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Sent: Tuesday, February 9, 2016 11:21 AM
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Cc: Parker, Esther HLTH:EX
Subject: ACTION REQUIRED: Northeast Oil and Gas Human Health Risk Assessment Project: Recommendations reporting to the public
Attachments: HHRA Progress Report to the Minister Oct 2015.pdf

Dear ADMs/VPs with responsibilities in responding to the 14 recommendations from the Northeast Oil and Gas Human Health Risk Assessment (HHRA) Project:

Thank you for your assistance with preparing the first six month progress report to the Minister of Health which was completed and submitted last October (please see attachment). It is now time to begin drafting the first Progress Report for public release scheduled for spring 2016.

Once again, I am requesting your assistance. For the fall report, you provided us with the following name(s) of the contact people in your respective agencies.

Name	Agency
Glen Okranitz	MoE
Kristine Ciruna (Elizabeth Johnson)	FLNRO
Michelle Schwabe (Don D'Souza)	NGD
Celine Davis	MoE
Kari Harder	NHA
Mike Pennock (Joanne Stares)	MoH
Jennifer Maxwell	MoE
Meggin Messenger (Kris Nichols)	CSCD
Andrew Morgan (Laura Coward)	OGC

I suggest in moving forward, my staff coordinate with these people again (or alternates or others you may suggest) to update the report. Please could you let Esther.Parker@gov.bc.ca know if there has been a change or addition to the contact person(s) for your agency. She will be scheduling a conference call with them during the week of February 15 to discuss the process for updating the report and the timelines.

Once a first draft has been prepared, I will circulate back to you to ensure your agencies have a chance for final review of the information provided.

Thank you again for your contribution to this project.

Regards,

Arlene Paton
Assistant Deputy Minister
Population and Public Health

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Regards,

Arlene Paton

PROGRESS REPORT:

**RECOMMENDATIONS IN THE *HUMAN HEALTH
RISK ASSESSMENT OF OIL AND GAS ACTIVITIES IN
NORTHEASTERN BRITISH COLUMBIA***

REPORT TO THE MINISTER OF HEALTH

OCTOBER 2015

**HEALTH PROTECTION BRANCH
MINISTRY OF HEALTH**



CONTENTS

CONTENTS	3
PROGRESS REPORT: RECOMMENDATIONS IN THE <i>HUMAN HEALTH RISK ASSESSMENT OF OIL AND GAS</i>	
<i>ACTIVITIES IN NORTHEASTERN BRITISH COLUMBIA</i>	1
Introduction	1
RECOMMENDATIONS.....	2
Recommendation 1.....	2
Recommendation 2.....	2
Recommendation 3.....	3
Recommendation 5.....	5
Recommendation 6.....	6
Recommendation 7.....	6
Recommendation 8.....	7
Recommendation 9.....	8
Recommendation 10.....	8
Recommendation 11.....	10
Recommendation 12.....	10
Recommendation 13.....	12
Recommendation 14.....	13
OTHER OPPORTUNITIES FOR IMPROVEMENT	13

PROGRESS REPORT: RECOMMENDATIONS IN THE HUMAN HEALTH RISK ASSESSMENT OF OIL AND GAS ACTIVITIES IN NORTHEASTERN BRITISH COLUMBIA

INTRODUCTION

The Human Health Risk Assessment of Oil and Gas Activities in Northeastern British Columbia was a three-phase project led by the Ministry of Health (MOH) to identify, explore and assess concerns about human health risks relating to oil and gas activities in northeastern British Columbia. The project began in 2012. All phases of the project have been completed.

- **Phase 1:** Identified concerns raised by the public and stakeholders in the region relating to oil and gas development.
- **Phase 2:** Evaluated potential human health concerns related to oil and gas activities.
- **Phase 3:** Reported on findings to the Province, stakeholders and the public.

The final reports are available on the Ministry of Health website at:

<http://www2.gov.bc.ca/gov/content/health/keeping-bc-healthy-safe/oil-and-gas-activities>

The recommendations report is comprised of 14 recommendations that provide suggestions to government and industry in relation to mitigating potential human health impacts in the region.

At the public release of the Phase 2 findings and recommendations for the Northeast Oil and Gas Human Health Risk Assessment Project, the Minister of Health announced that MOH would follow up with the ministries and agencies responsible to ensure the recommendations are followed.

The Minister also committed to the release of regular (six-month) progress reports on the implementation of the recommendations with an annual report out publicly. This report is the first in this series of progress reports. It outlines the steps the Ministry of Health (MOH) and Northern Health Authority (NHA), Ministry of Environment (MOE), Ministry of Forests, Lands and Natural Resource Operations (MFLNRO), Ministry of Natural Gas Development (MNGD), BC Oil and Gas Commission (OGC), Ministry of Community, Sport and Cultural Development (CSCD) and their partners are taking to address the recommendations.

RECOMMENDATIONS

RECOMMENDATION 1

The tools applied to the calculation of emergency planning zones (EPZs) representing the range of hazards associated with oil and gas infrastructure and activities should be updated and use scientifically supportable methods and emergency-based consequence endpoints.

Project(s)	Outputs to October 1, 2015	Target Date	Status
Plume Modeling OGC is investigating a number of plume modeling tools to determine if they are: <ul style="list-style-type: none"> • Effective with the gases and fluids typically seen in industry. OR <ul style="list-style-type: none"> • Can be modified to make them effective with gases and fluids. 	<ul style="list-style-type: none"> • OGC has begun preliminary dialogue with industry and evaluation/comparison of plume modeling tools that inform hazard planning zone (HPZ) calculations in other jurisdictions. • Draft recommendations on the development of a hazard assessment model are anticipated in late fall 2015. <p><i>Note: The term HPZ is used in place of EPZs. HPZ encompasses the “all-hazards” approach indicated by the <i>Oil and Gas Activities Act</i> (OGAA) Emergency Management Regulation.</i></p>	Fall 2016	In progress

RECOMMENDATION 2

Land use and setback provisions applied in B.C. should be updated. Also, they should use scientifically supportable methods, along with individual and societal risk-based endpoints, that are consistent with accepted risk norms, guidelines and standards used in other developed, industrialized countries. Further, it is recommended that these land use and setback provisions be applied equally to both oil-and-gas and land-development activities.

Project(s)	Outputs to October 1, 2015	Target Date	Status
HPZ Consultation OGC is consulting with the Canadian Association of Petroleum Producers on HPZ impacts to the Consultation and Notification Regulation (C&NR) radii. The C&NR prescribes the notification and consultation distances from various O&G activities. <p><i>Note: For setbacks to be fair and effective, they must apply both to oil and gas activities and other land use activities (such as subdivision for residential purposes).</i></p> OGC does not have legal authority over private land use. The last part of this recommendation	<ul style="list-style-type: none"> • In June 2014, OGC announced an exclusion-zone policy that prohibits drilling within one kilometre of schools in B.C. • Tools are being developed to inform delineation of HPZs. They will be used to assist with future work on setback, notification and public engagement provisions. 	Fall 2016	In progress

Project(s)	Outputs to October 1, 2015	Target Date	Status
pertaining to applying setbacks to land development activities other than oil and gas activities is outside OGC's mandate.			
Under the <i>Local Government Act</i> , local governments have the authority to implement setbacks or buffers within their jurisdiction.	<ul style="list-style-type: none"> The Ministry of Community, Sport and Cultural Development (CSCD) works with local governments and provincial agencies to support best practices in local government land-use bylaws, policies and plans. The work on this is ongoing. 		Ongoing

RECOMMENDATION 3

The B.C. Ambient Air Quality Objectives should guide the development of regulations, directives and policies pertaining to venting, fugitive emissions, flaring limits, flaring notification and reporting, and flaring performance requirements. This should be done in a transparent manner that demonstrates how the objectives are considered.

Project(s)	Outputs to October 1, 2015	Target Date	Status
B.C. Ambient Air Quality Objectives The B.C. <i>Environmental Management Act</i> gives the Minister of Environment the authority to develop objectives to manage air quality in the province. Air quality objectives are nonstatutory limits. All oil and gas activities are regulated to minimize impacts on air quality. OGC considers the B.C. Ambient Air Quality Objectives when making decisions to authorize oil and gas activities.	<ul style="list-style-type: none"> MOE and OGC continue to collaborate to ensure that the B.C. Ambient Air Quality Objectives are applied consistently throughout the province. The BC Oil and Gas Commission Flaring and Venting Reduction Guideline include a section on ambient air quality evaluation for permit holders and operations covered by the Oil and Gas Waste Regulation. This Guideline is in the process of being updated. As part of the update consideration will be made to providing greater clarity for considering B.C. Ambient Air Quality Objectives in relation to flaring and venting. 	March 2016	Ongoing
Air Quality Dispersion Modelling Guidance Update The flaring component of the MOE Air Quality Dispersion modelling guidance document is being updated in light of the Interim Ambient Air Quality Objectives for SO ₂ and NO ₂ adopted by the Province in September 2014.	<ul style="list-style-type: none"> MOE is updating the flaring component of the MOE Air Quality Dispersion modelling guidance document. 	March 2016	In progress

RECOMMENDATION 4

The implementation of baseline, predrilling groundwater testing requirements for oil and gas activity in B.C. should be considered. Whenever possible, the process for collecting the information should be transparent. The results

should be publicly available and reviewed on a regular basis. To facilitate the interpretation of results, it may also be beneficial to encourage the collection and reporting of well information in addition to sample data.

Project(s)	Outputs to October 1, 2015	Target Date	Status
<p>Northeast Water Strategy (NEWS) – Geoscience BC Peace Project: Collection of Additional Baseline Groundwater Information</p> <p>NEWS is a proactive, long-term approach for the sustainable use and management of water resources in northeastern B.C. Project partners include provincial and local governments, First Nations and industry. The Peace Project is a collaborative effort to characterize aquifers and groundwater chemistry in the Groundbirch /Dawson Creek area. Partners include the provincial government; OGC; Simon Fraser University; and Peace River Regional District. MOH has also contributed to the funding for the characterization of baseline drinking water quality.</p>	<ul style="list-style-type: none"> OGC and MFLNRO are collecting additional baseline groundwater information. 		Ongoing
<p>Northeast Water Strategy – Geoscience BC Peace Project: Observation Wells</p>	<ul style="list-style-type: none"> MOE installed seven observation wells near Dawson Creek in 2011. These wells are tested for groundwater chemistry on an annual basis. Dissolved methane, oil and grease, and VOCs are tested in addition to the standard provincial observation well water chemistry package. 		Ongoing
<p>BC OGC Groundwater Monitoring and Protection Program</p> <p>OGC has developed a proposal for a new draft groundwater monitoring and protection program to provide pre- and post-development groundwater protection monitoring. The proposal includes three components: domestic water well sampling; risk-based purpose-built monitoring; and risk-based investigative monitoring.</p>	<ul style="list-style-type: none"> OGC has drafted a groundwater monitoring and protection program that is under discussion at OGC. Internal discussions will be followed by consultation with the Ministry of Natural Gas Development (MNGD) and Canadian Association of Petroleum Producers (CAPP). 	Spring 2016	In progress

RECOMMENDATION 5

The Province should consider refining its fracturing fluid disclosure process so designated authorities and health professionals can gain access to information about fluid ingredients, without compromising confidential business information.

Project(s)	Outputs to October 1, 2015	Target Date	Status
Review of Fracturing Fluid Disclosure Processes The Province is committed to the disclosure of hydraulic fracture fluid ingredients. All companies must report their use on FracFocus, the Chemical Disclosure Registry (fracfocus.ca). Chemicals added to hydraulic fracturing fluid are governed by federal hazardous materials legislation and regulation.	<ul style="list-style-type: none"> OGC is working with UBC Okanagan to review the toxicity of additives to hydraulic fracturing fluids and flowback water. Initial conversations have taken place with several companies and the Alberta Energy Regulator (AER). 	Spring 2016	In progress
Review of Fracturing Fluid Disclosure Processes OGC will require all fracture fluid service companies to provide it with emergency contact details to expedite information retrieval for health professionals.	<ul style="list-style-type: none"> November 2014 – All fracture fluid service companies agreed to provide contact details. March 2015 – A new category was created in the KERMIT database under the Corporate Registry, called "Hydraulic Fracturing Services." It will enable hydraulic fracturing service companies to be easily and quickly identified. April 2015 – The Corporate Registry "New Company Application" form was updated to collect contact information. Next step – Distribute the updated New Company Application form to all Petroleum Services Association of Canada (PSAC) members for registration. Collecting the direct contact information of all hydraulic fracturing service companies operating in B.C. will improve access to information in the event of an emergency. 	Fall 2015	In progress

RECOMMENDATION 6

When possible, the site classification tool and the existing framework for managing contaminated sites should be used together in the assessment and management of legacy sites in northeastern B.C.

Project(s)	Outputs to October 1, 2015	Target Date	Status
Liability Management Program OGC's Liability Management Program, coupled with the existing provincial regulatory framework under the commission and MOE, provide the tools necessary for managing contaminated sites. A working group of subject-matter experts from OGC and MOE will be established to review how these tools are currently applied, and identify opportunities for improvement.	<ul style="list-style-type: none">• OGC continues to work with MOE to ensure sites are appropriately classified and under the oversight of the appropriate regulator.• OGC will approach MOE to establish a working group by October 30, 2015 and aim to develop a framework regarding the assessment and management of legacy sites by March 31, 2016.	March 2016	Ongoing
Legacy Site Identification and Management OGC will address legacy sites identified to have residual contamination that may present a risk to human health or the environment, using the site classification tool and the existing framework for managing contaminated sites.	<ul style="list-style-type: none">• One contaminated legacy site was identified in 2014. The commission issued an order on Nov 5, 2014 requiring the operator to investigate and remediate. The operator investigated and remediated as per the order.• No legacy sites were identified or reported in this period.		Ongoing

RECOMMENDATION 7

The overall objectives and efficient use of the various databases that manage permits, facility information, and well and flare data should be reviewed, to identify ways to make the systems more accessible and user friendly.

Project(s)	Outputs to October 1, 2015	Target Date	Status
Online Permit Data <i>Environmental Management Act (EMA)</i> EMA permits that are OGC's responsibility are available online (along with those issued by MOE).	<ul style="list-style-type: none">• OGC EMA permit data is now being made available online at: https://1200.gov.bc.ca/pub/ams/default.aspx?PosseMenuName=MM_Main.• Northeast air monitoring data was made available online at: http://www.bcairquality.ca/readings/northeast.html.		Completed
Ongoing Improvements to B.C. Government Data Warehouse OGC is in the process of making data more accessible. It is anticipated that specific initiatives around data sharing and accessibility will be launched in the coming year.	<p>OGC has been working to improve the usability of its databases for the past three years. Examples:</p> <ul style="list-style-type: none">• Making publicly available more than 60 new oil- and gas-related data sets via the B.C. Government Data Warehouse / GeoBC, the public-land	Spring 2016	Ongoing

Project(s)	Outputs to October 1, 2015	Target Date	Status
	<p>database, within the past three years.</p> <ul style="list-style-type: none"> • Initiation and expansion of fracfocus.ca, tracking use of hydraulic fracturing fluids. • Business transition strategy, making decision making more efficient and transparent. • Area-based analysis tool, managing the impact of oil and gas activities within acceptable levels in the broader context of all development. • The OGC Incident Map, showing pipeline incidents from 2000 to current. • Major Projects Centre, tracking proposals that require a high degree of internal and external co-ordination. • Water information tools, including the Water Portal, NorthEast Water Tool (NEWT) and NorthWest Water Tool (NWWT). 		
<p>Improvement of the WELLS Database</p> <p>This involves ongoing improvements to WELLS to make data more accessible. WELLS is the provincial database of water well data in B.C. It captures information about wells such as their location, depth, diameter, lithology and productivity.</p>	<ul style="list-style-type: none"> • WELLS database restructuring: Information on classified aquifers is currently being made available to the public (online). • MOE will add additional columns to wells database to accommodate standardized lithology, GPS location data and hyperlinks to scanned well logs. 	2016	Ongoing

RECOMMENDATION 8

The Province's ongoing air monitoring program in the Northeast should continue to follow and principles outlined in MoE's *Framework for the British Columbia Air Monitoring Network*. Consideration should be given to the air quality contour maps provided in the detailed HHRA in placing future air quality monitors. As well, the identification of specific air contaminants for inclusion in the air monitoring program should consider the findings of the HHRA.

Project(s)	Outputs to October 1, 2015	Target Date	Status
<p>Northeast Air Quality Monitoring Project</p> <p>The Northeast Air Monitoring project is a multiphase project to:</p> <ul style="list-style-type: none"> • Monitor, report and assess air quality in northeastern B.C. 	<ul style="list-style-type: none"> • Using a process that is consistent with the <i>Framework for the British Columbia Air Monitoring Network</i> and uses the HHRA contour maps, the Technical Advisory Group (TAG) has provided advice to the Northeast Air Monitoring Project Steering 	September 2015	In progress

Project(s)	Outputs to October 1, 2015	Target Date	Status
<ul style="list-style-type: none"> • Reach out to the local community in this process. • Establish a long-term air monitoring network with a sustainable funding mechanism. <p>The project is led by MOE and includes partners from the Canadian Association of Petroleum Producers; MOH; MNGD; OGC; and Spectra Energy.</p>	<p>Committee on the:</p> <ul style="list-style-type: none"> • Location of three moveable monitors installed in Phase 1. • Pollutants that should be monitored at each site. 		

RECOMMENDATION 9

Once additional data for the Northeast is available from new monitoring stations or are made available from regulatory submissions, the air quality predictions and human health risks estimates from the detailed HHRA should be revisited.

Project(s)	Outputs to October 1, 2015	Target Date	Status
<p>Northeast Air Monitoring Project</p> <p>Phase 3 of this project is the implementation of a sustainable air quality monitoring network in the Northeast.</p> <p>The data collected by this network will determine the need for a future re-evaluation of the HHRA risk estimates by MOE and MOH.</p>	<ul style="list-style-type: none"> • Phase 3 of the Northeast Air Monitoring Project (implementation) is anticipated to launch in July 2016. 	July 2016 (Launch of Phase 3)	In progress

RECOMMENDATION 10

While some aquifer mapping has been completed in the Northeast, it is recommended that the aquifer mapping (and vulnerability mapping) be expanded to enhance groundwater protection with respect to oil and gas development. This information would aid regional and site-specific assessments of potential risks to groundwater. One limitation of the current aquifer mapping relates to an absence of subsurface data. Therefore, it is suggested that surficial geology mapping (on an appropriate scale) for the region be completed as well.

Project(s)	Outputs to October 1, 2015	Target Date	Status
<p>Northeast Water Strategy – Peace Project on Groundwater</p> <p>Within the Northeast Water Strategy, the Geoscience BC Peace Project is a collaborative effort that will generate new information about the distribution of shallow aquifers in the Northeast's Peace region and their groundwater quantity and quality.</p> <p>Peace Project partners include the</p>	<p>Airborne electromagnetic data collection:</p> <ul style="list-style-type: none"> • Airborne electromagnetic geophysics data has been collected for the Montney North Region. The electromagnetic images help identify buried sand and gravel layers that host groundwater aquifers. • Data collection has been completed. • Next step – Data interpretation 	March 2016	In progress

Project(s)	Outputs to October 1, 2015	Target Date	Status
provincial government (MFLNRO, MOE, MOH, and MNGD); OGC; and Geoscience BC. Partner support to Geoscience BC comes from Canadian Association of Petroleum Producers through the Science and Community Environmental Knowledge fund; ConocoPhillips Canada; Progress Energy Canada Ltd.; and the Northern Development Initiative Trust.	Overburden depth to bedrock mapping: <ul style="list-style-type: none"> • Experimental use of gamma log on petroleum wells to determine bedrock depth. A gamma log is a geophysical tool used in petroleum exploration. • Past measurements are being re-examined and reinterpreted to help determine over burden depth to bedrock. • The process is experimental and will produce a map when complete. 	March 2016	In progress
	Private well water chemistry sampling: <ul style="list-style-type: none"> • Individual wells have been sampled and analyses have been completed. • Next step – project report. Further round of water well sampling, analyses and reporting is ongoing. 	March 2016 (project report)	Ongoing
	<ul style="list-style-type: none"> • Core drilling of paleovalley aquifers to provide information on geology has been completed. Remote sensing data is used to detect paleovalley aquifers and ground truth data (such as core drilling) improves detection. • Two wells were drilled. The lithology was mapped, providing evidence for geological contacts inferred from the geophysics. 		Completed
	Developing groundwater vulnerability model of northeastern British Columbia: <ul style="list-style-type: none"> • DRASTIC mapping has been completed. • Next step – Project report • Note: DRASTIC is a method of assessing groundwater vulnerability in an area and considers: D – Depth to Water; R – Net Recharge; A – Aquifer Media; S – Soil Media; T – Topography; I – Impact of Vadose Zone Media; and C – Hydraulic Conductivity of Aquifer. 	October 2015	In progress
Peace River Regional District (PRRD) Aquifer Initiative PRRD is using the WELLS database and aquifer chemistry data to help visualize and characterize groundwater.	<ul style="list-style-type: none"> • MoE, MFLNRO and OGC provided peer review of information presented on behalf of PRRD to the public in a series of information sessions. 	March 2016	In progress

RECOMMENDATION 11

Additional study of groundwater and surface water interactions in shallow aquifers and local groundwater flow conditions in the Northeast should be completed. This information could improve the understanding of potential contaminant fate and migration. As well, studies could be carried out to investigate the location and sources of groundwater recharges.

Project(s)	Outputs to October 1, 2015	Target Date	Status
Northeast Water Strategy – Private Well Sampling Program Within the Northeast Water Strategy, the Private Well Sampling Program is a multipartner effort to characterize aquifers and groundwater chemistry in the Groundbirch/Dawson Creek Area. Partners include the provincial government; Simon Fraser University; and Peace River Regional District. MOH has also contributed funding to the contract. OGC is participating in a number of related studies.	Private well water chemistry sampling: <ul style="list-style-type: none">• Individual wells have been sampled and analyses have been completed.• Next step – project report. Further round of water well sampling, analyses and reporting is ongoing• In addition to the water sample analysis, groundwater level and well head elevation have been measured for each individual well.	March 2016 (project report)	Ongoing

RECOMMENDATION 12

Consideration should be given to the overall goals of the existing environmental monitoring programs for soil, water and biota, along with the presentation and quality of this data within the existing databases, specifically as these relate to the value the data could provide with respect to human and environmental health.

Project(s)	Outputs to October 1, 2015	Target Date	Status
Northeast Water Strategy (NEWS) – Enhance Information to Support Decision Making This strategy addresses the presentation and quality of data as it relates to the value they could provide with respect to protecting human and environmental health.	<ul style="list-style-type: none">• March 2015 – Public release of NEWS document.• The multipartner Water Working Group was struck to identify priorities and develop an implementation plan.• An interagency steering committee is under development. It will help the provincial government (MFLNRO, MOE, MOH and MNGD) function with greater unity on water-related issues and provide a unified voice in the Water Working Group.		Ongoing
Northeast Water Strategy (NEWS) – Improved Surface Water Quantity Monitoring	<ul style="list-style-type: none">• Long-term support of the Geoscience BC/Horn River Producers Group, Horn River Basin hydrometric stations is under discussion.• The hydrometric stations were created for a Geoscience BC project to Provincial Hydrometric Standards. They are not currently included in the		In progress

Project(s)	Outputs to October 1, 2015	Target Date	Status
	Water Survey of Canada (WSC) database because the WSC only accepts data from stations they operate. The province is investigating capturing the data in the provincial water system (Aquarius).		
<p>Northeast Water Strategy – Disturbance Sensitivity Approach to Identifying Enhanced Water Monitoring Priorities in Northeastern B.C.</p> <p>The tool is intended to guide the establishment of water monitoring priorities for surface water and groundwater under the Northeast Water Strategy.</p> <p>The approach has been developed by MFLNRO in collaboration with First Nations, communities and industry. The model considers stressors on the landscape, as well as areas of concern that may not be well addressed currently.</p> <p>Factors were combined and weighted using GIS to determine areas with the greatest requirement for monitoring water quality and quantity.</p>	<p>As of August 2015:</p> <ul style="list-style-type: none"> Developed a risk-based model to identify where monitoring resources should be placed. The model was made available to provincial government staff. Project Metadata report was completed. Metadata is an important requirement for releasing the model. It explains which data was used in generating the model and supports reproducibility and transparency. By providing the means for examination and reproduction, the model can be validated and improved. Next step – Production of a methods report and a website. The methods report (planned to be a scientific peer-reviewed article) will provide the rationale for the project, data choices and the utility of the model. The website will be available to the public. It will allow decision makers and work groups under NEWS to focus on watersheds or groundwater areas that need more monitoring, and help members prioritize areas. 	March 2016	In progress
Collaboration between Responsible Ministries	<ul style="list-style-type: none"> B.C.'s natural resource sector will continue to improve access to existing and historical monitoring data, and provide opportunities for expanding the existing data logically. OGC's use of area-based analysis (ABA) in decision making helps to manage the impact of oil and gas activities within acceptable levels. ABA provides area-specific maps of all industrial activity and sets triggers to protect identified values, including environmental, to reduce the overall impact. 		Ongoing
<p>Northeast BC Permafrost Project</p> <p>This is a three-year project led by the</p>	<ul style="list-style-type: none"> The first six months of the project have been completed. 	March 2018	In progress

Project(s)	Outputs to October 1, 2015	Target Date	Status
Permafrost Ecosystems in Transition University-Industry-Government research Consortium on permafrost in peat land. Information from the study will be used to estimate future quantities of runoff from surface water storage within boreal and subarctic landscapes with discontinuous permafrost under possible scenarios of climate warming and human disturbance.	<ul style="list-style-type: none"> • MFLNRO has assisted with mapping the changing spatial distribution of permafrost, wetland and forest coverage over the past 60 years using aerial photography, satellite images and LiDAR. • MFLNRO is providing a support role for annual meetings and information exchange. 		
Murray River Cumulative Effects Monitoring Framework This framework is meant to assess and better understand the aquatic ecosystem of the Murray River watershed and cumulative effects of development. It is also intended to inform the management actions needed to improve the watershed's sustainability, to guide cumulative effects monitoring.	<ul style="list-style-type: none"> • June 2015 – The Working Group and Steering Committee were created, Terms of Reference were defined and work was initiated. 	March 2016	In progress

RECOMMENDATION 13

The Province should explore tailoring its health surveillance to determine whether or not there are any differences in disease rates in those areas identified in the HHRA with the highest predicted air concentrations. If possible, such future health surveillance would help verify the conclusions of the HHRA.

Project(s)	Outputs to October 1, 2015	Target Date	Status
Preliminary Analyses on Air Quality and Respiratory Disease in Northeastern B.C. MOH and Northern Health Authority are conducting preliminary analyses to explore the relationship between air quality and health outcomes in northeastern B.C.	<ul style="list-style-type: none"> • June 2015 – MOH completed preliminary testing of Medical Services Plan data and asthma data at the local-health-area level, to establish the degree of variability and utility of the data for this purpose. • July 2015 – MoH held an initial discussion with the Collaborating Centre for Environmental Health regarding collaboration. • MOH is working on a public health surveillance plan to support the recommendations in the HHRA. MOH anticipates that it will be finalized by the end of September 2015. 		Ongoing

RECOMMENDATION 14

The B.C. air quality objectives should be reviewed and updated based on the existing provincial framework for developing air quality objectives.

Project(s)	Outputs to October 1, 2015	Target Date	Status
Review of Interim Ambient Air Quality Objectives The Interim Ambient Air Quality Objectives for SO ₂ and NO ₂ adopted by the Province in September 2014 will be reviewed when the new Canadian Ambient Air Quality Standards (CAAQS) for SO ₂ and NO ₂ are adopted.	• None	Fall 2016 or Spring 2017 (depending on pace of the CAAQS process)	In progress

OTHER OPPORTUNITIES FOR IMPROVEMENT

In 2015, Ernst and Young completed an assessment of the regulatory framework governing hydraulic fracturing for the Oil and Gas Commission. In their report, *Review of British Columbia's hydraulic fracturing regulatory framework*, Ernst and Young assessed issues related to water use and protection, induced seismicity, and quality-of-life disturbances. Although they concluded that the overall framework governing hydraulic fracturing in B.C. is robust, they also made 23 recommendations for improvement. These recommendations fall into three main categories, including:

- Data collection and monitoring: Instances in which the collection of additional data would enable the OGC to better establish baselines, do ongoing environmental monitoring and make more informed regulatory decisions.
- Regulatory authority and oversight: Instances in which no regulatory instrument directly within the control of the OGC provides the necessary authority to mitigate a risk or respond to an issue.
- Regulatory instrument coverage: Instances in which existing regulatory instruments could be enhanced to regulate specific issues more comprehensively.

Broadly speaking, the HHRA report makes recommendations regarding air quality, fracture fluid disclosure, and data availability and transparency. The Ernst and Young report makes recommendations regarding water source management, flowback water management, microseismic data collection, and induced seismicity. Both reports make recommendations on improving setbacks, surface and groundwater management, aquifer characterization, and well-casing integrity.

While the Ernst and Young recommendations are not directly linked to the Ministry of Health's *Detailed Human Health Risk Assessment of Oil and Gas Activities in Northeastern B.C.*, a number of the actions that may be undertaken by the OGC to address the recommendations identified by Ernst and Young are relevant to environmental health protection in the Northeast.

The OGC is developing a work plan to address the Ernst and Young recommendations.

For information on the recommendations identified in the Ernst and Young report and their priority for completion, please see Appendix B of the *Review of British Columbia's hydraulic fracturing regulatory framework*: <http://www.bccgc.ca/node/12471/download>.

From: Parker, Esther HLTH:EX
Sent: Tuesday, April 19, 2016 4:35 PM
To: Coward, Laura P
Cc: Morgan, Andrew; Gibbs, Claire MNGD:EX; Schwabe, Michelle MNGD:EX; Porter, Charles OGC:EX
Subject: RE: HHRA Progress Report

Thanks, Laura. Is there anyone in particular at MOE I could talk to?

From: Coward, Laura [<mailto:laura.coward@bcogc.ca>]
Sent: Tuesday, April 19, 2016 4:27 PM
To: Parker, Esther HLTH:EX
Cc: Morgan, Andrew; Gibbs, Claire MNGD:EX; Schwabe, Michelle MNGD:EX; Porter, Charles OGC:EX
Subject: HHRA Progress Report

Hi Esther,

Please find attached a revised draft HHRA report. We've included some minor edits and consistency type changes. We've also adjusted the recommendation descriptions to be consistent with the HHRA report. All edits are tracked and smaller ones highlighted for clarity.

Regarding recommendation 7, we have been unable to get any review or input from MOE. The OGC staff contact has been away and is now responding to wildfire air monitoring needs in the Fort St John area. We will discuss the issue around recommendation 7 wording as soon as they get back and will suggest some edits for your consideration as soon as possible, unless you can get input from MOE on this.

Thanks!
Laura



Laura Coward RPF: RPBio
Strategic Legislation Analyst
laura.coward@bcogc.ca

Victoria BC
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From: Parker, Esther HLTH:EX [<mailto:Esther.Parker@gov.bc.ca>]
Sent: Wednesday, April 13, 2016 3:20 PM
Subject: HHRA Progress Report
Importance: High

Hi everyone,

Thank you for your patience working with me to complete the *Progress Report on Recommendations in the NE Oil and Gas HHRA for the Public*.

Please could you review your contributions one more time and check for errors.

A couple of items are outstanding:

1. FLNRO to report on status of PRRD project
2. OGC to get feedback from MOE on recommendation 7

Please indicate your approval of the document by email to me no later than 4:30 Tuesday, April 19.

Next Wednesday April 20, I will forward the progress report to my ADM (Arlene Patton) for her review. She will then forward it to your executive for their review and sign-off.

If you have any questions, please don't hesitate to contact me.

Thanks again for your assistance.

Esther

**Esther Parker, Senior Policy Analyst/ Ministry of Health/ PO BOX 9646 Stn Prov Govt/
Victoria BC V8W 9P1**

New Phone#: (250) 952-1463 / Fax: (250) 952-1713 / Email: esther.parker@gov.bc.ca

From: Parker, Esther HLTH:EX
Sent: Tuesday, April 19, 2016 11:45 AM
To: Schwabe, Michelle MNGD:EX
Cc: Johnson, Elizabeth MNGD:EX
Subject: RE: HHRA Progress Report

Great. Thanks, Michelle.

From: Schwabe, Michelle MNGD:EX
Sent: Tuesday, April 19, 2016 9:22 AM
To: Parker, Esther HLTH:EX
Cc: Johnson, Elizabeth MNGD:EX
Subject: FW: HHRA Progress Report

Hi Esther,

Please find attached some additional changes. I have made some edits to #10 in the table and also the text please see my comments. Elizabeth has also added in #11 the Site C Aquifer report that was released Dec 2012. I don't know if this report would have been considered when the HHRA was completed or not. We will leave it to you to decide if it should be included.

Thanks,

Michelle

From: Johnson, Elizabeth MNGD:EX
Sent: Monday, April 18, 2016 2:47 PM
To: Schwabe, Michelle MNGD:EX
Subject: FW: HHRA Progress Report
Importance: High

Hi Michelle,

The HHRA is almost ready for release. I have made submissions across the course of the year and have made changes to the most recent version which needs to be returned to Ester Parker. OGC has been consulted frequently throughout the process as well.

I support the release of this document.

Cheers,
Elizabeth

From: Parker, Esther HLTH:EX
Sent: Wednesday, April 13, 2016 3:20 PM
To: Ciruna, Kristine FLNR:EX; Coward, Laura P; Davis, Celine ENV:EX; D'Souza, Don MNGD:EX; Johnson, Elizabeth MNGD:EX; Kari Harder; Maxwell, Jennifer A ENV:EX; Messenger, Meggin A CSCD:EX; Morgan, Andrew; Morgan, Dale ABR:EX; Nichols, Kris CSCD:EX; Okrainetz, Glen R ENV:EX; Pennock, Mike HLTH:EX; Schwabe, Michelle MNGD:EX; Stares, Joanne HLTH:EX
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Victoria BC V8W 9P1**

New Phone#: (250) 952-1463 / Fax: (250) 952-1713 / Email: esther.parker@gov.bc.ca

From: Johnson, Elizabeth MNGD:EX
Sent: Monday, April 18, 2016 3:14 PM
To: Schwabe, Michelle MNGD:EX
Subject: RE: HHRA Progress Report

Sorry.
It's attached now.

From: Schwabe, Michelle MNGD:EX
Sent: Monday, April 18, 2016 3:13 PM
To: Johnson, Elizabeth MNGD:EX
Subject: RE: HHRA Progress Report

Hi Elizabeth,

I don't see tracked changes in the document – is this the right version?

From: Johnson, Elizabeth MNGD:EX
Sent: Monday, April 18, 2016 2:47 PM
To: Schwabe, Michelle MNGD:EX
Subject: FW: HHRA Progress Report
Importance: High

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Page 024 to/à Page 045

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From: Coward, Laura P
Sent: Tuesday, April 19, 2016 4:27 PM
To: Parker, Esther HLTH:EX
Cc: Morgan, Andrew; Gibbs, Claire MNGD:EX; Schwabe, Michelle MNGD:EX; Porter, Charles OGC:EX
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Victoria BC V8W 9P1**

New Phone#: (250) 952-1463 / Fax: (250) 952-1713 / Email: esther.parker@gov.bc.ca

Page 048 to/à Page 069

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From: Piccinino, Ines MNGD:EX
Sent: Tuesday, April 19, 2016 9:54 AM
To: Schwabe, Michelle MNGD:EX; Grieve, Richard MNGD:EX
Subject: RE: Update: HHRA Progress Report

Excellent, thanks for the update, Michelle!

Ines

From: Schwabe, Michelle MNGD:EX
Sent: Tuesday, April 19, 2016 9:28 AM
To: Grieve, Richard MNGD:EX; Piccinino, Ines MNGD:EX
Subject: Update: HHRA Progress Report

Good Morning,

The draft HHRA Recommendations report is attached. OGC/FLNRO have provide the input on progress for the initiatives. We have provided comment.

Next Steps: The report will go to Arlene for her review/edits/approval and then she will send out to Ines and other ministry executive for their review and sign off.

Thanks,

Michelle

From: Schwabe, Michelle MNGD:EX
Sent: Tuesday, April 19, 2016 9:22 AM
To: Parker, Esther HLTH:EX
Cc: Johnson, Elizabeth MNGD:EX
Subject: FW: HHRA Progress Report

Hi Esther,

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Subject: FW: HHRA Progress Report
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Esther

**Esther Parker, Senior Policy Analyst/ Ministry of Health/ PO BOX 9646 Stn Prov Govt/
Victoria BC V8W 9P1**

New Phone#: (250) 952-1463 / **Fax:** (250) 952-1713 / **Email:** esther.parker@gov.bc.ca

Page 072 to/à Page 093

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From: Johnson, Elizabeth MNGD:EX
Sent: Monday, April 18, 2016 2:47 PM
To: Schwabe, Michelle MNGD:EX
Subject: FW: HHRA Progress Report
Importance: High

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Victoria BC V8W 9P1

New Phone#: (250) 952-1463 / *Fax:* (250) 952-1713 / *Email:* esther.parker@gov.bc.ca

Piccinino, Ines MNGD:EX

From: Piccinino, Ines MNGD:EX
Sent: Thursday, April 21, 2016 2:00 PM
To: Paton, Arlene HLTH:EX
Cc: Paulson, Ken OGC:IN
Subject: RE: FOR REVIEW - Northeast Oil and Gas Human Health Risk Assessment (HHRA)
Project: Recommendations Report to the Public
Attachments: hhra recommendations progress report for public April 20 2016.docx

Hi, Arlene,

I have two comments to the report (attached). It looks great overall. Ken: you might want to have a look at my first comment as it refers to an OGC example and I don't think it's a good example in this context.

Thanks!

Ines

From: Barnes, Renee A HLTH:EX **On Behalf Of** Paton, Arlene HLTH:EX
Sent: Thursday, April 21, 2016 11:06 AM
To: XT:Allison, Sandra HLTH:IN; Paulson, Ken OGC:IN; Zacharias, Mark ENV:EX; Bowman, Deborah TRAN:EX; Faganello, Tara CSCD:EX; Piccinino, Ines MNGD:EX; Nash, Laurel ABR:EX; Kittleson, Christian ABR:EX; Kriese, Kevin FLNR:EX; Puggioni, Giovanni ABR:EX
Cc: Lambert, Tim HLTH:EX; Janke, Brenda G HLTH:EX; Tucker, Evelyn L HLTH:EX
Subject: FOR REVIEW - Northeast Oil and Gas Human Health Risk Assessment (HHRA) Project: Recommendations Report to the Public

Dear ADMs/VPs with responsibilities in responding to the 14 HHRA recommendations:

Thank you for the work that you and your staff have done to assist in the preparation of the attached draft *Progress Report: Recommendations in the Human Health Risk Assessment of Oil and Gas Activities in Northeastern British Columbia (Report to the Public)*.

As you recall, at last year's public release of the Phase 2 findings and recommendations for the Northeast Oil and Gas HHRA Project, the Minister of Health announced that the Ministry of Health (MoH) would follow-up with the ministries and agencies responsible for implementing the recommendations to ensure that action is taken. The Minister committed to the release of a progress report to the public on the implementation of the recommendations. This report is due April/May 2016.

Last June, we met to discuss options for progress reporting on the HHRA. At this meeting we agreed upon a reporting template and reporting process for the October report to the Minister of Health. This Spring, MoH has worked with staff from each of your agencies to complete a second report of the initiatives that address the HHRA recommendations. This second report that will be released to the public.

Your staff have provided input and approved this draft of the report, which is attached for your final review and approval. **The report is intended for public release.**

Please reply back to me by April 27, if you have any additions, changes or clarifications to this report.

Thank you again for your contribution to this project. I look forward to hearing from you.

Regards,

Arlene Paton
Assistant Deputy Minister
Population and Public Health
Ministry of Health
Phone: (250) 952-1731

Page 098 to/à Page 119

Withheld pursuant to/removed as

s.13

**MINISTRY OF NATURAL GAS DEVELOPMENT AND
MINISTER RESPONSIBLE FOR HOUSING
UPSTREAM DEVELOPMENT DIVISION
ESTIMATES BRIEFING NOTE 2016/17**

ISSUE: Human Health Risk Assessment of Oil and Gas Development

KEY MESSAGES:

- We have strong policies and regulations in place and an excellent safety record in BC when it comes to oil and gas activity.
- To maintain the highest standards possible, the BC Government conducted a Northeast BC Oil and Gas Human Health Risk Assessment that would identify, explore and assess human health risks, including any dangers from chemical exposures.
- The three-phase study led by the Ministry of Health (MOH) found that the risk to human health from emissions from oil and gas activities in Northeast BC (NEBC) remain low and that the existing regulatory framework is extensive and broadly protective of human health.
- Phase 1, completed in June 2012 by the Fraser Basin Council, involved canvassing non-commercial stakeholders about their health concerns related to oil and gas activity in NEBC.
- Phase 2, the human health risk assessment phase, evaluated potential human health concerns and provided recommendations for improvement in specific areas by means of a report in March 2015.
- The Province of British Columbia accepted the recommendations and has made significant progress in implementing them through initiatives such as the Northeast Air Monitoring Project and the Northeast Water Strategy.
- Phase 3 involves reporting back to the public and stakeholders on the findings. Public information sessions were held in 2015 and the first progress report will be release in Spring 2016.
- The data and information compiled through the study will serve as a valuable baseline for monitoring the health effects of future development of natural gas and other resource activities in our region.

BACKGROUND:

- Public concerns over health and safety in the oil and gas sector have been expressed over a number of years in BC.

On June 28, 2011, MOH agreed to conduct a health assessment of oil and gas sector operations in NEBC which involved the Ministry of Natural Gas Development (MNGD), Ministry of Environment (MOE), BC Oil and Gas Commission (Commission), Environmental Assessment Office, industry, First Nations, local government, and impacted communities.

- Potential human health hazards subject to review included gas extraction methods, emergency events such as well blowouts and pipeline breaks, chemicals in drilling waste, air quality issues from well venting, processing and land reclamation.
- The Commission is responsible for regulatory oversight of the oil and gas sector while MOE is accountable for human health related to air and water and some oilfield waste issues. At MOH, the Emergency Management Unit is responsible for health emergency responses, while the Health Protection Branch deals with drinking water quality.

Phase 1 (Completed)

- The Province of British Columbia contracted the Fraser Basin Council to canvass the public, local governments, First Nations, and other groups and individuals to determine stakeholder perceptions of human health hazards and develop subject areas for inquiry and review.
- A report released on June 6, 2012 summarized the identified concerns.
- No attempt was made to link public perception and existing scientific data.

Phase 2 (Completed)

- Phase 2 of the project, undertaken by Intrinsik, included a detailed human health risk assessment (HHRA), a review of the regulatory framework and a recommendations report.
- Phase 2 began with a Screening Level Risk Assessment (SLRA) to identify the potential oil and gas related emission sources in the region that present the greatest potential risk to human health, and to provide a means of prioritizing scenarios for a quantitative assessment in the detailed HHRA. Based on the decision made within the SLRA, the HHRA evaluated the potential adverse health risks in relation to oil and gas activity in NEBC from continuous air emissions scenarios from gas processing plants and production facilities.
- Intrinsik conducted the detailed qualitative analysis for air emissions using widely accepted methods endorsed by regulatory organizations worldwide. It focussed on a list of representative chemicals that are known to be associated with the identified emission sources and have the potential to, at high enough concentrations, cause a number of the health effects.
- Recommendations for improvement included: emergency planning; flaring, venting and fugitive emission management; hydraulic fracturing; information management; and environmental monitoring.

Phase 3

- Phase 3 will report back to the public and stakeholders on the findings and any recommendations for improvement that may be appropriate. The first public

information session was held in Fort St. John on Tuesday March 31, 2015. Additional sessions will be held in the following months.

- The MOH has created a webpage about the HHRA to keep the public up to date about progress on the project and to post the latest available reports.
- MNGD, the Commission, MOE and the Ministry of Forests, Lands and Natural Resource Operations have been collaborating with the MOH and with other agencies to implement the recommendations set out in the report.

ALBERTA WATER CONTAMINATION CASE

Topic: The Supreme Court of Canada will soon hear the appeal of Jessica Ernst and decide if she can sue the Alberta provincial regulator over alleged contamination of her well by Encana.

- In B.C., we have a 50-year record of safely recovering oil and gas resources.
- We have some of the most up-to-date regulations in the world for hydraulic fracturing.
- The BC Oil and Gas Commission provides transparency on all aspects of the industry. Their website has many reports and details about industry compliance, enforcement actions, water usage, and regulations.
- We also have fracfocus.ca. We were the first province in Canada to regulate the public disclosure of ingredients used for hydraulic fracturing.
- B.C. requires steel casing and cementing to a depth of 600 metres - to provide complete isolation of water from a natural gas well.
- The depths in B.C. differ from the case in Alberta. In B.C., shale formations are very deep and naturally isolated from near surface groundwater sources.
- B.C. has never had a reported incident of water contamination occurring as a result of hydraulic fracturing.
- We will remain a leader in responsible development.

Background:

The Supreme Court of Canada is scheduled to hear the appeal from Jessica Ernst, a property owner in northeast Calgary, on January 12, 2016.

Earlier, the Alberta courts turned down a provincial attempt to get out of the case, but exempted the regulator, citing immunity provisions in Alberta's Energy Resources Conservation Act. Ernst appealed to the Supreme Court and they agreed to hear her appeal.

Ernst is alleging that Encana's hydraulic fracturing has contaminated her well. Ernst claims that fracking on her land released hazardous amounts of chemicals such as methane into her well and that her concerns were not properly investigated. Ernst's legal counsel maintains a website with the details of the case: <http://www.ernstversusencana.ca/>

Ernst has been vocal in the media. She says the Alberta oil and gas industry uses gag orders and other forms of cover-ups to deal with contamination from hydraulic fracturing.

B.C. Operations:

- The BC Oil and Gas Commission closely regulates hydraulic fracturing to protect groundwater. Legislation and regulation guiding the protection of domestic water wells is very specific, including setback distances and well casing requirements.
- The normal depth of a potable water well for domestic purposes in northeast B.C. is between 18 and 150 metres. Shale gas reservoirs in B.C. are found at 1.7 - 4 kilometres (km) below the surface in the Montney area; 2.5- 3 km below the surface in the Horn River Basin. These are the depths where the hydraulic fracturing method takes place – far below the depth of domestic water zones.
- Steel and cement casing requirements are mandatory and must extend to the full length of the well or to a minimum depth of 600 metres.
- There are numerous, naturally impermeable, confining layers between any potable water zone (18-150 metres) and the producing hydrocarbon zone (1.7 km – 4 km) which prevent any seepage from depth to near surface zones.
- After the hydraulic fracturing process, fluids flow back to the surface and are collected at the wellsite. It is against the law in B.C. to introduce flowback fluids onto the surface environment. Fluid collected must be disposed of at a Commission-approved disposal well or facility. Some fluids are treated and water is recycled for continual use.
- B.C.'s legal framework is different from Alberta's. B.C. legislation does not include a provision that bars civil actions against the Crown or the Oil and Gas Commission (only individuals – the Commissioner, an official or the Commission's directors or employees), while Alberta has a provision that bars civil action against the Alberta Energy Regulator. The statutory immunity provisions in OGAA are limited, generally, to situations where the Commission takes action that is akin to the role of an operator.

SHALE GAS – HYDRAULIC FRACTURING 2016

Topic: Hydraulic fracturing is a process used to free natural gas contained within shale formations, the most commonly occurring type of sedimentary rock in northeast B.C.

- B.C.'s natural gas sector is safe with strict regulations in place for shale gas development.
- Last year, an independent review found B.C. has a robust regulatory framework governing hydraulic fracturing.
- That was one of two impartial reviews last year concluding B.C.'s regulatory framework is well developed.
- We were the first province in Canada to regulate public disclosure of additives used in hydraulic fracturing.
- B.C. requires steel casing and cementing to a depth of 600 metres to isolate water sources from a natural gas well.
- B.C. has never had a reported incident of water contamination resulting from the hydraulic fracturing process.

Background:

Hydraulic fracturing is a process used to free natural gas contained within shale formations, the most commonly occurring type of sedimentary rock in northeast B.C. In shale formations, the natural gas molecules are held in the reservoir rock. Hydraulic fracturing is used to create small cracks in the rock that stimulates the flow of gas into the well bore.

The emergence of horizontal drilling of multiple wells from a single pad has made it economical to produce, while reducing environmental footprint.

On January 1, 2012, the BC Oil and Gas Commission (OGC) launched FracFocus.ca – a publicly accessible website detailing B.C.'s hydraulic fracturing activities and the additives used in the process. B.C. was the first province in Canada (now joined by Alberta) to regulate the public disclosure of the chemicals used by hydraulic fracturing operators.

The BC Oil and Gas Commission closely regulates hydraulic fracturing to protect groundwater. Legislation and regulation guiding the protection of domestic water wells is very specific, including setback distances, well casing and securing requirements.

The normal depth of potable water well for domestic use in northeast B.C. is between 18 and 150 metres. Drinking water aquifers are normally less than 300 metres below the surface. Shale gas reservoirs in B.C. are found at approximately 1,700 to over 4,000 metres below the surface (1.7 - 4 km below the surface in the Montney; 2.5- 3 km below the surface in the Horn River Basin). These are the depths where hydraulic fracturing takes place – far below the depth of domestic water zones.

Steel and cement casing requirements are mandatory and must extend to the full length of the well, or to a minimum depth of 600 metres; (a detailed risk assessment would be required and an application for approval by the OGC, for any work conducted at a depth of less than 600 metres).

There are numerous, naturally impermeable, confining layers between any potable water zone (18-150 metres), and the producing hydrocarbon zone (1.7 km – 4 km), which prevents any seepage from depth to near surface zones. This is confirmed by the gas producing zones that are at high pressures and have remained under pressure for thousands of years.

After the hydraulic fracturing process, fluids flow back to the surface and are collected at the wellsite. It is against the law in B.C. to introduce flow back fluids onto the surface environment. Fluid is collected and must be disposed of at a Commission-approved disposal well or facility. Some fluids are treated and recycled for continual use.

Support for B.C. Regulations

Ernst & Young Review (June 2015) found that British Columbia has a robust regulatory framework governing hydraulic fracturing.

Human Health Risk Assessment Report (March 2015) found that the probability of adverse health impacts from these oil and gas activities to be low.

**MINISTRY OF NATURAL GAS DEVELOPMENT AND
MINISTER RESPONSIBLE FOR HOUSING
UPSTREAM DEVELOPMENT DIVISION
ESTIMATES BRIEFING NOTE 2016/17**

ISSUE: Shale Gas Hydraulic Fracturing

KEY MESSAGES:

- Advances in directional drilling and hydraulic fracturing technology have enabled BC to develop its abundant shale gas deposits.
- BC has instituted stringent safety procedures for natural gas development. Having the most up-to-date regulations in Canada, BC is a progressive shale gas development jurisdiction.
- Under the Oil and Gas Activities Act (OGAA) specific construction and production regulations ensure safe hydraulic fracturing practices including containment and proper disposal of hydraulic fracturing fluids.
- Regulations ensure that potable groundwater is protected.
- On January 1, 2012, BC became the first jurisdiction in Canada to make it mandatory for all oil and gas producers to report hydraulic fracturing fluid ingredients through the website FracFocus.ca.
- Water is an important factor in shale gas development. The Ministry of Natural Gas Development is collaborating with appropriate ministries, industry and other partners to evaluate the availability of water sources in BC's shale gas areas.

BACKGROUND:

- Hydraulic fracturing involves injecting a fluid, primarily composed of water, sand and small amounts of chemical additives (friction reducers and surfactants) at a high enough pressure to fracture or crack the rock. Sand holds the cracks open once the pressure is lowered, allowing the natural gas to migrate to the wellbore and up to the well head at surface.
- Specific hydraulic fracturing fluid formulas are often proprietary and vary amongst companies and applications. Overall, the concentration of chemical additives accounts for 0.1 percent to 2 percent with water and sand making up 98 percent to 99.9 percent of the fluid.
- In BC, hydraulic fracturing has been used to stimulate gas production in conventional reservoirs for decades, and since 2005 the development of horizontal drilling, together with hydraulic fracturing, has enabled the development of BC's vast unconventional shale gas resources.
- Hydraulic fracturing in BC is strictly managed and addressed via rigorous regulation; industry best practices and ongoing research on water quality and quantity.

- Hydraulic fracturing in BC is done at considerable depths: in the Montney Formation fracturing is performed approximately at 1.4 – 3.8 kilometres (km) below the surface; and Horn River fracturing is performed at approximately 1.9 – 3.8 km below the surface.
- Hydraulic fracturing in shale gas development uses significantly more water than conventional hydraulic fracturing. Fluids used in a single well can range from 1,000 cubic meters (m^3) to more than 70,000 m^3 , depending on the number of hydraulic fractures conducted and the geology in the area.
- In 2014, the average water use was 10,383 m^3 /well (275 wells) in the Heritage Basin, 13,953 m^3 /well (319 wells) in the North Montney, and 88,634 m^3 /well (17 wells) in the Horn River Basin.
- Water is mainly obtained from surface sources such as rivers and lakes and its use is approved by the BC Oil and Gas Commission (Commission). Other sources include shallow, subsurface aquifers (0 - approximately 600m) and deep subsurface aquifers (>600m), where formation water is typically saline.
- BC's mature regulatory environment has comprehensive regulations related to well construction and production. For example, the Drilling and Production Regulation under OGAA requires that cemented steel casing is installed to a depth of 600 metres to ensure that potable water aquifers are protected.
- Regulations ensure that potable groundwater is protected. This is achieved by drilling practices that include surface casing, cementing surface casing, production casing and cementing production casing. The drilling and production regulations outline in detail how industry must ensure water resources are protected.
- Under the Environmental Management Act, fluids produced from oil or gas operations cannot be discharged into the environment, (i.e., into rivers/lakes, onto the ground surface, or into aquifers) without authorization. The OGAA further regulates waste water wherein produced fluids, including fracture flowback water from natural gas wells can be reused for well completions, or be disposed into deep, underground saline aquifers.
- In September 2011, the Canadian Association of Petroleum Producers (CAPP) announced its "Guiding Principles for Hydraulic Fracturing" for industry to guide water management and improved water and fluids reporting practices for shale gas development. CAPP developed operating practices to support the guiding principles for hydraulic fracturing and is in the process of reviewing their members' adherence to the practices.
- The Petroleum Service Association of Canada announced a hydraulic fracturing code of conduct in October 2013 that was created as part of its Working Energy Commitment. This process involved consultation with numerous stakeholders in various locations throughout Alberta, BC, Saskatchewan and Manitoba.
- The Commission, via the British Columbia Oil and Gas Research and Innovation Society along with Geoscience BC, CAPP and Natural Resources Canada, have hired a seismologist to conduct a two year study on induced seismicity from natural gas development in Northeast BC and examine the relationship between fluid injection and large-magnitude seismic events.

**MINISTRY OF NATURAL GAS DEVELOPMENT AND
MINISTER RESPONSIBLE FOR HOUSING
LNG TASK FORCE
ESTIMATES BRIEFING NOTE 2016/17**

ISSUE: Air Quality and Emissions Management

KEY MESSAGES:

- We are working closely with industry and stakeholders to ensure emissions from LNG development and the cumulative impacts on the airshed are managed effectively.
- We will ensure the highest environmental standards and health standards for the citizens of this province continue to be met for our future generations.
- We have established world-leading interim ambient air quality objectives for nitrogen oxides and sulfur oxides (NO_x and SO_x) for industry which includes the LNG sector.

BACKGROUND:

- Emissions from natural gas turbine power generation are potentially the largest source of emissions from LNG facilities.
- Canadian Ambient Air Quality Standards (CAAQS) have been adopted for fine particulate matter (PM_{2.5}) and ground-level ozone. CAAQS for nitrogen dioxide (NO₂) and sulfur dioxide (SO₂) are under development but not expected to be finalized until the fall of 2016 at the earliest.
- To bridge the gap until new national standards are available and to ensure that major new developments are assessed using objectives that reflect the current state of science, interim ambient air quality objectives (IAAQOs) for NO₂ and SO₂ were established in 2014 at 100 parts per billion of NO₂ and 75 parts per billion of SO₂ as the daily 1-hour maximum.
- The numeric limits of proposed CAAQS (1-hour) for 2020 and 2025 are lower than the interim objective. The Province has committed to review the interim objectives once new CAAQS are finalized.
- These objectives replace previous provincial and national objectives used in BC.
- In 2013, the Province funded a scientific study to help inform regulatory and policy development for future industrial activity in the Kitimat area. The study looked at cumulative effects of industrial air emissions, primarily sulphur and nitrogen oxides.
- The Kitimat Airshed Study determined that with proper management, Kitimat's airshed can safely accommodate LNG and other new industrial growth, while still protecting human health and the environment.
- In December 2014, the Province funded an independent science-based study to better understand the potential cumulative impacts from industrial air emissions in the Prince Rupert, building on information from the Kitimat Airshed Study.

Contact: Brian Hansen
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Date: April 8, 2016

Estimate Note: 20

Page 1 of 2

- These reports are helping to shape management strategies to protect air quality, human health and our overall environment.
- As part of the Environmental Assessment process, LNG proponents are required to conduct an impact assessment on air quality as well as a cumulative effects assessment.
- Ministry of Environment (MOE) has formed a dedicated team of expert staff to review all environmental aspects of LNG projects, including the setting of relevant emissions standards, supporting environmental assessment, and issuing the necessary construction permits. The Oil and Gas Commission (OGC) is responsible for permitting LNG plant operations under the *Oil and Gas Activities Act* and the *Environmental Management Act*.
- MOE staff has also been dedicated to collaboration and support of *Environmental Management Act* permitting, which, in this case, is the responsibility of the OGC as well as the sharing of information and expertise with the Ministry of Natural Gas Development.
- The Province has conducted discussions with most LNG proponents regarding the studies and data needed to properly predict potential environmental effects from air emissions at LNG facilities.

**MINISTRY OF NATURAL GAS DEVELOPMENT AND
MINISTER RESPONSIBLE FOR HOUSING
LNG TASK FORCE
ESTIMATES BRIEFING NOTE 2016/17**

ISSUE: Prince Rupert Airshed Assessment

KEY MESSAGES:

- We want to ensure emissions from any industrial development, including LNG, can be safely accommodated within the Prince Rupert airshed.
- This is why the Province funded an independent science-based study to better understand the potential cumulative impacts from industrial air emissions in the region.
- We are working closely with industry and stakeholders to ensure emissions from LNG development and the cumulative impacts to the airshed are managed effectively.
- We will ensure the highest environmental standards and health standards for the citizens of this province continue to be met for our future generations.
- Proponents are aware of the Prince Rupert Airshed Study and they have contributed their emissions information.
- The study will inform government with respect to the emissions profile of projects currently in the environmental assessment process as well as those in the permitting phase such as PNWLNG.
- Release of the final report is expected in Spring 2016.
- We are committed to working with our stakeholders and partners, including First Nations, to review their comments on the draft report prior to releasing the final report to the public.

BACKGROUND:

- On December 2, 2014, the Province issued a Request for Proposal (RFP) to conduct a study of the Prince Rupert airshed. The Province is funding this \$500,000 study to help inform future decisions on industrial development within the airshed while examining any potential environmental and health impacts.
- The successful proposal was put forward by ESSA Technologies of Vancouver, BC. This is the same contractor that conducted the Kitimat Airshed Assessment.

Contact: Brian Hansen
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Date: April 8, 2016

Estimate Note: 22

Page 1 of 2

- The study will include a thorough review and analysis of the cumulative effects of existing and proposed industrial air emissions from:
 - Six proposed LNG terminals (Pacific Northwest, Prince Rupert, WCC, Woodside, Aurora, Watson Island);
 - Existing and proposed Prince Rupert Port Authority development;
 - Gas turbine powered electrical generation facilities; and
 - Related rail and marine transportation.
- The study will assess the impact of emissions (Nitrogen Dioxide, Sulphur Dioxide and Particulate Matter 2.5) through seven scenarios or case studies, including their potential effects on surface water, soils, vegetation and human health.
- Conclusions from the study will be used to inform environmental assessment work as well as future permitting and regulatory decisions for LNG and other industrial proponents in the Prince Rupert airshed.
- The draft report was received by the ministry in March 2015 and has undergone a series of reviews, including reviews by technical experts, stakeholders and First Nations.
- This review identified issues that required further analysis including:
 - Emissions from the Port of Prince Rupert regulated facilities were not reflective of current emissions or standards possibly resulting in higher emissions. New data for the port is now available.
 - Non-LNG shipping numbers were not available at the time of the initial analysis, and now are available for consideration.
 - The addition of a base case scenario to show the difference between current emissions and predicted emissions.
 - LNG facility design and emissions information being updated.
- Release of the study is expected in Spring 2016.

**2nd Meeting of the PNW Working Group
Suite 504-800 Burrard St, Vancouver
or by Videoconference/Teleconference
Friday, July 24, 10:00 – 12:00 Draft meeting summary**

IN_ATTENDANCE: Carr, Steve, MNGD; Cheung, Alice, DFO; Clark, Brian, PNW; Coley, Simon, BC MNGD; Delany, Jim, NRCan; Gill, Tessa, PNW; Henderson, Mike, MPMO-W; Magnum, Al, on behalf of Bonnie Antcliffe, DFO; Murray, David, MPMO-W; O’Gorman, Erin, MPMO; Prystay, Ward, Stantec; Wongkee, Sarah, MPMO-W;

CHAIR: Henderson, Mike, MPMO-West

ACTION ITEMS:

1. s.13,s.16
- 2.
- 3.
- 4.
- 5.

MEETING SUMMARY:

Opening Remarks (M. Henderson)

- The [federal and provincial governments and proponents] should consider developing a clear vision; identify best practices and a governance structure for moving forward. A potential model to look to is where proponents, federal and provincial governments in Eastern Canada signed agreements on their intention to collaborate.
- S. Carr: Governance is an important consideration for the long term, but the opportunities for fish habitat work should be a higher priority as it will result in more immediate results.

1. Summary of current fish habitat related work by federal and provincial governments and Pacific Northwest

- Walked through the *PNW LNG Working Group – Summary of Fish Habitat Activities Draft for Discussion Purposes*.

Section 1.1—Fisheries and Oceans (DFO)/MPMO-W (A. Cheung)

- s.13,s.16

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Section 1.2—Province of British Columbia (S. Coley)

- Currently the Province is not funding any fish and fish habitat related initiatives in the Prince Rupert area, however, their regional offices are involved in several projects.
- M. Henderson – for this project we should maintain a narrow scope focused on Tsimshian related fish habitat work.

Section 1.3—Pacific Northwest LNG (B. Clark)

SAMRC update

- SAMRC has identified 3 key priority areas: Salmon, Eulachon, and Marine Mammals. Research on Eulachon is important because of a gap in the baseline sampling/knowledge required to determine potential impacts of development (about its lifecycle and behaviour).
- Salmon proposal for Upper Nass
- s.13,s.16

- There was discussion around how SAMRC and TESA (which Lax doesn't belong to) relate, however, that will remain unclear until TESA completes their work plan and conceptual framework.
- Need to work with both groups in short term, but would like to see inclusive collective in the long term
- S. Coley: there is a strong consensus within First Nations groups that we need to improve the information sharing capabilities within the research initiatives in the area (EAs, inventory work, baseline data).

PNW initiatives

- PNW is engaged with Tsimshian Nations to start an Eelgrass enhancement pilot project. S. Carr suggested PNW look to the successful work by TC- highways on Eelgrass projects.

- PNW has identified several areas for potential research that would satisfy the Fisheries act requirements in terms of complimentary initiatives, as well as those beyond regulatory requirements (for example hydrophones at mouth of Skeena River).

Engagement in the short-term

s.16

considerations of engaging with one nation at a time.

Section 2.0—Key gaps/challenges

- First Nations governance issues / political tensions
- Federal Strategic Partnership Initiative (SPI) funding program only for 5 years.
- While short-term habitat work is taking place in the Lower Skeena, no longer-term plan exists to address First Nations' interests.

Section 3.0—Joint opportunities related to fish and fish habitat

s.13,s.16

2. Status of Federal Cumulative Effects Project (Henderson)

s.13,s.16

3. ESI Update (S. Coley)

s.13,s.16

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4. TESA Update (M. Henderson)

s.13,s.16

5. Desired Outcome of “Environmental” Initiatives (covered in previous items)

6. Next Steps (see action items on pg. 1)

Page 5 to/à Page 9

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s.16;s.13

Page 1 to/à Page 3

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