



REGIONAL INTERESTS DEVELOPMENT APPLICATION - ASSESSMENT REPORT

Prepared for: Bengal Energy (Australia) PTY LTD

PREPARED BY

T29 Holdings Pty Ltd
ABN 50 628 672 677
E: admin@t29.com.au

BASIS OF REPORT

This report has been prepared by T29 Holdings Pty Ltd (T29) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Bengal Energy (Australia) PTY LTD (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from T29.

T29 disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Date	Prepared	Checked	Authorised
March 2021	TW	AS/LD	KE

CONTENTS

1	INTRODUCTION	1
1.1	Overview	1
1.2	Applicant	1
1.3	Landholder Copy of the Application	1
1.4	Referable Application	1
2	PROPOSED ACTIVITY - LEGBAR.....	2
2.1	Constraints planning	2
2.2	Exploration well	3
2.2.1	Well Drilling Activities and Associated Infrastructure	3
2.2.2	Operation	4
2.3	Access tracks.....	5
2.3.1	Construction	5
2.3.2	Operation	5
2.4	Borrow pits.....	5
3	ENVIRONMENTAL ATTRIBUTES AND POTENTIAL IMPACTS.....	6
3.1	Land Use.....	6
3.2	Climate	7
3.3	Riparian Processes, Regional Ecosystems and Environmentally Sensitive Areas.....	7
3.3.1	Potential Impacts and management measures.....	8
3.4	Wildlife Corridors.....	9
3.4.1	Potential Impacts and management measures.....	10
3.5	Hydrologic Processes, Beneficial Flooding and Water Quality	13
3.5.1	Potential Impacts and management measures.....	14
3.6	Geomorphic Processes	14
3.6.1	Regional.....	14
3.6.2	Local	15
3.6.3	Potential Impacts and management measures.....	15
4	REQUIRED OUTCOME ASSESSMENT	18

DOCUMENT REFERENCES

Tables

Table 1	Proposed surface disturbance within SEA	2
Table 2	Regional Ecosystems Descriptions	8
Table 3	Cooper Creek Surface Water Quality (1956-2016)	13
Table 4	Schedule 2, Part 5 RPI Reg.....	18
Table 5	Temporary drilling sump	19

Figures

Figure 1	ATP934 Field location.....	2
Figure 2	Activities location	3
Figure 3	Proposed activities	4
Figure 4	Monthly Average Rainfall and Temperature for Ballera Gas Field Station (2000-2019)	7
Figure 5	Regional Ecosystems	11
Figure 6	State and Regional Biodiversity Corridors.....	12
Figure 7	Watercourse, Wetlands and Strategic Environmental Areas.....	17

Abbreviations

The following abbreviations are used throughout this Supporting Information Report.

Abbreviation	Description
ATP	Authority to Prospect
Bengal	Bengal Energy (Australia) Pty Ltd as operator of ATP934
DERM	Department of Environment and Resource Management (former department before DES)
DES	Department of Environment and Science
DoR	Department of Resources
EA	Environmental Authority EPPG00736513
EP Act	<i>Environmental Protection Act 1994 (Qld)</i>
ERA	Environmentally Relevant Activities
ESA	Environmentally Sensitive Areas
km	Kilometre
SEA	Strategic Environmental Area

1 Introduction

1.1 Overview

Bengal Energy (Australia) Pty Ltd (Bengal) is the operator and authorised holder of Authority to Prospect (ATP) 934. ATP 934 was applied for on 27 August 2007 and granted to Bengal Energy Limited for a six-year term on 27 February 2015.

ATP 934 is located approximately 75 km west of Jackson in south west Queensland. ATP 934 covers an area of approximately 1461 km² and is largely located within the Channel Country Strategic Environmental Area (SEA) - designated precinct (refer to Figure 1). The prominent use of land, apart from oil and gas activities, is cattle grazing.

Bengal has prepared this assessment report to support an assessment application for a Regional Interests Development Approval (RIDA) as required under section 29 of the *Regional Planning Interests Act 2014* (RPI Act); to carry out resource activities within the tenement.

This RIDA proposes one exploration well, three borrow pits and an access tracks within the SEA designated precinct.

The assessment report has been prepared in accordance with the RPI Act Statutory Guideline 01/14: How to make an assessment application for a regional interests development approval under the RPI Act and the RPI Act Statutory Guideline 05/14: Carrying out resource activities and regulated activities within a Strategic Environmental Area.

This assessment report provides the following:

- Description of the proposed activities
- Identification of the relevant environmental attributes of the land subject to the application
- Evaluation of the potential impacts on the identified relevant environmental attributes
- An assessment of how the proposed activities meet the required outcome for SEA as detailed in the *Regional Planning Interests Regulation 2014* (RPI Reg).

1.2 Applicant

Bengal is the applicant as per section 28 of the RPI Act. ATP 934 (a resource authority under the RPI Act) and the associated environmental authority (EA) EPPG00736513 are held by Bengal Energy (Australia) Pty Ltd, and are an eligible person under the RPI Act.







Figure 3 Proposed activities

1.3 Landholder Copy of the Application

The Applicant is seeking an exemption from public notification for the assessment application under section 34(3) of the RPI Act based on the following justification:

In accordance with Section 34(2) of the RPI Act, and Section 13 of the RPI Reg, notification of the assessment application is not mandatory, as the activities are not proposed to be carried out in an area of regional interest that is a priority living area.

Discretionary notification under s34(4) would not be necessary given that separate regulatory systems are in place that require the Applicant to notify the landholder of petroleum activities occurring within their property(s), the very large size of the cattle stations relative to the limited impact activities proposed, that the landholders within ATP 934 are engaged continuously throughout the undertaking of activities on their properties, and that all landholders will receive a copy of the application as described above.

ATP 934 was granted as a result of a Public Tender PLR2007-2-14. The Call for Tender for petroleum exploration was made in the Government Gazette on 30 March 2007 (p1464-1466) and a Ministerial Statement. This was also published on the then departmental website, along with the Call for Tenders booklet.

1.4 Referable Application

In accordance with Section 12(2) and Schedule 1 of the RPI Reg, the application is referable to the Department of Environment and Science (DES) and the Department of Resources (DOR).

2 Proposed Activity - Legbar

The resource activities the subject of this RIDA application include construction and operation of:

- The lease for Legbar 1 well which includes a tank pad, sump and spoil area
- Three borrow pit areas
- Associated access tracks

A separate RIDA application will be lodged for a buried gas flowline (known as the Legbar 1 flowline). This flowline will require a petroleum pipeline licence and will be owned and operated by Santos Limited.

Figure 1, Figure 2 and Figure 3 show the proposed infrastructure location. The location has been selected to ensure that:

- Any identified cultural heritage constraints are avoided
- Minimal earth works are required for both linear and non-linear infrastructure.

The total area of disturbance associated with the proposed activities within SEA is 6.6 hectares.

Table 1 Proposed surface disturbance within SEA

Infrastructure	Disturbance area
Well pad (including sump spoil area and tank)	1.6 ha
Borrow pits (x3) including diversion berms	2.6 ha
Roads (6m wide)	2.4 ha
Total	6.6 ha

2.1 Constraints planning

The location of exploration wells, access tracks and borrow pits are designed using constraints mapping considering topography, vegetation, cultural heritage and impact on landowners. Where possible, previously disturbed areas are utilised for petroleum infrastructure. To minimise potential disturbance, access tracks will utilise existing roads and farm tracks, rather than develop new access infrastructure, where practicable.

Bengal has selected the proposed location to ensure minimal amounts of earth work are required.

2.2 Exploration well

2.2.1 Well Drilling Activities and Associated Infrastructure

2.2.1.1 Drilling

The well would be constructed in accordance with the *Code of Practice for the construction and abandonment of petroleum wells and associated bores in Queensland* (DNRME, 2019).

Before the drill rig is mobilised to site, the drill site or 'well lease' and access tracks are prepared. This includes three main steps.

1. The minimal amount of vegetation is cleared within the well lease and for access tracks.
2. Topsoil (where present) is removed using earthmoving equipment. This is stockpiled to one side of the lease and/or access track for later rehabilitation use. Finally, earthmoving equipment moves in to cut and fill the lease site where necessary.
3. A drill rig arrives to install a large diameter conductor pipe. The drill rig sets up over the conductor pipe. The drill rig is usually made up of:
 - a diesel motor that drives the rigs operation;
 - a derrick, which is basically a vertical tower used to manage the long pieces of drill pipe for the drilling process;
 - a mud pump which pumps drilling mud through the drill pipe and brings the cuttings to the surface. There the mud is circulated into tanks or ground sumps, where the drill cuttings settle out and the mud is re-used;
 - an iron roughneck, which tightens the pieces of drill stem together as the hole is drilled deeper; and
 - a generator to maintain power to equipment and associated ancillary site buildings.

The drill rig first drills the surface section of the hole which takes approximately one day. A casing is then cemented in place by pumping cement into the wellbore and circulating back through the casing/well ring. This cement isolates any shallow surface aquifers and prevents cross contamination. Drilling takes approximately 11 days. Drilling fluid would be continuously circulated down the drill pipe and back to the surface equipment to balance underground pressure (if required), cool the drill bit and flush out rock cuttings. A drilling sump would be used to contain drilling fluids. The drilling sump would be designed to exclude overland flow. Following the completion of drilling, the rig will be dismantled and transported from site and partial rehabilitation will commence, including the removal of drilling fluids from the drilling sump and backfilling of the drilling sump. It is expected that sumps will be emptied of drilling fluids and backfilled within 9 months of drilling completion. Nevertheless, flood alerts will be monitored to ensure affected sumps are emptied and backfilled before forecast floodwater has the potential to impact the site.

The second stage is to drill the production section of the hole, which is cased with perforated casing across the target formations to allow gas to flow into the well. Above the target formations the casing is cemented back to surface, which isolates the formation. The drilling rig is then packed up.

Following the drilling program, a completions rig is mobilised to site, assembled and the rig then drills through the cement barriers left by the drilling and installs the equipment required to operate the well.

Drilling activities would be scheduled during periods where surface water is expected to be absent from the site, and outside of flood events/inundation periods. The well would be drilled in accordance with industry standards from the American Petroleum Institute (API) and NORSOK. These standards provide minimum construction requirements and good industry practice for petroleum production. The preliminary well design is a 2-string design with 7-5/8" steel surface casing and 3-1/2" chrome steel tubing. These strings would be cemented either back to surface or to inside the previous casing.

2.2.1.2 Hydraulic Fracturing

Well stimulation techniques including hydraulic fracturing may be used to increase the recovery of resources (oil and gas) by increasing the permeability of the reservoir. Hydraulic fracturing involves pumping a fluid under pressure into the reservoir to open up and connect fractures within the reservoir rock, thereby increasing the opportunity for the resource to move within the reservoir rock and flow toward the well. A proppant within the fluids holds the fractures open after the activity ceases. Approximately 99.5% of the material pumped into the well is water and sand. Minor quantities of additives make up the remaining 0.5% of the fluid. The purpose of these additives is to:

- enhance fracture initiation;
- help lubricate the flow of proppant (i.e. sand) into the fractures;
- prevent microbial or chemical reactions following introduction of the fluids; and
- prevent formation of scale deposits that may affect the well or pumps.

After the fracture process is completed, fluids that return to surface when the pressure is released are captured in tanks or lined pits for reuse, recycling or transported to a licenced water management facility.

The proposed well may be hydraulically fractured in accordance with Schedule I of the EA.

2.2.2 Operation

During operation of the well, surface facilities would be used for the purpose of petroleum production. Surface facilities would include the wellhead and a tie-in riser. The wellhead consists of equipment which supports the various pipe strings, seals off the well, and controls the paths and flow of reservoir fluids. The tie-in riser connects the well to the gas flowline and enables transportation of the extracted petroleum.

Well workovers may also be required during operation of the well. Well workover activities include basic maintenance works like cleaning out production conduits and replacing tubing, retrieving, or drilling out obstructions in the well, and well bore decommissioning. For some workovers, a workover rig and associated infrastructure (i.e., a drilling fluids sump) would be required temporarily. This infrastructure would be contained in the existing disturbance area. Workovers would also be scheduled to be completed when no surface water is expected to be present on site and outside of flood events/inundation periods.

The well would be restored at end-of-life in accordance with the *Petroleum and Gas (Production and Safety) Act 2004* (P&G Act 2004) and the relevant EA conditions.

2.3 Access tracks

The well would be accessed from the Woomanooka Road. Approximately 3.5 km of additional track would be constructed to provide access from Woomanooka Road to the well lease and to provide a truck turn-around area.

2.3.1 Construction

The proposed access track would be six metres in width and lightly graded and capped with clay or similar locally available borrow pit material. The tracks will not be constructed to any flood immunity, allowing the natural passage of surface water to avoid impacts to the existing hydrology. Access tracks can also include disturbances for drainage and erosion and sediment controls in key areas where required to ensure stability is maintained.

2.3.2 Operation

The access track would be used for ongoing access to the site. The access track would be designed to convey natural surface water flows consistent with the existing hydrology and would not be accessed during excessive wet weather.

At the end of operations, the access track would be rehabilitated in accordance with EA conditions, or left in place for future use by the landholder subject to agreement.

2.4 Borrow pits

Borrow pits would be established close to the proposed activities (refer Figure 3) to provide suitable material to construct a stable and supportive surface for the lease and access track.

A diversion berm around the upslope edge of each borrow pit will be included as required to prevent rainwater ingress into the pit, diverting it to undisturbed areas and subsequently prevent erosion of the edges of the borrow pit.

The side batters of the borrow pit will be maintained at a slope of approximately 3:1, and the batters of the entrance / exit will be maintained at a slope of approximately 7:1. The borrow pit will be stabilised by ripping the floor and sides of the borrow pit to a depth of approximately 300 mm generally along the contour (**Error! Reference source not found.**). During restoration, stockpiled topsoil and vegetation would be respread to a uniform depth over the entire area from which it was removed. The sides and floor of the pit would be graded to give a contoured finish, as required by the relevant EA conditions.

3 Environmental Attributes and Potential Impacts

Section 7 of the RPI Reg prescribes the following environmental attributes relevant to the Channel Country SEA:

- a) the natural hydrologic processes of the area characterised by-
 - i. natural, unrestricted flows in and along stream channels and the channel network in the area; and
 - ii. overflow from stream channels and the channel network onto the flood plains of the area, or the other way; and
 - iii. natural flow paths of water across flood plains connecting waterholes, lakes and wetlands in the area; and
 - iv. groundwater sources, including the Great Artesian Basin and springs, that support waterhole persistence and ecosystems in the area;
- b) the natural water quality in the stream channels and aquifers and on flood plains in the area;
- c) the beneficial flooding of land that supports flood plain grazing and ecological processes in the area.

DSDMIP's RPI Act Statutory Guideline 05/14: Carrying out resource activities and regulated activities within a Strategic Environmental Area summarises the above attributes to broadly relate to:

- Riparian process
- Wildlife corridors
- Water quality
- Hydrologic processes
- Geomorphic processes
- Beneficial flooding.

The relevance of the above environmental attributes to the proposed activities is described below.

3.1 Land Use

The proposed activities are located on Durham Downs Pastoral Station (Lot 1 on Plan SP133822). Durham Downs is a pastoral lease that operates as a cattle station with a capacity of up to 21,500 head of cattle¹. The primary land uses are cattle grazing and petroleum activities. Sections of the pastoral leases have been subject to long-term grazing from pastoral operations.

¹ S. Kidman & Co Ltd (2018) Durham Downs, <https://www.kidman.com.au/locations/durham-downs/> Accessed 05/02/21.

3.2 Climate

The Channel Country SEA is located in an arid to semi-arid region of central Australia where the average rainfall is low. Seasons in the area are characterised by dry, hot summers and short, very dry winters as shown on Figure 2. Climate data from a nearby weather station (Ballera Gas Field (Station Number 045009)) shows that the mean rainfall for the project area from 2000 - 2019 is 181.8 mm/year. The mean number of days of rain more than or equal to 1 mm is 20.1 days/year; that is on average, the project area can expect approximately 344 days each year of less than 1 mm of rainfall. The El-Nino Southern Oscillation (ENSO) exerts significant influence on inter-annual climate variability across the area, producing marked fluctuations in the amount, timing and distribution of rainfall. As such, there is considerable year-to-year variation, particularly during the summer months, ranging from 'failed' wet seasons, to 'normal' and above average rainfall and tropical cyclone activity.

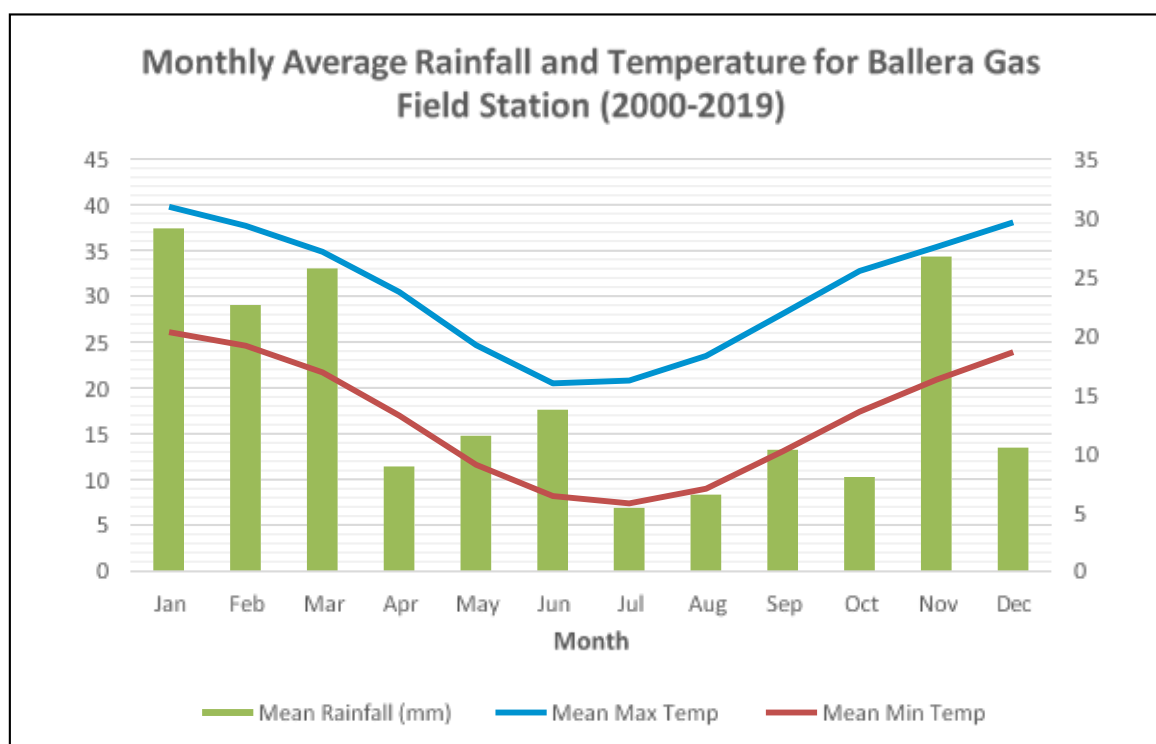


Figure 4 Monthly Average Rainfall and Temperature for Ballera Gas Field Station (2000-2019)

3.3 Riparian Processes, Regional Ecosystems and Environmentally Sensitive Areas

Regional Ecosystem (RE) mapping and aerial photography indicate that vegetation present within ATP 934 is typical of the elsewhere in the bioregion (Channel Country) and subregions (Cooper - Diamantina Plains and Sturt Stony Desert) - dominated by tussock grasslands and forblands through the centre of the tenure, with large sections of wetlands to the west and other acacia dominated open forests, woodlands and shrublands to the east. REs present in ATP 934 are widespread and commonly present across the Cooper Creek catchment area. Vegetation within ATP 934 has been subject to long-term cattle grazing from the operation the pastoral stations.

REs mapped to be present within ATP 934 is shown in Figure 5 and detailed in Table 2. All REs are listed as No Concern at Present (NCAP). Some of these REs are known to include riparian vegetation, particularly within the Cooper Creek and the Windula Creek, which are located along most of the western boundary of ATP 934. The proposed activities are entirely located within NCAP Res 5.3.13/5.3.8.

Approximately 943 ha (0.6% of the tenure area) of essential habitat is present within ATP 934. There are no other mapped Environmentally Sensitive Areas (ESAs) present within or surrounding the tenure area. The proposed activities will not be undertaken within areas mapped as essential habitat.

Table 2 Regional Ecosystems Descriptions

RE Code	RE Short Description	VM Act Class	BD Status	Structural Category	% of Tenure Area
5.3.13a	<i>Duma florulenta</i> open shrubland in depressions on flood plains, interdune flats, clay pans and clay plains.	LC	NCAP	Very Sparse	11.6
5.3.16b	<i>Eragrostis australasica</i> sparse tussock grassland on intermittently inundated depressions on flood plains, interdune flats, clay pans and clay plains.	LC	NCAP	Very Sparse	1.2
5.3.18a	Braided channel complex of major alluvial plains, includes <i>Chenopodium auricomum</i> open shrubland and variable sparse to open-herbland.	LC	NCAP	Sparse	15.9
5.3.18b	Braided channel complex of major alluvial plains, includes <i>Chenopodium auricomum</i> open shrubland and variable sparse to open-herbland.	LC	NCAP	Sparse	9.4
5.3.19	Variable sparse to open herbland on frequently flooded alluvial plains.	LC	NCAP	Sparse	18.9
5.3.2	<i>Eucalyptus camaldulensis</i> +/- <i>Eucalyptus coolabah</i> open woodland on levees and banks of drainage lines.	LC	NCAP	Very Sparse	0.4
5.3.21a	Variable sparse to open herbland, <i>Senna</i> spp. open shrubland and bare scalded areas on infrequently flooded alluvia of major rivers their distributaries, drainage channels and creeks.	LC	NCAP	Sparse	3.3
5.3.7	<i>Eucalyptus coolabah</i> +/- <i>Lysiphyllum gilvum</i> +/- <i>Acacia stenophylla</i> +/- <i>Acacia cambagei</i> low open woodland on major channels.	LC	NCAP	Very Sparse	0.2
5.3.8a	<i>Eucalyptus coolabah</i> low open woodland +/- <i>Duma florulenta</i> on braided channels, drainage lines, flood plain lakes and claypans.	LC	NCAP	Very Sparse	3.7
5.5.2	<i>Acacia aneura</i> low open woodland +/- <i>Acacia sibirica</i> +/- <i>Eremophila latrobei</i> on Quaternary deposits.	LC	NCAP	Very Sparse	1.1
5.5.4	<i>Acacia sibirica</i> +/- <i>Acacia aneura</i> +/- <i>Corymbia</i> spp. open shrubland on Quaternary sediments.	LC	NCAP	Very Sparse	3.7
5.6.1	<i>Crotalaria eremaea</i> +/- <i>Eragrostis eriopoda</i> sparse to open herbland on isolated and/or deflated sand dunes on alluvium.	LC	NCAP	Other	4.9
5.9.2x1	<i>Senna artemisioides subsp. helmsii</i> +/- <i>Senna artemisioides subsp. oligophylla</i> +/- <i>Acacia georginae</i> +/- <i>Acacia</i> spp. open shrubland on Cambrian limestone.	LC	NCAP	Very Sparse	3.4
5.9.3	<i>Astrebla</i> spp. +/- short grasses +/- forbs open herbland on Cretaceous sediments.	LC	NCAP	Sparse	22.3

3.3.1 Potential Impacts and management measures

The proposed activities will result in clearing approximately 5 ha in RE 5.3.13/5.3.8 (70/30), approximately 2.78 % of these REs within the tenure.

Res 5.3.13 and 5.3.8 are typical of the vegetation communities in the Channel Country Bioregion having very sparse structural categories. Given the sparse nature of the REs, there will be maximum ability to avoid woody mature vegetation. Furthermore, these REs are naturally ephemeral, disturbance tolerant and resilient having naturally adapted to respond to the periods of boom and bust associated with the Channel Country Bioregion.

As discussed in Section 2.1, the field planning has identified an appropriate lease location, borrow pits and access track to minimise impacts. Specific mitigation measures include:

- The proposed activities will be undertaken in accordance with the conditions of EA EPPG00736513
- Disturbance of vegetation will be avoided as far as practicable, particularly the removal of mature native tree species
- Linear infrastructure corridor widths will be restricted to the smallest extent practicable
- Any fuels / chemicals will be stored and handled in accordance with Australian Standards and spill kits will be located onsite to contain any spills if required
- Measures shall be adopted to prevent fauna entrapment within excavation work areas and infrastructure developments, such as ensuring cellar covers are installed as soon as reasonably practicable
- Access to and from authorised activities will occur along designated access tracks only
- Rehabilitation to promote conditions suitable for the natural revegetation of disturbed areas will occur progressively
- Infrastructure / disturbances with no ongoing use (e.g. by the landholder / pastoral leaseholder) will be rehabilitated as soon as reasonably practicable following the cessation of petroleum activities to promote the natural re-establishment of vegetation of similar species composition and density to the surrounding undisturbed land in accordance with the relevant EA

3.4 Wildlife Corridors

Figure 4 shows state and regional riparian and terrestrial corridors present within ATP 934 as per DES Biodiversity Planning Assessments and Aquatic Conservation Assessments environmental reports.

Riparian corridors identified within these environmental reports are based upon major channels (250k geodata hierarchy 1) and minor channels (250k geodata hierarchy 2 and 3) necessary to capture permanent waterholes, buffered by 1 km either side and clipped to land zone 3². Terrestrial corridors identified within these environmental reports are based upon major themes of habitat connectivity across the bioregion. It includes the north/south and east/west links that cover areas characterised by a relative continuity of similar or related habitat.

Within ATP 934 riparian corridors are associated primarily with the Cooper Creek and its braided channels, and the Windula Creek. One mapped terrestrial corridor edges into ATP 934 along its eastern boundary. One of the borrow pits is located within the riparian corridor buffers but does not intersect the centreline.

² DERM 2009 *Biodiversity Planning Assessment, Channel Country Bioregion, Landscape Expert Panel Report, Version 1.1*

The REs within the tenure area (as described in Section 3.3) may provide suitable general habitat for a range of wetland water birds and other flora and fauna. Approximately 943 ha (0.6% of the tenure area) of essential habitat is present within ATP 934. There are no other mapped Environmentally Sensitive Areas (ESAs) present within or surrounding the tenure area. Proposed activities will not be undertaken within areas mapped as essential habitat.

3.4.1 Potential Impacts and management measures

Wildlife corridors in the tenure area are primarily associated with the major watercourses. Given the naturally sparse to very sparse vegetation structure, fauna species would be adapted to relatively low cover environments. The nature of the proposed operations may cause temporary displacement of individual animals. However, is not expected to impede the use of the riparian vegetation by fauna species for migration, shelter and habitat associated with watercourses. Hygiene protocols will be implemented as appropriate to minimise the introduction, spread and persistence of weed species. As a result, no widespread or irreversible impacts on wildlife corridor function within the Channel Country SEA are expected to occur from the proposed activities.

The following management measures will be implemented:

- Access to and from authorised activities would occur along designated access tracks only.
- Rehabilitation to promote conditions suitable for the natural revegetation of disturbed areas would occur progressively.
- Infrastructure / disturbances with no future use would be rehabilitated as soon as reasonably practicable following the cessation of petroleum activities to promote the natural reestablishment of vegetation of similar species composition and density to the surrounding undisturbed land in accordance with the relevant EA.

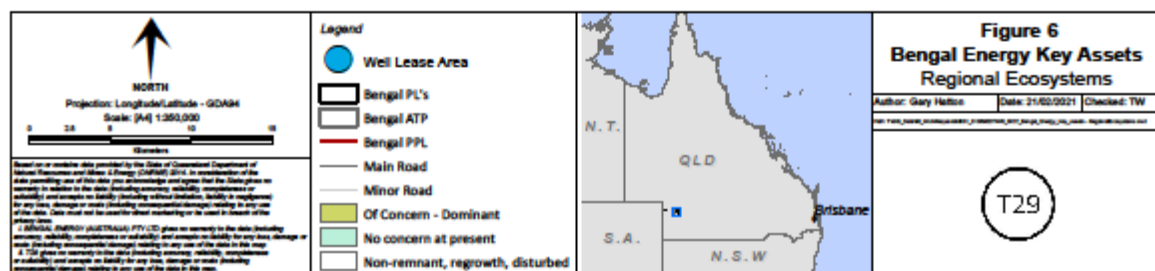
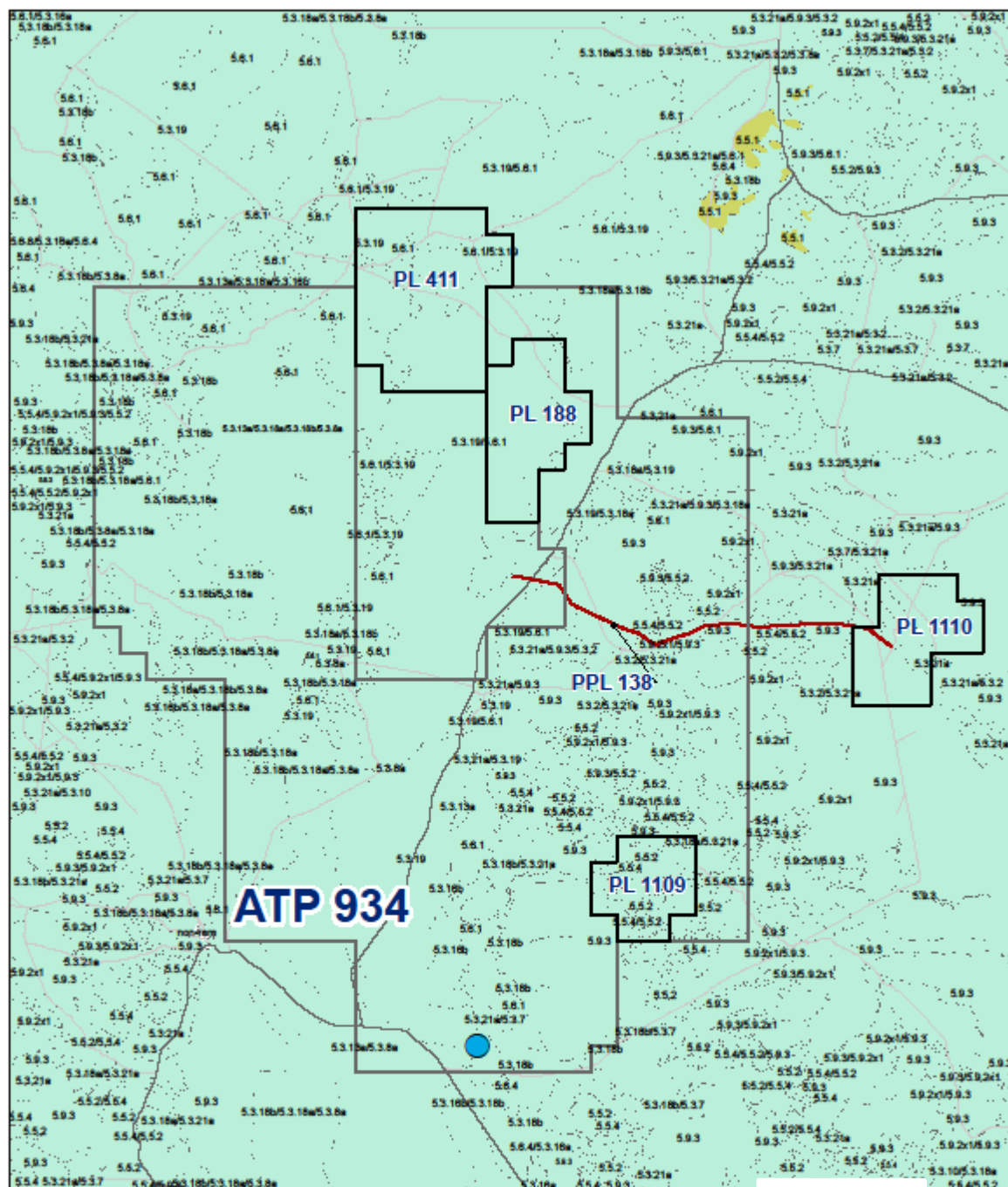


Figure 5 Regional Ecosystems

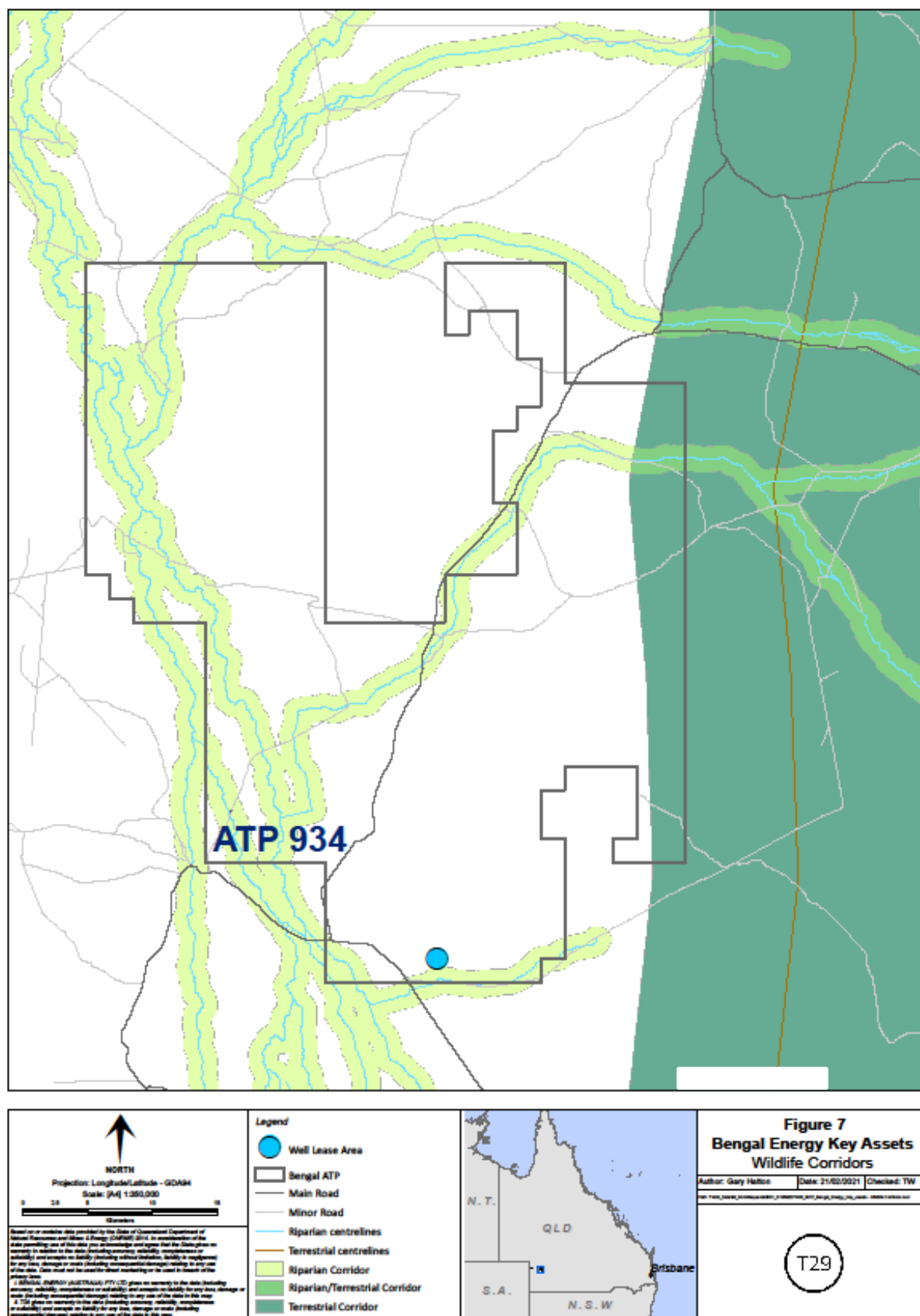


Figure 6 State and Regional Biodiversity Corridors

3.5 Hydrologic Processes, Beneficial Flooding and Water Quality

ATP 934 is located in the Cooper Creek catchment area. The Cooper Creek and its braided channels run down the western boundary of the tenure (Figure 5). The drainage system is dominated by the Cooper Creek Basin draining towards Lake Eyre. During periods of high rainfall, the flat topography and drainage channel system becomes a largely flooded plain with water flow concentrating where Cooper Creek crosses the QLD-SA border.

The Cooper Creek system catchment covers an area of approximately 300,000 km². Generally, Cooper Creek streamflow is confined to the main channels, but every 3-4 years, flows are sufficient to inundate parts of the Cooper floodplain via a network of tributary channels. During extended periods of no flow, the Cooper Creek contracts to a series of waterholes. Very large Cooper Creek flood events with the potential to inundate the broader Channel Country region, and flow water into the lower Cooper Creek in South Australia, occur on average once every 10 years, reaching Lake Eyre North in an estimated 1 in every 20 years.

While there is limited water quality data available for Cooper Creek, the data that is available indicates water quality is likely subject to local influence and conditions vary between flood times and periods of no-flow (Smith et al. 2016). Electrical conductivity (EC) levels, while normally low and stable, tend to increase during low or no-flow periods and sharply decrease following inundation (Smith et al. 2016). Turbidity is generally high but varies subject to local influences (Smith et al. 2016). Turbidity decreases from upstream to downstream and then increases again before the Cooper Creek crosses the Queensland-SA border (Smith et al. 2016; Karim et al. 2015).

Historical (1965-2016) water quality data from the QLD Government's Cooper Creek gauging station 003103A, located approximately 99 kilometres south west, is summarised in Table 3.

Table 3 Cooper Creek Surface Water Quality (1956-2016)

Parameter	Average Value
Conductivity @ 25°C	345 µS/cm
Turbidity	512 NTU
pH	7.4
Total Nitrogen	1.4 mg/L
Total Phosphorus as P	0.4 mg/L
Sodium as Na	44.6 mg/L
Magnesium as Mg	7.4 mg/L
Chloride as Cl	62.6 mg/L
Fluoride as F	0.2 mg/L

The main Great Artesian Basin (GAB) aquifers of the ATP 934 area are within the Eromanga Basin stratigraphy and include the Winton Formation, Cadna-owie Formation, Hooray Sandstone, Hutton Sandstone and Poolowanna Formation (Precipice Sandstone equivalent). The aquifers of the Eromanga Basin are considered highly productive aquifers over most of the GAB. Shallow groundwater is generally found within the Quaternary and Tertiary alluvium formations associated with the very flat structures of flood plains and is absent where the Winton Formation occasionally outcrops.

Terrestrial groundwater dependent ecosystems may be present within the project area. However, due to the vertical separation of the target formation for the proposed wells (Permian-aged Toolachee Formation, ~2,000 m) and the location of potential groundwater depending ecosystems, these ecosystems will not be impacted by the drilling of the well.

The closest water supply bore is Wareena Creek (bore ID 16138) which is located approximately 10 km east of the proposed activities. There are no GAB ROP discharge or recharge springs located within or surrounding ATP 934. The nearest spring is located approximately 250 km north east. Terrestrial Groundwater Dependant Ecosystems (GDE) and GDE aquifers (unconsolidated sedimentary aquifers) may be present within the tenure area.

3.5.1 Potential Impacts and management measures

Drilling would be scheduled to occur outside of flood events/inundation periods.

No activities proposed involve the discharge of water (point or diffuse sources) or the construction or operation of regulated dams and other major infrastructure (i.e., separator ponds, permanent camps). Any fuels / chemicals used on site will be stored and handled in accordance with Australian Standards and spill kits will be located onsite where required to contain any spills should they occur. All waste materials and non-essential infrastructure will be removed at the end of the petroleum activities as soon as reasonably practicable, minimising risks associated with contamination, or a reduction in water quality, in accordance with EA conditions. Rehabilitation to promote conditions suitable for the natural revegetation of disturbed areas will occur progressively.

Contingency measures for unplanned releases of contaminants will be implemented in accordance with EA conditions. Moreover, due to the slow nature of the encroachment of flood waters in the Cooper Creek, sufficient time is generally available to prepare areas for potential flood impacts e.g. in these situations all non-essential materials present on site at the time (e.g. hydrocarbons, chemicals, infrastructure) shall be removed from construction and/or operational areas prior to the arrival of floodwaters.

The petroleum well would be completed with steel surface casing, steel production casing, and cement in accordance with the SMS Onshore Drilling and Completions technical standards, to isolate the well from aquifers, including the GAB and other geological units that may contain terrestrial groundwater dependent ecosystems.

A diversion berm will be installed around the upslope edge of each borrow pit as required to prevent rainwater ingress into the pit, diverting it to undisturbed areas and subsequently prevent erosion of the edges of the borrow pit.

3.6 Geomorphic Processes

3.6.1 Regional

Surface geology is dominated by Quaternary alluvium deposits associated with flood plains, with consolidated Tertiary sediments or Winton Formation on the higher ground. Cooper Creek is a large sedimentary sump accreting over a vast floodplain³.

³ Maroulis, J (undated) Channel Country landforms and the processes that shape them. University of Southern QLD Faculty of Education/Australian Centre for Sustainable Catchments.

3.6.2 Local

The western portion of ATP 934 is primarily mapped as Channel Country (flooded alluvial plains with anastomosing channels) with small, dispersed areas of dunefields (isolated dunes or small groups of rounded dunes 5-10m high with mobile crests on alluvial plains) and other alluvia (flat alluvial plains). This portion is associated with the irregularly flooded Cooper Creek main channel area. The eastern portion of ATP 934 is primarily mapped as undulating downs (undulating to gently undulating plains) intertwined with areas of dissected residuals (scarps and flat to gently undulating tops of dissected tablelands, mesas and buttes), undulating Gidgee lands (undulating mantled pediments and scarp retreat zone), and hard mulga lands (gently undulating to undulating plains). The eastern and western portions of ATP 934 are generally separated down the middle by other alluvia (occasionally flooded alluvial plains).

Dominant soils⁴ within ATP 934 include:

- CC87 - grey clays (Ug5.24) but other cracking clays such as (Ug5.34) and (Ug5.25) may occur;
- CC87 - grey clays (Ug5.24) but brown clays (Ug5.3) may occur also. There are (Uc1.2) soils on dunes and sand-hills, while other soils (undescribed) may occur on the flanks of the sandy areas;
- BE14 - throughout the sloping areas and upland plains are shallow earthy loams (Um5.3) below which red-brown hardpan occurs, and (Um5.51) soils with mottled rock below. Associated are (Gn2.12) and less commonly (Gn2.13), both underlain by red-brown hardpan on upland plains; and (Dr2.33) soils often underlain by red-brown hardpan on dissection slopes, pediments, and low-lying flat areas; and
- Fz49 - shallow stony loams (Um1.43) on scarps and areas of steeper relief generally, with shallow earthy loams (Um5.3) on areas of gentler relief. Associated are (Gn2.12) soils on areas of gentler relief, and (Dr2.33) and (Ug5.2) and (Ug5.3) soils at the base of scarps in small variable areas.

The dominant soil around the proposed Legbar activities is CC88: *Clay plains marginal to major rivers and not channelled to the same extent as unit CC87; subject to seasonal inundation for the greater part; some sand dune and sand-hill areas: chief soils are grey clays (Ug5.24) but brown clays (Ug5.3) may occur also. There are (Uc1.2) soils on dunes and sand-hills, while other soils (undescribed) may occur on the flanks of the sandy areas.*

3.6.3 Potential Impacts and management measures

No activities are proposed to be placed in a watercourse, lake or spring as a part of this project. The proposed activity is located within floodplains and land mapped as palustrine wetlands – arid/semi-arid non floodplain grass, sedge, herb swamps (DES 2019). These swamps primarily fill from inflowing channels, overland flow and backflow from flooded rivers, and local runoff (DES 2013) and are typically dry. Water depth when filled may be shallow to moderate depending on local conditions and flows (DES 2013). The site may be subject to intermittent surface water flows during storm events, causing localised ponding of surface water.

⁴ ASRIS (2018). Atlas of Australian Soils (spatial dataset), Australian Soil Resource Information System (CSIRO), Accessed 22/02/2021. Available online at: <http://www.asris.csiro.au/downloads/Atlas/soilAtlas2M.zip>

The vegetation communities within the tenure area are naturally sparse and it is expected that natural erosion within the area along watercourses already exists due to cattle grazing and seasonal rainfall events. Additionally, as a result of the sparse cover of vegetation in the area, it is expected that the turbidity and total suspended solid loads to waterways would increase during times of high rainfall. Proposed activities will be scheduled to be completed when no surface water is expected to be present on site and outside of flood events/inundation periods.

Accordingly, it is not envisaged that the proposed activity would cause a widespread or irreversible impact on geomorphic processes within the Channel Country SEA.

Other measures to reduce the proposed activities' impact on existing geomorphic processes discussed above include:

- minimising the total area of disturbance and vegetation clearing to the greatest extent practicable
- designing access tracks without flood immunity to allow maintenance of natural overland flows
- ensuring workover activities are conducted outside of flooding/inundation periods.
- Borrow pits will have diversion berms to divert flows around the borrow pits.
- ESC devices will be installed as required to prevent erosion and sedimentation of nearby watercourses.

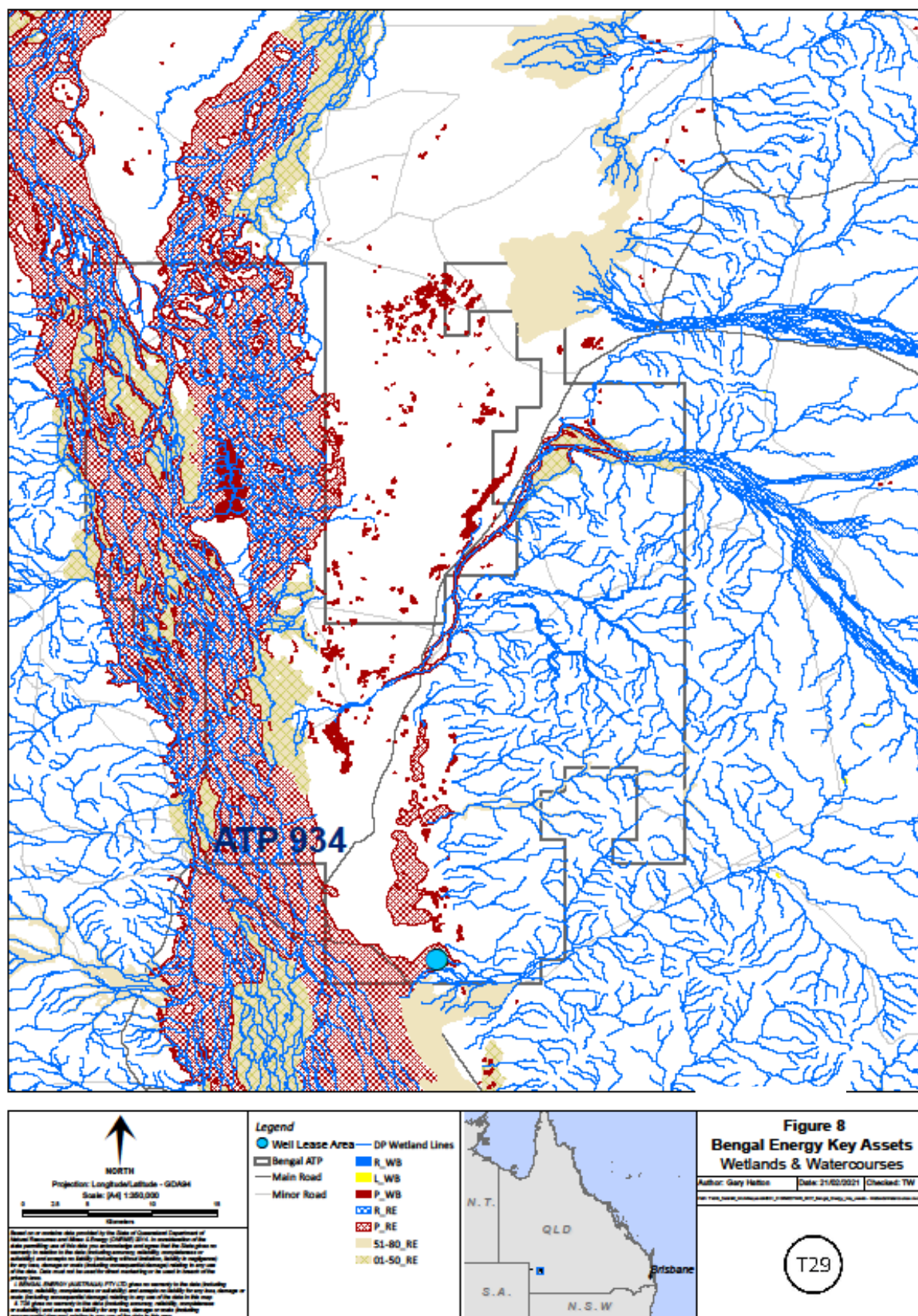


Figure 7 Watercourse, Wetlands and Strategic Environmental Areas

4 Required Outcome Assessment

Schedule 2, Part 5 of the RPI Reg provides criteria for assessment by agencies. In accordance with Section 14(3) of the RPI Reg, if the application demonstrates compliance with either of the prescribed solutions stated in Part 5, Schedule 2, the proposed activities will meet the required outcome for the regional interest. Critically, the application demonstrates that the prescribed solution provided in s15(1)(a) will be met as the proposed activity, a single lease and associated infrastructure will not impact on an environmental attribute of the Channel Country SEA. The application also demonstrates the prescribed solution provided in s15(1)(b) will also be met (Table 4).

Table 4 Schedule 2, Part 5 RPI Reg

Schedule 2, Part 5 RPI Reg		Relevance To Application
14 Required outcome <i>The activity will not result in a widespread or irreversible impact on an environmental attribute of a strategic environmental area.</i>	ü	The petroleum activities would not result in a widespread or irreversible impact on each of the environmental attributes as provided in section 3.
15 Prescribed solution <i>(1) The application demonstrates either – (a) the activity will not, and is not likely to, have a direct or indirect impact on an environmental attribute of the strategic environmental area; or</i>	ü	Refer to section 3.
<i>(b) all of the following – (i) if the activity is being carried out in a designated precinct in the strategic environmental area –the activity is not an unacceptable use for the precinct;</i>	ü	The proposed activities do not include any of the unacceptable uses prescribed by Section 15(2) of the RPI Act.
<i>(ii) the construction and operation footprint of the activity on the environmental attribute is minimised to the greatest extent possible;</i>	ü	Constraints planning will be implemented to minimise disturbance to an absolute must.
<i>(iii) the activity does not compromise the preservation of the environmental attribute within the strategic environmental area;</i>	ü	Refer to section 3.
<i>(iv) if the activity is to be carried out in a strategic environmental area identified in a regional plan – the activity will contribute to the regional outcomes, and be consistent with the regional policies, stated in the regional plan.</i>	ü	The South West Regional Plan does not identify the Channel Country SEA.

The application also demonstrates the proposed use of a temporary drilling sump does not constitute regulated activity as defined by the RPI Act.

Table 5 Temporary drilling sump

s11(3) of the Regional Planning Interests Regulation 2014		Relevance To Application
<p><i>Water storage (dam) is storing water using a dam, other than storing water on land to be used only for any or all of the following purposes—</i></p> <p><i>(a) to meet the domestic water needs of the occupants of the land;</i></p> <p><i>(b) to water the stock that is usually grazed on the land;</i></p> <p><i>(c) to water stock that is travelling on a stock route on or near the land.</i></p>	ü	<p>N/A – the application does not propose to store water in a dam. The application proposes to temporarily store drilling fluids in a sump designed to exclude surface flow and avoid the impounding of surface water. In addition, construction and workover activities would be scheduled to be completed when no surface water is expected to be present on site and outside of flood events/inundation periods. Therefore, all non-essential surface infrastructure, including a drill sump, would be removed prior to Cooper Creek flood events.</p>
Schedule 6 of the Regional Planning Interests Regulation 2014		Relevance to Application
<p><i>dam—</i></p> <p><i>(a) means the following—</i></p> <p><i>(i) a barrier, whether permanent or temporary, that does, could or would impound water;</i></p>	ü	<p>N/A – the drilling sump would not impound water. Drilling sumps are designed to exclude surface water and avoid the impounding of surface water. Construction and workover activities would be scheduled to be completed when no surface water is expected to be present on site and outside of flood events/inundation periods. Therefore, all non-essential surface infrastructure, including a drill sump, would be removed prior to Cooper Creek flood events.</p>
<p><i>((ii) the storage area created by the barrier; (iii) an embankment or other structure that is associated with the barrier and controls the flow of water; but</i></p>	ü	<p>N/A – the sump would not constitute a barrier for the storage of water.</p>
<p><i>(b) does not include a water tank, including a rainwater tank, constructed of steel, concrete, fibreglass, plastic or similar material.</i></p>	ü	<p>N/A – the proposed sumps does not constitute a water tank.</p>

Appendix A EA EPPG00736513

Permit

Environmental Protection Act 1994

Environmental authority EPPG00736513

This environmental authority is issued by the administering authority under Chapter 5 of the Environmental Protection Act 1994.

Environmental authority number: EPPG00736513

Environmental authority takes effect on 24 April 2020

Environmental authority holder(s)

Name(s)	Registered address
BENGAL ENERGY (AUSTRALIA) PTY LTD	Level 10 300 Ann Street BRISBANE CITY QLD 4000
Bengal SPV Pty Ltd	Hall Chadwick Centre Suite 2 Level 8 46 Edward St BRISBANE CITY QLD 4000 Australia

Environmentally relevant activity and location details

Environmentally relevant activity/activities	Location(s)
Non-Scheduled Petroleum Activity Authority to Prospect - ATP	ATP934

Additional information for applicants

Environmentally relevant activities

The description of any environmentally relevant activity (ERA) for which an environmental authority (EA) is issued is a restatement of the ERA as defined by legislation at the time the EA is issued. Where there is any inconsistency between that description of an ERA and the conditions stated by an EA as to the scale, intensity or manner of carrying out an ERA, the conditions prevail to the extent of the inconsistency.

An EA authorises the carrying out of an ERA and does not authorise any environmental harm unless a condition stated by the EA specifically authorises environmental harm.

A person carrying out an ERA must also be a registered suitable operator under the *Environmental Protection Act 1994* (EP Act).

Contaminated land

It is a requirement of the EP Act that an owner or occupier of contaminated land give written notice to the administering authority if they become aware of the following:

- the happening of an event involving a hazardous contaminant on the contaminated land (notice must be given within 24 hours); or
- a change in the condition of the contaminated land (notice must be given within 24 hours); or
- a notifiable activity (as defined in Schedule 3) having been carried out, or is being carried out, on the contaminated land (notice must be given within 20 business days);

that is causing, or is reasonably likely to cause, serious or material environmental harm.

For further information, including the form for giving written notice, refer to the Queensland Government website www.qld.gov.au, using the search term 'duty to notify'.

Take effect

Please note that, in accordance with section 200 of the EP Act, an EA has effect:

- a) if the authority is for a prescribed ERA and it states that it takes effect on the day nominated by the holder of the authority in a written notice given to the administering authority-on the nominated day; or
- b) if the authority states a day or an event for it to take effect-on the stated day or when the stated event happens; or
- c) otherwise-on the day the authority is issued.

However, if the EA is authorising an activity that requires an additional authorisation (a relevant tenure for a resource activity, a development permit under the *Sustainable Planning Act 2009* or an SDA Approval under the *State Development and Public Works Organisation Act 1971*), this EA will not take effect until the additional authorisation has taken effect.

If this EA takes effect when the additional authorisation takes effect, you must provide the administering authority written notice within 5 business days of receiving notification of the related additional authorisation taking effect.

If you have incorrectly claimed that an additional authorisation is not required, carrying out the ERA without the additional authorisation is not legal and could result in your prosecution for providing false or misleading information or operating without a valid environmental authority.

Clancy Mackaway
Department of Environment and Science
Delegate of the administering authority
Environmental Protection Act 1994

Date issued: 24 April 2020

Enquiries:
Energy and Extractive Resources Unit
Department of Environment and Science

Phone: 3330 5715
Email: energyandextractive@des.qld.gov.au

Obligations under the *Environmental Protection Act 1994*

In addition to the requirements found in the conditions of this environmental authority, the holder must also meet their obligations under the EP Act, and the regulations made under the EP Act. For example, the holder must comply with the following provisions of the Act:

- general environmental duty (section 319)
- duty to notify environmental harm (section 320-320G)
- offence of causing serious or material environmental harm (sections 437-439)
- offence of causing environmental nuisance (section 440)
- offence of depositing prescribed water contaminants in waters and related matters (section 440ZG)
- offence to place contaminant where environmental harm or nuisance may be caused (section 443)

This environmental authority consists of the following Schedules:

SCHEDULE A – GENERAL CONDITIONS6

SCHEDULE B – WATER.....10

SCHEDULE C – REGULATED STRUCTURES.....14

SCHEDULE D - LAND.....15

SCHEDULE E - DISTURBANCE TO LAND17

SCHEDULE F – ENVIRONMENTAL NUISANCE.....20

SCHEDULE G – WASTE.....23

SCHEDULE H – REHABILITATION.....24

SCHEDULE I – WELL CONSTRUCTION, MAINTAINANCE AND HYDRAULIC FRACTURING
ACTIVITIES27

SCHEDULE J – COMMUNITY ISSUES30

SCHEDULE K – NOTIFICATION31

SCHEDULE L – DEFINITIONS.....33

APPENDIX A – Map 1: ATP934



SCHEDULE A – GENERAL CONDITIONS**Authorised Activities**

- (A1) This environmental authority authorises activities, relevant to exploration and appraisal activities for conventional oil, conventional gas, shale oil, shale gas and tight gas activities on ATP934, as follows:
- (a) the authorised petroleum activities listed in *Schedule A, Table 1 – Authorised Petroleum Activities* to the extent they are carried out in accordance with the activity's corresponding number or maximum size or both (where applicable); and
 - (b) Incidental activities that are not otherwise authorised petroleum activities.

Schedule A, Table 1 – Authorised Petroleum Activities

Resource Authority	Petroleum Activity	Number of Existing Petroleum activities	Number of Proposed Petroleum activities	Maximum size (where applicable)
ATP934	Seismic 3D (square kilometres)	0	310	310
	Total wells	0	7	7
	- Exploration Wells (indicative)	0	7	7
	- Appraisal Wells (indicative)	0	0	NA
	Low hazard dams	0	0	NA
	Borrow pits	0	50	5000 tonne per borrow pit

Work program and development plan

- (A2) The following must be submitted to the **administering authority**:
- (a) a copy of the initial work program, later work programs and any amendments to work programs when submitted to the administering authority of the *Petroleum and Gas (Production and Safety) Act 2004* (P&G Act) for authorities to prospect; or
 - (b) a copy of the initial development plan, later development plans and any amendments to development plans when submitted to the administering authority of the P&G Act for petroleum leases.

Contingency Plan for Emergency Environmental Incidents

- (A3) A Contingency Plan for Emergency Environmental Incidents must be developed prior to the carrying out of the petroleum activity(ies).
- (A4) The Contingency Plan for Emergency Environmental Incidents must include, but not necessarily be limited to:
- (a) a clear definition of what constitutes an environmental emergency incident or near miss for the petroleum activity(ies) authorised to be carried out under this environmental authority;
 - (b) identification of the types of environmental incidents that may occur, including but not limited to flooding impacts, relevant to the petroleum activity(ies) authorised to be carried out under this environmental authority;
 - (c) response procedures to minimise the extent and duration of environmental harm caused by environmental emergency incidents;
 - (d) the resources to be used in response to environmental emergency incidents;
 - (e) procedures for responding to incidents resulting from **hydraulic fracturing** activities, including specific rectification measures in the event of non-routine hydraulic fracturing events;
 - (f) plans for restoring loss of well mechanical integrity so as to prevent environmental harm;
 - (g) procedures to investigate the cause of any incidents including releases or near misses, and where necessary, the remedial actions to be implemented to reduce the likelihood of recurrence of similar events;
 - (h) the practices and procedures to be employed to restore the environment or mitigate any environmental harm caused;
 - (i) procedures for accessing monitoring locations during emergency environmental incidents;
 - (j) a receiving environment monitoring program, to be specifically implemented in the event of a release to waters or land to examine / assess environmental impacts. For monitoring of waters, this program must include upstream, downstream and impact site monitoring procedures. For soils monitoring, three replicate samples must be taken at depth intervals of 0-10 cm, 20-30 cm and 50-60 cm at both a reference site and the impact site as a minimum;
 - (k) communication procedures and lines of communication within and beyond the organisation, including but not limited to Local Government, to be employed in responding to environmental emergency incidents;
 - (l) the provision and availability of documented procedures to staff attending any emergency environmental incident to enable them to effectively respond;
 - (m) training of staff that will be called upon to respond to emergency environmental incidents to enable them to effectively respond;
 - (n) timely and accurate reporting of the circumstance and nature of emergency environmental incidents to the administering authority and any affected landholder, occupier and / or their nominated representative in accordance with conditions of this environmental authority.

Maintenance of Measures, Plant and Equipment

- (A5) The holder of the environmental authority must:

- (a) install all measures, plant and equipment necessary to ensure compliance with the conditions of this environmental authority;
 - (b) maintain such measures, plant and equipment in their proper and effective condition; and
 - (c) operate such measures, plant and equipment in a proper and effective manner.
- (A6) No change, replacement or alteration of any plant or equipment is permitted if the change, replacement or alteration materially increases, or is likely to increase, the environmental harm caused by the petroleum activity(ies).

Monitoring

- (A7) All monitoring required under this environmental authority must be undertaken by a suitably qualified person.
- (A8) All laboratory analyses and tests required to be conducted under this environmental authority must be carried out by a laboratory that has **NATA accreditation** for such analyses and tests, except as otherwise authorised by the administering authority.
- (A9) Any management or monitoring plans, systems, programs or procedures required to be developed and implemented by a condition of this environmental authority must be reviewed for performance and amended as required but not less than once every three (3) years in accordance with the requirements for the particular plans, systems, programs and procedures in the conditions of this environmental authority.
- (A10) If monitoring conducted in accordance with this environmental authority indicates a circumstance, condition or contaminant level has caused, or has potential to cause, environmental harm, the holder of this environmental authority must, as soon as is practicable, take the necessary actions to rectify the circumstance, condition or contaminant level so as to avoid or minimise environmental harm.

Surface water Sampling Methodology

- (A11) The methods of water sampling required by this environmental authority must comply with that set out in the latest edition of the *Queensland Monitoring and Sampling Manual* as amended from time to time.

Groundwater Sampling Methodology

- (A12) The methods of groundwater sampling required by this environmental authority must comply with the latest edition of the *Queensland Monitoring and Sampling Manual*, AS/NZS 5667:11 1998 *Water Sampling Guidelines – Part 11 Guidance on sampling groundwater*, and the Australian Government's *Groundwater Sampling and Analysis – A Field Guide* (2009:27 GeoCat #6890.1) as relevant and as may change from time to time.

Noise Sampling Methodology

- (A13) Noise must be measured in accordance with the prescribed standards in the *Environmental Protection Regulation 2019*.

Air Sampling Methodology

- (A14) The method of measurement of point source contaminant releases to air must comply with the latest edition of the *Queensland Air Quality Sampling Manual* and/or **Australian Standard 4323** as amended from time to time.

Documentation and Records Management

- (A15) A record of all **documents** required by this environmental authority must be kept for a minimum of five (5) **years**.
- (A16) All plans required by this environmental authority must be **certified** by a **suitably qualified person**.
- (A17) **Documents** required under this environmental authority must be developed in a way that is consistent with the requirements of this environmental authority.

SCHEDULE B – WATER**Contaminant Release**

- (B1) Contaminants must not be directly or indirectly **released** to any **waters** except as permitted under this environmental authority

Resource activities in wetlands, watercourses, lakes and springs

- (B2) Petroleum activities conducted in the former special floodplain management area within the **designated precinct**, as identified in Appendix A - Map 1, must be in accordance with conditions (B3) – (B17).
- (B3) With the exception of activities carried out for **specified works** and temporary campsites/workforce accommodation, only limited petroleum activities are permitted in the designated precinct.
- (B4) Specified works in the designated precinct must be co-located to the greatest possible extent.
- (B5) Specified works must not be constructed across a watercourse in the designated precinct, or across *Windula Creek* where an alternative watercourse crossing is already in existence and is within a reasonable distance.
- (B6) Temporary campsites/workforce accommodation and infrastructure necessary to support their operation are not prohibited within the designated precinct area provided that they do not occur within 200 lateral metres of a watercourse, lake or spring in the designated precinct.
- (B7) The size of any temporary campsites/workforce accommodation in the designated precinct is limited to 2250m² and no more than 30 people are accommodated at any time.
- (B8) Limited petroleum activities and temporary campsites/workforce accommodation in the designated precinct must not increase the natural movement of sediment beyond the work area and must not increase the delivery of sediment to water either during or following construction activities.
- (B9) Limited petroleum activities and temporary campsites/workforce accommodation in the designated precinct must not:
- (a) concentrate flood flows in a way that will or may cause or threaten an adverse impact in the designated precinct; or
 - (b) divert flood flows from natural drainage paths; or
 - (c) increase the local duration of floods; or
 - (d) increase the risk of detaining flood flows.

- (B10) Limited petroleum activities and specified works carried out within the bed and banks of a watercourse, wetland, lake or spring must:
- (a) not result in disturbance to the bed and banks of a watercourse, wetland, lake or spring beyond the minimum area necessary for the purpose of the disturbance; and
 - (b) be designed and undertaken by a suitably qualified person taking into account the matters listed in the 'Planning Activities' and 'Impact Management During Activities' sections of the administering authority's 'Guideline—Activities in a watercourse, lake or spring associated with mining operations' December 2010, as amended from time to time.
- (B11) Upon cessation of the works described above Condition (B10), rehabilitation must commence immediately.
- (B12) For activities carried out for pipelines or flow lines in the designated precinct:
- (a) any interference with overland flow and the potential for any interference with overland flow, must be temporary; and
 - (b) works must be planned in such a way as to minimise the potential for, and duration of, interference with overland flow; and
 - (c) the activities must not interfere with water in a watercourse, lake or spring (other than activities that are of a temporary nature).
- (B13) Prior to the construction of any limited petroleum activities that will result in significant disturbance in or on the bed and banks of a watercourse, it must be demonstrated that:
- (a) no reasonable or practicable alternative exists; and
 - (b) the activity is preferentially located in pre-existing areas of clearing or significant disturbance.
- (B14) The construction or maintenance of linear infrastructure activities in a watercourse must be conducted in the following preferential order:
- (a) firstly, in times where there is no water present;
 - (b) secondly, in times of no flow; and
 - (c) thirdly in times of flow, but in a way that does not impede low flow.
- (B15) Construction or maintenance activities must not release any contaminants to any waters that exceed the water quality limits specified in Protecting water values, *Schedule B - Table 1—Release limits for construction or maintenance of linear infrastructure*.

Schedule B - Table 1—Release limits for construction or maintenance of linear infrastructure.

Water quality parameters	Units	Water quality limits
Turbidity	Nephelometric Turbidity Units (NTU)	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. 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.
		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. 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.
Hydrocarbons	-	For within the designated precinct, or watercourse, no visible sheen or slick

- (B16) Monitoring must be undertaken at a frequency that is appropriate to demonstrate compliance with condition (B14).
- (B17) From 24 April 2020, records must be kept of all significant construction and maintenance activities causing disturbance and conducted in the designated precinct or a watercourse, which must include:
- (a) location of the activity (e.g. GPS coordinates (GDA94)); and
 - (b) duration of works.

River Improvement Areas

- (B18) All measures must be taken to prevent and/or minimise negative impacts to, or reversal of, any river improvement works carried out in River Improvement Areas by Queensland's River Improvement Trusts.

Activities in floodplains

- (B19) Petroleum activity(ies) on floodplains must be carried out in a way that does not:
- (a) concentrate flood flows in a way that will or may cause or threaten a negative environmental impact; or
 - (b) divert flood flows from natural drainage paths and after flow distribution; or

- (c) increase the local duration of floods; or
- (d) increase the risk of detaining flood flows

SCHEDULE C – REGULATED STRUCTURES

(C1) Regulated structures are not permitted.

SCHEDULE D - LAND

Contaminated releases

- (D1) Contaminants must not be directly or indirectly released to land except as permitted under this environmental authority.

Sewage Treatment Works

- (D2) The construction and operation of sewage treatment works is authorised if it is operated as a no-release works.

Soil Management

- (D3) Except in areas of highly erodible soils, **top soil** must be:
- (a) removed from an area prior to other significant disturbance commencing in the area;
 - (b) stockpiled in a manner that will minimise erosion and preserve its biological and chemical integrity; and
 - (c) used for on-site rehabilitation purposes.
- (D4) Highly erodible soils must not be disturbed as a result of the carrying out of the petroleum activity(ies).

Chemical Storage

- (D5) This environmental authority does not authorise chemical storage in excess of:
- (a) a total quantity of:
 - (i) 500 m³ of chemicals of class C1 or C2 combustible liquids or dangerous goods class 3 under AS 1940 *The Storage and Handling of Flammable and Combustible Liquids*; or
 - (ii) 50t or more of chemicals of dangerous goods class 1 or class 2, division 2.3; or
 - (b) 50 tonnes or more of chemicals of dangerous goods class 6, division 6.1 in containers capable of holding at least 900 kg of the chemicals.
- (D5) Chemicals and fuels on the relevant resource authorities must be contained within an on-site containment system and controlled in a manner that prevents environmental harm.
- (D6) All petroleum product storage's must be designed, constructed and maintained in accordance with AS 1940 - Storage and Handling of Flammable and Combustible Liquids.

Fauna Management

- (D7) Measures must be employed to prevent fauna entrapment:

- (a) during the construction of pipelines in pipe sections and pipeline trenches; or
- (b) during the construction and operation of well infrastructure.

Pipelines

- (D8) Each pipeline construction corridor must not exceed 30 metres in width.
- (D9) Turn around and work areas associated with pipeline construction corridors must not exceed 50 metres in width.
- (D10) The length of pipeline trench open at any one time must be minimised as far as practicable.
- (D11) Pipelines must be preferentially located alongside existing **linear infrastructure**.

Decommissioning pipelines

- (D12) Inactive buried pipelines must be decommissioned by in-situ decommissioning (abandonment in place).
- (D13) Prior to pipelines and equipment being disconnected they must be drained or vented and cleaned via purging or flushing.
- (D14) Any water used for purging or flushing the pipelines must be contained on **site**, tested and either:
 - (a) directly reused where suitable for the petroleum activity(ies);
 - (b) treated so that it meets water quality criteria for the intended reuse; or
 - (c) removed from the site for disposal or treatment at an appropriately authorised facility.

SCHEDULE E - DISTURBANCE TO LAND

Pre-disturbance assessment

- (E1) Prior to conducting petroleum activities that involve **significant disturbance to land**, an assessment must be undertaken of the condition, type and ecological value of soils and vegetation in such areas where the activity is proposed to take place.
- (E2) The assessment required by condition (E1) must be undertaken by a **suitably qualified person** and include the carrying out of field validation surveys, observations and mapping of any **Category A, B or C Environmentally Sensitive Areas, wetlands** and the presence of species classed as endangered, vulnerable, rare or near threatened under the *Nature Conservation Act 1992*.
- (E3) The assessment required by condition (E1) must include, but not necessarily be limited to:
- (a) baseline soils quality data and maps for the soil units to be disturbed;
 - (b) identification of the vegetation communities present (including species composition and regional ecosystem type¹ for native vegetation communities) within each area(s) to be disturbed;
 - (c) data representing each vegetation community present within each area(s) to be rehabilitated including:
 - (i) flora **species richness** and diversity;
 - (ii) structural data including woody stem count densities for dominant species within each stratum; and
 - (iii) percent **foliage cover** (accounting for seasonal variation and excluding **pests**);
 - (d) data regarding habitat features, including but not necessarily limited to:
 - (i) organic litter cover (%); and
 - (ii) trees with hollows $\geq 10\text{cm}$ diameter (count and number per hectare);
 - (iii) hollow bearing logs (count and number per hectare); and
 - (iv) fallen woody material (total length of logs $\geq 10\text{ cm}$ diameter per hectare and number of logs $\geq 10\text{cm}$ diameter per hectare); and
 - (e) data on the level of **ecosystem functioning**;
 - (f) a map or series of maps of suitable scale displaying the distributing of vegetation communities.

Mapping Validation

- (E4) If the assessment required by conditions (E1) to (E3) indicates that that an Environmentally Sensitive Area or **wetland** is incorrectly identified through State mapping, or is present and not identified by State

¹ Regional ecosystem type should be established using the most current version of the Qld Government's "*Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland*". Assessment of the vegetation communities should be sufficient to establish any inherent variation within a single regional ecosystem type.

mapping, the administering authority must be advised in writing before any significant disturbance to land takes place.

- (E5) Following the lodgement of the notification under condition (E4), **significant disturbance to land** within the relevant area is prohibited until the administering authority provides written advice that **significant disturbance to land** may proceed.

Site Planning

- (E6) When carrying out the petroleum activity(ies), the location of activities must be determined to:
- (a) in order of preference, avoid, minimise or mitigate any impacts on areas of vegetation or other areas of ecological value;
 - (b) minimise disturbance to land that may otherwise result in land degradation;
 - (c) ensure that for land that is to be significantly disturbed by the petroleum activity(ies):
 - (i) the top layer of the soil profile is removed and stockpiled separately in a manner that will preserve its biological and chemical properties; and
 - (ii) soils are used for rehabilitation purposes;
 - (d) avoid **clearing** mature trees.
- (E7) Prior to carrying out petroleum activities, the holder of this environmental authority must make all relevant staff, contractors or agents carrying out those petroleum activities, aware of the location of any State Significant Biodiversity Value, Category A, B or C Environmentally Sensitive Areas, wetlands and presence of species classed as endangered, vulnerable, rare or near threatened under the *Nature Conservation Act 1992* and the requirements of this environmental authority.
- (E8) Significant disturbance to land caused by the carrying out of the petroleum activity(ies) must not involve **clearing** vegetation or placing **fill**:
- (a) in a way which significantly isolates, fragments or dissects tracts of vegetation resulting in a reduction in the current level of ecosystem functioning, ecological connectivity (i.e. stepping stone or contiguous bioregional / local corridor networks) and / or results in an increase in **threatening processes**;
 - (b) on slopes greater than 10 % for the petroleum activity(ies) other than for pipelines and wells; or
 - (c) in **discharge areas**.
- (E9) Where petroleum activities are undertaken within high value regrowth or remnant vegetation, for linear infrastructure, that significant disturbance to land does not exceed the following areas:
- (a) 18 meters in width for dual carriage way roads;
 - (b) six (6) metres in width for access tracks not associated with a water or gas line; or
 - (b) for pipelines, including provision for a utility corridor and access track:
 - (i) 12 metres width for a single water or gas gathering line; or

- (ii) 18 metres width for a trench with one water gathering line and one parallel gas gathering pipeline; or
- (iii) 25 metres width for multiple trenches where there are three (3) parallel gas or water gathering lines; and
- (iv) seven (7) metres width for any additional trench for a water or gas line.

Disturbance to Land - Environmentally Sensitive Areas

- (E10) Petroleum activities must not be carried out within, or in the **primary protection zones** of Category A, B or C Environmentally Sensitive Areas.
- (E11) Only limited petroleum activities are permitted in the **secondary protection zone** of Category A, B and C Environmentally Sensitive Areas.

SCHEDULE F – ENVIRONMENTAL NUISANCE

Release of contaminants to the atmosphere

- (F1) The release of odour, dust or any other airborne contaminant(s), or light from the petroleum activity(ies) must not cause an environmental nuisance at any **sensitive place**.
- (F2) Individual or combined fuel burning equipment that is capable of burning at least 500 kg in an hour is not permitted under this environmental authority.

Nuisance monitoring

- (F3) When the administering authority advises of a complaint alleging nuisance, the holder must investigate the complaint as soon as practicable. The investigation is to include monitoring of environmental nuisance at any sensitive place within a reasonable and practical timeframe as specified by the administering authority.
- (F4) The administering authority must be advised in writing of the results of the investigation (including an analysis and interpretation of the monitoring results) and actions proposed or undertaken to resolve the complaint within five (5) business days of completing the complaint investigation, unless a longer time is agreed to in writing by the administering authority.
- (F5) If the investigation or monitoring in accordance with condition (F3) indicates that emissions exceed the limits set in this environmental authority or are causing environmental nuisance, then:
- (a) the complaint must be addressed including the use of alternative dispute resolution services if required; and / or
 - (b) abatement or attenuation measures must be implemented so that the authorised petroleum activity(ies) does not result in further environmental nuisance.
- (F6) Noise monitoring and recording required under this environmental authority must include, but not necessarily be limited to:
- (a) LAN,T (where N equals the statistical levels of 1, 10 and 90 and T=15 mins);
 - (b) LAeq adj, 15 mins;
 - (c) background noise level as LA 90, 15 mins;
 - (d) Max LpA, 15 mins ;
 - (e) the level and frequency of occurrence of impulsive or tonal noise and any adjustment and penalties to measured noise levels levels;
 - (f) atmospheric conditions including temperature, relative humidity and wind speed and directions;
 - (g) effects due to any extraneous factors such as traffic noise;
 - (h) location, date and time of monitoring;

- (i) if the complaint concerns low frequency noise, Max LpZ, 15 mins; and
- (j) if the complaint concerns low frequency noise, one third octave band measurements in dB(LIN) for centre frequencies in the 10 – 200 Hz range for both the noise source and the background noise in the absence of the noise source.

Noise

- (F7) The emission of noise from the petroleum activity(ies) authorised under this environmental authority must not result in levels greater than those specified in *Schedule F, Table 1 – Noise limits at Sensitive Receptors* in the event of a valid complaint about noise being made to the administering authority.

Schedule F, Table 1 – Noise Limits at Sensitive Receptors

Time Period	Metric	Short Term Noise Event	Medium Term Noise Event	Long Term Noise Event
7:00 am – 6:00 pm	L _{Aeq,adj,15 min}	45 dBA	43 dBA	40 dBA
6:00 pm – 10:00 pm	L _{Aeq,adj,15 min}	40 dBA	38 dBA	35 dBA
10:00 pm – 6:00 am	L _{Aeq,adj,15 min}	28 dBA	28 dBA	28 dBA
	Max L _{pA} , 15 mins	55 dBA	55 dBA	55 dBA
6:00 am – 7:00 am	L _{Aeq,adj,15 min}	40 dBA	38 dBA	35 dBA

1. The noise limits in Table 1 have been set based on the following deemed **background noise levels** (L_{ABG}):

7:00 am - 6:00 pm: 35 dBA

6:00 pm – 10:00 pm: 30 dBA

10:00 pm – 6:00 am: 25 dBA

6:00 am – 7:00 am: 30 dBA

- (F8) If the noise subject to a complaint is tonal or impulsive, the adjustments detailed in *Schedule F, Table 2 – Adjustments to be Added to Noise Levels at Sensitive Receptors* are to be added to the measured noise level(s) to derive L_{Aeq, adj, 15 min}.

Schedule F, Table 2 – Adjustments to be Added to Noise Levels at Sensitive Receptors

Noise Characteristic	Adjustment to Noise
Tonal characteristic is just audible	+ 2 dBA
Tonal characteristic is clearly audible	+ 5 dBA
Impulsive characteristic is just audible	+ 2 dBA
Impulsive characteristic is clearly audible	+ 5 dBA

- (F9) The method of measurement and reporting of noise levels must comply with the latest edition of the Administering Authorities (Environmental Protection Agency's) Noise Measurement Manual (2000) or the most recent version of *AS1055 Acoustics – Description and measurement of environmental noise*.

Low Frequency Noise

- (F10) Notwithstanding condition (F6), emission of any low frequency noise must not exceed the following limits in the event of a valid complaint about low frequency noise being made to the administering authority:
- (a) 60 dB(C) measured outside the sensitive receptor; and
 - (b) the difference between the external A-weighted and C-weighted noise levels is no greater than 20 dB; or
 - (c) 50 dB(Z) measured inside the sensitive receptor; and
 - (d) the difference between the internal A-weighted and Z-weighted noise levels is no greater than 15 dB.

Noise Monitoring

- (F11) Noise monitoring must be undertaken as soon as practicable when requested by the administering authority.
- (F12) The results of the noise monitoring must be reported to the administering authority within three (3) business days of completion of the monitoring event.

Vibration and Blasting

- (F13) Blasting activities are not permitted under this environmental authority.

SCHEDULE G – WASTE

General

- (G1) All general waste must only be removed from the site and sent to a recycling facility or disposal facility licensed to accept the waste under the *Environmental Protection Act 1994*.
- (G2) All regulated waste must only be removed from the site by a person who holds a current authority to transport such waste under the provisions of the *Environmental Protection Act 1994* and sent to a recycling facility or disposal facility licensed to accept the waste.
- (G3) Waste must not be burned on the site, unless it is vegetation and is authorised in writing under the *Forestry Act 1959*.
- (G4) All waste fluids and muds resulting from drilling and exploration petroleum activities, including hydraulic fracturing activities if authorised by this environmental authority, must be contained in a lined dam or containment structure for off-site disposal, remediation or reuse.

Storage

- (G5) All containment systems for waste liquids stored on site that have the potential to cause environmental harm must be designed to minimise rainfall collection within the system.

SCHEDULE H – REHABILITATION

Analogue Site for Rehabilitation Monitoring

- (H1) **Analogue sites** for measuring the success of rehabilitation activities on **significantly disturbed land** must be identified, mapped and surveyed prior to rehabilitation activities commencing.

Progressive Rehabilitation for Significantly Disturbed Land

- (H2) Pipelines trenches must be backfilled immediately after pipe laying and rehabilitated as soon as practicable but not longer than three (3) months after completion.
- (H3) During backfilling of pipeline trenches, soils must be replaced so that the soil horizons are consistent with the soil horizons of the immediately surrounding area.
- (H4) Backfilled and rehabilitated pipeline trenches must:
- (a) be a stable landform;
 - (b) exhibit no subsidence or erosion gullies for the life of the operational pipeline; and
 - (c) be re-profiled to a level consistent with surrounding soils; and
 - (d) be re-profiled to original contours and established drainage lines; and
 - (e) be visually consistent with the surround land features; and
 - (f) be vegetated with groundcover as a minimum to ensure that erosion is minimised.
- (H5) Progressive rehabilitation of significantly disturbed land caused by the carrying out of the petroleum activity(ies) (other than constructing pipelines) which is not required for the ongoing conduct of the petroleum activity(ies) must commence as soon as practicable, but not longer than nine (9) months following the completion of any construction or operational works associated with the petroleum activity(ies).
- (H6) Progressive rehabilitation of significantly disturbed land caused by the carrying out of the petroleum activity(ies) must be undertaken in accordance with the Schedule of Disturbance as submitted to the administering authority as part of the financial assurance calculations.
- (H7) Progressive rehabilitation of significantly disturbed land caused by the carrying out of the petroleum activity(ies) must:
- (a) remediate any contaminated land (e.g. contaminated soils, decommissioned dams containing salt);
 - (b) reshape all significantly disturbed land to a stable landform;
 - (c) reprofile all significantly disturbed land to original contours;

- (d) on all significantly disturbed land:
 - (i) re-establish surface drainage lines;
 - (ii) reinstate the top layer of the soil profile;
 - (iii) establish groundcover to ensure that erosion is minimised;
 - (iv) establishing vegetation of similar species composition and density cover to the analogue site;
- (e) undertake rehabilitation in a manner such that any actual and potential acid sulfate soils in or on the site are either not disturbed, or submerged, or are treated to prevent and / or minimise environmental harm.

Final Acceptance Criteria for Significantly Disturbed Land

- (H8) All significantly disturbed land caused by the carrying out of the petroleum activity(ies) must be rehabilitated to meet the following final acceptance criteria:
- (a) For all land use(s):
 - (i) all significantly disturbed land is reinstated to the pre-disturbed soil suitability class;
 - (ii) the landform is safe for humans and fauna;
 - (iii) the landform is stable with no subsidence or erosion gullies for at least three (3) years;
 - (iv) all significantly disturbed land is reinstated so that the distribution of vegetation communities represents that of the analogue site;
 - (v) there is no ongoing contamination to waters;
 - (vi) the maintenance requirements for rehabilitated land is no greater than that required for the land prior to its disturbance caused by carrying out the petroleum activity(ies).
 - (b) Additional requirements for sites that are being reinstated to native ecosystems:
 - (i) each vegetation community must be re-established so that each of the following rehabilitation parameters are maintained for at least three (3) years:
 - (a) the rehabilitated site shows distinct and progressive re-establishment of the various strata which characterise the vegetation community in the analogue site;
 - (b) all dominant species within each strata are re-established at densities equivalent to that of the analogue site;
 - (c) notwithstanding (H8) (b)(i) and (H8) (b)(ii), a minimum of 70% **species richness** and **species diversity** is observed when compared to the relevant analogue site;
 - (d) a minimum of 50% **foliage cover** is observed when compared to the relevant analogue site;
 - (e) each vegetation community must be rehabilitated and maintained until it can be demonstrated that it is resilient and self-sustaining (demonstrated by reproduction and colonisation); and
 - (f) percent organic litter cover, count and density of hollow bearing logs and nest boxes (as replacement for trees with hollows ≥ 10 cm diameter) and fallen woody material (total length of logs ≥ 10 cm diameter per hectare and number of logs ≥ 10 cm per

hectare) have been installed at numbers and densities no lower than the analogue site.

Rehabilitation Monitoring Program

- (H9) A Rehabilitation Monitoring Program must be developed prior to carrying out any petroleum activity authorised as per Condition (A1).
- (H10) The Rehabilitation Monitoring Program must include, but not necessarily be limited to:
- (a) methods to measure subsidence and erosion rates at rehabilitated buried transmission pipeline corridors and buried flow lines;
 - (b) monitoring of indicators identified in the Rehabilitation Plan at analogue sites to measure progressive and final rehabilitation success relevant to the final land use(s); and
 - (c) frequency and seasonality of monitoring analogue sites and rehabilitated areas to **assess** rehabilitation success; and
 - (d) identification of the experimental design for analysing analogue and rehabilitated site data including statistical methods of analyses.

Monitoring of Progressive Rehabilitation

- (H11) Regular maintenance and at least yearly monitoring of rehabilitated areas must take place to measure compliance with condition (H4) and (H7) .

Monitoring of Final Rehabilitation Success

- (H12) Final acceptance criteria are deemed to be met when monitoring of rehabilitated areas demonstrate compliance with the requirements of condition (H8) for three (3) consecutive years.

SCHEDULE I – WELL CONSTRUCTION, MAINTAINANCE AND HYDRAULIC FRACTURING ACTIVITIES

Drilling Activities

- (I1) **Oil based drilling muds** must not be used in the carrying out of the petroleum activity(ies).
- (I2) **Synthetic oil-based drilling muds** must not be used in the carrying out of the petroleum activity(ies).
- (I3) Drilling activities must not result in the connection of the target gas producing formation and another aquifer.
- (I4) Practices and procedures must be in place to detect, as soon as practicable, any fractures that have or may result in the connection of a target formation and another aquifer as a result of drilling activities.

Hydraulic Fracturing Activities

- (I5) Polycyclic aromatic hydrocarbons or products that contain polycyclic aromatic hydrocarbons must not be used in hydraulic fracturing fluids in concentrations above the reporting limit.
- (I6) Hydraulic fracturing activities must not negatively affect water quality, other than that within the **stimulation impact zone** of the target gas producing formation.
- (I7) Hydraulic fracturing activities must not cause the connection of the target gas producing formation and another aquifer.
- (I8) The holder of this authority must ensure the internal and external mechanical integrity of the well system prior to and during hydraulic fracturing such that there is:
 - (a) no significant leakage in the casing, tubing, or packer; and
 - (b) there is no significant fluid movement into another aquifer through vertical channels adjacent to the well bore hole.
- (I9) Practices and procedures must be in place to detect, as soon as practicable, any fractures that cause the connection of a target gas producing formation and another aquifer.

Stimulation Risk Assessment

- (I10) Prior to undertaking well hydraulic fracturing activities, a risk assessment must be developed to ensure that stimulation activities are managed to prevent environmental harm.

Water Quality Baseline Monitoring

- (I11) Prior to undertaking any hydraulic fracturing activity, a baseline bore assessment must be undertaken of the water quality of:
- (a) all landholders' active groundwater bores (subject to access being permitted by the landholder) that are spatially located within a two (2) kilometre horizontal radius from the location of the stimulation initiation point within the target gas producing formation; and
 - (b) all landholders' active groundwater bores (subject to access being permitted by the landholder) in any aquifer that is within 200 metres above or below the target gas producing formation and is spatially located with a two (2) kilometre radius from the location of the stimulation initiation point; and
 - (d) any other bore that could potentially be adversely impacted by the stimulation activity(ies) in accordance with the findings of the risk assessment required by conditions (I10) and (I11).
- (I12) Prior to undertaking stimulation activities at a well, there must be sufficient water quality data to accurately represent the water quality in the well to be stimulated. The data must include as a minimum the results of analyses for the parameters in condition (I13) .
- (I13) Baseline bore and well assessments must include relevant **analytes** and physico-chemical parameters to be monitored in order to establish baseline water quality and must include, but not necessarily be limited to:
- (a) pH;
 - (b) electrical conductivity [$\mu\text{S}/\text{m}$];
 - (c) turbidity [NTU];
 - (d) total dissolved solids [mg/L];
 - (e) temperature [$^{\circ}\text{C}$];
 - (f) dissolved oxygen [mg/L]
 - (g) dissolved gases (methane, chlorine, carbon dioxide, hydrogen sulfide) [mg/L];
 - (h) alkalinity (bicarbonate, carbonate, hydroxide and total as CaCO_3) [mg/L];
 - (i) sodium adsorption ratio (SAR);
 - (j) anions (bicarbonate, carbonate, hydroxide, chloride, sulphate) [mg/L];
 - (k) cations (aluminium, calcium, magnesium, potassium, sodium) [mg/L];
 - (l) dissolved and total metals and metalloids (including but not necessarily being limited to: aluminium, arsenic, barium, borate (boron), cadmium, chromium III, copper, iron, fluoride, lead, manganese, mercury, nickel, selenium, silver, strontium, tin and zinc) [$\mu\text{g}/\text{L}$];
 - (m) total petroleum hydrocarbons [$\mu\text{g}/\text{L}$];
 - (n) **BTEX** (as benzene, toluene, ethylbenzene, ortho-xylene, para-xylene, meta-xylene and total xylene) [$\mu\text{g}/\text{L}$];
 - (o) polycyclic aromatic hydrocarbons (including but not necessarily being limited to: naphthalene, phenanthrene, benzo[a]pyrene) [$\mu\text{g}/\text{L}$];

- (q) sodium hypochlorite [mg/L];
- (r) sodium hydroxide [mg/L];
- (s) formaldehyde [mg/L];
- (t) ethanol [mg/L]; and
- (u) gross alpha + gross beta or radionuclides by gamma spectroscopy [Bq/L].

Stimulation Impact Monitoring Program

- (I14) A Stimulation Impact Monitoring Program must be developed prior to the carrying out of hydraulic fracturing activities which must be able to detect adverse impacts to water quality from hydraulic fracturing activities and must consider the findings of the risk assessment required by condition (I10) that relate to hydraulic fracturing activities and must include, as a minimum, monitoring of:
- (a) the stimulation fluids to be used in hydraulic fracturing activities at sufficient frequency and which sufficiently represents the quantity and quality of the fluids used; and
 - (b) flow back waters from stimulation activities at sufficient frequency and which sufficiently represents the quality of that flow back water; and
 - (c) flow back waters from hydraulic fracturing activities at sufficient frequency and accuracy to demonstrate that 150 % of the volume used in stimulation activities has been extracted from the stimulated well; and
 - (d) all bores in accordance with condition (I11) .
- (I15) The Stimulation Impact Monitoring Program must provide for monitoring of:
- (a) analytes and physico-chemical parameters relevant to baseline bore and well assessments to enable data referencing and comparison including, but not necessarily being limited to the analytes and physico-chemical parameters in condition (I14); and
 - (b) any other analyte or physico-chemical parameters that will enable detection of adverse water quality impacts and the inter-connection with a non-target aquifer as a result of hydraulic fracturing activities including chemical compounds that are actually or potentially formed by chemical reactions with each other or coal seam materials during hydraulic fracturing activities.
- (I16) The Stimulation Impact Monitoring Program must provide for monitoring of the bores in condition (I14) (d) at the following minimum frequency:
- (a) monthly for the first six (6) months subsequent to the hydraulic fracturing activities being undertaken; then
 - (b) annually for the first five (5) years subsequent to the hydraulic fracturing activities being undertaken or until analytes and physico-chemical parameters listed in condition (I13) (b), (I13) (n) – (I13) (u) are not detected in concentrations above baseline bore monitoring data on two (2) consecutive monitoring occasions.
- (I17) The results of the Stimulation Impact Monitoring Program must be made available to any potentially affected landholder upon request by that landholder.

SCHEDULE J – COMMUNITY ISSUES

- (J1) A record of all valid complaints and incidents causing environmental harm, and actions taken in response to the valid complaint or incident must be kept.
- (J2) The following details for all valid complaints received must be recorded:
- (a) name, address and contact number for valid complainant;
 - (b) time and date of valid complaint;
 - (c) reasons for the complaint as stated by the valid complainant;
 - (d) investigations undertaken in response to the valid complaint;
 - (e) conclusions formed;
 - (f) actions taken to resolve the valid complaint;
 - (g) any abatement measures implemented to mitigate the cause of the valid complaint; and
 - (h) name and contact details of the person responsible for resolving the valid complaint.

SCHEDULE K – NOTIFICATION

- (K1) The Department of Environment and Heritage Protection Pollution Hotline (telephone: 1300 130 372) must be notified as soon as reasonably practicable, but within 48 hours after becoming aware of:
- (a) a release of contaminants as provided for in condition (K2) ; or
 - (b) any event where environmental harm (excluding environmental nuisance) has been caused or may be caused; or
 - (c) any detection of **restricted stimulation fluids** from stimulation fluid monitoring; or
 - (d) any result from baseline bore, well or stimulation impact monitoring that exceeds a water quality objective for the protection of an environmental value of that water resource.
 - (e) any non-compliance with any condition of this environmental authority other than in relation to a release of contaminants; or
 - (f) any incident where there is a potential or actual loss of well integrity (e.g. when the annulus pressure during stimulation increases by more than 3.5 MPa from the pressure immediately preceding stimulation).
- (K2) The Department of Environment and Heritage Protection Pollution Hotline (telephone: 1300 130 372) must be notified as soon as reasonably practicable, but within 48 hours after becoming aware of the following releases (or their mixtures):
- (a) releases of any volume of contaminants to water;
 - (b) releases of volumes of contaminants to land greater than:
 - (i) 200L of hydrocarbons; or
 - (ii) 200 L of stimulation additives; or
 - (iii) 500 L of stimulation fluids; or
 - (iv) 1000 L of **brine**; or
 - (v) 5 000 L of sewage or treated sewage effluent.
- (K3) The notification of emergencies or incidents as required by condition (K2) must be submitted to the administering authority using a *Notice Duty to Notify Harm (EM468)*.
- (K4) Unless a longer time is agreed to in writing by the administering authority, a written report must be provided to the administering authority within 10 business days of notification under condition (K3) including the following (where relevant to the emergency or incident):
- (a) the root cause of the emergency or incident;
 - (b) the confirmed quantities and types of any contaminants involved in the incident;
 - (c) results and interpretation of any analysis of samples taken at the time of the emergency or incident (including the analysis results of any impact monitoring);
 - (d) a final assessment of the impacts from the emergency or incident including any actual or potential environmental harm that has occurred or may occur in the longer term as a result of the release;

- (e) the success or otherwise of actions taken at the time of the incident to prevent or minimise environmental harm;
- (f) results and current status of landholder consultation, including commitment to resolve any outstanding issues / concerns; and
- (g) actions and / or procedural changes to prevent a recurrence of the emergency or incident.

SCHEDULE L – DEFINITIONS

administering authority means:

- (a) for a matter, the administration and enforcement of which has been devolved to a local government under section 514 of the *Environmental Protection Act 1994* – the local government; or
- (b) for all other matters – the Chief Executive of the Department of Environment and Heritage Protection; or
- (c) another State Government Department, Authority, Storage Operator, Board or Trust, whose role is to administer provisions under other enacted legislation.

analogue site means an area of land which contains values and characteristics representative of an area to be rehabilitated prior to disturbance. Such values must encompass land use, topographic, soil, vegetation and other ecological characteristics. Analogue sites can be the pre-disturbed site of interest where significant surveying effort has been undertaken to establish benchmark parameters such as that ground truthing assessment required under the Land Schedule of this environmental authority.

analytes means a chemical parameter determined by either physical measurement in the field or by laboratory analysis.

annual exceedance probability or **AEP** is the probability that a given rainfall total accumulated over a given duration will be exceeded in any one year.

appraisal well means a petroleum well to test the potential of one (1) or more natural underground reservoirs for producing or storing petroleum. For clarity, an appraisal well does not include an exploration well.

Australian Standard 4323 means Australian Standard 4323.1:1995 *Stationary source emissions method 1: Selection of sampling positions*.

authorised person means a person holding office as an authorised person under an appointment under the *Environmental Protection Act 1994* by the chief executive or chief executive officer of a local government.

background noise level means the sound pressure level, measured in the absence of the noise under investigation, as the $L_{A90,T}$ being the A-weighted sound pressure level exceeded for 90 percent of the measurement time period T of not less than 15 minutes, using Fast response.

bed and banks for a watercourse or wetland means land over which the water of the watercourse or wetland normally flows or that is normally covered by the water, whether permanently or intermittently; but does not include land adjoining or adjacent to the bed or banks that is from time to time covered by floodwater.

bore means a water observation bore or a water supply bore that is either sub-artesian or artesian.

brine means saline water with a total dissolved solid concentration greater than 40 000 mg/l.

bund or bunded in relation to spill containment systems for fabricated or manufactured tanks or containers designed to a recognised standard means an embankment or wall of brick, stone, concrete or other impervious material which may form part or all of the perimeter of a compound and provides a barrier to retain liquid. Since the bund is the main part of a spill containment system, the whole system (or bunded area) is sometimes colloquially referred to within industry as the bund. The bund is designed to contain spillages and leaks from liquids used, stored or processed above ground and to facilitate clean-up operations. As well as being used to

prevent pollution of the receiving environment, bunds are also used for fire protection, product recovery and process isolation.

business day has the meaning in the *Acts Interpretation Act 1954* and means a day that is not—

- a Saturday or Sunday; or
- a public holiday, special holiday or bank holiday in the place in which any relevant act is to be or may be done.

BTEX means benzene, toluene, ethylbenzene, ortho-xylene, para-xylene, meta-xylene and total xylene.

Category A Environmentally Sensitive Area means any area listed in Schedule 19, Part 1, section 1 of the Environmental Protection Regulation 2019.

Category B Environmentally Sensitive Area means any area listed in Schedule 19, Part 1, section 2 of the Environmental Protection Regulation 2019.

Category C Environmentally Sensitive Area means any of the following areas:

- Nature Refuges as defined under the *Nature Conservation Act 1992*;
- Koala Habitat Areas as defined under the Nature Conservation (Koala) Conservation Plan 2006;
- State Forests or Timber Reserves as defined under the *Forestry Act 1959*;
- Declared catchment areas under the *Water Act 2000*;
- Resources reserves under the *Nature Conservation Act 1992*;
- An area identified as “Essential Habitat” or “Essential Regrowth Habitat” under the *Vegetation Management Act 1999* for a species of wildlife listed as endangered, vulnerable, rare or near threatened under the *Nature Conservation Act 1992*; or
- Of Concern Regional Ecosystems identified in the database called ‘RE description database’ containing Regional Ecosystem numbers and descriptions.
- Threshold regional ecosystems as defined and listed in Appendix 6 of the *Queensland Biodiversity Offsets Policy*; or
- Critically limited regional ecosystems as defined and listed in Appendix 5 of the *Queensland Biodiversity Offsets Policy*.

certification or certified by a suitably qualified and experienced person in relation to a design plan, ‘as constructed’ drawings or an annual report regarding dams, means that a statutory declaration has been made by that person and, when taken together with any attached or appended documents referenced in that declaration, all of the following aspects are addressed and are sufficient to allow an independent audit at any time:

- exactly what is being certified and the precise nature of that certification.
- the relevant legislative, regulatory and technical criteria on which the certification has been based;
- the relevant data and facts on which the certification has been based, the source of that material, and the efforts made to obtain all relevant data and facts; and

- the reasoning on which the certification has been based using the relevant data and facts, and the relevant criteria.

certify or certification or certified in relation to any matter other than a design plan, ‘as constructed’ drawings or an annual report regarding dams in this environmental authority means a Statutory Declaration by a suitably qualified person accompanying the written document stating that:

- all relevant material has been considered in the written document; and
- that the content of the written document is accurate and true; and
- that the written document meets the requirements of the relevant conditions of the environmental authority.

clearing has the meaning in the dictionary of the Vegetation Management Act 2000 and for vegetation—

(a) means remove, cut down, ringbark, push over, poison or destroy in any way including by burning, flooding or draining; but

(b) does not include destroying standing vegetation by stock, or lopping a tree.

dams means a land-based structure or a void that is designed to contain, divert or control flowable substances, and includes any substances that are thereby contained, diverted or controlled by that land-based structure or void and associated works. A dam does *not* mean a fabricated or manufactured tank or container, designed and constructed to an Australian Standard that deals with strength and structural integrity of that tank or container.

design plan is the documentation required to describe the physical dimensions of the dam, the materials and standards to be used for construction of the dam, and the criteria to be used for operating the dam. The documents must include design and investigation reports, specifications and certifications, together with the planned decommissioning and rehabilitation works and outcomes. A design plan may include ‘as constructed’ drawings.

designated precinct has the meaning in Part 5 section 15(3) of the Regional Planning Interests Regulation 2014 and means:

- for a strategic environmental area mentioned in section 4(1) – the area identified as a designated precinct on the strategic environmental area map for the strategic environmental area; or
- if a strategic environmental area is shown on a map in a regional plan – the area identified on the map as a designated precinct for the strategic environmental area.

development well means a petroleum well which produces or stores petroleum. For clarity, a development well does not include an appraisal well.

discharge area means:

- that part of the land surface where groundwater discharge produces a net movement of water out of the groundwater; and
- identified by an assessment process consistent with the document “Salinity Management Handbook” Queensland Department of Natural Resources, 1997, as amended from time to time; or
- identified by an approved salinity hazard map.

document has the meaning in the *Acts Interpretation Act 1954* and means:

- any paper or other material on which there is writing; and
- any paper or other material on which there are marks; and
- figures, symbols or perforations having a meaning for a person qualified to interpret them; and
- any disc, tape or other article or any material from which sounds, images, writings or messages are capable of being produced or reproduced (with or without the aid of another article or device).

ecosystem functioning means the interactions between and within living and nonliving components of an ecosystem and generally correlates with the size, shape and location of an area of vegetation.

end means the stopping of the particular activity that has caused a significant disturbance in a particular area. It refers to, among other things, the end of a seismic survey or the end of a drilling operation. It does not refer to the end of all related petroleum activities such as rehabilitation. In other words, it does not refer to the 'completion' of the petroleum activity(ies), the time at which the petroleum authority ends or the time that the land in question ceases to be part of an authority.

equivalent person or EP has the meaning under section 3 of the Planning Guidelines For Water Supply and Sewerage, 2005, published by the Queensland Government. It is calculated in accordance with Schedule 2, Section 63 of the Environmental Protection Regulation 2019 where:

- $EP = V/200$ where V is the volume, in litres, of the average dry weather flow of sewage that can be treated at the works in a day; or
- $EP = M/2.5$ where M is the mass, in grams, of phosphorus in the influent that the works are designed to treat as the inlet load in a day.

exploration well means a petroleum well that is drilled to:

- explore for the presence of petroleum or natural underground reservoirs suitable for storing petroleum; or
- obtain stratigraphic information for the purpose of exploring for petroleum.

For clarity, an exploration well does not include an appraisal or development well.

exploring for petroleum means carrying out an activity for the purpose of finding petroleum or natural underground reservoirs as per section 14 of the *Petroleum and Gas (Production and Safety) Act 2004* for example including:

- conducting a geochemical, geological or geophysical survey;
- drilling a well;
- carrying out testing in relation to a well;
- taking a sample for chemical or other analysis.

fill means any kind of material in solid form (whether or not naturally occurring) capable of being deposited at a place but does not include material that forms a part of, or is associated with, a structure constructed in a watercourse, wetland or spring including a bridge, road, causeway, pipeline, rock revetment, drain outlet works, erosion prevention structure or fence.

floodplain has the meaning in the *Water Act 2000* and means an area of reasonably flat land adjacent to a watercourse that—

- is covered from time to time by floodwater overflowing from the watercourse; and
- does not, other than in an upper valley reach, confine floodwater to generally follow the path of the watercourse; and
- has finer sediment deposits than the sediment deposits of any bench, bar or in-stream island in the watercourse.

flowable substance means matter or a mixture of materials which can flow under any conditions potentially affecting that substance. Constituents of a flowable substance can include water, other liquids fluids or solids, or a mixture that includes water and any other liquids fluids or solids either in solution or suspension.

foliage cover means the proportion of the ground, which would be shaded if sunshine came from directly overhead and is defined for each stratum. It includes branches and leaves and is similar to the crown type of Walker and Hopkins (1990) but is applied to a stratum or plot rather than an individual crown.

foreseeable future means the period used for assessing the total probability of an event occurring. Permanent structures and ecological sustainability should be expected to still exist at the end of a 150 year foreseeable future with an acceptably low probability of failure before that time.

geophysical survey means a systematic collection of geophysical data.

hazard category means a category, either low significant or high, into which a dam is assessed as a result of the application of tables and other criteria in *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams*, published by the Department of Environment and Resource Management, as amended from time to time.

high value regrowth vegetation means

- any of the following:
 - an endangered regional ecosystem;
 - an of concern regional ecosystem;
 - a least concern regional ecosystem; and
- have not been cleared since 31 December 1989; and
- is shown on a regrowth vegetation map.

hydraulic fracturing means a technique used to create cracks in underground coal seams to increase the flow and recovery of gas or oil out of a well. It involves pumping a fluid, comprised largely of water and sand, under pressure, into a coal seam. This action fractures the coal seam which provides a pathway that increases the ability for gas to flow through the coal.

hydraulic performance means the capacity of a regulated dam to contain or safely pass flowable substances based on a probability (AEP) of performance failure specified for the relevant hazard category *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams*, published by the Department of Environment and Resource Management, as amended from time to time.

impulsive noise means sound characterised by brief excursions of sound pressure (acoustic impulses) that significantly exceed the background sound pressure. The duration of a single impulsive sound is usually less than one second.

Incidental activities for this environmental authority means an activity that is not a specified petroleum activity and is necessary to carry out the activities authorised by this environmental authority.

infrastructure means plant or works including for example, communication systems, compressors, powerlines, pumping stations, reservoirs, roads and tracks, water storage dams, evaporation or storage ponds and tanks, equipment, buildings and other structures built for the purpose and duration of the conduct of the petroleum activity(ies) including temporary structures or structures of an industrial or technical nature, including, for example, mobile and temporary camps.

Infrastructure does not include other facilities required for the long term management of the impact of those petroleum activities or the protection of potential resources. Such other facilities include dams other than water storage dams, pipelines and assets, that have been decommissioned, rehabilitated, and lawfully recognised as being subject to subsequent transfer with ownership of the land.

L_{Aeq}, adj, 15 mins means the A-weighted sound pressure level of a continuous steady sound, adjusted for tonal character, that within any 15 minute period has the same square sound pressure as a sound level that varies with time.

L_{A 90}, adj, 15 mins means the A-weighted sound pressure level, adjusted for tonal character, that is equal to or exceeded for 90% of any 15 minutes sample period equal, using Fast response

lake means:

- a lagoon, swamp or other natural collection of water, whether permanent or intermittent; and
- the bed and banks and any other element confining or containing the water.

Land means the solid substance of the earth's surface.

Land degradation has the meaning in the Vegetation Management Act 1999 and means the following:

- soil erosion
- rising water tables
- the expression of salinity
- mass movement by gravity of soil or rock
- stream bank instability
- a process that results in declining water quality.

landholders' active groundwater bores for the purposes of stimulation baseline and impact monitoring in this environmental authority means bores that are able to continue to provide a reasonable yield of water in terms of quantity for the bores authorised purpose or use. This term does not include monitoring bores owned by the administering authority of the *Water Act 2000*.

leachate means a liquid that has passed through or emerged from, or is likely to have passed through or emerged from, a material stored, processed or disposed of on site which contains soluble, suspended or miscible contaminants likely to have been derived from the said material.

limited petroleum activities mean only the following petroleum activities:

- well sites not exceeding 1 hectare disturbance and multi-well sites not exceeding 1.5 hectare disturbance. Well sites may include the following infrastructure:
 - well pads;
 - water pumps and generators associated with well operations;
 - sumps for storing drilling muds;
 - flare pits;
 - ponds used to contain and / or store stimulation fluid;
- geophysical surveys (including seismic petroleum activities);
- ecological geological surveys (including seismic petroleum activities);
- gathering / flow pipelines from a well head to the initial compression facility;
- supporting access tracks; and
- communication and power lines that are necessary for the undertaking of petroleum activities and that are located within well sites, well pads and pipeline right of ways without increasing the disturbance area of petroleum activities.

For clarity, limited petroleum activities exclude and exclusions are not necessarily limited to:

- the construction of infrastructure for processing or storing petroleum or by-products;
- low hazard dams (that do not meet the limitations prescribed above);
- regulated dams;
- borrow pits;
- compressor stations;
- campsites / workforce accommodation;
- pipelines which are used to transport gas after the initial compression facility (e.g. trunk pipelines, transmission pipelines or pipelines that require a pipeline licence);
- waste disposal; or
- other supporting infrastructure for the project (e.g. sewage treatment plants).

linear infrastructure means powerlines, pipelines, roads and access tracks.

long term noise event is a noise exposure, when perceived at a sensitive receptor, persists for a period of greater than five (5) days, even when there are respite periods when the noise is inaudible within those five (5) days.

lopping a tree, means cutting or pruning its branches, but does not include—

- removing its trunk; and
- cutting or pruning its branches so severely that it is likely to die.

low hazard dam means any dam that is not classified as high or significant as assessed using the *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams*, published by the Department of Environment and Resource Management and which contains contaminants in concentrations which exceed or will exceed during the dam's operational life, the values or range shown in Table 3 of said Manual.

low impact petroleum activities means limited petroleum activities which do not result in the clearing of native vegetation, cause disruption to soil profiles through earthworks or excavation or result in significant disturbance to land. Examples of such activities include but are not necessarily limited to soil surveys, topographic surveys, cadastral surveys and ecological surveys and traversing land by car or foot via existing access tracks or routes or in such a way that does not result in permanent damage to vegetation.

Max $L_{pA, 15 \text{ min}}$ means the absolute maximum instantaneous A-weighted sound pressure level, measured over 15 minutes.

medium term noise event is a noise exposure, when perceived at a sensitive receptor, persists for an aggregate period not greater than five (5) days and does not re-occur for a period of at least four (4) weeks. Re-occurrence is deemed to apply where a noise of comparable level is observed at the same receptor location for a period of one hour or more, even if it originates from a difference source or source location.

meter means a device for measuring, or giving an output signal proportional to, quantities of water passed and/or the rate of flow in a pipe.

month has the meaning in the Acts Interpretation Act 1954 and means a calendar month and is a period starting at the beginning of any day of one (1) of the 12 named months and ending—

- immediately before the beginning of the corresponding day of the next named month; or
- if there is no such corresponding day—at the end of the next named month.

NATA accreditation means accreditation by the National Association of Testing Authorities Australia.

oil-based drilling mud means mud where the base fluid is a petroleum product such as diesel fuel.

pest means species:

- declared under the *Land Protection (Pest and Stock route Management) Act 2002*;
- declared under Local Government model local laws; and
- which may become invasive in the future.

populated area includes towns and cities which have a population of 200 or more people and with a minimum density of 40 people / km².

primary protection zone means an area within a 200 metre buffer from the boundary of any Category A, B or C Environmentally Sensitive Area.

regulated dam means any dam in the significant or high hazard category as assessed using the *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams*, published by the Department of Environment and Resource Management, as amended from time to time.

regulated structure means any dam or levee in the significant or high hazard category as assessed using the *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams*, published by the Department of Environment and Heritage Protection, as amended from time to time.

rehabilitation means the process of reshaping and revegetating land to restore it to a stable landform and in accordance with the acceptance criteria set out in this environmental authority and, where relevant, includes remediation of contaminated land.

regrowth vegetation map means a map certified by the chief executive as the regrowth vegetation map for the State and showing for the State:

- areas of regrowth vegetation, identified on the map as high-value regrowth vegetation, that—
 - are any of the following:
 - (i) an endangered regional ecosystem;
 - (ii) an of concern regional ecosystem;
 - (iii) a least concern regional ecosystem; and
 - have not been cleared since 31 December 1989; and
- particular watercourses in the Burdekin, Mackay Whitsunday and Wet Tropics catchments, identified on the map as regrowth watercourses; and
- areas the chief executive decides under section 20AI to show on the map as high value regrowth vegetation.

remnant vegetation means vegetation, part of which forms the predominant canopy of the vegetation—

- covering more than 50 % of the undisturbed predominant canopy; and
- averaging more than 70 % of the vegetation's undisturbed height; and
- composed of species characteristic of the vegetation's undisturbed predominant canopy cover.

release of a contaminant into the environment includes:

- (a) to deposit, discharge, emit or disturb the contaminant; and
- (b) to cause or allow the contaminant to be deposited, discharged, emitted or disturbed; and
- (c) to allow the contaminant to escape; and
- (d) to fail to prevent the contaminant from escaping.

reporting limit means the lowest concentration that can be reliably measured within specified limits of precision and accuracy during routine laboratory operating conditions. For many analytes, the reporting limit is selected as the lowest non-zero standard in the calibration curve. Results that fall below the reporting limit will be reported as "less than" the value of the reporting limit. The reporting limit is also referred to as the practical quantitation limit or the limit of quantitation.

restricted stimulation fluids means fluids used for the purpose of stimulation, including fracturing, that contain the following chemicals in more than the maximum amounts prescribed under section 81B of the *Environmental Protection Regulation 2008*:

- petroleum hydrocarbons containing benzene, ethylbenzene, toluene or xylene; or
- chemicals that produce, or are likely to produce, benzene, ethylbenzene, toluene or xylene as the chemical breaks down in the environment.

The amount of any chemical is not measured in relation to water included in the restricted stimulation fluid.

secondary protection zone in relation to a Category A Environmentally Sensitive Area means an area within an 800 metre buffer from the boundary of a primary protection zone.

secondary protection zone in relation to a Category B or C Environmentally Sensitive Area means a area within a 300 metre buffer from the boundary of a primary protection zone.

sensitive place means:

- a dwelling (including residential allotment, mobile home or caravan park, residential marina or other residential premises, motel, hotel or hostel; or
- a library, childcare centre, kindergarten, school, university or other educational institution;
- a medical centre, surgery or hospital; or
- a protected area; or
- a public park or garden that is open to the public (whether or not on payment of money) for use other than for sport or organised entertainment; or
- a work place used as an office or for business or commercial purposes, which is not part of the petroleum activity(ies) and does not include employees accommodation or public roads.
- for noise, a place defined as a sensitive receptor for the purposes of the Environmental Protection (Noise) Policy 2019.

sensitive receptor is defined in Schedule 2 of the Environmental Protection (Noise) Policy 2019, and means an area or place where noise is measured.

short term noise event is a noise exposure, when perceived at a sensitive receptor, persists for an aggregate period not greater than eight hours and does not re-occur for a period of at least seven (7) days. Re-occurrence is deemed to apply where a noise of comparable level is observed at the same receptor location for a period of one hour or more, even if it originates from a different source or source location.

significantly disturbed land or significant disturbance to land or significant disturbance means Land is significantly disturbed if–

- (a) it is contaminated land; or
- (b) it has been disturbed and human intervention is needed to rehabilitate it–
 - (i) to a condition required under the relevant environmental authority; or

- (ii) if the environmental authority does not require the land to be rehabilitated to a particular condition—to the condition it was in immediately before the disturbance.

Without limiting subsection (1)(b), land requires human intervention to rehabilitate it if—

- (a) the disturbance has made the land more susceptible to erosion; or
- (b) the land use capability or suitability of the land is diminished; or
- (c) the quality of water in a watercourse downstream of the land has been significantly reduced.

site means the area within the petroleum authority or authorities to which this environmental authority relates.

species richness means the number of different species in a given area.

species diversity means the diversity within an ecological community that incorporates both species richness and the evenness of species' abundances.

specified works means:

(a) infrastructure and works prescribed under a regulation to be necessary for disaster management; or (b) desnagging that is the minimum necessary to allow safe navigation of a marked navigable channel; or (c) the following infrastructure and works—

- (i) roads;
- (ii) railways;
- (iii) jetties and boat ramps for use by the public;
- (iv) works for the rehabilitation of land, including, for example, rehabilitation of abandoned mines;
- (v) infrastructure for the transmission or distribution of electricity;
- (vi) pipelines;
- (vii) conveyor belts;
- (viii) cables;
- (ix) other infrastructure, prescribed under a regulation, that relates to the transportation, movement, transmission or flow of anything through the **strategic environmental area** including, for example, goods, materials, substances, matter, particles with or without charge, light, energy, information and anything generated or produced.

spring means the land to which water rises naturally from below the ground and the land over which the water then flows.

stable in relation to land, means landform dimensions are or will be stable within tolerable limits now and in the foreseeable future. Stability includes consideration of geotechnical stability, settlement and consolidation allowances, bearing capacity (trafficability), erosion resistance and geochemical stability with respect to seepage, leachate and related contaminant generation.

stimulation means a technique used to increase the permeability of a natural underground reservoir that is undertaken above the formation pressure and involved the addition of chemicals. It includes hydraulic fracturing / hydrofracking, fracture acidizing and the use of proppant treatments.

stimulation fluid means the fluid injected into an aquifer to increase the permeability of a natural underground reservoir. For clarity, the term stimulation fluid only applies to fluids injected down well post-perforation.

stimulation impact zone means a 100 metre maximum radial distance from the stimulation target location within a gas producing formation.

strategic environmental area has the meaning in section 11 of the *Regional Planning Act 2014*.

structure means a dam or levee.

suitably qualified person means a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis to performance relative to the subject matter using the relevant protocols, standards, methods or literature.

synthetic oil-based drilling mud means a mud where the base fluid is a synthetic oil, consisting of chemical compounds which are artificially made or synthesised by chemically modifying petroleum components or other raw materials rather than the whole crude oil.

threatening processes means processes, features and actions that can have a detrimental effect upon the health and viability of an area of vegetation (e.g. altered hydrology, land use practices, invasion by pest and weed species, land degradation, edge effects and fragmentation).

tolerable limits means a range of parameters regarded as being sufficient to meet the objective of protecting relevant environmental values (e.g. a range of settlement for a tailings capping, rather than a single value, could still meet the objective of draining the cap quickly, preventing damage and limiting infiltration and percolation).

top soil means the surface (top) layer of a soil profile, which is more fertile, darker in colour, better structured and supports greater biological activity than underlying layers. The surface layer may vary in depth depending on soil forming factors, including parent material, location and slope, but generally is not greater than about 300 mm in depth from the natural surface.

transmissivity means the rate of flow of water through a vertical strip of aquifer which is one unit wide and which extends the full saturated depth of the aquifer.

valid complaint means a complaint the administering authority considers is not frivolous, nor vexatious, nor based on mistaken belief.

void means any man-made, open excavation in the ground (includes borrow pits, drill sumps, frac pits, flare pits, cavitation pits and trenches).

waters includes all or any part of a creek, river, stream, lake, lagoon, swamp, wetland, spring, unconfined surface water, unconfined water in natural or artificial watercourses, bed and bank of any waters, non-tidal or tidal waters (including the sea), stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and underground water.

watercourse has the meaning provided in section 5 of the *Water Act 2000* and includes the bed and banks and any other element of a river, creek or stream confining or containing water.

watercourse, wetland, lake or spring with state significant biodiversity values are those described in Appendix 1 of the *Queensland Biodiversity Offsets Policy* (Department of Environment and Resource Management, 2011).

well infrastructure means infrastructure required for the construction, completion and operation of a well including but not limited to cellar pits, dams and drill sumps.

well site means a maximum area of land disturbance for the purposes of constructing, installing and operating an exploration, appraisal or development well or such wells as part of a multi-well arrangement and includes well lease infrastructure.

wetland for the purpose of this environmental authority, wetland means:

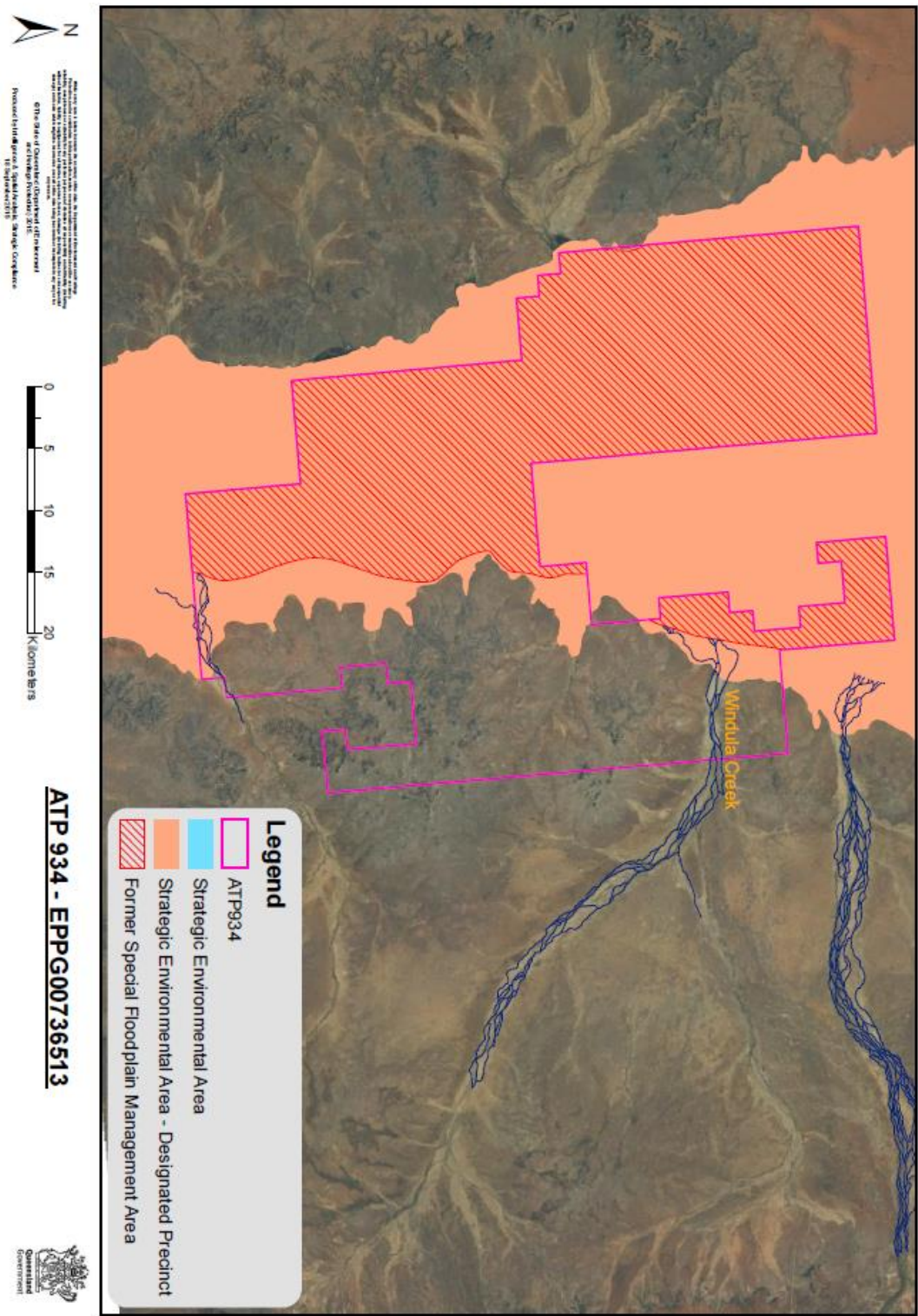
an area shown as a wetland on the map of Queensland Wetland Environmental Values.

Note: The Environmental Protection (Water and Wetland Biodiversity) Policy 2019 Schedule 2, Map of Queensland Wetland Environmental Values means the document 'Map of Queensland Wetland Environmental Values' made by the Chief Executive and published on the website.

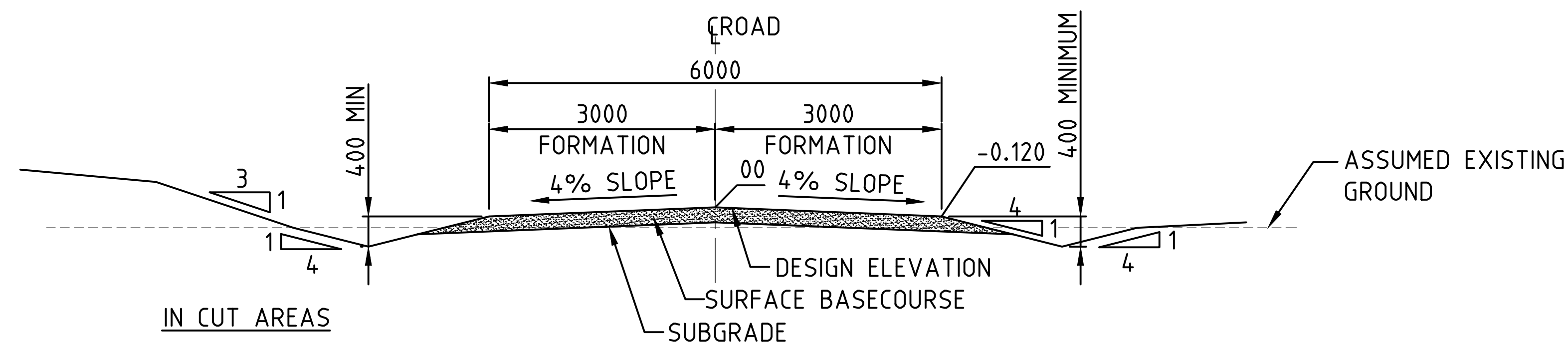
Environmental values in section 8 of the Environmental Protection (Water and Wetland Biodiversity) Policy 2019 apply to wetland areas on the map, which are categorised as wetlands of high or general ecological significance.

year means a period of 12 months.

Appendix A - Map 1: ATP934



Appendix B Typical road cross section for Class D roads

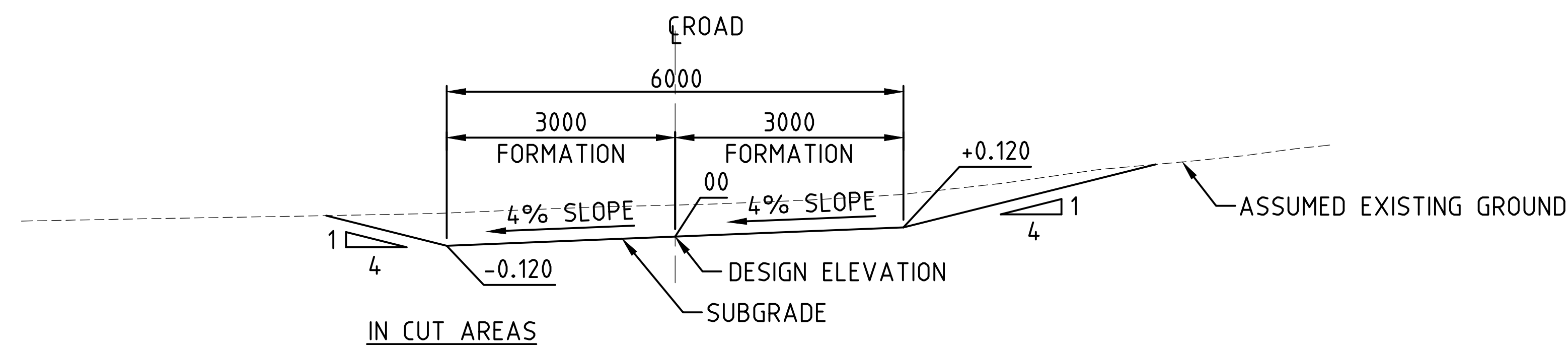


PAVEMENT MATERIAL - CLASS C ROAD

SURFACE COURSE	MINIMUM 200mm BEST AVAILABLE LOCAL (CLAY OR CLAYEY SAND) MATERIAL, COMPACTED TO 95% MMDD @ +/- 2% OMC.
SUBGRADE	REMOVE ALL VEGETATION AND COMPACT 200mm SUBGRADE TO 95% MMDD @ +/- 2% OMC.

TYPICAL SECTION - CLASS D ROAD (FOR ELEVATED SECTIONS)

SCALE 1:50



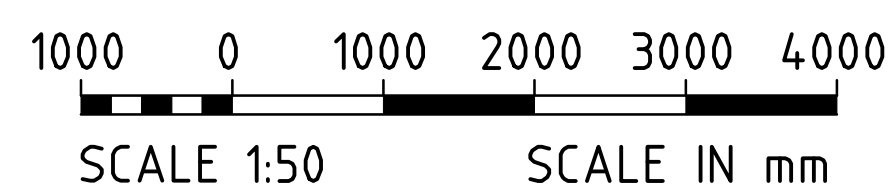
TYPICAL SECTION - CLASS D ROAD (FOR SECTIONS GRADED TO HARD SURFACE)

SCALE 1:50

ROAD CONDITION	MIN. VERTICAL CURVE LENGTH (m)	
GRADE CHANGE %	CLASS D	CLASS D 30kph*
1	80	30
2	80	30
3	90	30
4	120	30
5	150	30
6	180	30
7	210	40
8	240	40
9		50
10		55

CLASS D ROADS, SAND DUNE CROSSINGS

ROAD CONDITION	SPEED LIMIT	MIN. HORIZONTAL CURVE LENGTH (m)
CLASS D ROAD	80kph	500

[illegible]

NOTES:

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL THE COMPLETE CONTRACT DOCUMENTS AND SPECIFICATIONS.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
3. FOR SITE PREPARATION, EXCAVATION AND BACKFILL REFER TO PROJECT SPECIFICATION.
4. FOR ROAD CONSTRUCTION REFER TO ROAD WORKS SPECIFICATION 1515-120-S006.
5. SIDE BATTER SLOPES FOR CLASS D ROAD SHALL BE 4 HORIZONTAL TO 1 VERTICAL IN CUT AND FILL.
6. CLEARING, GRUBBING AND STRIPPING OF FULL DEPTH (MIN. 100mm) OF TOPSOIL WITHIN THE ROAD RIGHT OF WAY SHALL BE UNDERTAKEN FOR THE NEW ROAD ALIGNMENTS.
7. FOR CLASS D ROAD, FORMATION ELEVATED TO PROVIDE STABLE RUNNING SURFACE NO PROVISION FOR DRAINAGE.

ROAD CLASSES	D
ROAD WIDTH - METRES	
NORMAL WIDTH	6.0
SAND DUNE CROSSING	8.0
CULVERT/FLOODWAY	8.0

8. TABLE DRAINS. TABLE DRAINS SHALL MITRE AT THE FOLLOWING SPACING.

RECOMMENDED MITRE DRAIN SPACING		
SLOPE		SPACING (m) (MAXIMUM)
%	GRADIENT	
0.5	1 : 200	120
1	1 : 100	120
2	1 : 50	100
3	1 : 33	80
4	1 : 25	60
5	1 : 20	60
6	1 : 17	50
8	1 : 12.5	30

9. MINIMUM INVERT OF TABLE DRAIN TO BE BELOW PAVEMENT SUB-GRADE LEVEL.
10. VERTICAL GRADE ON DUNE APPROACH ROADS TO BE LIMITED TO (10% MAX.) 6% VERTICAL GRADIENT PREFERRED.

CIVIL STANDARD DRAWING
TYPICAL ROAD CROSS SECTION
CLASS D ROADS

Santos

DRAWING No.	0001-040-DDR-0005
-------------	-------------------

ADFILE No. - aaaa-40-005-1



ATTACHMENT 4 –

GIS