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EXECUTIVE SUMMARY

SunWater Ltd is the Proponent for the Nathan Dam and Pipelines Project. For over 80 years, SunWater has specialised in the investigation, design, construction, maintenance and operation of water infrastructure. SunWater also manages bulk water supply to rural, urban and industrial customers.

SunWater owns and operates bulk water supply and distribution infrastructure located throughout regional Queensland with an estimated replacement value of $6.9 billion and supplying about 40% of the water used commercially in Queensland via 23 water supply schemes and three subsidiary companies. SunWater services approximately 6,000 water supply customers including mining, industrial and manufacturing companies, local governments, power stations, irrigators and statutory water boards. SunWater has extensive experience in water supply development, and has the support systems in place to enable it to effectively implement the Project and ensure compliance with relevant legislation, including certified quality, environmental and workplace health and safety management systems.

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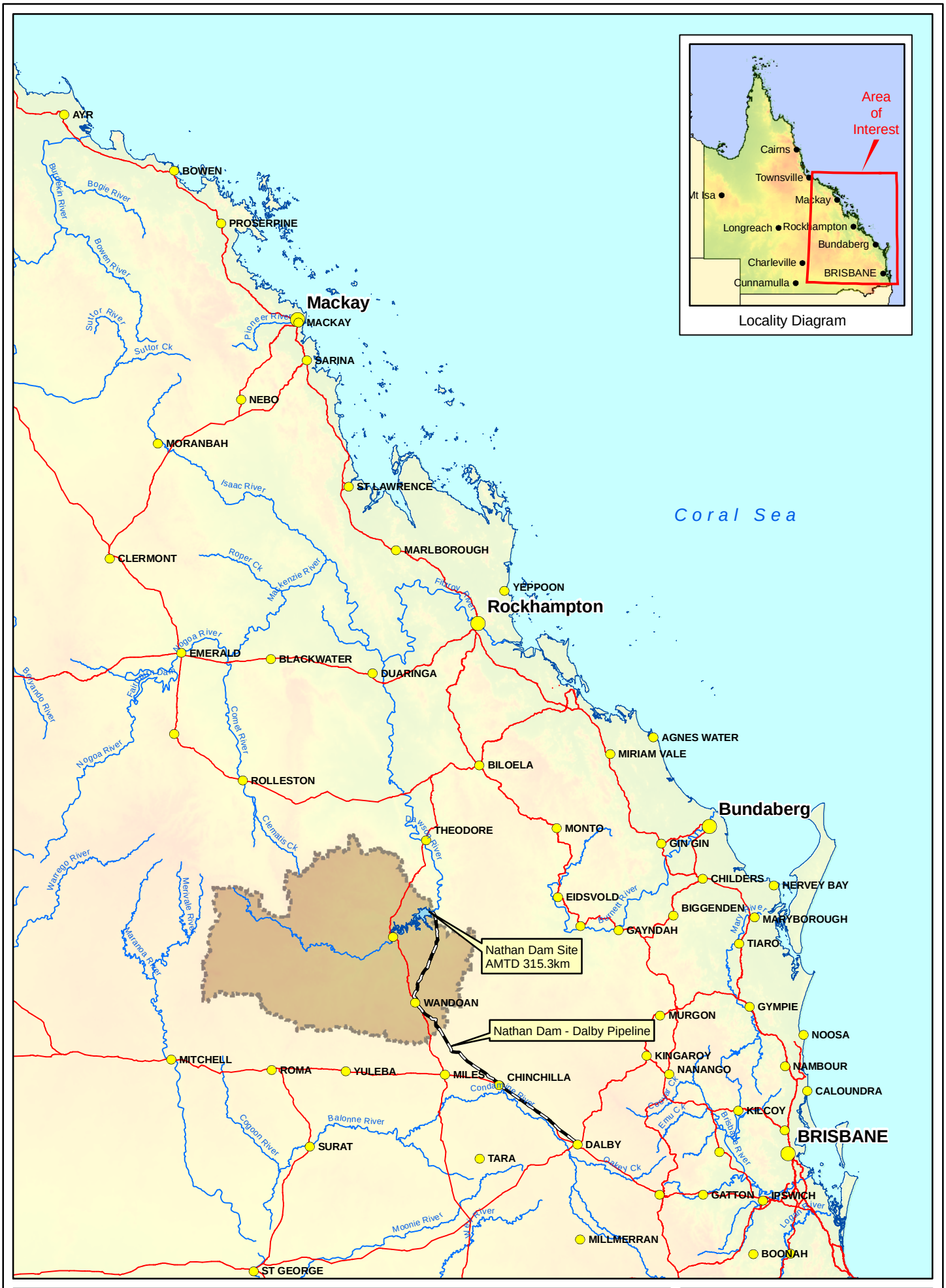
ES1.1 Description of the Project

The Project is the construction and operation of Nathan Dam on the Dawson River in Central Queensland and associated water delivery infrastructure (Figure ES-1).

The dam wall will consist of an Earth and Rockfill (E&R) embankment spanning 1240 m. The main spillway will be situated on the right abutment.

The capacity of the dam will be 888,312 Megalitres (ML) at a Full Supply Level (FSL) of 183.5 m Australian Height Datum (AHD) and it will inundate an area of approximately 13,508 ha (or 13,824 ha including islands) from a catchment of 23,185 km^2 (Figure ES-1 and Figure ES-2).

Water from the dam will be transported via a trunk pipeline to primarily service coal mines and power stations (and associated urban communities) in the Surat Basin, extending to Dalby (Figure ES-3). Water will continue to be released downstream to towns along the Dawson River and to existing irrigation customers in the Dawson Valley Water Supply Scheme as well as to new mining customers in the Southern Bowen Basin. Water may also be reserved within the storage as required to meet critical urban supply needs in the lower Fitzroy and other parts of Queensland in line with the government's objective to establish a state water grid.



LEGEND

- Towns
- Major Roads
- Major Rivers
- Nathan Dam Catchment

Projection: GDA94 Zone 56

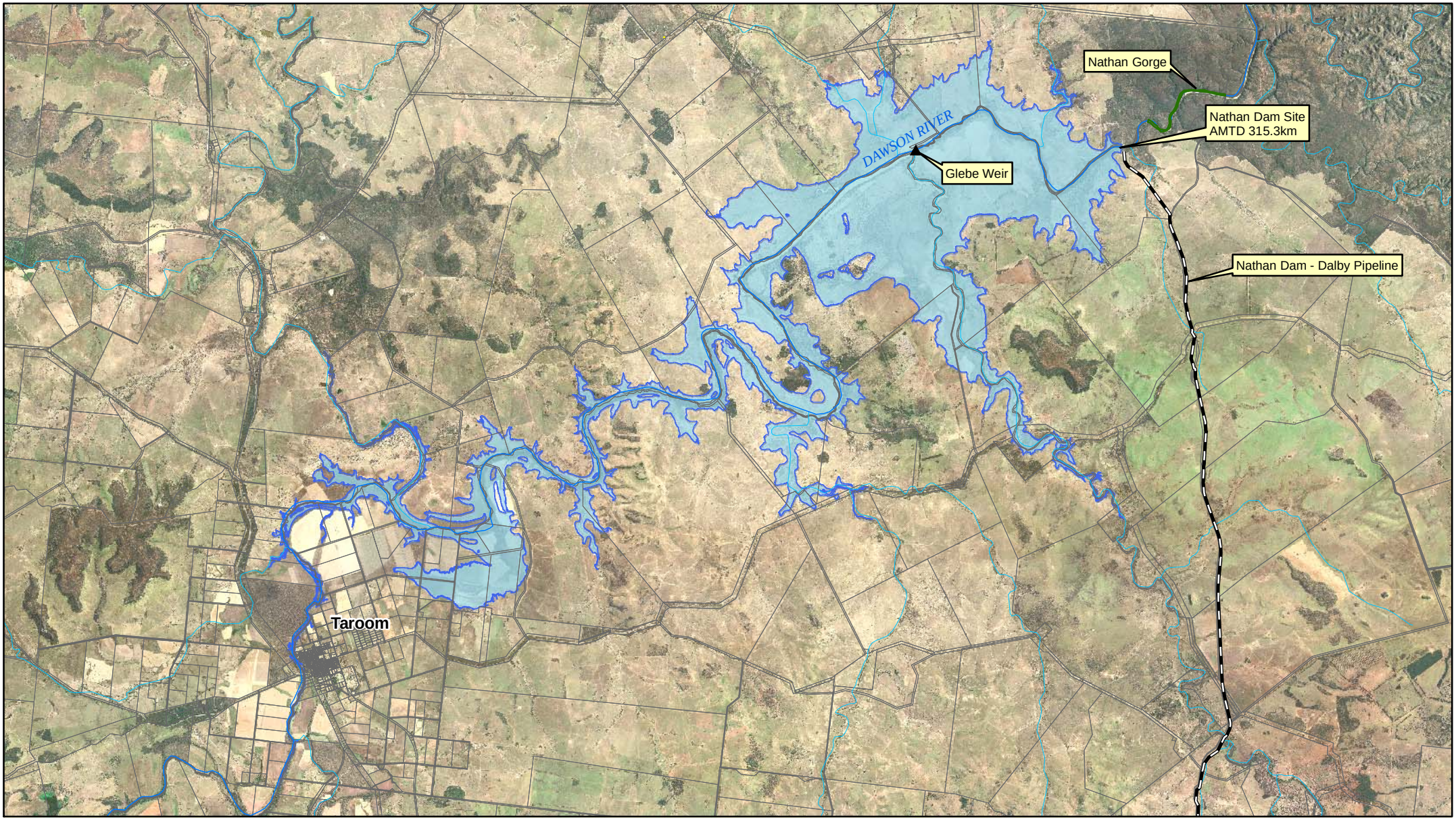
Figure ES-1

0 15 30 60 90
Kilometres
Scale 1:4,000,000 (at A4)
SW 233053B

SKM SunWater Making Water Work

NATHAN DAM AND PIPELINES EIS

Locality plan



LEGEND

Full Supply Level 183.5 AHD

Projection: GDA94 Zone 56

Figure ES-2

0 1.5 3 6

Kilometres

Scale 1:200,000 (at A4)

N

SW 233205B

SKM SunWater Making Water Work

NATHAN DAM AND PIPELINES EIS

Water storage area

The pipeline will generally be buried and largely follow existing easements south then southeast over a distance of approximately 260 km from Nathan Dam to Dalby. It will be capable of delivering 136 ML/day, with the design discharge reducing down the system. The delivery system will include four pump stations and three balancing storages, as well as air valves, scours, surge tanks and standpipes. Potential future lateral delivery pipelines are not included in this project.

The Project also includes the following components:

- establishing clay borrow areas (all other materials such as sand and rock will be sourced from commercial suppliers);
- constructing a dam site access road;
- relocating, raising or otherwise upgrading sections of local government roads and state controlled roads;
- providing new property access where required;
- relocating local power and telecommunications infrastructure and providing new infrastructure;
- removing or treating redundant infrastructure (such as Glebe Weir);
- relocating private infrastructure required to support continued use of land not affected by the Project;
- constructing various related facilities such as offtake and outlet works, fish and aquatic fauna transfer device, protective works and recreational facilities;
- establishment of temporary material lay-down areas;
- installing new gauging stations at the headwater and tailwater of the dam and at major tributaries upstream of the dam (including rainfall gauges strategically located throughout the catchment area); and
- providing access tracks to the pipeline.

Operation of the water storage involves management of the infrastructure (including a small buffer area to the infrastructure), the land inundated by the water storage at FSL and also additional land above this area based on the peak water surface level reached during a 1 in 100 Annual Exceedance Probability (AEP) flood. The exact area of land incorporated in the flood buffer will have regard to specific on site characteristics such as slope, vegetation, location of improvements and infrastructure and will be finalised in consultation with individual landholders. This area incorporating the flood buffer represents the minimum land purchase area for the water storage.

Operation of the water distribution infrastructure involves maintenance of the pipes, valves, surge tanks, standpipes, scours, access tracks and other structural components primarily within a permanent easement of 15 m width. A temporary easement of 30 m width will be required for construction. It also includes the operation of balance tanks and pump stations for which land will be acquired. In some cases land may also be acquired for surge tanks.

The Project has been divided into seven primary sections for the purpose of the Environmental Assessment. These comprise the:

- dam and surrounds – includes the dam construction footprint and water storage area;

- dam construction footprint – the dam wall footprint, embankments, spillway, site offices, associated facilities and immediate downstream works area;
- water storage area – the area inundated at FSL plus the flood margin;
- pipeline – including pipeline, pipeline infrastructure such as valves, surge tanks, standpipes, scour points and easements / access agreements covering construction and operational requirements;
- associated infrastructure footprint – the location of clay borrow areas, road works, construction camps and realignment of any associated infrastructure;
- downstream – the Dawson River and Fitzroy River downstream of the Project ending at the Great Barrier Reef World Heritage Area (GBRWHA);
- potential benefited areas, being areas that receive water from the Project;
  - downstream areas (Dawson Valley Water Supply Scheme, Bowen Basin mining and industrial areas, Lower Fitzroy Water Supply Scheme, State Water Grid; and
  - potential pipeline lateral access areas (Surat Basin mines, urban areas, power stations, other industry).

The capital cost of the Project is $1,400 million (at preliminary design accuracy). The aim is to commission the Project in June 2016. Pending approvals, the construction period is programmed for between July 2013 and June 2016. This will include a six month early works program in the latter half of 2013 when the required road upgrades will be undertaken and site facilities established prior to the commencement of dam and pipeline construction activities in January 2014.

The dam infrastructure and water storage area incorporate the following environmental design features:

- multi-level offtake to enable the best quality water to be extracted;
- outlet mechanisms that provide flexible options for environmental flow releases;
- outlet mechanisms that provide for re-aeration of the water released downstream;
- aquatic fauna transfer devices;
- design consideration and protective mechanisms to avoid or mitigate injury to fauna during operations;
- provision of structural habitat for fish and other fauna;
- lease conditions that provide for management of the edges of the storage and riparian zone;
- recreational facilities; and
- operation phase monitoring that addresses the effects of the Project on water quality, ecology and human use.

The project also includes an environmental management plan (EMP) that incorporates the impact mitigation measures identified in this impact assessment. Vegetation and biodiversity impacts which cannot be entirely mitigated will be offset through a package of measures including habitat protection and rehabilitation.

The nominal engineering design life of the Project is expected to be 100 years, although it is likely to be maintained after that period provided that it continues to meet dam safety requirements and remains an integral part of the regional water supply strategy. A decommissioning date for the Project has not been determined at this stage and the likely date is too far in the future to allow effective planning for decommissioning to occur at present. The design life of the water distribution pipeline is anticipated to be in the order of 80 years. Pumps, valves and motors would have design lives ranging from 20 to 40 years. Decommissioning of the pipeline is not expected in the foreseeable future.

ES1.2 The Environmental Impact Assessment process

On 19 January 2008, the proponent lodged an Initial Advice Statement (IAS) for the Project with the Queensland Coordinator-General (CG). The IAS provided an outline of the proposed Project, including the Project rationale and its potential impacts.

On 18 April 2008, the CG declared the Project to be a "significant Project for which an Environmental Impact Statement (EIS) is required", pursuant to section 26(1) (a) of the *State Development and Public Works Organisation Act 1971* (SDPWO Act).

On 30 July 2008, the Commonwealth Minister for the Environment, Heritage and the Arts (now SEWPaC) determined that the Project is a "controlled action" under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) due to the potential impacts on matters of national environmental significance. The controlling provisions under the EPBC Act are:

- sections 12 and 15A (World Heritage properties);
- sections 15B and 15C (National Heritage places);
- sections 16 and 17B (Wetlands of International importance);
- sections 18 and 18A (Listed threatened species and communities);
- sections 20 and 20A (Listed migratory species); and
- Sections 23 and 24A (Marine Environment).

As a consequence, the Project requires assessment and approval under the EPBC Act. The Australian Government has accredited the EIS process, to be conducted under the SDPWO Act, under a Bilateral Agreement between the Australian and Queensland Governments. This will enable the EIS to meet the impact assessment requirements under both Australian and Queensland legislation. The Project will require approval from the responsible Commonwealth Minister under Part 9 of the EPBC Act before it can proceed.

The Department of Employment, Economic Development and Innovation (DEEDI) is managing the EIS process on behalf of the CG. The DEEDI has invited relevant Australian, Queensland and local government representatives and other relevant authorities to participate in the process as advisory agencies.

ES1.3 Background and need for the Project

ES.1.3.1 Strategic planning

The Statewide Water Policy (SWP) (DIP, 2006) established a plan to balance water supply with increasing demand from urban communities, industry and rural users, to improve water security, and support ongoing economic growth. The SWP was, with respect to the Fitzroy Basin, based on the *Central Queensland Regional Water Supply Strategy* (CQRWSS) (NRW, 2006a) which presented the preferred options for water supply for the region as developed through the *Central Queensland Regional Water Supply Study*. The study involved a partnership process including State government agencies, local government, industry, and community organisations and addressed issues such as continuing urban growth and industrial development particularly in the Lower Fitzroy and Gladstone areas, continuing mining development in the Bowen and Surat Basins, approaching full utilisation of entitlements in some existing water supply schemes, failure of some existing water supply schemes to meet users requirements, and predicted water supply shortfalls throughout much of the region from 2005 to 2020 based mainly on projected water demands for urban, industrial, and mining uses.

The CQRWSS was developed having regard to long-term integrated regional growth management frameworks to ensure optimisation of economic, social and environmental outcomes as required under the National Water Initiative (NWI). The CQRWSS identified a mix of options for meeting future water demands and was underpinned by a hierarchy of three key principles:

- facilitating the highest value and best use of water through trading of existing secure and well specified water entitlements;
- promoting efficient use of water – for example, by improving demand management and by recycling water; and
- developing additional water supply sources only where demands cannot be met through the above measures and where unallocated water is available.

The CQRWSS notes that there is full utilisation of available supplemented water supplies in some existing schemes, particularly the Nogoa Mackenzie Water Supply Scheme, the Dawson Valley Water Supply Scheme and the Lower Fitzroy Water Supply Scheme, and that the performance of some major water supply schemes is below what is required by their users.

The CQRWSS anticipates that water demand in the region will continue to increase, principally driven by growth in the industrial and mining sectors and associated urban development with some growth in irrigated agriculture. The strategy considers future water demands in, 2015 and 2020 and the adequacy of existing supplies to identify likely shortfalls (NRW, 2006a). A number of measures were identified that will all contribute to addressing the predicted water availability shortfalls:

- developing more effective water entitlement trading opportunities including providing for conversion of medium priority water allocations to high priority water allocations in the Nogoa Mackenzie Water Supply Scheme – the Resource Operations Plan (ROP) already provides for such conversions in the Lower Fitzroy and Fitzroy Barrage Water Supply Schemes. High priority water is to be used for industrial, mining and urban uses, while medium priority water is to be used mainly for agricultural demands;

- maximising the effectiveness of supplies through demand management and more efficient use of water including:
- releasing unallocated water including that reserved for specific infrastructure projects on implementation of these projects, after rigorous evaluation; and
- assessing and, if feasible, proceeding with the Connors River Dam, Fitzroy Weirs and Nathan Dam proposals.

The CQRWSS identifies Nathan Dam as a means of meeting the short to medium-term water needs in the Dawson/Callide that cannot be met by trading or efficiency measures and assigns a high priority to the initiative. Also, Nathan Dam is identified as a means of meeting mining demands in the Upper Dawson in the short to medium-term and indicates that it may represent a feasible long-term solution to meeting water supply needs in the Lower Fitzroy, particularly in times of critical water shortage. The Queensland Government's *Coal Infrastructure Program of Action* (DIP, 2005; 2008) also identified the Nathan Dam and Pipelines Project in relation to mining water demands in the Surat Basin and southern Bowen Basin.

Under the SWP, the State Government committed $120 million to design and construct Nathan Dam subject to obtaining approval under the EPBC Act. Subsequent to development of the SWP, the Nathan Dam and Pipelines Project was included in the *Program of Works, Statewide Water Grid Regional Water Infrastructure Projects* approved by the Governor in Council under Part 3 of the SDPWO Act on 18 April 2008. This program directs the designated proponents of the Projects to undertake all necessary investigations in order to obtain environmental approvals and prepare a business case for their respective designated regional water projects. SunWater was the designated proponent for the Nathan Dam and Pipeline Project.

ES.1.3.2 Demand studies

SunWater has undertaken a future demand study to identify demands for water for the coal mining, power generation, other mining, and quarry materials sectors; and local authorities in the Surat Basin and adjacent areas that could be supplied from Nathan Dam. This study considered the next 5 to 10 years and identified 19 coal mine and power generation projects and five local authorities where there is an appreciable probability that water could be supplied from Nathan Dam. Depending on development of the necessary port and rail infrastructure, current estimates of industrial water demand from Nathan Dam range from 69,000 ML/a to 100,000 ML/a over the next 5-10 years.

In addition there is some probability of demand for water from Nathan Dam for projects in the other mining and quarry materials sectors and from the implementation of clean coal technology.

Other findings of the future demand study were that:

- there is likely to be large additional demands from the coal industry over the next 20 years but these cannot be estimated with sufficient accuracy at this time for them to be considered; and
- the price of water from Nathan Dam is likely to be several times the irrigated agriculture viability limit so that the probability of irrigated agriculture demands being met is effectively nil.

As the functional life of a dam is in the order of at 100 years, it is assumed that if the identified demands are not met in the short term, they will be in the long term.

ES.1.3.3 Consequences of not proceeding with the Project

The SWP states that water is fundamental to the world-class quality of life in Queensland, to economic growth, and to our environment and notes that population and economic growth increase pressures on existing water supplies. Climate variability and climate change compound these pressures.

Key mechanisms identified to treat risks identified, such as climate change, water demands, environmental issues, social issues and stakeholder interests include:

- regular reassessment of the ability of existing sources to meet existing demands;
- regular reassessment of the ability of new sources to meet demands;
- regular updating of demand projections;
- assessment of new source options to establish appropriate certainty regarding development timeframes;
- initiation and management of process for the development of new sources of supply in a timely and effective way;
- expansion of environmental monitoring; and
- maximisation of certainty and minimisation of risk for the development of new water sources adequately in advance of needs.

The CQRWSS highlights the importance of secure, sustainable water supplies in supporting lifestyle, growth and prosperity. To do nothing in relation to increasing the availability of water supplies in Central Queensland and particularly the Dawson/Callide and Surat Basin areas is not an acceptable option in the light of these Queensland Government imperatives.

ES1.4 Alternatives considered

There is a need for a substantial and secure water supply to service the Upper Dawson and Dawson-Callide sub-regions and the Surat Basin, as well as to support the Lower Fitzroy and State Water Grid at times of critical water shortage. This section addresses potential alternative means of meeting those demands. When the preferred option for water supply is identified, alternative means of developing that supply are also addressed, including alternative water delivery mechanisms and pipeline routes. Alternative water supply sources considered include:

- water trading;
- recycling, system management and water use efficiency;
- groundwater;
- coal seam gas water;
- desalination;
- surface water supplies; and

- alternative combinations of the above sources.

The Queensland government has, over recent years, developed a range of strategic planning and policy initiatives that support and coordinate this development. The Nathan Dam and Pipelines Project is recognised in all the relevant documents as the preferred alternative water supply in the region. The level of demand is such that the maximum storage capacity feasible at the dam site will ultimately be required to meet that demand. The CQRWSS identified future water needs for the sub-regions and the preferred water supply option for meeting these needs. Within the Dawson-Callide and Upper Dawson sub-regions the Nathan Dam was identified as the best option for meeting the short to medium-term water needs.

ES.1.4.1 Within-Project alternatives

ES.1.4.1.1 Nathan Dam

The dam types considered for the preliminary design of Nathan Dam included Concrete Faced Rockfill (CFRD), Roller Compacted Concrete (RCC) and Earth and Rockfill (E&R). The configuration of alternative arrangements is heavily influenced by site conditions which include artesian pressures within the sandstone foundation and relatively low shear strengths on sandstone bedding.

Due to the challenges that would be involved in exposing the sandstone foundation and managing groundwater for the CFRD arrangement, this option was not considered in detail.

It was considered that the most suitable dam types for the site would be either an RCC dam or an E&R dam. Both types were investigated thoroughly and a comparison made between the two.

The RCC arrangement has some considerable disadvantages over the E&R embankment including:

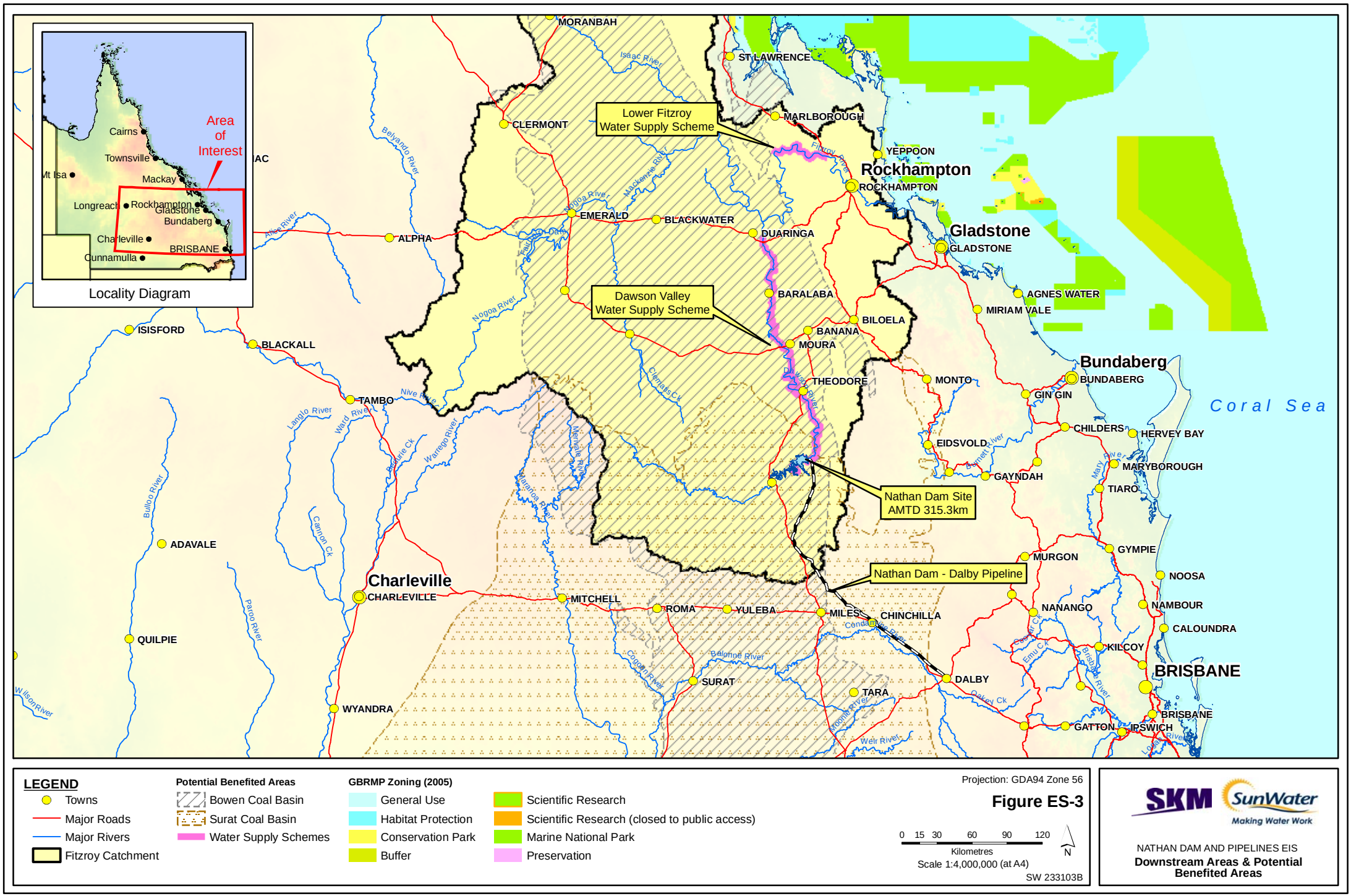
- Wide cross-section required to achieve stability,
- Exposing the aquifer during construction and an associated dewatering requirement for an extended period,
- Lack of proximity to a suitable aggregate source, and
- Relatively high capital cost.

As most of the construction materials for the E&R embankment are available near the dam site, as it is not affected by sandstone strengths, and has the least groundwater management requirements, it has been concluded that the earth and rockfill dam is the most suitable dam type and has been adopted.

ES.1.4.1.2 Pipeline

A number of alternative pipeline routes were assessed at the commencement of the Project. All of these routes have followed the most direct path from Nathan Dam to Wandoan for the northern-most section of the alignment given the relatively large potential customer base that exists in this area. The most notable is the Wandoan Coal Project (WCP), but other demand nodes also exist in the form of other coal mining developments such as Northern Energy's Ellimatta project and the reserves held by Cockatoo Coal such as Woori and their joint venture operations with Mitsui Coal at Collingwood and Taroom. There are also plans by the Wandoan Power consortium to construct a clean coal power station at Wandoan, which would represent another significant demand source for the Project.

It should be noted that there is a possibility that SunWater will need to construct two pipelines along this northern section of the alignment; the Glebe Weir to Wandoan Coal Project (WCP) pipeline, which was detailed in the WCP EIS in late 2008 and approved in 2010, and the Nathan Pipeline assessed as part of this EIS. The need for two pipelines stems from the timing of the two projects, with Xstrata requiring a water supply in 2013 when the Nathan Dam project would be only commencing construction. However it is SunWater's preference to amalgamate the two pipelines if possible, and as both projects proceed and their approval and construction timeframes become certain, every effort will be made to proceed with a single pipeline.


Locality Diagram
Area of Interest
Cairns
Townsville
Mt Isa
Mackay
Longreach
Rockhampton
Gladstone
Bundaberg
Charleville
BRISBANE
Cunnamulla
MORANBAH
ST LAWRENCE
CLERMONT
Lower Fitzroy Water Supply Scheme
MARLBOROUGH
YEPPOON
Rockhampton
ROCKHAMPTON
EMERALD
BLACKWATER
DUARINGA
Gladstone
GLADSTONE
ALPHA
BARALABA
Dawson Valley Water Supply Scheme
AGNES WATER
MIRIAM VALE
BILOELA
ISISFORD
BANANA
MOURA
BLACKALL
THEODORE
MONTO
Bundaberg
BUNDABERG
GIN GIN
TAMBO
CHILDERS
HERVEY BAY
EIDSVOLD
MARYBOROUGH
GAYNDAH
TIARO
Nathan Dam Site AMTD 315.3km
GYMPIE
MURGON
Nathan Dam - Dalby Pipeline
NOOSA
ADAVALE
Charleville
CHARLEVILLE
MITCHELL
ROMA
YULEBA
MILES
CHINCHILLA
NANANGO
NAMBOUR
CALOUNDRA
QUILPIE
KILCOY
BRISBANE
SURAT
DALBY
TARA
WYANDRA
GATTON
IPSWICH
Coral Sea
Isaac River
Belyando River
Fitzroy River
Mackenzie River
Nogoa River
Alice River
Theodore Dam
Nogoa River
Comet River
Nive River
Langlo River
Ward River
Warrego River
Bradley Ck
Merivale River
Maranoa River
Bulloo River
Cannon Ck
Patoo River
Wilson River
Cogoon River
Belonne River
Moonie River
Weir River
Condamine River
Dalby Ck
Emu Ck
Brisbane River
Logan River
Mary River
Burnett River
LEGEND
Towns
Major Roads
Major Rivers
Fitzroy Catchment
Potential Benefited Areas
Bowen Coal Basin
Surat Coal Basin
Water Supply Schemes
GBRMP Zoning (2005)
General Use
Habitat Protection
Conservation Park
Buffer
Scientific Research
Scientific Research (closed to public access)
Marine National Park
Preservation
Projection: GDA94 Zone 56
Figure ES-3
0 15 30 60 90 120
Kilometres
Scale 1:4,000,000 (at A4)
SW 233103B
SKM
SunWater
Making Water Work
NATHAN DAM AND PIPELINES EIS
Downstream Areas & Potential Benefited Areas

The major variation in pipeline alignment options commence south of Wandoan. Initially three main options were examined, including:

- Option 1: A direct route from Wandoan to Dalby, traversing through the Barakula State Forest;
- Option 2: A route that departs the Leichhardt Highway approximately 20 km south of Wandoan and takes a relatively direct route to Chinchilla whilst traversing around the southwest corner of the Barakula State Forest; and
- Option 3: A route that stayed largely within the Leichhardt Highway road reserve to Miles, then the Warrego Highway road reserve through to Dalby.

Whilst Option 1 represented the shortest (and therefore the least capital intensive) option for the alignment it was quickly discarded given the potential impacts to the State Forest.

SunWater's initial planning had focused on option 3, with the primary driver for this option being the opportunity to avoid private property impacts by restricting the pipeline to the road reserve. However further assessment of this option revealed a number of difficulties with this strategy, including:

- insufficient width to contain the required construction or operational easement within the road reserve;
- future planned upgrades for the Warrego Highway that would either risk damage to the pipeline or in a worst case scenario require the pipeline to be relocated;
- safety concerns for both construction and maintenance of the pipeline due to proximity with the highway;
- additional length of the route; and
- with the exception of the town of Miles (which could potentially be supplied by a small lateral offtake from the main pipeline), limited demands identified along the highway route between Wandoan and Chinchilla.

Subsequently pipeline option 2 was selected as the preferred alignment for the pipeline. This option provides a more direct route than option 3, and offers the potential to service the vast majority of SunWater's projected customer base whilst avoiding sensitive environmental areas.

The horizontal alignment of Option 2 has been progressively refined during the preliminary design phase through the assessment of a number of factors, including:

- avoiding topographical extremes, such as steep, rough and unstable terrain;
- identifying co-location opportunities with existing infrastructure such as the Surat Gas Pipeline and road reserves, where feasible;
- avoiding National Parks, nature reserves and designated or potential, heritage and conservation areas;
- avoiding existing coal mining tenures;

- minimising extreme directional changes (consistent with route length minimization); and
- minimising river and creek crossings.

ES1.5 Existing environment, potential impacts and mitigation measures

The Project including all components of dam, pipeline and associated infrastructure works is expected to generate a wide extent and variation in scale of impacts, both negative and positive. The more significant impacts and mitigation measures which have been incorporated into the Project's Environmental Management Plans are detailed below.

The impact assessment process has utilised a significant number of existing studies and research, field studies and new research, published and unpublished information, professional and technical input and review, and community and agency consultation .

ES.1.5.1 Climate and natural disasters

The Project area has a predominantly dry climate with warm to hot wet summers and mild dry winters. The Project area has limited vulnerability to natural hazards. There is a low to medium bushfire risk. The region occasionally experiences some flooding associated with cyclone activity but more frequently experiences flooding associated with thunderstorm activity.

The Project generally has a limited vulnerability to the impact of climate change with the greatest potential impact being a reduction in yield as a result of decreased annual rainfall and increased evaporation.

The key climate change related threats to the biodiversity of the Project area are an increase in the period between rainfall events (and subsequently reduced flows), changes to mean annual rainfall and temperature and the increased incidence and intensity fire. Whilst these impacts appear unavoidable, they can be minimised, particularly with the management of downstream flows from the storage, conservation of a representative array of well-functioning ecosystem, removal or minimisation of stresses such as weeds and fire and the conservation of substantial areas of vegetation with a high level of connectivity.

ES.1.5.2 Topography and geomorphology

The Project will have a significant impact on topography and geomorphology, with the inundation of areas that lie below FSL of 183.5 m AHD. This impact is offset by economic benefits of improved water supply security and does not represent an ongoing risk to the regional topography. Although some localised erosion and sedimentation impacts may occur, overall the ongoing risks to topography and geomorphology are low to medium. The residual risks relevant to topography and geomorphology are acceptable and can be effectively managed.

ES.1.5.2 Landscape character and visual amenity

The visual catchment of the Nathan Dam is remote and largely contained within a relatively closed valley surrounded by sloping terrain. Access to this area is limited and there are currently few visually sensitive receptors.

The visual impact in the immediate vicinity of the dam and water storage area during construction would be limited as there is limited public access to the area. However, there would be visual impacts during operation when residents within Taroom and recreational visitors would be able to view parts of the water storage area. For recreational visitors,

the view of the dam and water storage area would be considered to be a positive experience. The addition of water as a visual element and its association with the surrounding land and topography is likely to increase the visual amenity of the visual catchment from a visitor's perspective.

Impacts can be minimised by locating infrastructure away from sensitive receptors wherever possible and retaining existing vegetation. Re-vegetation of disturbed areas would further reduce the impact on visual amenity.

ES.1.5.3 Geology and soils

Dam design and construction methods will take full account of earthquake and geologic hazards. The potential for soil erosion impacts resulting from construction and operation is considered to be minor. However, standard industry practice mitigation measures will be employed around all construction activities to minimise erosion and sediment transport. Pipeline construction will be completed by restoring the land surface to pre-disturbance condition as far as practicable and as soon as possible after completion.

ES.1.5.4 Land use and infrastructure

The provision of water to service mining operations would support mining within the region, and support economic development within existing towns. Where compensation has been agreed, agricultural properties affected by the pipeline would also benefit from increased water availability for stock and domestic uses. This is consistent with the Central Queensland Regional Growth Management Framework and the local planning schemes which support the mining industry, infrastructure, agriculture and growth of the various local towns.

The dam and water storage area will impact on existing rural land uses, tenures and infrastructure during the construction and operational phases. Land inundated within the affected properties results in a loss of rural land and the productive areas of the properties (i.e. cropping). However, the loss of this productive rural land is considered minimal from a regional perspective. Furthermore, the loss of agricultural land within the water storage area will be adequately offset by the increased supply or security of supply of water in the region.

The vast majority of land acquisitions within the impoundment will be on a partial acquisition basis. An assessment will be undertaken of the impact to each property of the loss of the area under the full supply level, and if a property is significantly impacted by this loss then consideration will be given to offering a full acquisition to the relevant landholder.

Wherever possible, the pipeline will be located within or contiguous with existing easements, roads and rail corridors minimising the potential impact on land uses, and the need for new or full width easements. Although it is a positive for sections of the pipeline to be co-located within existing infrastructure easements or corridors to reduce the overall impact of the Project, the future expansion of these facilities will be constrained.

The impact of the pipeline on land use is likely to be minimal with the pipeline located primarily underground. Existing land uses should be able to continue with the pipe being laid at sufficient depth to allow continued cropping and grazing over the pipeline route. Detailed consideration of the landform above the pipeline will be undertaken in consultation with land owners in farming areas where laser levelling of paddocks has been undertaken.

Where access to private properties is affected during the construction of the pipeline, alternative access will be arranged through consultation with landholders.

Based on this assessment, the impacts relevant to land use and infrastructure can be effectively managed and the residual risks are acceptable.

ES.1.5.6 Land contamination

The EIS identified one land parcel within the 1 in 100 AEP flood level that is listed on the Environmental Management Register (EMR) as containing a cattle dip or spray race. Two potential cattle dip sites were identified within the FSL. An additional seven stockyards were identified above FSL with one potential cattle dip site identified within the 1 in 100 AEP flood extent. Two farm buildings and an area of disturbed land were identified within the FSL. Further investigation of these sites will be undertaken to establish the extent and significance of contamination and remediation requirements.

The pipeline route intersects nine properties listed on the EMR for notifiable activities including:

- livestock dip or spray race;
- landfill;
- petroleum product or oil storage;
- chemical storage;
- hazardous contaminant; and
- gun, pistol or rifle range.

A site inspection of the dam and surrounds, the pipeline route and associated infrastructure will be undertaken to identify sites with the potential for contamination which may not have been identified within the scope of the EIS. Further investigations will be undertaken at the potentially contaminated sites based on the requirements of the *Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland* and the National Environment Protection (Assessment of Site Contamination) Measure (and amendments approved by the Department of Environment and Resource Management (DERM)). Identified properties will be listed on the EMR in accordance with the *Environmental Protection Act 1994* (EP Act).

If required, remediation of contaminated sites will be undertaken prior to inundation of the water storage area or construction of the pipeline. Remediation may not include removal of the sites from the EMR.

If required, disposal permits will be obtained from DERM for the removal of contaminated soil in accordance with the EP Act.

A Draft Environmental Management Plan (EMP) has been prepared which includes measures to prevent the contamination of land and water, and the management of unforeseen contamination. A construction health and safety plan will be prepared to manage exposure to potentially contaminated sites during construction following the completion of further investigations of the potentially contaminated sites.

Based on this assessment, the impacts to the environment from potentially contaminated land can be effectively managed and the residual risk is acceptable.

ES.1.5.7 Sensitive environmental areas

Environmentally sensitive areas are in proximity to the Project. Environmentally sensitive areas include those zoned under legislation or planning schemes, such as nature refuges, national parks, conservation parks, declared fish habitat areas, wilderness areas, aquatic reserves, heritage/historic areas or items, national estates, world heritage areas and sites covered by international treaties or agreements , areas of cultural significance and scientific reserves.

- Terrestrial environment

The Precipice and Isla Gorge National Parks and the Cherwondah, Gurulmundi, Binkey, Barakula and Braemar State Forests are located within the vicinity of the Project area but will not be impacted by the Project.

Protected areas classified as National Estate including Boggomoss Area No. 1 and Boggomoss Area No. 2 will be affected by inundation. No other protected areas located in the vicinity of the Project will be impacted upon, including the Brigalow Invertebrate Site (road reserve along Leichhardt Highway). Associated management measures are outlined in ES 1.5.8.

A small portion of the Boggomoss Nature Refuge will be affected by inundation at FSL. The Mount Rose Nature Refuge will not be impacted.

- Aquatic environment

The nearest point of the Fitzroy River Declared Fish Habitat Area (FHA) is approximately 620 km downstream of the dam. The FHA will not be affected by the Project.

There are no wetlands of international significance (Ramsar) located within the Project area. Lake Murphy Conservation Area, Boggomoss Springs and Palm Tree Creek - all listed in the Directory of Important Wetlands - are located within the study area, however will not be affected by the Project.

ES.1.5.8 Terrestrial flora

- Dam and surrounds

Current remnant Regional Ecosystems (REs), as mapped by DERM, cover 26% of the area within the FSL leaving 74% as non-remnant land, some of which comprises regrowth vegetation however the majority is cleared and constitutes pasture or cropping.

Twenty three remnant REs within the dam and surrounds study area (water storage area plus 2 km buffer), were identified by field survey. Three REs are listed as Endangered (including a sub-type) and four as Of Concern under the VM Act and Biodiversity Status. An additional two REs are listed as Of Concern under the VM Act, but have an Endangered Biodiversity Status.

Brigalow (*Acacia harpophylla* dominant and co-dominant) was the only EPBC Act listed community found within the dam and surrounds.

Threatened species recorded within the dam impact area include *Cryptandra ciliata, Rutidosis crispata* and *Livistona nitida*. Potential habitat also exists for *Arthraxon hispidus* and *Thelypteris confluens*.

Pipeline

The vegetation mapping completed for the EIS identified that 54% of vegetation within the pipeline corridor is non-remnant or regrowth.

A total of 22 remnant REs were identified within the pipeline corridor (30 m easement) including four Endangered REs and five regarded as Of concern under the VM Act and Biodiversity Status and two REs that have an Endangered Biodiversity Status but are Of concern under VM Act.

Two EPBC Act listed communities were found within the pipeline corridor. Brigalow (*Acacia harpophylla* dominant and co-dominant) was identified as occurring within the pipeline easement. Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin occur as a narrow linear patch within the roadside of the Warrego Highway at Macalister.

Threatened species recorded within the pipeline corridor include *Acacia tenuinervis*, *Cryptandra ciliata, Rutidosis crispata* and *Livistona nitida*. Potential habitat also exists for *Acacia curranii, Bertya pedicellata* and *Gonocarpus urceolatus*.

Associated Infrastructure

The construction of new or upgraded roads will result in the loss of 25.8 ha of remnant vegetation of which approximately 8.7 ha is listed as Of Concern or Of Concern sub-dominant and 10.5 ha is listed as Endangered or Endangered sub-dominant. Potentially 10.4 ha also meets the criteria for the EPBC listed Brigalow ecological community, due to the dominance or co-dominance of Brigalow.

Potential impacts and Mitigation measures

Potential impacts to terrestrial flora are assessed as follows:

- loss of 3,655 ha of remnant vegetation and 342 ha of non remnant vegetation (assuming islands are lost as a result of fragmentation) within the dam construction footprint and water storage, including 128.2 ha of Endangered REs and 1,777.9 ha of Of Concern REs. Clearing within the dam construction footprint and water storage will impact on populations of three threatened flora species, *Cryptandra ciliata, Rutidosis crispata* and *Livistona nitida*, and potential habitat for *Arthraxon hispidus* and *Thelypteris confluens*;
- loss of 28 GAB spring wetlands due to inundation within FSL. This equates to a reduction of 11% of the GAB springs in the Springsure Supergroup;
- GAB spring wetlands outside the FSL will also be subject to increased groundwater pressure resulting in increased groundwater flow which is likely to cause wetlands to expand. It is likely that new springs will also be created;
- maximum loss of 123.6 ha of remnant vegetation and 146.5 ha of non-remnant vegetation within the pipeline corridor including 1.8 ha of Endangered REs and 16.6 ha of Of Concern REs, which include 1.7 ha of the EPBC listed Brigalow ecological community; and
- clearing within the pipeline easement has the potential to impact on a number of known species (*Livistona nitida, Acacia tenuinervis, Rutidosis lanata* and *Cryptandra ciliata*).

Pre-construction surveys will be undertaken for both the dam and surrounds and the pipeline easement to confirm the size and condition of existing or potential populations. Translocation and/or propagation plans will be developed to rehabilitate these species in suitable habitat outside the impact area. The downstream environmental flow regime will maintain downstream riparian habitat for *Livistona nitida*. Any residual impacts will be compensated by the offsets package.

Impacts on Endangered and Of Concern REs and threatened ecological communities will be minimised by further refinement of the final pipeline route, where possible, to avoid or at least traverse the edges of patches of significant communities, minimising the clearing width to as little as 15 m where topography and access allow and rehabilitation of the construction easement post-construction back to the original community.

An offset strategy is being developed that will compensate for the loss of remnant vegetation and of habitat. The strategy will be finalised through discussion with DERM and DEEDI. The offset package will include efforts to restore and protect GAB spring communities outside the impact area in line with the recovery plan actions. GAB springs outside the impact area will be monitored to observe any changes in biotic factors.

The spread of weeds will be managed by implementation of a weed management plan during construction and operation.

Based on this assessment, the impacts relevant to terrestrial flora can be effectively managed with successful implementation of offsets.

ES.1.5.9 Terrestrial fauna

- Dam and surrounds (including associated infrastructure)

Two hundred and sixteen species of vertebrate fauna were recorded in the EIS, comprising 16 amphibians, 37 reptiles, 125 birds, 21 non-flying mammals and 17 bats. At a regional level this represents 67% of the known regional fauna (54% of amphibians, 50% of reptiles, 50% of birds and 77% of mammals).

In relation to the occurrence of threatened species, desktop analysis, field surveys and habitat assessment revealed that one amphibian, seven reptiles, eleven birds, four mammals and two invertebrates are either known, likely or possible occurrences within the study area. Fifteen non-EVR priority taxa are also considered known, likely or possible occurrences.

One invertebrate of conservation significance is known to occur within the dam study area. The Boggomoss Snail (*Adclarkia dawsonensis*) is listed as critically endangered under the EPBC Act.

A series of surveys have been undertaken to assess the distribution and population size of the Boggomoss Snail within the water storage area and within the broader region. A total of 187 sites in the Dawson River catchment have been surveyed for the Boggomoss Snail between 2008 and 2010 through the collective efforts of BAMM, SKM and JKR Ecological, covering all potential habitat types within the region.

The species has been recorded from 17 sites, increased from the original two sites identified in the Recovery Plan for the species (Stanisic, 2008). There are six breeding sub-populations of the Boggomoss Snail now known from Mt Rose

Station, Isla-Delusion Camping Reserve, Southend Station (x3) and Gyranda. With the exception of Mt Rose which is located within the water storage area, these sites all occur within the Dawson River riparian zone downstream of Nathan Gorge.

The population estimate for the Boggomoss Snail has been calculated at 29,446 (ranging from 22,951-36,479) for the Dawson River subpopulation and 350 for the Mt Rose subpopulation for which an estimate was made. Population estimates were not made for all sites where live snails were found, either because the habitat patch was too small to allow a population estimate by the SKM methodology, or the recorded snail densities were too low to allow a population estimate by the BAAM methodology. The population estimates are given separately due to the different methods used.

It is acknowledged that estimating the population size of a species that is cryptic and very patchily distributed is not precise, as indicated by the standard errors.

In terms of long-term population viability, the largest and most intact habitat systems occur downstream of the Isla-Delusion Crossing, particularly on the properties Lagoona (which is a part of the Isla-Delusion habitat) and Southend. A mix of adult and sub-adult snails has been reported from all of the known populations, indicating that conditions remain suitable for recruitment of individuals to those populations.

Pipeline

A total of 51 species of vertebrate fauna were observed along the pipeline corridor during the field surveys including one frog, nine reptiles, 38 birds and two mammals. Note that some of these are associated with a superseded pipeline route.

In relation to the occurrence of threatened species, desktop analysis, field surveys and habitat assessment revealed that one amphibian, seven reptiles, nine birds, four mammals and one invertebrate of conservation significance are either known or potential occurrences along the pipeline corridor.

Potential impacts and mitigation measures

Potential impacts to terrestrial fauna are assessed as follows:

- there will be a total loss of 3655 ha of remnant habitat and 341 ha of non remnant habitat for fauna within the dam construction footprint and water storage. This will be minimised to some extent by not clearing vegetation within 1.5 m vertical below FSL in riparian zones, implementing a vegetation clearing and fauna relocation strategy to assist fauna to move into adjacent suitable habitats and relocating habitat features. As it is not possible to fully mitigate this impact, this will be compensated by the offsets package;
- the water storage will fragment riparian habitats along the Dawson River and reduce habitat connectivity along this east-west riparian corridor. The offsets package will include strategic establishment of offsets to restore habitat connectivity around the water storage;
- the water storage will inundate 0.75 ha of known habitat for the critically endangered Boggomoss Snail associated with boggomosses at Mt Rose Station, resulting in the loss of one of six sub-populations (350 individuals). Although this represents a small reduction in population size (1.2%) and a small loss of known habitat (1.9%), the loss is important as it is the only remaining population that occurs in refugial boggomoss habitat (all others occur in riparian habitat). A translocation plan will be implemented for the Boggomoss Snail to collect and relocate as many

snails as possible from the Mt Rose boggomosses to relocation sites outside the impact area. Maintaining environmental flows during operation of the dam will mitigate impacts on the five downstream sub-populations of the Boggomoss Snail. With mitigation, the impact to the species is considered to be low; and

- there will be a loss of 145.6 ha of remnant habitat and 40.9 ha of regrowth habitat for fauna along the pipeline corridor, including potential habitat for a number of threatened species and fragmentation of habitat in the middle section of the pipeline where it traverses large tracts of remnant vegetation. With project controls, the initial impact from the loss and fragmentation of fauna habitat along the pipeline is medium. This will be mitigated by avoiding and realigning pipeline around patches of significant vegetation and habitat, and progressive rehabilitation of the pipeline easement post-construction. Although mitigation reduces the consequence, the impact is still medium. The residual impact will be compensated by offsets.

Based on the risk assessment, the majority of impacts to terrestrial fauna can be effectively managed to acceptable levels. The exception to this is the loss of fauna habitat and the Dawson River riparian corridor, which is unavoidable to allow the Project to proceed and will be compensated by the offsets package and substantial replanting of the riparian zone around the water storage.

ES.1.5.10 Aquatic flora

The assessment showed that:

- the aquatic flora communities inhabiting the dam and surrounds study area is typical of that found throughout the wider Fitzroy Basin and comprised primarily of common and widespread taxa;
- aquatic flora may be lost within the water storage area during construction and filling. Once conditions stabilise, Nathan Dam is expected to support diverse communities of aquatic flora similar in diversity and composition to those observed in Glebe Weir prior to construction;
- baseflows provided in the operations strategy along with decreased moderate flows will provide a stable habitat for macrophyte colonisation downstream of the dam, which may result in the development of a stable and abundant community during the dry season. There will, however, be minimal impact to high flow events or larger flushing events that result in the seasonal loss of some macrophytes;
- only one species protected under State or Commonwealth legislation is expected to be present in the pipeline study area. *Myriophyllum artesium* is known to inhabit a mound spring on Sandy Creek (a small tributary of Cockatoo Creek) and is nationally listed as 'endangered' under the EPBC Act and in Queensland under the NC act. As the spring *Myriophyllum artesium* inhabits is not near any works, no impact upon this species is expected;
- two exotic macrophyte species (*Alternantherea philoxeroides* (alligator weed) and *Urochola* (paragrass)) were recorded within the pipeline study area, however, the risks of transfer, or introduction of new exotic species, are considered to be low;
- although blue-green algae outbreaks may occur within the reservoir, such events are not a feature of other storages in the Fitzroy Basin and the risk of occurrence within the dam is considered to be medium (as low as is reasonably practical). SunWater will implement an appropriate monitoring program for cyanobacteria similar to other storages in Central Queensland;

- construction of the pipeline has the potential to result in a very small and temporary loss of aquatic flora, either due to direct disturbance, or impacts to water quality. However, the native communities are expected to recover after construction;
- these impacts will be effectively managed and mitigated through EMPs for erosion and sediment control, dam operations, and rehabilitation of both temporary and permanent creek crossings; and implementation of fuel-handling and storage in accordance with Australian Standard AS 1940 (2004); and
- as no flow, water quality or sediment regime changes are predicted in the estuary or near-shore environments, no impacts are predicted on flora in those locations (including in the GBRWHA and the Shoalwater and Corio Bays Area Ramsar site).

Based on this assessment, the impacts relevant to aquatic flora can be effectively managed and the residual risks are acceptable.

ES.1.5.11 Aquatic fauna

This assessment showed that:

- the aquatic fauna community in the dam and surrounds study area is diverse and comprised primarily of common and widespread taxa. Although composition of aquatic fauna communities is expected to shift towards those species preferring pool habitat, the diversity of aquatic fauna communities is not expected to decrease;
- only one species protected under State or Commonwealth legislation is expected to be present in the dam and surrounds study area. The Fitzroy River turtle was not recorded during the baseline surveys, however an anecdotal reference to a deceased record exists downstream of Glebe Weir within the Project area. Live records and nests have been recorded in Theodore Weir, approximately 75 km downstream of the proposed dam site. It is considered likely that this species is present in the Project area. As key flows responsible for the maintenance of water quality, foraging habitat and habitat connectivity are not anticipated to change significantly following construction of Nathan Dam, and movement past the dam wall will be facilitated via the construction of a turtleway, the potential for significant impact on this species is considered low;
- the white-throated snapping turtle was recorded in the study area and is listed as 'least concern' under the NC Act, and has been identified as a high priority for conservation in the DERM's species prioritisation framework. The known habitat preferences of this species suggest that this species will be able to establish within the Nathan Dam water storage. Additionally, movement past the dam wall will be facilitated via the construction of a turtleway. Accordingly, the risk of impact upon this species following the construction of Nathan Dam is considered to be low;
- two exotic (*Gambusia holbrooki* and *Carassius auratus*) and two translocated (*Bidyanus bidyanus* and *Hephaestus fuliginosus)* fish species were recorded in the study area. However, the risks of transfer, or introduction of new species, are low;
- physical disturbance at construction sites and as a result of inundation has the potential to directly impact aquatic fauna causing mortality. The scale of the impact area within the local region is not likely to be significant and the DPIF Fish salvage guidelines will be utilised to minimise any potential impacts;

- the water storage will be mostly colonised by the native species that currently inhabit the river and streams, although the proportional abundance will change. Given likely good water quality, relatively low probably of significant stratification and turnover and only occasional major long term water level changes, the lake is expected to be productive and to support a diverse native fauna;
- no commercial fishery exists in the area or is reliant upon breeding from the area;
- a fishway will be provided and will have a broad operational range. It is expected to be suited to a wide range of species;
- the preliminary operational strategy maintains the downstream flows in accordance with the WRP and ecosystem requirements. In conjunction with use of the multi-level offtake, the Project is expected to deliver suitable water quality and flows; and
- potential impacts associated with the Project can be effectively managed and mitigated through effective Environmental Management Plans for erosion and sediment control, dam construction and operations (including factors such as rehabilitation of habitat in the water storage area and effective design of the fishway), and rehabilitation of both temporary and permanent creek crossings; and implementation of fuel-handling and storage in accordance with Australian Standard AS 1940 (2004);
- where proposed water infrastructure in the Fitzroy Basin (i.e. Connors River Dam, Nathan Dam and Lower Fitzroy Weirs (comprising Eden Bann Weir Stage 3 and Rookwood Weir Stage 2 in a staged development)) is operated to provide ecologically critical environmental flows, and are fitted with an effective fishway, the cumulative impacts of this water infrastructure to aquatic fauna are expected to be minimal and acceptable; and
- as no flow, water quality or sediment regime changes are predicted in the estuary or nearshore environments, no impacts are predicted on aquatic fauna in those locations, including in the GBRWHA and the Shoalwater and Corio Bays Area Ramsar site are expected.

Based on this assessment, the impacts relevant to aquatic fauna can be effectively managed and the residual risks are acceptable.

ES.1.5.12 Surface water

Dam and surrounds

Surface water flows in the Fitzroy Basin are highly seasonal, with the majority of flows occurring from December to April and high flow events generally occurring in late summer/early autumn. The Nathan Dam catchment has a total area of approximately 23,185 km^2, approximately 16% of the total Fitzroy Basin. This consists of mainly cleared farming land, although approximately 30% of the catchment is undisturbed.

The Dawson River currently has six instream water storages, which impound approximately 138.5 km of the river. Downstream of Glebe Weir the Dawson River is highly regulated and demonstrates significant modification from existing water resource development. Flow records at Nathan Gorge show that low flows have been heavily modified, and that the river regularly experiences periods of no flow under current levels of approved development.

Further downstream along the Dawson River all flows, with the exception of infrequent high flow events, have been significantly reduced by development within the catchment. At Beckers the impact of flow regulation can be seen on low flows which are artificially maintained within the river due to river regulation and water storage operations.

At the downstream end of the Dawson River, the impact of water resource development is ameliorated by the inflows from the Don River, which has a relatively undeveloped catchment. This reduces the impact of the development within the Dawson catchment on flows into the Fitzroy River.

Flows in the Fitzroy River reflect moderate levels of impact, although a high degree of regulation is evident in the low flow range at Eden Bann Weir and at the mouth of the Fitzroy River. This is primarily due to extraction from the water storages.

Pipeline

The preferred pipeline route includes approximately 20 stream crossings, of both major and minor streams. Although the larger streams crossed by the pipeline may be perennial, the smaller watercourses flow intermittently or are ephemeral. These streams support a number of farmers who generally use small volumes of unsupplemented water, predominantly for irrigation, and stock and domestic purposes.

Associated Infrastructure

Where new roads or road upgrades are required culverts will be constructed to maintain existing local drainage patterns. Currently the majority of roads in the area have a flood immunity of 1 in 2 AEP while new roads and modified or upgraded roads will be designed to achieve a flood immunity of at least 1 in 10 AEP. Two flood causeways and a bridge will be constructed; these will be designed to achieve a flood immunity of at least 1 in 10 AEP.

Glebe Weir and its associated infrastructure will be inundated by the Nathan Dam storage however; Glebe Weir will continue to serve its role in the Dawson Valley Water Supply Scheme until Nathan Dam commences to store water and can take over that role. Decommissioning of the weir will involve completely abandoning the storage, with its removal to the extent that it no longer retains water.

Potential impacts and mitigation measures

Construction

During the construction process downstream flows in the Dawson River will be maintained, with Glebe Weir continuing to fulfil its role as the uppermost storage of the DVWSS. A diversion tunnel will be constructed to divert water around the works, maintaining water access of existing downstream users as well as downstream environmental flows during the construction period.

Pipeline construction in waterways will be scheduled for the dry season when most crossings are expected to be dry. Once construction is completed the channel will be returned to its natural condition, minimising any long term impacts to the downstream flow regime.

The majority of the pipeline will be buried, with the alignment being returned to its natural condition. While some minor impacts to local hydrology may occur during construction it is anticipated that there will be no changes to the existing flow regime after the pipeline has been finalised.

Operations

Potential impacts to the flow regime can be summarised as follows:

- the total impounded extent on the Dawson River will increase from 138.5 km to 183.2 km;
- there will be a range of impacts on the flow regime along the Dawson River although these will decrease with distance downstream from the dam, as flow from additional tributaries enters the river. Downstream of the Don River confluence (267 km downstream of the dam) impacts to the flow regime are minimal;
- impacts to the flow regime directly downstream of the dam (at Nathan Gorge) will be varied, with the low flow range improved to better mimic pre-development conditions, the medium flow range moderately reduced and minor reductions to the high flow range. The overall flow volume (on an annual basis) will decrease; and
- the Project will have minimal impacts on flow regimes in the Fitzroy River, downstream of the Dawson River.

Potential impacts to existing users can be summarised as follows:

- existing high priority users in the Dawson and Lower Fitzroy catchments will not be impacted by the Project;
- existing medium priority users in the Dawson catchment will experience a range of impacts, with some users experiencing a reduction in the reliability of supply and mean annual diversion and some experiencing an increase. These impacts are not directly due to the construction of the dam but are more to do with the revised operational rules of the water supply scheme;
- the Lower Fitzroy unsupplemented irrigators will experience some changes to the days of waterharvesting opportunity and a minor overall reduction of diversions (approximately 1%);
- the unsupplemented irrigators in the Dawson catchment will experience an average reduction of 10% of their mean annual diversion. The groups that are impacted are the waterharvesters with high passing flow thresholds associated with their licences, reflecting the reduction in medium to high flows; and
- appropriate compensation strategies for existing water users will be developed at later stages of the Project, after the new WRP is modelled and in conjunction with local irrigator groups.

Based on the risk assessment, the majority of impacts to surface water resources can be effectively managed to acceptable levels.

The potential impact of the Project on fluvial geomorphology in the Dawson River and wider Fitzroy River Basin has also been assessed. This assessment showed geomorphic processes for the Dawson River are likely to be maintained for the post-dam case and the residual risk is generally low, with the exception of the 2 km section of river immediately downstream of the dam. There is the potential to further mitigate these risks through the optimisation of the flow release strategy. Although some localised erosion and sedimentation impacts may occur, overall the risks to fluvial

geomorphology are low to medium. The residual risks relevant to fluvial geomorphology are acceptable and can be effectively managed.

ES.1.5.13 Groundwater

Assessment of the existing hydrogeological environment is summarised below:

- there are three main aquifers systems that will potentially be impacted by Nathan Dam. These are:
  - Precipice Sandstone and Hutton Sandstone that are significant consolidated sandstone aquifers of the Surat Basin; and
  - minor to significant unconsolidated sedimentary aquifers associated with the alluvium of the Dawson River and its major tributaries;
- regional groundwater flow patterns indicate that recharge to the Precipice and Hutton Sandstones occurs in the outcrop areas located well to the west and north of the dam site and that groundwater flows largely to the south-east before discharging along the Dawson River and Boggomoss springs. There is also localised recharge occurring via infiltration of rainfall on exposed outcrops of Precipice Sandstone on the flanks of the Dawson River valley;
- recharge to the alluvium of the Dawson River occurs via a combination of mechanisms including, direct infiltration of rainfall; infiltration of stream flow, particularly during flood periods; and upward leakage of artesian water from underlying formations. Groundwater discharge from the Alluvial Aquifer occurs primarily as down-valley through flow or discharge into streams.;
- there are 83 registered springs within the Project area. All are associated with discharge from the Precipice Sandstone except for a series of springs located in the Palm Creek area. These springs were believed to be associated with groundwater discharge from the Hutton Sandstone / Eurombah Formation;
- the Dawson River is fed by springs that contribute to its permanent flow;
- the use of groundwater for on-site purposes (such as dust suppression, etc.) has not been identified as a requirement for pre-construction, construction, and operational phases of the dam;
- dewatering activities associated with the construction of the dam chimney filter will locally lower groundwater levels in the water table aquifer by up to 19 m; and
- seepage loss and transfer of pressure from the weight of the dam wall will result in an increase in the groundwater levels of the underlying aquifers.

Potential impacts to groundwater systems arising from the construction and operation of the dam were identified using available knowledge of groundwater occurrence in the Project area and development of a groundwater model. It is considered that identified groundwater impacts can be addressed through implementation of appropriate management activities and monitoring. It is not anticipated that any significant risks relevant to groundwater resources will remain after mitigation.

Groundwater monitoring will be required to be undertaken to monitor potential impacts and confirm predictions.

ES.1.5.14 Surface water quality

The existing environment is indicative of a disturbed system, impacted by surrounding land-uses (predominantly grazing and cropping). Potential impacts are separated into construction and operational phases. During construction, the potential impacts relate mainly to reduced surface water quality from sediment disturbance and tranpsort. These are mitigated by sediment and erosion control measures such as a diversion channel, temporary water storage ponds, sediment booms, sediment fences and re-vegetation. During operation, the potential impacts are reduced water quality within the dam during the initial filling phase, reduced water quality within the reservoir caused by turn-over events, and reduced water quality downstream. These are mitigated by the Preliminary Operational Strategy (water releases), a first fill strategy, a multi-level off-take, weed management strategies and revegetation and vegetation offset strategies. Based on this risk assessment, the impacts relevant to surface water quality can be effectively managed and the residual risks are acceptable.

ES.1.5.15 Air quality

This assessment has quantitatively and qualitatively assessed the air quality impacts of the construction of the dam and associated infrastructure. Dispersion modelling was used to predict PM_{10} and TSP concentrations and dust deposition rates at sensitive receivers.

The modelling indicated that the main activities of the Project will not cause exceedances of DERM air quality goals at the nearest sensitive receivers provided the buffer distances recommended in this report for certain activities are implemented.

All borrow areas are contained within FSL and as such are unlikely to affect sensitive receivers in the study area.

Operational air quality impacts are likely to be very minor given the access roads will be sealed, low vehicle speeds at the recreation area and generally low levels of activity.

ES.1.5.16 Greenhouse gas

The cumulative total potential GHG emissions due to the construction of the dam and pipeline are estimated at approximately 612,889 tCO_2-e per year with a further 71,645 tCO_2-e per year for the operational phase. The largest contributor to GHG emissions is land use change.

The construction program has been designed to maximise energy efficiency and minimise greenhouse gas emissions from the works. The continued implementation of SunWater's Energy Management Standard will minimise greenhouse gas emissions from the operation of the Project. SunWater is required to estimate and report annual greenhouse gas emissions under the National Greenhouse and Energy Reporting System. The development of consistent data capture and reporting processes will assist with the ongoing management of SunWater's greenhouse and energy management programs.

The Project is physically closer to mining operations than other water supply options. The greenhouse gas and energy intensity associated with pumping water will be lower than these other water supply options because of the shorter transport distance and lower pressure drop through the Pipeline.

ES.1.5.17 Noise and vibration

The existing acoustic environment is mainly representative of a quiet rural area. The potential noise and vibration impacts of the construction and operation of the Project have been assessed. Sensitive receivers and acoustic quality environmental values to be protected have been identified and potential noise and vibration levels have been predicted using modelling and fundamentals.

The potential for significant noise and vibration nuisance impacts from the construction of the Project is low, given the distance between construction activities and sensitive receivers, the temporary nature of impacts, and through the implementation of the mitigation measures identified in this section of the EIS. When assessed against the Project noise and vibration goals, expected noise and vibration levels at sensitive receivers were found to comply. Noise emissions during the pipeline construction may cause some short term impacts on nearby residents where located near townships. Noise mitigation measures will be implemented for these areas.

ES.1.5.18 Waste

The management of waste associated with the construction, construction site decommissioning and operation of the Project will be undertaken in accordance with relevant legislative requirements, guidelines and the Draft EMP.

It is anticipated that much of the waste generated as a result of the works can be beneficially reused within the Project or in nearby projects. Where wastes cannot be reused, recycling opportunities will be maximised. Appropriate facilities exist in the local region to accept wastes that need to be disposed off-site.

ES.1.5.19 Transport

Construction and ultimate operational activities for the Project will be solely dependent on road transport as the Project site is not served directly by rail or sea infrastructure. Traffic and transport impacts have been assessed by:

- identifying the transport methods and routes associated with the Project, including proposed new or alterations to transport-related infrastructure, and the construction of any project-related plant or utilities;
- identifying demand, composition, timing and routes, of inputs and outputs of traffic generation for the Project; and
- assessing the potential impacts of project related traffic on the surrounding road network, including those related to safety, interaction with other road users (such as buses and emergency vehicles), and special circumstances such as the transport of over dimensional or dangerous goods, and the required mitigation measures.

The assessment has found that peak transport activity for the entire project is when pipeline bedding material delivery is concurrent with the delivery of pipes. This would take place during normal (non-peak) dam construction activity. The assessment has found that the increase in traffic generated by the Project during its peak construction period will not affect the level of service experienced by drivers on roads affected by the Project. The construction works will not affect the range of vehicle types using these state controlled roads, so no change in the geometry of the existing roads will be required.

Transportation of over-dimensional loads and dangerous goods will be on state roads under permit and, where necessary, accompanied by safety escorts. In terms of the local road network, the dam site access of Glebe Weir Road and Spring Creek Road will be upgraded, as well as road segments of Taroom - Cracow Road to the south of the dam

site. A section of Bundulla Road will be closed due to inundation. Where property access is affected it will be realigned or replaced. Overall, an increase in retrace routeing is estimated for a minor number of anticipated trips. Bundulla Road would become two terminal roadways as a result of the road closure.

While the potential impacts on health, education and emergency services are expected to be minimal with no significant increases on services required, ongoing consultation, in particular with Queensland Police Service, Queensland Fire and Rescue Service and Queensland Health will be undertaken to ensure that services are able to accommodate the Project and any associated impacts are addressed. There will be no impact on the accessibility to transport for people with a disability.

The pipeline route crosses the future Surat Basin Rail corridor north of Wandoan. SunWater will consult with Queensland Rail and the Surat Basin Rail Corporation regarding construction or operational works, including approvals, related to this crossing.

A number of mitigation measures and routes have been identified and/or recommended to mitigate impacts to the state controlled roads, local roads and railway corridors. Most of these measures have been determined through project design and will be reviewed in consideration of other projects in the area with the construction and haulage contractors once they are appointed. The road impact assessment will then be revised to reflect the actual routes and transport methods to be used. Specific mitigation measures and strategies to be implemented will be determined at detailed project design.

ES.1.5.20 Indigenous cultural heritage

SunWater is addressing all aspects of its duty of care in regard to Aboriginal cultural heritage associated with the Project area and is developing cultural heritage management strategies in consultation with the appropriate Aboriginal parties in line with the requirements of the *Aboriginal Cultural Heritage Act (2003)* (ACHA).

Pursuant to section 87 of the ACHA, a cultural heritage management plan (CHMP) is required if an environmental impact statement is needed for a project. SunWater has engaged with the following Aboriginal Parties to develop CHMPs over the Project area:

- the Wulli Wulli people, who hold a registered native title claim (QC00/007) that covers the lower section of the Nathan Dam impoundment and the first 24 km of the pipeline from the dam to Cockatoo Creek, and who responded to a CHMP public notice for the upper (unclaimed) part of the dam impoundment area;
- the Iman #2 people, who hold a registered native title claim (QC97/055) that covers 69 km of the pipeline route from where it crosses Cockatoo Creek to a point about 10 km south of Wandoan, and who responded to a CHMP public notice for the upper (unclaimed) part of the dam impoundment area;
- the Barunggam People, who held a native title claim (QC99/005 – dismissed 5 June 2008) at the time of issuing the CHMP notices that covers 160 km of the pipeline route from a point about 20 km south of Wandoan through to Dalby.; and
- the Western Wakka Wakka People, who were the last group to hold a native title claim (QC99/004 – struck out on 27 April 2007) over a 10 km-long section of the pipeline route south west of Wandoan.

Searches of the Queensland Aboriginal Heritage Database and Register revealed only one Aboriginal cultural heritage site previously recorded within the dam water storage area and no sites previously recorded along the pipeline route While indigenous cultural heritage investigations had been undertaken in association with the previous Nathan Dam investigations during the mid to late 1990s and cultural heritage was identified within the Project area as a result of these studies, no data was submitted to DERM for entry to the Register.

SunWater has undertaken extensive consultation with the endorsed Aboriginal parties commencing in December 2007. Meetings have been held with all of the endorsed parties to explain the Project and discuss and agree on the approach to be taken to cultural heritage management. Cultural heritage engagement agreements (CHEAs) were finalised with all of the parties for the purposes of undertaking cultural heritage surveys and early works clearances.

Systematic and comprehensive indigenous cultural heritage surveys have, or are being carried out over all areas impacted by the Project. Surveys have been completed over the dam impoundment area and much of the pipeline route (ongoing). Confidential cultural heritage survey and assessment reports have or are being prepared that include recommendations for the management of indigenous cultural heritage identified within the Project area.

Potential impacts and mitigation measures

SunWater seeks to ensure that management of indigenous cultural heritage identified by the surveys is done on a collaborative basis, and in a manner which empowers the relevant Aboriginal Parties in the decision making process. CHMPs are being developed in consultation with the endorsed Aboriginal parties, with negotiations based on the management recommendations set out in the cultural heritage assessment reports.

The CHMPs for the dam areas and the first section of the pipeline route (Wulli Wulli, Iman and Joint Wulli Wulli/Iman areas of interest) have been completed, endorsed and lodged with DERM for registration in 2011. CHMPs for the remaining sections of the pipeline route (Western Wakka Wakka and Barunggam areas of interest) will be negotiated during 2012. Management of cultural heritage in accordance with the CHMPs will be implemented only after all project approvals have been received.

Management strategies in the CHMP will cover:

- the clearing and construction component of the Project;
- future activities/operations associated with the Project which may impact on Aboriginal cultural heritage; and
- processes to manage or mitigate these impacts for as long as the Project remains in place.

ES.1.5.21 Non-indigenous cultural heritage

The EIS assessed sites of non-Indigenous cultural heritage significance within a 5 km buffer of both the dam and surrounds and pipeline areas. The study located 35 sites of historical/archaeological significance (HAS), of which 17 were previously known through heritage registers. These sites included a broad cross-section of site types across all areas of the Project and all require further analysis and management if they are to be impacted. These sites are important because each reflects key heritage themes within the study area, including pastoralism, exploration, mining and infrastructure development.

Some sites also have unique associations with properties and individuals within the study area, such as the inscribed rocks (HAS-14, 16). The sites located during the study, except for those described as historical interest (HI), warranted further assessment for significance and impact. The cultural heritage values attributed to these sites were influenced by historical research, land holder consultation and Queensland Heritage Act 1992 guidelines. No sites identified during the study were of national heritage significance. Twelve were found to be of State significance and the remaining 23 met local significance criteria. Three sites were identified as containing archaeological potential.

Management strategies for all these sites in accordance with DERM guidelines have been provided in the EIS. For sites being inundated, there will be no future use or access. It has been recommended that photography and records of these sites be undertaken. For any sites not inundated, the current longterm use and access will notbe impacted. Interruption of access to HAS sites due to nearby construction works will be minimised by minimising the construction period where possible.

Three HI sites were located during the study. These are not considered significant enough to warrant further significance or impact assessment, however if possible, they should be retained.

The Glebe Homestead is listed on the Queensland Heritage Register and will be directly impacted by the Project as it lies within the water storage area. The homestead will be the subject of an Archaeological Management Plan and will be relocated as part of the Project, if this is a recommendation of the plan.

The Taroom Aboriginal Reserve was recently listed as a heritage place on the Queensland Heritage Register and parts of the reserve will be impacted by inundation by the dam. Management of the areas impacted by inundation will be covered under indigenous cultural heritage management plans and wide community consultation on CHMP management strategies will be undertaken. An Archaeological Management Plan will be developed and implemented.

The Juandah Heritage Site is located on the pipeline route east of Wandoan and approximately 1% of the site will be affected by pipeline easements. A significance assessment will be conducted for this site and if warranted a site-specific Archaeological Management Plan will be developed in consultation with the Juandah Historical Society.

The results outlined above demonstrate a broad dispersal of sites throughout the study area. Further field survey of the pipeline alignment will be undertaken during the detailed design phase. Several site types were identified in the field survey that can be predicted to be located across more of the study area as the Project commences. These include survey trees, telegraph alignments, old road alignments and railway sidings.

ES.1.5.22 Social environment

Construction and operation of the Project would have a number of impacts for local and regional communities. In the short term; the primary benefits of the Project would be the creation of employment, training and procurement opportunities for local communities and businesses. However, the potential for communities to realise these benefits would be dependent on the nature of training and education that is provided pre-construction, and on the implementation of local procurement policies by SunWater and the construction contractors.

The majority of social impacts associated with the Project would be experienced during the construction phase and would generally relate to:

- increased construction traffic on local and regional roads, resulting in potential changes and disruption to local access and connectivity, and community concerns relating to road safety;
- potential for increased demand for housing and accommodation from construction workers;
- temporary disruption to farming operations along the pipeline during construction of the pipeline;
- increased demand for some social services, especially health and emergency services; and
- potential impacts on local environmental values relating to the clearing of vegetation along the pipeline, the spread of weeds between properties and the crossing of creeks and rivers by the pipeline, including construction works in the vicinity of creeks and rivers.

Potential impacts of construction on local and regional communities would be effectively managed through the design of the Project and implementation of mitigation and environmental management measures. In particular, the establishment of construction camps to accommodate construction workers would address impacts associated with increased demand for housing and accommodation. These would be relatively self-contained and would include facilities to cater for the day-to-day needs of construction workers. The camps would also help to reduce demand for services and facilities in local towns as well as mitigate impacts on community cohesion, and population and demography of local towns.

The provision of buses to transport workers between construction camps and work sites, and from regional centres to construction camps would also assist in reducing construction traffic on local and regional roads and road safety impacts, particularly associated with fatigue related accidents.

Early and ongoing consultation and communication with directly affected property owners would also help to manage impacts of the pipeline's construction on the use of land and farming operations of properties along the pipeline. This would include information on matters relation to environmental management and mitigation and land access protocols.

In the longer term, social impacts of the Project generally relate to:

- beneficial social and economic development opportunities supported by a more reliable water supply to the region;
- changed downstream flow for irrigators and water harvesters, potentially affecting lifestyles and livelihoods;
- the acquisition of pastoral properties and loss of farming land within the water storage area;
- changes for local residents who are required to relocate from properties acquired for the Project;
- impacts on community values associated with the loss of rural land and agricultural lifestyles;
- changes to local access and connectivity in the vicinity of the water storage area, due to closure and diversion of local roads;
- potential restrictions on the use of land and farming operations within the pipeline easement; and
- improved access for local communities to recreational facilities provided at the dam.

Compensation would be paid to directly affected property owners in accordance with relevant legislation. SunWater have also identified measures to off-set environmental impacts associated with vegetation clearing within the water storage area.

ES.1.5.23 Economic environment

The Project will provide an overall positive impact in terms of providing additional water security to support the development of the coal mining industry, to ensure water supplies for regional urban development and to offer opportunities for additional agricultural development. However, because the regional economy is already relatively buoyant due mainly to the mining activity, the Project impacts are likely to be dispersed more widely across the State than a similar Project undertaken in a region with a less buoyant economy and more under-utilised resources.

It is also important to note that some impacts will be temporary and largely driven by the construction process and the impact this will have on the local economy, whilst other impacts are more permanent in their nature and driven by the ongoing provision of water by the dam and pipeline. However, while there are very large on-going potential benefits contingent on the Project's completion, the bulk of these benefits are not included in this impact assessment as they are subject to additional and separate investment decisions (e.g. mining expansion plans) and not part of the terms of reference for this impact assessment.

During construction the Project will generate direct employment opportunities for a mix of on-site construction workers and professional support personnel including senior and junior engineers, clerical staff, supervisors, foremen as well as soil technicians, environmental officers and their support staff. The construction workforce for each component of the Project includes:

- an average of 90 people for construction of the dam, peaking to 170 people during the dam construction period. This includes some 20-30 professional staff;
- an average of some 150 pipeline construction staff peaking at 220 people during pipeline construction including some 70 support staff; and
- approximately 35 road construction workers, plus professional staff.

Economic costs in the form of forgone production will also result from the Project. The largest of these are agricultural losses where land once used for agriculture will form part of the water storage area and due to reduced water diversions particularly through reduced waterharvesting volumes. The cost however is considered to be small relative to regional production and will be mitigated through compensation arrangements.

ES.1.5.24 Hazard and risk

The failure hazard category has important impacts on the design work to be undertaken to achieve the required reliability of the structure under the various failure modes. Based on the preliminary estimate of population at risk, the Nathan Dam is expected to be assigned a *High A* sunny day failure hazard.

The acceptable flood capacity for a dam is based on the assigned hazard category. In Queensland, this must be undertaken according to the Guidelines on Acceptable Flood Capacity for Dams (DNRW, 2007) which deviates slightly from the comparable ANCOLD requirements.

The fallback option for a *High A* hazard category dam is that it is required to have adequate spillway capacity to safely pass the Probable Maximum Precipitation Design Flood (PMPDF) which has an Annual Exceedance Probability (AEP) of 1 in 43,000 for this dam. However, due to the uncertainty of the hazard category at this time, the Nathan Dam spillway has been designed to pass the Probable Maximum Flood (PMF) which significantly exceeds this requirement.

The final design should include a quantitative risk assessment consistent with the requirements of the ANCOLD Guidelines on Risk Assessment (2003b). This will involve demonstrating compliance with ANCOLD societal and individual risk criteria as well as demonstrating that the risks posed by the dam are As Low As Reasonably Practicable (ALARP).

The risk assessment for aspects other than dam failure shows that the residual risks of the Project are no higher than moderate with most being related to typical construction activities that are regularly managed through the contractor selection process and implementation of current environmental management and health and safety practices. Operational risks relate to public safety at the dam and public access to the pipeline especially during maintenance activities.

Provided competent construction and operation of the dam and pipeline is in place there are no identified residual risks that are abnormal or pose an increased level of uncertainty in achieving the objectives for this Project.

ES.1.5.25 Cumulative impacts

This section has presented an overview of the impacts of the Project and the potential for cumulative impacts arising from the Project construction and operation. Three Project activities (vegetation clearing/inundation, operation of the storage and potential spread of weeds) were identified as having the potential to cause long term cumulative impact, whilst three short-term cumulative impacts associated with multiple projects within the vicinity of the pipeline route (increased heavy vehicle haulage, increase in workforce and changes to community values and cohesion) were addressed.

With respect to vegetation clearing/inundation, a Vegetation Clearance Management Plan will be developed for the Project to manage clearing and minimise the impacts on vegetation. There will however be an unavoidable loss of remnant vegetation and as such an offsets strategy will be developed to comply with the legislative requirements.

To determine potential cumulative impacts associated with changes to downstream flows, a cumulative impacts scenario was modelled in order to represent the infrastructure currently proposed for the basin. Overall, the impacts of the Cumulative Impacts scenario are moderate and able to be managed through a combination of environmental flow releases and management rules. These will need to be developed as the proposed infrastructure is approved and finalised.

To minimise the potential for the spread and introduction of weeds from the outset of construction of the dam and pipeline, a weed management plan will be developed for construction and operation of the Project. This will include use of wash-down facilities for construction vehicles and equipment, weed inspection and control and monitoring.

Should a number of projects currently undergoing environmental approvals commence construction concurrent to the Project's construction phase, the surrounding state and local roads would experience a considerable increase in additional traffic demand. These additional demands will be managed through a Road Use Management Plan (RUMP) and associated Traffic Management Plans (TMPs) developed in consultation with Queensland Department of Transport and Main Roads, local Police and councils. SunWater will also liaise with other parties currently or planning to add significant volumes of traffic onto the surrounding road network.

To minimise cumulative social impacts on local communities during pipeline construction, ongoing consultation and communication with the Banana Shire Council, Western Downs Regional Council, relevant Queensland Government agencies (e.g. Department of Communities, Queensland Police, Queensland Health, Department of Transport and Main Roads, Department of Employment and Economic Development and Innovation and Department of Education and Training) and other project proponents in the study area, will be undertaken.

The Project will provide an overall positive economic impact in terms of providing additional water security to support the development of the coal mining industry and to ensure water supplies for regional urban development.

ES.1.5.26 Matters of National Environmental Significance (MNES)

No federally listed threatened flora species were recorded from the Project area. Database searches indicate that two threatened flora species may occur within the Project area, Hairy-joint Grass and Curly-bark Wattle. Hairy-joint Grass was not recorded in the Project area, despite targeted searches, therefore, the Project is unlikely to impact an important population of this species. One threatened flora species is considered likely to occur along the pipeline corridor, Curly Bark Wattle (*Acacia curranii*). Three EPBC listed 'endangered' ecological communities are identified as occurring within the Project area:

- Brigalow (*Acacia harpophylla* dominant and co-dominant);
- natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin; and
- semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions.

The Brigalow EC was recorded within the water storage area and along the pipeline route. The Natural grassland and Semi-evergreen vine thicket (SEVT) ECs were recorded only along the pipeline route. The pipeline has been realigned to avoid the SEVT.

Clearing for the dam, pipeline and road upgrades will result in the loss of up to 214.4 ha of Brigalow. This impact will be further minimised where practical by realigning the final pipeline route to avoid or at least traverse the edges of Brigalow, minimise the construction width and rehabilitation of the construction easement post-construction. Offsets will be provided to compensate residual impacts on Brigalow.

Two listed threatened fauna species were recorded from the Project area, the Boggomoss Snail (*Adclarkia dawsonensis*) and Squatter Pigeon (Southern) (*Geophaps scripta*). Four additional species are considered likely to occur in the Project area, the Brigalow Scaly-foot (*Paradelma orientalis*), the Ornamental Snake (*Denisonia maculata*), the Australian Painted Snipe (*Rostratula australis*) and the Fitzroy River Turtle (*Rheodytes leukops*).

Four listed Migratory species are known from the Project area, White-bellied Sea-eagle (*Haliaeetus leucogaster*), White-throated Needletail (*Hirundapus caudacutus*), Cattle Egret (*Ardea ibis*), and Rainbow Bee-eater (*Merops ornatus*). A further four migratory species are considered likely to occur in the Project area.

Potential impacts on threatened species and ecological communities have been considered at length. With successful implementation of mitigation strategies, the Project is not considered to have a significant adverse impact on any threatened species or ecological community. However residual impacts will be present and SunWater is committed to an offset strategy to address these impacts.

Consequential actions and cumulative impacts of the proposed action have been considered. It is considered that there are two core environmental issues associated with cumulative impact with other projects: changes to the flow regime and clearing of vegetation. As part of the hydrologic assessment a cumulative impacts scenario was modelled. Overall, the impacts of the cumulative impacts scenarios are moderate and will be able to be managed through a combination of environmental flow releases and management rules. These will need to be developed as the other proposed infrastructure is approved and finalised. The clearing of vegetation will be offset by protection and rehabilitation of extensive tracts of habitat around and downstream of the water storage. With mitigation and offsets there is not expected to be a net loss of significant vegetation and habitat for threatened species, and thus cumulative impacts with other projects in the region (i.e. Wandoan Coal Mine), which are themselves required to provide offsets, are expected to be low.

The Fitzroy River estuary and Great Barrier Reef Marine Park are located some 620 km downstream of the dam. No significant flow, water quality or sediment regime changes are predicted in the estuary or near-shore environments, therefore impacts on flora, fauna or the marine environment in these locations, including the World Heritage Values and the Marine Park, are unlikely. The Shoalwater and Corio Bay Wetlands of National Environmental Significance are similarly separated from the Project area and significant impacts are unlikely.

A series of mitigation measures are proposed which minimise the residual risk to matters of national environmental significance as far as practically possible.

ES1.6 Stakeholder consultation

More than a thousand stakeholder interactions were conducted throughout the public consultation process for the Nathan Dam EIS. These interactions took place across the various public consultation activities aimed at providing opportunity for involvement of as many interested and affected stakeholders in the EIS process as possible.

Stakeholders were identified based on their proximity to the Project and statutory identification as either an Affected Person (primary stakeholder) or and Interested Person (secondary stakeholder). Stakeholders with an interest in regional issues such as local businesses were also engaged as well as government representatives.

With regard to meeting the requirements of the ToR, the Project consultation has:

- provided opportunities for community involvement and education;
- enabled people with a disability, families and carers to participate through a range of appropriate communication modes;

- identified broad issues of concern to local and regional communities and interest groups and addressed issues from project planning through to commissioning and project operations; and
- documented detailed results of the consultation process.

ES1.7 Approach to environmental management

A number of recommendations have been made in this Environmental Impact Statement (EIS) in relation to the management of environmental impacts during the construction and operation of the Project. These recommendations will require actions to be taken during the design, construction and operational life of the Project.

The mitigation of impact and realisation of beneficial outcomes identified in the environmental impact assessment process will require an effective management framework and implementation. Detailed environmental management plans (EMPs) will need to be prepared. Some aspects of the EMPs will need to be approved by the Queensland Government and others will need to be approved by SunWater prior to the commencement of construction and operation of the Project. Existing laws, regulations, codes and the like determine the approval roles and responsibilities of the Queensland Government, Federal Government and SunWater.

The EIS provides draft EMPs which set out the Project commitments to avoid or minimise potential environmental impacts of the Project as identified in the EIS, identification of environmental aspects to be managed and how environmental values may be protected and enhanced. Included are Construction and Operational Environmental Management Plans which are dynamic documents as they incorporate continuous improvement. Each plan will be updated to incorporate further information, approval conditions, and changes in environmental management procedures in the light of ongoing detailed design, monitoring results, new techniques, and relevant legislative requirements.

ES1.8 Recommendations

Having regard for the benefits and the impacts of the Project presented in this EIS, it is a recommendation of the EIS that the Project proceeds subject to:

a) developing and implementing detailed EMPs for the construction phase and the operational phase;

b) developing and implementing a scheme of effective mitigation measures and proponent commitments such as those set out in the EIS; and

c) finalising the offset strategy.

In making the recommendation, the Coordinator-General is requested to:

1) assess the EIS;

2) recommend the Project proceed; and

3) state conditions for the Project under section 39 (1) (a) of the *State Development and Public Works Organisation Act 1971*.