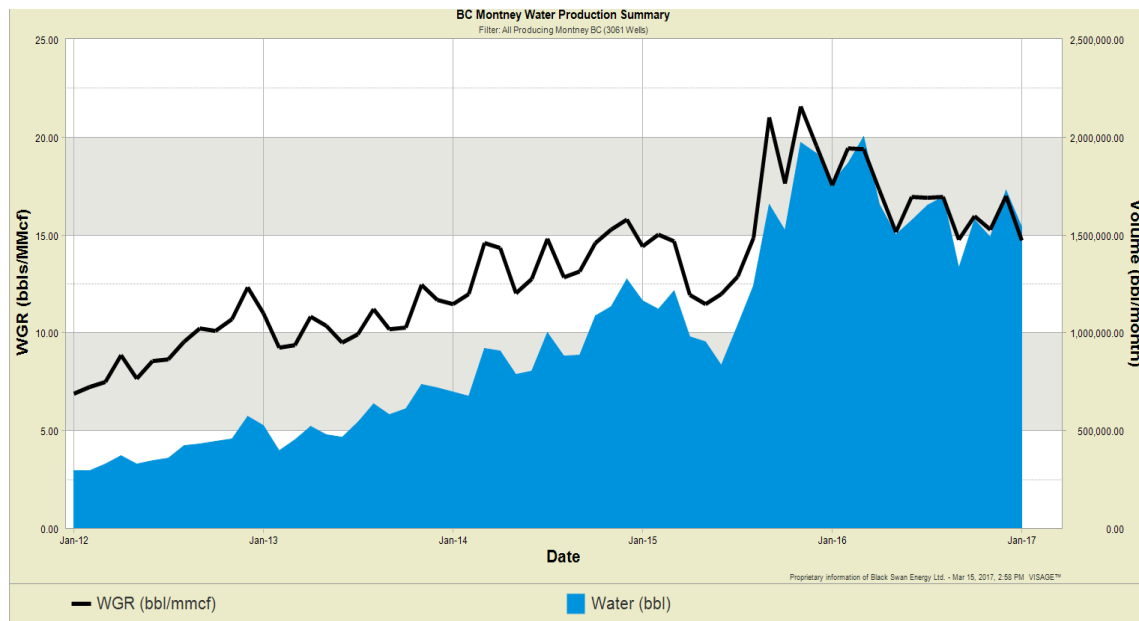
## Development

- More than 4x production from Marcellus/Utica (at time of report) as compared to the Montney

## Go Forward

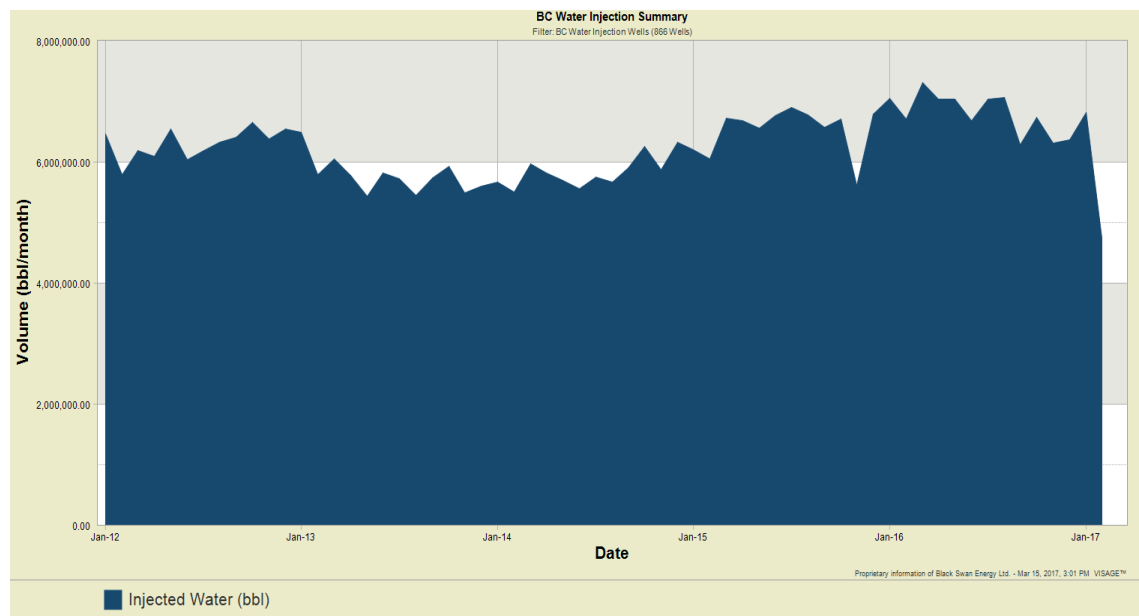
- Montney following in the footsteps of the Marcellus
- Completion dependency on water continues to grow

# Montney Production and Injection Trends



## Water Production

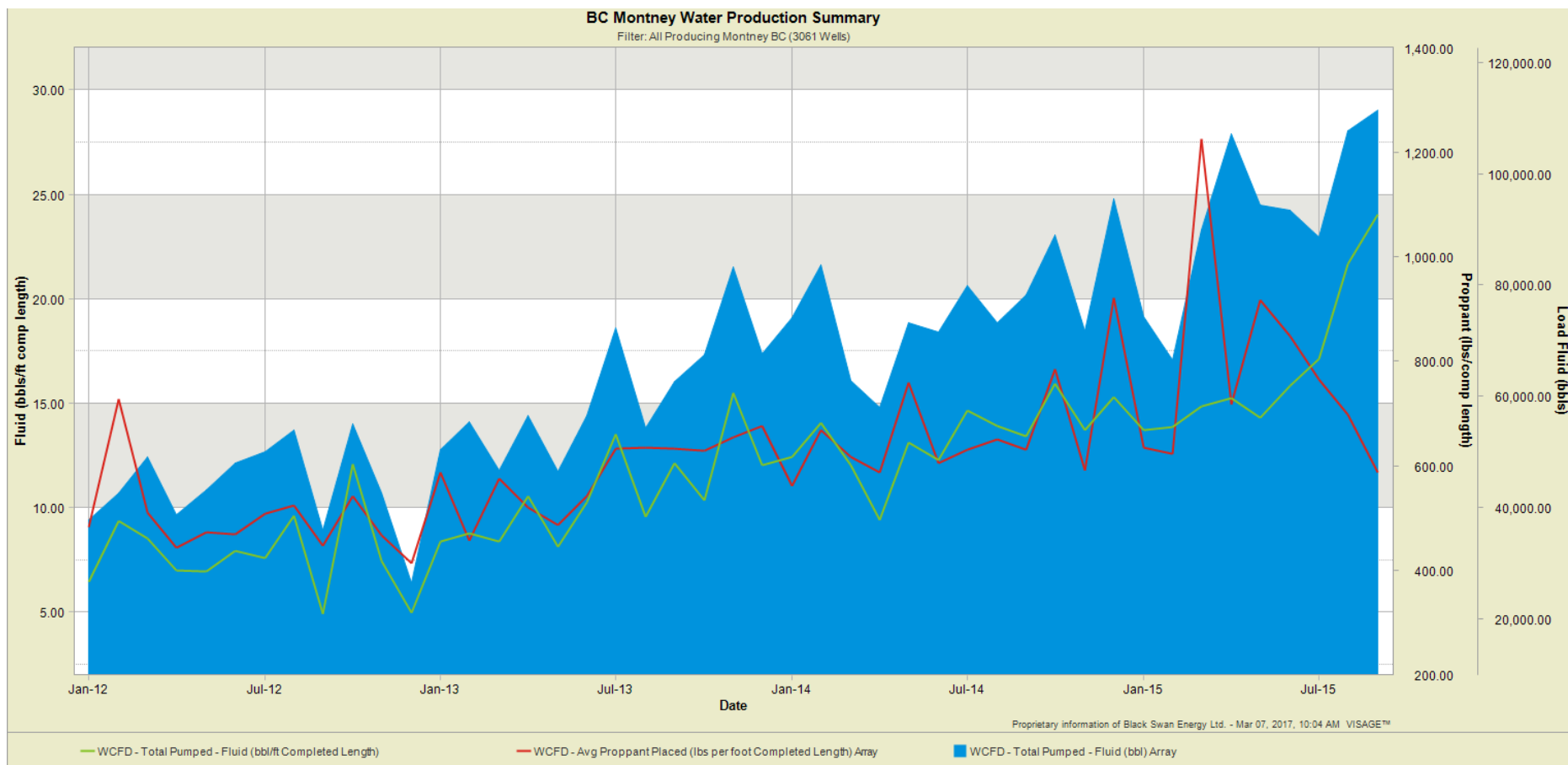
- BC Montney water production has doubled in the last 2.5 years
- Average well WGR is also steadily increasing on account of larger frac designs
- High percentage of reuse is encouraged through regulatory framework and operators are aligned



## Injection Capability

- Roughly 100 active water injection/disposal wells in NEBC
- Injection capacity largely unchanged in last 5 years
- Regulations continue to become more stringent on injection well applications

# Completion Design Trends Related to Water Usage



## Montney Completions

- Fluid and sand intensity continue to trend upwards in BC Montney completions
- Total Fluid per well also continuing to increase with time

## Frac Fluid Sourcing

- How are operators meeting demand for water?

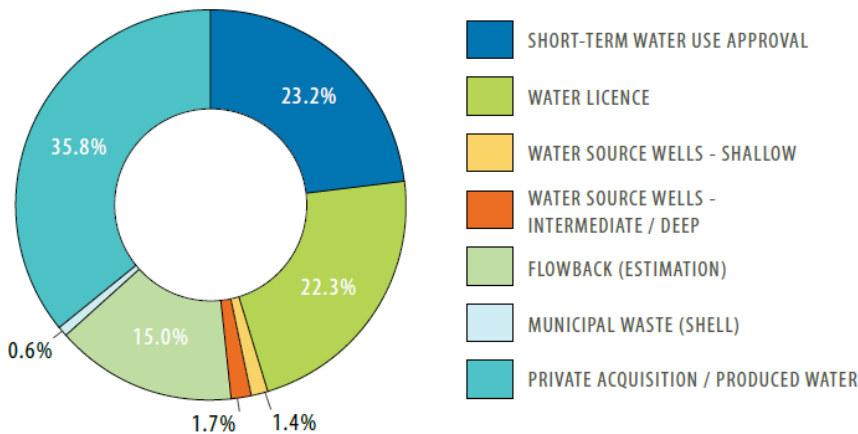
## 2015 Water Used for Hydraulic Fracturing Province BC

	Number of Wells	Mean (bbls/ well)	Total Water Use (bbls)
Montney	521	90 525	47 163 525
Other	13	114 775	1 492 075
<b>Total</b>	<b>534</b>	<b>107 140</b>	<b>48 655 600</b>

Data Source: OGC Water Management for Oil and Gas Activity 2015 Annual Report

## 2015 Water Use Breakdown

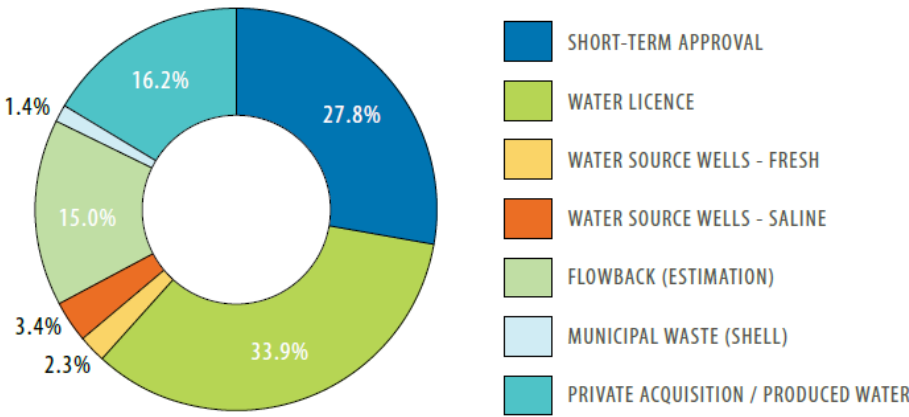
FIGURE 2: SOURCES FOR ACQUISITION OF WATER USED FOR HYDRAULIC FRACTURING



Source: OGC Water Management for Oil and Gas Activity 2015 Annual Report

## 2014 Water Use Breakdown

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





# Water Sourcing Options and Costs

Produced Water from C-Ring to Pad	Cost (\$/bbl)
Treatment	\$1.50
Trucking	\$1.20
*C-Ring Rent	\$0.20
*C-Ring Setup and Teardown	\$0.25
<b>**Total (BSE Owned C-Rings)</b>	<b>\$3.80</b>
<b>**Total (Third Party C-Rings)</b>	<b>\$4.70</b>

\*Monthly Expense

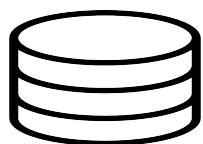
\*\*Assumes 1 pad completion per quarter

Private Access Water	Cost (\$/bbl)
Access	\$1.10
Trucking	\$2.00
<b>Total</b>	<b>\$3.10</b>



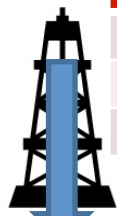
Private Water Source

Produced Water from Gas Plant to C-Ring	Cost (\$/bbl)
Treatment (H2S Scavenger)	\$0.40
Trucking	\$1.75
<b>Total</b>	<b>\$2.15</b>



C-Ring

Third Party Water Disposal	Cost (\$/bbl)
Disposal Fee	\$4.00
Trucking	\$4.00
<b>Total</b>	<b>\$8.00</b>



Disposal Well

Fresh Water Pump	Cost (\$/bbl)
Direct to Location	\$0.60
Via Fresh Pit	\$1.20



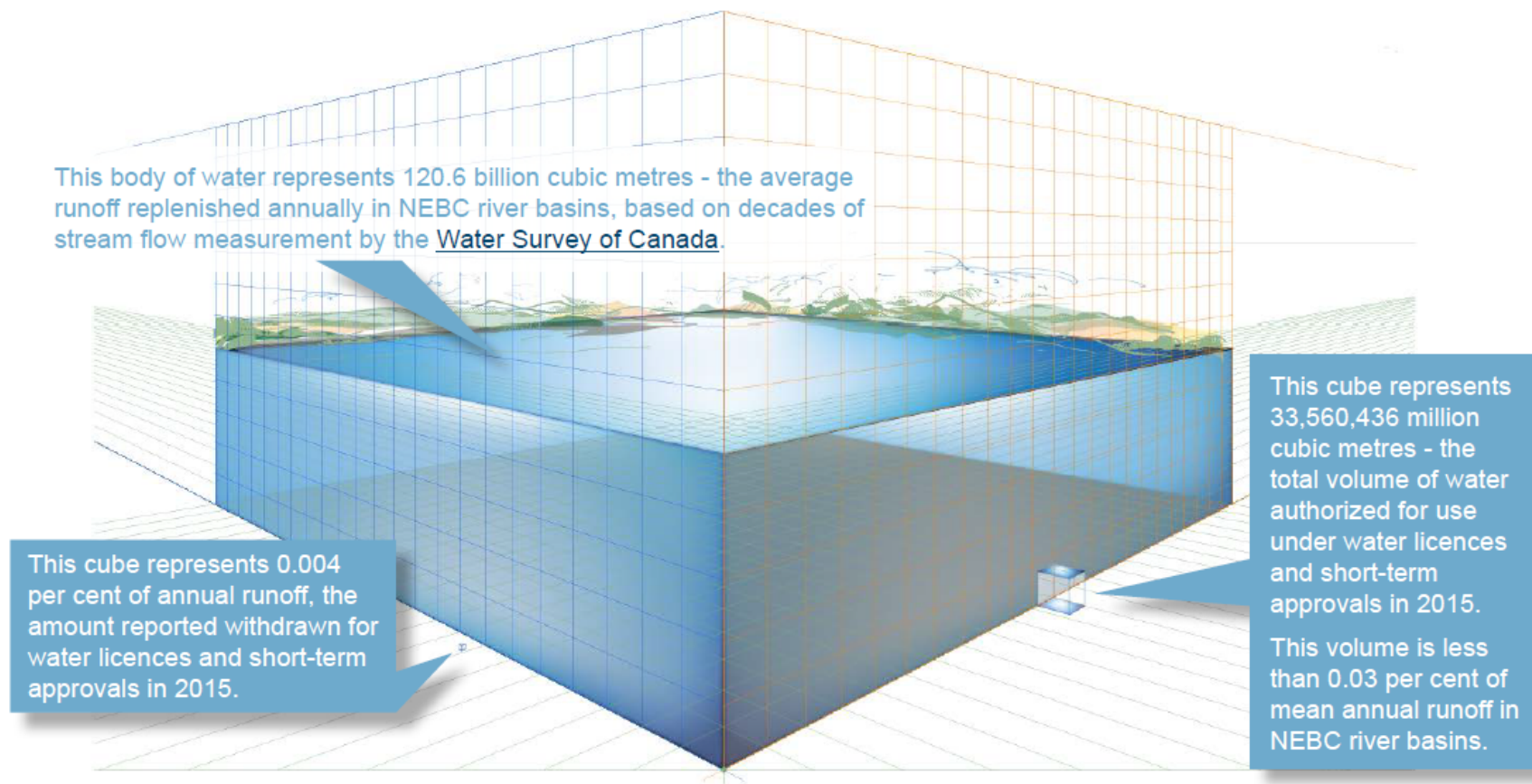
Fresh Water Pit



Fresh Water Source



Gas Plant



Source: OGC Water Management for Oil and Gas Activity 2015 Annual Report

FIGURE 1: COMPARISON OF ANNUAL RUNOFF, WATER ALLOCATION AND VOLUMES REPORTED WITHDRAWN IN 2015

- Very positive feed back from stakeholders regarding team approach
- Easier for regulator to meet with Montney Water Operators Group as a whole than approaching each company separately

**After a few brainstorming sessions, a terms of reference document was created for all:**

1. We will collaborate and share knowledge in order to reduce our environmental and social impact in the areas of NE British Columbia where we work.
2. We will work together under the premise of giving to receive – everyone contributes.
3. Confidential information is out of scope such as but not limited to:
  - ☐ Anything subsurface for producing zones of interest such as well design, completions techniques, well integrity, etc.
  - ☐ Anything related to land sales, company growth plans, acquisition and divestment, etc.
  - ☐ Anything related to costs and recommendations for specific contractors, 3<sup>rd</sup> party companies

## Online Bulletin Board

- Website designed by one member company for posting water requirements and water over supplies
- Open to all members for use
- Automatic e-mail notifications with volume and timing specifics as well as contact information

## Agreements

- No charge for water
- Transport agreement negotiated
- Certain companies require formal agreements to be executed outlining custody transfer specifics and liabilities

## Impact

- Material cost savings for water user compared to procuring water to site
- Material cost savings for water supplier to avoid disposal fees and lengthy water hauls
- Environmental impact in reducing fresh water usage and limiting water disposal
- Regulator moving towards a collaborative approach to fresh water usage approvals

