OIL & GAS AIR PERMIT AUDIT COMPLIANCE REPORT

2017

Environmental Management Act





August 2017

Executive Summary

Air quality is one of the key components under the *Environmental Management Act (EMA)* and other regulations of the British Columbia (BC) Ministry of Environment and Climate Change Strategy (ENV) for the protection of human health and the environment. Science based evidence shows that human health is impacted by air pollutants (ENV 2014a). To protect human health and the environment by reducing air pollution, ENV has adapted the federal Air Quality Management System (AQMS) that measures air quality in BC communities against the Canadian Ambient Air Quality Standards (CAAQS) and BC Air Quality Objectives (AQOS). The AQMS pollutants measured are

- particulate matter with aerodynamic diameter less than 2.5 micrometers (PM_{2.5});
- sulphur dioxide (SO₂);
- ground level ozone (O₃); and
- various industrial emissions (BC Lung Association, 2016; Environment and Climate Change Canada, 2016).

The Peace region is a major centre for oil and gas activities related to the exploration, production, gathering, processing and transmission of oil and gas. They produce a variety of air emissions. ENV and the Oil & Gas Commission (Commission) regulate these emissions through authorizations under EMA and its relevant regulations. ENV has established a multi-phase project, the Northeast Air Quality Monitoring project, designed to monitor, report and assess ambient air quality in Northeast BC.

An audit was conducted of five Spectra gas plants' air permits for compliance with the regulations and the permit requirements.

The purpose of this audit was:

To evaluate the level of compliance with air permit requirements at five Spectra Gas Plants in the Peace region (Dawson Creek Processing Plant, Fort Nelson Gas Plant, Fort Nelson North Processing Facility, McMahon Gas Plant Taylor and Pine River Gas Plant) for the years 2013 to 2016.

Overall, a compliance rate of 50% was observed based on pooled data with the permit conditions of the five gas plants. The audit results determined that Spectra was out of compliance with some permit requirements such as maintenance of works, bypasses, unauthorized works and reporting requirements. As a result of the non-compliances, Spectra was issued five Advisories and two Warnings. The audit results revealed that ambient air quality monitoring programs were in place at all five sites; the monitoring equipment was functioning properly; up to date maintenance records were present onsite; and data and reports were submitted as required by the permits' timeline requirements.

Hydrogen sulphide (H_2S) values exceeded the AQOs limits, at the McMahon and Pine River Gas Plants in 2013 to 2015. Sulphur dioxide (SO_2) values did not exceed the AQOs at any of the audited processing facilities from 2013 to 2015.

It was observed that some sections of the permits need to be amended pertaining to equipment or processes that were unauthorized, decommissioned or no longer in use. The updated permits would reflect the correct equipment and be beneficial to have a more accurate compliance determination.

Given the results of the audit, the following recommendations have been made:

For the Oil and Gas Industry:

- 1. Operators regularly maintain equipment to avoid repeats of air audits or emergencies;
- 2. Develop a consistent reporting template and include the methodology for results;
- 3. Use best available technology to minimize/eliminate emissions to the environment; and
- 4. Ensure personnel and contractors understand permit requirements.

For Ministry of Environment and Climate Change Strategy Regional Operations Branch:

- 5. Have an air meteorologist conduct a follow up detailed ambient air audit for trends in air quality; and
- 6. Upgrade permits with similar common and enforceable requirements across the oil and gas sector.

General:

7. Continue to educate the general public about the air quality in the region.

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Introduction

- Air quality is one of the key components under the *Environmental Management Act (EMA)* and its regulations of the British Columbia (BC) Ministry of Environment and Climate Change Strategy (ENV) for the protection of human health and the environment. Science based evidence shows that human health is impacted by air pollutants (ENV 2014a). To protect human health and the environment by reducing air pollution, Air Quality Management System (AQMS) is being implemented across Canada that measures air quality in communities through the Canadian Ambient Air Quality Standards (CAAQS), Base-Level Industrial Emission Requirements (BLIERS), air zone management and increased collaboration and coordination across jurisdictional borders (ENV 2014a). The AQMS pollutants measured are:
- particulate matter with aerodynamic diameter less than 2.5 micrometers (PM_{2.5});
- sulphur dioxide (SO₂);
- ground level ozone (O₃); and
- various industrial emissions (BC Lung Association, 2016; Environment and Climate Change Canada, 2016).

Under the AQMS, BC is divided into seven air zones (ENV 2014a). An air zone is defined as an area exhibiting similar air quality characteristics, issues and trends. ENV has established a multi-phase project, the Northeast Air Quality Monitoring project, designed to monitor, report and assess ambient air quality in Northeast BC (ENV Fact Sheet 1). Figure 1 shows current and past locations of the ambient air monitoring stations for the Peace region.



Figure 1 – Current and past locations of continuous air quality monitoring stations in the Peace region

Under the authority of EMA, ENV developed Air Quality Objectives (AQOs) for BC. AQOs are nonstatutory limits and are not legally binding (ENV 2016b). These objectives are used to gauge air quality and guide environmental impact assessments, authorization decisions, and airshed planning (ENV 2016b). Historically ambient AQOs had three distinct tiers:

Tier 1: Level A was the maximum desirable air quality;

Tier 2: Level B was the maximum acceptable air quality; and

Tier 3: Level C was the maximum tolerable air quality.

However, ENV revised the AQOs (ENV 2016b). The interim BC ambient AQOs for hydrogen sulphide (H_2S) ; BC AQOs and Canadian Council of Ministers of the Environment (CCME) CAAQs for SO₂ (ENV 2016b) are presented in Table 1. Provincial objectives for total reduced sulphur (TRS) and H₂S were rescinded in 2006, but have been used as reference values.

Contaminant	Averaging Period	AQO/0	CAAQS
TRS as H ₂ S (Provincial –		μg/m³	ppb
purposes)	1-hour	7	5
	24-hour	3	2

Table 1 – Applicable H₂S and SO₂ AQOs and CAAQS

	Annual mean	-	
SO ₂ (Provincial)	1-hour*	196	75
	24-hour	-	
	Annual mean**	13	5
SO ₂ (CCME - Federal) Effective 2020	1-hour***	183	70
	Annual mean****	13	5

Achievement based on annual 97th percentile of D1HM averaged over 2015-2017, annual 97.5th percentile of D1HM averaged over 2016-2018 and annual 98th percentile of D1HM averaged over 2017-2019, with one allowable excursion above 75 ppb to a maximum of 85 ppb over a three-year period prior to 2020. Superseded by CAAQS level and metric January 1, 2020.

** Achievement based on annual average of 1-hour concentrations over one year, effective January 1, 2020. Used to inform new air management decisions beginning January 1, 2017 and all air management decisions beginning January 1, 2020.

*** The 3-year average of the annual 99th percentile of the SO₂ daily maximum 1-hour average concentrations

**** The arithmetic average over a single calendar year of all 1-hour average SO₂ concentrations

The Ministry of Health (MoH) initiated a human health risk assessment study in 2012 in the Peace region. The study concluded that oil and gas activities in the region have a low probability of health impacts (MoH 2015). According to the Work Safe BC, for H₂S the maximum short exposure ceiling limit in BC is 10 parts per million (ppm) (Work Safe BC 2016).

Background

The Peace region is a major centre for oil and gas activities related to the exploration, production, gathering, processing and transmission of oil and gas. These activities produce large volumes of a variety of air emissions. ENV and the Oil & Gas Commission (Commission) regulate these emissions through authorizations under EMA and its relevant regulations.

Recently, Enbridge purchased Spectra/Westcoast Energy. For the purpose of this report Enbridge Spectra/Westcoast Energy will be referred to as Spectra.

Spectra operates pipelines, gas processing plants and booster/compressor stations in BC. Spectra, on its website, states "BC Field Services is a gathering and processing system, gathering raw gas from as far north as the Yukon and southern Northwest Territories, with a daily processing capacity of 2.2 billion cubic feet. BC Pipeline's infrastructure stretches across the entire length of the province from Fort Nelson to the Canada/US border, and is capable of transporting 2.4 billion cubic feet of natural gas per day" (Enbridge Westcoast Energy Inc., 2017). "Transporting approximately 55% of the gas produced in the province, our pipeline business has been the backbone of B.C.'s natural gas industry since its inception" (Spectra 2017).

The main environmental and human health concerns in the region are the release of several pollutants from oil and gas activities which include: particulate matter (PM), nitrogen dioxide (NO₂), sulphur

dioxide (SO₂), volatile organic compounds (VOCs), formaldehyde (CH₂O), hydrogen sulphide (H₂S) and odours from emissions (ENV 2017). SO₂ is a colourless gas with an acrid odour which results from the combustion of sulphur-containing fuels (Figure 2). H₂S is a significant component of Total Reduced Sulfur (TRS) from oil and gas activities. TRS is a mixture of sulphur gases which smells like rotten eggs at very low concentrations. Both H₂S and TRS are monitored in the Peace region. PM is classified as inhalable particulates that are < 10 micrometres (μ m) in diameter and respirable particulates that are < 2.5 μ m in diameter (Figure 2).



Figure 2 – Sulphur dioxide (SO₂) molecule and PM2.5 particles under a microscope (ENV Fact Sheets 1 & 2)

Similar to the oil and gas sector, there are other industrial sectors that may release potentially detrimental air emissions. Therefore, there is an ongoing concern with BC air quality due to continued growth in the industrial and domestic sectors, for example, increase oil and gas activities, vehicles, woodstove burning, etc.

In response to these concerns, an audit of five Spectra gas plants air permits was conducted for compliance with the regulations and the permit requirements.

The purpose of this audit was:

To evaluate the level of compliance with air permit requirements at five Spectra Gas Plants in the Peace region (Dawson Creek Processing Plant, Fort Nelson Gas Plant, Fort Nelson North Processing Facility, McMahon Gas Plant Taylor and Pine River Gas Plant) for the years 2013 - 2016.

The objectives of the audit were to:

- 1. Determine if ambient air monitoring programs were in place as per the respective authorization requirements and determine if Spectra was submitting the data as per the required timelines and formats.
- 2. To determine compliance and if Spectra was following the requirements of its permits.
- 3. Perform site visits to assess if monitoring equipment was functioning properly and the Maintenance of Works records were on site.
- 4. Determine if permit sections needed to be updated to reflect current standards.

Requirements

ENV regulates waste discharge through permits, approvals, and codes of practice under EMA. Pertinent requirements from EMA and Spectra's air permits are presented below.

Environmental Management Act: Waste disposal

Section 6

(2) Subject to subsection (5), a person must not introduce or cause or allow waste to be introduced into the environment in the course of conducting a prescribed industry, trade or business.

(3) Subject to subsection (5), a person must not introduce or cause or allow to be introduced into the environment, waste produced by a prescribed activity or operation.

(4) Subject to subsection (5), a person must not introduce waste into the environment in such a manner or quantity as to cause pollution.

(5) Nothing in this section or in a regulation made under subsection (2) or (3) prohibits any of the following:

(a) the disposition of waste in compliance with this Act and with all of the following that are required or apply in respect of the disposition:

- (i) a valid and subsisting permit;
- (ii) a valid and subsisting approval;
- (iii) a valid and subsisting order;
- (iv) a regulation;

(v) a waste management plan approved by the minister.

Air Permit Conditions:

Each of the five audited Spectra facilities has an authorization for air waste discharge. The waste discharge requirements are variable depending on the processes at each facility. The common permit requirements are as below:

- 1. Sulphur Recovery Requirements
- 2. Sampling Facilities
- 3. Maintenance of Works
- 4. Bypasses
- 5. Process Modifications
- 6. Ambient Air Monitoring

7. Reporting

Audit Inspections

Five major Spectra gas plants among 16 operating Spectra gas plants across northeastern BC were selected for the audit project (Table 2) and (Figure 3).

Plant Name	Location	Permit	Coordinates
Spectra Fort Nelson Gas			Latitude: 58° 39' 14.42"
Plant	Fort Nelson	PA – 1555	Longitude: 122° 41′ 18.99″
Spectra McMahon Gas			Latitude: 56° 08′ 44.35″
Plant	Taylor	PA – 1742	Longitude: 120° 40' 09.79"
Spectra Pine River Gas			Latitude: 55° 34' 21.53"
Plant	Chetwynd	PA – 5151	Longitude: 121° 56' 40.54"
Spectra Dawson Creek			Latitude: 55° 47′ 35.90″
Processing Plant	Dawson Creek	PA – 105656	Longitude: 120° 31' 22.41"
Spectra Fort Nelson North	75 km north of Fort		Latitude: 59° 12′ 06.18″
Processing Facility	Nelson	PA – 105748	Longitude: 121° 35′ 06.58″



Figure 3 – Locations of five Spectra Gas Plants

Audit Approach

The formal audit consisted of two components:

1. A desktop review of all permit requirements, submitted monthly reports, non-compliance

reports, dangerous goods information records (DGIRs), and ENV Air Quality Section audit reports from 2013 to 2016. Also, the reporting format was reviewed to determine if it was acceptable to the Director.

2. Site visits for a formal audit

The lead auditor conducted onsite inspections in September – October 2016. During the onsite inspections the permitted discharge locations and equipment were inspected by touring the whole site. Observations were made during the onsite inspections to verify that the permitted equipment was in place and functional, and maintenance records were reviewed.

COMPLIANCE DETERMINATIONS

In order to determine the compliance, one of the following four compliance determinations was assigned for each section of the permits assessed. The four determinations used in the audit are defined as:

- 1. In Facilities met the requirements of sections and/or subsections of the permit.
- 2. **Out** Facilities did not meet the requirements of sections and/or subsections of the permit.
- 3. Not Applicable Facilities equipment or process that was decommissioned or no longer in use.
- 4. Not Determined Incomplete information.

COMPLIANCE/ENFORCEMENT RESPONSE DETERMINATIONS

A final ENV compliance/enforcement response was determined based on the non-compliances with the permit requirements observed during site inspection and desktop review. Non-compliances and final compliance/enforcement responses were described and summarized in an inspection record for each permit which was sent to Spectra.

Each of the five Spectra gas plants has its own individual air permit with specific requirements. Therefore, each individual gas plant was assessed based on the requirements of its air permit. A final decision on what the appropriate compliance/enforcement response for individual facility was based on a consideration of the Non-Compliance Decision Matrix of ENV's *Compliance and Enforcement Policy and Procedure, Version 3, 2013* (Appendix 1) and the Officer's professional judgement.

An overall response after the compliance determinations resulted in one of the following:

- 1. Notice Facility was in compliance with permit requirements.
- 2. Advisory Facility was in minor non-compliance with permit requirements.
- 3. Warning Facility was in major non-compliance with permit requirements.

Results of the Audit

Overall, Spectra was in compliance with 50% of audited permit requirements. The audit results revealed that: ambient air monitoring programs were in place at all five sites; the monitoring equipment was functioning properly; up to date maintenance records were present onsite as required by the permit. The audit results determined that Spectra was out of compliance with some permit requirements such as maintenance of works, bypasses, unauthorized works and reporting requirements.

It was determined that Spectra submitted all pertinent reports (i.e. monthly, quarterly, annual report depending on the permit requirements) and data as per the permit requirements. However, some reports were missing required elements. An inconsistent reporting format was observed from permit to permit. The inconsistencies included no table numbers, no reference to the permit section or subsection, no titles of the tables or figures and methodology used to obtain results, etc. Also, data were not reported for the active ambient air monitoring station at the Dawson Creek Gas Processing Plant permit PA-105656.

It was observed that some of the permits require amendments in sections pertaining to equipment or processes that were unauthorized, decommissioned or no longer in use. The updated permits would reflect the correct equipment and be beneficial to have a more accurate compliance determination.

Following are the audit results for individual Spectra facilities:

Fort Nelson Gas Plant

The discharge of air contaminants from the Fort Nelson Gas Plant is authorized under Permit PA-1555 (Appendix 2). The Fort Nelson Gas Plant was in compliance with the following permit requirements at all times: sulphur discharge (subsections 1.1.2, 1.1.3), sampling facilities (section 5), ambient monitoring (subsection 9.5) and reporting (section 10) (Figure 4). The Fort Nelson Gas Plant was out of compliance for permit requirements ranging from 33% to 50% of the time for 3-month rolling sulphur recovery (subsection 1.1.1), maintenance of works and emergency procedures (section 6) and bypasses (section 7) (Figure 4).



Figure 4 – Fort Nelson Gas Plant compliance with the air permit PA-1555 requirements

Overall, the Fort Nelson Gas Plant was in compliance 85% of the time in 2015 and 66% in 2016. Also, in 2016, it was out of compliance with 9% of the permit requirements (Figure 5). No inspections were conducted during 2013 and 2014. Inspections conducted at the Fort Nelson Gas Plant in 2015 and 2016 resulted in two Notices of Compliance for meeting the requirements and an Advisory of Non-Compliance due to Spectra not meeting the requirements of its permit conditions.



Figure 5 – Results of the compliance inspections of Fort Nelson Gas Plant

Ambient Air Monitoring

Data for H₂S and SO₂ from three passive ambient air monitoring stations were reviewed from 2013 to 2016. The ambient air monitoring stations were located at Fort Nelson Townsite, Fort Nelson First Nation's Office, and Jackfish Creek (Figure 6). An example of a passive ambient monitoring station is shown in Appendix 3.



Figure 6 – Locations of the passive ambient air monitoring stations in Fort Nelson

In 2013, analytical data showed the detection of H_2S at Fort Nelson Townsite and Fort Nelson First Nation's Office locations, but it did not exceed the AQOs. Also, in 2013 the SO₂ levels were recorded at all three monitoring stations but were below the AQOs. Data revealed that there had been no H_2S and SO₂ spikes at any location after 2013 (Figures 7 and 8).



Figure 7 – Analytical results for average H₂S levels for Fort Nelson Gas Plant



Figure 8 – Analytical results for average SO₂ levels for Fort Nelson Gas Plant

A review of the ENV Air Auditor's reports, from 2013 to 2016, revealed that Fort Nelson Gas Plant passed all stack audits (ENV Air Audit Reports 2016), suggesting that the audited equipment performed within acceptable parameters (ENV 2009).

Suggested Permit Improvement/Amendments:

The Permittee is encouraged to apply for a permit amendment for the suggested improvements to have an updated permit in place (Table 3).

Existing Permit Section	Suggested Amendment
Section 1.1.1: The overall gas plant in accordance with Section 10.4 below	Section 10.4 does not exist in the permit and it should refer to Section 9.4.
Section 2: All of the specific authorized defined in sub- Section 1	defined in Section 1
Sections 2.4; 2.7; 2.10; 2.11 and 3	The Permittee may wish to apply for a permit amendment for these sections as identified in the inspection records.
Section 6:	May be split into two sections by making the spill reporting as a separate section

Table 3 – Suggested Permit Amendments for Permit PA-1555

McMahon Gas Plant

The discharge of air contaminants from the McMahon Gas Plant is authorized under air Permit PA-1742. The McMahon Gas Plant was in compliance with the following permit requirements at all times: discharge of sulphur (subsection 1.2), sampling facilities (subsection 3.2), Stack sampling (subsection 4.1.2) and reporting (subsection 4.9) (Figure 9).

The McMahon Gas Plant was out of compliance with permit requirements 33% for minimum sulphur recovery (section 1.1), 50% with bypasses (subsection 3.3) and ambient monitoring (subsection 4.5.2), 65% with process modification (subsection 3.4), and 100% with maintenance of works, emergency procedures and non-compliance reporting (subsection 3.5) (Figure 9).



Figure 9 – McMahon Gas Plant compliance with the air permit PA-1742 requirements

Overall, the McMahon Gas Plant was in compliance with the inspected permit requirements 80% of the time in 2015 and 66% in 2016. Also, in 2016, the McMahon Gas Plant was out of compliance with 15% of the permit requirements (Figure 10). No inspections were conducted during 2013 and 2014. Inspections conducted at the McMahon Gas Plant in 2015 and 2016 resulted in one Notice of Compliance, one Advisory and one Warning due to Non-Compliance with the permit conditions and regulations.



Figure 10 – Results of the compliance inspections of McMahon Gas Plant

Ambient Air Monitoring

Spectra reported data for H₂S and SO₂ from two active ambient air monitoring stations from 2013 to 2015 which was reviewed. The ambient air monitoring stations are located at Taylor Townsite, and Taylor South Hill (Figure 11). An example of an active ambient air monitoring station is shown in Appendix 3.



Figure 11 – Locations of the two active ambient air monitoring stations in Taylor for PA-1742

 H_2S exceedances for short durations were observed at the Taylor Townsite from 2013 to 2015 when compared to the AQOs. H_2S exceedances were observed at the Taylor South Hill site only in 2014. The H_2S exceedances could be the result of prevailing weather conditions, authorized works maintenance, combined emissions from all industries in the area, etc. H_2S is considered to be a potential contributing source of odour in Taylor.

No exceedances for SO₂ values were observed at either the Taylor Townsite or Taylor South Hill ambient air monitoring stations from 2013 to 2015 when compared to the AQOs.

A review of the ENV Air Auditor's audit reports, from 2013 to 2016, revealed that the McMahon Gas Plant passed all ambient monitor and stack audits except:

- The Continuous Emission Monitor Train 2 could not be done due to frozen winch to haul up the stack on Nov 20, 2013, and on April 27, 2016, due to broken hoist for lifting audit equipment (but it passed at the repeat audit).
- 2. South Hill continuous ambient monitor due to massive leak in connections on Nov 21, 2013 (ENV 2016a).

Based on (ENV 2016a), it is suggested that Spectra properly maintain the equipment to avoid any repeats of the air audits.

Suggested Permit Improvement/Amendments:

The Permittee is encouraged to apply for a permit amendment for the suggested improvements to have an updated permit in place (Table 4).

Table 4 – Suggested Permit Amendments for Permit PA-17	742
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Existing Permit Section	Suggested Amendment
Section 1	Add the EMS number E211793
Sections 2.6; 2.9; 2.10; 2.11; 2.12	The Permittee may wish to apply for a permit amendment for these sections as identified in the inspection records
Section 3.4	Add the unauthorized back up diesel water pump at the water pump house to the air permit
Section 3.5	May be split into two sections by making the spill reporting as a separate section

Pine River Gas Plant

Air discharges from the Pine River Gas Plant are authorized under the air Permit PA-5151. The Pine River Gas Plant was in compliance with the following permit requirements at all times: process modification (section 3.4), stack sampling (subsection 4.1.2), and receiving environment monitoring (section 4.5) (Figure 12). However, the Pine River Gas Plant was out of compliance ranging from 33% to 100% for the

following permit requirements: 50% for the overall three month rolling average sulphur recovery efficiency (section 1.1), bypasses (section 3.3), and continuous monitoring (subsection 4.1.1); 33% for maintenance of works and emergency procedures (section 3.2), and 100% for reporting (section 4.7) (Figure 12).



Figure 12 – Pine River Gas Plant compliance with the air permit PA-5151 requirements

The Pine River Gas Plant was in compliance 86% of the time in 2015 and 67% of the time in 2016. Also, in 2016, non-compliances were observed with 24% of the permit requirements (Figure 13). No inspections were conducted during 2013 and 2014. Inspections conducted at the Pine River Gas Plant in 2015 and 2016 resulted in two Notices of Compliance and one Advisory due to Non-Compliance with the permit conditions and regulations.



Figure 13 – Results of the compliance inspections of Pine River Gas Plant

Ambient Air Monitoring

Spectra reported data for H₂S and SO₂ from two active ambient air monitoring stations from 2013 to 2015 which was reviewed. The ambient air monitoring stations were located at Pine River Gas Plant, and Hassler Community (Figure 14).



Figure 14 – Locations of the two active ambient air monitoring stations for PA-5151 Pine River

A decline in the number of H₂S exceedances was observed, as compared to the AQOs, at the Pine River Gas Plant.

No exceedances for SO_2 were observed at either the Pine River Gas Plant or Hasler Community sites from 2013 to 2015 when compared to the AQOs.

A review of the (ENV 2016a) from 2013 to 2016 revealed that the Pine River Gas Plant passed all ambient monitor and stack audits except the Continuous Emission Monitor Gas Plant Stack failed on April 27, 2016 (but it passed at the repeat audit). Based on the (ENV 2016a), it is suggested that Spectra properly maintain the equipment to avoid any repeats of the air audits.

Suggested Permit Improvement/Amendments:

The Permittee is encouraged to apply for a permit amendment for the suggested improvements to have an updated permit in place (Table 5).

Existing Permit Section	Suggested Amendment
Section 3.2	May be split into two sections by making the spill reporting as a separate section.
Section 3.5: Refers to Operations Procedures for	Spectra has an updated version dated May 4,
Gas Flaring, March 31, 1999.	2001. A permit amendment is required to reflect
	the correct version.
Sections 3.1 and 4.1	The Permittee may wish to apply for a permit
	amendment for these sections as identified in the
	inspection records

Table 5 – Suggested Permit Amendments for Permit PA-5151

Dawson Creek Processing Plant

Air discharges from the Dawson Creek Processing Plant are authorized under air Permit PA-105656. Dawson Creek Processing Plant was in compliance with the following permit requirements at all times: bypasses (section 2.3), spill reporting (section 2.4), inlet gas composition (section 3.1), flaring (section 3.2), passive monitoring (subsection 3.4.1), reporting (subsections 3.9.1 and 3.9.2) (Figure 15).

The Dawson Creek Gas Plant was out of compliance ranging from 33% to 100% with the following permit requirements: 100% for process modification (section 2.5) and generator emission testing (section 3.3); 33% for vapour recovery unit (section 2.9), and continuous monitoring (subsection 3.4.2) (Figure 15).



Figure 15 – Dawson Creek Gas Plant compliance with the air permit PA-5151 requirements

The Dawson Creek Processing Plant was 83% in compliance in 2016 with the inspected permit requirements. Also, for 50% of the requirements in 2013 and 9% of the requirements in 2016, the facility was out of compliance (Figure 16). No inspections were conducted during 2014 and 2015. Inspection conducted at the Dawson Creek Processing Plant in 2013 resulted in one Notice of Compliance with the permit conditions and regulations. However, the Notice of Compliance should have been an Advisory of Non-Compliance as non-compliances were observed during the site inspection. Inspections conducted in 2016 resulted in an Advisory and a Warning of Non-Compliance due to Spectra not meeting the requirements of their permit conditions and regulations.



Figure 16 – Results of the compliance inspections of Dawson Creek Gas Plant

Ambient Air Monitoring

Analytical data for H₂S and SO₂ were reviewed from 2013 to 2016 for five passive ambient air monitoring stations located at different spots around the gas plant (Figure 17).



Figure 17 – Locations of the five passive and one active air monitoring stations

No exceedances for H_2S and SO_2 were observed from any passive monitoring stations when compared to the AQOs (Figures 18 and 19). Data were not reported for the active ambient air monitoring station located on Mason Road.



Figure 18 – Analytical results for average H₂S for Dawson Creek Gas Plant



Figure 19 – Analytical results for average SO₂ for Dawson Creek Gas Plant

Suggested Permit Improvement/Amendments:

The Permittee is encouraged to apply for a permit amendment for the suggested improvements (Table 6) to have an updated permit in place.

Existing Permit Section	Suggested Amendment
Subsection 1.7.3 Refers to sub-section 1.7.4 as 1.74.	Should be amended to reflect 1.7.4
Section 2.5: Unauthorized works	Two unauthorized building furnaces need to be on air permit 105656.

Table 6 – Suggested Permit Amendments for Permit PA-105656

Fort Nelson North Processing Facility

Air discharges from the Fort Nelson North Processing Facility are authorized under Permit PA-105748. The Fort Nelson North Processing Facility was in compliance with the following permit requirements at all times: spill reporting (section 2.4), process modification (section 2.5), fugitive emission management (section 2.6), monitoring and reporting (sections 3.1, 3.2, 3.3, 3.4, 3.5, and 3.11.2).

On the other hand, Fort Nelson North Processing Facility was out of compliance: 50% for maintenance of works (section 2.2) and bypasses (section 2.3); and 100% for reporting (section 3.11.1) (Figure 20).



Figure 20 – Fort Nelson North Processing Facility compliance with the air permit PA-105748 requirements

The Fort Nelson North Processing Facility was in compliance with 63% of the inspected permit requirements in 2016. Also, in 2016, 10% non-compliances were observed with the permit requirements (Figure 21). No inspections were conducted from 2013 to 2015. Inspections conducted at the Fort Nelson North Gas Plant Facility in 2016 resulted in a Notice of Compliance with the permit conditions



and regulations and an Advisory of Non-Compliance due to Spectra not meeting the permit requirements.

Figure 21 – Results of the compliance inspections of Fort Nelson North Processing Facility

Ambient Air Monitoring

Data for sulphur dioxide (SO_2) , from five passive ambient air monitoring stations located at different spots around the gas plant, were reviewed from 2013 to 2016 (Figure 22).



Figure 22 – Locations of passive monitoring stations at Fort Nelson North Processing Facility



No exceedances for SO_2 were observed at any monitoring stations as compared to the AQOs (Figure 23).

Figure 23 – Analytical results for average SO₂ for Fort Nelson North Processing Facility

Suggested Permit Improvement/Amendments:

The Permittee is encouraged to apply for a permit amendment for the suggested improvements to have an updated permit in place (Table 7).

Table 7 – Suggested Permit Amendments for Permit PA-105748

Existing Permit Section	Suggested Amendment
Subsection 3.11.2: The sub-section numbers are	A permit amendment is required to reflect the
incorrectly written as 3.10.2.1, 3.10.2.2, 3.10.2.3	correct subsection numbers as 3.11.2.1, 3.11.2.2.,
and 3.10.2.4.	3.11.2.3 and 3.11.2.4.

Compliance Summary

Five Spectra gas plant facilities, representing 31%, out of a total of 16 processing facilities in BC were audited to determine compliance with their ambient air monitoring permits between 2013 and 2016. A compliance rate of 50% was observed based on pooled data (Figure 24). The overall compliance response rate was 50% Notice of Compliance, 36% Advisory and 14% Warning of Non-Compliance (Figure 25).



Figure 24 – Overall compliance for Spectra based on five audited air permits



Figure 25 – Percentage of compliance response based on five audited air permits

A comparison of onsite inspections and office review inspections revealed that Spectra was in compliance with 78% of the permit requirements during onsite inspections and out of compliance with 22% of the permit requirements. As a result of the office review inspections all audited facilities were found to be out of compliance with some of their permit requirements from 2013 - 2016 (Figure 26).



Figure 26 – Comparison of onsite vs office review inspections

An overall comparison based on compliance from 2013 to 2016 among the five Spectra gas plants was made. The compliance data revealed no apparent difference among the five plants for their air permit compliance (Figure 27).



Figure 27 – Compliance performance of five Spectra gas plants

Conclusions/Recommendations

An ambient air quality monitoring audit was conducted for five Spectra gas plants in the Peace region of BC. The purpose of this audit was:

To evaluate the level of compliance with ambient air permit requirements at five Spectra Gas Plants in the Peace region (Dawson Creek Processing Plant, Fort Nelson Gas Plant, Fort Nelson North Processing Facility, McMahon Gas Plant Taylor and Pine River Gas Plant) for the years 2013 - 2016.

Overall, a compliance rate of 50% was observed based on pooled data with the permit conditions of the five audited gas plants. The audit results determined that Spectra was out of compliance with some permit requirements such as maintenance of works, bypasses, unauthorized works and reporting requirements. As a result of the non-compliances, Spectra was issued five Advisories and two Warnings of Non-Compliance. The audit results revealed that Spectra was in compliance at all five sites for requirements such as ambient air quality monitoring programs in place; the monitoring equipment were functioning properly; up to date maintenance records were present onsite; and data and reports were submitted as required by the permits timeline requirements.

It was determined that Spectra submitted all pertinent reports (i.e. monthly, quarterly, annual report depending on the permit requirements) and data as per the permit requirements. However, some reports were missing permit reporting requirements. An inconsistent reporting format was observed from permit to permit. The inconsistencies included no table numbers, no reference to the permit section or sub-section, no titles of the tables or figures and methodology used to obtain results, etc. Also, data were not reported for active ambient air monitoring station for the Dawson Creek Gas Processing Plant permit PA-105656.

It was observed that some of the permits require amendments in sections pertaining to equipment or processes that were unauthorized, decommissioned or no longer in use. The updated permits would reflect the correct equipment and be beneficial to have a more accurate compliance determination.

Given the results of the audit, the following recommendations have been made:

For the Oil and Gas Industry:

- 1. Operators regularly maintain equipment to avoid repeats of air audits or emergencies;
- 2. Develop a consistent reporting template and include the methodology for results;
- 3. Use best available technology to minimize/eliminate emissions to the environment; and
- 4. Ensure personnel and contractors understand permit requirements.

For Ministry of Environment and Climate Change Strategy Regional Operations Branch:

5. Have an air meteorologist conduct a follow up detailed ambient air audit for trends in air quality; and

6. Upgrade permits with similar common and enforceable requirements across the oil and gas sector.

General:

7. Continue to educate the general public about the air quality in the region.

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Appendix 1 – Non-Compliance Decision Matrix

Non-Compliance Decision Matrix

The Non-Compliance Decision Matrix is a risk-based guidance tool for assessing the variability and severity of factors influencing the selection of compliance tools.

These factors include:

- escalating levels of environmental, human health or safety impacts; and
- diminishing likelihood of achieving compliance

The Non-Compliance Decision Matrix helps to ensure a consistent and principled approach to assessing and responding to regulatory non-compliance; it is to be used with discretion by ministry staff when considering the context and specifics of individual cases of non-compliance.

		ESCALATING ENVIRONMENTAL, HUMAN HEALTH OR SAFETY (ACTUAL OR POTENTIAL)				
		LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
PLY)	CATEGORY A (HIGH)	Advisory	ADVISORY - WARNING	WARNING - ORDER - ADMIN SANCTION -	ORDER - ADMIN SANCTION - AP - INVESTIGATION	
PLIANCE PACITY TO CON	CATEGORY B	ADVISORY - WARNING	WARNING - AP	AP - INVESTIGATION		
OOD OF COM	CATEGORY C	WARNING - AP	WARNING - ORDER			
DIMINISHING LIKELIH (COMPLIANCE HISTORY/WILLING	CATEGORY D	WARNING - ORDER - ADMIN SANCTION - AP	- ADMIN SANCTION - AP - INVESTIGATION	INVESTIGATION Note: An investigation is always necessary prior to issuance of a ticket, recommendation of formal charges or use of restorative justice therefore these tools are not shown on the matrix. Depending on the outcome, an investigation could also culminate in the issuance of a warning, administrative sanction or penalty, or an order.		essary r use of ools are on the
	CATEGORY E (LOW)	ORDER - ADMIN SANCTION - AP - INVESTIGATION				also ning, or an

Categories of Likelihood of Compliance

Categories of Likelihood of Compliance

(Compliance History/Willingness and Capacity to Comply)

- CATEGORY A Indications of future and ongoing compliance are very high
- No previous occurrences of non-compliance;
- · Good demonstrated awareness of and/or capacity to meet regulatory requirement; and/or
- Offender has a reasonable and cooperative attitude.

CATEGORY B - Indications of future and ongoing compliance are uncertain

- Few previous occurrences of non-compliance; and/or
- Questionable awareness of and/or capacity to meet regulatory requirement.

CATEGORY C - Indications of future and ongoing compliance are unlikely

- Numerous previous occurrences of non-compliance; and/or
- Little or no awareness of and/or capacity to meet regulatory requirement.

CATEGORY D - No indication of future and ongoing compliance

- Wilful violation of ministry regulatory requirement; and/or
- Little or no demonstrated willingness or capacity to meet regulatory requirement.

CATEGORY E - No indication of future and ongoing compliance

- Hindering or obstructing a ministry official;
- Refusing to furnish required information; and/or
- Intentionally including false or misleading information in any required document.

Levels of Escalating Environmental, Human Health or Safety Impacts

Levels of Escalating Environmental, Human Health or Safety Impacts (Actual or Potential)

LEVEL 1

- Non-compliance that does not result or is unlikely to result in any environmental, human health or safety impact; or
- Minor administrative non-compliance.

LEVEL 2

- Non-compliance resulting in a minor, temporary impact to the environment or minor, temporary threat to human health or safety; or
- Significant administrative non-compliance.

LEVEL 3

 Non-compliance resulting in a moderate, temporary impact to the environment or moderate, temporary threat to human health or safety.

LEVEL 4

• Non-compliance resulting in a significant impact to the environment or significant threat to human health or safety (may be temporary or permanent).

LEVEL 5

 Known or likely human health impact that is severe in effect, i.e. resulting in hospitalization and/or long term human health consequences.

Appendix 2 – Permit Compliance Requirements

Permit PA-1555 compliance requirements

Section 1 - Sulphur recovery requirements - 1.1. Overall Gas Plant

1.1.1. The overall gas plant three month rolling average sulphur recovery efficiency, as calculated in accordance with Section 10.4, below, shall not be less than 95%.

1.1.2. The maximum authorized total rate of discharge of sulphur compounds from all combined plant emissions, expressed as sulphur dioxide is 68 tonnes/day, provided the conditions set out in Section 1.1.1, above, are met.

1.1.3. The annual average daily rate of discharge of sulphur compounds from all combined plant emissions, expressed as sulphur dioxide, is 38 tonnes/day, provided the conditions set out in Section 1.1.1, above are met.

Section 5 - Sampling Facilities

Electrical and pneumatic outlets and, where required, approved access facilities of adequate size are to be appropriately located near the sampling ports for the emissions from stacks specified by the Director, such that Environmental Protection personnel may monitor the discharges.

Section 6. Maintenance of works and emergency procedures

The Permittee shall inspect the authorized works regularly and maintain them in good working order. In the event of a malfunction of the authorized works, the Permittee shall immediately take appropriate remedial action and notify the Environmental Protection Office by telephone or facsimile transmission. The report shall include the duration of the incident, the characteristics of any discharge and an estimate of the quantity of contaminants discharged. All such reports must be received within 24 hours of the detection of the occurrence.

In addition, for emergencies involving major, uncontrolled atmospheric emissions that have the potential to affect public health, a report shall be made immediately to the Provincial Emergency Program through the Spill Reporting telephone number, 1-800-663-3456.

Section 7 - Bypasses

The discharge of air contaminants which have bypassed the designated treatment works, is prohibited unless the consent of the Director is obtained and confirmed in writing.

Section 8 - Process modifications

The Permittee shall notify the Director in writing prior to implementing changes to any process that may substantially affect the quality and/or quantity of the discharge.

Section 9 - Sampling and Monitoring Program

The Director may alter the monitoring program as needed. The need for changes to the program will be based upon results submitted as well as any other information obtained by Environmental Protection in connection with the discharges.

9.5 - Ambient Monitoring

The Permittee shall maintain ambient air quality monitoring stations in accordance with the version of the document, Ambient Monitoring Plan for Air Quality Impacts Associated with the Fort Nelson Gas Plant that has been most recently approved by the Director and H₂S monitors shall be included in the monitoring stations.

Section 10 - Reporting

The results of monitoring and calculations required in Section 9 (except those of Section 9.2.2 and 9.5), above, shall be submitted on a monthly basis to the Regional Environmental Protection Office within 30 days of the end of the month in which the monitoring occurred.

The results of monitoring required in Section 9.2.2 above, shall be submitted on an annual basis to the Regional Environmental Protection Office on or before June 30th of each year for operations of the preceding calendar year.

The results of monitoring required in Section 9.5 above, shall be submitted on a quarterly basis to the Regional Environmental Protection Office within 45 days of the end of the quarter in which the monitoring occurred.

The results of monitoring required in Section 2.11.11 (spent solvent incineration) and 3 (emergency flare activity), above, shall be submitted in acceptable reporting format to the Regional Environmental Protection Office within 60 days of completion of the authorized activity.

Data shall be suitably tabulated and submitted in a format acceptable to the Director. The reporting frequency may be changed if so instructed in writing by the Director.

Permit PA-1742 compliance requirements

Section 1 - Overall Gas Plant Sulphur Recovery Requirements:

1.1 Minimum sulphur recovery efficiency requirement

The overall gas plant three month rolling average sulphur recovery efficiency, as calculated in accordance with subsection 4.4, below, shall not be less than 98.4%.

1.2 Maximum Allowable Discharge of Sulphur Compounds

The maximum allowable rate of discharge of sulphur compounds resulting from the operation of the gas plant is 17.88 tonnes per day, expressed as sulphur dioxide (SO₂). The Permittee shall adjust gas plant operations as required to conform to this limit.

Section 3.2 - Sampling Facilities

Sampling ports shall be provided with nearby electrical and pneumatic outlets and, where required, approved access ladders and adequately sized platforms to enable Environmental Protection personnel to monitor these emissions.

Section 3.3 - Bypasses

Other than those events specified in subsection 3.6, below, the discharge of contaminants which have bypassed the designated treatment works is prohibited unless the approval of the Regional Waste Manager is obtained and confirmed in writing.

Section 3.4 - Process Modifications

The Permittee shall notify the Regional Waste Manager prior to implementing changes to any process that may substantially affect the quality and/or quantity of the discharge.

Section 3.5 - Maintenance of Works, Emergency Procedures and Non-Compliance Reporting

The Permittee shall inspect the pollution control works regularly and maintain them in good working order. The Permittee shall immediately notify the Regional Waste Manager or designate of any emergency or other circumstance which prevents continuing operation of the approved method of pollution control or results in noncompliance with the requirements of this permit and take appropriate remedial action. Written confirmation of the foregoing is required by facsimile within 24 hours of the original notification unless otherwise directed by the Regional Waste Manager.

In addition, for emergencies involving major atmospheric emissions that have the potential to affect public health, a report must be made immediately to the Spill Reporting telephone number, 1-800-663-3456.

Section 4.1 - Sulphur Recovery Plant Waste Gas Stacks

4.1.2 Stack Sampling: Once each quarter, or more often if needed, verify by stack sampling the accurate operation of the continuous SO2 analyser, continuous stack gas temperature recorder and continuous flow recorder used to determine the daily rate of discharge of gases from each 91 metre stack.

Section 4.5 - Ambient Monitoring

4.5.2 Maintain, at sites approved by the Regional Waste Manager, two continuous ground level monitoring stations. Ambient analyses for H_2S and SO_2 shall be included with wind speed and direction measurements. In the monthly report, provide 1-hour and 24-hour average SO_2 concentrations. Summarize occurrences for 1-hour average SO_2 concentrations exceeding 450 µg/m³ and/or H_2S concentrations exceeding 7.5 µg/m³. Include duration of occurrence, wind speed and wind direction.

Section 4.9 - Reporting

The results of monitoring and calculations required in subsection 4 .4, above, shall be submitted to the Regional Waste Manager within 30 days of the end of the month in which the monitoring occurred in a format satisfactory to the Regional Waste Manager.

Permit PA-5151 - Compliance Requirements

Section 1 - Sulphur Recovery Requirements

1.1. The overall gas plant three month rolling average sulphur recovery efficiency, as calculated in accordance with subsection 4.4, shall not be less than 99%.

Section 3.2 - Maintenance of Works and Emergency Procedures

The Permittee shall inspect the authorized works regularly and maintain them in good working order. In the event of an emergency or condition beyond the control of the Permittee which prevents continuing operation of the approved method of pollution control the Permittee shall take appropriate remedial action and notify the Regional Waste Manager by telephone or facsimile transmission. The report shall include the duration of the incident, the characteristics of any discharge and an estimate of the quantity of contaminants discharged. All such reports must be received within 24 hours of the detection of the occurrence.

In addition, for emergencies involving major, uncontrolled atmospheric emissions that have the potential to affect public health, a report shall be made immediately to the Provincial Emergency Program through the Spill Reporting telephone number, 1-800-663-3456.

Section 3.3 - Bypasses

The discharge of air contaminants which have bypassed the authorized works is prohibited unless the consent of the Regional Waste Manager is obtained and confirmed in writing.

Section 3.4 - Process Modifications

The Permittee shall notify the Regional Waste Manager in writing prior to implementing changes to any process that may substantially affect the quality and/or quantity of the discharge.

Section 4 - Monitoring and Reporting Requirements

The Regional Waste Manager may alter the monitoring program as needed. The need for changes to the program will be based upon results submitted as well as any other information obtained by Pollution Prevention in connection with the discharges.

Section 4.1 - Sulphur Recovery Plant Waste Gas Stacks

4.1.1. Continuous monitoring

For the discharge from each of the two 95 metre stacks authorized in Section 2.1, monitor and record on a continuous basis:

- 1) the concentration of SO₂,
- 2) the temperature, and
- 3) the flow rate.

4.1.2. Stack sampling

Once per quarter, or more often if needed, verify, by stack sampling, the accurate operation of the continuous SO_2 , temperature, and flow rate monitors required in subsection 4.1.1.

Section 4.5 - Receiving Environment Monitoring

1) Maintain at sites approved by the Regional Waste Manager, and provide real-time electronic access to, continuous ground level monitoring stations. Ambient analyses for H_2S and SO_2 are to be included with wind speed and direction measurements. In an annual report, due on June 30th, provide the following data summaries and analyses: i) summary of occurrences for one hour average SO_2 concentrations exceeding 450 µg/m³ and/or H_2S concentrations exceeding 7.5 µg/m³, ii) summary of wind speed and wind direction during exceedance intervals, iii) summary statistics of hourly SO_2 and H_2S concentrations, and 4) summary of annual wind speed and wind direction, including wind roses.

2) A biomonitoring and lake chemistry monitoring program shall be conducted to the satisfaction of the Regional Waste Manager. The program report shall be submitted by May 1 for the previous period's program. The report shall include any proposed changes to the program and a proposed schedule.

Section 4.7 - Reporting

The results of monitoring and calculations required in Section 4 shall be submitted to the Regional Pollution Prevention office in a format acceptable to the Regional Waste Manager. The reports shall be submitted monthly, with the exception of subsection 4.5, within 30 days of the end of the month in which the monitoring occurred.

Permit PA-105656 compliance requirements

Section 2.2 - Maintenance of Works and Emergency Procedures

The authorized works must be inspected regularly and maintained in good working order. In the event of an emergency or condition beyond the control of the permittee which prevents effective operation of the authorized works and/or leads to an unauthorized discharge to trigger the Spill Reporting Regulation, the permittee must take appropriate remedial action and notify the Director within 60 hrs. The Director may reduce or suspend operations to protect the environment until the authorized works have been restored, and/or corrective steps are taken to prevent unauthorized discharges.

The Permittee must submit written documentation of any malfunction or emergency condition that affects the authorized works at the facility to the Environmental Protection office within 14 calendar days of the occurrence of the incident. The documentation must include the cause of the incident, corrective actions, and preventative actions to be undertaken.

Section 2.3 - Bypasses

Any bypass of the authorized works is prohibited unless approval is obtained from the Director in writing.

Section 2.4 - Spill Reporting

All spills to the environment (as defined in the Spill Reporting Regulation, BC Reg 263/90) must be reported immediately in accordance with the Spill Reporting Regulation. Notification must be via the Environmental Emergency Program at 1-800-663-3456.

Section 2.5 - Process Modifications

The Director must be notified prior to implementing changes to any process that may adversely affect the quality and/or quantity of the discharge. Despite notification under this section, permitted levels must not be exceeded.

Section 2.6 - Sources of Wastes

Wastes authorized for discharge in Section 1 must originate from the Dawson Processing Plant, except waste gases generated from pipeline pigging activity at pigging facilities which are located at the Dawson Processing Plant but are not owned or operated by the Permittee. These waste gases may also be discharged through the High Pressure/Low Pressure Flare authorized in Section 1.5 above.

Section 2.9 - Vapor Recovery Unit

The Permittee must operate a Vapour Recovery Unit (VRU) to collect discharges from rotating equipment seals, blanket gas, and other ancillary systems that would otherwise be discharged to atmosphere or routed to flare. Gas normally gathered and compressed by the VRU and re-injected into the plant process may be sent to the Low Low Pressure Flare authorized in Section 1.6 above when the VRU is not operational. The permittee must record the dates, durations and reasons that the VRU is not operating while the plant is processing gas and submit the information as required in Section 3.9, Reporting.

Section 3 - Monitoring and Reporting Requirements

The Director may alter the monitoring program as needed. The need for changes to the program will be based upon the results submitted as well as any other information obtained by Environmental Protection in connection with the discharges.

Section 3.1 - Inlet Gas Composition

Monitor inlet gas H_2S concentration. Calculate an average monthly inlet gas H_2S concentration. Document and submit the method used to calculate the monthly inlet gas H_2S concentration.

Section 3.2 - Flaring

Maintain a daily record of the volume of flared gas from both the High Pressure/Low Pressure Flare authorized in Section 1.5 above, and the Low Low Pressure Flare authorized in Section 1.6 above. Differentiate between pilot gas (including purge gas), and gas flared due to:

- plant start up and shut down;
- process upset;
- operating or maintenance needs;

- emergency conditions; and
- circumstances when acid gas generated by the gas sweetening system cannot be transported to the McMahon Gas Plant for processing.

For the High Pressure/Low Pressure Flare, using these volumes and the most recently-determined inlet gas H₂S concentration, calculate the daily mass, in tonnes, of sulphur discharged as the result of flaring. For both the High Pressure/Low Pressure and Low Low Pressure Flares, record the duration (in minutes) of each flaring event (non-pilot and non-purge) and the reasons for flaring events listed above in a tabulated format on a daily basis. The reasons for flaring events must be specific.

Section 3.3 - Generator Emissions Testing

During the first year of operations the permittee must conduct two stack tests on each electricity generator drive unit authorized in Section 1.7 above, and analyse for carbon monoxide and nitrogen oxides as NO₂. Record relevant operating parameters at the time of the test. One stack test must be conducted under summer conditions and one stack test under winter conditions. Thereafter, beginning in 2013, the Permittee must conduct one stack emissions test on each electricity generator drive unit per calendar year. Compare the stack testing results to provincial and federal emission requirements and to the expected performance data supplied by the manufacturer and submitted with the permit application.

Section 3.4 - Environment Monitoring

3.4.1 Passive Monitoring. Using an approved passive monitor, the ambient air must be continuously monitored for SO_2 and H_2S . The number of monitors and locations of the monitoring stations must be approved by the Director.

Section 3.4.2 Continuous Monitoring. Using an approved continuous monitor, the ambient air must be continuously monitored for SO_2 and H_2S . The location of the monitoring station must be approved by the Director.

The ministry must have real time access to all data. The data must be submitted in electronic format via the ministry's database in a format that is consistent with current ministry standards for ambient monitors and that is satisfactory to the Director.

The Permittee shall undertake all regular maintenance and calibration on all data collection equipment in order to meet data quality assurance standards acceptable to the Director. An external qualified contractor shall be used for calibration and instrument service. The Permittee shall participate in the ministry's independent instrument auditing program for continuous monitors.

The Permittee shall maintain and periodically review a monitoring plan outlining quality assurance procedures, performance, and schedules for instrument maintenance and calibration.

Section 3.9 - Reporting

The Permittee shall maintain information, analytical data and flow measurements for inspection by Environmental Protection staff. For the purposes of compliance evaluation, information required to be submitted to the Director by the appropriate dates.

3.9.1 Quarterly Report: For each calendar quarter, prepare and submit a report in a format acceptable to the Director. The report must be received by the Director no later than 45 days after the end of the calendar quarter. The report must include the following:

3.9.1.1 Air Emissions and Monitoring Reporting. Results of analyses, flow measurements and information as required in Sections 2.7, 2.9, 3.1, 3.2, 3.3 and 3.4 above, suitably tabulated. If no stack testing was conducted under Section 3.3 during the reporting period, include a statement to that effect in the report.

3.9.1.2 Failure of Works, Bypasses, Spills and Process Modifications. Summaries of information required under Sections 2.2, 2.3, 2.4, and 2.5 above. If no reportable activity occurred under these sections of the Permit during the reporting period, include a statement to that effect in the report.

Section 3.9.2 Annual Report: Each calendar year, prepare and submit the following reports in a format acceptable to the Director. The reports must be received by the Director no later than January 30 for the preceding calendar year.

Section 3.9.2.1 Fugitive Emission Reporting. The report must include a description of routine activities including assessments and repairs, and periodic LDAR emission surveys undertaken during the year in accordance with the Fugitive Emissions Management Plan required in Section 2.8 above.

Permit PA-105748 compliance requirements

Section 2.2 - Maintenance of Works and Emergency Procedures

The authorized works must be inspected regularly and maintained in good working order. In the event of an emergency or condition beyond the control of the permittee which prevents effective operation of the authorized works and/or leads to an unauthorized discharge to trigger the Spill Reporting Regulation, the permittee must take appropriate remedial action and notify the Director within 60 hrs. The Director may reduce or suspend operations to protect the environment until the authorized works have been restored, and/or corrective steps are taken to prevent unauthorized discharges.

The Permittee must submit written documentation of any malfunction or emergency condition that affects the authorized works at the facility to the local Environmental Protection office within 14 days of the occurrence of the incident. The documentation must include the cause of the incident, corrective actions, and preventative actions to be undertaken.

Section 2.3 - Bypasses

Any bypass of the authorized works is prohibited unless approval is obtained from the Director in writing.

Section 2.4 - Spill Reporting

All spills to the environment (as defined in the Spill Reporting Regulation, BC Reg 263/90) must be reported immediately in accordance with the Spill Reporting Regulation. Notification must be via the Environmental Emergency Program at 1-800-663-3456.

Section 2.5 - Process Modifications

The Director must be notified prior to implementing changes to any process that may adversely affect the quality and/or quantity of the discharge. Despite notification under this section, permitted levels must not be exceeded.

Section 2.6 - Fugitive Emission Management

Fugitive emissions generated within the operating areas must be suppressed and managed in accordance with the Permittee's most recent Fugitive Emissions Management Plan. If the air quality becomes a concern, the Director will evaluate the sensitivity of the receiving environment, the contribution of the Permittee's sources and other pertinent information. The Director may require additional control measures on fugitive emission sources and/or any necessary changes to the Plan to protect the environment.

Section 3 - Monitoring and Reporting Requirements

The Director may alter the monitoring program as needed. The need for changes to the program will be based upon the results submitted as well as any other information obtained by Environmental Protection in connection with the discharges.

Section 3.1 - Processing Facility Sulphur Emissions

3.1.1 Determine inlet gas H_2S concentration monthly. Monthly inlet gas H_2S concentration may be based on actual measurement or may be calculated using a method acceptable to the Director. At a minimum, four actual measurements must be taken and submitted each year.

3.1.2 Maintain a daily record of the volume of flared gas from the LP Flare, authorized in section 1.7 above, and the HP flare, authorized in section 1.8 above. Differentiate between gas flared due to emergency conditions and gas flared due to operating or maintenance conditions. Using these volumes and the most recently determined inlet gas H₂S concentration, calculate the daily mass, in tonnes, of sulphur discharged as the result of flaring. For both the HP and LP Flares, record the duration (in minutes) of each flaring event (non-pilot and purge) and the reasons for flaring and tabulate on a daily basis.

3.1.3 Prepare, on a monthly basis, a sulphur balance report for the gas plant identifying specifically: inlet sulphur, sulphur flared in the LP and HP flares; sulphur incinerated in the Acid Gas Incinerator; and sulphur in sales gas.

Section 3.2 - Inlet Gas CO₂ Concentration

Determine inlet gas CO₂ concentration monthly, or as required by the Acid Gas Incinerator Operating Procedures in section 2.11. Monthly inlet gas CO₂ concentration may be based on actual measurement or may be calculated using a method acceptable to the Director.

Section 3.3 - Stack Emission Monitoring–Acid Gas Incinerator Stack

Contaminant	Unit	Averaging	Monitoring	Implementation
Containinant	Unit	Period	Requirement	Date
	1 3			
Sulphur Dioxide	mg/m°	1 Hour	Continuous	Immediately,
(SO ₂)				when discharge
				begins
Hydrogen	mg/m ³	1 Hour	Continuous	If needed and
Sulphide				required by
(H ₂ S)				Director

3.3.1 For the discharge from the acid gas incinerator stack authorized in subsection 1.1 above, the Permittee must monitor and record contaminants in the exhaust gas stream as follows:

The specified contaminants must be continuously measured a minimum of 85% of the time that the stack authorized in subsection 1.1 is discharging, calculated on the basis of each calendar quarter.

3.3.2 For each hour of operating time, record whether the continuous stack emission monitor for SO_2 is operational. "Operating time" is defined as whenever the stack authorized in subsection 1.1 is discharging.

3.3.3 For the discharge from the acid gas incinerator stack authorized in subsection 1.1 above, the Permittee must determine through measurement, calculation or other appropriate means acceptable to the Director, for each day of operation:

Parameter	Units
Daily maximum hourly volumetric flow rate	m³/s
Daily average hourly volumetric flow rate	m ³ /s
Daily average stack gas discharge temperature	Degrees C

3.3.4 Once per year, or more often as needed, the Permittee must verify, through stack sampling or other appropriate means acceptable by the Director, the accurate operation of the flow measurement and continuous emission monitoring equipment.

3.3.5 Once per quarter or more often as needed, for the discharge from the acid gas incinerator stack authorized in subsection 1.1 above, the Permittee must conduct quarterly grab sampling and analyses for CO and VOCs during the first year of the permit amendment (year 2015). Based on the sampling results in the specified period, the duration and frequency of monitoring may be changed at the discretion of the Director.

Section 3.4 - Receiving Environment Monitoring - Sulphur Dioxide

Monitor ambient sulphur dioxide (SO₂) concentrations that result from operations at the Fort Nelson North Processing Facility.

The number of monitors, locations of the monitoring stations, and the duration and frequency of monitoring is subject to change at the discretion of the Director.

Section 3.5 - Generator and Compressor Turbine Emissions Testing

The Permittee must conduct one stack emissions test on each gas engine generator and sweet gas compressor turbine drive unit per calendar year, if generators and compressors are operated more than 50% of the plant operating hours. If the operation hours are less than 50% of the plant operating hours, the Permittee must conduct one stack emissions test every 2 years.

The stack test results must be compared to:

- 1) The provincial and federal emission requirements.
- 2) The expected performance data supplied by the manufacturer.
- 3) The permitted rates in current amended permits.

The Director may change the frequency and duration requirements of the testing based on the review of the testing results and requests of the Permittee.

Section 3.6 - Acid Gas Incinerator Operating Procedures Monitoring

Monitor and maintain records in accordance with the Acid Gas Incinerator Operating Procedures described in section 2.11.

Section 3.11 - Reporting

The Permittee shall maintain information, analytical data and flow measurements for inspection by Environmental Protection staff. The Permittee must maintain required records for a period of five (5) years. For the purposes of compliance evaluation, information required to be submitted to the Director by the appropriate dates.

3.11.1 Quarterly Report - Air Emissions Reporting: For each calendar quarter, prepare and submit a report in a format acceptable to the Director. The report must be received by the Director no later than 45 days after the end of the calendar quarter. The report must include results of analyses, flow measurements and information as required in sections 3.1, 3.2, 3.3, 3.4, 3.5 and 3.6 above, suitably tabulated. The report must compare the collected data to relevant Permit requirements and to applicable air quality objectives. If no stack testing was conducted under section 3.3.4 during the reporting period, include a statement to that effect in the report.

3.11.2 Annual Reports: Each calendar year, prepare and submit the following reports in a format acceptable to the Director. The reports must be received by the Director no later than January 30 for the preceding calendar year.

3.10.2.1 Fugitive Emission Reporting: The report must include a description of routine activities including assessments and repairs, and periodic leak detection and repair emission surveys undertaken during the year in accordance with the Fugitive Emissions Management Plan required in section 2.6.

3.10.2.2 - Ground Water Monitoring Reporting: Prepare an annual report describing results of the groundwater monitoring program required in section 2.12 above, including, as a minimum, monitoring data (suitably tabulated), a map showing monitoring locations and an analysis of monitoring data trends over time.

3.10.2.3 Surface Water Management Reporting: Prepare an annual report describing implementation of the Surface Water Management Plan required in section 2.13 and information relating to discharges (i.e. duration, date and volume discharged from the surface water storage pond), associated analyses of each discharge in the reporting year, and issues identified during the reporting period, and if applicable, the proposed activities and improvements for the following year.

3.10.2.4 Failure of Works, Bypasses, Spills and Process Modifications: Provide summaries of information required under sections 2.2, 2.3, 2.4, and 2.5. If no reportable activity occurred under these sections of the Permit during the reporting period, include a statement to that effect in the report.

Appendix 3 – Ambient Air Monitoring Station Photos



Passive Monitoring Station



Active Monitoring Station