Bowen – BGP Plan of Operations Plan

Environmental Authority: EPPG03219115

Bowen Gas Project (PL486)

27 May 2024 to 26 May 2027

Version	1.0
Released	May 2024
Document Owner	Operations Director
Document Author	Senior Environmental Advisor – Compliance and Assurance
Review Date	Not Applicable
Document Status	Issued for Use
Security Classification	Restricted

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Contents

1. Introduction

Arrow CSG (ATP364) Pty Ltd and CH4 Pty Ltd (CH4) are the principal holders of Environmental Authority EPPG03219115 (EA). This EA authorises petroleum activities within petroleum lease (PL486) near the township of Moranbah in central Queensland. Arrow is developing this lease for the production of coal seam gas (CSG).

PL486 was developed by CH4 and Arrow CSG (AT364) to produce coal seam gas (CSG) as part of the Bowen Gas Project (BGP). CH4 and Arrow CSG (ATP364) are wholly owned subsidiaries of Arrow Energy Holdings Pty Ltd (Arrow).

1.1 Purpose and Scope

This Plan of Operations (PoO) has been prepared in accordance with Section 292 of the *Environmental Protection Act 1994* (EP Act), which requires the preparation of a plan of operations for petroleum activities undertaken by Arrow within petroleum leases authorised under EPPG03219115.

This Plan describes actual activities completed to date, activities currently planned and current data.

1.2 Timeframe

The Plan of Operations is effective for the period of 27 May 2024 to 26 May 2027.

2. Plan of Activities (Existing and Planned)

Existing and planned activities including water balance and material balance are described in Table 1 and the ERC calculator. Existing disturbance is also described in the shape files provided with this plan.

3. Rehabilitation Program

Rehabilitation activities undertaken to date and the rehabilitation plan and schedule are described in Table 2 below.

4. Action Program

Arrows action program for EA EPPG03219115 is provided in Table 3 below.

Table 1 Plan of Activities (Existing and Planned)

			Existing Activities	Existing	Dis (D1)	Reh (R1)	Reh (R2)	CR (R3)	Proposed Activities	2024	2024	2025	2025	2026	2026
Domain	**Activity Type**	**Tenure (Location)**	**Description of Existing infrastructure**	**Parameters (km)**	**Disturbance Area (ha)**	**Disturbance Area (ha)**	**Disturbance Area (ha)**	**Disturbance Area (ha)**	**Description of proposed infrastructure**	**Parameters (km)**	**Disturbance Area (ha)**	**Parameters (km)**	**Disturbance Area (ha)**	**Parameters (km)**	**Disturbance Area (ha)**
Roads, tracks, laydowns and borrow pits	Access track	PL486	No laydowns or borrow pits are present. Some access tracks utilise the Right of Way (RoW) with majority of of tracks (13.2 km) present outside the RoW.	13.21	8.72				0.6 km of access track will be constructed this period.	0.60	0.36	0	0	0	0
Well pads and associated infrastructure	Well pads	PL486	78 wells are present on 61 pads: - 24 pads with a single P&Ad monitoring well - 10 pads with a single suspended well - 6 pads with a single operational well - 8 pads cleared for well that was not installed. - 10 multi pads (2-4) containing 27 P&Ad wells. -3 multi pads (2-4) containing 1 P&A'd well, 2 operational wells and 3 suspended. Well and pad rehabilitation costs are accounted for in Section 6 and 11 of Main sheet in the ERC calculator.			20.68	18.50		No new proposed. Further detail on wells and pads is provided in the ERC calculator.	0	0	0	0	0	0
Pipelines	Right of Way	PL486	Gas and water pipelines are present in the same Right of Way.	8.10		15.70			No new proposed gas and water gathering lines. Any addition would plan to share the same Right of Way.	0	0	0	0	0	0
Pipelines	Gas Pipeline	PL486	Detail of existing gas pipelines including crossings and diameter is provided in the ERC calculator.	8.57					No new proposed gas pipeline, further detail including crossing and diameter is provided in the ERC calculator.	0	0	0	0	0	0
Pipelines	Water Pipeline	PL486	Detail of existing water pipelines including crossings and diameter is provided in the ERC calculator.	8.23					No new proposed water pipeline, further detail including crossing and diameter provided in the ERC calculator.	0	0	0	0	0	0

			Existing Activities	Existing	Dis (D1)	Reh (R1)	Reh (R2)	CR (R3)	Proposed Activities	2024	2024	2025	2025	2026	2026
Domain	**Activity Type**	**Tenure (Location)**	**Description of Existing infrastructure**	**Parameters (km)**	**Disturbance Area (ha)**	**Disturbance Area (ha)**	**Disturbance Area (ha)**	**Disturbance Area (ha)**	**Description of proposed infrastructure**	**Parameters (km)**	**Disturbance Area (ha)**	**Parameters (km)**	**Disturbance Area (ha)**	**Parameters (km)**	**Disturbance Area (ha)**
Water Storage Infrastructure	Dams and Panel tanks	PL486	7 Existing WS Polygons as per ERC supporting shape file - 6 decommissioned and no storage. One lined panel water storage tank remains in-situ (RH098 -100 Tank, 5ML capacity). Water typically evaporates from an open panel tank, estimation of residual salt for disposal provided in ERC calculator.		0.69	0.98	5.03		No new water infrastructure is proposed.	0	0	0	0	0	0
			Total disturbance (ha)	**70.30**					**Proposed disturbance (ha)**	**0.36**					

Notes

1. The lease land is described in the spatial information provided. This includes original land use, post-operational land use, sensitive receptors, and the project boundary. Further information about the land to which the plan applies is provided in Q.7 of the Plan of Operations submission form.

2. The Plan of Activities describes existing and proposed activities. Spatial information for existing activities and their rehabilitation status in accordance with applicable schema is also provided.

3. The Rehabilitation Program (including plan and schedule) also satisfies the rehabilitation plan requirements of the ERC application form.

Table 2 Rehabilitation Program

			Rehabilitation Program (including Rehabilitation Plan & Schedule)			
Domain	**Activity Type**	**Tenure (Location)**	**Post-operation land use**	**Timing**	**Rehabilitation Methodology**	**Rehabilitation Works already undertaken**
Roads, tracks, laydowns and borrow pits	Access track	PL486	forestry/mining/grazing/cropping	End of working life or end of project.	All new and existing access tracks will remain in use throughout the period of this Plan of Operations and will be rehabilitated at the end of the project.	None to date
Well pads and associated infrastructure	Well pads	PL486	forestry/mining/grazing/cropping	2024/2025/2026. Each new well footprint will be reduced to an operational area within 3-6 months of construction. Final P&A will occur at the end of the working life of the well. A well pad is only considered fully rehabilitated (not certified) when all wells have been P&A'd.	Arrow undertakes transitional rehabilitation as soon as practicable (usually within 3-6 months) after the completion of an activity causing disturbance to land. This includes regrading and stabilisation: Re-profiling significantly disturbed land to a stable landform similar to the original land contours. Re-establishing surface drainage lines on significantly disturbed land. Re-establishment of vegetation around completed wells. Once the well is constructed the area surrounding the wellhead is stabilised and vegetation commences re-establishment, the disturbed footprint is reduced to an operational area within 6 months. Rehabilitation monitoring is undertaken at appropriate time intervals thereafter. In accordance with the DESI spatial data master schema, in spatial files well pads that have commenced rehabilitation are assigned a status of R1 (rehabilitation commenced) and well pads where all wells have been P&A'd have a status of R2 (rehabilitation completed not certified). The majority of Arrow infrastructure has an estimated life span of approximately 20 years. Therefore, transitional rehabilitation comprises the majority of rehabilitation activities.	52 wells have been plugged and abandoned. 19 well pads have been fully rehabilitated (not certified) and 26 well pads have commenced rehabilitation (not-certified).
Pipelines	Right of Way	PL486	forestry/mining/grazing/cropping	Within 3 months of pipe laying	All new and existing pipelines will remain in use throughout the period of this Plan of Operations and will be rehabilitated at the end of their working life or the end of the project. Once pipe is laid the trench is backfilled, compacted and topsoil spread on surface with amelioration and seeding (occurring within 1-2 months) reducing the ROW to only the access track width (6 m). If required erosion and sediment controls are in place until site is stabilised with regrowth. Monitoring continues for the life of the project.	All existing Right of Way have been rehabilitated to their operational width.

			Rehabilitation Program (including Rehabilitation Plan & Schedule)			
Domain	**Activity Type**	**Tenure (Location)**	**Post-operational land use**	**Timing**	**Rehabilitation Methodology**	**Rehabilitation Works already undertaken**
Pipelines	Gas Pipeline	PL486	forestry/mining/grazing/cropping	Within 3 months of pipe laying	All new and existing pipelines will remain in use throughout the period of this Plan of Operations and will be rehabilitated at the end of their working life or the end of the project. Once pipe is laid the trench is backfilled, compacted and topsoil spread on surface with amelioration and seeding (occurring within 1-2 months) reducing the ROW to only the access track width (6 m). If required erosion and sediment controls are in place until site is stabilised with regrowth. Monitoring continues for the life of the project.	None to date
Pipelines	Water Pipeline	PL486	forestry/mining/grazing/cropping	Within 3 months of pipe laying	All new and existing pipelines will remain in use throughout the period of this Plan of Operations and will be rehabilitated at the end of their working life or the end of the project. Once pipe is laid the trench is backfilled, compacted and topsoil spread on surface with amelioration and seeding (occurring within 1-2 months) reducing the ROW to only the access track width (6 m). If required erosion and sediment controls are in place until site is stabilised with regrowth. Monitoring continues for the life of the project.	None to date
Water Storage Infrastructure	Dams and Panel tanks	PL486	forestry/mining/grazing/cropping	End of working life or end of project.	One existing water storage infrastructure (RH098-100Tank) will remain in care and maintenance throughout the period of this Plan of Operations. Infrastructure will be rehabilitated (and the area regraded and re-seeded) at the end of its working life or the end of the project. Monitoring of rehabilitation will continue for the life of the project.	Maintenance of six rehabilitated water storage areas (including 5 dams and 1 tank) for which rehabilitation has been completed (not yet certified). Rehabilitation includes one former Dam (Dam RH007-015) re-purposed as Greenswamp camp. Camp infrastructure is now removed and rehabilitation has occurred.

Table 3 Action Program

EA Condition	Internal Process/Management System	Environmental Management Strategies
Schedule A - General	HSE Management System HSE Standards Compendium - management system standards, personal safety, security and incident response, health and hygiene, environment, and process safety. Compliance, Assurance, Incident and Risk Management System (CAIRM). Complaints management system.	Arrow's environmental policy governs the development and implementation of Arrow's HSEMS. The HSEMS is a hierarchical document structure that describes what Arrow can do and how it can do it, to keep its staff and contractors safe and minimise the environmental impact of its activities. It is generally aligned with Australian Standard 4801 and International Standards Organisation 14001. Plans and procedures under the HSEMS manage Arrow's environmental risk in relation to: Air quality, Geology, landform and soils, Landscape and visual amenity, Terrestrial ecology, Groundwater, Surface water, Aquatic ecology, Coal seam gas water, Dams, Noise and vibration, Waste, Cultural heritage, Roads and transport, Agriculture. As necessary standards, procedures, plans, etc. are developed in consideration of industry and Government guidelines. By implementing the HSEMS Arrow ensures that its operations are compliant with all relevant environmental legislation, regulations, licences, permits, standards, approvals, and authorities. Deliverables, actions, and outcomes, including incidence reporting and tracking, are recorded in CAIRM. The Arrow HSE Standards Compendium - Standards for the management of Health, Safety and Environment (ORG-ARW-HSM-STA-00001) provide a set of consistent and objective requirements that have mandatory application across Arrow's business and contractors. Specifically, the HSE Standards: - Set and formalise expectations to staff and contractors - Define what must be achieved in relation to HSE - Provides auditable criteria - Establishes a basis to continual improvement Arrow maintains a complaint management system to ensure that all complaints are managed in an accountable, transparent, timely and meaningful way. The system includes recording and tracking grievances through an established network of land liaison officers and through Arrow's website, 1800 Community line or email (info@arrow.com.au).
Schedule B - Waste Management	HSE MS Standards Compendium – waste, coal seam gas water	Wastes generated through Arrow's activities include: - General waste - commercial, domestic and recyclable wastes including glass, metal, cardboard plastic, and food scraps - Regulated waste - waste oil, oily water or soil, and oily rags, sewage effluent and the offsite disposal of CSG water, brine and residual drill material Arrow's waste management practices are guided by the waste and resource management hierarchy of avoid, reduce, re-use, recycle, recover, treat or dispose. Site waste management guides identify the types of waste, risks and management measures to be implemented, waste management practices and systems required and record keeping.
Schedule C - Protecting Acoustic Values	HSE MS Standards Compendium - Amenity. Complaints Management System.	During site selection and prior to disturbance, construction or operational activities being undertaken, Arrow review and identify the locations of activities relative to locations of sensitive receptors, check required separation distances and EA specific noise limits permitted. Where necessary and appropriate noise modelling and/or monitoring is undertaken to ensure compliance with noise conditions.
Schedule D - Protecting Air Values	HSE MS Standards Compendium – air quality, greenhouse gas, amenity, venting and flaring. Complaints Management System.	Arrow undertakes air quality assessments to inform the development of air emissions criteria and undertakes monitoring as required. A register of fuel burning, and combustion equipment is maintained. Dust suppression is a standard requirement of construction projects.

EA Condition	Internal Process/Management System	Environmental Management Strategies
Schedule E - Protecting Land Values	HSEMS Standards Compendium – chemical management, land management; biodiversity. Pipeline management system. CAIRM. GIS database. Access and Approvals Process. Offset tracking database.	Erosion, sediment control, clean water diversion and soil management are key aspects associated with land disturbance and managed through the development of site-specific erosion and sediment control plans. ESCPs are developed by a suitably qualified person and in accordance with IECA BESC 2008. Pipeline operations and maintenance is undertaken in accordance with the APGA Code of Environmental Practice: Onshore Pipelines (as relevant). Arrow undertakes ecological impact assessments as a prerequisite for site access and prior to commencing significant land disturbance for all of Arrow's development activities. These assessments, including both desktop and/or field assessment as applicable, establish the ecological and biodiversity characteristics of areas that may be disturbed. The assessments are also used to identify site-specific ecological constraints and opportunities (eg sensitive ecological features, areas of high biodiversity value, ESAs, high value waters, weeds and pests, etc.), and management requirements to avoid, minimise or mitigate environmental harm associated with land disturbance activities. Assessments are used to inform site selection, site-specific management plans and procedures (fauna, flora, pest, etc.), future rehabilitation requirements and offsets where residual impacts remain.
Schedule F - Protecting Biodiversity Values	HSEMS Standards Compendium – chemical management, land management; biodiversity. Pipeline management system. CAIRM. GIS database. Access and Approvals Process. Offset tracking database.	Erosion, sediment control, clean water diversion and soil management are key aspects associated with land disturbance and managed through the development of site-specific erosion and sediment control plans. ESCPs are developed by a suitably qualified person and in accordance with IECA BESC 2008. Pipeline operations and maintenance is undertaken in accordance with the APGA Code of Environmental Practice: Onshore Pipelines (as relevant). Arrow undertakes ecological impact assessments as a prerequisite for site access and prior to commencing significant land disturbance for all of Arrow's development activities. These assessments, including both desktop and/or field assessment as applicable, establish the ecological and biodiversity characteristics of areas that may be disturbed. The assessments are also used to identify site-specific ecological constraints and opportunities (eg sensitive ecological features, areas of high biodiversity value, ESAs, high value waters, weeds and pests, etc.), and management requirements to avoid, minimise or mitigate environmental harm associated with land disturbance activities. Assessments are used to inform site selection, site-specific management plans and procedures (fauna, flora, pest, etc.), future rehabilitation requirements and offsets where residual impacts remain.
Schedule G - Protecting Water Values	HSE MS Standards Compendium – Biodiversity, Coal seam gas water, land management, waste, groundwater.	Arrow undertakes ecological impact assessments as a prerequisite for site access and prior to commencing significant land disturbance for all of Arrow's development activities. These assessments, including both desktop and/or field assessment as applicable, establish the ecological and biodiversity characteristics of areas, including watercourses, wetlands, lakes and springs that may be disturbed. The assessments are also used to identify site-specific ecological constraints and opportunities (eg sensitive ecological features, areas of high biodiversity value, ESAs, high value waters, weeds and pests, etc.), and management requirements to avoid, minimise or mitigate environmental harm associated with land disturbance activities. Assessments are used to inform site selection, site-specific management plans and procedures (fauna, flora, pest, etc.), future rehabilitation requirements and offsets where residual impacts remain.Arrow constructs infrastructure in accordance with specifications developed in consideration of relevant Australian Standards, Codes of Practice (eg APGA Code of Environmental Practice) and Guidelines (eg Queensland Urban Drainage Manual) document how overland flow / flood flow and site drainage is addressed. Further, Arrow undertakes flood studies and prior to development undertakes site-specific overland flow assessments to mitigate and manage impacts on surface water.As far as possible Arrow seeks to maximise beneficial reuse of CSG water and minimise environmental impacts associated with water use and disposal. It also seeks (where possible) to manage coal seam gas water in such a way as to mitigate the impacts on aquifers.Arrow manages produced CSG water through a combination of water storage dams and water treatment facilities. The treatment facilities allow for the treatment and beneficial use of CSG water generated through production activities. Further, Arrow's Water Services Agreement with QGC allows for produced water to be transferred into the QGC regional water management network for subsequent treatment at QGC's Kenya Water Treatment Facility.Site-specific erosion and sediment control plans developed for individual projects address potential impacts of construction activities on surface water and/or groundwater.Site-specific seepage monitoring programs, including the installation of seepage monitoring bores and plans for early detection of seepage of contaminants, are used to mitigate and manage risks associated with containment facilities.

EA Condition	Internal Process/Management System	Environmental Management Strategies
Schedule H - Rehabilitation	HSE Standards Compendium - Land Management	Arrow aims to minimises disturbance to vegetation, land, native flora and fauna and farmland and infrastructure (including crops, pastures and stock. Rehabilitation objectives are to facilitate the return of land to a stable state where either the former land use or another specified use as agreed with the State and landowner and in accordance with the EA conditions, can be resumed. Rehabilitation applies to stabilisation of operating areas, decommissioning and final closure rehabilitation to stabilise the land following decommissioning of infrastructure eg plugged and abandon wells, as follows: Stabilisation: where land disturbance is undertaken, Arrow ensures that sites are maintained in an appropriate stable condition following completion of construction activities. Stabilisation of disturbed areas is undertaken as practicable following land disturbance. Ongoing monitoring and maintenance is undertaken to ensure the site remains in a stable condition and site records document the areas, volumes, methods and locations. Decommissioning: Following completion of activities infrastructure is decommissioned, and above ground infrastructure removed (subject to alternate arrangements being made with landowners and authorised under the EA). Site-specific decommissioning plans are developed as necessary for large infrastructure such as dams, and for pipeline and gathering networks. Final rehabilitation: sites are rehabilitated (including monitoring) to achieve final rehabilitation acceptance criteria, are non-polluting, provide a stable landform and can sustain the current use of the land with no further mitigation or management measures required beyond the normal management of the land.
Schedule I - Well construction, maintenance and stimulation activities	Well Integrity Management System	Well programs have been developed that specify water-based mud to be used in well construction. Arrow's Well Integrity Management System includes monitoring and maintenance to ensure that wells meet operational availability objectives and well integrity goals for the full life cyle of the well. Arrow has not conducted well stimulation in the areas covered under this EA during the time the EA has been in effect.
Schedule J -Regulated Structures	HSE MS Standards Compendium - Coal Seam Gas Water.	Arrow manages dams as part of its water management system, providing operational storage or water balance capacity to ensure containment of coal seam gas water. Arrow maintains a regulated dam register that documents the names, types, consequence category, dimensions, storage capacity, certification by suitably qualified and experienced persons and inspections. Annual inspections are undertaken to ensure structural soundness and compliance with performance standards. Procedures and criteria used for operating dams, including management, maintenance and monitoring are defined in individually developed asset operating plans. These operating plans include: operating guidelines, emergency management, inspections checklists, regulatory reporting and notification requirements, the surface and groundwater monitoring programs developed.