Sustainability Assessment

Water Forever: South West

June 2014

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Introduction

Sustainability is defined as "meeting the needs of the current and future generations through integration of environmental protection, social advancement and economic prosperity"[1].

This report describes the sustainability assessment tool (SAT) used to evaluate the various source options for the Water Forever South West Project, how it was developed, and how it is applied, and the results of the assessment. The purpose of this report is outline the SAT method used to evaluate the sustainability of various source options.

Background

The assessment process used in the Water Forever South West Project is very similar to that used for the Water Forever Perth and Water Forever Lower Great Southern Projects. It was developed from a number of widely accepted sources including the Water Services Association of Australia Sustainability Framework[2], International Association for Impact Assessment[3], and the Corporation's own business principles which focus on delivering positive outcomes.

Sustainability Objectives

The overall aim of the Water Forever South West sustainability assessment is to identify the most sustainable water options, taking into account a range of issues and impacts.

In addition, the assessment aims to:

- Develop and prioritise a portfolio of sustainable water supply options;
- Ensure the integrated assessment of demand (efficiency) and supply (source) options including the use of wastewater as a source;
- Ensure early exclusion of options which are unacceptable based on cost, environmental or public health risk;
- Demonstrate transparency around the data and analysis available to perform the assessment;
- Incorporate stakeholder input into the development of options and criteria, as well as analysis; and
- Investigate and implement opportunities to improve the outcomes of options through mitigation and enhancement.

It is noted that there are challenges in undertaking sustainability assessment over a long time horizon (50 years). A 50 year plan allows us to consider robust forecast population growth, an even drier climate, and our impact on the environment. The SAT tool does document the issues and impacts with knowledge at a particular point in time, and hence is useful for informing the water options that are including the portfolio.

When there is a supply gap shortage in the future the available options will be investigated in more detail, including an updated sustainability assessment with the best tool at the time. The use of this SAT is to allow us to compare many options at a high level.

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[1] Western Australian State Sustainability Strategy, 'Hope for the Future (2003)'
[2] WSAA Sustainability Framework (WSAA Occasional Paper No.17, February 2008).
[3] January 1999

Sustainability Methodology

Multi-criteria analysis was chosen as the tool to enable assessment to be measured against individual criteria and aggregated into an overall ranking or performance matrix of options.

A comprehensive assessment of 80 source options was undertaken based on 15 detailed sustainability assessment criteria. These 15 criteria are detailed below and are evenly split and weighted between the environment, social and economic pillars. Integrated resource planning ensures that options to reduce demand on water supplies (such as water use efficiency initiatives) are compared on an equal basis with options that increase supply (such as new water sources).

Appendix 1 summarises the sustainability assessment tool used to evaluate each option. Each option can be rated with a sustainability score of between 0 (least sustainable) to 4 (most sustainable) against each criterion. Therefore assessment against 15 criteria will provide a total sustainability score of between 0 (least sustainable) and 60 (most sustainable).

4.1 Environmental

The criteria included in this pillar are outlined below.

4.1.1 Physical Footprint

This criterion reviews the amount of clearing of vegetation (native, forests etc) that is required to implement each source option compared with the water extracted. The unit used is Water Yield (billions of litres per year) per Footprint Area (Hectare). Options that involve no clearing, or that have the highest yield per hectare cleared, will be more sustainable and productive than options that involve vegetation clearing for low water yield. Clearing has been used as a measure because it can generally be used as a surrogate for impact on biodiversity, where detailed environmental impact assessment has not been completed.

4.1.2 Energy Intensity

This criterion evaluates the power used to produce each kilolitre of water. The less power, the more sustainable the option is rated. This criterion is based on the Water Corporation's Greenhouse Gas Strategy which advocates the pyramid of energy use, avoidance and efficiency, followed by use of renewable energy and then offsets (particularly offsets that provide multiple business benefits).

There cannot be water supply without energy, and therefore energy is a key factor in the sustainability of all future water supply options. There is no doubt that power will always be available for all source options, however the source and cost of the power will change.

Currently power is provided to all current south west water supplies through the South West Interconnected System. The mix of power sources for this grid is 54% coal, 40% gas, 5% renewable and <1% diesel. Future power options for water source options such as the micro-desalination plants in the south west will preferentially be from renewable sources such as wave energy or wind turbines. It is advantageous for the water supply industry to adopt renewable energy because carbon emissions from traditional power sources are linked to global warming, rainfall reductions and subsequently a reduction in available potable surface and groundwater supplies.

Highly energy intensive new water sources, such as desalination, or water sources that are a geographically distant and require pumping over many kilometres, do achieve a low sustainability score using the Sustainability Assessment Tool methodology to reflect the points made above.

4.1.3 Capacity to enhance the environment

This criterion evaluates whether the option enhances, maintains or degrades the environment and to what degree. The options that enhance the environment achieve a higher sustainability score. Impacts on national parks, nature reserves, State forests, threatened ecological communities, groundwater dependent ecosystems, wetlands and acid sulphate soils are just some of the impacts measured through this criterion.

4.1.4 Water Efficiency/Waste Management

This criterion assesses if the option contributes to more efficient use of water resources (either potable water, wastewater or non-scheme water). It is specifically targeting water recycling options such as Groundwater Replenishment, Managed Aquifer Recharge and alternative water supplies for Public Open Space, industry, agriculture and third pipe systems. Options that can recycle water without treatment score higher on the sustainability scale than those that require treatment. The Water efficiency and Alternative Water Supply suite of options such as rainwater tanks, greywater systems, behavioural programs, retrofits, smart metering, leak detection and water restrictions gain the highest sustainability score under this criterion as they reduce water use. The assessment of this criterion reflects the Environmental Protection Authority's hierarchy for management of waste as follows:

- Avoidance;
- Reuse;
- Recycling;
- Recovery of energy;
- Treatment;
- Containment; and
- Disposal.

4.1.5 Water Allocation

This criterion evaluates whether the groundwater/surface water source option is supported by a Department of Water Allocation Plan or Water Management Plan (WMP). If it is, or if a WMP is not required, then the option gained the highest sustainability score. Source options that conflict with a WMP or are not supported by a WMP receive the lowest sustainability score against this criterion.

4.2 Social

The social criteria included in this pillar are outlined below.

4.2.1 Community Preference

This criterion measures the community support for each option as determined by the community response from the "Have your say" stage of the community consultation phase of the project. This involves feedback from a statistically representative phone survey conducted in January 2014 of south west residents. The higher the percentage support, the higher the sustainability score.

Environmental issues related to water supplies such as water needs, environmental pollution, energy and climate change were amongst the top important issues to people in the south west according to the phone survey being the first, third, fourth and sixth respectively. 78% of people thought water supply was the top issue, 65% were concerned about environmental pollution and 46% were worried about climate change impacts. The community preference criterion endeavours to capture some of these concerns.

4.2.2 Indigenous Heritage (sites)

The *Aboriginal Heritage Act 1972 (AHA)* protects places and objects that may be of importance to people of Aboriginal descent in Western Australia. This criterion determines if the options impact on registered indigenous heritage sites, and is evaluated using the Register of Aboriginal Sites. Those that have no impact score the highest sustainability score.

4.2.3 Long Term Amenity/Lifestyle Value

This criterion evaluates whether the option enhances, maintains or reduces the social amenity/lifestyle and to what degree. The options that enhance social amenity and lifestyle value achieve a higher sustainability score.

When considering options for the future, the following values are considered to provide social amenity and lifestyle benefits:

- Objective – recreation (fishing, camping, walking, water sports) and tourism (which may also have links to economic benefit), land value; and
- Subjective – sense of place, lifestyle – strongly related to the environment, deriving pleasure out of something “because it is there” (proximity to waterways and wetlands, bushland, public open space, visual amenity, having green lawns etc).

Social amenity and lifestyle can be impacted by many factors including odour, noise, presence of infrastructure (impacting visual amenity), removal of bushland, declining water levels, water restrictions, restricted access and increased cost.

4.2.4 Empowers Customers

Assessed by the Water Forever Project Team, this criterion determines how much personal ownership customers will have over each source option. Options where customers have full control of the source and how it is used will have the highest sustainability score (eg. rainwater tanks, water efficiency behavioural programs), compared to options where there is low or no customer control (eg operation of desalination plants or water restrictions on potable scheme supplies).

4.2.5 Source Risk

This criterion is assessed by the Corporation’s Drinking Water Quality Branch and evaluates the safety of the water option for potable supply. Sources where there is a low water quality risk will achieve a high sustainability score; sources where there is a high water quality risk will receive a low sustainability score.

4.3 Economic

The economic criteria included in this pillar are outlined below.

4.3.1 Net Economic Cost to Community

This criterion determines the cost per kilolitre in 2013 dollars for each source option. It is evaluated by the Corporation’s Infrastructure Planning Branch and Pricing and Evaluation Branch considering capital and operating costs for each option. The lower the cost, the higher the sustainability score.

4.3.2 Complexity

This criterion determines the degree of technical and/or regulatory complexity of implementing each source option in terms of planning, setup and operation. This can affect timing and may create operational issues which could add to the overall cost. It is evaluated by the Corporation’s Infrastructure Planning Branch. A highly complex project to provide water (eg groundwater replenishment or desalination) will score a lower sustainability score than a project with a very low level of complexity (eg. groundwater bore).

4.3.3 Reliability

This criterion evaluates whether the source option is a reliable one in terms of asset breakdown or water volumes or water savings (for water use efficiency initiatives). For example, water use efficiency initiatives are given a low level of reliability (and hence low sustainability score) as they rely on the customer’s behaviour to implement which cannot be guaranteed. In contrast, a desalination plant asset has a high level of reliability to provide a source of water and therefore will attain a high sustainability score under this criterion.

4.3.4 Rainfall Dependence

The level to which the option is dependent on rainfall was assessed by the Corporation’s Infrastructure Planning Branch under this criterion, with rainfall dependent options (eg. dams, shallow groundwater) receiving a lower sustainability score than non-rainfall dependent sources (eg. desalination, recycling). This criterion reflects the reliability of the sources into the future with the drying climate trend in the south west of the State. CSIRO are predicting further reductions in streamflows to the dams and less groundwater recharge in the south west.

4.3.5 Flexibility and Adaptability to Changing Circumstances

This criterion evaluates whether a chosen water source option can adapt to changing circumstances such as changes in demand, drying climate, energy provision etc. It was assessed by the Corporation's Infrastructure Planning Branch.

Six sub-criteria have been identified to assess this criterion. These include:

- Multi-use – the capacity can be used in different ways;
- Staged construction – option can be developed in stages;
- Ability to be moved, turned off/on, reversed, collapsed and recycled;
- Susceptibility to incompatible land and marine uses – this includes both water quality and quantity issues;
- Accommodate changes in inputs such as chemicals/membranes, materials availability, energy and skilled labour; and
- Ability to adapt to changes in technology.

For example, it is considered that a dam asset has a low ability to be flexible and adaptable should the climate continue to dry as it cannot be relocated elsewhere so it will receive a low sustainability score under this criterion. In contrast, water use efficiency initiatives are fully flexible and adaptable to changing circumstances and will receive a high sustainability score under this criterion.

4.4 Data Quality

The quality of the data used in the planning and assessment of each source option was given a rating by the Corporation's Infrastructure Planning Branch. The ratings ranged from 5 (excellent quality) to 1 (no data/information available). Table 1 below summarises the data quality rating system.

4.5 Detailed Assessment

Detailed scoring is included in Appendix 2 and discussed in the next section of this report.

4.6 Sustainability Assessment Review

The Water Reference Panel reviewed the sustainability assessment methodology at their first meeting in October 2013 and were satisfied with the proposed methodology.

The Water Reference Panel reviewed the sustainability assessment again during the community feedback consultation phase in March 2014, and the draft report. A summary of the final sustainability assessment report will be included in the final South West Water Forever Project report.

Table 1 – Data Quality Rating

Rating	Description
5	Excellent quality – current planning report or consultants study
4	Good quality – old planning report or consultants study
3	Average quality – external reports, websites
2	Below average quality – incomplete data
1	No data/information available – broad estimates only

6 Results of Assessment

6.1 Summary

Figure 1 shows the raw scores of each source option as well as the level of data quality used to assess each option. Figure 2 shows the raw sustainability scores for each option split between the environmental, social and economic pillars.

Similar options have been summarised with the mean scores for each grouping as shown in Figure 3. This figure also shows the community support for each suite of options.

Figure 4 shows the same information in addition to the volume of water estimated to be yielded by each source. The most popular community preferences tend to have some of the lowest total yields. Other than dams, this preference is generally supported by the sustainability assessment and the community engagement work undertaken by the project.

This reflects a hierarchy of community preference for water efficiency initiatives, alternative water supplies, dams and recycling options ahead of groundwater and new sources. The following sections examine these groupings in further detail.

6.2 Water Efficiency

In the south west we can undertake a number of water efficiency initiatives without affecting our standard of living.

This includes initiatives like customer comparative usage feedback on customer bills, influencing land development (eg mandatory waterwise land developments, waterwise councils, urban density) and urban form, leak detection and repair of Water Corporation asset infrastructure,, and the traditional customer water efficiency programs (eg. changing water use behaviour, more water efficient fixtures and fittings, leakage detection, pressure management, smart metering etc).

All water efficiency initiatives score maximum points on:

- Physical footprint;
- Energy intensity;
- Water efficiency;
- Water allocation;
- Source risk;
- Community Preference;
- Net economic cost to community; and
- Rainfall independence.

These options do not directly require the building and operation of any water infrastructure like a dam or a desalination plant. Given that they are programs, they can be easily revised to accommodate changes in consumer behaviour or other factors.

However these options score poorly on the Reliability sustainability criteria. Reliability is an issue for these programs as they rely to some extent on customer behaviour for short and long term savings. There has been a 15% reduction in demand in the south west over the past 5 years, and it is difficult to predict if further reductions can be achieved into the future.

In addition these programs often require new policy and regulation to support water use efficiency. Hence the regulatory complexity is significant. The push for increasing housing density and improved urban form requires land planning policy, developers and consumers to collaborate otherwise these cannot be achieved.

The community response to more water restrictions (above the current sprinkler roster of two watering days per week) was divided, with only 37% support.

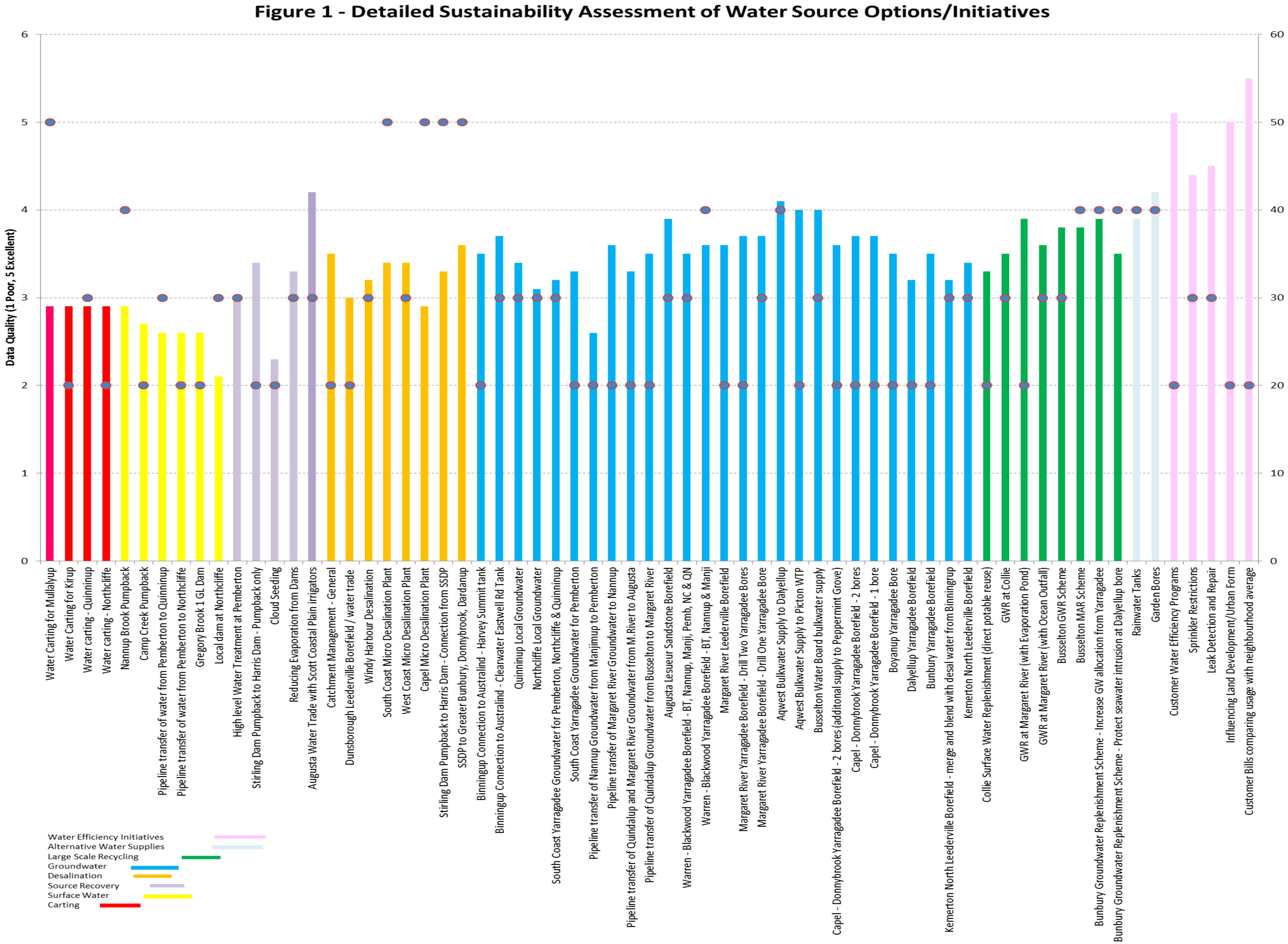

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Figure 2 - Sustainability Assessment Results

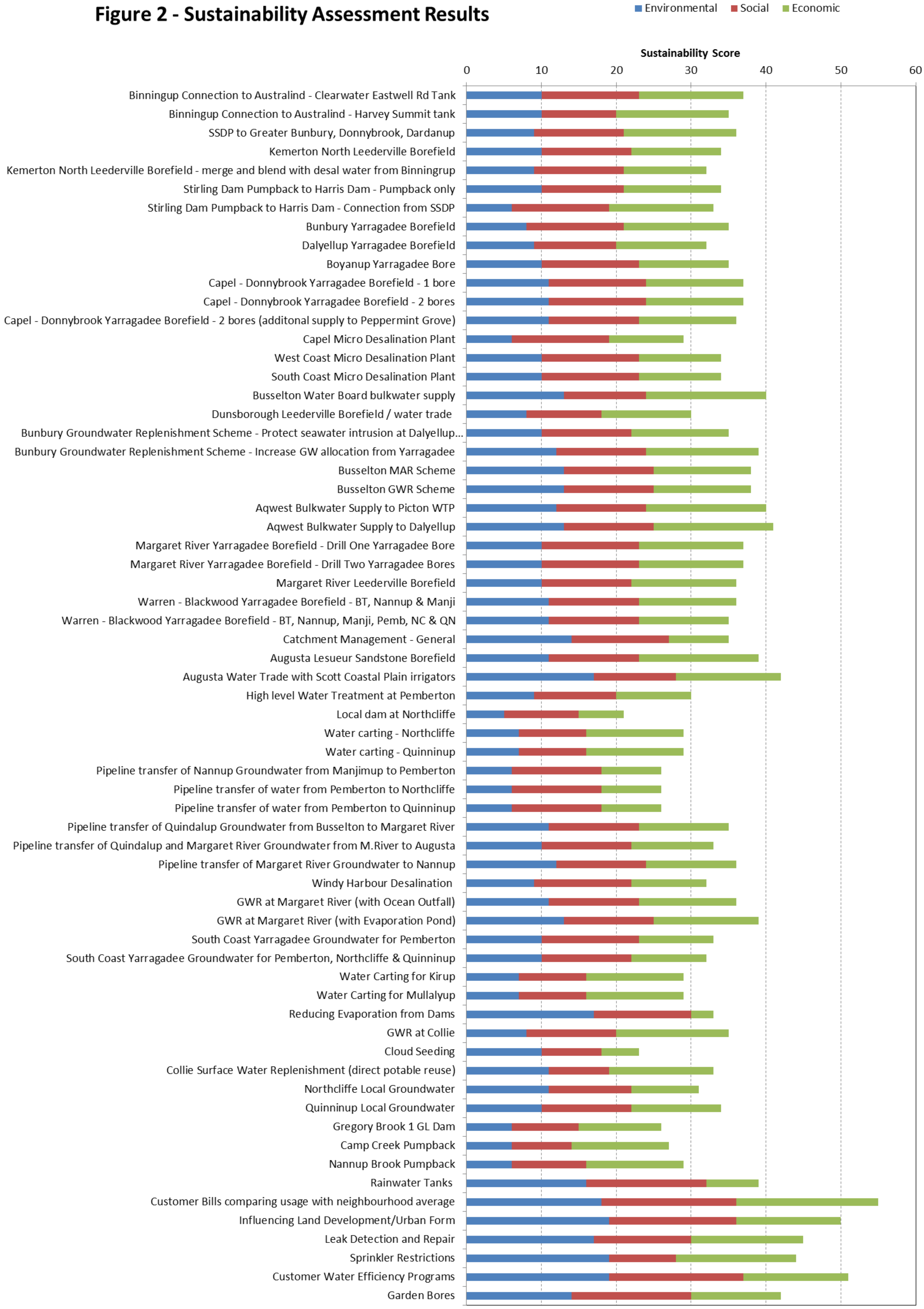


Figure 3 - Sustainability Assessment & Community Support

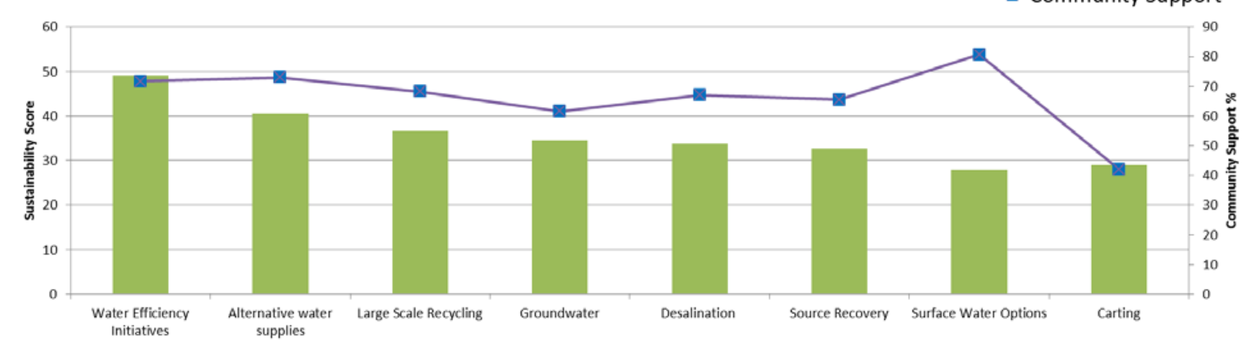
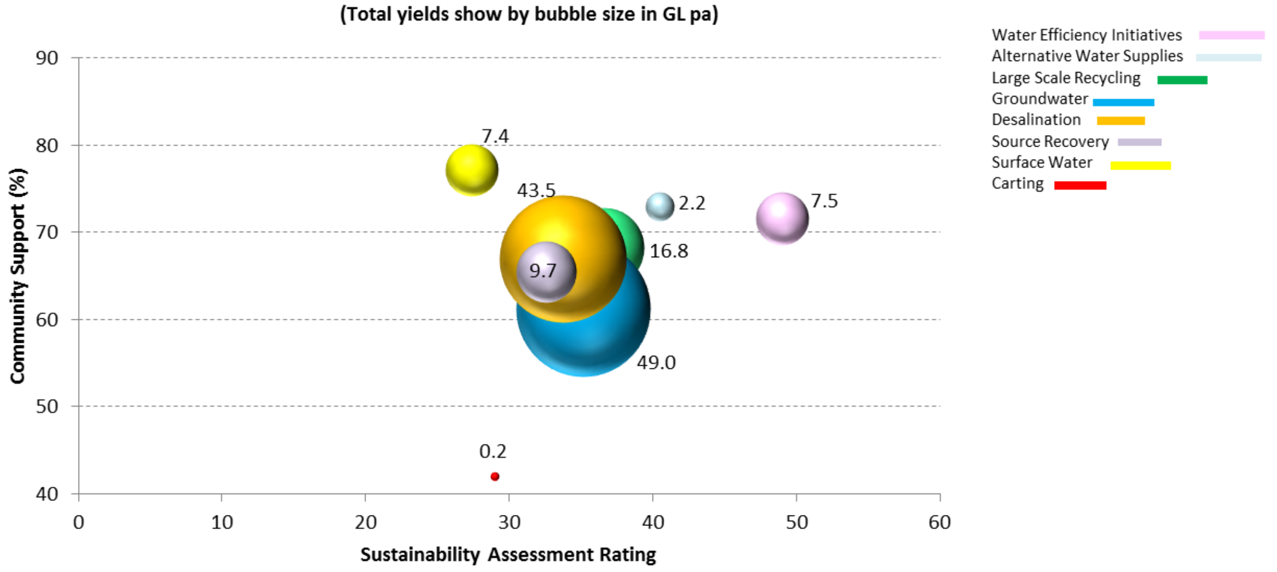


Figure 4 - Community Support & Sustainability

(Total yields show by bubble size in GL pa)



6.3 Alternative Water Supplies

The two source options assessed under this category were rainwater tanks for new services, and garden bores for new houses (for the area Dunsborough to Eaton/Australind only). This option performed well in the areas of:

- Empowering customers
- Energy intensity
- Indigenous heritage
- Physical footprint

This reflects the ability for customers to control this source and its use in the home. Rainwater tanks afford protection against externally imposed restrictions, and provide a fit for purpose alternative for outdoor watering, food production (excluding greywater) and other non-drinking water uses such as toilet flushing.

However alternative water sources can be expensive because the yield of water produced is relatively small compared to the cost of installation and operation. Water sourced from rainwater tanks for non-potable use costs between $9/kL and $13/kL, whereas Garden bores are much cheaper at up to $5.50/kL.

East of the Australind bypass in East Eaton, where the majority of population growth is forecast, the superficial aquifer is dominated by heavy clays and is unfortunately not suitable for domestic bores. In these areas, garden bores would only be feasible if they drew from the confined Leederville aquifer, requiring a license from the Department of Water. There is limited recharge to the Leederville at this location would be the limiting factor to the number of domestic bores.

6.4 Large Scale Recycling

The new water source option that will become more attractive in the future in the south west is groundwater replenishment and managed aquifer recharge.

Groundwater replenishment (GWR) is a process where secondary treated wastewater is further treated to drinking water standards and recharged into an aquifer. The treatment is to the highest standard involving ultrafiltration, reverse osmosis and UV disinfection. Once pumped back into the aquifer, the high quality water then mixes with existing groundwater and can be taken out many years later and treated again for use. Towns in the south west where GWR may be viable are Bunbury, Busselton, Margaret River, and Collie. The Groundwater Replenishment Trial (GWRT) located in Perth, the first GWR scheme in Australia, had recharged 3.5 GL by the beginning of March 2014. Stage 1 has commenced construction and is scheduled to begin recharging 7 GL/yr by mid 2016. Eventually the Perth GWR scheme will provide 28 GL per year of water. The schemes in the SWR would be smaller with the annual volumes by 2060 predicted to be 0.6 GL (Collie), 0.75 GL (Margaret River), 3.2 GL (Busselton) and 6 GL (Bunbury).

Managed Aquifer Recharge (MAR) involves treating the incoming secondary treated wastewater to tertiary quality prior to injecting it into a local confined aquifer (usually Leederville or Yaragadee). Water can be either: injected back into the confined aquifer along the coastline to prevent seawater intrusion into the less saline groundwater. This protects the groundwater resource for all users, not just the Corporation, because once an aquifer becomes saline it becomes unusable for drinking water and other uses; or MAR water can be recharged to the aquifers (confined or unconfined) and then indirectly reused by industry or agriculture.

Suitable locations for MAR in the south west are Bunbury and Busselton. The Bunbury MAR scheme purpose would be to provide a saltwater barrier and would recharge 1.7 GL per year. The Busselton MAR scheme could recharge 3.2 GL per year which could be used as both a saltwater barrier and for agriculture/industry.

Recycling options achieve very high scores for community preference, rainfall independence, water allocation, reliability and flexibility. This reflects the lack of any dependence on rainfall making them attractive in a drying climate. Once the infrastructure is in place it can be used for other purposes (eg. a water recycling plant could be used to desalinate brackish groundwater with some modifications).

However large scale recycling options like MAR and GWR score poorly on empowering customers as these options are large, scheme based solutions where the customer has no control over the source and supply of the water. They are also highly technical and complex from a regulatory perspective, with the GWR scheme in Perth taking a decade to get approval. It is anticipated similar schemes in the south west will require 6 to 8 years of assessment in local conditions before regulatory approval can be attained.

The recycling options also have the higher source risk (being sourced from secondary treated wastewater) than more traditional sources such as dams and groundwater in protected catchments. This can be mitigated by higher levels of treatment, management and regulatory controls.

6.5 Groundwater

Groundwater source options form the majority of the investigations for this project and provide the largest total yield of any other source, reflecting the available groundwater allocations in the south west. These options score well on source risk (particularly where the water is sourced from a confined aquifer). The sources also score well on cost per kilolitre (often less than $3/kL) unless there is a significant conveyance distance.

As with other large schemes options, groundwater scores poorly on empowering customers.

6.6 Desalination

Eight desalination options were assessed in this project. Four involved connection to the existing Southern Seawater Desalination Plant in Binningup to provide 5 to 10 GL of water to the northern part of the study area. The other four desalination options involve new micro-desalination plants that individually would provide between 1 and 8 GL/year of water each. These are proposed to be located on the coast near Capel, Yallingup, Augusta and Windy Harbour.

These options have high supply security because, in common with water recycling, desalination does not rely on rainfall and is not dependent on water allocation policy (although environmental approvals are required). Desalination is highly attractive in a drying climate.

Desalination scores highly on a public health criteria – due to the high levels of treatment (membrane filtration rather than chemical). Seawater has a lower source risk than treated wastewater or dams with degraded catchments. Desalination also provides a high water yield for the region, second only to groundwater.

The downside of desalination options is high energy intensity, and the cost (especially when distant from demand due to the pipeline and pump stations eg. Windy Harbour and Augusta). Energy requirements can be managed by sourcing energy from renewable sources such as wind and/or wave energy or offsetting greenhouse emissions if these options are adopted around the 2050 to 2060 timeframe.

6.7 Source Recovery

Options assessed under the source recovery category were:

- water trading with farmers on the Scott Coastal Plain and in Dunsborough;
- catchment management;
- reducing evaporation in dams; and
- cloud seeding.

These options generally perform well on cost and energy intensity, reflecting the low need for significant infrastructure. However reducing evaporation in dams scores very poorly on economic costs because there is significant cost in infrastructure for floating covers on dams.

None of the source recovery options empower customers due to their centralised nature. At least two of them (cloud seeding and catchment management) are rainfall dependent. In addition there are low levels of reliability of all but the water trading. Water trading options have good environmental outcomes where water saved from efficiencies is traded but are highly complex from a commercial and regulatory standpoint.

Catchment management received the highest level of community support (88%) of any option in the water forever south west portfolio. In comparison, water trading received the lowest community support of 29%. Verbatim comments from the phone survey that produced these community preference figures, indicate that some community members were not aware that "catchment management" in a drinking water supply setting refers to a range of forestry practices such as undergrowth thinning to return the forest to a more natural state that will use less water. The figures also show there was not enough information provided around about water trading.

6.8 Surface Water

Surface water options have the highest community preference as future water sources other than catchment management, with 83% support.

These options are also the best performers on cost, energy intensity, and reliability in relation to sustainability.

However they are poor scoring on water quality, especially the supply to Pemberton from Big Brook Dam where recreational use occurs in the surface water catchment and water body. With respect to rainfall dependence, these options are the worst performers as they are fully rainfall dependent and very much impacted by climate change. New dams also require significant clearing of vegetation and often impact indigenous heritage areas, so surface water options again scored low in these environmental and social criteria. The yield of five out of the six surface water options is fairly small at less than 0.4GL/yr.

6.9 Carting

Water carting currently occurs in the towns of Northcliffe, Quinninup, Kirup and Mullalyup. Carting occurs all year round in Northcliffe and Quinninup due to water quality risks in the traditional surface water sources for these towns. It is seasonal in Kirup and Mullalyup.

Sustainability assessments show that this is the least sustainable option in terms of cost per kilolitre, water quality, energy intensity and community support. It also scores poorly on customer empowerment as customers have no say as to when this operational activity occurs.

7 Sustainability Assessment and Other Key Factors

There are a number of specific factors which have traditionally been highly influential in source decisions. These include:

- Cost;
- Water quality;
- Rainfall dependence;
- Reliability; and more recently
- Energy Intensity.

Another issue that is important to consider with respect to the options is the expected water yield.

The following graphs demonstrate how these specific factors rate against the expected water yield (or savings in the case of water use efficiency initiatives) and the overall sustainability score for the options. The water yield is shown by the size of the bubble on the graph.

7.1 Cost & Sustainability

Figure 5 shows the median cost per kilolitre of water for each source option against its sustainability. The results show that water efficiency initiatives are the most sustainable and on average have the least cost. In the south west, the traditional sources of surface water and groundwater perform also well in relation to cost and sustainability. Similarly, source recovery options such as water trading and catchment management are also favoured. In comparison, alternative water supplies like rainwater tanks and carting are expensive relative to the volume of water they provide.

High technology new source options such as desalination and groundwater replenishment score less favourably against this indicator.

7.2 Water Quality & Sustainability

Desalination, water trading and groundwater from confined aquifers such as the South West Yarragadee perform well in relation to water quality and sustainability (Figure 6). Again, water efficiency initiatives are standout performers against these indicators. Dams and carting water from dam sources are the least favoured in terms of water quality and sustainability. Rainwater tanks for non potable uses and water recycling pose the highest risk for water quality, despite registering a good outcome on the sustainability assessment.

7.3 Rainfall Dependence & Sustainability

High yielding desalination and water recycling options are the stand out here because they are rainfall independent (Figure 7). In a drying climate, as is forecast for the south west region, these are attractive options. Similarly, water efficiency initiatives are attractive under this indicator. Dams and rainwater tanks are the least attractive as they are fully rainwater dependent.

7.4 Reliability & Sustainability

Figure 8 emphasises the high reliability (in terms of asset reliability and water yields (or water savings for water efficiency initiatives)), large yields and high sustainability score of the large scale water recycling options such as groundwater replenishment and managed aquifer recharge. Desalination also rates as a highly reliable source. Surface water options (dams) are also highly reliable (climate issues aside). In comparison, water efficiency initiatives are considered a low reliability because the Water Corporation can only influence, not fully guarantee, the implementation and adherence to them by customers.

7.5 Energy Intensity & Sustainability

Water efficiency initiatives and rainwater tanks have the best outcome in relation to energy usage and sustainability, however the total yield is small (Figure 9). Dams also rate as a good performer for minimising energy usage. In terms of best yield for a good sustainability and energy intensity outcome, groundwater options are the most favourable.

8 Concluding remarks

Water Corporation understands the need to deliver sustainable outcomes when planning for water, wastewater and drainage services. It is our responsibility to provide customers with safe and reliable water services. We aim to provide water solutions that deliver a “quality of life” for customers and surrounding communities, in an environmentally responsible and affordable way.

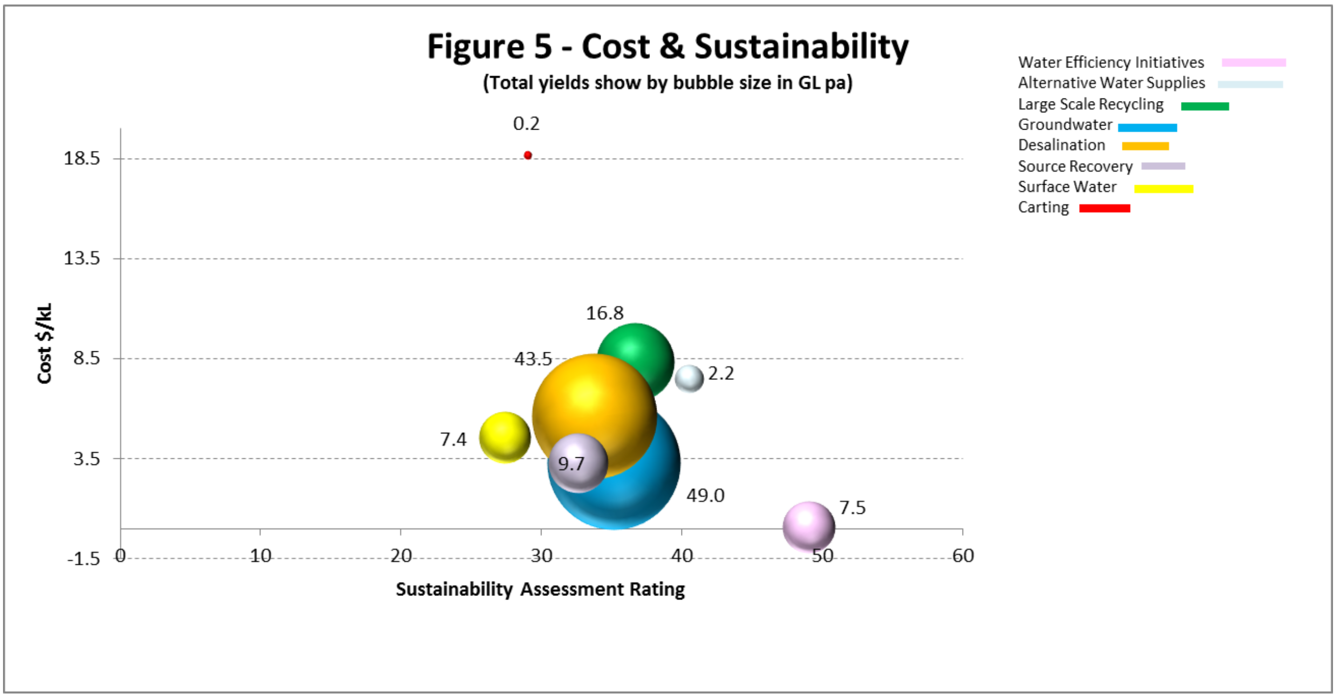


Figure 5 - Cost & Sustainability
(Total yields show by bubble size in GL pa)
Water Efficiency Initiatives
Alternative Water Supplies
Large Scale Recycling
Groundwater
Desalination
Source Recovery
Surface Water
Carting
Cost $/kL
18.5
13.5
8.5
3.5
-1.5
0
10
20
30
40
50
60
Sustainability Assessment Rating
0.2
16.8
43.5
2.2
7.4
9.7
49.0
7.5

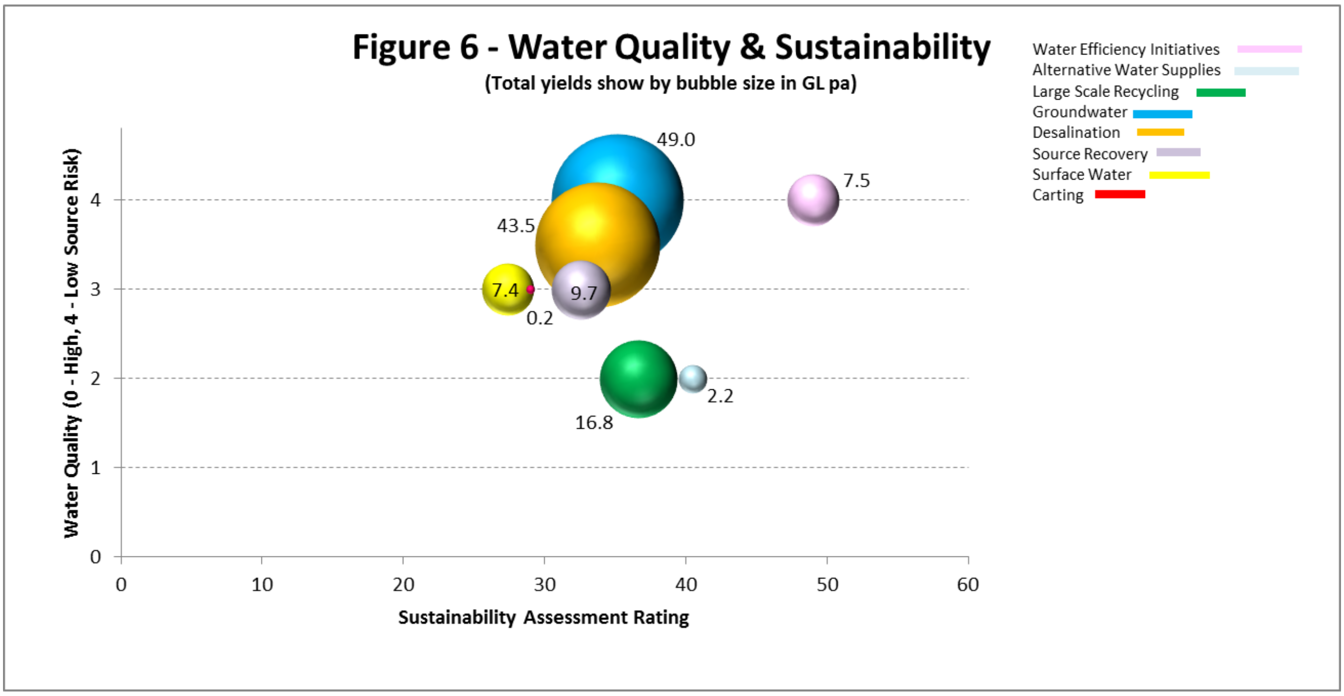


Figure 6 - Water Quality & Sustainability
(Total yields show by bubble size in GL pa)
Water Efficiency Initiatives
Alternative Water Supplies
Large Scale Recycling
Groundwater
Desalination
Source Recovery
Surface Water
Carting
Water Quality (0 - High, 4 - Low Source Risk)
0
1
2
3
4
0
10
20
30
40
50
60
Sustainability Assessment Rating
49.0
7.5
43.5
7.4
9.7
0.2
2.2
16.8

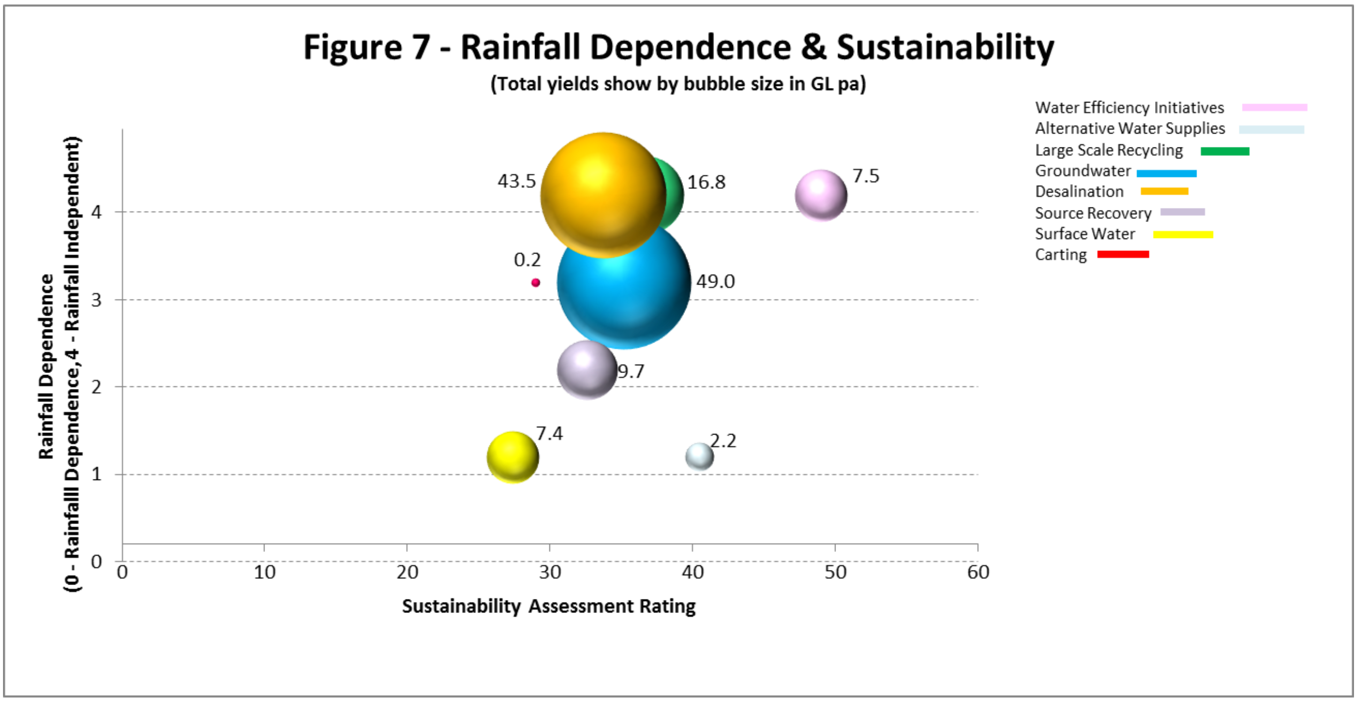


Figure 7 - Rainfall Dependence & Sustainability
(Total yields show by bubble size in GL pa)
Rainfall Dependence
(0 - Rainfalll Dependence, 4 - Rainfall Independent)
Sustainability Assessment Rating
43.5
16.8
7.5
0.2
49.0
9.7
7.4
2.2
Water Efficiency Initiatives
Alternative Water Supplies
Large Scale Recycling
Groundwater
Desalination
Source Recovery
Surface Water
Carting

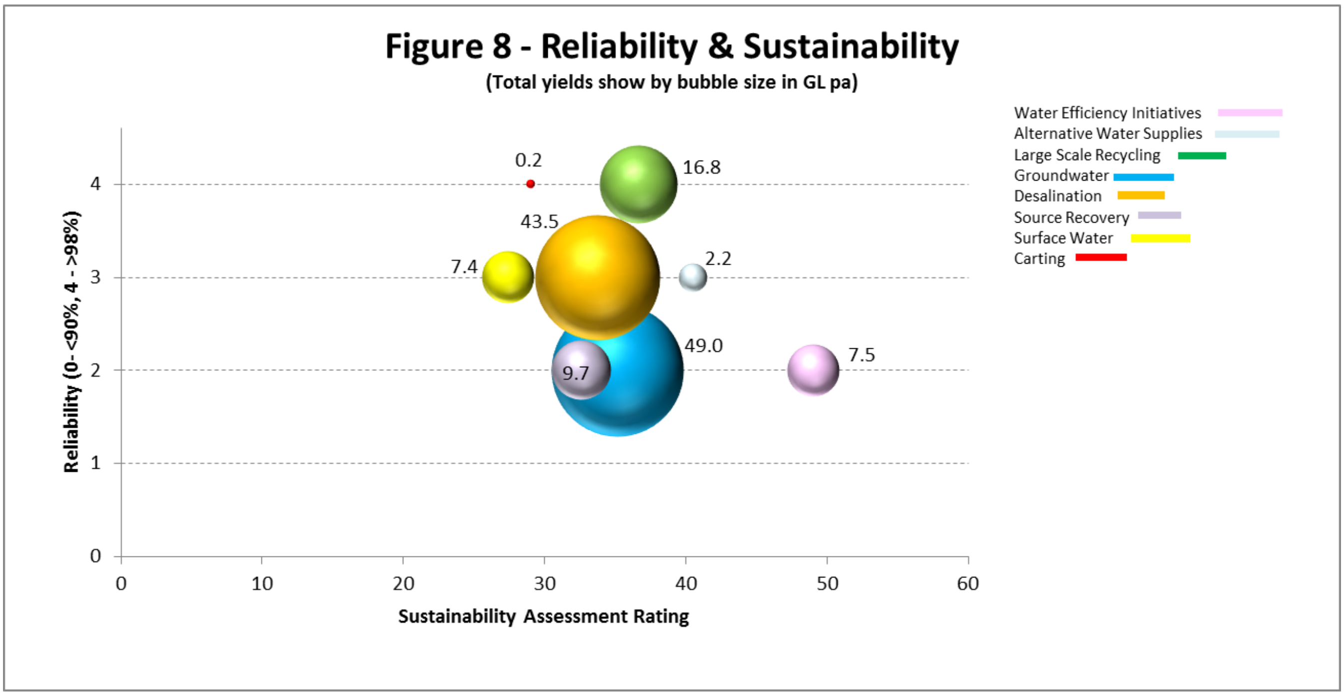


Figure 8 - Reliability & Sustainability
(Total yields show by bubble size in GL pa)
Reliability (0- <90%, 4 - >98%)
Sustainability Assessment Rating
0.2
16.8
43.5
7.4
2.2
49.0
7.5
9.7
Water Efficiency Initiatives
Alternative Water Supplies
Large Scale Recycling
Groundwater
Desalination
Source Recovery
Surface Water
Carting

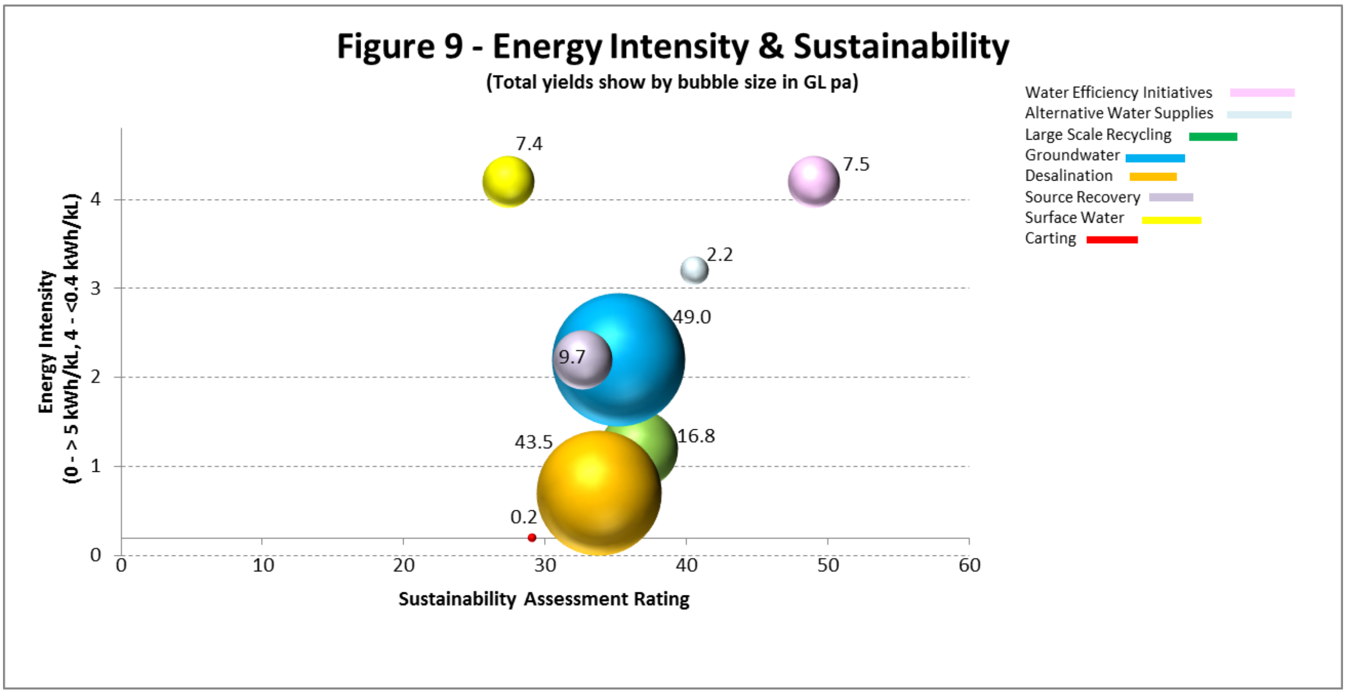


Figure 9 - Energy Intensity & Sustainability
(Total yields show by bubble size in GL pa)
Energy Intensity
(0 - > 5 kWh/kL, 4 - <0.4 kWh/kL)
Sustainability Assessment Rating
0
10
20
30
40
50
60
1
2
3
4
7.4
7.5
2.2
49.0
9.7
16.8
43.5
0.2
Water Efficiency Initiatives
Alternative Water Supplies
Large Scale Recycling
Groundwater
Desalination
Source Recovery
Surface Water
Carting

Appendix 1 – Detailed Sustainability Assessment (Pillars, Criteria, Units of Measure and Rating Scale)

Pillar	Business Principles	Criteria	Source	Unit	4	3	2	1	0
Environment	*Conserve the value of the environment; Enhance the resilience of the natural and human environment; Prevent harm to the environment*	**Physical footprint**	IPB assessment	Water yield (GL/yr)/Footprint area (ha)	No clearing	>10GL/ha/yr	5 - 10GL/ha/yr	1 - 5GL/ha/yr	<1GL/ha/yr
		Energy intensity	IPB assessment	kWh/kL	<0.4	0.4 - 0.8	0.8 - 2.5	2.5 - 5	≥ 5
		Capacity to enhance the environment	IPB Assessment		Significantly enhances the environment	Enhances the environment	Maintains the environment	Degrades the environment	Significantly degrades the environment
		Water efficiency/Waste management	IPB Assessment	Waste hierarchy and Water hierarchy	Waste Avoidance/Reduce water use	Reuse of waste and non scheme water (untreated)	Recycling of waste and non scheme water (treated)	Recovery of waste to create energy/Recovery of lost water	Treatment, containment and disposal of waste but use of water resources
		Water allocation	IPB assessment	Water mngt plan	Supported by water mngt plan/Not required	Provided for in water mngt plan framework	Current allocation/licence to use (but no WMP)	May conflict with WMP objectives	Not supported by WMP
Social	*Respect the values of all; Enhance community capacity; Protect the health and safety of all and support the wellbeing of our employees and customers*	**Community preference**	Have Your Say	% support	>70%	60% - 69%	50% - 59%	40% - 49%	<40%
		Indigenous heritage (sites)	Registered sites	Significance of sites	No impact on sites	Low impact on sites	Medium impact on sites	High impact on sites	Very high impact on sites
		Long term amenity/lifestyle value	IPB Assessment		Significantly enhances social amenity/lifestyle	Enhances social amenity/lifestyle	Maintains/preserves social amenity/lifestyle	Reduces social amenity/lifestyle	Significantly reduces social amenity/lifestyle
		Empowers customers	WF assessment	Personal ownership	Full control	High control	Some control	Little control	No control
		Source risk	DWQ Branch		Low	Low-Medium	Medium	Medium-High	High
Economic	*Find efficiencies that reduce internal and external costs; Enhance the economic value to our customers, suppliers and the community while delivering shareholder returns; Preserve our capacity to provide water services to meet present and future needs*	**Net economic cost to community**	IPB Pricing and Evaluation	$ / kilolitre (2013)	0 - 3	3 - 4	4-6	6-8	≥ 8
		Complexity	IPB assessment		Very low level of complexity	Low level of complexity	Medium level of complexity	High level of complexity	Very high level of complexity
		Reliability	Asset Mgt/IPB Assessment	% up time/level of reliability of savings (WUE initiatives)	98-100%/Very high level of reliability	High level of reliability	90-97%/Medium level of reliability	Low level of reliability	<90%/Very low level of reliability
		Rainfall dependence	IPB assessment	Level of dependence	Not dependent (desalination, recycling)	Confined aquifer (groundwater)	Superficial aquifer (Groundwater)	Rainfall dependent (surface storage)	Fully rainfall dependent
		Flexibility and adaptability to changing circumstances	IPB assessment		Very high (≥5)	High (4 - 5)	Medium (2.5 - 3.5)	Low (1 - 2)	Very low (<1)

APPENDIX 2 – DETAILED SCORINGS OF WATER SOURCE OPTIONS FOR DETAILED ASSESSMENT

Water Efficiency Initiatives

Options	Environmental						Social						Economic						Total	Data Quality Rating
	Physical Footprint	Energy Intensity	Enhance Environment	Water Efficiency	Water Allocation	Sub Total	Community Preference	Indigenous Sites	Social Amenity	Empowers Customers	Source Risk	Sub Total	Economic Cost	Complexity	Reliability	Rainfall Dependence	Flexibility	Sub total		
Customer Bills comparing usage with neighbour-hood average	**4**	**4**	**2**	**4**	**4**	**18**	**4**	**4**	**2**	**4**	**4**	**18**	**4**	**4**	**3**	**4**	**4**	**19**	**55**	**5**
Influencing Land Development /Urban Form	**4**	**4**	**3**	**4**	**4**	**19**	**4**	**4**	**3**	**2**	**4**	**17**	**4**	**2**	**1**	**4**	**3**	**14**	**50**	**2**
Leak Detection & Repair	**3**	**4**	**2**	**4**	**4**	**17**	**4**	**3**	**2**	**0**	**4**	**13**	**4**	**2**	**2**	**4**	**3**	**15**	**45**	**3**
Sprinkler Restrictions	**4**	**4**	**3**	**4**	**4**	**19**	**0**	**4**	**1**	**0**	**4**	**9**	**4**	**3**	**2**	**4**	**3**	**16**	**44**	**2**
Customer Water Efficiency Programs	**4**	**4**	**3**	**4**	**4**	**19**	**4**	**4**	**2**	**4**	**4**	**18**	**4**	**2**	**0**	**4**	**4**	**14**	**51**	**4**
Mean	**4**	**4**	**3**	**4**	**4**	**18**	**3**	**4**	**2**	**2**	**4**	**15**	**4**	**3**	**2**	**4**	**3**	**16**	**49**	**3.2**

Alternative Water Supplies

Options	Environmental						Social						Economic						Total	Data Quality Rating
	Physical Footprint	Energy Intensity	Enhance Environment	Water Efficiency	Water Allocation	Sub Total	Community Preference	Indigenous Sites	Social Amenity	Empowers Customers	Source Risk	Sub Total	Economic Cost	Complexity	Reliability	Rainfall Dependence	Flexibility	Sub total		
Rainwater Tanks for new services for non-potable water use	**4**	**2**	**3**	**3**	**4**	**16**	**4**	**4**	**3**	**3**	**2**	**16**	**0**	**3**	**3**	**0**	**1**	**7**	**39**	**3**
Garden bores – Dunsborough to Eaton/ Australind	**4**	**4**	**1**	**3**	**2**	**14**	**3**	**4**	**3**	**4**	**2**	**16**	**3**	**3**	**3**	**2**	**1**	**12**	**42**	**2**
Mean	**4**	**3**	**2**	**3**	**3**	**15**	**4**	**4**	**3**	**4**	**2**	**16**	**2**	**3**	**3**	**1**	**1**	**10**	**40**	**2**

Large Scale Recycling (GWR = Groundwater Replenishment; SWR = Surface Water Replenishment; MAR = Managed Aquifer Recharge)

Options	Environmental						Social						Economic						Total	Data Quality Rating
	Physical Footprint	Energy Intensity	Enhance Environment	Water Efficiency	Water Allocation	Sub Total	Community Preference	Indigenous Sites	Social Amenity	Empowers Customers	Source Risk	Sub Total	Economic Cost	Complexity	Reliability	Rainfall Dependence	Flexibility	Sub total		
Collie SWR (direct potable reuse)	**0**	**3**	**2**	**2**	**4**	**11**	**1**	**4**	**2**	**0**	**1**	**8**	**2**	**0**	**4**	**4**	**4**	**14**	**33**	**3**
GWR at Collie	**0**	**1**	**2**	**2**	**3**	**8**	**4**	**4**	**2**	**0**	**2**	**12**	**2**	**1**	**4**	**4**	**4**	**15**	**35**	**2**
GWR at Margaret River (with evaporation pond)	**3**	**2**	**2**	**2**	**4**	**13**	**4**	**4**	**2**	**0**	**2**	**12**	**1**	**1**	**4**	**4**	**4**	**14**	**39**	**2**
GWR at Margaret River (with Ocean Outfall)	**1**	**2**	**2**	**2**	**4**	**11**	**4**	**4**	**2**	**0**	**2**	**12**	**0**	**1**	**4**	**4**	**4**	**13**	**36**	**2**
Busselton GWR Scheme	**4**	**1**	**2**	**2**	**4**	**13**	**4**	**4**	**2**	**0**	**2**	**12**	**0**	**1**	**4**	**4**	**4**	**13**	**38**	**3**
Busselton MAR Scheme	**4**	**1**	**2**	**2**	**4**	**13**	**4**	**4**	**2**	**0**	**2**	**12**	**0**	**1**	**4**	**4**	**4**	**13**	**38**	**3**
Bunbury GWR Scheme – Increase GW allocation from Yarragadee	**4**	**1**	**2**	**2**	**3**	**12**	**4**	**4**	**2**	**0**	**2**	**12**	**2**	**1**	**4**	**4**	**4**	**15**	**39**	**2**
Bunbury GWR Scheme – Protect from Seawater Intrusion at Dalyellup	**0**	**0**	**4**	**2**	**4**	**10**	**3**	**4**	**3**	**0**	**2**	**12**	**0**	**1**	**4**	**4**	**4**	**13**	**35**	**2**
Mean	**2**	**1**	**2**	**2**	**4**	**11**	**4**	**4**	**2**	**0**	**2**	**12**	**1**	**1**	**4**	**4**	**4**	**14**	**37**	**2**

Groundwater (GW)

Options	Environmental						Social						Economic						Total	Data Quality Rating
	Physical Footprint	Energy Intensity	Enhance Environment	Water Efficiency	Water Allocation	Sub Total	Community Preference	Indigenous Sites	Social Amenity	Empowers Customers	Source Risk	Sub Total	Economic Cost	Complexity	Reliability	Rainfall Dependence	Flexibility	Sub total		
Quinninup Local GW	**4**	**3**	**1**	**0**	**2**	**10**	**3**	**4**	**2**	**0**	**3**	**12**	**2**	**2**	**3**	**2**	**3**	**12**	**34**	**4**
Northcliffe Local GW	**4**	**4**	**1**	**0**	**2**	**11**	**3**	**4**	**2**	**0**	**2**	**11**	**0**	**2**	**2**	**2**	**3**	**9**	**31**	**3**
South Coast Yarragadee GW for Pemberton, Northcliffe & Quinninup	**4**	**2**	**1**	**0**	**3**	**10**	**2**	**4**	**2**	**0**	**4**	**12**	**0**	**2**	**2**	**3**	**3**	**10**	**32**	**2**
South Coast Yarragadee GW for Pemberton	**4**	**2**	**1**	**0**	**3**	**10**	**3**	**4**	**2**	**0**	**4**	**13**	**0**	**2**	**2**	**3**	**3**	**10**	**33**	**2**
Pipeline transfer – Margaret River to Nannup	**4**	**4**	**1**	**0**	**3**	**12**	**2**	**4**	**2**	**0**	**4**	**12**	**4**	**2**	**2**	**3**	**1**	**12**	**36**	**3**
Pipeline transfer – Margaret River to Augusta	**4**	**2**	**1**	**0**	**3**	**10**	**2**	**4**	**2**	**0**	**4**	**12**	**3**	**2**	**2**	**3**	**1**	**11**	**33**	**3**
Pipeline transfer – Busselton to Margaret River	**4**	**3**	**1**	**0**	**3**	**11**	**2**	**4**	**2**	**0**	**4**	**12**	**4**	**2**	**2**	**3**	**1**	**12**	**35**	**2**
Pipeline transfer of Nannup Groundwater – Manjimup to Pemberton	**0**	**4**	**1**	**0**	**1**	**6**	**3**	**4**	**2**	**0**	**3**	**12**	**0**	**2**	**3**	**2**	**1**	**8**	**26**	**4**
Augusta Lesueur Sandstone borefield	**4**	**2**	**1**	**0**	**4**	**11**	**3**	**4**	**2**	**0**	**3**	**12**	**4**	**4**	**2**	**3**	**3**	**16**	**39**	**2**

Warren Blackwood Yarragadee borefield – BT, Nannup, Manji, Pemb, NC & QN	**4**	**2**	**1**	**0**	**4**	**11**	**2**	**4**	**2**	**0**	**4**	**12**	**2**	**2**	**2**	**3**	**3**	**12**	**35**	**2**
Warren Blackwood Yarragadee Borefield – BT, Nannup & Manji	**4**	**2**	**1**	**0**	**4**	**11**	**2**	**4**	**2**	**0**	**4**	**12**	**3**	**2**	**2**	**3**	**3**	**13**	**36**	**2**
Margaret River Leederville borefield	**4**	**2**	**1**	**0**	**3**	**10**	**3**	**4**	**2**	**0**	**3**	**12**	**3**	**2**	**3**	**3**	**3**	**14**	**36**	**2**
Margaret River Yarragadee Borefield – drill 2 Yarragadee Bores	**4**	**2**	**1**	**0**	**3**	**10**	**3**	**4**	**2**	**0**	**4**	**13**	**4**	**2**	**2**	**3**	**3**	**14**	**37**	**3**
Margaret River Yarragadee Borefield – drill 1 Yarragadee Bore	**4**	**2**	**1**	**0**	**3**	**10**	**3**	**4**	**2**	**0**	**4**	**13**	**4**	**2**	**2**	**3**	**3**	**14**	**37**	**3**
Aqwest Bulkwater Supply to Dalyellup	**4**	**4**	**1**	**0**	**4**	**13**	**3**	**4**	**2**	**0**	**3**	**12**	**4**	**3**	**3**	**3**	**3**	**16**	**41**	**3**
Aqwest Bulkwater Supply to Picton WTP	**4**	**3**	**1**	**0**	**4**	**12**	**3**	**4**	**2**	**0**	**3**	**12**	**4**	**3**	**3**	**3**	**3**	**16**	**40**	**3**
Busselton Water Board Bulkwater Supply	**4**	**4**	**1**	**0**	**4**	**13**	**2**	**4**	**2**	**0**	**3**	**11**	**4**	**3**	**3**	**3**	**3**	**16**	**40**	**2**

Capel – Donnybrook Yarragadee Borefield – 2 bores (additional supply to Peppermint Grove)	**4**	**2**	**1**	**0**	**4**	**11**	**2**	**4**	**2**	**0**	**4**	**12**	**2**	**2**	**3**	**3**	**3**	**13**	**36**	**5**
Capel – Donnybrook Yarragadee Borefield – 2 bores	**4**	**2**	**1**	**0**	**4**	**11**	**3**	**4**	**2**	**0**	**4**	**13**	**2**	**2**	**3**	**3**	**3**	**13**	**37**	**5**
Capel – Donnybrook Yarragadee Borefield – 1 bore	**4**	**2**	**1**	**0**	**4**	**11**	**3**	**4**	**2**	**0**	**4**	**13**	**2**	**2**	**3**	**3**	**3**	**13**	**37**	**5**
Boyanup Yarragadee Bore	**4**	**4**	**1**	**0**	**1**	**10**	**3**	**4**	**2**	**0**	**4**	**13**	**1**	**2**	**3**	**3**	**3**	**12**	**35**	**3**
Dalyellup Yarragadee Borefield	**4**	**2**	**1**	**0**	**2**	**9**	**3**	**4**	**2**	**0**	**2**	**11**	**4**	**2**	**2**	**3**	**1**	**12**	**32**	**5**
Bunbury Yarragadee Borefield	**2**	**2**	**1**	**0**	**3**	**8**	**3**	**4**	**2**	**0**	**4**	**13**	**4**	**2**	**2**	**3**	**3**	**14**	**35**	**3**
Kemerton North Leederville Borefield – merge and blend with desal water from Binningup	**4**	**1**	**1**	**0**	**3**	**9**	**3**	**4**	**2**	**0**	**3**	**12**	**2**	**1**	**2**	**4**	**2**	**11**	**32**	**2**
Kemerton North Leederville Borefield	**4**	**2**	**1**	**0**	**3**	**10**	**3**	**4**	**2**	**0**	**3**	**12**	**2**	**2**	**2**	**3**	**3**	**12**	**34**	**2**
Mean	4	2	1	0	3	10	3	4	2	0	4	13	3	2	2	3	3	13	36	3

Desalination

Options	Environmental						Social						Economic						Total	Data Quality Rating
	Physical Footprint	Energy Intensity	Enhance Environment	Water Efficiency	Water Allocation	Sub Total	Community Preference	Indigenous Sites	Social Amenity	Empowers Customers	Source Risk	Sub Total	Economic Cost	Complexity	Reliability	Rainfall Dependence	Flexibility	Sub total		
Windy Harbour Micro Desalination	**4**	**0**	**1**	**0**	**4**	**9**	**3**	**4**	**2**	**0**	**4**	**13**	**0**	**1**	**3**	**4**	**2**	**10**	**32**	**2**
South Coast Micro Desalination	**4**	**1**	**1**	**0**	**4**	**10**	**3**	**4**	**2**	**0**	**4**	**13**	**1**	**1**	**3**	**4**	**2**	**11**	**34**	**2**
West Coast Micro Desalination	**4**	**1**	**1**	**0**	**4**	**10**	**3**	**4**	**2**	**0**	**4**	**13**	**1**	**1**	**3**	**4**	**2**	**11**	**34**	**2**
Capel Micro Desalination	**1**	**0**	**1**	**0**	**4**	**6**	**3**	**4**	**2**	**0**	**3**	**13**	**0**	**1**	**3**	**4**	**2**	**10**	**29**	**2**
Stirling Dam Pumpback to Harris Dam – Connection from SSDP	**1**	**0**	**1**	**0**	**4**	**6**	**4**	**4**	**2**	**0**	**3**	**13**	**3**	**2**	**3**	**4**	**2**	**14**	**33**	**2**
SSDP to Greater Bunbury, Donnybrook, Dardenup	**4**	**0**	**1**	**0**	**4**	**9**	**3**	**4**	**2**	**0**	**3**	**12**	**4**	**2**	**3**	**4**	**2**	**15**	**36**	**2**
Binningup Connection to Australind – Harvey Summit Tank	**4**	**1**	**1**	**0**	**4**	**10**	**3**	**2**	**2**	**0**	**3**	**10**	**4**	**1**	**4**	**4**	**2**	**15**	**35**	**3**
Binningup Connection to Australind – Clearwater Eastwell Rd Tank	**4**	**1**	**1**	**0**	**4**	**10**	**4**	**4**	**2**	**0**	**3**	**13**	**3**	**2**	**3**	**4**	**2**	**14**	**37**	**2**
Mean	**3**	**0**	**1**	**0**	**4**	**9**	**3**	**4**	**2**	**0**	**3**	**12**	**2**	**1**	**3**	**4**	**2**	**13**	**34**	**2**

Source Recovery

Options	Environmental						Social						Economic						Total	Data Quality Rating
	Physical Footprint	Energy Intensity	Enhance Environment	Water Efficiency	Water Allocation	Sub Total	Community Preference	Indigenous Sites	Social Amenity	Empowers Customers	Source Risk	Sub Total	Economic Cost	Complexity	Reliability	Rainfall Dependence	Flexibility	Sub total		
Cloud Seeding	**4**	**2**	**1**	**1**	**2**	**10**	**No data**	**4**	**2**	**0**	**2**	**8**	**2**	**0**	**0**	**0**	**3**	**5**	**23**	**2**
Reducing Evaporation from Dams	**4**	**4**	**1**	**4**	**4**	**17**	**4**	**4**	**2**	**0**	**3**	**13**	**0**	**2**	**0**	**1**	**0**	**3**	**33**	**3**
Augusta Water Trade with Scott Coastal Plain Irrigators	**4**	**2**	**3**	**4**	**4**	**17**	**1**	**4**	**3**	**0**	**3**	**11**	**3**	**2**	**3**	**3**	**3**	**14**	**42**	**2**
Catchment Management - General	**0**	**4**	**3**	**3**	**4**	**14**	**4**	**3**	**3**	**0**	**3**	**13**	**4**	**1**	**2**	**0**	**1**	**8**	**35**	**3**
Dunsborough Leederville Borefield - water Trade	**4**	**2**	**1**	**0**	**1**	**8**	**1**	**4**	**2**	**0**	**3**	**10**	**3**	**1**	**3**	**2**	**3**	**12**	**30**	**3**
Mean	**3**	**3**	**2**	**2**	**3**	**13**	**2**	**4**	**2**	**0**	**3**	**11**	**2**	**1**	**2**	**1**	**2**	**8**	**33**	**3**

Carting

Options	Environmental						Social						Economic						Total	Data Quality Rating
	Physical Footprint	Energy Intensity	Enhance Environment	Water Efficiency	Water Allocation	Sub Total	Community Preference	Indigenous Sites	Social Amenity	Empowers Customers	Source Risk	Sub Total	Economic Cost	Complexity	Reliability	Rainfall Dependence	Flexibility	Sub total		
Water Carting for Mullalyup	**4**	**0**	**1**	**0**	**2**	**7**	**1**	**4**	**1**	**0**	**3**	**9**	**0**	**3**	**4**	**3**	**3**	**13**	**29**	**2**
Water Carting for Kirup	**4**	**0**	**1**	**0**	**2**	**7**	**1**	**4**	**1**	**0**	**3**	**9**	**0**	**3**	**4**	**3**	**3**	**13**	**29**	**2**
Water Carting - Quinninup	**4**	**0**	**1**	**0**	**2**	**7**	**1**	**4**	**1**	**0**	**3**	**9**	**0**	**3**	**4**	**3**	**3**	**13**	**29**	**3**
Water Carting - Northcliffe	**4**	**0**	**1**	**0**	**2**	**7**	**1**	**4**	**1**	**0**	**3**	**9**	**0**	**3**	**4**	**3**	**3**	**13**	**29**	**3**
Mean	**4**	**0**	**1**	**0**	**2**	**7**	**1**	**4**	**1**	**0**	**3**	**9**	**0**	**3**	**4**	**3**	**3**	**13**	**29**	**3**

Surface Water

Options	Environmental						Social						Economic						Total	Data Quality Rating
	Physical Footprint	Energy Intensity	Enhance Environment	Water Efficiency	Water Allocation	Sub Total	Community Preference	Indigenous Sites	Social Amenity	Empowers Customers	Source Risk	Sub Total	Economic Cost	Complexity	Reliability	Rainfall Dependence	Flexibility	Sub total		
Nannup Brook Pumpback	**0**	**4**	**0**	**0**	**2**	**6**	**4**	**2**	**0**	**0**	**4**	**10**	**4**	**3**	**4**	**1**	**1**	**13**	**29**	**2**
Camp Creek Pumpback	**0**	**4**	**0**	**0**	**2**	**6**	**4**	**2**	**0**	**0**	**2**	**8**	**4**	**3**	**4**	**1**	**1**	**13**	**27**	**4**
Gregory Brook 1 GL Dam	**0**	**4**	**0**	**0**	**2**	**6**	**4**	**2**	**0**	**0**	**3**	**9**	**2**	**3**	**4**	**1**	**1**	**11**	**26**	**4**
Local Dam at Northcliffe	**0**	**3**	**0**	**0**	**2**	**5**	**4**	**4**	**1**	**0**	**1**	**10**	**0**	**1**	**2**	**1**	**2**	**6**	**21**	**4**
High Level Water Treatment at Pemberton	**4**	**2**	**1**	**0**	**2**	**9**	**4**	**4**	**2**	**0**	**1**	**11**	**3**	**1**	**2**	**1**	**3**	**10**	**30**	**3**
Pipeline transfer – Pemberton to Quinninup	**0**	**4**	**1**	**0**	**1**	**6**	**3**	**4**	**2**	**0**	**3**	**12**	**0**	**2**	**3**	**2**	**1**	**8**	**26**	**4**
Pipeline transfer – Pemberton to Northcliffe	**0**	**4**	**1**	**0**	**1**	**6**	**3**	**4**	**2**	**0**	**3**	**12**	**0**	**2**	**3**	**2**	**1**	**8**	**26**	**4**
Stirling Dam Pumpback to Harris Dam – Pumpback only	**2**	**3**	**1**	**0**	**4**	**10**	**3**	**3**	**2**	**0**	**3**	**11**	**4**	**2**	**3**	**1**	**3**	**13**	**34**	**3**
Mean	**1**	**4**	**0**	**0**	**2**	**7**	**4**	**3**	**1**	**0**	**2**	**10**	**2**	**2**	**3**	**1**	**2**	**10**	**27**	**4**