

May 2014

## **Infrastructure**

### **If development proceeds in Eagle Plains, what kinds of changes can we expect on the Dempster Highway?**

Northern Cross is still in the exploration phase so it is hard to predict what impact any potential development might have on the Dempster Highway. At the very least, there will likely be some increase in traffic and new access points from the Dempster Highway to future drilling sites or potential future developments, though exactly how much that increase is cannot be determined at this time. More resource definition is required through additional drilling before an estimation can be confidently made.

### **Who would pay for changes to the roads? Are companies prepared to include highway construction and maintenance costs in their budget?**

The Dempster Highway is a public highway so Northern Cross expects similar consideration to any other commercial user.

### **How many trucks will be required for each well that might be developed in Eagle Plains? (Including construction and reclamation phases)**

The number of trucks associated with the drilling of a well depends on the size of drilling rig being used and the kind of services that are employed to prepare the site, to drill, complete, test and bring into production a well. It also depends on whether a development is based on a discovery of oil or natural gas. Since Northern Cross is still at the exploration phase of this project, it is not possible to predict the number and frequency of trucks required. The current level of trucking is quite variable since the nature of the exploration projects is a series of short duration activities.

## **Water use & disposal**

### **How much water is used by hydraulic fracturing operations compared to how much water is used by communities? Does the oil and gas industry use more water than communities?**

Northern Cross has no plans to employ hydraulic fracture stimulation techniques at this time and therefore has not investigated the use of water for this purpose.

### **Have you already moved chemicals needed to produce fracking fluids to Eagle Plains in anticipation of receiving permission to move ahead with gas extraction?**

No, Northern Cross has no plans to use hydraulic fracture stimulation techniques at this time.

Response from Northern Cross (Yukon) Limited to remaining public questions from the Select Committee Regarding the Risks and Benefits of Hydraulic Fracturing public proceedings January 31, 2014

**How will you handle/store your fluid waste once in production? Where do you propose to store your waste water and for how long?**

Handling waste water is governed by Yukon Oil and Gas and other government administered regulations and Northern Cross strictly adheres to those regulations. Northern Cross has several large tanks that it uses during its operations to store fluids. At the end of a program, water that cannot be recycled is removed for disposal at approved sites in northeast British Columbia.

**Where are the drilling wastes from Eagle Plains being disposed of? What is in those wastes?**

The answer to this question was provided to the Select Committee via Energy Mines and Resources in its January 2014 response to questions from the Select Committee. See points 6 and 7 of that submission. Northern Cross does have permission to dispose of drilling cuttings if the provisions of ERCB Directive 50 are satisfied. Provided ERCB Directive 50 provisions are satisfied, drill cuttings are not considered a waste.

**Which water resources would you use for hydraulic fracturing and how many gallons do you use per operation?**

Northern Cross has no plans to conduct any hydraulic fracture stimulation at this time so has not investigated any water sources for this purpose.

**Who is responsible for the long term integrity of abandoned wells? Do abandoned wells present a risk to groundwater?**

Wells are drilled and abandoned in accordance with Yukon Oil and Gas regulations which are designed to ensure isolation of the abandoned well with the environment. The responsibility for any historically abandoned wells at Eagle Plain is with the Yukon Government, not Northern Cross.

**What baseline water data exists in your drilling area and is it publically available?**

The area where Northern Cross has been operating is in the upper part of the Porcupine River watershed. There are several sampling stations in this watershed and it is our understanding from Yukon Water Resources Branch that the locations and information recorded is or is soon to be posted on [www.YukonWater.ca](http://www.YukonWater.ca)

**Do you understand the full hydrology history of the area? (How many aquifers? At what depths? What pressures?)**

Eagle Plains is an area of permafrost. Northern Cross has measured permafrost to a depth of about 220 metres at a suspended well located in the Chance Significant Discovery License. Below the permafrost layer, Northern Cross has not encountered any potable water zones.

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**What baseline studies and research in terms of aquifers and water quality does your company complete prior to activity in your licensed area and what is the dollar amount of this research?**

Northern Cross provides assistance in kind to various parties involved in baseline data gathering and monitoring. The approximate cost per year varies but is estimated to be between \$25,000 and \$50,000.

**What environmental baseline data have your companies collected before and during your operations?**

Northern Cross participates in baseline studies connected to wildlife populations, water quality and quantity, thermal, and air quality.

**Permafrost**

**What is your company doing to mitigate the impact on permafrost?**

Please refer to the presentation given to the Select Committee on January 31, 2014. There is considerable discussion in this presentation regarding the measures Northern Cross takes to protect the permafrost.

**What is your experience with permafrost and drilling horizontal wells in permafrost?**

Eagle Plain has lithified bed rock at or near the surface so drilling in permafrost poses few challenges. Northern Cross has recently drilled four wells in a permafrost setting without any incident. In the presentation given to the Select Committee on January 31, 2014, there is more detail regarding measures that Northern Cross has taken to protect permafrost.

**Funding**

**Has EFLO or Northern Cross made donations to the Yukon Party or lobbied the Yukon government?**

Northern Cross wishes to work with all governments in Yukon and has no political affiliation with any party. It has no political bias and has not nor does not make donations to any political parties. Northern Cross collaborates with various First Nation and Yukon Government agencies in formulating land use plans, developing and amending regulations and legislation, establishing Benefits Agreements as part of the normal course of business activities.

**What is the total amount of money which your company has contributed to the Government of Yukon contingency fund should the integrity of any of your wells fail at any time in the future?**

In accordance with Yukon Oil and Gas Regulations, the deposit to date is about \$700,000 and changes as more wells are drilled or abandoned.

**What is the size of the orphan fund in Yukon?** Ask Yukon Government.

### **Scale of operations**

**If given the approval, what is your full build-out plan? How many wells will you eventually have on your lease?**

Since Northern Cross is at the exploration stage, it does not have sufficient information about the resource quality or quantity to move forward to a development. Therefore, Northern Cross is not able to answer these questions as this time.

**How would a ban on use of hydraulic fracturing affect your operations and long term plans?**

It could eliminate the option of evaluating and potentially developing oil and gas resources sometime in the future that would benefit from hydraulic fracture stimulation to enhance production performance. This in turn would negatively impact future benefits to Yukon that accrue from oil and gas activities such as royalties, taxes, economic diversification and employment.

**Have your companies performed any hydraulic fracturing, experimental or otherwise in the Yukon?**

No.

**How many wells do you plan to drill in the next ten years?**

This depends on several factors such as exploration success, access to markets, access to capital, regulatory approvals and overall jurisdictional support for the oil and gas industry. At this time, it is not possible to predict the number of wells that Northern Cross will drill in the next ten years.

**Do you plan on selling fuel to a Yukon market or is it strictly for export? (Out of territory? Out of country?)**

This depends on many factors, including exploration success. Northern Cross will consider all market options if it gets to a position of developing oil and/or natural gas resources. The company is interested in satisfying Yukon market needs if the products match the appetite. At this time, there is no market in Yukon for either crude oil or natural gas.

**Are you planning to extract natural gas in the Peel Plateau which is part of the Peel Watershed?**

No, Northern Cross has no oil and gas rights in the Peel Plateau

## **Emissions**

**Does your organization accept any responsibility for insuring that the greenhouse gas emissions from your producers do not exceed current reduction targets?**

Northern Cross will abide by relevant production regulations and conditions specified in any emissions license issued by the appropriate Yukon Government Agency.

**What level of fugitive emissions does your production and/or do you expect your production to produce? If regulated, what level of fugitive emissions would you find acceptable?**

Northern Cross is not producing any oil or natural gas at this time so does not have any emissions, fugitive or otherwise. Northern Cross expects to abide by Yukon regulations governing any emissions.

## **Well leaks**

**Do wells leak? Does fluid migrate?**

Northern Cross can only comment on its own wells. Northern Cross is not aware of any leaks or fluid migration based on drilling and casing procedures used by the company and performs inspections of all its wells in accordance with Yukon Oil and Gas Regulations.

**Does cement/concrete shrink or crack, or not completely fill the intended casing?**

Northern Cross is not aware of this matter being an issue at any of its wells based on inspection.

**How can you recognize in advance when a drilling device enters an aquifer?**

Regional geological mapping is the only way to predict in advance whether an aquifer exists. For Eagle Plain, where there are very few wells drilled, predicting where and when an aquifer could be penetrated while drilling is only approximate.

**How do you monitor leakage for thousands of metres of casing and grout?**

Casing integrity tests and cementing procedures as performed in accordance with Yukon Oil and Gas Regulations by Northern Cross do not indicate any risk of leakage. In addition, Northern Cross conducts regular surface inspections of its wells in accordance with Yukon Oil and Gas Regulations and has not detected any leaks.