

**ATTACHMENT E ENVIRONMENTAL MANAGEMENT PLAN**



significant disturbance to a wetland or watercourse

# Environmental Management Plan

Atlas Stage 3 Gas Project

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Date: 07 December 2023

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Revision: 4

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# Document Status

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## Revision History

Revision	Release Date	Document Status	Revision Comments	Author
A	03/11/2022	Issued for Review	Document creation	M Harris
1	15/11/2022	Issued for Use		M Harris
2	31/07/2023	Issued for Use	Updated to address EPBC RFI	J. Claridge
3	07/09/2023		Response to RFI comments	
4	07/12/2023		Respond to DCCEEW adequacy review comments	S Fox

## Document Approval

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<b>Approved by</b>	Jacob Cumpstay Environment Manager	<b>Signed</b>	Date
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# 1 Introduction

Senex Energy Pty Ltd (**Senex**), through its subsidiaries Senex Assets Pty Ltd and Senex Assets 2 Pty Ltd, is progressing development of Atlas Stage 3 Gas Project on Authority to Prospect (**ATP**) 2059, Petroleum Lease (**PL**) 445, the northern half of PL209 and parts of PL1037, and any subsequent or replacement petroleum authorities over the areas so described (together, the **Project Area** shown in Figure 1) in the central part of the Surat Basin; an established gas producing region. Atlas Stage 3 Gas Project will involve developing production wells and supporting infrastructure to produce gas for domestic and international markets.

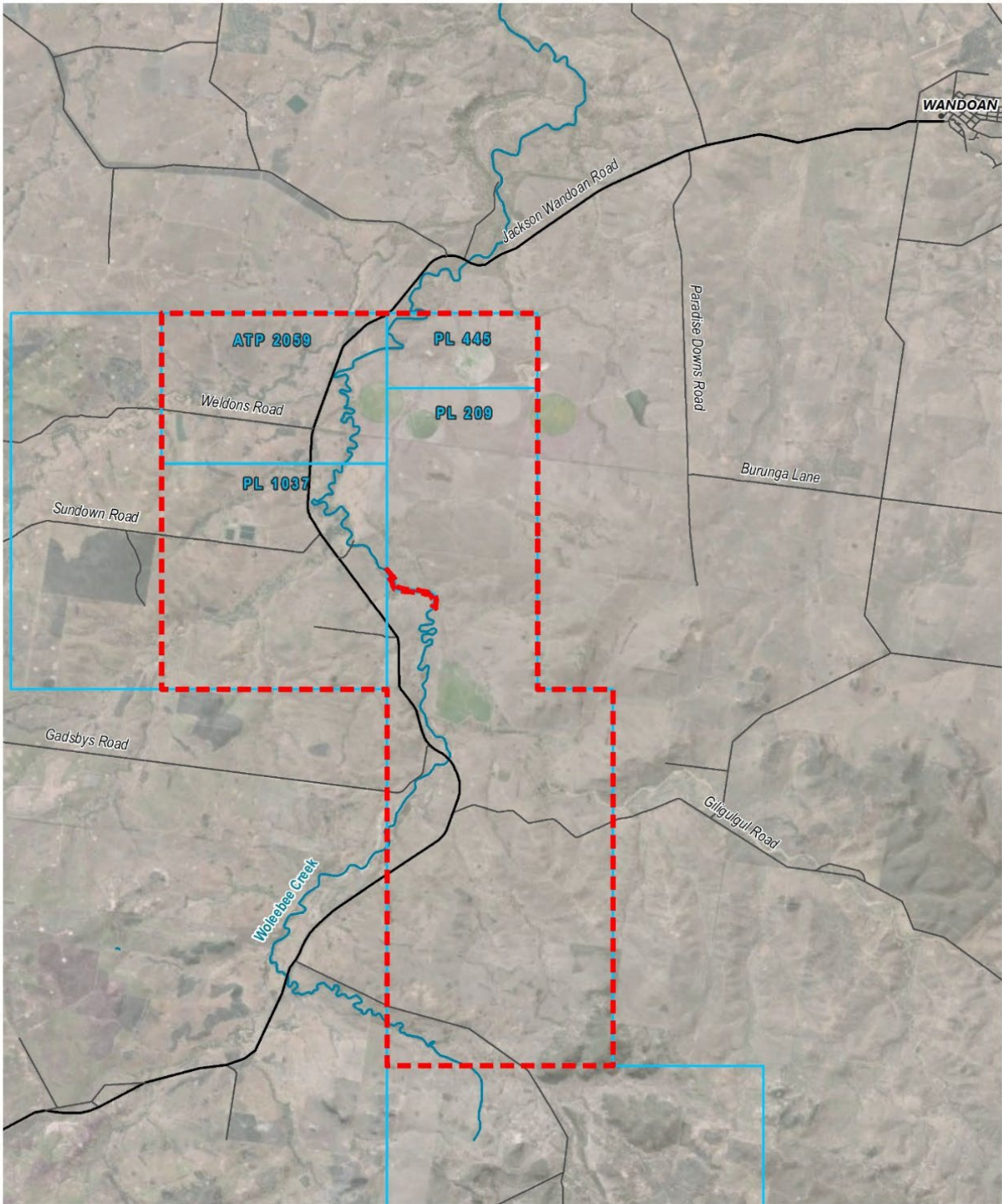
The Project Area totals 12,304 hectares (ha) and is located approximately 44 kilometres (km) north of the Warrego Highway, between the townships of Wandoan and Wallumbilla (**Figure 1**). The potential disturbance within the Project Area relates to the Field Development Area (FDA), plus a required brine storage dam which will be located in an area devoid of MNES. The term Project Area is used to describe the Project and its location more broadly in this Environmental Management Plan (**EMP**). The FDA is approximately 9,772 ha and is located within the Project Area.

The operating life of a production well is expected to be between approximately 15 to 35 years, with wells no longer required for operational purposes progressively decommissioned and rehabilitated throughout the Project Area life. The Atlas Stage 3 Gas Project will be progressively developed over approximately 5 to 10 years and will result in approximately 200 PJ of additional resource of natural gas to be produced for domestic and international markets.

Proposed activities will build upon infrastructure to be established for appraisal activities and will include but not be limited to constructing and operating:

- 151 wells and associated well site facilities;
- Gas and watering gathering system for the producing wells;
- Produced water management facilities including water aggregation dams, reverse osmosis treatment facility, and brine dam;
- Several temporary accommodation facilities required for construction and drilling activities;
- Laydown, stockpile and site office areas (approximately 45 ha in areas previously cleared of original native vegetation);
- Borrow pits (approximately 11 ha in areas previously cleared of original native vegetation);
- Other-ancillary facilities and infrastructure with a footprint of (approximately 30 ha disturbance in areas previously cleared of original native vegetation) including:
  - power/communication lines (overhead or underground);
  - plant and equipment service and maintenance facilities and workshops;
  - construction support, warehousing and administration buildings;
  - fuel and chemical storage;
  - washdown-facilities;
  - ancillary infrastructure such as communications infrastructure, water supply and holding tanks and dams and energy supply;
  - groundwater-monitoring bores;
  - environmental monitoring equipment and management controls; and
  - ecological, topographic, cadastral, geological, geophysical and geotechnical surveys;
- Operating wells, gathering system and associated facilities established for the appraisal program; and
- Access tracks will be required for operational purposes for the life of the well and will be located within the right of way (**ROW**) with the buried pipeline.





Tenement	PL 445, PL 209, PL 1037, ATP 2059
Project	Surat Basin Expansion
Title	Atlas Stage 3 Location Map
Landholder	N/A
Property	N/A
Function	Environment
Description	Issued for Review
Date	18/10/22
Revision	A
Requested by	MH
Prepared by	MC
Reviewed by	MH
Approved by	SF
Document No.	SENEX-CORP-GI-MAA-755-1



Acknowledgements:  
 Mining Tenement QLD data © Department of Mines and Energy 2022  
 Well Data / Pipeline info GPRNFO 2022

Legend:

- Towns
- Main Road
- Local Road
- Major Mapped Watercourse
- ▭ Project Area
- ▭ PL / ATP Boundary



Document Path: F:\Senex\_GIS\GIS Mapping - All Mapping\Qld Project Atlas\Project wide mapping\Environment\MAA-755-1 EPBC Report Maps\MAA-755-1 Project Area Atlas\_Stage 3 Location.mxd

Figure 1: Atlas Stage 3 Gas Project Area and Location

## 1.1 Purpose and Scope

This EMP describes how Senex will manage potential environmental impacts associated with conducting appraisal and production activities in the Project Area and ensure compliance with the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (**EPBC Act**) and Environmental Authority (**EA**) conditions, industry guidelines and other regulatory requirements.

The objectives of this EMP are to ensure:

- Potential project related impacts are avoided, minimised, mitigated and restored;
- Potential impacts upon the surrounding environment, including “matters of national environmental significance” (**MNES**), are identified and addressed within an internal planning process and incorporated into field management procedures;
- Activities that have, or are likely to have, temporary impacts on the environment are monitored and managed; and
- Activities which have, or are likely to have, long term significant impacts on the environment or land use are managed and mitigated.

Broadly, this EMP covers:

- Specific requirements for compliance with government regulatory requirements, EA and other approval conditions;
- Activities authorised to be undertaken in the Project Area;
- Communication and documentation of environmental compliance undertakings for all activities; and
- Environmental management measures to be implemented to minimise identified potential environmental impacts.

## 1.2 Supporting Plans and Procedures

The EMP will be updated:

- To reflect new or additional permit conditions, regulatory requirements; and
- As required by a risk assessment or changed project outcomes.

Senex contractors will be provided with a copy of this EMP and will be required to comply with its contents.

This EMP is supported by several internal plans, procedures and processes including but not limited to the following:

- Senex Health, Safety and Environmental Management System [SENEX-CORP-HS-STD-001] (**HSEMS**) which relies upon procedures for incident notification, response, investigation and reporting procedures including the:
  - Incident Management Procedure [SENEX-CORP-HS-PRC-004];
  - Contingency Procedures for Emergency Environmental Incidents (SENEX-QLDS-EN-PRC-024; and
  - Senex Spill Response Plan [SENEX-CORP-ER-PLN-006].
- Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [OPS-ATLS-EN-PLN-001] (the **Constraints Protocol**), comprising a GIS analysis tool and integrated within infrastructure development and land access planning processes;
- Senex Action Item Tracking Register (**AITR**) database which tracks complaints, grievances and all other items required to be actioned;
- Queensland Operations Biosecurity Management Plan [SENEX-QLDS-EN-PLN-001];



- Queensland Weed Hygiene Procedure [SENEX-QLDS-EN-PRC-023];
- Senex Waste Management Procedure Qld [SENEX-QLDS-EN-PRC-022];
- Rehabilitation Plan Atlas Stage 3 Gas Project [SENEX-ATLS-EN-PLN-018];
- Queensland Erosion and Sediment Control Procedure [SENEX-QLDS-EN-PRC-003];
- Queensland Fauna and Stock Management Procedure [SENEX-QLDS-EN-PRC-021];
- Atlas Stage 3 Gas Project Significant Species Management Plan (ERM 2023);
- Atlas Stage 3 Water Monitoring and Management Plan [SENEX-ATLS-EN-PLN-017];
- ATP 2059 Coal Seam Gas Water Management Plan [SENEX-ATLS-EN-PLN-013];
- PL 445 and PL 209 Coal Seam Gas Water Management Plan [SENEX-ATLS-EN-PLN-014];
- Atlas Stage 3 Gas Project Chemical Risk Assessment Report (KCB 2023); and
- Atlas Stage 3 Gas Project EPBC Water Resource Impact Assessment (CKB 2023).

### 1.3 Terms of Reference

The following terms and abbreviations are used throughout this EMP.

Term	Definition
AITR	the Senex Action Item Tracking Register.
AREMP	an Air Receiving Environment Monitoring Program.
AS	Australian Standards.
ATP	Authority to Prospect.
ATW	Access to Work documentation.
BUA	Beneficial Use Approval.
CCA	Conduct and Compensation Agreement.
Constraints Protocol	Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [OPS-ATLS-EN-PLN-001].
DAF	the Department of Agriculture and Fisheries.
DES	the Department of Environment and Science.
DTMR	the Department of Transport and Main Roads.
EA	Environmental Authority.
EMP	this Environmental Management Plan for Project Atlas.
EMS	Senex's Environmental Management System.
EP Act	the <i>Environmental Protection Act 1994</i> (Qld).
EP Regulation	the <i>Environmental Protection Regulation 2019</i> (Qld).
EPBC Act	the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cth).
ESA	Environmentally Sensitive Areas.
HDPE	high density polyethylene.
HPV	High Point Vent.
HSEMS	the Senex Health, Safety and Environment Management System.
LPD	Low Point Drain.
MAOP	maximum allowable operating pressure.

<b>Term</b>	<b>Definition</b>
MNES	matters of “national environmental significance” as that term is defined under the EPBC Act.
NC Act	the <i>Nature Conservation Act 1992</i> (Qld).
P&G Act	the <i>Petroleum and Gas (Production and Safety) Act 2004</i> (Qld).
PCP	progressive cavity pump.
PL	Petroleum Lease.
Project Area	PLs 1037, 109 and 445, and ATP 2059, and includes any subsequent or replacement petroleum authorities.
RO	reverse osmosis.
ROW	Right of Way.
RTU	remote terminal unit.
SCADA	supervisory control and data acquisition.
SDS	the Safety Data Sheets.
Senex	Senex Assets Pty Ltd and Senex Assets 2 Pty Ltd.
Water Act	the <i>Water Act 2000</i> (Qld).
ADR	the <i>Accepted development requirements for operational work that is constructing or raising waterway barrier works</i>
WRR Act	the <i>Waste Reduction and Recycling Act 2011</i> (Qld).
WSA	Water Supply Agreement.

## 2 Legislative Requirements

### 2.1 State Legislation

The principal legislation regulating petroleum and gas activities for the project is the *Petroleum and Gas (Production and Safety) Act 2004* (Qld) (**P&G Act**). The principal environmental legislation is the *Environmental Protection Act 1994* (Qld) (**EP Act**) and associated regulation and protection policies.

The EP Act introduces the ‘general environmental duty’ which specifies that a person must not perform their duties in a manner which will cause, or is likely to cause, environmental harm unless the person takes all reasonable and practical measures to prevent or minimise the harm.

The EA authorises petroleum activities under the EP Act, and Senex and all contractors undertaking petroleum activities within the Project Area must comply with the conditions of the EA, to meet their respective obligations under the EP Act.

Fisheries resources and development in fisheries habitat areas in Queensland are regulated under the *Fisheries Act 1994* (Qld). The most relevant provisions in the *Fisheries Act 1994* (Qld) relate to installation of temporary and permanent waterway barriers (“waterway barrier works”), which may be assessable development under the *Planning Act 2016* (Qld).

The *Nature Conservation Act 1992* (Qld) (**NC Act**) provides a framework for the creation and management of protected areas and the protection of native flora and fauna, which are classified as being either endangered, vulnerable, near threatened or least concern, and are referred to as “protected plants” and “protected animals”, respectively.

There is a general prohibition on using, taking, keeping and interfering with protected plants and animals in Queensland, although there are various exemptions where the take may be lawful (depending on the purpose and the location in which the activity occurs).

The *Waste Reduction and Recycling Act 2011* (Qld) (**WRR Act**) establishes the framework for waste management and resource recovery in Queensland, including the waste and resource management hierarchy, the “user pays” principle, the proximity principle and product stewardship principles. Waste management strategies must be aligned with the hierarchy and principles under this Act.

The *Water Act 2000* (Qld) (**Water Act**) provides a framework for planning and regulating the use and control of water in Queensland. The Act provides a wide range of tools to regulate in-stream (that is, watercourses, lakes and springs) and overland water flow and groundwater within the context of “sustainable management and efficient use” of water.

Obligations also exist under other Queensland legislation for carrying out petroleum activities on the project area, a number of which are identified in the following sections of this EMP. It remains the duty of Senex employees and contractors to meet all obligations under Queensland legislation before undertaking activities in the project area. The Senex Environment Manager should be contacted where assistance is required.

### 2.2 Commonwealth Legislation

The EPBC Act is the principal piece of environmental legislation administered by the Commonwealth Government. It provides a legal framework to protect and manage, among other matters, nationally and internationally important flora, fauna, ecological communities and heritage places defined in the EPBC Act as MNES.

The EPBC Act requires the principles of ecologically sustainable development to be considered for a new development proposal if that proposal is likely to result in a significant impact on the environment.

### 3 Roles and Responsibilities

Senex is responsible for the ongoing management of activities in the Project Area. All Senex employees and contractors are responsible for conforming to applicable Australian and Queensland laws and regulations and for conducting work in accordance with permit requirements and this plan.

Roles and responsibilities of Senex personnel and contractors in relation to this EMP are summarised in the table below.

Role	Responsibility
Senex Environmental Manager	<ul style="list-style-type: none"> <li>• Secure and manage environmental and associated approvals.</li> <li>• Overall responsibility for environmental compliance, including monitoring, data collection and reporting.</li> <li>• Report incidents to the Department of Environment and Science (<b>DES</b>) and other Government agencies / stakeholders as required.</li> <li>• Ensure resources are available to manage environmental obligations and responsibilities.</li> <li>• Ensure that all personnel are competent to perform their assigned duties and have received appropriate training and inductions.</li> <li>• Implement an environmental compliance system that includes audits and assurance to help ensure compliance with Approval conditions and other regulatory requirements.</li> <li>• Keep up to date environmental management documentation including this EMP and associated plans, such as Significant Species Management Plan and procedures.</li> </ul>
Senex Land Access Manager	<ul style="list-style-type: none"> <li>• Secure land access for Senex activities including land access agreements/land access rules or Conduct and Compensation Agreements (<b>CCA</b>) with landholders whose properties will be impacted by Senex activities.</li> <li>• Engage with landholders and liaise with Senex Site Supervisor(s) to ensure activities are undertaken in accordance with the Queensland Land Access Code 2016 and conditions of any land access agreements/land access rules or CCAs.</li> <li>• Compile and distribute Access to Work documentation (<b>ATW</b>) prior to commencement of activities on site.</li> </ul>
Senex Site Supervisors (Drilling, Completions, Civil Construction etc.)	<ul style="list-style-type: none"> <li>• Represent Senex on site. Responsible for ensuring this EMP and other relevant environmental procedures are implemented on site, including any site-specific requirements identified during the planning phase.</li> <li>• Ensure that Senex staff and contractors comply with regulatory requirements including all relevant Approval conditions and requirements of the ATW.</li> <li>• Induct the Contractor Site Supervisor into relevant requirements of the EA, EMP, and supporting plans and procedures applicable to their activities on site.</li> <li>• Conduct inductions of any visitors to site.</li> <li>• Ensure toolbox and other safety talks adequately address environmental matters to be considered on site as relevant to the work being undertaken including those identified in the ATW (for example, property-specific weed hygiene requirements).</li> <li>• Ensure that the Contractor Site supervisor is adequately supervised.</li> <li>• Ensure activities do not harm or disturb cultural heritage objects or areas of significance.</li> <li>• Ensure that the requirements under any native title agreement are adhered to.</li> <li>• Ensure compliance with landholder agreements or CCA conditions as</li> </ul>

Role	Responsibility
	<p>defined in the ATW.</p> <ul style="list-style-type: none"> <li>• Ensure vehicle and machinery weed washdown requirements are complied with as specified in this EMP and supporting procedures and plans.</li> <li>• Empower all project staff to stop work when the potential for environmental harm is perceived.</li> <li>• Report to the Senex Environmental Manager on environmental matters and provide all relevant reporting and monitoring documentation as required.</li> <li>• Report to the Land Access Manager on landholder and property matters.</li> </ul>
Contractor Site Supervisor	<ul style="list-style-type: none"> <li>• Adequately identify and address any risks associated with the Contractor's activities prior to commencing and develop a construction methodology that has due regard for identified risks.</li> <li>• Ensure that appropriate training and inductions in the requirements of this EMP, EA conditions and other regulatory requirements as relates to their activities have been carried out for all Contractor personnel.</li> <li>• Ensure that Contractor personnel are adequately supervised.</li> <li>• Implement this EMP on site, including any site-specific requirements identified in Site Environmental Requirements documents, the ATW or as directed by the Senex Site Supervisor.</li> <li>• Ensure all activities are carried out in accordance with the requirements set out in the EMP, EA conditions, regulatory requirements and as specified in other relevant documents including tender documentation and contract with Senex.</li> <li>• Immediately notify the Senex Site Supervisor if cultural heritage sites, objects or human remains are found.</li> <li>• Immediately notify the Senex Site Supervisor of any incidents and non-compliances with the EA, EPBC Act approval, this EMP, supporting plans or procedures.</li> <li>• Report to the Senex Site Supervisor as instructed and provide all reporting and monitoring information to the Senex Site Supervisor as required.</li> <li>• Ensure that records are maintained of all monitoring activities.</li> <li>• Empower all project staff to stop work when the potential for environmental harm is perceived.</li> <li>• Implement a program of internal environmental audit against this EMP and supporting plans and procedure.</li> </ul>
Contractor Personnel	<ul style="list-style-type: none"> <li>• Undertake training and induction as required to competently undertake activities on the project area.</li> <li>• Carry out all activities in compliance with this EMP, Approval conditions, site environmental requirements identified in planning, the ATW or as directed by the Contractor Site Supervisor and/or Senex Site Supervisor.</li> <li>• Immediately notify the Contractor Site Supervisor if cultural heritage sites, objects or human remains are found.</li> <li>• Immediately notify the Contractor Site Supervisor of any incidents and non-compliances with the EA, EPBC Act approval, this EMP, supporting plans or procedures.</li> </ul>
Senex Environment Team and/or Field Environment Representative	<ul style="list-style-type: none"> <li>• Assist the Senex Site Supervisor as required in ensuring that all petroleum activities, including those undertaken by Contractors, are conducted in accordance with the EMP and in compliance with EA conditions.</li> <li>• Promote environmental awareness amongst the workforce and hold site meetings on environmental matters as required.</li> <li>• Assist the Senex Site Supervisor in providing training in the form of toolbox talks and pre-works meetings on environmental matters.</li> <li>• Notify the Senex Site Supervisor and Environment Manager of any environmental incidents and non-compliances with EA conditions, the EMP and associated plans and procedures within specified timeframes in the</li> </ul>



Role	Responsibility
	<p>Senex Health, Safety and Environmental Management System [SENEX-CORP-HS-STD-001] and liaise with the Construction Site Supervisor to investigate and report on the incident or noncompliance.</p> <ul style="list-style-type: none"> <li>• Ensure that all records, environmental approvals, and permits are managed, maintained and stored as appropriate and copies of the EMP, Approval conditions and supporting procedures and plans are available as required.</li> <li>• Co-ordinate implementation of rehabilitation plans and programs as required for the Project Area.</li> <li>• Undertake monitoring in accordance with this EMP, supporting plans and procedures and Approval conditions as directed by the Senex Environment Manager.</li> <li>• Complete Environmental Audits as directed by the Environment Manager.</li> </ul>

## 4 Environmental Training and Inductions

Environmental awareness training and inductions appropriate to the level of risk and type of work being performed will be provided to personnel, contractors and visitors as relevant. Senex contractors and consultants are made aware of the requirements of this EMP and associated procedures through the contracts and procurement process. Senex staff will undergo formal induction into the requirements of the EMP and associated plans and procedures.

### 4.1 General Training and Inductions

Training and inductions will cover:

- Environmental obligations and responsibilities under the EP Act, *Environmental Protection Regulation 2019* (Qld) (**EP Regulation**) and the EA;
- Environmental obligations and responsibilities under the EPBC Act.
- Requirements of this EMP and other project management plans and procedures;
- Environmental hazards and control measures;
- Emergency, incident and spill response procedures and incident notification procedures, including duty to report environmental incidents;
- Weed management and hygiene procedures;
- Water and waste management obligations; and
- Interactions with flora and fauna.

Relevant site-specific environmental information will be considered during site planning and disseminated through contract documentation to Contractors, through Site Environmental Requirement plans, ATW documentation to site personnel and to all during toolbox sessions. Information may include:

- Land access requirements;
- Areas identified as containing weeds or being clean and weed free, and procedures for moving between these areas;
- Weed hygiene certification requirements;
- Environmentally sensitive areas, including no-go areas that must be avoided;
- Any areas for which specific management measures must be implemented prior to working adjacent to or within; and
- Any significant flora and fauna species (including MNES) identified as potentially present in the work areas.

Records of training and inductions will be maintained to demonstrate achievement of competence. Training and induction material will be reviewed following change, incident investigations and hazard studies. Separate training and inductions are provided covering the topics of safety, cultural heritage and land access.

### 4.2 Fire Prevention Training

Fire on site has the potential to cause significant damage and/or injury to personnel, property, stock and the environment. The likelihood of fire starting in rural locations can be influenced by the condition of ground cover (for example, tall, dry grass), the type and working condition of machinery, and human behaviour such as inappropriate disposal of cigarette butts.

Fire prevention will be covered as part of safety training and/or toolbox meetings to ensure all personnel are fully aware of the potential for fire to start in the area in which work is being performed. Fire-fighting equipment and procedures will be in place at all Senex operated sites.

Measures to aid in the prevention of fires may include:

- Provision of appropriate fire-fighting equipment at Senex work sites;
- Training of personnel in fire-fighting procedures appropriate to the workplace;
- Fitting of Senex vehicles and/or other machinery with fire extinguishers which comply with the relevant Australian standards;
- Ensuring Senex vehicles and/or machinery have efficient exhaust systems free from leaks and, where appropriate, spark arresters; and
- Inspection of the underneath of vehicles for, and removal of, collected flammable material as required (for example, after working in long grass).

## 5 Description of Petroleum Activities

### 5.1 Petroleum Appraisal Activities

Appraisal wells are drilled to determine the location, extent, thickness, permeability, gas content and gas saturation of coal seams present in the target area. The location of well sites, access tracks and associated infrastructure will be site-specific depending on location and characteristics of the hydrocarbon reservoir and local environmental conditions.

Appraisal testing involves drilling a cluster of wells in one area, with one central well and several wells surrounding it. The data is used in future gas field development planning to optimise well spacing, water and gas infrastructure, water treatment options and pump sizes.

The location of the wells and all associated infrastructure will be selected by implementing the Constraints Protocol. Well pads are up to approximately 0.6 ha to safely accommodate the drilling rig and associated equipment.

Water is required by the drilling process and may be pumped or trucked to site.

The CSG produced from wells will be locally cold vented where it cannot be used commercially or technically used as fuel in the carrying out of authorised activities in accordance with the P&G Act.

Beneficial use options for produced water generated through appraisal activities may comprise providing stock water, subject to commercial arrangements.

### 5.2 Production Wells

Senex expects that production well drilling campaigns will be between approximately 15 to 35 wells per annum, with a total of 151 wells being drilled. They will be drilled and constructed in accordance with the Queensland codes of practice for constructing and abandoning CSG wells. The wells will be spaced between 500 to 750 m apart.

The location of the wells and all associated infrastructure will be selected by implementing the Constraints Protocol.

The initial wellsite will generally be constructed in an area of up to approximately 80 m by 70 m, to allow the initial drilling and completion of the well (installing surface facilities). Following the initial drilling and commissioning of the well, the well site will be partially rehabilitated, leaving an area of approximately 60 m x 60 m to allow an adequate area for workover rig operations that will be required throughout the well's life.

It will take up to 6 months to dewater each production well sufficiently for gas to flow; approximately 18 months to reach peak production; and an estimated 8 years for gas to free-flow.

Once depleted of gas, wells will be capped, rehabilitated and abandoned. This is not expected to occur for at least 15 years from drilling a well and may be much longer (more than 25 years).

### 5.3 Drilling and Operations

For appraisal and production wells, drilling and completions wastes will either be collected in an appropriately sized storage container to be removed from site and disposed of at an appropriately licensed facility; or they may be managed on site as authorised by the standard conditions. Drilling muds may be reclaimed for use throughout the drilling program.

Following the well drilling phase, the wells will be completed, and a pump installed to dewater the production reservoir. Separate connections will be provided at the well head for the gas and water streams. Produced water will be pumped to the surface by a downhole progressive cavity pump (**PCP**), driven by an electric motor, and connected from the wellhead tubing.

The standard well site facility will generally consist of:

- A wellhead gas and water metering package to achieve full time gas and water metering for each well. This prevents pumps running dry, enables early diagnoses of pump or other equipment failure and identification of potential flow line ruptures/leaks, while monitoring efficiency of low point drain

operation.

- Gas and water separation in the downhole wellbore annulus area. A well head gas/water separator may be incorporated into the metering package if additional separation is required.
- Natural gas power generation package to provide power for the electric motor driving the downhole pump.
- Fuel and instrument gas scrubber to power the generator and supply gas to instruments.
- (Optional) Sand/particulate filter separator for water and gas streams.
- Remote terminal unit (**RTU**)/supervisory control and data acquisition (**SCADA**) and solar panel/battery package for site communication and status.
- Equipment being located on sleepers (concrete or timber) to minimize disturbance and reduce/eliminate the need for foundations.
- Prefabricated cattle panels for perimeter fencing around the production facilities to allow maintenance as required. The area may be graveled to allow operating access in wet weather.
- Surface pressure piping constructed of steel to the required specification. Transition to the gathering system material (high density polyethylene (**HDPE**)) will occur either at or below grade.

Once depleted of gas, wells will be capped, rehabilitated and abandoned. This is not expected to occur for at least 15 years from drilling a well; and may be much longer (more than 25 years).

#### 5.4 Gas and Water Gathering System

Gas and water from the wellsite facilities will be delivered to a compression facility and water treatment/storage facilities via the gas and water gathering system. These may be owned and /or operated by another entity, including third parties over time.

The buried gathering system will enable gas at low pressure and water to flow through separate HDPE pipelines. The pipelines will typically be between 63 mm and 650 mm in diameter and buried with a minimum depth of cover of 750 mm for pipe greater than 160 mm in diameter. Pipe equal to or less than 160 mm in diameter may have a 600 mm depth of cover where a risk assessment confirms an alternate burial depth can effectively minimise disruption to land use and ensure safety and pipeline integrity are appropriately managed. Pipelines will transport water in a separate HDPE pipeline installed underground to water management facilities.

To install the gathering lines, ROWs between 12 m and 18 m wide (with 24 m ROWs required for approximately 15 km of major gathering trunklines) will require vegetation to be removed. Pipeline ROWs will be preferentially aligned with existing roads/tracks, fence or power lines or other linear infrastructure to minimise disturbance and overall impact on land users. Once constructed, the ROW will be rehabilitated (transitional rehabilitation) except for areas required for an access track (approximately 6 m wide).

Horizontal directional drilling (**HDD**) may be used in the crossing of watercourses with protected vegetation and/or habitat, such as Woleebee Creek.

The gas gathering system will typically operate at 70 – 400 kPag with a Maximum Allowable Operating Pressure (**MAOP**) of 615 kPag. The water gathering system will typically operate up to 1,000 kPag depending on the terrain.

Although the gas and water will be transported in separate pipelines, the water will contain some entrained gas; and the gas will be saturated and contain carry over water (from well site separation) and water from condensation (from changes in temperature). As a result of the entrained gas, the water gathering system will have high point vents (**HPV**) installed to remove the accumulated gas at high points in the gathering line. The gas gathering system will have low point drains (**LPD**) to remove water that accumulates in pipeline low points. The purpose of the LPDs and HPVs is to restore the flow efficiency of the respective pipelines resulting in a more consistent and overall lower wellhead operating pressure. Not every high-point and low-point will require a vent or drain (respectively). The requirement will be assessed on a case-by-case basis. The LPDs and HPVs aim to restore the pipeline flow efficiency of the respective flowlines resulting in a more consistent and overall lower wellhead operating pressure.



## 5.5 Produced Water Management Facilities

Produced water has the potential to be beneficially used for a range of purposes in both treated and untreated (raw) forms. Produced water management options are considered in the context of the *Coal Seam Gas Water Management Policy 2012—ESR/2016/2381 (formerly EM738)*, which identifies the hierarchy of disposal options. The preferred option is beneficial use with a view to maximising benefits to the community. Where produced water can be beneficially used it is no longer considered a waste under the EP Act.

Produced water will generally be collected from the water gathering systems into an aggregation dam/s. Water for beneficial use, where treatment is not required, will be drawn from the aggregation dams. Senex will use some untreated CSG produced water to support ongoing development / construction activities such as dust suppression, drilling, construction and hydro-testing. Any untreated produced water used as part of project activities will be undertaken in accordance with the *End of Waste Codes (ENEW07546918 and ENEW07547018)* produced water with moderately low salinities (<4 dS/m) will generally be processed by calcium and pH amendment only, however for higher salinities treatment by reverse osmosis (**RO**) or blending with available fresh water will be undertaken as required. Where suitable, water use options to be considered include stock watering and irrigation.

A single RO treatment plant is expected to be required, with a capacity in the range of 1.5 ML/d to 4.5 ML/d and has a footprint of up to 4 ha. The RO treatment of water will produce concentrated brine. A brine storage dam of up to 300 ML (up to 30 ha) may be constructed near the water treatment facility. This dam is expected to contain the entire production of brine from the project, taking into account evaporation. The salt will eventually be removed from site following solar or thermal evaporation.

Senex prioritises utilising the CSG produced water for beneficial use by establishing Landowner Water Supply Agreement (**WSA**).

## 5.6 Dams

New pre-engineered above ground tanks and/or purpose-built earthen dams with impervious liners and leakage detection/collection systems may be established on PL1037 and/or PL209. These new storages are part of the proposed action. To minimise impacts and improve operational efficiency, some of the water from the gathering system will be transferred to centrally located aggregation dams that are already established for Senex Assets Pty Ltd's 'Project Atlas'. Treated water will be transferred to third party irrigation dam(s) (approximately 50-200ML each) on PL1037 and/or PL209. The water will be treated to comply with the standard water quality parameters as specified in State codes. Dam locations will depend on gas well locations, in addition to environmental and social factors including soil types, conservation values, catchment areas, land uses, cultural heritage, and landholder agreements. Senex will ensure that all dams are designed and constructed in accordance with the prescribed standards (with appropriate reference to the DES guidelines and manuals: *Structures which are dams or levees constructed as part of environmentally relevant activities (ESR/2016/1934)* and *Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933)*).

Specific dam designs will be developed by a suitably qualified and experienced person and will be assessed for its consequence category. Where required, information on dam design, construction and post-construction specifications will be lodged with DES as required at relevant stages prior to its operation, in accordance with EA conditions.

Once dams are no longer required they shall be decommissioned and rehabilitated or as in agreement with the landholder and in accordance with approval conditions.

## 5.7 Roads and Access Tracks

Access tracks are required to allow the construction and operation of gas wells and supporting infrastructure. Established access tracks will be used wherever possible with purpose-built access tracks constructed where existing tracks are not suitably located. Appropriate erosion and sediment controls are to be installed maintained for both construction and ongoing use of access tracks. A typical access track consists of a 6 m carriageway but may be wider in certain areas to provide for truck turnarounds.

Where access tracks are required to cross waterways the *Accepted development requirements for operational work that is constructing or raising waterway barrier works (ADR)* will be complied with. If the waterway crossings proposed cannot comply with the ADR, Senex will obtain a Development Approval under the Planning Act.

Once construction is complete, the access track disturbance is rehabilitated to the minimum width possible whilst ensuring safe use of the track or road. Rehabilitation requirements for waterway crossings are specified in the ADR.

## **5.8 Ancillary Facilities**

Ancillary facilities will be required to enable the field to function efficiently. Facilities for service and maintenance of plant and equipment and storage of fuel and chemicals will be established in cleared areas. Typically, these areas will be cleared, graded and set up with the following equipment and facilities:

- Workshop areas;
- Fuel and chemical storage;
- Laydown yard with warehouse;
- Borrow pits;
- Communication tower;
- Roads and well lease tracks; and
- Vehicle weed washdown facilities.

Laydown/hardstand areas will be required for temporary storage of equipment and materials. These areas will also be required for storage of chemicals (for example, oils, lubricants, diesel and other fuels etc.) and for the maintenance and refueling of plant and machinery. Regulated, recyclable and general wastes will be temporarily stored in designated locations at laydown areas as required and will be transported off site by licensed contractors for reuse, disposal or recycling at licensed facilities.

The expected volumes of regulated wastes and chemicals to be temporarily stored on site will be managed to remain below the thresholds of ERAs 8 - Chemical storage and 56 - Regulated Waste storage. Notifiable Activity 5 Chemical Storage (Schedule 3, EP Act) may be triggered depending on the volumes of various chemicals stored on site.

Borrow pits will be typically required as a source of gravel and other materials used on an as required basis for the construction of well sites, access tracks and laydown/hardstand areas.

## **5.9 Camps and Sewerage Treatment**

Temporary camp(s) will be required to accommodate drilling and construction crews. The need for temporary camps is dependent on the proximity, available services and amenities of the towns to the Project Area. The camps may provide accommodation, mess facilities, communications, vehicle maintenance and parking areas, fuel handling and storage areas, and collect general, recyclable and regulated waste streams.

Sewage treatment plants will generally form part of the camp infrastructure and may be closed or open systems. Any irrigation of treated effluent and/or greywater on site will be undertaken in accordance with the requirements outlined in the EA, and other relevant Local and State Government approvals.

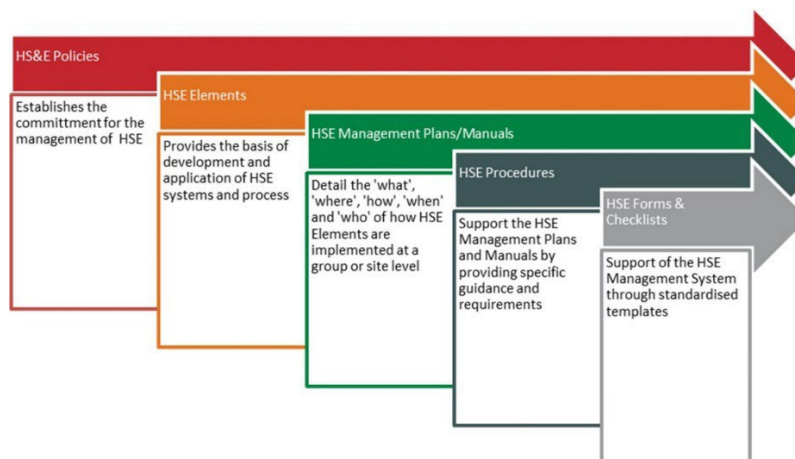
## 6 Environmental Management

### 6.1 Health, Safety and Environment Management System

The Senex HSEMS provides a framework that establishes expectations and parameters to drive continuous improvement in HSE performance. The HSEMS is applicable to all Senex worksites and personnel working for or on behalf of Senex.

The HSEMS (**Figure 2**) has a hierarchical document structure, with Health, Safety and Environment policies setting the corporate commitments for HSE management. The HSEMS framework includes 10 HSE elements, of which environmental impacts and effects is one. Potential environmental impacts and effects of Senex operations and activities are identified and managed, using a risk based and systematic approach.

**Figure 2: Health, Safety and Environment Management System**



Senex is committed to conducting its operations and activities in an environmentally sound and responsible manner. Activities are planned and managed to minimise disturbance to the environment by utilising environmental standards consistent with development in technology, industry codes of practice and relevant statutory requirements.

Environmental impacts are to be identified and measures are set in place to mitigate, measure and review impacts and environmental performance. This EMP is a component of the HSEMS.

By implementing the HSEMS, Senex aims to:

- Conduct operations in compliance with all relevant environmental legislation, regulations, licences, permits, standards, approvals and authorities;
- Clearly allocate responsibilities for environmental performance at all levels within Senex and its contractors;
- Develop environmental competency through instructing and educating employees and contractors;
- Continuously improve environmental performance through setting appropriate objectives and targets, providing sufficient financial and human resources to meet these objectives and targets, and applying research and development outcomes, cleaner production principles and using environmentally sustainable products and resources;
- Apply best industry practice in the management, supply and delivery of oil and gas product; and
- Communicate with stakeholders and the community about environmental commitments, its application and Senex's performance.

### 6.2 Senex Environmental Policy

Senex's Environmental Policy (Appendix A) governs the development and implementation of Senex's Environmental Management System (**EMS**), and, along with the EMP, are the key tools used by Senex to carry out petroleum activities in an environmentally acceptable manner.

## 7 Environmental Management Controls

### 7.1 Site Assessment and Internal Approval Process

To assist in meeting EA conditions and EPBC approval conditions, prior to carrying out any disturbance, construction or operational activities on the Project Area, approval must be obtained from the Senex cultural heritage, land access and environmental managers. Approval for disturbance is to be initiated using the Constraints Protocol. Site selection also considers engineering requirements, geological constraints, cultural heritage requirements and landholder requirements. As part of the site selection and approval process a site survey will be conducted no more than 12 months prior to undertaking activities that result in significant disturbance to land.

The site survey findings will be captured in Site Environmental Instructions prepared for specific activities and areas. This report is used to decide whether the activity can proceed in that location and inform development of appropriate impact mitigation measures. Requirements for other approvals such as vegetation clearing permits, waterway barriers works permits and the requirement for offsets will also be determined at this stage.

Once all clearances, permits and approvals are in place, including any measures required under this EMP, final approval will be granted for the work to proceed by way of the ATW permit.

All personnel and contractors will familiarise themselves with ATW requirements prior to commencing works.

Management measures in the following sections have been developed to be consistent with the "SMART" principle which is defined as:

- S – Specific (what and how)
- M – Measurable (baseline information, number/value, auditable)
- A – Achievable (timeframe, money, personnel)
- R – Relevant (conservation advices, recovery plans, threat abatement plans)
- T – Time-bound (specific timeframe to complete).

### 7.2 Housekeeping Measures

The following housekeeping measures will be undertaken within the Project Area.

Category	Measures
Environmental Controls	<ul style="list-style-type: none"><li>• No firearms, traps, nets or pets are permitted on site or in camp. Traps can be authorised for use by the Environment Manager for ecological assessments.</li><li>• No fires are permitted on site or in camp.</li><li>• Feeding of native animals is not permitted.</li><li>• Personnel must stay within areas approved for operations (cleared work zones) and not drive off approved access tracks or enter exclusion areas or 'no-go' zones.</li><li>• All rubbish and waste materials including cigarette butts are to be disposed of in the appropriate bins, or in the absence of bins, removed daily from site. All personnel are responsible for ensuring that sites remain litter free.</li><li>• Only water from a Senex approved source will be used.</li><li>• Adequate and properly maintained firefighting equipment will be present on site and potential ignition sources controlled.</li></ul>

### 7.3 Vehicle Management

The following vehicle management controls will apply within the Project Area.

Category	Controls
Performance Criteria	<ul style="list-style-type: none"> <li>All site vehicles regularly inspected and maintained in accordance site safety requirements and manufacturers specifications as evidenced by inspection and service records.</li> <li>All vehicles are to be operated in a safe manner.</li> <li>All access to private property is in accordance with landholder agreements and CCAs, as identified in the ATW.</li> <li>Signage is in place to warn third parties of access restrictions to construction and operational areas, with warnings when potentially dangerous activities are being undertaken.</li> <li>All works on public roads is in accordance with relevant approvals from local council or Department of Transport and Main Roads (<b>DTMR</b>).</li> </ul>
Management Measures	<ul style="list-style-type: none"> <li>Vehicles and personnel will only enter and exit the site at designated access points from designated access tracks and roads. Vehicles, plant, machinery and equipment must remain on formed access tracks at all times unless agreed otherwise as specified in the CCA and identified in the ATW.</li> <li>All gates must be left in the condition in which they are found. Damage caused to gates or fences by Senex activities is to be reported to the Senex Site Supervisor immediately.</li> <li>Vehicles must carry adequate firefighting equipment including a fire extinguisher at all times.</li> <li>The integrity of private roads and tracks must be maintained at all times.</li> <li>All vehicles must be maintained weed free.</li> </ul>
Monitoring and Reporting	Heavy equipment and vehicle movements will be managed according to local council/DTMR requirements.

### 7.4 Pest and Weed Management

The following pest and weed management controls will apply within the Project Area.

Category	Controls
Performance Criteria	<ul style="list-style-type: none"> <li>No spread of invasive plants (declared weeds) or high priority pest flora or fauna species within or outside of works area due to Senex activities (refer definitions and species in Atlas Biosecurity Management Plan [SENEX-QLDS-EN-PLN-001]).</li> <li>Invasive plants (declared) and high priority weeds managed in accordance with ATWs, CCAs, Land Access Code 2016 requirements, <i>Biosecurity Act 2014</i> (Qld) and other regulatory requirements, and relevant Senex supporting procedures and plans.</li> <li>Valid weed hygiene certification maintained at all times for vehicles, plant, machinery and equipment.</li> </ul>
Management Measures	<ul style="list-style-type: none"> <li>During construction and operations, activities must be planned so that movement of vehicles, plant, machinery and equipment avoid moving between properties, corridors or areas with weed infestations.</li> <li>Site specific weed management requirements must be defined prior to access to any property or work site.</li> <li>During construction and operations, pest and weed management control activities will be undertaken as directed by Senex.</li> <li>Weed management and control methods will depend upon the location, weed species identified, the degree of the infestation, relevant landholder agreement or CCA provisions, and local, state and national regulatory requirements.</li> </ul>



Category	Controls
	<ul style="list-style-type: none"> <li>• During construction and operations, all vehicles, plant and equipment must be maintained weed free.</li> </ul>
Relevant Plans and Procedures	<ul style="list-style-type: none"> <li>• Queensland Operations Biosecurity Management Plan [SENEX-QLDS-EN-PLN-001]</li> <li>• Queensland Weed Hygiene Procedure [SENEX-QLDS-EN-PRC-023].</li> </ul>
Monitoring and Reporting	<ul style="list-style-type: none"> <li>• The Senex Site Supervisor must be notified of any pest sightings or weed infestations found on site, including infestations which have been reported by others (for example, drilling staff and landholders).</li> <li>• Records of all weed notifications and inspection data are to be maintained by the Senex Environment Manager.</li> <li>• Records of weed washdown and certification must be always kept in the vehicle and made available to landholders on request and presented to the Senex Site Supervisor upon initial entry to site.</li> </ul>

## 7.5 Chemical Use and Fuel Storage

The following chemical use and fuel storage controls will apply within the Project Area.

Category	Controls
Performance Criteria	<ul style="list-style-type: none"> <li>• No uncontrolled release of chemicals, oil or fuel.</li> <li>• All chemicals, oil and fuel handled, stored and effectively contained, and transported appropriately and in accordance with relevant Australian Standards (<b>AS</b>) and Australian Dangerous Good Code.</li> <li>• All chemicals to be used on site for drilling and well production (such as work overs) are on the Queensland Well Production and Drilling Chemical Register [SENEX-QLDS-EN-REG-001] maintained by the Senex Environment Team.</li> </ul>
Management Measures	<ul style="list-style-type: none"> <li>• All fuel, oil and chemicals are to be stored, transported and handled in accordance appropriate standards including AS 3780:2008 – The storage and handling of corrosive substances, AS 1940:2004 – The storage and handling of flammable and combustible liquids, AS 3833:2007 – Storage and handling of mixed classes of dangerous goods in packaged and intermediate bulk containers.</li> <li>• All drilling chemicals that are to be used on site must be approved on the Senex Queensland Well Production and Drilling Chemical Register [SENEX-QLDS-EN-REG-001]. If a chemical is not listed on the register, a chemical risk assessment must be conducted within the approved Chemical Risk Assessment Framework. Chemicals can be added to the register where it is likely that that drilling fluid will not adversely impact a <b>MNES</b> i.e. with the outlined controls, the overall risk is not significant.</li> <li>• Bulk fuel tanks stored outside a bunded area must be contained within a self-bunded tank with safety valves.</li> <li>• Appropriate spill response equipment must be available on site and/or with vehicles, and regularly maintained.</li> <li>• During construction and operations, an inventory of all chemicals maintained on each site is to be maintained by the Senex Site Supervisor.</li> <li>• Safety Data Sheets (<b>SDS</b>) are to be maintained on site at all times and for all chemicals.</li> <li>• Storage areas must be sealed, bunded, and adequately ventilated.</li> <li>• Storage and refueling areas will be preferentially located away from watercourses, sensitive areas and any source of ignition as determined by the Senex Site Supervisor.</li> <li>• Incompatible substances are to be segregated according to SDS specifications.</li> <li>• All flammable liquids used are to be stored and dispensed only from approved containers.</li> <li>• Substances not in active use are to be sealed and safely stored in a secure</li> </ul>

Category	Controls
	<p>area.</p> <ul style="list-style-type: none"> <li>Substance storage/containment and disposal must be in accordance with the SDS (including personal protective equipment, ventilation, spill containment and precautions to avoid fire).</li> <li>Containment bunds and/or sumps will be drained periodically of accumulated rainwater to prevent overflow and subsequent pollution of the surrounding land and watercourses.</li> </ul>
Relevant Plans and Procedures	<ul style="list-style-type: none"> <li>Health, Safety and Environmental Management System [SENEX-CORP-HS-STD-001]</li> <li>Queensland Well Production and Drilling Chemical Register [SENEX-QLDS-EN-REG-001]</li> <li>Contingency Procedures for Emergency Environmental Incidents [SENEX-QLDS-EN-PRC-024].</li> <li>Senex Spill Response Plan [SENEX-CORP-ER-PLN-006]</li> <li>Senex Hazardous Substances and Dangerous Goods Procedure [SENEX-CORP-HS-PRC-010]</li> <li>Senex Personal Protective Equipment Procedure [SENEX-CORP-HS-PRC- 12].</li> </ul>
Monitoring and Reporting	<ul style="list-style-type: none"> <li>All chemical, oil and fuel storage areas are to be inspected at least weekly for temporary storage, and monthly for permanent storage areas during the operating phase by the Contractor Site Supervisor and/or the Senex Site Supervisor.</li> <li>All spills are to be contained immediately and managed through the Senex Spill Response Plan [SENEX-CORP-ER-PLN-006].</li> <li>Emergency events will be managed in accordance with the contingency procedures in the Atlas Emergency Response Plan [SENEX-QLDS-ER-PLN-001].</li> <li>Incident details must be recorded immediately and notified through the Senex Incident reporting systems, reported and investigated accordingly.</li> </ul>

## 7.6 Cultural Heritage

The following cultural heritage controls will apply within the Project Area.

Category	Controls
Performance Criteria	<ul style="list-style-type: none"> <li>No loss or disturbance of items or areas of cultural value due to Senex activities.</li> <li>No valid complaints related to impacts on cultural heritage from the local community or traditional owners.</li> </ul>
Management Measures	<ul style="list-style-type: none"> <li>Corporate cultural heritage inductions.</li> <li>Cultural heritage clearance is to be undertaken prior to commencing any works other than preliminary walk-over type surveys (for example, ecology surveys and bore baseline assessments) within the Project Area.</li> <li>No works are to be undertaken or access permitted within areas marked as cultural heritage 'no go' areas.</li> <li>The Senex Site Supervisor must be notified immediately if any cultural heritage sites, objects or remains are located. Should this occur, work must cease immediately.</li> </ul>
Relevant Plans and Procedures	Cultural Heritage and Native Title Management Procedure (Queensland) [SENEX-CORP-NT-PRC-002].

Monitoring and Reporting	<ul style="list-style-type: none"> <li>Any incidents including access into cultural heritage no-go zones or damage to any items or areas of cultural heritage value must be reported to the Senex Site Supervisor who in turn will report to the Approvals Manager.</li> <li>Non-compliance and incident reporting will be closed out by management to ensure prompt rectification.</li> </ul>
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## 7.7 Produced Water Management

The following produced water management controls will apply within the Project Area.

Category	Controls
Performance Criteria	<ul style="list-style-type: none"> <li>Contaminants are not directly or indirectly released to water.</li> <li>No accidental or uncontrolled release of water to waterways or drainage lines.</li> <li>No use of produced water on site except in accordance with EA conditions, or approved End of Waste Codes as relevant.</li> </ul>
Management Measures	<ul style="list-style-type: none"> <li>No discharges of water to land or surface waters will occur without authorisation from the Senex Site Supervisor having consulted with the Senex Environment Manager.</li> <li>Produced water<sup>1</sup> may be re-used in drilling and well hole activities.</li> <li>Produced water may be used for dust suppression and construction purposes provided the use: <ul style="list-style-type: none"> <li>does not result in negative impacts on the composition and structure of soil or subsoils;</li> <li>is not directly or indirectly released to waters;</li> <li>does not result in runoff from the construction site; and</li> <li>does not harm vegetation surrounding the construction site.</li> </ul> </li> <li>The use of produced water for dust suppression must: <ul style="list-style-type: none"> <li>not cause on-site ponding or runoff;</li> <li>be directly applied to the area requiring suppression;</li> <li>not harm vegetation surrounding the area being dust suppressed; and</li> <li>not cause visible salting.</li> </ul> </li> </ul> <hr/> <ul style="list-style-type: none"> <li>Produced water may be disposed of for domestic purposes or stock purposes and must meet the irrigation or livestock watering criteria as relevant to those purposes in the <i>Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2018 revision; online resource)</i>. It must be disposed of in accordance with the BUAs where approved by Senex Site Supervisor having consulted with the Senex Environment Manager.</li> <li>Operate water treatment facilities (if required) to meet required treated water quality for intended use.</li> <li>During operations pipeline wastewater (for example, hydrostatic test water and flush water from low point drains), may be released to land provided, if it meets the following water quality parameters: <ul style="list-style-type: none"> <li>electrical conductivity does not exceed 3000 µS/cm;</li> <li>sodium adsorption ratio (SAR) not exceeding 8;</li> <li>pH between 6.0 and 9.0;</li> <li>heavy metals (measured as a total) meets the respective short-term trigger value in section 4.2.6, Table 4.2.10- Heavy metals and metalloids in Australian and New Zealand Guidelines for Fresh and Marine Water Quality; and</li> <li>does not contain biocides.</li> </ul> </li> <li>During operations pipeline wastewater must be released in a way that does not result in visible scouring or erosion or pooling or run-off or vegetation die-off.</li> </ul>

<sup>1</sup> Definitions for all items in bold are provided in Appendix B of the EA.

Category	Controls
	<ul style="list-style-type: none"> <li>• Dams must only be constructed as authorised by the ATW and under the design and conditions specified by the Senex Project Execution and Environment teams.</li> <li>• All dams must be constructed, operated and maintained in accordance with accepted engineering standards; and be designed with a floor and sides made of material that will contain the wetting front and any entrained contaminants within the bounds of the containment system during both its operational life and including any period of decommissioning and rehabilitation.</li> <li>• For regulated structures, the consequence category must be assessed in accordance with the <i>DES Manual for Assessing Consequence Categories and Hydraulic Performance of Structures</i> and the <i>DES Guideline Structures which are dams or levees constructed as part of environmentally relevant activities</i>.</li> <li>• Water production forecast (quality and quantity) shall be determined and reviewed periodically via an appropriate reservoir model.</li> <li>• When no longer required for operations, dams must be decommissioned to no longer accept inflow from the petroleum activities and be either: <ul style="list-style-type: none"> <li>○ rehabilitated; or</li> <li>○ approved by DES and the landholder, as per EA requirements.</li> </ul> </li> </ul>
Relevant Plans and Procedures	<ul style="list-style-type: none"> <li>• <i>DES Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933)</i>.</li> <li>• <i>DES Guideline Structures which are dams or levees constructed as part of Environmentally Relevant Activities' (ESR/2016/1934)</i>.</li> <li>• Register of Regulated Dams maintained for each regulated dam.</li> <li>• Atlas Stage 3 Water Monitoring and Management Plan [SENEX-ATLS-EN-PLN-017].</li> <li>• ATP 2059 Coal Seam Gas Water Management Plan [SENEX-ATLS-EN-PLN-013].</li> <li>• PL 445 and PL 209 Coal Seam Gas Water Management Plan [SENEX-ATLS-EN-PLN-014].</li> <li>• Atlas Stage 3 Gas Project EPBC Water Resource Impact Assessment (Klohn Crippen Berger 2023) (Doc No. DX10171A12).</li> </ul>
Monitoring and Reporting	<ul style="list-style-type: none"> <li>• Visual inspection of areas where produced water is used will be undertaken during and post-application daily to ensure conditions are being met.</li> <li>• Monitoring and inspections including of water levels, water quality and early signs of loss of structural or hydraulic integrity will be undertaken by a suitably qualified and experienced person to ensure conditions are being met.</li> <li>• Dams and regulated structures must be monitored for early signs of loss of structural or hydraulic integrity as specified in the initial hazard assessment.</li> <li>• Monitoring and reporting of groundwater to be undertaken as per the Atlas Stage 3 Water Monitoring and Management Plan [SENEX-ATLS-EN-PLN-017].</li> </ul>

## 7.8 Noise and Vibration

The following noise and vibration controls will apply within the Project Area.

Category	Controls
Performance Criteria	<ul style="list-style-type: none"> <li>• Noise generated by activities do not cause environmental nuisance at any sensitive receptor, per limits specified in the EA.</li> <li>• No noise-related complaints received.</li> </ul>
Management Measures	<ul style="list-style-type: none"> <li>• Potentially impacted sensitive receptors will be identified in the ATW.</li> </ul>

Category	Controls
	<ul style="list-style-type: none"> <li>• Prior to construction and other noisy activities, landholders will be notified of the nature and expected duration of noisy activities.</li> <li>• Construction hours will be in accordance with EA conditions and requirements of the <i>Environmental Protection (Noise) Policy 2019</i> (EPP Noise).</li> <li>• Noise impacts and requirements for noise mitigation will be considered during the engineering design and site planning processes. Noise impacts will be minimised by adopting measures in the EPP Noise hierarchy as appropriate (for example, locating activities at suitable distances from noise sensitive places). Facility specific noise modelling will be undertaken during the design phase, where required.</li> <li>• Noise modelling or assessment will be undertaken for temporary and operational activities to assess expected noise emissions at potential sensitive receptors.</li> <li>• Operators of construction equipment will be made aware of potential noise impacts and will be required to employ techniques and/or equipment to minimise noise emissions where necessary.</li> <li>• Where blasting is required, a blast management plan will be developed in accordance with AS 2187, and EA conditions for blasting operations.</li> </ul>
Relevant Plans and Procedures	<ul style="list-style-type: none"> <li>• Prior to conducting any blasting activities, a blast management plan will be developed in accordance with AS 2187, and EA conditions for blasting operations.</li> <li>• Incident Reporting and Investigation Procedure [SENEX-CORP-HS-PRC-004].</li> </ul>
Monitoring and Reporting	<ul style="list-style-type: none"> <li>• Noise complaints will be recorded in the Senex Stakeholder Management database and appropriate corrective actions taken (commensurate to the magnitude of the impact and non-conformance).</li> <li>• Noise must be measured in accordance with the prescribed standards in the Environmental Protection Regulation 2019.</li> <li>• Noise monitoring during construction activities will be undertaken where required as part of the investigation of noise incidents or complaints. Where required, noise monitoring will be carried out in accordance with EA conditions and provisions of the EPP Noise.</li> <li>• Where noise levels exceed those prescribed in the EA, corrective actions will be defined as part of the incident investigation.</li> <li>• Non-compliance and incident reporting will be closed out by senior management to ensure prompt rectification and change management as required and appropriate.</li> </ul>

## 7.9 Air Quality

The following air quality controls will apply within the Project Area.

Category	Controls
Performance Criteria	<ul style="list-style-type: none"> <li>• No environmental nuisance at any sensitive place (as provided by EA conditions) identified or reported due to dust or other air quality emissions.</li> <li>• At authorised point sources, fuel burning and combustion facilities do not result in releases to air that exceed authorised EA limits.</li> </ul>
Management Measures	<ul style="list-style-type: none"> <li>• Site specific modelling or assessments will be undertaken to assess potential air emissions at the design state for the operating infrastructure to assess air quality at potential sensitive receptors and to meet approval requirements.</li> <li>• An air receiving environment monitoring program (<b>AREMP</b>) will be prepared and implemented in accordance with EA conditions, if required.</li> <li>• Landholders or residents of any adjacent sensitive places will be advised of planned works prior to the commencement of activities.</li> <li>• Staff and contractors will be made aware through general site induction and training of the potential to generate dust emissions and mitigation and</li> </ul>

Category	Controls
	<p>management measures that should be implemented.</p> <ul style="list-style-type: none"> <li>• Vehicles, plant and equipment will be regularly maintained to ensure all machinery is in good working order and does not generate excessive air emissions. Plant and equipment must be operated in their proper and effective condition.</li> <li>• Vehicles will be operated in a fuel-efficient manner and will not be left turned on or idling at the site for longer than required.</li> <li>• Vehicles, plant and machinery must comply with site-specific speed limits to minimise dust generation.</li> <li>• Disturbed areas and access roads will be watered using a water cart/truck on a routine basis to minimise the potential for environmental nuisance due to dust. Watering frequency may be increased (for example, during periods of high risk (prolonged dry periods and under windy conditions), if excessive levels of dust is visible or as reasonably requested by the landholder). Dust suppression using produced water must comply with EA conditions.</li> <li>• Odour complaints shall be recorded in the Senex Stakeholder Management Database and appropriate corrective actions taken (commensurate to the magnitude of the impact).</li> <li>• Fugitive emissions shall be mitigated through appropriate well design and construction that is undertaken in accordance with accepted industry standards.</li> </ul> <p><b>Venting:</b></p> <ul style="list-style-type: none"> <li>• Short duration cold venting during workover operations in lieu of flaring due to land agreements.</li> </ul>
Relevant Plans and Procedures	<ul style="list-style-type: none"> <li>• Health, Safety and Environmental Management System [SENEX-CORP-HS-STD- 001]</li> <li>• Incident Reporting and Investigation Procedure [SENEX-CORP-HS-PRC-004]</li> <li>• An AREMP will be prepared and implemented as required.</li> </ul>
Monitoring and Reporting	<ul style="list-style-type: none"> <li>• In accordance with AREMP.</li> <li>• In the event of an environmental nuisance complaint, an incident report will be raised in accordance with the Senex Incident Reporting and Investigation Procedure and investigated. Where undertaken, dust/air quality must be monitored in accordance with EA requirements.</li> <li>• Any complaints relating to air quality including environmental nuisance will be recorded and actioned in a timely manner through the Senex Stakeholder Management database.</li> </ul>

## 7.10 Waste Management

The following waste management controls will apply within the Project Area.

Category	Controls
Performance Criteria	<ul style="list-style-type: none"> <li>• No contaminants are directly or indirectly released to land.</li> <li>• Waste is managed at all Senex sites in accordance with the waste and resource management hierarchy and the waste and resource management principles under the EP Regulation and the WRR Act.</li> </ul>
Management Measures	<ul style="list-style-type: none"> <li>• Waste is appropriately managed to avoid or minimise the potential for: <ul style="list-style-type: none"> <li>• Release of hazardous waste to land or waters either through inappropriate waste disposal or accidental release;</li> <li>• Inadequate waste management leading to inappropriate disposal or inadequate re-use and recycling; or</li> <li>• Impacts to the environment, land use or well-being of people resulting from inappropriate storage, handling or disposal of waste.</li> </ul> </li> <li>• All waste generated in construction, operations and decommissioning must</li> </ul>



Category	Controls
	<p>be stored, handled and transported in accordance with the waste and resource management hierarchy, waste and resource management principles, appropriate standards and regulatory requirements as outlined in the Senex Waste Management Procedure – Qld Operations [SENEX-QLDS-EN-PRC-022].</p> <ul style="list-style-type: none"> <li>• The SDS for materials will be referenced to assist with the appropriate identification for handling and disposal of waste material.</li> <li>• All wastes must be transported in covered or sealed containers to prevent the loss of waste materials during transport.</li> <li>• All sites will be kept free from litter.</li> <li>• Items of general waste are not to be disposed of in sump or pits.</li> <li>• Waste material (including domestic waste) must be collected and stored in covered bins to prevent loss and scavenging by animals.</li> <li>• Recyclable materials will be segregated (for example, glass and cans, scrap metals, used chemical and fuel drums and timber pallets) in designated containers for recycling.</li> <li>• All wastes regulated wastes are to be transported offsite by a licensed contractor to a suitably licensed facility for reuse, recycling or disposed unless authorised under the EA as being able to be disposed of on-site.</li> <li>• All waste materials must be removed from site once activities are completed.</li> <li>• Green waste may be used on site for both rehabilitation and sediment and erosion control.</li> <li>• Only licensed waste contractors may collect, transport and dispose of regulated waste from the site.</li> </ul> <p><b>Drilling Material</b></p> <ul style="list-style-type: none"> <li>• All drilling and exploration waste fluids and muds must be contained in an appropriately constructed containment structure for disposal, remediation or re-use where possible.</li> <li>• If sumps are to be used to store residual drilling material or drilling fluids, they must be decommissioned (no longer used) following the completion of drilling activities.</li> <li>• Adequate freeboard must be maintained on the sump at all times to prevent overflow during storage for the duration of drilling activities.</li> <li>• Where drilling muds are removed from site they must be disposed of to a licensed facility or authorised EA process.</li> <li>• Waste fluids<sup>2</sup>, (other than residual drilling material or drilling fluids stored in sumps) must be contained in either above ground containers or a dam.</li> <li>• Produced water may be re-used for drilling and well-hole activities or where approved, re-used under a BUA or End of Waste Code. Any proposed re-use must first be confirmed with the Senex Environment Team.</li> </ul> <p><b>Residual Drilling Material</b></p> <ul style="list-style-type: none"> <li>• Residual drilling material must be stored in sumps for the duration of drilling, after which it must be removed from site for disposal. The exception to this is where drilling material meets approved quality criteria and can be disposed of using the mix-bury-cover method as approved by Senex Environment Team; or the drilling material is approved by the Senex Environment Team as being of acceptable quality for disposal to land.</li> </ul> <p><b>Sewage from Mobile or Temporary Facilities</b></p> <ul style="list-style-type: none"> <li>• Treated sewage effluent or greywater can be released to land in accordance with EA conditions. Any proposed release to land must be confirmed with the Senex Environment Team.</li> <li>• Treated sewage effluent or greywater must meet or exceed secondary treated Class B standards for a treatment system between 150 and 1500 EPs equivalent persons.</li> </ul>

<sup>2</sup> Definitions for all items in bold are provided in Appendix A of the EA.

Category	Controls
	<ul style="list-style-type: none"> <li>• Treated sewage effluent or greywater must meet or exceed secondary treated Class C standards for a treatment system &lt;150 equivalent persons.</li> <li>• Release of treated sewage effluent of greywater must be: <ul style="list-style-type: none"> <li>• to a designated (fenced and signed) area;</li> <li>• not result in pooling or run-off or aerosols or spray drift or vegetation die- off; and</li> <li>• the contaminated release area must be kept vegetated with groundcover (not weeds).</li> </ul> </li> <li>• Waste gases, predominantly methane but also carbon dioxide, are expected to be generated at each well head. Cold venting will occur during some activities while the well is being worked over underbalanced during service activities. These will be of short duration.</li> </ul>
Relevant Plans and Procedures	<ul style="list-style-type: none"> <li>• Senex Waste Management Procedure – Qld Operations [SENEX-QLDS-EN-PRC-022].</li> <li>• Waste Tracking Procedure [SENEX-QLDS-EN-PRC-006].</li> <li>• Atlas Stage 3 Gas Project Chemical Risk Assessment Report (KCB 2023).</li> </ul>
Monitoring and Reporting	<ul style="list-style-type: none"> <li>• Records will be maintained for all waste removed from the site, including waste type and volume or weight as outlined in the Waste Tracking Procedure.</li> <li>• Waste tracking documentation will be maintained by the Contractors Supervisor and provided to the Senex Site Supervisor for all trackable waste removed from site.</li> <li>• All waste records will be provided to the Senex Environment Manager by the Senex Site Supervisor on a monthly basis or upon request.</li> </ul>

### 7.11 Land Disturbance and Flora Management

The following land disturbance and flora management controls will apply within the Project Area. The controls applicable to EPBC Act listed threatened species and communities are further detailed in the Atlas Stage 3 Gas Project Significant Species Management Plan (ERM, 2023).

Category	Controls
Performance Criteria	<ul style="list-style-type: none"> <li>• No land disturbance or vegetation clearing is undertaken without appropriate authorisation and approval.</li> <li>• Clearing of vegetation and protected plants is in accordance with relevant permits or exemptions issued under the <i>Nature Conservation Act 1992</i>, MNES as required by the EPBC Act and relevant EA conditions.</li> </ul>
Management Measures	<ul style="list-style-type: none"> <li>• During project planning, the Constraints Protocol will be used to avoid and minimise disturbance to biodiversity values.</li> <li>• Clearing of native vegetation must be minimised to that necessary for construction and operational activities in line with the Constraints Protocol and EA approval conditions.</li> <li>• Within Environmentally Sensitive Areas (<b>ESA</b>), infrastructure must be preferentially located in areas of non-remnant vegetation, and, water storage facilities will be preferentially located more than 300 m from a Category B ESA and 200 m from a Category C ESA.</li> <li>• No more than 12 months prior to undertaking activities that result in significant disturbance to land, an ecological survey must be undertaken by a suitably qualified person.</li> <li>• Vegetation must not be cleared unless authorised under a Senex ATW. The ATW must be approved prior to any vegetation clearance or disturbance occurring.</li> <li>• Positive visual markings or pegs are to be used to identify the extent of any vegetation to be removed.</li> <li>• Any sensitive areas, such as ESAs or threatened plants/communities</li> </ul>

Category	Controls
	<p>adjacent to the work area should be communicated via toolboxes to project staff and contractors.</p> <ul style="list-style-type: none"> <li>• ‘No-go’ areas will be GPS located and clearly marked (for example, with bunting and/or flagging tape). No-go areas will be prohibited to enter for construction staff and contractors and will only be accessed by authorised persons for relevant activities.</li> <li>• Measures to minimise stormwater entering significantly disturbed land must be implemented and maintained.</li> <li>• Sediment and erosion control measures to prevent soil loss and deposition beyond significantly disturbed land will be implemented and maintained.</li> <li>• Where the clearing of mature, hollow-bearing trees is unavoidable due to safety or cultural heritage constraints, it will be managed as per the Atlas Stage 3 Gas Project Significant Species Management Plan</li> <li>• Cleared vegetation/green waste that cannot be used on-site for rehabilitation and/or sediment erosion control will be stockpiled to facilitate re-spreading or salvaging.</li> <li>• Vehicles or equipment are to remain within authorised work zones, particularly during vegetation clearing activities to prevent unnecessary land and vegetation disturbance.</li> </ul>
Relevant Plans and Procedures	<ul style="list-style-type: none"> <li>• Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [OPS-ATLS-EN-PLN-001].</li> <li>• Rehabilitation Plan Atlas Stage 3 Gas Project [SENEX-ATLS-EN-PLN-018].</li> <li>• Queensland Erosion and Sediment Control Procedure [SENEX-QLDS-EN-PLN-003].</li> <li>• Atlas Stage 3 Gas Project Significant Species Management Plan (ERM 2023).</li> <li>• Site Environmental Instructions issued for each phase of the project.</li> </ul>
Monitoring and Reporting	<ul style="list-style-type: none"> <li>• Each site will be ground-truthed and the extent and biodiversity value recorded (including GIS coordinates of the area) during pre-clearance surveys by a suitably qualified ecologist.</li> <li>• This data will be retained on Senex record management and GIS systems.</li> <li>• Vegetation clearance works will be supervised by the Senex Site Supervisor or designated representative.</li> <li>• Coordinates of areas cleared of vegetation and/or where ground disturbance takes place will be recorded in GIS format by the Construction Site Supervisor and provided to the Senex Site Supervisor and managed by the GIS team.</li> </ul>

## 7.12 Fauna and Stock Management

The following fauna and stock management controls will apply within the Project Area. The controls applicable to EPBC Act listed threatened species and communities are further detailed in the Atlas Stage 3 Gas Project Significant Species Management Plan (ERM, 2023).

Category	Controls
Performance Criteria	<ul style="list-style-type: none"> <li>• Impacts to fauna habitat minimised in accordance with approved management plans.</li> <li>• No injury, entrapment or death of wildlife or domestic stock, as a result of Senex’s activities.</li> </ul>
Management Measures	<ul style="list-style-type: none"> <li>• Active work areas, pits, sumps and other areas hazardous to fauna and stock must be fenced or covered to prevent access.</li> <li>• Clearing of mature or hollow bearing trees will be avoided or otherwise undertaken in accordance with relevant Construction Environmental Management Plan.</li> <li>• Measures to prevent fauna entrapment and facilitate escape must be implemented during construction for example, open excavations.</li> </ul>

Category	Controls
	<ul style="list-style-type: none"> <li>Excavations and trenches must be inspected for trapped fauna on a daily basis.</li> <li>A qualified fauna spotter-catcher will conduct a search on the day of clearing woody vegetation or disturbing log piles for the presence of fauna species. Where fauna is detected, the spotter catcher will assess and implement the most appropriate method to avoid or minimise impacts on that fauna as a result of clearing.</li> <li>Stockpiled timber, where left for more than 24 hours, will be inspected for fauna prior to mulching.</li> <li>Natural vegetation along creeks and rivers shall not be disturbed unless authorised under an ATW and only at the location specified.</li> <li>Where activities may impose barriers to the movement of fauna for extended period of time, reasonable measures will be implemented to facilitate fauna movement around or through active work areas, such as breaks in stockpiled cleared vegetation at least every 50m.</li> <li>Any waterway barrier works (works that pose a barrier to water flow and fish movement) must only be undertaken where authorised under an ATW and only at the location indicated on the Site Environmental Instruction.</li> <li>Any restrictions placed on stock movements in the vicinity of work areas will be agreed with landholders and identified in the ATW so that any disruption is minimised.</li> </ul>
Relevant Plans and Procedures	<ul style="list-style-type: none"> <li>Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [OPS-ATLS-EN-PLN-001].</li> <li>Atlas Stage 3 Gas Project Significant Species Management Plan (ERM 2023).</li> <li>Rehabilitation Plan Atlas Stage 3 Gas Project [SENEX-ATLS-EN-PLN-018].</li> <li>Queensland Fauna and Stock Management Procedure [SENEX-CORP-EN-PRC-021].</li> <li>Incident Reporting and Investigation Procedure [SENEX-CORP-HS-PRC-004].</li> <li>Site Environmental Instructions issued for each phase of the project.</li> </ul>
Monitoring and Reporting	<ul style="list-style-type: none"> <li>Fauna and stock deaths must be immediately communicated to the Contractor Site Supervisor or Senex Site Supervisor as appropriate and then the Senex Environment Manager/ Senex Land Manager-Queensland</li> <li>Fauna spotter-catcher update on interactions and reporting must be provided as indicated to the Senex Site Supervisor then to the Senex Environment Manager.</li> <li>Reports on fauna interactions are to be provided to regulatory authorities as indicated.</li> </ul>

### 7.13 Watercourse and Wetlands

The following watercourse and wetlands controls will apply within the Project Area.

Category	Controls
Performance Criteria	<ul style="list-style-type: none"> <li>Water quality during construction and maintenance does not exceed authorised release limits.</li> <li>The construction or maintenance of linear infrastructure in proximity to a wetland or watercourse are compliant with the relevant EA conditions.</li> </ul>
Management Measures	<ul style="list-style-type: none"> <li>Petroleum activities within any wetland area or watercourse must be carried out in accordance with an approved ATW. Watercourse crossings will be limited to those strictly necessary for construction or operation of infrastructure and only at locations approved in the ATW.</li> <li>Petroleum activities, including exploration activities will be sited using the Constraints Protocol [SENEX-OPS-ATLS-EN-PLN-001] which includes watercourse and wetland constraints.</li> </ul>

Category	Controls
	<ul style="list-style-type: none"> <li>• Construction and maintenance of linear infrastructure must be conducted in accordance with the following preference: when no water is present, in times of no flow, in times of flow but in a way that does not impede low flow.</li> <li>• Construction and maintenance of infrastructure resulting in a significant disturbance to a wetland or watercourse must be undertaken by a suitably qualified person in accordance with the guideline Activities in a watercourse, lake or spring associated with a resource activity or mining operations.</li> <li>• Any waterway barrier works (works that pose a barrier to water flow) must only be undertaken where authorised under an ATW and only at the location specified.</li> <li>• Measures to minimise stormwater entering significantly disturbed land must be implemented and maintained.</li> <li>• Sediment and erosion control measures to prevent soil loss and deposition beyond significantly disturbed land will be implemented and maintained.</li> <li>• Watercourse crossing points will be adequately stabilised to prevent erosion.</li> <li>• Positive visual markings or pegs are to be used to identify the extent of any vegetation to be removed.</li> <li>• ‘No-go’ areas will be GPS located and clearly marked (for example, with bunting and/or flagging tape).</li> <li>• Construction activities must be managed to minimise interference with overland flow paths.</li> <li>• Clean stormwater will be diverted around construction works or passed through construction works in a controlled manner.</li> <li>• For linear Infrastructure (for example, pipelines) – construction or maintenance activities in wetlands or a watercourse must only be carried out under the authorization of an ATW and under the supervision of a Senex environment representative to ensure conditions of the EA are achieved.</li> </ul>
Relevant Plans and Procedures	<ul style="list-style-type: none"> <li>• Site Environmental Instructions issued for each phase of the project.</li> <li>• Queensland Erosion and Sediment Control Plan [SENEX-QLDS-EN-PRC-003].</li> <li>• ATW for the specific scope of work.</li> <li>• Atlas Stage 3 Water Monitoring and Management Plan [SENEX-ATLS-EN-PLN-017].</li> <li>• ATP 2059 Coal Seam Gas Water Management Plan [SENEX-ATLS-EN-PLN-013].</li> <li>• PL 445 and PL 209 Coal Seam Gas Water Management Plan [SENEX-ATLS-EN-PLN-014].</li> <li>• Atlas Stage 3 Gas Project EPBC Water Resource Impact Assessment (Klohn Crippen Berger 2023) (Doc No. DX10171A12).</li> </ul>
Monitoring and Reporting	<ul style="list-style-type: none"> <li>• Records of all erosion and sediment control and water quality checks will be maintained by the Senex Site Supervisor and provided weekly during period of activity in the wet season and monthly at other times to the Senex Environment Manager.</li> <li>• Watercourse crossings must be monitored for erosion and sedimentation during construction, with at least weekly inspections during dry conditions, and daily inspections during rainfall of &gt;50 mm in one day or &gt;100 mm over 4 days or as soon as watercourse access is re-established after flooding.</li> <li>• Senex will undertake inspections and monitoring associated with the water storage dams and tanks to assess integrity of the structures and monitor any potential impacts to waters.</li> <li>• Construction or maintenance works on linear infrastructure in wetlands or watercourses must be monitored by a Senex Environment representative to ensure compliance with the EA conditions.</li> </ul>

Category	Controls	
	Table 1: Release limits for construction or maintenance of linear infrastructure	
	<b>Water Quality Parameters</b>	<b>Units</b>
	<b>Assessment procedure</b>	
	Turbidity	Nephelometric Turbidity Units (NTU)
		<p>For a wetland of other environmental value, if background water turbidity is above 45 NTU, no greater than 25% above background water turbidity measured within a 50m radius of the construction or maintenance activity.</p> <p>For a watercourse, if background water turbidity is above 45 NTU, no greater than 25% above background water turbidity measured within 50m downstream of the construction or maintenance activity.</p> <p>For a wetland of other environmental value, if background water turbidity is equal to, or below 45 NTU, a turbidity limit of no greater than 55 NTU applies, measured within a 50m radius of the construction or maintenance activity.</p> <p>For a watercourse, if background water turbidity is equal to, or below 45 NTU, a turbidity limit of no greater than 55 NTU applies, measured within 50m downstream of the construction or maintenance activity.</p>
	Hydrocarbons	
		For a wetland of other environmental value, or watercourse, no visible sheen or slick.

## 7.14 Soil and Erosion Management

The following soil and erosion management controls will apply within the Project Area.

Category	Controls
Performance Criteria	<ul style="list-style-type: none"> <li>Compliance with the Queensland Erosion and Sediment Control Procedure [SENEX-QLDS-EN-PRC-003] and any contractor erosion and sediment control plans.</li> <li>No notifiable incidents relating to sediment releases from site.</li> <li>Mass movement, gully erosion and tunnel erosion do not occur.</li> <li>Topsoil managed in accordance with management measures.</li> </ul>
Management Measures	<ul style="list-style-type: none"> <li>Works on site will not commence until any relevant Contractor erosion and sediment control plans have been approved by the Senex Site Supervisor and been installed on significantly disturbed land.</li> <li>Measures to minimise stormwater entering significantly disturbed land must be implemented and maintained.</li> <li>Sediment and erosion control measures to prevent soil loss and deposition beyond significantly disturbed land will be implemented and maintained.</li> <li>Sediment and erosion control must be managed in accordance with the Senex Queensland Erosion and Sediment Procedure [SENEX-QLDS-EN-PRC-003] and the Contractor's erosion and sediment control plans (ESCP).</li> <li>Erosion and sediment control structures must be inspected periodically and after rain events and maintenance carried out where indicated.</li> <li>All contaminated soils will be managed and remediated in accordance with EP Act requirements.</li> <li>Where soil is moved to the site, a weed declaration will be provided.</li> <li>Divert clean water around work sites during construction or ensure stormwater passes through the site in a controlled manner and at non-erosive flow velocities.</li> <li>Complete transitional rehabilitation (stabilisation) such that the duration that disturbed soils are exposed to the erosive forces of wind rain and flowing water is less than 6 months for pipelines and less than 12 months for other significantly disturbed areas no longer required for on-going operational phase petroleum activities.</li> </ul>



Category	Controls
	<ul style="list-style-type: none"> <li>• Implement erosion and sediment control measures to all work-related disturbances.</li> <li>• Minimise negative impacts to land or properties adjacent to the activities (including roads) by implementing ESCP for construction areas.</li> <li>• Be periodically inspected at worksites, before expected rainfall events, and after rain events and maintenance undertaken where indicated as per the Queensland Erosion and Sediment Control Procedure [SENEX-QLDS-EN-PRC-003].</li> </ul> <p><b>Topsoil</b></p> <ul style="list-style-type: none"> <li>• Soil stripping (where necessary) will not be undertaken in periods of high wind, rainfall or within the immediate period after rainfall to help avoid soil degradation.</li> <li>• Topsoil (approx. upper 100 to 200 mm depending on soil type), which contains the bulk of the natural seed bank and organic matter will be stockpiled separately from subsoil.</li> <li>• Topsoil is to be stockpiled in mounds no greater than 2 m high.</li> <li>• Topsoil will not be mixed with subsoil either during stockpiling or during re-placement on disturbed areas.</li> <li>• Topsoil stockpiles will be located away from watercourses, natural drainage and flow lines to minimise erosion and waterway sedimentation.</li> <li>• Erosion and sediment controls are to be established around topsoil stockpiles to minimise the loss of soil during rain and slumping events. Stockpiles and sediment controls are to be routinely checked.</li> <li>• Once construction activities are complete, soil horizons will be reinstated in the order in which they were excavated.</li> </ul>
Relevant Plans and Procedures	<ul style="list-style-type: none"> <li>• Queensland Erosion and Sediment Control Procedure [SENEX-QLDS-EN-PRC-003].</li> <li>• Contractor Erosion and Sediment Control Plans for sites.</li> <li>• Site Environmental Instructions issued for each phase of the project.</li> </ul>
Monitoring and Reporting	<ul style="list-style-type: none"> <li>• Regular inspections to monitor for potential erosion and sedimentation during construction works will be undertaken. These inspections will include at least weekly inspections during dry conditions, and daily inspections during rainfall of &gt;50 mm in one day or &gt;100 mm over 4 days or as soon as site access is re-established.</li> <li>• Records of all erosion and sediment control and water quality monitoring will be maintained by the Senex Site Supervisor and provided weekly during period of activity in the wet season and monthly at other times to the Senex Environment Manager.</li> </ul>

## 8 Environmental Incident and Notification

### 8.1 Emergency and Incident Response

The following emergency and incident response controls will apply within the Project Area.

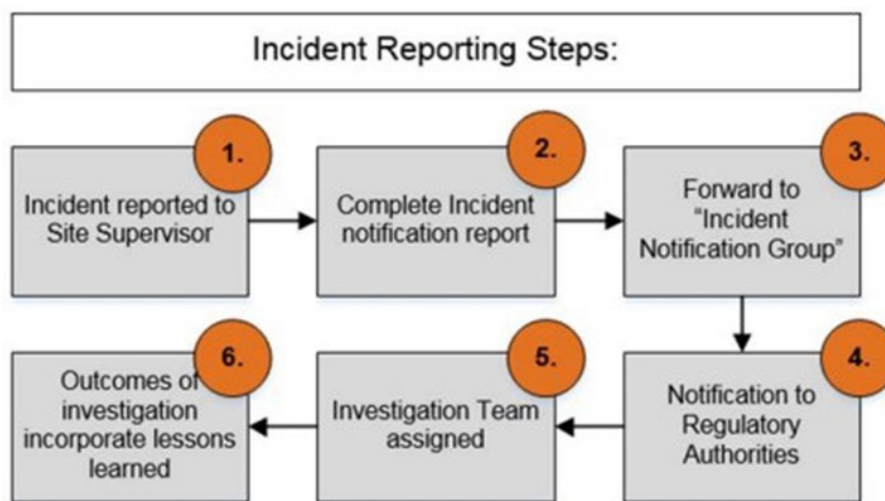
Category	Controls
Performance Criteria	<ul style="list-style-type: none"> <li>All emergencies on site managed in accordance with the project Emergency Response Plan.</li> <li>All incidents are reported, notified and investigated in accordance with the HSE management system and Senex Incident Reporting and Investigation Procedures [SENEX-CORP-HS-PRC-004].</li> <li>All spills are managed in accordance with the Senex Spill Response Plan [SENEX-CORP-ER-PLN-006].</li> </ul>
Management Measures	<ul style="list-style-type: none"> <li>Personnel who observe an environmental incident including a spill must immediately notify the Contractor Site Supervisor who will then notify the Senex Site Supervisor.</li> <li>In the event of a chemical, oil or fuel spill, the spill will be contained and cleaned up as outlined in the Senex Spill Response Plan [SENEX-CORP-ER-PLN-006].</li> <li>Contractors must have in place procedures for spill response which are in accordance with the Senex Spill Response Plan [SENEX-CORP-ER-PLN-006] and will include details requirements for: <ul style="list-style-type: none"> <li>minimising release;</li> <li>containing spilled material;</li> <li>raising the alarm and response;</li> <li>locations of spill kits; and</li> <li>management of contaminated material if necessary.</li> </ul> </li> <li>Any spills will be assessed by the Senex Site Supervisor supported by the Senex Environment Manager as required to determine appropriate remediation options such as the removal of contaminated material.</li> <li>Incident reports must contain information required by the HSE Management System and Incident Reporting and Investigation Procedure [SENEX-CORP-HS-PRC-004].</li> <li>Emergency Response drills will be performed to ensure readiness and identify opportunities for improvement.</li> </ul>
Relevant Plans and Procedures	<ul style="list-style-type: none"> <li>HSE Management System [SENEX-CORP-HS-STD-001].</li> <li>Contingency Procedures for Emergency Environmental Incidents [SENEX-QLDS-EN-PRC-024].</li> <li>Senex Spill Response Plan [SENEX-CORP-ER-PLN-006].</li> <li>Senex Incident Reporting and Investigation Procedure [SENEX-CORP-HS-PRC-004].</li> </ul>
Monitoring and Reporting	<ul style="list-style-type: none"> <li>Refer to Section 8.2 for reporting and notification requirements for environmental incidents.</li> <li>Regular inspection of spill response kits and general emergency preparedness.</li> </ul>

## 8.2 Environmental Incident Notification

Senex requires that all incidents including spills are reported and fully investigated in accordance with their specific level of potential risk. The Senex Incident Reporting and Investigation Procedure [SENEX-CORP-HS-PRC-004] defines the process for the investigation and reporting of incidents and ensures that Senex meets all regulatory notification requirements. Senex's Spill Response Plan [SENEX-CORP-ER-PLN-006] provides the standard protocols that must be used to respond in an appropriate and timely manner in the event of a spill. The procedure details the following steps:

- Prevention – take actions to reduce or eliminate the likelihood of effects of an incident.
- Preparedness – take steps before an incident to ensure effective response and recovery.
- Response – contain, control or minimise the impacts of an incident.
- Recovery – take steps to minimise disruption and recovery times.

Figure 3: Incident Reporting Steps



Activities that have caused or are likely to cause environmental nuisance or environmental harm under the EP Act must be notified to DES. Additionally, the EA requires the following notification process to be complied with in the event of an incident.

Events that must be notified under the EA conditions include:

- A person carries out activities or becomes aware of an act of another person arising from or connected to those activities which causes or threatens serious or material environmental harm;
- The activity negatively affects (or is reasonably likely to negatively affect) the water quality of an aquifer;
- The activity has caused the unauthorised connection of 2 or more aquifers; and
- Activation of the contingency procedures<sup>3</sup> (within 5 business days of activation).

All notification of environmental incidents or events will be reported in accordance with the process in the Senex Regulatory Reporting Requirements [SENEX-CORP-ER-CHA-002].

<sup>3</sup> Contingency measures must be prepared prior to petroleum activities commencing under Schedule B of the EA.  
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## 9 Rehabilitation

### 9.1 Well Pads

The timing and works undertaken as part of rehabilitation activities will be dependent on the activity type and operational stage of the project and governed by EA requirements. Some project activities such as drilling are temporary in nature, enabling transitional rehabilitation (also called progressive rehabilitation) to be undertaken once the disturbance area is no longer required for operational activities. Other infrastructure and disturbance is longer-term requiring decommissioning and rehabilitation at the end of project life.

Significantly disturbed areas that are no longer required for ongoing petroleum activities will be rehabilitated within 12 months and be maintained to meet the relevant EA conditions and Senex acceptance criteria.

All infrastructure constructed by Senex will be removed from site except where it is to remain with the written agreement of the landholder. All decommissioning and rehabilitation activities will be undertaken in accordance with Senex acceptance criteria and EA conditions.

Specific rehabilitation requirements are outlined in the Rehabilitation Plan Atlas Stage 3 Gas Project [SENEX-ATLS-EN-PLN-018].

When no longer required for appraisal or production purposes, a well is 'plugged and abandoned'; a process that involves decommissioning the well and rehabilitating the site. This involves isolating the groundwater aquifers within the well using cement plugs as the sealing medium. The final cement plug is brought to surface and the wellhead is cut off approximately 1.5 m below the surface, capped with a metal identification plate and buried. The land is then rehabilitated to its pre-disturbed state or as agreed with the landholder. These works are undertaken in accordance with the P&G Act requirements and the *Code of Practice for constructing and abandoning coal seam gas wells and associated bores in Queensland – Department of Natural Resources and Mines (Queensland): Edition 2.0, October 2013*.

After completing primary drilling of the well, but usually before the completion rig is mobilised, drilling fluids and muds in sumps will be disposed of in accordance with EA conditions. Waste fluids and muds will be either removed from the Atlas area for disposal at a licensed facility or disposed of using mix-bury-cover or other method of disposing to land that is certified as not causing environmental harm.

The disturbance area associated with well construction is then reduced through transitional rehabilitation after well completion to a hardstand area of approximately 0.36 ha. This is maintained for the operational life of the well. Transitional rehabilitation of well lease pads generally involves ripping any compacted areas, partial respreading of topsoil and direct seeding with species that will provide an appropriate level of groundcover and that are suitable considering the intended post-disturbance land use.

Once the well lease pad is no longer required for ongoing petroleum activities, final rehabilitation will be undertaken as follows:

- Decommissioning/removing the well head, pumps and other infrastructure;
- Cut and fill batters profiled to re-contour the land surface and drainage lines;
- Compacted hardstand areas are ripped;
- Stockpiled topsoil is respread; and
- Topsoil is seeded with pasture grasses, or native species depending on the final land use.

### 9.2 Drilling Sumps

Drilling muds vary in profile and composition, depending on the depth, rock type, and drilling speed, however, drilling muds generally consist of water, clay materials, and some trace chemical additives (for example, salts), and do not contain oil-based or synthetic compounds.

When used, drilling mud sumps are decommissioned once drilling activities have ceased. Where possible, drilling materials should be re-used or recycled. Drilling activities should be planned in a manner that allows maximum re-use of drilling materials, whenever possible. Clean drilling materials that do not contain harmful contaminants are permitted to be disposed of on-site by using the mix-bury-cover method (in accordance with approved quality criteria).

Drilling materials that do not meet the quality acceptance criteria should be removed for appropriate disposal by a licensed waste contractor.

### **9.3 Gas and Water Gathering Pipelines**

Pipeline trenches will be backfilled and topsoil reinstated within three months after pipe laying. During backfilling of pipeline trenches, soils will be replaced so that the topsoil and subsoil are consistent with the immediately surrounding area, this will allow for natural regeneration. Following soil replacement, areas will be revegetated. Areas required for operational purposes (that is, access tracks and areas above pipelines) should be revegetated with pasture grasses, or native grasses and ground cover species depending on the final land use. Remaining areas no longer required for operational activities or maintenance will be rehabilitated to the post-disturbance land use.

Final rehabilitation of the gas and water gathering lines will occur after decommissioning of all pipelines. Where it is practical and safe to do so, the pipelines will be abandoned and left in-situ in accordance with the *APGA Code of Practice- Upstream Polyethylene Gathering Networks- CSG Industry, and Australia Standard (AS) 2885 section 10.6 and section 8 of the Australian Pipeline Industry Association Code of Environmental Practice*. The pipelines will be left in-situ to avoid disturbing the re-established vegetation through excavation and removal. The overall objective is to leave the ROW in a condition that is as near as practical to pre-existing environmental conditions. If the pipelines are to be abandoned and left in-situ, an abandonment plan will be developed in accordance with *APGA Code of Practice – Upstream Polyethylene Gathering Networks – CSG Industry*. When abandoning in-situ, the pipeline section shall be abandoned in such a way to ensure that ground subsidence and the risk of contamination of the soil or groundwater is minimised.

The pipelines are to be disconnected from all sources of hydrocarbons that may be present in other pipelines, processing plant, meter stations, control lines and other appurtenances, and shall be purged of all hydrocarbons and vapour with a non-flammable fluid and then capped. Disposal of the purging fluid shall meet all relevant environmental and safety requirements. The pipeline will be decommissioned in a manner that minimises potential impacts to the environment, land use and third parties and guidance should be taken from AS 2885. All above ground pipes and supports along the pipeline should be cut-off at a minimum depth of 750mm below the natural surface, or at pipeline depth as determined by AS 2885.3. These pipes should be removed and capped off below the surface. All above ground signs and markers above the pipeline should be removed.

When it's either unsafe or not practical, decommissioning will be undertaken via removal, and the removal methods should be considered similar to those for pipeline construction and shall comply with the relevant requirements of AS 2885.1.

After decommissioning of the pipeline compacted hardstands, access tracks and stockpile areas should be ripped to aid binding of the soil layers, increase water retention, helping water infiltrate into the soil, and thus increase seed germination success. Seeding will be undertaken on the remaining areas with an appropriate seed mix, depending on the post-disturbance land use to be achieved.

### **9.4 Access Tracks**

Temporary access tracks no longer required for ongoing operational activities or not to be retained by the landholder will be closed and reinstated to a condition compatible with the surrounding land use. This will generally involve ripping to remove compaction, re-spreading stockpiled topsoil and revegetating.

Landholder tracks in existence prior to construction will have access re-instated and will not be blocked in anyway. Where tracks are to be retained by landholders, any wheel ruts should be graded and erosion-control measures such as diversion drains installed to an agreed condition.

### **9.5 Waterway Crossings**

Waterway crossings will be rehabilitated by re-contouring disturbed areas to match the surrounding once petroleum activities in the location have ceased. The surface will usually be lightly scarified before spreading the topsoil, to promote vegetation re-growth and protect against the topsoil loss. Temporary waterway barriers will be removed and reseeding undertaken to minimise erosion and promote regeneration of riparian vegetation.

## 9.6 Infrastructure, Camps, Laydown, Hardstand and Stockpile Areas

Rehabilitation will be undertaken when the area for infrastructure, laydowns, hardstands or stockpile areas is no longer required for operational activities. Once infrastructure is removed or transported off site, gravel is generally removed from the hardstand and any areas of contamination remediated or excavated for disposal at an off-site licensed facility. Compacted areas will be ripped and the area seeded with a species mix determined by the post-disturbance land use.

## 9.7 Dams/Tanks

Produced water will be managed using holding dams and brine storage dams. Prior to decommissioning, landholders will be given the option to retain the dams for their own water storage purposes. Any residue in the dam must be quantified and tested to demonstrate that it is safe and fit the intended use of the dam.

Where brine storage dams are to be decommissioned, any saline residue or salt resulting from reverse osmosis will be stored in a tank for off-site disposal to an appropriately licensed facility. Holding dams will have all water removed (preferably through beneficial use options). Once any liquid is removed, dams will be rehabilitated to remove any source of potential contaminants and the land returned to a useable form. The process for decommissioning and rehabilitation the produced water holding and brine storage dams generally involve the following:

- Remove and recycle or dispose of synthetic liners;
- Assess any land contamination that may have occurred. In the case where some leakage of the liner system has occurred a contaminated land assessment should be undertaken as per the current National Environment Protection (Site Assessment) Measure;
- Remediate soils through removal to a soil remediation area or in-situ treatment of contaminated soils where required or dispose of the contaminated soils to an off-site licensed facility;
- Retain clay materials where clay has been used as part of the containment system for reuse if reasonably practicable;
- Rehabilitate the site by pushing in dam embankments and filling in depressions to re- contour landforms to match surrounding topography;
- Any retained subsoil could be used to infill dams and topsoil can be respread; and
- Revegetate the area by direct seeding with appropriate species based on post- disturbance landform.



## 10 Environmental Monitoring and Auditing

Monitoring, auditing of, and reporting on, contractor and Senex on-site activities provides a direct measure of Senex's compliance with environmental regulations and EA conditions, together with an indication of the effectiveness of the HSEMS, EMP and supporting procedures and plans.

Environmental inspection, monitoring and auditing will be undertaken by the Senex Site Supervisor and Senex Environmental representative on a periodic basis to assess whether activities are in compliance with the requirements of these systems and documents.

### 10.1 Complaints and Grievances

Complaints and grievances will be recorded and responses (actions) tracked. Records of complaints will be kept and must include the date, complainant's details, source, reason for the complaint, description of investigation and actions undertaken in resolving the complaint.

Depending on the nature of the complaint or grievance the responsibility and associated timeframes for addressing and closing out the complaint or grievance will be assigned to the relevant Senex personnel. Any investigations required to be carried out will be undertaken with input from relevant personnel. Results of any investigation including proposed mitigation or management measures will be recorded and the complainant informed of how Senex either proposes to, or has, resolved the issue.

### 10.2 Monitoring

All monitoring must be undertaken by a suitably qualified person who has professional qualifications, training or skills or experience relevant to the monitored subject matter as defined in the approval conditions.

Monitoring to be undertaken on the project area includes the following:

- Monitoring implementation of the EMP and supporting procedures and plans by the Senex Site Supervisor or the Senex Environmental representative as appropriate;
- Regular inspection of construction and operational activities by the Senex Site Supervisor or the Senex Environmental representative as appropriate;
- Environmental monitoring of over time for weed infestations with reference to the Atlas Biosecurity Management Plan [SENEX-QLDS-EN-PLN-001] and rehabilitation progress (for example, photo-monitoring and audits);
- Reporting and analysis of regulated discharges, emissions and waste disposal; and
- Any other prescribed monitoring in accordance with the conditions of approval.

### 10.3 Corrective Actions

Where inspections, monitoring and analysis for reporting indicate that performance criteria are not being met or are trending towards criteria not being met, corrective actions will be applied to the matter to protect environmental values and improve predicted outcomes. Results of environmental audits and resolutions of complaints and grievances will also drive changes to methodologies and frequency of controls.

This may include re-application of control measures, increased frequency of inspection or revision of methodologies.

#### 10.3.1 Notifications

Where monitoring indicates a non-compliance with conditions of approval, this will be notified as required by the condition of approval. All incidents are reported, notified and investigated in accordance with the Contingency Procedures for Emergency Environmental Incidents [SENEX-QLDS-EN-PRC-024] and Incident Reporting and Investigation Procedure [SENEX-CORP-HS-PRC-004].

### **10.3 Auditing**

Environmental audits will be undertaken as both scheduled and unscheduled activities. The audit program may include the use of external auditors and will include regular (for example, annual) environmental compliance audits to assess compliance with this EMP, EA conditions and other regulatory requirements. The audit program will include audits of Contractor procedures and management plans and will be undertaken by the Senex Site Supervisor or Senex Environmental representative as appropriate.

## 11 Record Keeping and Reporting

Senex and its contractors will maintain an appropriate and auditable record system. Environmental reporting information will include as relevant:

- Inspection / monitoring reports;
- Photographic records;
- Training and induction attendance and associated dates;
- Incident reports;
- Remedial actions taken following incident reports;
- Records of waste removal including waste tracking certificates; and
- Audit reports.

All records and data required to be maintained by conditions of approval will be retained for a minimum of 5 years.

The annual reporting to DES (annual return) will require providing details of activities conducted during the annual return period, demonstrating actions such as:

- The area of significant disturbance from the project;
- Rehabilitation undertaken;
- A list of all valid complaints relating to environmental issues made including the date, source, reason for the complaint and a description of investigations undertaken in resolving the complaint; and
- The results of all monitoring undertaken.

# **Appendix A – Senex Environmental Management Policy**

See next page.

# Environmental Management Policy

Document Number  
SENEX-CORP-EN-POL-001

## ENVIRONMENTAL MANAGEMENT POLICY

Senex Energy Limited (Senex) is an environmentally responsible company committed to conducting our business in a manner which ensures high standards of environmental management performance.

Senex will achieve this commitment through applying our core values to promote and maintain a culture of sustainability and continuously review and improve our environmental performance across the business.

We will achieve our environmental goals by actively focusing on:

- Assessing the potential impacts of our operations and activities on the local environment to limit disturbance;
- Operate in a safe and environmentally responsible manner;
- Empowering employees and contractors to achieve environmentally responsible operations and to improve environmental performance; and
- Maintaining and continuously improving environmental standards, systems and controls across all activities and operational areas.

Senex will ensure effective implementation of this policy through:

- Ensuring that environmental goals and standards are understood and adopted at all levels across the Company;
- Instructing and educating employees and contractors where appropriate of their environmental responsibilities;
- Reporting environmental incidents, determining the cause and where appropriate implementing changes to prevent a recurrence;
- Measuring our performance through regular monitoring, environmental audits and reporting; and
- Ensuring compliance with relevant laws, regulations and where appropriate industry codes.



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