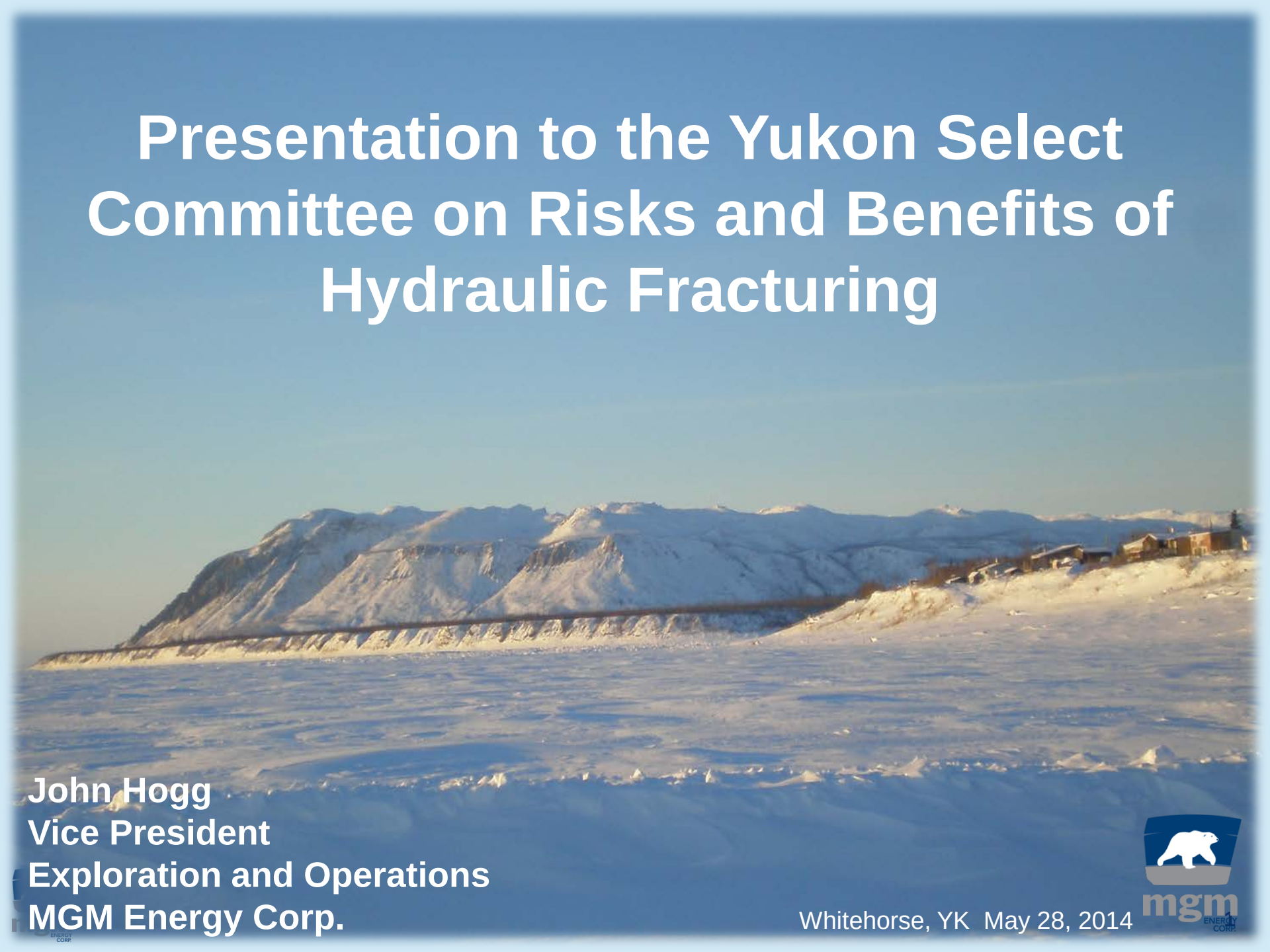
Presentation to the Yukon Select Committee on Risks and Benefits of Hydraulic Fracturing



John Hogg
Vice President
Exploration and Operations
MGM Energy Corp.

Whitehorse, YK May 28, 2014

Who is MGM?

- MGM Energy Corp. (MGM) is a Northern Canada exploration and development company founded in 2007

- MGM is one of the largest on land leaseholder in the Northwest Territories (Sahtu District and ISR, Mackenzie Delta)

- MGM operates in excess of 500,000 acres of exploration land in the Sahtu

Who is John Hogg, P.Geo, CPG?

- Graduated from McMaster University in 1981, with a B.Sc. in Geology
- Professional Geoscientist, *P.Geo.*, registered in the Northwest Territories, Nunavut and Alberta and Certified Petroleum Geologist, *CPG*, with the American Association of Petroleum Geologists
- Began working as a geologist in 1981, have drilled hundreds of wells in Alberta, Northwest Territories, Nunavut and offshore Nova Scotia and Newfoundland
- Thirty-plus years of working exploring on Federal Lands in Canada
- Have been involved in fracture stimulation of wells since the early 1990's
- At MGM Energy Corp., responsible for G&G, Drilling, Construction, Completions
- Drilled the shale oil first fracture stimulated well in the Central Mackenzie Corridor 2012/13 at East MacKay I-78
- Past President of the Canadian Society of Petroleum Geologists, former Councilor with the Association of Professional Engineers and Geoscientists of Alberta, former director of Geoscientists Canada and currently the President-Elect of the American Association of Petroleum Geologists
- Honourary Member of the CSPG and AAPG

Presentation

Overview Fracture Stimulation in the Central Mackenzie Corridor

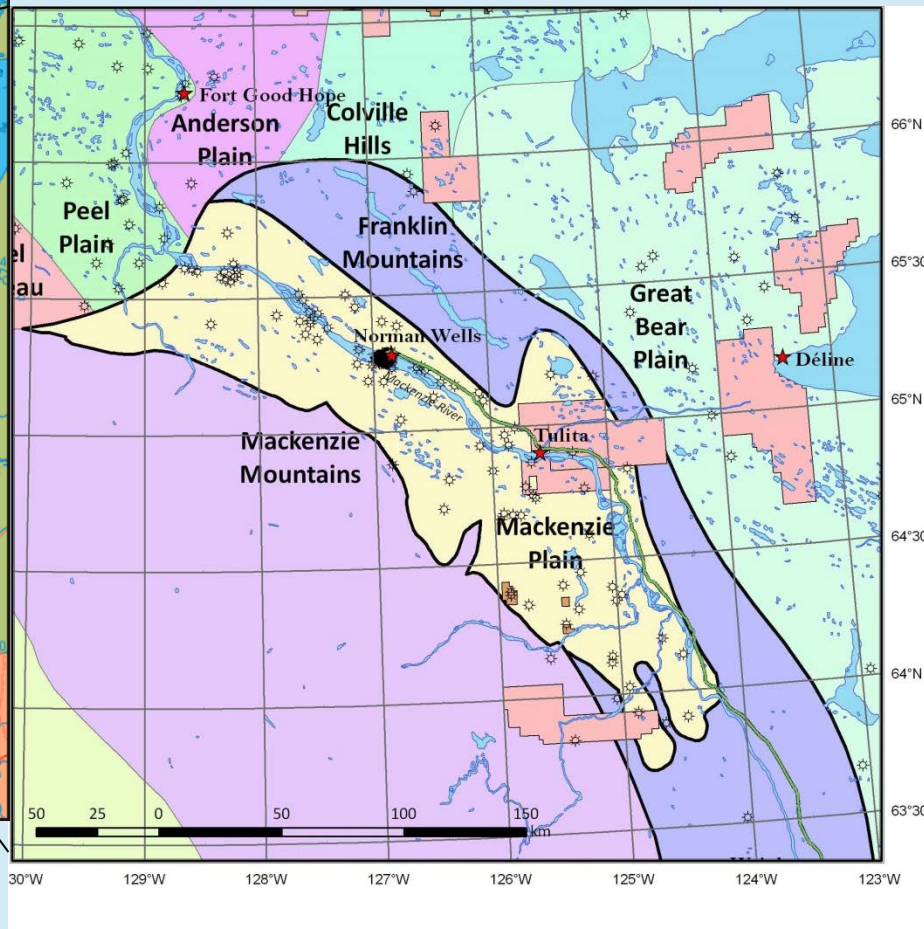
- **Operations**
  - Drilling Water Wells
  - Drilling Exploration Well
- **Completions**
  - Hydraulic Fracturing

Exploration for Shale Resources in the Yukon

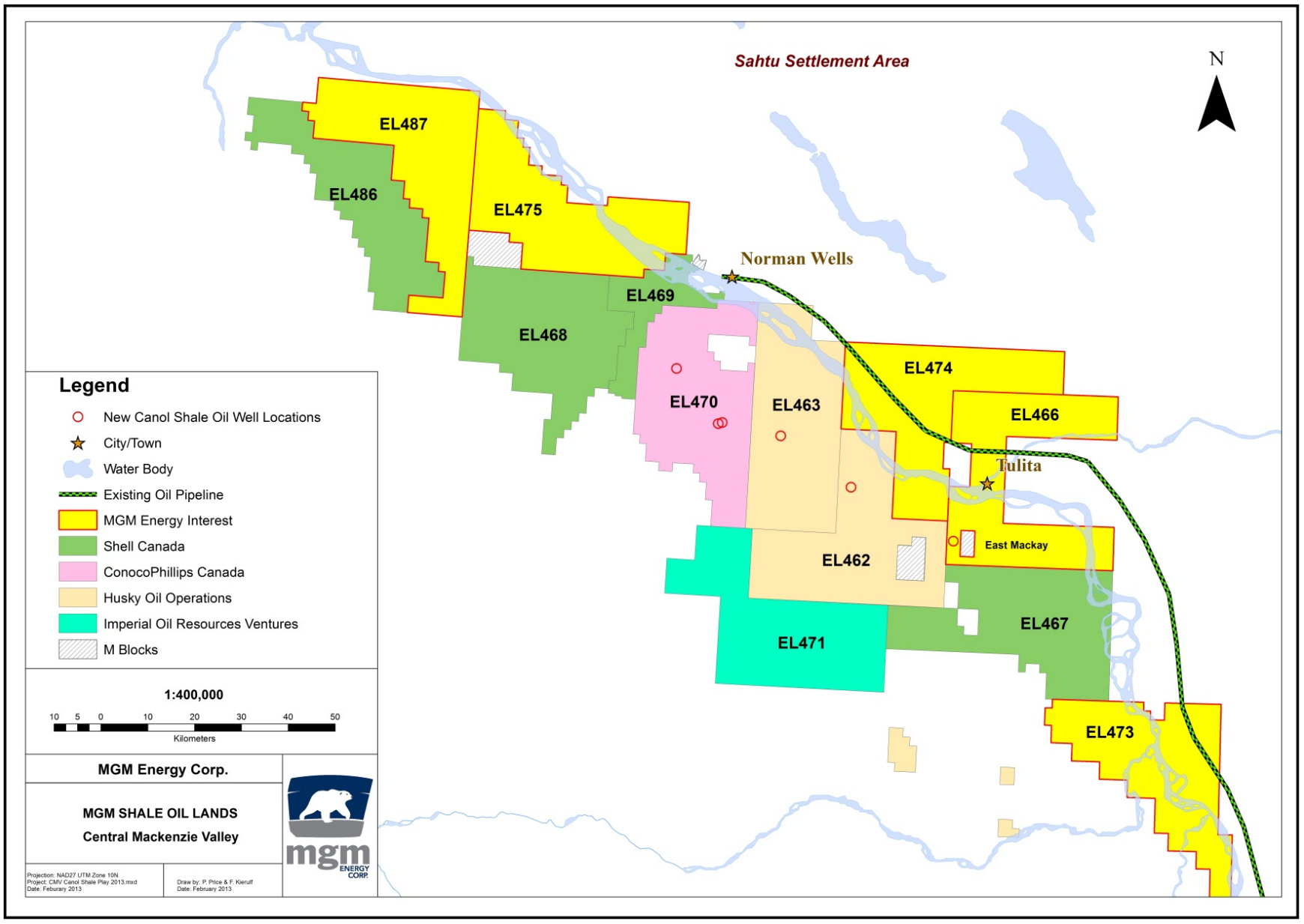
Observations for Consideration

Summary

Northwest Territories Canol Shale Resource

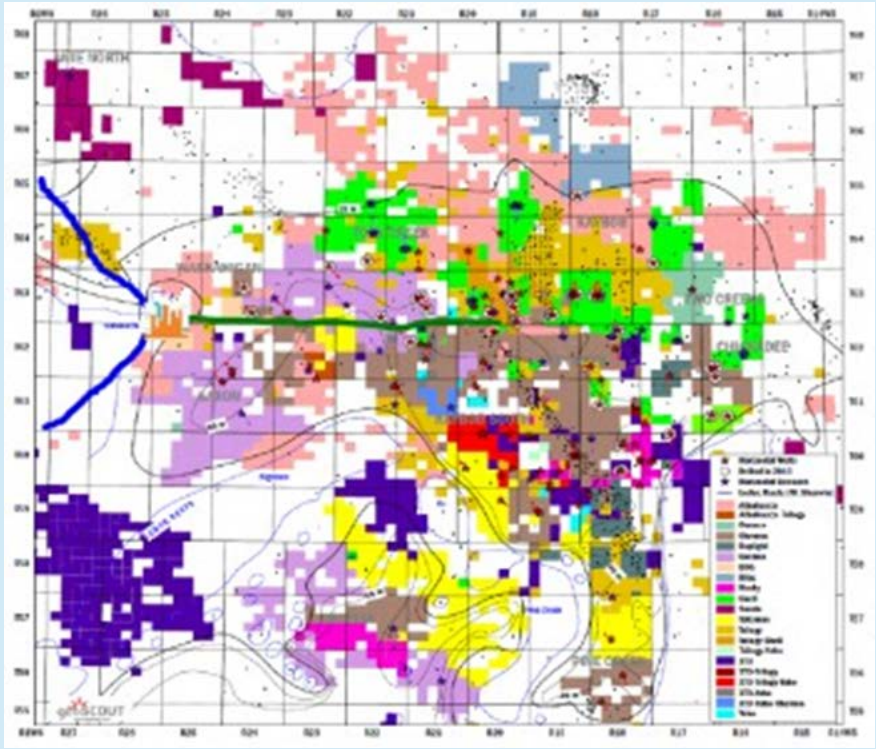


Canol Land and Activity Map 2014



Yukon and NWT lands vs. Southern Lands

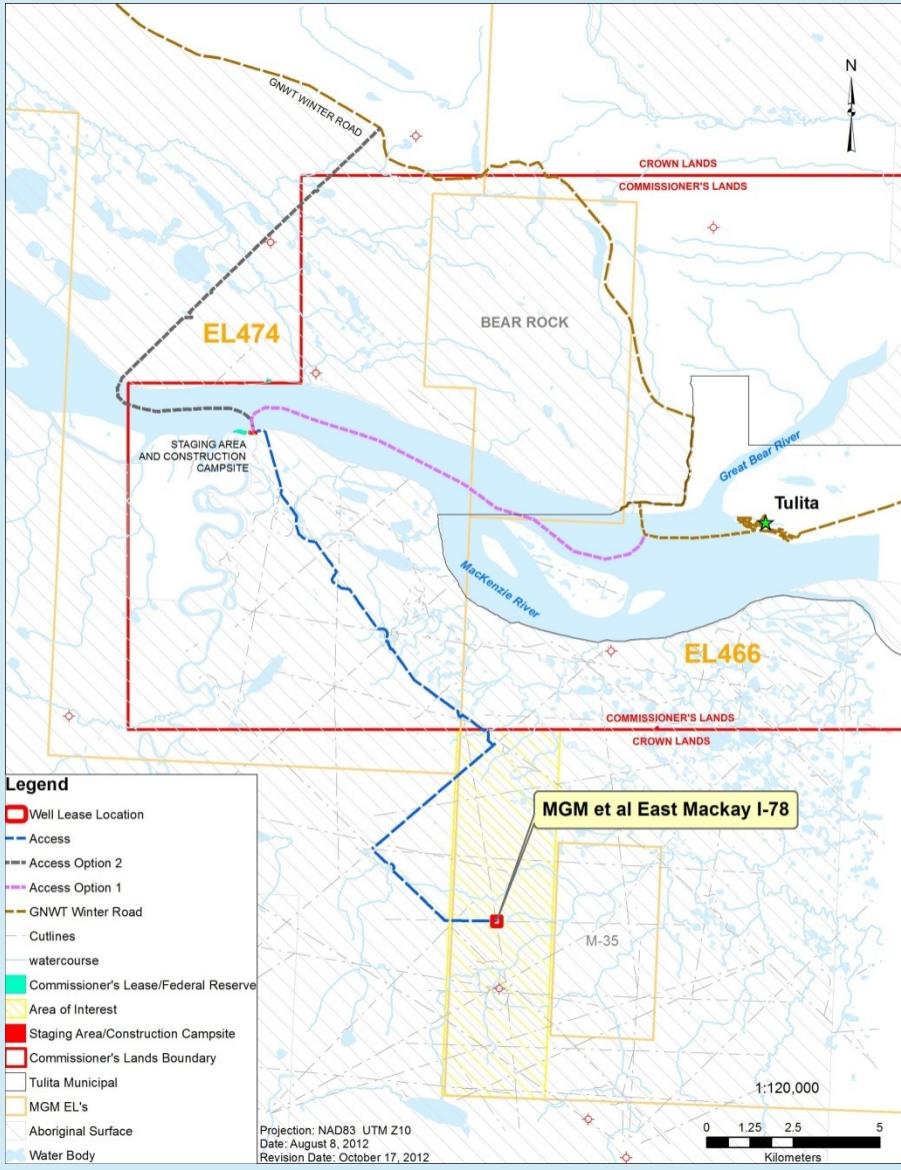
- In British Columbia, Alberta, the USA lands are auctioned as small as quarter sections
- Yukon lands are single parcels of ~ 50,000 ha
- Checker-boards of land won't happen
- It will never look like NEBC



Overview of MGM Activity 2012/13

Activity on EL # 466:

- Staging (Complete)
- Road/Lease Construction
- Ground Water Wells (3)
- Vertical Exploration Well
  - Coring the Canol/Bluefish
  - Vertical Fracture Stimulation
  - Short term Production



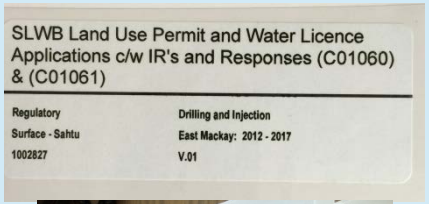
Regulatory Process in NWT

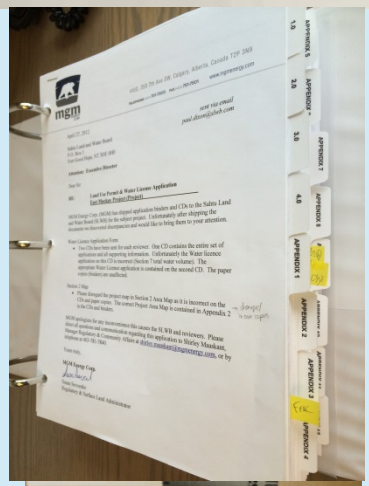
- MGM took 9-12 months to secure approval to drill in the NWT
- Multiple stakeholder consultation
- Review of the Project Description by 20 GNWT and Federal Agencies
- Review of the Project Description by local Sahtu Boards, towns and hamlets
- Coordination of the Project Description is done by the Sahtu Land and Water Board
- Technical, well design, jurisdiction is the responsibility of the GNWT and NEB

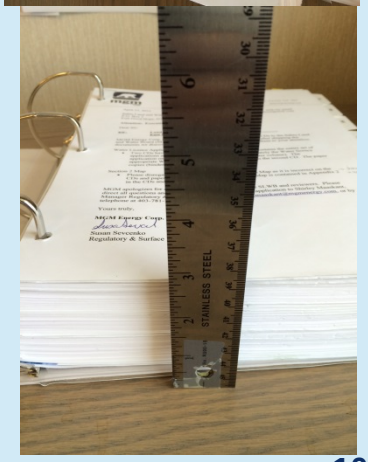
mgm ENERGY CORP.

NWT Well Project Description

- **MGM's Vertical Well at East MacKay I-78 application was more than 1200 pages, took nine months to complete**
- **Entire document is Public**
  - http://www.mvlwb.ca/Boards/slwb/Registry
- **All aspects of drilling and Fracture Stimulation, including all chemicals, are part of the public record**
- **Not included in the Project Description are the technical approvals related to the drilling and hydraulic stimulation**
- **This is a very robust and thorough review process**



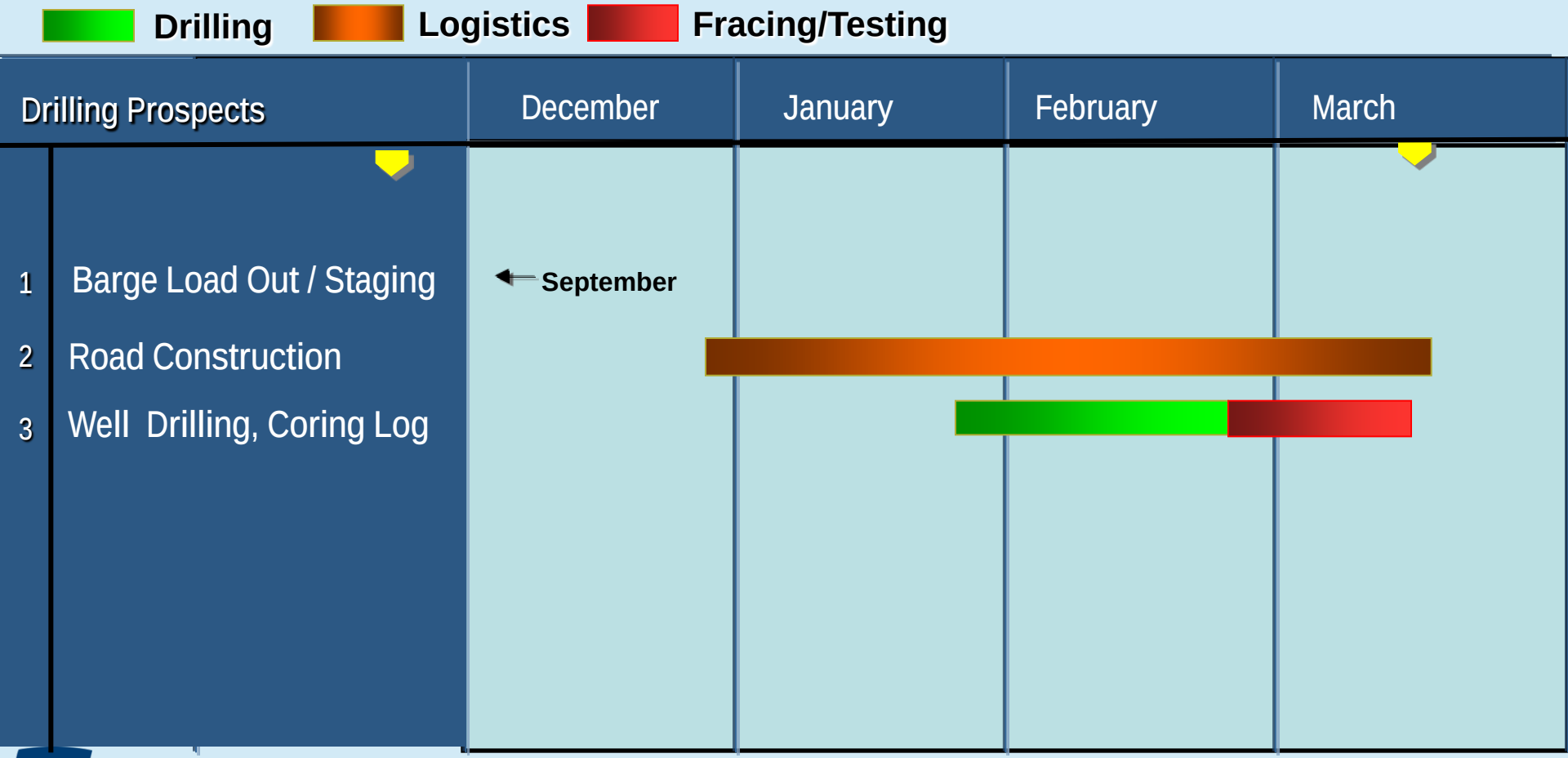




2012/13 MGM Planned Activity for a Vertical Well

- Access and Benefits Agreements
- Land Use Permit and Water License
- Equipment barged to staging area
- Winter road and lease construction
- Technical Applications, NEB
- Surface water sampling
- Drill three 150m ground water monitoring wells
- Drill Vertical shale exploration well
- Hydraulic Fracture Stimulation
- Short Production Test

2012/13 MGM Central Mackenzie Drill Program



Equipment and Personnel Required for Project

Services that are required include:

- Drilling rig
- Camp/Catering
- Road & lease construction equipment
- Rig & camp support equipment
- General oilfield hauling & oilfield rentals
- Service rig workers
- Wildlife Monitor
- Logistic Support
- Testing equipment
- Fluid hauling
- Industrial fire protection

Northern Work Force

- Exploration drilling requires a northern work force
- Central Mackenzie has many services
- ~100,000 man hours of work was required, more than 8,000 12 hr. employment days
- ~50% of those hours being done by Northerners for East MacKay I-78

Table 4

Name of Direct Contractor	Contractor Community	Tulita Dene & Metis Business (Y/N)	Summary of Goods or Services Purchased
Northern Companies			
Air North	Whitehorse, YK	N	Travel & Courier
Akita Drilling Ltd.	Norman Wells, NT	Y	Drilling
Aurora Technologies Limited	Norman Wells, NT	Y	Communications
BJ Services Ltd.	Tulita, NT	Y	Catering
Borealis Communications Inc.	Norman Wells, NT	Y	Communications
Canadian Helicopters Limited	Edmonton, AB	N	Travel
Canadian North Inc.	Yellowknife, NT	N	Travel & Courier
Challenger Geomatics	Tulita, NT	Y	Mapping
Chief Albert Wright School	Tulita, NT	N	Catering
Cooper Barging Services Ltd.	Fort Nelson, BC	N	Transportation
Cornerstone Oilfield Services Inc.	Tulita, NT	Y	Oilfield Services
Exlogs Sahtu Ltd.	Norman Wells, NT	Y	Medical Services
Hallmark Tubulars Ltd.	Tulita, NT	Y	Supplies
Hamlet of Tulita	Tulita, NT	N	Rental
HCI Holdings Ltd.	Norman Wells, NT	Y	Transportation & Equip
Heritage Hotel	Norman Wells, NT	N	Accommodation
Hodgson's Contracting Inc.	Norman Wells, NT	Y	Trucking
HSE Integrated Ltd.	Tulita, NT	Y	Medical Services
Mackay Expediting & Logistics	Norman Wells, NT	Y	Expediting
Mackenzie Valley Hotel	Norman Wells, NT	N	Accommodation
McCoy Enterprises Ltd.	Norman Wells, NT	N	Safety
Mullen Oilfield Services LP	Norman Wells, NT	Y	Oilfield Services
National Transportation Company Ltd.	Edmonton, AB	N	Transportation
Norman Wells Ren Res Council	Norman Wells, NT	N	Monitor
Norman Wells Transportation Ltd.	Norman Wells, NT	N	Vehicle Rental
North Wright Airways Ltd.	Norman Wells, NT	N	Travel & Courier
Northridge Contracting Ltd.	Norman Wells, NT	Y	Transportation & Equip
Northwestel Inc.	Yellowknife, NT	N	Communications
Norwel Developments Ltd.	Norman Wells, NT	N	Catering / Camp
Pete Rose's Welding Ltd.	Norman Wells, NT	N	Welding
S.R.P. Northern Ventures Ltd.	Norman Wells, NT	N	Fuel
Sahtu Building Supplies Ltd.	Norman Wells, NT	N	Supplies
Sahtu Geomatics	Tulita, NT	Y	Mapping
Sahtu Helicopters	Tulita, NT	Y	Travel
Sahtu Oilfield Services Limited	Norman Wells, NT	Y	Oilfield Services
Sahtu Propane & Environmental Inc.	Norman Wells, NT	N	Fuel
Town of Norman Wells	Norman Wells, NT	N	Rental
Translator	Tulita & NW, NT	N	Translation

Northern Services Employed East MacKay I-78

Northern Services – per well

Person Hours & Wages by Claimant Status				
	Northern		Southern	
	Hours	Wages	Hours	Wages
Tulita Dene & Metis	18759	$635,200	587	$48,000
Sahtu Dene & Metis	5596	$166,600	0	$0
Non-Sahtu Dene & Metis	9576	$279,100	3318	$31,400
No Claimant Status	8602	$287,400	31880	$1,445,300
Total	42533	$1,368,300	35785	$1,524,700

Planning, Staging and Construction

Staging using Mackenzie River

Staging Fuel

Project Construction

- Ice Road Construction on this project
- Included 23 km of onshore road and
- 13km of ice road on the Mackenzie River
- Lease construction was a 150x200m exploration lease
- All roads were previous seismic lines
- Water used was from the Mackenzie River ~ 40,000 m^3

  80% was used for roads
  15% lease/staging area
  5% Camp

Pre-Construction

Post-Construction

Water Well Drilling

Water Well Drilling

Water Well Completion Test

Steady pumping rate = ~10 gpm for 24 hrs
Total produced 14,500 gallons, 55m^3

MGM Water Monitor Well Testing

MGM flowed one of the groundwater monitoring wells to establish a rate and flowed all three wells four times for testing and evaluation:

1. Before drilling, Winter, 2013
2. After drilling and stimulating Spring, 2013
3. Summer of 2013
4. Summer of 2014

MGM also conducted surface water sampling throughout the Project area, before, during and after drilling

Groundwater Monitoring Results

- MGM has made all of the results from our three water wells public
- Results show that the fresh water around our location at ~ 80-100 metres is naturally a little high in Fluoride, Copper and Zinc
- There is no trace of hydrocarbons, before or after our operations
- Public documents on the SLWB site:

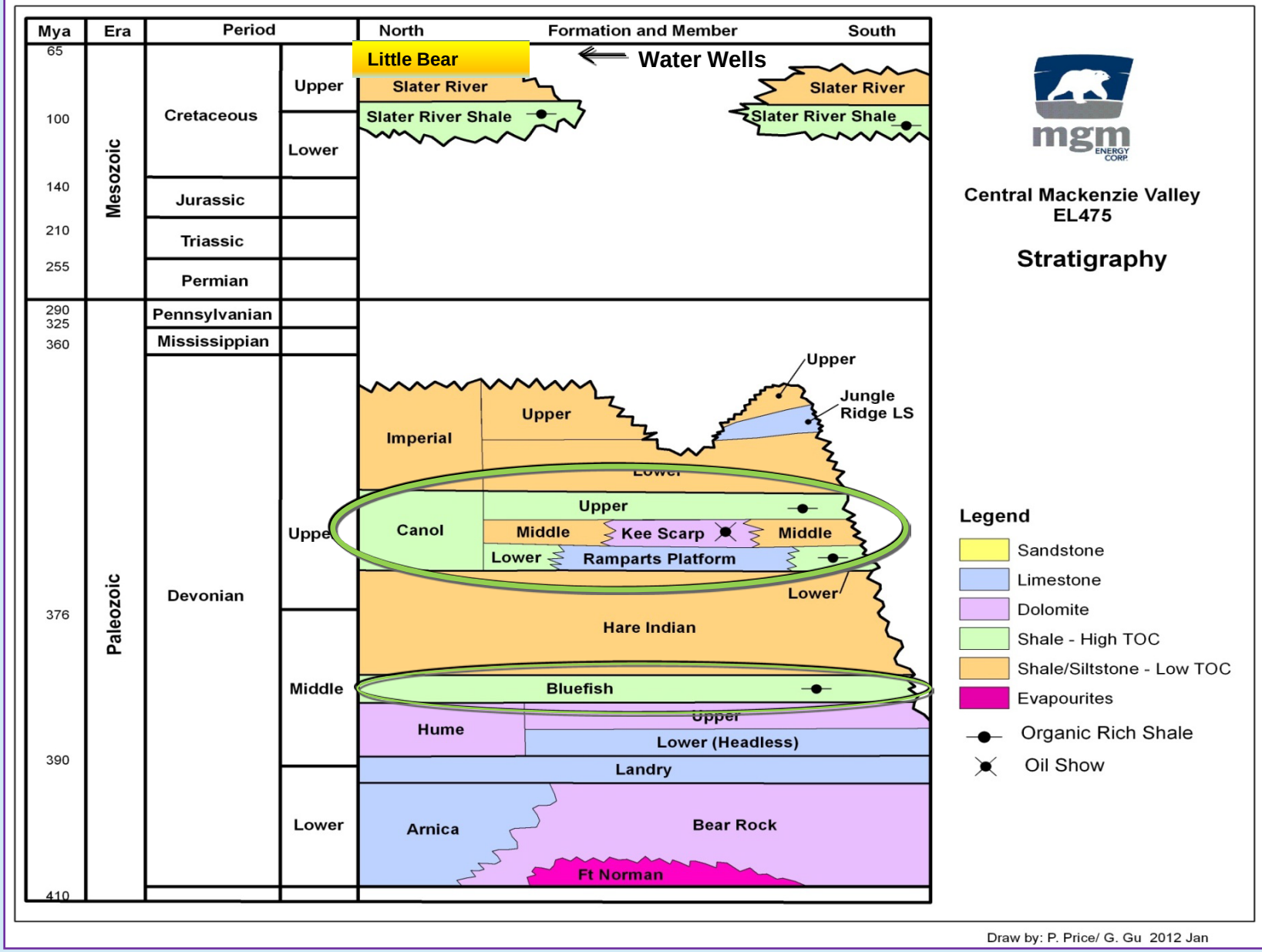
www.mvlwb.ca/Boards/slwb/Registry/2012/S12L1-001%20-%20MGM%20Energy%20Corp/S12L1-001%20-%20Groundwater,%20Surface%20Water%20and%20Water%20Supply%20Well%20Monitoring%20Report%20-%20Jul%20%202013.pdf

Use of Water for Hydraulic Fracturing

- **In the NWT the exploration phase has used surface waters**
  - Disposal of those surface waters was in the waste water treatments sites in the south
- **Development in the NWT will mostly likely use subsurface, non-potable waters, from deep formations for fracture stimulation and disposal of production waters**

Exploration Drilling

Central Mackenzie Stratigraphy



Canol Formation

Canol Section Little Bear River

Photo: P.R. Price


Canol Shale
15 CM
This is a naturally fractured reservoir

Fracture Stimulation Operations

Potential Shales of the Yukon

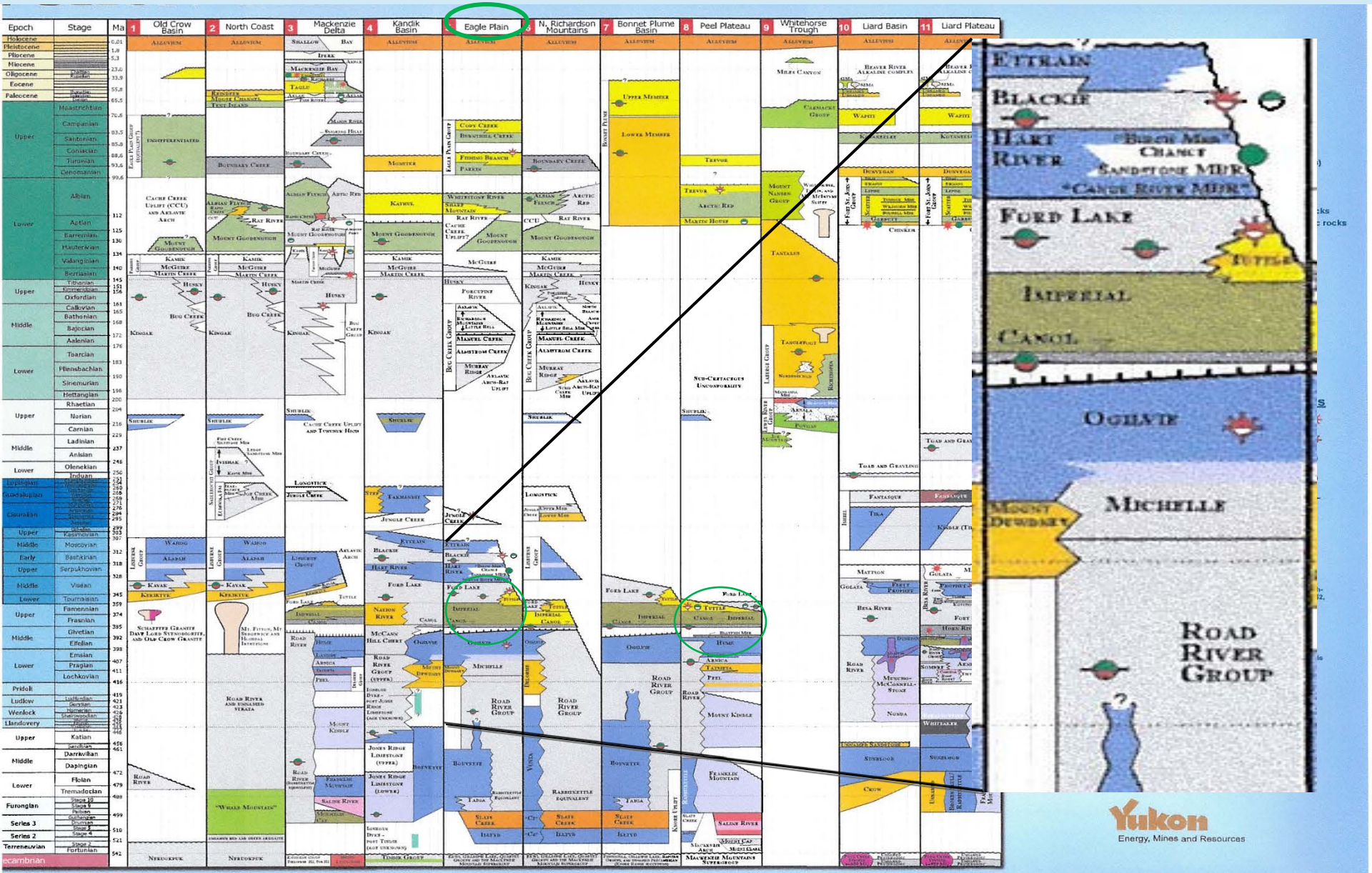
Shale Potential highest in the SE corner of the Yukon

Conventional oil and gas in Eagle Plains and potential for shale gas below the discovered resources

Shale gas potential is established in the Liard, speculative in the Eagle Plains

Modified from:
http://www.emr.gov.yk.ca/oilandgas/pdf/201311_pipelineoptionsmap.pdf

Yukon Stratigraphy



Yukon Disposition of Rights

- **Yukon's 3 step Disposition Process is similar to other jurisdiction's land systems and are held twice annually at the discretion of the Minister**
  - Request for Postings
  - Public Review Process
  - Call for Bids
- **Permits are issued to the highest bidder with the right to explore and test produce for oil or gas**
- **Permits are currently issued with an initial term of 6 years with a right of renewal for 4 years, terms are at the discretion of the Government**
- **Permits may not exceed 10 years in total**
- **An Oil and Gas Permit may be converted into a 10 year Lease at any time during the term of a permit**
- **It may be renewed for further terms of 5 years**
- **It would then continue as long as there is production**

Oil and Gas Rights and Exploration

- Given the Yukon is in full control of the lands, calls for land nominations can be controlled
- Maximum size of a Request for Posting is 500 km² or 50,000 ha per Permit which is approximately 30% smaller than the NWT
- Minimum bids for Yukon is $400k which is less than half of the minimum bid in NWT.
- Review all existing regulations to ensure that shale oil and gas extraction is done at the highest safety and environmental standards

How much oil and gas land usage is too much?

- The Yukon is an area of more than 480,000 km²
- Yukon shale gas will be expensive to find and produce
- I would predict that in 10-15 years less than 100,000 ha of land would be developed for shale gas
- Is *0.02%* of land in the Yukon too much oil and gas development?

Why Explore and Develop Oil and Gas in the Yukon?

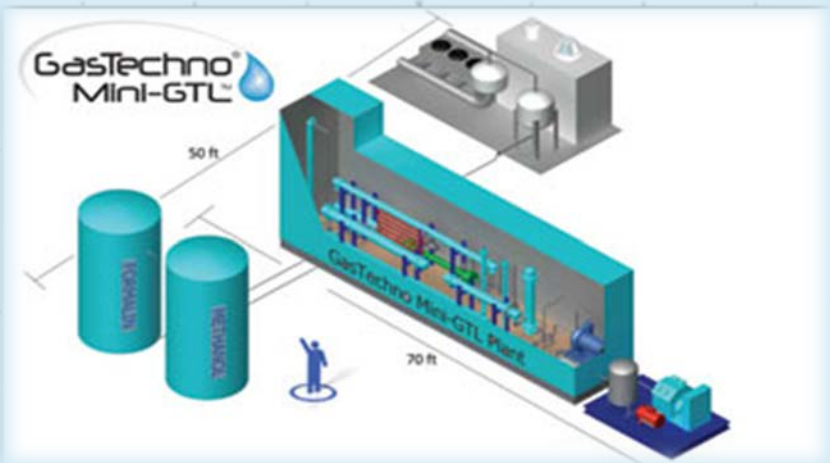
What are the benefits of Shale Oil and Gas?

- Building a new industry by Yukoners, for Yukoners and diversification of the economy
- Jobs, local benefits, business opportunities, training, First Nations benefits, increase in GDP, royalties
- Displace diesel, brought from the south (*natural gas is 39% cleaner than diesel*),
- Produce oil and gas locally for the Yukon economy
- Opportunity to build a "*made in the Yukon"* transportation network for LNG or CNG (Compressed Natural Gas) for the Yukon
- Look to Liquefaction and Gas to Liquids, with Micro GTL, for production of diesel in the Yukon

CNG/LNG Delivery Systems

- CNG/LNG trucks On the shelf technology
- Both capable of using their gas supply for transport, thus eliminate the need for Diesel
- Micro CNG/GTL plants are skid mounted, could be used in the Yukon

Gas to Liquids Technology



- Turning Natural Gas into Syn-diesel
- Can solve some of the demand for diesel in Yukon
- Skid mounted, need a only minor amounts of infrastructure
- Exothermic reaction, this can also generate electricity

Observations

1. Pace and Scale of Exploration

- Decide on one or two basins to start exploring
- Start with one license every two to three years
- Make the size of the license smaller ~20,000 ha
- Increase the minimum bid level to ensure that companies have the wherewithal to do the job and meet the regulatory compliance

Observations

2. Access and Transparency of Information and Data

- All data for the Project Description is public information
- Industry representatives should be available to all stakeholders
- Make groundwater monitoring wells mandatory, in the license, before drilling exploration wells
- Make surface water and groundwater monitoring well data public information
- Ensure that all chemicals and the fracture stimulation design are public information

Observations

3. Drilling Regulations

- Ensure clear rules for cementing of casing strings
- Make cement bond logging of each casing strings mandatory to ensure competent connection of casing to formation
- Make sure that areas of industry activity protect the permafrost and natural gas hydrates, if present, above the shale formations
- Ensure that there is an ongoing monitoring programs for producing wellbores to detect any potential natural gas leakage

Observations

4. Hydraulic Fracture Stimulation

- Volumes of water used should be part of the public record
- Industry monitoring of fracture stimulation with micro-seismic
- Government monitoring of natural seismicity, needs to start before the awarding of lands to establish baseline data

Observations

5. **Ongoing Monitoring** (*Industry/Government*)
   - Surface and Subsurface potable waters
   - GYK should look collect both surface and subsurface water, from groundwater wells
   - Permafrost monitoring
   - Natural Seismicity vs. Industry Induced Seismicity
   - Flora, Fauna
   - Host all information on a single Yukon Government Website that is user friendly and free to all

Recent Report from the Council of Academics

Their Five Distinct Elements:

1. ***Technologies to develop and produce shale gas…***
2. ***Management systems to control the risks to the environment and public health …***
3. ***An effective regulatory system…***
4. ***Regional planning to address cumulative impacts…***
5. ***Engagement of local citizens and stakeholders…***

The Yukon is well placed with strong regulatory and management systems, can employ the right technologies and will soon have regional land use plans covering most of the oil and gas basins

The Yukon has a program of continuous engagement of the public and conducts sound policy based consultations and consultations with First Nations

http://www.scienceadvice.ca/uploads/eng/assessments%20and%20publications%20and%20news%20releases/shale%20gas/shalegas_execsummen.pdf

Summary

- Shale resources can be explored for an produced in a responsible manner in the Yukon
- Shale requires horizontal wells, hydraulic fracturing, to be economic
- A number of basins in the Yukon have potential, but they need to be explored to see if shale resources will flow at economic rates
- Shale resources may hold a future that could see the Yukon become energy self-sufficiency: hydro, wind, geothermal and natural gas from shale