

APPENDIX 2-1-V3.4

WESTERN CSM WATER SUPPLY PIPELINE ROUTE SELECTION REPORT

Wandoan Coal Project Route Selection Report Western coal seam methane water supply pipeline

October, 2008

Wandoan Joint Venture



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Distribution: Wandoan Joint Venture, PB File, PB Library

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Executive summary

Parsons Brinckerhoff (PB) has been commissioned by Wandoan Joint Venture (WJV) to undertake route selection for a proposed western water supply pipeline option between the Wandoan Coal Project area and the Origin and Santos coal seam methane area located approximately 100 km to the west at Spring Gully and Fairview.

The Wandoan Coal Project proposes to develop thermal coal resources situated immediately west of the Wandoan township, located in the Dalby Regional Council area. The mining of the coal resources will be developed using a combination of truck, shovel, dozer and dragline mining equipment. Coal will be mined at a rate of around 30 million tonnes per annum run of mine coal and may be increased to 40 Mt/a in the future. The coal will be crushed, sized and washed before being transported by rail to the Port of Gladstone.

The Wandoan Coal Project will include on-site coal handling and processing which will require a constant and reliable water supply. It is anticipated that water requirements at the Wandoan Coal Project will be approximately 9,100 ML/a (with potential expansion to 11,400 ML/a if mine production is increased to 40 Mt/a). Coal seam methane development which is being conducted at Spring Gully and Fairview involves extraction of methane from coal seams by reducing groundwater pressure that keeps the methane adsorbed to the coal. Water is the primary by-product of coal seam methane development and therefore has been identified as a potential water resource to satisfy the Wandoan Coal Project water demand.

The purpose of this report is to investigate potential route alignment options for the western water supply pipeline and specifically to:

- assess potential pipeline route options in the study area based on a selection of identified regulatory, planning, environmental, social and economic criteria
- comparatively assess and analyse the alternative route options
- utilising agreed assessment criteria, identify the preferred pipeline route alignment for further detailed studies in the forthcoming environmental impact assessment.

Investigations of potential pipeline route options involved a review of available desktop information, data sources and also observations made during a field reconnaissance. Potential pipeline route options were assessed by considering a range of issues or selection criteria that could be interpreted from this information. Potential selection criteria were categorised as regulatory, planning, environmental, social or economic criteria. Each selection criterion was then reviewed to determine whether it would add value to the assessment of corridor options. Where selection criteria would not add value to the assessment process they were not included in the comparative assessment of options.

Six potential pipeline route alignments were identified through desktop assessment and field reconnaissance, to which the identified selection criteria were applied and a comparative assessment undertaken. Of the options considered, Option 1 is the option with the least impact to mapped regional ecosystems, affects the least number of privately owned properties and is the shortest pipeline length and therefore has the least associated cost. In summary, Option 1 is regarded as the overall preferred alignment across a number of the criteria which were included in the comparative analysis.

1. Introduction

As part of the assessment of the Wandoan Coal Project on behalf of the Wandoan Joint Venture (WJV), Parsons Brinckerhoff (PB) has been commissioned to undertake a route selection for a proposed western water supply pipeline (the project) between the Wandoan Coal Project area and the Origin and Santos coal seam methane area located approximately 100 km to the west at Spring Gully. The project locality is shown in Figure 1-1. The proposed western water supply pipeline forms one of three main potential raw water supply options which are being considered for the Wandoan Coal Project. The other two potential raw water supply options will be investigated and reported in separate documents.

1.1 Background

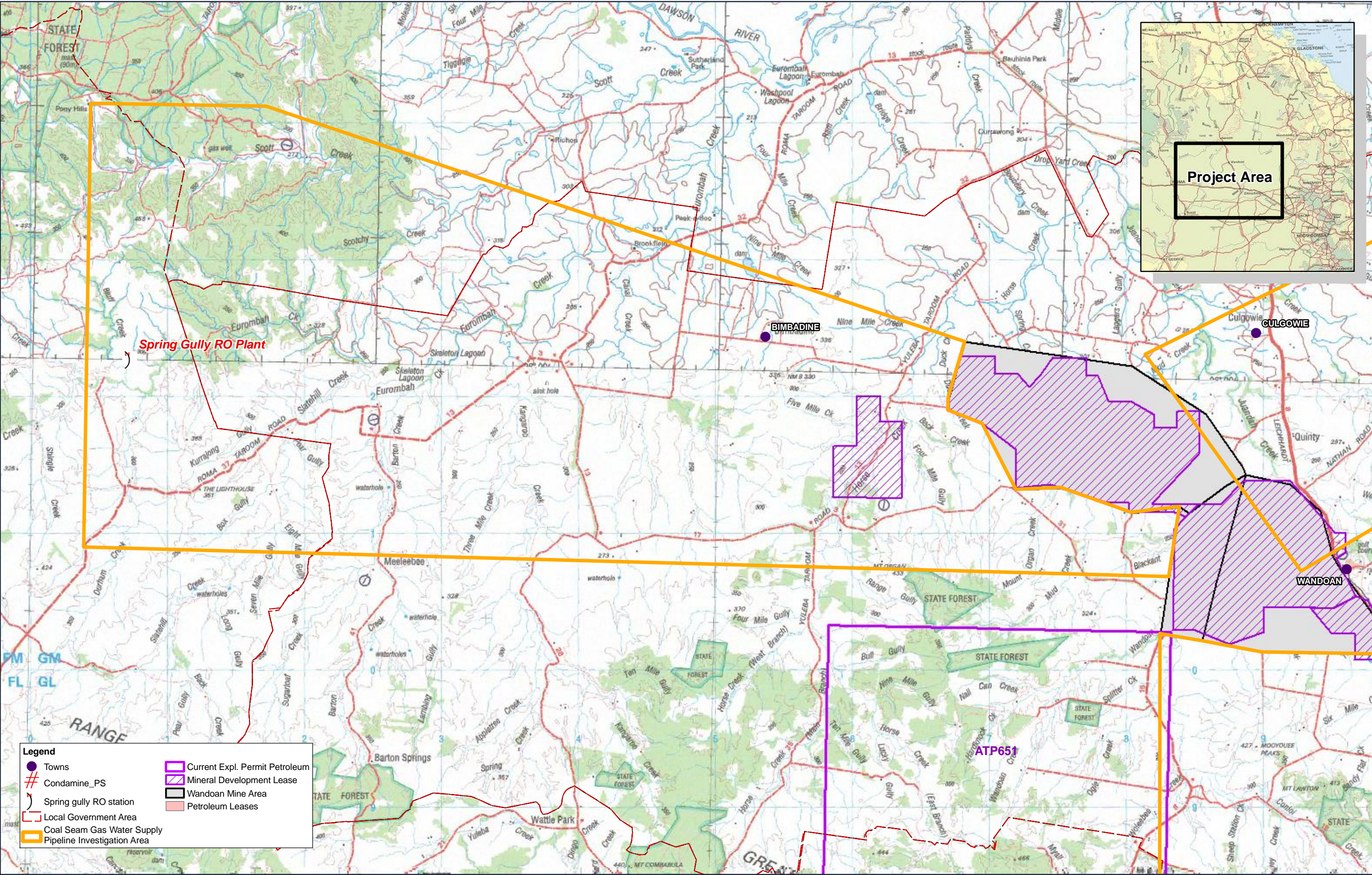
1.1.1 Project description and need

The Wandoan Coal Project proposes to develop thermal coal resources situated immediately west of the Wandoan township, located in the Dalby Regional Council area. The Wandoan Coal Project site is located approximately 350 km north-west of Brisbane and 60 km south of Taroom as shown in Figure 1-1. The coal reserves for the Wandoan Coal Project exist within the area of three mining lease applications (MLA), MLA 50229, 50230 and 50231 and will be developed as an open cut mine and related infrastructure. The Wandoan Coal Project covers an area of approximately 32,000 ha.

The mining of the coal resources will be developed using a combination of truck, shovel, dozer and dragline mining equipment. Coal will be mined at a rate of around 30 million tonnes per annum (Mt/a) run of mine (ROM) coal, with the potential for expansion to 40 Mt/a. The coal will be crushed, sized and washed before being transported by rail to the Port of Gladstone.

The Wandoan Coal Project will include on-site coal handling and processing which will require a constant and reliable water supply. It is anticipated that water requirements at the Wandoan Coal Project will be approximately 9,100 ML/a (with potential expansion to 11,400 ML/a if mine production is increased to 40 Mt/a). A potential water resource to help satisfy this demand has been identified at the Origin and Santos coal seam methane extraction wells located at Spring Gully and Fairview, approximately 100 km west of the Wandoan Coal Project site.

Coal seam methane development involves extraction of methane from coal seams by reducing groundwater pressure that keeps the methane adsorbed to the coal. Water is the primary by-product of coal seam methane development and this water is often rich in salts and other constituents that render it unsuitable for many direct beneficial uses. The poor quality of the water makes the management of this water one of the major concerns associated with coal seam methane development.



Project locality and western water supply pipeline study area

However, in order to beneficially re-use coal seam methane water and secure a water supply for the Wandoan Coal Project, it is proposed to establish the western water supply pipeline and pipe the water from the evaporation pond at the Spring Gully coal seam methane fields to the Wandoan Coal Project site. If necessary, treatment of the coal seam methane water to a standard suitable for use in coal handling and processing will be undertaken prior to the water leaving the Spring Gully coal seam methane field.

Initial design concepts indicate that the pipeline will be between 91 km and 115 km in length and will require a single lift pump station at the point of supply nominated by Origin, likely adjacent to the existing Spring Gully reverse osmosis plant. The pump will operate for 20 hours per day. A number of pipe diameter sizes and construction materials have been investigated for cost and constructability. The pipeline will generally be located underground, constructed using a section trench and backfill method.

A study area between the Wandoan Coal Project site and the Spring Gully coal seam methane extraction wells has been identified (refer Figure 1-1) and preliminary pipeline route alignments have been investigated. A referral to the Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA), for determination on whether the Project is a 'controlled action' pursuant to the *Environment Protection and Biodiversity Conservation Act 1999* has been undertaken on this study area as part of the greater Wandoan Coal Project.

1.2 Purpose of this report

The purpose of this report is to investigate potential route alignment options for the western water supply pipeline and specifically to:

- assess potential pipeline route options in the study area based on a selection of identified regulatory, planning, environmental, social and economic criteria
- comparatively assess and analyse the alternative route options
- identify the preferred pipeline route alignment for further detailed studies based on agreed assessment criteria.

The preferred pipeline alignment will then be the subject of environmental impact assessment as part of the Wandoan Coal Project. This report is one of two Coal Seam Methane (CSM) water supply pipeline route selection reports prepared for the Wandoan Coal Project.

1.3 Route assessment methodology

Investigations of potential pipeline route options involved a review of available desktop information, data sources and also observations made during a field reconnaissance. Potential pipeline route options were assessed by considering a range of issues that could be interpreted from this information.

Route options were initially assessed through desktop investigations and a field reconnaissance was later conducted to validate desktop information. In order to assess the potential environmental, planning and social constraints associated with these routes, a range of selection criteria were identified. These selection criteria covered all relevant issues that are regularly addressed in environmental assessments of pipeline routes.

Potential selection criteria were categorised as regulatory, planning, environmental, social or economic criteria. Each selection criterion was then reviewed to determine whether it would add value to the assessment of corridor options. Where selection criteria would not add value to the assessment process they were not included in the comparative assessment of options. This occurred in cases where:

- there was little or no variation in the selection criterion across the study area, making differentiation between the merits of route options difficult to assess or negligible
- paucity of available information made differentiation between the merits of the different corridor options too difficult to assess without undertaking significant additional studies.

Where it was determined that selection criteria were relevant (either due to relevance to the study area or variation between the route options), performance measures were identified to measure the criteria. Consideration was also given to the balance between selection criteria to ensure that no single criterion received a higher priority than others. As a result, some performance measures provide a measure for more than one criterion. For example, the performance measure 'number of properties affected' provides an assessment for a number of criteria including visual impacts, social receptors and potential construction phase noise and air quality impacts or nuisance issues. The selection criteria that were chosen for the initial assessment were given an equal weighting. This method is used to avoid creating subjective criteria.

The comparison of route options was carried out using a comparative assessment approach where each criterion was compared for each route option. A ranking system has been used to provide a comparative measure of how each option meets the relative performance measures. A ranking of 1 indicates the least impact, while 5 represents the greatest impact. The option with the lowest numbers identifies the route with the least impact and highest compliance with performance measures (and therefore criterion). However, a straight numerical comparison of criteria of this sort is considered potentially misleading. To overcome this, professional judgement was used to differentiate between options, and a reason for the choice is provided.

1.4 Regulatory framework

The design, construction and development approval process for a the proposed western water supply pipeline project will trigger requirements and/or need with regard to Commonwealth, State and local legislation. This legislation will require a number of approvals, licences and permits to be obtained by the Proponent prior to and during the development of the Project. This section of the report summarises the relevant legislation and associated approvals, licences and permits.

1.4.1 Relevant Commonwealth legislation

Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) protects matters of national environmental significance which include: World Heritage areas/places, Ramsar wetlands, listed threatened species and communities, listed migratory species, nuclear actions and the Commonwealth marine environment.

Where a project or action is believed to potentially cause a significant impact on a matter of national environmental significance it is to be referred to the DEWHA for assessment as to whether the action is a 'controlled action' requiring Commonwealth approval is required for the proposed action. Where an action requires Commonwealth approval a formal assessment process is undertaken in accordance with provisions of relevant legislation.

A search of the study area using the DEWHA online Protected Matters Search Tool was undertaken on 2 May 2008 and the following Table 1-1 summarises the search results with regard to presence of Matters of National Environmental Significance potentially present within the study area.

Table 1-1: Online protected matter search tool results for the study area

World Heritage areas/places
Nil recorded within the study area
National Heritage Places
Nil recorded within the study area
Wetlands of International Significance
Nil recorded within the study area. However Shoalwater and Corio Bays Area located off-shore in same catchment area.
Commonwealth Marine Areas
Nil recorded within the study area
Threatened Ecological Communities
Community of brigalow (<i>Acacia harpophylla</i> dominant and co-dominant) is known to occur within the study area. This community has a conservation status of 'endangered'.
Community of semi-evergreen vine thickets of the Brigalow Belt (north and south) and Nandewar regions is likely to occur within the study area. This community has a conservation status of 'endangered'.
A community of native species dependent on natural discharge of groundwater from the Great Artesian Basin is known to occur within the study area. This community has a conservation significance of 'endangered'.
Threatened species
Four threatened bird species may or are likely to have habitat occur within the study area.
Two mammal species may have habitat occur within the study area.
Four reptile species may or are likely to have habitat occur within the study area.
Four plant species may or are likely to have habitat occur within the study area.
Migratory species
Three migratory terrestrial species may or are likely to occur within the study area.
Five migratory wetland bird species may occur within the study area.
Three migratory marine bird species may occur within the study area.
Nuclear actions
The project does not involve nuclear actions, neither do any occur within the study area.

A referral to the DEWHA, for determination of whether or not the Project is a 'controlled action' pursuant to the EPBC Act has been undertaken on this study area as part of the Wandoan Coal Project.

Heritage legislation

Indigenous and non-indigenous cultural heritage is protected by Commonwealth legislation in the form of the *Australian Heritage Council Act 2003*. The regime under this Act has created the National Heritage List and Commonwealth Heritage List. The listing of a place on the National Heritage List is defined as a matter of national environmental significance under the EPBC Act. Other associated Acts include:

- *Environment and Heritage Legislation Amendment Act (No. 1) 2003*
- *Australian Heritage Council (Consequential and Transitional Provisions) Act 2003*.

Categories of places, sites and precincts that may be included on the National Heritage List or Commonwealth Heritage List include the historic environment (the built environment), modified landscapes and archaeological sites. The records of the Australian Heritage Council also include the natural environment and the indigenous environment (archaeological sites, and features of the natural landscape that are culturally significant).

A review of the Australian Heritage Database identified that the proposal is in proximity to the following places:

- Waaje Area, approximately 30 km east of Wandoan, within State Forest 302 (indicative place)
- Boggomosses Area No. 1, Glebe Weir Road, Taroom (registered place)
- Boggomosses Area No. 2, Cracow (registered place)
- Brigalow Invertebrate Site, Leichhardt Highway, Taroom (registered place)
- Carraba Environmental Park, Roma Taroom Road, Taroom (indicative place)
- Central Highlands Region, Carnarvon Developmental Road, via Rolleston (indicative place)
- Expedition Range Area, Dawson Highway, Bauhinia Downs (registered place)
- Hornet Bank Homestead, Hornet Bank Road, Taroom (indicative place)
- Isla Gorge National Park (1978 boundary), Leichhardt Highway, Theodore (registered place)
- Robinson Gorge National Park (former), Taroom (registered place).

However, no items or places of heritage significance are located along or immediately adjacent to the proposed pipeline route options or within the study area.

Aboriginal and Torres Strait Islander Heritage Protection Act 1984

Indigenous cultural heritage is also protected by Commonwealth legislation in the form of the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*. This Act provides for interim and final orders to be made protecting Aboriginal Cultural Heritage, including tangible and intangible items. Any Aboriginal or Torres Strait Islander person or organisation may apply to the Minister for a temporary or permanent 'Stop Order' for protection of threatened areas or objects of significant indigenous cultural heritage. The Commonwealth Act overrides state legislation if the Commonwealth Minister is of the opinion that the state legislation (or undertaken process) is insufficient to protect the threatened areas or objects. In the event that an application is made to the Commonwealth Minister for a Stop Order, the Commonwealth Minister will, as a matter of course, contact the Queensland Environmental

Protection Agency (EPA) to ascertain what protection is being imposed by the state and/or what mitigation procedures have been proposed by the land user/developer. No specific action is required by the development proponent in this instance.

Native Title Act 1993

The *Native Title Act 1993* recognises native title rights and provides ways in which to validate or legitimise past or intermediate acts, such as granting of leases. The registered native title claimants for the study area are the Iman People with the associated active native title claim being claim QC97/55 Iman People #2 filed on 30 October 1997. Where required, WJV will undertake any necessary action regarding native title claims and the proposed pipeline.

1.4.2 Relevant State legislation

Integrated Planning Act 1997

The *Integrated Planning Act 1997* (IP Act) governs development in Queensland. The IP Act applies to development approval (material change of use, reconfiguration of a lot, or operational, building, plumbing or drainage works) outside the scope of the *Mineral Resources Act 1989*. As such, the IP Act does not apply to mining activities authorised by the *Mineral Resources Act 1989* and carried out under a relevant mining tenement.

However, with specific regard to the proposed western water supply pipeline, the holder of a petroleum tenure (i.e. the petroleum tenure encompassing the Spring Gully coal seam methane field) is permitted to carry out reasonably necessary, ancillary or authorised activities, including works associated with water pipelines. The lease holder is issued with a specific authority to construct a water pipeline on the lease. The pipeline may only extend beyond the lease where an adjacent petroleum lease is owned by the same holder.

However, where the water pipeline will be outside the petroleum lease or it is proposed to on-supply associated water via a pipeline for any other purpose not authorised under the *Petroleum and Gas (Production and Safety) Act 2004* (PG Act), a development approval is required for the pipeline and associated infrastructure under the IP Act.

All development is assumed to be exempt development under the IP Act unless otherwise declared self-assessable or assessable development through either Schedule 8 of the IP Act or the relevant local government planning scheme. Section 2.3.3 of this report details the level of assessment for the proposed pipeline as outlined under the:

- Planning Scheme for Taroom Shire 2006 (Taroom Planning Scheme)
- Planning Scheme for Bungil Shire Council Area 2006 (Bungil Planning Scheme).

Petroleum and Gas (Production and Safety) Act 2004

The *Petroleum and Gas (Production and Safety) Act 2004* (PG Act) provides regulation for petroleum exploration, extraction and pipeline licensing. This Act is administered by the Department of Natural Resources and Water (DNRW).

The Environmental Protection Agency's (EPA) *Operational policy for management of water produced in association with petroleum activities (associated water)* 2007 details that under the PG Act, associated water is defined as underground water that is taken or interfered with, if the taking or interference occurs during the course of, or results from, the carrying out of another authorised activity for the tenure.

The following provides a summary of the current legislative position in relation to coal seam methane water use:

- under the PG Act, the petroleum licence (PL) holder has the right to extract associated water providing the extraction happens during the course of or results from the carrying out of an authorised activity for the tenure
- the PL holder can use the associated water for activities carried on under the PL
- the PL holder can apply for a water licence to on-supply associated water for all other purposes not expressly authorised under the PG Act
- the PL holder has a "make good" obligation if its extraction of associated water adversely impacts on landowner's ability to extract water from the same aquifer
- once a water licence is granted, the PL holder can on-supply the water but must not charge a fee unless the PL holder is also registered as a water service provider under the Water Act 2000.

Environmental Protection Act 1994

The *Environmental Protection Act 1994* (EP Act) provides the key legislative framework for environmental management and protection in Queensland. The Act was introduced to protect Queensland's environment while allowing for economic development, consistent with the principles of ecologically sustainable development.

The EPA released the *Operational Policy for the Management of water produced in association with petroleum activities (associated water)* in March 2007.

Section 13 of the EP Act defines waste as '*anything that is left over, or an unwanted product*'. Management of coal seam methane water (considered as waste) was addressed by activity specific conditions on the environmental authority issued for the petroleum activities. Disposal, transport, storage treatment, recycling or reprocessing are listed as level 1 Environmental Relevant Activity (ERAs 75,81,83,84 and 85).

If the associated water is approved for a beneficial use and the receiver, re-user or recycler has given the environmental authority holder (the producer) written agreement that they can comply with the conditions of the notice of decision to approve a resource for beneficial use (the Notice), there is no requirement for an application for development approval or resignation certificate for regulated waste transport, storage, treatment, recycling or reprocessing, or disposal.

The EP Act further provides for 'general environmental duty' (Section 319) which stipulates that:

'A person must not carry out any activity that causes, or is likely to cause, environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm'

Additionally, Section 320 of this Act requires that a person must notify the administering authority (the EPA) if they become aware that serious or material environmental harm is caused or threatened by conducting an activity. Failing to notify environmental harm in accordance with the provisions of the Act may lead to a penalty or prosecution by the administering authority.

Environmental Protection Regulation 1998

Pursuant to the Environmental Protection Regulation 1998, activities that will, or have the potential to, release contaminants into the environment and which may cause environmental harm are defined as Environmentally Relevant Activities (ERAs). ERAs are assessable development under the IP Act and require development approval.

Where the proposed western water supply pipeline is proposed to be constructed through or under a watercourse and this requires removal of material from the bed of the watercourse, ERA 19 – Dredging may potentially be triggered and an approval to undertake these works will be required from the EPA. It is anticipated that all materials will be pre-fabricated and that no actual product manufacture (e.g. concrete batching) will occur along the proposed pipeline route. In this case, it is not anticipated that the proposed water supply pipeline will trigger any other ERAs. However, if it were found that as the project progresses an ERA is required, it would be necessary to submit a development application.

Environmental Protection (Water) Policy 1997

The Environmental Protection (Water) Policy (EPP (Water)) is a policy under the *Environmental Protection Act 1994*. The policy defines and protects environmental values of Queensland waterways.

Under Section 32 of the EPP (Water) it is an offence to allow sand, silt or mud to accumulate in a waterway or where it could wash into a waterway unless it is permitted by an Environmental Authority. A number of waterways which will have to be crossed by the pipeline exist within the study area and therefore, appropriate management strategies will need to be implemented in order to ensure compliance with the provisions of the EPP (Water).

Environmental Protection (Air) Policy 1997

The purpose of the Environmental Protection (Air) Policy 1997 is to achieve the objectives of the *Environmental Protection Act 1994* with regard to Queensland's air environment. The policy provides a framework for:

- identifying air quality values to be enhanced or protected
- specifying air quality indicators and goals to protect the environmental values
- providing processes which manage the air environment and involve the community in achieving air quality goals that best protect Queensland's air environment.

Potential impacts to local air quality may be associated with construction of the western water supply pipeline, such as dust and construction machinery emissions. Management and mitigation strategies may require implementation however, this will be further investigated and reported as part of the environmental impact statement for the Project.

Environmental Protection (Noise) Policy 1997

The purpose of the Environmental Protection (Noise) Policy 1997 is to achieve the objectives of the *Environmental Protection Act 1994* in relation to Queensland's acoustic environment. The policy provides a framework for:

- identifying the acoustic (including vibration) values to be enhanced or protected
- specifying the Project's acoustic quality objective

- providing processes to protect Queensland's acoustic environment such as dispute resolution and facilitating the development of noise management programs.

Potential impacts to acoustic quality may be associated with construction of the western water supply pipeline and also pump station operation, dependent on design and location. Management and mitigation strategies may require implementation however, this will be further investigated and reported as part of the environmental impact assessment for the Project.

Environmental Protection (Waste Management) Regulation 2000

The purpose of the Environmental Protection (Waste Management) Regulation 2000 is to provide a strategic framework for managing wastes in Queensland. It does this by establishing a preferred waste management hierarchy and various principles as the basis for waste management.

The waste hierarchy moves from the most preferred alternative, waste avoidance, through re-use, recycling, and energy recovery, to waste disposal, the least preferred. Waters produced as a result of the CSM extraction process may be considered as 'regulated waste' depending on the quality of the water produced.

The EPA has produced the 'Operational policy for management of water produced in association with petroleum activities (associated water)'. The aim of this Operational Policy is to promote beneficial use of associated water from petroleum activities in Queensland in accordance with the waste management hierarchy in the Environmental Protection (Waste Management) Regulation 2000 and minimisation of environmental harm. To facilitate the beneficial use of associated water, the EPA has decided to grant a general approval under section 66F of the Environmental Protection (Waste Management) Regulation 2000 for the use of associated water of certain types, for stated purposes. The approval and general conditions of approval are contained in the 'Notice of decision to approve a resource for beneficial use' which is appended to the Operational Policy. If the associated water complies with the conditions of the General Notice, it is not classified as a waste and can be reused in accordance with the conditions in the General Notice.

Preliminary discussions indicate that associated waters will be wholly or partially treated at the Spring Gully CSM facility prior to being piped to the Wandoan Coal Project area, so as to meet required water quality specifications for coal processing. This method of beneficial use is considered a 'Treated Use' under the Operational Policy and generally includes treatment of associated water by desalination (including reverse osmosis, ion exchange, capacitive desalination or deionisation, electrodialysis reversal, freeze/thaw technology or distillation), sterilisation and/or filtration. This option will also necessarily include the storage of water in dams prior to treatment and the disposal of hyper-saline wastewaters.

Water Act 2000

The purpose of the *Water Act 2000* is to provide for the sustainable management of water and other resources. Under Section 266 of the *Water Act 2000*, a Riverine Protection Permit is required from the Department of Natural Resources and Water (DNRW) to:

- destroy vegetation in a watercourse
- excavate in a watercourse
- place fill in a watercourse.

The proposed pipeline route options traverse a number of watercourses including small creeks and large rivers and therefore, it is likely that approvals and/or permits will be required for pipeline crossings of watercourses. The number of waterway crossings may have implications for the project in terms of Project approvals timeframes and project costs. Therefore, the number of waterways crossed by a pipeline route option is considered to be an important determining criterion and is further considered in the comparative analysis of options.

Additionally, where waters are to be taken from a watercourse, lake, spring or underground water, e.g. for use in dust suppression during construction works, a Permit to Take Water may be required pursuant to s. 237 of the *Water Act 2000*.

The majority of the study area is located within the Fitzroy Basin which is subject to a water resource plan. The DNRW monitors the implementation of water resource plans. Water resource plans are structured under the *Water Act 2000* to deliver new levels of sustainability for river ecosystems and certainty for water users. Additionally, environmental objectives for the relevant catchment/basin are set out in a water resource plan and are subsequently achieved through implementation of Resource Operations Plans that establish day-to-day river management rules and a framework for trading water allocations. The Fitzroy Basin water resource plan, was finalised in 1999 and was approved under the *Water Act 2000* as the Water Resource (Fitzroy Basin) Plan 1999. Interactions between the proposed Wandoan Coal Project (including associated infrastructure) and the Water Resource (Fitzroy Basin) Plan 1999 should be investigated and reported as part of the environmental impact assessment.

Transport Infrastructure Act 1994

The *Transport Infrastructure Act 1994* includes provisions relating to interference with railways. Where the pipeline corridors and either existing or future rail corridors cross or otherwise interact, the requirements of the Act must be complied with. The conditions of the rail corridor head lease, if applicable, and any existing sublease agreements will have to be considered, where relevant. Rail infrastructure is not present within the study area and therefore, the proposed pipeline routes do not interfere with rail infrastructure and/or land in any way. Therefore, the provisions of this Act are not considered relevant to the current proposed Project.

Land Act 1994

The *Land Act 1994* provides a framework for the allocation of state land as either leasehold, freehold or other tenure. Permits may be acquired under this Act from DNRW for the occupation of a reserve, road or unallocated state land.

Under Chapter 4, Part 4 of the Act, a permit to occupy will be required from the Chief Executive of DNRW where the proposed pipeline and ancillary works are developed on unallocated state land, a reserve or a road.

Unallocated state land is not located within the study area and therefore, will not be traversed or impacted by the proposed project. However, various sections of all proposed pipeline options are situated within state controlled and local government road reserves and therefore, provisions of this Act are likely to be applicable to the western water supply pipeline Project.

Vegetation Management Act 1999

The purpose of the *Vegetation Management Act 1999* is to regulate the clearing of vegetation on freehold and leasehold land except where exemptions exist under the *Land Act 1994* and the *Forestry Act 1959*. In addition, the *Vegetation Management Act 1999* aims to:

- preserve vegetation in areas of high nature conservation value
- maintain or increase biodiversity
- maintain ecological processes
- allow for ecologically sustainable land use.

A development permit is not required for the clearing of vegetation that is directly associated with, or facilitates or supports, mining under the *Mineral Resources Act 1989* once the Mining Lease is granted. However, for vegetation clearance in areas of the Project that are located outside the proposed Mining Lease, such as the pipeline route, a vegetation clearing permit is required under the *Vegetation Management Act 1999*. Therefore, if the pipeline alignment is proposed to traverse any remnant vegetation areas as designated under the Act, an approval for vegetation clearing is required to be sought from the DNRW.

Nature Conservation Act 1992

The purpose of the *Nature Conservation Act 1992* is to provide for the conservation of nature including important natural areas as well as flora and fauna. A Wildlife Clearing Permit is required where the following activities are proposed:

- taking, using, keeping or interfering with a protected plant, other than under a conservation plan applicable to the plant or under exemption under a regulation
- taking, using, keeping or interfering with cultural or natural resources of a protected area other than under interim or declared management intent for the area or a conservation agreement for the area
- taking, using, keeping or interfering with a protected animal other than under a conservation plan or exemption
- taking, using, keeping or interfering with wildlife (animal or plant) that is not protected, but is found in an area identified as a critical habitat or an area of major interest by a conservation plan
- clearing of a protected plant.

Based on desktop information there is potential for the proposed pipeline routes to impact on flora and fauna species listed under this Act and therefore, require permits in relation to the above. However, it is recommended that this be further assessed during the detailed studies conducted as part of the environmental impact assessment of the Project.

Soil Conservation Act 1986

The *Soil Conservation Act 1986* provides for the preparation of plans that outline works and measures that may be used to contain soil erosion. There is no requirement on a landholder to actually implement works unless a Notice or Order has been issued (by the administering authority) requiring compliance with the approved plan. Further, there are provisions in this Act to allow a landholder to seek an amendment to an approved plan, or to have the approval revoked. Plans may show a preferred, or recommended, layout of soil conservation

works used to control erosion, principally on cultivation land; however, the plans may not necessarily reflect what has actually been implemented. Any construction activities or maintenance activities will need to recognise the existence of any of the implemented soil conservation works. This would include all construction works including access requirements as well as subsequent maintenance operations.

Discussions with the DNRW Toowoomba office indicate that there are no approved Soil Conservation Plans within the study area and therefore, the provisions of this legislation are not relevant to the current proposed project.

Queensland Heritage Act 1992

Queensland cultural heritage derives state protection pursuant to the *Queensland Heritage Act 1992*. This legislation protects those areas that are considered to be of state significance and are placed on the 'Queensland Heritage Register', which is administered by the Heritage Council. For these areas, approval of the Heritage Council is required if any development is proposed. A search of the Register indicates that the study area is in proximity to the following significant heritage places:

- Leichhardt Tree, Yalwyn Street, Taroom
- The Glebe Homestead, Taroom-Cracow Road, Taroom.

However, no places, objects or sites listed on the Queensland Heritage Register are located directly within the study area or along or immediately adjacent to the proposed pipeline route options.

Aboriginal Cultural Heritage Act 2003

The *Aboriginal Cultural Heritage Act 2003* provides for the protection of significant Aboriginal cultural heritage, including the establishment of a register of Aboriginal cultural heritage and processes for addressing land use impacts. The Cultural Heritage Coordination Unit of the DNRW implements this legislation.

A search of the register of Aboriginal cultural heritage administered by the DNRW has been requested for the study area. The results of this request indicate that two Aboriginal cultural heritage sites are recorded within the study area. The details of the sites and relevance to the proposed project are further discussed in Section 2.5.3 of this report.

WJV is responsible for carrying out activities with reasonable and practical measures to ensure it meets its Duty of Care established under the Act. Where necessary, WJV will implement a Cultural Heritage Management Plan in consultation with the traditional owners for the preferred pipeline route alignment.

Native Title (Queensland) Act 1993

The objective of the *Native Title (Queensland) Act 1993* is to achieve consistency with the *Native Title Act 1993* (Commonwealth). It validates past acts that were invalidated because of the existence of Native Title and confirms various rights conferred by those Acts. Additionally, the Act aims to ensure protection of native title and establishes ways in which future dealings regarding native title may proceed.

The registered native title claimants for the study area are the Iman People with the associated active native title claim being claim QC97/55 Iman People #2 filed on 30 October 1997.

1.4.3 State planning policies

State planning policies (SPP) are statutory planning instruments that relate to matters of Queensland state interest.

The Minister for Local Government and Planning has identified that the following SPPs were adequately addressed in the respective planning schemes:

Taroom Planning Scheme:

- SPP 1/92 – Development and Conservation of Agricultural Land (where land is included within the Rural Zone – Rural B precinct only)
- the bushfire and landslide components of SPP 1/03 – Mitigating the Adverse Impacts of Flood, Bushfire and Landslide.

Bungil Planning Scheme:

- SPP 1/92 – Development and Conservation of Agricultural Land (on lots greater than 1,000 ha in the rural zone)
- SPP 1/02 – Development in the Vicinity of Certain Airports and Aviation Facilities
- SPP 1/03 – Mitigating the Adverse Impacts of Flood, Bushfire and Landslide, except for Flood assessment provisions.

The SPPs relevant to the proposal are assessed below. Hence, the discussion below refers to the Overlay Maps contained in the planning schemes.

State planning policy 1/03 Mitigating the adverse impacts of flood, bushfire and landslide

The purpose of this policy is to set out the state government's interests with regard to natural hazards of flood, bushfire and landslide and ensure these matters are adequately addressed when carrying out development assessment.

The proposed water supply pipeline will generally be located underground, constructed through a section trench and backfill operation. Therefore, it is expected that the pipeline will be compatible with the impacts of the potential natural hazards. Due to the nature of the proposal being an underground pipeline it is anticipated that the project would not significantly compromise the intent of this SPP.

- **Bushfire:** Bushfire hazard mapping prepared by the Queensland Rural Fire Service indicates the bushfire hazard areas in the Taroom and Bungil Shires. All proposed water supply pipeline options are predominately beneath land identified as areas of low bushfire hazard, with small areas of medium bushfire hazard along the alignment. The design (i.e. underground) is unlikely to impose restrictions upon existing bushfire management techniques. Preliminary investigations indicate that the pipeline design may include an adjacent access track to aid in maintenance operations and access. Therefore, the proposal will potentially improve access for ground-based fire fighting vehicles. The underground pipeline would not be impacted by normal fire events.
- **Flooding:** The proposed pipeline it is unlikely to adversely affect flood events or contribute to increased flood events as it is located underground, and will be constructed using a section trench and backfill operation.

- Landslide: The project would not involve land containing slopes greater than 6% (refer Figure 2-4). In accordance with the SPP, the project will not exceed a slope of 15%, which would be defined as an area of natural hazard management. As such, the proposed development will not compromise the SPP outcomes.
- Outcomes 1-3 of the SPP are shown to be achieved by the foregoing assessment of the project and are therefore not discussed further in this section.

State planning policy 1/92 Development and conservation of agricultural land, 1992

This SPP addresses the conservation of good quality agricultural land (GQAL) and provides guidance to local authorities on how this issue should be addressed when carrying out their range of planning duties. Local authorities, the Planning and Environment Court and the Government are required to have due regard to this Policy when carrying out their planning functions.

Four classes of land have been defined for Queensland. These are Classes A, B, C and D, as described in Table 1-2.

Table 1-2: Land classes

Class	Description
Class A	Crop Land — land suitable for current and potential crops with limitations to production that range from none to moderate levels. All crop land is considered to be GQAL.
Class B	Limited Crop Land — land that is marginal for current and potential crops due to severe limitations and suitable for pastures. Engineering and/or agronomic improvements may be required before the land is considered suitable for pasture cropping. Land marginal for particular crops of local significance is considered to be GQAL.
Class C	Pasture Land — land suitable only for improved or native pastures due to limitations that preclude continuous cultivation for crop production; but some areas may tolerate a short period of ground disturbance for pasture establishment.
Class D	Non-agricultural Land — land not suitable for agricultural uses due to extreme limitations. This may be undisturbed land with significant habitat, conservation and/or catchment values, or land that may be unsuitable because of very steep slopes, shallow soils, rock outcrops or poor drainage.

These land classes are based on an assessment of the suitability of the land for specified agricultural uses that involve rating the ability of the land to maintain a sustainable level of productivity using soils, topographic and climatic factors that determine sustainable productivity. The DNRW describes GQAL as Class A, B and C1 land.

Various classes of GQAL are present within the study area and therefore, may be impacted by the proposed pipeline options to different degrees. Potential impacts to GQAL are detailed and discussed in latter sections of this report.

Development in the vicinity of certain airports and aviation facilities — SPP 1/02

This SPP sets out broad principles concerning development in the vicinity of airports and aviation facilities considered essential for the State's transport infrastructure or national defence system. This SPP sets out broad principles for protecting airports and associated aeronautical facilities from encroachment by incompatible developments, in the interest of maintaining operational integrity and community safety. There are no airports of State significance in the previous local government areas of Taroom or Bungil Shires and therefore, the provisions of this SPP are not relevant to the current project.

An off-airport facility (non-directional beacon and VHF omnidirectional range) is identified in the guideline for the SPP 1/02 for the previous local government area of Taroom. The facility is located along the Leichardt Highway. The western water supply pipeline is expected to be constructed underground and therefore does not exceed the minimum development constraint as identified in the SPP. No on- or off-airport facilities have been identified in the previous Bungil local government area.

Planning and managing development involving acid sulfate soils — SPP 2/02

The Acid Sulfate Soils SPP applies to certain coastal areas of Queensland where the natural ground level is less than 20 m Australian Height Datum (AHD) and soil below 5 m AHD is disturbed by the proposed works.

No areas under 5 m AHD or underlain by estuarine sediments are traversed by the proposed pipeline options, and the requirements of the SPP are therefore not considered relevant as a corridor selection criterion in this instance.

Protection of extractive resources — SPP 2/07

The purpose of this policy is to set out the state's interests with regard to extractive resources and protect the Key Resource Areas (KRA) from incompatible development as a result of poor land use decisions. It is intended that this policy maintains the long-term availability of extractive resources in KRA. The SPP came into effect on 3 September 2007.

Mapping (Warrian KRA (85)) for the Bungil local government area indicates that the proposed pipeline route options will not traverse an area identified as a KRA.

No KRA mapping exists for the previous local government area of Taroom.

State Coastal Management Plan

Under the *Coastal Protection and Management Act 1995*, the State Coastal Management Plan and subsequent Regional Management Plans have the status of a SPP for the purposes of making and amending planning schemes and assessing and deciding development applications. The State Coastal Management Plan provides a framework to address and manage pressures on the coastal zone and as part of its core topics, emphasises that development should occur in an ecologically sustainable manner. The State Coastal Management Plan applies to the coastal zone defined in section 11 of the Act.

The State Coastal Management Plan is not relevant to the proposed pipeline route options as the subject area:

- is physically distant from coastal environments with the pipeline being located in an inland area

- is generally a modified low-density rural area
- does not contain significant physical features, ecological or natural processes or human activities that affect, or have the potential to affect, the coast or coastal resources or a significant high order stream
- irrespective of whether being a catchment or not, does not comprise proposed development that would have the ability to significantly impact on coastal resources or waters.

As there is no link with the coast or coastal resources, the State Coastal Management Plan is not considered to be applicable to the proposed development.

Housing and residential development — SPP 1/07

This SPP seeks to ensure that large, higher growth local governments identify their community's housing needs and analyse, and modify if necessary, their planning schemes to remove barriers and provide opportunities for housing options that respond to identified needs. SPP 1/07 is supported by a Guideline that provides information and advice on interpreting and implementing the Policy.

The importance of housing to ecological sustainability is discussed in the SPP including the need for new approaches in the planning, design and building of dwellings to ensure that they are socially, environmentally and economically sustainable. This includes the requirement for efficient use of water and energy resources and minimisation of waste. A sustainable house is more cost-efficient over time, comfortable, cheaper to maintain and complements the environment.

The Project does not conflict with the outcome sought by this policy as it will not create barriers to a range of housing options that respond to the housing needs of the community, consequently this SPP is considered not applicable.

1.4.4 Regional and local planning instruments

Central Queensland Regional Growth Management Framework 2002

The Central Queensland Regional Growth Management Framework 2002 (CQRGMF 2002) is a joint government, community and industry project to develop a long-term strategic plan to guide management, growth and development of the region over the following 20 years.

The CQRGMF 2002 was prepared under Part 5 of the IP Act. Once implemented, the local governments are required to develop or amend their planning schemes to reflect the intentions of the Regional Growth Management Framework.

The CQRGMF 2002 seeks to make Central Queensland the most diverse and prosperous region in Australia through economic growth that is ecologically sustainable and where people and industry work in harmony with the environment for the benefit of both present and future generations whilst respecting the diversity of our past.

The CQRGMF affects all of the study area and therefore, further discussion regarding the association between the CQRGMF 2002 and the proposed Wandoan Coal Project will be provided in the environmental impact statement.

Local authority planning schemes

The majority of the western water supply pipeline study area is located within the Dalby Regional Council area, with the western portion of the study area being located with the Roma Regional Council jurisdiction.

Despite the recent local government amalgamations that have occurred in Queensland, the study area remains subject to existing IP Act planning instruments being the:

- Taroom Planning Scheme
- Bungil Planning Scheme.

The provisions of these planning instruments have been considered in this route selection process and details are provided in Section 2.3.3 of this report.

Local laws

The local laws identified under the Roma Regional Council for the previous local government area of Bungil would not be applicable to the proposed pipeline.

Dalby Regional Council does not have any local laws specific to the previous local government area of Taroom.

2. Route option evaluation

2.1 Information sources

Information sources used in researching the constraints for each of the proposed route options include those listed in Table 2-1.

Table 2-1: Desktop review information sources

Potential constraint	Information and data sources
Commonwealth threatened species	<i>Environment Protection and Biodiversity Conservation Act 1999</i> online 'Protected matters search tool'
Commonwealth listed migratory species	<i>Environment Protection and Biodiversity Conservation Act 1999</i> online 'Protected matters search tool'
Commonwealth threatened ecological communities	<i>Environment Protection and Biodiversity Conservation Act 1999</i> online 'Protected matters search tool'
State listed threatened species (<i>Nature Conservation Act 1992</i>)	Wildlife On-line (EPA)
State listed conservation significant vegetation communities (<i>Vegetation Management Act 1999</i>)	Remnant vegetation and Regional Ecosystem mapping (current version 5.0 with the addition of any certified changes) produced by the EPA.
Watercourses	Land, Vegetation and Water Packaged Digital Data produced by the DNRW
Water catchments and water resource planning	Water Resource (Fitzroy Basin) Plan 1999 produced by the DNRW
Mining and petroleum tenements	Department of Mines and Energy on-line interactive mapping tool
Coal seam methane wells	Department of Mines and Energy on-line interactive mapping tool
State controlled roads	Department of Main Roads South Western District 4 map
Railways	Network system information produced by Queensland Rail
Land tenure	Land, Vegetation and Water Packaged Digital Data produced by the DNRW
Good quality agricultural land	Dalby and Roma Regional Councils: Planning Scheme for Taroom Shire 2006 Planning Scheme for the Bungil Shire Council Area 2006
Town planning land designation	Dalby and Roma Regional Councils: Planning Scheme for Taroom Shire 2006 Planning Scheme for the Bungil Shire Council Area 2006

Potential constraint	Information and data sources
Topography	SRTM data sets produced by the National Aeronautics and Space Administration and the National Imagery and Mapping Agency
Geology	Land, Vegetation and Water Packaged Digital Data produced by the DNRW
Soils	Digital Atlas of Australian Soils produced by CSIRO
Properties subject to approved Soil Conservation Plans	Information provided by the DNRW, Toowoomba office
Local authority roads	Land, Vegetation and Water Packaged Digital Data produced by the DNRW
Key/future resource areas	Department of Mines and Energy on-line interactive mapping tool
Properties, residences	1:250,000 Digital Topographic Data produced by Geosciences Australia
Existing infrastructure (e.g. pipelines, powerlines etc)	Department of Mines and Energy on-line interactive mapping tool Planning Scheme for Taroom Shire 2006 Planning Scheme for the Bungil Shire Council Area 2006
Fire hazard	Rural Fire Service bushfire hazard mapping for local government areas
Cost to construct (indicative)	Pipeline designers (PB)
Native title	National Native Title Tribunal mapping and Register information
Cultural Heritage (non-indigenous)	Queensland Heritage Register, National Heritage List, Commonwealth Heritage List
Cultural heritage (indigenous)	Register of Aboriginal cultural heritage (DNRW), National Heritage List, Commonwealth Heritage List

It should be noted that whilst all of the above potential constraints were identified and information collated, not all of these potential constraints were considered as principal determining criteria in the route selection study. For example, the presence of saline and sodic soils within the study area may influence pipeline design and construction however, this issue will be common for all potential pipeline route options. Therefore, not all of the above listed constraints have been utilised in the route option evaluation and comparative analysis.

2.2 Selection of assessment criteria

The issues typically addressed in environmental impact assessments are also relevant to the comparison of alternatives in a route evaluation, and can be used to develop suitable criteria for selecting a preferred alignment. The criteria can be broken into regulatory, planning, environmental, social and economic categories. These criteria typically consist of:

Regulatory criteria

- Provisions of relevant Commonwealth legislation.
- Provisions of relevant state legislation and policies.

Regulatory provisions, as they relate to this Project, are generally associated with the use, development or potential impact to environmental, planning, social and economic criteria. Therefore, whilst noteworthy that these criteria exist, in the context of this assessment, regulatory criteria will be considered in conjunction with relevant environmental, planning, social and economic assessment criteria.

Planning assessment criteria

- Land use and tenure.
- Location of petroleum and mining leases.
- Location of resource (e.g. coal, petroleum, mineral) areas.
- Local governments and planning schemes.
- Location and extent of existing infrastructure such as pipelines, roads (local and state controlled), railway lines, dams/water infrastructure etc.

Environmental assessment criteria

- Topography.
- Geology and soils.
- Watercourses and wetlands.
- Fire risk.
- Flora and vegetation communities.
- Fauna and habitat values.

Social assessment criteria

- Proximity of residences and other sensitive receptors to the proposed development.
- Properties and landholders affected.
- Visual amenity.
- Cultural heritage (indigenous and non-indigenous).

Economic assessment criteria

- Cost and constructability.

Sections 2-3 to 2-6 (inclusive) describe how these assessment criteria were considered in developing the performance measures, against which each option will be measured. As mentioned above, in some cases it is possible to establish that a particular criterion will not be useful in the assessment process and therefore no further analysis will be undertaken. A summary of the selection criteria and relevance to the proposed project is provided in Table 2-4.

2.3 Planning assessment criteria

2.3.1 Land use and tenure

The existing land uses within the study area are predominantly agricultural and resource based. The proposed Wandoan Coal Project area is located to the east of the study area, covering approximately 32,000 ha (refer Figure 1-1). The Spring Gully and Fairview CSM extraction wells, operated by Origin and Santos, are located within the western portion of the study area, approximately 100 km to the west of Wandoan. The balance of the land within the study area is predominantly utilised for agricultural purposes, including grazing and cropping activities.

In terms of future land use, the Strategic Plan for the Bungil and Taroom Shire local government areas indicates the long-term land use pattern for the regions. The frameworks contained in the Strategic Plans indicate that the following future uses are to be provided adjacent the proposed alignment:

Bungil Shire:

- rural industries, timber production and extractive uses are located within the rural area to take advantage of the economic potential of the area's natural resources.

Taroom Shire:

- productive rural land, rural industries and natural features (including mineral and extractive resources and tourist resources such as national parks, reserves, conservation parks and wetlands) are protected to reflect and enhance their continued economic potential and viability.

The land within the study area is envisaged to continue to cater for predominantly agricultural based land uses.

Reference to the Department of Mines and Energy online interactive mapping tool indicates that a number of coal resource areas have been identified within the study area. These areas are located predominantly within the eastern portion of the study area, within close proximity to the Wandoan Coal Project. A small number of coal seam methane wells (in various stages of exploration or development) occur sporadically across the southern portion of the study area. Future land uses and location of key resource areas will be a principal determining criterion in the pipeline route selection process to ensure that these resource areas are not sterilised to future development.

Sensitive land uses such as schools, community facilities, cemeteries (where relevant) and land uses associated with temporary or permanent infrastructure or equipment such as gas fields, and irrigation have been avoided during the route selection process. Therefore, there is no variation in the selection criterion across the study area, making differentiation between the merits of route options negligible. Land use and tenure will not be utilised as a determining criteria for pipeline route alignment and will not be considered in the comparative assessment of options undertaken in Section 4.

2.3.2 Mining leases, petroleum leases and resource areas

Mining

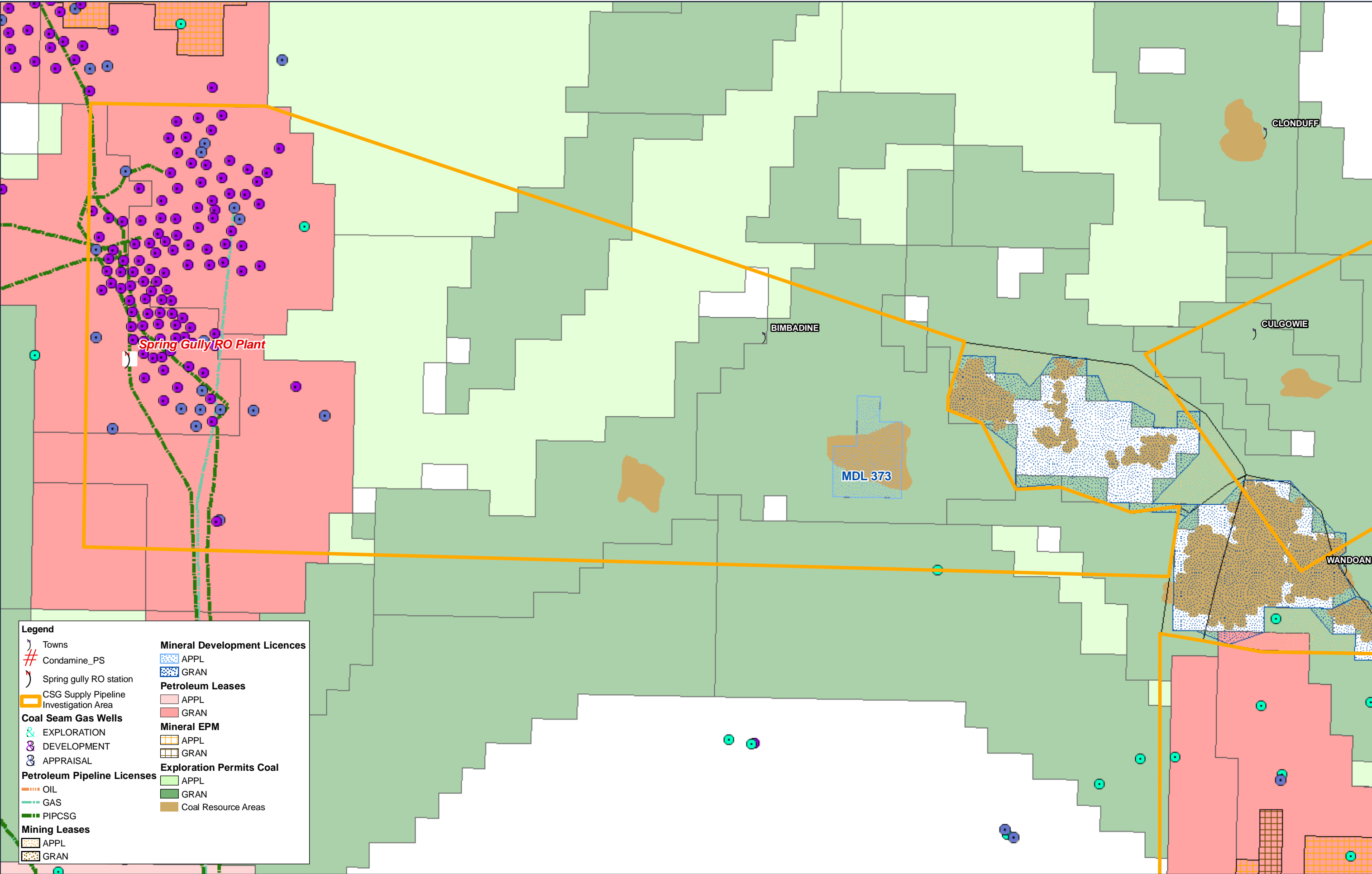
Reference to the Department of Mines and Energy interactive online search tool (conducted 15 May 2008) indicates that the Wandoan No. 1 Mining Lease (ML) is located immediately to the east, outside of the study area. Mineral Development Licence (MDL) No. 373 held by Taroom Coal Pty Ltd is located within the central-eastern portion of the study area in the vicinity of Bundi Ryalls Road and Horse Creek (refer Figure 2-1). The location of existing ML's and MDL's is considered to be a significant constraint to the water supply pipeline route alignment and therefore, were considered during development of the preliminary route options. The current options discussed in this report avoid crossing MDL 373. Therefore, given that no impact to existing ML's or MDL's is expected to occur, this criterion will not be considered further in the comparative assessment of options.

Petroleum

Reference to the Department of Mines and Energy interactive online search tool (conducted 15 May 2008) indicates that Petroleum Leases (PLs) 195, 203 and 204 are located within the western portion of the study area. These PLs constitute part of the Spring Gully coal seam methane fields operated by Origin and Santos and from which the western water supply will be sourced (refer Figure 2-1). Five of the pipeline options propose to cross the eastern portion of the PLs (outside of existing road reserves) and discussions with the PL holders will be required in order to negotiate an appropriate alignment across the PL areas. Given that the majority of proposed alignments will traverse PL areas, there is considered to be no distinct or material difference between the options in this regard and therefore, this criterion has not been considered further in the comparative assessment included in Section 4.

Resource areas

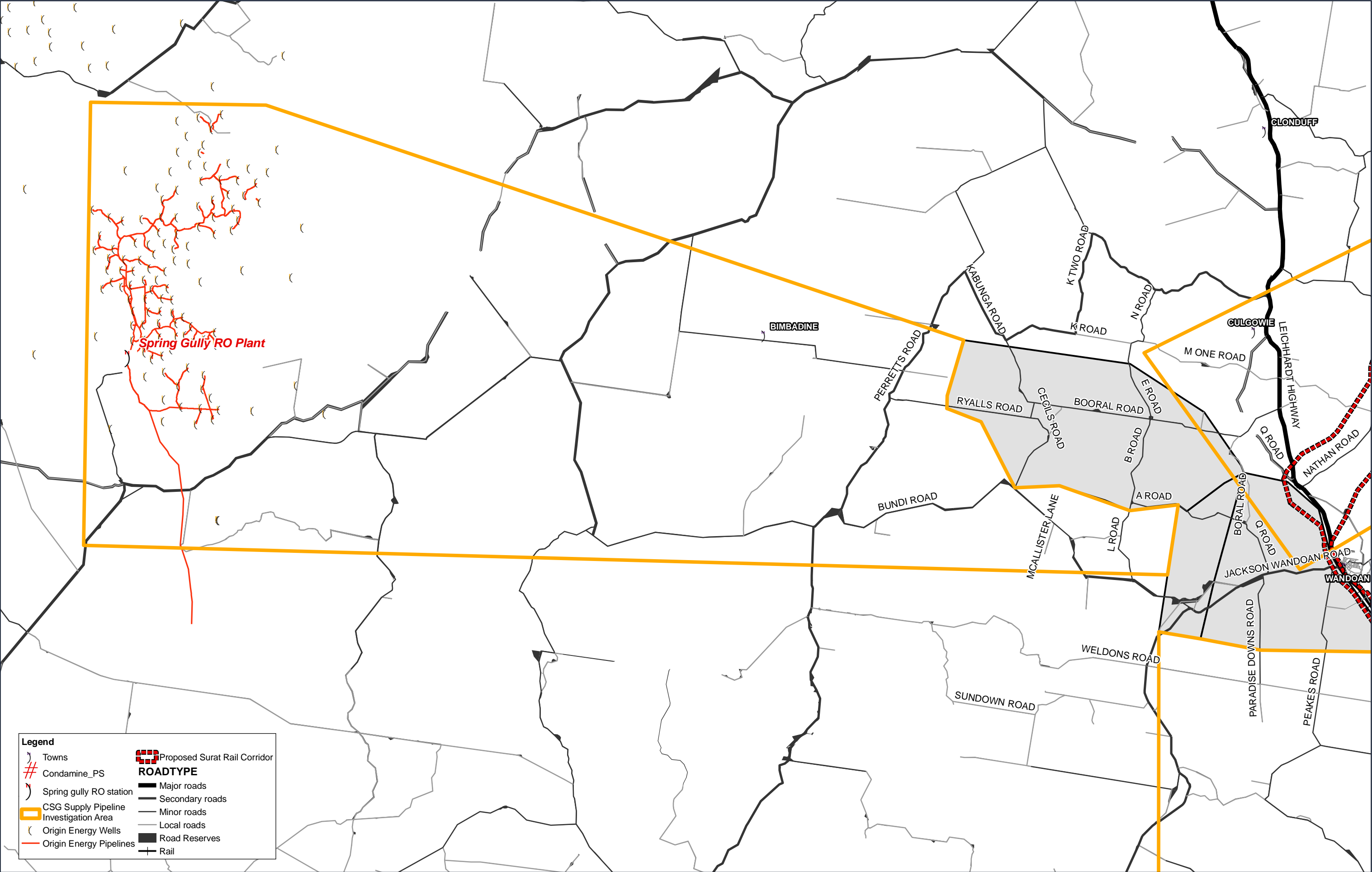
Reference to the Department of Mines and Energy online interactive mapping tool indicates that a number of coal resource areas have been identified within the study area (refer Figure 2-2). These areas are located predominantly within the eastern portion of the study area, within close proximity to the Wandoan Coal Project. A small number of coal seam methane wells (in various stages of exploration or development) occur sporadically across the southern portion of the study area. Future land uses and location of key resource areas are considered to be a principal determining criterion in the pipeline route selection process to ensure that these resource areas are not sterilised to future development. Therefore, the location of these resource areas was considered during initial alignment options planning and all alignments were designed to avoid these resource areas. Therefore, there is no material difference between options in this regard and therefore, this criterion will not be considered further in the comparative assessment.



N



Mining and petroleum leases and resource areas



Existing Infrastructure within the study area

2.3.3 Local government authorities and planning schemes

The proposed pipeline would be developed on land under the jurisdiction of the following local government authorities:

- Dalby Regional Council (amalgamated Chinchilla, Dalby, Murilla, Tara, Wambo and division two of Taroom Shire Councils)
- Roma Regional Council (amalgamated Bendemere, Booringa, Bungil, Roma and Warroo Shire Councils).

Approximately 90 km of the proposed pipeline routes are located within the Dalby Regional Council area, traversing an area from Wandoan to Waikola. West of this point to the Spring Gully CSM extraction wells traverses the Roma Regional Council Area. The delineation of the study area across Dalby and Roma Regional Council areas is shown on Figure 1-1.

The Regional Councils were formed on 17 March 2008 and will continue to operate under the current IP Act compliant planning schemes relevant to the previous local government areas. The planning schemes applicable to the proposed pipeline alignment are:

- Planning Scheme for Taroom Shire 2006 (Taroom Planning Scheme)
- Planning Scheme for Bungil Shire Council Area 2006 (Bungil Planning Scheme).

The following section details the assessment process under each planning scheme.

Level of assessment

A review of the Taroom Planning Scheme identified the water pipeline would potentially be exempt development. Section 1.4 (2)(V) of the planning scheme states the following development is exempt from requiring development approval:

“Development” involving water cycle management infrastructure, including infrastructure for water supply, sewerage, collecting water, treating water, stream managing, disposing of waters and flood mitigation, but excluding water supply or sewage treatment plants.

Confirmation from Dalby Regional Council would be required for this interpretation and discussions will be undertaken as part of the environmental impact assessment process.

Section 1.12(v) of the Bungil Planning Scheme detailed that the proposed water pipeline would be exempt development (not requiring approval under the planning scheme) where:

development involving water cycle management infrastructure, including infrastructure for water supply, sewerage, collecting water, treating water, stream managing, disposing of waters and flood mitigation, but excluding water supply and sewerage treatment plants;

Notwithstanding this, where the associated works (i.e. pump stations) were to be developed above ground, a building works approval would be required under the IP Act from Council.

Furthermore, where the pipeline traverses or interacts with existing pipeline or other easements, approval from the relevant authority will be required, including sign off on the proposed pipeline standard to be used.

As the proposed pipeline at this time is assumed to be exempt development under the planning schemes, further assessment of the development codes contained in the Taroom and Bungil Planning Schemes is not deemed necessary.

2.3.4 Existing infrastructure

Local government roads

A number of local government roads are located within the study area for the western water supply pipeline and propose to be crossed by the proposed pipeline options. Whilst the number of road crossings may have implications for project costs associated with removing and replacing existing road surfaces (e.g. subgrade and asphalt), it is not considered further as a criteria in the comparative assessment. However, various sections of the pipeline route options are proposed to be located within the existing road reserve of local authority roads within the study area which will require approval/agreement by the relevant local authority. Therefore, the length of proposed pipeline within existing road reserves is considered important to route selection and has been included as a criterion in the comparative assessment of options.

State controlled roads

State controlled road number 4397 'Roma – Taroom Road' traverses the central and western portions of the study area. Due to the location of Roma – Taroom Road within the study area, all pipeline route options will be required to cross this state controlled road (refer Figure 2-2). Additionally, various sections of the pipeline route options are proposed to be located within the existing road reserve of the Roma – Taroom Road and will require approval/agreement by the Department of Main Roads. Therefore, as above, the length of proposed pipeline within existing road reserves is considered important to route selection and has been included as a criterion in the comparative assessment of options.

Rail infrastructure

No Queensland Rail network exists within the study area. The nearest rail infrastructure is an arm of the single track western network system which connects Miles and Wandoan. Therefore, pipeline route options will not cross Queensland Rail infrastructure and consequently, no further consideration of this criterion will be undertaken in the comparative analysis of options.

Existing pipelines, power transmission lines etc and other infrastructure

Existing pipeline infrastructure is present within the study area for the proposed western water supply pipeline, predominantly associated with the Spring Gully coal seam methane fields. Both coal seam methane well pipelines and transmission pipelines (authorised under a petroleum pipeline licence) are present and will be traversed by the pipeline route options.

Existing high voltage powerlines have not been identified within the study area.

Where the proposed pipeline options traverse or intersect with existing pipelines or other infrastructure easements, approval from the relevant authority will be required, including sign off on the proposed pipeline standard to be used. Whilst this is an important criterion to be considered in route selection processes, initial design and route planning indicated that the number of crossings of existing easements would be low and that there would be no distinct or material difference between the options in this regard. Therefore, this criterion has not been considered further in the comparative assessment included in Section 4.

2.3.5 Good quality agricultural land

Good quality agricultural land occurs throughout the majority of the study area for the proposed western water supply pipeline. Specifically, the proposed pipeline options traverse areas mapped as Class A and Class B good quality agricultural land. Figure 2-3 illustrates the occurrence of good quality agricultural land within the study area. Whilst any pipeline option is proposed to be constructed underground, an easement will be required over the pipeline and terms and conditions of the easement agreement may limit (in some areas) or restrict the land use activities which can be conducted within the easement area, thereby potentially affecting a landowners use of the easement area and good quality agricultural land. Therefore, the imposition of the pipeline easement over good quality agricultural land is considered important to route selection and has been included as a criterion in the comparative assessment of options.

2.4 Environmental assessment criteria

2.4.1 Topography

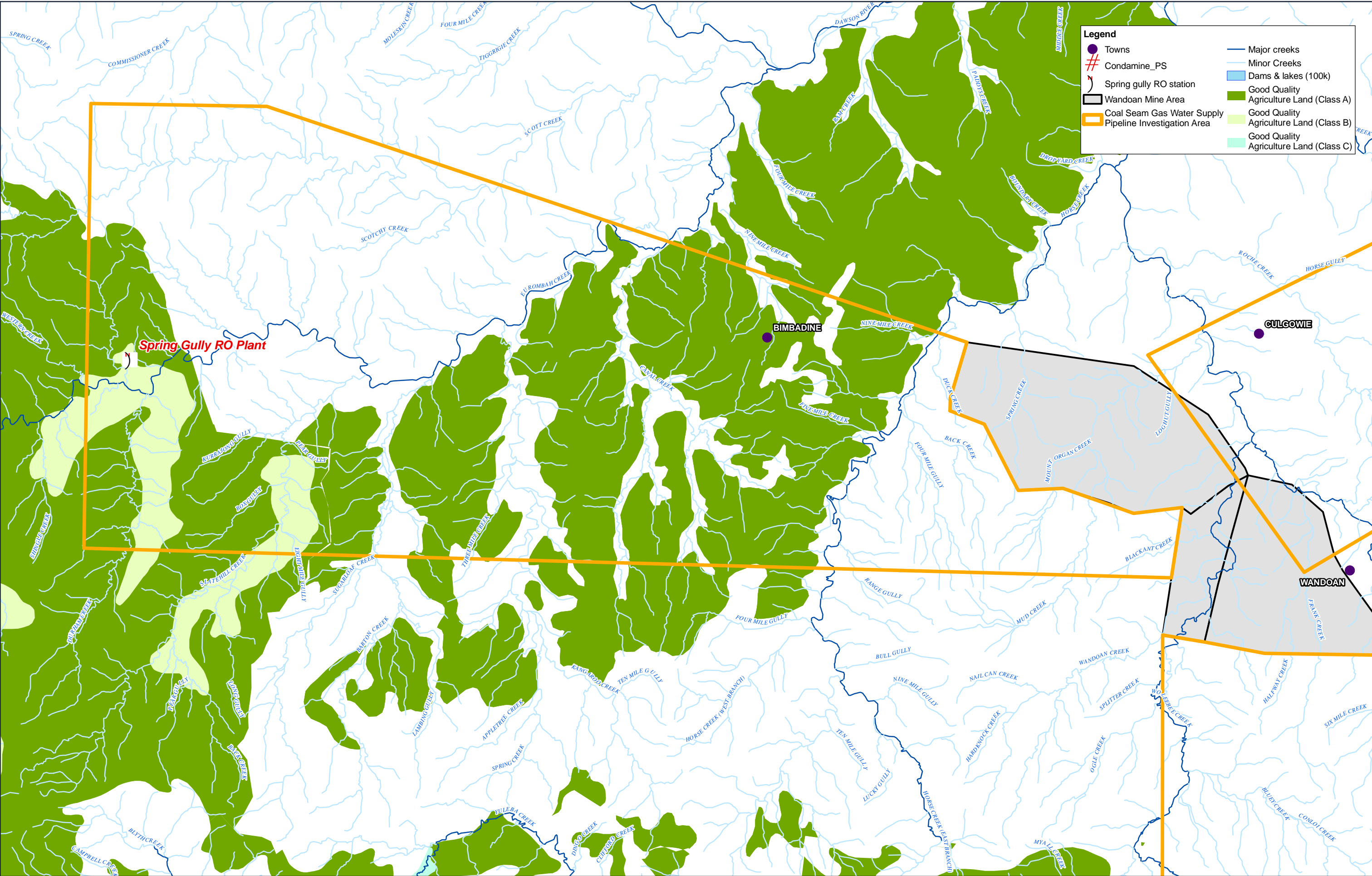
Compared with the eastern portion of the study area, the western portion becomes elevated and constitutes the foothills of the Carnarvon Range which is part of the Great Dividing Range (refer Figure 2-4). The plains within the central and eastern portions of the study area are generally open and slightly undulating, traversed by a number of watercourses creating narrow alluvial plains. All proposed pipeline options will traverse a similar route in terms of terrain and therefore, relevance of topography as a determining criterion for pipeline route alignment is considered to be consistent across route options and will not be considered in the comparative assessment of options undertaken in Section 4.

2.4.2 Soils and geology

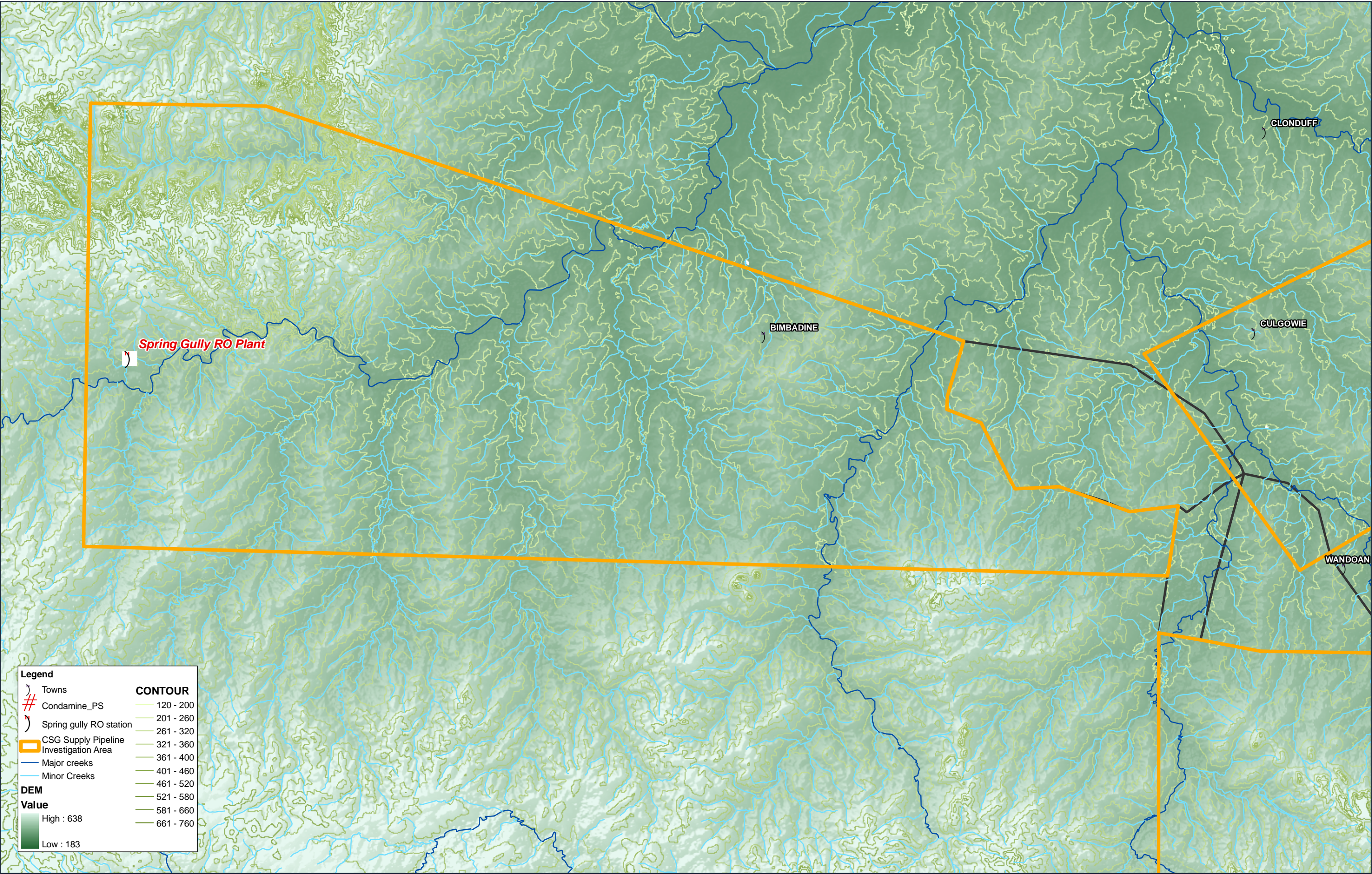
Reference to the Geological Survey of Queensland's 1:250,000 series Roma and Taroom sheets indicate that geologic units in the wider Wandoan region occur in generally west-north-west to east-south-east trending bands, parallel to the elevated topography of the Great Dividing Range that is approximately 50 km south of Wandoan. Soils and the underlying rock of the area include the following main geological units:

- Quaternary alluvium
- Middle to upper Jurassic age Injune Creek Group rocks comprising mudstone; labile sandstone and siltstone (some being calcareous), and coal
- Middle Jurassic age Birkhead Formation rocks comprising calcareous lithic sandstone, calcareous siltstone, shale, carbonaceous shale and coal (refer Figure 2-5).

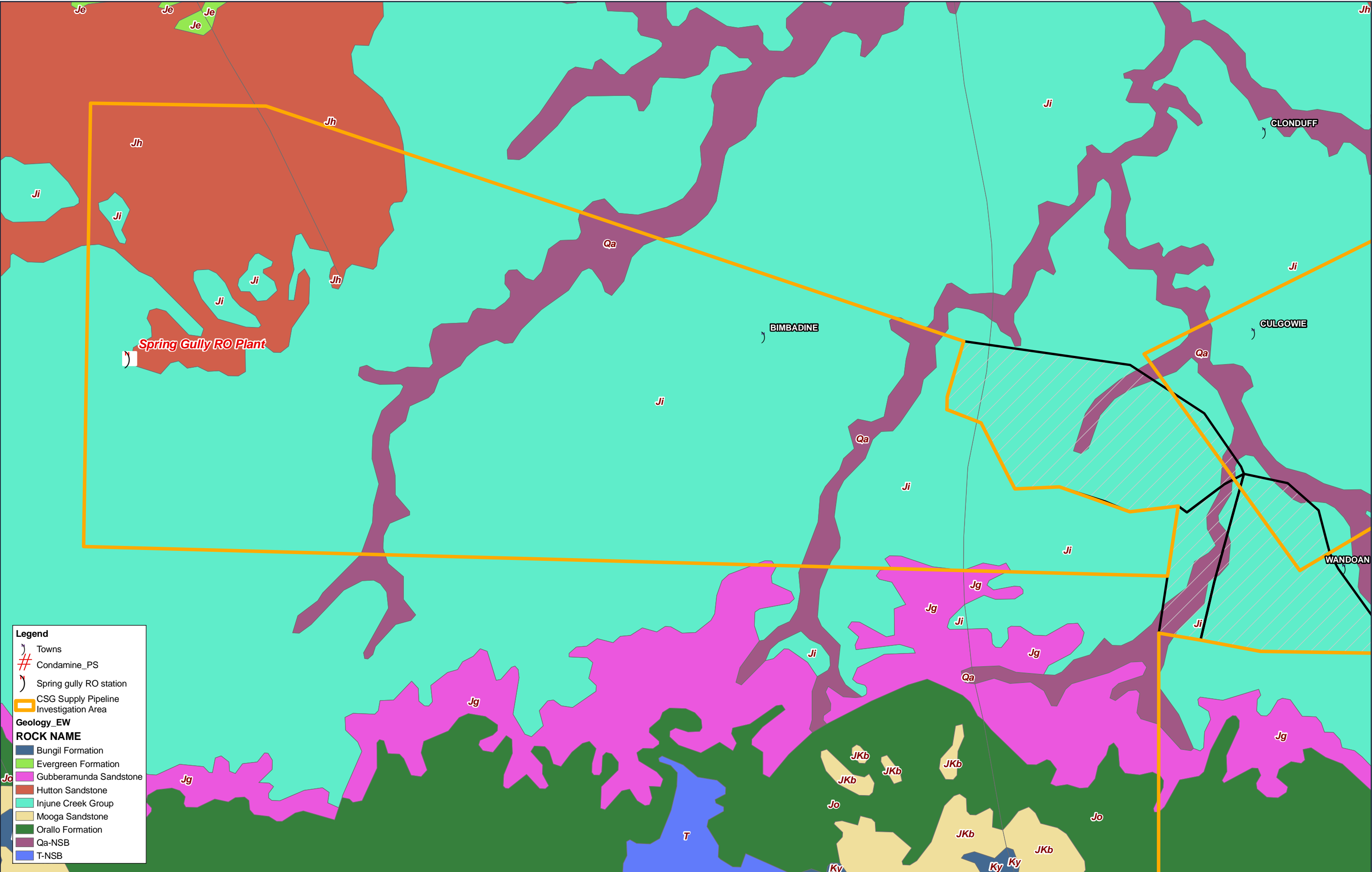
It should be noted that soils in the Wandoan area have been subject to a lengthy history of anthropogenic influences that have served to alter the natural soil structure. As a result, actual soils within the study area may not represent soils in a 'natural' condition. In previously cultivated areas the soil structure, especially in the A1 and/or A2 horizons, are generally disturbed by the agricultural activities.



Good quality agricultural land



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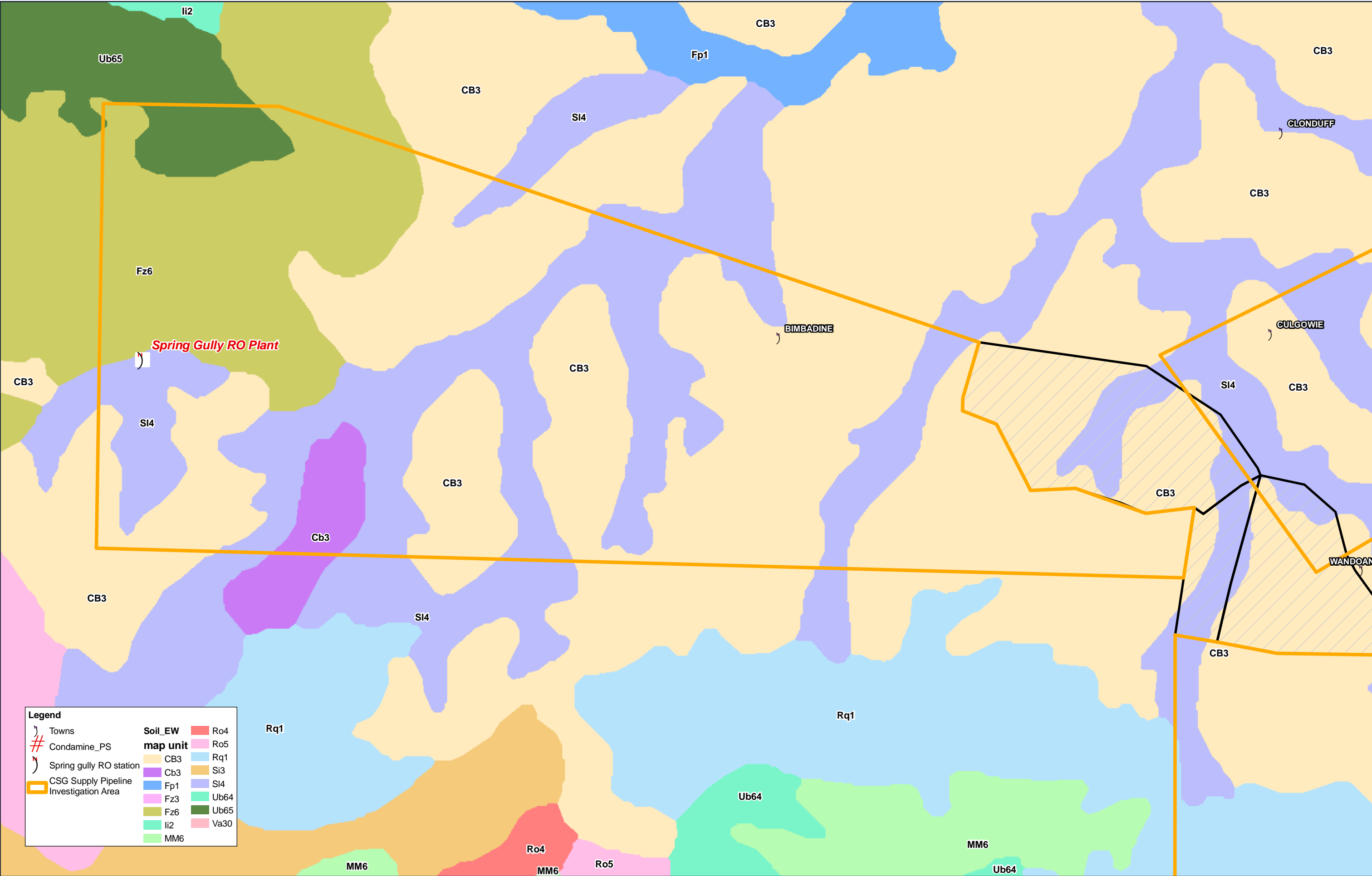
Legend

- Towns
- Condamine_PS
- Spring gully RO station
- CSG Supply Pipeline Investigation Area

Geology_EW

ROCK NAME

- Bungil Formation
- Evergreen Formation
- Gubberamunda Sandstone
- Hutton Sandstone
- Injune Creek Group
- Mooga Sandstone
- Orallo Formation
- Qa-NSB
- T-NSB



Legend

Towns

Condamine_PS

Spring gully RO station

CSG Supply Pipeline

Investigation Area

Soil_EW

map unit

Ro4

Ro5

Rq1

Si3

Si4

Ub64

Ub65

Va30

A number of different soil types have been identified within the Wandoan Coal Project area and are expected to be similar across the study area for the pipeline route options. Soils in the area show a number of characteristics including alkalinity, sodicity, dispersivity and salinity. The general soil types and conditions are not expected to differ substantially across the study area and between water supply pipeline route options. Therefore, this criterion is not considered to be a significant determinant in alignment of the pipeline route and will not be considered in the comparative assessment of options undertaken in Section 4.

Soil Conservation Plans

As mentioned above in Section 1.4.1, discussions with the DNRW Toowoomba office indicate that there are no approved Soil Conservation Plans within the study area and therefore, the provisions of the *Soil Conservation Act 1986* are not relevant to the proposed project. Therefore, no further consideration of this selection criterion will be undertaken.

2.4.3 Climate

In general, and as demonstrated by the climate data provided in Table 2-2, the Taroom region receives summer rainfall and summer temperatures are typically hot. Annual rainfall drops quickly west of the Great Dividing Range to an annual median of about 700 mm. Average temperatures during summer months are in the mid 30's. Winters are dry and cold at night with morning frosts not uncommon. Humidity is generally moderate throughout the year.

Table 2-2: Climate data for Taroom

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean max. temp	33.7	32.9	31.7	28.7	24.5	21.4	20.9	22.9	26.7	29.9	31.8	33.4	28.2
Mean min. temp	20.6	20.4	18.2	14.2	9.8	6.3	5.0	6.4	10.3	14.7	17.4	19.6	13.6
Mean rainfall	98.9	87.1	62.1	35.2	40.9	36.4	33.5	28.2	30.9	55.4	75.0	89.4	673.0
Mean 9:00 am relative humidity	64	67	66	67	72	76	74	67	58	56	57	60	65
Mean 3:00 pm relative humidity	41	45	42	40	43	45	42	38	33	34	37	38	40

Source: Bureau of Meteorology (downloaded 28 April, 2008)

The general climatic conditions are not expected to differ substantially across the study area and between water supply pipeline route options. Therefore, this criterion is not considered to be a significant determinant in alignment of the pipeline route and will not be considered in the comparative assessment of options undertaken in Section 4.

2.4.4 Watercourses

For water resource planning purposes, the study area is located in the greater Fitzroy Basin which includes the Dawson, Nogoa, Mackenzie and Fitzroy River systems. A number of smaller watercourses which are tributaries of the Dawson River system, traverse the study area. These include (but are not limited to) Mud Creek, Horse Creek, Eurombah Creek, Scott Creek and Wandoan Creek and Woleebee Creek (refer Figure 2-7).

Disturbance of watercourses (e.g. disturbance to bed and banks, removal of vegetation, excavation or placement of fill) generally require statutory approval under the *Water Act 2000* and possibly the Environmental Protection Regulation 1998 (Environmentally Relevant Activity 19 – Dredging). The number of watercourses crossed and the number of regulatory approvals required may have implications for Project timelines and costs. Therefore, the number of watercourse crossings is considered important to route selection and have been included as a criterion in the comparative assessment of options.

2.4.5 Noise

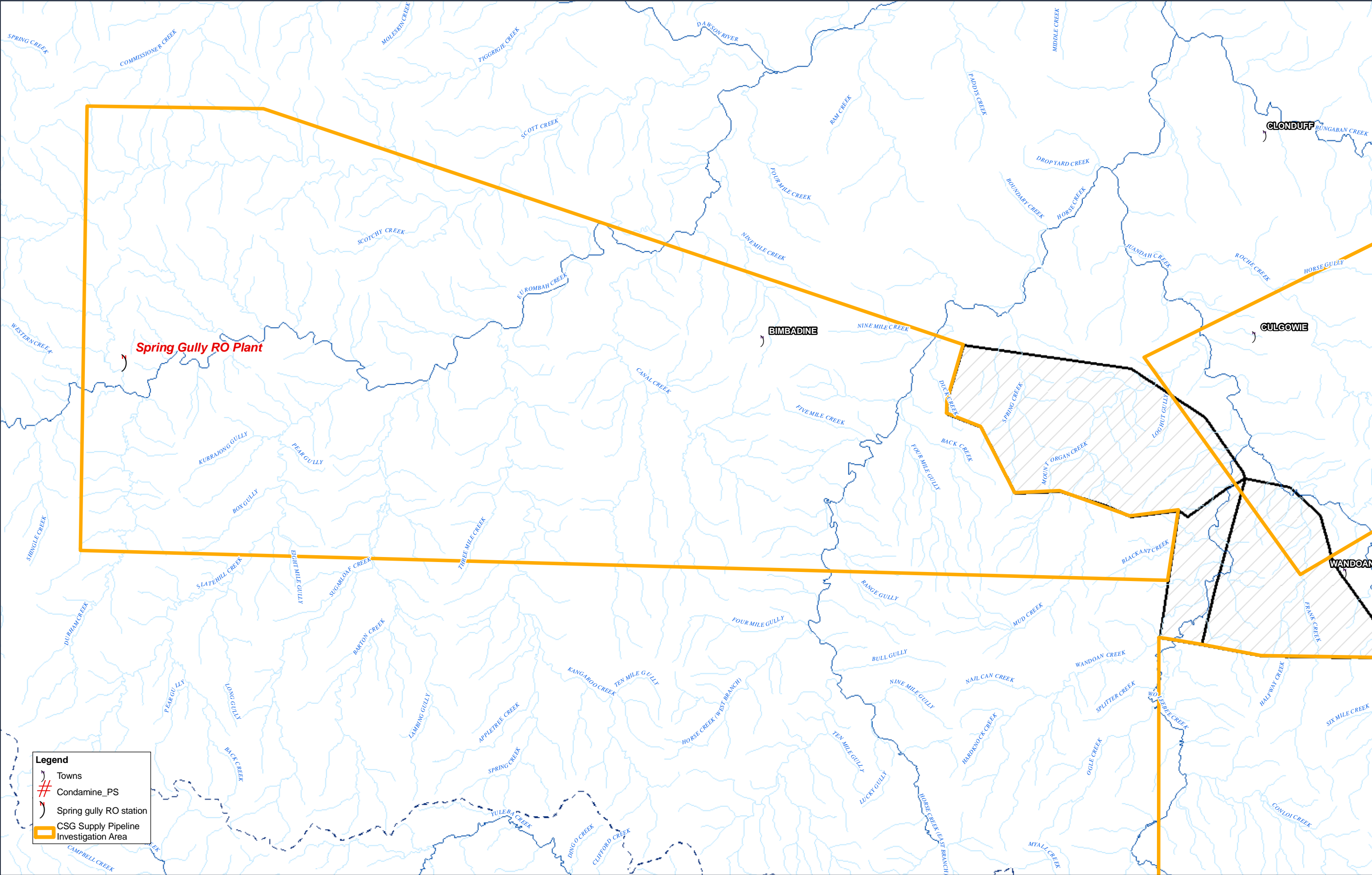
Limited noise data is currently available for the study area. Background noise levels in the existing environment would be typical of most rural areas and would vary from 30–40 dB(A) at night to 50–60 dB(A) during the day depending on the extent of traffic, machinery operations and general activity in the area. No densely populated areas such as towns are located within the study area.

Given the nature of the proposed pipeline, operational acoustic emissions are expected to be minimal. Some acoustic emissions can be expected from the pump stations, however the extent of acoustic emission and potential nuisance caused will depend upon pump station design and separation distance from noise sensitive receivers. Construction of the proposed pipeline may also cause temporary nuisance to surrounding noise sensitive receivers.

Potential impacts to the acoustic environment associated with construction and operation of the proposed pipeline are expected to be consistent across the different pipeline route options and therefore, are not considered to be a significant determining criterion between the different options. No further consideration of potential acoustic impacts has been included in the comparative analysis undertaken in Section 4. Detailed acoustic studies will be completed as part of the environmental impact assessment and appropriate management strategies to limit any potential impact to noise sensitive receivers will be identified for implementation where considered necessary.

2.4.6 Fire risk

Bushfire risk analysis mapping prepared by the Queensland Rural Fire Service indicates that bushfire risk is consistent across the study area. The elevated western portion of the study area is allocated a medium bushfire hazard, whilst the central and eastern portions of the study area are allocated a low bushfire hazard. Given that the bushfire hazard trend is consistent across the study area and route options, this criterion is not considered to be a significant determinant between route options and therefore, will not be considered further in the comparative analysis undertaken in Section 4.



Legend

- Towns
- Condamine_PS
- Spring gully RO station
- CSG Supply Pipeline
- Investigation Area



Watercourses within the study area

2.4.7 Air quality

Limited air quality data is currently available for the study area, however, the study area is expected to encompass the typical characteristics of a rural air shed. Local air quality is expected to vary from time to time and associated with land use activities such as machinery operations (ploughing etc).

Localised impacts to air quality may occur as a result of construction of the proposed pipeline, however, negligible impacts are expected during the operation phase due to the nature and design (i.e. underground) of the proposed development. Potential impacts to the local air environment associated with construction and operation of the pipeline are expected to be consistent across the different pipeline route options and therefore, no further consideration of potential air quality impacts has been included in the comparative analysis undertaken in Section 4.

Detailed air quality studies will be completed as part of the environmental impact assessment and appropriate management strategies to limit any potential impact to nearby sensitive receivers will be identified for implementation where considered necessary.

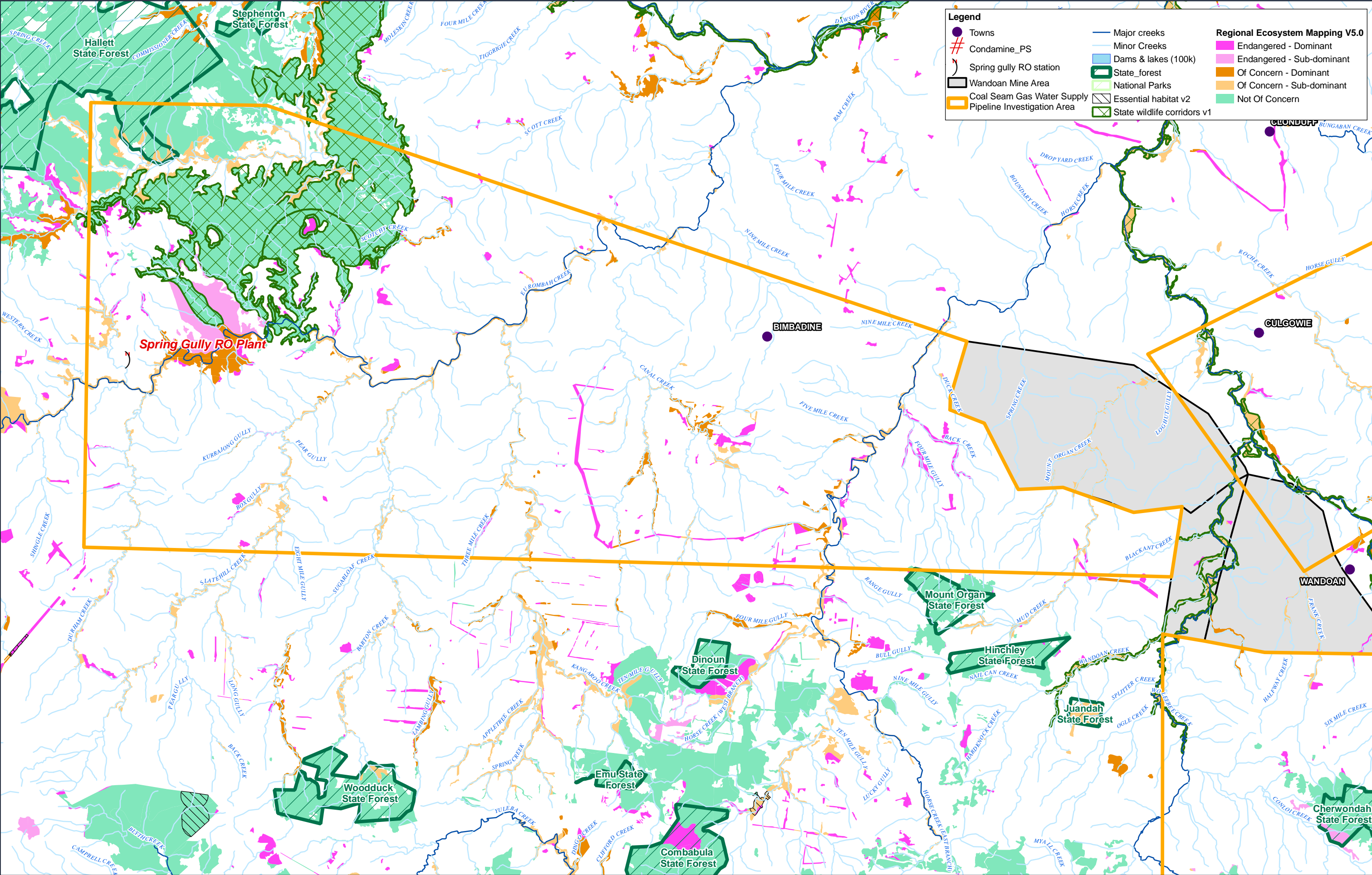
2.4.8 Flora and fauna

Historical land use practices within the study area have resulted in the majority of the study area having been cleared of remnant and native vegetation. However, reference to EPA Regional Ecosystem mapping indicates that there are a number of 'of concern' and 'endangered' regional ecosystems remaining within the study area, predominantly being riparian vegetation associated with waterways (refer Figure 2-8). Additionally, reference to the DEWHA Protected Matters Search Tool indicates that a number of threatened ecological communities and species are known, may or are likely to occur within the study area. Given the regulatory provisions at both the state and Federal level which apply to use or development of these resources, consideration of protected flora and fauna values is considered to be important to route selection and therefore have been included as a criterion in the comparative assessment of options.

2.5 Social, culture and heritage assessment criteria

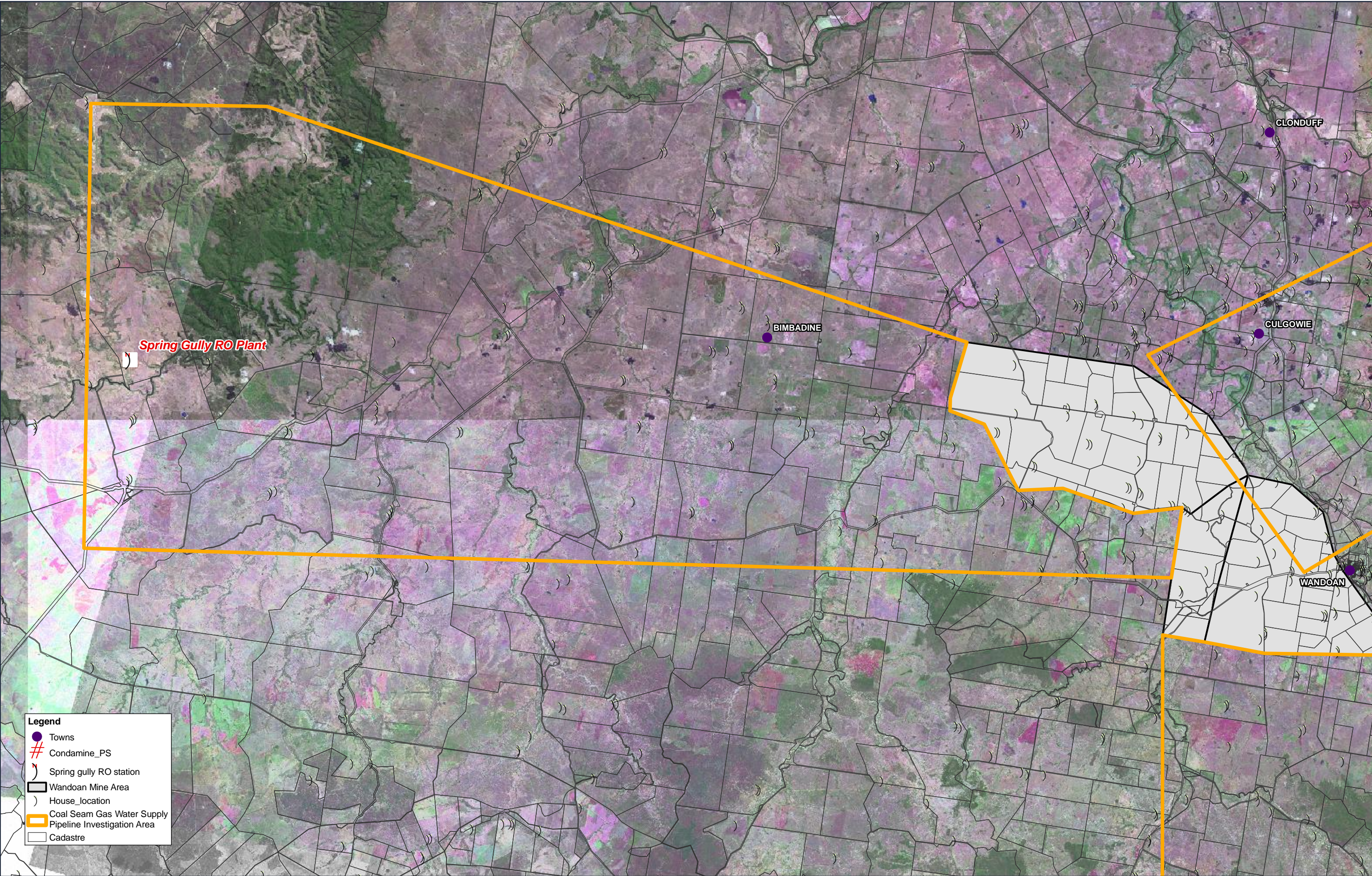
2.5.1 Houses and properties

The study area generally comprises large rural allotments utilised for predominantly agricultural land use activities including cropping and live-stock grazing. A number of homesteads (residences) and associated out-buildings are located within the study area on the various rural allotments (refer Figure 2-9). The proposed pipeline alignment options have been situated in order to ensure that the existing residences are not impacted by the proposed development.



Source: Vegetation Communities and Regional Ecosystems of Queensland, Ver 5.0, Environmental Protection Agency 2006. Interactive Resource and Tenure Maps, Department of Natural Resources and Mines 2007. Essential habitat info sourced from the Environmental Protection Agency.

Regional Ecosystems, essential habitat mapping and state forests within the study area



Source: Digital Cadastral Data Base, Department of Natural Resources and Mines 2005.
Interactive Resource and Tenure Maps, Department of Natural Resources and Mines 2007.

Location of houses and property boundaries

Acquisition of private property for establishment of easements for construction and operation of pipeline infrastructure can introduce issues such as increased cost for the Project, increased community anxiety and increased complexity in the acquisition/easement establishment process if a large number of property owners are involved. However, a number of the proposed pipeline options still propose to traverse private land and therefore, the number of properties impacted by the proposed pipeline is still considered to be an important selection criterion and has been included in the comparative assessment which has been undertaken in Section 4.

2.5.2 Visual amenity

The proposed pipeline infrastructure is proposed to generally be constructed underground and therefore, is not expected to contribute to on-going visual amenity impacts. However, vegetation clearing will be required in order to facilitate construction of the pipeline and such works may have visual amenity impacts. The extent of vegetation clearing is assessed under the impact on mapped regional ecosystems and therefore is not considered again here.

2.5.3 Cultural heritage

Indigenous cultural heritage

A search of NRW's register of Aboriginal cultural heritage was undertaken for the study area. The search results revealed that two sites, places and/or artefacts of Aboriginal cultural heritage significance are located within the study area. These registered Aboriginal cultural heritage sites are located within the northern portion of the study area and are not located adjacent to or within close proximity of the various pipeline route options. Therefore, negligible impacts to Aboriginal cultural heritage values are anticipated and this criterion has not been considered further in the comparative assessment of options.

It is to be noted that the accuracy of the locations of the sites as provided by NRW has not been verified, and the results represent only known sites on the register that have been identified through surveys undertaken as part of other infrastructure development projects. Accordingly, there is potential for further cultural heritage sites to be present in the study area, particularly in the vicinity of watercourses and permanent or semi permanent waterholes or natural springs or locations with outstanding landscape features such as rock outcrops or caves. Therefore, it is recommended that appropriate indigenous cultural heritage investigations and surveys be undertaken as part of the environmental impact assessment for the Wandoan Coal Project.

Non-indigenous cultural heritage

As mentioned above in Section 1, no places, objects or sites listed on the Queensland Heritage Register or Register of the National Estate are located along or immediately adjacent to the proposed pipeline route options. Therefore, minimal impacts to non-indigenous cultural heritage values are anticipated and this criterion will not be considered further in the comparative assessment of options.

2.5.4 Native title

A Native Title Claim by the Iman People No. 2, was lodged on 30 October 1997 and is registered. The National Native Tribunal number for this claim is QC97/55. Given the presence of a Native Title claim over the entire study area, this matter will apply to all pipeline route options and is not dependent upon route selection. Therefore, this criterion will not be further considered in the comparative analysis of options undertaken in Section 4.

2.6 Economic criteria

For commercial in confidence reasons, an analysis of costs associated with the various pipeline options is not included within this assessment.

2.7 Summary of selection criteria

A summary of the potential selection criteria and relevance to comparative assessment of the proposed pipeline options as discussed in preceding sections is provided in Table 2-3 below.

Table 2-3: Assessment of potential selection criteria

Assessment criteria	Relevance	Relevant criteria	Performance measures
Regulatory			
Commonwealth legislation (commensurate with flora and fauna criteria below)	<i>Environment Protection and Biodiversity Conservation Act 1999</i>	Yes	<ul style="list-style-type: none"> Approximate area of threatened ecological communities to be cleared
State legislation (commensurate with flora and fauna criteria below)	<i>Vegetation Management Act 1999, Nature Conservation Act 1992</i>	Yes	<ul style="list-style-type: none"> Approximate area of mapped regional ecosystems to be cleared Approximate area of mapped essential habitat to be cleared
Planning			
Land use	Land uses associated with temporary or permanent infrastructure or equipment i.e. gas fields, irrigation etc. Sensitive land uses such as schools, community facilities, cemeteries etc.	No	N/a
Land tenure	Land tenure across the study area is consistent (i.e. Rural A and Rural B) and does not vary significantly between pipeline options.	No	N/a

Assessment criteria	Relevance	Relevant criteria	Performance measures
Good Quality Agricultural Land	Sterilisation of or impact on productive and intensive agricultural land (e.g. good quality agricultural land should be minimised).	Yes	<ul style="list-style-type: none"> Area of GQAL traversed
Petroleum and mining leases	Conflict with existing mining leases and mineral development licences has not been identified. Approval of petroleum lease holder required to cross petroleum lease area.	No	N/a
Future resource areas	Resource areas have been identified for future development within the study area. Pipeline route options should avoid sterilisation of these resources.	No	N/a
Local government planning schemes	The proposed pipeline is considered to be exempt development in relevant planning schemes.	No	N/a
Existing infrastructure	Crossing existing infrastructure may have implications such as safety and increased design and construction cost. Therefore, the number of crossings may influence route selection.	Yes	<ul style="list-style-type: none"> Length of pipeline within road reserve
Environment			
Topography	The general terrain of the study area varies mildly from relatively flat alluvial plains adjacent to waterways in the east and central portions to elevated areas forming the foothills of the Carnarvon Range in the west.	No	N/a
Geology and soils	All pipeline options will traverse a similar route in terms of soils and geology. Therefore, the overall relevance of this criterion to options assessment and comparison is considered to be negated.	No	N/a
Watercourses and wetlands	Crossing waterways and wetlands may have implications such as application of regulatory provisions and increased costs for design and construction. Therefore, the number of crossings may influence the route selection.	Yes	<ul style="list-style-type: none"> Number of waterways to be crossed
Fire risk	Bushfire fire risk mapping indicates that the study area varies between low and	No	N/a

Assessment criteria	Relevance	Relevant criteria	Performance measures
	medium bushfire hazard. Fire risk does not vary significantly between options.		
Flora and fauna values	Potential impacts on threatened vegetation communities could differentiate between route options and may influence route selection.	Yes	<ul style="list-style-type: none"> Approximate area of mapped regional ecosystems to be cleared
Social			
Residences and sensitive receptors	Existing residences and associated buildings will be identified and avoided during the route selection process.	No	N/a
Properties and landholders	The pipeline route options may traverse privately owned and leased land. This may have implications for project consultation and cost.	Yes	<ul style="list-style-type: none"> Number of properties affected
Visual amenity	The proposed pipeline will be located underground and therefore, operational visual amenity is expected to be minimal. Construction impacts through clearance of vegetation may be evident, however, this will be assessed under flora and vegetation criteria.	No	N/a
Indigenous cultural heritage	Aboriginal cultural heritage sites are not located adjacent to or within close proximity of the proposed pipeline route alignments.	No	N/a
Non-indigenous cultural heritage	Non-indigenous places, sites, objects etc have not been identified within the study area. Therefore, no impact to these cultural resources is expected.	No	N/a
Economic			
Cost and constructability	Length of pipeline, number of privately owned properties impacted, number of pump stations etc are all factors which may influence the cost and constructability of the proposed pipeline.	Yes	N/a

3. Option development

The development of pipeline route options for consideration in this route selection was based on a number of common requirements for the proposed infrastructure which included:

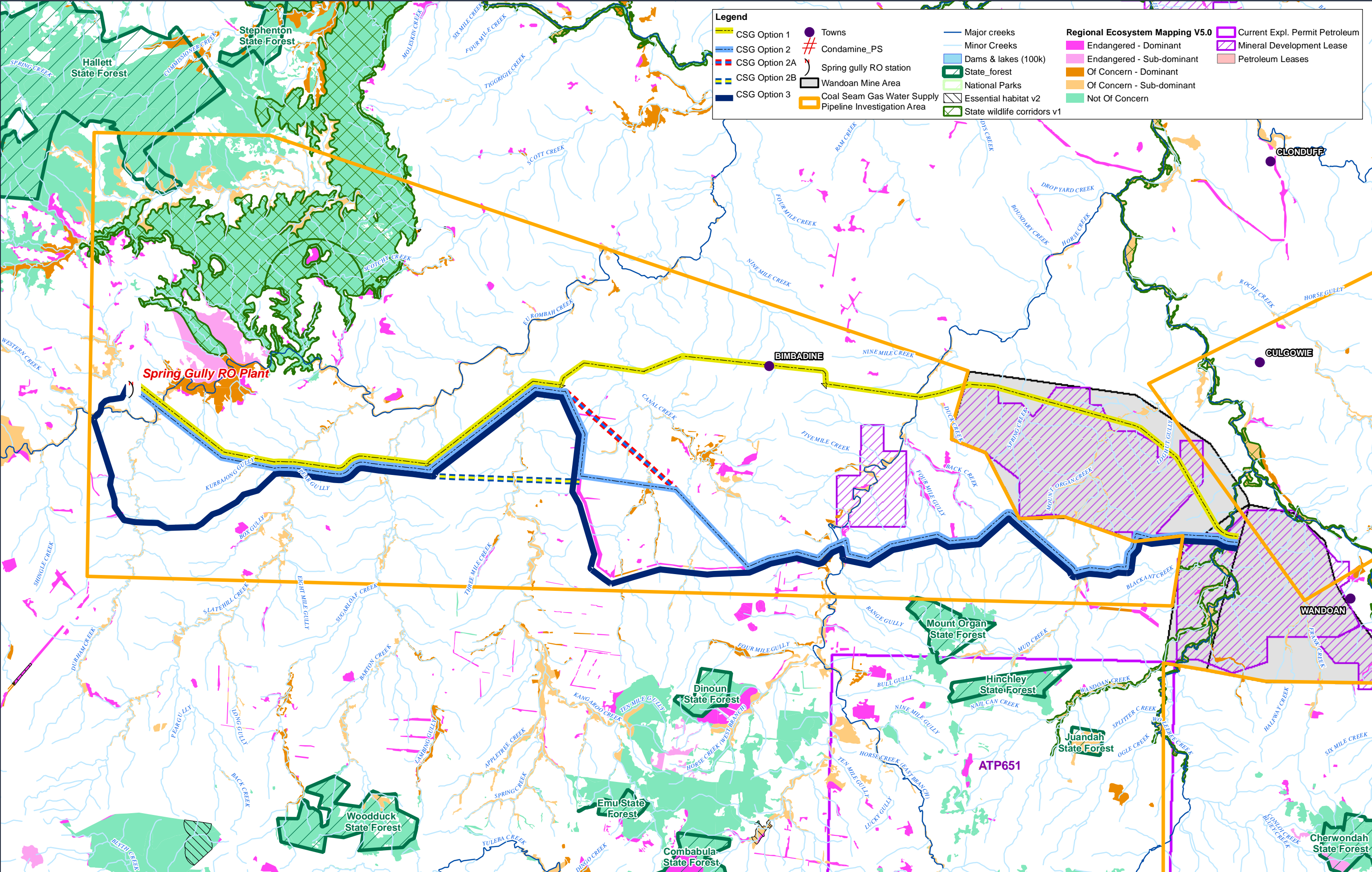
- transport of CSM water from the Spring Gully and Fairview CSM fields
- capacity for delivery of a minimum of 11,400 ML/a
- delivery of the water direct to a dam on the Wandoan Coal Project area
- minimisation of overall route length to reduce the dynamic (friction) head loss and capital cost associated with the pipeline
- adopting a configuration warranting minimal capital cost in terms of pipeline class and diameter, against the cost of a secondary pumping station.

Additionally, a number of site specific, practicality and constructability issues were identified for inclusion in pipeline option development. The additional criteria considered include:

- minimisation of height extremes to reduce the overall static head, power requirements of the pump station and overall pipe diameter
- preferable location within public land to avoid potential land use impacts on local landowners and reduce the number of parties involved in subsequent land acquisition negotiations.

Based on the issues outlined above, six potential pipeline route alignments were identified, to which the selection criteria detailed in Section 2 have been applied and a comparative assessment undertaken (refer Section 4). A description of the proposed pipeline alignments is included in the following sections and the proposed alignments are diagrammatically displayed in Figure 3-1.

It should be noted that the final pipeline alignment through the PLs which constitute the Spring Gully CSM extraction fields will be subject to future negotiation between WJV and relevant petroleum lease holders. Additionally, the final pipeline alignment through the Wandoan Coal Project MLA area will also be subject to future finalisation of the mine layout plan. Therefore, the sections of pipeline within the petroleum leases and the MLA area as represented on Figure 3-1 are indicative only and may be altered based on future CSM water supply negotiations and detailed mine planning.



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3.1 Description of options

3.1.1 Option 1

Option 1 begins at the existing reverse osmosis plant at the Spring Gully coal seam methane fields and will traverse the existing PLs generally in a south-easterly direction. The alignment through the PLs has not as yet been finalised and will be the subject of future negotiations between the PL holders and the WJV. At some point within the PLs the alignment is proposed to intersect with the Roma-Taroom Road. The proposed pipeline then follows Roma-Taroom Road in a north-easterly direction until the north-western property boundary of Lot 9 on plan AB127. The proposed alignment then turns east along the property boundary between Lot 9 on plan AB127 and Lot 8 on plan AB127. The eastern 'L' section of Lot 9 on plan AB127 is proposed to be traversed to meet the Goldens Bimbadeen Road from which the proposed alignment travels east until the intersection with Ferrets Road. From this point, the proposed alignment continues in an easterly direction and utilises the southern property boundary of Lot 132 on plan SP121742. The south-eastern corner of this same allotment is then proposed to be traversed, then onto the south-western corner of Lot 58 on plan FT556 until it meets the western boundary of the Wandoan Coal Project MLA. The proposed alignment within the MLA area to the termination point at the proposed mine infrastructure area of the Wandoan Coal Project site is not yet finalised and will be determined dependent on the final mine layout in order to avoid proposed pit areas and other mine infrastructure.

Option 1 is approximately 91 km in length, is the shortest pipeline option and is proposed to be constructed both within road reserve and other land parcels.

3.1.2 Option 2

Option 2 follows the same alignment as Option 1 until the intersection of Roma-Taroom Road and Lot 9 on plan AB127. The alignment then turns south along Canal Clifford Road and continues to the southern boundary of Lot 10 on plan AB120. An easterly turn is made in the alignment along the property boundary between Lot 4 on plan AB20 and Lot 5 on plan AB27. Approximately two-thirds of the way along this boundary, a north-easterly alignment is taken before crossing the south-western corner of Lot 7 on plan RP868228 to meet the north-eastern point of Lot 9 on plan AB112. The proposed alignment then travels in a south-easterly direction across Lot 6 on plan AB112 until reaching the intersection of Bundi Clifford and Dragon Crest Roads. From this point, the proposed Option 2 alignment turns east and follows Bundi Clifford Road, Bundi Road until the north-easterly point of Lot 14 on plan FT165. From here, the proposed pipeline alignment enters the southern boundary of the Wandoan Coal Project MLA. The proposed alignment within the MLA area to the termination point at the proposed mine infrastructure area of the Wandoan Coal Project site is not yet finalised and will be determined dependent on the final mine layout in order to avoid proposed pit areas and other mine infrastructure.

Option 2 is approximately 99 km in length and is proposed to be constructed both within road reserve and other land parcels.

3.1.3 Option 2A

Option 2A is similar to Option 2 described above for the majority of the proposed pipeline alignment. A deviation between the two routes occurs at the intersection of Roma-Taroom Road and Lot 9 on plan AB12 where Option 2A turns in a south-easterly direction and traverses Lot 9 on plan AB127 and Lot 4 on plan AB20. This deviation meets again with proposed Option 2 at the south-west corner of Lot 7 on plan RP868228, from where it follows the remainder of the proposed Option 2 alignment to the southern boundary of the Wandoan Coal Project MLA. The proposed alignment within the MLA area to the termination point at the proposed mine infrastructure area of the Wandoan Coal Project site is not yet finalised and will be determined dependent on the final mine layout in order to avoid proposed pit areas and other mine infrastructure.

Option 2A is approximately 97 km in length and is proposed to be constructed both within road reserve and other land parcels.

3.1.4 Option 2B

Option 2B is also similar to Option 2 for the majority of the proposed pipeline alignment. A deviation between the two routes occurs along the property boundary of Lot 1 on plan AB144 and the Roma-Taroom Road where the proposed pipeline leaves the road and continues along the property boundary between Lot 1 on plan AB144 and Lot 6 on plan AB155. The proposed alignment then continues in an easterly direction traversing both Lot 6 on plan AB155 and Lot 11 on plan AB153 until it intersects with Canal Clifford Road. At this point, the alignment meets the Option 2 alignment at the southern boundary of Lot 10 on plan AB120. From this point, Option 2B follows the remainder of the proposed Option 2 alignment to the southern boundary of the Wandoan Coal Project MLA. The proposed alignment within the MLA area to the termination point at the proposed mine infrastructure area of the Wandoan Coal Project site is not yet finalised and will be determined dependent on the final mine layout in order to avoid proposed pit areas and other mine infrastructure.

Option 2B is approximately 92 km in length and is proposed to be constructed both within road reserve and other land parcels.

3.1.5 Option 3

Option 3 also begins at the Spring Gully reverse osmosis plant, then turns south and follows Wybara Road to its intersection with Roma-Taroom Road. The proposed alignment then turns east and follows Roma-Taroom Road until its intersection with Canal Clifford Road. The alignment then turns south and follows Canal Clifford Road to its intersection with Bundi Clifford Road from where it turns east and follows the Bundi Clifford Road to its intersection with Dragon Crest Road. From this point, the proposed Option 3 alignment follows the remainder of the proposed Option 2 alignment to the southern boundary of the Wandoan Coal Project MLA. The proposed alignment within the MLA area to the termination point at the proposed mine infrastructure area of the Wandoan Coal Project site is not yet finalised and will be determined dependent on the final mine layout in order to avoid proposed pit areas and other mine infrastructure.

Option 3 is the longest pipeline route at approximately 115 km and is proposed to be situated within road reserve for the entire length.

3.1.6 Option 4

Option 4 is similar in alignment to Option 2B until Lot 6 on plan AB112. Shortly into Lot 6 on plan AB112, the proposed alignment turns in an easterly direction and traverses the northern portion of this allotment in a straight line until it meets the road reserve of Dragon Crest Road. At this point, the alignment turns in a north-easterly direction and follows the Dragon Crest Road until the north-east corner of the western portion of Lot 37 on plan AB180. From this point, the proposed alignment traverses the eastern portion of Lot 37 on plan AB180 and Lot 24 on plan SP174422 until it intersects with the Goldens Bimbadeen Road from where it follows the proposed alignment of Option 1 to the western boundary of the Wandoan Coal Project MLA. The proposed alignment within the MLA area to the termination point at the proposed mine infrastructure area of the Wandoan Coal Project site is not yet finalised and will be determined dependent on the final mine layout in order to avoid proposed pit areas and other mine infrastructure.

Option 4 is approximately 93 km in length and is proposed to be constructed both within road reserve and other land parcels.

4. Comparative assessment of options

This section provides a comparative assessment of pipeline route options according to performance criteria identified in Section 2. A ranking approach has been used. These rankings relate to the extent the option results meet performance criteria, taking into consideration level of impact and other aspects discussed in Section 2. The ranking system ranges from 1 (least impact or preferred option), represented by green colouring, to 5 (greatest impact or least preferred), indicated by red. It should be noted that more than one option can be awarded the same ranking should assessment against the performance criteria be equal or comparative. An assessment is made based on professional judgement where necessary as to whether any difference between options is significant for the purpose of this coding. An option with all 1's, or green colouring, is preferred over one with one or more 5's (red colouring). Otherwise, for the purpose of this assessment the preferred option is generally the option with fewer rankings of 5.

Where a simple comparison of rankings for the options under consideration might be misleading because of the relative importance of the criteria being considered, an assessment has been made based on the professional judgement of relevant specialists within PB and commentary provided on the assessment table. Table 4-1 shows the six options that have been comparatively assessed to determine the optimal pipeline route alignment. This table is intended as a visual tool only, and must be read in conjunction with the description of the assessment against each performance criteria provided in Section 4.1.

It should be noted that a pipeline corridor width of 50 m has been used in calculations prepared for Table 4-1. Whilst it is expected that the actual pipeline and access track will likely only have a construction footprint of 10 m width, designs are still in preliminary stages and it would be inappropriate to fix the width at this stage. Additionally, adopting a pipeline corridor width of 50 m will allow for realignment of the pipeline in some areas where additional environmental values may be observed on-the-ground as part of field studies conducted during the environmental impact assessment. The calculations in Table 4-1 do not include any areas for stockpiling or layover of equipment. It is assumed that existing and suitable cleared areas will be found for this purpose during construction works. The only land requirement will be the area of any future easement which will only be known once the detailed design has been completed.

Table 4-1: Comparative assessment of options (for pipeline corridor width of 50 m)

Performance measure	Option 1	Option 2	Option 2A	Option 2B	Option 3	Option 4
Properties						
Number of properties affected	1	3	1	3	1	5
Area (ha) of properties affected	2	3	3	4	1	5
Road reserves						
Distance within road reserves	3	4	3	2	5	1
Waterways						
Number of waterways to be crossed	1	1	1	1	1	1
Approximate area mapped of mapped regional ecosystems to be cleared						
Total area of all regional ecosystems along option alignment	1	4	3	3	5	2
GQAL						
Area of GQAL traversed outside of road reserves	2	3	3	4	1	5

4.1 Review of criteria

4.1.1 Number of properties affected

Table 4-2 outlines the number and area (ha) of privately owned properties which would be affected by each proposed pipeline alignment option. The area calculation is based on a potential corridor width of 50 m.

Table 4-2: Comparison properties affected across pipeline route options

Route option	Total no. of properties affected	Total area of properties affected (ha)
Option 1	4	55.02
Option 2	5	81.44
Option 2A	4	93.62
Option 2B	6	132.83
Option 3	3	9.32
Option 4	11	172.29

Location of large sections of the pipeline within privately owned allotments may encompass implications including increased project cost associated with greater areas of land acquisition and access requirements and (possible) more complex negotiation processes given the increased amount of landholders involved. In terms of the alignment options considered, Option 3 would affect the least amount of private properties, followed closely by Options 1 and 2A. Option 1 is the shortest pipeline route, whilst Option 3 is the longest pipeline route and is located predominantly within local and State government road reserves.

Options 2 and 2B affect a similar number of properties whilst Option 4 affects the greatest number of privately owned properties and therefore, is not the preferred option for this performance measure.

Option 3 is the preferred alignment option based on this performance measure.

4.1.2 Length of proposed pipeline within road reserve

Table 4-3 outlines the length of the pipeline options which are proposed to be located within road reserve (local government and state controlled roads).

Table 4-3: Comparison of pipeline lengths within road reserves

Route option	Length of pipeline	Length of pipeline proposed within road reserve	Total % of pipeline proposed within road reserve
Option 1	91 km	43.9 km	48.2%
Option 2	99 km	52.6 km	53.1%
Option 2A	97 km	46.4 km	47.8%
Option 2B	92 km	34.2 km	37.2%
Option 3	115 km	93.5 km	81.3%
Option 4	93 km	22.2 km	23.9%

Option 3 is located predominantly within local authority and state controlled road reserves. Whilst this may negate complexities associated with land acquisition, access requirements and landholder negotiation, it should be noted that the majority of remnant vegetation within the study area is located within road reserves due to extensive clearing undertaken as part of historical land use practices of the area. Further, construction works within the road reserve may also have safety and traffic flow implications resulting in inconvenience for road users. Therefore, in an attempt to balance these somewhat competing performance measures, an alignment utilising both private land and road reserve is considered appropriate. Therefore, Option 3 is not the preferred option with regard to this performance measure.

Option 1 is the shortest pipeline alignment and proposes to utilise both private land and road reserves in almost equal proportions. Option 4 proposes to predominantly utilise private land as only 23.9% of the length of the pipeline is proposed to be located in road reserve. However, Option 4 impacts on the greatest number of private land parcels (refer Table 4-2). Whilst minimal impact to mapped regional ecosystems is preferred, location of pipelines within private land also has associated issues including impact to landowners, land acquisition/easement establishment costs, potential disruption to existing and future land use activities and therefore, Option 4 is not the preferred option with regard to this performance measure.

Options 2, 2A and 2B are relatively similar in the number of private allotments which may be affected (refer Table 4-2), however they differ in the length of pipeline proposed to be contained within road reserves. Of these three options, Option 2B proposes the shortest length within road reserves and therefore encompasses the lowest combined impact of all inter-related performance measures on this regard.

It should be noted, however, that approval and/or consent from the administering authority for the road reserve i.e. local governments for local government roads and the Department of Main Roads for state controlled roads, will be required in order to construct the pipeline within any road reserve.

Option 2B is the preferred option for this performance measure, as it results in the lowest combined impact with regard to issues associated with proposed location of the pipeline within road reserves including clearing of roadside vegetation (which may be mapped as regional ecosystem remnant vegetation) and number of privately owned allotments to be affected.

4.1.3 Number of waterway crossings

The waterways potentially impacted by the proposed pipeline development include (but are not limited to) Eurombah Creek, Horse Creek, Canal Creek and Three Mile Creek. As detailed in Table 4-4, Options 2, 2A and 2B traverse four watercourses across their total length whilst Options 1 and 4 traverse five watercourses and Option 3 traverses six watercourses along the total pipeline length. Assuming that the required waterway crossings will be of similar length and complexity, there is little difference regarding waterway crossings between the six proposed pipeline options and the results for this selection criterion do not indicate clear benefits or detractors for any of the alignment options.

In summary, the six pipeline alignment options are all equally preferred options for this performance measure.

Table 4-4: Comparison of waterway and wetland crossings across pipeline route options

Route option	Total number of waterway crossings
Option 1	5
Option 2	4
Option 2A	4
Option 2B	4
Option 3	6
Option 4	5

4.1.4 Regional ecosystem areas to be crossed

Calculations prepared for this comparative assessment of options indicate that all six proposed pipeline alignment options will involve clearing of some mapped regional ecosystem areas, as shown in Table 4-5.

Initial ecological field assessments of the proposed pipeline alignments have not yet been conducted and therefore, potential inaccuracies in the regional ecosystem mapping may exist which have not yet been identified. It is recommended that areas of mapped regional ecosystems are considered during the detailed assessment for the environmental impact statement, and where required, mitigation measures developed to minimise any impacts.

Table 4-5: Comparison of mapped regional ecosystem areas across pipeline route options

Route option	Area of 'endangered – dominant' regional ecosystem	Area of 'of concern – dominant' regional ecosystem	Area of 'of concern – subdominant' regional ecosystem	Total area of regional ecosystem areas to be crossed
Option 1	0	0	1.87	1.87
Option 2	36.43	12.32	2.72	51.47
Option 2A	13.51	12.32	5.03	30.85
Option 2B	14.03	13.24	1.94	29.21
Option 3	110.79	25.18	8.3	144.27
Option 4	1.48	0.87	1.55	3.89

Note: 'not of concern' or 'endangered – subdominant' regional ecosystems will not be affected by the proposed pipeline alignments and therefore, are not listed in the above table.

Option 3 has the potential to impact the largest area of mapped regional ecosystems and includes the largest areas of 'endangered – dominant', 'of concern – dominant' and 'of concern – subdominant' remnant vegetation. Therefore, Option 3 is not the preferred pipeline alignment option based on this performance measure.

Options 1 and 4 clearly have the potential to impact the least amount of mapped regional ecosystems across the pipeline alignment options. Option 1 may involve clearing of 'of concern – subdominant' remnant vegetation whilst avoiding areas of 'of concern – dominant' and 'endangered dominant' remnant vegetation. However, Option 4 may involve clearing of 'of concern – dominant', 'of concern – subdominant' and 'endangered – dominant'. Therefore, Option 1 would be preferred over Option 4 with regard to this performance

measure as the overall area of regional ecosystems which may be cleared is less for Option 1 and Option 1 also avoids areas of 'endangered – dominant' regional ecosystem.

Options 2, 2A and 2B all contain mapped regional ecosystem areas and include areas of 'endangered – dominant', 'of concern – dominant' and 'of concern – subdominant' remnant vegetation. These three options may require clearing of significantly larger amounts of remnant vegetation than Options 1 and 4 and therefore, have been discounted as feasible options with regard to this performance criteria.

However, it should be noted that the calculations contained in Table 4-5 are based on a 50 m wide corridor. Therefore it is possible that the pipeline alignment may be repositioned or relocated within this corridor to avoid remnant vegetation and consequently further reduce any associated impacts on areas of remnant vegetation required to be cleared. It is recommended that final positioning of the pipeline within the corridor be undertaken as part of the environmental impact assessment process and only be undertaken after field inspections have been conducted to ratify the accuracy of the regional ecosystem mapping.

Option 1 is the preferred alignment option based on this performance measure followed by Option 4.

4.1.5 Good quality agricultural land

All six options traverse land mapped as Class A and Class B GQAL (Table 4-6). Whilst all pipeline options are proposed to be constructed underground, an easement will be required over the pipeline and terms and conditions of the easement agreement may limit or restrict current or future land use activities which can be conducted within the easement area, thereby potentially affecting a landowners use of the easement area and GQAL. *In terms of this criterion, Option 3 is preferred in that it traverses the least amount of GQAL outside of road reserves.*

Table 4-6: Good quality agricultural land

Route option	Class A (ha)	Within road reserve (ha)	Total outside road reserve (ha)
Option 1	445	357	88
Option 2	446	302	144
Option 2A	412	239	172
Option 2B	352	128	224
Option 3	557	554	2
Option 4	412	139	273

4.1.6 Indicative pipeline cost

For commercial in confidence reasons, an analysis of costs associated with the various pipeline options is not included within this assessment.

4.1.7 Comparative analysis

A preliminary hydraulic analysis has been performed on each of the six options. The initial elevation at Spring Gully Reverse Osmosis (RO) plant is 308 m AHD. Maximum elevations on all pipeline routes are of the order of 310 m and occur near the RO plant. Surface elevations fluctuate moderately with minimum elevations on the order of 240 m AHD in stream beds. The final elevation at the raw water dam is approximately 250 m AHD.

The initial design seeks to minimise the pipe diameter as much as possible, to reduce overall costs. As pipe diameters are reduced, friction within the pipe increases. As a result, the pump head required to drive the water through the pipeline increases.

Since there are no substantial electrical power sources within the study area it is assumed that one pump station at the RO plant must provide sufficient head to drive the water nearly 100 km to the raw water dam in the Wandoan Coal Project mine infrastructure area.

Preliminary hydraulic analysis draped all six routes over existing topographic data. While the use of PE pipe was considered, high heads at the pump station require a very thick walled pipe. As a result PE pipe is not cost competitive to DICL or MSCL pipe. Maximum pressure in the pipe was limited to 350 m of head so that DICL PN35 could be used. It was assumed that a single pipe diameter would be used for the length of the route. During subsequent design stages the pipeline design should be optimised to ensure that both capital costs associated with pipe and pump works and operation costs are minimised. Note that water hammer analysis must be performed in subsequent design stages and incorporated into pipeline design and material selection. Indicative design parameters for all proposed pipeline options (for 40 Mt/a scenario) are provided in Table 4-7.

Table 4-7 Indicative design parameters for pipeline options (40 Mt/a scenario)

Design parameter	Option 1	Option 2	Option 2A	Option 2B	Option 3	Option 4
Pipe specification	DICL pipe – DN600 PN35 AS/NZS 2280 K9	DICL pipe – DN600 PN35 AS/NZS 2280 K9	DICL pipe – DN600 PN35 AS/NZS 2280 K9	DICL pipe – DN600 PN20 AS/NZS 2280 K9	DICL pipe – DN600 PN35 AS/NZS 2280 K9	DICL pipe – DN600 PN35 AS/NZS 2280 K9
Pipeline length	91 km	99 km	97 km	92 km	115 km	93 km
pump power requirement (kW)	1,146	1,175	1,175	1,079	1,365	1,146
maximum pressure head (m)	217	250	531	232	283	217
static head (m)	-60	-60	-60	-60	-60	-60
loss factor K	0.15	0.15	0.15	0.15	0.15	0.15
pumping hours (hr/day)	20	20	20	20	20	20
flow rate (l/s)	434	434	434	434	434	434
flow rate (ML/day)	31	31	31	31	31	31
flow rate (ML/annum)	11,400	11,400	11,400	11,400	11,400	11,400

4.2 Conclusion

Six options were considered for analysis for a proposed pipeline route to supply the Wandoan Coal Project with water from the Origin and Santos coal seam methane fields, approximately 100 km to the west at Spring Gully and Fairview.

Options 2, 2A and 2B performed relatively similarly with regard to the criteria considered in the comparative analysis and no clear benefits or detractions for or against any of these alignment options became apparent. Of these options, Option 2B affected the second largest amount of good quality agricultural land. Option 2A performed averagely across all criteria whilst Option 2 included the second greatest length within road reserves and consequently may have impacted the second greatest amount of mapped regional ecosystems.

Options 3 and 4 can be considered as the worst performing options against the criteria in the comparative assessment. Option 3 is located predominantly within State and local government road reserves and therefore, also impacts the least number of privately owned properties. However, field observation indicates, that the majority of remnant vegetation within the study area is located within road reserves as a result of extensive vegetation clearing for historical land uses such as grazing and cropping. As such, this option is the least preferred due to its significant impact on mapped regional ecosystems. Due to its greater length, it is also the most costly of all the options analysed (30 Mt/a and 40 Mt/a scenarios). Option 4 affects the greatest number and area of privately owned properties, the greatest amount of privately owned land and the greatest amount of good quality agricultural land. Despite having the shortest length of pipeline proposed within road reserves, Option 4 may potentially affect more mapped regional ecosystems than Option 1.

Of the options considered, Option 1 is the option with the least impact to mapped regional ecosystems, affects the least number of privately owned properties and is the shortest pipeline length and therefore has the least associated cost (40 Mt/a scenario). In summary, Option 1 is regarded as the overall preferred alignment across a number of the criteria which were included in the comparative analysis.

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