2. PROJECT NEED AND ALTERNATIVES

2.1. Historical Background

Water scarcity has been a long standing problem in the Granite Belt.

A number of reports have been prepared over the last 33 years to identify suitable options for improving reliability of water supply for the town of Stanthorpe and rural industries in the Granite Belt area:

- Report on Water Resources Development Potential [in the] Granite Belt Area, (DPI, 1980);
- Granite Belt Dam Sites – Yield Analysis, Surface Water Branch Hydrology Report No 416308.PR. (Teske, 1983);
- Preliminary Report on the Effects of Upstream Land Use on Storm King Dam (Monro Johnson & Associates, 1983);
- Report on Stanthorpe Water Supply Strategy Study (Monro Johnson & Associates, 1984);
- Report on Granite Belt Damsites – Yield Analysis and Flood Hydrology at (1) Quart Pot Creek Damsite at 292.9 km, and (2) The Broadwater Damsite at 10.8 km (Huxley, 1986);
- Report on Granite Belt Investigation (DPI, 1988);
- Water Supply Headworks Strategy Study for Stanthorpe and Wallangarra (SKM, 1997);
- Water Supply Headworks Strategy Study for Stanthorpe and Wallangarra – Investigation of Alternative Dam Sites (SKM, 1997);
- Proposed Dam near Ballandean on the Severn River – Water Infrastructure Advisory Council Submission (SKM, 1998);
- Feasibility Study of Integrated Water Supply Proposals on the Granite Belt (SKM, 1999);
- Stanthorpe Water Supply Dam Options Review (SKM, 2005).
- Stanthorpe Shire Water Opportunities Urban Water Needs Analysis (SKM, 2006).
- Emu Swamp Dam Flood Hydrology and Failure Impact Assessment (SKM, 2007a);
- Stanthorpe Water Supply Strategy IQQM Modelling Report (SKM, 2007b);
- Stanthorpe's Next Water Supply Source Yield Assessment of Kia Ora Dam Site (SKM, 2007c);
- Stanthorpe Water Network Study (SKM, 2007d);
- Emu Swamp Dam Planning Report (SKM, 2007e); and
- South West Queensland Urban Water Demand Study – Stanthorpe (MWH, 2013).

Emu Swamp Dam has been adopted by SDRC to provide urban and irrigation water.

2.2. Project Need

2.2.1. Current Water Supply and Usage

A number of submission agreed with EIS findings that water security was a major concern for the Stanthorpe community.

Section 2.1.1 of the EIS identified that water is supplied to Stanthorpe from Storm King Dam which is located southeast of Stanthorpe on Quart Pot Creek. Storm King Dam has a water allocation of 700 ML/year under the Border Rivers Resource Operations Plan (ROP). The storage characteristics of Storm King Dam are presented in Table 2-1.

Table 2-1 Dam Storage Characteristics of Storm King Dam

	Storage Characteristics
Full Storage Volume (ML)	2,180
Minimum Operating Volume (ML)	200
Inundated Area at Fully Supply Level (ha)	78
Catchment Area (km^2)	95
Stream	Quart Pot Creek
Average Mean Thread Distance (AMTD) (km)	300.7

Storage volumes in Storm King Dam from 1969 to 2013 are presented in Figure 2-1. Storm King Dam has been drawn down to very low levels on at least four occasions. In late 2007 Stanthorpe was left with just two months water supply from Storm King Dam.

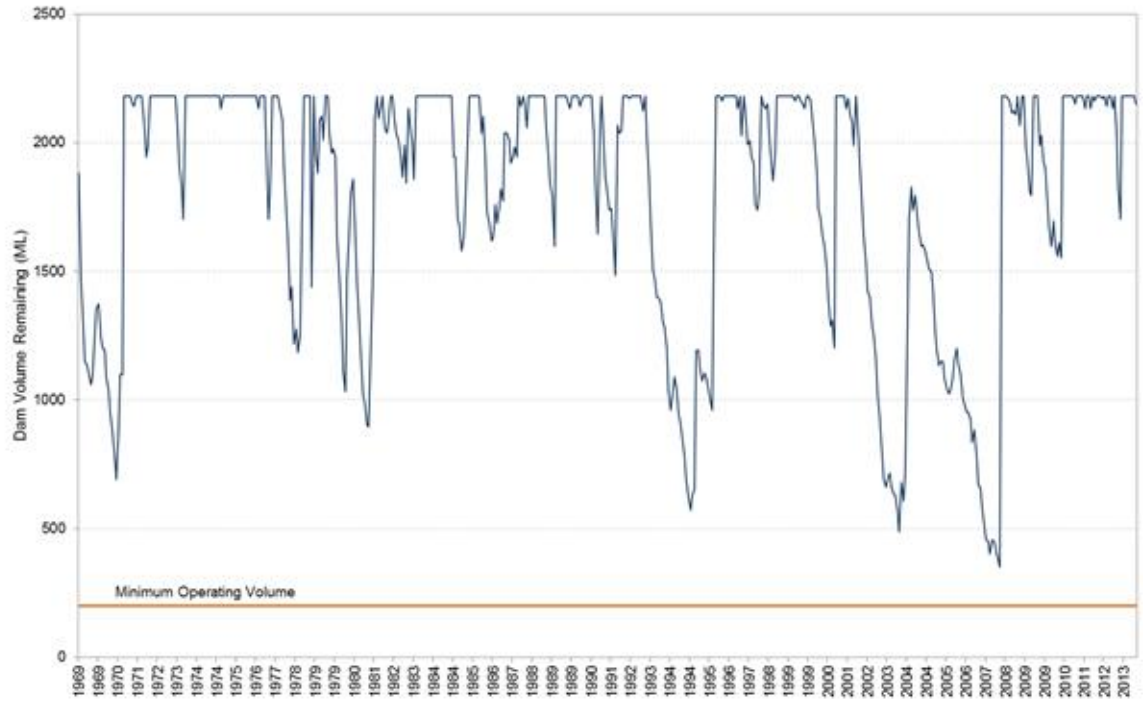


Figure 2-1 Storage Volumes in Storm King Dam 1969 to 2013

It should be noted that Storm King Dam 's reliability of 95% (annual) and 98% (monthly) is substantially less than Emu Swamp Dam and less than desirable for urban water supply.

MWH (2010) reviewed water production from Storm King Dam from 2003 to 2008. The annual water production figures are presented in Table 2-2. Total water consumption in Stanthorpe was severely constrained during this period because of low water levels in Storm King Dam. Outdoor use of reticulated water in Stanthorpe was minimal from 2003 to 2008 due to drought restrictions - Level 4 (one hour of outdoor watering per week) and Level 5 restrictions (no outdoor water use) were in force for all of this period. Residential water consumption rates over this period were amongst the lowest in Australia.

Table 2-2 Water Production from Storm King Dam 2003 to 2008

Year	Water Production	Residential Water Demand
2003	538.6 ML	163 L/person/day
2004	639.1 ML	204 L/person/day
2005	564.2 ML	170 L/person/day
2006	524.5 ML	151 L/person/day
2007	445.8 ML	137 L/person/day
2008	503.0 ML	150 L/person/day

Water production rates from this period were below the water allocation of 700 ML/year for Storm King Dam in the ROP but were severely constrained by restrictions. Despite the reduced water consumption over this period, dam levels in Storm King Dam were the lowest on record in late 2007. Historical evidence shows Storm King Dam lacks the capacity to provide a reliable water supply for the Stanthorpe community during periods of drought.

2.2.2. Projected Water Demand

A number of submissions questioned the projected water demand for both urban and irrigation water in the EIS.

Urban Water Demand

Projected residential water demand was presented in Section 2.2.1 of the EIS. The projected residential water demand for Stanthorpe was based on the population projections for Stanthorpe and residential water consumption of 253 L/person/day adopted from the South East Queensland Regional Water Supply Strategy (DNRM/BCC 2004) and from the SEQ Regional Plan (OUM 2005).

Projected non-residential water demand for Stanthorpe was presented in Section 2.2.1 of the EIS. The projected non-residential demand was estimated based on historical data and recent development activity. Non-residential water demand was determined at 123 ML/year in 2005. Between 2005 and 2007 Stanthorpe Shire Council approved 110 ML/year of non-residential water demand including tourist accommodation facilities, industries including food processing, retirement accommodation facilities, retail and commercial premises and the College of Wine Tourism.

Table 2-3 Urban (Residential and Non-Residential) Water Demand Projections from EIS

	2010	2020	2030	2040	2050
Total Water Demand (ML)	757	918	1,163	1,409	1,656

Subsequent to the public release of the EIS, MWH (2010) were commissioned jointly by the Department of Environment and Resource Management (DERM) and Department of the Environment, Water, Heritage and the Arts (DEWHA) to identify existing water use and to forecast future water demand for the next 50 years for urban, industrial and rural sectors in South West Queensland. The study involved:

- analysis and climate correction of historical water production trends;
- analysis and climate adjustment of customer billing data and water consumption trends;
- forecasting of future total and per person baseline water demand for the next 50 years;
- assessment of water savings opportunities; and
- development of a demand forecast based on low, medium, high water savings.

Analysis of residential water consumption rates determined:

- the residential water consumption at Stanthorpe was 143 L/person/day with the average across residential and rural residential water users of 150 L/person/day (due to water restrictions during this period); and
- only 2% of water was used for external purposes as (due to restrictions on outdoor water use).

Baseline water production and residential consumption projections (MWH, 2010) from 2011 to 2056 are presented in Table 2-4. A 2011 baseline water production rate of 370 L/person/day was adopted to reflect normal conditions (ie without the influence of drought and/or water supply issues). The projected residential baseline consumption rates fall from approximately 200 to 190 L/person/day from 2011 to 2056 which is similar to the consumption rates in the EIS. Production includes residential and non-residential water demand.

Table 2-4 Water Production and Residential Consumption Projections

		2011	2016	2021	2026	2056
Total Annual Production (ML)	Baseline	684	705	729	755	952
	Demand management	671	674	686	708	895
Production per person (L/p/d)	Baseline	367	362	358	356	352
	Demand management	360	346	337	334	331
Residential consumption (L/p/d)	Baseline	206	201	197	194	189
	Demand management	200	191	185	180	176

Source: MWH, 2010

MWH (2010) also estimated water production and residential consumption projections (refer to Table 2-4) based on the implementation of preferred water demand management measures including:

- water efficiency labelling standards;
- demand measures in the Queensland Development Code MP4.1, MP4.2 and MP4.3;
- State Governmental residential rebates;
- education and non-residential programs;
- System Water Loss Management; and
- Water Efficiency Management Plans.

Even accounting for a range of water demand management measures, the baseline water production requirements for Stanthorpe of 895 ML/year in 2056 exceed the water allocation of 700 ML/year for Storm King

Dam from 2016 onwards. The MWH (2010) projections confirm that Storm King Dam is unable to provide Stanthorpe's water needs.

The above projected water demands are considered conservative because:

- population growth projections are low (0.81- 0.89%) – actual population growth for Stanthorpe in the 2006 – 2011 period was 14.5% (ABS, 2012); and
- growth in non-residential water was assumed to be proportional to residential growth - this provides minimal opportunities for business or industrial development in Stanthorpe.

Current water supply in Stanthorpe has constrained business investment in the past. SDRC have been forced to encourage business development in Warwick in preference to Stanthorpe because of the reliability of the water supply. The impact of water supply constraints has influenced the following business investment decisions in the Stanthorpe area:

- a juice factory being established in Warwick in preference to Stanthorpe; and
- a proposed tourist resort did not proceed as there was insufficient water available.

Business Opportunities

A number of industries have been investigated to determine the potential impact on water demand at Stanthorpe. The selected industries include craft beer breweries, fruit juice production, vegetable washing and packing plants and abattoirs. These industries were investigated as they are considered viable future industries for Stanthorpe.

There are more than a dozen craft breweries in Australia. Stanthorpe's unique elevation and climate provide a special marketing opportunity and several enterprises have considered craft breweries at Stanthorpe in the past. Typical water demands for craft breweries ranges from 15 ML/yr (for small regional operations) to 120 ML/yr (for mid-size national craft breweries) and more than 200 ML/yr for the larger craft breweries with an international market.

The Granite Belt could support a fruit juice processing and bottling plant at Stanthopre. More than 50,000 t/yr of apples and pears are produced locally. Typically fruit juice plants combine local fruit with from other regions. The water demand for a plant processing 10,000 t/yr of apples and citrus is typically 50 ML/yr.

Granite Belt growers presently deliver "salad rinse" ingredients to Brisbane plants for washing and packaging. The Granite Belt produces 7,000 t/yr of lettuce and baby-leaf. The major retail chains are likely to require growers to wash their produce (to remove soil, insects etc) prior to transport. At the water consumption rates of existing facilities this would guarantee a demand of 30 ML/yr at a Stanthorpe based "salad rinse" packaging plant.

The Granite Belt produces 35,000 t/yr of tomatoes, capsicums, brassicas, celery, beans, cucurbits, herbs, table grapes and strawberries. If all of these had to be washed locally there would be an additional 150 ML/yr of industrial water demand.

Abattoirs at Stanthorpe have been mooted in the past. One proposal was to relocate the Wallangarra abattoir to more reliable water supply. The Wallangarra abattoir process nearly a million small stock (mostly sheep) each year uses 120 ML/yr of water. The abattoir at Warwick processes approximately 100,000 large stock (mostly cattle) each year and uses 300 ML/yr of water. An abattoir at Stanthorpe would require 100-300 ML year of water.

The growth in non-residential water is not expected to be linear as presented in Section 2.2.1 of the EIS. As describe above, there are opportunities for business investment that will significantly increase water demand for non-residential use in Stanthorpe.

Business investment could potentially increase water demand in the non-residential sector by several hundred megalitres each year.

Stanthorpe needs Emu Swamp Dam to be able to seek and capture investment and employment opportunities in this sector.

Irrigation Water Demand

The irrigation water demand was presented in Section 2.2.2 of the EIS.

It is estimated that area licences of approximately 2,220 ha and nominal volumes of proposed water allocations of 1,930 ML currently exist within the Granite Belt catchment. The DSITIA IQQM model includes all of the existing irrigation allocations. The irrigation water use by individual farmers has a three year rolling cap that needs to match their allocation. The maximum and mean annual water irrigation diversions in the IQQM are 20,005 ML and 10,688 ML respectively. The Project will result in additional water (1,740 ML) being made available to irrigators across the Granite Belt Catchment. This additional water represents an increase of 16% in average years above existing irrigation entitlements. The estimated water demand in the former Stanthorpe Shire Council area is approximately 16,500 ML/year which clearly exceeds the volume of water which will be available after the dam is constructed

Currently horticulture, the major industry of the Granite Belt economy, is significantly restricted by water availability and reliability. Horticulture is a significant contributor to the local economy reflecting an abundance of reasonable quality land, high altitude and temperate climate. Market trends suggest an increase in demand for fresh and nutritious food, seasonal produce and 'localness'.

Additional irrigation water has been sought by irrigators and associated industries for many years. A number of surveys of growers were undertaken to determine the potential take up of additional irrigation water:

- Tancred (2001) surveyed 30 growers, 26 of whom said they would require around 5,155 ML of additional water.
- T. Sargent Services (2013) surveyed 48 growers in the Emu Swamp Dam catchment, 34 of whom said they would require around 3,955 ML of additional water.

There remains substantial unsatisfied demand for additional irrigation water in the region. The potential benefits associated with the supply of irrigation water are presented in Section 2.3.

Water is the main limiting factor affecting the expansion of horticultural production in the Granite Belt (Tancred & McGrath, 2013).

One of the potential concerns arising from increased irrigation water is increased clearing of land for agricultural production. This is not expected to occur because of the regulatory protections for remnant vegetation and because there is presently excess cleared land already available. Tancred & McGrath (2013) advise that the cropped areas, particularly apples, have decreased substantially over the last 35 years (even though overall production has been maintained or increased) due to agronomic advances and water use improvements.

2.2.3. Water Demand Management

A number of submissions questioned the water demand management strategies being implemented by the Stanthorpe Shire Council (now part of SDRC).

Demand reduction strategies were described in Section 2.3.1.2 of the EIS. The EIS described a range of water saving programs implemented by Stanthorpe Shire Council including Water Savings Targets for New Homes, the Home Waterwise Rebate program, the Business Water Efficiency Program and a Drought Management Plan.

One submission recognised the water demand reduction initiatives of Stanthorpe Shire Council have resulted in substantial water savings.

Subsequent to the amalgamation, the SDRC has prepared a Drought Management Plan that including four levels of water restrictions include measures for residential and non-residential use: permanent water conservation measures, along with medium, high and extreme restriction levels. The plan also specifies maximum per person water usage targets for each of the restriction levels. The water usage targets range from are 140 L/person/day (extreme restriction levels) to 230 L/person/day (permanent water conservation measures).

SDRC have adopted a range of demand management measures as part of the Drought Management Plan including outdoor conservation plan, water restriction levels, maximum consumption targets, and Water Efficiency Management Plans for businesses using more than 10 ML per annum. Even accounting for a range of water demand management measures, the projected water production requirements for Stanthorpe of 895 ML/year in 2056 exceed the water allocation of 700 ML/year for Storm King Dam from 2016 (MWH, 2010).

A number of submissions questioned the water efficiency of irrigators. Irrigation efficiency was discussed in Section 2.3.2.1 of the EIS. Water efficient technologies adopted in the region include micro-sprays, drip irrigation and soil moisture monitoring.

Growers have been early adopters of new techniques and technologies to improve water efficiency (Tancred & McGrath, 2013). Growers have invested heavily in evaporation controls such as suspended shade cloth, floating covers and chemical formulations. The construction of a single large dam is considered to provide the best single option 'to minimise' evaporation as water savings are proportional to the reduced surface area of the water in storage and also loss through seepage (T. Sargent Services, 2013).

2.3. Benefits of Additional Water Supply

One submission questions the potential benefit for the town of Stanthorpe and the wider community.

The social impact assessment in the EIS determined local residents were broadly supportive of the Project and believed the provision of a reliable urban water supply is necessary for the further growth and sustainability of the Stanthorpe region. The development of a reliable irrigation supply was seen as important for the future development of primary industries in the region.

The benefits of providing additional urban water supply include:

- value adding industries can establish creating diversity in employment opportunities;
- restrictions on growth in Stanthorpe's will be removed; and
- tourism can increase.

The proposed Emu Swamp Dam is in a very important Queensland horticulture region, producing 5-8% of the State's total fruit and vegetable production and showing strong potential for future growth. Tancred and McGrath (2013) estimate the value of production of horticultural produce is $283 million in the former Stanthorpe Shire Council region.

The Queensland Government intends to double Queensland's food production by 2040 which will increase demand on water. Irrigation water has potential to increase economic output through:

- additional water security increasing production during dry periods;
- increasing production rates of high value horticultural produce (eg tomatoes, strawberries, broccoli); and
- some expansion of horticultural areas (on the Granite Belt sufficient cleared land is already available).

The benefits of providing additional irrigation water for the Granite Belt include:

- increased water security leading to increased small farmer security and confidence and the ability to plan for the future;
- expansion of agricultural production leading to an increase in employment opportunities;
- increased water availability in drought periods leading to improved productivity; and
- greater recognition of the economic importance of Stanthorpe to Queensland and promote confidence in the local community.

Subsequent to the EIS, SDRC commissioned T. Sargent Services (2013) to assess the economic impacts of the Project. Economic benefits from the construction and ongoing operations phases of the Project have been analysed.

The economic benefits from construction of the Project in the SDRC region and in Queensland are presented in Error! Reference source not found..

Table 2-5 Economic benefits from construction of the Project

Impact Summary	Region	Direct	Indirect	Total
Output ($)	SDRC	$29.0M	$17.1M	$46.1M
	Queensland	$87.6M	$51.5M	$139.1M
Employment (jobs)	SDRC	32	61	93
	Queensland	96	185	281
Wages and Salaries ($)	SDRC	$5.6M	$3.9M	$9.5M
	Queensland	$17.0M	$11.6M	$28.6M
Value Added ($)	SDRC	$10.2M	$6.7M	$16.9M
	Queensland	$30.9M	$20.1M	$51M

The benefits from the construction of the Project to the SDRC region are:

- an additional $46.1 million in output (with direct and indirect outputs of $29 million and $17.1 million respectively);
- an additional $16.9 million in value-added or Gross Regional Product (GRP) with direct and indirect impacts of $10.2 million and $6.7 million respectively;
- an additional $9.5 million in wages and salaries paid with direct and indirect impacts of $5.6 million and $3.9 million respectively; and

- An additional 93 full time equivalent (FTE) jobs with direct and indirect employment of 32 and 61 FTE's respectively.

The benefits from the construction of the Project to Queensland are:

- an additional $139.1 million in output (with direct and indirect outputs of $87.6 million and $51.5 million respectively);
- an additional $51 million in value-added or Gross Regional Product (GRP) with direct and indirect impacts of $30.9 million and $20.1 million respectively;
- an additional $28.6 million in wages and salaries paid with direct and indirect impacts of $17 million and $11.6 million respectively; and
- An additional 281 FTE jobs with direct and indirect employment of 96 and 185 FTE's respectively.

The recurrent economic impacts from the operation of the Project within the SDRC region are presented in Error! Reference source not found.. Granite Belt growers generally make decisions based on the amount of water they hold in storage. The economic benefits from the operation of the Project are primarily associated with the increased opportunity realised by the additional 'water security'. There will be considerable production and consumption flow-on effects associated with this.

Table 2-6 Recurrent economic impacts from operation of the Project to SDRC region

Impact Summary	Direct	Indirect	Total
Output ($)	$37.1M	$6.1M	$43.2M
Employment (jobs)	157	23	180
Wages and Salaries ($)	$13M	$1.3M	$14.3M
Value Added ($)	$16.3M	$2.7M	$19M

It is expected almost all of the economic impacts of the operations of the Project will be retained within the SDRC region. The ongoing benefits from the operation of the Project include:

- an additional $43.2 million in growers output (with direct and indirect outputs of $37.1 million and $6.1 million respectively);
- an additional $19 million in value-added or Gross Regional Product (GRP) with direct and indirect impacts of $16.3 million and $2.7 million respectively;
- an additional $14.3 million in wages and salaries paid with direct and indirect impacts of $13 million and $1.3 million respectively; and
- An additional 180 FTE jobs with direct and indirect employment of 157 and 23 FTE's respectively.

2.4. Project Alternatives

A number of submissions requested additional information on the potential alternatives to Emu Swamp Dam. Further detail on potential environmental impacts was requested for the potential alternatives.

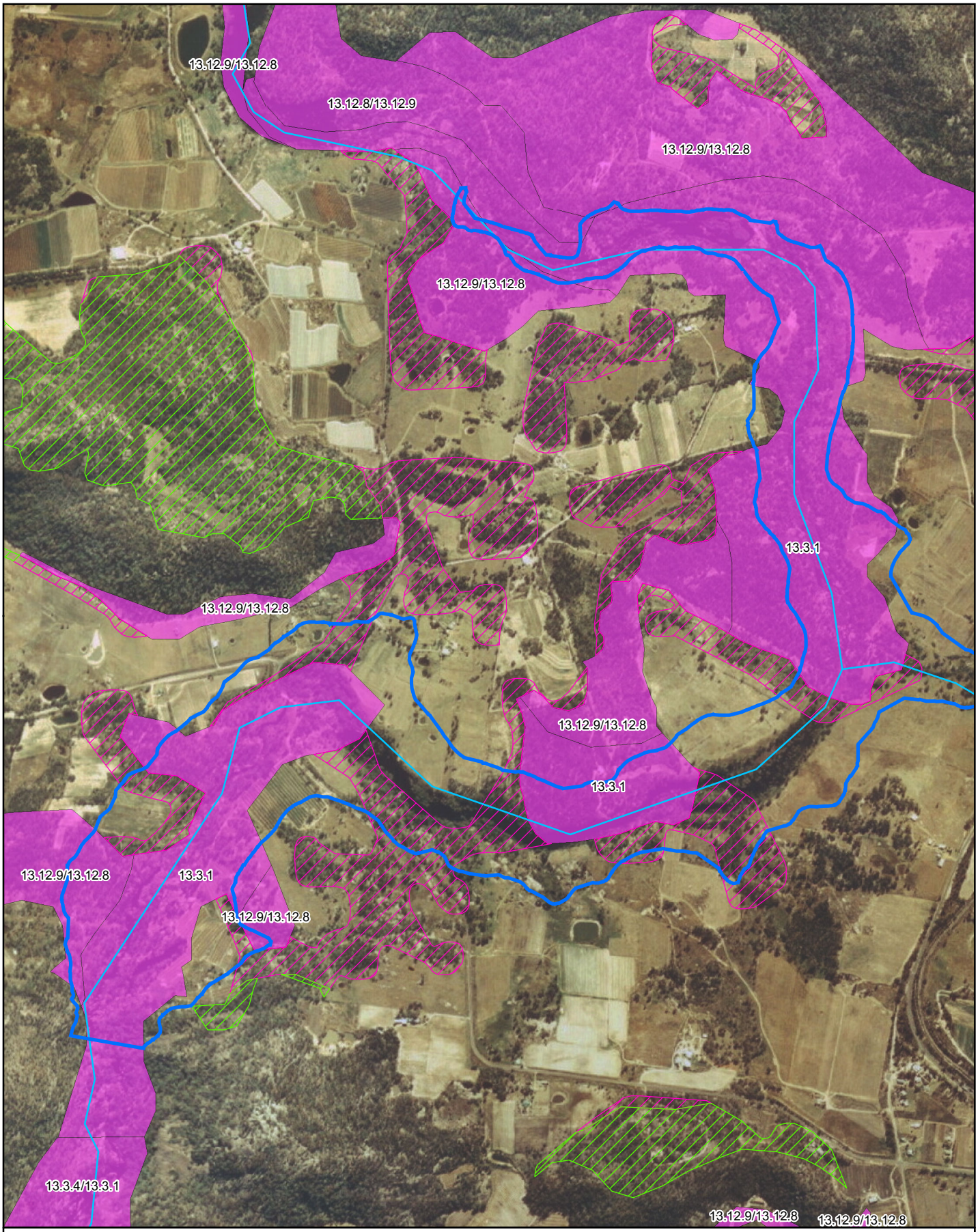
SDRC (and previously Stanthorpe Shire Council) undertook a large number of studies as part of development of water supply strategy for the region since 1980. A summary of the alternative dam sites was presented in Section 2.3.1.7 of the EIS.

As described in Section 1.4.2, SDRC have resolved to progress with the Combined Urban and Irrigation Dam.

As described in Section 2.1 there has been a range of reports investigations over the last 33 years to identify suitable options for improving reliability of water supply for the town of Stanthorpe and rural industries in the Granite Belt area.

Only two dam options were identified that had capacity to supply the required urban and irrigation water:

- the proposed Emu Swamp Dam option; and
- the Fletcher/Ballandean Dam option (refer to Figure 2-2).



LEGEND

- Waterway
- Full Supply Level 700.6 AHD

Regional Ecosystem

- Endangered - Dominant
- Endangered - Sub-dominant
- Of Concern - Dominant
- Of Concern - Sub-dominant
- Least of Concern
- Non-remnant

High Value Regrowth

- Containing Endangered regional ecosystems
- Containing Of Concern regional ecosystems
- Is a Least Concern regional ecosystem

N
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Kilometres

Scale - 1:15,000

Projection: GDA94 MGA56

EMU SWAMP DAM SUPPLEMENTARY REPORT

Figure 2-2

Fletcher/Ballandean Dam Option

SINCLAIR KNIGHT MERZ
SKM

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A comparison of the two dam options is presented in Table 2-7. The potential impacts of the inundation area on mapped vegetation communities are similar for both dam options.

- The Fletcher/Ballandean option has potential for greater impact on the critically endangered EPBC ecological community Box Gum Grassy Woodlands. The potential impact on endangered regional ecosystems is similar for both dam options.
- The Fletcher/Ballandean option would inundate a section of the New England Highway requiring the road to be either relocated raised onto an embankment above the flood level.
- The Fletcher/Ballandean option is located further away from Stanthorpe requiring a longer pipeline with a potential for increased impacts on vegetation communities along the pipeline route. There would also be higher electricity consumption and costs during operation due to the greater pumping distances.
- The Fletcher/Ballandean option would have higher capital cost as a result of inundating the New England Highway.

Table 2-7 Comparison of Emu Swamp Dam and Fletcher/Ballandean Dam

	Emu Swamp Dam	Fletcher/Ballandean Dam
Description	The Upper Emu Swamp dam site is located on the Severn River west of the township of Severnlea.	This dam site is located on the Severn River in a narrow pass between two ridges.
Concept Design	A gravity concrete dam using Roller Compacted Concrete This pipeline will be about 21 km in length and the alignment will generally follow the New England Highway.	A gravity concrete dam using Roller Compacted Concrete This pipeline will be about 25 km in length and the alignment will generally follow the New England Highway.
Inundated Area	196 ha	163 ha (includes a section of the New England Highway)
Direct impacts to vegetation communities in inundation areas	EPBC Threatened Ecology Communities - Box Gum Grassy Woodland (CE) – 72 ha Regional Ecosystems RE 13.3.1 (E) – 46 ha RE 13.12.9 (E) – 53 ha RE 13.12.6 (OC) – 1 ha	EPBC Threatened Ecology Communities - Box Gum Grassy Woodland (CE) – 89 ha Regional Ecosystems RE 13.3.1 (E) – 6 ha RE 13.12.8/13.12.9 (E) – 83 ha RE 13.12.5 (NoC) – 1 ha