

Environment management approach



We care about our impact on the environment and seek to operate responsibly and protect the environment in which we work.

Origin is committed to engaging with its stakeholders, including communities and landholders, on the environmental impacts of our activities.

One of our core values is caring about our impact – on each other, on the environment and on the communities in which we operate. We are committed to keeping our people, environment and communities safe. This aspiration is set out in our [Health, safety and environment policy](#), which describes how we think about, plan and manage health, safety and environmental (HSE) risks and initiatives across our business.

HSE management and governance

The HSE policy is supported by our HSE management system, including directives that outline minimum requirements for how we manage HSE risks and impacts.

Our HSE management system mandates the minimum performance-based outcomes for the management of HSE risks and/or impacts and conforms to the requirements of ISO 14001. Eraring Power Station's Environmental management system is certified to ISO 14001:2015.

The Origin Board oversees HSE matters, supported by the Board Safety and Sustainability Committee.¹ The Executive HSE Committee meets quarterly and supports the Executive Leadership Team in monitoring and managing operational risks relating to emissions, water scarcity, waste, restoration and rehabilitation, and biodiversity.

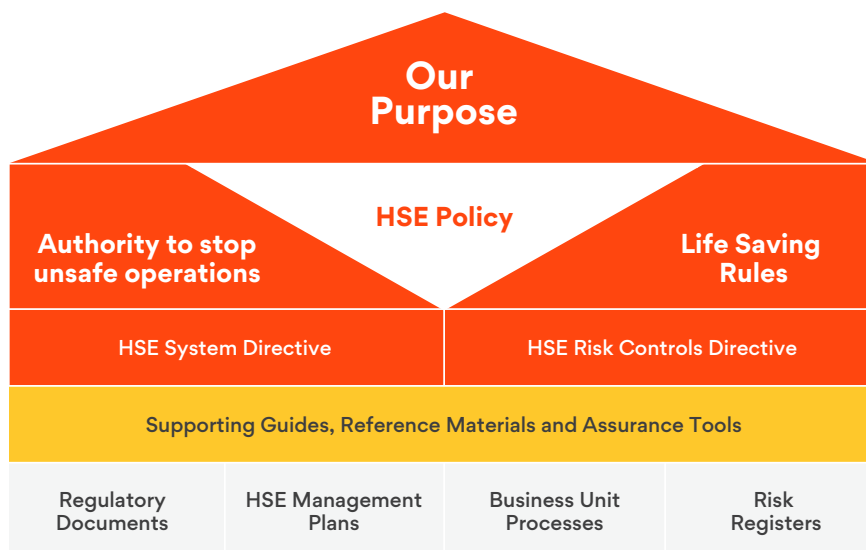
See our [Health and safety management approach](#) for more information on our HSE risk management, including Board and management oversight and employee HSE committees.

Greenhouse gas emissions

We are committed to reducing our greenhouse gas (GHG) emissions and helping lead the transition to a low-carbon future.

The majority of the operational carbon emissions we report are categorised as Scope 1, which are direct emissions created through our business activities. The remainder of our operational emissions are Scope 2 emissions from the electricity we purchase to undertake those activities. Our Scope 3 emissions are largely associated

Our HSE management system



¹ During FY2021, the Board reviewed the roles and responsibilities of its Committees, and effective from FY2022, the Board's Health, Safety and Environment Committee has been renamed the Safety and Sustainability Committee.

with the purchase of electricity from Australia's National Electricity Market (NEM) and the combustion of fuels we deliver to the domestic market.

Our generation portfolio

The NEM is an aggregate of different sources of electricity. In our generation portfolio, the majority of Scope 1 emissions relate to Eraring Power Station, our only coal-fired power station, which uses black coal. Gas-fired power stations are typically less emissions intensive than coal-fired power stations.

Most of our GHG emissions are direct emissions (Scope 1), resulting from our role as an electricity generator. Indirect emissions from purchased energy (Scope 2) and other indirect emissions account for a portion of Origin's total GHG emissions.

We continue to look for ways to improve Eraring's environmental performance, including reducing emissions. We have introduced an artificial intelligence program called Real Time Optimisation (RTO), aimed at improving the plant's overall heat rate – the fuel consumed per megawatt of electricity produced – which in turn can reduce the plant's emissions.

The RTO continuously performs technical calculations, learns from the power station's performance and takes actions to operate 32 different pieces of equipment on each unit every five minutes. These actions help Eraring operate more efficiently and reliably. The RTO program is targeted to save up to 1 million tonnes of CO₂-e between 2020 and 2025.

Australia Pacific LNG

Fugitive emissions

Fugitive emissions are the gases that leak or are vented or flared while extracting, producing, processing, storing, transmitting or distributing certain fossil fuels.

Origin has a risk-based inspection and infrastructure integrity program that is designed to minimise leaks. It includes an annual maintenance program for wellheads and surface facilities, and continual testing of pipework and vessels for cracking and erosion. Emissions estimation methods used to estimate leaks are in line with the Government's regulatory requirements. Where possible, digital technology tools are being developed to improve leak detection, reduce the duration of leaks, and improve emissions reporting.

To facilitate safe gas production, the production and processing facilities require pressure relief mechanisms, such as venting or flaring of gas. Venting emits methane into the atmosphere, whereas flaring, a process

to release gas by burning the methane through specially designed equipment, converts methane to carbon dioxide, a less potent GHG.

We are continuously seeking opportunities to further reduce our emissions, including by optimising processes and retrofitting or replacing equipment and devices with more efficient and advanced technologies to reduce venting of methane and fuel gas consumption. We aim to minimise controlled cold venting of hydrocarbon gases, except in emergencies.

Flaring is used to safely manage excess gas during periods of planned and unplanned maintenance when processing equipment is offline and gas cannot be processed for sale. We are focused on minimising flaring at our gas processing facilities through enhanced operational excellence and an increased focus on managing well turndowns.

Origin has also developed an industry-leading artificial intelligence production optimisation tool. It uses machine learning and economic modelling to take data from thousands of wells simultaneously to determine which wells we can turn down and turn back on again with the lowest probability of disruption to production. The tool enables us to reduce the number of workovers and extend the life of each well, and importantly, reduce emissions from flaring because we can shut off production with confidence that the wells will return to production when required.

Monitoring and studies

We continue to focus on our gas monitoring program, aiming to reduce our reliance on regulatory emission factors and detect any leaks as early as possible. A specialised Picarro Surveyor system, or 'sniffer truck', operates in the gas fields to establish an emissions baseline by identifying non-gas related landscape emissions and quantifying fugitive emissions from coal seam gas (CSG) infrastructure. The sniffer truck is a vehicle mounted with a three-metre extendable mast containing sensors, and a state-of-the-art methane detection instrument (Picarro's cavity ring-down spectrometer). If the sniffer truck detects an elevated level of methane during an infrastructure survey, this is reported and field maintenance is actioned. This monitoring data also helps inform decisions on whether to retrofit or change the design of new infrastructure to reduce emissions from leaks.

Origin works with independent scientific experts from the CSIRO to validate the Picarro system with independent measurements, as well as scientifically robust fugitive emission measurements

from major CSG infrastructure emission sources such as CSG wells, processing and compression facilities.

In June 2019, the CSIRO finished measuring emissions from nearly 300 CSG wells across Origin's operations in the Surat Basin as part of its fugitive emissions research program. This research has confirmed that the emissions rates estimated in a 2014 report by the CSIRO were accurate.¹

This research also validates the data we are collecting via the sniffer truck, and that the design, operation and maintenance of our infrastructure is keeping emissions from venting and leaks low, at or below 0.1 per cent of metered gas sales.

Origin collaborates with the CSIRO's Gas Industry Social and Environmental Research Alliance (GISERA) to establish independent evidence-based data on the fugitive emission levels during unconventional shale development activities. The key objectives of the research program are to:

- quantify the fugitive methane emissions from well construction and completion activities (including drilling, hydraulic fracturing stimulation and completion) from unconventional shale petroleum exploration in the Beetaloo Sub-basin by conducting long-term continuous monitoring at well sites;
- compare actual measured results with estimated results to verify the adequacy of existing calculated emissions estimates; and
- demonstrate the use of autonomous emission monitoring stations to continuously measure the emissions related to natural gas activities and infrastructure and other background sources of methane.

Landscape emissions

Methane gas emissions can occur naturally from the surrounding landscape in the gas fields through naturally occurring geological pathways, also called seeps. While there is no regulatory requirement to externally report landscape emissions, Origin aims to quantify these emissions against its operations and to identify and quantify other sources of emissions, such as abandoned coal exploration bores (which pre-date natural gas production activities), landholder water bores and other agricultural activity in the gas field areas. The Picarro sniffer truck is used for this purpose.

Work to intercept emissions associated with Condamine River seeps has proven effective in capturing shallow gas and reducing the amount of methane emitted. Targeted intercept wells and development

¹ www.csiro.au

work around the Condamine River assists the capture of methane before it reaches the surface and directs it to Australia Pacific LNG's production facilities. Origin monitors wells, water bores and the river seeps to ensure the measures we have implemented are effective.

Reporting our emissions

We report on our GHG emissions in our annual Sustainability Report.

We are committed to complying with relevant emissions reporting frameworks. In Australia, GHG emissions reporting is tightly regulated and aligned to the Intergovernmental Panel on Climate Change (IPCC) reporting framework. We report the GHG emissions produced directly and indirectly by our operations to the regulator according to the *National Greenhouse and Energy Reporting Act 2007 (Cth)* (NGER Act).

We report our GHG emissions to the Clean Energy Regulator under the *NGER Act* by 31 October each year. The reported Scope 1 and Scope 2 emissions from Origin's generation assets and Integrated Gas business undergo external, limited assurance audits annually. We have employees who are responsible for managing our compliance with all reporting requirements.

In accordance with the *NGER Act*, two NGER reporting facilities operated by Origin on behalf of Australia Pacific LNG are participants in the regulatory Emissions Reduction Fund Safeguard Mechanism.

We are not required to report our Scope 3 emissions under NGER, however, we believe it is important that entities take responsibility for influencing emissions reduction throughout the value chain and as such we measure and report our equity Scope 3 emissions data. We calculate Scope 3 emissions based on the Greenhouse Gas Protocol's Corporate Value Chain (Scope 3) Accounting and Reporting Standard and Scope 3 guidance documents.¹

Since 2006 we have also undertaken voluntary reporting of our emissions to the Carbon Disclosure Project (CDP). Our responses to the CDP climate change survey have been publicly available since 2008 and can be accessed via CDP's website.²

Water

We recognise that water is a scarce and valuable resource, and that managing water is essential to Origin's long-term success. Our operations seek to minimise and responsibly manage our water

consumption and protect water resources in the natural environment.

Origin mainly uses water for cooling while generating electricity, primarily at Eraring Power Station. As the upstream operator for Australia Pacific LNG, one of Australia's largest producers of CSG, we also produce water as part of the gas extraction process.

Our management of water is monitored in accordance with regulatory approvals and is guided by our HSE Risk Controls Directive

Electricity generation

Eraring takes salt water from Lake Macquarie to cool its generating units, all of which is returned to the lake after use in accordance with water quality and temperature limits governed by our Environment Protection Licence. This represents the majority of water use in our Energy Markets business.

When compared to generators using evaporative cooling, the system design at Eraring typically has a lower impact on municipal and fresh water supplies, and can continue to reliably generate power generation in times of fresh water scarcity. We also operate a Water Reclamation Plant that further purifies secondary treated effluent from the local Dora Creek Wastewater Treatment facility for boiler and plant use, minimising the use of potable water at Eraring.

Our gas-fired power stations require much less water to operate than Eraring and draw water from bores or town supply. Origin's combined cycle Darling Downs Power Station uses air-cooled condensers for the steam turbine, which significantly reduces its water usage compared to a typical combined cycle plant.

The Shoalhaven Hydro Pump Storage Scheme in the Southern Highlands of NSW consists of two pumped storage hydropower stations, Kangaroo Valley Power Station and Bendeela Power Station. The power stations use the pumped storage hydroelectric principle to generate electricity, which circulates water in a closed loop. Water released from the Fitzroy Falls Reservoir is passed through the power stations to generate electricity during periods of peak demand. During periods of low demand, water is pumped back to storage ponds above each station in the Fitzroy Falls Reservoir for use when generation is next required.

Australia Pacific LNG

The Australia Pacific LNG project produces gas from coal seams that have formed beneath the earth over millions of years. Natural gas collects in the coal seams, which are generally filled with water. In

order to extract the gas, the coal seams are depressurised by extracting the water, allowing the gas to flow to the surface. This extracted water is called 'produced water'. We also extract smaller volumes of water from other sources, such as dams and groundwater bores for project use.

We manage produced water extraction in accordance with legislative requirements, conditions specified in our approvals, and agreements we have with stakeholders. This includes measures that seek to prevent unplanned releases of produced water through asset integrity management, routine inspections and operational controls. Any incidents are reported as required to the relevant regulatory authority with learnings applied to our operations.

Most of the extracted produced water is treated using a number of processes, including microfiltration and reverse osmosis. These processes purify water by forcing it through a partially permeable membrane to separate ions, unwanted molecules and larger particles.

Treated water is supplied for a range of beneficial uses, including:

- Aquifer injection – Origin pioneered the injection of treated produced water into aquifers to increase aquifer pressure and available groundwater. Our initial Spring Gully scheme was the first to be approved by the Queensland Government, in 2015. A second injection scheme was implemented at Reedy Creek in 2015. Both schemes inject into the Precipice Sandstone aquifer.
- Irrigation and livestock drinking water – Origin has supplied treated produced water to landholders since 2014 via the Fairymeadow Road Irrigation Pipeline. The scheme is a practical application of the Queensland Government's Coal Seam Gas Water Management Policy (2012), which requires CSG companies to find beneficial uses for treated produced water. We also supply treated produced water from the Spring Gully water treatment facility to local landholders for irrigation and stock watering.

Australia Pacific LNG also uses treated and untreated produced water for drilling and construction activities, dust suppression and as potable water at a number of facilities and accommodation camps. The use of treated and untreated produced water for these purposes reduces pressure on municipal and groundwater supplies and helps to make sites self-sufficient for water.

¹ Greenhouse Gas Protocol, *Corporate Value Chain (Scope 3) Standard*.

² www.cdp.net

Protecting water resources

CSG production wells generally extract gas from below water aquifers used by others, such as local landholders. As part of the installation process, and in accordance with regulation, steel casing is cemented into place to prevent aquifer interconnection during operations.

We continuously monitor for interconnection, which can be detected by observing changes in the groundwater levels of shallower aquifers surrounding the gas production well and in the quality of water pumped from the water well. We install monitoring bores to monitor groundwater levels and water quality around our Australia Pacific LNG operations.

The Office of Groundwater Impact Assessment collects and analyses data from all CSG operators in Queensland. Using this data, they model impacts to groundwater using their regional groundwater model. Where the model predicts impacts on landowner bores, or if a reduction in groundwater availability is identified independent of the predicted modelling, Origin undertakes detailed bore investigations. Based on these investigations, Origin may enter into 'make good' arrangements, such as access to an equivalent water supply if this is the landowners' preferred option.

Monitoring bores installed by Australia Pacific LNG support ongoing and extensive regulatory monitoring of groundwater levels and groundwater quality within and between our areas of operation. Results from these bores are submitted to the Queensland Government for aggregation with other operations for regional monitoring and management. This information is released in the Queensland Government's Surat Underground Water Impact Report available online and in [Australia Pacific LNG's Annual groundwater assessments](#).

We contribute monitoring data to the Queensland Government's *Groundwater Net*, a monitoring network for groundwater levels and impact on water bores in areas surrounding the resource industry. We have also provided funding to offset the cost to landowners who install monitoring equipment in their water bores across the Surat Basin.

We work with partners to monitor and protect waterways, such as the Fitzroy Partnership for River Health, a collective of government, agriculture, resources, industry, research and community interests across the Fitzroy Basin in central Queensland. Partners have a common goal of providing a complete picture of river health and support this goal

by providing funding and resources, contributing data on water quality and ecosystem health, and monitoring data through data-sharing arrangements.

Beetaloo Basin

In 2018, the independent Scientific Inquiry into Hydraulic Fracturing in the Northern Territory handed down its recommendations, which included the *Code of Practice: Onshore Petroleum Activities in the Northern Territory*. The Code of Practice sets enforceable standards for a range of activities, including well operations, surface activities, and water management.

The detailed safeguards we put in place to protect land and water in the Northern Territory are explained in our [Environmental management plans](#), including how we comply with our regulatory obligations under the *Code of Practice*.

Origin employs engineered barriers and controls along with natural geological barriers to seek to isolate and protect underground water sources at the Beetaloo Basin. We design and engineer our wells to protect aquifers and test controls before proceeding with work. Independent monitoring starts before our work begins and continues throughout the project.

A water monitoring program was established in 2014 to provide a baseline of the natural variability in water levels and water quality and detect any impacts associated with gas exploration in the Beetaloo Basin. Additional groundwater monitoring bores have been installed around all of our hydraulically fractured exploration wells in accordance with the *Code of Practice*. All data is made publicly available on the Northern Territory Government website. These monitoring programs have found no evidence of any impact from our work to date.

Hydraulic fracture stimulation

Hydraulic fracture stimulation, or 'fracking', is the process designed to release gas trapped in coal seams or dense shale rocks deep underground. Origin uses hydraulic fracturing in a number of our Australia Pacific LNG wells and in our Northern Territory shale gas exploration program. Hydraulic fracturing has been carried out safely in Queensland and the Northern Territory for more than 40 years.

At a minimum, we comply with the stringent regulatory requirements that guide hydraulic fracturing. We have robust processes and procedures in place to effectively mitigate risk to water sources and manage environmental impacts. We regularly engage with our community

stakeholders to inform them of our processes and respond to any concerns.

Our [Coal seam gas hydraulic fracture stimulation fact sheet](#) provides further information on the process we use at our Australia Pacific LNG operations, including a list of the additives in the hydraulic fracturing fluid used by Origin.

More information on fracking in the Beetaloo Basin can be found on the [Origin Beetaloo Exploration Project website](#).

Hydraulic fracturing process

Hydraulic fracturing involves pumping water mixed with sand and some chemical additives in low concentrations under pressure to create additional pathways (fractures) to allow the gas to flow into the well and be brought to the surface. The fluid used in our operations for hydraulic fracturing comprises around 99 per cent water and sand. Of the remaining additives, approximately 0.33 per cent to 1.2 per cent of these are used in clay management, gel management and water conditioning.

Hydraulic fracturing fluids are subject to strict regulatory control in Australia. Most additives used are found in a typical household; in items such as food and cleaning products. The hydraulic fracture fluid is recovered from the well during the initial production phase; however, the proppant (i.e. sand) is designed to remain within the gas reservoir to ensure the newly formed fractures remain open and allow the gas to flow to the well.

Well design

We apply regulatory standards for well design and construction. All wells have multiple steel casings with cement sheaths that isolate surrounding formations from each other and the well bore. We support these rigid standards, which mean that fracturing fluids and gas cannot enter surrounding aquifers and prevent the potential for groundwater migration vertically from one aquifer to another. We always confirm the integrity of the well before fracture stimulation.

CSIRO research program

In April 2020, the CSIRO released the results of a landmark, three-year scientific research program into the impacts of hydraulic fracturing in Australia.¹ CSIRO took more than 1,000 air, water and soil samples, across 13 sites before, during and after fracking operations at six of our wells at Reedy Creek Combabula. Results found hydraulic fracturing has minimal to no impact on air quality and no detectable impact on local waterways, groundwater or soils.

¹ gisera.csiro.au/project/air-water-and-soil-impacts-of-hydraulic-fracturing-phase-2/

Waste

Origin is committed to effectively managing waste. We look for ways to reduce, recycle or eliminate waste, including hazardous waste, across our business. Our approach to waste management is governed by operating licences and conditions at an asset level.

Origin applies a hierarchy of waste management, with the aim of minimising the waste we ultimately dispose of:

- Avoid waste by selecting items with the least packaging or that require the least resources to produce. Avoid using disposable items or single-use materials wherever possible.
- Reduce waste by making processes more efficient.
- Reuse materials by procuring products that are produced from recycled or recyclable materials, that can be repaired, reused or repurposed.
- Recycle materials such as plastics, glass and paper, and waste materials by processing them to make alternative products.
- Recover non-recyclable waste materials by converting them into usable heat, electricity or fuel.
- Dispose of remaining waste correctly by removing any contaminants, appointing licensed contractors if required, and following all required procedures for hazardous waste.

Most of the waste material that we manage is not considered to be hazardous. Where hazardous materials are present, these are managed – including proper disposal – in accordance with applicable laws or with reference to relevant international standards where there are no applicable laws, with a focus on minimising risks to our people, the environment and the community. A register of hazardous materials procured or produced by Origin is developed and maintained, while all personnel who may be exposed to hazardous materials as part of their work are provided with appropriate training and personal protective equipment.

Eraring Power Station

The main by-product from burning coal at Eraring is fly ash. This comes in the forms of finer fly-ash and a coarser bottom ash, which represent 90 per cent and 10 per cent of Eraring's coal combustion products (CCPs) respectively. CCPs are subject to regulatory controls, including our environmental protection licence.¹

CCPs are managed under Eraring's environmental approvals. Our [Long Term](#)

[Ash Management Strategy](#) outlines our commitment to improve the efficiency of, and reduce environmental impacts associated with, the operation of Eraring and the ash dam.

The fly ash we produce has numerous applications across the industrial and construction sectors, including as an ingredient in cement and concrete, and as a stabilisation material in land remediation. A large proportion of the CCPs, generated by Eraring, are supplied on-site to multiple customers for a range of end uses, and we are actively pursuing new supply chain opportunities and non-traditional markets to support increasing our re-use levels. CCPs produced by Eraring that are not re-used, are stored on site in an ash dam.

Origin remains committed to minimising the quantity of coal ash that is sent to the ash dam consistent with the NSW Department of Planning, Industry and Environment's ash re-use goal of 80 per cent by 31 December 2021. Achievement of this goal would be possible with the removal of regulatory barriers governing the use of coal ash in roads and the establishment of new markets.

Origin is also actively participating in and advocating for collaboration between generators, government agencies, regulators and potential customers to optimise the recovery of ash as a resource.

Fly ash can contribute to reducing carbon emissions when making concrete, by being used as a substitute product for Portland cement. For every tonne of Portland cement that is substituted with fly ash, it is estimated that up to one tonne of carbon dioxide is avoided. Up to 300,000 tonnes of Eraring's fly ash is used for this purpose every year, leading to an indirect reduction in carbon emissions of approximately 300kt CO₂-e.

Australia Pacific LNG brine management

The main waste product from Australia Pacific LNG's upstream operations is brine. Its operations extract groundwater from wells, and the water contains naturally occurring salt. We use reverse osmosis to remove the salt so that most of the water can be re-used. The salt removed during the reverse osmosis process is captured within a brine waste stream, which is sent to specifically designed brine ponds to undergo further concentration through evaporation. Origin continues to investigate alternative salt management and salt opportunities as part of its brine and salt strategy.

The brine ponds are classified as regulated dams under the Environmental Authority

issued by the Queensland Government. In addition to annual certification by registered professional engineers, regular inspections and sampling occur in line with asset integrity, groundwater and surface monitoring protocols, and operational procedures.

Air emissions

Air emissions such as oxides of nitrogen (NO_x), sulphur oxides (SO_x), volatile organic compounds (VOC), particulate matter (PM) and mercury (Hg), primarily arise from the combustion of fuels such as natural gas, diesel and coal.

Origin's main air emissions are from the generation of electricity at our power stations and the production of natural gas. We seek to minimise emissions and consider opportunities to do so throughout an asset's lifecycle. When assessing and selecting new plant and equipment, procurement processes must evaluate low emissions technology.

SO_x, NO_x and PM emissions from Eraring stacks are managed by using quality coal and fuel oil, low NO_x burners, boiler tuning and fabric filter maintenance.

As the upstream operator of Australia Pacific LNG, Origin continues to monitor ambient air quality in the Surat Basin. Initially established under GISERA, a network of ambient air quality stations collects air quality data, which is streamed live to the Queensland Government's website to ensure transparency of data collection.²

Origin's larger operating sites track and report air emissions under the Australian NPI framework, a publicly available database of emissions from Australian industrial facilities. Eraring's emission calculations are independently verified and its [Environmental Protection License monitoring data](#) is available on Origin's website.

Biodiversity

We are committed to minimising impacts to the biodiversity of the areas in which we operate.

Origin's development activities and operations span marine and terrestrial environments. Our operations are located across a wide geographical area and include a variety of environmental settings with different biodiversity values. We always seek to understand and protect these values in accordance with their significance, applicable laws and stakeholder expectations.

Our approach to managing biodiversity is governed by the requirements of federal

¹ NSW EPA, List of licences

² www.ehp.qld.gov.au/air/data/search.php

and relevant state and territory laws and regulations. We are also required to comply with the legal and regulatory conditions of the specific operating licences for our activities with regard to biodiversity management.

We engage with local communities and biodiversity experts on the impacts of our activities and ways to reduce our disturbance footprint. We also work with communities to restore and protect the local biodiversity through programs such as tree planting and fish restocking in local waterways.

In areas where biodiversity can be impacted, activities are planned, conducted and documented to:

- a. abide by applicable law for protected areas;
- b. manage sensitive seasons where there is a threat to the viability of species or communities;
- c. incorporate local populations, species and ecosystems that have the potential to be impacted;
- d. avoid habitat loss and/or degradation of the habitat integrity; and
- e. include habitat re-establishment programs that focus on habitat integrity and connectivity.

The design and site selection of new assets and work activities consider approaches that avoid development in areas of high conservation value. We will not conduct our activities on any location that is on the World Heritage List.

We record incidents and observations according to Origin's biodiversity incident management procedures. Our biodiversity management procedures include emergency response scenarios and plans for instances where our actions could negatively impact biodiversity.

Australia Pacific LNG

The greatest land footprint of our activities is our role as the upstream operator of Australia Pacific LNG in the development and operation of the CSG fields in the Surat and Bowen Basins in Queensland.

We conduct biodiversity assessments during the design phase of each project. The assessment identifies whether biodiversity may be affected or placed at risk by a specific project, site or activity, taking into account the views of relevant external and internal stakeholders.

Once the biodiversity assessment is complete, we develop site construction plans that minimise and mitigate our impacts. These plans also take into account cultural heritage, landowner needs, erosion risk, and constructability.

Offset initiatives

Origin implements offset initiatives for projects where a significant impact to a site's biodiversity is unavoidable. These initiatives are designed to align with stakeholder interests and counterbalance defined impacts.

Australia Pacific LNG has three key direct offsets properties that provide offsets for threatened ecological communities, endangered and of concern vegetation, and threatened fauna habitat, and for relocating and transplanting threatened flora species removed or impacted by our operations.

Rehabilitation and restoration

Origin's development activities and operations are located across a wide geographical area and include both high and low levels of land disturbance. We seek to understand and protect any area we disturb, ensuring that it can be returned to its original condition, or better use, balancing the expectations of our landholder and community stakeholders, Traditional Owners, and commitments to regulators.

Our approach to managing rehabilitation and restoration is governed by the requirements of federal and relevant state and territory laws and regulations. We are also required to comply with the legal and regulatory conditions of the specific operating licences for our activities with regard to rehabilitation and restoration.

During the project design and development phases, we create plans for a site's rehabilitation, closure and decommissioning, taking the biodiversity assessment into account. Site closure and rehabilitation plans consider:

- management of contaminated land and soil;
- the suitability of selected seed species, including factors affecting seed management;
- seedling growth, transfer and planting;
- fauna habitat re-establishment;
- benthic habitat re-establishment for impacted water bodies, such as lakes and rivers; and
- maintenance and monitoring of rehabilitated areas.

We rehabilitate disturbed areas no longer in use as required by regulatory approvals and/or as agreed to in consultation with landowners, Traditional Owners or local communities as appropriate. To minimise impacts to disturbed areas, we progressively rehabilitate land following completion of construction activities, including a return to pasture where this was the prior land use. Where clearing of native vegetation could not be avoided, the land is reinstated to allow natural regeneration of the native species and monitored to ensure it meets the rehabilitation criteria for the area. Where assets have an ongoing beneficial use to communities and landholders, such as dams, tracks and fences, Origin will seek to provide these assets for ongoing use.

Origin plans for rehabilitation and restoration activities based on our legal obligations, and records financial provisions under the requirements of the Australian Accounting Standards Board. We review our rehabilitation and restoration plans and associated provisions annually, considering the potential or agreed future use of the land.

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Further information about Origin's performance can be found on our website originenergy.com.au
