



Cover letter

Lock the Gate Alliance Ltd
C/- Mr John Russell
PO Box 55 Helensvale. Queensland 4212
E: john@lockthegate.org.au
M: 0407 632 864

Lock the Gate Alliance Ltd
Margaret Fleck,
M: 0428437930
E: andertonfleck@ozemail.com.au
Carmel Flint,
E: carmelflint@tpg.com.au

Dear Mr John Russell,

Thank you for the opportunity to provide our company, Consulting & Environmental Services to the Lock the Gate Alliance in the campaign to empower the landholders.

The accompanying documentation presents the spatial data for the Queensland, New South Wales Hunter Gas Pipeline that is a design corridor from a source in Queensland's Surat Basin through to the *Kooragang Nature Reserve* and the *Hunter Estuary Wetlands* at Newcastle in New South Wales. This report demonstrates the power of accessible mapping for integrating landscape data with land use for properties along the high-pressure gas pipeline.

The data deliverable is divided into four parts. The report provides NSW State Government environmental management planning information specific to each of the ten local government areas.

With regards and sincerely,

Jane T Aiken, CPSS, CEnvP, PhD,
Director
Consulting & Environmental Services Pty Ltd





Executive Summary

Consulting & Environmental Services was commissioned to conduct a systematic review of the proposed route of the Queensland Hunter Gas Pipeline (the Pipeline) using environmental mapping and data analyses with a focus on soil and environmental constraints, including:

1. Spatial analysis of
 - biodiversity,
 - cultural heritage,
 - geographic and topographic,
 - socio-economic, and
 - land use planning attributes

for the entire 620km length of the pipeline in NSW, including a breakdown of this analysis into the ten affected local government areas (LGAs).

2. Provision of local scale case studies for two specific land parcels regarding the five mapped attributes described above.

The Pipeline project proposed by Hunter Gas Pipeline Pty Ltd (the Proponent) would involve construction of a high-pressure gas pipeline from Wallumbilla, Queensland, to Newcastle, New South Wales (NSW). It was stated in the Environmental Assessment that the Pipeline was necessary to deliver increased competition and security of gas supply to support regional development in NSW.

The Pipeline was assessed as a State Significant Project and approved by the NSW Department of Planning on 11 February 2009, with a ten-year timeframe to commence construction. Construction did not begin within 10 years and on 17 October 2019 the proponent was granted a modified lapse date of the 15 October 2024 (Mod 1 Approval).

The 833km Pipeline corridor includes 620km within NSW, crossing ten Local Government Areas (LGA): Moree Plains, Narrabri, Gunnedah, Liverpool Plains, Upper Hunter, Muswellbrook, Singleton, Maitland, Port Stephens, and Newcastle.

Part A of this Report provides the context of the Pipeline, including the development approval process and a review of the available data for conducting the analysis. Part B provides detailed spatial data for each of the affected local government areas enabling each factor considered to be reviewed against the Conditions of Approval (CoA) as updated in the Mod 1 Approval. Part C of the Report identifies particular locations where additional specific impact assessment should be undertaken. Part D provides overall recommendations and concludes, among other things, that **significant costs may be incurred by landowners** in providing the 24-hour access to their land for the purposes of construction and operation of the Pipeline.

The datasets used to produce this report are publicly and freely available and a full list of references can be found at the end of this report. The detailed maps are available at Cessoils.com.au. Table 1 of the report provides a detailed quantitative summary of relevant spatial data for the proposed Pipeline.



The mapping indicates that there are 31 recorded Aboriginal cultural heritage sites within the pipeline corridor and 97 within a 200m buffer of the pipeline. A large section of the pipeline is also currently subject to a native title application by Gomeroi Traditional Owners.

The mapping reveals that the pipeline route has incredible importance for agriculture, traversing extensive areas of strategic agricultural land, high fertility soils, erosional soils, floodprone land and critical industry clusters. Specifically, the analysis reveals that the pipeline corridor encompasses the following areas of mapped agricultural value:

- **Biophysical Strategic Agricultural Land — 4446Ha (33.4%)**
- **High and moderately high inherent soil fertility – 7.716Ha (58%)**
- **Erosional soils – 2721Ha (20.4%)**
- **Flood prone land – 2437 (18.3%)**
- **Critical Industry Cluster Land - 1056Ha (7.9%)**
- **Acid sulphate soils – 1096Ha (8.2%)**

The mapping analysis also reveals the outstanding conservation significance of the proposed pipeline route, including very high value for Koalas, especially in the context of the recent severe Koala population decline in NSW caused by the 2019/2020 bushfires. The analysis identified 110 threatened fauna species and 56 threatened flora species that have been recorded within a 10km radius of the corridor. It reveals a high level of significance for Koalas, with 15 recorded sightings within the corridor and 2,467 within a 10km radius. The mapping also reveals the pipeline corridor encompasses:

- **High quality koala habitat — 1014Ha (7.6% of corridor)**
- **Dedicated areas of regional koala significance (ARKS) — 961Ha (7.2%)**
- **Native vegetation — 7039Ha (53%)**

There are 42 points where the pipeline corridor crosses Travelling Stock Routes, which are recognised as having high conservation value. The analysis also identifies 10 species of threatened flora and 12 species of threatened fauna that have been recorded within a 10km radius of the pipeline corridor since it was approved in 2009. These include:

Flora

- Angophora inopina (Charmhaven Apple)
- Cynanchum elegans (White-flowered Wax Plant)
- Diuris arenaria (Sand Doubletail)
- Greivillea shiressii
- Lepidium monoplocoides (Winged Peppergrass)
- Lindernia alsinoides
- Pomaderris bodalla (Bodalla Pomaderris)
- Tetratheca glandulosa (Black-eyed Susan)
- Thesium australe (Austral Toadflax)
- Tylophora linearis

Fauna

- Arctocephalus pusillus doriferus (Australian Fur-seal)
- Caretta caretta (Loggerhead Turtle)
- Cercartetus nanus (Eastern Pygmy-possum)
- Chelonia mydas (Green Turtle)
- Delma impar (Striped Legless Lizard)
- Eretmochelys imbricata (Hawksbill Turtle)
- Litoria booroolongensis (Booroolong Frog)
- Onychoprion fuscata (Sooty Tern)
- Planigale maculata (Common Planigale)
- Pseudomys novaehollandiae (New Holland Mouse)
- Thalassarche cauta (Shy Albatross)
- Uperoleia mahonyi (Mahony's Toadlet)



Other matters of particular concern that should be highlighted are:

- **Water courses:** There are a large number of water courses (up to 1044) within the current proposed corridor (hydroline layer), with 136 of these being streams of second order or higher. We recommend that water management reports are prepared for all crossings of streams of second order or higher.
- **Wetlands:** Section 2.6 of the CoA states:

The project shall avoid any disturbance to, or crossing of, wetlands mapped under State Environmental Planning Policy (Coastal Management) 2018. Where the project route lies within 100 metres of a mapped SEPP 14 wetland, an appropriate buffer around these wetlands shall be defined and illustrated in the Construction Environmental Management Plan required under condition 6.2, to ensure no adverse effects to the wetland result from the project.

The proposed corridor crosses SEPP 14 wetlands and RAMSAR wetlands near Tomago and Newcastle. A buffer, necessary to comply with the condition above, is not feasible as the proposed corridor intersects directly through these wetlands.

In addition, methods of addressing the following matters are contained in the conclusion to the Report:

- **Threatened flora and fauna and native vegetation:** Assessment is required for clearing of native vegetation; attention should be given to impacts on threatened flora and ecological communities; specific biodiversity values mapped within the corridors require particular guidance as there is potential for irreversible damage and impacts. Detailed vegetation mapping across the length of the pipeline corridor is required to identify Endangered Ecological Communities.
- **Koala habitat:** A specialist is required to fully assess Koala habitat within the pipeline corridor.
- **Soils:** There are considerable risks to landholders from potential erosion associated with the pipeline, given the substantial area of erosional soils that the pipeline will pass through, along with risks of exposure of acid sulphate soils in certain parts of the corridor.
- **Socio-economic impacts:** Potential loss of land that is of moderately high to high fertility is seen in all LGAs along the Pipeline corridor.
- **Land Tenure:** Consideration of the effect of Pipeline construction on biodiversity value of travelling stock routes is warranted.



Document Registration

Client	Lock the Gate Alliance Ltd PO Box 55, Helensvale, QLD, 4212. Mr John Russell E: john@lockthegate.org.au M: 0407 632 864
Client Liaison Officers	Margaret Fleck E: andertonfleck@ozemail.com.au M: 0428437930 Carmel Flint E: carmelflint@tpg.com.au
Prepared By	Consulting & Environmental Services Pty Ltd Office @ 2A Eskbank Street Lithgow NSW 2790 E: info@cessoils.com.au T: 6352 5758 (M) 0407 990 613
Date Issued	27 July 2021
Document Filename	108-2010 Consultant Report, mapping review: QHGP; Lock the Gate Alliance
Document Title	Assessment of the Hunter Gas Pipeline Corridor and Buffer areas for the Lock the Gate Alliance through spatial analysis and mapping
Document Prepared By	Ms Malin Höppner, Environmental Drafting, BSc, MSc Environmental Sciences  Ms Premala Sangarananda, Executive Business Manager, BSc, GradDipEd, Project Management 
Document Registered By	Dr Jane T. Aiken, Principal Consultant 
Version	01 – Draft Report 29 April 2021 02 – Draft Report 10 June 2021 03 – Amended 08 July 2021 - Edits from Carmel Flindt and Margaret Fleck as well as discrepancy in the retrieval of the Aboriginal cultural heritage sites 04- Final Version 27 July 2021



Table of Contents

Cover letter.....	1
Executive Summary.....	2
Document Registration	5
Table of Contents.....	6
1.0 PART A CONTEXT FOR THE REPORT	8
1.1 Preamble.....	8
1.1.1 The State Significant Development.....	8
1.1.3 Relevant Legislation, Codes and Standards for State of New South Wales	9
1.1.4 Land Tenure Considerations.....	9
1.2 Scope of Deliverables.....	9
1.2.1 Aims and Objectives.....	9
1.2.2 Methodology.....	10
1.2.3 Accuracy Statement	10
1.3 Project Approval Information.....	11
1.3.1 Timeline.....	11
1.4 Review for Pipeline Data on Design Corridor.....	11
1.4.2 Ten New South Wales Local Government Areas's	11
1.4.1 <i>Conditions of Approval Mod 1</i>	11
1.4.3 Overall recommendations	11
2.0 PART B – REVIEW FOR LOCAL GOVERNMENT	12
2.1 Objective and scope.....	12
2.2 Spatial data results for each LGA.....	12
A Moree Plains	12
B Narrabri.....	21
C Gunnedah.....	31
D Liverpool Plains.....	39
E Upper Hunter	47
F Muswellbrook	57
G Singleton	66
H Maitland	74
I Port Stephens.....	83
J Newcastle.....	91
3.0 PART C – ASSESSMENT TO CONDITION OF APPROVALS	100
4.0 PART D – OVERARCHING RECOMMENDATIONS.....	118
5.0 CLOSE.....	121
TABLES	122



Table 1: Quantitative summary of biodiversity, cultural heritage, geographic and topographic, socio-economic and land use planning attributes that are applicable to the proposed Queensland Hunter Gas Pipe within NSW.....	122
Table 1-1-1 Schedule of maps.....	125
Table 1-1-2 Bionet threatened flora and fauna	126
Table 1-1-3 Listed legislation, codes and standards.....	126
Table 1-3 Project Approval Timeline.....	127
Table 2-1 Summary of aspects and impacts for LGA's.....	127
MAPS.....	127
APPENDICES.....	128
Appendix 1 Soil Definitions	128
Appendix 2 Verification Statement as an example – Property Information Case Study.....	130
Appendix 3 List of Properties with Erosional Soils within proposed pipeline corridor	130
Appendix 4 Specialists recommendation from SEEC: Review of Soil and Drainage Line Constraints	152
Appendix 5 Stock Route.....	156
Appendix 6 Methods flow diagram.....	157
REFERENCES	158



1.0 PART A CONTEXT FOR THE REPORT

1.1 Preamble

Consulting & Environmental Services were commissioned to assist with soil-based reviews of the Queensland Hunter Gas Pipeline, a New South Wales Department of Planning approved State significant project.

The commission from Lock the Gate Alliance is to complete a soil review using spatial data analysis and interrogate the broad-scale aspects of the statement of environmental effects and department of planning conditions of approval. The study focuses solely on the section of the pipeline which is located in New South Wales.

1.1.1 The State Significant Development

The pipeline corridor is an 833 km route traversing a mineral and gas-rich region from Wallumbilla, Queensland, to Newcastle, New South Wales (NSW). Approximately 620km of the high-pressure gas pipeline occurs in the NSW section. In NSW, it will cross ten Local Government Areas (LGA), namely Moree Plains, Narrabri, Gunnedah, Liverpool Plains, Upper Hunter, Muswellbrook, Singleton, Maitland, Port Stephens, and Newcastle. The Dungog Shire Council is also included when a 10km buffer is applied to some quantifications in this report.

The data presented are the land and property information for the published corridor alignment proposed by Hunter Gas Pipeline Pty Ltd. based on current New South Wales Government spatial data resources.

In December 2008, the Federal Government decided that the pipeline was not a controlled action for the purposes of the Federal *Environmental Protection and Biodiversity Conservation Act 1999*. The pipeline proposal received NSW State Government approval in 2009.

Modified conditions of approval to construct a high-pressure gas transmission pipeline in NSW were provided to the applicant Hunter Gas Pipeline Pty in October 2019.

Land required for the construction and operation of the proposed Queensland to Hunter Gas pipeline in design and determining a final alignment is a linear corridor of 200 m width [1]. Being predominantly located in agricultural areas raises the attention of Lock the Gate Alliance Ltd.



1.1.3 Relevant Legislation, Codes and Standards for State of New South Wales

[Table 1-1-3](#) lists legislation, codes and standards that are relevant to the proposed development[1].

1.1.4 Land Tenure Considerations

The analysis shows that 55.75% (7,416 ha) of the corridor is covered by mining titles. (with some areas that have several titles on the same land).

Some 77.17% (10,265ha) of the corridor is under an active Native Title claim by the Gomeroi People (effective 20/12/2011).

1.2 Scope of Deliverables

Consulting & Environmental Services reference our quotation Q1904 to undertake a systematic review using environmental mapping speciality data analyses, with a focus on soil and environmental constraints. The deliverables for our works are listed as:

1. Spatial analysis of biodiversity, cultural heritage, geographic and topographic, socio-economic, and land use planning attributes for the entire 620km length of the pipeline in NSW.
2. Spatial analysis of the above attributes for each of the ten local government areas (LGAs) where the proposed pipeline corridor will traverse these LGAs.
3. Case studies demonstrating local scale mapping for specific land parcels for the attributes outlined in deliverable one.

1.2.1 Aims and Objectives

Our study investigates various questions associated with pipeline alignment (Version L), waterways, soils, and the impacts on agriculture, heritage areas, and biodiversity.

Our aim is to develop informative documentation. We present four objectives as:

1. Conduct an environmental review of the Department of Planning Conditions of Approval (CoA) MP_06_0286 MOD 1.
2. Collate data in relation to the impacts of the pipeline and access for the pipeline on cultural heritage sites, vegetation, rivers & creeks, threatened species habitat, soil management and flooding.
3. Review all ten local government areas against five mapping aspects (biodiversity, cultural heritage, geographic and topographic socio-economic, land use planning).



4. Produce an example landholder case study: a map-based verification report for Lots 227 and 229/DP751017 plus Lot 234/DP652489 within the Liverpool Plains Shire.

1.2.2 Methodology

Spatial data was analysed and mapped in ArcGIS Pro 2.5 (Esri, Australia). The pipeline alignment (Version L) was intersected with the publicly available data (see 1.2.3) to obtain a quantification of the interrogated biodiversity, cultural heritage, geological and topographic, socio-economic, and land use planning impacts.

By intersecting the pipeline corridor, with the individual lot and deposited plan information landscape features were also retrieved for the property-scale case study.

An example flow diagram of the applied geoprocessing methods can be found in [Appendix 6](#).

Aboriginal cultural heritage sites were retrieved using the extensive AHIMS search. The sites were exported from Google Maps as a klm file and added to ArcGIS Pro. They were converted using the 'KLM to Layer' tool and subsequently intersected with the pipeline corridor version L and a 200m buffer (either side) around the corridor. The link to the mapped Aboriginal cultural heritage sites is available upon request.

1.2.3 Accuracy Statement

The proposed Queensland to Hunter Gas Pipeline [2] covers a total distance of 620km (planar) and the 200-350m design corridor for the pipeline covers 13,300.95 ha within NSW. All analysis in mapping was developed from the shapefile of the pipeline corridor, which was applied for by Lock the Gate Alliance through GIPA and forwarded to Consulting & Environmental Services on 8 December 2020.

All datasets used to interrogate the biodiversity, cultural heritage, geological and topographic, socio-economic, and land use planning impacts are publicly available.

Links to the ArcGIS (Esri, Australia) geographical information system (GIS) datasets can be found in the reference list. Accuracy is with high confidence.

1.2.3.1 Limitations of analysis

- Areas and percentages of exploration and mining titles may be calculated too high in some areas due to land having more than one title, e.g., the same parcel of land can have an exploration title for coal and a mining title for petroleum.
- The number of rivers and creeks may be too high in some areas if the shapefile of that watercourse is segmented, and different sections of the watercourse intersect with the pipeline corridor at different locations. The number of management plans that will need



to be prepared by Queensland Hunter Gas Pipeline Pty Ltd needs to be re-evaluated when the final pipeline alignment is published.

1.3 Project Approval Information

1.3.1 Timeline

Environmental Assessments for the project were completed in 2008 and the Queensland Hunter Gas Pipeline Infrastructure Modification Assessment of 2019 represents the current relevant approval for the project. The project timeline is seen in [Table 1-3](#) below.

1.4 Review for Pipeline Data on Design Corridor

1.4.2 Ten New South Wales Local Government Areas's

Part B of this report breaks the information into Local government Areas, detailing the specific outline of factors that impact the areas including interpretation and recommendations from Consulting & Environmental Services.

1.4.1 Conditions of Approval Mod 1

Part C of this report interrogates the Conditions of Approval in alignment with the information that has been established through the spatial data analysis and the interrogation of the maps.

1.4.3 Overall recommendations

Part D of this report is a summary of the recommendations that Consulting & Environmental Services Pty Ltd has stipulated in each section of Part B Review for Local Government Area. In this section we look at the whole picture in relationship to the details that are required to be assessed.



2.0 PART B – REVIEW FOR LOCAL GOVERNMENT

2.1 *Objective and scope*

Publication for community consultation.

This section intends to inform and empower the communities of the ten local government areas that will be directly impacted by the proposed pipeline corridor with factual data and mapping relevant to their LGA as extractable information. This information can be used at community consultation meetings by Lock the Gate Alliance liaisons officers in conjunction with information from Part A (whole length of pipeline in NSW), Part C (Conditions of Approval) and Part D (Overall Recommendations).

2.2 *Spatial data results for each LGA*

A Moree Plains

Over 26% (3558.37 ha) of the proposed pipeline corridor are located within the borders of the Moree Plains Shire Local Government Area. A total length of approximately 163.5km of pipeline traverse through this LGA.

A.1 *Biodiversity*

- 47.34% of the proposed corridor in Moree Plains is classified as native vegetation (1685.01ha) from 16 vegetation classes [3]:

Candidate Native Grasslands: Candidate Native Grasslands
Coolibah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion (North-west Floodplain Woodlands)
Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions (North-west Floodplain Woodlands)
Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW (Floodplain Transition Woodlands)
Coolibah – open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains (North-west Floodplain Woodlands)
Water Couch marsh grassland wetland of frequently flooded inland watercourses (Inland Floodplain Swamps)



Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion (Riverine Plain Woodlands)
River Red Gum tall to very tall open forest / woodland wetland on rivers on floodplains mainly in the Darling Riverine Plains Bioregion (Inland Riverine Forests)
Shallow freshwater wetland sedgeland in depressions on floodplains on inland alluvial plains and floodplains (Inland Floodplain Swamps)
Whitewood low open woodland of the Brigalow Belt South Bioregion and north-eastern Darling Riverine Plains Bioregion (Subtropical Semi-arid Woodlands)
River Coobah swamp wetland on the floodplains of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion (Inland Floodplain Shrublands)
Poplar Box - White Cypress Pine - Wilga - Ironwood shrubby woodland on red sandy-loam soils in the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion (Western Peneplain Woodlands)
Poplar Box – Coolibah floodplain woodland on light clay soil mainly in the Darling Riverine Plains Bioregion (North-west Floodplain Woodlands)
Western Rosewood - Wilga - Wild Orange - Belah low woodland of the Brigalow Belt South Bioregion and eastern Darling Riverine Plains Bioregion (Western Peneplain Woodlands)
Lignum shrubland wetland on regularly flooded alluvial depressions in the Brigalow Belt South Bioregion and Darling Riverine Plains Bioregion (Inland Floodplain Shrublands)
Derived Copperburr shrubland of the NSW northern inland alluvial floodplains (Riverine Chenopod Shrublands)

- 13% of the corridor are high quality koala habitat (462.27ha) (>70% koala habitat suitability) [4].



- 164 threatened fauna records from 27 species in total within a 10km buffer around the proposed pipeline corridor [5]. Please refer to map: Moree Plains – Overview with threatened species (M0.1).
 - 82 threatened fauna records before 2008
 - 82 threatened fauna records in or after 2008
 - 46 threatened fauna records in or after 2015

Hieraaetus morphnoides	Little Eagle
Calyptorhynchus lathami	Glossy Black-Cockatoo
Chalinolobus picatus	Little Pied Bat
Grantiella picta	Painted Honeyeater
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies))
Neophema pulchella	Turquoise Parrot
Macropus dorsalis	Black-striped Wallaby
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)
Stagonopleura guttata	Diamond Firetail
Saccolaimus flaviventris	Yellow-bellied Sheath-tail-bat
Circus assimilis	Spotted Harrier
Phascolarctos cinereus	Koala
Anseranas semipalmata	Magpie Goose



<i>Falco subniger</i>	Black Falcon
<i>Ninox connivens</i>	Barking Owl
<i>Lophoictinia isura</i>	Square-tailed Kite
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox
<i>Pseudomys gouldii</i>	Gould's Mouse
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork
<i>Daphoenositta chrysoptera</i>	Varied Sittella
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies))
<i>Artamus cyanopterus</i>	Dusky Woodswallow
<i>Grus rubicunda</i>	Brolga
<i>Calyptorhynchus banksii samueli</i>	Red-tailed Black-Cockatoo (inland subspecies)
<i>Tyto longimembris</i>	Eastern Grass Owl

- 66 koala sightings within 10km buffer around the proposed corridor [5]



A.2 Cultural heritage

- Aboriginal sites or artefacts: 2 sites within pipeline corridor; 16 within 200m buffer around corridor

A.3 Geographic and topographic constraints

- **Riparian lands and water courses**, please refer to map: Moree Plains – Waterways (MO.3).
 - No Environmental Planning Instrument (EPI) mapping
 - 25 ha riparian lands and watercourses (Biodiversity Values Map) (0.7%) of pipeline corridor [6]
 - 81 creeks within corridor (from hydro line layer) [7]
 - 49 of these are non-perennial.
 - 15 stream order 2 or higher crossings [8]
 - ❖ GIL GIL CREEK
 - ❖ HALLS CREEK
 - ❖ MARSHALLS PONDS CREEK
 - ❖ MEHI RIVER
 - ❖ GNOURA GNOURA CREEK
 - ❖ WHALAN CREEK
 - ❖ MILLIE CREEK
 - ❖ MACINTYRE RIVER
 - ❖ TYCANNAH CREEK
 - ❖ GURLEY CREEK
 - ❖ CENTRE CREEK
 - ❖ DUFFYS CREEK
 - ❖ GWYDIR RIVER
 - ❖ LITTLE BUMBLE CREEK
 - ❖ BOOMI RIVER

- **Soil and land resources**, please refer to Map: Moree Plains (MO.2) – Soil and land resources by process:

- 15 soil landscapes from 3 processes [9]

Boolcarroll	Stagnant Alluvial
Black Creek	Alluvial
Gurley	Residual



Mehi River	Alluvial
Mobbindry Creek	Alluvial
Moppin	Alluvial
Mallowa	Alluvial
Nee Nee Creek	Alluvial
Terry Hie Hie	Residual
Watercourse Road	Alluvial
Bellata	Residual
Boyanga	Alluvial
Cowmerton	Alluvial
Mungindi	Alluvial
Turrawah	Alluvial

A.4 Socio-economic implications

- Biophysical Strategic Agricultural Land: 26.25% of pipeline corridor (934.14ha) [10]
- Inherent soil fertility: 80.58% of pipeline corridor go through soils of high or moderately high soil fertility [11]

A.5 Land use planning impacts

- 42.65% (1517.7ha) of corridor in Moree Plains is covered by existing exploration and mining titles: petroleum (Holder: COMET RIDGE LTD; COMET RIDGE GUNNEDAH PTY LTD & SANTOS NSW (BETEL) PTY LTD) [12]. Note that areas and percentages may be higher as some areas have several titles on the same land.

Secondary Land Use (2017)	Area (ha)	Proportion (%) of pipeline corridor in LGA
2.1.0 Grazing native vegetation	1587.99	44.63
3.2.0 Grazing modified pastures	56.11405	1.58
3.3.0 Cropping	1747.697	49.12



4.3.0 Irrigated cropping	117.8536	3.31
5.4.0 Residential and farm infrastructure	14.7262	0.41
5.7.0 Transport and communication	5.109727	0.14
6.2.0 Reservoir/dam	1.602694	0.05
6.3.0 River	13.85024	0.39
6.5.0 Marsh/wetland	13.51907	0.38

[13]

A.6 Interpretation

Moree Plains Shire is represented in the Hunter gas pipeline design corridor from chainage 222 to chainage 385 covering a length 163.5km which is an area of 3,558.37 ha and 26.75% of the total pipeline.

Of this, 47.34% (1685 ha) is classified as native vegetation from 16 different vegetation classes. 13% (462ha) is high quality Koala habitat, with 66 recorded koala sightings and 164 threatened fauna records from 27 species within a 10km buffer of the proposed pipeline. Two Aboriginal sites are within the pipeline corridor and 16 within a 200m buffer. 0.7 % (25 ha) of the corridor is riparian lands and water courses, with 81 creeks within the corridor. The pipeline will cross 15 streams of order 2 or higher. The pipeline traverses 15 different soil landscapes.

26.25% (934 ha) of the corridor is over Biophysical Strategic Agricultural land and 80.58% (2867 ha) will go through soils of high or moderately high soil fertility.

Petroleum exploration and mining titles are held by COMET RIDGE LTD, COMET RIDGE GUNNEDAH PTY LTD AND SANTOS NSW (BETEL) PTY LTD and cover 43% of the corridor in this LGA.

The pipeline will go through the following land uses; grazing on native vegetation (44.63 %), grazing on modified pastures (1.58 %), cropping (49.12 %), irrigated cropping (3.31 %), residential and farm infrastructure (0.41 %), transport and communication (0.14 %), reservoir/dam (0.05 %), Rivers (0.39 %) and marsh/wetlands (0.38 %).



A.7 Recommendation

Stakeholders in the Moree Plains Shire LGA are advised to ensure and question whether the proponent carries out the pipeline project in accordance with the Conditions of Approvals (COA) (Part C). The table below outlines the implications of the discussed biodiversity, cultural heritage, geographic and topographic, socio-economic and land use planning impacts of the proposed pipeline corridor within the Moree Plains LGA and recommends actions in responds to those impacts.

Constraints	Report	Action	Applicable Conditions of Approval
Water crossing	Maximum of 81 water management reports corresponding to each crossing.	Engage a specialist hydrologist for the water management reports. Engage an ecologist to assess impacts on riparian zones.	2.5, 2.7, 3.22
Threatened Flora & Fauna: Native Vegetation	47% of the corridor in the LGA needs assessment for clearing the native vegetation. Impacts on threatened flora, fauna and ecological communities need to be assessed	Engage a specialist ecologist to survey impacts of native vegetation clearing on threatened fauna (nocturnal and diurnal), threatened flora and threatened ecological communities.	2.1.1, 2.1.2, 2.4, 3.15, 3.16, 3.18, 6.2,
Koala	Impacts on koala habitat and threatened species: 13% of corridor in LGA are high quality koala habitat.	Engage a specialist ecologist that has the accreditation for the assessment of Koala habitat.	3.15
Soils	Alluvial, Residual and Stagnant Alluvial soils are present in the corridor.	Engage a specialist CPSS qualified soil assessor to assess the soils for potential	3.22, 6.2



		degradation and erosional potential.	
Socio-Economic	<p>Potential loss of 81% of land (2867ha) that is of moderately high to high fertility.</p> <p>Potential loss of 934Ha land that is mapped as Biophysical Strategic Agricultural Land which sustains the \$13.1B agricultural industry in NSW[14]. Further, 99% of the corridor in the LGA are covered by farming related land uses.</p>	Request a Gateway Assessment to be conducted by an independent assessor before the granting of any approvals.	3.14, 6.2, There is no COA that is specific to agricultural land other than livestock (3.14)
Cultural Heritage	Under native title claim and existing aboriginal sites – 2 within the pipeline corridor and 16 within the 200m buffer.	Consultation with traditional owners and title claim holders are required.	3.27, 5.1, 6.2
Land Tenure	Existing exploration and mining titles as well as travelling stock routes	Consultation with stakeholders	2.3, 3.12 (should be applicable for all stock routes, not just the Pullaming SR), 3.14, 5.1



B Narrabri

Over 18% (2424.58ha) of the proposed pipeline corridor is located within the borders of the Narrabri Shire Local Government Area. A total length of approximately 113.8km of the pipeline traverses this LGA.

B.1 Biodiversity

- 42.8% of the proposed corridor in Narrabri is classified as native vegetation (1037.84ha) from 23 vegetation classes [3].

Candidate Native Grasslands (Candidate Native Grasslands)
Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion (Brigalow Clay Plain Woodlands)
Pilliga Box - White Cypress Pine - Buloke shrubby woodland in the Brigalow Belt South Bioregion (Pilliga Outwash Dry Sclerophyll Forests)
Poplar Box - White Cypress Pine shrub grass tall woodland of the Pilliga - Warialda region, Brigalow Belt South Bioregion (Pilliga Outwash Dry Sclerophyll Forests)
Belah - Wilga +/- White Box dry viney scrub woodland the NSW Brigalow Belt South Bioregion (Western Vine Thickets)
Narrow-leaved Ironbark - White Cypress Pine - Buloke tall open forest on lower slopes and flats in the Pilliga Scrub and surrounding forests in the central north Brigalow Belt South Bioregion (Western Slopes Dry Sclerophyll Forests)
Buloke - White Cypress Pine woodland on outwash plains in the Pilliga Scrub and Narrabri regions, Brigalow Belt South Bioregion (Pilliga Outwash Dry Sclerophyll Forests)
River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion (Inland Riverine Forests)



Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions (North-west Floodplain Woodlands)
Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion (Riverine Plain Woodlands)
Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion (Brigalow Clay Plain Woodlands)
Shallow freshwater wetland sedgeland in depressions on floodplains on inland alluvial plains and floodplains (Inland Floodplain Swamps)
White Cypress Pine - Silver-leaved Ironbark - Wilga shrub grass woodland of the Narrabri-Yetman region, Brigalow Belt South Bioregion (North-west Slopes Dry Sclerophyll Woodlands)
Water Couch marsh grassland wetland of frequently flooded inland watercourses (Inland Floodplain Swamps)
River Red Gum tall to very tall open forest / woodland wetland on rivers on floodplains mainly in the Darling Riverine Plains Bioregion (Inland Riverine Forests)
Coolibah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion (North-west Floodplain Woodlands)
Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW (Floodplain Transition Woodlands)
Broombush - wattle very tall shrubland of the Pilliga to Goonoo regions, Brigalow Belt South Bioregion (Pilliga Outwash Dry Sclerophyll Forests)
Derived Copperburr shrubland of the NSW northern inland alluvial floodplains (Riverine Chenopod Shrublands)
Mock Olive - Tumbledown Red Gum - Red Ash - Wilga siliceous rocky hill low woodland / shrubland in the Gunnedah - Tambar Springs region, Brigalow Belt South Bioregion (Inland Rocky Hill Woodlands)



Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion (Western Slopes Dry Sclerophyll Forests)

Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion (North-west Slopes Dry Sclerophyll Woodlands)

Black Tea-tree - River Oak - Wilga riparian low forest/shrubland wetland of rich soil depressions in the Brigalow Belt South Bioregion (Inland Riverine Forests)

- 7.9% of the corridor is high quality koala habitat (190.5ha) (>70% koala habitat suitability [4])
- 1378 threatened fauna records from 48 species in total have been recorded within 10km buffer around proposed pipeline corridor [5]. Please refer to map: Narrabri – Overview with threatened species (Map NA.1).
 - 255 threatened fauna records before 2008
 - 1123 threatened fauna records in or after 2008
 - 829 threatened fauna records in or after 2015

<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)
<i>Chthonicola sagittata</i>	Speckled Warbler
<i>Neophema pulchella</i>	Turquoise Parrot
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)
<i>Daphoenositta chrysoptera</i>	Varied Sittella
<i>Stagonopleura guttata</i>	Diamond Firetail
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)



<i>Hirundapus caudacutus</i>	White-throated Needletail
<i>Hieraaetus morphnoides</i>	Little Eagle
<i>Phascolarctos cinereus</i>	Koala
<i>Falco subniger</i>	Black Falcon
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll
<i>Vespadelus trougtoni</i>	Eastern Cave Bat
<i>Petaurus norfolcensis</i>	Squirrel Glider
<i>Grantiella picta</i>	Painted Honeyeater
<i>Ninox connivens</i>	Barking Owl
<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat
<i>Glossopsitta pusilla</i>	Little Lorikeet
<i>Lophoictinia isura</i>	Square-tailed Kite
<i>Circus assimilis</i>	Spotted Harrier
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)
<i>Hamirostra melanosternon</i>	Black-breasted Buzzard
<i>Tyto novaehollandiae</i>	Masked Owl
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle
<i>Rostratula australis</i>	Australian Painted Snipe
<i>Epthianura albifrons</i>	White-fronted Chat
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork



Petroica boodang	Scarlet Robin
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat
Petroica phoenicea	Flame Robin
Cercartetus nanus	Eastern Pygmy-possum
Stictonetta naevosa	Freckled Duck
Macropus dorsalis	Black-striped Wallaby
Pseudomys pilligaensis	Pilliga Mouse
Polytelis swainsonii	Superb Parrot
Anomalopus mackayi	Five-clawed Worm-skink
Anthochaera phrygia	Regent Honeyeater
Burhinus grallarius	Bush Stone-curlew
Anseranas semipalmata	Magpie Goose
Tyto longimembris	Eastern Grass Owl
Pteropus poliocephalus	Grey-headed Flying-fox
Chalinolobus picatus	Little Pied Bat

- 40 koala sightings (Bionet species sightings) in 10km buffer around corridor (all time) [5]

B.2 Cultural heritage

- Aboriginal sites or artefacts: 2 sites within pipeline corridor; 14 within 200m buffer around corridor

B.3 Geographic and topographic constraints

- **Riparian lands and water courses**, please refer to map: Narrabri – Waterways (Map NA.3)
 - No EPI mapping



- 24.8 ha riparian lands and watercourses (Biodiversity Values Map) (1.02%) of corridor [6]
- 98 creeks within corridor (from hydroline layer) [7]
 - 80 of these are non-perennial.
- 17 stream order 2 or higher crossings (RiverStyles layer) [8]
 - ❖ BOBBIWAA CREEK
 - ❖ MULGATE CREEK
 - ❖ SPRING CREEK
 - ❖ HORSEARM CREEK
 - ❖ DRIGGLE DRAGGLE CREEK
 - ❖ NAMOI RIVER
 - ❖ KURRAJONG CREEK
 - ❖ BOLLLOL CREEK
 - ❖ TULLA MULLEN CREEK
 - ❖ PINE CREEK
 - ❖ MYALL HOLLOW CREEK
 - ❖ GALATHERA CREEK
 - ❖ BULLDOG CREEK
 - ❖ BOGGY CREEK
 - ❖ TEN MILE CREEK
- **Soil and land resources:**
 - 15 soil landscapes from 6 processes, please refer to Map: Narrabri – Soil and land resources by process (Map NA.2) [9]
 - ❖ Boolcarroll (Stagnant Alluvial)
 - ❖ Boggabri Trig (Vestigial)
 - ❖ Blue Vale (Residual)
 - ❖ Gurley (Residual)
 - ❖ Jacks Creek (Alluvial)
 - ❖ Mehi River (Alluvial)
 - ❖ Mungle (Erosional)
 - ❖ Mobbindry Creek (Alluvial)
 - ❖ Manamoi (Transferral)
 - ❖ Nee Nee Creek (Alluvial)
 - ❖ Terry Hie Hie (Residual)
 - ❖ Velyama (Transferral)
 - ❖ Bellata (Residual)
 - ❖ Burburgate (Alluvial)
 - ❖ Driggle Draggie (Stagnant Alluvial)



- Flood prone land (EPI): 10.40% (252ha) of pipeline corridor around Narrabri (town)

B.4 Socio-economic implications

- Biophysical Strategic Agricultural Land: 94.94% of pipeline corridor (1283.62ha) [10]
- Inherent soil fertility: 62.26% of pipeline corridor go through soils of high or moderately high soil fertility [11]

B.5 Land use planning impacts

- 2696ha (111%) of corridor in Narrabri is covered by existing exploration and mining titles: : coal and petroleum (Holder: SECRETARY OF REGIONAL NSW, WHITEHAVEN COAL MINING LIMITED, SANTOS NSW PTY LTD COMET RIDGE LTD) [12]. Note that areas and percentages may be higher as some areas have several titles on the same land.

Secondary Land Use (2017)	Area (ha)	Proportion (%)
2.1.0 Grazing native vegetation	671.7895	27.71%
3.2.0 Grazing modified pastures	347.0564	14.31%
3.3.0 Cropping	1214.718	50.10%
4.3.0 Irrigated cropping	177.8114	7.33%
5.4.0 Residential and farm infrastructure	0.482871	0.02%
5.7.0 Transport and communication	10.63338	0.44%
6.2.0 Reservoir/dam	0.157302	0.01%
6.3.0 River	1.968974	0.08%

[13]

B.6 List of properties with erosional soils within proposed pipeline corridor

See [Appendix 3](#) for details on this information.



B.7 Interpretation

Narrabri Shire is represented in the Hunter gas pipeline design corridor from chainage 386 to chainage 499 covering a length of 113.8km which is an area of 2,424.58 ha and 18.23% of the total pipeline.

Of that area within the Narrabri district, 42.8% (1038 ha) is classified as native vegetation from 23 different vegetation classes. 7.9 % (191 ha) is high quality Koala habitat, with 40 recorded koala sightings and 1378 threatened fauna records from 48 species within a 10 km buffer of the proposed pipeline. There are two recorded Aboriginal cultural sites within the pipeline corridor and 14 within a 200m buffer. 1.02 % (24.8 ha) of the corridor is riparian lands and water courses, with 98 creeks within the corridor and the pipeline will cross 17 streams of order 2 or higher. The pipeline traverses 15 different soil landscapes and 10.4 % (370.07 ha) of the pipeline corridor is in flood prone land. 53% (1283.62ha) is over Biophysical Strategic Agricultural land and 62.26 % will go through soils of high or moderately high soil fertility.

These numbers show that nearly half of the proposed pipeline is going through native vegetation of high diversity which is indicative of the lands ability to support biodiversity. This indicates high environmental value and ecosystem services. It also indicates that the Narrabri area and the livelihoods of the various landholders will be impacted commercially by the proposal and that the environmental value and ecosystem services will also be affected.

Coal and petroleum exploration and Mining titles are held by SECRETARY OF REGIONAL NSW, WHITEHAVEN COAL MINING LTD, SANTOS NSW PTY LTD, COMET RIDGE LTD and cover most of the area of the pipeline corridor.

Land holders will be required to provide 24hr access, 7 days a week to the pipeline easement if the proposal proceeds. We recommend a review by council and all individual landholders. The review should consider environmental and financial impacts on the natural and commercial assets of the land.

Available mapping identifies commercial and financial costs could be petitioned by the following groups listed as a percentage of total pipeline corridor area; grazing on native vegetation (27.71 %), grazing on modified pastures (14.31 %), cropping (50.1 %), irrigated cropping (7.33 %), residential and farm infrastructure (0.02 %), transport and communication (0.44 %), reservoir/dam (0.01 %), Rivers (0.08 %). Five properties that the pipeline will cross have been identified with erosional soils.



B.8 Recommendation

Stakeholders in the Narrabri Shire LGA are advised to ensure and question whether the proponent carries out the pipeline project in accordance with the Conditions of Approvals (COA) (Part C). The table below outlines the implications of the discussed biodiversity, cultural heritage, geographic and topographic, socio-economic and land use planning impacts of the proposed pipeline corridor within the Narrabri LGA and recommends actions in responds to those impacts.

Constraints	Impact	Action	Applicable Conditions of Approval
Water crossing	<p>Maximum of 98 water management reports corresponding to each crossing.</p> <p>Over 10% of corridor in LGA are mapped as flood prone.</p>	<p>Engage a specialist hydrologist for the water management reports.</p> <p>Engage an ecologist to assess impacts on riparian zones.</p> <p>Hydrologist and soil assessors to assess hazards and risks of erosion potential in flood prone areas.</p>	2.5, 2.7, 3.22
Threatened Flora & Fauna; Native Vegetation	<p>43% of the corridor in the LGA need assessment for clearing the native vegetation.</p> <p>Impacts on threatened flora, fauna and ecological communities need to be assessed.</p>	Engage a specialist ecologist to survey impacts of native vegetation clearing on threatened fauna (nocturnal and diurnal), threatened flora and threatened ecological communities.	2.1.1, 2.1.2, 2.4, 3.15, 3.16, 3.18, 6.2,
Koala	Impacts on koala habitat and threatened species: 8% of corridor in LGA are high quality koala habitat.	Engage a specialist ecologist that has the accreditation for the assessment of Koala habitat.	3.15



	Pipeline crosses Areas of Regional Koala Significance (ARKS).		
Soils	Alluvial, stagnant alluvial, erosional, residual and transferral are present in the corridor.	Engage a specialist CPSS qualified soil assessor to assess the soils for potential degradation and erosional potential.	3.22, 6.2
Socio-Economic	<p>Potential loss of 62% of land (1509ha) that is of moderately high to high fertility.</p> <p>Potential loss of 1284ha land (53% of corridor in LGA) that is mapped as Biophysical Strategic Agricultural Land which sustains the \$13.1B agricultural industry in NSW[14]. Further, 99% of the corridor in LGA are covered by farming related land uses.</p>	Request a Gateway Assessment to be conducted by an independent assessor before the granting of any approvals.	3.14, 6.2, There is no COA that is specific to agricultural land other than livestock (3.14)
Cultural Heritage	Under native title claim and few existing aboriginal sites – 2 within the pipeline corridor and 14 within the 200m buffer.	Consultation with traditional owners and title claim holders are required.	3.27, 5.1, 6.2
Land Tenure	Existing exploration and mining titles	Consultation with stakeholders	2.3, 3.14, 5.1



C Gunnedah

Thirteen percent (1705ha) of the proposed pipeline corridor is located within the borders of the Gunnedah Shire Local Government Area. A total length of approximately 80km of pipeline traverses this LGA.

C.1 Biodiversity

- 36.94% of the proposed corridor in Gunnedah is classified as native vegetation (629.95ha) from 6 vegetation classes [3].

Candidate Native Grasslands (Candidate Native Grasslands)
River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion (Forested Wetlands)
Black Tea-tree - River Oak - Wilga riparian low forest/shrubland wetland of rich soil depressions in the Brigalow Belt South Bioregion (Forested Wetlands)
Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion (Semi-arid Woodlands (Grassy sub-formation))
Shallow freshwater wetland sedgeland in depressions on floodplains on inland alluvial plains and floodplains (Freshwater Wetlands)
Liverpool Plains grassland mainly on basaltic black earth soils, Brigalow Belt South Bioregion (Grasslands)

- 3.14% of the corridor is high quality koala habitat (53.57ha) (>70% koala habitat suitability [4].

897 threatened fauna records from 37 species in total within a 10km buffer around the proposed pipeline corridor [5]. Please refer to map: Gunnedah – Overview with threatened species (GU.1).

- 479 threatened fauna records before 2008
- 420 threatened fauna records in or after 2008
- 272 threatened fauna records in or after 2015



<i>Circus assimilis</i>	Spotted Harrier
<i>Phascolarctos cinereus</i>	Koala
<i>Falco subniger</i>	Black Falcon
<i>Ninox connivens</i>	Barking Owl
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)
<i>Stagonopleura guttata</i>	Diamond Firetail
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat
<i>Chalinolobus picatus</i>	Little Pied Bat
<i>Glossopsitta pusilla</i>	Little Lorikeet
<i>Neophema pulchella</i>	Turquoise Parrot
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)
<i>Chthonicola sagittata</i>	Speckled Warbler
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow
<i>Lathamus discolor</i>	Swift Parrot
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox
<i>Vespadelus troungtoni</i>	Eastern Cave Bat
<i>Aprasia parapulchella</i>	Pink-tailed Legless Lizard
<i>Hieraaetus morphnoides</i>	Little Eagle
<i>Daphoenositta chrysoptera</i>	Varied Sittella
<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat



Uvidicolus sphyrrus	Border Thick-tailed Gecko
Hoplocephalus bitorquatus	Pale-headed Snake
Grantiella picta	Painted Honeyeater
Petaurus norfolcensis	Squirrel Glider
Hamirostra melanosternon	Black-breasted Buzzard
Lophoictinia isura	Square-tailed Kite
Tyto novaehollandiae	Masked Owl
Oxyura australis	Blue-billed Duck
Petroica phoenicea	Flame Robin
Grus rubicunda	Brolga
Anthochaera phrygia	Regent Honeyeater
Falco hypoleucos	Grey Falcon
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat
Hirundapus caudacutus	White-throated Needletail
Chalinolobus dwyeri	Large-eared Pied Bat

- 669 koala sightings (Bionet species sightings) in 10km buffer around corridor in total [5].
- Areas of Regional Koala Significance (ARKS): One ARKS intersects with pipeline corridor and makes up 39.7 % of total pipeline corridor in Gunnedah (677ha).

C.2 Cultural heritage

- Aboriginal sites or artefacts: 9 sites within pipeline corridor; 21 within 200m buffer around corridor.

C.3 Geographic and topographic constraints

- **Riparian lands and water courses**, please refer to map: Gunnedah – Waterways (GU.3).



- No EPI mapping
- 25.49 ha riparian lands and watercourses (Biodiversity Values Map) (1.49%) of corridor [6]
- 70 creeks within corridor (from hydroline layer) [7]
 - ❖ 26 of these are non-perennial.
- 7 stream order 2 or higher crossings (RiverStyles layer) [8]
 - ❖ MOOKI RIVER
 - ❖ WERRIS CREEK
 - ❖ CARROLL CREEK
- **Soil and land resources:** [9]. please refer to Map: Gunnedah – Soil and land resources by process (GU.2)
 - 12 soil landscapes from 4 processes

Burburgate	Alluvial
Blue Vale	Residual
Brentry	Transferral
Carroll Creek	Stagnant Alluvial
Conadilly	Alluvial
Driggle Draggie	Stagnant Alluvial
Maryland	Transferral
Quirindi Creek	Alluvial
Top Rock	Transferral
Velyama	Transferral
Mooki River	Alluvial
Rangira Outwash	Alluvial

- Flood prone land (EPI): 91.18% (1,555ha) of pipeline corridor in Gunnedah.

C.4 Socio-economic implications

- Biophysical Strategic Agricultural Land: 69.12% of pipeline corridor (1178.68ha) [10]



- Inherent soil fertility: 84.61% of pipeline corridor go through soils of high or moderately high soil fertility (1442.95ha) [11]

C.5 Land use planning impacts

- 72.87% (1243ha) of corridor in Gunnedah is covered by existing exploration and mining titles: coal and petroleum (Holder: SECRETARY OF REGIONAL NSW, WHITEHAVEN COAL MINING LIMITED, AUSTRALIAN COALBED METHANE PTY LIMITED; SANTOS QNT PTY.LTD., COALWORKS (VICKERY SOUTH) PTY LTD; VICKERY SOUTH PTY LTD [12]. Note that areas and percentages may be higher as some areas have several titles on the same land.

Secondary Land Use (2017)	Area (ha)	Proportion (%)
2.1.0 Grazing native vegetation	299.948	17.59
3.2.0 Grazing modified pastures	167.608	9.83
3.3.0 Cropping	656.0956	38.47
4.3.0 Irrigated cropping	357.1744	20.94
5.4.0 Residential and farm infrastructure	10.99452	0.64
5.7.0 Transport and communication	132.6338	7.78
6.2.0 Reservoir/dam	25.86177	1.52
6.3.0 River	26.04999	1.53
6.4.0 Channel/aqueduct	24.70343	1.45
6.5.0 Marsh/wetland	4.299072	0.25

[13]

C.6 Interpretation

Gunnedah Shire is represented in the Hunter gas pipeline design corridor from chainage 500 to chainage 579 covering a length of 80km which is an area of 1,705.38ha and 12.82% of the total pipeline.

Of this, 36.94 % (629.95 ha) is classified as native vegetation from 6 different vegetation classes. 3.14 % (53.57 ha) is high quality Koala habitat, with 669 recorded koala sightings and 897 threatened fauna records from 37 species within a 10 km buffer of



the proposed pipeline. Nine Aboriginal cultural heritage sites exist within the pipeline corridor and 21 within a 200m buffer. 1.49 % (25.49 ha) of the pipeline is riparian lands and water courses, with 70 creeks within the corridor and the pipeline will cross 7 streams of order 2 or higher. The pipeline traverses 12 different soil land scapes. 91.18 % of the corridor is in flood prone land, 69.12% (1178.68ha) is Biophysical Strategic Agricultural land and 84.61 % (1442.95 ha) will go through soils of high or moderately high soil fertility.

Coal and petroleum exploration and mining titles are held by SECRETARY OF REGIONAL NSW, WHITEHAVEN COAL MINING LIMITED, AUSTRALIAN COALBED METHANE PTY LIMITED; SANTOS QNT PTY.LTD., COALWORKS (VICKERY SOUTH) PTY LTD; VICKERY SOUTH PTY LTD (1242.7ha (72.87%)). Land uses that the pipeline will go through are: grazing on native vegetation (17.59 %), grazing on modified pastures (9.83 %), cropping (38.47 %), irrigated cropping (20.94 %), residential and farm infrastructure (0.64 %), transport and communication (07.78 %), reservoir/dam (1.52 %), Rivers (1.53 %), channel/aqueduct (1.45 %) and marsh/wetland (0.25 %). Five properties that the pipeline will cross have been identified with erosional soils.

C.7 Recommendation

Stakeholders in the Gunnedah Shire LGA are advised to ensure and question whether the proponent carries out the pipeline project in accordance with the Conditions of Approvals (COA) (Part C). The table below outlines the implications of the discussed biodiversity, cultural heritage, geographic and topographic, socio-economic and land use planning impacts of the proposed pipeline corridor within the Gunnedah LGA and recommends actions in responds to those impacts.

Constraints	Impact	Action	Applicable Conditions of Approval
Water crossing	Maximum of 70 water management reports corresponding to each crossing.	Engage a specialist hydrologist for the water management reports.	2.5, 2.7, 3.22
	Over 91% of corridor in LGA are mapped as flood prone.	Engage an ecologist to assess impacts on riparian zones.	



		Hydrologist and soil assessors to assess hazards and risks of erosion potential in flood prone areas.	
Threatened Flora & Fauna; Native Vegetation	<p>37% of the corridor in the LGA need assessment for clearing the native vegetation.</p> <p>Impacts on threatened flora, fauna and ecological communities need to be assessed.</p>	Engage a specialist ecologist to survey impacts of native vegetation clearing on threatened fauna (nocturnal and diurnal), threatened flora and threatened ecological communities.	2.1.1, 2.1.2, 2.4, 3.15, 3.16, 3.18, 6.2,
Koala	<p>Impacts on koala habitat and threatened species: 3% of corridor in LGA are high quality koala habitat.</p> <p>Pipeline crosses Areas of Regional Koala Significance (ARKS).</p>	Engage a specialist ecologist that has the accreditation for the assessment of Koala habitat.	3.15
Soils	Alluvial, stagnant alluvial, residual and transferral are present in the corridor.	Engage a specialist CPSS qualified soil assessor to assess the soils for potential degradation and erosional potential.	3.22, 6.2
Socio-Economic	<p>Potential loss of 85% of land (1443ha) that is of moderately high to high fertility.</p> <p>Potential loss of 1179ha land (69% of corridor in LGA) that is mapped as Biophysical Strategic Agricultural Land which</p>	Request a Gateway Assessment to be conducted by an independent assessor before the granting of any approvals.	3.14, 6.2, There is no COA that is specific to agricultural land other than livestock (3.14)



	sustains the \$13.1B agricultural industry in NSW[14]. Further, 87% of the corridor in LGA are covered by farming related land uses.		
Cultural Heritage	Under native title claim and few existing aboriginal sites – 9 within the pipeline corridor and 21 within the 200m buffer.	Consultation with traditional owners and title claim holders are required.	3.27, 5.1, 6.2
Land Tenure	Existing exploration and mining titles; traveling stock routes (especially the Pullaming Stock Route addressed in COA 3.12).	Consultation with stakeholders	2.3, 3.12 (should be applicable for all stock routes, not just the Pullaming SR), 3.14, 5.1



D Liverpool Plains

Almost 10% (1320.40ha) of the proposed pipeline corridor is located within the borders of the Moree Plains Shire Local Government Area. A total length of approximately 60.9km of pipeline traverses this LGA.

D.1 Biodiversity

- 29.27% of the proposed corridor in Liverpool Plains is classified as native vegetation (386.46ha) from 16 vegetation classes [3]

Candidate Native Grasslands (Candidate Native Grasslands)
Liverpool Plains grassland mainly on basaltic black earth soils, Brigalow Belt South Bioregion (Western Slopes Grasslands)
White Box grassy woodland to open woodland on basalt flats and rises in the Liverpool Plains sub-region, BBS Bioregion (Western Slopes Grassy Woodlands)
Blakely's Red Gum - Yellow Box grassy tall woodland on flats and hills in the Brigalow Belt South Bioregion and Nandewar Bioregion (Western Slopes Grassy Woodlands)
River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion (Inland Riverine Forests)
River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South and Nandewar Bioregions (Eastern Riverine Forests)
Derived grasslands of the Upper slopes, ridge tops and frost hollows of the Upper Hunter and Barrington Ranges
Yellow Box - White Box - Silvertop Stringybark - Blakelys Red Gum grass shrub woodland mainly on the Liverpool Range, Brigalow Belt South Bioregion
Yellow Box - Rough-barked Apple grassy woodland of the upper Hunter and Liverpool Plains
Derived grassland of the NSW South Western Slopes



Silvertop Stringybark - Yellow Box +/- Norton's Box grassy woodland on basalt hills mainly on northern aspects of the Liverpool Range, Brigalow Belt South Bioregion (New England Grassy Woodlands)

Silvertop Stringybark - Yellow Box - Apple Box - Rough-barked Apple shrub grass open forest mainly on southern slopes of the Liverpool Range, Brigalow Belt South Bioregion (New England Grassy Woodlands)

White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland on mainly clay loam soils on hills mainly in the Nandewar Bioregion (Western Slopes Grassy Woodlands)

Grey Box grassy woodland or open forest of the Nandewar Bioregion and New England Tableland Bioregion (Western Slopes Grassy Woodlands)

Yellow Box - White Box - Silvertop Stringybark - Blakely's Red Gum grass shrub woodland mainly on the Liverpool Range, Brigalow Belt South Bioregion (New England Grassy Woodlands)

Mock Olive - Wilga - Peach Bush - Carissa semi-evergreen vine thicket (dry rainforest) mainly on basalt soils in the Brigalow Belt South Bioregion (Western Vine Thickets)

- 1.96% of the corridor is high quality koala habitat (25.92ha) (>70% koala habitat suitability [4])
- 138 threatened fauna records from 25 species in total occur within a 10km buffer around the proposed pipeline corridor [5]. Please refer to map: Liverpool Plains – Overview with threatened species (LI.1).
 - 13 threatened fauna records before 2008
 - 125 threatened fauna records in or after 2008
 - 44 threatened fauna records in or after 2015

Dasyurus maculatus	Spotted-tailed Quoll
Glossopsitta pusilla	Little Lorikeet
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)
Hieraaetus morphnoides	Little Eagle



<i>Tyto novaehollandiae</i>	Masked Owl
<i>Phascolarctos cinereus</i>	Koala
<i>Litoria booroolongensis</i>	Booroolong Frog
<i>Chthonicola sagittata</i>	Speckled Warbler
<i>Neophema pulchella</i>	Turquoise Parrot
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle
<i>Stagonopleura guttata</i>	Diamond Firetail
<i>Anthochaera phrygia</i>	Regent Honeyeater
<i>Pomatostomus temporalis</i> <i>temporalis</i>	Grey-crowned Babbler (eastern subspecies)
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle
<i>Vespadelus troughtoni</i>	Eastern Cave Bat
<i>Falco subniger</i>	Black Falcon
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat
<i>Oxyura australis</i>	Blue-billed Duck
<i>Artamus cyanopterus</i> <i>cyanopterus</i>	Dusky Woodswallow
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat
<i>Circus assimilis</i>	Spotted Harrier
<i>Petaurus norfolcensis</i>	Squirrel Glider
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)

- 45 koala sightings (Bionet species sightings) in a 10km buffer around the pipeline corridor in total [5].



D.2 Cultural heritage

- Aboriginal cultural heritage sites or artefacts: 0 recorded sites within pipeline corridor; 0 within 1200m buffer around corridor.

D.3 Geographic and topographic constraints

- **Riparian lands and water courses**, please refer to map: Liverpool Plains – Waterways (LI.3)
 - No EPI mapping
 - 9.94 ha riparian lands and watercourses (Biodiversity Values Map) (0.75%) of corridor [6]
 - 125 creeks within corridor (from hydroline layer) [7]
 - ❖ 111 of these are non-perennial.
 - 6 stream order 2 or higher crossings (RiverStyles layer) [8]
 - ❖ QUIPOLLY CREEK
 - ❖ BORAMBIL CREEK
 - ❖ QUIRINDI CREEK
 - ❖ WERRIS CREEK
- Soil and land resources: [9]
 - 16 soil landscapes from 6 processes, please refer to Map: Liverpool Plains – Soil and land resources by process (LI.2):

Borambil Creek	Alluvial
Doona	Residual
Eurunderee	Transferral
Oak	Erosional
Goscombes Road	Transferral
Inverkip Road	Erosional
Lever Gully	Transferral
Moan	Erosional
St Mervins	Erosional
Meadow Bank	Erosional
Stafford Gap	Erosional



Warrah	Transferral
Disturbed Terrain	Disturbed
Coober Bulga	Colluvial
Mooki River	Alluvial
Quirindi Creek	Alluvial

D.4 Socio-economic implications

- Biophysical Strategic Agricultural Land: 13.9% of pipeline corridor (183.6ha) [10]
- Inherent soil fertility: 55.32% of pipeline corridor go through soils of high or moderately high soil fertility (730.45ha) [11]

D.5 Land use planning impacts

- 103.26% (1363.4ha) of corridor in Liverpool Plains is covered by existing exploration and mining titles:: petroleum and minerals (Holder: AUSTRALIAN COALBED METHANE PTY LIMITED; SANTOS QNT PTY.LTD., SANTOS QNT PTY.LTD., ZEOLITE AUSTRALIA PTY LIMITED) [12]. Note that areas and percentages may be higher as some areas have several titles on the same land.

Secondary Land Use (2017)	Area (ha)	Proportion (%)
2.1.0 Grazing native vegetation	578.21	43.79%
3.2.0 Grazing modified pastures	334.00	25.30%
3.3.0 Cropping	194.64	14.74%
3.4.0 Perennial horticulture	1.86	0.14%
4.2.0 Grazing irrigated modified pastures	15.72	1.19%
4.3.0 Irrigated cropping	110.45	8.36%
5.2.0 Intensive animal production	3.81	0.29%



5.4.0 Residential and farm infrastructure	29.48	2.23%
5.7.0 Transport and communication	43.92	3.33%
6.2.0 Reservoir/dam	7.54	0.57%
6.3.0 River	0.90	0.07%

[13]

D.6 List of properties with erosional soils within proposed pipeline corridor

See [Appendix 3](#) for details on this information.

D.7 Interpretation

Liverpool Plains Shire is represented in the Hunter gas pipeline design corridor from chainage 580 to chainage 639 covering a length of 60.9km which is an area of 1,320.4ha and 9.93% of the total pipeline.

Of this, 29.27 % (386.46 ha) is classified as native vegetation from 16 different vegetation classes. 1.96 % (25.92 ha) is high quality Koala habitat, with 45 recorded koala sightings and 138 threatened fauna records from 25 species within a 10 km buffer of the proposed pipeline. 0.75 % (9.94 ha) of the pipeline is riparian lands and water courses, with 125 creeks within the corridor. The pipeline will cross 6 streams of order 2 or higher. The pipeline traverses 16 different soil land scapes. 13.9% (183.6 ha) is Biophysical Strategic Agricultural land, 55.32 % (730.45ha) will go through soils of high or moderately high soil fertility.

Coal and petroleum exploration and Mining titles are held by AUSTRALIAN COALBED METHANE PTY LIMITED; SANTOS QNT PTY.LTD., SANTOS QNT PTY.LTD., ZEOLITE AUSTRALIA PTY LIMITED.

Land uses the pipeline will go through are grazing on native vegetation (43.79 %), grazing on modified pastures (25.30 %), cropping (14.74 %), perennial horticulture (0.14 %), grazing irrigated modified pastures (1.19 %), irrigated cropping (8.36 %), intensive animal production (0.29 %), residential and farm infrastructure (2.23 %), transport and communication (3.33 %), reservoir/dam (0.57 %), Rivers (0.07 %), channel/aqueduct (1.45 %) and marsh/wetland (0.25 %). 155 properties the pipeline will cross have been identified with erosional soils.



D.8 Recommendation

Stakeholders in the Liverpool Plains Shire LGA are advised to ensure and question whether the proponent carries out the pipeline project in accordance with the Conditions of Approvals (COA) (Part C). The table below outlines the implications of the discussed biodiversity, cultural heritage, geographic and topographic, socio-economic and land use planning impacts of the proposed pipeline corridor within the Liverpool Plains LGA and recommends actions in responds to those impacts.

Constraints	Impact	Action	Applicable Conditions of Approval
Water crossing	Maximum of 125 water management reports corresponding to each crossing.	Engage a specialist hydrologist for the water management reports. Engage an ecologist to assess impacts on riparian zones.	2.5, 2.7, 3.22
Threatened Flora & Fauna; Native Vegetation	29% of the corridor in the LGA need assessment for clearing the native vegetation. Impacts on threatened flora, fauna and ecological communities need to be assessed.	Engage a specialist ecologist to survey impacts of native vegetation clearing on threatened fauna (nocturnal and diurnal), threatened flora, and threatened ecological communities.	2.1.1, 2.1.2, 2.4, 3.15, 3.16, 3.18, 6.2,
Koala	Impacts on koala habitat and threatened species: 2% of corridor in LGA are high quality koala habitat. Pipeline crosses Areas of Regional Koala Significance (ARKS).	Engage a specialist ecologist that has the accreditation for the assessment of Koala habitat.	3.15



Soils	Alluvial, transferral, erosional and colluvial are present in the corridor.	Engage a specialist CPSS qualified soil assessor to assess the soils for potential degradation and erosional potential.	3.22, 6.2
Socio-Economic	<p>Potential loss of 55% of land (730ha) that is of moderately high to high fertility.</p> <p>Potential loss of 184ha land (14% of corridor in LGA) that is mapped as Biophysical Strategic Agricultural Land which sustains the \$13.1B agricultural industry in NSW[14]. Further, 96% of the corridor in LGA are covered by farming related land uses.</p>	Request a Gateway Assessment to be conducted by an independent assessor before the granting of any approvals.	3.14, 6.2, There is no COA that is specific to agricultural land other than livestock (3.14)
Cultural Heritage	Under native title claim	Consultation with traditional owners and title claim holders are required.	3.27, 5.1, 6.2
Land Tenure	Existing exploration and mining titles; traveling stock routes (especially the Pullaming Stock Route addressed in COA 3.12).	Consultation with stakeholders	2.3, 3.12 (should be applicable for all stock routes, not just the Pullaming SR), 3.14, 5.1



E Upper Hunter

Over 10% (1,337.7 ha) of the proposed pipeline corridor are located within the borders of the Upper Hunter Shire Local Government Area. A total length of approximately 62.9km of pipeline traverses this LGA.

E.1 Biodiversity

- 60.73% of the proposed corridor in Upper Hunter is classified as native vegetation (812.34ha) from 16 vegetation classes [3]

Derived grassland of the NSW South Western Slopes (Western Slopes Grasslands)
River Red Gum / River Oak riparian woodland wetland in the Hunter Valley (Eastern Riverine Forests)
River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion (Eastern Riverine Forests)
Weeping Myall - Coobah - Scrub Wilga shrubland of the Hunter Valley (Coastal Valley Grassy Woodlands)
Yellow Box - Rough-barked Apple grassy woodland of the upper Hunter and Liverpool Plains (Western Slopes Grassy Woodlands)
Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley (Western Slopes Grassy Woodlands)
Derived tall spear grass Plains Grass? grassland on mainly basalt hills of the Liverpool Plains, Liverpool Range and in the upper Hunter Valley (Merriwa district), south-eastern Brigalow Belt South Bioregion (Western Slopes Grasslands)
Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter (North-west Slopes Dry Sclerophyll Woodlands)
Blakelys Red Gum - Narrow-leaved Ironbark - Rough-barked Apple shrubby woodland of the upper Hunter (North-west Slopes Dry Sclerophyll Woodlands)
Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter (Coastal Valley Grassy Woodlands)



Weeping Myall - Plains Grass grassy woodlands of the Brigalow Belt South (Riverine Plain Woodlands)
Western Hunter Flats Rough-barked Apple Forest (Eastern Riverine Forests)
Derived grasslands of the Upper slopes, ridge tops and frost hollows of the Upper Hunter and Barrington Ranges (Temperate Montane Grasslands)
White Box grassy woodland to open woodland on basalt flats and rises in the Liverpool Plains sub-region, BBS Bioregion (Western Slopes Grassy Woodlands)
River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion) (Eastern Riverine Forests)
Silvertop Stringybark - Yellow Box +/- Nortons Box grassy woodland on basalt hills mainly on northern aspects of the Liverpool Range, Brigalow Belt South Bioregion (New England Grassy Woodlands)
Yellow Box - White Box - Silvertop Stringybark - Blakelys Red Gum grass shrub woodland mainly on the Liverpool Range, Brigalow Belt South Bioregion (New England Grassy Woodlands)
White Box - Silvertop Stringybark +/- White Cypress Pine grass shrub open forest of the southern Nandewar Bioregion and New England Tableland Bioregion (North-west Slopes Dry Sclerophyll Woodlands)
Rough-barked Apple - Silvertop Stringybark - Ribbon Gum shrub/grass open forest on hills of the southern Nandewar Bioregion (New England Dry Sclerophyll Forests)
Grey Box - Grey Gum - Rough-barked Apple - Blakelys Red Gum grassy open forest of the central Hunter (Hunter-Macleay Dry Sclerophyll Forests)
Grey Gum - Grey Myrtle - Narrow-leaved Stringybark - Rusty Fig open forest on ranges of the Upper Hunter (Sydney Hinterland Dry Sclerophyll Forests)
Rough-barked Apple - Tree Violet grassy open forest on sheltered sites of the Liverpool Range (New England Grassy Woodlands)
River Oak moist riparian tall open forest of the upper Hunter Valley, including Liverpool Range (Eastern Riverine Forests)



Silvertop Stringybark - Yellow Box - Apple Box - Rough-barked Apple shrub grass open forest mainly on southern slopes of the Liverpool Range, Brigalow Belt South Bioregion (New England Grassy Woodlands)

Silvertop Stringybark - Forest Ribbon Gum grassy open forest of the Liverpool Ranges (Northern Tableland Wet Sclerophyll Forests)

White Box - Narrow-leaved Ironbark - Blakelys Red Gum shrubby open forest of the central and upper Hunter (North-west Slopes Dry Sclerophyll Woodlands)

Narrow-leaved Stringybark - Ironbark heathy open forest on sandstone ranges of the upper Hunter (Western Slopes Dry Sclerophyll Forests)

River Oak - White Cedar Grassy Riparian Forest of the Dungog Area and Liverpool Ranges (Eastern Riverine Forests)

Western Hunter Footslopes Box Woodland (Western Slopes Grassy Woodlands)

- 4.81% of the corridor is high quality koala habitat (64.38ha) (>70% koala habitat suitability [4])
- 135 threatened fauna records from 31 species in total are located within a 10km buffer around the proposed pipeline corridor [5]. Please refer to map: Upper Hunter – Overview with threatened species (UP.1)
 - 83 threatened fauna records before 2008
 - 52 threatened fauna records in or after 2008
 - 30 threatened fauna records in or after 2015

Dasyurus maculatus	Spotted-tailed Quoll
Hirundapus caudacutus	White-throated Needletail
Phascolarctos cinereus	Koala
Petroica phoenicea	Flame Robin
Hieraaetus morphnoides	Little Eagle
Falco subniger	Black Falcon
Myotis macropus	Southern Myotis
Miniopterus orianae oceanensis	Large Bent-winged Bat



<i>Tyto novaehollandiae</i>	Masked Owl
<i>Petaurus australis</i>	Yellow-bellied Glider
<i>Miniopterus australis</i>	Little Bent-winged Bat
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox)
<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat
<i>Vespadelus troungtoni</i>	Eastern Cave Bat
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow
<i>Lathamus discolor</i>	Swift Parrot
<i>Glossopsitta pusilla</i>	Little Lorikeet
<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat
<i>Chthonicola sagittata</i>	Speckled Warbler
<i>Stagonopleura guttata</i>	Diamond Firetail
<i>Petaurus norfolcensis</i>	Squirrel Glider
<i>Petroica boodang</i>	Scarlet Robin
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat
<i>Anseranas semipalmata</i>	Magpie Goose
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle
<i>Anthochaera phrygia</i>	Regent Honeyeater



- 6 koala sightings (Bionet species sightings) in a 10km buffer around the pipeline corridor in total [5]

E.2 Cultural heritage

- Aboriginal cultural heritage sites or artefacts: 5 recorded cultural heritage sites within pipeline corridor; 9 within 200m buffer around corridor.

E.3 Geographic and topographic constraints

- **Riparian lands and water courses**, please refer to map: Upper Hunter – Waterways (UP.3).
 - EPI Riparian Lands and Watercourses: 0.06% (0.83ha) of corridor [15]
 - 30.78ha riparian lands and watercourses (Biodiversity Values Map) (2.30%) of corridor [6]
 - 186 creeks within corridor (from hydroline layer) [7]
 - ❖ 159 of these are non-perennial.
 - 30 stream order 2 or higher crossings (RiverStyles layer) [8]
 - ❖ NO NAMES IN DATASET, FROM MAP:
 - ❖ CAMPBELLS CREEK
 - ❖ DRY CREEK
 - ❖ PAGES RIVER
 - ❖ BOYDS CREEK
 - ❖ PETWYN VALLEY CREEK
 - ❖ DRY CREEK
 - ❖ MIDDLE CREEK
 - ❖ DARK BROOK
 - ❖ KINGDON PONDS
 - ❖ HUNTER RIVER
- **Soil and land resources:** [9]
 - 19 soil landscapes from 6 processes, please refer to Map: Upper Hunter – Soil and land resources by process (UP.2):

Ant Hill	Erosional
Ant Hill variant a	Erosional
Cressfield Road	Erosional
Cressfield Road variant a	Erosional



Donalds Gully	Transferral
Dochra	Erosional
Dunwell	Erosional
Fordwich	Residual
Glen Oak	Erosional
Kingdon Ponds	Alluvial
Lovedale	Transferral
Thompsons Creek	Alluvial
Tinagroo	Erosional
Wingen Maid	Colluvial
Disturbed Terrain	Disturbed
Yarramoor	Alluvial
Cooper Bulga	Colluvial
Moan	Erosional
Singleton	Alluvial

E.4 Socio-economic implications

- Biophysical Strategic Agricultural Land: 27.98% of pipeline corridor (374.35ha) [10]
- Inherent soil fertility: 55.32% of pipeline corridor go through soils of high or moderately high soil fertility (374.35ha); Critical Industry Cluster Land (Equine): 76.67% (1025.65ha), Critical Industry Cluster Land (Viticulture): 0.15% (2.02ha) of pipeline corridor [11]

E.5 Land use planning impacts

- 42.62% (570.2) of corridor in the Upper Hunter is covered by existing exploration and mining titles:: petroleum (Holder: SANTOS QNT PTY.LTD.,



HUNTER GAS PTY LTD; SANTOS QNT PTY.LTD.) [12]. Note that areas and percentages may be higher as some areas have several titles on the same land.

Secondary Land Use (2017)	Area (ha)	Proportion (%)
1.3.0 Other minimal use	33.13495	2.48
2.1.0 Grazing native vegetation	554.3066	41.44
3.2.0 Grazing modified pastures	532.4696	39.81
3.3.0 Cropping	44.54146	3.33
4.2.0 Grazing irrigated modified pastures	72.24632	5.40
5.2.0 Intensive animal production	10.58564	0.79
5.4.0 Residential and farm infrastructure	27.04383	2.02
5.5.0 Services	0.058973	0.00
5.7.0 Transport and communication	31.58105	2.36
5.9.0 Waste treatment and disposal	1.193539	0.09
6.2.0 Reservoir/dam	5.260643	0.39
6.3.0 River	25.27431	1.89

[13]

E.6 List of properties with erosional soils within proposed pipeline corridor

See [Appendix 3](#) for further information.

E.7 Interpretation

Upper Hunter Shire is represented in the Hunter gas pipeline design corridor from chainage 640 to chainage 702 covering a length of 62.9km which is an area of 1,337.69ha and 10.06% of the total pipeline.

Of this, 60.73% (812.34 ha) is classified as native vegetation from 16 different vegetation classes. 4.8 % (64.38 ha) is high quality Koala habitat, with 6 recorded koala



sightings and 135 threatened fauna records from 31 species within a 10 km buffer of the proposed pipeline. Five recorded Aboriginal cultural heritage sites exist within the pipeline corridor and 9 within a 1200m buffer. 2.3 % (30.78 ha) of the pipeline is riparian lands and water courses, with 186 creeks within the corridor. The pipeline will cross 30 streams of order 2 or higher. The pipeline traverses 19 different soil land scapes. 27.98 % (374.35 ha) is Biophysical Strategic Agricultural land and 55.32% (374.35ha) will go through soils of high or moderately high soil fertility.

Petroleum exploration and Mining titles are held by SANTOS QNT PTY.LTD., HUNTER GAS PTY LTD; SANTOS QNT PTY.LTD. Land uses the pipeline will go through are: grazing on native vegetation (41.44 %), grazing on modified pastures (39.81 %), cropping (3.33 %), grazing irrigated modified pastures (5.4 %), intensive animal production (0.79 %) residential and farm infrastructure (2.02 %), services, transport and communication (2.36 %), waste treatment and disposal (0.09 %) reservoir/dam (0.39 %), Rivers (1.89 %). 129 properties the pipeline will cross have been identified with erosional soils.

E.8 Recommendation

Stakeholders in the Upper Hunter Shire LGA are advised to ensure and question whether the proponent carries out the pipeline project in accordance with the Conditions of Approvals (COA) (Part C). The table below outlines the implications of the discussed biodiversity, cultural heritage, geographic and topographic, socio-economic and land use planning impacts of the proposed pipeline corridor within the Upper Hunter LGA and recommends actions in responds to those impacts.

Constraints	Impact	Action	Applicable Conditions of Approval
Water crossing	Maximum of 186 water management reports corresponding to each crossing.	Engage a specialist hydrologist for the water management reports. Engage an ecologist to assess impacts on riparian zones.	2.5, 2.7, 3.22



Groundwater	18% of corridor in LGA are mapped as groundwater vulnerability.	Engage a specialist groundwater consultant to assess potential impacts on groundwater.	3.23
Threatened Flora & Fauna; Native Vegetation	61% of the corridor in the LGA need assessment for clearing the native vegetation. Impacts on threatened flora, fauna and ecological communities need to be assessed.	Engage a specialist ecologist to survey impacts of native vegetation clearing on threatened fauna (nocturnal and diurnal), threatened flora and threatened ecological communities.	2.1.1, 2.1.2, 2.4, 3.15, 3.16, 3.18, 6.2,
Koala	Impacts on koala habitat and threatened species: 5% of corridor in LGA are high quality koala habitat.	Engage a specialist ecologist that has the accreditation for the assessment of Koala habitat.	3.15
Soils	Alluvial, transferral, erosional and colluvial are present in the corridor.	Engage a specialist CPSS qualified soil assessor to assess the soils for potential degradation and erosional potential.	3.22, 6.2
Socio-Economic	Potential loss of 35% of land (472ha) that is of moderately high to high fertility. Potential loss of 374ha land (28% of corridor in LGA) that is mapped as Biophysical Strategic Agricultural Land which sustains the \$13.1B agricultural industry in NSW[14]. Further, 93% of	Request a Gateway Assessment to be conducted by an independent assessor before the granting of any approvals.	3.14, 6.2, There is no COA that is specific to agricultural land other than livestock (3.14)



	<p>the corridor in LGA are covered by farming related land uses.</p> <p>Additionally, 1026ha (77% of corridor in LGA) of Critical Industry Cluster Land (Equine), and 2ha (0.15%) of Critical Industry Cluster Land (Viticulture). These areas were identified as 'highly productive. Industries within the region [...], contribute to the identity of that region and provide significant employment opportunities. The creation of these industry clusters aims to protect this high quality agricultural land from the impacts of coal seam gas (CSG) and mining activities." [16]</p>		
Cultural Heritage	Under native title claim and few existing aboriginal sites – 5 within the pipeline corridor and 9 within the 200m buffer.	Consultation with traditional owners and title claim holders are required.	3.27, 5.1, 6.2
Land Tenure	Existing exploration and mining titles; traveling stock routes	Consultation with stakeholders	2.3, 3.12 (should be applicable for all stock routes, not just the Pullaming SR), 3.14, 5.1



F Muswellbrook

Almost 4% (522.47 ha) of the proposed pipeline corridor is located within the borders of the Muswellbrook Shire Local Government Area. A total length of approximately 23.6km of pipeline traverses this LGA.

F.1 Biodiversity

- 80.47% of the proposed corridor in Muswellbrook is classified as native vegetation (420.42ha) from 15 vegetation classes [3]

Derived grassland of the NSW South Western Slopes (Western Slopes Grasslands)
River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion) (Eastern Riverine Forests)
Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter (North-west Slopes Dry Sclerophyll Woodlands)
Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter (Coastal Valley Grassy Woodlands)
White Mahogany - Spotted Gum - Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley (Northern Hinterland Wet Sclerophyll Forests)
Forest Red Gum grassy open forest on floodplains of the lower Hunter (Coastal Floodplain Wetlands)
Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter (Coastal Valley Grassy Woodlands)
Grey Box - Grey Gum - Rough-barked Apple - Blakelys Red Gum grassy open forest of the central Hunter (Hunter-Macleay Dry Sclerophyll Forests)
Derived tall spear grass Plains Grass? grassland on mainly basalt hills of the Liverpool Plains, Liverpool Range and in the upper Hunter Valley (Merriwa district), south-eastern Brigalow Belt South Bioregion (Western Slopes Grasslands)



Whalebone Tree - Red Kamala dry subtropical rainforest of the lower Hunter River (Dry Rainforests)
White Box - Narrow-leaved Ironbark - Blakelys Red Gum shrubby open forest of the central and upper Hunter (North-west Slopes Dry Sclerophyll Woodlands)
Rusty Fig - Native Quince - Native Olive dry rainforest of the Central Hunter Valley (Dry Rainforests)
Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest of the central and lower Hunter (Hunter-Macleay Dry Sclerophyll Forests)
Blakelys Red Gum - Narrow-leaved Ironbark - Rough-barked Apple shrubby woodland of the upper Hunter (North-west Slopes Dry Sclerophyll Woodlands)
Western Hunter Flats Rough-barked Apple Forest (Eastern Riverine Forests)

- 1.03% of the corridor are high quality koala habitat (5.4ha) (>70% koala habitat suitability) [4]
- Identified Rainforest (Biodiversity Values): 0.02% (0.12ha) [6]
- Threatened species or communities with potential for serious and irreversible impacts (Biodiversity Values): 0.07% (0.38ha) [6]
- 501 threatened fauna records from 39 species are located within a 10km buffer around the proposed pipeline corridor [5]. Please refer to map: Muswellbrook – Overview with threatened species (MU.1).
 - 55 threatened fauna records before 2008
 - 406 threatened fauna records in or after 2008
 - 307 threatened fauna records in or after 2015

<i>Litoria aurea</i>	Green and Golden Bell Frog
<i>Delma impar</i>	Striped Legless Lizard
<i>Anseranas semipalmata</i>	Magpie Goose
<i>Stictonetta naevosa</i>	Freckled Duck
<i>Hirundapus caudacutus</i>	White-throated Needletail
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork



<i>Circus assimilis</i>	Spotted Harrier
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle
<i>Hieraaetus morphnoides</i>	Little Eagle
<i>Lophoictinia isura</i>	Square-tailed Kite
<i>Falco subniger</i>	Black Falcon
<i>Calyptrorhynchus lathamii</i>	Glossy Black-Cockatoo
<i>Glossopsitta pusilla</i>	Little Lorikeet
<i>Lathamus discolor</i>	Swift Parrot
<i>Neophema pulchella</i>	Turquoise Parrot
<i>Tyto tenebricosa</i>	Sooty Owl
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)
<i>Chthonicola sagittata</i>	Speckled Warbler
<i>Anthochaera phrygia</i>	Regent Honeyeater
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)
<i>Daphoenositta chrysoptera</i>	Varied Sittella
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)
<i>Petroica boodang</i>	Scarlet Robin
<i>Stagonopleura guttata</i>	Diamond Firetail
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale
<i>Phascolarctos cinereus</i>	Koala
<i>Petaurus norfolcensis</i>	Squirrel Glider
<i>Pteropus poliocephalus</i>	Grey-headed Flying fox



Saccolaimus flaviventris	Yellow-bellied sheath-tail-bat
Micronomus norfolkensis	Eastern Coastal Free-Tailed Bat
Chalinolobus dwyeri	Large-eared Pied Bat
Falsistrellus tasmaniensis	Eastern False Pipistrelle
Myotis macropus	Southern Myotis
Scoteanax rueppellii	Greater Broad-nosed Bat
Vespadelus troungtoni	Eastern Cave Bat
Miniopterus australis	Little Bent-winged Bat
Miniopterus orianae oceanensis	Large Bent-winged Bat

- 11 koala sightings (Bionet species sightings) in 10km buffer around corridor (all time) [5].

F.2 Cultural heritage

- Aboriginal cultural heritage sites: 4 recorded sites within pipeline corridor; 8 within 200m buffer.

F.3 Geographic and topographic constraints

- **Riparian lands and water courses**, please refer to map: Muswellbrook – Waterways (MU.3).
 - No EPI mapping
 - 15.60ha riparian lands and watercourses (Biodiversity Values Map) (2.99%) of corridor [6]
 - 98 creeks within corridor (from hydroline layer) [7]
 - ❖ 96 of these are non-perennial.
 - 11 stream order 2 or higher crossings (RiverStyles layer) [8]
 - ❖ NO NAMES IN DATASET, FROM MAP:
 - ❖ WELL GULLY
 - ❖ SANDY CREEK
 - ❖ MUSCLE CREEK
 - ❖ COALHOLE CREEK
 - ❖ BOWMANS CREEK
- **Soil and land resources:** [9]



- 14 soil landscapes; 5 processes, please refer to Map: Muswellbrook – Soil and land resources by process (MU.2):

Dochra	Erosional
Foy Pinnacle	Colluvial
Foy Brook	Alluvial
Gundy Gundy	Erosional
Goorangoola	Erosional
Gyarran	Erosional
Isis	Transferral
Kangaroo Ridge	Colluvial
Little Grasstree Hill	Erosional
Ravensworth	Erosional
Scrumlo Ridge	Erosional
Waverly	Erosional
Disturbed Terrain variant a	Disturbed
Singleton	Alluvial

- Environmentally Sensitive Lands (EPI): 3.69% (19.27ha) of pipeline corridor
- Terrestrial Biodiversity (EPI): 3.96% (19.27ha) of pipeline corridor

F.4 Land use planning impacts

- 4.87% (25.42ha) of corridor in Muswellbrook is covered by existing exploration and mining titles: Coal (Holder: MUSWELLBROOK COAL COMPANY LTD) [12]. Note that areas and percentages may be higher as some areas have several titles on the same land.



Secondary Land Use (2017)	Area (ha)	Proportion (%)
1.3.0 Other minimal use	19.52019	3.74
2.1.0 Grazing native vegetation	382.4988	73.21
3.2.0 Grazing modified pastures	100.4813	19.23
3.3.0 Cropping	8.779245	1.68
5.4.0 Residential and farm infrastructure	2.625761	0.50
5.7.0 Transport and communication	1.693671	0.32
6.2.0 Reservoir/dam	1.251015	0.24
6.3.0 River	5.623078	1.08

[13]

F.5 List of properties with erosional soils within proposed pipeline corridor

See [Appendix 3](#) for further information.

F.6 Interpretation

Muswellbrook Shire is represented in the Hunter gas pipeline design corridor from chainage 703 to chainage 729 covering a length of 26.6km which is an area of 522.47ha and 3.93% of the total pipeline.

Of this, 80.47 % (420.42 ha) is classified as native vegetation from 15 different vegetation classes. 1.03 % (5.4 ha) is high quality Koala habitat, with 11 recorded koala sightings and 501 threatened fauna records from 39 species within a 10 km buffer of the proposed pipeline. 0.02 % (0.12 ha) is identified rainforest and 0.07 % (0.38 ha) is threatened species or communities with potential for serious and irreversible impacts. Four recorded Aboriginal cultural heritage sites exist within the pipeline corridor and 8 within a 200m buffer of the pipeline. 2.99 % (15.6 ha) of the pipeline is riparian lands and water courses, with 98 creeks within the corridor. The pipeline will cross 11 streams of order 2 or higher. The pipeline traverses 14 different soil land scapes. 3.69 % (19.27 ha) of Environmentally sensitive lands (EPI) and 3.69 % (19.27 ha) of Terrestrial biodiversity (EPI).



Petroleum exploration and Mining titles are held by MUSWELLBROOK COAL COMPANY LTD. Land uses that the pipeline will go through are: other minimal use (3.74 %), grazing on native vegetation (73.21 %), grazing on modified pastures (19.23 %), cropping (1.68 %), residential and farm infrastructure (0.5 %), transport and communication (0.32 %), reservoir/dam (0.24 %), Rivers (1.08 %). 59 properties the pipeline will cross have been identified with erosional soils.

F.7 Recommendation

Stakeholders in the Muswellbrook Shire LGA are advised to ensure and question whether the proponent carries out the pipeline project in accordance with the Conditions of Approvals (COA) (Part C). The table below outlines the implications of the discussed biodiversity, cultural heritage, geographic and topographic, socio-economic and land use planning impacts of the proposed pipeline corridor within the Muswellbrook LGA and recommends actions in responds to those impacts.

Constraints	Impact	Action	Applicable Conditions of Approval
Water crossing	Maximum of 98 water management reports corresponding to each crossing.	Engage a specialist hydrologist for the water management reports. Engage an ecologist to assess impacts on riparian zones.	2.5, 2.7, 3.22
Threatened Flora & Fauna; Native Vegetation	80% of the corridor in the LGA need assessment for clearing the native vegetation. Impacts on threatened flora, fauna and ecological communities need to be assessed. Specific biodiversity values were mapped for the	Engage a specialist ecologist to survey impacts of native vegetation clearing on threatened fauna (nocturnal and diurnal), threatened flora and threatened ecological communities.	2.1.1, 2.1.2, 2.4, 3.15, 3.16, 3.18, 6.2,



	corridor within this LGA: Identified Rainforest and Threatened species or communities with potential for serious and irreversible impacts.	Additionally, special surveys need to be conducted to assess impacts on the identified biodiversity values.	
Koala	Impacts on koala habitat and threatened species: 1% of corridor in LGA are high quality koala habitat.	Engage a specialist ecologist that has the accreditation for the assessment of Koala habitat.	3.15
Soils	Alluvial, transferral, erosional and colluvial are present in the corridor.	Engage a specialist CPSS qualified soil assessor to assess the soils for potential degradation and erosional potential.	3.22, 6.2
Socio-Economic	<p>Potential loss of 11% of land (59ha) that is of moderately high to high fertility.</p> <p>Potential loss of 14.5 ha land (3% of corridor in LGA) that is mapped as Biophysical Strategic Agricultural Land which sustains the \$13.1B agricultural industry in NSW[14]. Further, 98% of the corridor in LGA are covered by farming related land uses.</p> <p>Additionally, 30.6ha (6% of corridor in LGA) of Critical Industry Cluster Land (Equine). These areas were identified as 'highly productive.</p>	Request a Gateway Assessment to be conducted by an independent assessor before the granting of any approvals.	3.14, 6.2, There is no COA that is specific to agricultural land other than livestock (3.14)



	Industries within the region [...], contribute to the identity of that region and provide significant employment opportunities. The creation of these industry clusters aims to protect this high quality agricultural land from the impacts of coal seam gas (CSG) and mining activities." [16]		
Cultural Heritage	4 existing aboriginal sites within the pipeline corridor and 8 within 200m buffer.	Consultation with traditional owners is required.	3.27, 5.1, 6.2
Land Tenure	Existing exploration and mining titles	Consultation with stakeholders	2.3, 3.14, 5.1



G Singleton

Over 8% (1,122 ha) of the proposed pipeline corridor is located within the borders of the Singleton Shire Local Government Area. A total length of approximately 52.6km of pipeline traverses this LGA.

G.1 Biodiversity

- 69.19% of the proposed corridor in Singleton is classified as native vegetation (776.26ha) from 13 vegetation classes [3]

Derived grassland of the NSW South Western Slopes (Western Slopes Grasslands)
Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter (Hunter-Macleay Dry Sclerophyll Forests)
Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest of the central and lower Hunter (Hunter-Macleay Dry Sclerophyll Forests)
Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter (Coastal Valley Grassy Woodlands)
Swamp Oak - Weeping Grass grassy riparian forest of the Hunter Valley (Coastal Swamp Forests)
River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion) (Eastern Riverine Forests)
White Mahogany - Spotted Gum - Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley (Northern Hinterland Wet Sclerophyll Forests)
Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter (Hunter-Macleay Dry Sclerophyll Forests)
Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter (Coastal Valley Grassy Woodlands)



Blakelys Red Gum - Narrow-leaved Ironbark - Rough-barked Apple shrubby woodland of the upper Hunter (North-west Slopes Dry Sclerophyll Woodlands)

Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter (Coastal Valley Grassy Woodlands)

Whalebone Tree - Red Kamala dry subtropical rainforest of the lower Hunter River (Dry Rainforests)

Sydney Blue Gum - Silvertop Stringybark grassy open forest on ranges of the lower North Coast (Northern Tableland Wet Sclerophyll Forests)

- 5.55% of the corridor is high quality koala habitat (62.23ha) (>70% koala habitat suitability [4])
- Threatened species or communities with potential for serious and irreversible impacts (Biodiversity Values): 0.04% (0.40ha)
- 1010 threatened fauna records from 44 species in total are located within a 10km buffer around the proposed pipeline corridor [5]. Please refer to map: Singleton – Overview with threatened species (SI.1).
 - 329 threatened fauna records before 2008
 - 681 threatened fauna records in or after 2008
 - 275 threatened fauna records in or after 2015

Micromys norfolkensis	Eastern Coastal Free-tailed Bat
Miniopterus australis	Little Bent-winged Bat
Miniopterus orianae oceanensis	Large Bent-winged Bat
Myotis macropus	Southern Myotis
Phascolarctos cinereus	Koala
Pteropus poliocephalus	Grey-headed Flying-fox
Ninox strenua	Powerful Owl
Chthonicola sagittata	Speckled Warbler
Daphoenositta chrysoptera	Varied Sittella
Petaurus norfolcensis	Squirrel Glider



<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat
<i>Hirundapus caudacutus</i>	White-throated Needletail
<i>Tyto novaehollandiae</i>	Masked Owl
<i>Tyto tenebricosa</i>	Sooty Owl
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle
<i>Glossopsitta pusilla</i>	Little Lorikeet
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle
<i>Circus assimilis</i>	Spotted Harrier
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)
<i>Petroica phoenicea</i>	Flame Robin
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat
<i>Vespadelus troughtoni</i>	Eastern Cave Bat
<i>Stagonopleura guttata</i>	Diamond Firetail
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow
<i>Petroica boodang</i>	Scarlet Robin
<i>Litoria aurea</i>	Green and Golden Bell Frog



Hieraaetus morphnoides	Little Eagle
Tyto longimembris	Eastern Grass Owl
Lathamus discolor	Swift Parrot
Ninox connivens	Barking Owl
Erythrotriorchis radiatus	Red Goshawk
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)
Oxyura australis	Blue-billed Duck
Turnix maculosus	Red-backed Button-quail
Pseudomys novaehollandiae	New Holland Mouse
Neophema pulchella	Turquoise Parrot
Calyptorhynchus lathami	Glossy Black-Cockatoo

- 18 koala sightings (Bionet species sightings) in 10km buffer around corridor (all time) [5].

G.2 Cultural heritage

- Aboriginal sites: 2 recorded cultural heritage sites within pipeline corridor; 9 within 200m buffer.

G.3 Geographic and topographic constraints

- **Riparian lands and water courses**, please refer to map: Singleton – Waterways (SI.3).
 - EPI Riparian Lands and Watercourses: 9.02% (101.25ha) [15]
 - 35.44ha riparian lands and watercourses (Biodiversity Values Map) (3.16%) of corridor [6]
 - 230 creeks within corridor (from hydroline layer) [7]
 - ❖ 214 of these are non-perennial.
 - 36 stream order 2 or higher crossings (RiverStyles layer) [8]
 - ❖ No names in dataset, from map:
 - ❖ Dawleys Creek



- ❖ Glennies Creek
- ❖ Sawyers Creek
- ❖ West Brook
- ❖ Glendon Brook
- ❖ Webbers Creek
- ❖ Stanhope Creek
- ❖ Lambs Valley Creek
- ❖ Kilfoyles Creek

- **Soil and land resources:** [9]

- 13 soil landscapes; 4 processes, please refer to Map: Singleton – Soil and land resources by process (SI.2):

Dochra	Erosional
Foy Pinnacle	Colluvial
Granbalang	Erosional
Gundy Gundy	Erosional
Goorangoola	Erosional
Gyarran	Erosional
Ilala	Erosional
Isis	Transferral
Paterson River	Alluvial
Ravensworth	Erosional
Scone Mountain	Colluvial
Vacy	Transferral
Welshmans Creek	Erosional



G.4 Land use planning impacts

- Exploration and mining titles: not applicable

Secondary Land Use (2017)	Area (ha)	Proportion (%)
1.1.0 Nature conservation	28.07014	2.50
1.3.0 Other minimal use	15.81079	1.41
2.1.0 Grazing native vegetation	795.9054	70.94
3.2.0 Grazing modified pastures	239.6716	21.36
3.3.0 Cropping	0.287369	0.03
4.2.0 Grazing irrigated modified pastures	10.16387	0.91
5.4.0 Residential and farm infrastructure	13.02069	1.16
5.7.0 Transport and communication	7.462448	0.67
6.2.0 Reservoir/dam	3.610204	0.32
6.3.0 River	7.972351	0.71

G.5 List of properties with erosional soils within proposed pipeline corridor

See [Appendix 3](#) for further information.

G.6 Interpretation

Singleton Shire is represented in the Hunter gas pipeline design corridor from chainage 730 to chainage 782 covering a length 52.6km which is an area of 1,121.98 ha and 8.44% of the total pipeline.

Of this, 69.19 % (776.26 ha) is classified as native vegetation from 13 different vegetation classes. 5.55 % (62.23 ha) is high quality Koala habitat, with 18 recorded koala sightings and 1010 threatened fauna records from 44 species within a 10 km buffer of the proposed pipeline. 0.04 % (0.4 ha) is threatened species or communities



with potential for serious and irreversible impacts. Two recorded Aboriginal cultural heritage sites are within the pipeline corridor and 9 within a 200m buffer. 3.16 % (35.44 ha) of the pipeline is riparian lands and water courses, with 230 creeks within the corridor and the pipeline will cross 36 streams of order 2 or higher. The pipeline traverses 13 different soil landscapes.

Land uses that the pipeline will go through are: Nature conservation (2.5 %), other minimal use (1.41 %), grazing on native vegetation (70.94 %), grazing on modified pastures (21.36 %), cropping (0.03 %), grazing irrigated modified pastures (0.91 %), residential and farm infrastructure (1.16 %), transport and communication (0.67 %), reservoir/dam (0.32 %), Rivers (0.71 %). 151 properties the pipeline will cross have been identified with erosional soils.

G.7 Recommendation

Stakeholders in the Singleton Shire LGA are advised to ensure and question whether the proponent carries out the pipeline project in accordance with the Conditions of Approvals (COA) (Part C). The table below outlines the implications of the discussed biodiversity, cultural heritage, geographic and topographic, socio-economic and land use planning impacts of the proposed pipeline corridor within the Singleton LGA and recommends actions in responds to those impacts.

Constraints	Impact	Action	Applicable Conditions of Approval
Water crossing	Maximum of 230 water management reports corresponding to each crossing.	Engage a specialist hydrologist for the water management reports. Engage an ecologist to assess impacts on riparian zones.	2.5, 2.7, 3.22
Threatened Flora & Fauna; Native Vegetation	69% of the corridor in the LGA need assessment for clearing the native vegetation. Impacts on threatened flora, fauna and ecological communities need to be assessed.	Engage a specialist ecologist to survey impacts of native vegetation clearing on threatened fauna (nocturnal and diurnal), threatened flora and threatened	2.1.1, 2.1.2, 2.4, 3.15, 3.16, 3.18, 6.2,



	Specific biodiversity values were mapped for the corridor within this LGA: Threatened species or communities with potential for serious and irreversible impacts.	ecological communities. Additionally, special surveys need to be conducted to assess impacts on the identified biodiversity values.	
Koala	Impacts on koala habitat and threatened species: 6% of corridor in LGA are high quality koala habitat.	Engage a specialist ecologist that has the accreditation for the assessment of Koala habitat.	3.15
Soils	Transferral, erosional and colluvial are present in the corridor.	Engage a specialist CPSS qualified soil assessor to assess the soils for potential degradation and erosional potential.	3.22, 6.2
Socio-Economic	Potential loss of 8% of land (85ha) that is of moderately high to high fertility. Potential loss of 77ha land (7% of corridor in LGA) that is mapped as Biophysical Strategic Agricultural Land which sustains the \$13.1B agricultural industry in NSW[14]. Further, 98% of the corridor in LGA are covered by farming related land uses.	Request a Gateway Assessment to be conducted by an independent assessor before the granting of any approvals.	3.14, 6.2, There is no COA that is specific to agricultural land other than livestock (3.14)
Cultural Heritage	Two existing aboriginal sites within the corridor and 9 within the 200m buffer.	Consultation with traditional owners is required.	3.27, 5.1, 6.2



H Maitland

Over 7% (964 ha) of the proposed pipeline corridor is located within the borders of the Maitland Shire Local Government Area. A total length of approximately 44.4km of pipeline traverses this LGA.

H.1 Biodiversity

- 99.84% of the proposed corridor in Maitland is classified as native vegetation (962.53ha) from 9 vegetation classes [3]

Hunter Valley Moist Forest C. maculata / E. punctata
Seaham Spotted Gum Iron Bark Forest C. maculata / E. crebra / E. punctata / E. fibrosa
Lower Hunter Spotted Gum - Ironbark Forest C. maculata / E. fibrosa / E. punctata
Hunter Valley Dry Rainforest Ficus rubiginosa / Streblus brunonianus / C. maculate
Hunter Lowland Redgum Forest E. tereticornis / E. punctata / E. crebra / A. floribunda / C. maculate
Alluvial Tall Moist Forest E. saligna / S. glomulifera / Glochidion ferdinandi
Swamp Mahogany - Paperbark Forest Melaleuca quinquinervia / E. robusta / C. glauca
Freshwater Wetland Complex Ludwigia peploides subsp montevidensis / Paspalum distichum / Eleocharis sphacelata / Juncus usitatus
Swamp Oak Rushland Forest C. glauca / Melaleuca ericifolia / Baumea juncea



- 8.26% of the corridor is high quality koala habitat (79.66ha) (>70% koala habitat suitability [4]
- Threatened species or communities with potential for serious and irreversible impacts (Biodiversity Values): 0.04% (0.40ha) [6]
- 846 threatened fauna records from 45 species are located within a 10km buffer around the proposed pipeline corridor [5]. Please refer to map: Maitland – Overview with threatened species (MA.1).
 - 241 threatened fauna records before 2008
 - 605 threatened fauna records in or after 2008
 - 249 threatened fauna records in or after 2015

Glossopsitta pusilla	Little Lorikeet
Pteropus poliocephalus	Grey-headed Flying-fox
Falsistrellus tasmaniensis	Eastern False Pipistrelle
Miniopterus australis	Little Bent-winged Bat
Hirundapus caudacutus	White-throated Needletail
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat
Chalinolobus dwyeri	Large-eared Pied Bat
Myotis macropus	Southern Myotis
Scoteanax rueppellii	Greater Broad-nosed Bat
Vespadelus troughtoni	Eastern Cave Bat
Dasyurus maculatus	Spotted-tailed Quoll
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)
Daphoenositta chrysoptera	Varied Sittella
Artamus cyanopterus cyanopterus	Dusky Woodswallow
Petauroides volans	Greater Glider
Saccolaimus flaviventris	Yellow-bellied Sheath-tail-bat
Miniopterus orianae oceanensis	Large Bent-winged Bat



<i>Ninox connivens</i>	Barking Owl
<i>Ninox strenua</i>	Powerful Owl
<i>Tyto novaehollandiae</i>	Masked Owl
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo
<i>Petroica boodang</i>	Scarlet Robin
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork
<i>Phascolarctos cinereus</i>	Koala
<i>Hamirostra melanosternon</i>	Black-breasted Buzzard
<i>Pandion cristatus</i>	Eastern Osprey
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)
<i>Lathamus discolor</i>	Swift Parrot
<i>Petaurus norfolcensis</i>	Squirrel Glider
<i>Chthonicola sagittata</i>	Speckled Warbler
<i>Rostratula australis</i>	Australian Painted Snipe
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale
<i>Litoria aurea</i>	Green and Golden Bell Frog
<i>Sternula albifrons</i>	Little Tern
<i>Anthochaera phrygia</i>	Regent Honeyeater
<i>Ptilinopus magnificus</i>	Wompoo Fruit-Dove
<i>Circus assimilis</i>	Spotted Harrier
<i>Anseranas semipalmata</i>	Magpie Goose
<i>Oxyura australis</i>	Blue-billed Duck
<i>Stictonetta naevosa</i>	Freckled Duck



Ptilinopus regina	Rose-crowned Fruit-Dove
Caretta caretta	Loggerhead Turtle
Litoria littlejohni	Littlejohn's Tree Frog
Epthianura albifrons	White-fronted Chat

- 10 koala sightings (Bionet species sightings) in 10km buffer around corridor (all time) [5].

H.2 Cultural Heritage

- Aboriginal sites: 3 recorded cultural heritage sites within pipeline corridor; 13 within 200m buffer.

H.3 Geographic and topographic constraints

- **Riparian lands and water courses**, please refer to map: Maitland – Waterways (MA.3).
 - EPI Riparian Lands and Watercourses: 0.11% (1.09ha) [15]
 - 17.30 ha riparian lands and watercourses (Biodiversity Values Map) (1.79%) of corridor [6]
 - 141 creeks within corridor (from hydroline layer) [7]
 - ❖ 135 of these are non-perennial.
 - 13 stream order 2 or higher crossings (RiverStyles layer) [8]
 - ❖ No names in dataset; from map:
 - ❖ Kilfoyles River
 - ❖ Hunter River
 - ❖ Dawleys Creek
 - ❖ Paterson River
 - ❖ Saltwater Gully
- **Soil and land resources**: [9]
 - 17 soil landscapes from 7 processes; please refer to Map: Maitland – Soil and land resources by process (MA.2):

Bolwarra Heights	Erosional
Gyarran	Erosional



Hexham Swamp	Swamp
Hunter	Alluvial
Middlehope	Erosional
North Eelah	Erosional
Rivermead	Residual
Seaham	Erosional
Seaham variant	Erosional
Vacy	Transferral
Welshmans Creek	Erosional
Wallalong	Erosional
Wallalong variant a	Transferral
Disturbed Terrain	Disturbed
Millers Forest	Alluvial
Scone Mountain	Colluvial
Singleton	Alluvial

- EPI Acid Sulfate Soils: 100% [17]
- Acid Sulfate Soil Risk: 43.71% [18]
 - Acid Sulfate Risk - No known occurrence: 2.2 %
 - Acid Sulfate Risk - High probability of occurrence: 41.52%
- EPI Flood Prone Lands: 65.35% (629.96ha) [19]

H.4 Land use planning impacts

- Exploration and mining titles: not applicable [12]

Secondary Land Use (2017)	Area (ha)	Proportion (%)
1.3.0 Other minimal use	44.9728	4.67
2.1.0 Grazing native vegetation	46.76154	4.85



3.2.0 Grazing modified pastures	647.6144	67.18
3.3.0 Cropping	22.64915	2.35
4.2.0 Grazing irrigated modified pastures	14.98823	1.55
4.3.0 Irrigated cropping	55.47554	5.75
4.4.0 Irrigated perennial horticulture	0.467701	0.05
4.5.0 Irrigated seasonal horticulture	1.750591	0.18
5.2.0 Intensive animal production	13.38099	1.39
5.3.0 Manufacturing and industrial	17.34905	1.80
5.4.0 Residential and farm infrastructure	7.370474	0.76
5.5.0 Services	5.929888	0.62
5.7.0 Transport and communication	27.6349	2.87
5.8.0 Mining	19.95856	2.07
6.2.0 Reservoir/dam	7.877025	0.82
6.3.0 River	14.14459	1.47
6.4.0 Channel/aqueduct	8.971699	0.93
6.5.0 Marsh/wetland	6.721643	0.70

[13]

H.5 List of properties with erosional soils within proposed pipeline corridor

See [Appendix 3](#) for further information.



H.6 Interpretation

Maitland Shire is represented in the Hunter gas pipeline design corridor from chainage 783 to chainage 822 as well as from chainage 0 to chainage 9 covering a length of 44.4km which is an area of 964.02ha and 7.25% of the total pipeline.

Of this, 99.84 % (962.53 ha) is classified as native vegetation from 9 different vegetation classes. 8.26 % (79.66 ha) is high quality Koala habitat, with 10 recorded koala sightings and 846 threatened fauna records from 45 species within a 10 km buffer of the proposed pipeline. 0.04 % (0.4 ha) is threatened species or communities with potential for serious and irreversible impacts. Three recorded Aboriginal cultural heritage sites exist within the pipeline corridor and 13 within a 200m buffer.

1.79 % (17.3 ha) of the pipeline is riparian lands and water courses, with 141 creeks within the corridor and the pipe will cross 13 streams of order 2 or higher. The pipeline traverses 17 different soil land scapes. 100 % is over acid sulfate soils, with acid sulfate soil risk 43.71 % and 65.35 % (629.96 ha) is on flood prone lands.

Land uses that the pipeline will go through are; other minimal use (4.67 %), grazing on native vegetation (4.85 %), grazing on modified pastures (67.18 %), cropping (2.35 %), grazing irrigated modified pastures (1.55 %), irrigated cropping (5.75 %), irrigated perennial horticulture (0.05 %), irrigated seasonal horticulture (0.18 %), intensive animal production (1.39 %), manufacturing and industrial (1.8 %), residential and farm infrastructure (0.76 %), services (0.62 %), transport and communication (0.14 %), mining (2.07 %), reservoir/dam (0.82 %), Rivers (1.47 %), channel/aqueduct (0.93 %) and marsh/wetlands (0.38 %). 69 properties the pipeline will cross have been identified with erosional soils.

H.7 Recommendation

Stakeholders in the Maitland Shire LGA are advised to ensure and question whether the proponent carries out the pipeline project in accordance with the Conditions of Approvals (COA) (Part C). The table below outlines the implications of the discussed biodiversity, cultural heritage, geographic and topographic, socio-economic and land use planning impacts of the proposed pipeline corridor within the Maitland LGA and recommends actions in responds to those impacts.

Constraints	Impact	Action	Applicable Conditions of Approval
-------------	--------	--------	-----------------------------------



Water crossing	<p>Maximum of 141 water management reports corresponding to each crossing.</p> <p>65% of the corridor in this LGA (630ha) are mapped as flood prone land.</p>	<p>Engage a specialist hydrologist for the water management reports.</p> <p>Engage an ecologist to assess impacts on riparian zones.</p> <p>Hydrologist and soil assessors to assess hazards and risks of erosion potential in flood prone areas.</p>	2.5, 2.7, 3.22
Threatened Flora & Fauna; Native Vegetation	<p>99.8% of the corridor in the LGA need assessment for clearing the native vegetation.</p> <p>Impacts on threatened flora, fauna and ecological communities need to be assessed.</p> <p>Specific biodiversity values were mapped for the corridor within this LGA: Threatened species or communities with potential for serious and irreversible impacts.</p>	<p>Engage a specialist ecologist to survey impacts of native vegetation clearing on threatened fauna (nocturnal and diurnal), threatened flora and threatened ecological communities.</p> <p>Additionally, special surveys need to be conducted to assess impacts on the identified biodiversity values.</p>	2.1.1, 2.1.2, 2.4, 3.15, 3.16, 3.18, 6.2,
Koala	<p>Impacts on koala habitat and threatened species: 8% of corridor in LGA are high quality koala habitat.</p>	<p>Engage a specialist ecologist that has the accreditation for the assessment of Koala habitat.</p>	3.15
Soils	<p>Transferral, erosional and colluvial, disturbed and swamp soils are present in the corridor.</p>	<p>Engage a specialist CPSS qualified soil assessor to assess the soils for potential</p>	3.22, 3.26, 6.2



	100% of the corridor in the LGA are mapped under the Environmental Protection Instrument (EPI) Acid Sulfate Soils.	degradation and erosional potential. Engage a soil specialist to assess any potential acid sulfate soils. Further, during construction, engage specialist consultant to treat and dispose acid sulfate soils.	
Socio-Economic	<p>Potential loss of 55% of land (528ha) that is of moderately high to high fertility.</p> <p>Potential loss of 401ha land (42% of corridor in LGA) that is mapped as Biophysical Strategic Agricultural Land which sustains the \$13.1B agricultural industry in NSW[14]. Further, 86% of the corridor in LGA are covered by farming related land uses.</p>	Request a Gateway Assessment to be conducted by an independent assessor before the granting of any approvals.	3.14, 6.2, There is no COA that is specific to agricultural land other than livestock (3.14)
Cultural Heritage	Three existing aboriginal sites within the corridor and 13 within the 200m buffer.	Consultation with traditional owners is required.	3.27, 5.1, 6.2



I Port Stephens

0.5% (66.63 ha) of the proposed pipeline corridor is located within the borders of the Port Stephens Local Government Area. A total length of approximately 3.1km of pipeline traverses this LGA.

I.1 Biodiversity

- 93.72% of the proposed corridor in Port Stephens is classified as native vegetation (62.44ha) from 7 vegetation classes [3]

Swamp Mahogany - Paperbark Forest Melaleuca quinquinervia / E. robusta / C. glauca
Swamp Oak Rushland Forest C. glauca / Melaleuca ericifolia / Baumea juncea
Coastal Sand Wallum Woodland – Heath Banksia aemula / C. gummifera / A. costata
Coastal Foothills Spotted Gum - Ironbark Forest C. maculata / E. umbra / E. siderophloia
Freshwater Wetland Complex Ludwigia peploides subsp montevidensis / Paspalum distichum / Eleocharis sphacelata / Juncus usitatus
Coastal Sand Apple - Blackbutt Forest A. costata / E. pilularis / Banksia serrata
Mangrove-Estuarine Complex Avicennia marina subsp australasica / Sarcocornia quinqueflora subsp quinqueflora / Aegiceras corniculatum

- 35.94% of the corridor is high quality koala habitat (23.94ha) (>70% koala habitat suitability [4])



- 2432 threatened fauna records from 48 species are located within a 10km buffer around the proposed pipeline corridor [5]. Please refer to map: Port Stephens – Overview with threatened species (PO.1).
 - 1,691 threatened fauna records before 2008
 - 741 threatened fauna records in or after 2008
 - 328 threatened fauna records in or after 2015

<i>Litoria aurea</i>	Green and Golden Bell Frog
<i>Megaptera novaeangliae</i>	Humpback Whale
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat
<i>Petaurus norfolcensis</i>	Squirrel Glider
<i>Ninox strenua</i>	Powerful Owl
<i>Phascolarctos cinereus</i>	Koala
<i>Pseudomys novaehollandiae</i>	New Holland Mouse
<i>Myotis macropus</i>	Southern Myotis
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle
<i>Miniopterus australis</i>	Little Bent-winged Bat
<i>Tyto novaehollandiae</i>	Masked Owl
<i>Hieraaetus morphnoides</i>	Little Eagle
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow
<i>Planigale maculata</i>	Common Planigale
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat
<i>Epthianura albifrons</i>	White-fronted Chat
<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat
<i>Tyto longimembris</i>	Eastern Grass Owl



<i>Crinia tinnula</i>	Wallum Froglet
<i>Botaurus poiciloptilus</i>	Australasian Bittern
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork
<i>Glossopsitta pusilla</i>	Little Lorikeet
<i>Pandion cristatus</i>	Eastern Osprey
<i>Neophema pulchella</i>	Turquoise Parrot
<i>Anseranas semipalmata</i>	Magpie Goose
<i>Hirundapus caudacutus</i>	White-throated Needletail
<i>Daphoenositta chrysoptera</i>	Varied Sittella
<i>Vespadelus trougtoni</i>	Eastern Cave Bat
<i>Uperoleia mahonyi</i>	Mahony's Toadlet
<i>Ptilinopus magnificus</i>	Wompoo Fruit-Dove
<i>Potorous tridactylus</i>	Long-nosed Potoroo
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale
<i>Anthochaera phrygia</i>	Regent Honeyeater
<i>Pomatostomus temporalis</i>	temporalis (Grey-crowned Babbler (eastern subspecies))
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo
<i>Ptilinopus superbus</i>	Superb Fruit-Dove
<i>Rostratula australis</i>	Australian Painted Snipe
<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat
<i>Lathamus discolor</i>	Swift Parrot
<i>Lophoictinia isura</i>	Square-tailed Kite
<i>Circus assimilis</i>	Spotted Harrier
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll



Petroica boodang	Scarlet Robin
Petauroides volans	Greater Glider
Chthonicola sagittata	Speckled Warbler

- 1,579 koala sightings (Bionet species sightings) in 10km buffer around corridor (all time) [5]
- Core Habitat within an approved Koala Plan of Management (SEPP 44): 0.62% (0.41ha) [6]
- Areas of Regional Koala Significance (ARKS): Two ARKS intersects with pipeline corridor and makes up 93.17% of total pipeline corridor in Port Stephens (62.08ha) [20]

1.2 Cultural heritage

- Aboriginal sites: 4 recorded cultural heritage sites within pipeline corridor; 7 within 200m buffer.

1.3 Geographic and topographic constraints

- **Riparian lands and water courses.** No map was prepared for the waterways in Port Stephens due to the short section of the pipeline passing through this LGA.
 - No EPI mapping
 - No riparian lands in Biodiversity Values Map
 - Coastal Management Act (Biodiversity Values Map): 1.69% (1.13ha) [6]
 - EPI Wetlands: 9.53% (6.35ha) [21]
 - 6 creeks within corridor (from hydroline layer) [7]
 - ❖ 4 of these are non-perennial.
 - 1 stream order 2 or higher crossings (RiverStyles layer) [8]
 - ❖ Hunter River
- **Soil and land resources:** [9]
 - 6 soil landscapes from 6 processes; please refer to Map: Port Stephens – Soil and land resources by process (PO.2):

Beresfield	Residual
Fullerton Cove	Estuarine
Hexham Swamp	Swamp



Millers Forest	Alluvial
Tea Gardens variant a	Aeolian

- EPI Acid Sulfate Soils: 93.72% (62.44ha) [17]
- Acid Sulfate Risk: 100% [18]
 - Acid Sulfate Risk - Low probability of occurrence: 77.74%
 - Acid Sulfate Risk - High probability of occurrence: 22.26%

1.4 Land use planning impacts

- Exploration and mining titles: not applicable

Secondary Land Use (2017)	Area (ha)	Proportion (%)
1.3.0 Other minimal use	7.26	10.89
2.1.0 Grazing native vegetation	10.60	15.90
3.2.0 Grazing modified pastures	8.92	13.39
5.3.0 Manufacturing and industrial	6.64	9.96
5.5.0 Services	3.30	4.95
5.6.0 Utilities	21.76	32.66
5.7.0 Transport and communication	2.30	3.45
6.3.0 River	5.70	8.56
6.4.0 Channel/aqueduct	0.16	0.24

[13]

1.5 Interpretation

Port Stephens Shire is represented in the Hunter gas pipeline design corridor from chainage 819 to chainage 822 covering a length of 3.1km which is an area of 66.63ha and 0.5% of the total pipeline.

Despite the short section of the pipeline crossing Port Stephens, it intersects with several highly significant biodiversity attributes. 93.72 % (32.44 ha) is classified as native vegetation from 7 different vegetation classes. 35.94 % (23.94 ha) is high quality



Koala habitat, with 1,579 recorded koala sightings within 10 km of the proposed pipeline. 0.62 % (0.41 ha) is Core Habitat within an approved Koala Plan of Management. 93.17 % (62.08 ha) of the pipeline intersects with two ARKS (Areas of Regional Koala Significance). There are 2,432 threatened fauna records from 48 species within a 10 km buffer of the proposed pipeline. Four recorded Aboriginal cultural heritage sites exist within the pipeline corridor and 7 within a 200m buffer.

1.69 % (1.13 ha) is under the Coastal Management Act, 9.53 % (6.35 ha) is wetlands. Six creeks are with the pipeline corridor and the pipeline will cross one stream of order 2 or higher. The pipeline traverses 6 different soil landscapes. 93.72 % (62.44 ha) is acid sulfate soils with acid sulfate risk of 100%. Land uses that the pipeline will go through are: other minimal use (10.89 %), grazing on native vegetation (15.9 %), grazing on modified pastures (13.39 %), manufacturing and industrial (9.96 %), services (4.95 %), transport and communication (3.45 %), Rivers (8.56 %) and channel /aqueduct (0.24 %).

1.6 Recommendation

Stakeholders in the Port Stephens Shire LGA are advised to ensure and question whether the proponent carries out the pipeline project in accordance with the Conditions of Approvals (COA) (Part C). The table below outlines the implications of the discussed biodiversity, cultural heritage, geographic and topographic, socio-economic and land use planning impacts of the proposed pipeline corridor within the Port Stephens LGA and recommends actions in responds to those impacts.

Constraints	Impact	Action	Applicable Conditions of Approval
Water crossing	Maximum of 6 water management reports corresponding to each crossing.	Engage a specialist hydrologist for the water management reports. Engage an ecologist to assess impacts on riparian zones.	2.5, 2.7, 3.22
Wetlands	9.5% of the corridor in this LGA are mapped under the	Engage an environmental consultant to assess	2.6 (This is specific to coastal



	Environmental Planning Instrument (EPI) Wetlands.	any adverse impacts on wetlands.	wetlands under SEPP14 but should be applicable to all wetlands within the corridor).
Threatened Flora & Fauna; Native Vegetation	<p>94% of the corridor in the LGA need assessment for clearing the native vegetation.</p> <p>Impacts on threatened flora, fauna and ecological communities need to be assessed.</p> <p>Specific biodiversity values were mapped for the corridor within this LGA: Threatened species or communities with potential for serious and irreversible impacts.</p>	<p>Engage a specialist ecologist to survey impacts of native vegetation clearing on threatened fauna (nocturnal and diurnal), threatened flora and threatened ecological communities.</p> <p>Additionally, special surveys need to be conducted to assess impacts on the identified biodiversity values.</p>	2.1.1, 2.1.2, 2.4, 3.15, 3.16, 3.18, 6.2,
Koala	<p>Impacts on koala habitat and threatened species: 36% of corridor in LGA are high quality koala habitat.</p> <p>Further, a small proportion of the area within the corridor is mapped under SEPP44 (Core Habitat within an approved Koala Plan of Management).</p> <p>Pipeline crosses Areas of Regional Koala Significance (ARKS).</p>	Engage a specialist ecologist that has the accreditation for the assessment of Koala habitat.	3.15
Soils	Residual, estuarine, swamp, alluvial and aeolian are present in the corridor.	Engage a specialist CPSS qualified soil assessor to assess	3.22, 6.2



	94% of the corridor in the LGA are mapped under the Environmental Protection Instrument (EPI) Acid Sulfate Soils. Further, acid sulfate soil risk is mapped as 100% of the corridor in this LGA with 22% of this being high probability of occurrence.	the soils for potential degradation and erosional potential. Engage a soil specialist to assess any potential acid sulfate soils. Further, during construction, engage specialist consultant to treat and dispose acid sulfate soils.	
Socio-Economic	Potential loss of 14% of land (9ha) that is of moderately high to high fertility. 40% of the corridor in LGA are covered by farming related land uses.		
Cultural Heritage	Four existing aboriginal sites within the corridor and 7 within the 200m buffer.	Consultation with traditional owners is required.	3.27, 5.1, 6.2



J Newcastle

2% (279 ha) of the proposed pipeline corridor is located within the borders of the Newcastle Local Government Area. A total length of approximately 12.3km of pipeline traverses this LGA.

J.1 Biodiversity

- 95.35% of the proposed corridor in Newcastle is classified as native vegetation (266.07ha) from 2 vegetation classes [3]

Swamp Oak Rushland Forest

C. glauca / *Melaleuca ericifolia* / *Baumea juncea*

Mangrove-Estuarine Complex

Avicennia marina subsp *australasica* / *Sarcocornia quinqueflora* subsp *quinqueflora* / *Aegiceras corniculatum*

- 16.65% of the corridor is high quality koala habitat (46.46ha) (>70% koala habitat suitability [4])
- 12,174 threatened fauna records from 78 species in total are located within a 10km buffer around the proposed pipeline corridor [5]. Please refer to map: Newcastle – Overview with threatened species (NE.1).
 - 3,126 threatened fauna records before 2008
 - 9,048 threatened fauna records in or after 2008
 - 7,154 threatened fauna records in or after 2015

<i>Diomedea exulans</i>	Wandering Albatross
<i>Macronectes giganteus</i>	Southern Giant Petrel
<i>Ninox strenua</i>	Powerful Owl
<i>Onychoprion fuscata</i>	Sooty Tern
<i>Glossopsitta pusilla</i>	Little Lorikeet
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat



<i>Neophema pulchella</i>	Turquoise Parrot
<i>Lophoictinia isura</i>	Square-tailed Kite
<i>Caretta caretta</i>	Loggerhead Turtle
<i>Eretmochelys imbricata</i>	Hawksbill Turtle
<i>Ptilinopus superbus</i>	Superb Fruit-Dove
<i>Ninox connivens</i>	Barking Owl
<i>Pandion cristatus</i>	Eastern Osprey
<i>Phascolarctos cinereus</i>	Koala
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle
<i>Ptilinopus magnificus</i>	Wompoo Fruit-Dove
<i>Ptilinopus regina</i>	Rose-crowned Fruit-Dove
<i>Daphoenositta chrysoptera</i>	Varied Sittella
<i>Sula dactylatra</i>	Masked Booby
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork
<i>Sternula albifrons</i>	Little Tern
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat
<i>Cercartetus nanus</i>	Eastern Pygmy-possum
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)
<i>Anthochaera phrygia</i>	Regent Honeyeater
<i>Petaurus norfolcensis</i>	Squirrel Glider
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll
<i>Miniopterus australis</i>	Little Bent-winged Bat
<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat
<i>Dugong dugon</i>	Dugong



<i>Burhinus grallarius</i>	Bush Stone-curlew
<i>Tyto novaehollandiae</i>	Masked Owl
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo
<i>Tyto tenebricosa</i>	Sooty Owl
<i>Tyto longimembris</i>	Eastern Grass Owl
<i>Anseranas semipalmata</i>	Magpie Goose
<i>Hieraaetus morphnoides</i>	Little Eagle
<i>Chelonia mydas</i>	Green Turtle
<i>Haematopus longirostris</i>	Pied Oystercatcher
<i>Numenius madagascariensis</i>	Eastern Curlew
<i>Limosa limosa</i>	Black-tailed Godwit
<i>Charadrius leschenaultii</i>	Greater Sand-plover
<i>Charadrius mongolus</i>	Lesser Sand-plover
<i>Calidris canutus</i>	Red Knot
<i>Calidris ferruginea</i>	Curlew Sandpiper
<i>Calidris tenuirostris</i>	Great Knot
<i>Limicola falcinellus</i>	Broad-billed Sandpiper
<i>Xenus cinereus</i>	Terek Sandpiper
<i>Epthianura albifrons</i>	White-fronted Chat
<i>Megaptera novaeangliae</i>	Humpback Whale
<i>Oxyura australis</i>	Blue-billed Duck
<i>Irediparra gallinacea</i>	Comb-crested Jacana
<i>Lathamus discolor</i>	Swift Parrot
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo
<i>Thalassarche cauta</i>	Shy Albatross



<i>Arctocephalus pusillus doriferus</i>	Australian Fur-seal
<i>Hirundapus caudacutus</i>	White-throated Needletail
<i>Litoria aurea</i>	Green and Golden Bell Frog
<i>Botaurus poiciloptilus</i>	Australasian Bittern
<i>Petroica boodang</i>	Scarlet Robin
<i>Pterodroma solandri</i>	Providence Petrel
<i>Myotis macropus</i>	Southern Myotis
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail-bat
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat
<i>Stictonetta naevosa</i>	Freckled Duck
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle
<i>Circus assimilis</i>	Spotted Harrier
<i>Stagonopleura guttata</i>	Diamond Firetail
<i>Vespadelus troughtoni</i>	Eastern Cave Bat
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)
<i>Rostratula australis</i>	Australian Painted Snipe
<i>Falco subniger</i>	Black Falcon
<i>Petauroides volans</i>	Greater Glider
<i>Ixobrychus flavicollis</i>	Black Bittern
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)

- 12 koala sightings (Bionet species sightings) in 10km buffer around corridor (all time) [5]
- Core Habitat within an approved Koala Plan of Management (SEPP 44): 0.21% (0.59ha) [6]



- Areas of Regional Koala Significance (ARKS): One ARKS intersects with pipeline corridor and makes up 0.01% of total pipeline corridor in Newcastle (0.02ha) [20]

J.2 Cultural heritage

- Aboriginal sites: 0 recorded cultural heritage sites within pipeline corridor; 0 within 200m buffer

J.3 Geographic and topographic constraints

- **Riparian lands and water courses**, please refer to map: Newcastle – Waterways (NE.3).
 - No EPI mapping
 - No riparian lands in Biodiversity Values Map
 - Coastal Management Act (Biodiversity Values Map): 20.65% (57.62ha) [6]
 - EPI Wetlands: 0.013ha [21]
 - Ramsar Wetland: 5.16% (14.39ha) [6]
 - 9 creeks within corridor (from hydroline layer) [7]
 - ❖ 5 of these are non-perennial.
 - 1 stream order 2 or higher crossings (RiverStyles layer) [8]
 - ❖ Hunter River
- **Soil and land resources:** [9]
 - 4 soil landscapes from 3 processes; please refer to Map: Newcastle – Soil and land resources by process (NE.2):

Bobs Farm	Estuarine
Fullerton Cove	Estuarine
Disturbed Terrain	Disturbed
Millers Forest	Alluvial

- EPI Acid Sulfate Soils: 25.08% (69.98ha) [17]
- Acid Sulfate Soil Risk: 100% [18]
 - Acid Sulfate Risk - Disturbed Terrain: 55.53 %
 - Acid Sulfate Risk - High probability of occurrence: 44.47 %



J.4 Land use planning impacts

- Exploration and mining titles: not applicable

Secondary Land Use (2017)	Area (ha)	Proportion (%)
1.1.0 Nature conservation	66.77716	23.93
2.1.0 Grazing native vegetation	5.121756	1.84
3.2.0 Grazing modified pastures	10.46284	3.75
5.3.0 Manufacturing and industrial	100.5362	36.03
5.5.0 Services	12.11957	4.34
5.7.0 Transport and communication	8.271832	2.96
5.9.0 Waste treatment and disposal	49.76338	17.83
6.3.0 River	21.09438	7.56
6.5.0 Marsh/wetland	4.889577	1.75

[13]

J.5 Interpretation

Newcastle Shire is represented in the Hunter gas pipeline design corridor from chainage 823 to chainage 833 covering a length of 12.3km which is an area of 279ha and 2.10% of the total pipeline.

Of this, 95.35 % (266.07 ha) is classified as native vegetation from 2 different vegetation classes. 16.65 % (46.46 ha) is high quality Koala habitat, with 12 recorded koala sightings within 10 km of the proposed pipeline. 0.21 % (0.59 ha) of the corridor is a Core Habitat within an approved Koala Plan of Management. 0.01% (0.02ha) of the pipeline intersects with one ARKS (Areas of Regional Koala Significance). There are 12,174 threatened fauna records from 78 species within a 10 km buffer of the proposed pipeline.

20.65 % (57.62 ha) of this area is under the Coastal Management Act, 0.013 ha are wetlands and 5.16 % (14.39 ha) is Ramsar wetland (Wetland of International Importance under the Ramsar convention). There are 9 creeks within the corridor and the pipe will cross one stream of order 2 or higher. The pipeline



traverses 4 different soil landscapes. 25.08 % (69.98 ha) of acid sulfate soils with an acid sulfate soil risk of 100 %.

Land uses that the pipeline will go through are: Nature conservation (23.93 %), grazing on native vegetation (1.84 %), grazing on modified pastures (3.75 %), manufacturing and industrial (36.03 %), services (4.34 %), transport and communication (2.96 %), Rivers (7.56 %) and marsh/wetlands (1.75 %).

J.6 Recommendation

Stakeholders in the Newcastle Shire LGA are advised to ensure and question whether the proponent carries out the pipeline project in accordance with the Conditions of Approvals (COA) (Part C). The table below outlines the implications of the discussed biodiversity, cultural heritage, geographic and topographic, socio-economic and land use planning impacts of the proposed pipeline corridor within the Newcastle LGA and recommends actions in responds to those impacts.

Constraints	Impact	Action	Applicable Conditions of Approval
Water crossing	Maximum of 9 water management reports corresponding to each crossing.	Engage a specialist hydrologist for the water management reports. Engage an ecologist to assess impacts on riparian zones.	2.5, 2.7, 3.22
Wetlands	A small proportion of the corridor in this LGA are mapped under the Environmental Planning Instrument (EPI) Wetlands. Further, part of the pipeline corridor pass through Ramsar wetlands and SEPP14 wetlands.	Engage an environmental consultant to assess any adverse impacts on wetlands. Inform the Ramsar Convention about potential changes to the ecological character of the wetlands [22].	2.6



Threatened Flora & Fauna; Native Vegetation	<p>95% of the corridor in the LGA need assessment for clearing the native vegetation.</p> <p>Impacts on threatened flora, fauna and ecological communities need to be assessed.</p> <p>24% of the land use is nature conservation.</p>	Engage a specialist ecologist to survey impacts of native vegetation clearing on threatened fauna (nocturnal and diurnal), threatened flora and threatened ecological communities.	2.1.1, 2.1.2, 2.4, 3.15, 3.16, 3.18, 6.2,
Koala	<p>Impacts on koala habitat and threatened species: 17% of corridor in LGA are high quality koala habitat.</p> <p>Further, a small proportion of the area within the corridor is mapped under SEPP44 (Core Habitat within an approved Koala Plan of Management).</p> <p>Pipeline crosses Areas of Regional Koala Significance (ARKS).</p>	Engage a specialist ecologist that has the accreditation for the assessment of Koala habitat.	3.15
Soils	<p>Estuarine, disturbed and alluvial are present in the corridor.</p> <p>25% of the corridor in the LGA are mapped under the Environmental Protection Instrument (EPI) Acid Sulfate Soils. Further, acid sulfate soil risk is mapped as 100% of the corridor in this LGA with 45% of this being high probability of occurrence, and 55% being disturbed terrain.</p>	<p>Engage a specialist CPSS qualified soil assessor to assess the soils for potential degradation and erosional potential.</p> <p>Engage a soil specialist to assess any potential acid sulfate soils. Further, during construction, engage specialist consultant to treat</p>	3.22, 3.26, 6.2



		and dispose acid sulfate soils.	
Socio-Economic	<p>Potential loss of 4% of land (12ha) that is of moderately high to high fertility.</p> <p>42% of the corridor in LGA are covered by farming related land uses.</p>		
Cultural Heritage	<p>There are no mapped sites of cultural heritage, nonetheless, traditional owners need to be consulted with.</p>	<p>Consultation with traditional owners is required.</p>	<p>3.27, 5.1, 6.2</p>



3.0 PART C – ASSESSMENT TO CONDITION OF APPROVALS AND ENVIRONMENTAL ASSESSMENT

1. ADMINISTRATIVE CONDITIONS	
Terms of Approval	
1.1 The Proponent shall carry out the project: a) generally in accordance with the EA; and b) in accordance with the conditions of approval.	
	Not Applicable
1.2 In the event of any inconsistency between the above documents, the most recent document shall prevail to the extent of the inconsistency. However, the conditions of approval shall prevail to the extent of any inconsistency.	
	Not Applicable
1.3 The Proponent shall comply with any reasonable requirement(s) of the Secretary arising from the Department's assessment of: a) any documents that are submitted in accordance with this approval; and b) the implementation of any actions or measures contained in these documents.	
	Not applicable
Lapse of Approval	
1.4 This approval will lapse if the Proponent does not physically commence the project by 15 October 2024.	
	Not applicable
Statutory Requirements	
1.5 The Proponent shall ensure that all licences, permits and approvals are obtained and maintained as required throughout the life of the project. No condition of this approval removes the obligation for the Proponent to obtain, renew or comply with such licences, permits or approvals.	
	Not applicable
Structural Adequacy & Standards	



1.6 The Proponent shall ensure that:

- a) all new buildings and structures, any alterations or additions to existing buildings and structures, are constructed in accordance with the relevant requirements of the BCA; and**
- b) the pipeline is constructed in accordance with Australian Standard AS 2885.**

Not applicable

Demolition

1.7 The Proponent shall ensure that all demolition work associated with the project is carried out in accordance with Australian Standard AS 2601 – 2001: The Demolition of Structures, or its latest version.

Not applicable

Operation of Plant and Equipment

1.8 The Proponent shall ensure that all plant and equipment used on the site, or to monitor the performance of the project, is:

- a) maintained in a proper and efficient condition; and**
- b) operated in a proper and efficient manner.**

Not applicable

2. PROJECT DESIGN REQUIREMENTS

Route Alignment

2.1.1 The Proponent shall submit, as part of the Construction Environmental Management Plan required under condition 6.2, route alignment sheets for the project identifying the final 30-metres Construction Right of Way. The route alignment sheets shall, except as provided below, demonstrate the avoidance of Endangered Ecological Communities.

2.1.2 The route may only be aligned within an Endangered Ecological Community if the Proponent has:

- a) demonstrated to the satisfaction of the Secretary, in consultation with the BCD, that there will only be minimal impacts; and**
- b) provision has been made for biodiversity offsets, consistent with condition 3.18 of this Approval.**

2.2 The Proponent shall consult with all landowners potentially affected by the final 30-metres Construction Right of Way during the preparation of the route alignment sheets.

Not Applicable

2.3 During the process of finalising the route alignment, the Proponent shall ensure consultation with relevant companies and titleholders of mineral and petroleum resource licences in relation to the potential for conflict between the route of the project and current and future resource exploration and extraction activities. The consultation shall aim to resolve any identified potential conflict where practicable.



Comment: 56% of the corridor are covered by existing titles (Note that some areas have several titles on the same land. The area and percentage is a total of these, therefore the actual numbers may be smaller).. 11 different holders of exploration and mining titles (Muswellbrook Coal Company Ltd, Secretary of Regional NSW, Whitehaven Coal Mining Ltd, Australian Coalbed Methane Pty Ltd, Comet Ridge Gunnedah Pty Ltd, Santos NSW Pty Ltd, Comet Ridge Ltd, Santos QNT Pty Ltd, Hunter Gas Pty Ltd, Zeolite Australia Pty Ltd, Coalworks (Vickery Sth) Pty Ltd).

2.4 The route alignment of the project shall be within the corridor identified in the documents referred to in condition 1.1. Any deviations in route alignment outside this corridor shall only occur for the purpose of:

- a) reducing impacts to biodiversity, cultural heritage or human amenity;
- b) avoiding geological or topographical constraints, providing the deviations do not increase impacts to those areas referred to under a); and
- c) after consultation with potentially affected landholders and relevant agencies.

Comment: See the recommendations in Part B: Local Government Section

Watercourse Crossings

2.5 The Proponent shall prepare, in accordance with *APGA Code of Environmental Practice – Onshore Pipelines* and the *Guidelines for Controlled Activities on Waterfront Land (NRAR 2018)*, or their latest versions, site-specific watercourse crossings and details of associated methods of construction. These documents shall be submitted for the endorsement of the NRAR prior to the submission of the Construction Environmental Management Plan required under condition 6.2. The Construction Environmental Management Plan shall include:

- a) a copy of the NRAR's endorsement(s) of the documents required under this condition;
- b) details of the duration and timing of works associated with watercourse crossings;
- c) details of the measures that would be implemented to avoid or minimise impacts of the project on riparian and aquatic habitats in and around the water crossings.

In preparing the documents required under this condition, the Proponent shall consult with the relevant Local Land Services with regard to watercourse crossing methodologies and site-specific mitigation measures for watercourses.

Comment: A total of 1,044 water courses within the current proposed corridor (hydroline layer). 136 of these are streams second order or higher thus we would recommend that water management reports for all crossings are prepared. Please refer to Section 1.2.3.1 Limitations of analysis in regard to the accuracy of these numbers. The total amount of managements report will need to be re-evaluated when the final alignment of the pipeline is published.

2.6 The project shall avoid any disturbance to, or crossing of, wetlands mapped under *State Environmental Planning Policy (Coastal Management) 2018*. Where the project route lies within 100 metres of a mapped SEPP 14 wetland, an appropriate



buffer around these wetlands shall be defined and illustrated in the Construction Environmental Management Plan required under condition 6.2, to ensure no adverse effects to the wetland result from the project.

Comment: Coastal wetland Map demonstrates that the proposed corridor crosses SEPP 14 wetlands and RAMSAR wetlands near Tomago and Newcastle. A buffer in this instance is not feasible as the proposed corridor intersect directly through these wetlands. Our recommendation is to change the alignment to follow existing roads: Maitland Rd and Cormorant Rd to minimise any further detrimental effects on the wetlands of international significance.

2.7 The Proponent shall, where practicable, avoid temporary watercourse crossings for heavy machinery.

Comment: There are 164 of the 1043 water courses are identified as non-perennial. Heavy machinery will be utilised in these temporary watercourses. Recommendation: Avoid these watercourses or have a stringent management plan to address the issues that arise.

There are 1043 water courses and as such we would recommend building a permanent access for all heavy machinery to disrupt interference of ecological significance to the riparian areas.

All mitigation to stop the possibility of creating a sinkhole should be managed with clear management practices.

2.8 The Proponent shall consult with NSW Fisheries in relation to any temporary infrastructure or works in and around watercourses that may result in the blockage of fish passage.

Comment: This could be addressed in relationship to the ecological surroundings in the water crossings reports as impacts.

2.9 The Proponent shall provide off-take points (valves) to enable the project to service the following areas:

- a) Narrabri and Boggabri;
- b) Gunnedah;
- c) Quirindi;
- d) Murrurundi, Scone and Aberdeen; and
- e) Port Stephens.

The Proponent shall consult with the relevant local council in identifying locations for off-take points referred to under this condition and in relation to any requirements for servicing relevant areas. The outcomes of this consultation shall be provided to the Department prior to the commencement of construction of the relevant part of the project, unless otherwise agreed by the Secretary.

Not Applicable

Pipeline Construction

2.10 The project shall be constructed in accordance with the APGA *Code of Environmental Practice – Onshore Pipelines*.

Not applicable



3. SPECIFIC ENVIRONMENTAL CONDITIONS

Noise Impacts

Construction Noise

3.1 The Proponent shall only undertake construction activities associated with the project, other than blasting, that would generate an audible noise at any residential or sensitive receiver during the following hours:

- a) 7:00 am to 6:00 pm, Mondays to Fridays, inclusive;
- b) 8:00 am to 1:00 pm on Saturdays; and
- c) at no time on Sundays or public holidays.

Subject to the Secretary's approval of the Construction Environmental Management Plan (under condition 6.2), construction activities may occur outside these hours (for example a 28-day construction, 9 day respite construction schedule approach).

This condition does not apply in the event of a direction from police or other relevant authority for safety reasons, or to avoid immediate environmental harm.

NOTE: the 28-day on/ 9-day off cycle is generally accepted as appropriate construction hours, however it is important that recognition is given to noise sensitive areas and an alternative schedule be developed for these areas through the Construction Environmental Management Plan.

Not applicable

Construction Blasting

3.2 Blasting associated with the construction of the project shall only be undertaken during the following hours:

- a) 9:00 am to 5:00 pm, Mondays to Fridays, inclusive;
- b) 9:00 am to 5:00 pm on Saturdays; and
- c) at no time on Sundays or public holidays.

Not applicable

3.3 The Proponent shall ensure that air blast overpressure generated by blasting associated with the project does not exceed the criteria specified in Table 1 when measured at the most-affected residential or sensitive receiver.

Airblast Overpressure (dB(Lin Peak))	Allowable Exceedance
115	5% of total number of blasts over a 12-month period
120	Never

Not applicable



3.4 The Proponent shall ensure that the ground vibration generated by blasting associated with the project does not exceed the criteria specified in Table 2 when measured at the most-affected residential or sensitive receiver.

Peak Particle Velocity Criteria	Allowable Exceedance
5	5% of total number of blasts over a 12-month period
10	Never

Not applicable

3.5 Prior to each blasting event, the Proponent shall notify the relevant local council and potentially-affected landowners, including details of time and location of the blasting event and providing a contact point for inquiries and complaints.

Not applicable

Air Quality Impacts

3.6 The Proponent shall construct the project in a manner that minimises dust emissions from the site, including wind-blown and traffic-generated dust. All activities on the site shall be undertaken with the objective of preventing visible emissions of dust from the site. Should such visible dust emissions occur at any time, the Proponent shall identify and implement all practicable dust mitigation measures, including cessation of relevant works, as appropriate, such that emissions of visible dust cease.

Not applicable

3.7 The Proponent shall not permit any offensive odour, as defined under section 129 of the *Protection of the Environment Operations Act 1997*, to be emitted beyond the boundary of the site.

Not applicable

Traffic and Transport Impacts

3.8 Where directional drilling/boring is proposed under roads or where trenching is proposed to cross roads or where trenching is proposed to occur within the road reserve in close proximity to the road pavement, the Proponent shall obtain consent under Section 138 of the *Roads Act 1993* for any such works. The following information must be provided to these authorities, prior to the commencement of construction, when seeking consent:

- a) detailed plans of the pipeline including vertical and horizontal alignment;
- b) plant and equipment proposed to be used and construction compound locations;
- c) construction schedule and hours of construction;
- d) mitigation measures proposed to reduce impacts to traffic and pedestrian safety; and
- e) indicative maintenance arrangements during operation.

This information shall also be provided as part of the Construction Traffic Management Plan required for the Construction Environmental Management Plan (refer to condition 6.3b)).



	Not applicable
3.9 The Proponent shall ensure that any measures to restore or reinstate roads affected by the project are undertaken in a timely manner, in accordance with the requirements and to the satisfaction of the relevant road authority, including the Crown Lands and at the full expense of the Proponent.	
	Not applicable
3.10 The Proponent shall ensure that all crossings of the council-maintained roads are constructed using construction methods and depth of cover determined in consultation with the relevant local council.	
	Not applicable
Existing Infrastructure and Resources	
3.11 The Proponent shall undertake all reasonable and feasible measures to minimise the impact of the project on all existing infrastructure in the vicinity of the project route. The Proponent shall consult with the appropriate owner of such infrastructure with regard to measures to mitigate or manage any potential impact. The Proponent shall bear the cost of repairing or relocating any infrastructure directly impacted or damaged as a result of the project.	
	Not applicable
3.12 The Proponent shall consult with Gunnedah Shire Council regarding any existing leases and access/occupation rights that may exist within the Pullaming Stock Route, in order to determine and manage any potential impacts to this area from the installation and ongoing maintenance of the project.	
Comment: There are 42 points of travelling stock routes intersecting with the proposed corridor, 19 of those are in Moree Council, 6 points in the Hunter, 10 points in Narrabri, 4 points in Gunnedah Shire and 3 in Liverpool Plains. See Appendix 5.	
3.13 Prior to the commencement of relevant construction works, the Proponent shall consult with holders of mineral, mining and coal tenements with respect to measures to be applied during construction and operation of the project so as to minimise the potential for any sterilisation of resources on the tenement. This must include, but is not limited to, Namoi Valley Coal Pty Limited, the owner of mining tenements CL316 and AUTH406 and Muswellbrook Coal Company Ltd, the owner of coal tenements AUTH176 and ML1304.	
	Not applicable
3.14 Prior to the commencement of construction, the Proponent shall consult with each landholder, whose property is directly impacted by the project, the terms and conditions relating to construction activities on their land, including: a) access to land; b) measures to control spread of weeds, genetically modified organisms and methods to ensure security of livestock on the land during construction; and	



c) acquiring of necessary easements, including terms of the easement agreement and compensation to the landowner for the proposed easement on their land.

Comment: There are 1449 titles that are within the proposed construction corridor for the pipeline.

Ecological Impacts

3.15 The Proponent shall:

- a) submit, as part of the Construction Environmental Management Plan required under condition 6.2, a study of the potential impacts from the construction of the project on potential koala habitat;**
- b) monitor open trench areas for any fauna and any sightings of fauna shall be actively managed to minimise actual and potential impacts on those species. Any fauna found in the open trench shall be recorded and managed in consultation with BCD; and**
- c) for a period of two years after construction (or as otherwise required by the Secretary) monitor the areas along the project alignment, after construction is complete, for weed infestation and any infestations**

Comment: 1,014 Ha of the proposed construction corridor are considered high quality koala habitat and 961 Ha are dedicated areas of regional koala significance (ARKS). There have been 2,467 sightings of koala within a 10 km buffer around the corridor. Furthermore, there have been sightings of 110 threatened fauna species, 56 threatened fauna species & 4 endangered populations. 12 of the threatened fauna species and 10 of the threatened fauna species have been recorded only in/after 2008.

3.16 Clearing of native vegetation shall be limited to the minimal extent practicable required for the construction of the project. This shall be achieved by both location of the pipeline in previously cleared areas where possible, and where clearing cannot be avoided a minimal width clearing corridor.

Comment: 7,039 Ha or 53% of the proposed construction corridor is native vegetation.

3.17 The construction activities of the pipeline shall not disrupt to the extent practicable, the previous vegetation rehabilitation works conducted by the Kooragang Wetland Rehabilitation Project and Hunter Bird Observers Club, on the western part of Kooragang Island (also referred to as Ash Island).

Comment: The proposed corridor goes directly through the Kooragang City Farm as well as mangroves of the Kooragang wetland rehabilitation project.

3.18 The Proponent shall develop and submit for the approval of the Secretary, a Biodiversity Offset Needs Study. The study shall be developed in consultation with BCD and shall include a methodology for determining biodiversity offset requirements. The study shall:

- a) quantify vegetation clearing, considering condition of vegetation,**
- b) detail the significance of impacts to biodiversity as a result of the loss quantified in 3.18(a);**
- c) inform the quantification of biodiversity offset requirements;**



d) consider the biodiversity management measures or activities identified in the documents set out in condition 1.1 or elsewhere in these Conditions of Approval, including: i) revegetation measures; ii) relevant construction measures to reduce terrestrial and aquatic impacts; iii) any other fauna mitigation measures such as nest boxes; and iv) any ongoing biodiversity or threatened species monitoring requirements; e) describe the decision-making framework used in determining the level of impact to biodiversity; f) detail the final methodology used to determine the biodiversity offset requirements; and g) include a program (timeline) to achieve the implementation of the final suite of measures to mitigate and or manage impacts to biodiversity.

Unless otherwise agreed by the Secretary, the Biodiversity Offset Needs Study shall be submitted to the Secretary for approval prior to the commencement of any construction works.

Comment: 7,039 Ha or 53% of the proposed construction corridor is native vegetation. Additionally, 2,543 Ha (19.12 %) of the corridor identifies key fauna habitat, fauna corridor or climate change corridor for moist, dry, and coastal habitat.

Hazards and Risk

3.19 Prior to the commencement of the construction of the project, unless the Secretary agrees otherwise, the Proponent shall prepare a Final Hazard Analysis (FHA) of the project to the satisfaction of the Secretary.

Not applicable

3.20 Prior to the commencement of the operation of the project, the Proponent shall submit to the Department a copy of the Pipeline Management Plan required for the project under the *Pipelines Regulation 2013*.

Not applicable

Soil and Water Quality Impacts

3.21 Except as may be expressively provided by an Environment Protection Licence for the project, the Proponent shall comply with section 120 of the *Protection of the Environment Operations Act 1997* which prohibits the pollution of waters.

Not applicable

3.22 Soil and water management controls shall be employed to minimise soil erosion and the discharge of sediment and other pollutants to lands and/or waters during construction activities, in accordance with *Managing Urban Stormwater: Soils and construction* (DECC, 2008), or its latest version.

Comment: 2721 Ha or 24.6% of the proposed corridor is in erosional soils.

3.23 The Proponent shall prepare a contingency plan for events that have the potential to pollute or contaminate surface or ground water. The plan is to include threshold levels, remediation actions and communication strategies for the effective management of such an event. This plan is to be included in the Construction Environmental Management Plan required under condition 6.2.



Comment: 245 Ha which are mapped under the EPI groundwater vulnerability.	
3.24 The Proponent shall notify the relevant local council should contaminated soil be uncovered during excavation works. The Construction Environmental Management Plan required under condition 6.2 shall include management measures for any contamination that may be uncovered during construction of the project.	
	Not applicable
3.25 Proponent shall ensure that all water supplies for construction, hydro-testing and operation are sourced from an authorised and reliable supply.	
	Not applicable
3.26 Any Acid Sulphate Soils encountered during construction of the project shall be treated and disposed of in accordance with the <i>Acid Sulphate Soils Manual</i> (Acid Sulphate Soil Management Advisory Committee, 1998) or its latest version.	
Comment: 1,096 Ha (8.24%) mapped under the EPI as Acid Sulphate Soils. 767 Ha mapped as Acid Sulphate Soils risks.	
3.27 The Proponent shall prepare an oral histories study for determining significant Aboriginal heritage significant sites along the potential route. The study shall be informed by the views of the Traditional Owners and appropriate Aboriginal community. The Construction Environmental Management Plan (condition 6.2) protocols adopted in relation to avoidance, constraints and mitigation measures shall be informed by the oral histories. The results of this study shall be used to assist in the determination of the final project right of way (refer to condition 2.1.1).	
Comment: There are 21 mapped cultural heritage sites or artefact within the corridor and 45 sites in the 10 km buffer around the corridor. A large part of the area in NSW is under an existing native title claim by the Gomeroi people.	
3.28 If during the course of any ground fieldwork assessment, the Proponent uncovers any significant Aboriginal heritage sites, the Proponent shall consult BCD with regard to an appropriate course of action for the management of these sites.	
	Not applicable
3.29 If during the course of construction, the Proponent becomes aware of any previously unidentified significant Aboriginal object(s), all work likely to affect the object(s) shall cease immediately and BCD informed in accordance with the <i>National Parks and Wildlife Act 1974</i>. Relevant works shall not recommence until written authorisation from BCD advising otherwise is received by the Proponent.	
	Not applicable
Crown Lands Easement	
3.30 The Proponent shall liaise with the Crown Lands and negotiate measures to be applied during construction and operation of the project so as to minimise the potential for any impact to the environment on Crown lands.	
	Not applicable



3.31 The Proponent shall ensure the provision of long term access management measures, such as fences, gates and barriers to be installed at all pipeline entry points on Crown Land to minimise the opportunity of utility easements being utilised for illegal rubbish dumping, illegal trail bike riding, damaging 4WD use and bushfire ignition points.

Not applicable

Waste Generation and Management

3.32 All waste materials removed from the site shall only be directed to a waste management facility lawfully permitted to accept the materials.

Not applicable

3.33 The Proponent shall maximise the treatment, reuse and/ or recycling on the site of any waste oils, excavated soils, slurries, dusts and sludges associated with the project, to minimise the need for treatment or disposal of those materials outside the site.

Not applicable

3.34 The Proponent shall not cause, permit or allow any waste generated outside the site to be received at the site for storage, treatment, processing, reprocessing, or disposal on the site, except as expressly permitted by a licence under the *Protection of the Environment Operations Act 1997*, if such a licence is required in relation to that waste.

Not applicable

3.35 The Proponent shall ensure that all liquid and / or non-liquid waste generated and / or stored on the site is assessed and managed in accordance with the relevant NSW *Waste Classification Guidelines* (EPA, 2014), or their latest versions.

Not applicable

4. COMPLIANCE NOTIFICATIONS AND REPORTING

Notification – Date of Commencement

4.1 The Proponent shall notify the Department in writing of the date of commencement of:

- a) any stage of construction of the project;
- b) the commissioning of the pipeline; and
- c) the operation of the pipeline.

Not applicable

Compliance Reporting

4.2 The Proponent shall provide regular compliance reporting on the project as required by the Department and in accordance with the relevant *Compliance Reporting* (DPE 2018) requirements.

Not applicable

Regular Reporting



4.3 The Proponent shall provide regular reporting on the environmental performance of the project on its website in accordance with the reporting requirements in any strategies or plans approved under the conditions of approval.

Not applicable

Incident Notification

4.4 The Department shall be notified in writing to compliance@planning.nsw.gov.au immediately after the Proponent becomes aware of an incident. The notification must identify the project (including the application number and name of the project) and set out the location and nature of the incident.

Not applicable

Non-Compliance Notification

4.5 The Department shall be notified in writing to compliance@planning.nsw.gov.au within 7 days after the Proponent becomes aware of any non-compliance with the conditions of this approval. The notification must identify the project (including the application number and name of the project), set out the condition of approval that the project is non-compliant with, the way in which it does not comply, the reasons for the non-compliance (if known) and what actions have been taken, or will be, undertaken to address the non-compliance.

Not applicable

5. COMMUNITY INFORMATION, CONSULTATION AND INVOLVEMENT

Environmental Management Strategy

5.1 Prior to the commencement of the construction of the project, the Proponent shall prepare an Environmental Management Strategy for the project to the satisfaction of the Secretary. This strategy must:

- a) provide the strategic framework for the environmental management of the project;**
- b) identify the statutory approvals that apply to the project;**
- c) describe the role, responsibility, authority and accountability of all key personnel involved in the environmental management of the project; and**
- d) describe the procedures that would be implemented to:**
 - keep the local community and relevant agencies informed about the progress of the project;**
 - receive, handle, respond to, record and report complaints;**
 - resolve any disputes that may arise during the project;**
 - respond to any non-compliance; and**
 - respond to any incidents or emergencies.**

Comment: Recommendation is that the Environmental Management Strategy should be landowners specific as each site has its own limitations, native vegetation, threatened species (Flora and Fauna). Site specific Management Strategy needs



to be conveyed to the title holder as there is clear ramifications to the management of the site pre, during and post construction.

Access to Information

5.2 From the commencement of the construction of the project, the Proponent shall:

a) make copies of the following information publicly available on its website:

- the EA;
- current statutory approvals for the project;
- approved studies, strategies and plans required for the project under the conditions of approval;
- a comprehensive summary of the monitoring results on the project, reported in accordance with the requirements in the conditions of approval or any approved studies, strategies or plans for the project;
- a summary of any complaints received, updated monthly;
- any other matter required by the Secretary; and

b) keep this information up to date.

Not applicable

6. ENVIRONMENTAL MONITORING AND MANAGEMENT

Updating & Staging of Studies, Strategies & Plans

6.1 To ensure the studies, strategies and plans for the project are updated on a regular basis and incorporate any required measures to improve the environmental performance of the project, the Proponent may submit revised studies, strategies or plans required for the project under the conditions of approval at any time. With the agreement of the Secretary, the Proponent may also submit any study, strategy or plan required under the conditions of this approval on a staged basis. The Secretary may approve a revised strategy or plan required under the conditions of approval, or the stage submission of these documents, at any time. With the approval of the Secretary, the Proponent may prepare the revised or staged strategy or plan without undertaking consultation with all parties nominated under the applicable condition in this approval.

Notes:

- *While any study, strategy or plan may be submitted on a progressive basis, the Proponent will need to ensure that the existing operations on site are covered by suitable studies, strategies or plans at all times.*
- *If the submission of any study, strategy or plan is to be staged, then the relevant study, strategy or plan must clearly describe the specific stage to which the study, strategy or plan applies, the relationship of this stage to any future stages, and the trigger for updating the study, strategy or plan.*



Comment: For all landholders, there needs to be always an environmental management plan with appropriate studies and all sites that have identified potential impacts will need ground truthing and updated with factual data on a regular basis. This site specific study needs to be updated with survey data for each site.

Construction Environmental Management Plan

6.2 Prior to the commencement of the construction of the project, the Proponent shall prepare a Construction Environmental Management Plan (CEMP) for the project to the satisfaction of the Secretary. This plan must outline the environmental management practices and procedures to be followed during construction of the project. The CEMP shall be consistent with *Guideline for the Preparation of Environmental Management Plans* (DIPNR 2004), or its latest version, and shall include, but not necessarily be limited to:

- a) a description of all relevant activities to be undertaken on the site during construction;**
- b) details of the areas designated for the erection of public information signage;**
- c) details of any construction camp sites and the management of these sites**
- d) details of the measures to be employed to minimise soil erosion and trench compaction;**
- e) details on potential occurrence of expansive soils and saline areas along the proposal route and management and mitigation measures;**
- f) details of measures to be installed to separate construction areas from publicly accessible areas;**
- g) details of the protocols to be implemented to minimise impacts to Aboriginal cultural heritage sites;**
- h) statutory and other obligations that the Proponent is required to fulfil during construction including all relevant approvals, consultations and agreements required from authorities and other stakeholders, and key legislation and policies;**
- i) details of how the environmental performance of the construction works will be monitored, and what actions will be taken to minimise environmental impacts. In particular, the following environmental performance issues shall be addressed in the Plan:**
 - i) measures to monitor and minimise dust emissions;**
 - ii) measures to monitor and minimise soil erosion and the discharge of sediment and other pollutants to lands and/ or waters during construction activities;**
 - iii) measures to monitor and minimise noise emissions during construction works;**
 - iv) measures to monitor and minimise air emissions during construction to ensure that air emissions;**
 - v) measures to minimise the impact of construction on local flora and fauna, consistent with the mitigation measures described in section 9.4 and Appendix D of the documents referred to under condition 1.1a) , including minimisation of vegetation clearing; methods to minimise unintended impacts on vegetation to be retained and fauna; details of the rehabilitation of cleared areas; topsoil, seed and vegetative material re-use initiatives to be**



- employed; and measures to be undertaken to control weed spread;**
- vi) measures to monitor and minimise the impacts on indigenous heritage values on site including involvement of the relevant Local Land Councils, Committees and Traditional Owner Groups; and**
- j) the additional plans listed under condition 6.3 of this approval.**

The Proponent shall implement the approved CEMP for the project.

Not applicable

6.3 The Construction Environmental Management Plan required under condition 6.2 must include:

a) a Construction Noise Management Plan to minimise noise impacts during construction. The Plan must include, but not necessarily be limited to:

- i) revised noise predictions for the final route of the pipeline, taking in consideration the proposed mitigation measures;**
- ii) details of the scheduling and management of construction works outside the hours specified under condition 3.1, where relevant, including:**

- identification of construction works and construction areas for which construction noise will be audible or inaudible at respective residential and sensitive receivers;**
 - for construction works identified as audible at residential and sensitive receivers, provisions for consultation with affected receivers with respect to any construction works outside the hours specified under condition 3.1, including provisions for the establishment of negotiated agreements with those receivers for out-of-hours works;**
 - reflection of a general 28-day construction, 9-day respite scheduling approach, unless the intensity of works and/ or nature of impacted residential or sensitive receivers requires otherwise. In such circumstances, the Plan shall demonstrate that consideration has been given to additional noise mitigation (at-source and/ or at receiver), or alternatively that the 28-day/ 9-day scheduling cycle has been refined in recognition of the impacted receivers;**
 - reflection of an approach to scheduling construction activities that takes into account the intensity, characteristics (tonality/ frequency/ impulsiveness) and duration of construction noise and the need for provision of respite for affected receivers;**
 - recognition of special arrangements required for public and religious holidays, sensitive receivers (hospitals, schools etc) and sensitive periods (for example, school exam periods);**
 - proactive and reactive monitoring and management measures for all audible out-of-hours construction works;**
 - auditing and reporting requirements, where relevant, to ensure that residential and sensitive receivers are not being adversely impacted by construction noise associated with the project;**
- iii) details of the measures that would be implemented to minimise the construction noise impacts of the project, having regard to the best practice requirements**



- i outlined in the *Interim Construction Noise Guideline* (DECC, 2009), or its latest version; and**
- ii iv) details, where impacts cannot be mitigated to meet the relevant highly noise affected criterion in the *Interim Construction Noise Guideline*, of effective consultation and/or negotiation with affected receptors.**
- iii b) a Construction Traffic Management Plan to minimise the construction traffic impacts of the project. The Plan must address the requirements of the relevant Councils, RMS, Crown Lands, and any other relevant road authority and shall include, but not necessarily be limited to:**
 - iv i) details of how construction of project infrastructure will be managed in proximity to local and regional roads;**
 - v ii) the measures that would be implemented to minimise the traffic impacts of the project on road users and the capacity and safety of the road network, including:**
 - vi • imposing restrictions on the use of heavy or over-dimensional vehicles;**
 - vii • a driver's code of conduct for workers associated with the project;**
 - viii • notifying the local community about project-related traffic impacts;**
 - ix • ensuring vehicles enter and leave the site in a forward direction and have their loads covered or contained;**
 - x • minimising dirt being tracked onto the public road network from project-related traffic; and**
 - xi • providing sufficient parking on site for project-related traffic;**
 - xii iii) include a program to monitor and report on the effectiveness of these measures; and**
 - xiii iv) evidence to demonstrate that all statutory responsibilities with regard to road traffic impacts have been complied with.**
 - xiv c) a Water Management Plan to minimise the water impacts of the project. The Plan shall:**
 - xv i) identify all sources of water that would be used for the construction of the project (including water for hydro-testing), and the amount of water to be extracted from each source; and**
 - xvi ii) describe the measures that would be implemented to minimise the water impacts of the project, including:**
 - xvii • the measures to avoid any off-site water pollution occurring;**
 - xviii • the measures to minimise soil erosion and the discharge of sediments from the site;**
 - xix • the measures to ensure all chemical and hydrocarbon products are stored on site in bunded areas in accordance with the relevant Australian Standards; and**
 - xx • details on the proposed disposal sites for hydro-test water and the environmental protection measures to be used at any such disposal sites; and**
 - xxi iii) include a include a program to monitor and report on the effectiveness of these measures.**

Not applicable

Operation Environmental Management Plan



6.4 Prior to the commencement of the operation of the project, the Proponent shall prepare an Operation Environmental Management Plan (OEMP) to the satisfaction of the Secretary. This plan must outline the environmental management practices and procedures to be followed during the operation of the project. The OEMP shall be consistent with *Guideline for the Preparation of Environmental Management Plans* (DIPNR 2004), or its latest version, and shall include, but not necessarily be limited to:

- a) identification of all relevant statutory and other obligations that the Proponent is required to fulfil in relation to operation of the project, including all relevant approvals, licences, approvals and consultations;**
- b) details of the areas designated for the erection of public information signage in accordance with AS 2885;**
- c) details of the monitoring methods of rehabilitated areas;**
- d) specific consideration of relevant measures to address any requirements identified in the documents referred to under conditions 1.1a) of this approval;**
- e) details control measures for soil erosion and sedimentation;**
- NSW Government Department of Planning, Industry and Environment 16**
- f) overall environmental policies and principles to be applied to the operation of the project;**
- g) relevant standards and performance measures to be applied to the project, and a means by which environmental performance can be periodically reviewed and improved, where appropriate;**
- h) management policies to ensure that environmental performance goals are met and to comply with the conditions of this approval;**
- i) measures to ensure that relevant ambient air criteria will be met for operational activities, including gas venting;**
- j) measures to minimise the operational noise impacts of the project and ensure it complies with the relevant noise criterion specified in the *Noise Policy for Industry* (EPA 2017), or its latest version; and**
- k) management measures for easement areas, including management of vegetation, soil erosion, weed control and landholder liaison.**

The Proponent shall implement the approved OEMP for the project.

Not applicable

Revision of Strategies, Plans and Programs

6.5 Within 3 months, unless the Secretary agrees otherwise, of:

- a) the submission of an incident notification under condition 4.4 above;**
- b) the approval of any modification to the conditions of approval; or**
- c) a direction from the Secretary under condition**

The Proponent shall review and, if necessary, revise the studies, strategies or plans required under the conditions of approval to the satisfaction of the Secretary.



Where this review leads to revisions in any such document, then within 4 weeks of the review the revised document must be submitted to the Secretary for approval.

Not applicable



4.0 PART D – OVERARCHING RECOMMENDATIONS

The table below is a series of recommendations that we would advise from the interrogation of the maps and the environmental planning instruments. We have addressed all of these respectively in Part B Review for Local Government Area.

We suggest following the recommendations prepared by Strategic Environmental and Engineering Consulting for Hunter Gas Pipeline Pty Ltd ([Appendix 4](#)). The report only interrogates vertosol soils in one particular landscape, however the overall suggestions are applicable.

Constraints	Impact	Action	LGA Applicable
Water crossing	Water management reports corresponding to each crossing should be done.	A specialist Hydrologist to be engaged for water management reports and engage an Ecologist to assess impacts on riparian zones.	Moree, Narrabri, Gunnedah, Liverpool Plains, Upper Hunter, Muswellbrook, Singleton, Maitland, Port Stephens, Newcastle
Wetlands	Mapped under the Environmental Planning Instrument (EPI) Wetlands.	An Environmental consultant to be engaged to assess any adverse impacts on wetlands.	Port Stephens & Newcastle
Threatened Flora & Fauna; Native Vegetation	Assessment required for clearing the native vegetation, impacts on threatened flora and ecological communities needs attention and specific biodiversity values mapped within the corridors require specific guidance as there is potential for irreversible damage and impacts.	A specialist Ecologist to be engaged to survey impacts of native vegetation clearing on threatened fauna (nocturnal and diurnal), threatened flora, and threatened ecological communities. To identified biodiversity values	Moree, Narrabri, Gunnedah, Liverpool Plains, Upper Hunter, Muswellbrook, Singleton, Maitland, Port Stephens, Newcastle



		special surveys would be essential to assess the impacts and avert any irreversible decision.	
Koala	There are high quality koala habitat and threatened species: in each area of the corridor that requires attention. There are proportion of the area within the corridor is mapped under SEPP44 (Core Habitat within an approved Koala Plan of Management). Furthermore, the Pipeline crosses Areas of Regional Koala Significance (ARKS).	A specialist Ecologist to be engaged that has the accreditation for the assessment of Koala habitat.	Moree, Narrabri, Gunnedah, Liverpool Plains, Upper Hunter, Muswellbrook, Singleton, Maitland, Port Stephens, Newcastle
Soils	Identification of soil types is noted in Appendix 5 . A variety of soil types have been identified in each local government area that would determine how the landscape and its fertility should be handled during construction of the pipeline.	A specialist CPSS qualified soil assessor is to be engaged to assess the soils for potential degradation and erosional potential, any potential acid sulfate soils. Further, during construction, engage specialist consultant to treat and dispose acid sulfate soils.	Moree, Narrabri, Gunnedah, Liverpool Plains, Upper Hunter, Muswellbrook, Singleton, Maitland, Port Stephens, Newcastle
Socio-Economic	Potential loss of land that is of moderately high to high fertility is seen in all local government areas of the pipeline corridor.	To ensure stakeholder engagement is done with all stakeholders, with all owners and indigenous land	Moree, Narrabri, Gunnedah, Liverpool Plains, Upper Hunter, Muswellbrook, Singleton,



		holder and all title holders which include all exploration and mining titles and all agricultural stakeholders which include equine and viticulture.	Maitland, Port Stephens, Newcastle
Cultural Heritage	Existing aboriginal sites within the corridor have been identified throughout the entire corridor of the pipeline.	Consultation with traditional owners is required. A study that demonstrates care and consideration to the managing and handling of possible discoveries of artefacts should be assessed. Traditional Owners working with their preferred experts should be engaged to identify the sites and document the historical details.	Moree, Narrabri, Gunnedah, Liverpool Plains, Upper Hunter, Muswellbrook, Singleton, Maitland, Port Stephens, Newcastle
Groundwater	Groundwater vulnerability is mapped.	A specialist Groundwater Consultation to be engaged to assess potential impacts on groundwater.	Upper Hunter
Land Tenure	Existing exploration and mining titles as well as travelling stock routes	Consultation with stakeholders	Moree, Narrabri, Gunnedah, Liverpool Plains, Upper Hunter, Muswellbrook



5.0 CLOSE

Consulting & environmental Services provides this report prepared for Lock the Gate Alliance to better understand the landscape, soils and limitations that may be impacted from the Hunter Gas Pipeline Pty Ltd development of the Gas Pipeline Corridor during the construction phase and operational phase.

We utilised spatial data analysis with ArcGIS Pro 2.5 to interrogate biodiversity, cultural heritage, geographic and topographic, socio-economic and land use planning constraints to determine potential impacts of the proposed pipeline corridors. Our report shows that there will be adverse impacts in all local government areas to all of the above categories.

We would recommend:

1. As a State Significant Development, with the current Department of Planning Condition of Approval Mod 1, dated 19 October 2019 further investigation and assessment should follow all overarching recommendations as outlined in Part D, which sets out the scope necessary for briefing specialist consultants.
2. The report is shared with each of the ten local government areas across New South Wales, as outlined in Part B, to better highlight the likely impacts of the project.
3. The Department of Planning considers the details of the project with respect to Part C so that these impacts can be minimised as much as possible.

Final Word - We encourage all affected land and title holders to better understand their property's landscape and values. Consulting & Environmental Services Pty Ltd will provide a fee for service verified information pack for affected landholders that provides details on soils, agricultural and environmental values within their land parcel. .

Consulting & Environmental Services Pty Ltd



TABLES

Table 1: Quantitative summary of biodiversity, cultural heritage, geographic and topographic, socio-economic and land use planning attributes that are applicable to the proposed Queensland Hunter Gas Pipe within NSW.

Category	Subcategory/Notes	Area (ha) of proposed pipeline corridor in NSW	Proportion of total area of proposed pipeline corridor in NSW	Amount
Proposed pipeline corridor		13,300.95		
Number of cultural heritage sites	In corridor			31
	Including 200m buffer around corridor			97
Land use 2017	Nature conservation ¹	94.85	0.71%	
	Grazing ²	7,490.65	56.32%	
	Cropping and horticulture ³	4712.24	35.43%	
	Intensive animal production ⁴	27.78	0.21%	
	Industry and infrastructure ⁵	615.58	4.63%	
	Water courses and wetlands ⁶	239.39	1.80%	
	Grazing, cropping and horticulture in HIGH or MODERATELY HIGH soil fertility ⁷	7,228.05	54.34%	
Erosional soils		2,721.08	20.46%	
Acid sulphate soils (EPI)		1096.42	8.24%	

¹ 1.1.0 Nature conservation

² 2.1.0 Grazing native vegetation; 3.2.0 Grazing modified pastures; 4.2.0 Grazing irrigated modified pastures.

³ 3.3.0 Cropping; 3.4.0 Perennial horticulture; 4.3.0 Irrigated cropping; 4.4.0 Irrigated perennial horticulture; 4.5.0 Irrigated seasonal horticulture

⁴ 5.2.0 Intensive animal production

⁵ 5.3.0 Manufacturing and industrial; 5.4.0 Residential and farm infrastructure; 5.5.0 Services

5.6.0 Utilities; 5.7.0 Transport and communication; 5.8.0 Mining; 5.9.0 Waste treatment and disposal

⁶ 6.2.0 Reservoir/dam; 6.3.0 River; 6.4.0 Channel/aqueduct; 6.5.0 Marsh/wetland

⁷ 2.1.0 Grazing native vegetation; 3.2.0 Grazing modified pastures; 3.3.0 Cropping; 3.4.0 Perennial horticulture; 4.2.0 Grazing irrigated modified pastures; 4.3.0 Irrigated cropping; 4.4.0 Irrigated perennial horticulture; 4.5.0 Irrigated seasonal horticulture.



Acid sulphate soils (risk)		767.08	5.77%	
Estimate inherent soil fertility	High	1490.58	11.21%	
	Low	222.29	1.67%	
	Moderate	2234.54	16.80%	
	Moderately high	6225.75	46.81%	
	Moderately low	2920.13	21.95%	
	Not assessed	183.55	1.38%	
	Water	6.62	0.05%	
Strategic Agricultural Lands	Total	5504.89	41.39%	
	Biophysical Strategic Agricultural Land	4446.60	33.43%	
	Critical Industry Cluster Land (Equine)	1056.27	7.94%	
	Critical Industry Cluster Land (Viticulture)	2.02	0.02%	
Koala habitat	High-quality koala habitat (habitat suitability > 70%) within proposed pipeline corridor	1014.40	7.63%	
	Habitat suitability > 90% within proposed pipeline corridor	155.0	1.17%	
Number of koala sightings	In corridor			15
	In 10km buffer around corridor			2,467
Areas of regional koala significance (ARKS)	3 ARKS	961.08	7.23%	
Number of threatened fauna species⁸	In 10km buffer around corridor			110
Number of threatened flora species	In 10km buffer around corridor			56
Number of threatened ecological communities	In 10km buffer around corridor			4

⁸ Species, not records.



Flood prone land		2437.03	18.32%	
	In erosional soils	2011.26	15.12%	
SEPP 14 Coastal wetlands		58.75	0.44%	
Riparian lands and watercourses⁹		271.04	2.04%	
Native vegetation		7039.44	52.92%	
Climate change corridors	Coastal, dry, and moist habitat	2485.23	18.68%	
Exploration and mining titles	Total	7415.55	55.75%	
	Coal	1358.80	10.22%	
	Minerals	43.03	0.32%	
	Petroleum	6013.72	45.21%	

⁹ 30m buffer around all second order streams or higher from RiverStyles

Table 1-1-1A Schedule of maps per LGA with codes referring to those used to organise maps on Consulting & Environmental Services website

LGA	Moree Plains	Narrabri	Gunnedah	Liverpool Plains	Upper Hunter	Muswellbrook	Singleton	Maitland	Port Stephens	Newcastle
Location Plan	MO.1 Location with threatened species	NA.1 Location with threatened species and ARKS	GU.1 Location with threatened species and ARKS	LI.1 Location with threatened species and ARKS	UP.1 Location with threatened species	MU.1 Location with threatened species	SI.1 Location with threatened species	MA.1 Location with threatened species and ARKS	PO.1 Location with threatened species and ARKS	NE.1 Location with threatened species and ARKS
Soil and land resources	MO.2 SLR	NA.2 SLR	GU.2 SLR	LI.2 SLR	UP.2 SLR	MU.2 SLR	SI.2 SLR	MA.2 SLR	PO.2 SLR	NE.2 SLR
Watercourses	MO.3 Watercourses	NA.3 Watercourses (with EPI Flood)	GU.3 Watercourses (with EPI Flood)	LI.3 Watercourses	UP.3 Watercourses (with EPI Riparian and Groundwater vulnerability)	MU.3 Watercourses (with EPI Terrestrial lands)	SI.3 Watercourses (with EPI Riparian)	MA.3 Watercourses (with EPI Riparian, Flood and ASS)	NA	NE.2 Watercourses (with EPI ASS)

Table 1-1-1B Schedule of maps for the entire length of the pipeline within NSW with codes referring to those used to organise maps on Consulting & Environmental Services website

O.1 LGA	O.2 Monthly mean hillslope erosion	O.3 Erosional soils	O.4 Inherited soil fertility	O.5 Strategic agricultural lands	O.6 Koala habitat suitability with sightings & ARKS	O.7 Koala tree index with sightings	O.8 Climate change corridors & fauna key habitat	O.9 Exploration and mining titles	O.10 Cultural heritage with aboriginal sites and native title claims	O.11 Acid sulfate soils (EPI)	O.12 Acid sulfate soils (Risk)	O.13 Coastal wetlands	O.14 Travelling Stock Route Conservation Values
---------	------------------------------------	---------------------	------------------------------	----------------------------------	---	-------------------------------------	--	-----------------------------------	--	-------------------------------	--------------------------------	-----------------------	---



Table 1-1-2 Bionet threatened flora and fauna

Threatened flora ONLY recorded in or after 2008	Threatened fauna ONLY recorded in or after 2008
Angophora inopina (Charmhaven Apple)	Arctocephalus pusillus doriferus (Australian Fur-seal)
Cynanchum elegans (White-flowered Wax Plant)	Caretta caretta (Loggerhead Turtle)
Diuris arenaria (Sand Doubletail)	Cercartetus nanus (Eastern Pygmy-possum)
Grevillea shiressii	Chelonia mydas (Green Turtle)
Lepidium monoplacoides (Winged Peppergrass)	Delma impar (Striped Legless Lizard)
Lindernia alsinoides	Eretmochelys imbricata (Hawksbill Turtle)
Pomaderris bodalla (Bodalla Pomaderris)	Litoria booroolongensis (Booroolong Frog)
Tetradlea glandulosa (Black-eyed Susan)	Onychoprion fuscatus (Sooty Tern)
Thesium australe (Austral Toadflax)	Planigale maculata (Common Planigale)
Tylophora linearis	Pseudomys novaehollandiae (New Holland Mouse)
	Thalassarche cauta (Shy Albatross)
	Uperoleia mahonyi (Mahony's Toadlet)

Table 1-1-3 Listed legislation, codes and standards

State of New South Wales

- Environmental Planning & Assessment Act 1979 (EP&A Act)
- Mining Act 1992 amended 2008.
- Petroleum Act (Onshore) 1991
- APGA Code of Environmental Practice 2017 – Onshore Pipelines Revision 4
- Biodiversity and Conservation Act 2016
- Water Management Act 2000
- State Environmental Planning Policy – Coastal Management 2018
- Protection of the Environmental Operations Act 1997
- Roads Act 1993 No 33
- Mining Act 1992 No 29
- Managing Urban Stormwater – Soils and Construction DECC 2008
- Acid Sulphates Soil manuals (Acid Sulphate Soil Management Advisory Committee 1988)



- National Parks and Wildlife Act 1974
- Petroleum and Gas (Production and Safety) Act 2004

Federal Government

- Aboriginal and Torres Strait Islander Heritage Protection Act 1984
- Aboriginal and Torres Strait Islander Act 2005
- Commonwealth of Australia
- Environmental Protection Biodiversity Conservation Act (EPBC)
- Native Title Act 1993
- Pipelines Acts 1967 No 90

Table 1-3 Project Approval Timeline

Document	Date	File No.	Description
Original Approval	11/02/2009	S06/00901	Only assessed under State Level
Request for Modification	31/08/2018	06-0286	Application for extension
Queensland-Hunter Gas Pipeline (MOD 1) - Assessment Report	17/10/2019	MP_06_0286 MOD 1	Critical State Significant Infrastructure Modification Assessment
Notice of Decision – QLD Hunter Gas Pipeline Project	17/10/2019	MP_06_0286 MOD 1	Section 2.22 and clause 20 of Schedule 1 of EP&A Act
Notice of Modification	17/10/2019		Only assessed under State Level
MP 06_0286 MOD 1 - Consolidated Project Approval	17/10/2019	S06/00901	Section 5.25 EP&A Act

Table 2-1 Summary of aspects and impacts for LGA's

MAPS

Due their size, the maps will be supplied through cloud storage.



APPENDICES

Appendix 1 Soil Definitions

Aeolian	A term applied to deposits of soil materials transported and/or arranged by wind.
Alluvial	Soils developed from recently deposited alluvium, normally characterise little or no modification of the deposited material by soil forming processes, particularly with respect to soil horizon development. Soil landscapes formed by deposition along rivers and streams. Soil parent material is usually deep, sorted and often stratified or previously stratified alluvium. Alluvial soil landscapes include current floodplains and alluvial deposits. Typical landform elements include those found on meander plains including bars, back plains, scrolls, scroll plains, flood-outs, oxbows, levees, lower terraces, prior and current stream channels.
Beach/Barrier	Soil landscapes which have ground surfaces and soil parent materials that have been deposited by wave action, including accumulation of sand-sized coastal sediments during sea level changes. They typically occur near sandy coastlines or close to lake edges.
Colluvial	Soil landscapes affected by mass movement. Soil parent material consists mostly of colluvial mass movement debris including scree and talus along with other landslide, mudflow and creep deposits. Colluvial soil landscapes usually include alcoves, cliffs, cliff-foot slopes, scarps, landslides, talus, some moderately inclined to precipitous hillslopes, and areas with commonplace evidence of mass movement. Slope wash processes are considered less dominant.
Disturbed	Soil landscapes dominated by ground surfaces arising from human activity. Soil parent materials have been moved, accumulated, removed or replaced (with soil or other items). Landform elements include fill-tops, embankments, cut faces, cut-over surfaces, dams, mounds and pits.
Erosional	Soil landscapes that have been sculpted primarily by the erosive action of running water. Streams are well-defined and capable of transporting their sediment load. Soils are usually shallow (with occasional deep patches) and mode of origin is variable and complex. Soils may be either absent, derived from water-washed parent materials or derived from in situ weathered bedrock. In many instances, subsoils have formed in situ while topsoils have formed from materials washed from further upslope. Erosional soil landscapes usually consist of steep to undulating hillslopes and may include tors, benches and areas of rock outcrop. Evidence of mass movement is rare.
Estuarine	Occur where rivers and streams enter large bodies of water such as the sea or inland lakes. Channel flow is dissipated and is also modified by wave and/or (in the case of estuarine soil landscapes) tidal action. Soil materials may also be influenced by saline conditions in both cases. Typical landform elements within estuarine soil landscapes include estuaries, deltas, tidal creeks and flats, and parts of coastal lagoons. Typical landform elements within deltaic soil landscapes include stream channels, levees, back plains and some swamps and lagoons.
Gilgai	Soil landscapes where seasonal shrink-swell is the dominant soil process. They are characterised by undulating microrelief, with small depressions, holes, shelves and mounds. Drainage is typically disintegrated. Gilgai types include crabhole, normal, linear, lattice, melonhole and contour.



Karst	A pattern of unspecified relief and slope, typically with fixed deep erosional stream channels forming a non-directional disintegrated tributary pattern and many closed depressions without stream channels. Eroded by continuously active solution and rarely active collapse, the products being removed through underground channels. Typical elements are hillcrest, hillslope (dominant) and doline. Includes summit surface, valley flat, plain, alcove, drainage depression, stream channel, scarp, footslope and landslide, and talus. Soil landscapes dominated by solutional processes, particularly on limestone and related rock types. Soil parent materials include accumulations of less soluble minerals. Drainage patterns are deranged and solution hollows are common. Landform patterns may include tors, hillslopes and dolines.
Lacustrine	Unconsolidated surface material deposited mainly in standing water such as lakes. Result from infilling of lakes with sediments deposited in still water. Soil parent materials are usually fine-grained, well-sorted and often varved. Ground surfaces are level to gently inclined and slightly concave. Landform elements include lakes, playas and some oxbows and lagoons.
Residual	In situ processes of weathering, leaching and new mineral formation are dominant. Lateral surface movement is minimal. A residual site may occur either on low gradient topography, such as a plateau surface, or where soil material is of such a nature as to resist lateral movement despite a considerable slope gradient (Paton 1978). Soil landscapes dominated by sites where deep soils have formed from in situ weathering of parent materials. Residual soil landscapes typically have level to undulating elevated landforms. Landform elements include some summit surfaces, plateaux, terrace plains, peneplains and old ground surfaces. Stream channels are usually poorly defined
Stagnant Alluvial	Occur as alluvial plains where erosion and aggregation by channel and over-bank flow is barely active because of reduced water flow and stream migration. Typical landform elements are usually subdued and often inactive. They include plains, some higher terraces, prior streams, back plains and swamps.
Swamp	Soil landscapes dominated by ground surfaces and soils that are at least seasonally wet. Soil parent material includes large amounts of accumulated decayed organic matter. Water tables are frequently close to the surface. Landform elements may include swamps and some relic oxbows, abandoned channels, lagoons and swales.
Transferral	Deep deposits of mostly eroded parent materials washed from areas directly upslope. Soil landscapes formed on deep deposits of mostly eroded parent materials washed from areas upslope. Stream channels are often discontinuous, and slopes are generally concave. Transferral landscapes include foot slopes, valley flats, fans, bajadas and piedmonts.
Vestigial	Soil landscapes dominated by sites where shallow soils have formed from in situ weathering of typically resistant parent materials. Landform elements can include summit surfaces, plateaux and old ground surfaces. Rock outcrop may be common.



Appendix 2 Verification Statement as an example – Property Information Case Study

Appendix 3 List of Properties with Erosional Soils within proposed pipeline corridor

Narrabri

LGA	Lot	Section	DP	Soil Landscape Name
Narrabri	4		DP1021985	Mungle
Narrabri	3		DP1038813	Mungle
Narrabri	11		DP1061142	Mungle
Narrabri	12		DP1061142	Mungle
Narrabri	3		DP835657	Mungle

Liverpool Plains

LGA	Lot	Section	DP	Soil landscape name
Liverpool Plains	2		DP1140250	Glen Oak
Liverpool Plains	3		DP1140250	Glen Oak
Liverpool Plains	4		DP1140250	Glen Oak
Liverpool Plains	101		DP1150060	Glen Oak
Liverpool Plains	1		DP136316	Glen Oak
Liverpool Plains	E		DP161853	Glen Oak
Liverpool Plains	32		DP242463	Glen Oak
Liverpool Plains	212		DP535109	Glen Oak
Liverpool Plains	12		DP553496	Glen Oak
Liverpool Plains	91		DP557551	Glen Oak
Liverpool Plains	100		DP706439	Glen Oak
Liverpool Plains	9		DP7215	Glen Oak
Liverpool Plains	12		DP7215	Glen Oak
Liverpool Plains	13		DP7215	Glen Oak



Liverpool Plains	14	DP7215	Glen Oak
Liverpool Plains	75	DP7215	Glen Oak
Liverpool Plains	75	DP7215	Glen Oak
Liverpool Plains	1	DP724065	Glen Oak
Liverpool Plains	62	DP751028	Glen Oak
Liverpool Plains	81	DP751028	Glen Oak
Liverpool Plains	81	DP751028	Glen Oak
Liverpool Plains	202	DP751028	Glen Oak
Liverpool Plains	217	DP751028	Glen Oak
Liverpool Plains	217	DP751028	Glen Oak
Liverpool Plains	1	DP781197	Glen Oak
Liverpool Plains	1	DP783603	Glen Oak
Liverpool Plains	2	DP783603	Glen Oak
Liverpool Plains	311	DP804745	Glen Oak
Liverpool Plains	111	DP839107	Glen Oak
Liverpool Plains	112	DP839107	Glen Oak
Liverpool Plains	102	DP844860	Glen Oak
Liverpool Plains	1	DP859146	Glen Oak
Liverpool Plains	27	DP95986	Glen Oak
Liverpool Plains	5	DP111751	Inverkip Road
Liverpool Plains	6	DP111751	Inverkip Road
Liverpool Plains	3	DP29249	Inverkip Road
Liverpool Plains	67	DP37642	Inverkip Road
Liverpool Plains	100	DP706439	Inverkip Road
Liverpool Plains	8	DP7215	Inverkip Road
Liverpool Plains	9	DP7215	Inverkip Road



Liverpool Plains	10	DP7215	Inverkip Road
Liverpool Plains	11	DP7215	Inverkip Road
Liverpool Plains	14	DP7215	Inverkip Road
Liverpool Plains	75	DP7215	Inverkip Road
Liverpool Plains	75	DP7215	Inverkip Road
Liverpool Plains	78	DP7215	Inverkip Road
Liverpool Plains	1	DP724065	Inverkip Road
Liverpool Plains	71	DP732009	Inverkip Road
Liverpool Plains	72	DP732009	Inverkip Road
Liverpool Plains	4	DP743546	Inverkip Road
Liverpool Plains	1	DP783603	Inverkip Road
Liverpool Plains	121	DP857377	Inverkip Road
Liverpool Plains	1	DP136316	Meadow Bank
Liverpool Plains	1	DP161808	Meadow Bank
Liverpool Plains	67	DP37642	Meadow Bank
Liverpool Plains	91	DP557551	Meadow Bank
Liverpool Plains	100	DP706439	Meadow Bank
Liverpool Plains	4	DP743546	Meadow Bank
Liverpool Plains	8	DP743547	Meadow Bank
Liverpool Plains	121	DP857377	Meadow Bank
Liverpool Plains	121	DP857377	Meadow Bank
Liverpool Plains	51	DP95938	Meadow Bank
Liverpool Plains	701	DP1024989	Moan
Liverpool Plains	701	DP1024990	Moan
Liverpool Plains	7008	DP1024991	Moan
Liverpool Plains	7003	DP1024994	Moan



Liverpool Plains	341	DP1037352	Moan
Liverpool Plains	1	DP1062468	Moan
Liverpool Plains	5	DP1080920	Moan
Liverpool Plains	1451	DP1111501	Moan
Liverpool Plains	34	DP1111535	Moan
Liverpool Plains	3	DP1125072	Moan
Liverpool Plains	1	DP1140250	Moan
Liverpool Plains	2	DP1140250	Moan
Liverpool Plains	4	DP1140250	Moan
Liverpool Plains	101	DP1150060	Moan
Liverpool Plains	101	DP1188303	Moan
Liverpool Plains	103	DP1188303	Moan
Liverpool Plains	1	DP161808	Moan
Liverpool Plains	E	DP161853	Moan
Liverpool Plains	1	DP242205	Moan
Liverpool Plains	32	DP242463	Moan
Liverpool Plains	1	DP350398	Moan
Liverpool Plains	4	DP590832	Moan
Liverpool Plains	11	DP595515	Moan
Liverpool Plains	12	DP595515	Moan
Liverpool Plains	1	DP653859	Moan
Liverpool Plains	3	DP664030	Moan
Liverpool Plains	14	DP7215	Moan
Liverpool Plains	75	DP7215	Moan
Liverpool Plains	62	DP751028	Moan
Liverpool Plains	81	DP751028	Moan



Liverpool Plains	177		DP751028	Moan
Liverpool Plains	202		DP751028	Moan
Liverpool Plains	217		DP751028	Moan
Liverpool Plains	226		DP751028	Moan
Liverpool Plains	1	2	DP758027	Moan
Liverpool Plains	1	8	DP758027	Moan
Liverpool Plains	1	10	DP758027	Moan
Liverpool Plains	1	5	DP758027	Moan
Liverpool Plains	2	8	DP758027	Moan
Liverpool Plains	2	5	DP758027	Moan
Liverpool Plains	2	2	DP758027	Moan
Liverpool Plains	2	10	DP758027	Moan
Liverpool Plains	2	12	DP758027	Moan
Liverpool Plains	3	2	DP758027	Moan
Liverpool Plains	3	5	DP758027	Moan
Liverpool Plains	4	8	DP758027	Moan
Liverpool Plains	4	5	DP758027	Moan
Liverpool Plains	4	10	DP758027	Moan
Liverpool Plains	4	12	DP758027	Moan
Liverpool Plains	4	2	DP758027	Moan
Liverpool Plains	5	8	DP758027	Moan
Liverpool Plains	5	10	DP758027	Moan
Liverpool Plains	5	5	DP758027	Moan
Liverpool Plains	5	2	DP758027	Moan
Liverpool Plains	6	5	DP758027	Moan
Liverpool Plains	6	9	DP758027	Moan



Liverpool Plains	6	2	DP758027	Moan
Liverpool Plains	6	10	DP758027	Moan
Liverpool Plains	7	2	DP758027	Moan
Liverpool Plains	7	10	DP758027	Moan
Liverpool Plains	7	9	DP758027	Moan
Liverpool Plains	7	5	DP758027	Moan
Liverpool Plains	8	10	DP758027	Moan
Liverpool Plains	9	10	DP758027	Moan
Liverpool Plains	10	4	DP758027	Moan
Liverpool Plains	10	10	DP758027	Moan
Liverpool Plains	11	10	DP758027	Moan
Liverpool Plains	11	4	DP758027	Moan
Liverpool Plains	12	4	DP758027	Moan
Liverpool Plains	13	4	DP758027	Moan
Liverpool Plains	14	4	DP758027	Moan
Liverpool Plains	15	4	DP758027	Moan
Liverpool Plains	16	4	DP758027	Moan
Liverpool Plains	17	4	DP758027	Moan
Liverpool Plains	18	4	DP758027	Moan
Liverpool Plains	19	4	DP758027	Moan
Liverpool Plains	1		DP781197	Moan
Liverpool Plains	2		DP781197	Moan
Liverpool Plains	3		DP781197	Moan
Liverpool Plains	311		DP804745	Moan
Liverpool Plains	312		DP804745	Moan
Liverpool Plains	111		DP839107	Moan



Liverpool Plains	121	DP857377	Moan
Liverpool Plains	27	DP95986	Moan
Liverpool Plains	234	DP652489	St Mervins
Liverpool Plains	3	DP718843	St Mervins
Liverpool Plains	321	DP1144673	Stafford Gap
Liverpool Plains	57	DP1228713	Stafford Gap
Liverpool Plains	58	DP1228713	Stafford Gap
Liverpool Plains	52	DP558400	Stafford Gap
Liverpool Plains	59	DP751006	Stafford Gap
Liverpool Plains	60	DP751006	Stafford Gap
Liverpool Plains	255	DP751006	Stafford Gap

Upper Hunter

LGA	Lot	Section	DP	Soil landscape name
Upper Hunter	1		DP1003054	Ant Hill
Upper Hunter	7001		DP1024818	Ant Hill
Upper Hunter	7002		DP1024818	Ant Hill
Upper Hunter	7004		DP1059619	Ant Hill
Upper Hunter	7019		DP1059625	Ant Hill
Upper Hunter	260		DP1089368	Ant Hill
Upper Hunter	444		DP1207715	Ant Hill
Upper Hunter	26		DP227683	Ant Hill
Upper Hunter	1		DP1003054	Ant Hill variant a
Upper Hunter	2		DP1081376	Ant Hill variant a
Upper Hunter	260		DP1089368	Ant Hill variant a
Upper Hunter	1		DP1130383	Ant Hill variant a
Upper Hunter	129		DP750944	Ant Hill variant a



Upper Hunter	206	DP750965	Ant Hill variant a
Upper Hunter	207	DP750965	Ant Hill variant a
Upper Hunter	209	DP750965	Ant Hill variant a
Upper Hunter	365	DP750965	Ant Hill variant a
Upper Hunter	2	DP1008618	Cressfield Road
Upper Hunter	3	DP1008618	Cressfield Road
Upper Hunter	4	DP1008618	Cressfield Road
Upper Hunter	7	DP1008618	Cressfield Road
Upper Hunter	9	DP1008618	Cressfield Road
Upper Hunter	1	DP1017535	Cressfield Road
Upper Hunter	2	DP1017535	Cressfield Road
Upper Hunter	1	DP1047491	Cressfield Road
Upper Hunter	5	DP1054233	Cressfield Road
Upper Hunter	10	DP1094398	Cressfield Road
Upper Hunter	2	DP1099334	Cressfield Road
Upper Hunter	515	DP1107787	Cressfield Road
Upper Hunter	56	DP1109118	Cressfield Road
Upper Hunter	151	DP1117449	Cressfield Road
Upper Hunter	2	DP1123467	Cressfield Road
Upper Hunter	2	DP1123985	Cressfield Road
Upper Hunter	5	DP1123985	Cressfield Road
Upper Hunter	2	DP1125326	Cressfield Road
Upper Hunter	1	DP1130329	Cressfield Road
Upper Hunter	2	DP1130329	Cressfield Road
Upper Hunter	100	DP1148460	Cressfield Road
Upper Hunter	1002	DP1150173	Cressfield Road



Upper Hunter	1	DP1159003	Cressfield Road
Upper Hunter	103	DP1164133	Cressfield Road
Upper Hunter	14	DP1171944	Cressfield Road
Upper Hunter	1	DP1177099	Cressfield Road
Upper Hunter	1	DP158493	Cressfield Road
Upper Hunter	2	DP222710	Cressfield Road
Upper Hunter	7	DP258183	Cressfield Road
Upper Hunter	D	DP38812	Cressfield Road
Upper Hunter	E	DP38812	Cressfield Road
Upper Hunter	11	DP534241	Cressfield Road
Upper Hunter	210	DP575296	Cressfield Road
Upper Hunter	51	DP598815	Cressfield Road
Upper Hunter	52	DP598815	Cressfield Road
Upper Hunter	2	DP626773	Cressfield Road
Upper Hunter	22	DP628045	Cressfield Road
Upper Hunter	28	DP660946	Cressfield Road
Upper Hunter	1	DP69002	Cressfield Road
Upper Hunter	11	DP700758	Cressfield Road
Upper Hunter	1	DP728371	Cressfield Road
Upper Hunter	46	DP750941	Cressfield Road
Upper Hunter	71	DP750941	Cressfield Road
Upper Hunter	98	DP750941	Cressfield Road
Upper Hunter	120	DP750944	Cressfield Road
Upper Hunter	39	DP750965	Cressfield Road
Upper Hunter	40	DP750965	Cressfield Road
Upper Hunter	122	DP750965	Cressfield Road



Upper Hunter	159	DP750965	Cressfield Road
Upper Hunter	172	DP750965	Cressfield Road
Upper Hunter	173	DP750965	Cressfield Road
Upper Hunter	180	DP750965	Cressfield Road
Upper Hunter	181	DP750965	Cressfield Road
Upper Hunter	183	DP750965	Cressfield Road
Upper Hunter	1	DP779423	Cressfield Road
Upper Hunter	296	DP801013	Cressfield Road
Upper Hunter	81	DP810572	Cressfield Road
Upper Hunter	2	DP82248	Cressfield Road
Upper Hunter	22	DP857355	Cressfield Road
Upper Hunter	7003	DP93476	Cressfield Road
Upper Hunter	1	DP962318	Cressfield Road
Upper Hunter	3	DP978019	Cressfield Road
Upper Hunter	4	DP978019	Cressfield Road
Upper Hunter	2	DP1081376	Cressfield Road variant a
Upper Hunter	3	DP1081376	Cressfield Road variant a
Upper Hunter	1	DP1084788	Cressfield Road variant a
Upper Hunter	515	DP1107787	Cressfield Road variant a
Upper Hunter	5	DP1123985	Cressfield Road variant a
Upper Hunter	7301	DP1138271	Cressfield Road variant a
Upper Hunter	103	DP1164133	Cressfield Road variant a
Upper Hunter	531	DP1180147	Cressfield Road variant a
Upper Hunter	21	DP556401	Cressfield Road variant a
Upper Hunter	102	DP700168	Cressfield Road variant a
Upper Hunter	62	DP750941	Cressfield Road variant a



Upper Hunter	129	DP750944	Cressfield Road variant a
Upper Hunter	134	DP750944	Cressfield Road variant a
Upper Hunter	135	DP750944	Cressfield Road variant a
Upper Hunter	206	DP750965	Cressfield Road variant a
Upper Hunter	207	DP750965	Cressfield Road variant a
Upper Hunter	209	DP750965	Cressfield Road variant a
Upper Hunter	365	DP750965	Cressfield Road variant a
Upper Hunter	761	DP847816	Cressfield Road variant a
Upper Hunter	22	DP857355	Cressfield Road variant a
Upper Hunter	1	DP1168564	Dochra
Upper Hunter	531	DP1180147	Dochra
Upper Hunter	532	DP1180147	Dochra
Upper Hunter	21	DP556401	Dochra
Upper Hunter	159	DP712988	Dochra
Upper Hunter	131	DP718199	Dochra
Upper Hunter	55	DP739487	Dochra
Upper Hunter	7015	DP1124288	Dunwell
Upper Hunter	11	DP1171944	Dunwell
Upper Hunter	14	DP1171944	Dunwell
Upper Hunter	1	DP220944	Dunwell
Upper Hunter	210	DP575296	Dunwell
Upper Hunter	22	DP628045	Dunwell
Upper Hunter	1	DP728371	Dunwell
Upper Hunter	2	DP733050	Dunwell
Upper Hunter	2	17 DP758738	Dunwell
Upper Hunter	1	DP1044940	Glen Oak



Upper Hunter	2	DP1044940	Glen Oak
Upper Hunter	1	DP131966	Glen Oak
Upper Hunter	2	DP1044940	Moan
Upper Hunter	2	DP1003054	Tinagroo
Upper Hunter	260	DP1089368	Tinagroo
Upper Hunter	232	DP1136567	Tinagroo
Upper Hunter	14	DP1171944	Tinagroo
Upper Hunter	1	DP220944	Tinagroo
Upper Hunter	210	DP575296	Tinagroo
Upper Hunter	21	DP833306	Tinagroo
Upper Hunter	22	DP833306	Tinagroo
Upper Hunter	1	DP922722	Tinagroo

Muswellbrook

LGA	Lot	Section	DP	Soil Landscape Name
Muswellbrook	24		DP1076691	Dochra
Muswellbrook	1		DP184481	Dochra
Muswellbrook	131		DP718199	Dochra
Muswellbrook	5		DP718875	Dochra
Muswellbrook	175		DP729970	Dochra
Muswellbrook	176		DP729970	Dochra
Muswellbrook	26		DP752485	Dochra
Muswellbrook	27		DP752485	Dochra
Muswellbrook	75		DP752485	Dochra
Muswellbrook	77		DP752485	Dochra
Muswellbrook	130		DP752485	Dochra
Muswellbrook	14		DP873542	Dochra



Muswellbrook	8	DP113523	Goorangoola
Muswellbrook	3	DP113737	Goorangoola
Muswellbrook	1	DP1190803	Goorangoola
Muswellbrook	1	DP136691	Goorangoola
Muswellbrook	4	DP136691	Goorangoola
Muswellbrook	1	DP304082	Goorangoola
Muswellbrook	1	DP6656	Goorangoola
Muswellbrook	2	DP6656	Goorangoola
Muswellbrook	3	DP6656	Goorangoola
Muswellbrook	5	DP6656	Goorangoola
Muswellbrook	81	DP752444	Goorangoola
Muswellbrook	372	DP703735	Gundy Gundy
Muswellbrook	125	DP752462	Gundy Gundy
Muswellbrook	125	DP752462	Gundy Gundy
Muswellbrook	234	DP752465	Gundy Gundy
Muswellbrook	237	DP752465	Gundy Gundy
Muswellbrook	238	DP752465	Gundy Gundy
Muswellbrook	240	DP752465	Gundy Gundy
Muswellbrook	32	DP809030	Gundy Gundy
Muswellbrook	33	DP809030	Gundy Gundy
Muswellbrook	125	DP752462	Gyarran
Muswellbrook	125	DP752462	Gyarran
Muswellbrook	302	DP1026063	Little Grasstree Hill
Muswellbrook	24	DP1076691	Little Grasstree Hill
Muswellbrook	25	DP1076691	Little Grasstree Hill
Muswellbrook	5	DP718875	Little Grasstree Hill



Muswellbrook	14	DP873542	Little Grasstree Hill
Muswellbrook	10	DP1077993	Ravensworth
Muswellbrook	11	DP1077993	Ravensworth
Muswellbrook	101	DP1116074	Ravensworth
Muswellbrook	102	DP1116074	Ravensworth
Muswellbrook	1	DP722204	Ravensworth
Muswellbrook	21	DP733930	Ravensworth
Muswellbrook	22	DP733930	Ravensworth
Muswellbrook	4	DP802081	Scrumlo Ridge
Muswellbrook	61	DP1113302	Waverly
Muswellbrook	101	DP1116074	Waverly
Muswellbrook	102	DP1116074	Waverly
Muswellbrook	1	DP136691	Waverly
Muswellbrook	1	DP184481	Waverly
Muswellbrook	2	DP398873	Waverly
Muswellbrook	3	DP571355	Waverly
Muswellbrook	2	DP6656	Waverly
Muswellbrook	1	DP723294	Waverly
Muswellbrook	62	DP752484	Waverly
Muswellbrook	98	DP752484	Waverly

Singleton

LGA	Lot	Section	DP	Soil landscape name
Singleton	101		DP1124459	Dochra
Singleton	6		DP1145299	Dochra
Singleton	2		DP1164492	Dochra
Singleton	3		DP1164492	Dochra



Singleton	65	DP752450	Dochra
Singleton	86	DP752450	Dochra
Singleton	126	DP752458	Dochra
Singleton	8	DP1002203	Goorangoola
Singleton	1	DP1050001	Goorangoola
Singleton	91	DP1093561	Goorangoola
Singleton	92	DP1093561	Goorangoola
Singleton	215	DP1128514	Goorangoola
Singleton	4	DP1170489	Goorangoola
Singleton	5	DP1170489	Goorangoola
Singleton	6	DP1170489	Goorangoola
Singleton	1	DP1199836	Goorangoola
Singleton	2	DP625044	Goorangoola
Singleton	3	DP625044	Goorangoola
Singleton	4	DP625044	Goorangoola
Singleton	126	DP752458	Goorangoola
Singleton	26	DP752462	Goorangoola
Singleton	125	DP752462	Goorangoola
Singleton	387	DP752462	Goorangoola
Singleton	72	DP864153	Goorangoola
Singleton	1	DP998148	Goorangoola
Singleton	1	DP998148	Goorangoola
Singleton	3	DP1164492	Granbalang
Singleton	34	DP752450	Granbalang
Singleton	86	DP752450	Granbalang
Singleton	132	DP752450	Granbalang



Singleton	5	DP1003061	Gundy Gundy
Singleton	6	DP1003061	Gundy Gundy
Singleton	8	DP1003061	Gundy Gundy
Singleton	892	DP1008008	Gundy Gundy
Singleton	1	DP1050001	Gundy Gundy
Singleton	111	DP1085409	Gundy Gundy
Singleton	1	DP1126513	Gundy Gundy
Singleton	2	DP1126513	Gundy Gundy
Singleton	215	DP1128514	Gundy Gundy
Singleton	215	DP1128514	Gundy Gundy
Singleton	6	DP1170489	Gundy Gundy
Singleton	1	DP261477	Gundy Gundy
Singleton	5	DP263436	Gundy Gundy
Singleton	6	DP263436	Gundy Gundy
Singleton	1	DP40555	Gundy Gundy
Singleton	31	DP617958	Gundy Gundy
Singleton	32	DP617958	Gundy Gundy
Singleton	4	DP625044	Gundy Gundy
Singleton	101	DP631681	Gundy Gundy
Singleton	5	DP702831	Gundy Gundy
Singleton	6	DP702831	Gundy Gundy
Singleton	1	DP705470	Gundy Gundy
Singleton	21	DP718019	Gundy Gundy
Singleton	2	DP733401	Gundy Gundy
Singleton	3	DP733401	Gundy Gundy
Singleton	4	DP736821	Gundy Gundy



Singleton	2	DP741173	Gundy Gundy
Singleton	4	DP752462	Gundy Gundy
Singleton	16	DP752462	Gundy Gundy
Singleton	25	DP752462	Gundy Gundy
Singleton	26	DP752462	Gundy Gundy
Singleton	26	DP752462	Gundy Gundy
Singleton	46	DP752462	Gundy Gundy
Singleton	80	DP752462	Gundy Gundy
Singleton	81	DP752462	Gundy Gundy
Singleton	82	DP752462	Gundy Gundy
Singleton	83	DP752462	Gundy Gundy
Singleton	84	DP752462	Gundy Gundy
Singleton	117	DP752462	Gundy Gundy
Singleton	125	DP752462	Gundy Gundy
Singleton	125	DP752462	Gundy Gundy
Singleton	384	DP752462	Gundy Gundy
Singleton	385	DP752462	Gundy Gundy
Singleton	387	DP752462	Gundy Gundy
Singleton	387	DP752462	Gundy Gundy
Singleton	4	DP771820	Gundy Gundy
Singleton	725	DP816962	Gundy Gundy
Singleton	2	DP834296	Gundy Gundy
Singleton	2	DP834296	Gundy Gundy
Singleton	2	DP834296	Gundy Gundy
Singleton	872	DP851252	Gundy Gundy
Singleton	72	DP864153	Gundy Gundy



Singleton	213	DP868512	Gundy Gundy
Singleton	1	DP998148	Gundy Gundy
Singleton	1	DP998148	Gundy Gundy
Singleton	902	DP1061259	Gyarran
Singleton	904	DP1061259	Gyarran
Singleton	904	DP1061259	Gyarran
Singleton	5	DP1102521	Gyarran
Singleton	8	DP1102521	Gyarran
Singleton	8	DP1102521	Gyarran
Singleton	9	DP1102521	Gyarran
Singleton	3	DP1131400	Gyarran
Singleton	4	DP1131400	Gyarran
Singleton	6	DP1131400	Gyarran
Singleton	7	DP1131400	Gyarran
Singleton	8	DP1131400	Gyarran
Singleton	9	DP1131400	Gyarran
Singleton	10	DP1131400	Gyarran
Singleton	11	DP1131400	Gyarran
Singleton	12	DP1131400	Gyarran
Singleton	1	DP1143500	Gyarran
Singleton	4	DP1163593	Gyarran
Singleton	2	DP1168925	Gyarran
Singleton	1	DP1233628	Gyarran
Singleton	3	DP262509	Gyarran
Singleton	2	DP37605	Gyarran
Singleton	3	DP37605	Gyarran



Singleton	4	DP37605	Gyarran
Singleton	5	DP37605	Gyarran
Singleton	6	DP37605	Gyarran
Singleton	5	DP6759	Gyarran
Singleton	7	DP6759	Gyarran
Singleton	7	DP6759	Gyarran
Singleton	1	DP715737	Gyarran
Singleton	2	DP715737	Gyarran
Singleton	3	DP715737	Gyarran
Singleton	125	DP752462	Gyarran
Singleton	33	DP752473	Gyarran
Singleton	39	DP752473	Gyarran
Singleton	41	DP752473	Gyarran
Singleton	49	DP752473	Gyarran
Singleton	50	DP752473	Gyarran
Singleton	52	DP752473	Gyarran
Singleton	54	DP752473	Gyarran
Singleton	55	DP752473	Gyarran
Singleton	64	DP752473	Gyarran
Singleton	65	DP752473	Gyarran
Singleton	65	DP752473	Gyarran
Singleton	1	DP752492	Gyarran
Singleton	131	DP863366	Gyarran
Singleton	1	DP1095964	Ilala
Singleton	8	DP1102521	Ilala
Singleton	2	DP1131400	Ilala



Singleton	41	DP1144702	Ilala
Singleton	4	DP814254	Ilala
Singleton	3	DP1164492	Ravensworth
Singleton	34	DP752450	Ravensworth
Singleton	132	DP752450	Ravensworth
Singleton	8	DP1102521	Welshmans Creek
Singleton	9	DP1102521	Welshmans Creek
Singleton	1	DP1143500	Welshmans Creek
Singleton	1	DP1168925	Welshmans Creek
Singleton	2	DP1168925	Welshmans Creek
Singleton	3	DP37605	Welshmans Creek
Singleton	4	DP37605	Welshmans Creek
Singleton	31	DP580524	Welshmans Creek
Singleton	1	DP715737	Welshmans Creek
Singleton	41	DP752473	Welshmans Creek
Singleton	12	DP842036	Welshmans Creek
Singleton	131	DP863366	Welshmans Creek

Maitland

LGA	Lot	Section	DP	Soil landscape name
Maitland	61		DP1004702	Bolwarra Heights
Maitland	1003		DP1034129	Bolwarra Heights
Maitland	11		DP1039363	Bolwarra Heights
Maitland	5		DP1088672	Bolwarra Heights
Maitland	1122		DP1093978	Bolwarra Heights
Maitland	6		DP1118269	Bolwarra Heights
Maitland	7		DP1118288	Bolwarra Heights



Maitland	1400	DP1131859	Bolwarra Heights
Maitland	1	DP1183183	Bolwarra Heights
Maitland	2	DP1183183	Bolwarra Heights
Maitland	101	DP135907	Bolwarra Heights
Maitland	1	DP185510	Bolwarra Heights
Maitland	42	DP221934	Bolwarra Heights
Maitland	1	DP631514	Bolwarra Heights
Maitland	3	DP731499	Bolwarra Heights
Maitland	181	DP777237	Bolwarra Heights
Maitland	12	DP789061	Bolwarra Heights
Maitland	13	DP789061	Bolwarra Heights
Maitland	112	DP834908	Bolwarra Heights
Maitland	113	DP834908	Bolwarra Heights
Maitland	1	DP952550	Bolwarra Heights
Maitland	61	DP1085552	Gyarran
Maitland	62	DP1085552	Gyarran
Maitland	1	DP1130561	Gyarran
Maitland	1	DP1130561	Gyarran
Maitland	1	DP238945	Gyarran
Maitland	13	DP253130	Gyarran
Maitland	17	DP253130	Gyarran
Maitland	1	DP37599	Gyarran
Maitland	121	DP597856	Gyarran
Maitland	122	DP597856	Gyarran
Maitland	41	DP819681	Gyarran
Maitland	43	DP819681	Gyarran



Maitland	10	DP1102793	Middlehope
Maitland	11	DP1102793	Middlehope
Maitland	42	DP221934	Middlehope
Maitland	11	DP1039363	North Eelah
Maitland	330	DP1054837	North Eelah
Maitland	331	DP1054837	North Eelah
Maitland	332	DP1054837	North Eelah
Maitland	111	DP1081611	North Eelah
Maitland	112	DP1081611	North Eelah
Maitland	1021	DP1177012	North Eelah
Maitland	100	DP1212195	North Eelah
Maitland	101	DP1212195	North Eelah
Maitland	2	DP1235193	North Eelah
Maitland	321	DP1241410	North Eelah
Maitland	101	DP135907	North Eelah
Maitland	1	DP185510	North Eelah
Maitland	42	DP221934	North Eelah
Maitland	A	DP431719	North Eelah
Maitland	33	DP755228	North Eelah
Maitland	112	DP834908	North Eelah
Maitland	61	DP1085552	Seaham
Maitland	10	DP1102793	Seaham
Maitland	122	DP597856	Seaham
Maitland	10	DP1102793	Seaham variant a
Maitland	11	DP1102793	Seaham variant a
Maitland	1021	DP1177012	Wallalong



Maitland	816	DP1182211	Wallalong
Maitland	721	DP1191240	Wallalong
Maitland	722	DP1191240	Wallalong
Maitland	2	DP1225208	Wallalong
Maitland	712	DP1233410	Wallalong
Maitland	11	DP544478	Wallalong
Maitland	690	DP597283	Wallalong
Maitland	75	DP622205	Wallalong
Maitland	76	DP622205	Wallalong
Maitland	1	DP1130561	Welshmans Creek

Appendix 4 Specialists recommendation from SEEC: Review of Soil and Drainage Line Constraints

Recommendation		Details
Planning Phase		
1	Detailed soil survey	<p>Conduct a detailed soil survey along the route of the proposed pipeline in areas where Vertosols are mapped (based on the Namoi Catchment Management Authority (NCMA, 2009) Soil Landscape mapping) to determine soil conditions. This survey should include an assessment of soil conditions at multiple depths within the soil profile, including below the proposed pipe elevation. Soil assessments should include {but not be limited to):</p> <ul style="list-style-type: none"> • Describing the soil type; • Particle size analysis; • Observed shrink/swell properties; • Optimum moisture content to aid compaction and settlement; • Volume expansion. <p>Any soil survey program must be designed in consultation with a geotechnical engineer specialising in pipelines, as well as a soil conservationist.</p> <p>It is also recommended that detailed soil surveys include consultation with landholders along the proposed survey corridor, as they have extensive experience and knowledge of the inherent soil conditions.</p>
2	Detailed fluvial geomorphology survey of all watercourses to be crossed.	<p>An expert fluvial geomorphologist should conduct a detailed investigation of all watercourse crossings along the route of the proposed pipeline. This survey should include (but not be limited to):</p>



		<ul style="list-style-type: none"> Existing erosion issues, including the depth, width and bank condition of any existing eroded gullies; The potential for future erosion issues, caused by both external factors (non-pipeline-related, such as runoff from surrounding lands) and by pipeline-related (e.g. trenching across a natural watercourse); Watercourse conditions that might influence decision-making regarding construction methodology or timing (e.g. depth of alluvial material, flow patterns, natural vegetation etc.).
3	Locally relocate the pipe to avoid high-risk areas	<p>Following on from the detailed survey of soils and watercourses (items 1 and 2 in this table), determine where the pipeline route might be locally relocated to avoid high-risk areas (if possible).</p> <p>Note that any areas identified for local relocation would also need to be subject to soil and watercourse assessment as per items 1 and 2, above.</p>
4	Locally position the pipe in road reserves	<p>In addition to the recommendations in item 3, to avoid the most productive agricultural land, consider the potential to position the pipeline within road reserves if possible.</p> <p>Road reserves tend to have a more constant moisture content in the soils than surrounding agricultural lands, because ground cover conditions (especially vegetation) don't change as frequently, soils are often compacted, and batter slopes encourage runoff, rather than infiltration.</p> <p>A more constant moisture content in soils will help reduce shrinking and swelling within reactive clay soils.</p>
5	Training for construction staff	<p>While training and induction are typically undertaken on any construction project, it is recommended that training be provided to construction staff specifically related to potential issues associated with highly reactive clay soils. This training should include (but not be limited to):</p> <ul style="list-style-type: none"> Erosion issues associated with subsidence along backfilled trench lines; how to recognise potential problems and address them. Erosion issues associated with mounding of spoil over trench lines; how to recognise potential problems and address them; Erosion issues associated with open trenching through watercourses and gullies, and how to avoid common problems. Constructing access tracks, cross banks, and drainage features for stability and to replicate the natural movement of water in the landscape.
Construction Phase		
6	Use trenchless construction techniques across higher-risk watercourses	<p>The detailed fluvial geomorphological survey of all watercourses to be crossed (item 2) will identify where there is a significant risk of erosion that might impact on or be exacerbated by pipeline construction.</p>



		<p>In those locations, consideration should be given to trenchless construction techniques such as Horizontal Directional Drilling (HDD).</p> <p>This is particularly relevant where:</p> <ul style="list-style-type: none"> • Open trenching across an actively eroding watercourse or gully line would create a permanent weak spot in the bed and banks of that watercourse; and/or • Compaction issues in the backfilled trench could act as a subsurface pathway for water movement that might cause or exacerbate erosion. <p>Adoption of any trenchless techniques for pipe construction must be in consultation with a geotechnical engineer specialising in pipelines.</p>
7	Ensure adequate pipe depths	<p>The soil and watercourse surveys (items 1 and 2 in this table) will identify (among other things):</p> <ul style="list-style-type: none"> • The depths to which highly reactive clay soils extend down to; and • The depth of any alluvial material in watercourses that would be prone to re-entrainment in future large flow events. <p>Note that the above requirements would also apply to any pipe scour protection measures, which should also be finished flush with the solid watercourse bed materials. They should not extend into the watercourse bed load material that is expected to migrate during high flows. Ultimately, pipe depth will be determined based on a number of factors and advice should be sought from a geotechnical engineer specialising in pipelines.</p>
8	Lime treatment of reactive soils above, around and below the pipe.	<p>Lime stabilisation of subgrades is frequently used to minimise the risk of damage to road pavements from reactive clay soils.</p> <p>This technique might be feasibly used to chemically alter the soil conditions and reduce the amount of potential soil movement around the pipe. Note that specialist geotechnical advice must be sought on this issue.</p>
9	Design and construct the pipeline to cope with soil movement.	<p>If possible, the pipeline (or the material surrounding it) should be constructed to allow for expected soil shrinking and swelling.</p> <p>Note that specialist advice must be sought on this issue from engineers specialising in pipe construction and soil movement.</p>
10	Minimise potential for subsurface water movement along the pipe	<p>To reduce the risk of the pipe trench providing a preferential pathway for subsurface water movement, scour protection measures (e.g. trench breaks) should be included at regular intervals.</p> <p>The positioning and design of these should be determined in consultation with a specialist pipeline engineer.</p>
11	Compaction during trench backfill operations	<p>Advice should be sought from a geotechnical engineer regarding the optimum moisture conditions for backfill material, as cracking clay soils such as Vertosols can be more readily compacted when moist.</p>



		During construction, water might need to be applied to windrowed hench spoil to attain optimum moisture content in the material prior to returning it to the trench.
12	Stockpile excess trench spoil for rapid use to fill any subsidence over the pipe.	If possible, create stockpiles of excess trench spoil as a resource to use for rapid repair (filling) of any subsidence along the trench line.
13	Construct access tracks to avoid concentrating water or modifying existing drainage patterns	Access tracks along the pipeline easement should be well-formed and shaped in a manner that avoids them causing artificial concentrations of runoff. Access tracks should include drainage features such as cross banks, table drains, mitre drains (turn-outs) etc as required so that they replicate the existing drainage pattern of the surrounding landscape as much as possible.
Operation Phase		
14	Maintain relatively constant soil moisture	Soil movement at pipe depth is influenced by changing moisture content. Therefore, if soil moisture content can be maintained relatively constant, this will help to reduce the amount of soil movement. While this is very difficult to achieve in practice, consideration should be given to the role that vegetation cover and land management practices play in controlling runoff, infiltration and soil moisture content. If possible, the pipeline should not be sited adjacent to lands where management practices rapidly alter the soil moisture content (e.g. heavily irrigated lands).
15		Ongoing monitoring and maintenance is standard practice for a pipe asset owner/operator. However, in the case of highly reactive clay soils, conditions can change relatively rapidly and pipe damage or erosion could also occur relatively rapidly. As such, the asset owner/operator must have a highly responsive management framework to quickly respond to issues as they arise. This includes having ready access to: <ul style="list-style-type: none"> • In-house expertise to assess erosion problems and develop solutions/plans; • Appropriate machinery and equipment to access and address potential problem areas. I recommend an Operational Management Plan (OMP) be prepared that details how this would be addressed. This OMP should also address ongoing maintenance of access tracks (refer to item 12 in this table), as tracks are a frequent source of erosion problems along pipeline easements.



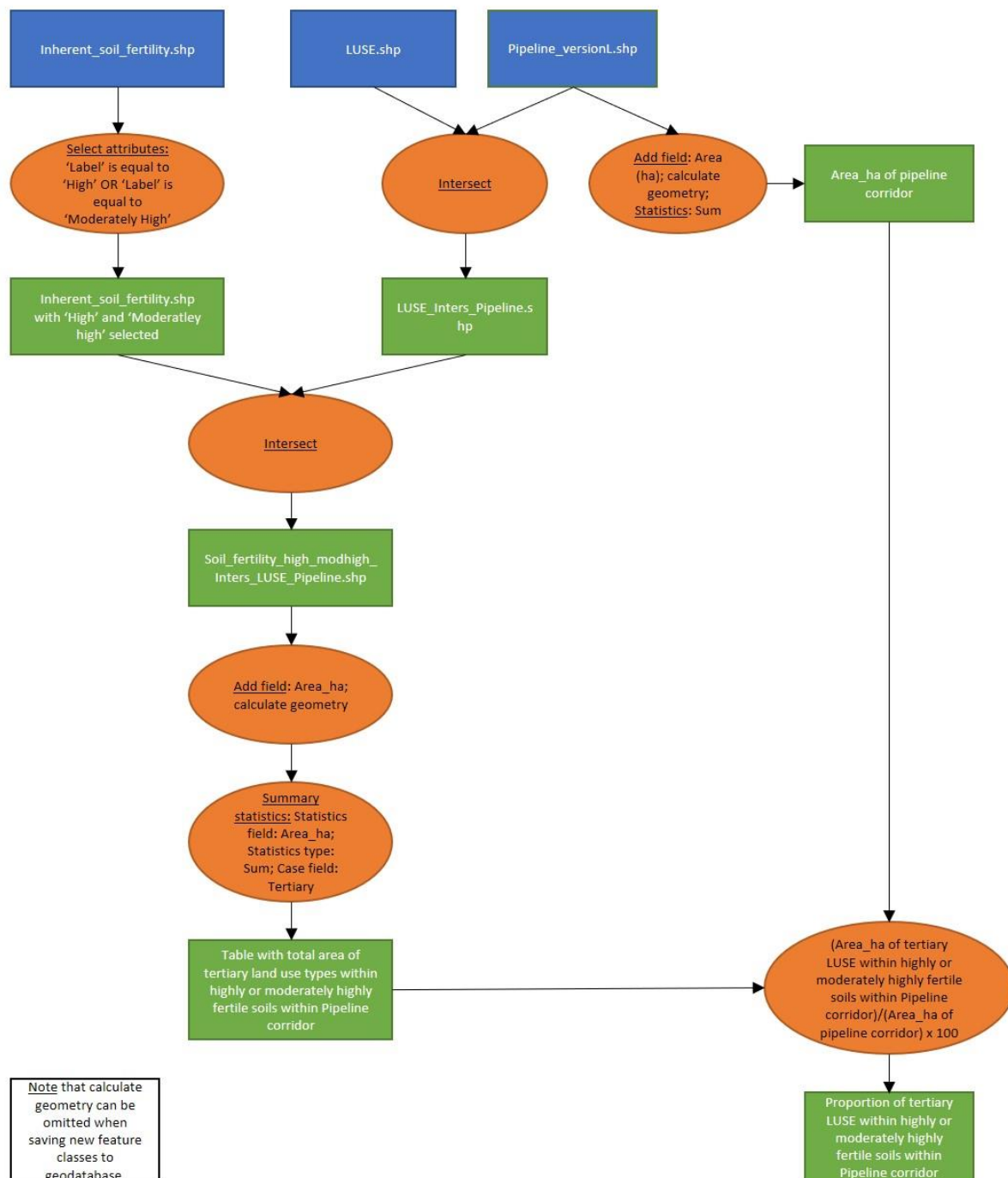
Appendix 5 Stock Route

Protection Boards	Travelling Stock Route Name
MOREE	Boonanger Crossing
MOREE	Gnoura Gnoura Creek
MOREE	Boomi River - Colliers Lane
MOREE	Boomi Reserve
MOREE	Naroola
MOREE	Euraba
MOREE	Glenmore
MOREE	Strathgar
MOREE	Gunnyanna
MOREE	Goorara
MOREE	Moppin
MOREE	Watervale
MOREE	Camurra Lane
MOREE	Boolooroo
MOREE	Sollings Lane
MOREE	4 Mile
MOREE	Windoondilla
NARRABRI	Bellata East
NARRABRI	Edgeroi - Moema
NARRABRI	Little Mountain
NARRABRI	Old Gunnedah Road Kaputar Corner - Fraters
NARRABRI	Frater's
NARRABRI	Turrawan
NARRABRI	Gunnedah Road North of Iron Bridge
TAMWORTH	Carrigans
TAMWORTH	Barbers Lagoon
TAMWORTH	The Nobbs
TAMWORTH	Johnsons
TAMWORTH	Longpoint
TAMWORTH	5 Mile Borambil
TAMWORTH	Borambil Creek
HUNTER	Range Top
HUNTER	Wingen Big
HUNTER	Wingen Watering Lane
HUNTER	Range Bottom
HUNTER	Wingen Lane
NARRABRI	Noonamena - 8 Mile
MOREE	Boonal Wells
MOREE	Boomi - Goondiwindi Road
TAMWORTH	Pullaming Stock Route
TAMWORTH	Johns



Appendix 6 Methods flow diagram

Flow diagram for shapefiles with three attributes of interest
 Example: Tertiary land use within high or moderately high soil fertility within pipeline corridor





REFERENCES

1. Biddles, E., *Queensland Hunter Gas Pipeline Environmental Assessment - Statement of validity*. 2008, Hunter Gas Pipeline Pty Ltd: Level 1, 106 King Street, Sydney, NSW 2000.
2. State of NSW, *Queensland Hunter Gas Pipeline Project Approval*. 2019, Department of Planning Industry and Environment: New South Wales.
3. State Government of NSW and Department of Planning, Industry and Environment *State Vegetation Type Map: Border Rivers Gwydir / Namoi Region Version 2.0. VIS_ID 4467*. 2015 [cited 2021; Available from: https://datasets.seed.nsw.gov.au/dataset/border-rivers-gwydir-namoi-regional-native-vegetation-map-version-2-0-vis_id-420443dc7. .
4. State Government of NSW and Department of Planning, Industry and Environment *NSW Koala Habitat Suitability Models v1.0*. 2019 [cited 2021; Available from: <https://datasets.seed.nsw.gov.au/dataset/koala-habitat-information-base-habitat-suitability-models-v1-0>.
5. NSW Department of Planning, Industry and Environment. *BioNet Species Sightings Search*. 2020 [cited 2021; Available from: https://www.environment.nsw.gov.au/atlaspublicapp/UI_Modules/ATLAS_AtlasSearch.aspx.
6. State Government of NSW and Department of Planning, Industry and Environment *Biodiversity Values Map*. 2018 [cited 2021; Available from: <https://datasets.seed.nsw.gov.au/dataset/biodiversity-values-map>. .
7. Department of Customer Service. *NSW Foundation Spatial Data Framework - Water - NSW Hydro Line*. 2018 [cited 2021; Available from: <https://data.nsw.gov.au/data/dataset/nsw-foundation-spatial-data-framework-water-nsw-hydro-line>.
8. NSW Office of Water, *River Styles Spatial Layer for New South Wales. Bioregional Assessment Source Dataset*. 2012.
9. State Government of NSW and Department of Planning, Industry and Environment. *Soil and Land Resources of Central and Eastern NSW*. 2016 [cited 2021; Available from: <https://datasets.seed.nsw.gov.au/dataset/soil-and-land-resources-of-central-and-eastern-nsw>. .
10. State Government of NSW and Department of Planning, Industry and Environment. *Environmental Planning Instrument - Strategic Agricultural Land*. 2018 [cited 2021; Available from: <https://www.planningportal.nsw.gov.au/opendata/dataset/epi-land-use-strategic-agricultural-land>.
11. Department of Planning, Industry and Environment. *Estimated Inherent Soil Fertility of NSW*. 2018 [cited 2021; Available from: <https://data.nsw.gov.au/data/dataset/estimated-inherent-soil-fertility-of-nswd793e>.
12. State Government of NSW and Department of Planning, Industry and Environment. *NSW Exploration and Mining Titles*. 2019 [cited 2021; Available from: <https://datasets.seed.nsw.gov.au/dataset/nsw-mining-titles>.



13. State Government of NSW and Department of Planning, Industry and Environment *NSW Landuse*, 2017. 2019 [cited 2021; Available from: <https://datasets.seed.nsw.gov.au/dataset/nsw-landuse-2017>. .
14. New South Wales Government. *Frequently asked questions by a physical strategic agricultural land mapping across NSW*. 2014; Available from: <https://www.planning.nsw.gov.au/-/media/Files/DPE/Factsheets-and-faqs/faqs-biophysical-strategic-agricultural-land-mapping-across-nsw-2014-01.pdf?la=en>.
15. State Government of NSW and Department of Planning, Industry and Environment. *Environmental Planning Instrument - Riparian Lands Watercourses*. 2014 [cited 2021; Available from: <https://www.planningportal.nsw.gov.au/opendata/dataset/epi-riparian-lands-watercourses#:~:text=Riparian%20lands%20are%20a%20transition,ecological%20functions%20of%20a%20watercourse>.
16. NSW Department of Planning, Industry and Environment,. *Critical Industry Clusters in the Upper Hunter*. 2020; Available from: <https://www.planning.nsw.gov.au/Policy-and-Legislation/Mining-and-Resources/Critical-Industry-Clusters-in-the-Upper-Hunter>.
17. State Government of NSW and Department of Planning, Industry and Environment. *Environmental Planning Instrument - Acid Sulfate Soils*. 1995 [cited 2021; Available from: <https://www.planningportal.nsw.gov.au/opendata/dataset/epi-acid-sulfate-soils>.
18. State Government of NSW and Department of Planning, Industry and Environment *Acid Sulfate Soils Risk*. 1998 [cited 2021; Available from: <https://datasets.seed.nsw.gov.au/dataset/acid-sulfate-soils-risk0196c>.
19. State Government of NSW and Department of Planning, Industry and Environment. *Environmental Planning Instrument – Flood*. 2014 [cited 2021; Available from: <https://www.planningportal.nsw.gov.au/opendata/dataset/epi-flood>. .
20. State Government of NSW and Department of Planning, Industry and Environment *NSW Koala Prioritisation Project - Areas of Regional Koala Significance (ARKS)*. 2018 [cited 2021; Available from: at <https://datasets.seed.nsw.gov.au/dataset/areas-of-regional-koala-significance-arks>. .
21. State Government of NSW and Department of Planning, Industry and Environment. *Environmental Planning Instrument – Wetlands*. 2014 [cited 2021; Available from: <https://www.planningportal.nsw.gov.au/opendata/dataset/epi-wetlands>. .
22. Department of Sustainability, Environment,, Water,, Population and Communities,. *Australia's obligations under the Ramsar Convention: Legislative support for wetlands*. 2012 [cited 2021; Available from: <https://www.environment.gov.au/system/files/resources/e0eb2ab8-23df-4b6d-8d95-146d4430725c/files/australia-ramsar-obligations-factsheet.pdf>.