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Lithium Mining in Australia

An overview of socio-environmental
governance of the sector

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Lithium Mining in Australia: An overview of socio-environmental governance of the sector

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1.0 Introduction

This case study is part of a broader project focused on strengthening supply chain resilience by analyzing the environmental and associated social impacts of critical minerals extraction and processing through the development of country-commodity case studies focused on nickel, lithium, and copper. As the second in the series and one of two on lithium, this case study describes Western Australia's environmental challenges and associated social issues from hard-rock lithium mining and examines the state of Western Australia's policy measures for managing them. Where applicable, differences are highlighted between hard-rock and brine lithium. The conclusions and lessons learned from this case study can be used to guide sustainable hard-rock lithium mining and processing in Australia, as well as other jurisdictions.

2.0 Methodology

This case study is based primarily on desk research, including documentation from research papers and news articles, as well as targeted questions asked of experts. The research was carried out from December 2025 to May 2026.



3.0 Context

Detailed contextual information is available from two Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IGF) publications: a country factsheet on Australia (IGF, 2026b) and a commodity profile on lithium (IGF, 2026a). This country-commodity case study draws on these sources and provides a more in-depth view of lithium as a strategic commodity in Australia.

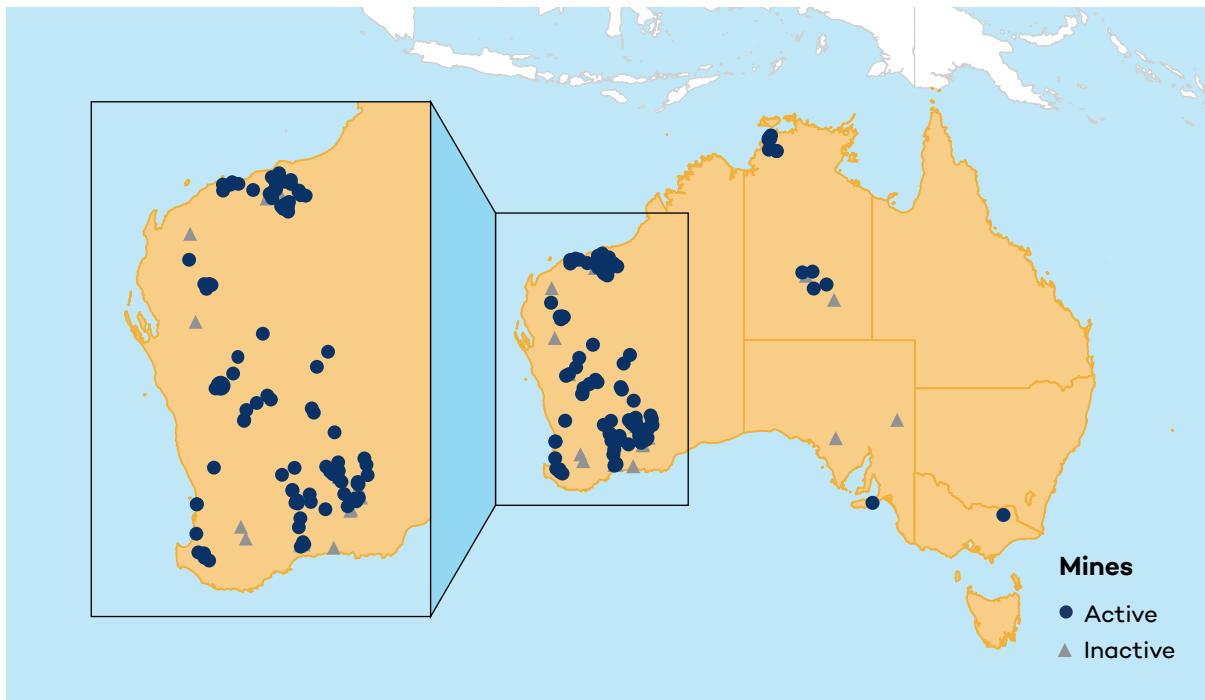
3.1 Geological and Mining Context

In 2025, Australia produced 92,000 tonnes of lithium, making it the world's leading lithium producer (United States Geological Survey, 2026). In 2024, Western Australia produced 42% of the world's lithium and 99% of Australia's (Government of Western Australia, 2025g). Given Western Australia's predominance in world lithium production and the subnational governance for mining across Australian states, this case study focuses on the governance of the socio-environmental impacts of lithium mining specifically in Western Australia.

Much of Western Australia's lithium comes from pegmatite, a coarse-grained rock found in the Archean terrains, which are stable, mineral-rich regions more than 2.5 billion years old (Government of Western Australia, 2025b). Pegmatite can contain spodumene, a mineral made up of lithium. Australia is the world's largest producer of spodumene (Koreis, 2025). Greenbushes is Western Australia's largest lithium mine and it accounted for 37% of the state's lithium production in 2024, followed by Pilgangoora (16%), Mt Marion (14%), Wodgina (10%), and Mt Cattlin, whose operations were suspended at the time of writing due to lower spodumene prices (Government of Western Australia, 2026d).



FIGURE 1. Map of lithium mines in Australia

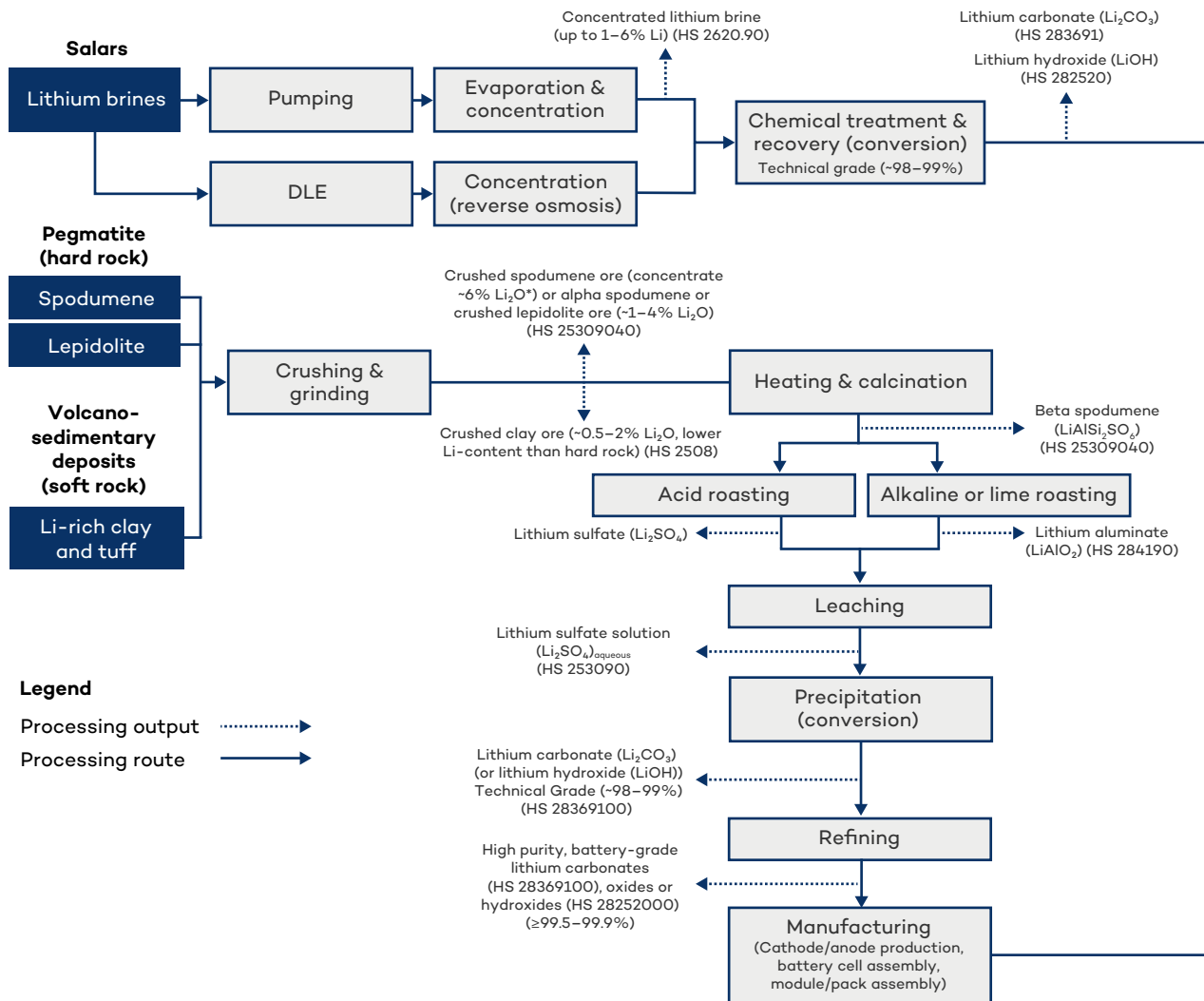


Source: Author.

Hard-rock lithium mining involves several stages to extract lithium from lithium ores. Traditional mining is used to extract lithium-bearing rock, such as spodumene. The ore is crushed and ground to reduce its particle size and is then concentrated to increase the lithium content. Lithium compounds are isolated using different chemical processes that separate lithium and other elements from the ore. Lithium is then purified through chemical treatments and precipitated as lithium carbonate, becoming a refined product (Abrishami et al., 2026).



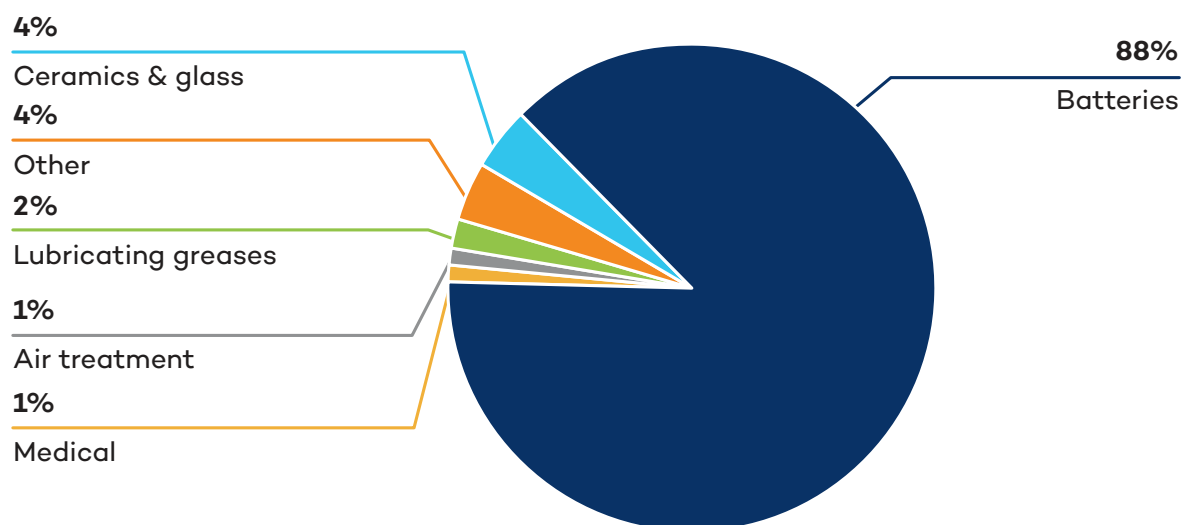
FIGURE 2. Lithium value chain



As depicted in Figure 3, the majority (88%) of lithium is used for batteries, given the increasing market for electric vehicles, energy grid storage, portable electronic devices, and electric tools (United States Geological Survey, 2026).



FIGURE 3. Lithium end uses



Source: Based on United States Geological Survey, 2026.

3.2 Governance and Regulatory Framework

In Australia, mining regulation is primarily a state and territory responsibility, while certain environmental and social matters are governed at the national level. This section outlines the key legislative and regulatory frameworks governing environmental protection, social impacts, and Indigenous rights at both the national and Western Australian state levels.¹

3.2.1 National Regulatory Framework

Environmental Protection

At the federal level, the Environment Protection and Biodiversity Conservation Act 1999 (Cth) provides the framework for environmental impact assessment and protection of matters of national environmental significance. The National Greenhouse and Energy Reporting Act 2007 (Cth) mandates national emissions and energy reporting for large emitters. The Climate Change Act 2022 (Cth) enshrines Australia's emissions reduction targets of 43% below 2005 levels by 2030 and net-zero by 2050 into law.

Gender Equality

Gender equality in the mining workforce is governed by the Workplace Gender Equality Act 2012 (Cth). Under the Act, employers with 100 or more employees are required to report annually on six topics, including sexual harassment in the workplace and the gender pay gap (Workplace Gender Equality Agency, n.d.). Employers with 500 or more employees are required to adopt strategies to improve their gender pay gap (Department of the Prime Minister and Cabinet, n.d.). Discrimination is prohibited under the Sex Discrimination Act 1984 (Cth).

¹ Unless otherwise indicated, the legislative instruments discussed in this report are Western Australian. Federal instruments are identified by the standard citation abbreviation (Cth), denoting the Commonwealth of Australia.



Indigenous Rights

Indigenous land and water rights are governed by the Native Title Act 1993 (Cth), which establishes the framework for recognizing and protecting Indigenous land rights across all jurisdictions. The National Native Title Tribunal (NNTT) is a quasi-judicial federal tribunal established under the Native Title Act 1993 (Cth) and tasked with resolving native title issues over land and water. It forms part of the executive arm of the government. Members of the NNTT are appointed by the Governor General (Australian Law Reform Commission, 2010; NNTT, 2010).

The granting of mining licences is subject to a time-bound “right to negotiate” with native title parties. The government must give notice to native title holders, the public, and the NNTT of its intention to grant a mining licence (Government of Western Australia, 2026b). Companies are required to negotiate in good faith to obtain the agreement of each affected native title party.

If an agreement is not reached within 6 months of the original notice, any party can apply to the NNTT for a determination. The NNTT can determine whether an activity may proceed. The Commonwealth Attorney General can overrule the NNTT’s decision (NNTT, 2020).

If an agreement is reached, it is likely to include controls on activities, including specific Aboriginal heritage protection protocols under the Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Cth), which provides a federal mechanism for emergency protection of significant Aboriginal areas and objects where state or territory laws are inadequate.

Though the right to negotiate requires negotiations to take place in good faith, decisions on mining activities are not contingent on the consent of native title parties, except in South Australia (Burton et al., 2024; Government of Western Australia, 2026b) and in the Northern Territory (Northern Territory Government, n.d.). In most of the country, including Western Australia, consent is given by the government only (Burton et al., 2024).

3.2.2 Western Australia Regulatory Framework

In Western Australia, the primary legislation governing mining is the Mining Act 1978, administered by the Department of Mines, Petroleum and Exploration (DMPE).

Environmental Protection

Environmental protection is regulated under the Environmental Protection Act 1986 and administered by the Department of Water and Environmental Regulation (DWER). Water resources are managed under the Rights in Water and Irrigation Act 1914. Biodiversity is further protected under the Biodiversity Conservation Act 2016, which provides for the conservation and protection of biodiversity and its components: diversity of ecosystems, species, and genes.

Workplace Health and Safety

Workplace health and safety in the mining sector is governed by the Work Health and Safety Act 2020 (WHS Act), which includes duties to prevent specific workplace risks. The Work Health and Safety (Mines) Regulations 2022 adapts the general duties in the WHS Act to the specific context of mineral exploration and mining activities (IGF, forthcoming).



Indigenous Rights

Indigenous rights are protected under the Aboriginal Heritage Act 1972. In 2021, Western Australia enacted reforms on the notion of consent via the Aboriginal Cultural Heritage Act 2021 to align the state's laws with the principles of Indigenous self-determination and Free, Prior, and Informed Consent (FPIC) under the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). This Act was in place for only five weeks before it was repealed following strong industry opposition (Lynch et al., 2023).

3.3 Socio-Economic Context

3.3.1 Employment Profile

As of 2025, the lithium industry in Western Australia employs 11,435 full-time equivalent workers, an increase of 41% from 2022–2023 (Government of Western Australia, 2025f, 2026e). Lithium mining employs significantly more workers in Western Australia than mining for nickel, copper, zinc, and rare earth minerals (Government of Western Australia, 2026e).

Gender Disaggregation in Employment Composition

Western Australia has the largest gender pay gap in Australia, taken as a difference in total remuneration between men and women (Workplace Gender Equality Agency [WGEA], 2025). This gap is in large part due to the dominant gender-unequal mining workforce: men occupy most roles in the mining sector (which are high paying), and women are concentrated across health care and social assistance roles in the industry, where pay is mid-range (WGEA, 2025).

For mining, Table 1 provides a breakdown of the gender balance in the labour force of major lithium mining companies in Western Australia and the corresponding gender pay gap.

TABLE 1. Gender-disaggregated employment data

Mine	Operating company	Workforce composition in operating company (% women in the workforce)	Gender pay gap (% difference in median total remuneration between men and women)
Greenbushes	Talison Lithium	28.3% (2023)	24.4% (2023)
Pilgangoora	PLS Group Ltd.	24% (2025)	11.1% (2025)
Wodgina	Mineral Resources	22.3% (2025)	19.4% (2025)
	Albemarle Lithium	18.2% women and non-binary employees (2025)	-
Mt Marion	Mineral Resources	22.3% (2025)	19.4% (2025)

Sources: Author-collected data from Albemarle, 2025; Mineral Resources, 2025; PLS Group Ltd., 2025; Talison Lithium, 2023.

Note: Mineral Resources operates other mines that are not lithium mines, so their data in the table are company-specific and not lithium mine-site-specific. Talison Lithium's, PLS Group Ltd.'s, and Albemarle's data are lithium mining-specific.



Women's participation in these major lithium companies roughly aligns with the overall gender balance in the mining workforce in Western Australia, which was 24.9% in 2025 (Workplace Gender Equality Agency, 2025). This figure is higher than women's participation in mining in Australia as a whole, which stands at 20% (IGF, 2026b), having increased by 2% points since 2020–2021 (IGF & International Labour Organization [ILO], 2022).

Only PLS Group Ltd. achieved a gender pay gap lower than the 16.4% average across all industries in Australia (Workplace Gender Equality Agency, 2025). Talison Lithium, PLS Group Ltd., and Mineral Resources have published statements and strategies committed to closing their gender pay gaps and increasing women's participation in the workforce, including in management positions (Mineral Resources, n.d.-a; PLS Group Ltd., 2025; Talison Lithium, 2023). The authors were unable to find a publicly available strategy from Albemarle. At Mineral Resources and PLS Group Ltd. (which are the companies for which there is available data), the gender pay gap decreased between 2022 and 2025.

3.3.2 Sexual and Gender-Based Violence and Occupational Health and Safety

Lithium mining in Western Australia often takes place in remote areas, with large temporary workforces, on-site accommodation, long shifts, and heavy reliance on contractors (IGF, 2026b). The Pilgangoora and Wodgina lithium mine sites are located in highly remote areas (Mineral Resources, n.d.-c; PLS Group Ltd., n.d.-b), while Greenbushes is adjacent to an established community and Mt Marion is 70 km south of Kalgoorlie (Mineral Resources, n.d.-b; Talison Lithium, n.d.-b). Remote mining operations often rely on fly-in, fly-out arrangements, which can blur the boundaries between work and living spaces, reduce access to outside support networks, complicate timely responses to incidents, and weaken accountability where liabilities overlap (Community Development and Justice Standing Committee, Western Australia Parliament, 2022). These conditions are known to heighten the risks of sexual and gender-based violence (SGBV), making it a foreseeable workplace-related risk that legislation and site-level regulations must address (Community Development and Justice Standing Committee, Western Australia Parliament, 2022). This risk is especially important to address where projects are located on or near Indigenous lands and remote communities, since the risk of SGBV extends beyond the workforce and requires appropriate community-facing safeguards to protect the health and safety of people in adjacent mining-affected communities.

3.4 Indigenous Peoples:² Aboriginal and Torres Strait Islander (First Nations)

Western Australia is the state with the highest proportion (80%) of land where Indigenous Peoples' rights are recognized in law in the form of Aboriginal and Torres Strait Islander Land Titles, Native Titles and Settlement Agreements (Burton et al., 2024).

² This study forms part of a comparative analysis of the socio-economic governance of critical minerals across multiple country contexts, each with distinct legal, political, and cultural understandings of Indigeneity. In this report, the terms Indigenous Peoples, First Nations, and Aboriginal and Torres Strait Islander Peoples are used according to the sources referenced. This approach is not intended to generalize or homogenize the diverse identities, rights, and experiences of Indigenous communities. Wherever applicable, the report aims to use context-specific terminology.



For lithium, 59.9% of early-stage projects, 38.1% of late-stage projects, and 63.3% of mine-stage projects are estimated to be on land with recognized rights held by Indigenous Peoples (Burton et al., 2024). These figures reflect a general trend for critical minerals projects, which across Australia are more likely to be located on land to which Indigenous Peoples have rights, compared to mining overall (Burton et al., 2024). They also reflect the global picture: lithium mining is estimated to have a significantly higher level of overlap (78%) with Indigenous Peoples' land rights than other critical minerals like copper and zinc (44%; Burton et al., 2024).

Most major lithium mining companies in Western Australia have company policies that recognize specific native title holder groups with whom their operations overlap, including the Noongar, Nyamal, Marlinyu Ghoorlie, and Kariyarra people (Goode & O'Reilly, 2018; Mineral Resources, n.d.-b, 2024; PLS Group Ltd., n.d.-a). However, Aboriginal connection to land and legally recognized native title are not always aligned. A project area may be relevant to several Aboriginal groups with cultural, historical, linguistic, residential, or asserted interests on the land, but the formal native title rights associated with that area may be held by a specific recognized claim group, may be shared through a broader composite group, or may not be legally recognized at all.

Economic Inclusion of Indigenous Peoples

In 2022–2023, 67% of First Nations Peoples in Australia were part of the formal labour force (Australian Institute of Health and Welfare, 2025). While First Nations participation in the overall labour force decreases with increasing remoteness (Australian Institute of Health and Welfare, 2025), the reverse is true for the mining sector, where Indigenous participation in employment increases with remoteness (Hatch, 2025). Indigenous workers represent 15% to 20% of the local workforce at remote mining sites, compared to 4.6% of the national mining workforce overall (Hatch, 2025). A joint IGF and ILO global mining workforce study showed that in 2016, women made up 19% of the Aboriginal and Torres Strait Islander mining workforce in Australia, a proportion slightly higher than that of women in the mining workforce overall that same year (IGF & ILO, 2022).

Indigenous Peoples in Australia generally have not benefited equitably from the wealth generated from mining, despite most mining activity occurring on their customary land (Burton et al., 2024). However, government efforts are being made to improve equitable benefit sharing with Indigenous populations, including through Australia's Critical Minerals Strategy (2023–2030) (Department of Industry, Science and Resources, 2023; Burton et al., 2024). Furthermore, many mining companies have Indigenous engagement strategies and agreements with Indigenous communities, gaining access to land and natural resources in exchange for financial benefits in the form of royalties, lease payments, and employment opportunities (Leyton-Flor & Sangha, 2024; PLS Group Ltd., 2024). Lithium mining companies have also engaged Indigenous-owned companies in procurement and services for lithium mine sites. For instance, in 2024 the Wodgina lithium mine awarded a 5-year contract to an Indigenous-owned business for road maintenance and civil works around the mine (Mineral Resources, 2024).



4.0 Environmental and Associated Social Impacts

The environmental impacts of lithium mining in Australia are broad and widespread. They range from greenhouse gas (GHG) emissions to heavy water consumption, habitat fragmentation, and toxic waste generation. These impacts are closely related to social issues, such as competition for scarce regional water, loss of cultural heritage sites, land governance conflicts, and heightened community anxiety over long-term environmental health. The following sections describe the environmental impacts and their associated social impacts in more detail.

4.1 Energy

Hard-rock lithium mining is energy intensive, requiring more energy than brine lithium extraction (Bostock, 2023). This requirement is largely due to the additional conversion process, in which direct heating is needed to produce lithium hydroxide or carbonate products. Conversion accounts for close to 80% of hard-rock lithium's total energy intensity. In contrast, brine lithium does not require this conversion, as these chemicals are produced during the processing of brine (Skarn Associates, 2024).

Australia's electricity grid is highly dependent on fossil fuels including coal, diesel, and gas (Department of Climate Change, Energy, the Environment and Water, 2025a), which increases the overall emissions intensity of lithium mining in the country. However, renewable energy generation has increased, and Australia aims to further expand its use overall (Department of Climate Change, Energy, the Environment and Water, 2025a).

4.1.1 Energy Governance

The Australian Government's Powering Australia policy aims to increase renewable energy to reduce emissions, lower energy costs, and create jobs (Department of Climate Change, Energy, the Environment and Water, 2025b). Using renewable energy could lower emissions from electricity consumption and, where electrification is possible, from fuel use. Australia's Critical Minerals Strategy (2023–2030) commits AUD 3 billion for renewable and low-emission technologies (Burton et al., 2024). At the state level, the Mining Act 1978 and the



Environmental Protection Act 1986 provide the regulatory framework within which mining operations must manage their energy-related environmental impacts.

4.2 Emissions

4.2.1 GHG Emissions

The high energy use for hard-rock lithium mining results in higher carbon emissions. On average, producing lithium from hard rock generates approximately two to eight times more GHG emissions than producing lithium from brine (International Energy Agency, 2021; Sun et al., 2025). In 2023, hard-rock lithium production had an average GHG emission intensity of 13.92 tonnes of carbon dioxide equivalent (tCO₂e) per tonne of lithium carbonate equivalent (LCE), while brine lithium had a GHG emission intensity of 2.54 tCO₂e/t LCE (Skarn Associates, 2024). Emission intensity varies depending on the energy source, ore grade, location, transport, and extraction method.

Mining companies around the world have implemented various measures to reduce emissions, including transitioning to renewable power sources. Australia's mining industry is no exception. For example, PLS Group Ltd.'s Pilgangoora Project in the Pilbara region began generating its own solar power from a 6-megawatt solar farm in late 2022. It is expected to replace approximately 3.8 million litres of diesel fuel annually, resulting in a reduction of approximately 9,900 tonnes of CO₂ per year (PLS Group Ltd., n.d.-b).

Impact of GHG Emissions on Communities

First Nations Peoples and people living in poverty in remote areas in Australia disproportionately bear the brunt of climate change impacts. They are already disproportionately exposed to extreme heat, rising seawater levels, and climate impacts on food sources. Increases in these events exacerbate the already lower health and well-being these populations experience (Australian Government, 2024).

Policy Measures

Under Powering Australia, the Safeguard Mechanism was established under the National Greenhouse and Energy Reporting Act 2007 (Cth) and is administered by the Clean Energy Regulator. It aims to reduce industrial emissions and applies to industrial facilities that emit more than 100,000 tCO₂e per year, setting baselines for each facility. These limits will gradually decline to reduce emissions, enabling the facilities to support Australia's broader decarbonization objectives, such as achieving the country's emission-reduction targets of 43% below 2005 levels by 2030 and net-zero by 2050, as enshrined in the Climate Change Act 2022 (Cth; Department of Climate Change, Energy, the Environment and Water, 2026). Facilities with excess emissions must manage that excess by April 1 of each year through a number of options: surrender Australian carbon credit units³ or Safeguard Mechanism

³ Australian Carbon Credit Units "are a tradeable financial product" aimed to encourage carbon abatement. They are traded on the secondary market or sold to the Australian Government. One credit unit represents 1 tCO₂e (Clean Energy Regulator, 2025a).



credit units⁴; apply to become a trade-exposed baseline-adjusted facility⁵; apply to borrow baseline emissions from the following year; or apply to extend the baseline under a multi-year monitoring period. Penalties for failure to comply may include receiving an infringement notice, civil penalties, or accepting enforceable undertakings (Clean Energy Regulator, 2025c).

The National Greenhouse and Energy Reporting Scheme, under the National Greenhouse and Energy Reporting Act 2007 (Cth), is a national framework for reporting GHG emissions, energy production, and energy consumption. The scheme sets thresholds for facilities and for corporations. Thresholds for facilities are emissions of 25,000 tCO₂e or more, production of 100 terajoules (TJ) or more of energy, or consumption of 100 TJ or more of energy. Thresholds for corporations are emissions of 50,000 tCO₂e or more, production of 200 terajoules (TJ) or more of energy, or consumption of 200 TJ or more of energy. The Clean Energy Regulator monitors and enforces compliance of the scheme (Clean Energy Regulator, 2026).

4.2.2 Dust Emissions

In traditional mining operations, such as hard-rock mining, dust is generated when drilling and blasting to make the mineral-containing rock accessible, when crushing to increase ore concentration in the mined rock, and when moving materials and vehicles to transport the ore (Talison Lithium, 2025a). Brine extraction does not involve these dust-producing steps and, consequently, generates lower dust emissions than hard-rock lithium mining (Abrishami et al., 2026).

Impact of Dust Emissions on Communities

Dust concentration in the lithium mining and processing industry is at levels capable of causing health issues among workers, including chronic obstructive pulmonary disease (or COPD) and silicosis, though responsible health and safety procedures and practices can mitigate these risks significantly (Gbondo et al., 2025). In addition to wind, rainfall can also pose a risk of mining dust leaching into water (Setu & Strezov, 2026).

Dust emissions increased with the expansion of Talison Lithium's Greenbushes mine in Western Australia, which led to local plants, orange trees, play equipment, and the nearby community's primary school being covered in dust (McArthur & Mitsopoulos, 2025). Local communities have raised concerns around health impacts affecting eyes, skin, and respiration, as well as additional potential health risks given the unknown composition of the dust (McArthur & Mitsopoulos, 2025). Women in Western Australia perform the majority of unpaid domestic and caring responsibilities (Government of Western Australia, 2026e), and an increase in community health issues due to mining projects has a disproportionate impact on their care burden.

To address the issue of dust emissions, Talison Lithium carries out a variety of dust-control measures to reduce potential dust emissions, as required by the Department of Water and Environmental Regulation (DWER). These measures include but are not limited to air-quality monitoring; real-time dust monitoring and tracking, which also acts as early warnings of

⁴ Safeguard Mechanism credit units are tradeable credits intended for emitters to reduce emissions from their facilities to below their baselines. These credits can be traded or surrendered. One credit unit represents 1 tCO₂e (Clean Energy Regulator, 2025c).

⁵ Trade-exposed baseline-adjusted facilities receive a reduced baseline decline rate, for up to 3 years. A facility must meet certain criteria to qualify (Clean Energy Regulator, 2025b).



dust generation, allowing the company to adjust or stop mine activities as needed; misting systems on material transfer points and stockpiles; water carts and non-hazardous chemicals on roads and open areas; dust extraction systems in processing areas; and enclosed trucks for moving product (Talison Lithium, 2025a).

Policy Measures

DWER regulates dust emissions and sets pollution levels under the Environmental Protection Act 1986. DWER also provides an online reporting form and a 24-hour hotline for citizens to report dust emissions (Government of Western Australia, 2025d).

The Department of Local Government, Industry Regulation and Safety (LGIRS) has a dust strategy to manage workplace dust and protect workers under Western Australia's WHS Act and the Work Health and Safety (Mines) Regulations 2022.⁶ The WHS Act requires employers to put in place reasonable measures to ensure that no person at the workplace is exposed to a substance or mixture in an airborne concentration that exceeds the workplace exposure limits for that substance (Safe Work Australia, 2024). The Work Health and Safety (Mines) Regulations 2022 require that miners with exposure to respirable silica dust above the exposure standard undertake regular health monitoring (Gbondo et al., 2025).

LGIRS conducts inspections, including air monitoring, to verify industry data and ensure compliance with health and safety standards (Government of Western Australia, Department of Mines, Industry Regulation and Safety, 2024). Non-compliance identified from inspections has resulted in the issuance of dust-related notices and the implementation of industry-developed action control plans, reviewed by LGIRS, to prevent hazardous levels of dust exposure (Government of Western Australia, 2024a).

4.3 Water

4.3.1 Water Quantity

Large amounts of water are required in hard-rock lithium mining during the refining stage, which accounts for most of the water used in this method of production (Sun et al., 2025). Water is also needed for dust control, transportation, waste management, and washing the final product (Blair et al., 2024; Passini, 2023). The amount of water consumed depends on site-specific operational practices (Setu & Strezov, 2026). However, hard-rock lithium mining consumes 4 to 25 times less water overall than extracting brine lithium (Sun et al., 2025).

Western Australia is located in arid and semi-arid regions where high evaporation and low precipitation contribute to extreme water deficits (Skrzypek et al., 2023). Lithium mining requires groundwater extraction (dewatering) to access ore bodies, which can lower local water tables. In arid and semi-arid climates, groundwater recharge rates are limited and infrequent (Skrzypek et al., 2023). Groundwater-dependent ecosystems, including vegetation and wetlands, rely on consistent access to subsurface water. Reductions in groundwater availability can disrupt ecological processes and lead to ecosystem degradation and biodiversity loss (Rohde et al., 2019).

⁶ Note: The Mines Safety and Inspection Act 1994, which previously governed mine safety, was repealed on March 31, 2022 upon commencement of the WHS Act 2020. The 1994 Act is retained only for levy-collection purposes and should not be presented as a parallel active safety regulatory instrument.



4.3.2 Water Quality

Hard-rock lithium mining can adversely affect the water quality of surrounding water sources (Blair et al., 2024; EcoServants, 2024). During the processing stage of hard-rock mining, the ore is crushed and roasted. The ore is then leached with a chemical solution, such as acid or cyanide. This solution selectively dissolves the valuable metal and mineral, which is then collected and processed to recover the metal (AZoMining, 2014). The contaminants used in leaching can harm aquatic species and pose health risks to nearby communities (EcoServants, 2024). Water quality is further threatened by land degradation (see Section 4.4), the disturbance of subsurface sediment, waste storage, and chemical use, all of which create significant contamination risks (Blair et al., 2024).

4.3.3 Water Governance

The DWER is Western Australia's government agency responsible for administering the Rights in Water and Irrigation Act 1914 and managing the state's water resources, including setting the amount of water that can be consumed and issuing licenses and permits for the taking⁷ and use of water (Government of Western Australia, 2024c). The Environmental Protection Act 1986 also applies to the protection of water quality from pollution caused by mining activities. Applicants can apply for licences and permits through an online customer portal, Water Online, where they can manage their submissions and submit other required documentation, such as monitoring reports (Government of Western Australia, 2023b). The DWER has a target of processing licences within 90 days of when an applicant registers in Water Online and pays any applicable fees (Government of Western Australia, 2024c).

Under the Mining Act 1978, companies are required to monitor and report on the use of water and its quality (Talison Lithium, n.d.-a). Environmental reports are required for all mining operations that have an environmental reporting condition included on their Approvals Statement. The reports document mining and environmental management activities and include a summary of monitoring results and environmental performance, as well as a list of relevant monitoring evidence documents (Government of Western Australia, 2026c).

Penalties for non-compliance with licensing obligations may include cancellation, suspension, or amendment of license or permits; a directive to comply with licence terms, conditions, or restrictions, to carry out specific works, or to limit water taking; an infringement notice; and prosecution (Government of Western Australia, 2023a).

4.3.4 Water and Aboriginal Heritage Sites

Water and land contain specific spiritual significance for Aboriginal groups (Government of Western Australia, 2026f). Talison Lithium's Greenbushes mine is located in an area that contains tributaries of the Blackwood River, a registered Aboriginal Heritage site that the Noongar peoples believe to have been created by the *Waugul* (central creator spirit). The tributaries are also located at a significant cultural boundary between two Aboriginal language groups (Goode & O'Reilly, 2018).

⁷ "Take" is a defined term under the Rights in Water and Irrigation Act, meaning "to remove water from, or reduce the flow of water in, a watercourse, wetland or underground water source," including by pumping, diverting, or impeding flow. It is therefore broader than consumption, and licences to take water are issued under section 5C of the Act.



In accordance with its obligations under the Aboriginal Heritage Act 1972, Talison Lithium commissioned an Aboriginal Heritage Survey to identify potential risks to the Blackwood River as part of the plans to expand the Greenbushes mine. The company conducted community consultations with Native Title claim representatives and after the process determined that no risk was present, the expansion was allowed to continue (Goode & O'Reilly, 2018). However, concerns remain that the lithium project has the potential to impact the water quality and flow of the river (Talison Lithium, 2025b).

4.4 Land Use

A significant amount of land is cleared for open-pit mines for hard-rock lithium mining. However, hard-rock mining typically requires less land per tonne of LCE than brine extraction (via evaporation ponds; Abrishami et al., 2026; Sun et al., 2025). Studies suggest that land-use intensity is approximately 335 m² to 525 m² per tonne of LCE for hard-rock mining and approximately 357 m² to 3,660 m² per tonne of LCE for brine extraction, depending on infrastructure and site conditions (Abrishami et al., 2026).

Land clearing leads to environmental degradation through the removal of soil and vegetation. This degradation can destroy habitats for plants and animals, and it destabilizes ecosystems, reducing their ability to recover and support vegetation regrowth after mining. The removal of topsoil and vegetation can also cause soil erosion, which further contributes to land degradation, making it more difficult for vegetation to regrow (EcoServants, 2024).

4.4.1 Land Governance

The DWER administers clearing provisions under the Environmental Protection Act 1986, which regulates native vegetation clearing (Government of Western Australia, 2024b). However, the Department of Mines, Petroleum and Exploration (DMPE) assesses and accepts or denies applications for Native Vegetation Clearing Permits, which are generally required to clear native vegetation in Western Australia, under Part V of the Act. Both DWER and DMPE commit to working in parallel when multiple approvals are required (Government of Western Australia, 2025e), ensuring that applications are processed concurrently.

As part of their application for new and amendment permits, applicants should provide a supporting document that outlines the nature, context, and location of the proposed clearing, including relevant technical reports and data gathered. Proponents are also required to follow the mitigation hierarchy to avoid, minimize, restore/rehabilitate, and offset impacts. As part of their application, they must prove that they have made efforts to avoid and minimize clearing. The DMPE considers offsets to be a last resort, applicable only when avoidance and minimization have been pursued (Government of Western Australia, 2026a). Additionally, the Mining Act 1978 requires mining tenement holders to comply with environmental conditions, including those relating to land rehabilitation. Compliance and penalties for unauthorized clearing of native vegetation may include education and warning letters, notices, rehabilitation requirements, and fines (DWER, n.d.).



BOX 1. REHABILITATION THROUGH COLLABORATION

The Pilbara Rehabilitation Group is an industry collaboration formed by resource companies operating in the Pilbara region of Western Australia. It acts as a platform for technical and professional members, including mining companies, to discuss, share experiences, and develop solutions to address rehabilitation issues. The group enables peer learning, industry alignment, and the identification of practical solutions for rehabilitation (Mineral Resources, 2025).

4.5 Policy Measures

Western Australia's Aboriginal Heritage Act 1972 requires land tenure holders to enter Heritage Agreements with the relevant Native Title Agreement Group before conducting mining activities. They must also assess risks to Aboriginal cultural sites and objects of significance, including sites like waterways, rock art, ancient caves, burial sites, ceremonial sites, or scar trees (Goode & O'Reilly, 2018). If potential impacts are identified, the company must obtain permission from the government before proceeding with the proposed activity (Government of Western Australia, 2023b). The relevant minister is required to consider the general interest of the community in deciding whether to grant consent (Government of Western Australia, 2025a). In 2023, amendments to the Aboriginal Heritage Act via the Aboriginal Heritage Legislation Amendment and Repeal Act 2023 came into effect, including a process for Aboriginal groups to challenge Section 18 (site destruction) approvals via the State Administrative Tribunal (Hook, 2025).



5.0 Strengths and Gaps

5.1 Strengths

5.1.1 Environmental Strengths

Renewable Energy Integration

The use of renewable power sources within Western Australia's lithium mining operations represents a significant step toward reducing the industry's carbon footprint. By replacing fossil-fuel-dependent energy, mining operations are reducing their emissions and helping Australia meet its national emission reduction targets.

Emissions and Energy Reporting

Australia has a national reporting system for GHG emissions and a Safeguard Mechanism that requires larger emitters (100,000 tCO₂e/year or more) to set baselines and implement measures to reduce their emissions over time in order to meet the country's emissions reduction targets of 43% below 2005 levels by 2030 and net-zero by 2050.

Publicly Available Environmental Reports

Summaries of environmental reports submitted online to the DWER are made publicly available, ensuring transparency in environmental oversight. This transparency allows stakeholders, including affected communities, to stay informed about environmental performance and hold companies accountable for non-compliance or poor outcomes.

Industry Collaboration

The Pilbara Rehabilitation Group serves as an example of how industry collaboration can drive meaningful progress on complex environmental challenges. By bringing together key stakeholders, this group has created a platform for peer learning, knowledge sharing, and the collective development of solutions to address the rehabilitation demands posed by lithium mining. This collaborative approach underscores the value of industry actors working together to foster solutions and consistency in rehabilitation practices across the state.



5.1.2 Social Strengths

Publicly Available Gender Pay Gap Reporting

Western Australia mandates equal pay for equal roles and requires employers with over 100 employees to publicly report on their gender pay gap. Public reporting obligations such as these increase transparency around systemic social and workplace discrimination, as well as company culture, enhancing accountability. Each of the major lithium mining companies operating in Western Australia that the authors of this report could find data for has coupled this reporting with actionable strategies to reduce inequalities in the workplace, reducing their gender pay gaps between 2022 and 2025.

SGBV Prevention Frameworks

Western Australia's Work Health and Safety Act 2020 requires employers to take reasonable steps to ensure the prevention, identification, and management of sexual harassment and violence. Making employers responsible for putting appropriate measures in place to prevent and address SGBV in the workplace is a comparatively advanced and emerging regulatory approach, and one that is necessary to address the heightened risks of SGBV on remote mine sites.

Right to Negotiate

Under the Native Title Act 1993 (Cth), the granting of mining licences on land subject to native title triggers a right to negotiate. While native title parties may express opposition and withhold consent during this process, the right to negotiate does not generally provide them with the ability to prevent mining activities from proceeding if agreement cannot be reached and statutory requirements are otherwise met (Burton et al., 2024; Government of Western Australia, 2026b). Nevertheless, the right to negotiate is an important procedural safeguard that ensures Indigenous communities are formally engaged before mining activities are approved on their traditional lands. This is a strength of the decision-making process, as it ensures that Indigenous communities are included in the process through a legal mechanism rather than being consulted solely at a company's discretion.

Protection of Aboriginal Heritage Sites

The Aboriginal Heritage Act requires mining companies to pre-emptively check for Aboriginal heritage using the Aboriginal Cultural Heritage Inquiry System before undertaking any activities. If sites may be impacted, landowners require approval from the government before proceeding with an activity. This step ensures that landowners and mining companies take protective measures to prevent harm to Indigenous heritage sites. This approach is important for preserving irreplaceable Indigenous cultural heritage sites—such as bodies of water, specific trees, animals, rock art, ancient caves, burial sites, and ceremonial sites—for which retrospective compensation for damage caused is not adequate.

5.2 Gaps

Inadequate Compliance and Enforcement

Between 2021 and 2024, the Office of the Auditor General (OAG) conducted an audit to assess DWER's policies, procedures, planning, and implementation of compliance and enforcement with



respect to water licence conditions. The audit deemed DWER's compliance activities to have been reactive, ad hoc, and less frequent in recent years (OAG, 2025), and it found that DWER does not adequately monitor or enforce conditions on water licences. It also found that DWER has limited resources to conduct enforcement. Similarly, the OAG issued a 2022 Compliance with Mining Environmental Conditions report, which flagged that compliance activities were not being completed and information was not being verified (OAG 2025).

No Right of Consent for Indigenous Communities

Australia has not ratified ILO Convention 169, but it has endorsed UNDRIP, which recognizes Indigenous Peoples' rights to participate in decision making on matters affecting them and provides that states shall obtain their FPIC in certain circumstances, including in relation to measures affecting their lands, territories and resources (UNDRIP, Articles 19 and 32). The interpretation and implementation of FPIC remains contested globally, and Australian law does not generally require Indigenous Peoples' consent before mining projects can proceed.

While Indigenous communities and Aboriginal heritage sites are protected nationally under the Native Title Act 1993 (Cth) and in Western Australia under the Aboriginal Heritage Act 1972, neither mechanism gives Indigenous communities the ability to prevent mining projects from proceeding in situations where the relevant government approvals have been granted. This situation contrasts with that in South Australia and Australia's Northern Territory. South Australia is the only Australian state where certain mining activities on Aboriginal land are subject to legislative requirements for Aboriginal consent before they can proceed, providing them with a stronger role in decision making. The Northern Territory also provides a stronger consent framework: under the Aboriginal Land Rights (Northern Territory) Act 1976 (Cth), if traditional owners on Aboriginal freehold land refuse consent for exploration projects, this results in a 5-year moratorium on the relevant exploration application (Northern Territory Government, n.d.).⁸ This limitation of the legislation in Western Australia is particularly relevant given the fact that a significant number of lithium mining projects in Western Australia occur on land where recognized rights are held by Indigenous Peoples. As discussed in this publication, hard-rock lithium mining has the potential to generate long-term impacts on land access, cultural heritage, water resources, dust exposure, and the well-being of nearby Indigenous communities.

⁸ Australia's states and territories have different constitutional statuses. States, like Western Australia and South Australia, are self-governing jurisdictions with constitutionally recognized powers, while territories, including the Northern Territory, derive their powers of self-government from legislation enacted by the Australian Parliament. South Australia therefore provides a more direct comparison with Western Australia, as both are states with responsibility for regulating mining activities within their jurisdictions. The Northern Territory is nevertheless relevant as a distinct example because it establishes a stronger statutory consent mechanism for exploration on Aboriginal freehold land than exists in most Australian jurisdictions. The consent framework applying to exploration on Aboriginal freehold land in the Northern Territory is established by Commonwealth legislation, the Aboriginal Land Rights (Northern Territory) Act 1976 (Cth).



6.0 Conclusions

Western Australia underpins Australia's position as the world's largest lithium producer, making its mining sector a significant driver of regional economic growth and employment. Western Australia has a comprehensive regulatory framework designed to manage the socio-environmental impacts of hard-rock lithium mining, including requirements related to environmental protection, Indigenous rights, and the prevention of health and safety for workers and surrounding communities.

Hard-rock lithium mining generally has a larger environmental footprint than brine extraction in terms of energy use, emissions, and land degradation, though it requires less water and occupies less surface area. In Western Australia, lithium mining operations significantly overlap with land where rights are held by Indigenous Peoples, requiring meaningful engagement and respect for Indigenous rights throughout the entirety of the mining cycle. Despite a strong legislative framework on SGBV and OHS, the remote nature of operations poses challenges for oversight and enforcement, making continued efforts to strengthen behavioural change, implementation, accountability and remedy frameworks for health and safety risks and SGBV particularly important.

As demand for lithium continues to grow, so too does the responsibility of industry and government to uphold and refine standards that govern mining practice. A proactive approach to compliance is key to ensuring mining can meet global demands without compromising the natural environment or the rights of local communities. Strengthening enforcement mechanisms as well as ensuring consistent implementation, clear accountability mechanisms and safeguards that extend beyond the immediate workforce to surrounding communities, and timely compliance activities will be essential in safeguarding the environment, workers, and nearby communities against the socio-environmental impacts of hard-rock mining.



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Appendix A. Relevant Australian Legal Instruments

TABLE A1. Australian legal instruments relevant to environmental and social impacts

Type	Title	High-level summary of objectives
Federal (Commonwealth - Cth) legislation		
Federal law	Aboriginal and Torres Strait Islander Heritage Protection Act 1984	Provides a federal mechanism to protect significant Aboriginal areas and objects, including emergency declarations where state or territory laws are inadequate
Federal law	Climate Change Act 2022	Enshrines Australia's greenhouse gas emissions reduction targets of 43% below 2005 levels by 2030 and net-zero by 2050 into law
Federal law	Environment Protection and Biodiversity Conservation Act 1999	Provides a legal framework to protect and manage matters of national environmental significance, including environmental impact assessments for significant projects
Federal law	National Greenhouse and Energy Reporting Act 2007	National framework requiring corporations that meet certain thresholds to report on greenhouse gas emissions, energy production, and energy consumption
Federal law	Native Title Act 1993	Establishes the framework for recognizing and protecting native title rights and interests of Indigenous Peoples in land and waters across Australia
Federal law	Workplace Gender Equality Act 2012	Requires employers with 100 or more employees to report annually on gender equality indicators, including the gender pay gap
State (Western Australia) legislation		
State law	Aboriginal Cultural Heritage Act 2021	Enacted to modernize Aboriginal heritage protection and align with Free, Prior, and Informed Consent principles under the United Nations Declaration on the Rights of Indigenous Peoples; repealed in 2023 after only 5 weeks in place
State law	Aboriginal Heritage Act 1972	Protects Aboriginal cultural heritage sites and objects by requiring heritage surveys and government approvals (Section 18) before activities that may impact heritage sites



State law	Aboriginal Heritage Legislation Amendment and Repeal Act 2023	Repealed the 2021 Act and restored the 1972 Act with amendments, including State Administrative Tribunal review rights for native title parties and new information disclosure requirements
State law	Biodiversity Conservation Act 2016	Provides for the conservation and protection of biodiversity and biodiversity components relevant to ecological impacts of mining, including habitat disturbance
State law	Contaminated Sites Act 2003	Provides a framework for identification, reporting, assessment, and remediation of contaminated sites, relevant to water and land contamination from mining
State law	Environmental Protection Act 1986	Regulates environmental protection including pollution control, native vegetation clearing, dust emissions, and environmental impact assessments
State law	Equal Opportunity Act 1984	Prohibits discrimination on specified grounds including sex, race, and disability; relevant to workplace gender equality
State law	Mines Safety and Inspection Act 1994	Previously provided safety and inspection standards for mining operations; repealed on March 31, 2022, upon commencement of the Work Health and Safety Act 2020
State law	Mining Act 1978	Primary legislation governing exploration, mining, and management of minerals in Western Australia
State law	Rights in Water and Irrigation Act 1914	Governs the management, use, and allocation of water resources, including licensing for water extraction
State law	Work Health and Safety Act 2020	Imposes duties on employers to ensure workplace health and safety, including prevention of sexual harassment and gender-based violence
State law	Work Health and Safety (Mines) Regulations 2022	Adapts general workplace health and safety duties to the specific context of mineral exploration and mining activities

Source: Authors.



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