JOBS IN OIL AND GAS WELL CLEANUP

IN ALBERTA, B.C. AND SASKATCHEWAN

Centre for Civic Governance

Jobs in Oil and Gas Well Cleanup in Alberta, B.C. and Saskatchewan

April 2026

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EXECUTIVE SUMMARY

Canada's backlog of unplugged oil and gas wells presents a major, largely untapped opportunity to create thousands of good-paying jobs.

Companies committed to this closure work when they drilled the majority of their wells, today totalling more than 700,000 wells across Western Canada. Yet many companies have failed to follow through, as hundreds of thousands of depleted or spent wells remain unplugged and unremediated, leaking methane and other hydrocarbons into the air and water. That failure puts the country's air, farmland, climate and drinking water at risk, while denying thousands of workers access to employment.

This report documents the substantial job opportunities associated with the remaining lifecycle of these wells. We estimate that closing and cleaning up the country's unplugged and unremediated wells could create approximately **11,000 full-time jobs over the next 25 years** in Alberta, B.C. and Saskatchewan, not including the thousands more indirect jobs that would also be generated by this effort.

Our findings represent an inaugural survey of the job opportunities in Western Canadian oil and gas well cleanup, based on one-on-one interviews with contractors and workers from 10 companies operating in Alberta, B.C. and Saskatchewan.

Across western provinces, cleanup work has lagged. However, new provincial regulations and a key Supreme Court case may begin to challenge the status quo, ushering in a new wave of cleanup work. At the same time, industry pressure threatens to delay or reverse the sector's limited progress. Further regulatory action will be essential to expand the oil and gas well restoration economy waiting on Canada's doorstep.

Well type glossary[1]

ACTIVE

Wells that are open (unplugged) and actively producing oil and gas.

CLEANED UP

As a shorthand, our report refers to wells that have been plugged, remediated, and reclaimed as "cleaned up."

INACTIVE

Wells that have not produced oil or gas in the last 6-12 months, but remain open and unplugged. These wells still have a solvent owner.

ORPHANED/ ABANDONED

A well that no longer has a liable owner, often following a bankruptcy. An "abandoned" well has not yet been transitioned to official orphan status under regional well cleanup programs, but has no solvent owner. Note that Alberta, B.C., and Saskatchewan databases indicate "abandoned" wells as those that have been plugged and had their wellheads removed.

UNPLUGGED

When referred to in the text, "unplugged" indicates wells that have not been plugged, including active, inactive, orphaned, and abandoned wells.

PLUGGED

Wells that have been filled with cement and had their wellheads removed (cut) and capped.

REMEDIATED

A previously contaminated wellsite that has been cleaned and decontaminated in accordance with a jurisdiction's environmental standards.

RECLAIMED

A well that has been plugged, remediated, and put on a trajectory to its pre-disturbance state, including removing any contaminated soil present on the site.

1 Adapted from the 2022 report from the Office of the Parliamentary Budget Officer.

PHOTO ANATOLIY_GLEB/SHUTTERSTOCK

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INTRODUCTION

Canada's oil and gas sector has long been a key economic driver in its westernmost provinces, Saskatchewan, Alberta and British Columbia. However, it has also left behind a vast legacy of unplugged, unremediated, and unreclaimed oil and gas wells across the region.

Over the years, that legacy has expanded from conventional wells to those drilled using unconventional methods, like hydraulic fracturing and steam-assisted gravity drainage (Cui et al., 2022). Regardless of well type, these sites must be cleaned up at the end of the life cycle to reduce the risk of leaks that can release air pollutants, contaminate the soil and poison groundwater.

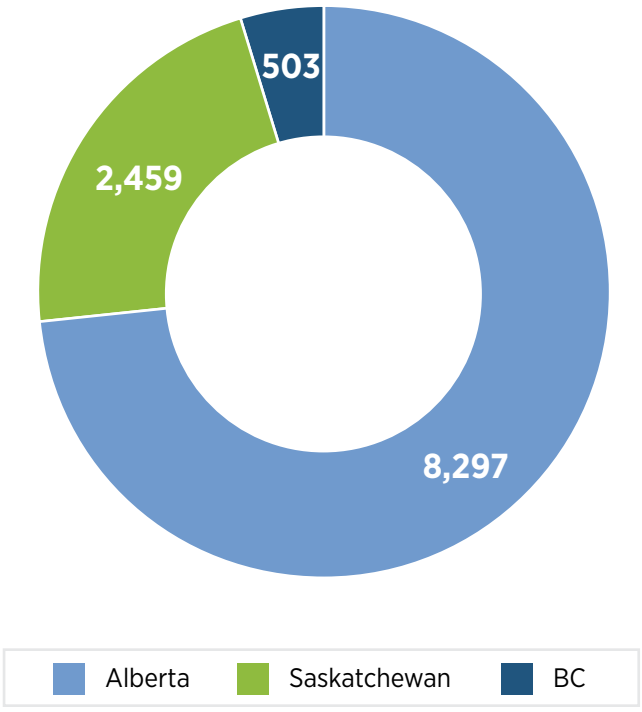
Early attempts at well closure and cleanup were haphazard, sometimes relying on materials such as wood or rocks to seal open wellbores (Nowamooz et al., 2018). It was not until the 1950s that companies began using cement plugs to cap wells, an approach that remains dominant today.

Oil and gas companies in Canada are required to carry out this cleanup work as a condition of their permits to operate but have historically faced few legal consequences for failing to do so (Yewchuk et al, 2023). This has begun to change, in part due to a wave of bankruptcies that left taxpayers responsible for cleaning up orphaned wells (Boychuk et al., 2021), coupled with increasing evidence that unplugged, unremediated wells pose substantial risks to public health, ecosystems and the climate. Already, taxpayers have shouldered billions of dollars in cleanup costs (Government of Canada, 2020; Yewchuk et al, 2023).

To close an oil or gas well, companies typically insert cement plugs or other barriers inside the well. They then cut and cap the well below ground before covering it with earth. If hydrocarbon contamination has occurred, owners are generally required to treat or remove the affected soil. Finally, reclamation puts the land on a trajectory to return to its previous state or intended use, for example, grading soil for farm cultivation or planting trees on wellsites in forested areas (Raimi et al, 2020). When skilled professionals perform each of these steps with care, the risk of dangerous leaks and further environmental contamination is reduced significantly.

Terminology to describe the stages of well closure varies considerably across jurisdictions. For simplicity, this report uses the term "cleanup" to refer to wells that have been plugged, capped, remediated and reclaimed.

FIGURE 1
25-year jobs cleaning up oil and gas wells in Alberta, BC and Saskatchewan



Risks of unplugged wells

Over time, wells tend to leak hydrocarbons and other contaminants into the environment. These leaks can stem from a myriad of causes, including gradual corrosion, particularly when H2S or "sour gas" is present (DiGiulio et al., 2023). Leaks can also result from faulty drilling practices, poorly sealed joints (Chukwuemeka et al., 2023) or external forces like seismic activity or nearby drilling (Pozzobon et al., 2023).

When leaks occur, fluids and hydrocarbons escape from the well into the environment. Often this happens through "surface casing vent flow," where gases migrate into the space between the pipe and the second barrier before escaping from the wellhead (Seymour et al, 2024). But leaks can also occur at other points inside the well or, once a well has been plugged, from the cap itself (Wisen et al., 2019).

These leaks pose serious risks to both human and environmental health. Contaminants can seep into groundwater, pollute surrounding soils and release harmful air pollutants, including volatile organic compounds like benzene, toluene, ethylbenzene and xylenes into the environment. Benzene, a known carcinogen, is particularly dangerous (Kang et al., 2023).

Research on the impacts of these leaks into the surrounding environment remains limited, but available studies illustrate concerning trends. A recent analysis found elevated benzene levels at around 70 per cent of sampled wells in Pennsylvania (DiGiulio et al., 2023). Leaks can also leach into drinking water: a 2016 study found gas contamination in 0.12 per cent to 4.5 per cent of the nearby water wells sampled in oil and gas producing wells in the Denver-Julesburg Basin in Colorado (Sherwood et al., 2016).

Leaks also release methane, a potent greenhouse gas, into the atmosphere. A recent study of Canada's non-producing oil and gas wells found emissions seven times higher than previously documented in Canada's National Inventory report, accounting for 13 per cent of the country's fugitive emissions (Klotz et al., 2025). Limited monitoring data means the problem's full scope remains unknown, making unplugged wells "one of the most uncertain anthropogenic methane emission sources in Canada's National Inventory Report" (Klotz et al., 2025).

Cleaning up oil and gas wells reduces these risks, but does not eliminate them. When properly closed, wells are less likely to leak into the surrounding environment (Williams et al., 2020). However, plugging isn't failproof: over time, plugs or other parts of the containment system can degrade or fail. For example, a 2019 report from Natural Resources Canada found that, of 25,000 wells found to be leaking since 1910, seven per cent had already been plugged (Wigston et al., 2019). Meanwhile, a 2023 study found that 89 per cent of unplugged wells exhibited surface casing vent flow leaks, compared to 52 per cent of plugged wells (Bowman et al, 2023).

Plugging wells properly to avoid leaks

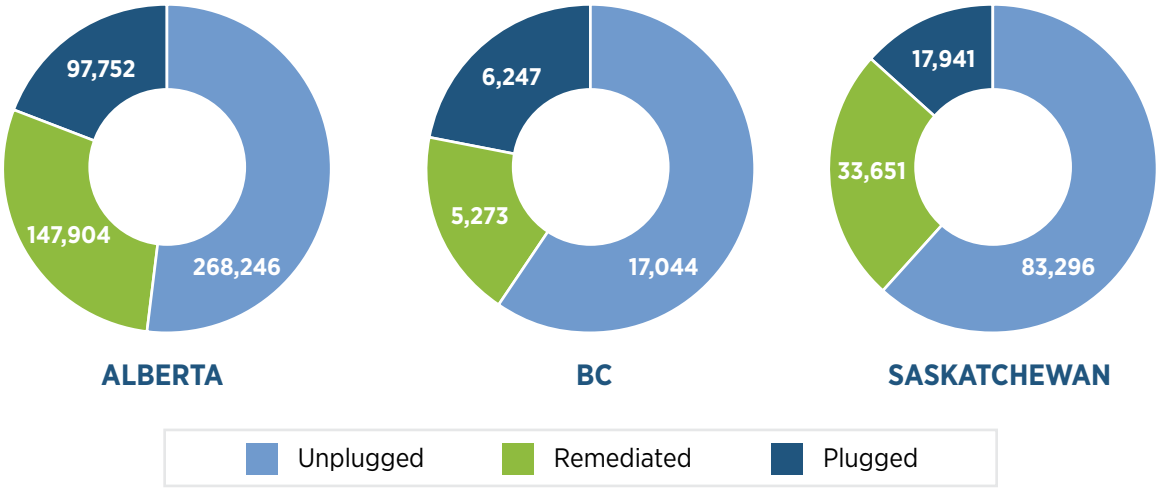
While plugging wells is critical to help avoid leaks, it is equally important that this work is done properly. Research shows that closure methods have a significant impact on the likelihood of well leaks (Chukwuemeka et al., 2023). However, research on the best closure methods to employ under different conditions remains limited (Trudel et al, 2019).

B.C., Saskatchewan and Alberta rely on a regulatory system that allows companies to choose their preferred cleanup method. In B.C., regulators have argued that this approach could help reduce provincial liability if a specific well-closure method fails and may enable companies to implement site-specific best practices (Trudel et al, 2019). However, it is unclear whether this approach is more effective than more prescriptive regulatory models.

It also remains unclear whether a more permanent closure approach to well closure, for example, installing secondary downhole barriers, is superior to more "iterative" approaches that prioritize investments in ongoing well monitoring and plug adjustment (Trudel et al. 2019).

Currently, companies in B.C., Saskatchewan and Alberta have no obligation to monitor leaks once their wells have been cleaned up. Given the evidence that wells can leak over time, this represents a significant gap in the regulatory framework, with potential risks to human and environmental health.

FIGURE 2
Well status in Alberta, BC and Sakatchewan



Regulatory limits

Across Western Canada, a patchwork of regulatory systems influences if, how and when wells are closed and remediated. Canada's first cleanup law was passed in Alberta in 1963, establishing basic requirements for plugging and reclamation on private land (The Surface Reclamation Act, 1963). In 1978, this was extended to Crown land (Alberta Energy Regulator, 2019), with B.C. and Saskatchewan later adopting similar frameworks. However, these early rules did not require companies to close and remediate their wells within a defined timeline (Watson, 2020).

Unsurprisingly, those regulatory gaps mean many wells have been left unplugged and unremediated. Meanwhile, many well owners have gone bankrupt, leaving insufficient funds for cleanup. Volatility in global oil prices has exacerbated this problem, as periodic downturns have resulted in insolvencies and growing numbers of orphan wells (Lewis et al., 2020).

Companies have also avoided cleanup liabilities as a matter of corporate strategy, selling inactive wells to smaller, less well-financed firms that lack the assets needed to clean them up (Olszynski et al., 2023). This pattern intensified following the 2014 commodity crash. A Globe and Mail investigation found that at least 140,000 wells had changed hands in Western Canada between 2015 and 2018, sometimes for as little as $1, with more than half of the companies involved considered financially weak by Alberta's regulator (Lewis et al., 2020).

In response to public pressure, Alberta, B.C. and Saskatchewan passed regulations to address the problem in the 2010s. These included tracking companies' insolvency risk and collecting funds to support orphan well cleanup. However, these initiatives were widely criticized as insufficient. Major loopholes remained: governments underestimated the true scale of liabilities, particularly the costs of remediation to address site contamination (Boychuk et al, 2021) and often failed to intervene before companies went bankrupt (Office of the Parliamentary Budget Officer, 2022).

A major legal shift occurred in early 2019, when the Supreme Court of Canada ruled on appeal that the Alberta Energy Regulator (AER) should be compensated before other creditors to clean up a bankrupt company's orphan wells (Orphan Well Association v. Grant Thornton Ltd., 2019). The decision upended the status quo in bankruptcy law, which had earlier positioned taxpayers as the last to be paid in a long line of creditors.

Subsequently, provinces have made some efforts to reduce growing oil and gas cleanup liabilities. B.C. established the Dormancy and Shutdown Regulation in 2019, establishing the first timelines for well cleanup in Canada. The regulation aims to require companies to restore dormant wells within a set timeline and classify wells under different risk categories for slower or faster cleanup (BLG, 2019). Alberta and Saskatchewan, by contrast, opted for quotas, requiring companies to clean up a share of their wells each year and provide more detailed financial information to regulators.

The federal government also provided a $1.72 billion subsidy to support well cleanup in Alberta, B.C. and Saskatchewan (Government of Canada, 2020). The funding, administered through various provincial programs, paid companies to close some of their inactive wells. While Saskatchewan fully utilized its $400 million share, B.C. returned $12 million of its $120 million allocation and Alberta returned $137 million in unspent funds (Bakx, 2024).

Despite these efforts, concerns remain about the strength of provincial regulatory systems. A recent report from the Pembina Institute found that half the wells considered "suspended," or unplugged and able to return to production, have remained in that state for over 10 years (Bryant, 2025). Meanwhile, Alberta plans to replace its current cleanup approach with the Mature Asset Strategy (Government of Alberta, 2025), which moves toward a "risk-based" approach to closure that could reduce companies' cleanup obligations if they install renewable energy technologies such as solar panels on well sites.

To the extent that such policy rollbacks curtail cleanup activities, regulators risk contributing to future job losses in Canada's oil and gas restoration economy. However, provinces' legal agreements with oil and gas companies remain in place as companies are still obligated to fund cleanup at their wells.

PHOTO ARMAN NOVIC/SHUTTERSTOCK

Potential gaps in labour standards

Some interviews with employees of cleanup companies conducted by the Centre for Civic Governance suggest that labour standards in the oil and gas well cleanup sector are a cause for concern, pointing to a pressing need for future research and analysis. Through anonymous interviews, the Centre heard that the sector hires mostly non-union workers and often fails to implement standardized training. Interviewees also consistently reported that wages in the oil and gas well closure sector are typically lower than in oil and gas production.

Pressure to reduce costs, including labour costs, may stem from oil and gas company pressure. The Centre learned of instances of low-bid competition among cleanup companies vying for available work. These conditions undermine the potential to create stable, well-paying jobs, suggesting a need for government action to ensure this opportunity is not lost.

Scoping the cleanup work ahead

Estimating the future labour needs of the oil and gas well cleanup presents a substantial challenge. In part, this reflects a lack of detailed research. Each well reflects a unique combination of circumstances, including geology, soil type, well age, drill method, fuel type and the presence or severity of on-site contamination. Consequently, the work required to close and remediate well sites can vary widely.

Provinces have attempted to estimate some companies' cleanup costs, often to support bonding requirements for orphan well programs. But these in-house liability estimates routinely underestimate actual cleanup costs, particularly for full remediation.

Canada's Parliamentary Budget Officer has identified orphaned oil and gas wells as a "growing liability" across Canada, noting that regions have failed to collect sufficient funds to address rising risks of insolvency in the sector (Office of the Parliamentary Budget Officer, 2022). The report estimated that total orphan well liabilities would reach $1.1 billion by 2025. Notably, this estimate covers only orphaned wells, a small portion of the active and inactive wells across the country and excludes the costs of remediation.

In 2018, a leaked presentation from the Alberta Energy Regulator suggested that the full cost of cleanup may be much higher than publicly reported. Drawing on early findings from a survey of active cleanup companies in the province, the analysis included a more comprehensive accounting of the cost of remediation. Presented by former Vice President of Closure and Liability Robert Wadsworth, it estimated that cleaning up Alberta's unplugged oil and gas wells could cost around $100 billion, more than three times the amount calculated by the province's public estimates (Olszynski, 2023). One slide noted that this figure was still considered low, as few heavily contaminated well sites have been reclaimed." (Olszynski, 2023)

Research on job potential in oil and gas well cleanup

There is limited research on labour projections for oil and gas well cleanup in North America. Key exceptions include the following:

- *Green Stimulus for Oil and Gas Workers* by the Columbia Center on Global Energy Policy and Resources for the Future estimated the total job years required to plug wells in Alberta, Colorado, North Dakota and Pennsylvania. Job year estimates were sourced through conversations with regulators. The study found that plugging 57,000 wells in Alberta — a small subset of the total — would create 5,602 job-years, at an estimated cost per job-year of between $242,650 to $485,301 (Raimi et al, 2021).
- The Alberta Liabilities Disclosure Project (ALDP) utilized data from the leaked AER presentation (described previously) and access to information requests to estimate total well cleanup costs in the province. Unlike the preceding analysis, which assessed only a subset of Alberta's wells, the ALDP applied its estimates to all wells in the province. By applying the AER's internal formula to the province's well totals, the ALDP estimated that closing and remediating Alberta's wells would cost between $40 billion to $70 billion. They applied a single labour coefficient sourced from Statistics Canada, "waste management and remediation services," to estimate that the work of closing and remediating Alberta's 300,000 unclosed wells would result in 252,803 job years. But it remains unclear whether waste management and remediation services offer a reasonable comparison to oil and gas well cleanup, particularly given the unique skills and equipment required (Boychuk et al, 2021).

PHOTO NALIDSA/SHUTTERSTOCK

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METHODOLOGY

To date, there is little publicly available research offering a detailed breakdown of labour requirements for oil and gas well cleanup in Western Canada. This report seeks to address that gap. We conducted anonymous interviews with workers and contractors from 10 firms in the cleanup sector, using a snowball sampling technique to assess labour needs. These findings are inherently limited by sample size, indicating a need for future research to represent a larger sample size of firms and validate findings with internal corporate data.

Notably, oil and gas wells vary widely in key characteristics that influence the scope and labour requirements of closure work. Efforts to plug wells are more time-consuming and dangerous when high pressure or sour gas is present, for example. The time and money required to remediate well sites are shaped by variables like the degree of contamination, soil and rock characteristics and the hydrocarbons in question. The estimates presented here reflect broad averages across diverse conditions.

Cleanup work also varies by stage and specialization. Some companies address multiple stages within their own company, while others specialize in individual components. For example, some companies plug, cut and cap wells, while some only cut and cap wells already plugged by another company. Representatives from some companies provided feedback on multiple segments of the analysis, while others had a more limited influence.

To estimate job years, we asked interviewees to provide their estimated labour requirements for each stage of their cleanup operation, including a high and low range of workers and days or hours. We calculated the average expected job hours[2] and the number of workers on site for each segment, first by company and then by stage of cleanup operation, then converted average job hours into job years, based on an average of 1500 on-site hours per year, which is common in the construction trades industry. We then multiplied each range by the number of unplugged wells in each province[3], including currently active wells, to achieve a total estimate of job years required to close the province's wells. Some wells in provincial databases indicate that plugging has occurred, but that the work of remediating the site is in process or incomplete. We nonetheless considered those wells to be cleaned up, indicating that the remediation job needs may be underestimated in our findings.

To ensure conservative estimates, we excluded extreme cases where remediation or plugging work requires months to complete. We also excluded job needs for the "demolition" category from our analysis, given the wide range of pipe and infrastructure present on wellsites. We also bracketed labour needs for reclamation services that restore wellsites to their natural state, given the disparity between labour needs to replant forestland, for example, relative to the lesser effort of converting a site back to tilled farmland. We did not include estimates for other forms of oil and gas activity, like oil sands mines and tailing ponds. These omissions also present key opportunities for future research.

2 Note that our analysis assumed a 12-hour day for the plugging, cut and cap and remediation stages, and an eight-hour day for site assessments conducted by environmental consultants.

3 Note that well numbers are current to communication with regulators in Alberta, BC and Saskatchewan in 2025.

Five steps in oil and gas well closure

Applying the methodology above, we estimate that around 281,479 additional job-years of work will be required to close and restore oil and gas wells across Alberta, B.C., and Saskatchewan, supporting around 11,000 full-time jobs for 25 years.

These estimates are based on distinct labour projections for each stage of the closure process, described in detail below.

TOTAL JOB YEARS	ALBERTA	BC	SASKATCHEWAN	ALL PROVINCES
Total unplugged wells	281,061	17,044	83,296	381,401
Hours in 1 working person year	1,500	1,500	1,500	1,500
Job years	207,427	12,579	61,474	281,479
25-year jobs	8,297	503	2,459	11,259

PHOTO FOKKE BAARSSEN/SHUTTERSTOCK

1. Plugging

To plug a well, companies typically pump cement or other tools, including bridge plugs, into the wellbore to seal off the hydrocarbon reservoir. The seal is then tested to ensure its integrity.

Plugging requirements vary widely depending on site conditions, as well as the amount of time, number of workers and equipment required to complete the work. Some wells contain multiple reservoirs, requiring several plugs within a single wellbore. Deeper wells generally require more time and effort to plug. In some cases, workers must first remove debris such as broken cement or corroded steel from the wellbore.

Additionally, wells with high pressures or temperatures may require specialized equipment to manage those conditions, as well as additional safety personnel. The same is true for wells containing toxic and corrosive "sour gas," or hydrogen sulphide.

POSITIONS	25-YEAR JOBS IN ALBERTA, B.C. AND SASKATCHEWAN
Labourers operating service rig, supervisor, safety personnel, cement crew, welder/fabricator, drivers	3,608

2. Cut and cap

After downhole plugging is complete, a separate team typically carries out a step known as "cut and cap," in which the wellhead is cut below ground, and a cap is placed over the exposed pipe. The site is then backfilled with earth so that the well is no longer visible and does not pose a hazard.

POSITIONS	25-YEAR JOBS IN ALBERTA, B.C. AND SASKATCHEWAN
Equipment operators, welders, supervisors	118

3. Demolition

After the well has been plugged and capped, a separate team typically carries out closure activities across the remainder of the site. This includes dismantling and removing any remaining infrastructure, such as storage tanks, small compressor stations and other above-ground equipment.

In many cases, pipelines connected to the wellsite are also decommissioned. This can involve sending cleaning plugs through the pipeline to remove residual hydrocarbons, cutting the pipeline riser and capping it below ground.

Note: This report excludes demolition activities from its job-hour calculations due to the wide variability in infrastructure and site conditions. As a result, the work associated with these activities should be considered an additional requirement not captured in this analysis.

POSITIONS	25-YEAR JOBS IN ALBERTA, BC AND SASKATCHEWAN
Labourers, equipment operators, locators to identify pipelines, supervisors, vacuum truck operators, and truck drivers.	N/A

4. Site Assessment

The remediation process begins with two phases of environmental site assessment conducted by environmental consultants. First, a desk-based review is carried out to determine the likelihood of contamination. If the well previously produced hydrocarbons, contamination is generally assumed to be likely.

The second phase involves on-site assessment where consultants often drill test holes throughout the well site to confirm the presence and extent of contamination and maps out remediation crews in their cleanup work.

POSITIONS	25-YEAR JOBS IN ALBERTA, BC AND SASKATCHEWAN
Environmental technician	1,098

5. Remediation

After the second phase assessment is complete, the remediation team arrives on site to clean up the identified contamination. Contaminated soil or gravel is typically excavated and transported to specialized hazardous waste landfills. In some cases, on-site treatment methods such as bioremediation, which uses microorganisms to break down contaminants, may be used instead.

Teams then proceed to reclamation, the final stage of the process, in which land is restored to its pre-disturbance state or placed on the path toward recovery. Depending on the region and wellsite, this may involve grading topsoil for agricultural use, reseeding grasses or planting trees.

Note: Due to limited available data, job-hour estimates for the reclamation stage are not included in this analysis.

POSITIONS	25-YEAR JOBS IN ALBERTA, BC AND SASKATCHEWAN
Bioremediation specialists, equipment operators and a supervisor. Haul remediation: equipment operators, supervisor, consultant, truck drivers.	6,435

PHOTO PI-LENS/SHUTTERSTOCK

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CONCLUSION

This report examined the employment potential of cleaning up oil and gas wells in Alberta, B.C. and Saskatchewan, finding that Canada has a significant, largely untapped opportunity to reduce emissions and environmental contamination while supporting job creation in the sector. Drawing on data from oil and gas well cleanup firms, it estimated labour requirements across each stage of the closure operation, from decommissioning to remediation. We estimate that closing and cleaning up the country's unplugged and unremediated wells could create approximately **11,000 full-time jobs over the next 25 years** in Alberta, B.C. and Saskatchewan, not including the thousands more indirect jobs that would also be generated by this work.

Due to limited available data and significant variation across wellsites, these job-year estimates do not include labour associated with infrastructure demolition or full site reclamation. This highlights the need for further research to assess labour requirements across the full spectrum of cleanup activities in Western Canada, and to better understand how those needs vary by well type and location.

Even with these limitations, this report provides a first ground-up assessment of labour demand in the well cleanup sector. In doing so, it offers a clearer picture of both the scale of the challenge and the opportunity to support sustained employment through comprehensive well closure and remediation.

References

Alberta Energy Regulator. (2019, September 19). *Liability narrative* [Draft]. The Narwhal. https://thenarwhal.ca/wp-content/uploads/2023/05/AER-liability-narrative.pdf

Bakx, K. (2024, September 17). 'A lost opportunity': Alberta gives back $137M to Ottawa in unspent funds to clean up inactive wells. *CBC News.* https://www.cbc.ca/news/canada/calgary/alberta-orphan-wells-inactive-decommision-1.7324701

Borden Ladner Gervais (BLG). (2019, June 13). *B.C. mandates timelines for oil and gas site cleanups*. https://www.blg.com/en/insights/2019/06/bc-mandates-timelines-for-oil-and-gas-site-cleanups

Bowman, L. V., Hachem, K. E., & Kang, M. (2023). Methane emissions from abandoned oil and gas wells in Alberta and Saskatchewan, Canada: The role of surface casing vent flows. *Environmental Science & Technology, 57*(48), 19594–19601. https://doi.org/10.1021/acs.est.3c06946

Boychuk, R., Anielski, M., Snow, J., Jr., & Stelfox, B. (2021). *The big cleanup: How enforcing the polluter pay principle can unlock Alberta's next great jobs boom*. Alberta Liabilities Disclosure Project. https://549b4da0-c9d6-4a84-b004-d25bccb850b3.filesusr.com/ugd/6ca287_2ffe90ca7c354d3eac43b5f141b6ec8a.pdf

Bryant, A. (2025). *Unfinished business: Addressing the emissions and environmental risks of Canada's non-producing oil and gas wells.* Pembina Institute. https://www.pembina.org/sites/default/files/2025-08/Unfinished_Business.pdf

Chukwuemeka, A. O., Oluyemi, G., Mohammed, A. I., & Njuguna, J. (2023). Plug and abandonment of oil and gas wells – A comprehensive review of regulations, practices, and related impact of materials selection. *Geoenergy Science and Engineering, 226*, 211718. https://doi.org/10.1016/j.geoen.2023.211718

Cui, G., Liu, T., Xie, J., Rong, G., & Yang, L. (2022). A review of SAGD technology development and its possible application potential on thin-layer super-heavy oil reservoirs. *Geoscience Frontiers, 13*(4), 101382. https://doi.org/10.1016/j.gsf.2022.101382

DiGiulio, D. C., Rossi, R. J., Lebel, E. D., Bilsback, K. R., Michanowicz, D. R., & Shonkoff, S. B. (2023). Chemical characterization of natural gas leaking from abandoned oil and gas wells in western Pennsylvania. *ACS Omega, 8*(22), 19443–19454. https://doi.org/10.1021/acsomega.3c00676

Egler, M. (2021). *Not well spent: A review of $1-billion federal funding to clean up Alberta's inactive oil and gas wells.* Oxfam Canada & Parkland Institute. https://d3n8a8pro7vhmx.cloudfront.net/parklandinstitute/pages/1897/attachments/original/1625610004/Not-Well-Spent-Report-FINAL.pdf

Girgis, J., Gurofsky, R., Konowalchuk, O., & Macleod, W. (2024, December 24). *Redwater's continuing impact on Canada's energy sector.* SSRN. http://dx.doi.org/10.2139/ssrn.5106292

Government of Alberta. (2025). *Mature asset strategy: What we heard and recommendations report.* https://open.alberta.ca/publications/mature-asset-strategy-what-we-heard-and-recommendations

Government of Canada. (2020, June 12). *COVID-19 update #4: Follow-up on $1.72 billion for orphan and inactive wells in Alberta, British Columbia, and Saskatchewan.* Indian Oil and Gas Canada. https://www.pgic-iogc.gc.ca/eng/1588343274882/1588355750048

Kang, M., Boutot, J., McVay, R. C., Roberts, K. A., Jasechko, S., Perrone, D., Wen, T., Lackey, G., Raimi, D., Digiulio, D. C., Shonkoff, S. B. C., Carey, J. W., Elliott, E. G., Vorhees, D. J., & Peltz, A. S. (2023). Environmental risks and opportunities of orphaned oil and gas wells in the United States. *Environmental Research Letters, 18*(7), 074012. https://doi.org/10.1088/1748-9326/acdae7

Klotz, L. A., Woolley, L., Lamarche, B., Boutot, J., & Kang, M. (2025). Sevenfold underestimation of methane emissions from non-producing oil and gas wells in Canada. *Environmental Science & Technology.* Advance online publication. https://doi.org/10.1021/acs.est.4c05602

Lackey, G., Rajaram, H., Sherwood, O. A., Burke, T. L., & Ryan, J. N. (2017). Surface casing pressure as an indicator of well integrity loss and stray gas migration in the Wattenberg Field, Colorado. *Environmental Science & Technology, 51*(6), 3567–3574. https://doi.org/10.1021/acs.est.6b06071

Lewis, J., Jones, J., D'Aliesio, R., & Wang, C. (2020, October 22). Hustle in the oil patch: Inside a looming financial and environmental crisis. *The Globe and Mail.* https://www.theglobeandmail.com/canada/article-hustle-in-the-oil-patch-inside-a-looming-financial-and-environmental/

Natural Resources Canada. (2019). *Technology roadmap to improve wellbore integrity: Summary report.* https://publications.gc.ca/collections/collection_2021/rncan-nrcan/M134-59-2019-eng.pdf

Natural Resources Canada. (2025, May 14). *Shale and tight resources in Canada.* https://natural-resources.canada.ca/energy-sources/fossil-fuels/shale-tight-resources-canada

Nowamooz, A., Comeau, F., & Lemieux, J. (2018). Evaluation of the potential for gas leakage along wellbores in the St. Lawrence Lowlands basin, Quebec, Canada. *Environmental Earth Sciences, 77*(8). https://doi.org/10.1007/s12665-018-7483-6

Office of the Parliamentary Budget Officer. (2022). *Estimated cost of cleaning Canada's orphan oil and gas wells.* https://www.pbo-dpb.ca/en/publications/RP-2122-031-S--estimated-cost-cleaning-canada-orphan-oil-gas-wells--estimation-couts-nettoyage-puits-petrole-gaz-orphelins-canada

Olszynski, M., Leach, A., & Yewchuk, D. (2023). Not fit for purpose: Oil sands mines and Alberta's mine financial security program. *The School of Public Policy Publications, 16*(1). https://doi.org/10.55016/ojs/sppp.v16i1.77856

Orphan Well Association v. Grant Thornton Ltd., 2019 SCC 5.

Pozzobon, C., Liu, Y., Kirkpatrick, J. D., Chesnaux, R., & Kang, M. (2023). Methane emissions from non-producing oil and gas wells and the potential role of seismic activity: A case study in Northeast British Columbia, Canada. *Environmental Science & Technology, 57*(51), 21673–21680. https://doi.org/10.1021/acs.est.3c06062

Raimi, D., Nerurkar, N., Bordoff, J., Kang, M., Prest, B., Hanger, J., Perry, S., Teague, M., Wrotenbery, L., LePore, M., Pipchuk, D., Ennenga, T., De Pauw, L., Andrews, D., Ntuk, U. J., & May, K. (2020). *Green stimulus for oil and gas workers: Considering a major federal effort to plug orphaned and abandoned wells.* Center on Global Energy Policy. https://media.rff.org/documents/Raimi_et_al_-_Abandoned_Wells.pdf

Rice, A. K., Lackey, G., Proctor, J., & Singha, K. (2018). Groundwater-quality hazards of methane leakage from hydrocarbon wells: A review of observational and numerical studies and four testable hypotheses. *Wiley Interdisciplinary Reviews: Water, 5*(4), e1283. https://doi.org/10.1002/wat2.1283

Seymour, S. P., Xie, D., & Kang, M. (2024). Highly uncertain methane leakage from oil and gas wells in Canada despite measurement and reporting. *Energy & Fuels, 38*(14), 13078–13088. https://doi.org/10.1021/acs.energyfuels.4c00908

The Surface Reclamation Act, S.A. 1963, c. 64. https://canlii.ca/t/53v9v

Sherwood, O. A., Rogers, J. D., Lackey, G., Burke, T. L., Osborn, S. G., & Ryan, J. N. (2016). Groundwater methane in relation to oil and gas development and shallow coal seams in the Denver-Julesburg Basin of Colorado. *Proceedings of the National Academy of Sciences, 113*(30), 8391–8396. https://doi.org/10.1073/pnas.1523267113

Trudel, E., Bizhani, M., Zare, M., & Frigaard, I. (2019). Plug and abandonment practices and trends: A British Columbia perspective. *Journal of Petroleum Science and Engineering, 183*, 106417. https://doi.org/10.1016/j.petrol.2019.106417

Watson, T. L. (2020). Abandoned wells create liability for future subsurface resource exploitation. *Alberta Law Review, 57*(4), 1001–1018. https://canlii.ca/t/sw93

Williams, J. P., Regehr, A., & Kang, M. (2020). Methane emissions from abandoned oil and gas wells in Canada and the United States. *Environmental Science & Technology, 55*(1), 563–570. https://doi.org/10.1021/acs.est.0c04265

Wisen, J., Chesnaux, R., Werring, J., Wendling, G., Baudron, P., & Barbecot, F. (2019). A portrait of wellbore leakage in northeastern British Columbia, Canada. *Proceedings of the National Academy of Sciences, 117*(2), 913–922. https://doi.org/10.1073/pnas.1817929116

Yewchuk, D., Fluker, S., & Olszynski, M. (2023). *A made-in-Alberta failure: Unfunded oil and gas closure liability.* The School of Public Policy. https://www.policyschool.ca/wp-content/uploads/2023/10/EFL-49A-AB-ConvenOGLiabilityRegime.YewchukFluker.pdf

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