

The choice is yours.

Which future would you choose?

Healthy vibrant northern communities exist. Rivers run clean. Caribou populations flourish. A diversified economy ensures northerners benefit from development.

OR

Land is damaged. Rivers are polluted. Northern communities benefit little. Ecosystems are fragmented, causing a decline in caribou populations.

Both scenarios are real possibilities. The choice is yours.

We looked at three areas in the North — the Northwest Territories' Mackenzie Delta and Colville Hills and the Yukon's Peel Plateau. We created maps that showed what these areas would look like over the next 30 years if all gas reserves are developed.

For many northerners, natural gas development is still a relatively new industry. In southern Canada where large-scale gas development has been around for years, much is known about its impacts on communities, ecosystems and wildlife.

That's why we decided to do some research. We want to know the full extent of future gas development projects in the North. With this study, we can now figure out the specific impacts that future gas development projects could have on the North. By understanding these impacts, we can make more informed choices to ensure a healthy, vibrant future for northern ecosystems and communities.

The information in this brochure is based on a detailed study. To download a free copy of the complete study, visit the Pembina Institute Web site at www.pembina.org.

Achieving your Vision

You have an opportunity to personally shape the future of the North.

Northerners can still choose where oil and gas development can occur and which areas will be free of development. In the places open to development, you can decide how it proceeds. In much of southern Canada this is no longer possible.

Encourage completion of protected areas planning and land use planning before large scale development comes to your backyard.

Find out what development is planned for your area. Learn more about the potential of gas development and its environmental impacts. Get involved in the decision-making process about gas development projects in your area. Examine how lower impact practices can reduce the footprint of development.

Communities can find ways to balance both the economic opportunities of gas development and the social and environmental risks.

Now that we can envision where potential gas development may be headed, you can begin to plan for your vision of the future.



A PEAK into the future:

Potential Landscape Impacts of Gas Development In Northern Canada



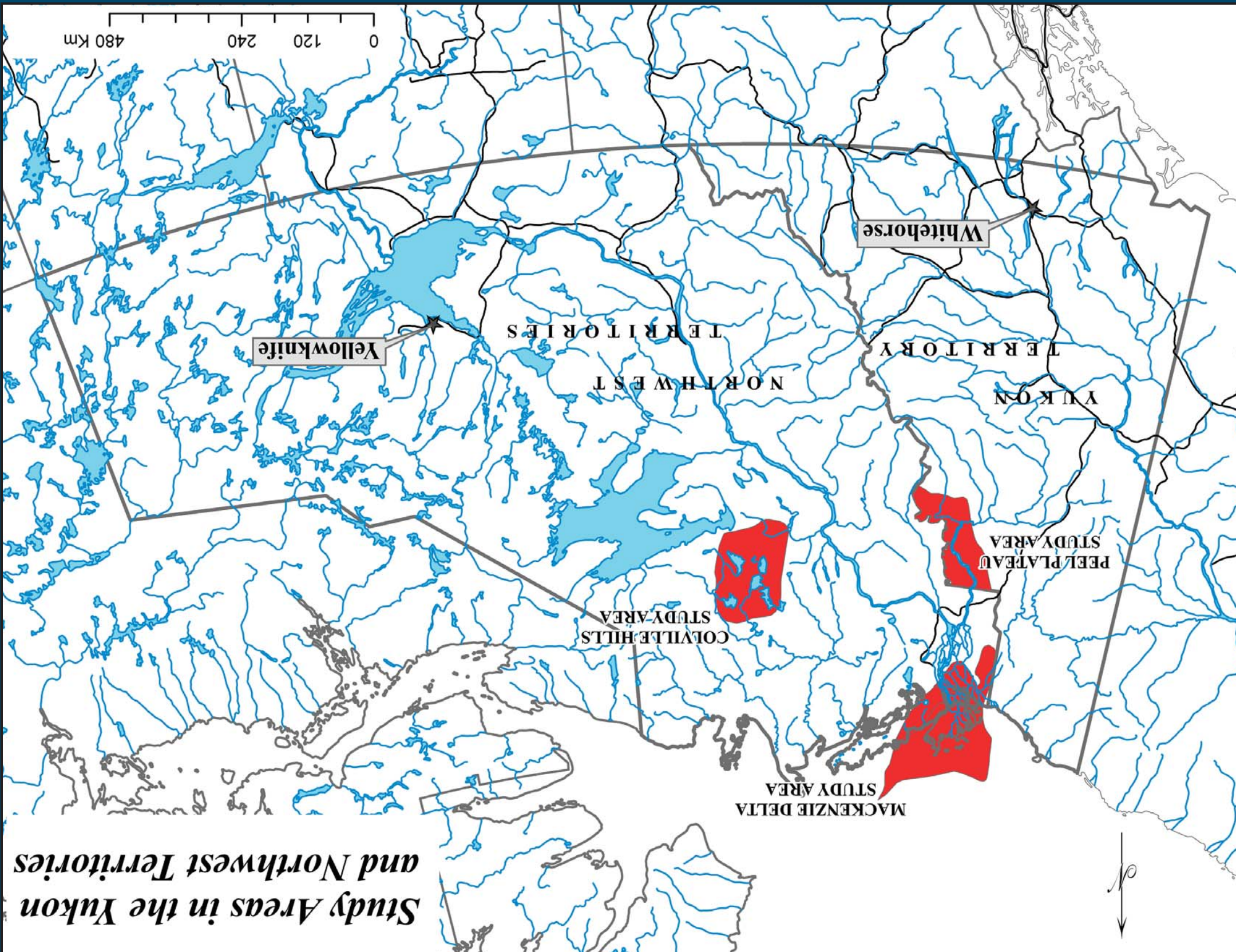
PEMBINA Institute



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This project was carried out by the Pembina Institute in partnership with the Canadian Arctic Resources Committee (CARC) and Canadian Parks and Wilderness Society (CPAWS)-Yukon Chapter and Northwest Territories Chapter.

The information in this brochure is based on a detailed study. To download a free copy of the complete study, visit the Pembina Institute Web site at www.pembina.org.



We studied these three areas because they are either the focus of intensive natural gas development or could be in the event the Mackenzie Valley Gas Pipeline is built.

Source: CPAWS - Yukon Chapter

Peel Plateau

Source: CPAWS - Yukon Chapter

Mackenzie Delta

Source: Beggs - Horton

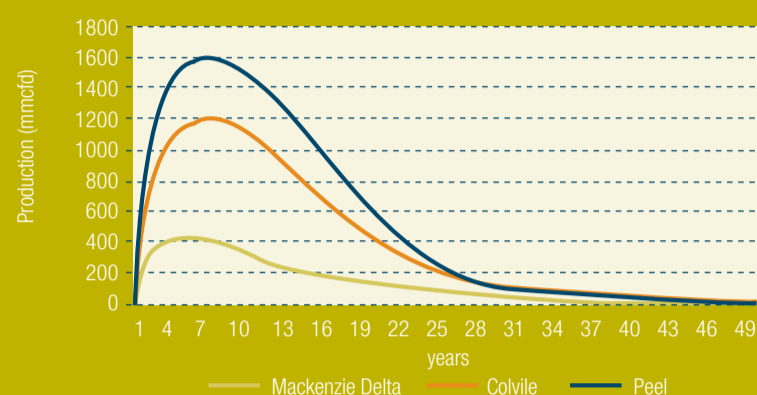
Colville Hills

Study Results

Based on public information on the amount of gas reserves in the Mackenzie Delta, Colville Hills and Peel Plateau, we determined the number of seismic lines, wells, pipelines and roads that would be required to extract all the gas in these areas.

We assumed that gas production in these areas will likely follow a typical development pattern, with peak production occurring within the first ten years and steadily declining after that until the field reserves are depleted. This pattern is shown below.

Production Life of a Gas Field



This development pattern is similar to that of other gas fields in Western Canada that are now fully developed.

The Potential Footprint of Development

The "footprint of development" is the amount of the land's surface companies use to develop gas reserves. This includes land taken up by buildings and equipment, well pads, seismic lines, pipelines and roads. This footprint has two components. The first measures the actual surface area (hectares – ha) cleared and disturbed. The second measures linear disturbance (kilometres per square kilometre – km/km²) and the spread of gas infrastructure across the landscape.

This study determined the potential footprint of future gas development in the three study areas. The actual footprint would likely be larger than the table below indicates, because the study did not include all of the facilities that would be needed in the development, such as camps, borrow pits, landfills and gas plants.

Environmental Impacts of Gas Development

Gas development includes activity and infrastructure, both of which can cause environmental disturbances to land, soil, water, wildlife, and vegetation.

Environmental impacts from gas development can include the following:

- Land is cleared of vegetation to make way for well sites, roads and pipeline right-of-ways. In Northern regions, it can take a long time for this vegetation to grow back.
- Gas field equipment can damage permafrost, alter water flows, cause erosion and compact the soil, making it difficult for plants to re-grow in these areas.
- Eroded soil can be deposited into lakes and rivers and harm fish habitat and water quality.
- Clearing land and operating a gas field can disturb wildlife in many ways. Cleared areas allow predators easier access to their prey, leading to a decline in animal populations. Animals are directly affected by increases in noise and human activity, the spread of invasive species of plants, exposure to hazardous materials, animal collisions with vehicles and reduced access to food, water and cover.
- Cleared seismic line, road and pipeline right-of-ways allow access to all-terrain vehicles, snowmobiles and off-road trucks. This can lead to increased legal and illegal hunting and fishing in certain areas and can delay the regrowth of vegetation.
- Linear disturbance, such as seismic lines, causes greater habitat loss for many species than surface area footprint. Gas field infrastructure fragments habitat. When landscapes are fragmented, this can disrupt habitat use by animals.

Best Practices

"Best practices" are technologies, techniques, and government policies that have been thought to reduce environmental damage. They do not eliminate the harm of natural gas development; nor the need for careful planning and management of when and where natural gas development occurs.

The chart below shows just a few of the best practices that industry can use and the degree to which these practices can reduce the footprint of future gas development projects.

Best Practice	Surface Footprint Reduced by
Reduce width of seismic lines from 5m to 2m	11%
Increase number of wells per pad from one to six	53%
Overlap seismic, road and pipeline corridors	29%
Reclaim land in an average of 15 years	47%

If northerners and decision-makers evaluate different practices in advance of development it can result in better decision making and solutions that protect northern ecosystems.

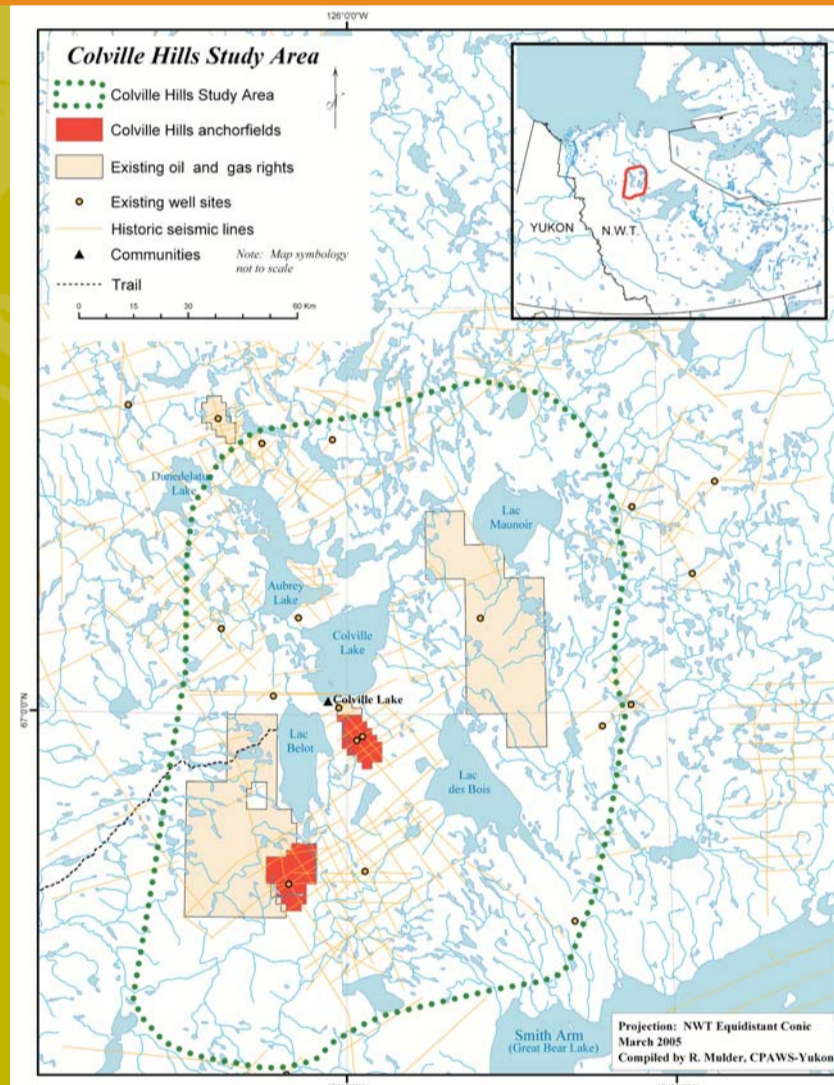
For more information on the potential environmental impacts of gas development, see the Pembina Institute series of primers, Environment and Energy in the North, available at www.pembina.org.

Maps

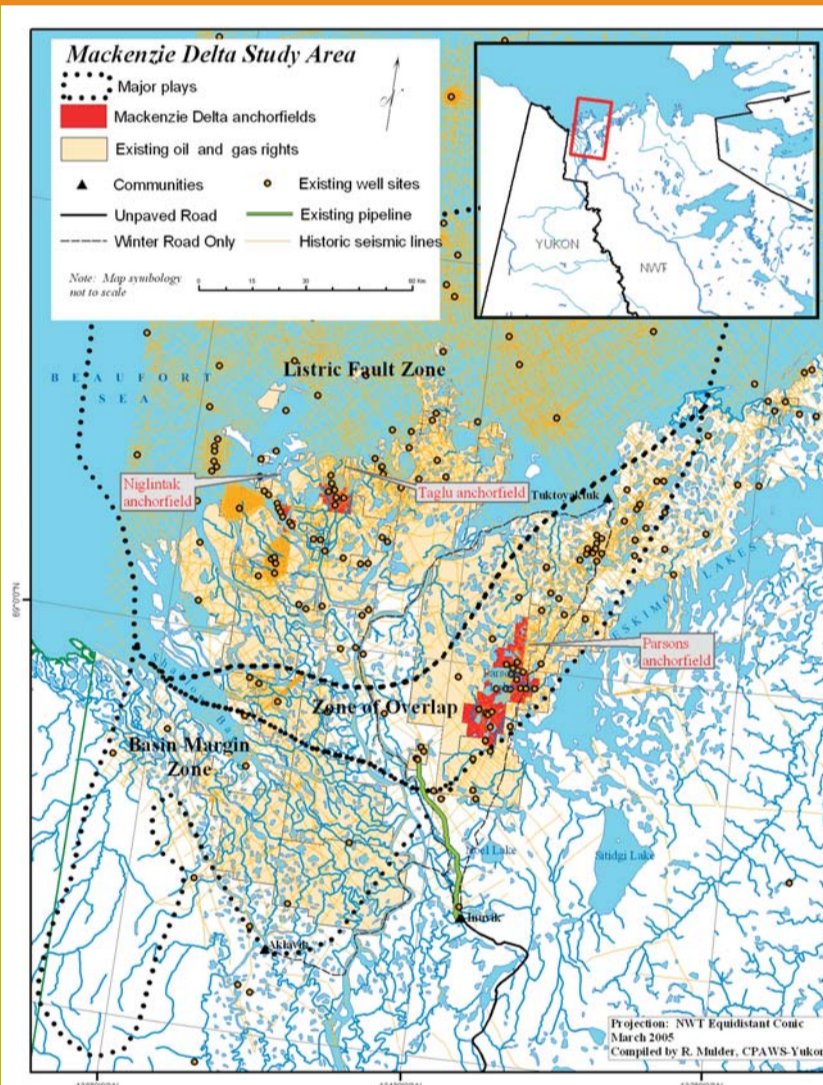
The three maps created as part of the study show an overall future scenario of development if all gas reserves are extracted in the Mackenzie Delta, Colville Hills and Peel Plateau areas.

The maps give an idea of the amount of land that could be used for future gas development, but they do not identify the exact location of well sites or pipelines.

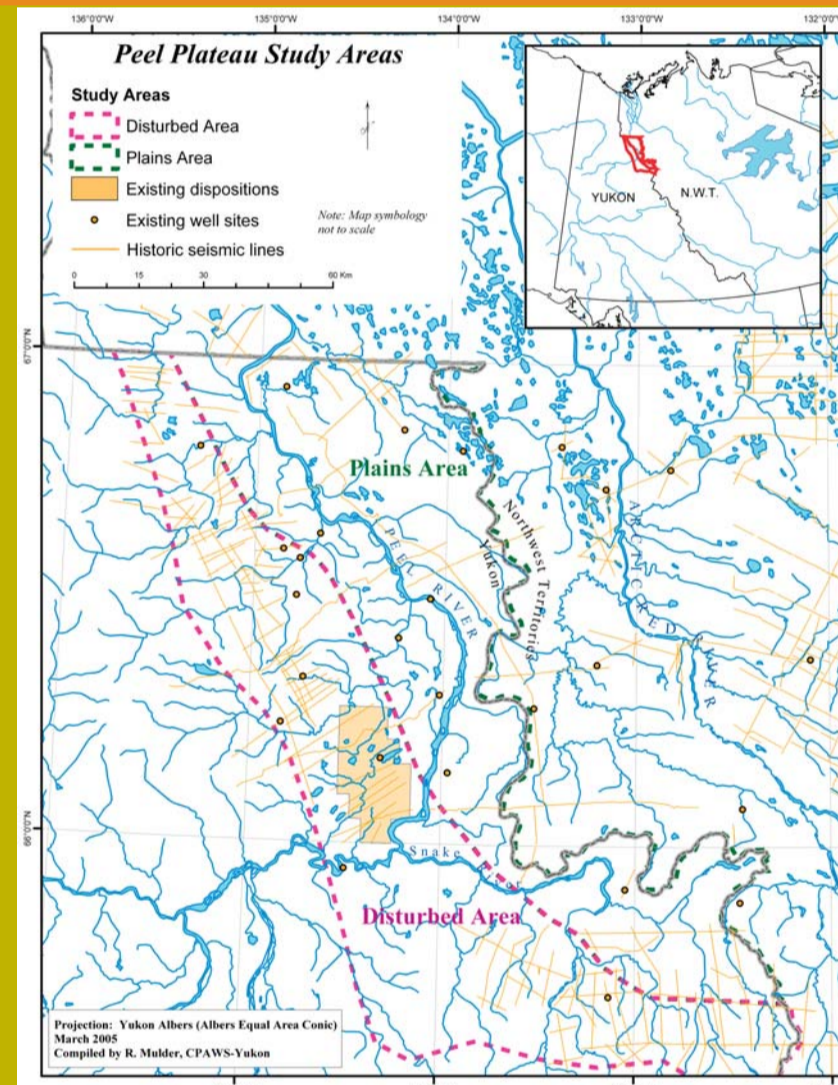
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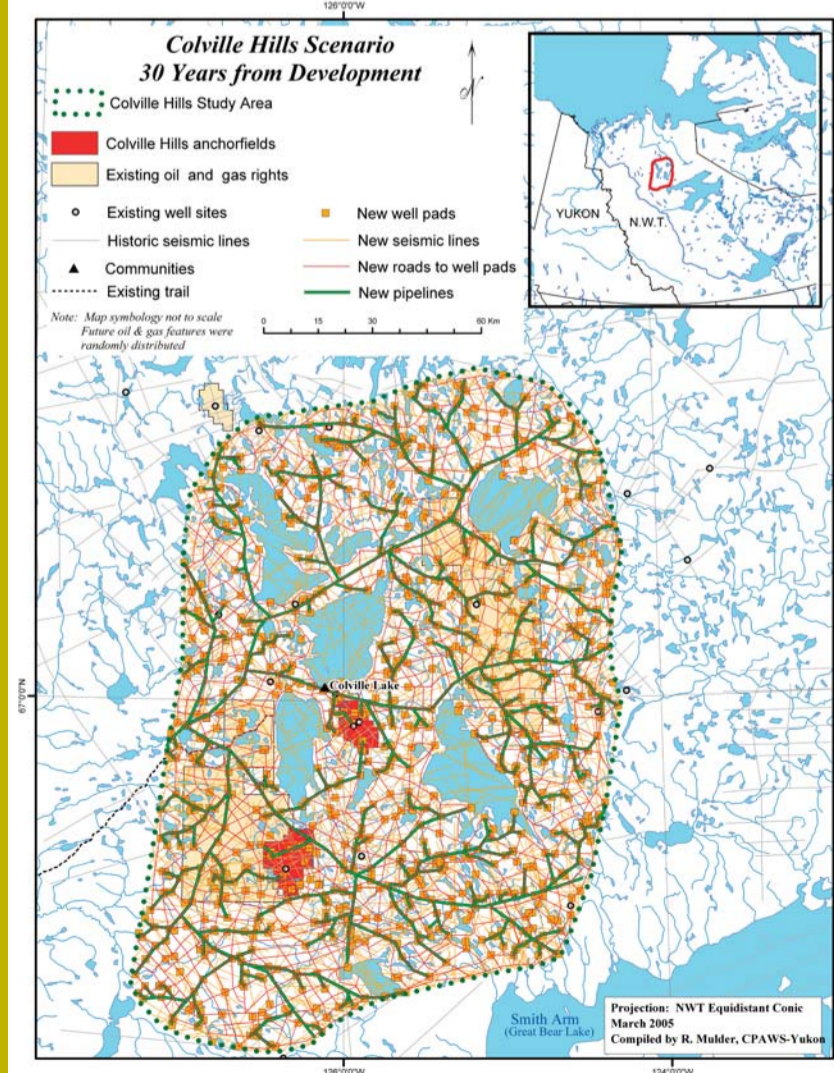
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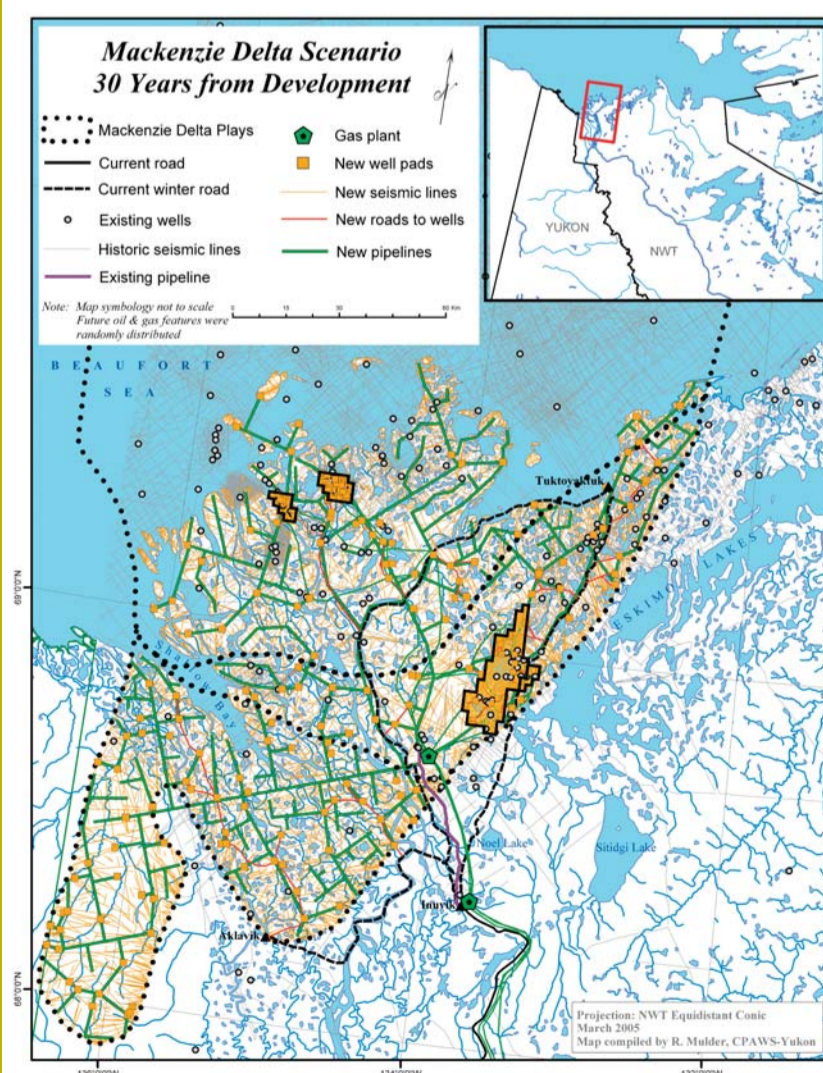
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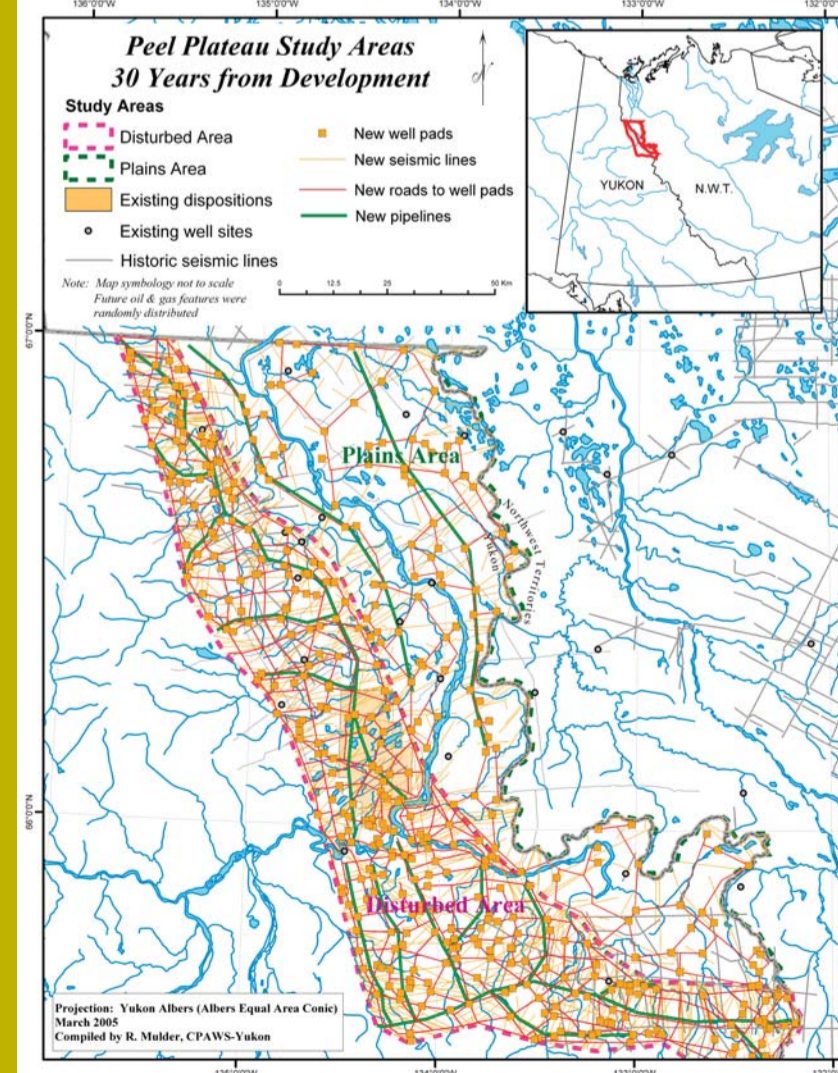
30 Years



30 Years



30 Years



Potential Landscape Impacts of Gas Developments in Northern Canada

	Mackenzie Delta (onshore only, anchor fields included)	Colville Hills	Peel Plateau
Total # of Wells Pads	331	964	453
Km of Seismic Lines	44,625	18,592	9,119
Km of New Pipelines	3,893	2,567	784
Km of New Roads	532	8,557	3,920
Total Hectares (ha) Disturbed	48,760	45,229	20,418

Mackenzie Delta Development Comparisons

Land area required	
well pads	= 6,151 hockey rinks
seismic lines	= a distance once around the Earth
new pipelines	= 3X longer than the proposed Mackenzie Valley pipeline
new roads	= 3X the distance from Inuvik to Tuktoyaktuk
hectares disturbed	= 29,148 football fields