# 27. SUMMARY OF KEY IMPACTS

The Surat Gas Project environmental impact statement (EIS) has identified and assessed the potential environmental and social impacts that may occur during the construction, operation and decommissioning phases of the project. This chapter summarises the identified key residual impacts for the Surat Gas Project, and discusses Arrow's approach to management of these impacts.

## 27.1 Impact Assessment Summary

Potential impacts were assessed using one of three methods: significance assessment, risk assessment or compliance assessment (see Chapter 7, Impact Assessment Method). The potential social and environmental impacts associated with the Surat Gas Project along with the proposed avoidance, mitigation and management measures that will reduce the environmental and social impacts to acceptable residual levels, are identified in Chapters 9 to 26.

Impacts assessed with a moderate and above residual significance or a medium and above residual risk are summarised in Table 27.1. Impacts assessed using the compliance approach are not included in the table as modelling indicated compliance with relevant regulatory objectives.

It should be noted that there is a degree of uncertainty in the residual impacts which are contingent upon the actual location of the project infrastructure insofar as the residual impacts cannot be accurately qualified without additional studies. There is uncertainty in residual impacts related to groundwater, agriculture, roads and transport, social and terrestrial flora and fauna aspects. These aspects are further discussed below, along with the proposed studies required to better understand the residual impact.

**Table 27.1 Summary of key impacts**

| Potential Impact Description | Residual Impact Assessment | | |
|---|---|---|---|
| | **Sensitivity/ Likelihood** | **Magnitude/ Consequence** | **Significance/ Risk** |
| ***Groundwater*** | | | |
| Coal seam gas water extraction from the Walloon Coal Measures causing reduced flows to groundwater dependent ecosystems and areas of cultural and spiritual importance fed by aquifers in the deep groundwater system. | High | Very Low to Low | Low to Moderate |
| Coal seam gas water extraction from the Walloon Coal Measures causing reduced flows to groundwater supply to existing or future groundwater users accessing groundwater from aquifers in the deep groundwater system. | High | Very Low to Low | Low to Moderate |
| Surface activities causing diminished groundwater quality in the shallow groundwater system. | Moderate | Low | Moderate |
| Sub-surface depressurisation activities causing groundwater mixing and diminished groundwater quality in the shallow groundwater system. | Moderate | Low | Moderate |
| Sub-surface depressurisation activities causing groundwater mixing and diminished groundwater quality in the intermediate groundwater system. | Moderate | Low | Moderate |
| Sub-surface depressurisation activities causing groundwater mixing and diminished groundwater quality in the deep groundwater system. | High | Low | Moderate |

**Table 27.1 Summary of key impacts (cont'd)**

| Potential Impact Description | Residual Impact Assessment | | |
|---|---|---|---|
| | Sensitivity/ Likelihood | Magnitude/ Consequence | Significance/ Risk |
| ***Surface Water*** | | | |
| Changes to physical form (wetlands and permanent and semi-permanent watercourses). | Moderate | Moderate | Moderate |
| Changes to hydrology (wetlands and permanent and semi-permanent watercourses). | Moderate | Moderate | Moderate |
| Surface water quality degradation (wetlands). | Moderate | Moderate | Moderate |
| ***Aquatic Ecology*** | | | |
| Erosion and sediment transport causing changed flow patterns, high turbidity or smothering of benthic aquatic habitat (indirect impacts to Lake Broadwater and Oakey Creek upstream of site C). | High | Low | Moderate |
| A decline in water quality and increased algal blooms (indirect impacts to Lake Broadwater and Oakey Creek upstream of site C). | High | Low | Moderate |
| Introduction of exotic aquatic flora species (indirect impacts to Lake Broadwater and Oakey Creek upstream of site C). | High | Low | Moderate |
| Reduced aquatic biota movement or feeding patterns (indirect impacts to Lake Broadwater and Oakey Creek upstream of site C). | High | Low | Moderate |
| Habitat loss, modification or fragmentation (indirect impacts to Lake Broadwater and Oakey Creek upstream of site C). | High | Low | Moderate |
| ***Terrestrial Flora and Fauna*** | | | |
| Habitat fragmentation and isolation of populations (EPBC Communities: Brigalow, Semi-evergreen vine thickets, and weeping myall woodlands. Regional ecosystems (RE's) 11.3.1, 11.4.3, 11.4.10, 11.9.5, 11.9.6, 11.9.4a and 11.8.3. RE's with an 'endangered' Biodiversity Status, not EPBC-listed: 11.3.17, 11.9.10 and 11.4.12. Category B environmentally sensitive areas (ESA's). Essential habitat (supporting listed wildlife species)). | High | Low | Moderate |
| Habitat fragmentation and isolation of populations (Category C ESA by tenure: Bendidee State Forest which provides habitat to the Bulloak jewel butterfly). | High | High | High[§] |
| Habitat fragmentation and isolation of populations (Category C ESA's by tenure: Gurulmundi State Forest, Binkey State Forest and Barakula State Forest. Wayaga-Kindon Ooline populations and Stock routes* and state/bioregional wildlife corridors). | High | Moderate | Moderate |

**Table 27.1 Summary of key impacts (cont'd)**

| Potential Impact Description | Residual Impact Assessment | | |
|---|---|---|---|
| | Sensitivity/ Likelihood | Magnitude/ Consequence | Significance/ Risk |
| ***Terrestrial Flora and Fauna (cont'd)*** | | | |
| Habitat loss, degradation and fauna mortality (EPBC Communities: Brigalow, Semi-evergreen vine thickets, and weeping myall woodlands. RE's 11.3.1, 11.4.3, 11.4.10, 11.9.5, 11.9.6, 11.9.4a and 11.8.3. RE's with an 'endangered' Biodiversity Status, not EPBC-listed: 11.3.17, 11.9.10 and 11.4.12. Category B ESA's. Essential habitat (supporting listed wildlife species)). | High | Low | Moderate |
| Habitat loss, degradation and fauna mortality (Category C ESA by tenure: Bendidee State Forest which provides habitat to the Bulloak jewel butterfly). | High | High | High[§] |
| Habitat loss, degradation and fauna mortality (Category C ESA's by tenure: Gurulmundi State Forest, Binkey State Forest and Barakula State Forest). | High | Low | Moderate |
| Habitat loss, degradation and fauna mortality (Wayaga-Kindon Ooline populations and Stock routes* and state/bioregional wildlife corridors). | High | Moderate | Moderate |
| Edge effects (EPBC Communities: Brigalow, Semi-evergreen vine thickets, and weeping myall woodlands. RE's 11.3.1, 11.4.3, 11.4.10, 11.9.5, 11.9.6, 11.9.4a and 11.8.3. RE's with an 'endangered' Biodiversity Status, not EPBC-listed: 11.3.17, 11.9.10 and 11.4.12. Category B ESA's. Category C ESA's: Gurulmundi State Forest, Binkey State Forest and Barakula State Forest. Wayaga-Kindon Ooline populations and essential habitat (supporting listed wildlife species)). | High | Low | Moderate |
| Edge effects (Category C ESA by tenure: Bendidee State Forest). | High | Moderate | Moderate |
| Edge effects (stock routes* and state/bioregional wildlife corridors). | High | Moderate | Moderate |
| Altered ecological processes (EPBC Communities: Brigalow, Semi-evergreen vine thickets. RE's 11.3.1, 11.4.3, 11.4.10, 11.9.5, 11.9.6, 11.9.4a and 11.8.3. RE's with an 'endangered' Biodiversity Status, not EPBC-listed: 11.3.17, 11.9.10 and 11.4.12. Category B ESA's. Category C ESA's by tenure: Gurulmundi State Forest, Binkey State Forest and Barakula State Forest. Wayaga-Kindon Ooline populations). | High | Insignificant to low | Low to Moderate |
| Altered ecological processes (Category C ESA by tenure: Bendidee State Forest, stock routes* and state/bioregional wildlife corridors and essential habitat (supporting listed wildlife species)). | High | Low | Moderate |
| ***Landscape and Visual Amenity*** | | | |
| Changes in landscape character (Landscape Types A – Wooded River Valley and H – Terraced Brigalow Farmland). | Medium | Noticeable to Considerable | Moderate |

**Table 27.1 Summary of key impacts (cont'd)**

| Potential Impact Description | Residual Impact Assessment | | |
|---|---|---|---|
| | **Sensitivity/ Likelihood** | **Magnitude/ Consequence** | **Significance/ Risk** |
| ***Landscape and Visual Amenity (cont'd)*** | | | |
| Changes in landscape character (Landscape Types D – Lowland Native Forest, E – Elevated Native Forest and F – Foothill Plains and Valleys). | Medium | Imperceptible to Noticeable | Low to Moderate |
| Changes in landscape character (Landscape Type I – Forested Steep Hills). | High | Noticeable | Moderate |
| Diminished visual amenity (Landscape Types A – Wooded River Valley and H – Terraced Brigalow Farmland). | Medium | Noticeable to Considerable | Moderate |
| Diminished visual amenity (Landscape Types B – Settled Arable Plains and F – Foothill Plains and Valleys). | Medium | Imperceptible to Noticeable | Low to Moderate |
| Diminished visual amenity (Landscape Type I – Forested Steep Hills). | High | Noticeable | Moderate |
| ***Roads and Transport*** | | | |
| Reduced efficiency, safety and amenity of the highways. | Low | Low to High | Negligible to Moderate |
| Reduced efficiency, safety and amenity of regional connecting roads. | Low | Low to High | Negligible to Moderate |
| Reduced efficiency, safety and amenity of rural connecting roads and rural access roads. | Moderate | Low to Moderate | Low to Moderate |
| ***Economic*** | | | |
| Impacts on the workforce through contributing to a deepening of existing skills shortages. | Almost Certain | Minor | Medium |
| Impacts on business where local businesses and local supply chains may not have reached maturity to maximise local benefits in terms of supplying the industry. | Almost Certain | Minor | Medium |
| Impacts on the agricultural productivity. | Likely | Minor | Medium |
| ***Social*** | | | |
| Offset population decline in smaller communities. | Possible | Moderate | Medium (positive) |
| Higher skilled resident workforce. | Possible | Moderate | Medium (positive) |
| Retention of younger population. | Possible | Moderate | Medium (positive) |
| Increased local employment opportunities. | Likely | Moderate | High (positive) |
| Increased labour force participation and reduction in unemployment. | Possible | Moderate | Medium (positive) |
| Increased training and skill development opportunities for the local populations. | Almost Certain | Moderate | High (positive) |
| Increased local expenditure on goods and services through project activities. | Likely | Moderate | Medium (positive) |
| Increased local expenditure on goods and services by incoming workers and residents. | Possible | Moderate | Medium (positive) |

**Table 27.1 Summary of key impacts (cont'd)**

| Potential Impact Description | Residual Impact Assessment | | |
|---|---|---|---|
| | Sensitivity/ Likelihood | Magnitude/ Consequence | Significance/ Risk |
| ***Social (cont'd)*** | | | |
| Increased potential for local business expansion / business establishment in local area. | Likely | Minor | Medium (positive) |
| Local business difficulties faced by operating in changed environment - increased costs, competition and labour. | Possible | Moderate | Medium |
| Increased landholder and community uncertainty. | Likely (pre mitigation) Possible (residual) | Moderate | Medium |
| Reduced vulnerability to impacts associated with agriculture – drought, etc. | Likely | Moderate | Medium (positive) |
| Loss of social connection to land / agricultural production. | Possible | Moderate | Medium |
| Increased participation and support in the community. | Likely | Minor | Medium (positive) |
| Increased demand on medical and health facilities. | Likely (pre mitigation) Possible (residual) | Moderate | Medium |
| Heightened road safety risk. | Possible | Moderate | Medium |
| Increased house, land purchase and rental prices resulting in diminished levels of housing affordability. | Possible | Moderate | Medium |
| Increased returns to existing residents through higher house, land and rental prices. | Possible | Moderate | Medium (positive) |
| Reduction in availability of accommodation for low income and vulnerable groups including Indigenous groups. | Possible | Moderate | Medium |
| Increased community anxiety on health, safety and environment effects of project. | Likely (pre mitigation) Possible (residual) | Moderate | Medium |
| ***Indigenous Cultural Heritage*** | | | |
| Accidental disturbance of cultural heritage artefacts or encroachment on known Indigenous cultural heritage sites. | Possible (pre mitigation) Unlikely (residual) | Major | Medium |
| Accidental disturbance of cultural heritage artefacts or encroachment on unknown Indigenous cultural heritage sites | Possible (pre mitigation) Unlikely (residual) | Serious | Medium |
| ***Non-Indigenous Cultural Heritage*** | | | |
| Accidental disturbance of known non-Indigenous cultural heritage artefacts and sites (artefacts and sites included in state registers and databases). | Possible (pre mitigation) Unlikely (residual) | Serious | Medium |

**Table 27.1 Summary of key impacts (cont'd)**

| Potential Impact Description | Residual Impact Assessment | | |
|---|---|---|---|
| | Sensitivity/ Likelihood | Magnitude/ Consequence | Significance/ Risk |
| ***Non-Indigenous Cultural Heritage (cont'd)*** | | | |
| Accidental disturbance of unknown non-Indigenous cultural heritage artefacts and sites. | Possible (pre mitigation) Unlikely (residual) | Serious | Medium |
| ***Preliminary Hazard and Risk*** | | | |
| Fire or explosion due to ignition of flammable or combustible material resulting in injury, fatality or destruction of property (production wells). | Rare | Severe | Medium |
| Fire or explosion due to ignition of flammable or combustible material resulting in injury or destruction of property (production facilities). | Unlikely | Major | Medium |
| Pressure burst resulting in operator injury or equipment damage. | Rare to possible | Moderate | Low to medium |
| Ignition of dry grass / brush on access tracks caused by vehicle resulting in a grass or bushfire and injury or damage to property and equipment. | Rare to possible | Moderate | Medium |
| Gas release and / or fire and explosion due to loss of containment of flammable gas from a wellhead or associated piping resulting in injury and equipment damage. | Unlikely | Major | Medium |
| Gas release or fire and explosion due to loss of containment of flammable gas from gathering system or medium- and high-pressure pipelines resulting in injury or property damage (if ignition sources present gas release may result in fire, if gas is allowed to build up or enter confined space and is then ignited, may result in explosion). | Unlikely | Major | Medium |
| Gas release and subsequent fire and explosion due to loss of containment of flammable gas from production facility process resulting in injury or fatality or property damage (if ignition sources present gas release may result in fire, if gas is allowed to build up or enter confined space and is then ignited, may result in explosion). | Rare | Severe | Medium |
| Fire or explosion risk due to ignition of triethylene-glycol resulting in injury or property damage. | Unlikely | Moderate | Medium |
| External events such as bushfires or floods encroach upon project infrastructure resulting in harm to workers, damage or loss of integrity of the equipment and potential escalation of incident. | Unlikely | Moderate to major | Medium |
| External events such as flooding or extreme rainfall events cause failure of dam level management and integrity management resulting in failure of dams and subsequent injury, property damage and equipment damage. | Unlikely | Major | Medium |
| Loss of containment of bulk volumes of liquid pollutant materials (concentrated brine, diesel, drilling muds, chemicals) resulting in injury and environmental harm. | Rare to possible | Moderate | Low to medium |

**Table 27.1 Summary of key impacts (cont'd)**

| Potential Impact Description | Residual Impact Assessment | | |
|---|---|---|---|
| | **Sensitivity/ Likelihood** | **Magnitude/ Consequence** | **Significance/ Risk** |
| ***Preliminary Hazard and Risk (cont'd)*** | | | |
| Injury to workers associated with manual handling, working at heights, dropped objects, slips, trips and falls and wildlife. | Rare to likely | Moderate | Low to medium |
| Road accident involving project vehicles and resulting in injury or fatality of member(s) of the workforce or public. | Possible | Severe | High† |
| Electrocution while maintaining electrical equipment resulting in injury or fatality of a worker. | Rare | Severe | Medium |
| Worker in confined space exposes member(s) of the workforce to toxic or oxygen deficient environments resulting in harm of member(s) of the workforce. | Rare | Moderate to major | Low to medium |
| Heavy vehicle / machinery incident resulting in operator injury. | Likely to possible | Minor to moderate | Medium |
| ***Agriculture*** | | | |
| Reduced productivity and increased costs | Discussion of impacts provided | | |
| Crop losses or disturbance of stock | | | |
| Soil disturbance | | | |
| Increased costs of farm management | | | |
| Loss of amenity | | | |

* REs identified through field surveys along stock routes are of extremely high or high sensitivity and are captured as listed REs in this table (including those identified along the extremely high sensitivity road reserves). The category as designated by the asterisk, captures any stock routes outside the area surveyed which may support additional, highly sensitive REs.

† The risk associated with light vehicle travel is widely recognised by society as a whole. Arrow has mitigated the risk to as low as reasonably practicable with in-vehicle monitoring systems, fatigue management, journey management and private road maintenance and deems the residual risk acceptable.

§ See Section 27.2.5, Terrestrial Ecology for further discussion on the bull oak jewel butterfly.

## 27.2 Additional Studies

The Surat Gas Project EIS identified key potential environmental and social impacts from project development as a result of the impact assessment. Groundwater, agriculture, roads and transport, social and terrestrial flora and fauna have some degree of uncertainty in regards to understanding their residual impacts. Arrow proposes additional studies to better understand the degree of residual impacts as described below.

### 27.2.1 Groundwater

The extraction of coal seam gas results in depressurisation of the Walloon Coal Measures, directly impacting that groundwater system. The extraction activities also have the potential to indirectly impact upon other groundwater systems (shallow, intermediate and deep).

Modelling conducted for the Surat Gas Project in isolation predicts an exceedance of trigger thresholds in the intermediate and deep groundwater systems, including the coal seam gas groundwater system (Walloon Coal Measures). The extent and location of drawdown varies across the project development area. The cumulative assessment, which accounted for other coal seam gas developments, also predicted increased drawdown levels when compared to the project in isolation. The cumulative assessment predicted that limited areas of the Condamine Alluvium (a component of the shallow groundwater system) would experience enhanced groundwater drawdown as a result of

coal seam gas water extraction in the underlying Walloon Coal Measures. These areas are located along the western edge of the project development area.

Results of the groundwater drawdown modelling identified a potential reduction in groundwater supply to existing and future groundwater users across the project development area. Although the implementation of Arrow's coal seam gas water management strategy, adaptive management framework and hierarchy of mitigation measures will assist in managing the residual impact, uncertainty still exists due to the nature of existing data used in the predictive model. Model uncertainties include the aquifer and aquitard properties (e.g., porosity, permeability, thicknesses), the geology of overlying and underlying aquifers, the interfaces between formations and water quality. The nature of hydrologic connectivity between the Condamine Alluvium and underlying Walloon Coal Measures is also uncertain.

Reduced flow from deep groundwater systems to groundwater-dependent surface ecosystems is another residual impact with a degree of uncertainty. Groundwater drawdown within the deep groundwater system is predicted to range from 10 m to 30 m as a result of the Surat Gas Project and have the potential to affect the natural discharge to surface features of high biological importance (e.g., spring complexes in the Great Artesian Basin).

Residual impacts also relate to diminished groundwater quality in deeper and shallower aquifers as a result of induced flows and subsequent mixing of groundwater caused by the extraction of coal seam gas water from the Walloon Coal Measures.

In order to reduce the uncertainties surrounding the potential impacts to groundwater and gain a further understanding of groundwater systems, Arrow is committed to a series of studies to verify model assumptions used to conduct the residual impact assessment, as listed below.

- An aquifer testing program to increase predictability of aquifer properties and groundwater movement.
- An investigative program to help quantify the connectivity between the Condamine Alluvium and the Walloon Coal Measures.
- The collection of local and regional monitoring data that inform and calibrate numerical models.
- Performing additional groundwater modelling simulations to predict residual impacts on groundwater resources in overlying and underlying aquifers.
- Evaluating the suitability of these underlying and overlying aquifers for use in make-good measures.
- Verifying the preferred water management strategy by modelling the effectiveness of substitution and injection (where conducted) in offsetting depressurisation impacts in aquifers.
- Working with the Queensland Water Commission to determine connectivity of deep groundwater systems with groundwater-dependent surface ecosystems.

The coal seam gas water management framework is an adaptive management tool, designed to identify any adverse trends early, enabling intervention and application of mitigation measures that target the observed effect. The above investigations, as well as the production data collected throughout the life of operations will ensure that the residual impacts are maintained as low as reasonably practicable.

### 27.2.2 Agriculture

It is not yet possible to assess the impact of project development on GQAL, strategic cropping land and specific agricultural enterprises, as locations of proposed infrastructure are not known.

Environmental and social protection objectives have been developed and the proposed avoidance, mitigation and management measures to achieve these objectives have the potential to reduce residual impacts. Potential impacts can be successfully managed through location planning of project infrastructure and modification of work practices.

The primary mitigation for reducing potential impacts on agricultural land and agricultural enterprises is siting of infrastructure. The secondary mitigation is the infrastructure design as well as the execution methods for construction, operation and maintenance that enable project activities to integrate with farm activities. The tertiary mitigation is the application of environmental management controls i.e., proven methods and techniques for protecting the environment. However it is acknowledged that there will be residual impacts depending on the ability to rehabilitate disturbed land back to its former use. The extent to which this is achieved will ultimately determine the degree of residual impacts. There are two main factors that influence this:

- Land that cannot be rehabilitated to its former land use, leading to a permanent change in land use. For example, production facility sites may not be suitable for cropping once rehabilitated but may be suitable for grazing.
- Soils that cannot be successfully reinstated, leading to diminished productivity.

Arrow will study the effectiveness of the proposed environmental management controls through trials and case studies that will better determine the degree of residual impact. Studies include:

- A trial on an Arrow-owned farm to demonstrate the effectiveness of the procedures developed for exploration chip and core drilling on black soils.
- Three separate case studies on different properties with different farming practices in intensively farmed land areas, involving working directly with landholders to design a coal seam gas development on their land that allows for co-existence with farming, with minimal impacts.
- Drilling and development trials of techniques to reduce impacts on intensively farmed land.
- Trials on Arrow-owned land to refine methods for rehabilitation of black soils.

Arrow will also continue engaging with the community on issues associated with development on intensively farmed land through a range of forums including:

- Arrow Surat Community Reference Group.
- Arrow Intensively Farmed Land Committee.
- Community presentations to landholders and community residents in the Surat Basin and the key irrigator representatives.
- Coal Seam Gas Engagement Group and sub-groups.

Rehabilitation trials and gas field development case studies are expected to assist Arrow achieve its objective of integrating its coal seam gas development activities with farming activities. Ongoing consultation about development on intensively farmed land will ensure proposed mitigation measures will be effective, and reduce the potential for residual impacts. Residual impacts will be identified through inspection and monitoring, and where identified, will be remediated or addressed through appropriate compensation.

### 27.2.3 Roads and Transport

The assessment of residual impacts was largely based on strategic modelling with assumptions on the project infrastructure locations, the type of vehicles likely to be used by the project, conceptual

travel routes, the period over which each travel route would be used and anticipated volumes of traffic.

Key impacts on roads and traffic include efficiency and safety, the magnitude of which is variable across the project development area and will depend on the location of the project activities and infrastructure.

Arrow recognises that in order to better define the residual impacts to roads and traffic, further modelling is required once infrastructure locations and project activities have been determined.

The primary means by which avoidance of impacts will be achieved is through site selection. Works required to manage road efficiency and safety issues associated with the project will be assessed and identified, and additional mitigation and management measures will be incorporated into journey management plans and traffic management plans. The latter will be developed in consultation with Department of Main Roads and Transport and local government.

### 27.2.4 Social

The project will operate in and around the key townships of Dalby, Chinchilla and Goondiwindi, which are predominantly rural-based communities, established as a result of agricultural development in the region. Residents strongly identify with being a part of a rural society characterised by stable, close knit communities, hard working, friendly people and wide open spaces with unique and diverse recreational opportunities.

Uncertainty of residual impacts includes aspects related to population increase, the number of direct and indirect workforce personnel required to construct the project and the available accommodation to house an increase in population. The rate and duration of change to be experienced by community members adds to their anxiety and uncertainty about the future and what it means for their communities.

The social impact assessment identified and assessed potential social residual impacts that may result from project activities. The project will deliver a range of positive social effects including direct and indirect employment, enhanced training and skill development prospects, additional local business opportunities and an injection of wealth and vitality into local communities. Industry diversification also may improve the economic and social resilience of both communities and agricultural enterprises.

Potential adverse residual impacts identified relate to the affordability and availability of housing and accommodation, increased demand on health facilities and services, uncertainty for landholders and community members, heightened road safety risk due to increased traffic levels, and the impact which higher wages may have on the viability of local businesses.

Arrow has developed a social impact management plan with specifies social commitments that:

- Maximise the positive benefits of the project.
- Protect the community from the effects of escalating housing and living costs.
- Minimise additional demands on existing services and social infrastructure.
- Make a positive contribution to community wellbeing and liveability through supporting community values and lifestyles.

Confirmation of residual impacts is integral to these commitments and can be accomplished through a comprehensive on-going community consultation program. Community engagement and participation has been, and remains a key element of the Surat Gas Project. Community involvement will continue throughout all stages of the proposed development and, where relevant, will be incorporated into the

social impact management plan. The social impact management plan is a living document that will be updated as further understanding of the residual impacts is recognised and as new information becomes available.

### 27.2.5 Terrestrial Ecology

Residual impacts to terrestrial flora and fauna were primarily associated with the loss or fragmentation of habitat and edge effects. Without knowing the final location of project infrastructure there is uncertainty in the degree of residual impacts. Arrow will better understand the residual impacts through preconstruction and ecological clearance surveys which will identify site-specific flora and fauna and inform revision of constraints mapping.

Constraints mapping will be used in site and route selection to, where practicable, ensure sensitive flora and fauna habitat is avoided, thereby reducing residual impacts. Where necessary, such as the case with the bull oak jewel butterfly (*Hypochrysops piceata*), additional management measures specific to the location and appropriate for the degree of sensitivity will be implemented. Additional studies for the bull oak jewel butterfly would include a desktop study to better understand its habitat requirements, breeding cycle and specific sensitivities, should Arrow consider conducting works in predisturbed areas of the state forest during the planning and design phase.

Should Arrow seek to work within disturbed areas of Bendidee State Forest, a preconstruction clearance survey of the forest will also be conducted with input from a butterfly specialist to inform the critical habitat and food resource of the bull oak jewel butterfly (*Hypochrysops piceata*). [C523]

Offsets and recovery plans may be implemented where avoidance is not practicable.

## 27.3 Conclusion

Both positive and adverse residual impacts were identified throughout this EIS.

The Surat Gas Project will contribute in excess of $3.3 and $1.7 billion to the revenue of the Australian and Queensland governments, respectively; will create over 500 jobs and stimulate significant future regional development.

Adverse residual impacts associated with each phase of the project were generally low to medium reflecting Arrow's knowledge base and proposed environmental management measures which meet the environmental protection objectives of the project. There is uncertainty in the degree of some of the residual impacts. The uncertainty necessitates additional studies to better understand these impacts. Arrow is committed to implementing all management measures proposed throughout this document (and listed in Attachment 8, EIS Commitments Summary) and further study of those areas where uncertainty exists.

Arrow will also continue to seek information on potential issues and impacts through a carefully designed ongoing stakeholder engagement program. Ongoing community engagement will be sought throughout the ensuing phases of the project and contribute to the responsible design, construction, operation and decommissioning of the Surat Gas Project.

The assessments carried out for the Surat Gas Project, as detailed in this EIS, show that impacts of the proposed development are manageable with implementation of the identified mitigation measures. Arrow's commitment to ongoing consultation and enhancement of groundwater models will ensure that development is integrated with agricultural activities on intensively farmed land, and proposed adaptive management is effective in addressing the potential impacts of groundwater drawdown. Participation in coal seam gas proponent and government forums will ensure cumulative impacts are effectively managed. The project involves significant investment in Queensland, with benefits realised in the region, state and nationally. On this basis, the project should proceed.