Pipeline Performance Summary

2021 Annual Report

BC Oil & Gas COMMISSION

Vision, Mission and Values

Vision

A resilient energy future where B.C.'s energy resource activities are safe, environmentally leading and socially responsible.

Mission

We regulate the life cycle of energy resource activities in B.C., from site planning to restoration, ensuring activities are undertaken in a manner that:

Protects public safety

Safeguards the environment

Supports meaningful reconciliation

Advances the public interest and contributes to B.C.'s economy

Values

Transparency is our commitment to be open and provide clear information on decisions, operations and actions.

Innovation is our commitment to learn, adapt, act and grow.

Integrity is our commitment to the principles of fairness, trust and accountability.

Respect is our commitment to listen, accept and value diverse perspectives.

Responsiveness is our commitment to listening and timely and meaningful action.

Role of the BC Oil and Gas Commission

As a provincial Crown agency, we protect public safety and safeguard the environment through the sound regulation of oil, gas and aspects of geothermal activities in B.C. while balancing a broad range of environmental, economic and social considerations.

We regulate resource activity through the Oil and Gas Activities Act (OGAA), the Petroleum and Natural Gas (PNG) Act, and other associated laws related to heritage conservation, roads, land and water use, forestry, and other natural resources.

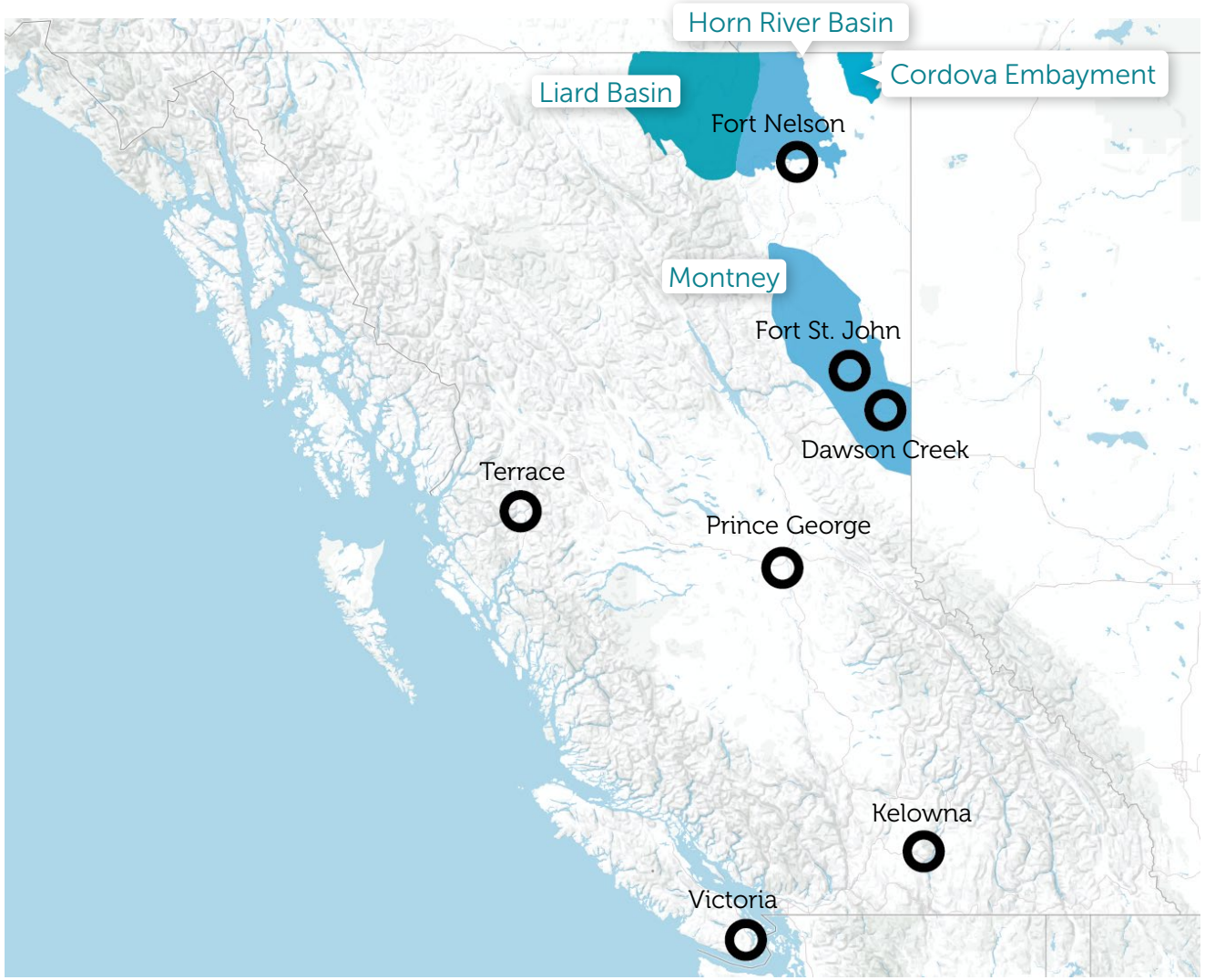
Through combined authority and working with partner agencies, we regulate activities on Crown land, private land, and the Agricultural Land Reserve. When oil, gas, or geothermal permits are granted, we are responsible for ensuring industry compliance with provincial legislation from initial exploration to final reclamation.

As more resources have been discovered, techniques for accessing them have advanced, environmental awareness has increased, and stakeholders have let us know they are interested in providing more input.

During our review and decision-making processes, we work closely with land owners, rights holders, and Indigenous communities.

The Commission currently has over 280 employees operating out of seven locations: Fort Nelson, Fort St. John, Dawson Creek, Terrace, Prince George, Kelowna and Victoria. The largest number of employees are in the Fort St. John office.

Commission Office Locations Throughout B.C.



Territorial Acknowledgement

We acknowledge and respect the many Indigenous Territories and Treaty areas, each with unique cultures, languages, legal traditions and relationships to the land and water, which the BC Oil and Gas Commission's work spans. We also respectfully acknowledge the Métis and Inuit people living across B.C.

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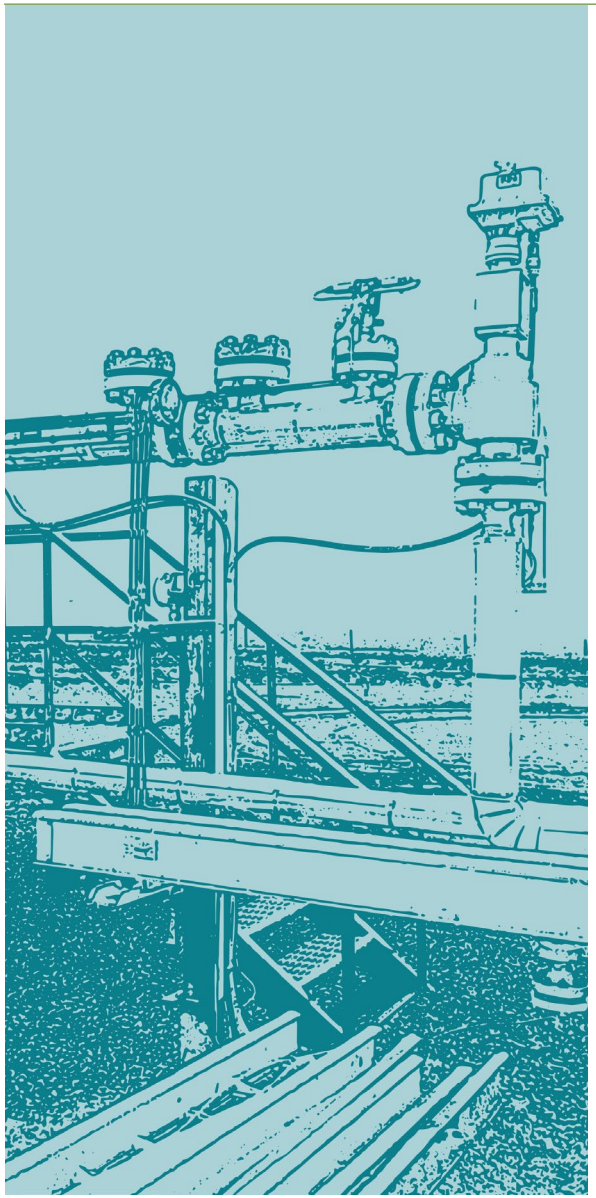


Introduction

Purpose of Report

British Columbia's oil and gas industry depends on pipelines for the distribution of products such as natural gas, water and oil. Pipelines are recognized as a safe and efficient mode of transportation, and secure operation is essential to protecting public safety and the environment.

This report provides a statistical overview of pipelines regulated by the Commission in the 2021 calendar year. It includes data on types of pipelines, lengths, uses and overall pipeline incident rates. The multi-stage life cycle of a pipeline is explained, and incident response protocols are outlined. It also summarizes the Integrity Management Program, a documented framework outlining the practices by which permit holders test and maintain pipelines to mitigate potential integrity issues.

Previous annual pipeline performance summaries can be found on the Commission's website at bcogc.ca/data-reports/reports/.

Pipeline Regulation

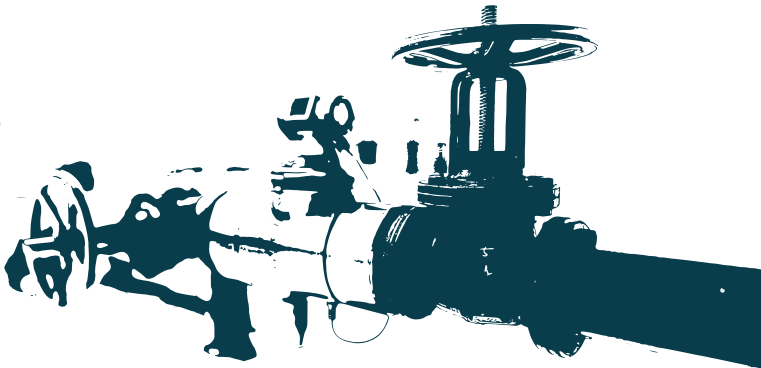
The Commission's jurisdiction extends to the majority of pipelines in British Columbia, as defined in legislation by the Oil and Gas Activities Act (OGAA). Activities regulated by the Commission extend throughout the life cycle of a pipeline, and include pre-activity consultation and notification, permitting, construction, operation, maintenance and abandonment. Pipelines outside the Commission's jurisdiction include those crossing provincial and/or national borders and low pressure pipelines owned by a utility and downstream of a city gate. Pipelines not under the Commission's jurisdiction are not addressed in this report.

Pipelines are regulated under the Pipeline Regulation, which states they must be operated and maintained in accordance with CSA Z662 – Oil and Gas Pipeline Systems. CSA Z662 is a national standard developed and maintained by the Canadian Standards Association (CSA) and covers the design, construction, operation and maintenance of oil and gas industry pipeline systems.

Permit holders are required to comply with other applicable regulations including the Environmental Protection and Management Regulation, Requirements for Consultation and Notification Regulation, Pipeline Crossings Regulation, and Emergency Management Regulation.

The Commission is also responsible for provincial authorizations involving the Land Act, Water Sustainability Act, and the Forest Act for pipeline right-of-ways, roads, land clearing and other minor works.

The Legislation page of the Commission website provides the full list of acts and regulations governing oil and gas activities in the province.



Pipeline Inventory

51,454 Kilometres

The Commission's annual Oil and Gas Reserves and Production report captures the general growing gas production in the province. This year saw a decrease in active pipelines, as permit holders are appropriately deactivating and abandoning older pipelines.

Pipelines transport a number of refined and unrefined products including natural gas, sour natural gas, liquid hydrocarbons (such as crude oil and high vapour pressure hydrocarbons), water and other miscellaneous gases. Over 78 per cent of the total pipelines regulated by the Commission transport natural gas, while approximately 11 per cent carry liquid hydrocarbons. The remainder carry water or other gases or liquids. Pipeline definitions and product classifications are available on page 15.

As shown in Table 1, the total length of pipelines in the province in 2021 was 51,454 km. This is a net addition of 641 km of total registered pipelines over the previous year. Deactivated pipelines decreased by 150 km while abandoned pipelines increased by 1,636 km. Operating pipelines in 2021 decreased by 846 km.

Table 1: Total Lengths of Pipelines by Type and Status (in Kilometres)

Type	Total	Operating	Deactivated	Abandoned
Natural Gas	22,341	18,077	1,854	2,410
Sour Natural Gas	17,893	11,888	3,558	2,447
Water	4,530	3,562	493	475
Liquid Hydrocarbons	5,825	4,162	953	710
Other	865	532	204	129
2021 Grand Total	**51,454**	**38,221**	**7,062**	**6,171**
Natural Gas	22,099	18,379	1,934	1,786
Sour Natural Gas	17,751	12,449	3,628	1,675
Water	4,408	3,541	482	385
Liquid Hydrocarbons	5,681	4,139	950	592
Other	874	559	218	97
2020 Grand Total	**50,813**	**39,067**	**7,212**	**4,535**
Natural Gas	21,672	18,437	1,896	1,339
Sour Natural Gas	17,643	13,077	3,476	1,090
Water	4,306	3,579	445	282
Liquid Hydrocarbons	5,575	4,149	871	554
Other	851	573	223	56
2019 Grand Total	**50,047**	**39,815**	**6,911**	**3,321**

Pipeline Life Cycle

Multi-Stage Planning

From the development of surface maps and creation of a preliminary pipeline plan, through construction and inspections, to deactivation and final site restoration, the steps described here depict the multiple stages of a typical pipeline life cycle.

At the outset, Commission staff conduct a comprehensive review of each pipeline application for engineering standards, legal requirements, and for environmental and public safety considerations. The Commission ensures proponents have conducted consultations with land owners and other rights holders on pipeline projects that will directly affect them. However, it is the Commission that undertakes consultation with Indigenous communities, consistent with the crown's legal duty to consult and avoid, mitigate, and accommodate any impacts to Indigenous rights.

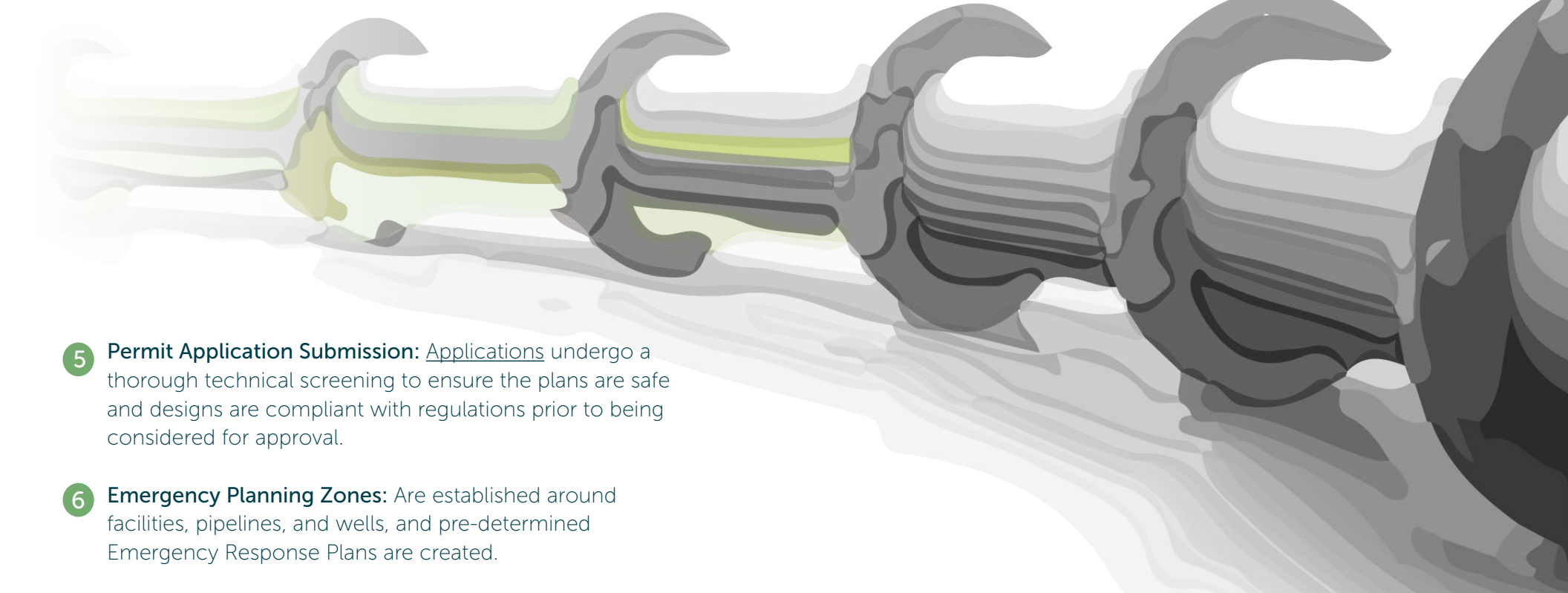
If a pipeline application is approved, Commission staff may set permit conditions as necessary to protect key environmental assets, such as water, wildlife and forest values. A significant component of the framework for managing the impacts of oil and gas development on the environment is Area-based Analysis.

The Commission verifies pipelines are constructed and operated in accordance with applicable regulations and monitors the project throughout its life cycle. Should any deficiencies be identified at a site, the Commission may order the permit holder to cease activities, as necessary, until appropriate actions are performed to safely resume operations.

As detailed in the Commission's mandate, and considering the many stages of a pipeline's life cycle, the protection of public safety and the environment is top priority. Permit holders are required to report to the Commission before, during and upon completion of their oil and gas activities. The framework under which pipelines are operated includes such requirements as the pipeline Integrity Management Program (IMP), designed to help prevent spills. IMPs are described on page 8.

Oil and Gas Activity Stages

1. **Land Survey:** Land measured to establish property boundaries, topography, and land features, and to develop surface maps.
2. **Pipeline Plan:** A preliminary pipeline plan is prepared, utilizing survey data to propose a safe, informed and responsible route.
3. **Consultation and Notification:** Stakeholder engagement begins; the Commission engages the appropriate stakeholders and ensures consultation is appropriate and adequate. Consultation with Indigenous communities is also undertaken at this stage.
4. **Site Assessment:** The pipeline route is determined, taking into account such matters as soil handling and conservation, aquifer protection, archaeological sites, and eventual site restoration considerations.



5. **Permit Application Submission:** Applications undergo a thorough technical screening to ensure the plans are safe and designs are compliant with regulations prior to being considered for approval.

6. **Emergency Planning Zones:** Are established around facilities, pipelines, and wells, and pre-determined Emergency Response Plans are created.

7. **Site Preparation, Construction and Inspection:** At any point during construction, the Commission reserves the right to inspect the construction process, watching for compliance with legislation of any permit approval conditions.

8. **Going Live:** The Commission receives notice the pipeline has been properly tested and the transporting of petroleum, natural gas, solids, water, or other substances to destinations such as refineries, processing plants, or shipping points begins.

9. **Safe Pipeline Operation:** Safety considerations begin at the initial design stage and are expected to be maintained through abandonment and final restoration.

10. **Integrity Management Program Overview:** During the full life cycle of the pipeline, the Commission will review a company's IMP and any incidents and repairs that occur.

11. **Deactivation:** The Commission evaluates deactivation requests for appropriate maintenance and monitoring measures, to prevent or minimize adverse effects while the pipeline remains idle.

12. **Decommissioning:** The Commission reviews abandonment (removal from service) requests to ensure safety considerations and habitat and land restoration plans are fully incorporated.

13. **Remediation:** Soil stability, productivity and vegetation are restored as required under legislation.

For more details regarding oil and gas activity stages, a Land Owner's Information Guide is available on the Commission's website.

Integrity Management Program

Compliance Assurance

To ensure public safety, environmental protection, and operational reliability, the Pipeline Regulation requires all pipeline permit holders in the province to implement an Integrity Management Program (IMP). A pipeline IMP is a preventative and documented framework specifying the processes and practices used by pipeline permit holders to anticipate hazards, and analyze and manage risks throughout the entire life cycle of pipelines. The IMP incorporates a management system approach.

Section 7 of the Pipeline Regulation states every pipeline permit holder planning, designing, constructing, operating, maintaining, and abandoning pipeline infrastructure must have an implemented IMP program. A compliance assurance protocol is available to permit holders, outlining the Commission Compliance Assurance Integrity Management Program expectations and operating requirements expected of permit holders, and provides guidance for developing, implementing, and maintaining effective IMPs.

Details of the compliance assurance process and scope of the protocol can be viewed on the Commission website. The 2021 IMP Compliance Assurance Summary Report is also available online.

The Commission has been evaluating the compliance of permit holders' IMP programs to our regulations and expectations since 2011. This assessment occurs using a standardized IMP compliance assurance process. In the preliminary phase, the Commission requires permit holders to submit a self-assessment. All new permit holders and those who have not been audited in the last two years are required to complete and submit a self-assessment. In the following phase, permit holders are annually selected for the audit based on the Commission's criteria, are notified, and requested to submit IMP workbooks and records for the audit. The next phase consists of audits involving systematic review of permit holders' IMP processes, records, and documents to verify compliance and generate audit findings. The final phase allows for corrective action plans and follow-ups to address any noncompliance findings determined through the audits.

Where non-compliances were identified, permit holders are required to develop and implement corrective actions to rectify the deficiencies within a timeframe specified and agreed to by the Commission. Each corrective action is monitored and assessed to ensure all findings of non-compliance are fully resolved through a structured oversight process.

The Commission will continue to undertake IMP audits for all pipeline permit holders in B.C. to ensure a systemic pipeline IMP is applied throughout the entire pipeline life cycle.

Incident Response and Enforcement Actions

An incident is defined as a present or imminent event or circumstance, resulting from an oil and gas activity that is outside the scope of normal operations, and may or may not be an emergency. Permit holders must communicate all reportable incidents to the Commission. Non-minor incidents must be reported immediately (within one hour), and minor incidents must be reported within 24 hours. The Commission's Incident Classification Matrix outlines spill reporting criteria, and how incident levels are assessed, determined and reported.

Any person aware spillage is occurring, or believes there is the potential for spillage, can provide assistance by calling the operating company indicated on the on-site signage and identifying the location of the pipeline, or by calling the Commission's 24/7 emergency number at 1-800-663-3456.

The Commission responds to all incidents, establishing communication with the permit holder, confirming the incident level and assessing the permit holder's response. Commission staff further determine what remedial actions must be taken, whether a pipeline can continue to operate safely, and whether compliance or enforcement actions are required.

Subsequent incident investigations allow the Commission to confirm the cause and any contributing factors, and whether repairs or solutions should be broadly communicated to all other permit holders to prevent similar incidents from occurring. Inspections may also be triggered by public enquiries and incidents reported to the Commission.

When required, orders, tickets and/or penalties are issued to the permit holder. The Commission posts its enforcement actions in a timely manner on its Compliance and Enforcement webpage.

Orders - issued if a permit holder fails to comply with OGAA, associated regulations, permits or authorizations, a previous order, or to deal with issues of public safety or protection of the environment.

Tickets - issued under the authority of provincial acts, including the Water Sustainability Act.

Administrative Penalties - levied in the event of a contravention of OGAA.

Charges - recommended to Crown counsel for prosecution and possible court conviction.

Pipeline Incidents and Emergency Response Programs

To coordinate and prepare for incidents in advance, permit holders must develop and maintain emergency response programs (ERPs) and response contingency plans, as directed in the Emergency Management Regulation (EMR) under OGAA.

Emergency response programs guide the creation, management and implementation of a permit holder's ERPs, allowing for quick access to critical information, coordination of multiple-responder activities, and identification of predetermined equipment and services available for deployment in an emergency. They equip incident responders with hands-on training and emergency response exercises, ensuring personnel understand their incident command structure, communication methods, and responsibilities in an emergency event.

The Commission's Safety, Engineering and Audit branch regularly audits ERPs to ensure consistent compliance with the EMR, and oversees and may participate in permit holder emergency response exercises. Should a permit holder's emergency protocols fail to meet requirements, the Commission may utilize compliance and enforcement actions, which can include issuing orders, penalties, or shutting-in a pipeline system.

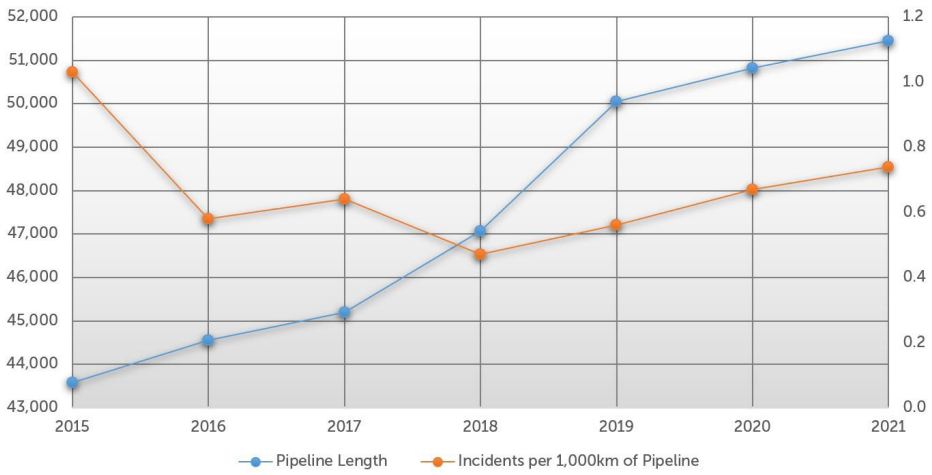
The requirements in the EMR are designed to create a framework for the protection of the public, emergency responders, property and the environment from incidents occurring due to oil and gas activities. Although emergency preparation, equipment and protocols help reduce the rate of incidents, the Commission strives to continually improve emergency management measures.

In 2021, there were 38 incidents on pipelines regulated by the Commission; however, not all led to the release of a product. Figure 1 shows an overall incident frequency of 0.74 for every 1,000 km of pipelines, an increase from 0.67 in 2020.

As stated, not all incidents result in a spill or release of a product. In 2010, the implementation of OGAA led to broader reporting criteria, meaning all incidents – including those that have the potential to affect the integrity of a pipeline but did not cause spillage – must be reported.

Additional information regarding emergency response and management, including guidelines and forms, is available on the Commission's Emergency Response & Safety webpage.

Figure 1: Year-to-Year Incident Frequency vs. Pipeline Length



The Commission conducted **3,461** pipeline inspections in 2021, an increase of 3 per cent compared to 2020

In 2021, there were **38** incidents on pipelines regulated by the Commission.

The Commission responds to urgent safety complaints within **30** minutes, 24/7, year-round.

If an incident results in spillage, the following actions must be taken (Sec. 37, OGAA):

1. **Prevent** spillage.
2. **Promptly report** any damage or malfunction that could cause spillage.
3. **Remedy** the cause or source of spillage if any occurs.
4. **Contain and eliminate** the spillage.
5. **Remediate** any affected land or body of water.
6. **Report location and severity** of spillage and any contributing damage or malfunction.
7. **On-call emergency officer** confirms severity and determines appropriate level of Commission response.
8. **Commission inspectors may attend** onsite during the response, depending on the nature of the incident.
9. **Damage repair** is conducted.

The number of reported incidents in 2021 was **0.74** for every 1,000 km of pipeline.

Site Cleanup and Remediation must be approved by the Commission, and incident causes investigated and resolved prior to pipeline operations resuming.

Post-Incident Reports must be submitted by the operator within 60 days identifying the root cause of the failure and any repair methods or design modifications that may be required.

Releases and Spills

2021 Statistics

In total, there were 22 release incidents in 2021, down from 28 in 2020. For incidents involving a release or spill, Table 2 shows the highest number of releases occurred on pipelines categorized as 'other' with eight incidents. Adjusted for total length of pipelines, pipelines classified as 'other' had the highest incident frequency per 1,000 km of pipeline with a frequency rate of 9.25.

The category 'other' contains miscellaneous liquids and gases such as oil emulsion and can also include service liquids and gases. All eight release incidents from the 'other' category were oil emulsion. There were no releases in 2021 from pipelines classified as 'liquid hydrocarbon' .

In the event of a pipeline gas release or liquid spill, the Commission ensures complete clean up and remediation by the company, and that all problems are fixed before operations resume.

The largest gas release from a pipeline in 2021 was a 9,400 m^3 release of sweet natural gas and 6,700 m^3 of sour natural gas on a pipeline approximately 10 km east of Dawson Creek, B.C. In addition to the gas release, 91 m^3 of sour condensate and 33 m^3 of sour produced water was released. The failure occurred due to aggressive internal corrosion; which is historically the most common failure mode for pipelines in B.C.

When the permit holder became aware of the incident, the emergency response plan was activated with participation and oversight from the Commission's inspectors, engineering, and emergency management staff. After approximately 24 hours, the incident was under control and downgraded to a minor level. On Feb. 4, 2021, the Commission issued an order requiring the pipeline to cease all operations and completion of an Engineering Assessment to determine the failure cause. On April 6, 2021, the aforementioned order was terminated, as all requirements of the order were met. On April 29, 2021, the pipeline was returned to service with an enhanced monitoring plan.

Table 2:
Total Number of Incidents with Release per 1,000 km by Type of Pipeline in 2021

Type of Pipeline	# of Incidents with Release	Length of Pipeline (KM)	Frequency (Per 1,000 KM)
Sour Natural Gas	4	17,893	0.22
Natural Gas	7	22,341	0.31
Liquid Hydrocarbons	0	5,825	0.00
Water	3	4,530	0.66
Other	8	865	9.25

Incident Causes

Table 3 summarizes incidents by failure cause. In 2021 metal loss (corrosion) continues to be the leading cause of pipeline incidents, contributing to 11 incidents. 2021 saw a significant increase in geotechnical incidents, with 10 separate incidents. In recent years, geotechnical incidents ranged from one to three annually. The increase can be partially attributed to the severe rain and flooding experienced in B.C. during the month of November 2021, which resulted in infrastructure damage across multiple industries. Five of the geotechnical incidents were a direct result of damage due to severe flooding in November.

The interactive web-based BCOGC Incident Map provides the location of pipeline incidents dating back to 2009. It includes data on pipeline spills, releases, and damage to active and discontinued pipelines, including the status of incidents.

Moving Forward

The Commission's priority is continual improvement in safety standards and reduction of incidents in order to serve the public and the environment, while fostering responsible development.

As tools are developed and operationalized to elevate pipeline performance, spill preparedness and emergency response capabilities, lessons learned will continue to be shared across the Commission and with stakeholders and experts throughout industry, to successfully meet the demands of a strong safety culture.

Table 3: Classification of Pipeline Failures

INCIDENT CASE	DEFINITION	2021	2020	2019	2018	2017
METAL LOSS	WALL THICKNESS REDUCTION DUE TO CORROSION OR OTHER CAUSES					
CORROSION METAL LOSS		***11***	***19***	***16***	***10***	***15***
PIPELINE/EQUIPMENT FAILURE						
CRACKING IN PIPE	MECHANICALLY DRIVEN OR ENVIRONMENTALLY ASSISTED CRACKING OF THE PIPE	3	0	2	0	0
PIPE FITTINGS/JOINT FAILURE	FAILURE IN VALVE, WELD, FLANGE, ETC.	4	2	4	3	3
TOTAL PIPELINE/EQUIPMENT FAILURE		***7***	***2***	***6***	***3***	***3***
EXTERNAL INTERFERENCE						
THIRD PARTY INTERFERENCE	INTERFERENCE BY SOMEONE OTHER THAN OPERATING COMPANY OR ITS EMPLOYEES/CONTRACTORS	2	1	3	3	5
COMPANY	INTERFERENCE BY OPERATING COMPANY OR ITS EMPLOYEES/CONTRACTORS	4	3	1	0	4
VANDALISM	INTERFERENCE CAUSED WILLFULLY BY SOMEONE THROUGH ATTEMPTED THEFT OF SERVICE FLUID	1	0	0	0	0
TOTAL EXTERNAL INTERFERENCE		***7***	***4***	***4***	***3***	***9***
OTHER CAUSES						
MATERIAL MANUFACTURING OR CONSTRUCTION	DEFECTS IN THE FITTING, CONSTRUCTION, OR COMPONENTS	0	1	0	2	0
GEOTECHNICAL FAILURE	LOSS OF INTEGRITY DUE TO GEOTECHNICAL EFFECT, FOR EXAMPLE, SLOPE MOVEMENT OR WEATHER	10	3	1	1	1
IMPROPER OPERATION	DECISION ERROR MADE BY OPERATING COMPANY DURING SERVICE	2	4	1	2	0
OVERPRESSURE	FAILURE CAUSED DUE TO OVERPRESSURE OF PIPE	1	1	0	1	1
TOTAL OTHER CAUSES		***13***	***9***	***2***	***6***	***2***
TOTAL INCIDENTS		**38**	**34**	**28**	**22**	**29**

Glossary

Definitions and Classification

Pipeline: pipelines regulated by the Commission are defined in OGAA (except in Section 9) as piping through which any of the following is conveyed or transported:

- Petroleum or natural gas.
- Water produced in relation to the production of petroleum or natural gas or conveyed to or from a facility for disposal into a pool or storage reservoir.
- Solids.
- Substances prescribed under Section 133(2)(v) of the Petroleum and Natural Gas Act.
- Other prescribed substances.

The scope of the definition also includes installations and facilities associated with the piping, but does not include:

- Piping used to transmit natural gas at less than 700 kilopascals (kPa) to consumers by a gas utility as defined in the Gas Utility Act.
- A well head.
- Anything else that is prescribed.

Abandoned Pipeline: pipelines removed from service and not maintained for a later return to service.

Deactivated Pipeline: pipelines removed from service but maintained for a later return to service.

Operating Pipeline: pipelines actively used for the transport of fluids related to oil and gas operations, and piping that has been suspended from service for less than 18 months but not formally deactivated.

Crude Oil: crude oil, sour crude and low-vapour pressure hydrocarbons.

Natural Gas: includes naturas gas, sweet gas, and fuel gas. Consisting mostly of methane, natural gas is a colourless, odourless, flammable gaseous hydrocarbon.

Other: miscellaneous gases and liquids, condensate and oil emulsion/effluent.

Sour Natural Gas: natural gas with a hydrogen sulphide (H_2S) partial pressure greater than 0.3 kilopascals.

High-Vapour Pressure (HVP) Hydrocarbons: examples include ethylene, propane, pentanes and liquid ethane. These products can quickly convert to gaseous.

Incident: for the purpose of this report, a present or imminent event or circumstance, resulting from an oil and gas activity that is outside the scope of normal operations, and may or may not be an emergency.

Low-Vapour Pressure (LVP) Hydrocarbons: these products flow through pipelines in liquid or quasi-liquid form at a lower pressure than HVP hydrocarbons. Examples include oil, heavy oil, and synthetic oil.

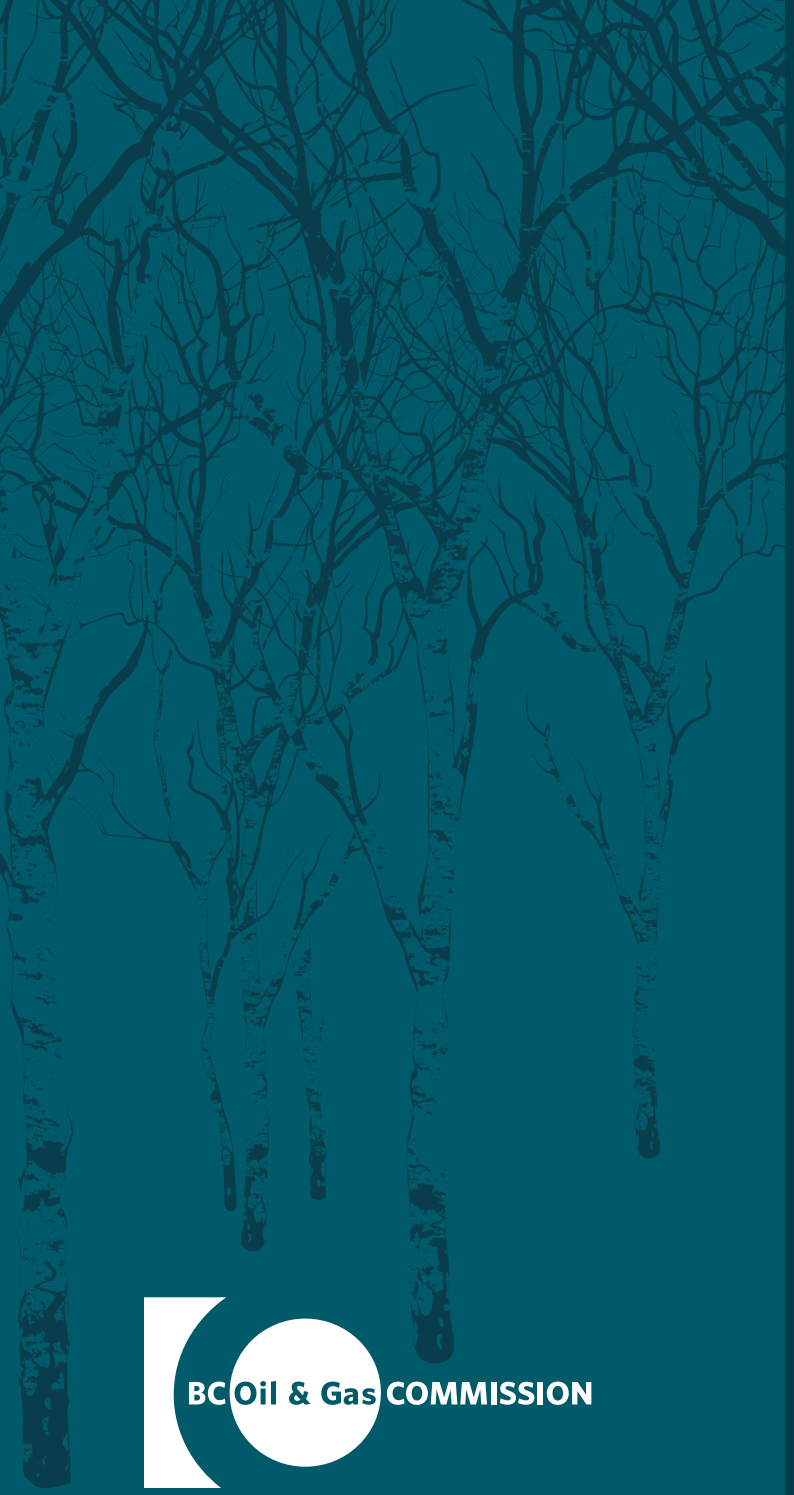
m^3: a measure of volume - cubic metres: 1m x 1m x 1m: 1,000 litres.

Pipeline Permit: a permit that includes permission to construct, maintain, and operate a pipeline.

Shut In: the isolation or closure of a well zone, a pipeline or a facility. For example, the temporary shut-in of a well allows for the analysis of such factors as a well's productive capacity, pressure, and permeability.

Spill: as defined in OGAA; petroleum, natural gas, oil, solids or other substances escaping, leaking, or spilling from a pipeline, well, shot hole, flow line, or facility (or any source apparently associated with any of those substances).

Water: fresh water, produced water, salt water, and sour water.



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