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20 CUMULATIVE IMPACTS

20.1 Introduction

Previous chapters of Volume 4 of the EIS have identified all likely direct and indirect environmental impacts associated with the Glebe Option. This chapter provides an overview of the key potential environmental impacts, and discusses the inter-relationship of these impacts.

In addition, cumulative impacts as they relate to particular issues or locations are examined. The potential impacts of the Glebe Option have also been related to other Projects within the region (where they can be identified) including the Surat Basin Railway and mine and mine infrastructure components of the Wandoan Coal Project. An overall assessment of the positive and negative cumulative impacts of the Glebe Option is provided.

A detailed assessment of the cumulative impacts of the overall Project (including the Glebe Option, if selected) in the context of other projects in the area, is provided in Chapter 26 of Volume 1.

20.2 Key environmental impacts

Volume 4 of the EIS has identified and assessed the environmental impacts that may result from the Glebe Option. Impacts have been assessed at scales appropriate to the issues identified.

The boundaries for local and regional scales for the Glebe Option are described in **Table 20-1**.

Table 20-1. Local and Regional Scale boundaries

Attribute	Local Scale	Regional Scale
Air	The area approximately 5 km from the activity	The broader Dawson Valley region up to approximately 50 km from the activity
Noise and Vibration	The immediate vicinity of the Weir and pipeline	The broader Dawson Valley Area
Transport and Access	The road network between Wandoan, Taroom, Cracow and the dam site.	District and regional road networks including the Leichhardt Highway
Terrestrial Flora and Fauna	The inundation area and pipeline route with a small buffer	Local government areas
Soils and Geology, Groundwater	The inundation area and up to 5km downstream of the weir and the pipeline route	The Dawson River catchment both upstream, downstream and within adjacent tributaries
Land Use	Local government area	The Dawson River catchment area
Groundwater	The inundation area as well as up to 5 km downstream of the weir	The Dawson River catchment area
Landscape Character and Visual Amenity	Areas within the immediate vicinity of the activity and the weir	The Dawson River catchment area
Water Quality	The inundation area and reach 5 km downstream of the weir, local creeks and the pipeline route	The Dawson River catchment area
Social and Economic	The area surrounding and within the inundation area and the population centres of Taroom and Wandoan	The Local Government Areas of Banana and Dalby
Aquatic Flora and Fauna	The inundation area and downstream to Gyrenda Weir and the pipeline route	The Dawson River catchment area

These impacts have also been assessed over three temporal timeframes as follows:

- Immediate: occurring when the activity is taking place (e.g. excavation);
- Short-term: occurring within approximately 24 hours of the activity and continuing for up to three years after the cessation of the activity; and
- Long-term: occurring for longer than three years after the activity has ceased.

As the construction phase is less than two years, all construction phase impacts are short term. Operations phase impacts tend to be long term.

The main environmental impacts relating to the Glebe Option have been identified as related to:

- Land acquisition, infrastructure and use
- Soils
- Water quality
- Groundwater
- Terrestrial flora and fauna
- Aquatic flora and fauna
- Construction traffic
- Air quality
- Social and economic

The specific residual environmental impacts (after applying mitigation strategies), their scale and timeframe are detailed in **Tables 20-2** and **20-3** for both the weir and the pipeline respectively. The majority of potential impacts can be successfully mitigated such that the residual impact was zero, negligible or minor. Those assessed as zero or negligible are not shown. Minor impacts are considered only when a number may act at one location, over an extended timeframe or on many species and hence may become a more significant cumulative impact.

The successful management of adverse impacts and enhancement of beneficial impacts will be achieved through the following strategies:

- mitigation measures specified in the Draft Glebe EMP;
- appropriate design;
- adequate environmental site management.; and
- appropriate community engagement.

Table 20-2. Key residual environmental impacts related to the weir raising (construction and operation)

Environmental Category	Impact	Scale	Timeframe	Impact at Measured Scale
Infrastructure	Requirement for relocation or replacement of private infrastructure	Local	Short-term	Minor
	Requirement for relocation or replacement of public infrastructure			
Land Use	Loss of approximately 920 ha of Good Quality Agricultural Land	Local	Long-term	Minor
Land Tenure	Land acquisition	Local	Long-term	Minor
Soils	Likely disturbance of sodic, dispersible soils	Local	Short-term	Minor
Water resources	Reduced water harvesting access downstream	Regional	Long-term	Minor
Water quality	Increase in sedimentation and resultant increase in turbidity	Local	Immediate/short-term	Minor
	Possible poor water quality in the weir pool	Local	Long-term / sporadic	Moderate
	Lowered water quality downstream as a result of releases	Regional (extending several kms downstream)	Long-term / sporadic	Moderate
Groundwater	Possible seepage and waterlogging adjacent to levees	Local	Long-term	Minor
Terrestrial Flora and Fauna	Disturbance of two endangered Regional Ecosystem (11.3.1 / 11.3.5 'Brigalow'), with up to 4.21 Ha impacted (0.005%) of total 'Brigalow' community in the Bioregion).	Regional	Long-term (incl. offset and rehabilitation)	Minor
	Clearing of linking riparian vegetation (RE 11.3.2, 11.3.3, 11.3.25) and habitat loss for fauna	Local	Long-term	Minor
	Inundation of one boggomoss	Local	Long-term	Minor
	Potential edge effects and introduction of weeds	Local	Long-term	Minor
Aquatic Flora and Fauna	Increased habitat for migratory species	Local	Long-term	Minor (beneficial)
	Impact upon fishes and macro-invertebrates if water quality diminished	Local	Long-term	Minor
	Barrier effect on movement	Regional	Long-term	Moderate (until fish passage is constructed)

Environmental Category	Impact	Scale	Timeframe	Impact at Measured Scale
Transport	Increased floodplain habitat	Local	Long term	Minor (beneficial)
	Increased risk of traffic accidents due to construction traffic	Local	Short-term	Minor
Air quality	Dust associated with all works and road transport	Local	Short-term	Minor
Social and Economic	Land acquisition	Local	Long-term	Minor (beneficial)
	Increased economic activity	Regional	Short-term	Moderate (beneficial)
	Increased job opportunities	Local	Short-term	Minor (beneficial)
	Construction worker influx	Local	Short-term	Moderate (beneficial)

Table 20-3. Key environmental impacts relating to the pipeline (construction and operation)

Environmental Category	Impact	Scale	Timeframe	Impact at measured scale
Infrastructure	Requirement for relocation or replacement of private infrastructure	Local	Short-term	Minor
Soils	Likely disturbance of sodic, dispersible soils	Local	Short-term	Minor
Water quality	Increased turbidity and sedimentation in creeks	Local	Immediate/Short-term	Minor
Terrestrial Flora and Fauna	Disturbance of two endangered Regional Ecosystems (11.3.1, 11.9.5) incl EPBC Brigalow (1.08ha or <0.001% or bioregional extent)	Regional	Long-term	Minor
	Potential edge effects and introduction of weeds	Local	Long-term	Minor
Aquatic Flora and Fauna	Impact upon fishes and macro-invertebrates if water quality diminished	Local	Short-term	Minor
Transport	Increased risk of traffic accidents due to construction traffic	Local	Short-term	Minor
Social and Economic	Increased economic activity	Regional	Short-term	Moderate (beneficial)
	Increased job creation opportunities	Local	Short-term	Minor (beneficial)
	Construction worker influx	Local	Short-term	Moderate

20.3 Cumulative impact assessment

20.3.1 Natural environmental values

Construction of the weir and pipeline will have both adverse and beneficial cumulative impacts. As shown in Tables 20-2 and 20-3, impacts will occur across numerous environmental values though few are of greater than minor concern. Operational phase water quality in the storage and downstream have been identified as moderately impacted environmental values and they are inter-related; it is water quality in storage that impacts on downstream water quality. The latter can be mitigated to minor or negligible levels by the planned multi-level offtake but until this is in place, the potential impact will remain at moderate levels. The multi-level offtake does not assist water quality in storage. Chapter 8 addressed this issue and noted a range of possible approaches.

This cumulative impact assessment therefore supports the following mitigation measures:

- SunWater fund riparian zone fencing on the perimeter of the storage and establishment of offstream watering points for stock; and
- the riparian zone of the storage be enhanced by rehabilitative planting schemes as part of any offset strategy.

This strategy will not only assist with local reduction of inputs of sediment and nutrients to the weir storage but it will simultaneously overcome the impact on the riparian fauna movement corridor and provide a positive benefit to locally threatened species through inclusion of seeds of EVR species of local provenance in the replanting.

As impacts related to poor in-storage water quality are likely to be sporadic, short term and restricted to the deeper parts of the weir pool, and the cost of implementation of mitigation measures that are most likely to be effective (air diffusers) is high, such mitigation is not recommended. However it is recommended that monitoring of stratification and turnover and associated potential blue-green algal blooms and fish kills, be monitored with a view to reconsidering potential mitigation measures should the frequency or intensity be shown to be of concerning levels.

Given the number, scale and location of other developments planned for the region, such as the Wandoan Coal mine and Surat Basin Railway, water quality during the construction phase may be potentially impacted beyond the direct influence of the Glebe Option. As such, the impacts directly attributed to the Glebe Option should be minimized, as should that of each other project.

20.3.2 Social and economic values

20.3.2.1 Taroom and Wandoan

Construction of the Glebe Option will result in a moderate positive direct economic benefit on a regional scale, as it will create increased employment opportunities and bring economic benefit, primarily to the local communities of Taroom and Wandoan.

There may be some minor adverse social impacts on Taroom and Wandoan as a result of the Glebe Option activities from the temporary construction camps. These can be mitigated through liaison between the contractor, local government and services representatives prior to camp establishment and have the potential to be a net positive outcome through involvement of workers in local club activities.

Construction traffic will utilise the Leichhardt Highway to pass through Taroom (**Chapter 9 – Transport**) and / or Wandoan. This will add to the existing heavy vehicle traffic and perhaps the utilization of parking areas currently provided for long distance transport operators. Traffic related impacts are expected to be greater on the smaller local roads such as Glebe Weir Road and Nathan Road and this is further discussed below.

20.3.2.2 Impacts on landholders

Some landholders in the vicinity of Glebe Weir and along the pipeline route will be impacted by:

- acquisition and long term loss of good quality agricultural land; and
- immediate and short-term construction related impacts, including the removal or relocation of infrastructure, increased traffic volume, alterations to access and dust nuisance (**Table 20-4**).

Other than land acquisition, the most significant cumulative impact for these landholders will be the loss of some 770 ha of Class 'A' Good Quality Agricultural Land (GOAL) and 150 ha of Class 'C' (**Chapter 7 - Land**). Some 84% of the impact on GOAL relates to property owned by the State of Queensland and under short term leases to the current lessees. However, the loss of regional income from this land will be more than offset by the regional and state wide economic benefits from the overall Project, as well as expenditure in the region related to the major infrastructure projects that have an extended life.

Some residents along the pipeline route may also be affected by multiple forms of impact during the construction phase, such as access restriction, dust and traffic on local roads. However the duration of such impacts other than traffic, is expected to be short, given the linear nature of the infrastructure and the rate at which construction will progress.

The community liaison component of the overall Project EMP and specific Glebe EMP will need to be particularly cognizant of these impacts, and those related to other projects, and sympathetic to the landholders involved.

Table 20-4. Cumulative impacts on nearest sensitive receptors

Real property description	Present ownership and control	Cumulative impacts (construction and operation)	Duration
Lot 14 CP LE230	State of Queensland (Reserve with Banana Shire Council as Trustee)	<ul style="list-style-type: none"> ▪ Noise ▪ Dust ▪ Construction Traffic ▪ Visual amenity 	<ul style="list-style-type: none"> ▪ Short term ▪ Short term ▪ Short term ▪ Long-term
Lot 2 CP LE284	State of Queensland (NRW) – Short-term lessee	<ul style="list-style-type: none"> ▪ Inundation of approximately 60 ha of Class 'A' GQAL plus irrigation restrictions ▪ Construction traffic 	<ul style="list-style-type: none"> ▪ Long-term ▪ Short-term
Lot 15 CP FT2	State of Queensland (NRW) – Short-term lessee	<ul style="list-style-type: none"> ▪ Inundation of approximately 710 ha of Class 'A' GQAL ▪ Loss of vegetation ▪ Construction traffic and vibration 	<ul style="list-style-type: none"> ▪ Long-term ▪ Short-term ▪ Short-term
Lot 14 CP FT1	Private	<ul style="list-style-type: none"> ▪ Land acquisition ▪ Loss of approximately 150 ha of Class 'C' GQAL ▪ Noise ▪ Construction traffic 	<ul style="list-style-type: none"> ▪ Long-term ▪ Long-term ▪ Short-term ▪ Short-term
Lot 2 FT 734	Private	<ul style="list-style-type: none"> ▪ Noise ▪ Construction traffic ▪ Dust 	<ul style="list-style-type: none"> ▪ Short-term ▪ Short-term ▪ Short-term

20.3.3 Cumulative impacts – Other activities within the region

Other known developments within the region that may impact upon the same environmental values of the Project include the Surat Basin Railway (SBR) and mine related components of the Wandoan Coal Project.

The following topics were identified as likely to be affected by cumulative impacts:

- Social and economic (including impacts on community and accommodation);
- Traffic;
- Water quality;
- Loss of terrestrial ecosystems.

The potential cumulative impacts of the Wandoan Coal Project (including each of the raw water supply options – such as the Glebe Option) is discussed fully in Chapter 26 of Volume 1. However the potential cumulative impacts between the SBR and the Glebe Option are also addressed below.

20.3.3.1 Social and economic

The construction phases of the Glebe Option, the mine component of the Project and SBR will likely occur during similar timeframes.

If the Glebe Option is selected by the WJV as the raw water supply option, local landholders may be affected by all three developments, particular those subjected to disruptions to normal activities. In several instances, landholders will be impacted by land acquisitions for two of these projects, and also be impacted by the associated construction and operational impacts described earlier.

Construction schedules for the projects will overlap to an extent, increasing the traffic on local roads (particularly Nathan Road and the Taroom – Cracow Road) and the number of over-size vehicles. SunWater will liaise with each of the major infrastructure project teams, local government and Main Roads to cooperatively deal with this issue.

Similarly the construction workforce from each project that requires local accommodation will also overlap. Similar group meetings with local government will be established to ensure facilities are in place to deal with the infrastructure requirements of the total workforce (such as sewage treatment and water supply).

The Queensland Government in September 2008 released the Sustainable Communities Resource Agreement. This is discussed in Volume 1 of the Wandoan Coal EIS.

In terms of the operational phases, the cumulative economic benefit of these projects is substantial. The local region (particularly Wandoan and Taroom but also Theodore) will benefit from employment opportunities and local businesses will benefit through increases in business activity and opportunities for providing services and consumables to these projects. On a broader scale, the state and national economy will also benefit. (Volume 1, Chapter 28).

20.3.3.2 Loss of terrestrial ecosystems

For the purposes of this assessment, it is assumed that other projects will result in the loss of terrestrial ecosystems. As the major known projects are in the same Bioregion, they are likely to impact on the same ecosystems. Each project is required to follow the legislative process set out in the Queensland *Vegetation Management Act 1999* for the clearing of regional ecosystems and provision of vegetation management offsets to mitigate this impact. For some communities and species, the EPBC Act requirements also apply. As part of the mitigation strategies for terrestrial flora SunWater has committed to undertake rehabilitation using locally derived seed of threatened species where it is available in order to provide greater certainty for key species and habitats in addition to that offered by the mandatory offsets.

20.4 Conclusions

This analysis indicates that there will be both adverse and beneficial cumulative impacts. The more substantial adverse cumulative impacts of the Glebe Weir project relate to long term water quality, terrestrial habitat related to movement corridors and multiple but minor impacts on some landholders. The strategies noted above will mitigate the cumulative impacts on landholders.

The beneficial impacts relate to economic benefits to the community at a regional scale.

When reviewed in conjunction with other major projects in the region, based on limited specific knowledge of those projects, the cumulative impacts primarily relate to loss of terrestrial ecosystems, traffic and the socio-economic impacts of land acquisition and related to the construction workforce. SunWater is committed to participating in joint discussions with local government or other service providers as necessary.