

MINISTRY OF ENVIRONMENT INFORMATION NOTE

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PREPARED FOR: Deputy Minister Wes Shoemaker

ISSUE: LNG, industrial emissions and air quality in Northwest BC – Kitimat Airshed
Study and supporting documents to summarize the findings.

BACKGROUND:

Air quality and the related cumulative effects (CE) of multiple LNG project proposals have been the focus of public concern, particularly in the Kitimat and Prince Rupert regions. The potential for adverse effects to human health and the environment associated with industrial air emissions was recognized by government early on as a significant issue for LNG. To ensure BC LNG facilities are the cleanest in the world, government commissioned an independent assessment of the Kitimat Airshed and directed that industry be consulted on proposals to update provincial air quality management policies.

Contaminants linked to proposed LNG production include sulphur and nitrogen oxides (SO₂ and NO₂), small particulates and ozone. At increased levels, these contaminants can cause acidification and health impacts, including increased hospitalization and respiratory symptoms.

DISCUSSION:

Building on the comprehensive studies on SO₂ completed by Rio Tinto Alcan (RTA) in 2012, the independent Kitimat airshed assessment provided an initial overview analysis of the potential impacts of additional emissions of SO₂ and NO₂ from future development scenarios. Initial results have shown that SO₂ emissions are already causing acidification of some lakes¹ that will increase with added SO₂ and NO₂ emissions. In addition, even low levels of exposure to NO₂ is likely to cause an increase in human health effects beyond those predicted for SO₂ emissions. The report results are considered conservative, but indicate that increased industrial development could proceed with acceptable impacts to air quality in the Kitimat Airshed as long as proposed facilities treat their emissions.

Provincial staff have completed an industry consultation on the proposed updates to provincial emission standards for gas turbines and interim ambient air quality objectives, and provided recommendations to Cabinet. With the completion of the Kitimat Airshed Assessment, proponents, regulators, First Nations and stakeholders are awaiting an announcement on government's clean air policy.

¹ Rio Tinto Alcan Technical Assessment Report, SO₂ *Environmental Management Act* Permit Amendment, December 2012.

The Kitimat Airshed Assessment – Understanding Air Quality at the Airshed Level

The purpose of the Kitimat Airshed Effects Assessment was to improve our understanding of the potential impacts from emissions across a range of scenarios combining Liquefied Natural Gas and other proposed development (Black oil refinery and Enbridge). The Kitimat airshed is considered “sensitive” due to confined geography and a history of industrial emissions and has been the subject of previous studies on SO₂.

The draft report was reviewed by experts and government regulators during a two-day workshop March 28-29, 2014. A candidate list of revisions was compiled and prioritized to strengthen and clarify the report. The final revised report was received April 25, 2014. While technically complex, the study is still considered an initial assessment, and has been designed to allow for further investigation. Staff have drafted a 5 page and a 10 page companion document to summarize the final 500 page technical report.

The Province of BC previously indicated that the results of the airshed study would be made available to regulators, proponents and the public as information for related *Environmental Assessment Act* or *Environmental Management Act* applications. The local communities, stakeholders, proponents, and First Nations are awaiting the study results as the projected impacts are anticipated to inform regulatory requirements and policies for future industrial development in their airsheds. In addition the appellants in the Environmental Appeal Board hearing on the RTA modernization permit amendment have requested a copy of the study to be entered into evidence maintaining it would provide the most up-to-date information about emissions in the region. So far the study has been not been released as it has been cited as subject to crown privilege.

Interpretation of the Kitimat Airshed Assessment study may vary and due to policy implications are likely to be scrutinized in terms of thoroughness and methods. Throughout the study the most conservative assumptions were used as a precautionary measure, and added together in the final assessment this approach likely overestimates actual risk. Industry analysts may seek to use technical arguments related to the study to push back on proposed clean air policies, while FN and ENGO's may interpret the study to have more specific impacts to local communities and the environment than is reasonable.

The study was designed to consider specific Coastal First Nations (CFN) concerns regarding air quality and continue to build the relationship for future regulatory processes. It is unclear whether the study will address the interests of both CFN and the Haisla Nation. However it is likely that both First Nations, and ENGOs consider the policy direction for clean air as a more important outcome.

Ambient Air Quality Objectives

Currently BC does not have a clear set of ambient air quality objectives (AQOs)² for the principal air contaminants of concern - NO₂ and SO₂. AQOs are a necessary tool for assessing air quality impacts and guiding requirements in EA certifications and EMA

²AQOs are acceptable air quality levels for each contaminant to address risks to human health and the environment. AQOs are different from “end-of pipe” emission standards, as they apply to ambient air quality, and are non-statutory guidelines.

authorizations. The province is considering options to establish and apply interim ambient AQOs for NO₂ and SO₂ to all proposals for new development in BC. Interim ambient objectives would reflect levels implemented by leading jurisdictions (World Health Organization and US EPA) and be subject to review when the national standards become available in 2015. Government has completed a consultation with the LNG industry, and internal and external health agencies on the interim ambient AQOs and recommended interim guidelines that align with BC's commitment to the cleanest in the world LNG operations.

Gas Turbine Emissions Control Technology

Given advances in turbine and treatment technology, developments in other jurisdictions and the expectation of LNG development in BC; new up-to-date guidelines have been developed for proponents of LNG processing plants and power generating facilities. s.12,s.16

It is still possible that in future the combined impact of multiple sources of emissions in a given area could result in unacceptable ambient contaminant levels in the airshed. If this situation occurred it would likely lead to additional restrictions on all dischargers.

SUMMARY:

s.12

s.12 Increased levels of NO₂ are a human health concern, and the report shows that increased industrial facilities in a constrained airshed will impact human health and the environment. Treatment will be required to maximize the number of facilities that can be built.

Stakeholders, First Nations, the local communities in the Northwest and proponents are anticipating the release of the Kitimat airshed study. Ideally release of this report accompanies an announcement on emissions standards and air quality objectives that meet the goal of having the world's cleanest LNG facilities.

NEXT STEPS:

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3. Decide when and how the government will release the Kitimat Airshed Assessment final report.

Attachments:

1. PPT on Air Quality and the Kitimat Airshed
2. Kitimat Airshed Study Compendium (5 pages)
3. Kitimat Airshed Study Compendium (10 pages)
4. ESSA Kitimat Airshed Emission Effects Assessments Final Report

Contact:

*Jim Standen
Environmental Protection
Division
250-387-1288*

Alternate Contact:

*Anthony Danks
Strategic Policy Branch
ESSPD
250-387-8483*

Prepared by:

*Laura Feyrer
Strategic Policy Branch
ESSPD
250-387-9796*

Reviewed by	Initials	Date
DM		
DMO		
ADM		
Exec Director		
Director	LP	June 24, 2014
Author	LJF	June 24, 2014



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Air Quality and the Kitimat Airshed

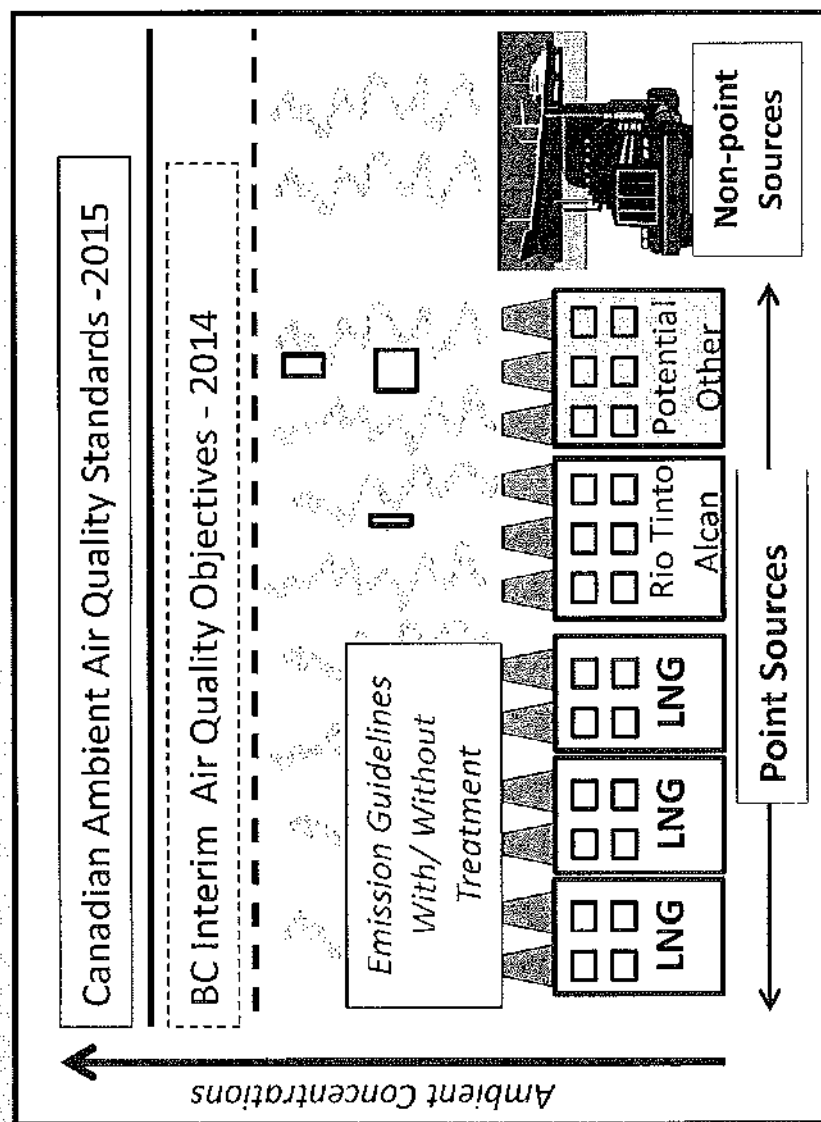


- The Kitimat airshed is considered sensitive due to its location in a long narrow valley and its history of industrial emissions
- This initial study used estimates of existing and proposed emissions to predict the potential effects of SO_2 and NO_2 in the airshed.



Kitimat Airshed Study Objectives

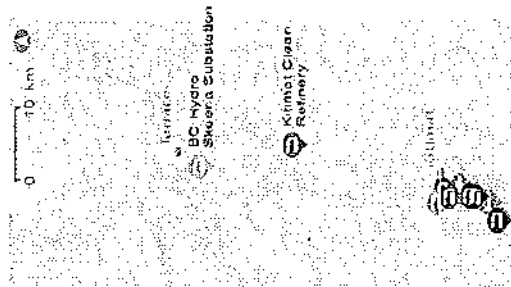
1. Builds on previous RTA air dispersion modelling;
2. Assess scenarios and impacts to environmental and human health
3. Better understanding of mitigation options for facilities in Kitimat; and
4. Establish a framework for research and potential issues in similar airsheds.





Industry Emissions Included in Scenarios

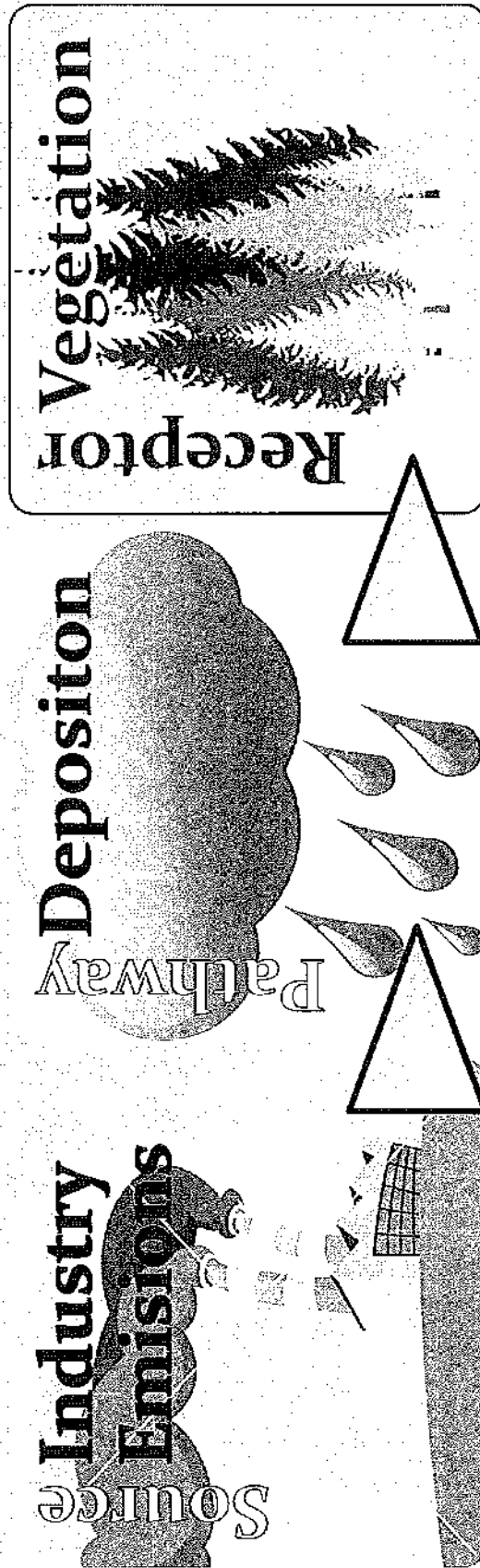
- Facility type
- Aluminum smelter
 - Electric generating facility
 - LNG terminal
 - Oil refinery
 - Port



- Existing aluminum smelter and the planned modernization,
- Four proposed LNG terminals,
- Proposed oil refinery,
- Gas turbine powered electrical generation facilities (BC Hydro),
- Predicted increases to marine shipping along Douglas Channel
- Future expected increases in road and rail traffic (background NO₂ concentrations)

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Understanding Receptors and Impacts



The “source” is the location where emissions are released.

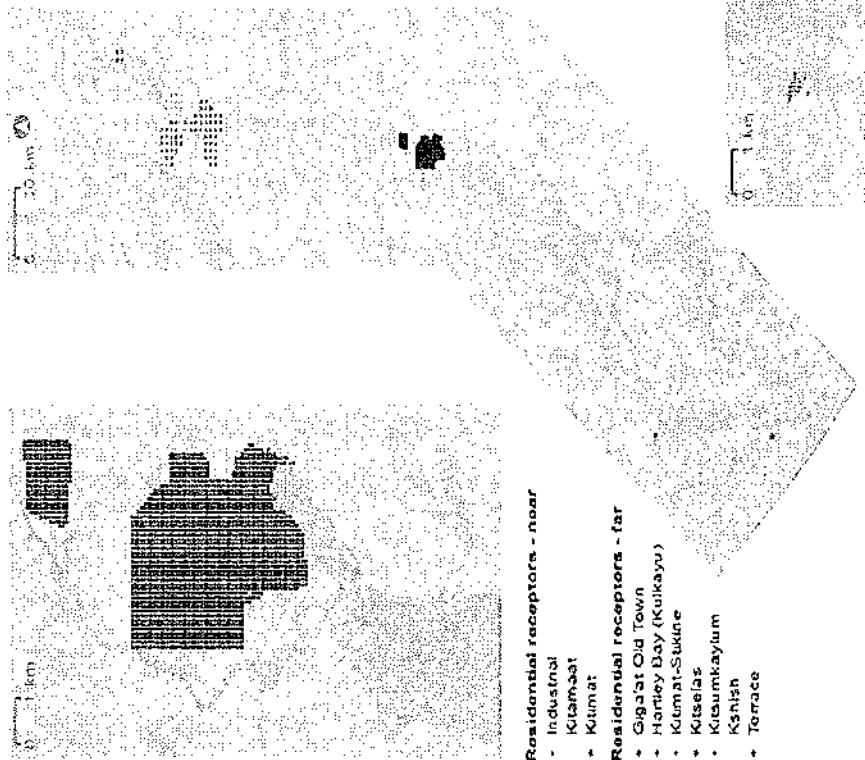
The “pathway” is the route a contaminant takes to its destination.

The “receptor” is the destination, which can include people and the environment.



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Human Health Effects



Contaminant concentrations were estimated for **10** locations and results were summarized in two groups:

- **Near:** Kitimat Industrial Service Centre, Kitimat, Kitimaat Village
- **Far:** Giga'at Old Town, Hartley Bay (Kulkayu), Kitimat-Stikine, Kitseles, Kitsumkaylum, Kshish, Terrace

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Risk Categorization of Potential Effects

Human Health Effects:	
Green	Air quality associated with "clean" environments
	Modelled air quality is below midpoint between green and red thresholds
Orange	Modelled air quality is above midpoint between green and red thresholds
Red	Modelled air quality exceeds the world leading Ambient Air Quality Standards

10/15/2014

Environmental Effects -Vegetation, Soils, & Lakes:	
Low	Scenario expected to have no, or negligible, impact
	Scenario expected to have an impact, but of a magnitude, frequency, and spatial distribution considered to be acceptable
High	Scenario expected to have an impact of a magnitude, frequency or spatial distribution, considered to be unacceptable; reducing uncertainties and refining assessment inputs may lower the risk
Critical	Scenario expected to have an impact of a magnitude, frequency or spatial distribution, considered to be extremely unacceptable ; reducing uncertainties and refining assessment is unlikely to lower the risk rating sufficiently to be considered acceptable



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Summary of Study Results - HUMAN HEALTH

<i>Emission Scenario</i>					
HUMAN HEALTH	Location	A (Low)	B (Low)	H (High)	I (High)
SO ₂ annual average	All			Orange	Orange
NO ₂ annual average	All				
SO ₂ hourly 99 th %ile	Near	Red	Red	Red	Red
SO ₂ Hourly 99 th %ile	Far				
NO ₂ Hourly 98 th %ile	Near	Orange	Orange	Orange	Orange
NO ₂ Hourly 98 th %ile	Far				

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Summary of Study Results - ENVIRONMENT

ENVIRONMENTAL RECEPTORS	<i>Emission Scenario</i>			
	A (Low)	B (Low)	H (High)	I (High)
Vegetation effects	Low	Low	Low	Low
Soil acidification	Low		High	High
Soil eutrophication	Low	Low		
Lake Acidification	Low	High	Critical	Critical

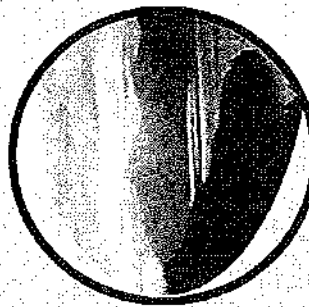


Integrating BC's Approach to Air Quality



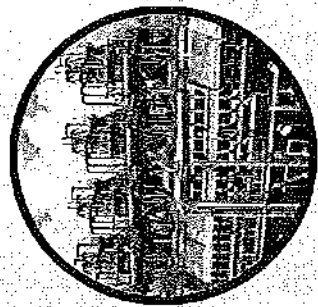
Kitimat Airshed Study

- Better understanding of mitigation options in the airshed
- Analyze impacts of new industry
- Informed by air quality science and world leading guidelines



Ambient Air Quality Objectives (AQO)

- Set acceptable levels of contaminants based on health science and leading jurisdictions
- Anticipate national air quality standards (2015)



Gas Turbine Emission Guidelines

- End of pipe: Reduce or treat emissions before they are released
- More stringent guidelines are being assessed

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Conclusion

- ✓ Study results support the provincial position that LNG facilities need to treat their emissions.
- ✓ The study is still considered an initial assessment, designed to allow for further investigation.
- ✓ Ongoing work in this area will continue to improve our understanding of the effects of emissions in the airshed.

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MINISTRY OF ENVIRONMENT INFORMATION NOTE

April 4, 2014
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PREPARED FOR: Deputy Minister Wes Shoemaker

ISSUE: LNG, industrial emissions and air quality in Northwest BC – Kitimat Airshed Study

BACKGROUND:

Air quality and the related cumulative effects (CE) of multiple LNG project proposals have been the focus of public concern, particularly in the Kitimat and Prince Rupert regions. The potential for adverse effects to human health and the environment associated with industrial air emissions was recognized by government early on as a significant issue for LNG. To ensure BC LNG facilities are the cleanest in the world, government commissioned an independent assessment of the Kitimat Airshed and directed that industry be consulted on proposals to update provincial air quality management policies.

Contaminants linked to proposed LNG production include sulphur and nitrogen oxides (SO₂ and NO₂), small particulates and ozone. At increased levels, these contaminants can cause acidification and health impacts, including increased hospitalization and respiratory symptoms.

DISCUSSION:

Building on the comprehensive studies on SO₂ completed by Rio Tinto Alcan (RTA) in 2012, the independent scoping level Kitimat airshed assessment evaluated the potential impacts of additional emissions of SO₂ and NO₂ from a number of future development scenarios. Initial results have shown that SO₂ emissions are already causing acidification of some lakes¹ that will increase with added SO₂ and NO₂ emissions. In addition, even low levels of exposure to NO₂ is likely to cause an increase in human health effects beyond those predicted for SO₂ emissions. The report results are considered conservative, but indicate that increased industrial development could proceed with acceptable impacts to air quality in the Kitimat Airshed as long as proposed facilities treat their emissions.

Provincial staff have completed an industry consultation on the proposed updates to provincial emission standards for gas turbines and interim ambient air quality objectives, and provided recommendations to Cabinet. With the completion of the Kitimat Airshed Assessment, proponents, regulators, First Nations and stakeholders are awaiting an announcement on government's clean air policy.

¹ Rio Tinto Alcan Technical Assessment Report. SO₂ Environmental Management Act Permit Amendment. December 2012.

Understanding Air Quality at the Airshed Level

The Kitimat airshed assessment took a scoping level approach to modelling the air quality impacts from a range of scenarios combining multiple LNG facilities with additional proposals (Black oil refinery and Enbridge). The local communities, stakeholders, proponents, and First Nations are awaiting the study results as the projected impacts are anticipated to inform regulatory requirements and policies for future industrial development in their airsheds. The Kitimat airshed is considered “sensitive” due to confined geography and a history of industrial emissions and has been the subject of previous studies on SO₂. As a result the Kitimat airshed was well positioned for further study on the additional impacts of LNG development. The Province of BC previously indicated that the results of the airshed study would be made available to regulators, proponents and the public as information for related *Environmental Assessment Act* or *Environmental Management Act* applications.

The draft report was reviewed by experts and government regulators during a two-day workshop March 28-29, 2014. A candidate list of revisions was compiled and prioritized to strengthen and clarify the report. The final revised report is due April 25, 2014. Staff are in the process of drafting a companion document to summarize the 300 page technical report and are considering the implications for public release of the full report.

Interpretation of the Kitimat Airshed Assessment results may vary and due to policy implications are likely to be scrutinized in terms of thoroughness and methods. Industry analysts may seek to use technical arguments related to the study to push back on the clean air policy, while FN and ENGO's may interpret the study to have more specific impacts to local communities and the environment than is reasonable.

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²AQOs are acceptable air quality levels for each contaminant to address risks to human health and the environment. AQOs are different from “end-of pipe” emission standards, as they apply to ambient air quality, and are non-statutory guidelines.

Gas Turbine Emissions Control Technology

In the past the BC Ministry of Environment has provided guidelines for gas turbine emissions to inform statutory decision makers. The Ministry issued guidelines for gas turbine emissions in 1992. Given advances in turbine and treatment technology, developments in other jurisdictions and the expectation of LNG development in BC; those guidelines were repealed in 2006 and new up-to-date guidelines have been developed for proponents of LNG processing plants and power generating facilities. It is anticipated that new guidelines for gas turbines used in the pipeline sector will follow at a later time.

Although industrial technology exists to treat or mitigate the emissions of LNG power turbines, additional treatment increases capital and operational costs due to related inefficiencies. These costs have been reviewed with industry and it is recognized that these costs are relative to facility size. Further consideration is being given to a size threshold for turbines requiring treatment s.12,s.16
s.12,s.16

Although guidance provided by the province sets discharge limits for individual gas turbines, it is still possible that in future the combined impact of multiple sources in a given area could result in unacceptable ambient contaminant levels in the airshed. If this situation occurred it would likely lead to additional restrictions on all dischargers.

SUMMARY:

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NEXT STEPS:

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3. Decide when and how the government will release the Kitimat Airshed Assessment final report.

Contact:*Jim Standen**Environmental Protection**Division**250-387-1288***Alternate Contact:***Anthony Danks**Strategic Policy Branch**ESSPD**250-387-8483***Prepared by:***Laura Feyrer**Strategic Policy Branch**ESSPD**250-387-9796*

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Author	LJF	April 4, 2014