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Casey Clyde Growth Area Whole of Water Cycle Management Summary Report

November 2013

Office of Living Victoria

State Government Victoria

Contents

1. Executive Summary

This report summarises the process and outcomes of the Casey Clyde Growth Area (CCGA) pilot project. It assumes prior knowledge of the history of the project and associated work. The project had two key objectives:

- To test the application of the Project Assessment Guidelines (PAG) and nested systems modelling in the context of comparing water servicing strategies to deliver whole of water cycle management; and
- To provide guidance on the selection of a whole of water cycle servicing strategy for the CCGA.

This report provides guidance on the selection of a whole of water cycle servicing strategy for the CCGA. A further report will provide feedback on learning from the testing and application of PAG and the nested systems modelling.

The key decisions to be informed by this pilot report include: finalisation of Precinct Structure Plans (PSP) 53 and 54, particularly relating to land take; and key elements of the water servicing strategy.

Ten water servicing and stormwater management options were developed for the CCGA (see Table 1) and were evaluated under the PAG. Options 1 (Business As Usual (BAU)) to 9 offer the same stormwater management solution including in-catchment wetlands and retarding basins to achieve BPEM and an end-of-catchment wetland to achieve SEPP F8. Option 10 offered in-catchment treatment designed to achieve SEPP F8, without the use of the end-of-catchment wetland.

Options 2 to 8 are all of a similar cost with the variance from option 1 being a maximum of 13%. Options 9 and 10 are less favoured due to cost. The cost range for options 2 to 8 is within estimating error and as such a decision between these options can be made based on non-quantified parameters and risks. The seven options deliver whole of water cycle management to varying degrees and are competitive against BAU.

The decision on which of the options (2 to 8) is selected does not need to be taken immediately, as it has minimal material impact on the PSPs with respect to land take. Given the outstanding level of uncertainty regarding costing, performance and implementation of the options there is a strong argument to finalise the PSPs in such a way as to retain flexibility to pursue any of options 2 to 8 . This could be achieved by having the PSPs reflect minimum performance outcomes related to the whole of water cycle. Further work should be undertaken by Melbourne Water (MW) and South East Water (SEW) to refine the costs and benefits of the shortlisted options, considering the views of other key stakeholders, with a decision to be reached in late 2014.

OLV is committed to continuing to work collaboratively with the stakeholders to further refine a preferred option for the best whole of water cycle outcome and address any implementation issues over the coming year.

TABLE 1: Whole of Water Cycle Management Options

Option	Potable Water	3rd Pipe Supply	Sewage	Stormwater
1 Traditional	Reticulated	Not supplied	Transfer to ETP	50% households have rainwater tanks (RWT) supplying toilets & garden. End-of-catchment stormwater (SW) treatment
2 ETP Recycled	Reticulated	Supplied from ETP	Transfer to ETP	No harvesting. End-of-catchment SW treatment
3 Small STP	Reticulated	Supplied from small local recycled water treatment plant	Part local treatment & part transfer to ETP	No harvesting. End-of-catchment SW treatment
4 Large STP	Reticulated	Supplied from large local recycled water treatment plant	Full local treatment	No harvesting. End-of-catchment SW treatment
5 Local SWTP	Reticulated	Supplied from large local SW treatment plant	Transfer to ETP	Central SW harvesting. End-of-catchment SW treatment
6 Decentralised SWTP	Reticulated	Supplied from six small local SW treatment plants	Transfer to ETP	Decentralised SW harvesting. End-of-catchment SW treatment
7 Combined Regional	Reticulated	Supplied from large local recycled water & SW treatment plant	Full local treatment	Central SW harvesting. End-of-catchment SW treatment
8 Rainwater Tanks	Reticulated	Not supplied	Transfer to ETP	Household RWT supplying toilet, garden & laundry. End-of-catchment SW treatment
9 Large STP & Rainwater Tanks	Reticulated	Supplied from large local recycled water treatment plant	Full local treatment	Household RWT supplying hot water & laundry. End-of-catchment SW treatment
10 ETP recycled, Rainwater tanks & in-catchment SW	Reticulated	Supplied from ETP	Transfer to ETP	Household RWT supplying hot water & laundry. In-catchment SW treatment

2. Background

2.1 Scope of the report

This report will summarise the process and outcomes of the Casey Clyde Growth Area (CCGA) pilot project. It assumes prior knowledge of the history of the project and associated work. The project had two key objectives:

- To test the application of the Project Assessment Guidelines (PAG) and nested systems modelling in the context of comparing water servicing strategies to deliver whole of water cycle management; and
- To provide guidance on the selection of a whole of water cycle servicing strategy for the CCGA.

This report provides guidance on the selection of a whole of water cycle servicing strategy for the CCGA. A further report will provide feedback on learning from the testing and application of PAG and the nested systems modelling.

OLV has coordinated this pilot in collaboration with key stakeholders, however this report does not replace normal due diligence needed by organisations in decisions affecting their businesses. It should be noted that this project has been undertaken with compressed timeframes and resources and while every effort has been made to provide a meaningful consideration, more work needs to be done to optimise the analysis and finalise intricacies relating to scale, numbers and timing.

2.2 Policy context

On 1 July 2013 the Victorian Government released the consultation draft of Melbourne's Water Future (MWF). MWF is a 40 year outlook that adopts an integrated or whole-of-water-cycle approach to urban planning. MWF takes a whole of government approach that brings together and integrates the efforts and actions of government, water corporations and the community.

Systems analysis modelling developed for the Living Victoria Ministerial Advisory Council, shows that adopting an approach that optimises local water cycle management can deliver the following benefits for Greater Melbourne:

- up to 35% reduction in energy use in the water sector, with emissions savings of up to 1 million tonnes of carbon dioxide by 2050;
- up to 45% reduction in mains water demand;
- up to 30% reduction in wastewater discharge;
- healthier waterways due to reduction in nutrient discharge of between 12-20% (4,760 – 8,250 tonnes)
- up to 40% reduction in stormwater runoff volumes; and
- further measures including holding stormwater in the landscape for amenity and liveability purposes to reduce stormwater runoff volumes from urban areas by greater than 70%.

Preparation of a Metropolitan Water Cycle Planning Framework is a priority initiative in MWF. MWF is clear that planning for growth areas should contribute to delivering these outcomes. The sector wide Project Steering Committee for this project has identified the following outcome areas that should guide system performance as follows: Affordability, Liveability, Waterway health, Water system sustainability and efficiency, Resilience of water systems and Innovation and industry capacity. Within the context of application of the PAG, these have been used to inform the assessment of the options (for details see Section 4).

2.3 Planning & decision making context

In July 2010 the State Government announced the extension of the Urban Growth Boundary (UGB) in the CCGA. The genesis of this project was a collaboration of a number of stakeholders – the Metropolitan Planning Authority (MPA, formerly the Growth Areas Authority), South East Water (SEW), Melbourne Water (MW), Casey City Council and Cardinia Shire Council – on a draft 50 year servicing strategy for the area that considered community, environmental and economic values, commenced in 2011. The work undertaken by these stakeholders produced nine potential servicing strategies. Waterway Management Consultants was engaged to develop a waterway, drainage and stormwater management plan for the area. A tenth option was identified under the Systems Framework and included for consideration.

The Office of Living Victoria (OLV) project timeframe has been largely driven by the MPA, in particular their timeline to finalise the Precinct Structure Plans (PSP). This report aims to inform key decisions to be made on the future planning direction of CCGA with regard to urban development in a whole of water cycle management context.

Key decisions to be informed by this pilot report include:

- Finalisation of two PSP's (PSP 53 and PSP 54) requiring decision of agencies by late December (see Figure 1).
  - The key water servicing agencies need to agree on key elements of the preferred servicing strategy to the extent that it impacts the two PSP's, in time for SEW's 18 November Board meeting including: elements related to land take i.e. land requirement for in-precinct solutions and an overlay requirement for a large wetland outside the UGB and a verdict regarding mandating of recycled water delivered via third pipe or rainwater tanks.

2.4 Regional context

The City of Casey is located approximately 40km south-east of Melbourne and is Victoria's largest municipality by population. The population is currently 270,000 people, and is projected to rise to 451,000 by 2036 (82% increase). The municipality has a mixture of established urban areas, growth areas and rural land.

The CCGA comprises approximately 51,700 residential lots, 530 Ha of employment, commercial and community facilities and 1020 ha of open space and encumbered land within the broader Casey Cardinia Growth Area in South East Melbourne.

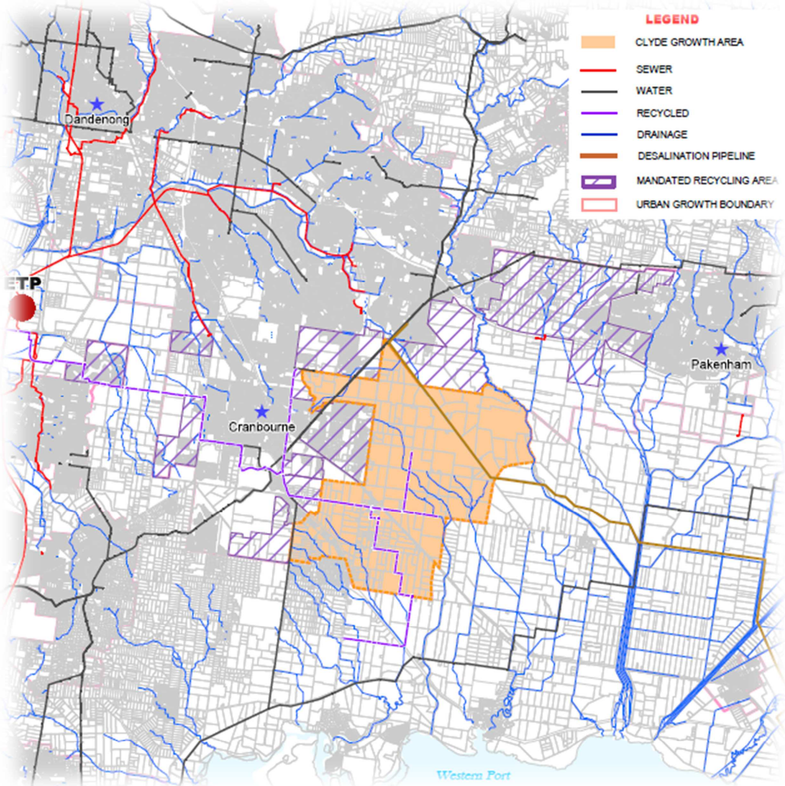

Figure 1: Casey Clyde study area location

The CCGA has aspects specific to the region that are relevant in decision making for water management and services. These include:

- Area drains to Westernport Bay which has high ecological value. SEPP F8 essentially prohibits discharge of wastewater to streams and the bay due to stringent quality requirements.
- Edge of existing development and adjacent to Bunyip food belt.
- Waterways (drainage channels) of currently low value. MW studies have not identified any records of ecological value in this area.
- Large, low lying (<3m above sea level), flood prone land just outside UGB.
- Abundance of water supply transfer system adjacent the area (Tarago pipeline, desalination to Cardinia pipeline). This sunk investment offers various supply configurations.
- Eastern Treatment Plant (ETP) is nearby to the Casey Clyde area producing Class A with abundance of spare capacity. ETP discharges via South Eastern Outfall (SEO) to Bass Strait.
- Area is adjacent to mandated recycled water (third pipe) areas
- There is limited capacity in the Hallam Valley sewer main.

3. Options Identification

The nine options identified in the SKM work are listed below. An additional option, option 10, which looks at in-catchment stormwater management and treatment was later introduced through OLV.

TABLE 1: Whole of Water Cycle Management Options

Option	Potable Water	3rd Pipe Supply	Sewage	Stormwater
1 Traditional	Reticulated	Not supplied	Transfer to ETP	50% households have rainwater tanks (RWT) supplying toilets & garden. End-of-catchment stormwater (SW) treatment
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Detailed descriptions of the options and selected schematics can be found in Appendix 2. Initially, options 7, 9 and 10 were shortlisted however further analysis detailed later in this report indicates that previously eliminated options should be reconsidered.

Two variations on option 8 were also presented to account for some of the risk to system resilience and security of supply should the rainwater tanks be ill-maintained or managed incorrectly. Option 8b utilises smart systems to monitor and control tank operation and in option 8c the pipework sizes are not reduced from BAU to manage increased use of potable water when tanks cannot be used.

Figure 2 shows the proposed layout of major storm water management assets identified for options 1 to 9. Note: the end-of-catchment retarding basin is not shown but is located outside the boundary to the south east of the PSPs.

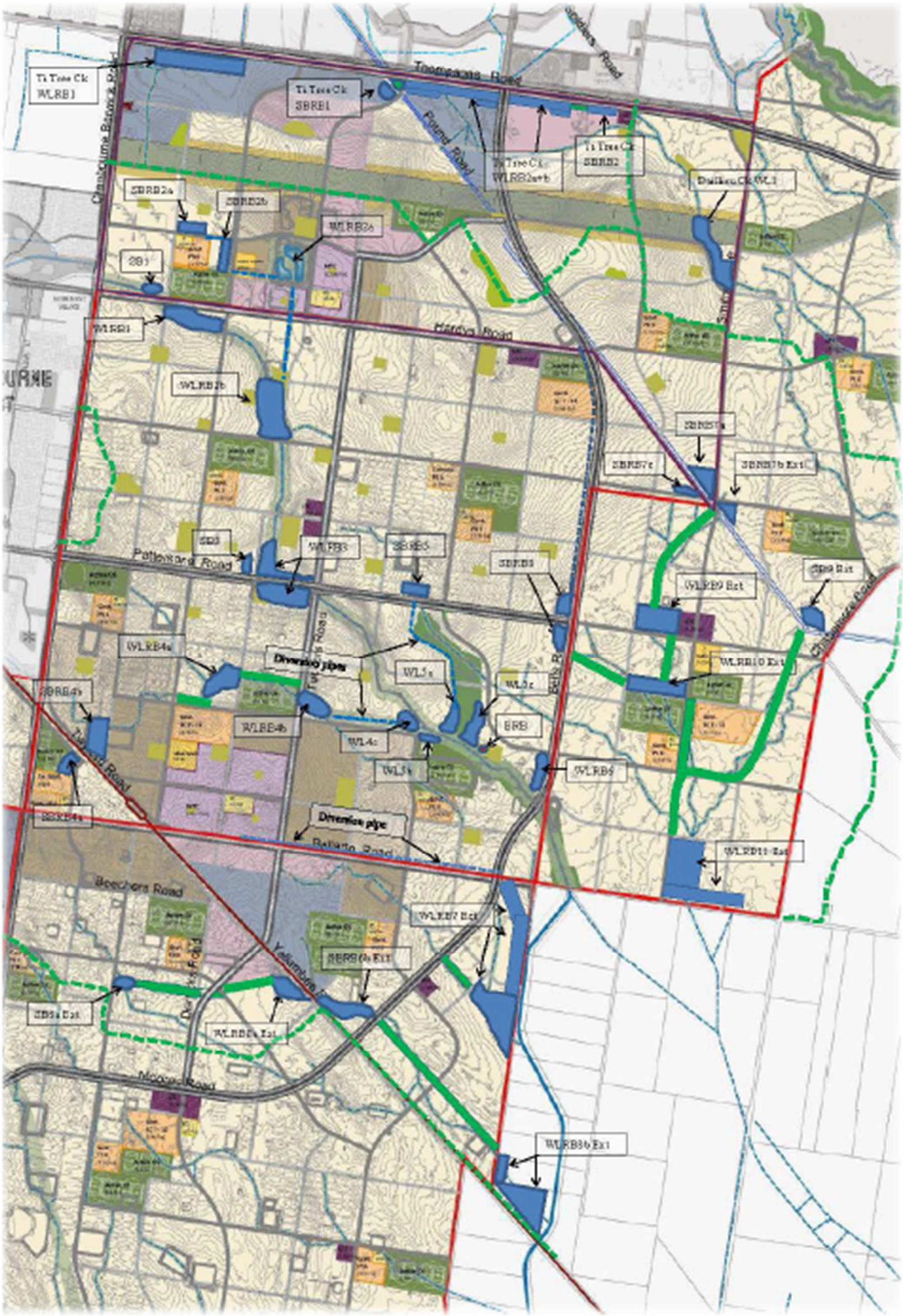


FIGURE 2: Stormwater Management Assets for PSP 53 & 54

4. Options Assessment

4.1 Analytical approaches

The project team deliberately adopted two different analytical approaches in order to compare and contrast outcomes. The two approaches were:

- Application of the systems framework with a nested systems model to conduct dynamic time based simulations of bundled options from 2010 to 2050 over the entire Casey Clyde local government areas. The framework includes resource flows, monetary flows and an economic assessment.
- Application of the SEW/MW approach which assumes a future full development end state and estimates resource flows and costs. The economic model developed by SEW/MW was modified for consistency with the PAG and applied.

The systems framework compared two options to BAU. One option was similar to Option 8 in the SEW/MW analysis and one was similar to option 9.

The SEW/MW analysis originally compared 8 options to BAU. Subsequently, and as a result of suggestions by the Office of the Chief Scientist (OSC) an additional option (option 10) was added to the suite for analysis.

The two quite different approaches provided indicatively similar water demand per property at full development. Both methods showed that a number of options were very close in terms of net present cost.

An outcome of the systems framework analysis was a memorandum from the OSC that recommended a number of key issues be addressed in the SEW/MW analysis. These issues were subsequently addressed through a number of means including sensitivity testing of key assumptions.

4.2 Economic analysis

This chapter is a summary of the assessment of the different options against the PAG, based on the scoping and costing figures provided. The PAG identifies 7 key steps detailed in Table 2 below.

TABLE 2: Economic assessment under the PAG

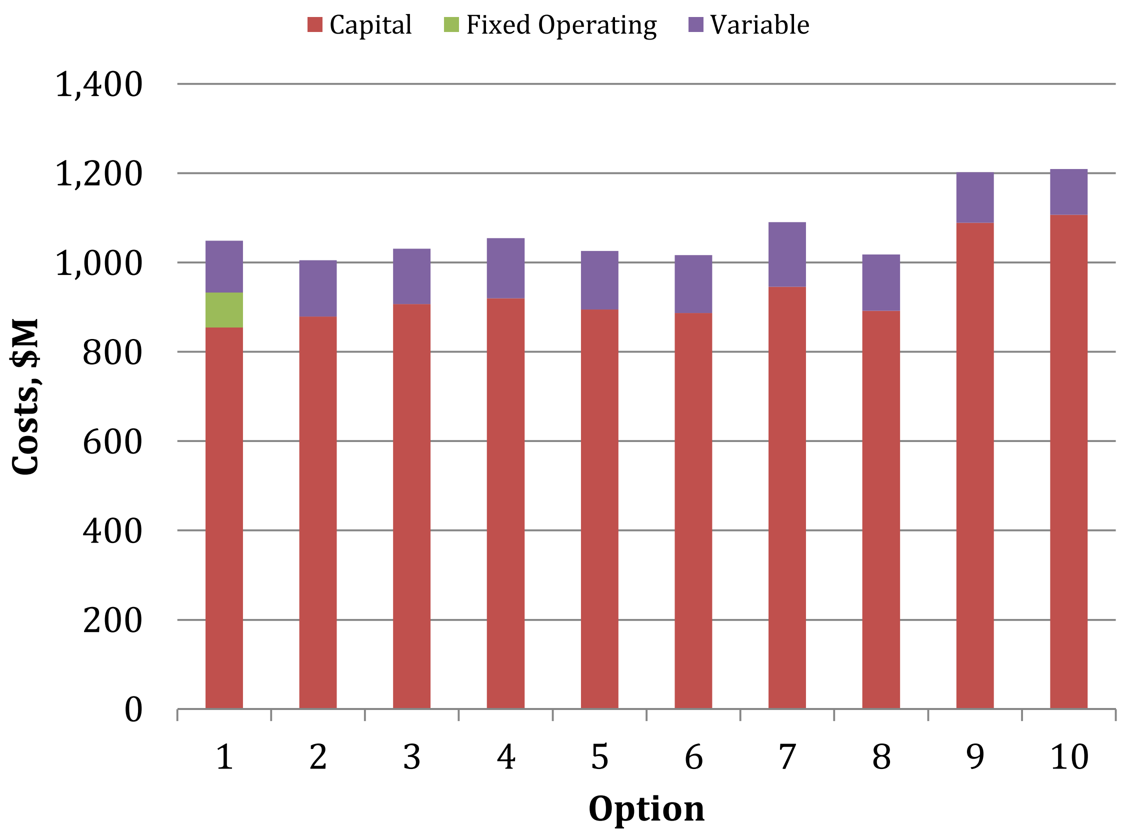
Step	Comment
1. Define the task and area affected	Done. Defined area but late suggestion that could be split into early critical zone (two PSPs) and the remainder with more flexible timing. Has the potential advantage of allowing for review of servicing options for later zones.
2. Map existing water infrastructure	Done.
3. Define the BAU scenario	Done. Connection to bulk water and sewerage systems to 2065. Does not include centralised 3rd pipe recycled water as the study area is outside the SEW mandated region

	due to the change in the UGB.
4. Specify alternative options	Done. Wide range of options moving further away from BAU with the addition of greater levels of IWCM.
5. Conduct net benefit assessment	Done. Costs social and environmental aspects in the community cost model
6. Validate the preferred option	Options cover most feasible solutions.
7. Analyse distributional impacts and funding	Done. Potential cost sharing arrangements still to be considered.

Net Present Cost

Figure 3 shows the results of the economic analysis. It can be seen that option 1 is the cheapest, however it could be argued the differences in capital spend, particularly in options 1 to 8 options are not markedly significant. This is further explored by undertaking a sensitivity analysis.

FIGURE 3: Net Present Cost



Sensitivity analysis

Discount rates

Sensitivities were tested around economic factors. The cost model uses three scenarios for discount rate; 3%, 5% and 8%. Assuming higher discount rates would favour options with lower capital spend. However, the differences in options 1 to 8 are not significant enough for reasonable variations in the discount rate to have a marked effect on the ranking of the options.

Given the majority of any investment sits with SEW and MW, and using prevailing mortgage rates as an indication of the cost to householders, 5% will be the most appropriate figure. It might be a useful modification to the model to allow differential discount rates for different stakeholders.

The impact of modelling different discount rates while holding all other inputs on the median assumptions can be seen in Table 3.

TABLE 3: Discount rates

Option	5% discount rate		Difference to BAU		Alternative discount rates			
	NPV $M	Rank	$M	%	3%	Rank	8%	Rank
BAU	1,050	1	-	-	1,450	2	718	1
2	1,061	2	11	1%	1,425	1	748	2
3	1,101	5	52	5%	1,490	5	767	6
4	1,138	7	88	8%	1,549	6	787	7
5	1,084	3	34	3%	1,468	3	754	3
6	1,085	4	35	3%	1,472	4	754	4
7	1,174	8	124	12%	1,601	8	809	8
8	1,128	6	79	8%	1,584	7	758	5
9	1,345	10	295	28%	1,878	10	903	9
10	1,343	9	293	28%	1,868	9	906	10

Water demand

The model base assumption for demand is 202kL/customer/year. This may be at the higher end of possible demands. A figure built up from SEW's Water Plan forecast suggests a slightly lower average demand but this will be sensitive to the mix of residential and non-residential customers. The water demand calculations can be found in Table 4.

TABLE 4: Demand for water

Water Plan forecast for 2017-18	
Residential demand (ML)	89,570
Non-residential demand (ML)	28,484
Residential recycled demand (ML)	1,202
Non-revenue water (ML)	13,748L
Total (ML)	133,004
Total customer numbers (residential + non-residential)	736,573
Average demand (kL/customer/year)	181

It could be argued that customers with a reliable supply of recycled water may use more in total, particularly as it is retailed at a lower price than the potable water it substitutes. There is little indication, however, that this is actually the case. There is little discretion in the indoor uses for recycled water. Discretionary outdoor use tends to be limited because properties with the service generally have limited outdoor space. In addition, as new-build properties, these will be built to higher standard of water and energy efficiency.

Long Run Marginal Cost

Long Run Marginal Cost (LRMC) is used in the model as the value for the avoided cost of bulk services that are replaced by alternative sources of water and sewerage.

The scenarios used in the model initially were $900/ML, $3,535/ML and $4,535/ML for water. However, MW has updated its estimates with input from SEW and OLV. Further discussion with MW indicates that that a reasonable assumption for LRMC for headworks is $475/ML. MW indicates that there is no plan to enhance transfer capacity to SEW so the effective LRMC for transfer is zero. The model now considers the expected scenario at this level and a high scenario at $1,535/ML.

Similarly, MW has updated its estimate for the LRMC of sewerage at ETP. The most recent estimate at $667/ML reflect that extensive upgrades have been made to the plant and any future significant investment is some way off. This was set as the expected Scenario so that he assumptions are $667/ML and $1,574/ML.

Modelling was carried out on the demand assumptions at 181kL/customer and 202kL/customer. For the lower figure, it was assumed that the potable take for each option was reduced but there was no reduction in potable substitution. This is reasonable if the substitution is used for water intensive indoor use including laundry and toilet but excluding shower, dishwasher etc. The volume of sewerage remained at 89% of the water volume. The effect of a higher LRMC for sewer alone was also modelled at 202kL to see if it has a material impact.

Table 5 shows the effect of varying LRMC using the expected estimate for water at $475/ML and a high estimate at $1,535/ML plus an expected estimate for sewage at $667/ML and a high of $1,574/ML.

TABLE 5: The effect of varying LRMC assumptions

Option	202kL at expected LRMC		202kL impact of high LRMC		202kL impact of high sewer LRMC only		181kL at expected LRMC		181kL impact of high LRMC	
	NPV $M	Rank	NPV $M	Rank	NPV $M	Rank	NPV $M	Rank	NPV $M	Rank
BAU	1,050	1	1,214	6	1,120	1	1,039	1	1,186	6
2	1,061	2	1,188	1	1,131	2	1,050	2	1,159	1
3	1,101	5	1,202	2	1,145	3	1,091	5	1,173	2
4	1,138	7	1,203	3	1,145	4	1,128	7	1,181	3
5	1,084	3	1,212	4	1,154	5	1,073	3	1,183	4
6	1,085	4	1,213	5	1,155	6	1,074	4	1,184	5
7	1,174	8	1,239	7	1,181	7	1,164	8	1,217	7
8	1,128	6	1,262	8	1,199	8	1,118	6	1,233	8
9	1,345	10	1,396	9	1,352	9	1,335	10	1,375	9
10	1,343	9	1,423	10	1,413	10	1,333	9	1,429	10

The revised, lower estimates of LRMC mean that the outcome is less sensitive to changes in the assumptions. A higher LRMC has the effect of raising the cost of options that have a greater reliance on bulk potable water. This can be seen in the movement of option 1 from cheapest under a low LRMC to sixth under a high LRMC. However, because the costs of options 1 to 8 are similar, it does not require a large swing.

Changing the assumption about the LRMC for sewerage alone does not make much of a difference. Volumes of sewage are fairly consistent across the options.

Looking at the options at 202kL, the median discount rate and the expected LRMC, options 2, 3, 5 and 6 are no more than 5% higher than BAU. Options 4 and 8 are within 10% of option 1 and the remainder are 12% or more higher.

Distribution of Net Present Cost

The direct cost of each option has been broken down into segments. Some costs are clearly identified against particular stakeholders. The destination of others, such as cost related to rainwater tanks, has not yet been agreed. Figure 4 shows that options 1 to 8 are broadly similar in cost terms (~10% difference) but options 9 and 10 are less favourable compared to option 1 (BAU). Two additional variations on option 8 were also assessed. These take a lower risk position in that they add contingencies for minimise the impact of lower-than-expected yields from rainwater tanks. Option 8b adds advanced control on rainwater tanks and option 8c has no downsizing of the potable network. Option 8b carries an additional cost of $46 million over option 8 and option 8c is an additional $52 million over option 8. The difference in the options will be discussed later in the report. Cost sharing principles are explored further in Appendix 1.

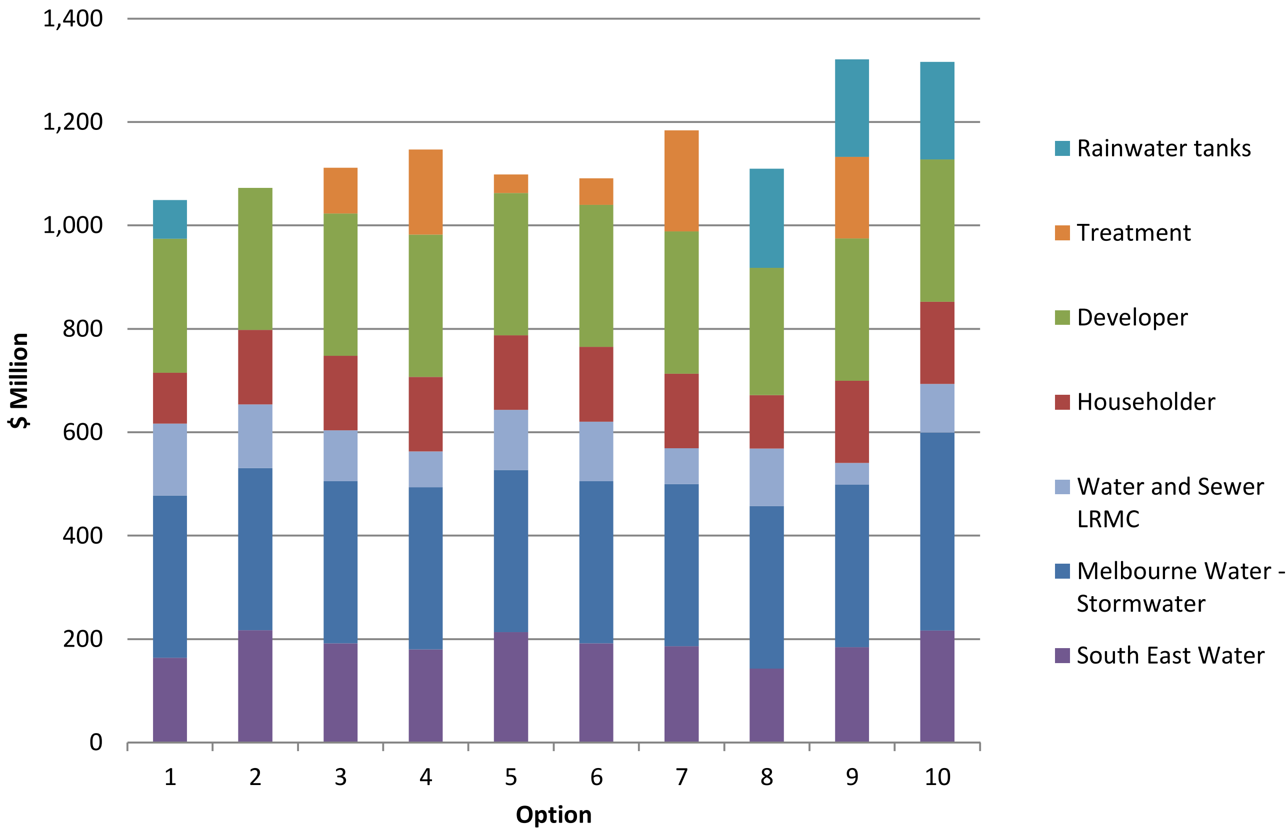


FIGURE 4: Net Present Cost and Allocation between Stakeholders

Table 6 shows the incremental cost of each option over option 1 and what this means in percentage terms. Table 7 shows where the incremental costs under each option are allocated to various segments.

Table 6: Direct cost and difference from option 1 ($M)

Option	1	2	3	4	5	6	7	8	9	10
Direct cost $M	1,049	1,076	1,111	1,146	1,099	1,091	1,184	1,110	1,321	1,316
Difference from option 1 $M	-	27	62	98	50	42	135	61	272	267
Difference from option 1 %	-	3%	6%	9%	5%	4%	13%	6%	26%	25%

Table 7: Cost difference to option 1 by segment ($M)

Option	Householder	Developer	SEW	MW – Stormwater	Bulk water & sewer	Rainwater tanks	Local treatment	Total
2	46	16	57	0	-16	-75	0	27
3	46	16	28	0	-41	-75	88	62
4	46	16	16	0	-70	-75	165	98
5	46	16	49	0	-23	-75	36	50
6	46	16	28	0	-24	-75	51	42
7	46	16	22	0	-70	-75	196	135
8	5	-13	-21	0	-27	117	0	61
9	60	16	21	0	-96	114	158	272
10	60	16	52	70	-45	114	0	267

Option 8 looks to be the most favourable for householders, developers and water authorities as there is no expenditure on third pipe. However, the cost for funding of the rainwater tanks needs to be explored. This may change the preferences of any given stakeholder depending on where the cost is allocated. This will be explored further in Section 4.3.

Community benefits

To benchmark a range of monetary values for environmental and amenity aspects OLV have used estimates from the UK National Ecosystem Assessment[1]. This is a comprehensive study that attempts to place values on ecosystems, including the aquatic environment. Although any comparison between the UK and Victoria should be treated with caution, they are similar enough to allow for a check on magnitudes. The figures from the UK study suggest that the assumptions used for this project are reasonable.

It is clear from looking at the cost of each option that the critical determinants of the assessment are capital and operating costs. These far outweigh other considerations such as the avoided cost of bulk services and the benefits to the environment and community. However, for options 2, 5, and 6 the quantified incremental benefits and the additional cost over option 1 are of similar orders of magnitude. Other options deliver similar levels of benefit but for greater cost. The net community cost and benefit can be seen in Figure 5.

[1] UK National Ecosystem Assessment (2011) The UK National Ecosystem Assessment Technical Report. UNEP-WCMC, Cambridge.

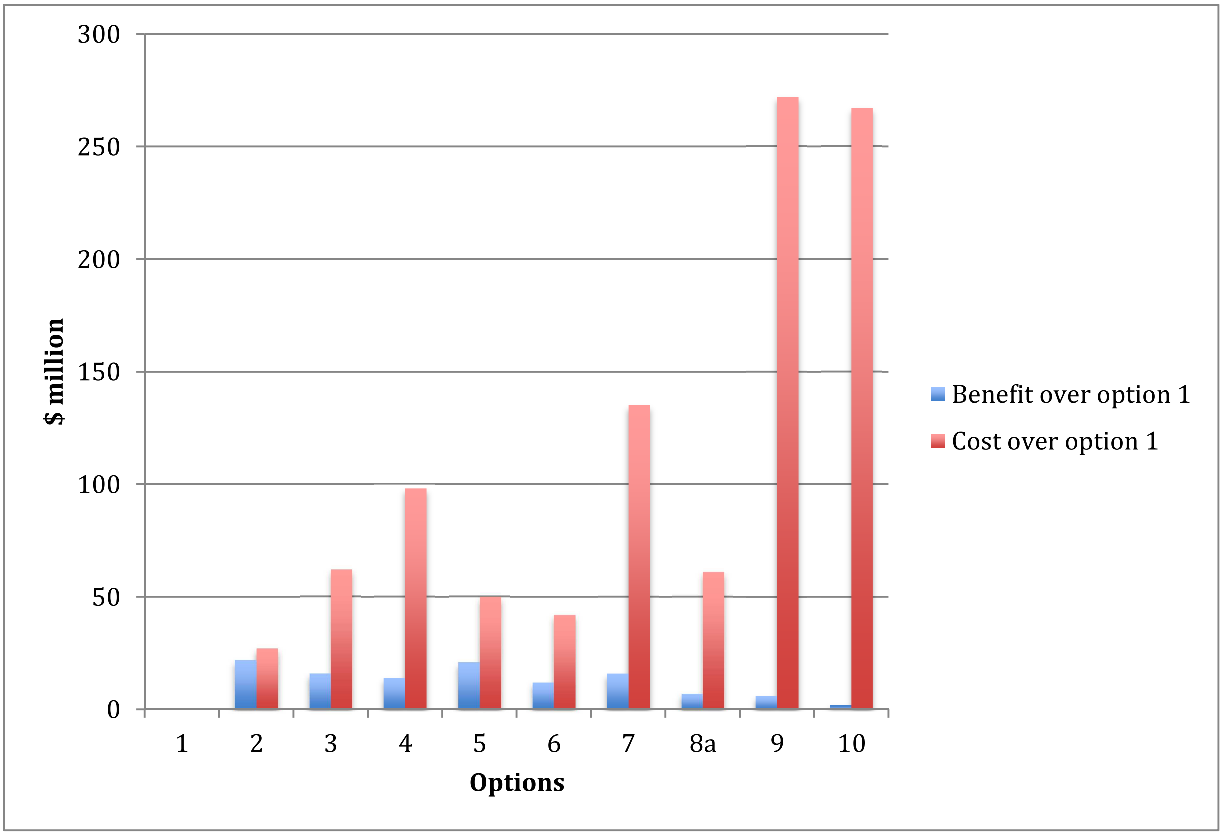


FIGURE 5: Net community cost and benefit compared to option 1

The magnitudes of the net community cost and benefit relative to option 1 can be seen in Table 8.

Table 8: Net cost and benefit relative to option 1

Option	1	2	3	4	5	6	7	8	9	10
Cost increment over option 1 ($M)	-	27	62	98	50	42	135	61	272	267
Benefit increment over option 1 ($M)	-	22	16	14	21	12	16	7	6	2

The benefits that were illustrated in Figure 5 have been broken down in Figure 6 and Table 9 to show both positive and negative impacts. The legend beside the chart shows which community benefits were costed and included in the economic modelling. This can form the basis as a stakeholder discussion on cost sharing. The main disbenefit is the opportunity cost of land required to implement each option.

FIGURE 6: Community benefits & disbenefits

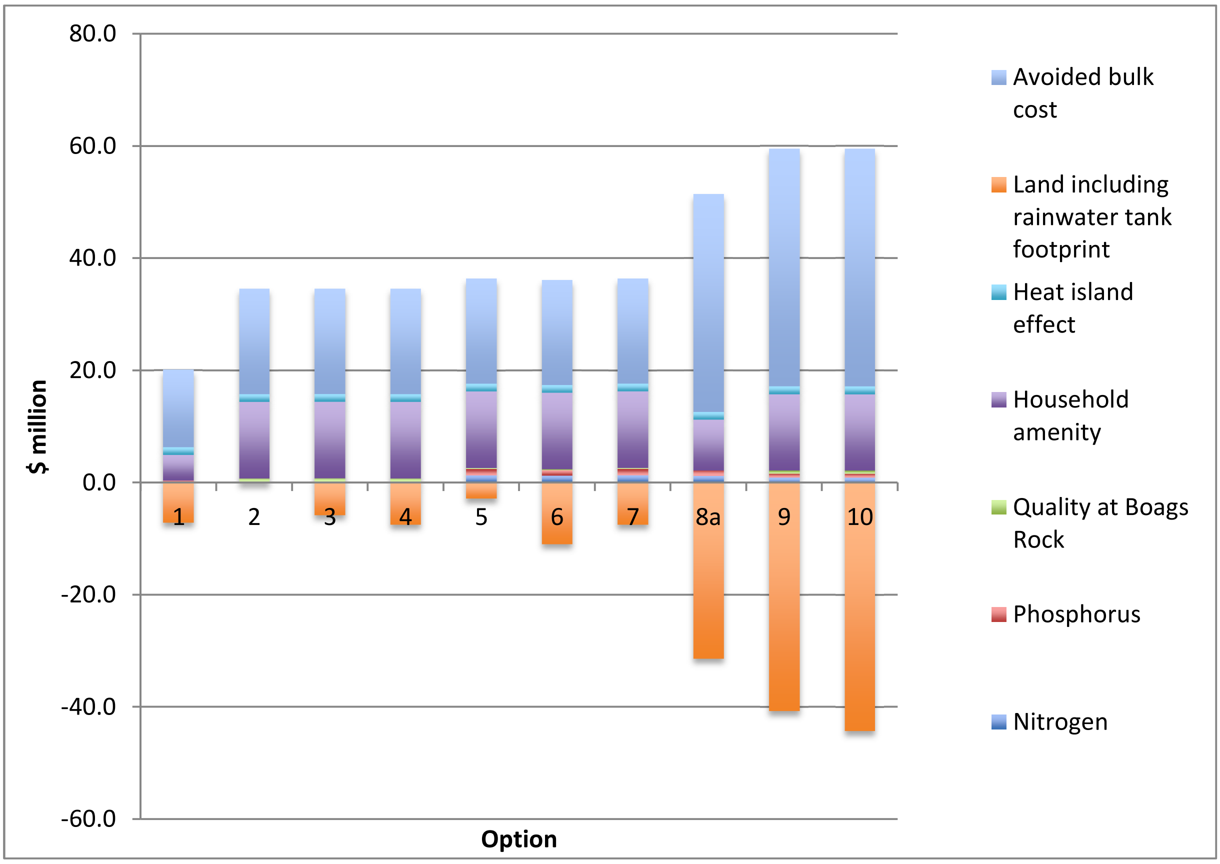


Table 9: Positive and negative benefits

Option	Nitrogen	Phosphorus	Quality at Boags Rocks	Household amenity	Heat island effect	Land take	Avoided bulk cost	Total
1	0.2	0.2	0.0	4.5	1.4	-7.1	13.8	13.0
2	0.0	0.0	0.8	13.6	1.4	0.0	18.7	34.5
3	0.0	0.0	0.8	13.6	1.4	-5.8	18.7	28.7
4	0.0	0.0	0.8	13.6	1.4	-7.4	18.7	27.1
5	1.4	1.1	0.2	13.6	1.4	-2.8	18.7	33.6
6	1.2	1.0	0.2	13.6	1.4	-11.0	18.7	25.1
7	1.4	1.1	0.2	13.6	1.4	-7.4	18.7	29.0
8	1.2	1.0	0.0	9.1	1.4	-31.4	38.9	20.0
9	0.9	0.7	0.6	13.6	1.4	-40.7	42.3	18.8
10	0.9	0.7	0.6	13.6	1.4	-44.2	42.3	15.2

4.3 Qualitative and quantitative analysis

The information in Table 10 below summarises key standards and outcomes from the various options. These outcomes reflect system wide benefits identified in MWF. It should be noted that all of the data in Table 10 (except waterway health) has been accounted for in the economic assessment and as such should not be double counted in the qualitative assessment. MWF outlines that, in determining the preferred future, a whole-of society and whole-of-system costs and benefits approach should be taken, which also places value on non-financial benefits – the *threshold test.* These are explored in Table 11 and linked to MWF outcome areas.

It should be noted that there are limitations to the technical, qualitative and quantitative analysis presented due to the compressed timeframes and use of preliminary. While all effort has been made to present a fair and accurate examination, stakeholders may wish to apply their own filter to the options.

TABLE 10: Standards and outcomes delivered by shortlisted options

Option		Option 1 (BAU)	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9	Option 10
Quality	In-catchment (SS:P:N)	BEPM 80:45:45	BEPM 80:45:45	BEPM 80:45:45	BEPM 80:45:45	BEPM 80:45:45	BEPM 80:45:45	BEPM 80:45:45	BEPM 80:45:45	BEPM 80:45:45	SEPP 93:66:63
	End-of-catchment (SS:P:N)	SEPP 93:66:63	SEPP 93:66:63	SEPP 93:66:63	SEPP 93:66:63	SEPP 93:66:63	SEPP 93:66:63	SEPP 93:66:63	SEPP 93:66:63	SEPP 93:66:63	SEPP 93:66:63
Waterway health	Improved km	107	107	107	107	107	135	107	135	135	135
	Improved above BAU km	-	0	0	0	0	28	0	28	28	28
	Waterways above 60ha km	36	36	36	36	36	55	36	55	55	55
	Constructed channels km	60	60	60	60	60	69	60	69	69	69
	Natural waterways km	11	11	11	11	11	11	11	11	11	11
Flooding	1 in 100	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Not assessed
Water demands	Potable ML	10,692	6,550	6,550	6,550	6,550	6,550	6,550	6,758	4,541	4,541
	% change from BAU	-	-39%	-39%	-39%	-39%	-39%	-39%	-37%	-58%	-58%
	% change from 2005/06 baseline	-23%	-53%	-53%	-53%	-53%	-53%	-53%	-51%	-67%	-67%
	Recycled ML	0	5,483	5,483	5,483	5,483	5,483	5,483	0	3,789	3,789
	Stormwater harvested ML	817	0	0	0	^5,483	^5,483	*0	4319	3219	3219
	Stormwater runoff ML	10,663	**11,480	**11,480	**11,480	5,997	5,997	**11,480	7,161	8,261	8,261
	% change from BAU	-	#-8%	#-8%	#-8%	44%	44%	#-8%	33%	23%	23%
	Effluent discharge ML	9,333	3,850	3,850	3,850	9,333	9,333	*3,850	9,333	5544	5544
	% change from BAU	-	59%	59%	59%	0%	0%	59%	0%	41%	41%
	Total alternative water used ML	817	5,483	5,483	5,483	5,483	5,483	5,483	4,319	7,008	7,008
Land take	Ha (inside PSP's)	108	108	108	108	108	176	109	106	109	265
	Rainwater tanks m^2/lot	3.7	-	-	-	-	-	-	3.7	3.7	3.7
	Ha (outside PSP's)	228 (wetland)	228 (wetland)	228 (wetland)	228 (wetland)	228 (wetland + SWTP)	228 (wetland)	228 (wetland + STP)	228 (wetland)	228 (wetland + STP)	-

^Based on 100% reliability of system

*Available for harvesting and treatment to Class A in regional treatment plant

**Available for harvesting from wetland if required – peak demand or agricultural purposes

#Increase on option 1 (BAU) as it has 50% of homes having rainwater tanks.

TABLE 11 Alignment with Draft Measures developed for Metropolitan Framework

	Option 1 (BAU)	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9	Option 10
Affordability	Addressed in PAG by adopting best community value option	As per option 1	As per option 1	As per option 1	As per option 1	As per option 1	As per option 1	As per option 1	As per option 1	As per option 1
Liveability & Environmental health of waterways	**Wetland** Designed for multiple benefits: Public open space – large portion of basin land would be accessible to the community. Transition from dense residential housing to parkland then farmland Threatened species habitat: Southern Brown bandicoot, Growling Grass frog. Water body used by migratory birds. Native vegetation – swamp plants, Gippsland Grassland plants. Retarding basin land is not otherwise developable as <3m above sea level. **Waterway health** Mitigates stormwater flow impacts on waterway health. Improves 107km of waterway. See Table 10 for details. Retarding basin – large area where water quality works could be constructed in future Co-location of flood management & water quality treatment assets in retarding basin	**Wetland** As per option 1 **Gardens, trees & outdoor water use** Recycled water – around the home, garden watering, trees, car washing **Open Space, sport & trees** Recycled water – irrigated open space, sports grounds & significant vegetation & tree cover **Waterway health** As per option 1	**Wetland** As per option 1 **Gardens, trees & outdoor water use** As per option 2 **Open Space, sport & trees** As per option 2 **Waterway health** As per option 1	**Wetland** As per option 1 **Gardens, trees & outdoor water use** As per option 2 **Open Space, sport & trees** As per option 2 **Waterway health** As per option 1	**Wetland** As per option 1 **Gardens, trees & outdoor water use** As per option 2 **Open Space, sport & trees** As per option 2 **Waterway health** As per option 1	**Wetland** As per option 1 **Gardens, trees & outdoor water use** As per option 2 **Open Space, sport & trees** As per option 2 **Waterway health** Mitigates stormwater flow impacts on waterway health. Improves 135 km of waterway. See Table 10 for details. Western Port is Ramsar listed, additional stormwater pollution reduction – above BPEM when used in conjunction with water quality treatment in large &/or distributed retarding basins.	**Wetland** As per option 1 **Gardens, trees & outdoor water use** As per option 2 **Open Space, sport & trees** As per option 2 **Waterway health** As per option 1	**Wetland** As per option 1 **Gardens, trees & outdoor water use** As per option 2 but from RWT. RWT less secure than recycled water in hot dry periods **Open Space, sport & trees** Non-residential/ centralised RWT may assist but this option does not provide secure supply during drought or restriction **Land Take for tanks** 5kL RWT 3.7m^2 of allotment, ~ $1500 per tank space depending on value assigned to land **Waterway health** As per option 6	**Wetland** As per option 1 **Gardens, trees & outdoor water use** As per option 8 **Open Space, sport & trees** As per option 2 **Land Take for tanks** As per option 8 **Waterway health** As per option 6	**Wetland** No regional wetland **Gardens, trees & outdoor water use** As per option 8 **Street scale WSUD** Amenity value – green infrastructure in an area with limited street & private vegetation. Increased land take requirements – reduced street & open space **Land Take for tanks** As per option 8 **Heat Vulnerability** Additional mitigation of urban heat island effect. **Waterway health** As per option 6 Current ecological condition is poor, mitigating this threat provides option for future ecological rehabilitation – growling grass frog, dwarf galaxias & spotted galaxias. Cost in improving waterway health in low ecological value areas could be diverted to protecting higher value waterways. Potential trade-off – improved amenity through waterway health vs loss of amenity through absence of large wetland

	Option 1 (BAU)	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9	Option 10
Water system sustainability & efficiency	**Potable demand** Reduction of **23%** over 2005/06 via water efficiency commensurate with current standards	**Potable demand** Reduction via water efficiency and substitution of **39%** over Option 1 and **53%** over 2005/06 demand **Water for Agriculture** Recycled water opportunities **Groundwater security** Excess stormwater or recycled water – ground water recharge or salt water intrusion barrier.	**Potable demand** As per option 2 **Water for Agriculture** As per option 2 **Groundwater security** As per option 2	**Potable demand** As per option 2 **Water for Agriculture** As per option 2 **Groundwater security** As per option 2	**Potable demand** As per option 2 **Water for Agriculture** Stormwater treatment plant located in wetland for 3rd pipe and use by adjacent market gardens **Groundwater security** As per option 2	**Potable demand** As per option 2 **Water for Agriculture** Wetland to store stormwater for use by adjacent market gardens. Decentralised stormwater treatment plants to feed into 3rd pipe network **Groundwater security** As per option 2	**Potable demand** As per option 2 **Water for Agriculture** Wetland to store and treat stormwater for use by adjacent market gardens **Groundwater security** As per option 2	**Potable demand** Reduction in via water efficiency and substitution of **37%** over Option 1 and **51%** over 2005/06 demand **Water for Agriculture** Not easily provided **Groundwater security** Reduced stormwater for groundwater recharge or salt water intrusion barrier	**Potable demand** Reduction via water efficiency and substitution of **58%** over Option 1 and **67%** over 2005/06 demand **Water for Agriculture** As per option 2 and 7 **Groundwater security** As per option 8	**Potable demand** As per option 9 **Water for Agriculture** As per option 2 **Groundwater security** Reduced stormwater for groundwater recharge or salt water intrusion barrier as no centralised storage
Resilience of water systems	**Water security** Option designed to meet industry service standards **Flooding & quality** Meets BPEM in-catchment and SEPP F8 at end-of-catchment and ARI 1.5 retarded & ARI 100 managed.	**Water security** Enhanced security during times of drought/outages (recycled water) **Flooding & quality** As per option 1 **Flexibility of supply** Opportunity to retrofit regional STP to supply adjacent agricultural area	**Water security** As per option 2 **Flooding & quality** As per option 1 **Flexibility of supply** Back-up supply for ETP Class A in case of outages – assist in managing demand peak, water can be exported. Reduced reliance on potable system as back up for the recycle system Develops decentralised recycled water grid in SE corridor – economies of scale	**Water security** As per option 2 **Flooding & quality** As per option 1 **Flexibility of supply** As per option 3	**Water security** As per option 2 (recycled stormwater) but to a lesser extent if long dry periods extend beyond storage capacity **Flooding & quality** As per option 1 **Flexibility of supply** As per option 3	**Water security** As per option 5 **Flooding & quality** As per option 1 plus increased flood protection through 6 decentralised stormwater treatment plants removing runoff **Flexibility of supply** As per option 3	**Water security** As per option 2 **Flooding & quality** As per option 1 **Flexibility of supply** As per option 5	**Water security** Enhanced security during times of drought/outages (RWT) but not to the same extent as recycled water. Water not always available during summer months (peak demand), however if tank fails supply can be met by potable system (under option 8c which resizes pipework) – abundance of transfer system capacity. **Flooding & quality** As per option 1 plus tanks provide additional flood mitigation benefits for 1 & 2 year ARI events	**Water security** Enhanced security during times of drought/outages (recycled water and RWT) **Flooding & quality** As per option 8, however less harvested rainwater due to Class A availability	**Water security** As per option 9 **Flooding & quality** Meets BPEM & SEPP F8 in-catchment and ARI 1.5 retarded & ARI 100 managed.
Innovation & industry capacity	Less innovation	Third pipe – Class A used rather than disposed through SEO	Regional sewage treatment plant	Regional sewage treatment plant	Regional stormwater treatment plant	Distributed regional stormwater treatment plants	Regional stormwater & sewage treatment plant	RWT – locally produced & consumed water	Innovative use of multiple alternative water sources e.g. regional sewage treatment plant, intelligent RWT	Innovative way to achieve SEPP F8 in-catchment

Risks have been identified in Table 12 below, including suggested mitigation measures. This list is by no means comprehensive and further work should be done in this area on the preferred option/s.

TABLE 12: Risk assessment and potential mitigation

	Risk description	Risk level	Risk mitigation measures	Residual risk level
Regional treatment plant (options 3, 4, 5, 7, 9)				
1	Potential negative community sentiment associated with location & operations of treatment plant.		• Wetland provides good buffer & environmental credentials • Undertake comprehensive community education & engagement program selling benefits of well-run plant to supply recycled water • Ensure plant meets all noise, odour, transport standards etc. • Plant designed to meet best practice	Low
2	Cost & risk of regional plant		• Plenty of time to confirm estimates of cost & revert decision to ETP if cost prohibitive • Time to assess new technologies • Utilise best practice capital procurement • Inline water quality measures potential to provide uniform stormwater quality to stormwater harvesting facilities	Low
3	Acquisition of land for regional plant		• Collaborate with MW on joint purchase & cost sharing for land purchase	Low
4	Water supply interface from regional wetland		• Collaborate with MW interface arrangements & cost sharing – plenty of time to do this	Low
Rainwater tanks (options 8, 9, 10)				
5	Clarity on stakeholder responsibilities for funding, operating & maintaining tanks		• Requires stakeholder decision regarding who will take on this role • Cost to customer must be considered – explore funding options • Opportunity to look at communal rainwater harvesting system	Med
6	Long term security of supply & stormwater benefits from RWT if managed by homeowners		• Undertake education programs on value of RWT to hip pocket & environment • Offer value for money commercial maintenance service, &/or • Design reticulation to meet peak summer periods (what is the cost of managing this risk in this way?) • Utilise existing spare transfer capacity as back up under option 8c (increased cost from larger pipework)	Med
7	Reduced SEW revenue & potential impacts to sewage disposal tariff if not addressed		• Build cost into business case & spread cost across rate base or • Review sewer volumetric tariff for mandated areas • Investigate how RWT might be managed, either by customers or by developing a commercial offering for this task	Low
8	Management of tank water quality & colour		• Tank quality likely impacted by trees & leaf litter • Design tanks for easy maintenance • Customer likely to request higher standard if they are not the manager	Low

	Risk description	Risk level	Risk mitigation measures	Residual risk level
9	Backflow protection from tanks to potable		• Conduct audits similar in concept to those currently done for recycled water	Low
10	Implications of mandating RWT		• OLV to explore appropriate regulatory instruments, such as using planning provisions, or • Adopt an ‘opt out’ model to defuse potential community concerns	Low
11	Potential developer/customer reaction to tank concepts		• Positive impact of tanks is well understood • Develop comprehensive marketing program to explain benefits of RWT to hip pocket & local environment • Adopt ‘opt out’ model • Research whether there is a demonstrated ‘willingness to pay’	Low
In-catchment treatment solution (option 10)				
12	Risk associated with efficient & effective management of in-catchment treatment systems		• Explore best practice • Ensure systems protected appropriately during development & housing construction phase • Ensure cost estimates accurate & provide for appropriate control audits etc.	Med
13	Likely encumbrance of stormwater facilities on public open space		• Participate in detail design process • Ensuring critical areas not encumbered	Med
14	Responsibility for management & funding of decentralized storm water facilities		• Explore best practice • Ensure systems protected appropriately during development & housing construction phase • Ensure cost estimates accurate & provide for appropriate control audits etc.	Med
15	Lack of clarity on solutions for the precinct & implementation		• After land take decision is resolved, further analysis can be performed on the water/sewer options & staging of implementation. MPA to be included in further discussions	Med

Impact of rainwater tanks on flood protection

To determine the level of flood protection offered through the use of 5kL rainwater tanks, they were modelled for a generic 60 ha catchment over a series of average rainfall intensity events, 1 in 1 year, 1 in 10 years and 1 in 100 years at initial tank capacities (between empty and full at the beginning of the rainfall event).

Table 13 shows the total storage volumes required to achieve the required rural flows for each rainfall event, what volume is captured by the tanks and what volume would need to be stored in a retarding basin (RB). The table highlights that rainwater tanks assist in protecting waterways for lower intensity rainfall events such as 1 in 1 year events, but there are no stream benefits in a 1 in 100 year event.

TABLE 13: Impact of rainwater tanks

ARI	Initial tank storage %	Peak RB discharge (rural flow) kL/s	Tank volume kL	RB storage required kL	Total storage volume kL
1	100	0.31	4,500	8,220	12,720
1	0	0.23	4,500	6,670	11,170
10	100	0.72	4,500	14,100	18,600
10	0	0.54	4,500	12,000	16,500
100	100	1.57	4,500	22,000	26,500
100	0	1.36	4,500	20,100	24,600

4.4 Further work required

As mentioned previously, the data presented in this report has some gaps, due to both short timeframes and uncertainties in the figures and financials. Further work is required before greater confidence can be achieved in the analysis. In order to present the most robust data possible, further examination needs to be given to:

- Refining cost estimates and assumptions;
- Exploring cost allocation/sharing for the options, particularly those with rainwater tanks;
- Further understanding the increased in-stream benefits from reduced stormwater runoff;
- Further understanding the impact of rainwater tanks on stormwater runoff in this specific region;
- Further modelling of option 10 to understand the efficacy of in-catchment treatment options and the subsequent impact on land take and lot density;
- Further refining of the PAG applying the learning from this project;
- Further refining of the systems framework in order to apply a whole of system approach; and
- Informing the process for the development of the regional IWCM plans.

5. Discussion

5.1 PAG Analysis

The options have been assessed according to the whole of water cycle PAG (beta version). This was issued by OLV in 2013 to provide a common approach to evaluating whole of water cycle projects. As stipulated, an economic analysis was performed with qualitative aspects costed where possible. According to the threshold test, where costs are similar across options a preferred option may be selected based on externalities such as uncosted benefits, and some of these are discussed below in the context of the MWF Metropolitan Framework outcome areas. The performance of the options against these areas is summarised below.

Affordability

Options 1 to 8 are fairly close in cost with their differences being within acceptable confidence intervals and options 9 and 10 are higher in cost. Options 2, 5 and 6 are within 5% of BAU, options 3, 4 and 8 are within 10% of BAU, option 7 is within 13% while options 9 and 10 are 26% and 25% respectively, higher than BAU. While option 1 (BAU) is the cheapest it offers little innovation and does not support a whole of water cycle approach.

A sensitivity analysis was performed using various discount rates, long run marginal costs and customer water demand assumptions. This caused the NPC's to rise and fall consistently but did not markedly affect the ranking of each option, meaning the key assumptions are reasonable for use in a comparison between options.

The analysis was performed to find the lowest community cost, however allocation of these costs should be further explored in order to understand the impact on individual stakeholders and identify potential cost sharing arrangements or funding sources. For example, if a stakeholder obtained a significant benefit from a particular option they may be prepared to 'purchase' this benefit from another stakeholder who does not receive the benefit.

Liveability, environment and waterway health

The stormwater management solutions offer improved liveability and environmental health of waterways. In options 1 to 5 and 7 approximately 107 km of waterway is improved and this is increased to approximately 135km in options 6, 8, 9 and 10. All of the options have been designed to meet BPEM in-catchment and SEPP F8 for discharge to Westernport Bay, except for option 10 which is designed to meet SEPP F8 in-catchment. Options 8 and 9 may provide additional local flood mitigation for ARI 1 and 2 year storm events due to rainwater tanks but this would have little benefit in ARI 100 storm events. Option 6 offers this same benefit through use of decentralised stormwater harvesting and treatment.

The regional wetland contained in options 1 to 9 offers a number of environmental, liveability and amenity benefits including: large open space with public access; a transition from housing to parkland then farming land; habitat for threatened species such as the Southern Brown Bandicoot and Growling Grass Frog; water bodies for migratory birds and native vegetation, such as swamp plants and Gippsland grasses. The 200ha of land proposed for the wetland is outside the UGB and therefore less expensive. It is also non-developable land as it is less than 3m above sea level. The land within the PSP is valued at $600,000/ha while the area outside is only valued at $250,000/ha.

The distributed system proposed in option 10 offers many of the above benefits but perhaps to a lesser extent due to the smaller sizes of the wetlands. However, the number and location of the wetlands makes them more accessible to the community and offers amenity within the precinct close to people’s homes. Up to an additional 265ha is required for this option which affects the NPC and may have impacts on public open space and lot density. Casey Council has also expressed concern regarding maintenance of these assets.

The current ecological condition of the waterways is poor, most of them being little more than drainage channels. The stormwater management solutions would improve stream benefits and provide for future ecological rehabilitation. However, it could be argued that the cost of improving waterway health from BPEM to SEPP F8 in constructed waterways in an area with low ecological values could better be diverted to protecting higher value waterways in another region i.e. is the significance placed on this improvement the same in an area with low ecological value to one with high ecological value.

Resilience and sustainability

All of the options offer a reduction in potable demand due to efficiency and use of alternative water sources ranging from 23% in option 1 (BAU) on 2005/06 figures solely due to 50% rainwater tanks and water efficiency, up to 67% in options 9 and 10. Greater resilience (reduced impact from drought and water restrictions) is seen in all options with recycled water but options 9 and 10 are arguably the most resilient as they utilise multiple alternative water sources. Option 7 could be seen as the more sustainable option as it treats stormwater as a resource but maintains security of supply through use of recycled water.

Option 8 has lower resilience than the recycled water options due to lack of rainwater availability in long dry periods, which also coincide with peak demand. However option 8 still has improved resilience on BAU. Rainwater can also provide for greater end uses, particularly hot water. Options 1, 2, 3, 5, 6 and 8 have lower energy demand than options 4, 7, 9 and 10.

Rainwater tanks present some implementation issues to be worked through such as how they could be funded and who would take responsibility for tank management. There is a risk to both system resilience and security of supply should they be ill-maintained or managed incorrectly.

Options 8b and 8c offer strategies to manage this risk such as utilising smart systems and increasing network pipe sizes. This means the potable system could be used as a back-up when tanks were not working or were empty during long dry spells, if water restrictions were not in effect. Service levels would be maintained however substitution of potable supply would be significantly reduced.

The footprint of the tank also impinges on lot size by up to 3.7sqm, although this could be reduced by siting it strategically, such as along the side of the house or under the garage. This land is valued around $1,500 and has been included in the economic analysis reflecting community cost. There is also the challenge with mandating tanks, however OLV is currently investigating a number of ways to manage this.

5.2 Option refinement

The discussion above is summarised in Table 15 and results in a shortlist of seven options, namely options 2, 3, 4, 5, 6, 7 and 8. Option 1 is not favoured as it doesn't support whole of water cycle management. Options 9 and 10 are not favoured due to lower economic performance. See Table 15 for details.

A discussion needs to occur around the cost allocation for various options raised in section 4.2. In the case of rainwater tanks in options 1, 8, 9 and 10, arrangements need to be agreed as to who funds and manages them as both potable substitution and stormwater management assets, and how much this service is valued by other beneficiaries.

TABLE 15: Shortlisted options

Option	Economic (first round)	Externalities (second round)
1 (BAU)	Not favoured as doesn't support whole of water cycle approach	
2	Shortlisted – BAU <3%	Good system resilience due to diversity of supply and security of recycled water supply from ETP Good supply of recycled water to adjacent agricultural area if wetland converted to storage area or network pipe sizes enlarged
3	Shortlisted – BAU <6%	Good system resilience due to diversity of supply and security of recycled water supply from small regional treatment plant Good supply of recycled water to adjacent agricultural area
4	Shortlisted – BAU <9%	Good system resilience due to diversity of supply and security of recycled water supply from large regional treatment plant Good supply of recycled water to adjacent agricultural area
5	Shortlisted – BAU <5%	Good system resilience due to diversity of supply and moderate security of recycled water supply from regional stormwater treatment plant Moderate supply of recycled water to adjacent agricultural area
6	Shortlisted – BAU <4%	Additional waterway health benefits for ARI <5 storm events Good system resilience due to diversity of supply and moderate security of recycled water supply from decentralised stormwater treatment plants
7	Shortlisted – BAU <13%	Good system resilience due to diversity of supply and security of recycled water and treated stormwater supply from regional treatment plant Good supply of recycled water to adjacent agricultural area
8	Shortlisted – BAU <6%	Additional waterway health benefits for ARI <5 storm events Good system resilience due to diversity of supply and moderate security of supply from RWT Tank management issues to be considered
9	Not favoured due to economics – BAU >26%	
10	Not favoured due to economics – BAU >25% & impacts of in-catchment stormwater management	

The seven shortlisted options deliver whole of water cycle management and are competitive against BAU.

Options 6 and 8 offer improved waterway health benefits over the other shortlisted options due to reduced stormwater runoff. This is consistent with the likely direction of the BPEM review currently underway. However, the value of improved waterway health in this region must be considered and balanced with the reduced security of supply relying on rainwater or treated stormwater rather than recycled water from ETP or a regional plant. This could reduce amenity in times of drought through the lack of garden watering and green open spaces. This drawback also applies to option 5, although larger storage volumes offer some redundancy.

Options 2, 3, 4 and 7 all offer increased security of supply through use of recycled water. Option 2 makes use of excess capacity available from ETP whereas options 3, 4 and 7 employ construction of a regional treatment plant and can potentially more easily supply the adjacent food belt. Option 7 also supplements the recycled water with treated stormwater, creating greater system redundancy and effectively treating stormwater as a resource instead of a concern.

Each of the shortlisted options offers pros and cons. Further analysis to refine the options and place values on the various risks and benefits is needed to inform final selection of a preferred option. This will ensure there is greater rigor around costs and consideration of what aspects are most valuable to water servicing agencies, which risks can be managed and which should be avoided.

6. Conclusion

The analysis completed shows that options 2-8 are all of a similar cost with the variance from option 1 being a maximum of 13%. These seven options deliver whole of water cycle management to varying degrees and are competitive against BAU.

The decision on which of the options (2 – 8) is selected does not have to be undertaken immediately, as it has minimal material impact on the PSPs with respect to land take. Given the outstanding level of uncertainty regarding costing, performance and implementation of the options there is a strong argument to finalise the PSPs in such a way as to retain flexibility as to whether a third pipe or rainwater tank option is pursued. This could be achieved by having the PSPs reflect minimum performance outcomes related to the whole of water cycle.

Further work should be undertaken by MW and SEW to resolve outstanding uncertainties, taking into account the views of other key stakeholders (including Casey Council, developers and the community), with a view to reaching a decision by late 2014. OLV will continue working collaboratively with the stakeholders to further refine a preferred option for the best whole of water cycle outcome and address any implementation issues, and is committed to supporting and facilitating this work over the coming year.

Refinement of costs and assumptions will be determined for the seven shortlisted options through a complete data audit and further detailed analysis. From this a preferred option will be selected with a full risk analysis, cost allocation and potential funding sources identified. From there, an implementation plan will be developed to ensure the best possible whole of water cycle outcome is achieved in the CCGA.

It should be noted that details such as scale, timing and location of decentralised treatment plants and whether in-catchment stormwater treatment to SEPP F8 was even achievable within the context of these PSPs, due to hydrological characteristics and land take requirements, was beyond the scope of this summary report within the timeframes permitted. However, the need for this information will inform future development of whole of water cycle planning. A full analysis of the impact of in-catchment treatment and use of rainwater tanks should be performed for a region where waterway health has high ecological value that could be threatened by land development.

An evaluation of the CCGA project will be undertaken both in terms of process and outcome. This will allow all key learnings to be incorporated into refining the PAG and informing development of the regional whole of water cycle plans. Stakeholders will be given the opportunity to contribute to the evaluation to ensure areas for improvement are identified and successes acknowledged.

7. Acknowledgements

This project has been intense and complex and has served as an insightful pilot to inform future work. The lessons learned will be detailed in a separate evaluation report. The results of this pilot project attests to the collaborative attitude brought by all of the stakeholders to the process.

Recognition should also be given to the vast amount of work performed in the years leading up to this report. The previous studies undertaken by SKM for SEW, MW and MPA were extremely detailed and involved numerous reasons for arriving at the nine options selected. There was also an extensive and consultative process developing the Multi-Criteria Assessment framework.

Dr Peter Coombes and the system analysts in the Office of the Chief Scientist provided modelling under the systems framework and introduced option 10. Neil Craigie of Waterway Management Consultants provided expertise in the stormwater management solution from both a technical and land take perspective, and in assessing the effectiveness of rainwater tanks in flood mitigation.

Without the significant input of all of the stakeholders this project could not have happened. OLV wishes to express thanks for the flexible and cooperative approach the project partners and stakeholders brought to the process and look forward to working collaboratively in the future to achieve whole of water cycle benefits across Greater Melbourne.

8. Glossary

ARI	Average Recurrence Interval
BAU	Business as Usual
BPEM	Best Practice Environmental Management
CCGA	Casey Clyde Growth Area
GGA	Growth Areas Authority
IWCM	Integrated Water Cycle Management
LRMC	Long Run Marginal Cost
MPA	Metropolitan Planning Authority
MW	Melbourne Water
MWF	Melbourne's Water Future
NPC	Net Present Cost
OSC	Office of the Chief Scientist
OLV	Office of Living Victoria
PAG	Project Assessment Guidelines
PSP	Precinct Structure Plans
RB	retarding basin
RWT	rainwater tank
SEO	South Eastern Outfall
SEW	South East Water
SKM	Sinclair Knight Merz
SEPP	State Environment Protection Policy
STP	Sewage Treatment Plant
SWTP	Stormwater Treatment Plant
UGB	Urban Growth Boundary
WSUD	Water Sensitive Urban Design

9. Appendices

Appendix 1: Asset creation ownership and risk allocation principles

Appendix 2: Detailed option description and community and stakeholder risks and benefits

Appendix 3: Vision for the proposed Clyde Creek Retarding Basin

Appendix 4: Stakeholder issues and considerations

Appendix 1: Asset creation ownership and risk allocation principles

Context

It is currently difficult to assign assets and operational requirements associated with newly created IWM solutions. This creates an obstacle when trying to implement these solutions.

For Water and Sewerage assets there are well established cooperative planning principles which set the basis for co investment. This is based around community benefit and least overall cost, allocation of costs and risks obligations and interface points

Similar principles do not exist for alternative water supply projects which results in the ownership and risk allocation being determined on a project by project basis which will become increasingly inefficient as more projects are implemented.

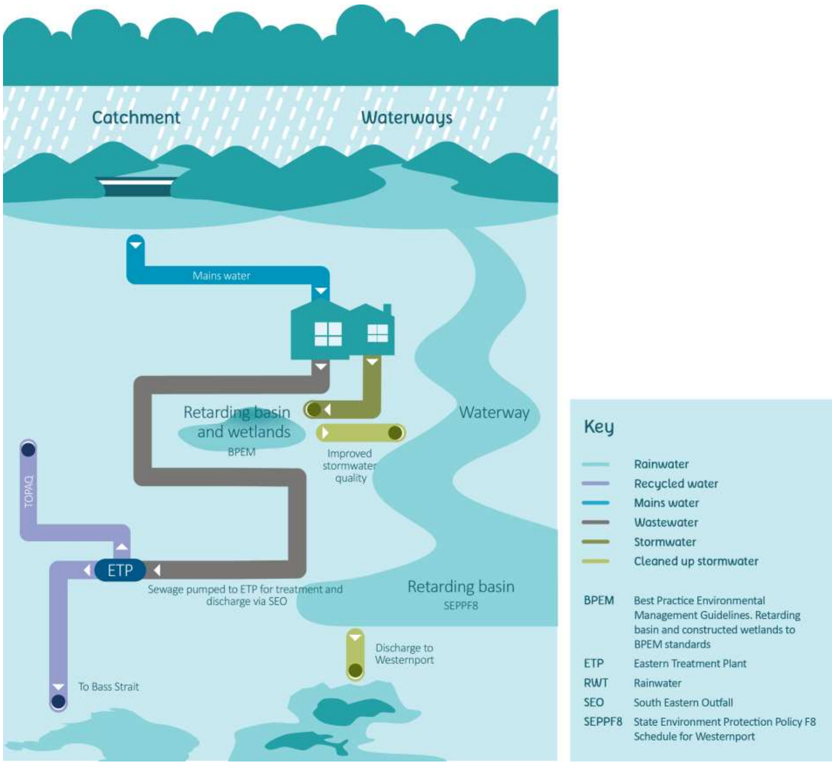
Principles

In order to effectively transition from IWM, concepts to on-ground functional solutions a set of guiding principles is required to appropriately define asset allocation, costs and responsibilities. The guiding principles should be based upon:

Theme	Principle
Best Community Outcome	Focuses outcomes based on least over all community costs and greatest community benefit Flexible approach to achieve outcomes
Working in Partnership	Genuine collaboration and meaningful engagement Sharing knowledge, information, expertise
Levels of Service	Determine appropriate performance and function of asset to ensure cost efficient outcome
Asset & Risk Allocation	Equity and fairness in allocation of risks and cost benefits Based on obligations, costs allocation, shared risk Defined agreement on clear roles, responsibilities and accountabilities
Adaptive management	Commitment to continuous improvement, monitoring, evaluation and research

Appendix 2: Detailed option description and community and stakeholder risks and benefits

Option 1



Water Demand

Demand Element	Residential	Units	Non Res	Open Space
Indoor Potable	Potable	Potable	Potable	Potable
Hot water	Potable	Potable	Potable	N/A
Laundry (cold)	Potable	Potable	Potable	N/A
Toilet	Potable	Potable	Potable	Potable
Outdoor	Potable	Potable	Potable	Potable

Stormwater

Stormwater discharge from properties is not normally constrained, however, may be regulated at some locations by Council. Unconstrained stormwater discharge from properties is assumed in this option.

Sewage Loads

Conventional gravity sewerage taking all indoor waste water streams from the property.

Water Supply Sources

Potable water supply from the existing water supply transfer system in the area comes from the Cardinia Reservoir and Cranbourne Tank water systems. A future source may be from the Desalination pipe running through the development area via Discharge Point 7 in the eastern edge of the area.

Water Supply System

There is minimal potable network augmentation required to bring water to the growth area. The internal distribution network within the precinct is sized to meet peak hour demand.

Sewerage System

Gravity sewerage network within the Westernport Catchment sized to meet peak 1 in 5 year sewer flows draining to the proposed regional pump station for transfer via a new rising main to Eastern Treatment Plant where it is treated to Class A for recycling or disposal in the SEO to Boags Rocks.

Stormwater Management System

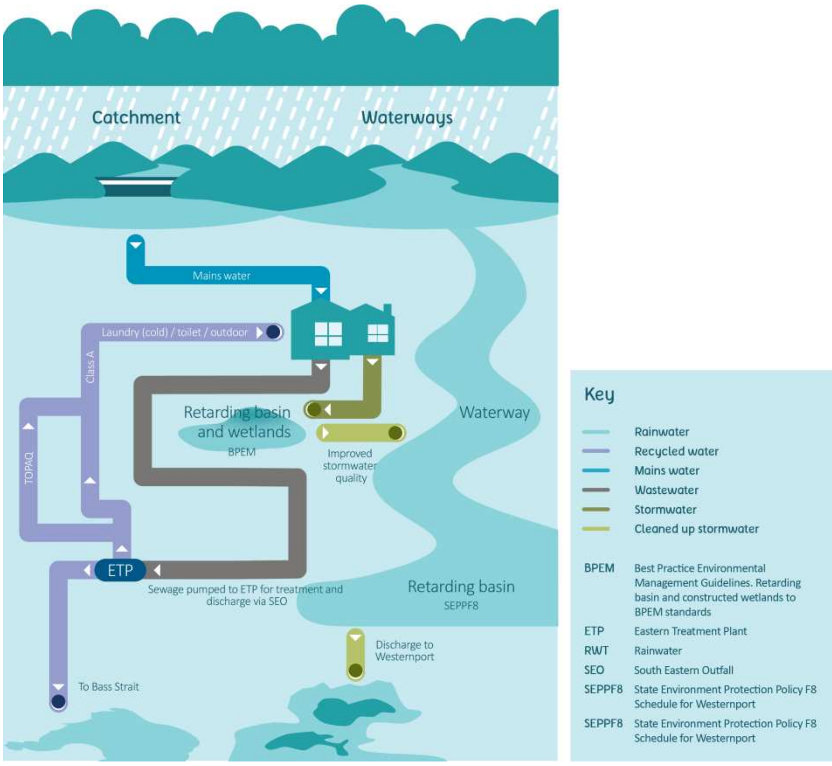
Drainage Schemes within the precincts will require management and treatment of flows to current Best Environmental Practice Management (BEPM) requirements. Stormwater from the development is disposed via traditional drainage to waterways. The proposed stormwater management scheme has a number of offline retarding basins and wetlands along the main streams to achieve quality treatment and quantity management. The regional wetland outside of the south east corner of the development corridor will provide additional treatment to SEPP F8 standard and further retardation of major storm events.

Community and stakeholder risks and benefits

Summary description: Potable water only, sewage pumped to ETP, Drainage with large regional Wetland, 50% of houses have a rainwater tank connected to toilet and outdoor.	
Community Cost	Results from PAG analysis possibly with sensitivity results
Merits	• Separated water sewerage and drainage systems via centralised systems which are conventional water networks • Does not comply with Melbourne's Water Future objectives • Large regional wetland providing a significant environmental asset for flora and fauna • Protection and management of flows for downstream residents and run of stream irrigators • Not meeting customer expectation of recycled water supply for growth areas
Community Risks	• Backflow protection from tanks to potable network Low
Stakeholder Perspectives	SEW • Lower cost solution • Not meeting customer expectations
(financial,	MW • Regional wetland robustness and future flexibility to regional stormwater strategy

merits, risks and implementation concerns)	Casey Council • Known stormwater strategy with acceptable level of maintenance requirements
	MPA • Clarity of known solutions for the precinct and implementation
	SRW • Reduced recharge of groundwater due to development of site and capture of stormwater.
	OLV • Does not provide a change in water management approach, and limited support to direction of MWF
	Developer • Impact on marketability of estate compared to offerings in adjacent estates which have mandated recycled water.
Implementation Challenges	• Not meeting government policy objectives • Acquisition of regional wetland

Option 2



Water Demand

Demand Element	Residential	Units	Non Res	Open Space
Indoor Potable	Potable	Potable	Potable	Potable
Hot water	Potable	Potable	Potable	N/A
Laundry (cold)	Recycle	Recycle	Potable	N/A
Toilet	Recycle	Recycle	Recycle	Recycle
Outdoor	Recycle	Recycle	Recycle	Recycle

Stormwater

Stormwater discharge from properties is not normally constrained, however may be regulated at some locations by Council. Unconstrained stormwater discharge from properties is assumed in this option.

Sewage Loads

Conventional gravity sewerage taking all indoor waste water streams from the property.

Water Supply Sources

Potable water supply from the existing water supply transfer system in the area comes from the Cardinia Reservoir and Cranbourne Tank water systems. A future source may be from the Desalination pipe running through the development area via Discharge Point 7 in the eastern edge of the area.

Initially, recycled wastewater supply to the development area will be from extension of supply from the adjacent existing recycled water areas which receive supply from the Eastern Treatment Plant via the TOPAQ recycled water system. Additional supply is expected to become available as TOPAQ agricultural customers relinquish their entitlements due to urban development.

Water Supply System

There is minimal potable network augmentation required to bring water to the growth area. The internal distribution network within the precinct is sized to meet peak hour demand.

As discussed previously, the TOPAQ network will initially provide recycled water to the area. A new recycled water supply pipeline is planned to augment supply to Cranbourne North, Clyde North and Officer as part of existing servicing recycled water strategies. The planned pipeline will be upsized to cater for additional demand from Casey Clyde. The distribution network within the precinct will be sized to meet peak hour demand including fire fighting.

Sewerage System

Gravity sewerage network within the Westernport Catchment sized to meet peak 1 in 5 year sewer flows draining to the proposed regional pump station for transfer via a new rising main to Eastern Treatment Plant where it is treated to Class A for recycling or disposal in the SEO to Boags Rocks.

Stormwater Management System

Drainage Schemes within the precincts will require management and treatment of flows to current Best Environmental Practice Management (BEPM) requirements. Stormwater from the development is disposed via traditional drainage to waterways. The proposed stormwater management scheme has a number of offline retarding basins and wetlands along the main streams to achieve quality treatment and quantity management.

The regional wetland outside of the south east corner of the development corridor will provide additional treatment to SEPP F8 standard and further retardation of major storm events.

Community and stakeholder risks and benefits

Summary description: Potable water for most indoor use, Reticulated recycled water for cold laundry, toilet and outdoor use, Sewerage pumped to ETP for treatment to class A, Drainage with large regional wetland for managing stormwater quality and flooding.

Community Cost	Results from PAG analysis possibly with sensitivity results
Merits	• Maximising reuse of ETP water resources • Large regional wetland providing a significant environmental asset for flora and fauna • Protection and management of flows for downstream residents and run of stream irrigators • Savings in potable water network from reduced demand
Community Risks	• Whole of Community versus Local Medium
Stakeholder Perspectives **(financial, merits, risks and implementation concerns)**	SEW • Meeting customer expectation
	MW • Regional wetland robustness and future flexibility to regional stormwater strategy • MW bulk recycled water supplier for the region
	Casey Council • Known stormwater strategy with acceptable level of maintenance requirements
	MPA

	• Clarity of known solutions for the precinct and implementation
	SRW • Reduction in groundwater recharge due to development of site and capture of stormwater.
	OLV • Supports direction of MWF
	Developer • Provides comparable marketable product to adjacent subdivisions with mandated recycled water
	Customer • Provides a cheaper source of water for irrigation, so customer has increased choice on level of greenness of property.
Implementation Challenges	Implementation Challenges • Acquisition of the Regional wetland

Option 3

Water Demand

Demand Element	Residential	Units	Non Res	Open Space
Indoor Potable	Potable	Potable	Potable	Potable
Hot water	Potable	Potable	Potable	N/A
Laundry (cold)	Recycle	Recycle	Potable	N/A
Toilet	Recycle	Recycle	Recycle	Recycle
Outdoor	Recycle	Recycle	Recycle	Recycle

Stormwater

Stormwater discharge from properties is not normally constrained, however may be regulated at some locations by Council. Unconstrained stormwater discharge from properties is assumed in this option.

Sewage Loads

Conventional gravity sewerage taking all indoor waste water streams from the property.

Water Supply Sources

Potable water supply from the existing water supply transfer system in the area comes from the Cardinia Reservoir and Cranbourne Tank water systems. A future source may be from the Desalination pipe running through the development area via Discharge Point 7 in the eastern edge of the area.

Water Supply System

There is minimal potable network augmentation required to bring water to the growth area. The internal distribution network within the precinct is sized to meet peak hour demand.

The ultimate principal source of recycled water supply is a new small regional sewage treatment plant located in the south east corner outside the development corridor. The supply will maximise the use of locally produced Class A water. In periods of low demand the plant will also be a source of supply for the current developing Cranbourne recycled water areas.

Sewerage System

Gravity sewerage network within the Westernport Catchment sized to meet peak 1 in 5 year sewer flows draining to the new regional treatment plant with remaining draining to the proposed regional pump station for transfer via a new rising main to Eastern Treatment Plant where it is treated to Class A for recycling or disposal in the SEO to Boags Rocks.

Stormwater Management System

Drainage Schemes within the precincts will require management and treatment of flows to current Best Environmental Practice Management (BEPM) requirements. Stormwater from the development is disposed via traditional drainage to waterways. The proposed stormwater management scheme has a number of offline retarding basins and wetlands along the main streams to achieve quality treatment and quantity management.

The regional wetland outside of the south east corner of the development corridor will provide additional treatment to SEPP F8 standard and further retardation of major storm events.

Community and stakeholder risks and benefits

<table>
<tr><th colspan="2">Summary description: Potable water for most indoor use. Reticulated recycled water for cold laundry, toilet and outdoor use. Sewerage regional treatment plant generating class A with remaining flowing to ETP. Drainage with large regional wetland with stormwater harvesting supplementing class A supply.</th></tr>
<tr><td>Community Cost</td><td>Results from PAG analysis possibly with sensitivity results</td></tr>
<tr><td>Merits</td><td>
• Water resource near Peri Urban area of Bunyip Food Belt augmented with a connection to ETP
• Water resource that could be used for ground water recharge or salt water intrusion barrier.
• Improves reliability of SE Recycle water networks with a second major source of supply
• Reduced reliance on potable system as back up for the recycle system
• Mixed use activity in the regional wetland enhancing investment in the area.
• Large regional wetland providing a significant environmental asset for flora and fauna
• Protection and management of flows for downstream residents and run of stream irrigators
• Use of stormwater as an additional supply for recycled water network and reduce loads to Westernport
• Savings in potable water network from reduced demand
• Provides a more resilient system.</td></tr>
<tr><td>Community Risks</td><td>• Whole of Community versus Local (WHO PAYS??) Medium</td></tr>
<tr><td rowspan="8">Stakeholder Perspectives

(financial, merits, risks and implementation concerns)</td><td>SEW
• Bares a greater proportion of costs and risks for regional plant
• Acquisition of land for the regional plant
• Regional wetland providing buffer zone and protecting from development encroachment on treatment plant
• Water supply interface from regional wetland</td></tr>
<tr><td>MW
• Regional wetland robustness and future flexibility to regional stormwater strategy</td></tr>
<tr><td>Casey Council
• Known stormwater strategy with acceptable level of maintenance requirements</td></tr>
<tr><td>MPA
• Clarity of known solutions for the precinct and implementation</td></tr>
<tr><td>SRW
• Reduction in groundwater recharge due to development of site and capture of stormwater.</td></tr>
<tr><td>OLV
• Supports direction of MWF</td></tr>
<tr><td>Developer
• Provides comparable marketable product to adjacent subdivisions with mandated recycled water</td></tr>
<tr><td>Customer
• Provides a cheaper source of water for irrigation, so customer has increased choice on level of greenness of property.</td></tr>
<tr><td>Implementation challenges</td><td>
• Acquisition of the Regional wetland
• Regulation to implement operate and maintain household tank systems
• Subsidy from community to householder to fund tanks which provide system wide benefits</td></tr>
</table>

Option 4

Water Demand

Demand Element	Residential	Units	Non Res	Open Space
Indoor Potable	Potable	Potable	Potable	Potable
Hot water	Potable	Potable	Potable	N/A
Laundry (cold)	Recycle	Recycle	Potable	N/A
Toilet	Recycle	Recycle	Recycle	Recycle
Outdoor	Recycle	Recycle	Recycle	Recycle

Stormwater

Stormwater discharge from properties is not normally constrained, however may be regulated at some locations by Council. Unconstrained stormwater discharge from properties is assumed in this option.

Sewage Loads

Conventional gravity sewerage taking all indoor waste water streams from the property.

Water Supply Sources

Potable water supply from the existing water supply transfer system in the area comes from the Cardinia Reservoir and Cranbourne Tank water systems. A future source may be from the Desalination pipe running through the development area via Discharge Point 7 in the eastern edge of the area.

Water Supply System

There is minimal potable network augmentation required to bring water to the growth area. The internal distribution network within the precinct is sized to meet peak hour demand.

The ultimate principal source of recycled water supply is a new large regional sewage treatment plant located in the south east corner outside the development corridor. The supply will maximise the use of locally produced Class A water. In periods of low demand the plant will also be a source of supply for the current developing Cranbourne recycled water areas.

Sewerage System

Gravity sewerage network within the Westernport Catchment sized to meet peak 1 in 5 year sewer flows draining to the new regional treatment plant where it is treated to Class A for recycling.

Stormwater Management System

Drainage Schemes within the precincts will require management and treatment of flows to current Best Environmental Practice Management (BEPM) requirements. Stormwater from the development is disposed via traditional drainage to waterways. The proposed stormwater management scheme has a number of offline retarding basins and wetlands along the main streams to achieve quality treatment and quantity management.

The regional wetland outside of the south east corner of the development corridor will provide additional treatment to SEPP F8 standard and further retardation of major storm events.

Community and stakeholder risks and benefits

Summary description: Potable water for most indoor use. Reticulated recycled water for cold laundry, toilet and outdoor use. Sewerage regional treatment plant generating class A. Drainage with large regional wetland with stormwater harvesting supplementing class A supply.	
Community Cost	Results from PAG analysis possibly with sensitivity results
Merits	• Water resource near Peri Urban area of Bunyip Food Belt augmented with a connection to ETP • Water resource that could be used for ground water recharge or salt water intrusion barrier. • Improves reliability of SE Recycle water networks with a second major source of supply • Reduced reliance on potable system as back up for the recycle system • Mixed use activity in the regional wetland enhancing investment in the area. • Large regional wetland providing a significant environmental asset for flora and fauna • Protection and management of flows for downstream residents and run of stream irrigators • Use of stormwater as an additional supply for recycled water network and reduce loads to Westernport • Savings in potable water network from reduced demand • Provides a more resilient system.
Community Risks	• Whole of Community versus Local (WHO PAYS??) Medium
Stakeholder Perspectives **(financial, merits, risks and implementation concerns)**	SEW • Bares a greater proportion of costs and risks for regional plant • Acquisition of land for the regional plant • Regional wetland providing buffer zone and protecting from development encroachment on treatment plant • Water supply interface from regional wetland
	MW • Regional wetland robustness and future flexibility to regional stormwater strategy
	Casey Council • Known stormwater strategy with acceptable level of maintenance requirements
	MPA • Clarity of known solutions for the precinct and implementation
	SRW • Reduction in groundwater recharge due to development of site and capture of stormwater.
	OLV • Supports direction of MWF
	Developer • Provides comparable marketable product to adjacent subdivisions with mandated recycled water
	Customer • Provides a cheaper source of water for irrigation, so customer has increased choice on level of greenness of property.
Implementation challenges	• Acquisition of the Regional wetland • Regulation to implement operate and maintain household tank systems • Subsidy from community to householder to fund tanks which provide system wide benefits

Option 5

Water demand

Demand Element	Residential	Units	Non Res	Open Space
Indoor	Potable	Potable	Potable	Potable
Hot water	Potable	Potable	Potable	N/A
Laundry (cold)	Recycle	Recycle	Potable	N/A
Toilet	Recycle	Recycle	Recycle	Recycle
Outdoor	Recycle	Recycle	Recycle	Recycle

Stormwater

Stormwater discharge from properties is not normally constrained, however may be regulated at some locations by Council. Unconstrained stormwater discharge from properties is assumed in this option.

Sewage Loads

Conventional gravity sewerage taking all indoor waste water streams from the property.

Water Supply Sources

Potable water supply from the existing water supply transfer system in the area comes from the Cardinia Reservoir and Cranbourne Tank water systems. A future source may be from the Desalination pipe running through the development area via Discharge Point 7 in the eastern edge of the area.

The ultimate principal source of recycled water supply is a new regional stormwater treatment plant located in the south east corner outside the development corridor. The supply will maximise the use available stormwater from the adjacent large regional wetland located outside the growth area. In periods of low demand the plant will also be a source of supply for the current developing Cranbourne recycled water areas.

Water Supply System

There is minimal potable network augmentation required to bring water to the growth area. The internal distribution network within the precinct is sized to meet peak hour demand.

Sewerage System

Gravity sewerage network within the Westernport Catchment sized to meet peak 1 in 5 year sewer flows draining to the proposed regional pump station for transfer via a new rising main to Eastern Treatment Plant where it is treated to Class A for recycling or disposal in the SEO to Boags Rock.

Stormwater Management System

Drainage Schemes within the precincts will require management and treatment of flows to current Best Practice Environmental Management (BPEM) requirements. Stormwater from the development is disposed via traditional drainage to a single regional drainage treatment plant for reticulation to properties with the excess stormwater transferring to the regional wetland outside of the south east corner of the development corridor will provide additional treatment to SEPP F8 standard and further retardation of major storm events.

Community and stakeholder risks and benefits

Summary description: Potable water for most indoor use. Reticulated recycled water for cold laundry, toilet and outdoor use. Stormwater regional treatment plant generating class A. Drainage with large regional wetland	
Community Cost	Results from PAG analysis possibly with sensitivity results
Merits	• Use of treated stormwater as a household supply for outdoor, toilet and laundry • Savings in potable water network from reduced demand
Community Risks	• Whole of Community versus Local (WHO PAYS??) Medium • Level of Stormwater Quality Improvements Medium • Storage capacity of treated stormwater may limit some use in long dry periods Medium
Stakeholder Perspectives **(financial, merits, risks and implementation concerns)**	SEW • Reduced revenue & impacts to sewage tariff
	MW • Regional wetland robustness and future flexibility to regional stormwater strategy
	Casey Council • Known stormwater strategy with acceptable level of maintenance requirements
	MPA • Developer reactions to concept
	SRW • Reduced recharge of aquifer due to development and capture of stormwater
	OLV • Supports direction of MWF
	Developer • Provides comparable marketable product to adjacent subdivisions with mandated recycled water from centrally treated stormwater
	Customer • Provides a cheaper source of water for irrigation, so customer has increased choice on level of greenness of property.
Implementation challenges	• Acquisition of the Regional wetland • Interface between SEW stormwater treatment plant and MW wetland

Option 6

Water Demand

Demand Element	Residential	Units	Non Res	Open Space
Indoor	Potable	Potable	Potable	Potable
Hot water	Potable	Potable	Potable	N/A
Laundry (cold)	Recycle	Recycle	Potable	N/A
Toilet	Recycle	Recycle	Recycle	Recycle
Outdoor	Recycle	Recycle	Recycle	Recycle

Stormwater

Stormwater discharge from properties is not normally constrained, however may be regulated at some locations by Council. Unconstrained stormwater discharge from properties is assumed in this option. Stormwater will be collected and treated in 6 decentralised treatment plants to Class A standard.

Sewage Loads

Conventional gravity sewerage taking all indoor waste water streams from the property.

Water Supply Sources

Potable water supply from the existing water supply transfer system in the area comes from the Cardinia Reservoir and Cranbourne Tank water systems. A future source may be from the Desalination pipe running through the development area via Discharge Point 7 in the eastern edge of the area.

The ultimate principal source of recycled water supply is six new decentralised stormwater treatment plants located throughout the precinct.

Water Supply System

There is minimal potable network augmentation required to bring water to the growth area. The internal distribution network within the precinct is sized to meet peak hour demand.

Sewerage System

Gravity sewerage network within the Westernport Catchment sized to meet peak 1 in 5 year sewer flows draining to the proposed regional pump station for transfer via a new rising main to Eastern Treatment Plant where it is treated to Class A for recycling or disposal in the SEO to Boags Rocks.

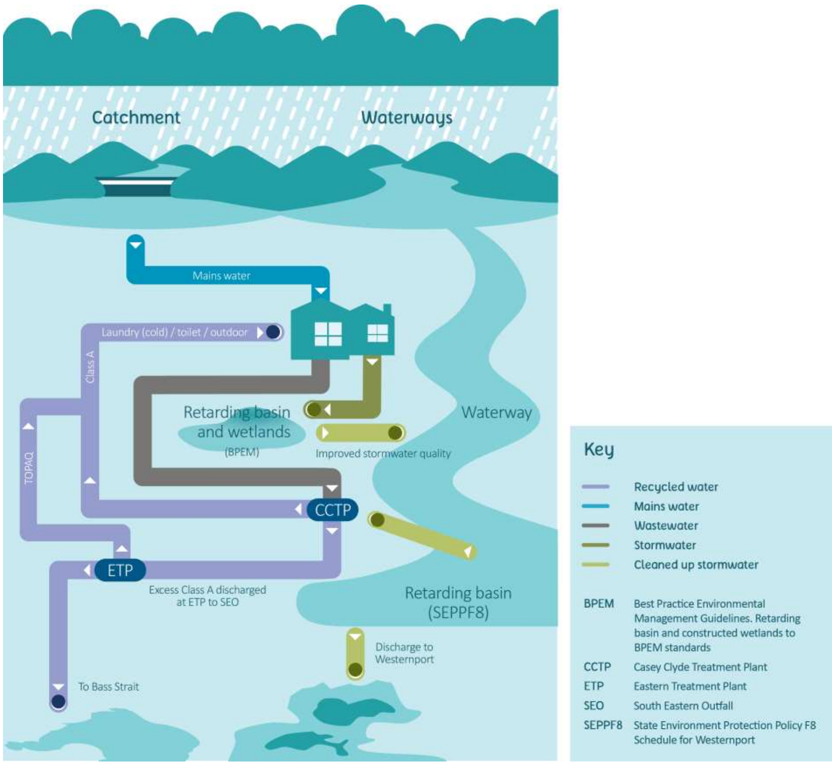
Stormwater Management System

Drainage Schemes within the precincts will require management and treatment of flows to current Best Environmental Practice Management (BEPM) requirements. Stormwater from the development is disposed via traditional drainage to a series of six proposed local drainage treatment plants for reticulation to properties with the excess stormwater transferring to the regional wetland outside of the south east corner of the development corridor will provide additional treatment to SEPP F8 standard and further retardation of major storm events.

Community and stakeholder risks and benefits

Summary description: Potable water for most indoor use. Reticulated recycled water for cold laundry, toilet and outdoor use. Six decentralised stormwater treatment plants generating class A. Drainage with large regional wetland	
Community Cost	Results from PAG analysis possibly with sensitivity results
Merits	• Use of treated stormwater as a household supply for outdoor, toilet and laundry • Savings in potable water network from reduced demand
Community Risks	• Whole of Community versus Local (WHO PAYS??) Medium • Level of Stormwater Quality Improvements Medium • Storage capacity of treated stormwater may limit some use in long dry periods Medium
Stakeholder Perspectives **(financial, merits, risks and implementation concerns)**	SEW • Reduced revenue & impacts to sewage tariff
	MW • Regional wetland robustness and future flexibility to regional stormwater strategy • Improved stormwater quality in-catchment due to decentralised capture and treatment
	Casey Council • Known stormwater strategy with acceptable level of maintenance requirements
	MPA • Developer reactions to concept
	SRW • Reduce recharge of aquifer due to development and capture of stormwater
	OLV • Supports direction of MWF
	Developer • Provides comparable marketable product to adjacent subdivisions with mandated recycled water from centrally treated stormwater
	Customer • Provides a cheaper source of water for irrigation, so customer has increased choice on level of greenness of property.
Implementation challenges	• Acquisition of land for the Regional wetland • Acquisition of land for the decentralised stormwater treatment plants

Option 7



* Discharge from precinct will be preferentially used to supply other mandated recycle water areas displacing ETP recycle water.

Water Demand

Demand Element	Residential	Units	Non Res	Open Space
Indoor Potable	Potable	Potable	Potable	Potable
Hot water	Potable	Potable	Potable	N/A
Laundry (cold)	Recycle	Recycle	Potable	N/A
Toilet	Recycle	Recycle	Recycle	Recycle
Outdoor	Recycle	Recycle	Recycle	Recycle

Stormwater

Stormwater discharge from properties is not normally constrained, however may be regulated at some locations by Council. Unconstrained stormwater discharge from properties is assumed in this option.

Sewage Loads

Conventional gravity sewerage taking all indoor waste water streams from the property.

Water Supply Sources

Potable water supply from the existing water supply transfer system in the area comes from the Cardinia Reservoir and Cranbourne Tank water systems. A future source may be from the Desalination pipe running through the development area via Discharge Point 7 in the eastern edge of the area.

Water Supply System

There is minimal potable network augmentation required to bring water to the growth area. The internal distribution network within the precinct is sized to meet peak hour demand.

Sewerage System

Gravity sewerage network within the Westernport Catchment sized to meet peak 1 in 5 year sewer flows draining to the proposed regional pump station for transfer via a new rising main to Eastern Treatment Plant where it is treated to Class A for recycling or disposal in the SEO to Boags Rocks.

Stormwater Management System

Drainage Schemes within the precincts will require management and treatment of flows to current Best Environmental Practice Management (BEPM) requirements. Stormwater from the development is disposed via traditional drainage to waterways. The proposed stormwater management scheme has a number of offline retarding basins and wetlands along the main streams to achieve quality treatment and quantity management.

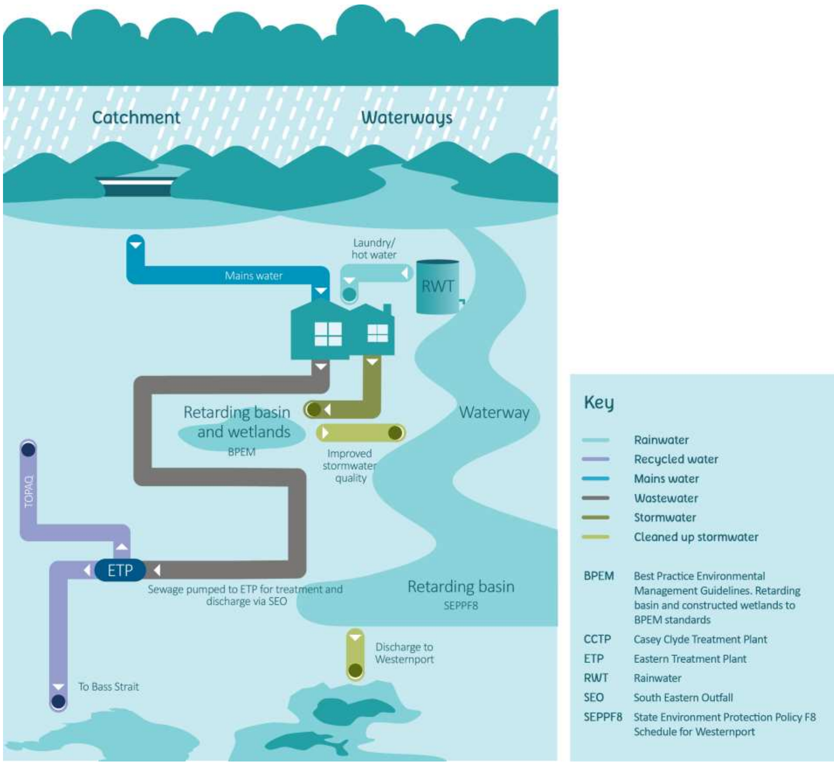
The regional wetland outside of the south east corner of the development corridor will provide additional treatment to SEPP F8 standard and further retardation of major storm events.

Community and stakeholder risks and benefits

Summary description: Potable water for most indoor use. Reticulated recycled water for cold laundry, toilet and outdoor use. Sewerage regional treatment plant generating class A. Drainage with large regional wetland with stormwater harvesting supplementing class A supply.	
Community Cost	Results from PAG analysis possibly with sensitivity results
Merits	• Water resource near Peri Urban area of Bunyip Food Belt augmented with a connection to ETP • Water resource that could be used for ground water recharge or salt water intrusion barrier. • Improves reliability of SE Recycle water networks with a second major source of supply • Reduced reliance on potable system as back up for the recycle system • Mixed use activity in the regional wetland enhancing investment in the area. • Large regional wetland providing a significant environmental asset for flora and fauna • Protection and management of flows for downstream residents and run of stream irrigators • Use of stormwater as an additional supply for recycled water network and reduce loads to Westernport • Savings in potable water network from reduced demand • Provides a more resilient system.
Community Risks	• Whole of Community versus Local (WHO PAYS??) Medium
Stakeholder Perspectives	SEW • Bares a greater proportion of costs and risks for regional plant • Acquisition of land for the regional plant • Regional wetland providing buffer zone and protecting from development encroachment on treatment plant • Water supply interface from regional wetland
	MW

(financial, merits, risks and implementation concerns)	• Regional wetland robustness and future flexibility to regional stormwater strategy
	Casey Council • Known stormwater strategy with acceptable level of maintenance requirements
	MPA • Clarity of known solutions for the precinct and implementation
	SRW • Reduction in groundwater recharge due to development of site and capture of stormwater.
	OLV • Supports direction of MWF
	Developer • Provides comparable marketable product to adjacent subdivisions with mandated recycled water
	Customer • Provides a cheaper source of water for irrigation, so customer has increased choice on level of greenness of property.
Implementation challenges	• Acquisition of the Regional wetland • Regulation to implement operate and maintain household tank systems • Subsidy from community to householder to fund tanks which provide system wide benefits

Option 8



Water Demand

Demand Element	Residential	Units	Non Res	Open Space
Indoor Potable	Potable	Potable	Potable	Potable
Hot water	Rainwater tank	Rainwater tank	Rainwater tank	N/A
Laundry (cold)	Rainwater tank	Rainwater tank	Rainwater tank	N/A
Toilet	Rainwater tank	Rainwater tank	Rainwater tank	Potable
Outdoor	Rainwater tank	Rainwater tank	Rainwater tank	Potable

Stormwater

Stormwater discharge from properties is not normally constrained, however properties with reduced annual flows due to recovery in tanks and may be regulated at some locations by Council. Unconstrained stormwater discharge from properties is assumed in this option.

Sewage Loads

Conventional gravity sewerage taking all indoor waste water streams from the property.

Water Supply Sources

Potable water supply from the existing water supply transfer system in the area comes from the Cardinia Reservoir and Cranbourne Tank water systems. A future source may be from the Desalination pipe running through the development area via Discharge Point 7 in the eastern edge of the area.

Water Supply System

There is minimal potable network augmentation required to bring water to the growth area. The internal distribution network within the precinct is sized to meet peak hour demand.

Sewerage System

Gravity sewerage network within the Westernport Catchment sized to meet peak 1 in 5 year sewer flows draining to the proposed regional pump station for transfer via a new rising main to Eastern Treatment Plant where it is treated to Class A for recycling or disposal in the SEO to Boags Rocks.

Stormwater Management System

Drainage Schemes within the precincts will require management and treatment of flows to current Best Environmental Practice Management (BEPM) requirements. Stormwater from the development is disposed via traditional drainage to waterways. The proposed stormwater management scheme has a number of offline retarding basins and wetlands along the main streams to achieve quality treatment and quantity management.

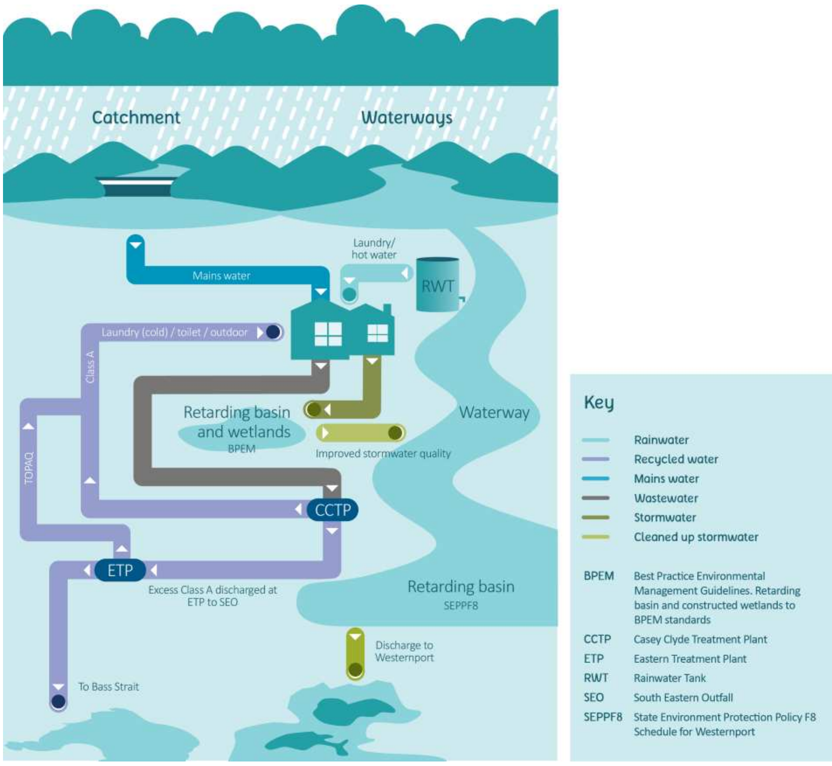
The regional wetland outside of the south east corner of the development corridor will provide additional treatment to SEPP F8 standard and further retardation of major storm events.

Community and stakeholder risks and benefits

Summary description: Potable water for drinking and supplementing household rainwater tank supply. Household rainwater tank supplying hot water, laundry, toilet and outdoor. Sewage pumped to ETP. Drainage with large regional Wetland.	
Community Cost	Results from PAG analysis possibly with sensitivity results
Merits	• Increased encumbrance on private property for tanks • Protection and management of flows for downstream residents and run of stream irrigators • Use of rainwater as a household supply for outdoor, toilet, laundry and hot water reduce loads to Westernport • Savings in potable water network from reduced demand
Community Risks	• Whole of Community versus Local (WHO PAYS??) Medium • Who pays for owns and manages the tanks Medium • Whole of life cost of Tanks, pumps and replacement High • Management of tank water quality and colour High • Level of Stormwater Quality Improvements Medium • Extent of storm retardation from RWT Medium • Long term continued utilisation of tanks Medium • Backflow protection from tanks to potable network Medium
Stakeholder Perspectives **(financial, merits, risks and implementation concerns)**	SEW • Role with mandated tanks • Reduced revenue & impacts to sewage tariff
	MW • Regional wetland robustness and future flexibility to regional stormwater strategy • Implications of mandating tanks on stormwater
	Casey Council

	• Known stormwater strategy with acceptable level of maintenance requirements • Role with mandated tanks
	MPA • Land take for households • Developer reactions to concept • Regulatory issues with mandated tanks
	SRW • Reduced recharge of groundwater due to development and capture of stormwater
	OLV • Supports direction of Melbourne's Water Future
	Developers • Reduced development costs • Impact on marketability of estate compared to adjacent mandated estates
	Customers • Encumbrance from RWT • Management and ownership of RWT • Variable water quality between water sources.(rainwater / potable)
Implementation Challenges	Implementation Challenges • Acquisition of the Regional wetland • Regulation to implement operate and maintain household tank systems • Subsidy from community to householder to fund tanks which provide system wide benefits

Option 9



* Discharge from precinct will be preferentially used to supply other mandated recycle water areas displacing ETP recycle water.

Water Demand

Demand Element	Residential	Units	Non Res	Open Space
Indoor Potable	Potable	Potable	Potable	Potable
Hot water	Rainwater tank	Potable	Potable	N/A
Laundry (cold)	Rainwater tank	Potable	Potable	N/A
Toilet	Recycle	Recycle	Recycle	Recycle
Outdoor	Recycle	Recycle	Recycle	Recycle

Stormwater

This option uses 5kL rainwater tank connected to the roof at each residential property to supply hot water and laundry demand via pump to replace potable demand for those uses.

The rainwater tank will reduce the volumes of stormwater discharge, and will also reduce peak discharges to the drainage system for minor storm events.

Sewage Loads

Conventional gravity sewerage taking all indoor wastewater streams from the property.

Water Supply Sources

Potable water supply from the existing water supply transfer system in the area comes from the Cardinia Reservoir and Cranbourne Tank water systems. A future source may be from the

Desalination pipe running through the development area via Discharge Point 7 in the eastern edge of the area.

The ultimate principal source of recycled water supply is a new regional treatment plant located in the south east corner outside the development corridor. The supply will maximise the use of sewage effluent as a water source. *(This could be supplemented with available stormwater from the adjacent large regional wetland located outside the growth area.)* In periods of low demand the plant will also be source of supply for the current developing Cranbourne recycled water areas.

Initially, recycled wastewater supply to the development area will be from extension of supply from the adjacent existing recycled water areas which receive supply from the Eastern Treatment Plant via the TOPAQ recycled water system. Additional supply is expected to become available as TOPAQ agricultural customers relinquish their entitlements due to urban development.

ETP recycled water supply provides top up to the system when demand is in excess of supply from the regional plant.

Household rainwater tanks (5kL) mandated at each property for laundry and hot water demand will further supplement alternative water supply to the household.

Water Supply System

There is minimal potable network augmentation required to bring water to the growth area. Distribution network within the precinct sized to meet peak hour demand.

As discussed previously, the TOPAQ network will initially provide recycled water to the area. A new recycled water supply pipeline is planned to augment supply to Cranbourne North, Clyde North and Officer as part of existing servicing recycled water strategies. The planned pipeline will be upsized to cater for additional demand from Casey Clyde. The distribution network within the precinct will be sized to meet peak hour demand including fire fighting.

Sewerage System

Gravity sewerage network within the Westernport Catchment sized to meet peak 1 in 5 year sewer flows draining to the proposed Casey Clyde Treatment Plant (CCTP). Initial sewerage service will be pumped via interim pump station to the Cranbourne and Hallam Valley main sewers using limited interim capacity to allow development to commence.

The pump stations will be decommissioned once the regional treatment plant is established around 2030.

Sewage Treatment and disposal

Ultimately all sewage is treated to class A and injected into the recycle water distribution system. Excess Class A will be pumped through the recycle water network back to the SEO for discharge at Boags Rocks.

The regional wetland surrounding the proposed treatment plant will provide additional water for recycled water and also provide buffer to the urban development area.

The land required for the Casey Clyde Treatment Plant (CCTP) will be purchased as part of the land purchase for the regional wetland and the wetland area will provide the minimum 500 metre buffer to the urban development area. Planning controls may need to be applied to some land.

(An alternate to be evaluated is a permanent pump station and rising mains pumping excess sewage flows above demand for class A water to ETP for treatment and discharge via the SEO)

Stormwater Management System

Drainage Schemes within the precincts will require management and treatment of flows to current Best Environmental Practice Management (BEPM) requirements. Stormwater from the development is disposed via traditional drainage to waterways. The proposed stormwater management scheme has a number of offline retarding basins and wetlands along the main streams to achieve quality treatment and quantity management. The extent of the required quality and quantity treatment works will be reduced with the introduction of household rainwater tanks.

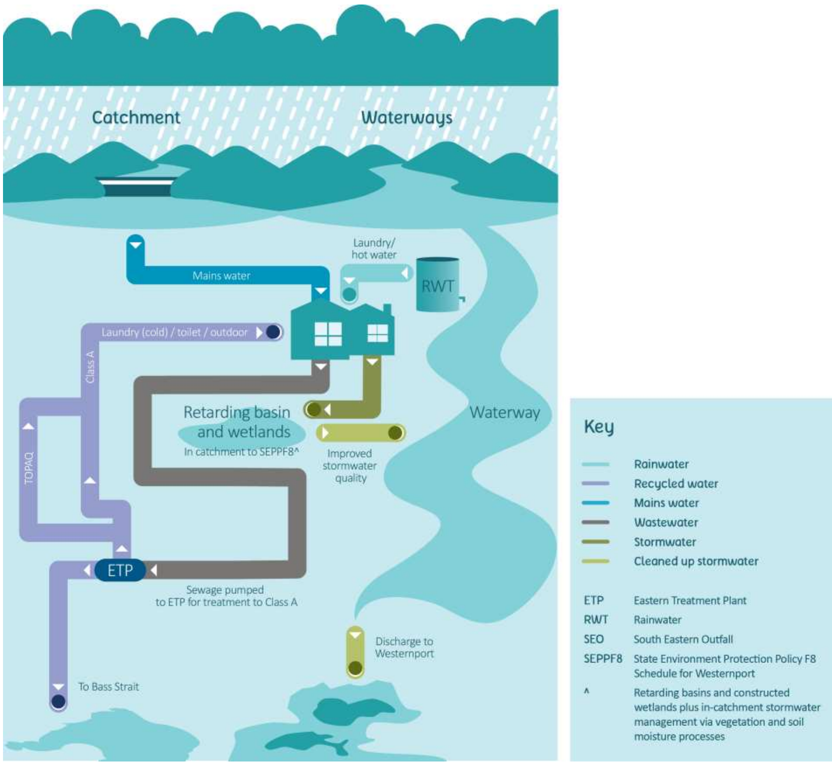
The regional wetland outside of the south east corner of the development corridor will provide additional treatment to SEPP F8 standard and further retardation of major storm events.

Community and stakeholder risks and benefits

Summary description: Potable water for drinking and supplementing household rainwater tank supply. Household rainwater tank supplying hot water, and laundry. Reticulated recycle for toilet and outdoor use Regional sewerage treatment plant generating class A. Drainage with large regional wetland.	
Community Cost	Results from PAG analysis possibly with sensitivity results
Merits	• Water resource near Peri Urban area of Bunyip Food Belt augmented with a connection to ETP. • Water resource that could be used for ground water recharge or salt water intrusion barrier. • Improves reliability of SE Recycle water networks with a second major source of supply. • Reduced reliance on potable system as back up for the recycle system. • Increased encumbrance on private property for tanks. • Mixed use activity in the regional wetland enhancing investment in the area and likely quality of maintenance. • Large regional wetland providing a significant environmental asset for flora and fauna. • Protection and management of flows for downstream residents and run of stream irrigators. • Use of rainwater as a household supply for laundry and hot water reduce loads to Westernport. • Savings in potable water network from reduced demand.
Community Risks	• Whole of Community versus Local (WHO PAYS??) Medium • Who pays for, owns, and manages the tanks High • Whole of life cost of Tanks, pumps and replacement High • Management of tank water quality and colour High • Level of Stormwater Quality Improvements Medium • Extent of storm retardation from RWT Medium • Long term continued utilisation of tanks Medium • Backflow protection from tanks to potable network Medium
Stakeholder Perspectives **(financial, merits, risks and implementation**	SEW • SE Water bears a greater proportion of costs and risks for regional plant • Role with mandated tanks • Acquisition of land and buffer for the regional plant • Water supply interface from regional wetland
	MW • Regional wetland robustness and future flexibility to regional stormwater strategy

concerns)	• Implications of mandating tanks on stormwater
	Casey Council • Known stormwater strategy with acceptable level of maintenance requirements • Role with mandated tanks
	MPA • Clarity of known solutions for the precinct and implementation • Regulatory issues with mandated tanks
	SRW • Reduced recharge of groundwater due to development and stormwater capture
	OLV • Supports direction of Melbourne's Water Future
	Developer • Impact of RWT on marketability of estate.
	Customer • Encumbrance on land from RWT • Management / ownership of RWT • Variable water quality from different water sources (potable, rainwater, recycled water) • Largest shift of costs to owners.
Implementation Challenges	• Acquisition of the Regional wetland • Regulation to implement operate and maintain household systems • Subsidy from community to householder to fund tanks

Option 10



Water Demand

Demand Element	Residential	Units	Non Res	Open Space
Indoor Potable	Potable	Potable	Potable	Potable
Hot water	Rainwater tank	Rainwater tank	Rainwater tank	N/A
Laundry (cold)	Rainwater tank	Rainwater tank	Rainwater tank	N/A
Toilet	Recycle	Recycle	Recycle	Recycle
Outdoor	Recycle	Recycle	Recycle	Recycle

Stormwater

This option mandates rainwater tanks as described for each property as follows:

Residential laundry and hot water

- 5kL of rainwater storage for each detached dwelling
- 2kL of rainwater storage for each unit dwelling

Non Residential, non-potable uses

- 50kL of tank storage for each hectare of non-residential land use (except public open space).

The rainwater storages will reduce total volumes of discharge and will also reduce discharges in minor storm events due to the consistent drawdown of water levels in tanks in response to the number of uses (toilet, laundry, outdoor and hot water). The impact of tanks in events above the 2 year ARI will be negligible.

Diversified stormwater management systems for quality and flows via landscape and soil moisture measures are required at a rate of 5 square metres per residential property and 50 square meters for each hectare of non-residential land uses. Proposed stormwater management has a number of offline retarding basins and wetlands along the main streams to achieve treatment and quantity management. In combination these measures are designed to achieve SEPP (F8) standards.

Sewage Loads

Conventional gravity sewerage taking all indoor waste water streams from the property.

Water Supply Sources

Potable water supply from the existing water supply transfer system in the area comes from the Cardinia Reservoir and Cranbourne Tank water systems. A future source may be from the Desalination pipe running through the development area via Discharge Point 7 in the eastern edge of the area.

The ultimate principal source of recycled water supply is a new regional treatment plant located in the south east corner outside the development corridor. The supply will maximise the use of sewage effluent as a water source. In periods of low demand the plant will also be a source of supply for the current developing Cranbourne recycled water areas.

Initially, recycled wastewater supply to the development area will be from extension of supply from the adjacent existing recycled water areas which receive supply from the Eastern Treatment Plant via the TOPAQ recycled water system. Additional supply is expected to become available as TOPAQ agricultural customers relinquish their entitlements due to urban development. ETP recycled water supply may provide top up to the system when demand is in excess of supply from the regional plant

Water Supply System

Distribution network within the precinct sized to meet peak hour demand.

As discussed previously, the TOPAQ network will initially provide recycled water to the area. A new recycled water supply pipeline is planned to augment supply to Cranbourne North, Clyde North and Officer as part of existing servicing recycled water strategies. The planned pipeline will be upsized to cater for additional demand from Casey Clyde. The distribution network within the precinct will be sized to meet peak hour demand including fire fighting.

Sewerage System

Gravity sewerage network within the Westernport Catchment sized to meet peak 1 in 5 year sewer flows draining to the proposed regional pump station for transfer via a new rising main to Eastern Treatment Plant where it is treated to Class A for recycling or disposal in the SEO to Boags Rocks.

Stormwater Management System

Rainwater storage will have some impact on reducing stormwater discharge due to the consistent drawdown of water levels in tanks in response to indoor uses. can also reduce peak discharges. Diversified stormwater management systems for quality and flows via landscape and soil moisture measures are required at a rate of 5 square metres per residential property and 50 square meters for each hectare of non-residential land uses. These measures could be at property and/or at street and or at precinct scale. The proposed stormwater management scheme also has a number of offline retarding basins and wetlands along the main streams. In combination these measures are designed to manage quality and quantity of stormwater to achieve SEPP (F8) standards when it leaves the development.

Community and stakeholder risks and benefits

Summary description: Potable water for drinking and supplementing household rainwater tank supply, household rainwater tank supplying hot water, and laundry, reticulated recycle from ETP for toilet and outdoor use, sewerage pumped to ETP generating class A, drainage in precinct treatment to SEPP f8 and flood retardation.	
Community Cost	Results from PAG analysis possibly with sensitivity results
Merits	• Improves reliability of SE Recycle water networks with a second major source of supply • Reduced reliance on potable system as back up for the recycle system • In precinct treatment of stormwater to achieve SEPP F8 standard improving stream quality • Increased encumbrance on open space and developable land • Protection and management of flows for downstream residents and run of stream irrigators • Use of rainwater as a household supply for laundry and hot water reduce loads to Westernport • Savings in potable water network from reduced demand
Community Risks	• Whole of Community versus Local (WHO PAYS??) Medium • Who pays for owns and manages the tanks High • Whole of life cost of Tanks, pumps and replacement High • Management of tank water quality and colour High • Level of Stormwater Quality Improvements Medium • Extent of storm retardation from RWT Medium • Long term continued utilisation of tanks Medium • Backflow protection from tanks to potable network Medium
Stakeholder Perspectives **(financial, merits, risks and implementation concerns)**	SEW • Role with mandated tanks
	MW • Regional wetland robustness and future flexibility to regional stormwater strategy • Implications of mandating tanks on stormwater • Managing in precinct treatment systems • Managing of regional flooding, particularly Muddy Creek Drain
	Casey Council • Transfer of O&M cost from MW to Council • Encumbrance on public open space • Known stormwater strategy with acceptable level of maintenance requirements • Role with mandated tanks
	MPA • Land take from developable land • Developer reception to concept • Lack of clarity on solutions for the precinct and implementation • Regulatory issues with mandated tanks
	SRW • Closest to natural recharging of groundwater
	OLV • Provides highest level of support to Melbourne's Water Future direction.

	Developer • Mixed messages to customers for reliability of supply • Potentially provides a point of difference to adjacent subdivisions because of the precinct stormwater work. • Less developable land – impact on developers profit margins?
	Customers • Encumbrance on land from RWT • Impacts on use of road reserves.
Implementation Challenges	• Regulation to implement operate and maintain household tank systems • Subsidy from community to householder to fund tanks • Impact of land take of in-catchment stormwater treatment on number of developable lots

Appendix 3: Vision for the proposed Clyde Creek Retarding Basin

The following is vision regarding the proposed large retarding basin. Note: it has not been endorsed by MW management but describes potential function and responsibilities.

- To be located between Graham Road and Muddy Gates Lane
- The main purpose for the acquisition of this land is to retard peak flows off the urbanised catchment. Other benefits must not compromise its primary function.
- MW will be meeting with DEPI, council and the community to develop a master plan for the retarding basin land.
- A large portion of the retarding basin land would be accessible to the community.
- The area that is to be excavated to provide material for the levee bank (maximum height 1.5 metres) could be formed into a water body that could be used by migratory birds that pass through the area.
- A habitat could be provided for the southern brown bandicoot that exists along the unused railway line that crosses this land.
- A habitat area could be provided for the growling grass frog (GGF) and a "natural" corridor created to the area set aside for the GGF inside the PSP just north of Ballarto Road.
- The lower areas of the site could be planted with swampy marshland plants that used to cover the entire Koo Wee Rup Swamp. In the higher dryer areas plants associated with the Gippsland Grassland community could be established. The lower wetter areas would be a sanctuary area.
- MW would not be funding works that require additional costs to that which are needed for drainage and waterway management.
- Large water bodies could be constructed on the land to store stormwater for use by the adjacent market gardens if this does not impact on water quality or flood storage.
- Note that the retarding basin provides a large area where water quality works could be constructed in the future should the standard of discharge to Westernport be raised.
- From a planning view it probably makes sense to transition from dense residential housing, to a park then to farmland further to the east.
- It may be possible to use a portion of the retarding basin land for water storage at some time in the future if a decision is made to convey treated effluent from ETP to Koo Wee Rup farmers.

Appendix 4: Stakeholder issues and considerations

The following table is a summary of stakeholder identified issues to be covered in this process to ensure they could commit to contributing to an IWCM solution.

Organisation	Key Issues	Technical	Financial / Economic	Risk
SEW **Rex Dusting** **GM Infrastructure**	• Clarity of options & relative merits for community & SE Water • Options assessed consistent with DTF framework • Liabilities & costs for SEW are equitably shared with others • Changes in services & new interface issues are addressed • Solution is supported by stakeholders, developers & customers	• Focus area of responsibility water, sewer, & recycle water. • Clarity around responsibility & mechanism of funding for stormwater & rainwater solutions • Options are robust & flexible to future change. • Demands & loads are realistic • Current service standards met • Systems are robust, address supply reliability, health & environmental risks	• Costing is realistic complete & consistent including O&M • Costs include risk contingency, delivery overheads are appropriate. • Cost of externals believable • Economic analysis transparent & meet DTF expectations • Differences are clearly justified • Sensitivity test performed on key variables • Financial position for SEW	• Enunciate what are risks & how addressed • Customer take up & use in the long term • New systems or requirements include risk • Where beyond current regulatory or operations frameworks identify how will be addressed.
MW **Drainage & Waterways** **Denis Corbett**	• Achieving flood performance & water quality compliance • Changes in services & new interface issues are addressed • Solution is supported by stakeholders, developers & customers • Changed role of other in management of stormwater	• RWT reliability & storm detention capability • What are the agreed treatment trains of the options. • Do they work in quality & quantity treatment	• Are the costs reasonable for developers against scheme rules • Transfer of costs & responsibility between MW & Council • Financial position for MW Water • Equity between local & city wide benefits so local does not pay for all	• Surety of drainage scheme strategy • Clear requirements for developers • What would expert witness challenge in VCAT
MW **Bulk Water & Sewer** **Jamie Ewert**	• costs & benefits for MW are equitably shared with others • Changes in services & new interface issues are addressed	• Where potable & recycle water & sewage are connected to the transfer system • Loads on ETP & the outfall • Level of potable back up required	• Reasonable bulk charges, shadow costs & desalination costs • Deals with TOPAQ for additional supply to customers	• Interfaces with ETP & the SEO with impacts on the license • Impacts to change of operation of interface points

Organisation	Key Issues	Technical	Financial / Economic	Risk
MPA **Paul Cassidy**	• Impact of options to precinct form & land take • Clarity of options & supporting evidence to be defensible in a planning panel • Who is responsible for new services development requirements are addressed • Solution is supported by stakeholders, developers & customers	• Impacts of the options to the precinct area form & land take	• Impact on land & construction affordability • Costs for households • Cost include landholding & delay costs	• Timeframe impact to PSP approval • Surety of servicing strategy • Clear requirements & acceptability to developers • What would expert witness challenge in VCAT • Developers – want clarity & certainty, acceptance of option, minimise risk
Casey Council **David Richardson** **Nicola Ward**	• Clear definition of proposed Council responsibilities, risks & liabilities for options • Reluctant to issue development permits if above not resolved	• Where will the additional infrastructure fit in dense greenfield development • Maintenance & replacement of tanks needs to be addressed • Council's expertise & capacity to be responsible for new water systems	• Transfer of costs from MW • Equity between local & city wide benefits so local does not pay for all • Funding of additional requirements on council	• Streets & public open space already heavily used need to consider local community impact • Role proposed for Council & acceptability to the local community • Maintenance liability & responsibility • Community acceptance on private property for tanks where space is limited.
EPA **Stephen Lansdell**	• Demonstrating how options meet regulatory standards • How risks are managed including residual contamination • Management of system failure or extreme events	• Proposed Class A is consistent with guidelines & SEO license if discharging • Flexibility & resilience to consistently achieve standards • Residuals contamination addressed • Opportunity to manage other waste streams • Need to demonstrate environmental benefit	• Costing of lifecycle of waste management e.g. contaminated sediments from wetlands • Economic impacts of differing management approaches • Changes in regulation will require Regulatory Impact assessment	• Environmental risk on relying on regional or ETP