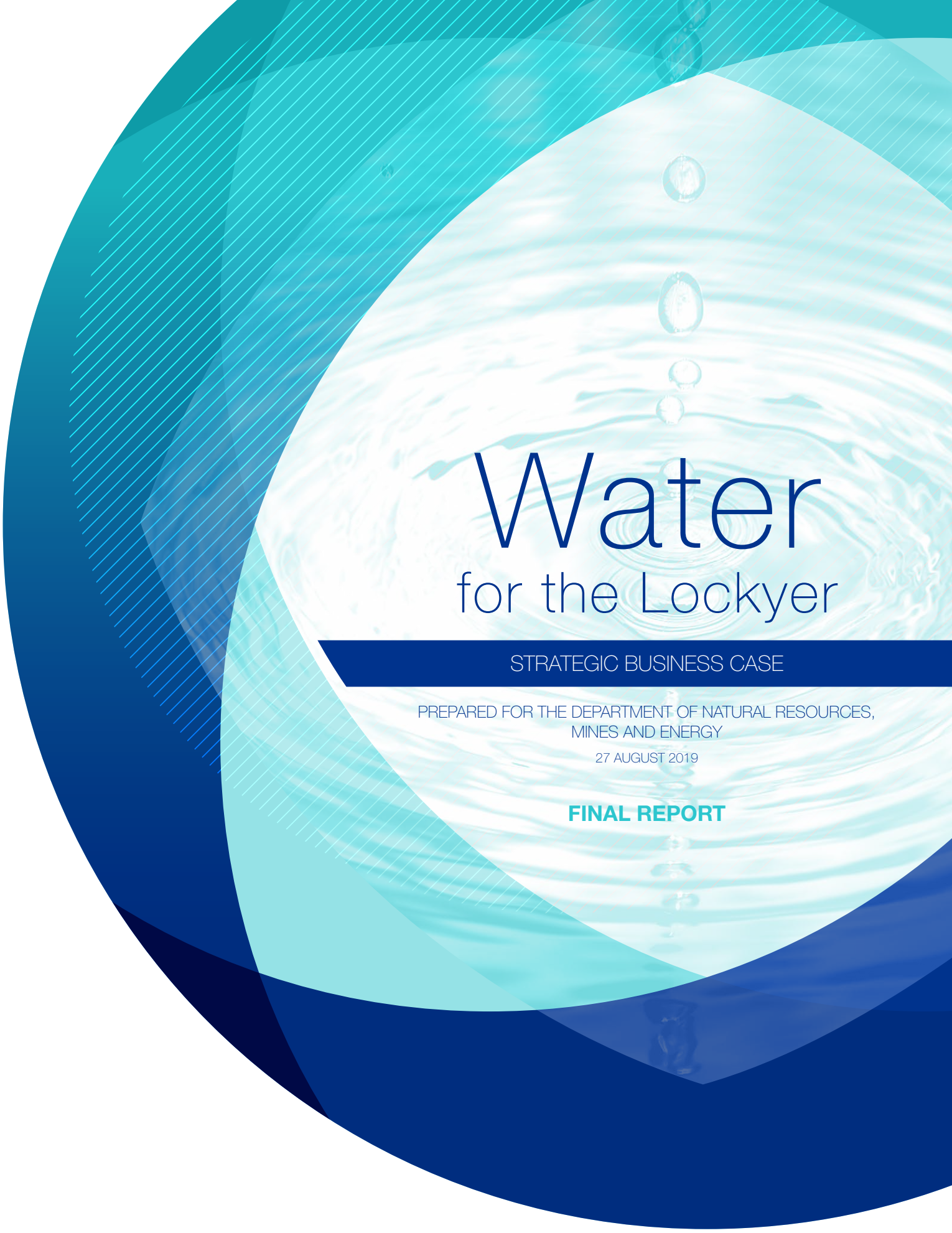

Water
for the Lockyer

STRATEGIC BUSINESS CASE

PREPARED FOR THE DEPARTMENT OF NATURAL RESOURCES, MINES AND ENERGY

27 AUGUST 2019

FINAL REPORT

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Water for the Lockyer

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Contents

Acronyms and other abbreviations

ASQ	Agri-Science Queensland
BCDF	Business Case Development Framework
BCR	benefit–cost ratio
BQ	Building Queensland
DAF	Department of Agriculture and Fisheries (Queensland Government)
DES	Department of Environment and Science (Queensland Government)
DESBT	Department of Employment, Small Business and Training (Queensland government)
DNRME	Department of Natural Resources, Mines and Energy (Queensland Government)
DPC	Department of Premier and Cabinet (Queensland Government)
DSDMIP	Department of State Development, Manufacturing, Infrastructure and Planning (Queensland Government)
ha	hectare
KPI	key performance indicator
ML	megalitre
NPV	net present value
PRW	purified recycled water
PSC	Project Steering Committee
PV	present value
PWG	Project Working Group
QAAFI	Queensland Alliance for Agriculture and Food Innovation
QTC	Queensland Treasury Corporation
QUU	Queensland Urban Utilities
SBC	strategic business case
TIQ	Trade Investment Queensland
WCRWS	Western Corridor Recycled Water Scheme

Executive summary

This report presents the 'Water for the Lockyer' strategic business case (SBC)" under the Building Queensland Business Case Development Framework. It provides a strategic-level assessment of the opportunities, challenges, benefits and options of additional water supply for the Lockyer Valley.

Background

The Lockyer Valley in South East Queensland, 90 km west of Brisbane, is a highly productive agricultural area. It is considered as one of the top 10 most fertile farming areas in the world and grows the most diverse commercial range of fruit and vegetables in Australia. The study area consists of the Lockyer Valley and Somerset regional council areas.

The total agricultural production is valued at over $469 million per year (2016–17), consisting almost mainly of vegetables and livestock production. The Lockyer Valley is one of the most important food bowl areas in Australia, supplying most of Australia's vegetables during the winter months and accounting for 28 per cent of Queensland's total horticultural production. Significant industry opportunities continue to emerge in the region, including specialist food processing, food packaging, transport and storage and new agritourism developments.

The irrigation water that underpins production comes from a variety of sources, with groundwater currently being the major source. Seqwater operates two irrigation schemes in the valley, the Central Lockyer water supply scheme and the Lower Lockyer water supply scheme, while some producers rely on farm storages and unsupplemented creeks for water.

Water, rather than land availability, is regarded as the limiting factor in production within the Lockyer Valley. Groundwater and surface water sources are fully allocated. Existing water availability is unreliable and is impacting on the productive capacity of the area. In the absence of additional water, a significant expansion in production cannot occur. Yet, increased production could provide necessary economic impetus, which has a higher unemployment rate than the rest of Queensland and a higher level of social disadvantage.

This business case builds on the extensive reports and investigations that have been carried out over the past 20 years in relation to additional water supply to irrigators in the area. It was developed in collaboration and under the guidance of a Project Steering Committee, whose members are government representatives, and a Project Working Group, comprising community and industry stakeholders and government agencies. Extensive stakeholder consultation has been undertaken as part of this investigation.

Previous studies

In 2018, Cardno carried out a pre-feasibility study, which estimated a potential additional demand for water of 15,000 to 45,000 ML per year, based on bringing currently unused high-quality land into production in the valley. Options that were identified for providing additional water were 1) water from Lake Wivenhoe; 2) recycled water from local wastewater treatment plants; 3) recycled water from the Western Corridor Recycled Water Scheme (WCRWS); and 4) improved on-farm efficiency.

The NuWater Project feasibility study by GHD in 2018 investigated a project to use recycled wastewater from the greater Brisbane area to reduce nutrient discharge to Moreton Bay and to grow agricultural production in the Lockyer Valley and the Darling Downs. GHD concluded that the project was not commercially viable and that the long-term costs outweighed the benefits. These poor economic and financial results were driven by the cost of pumping water over the Toowoomba Range to the Darling Downs, which is substantially further and higher than the Lockyer. A smaller-scale option of supplying just the Lockyer Valley was not assessed in detail.

Strategic business case

In this SBC, the problems and opportunities are identified as follows:

1) Availability of sustainable and reliable water supply limits opportunities for economic development and growth.
2) Lack of cross-government (three-tier) policy coordination constrains investment.
3) Leveraging the region's natural and competitive advantages would support economic growth.

The assessment and confirmation of the service need was informed through the development of a socio-economic baseline, investigations into the current reliability of supply, previous demand studies, stakeholder consultation, a land suitability assessment and consideration of market opportunities and policy objectives relevant to the area. Results confirmed that the lack of a sustainable and reliable water source was limiting the expansion of regional production, employment opportunities and broader economic development.

Service need

The **service need** is represented by an opportunity to significantly grow the economy and sustainability of the Lockyer region by 2030, with broader flow-on effects for South East Queensland, by:

- leveraging the region's natural and competitive advantages
- improving water reliability, supply, use and sustainability.

A range of initiatives that would potentially help meet the service need was identified. They included water trading; better policy, planning and coordination; applied research; improved efficiency and operation of existing irrigation assets; increased flood harvesting capacity; local and regional wastewater reuse; and sourcing additional water from the Wivenhoe Dam.

Longlist options

Following the multicriteria analysis of the 39 options, 22 options were not shortlisted, five options were considered suitable to be included in a program of other complementary options that should be pursued without a formal business case, and six options were already underway. Of the remaining options, six were shortlisted for further consideration and analysis.

The five options considered as suitable for a program of other complementary options included promoting public/private research investment, improve industry and policy coordination, promoting public / private agribusiness development, implement on-farm initiatives and examine the feasibility of deep aquifer drilling.

The six options considered to be already underway were supply chain improvement, market opportunities study, water trading, on-farm irrigation efficiency improvements, investigations into increasing diversion capacity and local wastewater recycling.

Shortlist options assumptions

The assumptions underpinning the shortlisted options will need to be reviewed in any future investigations.

One important assumption in this SBC relates to maintaining the trigger levels for the operation of the WCRWS unless required under the option proposed. However, the Water Security Program for South East Queensland which contains the triggers for the operation of the WCRWS is reviewed by Seqwater and the State Government to improve urban water security. Any future investigation will need to consider the possibility that trigger levels may be changed to meet the needs of an increasing South East Queensland urban population.

A second important assumption in this SBC relates to certain costs being recovered in water prices. The water prices presented in this report are indicative only. They will need to be reviewed in any further investigation including consideration of prices which are based on full cost recovery principles (Appendix I). Full recovery principles include an appropriate return on, and of, capital as well as ongoing operational and maintenance costs, and all comprehensive and complete costs associated with the water infrastructure. Consideration should also be given to any previous commitments and guidance from the State on forming a price.

Shortlist options

The six shortlisted options considered for further investigation were based on either the supply of water to the Lockyer Valley directly from Wivenhoe Dam or from the Western Corridor Recycled Water Scheme (WCRWS). All of the six shortlisted options will not impact on urban water supply security (or level of service), flood mitigation outcomes or Seqwater's dam safety obligations.

The shortlisted options for water from the Wivenhoe Dam were:

- Option 20—water is pumped from Wivenhoe Dam and delivered to the Lockyer Valley's existing irrigation dams via a new trunk main, and the existing distribution network is used to deliver water to producers.
- Option 19—water is pumped from Wivenhoe Dam and delivered to the Lockyer Valley's existing irrigation dams via a new trunk main and a new distribution network, and the existing irrigation dams are used to deliver water to producers.
- Option 23—water is pumped from Wivenhoe Dam and delivered directly to customers in the Lockyer Valley, bypassing the existing irrigation dams.

A critical expectation from Seqwater, who own and operate Wivenhoe Dam, is that the 'water from Wivenhoe Dam' options would need to ensure that SEQ urban water users be no worse off both in terms of bulk water charges and water security. The 'water from the Wivenhoe Dam' options will increase the use of recycled water releases from the WCRWS into the dam, in order to have no impact on urban water security for SEQ. These options will require a consideration of changes to the trigger levels of the WCRWS in order to supply more water to irrigators and maintain current levels of urban water security. Along with the costs to supply water from Wivenhoe Dam, irrigators would also need to pay for the earlier costs of using the WCRWS to ensure that the urban supply charges remain unaffected.

The WCRWS is currently not supplying water and there are substantial costs to recommission the scheme for the first time. Accordingly, Seqwater's current preference is for any supply to Lockyer Valley irrigators from Wivenhoe Dam to occur only after the WCRWS has been recommissioned for urban water supply purposes.

The following options for the direct supply of water to the Lockyer Valley from the WCRWS were examined:

- Option 31—Purified recycled water (PRW) is sourced from the WCRWS and supplied to producers through existing irrigation dams and a new distribution network following the recommissioning of the scheme.
- Option 32— PRW is sourced from the WCRWS and supplied to producers through a new distribution network following the recommissioning of the scheme.
- Option 24— PRW is sourced from the WCRWS and supplied to producers through a new distribution network (pre-commissioning of WCRWS).

Under these 'water to the Lockyer Valley from the WCRWS' options, irrigators would be required to pay for each megalitre produced for them. In contrast, the 'water from the Wivenhoe Dam' options would require irrigators to pay for the water delivered from Wivenhoe Dam along with the bring forward costs of WCRWS which would include incremental capital and operating costs. These bring forward costs are therefore lower than the costs of the direct WCRWS supply options as the WCRWS

costs are not incurred the entire time of supply, but rather irrigators only contribute for the period for which it is brought forward to operate for urban water supply purposes.

All six options would not result in an increase in the water level of Wivenhoe Dam compared to current arrangements. These options would not impact adversely on flood mitigation outcomes downstream of Wivenhoe Dam or on Seqwater's ability to meet its dam safety obligations.

Under all shortlisted options, irrigators would be able to be supplied with water when the WCRWS is not supplying water for urban purposes. However, when the scheme is needed for urban water use, irrigators' supply would be suspended until the scheme is not needed for urban water supply.

Current projections are that by 2050 the WCRWS would be required to supplement drinking water supplies 20 per cent of the time, which means that irrigators would have access to water from Wivenhoe Dam 80 per cent of the time. A climate change scenario was examined, which considered the impact of a drier future climate on irrigators' access to water. The drier climate change projection was found to increase the probability of switching on the recycled water scheme to 44 per cent of the time. Under such a scenario, irrigators might expect to have their access to water from Wivenhoe Dam reduced to 56 per cent of the time.

The preliminary economic analysis showed a benefit–cost ratio of above 1.0 for two of the water from Wivenhoe Dam options (options 19 and 23), which means that their benefits outweigh costs (as shown in the table below). All of the WCRWS options had a benefit–cost ratio of below 1.0. The much larger operating costs of the WCRWS options resulted in poorer performance in economic outcomes and cost-reflective prices. For this reason, the water from Wivenhoe Dam options are preferred.

Shortlisted options—summary of SBC analysis

Option	Present value of costs	Present value of benefits	Economic net present value	Economic benefit–cost ratio
Water from Wivenhoe Dam				
Option 20—Wivenhoe Dam water / new trunk main / existing distribution network	$390m	$240m	–$150m	0.6
Option 19—Wivenhoe Dam water / new trunk main / new distribution network/ existing irrigation dams	$440m	$523m	$83m	1.2
Option 23—Wivenhoe Dam water / new distribution network / no irrigation dams	$440m	$513m	$73m	1.2
Water from the Western Corridor Recycled Water Scheme (WCRWS)				
Option 31—WCRWS purified recycled water (PRW) / irrigation dams / new distribution network / post- recommissioning	$919m	$608m	–$311m	0.7
Option 32—WCRWS PRW / pipe to farm / post-recommissioning	$919m	$580m	–$339m	0.6
Option 24—WCRWS PRW / irrigation dams / new distribution network /pre-commissioning of WCRWS	$1,051m	$608m	–$443m	0.6

Note: The table is based on preliminary analysis only. Figures are subject to change after more detailed analysis under the next stage.

Risks and limitations

This strategic business case acknowledges the inherent limitations of this stage of analysis and sets out the uncertainties that need to be resolved in a detailed business case.

The economic analysis undertaken is more than adequate for a strategic business case. However, it is subject to limitations including the cost of each of the options is currently highly uncertain (+/- 50%) and the agricultural benefits are based on a desk top study and high-level consultation with irrigators. The willingness to pay of irrigators is also uncertain.

Accordingly, this strategic business case concludes that a detailed demand assessment and willingness to pay study of irrigators in the Lockyer Valley should be undertaken as part of any future detailed business case analysis. Increasing certainty about demand will mean that the detailed business case will be able to focus on delivering specific volumes of water to identified demand nodes. If a detailed business case is undertaken, the water from Wivenhoe Dam options should be assessed and confirmed as the preferred options for further investigation. A detailed business case would also reduce the uncertainty of the cost estimates.

Seqwater's current preference is for any supply to Lockyer Valley irrigators from Wivenhoe Dam to occur only after the WCRWS has been recommissioned for urban water supply purposes. The timing of this recommissioning is highly uncertain as it depends on rainfall and dam levels. A detailed business case would need to address this uncertainty and establish appropriate triggers for construction of a new scheme. Further, any use of the WCRWS (either before or after recommissioning) would need an adjustment to trigger levels to maintain the same level of urban water security. Government would need to approve these adjustments.

The environmental and other regulatory risks can likely be managed for the preferred options (water from Wivenhoe Dam). However, the cumulative impacts of the risks described here may result in no option been technically feasible, particularly if the WCRWS is not yet recommissioned for urban use. The combination of all the factors should be assessed in the detailed business case.

Conclusions and recommendations

The Water for the Lockyer SBC (which includes a part of the preliminary business case phase):

1) **Finds** that, in the context of the service need:

   a) the Wivenhoe water options (options 19, 20 and 23) are, as a group, the most economically and financially feasible infrastructure options.

   b) Option 20 has a BCR lower than 1.0; restricts voluntary participation by individual irrigators in securing additional water as the old and new products would be delivered by the same distribution system; restricts the ability to deliver water to new customers; and involves significant inefficiencies associated with delivering the additional water via an aquifer recharge mechanism.

   c) although the WCRWS options (options 24, 31 and 32) are the next most feasible infrastructure options, they have significantly lower BCRs, of less than 1, and negative NPVs, which are likely to result in very high annual variable charges.

2) **Recommends** that the Wivenhoe options (options 19 and 23) be considered as the preferred option(s) for any future detailed analysis. In developing a Detailed Business Case, the following needs to be taken into account:

   a) matters raised by Seqwater in relation to the recommissioning of WCRWS, cost and water security (Appendix H)

   b) matters and principles raised in DNRME letter on behalf of PSC (Appendix I) in relation to the availability and reliability of supply for the Lockyer due to population growth in future, and the following assessment principles for the development of a detailed business case:

i. The detailed business case must be developed in accordance with the Building Queensland Business Case Development Framework.

ii. Economic assessment must occur in accordance with the Building Queensland Cost Benefit Assessment guidelines with strict adherence to the appropriate inclusions in costs and benefits.

iii. Pricing of water needs to occur in the first instance based on full cost recovery principles (including return on, and of, capital as well as all ongoing operational and maintenance costs).

iv. Demand for water from the additional water supply and security options need to be assessed specifically in the context of the price at which water would be available.

v. Consideration of an appropriate level of customer commitment (i.e. commensurate with the level of detail of the assessment) should be incorporated into the detailed business case process.

vi. SEQ Urban water security cannot be negatively impacted by any of the options for additional water supply or security.

vii. SEQ urban water users must not be responsible for any increase in costs associated with any option considered.

c) Note the preferred alignment of the Inland Rail that traverses Lockyer Valley and consult with the project proponent, the Australian Rail Track Corporation.

3) **Recommends** a detailed water demand survey and capacity to pay be conducted as part of any future detailed business case analysis.

4) **Recommends** the following program of other new complementary options be considered in parallel, for the detailed business case analysis:

a) Public / private research investment (option 11)

b) Industry / policy coordination review (option 4)

c) Public / private agribusiness development (option 5)

d) On-farm initiatives (option 2)

e) Deep aquifer investigation (option 30).

5) **Notes** that the **base case** of the detailed business case will include the following options that are currently underway:

a) Supply chain improvements (option 1)

b) Market opportunities study (option 3)

c) Water trading (option 6)

d) On-farm irrigation efficiency (option 15)

e) Investigate increasing diversion capacity (option 7)

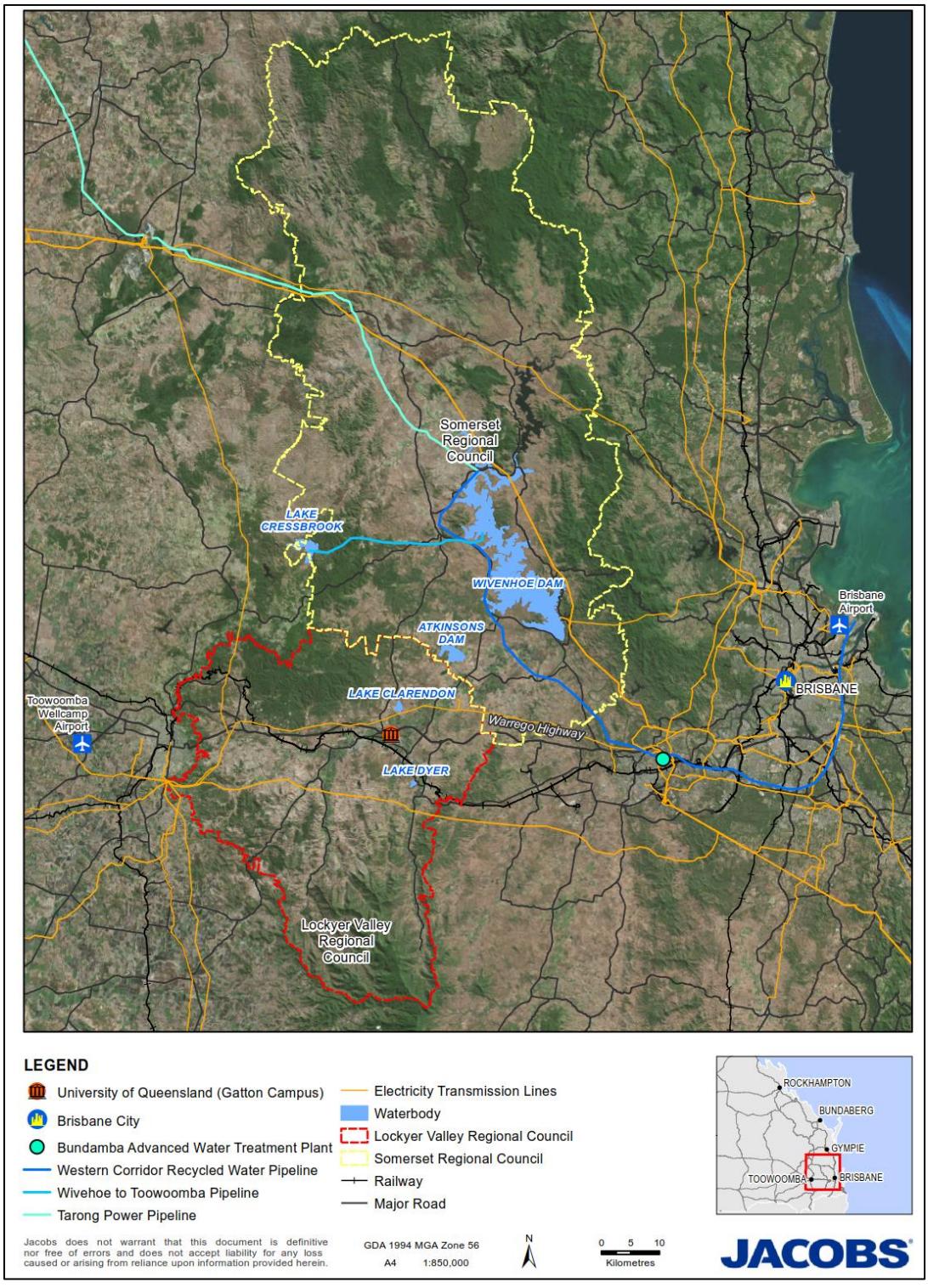
f) Local recycling (option 12).

1. Introduction

1.1 Background

The Lockyer Valley is located in South East Queensland (SEQ), about 90 kilometres west of the Brisbane CBD. The study area comprises both local governments for the region, namely the Lockyer Valley Regional Council and the Somerset Regional Council to the north (Figure 1.1).

Figure 1.1 : Map of Lockyer Valley—study area



Water for agriculture is the main demand in the region and primarily supplied from the Upper, Central and Lower Lockyer groundwater aquifers. Approximately 60 per cent of water is used to grow crops, 30 per cent for irrigated pastures and 10 per cent for livestock drinking water, dairy or piggery cleaning.[1]

Additional water is supplied from Seqwater's Central and Lower Lockyer water supply schemes. The lack of water supply and water security in the region is regarded by stakeholders as a major constraint to investment and economic diversification.

1.1.1 Purpose of the strategic business case

This business case provides an assessment of the opportunities, problems and benefits for the Lockyer Valley at a strategic level and identifies a shortlist of viable options for further investigation. In addition, a program of non-infrastructure works is developed for further separate investigation and possible implementation.

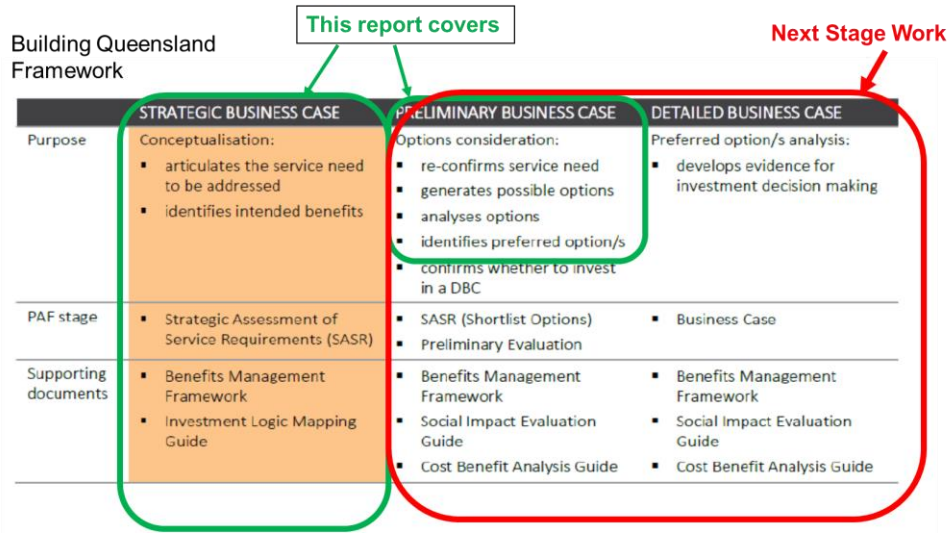
1.1.2 Business case development

This business case contains the elements of a strategic business case (SBC) (which is the first document in the business case suite of the Building Queensland Business Case Development Framework[2] (BCDF) and some of the elements of a BCDF preliminary business case.

For simplicity, the combined business case is referred to in this report as the Water for the Lockyer strategic business case.

The structure of the chapters in this business case is therefore an amalgamation of the structure for strategic and preliminary business cases as set out in the Building Queensland BCDF (Figure 1.2).

Figure 1.2: Building Queensland Framework



This document does not indicate government's policy or funding approval for infrastructure – this work is only the first stage of business case and is subject to the outcomes of the next stage of a detailed business case.

[1] ABS, *Water use on Australian Farms, 2016–17*, cat. 4618.0.
[2] Strategic Business Case Guidance and Template Release 2 December 2016 and Preliminary Business Case Guidance and Template release 2 December 2016, http://buildingqueensland.qld.gov.au/frameworks/.

1.1.3 When a problem/opportunity was selected for consideration

Water supply in the Lockyer Valley has been subject to investigations since at least 1979, when the Department of Environment and Resource Management undertook a study into land degradation in the Lockyer catchment.[3] A list of previous investigations is shown in Table 2.2.

1.1.4 Assurance processes

The governance and assurance processes in place for the development of this document are outlined in Chapter 3. This document has been reviewed by the Project Steering Committee (PSC) and the Project Working Group (PWG). However, its contents do not form government policy or funding commitment for construction, nor should it be assumed that it reflects the views of any individuals of either group.

1.2 Strategic alignment

1.2.1 Policy issues

It is important that major projects align with government policies and priorities, particularly if government support is needed. Each longlisted option will be assessed in terms of its strategic alignment. Government policies relevant to the project include:

Commonwealth Government

- *National Water Initiative (2004)*[4]

Queensland Government

- *Our Future State: Advancing Queensland's Priorities (2014)*[5]
- *Growing for Queensland*[6]
- *State Infrastructure Plan Part A (2016)*[7] *and Part B (2019)*[8]
- *Queensland Bulk Water Opportunities Statement*[9] *(QBWOS, July 2017)*
- *Queensland Agricultural Land Audit (May 2013)*[10]
- *SEQ Regional Plan 2017*
- *Water Plan* (Moreton) 2007 (Water Plan)[11]
- Water for Life (2016)[12]
- Brisbane River Strategic Floodplain Management Plan (2019)[13]
- Vocational education and training (VET) Investment Plan
- Queensland Climate Transition Strategy[14]

[3] Department of Environment and Resource Management, *Land Degradation in the Lockyer Catchment*, Division of Land Utilisation, Technical Bulletin 39, Queensland Government, 1979.
[4] COAG, *Intergovernmental Agreement on a National Water Initiative*, 25 April 2004, http://www.agriculture.gov.au/SiteCollectionDocuments/water/Intergovernmental-Agreement-on-a-national-water-initiative.pdf.
[5] Queensland Government, *The Queensland Plan*, 2014, https://www.queenslandplan.qld.gov.au/assets/images/qld-plan.pdf.
[6] Queensland Government, *Growing for Queensland*, 2018, https://publications.qld.gov.au/dataset/growing-for-queensland/resource/67a8d14f-1e2a-43db-9f1f-85d0ed47220d.
[7] Department of State Development, Manufacturing, Infrastructure and Planning, *State Development Plan*, Queensland Government, March 2016, https://www.dsdmip.qld.gov.au/infrastructure/state-infrastructure-plan.html.
[8] https://www.dsdmip.qld.gov.au/resources/plan/sip/sip-part-b-2019.pdf
[9] https://www.dews.qld.gov.au/__data/assets/pdf_file/0007/1266883/qld-bulk-water-opportunities-statement.pdf
[10] Department of Agriculture and Fisheries, *Queensland Agricultural Land Audit: South East Queensland*, 2013, https://www.daf.qld.gov.au/__data/assets/pdf_file/0011/74000/QALA-Ch13-SEQ.pdf.
[11] Business Queensland, Moreton water plan area, https://www.business.qld.gov.au/industries/mining-energy-water/water/catchments-planning/water-plan-areas/moreton.
[12] Seqwater, *Water for Life: South East Queensland's Water Security Program 2016–2046,* https://www.seqwater.com.au/waterforlife.
[13] https://www.qra.qld.gov.au/brcfs
[14] https://www.qld.gov.au/__data/assets/pdf_file/0026/67283/qld-climate-transition-strategy.pdf

- Queensland Climate Adaptation Strategy[15]

Local government

- *Lockyer Economic Development Plan (2018)*[16]
- *Somerset Economic Development Plan (2015)*[17]

South East Queensland City Deal (proposed)

City Deals are a mechanism to develop collaborative plans for growth, renewal and reform.[18] The concept was first introduced in 2016 under the Australian Government's Smart Cities Plan. Each City Deal represents a long-term commitment that outlines the investments, planning governance and actions needed to implement them. The Smart Cities Plan wants to promote opportunities for not only metropolitan cities but also regional cities.

1.2.2 Legal and regulatory consideration

The pre-feasibility report by Cardo in 2018 outlined the regulatory framework (see Appendix E).[19]

The *Water Act 2000* (Water Act) provides the legislative framework for the sustainable planning, allocation and management of water resources in Queensland (Appendix D). It requires that all planning, allocation and use of water must advance sustainable management and efficient use of water. Water plans provide the principal mechanism for achieving the requirements of the Water Act, setting out detailed strategies and outcomes for water to be shared among water users, including the environment.

Lockyer Creek is a sub-catchment in the Brisbane River and is managed under a subordinate legislation—a water plan. The Moreton Water Plan has been in place since March 2007 and was amended in 2009 and 2013 to address water allocation and management issues in other catchments in the plan area. The Lockyer scheme is the only remaining water supply scheme in the Moreton plan area that is still managed under interim arrangements.

The Moreton Water Plan is currently being amended to incorporate the management of water and will provide a sustainable platform for water entitlements, development of water sharing rules and allow for water trading. This step is necessary before any additional water supplies could be adequately accounted for and provided to the Lockyer Valley. The instruments (e.g. resource operations licence and operations manual) which implement the water plan can be developed to readily integrate the additional water supplies.

The key aim of the amendment is to finalise management arrangements for the scheme in a way that:

- supports the current economic and employment profile in the Central Lockyer Valley region
- supports the existing agricultural industry and associated jobs
- ensures a more equitable share and management of the water resource across all water users in the scheme.

[15] https://www.qld.gov.au/__data/assets/pdf_file/0017/67301/qld-climate-adaptation-strategy.pdf
[16] Stafford Strategy, *Lockyer Valley Economic Development Plan 2018–2023*, prepared for Lockyer Valley Regional Council, August 2018, https://www.lockyervalley.qld.gov.au/our-region/economic-and-regional-development/Documents/Economic%20and%20Development/Lockyer%20Economic%20Development%20Plan%202018%20-2023.pdf.
[17] Somerset Regional Council, *Somerset Economic Development Plan 2015 to 2020*, http://www.somerset.qld.gov.au/economic-development-plan.
[18] Queensland Treasury, City Deals in Queensland, Queensland Government, 2019, https://www.treasury.qld.gov.au/growing-queensland/queensland-city-deals/.
[19] Cardno, *Pre-feasibility: Water for agriculture productivity and sustainability*, prepared for Lockyer Valley Regional Council, April 2018, https://ww-w.lockyervalley.qld.gov.au/our-services/environment-and-pest-management/Documents/360615-REP-03-D%20-%20Pre-feasiblity%20-%20water%20for%20agricultural%20sustainability.pdf.

2. Previous studies

For more than 20 years, stakeholders have been carrying out feasibility studies to evaluate infrastructure solutions that would supply additional water to the Lockyer Valley for irrigated agriculture. Recently the Commonwealth Government, through the National Water Initiative, funded two pre-feasibility studies to investigate specific options for the region. These studies were carried out by Cardno, for the Lockyer Valley Regional Council,[20] and by GHD, for the Queensland Farmers' Federation.[21]

Table 2.2 provides a list of key recent studies and those identified in the Cardno report.

2.1 Pre-feasibility study for the Lockyer Valley Council

The pre-feasibility study for the Lockyer Valley Regional Council by Cardno in 2018 was titled *Water for agriculture productivity and sustainability*.

The study found that while demand cannot be accurately assessed, without a demand study and with reference to the various water products able to be supplied and the likely cost of supply of these products, the potential magnitude of demand can be estimated. The study estimated there is potential additional demand of greater than 15,000 to 45,000 ML per year from bringing unused high-quality land into production. Additional demand may also result from more intensive cropping, switching to higher water use (and higher value) crops and substitution away from groundwater.

The Cardno report's main findings were[22]:

1) The demand for and perceived value of potential water security options depends on whether volumetric entitlements are in place for groundwater abstraction or not. This is because groundwater when available is a substitute to potential water security options. Therefore, the proposed amendments to the water plan should be resolved as soon as possible to reduce the uncertainty over water security in the Lockyer Valley.
2) Based on the identified need to secure water supply for existing agriculture in the Lockyer Valley and the existence of potential supply options identified in this pre-feasibility study, Cardno recommended that:
    a) the service need (demand) across the region be defined in detail
    b) the identified shortlisted water supply options be further progressed.
    c) The above, (A) and (B) be progressed utilising the Business Queensland Preliminary Business Case and Detailed Business Case frameworks.

The report further recommended that:

> Further investigation needs to address the further technical investigations required for each shortlisted option, and It may be preferable to complete a standalone demand assessment before progressing further with the Business Case so that the service need is clear.

Table 2.1 outlines the options that were recommended by Cardno for further consideration.

[20] Cardno, *Pre-feasibility: Water for agriculture productivity and sustainability*, prepared for Lockyer Valley Regional Council, April 2018, https://www.lockyervalley.qld.gov.au/our-services/environment-and-pest-management/Documents/360615-REP-03-D%20-%20Pre-feasiblity%20-%20water%20for%20agricultural%20sustainability.pdf.
[21] GHD, *NuWater Project Feasibility Study*, prepared for Queensland Farmers' Federation, March 2018, https://www.qff.org.au/projects/nuwater/.
[22] Cardno, *Pre-feasibility: Water for agriculture productivity and sustainability*,, 2018, p. viii.

Table 2.1 : Recomended options for further consideration (Cardno, 2018)

Option	Infrastructure	Costs
Water from Lake Wivenhoe	Transfer pipeline and pump station from Lake Wivenhoe likely to the three major storages—Lake Atkinson, Lake Clarendon and Bill Gunn Dam. The proposed trunk network totals approximately 48.3 km, with diameters ranging in size from DN750 to DN1000. There is potential to use part of the existing Lake Wivenhoe to Cressbrook Dam pipeline as part of the transfer pipeline. Distribution pumping and pipelines from the three major storages. Estimates project a network equal to approximately 150 km of reticulation mains ranging in size from DN375 to DN100. Customer metering and telemetry.	Upfront cost of $71 to $108 million
Recycled water from local wastewater treatment plants	Local recycled water distribution network which may include storage for low demand periods	$110 to $1,288 per ML— both opex and capex
Recycled water from the Western Corridor Recycled Water Scheme	Transfer pipeline and pump station from the Lowood Recycled Water Balance Tank to the three major storages—Lake Atkinson, Lake Clarendon and Bill Gunn Dam. The proposed trunk network totals approximately 53.8 km, with diameters ranging in size from DN750 to DN1200. Distribution pumping and pipelines from the three major storages. Estimates project a network equal to approximately 150 km of reticulation ranging in size from DN375 to DN100. Customer metering and telemetry. Alternatively, recycled water may be discharged into local creeks which would recharge aquifers and the creeks would act as natural carriers. This would substantially reduce infrastructure requirements	Upfront cost of $71 to $104 million
Improved on-farm efficiency	On-farm infrastructure may include: • Monitoring equipment (e.g. soil moisture) • Supervision and control equipment for irrigation • Farm layout remodelling • More efficient irrigation devices	Varies

Cardno[23] also identified a number of previous studies relevant to the investigation as shown in Table 2.2.

Table 2.2 : Previous key studies summary

Year	Author	Title
1979	The Division of Land Utilisation, Department of Environment and Resource Management	Land Degradation in the Lockyer Catchment
1983	Queensland Water Resources Commission Surface Water Branch	Lower Lockyer Creek System Atkinson Dam Performance
1999	Queensland Government Natural Resources and Mines	Sustainability of Agricultural Systems using Recycled Water in the Lockyer Valley and Darling Downs Area
2002	GHD	SEQ Recycled Water Project—Infrastructure Costs Study
2002	Halliburton KBR Pty Ltd	Lockyer Valley Hydrological Consultancy
2004	GHD	Lockyer Valley Water Reliability Study

[23] Cardno, *Pre-feasibility: Water for agriculture productivity and sustainability*, 2018, Appendix B.

Year	Author	Title
2005	The Department of Natural Resources and Mines	Discussion paper—Declaration of the Whole Lockyer Valley as a Subartesian Area
2007	Lockyer Valley Water Users Forum INC & Capital Strategies Pty Ltd	Lockyer Valley Recycled Water Distribution Project Grant Application
2009	South East Queensland Healthy Waterways Partnership	Implications of supply of purified recycled water to the Lockyer and Warrill Valleys and mid-Brisbane River for groundwater recharge and irrigation purposes
2012	Queensland Urban Utilities	Options for recycled water supply to the Lockyer Valley – Investigation Report
2012	Tim Ellis and Leif Wolf	Impacts of Applying Purified Recycled Water (PRW) in the Lockyer Valley, Qld: Soil Physical Assessment of PRW Application to Local Soils
2013	Leif Wolf	Implications of using Purified Recycled Water as an Adjunct to Groundwater Resources for Irrigation in the Lockyer Valley
2013	The Stafford Group	Regional Food Sector Strategy
2016	Lisa Mary Kelly	Further Closing the Integrated Total Water Cycle in the Lockyer Valley: A Catchment Scale Integrated Water Resource Management Conceptual Model (PhD Thesis)
2017	WSP	Lockyer catchment preliminary socio-economic study
2018	GHD	NuWater Project Feasibility Study
2018	Cardno	Water for agriculture productivity and sustainability

2.2 NuWater Project Feasibility Study

A feasibility study and preliminary business case for the Queensland Farmers' Federation was developed by GHD, titled *NuWater Project Feasibility Study* (March 2018). This project was seeking to meet the dual objectives of (1) managing environmental impacts associated with treating South East Queensland's wastewater and disposing the effluent to sea; and (2) growing agricultural and industrial production in the Lockyer Valley and the Darling Downs.

This project included supply to the Lockyer Valley but mainly sought to deliver water to the Darling Downs. The project was found to have an economic NPV of between –$1.3 billion and –$2.2 billion. The BCR ranged from 0.23 to 0.33. GHD concluded that[24]:

> the NPVs of all shortlisted options remain significantly negative for all shortlisted options across all scenarios modelled.

The financial NPV ranged from –$1.6 billion to –$2.5 billion. GHD concluded that[25]:

> The results from the financial and commercial analysis demonstrate that, for all shortlisted options, the revenues derived from the project will be insufficient to recover the financial costs to be incurred. The project will therefore require significant government funding in order to be financially viable (noting that no additional revenue sources beyond water users have been identified).

These poor economic and financial results were driven by the cost of pumping water over the Toowoomba range to the Darling Downs which is substantially further and higher than the Lockyer. A smaller option of supplying just the Lockyer Valley was not assessed in detail. Table 2.3 summarised the options that GHD shortlisted.

[24] Cardno, *Pre-feasibility: Water for agriculture productivity and sustainability*, 2018, p vi.
[25] Cardno, *Pre-feasibility: Water for agriculture productivity and sustainability*, 2018, p. vii.

Table 2.3 : Recomended shortlist (GHD, NuWater, 2018)

Option	Infrastructure	Present value of capital costs
PRW	WCRWS pipeline + construction of Heathwood PS and upgrade of Gibson Island AWTP, including pipelines from Redcliffe STP to Sandgate STP and from Sandgate STP to Luggage Point STP .	$1.9 billion
Class A+	WCRWS pipeline + construction of Heathwood PS and upgrade of Gibson Island AWTP	$1.5 billion
Class B/C (as produced)	WCRWS pipeline + construction of Heathwood PS	$1.4 billion
PRW (LV) / Class B/C (DD	WCRWS pipeline (current capacity) OR Pipeline from Bundamba AWTP to Lowood Booster PS	$1.6 billion

This study concluded that pumping water over the Toowoomba range was not economically feasible. It also identified that Lockyer Valley irrigators require a higher quality of water than Darling Downs irrigators, due to the respective crop mixes.

2.3 Queensland Urban Utilities Study (2012)

The purpose of this study was to investigate a range of options for recycled water supply into the Lockyer Valley, for QUUs consideration of further investigations.

Four options were considered to transfer treated water to a connection point on the Western Corridor pipeline in the Lower Lockyer Valley, which would be the take-off point for a trunk main to service water users in the Lockyer Valley:

- Option 1—Transfer PRW via the existing Western Corridor Scheme
- Option 2—Construction of a new pipeline to transfer Class A+ recycled water[26]
- Option 3—Supply PRW and ROC to the Lockyer Valley via the existing Western Corridor Scheme and a new pipeline
- Option 4—Supply PRW to the Lockyer Valley and provide increased reverse osmosis concentrate treatment.

The results of the preliminary options assessment identified that Option 1 provided the lowest whole of life costs and it was adopted as the preferred method to transfer PRW to the Lockyer Valley.

2.4 Identified gaps

The Cardno pre-feasibility study identified the following issues that the preliminary business case and detailed business case would need to consider:

1) The demand for different water products from both existing irrigators and potential new entrants across the region and by locality across varying end uses including horticulture and intensive animal husbandry

2) The impact on demand for other water products arising from proposed amendments to the water plan to groundwater use within the Lockyer Valley

3) The potential for access to water resources, which may include:

[26] Water quality definitions can be found at Department of Energy and Water Supply, *Water quality guidelines for recycled water schemes*, Queensland Government, November 2008, https://www.dews.qld.gov.au/__data/assets/pdf_file/0019/45172/water-quality-guidelines.pdf.

a) existing allocations held by others, including the medium priority allocations in mid-Brisbane

b) existing strategic reserves in South East Queensland

c) recycled water from the Western Corridor Recycled Water Scheme either through a direct offtake or sourced indirectly from Wivenhoe Dam

4) The potential for the Lake Wivenhoe to Cressbrook Dam pipeline to form part of a bulk transfer system as an alternative to a new pipeline

5) Other public infrastructure requirements necessary to support the identified demand and supply options

6) In meeting the identified demands across the region, the option or combination of options with the highest net economic and social benefit to the Lockyer Valley

7) Environmental benefits arising from increased water security in the Lockyer Valley.[27]

GHD identified constraints that would need to be addressed.

1) The Lockyer, Darling Downs and surrounding region are characterised by the depth of opportunity for economic development and the magnitude of constraints on this development. In some instances, the opportunity and constraints are intertwined by complex internal and external forces, most notably with respect to water availability, access to markets, approvals, project lead-time to achieve a positive cash flow and downstream impacts of irrigation development.[28]

2) Insufficient access to water supplies is a key constraint on the expansion of production for several crops.[29]

Some of these constraints are addressed in this report. However, an enduring constraint is the uncertainty of additional irrigation demand for water and a willingness to pay study. This constraint needs to be addressed early in the detailed business case. The design (and therefore) cost of a scheme depends on the quantum and location of demand.

[27] Cardno, *Pre-feasibility: Water for agriculture productivity and sustainability*, 2018, p. 39.
[28] GHD, *NuWater Project Feasibility Study* 2017, p. 14.
[29] GHD, *NuWater Project Feasibility Study*, 2017, p. 27.

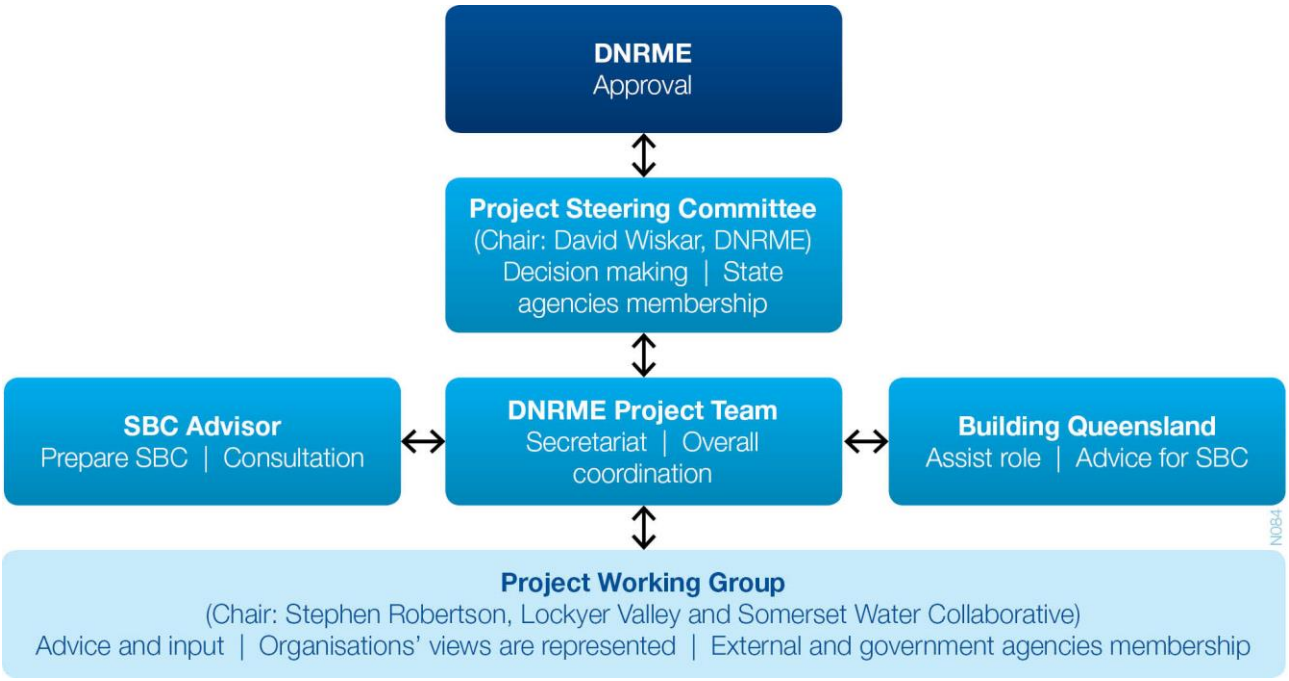
3. Governance

3.1 Proposal owner

To oversee the development of this business case, the governance arrangements shown below were put in place. The governance model includes stakeholders from state and local governments, statutory bodies and irrigator representatives (Figure 3.1).

The Department of Natural Resources Mines and Energy (DNRME) is responsible for the strategic business case (SBC) as the project owner. Building Queensland acts in an assist role in the development of the SBC to provide advice and to ensure its consistency with the Business Case Development Framework.

Figure 3.1 : Governance model



3.2 Project Steering Committee

The PSC consisted of government representatives and provided SBC development guidance. It provided strategic direction, reviews, comments upon and/or endorsed project elements that affected the SBC. The focus of the PSC was on:

- high-level strategic issues in the development of the SBC
- noting and/or endorsing key business case outputs and documentation as they are developed
- considering the SBC and making a recommendation to the project owner.

The key matters for PSC deliberation were:

- key project documentation (e.g. business case work stream outputs such as technical analysis and reports, business case management plan)
- major issues and risks associated with the project
- review of the draft SBC report
- endorsement of the final SBC report

- consideration of the SBC and making a recommendation to the chair.

The PSC members included representatives from:

- Department of Natural Resources, Mines and Energy (chair)
- Department of Premier and Cabinet
- Queensland Treasury
- Queensland Treasury Corporation
- Department of State Development, Manufacturing, Infrastructure and Planning
- Department of Agriculture and Fisheries
- Department of Environment and Science
- Building Queensland
- Seqwater
- Queensland Urban Utilities.

A summary of PSC meeting is shown in Table 3.1.

Table 3.1 : Summary of PSC meetings

Meeting number	Date	Topics	Decisions made
1	9 November 2018	Update, Terms of Reference for Project Steering Committee, Business Case Management Plan	Endorsement of Terms of Reference for Project Steering Committee, Business Case Management Plan
2	8 February 2019	Discussion of the service need	Endorsement of Service Need Statement
3	7 March 2019	Discussion of the longlist and multicriteria analysis criteria	Endorsement of long list
4	4 April 2019	Review of ranked and shortlist	Endorsement of shortlist
5	8 May 2019	Further SBC analysis on shortlisted infrastructure options, and non-infrastructure options	Endorsement of outcomes from SBC for DBC consideration, including program of new complementary and Base Case options.
6	12 June 2019	Presentation and review of draft SBC Report.	The draft SBC Report is to be provided to the PWG for review and subsequent comments from the PWG and PSC are to be incorporated. PSC to approve final SBC Report.

3.3 Project Working Group

The PWG provided guidance, input, direction and review to ensure that the project delivered the outcomes outlined in the project's purpose and objectives.

The focus of the PWG was to oversee the articulation of an agreed purpose that will lead to the development of the SBC that:

- details the service need to be addressed
- identifies intended benefits

- includes undertaking an investment logic mapping exercise with stakeholders
- leads to a multicriteria assessment of a list of options.

The PWG comprised community and industry stakeholders and government agencies. The PWG members included representatives from:

- Lockyer Valley and Somerset Water Collaborative (chair)
- Lockyer Valley Regional Council
- Somerset Regional Council
- Lockyer Valley Growers
- Lockyer Water Users Forum
- Lockyer Chamber of Commerce and Industry
- Queensland Urban Utilities
- Building Queensland
- Seqwater
- Department of Natural Resources, Mines and Energy
- Department of Agriculture and Fisheries
- Department of State Development, Manufacturing, Infrastructure and Planning
- Queensland Treasury
- Queensland Treasury Corporation.

A summary of PWG meetings is shown in Table 3.2.

Table 3.2 : Summary of PWG meetings

Meeting number	Date	Topics	Decisions made
1	25 May 2018	Introduction and roles	
2	2 July 2018	Role of Building Queensland	
3	20 August 2018	Project update, Building Queensland BCDF and draft Terms of reference for PWG	Adopted Building Queensland BCDF and PWG to be chaired by Stephen Robertson
4	2 October 2018	Terms of reference, formation of Project Steering Committee	Finalisation of terms of reference
5	19 November 2018	Investment logic map—problem / opportunity, benefits Service need statements	
6	17 December 2018	Review of investment logic map—problem / opportunity, benefits Service need statements Continue Investment logic mapping Strategic responses Potential initiatives	Confirmation of problem / opportunity, benefits

Meeting number	Date	Topics	Decisions made
7	29 January 2019	Review of investment logic mapping—KPIs (of benefits), strategic responses, potential initiatives Risk workshop	
8	25 February 2019	Overview of the longlist and feedback. Assessment criteria for use in the multi criteria analysis	Preliminary endorsement of the longlist and assessment criteria.
9	16 April 2019	Review of ranked longlist and shortlist	Endorsement of shortlist
10	14 May 2019	Discussion on further SBC analysis on shortlisted infrastructure options, and non-infrastructure options	Agreed with outcomes from SBC for detailed business case consideration, including program of new complementary and base case options.
11	18 June 2019	Presentation of draft SBC Report	Comments to be provided for inclusion in the final SBC report.
12	22 July 2019	Discussion of PWG written comments on the draft SBC report.	Agreed response to PWG comments - to be incorporated into the final SBC Report.

4. Methodology

A desktop study and gap analysis of work done to date (for example, prior studies) was undertaken to capture previous work and to identify areas where additional work was required.

Several state agencies and local governments were actively involved. This ensured that all state and local government portfolio interest were captured. Also, the PWG had a strong representation from grower groups to provide an irrigation perspective.

QTC was engaged to explore economic opportunity given global trends (Chapter 6).

All the key elements were discussed with the Project Working Group (PWG) and the Project Steering Committee (PSC). Details of the PWG and PSC are provided in Chapter 3. The main topics were the service need, benefits, risks and potential initiatives, options long list, options short list and recommendations. The service need, benefits, risks and potential initiatives are summarised in the investment logic map (Appendix A).

The SBC is the first document in the business case suite of the Building Queensland BCDF. It aims to ensure that the service need is substantiated and effectively articulated and that the benefits sought are achieved through the proposed initiatives.

The SBC is developed in the pre-project phase and is used to determine whether there are problems and opportunities to address. This SBC:

- provides evidence for the clearly articulated service need
- documents the benefits sought by responding to the service need and providing a minimum benefit against which any options generated in the PBC can be compared
- identifies a range of strategic initiatives that might respond to the service need and achieve some (or all) of the benefits sought
- provides decision-makers with the information needed to consider whether to further progress the proposal.

4.1 Risk approach

The risk management approach is aligned with DNRME risk matrix and the relevant Australian Standard AS/NZS ISO 31000:2009 Risk Management—Principles and Guidelines.

During a meeting of the PWG, a risk workshop was conducted. This process identified the material risks to the development of the business case and risks associated with the delivery of any project recommendations. Risk mitigation strategies were identified and implemented as needed. These findings are summarised in the risk register (Appendix B).

4.2 Stakeholder engagement

Stakeholder engagement enables an understanding of the relationship between the objectives of a project and the outcomes expected by stakeholders. Most of the stakeholder engagement took place within the PWG (and some members of their organisation) and PSC, which represents a broad cross-section of interested parties (see Chapter 7 for a summary of the stakeholders and their views and Appendix D for the Stakeholder Engagement Plan).

4.3 Service need assessment

Assessment and confirmation of the service need was informed through the development of a socio-economic baseline, investigations into the current reliability of supply, previous demand studies, stakeholder consultation, a land suitability assessment and consideration of market opportunities and policy objectives relevant to the area.

4.4 Options identification and assessment

Many practical options to address the service need, identified issues and opportunities of the Lockyer Valley were considered. This was done through close collaboration and discussions with the PWG and PSC. Through this process it was recognised that there may be more than one approach to solve a problem or address an opportunity, and that in many situations multiple options will be required to achieve the desired outcome. For example, a combination of 'better use' and 'improve existing' may effectively delay the need for new infrastructure, while 'reform' in combination with 'new' could reduce the cost of new infrastructure.

A workshop with relevant stakeholders was facilitated to explore all the possible infrastructure and non-infrastructure solutions to address the identified issues. In this way information collected through the needs assessment and engagement with key stakeholders about potential solutions was leveraged.

The main approach to identifying options was through the 'investment logic mapping' approach, which was undertaken by the PWG and then further considered and endorsed by the PSC. This approach meant that a very wide cross-section of stakeholders could contribute to the option selection. In addition, previous reports were considered, and their options were included.

4.4.1 Shortlisting

A multicriteria analysis workshop was used to rank all the identified options. Each option was individually assessed against the established multicriteria analysis framework to develop a shortlist of the most suitable options for further investigation. The multicriteria assessment criteria (Table 4.1) were discussed and endorsed by the PWG and PSC.

Table 4.1 : Assessment criteria

Assessment criteria	Weighting (per cent)
Additional water (annual maximum volume)	10
Average availability	10
Capital costs (millions)	15
Stakeholder support	10
Technical feasibility	10
Strategic considerations and state agencies support including competing interests	10
Levelised costs and capacity to pay	15
Economic net present value	10
Financial net present value	10
Total	100

The focus of the multicriteria analysis workshop was to identify a shortlist of viable options that are suitable from a social, economic, technical, environmental and water reliability perspective. This allows specific attention and evaluation to be provided to the limited number of shortlisted options and provides a greater level of confidence on the preferred option(s) identified at the conclusion of the detailed analysis.

Specific investigations of each shortlisted option include appropriate technical and engineering details, including, but not limited to, risks, opportunities and life cycle costs.

4.4.2 Next steps

This SBC recommends what activities should occur after completion of the business case. This includes any options (including a program of new complementary options and existing base case options) that have individual merit and could be progressed by the government or private investors.

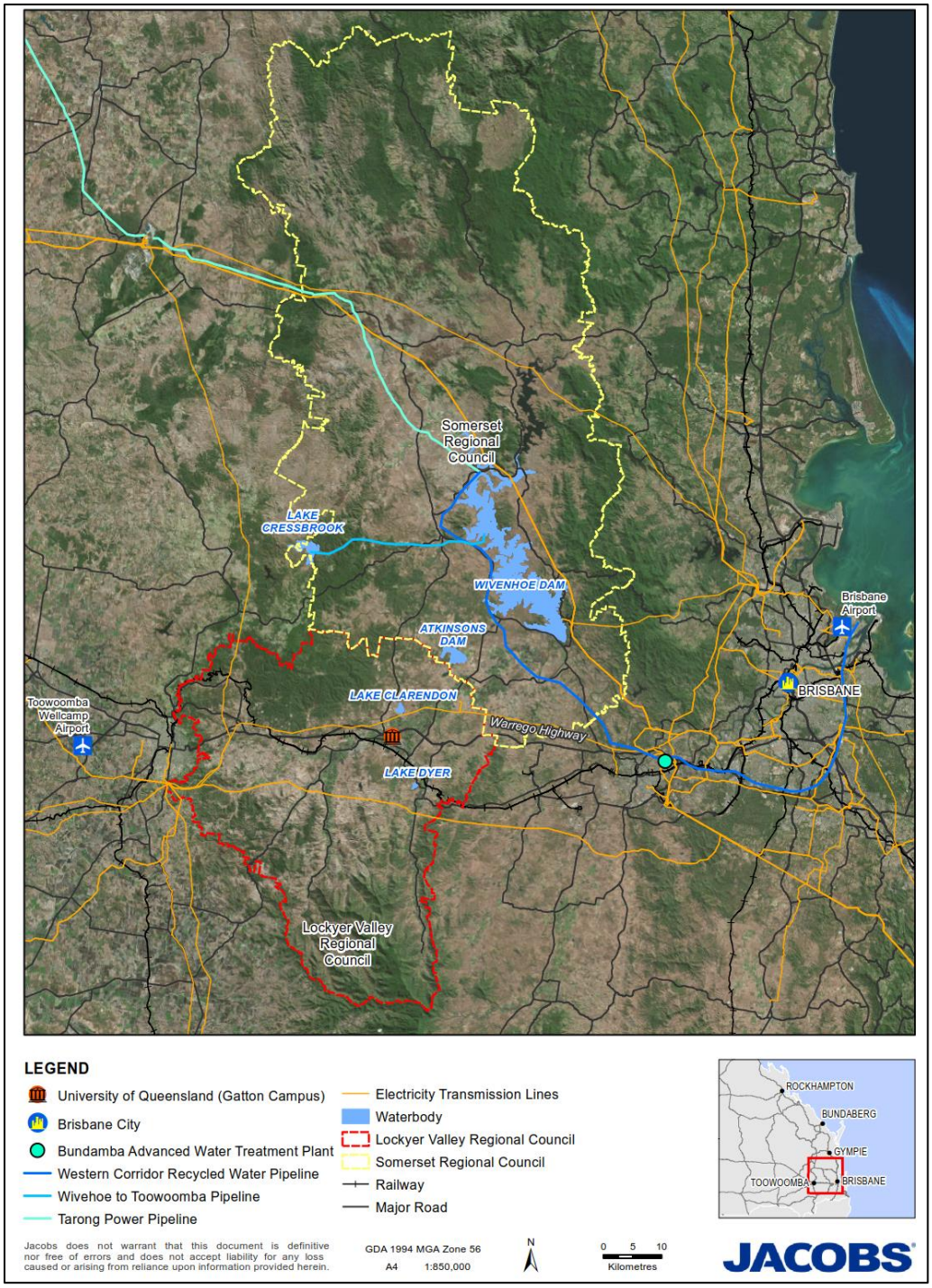
5. Service need

The service need may result from a problem or opportunity, and this section includes evidence of why it is necessary to address the problems and opportunities.

5.1 Current state

The current infrastructure is shown in Figure 5.1.

Figure 5.1 : Map of local infrastructure



5.2 Current state of demographics

5.2.1 Current state of the regional economy

The combined gross regional product of the two local government areas (LGAs) is $2.6 billion. This is less than 3 per cent of the total Queensland economy.[30] Agriculture is the dominant industry in the Lockyer Valley—total agricultural production is valued at over $469 million per year[31], consisting almost mainly of vegetables and livestock production. A sample of economic indicators is shown in Table 5.1.

Table 5.1 : Lockyer Valley economic indicators (2017–18)

	Lockyer Council LGA	Somerset Council LGA	Total
Gross regional product	$1,643 million	$923 million	$2,566 million
Jobs (number)	13,662	7,458	21,120
Unemployment	7.1%	9.2%	7.9%
Businesses (number)	3,085	2,013	5,098
Population (number of people)	41,011	25,887	66,898

Source:.id (https://home.id.com.au/) and National Economics, National Economic Indicators series, 2017–18.

5.2.2 Employment

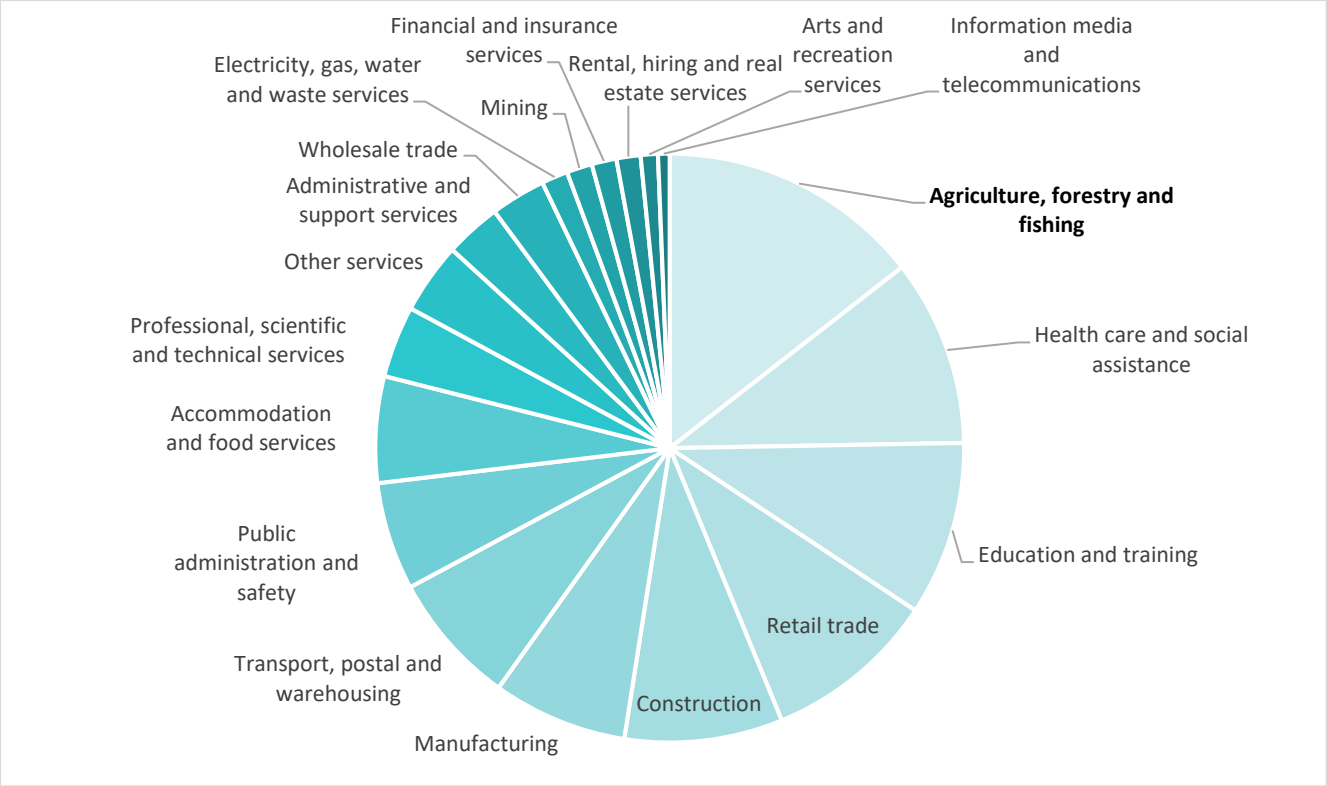
The average unemployment rate in the Lockyer Valley is higher than in the rest of Queensland. In the Lockyer Valley, unemployment is 7.9 per cent, compared with a Queensland average of 5.9 per cent (Table 5.1).[32]

Agriculture is the biggest employer in the Lockyer Valley, employing 14 per cent of workers. It is larger than the health care and education sectors, each of which employs 10 per cent (Figure 5.2).

This data indicates that substantial growth in agriculture could improve the employment outcomes for residents.

[30] Queensland Government Statistician's Office, *Queensland domestic production account, Trend, chain volume measure (a), $m*, September 2018.
[31] ABS, *Gross value, Value of Agricultural Commodities Produced, Australia, 2016–17*, cat.no. 7503.0, Ipswich Statistical Area Level.
[32] ABS, *Labour force, Australia*, cat. 6202.0, Table 6, Labour force status by sex, Queensland, series ID A84423956W, March 2019.

Figure 5.2 : Employment by sector



Source: Queensland Government Statistician's Office, Queensland Treasury, Queensland Regional Profiles: Resident Profile for Lockyer Valley (R) Local Government Area, 2016.

5.2.3 Population

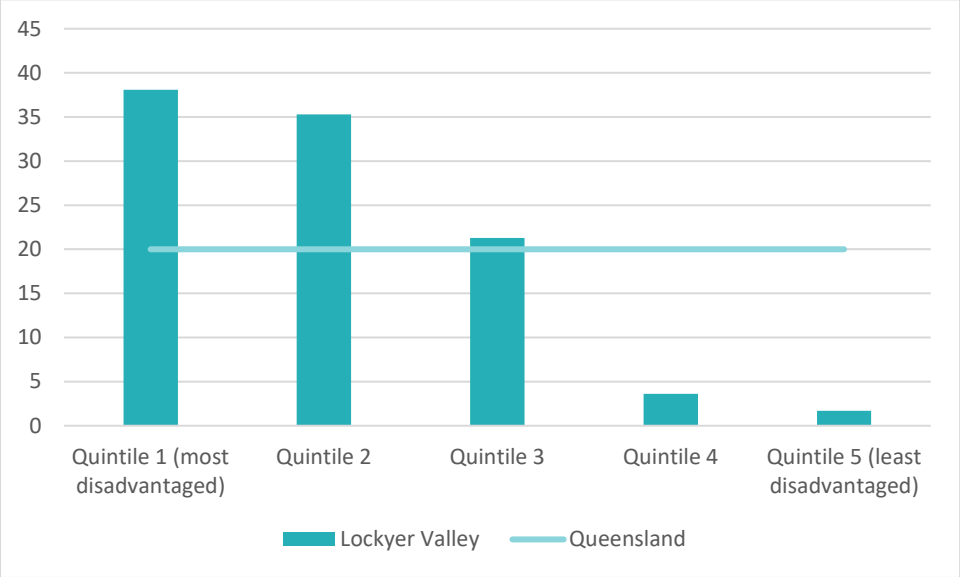
The population of the Lockyer Valley is 66,000 and has been growing at 2.4 per cent annually over the past 10 years. Over the same period, the Queensland population increased by 1.8 per cent annually.

By 2041, the Lockyer Valley population is expected to reach 98,000—an increase of almost 50 per cent over 25 years.[33]South East Queensland as a region is expected to increase by 55 per cent of the same period. This will result in additional demand for the agricultural products grown in the Lockyer Valley.

The level of socio-economic disadvantage in the Lockyer Valley is high, compared with the rest of Queensland. Lockyer Valley residents are twice as likely to be highly disadvantaged and 90 per cent less likely to be highly advantaged (**Error! Reference source not found.**3).

[33] Queensland Government's Statisticians Office, Qld Regional Profiles. (2016)

Figure 5.3 : Socio-economic disadvantage



Source: Queensland Government Statistician Office, Queensland Regional Profiles 2016.

5.2.4 Education

Educational attainment is lower in the Lockyer Valley than the rest of Queensland. In 2016, 52 per cent of Lockyer Valley residents had a post-school qualification (bachelor's degree, diploma or certificate) compared with 59 per cent of the Queensland population.

The University of Queensland has an agricultural college at Gatton. This facility undertakes a range of research functions and has a research farm of 1,100 hectares. The Gatton campus is home to the School of Agriculture and Food Sciences, where students can take degrees in:

- Agribusiness
- Sustainable Agriculture
- Agricultural Science
- Food Technology.

The university teaches approximately 1,700 students each year. Graduates of the School of Agriculture and Food Sciences are equipped with the skills needed to work on farms in the Lockyer Valley.

5.3 Current state of agriculture

According to Trade and Investment Queensland:

> The Lockyer Valley is one the top 10 most fertile farming areas in the world and grows the most diverse commercial range of fruit and vegetables in Australia. [34]

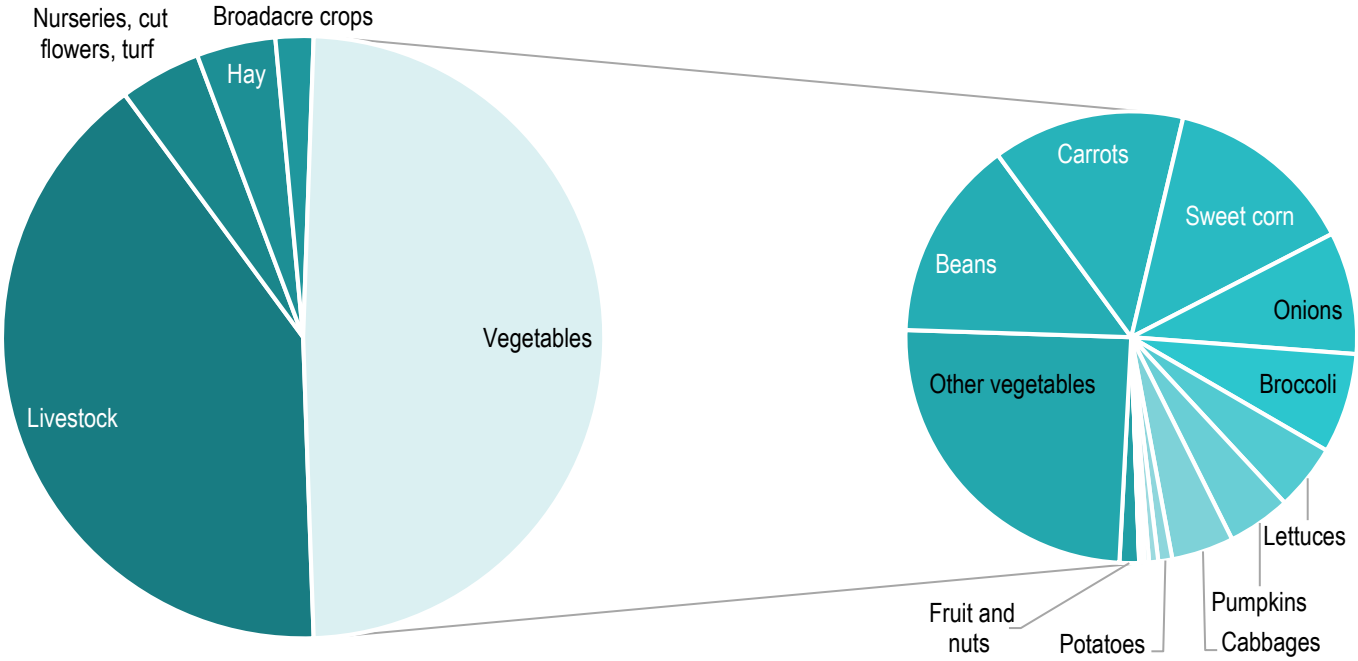
The Lockyer Valley is also one of the most important food bowl areas in Australia, supplying most of Australia's vegetables during the winter months and typically accounting for 28 per cent of Queensland's total horticultural production. Significant industry opportunities continue to emerge in the region including specialist food processing, food packaging, transport and storage, construction and new agritourism developments. A diverse food processing sector is developing, which includes

[34] Trade and Investment Queensland, *Market profile Lockyer Valley*, 24 October 2017, https://www.tiq.qld.gov.au/download/business-interest/about-queensland/qld-regional-market-profiles/Market-Profile-Lockyer-Valley.pdf.

dairy manufacturers, small goods manufacturers and meat processors. The region has export capabilities in agricultural technologies, services and equipment manufacturing.

Agriculture is the dominant industry in the Lockyer Valley—total agricultural production is valued at over $469 million per year[35], consisting almost mainly of vegetables and livestock production. A breakdown is shown in Figure 5.4.

Figure 5.4 : Gross value of commodities in the Lockyer Valley, 2016–17



Source: ABS, Value of Agricultural Commodities Produced, Australia, 2016–17, cat. 7503.0, May 2018.

Vegetables contribute approximately half of the gross value of agricultural production. Most of the irrigated agriculture relates to vegetable production, with beans, carrots and sweetcorn the largest three crops measured by value of production. The breakdown varies from year to year, depending on market and environmental conditions.

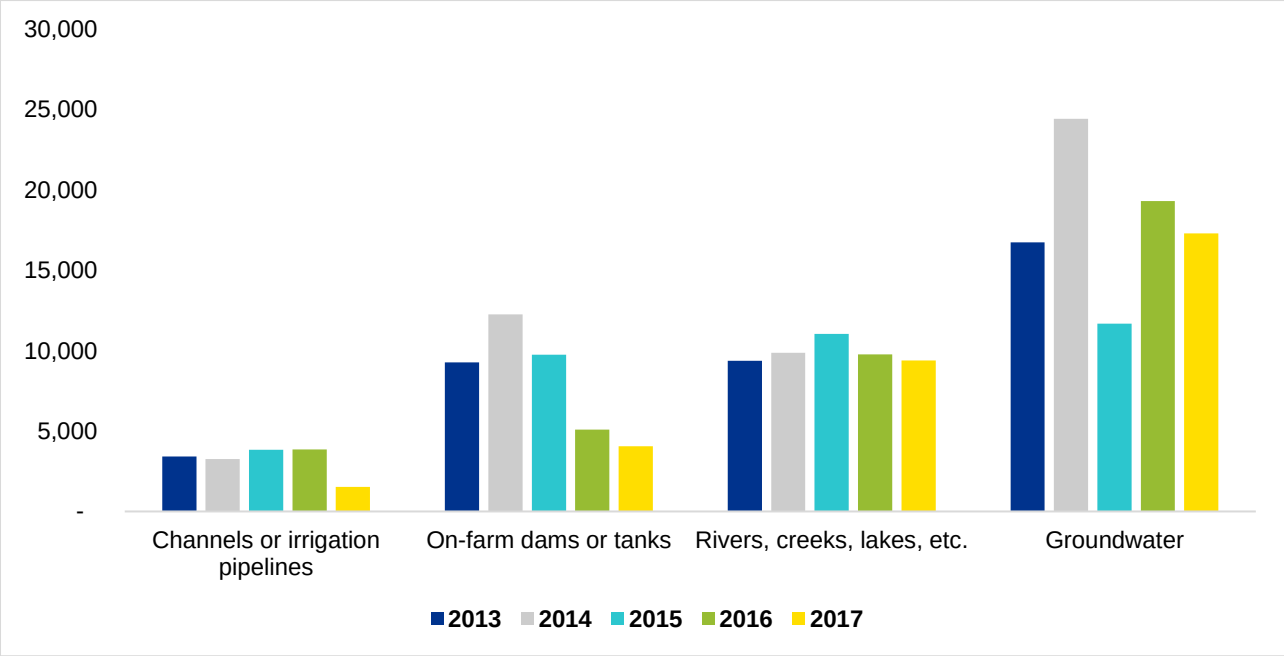
The crop mix are annual crop and can be planted and harvested each year. This approach allows for production to rise and fall in line with water availability and with rainfall

5.3.1 Existing water use

Irrigators access water from a variety of sources. Over the past five years (2013–2017), the annual water use has averaged approximately 40,000 megalitres (ML) for the Lockyer Valley. Irrigators source their water from Seqwater irrigation schemes, on-farm storages, unsupplemented rivers and creeks, and groundwater. Rainfall is captured in privately owned on-farm dams. However, groundwater is the dominant source as is shown in Figure 5.5.

[35] ABS, *Gross value, Value of Agricultural Commodities Produced, Australia, 2016–17*, cat.no. 7503.0, Ipswich Statistical Area Level.

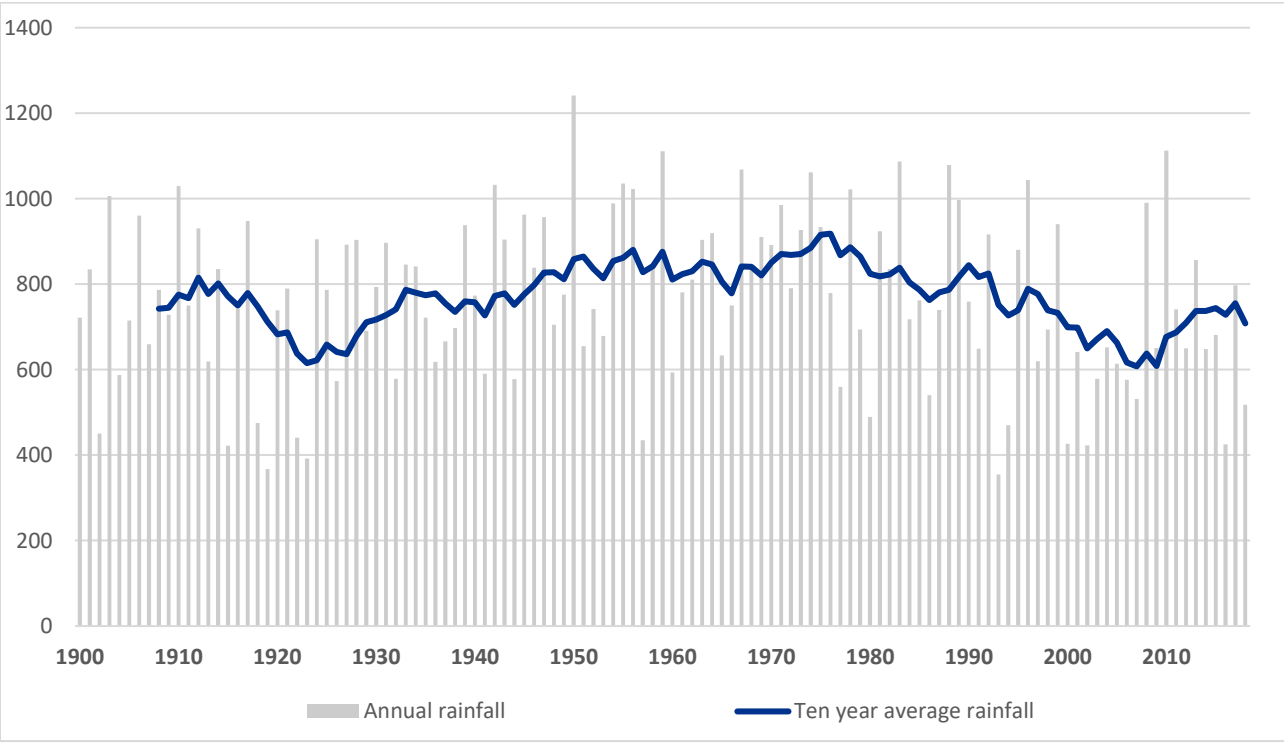
Figure 5.5 : Water sources in the Lockyer Valley , 2013–2017 (ML)



Source: ABS, Water Use on Australian Farms, cat. no. 4618.0. Data has been collected by Statistical Area 4 since 2012–13.

In addition, crops are irrigated naturally by rainfall. The average annual rainfall is shown in Figure 5.6.

Figure 5.6 : Rainfall at the University of Queensland, Gatton (mm)



Source: BOM, station number 040082.

5.3.2 Groundwater

Groundwater resources provide a significant source of water for the Lockyer catchment, as evidenced by the high concentration of bores located within the alluvial plains where irrigated agriculture is undertaken. Streamflow within the waterways of the Lockyer catchment is interlinked with these groundwater resources. From the 1940s there was a rapid increase in the number of bores drilled in the catchment to access groundwater resources, resulting in a rapid increase in groundwater table drawdown in selected areas. In 2013, an estimated 5,000 or more bores were accessing groundwater resources within the Lockyer catchment.[36]

Intensive groundwater use can decrease water table levels resulting in adverse water quality impacts, in terms of increased salinity, particularly during prolonged drier periods. Recent wet years, including the flood events in 2011 and 2013, resulted in a major recharge of the groundwater system demonstrating that the system is able to recover.[36.]

5.3.3 Existing Seqwater irrigation assets

Seqwater operates Wivenhoe and Somerset dams within the study area. These storages are overwhelmingly used to supply urban water needs. A small volume of water allocations is available for irrigators.

Seqwater operates two schemes in the Lockyer Valley—the Central Lockyer water supply scheme (including the Morton Vale pipeline) and the Lower Lockyer water supply scheme. The existing water storages and distribution assets for the schemes include the following:

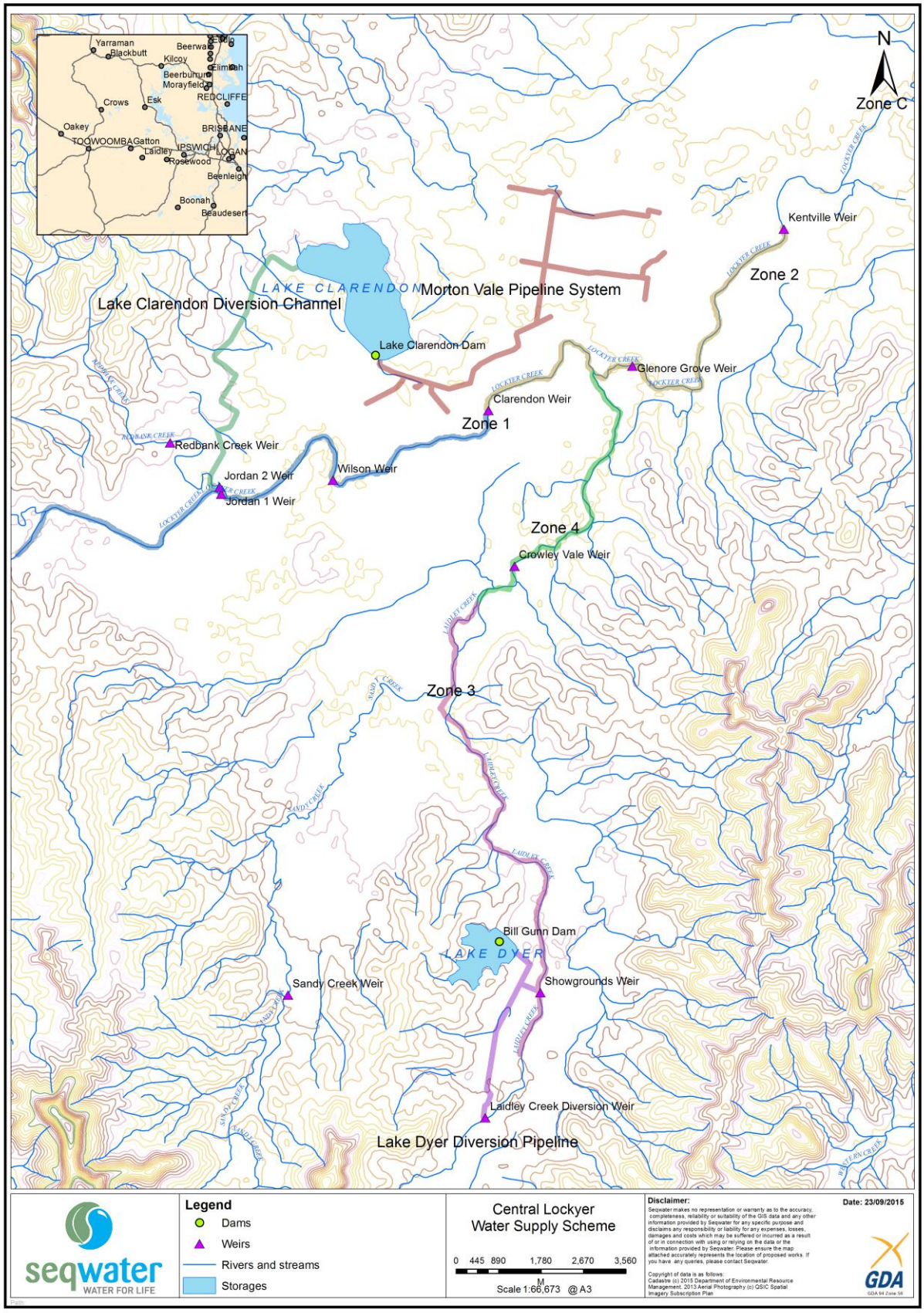
- Bill Gunn Dam
- Clarendon Dam
- Atkinson Dam
- Kentville Weir
- Jordan 1 and 2 Weirs
- Wilson Weir
- Clarendon Weir
- Glenore Grove Weir
- Laidley Creek Diversion Weir
- Showgrounds Weir
- Crowley Vale Weir
- Morton Vale Pipeline.

The dams are off-stream storages that are filled by diverting water from nearby creeks during significant flow events. Water is then released at a later time to supply customers. Accordingly, the rate of inflow in constrained by the size of the pumps and diversions pipes/channels, and the dams are not able to capture all the available water during flow events.

The Central Lockyer Valley scheme is supplied by Clarendon and Bill Gunn dams. The scheme supplies water using the Morton Vale Pipeline, recharges the groundwater areas adjacent to Lockyer Creek using the weirs, and supplies downstream area-based surface-water entitlements. This scheme is shown in Figure 5.7.

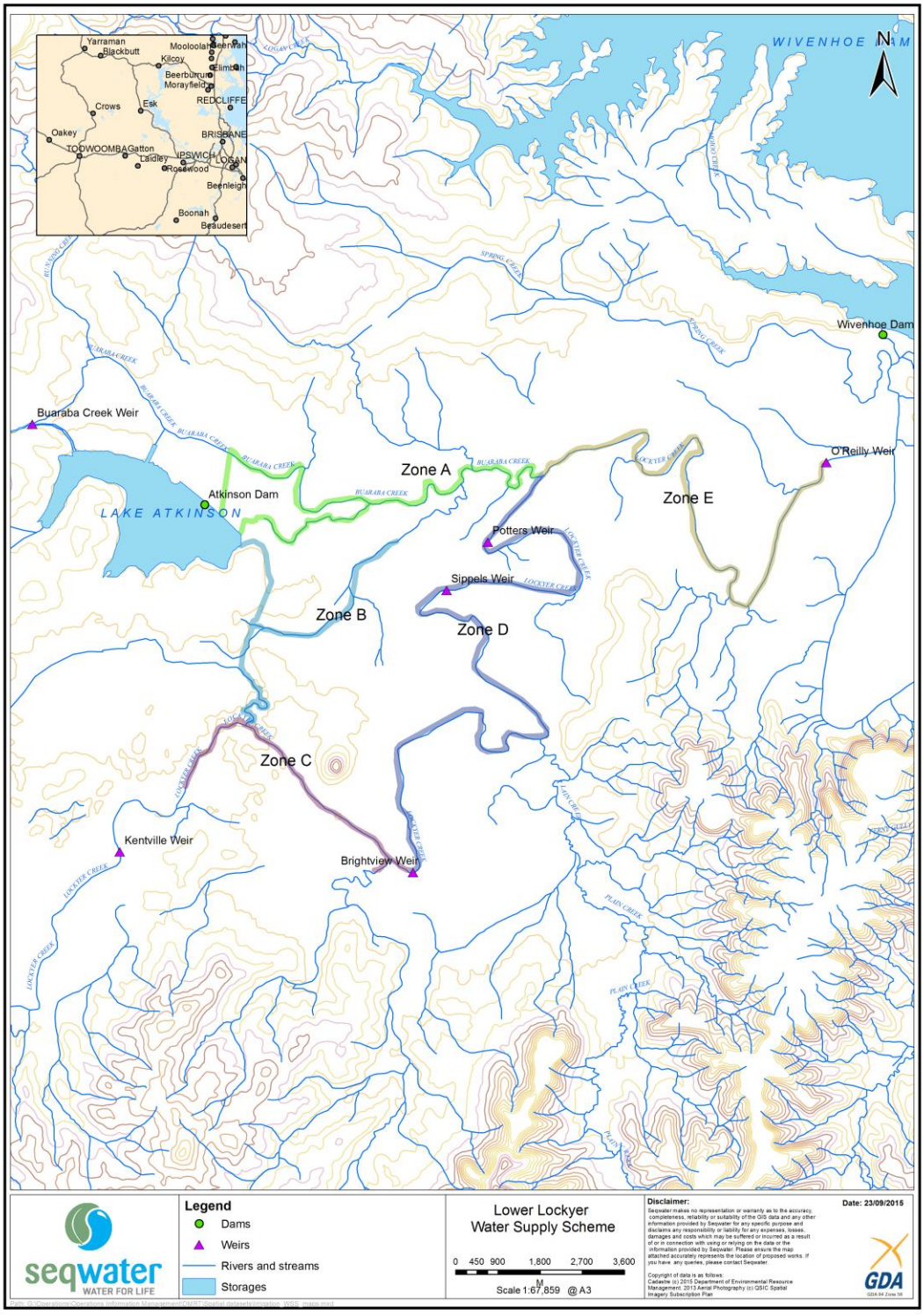
[36] Lockyer catchment preliminary socio-economic study, WSP, October 2017.

Figure 5.7 : Map of the Central Lockyer Valley water supply scheme



The Lower Lockyer water supply scheme was designed to supply surface water for irrigation. The scheme is managed under the Moreton Water Plan (Water Management Protocol and Lower Lockyer Valley Water Supply Scheme Operations Manual). A map of the scheme is shown in Figure 5.8.

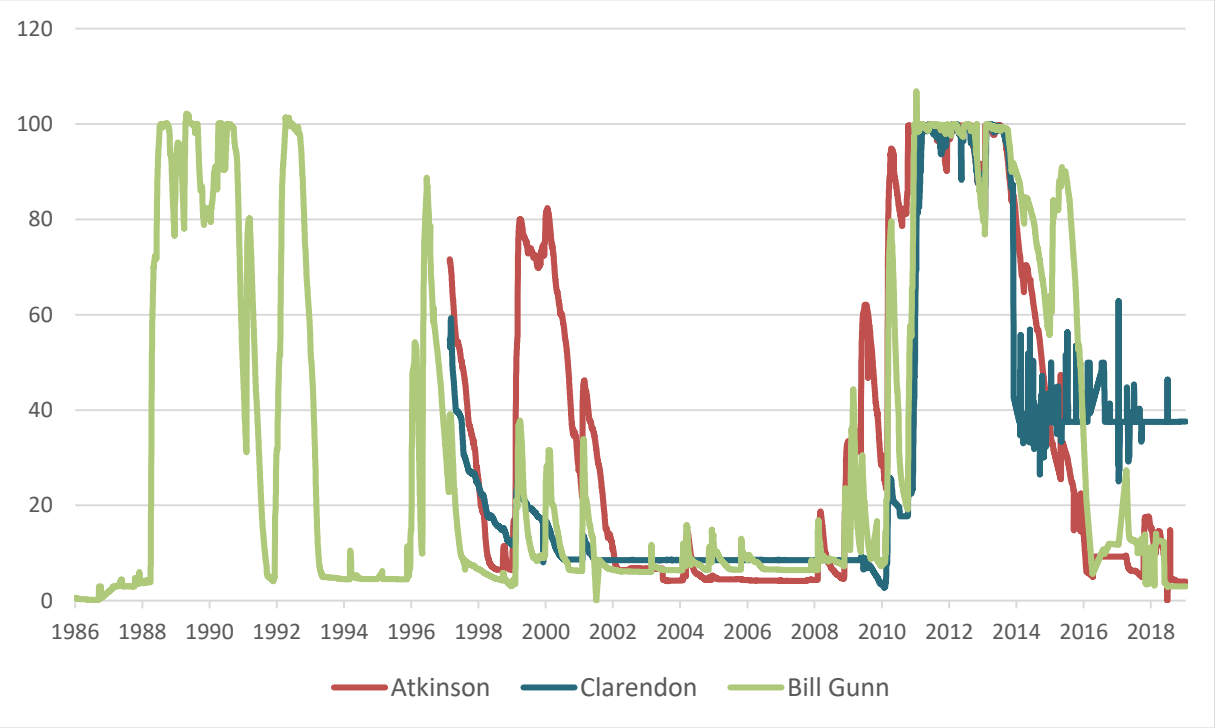
Figure 5.8 : Map of the Lower Lockyer water supply scheme



Water reliability is low in the Seqwater schemes, relative to most other irrigation schemes in Queensland, where reliability is generally targeted to be about 80 per cent for medium priority water allocations. In the Central Lockyer Valley water supply scheme and the Lower Lockyer water supply

scheme the monthly reliabilities are both 50–65 per cent. There have been periods of very low water availability, such as in the early 2000s, when supply was low. This is shown in Figure 5.9 and Figure 5.10

Figure 5.9 : Utilised storage capacity of Lockyer Valley irrigation dams (%)



These fluctuations result in variations in medium priority announced allocations. For example, in the Lower Lockyer water supply scheme, during the period from 2008 to 2018, three years started with a 0 per cent announced allocation, while four years started with a 100 per cent allocation (Table 5.2).

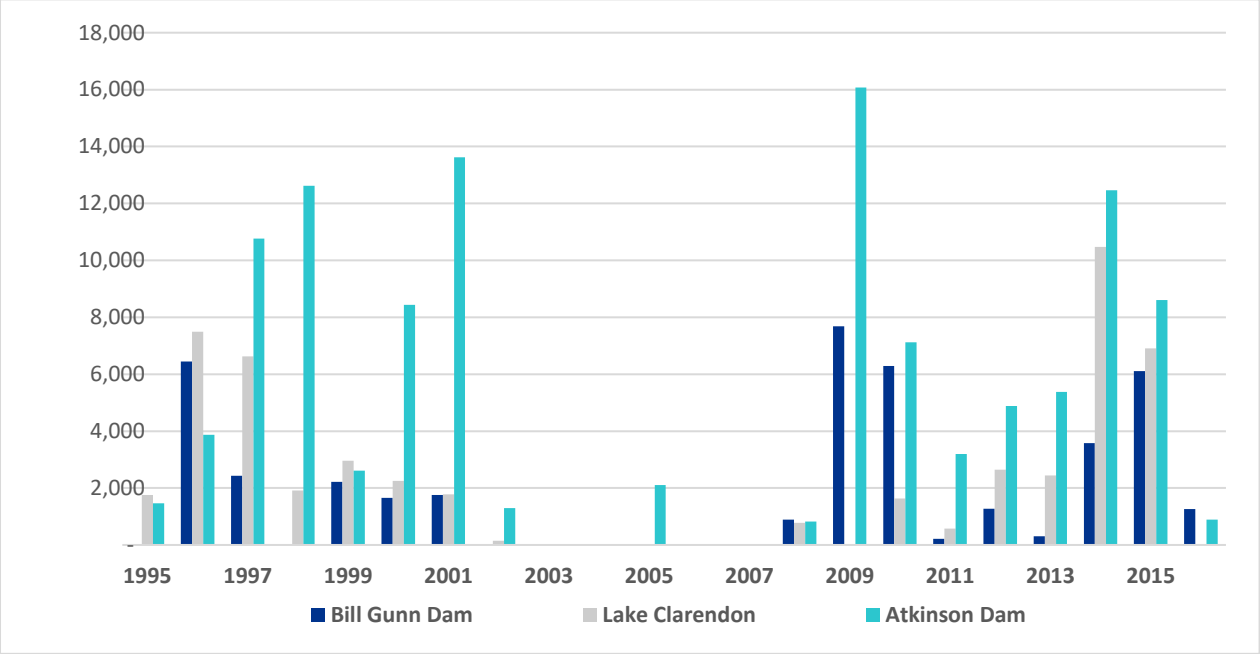
Table 5.2 : Announced allocation—Lower Lockyer Valley water supply scheme

Year	Lower Lockyer Valley water supply scheme announced allocation (%)
2008	0–16
2009	13–63
2010	27–100
2011	100
2012	100
2013	100
2014	100
2015	81
2016	31
2017	0–10
2018	0–17

Note: Where a range is shown, the first number is the announced allocation at the beginning of the water year, and the last number is at the end.

Source: Seqwater, submission to the Queensland Competition Authority—appendix E, Rural irrigation price review 2020–24, 30 November 2018.

Figure 5.10 : Volume of water released from Lockyer Valley irrigation dams (ML)



Source: Irrigators' historical records.

It costs Seqwater approximately $2.5 million[37] annually to operate these schemes. The Queensland Government provides Seqwater with an annual community service obligation (a subsidy), of approximately $1.7 million. This payment reflects the difference between total costs incurred by Seqwater and revenue received from irrigators.

5.4 Summary of the current state

5.4.1 Impacts of the problem/opportunity

Agricultural production in the Lockyer Valley is highly dependent on water availability. Water availability is unreliable.

The problems and opportunities that characterise the service need were identified and formulated as follows:

1) Availability of sustainable and reliable water supply limits economic development opportunities and growth
2) Lack of cross-government (three-tier) policy coordination constrains investment
3) Leveraging the region's natural and competitive advantages would support economic growth.

These statements are further discussed in section 5.5.1.

5.4.2 Timeframe and urgency

The low level of water availability in the irrigation dams is the main driver for an urgent solution. Further, the finalisation of the water plan will specify more clearly each customer's entitlement to water. This may trigger a greater desire to augment current irrigation supplies.

[37] Seqwater, *Central Lockyer Valley Water Supply Scheme Annual Network Service Plan 2018–19* and *Lower Lockyer Valley Water Supply Scheme Annual Network Service Plan 2018–19*.

5.4.3 Root causes and continuation of current state

The Lockyer Valley has many natural endowments, but access to adequate and reliable water is not among them. During the workshops, participants considered that the social and economic upside was large.

Without increasing water supply and reliability in the Lockyer Valley, a significant change in agricultural output will likely not occur. This is consistent with the first problem statement (section 5.4.1).

5.4.4 Consequence of continuing the current state

If the current state is maintained, then it is expected that the following outcomes will continue:

- Unemployment will be higher than the Queensland average.
- Wages will be lower than the Queensland average.
- Socio-economic disadvantage will remain higher than in the rest of Queensland.
- Education attainment will remain lower than in the rest of Queensland.

5.4.5 Strategic alignment

All levels of government have a strong commitment to:

- appropriately allocating water
- investing in infrastructure that will result in additional local employment
- growing agricultural industries
- making efficient infrastructure decisions.

The service need is consistent with these strategic objectives (which are further detailed in 5.7)

5.5 Documenting the service need

5.5.1 Problem and opportunity statements

The Project Working Group (PWG) developed the service need through the investment logic mapping workshops which was endorsed by the Project Steering Committee (PSC). These workshops were informed by the work undertaken for previous studies (for example, NuWater and Cardno) and by broad consultation (see Chapter 7).

The problems and opportunities that characterise the service need was identified and formulated as follows:

1) Availability of sustainable and reliable water supply limits economic development opportunities and growth

The Lockyer Valley experiences lower and more variable rainfall than the rest of South East Queensland. Agriculture relies on irrigation from groundwater, which is in turn impacted by droughts and floods. The agricultural sector shifted away from dairy, towards horticultural and market gardening in the 1960s, aided by irrigation. Climate change is likely to reduce access to water.

The analysis of groundwater and surface water indicated that these sources are fully allocated and relatively unreliable.

The PWG considered this data as well as the water supply data (section 5.3) and concluded that the availability and unreliability of water limits economic development opportunities and growth.

2) Lack of cross-government (three-tier) policy coordination constrains investment

Consultation with stakeholders revealed that interactions with the government can be uncoordinated. Governments at all levels have an interest in increasing the productive capacity of the region, and it is important that this is done in a coordinated fashion.

Improved coordination could increase investment and certainty among businesses. That could result in additional regional investment, leading to additional local jobs being created. It would also support agri-business and local value-add production.

The creation of new markets, especially export markets, requires a coordinated regional approach so that economies of scale can be leveraged, and learnings applied across the region.

These issues were raised in the PWG workshops and it was agreed to include them a problem statement.

3) Leveraging the region's natural and competitive advantages would support economic growth

QTC found that the region has significant natural endowments, which result in competitive advantages:

> The Lockyer Valley possesses fertile alluvial soils allowing it to grow the most diverse commercial range of fruit and vegetables in Australia. The Lockyer Valley supplies the majority of Australia's vegetables during the winter months. Reportedly, there is technical potential to irrigate an additional 15,000 hectares of suitable land in the Lockyer Valley.
>
> Significant transport infrastructure traverses the region—highway access to Brisbane and Toowoomba (the Toowoomba Second Range Crossing is due for completion in 2019), and a railway line servicing Toowoomba and further west. The Western corridor is bookended by Brisbane Airport and Toowoomba Wellcamp Airport. Inland Rail may provide connectivity to NSW and Victoria from the Rocklea station.
>
> Significant industry experience and know-how are held by local growers. The University of Queensland and University of Southern Queensland offer research and training in agriculture. Numerous peak-bodies and government agencies offer additional informational support.
>
> The Lockyer Valley is located in the western growth corridor. The SEQ population is forecast to increase by 1.9 million inhabitants by 2041, and the economies of Asia are growing rapidly—a significant opportunity for the Lockyer Valley. Free-trade agreements, most recently with China and Indonesia, present opportunities to access international markets.[38].

The SEQ city deal could also be leveraged to support a seamless connection between agricultural production and access to markets.

The PWG considered these natural endowments and considered that the leverage of these natural and competitive advantages could support economic growth.

5.6 Potential additional demand for water

A key question to address is: What is the demand for additional water? The best approach to forecast additional demand is to undertake a detailed demand study and willingness to pay study, as

[38] Trade and Investment Queensland, Market profile Lockyer Valley,24 October 2017, https://www.tiq.qld.gov.au/download/business-interest/about-queensland/qld-regional-market-profiles/Market-Profile-Lockyer-Valley.pdf.

recommended by Cardno.[39] In the absence of a detailed demand study, a study of the relevant factors can provide a range of possible future scenarios.

The relevant factors include the availability of additional land, the price of the water relative to farm incomes, an opportunity for double or triple cropping of existing irrigated land and the potential of a market for any additional product.

5.6.1 Previous demand assessments

A demand assessment was undertaken during the NuWater project.[40] This assessment found confirmed additional demand of 2,650 ML in the Lockyer Valley, which was based on limited responses from irrigators.

However, GHD (who undertook the study) experienced a low response rate. It found that the poor response rate in the Lockyer Valley can be attributed, at least in part, to the uncertainly regarding the future regulatory arrangements for the use of groundwater resources in the region. It concluded that the outcomes from DNRME ongoing review of the sustainability of groundwater use in the Lockyer Valley had the potential to have an impact on the level of demand for water from the project in the Lockyer Valley.

Cardno undertook a high-level assessment and found that:

> [An] approach to estimating the demand for water for agriculture is through a bottom-up assessment by considering the crops produced and land under production in the Lockyer Valley. Potential additional demand for water may arise from:
>
> - Utilisation of high-quality land that is currently not in production
> - More intensive use of existing land for cropping or animal husbandry
> - Substitution for other sources if volumetric entitlements are in place for groundwater.
>
> Estimating the level of potential additional demand is very difficult because of the uncertainties involved. A simple estimate of demand arising from utilisation of high-quality land that is currently not in production can be made by multiplying the land not in production (approximately 15,000ha) by typical usage rates (1–3ML/ha/year) to arrive at 15–45 GL/year.
>
> This is an upper bound for potential additional demand from usage of this land not in production and does not account for ability or willingness to pay. Potential additional demand arising from the other two drivers is too uncertain to be estimated even at a high level. A rigorous demand assessment is needed to reliably estimate future potential demand. However, potential future demand will be influenced by whether volumetric entitlements are in place and a demand assessment should not be undertaken until there is certainty in this area.[41]

5.6.2 Additional water demand

It is possible to increase agricultural production by either irrigating additional land or increasing irrigation, which would result in additional water demand.

The 2012 Queensland Agricultural land audit identified approximately 111,000 hectares of class A land and 19,000 hectares of class B land within the study area. These figures should be taken as indicative only—they need to be confirmed through further investigation—but they identify locations that could potentially contribute to increased production from the Lockyer Valley.

[39] Cardno, *Pre-feasibility study—Water for agriculture productivity and sustainability*, pre-feasibility report prepared for Lockyer Valley Regional Council, 17 October 2017.
[40] GHD, NuWater *Project Feasibility Study,* prepared for Queensland Farmers' Federation, March 2018.
[41] Cardno, 17 October 2017.

Class A land is land that is suitable for a wide range of current and potential crops with nil to moderate limitations to production. Strategic cropping land corresponds to 'class A' agricultural land under the Queensland agricultural land class system. 'Class B' land is limited crop land that is suitable for a narrow range of current and potential crops. It is land that is marginal for current and potential crops due to severe limitations but is highly suitable for pastures. Class B land may be suitable for cropping with engineering or agronomic improvements.

The study area is defined to include both the Lockyer Valley and Somerset regional councils.

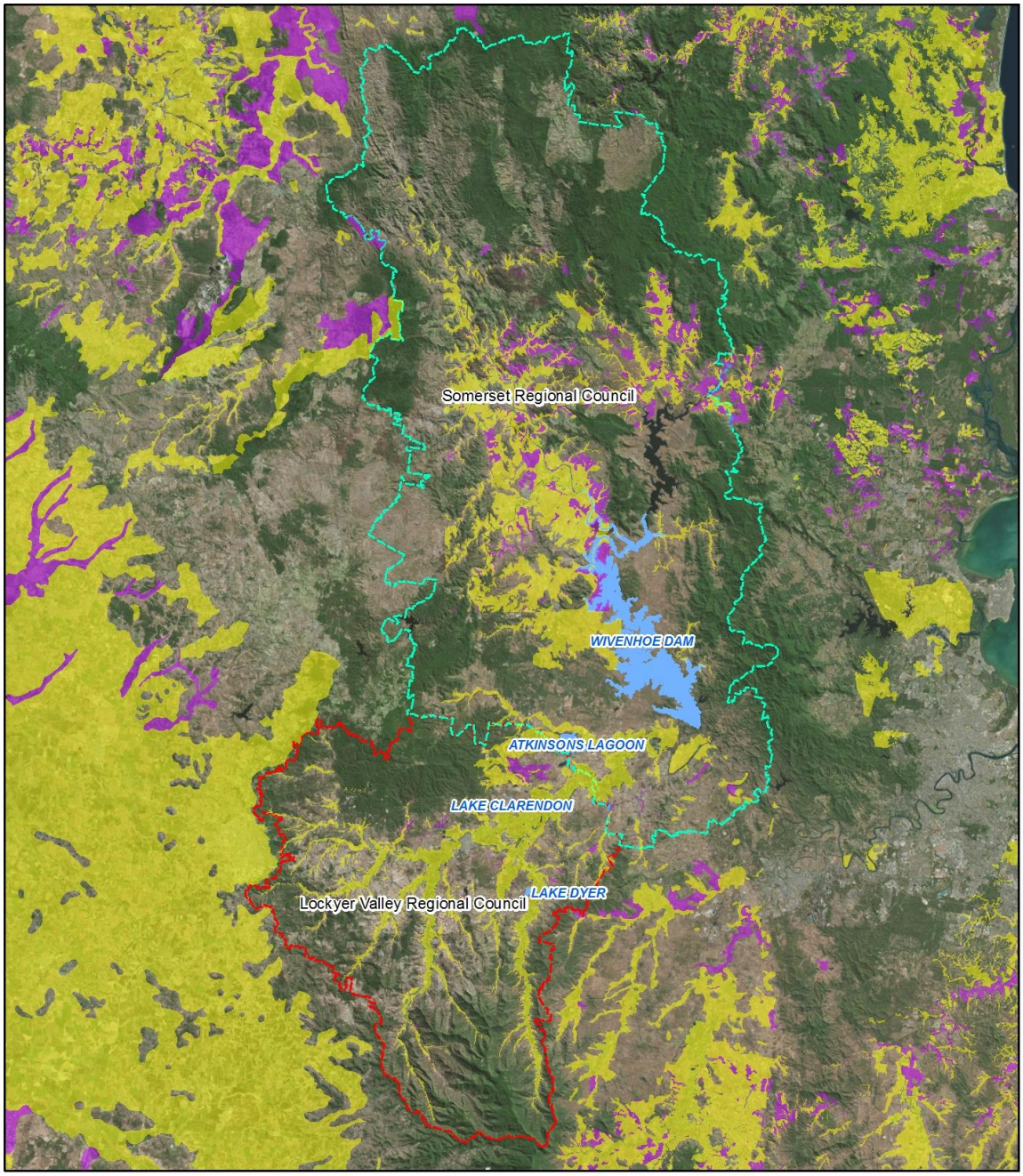
Most irrigators use the same plot of land to grow an average of 1.5 crops per year. However, for most leafy vegetable crops, 8 to 16 weeks are needed between planting and harvesting. While land does require some period of being fallow, irrigators said during consultation that an additional crop could be planted each year if water was available. This would increase the number of crops per year to 2.5 (a 67 per cent increase) without needing additional land.

Based on a conservative estimate of Cardno's findings, an additional 15,000 ha of Class A land is available for agricultural production. Using a conservative application rate of 2.5 ML per hectare, a further 37,500 ML per annum would be required for irrigation. Further, if existing land was planted for an extra crop per year, this would result in 67 percent more water use—approximately 20,000 ML per annum. Therefore, combining both existing and new land, an increased demand of 57,500 ML per annum could be expected.

It is assumed that not every landholder would increase their production. For the purpose of estimating costs and benefits, it has been assumed that additional demand would be 50,000 ML per year. It could be much more, depending on the amount of additional land irrigated. Irrigation demand would need to be thoroughly investigated during a detailed business case.

The suitable land is shown in Figure 5.11.

Figure 5.11 : Land mapping



5.6.3 Additional demand for agricultural product

For there to be additional demand for water, irrigators need to be able to profitably increase their production. This can be done either by increasing supply into the domestic or international markets.

The Lockyer Valley already supplies a large portion of vegetables into the south east Queensland market. As identified by QTC:

> As Australia's third-largest urban region, SEQ is home to one in seven Australians (3.4 million people) and is expected to attract an additional 1.9 million residents by 2041.[42]

It is reasonable to expect that the Lockyer could increase supply to service this market. The region could also increase the share of production that is currently relatively low (turf, flowers, etc.). These products require reliable water supply.

Another option is to increase supply into international markets. Presently, 6 per cent of output is exported. There are significant barriers to increasing exports, however (discussed below).

While it is reasonable to expect additional demand for water over time, in the absence of a detailed demand assessment, it is unknown whether commercial irrigators are prepared to take the risk of expansion, and what type of water products they would pay for.

As recommended by Cardno, a detailed demand assessment and willing to pay study should be undertaken to confirm additional demand, for both agricultural and associated industries.

5.6.4 Transport links and access to markets

The Lockyer Valley is strategically located in terms of transport. For example:

- The Lockyer Valley is linked by road to Brisbane and surrounds, including the Rocklea fruit and vegetable markets, which the main markets serving South East Queensland. These markets are less than one hour away from Gatton.
- It takes only two hours to travel to most of South East Queensland, which has a population of 3.5 million.
- Commercial airports are not far away, for example Toowoomba's Wellcamp (53 km) and Brisbane (104 km).
- The Toowoomba Second Range Crossing is due for completion in 2019 will allow enhanced freight routes bypassing Toowoomba city.

These transport links (which are already good and are still improving) could support the increase of agricultural production. This was supported by QTC, who found that:

> Transport infrastructure is not a material barrier. The Lockyer Valley has strength in agricultural production and is served by good transport infrastructure in the form of highways, ports, and airports. These competitive strengths allow the Lockyer Valley to supply the majority of Australia's vegetable requirements during the winter months. Stakeholders supported the view that regional transport infrastructure is a key strength of the regional economy. Government continues to invest in these strengths e.g. Inland Rail and the Toowoomba Second Range Crossing. Lockyer Valley Regional Council has identified opportunities to build relationships with transport firms and growers, as well as

[42] Trade and Investment Queensland, Market profile Lockyer Valley, 24 October 2017, https://www.tiq.qld.gov.au/download/business-interest/about-queensland/qld-regional-market-profiles/Market-Profile-Lockyer-Valley.pdf.

a Gatton West Industrial Zone which could further leverage these competitive strengths. It should continue to implement this strategy.[43]

5.7 Policy coordination

Discussions with stakeholders and the PWG identified that the application of government policy could be better coordinated into a single regional approach. The relevant policies are outlined below.

5.7.1 Policy issues

Government policies relevant to the project include:

Commonwealth Government

- *National Water initiative (2004).*[44] Under this initiative, governments have a responsibility to ensure that water is allocated and used to achieve socially and economically beneficial outcomes in a manner that is environmentally sustainable. This requires that prices reflect the full costs and that water be properly managed before additional infrastructure is constructed.

Queensland Government

- *Our Future State: Advancing Queensland's Priorities (2014).*[45] The relevant priorities include creating jobs, increasing private sector investment and engaging more young Queenslanders in education, training or work.
- *Growing for Queensland.*[46] These initiatives set out how the Queensland Government plans to enable the agricultural, fisheries and forestry sector to be innovative, responsive and sustainable in the face of extraordinary opportunities and challenges.
- *State Infrastructure Plan (2016).*[47] The plan outlines that the provision of efficient infrastructure is a key enabler of this economic activity and can be met by making better use of existing infrastructure—to leverage the opportunities of the new world economy, Queensland's regions will need to play to their advantages to grow local economies. From a population of 4.7 million, Queensland is expected to grow to 7 million by 2036 and reach 10 million by 2061. Most of this growth will be in SEQ and some coastal centres. Part B (2019) of the plan outlines six opportunities for water:
    - Maintain water supplies to meet requirements, minimise flood risks and keep dams safe.
    - In partnership with local governments and water utilities, assess options to provide new water sources to the northern part of SEQ where demand is forecast to exceed supply by about 2040.
    - Facilitate more efficient use of existing water resources and infrastructure assets and optimise access through the continued expansion of water trading and flexible sharing arrangements across the state.
    - Consider the use of fit-for-purpose, alternative bulk water sources and opportunities to meet future demands in innovative ways.
    - Prioritise bulk water infrastructure proposals and improve assessment processes.
    - Optimise existing infrastructure to maximise value.

[43] Trade and Investment Queensland, Market profile Lockyer Valley,24 October 2017, https://www.tiq.qld.gov.au/download/business-interest/about-queensland/qld-regional-market-profiles/Market-Profile-Lockyer-Valley.pdf
[44] COAG, *Intergovernmental Agreement on a National Water Initiative*, 25 April 2004, http://www.agriculture.gov.au/SiteCollectionDocuments/water/Intergovernmental-Agreement-on-a-national-water-initiative.pdf.
[45] Queensland Government, *The Queensland Plan*, 2014, https://www.queenslandplan.qld.gov.au/assets/images/qld-plan.pdf.
[46] Queensland Government, *Growing for Queensland*, 2018, https://publications.qld.gov.au/dataset/growing-for-queensland/resource/67a8d14f-1e2a-43db-9f1f-85d0ed47220d.
[47] Department of State Development, Manufacturing, Infrastructure and Planning, *State Development Plan*, Queensland Government, March 2016, https://www.dsdmip.qld.gov.au/infrastructure/state-infrastructure-plan.html.

- *Queensland Bulk Water Opportunities Statement*[48] (QBWOS, July 2017). It seeks to use existing water resources and infrastructure more efficiently.

- *Queensland Agricultural Land Audit (May 2013).*[49] The audit identifies land important to current and future production and the constraints to development, highlighting the diversity and importance of Queensland's agricultural industries across the state. It is a key reference tool that will help guide investment in the agricultural sector and inform decision making to ensure the best use of our agricultural land in the future.

- *Department of Agriculture and Fisheries strategic plan, 2017–21.*[50] The plan commits to creating conditions for successful agribusinesses and supply chains that encourage innovation and productivity. It also seeks to assist people in agriculture and rural businesses to respond to challenges and protect environmental values.
- *SEQ Regional Plan 2017.* The plan provides a regional framework for growth management, and sets planning direction for sustainable growth, global economic competitiveness and high-quality living by:
  - harnessing regional economic strengths and clusters to compete globally
  - ensuring land use and infrastructure planning are integrated
  - valuing and protecting the natural environment, productive land, resources, landscapes and cultural heritage.
- *Water Plan (Moreton) 2007*.[51] The water plan defines the availability of water in the plan area, identify priorities and mechanisms for dealing with future water requirements, provides a framework for sustainably managing water and establish water entitlements for surface water, groundwater and overland flow water. A new draft targeted amendment to the water plan is expected to be released in mid-2019 for public consultation. This aims to set sustainable extraction levels and flexible management arrangements for water within the Central Lockyer Valley water supply scheme. The targeted amendment to the water plan is scheduled to be finalised in 2019.
- Water for Life (2016).[52] The Water Security Program is Seqwater's plan for providing the region's drinking water over the next 30 years, including during times of drought and flood. The Water Security Program focuses on meeting level of service objectives for South East Queensland set by DNRME. The program covers urban use only and does not assess water security for irrigation customers.
- Brisbane River Strategic Floodplain Management Plan, released in April 2019, outlines an integrated catchment management planning approach that positions water security and supply within the context of flood management, land use planning and landscape management. Wivenhoe Dam also provides flood mitigation for the downstream floodplain. The optimisation of water supply, flood mitigation and dam safety is a complex matter and is being addressed by Seqwater. The options investigated do not affect the flood mitigation or dam safety aspects of the dam.
- Vocational education and training (VET) Investment Plan[53] supports the skills development of those involved in agriculture sector by investing in a range of primary industry priority qualifications based on industry skills need. In 2018-19, the VET Plan provided funding of $19.4 million to support skills development for the primary industry sector, including subsidies for apprentices and trainees, school students, Queenslanders seeking to gain their first post-school qualification, and those seeking to gain higher level qualifications or

[48] https://www.dews.qld.gov.au/__data/assets/pdf_file/0007/1266883/qld-bulk-water-opportunities-statement.pdf.
[49] Department of Agriculture and Fisheries, *Queensland Agricultural Land Audit: South East Queensland*, 2013, https://www.daf.qld.gov.au/__data/assets/pdf_file/0011/74000/QALA-Ch13-SEQ.pdf.
[50] Department of Agriculture and Fisheries, *Strategic Plan 2017–21*, https://publications.qld.gov.au/dataset/strategic-plan-department-of-agriculture-and-fisheries/resource/8ef395a4-0304-4cae-9755-e5061b8510c4.
[51] Business Queensland, Moreton water plan area, https://www.business.qld.gov.au/industries/mining-energy-water/water/catchments-planning/water-plan-areas/moreton.
[52] Seqwater, *Water for Life: South East Queensland's Water Security Program 2016–2046,* https://www.seqwater.com.au/waterforlife
[53] https://desbt.qld.gov.au/training/docs-data/strategies/vetinvest

skill sets. In addition, the Regional Skills Investment Strategy project focuses on three key industry sectors for the region i.e. agriculture, construction and hospitality where the Lockyer Valley Regional Council has been approved $350,000 funding.

- Queensland Climate Transition Strategy. This strategy outlines the Queensland Government's target to reach zero net emissions by 2050 and the interim target for at least a 30% reduction in emissions on 2005 levels by 2030.
- Queensland Climate Adaptation Strategy includes commitment to support industry-led (through Queensland Farmers Federation, AgForce and Growcom) development of Sector Adaptation Plans (SAP) and to work with the sector to address the priority actions identified in each SAP. Under the Q-CAS Queensland Government has invested in eight industry lead SAPs, including an Agriculture SAP. Under the Agriculture SAP key recommendations identified by industry include:

  1. Optimise access to climate hazard projections and hazard information,
  2. Continue to develop and refine tools and resources that support farm, regional, supply chain and industry-level management decision-making,
  3. Support the delivery of facilitation and engagement programs,
  4. Improve access to necessary finance and agriculture insurance,
  5. Explore mechanisms to enable climate risk management and adaptation to be addressed across agricultural supply chains, and
  6. Enhance investment in programs and initiatives that support innovation and resilience.

  Queensland Government has also invested in development of a high-level action plan for the East Coast North Sub-cluster, managed by Queensland Farmers Federation, that translates key recommendations from the Agriculture SAP for on-farm actions for all the agricultural industries throughout this diverse region. The east coast north sub-cluster includes the Fitzroy Basin Association, Burnett Mary Regional Group and Healthy Land and Water Natural Resource Management (NRM) Groups.

Local government

- *Lockyer Economic Development Plan (2018.)*[54] The plan identifies key opportunities for economic growth and some challenges to address. The plan seeks to invest in skills development across various sectors including health, retail, construction, education and agriculture.
- *Somerset Economic Development Plan (2015).*[55] The plan identifies opportunities as a lifestyle region, Somerset needs to retain its scenic environment, its quality towns and villages and maintain the 'country lifestyle' that is 'really close to Brisbane'. The plan is focused on job creation—strengthening the economy, creating local jobs in the region and retaining strong agriculture, manufacturing and construction sectors in the economy.

5.7.2 South East Queensland City Deal

City Deals are a mechanism to develop collaborative plans for growth, renewal and reform. The concept was first introduced in 2016 under the Australian Government's Smart Cities Plan. Each City Deal represents a long-term commitment that outlines the investments, planning governance and actions needed to implement them. The Smart Cities Plan wants to promote opportunities for not only metropolitan cities but also regional cities.

[54] https://www.lockyervalley.qld.gov.au/our-region/economic-and-regional-development/Documents/Economic%20and%20Development/Lockyer%20Economic%20Development%20Plan%202018%20-2023.pdf.
[55] Somerset Regional Council, *Somerset Economic Development Plan 2015 to 2020*, http://www.somerset.qld.gov.au/economic-development-plan.

On 12 February 2019, the Queensland Government and the Council of Mayors (SEQ) jointly released TransformingSEQ, in which they outlined their proposition to the Commonwealth Government for a SEQ City Deal. The Australian Government has also confirmed its commitment to working with the Queensland and local government councils in SEQ to develop a City Deal for the region.[56]

Water-related opportunities for the Lockyer Valley are specifically mentioned under TransformingSEQ's 'jobs and skills' domain:

> *An SEQ City Deal could focus on developing and implementing an Agribusiness Strategy and Action Plan to realise the potential of:*
>
> - *smart agriculture and next generation farming*
> - *improved supply chains, including via the proposed Trade and Enterprise Spine*
> - *our robust biosecurity practices*
> - *food provenance, assurance and data management*
> - *our agricultural technology innovation.*
>
> *It could also assist with examining further opportunities in relation to water (such as improved water efficiency and use of recycled water) to increase agricultural production and associated agribusiness in Priority Agricultural Areas, such as the Lockyer Valley area.*[57]

5.7.3 Conclusion

Based on feedback provided by stakeholders and through the PWG, there is a lack of a coordinated approach to implementing the above policies. An increase in coordination may allow for streamlined investment.

5.8 Summary of the service need

5.8.1 Impact of the problem

Despite water reliability challenges, the Lockyer Valley is one of the most productive farming areas in Queensland, with significant comparative advantages and the potential to expand greatly.

The groundwater and surface water resources are, however, fully allocated and unreliable.

5.8.2 Why it is necessary to address the problem

The Lockyer Valley is a productive agricultural area with many natural endowments. It may be possible to significantly improve water supply and reliability and the livelihood of residents. The potential benefits that could accrue from meeting the problem include:

- increased agricultural production, value and economic activity
- increased agribusiness and local value-add production, value and activity
- additional regional investment
- creating local jobs
- encouraging commercially focused research and skill attainment
- development of new markets

[56] S Morrison, City Deal for South East Queensland, media release, 12 February 2019, https://www.pm.gov.au/media/city-deal-south-east-queensland.

[57] Queensland Government and Council of Mayors South East Queensland, *TransformingSEQ: The SEQ City Deal Proposition,* February 2019, https://s3.treasury.qld.gov.au/files/TransformingSEQ_CityDealProposition_Final_2.pdf.

- supporting diversification, resilience, wellbeing and economic prosperity.

5.8.3 Timeframe

If additional water / more reliable water is provided into the Lockyer Valley, the benefits would start to be realised almost immediately. This is because most of the agricultural production has a 16–20-week gap between planting and harvest. Therefore, additional water could be applied immediately, and the benefits could start to accrue within months of additional water becoming available.

5.8.4 Conclusion

The problems and opportunities that characterise the service need was identified and formulated as follows:

- Availability of sustainable and reliable water supply limits economic development opportunities and growth.
- Lack of cross-government (three-tier) policy coordination constrains investment.
- Leveraging the region's natural and competitive advantages would support economic growth.

These problems and opportunities are considered to have the same weighting. On this basis, the service need statement can be described as follows.

The **service need** is represented by an opportunity to significantly grow the economy and sustainability of the Lockyer region by 2030 with broader flow-on effects for South East Queensland by:

- leveraging the region's natural and competitive advantages
- improving water reliability, supply, use and sustainability.

The aim to 'significantly' grow the economy and sustainability of the Lockyer region was deliberately chosen to be unquantified. This was done to ensure that potential initiatives that may not meet a certain threshold were not discarded as it may be possible to combine several initiatives. The objective is for the economy to leverage opportunity, striving for a generational step-change.

6. Lockyer Valley economic opportunity assessment

DNRME engaged QTC in November 2018 to provide insight into how Lockyer Valley's competitive strengths can be leveraged to deliver sustainable economic growth and development. QTC found that meeting the demand of a rapidly growing Asian middle class is often framed as a significant economic opportunity for growers around the world. Nevertheless, there are many hurdles to overcome in order to break into these growing foreign markets.

QTC's assessment of key growth enablers points to greater innovation and entrepreneurship being the key to unlock an economic step-change. QTC's analysis and stakeholder consultation highlight the following areas of strategic focus:

- Building the skill sets, knowledge, experience and culture of prospective exporters—this includes addressing the lack of both scale and continuity of supply of individual businesses, and the need to foster a demand-driven approach to export markets.
- Facilitating timely commercial market intelligence and market insights related to foreign markets.
- Undertaking market research to understand product and packaging needs and opportunities for each market, and the importance of consistent and focused brand messaging.[58]

These headline strategic actions will complement the region's excellent transport infrastructure, fertile soils, and collective skills and experience in agricultural production.

To realise opportunities in the region, it could be necessary to improve the flow of outside financial capital into growers' operations or investigate novel forms of industry cooperation.

In the absence of an economic step-change, it is likely that demand for Lockyer Valley's agricultural output will continue to increase with domestic population growth, particularly in South East Queensland. However, increasing agricultural production may also hit resource constraints as the impact of climate change develops.

Water infrastructure is, by itself, not likely to be a sufficient condition to achieving an economic step-change.

Without regional economic step-change, options for economically viable water infrastructure investment are necessarily more limited and dependent on domestic demand growth.

6.1 Key findings

6.1.1 The region is an important agricultural hub

Lockyer Valley is part of a functional economic region running from Toowoomba to Brisbane. Agriculture is the cornerstone of the regional economy, supporting related activity in transport, construction and manufacturing.

6.1.2 An economic step-change requires large, value-added markets

- An economic step-change will most likely be delivered through increased exports to rapidly growing Asian markets. This offers potential rewards but comes with additional risks. Currently only 6 per cent of regional product is exported.
- Australian horticultural exports are often not cost-competitive and need to compete on non-price factors (e.g. quality).

[58] Trade and Investment Queensland, Market profile Lockyer Valley, 24 October 2017, https://www.tiq.qld.gov.au/download/business-interest/about-queensland/qld-regional-market-profiles/Market-Profile-Lockyer-Valley.pdf.

- It is necessary to augment existing strengths in agriculture with innovation and entrepreneurship, to facilitate exports of premium agricultural products.
- Developing a demand-driven outlook and exploring further options for processing to meet export demand could be elements of regional development driving a step-change.

6.1.3 Growers, industry and government can collaborate to drive value

- Some export impediments can be overcome. The following focus areas should be prioritised:
  - skill sets, knowledge, experience and culture of prospective exporters and lack of scale and continuity of supply of individual businesses
  - lack of timely commercial market intelligence and market insights; and understanding product and packaging needs and opportunities for each market as well as the importance of consistent and focused brand messaging.
- Market access remains an impediment in many markets, despite the increased prevalence of free trade agreements. Understanding these restrictions will allow focus and inform future investment decisions.
- If these impediments are addressed, other prerequisites for success appear to be in place. Lockyer Valley can overcome Australia's lack of global price competitiveness through competing on quality (clean product) and specialisation.

6.1.4 Domestic demand

- In the absence of an export led step-change, domestic demand is still expected to grow. Lockyer Valley is well placed to continue to meet this demand, both in South East Queensland and nationally.
- Stakeholders acknowledged the risk of oversupply depressing commodity prices and placing financial pressure on operators.

6.1.5 Water as a catalyst for change

- Additional water for agricultural production, by itself, is unlikely to deliver an economic step-change.
- Increasing regional agricultural production may hit resource constraints through the impact of climate change.
- The cost of building significant water infrastructure is likely to result in higher tariffs for those wanting access to additional supply, than the tariffs that growers currently pay.

6.2 Export opportunities

The Port of Brisbane has the greatest export volume of the eastern capital city ports, but the lowest value of exports, which demonstrates its comparatively lower-value commodities. Better leveraging the capacity of South East Queensland's major export gateway has potential to yield significant economic returns. The challenge for the region is to increase the volume of high-value exports.

This is an area of opportunity for Lockyer Valley. While most of the regional output is consumed locally or exported to domestic markets, there is potential to leverage off existing production to grow the export potential of the region. However, although increased water security may be part of the solution, the issues in developing a significant agriculture and agribusiness export capability within the region are more complex than just addressing this matter. Only 6 per cent of output from the Lockyer Valley is exported internationally, so developing export capability starts from a low base.

While increasing South East Queensland's exposure to trade-related industry is a key plank of the government's policy framework, including the proposed SEQ City Deal[59], it is also important not to ignore opportunities arising from servicing an increasing regional population. Meeting a material portion of the demand for food in a growing South East Queensland also provides a strong future economic base for the Lockyer Valley, without necessarily delivering a 'step-change' in the region's economic fortunes.

When stakeholders were asked why just 6 per cent of Lockyer Valley's agricultural output is sold abroad, they suggested that one impediment to export growth is the inability to meet reliability standards in export contracts due to lack of water reliability. Farmers may therefore be reluctant to focus on export opportunities.

An increase in water security in Lockyer Valley could drive an increase in agricultural output. It does not automatically follow there will be an increase in demand, particularly for international exports, where performance to date has been poor, and where other impediments remain.

While domestic demand, particularly in South East Queensland, will deliver steady incremental growth opportunities, it will be more difficult to develop market share in international markets due to a greater degree of international competition, informational barriers, real and perceived risks, and technical barriers to trade.

Australian vegetable imports and production have both grown strongly since the early nineties. Increased domestic consumption has likely constrained opportunities for export growth.

The largest vegetable export markets in 2016–17 were Singapore ($45 million), the United Arab Emirates ($35 million), Japan ($35 million), Malaysia ($20 million) and Hong Kong ($15 million).The most valuable export products in 2016/17 were carrots (37%), potatoes (11%), onions (7%), cauliflower and broccoli (7%) and asparagus (13%). The Lockyer Valley produces high volumes of cauliflower and broccoli.

6.2.1 Constraints on Australian export performance

Australian growers generally have competitive strength in quality, product integrity and safety, seasonality and location. But growers must compensate for a lack of overall price competitiveness by marketing innovative products. Stakeholder consultation generally supported these issues as impediments to export growth.

AUSVEG has identified 10 'burning issues' impacting on Australia's export performance shown in Figure 6.1.[60]

[59] Queensland Treasury, *TransformingSEQ: The SEQ City Deal Proposition*, February 2019.
[60] AUSVEG, *Vegetable industry export strategy 2020*, summary, https://ausveg.com.au/app/uploads/2018/02/VIES2020_summary.pdf.

Figure 6.1 : AUSVEG—constraints on agricultural exports

7. Stakeholders

7.1 Identifying stakeholders

Stakeholder engagement enables an understanding of the relationship between the objectives of a project and the outcomes expected by stakeholders. It is also critical for developing a longlist of options to solve the identified problem or opportunity—and for refining selection criteria that are relevant to commercial irrigators, the environment, the community, Seqwater and the government/regulators.

Stakeholder engagement was intentionally collaborative, with most stakeholder engagement taking the form of workshops and discussions. The focus was on forming a shared understanding across all stakeholders. Most of the stakeholder engagement took place within the PWG and PSC, which represents a broad cross-section of interested parties.

7.1.1 Stakeholder details

Consultation took place with a wide range of stakeholders, most of whom were also represented on the PWG, which met generally on a monthly basis, and the PSC. The PWG was established in May 2018 before the strategic business case commenced. A large amount of consultation had already taken place (for the NuWater and Cardno reports[61]) and was underway (for the Moreton Water Plan amendment). Therefore, to avoid 'consultation fatigue' the PSC and PWG were the main consultation vehicles.

Consulted stakeholders are listed below (Table 7.1).

Table 7.1 : Consulted stakeholders

SECTOR	STAKEHOLDER	NEEDS AND EXPECTATIONS
Irrigators	Lockyer Water Users Forum (Brock Sutton), Lockyer Valley Growers (Gordon Van Der Est), Greg Banff, Anthony Staatz, Tim Linan, Troy Qualischefski	Existing water users have an expectation that their issues will be considered and addressed
Local business	Lockyer Chamber of Commerce & Industry	Representing local businesses with an expectation that the project will consider broader economic issue.
Statutory bodies	Seqwater	Existing infrastructure owner with legal obligations for dam safety and urban water supply that must be maintained
	Queensland Urban Utilities	Existing infrastructure owner with potentially useful assets in the area for supplying irrigators
Local government	Lockyer Valley Regional Council, Somerset Regional Council	Representing the local community with an expectation that all sectors of the community can benefit
State government	DNRME, DAF, DSDMIP, Queensland Treasury, QTC, Building Queensland	Representing the state's interests with an expectation that the business case is comprehensive, and the process is collaborative

7.2 Engagement mechanism

Stakeholders were engaged directly or through the PWG and PSC.

[61] Cardno, *Pre-feasibility: Water for agriculture productivity and sustainability*, prepared for Lockyer Valley Regional Council, April 2018; GHD, *NuWater Project Feasibility Study,* prepared for Queensland Farmers' Federation, March 2018.

7.2.1 Direct stakeholder engagement

The proposed stakeholders and the stakeholder engagement plan were endorsed by the PSC.

A register of consultation and meeting notes were maintained. In addition to PWG and PSC meetings, additional meetings took place (Table 7.2).

Table 7.2 : Stakeholder meetings

DATE	LOCATION	ATTENDEES	KEY TOPICS
30 October 2018	Gatton	Irrigator representatives and individual irrigators	• Irrigation need for water including reliability and volume (service need) • Longlist of options • Economic benefits—gross margins and net margins / how the water would be used / crops, yields and land area / security of water
1 November 2018	Gatton	Lockyer Valley Regional Council	• Service need / the council's need for water / reliability and volume • Longlist of options • Selection criteria
1 November 2018	Esk	Somerset Regional Council	• Service need / the council's need for water / reliability and volume • Longlist of options • Selection criteria
7 November 2018	Brisbane	Seqwater, DNRME, Building Queensland	• Proposed longlist of options • Identification of Seqwater's current bulk water strategies, studies / initiatives and any opportunities relevant to the project

7.3 Consultation risks

Many of the identified risks (Appendix D) can be addressed through consultation. Therefore, the stakeholder plan (Appendix E) has been developed to include all relevant stakeholders.

8. Benefits sought

8.1 Benefit statements

The PWG met to determine potential benefits that could arise from responding to the service need. The benefits that it identified are:

- increased agricultural production, value and economic activity
- increased agribusiness and local value-add production, value and activity
- additional regional investment
- creating local jobs
- encouraging commercially focused research and skill attainment
- development of new markets
- supporting diversification, resilience, wellbeing and economic prosperity.

A record of the benefits is maintained in the Benefit Register (Appendix B). There are no assumptions or dependencies that have an impact on the benefits sought.

8.1.1 Increased agricultural production, value and economic activity

If water volume and reliability is increased, agricultural production, value and economic activity will increase, which would result in broader economic activity.

The beneficiaries include the farm owners, workers, suppliers and consumers.

Achieving this benefit may require investment in other supporting public infrastructure. It also requires availability of skilled labour.

The **key performance indicator (KPI)** is value of agricultural production (in dollars). This benefit should be measured using the value of agricultural commodities produced, published by the ABS.[62] Given the primary beneficiaries will be irrigated agriculture, only crops[63] (not livestock) will be measured.

8.1.2 Increased agribusiness and local value-add production, value and activity

If agricultural output increases, then additional business activity can be expected. This business activity could include agricultural inputs such as fertiliser, machinery or professional services. The potential for local value-add industries would also increase. Such industries may package, process, cool, dry, or extract the raw agriculture produce, and increase the value of the production before it leaves the area.

The beneficiaries include the existing and new business and their workers.

The **KPI** is the number of new businesses, measured by the Counts of Australian Businesses, published by the ABS[64], for the Lockyer and Somerset councils.

8.1.3 Additional regional investment

It I expected that as the economic activity in the region increases, additional investment in capital will be required. This additional capital will increase the productive capacity of the area and allow for the unlocking of other benefits.

The beneficiaries include the business owners, workers, wholesale suppliers and local residents.

[62] ABS, *Value of Agricultural Commodities Produced, Australia*, cat. 7503.0.
[63] ABS commodity code 9013959.
[64] ABS, *Counts of Australian Businesses, including Entries and Exits*, *June 2014 to June 2018*, cat. 8165.0

To undertake investment, businesses need to have access to credit, or sufficient equity.

The **KPI** is change in regional investment.

8.1.4 Creating local jobs

An increase in business activity will increase employment opportunities.

The beneficiaries include the unemployed (or under-employed) Lockyer Valley residents, and the people who move into the area due to the availability of employment opportunities.

Potential new workers will need to have the required skills.

The **KPI** is the number of new jobs, measured by the data on small area labour markets, which is published by the Australian Government Department of Employment, Skills, Small and Family Business.[65]

8.1.5 Encouraging commercially focused research and skill attainment

If production increases, then it may become more commercially viable to undertake research specific to the Lockyer Valley—for example, research into developing seed and crop types and varieties that are best suited to the soils and climate of the Lockyer Valley. For this to occur, there needs to be sufficient scale so that there can be a return on the research investment. Collaboration with research and teaching institutions (universities and TAFE) could also occur.

The stakeholders and beneficiaries are the farm owners able the access the improved technologies and the highly skilled workers undertaking the research.

Close collaboration with the local universities is required to undertake applied research.

Further, as the agricultural sector becomes increasingly automated and specialised, there will be a greater need for highly trained employees and greater opportunities to become highly trained.

The **KPI** is a change in the number of people with post-school qualifications.[66]

8.1.6 Develop new markets

The Lockyer Valley supplies a significant portion of vegetables into the state and domestic markets. If water volume and reliability is increased, then the Lockyer Valley can increase its production to meet the growing domestic demand.

However, new exports markets could also be developed with access to reliable water. This will uncap the potential of the Lockyer Valley and lead to a significant growth in export incomes.

The beneficiaries are the farm business, transport, logistics, processing and packaging business.

For exports to increase, there will need to be substantial investment in trading relationships, supply chain and logistics. Further, access to markets can change quickly due to macro-political factors such as tariff changes and import protocols.

The **KPI** is an increase in the dollar value of international exports from the Lockyer Valley.

8.1.7 Supporting diversification, resilience, wellbeing and economic prosperity (e.g. new tourism)

A benefit sought is that the economy will diversify, and that economic prosperity will increase for all residents of the Lockyer Valley—whether directly involved in agriculture or not.

It is expected that general wellbeing for residents and visitors (tourism) will be enhanced.

The **KPIs** are:

[65] Department of Employment, Skills, Small and Family Business, Small Areal Labour Markets publication, Australian Government, https://www.jobs.gov.au/small-area-labour-markets-publication.
[66] ABS census data.

- a change in the number of new tourists spending time and money in the area
- an improvement in the index of relative socio-economic disadvantage.

8.2 Relative importance of benefits

The benefits are not all equal and have different impacts on different parties. To determine the weighting of each benefit, the following factors were considered by the PWG, with each factor giving a qualitative score of low, medium or high:

- Impact on stakeholders—will the benefit have a significant or immaterial impact? The bigger the impact, the higher the score.
- Number of beneficiaries—will the benefits be distributed broadly or concentrated to just a few beneficiaries? The greater the number of beneficiaries, the higher the score.
- Certainty of benefit—is the benefit likely to manifest or is it subject to significant uncertainty? The more certain the benefit, the higher the score.
- Ability to measure—can the benefit sought be measured to determine whether the benefit has been achieved? The easier the ability to measure, the higher the score.

The scoring is presented in Table 8.1.

Table 8.1 : Ranking of benefits

Benefit sought	Impact on stakeholders	Number of beneficiaries	Certainty of benefit	Ability to measure	Weighting
Increased agricultural production, value and economic activity	High	Medium	High	High	25%
Increased agribusiness and local value add production, value and activity	High	High	Medium	High	25%
Additional regional investment	Medium	Medium	Medium	Medium	10%
Creating local jobs	High	High	Medium	High	20%
Encouraging commercially focused research and skill attainment	Medium	Medium	Low	Low	10%
Develop new markets	Medium	Low	Low	Low	5%
Supporting diversification, resilience, wellbeing and economic prosperity	Medium	High	Low	Medium	5%

The weightings were applied through consultation with the PWG and PSC. These benefits informed the multicriteria analysis criteria that were used to assess the options.

9. Strategic responses

This section describes the potential strategic responses to the identified service need. A valid strategic response must have the potential to deliver some or all of the identified benefits and, in doing so, address the related service need. To ensure it is sufficiently strategic, its implementation must allow more than one possible solution.

Strategic responses usually fall into one or more of the below categories. Categories include responses that:

- change demand
- improve productivity/efficiency
- change supply
- respond directly to the problem/opportunity
- influence the cause of the problem/opportunity
- address the effects/impacts of the problem.

9.1 Investment logic mapping workshops

Several investment logic mapping workshops were held with the PWG. The investment logic map was endorsed by the PSC. These workshops were used to identify and develop the strategic responses. Four strategic responses were identified to address the service need and obtain the benefits.

1) Improve policy settings and coordination

Two benefits could be achieved by improving policy settings and coordination.

Benefit sought	Strategic response
Additional regional investment	Improve policy settings and coordination
Encouraging commercially focused research and skill attainment	

This strategic response could attract additional regional investment by increasing investment certainty and improving the overall investment environment. There is some evidence that policy coordination can be improved and that government agencies can improve their alignment.

A related benefit is encouraging commercially focused research and skill attainment. This benefit could be realised if policy settings encouraged investment into regionally targeted research. Skills could also be developed if the research was undertaken in the region.

2) Promote, attract and achieve regional economic growth including addressing impediments to export

Benefits sought	Strategic response
Increased sustainable agricultural production, value and economic activity	Promote, attract and achieve regional economic growth including addressing impediments to export
Increased business and local value-add production, value and activity	
Additional regional investment	

This strategic response could increase sustainable agricultural production, value and economic activity by addressing the impediments to increasing export activity described in Chapter 6.

Increased sustainable agricultural production would lead to increased business activity and opportunities for local value-add production. As economic activity increases, additional investment could follow.

3) Improve water efficiency and innovation

It is critical that existing resources are used efficiently and effectively before additional resources are provided. If not, then it is more efficient to optimise existing resources. This relates both to on-farm water use and general agricultural productivity.

Benefits sought	Strategic response
Increased sustainable agricultural production, value and economic activity	Improve water efficiency and innovation
Additional regional investment	
Develop new markets	

An increase in water efficiency and innovation will likely lead to an increase in agricultural production, value and economic activity. As the realisation of water efficiency often requires investment, additional water saving projects will result in regional investment. Further, as the extra production is realised, there will be investment in associated projects. Likewise, the additional production may allow for the development of new markets.

4) Increase water supply and security

As identified in the service need, water availability is currently constrained. This limits the potential to increase economic activity—both on-farm and through the broader regional economy. Several significant benefits can be achieved if this constraint were addressed.

Benefits sought	Strategic response
Increased sustainable agricultural production, value and economic activity	Increase water supply and security
Additional regional investment	
Creating local jobs and improving socio-economic outcomes	
Encouraging commercially focused research and skill attainment	
Develop new markets	
Supporting diversification, resilience, wellbeing and economic prosperity	

9.2 Conclusion

The investment logic mapping process (Appendix C) involving key stakeholders identified four strategic responses that can assist in addressing the service need and delivering the identified benefits. The four strategic responses include:

1) Improve policy settings and coordination.
2) Promote, attract and achieve regional economic growth including addressing impediments to export.
3) Improve water efficiency and innovation.
4) Increase water supply and security.

10. Potential initiatives

Potential initiatives are high-level activities that could be undertaken to address the service need. They culminate from the strategic responses.

Potential initiatives may, at some future point, become options, projects, or elements of a program. Not all potential initiatives are likely to be implemented and some actions may become redundant as a result of other identified/implemented actions. However, the full set (or program) of potential initiatives should provide confidence, be capable of solving the problem and be capable of realising the benefits sought. Some potential initiatives might be 'either/or' choices that will be addressed later.

10.1 Initiatives that were identified

Potential initiatives may include activities that improve the use of an asset, change behaviour or focus, improve the capacity of an existing asset, or implement a new asset. These activities are generally referred to as non-asset, asset-lite and asset solutions. Potential initiatives may not solve the entire problem and may only enable partial realisation of benefits. However, they may delay the need for implementing more expensive solutions and reduce the size of the problem.

The potential initiatives were developed through the investment logic mapping workshops by the PWG and were endorsed by the PSC. These are shown in Table 10.1.

Table 10.1 : Summary of potential initiatives

Initiative	High-level concept	Potential benefits	Stakeholders and beneficiaries
Facilitate water trading	Allow owners of a water right to trade that right to another person, independent of the trading of land	Allows water to move to a higher-value use and will result in a more efficient use	Buyers and sellers of water
Give higher priority to agricultural water needs in Queensland Government policy	Actively pursue options to increase the amount of water available for agricultural use	Additional agricultural production	Users of agricultural water
Give higher priority to non-urban use in Seqwater's strategic planning	Seqwater would give greater prominence and importance to non-urban users in its strategic and operational planning	Non-urban users could be supplied with additional water	Non-urban water users
Remove policy barriers to access recycled water and other sources for agriculture	Queensland Government policy would need to be amended in order to repurpose the WCRWS for other uses. Conveyance of high quality PRW, will be subject to approval from DNRME, Seqwater and DES as the responsible statutory authorities for the WCRWS and its operation.	The WCRWS could be utilised	Non-urban water users
Form industry and government policy coordination and economic development groups	Initiative groups with the purpose of coordinating government policy. Members would include the	Clearer government policy and improved certainty for business owners	Government and local businesses

Initiative	High-level concept	Potential benefits	Stakeholders and beneficiaries
focused on the Lockyer/Somerset region	government, utilities and industry		
Develop a supply value chain for the region	In order to encourage an export industry, the logistics of exporting could be strengthened, including transport, refrigeration, value-add and processing	Increased capacity to export	Businesses involved in the supply value chain
Facilitate applied research in and for the Lockyer Valley	The region has an agricultural university. Region-specific research could improve productivity and yields through enhanced seeds and improved harvesting to suit local conditions	Increased agricultural production	Businesses and universities
Increase efficiency of Seqwater's existing irrigation assets	Seqwater could maintain and operate its assets to improve the reliability of the water supplies. For example, weirs could be de-silted so that additional storage could be available	Improved storages and reliability	Seqwater and irrigators
Improve efficiency of existing assets by improving flood harvesting capacity	Improve the pumps or channel diversion capacity to allow Seqwater to pump more into Atkinson, Clarendon and Bill Gunn dams during flow events	Additional water will be stored and then used for irrigation	Seqwater customers
Facilitate more efficient on-farm water use	It is essential that current resources are maximised before additional activities are undertaken. This would involve measuring existing efficiency and then improving efficiency, perhaps through government programs	Increased agricultural production	Irrigators
Introduce recycled water into the Lockyer/Somerset region (direct to farm, into Seqwater irrigation dams, managed aquifer recharge)	The WCRWS is located in Bundamba, just outside the Lockyer Valley. It is designed to supply water for urban use, when dam levels drop below certain triggers. When not needed for urban use, the recycled water could be provided to irrigators	Additional water for irrigators and improved utilisation of an asset	Seqwater, the government, Queensland Urban Utilities (QUU) and irrigators
Source water from Wivenhoe Dam	Allow irrigators to take water from Wivenhoe Dam in a way that does not impact Seqwater's existing urban security objectives or dam safety obligations	Additional water for irrigators	Seqwater, the government, QUU and irrigators

Initiative	High-level concept	Potential benefits	Stakeholders and beneficiaries
Extend distribution network	Extend the existing distribution network so that additional irrigators can access regulated water supplies	Additional water for irrigators	New water accessors

10.2 Alignment to the State Infrastructure Plan Priority Model

The State Infrastructure Plan ranks initiatives from most preferred (reform) to least preferred (new) as shown in Figure 10.1.

Figure 10.1 : State Infrastructure Plan Priority Model

Source: State Infrastructure Plan (2016)

Each of the potential initiatives has been categorised according to the State Infrastructure Plan. Most of the potential initiatives are reform-related (Table 10.2).

Table 10.2 : Alignment with the State Infrastructure Plan

Reform	Better use	Improve existing	New
Facilitate water trading	Increase efficiency of Seqwater's existing irrigation assets	Introduce recycled water into the Lockyer/Somerset region (direct to farm, into Seqwater irrigation dams, managed aquifer recharge)	Extend distribution network
Give higher priority to agricultural water needs in Queensland Government policy	Facilitate more efficient on-farm water use	Source water from Wivenhoe Dam	-
Give higher priority to non-urban use in Seqwater's strategic planning	-	Improve efficiency of existing assets by improving flood harvesting capacity	-

Reform	Better use	Improve existing	New
Remove policy barriers to access recycled water and other sources for agriculture	-	-	-
Form industry and government policy coordination and economic development groups focused on the Lockyer/Somerset region	-	-	-
Develop a supply value chain for the region	-	-	-
Facilitate applied research in and for the Lockyer	-	-	-

11. Options generation and assessment

The generation and critical interrogation of options capable of meeting the identified service need is a central deliverable of this business case. A list of project options (solutions) for analysis was generated and considered against the benefits sought.

11.1 Approach

All options were included on the longlist. This reflected the desire not to exclude options without due consideration. This SBC is designed to be a comprehensive high-level assessment based on previous work. The longlist of options was generated by:

- reviewing the potential initiatives (see Chapter 10) and then considering what activities are needed to implement that activity; in some cases, one potential initiative resulted in several options and in other instances, an option involves several potential initiatives
- considering, for each of the potential initiatives identified in the SBC, the activities necessary to implement that initiative—this included non-asset initiatives (i.e. reform and better use initiatives)
- reviewing the work already undertaken—particularly the reports by Cardno and GHD (for NuWater)[67], whose options were all included
- consulting widely. This was initially done in the PWG, where most of the options were generated. Further consultation was undertaken with the PSC, where additional options were added.

This approach ensured that all options previously considered, and all options contemplated by contemporary stakeholders were included.

11.2 Option longlist

Thirty-nine options were identified. Some of the options have similarities and can be grouped together into categories.

11.2.1 Water from Wivenhoe Dam options

The first suite of options involves sourcing water from Wivenhoe Dam. All of these options include:

- taking water from Wivenhoe Dam
- consideration of amending the trigger levels for replenishing Wivenhoe with water from the WCRWS to ensure that irrigators can be supplied without impacting on urban water supply security
- suspending irrigation supplies when the WCRWS is turned on, until the WCRWS is turned off.
- Due to the interconnectedness of the WCRWS and Wivenhoe Dam for urban water supply, and the significance of its initial recommissioning for urban water supply, it is the preference of Seqwater that any supply to the Lockyer Valley irrigators from Wivenhoe Dam, would occur only after the WCRWS had already been recommissioning for urban water supply purposes.

Figure 11.1 shows an example of the trunk infrastructure that would be required for this suite of options (options 19 and 20). Table 11.1 provides a description of these options.

[67] Cardno, *Pre-feasibility: Water for agriculture productivity and sustainability*, prepared for Lockyer Valley Regional Council, April 2018; GHD, *NuWater Project Feasibility Study*, prepared for Queensland Farmers' Federation, March 2018.

Figure 11.1: Water from Wivenhoe option

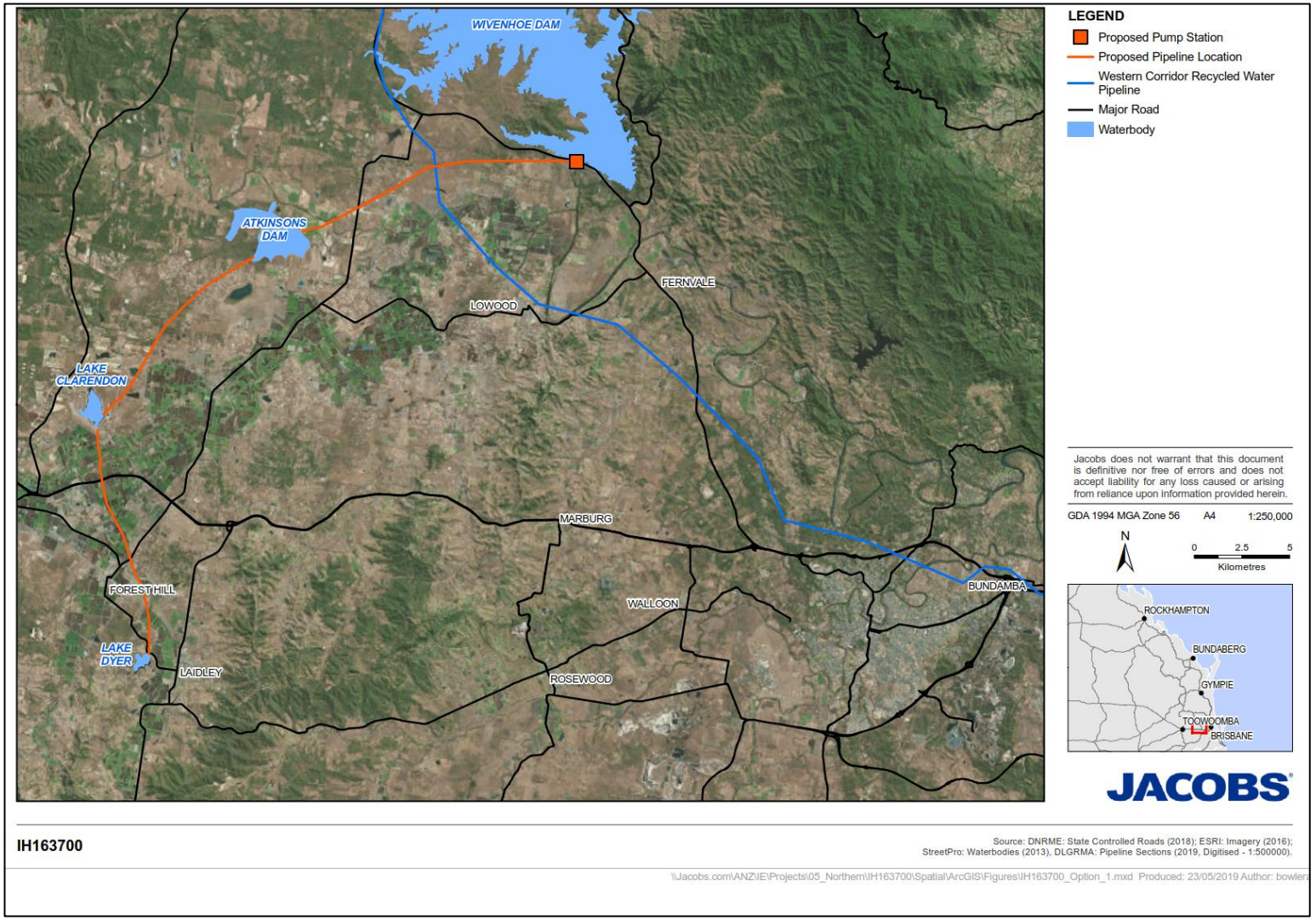


Table 11.1 : Water from Wivenhoe Dam options

Option number	Option name	Description	Benefits to be achieved	Stakeholders	Timeframe
19	Water from Wivenhoe Dam / new trunk main / new distribution network	• Water from Wivenhoe/Somerset Dam • New small diameter trunk main supplying raw water to Atkinson Dam, Lake Clarendon and Lake Dyer (Figure 11.1) • New distribution network to the farm gate (not shown as the location is highly uncertain)	• Increased sustainable agricultural production, value and economic activity • Additional regional investment	• Seqwater • QUU • Governments • Irrigators	2–3 years
20	Water from Wivenhoe Dam / new trunk main / existing distribution network	• Water from Wivenhoe/Somerset dam • New small-diameter trunk main supplying raw water to Atkinson Dam, Lake Clarendon and Lake Dyer (Figure 11.1) • Existing distribution networks / managed aquifer recharge. (as per Figure F.)	• Increased sustainable agricultural production, value and economic activity • Additional regional investment • Supporting diversification, resilience, wellbeing and economic prosperity	• Seqwater • QUU • Governments • irrigators	2–3 years
23	Water from Wivenhoe Dam / new distribution network / no irrigation dams	• Water from Wivenhoe/Somerset Dam • No trunk main and no use of irrigation dams • The new distribution network (small pipes) takes water from the dam to farm	• Increased sustainable agricultural production, value and economic activity • Additional regional investment	• Seqwater • QUU • Governments • Irrigators	2–3 years

11.2.2 Water from Wivenhoe Dam—utilising the existing Toowoomba pipeline

A permutation of the above options is to use the existing Toowoomba pipeline. It was considered that this may reduce the length of new trunk mains needed. However, the length of trunk mains is likely increased using this option. Further, the existing pipeline also has a more limited capacity than what would likely be required and is needed to supply Toowoomba—therefore, access would be constrained.

Figure 11.2 and Table 11.2 provide some descriptions of these options.

Figure 11.2: Water from Wivenhoe Dam through the existing Toowoomba pipeline

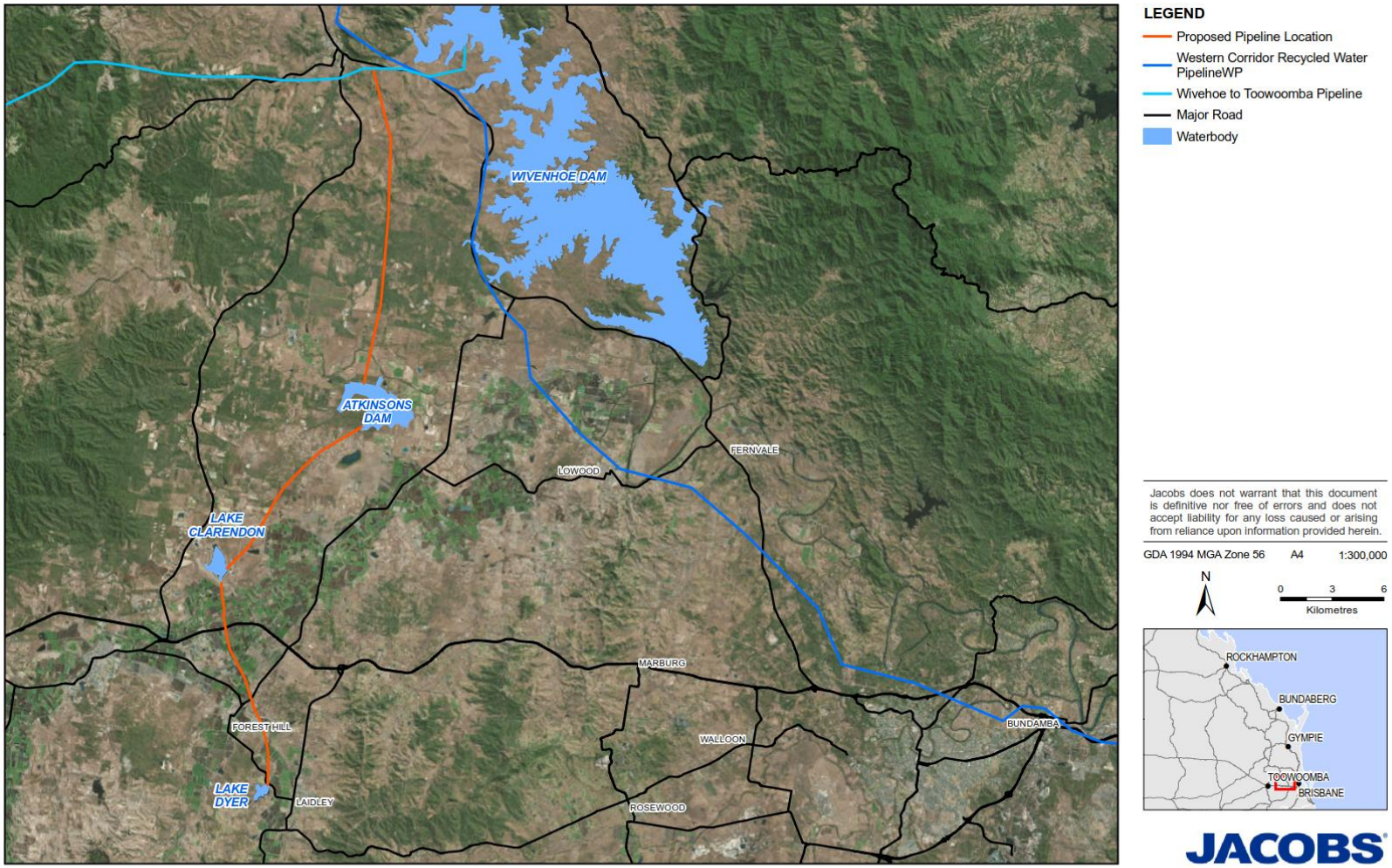


Table 11.2: Water from Wivenhoe Dam through the Toowoomba pipeline

Option number	Option name	Description	Benefits to be achieved	Stakeholders	Timeframe
21	Water from Wivenhoe / Toowoomba pipeline / existing distribution network	• Water from Wivenhoe/Somerset Dam • New pipeline from the existing Toowoomba pipeline to Atkinson Dam, Lake Clarendon and Lake Dyer • New distribution network to the farm gate	• Increased sustainable agricultural production, value and economic activity • Additional regional investment	• Seqwater • QUU • Governments • irrigators	2–3 years
22	Water from Wivenhoe / Toowoomba pipeline / new distribution network	• Water from Wivenhoe/Somerset Dam • New pipeline from the existing Toowoomba pipeline to Atkinson Dam, Lake Clarendon and Lake Dyer • Existing distribution networks / managed aquifer recharge	• Increased sustainable agricultural production, value and economic activity • Additional regional investment • Supporting diversification, resilience, wellbeing and economic prosperity (e.g. new tourism)	• Seqwater • QUU • Governments • Irrigators	2–3 years

11.2.3 Flood harvesting from Wivenhoe Dam

Two of the options involve taking water from Wivenhoe Dam when it is spilling and transporting it to the existing irrigation dams. Then the water is delivered to customers either via the existing managed aquifer recharge or a new distribution network. These options are described in Table 11.3.

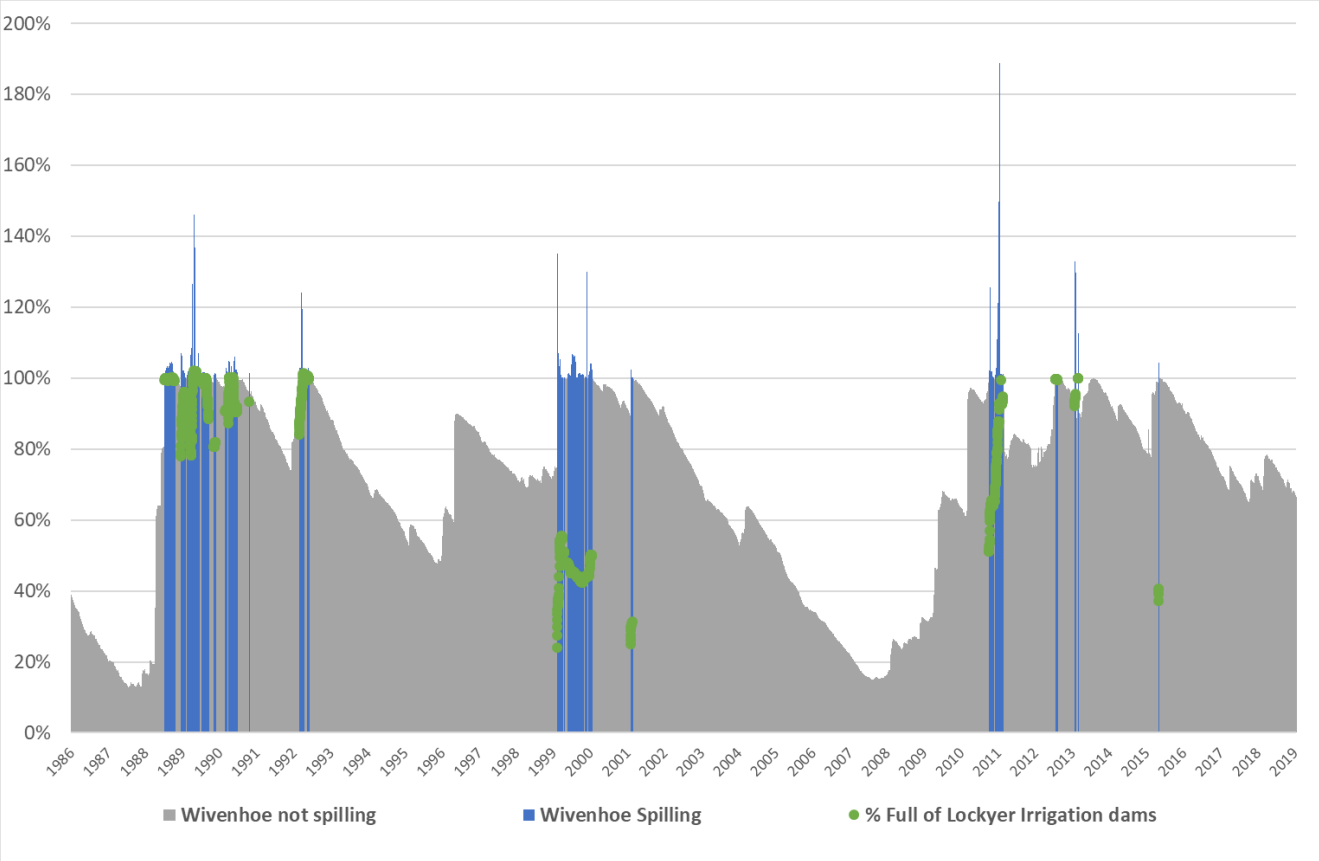
Table 11.3: Flood harvesting from Wivenhoe Dam

Option number	Option name	Description	Benefits to be achieved	Stakeholders	Timeframe
17	Wivenhoe Dam flood harvesting / new trunk main / fill irrigation dams / existing distribution network	Flood harvesting water from Wivenhoe/Somerset Dam New large diameter trunk main supplying raw water to Atkinson Dam, Lake Clarendon and Lake Dyer New distribution network to the farm gate	• Increased sustainable agricultural production, value and economic activity • Additional regional investment • Supporting diversification, resilience, wellbeing and economic prosperity	• Seqwater • QUU • Governments • Irrigators	2–3 years
18	Wivenhoe Dam flood harvesting / new trunk main / fill irrigation dams / new distribution network	Flood harvesting water from Wivenhoe/Somerset Dam New large diameter trunk main supplying raw water to Atkinson Dam, Lake Clarendon and Lake Dyer Existing distribution networks / managed aquifer recharge	• Increased sustainable agricultural production, value and economic activity • Additional regional investment • Supporting diversification, resilience, wellbeing	• Seqwater • QUU • Governments • irrigators	2–3 years

Option number	Option name	Description	Benefits to be achieved	Stakeholders	Timeframe
			and economic prosperity		

This option requires there to be capacity within the irrigation dams to accommodate the water when Wivenhoe Dam is spilling. Wivenhoe Dam had seven spill events (Figure 11.3, indicated in blue) over the past 33 years. Of these seven events, the Lockyer irrigation dams had significant capacity in only three (Figure 11.3, indicated in green).

Figure 11.3 : Wivenhoe Dam levels



11.2.4 Water from the Western Corridor Recycled Water Scheme

A suite of options relate to sourcing recycled water from the WCRWS. An example of the infrastructure needed is shown in

Figure 11.4.

Under these options:

- The WCRWS would be operated to supply water to irrigators.
- As required for urban water security, the WCRWS would be used to supplement Wivenhoe Dam. At this point, the supply to irrigators would be suspended.
- The options include consideration of both PRW and A+ supplies. Both supplies are (more than) suitable for irrigation. If PRW is used (options 24, 25, 26, 31, 32 and 33), then the existing pipeline from Bundamba to Wivenhoe Dam could be used to transport the water part-way (until past Lowood). When needed, the water would continue to Wivenhoe Dam.
- If A+ water was transported in the existing pipeline, then Seqwater could not use this pipeline to supplement Wivenhoe. Instead, these options (options 27, 28, 29, 34, 35, 36) assume direct potable

reuse, where PRW is transported from Bundamba directly to Mt Crosby, for direct inclusion in drinking water supplies. This would require a very substantial change to government policy.

- The WCRWS needs to be recommissioned before it can be used again. The approximate cost of recommissioning is $180 million. If the WCRWS was to be turned on for the benefit of irrigators, it is appropriate that they pay this cost. However, irrigators can avoid this cost if the WCRWS is already switched on for urban water supply. The options below consider both scenarios.
- The options also consider three delivery infrastructure options:
  - Trunk mains connecting the existing irrigation dams and building a new distribution network
  - Trunk mains connecting the existing irrigation dams and using the existing distribution network
  - Not using the existing irrigation dams and delivering directly to farms.

Figure 11.4 and Table 11.4 provide further details

Figure 11.4: Water from the WCRWS

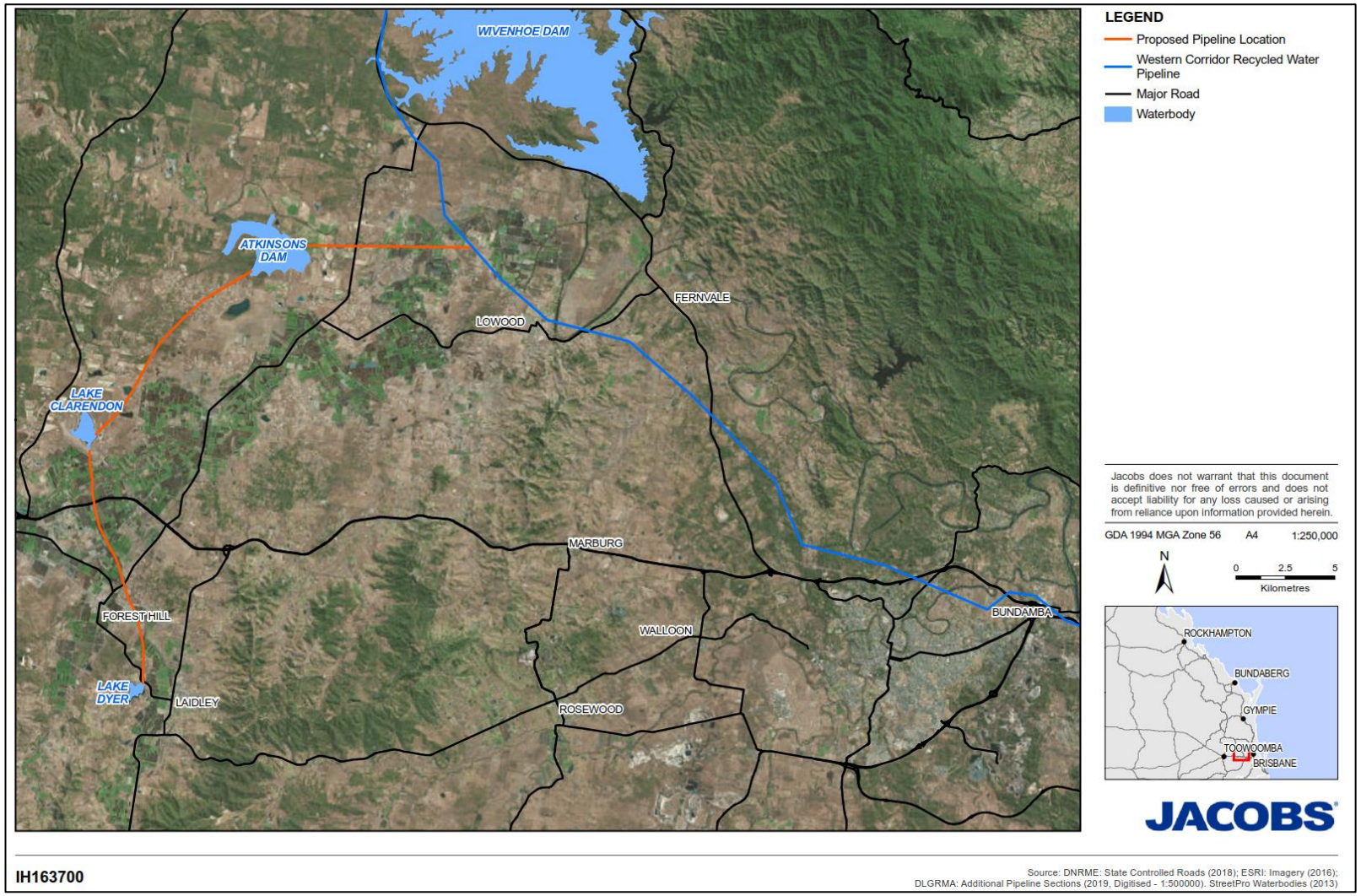


Table 11.4: Water from the WCRWS options

Option number	Option name	Description	Benefits to be achieved	Stakeholders	Timeframe
24	WCRWS PRW / irrigation dams / new distribution network	PRW from Bundamba WCRWS - Use existing irrigation dams - New pipe from Wivenhoe pipeline to irrigation dams - New distribution network to the farm gate	• Increased sustainable agricultural production, value and economic activity • Additional regional investment	• Seqwater • QUU • Governments • Irrigators	2–3 years
25	WCRWS PRW / pipe to farm	PRW from Bundamba WCRWS New distribution network from Wivenhoe pipeline to farm gate	• Increased sustainable agricultural production, value and economic activity • Additional regional investment	• Seqwater • QUU • Governments • Irrigators	2–3 years
26	WCRWS PRW / managed aquifer recharge	PRW from Bundamba WCRWS. Use existing irrigation dams and existing Wivenhoe pipeline New distribution network from Wivenhoe pipeline to managed aquifer recharge	• Increased sustainable agricultural production, value and economic activity • Additional regional investment	• Seqwater • QUU • Governments • Irrigators	2–3 years
27	WCRWS A+ water / irrigation dams / new distribution network / direct / direct potable reuse	A+ grade water from Bundamba WCRWS New pipe to irrigation dams from Wivenhoe pipeline New distribution system to farm gate New pipe to Mt Crosby from Bundamba WCRWS	• Increased sustainable agricultural production, value and economic activity • Additional regional investment	• Seqwater • QUU • Governments • Irrigators	2–3 years
28	WCRWS A+ water / pipe to farm / direct potable reuse	A+ grade water from Bundamba WCRWS New distribution network from Wivenhoe pipeline to farm gate New pipe to Mt Crosby from Bundamba WCRWS	• Increased sustainable agricultural production, value and economic activity • Additional regional investment	• Seqwater • QUU • Governments • Irrigators	2–3 years
29	WCRWS A+ water / Existing distribution network / direct potable reuse	A+ grade water from Bundamba WCRWS. Use existing distribution network for irrigators New distribution network from Wivenhoe pipeline to managed aquifer recharge	• Increased sustainable agricultural production, value and economic activity • Additional regional investment	• Seqwater • QUU • Governments • Irrigators	2–3 years
31	WCRWS PRW / irrigation dams / new distribution network / post recommissioning	PRW from Bundamba WCRWS New pipe from Wivenhoe pipeline to irrigation dams New distribution network to the farm gate. Post recommissioning	• Increased sustainable agricultural production, value and economic activity	• Seqwater • QUU • Governments • Irrigators	2–3 years

Option number	Option name	Description	Benefits to be achieved	Stakeholders	Timeframe
32	WCRWS PRW / pipe to farm / post recommissioning	PRW from Bundamba WCRWS New distribution network from Wivenhoe pipeline to farm gate Post recommissioning	• Increased sustainable agricultural production, value and economic activity • Additional regional investment	• Seqwater • QUU • Governments • Irrigators	2–3 years
33	WCRWS PRW / managed aquifer recharge / post recommissioning	PRW from Bundamba WCRWS New distribution network from Wivenhoe pipeline to managed aquifer recharge Post recommissioning	• Increased sustainable agricultural production, value and economic activity • Additional regional investment	• Seqwater • QUU • Governments • Irrigators	2–3 years
34	WCRWS A+ water / irrigation dams / new distribution network / direct / direct potable reuse / post recommissioning	A+ grade water from Bundamba WCRWS. New pipe to irrigation dams from Wivenhoe pipeline. New distribution system to farm gate. New pipe to Mt Crosby from Bundamba WCRWS. Post recommissioning	• Increased sustainable agricultural production, value and economic activity • Additional regional investment	• Seqwater • QUU • Governments • Irrigators	2–3 years
35	WCRWS A+ water / pipe to farm / direct potable reuse / post recommissioning	A+ grade water from Bundamba WCRWS New distribution network from Wivenhoe pipeline to farm gate New pipe to Mt Crosby from Bundamba WCRWS Post recommissioning	• Increased sustainable agricultural production, value and economic activity • Additional regional investment	• Seqwater • QUU • Governments • Irrigators	2–3 years
36	WCRWS A+ water / managed aquifer recharge / direct potable reuse / post recommissioning	A+ grade water from Bundamba WCRWS. New distribution network from Wivenhoe pipeline to managed aquifer recharge Post recommissioning	• Increased sustainable agricultural production, value and economic activity • Additional regional investment	• Seqwater • QUU • Governments • Irrigators	2–3 years

11.2.5 Water from Queensland Urban Utilities Bundamba water treatment plant

QUU owns a water treatment plant at Bundamba which provides feed water for the WCRWS. These options investigate whether A+ water from this plant could be used by Lockyer irrigators.

The three same infrastructure scenarios are included:

- Trunk mains connecting the existing irrigation dams and building a new distribution network
- Trunk mains connecting the existing irrigation dams and using the existing distribution network
- Not using the existing irrigation dams and delivering directly to farms.

Table 11.5 provides extra detail for these options.

Table 11.5: Water from QUU

Option number	Option name	Description	Benefits to be achieved	Stakeholders	Timeframe
37	QUU A+ / irrigation dams / new distribution network	A+ grade water from QUU Bundamba water treatment plant New pipe to irrigation dams New distribution system to farm gate	• Increased sustainable agricultural production, value and economic activity • Additional regional investment	• Seqwater • QUU • Governments • Irrigators	5+ years
38	QUU A+ / pipe to farm	A+ grade water from QUU Bundamba water treatment plant New distribution network to farm gate	• Increased sustainable agricultural production, value and economic activity • Additional regional investment	• Seqwater • QUU • Governments • Irrigators	5+ years
39	QUU A+ / managed aquifer recharge	A+ grade water from QUU Bundamba water treatment plant New pipe to irrigation dams Existing managed aquifer recharge	• Increased sustainable agricultural production, value and economic activity • Additional regional investment	• Seqwater • QUU • Governments • Irrigators	5+ years

11.2.6 Policy and coordination

A number of the options relate to policy and coordination roles to be undertaken by government, organisation or private. These are shown below in Table 11.6.

Table 11.6 : Policy and coordination options

Option number	Option name	Description	Benefits to be achieved	Stakeholders	Timeframe
1	Supply chain improvements	Develop a supply value chain for the region and address supply chain gaps and constraints	• Increased business and local value add production, value and activity. • Develop new markets	• Irrigators • Local businesses	1 year
2	On-farm initiatives	Growcom is currently undertaking a number of initiatives (e.g. Hort360 South-East Queensland) that are focused on promoting best management practice within the horticulture industry, as well as addressing nutrient and sediment loss in catchments where this is a known issue. There would be value in these initiatives also identifying where water availability is (or is likely to become) a constraint to maximising on-farm production within the sustainable best management practice context.	• Increased sustainable agricultural production, value and economic activity	• Irrigators	1 year
3	Market opportunities study	Identifying the regional, state and national market implications of the Lockyer growing its	• Increased business and local value add	• Irrigators	1 year

Option number	Option name	Description	Benefits to be achieved	Stakeholders	Timeframe
		production in the future; also, development of export markets	production, value and activity. • Develop new markets	• Australian and Queensland governments	
4	Industry/policy coordination review	The PSC considered that past examples suggest that it may be more effective for one group (rather than two separate groups) to oversee and drive the industry and government policy coordination aspect and the economic development aspect. Review of examples deployed elsewhere might include: - South East Queensland Council of Mayors - Regional planning clusters - Regional natural resource management groups - RDAs If specific funding were to be directed to infrastructure investment in the Lockyer Valley, the group(s) might also provide a useful governance vehicle for steering and overseeing such initiatives.	• Increased business and local value add production, value and activity. • Develop new markets	• Irrigators • Local businesses • governments	1 year
5	Public/private agribusiness development	The PSC considered that a number of co-investment approaches currently being deployed might inform the model to be applied in the Lockyer Valley. These include R&D programs managed by Hort innovation, urban water alliance, Department of innovation. As UQ (Gatton) and USQ both have an existing presence in the region, they are well-positioned to be key delivery partners in R&D co-investment programs for the Lockyer Valley.	• Encouraging commercially focused research and skill attainment	• Irrigators • Governments • Universities	1 year
6	Water trading	Improve mechanisms to allow (or encourage) water trading	• Increased sustainable agricultural production, value and economic activity	• Irrigators	1 year
11	Public/private research investment	Government partnership / co-investment to attract a private sector research investment in the Lockyer Valley	• Encouraging commercially focussed research and skill attainment	• Universities • Governments • Irrigators	ongoing
15	On-farm irrigation efficiency	Improve on-farm irrigation efficiency	• Increased sustainable agricultural production, value and economic activity	• Irrigators • Governments	ongoing

11.2.7 Seqwater options

A number of the options are within Seqwater's area of operations, as described below in Table 11.7.

Table 11.7: Seqwater options

Option number	Option name	Description	Benefits to be achieved	Stakeholders	Timeframe
7	Increase diversion capacity	Seqwater to investigate whether pump/channel capacity can be increased to better utilise the off-stream storages	• Increased sustainable agricultural production, value and economic activity	• Irrigators • Seqwater	2–3 years
8	Weir and channel improvements	Increasing the effectiveness of existing weirs (potentially through desilting) and/or existing channels	• Increased sustainable agricultural production, value and economic activity	• Irrigators • Seqwater	2–3 years
9	New weirs	New irrigation weirs	• Increased sustainable agricultural production, value and economic activity	• Irrigators • Seqwater	2–3 years
10	Inter-catchment transfer	Water from other area in South East Queensland (for example, Paradise Dam) to improve reliability of the grid and allow irrigators to access water from Wivenhoe Dam	• Increased sustainable agricultural production, value and economic activity • Creating local jobs and improving socio-economic outcomes	• Irrigators • Seqwater • Governments	5+ years

11.2.8 Private sector options

The options for the private sector to advance are shown below in Table 11.8.

Table 11.8: Private sector options

Option number	Option name	Description	Benefits to be achieved	Stakeholders	Timeframe
12	Local recycled water	Recycled water from local treatment plants directly to the farm gate	• Increased sustainable agricultural production, value and economic activity	• QUU • Irrigators	1 year
13	Saline water use	Treated saline groundwater resources in the Lockyer Valley	• Increased sustainable agricultural production, value and economic activity	• Irrigators	1 year
14	Greywater reuse	Greywater reuse	• Increased sustainable agricultural production, value and economic activity	• Government • Irrigators	1 year
16	Desalination on coast	Build a desalination plant on the coast and pipe the water to the Lockyer	• Increased sustainable agricultural production, value and economic activity	• Irrigators • governments	5+ years
30	Deep Aquifer	Access very deep artesian water by drilling very deeply	• Increased sustainable agricultural production, value and economic activity	• Irrigators	2 years

12. High-level consideration / Options filter

By assessing and ranking each of the options presented, the most favourable options can be identified and assessed in greater detail.

To undertake this assessment, a series of assessment criteria were established. These criteria, which were agreed by the PWG and PSC, support the identified benefits sought. The nine criteria were established through consultation with stakeholders. This broad consultation led to a relatively large number of criteria. There is some overlap between the criteria—for example, capital costs are an input into the economic and financial net present values and the levelised costs. However, the PSC and PWG considered that each criterion was suitable for inclusion.

The weighing of each reflects the relative importance that the PWG and PSC placed on each criterion. Sensitivity analysis was also undertaken to test whether there was a material change in an option's score if changes were made to the criteria scoring process.

Each option was then scored against each of these criteria so that a combined score could be derived for each option. This would allow all of the 39 options to be ranked, relative to each other. For the qualitative criteria, there was naturally judgement required for the scoring. In the first instance, Jacobs provided the scores, which were then modified and confirmed by the PSC and PWG.

Table 12.1 lists the assessment criteria and the weighting applied.

Table 12.1 : Assessment criteria

Assessment criterion	Weighting
Capital costs	15%
Additional water (annual maximum consumption)	10%
Average reliability	10%
Stakeholder support	10%
Technical feasibility	10%
Strategic considerations and state agencies support including competing interests	10%
Levelised costs and capacity to pay	15%
Economic net present value	10%
Financial net present value	10%
Total	**100%**

To score each option against the criteria, the definition was established for each score, as shown in Table 12.2.

Table 12.2 : Assessment criteria cut-offs

	0	1	2	3	4	5
Capital costs ($m)	> $500	$201 to $500	$101 to $200	$51 to $100	$10 to $50	< $10
Additional water GL/a	0	0 to 5	6 to 10	11 to 20	31 to 30	>30
Average availability	< 21%	21 to 40%	41 to 60%	61 to 80%	81 to 90%	> 91%
Economic NPV ($m)	< –$200	–$199 to –$100	–$99 to $0	$1 to $200	$201 to $500	> $500
Financial NPV ($m)	Less than –$200	–$199 to –$100	–$99 to $0	$1 to $200	$201 to $500	> $500
Stakeholder support	All stakeholders strongly oppose	Stakeholders oppose	Indifference / mix of support and opposition	Support from all stakeholders	High support from all stakeholders	Very high support from all stakeholders

	0	1	2	3	4	5
Technical feasibility	Impossible	Hard—many problems to overcome across disciplines	Difficult—many problems to overcome across a discipline	Moderate—some problems	Easy—few problems	Simple—no material problems
Strategic considerations including competing interests	Fully inconsistent and/or not supported by Government	Mainly inconsistent	Neither consistent nor inconsistent	Some inconsistency	Mostly consistent	Fully consistent
Levelised costs per ML	> $3,000	$2,999 to $1,000	$999 to $500	$400 to $499 (or n.a.)	$300 to $399	< $300

12.1 Capital costs

The capital costs for each option have been estimated. Where possible, existing estimates have been used based on the reports produced by Cardno and GHD.[68] Where no existing estimate was available, we applied our engineering judgement to develop a high-level estimate. These estimates are accurate to +/- 50 per cent and is considered to be acceptable for this purpose of relative ranking for the SBC (refer Table 12.3).

Table 12.3 : Capital costs

Option number	Option description	Capital cost ($ m)	Score	Original source
1	Supply chain improvements	–	5	
2	On-farm initiatives	–	5	
3	Market opportunities study	–	5	
4	Industry/policy coordination review	–	5	
5	Public/private agribusiness development	–	5	
6	Water trading	–	5	
7	Increase diversion capacity	1	5	Jacobs
8	Weir and channel improvements	5	5	Jacobs
9	New weirs	25	4	Jacobs
10	Inter-catchment transfer	499	1	Jacobs
11	Public/private research investment	5	5	Jacobs
12	Local recycled water	25	4	Jacobs
13	Saline water use	25	4	Jacobs
14	Greywater reuse	25	4	Jacobs
15	On-farm irrigation efficiency	38	4	Jacobs
16	Desalination on coast	750	0	Jacobs
17	Wivenhoe flood harvesting / new trunk main / fill irrigation dams / existing distribution network	101	2	Cardno
18	Wivenhoe flood harvesting / new trunk main / fill irrigation dams / new distribution network	151	2	Cardno
19	Water from Wivenhoe / new trunk main / new distribution network	130	2	Cardno
20	Water from Wivenhoe / new trunk main / existing distribution network	80	3	Cardno
21	Water from Wivenhoe / Toowoomba pipeline / existing distribution network	79	3	Cardno
22	Water from Wivenhoe / Toowoomba pipeline / new distribution network	129	2	Cardno
23	Water from Wivenhoe / new distribution network / no irrigation dams	130	2	Cardno
24	WCRWS PRW / irrigation dams / new distribution network	378	1	GHD
25	WCRWS PRW / pipe to farm	378	1	GHD
26	WCRWS PRW / managed aquifer recharge	329	1	GHD
27	WCRWS A+ water / irrigation dams / new distribution network / direct / direct potable reuse	378	1	GHD

[68] Cardno, *Pre-feasibility: Water for agriculture productivity and sustainability*, prepared for Lockyer Valley Regional Council, April 2018; GHD, *NuWater Project Feasibility Study*, prepared for Queensland Farmers' Federation, March 2018.

Option number	Option description	Capital cost ($ m)	Score	Original source
28	WCRWS A+ water / pipe to farm / direct potable reuse	378	1	GHD
29	WCRWS A+ water / Existing distribution network / direct potable reuse	329	1	GHD
30	deep aquifer	3	5	Jacobs
31	WCRWS PRW / irrigation dams / new distribution network / post recommissioning	121	2	GHD
32	WCRWS PRW / pipe to farm / post recommissioning	121	2	GHD
33	WCRWS PRW / managed aquifer recharge / post recommissioning	72	3	GHD
34	WCRWS A+ water / irrigation dams / new distribution network / direct / direct potable reuse / post recommissioning	121	2	GHD
35	WCRWS A+ water / pipe to farm / direct potable reuse / post recommissioning	121	2	GHD
36	WCRWS A+ water / managed aquifer recharge / direct potable reuse / post recommissioning	72	3	GHD
37	QUU A+ / irrigation dams / new distribution network	159	2	Jacobs
38	QUU A+ / pipe to farm	159	2	Jacobs
39	QUU A+ / managed aquifer recharge	72	3	Jacobs

12.2 Additional water (annual maximum consumption)

Some of the options can provide additional water to irrigators in the study area. An estimate of the maximum annual additional water is shown in Table 12.4.

Table 12.4 : Additional water

Option number	Option description	Additional water (ML)	Score
1	Supply chain improvements	–	0
2	On-farm initiatives	–	0
3	Market opportunities study	–	0
4	Industry/policy coordination review	–	0
5	Public/private agribusiness development	–	0
6	Water trading	5,000	2
7	Increase diversion capacity	1,000	1
8	Weir and channel improvements	1,000	1
9	New weirs	1,000	1
10	Inter-catchment transfer	50,000	5
11	Public/private research investment	-	0
12	Local recycled water	4,400	1
13	Saline water use	1,275	1
14	Greywater reuse	4,400	1
15	On-farm irrigation efficiency	5,000	2
16	Desalination on coast	50,000	5
17	Wivenhoe flood harvesting / new trunk main / fill irrigation dams / existing distribution network	50,000	5
18	Wivenhoe flood harvesting / new trunk main / fill irrigation dams / new distribution network	50,000	5
19	Water from Wivenhoe / new trunk main / new distribution network	50,000	5
20	Water from Wivenhoe / new trunk main / existing distribution network	50,000	5
21	Water from Wivenhoe / Toowoomba pipeline / existing distribution network	15,000	3
22	Water from Wivenhoe / Toowoomba pipeline / new distribution network	15,000	3
23	Water from Wivenhoe / new distribution network / no irrigation dams	50,000	5
24	WCRWS PRW / irrigation dams / new distribution network	50,000	5
25	WCRWS PRW / pipe to farm	50,000	5
26	WCRWS PRW / managed aquifer recharge	50,000	5

Option number	Option description	Additional water (ML)	Score
27	WCRWS A+ water / irrigation dams / new distribution network / direct / direct potable reuse	50,000	5
28	WCRWS A+ water / pipe to farm / direct potable reuse	50,000	5
29	WCRWS A+ water / existing distribution network / direct potable reuse	50,000	5
30	Deep aquifer	1,274	1
31	WCRWS PRW / irrigation dams / new distribution network / post recommissioning	50,000	5
32	WCRWS PRW / pipe to farm / post recommissioning	50,000	5
33	WCRWS PRW / managed aquifer recharge / post recommissioning	50,000	5
34	WCRWS A+ water / irrigation dams / new distribution network / direct / direct potable reuse / post recommissioning	50,000	5
35	WCRWS A+ water / pipe to farm / direct potable reuse / post recommissioning	50,000	5
36	WCRWS A+ water / managed aquifer recharge / direct potable reuse / post recommissioning	50,000	5
37	QUU A+ / irrigation dams / new distribution network	11,000	3
38	QUU A+ / pipe to farm	11,000	3
39	QUU A+ / managed aquifer recharge	11,000	3

12.3 Average reliability

The different water products can have different reliability. For the purpose of this assessment, we have estimated the long-term average reliability (Table 12.5).

The reliability takes into account the reliability of the source of water and the amount of water lost during delivery. For example, the desalination option has a reliability of 100 per cent, as it is not dependent on climate. Also, the use of the existing distribution networks (as opposed to constructing a new piped network) impacts the reliability. For example, the use of the existing managed aquifer recharge is less reliable than a new pipe due to the losses with the aquifer.

Table 12.5 : Average reliability

Option number	Option description	Average availability (%)	Score
1	Supply chain improvements	NA	0
2	On-farm initiatives	NA	0
3	Market opportunities study	NA	0
4	Industry/policy coordination review	NA	0
5	Public/private agribusiness development	NA	0
6	Water trading	50%	2
7	Increase diversion capacity	50%	2
8	Weir and channel improvements	80%	4
9	New weirs	80%	4
10	Inter-catchment transfer	80%	4
11	Public/private research investment	NA	0
12	Local recycled water	100%	5
13	Saline water use	80%	4
14	Greywater reuse	100%	5
15	On-farm irrigation efficiency	65%	3
16	Desalination on coast	100%	5
17	Wivenhoe flood harvesting / new trunk main / fill irrigation dams / existing distribution network	6%	0
18	Wivenhoe flood harvesting / new trunk main / fill irrigation dams / new distribution network	6%	0
19	Water from Wivenhoe / new trunk main / new distribution network	66%	3
20	Water from Wivenhoe / new trunk main / existing distribution network	33%	1
21	Water from Wivenhoe / Toowoomba pipeline / existing distribution network	33%	1
22	Water from Wivenhoe / Toowoomba pipeline / new distribution network	66%	3
23	Water from Wivenhoe / new distribution network / no irrigation dams	66%	3
24	WCRWS PRW / irrigation dams / new distribution network	70%	3
25	WCRWS PRW / pipe to farm	66%	3
26	WCRWS PRW / managed aquifer recharge	33%	1
27	WCRWS A+ water / irrigation dams / new distribution network / direct / direct potable reuse	70%	3

Option number	Option description	Average availability (%)	Score
28	WCRWS A+ water / pipe to farm / direct potable reuse	66%	3
29	WCRWS A+ water / existing distribution network / direct potable reuse	33%	1
30	Deep aquifer	80%	4
31	WCRWS PRW / irrigation dams / new distribution network / post recommissioning	70%	3
32	WCRWS PRW / pipe to farm / post recommissioning	66%	3
33	WCRWS PRW / managed aquifer recharge / post recommissioning	33%	1
34	WCRWS A+ water / irrigation dams / new distribution network / direct / direct potable reuse / post recommissioning	70%	3
35	WCRWS A+ water / pipe to farm / direct potable reuse / post recommissioning	66%	3
36	WCRWS A+ water / managed aquifer recharge / direct potable reuse / post recommissioning	33%	1
37	QUU A+ / irrigation dams / new distribution network	100%	5
38	QUU A+ / pipe to farm	100%	5
39	QUU A+ / Managed aquifer recharge	50%	2

12.4 Stakeholder support

There are many stakeholders and it is important to determine their views and incorporate that into the assessment. The stakeholders used in this assessment is principally the PWG (and other key growers), as they represent a fairly broad range of potential users of the water. The level of stakeholder support is shown in Table 12.6.

Table 12.6 : Stakeholder support

Option number	Option description	Stakeholder support	Score
1	Supply chain improvements	Support from all stakeholders	3
2	On-farm initiatives	Very high support from all stakeholders	5
3	Market opportunities study	Very high support from all stakeholders	5
4	Industry/policy coordination review	Very high support from all stakeholders	5
5	Public/private agribusiness development	Support from all stakeholders	3
6	Water trading	Support from all stakeholders	3
7	Increase diversion capacity	Support from all stakeholders	3
8	Weir and channel improvements	Support from all stakeholders	3
9	New weirs	Indifference / mix of support and opposition	2
10	Inter-catchment transfer	Indifference / mix of support and opposition	2
11	Public/private research investment	Very high support from all stakeholders	5
12	Local recycled water	Indifference / mix of support and opposition	2
13	Saline water use	Indifference / mix of support and opposition	2
14	Greywater reuse	Indifference / mix of support and opposition	2
15	On-farm irrigation efficiency	Very high support from all stakeholders	5
16	Desalination on coast	Stakeholders oppose	1
17	Wivenhoe flood harvesting / new trunk main / fill irrigation dams / existing distribution network	Very high support from all stakeholders	5
18	Wivenhoe flood harvesting / new trunk main / fill irrigation dams / new distribution network	Very high support from all stakeholders	5
19	Water from Wivenhoe / new trunk main / new distribution network	Very high support from all stakeholders	5
20	Water from Wivenhoe / new trunk main / existing distribution network	Very high support from all stakeholders	5
21	Water from Wivenhoe / Toowoomba pipeline / existing distribution network	Very high support from all stakeholders	5

Option number	Option description	Stakeholder support	Score
22	Water from Wivenhoe / Toowoomba pipeline / new distribution network	Very high support from all stakeholders	5
23	Water from Wivenhoe / new distribution network / no irrigation dams	High support from all stakeholders	4
24	WCRWS PRW / irrigation dams / new distribution network	High support from all stakeholders	4
25	WCRWS PRW / pipe to farm	Support from all stakeholders	3
26	WCRWS PRW / managed aquifer recharge	Indifference / mix of support and opposition	2
27	WCRWS A+ water / irrigation dams / new distribution network / direct / direct potable reuse	High support from all stakeholders	4
28	WCRWS A+ water / pipe to farm / direct potable reuse	Support from all stakeholders	3
29	WCRWS A+ water / existing distribution network / direct potable reuse	Indifference / mix of support and opposition	2
30	Deep aquifer	Support from all stakeholders	3
31	WCRWS PRW / irrigation dams / new distribution network / post recommissioning	High support from all stakeholders	4
32	WCRWS PRW / pipe to farm / post recommissioning	Support from all stakeholders	3
33	WCRWS PRW / managed aquifer recharge / post recommissioning	Indifference / mix of support and opposition	2
34	WCRWS A+ water / irrigation dams / new distribution network / direct / direct potable reuse / post recommissioning	High support from all stakeholders	4
35	WCRWS A+ water / pipe to farm / direct potable reuse / post recommissioning	Support from all stakeholders	3
36	WCRWS A+ water / managed aquifer recharge / direct potable reuse / post recommissioning	Indifference / mix of support and opposition	2
37	QUU A+ / irrigation dams / new distribution network	High support from all stakeholders	4
38	QUU A+ / pipe to farm	Support from all stakeholders	3
39	QUU A+ / managed aquifer recharge	Indifference / mix of support and opposition	2

12.5 Technical feasibility

For an option to be viable, it needs to be technically feasible from an engineering, environmental, legal and regulatory perspective. An overall assessment has been undertaken (Table 12.7).

Table 12.7 : Technical feasibility

Option number	Option description	Technical feasibility	Score
1	Supply chain improvements	Moderate—some problems	3
2	On-farm initiatives	Moderate—some problems	3
3	Market opportunities study	Simple—no material problems	5
4	Industry/policy coordination review	Easy—few problems	4
5	Public/private agribusiness development	Moderate—some problems	3
6	Water trading	Easy—few problems	4
7	Increase diversion capacity	Moderate—some problems	3
8	Weir and channel improvements	Easy—few problems	4
9	New weirs	Moderate—some problems	3
10	Inter-catchment transfer	Hard—many problems to overcome across disciplines	1
11	Public/private research investment	Easy—few problems	4

Option number	Option description	Technical feasibility	Score
12	Local recycled water	Moderate—some problems	3
13	Saline water use	Moderate—some problems	3
14	Greywater reuse	Easy—few problems	4
15	On-farm irrigation efficiency	Easy—few problems	4
16	Desalination on coast	Hard—many problems to overcome across disciplines	1
17	Wivenhoe flood harvesting / new trunk main / fill irrigation dams / existing distribution network	Difficult—many problems to overcome across a discipline	2
18	Wivenhoe flood harvesting / new trunk main / fill irrigation dams / new distribution network	Difficult—many problems to overcome across a discipline	2
19	Water from Wivenhoe / new trunk main / new distribution network	Easy—few problems	4
20	Water from Wivenhoe / new trunk main / existing distribution network	Easy—few problems	4
21	Water from Wivenhoe / Toowoomba pipeline / existing distribution network	Moderate—some problems	3
22	Water from Wivenhoe / Toowoomba pipeline / new distribution network	Moderate—some problems	3
23	Water from Wivenhoe / new distribution network / no irrigation dams	Easy—few problems	4
24	WCRWS PRW / irrigation dams / new distribution network	Moderate—some problems	3
25	WCRWS PRW / pipe to farm	Difficult—many problems to overcome across a discipline	2
26	WCRWS PRW / managed aquifer recharge	Moderate—some problems	3
27	WCRWS A+ water / irrigation dams / new distribution network / direct / direct potable reuse	Moderate—some problems	3
28	WCRWS A+ water / pipe to farm / direct potable reuse	Difficult—many problems to overcome across a discipline	2
29	WCRWS A+ water / existing distribution network / direct potable reuse	Moderate—some problems	3
30	Deep Aquifer	Difficult—many problems to overcome across a discipline	2
31	WCRWS PRW / irrigation dams / new distribution network / post recommissioning	Moderate—some problems	3
32	WCRWS PRW / pipe to farm / post recommissioning	Difficult—many problems to overcome across a discipline	2
33	WCRWS PRW / managed aquifer recharge / post recommissioning	Moderate—some problems	3
34	WCRWS A+ water / irrigation dams / new distribution network / direct / direct potable reuse / post recommissioning	Moderate—some problems	3
35	WCRWS A+ water / pipe to farm / direct potable reuse / post recommissioning	Difficult—many problems to overcome across a discipline	2
36	WCRWS A+ water / managed aquifer recharge / direct potable reuse / post recommissioning	Moderate—problems	3
37	QUU A+ / irrigation dams / new distribution network	Moderate—some problems	3
38	QUU A+ / pipe to farm	Difficult—many problems to overcome across a discipline	2
39	QUU A+ / managed aquifer recharge	Moderate—some problems	3

12.6 Strategic considerations and state agencies' support including competing interests

The role of the state is to balance the competing interests and make decisions in the interests of everyone. Taking the competing factors into account, the alignment of each option with the state's strategic considerations was scored (Table 12.8).

Table 12.8 :Strategic considerations

Option number	Option description	Strategic considerations	Score
1	Supply chain improvements	Fully consistent	5
2	On-farm initiatives	Fully consistent	5
3	Market opportunities study	Fully consistent	5
4	Industry/policy coordination review	Fully consistent	5
5	Public/private agribusiness development	Fully consistent	5
6	Water trading	Fully consistent	5
7	Increase diversion capacity	Fully consistent	5
8	Weir and channel improvements	Some inconsistency	2
9	New weirs	Some inconsistency	2
10	Inter-catchment transfer	Some inconsistency	2
11	Public/private research investment	Fully consistent	5
12	Local recycled water	Fully consistent	5
13	Saline water use	Fully consistent	5
14	Greywater reuse	Fully consistent	5
15	On-farm irrigation efficiency	Fully consistent	5
16	Desalination on coast	Mainly inconsistent	1
17	Wivenhoe flood harvesting / new trunk main / fill irrigation dams / existing distribution network	Fully consistent	5
18	Wivenhoe flood harvesting / new trunk main / fill irrigation dams / new distribution network	Fully consistent	5
19	Water from Wivenhoe / new trunk main / new distribution network	Fully consistent	5
20	Water from Wivenhoe / new trunk main / existing distribution network	Fully consistent	5
21	Water from Wivenhoe / Toowoomba pipeline / existing distribution network	Fully consistent	5
22	Water from Wivenhoe / Toowoomba pipeline / new distribution network	Fully consistent	5
23	Water from Wivenhoe / new distribution network / no irrigation dams	Fully consistent	5
24	WCRWS PRW / irrigation dams / new distribution network	Fully consistent	5
25	WCRWS PRW / pipe to farm	Fully consistent	5
26	WCRWS PRW / managed aquifer recharge	Fully consistent	5
27	WCRWS A+ water / irrigation dams / new distribution network / direct / direct potable reuse	Mainly inconsistent	1
28	WCRWS A+ water / pipe to farm / direct potable reuse	Mainly inconsistent	1
29	WCRWS A+ water / existing distribution network / direct potable reuse	Mainly inconsistent	1
30	Deep aquifer	Some inconsistency	2
31	WCRWS PRW / irrigation dams / new distribution network / post recommissioning	Fully consistent	5
32	WCRWS PRW / pipe to farm / post recommissioning	Fully consistent	5
33	WCRWS PRW / managed aquifer recharge / post recommissioning	Fully consistent	5
34	WCRWS A+ water / irrigation dams / new distribution network / direct / direct potable reuse / post recommissioning	Mainly inconsistent	1
35	WCRWS A+ water / pipe to farm / direct potable reuse / post recommissioning	Mainly inconsistent	1
36	WCRWS A+ water / managed aquifer recharge / direct potable reuse / post recommissioning	Mainly inconsistent	1
37	QUU A+ / irrigation dams / new distribution network	Mainly inconsistent	1
38	QUU A+ / pipe to farm	Mainly inconsistent	1
39	QUU A+ / managed aquifer recharge	Mainly inconsistent	1

12.7 Levelised costs and capacity to pay

The levelised cost of each option represents the annual amount that would need to be paid per megalitre per year to recover the identified upfront capex and ongoing opex calculated over 30 years is shown in Table 12.9.

Table 12.9 : Levelised costs

Option number	Option description	Levelised cost ($/ML)	Multicriteria analysis score
1	Supply chain improvements	–	5
2	On-farm initiatives	–	5

Option number	Option description	Levelised cost ($/ML)	Multicriteria analysis score
3	Market opportunities study	–	5
4	Industry/policy coordination review	–	5
5	Public/private agribusiness development	–	5
6	Water trading	4	5
7	Increase diversion capacity	361	4
8	Weir and channel improvements	1,129	1
9	New weirs	3,143	0
10	Inter-catchment transfer	2,880	1
11	Public/private research investment	–	5
12	Local recycled water	1,440	1
13	Saline water use	6,877	0
14	Greywater reuse	1,617	1
15	On-farm irrigation efficiency	966	2
16	Desalination on coast	3,209	0
17	Wivenhoe flood harvesting / new trunk main / fill irrigation dams / existing distribution network	2,907	1
18	Wivenhoe flood harvesting / new trunk main / fill irrigation dams / new distribution network	4,346	0
19	Water from Wivenhoe / new trunk main / new distribution network	443	3
20	Water from Wivenhoe / new trunk main / existing distribution network	695	2
21	Water from Wivenhoe / Toowoomba pipeline / existing distribution network	2,302	1
22	Water from Wivenhoe / Toowoomba pipeline / new distribution network	1,558	1
23	Water from Wivenhoe / new distribution network / no irrigation dams	470	3
24	WCRWS PRW / irrigation dams / new distribution network	2,722	1
25	WCRWS PRW / pipe to farm	2,887	1
26	WCRWS PRW / managed aquifer recharge	5,536	0
27	WCRWS A+ water / irrigation dams / new distribution network / direct / direct potable reuse	2,285	1
28	WCRWS A+ water / pipe to farm / direct potable reuse	2,424	1
29	WCRWS A+ water / existing distribution network / direct potable reuse	4,610	0
30	Deep aquifer	335	4
31	WCRWS PRW / irrigation dams / new distribution network / post recommissioning	2,128	1
32	WCRWS PRW / pipe to farm / post recommissioning	2,257	1
33	WCRWS PRW / managed aquifer recharge / post recommissioning	4,277	0
34	WCRWS A+ water / irrigation dams / new distribution network / direct / direct potable reuse / post recommissioning	1,692	1
35	WCRWS A+ water / pipe to farm / direct potable reuse / post recommissioning	1,795	1
36	WCRWS A+ water / managed aquifer recharge / direct potable reuse / post recommissioning	3,352	0
37	QUU A+ / irrigation dams / new distribution network	1,625	1
38	QUU A+ / pipe to farm	1,625	1
39	QUU A+ / managed aquifer recharge	1,977	1

12.8 Economic net present value

An economic NPV determines whether the benefits of a project are greater than the costs. Full details are shown in Appendix A. Similar to the capex estimates, the present value of costs and benefits are subject to significant uncertainty in this stage of the assessment. However, for the purpose of ranking, we have established a high-level assessment of benefits and costs. This is considered to be acceptable for the purpose of relative rankings for the SBC. A more detailed assessment is described for shortlisted options in Chapter 13. The economic benefits include additional agricultural production, avoided environmental abatement costs, recreational and tourism benefits.

The economic costs include upfront capex and the NPV of opex (Table 12.10).

Table 12.10 : Economic net present value

Option number	Option description	Score
1	Supply chain improvements	2
2	On-farm initiatives	2
3	Market opportunities study	2
4	Industry/policy coordination review	2
5	Public/private agribusiness development	2
6	Water trading	3
7	Increase diversion capacity	3
8	Weir and channel improvements	3
9	New weirs	2
10	Inter-catchment transfer	1
11	Public/private research investment	2
12	Local recycled water	3
13	Saline water use	2
14	Greywater reuse	3
15	On-farm irrigation efficiency	3
16	Desalination on coast	0
17	Wivenhoe flood harvesting / new trunk main / fill irrigation dams / existing distribution network	2
18	Wivenhoe flood harvesting / new trunk main / fill irrigation dams / new distribution network	2
19	Water from Wivenhoe / new trunk main / new distribution network	5
20	Water from Wivenhoe / new trunk main / existing distribution network	4
21	Water from Wivenhoe / Toowoomba pipeline / existing distribution network	3
22	Water from Wivenhoe / Toowoomba pipeline / new distribution network	3
23	Water from Wivenhoe / new distribution network / no irrigation dams	5
24	WCRWS PRW / irrigation dams / new distribution network	3
25	WCRWS PRW / pipe to farm	3
26	WCRWS PRW / managed aquifer recharge	0
27	WCRWS A+ water / irrigation dams / new distribution network / direct / direct potable reuse	4
28	WCRWS A+ water / pipe to farm / direct potable reuse	3
29	WCRWS A+ water / existing distribution network / direct potable reuse	0
30	Deep aquifer	3
31	WCRWS PRW / irrigation dams / new distribution network / post recommissioning	4
32	WCRWS PRW / pipe to farm / post recommissioning	4
33	WCRWS PRW / managed aquifer recharge / post recommissioning	0
34	WCRWS A+ water / irrigation dams / new distribution network / direct / direct potable reuse / post recommissioning	4
35	WCRWS A+ water / pipe to farm / direct potable reuse / post recommissioning	4
36	WCRWS A+ water / managed aquifer recharge / direct potable reuse / post recommissioning	1
37	QUU A+ / irrigation dams / new distribution network	3
38	QUU A+ / pipe to farm	3
39	QUU A+ / managed aquifer recharge	3

12.9 Financial net present value

The financial NPV estimates the profitability of the option. As for the economic net present value, the present value of costs and benefits are subject to significant uncertainty in this stage of the assessment. It is acknowledged that the net present value uses capital costs, operating costs, water volume and reliability as inputs, which are assessment criteria in their own right.

For the purpose of this high-level assessment, we have assumed that irrigators would pay $4,000/ML, with an annual ongoing charge of $400/ML. These amounts do not seek to show an estimate of an irrigators capacity to pay, but rather are used simply for relative ranking purposes only for the SBC. The results are shown in Table 12.11.

Table 12.11 : Financial net present value

Option number	Option description	Score
1	Supply chain improvements	2
2	On-farm initiatives	2
3	Market opportunities study	2
4	Industry/policy coordination review	2
5	Public/private agribusiness development	2
6	Water trading	4
7	Increase diversion capacity	3

Option number	Option description	Score
8	Weir and channel improvements	2
9	New weirs	2
10	Inter-catchment transfer	0
11	Public/private research investment	2
12	Local recycled water	1
13	Saline water use	1
14	Greywater reuse	1
15	On-farm irrigation efficiency	2
16	Desalination on coast	0
17	Wivenhoe flood harvesting / new trunk main / fill irrigation dams / existing distribution network	1
18	Wivenhoe flood harvesting / new trunk main / fill irrigation dams / new distribution network	1
19	Water from Wivenhoe / new trunk main / new distribution network	5
20	Water from Wivenhoe / new trunk main / existing distribution network	3
21	Water from Wivenhoe / Toowoomba pipeline / existing distribution network	1
22	Water from Wivenhoe / Toowoomba pipeline / new distribution network	1
23	Water from Wivenhoe / new distribution network / no irrigation dams	5
24	WCRWS PRW / irrigation dams / new distribution network	0
25	WCRWS PRW / pipe to farm	0
26	WCRWS PRW / managed aquifer recharge	0
27	WCRWS A+ water / irrigation dams / new distribution network / direct / direct potable reuse	0
28	WCRWS A+ water / pipe to farm / direct potable reuse	0
29	WCRWS A+ water / existing distribution network / direct potable reuse	0
30	Deep Aquifer	3
31	WCRWS PRW / irrigation dams / new distribution network / post recommissioning	0
32	WCRWS PRW / pipe to farm / post recommissioning	0
33	WCRWS PRW / managed aquifer recharge / post recommissioning	0
34	WCRWS A+ water / irrigation dams / new distribution network / direct / direct potable reuse / post recommissioning	0
35	WCRWS A+ water / pipe to farm / direct potable reuse / post recommissioning	0
36	WCRWS A+ water / managed aquifer recharge / direct potable reuse / post recommissioning	0
37	QUU A+ / irrigation dams / new distribution network	1
38	QUU A+ / pipe to farm	1
39	QUU A+ / managed aquifer recharge	1

12.10 Summary of longlist assessment

The results of these assessment are provided in the ranked longlist in Figure 11.1 and Figure 11.2. The options that best meet the agreed criteria achieve the best scores and are ranked more highly that options that do not achieve the assessment criteria as well.

This section provides relativity for further analysis. A multicriteria analysis output alone should not be relied on to determine a shortlist. Further, some caution needs to be applied, as options may just fall to one side of several assessment criteria. Accordingly, sensitivity analysis was undertaken to ensure that the ranked longlist is robust, and that a material re-ordering does not occur if the criteria cut-offs are moved.

Figure 11.1: Ranked longlist

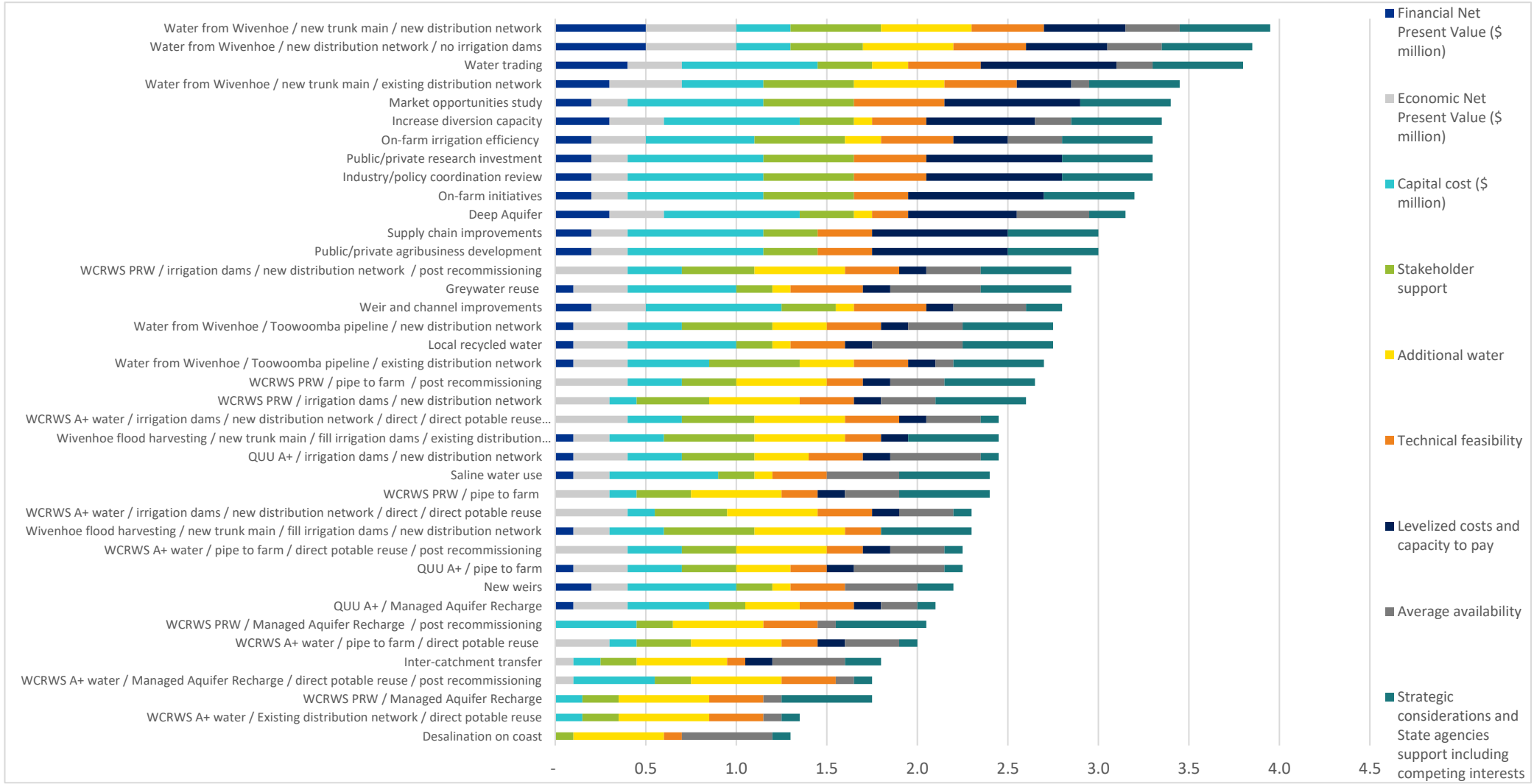
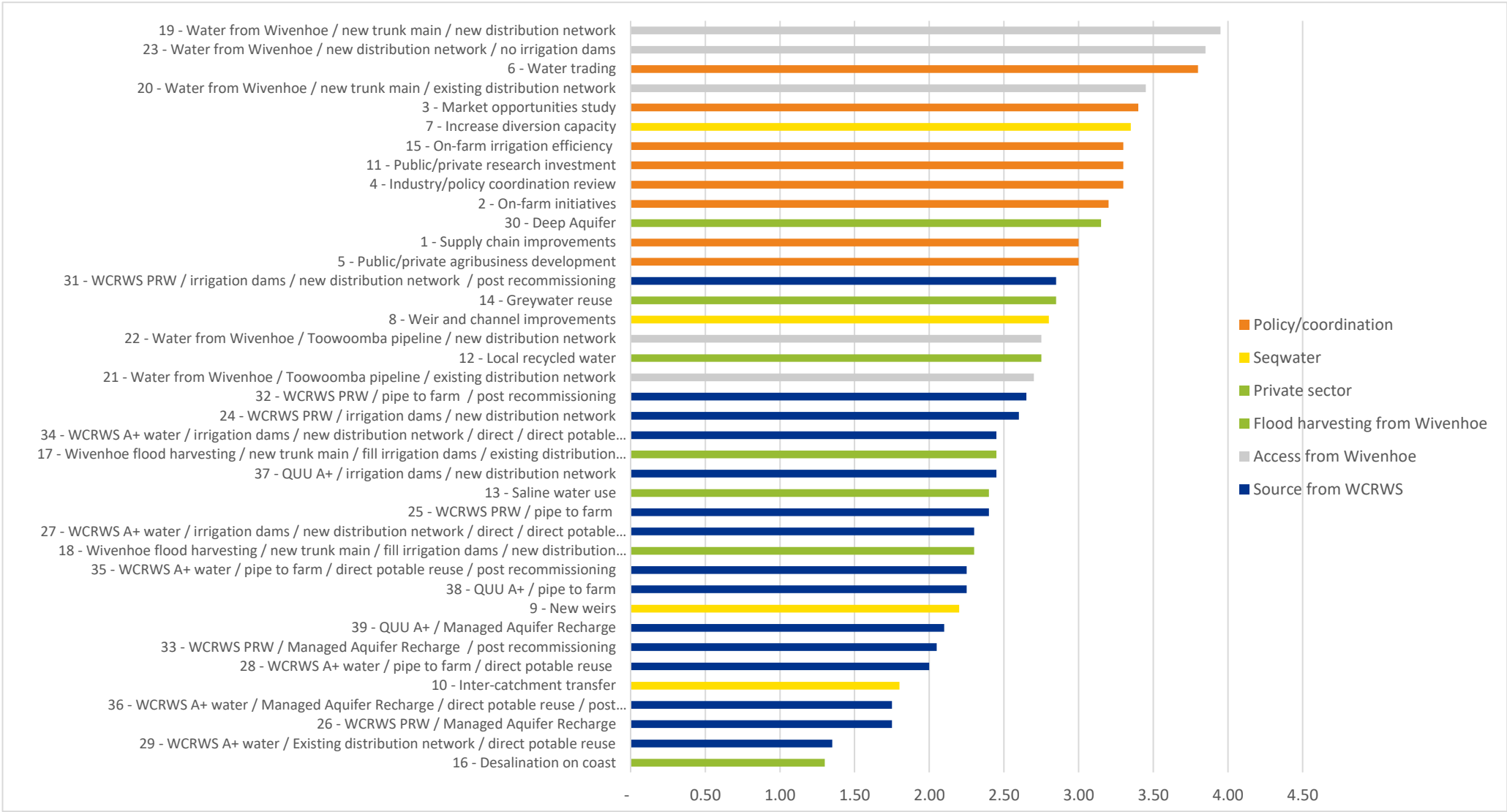


Figure 11.2: Ranked longlist



12.11 Sensitivity analysis

An important step to verify the ranking is to undertake sensitivity analysis. This process tests the robustness of the original rankings and can confirm that the original ranking is sound, and not prone to material changes with a variation to the quantitative cut-offs.

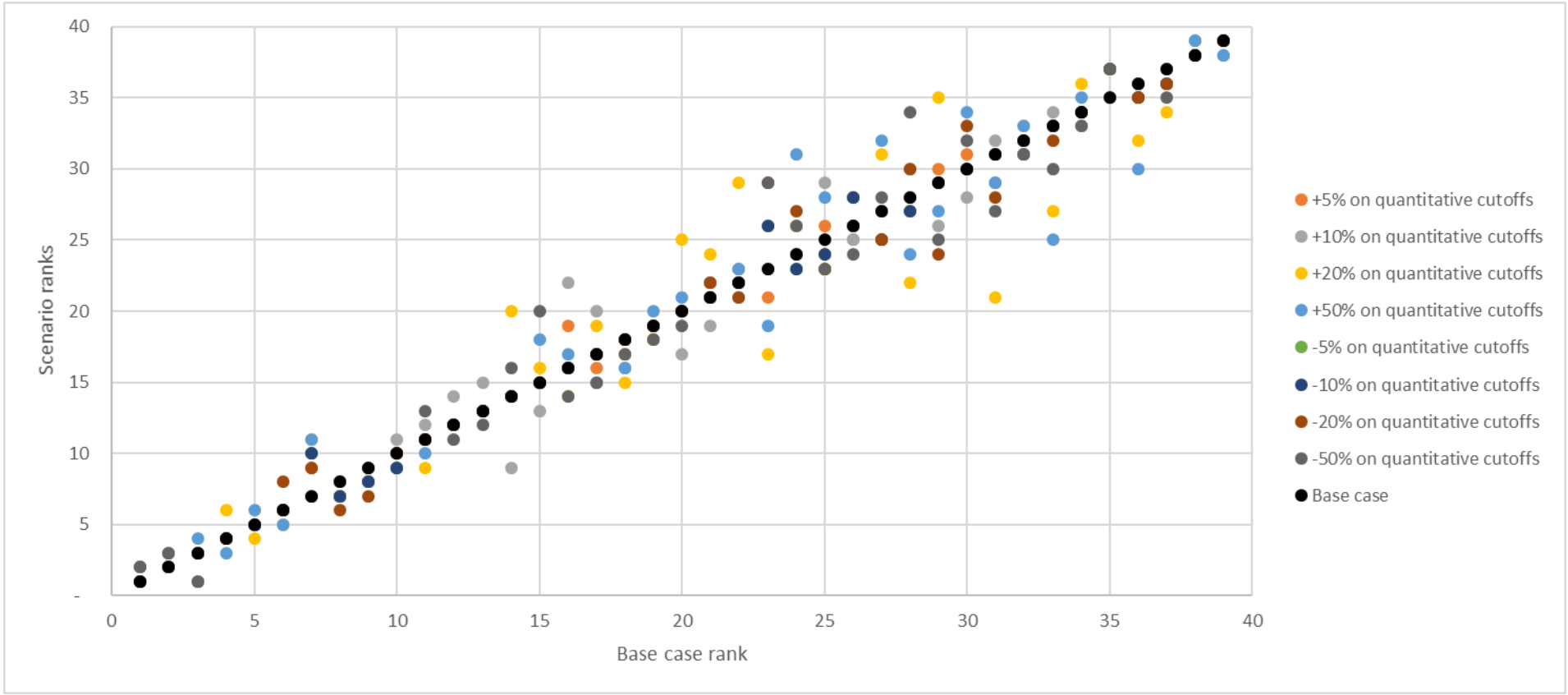
To test whether changing the cut-offs for the assessment criteria materially changes the ranking, sensitivity analysis of the quantitative criteria (i.e. capital cost, additional water, volume of water, Economic NPV and Financial NPV) has been undertaken (see Table 12.2).

The ranks were recalculated for an additional eight model runs after varying the cut-offs by +/- 5 per cent, 10 per cent, 20 per cent and 50 per cent.

The black dots show the original ranking. Additional dots then show the new ranking after the cut-offs have been altered. The smaller the vertical spread of dots, the less sensitive an option is to changes in the quantitative cut offs.

This analysis shows that most of the options only vary a few places, even when the quantitative cut offs are varied by +/- 50 per cent. Importantly, the top ten options exhibit low levels of variability, providing confidence that the rankings are robust. No mid-ranked options materially improve under this sensitivity testing. This means that none of these options significantly improve their ranking, even when cut offs are significantly changed.

Figure 11.3: Outcomes of sensitivity analysis



13. Option/s for further development

13.1 Program of other new complementary options and Existing Options (Base Case)

This business case has identified a number of initiatives that should be pursued. Individually, they may have a small impact. However, collectively they could substantially address the identified service need.

It is recommended that these options be pursued by the identified government agency, parallel to a detailed business case framework. Depending on timing, some of these initiatives may form the base case of a future detailed business case (Table 13.1)

Table 13.1 : Program of other new complementary options

Option	Description	Proposed Coordinator	Proposed collaborators	Scope of works*	Timeline	Benefits
On-farm initiatives (Option 2)	Promoting Best Management Practice within the irrigation industry.	Lockyer Valley and Somerset Water Collaborative	• Lockyer Valley Growers, Growcom, Ausveg, Horticulture Innovation Australia, DAF	• Promote and implement initiatives that aim to maximise efficient and sustainable on-farm water management, farm operations and agricultural production in the Lockyer Valley. • Utilise the intelligence from the collaborative project with Growcom to target future investment. • Utilise research and projects from other international regions (eg. UAE) to assist in providing advice regarding water use, management and re-use for best horticultural productive outcomes. • Encourage production stocktake assessments and encourage (through incentives and business development opportunities) new innovative farming practices (particularly on marginal land) including intensified greenhouse opportunities.	Ongoing	A more efficient agricultural sector that implements informed BMP decisions. Confidence that all parties are working collaboratively for the same end goal.
Industry / policy coordination	One group (rather than two separate groups)	DAF	• DPC, DESBT, DNRME,	• Stakeholder review/evaluation of the effectiveness and	1 year	Allows for industry and government

Option	Description	Proposed Coordinator	Proposed collaborators	Scope of works*	Timeline	Benefits
review (Option 4)	to oversee and drive the industry and government policy coordination aspect and the economic development aspect.		DSDMIP, DES and other applicable QG agencies, Lockyer and Somerset Regional Councils, Growcom (as peak industry body for horticulture across Qld)	success of existing models for promoting and driving industry and government policy coordination and economic development within a specific focus region. • Identify the optimal model for the Lockyer Valley, and then implement as a pilot.		resources to be deployed more effectively and more efficient engagement for achieving economic development outcomes.
Public / private agribusiness development (Option 5) Public / private research investment (Option 11)	Government partnership / co-investment to attract a private sector research investment in the Lockyer. There are a number of co-investment approaches currently being deployed that might inform the model to be applied in the Lockyer Valley. For example, partnership with UQ (Gatton) and/or USQ and/or Horticulture Innovation Australia.	DAF	• Build on existing initiatives and partnership • DAF, ASQ, BQ, Lockyer Valley Growers, Growcom, TIQ, Horticulture Innovation Australia, QAAFI	• DAF: 1. Identify agriculture research with specific trial sites in the Lockyer Valley that Queensland Government is leader or collaborator 2. Identify opportunities for greater R&D activity and address priorities in the Lockyer Valley 3. Identification and valuation of the commercial R&D corporations adding value to agricultural investment in the Lockyer Valley (ie. Seed companies, machinery suppliers, irrigation companies, technology and innovation platforms, chemical companies etc). • Government partnership / co-investment to attract a private sector research investment in the Lockyer. • Establishment of tailored R&D tools that are specifically tailored to producers in the Lockyer Valley priorities and needs.	Ongoing	Identification of all of the stakeholders involved in R&D in the Lockyer Valley. Identification of the R&D priorities for industry in the Lockyer Valley Tailoring of existing products (seeds, harvesting equipment) that will improve productivity locally. More efficiently use the combined resources and universities and industry to develop more productive farming (and associated agribusiness) methods. NB: Lockyer Valley is one of the highest vegetable levy growing

Option	Description	Proposed Coordinator	Proposed collaborators	Scope of works*	Timeline	Benefits
						regions in Australia
Deep aquifer investigation (Option 30)	Access deep artesian water by drilling allowed under the Great Artesian Basin and Other Regional Aquifers Water Plan.	Private		Individuals or enterprise may wish to commission drilling in their own farm/area of interest.	Ongoing	Additional water supply

**Scope of works may need to be further investigated by proposed coordinator*

13.2 Existing options

A number of the identified options have already commenced, or related investigations have commenced. It is appropriate that these investigations continue. However, the options were not included in the shortlist, as they already have a process to implement them (Table 13.2).

Table 13.2 :Existing options—projects already underway

Option	Description	Lead/Proposed Coordinator	Scope of works	Timeline	Benefit
Supply chain improvements (Option 1)	Develop a supply value chain for the region and address supply chain gaps and constraints.	Lockyer Valley Regional Council	• Undertake a consultancy study to examine, describe and quantify any impediments in the supply chain to meet new markets, with a focus on meeting domestic consumer expectations (more processed vegetables) and export markets. • Once identified, propose activities and solutions to overcome impediments.	1 year	Allows for government resources to be deployed more effectively. Allow for additional support to train producers in meeting market expectations including domestic and export markets. Engages whole supply chain in the project, not just water users/ horticultural producers.
Market opportunities study (Option 3)	Identifying the regional, state and national market implications of the Lockyer growing its production in the future. Plus, development of export markets.	Lockyer Valley Regional Council	• Undertake a consultancy study to examine, describe and quantify whether there is domestic and international demand for additional agricultural produce. Examine both existing and potential crops (including food and nursery crops) • Identify current and emerging consumer trends both domestically and internationally	1 year	Provides investment certainty for irrigators and Government by determining whether a market exists for additional agriculture produce.

Option	Description	Lead/Proposed Coordinator	Scope of works	Timeline	Benefit
			• Identify the likely catalysts for, and impediments to, meeting the additional demand. Utilise intelligence from existing studies including those from northern Australia, previous DAF funded projects (USQ/ Deloitte), DAF research (ASQ/RED), Horticulture Innovation Australia, Ausveg and Lockyer Valley Growers Inc whom have all implemented market development projects in the last five years. Consultation to include DESBT		Ensures that duplication of activity is reduced. Ensures that studies are utilised effectively
Water trading (Option 6) – upon finalisation of Moreton Water Plan amendment	Improve mechanisms to allow (or encourage) water trading.	DNRME	• A new draft water plan package was released on 14 August 2019 for public consultation. • Finalisation of the draft water plan amendment is scheduled for end of 2019, and the remainder of the planning instruments in early 2020. • When finalised, the water plan amendment will provide the framework for determining volumetric limits on groundwater allocations.	September –December 2019	Allows the conversion of water entitlements to tradeable allocations which drives efficient and effective water use.
On-farm irrigation efficiency (Option 15) – impending work by Growcom	Improve on-farm irrigation efficiency.	Lockyer Valley and Somerset Water Collaborative	Assess the spatial extent of irrigated agriculture in the Lockyer, current irrigation water use and management practices, wider market, environmental trends influencing industry, analyse water use efficiency and opportunities for improvements.	9 months	To work directly with irrigators to increase water efficiency in agricultural industries
Increase diversion capacity (Option 7) – investigation by Seqwater	Seqwater to investigate whether pump/channel capacity can be increased to better utilise the off-stream storages.	Seqwater	• Seqwater has engaged a specialist consultant to prepare a list of capital infrastructure investment options, related to the upgrade of existing diversion infrastructure, to improve water harvesting performance in the Central Lockyer. They have identified a number of potential capital improvement projects that could improve water harvesting capacity. On the basis of estimated costs and benefits they have recommended two projects for further investigation through the development of a detailed business case. Any costs associated with these projects will be considered by the QCA as part of the next price path review. • Subject to the finalisation of Seqwater's review, there may be a need to adjust the rules by which	2-5 years	Increased water supply and improved reliability

Option	Description	Lead/Proposed Coordinator	Scope of works	Timeline	Benefit
			the water may be taken within the relevant water planning instruments.		
Weir and channel improvements (Option 8)		Seqwater	• Seqwater is currently developing a project plan to undertake desilting of groundwater recharge weirs in the Central Lockyer. The project plan will form part of the application process for any environmental / development approvals required to undertake this project. Seqwater will begin the desilting of the weirs as soon as the necessary approvals have been obtained (currently planned for 2020). Other weir and channel improvement projects identified to date include clearing of the channel between Lockyer Creek and Redbank Creek, and clearing of Redbank Creek from Jordan 2 Weir up to Redbank Creek Pump Station. Any costs associated with these projects will be considered by the QCA as part of the next price path review. • The consultant referenced above in Option 7 also identified two minor capital projects, related to the upgrade of automated monitoring equipment, that would improve scheme efficiency and Seqwater is assessing the merit of these currently. • Under the proposed water planning changes, Seqwater will be required to monitor and report on the performance of the Central Lockyer Valley Water Supply Scheme through a 5-year diagnostic assessment of the effectiveness of the operational improvements it has made in delivering better water supply and security outcomes for its customers.	5 years	Increased water supply and improved reliability
Local recycling (Option 12) - 40% to-date by QUU	Supply directly to farms with recycled water from local treatment plants.	QUU	• Investigate further opportunities for recycled water supply direct to farms from local treatment plants	Ongoing	Additional water for agriculture

13.3 Shortlisting

The options that are already subject to a separate process, or are in the program of other new complementary options and Existing Options (Base Case), were not selected as the options for additional analysis. All the

longlisted options are shown below (Table 13.3). A brief explanation has been given when an option is excluded from the shortlist. This is consistent with the ranked longlist.

Table 13.3 : Selection of shortlist

Option number	Option description	Approach	Reason
1	Supply chain improvements	Already underway	• Requires an overall approach to determining any supply chain impediments.
2	On-farm initiatives	Include in Program of other new complementary options (Base Case)	• This approach could include a grant or subsidy scheme and is therefore best undertaken by government / organisation.
3	Market opportunities study	Already underway	• Requires an overall approach to determining whether a market exists for existing and potential crops. This needs to be undertaken without bias for any crop.
4	Industry/policy coordination review	Include in Program of other new complementary options (Base Case)	• Requires an overall approach to coordinating policy. Best undertaken by government, including consultation with the Department of Employment, Small Business and Training (DESBT).
5	Public/private agribusiness development	Include in Program of other new complementary options (Base Case)	• Requires an overall approach to industry development. Best undertaken by government.
6	Water trading	Already underway	• The amendment to the water plan is already underway by DNRME to introduce water trading
7	Increase diversion capacity	Already underway	• Seqwater is already investigating
8	Weir and channel improvements	Already underway	• This option is likely to improve the historical performance of the existing supplemented recharge scheme which Seqwater is already investigating
9	New weirs	Not shortlisted	• This option produces little additional water at a high $/ML cost
10	Inter-catchment transfer	Not shortlisted	• This option is very expensive
11	Public/private research investment	Include in Program of other new complementary options (Base Case)	• Requires an overall approach to coordinate public and private investment. Best undertaken by the government.
12	Local recycled water	Already underway	• QUU are already supplying local recycled water
13	Saline water use	Not shortlisted	• This option is very expensive
14	Greywater reuse	Not shortlisted	• This option is very expensive and produces little additional water
15	On-farm irrigation efficiency	Already underway	• This option scores well and already subject to an alternative investigation

Option number	Option description	Approach	Reason
16	Desalination on coast	Not shortlisted	• This option results in very negative financial and economic NPVs
17	Wivenhoe flood harvesting / new trunk main / fill irrigation dams / existing distribution network	Not shortlisted	• Wivenhoe flood harvesting creates a water product which reliability is too low for irrigation
18	Wivenhoe flood harvesting / new trunk main / fill irrigation dams / new distribution network	Not shortlisted	• Wivenhoe flood harvesting creates a water product which reliability is too low for irrigation
19	Water from Wivenhoe / new trunk main / new distribution network	Shortlisted	• Ranks number 1 in the MCA analysis
20	Water from Wivenhoe / new trunk main / existing distribution network	Shortlisted	• Ranks number 4 in the MCA analysis
21	Water from Wivenhoe / Toowoomba pipeline / existing distribution network	Not shortlisted	• The Toowoomba pipeline does not have the required capacity, is needed for Toowoomba and does not provide cost savings as it is not located in a place that would save capex
22	Water from Wivenhoe / Toowoomba pipeline / new distribution network	Not shortlisted	• The Toowoomba pipeline does not have the required capacity, is needed for Toowoomba and does not provide cost savings as it is not located in a place that would save capex
23	Water from Wivenhoe / new distribution network / no irrigation dams	Shortlisted	• Ranks number 2 in the multicriteria analysis
24	WCRWS PRW / irrigation dams / new distribution network	Shortlisted	• This option has not ranked well but is included for additional analysis to provide a range of potential future options
25	WCRWS PRW / pipe to farm	Not shortlisted	• Has a significantly negative financial NPV
26	WCRWS PRW / managed aquifer recharge	Not shortlisted	• Has a significantly negative financial and economic NPV and has a cost per megalitre that is prohibitively expensive
27	WCRWS A+ water / irrigation dams / new distribution network / direct / direct potable reuse	Not shortlisted	• Has a significantly negative financial NPV
28	WCRWS A+ water / pipe to farm / direct potable reuse	Not shortlisted	• Has a significantly negative financial NPV
29	WCRWS A+ water / existing distribution network / direct potable reuse	Not shortlisted	• Has a significantly negative financial and economic NPV and has a cost/ML that is prohibitively expensive
30	Deep aquifer investigation	Include in Program of other new complementary options (Base Case)	• Produces only a small volume of water and is investigated further through the Program of other new complementary options and Existing Options (Base Case)
31	WCRWS PRW / irrigation dams / new distribution network / post recommissioning	Shortlisted	• This is the highest ranked WCRWS options. Although the WCRWS options do not score as well as the water from Wivenhoe infrastructure option, it was considered reasonable to subject both infrastructure options to further analysis
32	WCRWS PRW / pipe to farm / post recommissioning	Shortlisted	• This is the second highest ranked WCRWS options. Although the WCRWS options do not score as well as the water from Wivenhoe infrastructure option, it was considered reasonable to subject both infrastructure options to further analysis
33	WCRWS PRW / managed aquifer recharge / post recommissioning	Not shortlisted	• Has a significantly negative financial and economic NPV and has a cost per megalitre that is prohibitively expensive

Option number	Option description	Approach	Reason
34	WCRWS A+ water / irrigation dams / new distribution network / direct / direct potable reuse / post recommissioning	Not shortlisted	• Has a significantly negative financial NPV
35	WCRWS A+ water / pipe to farm / direct potable reuse / post recommissioning	Not shortlisted	• Has a significantly negative financial NPV
36	WCRWS A+ water / managed aquifer recharge / direct potable reuse / post recommissioning	Not shortlisted	• Has a significantly negative financial NPV and has a cost/ML that is prohibitively expensive
37	QUU A+ / irrigation dams / new distribution network	Not shortlisted	• Has a cost/ML that is prohibitively expensive
38	QUU A+ / pipe to farm	Not shortlisted	• No fatal flaw but ranked 30 out of 39
39	QUU A+ / managed aquifer recharge	Not shortlisted	• No fatal flaw but ranked 32 out of 39

Note: The bundled options for Wivenhoe Water and WCRWS are highlighted in the table.

On this basis, two bundles of options were identified for further examination in this SBC. These options are:

1) Water from Wivenhoe Dam
   - Wivenhoe Dam allocation / new trunk main / existing distribution network (option 20)
   - Wivenhoe Dam allocation / new trunk main / new distribution network/ existing irrigation dams (option 19)
   - Wivenhoe Dam allocation / new distribution network / no irrigation dams (option 23)
2) Water from the WCRWS
   - WCRWS PRW / irrigation dams / new distribution network / post-recommissioning (option 31)
   - WCRWS PRW / pipe to farm / post-recommissioning (option 32)
   - WCRWS PRW / irrigation dams / new distribution network (option 24)

13.4 Further analysis of shortlisted infrastructure options

This section considers the two bundles of shortlisted options and examines them further under the SBC. This approach means that any 'fatal flaws' can be identified earlier than the detailed business case. The additional factors examined are:

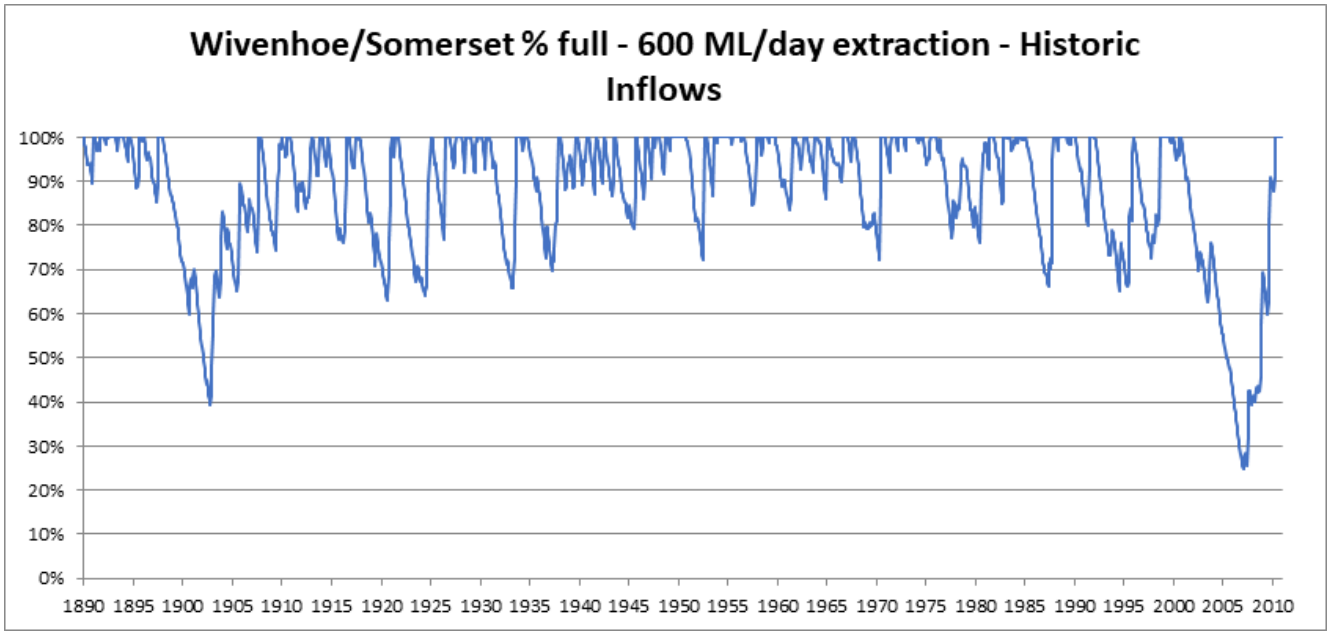
- reliability
- environment
- policy and legal
- economics
- average costs.

13.4.1 Reliability

The suites of options have an identical reliability. In both cases, when the WCRWS is turned on, any supply to the irrigators would cease. The WCRWS has trigger points when it is recommissioned and operated. Currently, it is recommissioned when the combined dam levels fall to 60 per cent. However, it is expected that this trigger level will increase to operate at 70 per cent after it has been recommissioned for urban water supply.

The below Figure 13.1 shows a simulation of the levels of the Wivenhoe and Somerset dams based on actual historical inflows and an assumed 600 ML per day extraction for urban use. That shows the frequency that the dam levels have dropped below 70 per cent over the past 130 years[69].

Figure 13.1 : Wivenhoe / Somerset inflows and extractions



Also relevant is the projected frequency that the WCRWS will be switched on in any given year. Current projections are that by 2050, the WCRWS would be in use 20 per cent of the time, meaning that irrigators would have access to water from Wivenhoe Dam 80 per cent of the time. This kind of reliability is similar to other Queensland irrigation schemes.

However, the projection that includes a climate change forecast has a 44 per cent probability of switching on the WCRWS, meaning that irrigators would have access to water from Wivenhoe Dam 56 per cent of the time (Table 13.4).

Table 13.4 :Probability of turning on the WCRWS

	2020	2030	2050
Probability of interruption—without climate change	6%	12%	20%
Probability of interruption—with climate change	19%	32%	44%

13.4.2 Environment

GHD[70] undertook a desktop review of environmental factors and supplemented and consolidated previous environmental investigations and reference material with current state and Commonwealth environmental data layers, to provide a description of the existing environment and environmental values within and surrounding the project footprint.

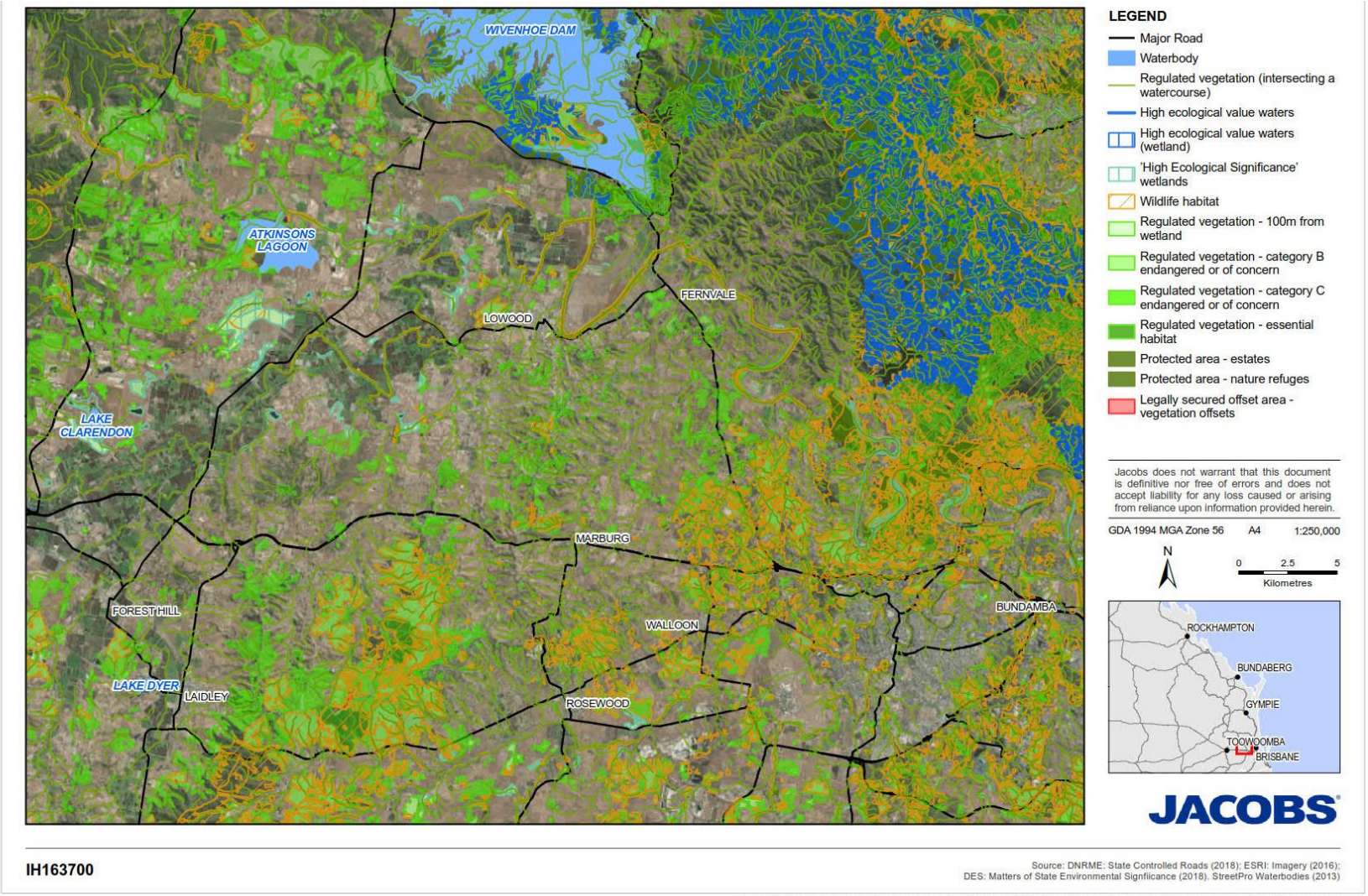
GHD found the following endangered flora:

- The Brigalow (Acacia harpophylla dominant and codominant) TEC
- The Swamp Tea-tree (Melaleuca irbyana).

[69] The trigger level is based on the water levels across a larger number of dams than only Wivenhoe and Somerset.
[70] GHD, *NuWater Project Feasibility Study*, prepared for Queensland Farmers' Federation, March 2018, p. 97.

The mitigation of environmental impacts will require an effective management framework and implementation. The project will require detailed environmental management plans. Figure 13.2 shows the areas with matters of state environmental significance.

Figure 13.2 : Matters of state environmental significance



13.4.3 Policy and legal

The water from Wivenhoe options will require a change in government policy. The government and Seqwater will need to be willing to change the trigger levels of the WCRWS in order to supply additional water to irrigators. The review of trigger levels is currently the subject of a different process.

Seqwater has indicated that their expectation is that urban water supply should not be worse off (either in bulk water charges or water security) due to supply to Lockyer Valley irrigators. Additionally, it is Seqwater's preference that any supply to Lockyer Valley irrigators under the options occur only after the WCRWS has already been recommissioned for urban water supply purposes, as this is a significant task.

However, this is government policy, which can be altered should the government be persuaded of the merits.

It is expected that irrigators will not purchase a water allocation. They would enter into a supply agreement with Seqwater, which would specify the conditions of supply.

To be supplied directly from the WCRWS, there would be a need for additional approvals.

The WCRWS is an approved scheme to deliver high quality recycled water (PRW) for indirect potable reuse under approvals obtained through the Water Act 2000 (Qld) as well as the Environmental Protection Act 1994 (Qld) authorities for the operation of the relevant advanced water treatment plants.

The potential for this scheme to be appropriated for a use other than its intended purpose, in particular conveyance of high quality PRW, will be subject to approval from DNRME, Seqwater and DES as the responsible statutory authorities for the WCRWS and its operation.

All of the options considered have needed to have no negative impact on the urban level of service, dam safety obligations, and the flood mitigation capacity of any storage.

13.4.4 Economic assessment

The economic assessment has been done in accordance with Building Queensland Cost Benefit Analysis Guide. The detail of the calculation of economic benefits is presented in Appendix A.

A summary of the economic metrics is shown in Table 13.5 and Table 13.6.

Table 13.5 : Upfront and ongoing costs

Option	Upfront capex ($m)	PV of opex ($m)	PV of total costs ($m)
Water from Wivenhoe Dam			
Option 20—Wivenhoe Dam water / new trunk main / existing distribution network	80	310	390
Option 19—Wivenhoe Dam water / new trunk main / new distribution network/ existing irrigation dams	130	310	440
Option 23—Wivenhoe Dam water / new distribution network / no irrigation dams	131	310	440
Water from the WCRWS			
Option 31—WCRWS purified recycled water (PRW) / irrigation dams / new distribution network / post- recommissioning	119	800	919
Option 32—WCRWS PRW / pipe to farm / post-recommissioning	119	800	919
Option 24—WCRWS PRW / irrigation dams / new distribution network /pre-commissioning of WCRWS	251	800	1,051

Table 13.6 : Economic outcomes

Option	PV of costs ($m)	PV of benefits ($m)	Economic NPV ($m)	Economic BCR
Water from Wivenhoe Dam				
Option 20—Wivenhoe Dam water / new trunk main / existing distribution network	390	240	–150	0.6
Option 19—Wivenhoe Dam water / new trunk main / new distribution network/ existing irrigation dams	440	523	83	1.2
Option 23—Wivenhoe Dam water / new distribution network / no irrigation dams	440	513	73	1.2
Water from the WCRWS				
Option 31—WCRWS purified recycled water (PRW) / irrigation dams / new distribution network / post- recommissioning	919	608	–311	0.7
Option 32—WCRWS PRW / pipe to farm / post-recommissioning	919	580	–339	0.6
Option 24—WCRWS PRW / irrigation dams / new distribution network /pre-commissioning of WCRWS	1,051	608	–443	0.6

This analysis shows that the 'water from Wivenhoe Dam' options (options 19 and 23) have positive NPVs and BCRs above 1.0. Conversely, all of the 'water from the WCRWS' options have negative NPVs and BCRs below 1.0. A BCR of 1.0 is when benefits exactly equal costs.

A similar process will be undertaken in the Detailed Business Case to determine economic benefits. The detailed demand assessment should involve a number of interviews with potential customers to determine demand and economic benefits. The type of information needed is:

- Demand for additional water (volume and reliability)
- Additional crop grown
- Costs to apply additional water
- Revenue received from using additional water
- Overall changes in business cash-flow as a result of additional water
- Water quality requirements for the additional water.

WSP were commissioned by Somerset and Lockyer Valley Councils and the Lockyer Water Users Forum to assess the impact of additional water. WSP found that:

> An additional 100,000 ML/annum of water for irrigation purposes was estimated to generate approximately $640 million in additional gross value. Of this approximately $585 million was attributed to vegetables for human consumption, $4.4 million to hay and silage and $50 million to nurseries, cut flowers and cultivated turf.

13.4.5 Long-term average annual cost

Based on the upfront capital and ongoing operating costs, the long-term average annual costs have been calculated. The assumption is that there is no government grant or subsidy.

The upfront cost reflects the upfront capital divided by the total volume of megalitres sold (assumed to be 50,000 ML). The annual fixed costs are incurred irrespective of whether water is available. The variable costs are incurred in order to make a water delivery. Costs are shown in Table 13.7.

Table 13.7 : Long-term average annual cost (per ML)

Option	Upfront cost (one-off) ($)	Annual fixed cost ($)	Annual variable cost ($)
Water from Wivenhoe Dam			
Option 20—Wivenhoe Dam water / new trunk main / existing distribution network	1,600	400	20
Option 19—Wivenhoe Dam water / new trunk main / new distribution network/ existing irrigation dams	2,600	400	100
Option 23—Wivenhoe Dam water / new distribution network / no irrigation dams	2,600	400	100
Water from the WCRWS			
Option 31—WCRWS purified recycled water (PRW) / irrigation dams / new distribution network / post- recommissioning	5,000	0	1,300
Option 32—WCRWS PRW / pipe to farm / post-recommissioning	2,400	0	1,300
Option 24—WCRWS PRW / irrigation dams / new distribution network /pre-commissioning of WCRWS	2,400	0	1,300

While a detailed demand assessment has not been undertaken, the cost-reflective charges for the Water from WCRWS are very likely to be above irrigators' capacity to pay. The prices for Water from Wivenhoe are likely high but may be acceptable to irrigators.

13.5 Findings of the analysis of shortlisted options

The examination of the shortlisted options concludes that for reliability, environmental and Legal/regulatory/policy, both options are similar. However, the much larger operating costs of the WCRWS options result in poorer performance in economic outcomes and cost-reflective prices. For this reason, the water from Wivenhoe Dam options are preferred. The summary is presented in Table 13.8.

Table 13.8 : Summary of shortlist analysis

Topic	Water from Wivenhoe Dam	Water from the WCRWS
Reliability and climate change sensitivity	Climate change presents a risk to reliability.	Climate change presents a risk to reliability.
Environmental	Approvals would be needed. Likely to be environmentally acceptable	Approvals would be needed. Likely to be environmentally acceptable
Legal/regulatory/policy	Requires Government approval for Wivenhoe water to be used for this project and for consideration of altering the trigger levels for the use of the WCRWS.	Approvals required through the Water Act 2000 (Qld) as well as Environmental Protection Act 1994
Economics	Positive NPV in some scenarios	All negative NPVs
Cost-reflective prices	May be affordable – will not know for sure until a demand assessment and capacity to pay study is done.	Probably not affordable – will not know for sure until a demand assessment and capacity to pay study is done.

14. Matters for the Detailed Business Case to consider

Three key stakeholder groups requested that a series of principles be taken into account during the Detailed Business Case. These were communicated in the form of letters, which are attached to this report. A summary is shown below.

DNRME (on behalf of the PSC) requested that the following principles be taken into account:

- The DBC must be developed in accordance with the Building Queensland Business Case Development Framework.
- Economic assessment must occur in accordance with the Building Queensland Cost Benefit Assessment guidelines with strict adherence to the appropriate inclusions in costs and benefits.
- Pricing of water needs to occur in the first instance based on full cost recovery principles (including return on, and of, capital as well as all ongoing operational and maintenance costs).
- Demand for water from the additional water supply and security options need to be assessed specifically in the context of the price at which water would be available.
- Consideration of an appropriate level of customer commitment (i.e. commensurate with the level of detail of the assessment) should be incorporated into the DBC process.
- SEQ Urban water security cannot be negatively impacted by any of the options for additional water supply or security.
- SEQ urban water users must not be responsible for any increase in costs associated with any option considered.

Seqwater provided a list of considerations and constraints to be factored into any subsequent business case. These include:

- Seqwater's preference is that any supply to Lockyer Valley irrigators should occur only after the WCWRS had already be recommissioned for urban water supply purposes
- Seqwater should be no worse off in terms of regulated bulk water charges or water security
- Arrangements should be consistent with the water planning regime
- Seqwater has a strong preference to not invest in or own new assets to connect the Lockyer Valley.

The Lockyer Valley Somerset Water Collaborative also provided feedback on the draft report, attached as Appendix J. This feedback has been addressed in this final version.

15. Conclusions

The Water for the Lockyer SBC (which includes a part of the preliminary business case phase):

1) **Finds** that, in the context of the service need:

   a) the Wivenhoe water options (options 19, 20 and 23) are, as a group, the most economically and financially feasible infrastructure options.

   b) Option 20 has a BCR lower than 1.0; restricts voluntary participation by individual irrigators in securing additional water as the old and new products would be delivered by the same distribution system; restricts the ability to deliver water to new customers; and involves significant inefficiencies associated with delivering the additional water via an aquifer recharge mechanism.

   c) although the WCRWS options (options 24, 31 and 32) are the next most feasible infrastructure options, they have significantly lower BCRs, of less than 1, and negative NPVs, which are likely to result in very high annual variable charges.

2) **Recommends** that the Wivenhoe options (options 19 and 23) be considered as the preferred option(s) for any future detailed analysis. In developing a Detailed Business Case, the following needs to be taken into account:

   a) matters raised by Seqwater in relation to the recommissioning of WCRWS, cost and water security (Appendix H).

   b) matters and principles raised in DNRME letter on behalf of PSC (Appendix I) in relation to the availability and reliability of supply for the Lockyer due to population growth in future, and the following assessment principles for the development of a detailed business case:

      i. The detailed business case must be developed in accordance with the Building Queensland Business Case Development Framework.

      ii. Economic assessment must occur in accordance with the Building Queensland Cost Benefit Assessment guidelines with strict adherence to the appropriate inclusions in costs and benefits.

      iii. Pricing of water needs to occur in the first instance based on full cost recovery principles (including return on, and of, capital as well as all ongoing operational and maintenance costs).

      iv. Demand for water from the additional water supply and security options need to be assessed specifically in the context of the price at which water would be available.

      v. Consideration of an appropriate level of customer commitment (i.e. commensurate with the level of detail of the assessment) should be incorporated into the detailed business case process.

      vi. SEQ Urban water security cannot be negatively impacted by any of the options for additional water supply or security.

      vii. SEQ urban water users must not be responsible for any increase in costs associated with any option considered.

   c) Note the preferred alignment of the Inland Rail that traverses Lockyer Valley and consult with the project proponent, the Australian Rail Track Corporation.

3) Recommends a detailed water demand survey and capacity to pay be conducted as part of any future detailed business case analysis.

4) **Recommends** the following program of other new complementary options be considered in parallel, for the detailed business case analysis:

   - Public / private research investment (option 11)
   - Industry / policy coordination review (option 4)
   - Public / private agribusiness development (option 5)
   - On-farm initiatives (option 2)

- Deep aquifer investigation (option 30).

5) **Notes** that the **base case** of the detailed business case will include the following options that are currently underway:

- Supply chain improvements (option 1)
- Market opportunities study (option 3)
- Water trading (option 6)
- On-farm irrigation efficiency (option 15)
- Investigate increasing diversion capacity (option 7)
- Local recycling (option 12).

16. Assurance

This report has been developed within the governance approach outlined in Chapter 3.

The PWG provided overall guidance, input, direction and review to ensure that this business case delivered the outcomes outlined in the project's purpose and objectives.

The PWG oversaw the articulation of an agreed purpose and the development of an SBC that:

- details the service need to be addressed
- identifies intended benefits
- includes undertaking an investment logic mapping exercise with stakeholders
- leads to a multicriteria assessment of a list of options

The PSC provided oversight of the development of the SBC. It provided strategic direction, reviews, comments upon and/or endorses project elements that will affect the SBC. The focus of the PSC is on:

- high-level strategic issues in the development of the SBC
- noting and/or endorsing key business case outputs and documentation as they are developed
- considering the SBC and making a recommendation to the project owner.

The contents of this report does not form government policy or funding commitment for construction, nor should it be assumed that it reflects the views of any individuals of either group.

Appendix A. Calculation of economic benefits

A.1 Method

The use of water for agricultural purposes will materially increase the economic value of production in the Lockyer Valley. This economic benefit has been calculated specifically for the region surrounding the project.

The additional water will be used for two broad purposes. The first is to expand agricultural production onto land that is not used for crops but other agricultural uses. The second is to use the water to plant an additional crop on land that is already irrigated.

The estimated economic benefit excludes improved yields of existing crops at existing planting frequencies, which for this assessment are assumed to offer only a marginal benefit. In reality, this marginal benefit may be more significant than Jacobs has assumed; however, our analysis is intentionally conservative (rather than optimistic).

The process used to calculate the economic benefit is as follows:

- Convert available gross margins into net margins by subtracting fixed costs per hectare.
- Determine the amount of water likely to be used per hectare for each crop type and cropping areas.
- Determine the annual net margin of each crop (per ML) and convert the annual net margin into a 30-year net present value (NPV) / the economic benefit per ML,
- Multiply scheme yield estimates (nominal volume times reliability) to determine volumes of water by the NPV of the net margin, to estimate economic value contributed by water (i.e. total economic benefit is determined by multiplying volume of water by the NPV of net margins per ML).

A detailed demand assessment has not been undertaken, so additional demand is unknown. To account for this uncertainty, we have assumed a range of additional water uses: low (20,000 ML per year), medium (40,000 ML per year) and high (50,000 ML per year). This is in addition to the water the growers' access from other sources.

A.2 Agricultural margins

The most common form of agricultural margin is a gross margin which equals the gross income of an enterprise minus the variable costs of that enterprise. Marsden Jacobs, as part of the amended water plan, estimated the gross margins for various crops in the Lockyer Valley, as follows in Table A.1:

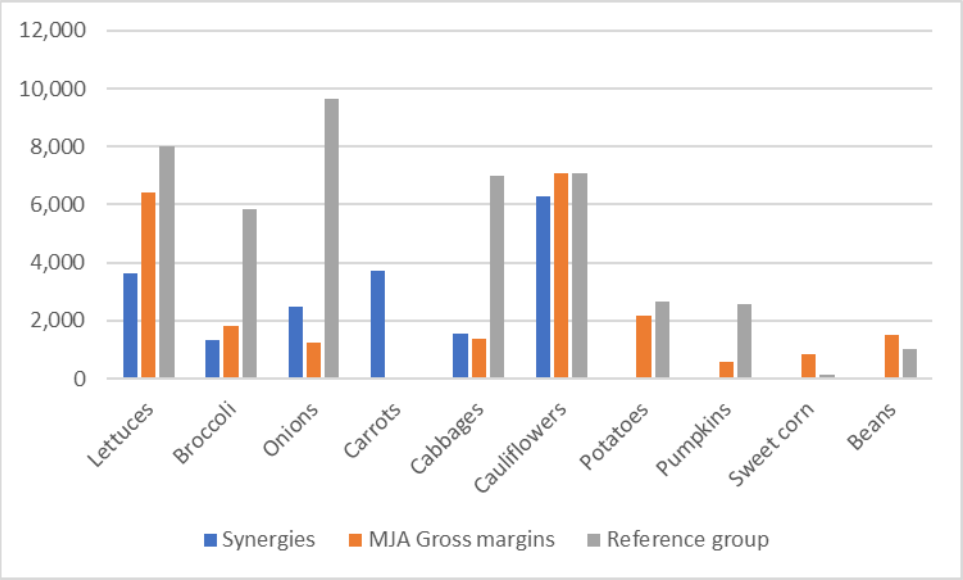
Table A.1 : Lockyer Valley gross margins, ranked by value

Crop	Gross margin per hectare ($/ha)
Cauliflowers	21,219
Lettuces	11,520
Potatoes	7,641
Broccoli	4,339
Sweet corn	4,130
Onions	3,750
Cabbages	3,470
Beans	3,000
Pumpkins	1,460
Simple average	**6,725**

Gross margins were also calculated by Synergies, as part of the NuWater. The MJA gross margins are slightly lower (more conservative) than Synergies'. MJA also published the irrigator reference group gross margins, which are generally higher than both consultant estimates. Therefore, to maintain Jacobs' conservative approach we have adopted the lowest set of numbers, as estimated and published by MJA.

A comparison of the Synergies, MJA and irrigator reference group gross margins is shown below in Figure A.1.

Figure A.1: Comparison of the Synergies, MJA and irrigator reference group gross margins



Source: MJA XXXX

However, a gross margin does not fully reflect a farm's profitability. Rather, gross margins can overstate economic benefits depending on the estimation of on-farm economic costs. A net margin is required, which equals gross margin minus fixed costs. This is an appropriate and conservative estimate of economic benefit, which obviates the needs to account for on-farm costs separately (as part of estimating project costs).

Fixed costs are specific to each enterprise and depend on the geography, crop type, land preparation / landform costs, land tax and council rates, assumed owner's and other permanent salaries, and levels of

debt and the cost of debt. As a demand study has not been undertaken, we do not know with certainty to which crops the additional water would be applied. Therefore, we have assumed that each of the crops in Table A.1 will be grown in equal proportion—taking a portfolio approach and using a simple average.

Upfront fixed costs have been estimated assuming a 15-hectare farm, as shown in Table A.2.

Table A.2 : Lockyer Valley upfront fixed costs

Item	Cost ($)
Clearing, levelling land and landform (for beds)	30,000
On-farm pipework and hydrants	15,000
Access to irrigation network	70,000
Contingency	35,000
Total ($ per 15 ha farm)	**150,000**
Total ($/ha)	**10,000**

Source: stakeholder consultation and industry knowledge

This equates to $10,000 per ha for upfront establishment costs. Based on a real discount rate of 7% over 40 years, this results in an annualized cost of $750 per ha. However, these costs are only required, if new land is needed. In many cases, already prepared land could be further utilised.

The opportunity cost for cleared land is zero as without water it is assumed that crops cannot be grown, and grazing will not take place on fallow land. The opportunity cost of grazing / uncleared land is $400 per ha, for forgone livestock production.

We have also identified the ongoing fixed costs of operation to be based on:

- $2,800 per hectare, based on an additional 0.5 FTE for a 15-ha farm (i.e. annual FTE salary of $84,000).

We have assumed a 50/50 split between cleared and uncleared land.

Once these costs are subtracted from the gross margin per hectare, the resulting net margin is calculated below for both grazing (uncleared) and existing cropping (cleared) land (Table A.3).

Table A.3 : Lockyer Valley net margin calculation

Item	Value for grazing (uncleared) land ($)	Value for cropping (cleared) land ($)
Gross margin (per ha)	6,725	6,725
- opportunity cost	400	-
- upfront establishment costs (annualised)	750	-
- ongoing fixed costs	2,800	2,800
Net margin (per ha)	**2,775**	**3,925**
Average water use	3	3
Net margin (per ML)	**972**	**1,375**

Assumed simple average water use for the portfolio of possible crops that could be grown with additional water is just under 3 ML/ha. This analysis shows that the average net margin for crops in the Lockyer Valley is between $972/ML and $1,375/ML.

A.3 Present value of increased agricultural production

The annual figure is then converted to a present value of economic benefits, using a real discount rate of 7% over 30 years. The present value is between $11,818/ML (uncleared land) and $17,058/ML (cleared land).

As a comparison, GHD found the present value of the economic benefit to be $21,04071/ML. Based on our water use scenarios, the economic benefit of additional agricultural production is $202 million to $505 million (Table A.4). A range of water use scenarios are shown, noting that the core scenario used to estimate capital and operating costs is an additional 50,000 ML.

Table A.4 : Lockyer Valley net margin calculation (7%)

Item	Value (uncleared)	Value (cleared)	Total
Net margin (per ML)	952	1,375	
NPV of net margin - over 30 years (per ML)	11,818	17,058	
Average reliability	70%	70%	
NPV ($m)—additional water (20,000 ML)	83	119	**202**
NPV ($m)—additional water (40,000 ML)	165	239	**404**
NPV ($m)—additional water (50,000 ML)	207	299	**505**

A.4 Sensitivity analysis—present value of economic benefit

Assessments for discount rates of 4 per cent and 10 per cent show that benefits range from $154 million to $704 million.

Table A.5 : Lockyer Valley net margin calculation—discount rate 10% real

Item	Value (uncleared)	Value (cleared)	Total
Net margin (per ML)	952	1,375	
NPV of net margin - over 30 years (per ML)	8,978	12,959	
Average reliability	70%	70%	
NPV ($m)—additional water (20,000 ML)	63	91	**154**
NPV ($m)—additional water (40,000 ML)	126	181	**307**
NPV ($m)—additional water (50,000 ML)	157	227	**384**

Table A.6 : Lockyer Valley net margin calculation – Discount rate 4% real

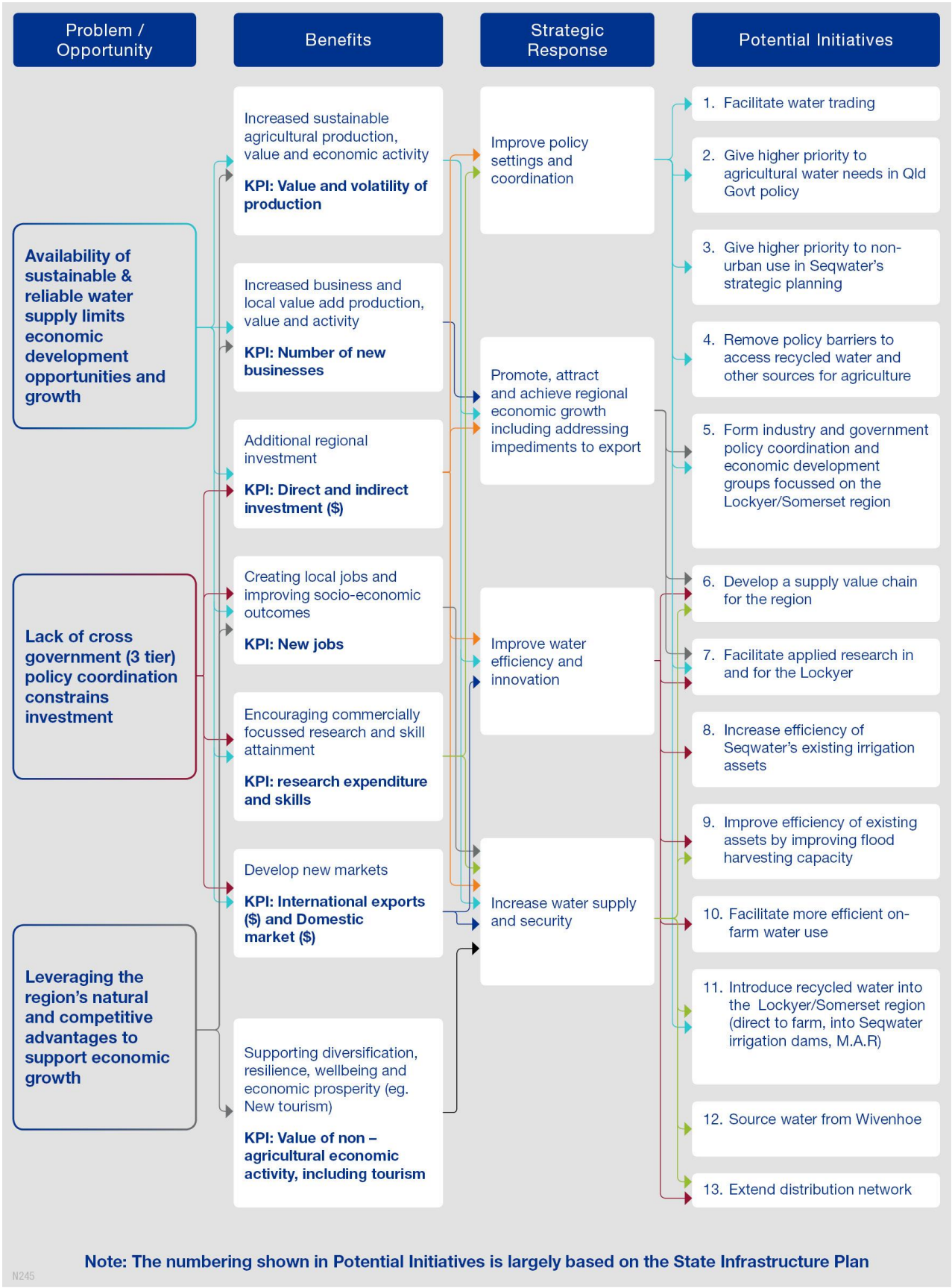
Item	Value (uncleared)	Value (cleared)	Total
Net margin (per ML)	952	1,375	
NPV of net margin - over 30 years (per ML)	16,468	23,771	
Average reliability	70%	70%	
NPV ($m)—additional water (20,000 ML)	115	166	**282**
NPV ($m)—additional water (40,000 ML)	231	333	**563**
NPV ($m)—additional water (50,000 ML)	288	416	**704**

[71] GHD, Table 10-1. Calculation: $157,800,000 divided by 7,500 ML

Appendix B. Benefits register

Benefit description	Related to problem / opportunity statement:	Related stakeholder/s and potential beneficiaries	Possible measures	Weighting
Increased agricultural production, value and economic activity	1,3	Farm owners, workers, suppliers and consumers.	Value of agricultural production ($).	25%
Increased agri-business and local value add production, value and activity	1,3	Existing and new business and their workers.	Number of new businesses	25%
Additional regional investment	1,2	Business owners, workers, wholesale suppliers and local residents.	Change in regional investment	10%
Creating local jobs	1,2,3	Unemployed and under-employed	New jobs will be measured by the Small Area Labour Markets Australia	20%
Encouraging commercially focused research and skill attainment	1,2	Farm owners and the highly skilled workers	To be developed	10%
Develop new markets	1,2	Farm business, transport, logistics, processing and packaging business.	International exports	5%
Supporting diversification, resilience, wellbeing and economic prosperity (e.g. New tourism)	3	Residents and tourists	Change in the number of new tourists spending time and money in the area Index of relative socio-economic disadvantage	5%

Appendix C. Investment logic map



Appendix D. Risk Register

The risk management approach is aligned with the DNRME risk matrix. This risk relates to the success of the SBC being implemented to the next DBC stage.

Table D1 : DNRME Risk Analysis and Scoring Matrix

Likelihood / consequence	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain	Medium (11)	Medium (16)	High (20)	Extreme (23)	Extreme (25)
Likely	Low (7)	Medium (12)	High (17)	High (21)	Extreme (24)
Possible	Low (4)	Medium (8)	Medium (13)	High (18)	High (22)
Unlikely	Low (2)	Low (5)	Medium (9)	Medium (14)	High (19)
Rare	Low (1)	Low (3)	Low (6)	Medium (10)	Medium (15)

Source: (Department of Natural Resources, Mines and Energy, 2017, p. 15)

Table D2 : DNRME risk likelihood categories

Likelihood	Description	Example to assist stakeholders
Almost certain	The event is expected to occur in most circumstances	May occur once a year or more
Likely	The event will probably occur in many circumstances	May occur once every 3 years
Possible	Identified factors indicate the event could occur at some time	May occur once every 10 years
Unlikely	The event could occur at some time but is not expected	May occur once every 30 years
Rare	The event may occur only in exceptional circumstances	May occur once every 100 years

Source: (Department of Natural Resources, Mines and Energy, 2017, p. 15).

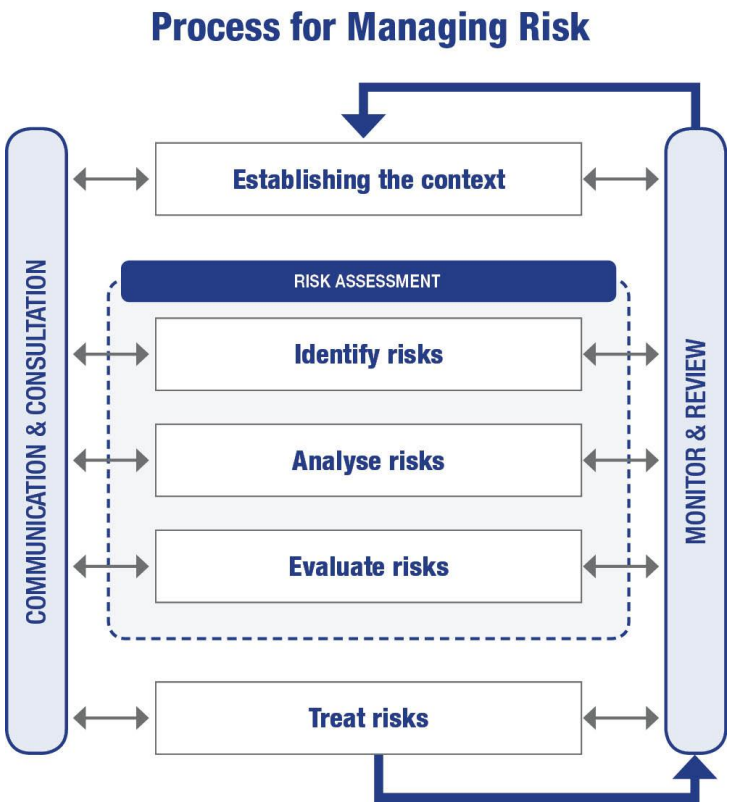
The range from ‘yearly’ to ‘every 100 years’ is appropriate for water infrastructure related risks.

Table D3 : Risk consequences—impact on realisation of benefits

Insignificant	Minor	Moderate	Major	Catastrophic
Negligible impact on realisation of project benefits	Minor impact on realisation of project benefits	Moderate impact on realisation of project benefits	Major impact on realisation of project benefits	Catastrophic impact on realisation of project benefits—cannot be realised

Source: Adapted from (Department of Natural Resources, Mines and Energy, 2017).

Figure D.2 : DNRME risk management process adopted



Source: (Department of Natural Resources, Mines and Energy, 2017, p. 2).

A risk register was developed by the PWG.

Table D.4 : Risk register

Risk description	Trigger	Impact	Likelihood	Consequence	Rating	Control strategy
Risk of industry being Government-led rather than market-led	Introduction of policy, regulation or legislation.	Markets signal will be affected, and inefficient decisions could be made.	Unlikely	Moderate	Medium	Government to not intervene in markets.
Risk that there is not additional demand	Completion of a demand assessment.	Project would not proceed.	Possible	Moderate	Medium	Engage an experienced party with an understanding of irrigation to forecast demand
A change of Government	Commonwealth election	Possible change in NWIDF policy and/or delay in project progression	Likely	Moderate	High	Comply with good business case practices with an unbiased assessment.

Risk description	Trigger	Impact	Likelihood	Consequence	Rating	Control strategy
Water plan	Finalisation of the water plan	Existing water use practices may need to change	Likely	Minor	Medium	Priority by government
Biosecurity	A biosecurity threat is found that limits the capacity to grow and sell produce.	Reduction in output, reduced demand for additional water.	Possible	Moderate	Medium	Continue to monitor biosecurity threats
Climate change and sustainability	Change in temperature and/or rainfall.	Climate change may result in an increase in number and severity of extreme events and resulting crop failures.	Possible	Moderate	Medium	Continue to monitor climate forecasts.
Stakeholders do not support project	Lack of stakeholder support or opposition		Possible	Moderate	Medium	Continue to engage with stakeholders
Seqwater	Support for the options affecting Seqwater	Low or no support would make many options difficult or impossible	Unlikely	Moderate	Medium	Continue to engage with Seqwater who is a member of PWG and PSC

Appendix E. Stakeholder engagement plan

A stakeholder management plan was developed by Jacobs to deliver this business case. The plan was endorsed by the PSC (add date). It is replicated below:

Stakeholder engagement activities in the SBC stage can support:

- greater understanding of different stakeholders' perceptions of the service need, which can help in identifying appropriate initiatives
- effective identification of stakeholders' expectations regarding the potential project and the benefits they seek
- better outcomes and greater accuracy in identifying possible strategic responses, business changes and potential initiatives
- establishment of 'social license'
- effective risk management
- improved project outcomes resulting from liaison between agencies when there are overlapping jurisdictions or when approvals are required from multiple departments or independent regulatory agencies (these improved project outcomes may relate to time, cost and user satisfaction).

Stakeholder engagement enables an understanding of the relationship between the objectives of a project and the outcomes expected by stakeholders. However, we understand that the irrigators of the Lockyer Valley may be experiencing 'consultation fatigue'. Accordingly, we propose a targeted (yet comprehensive) approach that focuses on key and committed stakeholders.

Where possible, we will leverage the results of previous consultation. We want to avoid asking people the same questions again.

The objectives of consultation will be to discuss the:

- service need
- options available to meet the service need.

The approach and timing will likely change over time to meet the organic needs of the project. Material departures will be discussed with DNRME.

Table E1 provides a list of key stakeholders identified to be interested and of influence to the SBC.

Table E1 : Stakeholders

Sector	Stakeholder	Approach	Timing
Irrigators	Lockyer Water Users Forum (Brock Sutton), Lockyer Valley Growers (Gordon Van Der Est)	Individual phone calls and discussions Be introduced to other interested and knowledgeable irrigators (3 to 5). Visit on-farm to minimise inconvenience to the irrigator, and to gain the most benefit from consultation. Interaction within the Project Working Group Public meeting and forums, if required.	Undertake the majority of individual irrigation consultation in October and November 2018.
Local business	Lockyer Chamber of Commerce & Industry	Individual phone calls and discussions	Undertake consultation in October to March 2019.
Statutory bodies	Seqwater	Consultation with Seqwater is required as water may be sourced from their bulk water supply assets and they have a priority of ensuring water security objectives.	Discussions regarding options and water availability will occur December 2018 to June 2019.

Sector	Stakeholder	Approach	Timing
		Interaction within the Project Working Group Discussions regarding individual options with knowledgeable officers	
	Queensland Urban Utilities	QUU are focused on facilitating economic development in the Lockyer Valley with the use of water Interaction within the Project Working Group Discussions regarding individual options with knowledgeable officers	Undertake consultation in November 2018 to March 2019.
Local Government	Lockyer Valley Regional Council, Somerset Regional Council	Individual phone calls and face-to-face discussions Interaction within the Project Working Group	Undertake consultation in October to March 2019. Ongoing consultation will occur through the Project Working Group.
State Government	DNRME, DAF, DSDMIP, Qld Treasury, QTC, Building Queensland	Weekly meetings with DNRME and Building Queensland, and other parties, as required. Interaction within the Project Working Group, Project Steering Committee and individual discussions, as needed.	Presentation to Project Steering Committee as required.

Note: All members of the PWG have the same level of influence within PWG meetings. However, there can be a differentiation outside of this group.

Appendix F. Full Long list

Option number	Option name	Description	Benefits to be achieved
1	Supply chain improvements	Develop a supply value chain for the region and address supply chain gaps and constraints	• Increased business and local value add production, value and activity. • Develop new markets
2	On-farm initiatives	Growcom is currently undertaking a number of initiatives (e.g. Hort360 South-East Queensland) that are focused on promoting best management practice within the horticulture industry, as well as addressing nutrient and sediment loss in catchments where this is a known issue. There would be value in these initiatives also identifying where water availability is (or is likely to become) a constraint to maximising on-farm production within the sustainable best management practice context.	• Increased sustainable agricultural production, value and economic activity
3	Market opportunities study	Identifying the regional, state and national market implications of the Lockyer growing its production in the future; also, development of export markets	• Increased business and local value add production, value and activity. • Develop new markets
4	Industry/policy coordination review	The PSC considered that past examples suggest that it may be more effective for one group (rather than two separate groups) to oversee and drive the industry and government policy coordination aspect and the economic development aspect. Review of examples deployed elsewhere might include: - South East Queensland Council of Mayors - Regional planning clusters - Regional natural resource management groups - RDAs If specific funding were to be directed to infrastructure investment in the Lockyer Valley, the group(s) might also provide a useful governance vehicle for steering and overseeing such initiatives.	• Increased business and local value add production, value and activity. • Develop new markets
5	Public/private agribusiness development	The PSC considered that a number of co-investment approaches currently being deployed might inform the model to be applied in the Lockyer Valley. These include R&D programs managed by Hort innovation, urban water alliance, Department of innovation. As UQ (Gatton) and USQ both have an existing presence in the region, they are well-positioned to be key delivery partners in R&D co-investment programs for the Lockyer Valley.	• Encouraging commercially focused research and skill attainment
6	Water trading	Improve mechanisms to allow (or encourage) water trading	• Increased sustainable agricultural production, value and economic activity

Option number	Option name	Description	Benefits to be achieved
7	Increase diversion capacity	Seqwater to investigate whether pump/channel capacity can be increased to better utilise the off-stream storages	• Increased sustainable agricultural production, value and economic activity
8	Weir and channel improvements	Increasing the effectiveness of existing weirs (potentially through desilting) and/or existing channels	• Increased sustainable agricultural production, value and economic activity
9	New weirs	New irrigation weirs	• Increased sustainable agricultural production, value and economic activity
10	Inter-catchment transfer	Water from other area in South East Queensland (for example, Paradise Dam) to improve reliability of the grid and allow irrigators to access water from Wivenhoe Dam	• Increased sustainable agricultural production, value and economic activity • Creating local jobs and improving socio-economic outcomes
11	Public/private research investment	Government partnership / co-investment to attract a private sector research investment in the Lockyer Valley	• Encouraging commercially focussed research and skill attainment
12	Local recycled water	Recycled water from local treatment plants directly to the farm gate	• Increased sustainable agricultural production, value and economic activity
13	Saline water use	Treated saline groundwater resources in the Lockyer Valley	• Increased sustainable agricultural production, value and economic activity
14	Greywater reuse	Greywater reuse	• Increased sustainable agricultural production, value and economic activity
15	On-farm irrigation efficiency	Improve on-farm irrigation efficiency	• Increased sustainable agricultural production, value and economic activity
16	Desalination on coast	Build a desalination plant on the coast and pipe the water to the Lockyer	• Increased sustainable agricultural

Option number	Option name	Description	Benefits to be achieved
			production, value and economic activity
17	Wivenhoe Dam flood harvesting / new trunk main / fill irrigation dams / existing distribution network	Flood harvesting water from Wivenhoe/Somerset Dam New large diameter trunk main supplying raw water to Atkinson Dam, Lake Clarendon and Lake Dyer New distribution network to the farm gate	• Increased sustainable agricultural production, value and economic activity • Additional regional investment • Supporting diversification, resilience, wellbeing and economic prosperity
18	Wivenhoe Dam flood harvesting / new trunk main / fill irrigation dams / new distribution network	Flood harvesting water from Wivenhoe/Somerset Dam New large diameter trunk main supplying raw water to Atkinson Dam, Lake Clarendon and Lake Dyer Existing distribution networks / managed aquifer recharge	• Increased sustainable agricultural production, value and economic activity • Additional regional investment • Supporting diversification, resilience, wellbeing and economic prosperity
19	Water from Wivenhoe Dam / new trunk main / new distribution network	• Water from Wivenhoe/Somerset Dam • New small diameter trunk main supplying raw water to Atkinson Dam, Lake Clarendon and Lake Dyer (Figure 11.1) New distribution network to the farm gate (not shown as the location is highly uncertain)	• Increased sustainable agricultural production, value and economic activity • Additional regional investment
20	Water from Wivenhoe / new trunk main / existing distribution network	• Water from Wivenhoe/Somerset dam • New small-diameter trunk main supplying raw water to Atkinson Dam, Lake Clarendon and Lake Dyer (Figure 11.1) Existing distribution networks / managed aquifer recharge.	• Increased sustainable agricultural production, value and economic activity • Additional regional investment • Supporting diversification, resilience, wellbeing and economic prosperity
21	Water from Wivenhoe / Toowoomba pipeline / existing distribution network	• Water from Wivenhoe/Somerset Dam • New pipeline from the existing Toowoomba pipeline to Atkinson Dam, Lake Clarendon and Lake Dyer New distribution network to the farm gate	• Increased sustainable agricultural production, value and economic activity

Option number	Option name	Description	Benefits to be achieved
			• Additional regional investment
22	Water from Wivenhoe / Toowoomba pipeline / new distribution network	• Water from Wivenhoe/Somerset Dam • New pipeline from the existing Toowoomba pipeline to Atkinson Dam, Lake Clarendon and Lake Dyer Existing distribution networks / managed aquifer recharge	• Increased sustainable agricultural production, value and economic activity • Additional regional investment • Supporting diversification, resilience, wellbeing and economic prosperity (e.g. new tourism)
23	Water from Wivenhoe Dam / new distribution network / no irrigation dams	• Water from Wivenhoe/Somerset Dam • No trunk main and no use of irrigation dams The new distribution network (small pipes) takes water from the dam to farm	• Increased sustainable agricultural production, value and economic activity • Additional regional investment
24	WCRWS PRW / irrigation dams / new distribution network	PRW from Bundamba WCRWS - Use existing irrigation dams - New pipe from Wivenhoe pipeline to irrigation dams - New distribution network to the farm gate	• Increased sustainable agricultural production, value and economic activity • Additional regional investment
25	WCRWS PRW / pipe to farm	PRW from Bundamba WCRWS New distribution network from Wivenhoe pipeline to farm gate	• Increased sustainable agricultural production, value and economic activity • Additional regional investment
26	WCRWS PRW / managed aquifer recharge	PRW from Bundamba WCRWS. Use existing irrigation dams and existing Wivenhoe pipeline New distribution network from Wivenhoe pipeline to managed aquifer recharge	• Increased sustainable agricultural production, value and economic activity • Additional regional investment
27	WCRWS A+ water / irrigation dams / new distribution network / direct / direct potable reuse	A+ grade water from Bundamba WCRWS New pipe to irrigation dams from Wivenhoe pipeline New distribution system to farm gate New pipe to Mt Crosby from Bundamba WCRWS	• Increased sustainable agricultural production, value and economic activity • Additional regional investment

Option number	Option name	Description	Benefits to be achieved
28	WCRWS A+ water / pipe to farm / direct potable reuse	A+ grade water from Bundamba WCRWS New distribution network from Wivenhoe pipeline to farm gate New pipe to Mt Crosby from Bundamba WCRWS	• Increased sustainable agricultural production, value and economic activity • Additional regional investment
29	WCRWS A+ water / Existing distribution network / direct potable reuse	A+ grade water from Bundamba WCRWS. Use existing distribution network for irrigators New distribution network from Wivenhoe pipeline to managed aquifer recharge	• Increased sustainable agricultural production, value and economic activity • Additional regional investment
30	Deep Aquifer	Access very deep artesian water by drilling very deeply	• Increased sustainable agricultural production, value and economic activity
31	WCRWS PRW / irrigation dams / new distribution network / post recommissioning	PRW from Bundamba WCRWS New pipe from Wivenhoe pipeline to irrigation dams New distribution network to the farm gate. Post recommissioning	• Increased sustainable agricultural production, value and economic activity •
32	WCRWS PRW / pipe to farm / post recommissioning	PRW from Bundamba WCRWS New distribution network from Wivenhoe pipeline to farm gate Post recommissioning	• Increased sustainable agricultural production, value and economic activity • Additional regional investment
33	WCRWS PRW / managed aquifer recharge / post recommissioning	PRW from Bundamba WCRWS New distribution network from Wivenhoe pipeline to managed aquifer recharge Post recommissioning	• Increased sustainable agricultural production, value and economic activity • Additional regional investment
34	WCRWS A+ water / irrigation dams / new distribution network / direct / direct potable reuse / post recommissioning	A+ grade water from Bundamba WCRWS. New pipe to irrigation dams from Wivenhoe pipeline. New distribution system to farm gate. New pipe to Mt Crosby from Bundamba WCRWS. Post recommissioning	• Increased sustainable agricultural production, value and economic activity • Additional regional investment
35	WCRWS A+ water / pipe to farm / direct potable reuse / post recommissioning	A+ grade water from Bundamba WCRWS New distribution network from Wivenhoe pipeline to farm gate New pipe to Mt Crosby from Bundamba WCRWS Post recommissioning	• Increased sustainable agricultural production, value and economic activity

Option number	Option name	Description	Benefits to be achieved
			• Additional regional investment
36	WCRWS A+ water / managed aquifer recharge / direct potable reuse / post recommissioning	A+ grade water from Bundamba WCRWS. New distribution network from Wivenhoe pipeline to managed aquifer recharge Post recommissioning	• Increased sustainable agricultural production, value and economic activity • Additional regional investment
37	QUU A+ / irrigation dams / new distribution network	A+ grade water from QUU Bundamba water treatment plant New pipe to irrigation dams New distribution system to farm gate	• Increased sustainable agricultural production, value and economic activity • Additional regional investment
38	QUU A+ / pipe to farm	A+ grade water from QUU Bundamba water treatment plant New distribution network to farm gate	• Increased sustainable agricultural production, value and economic activity • Additional regional investment
39	QUU A+ / managed aquifer recharge	A+ grade water from QUU Bundamba water treatment plant New pipe to irrigation dams Existing managed aquifer recharge	• Increased sustainable agricultural production, value and economic activity • Additional regional investment

Appendix G. The water planning process

G.1 Legislation

The *Water Act 2000* (Water Act) provides the legislative framework for the sustainable planning, allocation and management of water resources in Queensland. It requires that all planning, allocation and use of water must 'advance sustainable management and efficient use of water'.

Water plans provide the principal mechanism for achieving the requirements of the Water Act, setting out detailed strategies and outcomes for water to be shared among water users, including the environment. The water planning framework consists of:

- overarching legislation: Water Act
- subordinate legislation: Water Regulation 2016 and the Water plan
- statutory instruments: water entitlement notice and a water management protocol
- other associated documents: resource operations license and operations manual.

The water plan may apply to rivers, lakes, springs, overland flow and underground water. Water plans balance the needs of water users (e.g. towns, agriculture and other industries) and the environment.

G.2 Developing water plans

The development process generally includes the following stages:

- Technical assessments (environmental, economic, social, hydrologic and cultural data)
- Preliminary stakeholder consultation
- Preparation of a draft water plan
- Publication of draft plan and opportunity for public submissions
- Consideration of submissions
- Finalisation and approval of water plan.

G.3 Implementing water plans

Water plans are implemented through a range of documents, developed in consultation with water users. The following table explains each document.

Table F1: Queensland's water planning framework documents

Current framework (as at Dec 2016)	Contents of new document
Water plans	• Water covered by the plan • Desired outcomes, measures and strategies for achieving the outcomes • Performance indicators • Amounts of water available for consumptive use and future use • Specifications of water management areas and trading zones (previously in ROP) • Criteria for deciding water licences (previously in ROP)
Water management protocols	• Water dealing/trading rules • Water sharing rules for unsupplemented water • Seasonal water assignment rules • Any volumes of unallocated water reserved for particular purposes or stated locations
Resource operations licences or Distribution operations licences	• Roles and responsibilities of scheme operators to achieve the outcomes of the water plan • Details of the infrastructure used to operate the scheme • Watercourse authorised to be used for distribution of water • Environmental management rules • Monitoring and reporting requirements
Water supply scheme operations manuals	• Operational rules for the scheme • Water releases from dams • Water sharing rules • Seasonal assignment rules
Water entitlement notices	• Temporary documents to convert, grant or amend water entitlement

G.4 Amendment to the Moreton Water Plan

G.4.1 Background

The Moreton Water Plan has been in place since March 2007 and was amended in 2009 and 2013 to address water allocation and management issues in other catchments in the plan area. The Central Lockyer Valley water supply scheme is the only remaining water supply scheme in the Moreton plan area which is still managed under interim arrangements. The key aim of the amendment is to finalise management arrangements for the scheme in a way that:

- supports the current economic and employment profile in the Central Lockyer Valley region
- supports the existing agricultural industry and associated jobs

- ensures a more equitable share and management of the water resource across all water users in the scheme.

The amendment to the plan will allow any additional supply into the Lockyer to be accommodated.

G.5 Central Lockyer water supply scheme

G.5.1 Background

Releases are made from Bill Gunn Dam and Lake Clarendon into Laidley and Lockyer creeks to recharge the adjoining alluvial aquifer and to provide surface water for pumping.

In 1991 the benefitted groundwater area was defined based on an understanding of the benefits of releases down Laidley Creek and into Lockyer Creek from Bill Gunn dam. In 1997 the benefitted groundwater area was expanded to include that area that would benefit from releases from Lake Clarendon down Lockyer Creek. A map of this benefitted area is shown in Figure F.1.

G.5.2 Releases from Bill Gunn Dam and Lake Clarendon

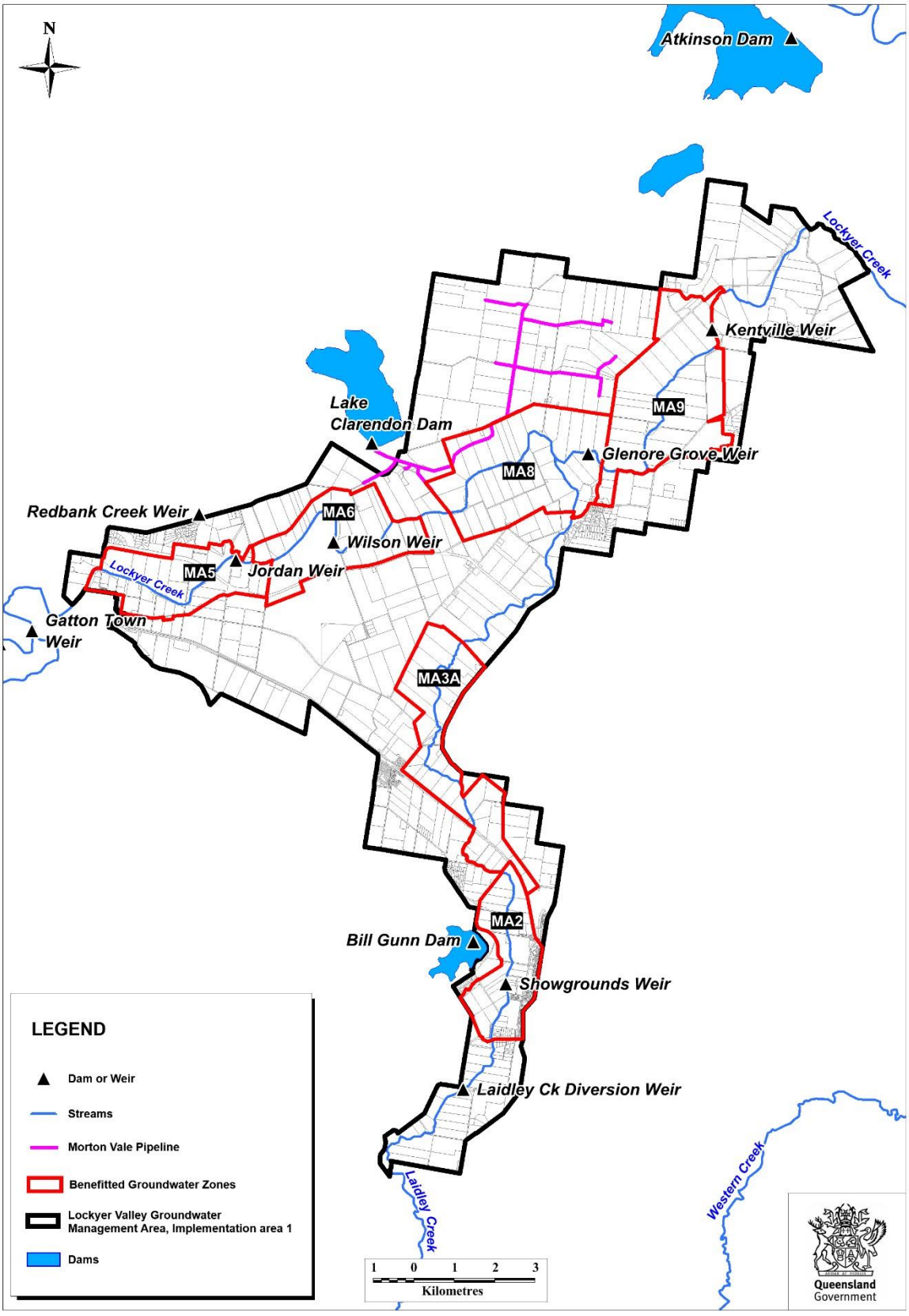
Bill Gunn Dam releases water into Showgrounds Weir on Laidley Creek (Figure F.1). The upstream point of the full supply storage in this weir is AMTD 19.1 km. The first releases from Bill Gunn Dam were made in 1988. When first constructed, water from this dam was released down Laidley Creek to its junction with Lockyer Creek and beyond to Kentville Weir at AMTD 46.4 km on Lockyer Creek.

Water is released from Lake Clarendon into Jordan Weir, which backs up to AMTD 70.9 km on Lockyer Creek. releases continue down the Lockyer Creek to Kentville Weir. The first water was released from Lake Clarendon in February 1996.

Releases are made strategically from both dams to service the supplemented areas of Laidley and Lockyer creeks as described above.

Releases generally occur after a natural flow event. Water is harvested into the dams during the natural flow event and releases are made from the dams as the natural flow reduces and/or stops. The benefits of releases are to maintain groundwater levels in the good recharge areas at a higher level for longer which allows more time for groundwater from these areas to move down gradient through the aquifer to other areas. Releases at higher rates will generally result in higher heads in the creeks and higher recharge rates, although where weirs are present. they have the advantage of maintaining higher heads from lower flow rates.

Figure F.1 : Map of benefitted boundary as at 1997 determinations



Appendix H. Letter from Seqwater

seqwater
WATER FOR LIFE

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Our Ref::WM:JR:D19/68378

3 June 2019

Mr David Wiskar
Executive Director - Water Policy
Department of Natural Resources, Mines and Energy
P O Box 15216
CITY EAST QLD 4002

Dear David

Development of the Water for Lockyer Valley and Somerset Strategic Business Case

As you are no doubt aware, Seqwater has been working in collaboration with the Water for Lockyer Collaborative and the established Working Group and Steering Committee of the Water for Lockyer Valley Somerset Strategic Business Case that has been commissioned by the Department.

As the development of the Strategic Business Case nears an end, it is apparent that the preferred infrastructure option at this early stage of the assessment will involve the utilisation of the Western Corridor Recycled Water Scheme (WCRWS) for supply to Lockyer Valley.

At recent Steering Committee and Working Group meetings our officers have been keen to ensure that the key considerations and constraints that we believe need to be factored into the assessment, are well understood and at least recognised in the Strategic Business Case as matters to be resolved in any subsequent business case. I thought it was worth setting these items in writing to you, as set out below:

1. **Impact on initial recommissioning of WCRWS:** the initial recommissioning of the WCRWS is a significant task and will require extensive community education and engagement. We would be concerned if arrangements for supply to the Lockyer Valley had the effect of bringing forward or increasing the likelihood of the initial recommissioning of the WCRWS, regardless of any cost compensation. That is, our preference would be for any supply to Lockyer Valley irrigators to occur only after the WCRWS had already been recommissioned for urban water supply purposes.
2. **SEQ to be no worse off in terms of regulated bulk water charges and water security:** that is, we would not expect our bulk water customers to pay for the additional costs or risks arising from Lockyer Valley supply to meet either existing and future urban water security needs. This may require irrigation customers to pay charges that offset the additional costs, for example both bring forward and incremental capital and operating costs, required to preserve water security or meet any future changes in standards. Irrigators will also be subject to supply restrictions and interruptions to ration water and prioritise urban supply. These restriction and interruption arrangements will need to be transparent, widely understood and accepted, and able to be implemented over long timeframes.
3. **Consistency with water planning regime:** any arrangements would need to be consistent with, and implementable through, water planning instruments in the Central Brisbane Water Supply Scheme. Those arrangements should not diminish or erode the performance of water access entitlements held by Seqwater and others in the Scheme and may need to be provided for under a

seqwater
WATER FOR LIFE

future Transmission License or similar instrument. The rights of various parties, including Lockyer Valley irrigators, to divert water from the Scheme would need to be clearly specified. Moreover, the arrangements should not place new or additional limits upon Seqwater's annual diversions at Mt Crosby compared to the current situation.

4. **No constraint to supply to existing recycled water (non-urban) customers:** Seqwater is currently able to supply recycled water under contracts direct to certain customers, including Tarong Power Station and Swanbank Power Station. These demands can vary from year to year. Supply to these customers would need to take first priority from any available capacity in the WCRWS.
5. **No change in risk to SEQ bulk water:** some options involve probabilistic assessments to determine impacts on SEQ bulk water, including costs and water security. Translating such assessments into commercial arrangements and prices will require an allocation of risk between the parties involved, given future events (particularly costs, inflows and storage levels) are uncertain. Moreover, levels of service and water security appetite may change over time, and arrangements with the Lockyer Valley should not prevent those changes occurring (e.g. to increase security). Any further development of options should clearly consider the allocation of risks between Seqwater (and ultimately SEQ water consumers) and Lockyer Valley irrigators. For SEQ consumers to be no worse off (and bear no greater risk), all new or additional risks associated with options would need to be allocated to Lockyer Valley.
6. **Asset ownership and funding:** Seqwater has a strong preference to not invest in or own new assets to connect the Lockyer Valley.
7. **Only recycled water of PRW quality standard will be used within the WCRWS assets:** we are concerned the production and transport of lower quality water would compromise our ability to convert to PRW standard later, which could then risk stranding the significant investment in the WCRWS.

I also ask that the Department and Seqwater develop a position on the governance and decision-making framework relating to these options and generally to supplying additional water to the Lockyer Valley. The nature of the supply relationships between the parties (including Seqwater) would also warrant detailed consideration. This is particularly important given Seqwater owns and controls the WCRWS and entitlements from Wivenhoe Dam. I would suggest these arrangements are considered as part of the next stage of the business case assessment, should it proceed.

We look forward to the finalisation of the Strategic Business Case and then continuing to engage with stakeholders as the Preliminary Business Case is commenced.

Should you require further information please contact Wayne Middleton, Manager Water Supply Planning on 0428 690624 or via email wayne.middleton@seqwater.com.au.

Yours sincerely

Ross Muir
General Manager, Water Services

cc: Linda Dobe, Deputy Director-General – Natural Resources, DNRME

Appendix I. Letter from Government

Queensland
Government

Department of
**Natural Resources,
Mines and Energy**

14 June 2019

To whom it may concern

The purpose of this letter is to provide input from the State Government's Project Steering Committee in the development of the Water for the Lockyer Project, as the consideration of the opportunity to achieve a step change economic outcome for the Lockyer and Somerset Regions, moves from the strategic business case to detailed business case phase.

In moving forward, it is important to acknowledge that Wivenhoe Dam and the Western Corridor Water Recycling Scheme (WCRWS) are key bulk water supply assets within the South East Queensland Water Grid which has been developed by the Queensland Government to provide water security for urban populations (and the associated businesses) in South East Queensland.

The costs of developing and operating these assets are currently being recouped from urban water and industrial customers in South East Queensland.

The population of South East Queensland is expected to grow by almost two million people by 2041. As a result, South East Queensland's requirements for urban water are expected to grow substantially.

Consequentially, **the availability and reliability** of these water sources for any use such as irrigation water for the Lockyer are likely to diminish as the urban population of South East Queensland expands.

Any business case and investment decisions regarding the use of these assets needs to adequately consider these facts and any risks that they may pose to any investment, either on farm, or in the development of future infrastructure to provide water to the Lockyer Valley.

The Water Security Program for South East Queensland contains a series of triggers for the recommissioning of the Western Corridor Recycled Water Scheme assets.

With current combined SEQ Dam Levels below 70%, Seqwater and the State Government are currently reviewing recommissioning arrangements and costs.

The timing of recommissioning of the Western Corridor assets is entirely related to dam levels and urban water security for SEQ.

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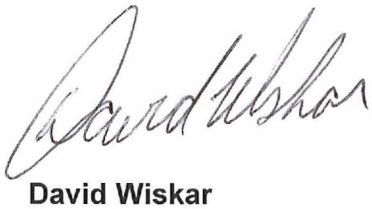
In terms of the Water for the Lockyer project some key facts are worth documenting;

- If the WCRWS is not to be used for augmenting urban water supply there may be impacts to both the WCRWS and the Wivenhoe options in the Strategic Business Case in terms of costs, benefits and pricing.
- The WCRWS options for supply to Lockyer are put forward on the basis of the WCRWS being available as a source for the Lockyer after being "turned on" for urban water supply. The costs associated with this option would significantly increase if this assumption was not realised i.e. if the WCRWS were turned on solely for the supply to Lockyer which is acknowledged in the report as prohibitive.
- In terms of the Wivenhoe option in the Strategic Business Case, the ability to supply significant volumes of water from Wivenhoe to the Lockyer Valley is underpinned by the ability to bring the WCRWS into operation earlier than would otherwise be the case to ensure no net impact on SEQ urban water security. Furthermore, the costs associated with a "bring forward" are to be factored into the price at which water would be made available to irrigators.

To provide direction to any future detailed business case assessment the Queensland Government Project Steering Committee has identified a series of principles and approaches which should underpin any detailed business case assessment (Attachment 1).

In closing, it is also important to recognise that the Queensland Government reserves all of its decision making authority on this matter.

Yours sincerely



David Wiskar
Executive Director, Water Policy, Policy Division

Attachment 1

Principles for the Development of a Detailed Business Case (DBC) Water for the Lockyer

- The DBC must be developed in accordance with the Building Queensland Business Case Development Framework.
- Economic assessment must occur in accordance with the Building Queensland Cost Benefit Assessment guidelines with strict adherence to the appropriate inclusions in costs and benefits.
- Pricing of water needs to occur in the first instance based on full cost recovery principles (including return on, and of, capital as well as all ongoing operational and maintenance costs).
- Demand for water from the additional water supply and security options need to be assessed specifically in the context of the price at which water would be available.
- Consideration of an appropriate level of customer commitment (i.e. commensurate with the level of detail of the assessment) should be incorporated into the DBC process.
- SEQ Urban water security cannot be negatively impacted by any of the options for additional water supply or security.
- SEQ urban water users must not be responsible for any increase in costs associated with any option considered.

Appendix J. Letter from the Lockyer Valley and Somerset Water Collaborative

Note: The issues raised in the attachment to the letter have been discussed at the PWG meeting on 22 July 2019 and the agreed response incorporated in this report.

LOCKYER VALLEY + SOMERSET
WATER COLLABORATIVE

Project Office
Lockyer Valley Regional Council
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19 July 2019

Mr David Wiskar
Executive Director
Water Policy | Policy Division
Department of Natural Resources, Mines and Energy

Dear David,

Following completion of the Draft Strategic Business Case for the Water for the Lockyer Project by Jacobs Advisory, the Lockyer Valley & Somerset Water Collaborative recently conducted a workshop to consider its contents and recommendations. The workshop was held on Thursday 4 July and was facilitated by Tom Vanderbyl (Badu Advisory). We also benefited from the attendance and input from Matt Bradbury.

The Collaborative also consider the letters from Seqwater and yourself that have been attached as appendices to the draft report.

I have attached a table which lists a range of issues which the Collaborative would like addressed prior to the finalisation of the Strategic Business Case. A number of these issues will be taken on Board by Jacobs as matters of clarification, however others may require broader consideration.

Kind regards

Stephen Robertson

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Project Partners

Lockyer Valley Regional Council · Somerset Regional Council · Lockyer Valley Growers · Lockyer Chamber of Commerce & Industry Engaging Our Region · Queensland Urban Utilities · LWUF lockyer water users forum

Strategic questions / issues

Strategic questions/issues re the Water for the Lockyer Strategic Business Case	LVSWC Recommendations

The LVSWC notes that at Section 5.3.3. (p31 of the Report) the various assets and schemes owned and operated by Seqwater in the Lockyer Somerset regions and the past performance of some of these assets are listed.
 	
The LVSWC understands that Seqwater is undertaking work to assess ways to improve the operational efficiencies of these assets including a review of operational rules and capital upgrades.
 	
The LVSWC further notes that Seqwater's letter to DNRME (attachment H) also does not refer to this body of work.
	• With respect to further consideration of Option 7 – Increase Diversion Capacity and Option 8 - Weir & Channel Improvements, the draft Strategic Business Case be updated to:
	  • note and detail the work proposed to be undertaken to upgrade and improve or redesign the operational efficiencies of existing water assets including weirs and channels.
	  • note that, as a consequence DNRME may need to refine the rules by which the water may be taken
	  • re Clause 5 of the recommendations, change "may" to "will".

Grower representatives of LVSWC noted that the Gross margins approach adopted in the draft SBC does not reflect how their members assess on-farm infrastructure investment opportunities. It is more common that growers adopt a farm gate value methodology.	• Suggest including a paragraph in the SBC referring to the type of information that will be required (noting that this will not be the same as that required by Building Queensland) in preparation for discussions with growers in advance of undertaking the demand assessment • Reference 2017 WSP Report - *Lockyer catchment preliminary socio-economic study* re: farm gate information • Review Appendix A para 2 (p107) to remove suggestion that the new water would be used for grazing – perhaps replace with lower value uses.
Page 39. re increase in crop cycles from 1.5 to 2.5 per annum does not seem to translate to a corresponding increase in production	• add clarification to para on page 39 that the draft SBC has assumed that not every landholder would take up the opportunity to increase crop production/cycles which would conservatively result in 50,000 ML additional demand (although this could be significantly more).
Page 61. Table 10.1 - LVSWC seeks to clarify who should lead complimentary options with respect to future market opportunities and supply chain improvements studies? Note at p96. (Table 13.4) currently 'Government' listed as responsible for undertaking these studies.	• Move these options to the ongoing list in the Conclusions (as well as the relevant tables in the body of the report) • Re: Market Opportunities & Supply Chain Improvement Studies – Lockyer Valley Regional Council is offering to lead collaboration with industry (including securing sources of funding). • Need to benchmark existing to enable measurement of activities undertaken from this point in time.

Strategic questions / issues

Strategic questions/issues re the Water for the Lockyer Strategic Business Case	LVSWC Recommendations
While important, and given the number of recommended actions, LVSWC is concerned that the work on the list of complementary options may slow down the work required to develop a Detailed Business Case.	• LVSWC acknowledges that work on the complementary options are important however the priority action is the developing Detailed Business Case. LVSWC is seeking assurances that should the Water for the Locker Project proceed to the next stage Detailed Business Case, that this work will not be unduly delayed or distracted by work on the list of complimentary options.
Page 105 Conclusions Recommendation 2 LVSWC Grower Representatives consider that that Option 20 is sufficiently different to options 19 and 23 that it should be uncoupled from the preferred options going forward as it would involve more complex management arrangements arising from recharge of water to the aquifer	• Recommend add third dot point to recommendation 2 referring specifically to Option 20 and to correspondence from Growers to DNRME outlining their concerns regarding implications for water metering across the whole valley. • LVSWC requests that this correspondence be attached to the SBC as an appendix.
LVSWC notes Seqwater's strong preference regarding ownership and funding of infrastructure to facilitate delivery and distribution of new water supplies to the Lockyer Valley & Somerset regions. It is further noted that Seqwater proposes developing a joint position with DNRME on the governance and decision-making framework in this regard.	• LVSWC seeks early engagement with Seqwater and DNRME to consider options on how new water infrastructure might be owned and managed including models of local management as part of development of the detailed Business Case.
Page 103 13.4.5 (Cost Reflective Pricing) LVSWC is concerned about the impact of requiring irrigators to pay fixed charges in years that supplies receive no water. This may be a significant disincentive for growers to enter into long term contracts and therefore undermine the business case.	• LVSWC request analysis of options for how fixed and variable charges may be structured around water availability as part of the development of the detailed business case. One option to consider to enable consideration of a wide range of options is to replace the term "annual fixed charge" with "long-term average annual cost" in the SBC.


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