MWH

Appendix B: Multi Criteria Analyses of the Shortlisted Options

EXTRACT

TWEED SHIRE COUNCIL

APPENDIX B

TWEED DISTRICT WATER SUPPLY AUGMENTATION OPTIONS STUDY

TABLE 1: DETERMINATION OF FINE SCREEN RATINGS

MULTI CRITERIA ANALYSIS FOR THE ASSESSMENT OF SHORTLISTED OPTIONS

		GOVERNANCE ASSESSMENT CRITERIA						ECONOMIC ASSESSMENT CRITERIA						SOCIAL ASSESSMENT CRITERIA				ENVIRONMENTAL ASSESSMENT CRITERIA			
	Option	Secure Yield		Planning Obligations		Legislative Acceptability		Established Technologies & Feasibility		Lead Time for Construction & Potential for Escalation of Costs		Capital, Operations, NPV & Levelised Cost per ML		Social Impacts		Cultural Heritage Impacts		Environmental Constraints		Greenhouse Gas & Energy Consumption	
No.	Description	Rating	Description	Rating	Description	Rating	Description	Rating	Description	Rating	Description	Rating	Description	Rating	Description	Rating	Description	Rating	Description	Rating	Description
1	Raising Clarrie Hall Dam Extra 26,300 ML Storage	5	Previous studies show this option will provide an additional 7,170 ML/annum, which is in excess of the required additional secure yield of 3,000 ML/annum over the planning horizon.	3	Allow 5.5 years for planning approvals including Section 112 EIS under Part 5 of EP&A Act 1979, and construction approvals processes. Uncertainty remains over EPBC referral.	4	The EP&A Act 1979 process has been followed on numerous other projects. There are uncertainties regarding Part 5, or Part 3A and whether referral under the federal EPBC Act 1999 will be triggered.	5	Foundation conditions and potential materials areas are well understood at this site	3	Environmental investigations and approvals processes, together with dam raising period require significant lead times. Earliest time for project completion from mid 2010 is mid 2017.	4	Levelised cost over 80 years is very favourable as $1,516/ML.	2	Social impacts involve 24 farming properties and inundation of up to 3 dwellings. Land acquisition and fair compensation will therefore be required, together with deviation of local roads.	3	Nine sites of known Aboriginal significance will be inundated. Further investigations and negotiations with the Aboriginal knowledge holders are required.	3	Some significant forest and threatened species have been identified in the area to be inundated. Additional investigations required to confirm EIS and/or referral under EPBC Act 1999.	4	GHG emissions are high initially during the construction phase, but thereafter are negligible under normal operations.
2	Byrrill Creek Dam Construction 16,300 ML Storage	5	Previous studies show this option will provide an additional 8,700 ML/annum, which is in excess of the required additional secure yield of 3,000 ML/annum over the planning horizon.	2	Allow 7 years for planning approvals including Section 112 EIS under Part 5 of EP&A Act 1979, and construction approvals processes. Uncertainty remains over EPBC referral.	2	Similar approvals process and uncertainties regarding Part 5, or Part 3A and federal EPBC Act 1999 as for Clarrie Hall Dam. Additional issues regarding NSW Weirs Policy and more stringent requirements given it is a new dam.	5	Foundation conditions are reasonably well known with few potential unknowns. Any variations can be accommodated through established and well tested methods.	1	Environmental investigations and approvals processes, together with dam construction period require significant lead times, and more so than for CHD Raising. Earliest time for completion from mid 2010 is mid 2019.	4	Levelised cost over 80 years is very favourable as $1,871/ML.	2	Social impacts involve 9 properties and inundation of up to 4 dwellings. Land acquisition and fair compensation will therefore be required together with road closures or major deviation of local roads.	2	Grinding hollows, paths of connectivity and several other sites of known Aboriginal significance will be inundated. Further investigations and negotiations with the Aboriginal knowledge holders are required.	2	Higher potential than CHD for impacting upon significant flora and threatened species in the inundated area and near the dam site. Additional investigations required to confirm EIS and referral under EPBC Act 1999.	3	GHG emissions are higher than for CHD raising during the construction phase, but thereafter are negligible under normal operations.
5	Pipeline to SEQ Water Grid 7 km of 500-mm Pipeline for 20 ML/day	3	This option may provide an additional 7,300 ML/annum. However, no agreement has yet been negotiated for this supply in terms of quantity, quality or guaranteed uninterrupted supply.	2	Allow 6.5 years for planning approvals including Section 112 EIS under Part 5 of EP&A Act 1979 and equivalent Queensland legislative framework, and construction approvals processes . Uncertainty remains over EPBC referral.	1	Simpler approvals processes for pipelines than for dams options. However, agreement for transfer of water between the States is likely to be complex and protracted.	5	Minimal latent conditions or issues envisaged with pipeline construction technologies in road reserves.	2	Construction period is less than that for dams, but agreement between the States would be protracted and costly. Earliest time for completion from mid 2010 is 2018.	2	Levelised cost over 30 years is unfavourable at $3,408/ML.	4	Short term inconvenience from construction activities along road reserves. Acquisition of pump station site may be required.	3	Areas with Aboriginal cultural significance have been identified for alignments A, B and C. For alignments D and E it is less likely. Culturally significant areas were identified under the Tugun Bypass EIS, however further surveys would be required.	4	Pipeline alignment C is more complex than alignment D, but for either alignment, the issues are much more manageable than for the dams options.	3	GHG emissions will be relatively moderate during the construction phase. High emissions during operations will be linked to mechanical and electrical plant for pumping.
C O M B I N E D	Pipeline to Rous Water 18 km of 300-mm Pipeline for 5 ML/day	2	The estimated additional supply of 1,800 ML/annum is an interim solution only from 2018 up to 2022. However, no agreement has yet been negotiated for this supply in terms of quantity, which may not be available during this period.	3	Allow 4 years for planning approvals and construction approvals processes, including EIS under Part 4 and Part 5 of EP&A Act 1979.	4	The EP&A Act 1979 process has been followed on numerous other projects. There are uncertainties regarding Part 4 and Part 5, or Part 3A, but more straight forward than the dams options.	5	Minimal latent conditions or issues envisaged with pipeline construction technologies in road reserves.	4	Environmental approvals required, but construction period longer than that for the pipeline to SEQ Water Grid. Earliest time for completion from mid 2010 is mid 2016.	1	Levelised cost over 30 years is unfavourable at $3,935/ML.	4	Short term inconvenience from construction activities along road reserves. Acquisition of pump station site may be required.	4	The majority of the pipeline would be constructed in areas previously disturbed, but no investigations have been carried out and an Archaeological Survey would be required.	4	Pipeline route is along the Old Coast Road, which has already been disturbed. Additional ecological studies would be required.	3	GHG emissions will be relatively moderate during the construction phase. High emissions during operations will be linked to mechanical and electrical plant for pumping.
	Pipeline to SEQ Water Grid 7 km of 300-mm Pipeline for 5 ML/day	3	The estimated additional supply of 1,800 ML/annum is an interim solution only from 2018 up to 2022. However, no agreement has yet been negotiated for this supply in terms of quantity, quality, or guaranteed uninterrupted supply.	2	Allow 6.5 years for planning approvals including Section 112 EIS under Part 5 of EP&A Act 1979 and equivalent Queensland legislative framework, and construction approvals processes. Uncertainty remains over EPBC referral.	1	Simpler approvals processes for pipelines than for dams options. However, agreement for transfer of water between the States is likely to be complex and protracted.	5	Minimal latent conditions or issues envisaged with pipeline construction technologies in road reserves.	2	Construction period is less than that for dams, but agreement between the States would be protracted. Earliest time for completion from mid 2010 is 2018.	2	Levelised cost over 30 years is unfavourable at $3,283/ML.	4	Short term inconvenience from construction activities along road reserves. Acquisition of pump station site may be required.	3	Areas with Aboriginal cultural significance have been identified for alignments A, B and C. For alignments D and E it is less likely. Culturally significant areas were identified under the Tugun Bypass EIS, however further surveys would be required.	4	Pipeline alignment C is more complex than alignment D, but for either alignment, the issues are much more manageable than for the dams options.	3	GHG emissions will be relatively moderate during the construction phase. High emissions during operations will be linked to mechanical and electrical plant for pumping.
	Groundwater Tweed River alluvuim including 8 km of 200-mm Pipeline to Bray Park WTP	2	The estimated additional supply of 1,470 ML/annum is sufficient as an interim solution from 2018 up to 2021. There remains risk that the expected yield may not be realised.	4	Allow 3 years for planning approvals including Section 111 REF under Part 5 of EP&A Act 1979, and construction approvals processes.	3	The EP&A Act 1979 process has been followed on numerous other projects. There are uncertainties regarding Part 5, or Part 3A, and risks of existing agricultural and domestic users, but more straight forward than the dams and pipelines options.	4	Whilst borefield technologies are well understood, the outcomes can be uncertain.	4	Lead time can be significant for environmental investigations, community consultation and approvals. The earliest time for completion from mid 2010 is mid 2014.	4	Levelised cost over 30 years is very favourable at $1,237/ML. This does not include the separate WTP.	3	Impacts expected to be less intrusive during the construction period than the pipelines options. Local groundwater users may have concerns.	4	Impacts are expected to be less than the dams options, even though Aboriginal knowledge holders regard groundwater resources as of particular cultural significance.	5	Groundwater has lesser potential for direct impacts than dams or pipelines options, and stringent extraction conditions would be imposed. Additional ecological studies would be required.	3	GHG emissions will be relatively moderate during the construction phase. High emissions during operations will be linked to mechanical and electrical plant for pumping.
	Groundwater Coastal groundwater including 4.3 ML/day WTP	4	The estimated additional supply of 1,470 ML/annum is sufficient as an interim solution from 2018 up to 2021. There is a risk that the expected yield may not be realised in full.	3	Allow 3+ years for planning approvals including Section 111 REF under Part 5 of EP&A Act 1979, and construction approvals processes. Planning approvals in coastal areas are more onerous than Eungella.	3	The EP&A Act 1979 process has been followed on numerous other projects. There are uncertainties regarding Part 5, or Part 3A, and risks of existing agricultural and domestic users, but more straight forward than the dams and pipelines options.	4	Whilst borefield technologies are well understood, the outcomes can be uncertain.	3	Lead time can be significant for environmental investigations, community consultation and approvals can become protracted. The earliest time for completion from mid 2010 is mid 2014 with a higher risk of delay.	1	Levelised cost over 30 years is very unfavourable at $3,745/ML. This includes a separate WTP.	3	Impacts expected to be less intrusive during the construction period than the pipelines options. New site for a WTP will need to be established and the local community may have concerns.	4	Impacts are expected to be less than the dams options, even though Aboriginal knowledge holders regard groundwater resources as of particular cultural significance.	4	Groundwater has lesser potential for direct impacts than dams or pipelines options, and stringent extraction conditions would be imposed. Additional ecological studies would be required. A new site for the WTP will need to be negotiated.	2	GHG emissions will be relatively moderate during the construction phase. High emissions during operations will be linked to mechanical and electrical plant for pumping and water treatment.

Notes: Rating is the impact upon the Assessment Criteria, which may be a risk, difficulty, etc: (The Rating is used in Table 2 to determine the Score for each option.)

1	High negative risk, impact, or difficulty
2	Difficulties encountered, which can be managed with special treatment
3	Moderately straightforward with a low degree of difficulty
4	Low negative impact
5	Very low negative impact / excellent

TWEED SHIRE COUNCIL **APPENDIX B**

TWEED DISTRICT WATER SUPPLY AUGMENTATION OPTIONS STUDY

TABLE 2: DETERMINATION OF FINE SCREEN SCORES AND RANKINGS

MULTI CRITERIA ANALYSIS FOR THE ASSESSMENT OF SHORTLISTED OPTIONS

		GOVERNANCE ASSESSMENT CRITERIA									ECONOMIC ASSESSMENT CRITERIA									SOCIAL ASSESSMENT CRITERIA						ENVIRONMENTAL ASSESSMENT CRITERIA							
	Option	Secure Yield			Planning Obligations			Legislative Acceptability			Established Technologies & Feasibility			Lead Time for Construction & Potential for Escalation of Costs			Capital, Operations, NPV & Levelised Cost per ML			Social Impacts			Cultural Heritage Impacts			Environmental Constraints			Greenhouse Gas & Energy Consumption			Total Score	Rank
No.	Description	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	0ut of 360	
1	Raising Clarrie Hall Dam	5	9	45	3	7	21	4	7	28	5	7	35	3	3	9	4	7	28	2	7	14	3	9	27	3	9	27	4	7	28	262	1
2	New Byrrill Creek Dam	5	9	45	2	7	14	2	7	14	5	7	35	1	3	3	4	7	28	2	7	14	2	9	18	2	9	18	3	7	21	210	3
5	Pipeline to SEQ Water Grid	3	9	27	2	7	14	1	7	7	5	7	35	2	3	6	2	7	14	4	7	28	3	9	27	4	9	36	3	7	21	215	2
COMBINED	Pipeline to Rous Water	2			3			4			5			4			1			4			4			4			3				
	Pipeline to SEQ Water Grid	3	9	21.0	2	7	21.0	1	7	18.7	5	7	32.7	2	3	10.0	2	7	16.3	4	7	25.7	3	9	33.0	4	9	39.0	3	7	21.0	238	The score of the combined option is not directly comparable to those of the other three options.
	Groundwater (Tweed River alluvium)	2			4			3			4			4			4			3			4			5			3				
COMBINED	Pipeline to Rous Water	2			3			4			5			4			1			4			4			4			3				
	Pipeline to SEQ Water Grid	3	9	27.0	2	7	18.7	1	7	18.7	5	7	32.7	2	3	9.0	2	7	9.3	4	7	25.7	3	9	33.0	4	9	36.0	3	7	18.7	229	The score of the combined option is not directly comparable to those of the other three options.
	Groundwater (Coastal)	4			3			3			4			3			1			3			4			4			2				

Notes: **Rating** is the impact upon the Assessment Criteria, which may be a risk, difficulty, etc:

- **1 =** High negative risk, impact, or difficulty
- **2 =** Difficulties encountered, which can be managed with special treatment
- **3 =** Moderately straightforward with a low degree of difficulty
- **4 =** Low negative impact
- **5 =** Very low negative impact / excellent

WF is the weighting factor, which is the relative level of significance placed on the Assessment Criteria as follows:

- **1 =** Very Low
- **3 =** Low
- **5 =** Moderate
- **7 =** High
- **9 =** Very High

Score is the product of the Rating and Weighting Factor to identify the preferred options for the Fine Screen

Rank is the relative preference from most preferred (ranked 1) to least preferred (ranked 9), based on the comparison of scores from all assessment criteria.

TWEED SHIRE COUNCIL **APPENDIX B**

TWEED DISTRICT WATER SUPPLY AUGMENTATION OPTIONS STUDY

TABLE 3: DETERMINATION OF FINE SCREEN SCORES AND RANKINGS BASED ON EVENLY WEIGHTED QBL

MULTI CRITERIA ANALYSIS FOR THE ASSESSMENT OF SHORTLISTED OPTIONS

		GOVERNANCE ASSESSMENT CRITERIA									ECONOMIC ASSESSMENT CRITERIA									SOCIAL ASSESSMENT CRITERIA						ENVIRONMENTAL ASSESSMENT CRITERIA							
	Option	Secure Yield			Planning Obligations			Legislative Acceptability			Established Technologies & Feasibility			Lead Time for Construction & Potential for Escalation of Costs			Capital, Operations, NPV & Levelised Cost per ML			Social Impacts			Cultural Heritage Impacts			Environmental Constraints			Greenhouse Gas & Energy Consumption			Total Score	Rank
No.	Description	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	0ut of 240	
1	Raising Clarrie Hall Dam	5	4	20	3	4	12	4	4	16	5	5	25	3	2	6	4	5	20	2	5	10	3	7	21	3	7	21	4	5	20	171	1
2	New Byrrill Creek Dam	5	4	20	2	4	8	2	4	8	5	5	25	1	2	2	4	5	20	2	5	10	2	7	14	2	7	14	3	5	15	136	3
5	Pipeline to SEQ Water Grid	3	4	12	2	4	8	1	4	4	5	5	25	2	2	4	2	5	10	4	5	20	3	7	21	4	7	28	3	5	15	147	2
C O M B I N E D	Pipeline to Rous Water	2			3			4			5			4			1			4			4			4			3				
	Pipeline to SEQ Water Grid	3	4	9.3	2	4	12.0	1	4	10.7	5	5	23.3	2	2	6.7	2	5	11.7	4	5	18.3	3	7	25.7	4	7	30.3	3	5	15.0	163	The score of the combined option is not directly comparable to those of the other three options.
	Groundwater (Tweed River alluvium)	2			4			3			4			4			4			3			4			5			3				
C O M B I N E D	Pipeline to Rous Water	2			3			4			5			4			1			4			4			4			3				
	Pipeline to SEQ Water Grid	3	4	12.0	2	4	10.7	1	4	10.7	5	5	23.3	2	2	6.0	2	5	6.7	4	5	18.3	3	7	25.7	4	7	28.0	3	5	13.3	155	The score of the combined option is not directly comparable to those of the other three options.
	Groundwater (Coastal)	4			3			3			4			3			1			3			4			4			2				

Notes: **Rating** is the impact upon the Assessment Criteria, which may be a risk, difficulty, etc:

- **1 =** High negative risk, impact, or difficulty
- **2 =** Difficulties encountered, which can be managed with special treatment
- **3 =** Moderately straightforward with a low degree of difficulty
- **4 =** Low negative impact
- **5 =** Very low negative impact / excellent

WF is the weighting factor, which is the relative level of significance placed on the Assessment Criteria as follows:

- **1 =** Very Low
- **3 =** Low
- **5 =** Moderate
- **7 =** High
- **9 =** Very High

Score is the product of the Rating and Weighting Factor to identify the preferred options for the Fine Screen

Rank is the relative preference from most preferred (ranked 1) to least preferred (ranked 9), based on the comparison of scores from all assessment criteria.

TWEED SHIRE COUNCIL **APPENDIX B**

TWEED DISTRICT WATER SUPPLY AUGMENTATION OPTIONS STUDY

TABLE 4: DETERMINATION OF FINE SCREEN SCORES AND RANKINGS BASED ON CWG RATIONALE

MULTI CRITERIA ANALYSIS FOR THE ASSESSMENT OF SHORTLISTED OPTIONS

		GOVERNANCE ASSESSMENT CRITERIA									ECONOMIC ASSESSMENT CRITERIA									SOCIAL ASSESSMENT CRITERIA						ENVIRONMENTAL ASSESSMENT CRITERIA							
	Option	Secure Yield			Planning Obligations			Legislative Acceptability			Established Technologies & Feasibility			Lead Time for Construction & Potential for Escalation of Costs			Capital, Operations, NPV & Levelised Cost per ML			Social Impacts			Cultural Heritage Impacts			Environmental Constraints			Greenhouse Gas & Energy Consumption			Total Score	Rank
No.	Description	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	0ut of 240	
1	Raising Clarrie Hall Dam	5	4	20	3	4	12	4	4	16	5	5	25	3	2	6	4	5	20	2	7	14	3	7	21	3	9	27	4	7	28	189	1
2	New Byrrill Creek Dam	5	4	20	2	4	8	2	4	8	5	5	25	1	2	2	4	5	20	2	7	14	2	7	14	2	9	18	3	7	21	150	3
5	Pipeline to SEQ Water Grid	3	4	12	2	4	8	1	4	4	5	5	25	2	2	4	2	5	10	4	7	28	3	7	21	4	9	36	3	7	21	169	2
COMBINED	Pipeline to Rous Water	2			3			4			5			4			1			4			4			4			3				
	Pipeline to SEQ Water Grid	3	4	9.3	2	4	12.0	1	4	10.7	5	5	23.3	2	2	6.7	2	5	11.7	4	7	25.7	3	7	25.7	4	9	39.0	3	7	21.0	185	The score of the combined option is not directly comparable to those of the other three options.
	Groundwater (Tweed River alluvium)	2			4			3			4			4			4			3			4			5			3				
COMBINED	Pipeline to Rous Water	2			3			4			5			4			1			4			4			4			3				
	Pipeline to SEQ Water Grid	3	4	12.0	2	4	10.7	1	4	10.7	5	5	23.3	2	2	6.0	2	5	6.7	4	7	25.7	3	7	25.7	4	9	36.0	3	7	18.7	175	The score of the combined option is not directly comparable to those of the other three options.
	Groundwater (Coastal)	4			3			3			4			3			1			3			4			4			2				

Notes: **Rating** is the impact upon the Assessment Criteria, which may be a risk, difficulty, etc:

- **1 =** High negative risk, impact, or difficulty
- **2 =** Difficulties encountered, which can be managed with special treatment
- **3 =** Moderately straightforward with a low degree of difficulty
- **4 =** Low negative impact
- **5 =** Very low negative impact / excellent

WF is the weighting factor, which is the relative level of significance placed on the Assessment Criteria as follows:

- **1 =** Very Low
- **3 =** Low
- **5 =** Moderate
- **7 =** High
- **9 =** Very High

Score is the product of the Rating and Weighting Factor to identify the preferred options for the Fine Screen

Rank is the relative preference from most preferred (ranked 1) to least preferred (ranked 9), based on the comparison of scores from all assessment criteria.

MWH

BUILDING A BETTER WORLD

FINAL REPORT

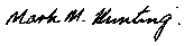
Tweed District Water Supply Augmentation Options Study

Stage 3 – Fine Screen Assessment of Shortlisted Options

Prepared for Tweed Shire Council

This document has been prepared specifically for Tweed Shire Council in relation to this project and should not be relied upon by other parties nor used for any other purpose without the specific permission of MWH.

Revision Schedule

Rev. No.	Date	Description	Prepared By	Reviewed By	Approved By
1.0	30 June 2010	Draft	M. Hunting	A. Burnham T. Mackney D. Grace M. Balandin	
2.0	24 August 2010	Final Draft	M.Hunting 	T. Mackney G. Samios	S. O'Brien
3.0	28 September	Final	T. Mackney	T. Moore	S. O'Brien

Cover landscape painting of "Brooding Wilderness Meets Tranquil Valley" by Lyn Ellison, won Second Prize at the 2008 Tweed Naturally Art Awards and is used with permission of the artist.

Executive Summary

E1. Introduction

Tweed Shire Council is in the process of implementing its Integrated Water Cycle Management Strategy, which involves initiatives on the demand-side to reduce water consumption and studies on the supply-side to plan for the future augmentation of its water resources.

The Demand Management Strategy was developed in two phases, the first dealt with initiatives for the reduction of household (residential) consumption and system losses, while phase two of this strategy was expanded to include the non-residential (commercial, industrial and rural) initiatives.

The implementation of the Demand Management Strategy will influence the demand projections and therefore determine the timing of the future augmentation of water resources.

The Tweed District Water Supply Augmentation Options Study is being undertaken to assist Tweed Shire Council in the determination of a preferred option for the augmentation of its water resources to the planning horizon of 2036.

The study was undertaken in three stages:

- **Stage 1: Identification of Feasible Options:** This stage involved a review of existing reports and data in relation to Tweed's water supply, including estimates of yield of the existing resources and demand forecasts to identify a list of nine feasible options;
- **Stage 2: Coarse Screen Assessment of the Options:** This stage involved an investigation of the issues and constraints associated with each of the nine options against a set of assessment criteria, in order to produce a sound basis for selecting a shortlist of three preferred options. A Combined Emergency Supply was also selected given lead times for the other shortlisted options and the potential that they may not be realised before the water supply system's secure yield was exceeded.
- **Stage 3: Fine Screen Assessment of Shortlisted Options:** This stage draws upon considerable additional information from subsequent reports, community consultation and meetings with stakeholders to analyse in more detail the shortlisted options against the ten assessment criteria, so that the preferred option is selected from the widest assemblage of available data.

This report summarises the Stage 3 investigations which are aimed at documenting the issues and constraints associated with making an informed decision over the preferred option for augmentation of the water source. The shortlisted options are analysed in greater detail over each of the ten assessment criteria to enable each to be scored against a quadruple bottom line (governance, economic, social and environmental) multi criteria analysis used in deciding the outcome of this study.

E2. Forecast Water Demand

The population forecasts show that there will be steady growth to a population of 157,000 persons by the year 2036 with a corresponding demand forecasts target of 16,750 ML/annum.

The existing secure yield of the Bray Park water supply scheme (including the existing Clarrie Hall Dam) is 13,750 ML/annum. Demand for water is expected to increase to exceed this secure yield sometime in the period 2018 to 2023:

- The "Baseline Forecast" (following present unrestricted trends) by the year 2018, or
- The "BASIX/WELS Forecast" (following the introduction of demand management efficiencies) by the year 2023.

The preferred option of water resource augmentation is assessed on its capacity to provide an additional 3,000 ML/annum of secure yield by the year 2036, which is equivalent to the target average annual water demand of 16,750 ML/annum, and includes the BASIX/WELS demand management efficiencies.

E3. Shortlisted Options Considered

The three shortlisted options which progressed for further consideration under the Fine Screen options review process are as follows:

Options Involving Dams:

- Option 1: Raising the existing Clarrie Hall Dam
- Option 2: New dam on Byrrill Creek

Option Involving a Pipeline to the Assets of Another Water Utility:

- Option 5: Pipeline link to the South East Queensland Water Grid

The options considered for the Combined Emergency Supply are as follows:

- Option 4: Pipeline link to Rous Water, at Ocean Shores
- Option 5A: Smaller pipeline link to the South East Queensland Water Grid, near the Tugun desalination facility.
- Option 7: Groundwater supply (Tweed alluvium and coastal aquifer)

E4. Approach to the Assessment of Shortlisted Options

The shortlisted options were assessed using a range of data sources including:

- Desk-top reviews of additional reports in relation to the environmental, social, cultural and water resources of the Tweed Shire – these reports were available subsequent to completion of the Coarse Screen study.
- Discussions with other water utilities to the north and south of Tweed Shire (Queensland Water Commission and Rous Water), with a view of ascertaining their potential for cross-boundary capacity sharing.
- Discussions with statutory stakeholders and government agencies in both NSW and Queensland over the options for water resource augmentation.
- Community consultation in conjunction with a Community Working Group, which was established to review the social and environmental impacts of the shortlisted options; plus a review of submissions received from the public
- Stakeholder consultation including potentially affected landholder, Aboriginal community and other community organisations.

Ten assessment criteria were used to differentiate the benefits and risks associated with each of the options, and these are summarised in the following table. These criteria were grouped under four categories to provide a Quadruple Bottom Line basis for the assessment.

Summary of Fine Screen Assessment Criteria

Assessment Criteria	Explanation
Governance (of Natural Resources)	
Secure Yield	Whether the augmentation option has sufficient capacity and certainty of provision to meet the 2036 forecast demand of 16,750 ML/annum for 157,000 population, and to what extent it has excess capacity to meet the uncertainty of the predicted demand and meet future demand beyond that date.
Planning Obligations	The number of stakeholders involved in the regulatory framework to meet the statutory compliance requirements and the associated timeframe and risks for completion by 2023, when augmentation is required.
Legislative Acceptability	The extent to which required legislation is influenced by discretionary powers, which impact upon the augmentation option to increase its uncertainty of delivery.
Maintenance of Stable Economic Growth	
Established Technologies and Feasibility	Whether existing technologies and accepted practice are involved, or whether there are risks associated with water quality, innovation and emerging technologies.
Lead Time for Construction & Potential for Escalation of Costs	Where the uncertainties associated with the preliminary phases of project delivery increase the risks of blow-out of time and of the end costs of the completed project.
Net Present Value based on Capital and Operating Costs and Levelised Cost ($ per ML)	Evaluation of estimated Net Present Value, taking account of the capital and operations costs over 80 or 30 years discounted to present day dollars at 7%. This is also expressed as levelised cost per unit of production ($ per ML).
Effective Protection of Social Values	
Social Impacts	Impact on established developed areas (urban, rural, agricultural, commercial, industrial, etc.) and their associated political interactions.
Cultural Heritage Impacts	Impacts upon areas of historical importance and sites of cultural significance.
Effective Protection of the Environment	
Environmental Constraints	Extent and severity of environmental impacts that are likely to be encountered including aquatic, terrestrial and areas of conservation significance.
Greenhouse Gas Emissions and Energy Consumption	An assessment of the greenhouse gas emissions due to embodied energy, construction activities and ongoing operational activities.

A multi criteria analysis was undertaken to identify the risks related to each option. A rating was applied to the relative risk (high risk rating 1 and low risk rating 5) under each of the assessment criteria. The ratings were based on the discussion on each of the assessment criteria and relative risk of each option.

A weighting factor (1 to 9) was also applied based on the relative importance of each of the assessment criteria (very low significance weighting 1 and very high significance weighting 9).

Each of the options was scored and ranked, based on the product of the rating and weighting factors.

E5. Results of the Assessment of Shortlisted Options

The results of the ranking of shortlisted options using the above process are summarised in the following table, in terms of the assessed score, the Net Present Value at 7 % discount rate and the Levelised Cost per ML over the assessment period. Three separate weighting approaches were adopted to assess the options – a Quadruple Bottom Line (QBL) approach, an Equal Weighting for each criteria (Even) and Community Working Group (CWG) weighting.

Ranking of Options

Rank	Option	NPV @ 7% ($ million)	Levelised Cost ($ per ML)	Assessed MCA Scores # (QBL, Even, CWG)
1	Option 1 - Raising Clarrie Hall Dam	$36.1	$1,516	262 or 171 or 189
2	Option 5 - Pipeline to the SEQ Water Grid	$55.1	$3,408	215 or 147 or 169
3	Option 2 - Byrrill Creek Dam Construction	$45.8	$1,871	210 or 136 or 150
Combined Emergency Supply				
-	Pipeline to Rous Water	$39.1	$3,935	238 or 163 or 185
	Pipeline to the SEQ Water Grid	$32.6	$3,283	
	Groundwater (Tweed alluvium)	$10.8	$1,255	
	Groundwater (Coastal aquifer)	$37.2	$4,318	

E6 Conclusions

Based on the Fine Screening of shortlisted options, the following conclusions are drawn:

1. The highest ranked option is Option 1 comprising the raising of Clarrie Hall Dam. This option achieved the highest overall score and highest individual scores for the following assessment criteria compared with the other two shortlisted options (excluding the Combined Emergency Supply):
   - Secure Yield — Rated 5/5
   - Planning Obligations — Rated 3/5
   - Legislative Acceptability — Rated 4/5
   - Established Technologies and Feasibility — Rated 5/5
   - Lead Time for Construction & Escalation Risk — Rated 3/5
   - Net Present Value & Levelised Cost per ML — Rated 4/5
   - Greenhouse Gas & Energy Consumption — Rated 4/5

   The above high ratings reflect the strongest Quadruple Bottom Line (economic, social, environmental and governance) foundation for proceeding with this Option. It would therefore appear that this is the preferred Option for augmenting the Tweed district water supply.

2. The planning approvals and pre-construction permit process associated with the raising of Clarrie Hall Dam, coupled with the relatively long phase of project implementation is expected to take seven years – from mid 2010 - mid 2017. This option leaves five and a half years lee-way, based on the revised BASIX/WELS demand projection, or six months lee-way if future demands follow the Baseline projection.

   The Clarrie Hall Dam option includes areas of National Park, which will require agreement with National Parks and Wildlife Service, involving appropriate offset measures. This issue presents possibly the greatest risk associated with the option.

3. The need for the Combined Emergency Supply is diminished from the Coarse Screen demand projections on the proviso that the revised demand projections involving BASIX/WELS are achieved. The Combined Emergency Supply will only be required in the event that the preferred option for augmentation of supply is not completed by the year 2023. The Combined Emergency Supply may be provided through a component of either the pipeline to Rous Water, or the groundwater supply.

4. Option 5 (alignment C, D or E) involving the pipeline to SEQ Water Grid (including this component of the Combined Emergency Supply) has relatively high risks associated with:
    - The expected protracted negotiations over the dealings with a number of political and procedural issues between the States, which have not previously been confronted.
    - The uncertainties over the high bulk purchase price of water from the SEQ Water Grid Manager.
    - The lack of assurance as to whether supply from the SEQ Water Grid would be maintained, in the event that the combined resources of SEQ fall below 40%.

5. The option with the longest lead time for completion was Option 2, a new dam at Byrrill Creek, which is likely to take nine years for the combined processes of planning and pre-construction approvals and the construction phase.

6. The option with the most significant environmental concerns in terms of a changing habitat, from a flowing watercourse to a lake environment, together with a new major fish barrier, was Option 2 - new Byrrill Creek Dam.

E7. Recommendations

Based on the Fine Screen assessment of shortlisted options it is recommended that Tweed Shire Council:

1. Implement appropriate demand management actions and systematically monitor demand to ensure that demand reductions equivalent or better to the BASIX/WELS standard are achieved over the planning period.

2. Adopt the raising of Clarrie Hall Dam as the preferred option for augmenting the Tweed District Water Supply over the planning horizon to 2036.

3. Proceed with the planning approvals processes outlined in Section 4.4.2.1 of this Report in relation to the raising of Clarrie Hall Dam, with priority given to the National Parks land issue.

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Glossary of Acronyms and Definitions

Acronym	Definition
AAC	Aboriginal Advisory Committee
AHD	Australian Height Datum
ASS	Acid Sulphate Soil
BASIX	A NSW Government requirement of a Building Sustainability Index for all new dwellings to meet water, energy and thermal comfort initiatives. Water initiatives include a range of features including rainwater tanks plumbed to the toilet, garden and laundry and the installation of efficient showerheads.
CEMP	Construction Environmental Management Plan
CO_2-e	Carbon Dioxide Equivalent
CWG	Community Working Group
DECCW	NSW Department of Environment Climate Change and Water manages the functions of NSW Office of Water; Environment Protection Authority (EPA) and National Parks and Wildlife Service (NPWS).
DTMR	Queensland Department of Transport and Main Roads
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement under Section 112 of the EP&A Act 1979
EPI	Environmental Planning Instrument
FSL	Full Supply Level
GHG	Greenhouse Gas
GWP	Global Warming Potential
HCV	High Conservation Value
HNFY	Historic No Failure Yield (secure yield)
KWH	Kilowatt Hour
LEP	Local Environment Plan
MCA	Multi Criteria Analysis
ML	Megalitre – volume of 1 million litres
MOU	Memorandum of Understanding
NPV	Net Present Value
OHS&R	Occupational Health, Safety and Rehabilitation
PAO	Preliminary Archaeological Overview
PEPO	Preliminary Environmental and Planning Overview
QBL	Quadruple Bottom Line
QWC	Queensland Water Commission
REF	Review of Environmental Factors under Section 111 of the EP&A Act 1979
RL	Reduced Level – known elevation above sea level
SEPP	State Environmental Planning Policy
SEQ	South East Queensland
SIS	Species Impact Statement
TBL	Triple Bottom Line

1 Introduction

Tweed Shire Council is in the process of implementing its Integrated Water Cycle Management Strategy, which involves initiatives on the demand-side to reduce water consumption and studies on the supply-side to plan for the future augmentation of its water resources.

The Demand Management Strategy (References No. 16 and 34) was developed in two phases, the first dealt with initiatives for the reduction of household (residential) consumption and system losses, while phase two of this strategy was expanded to include the non-residential (commercial, industrial and rural)initiatives. The implementation of the Demand Management Strategy will influence the demand projections and therefore determine the timing of the future augmentation of water resources.

The Tweed District Water Supply Augmentation Options Study was undertaken to assist Tweed Shire Council to determine a preferred option for the augmentation of its water resources to meet projected water demands to the year 2036 planning horizon.

Water demands of the Bray Park scheme are currently less than 10,000 ML/annum. This scheme supplies water to an equivalent population (residential, commercial and industrial consumers) of approximately 82,700 persons in 2010.

The Bray Park scheme involves the Bray Park Water Treatment Plant, which sources water from the Tweed and Oxley Rivers. When natural flows at the Bray Park Weir are insufficient to meet water supply demands, water is released into the Tweed River from Clarrie Hall Dam, located on Doon Doon Creek, a tributary of the Tweed River.

The existing secure yield of the Bray Park scheme is 13,750 ML/annum. The system demands are expected to exceed the secure yield by the year 2018 if demands continue to increase along historical trends of consumption. Under the influence of the demand management initiatives recommended in the Demand Management Strategy, in which per capita consumption will effectively decrease over time, the system demands will be extended to reach the secure yield beyond that of the Baseline projection. An extended demand scenario is shown in the Scenario 1 (BASIX/WELS) demand forecast, which is supported by a legislative framework in NSW.

Future development in the Shire has been analysed in detail as part of the Demand Management Strategy, which shows that growth is expected within the current planning horizon in Council's designated coastal growth corridors of Bilambil Heights, Cobaki Lakes, Kings Forest, Terranora, West Kingscliff and infill developments; increasing the population to around 157,000 persons by the year 2036.

Based on detailed assessment of demand management potential, it is forecast that demand will rise to 16,750 ML/annum by the year 2036 under the BASIX/WELS demand forecast and the preferred option of water resource augmentation will be assessed on its capacity to provide an additional 3,000 ML/annum of secure yield.

2 Background

This study has been developed in three stages to analyse and document the options available to augment the existing water source. A list of options was developed and a high level assessment of each was undertaken. Each option was scored against criteria based on quadruple bottom line issues and constraints (governance, environmental, social and economic). This enabled a shortlist to be developed for further, more detailed investigation.

2.1 Staged Development of the Options Study

The three stages of this Options Study are summarised in Table 1.

Table 1: Stages of the Options Study

Stages	Descriptions
Stage 1: Identification of Feasible Options	This stage involved a review of existing reports and data in relation to Tweed's water supply, including estimates of yield of the existing resources and demand forecasts to identify a list of feasible options. A stakeholder meeting was held on 7 March 2008 at which nine feasible options were identified for analysis.
Stage 2: Coarse Screen Assessment of Options	This stage involved an investigation of the issues and constraints associated with each option against a set of assessment criteria in order to produce a sound basis for selecting a shortlist of three or four preferred options, on which Council could focus its strategy. A set of ten assessment criteria, encompassing the various risks and issues, were developed to enable a multi criteria analysis to be applied in order to rank the options. The *Coarse Screen Assessment of Options* report provided the basis for selection of the shortlisted options through the coarse screening process.
Stage 3 (THIS REPORT): Fine Screen Assessment of Shortlisted Options	This stage focuses on the merits of the shortlisted options to analyse in more detail capital and operating costs, timing and constraints. In this stage a preferred option will be selected for augmenting the Tweed District Water Supply to satisfy demand to 2036.

Stages 1 and 2 have been completed and were presented to Tweed Shire Council in October 2009 as the "*Coarse Screen Assessment of Options"* report (Reference No. 32).

This Stage 3 *"Fine Screen Assessment of Shortlisted Options"* report draws upon more detailed information to hand in order to select the preferred option from the shortlisted options, which were documented in the previous Stages 1 and 2.

2.2 Population and Demands

2.2.1 Population Projections

Details of the population projections and demand forecasts were presented in the *Demand Management Strategy – Stage 1*, MWH December 2008 (Reference No. 16), which shows that growth is expected within the current planning horizon in Council's designated major development areas in the coastal growth corridors of Bilambil Heights, Cobaki Lakes, Kings Forest, Terranora, West Kingscliff and infill developments; increasing the population to around 157,000 persons by the year 2036.

The growth projections are summarised in Table 2.

Table 2: Services (Water) Population Projection for Tweed Shire

Estimated Population	2006	2011	2021	2031	2036	2041 (ultimate)
Existing Serviced Population	73,185	71,966	69,018	66,044	64,854	64,854
Projected Infill Population	0	6,951	16,402	22,435	25,896	28,461
Major Development Areas						
Bilambil Heights	*0*	*0*	*2,934*	*5,609*	*6,881*	*6,881*
Cobaki Lakes	*0*	*0*	*4,454*	*8,525*	*10,464*	*10,464*
Kings Forest	*0*	*0*	*4,640*	*8,880*	*10,900*	*10,900*
Terranora Area A	*0*	*0*	*1,300*	*2,498*	*3,071*	*3,071*
West Kingscliff	*0*	*0*	*1,158*	*2,197*	*2,687*	*2,687*
Total of Major Development Areas	0	0	14,486	27,709	34,003	34,003
Greenfield outside Major Areas	0	6,182	19,540	27,301	32,295	36,395
Tweed Shire Total	**73,185**	**85,099**	**119,446**	**143,488**	**157,048**	**163,714**

2.2.2 Demand Forecasts

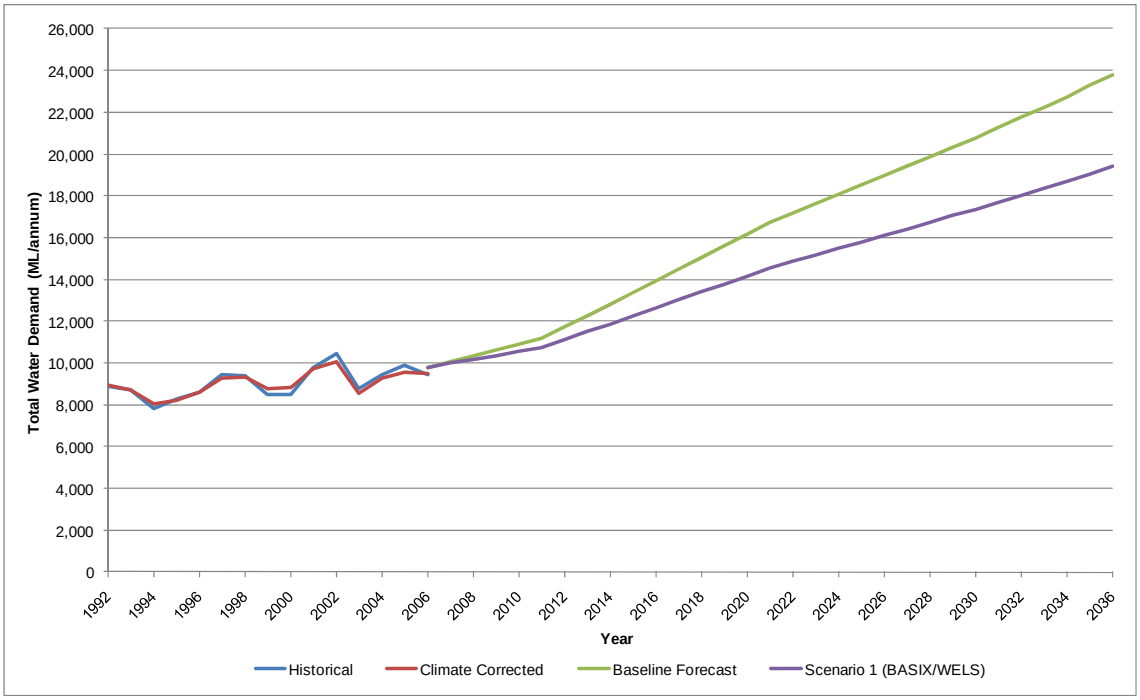
Demand forecasts included a Baseline case, which assumed that historical demands would continue, as well as a range of managed demand scenarios to reduce consumption. The managed scenarios were applicable to the planned major development areas and the whole of Shire. The managed demand scenarios included measures for reducing water use in the residential and non-residential sectors as well as measures for managing system losses.

The demand forecasts shown in the *Coarse Screen Assessment of Options* report, MWH, 6 October 2009 (Reference No. 32), are the two curves of Figure 1, which follow the Baseline projection and the BASIX/WELS projection of the *Demand Management Strategy - Stage 1*.

Table 3: Forecast Year at which Yield is Reached – Original Demand Forecast

Demand Scenario	Year that Secure Yield (13,750 ML/annum) is Reached	Demand at 2036 (ML/annum)
Baseline Demand	2016	23,800
BASIX/WELS Demand	2019	19,000

Figure 1: Forecast Water Demand – Demand Management Strategy Stage 1



The *Demand Management Strategy - Stage 2*, MWH 2009, (Reference No. 34), involved expanded demand forecasts of both the residential and non-residential demands, which supersede the demand curves of the *Coarse Screen Assessment of Options* report, as shown in Figure 2.

The revised demand forecast curves shown in Figure 2 follow the revised Baseline and BASIX/WELS projections of the *Demand Management Strategy - Stage 2*.

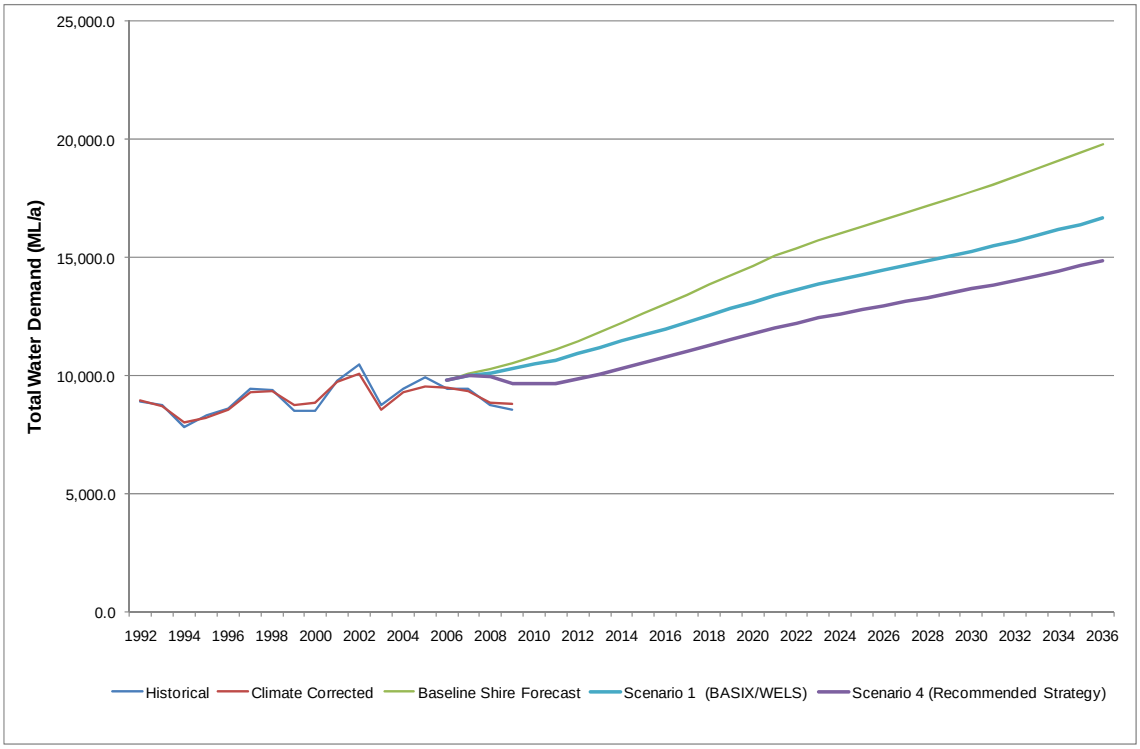
The recommended strategies for reducing consumption are:

- **Scenario 1** for the 'greenfield' major development areas, which required BASIX together with a 5,000 kL rainwater tank connected to external use, toilets and washing machine
- **Scenario 4** for the whole of Shire, which required the Scenario 1 requirements, plus WELS retrofitting for 'brownfield' areas and a suite of other measures to include pricing policy, leakage management, audit programs and non-residential demand measures.

Table 4: Forecast Year at which Yield is Reached – Demand Management Strategy Stage 2

Forecast Scenario	Year that Secure Yield (13,750 ML/annum) is Reached	Demand at 2036 (ML/annum)
Baseline Demand	2018	19,750
BASIX/WELS Demand	2023	16,750
Recommended Strategy	2031	14,850

Figure 2: Revised Forecast Water Demands - Demand Management Strategy Stage 2



It is recognised that the future projections of demands and the timing for the next major augmentation of water resources, when the existing secure yield of 13,750 ML/annum is reached, is an estimate and depends on several variables. These variables include:

- The actual versus planned rates of population growth in the major development areas, infill areas and the non-residential sector;
- The extent to which the managed demand scenarios are achieved, with their various measures to reduce consumption.

Council will be monitoring these variables over the coming years to track the performance of the recommended demand management strategies and this will influence the timing for the next major augmentation of water resources.

The BASIX/WELS demand forecast is a more conservative target and more readily achievable than the recommended strategies and is supported by an existing legislative framework in NSW. It will therefore be used as the basis for assessing the water supply augmentation options.

It is forecast that demand will rise to 16,750 ML/annum by the year 2036 under the BASIX/WELS demand forecast and the preferred option of water resource augmentation will be assessed on its capacity to provide an additional 3,000 ML/annum of secure yield.

3 Recap of Coarse Screening of Options

Stages 1 and 2 were presented to Tweed Shire Council in October 2009 as the "*Coarse Screen Assessment of Options"* report (Reference No. 32). The *Coarse Screen Assessment of Options* report involved an analysis of the nine options against ten assessment criteria, in order to select a shortlist of the preferred options.

3.1 List of Feasible Options

Nine options were identified in the Stage 1 process for consideration in the options review. The nine options were broadly grouped as follows:

Options involving Dams:

1. Raising the existing Clarrie Hall Dam
2. New dam on Byrrill Creek
3. New dam on Oxley River, near Tyalgum (Rocky Cutting site).

Options involving Pipelines to the Assets of other Water Utilities:

4. Pipeline from Pottsville to Rous Water, at Ocean Shores
5. Pipeline from Kennedy Drive, Tweed Heads to the South East Queensland Water Grid, near the Tugun desalination facility.

Other Options:

6. Desalination
7. Groundwater supply
8. Indirect potable reuse
9. Direct potable reuse.

These options were described in the *Coarse Screen Assessment of Options* report, MWH, 6 October 2009 and locality plans of each of the options were attached in the Appendix F.

3.2 Assessment of the Options

The above options were assessed against a variety of technical, environmental, social and economic criteria; a description of which is provided in Table 5.

Table 5: Summary of Coarse Screen Assessment Criteria

Assessment Criteria	Explanation
Secure Yield	Whether the augmentation option has sufficient capacity to meet the 2036 forecast demand of 19,000 ML/annum (revised to 16,750 ML/annum) for a 157,000 population, and to what extent it has excess capacity to meet future demand beyond that date.
Planning Obligations	The number of stakeholders involved in the regulatory framework and the associated timeframe and risks for completion by 2019 (revised to 2023), when augmentation is required.
Legislative Acceptability	The extent to which required legislation is influenced by discretionary powers, which impact upon the augmentation option to increase its uncertainty of delivery.
Established Technologies and Feasibility	Whether existing technologies and accepted practice are involved, or whether there are risks associated with innovation and emerging technologies.
Lead Time for Construction & Potential	Where the uncertainties associated with the preliminary phases of project delivery increase the risks of blow-out of the end costs of the project.

Assessment Criteria	Explanation
for Escalation of Costs	
Net Present Value based on Capital and Operating Costs and Annualised $ per ML	Evaluation of estimated Net Present Value, taking account of the capital and operations costs over 30 years discounted at 7%. This is also expressed as annualised cost per unit of production ($ per ML).
Social Acceptability	Impact on established developed areas (urban, rural, agricultural, commercial, industrial, etc.) and their associated political interactions.
Cultural Heritage Impacts	Impacts upon areas of historical importance and sites of cultural significance.
Environmental Constraints	Extent and severity of environmental impacts that are likely to be encountered including aquatic, terrestrial and areas of conservation significance.
Greenhouse Gas Emissions and Energy Consumption	An assessment of the energy inputs, which are proportional to the direct greenhouse gas emissions.

The tabulated summary of the ten assessments for each of the nine options were presented in the *Coarse Screen Assessment of Options* report, MWH, 6 October 2009 (Reference No. 32), Appendix A.

3.3 Multi Criteria Analysis (MCA) to Rank Options

The nine options were compared against the ten assessment criteria, which were used to differentiate the benefits and risks associated with each of the options. An assessment matrix, or multi criteria analysis (MCA) was developed, based on:

- A **rating** of the qualitative impact on the assessment criteria. The rating was based on a 1 to 5 system, with a 1 indicating a high risk and 5 indicating a low level of risk.
- A **weighting factor** of the relative level of significance on the assessment criteria. The initial weighting factors based on a multiplier of 1 to 5 are shown in Table 6.

Table 6: Coarse Screen - Weighting Factors

Assessment Criteria	Weighting Factor
Secure Yield	5
Planning Obligations	4
Legislative Acceptability	4
Established Technologies & Feasibility	4
Lead Time & Potential for Escalation	2
Capital, Operations, NPV & Costs per ML	4
Social Acceptability	3
Cultural Heritage Impacts	4
Environmental Constraints	4
Greenhouse Gas & Energy Consumption	3

- A **score** determined as the product of the rating and weighting factor to provide a ranked comparison of the options.

The resultant scores were then ranked from one to nine to identify the top preferences for further assessment (fine screening).

A *sensitivity analysis* was also applied, by adjusting the weighting factors to vary the relative level of significance of the assessment criteria. The results of the sensitivity analyses were not included in the *Coarse Screen Assessment of Options* report, because the ranking of the top options remained unchanged.

The results of the MCA, which ranked the options are summarised in Table 7.

Table 7: Coarse Screen - Ranking of Options

Rank	Option	Annualised Cost over 30 Years	Net Present Value ($m)	Assessed Score
1	Option 1 - Raising Clarrie Hall Dam	$569 / ML	$42 million	151
2	Option 2 - Byrrill Creek Dam Construction	$653 / ML	$51 million	117
3	Option 5 - Pipeline to the SEQ Water Grid	$1,655 / ML	$116 million	111
4	Option 4 - Pipeline to Rous Water	$2,444 / ML	$51 million	109
5	Option 3 - Oxley River Dam Construction	$696 / ML	$64 million	102
6	Option 7 - Groundwater Supply	$2,535 / ML	$44 million	93
7	Option 6 - Desalination	$2,782 / ML	$194 million	81
8	Option 8 - Indirect Potable Reuse	$3,579 / ML	$331 million	72
9	Option 9 - Direct Potable Reuse	$3,318 / ML	$307 million	65

The details of the MCA were presented in the *Coarse Screen Assessment of Options* report, MWH, 6 October 2009, Appendix E.

3.4 Shortlisted Options for Further Consideration

The three highest ranked options, which met the mandatory assessment criteria requirements of adequate secure yield and established technologies, are shown in Table 8.

Table 8: Coarse Screen - Highest Ranked Options

Rank	Option	Lead Time to Completion (Years)
1	Option 1 - Raising Clarrie Hall Dam	3.0
2	Option 2 - Byrrill Creek Dam Construction	3.5
3	Option 5 - Pipeline to the SEQ Water Grid	1.0

The fourth highest ranked option however, did not meet the minimum requirement for an additional 3,000 ML/annum (8.2 ML/day) of secure yield. This option was Option 4 - Pipeline to Rous Water, which was likely to provide only approximately 1,825 ML/annum (5 ML/day). This option was therefore only applicable as a short-term emergency source in the event that the capacity of the Tweed network could not supply the demands of growth at the southern extremities of the system.

Alternatively this option could have been part of a combination of a combined scheme involving:

- Option 4 – Pipeline to Rous Water, providing 5 ML/day, with
- Option 5 – Pipeline to SEQ Water Grid, providing up to 5 ML/day, with
- Option 7 – Groundwater Supply, providing 4.3 ML/day.

Council therefore adopted a contingency for a 'Combined Emergency Supply,' which could be implemented in much shorter lead time than the lead times for the shortlisted options, as shown in Table 8. The combined emergency supply is shown in Table 9.

Table 9: Coarse Screen - Possible Combined Emergency Supply

Rank	Option
3	Option 5 - Pipeline to the SEQ Water Grid
4	Option 4 - Pipeline to Rous Water
6	Option 7 - Groundwater Supply

4 Fine Screen Assessment of Shortlisted Options

This assessment of shortlisted options draws upon the considerable extent of additional reports, stakeholder meetings and community consultations that have taken place after completion of the Coarse Screen stage of this study.

4.1 Additional Reports and Studies

A summary of the additional studies is listed in Appendix A "References." This includes reports, which deal with:

- The environmental (flora, fauna and forestry) significance of Clarrie Hall Dam and the Byrrill Creek catchment dating back to 1998 (References No. 19, 20 and 24);
- Environmental flow studies and water sharing plans (References No. 25, 29, 30 and 37);
- Preliminary archaeological overviews (PAOs) of both the Raising of Clarrie Hall Dam and Byrrill Creek Dam options. (References No. 23 and 28).
- Revised demands to the planning horizon of 2036, including the residential sector (Stage 1 study) and water demand management measures for the non-residential sector (Stage 2 study) (Reference No. 34);
- The planning and legislative framework against which any water resources augmentation project will be required to follow, including the federal, State and local government processes and procedures (References No. 29, 36 and 42).

4.2 Stakeholder Engagement

Stakeholder meetings included:

- Discussions with both Rous Water and the Queensland Water Commission regarding the availability of pipeline supplies associated with the shortlisted Combined Emergency Supply from Rous Water and the Option 5 Pipeline to the SEQ Water Grid respectively;
- A Planning Focus Workshop held in January 2010, at which various State Government and local agencies provided feedback on major risks which may limit the ability of Council to proceed with a particular shortlisted option;
- Discussions with the Queensland Department of Transport and Main Roads in February 2010, regarding possible alignments in proximity to the Tugun Motorway in relation to Option 5 Pipeline to the SEQ Water Grid.

4.3 Community Consultation

Community consultations included:

- The significant involvement of the Community Working Group (CWG), which was convened by Council between December 2009 and March 2010 with specific terms of reference to assist Council select a preferred option from the key environmental, social and cultural issues associated with the shortlisted options;
- Membership of the CWG was drawn from relevant stakeholder groups, such as representatives of the community, environmental groups, business / commercial interests, landholders who would be affected by the dams options and the Aboriginal Advisory Committee (AAC);
- Engaging with the AAC on their terms to keep the traditional owners abreast of Council's plans for future water supply options and to receive feedback on concerns over the preservation of their cultural values;
- Visits of Council representatives to the landholders of over forty properties, which may be potentially affected by the augmentation of the water supply;

- Public Information Sessions during February 2010, which were held in three venues (Tweed Heads, Murwillumbah and Pottsville) , with the aim of improving the community's understanding of Council's initiatives to reduce water consumption in terms of demand management strategies and to inform the communities of the options to increase water resources to meet water needs into the future;
- A "Tweed District Water Supply Augmentation" link on the Tweed Shire Council website, which was (and remains) dedicated to the provision of public information about the progress of this study, fact sheets and the progress of the CWG;
- Provision of a 1800 free-call phone line and designated e-mail address, together with the solicitation and receipt of public submissions in relation to Council's integrated water cycle management strategy, specifically the Demand Management Strategy and the Water Supply Augmentation.

4.4 Review of Assessment Criteria for the Fine Screen Process

Sustainable development involves the balanced satisfaction of the above objectives, which meets the needs of the present without compromising the ability of future generations to meet their own needs. (The Brundtland Commission,1997). As part of the Fine Screen process the assessment criteria were grouped to achieve a more focussed sustainability based analysis. The groups were developed in terms of a **Quadruple Bottom Line** for sustainable development with the following four objectives:

- Governance (of Natural Resources)
- Maintenance of Stable Economic Growth
- Effective Protection of Social Values
- Effective Protection of the Environment

The ten assessment criteria, which were analysed in the Coarse Screen report were reviewed to reflect the additional analyses involved in the Fine Screen process. The descriptions of the Fine Screen assessment criteria are shown in Table 10.

Table 10: Summary of Fine Screen Assessment Criteria

Assessment Criteria	Explanation
Governance (of Natural Resources)	
Secure Yield	Whether the augmentation option has sufficient capacity and certainty of provision to meet the 2036 forecast demand of 16,750 ML/annum for 157,000 population, and to what extent it has excess capacity to meet the uncertainty of the predicted demand and meet future demand beyond that date.
Planning Obligations	The number of stakeholders involved in the regulatory framework to meet the statutory compliance requirements and the associated timeframe and risks for completion by 2023, when augmentation is required.
Legislative Acceptability	The extent to which required legislation is influenced by discretionary powers, which impact upon the augmentation option to increase its uncertainty of delivery.
Maintenance of Stable Economic Growth	
Established Technologies and Feasibility	Whether existing technologies and accepted practice are involved, or whether there are risks associated with water quality, innovation and emerging technologies.
Lead Time for Construction & Potential for Escalation of Costs	Where the uncertainties associated with the preliminary phases of project delivery increase the risks of blow-out of time and of the end costs of the completed project.

Assessment Criteria	Explanation
Net Present Value based on Capital and Operating Costs and Levelised Cost ($ per ML)	Evaluation of estimated Net Present Value, taking account of the capital and operations costs over 80 or 30 years discounted to present day dollars at 7%. This is also expressed as levelised cost per unit of production ($ per ML).
Effective Protection of Social Values	
Social Impacts	Impact on established developed areas (urban, rural, agricultural, commercial, industrial, etc.) and their associated political interactions.
Cultural Heritage Impacts	Impacts upon areas of historical importance and sites of cultural significance.
Effective Protection of the Environment	
Environmental Constraints	Extent and severity of environmental impacts that are likely to be encountered including aquatic, terrestrial and areas of conservation significance.
Greenhouse Gas Emissions and Energy Consumption	An assessment of the greenhouse gas emissions due to embodied energy, construction activities and ongoing operational activities.

The salient changes in the descriptions of the Fine Screen assessment criteria include:

- The secure yield of the Combined Emergency Supply is not the same as that of the other three shortlisted options. The Combined Emergency supply has a shorter time for implementation and was assessed on its capacity to meet the short term forecast demand by 2023, as described in Section 4.4.1.4.
- The economic criterion in the Fine Screen adopted a different formula of the "Levelised Cost per ML," which was used to compare investment projects of unequal life spans on an even basis, as described in Section 4.4.6.2.
- The greenhouse gas and energy consumption criterion focussed specifically on analyses of embodied energy, construction activities and ongoing operational activities, as described in Section 4.4.10.1.

4.4.1 Secure Yield

The secure yield is defined as whether the augmentation option has sufficient capacity and certainty of provision to meet the 2036 forecast demand of 16,750 ML/annum for 157,000 population, and to what extent it has excess capacity to meet the uncertainty of the predicted demand and meet future demand beyond that date.

The preferred option of water resource augmentation will be assessed on its capacity to provide an additional 3,000 ML/annum of secure yield by the planning horizon of 2036 as shown in Figure 2.

This Fine Screen report draws upon additional secure yield information to that which was available for the Coarse Screen report, and includes:

- NSW Department of Commerce, August 2009. "*Byrrill Creek Storage Size and Estimate of Secure Yield*" (Reference No. 30);
- NSW Public Works, February 2010. Memorandum "*Additional Yield Estimates for Byrrill Creek Storage*" (Reference No. 37).

4.4.1.1 Raising Clarrie Hall Dam

Secure yield studies for Clarrie Hall Dam were undertaken by SunWater in 2002 and reviewed in 2006 (Reference No. 13).

The historic no failure yield (HNFY), or secure yield is the annual volume of water (in ML/annum) that can be supplied without failure for every year of the analysis.

The Department of Energy, Utilities and Sustainability (DEUS) criteria ("5/10/20 rule") was applied to this HNFY, which requires that the yield can still be realised during the worst drought in the series. The DEUS criteria states that:

- Restrictions no more than 5% of the time;
- Restrictions to have an average frequency of no more than 1 in 10 years;
- A 20% reduction in consumption is achieved; and
- 80% of full demand must be deliverable even when the dam is at the contingency level when the worst recorded drought in the series commences. The contingency level is taken as 80% of the annual system demand.

The existing secure yield from this scenario was determined to be 13,750 Ml/annum, when the 95% probability of exceedence environmental flows are maintained downstream of the Bray Park Weir. (Reference 13, Page 44.)

SunWater also analysed the secure yield under a number of scenarios involving upgrades of the Clarrie Hall Dam storage capacity. The secure yield at a limiting capacity of 45,000 ML (FSL of 72 meters AHD) was 22,000 ML/annum. The secure yield for the proposed raising to 42,300 ML (FSL of 70 metres AHD) is therefore interpolated to be 20,920 ML/annum.

The raising of Clarrie Hall Dam to FSL 70 meters AHD will provide an additional 7,170 ML/annum of secure yield, which is well in excess of the required 3,000 ML/annum by the year 2036, and allows for possible reductions in secure yield of between 7-15% due to climate change effects (Reference No. 44).

The recommendation to raise Clarrie Hall Dam in a single stage to a capacity of 42,300 ML was based on economies of scale including considerations of engineering, social and environmental factors, as well as efficiency, constructability and economy.

4.4.1.2 Byrrill Creek Dam Construction

Secure yield studies for a future dam on Byrrill Creek were also undertaken by SunWater in 2006 (Reference No. 13) as part of the studies for Clarrie Hall Dam. These studies estimated the FSL of the dam to be 117.5 metres AHD.

However, the more recent analyses were undertaken by NSW Public Works, Water Solutions in 2009 and 2010, which estimated the 16,300 ML dam on Byrrill Creek with a FSL of 115.5 metres AHD would have a secure yield of 8,700 ML/annum. (Reference No. 37).

The above analyses were conducted with Byrrill Creek Dam as a separate system. However, should this project proceed, it would be incorporated into the existing Bray Park Scheme involving the existing Clarrie Hall Dam with an existing secure yield of 13,750 ML/annum. As such, the yield from the combined system of Clarrie Hall Dam with Byrrill Creek Dam can be higher than the sum of the yields of the individual parts.

A future 16,300 ML dam on Byrrill Creek (in combination with Clarrie Hall Dam at its present capacity), will provide at least an additional 8,700 ML/annum of secure yield, which is also well in excess of the required 3,000 ML/annum by the year 2036, and allows for possible reductions in secure yield of between 7-15% due to climate change effects (Reference No. 44).

The size of the Byrrill Creek Dam with a capacity of 16,300 ML was based on similar economies of scale for dam construction (as with Clarrie Hall Dam), and included considerations of engineering as well as efficiency, constructability and economy.

4.4.1.3 Pipeline to SEQ Water Grid

The secure yield of pipelines is expressed in terms of hydraulic capacity and the risks associated with the sustained delivery of supply. These risks are varied and are often associated with resource limitations, likelihood of pump or pipe failure, degree of system redundancy, capacity of regulating storages, Acts of God (flood, fire, drought, etc), acts of man (vandalism, negligence, regulatory controls, etc) and the terms of contract from a supplier.

Some of these risks are considered elsewhere in this study - in particular the assessment criteria, which deal with legislative acceptability.

The capacity of the pipeline to SEQ Water Grid is nominally 20 ML/day (to provide approximately 7,300 ML/annum), and involves approximately 7 kilometres of 500-mm pipeline and a 121 kW pumping station (duty and standby pumps) near the point of supply.

There is greater scope to adjust the design of this option to match the target demands of an additional 3,000 ML/annum by the year 2036.

In September 2010, the SEQ Water Grid Manager confirmed the ability to guarantee water supply to external customers like Tweed Shire Council through a two level tariff system. Notwithstanding this advice, there remains significant political, legislative and contractual risks which may prove insurmountable within the timeframe available for augmentation of the Tweed system.

The alignment and location of the pipeline for this Option are subject to further negotiations with several agencies in Queensland, including:

- Queensland Water Commission
- LinkWater
- WaterSecure
- South East Queensland Water Grid Manager
- Department of Transport and Main Roads (DTMR)

Discussions were held with the Queensland DTMR over five pipeline route alignments for this option, connecting to the existing main in Kennedy Drive:

- Alignments A and B - along the Tugun Bypass Motorway, Parkes Drive and Rose Street;
- Alignment C - via the proposed Cobaki Lakes development and Piggabeen Road;
- Alignments D and E - along Coolangatta Road, the Gold Coast Highway, and via either the Pacific Highway (Alignment D), or via Caloola Drive and Ducat Street (Alignment E).

The Queensland DTMR advised that it would refuse any request for approval involving access along the Tugun Bypass Motorway (Alignments A or B). However, it would not object to either an under-bore of the Motorway (Alignment C), or Alignments D and E.

Alignments A and B are therefore not considered further in this study.

4.4.1.4 Combined Emergency Supply

The requirement for the long-term preferred option is an additional 3,000 ML/annum (8 ML/day) to satisfy the demand forecast of 16,750 ML/annum by the year 2036 under the BASIX/WELS demand forecast. The preferred option needs to be completed before the year 2023, being the year that the existing secure yield is reached under the BASIX/WELS demand forecast.

It should be noted that this forecast for the year 2023 is an approximate estimate, which depends on many variables including actual population growth and the realisation of demand management actions.

The secure yield for the Combined Emergency Supply may be treated differently because it involves works, which would be implemented in the short-term, before the year 2023, and on the basis that the preferred option may take longer than this timeframe to implement.

The Combined Emergency Supply is therefore intended to operate by the year 2023 with a lower requirement, as a safeguard in the event that the BASIX/WELS demand forecast is not met. The short-term requirement of the Combined Emergency Supply is approximately 2,000 ML/annum (5.5 ML/day), being the difference in 2023 between the BASIX/WELS and the Baseline demand forecasts.

Table 11 shows the maximum capacity of the Combined Emergency Supply as 5,400 ML/annum (15.0 ML/day). This is in excess of the short-term requirement, whereas any single component of this option almost satisfies the short-term requirement for 2,000 ML/annum (5.5 ML/day).

Table 11: Capacities of the Combined Emergency Supply

Works	Descriptions	Capacity (ML/annum)	Capacity (ML/day)
Pipeline to Rous Water	18 km of 300-mm pipeline and 100 kW pumping station	1,800	5.0
Pipeline to SEQ Water Grid	7 km of 300-mm pipeline and 30 kW pumping station	1,800	5.0
Plus either			
Groundwater – Tweed River basal alluvium	Borefield and 8 km of 200-mm pipeline to Bray Park WTP	1,500	4.3
Groundwater – coastal aquifer	Borefield to separate WTP and 0.3 km of 200-mm pipeline	1,800	5.0
Maximum Capacity of Combined Emergency Supply		**5,400**	**15.0**

Council may focus on the single component of the Combined Emergency Supply, which has the least potential for delays, should it be necessary to implement this option before the year 2023. This issue is addressed under the Section 4.4.5 - Assessment Criterion for “Lead Time for Construction and Potential for Escalation of Costs.”

As mentioned earlier, the secure yield of pipelines is expressed in terms of hydraulic capacity and the risks associated with the sustained delivery of supply:

- The pipeline to Rous Water has the added risk that Rous Water has not provided any assurances of supplying the requirement, and its location may be subject to coastal erosion from the possibility of future rise in sea level, and from corrosive coastal groundwater areas;
- Similarly, the pipeline to SEQ Water Grid is far from secure in terms of a commitment from the Queensland agencies over their willingness and ability to supply the requirement;
- Groundwater involves the added risks that the coastal groundwater reserves have greater salt water intrusion risks as compared to the groundwater from the Tweed River basal alluvium, and groundwater schemes can involve significant discrepancies between monitoring bore and production bore yields.

4.4.1.5 Summary of Governance Criterion for Secure Yield

Table 12 summarises the foregoing discussion and presents the ratings that were applied in the multi criteria analysis in Section 5 of this report.

Table 12: Summary of Governance Criterion for Secure Yield

Option	Secure Yield (ML/annum)	MCA Rating
Option 1 - Raising Clarrie Hall Dam	7,170	5
Option 2 - Byrrill Creek Dam Construction	8,700	5
Option 5 - Pipeline to the SEQ Water Grid	7,300	3
Combined Emergency Supply		
Pipeline to Rous Water	1,800	2
Pipeline to the SEQ Water Grid	1,800	3
Groundwater (Tweed alluvium)	1,500	2
Groundwater (coastal aquifer)	1,800	4

4.4.2 Planning Obligations

Planning obligations are defined as the number of stakeholders involved in the regulatory framework to meet the statutory compliance requirements and the associated timeframe and risks for completion by 2023, when augmentation is required.

The importance of this governance criterion cannot be overlooked. Council is obliged to meet all statutory requirements of the local, state and federal legislative framework.

This Fine Screen report draws upon the following additional information in relation to the planning obligations, to that which was available for the Coarse Screen report, and includes:

- Discussions with both Rous Water and the Queensland Water Commission regarding the availability of pipeline supplies associated with the shortlisted Combined Emergency Supply from Rous Water and the Option 5 Pipeline to the SEQ Water Grid respectively;
- Tweed Shire Council, January 2010. "*Minutes of Planning Focus Meeting*" at which various State Government and local agencies provided feedback on major risks which may limit the ability of Council to proceed with a particular shortlisted option. (Reference No. 36);
- Discussions with the Queensland Department of Transport and Main Roads in February 2010, regarding possible alignments in proximity to the Tugun Motorway in relation to Option 5 Pipeline to the SEQ Water Grid;
- Tweed Shire Council, March 2010. *"Environmental and Social Impact Quantifiers"* (References 40 and 41)
- NSW Services Technology & Administration, June 2010. "*Preliminary Planning Overview of Tweed Water Supply Augmentation Options*" (Reference No. 42).

4.4.2.1 Raising Clarrie Hall Dam

The planning approvals process for raising Clarrie Hall Dam is expected to follow the provisions of the Environmental Planning and Assessment (EP&A) Act 1979 and the EP&A Regulation 2000. State Environmental Planning Policies (SEPPs) and Local Environment Plans (LEPs) are the key environmental planning instruments (EPIs) under the EP&A Act 1979.

4.4.2.1.1 Environmental Planning and Assessment (EP&A) Act 1979

The relevant sections under this Act are probably Part 5 – "Development without Consent." Where the development is likely to cause a significant environmental impact (including threatened species, ecological communities, or their habitats), then an Environmental Impact Statement (EIS) under Section 112 of the EP&A Act would also be required.

The above process is the indicative pathway for raising Clarrie Hall Dam. However, the requirement for an EIS will be determined upon completion of further ecological (fauna and flora) studies and cultural heritage (including European and Aboriginal) studies.

At this stage, Council may elect to keep open the alternative approvals process under Part 3A "Major Development" of the EP&A Act 1979. In this case the Minister of Planning would decide whether the project meets the requirements of the Part 3A process, based on a submission from Council as to whether the project is of regional or State planning significance and if so, the planning processes would then be controlled by the Department of Planning.

An advantage of proceeding under the Part 3A process is that further approvals under several acts would not be required, including Fisheries permits, National Parks and Wildlife Act, Heritage Act, Native Vegetation Act, Water Management Act. However some approvals would still be required under the Protection of the Environment Operations (POEO) Act 1997 (licences) and Roads Act, (among others).

Although the Raising of Clarrie Hall Dam does not meet the criteria for a Major Development as defined under the State Environmental Planning Policies (SEPP), Council may still prepare a case that this project is of regional or State planning significance. However, there are no existing guidelines for "regional or State planning significance."

Council's case for treatment of this project in terms of regional planning significance under Part 3A may be relevant where the raising of Clarrie Hall Dam is considered in the context of Rous Water's Future Water Strategy and the timing of Dunoon Dam. This would involve the Combined Emergency Supply pipeline between the Tweed system (with the raised Clarrie Hall Dam) and the Rous system.

4.4.2.1.2 State Environmental Planning Policies (SEPP)

The key SEPPs for public infrastructure are:

- SEPP (Infrastructure): There are approximately ten divisions of SEPP (Infrastructure) which may apply, depending on the ancillary works required. The prevailing sections of the SEPP (Infrastructure) that are likely to be relevant to the raising of Clarrie Hall Dam are:
  - Division 24 "Water Supply Systems"
  - Division 17 "Roads and Traffic" and
  - Division 12 "Parks and Public Reserves"
  - Division 8 "Forestry"
- SEPP (Major Development): Relevant to Part 3A process of EP&A Act 1979.
- SEPP No. 14 (Coastal Wetlands): Not relevant to Raising Clarrie Hall Dam
- SEPP No. 26 (Littoral Rainforests): Not relevant to Raising Clarrie Hall Dam

4.4.2.1.3 Local Environment Plans (LEP)

Raising of Clarrie Hall Dam would proceed under the Tweed LEP 2000 as a "Public Utility Undertaking" for the supply of water in respect of lands zoned 1(a) Rural and Existing and Future Dam Areas (Clause 52).

However, a 3.7 hectare portion of the land that may be inundated is a gully zoned 8(a), which is part of the Mount Jerusalem National Park. Council would need to seek approval to acquire this land under the provisions of the National Parks & Wildlife Act 1974 then re-zone this land for compatibility with other affected areas.

In this regard, consultations would need to take place between Council and the National Parks and Wildlife Service (NPWS) for revocation of the land under the Revocation of Lands Policy 2002 and for appropriate offset measures (land purchase to offset habitat loss of threatened species). Although there is no policy for offsets under Part 5 of the EP&A Act 1979, the preparation of either a Species Impact Statement (SIS), or biobanking methodology for biodiversity assessment, as a basis for assessing the offset has been applied previously for other similar situations involving rectification of National Parks.

There appears to be an issue with the Draft Tweed LEP 2010, in that the upper reaches of Doon Doon Creek are zoned W1 "Natural Waterways" under which, water storage development is prohibited. Under the current LEP 2000, development of a water storage as public infrastructure is permitted under Part 5 of the EP&A Act.

It is unclear if the intent of the draft LEP 2010 is to require approvals under Part 4 and/or Part 5 of the EP&A Act 1979, which could increase approvals costs and the risk of delays to the project. Initial indications from the Department of Planning are that the conditions under the existing LEP should prevail. However, Council must continue to liaise with the Department to clarify this issue.

4.4.2.1.4 Other Consultations and Legislative Approvals

The NSW planning processes involve approvals under other Acts and consultative processes with other organisations, and these depend upon which part of the EP&A Act 1979 is being followed – Part 5, or Part 3A and whether there are other triggers, such as threatened species, or whether the Minister for Planning has delegated responsibilities to other agencies:

- The Minister for Planning and the Director General for Planning are required to be consulted in the preparation of an EIS for the Part 5 process.
- The Protection of the Environment Operations (POEO) Act 1997 is administered by the Department of Environment Climate Change and Water (DECCW) and may require an environment protection licence if more than 30,000 m3 of material is excavated, or if there is an on-site concrete batching plant at Clarrie Hall Dam, including procedural controls, and monitoring and reporting requirements.
- The Fisheries Management (FM) Act 1994 protects fish passage in streams and requires permits for in-stream works, which may damage aquatic habitat. It appears unlikely that the Department of Industry & Investment (Fisheries) would require a fish ladder associated with the raising of Clarrie Hall Dam, and would be the case where Council has an in-principle agreement to this effect.
- The Threatened Species Conservation (TSC) Act 1995 provides for the protection of the identified threatened species and endangered ecological communities (EEC) as discussed under Environmental Constraints. It provides guidance for the preparation of an SIS under Part 5 of the EP&A Act 1979 and the voluntary offset, or biobanking schemes for protecting equivalent habitat in other areas as a means of compensation for impacts upon habitat.
- The Local Government Act 1993 provides for Tweed Shire Council to seek the approval of the NSW Office of Water to extend Clarrie Hall Dam "for the impounding of water for public use."
- The National Parks and Wildlife (NPW) Act 1974 provides for several important issues relevant to the raising of Clarrie Hall Dam:
    - Under the SEPP (Infrastructure), work cannot impinge upon Mount Jerusalem National Park without an authorisation under this Act;

- The Act protects the Aboriginal cultural heritage, which has been identified under the Preliminary Archaeological Overview (PAO) for the Proposed Raising of Clarrie Hall Dam report of Southern Cross University, March 2008 (Reference No. 23);
- The Act protects the flora, fauna and EEC, which has been identified under the Identification of Issues and Constraints of Proposed Raising of Clarrie Hall Dam report of Greenloaning Biostudies P/L, April 2008 (Reference No. 24).

- The Water Management (WM) Act 2000 provides for the sustainable use of water. A Water Management Works approval is required under Section 90 of the Act to authorise construction at Clarrie Hall Dam.

  - A Draft Water Sharing Plan has been prepared for the Tweed River, which comes into effect during 2010. Council's existing water access licence will be transferred from the Water Act 1912 to the new Act after the Water Sharing Plan is adopted.
  - The NSW Weirs Policy is to halt and reduce the environmental impact of the State's weirs (dams) and is administered by I&I Fisheries and the DECCW (Office of Water). Tweed Shire Council will have to demonstrate that Raising of Clarrie Hall Dam "is necessary to maintain the essential social and economic needs of the affected community."

- The Native Vegetation Act 2003 provides for the protection of native species and old growth areas. However, clearing under Part 5 and Part 3A of the EP&A Act 1979 is exempt from the provisions of this Act.
- The Environment Protection and Biodiversity Conservation (EPBC) Act 1999 is the Federal Government's key environmental legislation. This Act is relevant where a "*nationally significant impact"* is deemed to occur upon a nationally threatened species, EEC, or wetland of international importance (among others). EPBC listed species have been identified in the preliminary studies at Clarrie Hall Dam. Further flora and fauna studies are required to determine whether the Rai*sing of Clarrie Hall Dam const*itutes a "*significant impact*" on the presence of these species to trigger referral to the Federal Government.

In summary, the planning obligations involve a considerable number of stakeholders in the regulatory framework, which will take a number of years to work through should this Option be pursued. The risks that the *processes associ*ated with the satisfaction of these stakeholders will be completed by 2023, when augmentation is required are identified in Table 13.

Table 13: Raising Clarrie Hall Dam Risks and Timeframes for Stakeholders

Process	Indicative Timeframe
Planning Approvals Process	
EIS, under Part 5 of the EP&A Act 1979, including consultations with Minister for Planning:	30 months
Further investigations to identify EECs and any threatened flora & fauna to determine whether EIS, SIS, or EPBC referral is warranted	9 months
Protection of Aboriginal cultural heritage under the NPW Act 1974, including negotiations with the Traditional Owners	up to 24 months
Protection of threatened flora and fauna and EEC under the NPW Act 1974, including negotiations with environmental stakeholders	up to 24 months
Satisfaction of DECCW (Office of Water) and I&I Fisheries that raising CHD is not at odds with the NSW Weirs Policy.	3 months

Process	Indicative Timeframe
Investigate W1 “Natural Waterways” of Doon Doon Creek with the Draft Tweed LEP 2010.	12 months
Pre-Construction Approvals	
Pre-construction compliance activities – baseline monitoring, adaptive management, CEMP preparation, etc.	24 months
Authorisation under NPW Act 1974 for offset associated with inundation of a gully in the Mount Jerusalem National Park, including SIS and rezoning of the affected land.	12 months + +
Licensing under POEO Act 1997	3 months
Fisheries approvals	3 months
LG Act 1993 approval under Section 60, of the Minister for Land and Water Conservation to extend Clarrie Hall Dam	3 months
WM Act 2000 water supply work approval under Section 90 to authorise construction. (new process)	6 months + +
WM Act 2000 conversion of existing water licence following adoption of Water sharing Plan. (new process)	??

The above timeframes include both the relevant planning process under Part 5 of the EP&A Act 1979, and subsequent pre-construction approvals processes (a total of five and a half years). It should be noted that further delays and uncertainties could occur in the event of an EPBC referral and these impacts are not included in the estimated timeframe.

4.4.2.2 Byrrill Creek Dam Construction

The planning approvals process for constructing a new dam on Byrrill Creek is the same for that of raising Clarrie Hall Dam, and is also expected to follow the provisions of the Environmental Planning and Assessment (EP&A) Act 1979 and the EP&A Regulation 2000, including those of the SEPPs and LEPs.

The following differences are highlighted in relation to the site specific application of these processes for the new Byrrill Creek Dam.

4.4.2.2.1 Environmental Planning and Assessment (EP&A) Act 1979

The development is expected to cause a greater environmental impact (including threatened species, EECs, or their habitats), and an EIS under Section 112 of the EP&A Act 1979 would also be required. The requirement for an EIS will be determined upon completion of further ecological (fauna and flora) studies and cultural heritage (including European and Aboriginal) studies.

The Byrrill Creek Dam does not meet the criteria for a Major Development as defined under the SEPPs. Nevertheless, Council may prepare a case under Part 3A that this project is of regional or State planning significance.

4.4.2.2.2 State Environmental Planning Policies (SEPP)

The key SEPPs relevant to the Byrrill Creek Dam are as for Clarrie Hall Dam.

4.4.2.2.3 Local Environment Plans (LEP)

The Byrrill Creek Dam would proceed under the Tweed LEP 2000 as a “Public Utility Undertaking” for the supply of water in respect of lands zoned 1(a) Rural.

A 3.5 hectare portion of the land that may be inundated is zoned 8(a), which is part of the Mebbin National Park. Part of Mebbin National Park has World Heritage status, which constitutes the Gondwana Rainforest of NSW and it also contains one of the most intact low lying rainforest areas. Council would need to seek approval to acquire land under the provisions of the National Parks & Wildlife Act 1974, then re-zone this land for compatibility with other affected areas.

In this regard, consultations would need to take place between Council and the National Parks and Wildlife Service (NPWS) for revocation of the land under the Revocation of Lands Policy 2002 and for appropriate offset measures as per the process for raising Clarrie Hall Dam.

There is a similar issue with the Draft Tweed LEP 2010, in that Byrrill Creek is zoned W1 "Natural Waterways" under which water storage development is prohibited. Under the current LEP 2000, development of a water storage as public infrastructure is permitted under Part 5 of the EP&A Act.

It is unclear if the intent of the draft LEP 2010 is to require approvals under Part 4 and/or Part 5 of the EP&A Act 1979, which could increase approvals costs and the risk of delays to the project. Initial indications from the Department of Planning are that the conditions under the existing LEP should prevail. However, Council must continue to liaise with the Department to clarify this issue.

4.4.2.2.4 Other Consultations and Legislative Approvals

Other Acts and consultative processes include:

- The Minister for Planning and the Director General for Planning are required to be consulted in the preparation of an EIS for the Part 5 process.
- The Protection of the Environment Operations (POEO) Act 1997 – DECCW may deem that the mass earth construction of Byrrill Creek Dam is a polluting activity for which a licence is required.
- The Fisheries Management (FM) Act 1994 – Industry & Investment Fisheries would most likely require a fish ladder associated with the Byrrill Creek Dam.
- The Threatened Species Conservation (TSC) Act 1995 provides guidance for the preparation of an SIS associated with the offset, or biobanking schemes for protecting equivalent habitat in the Mebbin National Park and other areas as a means of compensation for impacts upon habitat.
- The Local Government Act 1993 provides for Tweed Shire Council to seek the approval of the NSW Office of Water for the Byrrill Creek Dam "*for the impounding of water for public use*."
- The National Parks and Wildlife (NPW) Act 1974 provides for several important issues relevant to the Byrrill Creek Dam:
    - Under the SEPP (Infrastructure), work cannot impinge upon Mebbin National Park without an authorisation under this Act. This includes the relocation of Byrrill Creek Road, which provides access to the National Park;
    - The Act protects the Aboriginal cultural heritage, which has been identified under the Preliminary Archaeological Overview (PAO) of Proposed Byrrill Creek Dam report of Converge, August 2009 (Reference No. 28);
    - The Act protects the flora, fauna and EEC, which have been identified under The Restoration Prioritisation of High Conservation Value Riparian Lands of the Upper and Mid Tweed River report of Eco-Sure Environmental Consultants, 2003 (Reference No. 21).

- The general consensus of the agencies that attended the Planning Focus Meeting in January 2010, is that the issues in relation to Byrrill Creek Dam are of greater extent and complexity, in terms of the environmental (flora and fauna) and Aboriginal cultural heritage, than for the raising of Clarrie Hall Dam.

- The Water Management (WM) Act 2000 provides for the sustainable use of water. A Water Management Works approval is required under Section 90 of the Act to authorise construction of Byrrill Creek Dam.
  - Council's existing water access licence will be transferred to the new WM Act 2000 after the Water Sharing Plan is adopted.
  - Tweed Shire Council will have to demonstrate to DECCW (Office of Water) and I&I Fisheries that a new dam on Byrrill Creek is not at odds with the NSW Weirs Policy and "*is necessary to maintain the essential social and economic needs of the affected community.*" It will be more difficult to justify a new dam than raising an existing dam.
- The Native Vegetation Act 2003 provides for the protection of native species and old growth areas. However, clearing under Part 5 and Part 3A of the EP&A Act 1979 is exempt from the provisions of this Act.
- Listed species under the Environment Protection and Biodiversity Conservation (EPBC) Act 1999 have been identified in the preliminary studies involving Byrrill Creek Dam. Further flora and fauna studies are required to determine whether the Byrrill Creek Dam constitutes a "*significant impact*" on the presence of these species to trigger referral to the Federal Government.
  - If part of Mebbin National Park affected by the Byrrill Creek Dam impinges in any way upon the World Heritage Site of the Gondwana Rainforest of NSW, then referral to the EPBC Act 1999 is likely.

In summary, the planning obligations associated with the Byrrill Creek Dam involve a similar number of regulatory stakeholders, which will also take a number of years to work through should this Option be pursued. The risks that the processes associated with the satisfaction of these stakeholders will be completed by 2023, when augmentation is required are identified in Table 14.

Table 14: Byrrill Creek Dam Risks and Timeframes for Stakeholders

Process	Indicative Timeframe
Planning Approvals Process	
EIS, under Part 5 of the EP&A Act 1979, including consultations with Minister for Planning:	30 – 36 months
Further investigations to identify EECs and any threatened flora & fauna to determine whether EIS, SIS, or EPBC referral is warranted	6 – 12 months
Protection of Aboriginal cultural heritage under the NPW Act 1974, including negotiations with the Traditional Owners	up to 24 months
Protection of threatened flora and fauna and EEC under the NPW Act 1974, including negotiations with environmental stakeholders	up to 24 months
Satisfaction of DECCW (Office of Water) and I&I Fisheries that a new dam on Byrrill Creek is not at odds with the NSW Weirs Policy.	6 months
Investigate W1 "Natural Waterways" of Byrrill Creek with the Draft Tweed LEP 2010.	12 months
Pre-Construction Approvals	
Pre-construction compliance activities – baseline monitoring, adaptive management, CEMP preparation, etc.	24 months
Authorisation under NPW Act 1974 for offset associated with inundation of	18 months + +

Process	Indicative Timeframe
Mebbin National Park, including SIS and rezoning of the affected land.	
Licencing under POEO Act 1997	3 months
Fisheries approvals and negotiations re fish ladders	12 months
LG Act 1993 approval of the Minister for Land and Water Conservation to construct Byrrill Creek Dam	6 months
WM Act 2000 water supply work approval under Section 90 to authorise construction. (new process)	6 months + +
WM Act 2000 conversion of existing water licence following adoption of Water sharing Plan. (new process)	??

Table 14 shows the timeframe for the EIS process and planning approval. It would be reasonable to add at least three years after planning approval for the subsequent pre-construction approvals process before construction.

The above timeframes include both the relevant planning process under Part 5 of the EP&A Act 1979, and subsequent pre-construction approvals processes (a total of seven years). It should be noted that further delays and uncertainties may occur in the event of EPBC referral and the impact on the timeframes above are not included.

4.4.2.3 Pipeline to SEQ Water Grid

The application of established planning processes associated with the pipeline to the SEQ Water Grid is not clear-cut. A section of this pipeline is in Queensland, and as such, Queensland and NSW planning rules and legislation may apply to the respective sections of the pipeline.

However, other notable infrastructure, which lies across the two States, is the Tugun Bypass Motorway. In this case, The Queensland Department of Transport and Main Roads owns and operates the entire Motorway, and the section south of the border will be handed back to NSW after the first ten years of operation.

A similar arrangement could apply to the pipeline to the SEQ Water Grid, whereby either Tweed Shire Council, or LinkWater may own and operate the entire pipeline for an initial period. The ownership arrangements of the pipeline are yet to be discussed with the Queensland Water Commission, as part of negotiations over this option.

On the basis that Queensland and NSW planning rules and legislation will apply to the respective sections of the pipeline, the following shall apply for alignments C, D or E.

4.4.2.3.1 The New South Wales Planning Approvals Process

The NSW planning approvals process for the pipeline to SEQ Water Grid is similar for that of the dams options, and is also expected to follow the provisions of the Environmental Planning and Assessment (EP&A) Act 1979 and the EP&A Regulation 2000, including those of the SEPPs and LEPs.

The following differences are highlighted in relation to the site specific application of these processes for the pipeline to SEQ Water Grid:

4.4.2.3.2 Environmental Planning and Assessment (EP&A) Act 1979

A pipeline is expected to cause a much lesser environmental impact, but an EIS under Section 112 of the EP&A Act 1979 may still be required. The requirement for an EIS will be determined upon completion of further ecological (fauna and flora) studies and cultural (including Aboriginal heritage) studies.

The pipeline to SEQ Water Grid does not meet the criteria for a Major Development as defined under the SEPPs. Nevertheless, Council may prepare a case under Part 3A that this project is of regional or State planning significance.

4.4.2.3.3 State Environmental Planning Policies (SEPP)

The key SEPPs for public infrastructure are:

- SEPP (Infrastructure): The prevailing sections of the SEPP (Infrastructure) that are relevant to the pipeline to SEQ Water Grid are:
  - Division 24 "Water Supply Systems"
  - Division 17 "Roads and Traffic"
- SEPP (Major Development): Relevant to Part 3A process of EP&A Act 1979.
- SEPP No. 14 (Coastal Wetlands): Alignment C passes through an SEPP 14 area. This may automatically trigger the need for an EIS, but depends on how the works are constructed. If the pipeline can be under-bored through the SEPP 14 area, then the need for an EIS may be avoided.
- SEPP No. 26 (Littoral Rainforests) Not relevant to Alignment C, D or E.

4.4.2.3.4 Local Environment Plans (LEP)

The pipeline to SEQ Water Grid would proceed under the Tweed LEP 2000 as a "Public Utility Undertaking" for the supply of water.

It is noted that the Alignment C falls within a future road reserve of the Cobaki Lakes residential development and that the Alignments D and E are within existing road reserves.

4.4.2.3.5 Other Consultations and Legislative Approvals

Other Acts and consultative processes include:

- The Minister for Planning and the Director General for Planning are required to be consulted in the event of an EIS under the Part 5 process.
- The Fisheries Management (FM) Act 1994 – Depending on the final alignment, trenching permits may be required, which would involve a construction environmental management plan (CEMP) for acid sulphate soils (ASS) management and the protection of marine vegetation.
- The Heritage Act 1977 – The Act protects European cultural heritage. Work would not proceed until a permit was issued under this Act and requirements met for the preservation of items. A CEMP would include procedures for the preservation of cultural heritage items.
- The Threatened Species Conservation (TSC) Act 1995 – The shoreline of Cobaki Lakes is also recognised for its visual values and also for high tide roosting sites of shore birds and at least three species of migratory birds.
- The National Parks and Wildlife (NPW) Act 1974 provides for the following issues relevant to the pipeline to SEQ Water Grid:
  - The Act protects Aboriginal cultural heritage. No archaeological investigations have been undertaken over alignments C, D or E. Section 87 of the Act deals with permits for archaeological investigations and with the removal of items along the route of the pipeline. (Section 87 excavation permits will no longer be required after October 2010). Section 90 deals with permits for the destruction of items and may involve delays of up to 12 months. It is noted that there was Aboriginal community dissatisfaction with the processes associated with the Tugun Bypass Motorway, and attention to detail should be exercised over pipeline alignment C;

- The Act protects the flora, fauna and EEC, which were also identified under the EIS for the Tugun Bypass Motorway, which triggered referral to the federal EPBC Act 1999, due to flora and fauna issues.
- The general consensus of the agencies that attended the Planning Focus Meeting in January 2010, is that the issues in relation to the pipeline to SEQ Water Grid are much more manageable, in terms of the environmental (flora and fauna) and Aboriginal cultural heritage, than for the two dams options.

- The Water Management (WM) Act 2000 – A Water Management Works approval is not required under Section 90 of the Act to authorise construction of the pipeline to SEQ Water Grid.
- The Native Vegetation Act 2003 – Clearing under Part 5 and Part 3A of the EP&A Act 1979 is exempt from the provisions of this Act.

- Listed species under the Environment Protection and Biodiversity Conservation (EPBC) Act 1999 were identified in the EIS for the Tugun Bypass Motorway. Further flora and fauna studies are required to determine whether the pipeline to SEQ Water Grid constitutes a "significant impact" on the presence of these species to trigger referral to the Federal Government.

  Referral of this option under the federal EPBC Act 1999 (if warranted) would reduce duplication between the State and Federal levels of government, because there is agreement between the NSW and Queensland State governments to use their environmental assessment processes for Federal EPBC Act 1999 referral. However, duplication would still be required at the State level for environmental assessment documentation under both the NSW EP&A Act 1979 and the Queensland Sustainable Planning Act 2009.

4.4.2.3.6 The Queensland Planning Approvals Process

The Queensland planning approvals process for the pipeline to SEQ Water Grid is expected to follow the provisions of the following:

- The Sustainable Planning Act 2009 – This Act implements the Integrated Development Assessment System (IDAS) for all works involving development approvals in Queensland.
- The Nature Conservation Act 1992 – Species considered as 'endangered,' 'vulnerable' or 'rare' in Queensland are listed in Schedules 2, 3 and 4 respectively in the Nature Conservation (Wildlife) Regulations 1994. Any listed species in Queensland will be addressed under this Act.
- The Environmental Protection Act 1994 – Provides for protection of the environment against pollution (air, water, noise). Due diligence under this Act is enforced through the CEMP, which includes provisions for ASS management.
- The Vegetation Management Act 1999 and Regulations 2000 – A Development Approval is required to clear native vegetation. However, significant clearing is not expected for the options involving pipelines.
- The Cultural Record (Landscapes Queensland and Queensland Estate) Act 1987 – Provides for the protection of sites of Aboriginal cultural heritage. Existing and new sites in the general area were identified as part of the Tugun Bypass Motorway project.
- The Water Act 2000 – This Act is likely to play a part in the delivery of water into NSW in terms of water resource and infrastructure planning for SE Queensland.

In summary, the planning obligations associated with the pipeline to SEQ Water Grid involve the most complex set of requirements of all shortlisted options. The timeframe for resolution of these issues is expected to take a number of years to work through should this Option be pursued. The risks that the processes associated with the satisfaction of these stakeholders will be completed by 2023, when augmentation is required are identified in Table 15.

Table 15: Pipeline to SEQ Water Grid Risks & Timeframes for Stakeholders

Process	Indicative Timeframe
Planning Approvals Process	
EIS, under Part 5 of the NSW EP&A Act 1979, including consultations with Minister for Planning:	30 months
• Further investigations to identify EECs and any threatened flora & fauna to determine whether EIS, or EPBC referral is warranted	6 months
• Protection of threatened flora and fauna and EEC under the NPW Act 1974, including negotiations with environmental stakeholders and preparation of CEMP	up to 24 months
Protection of European cultural heritage under the Heritage Act 1977 and/or Aboriginal cultural heritage under the NPW Act 1974, including negotiations with the Traditional Owners	up to 24 months
IDAS Process under the Qld. Sustainable Planning Act 2009	18 months
• Protection of threatened flora and fauna and EEC under the Nature Conservation Act 1992, including negotiations with environmental stakeholders and preparation of CEMP	12 months
• Protection of Aboriginal cultural heritage under the Cultural Record (Landscapes Queensland and Queensland Estate) Act 1987, including negotiations with the Traditional Owners and preparation of CEMP	18 months
Pre-Construction Approvals	
Pre-construction compliance activities – baseline monitoring, adaptive management, preparation of various management plans as part of CEMP, including ASS, Traffic, Safety, etc	12 months
Qld Water Act 2000 compliance involving implications for the transfer of water across State boundaries, including negotiations with SEQ WGM, QWC, LinkWater, WaterSecure, etc	48 months + +

Table 15 shows the timeframe for the EIS process and planning approval. It would be reasonable to add at least four years after planning approval for the subsequent pre-construction approvals process before construction.

The above timeframes include the relevant planning process under Part 5 of the EP&A Act 1979, under the Queensland IDAS process, and under subsequent pre-construction approvals processes (a total of six and a half years).

4.4.2.4 Combined Emergency Supply

The planning processes associated with the Combined Emergency Supply are discussed separately for the three components:

- Pipeline to Rous Water,
- Pipeline to SEQ Water Grid,
- Groundwater Supply.

4.4.2.4.1 Combined Emergency Supply – Pipeline to Rous Water

The planning approvals process for the pipeline to Rous Water is also expected to follow the provisions of the Environmental Planning and Assessment (EP&A) Act 1979 and the EP&A Regulation 2000, including those of the SEPPs and LEPs. However, as is discussed later, the Part 4 and Part 5 planning approvals will be required.

The following differences are highlighted in relation to the site specific application of these processes for the pipeline to Rous Water:

4.4.2.4.2 Environmental Planning and Assessment (EP&A) Act 1979

The pipeline to Rous Water is expected to cause a much lesser environmental impact than either of the dams options, but a similar environmental impact to Alignment C of the pipeline to SEQ Water Grid. An EIS under Section 112 of the EP&A Act 1979 will be triggered for the Part 4 component as it is Designated Development under SEPP 14 and SEPP 26. The EIS will include further ecological (fauna and flora) studies and cultural heritage (including European and Aboriginal) studies.

The pipeline to Rous Water does not meet the criteria for a Major Development as defined under the SEPPs. Nevertheless, Council may prepare a case under Part 3A that this project is of regional or State planning significance.

Council's case for the Minister for Planning to treat this project in terms of regional planning significance and subsequently Part 3A may be strengthened whereby the Combined Emergency Supply pipeline to Rous Water (with the raised Clarrie Hall Dam) is considered in the context of Rous Water's Future Water Strategy and the timing of Dunoon Dam.

4.4.2.4.3 State Environmental Planning Policies (SEPP)

The key SEPPs for public infrastructure are:

- SEPP (Infrastructure): The prevailing sections of the SEPP (Infrastructure) that are relevant to the pipeline to Rous Water are:
    - Division 24 "Water Supply Systems"
    - Division 17 "Roads and Traffic"
- SEPP (Major Development): Relevant to Part 3A process of EP&A Act 1979.
- SEPP No. 14 (Coastal Wetlands): The alignment along the Tweed Coast Road, south of Pottsville passes through SEPP 14 areas. This may trigger the need for an EIS under Part 4 of the EP&A Act 1979 and be Designated Development, depending on how construction will be undertaken, with Tweed Shire Council as the determining body.
- SEPP No. 26 (Littoral Rainforests): The alignment along the Old Coast Road, north of Ocean Shores passes through SEPP 26 areas. This will also trigger a Designated Development process under Part 4 of the EP&A Act 1979. In this case an EIS is required and the Northern Rivers Joint Regional Planning Panel (JRPP) will be the consenting body, with a separate concurrence required by the Director General for Planning and formal consultation with DECCW.

Under the existing SEPP 14 and SEPP 26 mapping, two planning approvals processes are required. In order to simplify the approvals process, representation may be made to the Department of Planning to amend these maps, because a section of the Old Coast Road is formed and sealed. It is clear that a pipeline in this road reserve will impinge upon neither SEPP 14 wetlands, nor SEPP 26 rainforests.

4.4.2.4.4 Local Environment Plans (LEP)

The pipeline to Rous Water would proceed under both the Tweed LEP 2000 and the Byron LEP 1988 as "utility installations" for the supply of water.

It is noted that the proposed pipeline is in existing road reserves. The above issues in relation to SEPP 14 and SEPP 26 are in relation to the Tweed LEP 2000. There are no SEPP 14, or SEPP 26 areas under the Byron LEP 1988, where the pipeline is proposed.

4.4.2.4.5 Other Consultations and Legislative Approvals

Other Acts and consultative processes include:

- The Minister for Planning and the Director General for Planning are required to be consulted in the event of an EIS under the Part 4 process.
- The Fisheries Management (FM) Act 1994 – Trenching permits may be required for works, which may damage aquatic habitat. This would involve a construction environmental management plan (CEMP) for acid sulphate soils (ASS) management.
- The Heritage Act 1977 – There are other utility services in Tweed Coast Road and Old Coast Road and as such the pipeline to Rous Water follows previously disturbed ground. Nevertheless, this Act would include procedures for the preservation of European cultural heritage items in the unlikely event that they are uncovered.
- The Threatened Species Conservation (TSC) Act 1995 – Although the pipeline is in a road reserve, it passes the environmentally sensitive Billinudgel Nature Reserve. Further flora and fauna studies are required to determine the impacts of the pipeline.
- The National Parks and Wildlife (NPW) Act 1974 provides for the following issues relevant to the pipeline to Rous Water:
    - The Act protects Aboriginal cultural heritage. Further archaeological investigations should be undertaken over the route of the pipeline;
    - The Act protects the flora, fauna and EEC. Further flora and fauna studies are required to determine the impacts of the pipeline.
    - The general consensus of the agencies that attended the Planning Focus Meeting in January 2010, is that the issues in relation to the pipeline to Rous Water are much more manageable, in terms of environmental (flora and fauna) and Aboriginal cultural heritage, than for the two dams options.
- The Water Management (WM) Act 2000 – A Water Management Works approval is not required under Section 90 of the Act to authorise construction of the pipeline to Rous Water.
- The Native Vegetation Act 2003 – Clearing under Part 5 and Part 3A of the EP&A Act 1979 is exempt from the provisions of this Act.
- Listed species under the Environment Protection and Biodiversity Conservation (EPBC) Act 1999 – The further flora and fauna studies are unlikely to determine that the pipeline to Rous Water constitutes a "*significant impact*" to trigger referral to the Federal Government.

The risks that the processes associated with the satisfaction of these stakeholders will be completed by 2023, when augmentation is required are identified in Table 16.

Table 16: Pipeline to Rous Water Risks and Timeframes for Stakeholders

Process	Indicative Timeframe
Planning Approvals Process	
Representation to the Department of Planning to amend SEPP 14 (Coastal Wetlands) and SEPP 26 (Littoral Rainforests) mapping.	6 months
Part 4 approvals process, including formation of JRPP consent body and DG for Planning concurrence body, together with consultation with DECCW (new	6 months

Process	Indicative Timeframe
process)	
EIS, under Part 4 of the EP&A Act 1979, including consultations with Minister for Planning:	24 months
• Further investigations to identify EECs and any threatened flora & fauna to determine whether EIS, or REF is required	6 months
• Protection of threatened flora and fauna and EEC under the NPW Act 1974, including negotiations with environmental stakeholders and preparation of CEMP	up to 18 months
• Protection of European cultural heritage under the Heritage Act 1977 and/or Aboriginal cultural heritage under the NPW Act 1974, including negotiations with the Traditional Owners and preparation of CEMP	up to 18 months
Pre-Construction Approvals	
Pre-construction compliance activities – baseline monitoring, adaptive management, preparation of various management plans as part of CEMP, including ASS, Traffic, Safety, etc	12 months
Negotiations with Rous Water for the supply of water including the contractual arrangements between the parties	9 months

Table 16 shows the timeframe for the EIS or REF process and planning approval. It would be reasonable to add at least twelve months after planning approval for the subsequent pre-construction approvals process before construction.

Thus the above timeframes include both the relevant planning process under Part 4 and Part 5 of the EP&A Act 1979, and subsequent pre-construction approvals processes (a total of four years).

4.4.2.4.6 Combined Emergency Supply – Pipeline to SEQ Water Grid

The planning approvals process for the pipeline to SEQ Water Grid as part of the Combined Emergency Supply are considered to be identical to those, which have already been described under the foregoing Section 4.4.2.3 for Option 5 and need not be repeated here.

Although this option involves a smaller diameter pipeline and smaller pumping station to deliver 5 ML/day, the planning requirements remain just as complex and carry the highest risks of delay.

4.4.2.4.7 Combined Emergency Supply – Groundwater

The groundwater supply may be located either in the coastal aquifers, where a separate water treatment plant would be required to treat the higher total dissolved solids that are expected, or in the Tweed River basal alluvium deposits, where the raw water quality is expected to be higher, but of lower yield and may be piped to the existing Bray Park Water Treatment Plant.

The following component of an emergency supply is considered on the basis that the borefield is in reasonable proximity and upstream of the Bray Park Water Treatment Plant, such that a separate treatment plant for the bore supply is not required. This means a much lower capital expenditure than the coastal borefield (from $39 million to approximately $11 million), whereby the groundwater may be piped to the existing Bray Park Water Treatment Plant.

The planning approvals process for the groundwater supply is also expected to follow the provisions of the Environmental Planning and Assessment (EP&A) Act 1979 and the EP&A Regulation 2000, including those of the SEPPs and LEPs. The coastal groundwater may involve SEPP 14 (Coastal Wetlands) and/or SEPP 26 (Littoral Rainforests), for which the planning process may become complicated.

The following differences are highlighted in relation to the site specific application of these processes for the groundwater supply (such as the Tweed River alluvium):

4.4.2.4.8 Environmental Planning and Assessment (EP&A) Act 1979

The groundwater supply is expected to cause a significantly lesser environmental impact than either of the dams options and a lesser environmental impact than either of the pipeline options. Either an EIS under Section 112 of the EP&A Act 1979 may still be required, or where the activity will not cause significant environmental impact, then a Review of Environmental Factors (REF) under Section 111 of the EP&A Act 1979 would be required. The requirement for an EIS, or a REF will be determined upon completion of further site specific ecological (fauna and flora) studies and cultural (including Aboriginal heritage) studies.

The groundwater supply does not meet the criteria for a Major Development as defined under the SEPPs.

4.4.2.4.9 State Environmental Planning Policies (SEPP)

The key SEPPs for public infrastructure are:

- SEPP (Infrastructure): The prevailing sections of the SEPP (Infrastructure) that are relevant to the groundwater supply for Development without Consent are:
  - Division 24 “Water Supply Systems”
  - Division 17 “Roads and Traffic”
  - Division 5 “Electricity Distribution Networks”
- SEPP (Major Development): Relevant to Part 3A process of EP&A Act 1979.
- SEPP No. 14 (Coastal Wetlands): Not relevant to groundwater supply.
- SEPP No. 26 (Littoral Rainforests): Not relevant to groundwater supply.

Neither SEPP 14 wetlands nor SEPP 26 rainforests mappings are expected to impinge upon the sites of the proposed borefields and the pipeline to Bray Park WTP.

4.4.2.4.10 Local Environment Plans (LEP)

The groundwater supply would proceed under the Tweed LEP 2000 as a “Public Utility Undertaking,” or under the draft Tweed LEP 2010 as a “water reticulation system.”

The pipeline between the bore field and the Bray Park WTP would be located in existing road reserves.

4.4.2.4.11 Other Consultations and Legislative Approvals

Other Acts and consultative processes include:

- The Minister for Planning and the Director General for Planning are required to be consulted in the event of an EIS under the Part 5 process.
- The Heritage Act 1977 – Includes procedures for the preservation of any European cultural heritage items in the unlikely event that they are uncovered.
- The Threatened Species Conservation (TSC) Act 1995 – The pipeline is proposed to be in a road reserve. Flora and fauna considerations would be included in a REF.
- The National Parks and Wildlife (NPW) Act 1974 provides for the following issues relevant to the groundwater supply:
  - The Act protects Aboriginal cultural heritage. Traditional Owners should be consulted over the extraction and use of groundwater reserves;
  - The Act protects the flora, fauna and EEC. These impacts are expected to be minimal and would be addressed in a REF;

- The general consensus of the agencies that attended the Planning Focus Meeting in January 2010, is that the issues in relation to the groundwater supply are much more manageable, in terms of environmental (flora and fauna) and Aboriginal cultural heritage, than for the two dams options and for the two pipelines options.

- The Water Management (WM) Act 2000 – A Water Management Works approval is required under Section 90 of the Act to authorise construction of groundwater supplies within 40 metres of the high bank of a river. A Water Access Licence under Section 61 will also be required and Council needs to clarify as to whether the area is covered by any other existing licence.
- The Water Act 1912 – A Water License would be required under the Act based on a resource assessment by the NSW Office Of Water.
- The Native Vegetation Act 2003 – Clearing under Part 5 and Part 3A of the EP&A Act 1979 is exempt from the provisions of this Act.
- The Environment Protection and Biodiversity Conservation (EPBC) Act 1999 – It is unlikely that the groundwater supply will constitute a "*significant impact*" to trigger referral to the Federal Government.

In summary, the planning obligations associated with a groundwater supply are expected to take three years to work through. The risks that the processes associated with the satisfaction of these stakeholders will be completed by 2023, when augmentation is required are identified in Table 17.

Table 17: Groundwater (Tweed River alluvium) Risks and Timeframes for Stakeholders

Process	Indicative Timeframe
Planning Approvals Process	
EIS, under Part 5 of the EP&A Act 1979, including consultations with Minister for Planning:	24 months
• Further investigations to identify EECs and any threatened flora & fauna to determine whether EIS, or REF is required	6 months
• Protection of threatened flora and fauna and EEC under the NPW Act 1974, including negotiations with environmental stakeholders and preparation of CEMP	up to 12 months (if required)
• Protection of European cultural heritage under the Heritage Act 1977, and/or Aboriginal cultural heritage under the NPW Act 1974, including negotiations with the Traditional Owners and preparation of CEMP	up to 18 months
Pre-Construction Approvals	
Consultation with Traditional Owners regarding the extraction and use of groundwater under the NPW Act 1974	6 – 12 months
Section 61 licence and Section 90 approval under the WM Act 2000	6 months

Table 17 shows the timeframe for the EIS or REF process and planning approval. It would be reasonable to add at least twelve months after planning approval for the subsequent pre-construction approvals process before construction.

The above timeframes include both the relevant planning process under Part 5 of the EP&A Act 1979, and subsequent pre-construction approvals processes (a total of three years).

The above timeframes (of up to three years) are relevant for the planning process under Part 5 of the EP&A Act 1979, including subsequent construction approvals processes.

There will be conditions attached to either the EIS, or REF, which will still need to be satisfied after the planning process is complete. It would be reasonable to add at least twelve months after planning approval for the subsequent construction approvals process before construction.

4.4.2.5 Summary of Governance Criterion for Planning Obligations

Table 18 summarises the foregoing discussion and presents the ratings that were applied in the multi criteria analysis in Section 5 of this report.

Table 18: Summary of Planning Obligations

Option	MCA Rating
Option 1 – Raising Clarrie Hall Dam	3
Option 2 – Byrrill Creek Dam Construction	2
Option 5 – Pipeline to the SEQ Water Grid	2
Combined Emergency Supply	
Pipeline to Rous Water	3
Pipeline to the SEQ Water Grid	2
Groundwater (Tweed River alluvium)	4
Groundwater (coastal aquifer)	3

4.4.3 Legislative Acceptability

Legislative acceptability is defined as the extent to which required legislation is influenced by discretionary powers, which impact upon the augmentation option to increase its uncertainty of delivery.

This Fine Screen report draws upon the following additional information in relation to the legislative framework, to that which was available for the Coarse Screen report, and includes:

- Discussions with both Rous Water and the Queensland Water Commission regarding the issues associated with the shortlisted Combined Emergency Supply from Rous Water and the Option 5 Pipeline to the SEQ Water Grid respectively;
- Tweed Shire Council, January 2010. "*Minutes of Planning Focus Meeting*" at which various State Government and local agencies provided feedback on major risks which may limit the ability of Council to proceed with a particular shortlisted option. (Reference No. 36);
- Discussions with the Queensland Department of Transport and Main Roads in February 2010, regarding possible alignments in proximity to the Tugun Motorway in relation to Option 5 Pipeline to the SEQ Water Grid;
- NSW Services Technology & Administration, June 2010. "*Preliminary Planning Overview of Tweed Water Supply Augmentation Options*" (Reference No. 42).

4.4.3.1 Raising Clarrie Hall Dam

The NSW legislative framework is explained in the previous section of this report, whereby this Option would most likely proceed under either Part 5 or Part 3A of the EP&A Act 1979, and referral to the Federal EPBC Act 1999 may be triggered on the grounds that the project will have a "significant impact" on environmental and/or cultural issues of national significance.

Although some elements of the above process lack definition (such as "significant impact," which is not defined under the Act), all of the above planning processes have been exercised previously on similar sized projects in NSW with favourable outcomes.

There are some elements of the pre-construction approvals, which present uncertain timelines, and these include:

- The Section 60 approval under the Local Government Act 1993 of the NSW Office of Water to extend Clarrie Hall Dam for public use;
- The Section 90 permit under the National Parks and Wildlife Act 1974, dealing with the destruction of an aboriginal object, or site. Delays in this regard can take over 12 months to resolve;
- The Section 91B approval to construct a water supply works under the Water Management Act 2000. This is a relatively new process and the risks of delay are not well tested.
- The authorisation procedures under the National Parks & Wildlife Act 1974 for offset or bio-banking arrangements over inundation of a gully in Mount Jerusalem National Park. Land substitution arrangements to satisfy NPWS concerns may become protracted.
- The Draft Tweed LEP 2010 zoning of W1 "Natural Waterways" of the upper reaches of Doon Doon Creek is a significant risk, whereby the development of water storage would be prohibited. A rezoning application would be required to allow the dam raising to be undertaken as Development without Consent under Part 5 of the EP&A Act 1979.
- Adaptive management associated with baseline monitoring for ecological (terrestrial and aquatic), archaeological and cultural transition, as quantified in Table 21, involves risks of uncertainty and can incur considerable time and costs during the approvals phase.

In summary, the legislative framework for raising Clarrie Hall Dam involves a tried and proven process with some uncertainties (such as adaptive management), which may delay aspects of the pre-construction approvals process.

4.4.3.2 Byrrill Creek Dam Construction

This Option would also proceed under either Part 5 or Part 3A of the EP&A Act 1979, and referral to the Federal EPBC Act 1999 may be triggered on the grounds that the project will have a "significant impact" on environmental and/or cultural issues of national significance.

It is anticipated that there is greater chance that this Option would trigger federal EPBC referral than the option of raising Clarrie Hall Dam, even though a comparative study has not been undertaken on the incidence of threatened flora and fauna species records at Byrrill Creek. The delays associated with this referral would be significant with an uncertain outcome. Nevertheless, all of the above planning processes have been exercised previously on similar sized projects in NSW with favourable outcomes.

There are some elements of the pre-construction approvals, which present uncertain timelines, and these include:

- The Section 60 approval under the Local Government Act 1993 of the NSW Office of Water to construct Byrrill Creek Dam for public use;

- The Section 90 permit under the National Parks and Wildlife Act 1974, dealing with the destruction of an Aboriginal object, or site. Delays in this regard can take over 12 months to resolve;
- The Section 91B approval to construct a water supply works under the Water Management Act 2000. This is a relatively new process and the risks of delay are not well tested.
- The authorisation procedures under the National Parks & Wildlife Act 1974 for offset or bio-banking arrangements over inundation of part of Mebbin National Park. Land substitution arrangements to satisfy NPWS concerns may become protracted, especially if the areas in question impinge upon the World Heritage Site of the Gondwana Rainforest of NSW. In this event, referral to the federal EPBC Act 1999 is likely.
- The Draft Tweed LEP 2010 zoning of W1 "Natural Waterways" of Byrrill Creek is a significant risk, whereby the development of water storage would be prohibited. A rezoning application would be required to allow the dam to be undertaken as Development without Consent under Part 5 of the EP&A Act 1979.
- Adaptive management associated with baseline monitoring for ecological (terrestrial and aquatic), archaeological and cultural transition, as quantified in Table 21 (Byrrill Creek Dam and Clarrie Hall Dam being similar), involves risks of uncertainty and can incur considerable time and costs during the approvals phase.

In summary, the legislative framework for Byrrill Creek Dam involves a tried and proven process with some uncertainties, such as adaptive management. The environmental aspects of the planning processes may take longer to resolve than for raising Clarrie Hall Dam because the Byrrill Creek Dam is a new on-stream storage.

There are aspects of the pre-construction approvals process which may cause delays.

4.4.3.3 Pipeline to SEQ Water Grid

It is expected that the established planning requirements under the NSW EP&A Act 1979 and the Queensland Sustainable Planning Act 2009 would be applied in each State for the respective sections of the pipeline in this Option.

Whilst the planning requirements are not insignificant compared to the dams options, they do not pose as many environmental concerns, because the works will be confined to a pipeline corridor in a future, or existing road reserve (Alignments C, D and E respectively).

Simpler pre-construction approvals processes apply to pipelines.

However, there may be significant duplication of processes, which deal with similar issues each side of the border. The issue of potential duplication of process depends on the precedent on how planning processes between the two states was simplified under the Tugun By-pass Motorway and its relevance to this project.

The main issue regarding legislative acceptability is that this Option is dealing with a number of political and procedural issues between the States, which have not previously been confronted. The timeframe associated with the resolution of these issues is expected to be very significant to the extent that the relevance of this Option as part of the Combined Emergency Supply is in doubt.

The political and procedural issues were raised by the Queensland Water Commission (QWC) in June 2010 and deal with (at least) the following seven matters, which are unlikely to be resolved in the short term:

1. Whether Council would be prepared to accept water quality, which meets Queensland's legislative requirements;
2. What reliability of supply does Council expect in terms of maximum period of interruption of supply;

3. Whether Council would be prepared to accept supply from Wivenhoe Dam if it is supplemented with purified recycled water;
4. Whether Council would accept the same restricted supply regime as that imposed upon customers in Queensland;
5. Who would own that part of the pipeline in Queensland;
6. What is Council's position on reciprocal arrangements – supply from Tweed to SEQ Water Grid;
7. Whether the NSW Government will support Tweed's future water resources options involving Queensland.

In September 2010, the SEQ Water Grid Manager confirmed water supply could be guaranteed to external customers like Tweed Shire Council through a two level tariff system. Notwithstanding this advice, there remains significant political, legislative and contractual risks which may prove insurmountable within the timeframe available for augmentation of the Tweed system.

In summary, the legislative complexities associated with the pipeline to SEQ Water Grid would involve the most protracted negotiations and highest risks of delay of all shortlisted options. The timeframe for resolution of these issues is expected to take a number of years to work through should this Option be pursued.

4.4.3.4 Combined Emergency Supply

The legislative acceptability associated with the Combined Emergency Supply is discussed separately for the three components:

- Pipeline to Rous Water
- Pipeline to SEQ Water Grid
- Groundwater Supply.

4.4.3.4.1 Combined Emergency Supply – Pipeline to Rous Water

This Option would proceed under the provisions of Part 4 and Part 5, or Part 3A of the EP&A Act 1979. If the SEPP 14 and SEPP 26 areas can be changed prior to an EIS, then it could proceed under Part 5 as Development without Consent.

Council may choose to treat this Option in terms of its "regional planning significance" under Part 3A. The pipeline to Rous Water may be considered in the context of Rous Water's Future Water Strategy and the timing of Dunoon Dam. This would involve the raised Clarrie Hall Dam with the pipeline to Rous Water. The Part 3A process would be expected to take longer than the Part 4 and Part 5 process.

In summary, the legislative framework for the pipeline to Rous Water involves a tried and proven process with fewer issues, which are much more manageable, in terms of environmental (flora and fauna) and Aboriginal cultural heritage, than for the two dams options.

4.4.3.4.2 Combined Emergency Supply – Pipeline to SEQ Water Grid

The legislative acceptability of the pipeline to SEQ Water Grid as part of the Combined Emergency Supply is deemed to be identical to that, which has been described under the foregoing Section 4.4.3.3 for Option 5 and need not be repeated here.

The legislative complexities carry the highest risks of delay. The timeframe associated with the resolution of these issues is expected to be very significant to the extent that the relevance of this Option as part of the Combined Emergency Supply is in doubt.

4.4.3.4.3 Combined Emergency Supply – Groundwater

This Option would most likely proceed under the provisions of Part 4 of the EP&A Act 1979 for the coastal groundwater (due to the likely presence of SEPP 14 and SEPP 26 areas), or under the provisions of Part 5 for the Tweed River alluvium.

The general consensus of the agencies that attended the Planning Focus Meeting in January 2010, is that the issues in relation to the groundwater supply are much more manageable, in terms of environmental (flora and fauna) and Aboriginal cultural heritage, than for the two dams options and for the two pipelines options.

4.4.3.5 Summary of Governance Criterion for Legislative Acceptability

Table 19 summarises the foregoing discussion and presents the ratings that were applied in the multi criteria analysis in Section 5 of this report.

Table 19: Summary of Governance Criterion for Legislative Acceptability

Options	MCA Ratings
Option 1- Raising Clarrie Hall Dam	4
Option 2 - Byrrill Creek Dam Construction	2
Option 5 – Pipeline to the SEQ Water Grid	1
Combined Emergency Supply	
Pipeline to Rous Water	4
Pipeline to SEQ Water Grid	1
Groundwater (Tweed River alluvium)	3
Groundwater (coastal aquifer)	3

4.4.4 Established Technologies and Feasibility

Established technologies and feasibility are defined as whether existing technologies and accepted practice are involved, or whether there are risks associated with water quality, innovation and emerging technologies.

This Fine Screen report draws upon the following additional information in relation to established technologies and feasibility, to that which was available for the Coarse Screen report, and includes:

- Discussions with the Queensland Department of Transport and Main Roads in February 2010, regarding possible alignments in proximity to the Tugun Motorway in relation to Option 5 Pipeline to the SEQ Water Grid;
- Discussions with Queensland Water Commission in February 2010, regarding the availability of supply associated with the Option 5 Pipeline to the SEQ Water Grid;
- NSW Public Works, December 2009 "*Construction of Dam on Byrrill Creek – Update of Cost Estimates*." (Reference No. 35).

4.4.4.1 Raising Clarrie Hall Dam

The existing dam is founded on fresh, massive rhyolite and consists of a concrete faced rockfill embankment, a concrete lined spillway, outlet tower and valve house.

The geology of the site is well understood and consists of volcanic rhyolite lavas, which are classified as strong to very strong.

The proposed raising to FSL 70 metres AHD involves covering the existing spillway with the raised embankment and constructing a new 40 metre wide concrete lined spillway channel, higher in the left abutment. From the new spillway channel excavation, sufficient rock would be available to balance the volume of rockfill required for the raised embankment. The existing outlet tower would be raised and strengthened with six post tensioned anchors and the access bridge will be reconstructed on higher piers.

Cost estimates indicate that raising the dam to its optimum level of FSL 70 metres AHD in a single construction is more economical than a staged approach.

The NSW Department of Commerce concept design associated with the raising of Clarrie Hall Dam has not changed since the completion of the earlier Coarse Screen report, and construction methodologies are based on established technologies. There are no known issues, which are beyond current technical capabilities.

4.4.4.2 Byrrill Creek Dam Construction

The proposed 16,300 ML Byrrill Creek Dam to FSL 115.5 metres AHD would comprise an earthfill and rockfill type embankment with a concrete lined spillway on the right abutment. An outlet tower is proposed with a conventional draw-off facility. An access bridge is required between the embankment crest to the tower.

Geotechnical investigations and drilling were conducted over the site by the Geological Survey of NSW in 1978. The foundations consist of sedimentary rocks of the Tabulum Group. Additional borelogs would be required to confirm the presence of the embankment earthfill materials. Although the potential for unforeseen ground conditions is higher at the Byrrill Creek Dam site than for a raising of Clarrie Hall Dam, no major problems are foreseen in regard to reservoir stability.

The NSW Department of Commerce preliminary layout of the Byrrill Creek Dam has not changed since the completion of the earlier Coarse Screen report, and construction methodologies are based on established technologies. There are no known issues, which are beyond current technical capabilities.

4.4.4.3 Pipeline to SEQ Water Grid

This option involves a 500 mm diameter pipeline and pumping station with a capacity of 20 ML/day between Tugun (as part of the SEQ Water Grid) and Kennedy Drive, Tweed Heads.

Five pipeline route alignments were examined for this option, connecting to the existing main in Kennedy Drive:

- Alignments A and B – along the Tugun Bypass Motorway, Parkes Drive and Rose Street;
- Alignment C – via the proposed Cobaki Lakes development and Piggabeen Road;
- Alignment D – along Coolangatta Road, the Gold Coast Highway, and the Pacific Highway.
- Alignment E - along Coolangatta Road, the Gold Coast Highway, Caloola drive and Ducat Street.

The Queensland Department of Transport and Main Roads (DTMR) advised that it would refuse any request for approval involving access along the Tugun Bypass Motorway (Alignments A or B). However, it would not object to either an under-bore of the Motorway (Alignment C), or Alignments D and E.

Alignments C, D or E involve conventional pipe open trenching or boring technologies, and pumping stations (mechanical, electrical and civil works), which are well within local contractor capabilities.

4.4.4.4 Combined Emergency Supply

The established technologies and feasibility associated with the Combined Emergency Supply is discussed separately for the three components:

- Pipeline to Rous Water,
- Pipeline to SEQ Water Grid,
- Groundwater Supply.

4.4.4.4.1 Combined Emergency Supply – Pipelines to Rous Water and to SEQ Water Grid

Both of these Options share similar technologies involving conventional pipe open trenching or boring technologies, and pumping stations (mechanical, electrical and civil works), which are well within local contractor capabilities, as discussed under Section 4.4.4.3 for Option 5.

However, there is an added degree of uncertainty with the Pipeline to Rous Water associated with the NSW draft Sea Level Rise Policy. This pipeline follows a coastal route, which may be susceptible to future coastal erosion risk.

4.4.4.4.2 Combined Emergency Supply – Groundwater

This Option (in the Tweed River basal alluvuim) is essentially another option involving pumps and pipes. The technologies are therefore similar to the other options involving pumped pipelines. However, the certainties regarding yield are not as predictable.

There is an added degree of uncertainty with the coastal aquifers associated with the NSW draft Sea Level Rise Policy. This supply may be susceptible to future saline intrusion risk.

In summary, all of the shortlisted options, whether they involve dams, or pumped pipelines are not expected to present any undue complexities in relation to the application of established technologies.

4.4.4.5 Summary of Economic Criterion for Established Technologies and Feasibility

Table 20 summarises the foregoing discussion and presents the ratings that were applied in the multi criteria analysis in Section 5 of this report.

Table 20: Summary of Economic Criterion for Established Technologies and Feasibility

Options	MCA Ratings
Option 1- Raising Clarrie Hall Dam	5
Option 2 - Byrrill Creek Dam Construction	5
Option 5 – Pipeline to the SEQ Water Grid	5
Combined Emergency Supply	
Pipeline to Rous Water	5
Pipeline to SEQ Water Grid	5
Groundwater (Tweed River alluvium)	4
Groundwater (coastal aquifer)	4

4.4.5 Lead Time for Construction and Escalation of Cost

Lead time for construction and potential for escalation of costs are defined as the uncertainties associated with the preliminary phases of project delivery increase the risks of blow-out of time and of end costs of the completed project.

This Fine Screen report draws upon the following additional information in relation to the lead time for construction and potential for the escalation of costs, to that which was available for the Coarse Screen report, and includes:

- Discussions with the Queensland Department of Transport and Main Roads in February 2010, regarding possible alignments in proximity to the Tugun Motorway in relation to Option 5 Pipeline to the SEQ Water Grid;
- Discussions with Queensland Water Commission in February 2010, regarding the availability of supply associated with the Option 5 Pipeline to the SEQ Water Grid;
- MWH, December 2009 "*Demand Management Strategy, Stage 2*." (Reference No. 34);
- NSW Public Works, December 2009 "*Construction of Dam on Byrrill Creek – Update of Cost Estimates*." (Reference No. 35);
- Tweed Shire Council, January 2010. "*Minutes of Planning Focus Meeting*" at which various State Government and local agencies provided feedback on major risks which may limit the ability of Council to proceed with a particular shortlisted option. (Reference No. 36);
- NSW Services Technology & Administration, June 2010 "*Preliminary Planning Overview of Tweed Water Supply Augmentation.*" (Reference No. 42).

4.4.5.1 Raising Clarrie Hall Dam

The revised BASIX/WELS demand curve projection of Figure 2 shows that the existing Bray Park scheme with its 16,000 ML Clarrie Hall Dam, will reach the secure yield by the year 2023, or earlier if demands follow the Baseline demand projection.

It is estimated that the planning and pre-construction approvals processes associated with the raising of Clarrie Hall Dam will take approximately five and a half years to complete (refer Table 11) and this assumes that the project will not be referred under the EPBC Act 1999.

There are several uncertainties associated with the pre-construction approvals processes, which are discussed under Section 4.4.3.1, but it anticipated that these uncertainties can be resolved within the above timeframe.

Assuming that the construction period for raising Clarrie Hall Dam will be approximately eighteen months; this means that the earliest time that a raised Clarrie Hall Dam is completed is seven years from mid 2010 - mid 2017.

This option leaves five and a half years lee-way, based on the revised BASIX/WELS demand projection, or six months lee-way if future demands follow the Baseline projection.

4.4.5.2 Byrrill Creek Dam Construction

It is estimated that the EP&A Act 1979 planning and pre-construction approvals processes associated with the 16,300 ML Byrrill Creek Dam will take approximately seven years to complete (refer Table 12) and this assumes that the project will not be referred under the federal EPBC Act 1999.

However, it should be noted that the possibilities of referral under the EPBC Act 1999 are higher for this option on the following grounds:

- The affected site is expected to involve a greater environmental impact in terms of the number of threatened species, EECs, or their habitats (even though a comparative study has not been undertaken) as compared to the raising of Clarrie Hall Dam, and this may trigger referral under EPBC.
- If part of Mebbin National Park affected by the Byrrill Creek Dam impinges in any way upon the World Heritage Site of the Gondwana Rainforest of NSW, then referral to the EPBC Act 1999 is likely.

There are several uncertainties associated with the pre-construction approvals processes, which are discussed under Section 4.4.3.2, but it anticipated that these uncertainties can be resolved within the above seven year timeframe.

Assuming that the construction period for the Byrrill Creek Dam will be approximately two years; this means that the earliest time that Byrrill Creek Dam is completed is nine years from mid 2010 - mid 2019.

This option leaves three and a half years lee-way, based on the revised BASIX/WELS demand projection, or completion eighteen months after it is required, if future demands follow the Baseline projection.

4.4.5.3 Pipeline to SEQ Water Grid

It is estimated that the NSW EP&A Act 1979 and Queensland Sustainable Planning Act 2009 planning and pre-construction approvals processes associated with the pipeline to SEQ Water Grid will take approximately six and a half years to complete (refer Table 13) and this assumes that the project will not be referred under the federal EPBC Act 1999.

It is noted that the State environmental assessment processes can be used for Federal EPBC Act 1999 purposes in the event EPBC referral is triggered.

The pre-construction approvals processes associated with the pipelines options are expected to be simpler than for the dams options.

The main issue is that this Option is dealing with a number of political and procedural issues between the States, which have not previously been confronted. The timeframe associated with the resolution of these issues is expected to be very significant (say four years) and has been included in the above assessment of six and a half years. To date, no commitment has been given by the Queensland agencies to provide water to Tweed in terms of their willingness and ability to supply the requirement.

Assuming that the construction period for the pipeline to SEQ Water Grid will be approximately one year; this means that the earliest time that the pipeline to SEQ Water Grid is completed is seven and a half years from mid 2010 - the beginning of 2018.

This option leaves 5 years lee-way, based on the revised BASIX/WELS demand projection, or no lee-way at all if future demands follow the Baseline projection.

4.4.5.4 Combined Emergency Supply

The lead time for construction and potential for escalation of costs associated with the Combined Emergency Supply is discussed separately for the three components:

- Pipeline to Rous Water
- Pipeline to SEQ Water Grid
- Groundwater Supply.

4.4.5.4.1 Combined Emergency Supply – Pipeline to Rous Water

It is estimated that the EP&A Act 1979 planning and pre-construction approvals processes associated with the pipeline to Rous Water will take approximately four years to complete (refer Table 14) and this assumes that the project will not be referred under the federal EPBC Act 1999.

It is noted that an EIS will be required under Part 4 of the EP&A act 1979.

The pre-construction approvals processes associated with the pipeline is expected to be simpler than for the dams options.

Assuming that the construction period for the pipeline to Rous Water will be approximately 18 months; this means that the earliest time that the pipeline to Rous Water is completed is five and a half years from mid 2010 – beginning of 2016.

This option leaves seven and a half years lee-way, based on the revised BASIX/WELS demand projection, or three and a half years if future demands follow the Baseline projection.

4.4.5.4.2 Combined Emergency Supply – Pipeline to SEQ Water Grid

The lead time for construction and potential for escalation of costs associated with the pipeline to SEQ Water Grid as part of the Combined Emergency Supply is deemed to be identical to that, which has been described under the foregoing Section 4.4.5.3 for Option 5 and need not be repeated here.

The political and procedural issues between the States carry the highest risks of delay. The timeframe associated with the resolution of these issues is expected to be very significant to the extent that the relevance of this Option as part of the Combined Emergency Supply is in doubt.

4.4.5.4.3 Combined Emergency Supply – Groundwater

It is estimated that the EP&A Act 1979 planning and pre-construction approvals processes associated with groundwater will take approximately three years to complete (refer Table 14) and this assumes that the project will not be referred under the federal EPBC Act 1999.

It is noted that an EIS may not be required, but that a REF may be appropriate for the groundwater from the Tweed River alluvium. However, the coastal groundwater would involve an EIS, where SEPP 14 and/or SEPP 26 areas are encountered.

The pre-construction approvals processes associated with groundwater is also expected to be simpler than for the dams options where the jurisdiction for groundwater falls under the Water Management Act 2000. However, where the area involves the Water Act 1912, then the approval of a groundwater licence would take longer.

Assuming that the construction period for the groundwater supply will be approximately 12 months; this means that the earliest time that groundwater is completed is four years from mid 2010 – mid 2014.

This option leaves nine years lee-way, based on the revised BASIX/WELS demand projection, or four years if future demands follow the Baseline projection.

4.4.5.5 Summary of Economic Criterion for Lead time for Construction and Potential for Escalation of Costs

Table 21 summarises the foregoing discussion and presents the ratings that were applied in the multi criteria analysis in Section 5 of this report.

Table 21: Summary of Economic Criterion for Lead Times for Completion

Option	Planning Process (Years)	Pre-construction Approvals (Years)	Construction Period (Years)	Total (Years)	MCA Rating
Raising Clarrie Hall Dam	3.5	2	1.5	**7**	3
New Byrrill Creek Dam	4	3	2	**9**	1
Pipeline to SEQ Water Grid	2.5	4	1	**7.5**	2
Combined Emergency Supply					
Pipeline & PS to Rous Water	3	1	1.5	**5.5**	4
Pipeline & PS to SEQ Water Grid	2.5	4	1	**7.5**	2
Groundwater (Tweed alluvium)	2	1	1	**4**	4
Groundwater (coastal aquifer)	2	1	2	**5**	3

4.4.6 Net Present Value & Levelised Cost per Megalitre

Two financial evaluations are used to assess the merits of the shortlisted options, which have different capital costs, operation costs and serviceable lives. These are the net present value (NPV) analysis and the levelised cost per megalitre method.

These are summarised in Appendix C for all of the shortlisted options.

This Fine Screen report draws upon the following additional information in relation to the net present value and levelised cost per unit of production, to that which was available for the Coarse Screen report, and includes:

- NSW Department of Commerce, August 2009. "*Byrrill Creek Storage Size and Estimate of Secure Yield*" (Reference No. 30);
- NSW Public Works, December 2009. "*Construction of Dam on Byrrill Creek – Update of Cost Estimates*" (Reference No. 35);
- NSW Public Works, February 2010. Memorandum "*Additional Yield Estimates for Byrrill Creek Storage*" (Reference No. 37);
- Tweed Shire Council land valuation information and Fact Sheets;

- SEQ Water Grid bulk water market prices 2008/09 to 2017/18, as published on the QWC website: www.qwc.qld.gov.au.
- Tweed Shire Council, March 2010. *"Environmental and Social Impact Quantifiers"* (References 40 and 41)
- Institute for Sustainable Futures, University of Technology Sydney. "*The Use of Levelised Cost in Comparing Supply and Demand Side Options*." Water Supply Vol. 13 No. 3, IWA Publishing. (Reference No.44)

4.4.6.1 Net Present Value Analysis

The net present value (NPV) is a financial indicator, which is used to compare the investment decisions between alternatives. Cash flows are measured over time and discounted at 5%, 7% and 9% back towards present day dollars, taking into account the capital and operating costs over a reasonable estimate of the serviceable life of the project. The NPVs quoted in this report are based on the discount rate of 7%.

The following assumptions are made concerning capital and operating costs as inputs to the NPV analyses:

4.4.6.1.1 Capital Costs of the Options

The preliminary estimated capital costs are expressed in 2010 dollars and comprise:

- The direct costs of construction including materials, labour and civil, electrical, mechanical works (as relevant) and the associated costs of site establishment and restoration;
- On-costs, which are expressed as percentages of the direct costs for surveys, designs, construction supervision and contract administration and contingencies;
- Consequential capital costs of road relocations, land acquisitions and a provision for utility services (communications, power, etc).

The allowance for contingencies is higher for the dams than for the pipelines options. This is because there is greater reliance and uncertainty on the geotechnical / geological aspects of dams construction than for the pipelines, and that the concept designs for the dams are still at a preliminary phase.

The NPV provides for the capital expenditure to take place in the years 2019 – 2020, which is based on the need for increased resources by the year 2023 according to the BASIX/WELS demand projection. The NPV results for this Fine Screen are consequently lower than those of the earlier Coarse Screen in which the capital expenditure occurred in the years 2014 – 2015. However, the parity between the options remains unchanged.

4.4.6.1.2 Operational Costs for the Options

The operating, or annual costs are broken down as follows:

- Power costs of pumping for the pipelines options (including groundwater) at $0.12 per kWH;
- Operator costs for attendance, based on:
  - 5% of operator time for the dams options
  - 15% of operator time for the pumped pipelines;
- Maintenance costs as 10% of a maintenance team's time;
- Mechanical and electrical equipment costs, based on:
  - Pump refurbishing every seven years as 33% of replacement cost;
  - Mechanical and electrical replacement every 21 years;
- Purchase costs of bulk water from Rous, or SEQ Water Grid Manager;
- Adaptive management costs associated with the monitoring of ecological, archaeological and cultural values, which will undergo significant change.

4.4.6.2 Levelised Cost per Megalitre

Another commonly used economic comparison tool is expressed as a cost per unit of production ($ per ML) of an asset over its entire lifespan. The serviceable life is assumed to be:

- For dams - 80 years.
- For pipelines (including groundwater) - 30 years.

The Levelised cost per Megalitre (differs from the annualised cost per Megalitre of the Coarse Screen study) and is used here as a decision making tool in capital budgeting when comparing investment projects of unequal life spans. For example, if asset A is serviceable for 20 years, and asset B is serviceable for 30 years, it would be improper to simply compare the net present values (NPVs) of the two assets, unless they were compared over the lowest common denominator of 60 years.

Levelised cost per Megalitre is calculated by dividing the NPV of a project by the present value of an annuity factor, such as a unit of production.

4.4.6.3 Raising Clarrie Hall Dam

Clarrie Hall Dam was commissioned in 1983. The existing full supply level (FSL) is 61.5 m AHD with a storage capacity of 16,000 ML. In May 2008, NSW Department of Commerce concluded that raising Clarrie Hall Dam to its optimum level of RL 70.0m AHD to increase the storage capacity to 42,300 ML in single stage construction would be more economical than raising in stages (Reference No. 17). This conclusion was based on considerations of engineering, social and environmental factors, as well as efficiency, constructability and economy.

The Clarrie Hall Dam site is shown in Fact Sheet No. 7, on the Tweed Shire Council website link to “Tweed District Water Supply Augmentation.”

It is proposed to cover the existing spillway by a raised embankment. A new 40 metre wide spillway is to be constructed higher in the left abutment. The new spillway excavation would provide a balanced volume of rock fill for the raised embankment. The existing outlet tower would be raised and strengthened.

The May 2008 preliminary estimated capital costs associated with these works was $30,000,000 and allowed for further investigations and design studies, environmental and contract management and contingencies of 40%. However, this estimate did not provide for the social impacts of property acquisitions and road re-alignments, as described in Section 4.4.7.1.

The preliminary estimated capital cost for raising Clarrie Hall Dam is shown in Table 22.

Table 22: Preliminary Estimated Capital Costs for Raising Clarrie Hall Dam

Description	Cost
Establishment	$1,000,000
Clearing, Diversion & Foundations	$500,000
Embankment	$4,800,000
Spillway and Outlet Works	$14,400,000
Fishway	assume not required
Permanent Services	$400,000
Total Direct Cost	**$12,100,000**
Survey, Investigation & Design (10 % of Direct Cost)	$2,110,000
Contract Administration (10 % of Direct Cost)	$2,110,000

Description	Cost
Contingencies (30 % of Direct Cost)	$6,330,000
Revocation of National Park and Purchase of Land Offset	$750,000
Land Acquisitions, Road & Service Relocations	$2,050,000
Total Estimated Capital Cost	**$34,450,000**

The operating costs associated with Clarrie Hall Dam are included in Table 23 and are based on similar dams in the region, such as the Shannon Creek Dam (Clarence Valley Council).

Table 23: Estimated Operating Costs for Clarrie Hall Dam

Description	Annual Cost
Catchment Area Maintenance (erosion controls, etc)	$50,000/annum
Land Management (weed & pest control, fencing, etc)	$200,000/annum
Adaptive Management Costs:	
Ecological Monitoring (first 5 years)	$250,000/annum
Archaeological Monitoring (first 2 years)	$200,000/annum
Cultural Heritage (signage, regeneration, etc)	$50,000/annum
River Monitoring	$250,000/annum
Maximum Operating Cost	**$1,000,000 /annum**

The NPV over 80 years, assuming that the dam raising works are constructed over the years 2019-20 is $36.1 million. The levelised cost per ML over 80 years is $1,516 per ML.

4.4.6.4 Byrrill Creek Dam Construction

A new earth and rock fill dam may be constructed on Byrrill Creek, which is a tributary of the Tweed River west of Uki. The dam analysed by NSW Department of Commerce in July 2004 (Reference No. 9), has a storage capacity of 16,300 ML with full supply level (FSL) of 115.5 m AHD and a secure yield of 9,000 ML/annum.

The Byrrill Creek Dam site is shown in Fact Sheet No. 7, on the Tweed Shire Council website link to “Tweed District Water Supply Augmentation.”

During consultation with the Community Working Group (CWG), the question was raised as to whether the 16,300 ML capacity of the Byrrill Creek Dam was ‘once and for all,’ or whether it too could be increased by raising it in stages over time, in similar fashion to the possible raising of Clarrie Hall Dam.

The NSW Department of Commerce provided further advice on this matter and confirmed that:

- The 16,300 ML dam on Byrrill Creek with a FSL of 115.5 metres AHD would have a secure yield of 8,700 ML/annum, and could be raised in stages. (Reference No. 37)
- The ultimate size dam on Byrrill Creek would be 36,000 ML with a FSL of 125.0 metres AHD, and that this size storage would have a secure yield of 15,400 ML/annum. (Reference Nos. 35 and 37)

The preliminary estimated capital costs of the Byrrill Creek Dam construction are shown in Table 24.

Table 24: Preliminary Estimated Capital Costs for Byrrill Creek Dam

Description	16,300 ML Dam	36,000 ML Dam
Establishment	$1,000,000	$1,000,000
Clearing, Diversion & Foundations	$3,500,000	$8,000,000
Embankment	$8,000,000	$13,600,000
Spillway and Outlet Works	$9,625,000	$10,420,000
Fish Elevator (based on NSW Tallowa Dam)	$5,000,000	$7,000,000
Permanent Services	$700,000	$750,000
Total Direct Cost	**$27,825,000**	**$40,770,000**
Survey, Investigation & Design (10 % of Direct Cost)	$2,782,500	$4,077,000
Contract Administration (10 % of Direct Cost)	$2,782,500	$4,077,000
Contingencies (30 % of Direct Cost)	$8,347,500	$12,231,000
Revocation of National Park and Purchase of Offset	$750,000	$1,500,000
Land Acquisitions, Road & Service Relocations	$2,950,000	$4,700,000
Total Estimated Capital Cost	**$45,437,500**	**$67,355,000**

The original 16,300 ML sized dam on Byrrill Creek is more than sufficient to provide the additional secure yield over the planning horizon to the year 2036 (and beyond). Therefore, the scope of the remainder of this study deals with the 16,300 ML capacity storage only.

The details of the ultimate larger Byrrill Creek Dam were investigated and provided to the CWG in the context of the ultimate social and environmental impacts of this option if it was to proceed. Should Council decide to augment its water resources with a scheme other than that which involves a dam on Byrrill Creek, then further discussions may be held with the Byrrill Creek community over any remaining social uncertainties associated with the long term planning for water resources beyond 2036.

The operating and adaptive management costs associated with a 16,300 ML dam on Byrrill Creek would be similar to those for Clarrie Hall Dam – maximum of $1,000,000/annum, diminishing after the first two years.

The NPV over 80 years, where the works are constructed over the years 2019-20 is $45.8 million. The levelised cost per ML over 80 years is $1,871 per ML.

4.4.6.5 Pipeline to SEQ Water Grid

This option involves a 500 mm diameter pipeline and pumping station with a capacity of 20 ML/day between Tugun (as part of the SEQ Water Grid) and Kennedy Drive, Tweed Heads.

The current preliminary estimated capital cost for a pipeline to the SEQ Water Grid at Tugun via the future Cobaki Lakes development (Alignment C) is shown in Table 25, (where this cost would be comparable to the alternative Alignments D or E).

Table 25: Preliminary Estimated Capital Costs for Pipeline to SEQ Water Grid

Description	Cost
6,850 metres of 500-mm pipeline	$6,400,000
121 kW pumping station	$650,000
Total Direct Cost	**$7,050,000**
Survey, Investigation & Design (12 % of Direct Cost)	$845,000
Contract Administration (8 % of Direct Cost)	$565,000
Contingencies (10 % of Direct Cost)	$705,000
Land Acquisitions & Service Relocations	N/A
Total Estimated Capital Cost	**$9,165,000**

The operating costs are discussed in Section 4.4.6.1.2, where costs associated with the Queensland Water Commission bulk water market price ($2,755 per ML in 2017-18) from the SEQ Water Grid are a significant part. The average annual operating costs are $280,000 per annum.

The adaptive management costs associated with the pipeline to SEQ Water Grid are included in Table 26.

Table 26: Estimated Adaptive Management Costs for Pipeline to SEQ Water Grid

Description	Annual Cost
Adaptive Management Costs:	
Ecological Monitoring (first 2 years)	$200,000/annum
Archaeological Monitoring (first 2 years)	$150,000/annum
Cultural Heritage (signage, regeneration, etc)	$50,000/annum
Maximum Operating Cost	**$400,000/annum**

The NPV over 30 years, where the works are constructed over the years 2019 - 20 is $55.1 million. The levelised cost per ML over 30 years is $3,408 per ML.

4.4.6.6 Combined Emergency Supply

The capital cost components of the Combined Emergency Supply are shown in Table 27.

Table 27: Preliminary Estimated Capital Costs of the Combined Emergency Supply

Supply	Description	Cost
Pipeline to Rous Water	18 km of 300-mm pipeline	$8,700,000
	100 kW pumping station	$425,000
	Total Direct Cost	**$9,125,000**
	Survey, Investigation & Design (12 % of Direct Cost)	$1,100,000
	Contract Administration (8 % of Direct Cost)	$730,000
	Contingencies (10 % of Direct Cost)	$910,000
	Land Acquisitions & Service Relocations	N/A
	Sub-total	**$11,865,000**
Pipeline to SEQ Water Grid	7 km of 300-mm pipeline	$3,170,000
	30 kW pumping station	$280,000
	Total Direct Cost	**$3,450,000**
	Survey, Investigation & Design (12 % of Direct Cost)	$415,000
	Contract Administration (8 % of Direct Cost)	$265,000
	Contingencies (10 % of Direct Cost)	$345,000
	Land Acquisitions & Service Relocations	N/A
	Sub-total	**$4,475,000**
Groundwater (coastal borefield with WTP)	Bore field and bore pumps	$4,250,000
	Water treatment plant	$21,750,000
	0.3 km of 200-mm pipeline	$250,000
	Total Direct Cost	**$26,250,000**
	Survey, Investigation & Design (15 % of Direct Cost)	$4,000,000
	Contract Administration (12 % of Direct Cost)	$3,000,000
	Contingencies (20 % of Direct Cost)	$5,250,000
	Land Acquisitions & Service Relocations	$500,000
	Sub-total	**$39,000,000**
All Three	**Total Cost**	**$55,340,000**

It may be possible to implement the Groundwater supply without an additional water treatment plant on the basis that the borefield is in the Quaternary age alluvium of the Tweed River upstream of Bray Park. (Reference No. 18, Section 2.4.5). The groundwater supply may then be diverted through the existing Bray Park Water Treatment Plant.

Table 28: Preliminary Estimated Capital Costs for Groundwater Supply in the Tweed River alluvium

Supply	Description	Cost
Groundwater (Tweed River basal alluvium)	Borefield and bore pumps	$4,250,000
	Water treatment plant	N/A
	8 km of 200-mm pipeline	$3,000,000
	Total Direct Cost	**$7,250,000**
	Survey, Investigation & Design (15 % of Direct Cost)	$1,100,000
	Contract Administration (12 % of Direct Cost)	$850,000
	Contingencies (20 % of Direct Cost)	$1,450,000
	Land Acquisitions & Service Relocations	$350,000
	Sub-total	**$11,000,000**
All three	**Total**	**$27,340,000**

The adaptive management costs associated with the pipelines for the Combined Emergency Supply would be similar to those for the pipeline to SEQ Water Grid – maximum of $400,000/annum for the first 2 years. The costs associated with Groundwater would be less – in the order of $200,000/annum for the first 2 years.

Council may focus on the single component of the Combined Emergency Supply, which has the least potential for delays, should it be necessary to implement this option before the year 2023. This issue is addressed under the Section 4.4.5.4.2 - Assessment Criterion for "Lead Time for Construction and Potential for Escalation of Costs."

4.4.6.7 Summary of Economic Criterion for NPV and Levelised Cost per Megalitre

Table 29 below summarises the foregoing discussion and presents the ratings that were applied in the multi criteria analysis in Section 5 of this report.

Table 29: Summary of Economic Criterion for NPV and Levelised Cost per Megalitre

Option	NPV @ 7% ($ million)	Levelised Cost ($ per ML)	MCA Rating
Option 1 - Raising Clarrie Hall Dam	$36.1	$1,516	4
Option 2 - Byrrill Creek Dam Construction	$45.8	$1,871	4
Option 5 - Pipeline to the SEQ Water Grid	$55.1	$3,408	2
Combined Emergency Supply			
Pipeline to Rous Water	$39.1	$3,935	1
Pipeline to the SEQ Water Grid	$32.6	$3,283	2
Groundwater (Tweed alluvium)	$10.8	$1,255	4
Groundwater (coastal aquifer)	$37.2	$4,318	1

4.4.7 Social Impacts

Social acceptability is defined as the impact on established developed areas (urban, rural, agricultural, commercial, industrial, etc.) and their associated political interactions.

This Fine Screen report draws upon the following additional information in relation to the social impacts, to that which was available for the Coarse Screen report, and includes:

- Peter Parker Environmental Consultants Pty Ltd, August 2000. "*Byrrill Creek Forestry Venture – An Environmental Assessment of Selected Harvesting*" (Reference No. 20);
- Tweed Shire Council, January 2010. "*Minutes of Planning Focus Meeting*" at which various State Government and local agencies provided feedback on major risks which may limit the ability of Council to proceed with a particular shortlisted option. (Reference No. 36);
- Meetings 1 to 5 of the Community Working Group (CWG), between December 2009 and March 2010, to assist Council select a preferred option from the key environmental, and social issues associated with the shortlisted options;
- Tweed Shire Council, March 2010. "*Tweed District Water Supply Augmentation Project – A Report by the Community Working Group*" (Reference No. 38).
- Tweed Shire Council, March 2010. *"Environmental and Social Impact Quantifiers"* (References 40 and 41)
- Tweed Shire Council, July 2010. "*Responses to Community Submissions on Demand Management Strategy and Water Supply Augmentation*." (Reference No. 43).

4.4.7.1 Raising Clarrie Hall Dam

The raising of Clarrie Hall Dam would inundate an additional 210 hectares of land, which would have social impacts upon a rural farming community and a relatively small section of approximately 7 hectares of commercial forest.

The social impacts may be quantified in terms of approximately:

- 24 farming properties entitled to compensation for loss. It should be noted that some landholders were affected during the original construction of Clarrie Hall Dam in 1983, and may be affected a second time;
- Up to three houses inundated;
- Eight properties severed in two and up to three properties adversely impacted by road re-alignments.

In addition to the above, the popular Cram's Farm recreation and picnic reserve would be partially inundated.

There will be short-term inconvenience to local residents and traffic in Clarrie Hall Dam Rd, Kyogle Road and Doon Doon Rd during the construction phase of this option. There are several residences within one kilometre of the dam wall construction area. These works would be conducted under the supervision of Council staff, where various management plans would cover all construction activities including such aspects as a Traffic Management Plan, OHS&R Management Plan and CEMP (including noise, dust, pollution spills, ASS and treatment of cultural heritage items), which would be provided by the contractor and compliance would be enforced.

4.4.7.2 Byrrill Creek Dam Construction

The proposed Byrrill Creek Dam would inundate an additional 235 hectares of land, which would have social impacts upon a rural community and a significant plantation of commercial hardwood forest. These impacts may be quantified in terms of approximately:

- 9 properties entitled to compensation for loss;

- Four houses inundated, two of which are owned by Council; and
- Two properties severed in two and four properties adversely impacted by road re-alignments. It is noted that a significant portion of the Byrrill Creek Road will be cut and any attempt of relocation to higher ground on the northern side of the proposed dam would incur significant costs and result in further environmental impacts. This road is an important route for access between Uki and Tyalgum, and also connects the Mebbin National Park back to the Kyogle Road.

Tweed Shire Council purchased 1,130 hectares of land in the early 1990s in the Byrrill Creek catchment for the purpose of securing the land for the future dam. Since then, Council has made portions available for grazing and has established hardwood plantations over 230 hectares, which would be harvested prior to proceeding with this Option. These plantations are operated as a joint venture with NSW State Forests on a 25 – 30 year cycle for harvesting; the plantations are presently about 66% through the initial cycle, which would reach maturity by about 2020.

In 1998, Council developed a further 157 hectares of cleared land for hardwood plantation with a shorter return period of harvesting every 10 and 20 years for woodchip production.

The Byrrill Creek Dam would inundate approximately 64 hectares of the existing hardwood plantations, which would be near maturity by the time that the land would be cleared for a dam. In this case the economic loss to Council would be minimal.

Both of the communities in the vicinities of a raised Clarrie Hall Dam, or a new Byrrill Creek Dam have been aware for many years, concerning Council's interests over their lands in respect of future water resources planning, and the potential that their properties will be affected in the event that one of the dams options will proceed.

There will be short-term inconvenience to local residents and traffic in Byrrill Creek Rd and Kyogle Rd during the construction phase of this option. There are several residences within 500 metres of the dam wall construction area. These works would be conducted under the supervision of Council staff, where various management plans would cover all construction activities including such aspects as a Traffic Management Plan, OHS&R Management Plan and CEMP (including noise, dust, pollution spills, ASS and treatment of cultural heritage items), which would be provided by the contractor and compliance would be enforced.

4.4.7.3 Pipeline to SEQ Water Grid

This option involves a buried pipeline in a future road reserve through the Cobaki Lakes development (Alignment C), or in established road reserves through the built-up areas of Coolangatta to Tweed Heads (Alignments D and E).

As such, there are not expected to be any acquisition issues, other than the possibility of minor land purchase for the pumping station site.

However, there will be short-term inconvenience to local residents and traffic in Piggabeen Road to Kennedy Drive (Alignment C), or the Gold Coast Highway, Ducat Street to Kennedy Drive (Alignments D or E) during the construction phase of this Option.

These works would be conducted under the supervision of Council staff, where various management plans would cover all construction activities including such aspects as a Traffic Management Plan, OHS&R Management Plan and CEMP (including noise, dust, pollution spills, ASS and treatment of cultural heritage items), which would be provided by the contractor and compliance would be enforced.

During the operations phase the social issues include those, which were raised by the QWC in June 2010 and discussed under Section 4.4.3.3 to include:

- Whether Tweed consumers would accept the same restricted supply regime as that imposed upon Queensland customers, even when Tweed Shire Council is paying the same price for water as it pays during times when restrictions are not applied;
- Tweed Shire Council's position on reciprocal arrangements – supply from Tweed to the SEQ Water Grid, in the event that Tweed has surplus water resources for its present requirement and Queensland's resources are depleted;
- Whether an 'out' clause would be included in the supply contract for periods when the combined water resources of the SEQ Water Grid fall below 40% and the SEQ Water Grid Manager determines that there is sufficient supply for Queensland only during severe times of shortage.

The above social issues involving autonomy and security do not apply for either of the dams options, because Tweed Shire Council would own and manage the dam(s).

4.4.7.4 Combined Emergency Supply

The social impacts associated with the Combined Emergency Supply are discussed separately for the three components:

- Pipeline to Rous Water,
- Pipeline to SEQ Water Grid,
- GroundwaterSupply.

4.4.7.4.1 Combined Emergency Supply – Pipelines to Rous Water and SEQ Water Grid

Both of these Options share similar issues of the social impacts and involve conventional open trenching or boring technologies, and pumping stations (mechanical, electrical and civil works). The pipeline to Rous Water is in a road reserve, which is predominantly remote from residential areas, but some of the pipeline may be through a nature reserve.

The issues in relation to social impacts involving autonomy and security during the operations phase are similar as those discussed under Section 4.4.7.3 for Option 5.

4.4.7.4.2 Combined Emergency Supply – Groundwater

There may be conflicts associated with farmers and other stock and domestic bore users, where there is a perception they are affected due to drawdown affects of aquifers, where the recharge of the borefield is not sustained. Given the significant approvals process to restrict groundwater extraction, the potential for and impacts from over-extraction are likely to be low.

The social impacts associated with installation of groundwater are likely to be less intrusive than the options involving the pipelines.

4.4.7.5 Summary of Social Criterion for Social Impacts

Table 30 summarises the foregoing discussion and presents the ratings that were applied in the multi criteria analysis in Section 5 of this report.

Table 30: Summary of Social Criterion for Social Impacts

Option	MCA Rating
Option 1 - Raising Clarrie Hall Dam	2
Option 2 - Byrrill Creek Dam Construction	2
Option 5 - Pipeline to the SEQ Water Grid	4
Combined Emergency Supply	
Pipeline to Rous Water	4
Pipeline to the SEQ Water Grid	4
Groundwater (Tweed alluvium)	3
Groundwater (coastal aquifer)	3

4.4.8 Cultural Heritage Impacts

Cultural Heritage Impacts are defined as the impacts upon areas of historical importance and sites of cultural significance. The focus of this section deals with the Aboriginal cultural heritage, which is managed under the National Parks and Wildlife Act 1974, whereas European cultural heritage is managed under the Heritage Act 1977. Aboriginal cultural heritage has the potential for greater impacts upon the timelines of approvals processes, than issues in relation to European cultural heritage.

This Fine Screen report draws upon the following additional information in relation to the cultural heritage impacts, to that which was available for the Coarse Screen report, and includes:

- Southern Cross University, March 2008. "*Preliminary Archaeological Overview for Proposed Raiding of Clarrie Hall Dam*" (Reference No. 23);
- Converge Heritage + Community Pty Ltd, August 2009. "*Preliminary Archaeological Overview of Proposed Byrrill Creek Dam*" (Reference No. 28);
- Tweed Shire Council, 2009 and 2010. Discussions with the Aboriginal Advisory Committee and community members;
- Tweed Shire Council, January 2010. "*Minutes of Planning Focus Meeting*" at which various State Government and local agencies provided feedback on major risks which may limit the ability of Council to proceed with a particular shortlisted option. (Reference No. 36);
- Tweed Shire Council, March 2010. "*Minutes of the Aboriginal Community Meeting."* (Reference No. 39);
- NSW Services Technology & Administration, June 2010. "*Preliminary Planning Overview of Tweed Water Supply Augmentation Options."* (Reference No. 42).

4.4.8.1 Raising Clarrie Hall Dam

Southern Cross University was engaged by the NSW Department of Commerce in 2008 to conduct a preliminary archaeological overview (PAO), including a 3-day field survey with four Aboriginal participants (Des Williams, Cyril Scott, Jason McDonald and Deidrie Currie), of the areas to be affected in the event of the raising of Clarrie Hall Dam to a FSL of 70.00 metres AHD.

A total of 21 registered sites have been identified, which confirm traditional Aboriginal occupation of the Doon Doon Creek area over the past 10,000 years.

- Five of these sites were inundated in 1983 as part of the original dam construction;
- The remaining 16 sites are within 2 kilometres of the current shoreline, and five of these will be inundated with the proposed raising of the dam.

A further eight sites were identified during the 2008 PAO; four of which will be inundated with the proposed raising of the dam.

The Aboriginal participants of the survey have stressed the importance of connectivity between the known sites of significance.

In the event that this option proceeds, the eight recommendations of the 2008 PAO should be observed, and these provide for the conservation and observance of protocols for the acknowledgement of sites of Aboriginal heritage, to include:

- A Memorandum of Understanding (MOU) be negotiated along the lines of the DECCW Interim Aboriginal Community Participation Guidelines and the National Parks and Wildlife Act 1974 provisions under Section 87 consents and Section 90 approvals for investigation, recovery and destruction of artefacts, be applied to all sites impacted by the raising of the dam;
- A comprehensive assessment be carried out of all sites that will be inundated, some of which are rock shelters and campfires;
- The presence of qualified Aboriginal monitors during activities involving ground clearing and construction activities.

4.4.8.2 Byrrill Creek Dam Construction

The Byrrill Creek area was populated by people of the Ngdonowal dialect of the Bundjalung and Yugambeh language chains.

Converge Pty Ltd was engaged by NSW Department of Commerce in 2009 to conduct a PAO of the area associated with the Byrrill Creek Dam, including a 3-day field survey with Aboriginal participants (George Scott, Garth Lena, Jackie McDonald and Harry Boyd).

A total of 26 registered sites are on the Bundjalung Mapping Project (BMP), which confirm traditional Aboriginal occupation in proximity to the project area. These sites include open camp fires, artefact scatters, scarred trees and grinding hollows. Grinding hollows are highly significant, as they confirm cultural practices such as food and pigment processing. These sites would be inundated by the Byrrill Creek Dam.

A further four new sites were identified during the 2009 PAO; all of which will also be inundated with the proposed dam.

The Aboriginal participants of the survey confirmed that pathways, which follow the ridgelines would be cut by the dam. The connectivity of ancient pathways "*provides a deeper cultural meaning*" and interruption of these was unacceptable to the Aboriginal participants.

All Aboriginal participants regarded the area as highly significant, and that:

"…..the situation which resulted in a loss of sites during construction of the Clarrie Hall Dam should be avoided at all costs."

and;

"It would be important that the water resource remain in the Tweed and not be supplied to other areas."

In the event that this option proceeds, then similar provisions would apply, which were made in relation to the 2008 PAO for the proposed raising of Clarrie Hall Dams, and would include:

- On-going consultation;
- Site avoidance of identified areas of cultural significance;
- The presence of qualified Aboriginal monitors;
- Observance of the legislative procedures under the National Parks and Wildlife Act 1974, and in particular, Section 90.

In summary, it is considered that the issues associated with Aboriginal cultural heritage are significant for both of the dams proposals. The members of the Aboriginal community that attended a meeting in March 2010, convened by Council to discuss the water supply augmentation options, were hesitant to support any proposal that would be interpreted as an approval to destroy Aboriginal cultural heritage sites and places. However, the members of the Aboriginal community were prepared to work with Council to determine a preferred option.

4.4.8.3 Pipeline to SEQ Water Grid

A cultural heritage assessment was carried out as part of the Tugun By-pass Motorway EIS in 2004. However, the 2004 assessment is relevant to the pipeline alignments A or B, which would be refused by the Queensland Department of Transport and Main Roads (DTMR), and are therefore ruled-out of further consideration in this study.

Pipeline alignment C is located in a future road reserve through the Cobaki Lakes development. The members of the Aboriginal community that attended the meeting in March 2010 confirmed that alignment C crosses an area that the community is studying, where at least 3000 artefacts have been found to date and that burial sites are likely to be uncovered. It is a significant area.

The issues from a cultural heritage perspective may be similar to those encountered in the Tugun By-pass EIS, in terms of newly located artefact scatters and shell middens, which may be encountered along the linear corridor of the pipeline.

The Planning Focus Meeting in January 2010 disclosed that the Aboriginal community was dissatisfied with the outcomes of the Tugun By-pass Motorway EIS in 2004.

As no archaeological investigations have been undertaken for pipeline alignment C, further cultural heritage assessments would be required after the final alignment of the pipeline has been established, and any artefacts and middens, which may be found can be managed through consultation and mitigation. The regulatory processes are split between two States, so duplication of process may be required.

Pipeline alignments D and E are located in existing road reserves through disturbed ground. Disturbance of items of cultural heritage significance are not expected.

In summary, the issues associated with Aboriginal cultural heritage are as significant for the pipelines options, as for the options involving the dams. Nevertheless, there remains greater scope with pipelines (and groundwater) designs than with the dams designs to avoid conflict with known sites of cultural interest.

4.4.8.4 Combined Emergency Supply

The cultural heritage impacts associated with the Combined Emergency Supply is discussed separately for the three components:

- Pipeline to Rous Water,
- Pipeline to SEQ Water Grid,
- Groundwater Supply.

4.4.8.4.1 Combined Emergency Supply – Pipelines to Rous Water and SEQ Water Grid

Both of these Options share similar issues of cultural heritage and involve conventional open trenching or boring technologies, and pumping stations (mechanical, electrical and civil works). The pipeline to Rous Water is also in a road reserve in proximity to other utility services, so is in or near disturbed ground. However, it is in a coastal area, so the unearthing of artefacts or middens is still a possibility.

As no archaeological investigations have been undertaken along the routes of the pipelines, further cultural heritage assessments would be required after the final alignment of the pipelines have been established.

The issues in relation to cultural heritage impacts would be of similar type and magnitude as those discussed under Section 4.4.8.3 for Option 5.

4.4.8.4.2 Combined Emergency Supply – Groundwater

The Traditional Owners should be consulted over the extraction and use of groundwater reserves, because groundwater will be culturally important if it is in any way connected to a groundwater dependent waterhole, or wetland in the vicinity.

The general consensus of the agencies that attended the Planning Focus Meeting in January 2010 is that the issues in relation to the groundwater supply are much more manageable, in terms of Aboriginal cultural heritage, than for the two dams options and for the two pipelines options.

4.4.8.5 Summary of Social Criterion for Cultural Heritage Impacts

Table 31 summarises the foregoing discussion and presents the ratings that were applied in the multi criteria analysis in Section 5 of this report.

Table 31: Summary of Social Criterion for Cultural Heritage Impacts

Option	MCA Rating
Option 1 - Raising Clarrie Hall Dam	3
Option 2 - Byrrill Creek Dam Construction	2
Option 5 - Pipeline to the SEQ Water Grid	3
Combined Emergency Supply	
Pipeline to Rous Water	4
Pipeline to the SEQ Water Grid	3
Groundwater (Tweed alluvium)	4
Groundwater (coastal aquifer)	4

4.4.9 Environmental Constraints

Environmental Constraints are defined as the extent and severity of environmental impacts that are likely to be encountered including aquatic, terrestrial and areas of conservation significance.

This Fine Screen report draws upon the following additional information in relation to the environmental constraints, to that which was available for the Coarse Screen report, and includes:

- Peter Parker Environmental Consultants Pty Ltd, December 1998. "*Byrrill Creek Reafforestation programme – A Flora and Fauna Assessment.*" (Reference No. 19);
- ECO-SURE Environmental Consultants, 2003. "*The Restoration Prioritisation of High Conservation Value Riparian Lands of the Upper and Mid Tweed River." (Reference No. 21);*
- EnviTE NSW and BRS Pty Ltd, March 2006. "*Byrrill Creek Riparian Rehabiliation Plan*" (Reference No. 22);
- Greenloaning Biostudies Pty Ltd, April 2008. "*Identification of Issues and Constraints of Proposed Raising of Clarrie Hall Dam." (Reference No. 24);*
- Tweed Shire Council, January 2010. "*Minutes of Planning Focus Meeting*" at which various State Government and local agencies provided feedback on major risks which may limit the ability of Council to proceed with a particular shortlisted option. (Reference No. 36);
- Meetings 1 to 5 of the Community Working Group (CWG), between December 2009 and March 2010, to assist Council select a preferred option from the key environmental, social and cultural issues associated with the shortlisted options;
- Tweed Shire Council, March 2010. "*Tweed District Water Supply Augmentation Project – A Report by the Community Working Group*." (Reference No. 38);
- Tweed Shire Council, March 2010. *"Environmental Impact Quantifier"* (Reference 40)
- Tweed Shire Council, July 2010. "*Responses to Community Submissions on Demand Management Strategy and Water Supply Augmentation*." (Reference No. 43).

4.4.9.1 Raising Clarrie Hall Dam

Greenloaning Biostudies Pty Ltd was engaged by the NSW Department of Commerce in 2008 to conduct preliminary investigations into the potential ecological impacts, including a 2-day field survey of the areas to be affected in the event of the raising of Clarrie Hall Dam.

The study area is part of the North Coast bioregion, of very high biodiversity at both a national and international level, which supports important remnant vegetation and regional wildlife corridors. Aquatic systems within the region are also high in biodiversity.

The current area of inundation is approximately 220 hectares. The area of inundation under the proposed FSL of 70.00 metres AHD is an additional 230 hectares, which extends to 320 hectares under the flood inundation scenario.

4.4.9.1.1 Terrestrial Flora

Data records indicate that a total of 34 threatened flora species occur within a 20 kilometre radius of the dam. Of these, 26 species have been recorded within 5 – 10 kilometres of the dam wall and 6 species are within 5 kilometres of the dam wall.

All threatened flora species are from rainforests, and include two tree species, which are listed under the Threatened Species Conservation Act 1995, as Durobby (*Syzygium moorei*) and Sweet Myrtle (*Gossia fragrantissima*). These trees most likely occur in the areas to be inundated by the raised dam.

4.4.9.1.2 Terrestrial Fauna

Data records indicate that a total of 36 threatened fauna species occur within 10 kilometres of the dam. Of these, 16 species have been recorded within 5 kilometres of the dam wall and include the Koala (*Phascolarctus cinereus*) and Red-legged Pademelon (*Thylogale stigmatica*), which are listed under the Threatened Species Conservation Act 1995.

It is expected that the long term inundation of habitat will adversely impact some of the threatened species on record.

4.4.9.1.3 Aquatic Ecosystems

The advent of the existing dam has brought the development of substantial littoral wetlands and the fresh water impoundment, both of which are unique to this locality. These are of significant value to aquatic species, such as water birds, platypus, macro-invertebrates, frogs (including the Giant Barred Frog), reptiles and fishes.

Two aquatic bird species, which inhabit the project site are the Comb-crested Jacana (which is common on existing water lily beds) and the Black-necked Stork, both of which are listed as vulnerable and endangered respectively under the Threatened Species Conservation Act 1995.

These communities and ecosystems are expected to be adversely impacted in the event of the dam raising, but will re-establish themselves in the longer term.

Although the existing dam has created an impediment to fish passage, the reservoir is known to support a number of fish species, including the Australian Bass (*Maquaaria novemaculeata*), which is popular with anglers.

4.4.9.1.4 Corridor Network Values

The study area forms part of a sub-regional corridor that connects with other similar expanses of habitat including seed dispersal values. It also falls within the Border Ranges Hotspot Biodiversity Management Plan study area, and as such the small pockets of rainforest in the environs of Clarrie Hall Dam are valued as an integral part of the Border ranges rainforest management area.

In this regard, the consultations with the National Parks and Wildlife Service (NPWS) involving appropriate offset measures for the 3.7 hectares of gully in Mount Jerusalem National Park could involve an equivalent corridor of similar habitat.

In summary, further studies are required to confirm the presence of threatened flora and fauna and endangered ecological communities in the event of a raised Clarrie Hall Dam, and the management of the impacts associated with the construction and operation phases of this Option.

4.4.9.2 Byrrill Creek Dam Construction

ECO-SURE Environmental Consultants were engaged by Tweed Landcare Inc. in 2003 to conduct a preliminary survey using the rapid assessment technique of six sub-catchments of the Upper and Mid Tweed River, to prioritise the high conservation value (HCV) remnant sites for restoration. One of the sub-catchments was Byrrill Creek and another was the Upper Tweed, which adjoins the Doon Doon Creek sub-catchment (including the Clarrie Hall Dam).

Although the ECO-SURE assessment is not a detailed flora or fauna assessment, the finding of this assessment is that the Byrrill Creek sub-catchment scored the highest average conservation values of the six sub-catchments assessed. The HCV areas are both upstream and downstream of the proposed dam wall and would be significantly impacted with this Option.

4.4.9.2.1 Terrestrial Flora

A Byrrill Creek Riparian Rehabilitation Plan was developed in 2006 by EnviTE to protect and reinstate habitat corridors for the movement of species. The EnviTE report notes 8 listed flora species as endangered or vulnerable under the Threatened Species Conservation Act 1995, of which 4 are also listed as vulnerable under the federal EPBC Act 1999.

4.4.9.2.2 Terrestrial Fauna

The EnviTE report noted the following threatened fauna:

- 12 mammal species, including Koala, platytpus and several species of bat;
- 14 bird species, including Albert's Lyrebird (*Menura albertii*) and several species of owl;
- frog species including the endangered Giant Barred Frog (Mixophyes iterates) and Loveridges Frog (Philoria loveridgei).

4.4.9.2.3 Corridor Network Values

The values of the existing native vegetation communities and habitat in the Byrrill Creek sub-catchment are enhanced by its connectivity between Mebbin National Park to the west and Mount Warning National Park to the north.

It may be inappropriate to draw direct comparison between the environmental studies and data in relation to Clarrie Hall Dam and the Byrrill Creek sub-catchment, because they were conducted for different purposes with different methodologies over study areas with different attributes. The ECO-SURE report for Landcare covered six sub-catchments of the Tweed River including Byrrill Creek, but did not cover the Doon Doon Creek sub-catchment in which Clarrie Hall Dam is situated.

Nevertheless, the general consensus of the agencies that attended the Planning Focus Meeting in January 2010, is that the issues and impacts in relation to Byrrill Creek Dam are of greater extent and complexity, in terms of the environmental (flora and fauna), than for the raising of Clarrie Hall Dam.

This view was also supported by members of the Community Working Group and a significant number of submissions received from the community.

4.4.9.3 Pipeline to SEQ Water Grid

The flora and fauna studies carried out as part of the Tugun By-pass Motorway EIS in 2004 triggered referral to the federal government under the EPBC Act 1999. However, these studies are relevant to the pipeline alignments A or B, which would be refused by the Queensland DTMR, and are not considered further in this study.

Pipeline alignment C is located in a future road reserve through the Cobaki Lakes development, and also involves an under-bored crossing of the Tugun By-pass Motorway near the Boyd Road overpass. The Planning Focus meeting held in January 2010 drew attention to the importance of migratory bird issues (3 protected species have been identified), major high tide roosting sites for shorebirds and an important locality to I&I Fisheries in terms of the avoidance of acid soils disturbance.

The issues from a flora and fauna perspective may be similar to those encountered in the Tugun By-pass Motorway EIS, in terms of proximity to wetland vegetation communities, flora and fauna species of legislative significance on a regional level and a SEPP 14 coastal wetland along the linear corridor of the pipeline, which would automatically trigger an EIS.

As no flora and fauna studies have been undertaken for pipeline alignment C, further assessments would be required after the final alignment of the pipeline has been established through the future Cobaki Lakes development.

The regulatory processes will be complicated as they come under NSW (Threatened Species Conservation Act 1995), Queensland (Nature Conservation Act 1992) and possibly federal EPBC Act 1999 legislation.

Pipeline alignments D and E are located in existing road reserves through disturbed ground and issues of flora and fauna significance are not expected.

In summary, it is expected that the issues associated with environmental flora and fauna are likely to be complicated for pipeline alignment C, but manageable, whereas pipeline alignments D or E will be much more manageable. Either way, the issues for the pipelines options should be relatively straightforward compared with the environmental impacts involving the dams options. This is also because there is greater scope with pipeline (and groundwater) designs to avoid conflict with known sites of environmental interest.

4.4.9.4 Combined Emergency Supply

The environmental impacts associated with the Combined Emergency Supply are discussed separately for the three components:

- Pipeline to Rous Water,
- Pipeline to SEQ Water Grid,
- Groundwater Supply.

4.4.9.4.1 Combined Emergency Supply – Pipelines to Rous Water and SEQ Water Grid

Both of these Options share similar issues of environmental impacts in coastal areas and involve conventional open trenching or boring technologies, and pumping stations (mechanical, electrical and civil works).

The pipeline to Rous Water is in a road reserve that is also shown to be covered by SEPP 14 (Coastal Wetlands) and SEPP 26 (Littoral Rainforests) areas. An EIS under Section 112 of the EP&A Act 1979 will be triggered for the Part 4 component as it is Designated Development.

After the final alignments of the pipelines have been established, further environmental (flora and fauna) studies and investigations would be required.

The pipeline to SEQ Water Grid would involve issues in relation to ecological impacts would be of similar type and magnitude as those discussed under Section 4.4.9.3 for Option 5, pipeline alignment C.

4.4.9.4.2 Combined Emergency Supply – Groundwater

The groundwater supply is expected to cause a significantly lesser environmental impact than either of the dams options and a lesser environmental impact than either of the pipeline options. Given the significant approvals process to restrict groundwater extraction, the potential for impacts from over-extraction are likely to be low. Where the activity is not expected to cause significant environmental impact, then a Review of Environmental Factors (REF) under Section 111 of the EP&A Act 1979 would be required. The requirement for an EIS, or a REF will be determined upon completion of further site specific ecological (fauna and flora) studies.

However, in the case of the coastal groundwater, where SEPP 14 and/or SEPP 26 areas are encountered, then an EIS would be automatically triggered. Other issues in relation to coastal groundwater include the control of acid sulphate soils and the potential of saline intrusion to the aquifer in the event of rising sea levels.

4.4.9.5 Summary of Environmental Criterion for Environmental Constraints

Table 32 summarises the foregoing discussion and presents the ratings that were applied in the multi criteria analysis in Section 5 of this report.

Table 32: Summary of Environmental Criterion for Environmental Constraints

Option	MCA Rating
Option 1 - Raising Clarrie Hall Dam	3
Option 2 - Byrrill Creek Dam Construction	2
Option 5 - Pipeline to the SEQ Water Grid	4
Combined Emergency Supply	
Pipeline to Rous Water	4
Pipeline to the SEQ Water Grid	4
Groundwater (Tweed alluvium)	5
Groundwater (coastal aquifer)	4

4.4.10 Greenhouse Gas Emissions and Energy Consumption

Greenhouse gas (GHG) emissions and energy consumption are indicators of the energy inputs, which are proportional to the direct greenhouse emissions, and their assessments assist in the overall options selection and eventually for incorporating sustainability into design processes.

GHG emissions are atmospheric gases which can be produced by anthropogenic activities such as engine combustion, electricity usage and vegetation removal. There are six main GHGs which have each been delegated a global warming potential (GWP) based on how much a gas is estimated to contribute to global warming. This GWP allows all GHG producing activities to be calculated as a consistent unit, which is, carbon dioxide equivalents (CO_2-e). The quantity of GHGs produced from an activity is determined from activity data (i.e. litres of fuel combusted, kWHs of electricity used or hectares of vegetation removed) which, when used in formulae (such as are adopted by the Commonwealth Department of Climate Change), will determine the CO_2-e produced from an activity.

This GHG emissions assessment was undertaken through a combination of qualitative and quantitative assessments incorporated into a multi-criteria analysis (MCA).

4.4.10.1 GHG Assessment Process

The assessment of GHG emissions has been broken down into three phases of GHG production, namely, embodied energy, construction activities and operational activities. These three phases are explained below:

- Embodied Energy
- Embodied energy emissions are generated upstream of the direct use of a product and are involved in producing that product. Examples of embodied energy emissions are extraction of raw materials (i.e. machinery fuel usage), the manufacturing process (i.e. electricity consumption at the plant) and transport of the product to the customer (i.e. truck fuel usage).
- Construction Activities

- Construction activity emissions are finite, in that they are limited to the period of construction. They emanate from a variety of sources including vehicles, machinery, plant used on-site, vegetation clearing, electricity consumption from power tool use and site office requirements, and solid waste generation.
- Operational Activities
- Operational activity emissions generally result from energy consumption through both electricity and fuel usage.

4.4.10.2 Application of GHG emissions to the four Shortlisted Options

The four shortlisted options were broken down into the expected sources of GHG emissions produced during the above phases. The qualitative analysis of expected GHG emissions for embodied energy and construction is summarised in Table 33 with the analysis of the operational phase for each shortlisted option in Table 34.

Table 33: Qualitative Analysis of Expected Sources of GHG Emissions

	Option 1 Raising Clarrie Hall Dam	Option 2 New Dam on Byrrill Creek	Option 5 Pipeline to SEQ Water Grid	Combined Emergency Supply		
				Pipeline to Rous Water	Pipeline to SEQ Water Grid	Groundwater Supply
Embodied Energy	▪ Construction materials: - Aggregate; - Cement; - Gravel; - Pipework (steel); - Reinforcing steel; - Valves, shutters, screens, misc steel; and - Fly ash. ▪ Transportation of construction materials.	▪ Construction materials: - Aggregate; - Cement; - Gravel; - Pipework (steel); - Reinforcing steel; - Valves, shutters, screens, misc steel; and - Fly ash. ▪ Transportation of construction materials.	▪ Construction materials, such as: - Bedding sand; - Pipe; - Steel; - Reinforcing steel; and - Cement. ▪ Transportation of construction materials.	▪ Construction materials, such as: - Bedding sand; - Pipe; - Steel; - Reinforcing steel; and - Cement. ▪ Transportation of construction materials.	▪ Construction materials, such as: - Bedding sand; - Pipe; - Steel; - Reinforcing steel; and - Cement. ▪ Transportation of construction materials.	▪ Construction materials, such as: - Pipe; and - Cement. ▪ Transportation of construction materials.
Construction Activities	▪ Use of explosives; ▪ Electricity usage (i.e. batching plant, lighting and site offices); ▪ Diesel consumption (i.e. machinery and generators); ▪ Waste; and ▪ Land-use change due to inundation (i.e. loss of vegetation)	▪ Use of explosives; ▪ Electricity usage (i.e. batching plant, lighting and site offices); ▪ Diesel consumption (i.e. machinery and generators); ▪ Waste; and ▪ Land-use change due to inundation (i.e. loss of vegetation)	▪ Electricity usage (i.e. lighting and site offices); ▪ Waste; and ▪ Diesel consumption (i.e. machinery and generators).	▪ Electricity usage (i.e. lighting and site offices); ▪ Waste; and ▪ Diesel consumption (i.e. machinery and generators).	▪ Electricity usage (i.e. lighting and site offices); ▪ Waste; and ▪ Diesel consumption (i.e. machinery and generators).	▪ Diesel consumption (i.e. machinery and generators); and ▪ Waste.
Operational Activities (see Table 34 for Quantitative analysis			▪ Electricity usage (i.e. operation of the pump station)	▪ Electricity usage (i.e. operation of the pump station)	▪ Electricity usage (i.e. operation of the pump station)	▪ Electricity usage (pumping)

Table 34: Quantitative Analysis of Operational Phase GHG Emissions

	Option 1 Raising Clarrie Hall Dam	Option 2 New Dam on Byrrill Creek	Option 5 Pipeline to SEQ Water Grid	Combined Emergency Supply		
				Pipeline to Rous Water	Pipeline to SEQ Water Grid	Groundwater Supply
Annual Operating Costs ($)	0	0	57,000	39,000	14,000	320,000
Annual Pumping costs ($) (assume 30% of Annual Operating Costs is electricity consumption for pumping)	0	0	17,100	11,700	4,200	96,000
Annual Electricity Usage (kWh) (assume cost of electricity is 12 cents per kWh)	0	0	142,500	97,500	35,000	800,000
Annual tonnes of CO_2-e (0.89 kg CO_2-e per kWh (Reference: NGA Factors - Department of Climate Change, 2009) [1]	0	0	125	85	30	715
Total t CO_2-e/year	**0**	**0**	**125**	**830**		

Reference 1: Department of Climate Change, *National Greenhouse Accounts (NGA) Factors (June 2009 edition)*. Commonwealth of Australia, Canberra

4.4.10.3 Limitations of Available Data

The qualitative GHG emissions assessment was undertaken for the embodied energy and construction phases because the information available at this stage is preliminary only and not yet fully developed, to the extent that accurate (detailed design) quantities are not yet known. Therefore, the accuracy of estimating GHG emissions, particularly for the dams options is 'high level' and based upon the known emissions of other similar dams projects, such as the Wyaralong Dam in Queensland, for which a similar GHG emissions assessment was recently undertaken.

An issue that needed to be captured for the dams options was the relationship between the two year construction period (over which the GHG emissions are high) and the 30 year operational period (over which the GHG emissions may be minimal). Where dams normally undergo periodic draw-down and refilling, the carbon emissions can be significant. This aspect has not been included in the analysis because Clarrie Hall Dam is not normally drawn down for extended periods to promote the regrowth of littoral vegetation. This issue may be addressed by application of the weighting factor in the following multi criteria analysis, whereby the operational activities may be weighted heavier than the construction activities.

4.4.10.4 Mini-Multi Criteria Analysis (Mini-MCA)

A mini-MCA was performed on the qualitative analyses of the embodied energy and construction phases, as provided in Table 31 and the quantitative analysis of the operational phase, as provided in Table 32 to determine the expected impact of GHG emissions. The Mini-MCA process involving ratings and weighting factors follows the same general procedure as the main MCA and is explained in Section 5 of this report.

- The rating is summarised in Table 35 based on a scale of 1 to 5 – 1 indicating a high impact and 5 indicating a low level of impact.
- The weighting factors are based on a scale of 1 to 9 as shown in Table 35.

Table 35: Ratings and Weighting Factors for Mini-MCA

Option Stage	Rating – GHG Emissions	Weighting Factor
Embodied Energy	1. Highly significant impact 2. High impact 3. Moderate impact 4. Low impact. 5. Insignificant impact	1. Very Low 3. Low 5. Moderate 7. High 9. Very High
Construction	1. Highly significant impact 2. High impact 3. Moderate impact 4. Low impact. 5. Insignificant impact	1. Very Low 3. Low 5. Moderate 7. High 9. Very High
Operation	1. > 400 t CO_2-e/year 2. 300 to 400 t CO_2-e/year 3. 200 to 300 t CO_2-e/year 4. 100 to 200 t $_{CO2}$-e/year 5. < 100 t CO_2-e/year	1. Very Low 3. Low 5. Moderate 7. High 9. Very High

- The **sub-score** is based on the product of the rating and the weighting factor to provide a comparison of options. The highest score represents a favourable outcome with the least GHG emissions over the 30 year life of the project.

The resultant sub-scores were then ranked from one to four to identify the option, which was expected to result in the least GHG emissions impact.

Details of the MCA are presented in Table 36. Ranking of the GHG emissions of the four options is provided in Table 37 indicating the least GHG emissions impact.

The results indicate that:

- *Option 1 – Raising Clarrie Hall Dam* has the lowest GHG emissions impact over the first 30 years of the project. This result is mainly due to the lower GHG emissions associated with its operation phase and its relatively short construction period.
- *Option 5 – Pipeline to SEQ Water Grid* was ranked second due to the short construction period, but, the energy required for pumping during the operational phase increases its expected GHG emissions.
- *Option 2 – New Dam on Byrill Creek* was ranked third due to the larger extent of construction in terms of affected areas of inundation and more extensive site works.
- The *Combined Emergency Supply* was ranked fourth due to the relatively large extent of energy over its operation phase and the associated moderately sized construction period.

Table 36: Summary of Mini-MCA for GHG Emissions

	Option 1			Option 2			Option 5			Combined Emergency Supply		
	Raising Clarrie Hall Dam			New Dam on Byrill Creek			Pipeline to SEQ Water Grid					
	Rating	Weighting	Score	Rating	Weighting	Score	Rating	Weighting	Score	Rating	Weighting	Score
Embodied Energy	2	5	10	1	5	5	3	5	15	2	5	10
Construction	2	7	14	1	7	7	4	7	28	3	7	21
Operation	5	9	45	5	9	45	2	9	18	2	9	18
TOTAL			69			57			61			49

Table 37: Ranking of Options for GHG Emissions

Rank	Option	Sub-Score
1	Option 1 - Raising Clarrie Hall Dam	**69**
2	Option 5 - Pipeline to the SEQ Water Grid	**61**
3	Option 2 - Byrrill Creek Dam Construction	**57**
4	Combined Emergency Supply	**49**

5 Multi Criteria Analysis of Shortlisted Options

5.1 Process Adopted

Each of the four shortlisted options was compared against the ten assessment criteria, which are used to differentiate the benefits and risks associated with each of the four shortlisted options to create an assessment matrix, as shown in Table 1 of Appendix B.

A multi criteria analysis (MCA) was applied to this matrix as a means of assigning the highest score for the preferred option, from a variety of decision criteria, where not all of the criteria may be aligned to produce a favourable outcome. For example, one option may have the lowest cost, but the greatest environmental impact. An MCA can be used to determine the preferred overall outcome with a balanced trade-off between competing values.

The MCA process was applied to this study, based on the assignment of ratings and weighting factors explained as follows

5.1.1 Assessment Criteria Ratings

A **rating** was assigned, based on a qualitative impact on the assessment criteria. The ratings are summarised in Table 1 of **Appendix B**, based on the detailed commentary under Section 4 of this report and based on a scale of 1 to 5, with a 1 indicating a high risk and 5 indicating a low level of risk.

5.1.2 Assessment Criteria Weighting Factors

A weighting factor was applied to the assessment criteria relative to the level of significance of the criteria. The weighting factors based on a scale of 1 to 9, with 1 indicating very low significance and 9 indicating very high significance.

The MCA process was applied to three sets of weighting factors in order to demonstrate the sensitivity of applying different weighting factors (which are subjective) and to vary the levels of significance of the assessment criteria:

- The first scenario applies the ratio of weighting factors, which were based on those used previously in the Coarse Screen report but revised based on the additional information made available during this Fine Screen stage. This scenario is presented in Table 2 of Appendix B.
- The second scenario applies evenly weighted factors over the 4 sets of assessment criteria. This scenario is presented to express an even balance of the quadruple bottom line between the governance, economic, social and environmental issues, and is shown in Table 3 of Appendix B.
- The third scenario applies the ratio of weighting factors to reflect the greater significance of the social and environmental criteria. This scenario is presented to reflect concerns expressed by members of the Community Working Group, and is shown in Table 4 of Appendix B.

The weighting factors, which have been applied to the assessment criteria are shown in Table 38.

Table 38: Adopted Weighting Factors for MCA

Assessment Criteria	Fine Screen Weighting (QBL) (Refer to Appendix B Table 2)	Even QBL Weighting (Refer to Appendix B Table 3)	CWG Weighting (Refer to Appendix B Table 4)
Governance:	**23**	**12**	**12**
Secure Yield	9	4	4
Planning Obligations	7	4	4
Legislative Acceptability	7	4	4
Stable Economic Growth:	**17**	**12**	**12**
Established Technologies & Feasibility	7	5	5
Lead Time & Potential for Escalation	3	2	2
NPV & Annualised Costs per ML	7	5	5
Social Progress:	**16**	**12**	**14**
Social Acceptability	7	5	7
Cultural Heritage Impacts	9	7	7
Environmental Protection:	**16**	**12**	**16**
Environmental Constraints	9	7	9
Greenhouse Gas & Energy Consumption	7	5	7

A **score** was derived based on the product of the rating and the weighting factor to provide a comparison of the shortlisted options. The ratings for the Combined Emergency Supply were averaged, then multiplied by the rating factors to derive the score. The resultant scores were then ranked from one to four to identify the preferred option.

5.2 Results of the MCA Analyses

The outcomes of the MCA analyses are presented in Table 39.

Table 39: Ranking of the Shortlisted Options

Rank	Option	Assessed Scores		
		Fine Screen QBL	Even QBL	CWG
1	Option 1 - Raising Clarrie Hall Dam	262	171	189
2	Option 5 - Pipeline to the SEQ Water Grid	215	147	169
3	Option 2 - Byrrill Creek Dam Construction	210	136	150
Combined Emergency Supply				
	Pipeline to Rous Water	238	163	185
	Pipeline to SEQ Water Grid			
	Groundwater (Tweed alluvium)			
	Groundwater (coastal aquifer)			

5.3 Discussion of the Results

5.3.1 Shortlisted Options

The MCA Analyses showed that the highest ranked option is Option 1 - Raising of Clarrie Hall Dam. This option remained the first ranked option against each of the three MCA weighting approaches used.

The second ranked option is Option 5 – Pipeline to SEQ Water Grid, appears to have inherently high risks associated with:

- The expected protracted negotiations over the dealings with a number of political and procedural issues between the States, which have not previously been confronted;
- The uncertainties over the high bulk purchase price of water from the SEQ Water Grid Manager;
- The lack of certainty regarding these issues which may prove insurmountable within the timeframe available for augmentation of the Tweed system

The third ranked option is Option 2 – Construction of a New Dam on Byrrill Creek, which does not rate higher than the raising of Clarrie Hall Dam for any of the assessment criteria, except possibly for the Social Acceptability criterion, where it is marginally favourable.

By using three MCA weighting approaches the MCA provides a sensitivity analysis of the subjectivity intrinsic in the MCA weightings. The results in Table 39 show that the process is robust and while option scores changed, the option rankings did not, regardless of the weighting approach used,

5.3.2 Combined Emergency Supply Option

This option is a short term solution (say within 4 years) on the basis that the preferred option takes longer than this timeframe to implement.

The lead times shown in Table 40 for the components of the Combined Emergency Supply, shows that the Pipeline to the SEQ Water Grid (7 km of 300-mm dia pipeline and 30 kW pumping station) does not meet this requirement for reasons discussed earlier. These reasons deal with the complexities of legislative acceptability for this option including a number of political and procedural issues between the States, which have not previously been confronted.

Table 40: Lead Times for the Combined Emergency Supply

Option	Planning Process (Years)	Pre-construction Approvals (Years)	Construction Period (Years)	Total (Years)
Combined Emergency Supply				
Pipeline & PS to Rous Water	3	1	1.5	**5.5**
Pipeline & PS to SEQ Water Grid	2.5	4	1	**7.5**
Groundwater (Tweed alluvium)	2	1	1	**4**
Groundwater (coastal aquifer)	2	1	2	**5**

The requirement of the Combined Emergency Supply is approximately 2,000 ML/annum (5.5 ML/day), being the difference in 2023 between the BASIX/WELS and Baseline demand forecasts.

The maximum capacity of the Combined Emergency Supply is estimated in Table 41 to be 5,400 ML/annum (15 ML/day). This is in excess of the short-term requirement, whereas any single component of this option almost satisfies the requirement for 2,000 ML/annum (5.5 ML/day).

Table 41: Capacities of the Combined Emergency Supply

Works	Description	Capacity (ML/annum)	Capacity (ML/day)
Pipeline to Rous Water	18 km of 300-mm pipeline and 100 kW pumping station	1,800	5.0
Pipeline to SEQ Water Grid	7 km of 300-mm pipeline and 30 kW pumping station	1,800	5.0
Plus either			
Groundwater – Tweed River basal alluvium	Borefield and 8 km of 200-mm pipeline to Bray Park WTP	1,500	4.3
or			
Groundwater – coastal aquifer	Borefield to separate WTP and 0.3 km of 200-mm pipeline	1,800	5.0
Maximum Capacity		**5,400**	**15.0**

Council may focus on a single component of the Combined Emergency Supply, which has the least potential for delays, should it be necessary to implement this option before the year 2023.

6 Conclusions

Based on the Fine Screening of shortlisted options for the augmentation of the Tweed District Water Supply, the following conclusions are drawn:

1. Detailed demand forecasting undertaken as part of the Demand Management Strategy (MWH 2008) identified that the demand in the Shire is likely to exceed the secure yield of the existing Clarrie Hall Dam (13,750 ML/a) by around 2018 based on the baseline demand forecast or 2023 assuming that the BASIX/WELS strategies are successfully implemented.

2. Based on the demand assessment a minimum supply augmentation of 3,000 ML/annum is targeted to achieve a forecast demand of 16,750 ML/a (with BASIX/WELS) in the year 2036.

3. The highest ranked option is Option 1 comprising the raising of Clarrie Hall Dam. This option achieved the highest overall score and highest individual scores for the following assessment criteria compared with the other two shortlisted options (excluding the Combined Emergency Supply):
   - Secure Yield — Rated 5/5
   - Planning Obligations — Rated 3/5
   - Legislative Acceptability — Rated 4/5
   - Established Technologies and Feasibility — Rated 5/5
   - Lead Time for Construction & Escalation Risk — Rated 3/5
   - Net Present Value & Levelised Cost per ML — Rated 4/5
   - Greenhouse Gas & Energy Consumption — Rated 4/5

   The above reflects the strongest Quadruple Bottom Line (economic, social, environmental and governance) foundation for proceeding with this Option. It would therefore appear that this Option provides the most secure way forward for augmenting the Tweed district water supply.

4. The planning approvals and pre-construction permit process associated with the raising of Clarrie Hall Dam, coupled with the relatively long phase of project implementation is expected to take seven years – from mid 2010 - mid 2017. This option leaves five and a half years lee-way, based on the revised BASIX/WELS demand projection, or six months lee-way if future demands follow the Baseline projection.

   The Clarrie Hall Dam option includes areas of National Park, which will require agreement with National Parks and Wildlife Service, involving appropriate offset measures. This issue presents possibly the greatest risk associated with the dam option.

5. The need for the Combined Emergency Supply is diminished from the Coarse Screen demand projections assuming that the revised demand projections resulting from the implementation of BASIX/WELS are achieved. The Combined Emergency Supply will therefore only be required in the event that the preferred option for augmentation of supply is not completed by the year 2023. The Combined Emergency Supply may be provided through a component of either the pipeline to Rous Water, or the groundwater supply.

6. Option 5 involving a pipeline connection to the SEQ Water Grid (including this component of the Combined Emergency Supply) has relatively high risks associated with:
   - The expected protracted negotiations over the dealings with a number of political and procedural issues between the States, which have not previously been confronted;
   - The uncertainties over the high bulk purchase price of water from the SEQ Water Grid Manager;

- The lack of certainty regarding these issues which may prove insurmountable within the timeframe available for augmentation of the Tweed system.

7. The option with the longest lead time for completion was Option 2 – New Byrrill Creek Dam, which is likely to take nine years for the combined processes of planning and pre-construction approvals and the construction phase.

8. The option with the most significant environmental concerns in terms of a changing habitat, from a flowing watercourse to a lake environment, together with a new major fish barrier was Option 2 - New Byrrill Creek Dam.

7 Recommendations

Based on the underlying demand forecast assumptions and the Fine Screen assessment of shortlisted options it is recommended that Tweed Shire Council:

1. Implement appropriate demand management actions and systematically monitor demand to ensure that demand reductions equivalent or better to the BASIX/WELS standard are achieved over the planning period.
2. Adopt the raising of Clarrie Hall Dam as the preferred option for augmenting the Tweed District Water Supply over the planning horizon to 2036.
3. Proceed with the planning approvals processes outlined in Section 4.4.2.1 of this Report in relation to the raising of Clarrie Hall Dam, with priority given to the National Parks land issue.

Appendix A: References

The following reports in chronological order were referred in the Coarse Screen Assessment of Options, MWH October 2009:

No.	Author	Date	Title	Report No.
1	GHD	February 1975	Augmentation of Tweed District Water Supply	
2	Geological Survey of NSW	September 1977	Tweed Shire Water Supply Augmentation - Reconnaissance Engineering Geological Report.	GS 1977/194
3	Dept. of Public Works NSW	October 1977	Tweed District Water Supply Headworks Augmentation Final Investigation Part 1 – Project Definition	WS 150-A
4	Geological Survey of NSW	August 1978	Feasibility investigations at Byrrill Creek and Doon Doon Damsites, Tweed Shire	GS 1978/252
5	Dept. of Public Works NSW	September 1979	Tweed District Water Supply Augmentation (Headworks) Clarrie Hall Dam - Site Confirmation and Selection of Dam Type	WS 150-C
6	Public Works Dept. of NSW	May 1981	Tweed District Water Supply Augmentation, Clarrie Hall Dam, Summary of Site Geology	GS1981/253
7	Geological Survey of NSW	1983	Tweed District Water Supply Augmentation, Clarrie Hall Dam Engineering Geology Report on Construction	GS1983/004
8	SunWater	July 2002	Clarrie Hall Dam and Bray Park Weir Yield Survey	E02065-01
9	NSW Department of Commerce	July 2004	Construction of Dam on Byrrill Creek, Update of Estimate	
10	DEUS	December 2005	New South Wales North and mid-North Coast Viability and Cost Effectiveness of Desalination	DC05201
11	HWA	March 2006	Tweed Integrated Water Cycle Management (IWCM) Context Study and Strategy	
12a	MWH	July 2006	Tweed Shire Council Activity Management Plans - Water Supply	A0151601
12b	MWH	July 2006	Tweed Shire Council Activity Management Plans - Wastewater	A0151601
13	SunWater	November 2006	Tweed River System Water Supply Security Review	G-81903-02-03-03

No.	Author	Date	Title	Report No.
14	Tweed Shire Council	2007	Water Supply and Sewerage Development Servicing Plans	
15	SMEC	2007	Integrated Water Supply Options of North East NSW and South East Queensland	
16	MWH	February 2008	Demand Management Strategy Stage 1	A1067401
17	NSW Department of Commerce	May 2008	Clarrie Hall Dam – Determination of Optimum Size and Dam Raising Options Study, Final Evaluation Report	DC08060
18	Environmental Hydrology Associates	22 July 2008	Tweed District Water Supply Augmentation Options Study – Identification of Feasible Options – Groundwater Supply	GW-08-02-REP-001 Rev A

The following additional reports in chronological order were referred in this Fine Screen Assessment of Shortlisted Options:

No.	Author	Date	Title	Report No.
19	Peter Parker Environmental Consultants Pty Ltd	December 1998	Byrrill Creek Reafforestation Programme – A Flora and Fauna Assessment	
20	Peter Parker Environmental Consultants Pty Ltd	August 2000	Byrrill Creek Forestry Venture – An Environmental Assessment of Selected Harvesting	
21	ECO-SURE Environmental Consultants	2003	The Restoration Prioritisation of High Conservation Value Riparian Lands of the Upper and Mid Tweed River	
22	EnviTE NSW and BRS Pty Ltd	March 2006	Byrrill Creek Riparian Rehabilitation Plan	
23	Southern Cross University	March 2008	Preliminary Archaeological Overview for Proposed Raising of Clarrie Hall Dam	
24	Greenloaning Biostudies Pty Ltd	April 2008	Identification of Issues and Constraints of Proposed Raising of Clarrie Hall Dam	0705001RP3
25	Dr. K A Bishop	July 2008	Environmental Flow Scoping Study for Doon Doon Creek and the Lower Tweed River, NSW (Draft Report)	
26	Biolink Ecological Consultants	July 2009	Koala Plan of Management for proposed World Championship Rally activities in Parts of the Tweed LGA	
27	Biolink Ecological Consultants	July 2009	Ecological Assessment – Proposed World Championship Rally event in Parts of Tweed LGA	
28	Converge Heritage + Community Pty Ltd	August 2009	Preliminary Archaeological Overview of Proposed Byrrill Creek Dam	09066C/2009
29	Department of Environment Climate Change & Water NSW	August 2009	Draft Water Sharing Plan – Tweed River Area Unregulated and Alluvial Water Sources	ISBN 978 1 921546 50 1
30	NSW Department of Commerce	August 2009	Byrrill Creek Storage Size and Estimate of Secure Yield	
31	Biolink Ecological	October 2009	Assessment of Amelioration Measures and Ecological Impacts associated with	

No.	Author	Date	Title	Report No.
	Consultants		a World Championship Rally event in parts of the Tweed and Kyogle LGA, August to September 2009	
32	MWH	6 October 2009	Tweed District Water Supply Augmentation Options Study Stages 1 & 2 Coarse Screen Assessment of Options	A1100300
33	Queensland Water Commission	June 2010	South East Queensland Water Strategy	ISSN 1836-5051 #29229
34A	MWH	December 2009	Demand Management Strategy - Stage 2 Non-Residential Program Evaluation	A1187200
34B	MWH	December 2009	Demand Management Strategy (Summary Report)	A1187200
35	NSW Public Works	December 2009	Construction of Dam on Byrrill Creek – Update of Cost Estimates	DC09140
36	Tweed Shire Council	January 2010	Minutes of the Planning Focus Meeting	
37	NSW Public Works Memorandum	February 2010	Additional Yield Estimates for Byrrill Creek Storage	
38	Tweed Shire Council and the Community Working Group	March 2010	Tweed District Water Supply Augmentation Project A Report by the Community Working Group	
39	Tweed Shire Council	March 2010	Minutes of the Aboriginal Community Meeting	
40	Tweed Shire Council	March 2010	Environmental Impact Quantifier	
41	Tweed Shire Council	March 2010	Social Impact Quantifier	
42	NSW Services Technology & Administration	June 2010	Preliminary Planning Overview of Tweed Water Supply Augmentation Options	
43	Tweed Shire Council	July 2010	Water Supply Augmentation Project Submissions Report on Demand Management Strategy and Water Supply Augmentation.	
44	Climate Change	2010	Projections of Australia's future climate	www.climatechan

No.	Author	Date	Title	Report No.
	in Australia, CSIRO		for the years 2030, 2050 and 2070	geaustralia.gov.au
45	Institute for Sustainable Futures, UTS		The Use of Levelised Cost in Comparing Supply and Demand Side Options	Water Supply Vol 13 No. 3 pp 185-192, IWA Publishing

Appendix B: Multi Criteria Analyses of the Shortlisted Options

TWEED SHIRE COUNCIL **APPENDIX B**

TWEED DISTRICT WATER SUPPLY AUGMENTATION OPTIONS STUDY

TABLE 1: DETERMINATION OF FINE SCREEN RATINGS

MULTI CRITERIA ANALYSIS FOR THE ASSESSMENT OF SHORTLISTED OPTIONS

		GOVERNANCE ASSESSMENT CRITERIA						ECONOMIC ASSESSMENT CRITERIA						SOCIAL ASSESSMENT CRITERIA				ENVIRONMENTAL ASSESSMENT CRITERIA			
	Option	Secure Yield		Planning Obligations		Legislative Acceptability		Established Technologies & Feasibility		Lead Time for Construction & Potential for Escalation of Costs		Capital, Operations, NPV & Levelised Cost per ML		Social Impacts		Cultural Heritage Impacts		Environmental Constraints		Greenhouse Gas & Energy Consumption	
No.	Description	Rating	Description	Rating	Description	Rating	Description	Rating	Description	Rating	Description	Rating	Description	Rating	Description	Rating	Description	Rating	Description	Rating	Description
1	Raising Clarrie Hall Dam Extra 26,300 ML Storage	5	Previous studies show this option will provide an additional 7,170 ML/annum, which is in excess of the required additional secure yield of 3,000 ML/annum over the planning horizon.	3	Allow 5.5 years for planning approvals including Section 112 EIS under Part 5 of EP&A Act 1979, and construction approvals processes. Uncertainty remains over EPBC referral.	4	The EP&A Act 1979 process has been followed on numerous other projects. There are uncertainties regarding Part 5, or Part 3A and whether referral under the federal EPBC Act 1999 will be triggered.	5	Foundation conditions and potential materials areas are well understood at this site	3	Environmental investigations and approvals processes, together with dam raising period require significant lead times. Earliest time for project completion from mid 2010 is mid 2017.	4	Levelised cost over 80 years is very favourable as $1,516/ML.	2	Social impacts involve 24 farming properties and inundation of up to 3 dwellings. Land acquisition and fair compensation will therefore be required, together with deviation of local roads.	3	Nine sites of known Aboriginal significance will be inundated. Further investigations and negotiations with the Aboriginal knowledge holders are required.	3	Some significant forest and threatened species have been identified in the area to be inundated. Additional investigations required to confirm EIS and/or referral under EPBC Act 1999.	4	GHG emissions are high initially during the construction phase, but thereafter are negligible under normal operations.
2	Byrrill Creek Dam Construction 16,300 ML Storage	5	Previous studies show this option will provide an additional 8,700 ML/annum, which is in excess of the required additional secure yield of 3,000 ML/annum over the planning horizon.	2	Allow 7 years for planning approvals including Section 112 EIS under Part 5 of EP&A Act 1979, and construction approvals processes. Uncertainty remains over EPBC referral.	2	Similar approvals process and uncertainties regarding Part 5, or Part 3A and federal EPBC Act 1999 as for Clarrie Hall Dam. Additional issues regarding NSW Weirs Policy and more stringent requirements given it is a new dam.	5	Foundation conditions are reasonably well known with few potential unknowns. Any variations can be accommodated through established and well tested methods.	1	Environmental investigations and approvals processes, together with dam construction period require significant lead times, and more so than for CHD Raising. Earliest time for completion from mid 2010 is mid 2019.	4	Levelised cost over 80 years is very favourable as $1,871/ML.	2	Social impacts involve 9 properties and inundation of up to 4 dwellings. Land acquisition and fair compensation will therefore be required together with road closures or major deviation of local roads.	2	Grinding hollows, paths of connectivity and several other sites of known Aboriginal significance will be inundated. Further investigations and negotiations with the Aboriginal knowledge holders are required.	2	Higher potential than CHD for impacting upon significant flora and threatened species in the inundated area and near the dam site. Additional investigations required to confirm EIS and referral under EPBC Act 1999.	3	GHG emissions are higher than for CHD raising during the construction phase, but thereafter are negligible under normal operations.
5	Pipeline to SEQ Water Grid 7 km of 500-mm Pipeline for 20 ML/day	3	This option may provide an additional 7,300 ML/annum. However, no agreement has yet been negotiated for this supply in terms of quantity, quality or guaranteed uninterrupted supply.	2	Allow 6.5 years for planning approvals including Section 112 EIS under Part 5 of EP&A Act 1979 and equivalent Queensland legislative framework, and construction approvals processes . Uncertainty remains over EPBC referral.	1	Simpler approvals processes for pipelines than for dams options. However, agreement for transfer of water between the States is likely to be complex and protracted.	5	Minimal latent conditions or issues envisaged with pipeline construction technologies in road reserves.	2	Construction period is less than that for dams, but agreement between the States would be protracted and costly. Earliest time for completion from mid 2010 is 2018.	2	Levelised cost over 30 years is unfavourable at $3,408/ML.	4	Short term inconvenience from construction activities along road reserves. Acquisition of pump station site may be required.	3	Areas with Aboriginal cultural significance have been identified for alignments A, B and C. For alignments D and E it is less likely. Culturally significant areas were identified under the Tugun Bypass EIS, however further surveys would be required.	4	Pipeline alignment C is more complex than alignment D, but for either alignment, the issues are much more manageable than for the dams options.	3	GHG emissions will be relatively moderate during the construction phase. High emissions during operations will be linked to mechanical and electrical plant for pumping.
C O M B I N E D	Pipeline to Rous Water 18 km of 300-mm Pipeline for 5 ML/day	2	The estimated additional supply of 1,800 ML/annum is an interim solution only from 2018 up to 2022. However, no agreement has yet been negotiated for this supply in terms of quantity, which may not be available during this period.	3	Allow 4 years for planning approvals and construction approvals processes, including EIS under Part 4 and Part 5 of EP&A Act 1979.	4	The EP&A Act 1979 process has been followed on numerous other projects. There are uncertainties regarding Part 4 and Part 5, or Part 3A, but more straight forward than the dams options.	5	Minimal latent conditions or issues envisaged with pipeline construction technologies in road reserves.	4	Environmental approvals required, but construction period longer than that for the pipeline to SEQ Water Grid. Earliest time for completion from mid 2010 is mid 2016.	1	Levelised cost over 30 years is unfavourable at $3,935/ML.	4	Short term inconvenience from construction activities along road reserves. Acquisition of pump station site may be required.	4	The majority of the pipeline would be constructed in areas previously disturbed, but no investigations have been carried out and an Archaeological Survey would be required.	4	Pipeline route is along the Old Coast Road, which has already been disturbed. Additional ecological studies would be required.	3	GHG emissions will be relatively moderate during the construction phase. High emissions during operations will be linked to mechanical and electrical plant for pumping.
	Pipeline to SEQ Water Grid 7 km of 300-mm Pipeline for 5 ML/day	3	The estimated additional supply of 1,800 ML/annum is an interim solution only from 2018 up to 2022. However, no agreement has yet been negotiated for this supply in terms of quantity, quality, or guaranteed uninterrupted supply.	2	Allow 6.5 years for planning approvals including Section 112 EIS under Part 5 of EP&A Act 1979 and equivalent Queensland legislative framework, and construction approvals processes. Uncertainty remains over EPBC referral.	1	Simpler approvals processes for pipelines than for dams options. However, agreement for transfer of water between the States is likely to be complex and protracted.	5	Minimal latent conditions or issues envisaged with pipeline construction technologies in road reserves.	2	Construction period is less than that for dams, but agreement between the States would be protracted. Earliest time for completion from mid 2010 is 2018.	2	Levelised cost over 30 years is unfavourable at $3,283/ML.	4	Short term inconvenience from construction activities along road reserves. Acquisition of pump station site may be required.	3	Areas with Aboriginal cultural significance have been identified for alignments A, B and C. For alignments D and E it is less likely. Culturally significant areas were identified under the Tugun Bypass EIS, however further surveys would be required.	4	Pipeline alignment C is more complex than alignment D, but for either alignment, the issues are much more manageable than for the dams options.	3	GHG emissions will be relatively moderate during the construction phase. High emissions during operations will be linked to mechanical and electrical plant for pumping.
	Groundwater Tweed River alluvuim including 8 km of 200-mm Pipeline to Bray Park WTP	2	The estimated additional supply of 1,470 ML/annum is sufficient as an interim solution from 2018 up to 2021. There remains risk that the expected yield may not be realised.	4	Allow 3 years for planning approvals including Section 111 REF under Part 5 of EP&A Act 1979, and construction approvals processes.	3	The EP&A Act 1979 process has been followed on numerous other projects. There are uncertainties regarding Part 5, or Part 3A, and risks of existing agricultural and domestic users, but more straight forward than the dams and pipelines options.	4	Whilst borefield technologies are well understood, the outcomes can be uncertain.	4	Lead time can be significant for environmental investigations, community consultation and approvals. The earliest time for completion from mid 2010 is mid 2014.	4	Levelised cost over 30 years is very favourable at $1,237/ML. This does not include the separate WTP.	3	Impacts expected to be less intrusive during the construction period than the pipelines options. Local groundwater users may have concerns.	4	Impacts are expected to be less than the dams options, even though Aboriginal knowledge holders regard groundwater resources as of particular cultural significance.	5	Groundwater has lesser potential for direct impacts than dams or pipelines options, and stringent extraction conditions would be imposed. Additional ecological studies would be required.	3	GHG emissions will be relatively moderate during the construction phase. High emissions during operations will be linked to mechanical and electrical plant for pumping.
	Groundwater Coastal groundwater including 4.3 ML/day WTP	4	The estimated additional supply of 1,470 ML/annum is sufficient as an interim solution from 2018 up to 2021. There is a risk that the expected yield may not be realised in full.	3	Allow 3+ years for planning approvals including Section 111 REF under Part 5 of EP&A Act 1979, and construction approvals processes. Planning approvals in coastal areas are more onerous than Eungella.	3	The EP&A Act 1979 process has been followed on numerous other projects. There are uncertainties regarding Part 5, or Part 3A, and risks of existing agricultural and domestic users, but more straight forward than the dams and pipelines options.	4	Whilst borefield technologies are well understood, the outcomes can be uncertain.	3	Lead time can be significant for environmental investigations, community consultation and approvals can become protracted. The earliest time for completion from mid 2010 is mid 2014 with a higher risk of delay.	1	Levelised cost over 30 years is very unfavourable at $3,745/ML. This includes a separate WTP.	3	Impacts expected to be less intrusive during the construction period than the pipelines options. New site for a WTP will need to be established and the local community may have concerns.	4	Impacts are expected to be less than the dams options, even though Aboriginal knowledge holders regard groundwater resources as of particular cultural significance.	4	Groundwater has lesser potential for direct impacts than dams or pipelines options, and stringent extraction conditions would be imposed. Additional ecological studies would be required. A new site for the WTP will need to be negotiated.	2	GHG emissions will be relatively moderate during the construction phase. High emissions during operations will be linked to mechanical and electrical plant for pumping and water treatment.

Notes: Rating is the impact upon the Assessment Criteria, which may be a risk, difficulty, etc: (The Rating is used in Table 2 to determine the Score for each option.)

1	High negative risk, impact, or difficulty
2	Difficulties encountered, which can be managed with special treatment
3	Moderately straightforward with a low degree of difficulty
4	Low negative impact
5	Very low negative impact / excellent

TWEED SHIRE COUNCIL **APPENDIX B**

TWEED DISTRICT WATER SUPPLY AUGMENTATION OPTIONS STUDY

TABLE 2: DETERMINATION OF FINE SCREEN SCORES AND RANKINGS

MULTI CRITERIA ANALYSIS FOR THE ASSESSMENT OF SHORTLISTED OPTIONS

		GOVERNANCE ASSESSMENT CRITERIA									ECONOMIC ASSESSMENT CRITERIA									SOCIAL ASSESSMENT CRITERIA						ENVIRONMENTAL ASSESSMENT CRITERIA							
	Option	Secure Yield			Planning Obligations			Legislative Acceptability			Established Technologies & Feasibility			Lead Time for Construction & Potential for Escalation of Costs			Capital, Operations, NPV & Levelised Cost per ML			Social Impacts			Cultural Heritage Impacts			Environmental Constraints			Greenhouse Gas & Energy Consumption			Total Score	Rank
No.	Description	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	0ut of 360	
1	Raising Clarrie Hall Dam	5	9	45	3	7	21	4	7	28	5	7	35	3	3	9	4	7	28	2	7	14	3	9	27	3	9	27	4	7	28	262	1
2	New Byrrill Creek Dam	5	9	45	2	7	14	2	7	14	5	7	35	1	3	3	4	7	28	2	7	14	2	9	18	2	9	18	3	7	21	210	3
5	Pipeline to SEQ Water Grid	3	9	27	2	7	14	1	7	7	5	7	35	2	3	6	2	7	14	4	7	28	3	9	27	4	9	36	3	7	21	215	2
COMBINED	Pipeline to Rous Water	2			3			4			5			4			1			4			4			4			3				
	Pipeline to SEQ Water Grid	3	9	21.0	2	7	21.0	1	7	18.7	5	7	32.7	2	3	10.0	2	7	16.3	4	7	25.7	3	9	33.0	4	9	39.0	3	7	21.0	238	The score of the combined option is not directly comparable to those of the other three options.
	Groundwater (Tweed River alluvium)	2			4			3			4			4			4			3			4			5			3				
COMBINED	Pipeline to Rous Water	2			3			4			5			4			1			4			4			4			3				
	Pipeline to SEQ Water Grid	3	9	27.0	2	7	18.7	1	7	18.7	5	7	32.7	2	3	9.0	2	7	9.3	4	7	25.7	3	9	33.0	4	9	36.0	3	7	18.7	229	The score of the combined option is not directly comparable to those of the other three options.
	Groundwater (Coastal)	4			3			3			4			3			1			3			4			4			2				

Notes: **Rating** is the impact upon the Assessment Criteria, which may be a risk, difficulty, etc:

- **1 =** High negative risk, impact, or difficulty
- **2 =** Difficulties encountered, which can be managed with special treatment
- **3 =** Moderately straightforward with a low degree of difficulty
- **4 =** Low negative impact
- **5 =** Very low negative impact / excellent

WF is the weighting factor, which is the relative level of significance placed on the Assessment Criteria as follows:

- **1 =** Very Low
- **3 =** Low
- **5 =** Moderate
- **7 =** High
- **9 =** Very High

Score is the product of the Rating and Weighting Factor to identify the preferred options for the Fine Screen

Rank is the relative preference from most preferred (ranked 1) to least preferred (ranked 9), based on the comparison of scores from all assessment criteria.

TWEED SHIRE COUNCIL **APPENDIX B**

TWEED DISTRICT WATER SUPPLY AUGMENTATION OPTIONS STUDY

TABLE 3: DETERMINATION OF FINE SCREEN SCORES AND RANKINGS BASED ON EVENLY WEIGHTED QBL

MULTI CRITERIA ANALYSIS FOR THE ASSESSMENT OF SHORTLISTED OPTIONS

		GOVERNANCE ASSESSMENT CRITERIA									ECONOMIC ASSESSMENT CRITERIA									SOCIAL ASSESSMENT CRITERIA						ENVIRONMENTAL ASSESSMENT CRITERIA							
	Option	Secure Yield			Planning Obligations			Legislative Acceptability			Established Technologies & Feasibility			Lead Time for Construction & Potential for Escalation of Costs			Capital, Operations, NPV & Levelised Cost per ML			Social Impacts			Cultural Heritage Impacts			Environmental Constraints			Greenhouse Gas & Energy Consumption			Total Score	Rank
No.	Description	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	0ut of 240	
1	Raising Clarrie Hall Dam	5	4	20	3	4	12	4	4	16	5	5	25	3	2	6	4	5	20	2	5	10	3	7	21	3	7	21	4	5	20	171	1
2	New Byrrill Creek Dam	5	4	20	2	4	8	2	4	8	5	5	25	1	2	2	4	5	20	2	5	10	2	7	14	2	7	14	3	5	15	136	3
5	Pipeline to SEQ Water Grid	3	4	12	2	4	8	1	4	4	5	5	25	2	2	4	2	5	10	4	5	20	3	7	21	4	7	28	3	5	15	147	2
COMBINED	Pipeline to Rous Water	2			3			4			5			4			1			4			4			4			3				
	Pipeline to SEQ Water Grid	3	4	9.3	2	4	12.0	1	4	10.7	5	5	23.3	2	2	6.7	2	5	11.7	4	5	18.3	3	7	25.7	4	7	30.3	3	5	15.0	163	The score of the combined option is not directly comparable to those of the other three options.
	Groundwater (Tweed River alluvium)	2			4			3			4			4			4			3			4			5			3				
COMBINED	Pipeline to Rous Water	2			3			4			5			4			1			4			4			4			3				
	Pipeline to SEQ Water Grid	3	4	12.0	2	4	10.7	1	4	10.7	5	5	23.3	2	2	6.0	2	5	6.7	4	5	18.3	3	7	25.7	4	7	28.0	3	5	13.3	155	The score of the combined option is not directly comparable to those of the other three options.
	Groundwater (Coastal)	4			3			3			4			3			1			3			4			4			2				

Notes: **Rating** is the impact upon the Assessment Criteria, which may be a risk, difficulty, etc:

- **1 =** High negative risk, impact, or difficulty
- **2 =** Difficulties encountered, which can be managed with special treatment
- **3 =** Moderately straightforward with a low degree of difficulty
- **4 =** Low negative impact
- **5 =** Very low negative impact / excellent

WF is the weighting factor, which is the relative level of significance placed on the Assessment Criteria as follows:

- **1 =** Very Low
- **3 =** Low
- **5 =** Moderate
- **7 =** High
- **9 =** Very High

Score is the product of the Rating and Weighting Factor to identify the preferred options for the Fine Screen

Rank is the relative preference from most preferred (ranked 1) to least preferred (ranked 9), based on the comparison of scores from all assessment criteria.

TWEED SHIRE COUNCIL **APPENDIX B**

TWEED DISTRICT WATER SUPPLY AUGMENTATION OPTIONS STUDY

TABLE 4: DETERMINATION OF FINE SCREEN SCORES AND RANKINGS BASED ON CWG RATIONALE

MULTI CRITERIA ANALYSIS FOR THE ASSESSMENT OF SHORTLISTED OPTIONS

		GOVERNANCE ASSESSMENT CRITERIA									ECONOMIC ASSESSMENT CRITERIA									SOCIAL ASSESSMENT CRITERIA						ENVIRONMENTAL ASSESSMENT CRITERIA							
	Option	Secure Yield			Planning Obligations			Legislative Acceptability			Established Technologies & Feasibility			Lead Time for Construction & Potential for Escalation of Costs			Capital, Operations, NPV & Levelised Cost per ML			Social Impacts			Cultural Heritage Impacts			Environmental Constraints			Greenhouse Gas & Energy Consumption			Total Score	Rank
No.	Description	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	Rating	WF	Score	0ut of 240	
1	Raising Clarrie Hall Dam	5	4	20	3	4	12	4	4	16	5	5	25	3	2	6	4	5	20	2	7	14	3	7	21	3	9	27	4	7	28	189	1
2	New Byrrill Creek Dam	5	4	20	2	4	8	2	4	8	5	5	25	1	2	2	4	5	20	2	7	14	2	7	14	2	9	18	3	7	21	150	3
5	Pipeline to SEQ Water Grid	3	4	12	2	4	8	1	4	4	5	5	25	2	2	4	2	5	10	4	7	28	3	7	21	4	9	36	3	7	21	169	2
COMBINED	Pipeline to Rous Water	2			3			4			5			4			1			4			4			4			3				
	Pipeline to SEQ Water Grid	3	4	9.3	2	4	12.0	1	4	10.7	5	5	23.3	2	2	6.7	2	5	11.7	4	7	25.7	3	7	25.7	4	9	39.0	3	7	21.0	185	The score of the combined option is not directly comparable to those of the other three options.
	Groundwater (Tweed River alluvium)	2			4			3			4			4			4			3			4			5			3				
COMBINED	Pipeline to Rous Water	2			3			4			5			4			1			4			4			4			3				
	Pipeline to SEQ Water Grid	3	4	12.0	2	4	10.7	1	4	10.7	5	5	23.3	2	2	6.0	2	5	6.7	4	7	25.7	3	7	25.7	4	9	36.0	3	7	18.7	175	The score of the combined option is not directly comparable to those of the other three options.
	Groundwater (Coastal)	4			3			3			4			3			1			3			4			4			2				

Notes: **Rating** is the impact upon the Assessment Criteria, which may be a risk, difficulty, etc:

- **1 =** High negative risk, impact, or difficulty
- **2 =** Difficulties encountered, which can be managed with special treatment
- **3 =** Moderately straightforward with a low degree of difficulty
- **4 =** Low negative impact
- **5 =** Very low negative impact / excellent

WF is the weighting factor, which is the relative level of significance placed on the Assessment Criteria as follows:

- **1 =** Very Low
- **3 =** Low
- **5 =** Moderate
- **7 =** High
- **9 =** Very High

Score is the product of the Rating and Weighting Factor to identify the preferred options for the Fine Screen

Rank is the relative preference from most preferred (ranked 1) to least preferred (ranked 9), based on the comparison of scores from all assessment criteria.

Appendix C: Summary of Net Present Value and Levelised Cost per Megalitre

Tweed District Water Supply Augmentation Options Study
Stage 3 Fine Screen of Shortlisted Options
Net present Value and Annualised Cost per Megalitre

NPV with (5.0% Discount Rate)

	Option	Additional Secure Yield	CAPEX	Average Annual OPEX Over Project Life	NPV of All Costs (5.0% Discount Rate)	Levelised Cost
		ML/annum	$	$	$	$/ML
Option 1	Raise Clarrie Hall Dam	7,170	$34,450,000	$575,625	$40,158,955	$871
Option 2A	Byrill Creek Dam Construction (16,300 ML)	8,700	$45,437,500	$575,625	$50,172,426	$1,039
Option 2B	Byrill Creek Dam Construction (36,000 ML)	15,400	$67,355,000	$575,625	$70,146,967	$1,394
Option 5	Pipeline to SEQ Water Grid	7,300	$9,165,500	$8,508,347	$81,342,368	$3,190
Contingency Option (Tweed Alluvium)	**Total**	**5,100**	**$27,340,000**	**$8,848,144**	**$111,588,422**	**$2,639**
	Contingency Pipeline to Rous Water	1,800	$11,865,000	$4,395,725	$53,543,709	$3,605
	Contingency Pipeline to SEQ Water Grid	1,800	$4,475,000	$4,319,752	$46,466,681	$3,129
	Groundwater (Tweed Alluvium)	1,500	$11,000,000	$132,667	$11,578,032	$892
Contingency Option (Coastal Aquifer)	**Total**	**5,400**	**$55,340,000**	**$9,072,144**	**$139,553,438**	**$3,132**
	Contingency Pipeline to Rous Water	1,800	$11,865,000	$4,395,725	$53,543,709	$3,605
	Contingency Pipeline to SEQ Water Grid	1,800	$4,475,000	$4,319,752	$46,466,681	$3,129
	Groundwater (Coastal Aquifer)	1,800	$39,000,000	$356,667	$39,543,047	$2,662

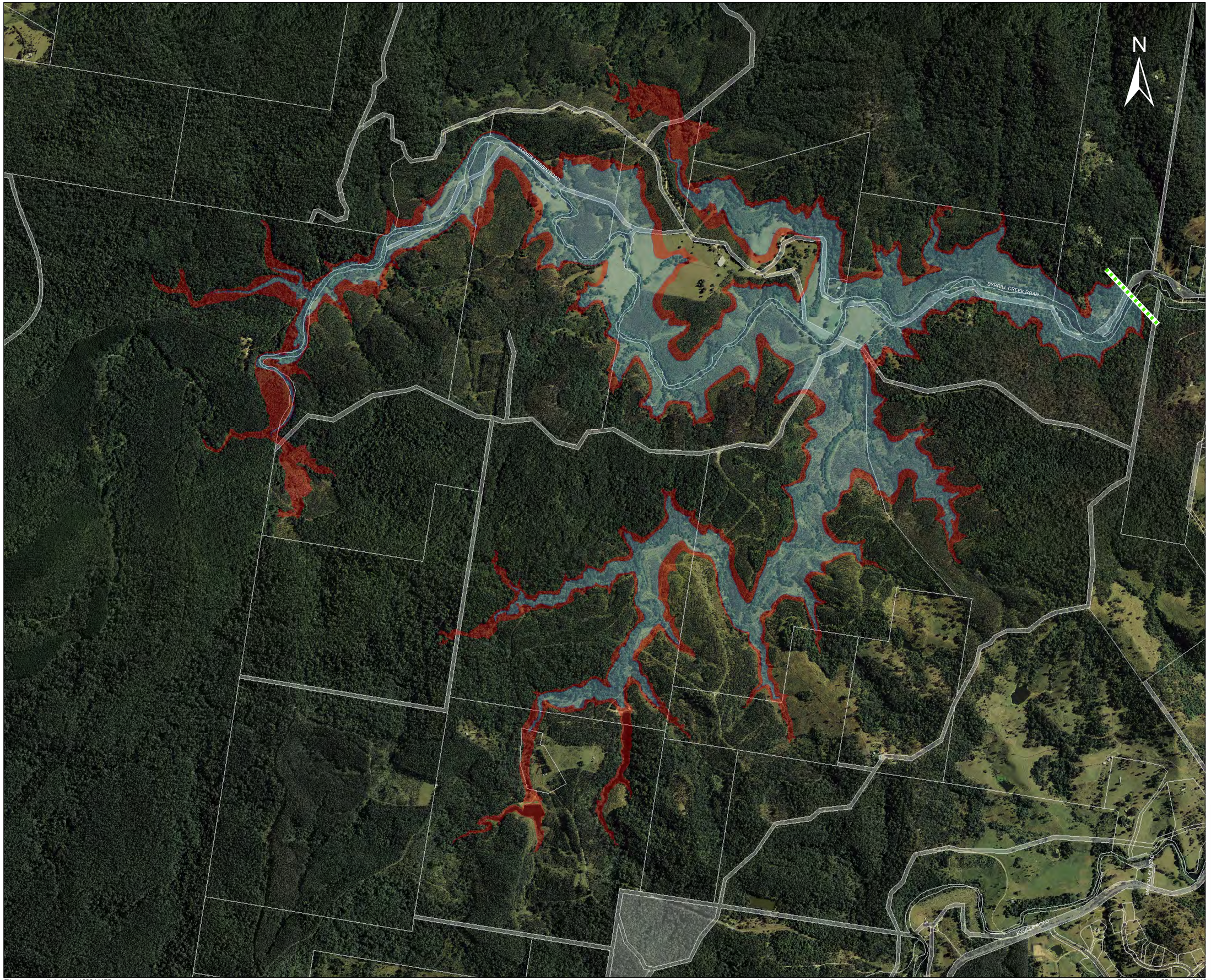
NPV with (7.0% Discount Rate)

	Option	Additional Secure Yield	CAPEX	Average Annual OPEX Over Project Life	NPV of All Costs (7.0% Discount Rate)	Levelised Cost
		ML/annum	$	$	$	$/ML
Option 1	Raise Clarrie Hall Dam	7,170	$34,450,000	$575,625	$36,144,904	$1,516
Option 2A	Byrill Creek Dam Construction (16,300 ML)	8,700	$45,437,500	$575,625	$45,829,810	$1,871
Option 2B	Byrill Creek Dam Construction (36,000 ML)	15,400	$67,355,000	$575,625	$65,148,938	$2,605
Option 5	Pipeline to SEQ Water Grid	7,300	$9,165,500	$8,508,347	$55,082,106	$3,408
Contingency Option (Tweed Alluvium)	**Total**	**5,100**	**$27,340,000**	**$8,848,144**	**$82,595,539**	**$2,911**
	Contingency Pipeline to Rous Water	1,800	$11,865,000	$4,395,725	$39,123,487	$3,935
	Contingency Pipeline to SEQ Water Grid	1,800	$4,475,000	$4,319,752	$32,644,033	$3,283
	Groundwater (Tweed Alluvium)	1,500	$11,000,000	$132,667	$10,828,019	$1,237
Contingency Option (Coastal Aquifer)	**Total**	**5,400**	**$55,340,000**	**$9,072,144**	**$109,007,083**	**$3,655**
	Contingency Pipeline to Rous Water	1,800	$11,865,000	$4,395,725	$39,123,487	$3,935
	Contingency Pipeline to SEQ Water Grid	1,800	$4,475,000	$4,319,752	$32,644,033	$3,283
	Groundwater (Coastal Aquifer)	1,800	$39,000,000	$356,667	$37,239,563	$3,745

NPV with (9.0% Discount Rate)

	Option	Additional Secure Yield	CAPEX	Average Annual OPEX Over Project Life	NPV of All Costs (9.0% Discount Rate)	Levelised Cost
		ML/annum	$	$	$	$/ML
Option 1	Raise Clarrie Hall Dam	7,170	$34,450,000	$575,625	$33,521,985	$2,469
Option 2A	Byrill Creek Dam Construction (16,300 ML)	8,700	$45,437,500	$575,625	$42,907,646	$3,112
Option 2B	Byrill Creek Dam Construction (36,000 ML)	15,400	$67,355,000	$575,625	$61,629,850	$4,426
Option 5	Pipeline to SEQ Water Grid	7,300	$9,165,500	$8,508,347	$39,226,052	$3,723
Contingency Option (Tweed Alluvium)	**Total**	**5,100**	**$27,340,000**	**$8,848,144**	**$63,985,703**	**$3,274**
	Contingency Pipeline to Rous Water	1,800	$11,865,000	$4,395,725	$29,871,589	$4,374
	Contingency Pipeline to SEQ Water Grid	1,800	$4,475,000	$4,319,752	$23,869,349	$3,495
	Groundwater (Tweed Alluvium)	1,500	$11,000,000	$132,667	$10,244,765	$1,689
Contingency Option (Coastal Aquifer)	**Total**	**5,400**	**$55,340,000**	**$9,072,144**	**$89,162,545**	**$4,352**
	Contingency Pipeline to Rous Water	1,800	$11,865,000	$4,395,725	$29,871,589	$4,374
	Contingency Pipeline to SEQ Water Grid	1,800	$4,475,000	$4,319,752	$23,869,349	$3,495
	Groundwater (Coastal Aquifer)	1,800	$39,000,000	$356,667	$35,421,607	$5,186

Appendix D: Plans of the Shortlisted Option



TWEED SHIRE WATER AUGMENTATION
BYRRILL CREEK DAM
(Proposed Size 16,300ML)

Legend

- Byrrill Creek Approximate Dam Crest Location
- Byrrill Dam Service Level (115.5m AHD Contour)
- Byrrill Dam Flood Level (121.5m AHD Contour)
- Road Reserve
- Property Boundaries

Note:
* Dam levels derived from LIDAR contours supplied to Tweed Shire Council by Fugro Spatial (June 2007)
* Levels are in meters AHD

0 112.5225 450 675 900
Metres

Civic and Cultural Centre
3 Tumbulgum Road
Murwillumbah NSW 2484

PO Box 816
Murwillumbah NSW 2484

T: (02) 6670 2400 | 1300 292 872
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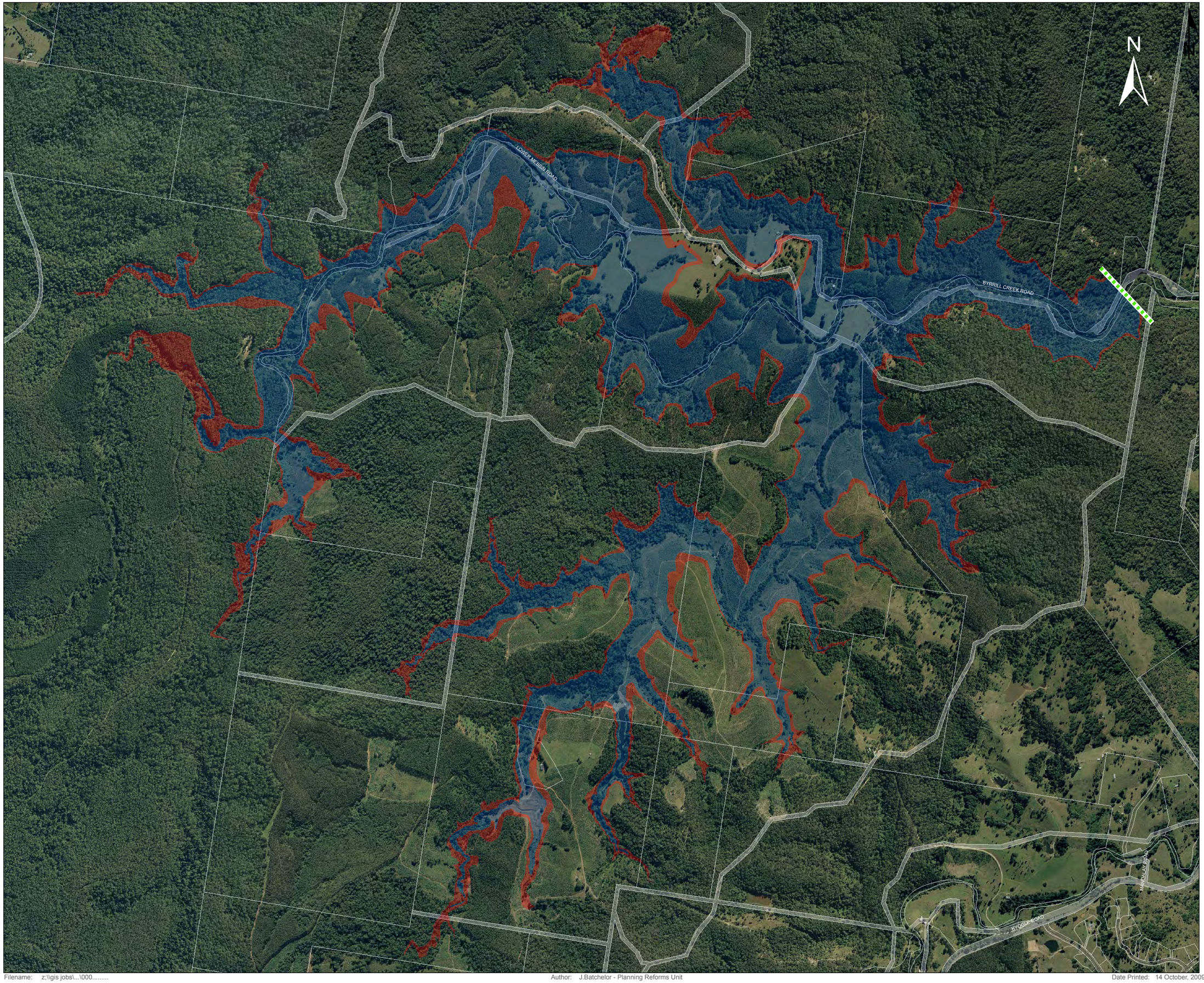
W: www.tweed.nsw.gov.au
E: planningreforms@tweed.nsw.gov.au

TWEED SHIRE COUNCIL

GDA
Coordinate System - MGA Zone 56 | Datum - GDA 94

Filename: z:\\gis jobs\...\00044175
Author: Leonard Moody - Engineering Unit
Date Printed: 25 August 2010



TWEED SHIRE WATER AUGMENTATION
BYRRILL CREEK DAM
(Proposed Size 36,000ML)

Legend

- Byrrill Creek Approximate Dam Crest Location
- Byrrill Dam Service Level (125m AHD Contour)
- Byrrill Dam Flood Level (130m AHD Contour)
- Property Boundaries
- Road Reserve

Note:
* Dam levels derived from LIDAR contours supplied to Tweed Shire Council by Fugro Spatial (June 2007)
* Levels are in meters AHD

0 100 200 400 600 800 Metres

Drawn: L.Moody (Engineering)
14 October 2009

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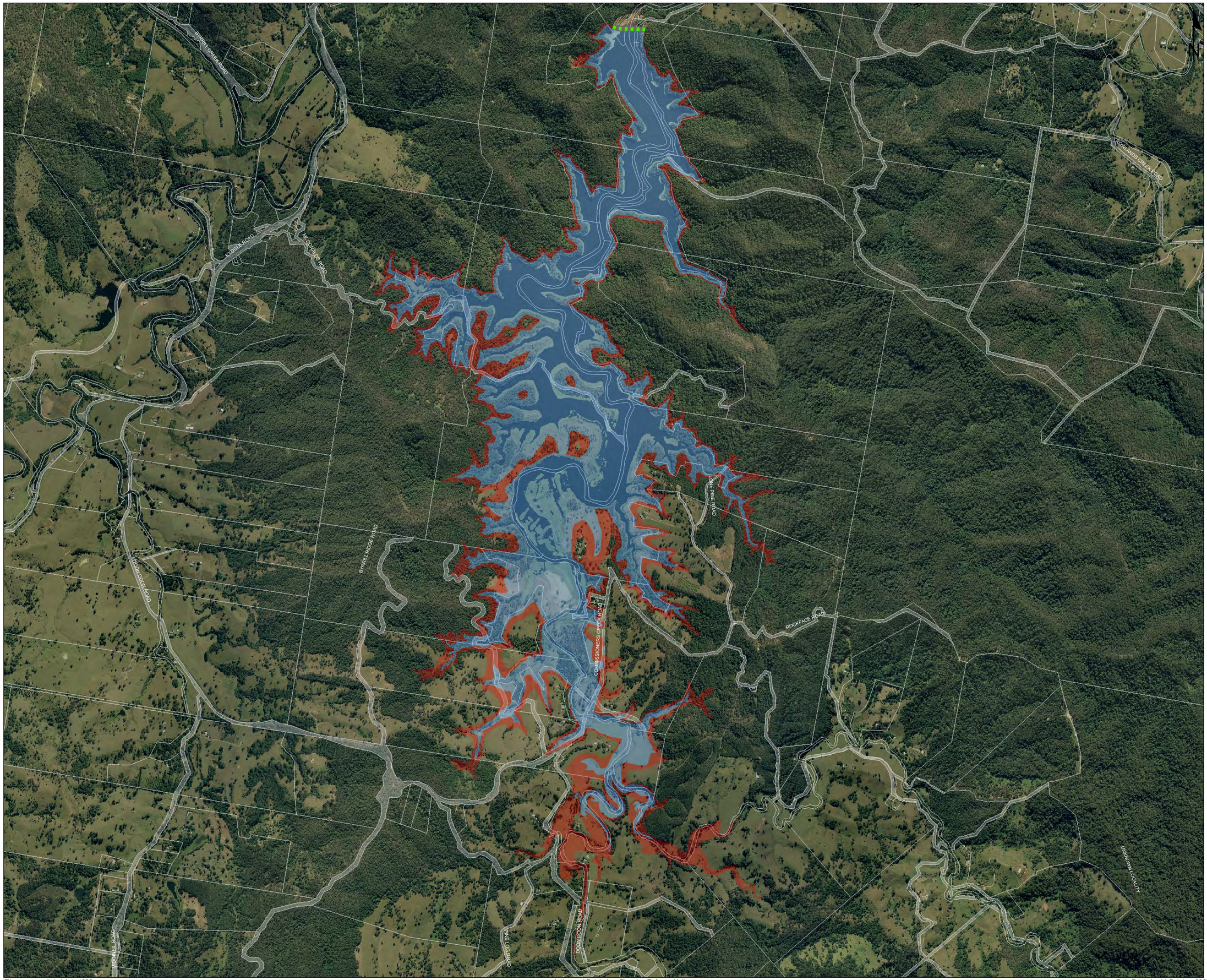

TWEED SHIRE WATER SUPPLY AUGMENTATION CLARRIE HALL DAM (Proposed Size 42,300ML)

N

Legend

- Existing Clarrie Hall Dam Crest Location
- Clarrie Hall Dam Service Level (70m AHD Contour)
- Clarrie Hall Dam Flood Level (77m AHD Contour)
- Road Reserve
- Property Boundaries

Note:
* Dam levels derived from LIDAR contours supplied to Tweed Shire Council by Fugro Spatial (June 2007)
* Levels are in meters AHD

0 150 300 600 900 1,200 Metres

Drawn: L.Moody (Engineering)
14 October 2009

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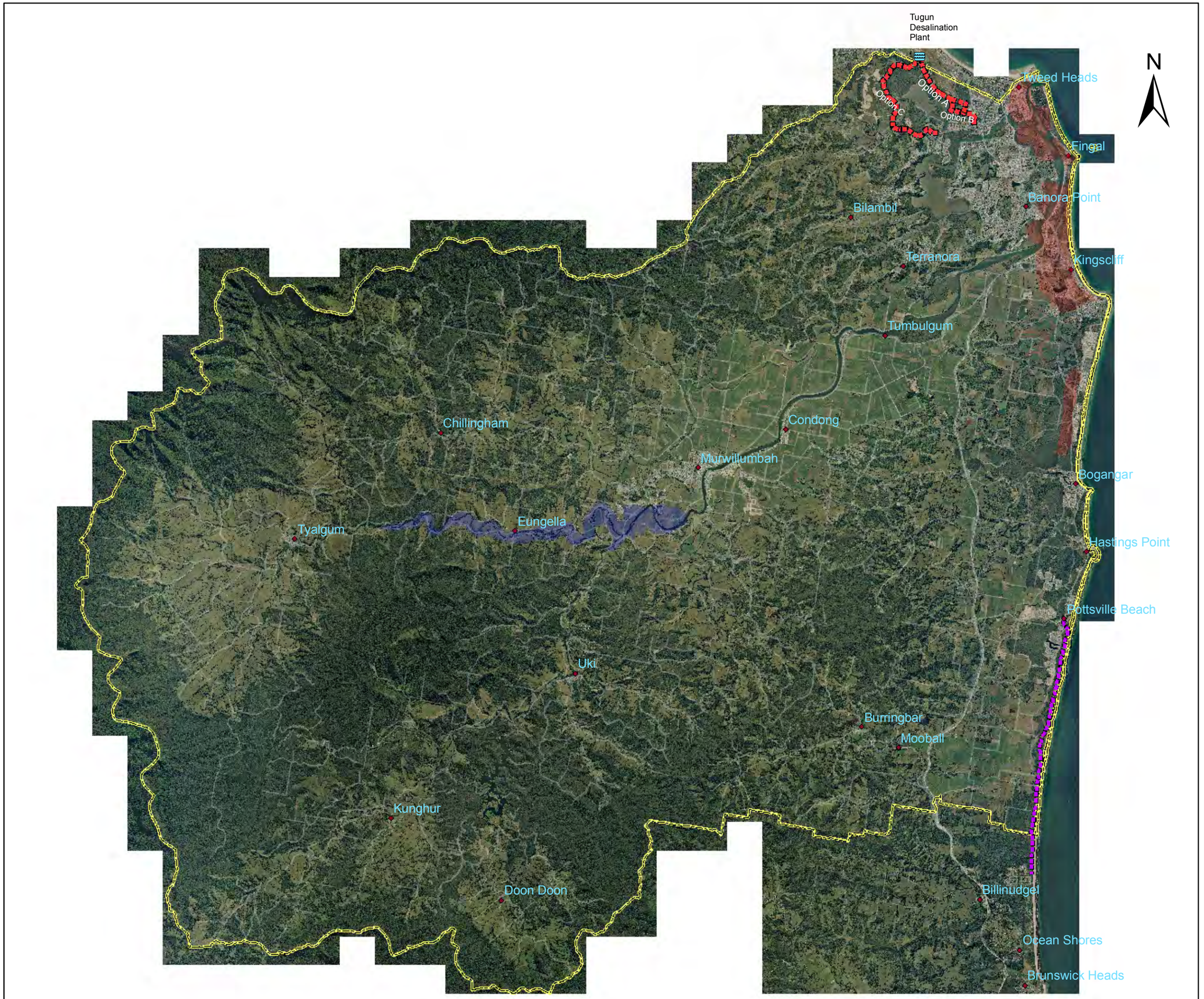
TWEED SHIRE WATER SUPPLY AUGMENTATION COMBINED CONTINGENCY OPTION (Pipelines and Groundwater)



Legend

- Tweed Shire LGA
- Pipeline to Rous Water
- Pipeline to SEQ water grid

Groundwater (approximate location)

Water quality and Yield

- 0-500mg/L Fresh>1.5L/s
- 1501-5000mg/L Fresh>2.5L/s

0 1,250 2,500 5,000 7,500 10,000 Metres

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Cadastre 14 October, 2009

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TWEED SHIRE WATER SUPPLY AUGMENTATION
(Pipeline to South East Queensland Water Grid)

Legend

- Proposed Pipeline to Gold Coast
- Tweed Shire LGA
- Property Boundaries
- Tweed Shire Localities

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Murwillumbah NSW 2484

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TWEED SHIRE COUNCIL

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Cadastre 14 October, 2009

Coordinate System - MGA Zone 56 | Datum - GDA 94

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Author: L.Moody (Engineering)

Date Printed: 12 July 2010

TWEED SHIRE COUNCIL

Submissions Report

Water Supply Augmentation Project

August 2010

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Table of Contents

Executive Summary

Aim of this Report

This report consolidates all feedback on the Water Supply Augmentation project received by Council from the Tweed community between October 2009 and May 2010.

Background

The Water Supply Augmentation project aims to ensure the ongoing security of the Tweed's water supply in the face of projected population growth.

Council's Demand Management Strategy highlighted that despite significant reductions in per capita water use (40% since 1992 plus equivalent planned future reductions) ongoing population growth will cause the existing water supply capacity to be exceeded.

The Water Supply System will require augmentation, probably some time between 2018 and 2023, depending on actual population growth and the success of demand management.

Process

A staged process has been followed which aims to ensure a wide range of options is considered, and that decisions are made based on information commensurate to the risks associated with that particular phase. The process aims to provide Council with the information and confidence it requires at each phase to make decisions that will reduce future risks.

Water Supply Augmentation Options Report

A Water Supply Augmentation Options study is being undertaken to determine the best way to augment the water supply to meet the Shire's needs until the end of the planning period in 2036. The first stage Coarse Screen Report identified nine options for analysis and ranked these options using multi criteria analysis (MCA).

The current phase 'Fine screen' assessment will determine which of the above options may be suitable for augmenting the water supply and which are not. The Fine Screen Report is informed through detailed studies and information from a comprehensive Community Consultation. The detailed information has been sourced through:

- Additional consultants reports focusing on environmental, cultural heritage, planning, and costing issues
- Consultation with stakeholder groups including potentially affected landholders, the Aboriginal community, government agencies, and community groups
- Consultation with residents and the Tweed community through a comprehensive six month process; including facilitation of an independent Community Working Group
- Improving ways for the community to provide feedback and submissions through a designated email address and Freecall 1800 number

This report consolidates all feedback on the Water Supply Augmentation project received by Council from the Tweed community between October 2009 and May 2010.

Community Consultation

The community was informed about the proposal and their feedback sought through the following avenues:

- Daily News advertisement on 28 January 2010, Tweed Link advertisements and articles on 26 January, 9 February and 16 February 2010, and media releases 12 January, 2 February 2010 inviting comments from the community and inviting the community to attend information days at Tweed Heads, Murwillumbah and Pottsville.
- A Community Working Group comprising of key representatives from the community met five times over a four month period to debate and discuss issues. The CWG produced a report of recommendations which informed the process.
- Council has attended regular meetings with the Aboriginal Advisory Committee and the Aboriginal Community.
- Three Community Information Sessions were held from 2pm to 7pm at:
  - Tweed Heads, Wednesday 10 February 2010
  - Murwillumbah, Thursday 18 February 2010
  - Pottsville, Tuesday 23 February 2010
- Free call 1800 telephone line enabling the public to have their questions answered and to take the effort out of writing a submission by making a 30 second verbal submission.
- Designated email address WaterTSC@tweed.nsw.gov.au to enable the community to contact Council's Water Unit directly.
- An Interested Parties Register to keep people and organisations informed of developments either by email or regular post. Over 100 people are registered and 13 circulars have been distributed.
- Council has made presentations to community groups including the Murwillumbah Rotary, the River Catchment Catch-up, the Aboriginal Advisory Committee, an open meeting of the Aboriginal Community, the Tweed River Committee, and Government Agencies.
- Multiple factsheets and reports to inform the community
- All factsheets and reports available online or at Council offices and libraries
- The date for submissions was extended following a request by the Community Working Group (CWG) to allow additional time for the community to make submissions

Submissions Report

Public feedback

There has been substantial public interest and feedback during this phase of community consultation and public exhibition, although compared to the overall populace the response is still very low, and it is unclear whether responses are representative of the views of the Shire's community.

Council has received community feedback from:

- A total of 159 submissions were received. One hundred and forty-six (146) of these were received by 30 April 2010 and another thirteen (13) submissions were accepted as late submissions.
- A total of approximately 40 members of the community who attended the three information sessions (Tweed Heads, Murwillumbah and Pottsville) to discuss water issues including demand management.

- The Community Working Group provided recommendations regarding the options and Council's approach.
- Over 60 phone calls were received by the 1800 Freecall telephone service centre relating to demand management issues.

Issues raised

Issues raised by these respondents included concerns about:

- Population growth, population projections and the carrying capacity of the Tweed
- New developments should be required to be more sustainable.
- More focus on demand before supply: Water substitution and alternative water sources should be pursued, and Council to support rebates and retrofits.
- Better education, higher water pricing, and communication of water use required. Meter individual dwellings in Retirement Villages and Multi-Unit Complexes
- An independent review of Council's approach to water required
- The adequacy of the CWG and community consultation. The need for a mechanism to better engage the broader community.
- The appropriateness of the starting point for the consultation process
- Understanding that there is a need for augmentation. Each of the four options has benefits and disadvantages

The full report provides further detail on these issues.

Responses to issues raised

Many of the submissions repeated or raised similar issues. Council received 159 submissions, containing over 1000 individual matters or issues. The CWG report and the Community Information Sessions also raised a number of similar matters for consideration.

Due to the volume of issues raised, they were paraphrased and grouped for presentation purposes. In many instances the text is a combination of the most representative and significant wording from individual submissions. The name of entities that raised the same or similar issue were recorded next to the paraphrased text. This produced a list of some 400 issues which are contained in Appendix A.

These issues were then grouped further under header issues according to content (header issues are in grey in Appendix A). The full list of 97 header issues is contained in the discussion section of this report.

Upon review of the complete list of issues raised, the major issues of significance have been consolidated in the table below. High level responses and discussion to these issues are also provided.

Issue		Response
Issues 1 - 4	Population Issues - population restrictions / carrying capacity - population projections used - population is pushing augmentation	A number of population planning issues outside of the scope of the project were raised, including determining the region's carrying capacity and restricting population growth. These would need to be addressed by the relevant local, state and federal planning instruments. The accuracy of population projections was questioned. Council's projections were based on the sum of development area staging over the next 30 years and is considered more reliable than using annual percentage growth rates. Augmentation is required due to population growth. Council has a responsibility to provide an ongoing water supply and to ensure it gains approvals for a preferred augmentation option before more water is needed. It should be noted that the timing of the implementation will be based on monitoring of actual future population and water demand.
Issues 5 – 7.	Sustainability of new developments	Current planning and competition laws may serve to limit a councils' ability to mandate self sustaining communities or development. These issues would not preclude an individual developer from making a voluntary decision to build a self sustaining development, however Council can only work with developers to pursue options over and above the regulations in an opportunistic way.
Issues 8 - 10	Demand Management actions should be implemented and Council should take these into account when formulating options for the future of Tweed's water supply.	This approach is the basis of Council's Integrated Water Cycle Management (IWCM) Strategy to produce a balanced and integrated water strategy. Demand has been looked at first. Supply is only being looked at because a supply short-fall was identified during the focus on Demand Management. Demand management will continue to be an important part of Council's approach. At the same time Council must plan for the earliest date the additional water supply capacity would be required (between 2018-2027). If it is found that future demand management is more effective than what has been predicted, then augmentation of the system can be postponed until such time it is required.

Issue		Response
Issues 12- 26 and 87 - 90	Lack of consensus on the most appropriate method(s) and interest for water substitution / alternative sources: - dual reticulation (third pipe) water recycling - high volume rainwater tanks - indirect potable water recycling - stormwater reuse - greywater reuse	Council has assessed the feasibility of each of these alternatives plus grey/blackwater (4th pipe) and decentralised sewerage. Based on triple and quadruple bottom line assessments, these alternatives are less sustainable and have higher risks than the options recommended in the Demand Management Strategy and Supply Augmentation projects. Notwithstanding, the DMS recommends Council pursue opportunistic prospects where possible. Opportunities will depend on developments proposed and will be assessed by Council.
Issues 54- 61 and 96 - 97	Lack of consensus on Council's approach and on the most appropriate method(s) to augment the water supply in terms of reduced environmental, social and economic impacts.	The range of views and responses highlight the difficult nature of the decision that must be made by Council. There is no perfect solution, and all options have positive and negative impacts. The MCA methodology is ideal for these complex assessments containing 'grey areas' where clear-cut decisions difficult. The MCA assesses all of the advantages and disadvantages against a quadruple bottom line to determine the overall best option. Council's cautious and staged approach aims at providing the best available data in order to make an informed decision to move to the next stage.
Issues 64 - 72	Mixed response to raising Clarrie Hall Dam, but generally greater support than the other options.	Impression in the community that raising Clarrie Hall Dam is least environmentally damaging since the impacts have mainly already occurred. Option is generally acceptable as long as demand management measures are put in place and approvals process ensures adequate mitigation measures. Landholders are concerned they won't be treated fairly.
Issues 73 - 77	Mixed response to constructing Byrrill Creek Dam, but generally far less support than the other options.	The community generally considers construction of Byrrill Creek Dam to have too high Social, Cultural Heritage & Environmental problems to be considered an option. The little support received focussed on benefits such as improved security through alternative rain catchment, Council owns most of the land, clean catchment surrounded by State and National Parks.

Issue		Response
Issues 78 – 82 and 91	Mixed response to constructing a pipeline to SEQ, but generally concern regarding the details of any relationship with SEQ.	The community has concerns that SEQ is eager to take water from Tweed, use of desalinated water has large energy requirements, and there is no guarantee the water will be available for the Tweed when required (ie during drought). However, the SEQ option does not consider sending water from the Tweed into Queensland, and any interbasin transfer would need to be looked at carefully and satisfy relevant State (and potentially Federal) government regulations.
Issues 83 - 86	Mixed response to the contingency option ranging from opposition to preference over inundation of irreplaceable rural areas	The community has concerns that while including a contingency option is good planning, the current option is flawed and could have impacts on agriculture. However any use of groundwater would be in accordance with strict licensing requirements set by State government agencies to ensure the sustainable use of the resource. Some in the community prefer pipeline and localised groundwater extraction in urbanising areas rather than inundating irreplaceable rural areas.
Issues 90 -95	External issues have not been considered.	Environmental considerations were taken into account in the assessment of options, with environmental considerations included in six of the ten MCA criteria. The analysis is based on option sustainability under a quadruple bottom line assessment. The studies investigating alternatives such as rainwater, recycling and stormwater accounted for flow-on effects such as potential benefits due to reduced discharges to receiving waters.
Issues 32 – 35	Use of education, promotion, pricing signals and rebates. More user-friendly format.	Education and promoting water savings and restrictions are key recommendations from the DMS. An "inclining block tariff" approach to pricing is recommended in the DMS and is in line with Council policy and best practice. Rebates for rainwater tanks were considered non cost-effective. Shower head rebates and home water audits are proposed as part of the DMS.

Issue		Response
Issues 42 – 45, 47 – 56 and 60 - 62	Independent review of Council's position, particularly: - population projections - climate change considerations - range of options - consideration of external environmental impacts	Given that all work to date has been carried out and cross-checked by a range of service providers recognised as experts in the water field, it is difficult for Council to justify further significant expenditure to have reviews carried out by additional experts. The approach to population projections is described above. Climate change modelling was taken into account to determine the Tweed's water supply capacity. Namely, modelling carried out by SE QLD and Rous Water which show that the secure yield in those adjacent regions could be reduced by between 7-15%. A number of independent experts and government authorities were involved in determining the maximum possible range of options for consideration. Alternatives were assessed on an industry standard approach using Triple and Quadruple Bottom Line approaches taking into consideration non-economic factors such as environmental benefits and impacts.
27 – 31, 36 – 41 & 49	Mixed response to CWG, community consultation and starting point.	The consultation process represented a major undertaking for Council, both in terms of time and resources. Feedback has been forwarded to Council's Marketing and Communication section for consideration in Council's Community Engagement Strategy. An observer from Southern Cross University provided an independent viewpoint of the process, and was generally supportive of Council's approach.

Aim of this Report

This report consolidates all feedback on the Water Supply Augmentation project received by Council from the Tweed community between October 2009 and May 2010.

The report:

- describes the historical context to Council's Water Supply Augmentation project
- lists the issues raised by the Tweed community regarding the project
- combines related issues in a summary table
- outlines how these will be / have been addressed by Council
- provides responses to issues where appropriate

Background

History

Integrated Water Cycle Management Strategy (IWCM)

Council's approach to water management has included a combination of focussed demand management and securing water supplies. Council's Integrated Water Cycle Management Strategy (IWCM 2006) incorporates 18 specific Strategy Actions.

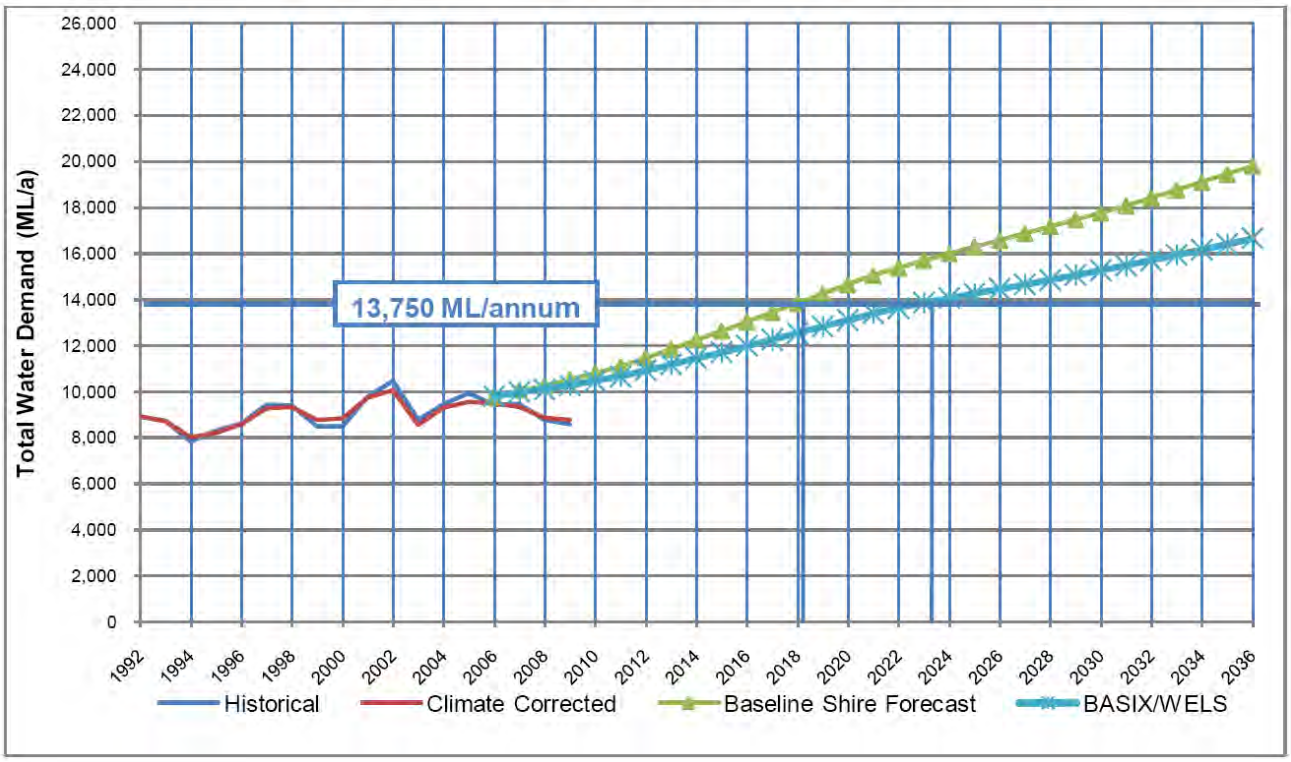
Action 1 of the IWCM aims at investigating ways to reduce potable water use, decrease water extractions from the environment, and increase the amount of water supplied from alternative sources such as water recycling and rainwater tanks. Council has been successful in reducing per capita water use by approximately 40% since the 1990's. The Demand Management Strategy (DMS) proposes ways to further reduce residential and non-residential demand and increase the amount of rainwater and recycled water utilised.

Action 7 of the IWCM focuses on improving the security and increasing the amount of water supplied. The results of Council's Demand Management Strategy highlighted that despite significant reductions in per capita water use ongoing population growth will mean that the existing water supply capacity will be exceeded.

Water Supply Augmentation Project

The Water Supply Augmentation project aims to ensure the ongoing security of the Tweed's water supply in the face of projected population growth.

Planning suggests the Water Supply System will require augmentation some time between 2018 and 2023, depending on actual population growth and the success of demand management.



Projected growth in Tweed Shire Annual Water Demand

Process

A staged process has been followed which aims to ensure a wide range of options is considered, and that decisions are made based on information commensurate to the risks associated with that particular phase. The process aims to provide Council with the information and confidence it requires at each phase to make decisions that will reduce future risks.

Water Augmentation Options

Water Supply Augmentation Options Report

A Water Supply Augmentation Options study is being undertaken to determine the best way to augment the water supply to meet the Shire's needs until the end of the planning period in 2036. The first stage Coarse Screen Report identified nine options for analysis and ranked these options using multi criteria analysis (MCA).

The current phase 'Fine screen' assessment will determine which of the above options may be suitable for augmenting the water supply and which are not. The Fine Screen Report is informed through detailed studies and information from a comprehensive Community Consultation. The detailed information has been sourced through:

- Additional consultants reports focusing on environmental, cultural heritage, planning, and costing issues
- Consultation with stakeholder groups including potentially affected landholders, the Aboriginal community, government agencies, and community groups
- Consultation with residents and the Tweed community through a comprehensive sixth month process; including facilitation of an independent Community Working Group
- Improving ways for the community to provide feedback and submissions through a designated email address and Freecall 1800 number

Options are being assessed based on their affects to social, environmental, governance and economic criteria.

Community consultation

Council has informed the community about the recommendations of the Coarse Screen Report and feedback has been sought through the following avenues:

- Daily News advertisement on 28 January 2010, Tweed Link advertisements and articles on 26 January, 9 February and 16 February 2010, and media releases 12 January, 2 February 2010 inviting comments from the community and inviting the community to attend information days at Tweed Heads, Murwillumbah and Pottsville.
- A Community Working Group comprising of key representatives from the community met five times over a four month period to debate and discuss issues. The CWG produced a report of recommendations which informed the process.
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- Free call 1800 telephone line enabling the public to have their questions answered and to take the effort out of writing a submission by making a 30 second verbal submission.
- Designated email address WaterTSC@tweed.nsw.gov.au to enable the community to contact Council's Water Unit directly.
- An Interested Parties Register to keep people and organisations informed of developments either by email or regular post. Over 100 people are registered and 13 circulars have been sent over the last sixth months.
- Council has made presentations to community groups including the Murwillumbah Rotary, the River Catchment Catch-up, the Aboriginal Advisory Committee, an open meeting of the Aboriginal Community, the Tweed River Committee, and Government Agencies.
- Multiple factsheets and reports to inform the community
- All factsheets and reports available online or at Council offices and libraries
- The date for submissions was extended following a request by the Community Working Group (CWG) to allow additional time for the community to make submissions

Public Participation

There has been substantial public interest and feedback during this phase of community consultation and public exhibition, although compared to the overall populace the response is still very low, and it is unclear whether responses are representative of the views of the Shire's community.

Council has received community feedback from:

- A total of 159 submissions were received. One hundred and forty-six (146) of these were received by 30 April 2010 and another thirteen (13) submissions were accepted as late submissions.

- A total of approximately 40 members of the community who attended the three information sessions (Tweed Heads, Murwillumbah and Pottsville) to discuss water issues including demand management.
- The Community Working Group provided recommendations regarding the options and Council's approach.
- Over 60 phone calls were received by the 1800 Freecall telephone service centre relating to demand management issues.

A number of submissions related to demand management issues, and the issues raised are referred to and dealt with in the Demand Management Strategy Submissions Report.

Submissions

Submissions received

Submissions were received from various sectors and geographical locations within the community as shown in the table below.

AREA	NUMBER
Murwillumbah, South Murwillumbah, Burringbar, Stokers Siding, North Tumbulgum, Reserve Crk, Farrants Hill	28
Uki, Byangum, Eungella, Smiths Creek	32
Commissioners Creek, Doon Doon	4
Byrrill Creek, Mt Burrell, Kunghur	20
Limpinwood, Pumpenbil, Tyalgum, Chillingham, Nobbys Creek	15
Fingal Head, Hastings Point, Kingscliff, Cudgera, Cudgen, Chinderah, Pottsville	18
Tweed Heads, Banora Point, Bilambil Heights, Terranora, Carool	14
Outside of Tweed Shire	12
Email only (no address)	6
Form only (no address)	1
CWG members (Individual comments from CWG Report)	10
CWG Report	1
TOTAL	**159**

Submissions were received from the following groups and individuals:

No.	Surname	Correspondence Details	Doc No.
1	Armfield, Gregory William	Email dated 7 March 2010	13723350
2	Baker, David	Email dated 30 April 2010	15723973
3	Barnett, Jade	Email dated 30 April 2010	15735878
4	Barnett, Kellie	Email dated 30 April 2010	15738046
5	Barron, Leonie Cheryl	Email dated 30 April 2010	15734849
6	Beltrame, Terry	Form 9 March 2010	13782563
7	Berg, David	Form 25 March 2010	14275524
8	Blackwell, Emily	Email dated 30 April 2010	15878842
9	Name withheld upon request	Form 3 May 2010	15887507

No.	Surname	Correspondence Details	Doc No.
10	Bolton, Kay	Form 25 March 2010	14275551
11	Bonar, Robert James	Email dated 30 April 2010	15730617
12	Bram, Nigel	Email dated 29 April 2010	15723892
13	Brodie, Steven	Email dated 25 April 2010	15679877
14	Budd, Derek K	Letter dated 5 November 2010	8598286
15	Caldera Environment Centre Inc	Letter **received** 3 May 2010	15934285
16	Caldera Environment Centre Inc - E. Hopkins	Letter **received** 3 May 2010	15934286
17	Caldera Environment Centre, Hopkins	Written submission	21252504
18	Campbell, William T	Email dated 26 February 2010	13338282
19	Carroll, Rob; Nimbin Environment Centre	Email dated 6 May 2010	16225705
20	Clarke	Written submission	21201194
21	Combined Tweed Rural Industries Association - Col Brooks	Letter dated 2 March 2010	13495860
22	Cooney, Graeme	Email dated 31 January 2010	12174467
23	Cornford, Robyn Elizabeth	Email dated 25 February 2010	13283995
24	Costello	Written submission	21202225
25	Cox, Margaret	Form dated 9 March 2010	13785816
26	Cudgen Progress Association	Written submission	11315157
27	Curtis, Wendy A	Email dated 30 April 2010	15922993
28	Davies G	Verbal submission	13730093
29	Name withheld upon request	Written submission	21202230
30	Dawe, Geoffrey Raymond	Form 11 December 2009	9887731
31	Dawe, Geoffrey Raymond	Letter dated 30 April 2010	15923002
32	Dawson, Samuel K	Email dated 30 April 2010	15723970
33	Duckworth	Written submission	21102672
34	Ehrlich, Ari	Email dated 30 april 2010	15878844
35	Eriksen, Diana Ruth	Email - attached to a Form - dated 25 April 2010	15676686
36	Evans	Written submission	10240178
37	Findlay, Elspeth	Email dated 1 May 2010	15878838
38	Fingal Head Coastcare	Written submission	21963352
39	Fuhrmann, Klaus	2nd Form dated 3 May 2010	15887523
40	Fuhrmann, Klaus	Form dated 3 May 2010	15887501
41	Gardner, Joanna	Letter dated 30 April 2010	15934351
42	Gardner	CD submission	21203309
43	Name withheld upon request	Form dated 24 March 2010	14236842
44	Graf, Roger	Email dated 19 February 2010 and email dated 10 November 2009 (to the General Manager for his information)	13123637
45	Graf, Roger	Email dated 30 April 2010	15740196
46	Haffer, Li	Email dated 30 April 2010	15734829
47	Hastings Point Progress Association,	Email dated 10 November 2009	8640479
48	Hastings Point Progress Association,	Email dated 29 April 2010	15690637
49	Havier, Mircalla Jadis	Email dated 30 April 2010	15735879
50	Hay, Jodie	Letter dated 26 April 2010	15983557

No.	Surname	Correspondence Details	Doc No.
51	Hayes, Jenny	Form 25 March 2010	14275519
52	Hearder, Susie	Email dated 30 April 2010	15735877
53	Hearder, Susie	Form dated 25 March 2010	14275521
54	Hollingsworth, Kim	Email dated 30 April 2010	15741467
55	Hollingsworth, Kim	Written submission	15741465
56	Name withheld upon request	Form dated 5 March 2010	13595094
57	Hoopmann, Robyn	Letter received 3 May 2010	15934352
58	Hudson, Deborah	Email dated 27 April 2010	15679889
59	Ingram	Written submission	21203313
60	Ipsen, Anthony	Email dated 29 April 2010	15723895
61	Jack, Elizabeth	Email dated 28 April 2010	15642351
62	Jack E	Written submission	21203313
63	Jack, Marie	Email dated 29 April 2010	15729572
64	Jack, Megan	Email dated 29 April 2010	15723897
65	Jack, Megan	Form dated 8 March 2010	13738559
66	James, Rhonda	Email dated 29 April 2010, Letter dated 27 April 2010	15723893
67	Kaye, Paulene	Letter dated 29 April 2010	15922999
68	Klaus	Written submission	21203313
69	Lanham Enterprises Pty Ltd	Form dated 30 March 2010, Letter dated 22 March 2010	14482610
70	Luca	Written submission	21203313
71	Lucas, Marie-Helene	Email dated 28 April 2010	15642350
72	Martin, Lisa	Email dated 29 April 2010	15683196
73	Mayfield, T H	Email dated 30 April 2010	15738061
74	Mayfield	Written submission	21203313
75	McConville, Stuart	Email dated 30 April 2010	15727449
76	McCormick, Fiona Dr	Email dated 30 April 2010	15738044
77	Mcinerney, Andrew	Letter received 3 May 2010	15934353
78	McNamara, Michael	Email dated 30 April 2010	15738059
79	McQueen, Bruce	Form dated 30 April 2010	15729530
80	Meath, Carol and Michael	Email dated 30 April 2010	15734850
81	Menzies, David	Email dated 26 April 2010	15679881
82	Merchant, Ellen Joyce	Email dated 30 April 2010	15738043
83	Milligan, James and Jennifer	Email dated 27 April 2010	15679883
84	Moore, Christine	Email dated 30 April 2010	15730611
85	Morrison, John	Email dated 29 April 2010	15723889
86	Murray, Tweed Heads Environment Group Inc	Written submission	21203313
87	O'Reilly, John	Email dated 30 April 2010	15878841
88	O'Toole, Brian Desmond	Form 11 Jan 2010 - containing letter that was received 29 December 2009	11315212
89	Outridge, Margo	Letter received 30 April 2010	15934350
90	Outridge, Mary Blane	Letter received 30 April 2010	15934348
91	Outridge, Mary Lou	Letter received 30 April 2010	15934349
92	Name withheld upon request	Form dated 28 April 2010	15634921
93	Pearce, Suzanne E	Form dated 9 March 2010	13773903
94	Pearson, Jenny	Letter received 30 April 2010	15934354
95	Pidgeon, Marcia	Email dated 8 March 2010	13731179
96	Piper, Mark	Email dated 23 February 2010	13175423

No.	Surname	Correspondence Details	Doc No.
97	Piper, Mark	Email dated 29 April 2010	15682068
98	Possenti, Paola Emma	Email dated 30 April 2010	15733811
99	Pottsville Community Dune Care	Written submission	21203313
100	Prince, Menkit	Email dated 29 April 2010	15723896
101	Purser, Shauna Lee	Email dated 29 April 2010	15723891
102	Name withheld upon request	Verbal submission	21203313
103	Ray, Bruce	Email dated 27 April 2010	15679891
104	Rich	Written submission	21203313
105	Riordan, Marion	Email dated 30 April 2010 attaching a letter dated 28 April 2010	15723898
106	Rotary Club of Kingscliff Inc	Written submission	21203313
107	Scanlan, Anthony William	Form dated 9 March 2010	13776065
108	Scorgie, Matthew	Letter received 28 April 2010	15676675
109	Sims, Melanie	Letter dated 27 April 2010	15676674
110	Sledge, Scott and Daniele Vionot	Email dated 27 April 2010	15679888
111	Sledge, Scott Dietrich	Form dated 18 November 2010	8994900
112	Sledge, Scott Dietrich	Form dated 24 November 2010, Submission dated 21 November 2010 (emailed 23 November 2010)	9283980
113	Sledge	Written submission	22100113
114	Sloane, Peter & Rosalie	Email dated 29 April 2010	15679898
115	Smith B	Written submission	21203313
116	Smith, Lindy	Letter dated 28 April 2010	15938491
117	Sonnenschein, Leslie Anne	Form dated 24 November 2010, Submission emailed 19 November 2010	9282938
118	Southern Cross University - Tweed Gold Coast Campus	Email dated 30 April 2010	15733812
119	Spragg, Robin C	Form dated 8 March 2010	13737490
120	Sta	Written submission	21203313
121	Stuart, Karen June	Email dated 30 April 2010	15723903
122	Styman, Brian	Form dated 29 April 2010	15691688
123	Summers, Brian	Email dated 30 April 2010	15723906
124	Summers, Brian	Form dated 5 March 2010	13546060
125	Symons, Peter	Letter dated 29 April 2010	15934347
126	Townsend, Janet & John	Letter dated 24 April 2010	15922996
127	Turner, Gaye Julie	Email dated 3 May 2010	15938492
128	Tweed District Residents & Ratepayers Association	Letter dated 19 April 2010	15922994
129	TweedCAN - Bush Regeneration Services	Email dated 2 May 2010 (containing a letter dated 30 April 2010)	15878836
130	Tyalgum Literary Institute & Progress Association	Form dated 18 January 2010Letter dated 31 December 2009	11616983
131	Tyman, John L	Email dated 30 April 2010	15735876
132	Uki Village & District Residents Association	Email dated 7 May 2010, Letter dated 6 May 2010	16223559
133	Name withheld upon request	Letter dated 29 April 2010	15934346
134	Vella	Written submission	21203313
135	Name withheld upon request	Written submission	21203313
136	Walton, Daniel	Form dated 11 January 2010, Email dated 29 October 2009	11322759

No.	Surname	Correspondence Details	Doc No.
137	Watsford, Penelope Jane	Letter dated 29 April 2010	15923000
138	Weatherley, Douglas Alfred	Form dated 2 February 2010, Letter dated 22 January 2010	12226546
139	Weber	Written submission	21203313
140	Welling, Uzume	Form dated 30 April 2010	15735919
141	Whittingham	Written submission	21203313
142	Wood, David	Letter dated 26 April 2010	15676673
143	Wrem, Don	Form dated 30 April 2010	15729535
144	Wuoti, Trevor John	Email dated 16 February 2010	12839682
145	Wuoti, Trevor John	Email dated 25 April 2010	15679875
146	Wuoti, Trevor John	Email dated 25 April 2010	15679878
147	Yeomans, Andrew Frederick	Email dated 29 April 2010	15690633
148	Name withheld upon request	Verbal submission	21203313
149	Community Working Group (CWG)	CWG report 10 March 2010	13828670
150	Allsop (CWG)	CWG report 10 March 2010	13828670
151	Beck (CWG)	CWG report 10 March 2010	13828670
152	Dawson (CWG)	CWG report 10 March 2010	13828670
153	Eberhard (CWG)	CWG report 10 March 2010	13828670
154	Edwards (CWG)	CWG report 10 March 2010	13828670
155	Gardner (CWG)	CWG report 10 March 2010	13828670
156	Learmonth (CWG)	CWG report 10 March 2010	13828670
157	Lemaire (CWG)	CWG report 10 March 2010	13828670
158	Murray (CWG)	CWG report 10 March 2010	13828670
159	Thompson (CWG)	CWG report 10 March 2010	13828670

The complete set of submissions received is bound under a separate cover “Submissions and feedback received – Water Supply Augmentation Project” and is available upon request. A detailed list of submission issues is contained in Appendix A. A summary of issues and responses follows in the discussion section.

Issues raised

Major issues raised in the submissions are grouped as follows:

1. The accuracy and sustainability of future population projections used
2. New developments should be required to be more sustainable
3. Water substitution and alternative water sources should be pursued.
4. Better education and higher water pricing required.
5. An independent review required
6. Mixed responses on the adequacy of the CWG and community consultation
7. Mixed responses to the starting point for the consultation process
8. Mixed responses to the short-listed options
    - a mixture of support and objection for Clarrie Hall Dam
    - Generally unsupportive of Byrrill Creek Dam
    - Generally unsupportive of SEQ pipeline

- Generally unsupportive of the components in the Emergency option

9. Improvements suggested for the MCA process

Public information sessions

Tweed Heads Public Information Session

The Public Information Session at Tweed Heads held from 2:00pm – 7:15pm on Wednesday 10 February 2010 at the South Sea Islander Room, Tweed Heads Civic Centre, Brett Street, Tweed Heads. It was attended by CWG members, Tweed Shire Council staff, and approximately 20 members of the public.

Murwillumbah Public Information Session

The Public Information Session at Murwillumbah was held from 2:00pm – 9:00pm on Thursday 18 February 2010, at the Canvas & Kettle Room, Murwillumbah Civic Centre, Murwillumbah. It was attended by CWG members, Tweed Shire Council staff, and approximately 12 members of the public.

Pottsville Public Information Session

The Public Information Session at Pottsville held from 2:00pm – 7:00pm on Tuesday 23 February 2010 at the Pottsville Environment Centre, Centennial Drive, Pottsville. It was attended by CWG members, Tweed Shire Council staff, and approximately 5 members of the public.

Issues raised

Major issues raised during public information sessions are grouped as follows:

1. Council is looking at both demand and supply sides of water.
2. New developments are not sustainable and should be required to be more sustainable
3. Water substitution and alternative water sources should be pursued. Council to support rebates and retrofits.
4. Better education, higher water pricing, and communication of water use required. Meter individual dwellings in Retirement Villages and Multi-Unit Complexes
5. Good that 40% reduction in water use since 1992, understandable that future savings will require more effort per litre saved. What additional regulations would help Council to enforce more demand management actions?
6. Water unit staff have been helpful and information is available and forthcoming.
7. CWG members should “get on with it” and not concentrate on “administrative” issues.
8. There is a need for augmentation. Four options presented are limited. Each of the four options has benefits and disadvantages
9. Options should avoid a dam at Byrrill Creek, reduce extractions and discharges in the river system
10. Compensation commitments were not honoured with original Clarrie Hall Dam
11. Current planning legislation out of step with community wants. Council can’t force developers to implement recycled water in new developments. Queensland can, but NSW has BASIX.

Notes from each of the public information sessions are contained in the appendices to this report. A summary of issues and responses follows in the discussion section.

Community Working Group

The Community Working Group (CWG) was primarily formed to provide information to Council regarding four shortlisted water supply augmentation options. The CWG also provided feedback on demand management issues.

CWG Report

The CWG produced a report covering these issues. It presents the views, interests and issues of members together with a summary of group recommendations. Council was presented with the report 5 March 2010. At its meeting of 16 March 2010, Council determined to publically display the report, and the report was placed on public display to provide other members of the community with additional information prior to the close of submission at the end of April. The full report is available on Council's website: http://www.tweed.nsw.gov.au/Water/WaterSupplyAugmentationWorkingGroup.aspx

Issues raised

Major issues relevant to the Water Supply Augmentation which the CWG raised in its report:

1. The accuracy and sustainability of future population projections used
2. More focus on demand before supply
3. An independent review required
4. Water substitution and alternative water sources should be pursued.
5. Climate change to be taken into account
6. Costs have taken finances but not the environment into account
7. Mixed responses to the starting point for the consultation process
8. Guarded support for Clarrie Hall Dam
    - considering many impacts have already occurred and will not be avoided
    - on the condition that Council implements demand management actions
9. Strong objection (though not unanimous) for Byrrill Creek Dam
10. Generally unsupportive of SEQ pipeline
11. Generally unsupportive of the components in the Emergency option
12. Improvements suggested for the MCA process

The CWG also made a number of suggestions for future community engagement:

13. Needed a mechanism to better engage the broader community who are generally complacent unless you discuss with them directly.
14. While the CWG has learnt a lot from the process adopted, the CWG felt uncomfortable speaking on behalf of the whole Tweed community, and encourages

Council to seek additional ways to engage the whole community in this process in the future.

Discussion

Summary of issues and responses

Upon review of the complete list of issues, the major issues of significance have been consolidated in the table below. High level responses and discussion to these issues are also contained in the table.

	Issue	Response
Issues 1 - 4	Population Issues - population restrictions / carrying capacity - population projections used - population is pushing augmentation	A number of population planning issues outside of the scope of the project were raised, including determining the region's carrying capacity and restricting population growth. These would need to be addressed by the relevant local, state and federal planning instruments. The accuracy of population projections was questioned. Council's projections were based on the sum of development area staging over the next 30 years and is considered more reliable than using annual percentage growth rates. Augmentation is required due to population growth. Council has a responsibility to provide an ongoing water supply and to ensure it gains approvals for a preferred augmentation option before more water is needed. It should be noted that the timing of the implementation will be based on monitoring of actual future population and water demand.
Issues 5 – 7.	Sustainability of new developments	Current planning and competition laws may serve to limit a councils' ability to mandate self sustaining communities or development. These issues would not preclude an individual developer from making a voluntary decision to build a self sustaining development, however Council can only work with developers to pursue options over and above the regulations in an opportunistic way.

Issue		Response
Issues 8 - 10	Demand Management actions should be implemented and Council should take these into account when formulating options for the future of Tweed's water supply.	This approach is the basis of Council's Integrated Water Cycle Management (IWCM) Strategy to produce a balanced and integrated water strategy. Demand has been looked at first. Supply is only being looked at because a supply short-fall was identified during the focus on Demand Management. Demand management will continue to be an important part of Council's approach. At the same time Council must plan for the earliest date the additional water supply capacity would be required (between 2018-2027). If it is found that future demand management is more effective than what has been predicted, then augmentation of the system can be postponed until such time it is required.
Issues 12- 26 and 87 - 90	Lack of consensus on the most appropriate method(s) and interest for water substitution / alternative sources: - dual reticulation (third pipe) water recycling - high volume rainwater tanks - indirect potable water recycling - stormwater reuse - greywater reuse	Council has assessed the feasibility of each of these alternatives plus grey/blackwater (4th pipe) and decentralised sewerage. Based on triple and quadruple bottom line assessments, these alternatives are less sustainable and have higher risks than the options recommended in the Demand Management Strategy and Supply Augmentation projects. Notwithstanding, the DMS recommends Council pursue opportunistic prospects where possible. Opportunities will depend on developments proposed and will be assessed by Council.
Issues 54- 61 and 96 - 97	Lack of consensus on Council's approach and on the most appropriate method(s) to augment the water supply in terms of reduced environmental, social and economic impacts.	The range of views and responses highlight the difficult nature of the decision that must be made by Council. There is no perfect solution, and all options have positive and negative impacts. The MCA methodology is ideal for these complex assessments containing 'grey areas' where clear-cut decisions difficult. The MCA assesses all of the advantages and disadvantages against a quadruple bottom line to determine the overall best option. Council's cautious and staged approach aims at providing the best available data in order to make an informed decision to move to the next stage.

Issue		Response
Issues 64 - 72	Mixed response to raising Clarrie Hall Dam, but generally greater support than the other options.	Impression in the community that raising Clarrie Hall Dam is least environmentally damaging since the impacts have mainly already occurred. Option is generally acceptable as long as demand management measures are put in place and approvals process ensures adequate mitigation measures. Landholders are concerned they won't be treated fairly.
Issues 73 - 77	Mixed response to constructing Byrrill Creek Dam, but generally far less support than the other options.	The community generally considers construction of Byrrill Creek Dam to have too high Social, Cultural Heritage & Environmental problems to be considered an option. The little support received focussed on benefits such as improved security through alternative rain catchment, Council owns most of the land, clean catchment surrounded by State and National Parks.
Issues 78 – 82 and 91	Mixed response to constructing a pipeline to SEQ, but generally concern regarding the details of any relationship with SEQ.	The community has concerns that SEQ is eager to take water from Tweed, use of desalinated water has large energy requirements, and there is no guarantee the water will be available for the Tweed when required (ie during drought). However, the SEQ option does not consider sending water from the Tweed into Queensland, and any interbasin transfer would need to be looked at carefully and satisfy relevant State (and potentially Federal) government regulations.
Issues 83 - 86	Mixed response to the contingency option ranging from opposition to preference over inundation of irreplaceable rural areas	The community has concerns that while including a contingency option is good planning, the current option is flawed and could have impacts on agriculture. However any use of groundwater would be in accordance with strict licensing requirements set by State government agencies to ensure the sustainable use of the resource. Some in the community prefer pipeline and localised groundwater extraction in urbanising areas rather than inundating irreplaceable rural areas.
Issues 90 -95	External issues have not been considered.	Environmental considerations were taken into account in the assessment of options, with environmental considerations included in six of the ten MCA criteria. The analysis is based on option sustainability under a quadruple bottom line assessment. The studies investigating alternatives such as rainwater, recycling and stormwater accounted for flow-on effects such as potential benefits due to reduced discharges to receiving waters.

Issue		Response
Issues 32 – 35	Use of education, promotion, pricing signals and rebates. More user-friendly format.	Education and promoting water savings and restrictions are key recommendations from the DMS. An "inclining block tariff" approach to pricing is recommended in the DMS and is in line with Council policy and best practice. Rebates for rainwater tanks were considered non cost-effective. Shower head rebates and home water audits are proposed as part of the DMS.
Issues 42 – 45, 47 – 56 and 60 - 62	Independent review of Council's position, particularly: - population projections - climate change considerations - range of options - consideration of external environmental impacts	Given that all work to date has been carried out and cross-checked by a range of service providers recognised as experts in the water field, it is difficult for Council to justify further significant expenditure to have reviews carried out by additional experts. The approach to population projections is described above. Climate change modelling was taken into account to determine the Tweed's water supply capacity. Namely, modelling carried out by SE QLD and Rous Water which show that the secure yield in those adjacent regions could be reduced by between 7-15%. A number of independent experts and government authorities were involved in determining the maximum possible range of options for consideration. Alternatives were assessed on an industry standard approach using Triple and Quadruple Bottom Line approaches taking into consideration non-economic factors such as environmental benefits and impacts.
27 – 31, 36 – 41 & 49	Mixed response to CWG, community consultation and starting point.	The consultation process represented a major undertaking for Council, both in terms of time and resources. Feedback has been forwarded to Council's Marketing and Communication section for consideration in Council's Community Engagement Strategy. An observer from Southern Cross University provided an independent viewpoint of the process, and was generally supportive of Council's approach.

Detailed issues and responses

Review of the complete list of issues found that many issues were referred to by multiple submissions. To enable more efficient review of all issues, these submissions were grouped together under headings based on the issues raised.

Methodology

Many of the submissions repeated or raised similar issues. Council received 159 submissions, containing over 1000 individual matters or issues. The CWG report and the Community Information Sessions also raised a number of similar matters for consideration.

Due to the volume of issues raised, they were paraphrased and grouped for presentation purposes. In many instances the text is a combination of the most representative and significant wording from individual submissions. The name of entities that raised the same or similar issue were recorded next to the paraphrased text. This produced a list of some 400 issues.

These issues were then grouped further under header issues according to content (refer Appendix A). The full list of 97 header issues is contained in the table below, together with detailed responses to each one.

Thus it should be noted that issues listed are not an attempt to record individual submissions word-for-word but are Council's best attempt to consolidate the number of issues, record those raising a similar issue, and enable responses to be drafted effectively.

Appendix A shows which individual comments on related topics have been grouped into header issues.

The complete set of submissions received is bound under a separate cover "Submissions and feedback received – Water Supply Augmentation Project" and is available upon request.

Issues and responses table

Responses and discussion to heading issues are contained in the table below.

No.	ISSUE	RESPONSE
	Planning Issues	
	Demand Projections	
1	Demand has not increased in recent years despite increasing population. Why does Council expect demand to increase in the future if the trend is towards lower usage per person?	Water conservation efforts in both the residential and non-residential sectors, Council's pricing reforms, and the 2002-3 drought have meant that per capita demand has dropped significantly since 1992. The usual pattern of large initial savings followed by continued smaller savings will mean that further per capita reductions will become increasingly difficult. Given the anticipated continued population growth in the shire, coupled with consolidation of per captia demand (even with the adoption of the recommended demand management measures) overall demand is expected to increase to the point that the secure yield of the existing water supply sources would be exceeded.
	Population issues	
2A	Population expectations and projections used are considered too high for the Tweed's future sustainability. The assumption that the population needs to double is flawed. The community has not given its consent to doubling the population.	This is a regional planning and infrastructure issue, rather than an isolated water demand and supply issue. Council has determined the potential population yield from the current LEP zonings (which have not significantly changed since the first LEP revision under the EP&A Act in the late 1980's). Urban land release sites already zoned for development mean that the population of the Tweed is allowed to double in the future. The rate of growth was based on the characteristics of each development area and its likely staging over the next 30 years. This was considered a more reliable population projection than to simply apply a per centage growth rate each year. Population growth figures are confirmed in the "Tweed Urban and Employment Lands Release Strategy" (GHD, 2009) which was released in 2009. Appendix A of the Stage 1 DMS report provides a detailed explanation of how population growth was determined. The augmentation strategy is a response to population increases based on the population capacity of currently zoned lands. The land zoned currently zoned for development would need to be changed to reduce the predicted population level.

No.	ISSUE	RESPONSE
2B	There is a lot of support for a population cap, but who will determine the cut-off point and how could this be enforced? Population can't be capped, but we can control growth to levels that our environment can handle by slowly staged development. The instruments for this are the Far North Coast Regional Strategy and the TSC Urban and Employment Strategy.	Tweed Council can make supported representation to the State government about its views on the carrying capacity of the Tweed's threshold limits to support future populations however, ultimately it is the State government who guides the population growth in each local government area. It is Tweed Council's role to make provision for that projected population through housing, employment and service infrastructure provision.
3	The population debate is an issue that will not go away. It needs to be addressed by a mechanism (eg inquiry) that identifies a sustainable population level for the Tweed.	Determining the threshold limits to carrying capacity of a given area (LGA) cannot be done in isolation and would need to be coordinated and agreed on at a State and Federal level. In this situation, the Water Supply Strategy would be amended to match. Refer to responses to Issues 2 and 2.3
4	If Council's population estimates are overestimated, then augmentation could be delayed and allow development of better water saving programs in the five new major developments and infill areas.	Ackowledged, population growth will be monitored and projections will be updated as required. Council has a repsonsibility to provide an ongoing water supply. To this end Council needs to ensure it gains approvals for a preferred augmentation option in advance, however the timing and implementation of the preferred scheme will be dependent on actual population growth and actual water demand.
	Sustainability of new housing developments	
5	New developments should be permitted only if they are sustainable, self-sufficent and are not dependent on the Shire's water grid.	Current planning and competition laws may serve to limit a councils' ability to mandate self sustaining communities or development. - There is legislation that describe requirements for provision of water supply and sewer services for urban development - Council must operate within requirements of this legislation - BASIX stipulates minimum requirements for a development but restricts what additional requirements Council can mandate. - In areas currently zoned for urban development, the existing approval processes do not practically permit developments to be independent of the public water supply. These issues would not preclude an individual developer from making a voluntary decision to build a self sustaining development, however Council can only work with developers to pursue options over and above the regulations in an opportunistic way.

No.	ISSUE	RESPONSE
		The Stage 1 Demand Management Strategy assessed options for dual reticulation and decentralised sewerage. It was found that in general dual reticulation and decentralised sewerage provided no advantage or additional advantage over the proposed implementation of BASIX, with 5,000 L water tanks and reduced infiltration gravity sewers (RIGS). Notwithstanding opportunities may arise for sewer mining in such greenfield areas. Such opportunities will be dependant on the style of the development proposed and the willingness of the developer. Where opportunities are identified by the developer Council will assess the proposals put forward.
6	New developments should be permitted only if they are sustainable and their demand on the Shire's water grid can be limited via sustainable design.	Refer to response to Issue 5
7	The proponents of Cobaki and Kings Forest initially proposed greywater recycling and dual reticulation but this was not supported by Council. Why didn't Council meet part of the costs with Leda?	The proponents of Cobaki Lakes proposed an alternative system with the objective of reducing the cost to sewer their development. A "four-pipe" system was proposed to collect and send "greywater" and "blackwater" to separate treatment plants. Treated greywater was to be returned to properties for non-potable residential reuse for external, toilet and cold water laundry. Treated blackwater was to irrigate public open space areas during dry periods. The proposal did not adquately consider: - wet weather flows and the regulatory ramifications of this - water balances to ensure the longterm sustainability of water recycling on the site - the need for discharge/disposal of treatment by-products - access to treatment plants for operation, maintenance and odour control - contingencies should the relatively untested blackwater system prove ineffective - that the fourth pipe system would substantially increase Council's operating costs - that excessive satelite treatment plants substantially increase Council's operating costs Council has a obligation to ensure developments meet all regulatory requirements, and a sustainable sewerage management system is implemented. As with any development, the proponents had the opportunity to revise their proposal to meet these requirements but did not do so.

No.	ISSUE	RESPONSE
	Demand Management Strategy	
	Proposed Demand Management Actions	
8	The interdependencies between demand and supply need to be taken into account by Council when formulating recommendations for the future of the Tweed's water.	This approach is supported and taken into account by TSC in the Integrated Water Cycle Management (IWCM) Strategy. The IWCM process rigorously investigates supply options as well as the options for demand reduction and recycling to produce a balanced and integrated water supply strategy. Whilst demand reduction and recycling will extend the time before bulk water supply becomes critical, there is a need to act now to progress the approval process for augmenting the water supply source.
9	The Demand Management Strategy is just a mechanism for TSC to meet legislative requirements to build a dam.	The preparation of a Water Demand Management Strategy (DMS) is an integral part of the Tweed Integrated Water Cycle Management Strategy on the demand side of the equation. The NSW Goverment has legislated conditions on the demand side involving water use efficiencies. Supply is being looked at because a supply short-fall was identified during the focus on Demand Management. This involves increasing the supply and will involve a process of approvals in a legislative framework prior to implementation. It is worth noting that the combined Demand Management and Water Supply Augmentation options represent a significant reduction in per person water demand than what is currently occuring. Council is continuing to proactively plan for further future water usage reductions, whilst ensuring the reliability of water supply for the Tweed's future population.
10	All demand management actions should be implemented before augmentation is considered. Time must be allowed for them to take effect, The timeframe for a decision on augmentation is too short.	Installation of water efficient appliances and rainwater tanks has been made mandatory in all new developments. Installations are also encouraged for existing homes, and Council is saving water by increasing the amount of recycled water used each year. But these measures will only delay the need to augment the current water supply system – they are not a substitute for water supply augmentation. Monitoring of demand management measures is an important part of tracking the

No.	ISSUE	RESPONSE
		performance of councils initiatives for demand management. Planning to augment the water supply will take time, and to ensure the Tweed is ready, planning is required now. Council must plan for the earliest date the additional water supply capacity would be required (between 2018-2027). If it is found that future water use is less than what has been predicted, then augmentation of the system can be postponed until such time it is required.
	Demand Management – infrastructure issues	
	Infrastructure Upgrades	
11	Tweed's water reticulation is energy and cost inefficient and should not be exacerbated with new developments based on a similar approach. Full ecological costs associated with new developments should be factored into government planning including s94 and s64 developer contributions. All dwellings should be individually metered.	Tweed's water reticulation system is operated as efficiently as possible. Assessment of options (both in the Demand Management Strategy and the Water Augmentation Options) has taken into account the ecological costs through the TBL assesment, which is normal industry practice for these types of studies. The s64 developer contribution plans were revised by council in 2007 and were prepared in accordance with the Guidelines for Developer Charges for Water Supply, Sewerage and Stormwater issued by the Minister for Land and Water Conservation (now Department of Water and Energy) in December 2002. The s94 are not related to water and sewerage supply. These guidelines were based on a Determination issued by the Independent Pricing and Regulatory Tribunal (IPART) in September 2000. Ideally all dwellings should be individually metered, however there are historical and practical reasons as to why all sub-lots and multiple occupancy sites are not. TSC is currently investigating ways to improve the sub-metering of these existing and future sites.
	High volume rainwater collection	
12	That Council should make high volume rainwater collection for primary source of water compulsory in all new developments. A minimum of 10,000-20,000L tanks should be required in residential and 40,000L for non-residential (even 7,500-10,000 gallon	10 - 20 kL would not provide a reliable supply. For a Greenfield single family residential property, a 100 kL tank or greater connected to 300 m2 of roof area would be required to meet 100% of the family's demand. A rural property may have the space for numerous tanks and connected roof area (eg large sheds) but this is not feasible on a suburban block.

No.	ISSUE	RESPONSE
	prescribed).	Currently the disadvantages of using rainwater tanks to supply all of a household's demand far outweigh the advantages due to the lack of water security (much higher probability of running dry than the existing reticulated system) and economics of large stand alone rainwater tanks in areas where potable supply is available.
13	Council has determined that a household of 4 requires 120,000L tank capacity to be self-sufficient. We could aim for 20,000L per household to supplement the reticulated supply enough to ensure existing infrastructure is adequate and avoid the need for new dams. Town water supply should only be as a backup.	Tank sizes that supplement the reticulated supply (ie are not self-sufficient) can provide benefits by reducing average potable water use, treatment requirements, and stormwater runoff. However, supplementary rainwater tanks do not avoid the need to augment the town water supply system. The reason is that the town water supply continues to be used as a back-up, so Council effectively remains the "supplier of last resort" during extended dry periods. When the supplementary tanks run dry Council will need to supply water as if the tanks did not exist (including to rural residential properties as is currently the case). The town system therefore needs to be sized to meet this demand, and augmentation of the system is not avoided.
14	Promotion and funding of rainwater tanks is unacceptable to public health due to risks from Dengue fever. Existing tanks should be maintained through professional service providers reporting back to Council.	Tweed is not a dengue risk area. "Local transmission of dengue has not been reported in NSW for decades." (NSW Health web-site, http://www.health.nsw.gov.au/publichealth/infectious/diseases/dengue.asp). Public health risks associated with rainwater tanks were highlighted in Technical Note 2: Large Stand Alone Rainwater Tanks (MWH, Feb 2010) prepared for the CWG. On this basis TSC recommends that rainwater is used for non-potable applications such as toilet flushing, outdoor use and cold water use in washing machines where potable water supply is available.
15	High volume rainwater collection (self-suffiency) can be accomodated by ensuring the size of blocks of land is large enough and by using space saver tanks and bladders.	Refer to responses to Issues 12 and 13. Space-saver devices can maximise the volume of water that can be stored in available areas, however they do not change the volume of water required to be stored, and so there is a limit to how much additional water can be stored on an average suburban block. Depending on the type of system used and its accessibility, space-saver storages can also create issues in terms of cost, system longevity, and ease of installation and maintenance.

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	Water substitution	
16	That Council should make all new developments self sustainable (energy and water).	Refer to response to Issue 5.
17	That Council should make water substitution methods compulsory in all new developments, in particular recycling water (effluent reuse) through dual reticulation, greywater reuse, and stormwater harvesting as they are in Pimpama/Coomera and Ballina.	Council needed to have a full commitment in place to recycle water prior to conditioning developments accordingly. Such a commitment would require not only changes in policies and standards but an approved financial commitment to providing the necessary infrastructure when required. Otherwise Council could be challenged in the Land and Environment Court. Options such as these were examined in detail as part of the Demand Management Stage 1 report. It found that these options did not score well in the Triple Bottom Line assessment. Their capital and operation costs were also high. For these reasons, Council has not committed to implementing these options at this point in time. However the DMS recommended they be pursued on an opportunistic basis where possible.
18	Promotion of independence and self-reliance, through on-site water collection and recycling, would help foster a sense of attachment to place and a feeling of unity to others in the community.	Promotion is a powerful tool but does not guarantee a higher take-up rate of participants, particularly with members of the community who prefer the convenience of reticulated systems managed by the relevant water authority and who are prepared to pay for that service. The NSW Government's 'Basix' energy rating scheme makes provision and requirements for water reuse which could be broadened in the future.
19	Recycled water use (dual reticulation) is only financially viable on larger new developments (such as Cobaki and Kings Forest). The opportunity to implement should not be lost.	Agreed; dual reticlation is only financially viable on new development. The Demand Management Strategy - Stage 1 reviewed data for the Tweed and found that options such as dual reticulation were not considered viable, however should be considered if proposed by a developer. The DMS recommends that for major development that requirements above the NSW Government's Building and Sustainable Building Index (BASIX) be pursued through agreement for the provision of 5,000 L Rain Water Tanks with a minimum connected roof area of 160m2, dual flush toilets and 3 star shower heads. Refer to responses to Issues 7 and 17.

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	Alternative water sources	
20	Water recycling is required.	Council has been recycling small quantities of water since the 1980s, and over the last decade has increased the amount of water recycled throughout the Shire. This process is ongoing and Council undertook a Recycled Water Options Report in 2006 which identified several potential water reuse options for the Tweed. One of these, at Chinderah Golf Course, has already been implemented and added to the existing water recycling schemes. Others, such as water recycling on the Les Burger Field at Bogangar are in various stages of implementation or investigation.
21	That Council should procure alternative water sources such as indirect potable reuse (ie returning highly treated sewage effluent to Clarrie Hall Dam or Bray Park Weir for all uses including drinking). Returning to Bray Park Weir would make this option more financially viable. Insufficent rationale provided to justify removing Indirect Potable Reuse from the options.	Council has investigated alternative supply schemes (such as reuse schemes) before embarking on this Water Supply Augmenetation project. Reuse in particular has been investigated in detail in the Stage 1 Demand Management Strategy which went on public exhibition in 2008. The Stage 1 report looked at the possibility of introducing recycled water in a 'three-pipe system' to supplement 'future major greenfield development sites' at Cobaki, Bilambil heights, Area E (Terranora), Kings Forest and West Kingscliff. A three-pipe system would include a pipe for drinking water, one for sewage and the third to transport recycled water from wastewater treatment plants. The study concluded that although this system would save the equivalent amount of water as the 'rainwater tank' option, both the upfront and ongoing costs of providing a three-pipe network and establishing membrane treatment was significantly higher. These overall combined costs to the community, home owners and council were approximately twice that of the rainwater tank option from a long-term financial perspective - in excess of $30 million over a period of 20 years.
22	Council should procure direct potable reuse (ie returning highly treated sewage effluent directly to local reserviors in Tweed and Chinderah). For just $20mill more, the West Kingscliff Sewage Treatment Plant could have been upgraded to produce potable water quality. Insufficent rationale provided to justify removing Indirect Potable Reuse from the options.	Refer to responses to Issue 5 and 21.
23	If there are community concerns with direct potable recycled water, household rainwater tanks could supply drinking water.	Community concerns (Social acceptability) was one of 10 criteria used to assess each of the preliminary options in the Coarse Screening report. Public health risks associated with rainwater tanks were highlighted in Technical Note 2: Large Stand Alone Rainwater Tanks (MWH, Feb 2010) prepared for the CWG:

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		http://www.tweed.nsw.gov.au/Water/WaterSupplyAugmentation.aspx (under Downloads) On this basis TSC recommends that rainwater is used for non-potable applications such as toilet flushing, outdoor use and cold water use in washing machines where potable water supply is available.
24	Greywater recycling to potable standard was discounted on technological grounds - but this is widely practiced in Europe. Why couldn't it be pumped directly into the Bray Park weir to run through the new Water Treatment Plant?	This amounts to discharging untreated greywater directly into the Tweed River and polluting it. Council would not be permitted to do this under existing environmental legislation and would not be considered "greywater recycling". Intentional contamination of the Bray Park Weir water source used for supply of the potable town water supply is in complete conflict with NSW Health regulations.
	Other technologies	
25	Sewage effluent can be dumped vertically to generate hydro-electricity. This power, along with methane generated in digesters, can be used to pump effluent through filtration and UV and other purifying systems to produce water for re-use.	Council's sewage treatment plants are situated approximately at sea level, and there are few opportunities for hydro-electricity generation using this method. Council's current treatment plants are all based on aerobic treatment processes.
26	The existing water supply is adequate for our current and projected population for at least 20 years, especially if 22,500L rainwater tanks and other on-site recycling systems including simple lowcost filters for drinking water were used.	This is incorrect. Refer to responses to Issues 12 and 13. Simple filters can be utilised to remove some contaminants, but these require on-going maintenance, need to be disposed of once used, and may not be so cost effective. One alternative (although often used after filtering) is to disinfect with UV, however this is expensive and requires specialist on-going maintenance.
	Consultation with the community	
27	A vehicle for dissemination of more, clearer and more timely information into the community is required.	Point noted. Council is investigating ways of improving future community consultation, and has been gauging the success of this phase of the community consultation process. The process represented a major undertaking for Council, both in terms of time and resources, and was important for Council to receive feedback. Since submissions closed, former members of the Community Working Group (CWG) met with Council officers to provide feedback on the positive and negative aspects of the process, and to recommend how the community consultation process could be improved in the future.

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		In addition, an independent observer from Southern Cross University has also provided Council with an independent viewpoint of the process, which will be used to improve similar processes in the future. http://www.tweed.nsw.gov.au/Water/WaterSupplyAugmentationWorkingGroup.aspx
28	Community consultation was a sham - the decision to raise Clarrie Hall dam has already been made. It has been a deceitful process, pre-planned to achieve pre-determined outcomes.	This is incorrect. The original Coarse Screening report used an MCA to rank all options. Clarrie Hall dam was only one of the options under investigation. The MCA gave Clarrie Hall dam the highest score based on the information available at the time. The intention of Council has always been to conduct further investigations and a more rigorous analysis in the Fine Screen MCA. Council's intention has been to gather information from stakeholders and the community on environmental, cultural and social issues in order to assist in determining the most appropriate option in the Fine Screen MCA. Given the complexity of the MCA (involving 10 criteria and 4 options = 40 variables) it is difficult for Council to pre-determine the result.
29	It would appear that Council has deliberately failed to inform the CWG that one of the options they have been given to consider is in fact specifically prohibited. This makes a mockery of the entire community consultation process regarding our future water supply options. Some have written to the Minister about this serious breach of transparency.	This statement is incorrect for several reasons. The option referred to is the dam on Byrrill Creek, and the State Government document is the draft Water Sharing Plan for the Tweed River. Council did not attempt to conceal this document and is not responsible for the document. It has been drafted by the DECCW (NSW Office of Water), and they are responsible for its distribution and for requesting comments to the plan. The Water Sharing Plan is a draft document only, and has not been gazetted by the Minister. It is also not certain whether the clause regarding Byrrill Creek will remain in the final version of the plan. Council is therefore bound to continue to carry-out the options selection process based on the existing regulations, which do not prohibit the construction of a dam on Byrrill Creek.

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		It is noted that once approved, the conditions in the plan would become part of the framework for any water resource augmentation.
30	Needed a mechanism to better engage the broader community (eg referendum) who are generally complacent unless you discuss with them directly. The process required an extended timeframe, with better and earlier involvement of the community.	Refer to response for Issue 27
31	Council should be congratulated for being proactive in engaging the community. It has attempted to disseminate a vast amount of information, create debate, include community input and encourage feedback.	Refer to response for Issue 27
	Demand Management – management issues	
	Water reduction initiatives	
32	Council should encourage water savings through community education implementation of waterwise initiatives in all dwellings and permanent water restrictions.	Education and promoting water savings and restrctions are some of the key recommendations from Council's Demand Management Strategy and the Drought Management Strategy to encourage water savings. The Drought Management Plan proposes that permanent restrictions will be implemented in July 2012. Low level permanent restrictions may include the following: • Watering on alternate days (3 days per week) for odd and even house numbers • External water use only during the hours of 6am to 9am and 5pm to 8pm • No runoff allowed from watering into gutters and stormwater systems • Vehicles not to be washed on hard surfaces and trigger sprays to be used.
	Price of water	
33	Council should increase the base price of water and decrease the water volumes which trigger the step price increase for excess consumption. Council should also target water use of 150L/p/d or lower (such as in SEQ and Melbourne). Why is Tweed aiming at only 205L/p/d water usage	This "inclining block tariff" approach is recommended in the DMS and is in line with Council policy and what is considered best practice. From TSC web-site: "To encourage water conservation, high residential consumers are subject to a 50% step price increase for consumption in excess of 450 kL per year. From July 2010, it is proposed to implement this 50% step price increase for consumption in excess of 350 kL per year. " http://www.tweed.nsw.gov.au/Water/WaterPricing.aspx

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		205 L/p/day is a short term target (2012), ultimate average shire-wide target in 2036 is 170 L/p/day. The target set in Melbourne and SEQ (155 L/p/day target and 140 L/p/day, respectively) are targets set under severe drought restrictions - not long term conservation goals. The long term planning target for SEQ is for 230 L/p/day.
	Rebates	
34	That Council should provide rebates for installation of rainwater tanks and retro-fitting of water efficient appliances.	Rebates for rainwater tanks was considered in the Stage 1 DMS but was deemed not to be cost-effective. Shower head rebates and home water audits are proposed are proposed as part of the DMS.
35	Instead of spending $75M at Bray Park and $35M on a dam ($110M total), Council could provide $500 rebates for rainwater tanks to all the houses projected to be in the shire in 2036.	The $110M referred to provides a secure water supply (through water treatment and the dam) for an estimated population in 2036 of 157,000. The increase in population from today is approximately 80,000, which roughly equates to 30,000 new houses. To install equivalent self-sufficent rainwater tanks would cost over $20,000 per residence. If the $110M was divided amongst residences, the equivalent rebate would be only $3700 per dwelling (assuming no rebates to commercial and industrial customers). For comparison, the shire-wide cost to make all new developments self-sufficient on rainwater tanks would be at least 30,000 x $20,000 = $600M.
	Community Working Group (CWG)	
36	The make-up of the CWG did not adequately represent stakeholder groups. Not all members were open or committed.	Other consultation tools are available, however the make-up of the CWG was considered the most appropriate to enable a variety of views from the community to be directly represented in the process. All CWG applicants were required to agree with the CWG Terms of Reference which outlined the make-up of the CWG and the responsibilities of its members in terms of representing their particular stakeholder group. It is acknowledged that some CWG members did not feel comfortable representing their stakeholder group. The Terms of Reference stipulated that all members were to be open and committed to the process.

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		This feedback is noted and will be used to assist Council improve community consultation in the future (Refer to responses to Issues 27 & 39).
37	Some of the CWG felt all of the nine options and demand management options should have been part of the process from the beginning.	This feedback is noted. All CWG applicants were required to agree with the CWG Terms of Reference which specified the scope and focus of the process. The Terms of Reference clearly stated that the four short-listed options would be the focus of the CWG. It is worth noting that not all members felt constrained, with members expressing a range of views, for example these quotes from the CWG report: - "correct approach was taken - not spending excessive time and resources by studying lots of options in depth with the preferred decision based on available information" - "there was already too much information to comprehend without including more options" - "impossible to go to the public with more options" - "Council started at a sensible place in the process"
38	The CWG process was rushed and the time span was insufficient for meaningful consultation. The community needs to see that recommendations from the CWG are followed or the process will be little more than a sham.	This feedback is noted. However, as stated in the CWG Terms of Reference, the recommendations from the CWG will not be considered alone. The recommendations from the CWG process and report will be used as one of the inputs to the Fine Screen MCA process. In particular, CWG recommendations have been utilised to fine tune the MCA weighting and rating system to better incorporate community views on environmental and social issues. In addition, the MCA will make use of information from reports, community information sessions and submissions received during the extended submission period (which came about due to the recommendations of the CWG). Council will reference and utilise all these sources of information when determining a preferred option.
39	There were instances where the CWG misunderstood the process. It was never the intention for the group to reach consensus - this	Acknowledged. Council has met with ex-CWG members since the process ended to discuss ways of improving Council's community consultation in the future. These

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	was imperative for all voices being heard. That the majority penned a statement of their own was indication of frustration felt by some that their contribution to the process would otherwise be of little value.	recommendations have been forwarded to Council's Communications and Marketing Unit for inclusion in its ongoing review of Council's Community Consultation Strategy.
40	The time and effort of the independently selected members of the Community Working Group should be acknowledged.	Agreed. Council has acknowledged the substantial commitment by CWG members on numerous occasions. This has taken the form of personal thanks, public statements & media releases, and gift hampers presented to each member by Councillors. Council wishes to take this opportunity to thank all ex-members of the CWG for their interest, time and commitment in assisting Council by providing vaulable information for a decision of such importance to the Shire.
41	The CWG process did not allow many members to discuss items of importance to them in a meaningful way. Greater clarity and better facilitation was required to better empower the group and improve the outcomes.	Acknowledged. Refer to responses to Issues 37 & 38.
	Forward thinking Council	
42	Outdated unsustainable solutions of damming should not be pursued. Why doesn't Council lead the way with sustainable solutions?	The focus of Council's IWCM Strategy is to pursue best practice managment of water resources in an integrated and sustainable manner. The first action in this strategy Council has undertaken is to target water reductions through demand management. Council is also assessing sustainable water supply and has assessed a range of possible augmentation options. The various water suppy alternatives and demand management measures have been assessed against a quadruple bottom line sustainability assessment. The preferred options from these assessments follow best practice, and are considered the most sustainable solutions available to Council.
43	Regulatory impediments to the enforcement of more stringent and sustainable water management must be removed.	Council is obliged to work within the regulatory framework. Council continues to work together with State and Federal agencies to improve the regulatory framework and remove restrictions where appropriate. Refer to response to Issue 5.
44	The Demand Management, Drought Management and Supply Augmentation strategies were all produced by MWH, resulting in little opportunity for peer input or review. The recommendations	Members of the CWG have written to Council's General Manager to request an independent expert review of the three studies in which MWH has been involved. One of these studies is a collaborative effort between MWH, NSW Public Works (Dams and Civil)

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	in these strategies result in a mostly "business as usual", "dollar focussed" approach. MWH was involved with the background studies for the Traveston Dam which were disputed, and their studies on the Tweed may also be disputed. Council should follow the CWG's recommendation for an independent expert review of the proposed demand management and water augmentation approaches.	and Environmental Hydrogeologists Associates, all of which contributed in the areas of their respective expertise, and thereby provided opportunity for peer review. Furthermore, this work has been based on previous studies by acknowledged specialists such as GHD and Hunter Water. All work to date has been carried out by independent experts. The variety of reports used on this project show the breadth and depth of that independent expertise and have included information from all of the following experts: Montgomery Watson Harza, NSW Public Works, Hunter Water, SunWater, Water Solutions, GHD, Southern Cross University, Converge Heritage & Community, Greenloaning Biostudies, Eco-sure Environmental Consultants, Tweed Landcare Inc., and Peter Parker Environmental Consultants. In addition Council and its consultants are continuing to work with independent relevant government agencies, particularly licensing authorities, to ensure their requirements are met through this ongoing review process. Council has requested feedback and advice from the following licensing and regulatory authorities during this process: NSW Office of Water, NSW Fisheries, National Parks, NSW Forestry, NSW Health, Department of Planning and Northern Rivers Catchment Management. Given that each of the participants are recognised experts in the water field, it is difficult for Council to justify further significant expenditure on expert reviews of the work already undertaken by experts. Given that Council would need to engage the said independent reviewer, there are also questions as to whether the community would accept the independence of this additional process. Finally, MWH was not involved in any studies concerning the Traveston Crossing Dam project. MWH reported to the Queensland Water Commission on the SEQ Water Strategy in relation to demand management strategies in face of the millenium drought.
45	The significant cost of the Bray Park WTP means that Council is not prepared to support alternative water supply options that will not utilise (and pay for) water from the new plant.	This is incorrect. Council is committed to pursuing the most sustainable and cost effective solution for the future of the Tweed community. Refer to response to Issue 35
	Extension of time for submissions	
46	Community groups are under much pressure to respond within the	Point noted. This and other requests resulted in an extension of the date of submissions.

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	scheduled timeframe.	
	Global best-practice water management	
47	Composting Toilets have not been given enough attention and Council should have designs which are approved and can implemented available for new and retro-fitted constructions.	There a number of benefits from composting toilets, however, successful operation of composting toilets may require intensive user intervention and understanding of various issues relating to ongoing maintenance: insects/flies (e.g. disease vectors for pathogens), odours, mechanical or electrical failures, or inappropriate use of toilets (i.e. addition of chemicals). Other issues of concern may arise due to possible contamination of adjacent soils and waterways as a result of the excess liquid (or leachate) disposal, use of compost prior to pathogen die-off, and poor environmental conditions required for composting (C/N, moisture, temperature). NSW Health regulations require both liquid and solid waste material to be removed and disposed of adequately. Cost effective disposal is usually on site, however the buffers required to neighbouring land will preclude most areas in urban environments. Alternatively, liquid (urine) could be diverted directly to the sewer and a registered waste collector could be contracted to collect and dispose of solid waste external to the block. Given these issues, the use of composting toilets is not recommended for wide scale adoption. Council encourages it in unsewered areas, and while it does not prohibit the installation of composting toilets in urban areas, it is not recommended.
	Water licenses	
48	The DMS should include better control over water extraction licenses for river and groundwater extraction by agriculture and other uses.	Water extraction licenses and groundwater extraction licenses are regulated by the NSW State Government. Council, and its Demand Management Strategy, does not have juridiction to control these issues.
	Draft Water Sharing Plan	
49	Until the Minister for Water finalises the Tweed Water Sharing Plan, Council doesn't have any options that can be considered for public comment. How can the public comment on options that have not been given the consent by the NSW Office of Water? Byrrill Creek Dam is prohibited, interstate and inter-region water exchange is prohibited and the environmental flow restrictions on Clarrie Hall dam may render it unviable.	The Tweed Water Sharing Plan is still in draft format and is due to be approved in Oct 2010. There is nothing which is currently known to prohibit any of the short-listed options. Furthermore Council has undertaken extensive consultation with the NSW Office of Water to receive feedback on all options and the viability of each. Following that extensive consultation the Office of Water stated that *"At this stage the Office of Water does not propose to make any further comment on the alternatives presented, [and it] believes*

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		council will have sufficient input from the Planning Focus Meeting [held with all government agencies], the community consultation CWG and public comments from the exhibition phase to prepare a representations / recommendations report." As with other government agencies, the Office of Water is unable to grant consent to multiple options at this early phase in the process. Further in depth consultation will be required once detailed studies and an Environmental Assessment on the preferred option have been prepared. Council will also be required to apply to the Office of Water for construction and operating licenses for the preferred option as part of any approvals process. Refer to response to Issue 29.
	Water Augmentation Options	
	Existing situation	
50	If the Tweed currently consumes 12,000ML/a and our license is for 27,000ML/a then there is no need for dam options and Council has time to investigate other approaches.	The demand on the Bray Park supply system is actually around 10,500 ML/a, while the secure yield of this system is currently 13,750 ML/a. Councils water licence entitlement is 27,500 megalitres per annum and was determined by the relevant state government department at the time of the construction of Clarrie Hall Dam (early 80's). It would have been based on the secure yield of the system as determined by the predecessor to the current IQQM water supply model. That model utilised historic rainfall and climatic data as does the current model but was simulated on a monthly basis and did not include a 95%ile environmental flows. The latest IQQM also utilises an additional 25years worth of rainfall and flow data (including the 2002-03 drought). This results in a reduced secure yield. The secure yield has been peer reviewed and is considered robust and accurate. Whilst the secure yield has reduced from 27,500 to 13, 750 ML/annum the water licence allocation was not reduced as it is an entitlement already granted to Council and the community.
51	If Clarrie Hall dam can hold 16,000ML and we're only using 10,500ML/yr then we have more than 5,000ML in excess, with one of the highest rainfalls in the state, and nothing needs to be done.	There is no direct correlation between the volume of a dam and its secure yield. The unique dam and climatic characteristics combine to determine the actual amount of water that can be reliably supplied.

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		The value of 16,000ML refers to the maximum volume of Clarrie Hall Dam, however not all of that water is useable. Some water at the bottom of the dam is inaccessible; Council must release some of the water for environmental flows; and water is lost through evaporation, seepage and during transmission down the Tweed River to Bray Park Weir. The dam is only used to supplement flows during dry periods. The Tweed gets most of its water from the Tweed and Oxley Rivers (and all tributaries) up stream of Bray Park Weir. This system is able to reliably supply 13,750ML/a (ie its Secure Yield). Whilst demand is currently approximately 10,500ML/a, demand forecasting has shown that the secure yield (13,750ML/a) will be reached in the next 8 to 13 years. So while TSC has enough water now, there is a need to plan for future augmentation.
52	Conflicting figures stating an extra 3,250ML/a is required, while the DMS states 5,250ML/a. Why to do we need options of 22,000ML at CHD or 36,000ML at BCD - isn't this excessive?	Stage 1 of the DMS stated 5,250ML/a, however this became 3,000ML/a in the final combined DMS report based on the revised figures in the Stage 2 report. The value of 3,000ML/a is rounded and refers to the additional Secure Yield required. The existing water system has a secure yield of 13,750ML/y and results from the combination of the Tweed and Oxley Rivers (and all tributaries) up stream of Bray Park Weir plus Clarrie Hall Dam. Secure Yield is the annual volume that can be supplied by the entire water system with a very low probability of failure. In simple terms failure should only occur if the worst drought on record is repeated. In Tweed's case the probability of that happening is very low based on 120 years of rainfall information, this includes applying water restrictions when needed. To have a secure water supply for 157,000 people, we would require a system with a Secure Yield of 16,750ML/a. In order for the entire system (ie rivers and dam) to provide this secure yield, modelling has shown that additional water is required. This could be supplied by increasing the size of CHD from 16,000ML to 42,300ML of storage volume, or alternatively by building a new BCD with a 16,300ML storage volume. The size of dams have also been chosen to provide economies of scale as well as efficiency and constructability.

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		Uncertainties such as climate change have also been taken into account (refer to response to Issue 95). It is worth noting the current national approach is tending towards provision of 12 months contingency storage which for Tweed system is more conservative than what is currently applied. The 36,000ML dam at BC refers to the ultimate size of a possible future dam (if BCD were to be raised again in the future - eg in 30-50 years time).
53	Given that Clarrie Hall dam contains 16,000ML, the weir at Bray Park is able to supply 13,750ML/annum, and only 3250ML/annum additional supply is required until 2036 it would appear that we have enough water for a population of 500,000.	The dam volume (measured in cubic metres) and the secure yield of the system (measured in likely water volume per year) are not directly comparable. The secure yield is not determined by simple calculation but by a sophisticated computer model (IQQM). It is determined by taking the dam volume into account, along with rainfall data, evaporation rates, seepage rates, environmental flow releases, water restrictions, transmission losses, and other factors in a statistically based model. In simple terms it looks at the worst year or period on record and determines what amount of water can be extracted without the system failing. For our current system that was the 2002/03 drought (it was more severe than the previous 1902/3 drought). In this 12 month period if the 95%ile flow regime was in operation an amount of 13,750 megalitres could have been extracted from the weir pool at Bray Park. The methodology is based on NSW State Government guidelines to ensure consistency across regions. Refer also to response to Issue 52.
	Process and Approach	
54	Limited number of well thought out options - Lack of rigour in exploring other options. Too much emphasis has been placed on supply rather than demand options. The shortlisted options promote an unsustainable and wasteful lifestyle.	The two issues are inter-related and need to be looked at together. Refer also to responses to Issues 8, 9, 10 & 58.2
55	The current ratepayers will be paying for the future water users. A separate charge should be imposed on the new developments for the additional costs involved with the upgrade of the water supply.	A seperate charge is levied on all new development to pay for the additional costs associated with providing new or upgraded infrastructure to meet the requirements of the development.

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	Rural areas are subsidising the unsustainable coastal fringe.	Council levels charges for the cost of augmenting the water supply on all new developments. These charges are based on the estimated future capital cost and projected population, and are reviewed every five years. In this way augmentation is paid for by the new developments that produce the additional demand. To ensure an ongoing water supply, Council will need to augment the system prior to the construction of the all new developments (and prior to receiving the full amount of developer charges). Council would then borrow a portion of the capital costs which would incur financing costs (loan costs). These are not fully recouperated from developer charges and under the LGA Act Council is not permitted to include the cost of financing. This additional cost is met by the entire rate payer base. Depending on the timing of the infrastructure, the amount borrowed and the financing conditions, the increased cost to ratepayers is estimated at between 0.5-1.5 cents per kL.
56	Concerns that the available data and information has been, and continues to be, insufficient to support the MCA analysis.	Noted, however Council believes the data utilised is adequate to enable the MCA to determine a preferred option. Council has followed a phased process which aims to provide information appropriate to the particular phase. The Fine screen MCA aims to assess the relativity between options, and to highlight any "show stopper" issues which would cause excessive risks to Council and the community. The report aims to highlight the potential benefits and any negative impacts from each of the options to assist Council in determining a preferred option for the good of the whole of community. Subsequent stages will focus on more detailed planning issues to ensure all impacts are assessed and appropriate mitigation & management strategies are developed. Refer also to response to Issue 58.
57	The available data is adequate for this stage of the process. Council has taken a sensible, efficient approach.	Acknowledged. This is the apporach which has been followed. At each stage in the process, Council has invested more time and resources while focussing on fewer options. This aimed to provide more detailed information in order to improve decision making. The Coarse Screening (Stage 2) Report investigated the nine options. The Fine Screen (Stage 3) has utilised more detailed information and additional reports

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		focussed on the four short-listed options. Subsequent stages will involve more detailed information focussed on the preferred option only.
58	There is no consensus within the community on the most appropriate method(s) to augment the water supply in terms of reduced environmental, social and economic impacts.	The range of views and responses highlights several issues including: - the diversity of the Tweed community - the sensitive nature of the project - the complexity of the issues - the diveristy of opinions on environmental, social and economic issues - the difficulty (time, interest, expertise) of accessing and interpreting information It also highlights the difficult nature of the decision that must be made by Council. There is no perfect solution, and all options have positive and negative impacts. The MCA methodology is ideal for these complex assessments containing 'grey areas' where clear-cut decisions difficult. The MCA assesses all of the advantages and disadvantages against a quadruple bottom line to determine the overall best option. Council's cautious and staged approach aims at providing the best available data in order to make an informed decision. Refer to Issues 58.1 to 58.9.
58.1	I support and endorse all of the options and more.	Acknowledged.
58.2	The coarse selection of bulk water supply options was considered to be inadequate, with too few similar dam choices and no regard to other more suitable bulk water supply choices.	The broadest possible range of possible solutions based on international best practice have been investigated for the project. A range of nine options have been considered during the Coarse Screen report of which six were options not involving dams: 1. Raising the existing Clarrie Hall Dam 2. New dam on Byrrill Creek 3. New dam on Oxley River, near Tyalgum (Rocky Cutting site). 4. Pipeline from Rous Water 5. Pipeline from South East Queensland Water Grid 6. Desalination 7. Groundwater supply

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		8. Indirect potable reuse 9. Direct potable reuse Additional options were also assessed in Council's Demand Management Strategy and Technical Papers including: - third pipe water recycling - fourth pipe water recycling - greywater reuse - stormwater reuse - rainwater tanks
58.3	Incredibly, the singular 'Direct potable use' (Option 9) became a main Tweed option in the Coarse Screening Assessment.	Option 9 'Direct potable use' is an option with potential to polarize the community. There are those within the community who believe it should not be considered, but there are also those who consider it as a logical option. Council would have been remiss had this option not been included in the Coarse Screening report. Refer to issues and response to Issues 22, 23 and 58.3.
58.4	Option 9 (Direct Potable Reuse) is the least environmentally damaging, but even this relies on fossil fuels for pumping and purification.	Option 9 was assessed during the Coarse Screening stage. It was found to provide some benefits over other options, however there are also disadvantages which needed to be considered. All options have impacts and consideration of these impacts from a whole of community perspective is required to determine the most appropriate option.
58.5	Unless more sustainable measures are implemented, cheaper and less sustainable solutions will prevail and ultimately delay the implementation and growth of sustainable development.	Agreed. This is why an MCA has been used to assess the sustainability of the options, rather than just an assessment of costs. The results of the MCA assessments are that the most sustainable options are selelcted in terms of environmental, social, economical, and governance issues.
58.6	Council did not consider stormwater harvesting, rainwater tank or recycling options.	Yes, these options were explored in depth in both the DMS and the Water Options study when considering new development areas in TSC.
58.7	Only the cheapest options have been considered.	A range of nine options have been considered during the Coarse Screen report. The most expensive options considered have capital costs up to six time the price of the cheapest option.
58.8	The cost of alternative water supply technologies (stormwater harvesting, greywater harvesting, water recycling, rainwater tanks)	This is a myth, numerous studies have shown that decentralised solutions can often cost more than centralised solutions on an annualised cost basis. A thorough costing exercise

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	is miniscule in relation to the estimated cost of building a new dam.	was conducted for both the WSA and DMS reports.
58.9	The estimated costs of either dam are too high and totally unacceptable , particularly when other far less expensive and more environmentally sensitive options are avaiable.	Option costs and their environmental characteristics were two of the ten assessment criteria used to consider preferred option for water reource augmentation. Each option was assessed based on a QBL assessment of all ten criteria.
59	The four options presented are contrary to Government policies and legislation (Northern Rivers Catchment Management Plan, Tweed Macro Water Sharing Plan, National Water Sensitive Cities Strategy).	This is not correct. The draft Tweed Area Water Sharing Plan does not preclude any of the options. Northern Rivers Catchment Management with whom Council is in consultation, has not suggested that the options are precluded by their plan. Council's Demand Management approach follows best practice guidelines for water use and sustainable approaches including those set by the National Water Initiative (NWI) and the NSW Office of Water. Furthermore, Council's Integrated Water Management Strategy has Water Sensitive Urban Design as one of its 18 key actions. Refer to Responses to Issues 29 and 49.
60	Contingency options should be reviewed every two years especially where new innovations in water recycling and use come on line and evidence that they are economically feasible to apply.	Point taken. The objective of this phase of the Water Supply Augmentation project is to review all of the options and determine the preferred option that is the most sustainable and with the least risk. The subsequent phase will focus on carrying out investigations & designs, examining impacts, and gaining development approval. This subsequent phase is expected to take a number of years (4-8 years). Once development approval has been granted, construction could commence or be delayed as required. Construction could proceed depending on the need shown by the actual and projected population growth and per capita water demand figures at that time. Council will continue to stay abreast of the development of alternative options during this time, whereby the approved option could be compared to any latest developments.
61	Perception that the conclusions of the Demand Management Strategy are weighted specifically to create the promise that the Shire has no option other than to undertake some massive centralised water infrastructure project. There should be a shift	The DMS has been carried out following NSW Office of Water guidelines (refer also to response to Issue 59). The Water Supply Augmentation project is in response to the identified shortfall in supply after savings from the DMS have been taken into account.

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	from hard infrastructure towards decentralised supplies which cause less devastation.	Future urban planning in the shire is towards centralised developments and their economies of scale for servicing requirements. It is also generally more difficult for decentralised schemes to provide adequate secure yield. Even local best practice examples such as in Pimpana/Coomera do not attempt to provide decentralised water supplies. The currently proposed development model does not permit effective implementation of decentralised schemes. Refer to responses to Issues 35 & 45.
	Dams	
62	Dams are unsustainable, deplete our waterways and result in a decline of water quality. Dams only have a 50 year lifespan. For these reasons dams are being dismantled around the world wherever possible.	All options have impacts and consideration of these impacts from a whole of community perspective is required to determine the most appropriate option. For this reason, dams are not the only options that Tweed are investigating.
63	Dams are outdated technology. Only the fastest/cheapest/easiest engineering solutions have been considered. London is an example of sustainability where the Thames River is its main water source and there is not dam supply.	A number of innovative engineering solutions have been considered in both the DMS and WSA, including dual reticulation, indirect potable reuse, direct potable reuses, rainwater tanks, desalination, groundwater, pipeline links to cross-boundary water supplies. The comment regarding the Thames is not strictly correct given that the Thames utilises a number of off-line dam storages to ensure a reliable supply. The existing CHD and the proposed BCD are based on a similar concept, and under existing legislation and licensing, are considered off-line storages that do not dam flows in the Tweed river.
	Raising Clarrie Hall Dam	
64	Is unacceptable as it will flood significant areas of native forest (and Native Park), significant vegetation, farmland, residential land, roads, sites of Aboriginal cultural heritage. It would mean 210ha of land would be flooded, affecting 24 property owners, and relocating McCabes bridge.	The impacts will be acknowledged and used in the assessment criteria. All options have impacts and consideration of these impacts from a whole of community perspective is required to determine the most appropriate option.
65	To increase the water Clarrie Hall dam can supply, Council should construct a holding pond on the Tweed River and pump water (run on solar energy) from this to the dam during periods of high flow.	During periods of high flow Clarrie Hall Dam would normally be full. Constructing a holding pond on the Tweed River would require more stringent controls than a new off-stream storage (such as proposed at Byrrill Creek) and is unlikely to be approved. The increased energy and cost, and lower reliability would mean it would be a less effective option than Clarrie Hall Dam raising and would rate significantly lower on most criteria.

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66	If demand management measures can not support the population, the most sensible choice is to raise Clarrie Hall Dam. Least environmentally damaging since the impacts have mainly already occurred. It will be important that the EIA process is comprehensive and mitigation measures are identified and implemented into the development conditions. Adequate emergency plans should also be put in place.	Noted. All of these issues will be included in Fine Screen assessment. A significant number of further impact studies and approvals would be required for the preferred option.
67	There are too many unanswered questions to support a solution. Will the dam affect access to Commissioners Creek Rd. Will construction affect the peace, access, and how long will it take?	These impacts will be considered in the assessment criteria. In any case, a significant number of further impact studies would be required for the preferred option.
68	Current dam releases polluted toxic foul-smelling water.	When water is released from the dam, it can come from a low oxygen environment in the deep water behind the dam wall. The water is not toxic, however the low oxygen content could have negative impacts on the downstream environment if not treated. Water is treated by releasing it through a conical dispersion valve to maximise mixing and re-oxygenation. This process releases hydrogen sulphide gas which produces a "rotten egg" smell. During this process excess soluble iron oxide and manganese are also precipitated out of the water and attach to the rock producing brown stains at the base of the dam. Field investigations on Doon Doon Creek below the dam have shown that the dissolved oxygen content of the released water is above saturation levels some 60m downstream of the outlet.
69	The seven metre buffer currently proposed seems excessive and should be reduced if possible.	The seven metre buffer is an estimate based on the information currently available. Further detailed design work would be undertaken if CHD were the preferred option. This would provide more accurate estimates for the required buffers. Subsequent EIS process may also propose revised buffer zones based on the impacts to landholders, the environment, cultural heritage, and infrastructure.
70	Council has been required since 2002 to enlarge the spillway but has delayed works pending the decision on whether or not to raise the dam wall. This work still needs to be done regardless of whether the wall is raised.	Correct. The NSW Dam Safety Committee, responsible for ensuring dam safety throughout the state, agreed in 2002 for works to be delayed until such time Council determines its preferred option. If an option other than CHD is chosen, then the spillway will need to be upgraded as a separate project.

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		If CHD is the preferred option, the DSC may agree to allow the spillway to be further delayed until such time the dam needs to be raised to increase the water supply. However, the DSC may not agree to further postponement and work on the spillway (currently estimated at $5M) may need to be carried out prior to the dam being raised.
71	Many landholders at Doon Doon Creek were dissatisfied with the way they were treated when Clarrie Hall Dam was constructed. The figures in the budget for compensation does not inspire confidence. Compensation to affected landholders needs to be appropriate and tailored to individuals. Fair financial compensation will be accpetable to most of the affected landholders. CHD landholders were burdened last time. Its time that burden passes to others.	The compensation process has changed markedly since the original dam was built. Compensation must be negotiated with affected land owners. Property holders are protected under the Land Acquisitions (Just Terms Compensation) Act 1991. Under that act Council must negotiate a fair price with the landholder, which must be equal or greater to the unaffected market value of the property (ie the market value before the development was considered). Other factors are also taken into account such as severence of property, ongoing loss of income and hardship or difficulties. Figures for compensation have been reviewed and included in the revised cost estimates within the Fine Screen report. At this stage, these are estimates for comparison purposes only. Council will be required to negotiate with individual owners. Once a development approval has been granted for the development the acquisition process can begin. The process is one of negotiation. Usually this will mean that both the landholder and Council will engage valuers to value the property and any other factors and then use these values as a basis for negotiations. If for some reason the parties can not agree on a final value for compensation the case is referred to the NSW Valuer General who is bound by the Act and must determine the value of the just terms compensation. These issues will be incorporated in the Fine Screen report.
72	Investigate the feasibility of a micro-hydro power plant as part of the augmentation.	Micro-hydro power has not been included in this early stage of the process. Council would be able to consider the viability and appropriateness of power generation if the dam becomes the preferred option.
	Byrrill Creek Dam	
73	Too high Social, Cultural Heritage & Environmental problems to be considered an option. From the evidence we have Byrrill Creek must be removed from the list of viable options Object as it will flood some of the highest conservation value land	TSC takes notice of the concerns expressed by the CWG and the community in terms of the environmental and social impacts associated with a dam at Byrrill Creek, particularly its environmental significance. These impacts will be considered in the assessment criteria. In any case, a significant

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	in the Tweed, is a regionally significant biodiversity hotspot adjacent to the Mt. Warning World Heritage National Park. Major drawcard for tourism. Road closures will occur. Residents and communities will be severely affected.	number of further impact studies would be required for the preferred option.
74	Are we damming our hinterland valleys to provide for coastal development that will ultimately be lost to the sea due to future climate change?	Not all options involved dams. Refer also to responses to Issues 2 to 7.
75	Building a dam at Byrrill Creek potentially provides positive outcomes: - Alternative catchment of rain - Council owns most of the land - Clean catchment, surrounded by State and National Parks - Water supply security - Reduced compensating costs - Quality in sourced water Building a dam at Byrrill Creek potentially provides nagative outcomes - Area is HCV - Local lifestyle disturbances - Best location for rehabilitation. - New road alignments required. - Rehabilitation works done.	Noted. All of these issues will be included in Fine Screen assessment.
76	Some residents will lose their homes. Others will be inconvenienced by property inundation or severence, closure of Byrrill Creek Road, alternative property access, spillway noise and construction impacts. Some residents were made aware of these issues when they purchased their land, others were not.	These effects to landholders, residents and public access will be considered in the Fine Screen report. Refer also to response to Issue 71. Council agrees that all residents should have been made aware of these issues at the time of land purchase at Byrrill Creek. Council's LEP and planning documents contain constraint maps under Clause 52 showing the potential area that would be affected by a dam at Byrrill Creek. When land is bought or sold, the Conveyancing Act 1919, requires that a Section 149 Planning Certificate be attached to the Contract for Sale. The 149 Certificate contains

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		information on how a property may be used and the restrictions on development, including whether the property is affected by Council planning documents or constraint maps. At the time of purchase a Solicitor or Conveyance Clerk should have been employed to check the 149 Certificate which would have caught the Cl52 – Constraint Map – relating to a dam.
77	Investigate the feasibility of a micro-hydro power plant as part of the augmentation.	Refer to response to Issue 72.
	Pipeline to SEQ Water grid	
78	Unsatisfactory option: selling water to the Gold Coast robs the Tweed of needed water and promotes unsustainable development on the Gold Coast without them providing the necessary infrastructure. Desalination has large energy requirements. SEQ has even less water than the Tweed. QLD government has not given any agreement. It is risky and water may not be available when required (ie during drought).	The short-listed Option 5 - Connection to SEQ Water Grid has many uncertainties which are reflected in the assessment criteria. Refer also to response to Issue 80.
79	Interbasin transfers are not the answer.	Interbasin transfers are common in Australia and are treated on their merits. Interbasin transfers would need to satisfy relevant State (and potentially Federal) government regulations.
80	The SEQ pipeline option is not permitted under the draft Tweed Area Water Sharing Plan.	This is not correct. The draft Tweed Area Water Sharing Plan does not preclude connection to the SEQ water grid nor for water to be supplied to the Tweed from SEQ (which is the proposed SEQ option). The SEQ option does not consider sending water from the Tweed into Queensland. Should SEQ require a reciprocal arrangement whereby flow could be reversed, the NSW government would need to amend several instruments such as the water sharing plan for this to be permissible.
81	The SEQ pipeline option should be more fully explored.	This is the objective of the Fine Screen report. It takes into account considerable additional information for the SEQ option such as: clearer information from stakeholders in QLD and NSW (eg Queensland Water Commission QWC, Department of Main Roads DMR, Office of Water, Planning Risk Review); alternative alignments D & E; and more detailed information from the Aboriginal community.
82	Alternative routes A and B are unacceptable on environmental grounds. Route C could potentially have less impact given the Cobaki Lakes development.	These issues are addressed in the Fine Screen Options report.

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	Contingency Option	
83	Including a contingency option is good planning, however the current option is flawed.	There are acknowledged limitations with the contingency option.
84	Use of groundwater would deplete finite supplies necessary for agriculture, the environment, and has cultural heritage impacts.	Any use of groundwater would be in accordance with strict licensing requirements set by State government agencies to ensure the sustainable use of the resource. A preliminary assessment of groundwater supplies has shown that water can be sustainably provided below specific yields. Further detailed studies would be required before any extraction would be permitted to occur. During these studies, requirements for agriculture, rural domestic supplies, the environment, and the Aboriginal community would need to be taken into consideration.
85	The pipeline link to Rous Water can only be considered if Rous increases its existing system capacity. If this were to occur, the option could be more sustainable, viable and cost effective than the SEQ pipeline. It could be a permanent contingency plan. There is no agreement with Rous Water for them to supply water to Tweed.	Acknowledged. This is only applicable as a short-term emergency source in the event that the capacity of the Tweed network cannot supply the demands of growth at the southern extremities of the system.
86	Pipeline options or localised groundwater extraction in urbanising areas would be preferable to inundating irreplaceable rural areas that are currently subsidising the growth of coastal fringes.	All options will be considered on their merits.
	Water-wise options	
87	Byrrill Creek Dam could be avoided by spending the $57M Byrrill Creek Dam would cost on rainwater tanks and composting toilets.	Refer to responses to Issues 35 & 47
88	Council should include the “water wise option” within the short-listed options.	Waterwise options have been considered separately in the DMS. The forecast demand including waterwise options has been used as the basis for assessing all water supply augmentation options.
89	Waterwise options may be more expensive up front, but will be much cheaper in the long run.	The studies carried out to date show that waterise options will only curb demand so much, ultimately there will be a need to augment the supply source based on continued population growth in Tweed.
	Alternative Options	
90	Multiple smaller dams to be constructed on unproductive higher land throughout the valley to reduce impacts from a larger dam. Water could be used by intensive agriculture on the fertile valley below and excess fed back into the Bray park weir for domestic	There are economies of scale for constructing a single dam. Also, dams are not the only options under consideration. Damming the Cobaki broadwater would result in converting an estuarine environment into

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	supply. Dam the Cobaki broadwater.	a freshwater environment in an area more susceptable to tidal issues than the existing Bray Park Weir.
	Sale of Tweed water	
91	Council only wants to sell water to SEQ or Rous Water and this should not be a reason for building new dams in the Tweed.	The focus of this project is to ensure the ongoing security of the Tweed's water supply to its current and future residents. Supply of water to other regions is not part of the scope of this project and is not considered as a reason for the need to augment the Tweed's water supply system.
	Environmental flows	
92	At its meeting 17 November 2009, Council approved further environmental flow restrictions on the Tweed River at Bray Park Weir: "The cessation level for flow bypass requirements at Bray Park Weir be set at a level of 50% of the capacity of the Clarrie Hall Dam".	Council is not able to approve or alter environmental flow requirements which fall under the jurisdiction of the NSW Office of Water. At its meeting 17 November 2009, Council adopted the Drought Management Strategy which included a recommendation to approach the NSW Office of Water to determine appropriate flows during periods of serious drought. Based on the recommendations from the Drought Management Strategy, Council requested the cessation of flows at Bray Park Weir when the capacity of Clarrie Hall Dam drops below 50%. However, in July 2010 the Office of Water imposed the following license conditions on Council: "*(9iii) [That there must be a flow equivalent or greater to the] 100th percentil flow at Bray Park Weir when Clarrie Hall Dam capacity is 50% or less and 2 weeks after the imposition of Level 6 water restrictions by Council."* A further relief clause was also provided for more extreme drought events: *"(10) If the storage level of Clarrie Hall Dam falls below 50% and an approved demand management strategy has been introduced the licensee may apply to the Office of Water for modification of the discharge requirements in subsection iii of condition 9."*
	Inclusion of external and flow-on effects	
93	External factors such as environmental costs and benefits have not been directly included in the economic and comparative analysis. The analysis should have included items such as reduced water discharges to sensitive receiving waters, reduced storm surcharges, creation of habitat. The cost of water recycling and dam construction cannot be fairly compared until environmental costs are incorporated into the overall dam costs.	Council acknowledges ecological sustainability and caring for the environment as intrinsic components of community expectations and statutory obligations. Environmental considerations were taken into account in the assessment of options. Considerations were included under six of the ten criteria: - Secure Yield - meeting environmental flow requirements - Planning obligations - meeting environmental regulatory requirements - Legislative acceptability - meeting government agency environmental requirements

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		- Capital & Operating Costs - cost of environmental mitigation actions, compensatory habitats, baseline & ongoing monitoring, management plans, adaptive management requirements - Environmental constraints - assessing the environmental issues and constraints due to the options - Greenhouse gas emissions - assessing GHG emissions due to the options
94	Stormwater was discarded based on cost constraints alone. This is a skewed way of assessing pros and cons. Stormwater harvesting and reuse of water would reduce discharges to estuaries, and in some instances flood surge damage.	Stormwater was discarded based on an assessment of its characteristics. MWH conducted a separate investigation into Stormwater Harvesting and Reuse. The study investigated costs, reliability, and treatment requirements; but also the potential benefits due to reduced discharges to receiving waters. http://www.tweed.nsw.gov.au/Water/WaterSupplyAugmentation.aspx (under Downloads) The study found that stormwater can not replace other more reliable sources. Unlike recycled water, which is a relatively constant source of supply, stormwater is climate dependent and supply is not guaranteed during periods of drought or below average rainfall. Because supply cannot be guaranteed, the size of town potable water infrastructure cannot be downsized as it will still need to be able to cater for peak water demand. Being climate dependent also has implications on the size of storage required for stormwater harvesting schemes, which need to be large enough to capture the wet period rainfall and store it to cater for the dry period demand. There is also a 'point of diminishing returns' in storage size, where increasing the size further does not provide a significant increase in yield and will determine the most cost-effective storage for a given demand and catchment, this will mean a reliability less than 100% and will require an additional water source to meet the required demand. Annualised costs for dual reticulation A+ quality recycled water is approximately $7/kL for schemes ranging from 90 to 440 ML/year. By comparison, stormwater harvesting costs for lower quality municipal use water show that schemes reusing volumes of 10 ML/year also cost approximately $7 per kL. Stormwater harvesting for third pipe systems is less cost effective than stormwater harvesting for municipal reuse due to the more stringent and costly treatment requirements. Similarly harvesting, treatment and storage for third pipe stormwater schemes is more costly than the equivalent recycled water scheme due to stormwater being climate dependent, having a variable quality and requiring larger

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		storages. Analysis of various development servicing options for a Greenfield site at Kalkallo in Melbourne showed that recycled water supplied by third pipe requires significantly less storage space than stormwater. To supply garden and toilet with 95% reliability and adopting end-use management measures, a 22 ML recycled water storage is required compared to a 1,100 ML stormwater storage. This equates to 0.9 hectares compared to 44 hectares (assuming a uniform 2.5 metre storage depth) or 0.2% of the storage requirement. Costs of stormwater harvesting schemes can be more attractive if other downstream treatments to remove pollution and improve waterway health can be avoided.
95	Climate change and sea level effects have not been considered.	Climate change and sea level effects have been adequately taken into account. Modelling of the Tweed's Secure Yield (capacity of the water supply system) has taken into account all climate data to date including the effects on other areas on the North Coast, and the worst droughts on record. Climate change modelling carried out immediately to the north and south of the Tweed (for SE QLD and Rous Water) have shown that the secure yield in those adjacent regions could be reduced by between 7-15%. The latest CSIRO reports commissioned by the NSW and Federal Governments confirm expected impacts for the Tweed are no worse than those contained in the Rous and SEQ reports. (see: http://www.environment.nsw.gov.au/climatechange/nswreports.htm http://www.climatechangeinaustralia.gov.au/nswacttemp1.php http://www.climatechangeinaustralia.gov.au/qldtemp1.php) Council is confident that climate change effects can be accomodated given that each of the short-listed water supply options are able to supply more than the required projected Secure Yield even when taking these reductions into account. Changes in sea level are not expected to have a significant impact on water demands. Therefore, the timeline for water resource augmentation would be unaffected.
	Multi-Criteria Analysis (MCA)	
96	Both social and environmental impacts are significant. Half the CWG considered them to be equal in importance. Half considered environmental issues are more important. It was interesting that	This feedback from the CWG and from the community has assisted in the preparation of the Fine Screen MCA. The weightings used in the Fine Screen MCA have been updated to take this data into account.

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	no one on the CWG considered social impacts ahead of environmental impacts.	
97	Suggested improvements to the MCA used in the coarse screening included: using a finer scoring system, refinement of weightings so that other criteria were weighted equal or greater to costs and secure yield, improving the transparency through inclusion of discussion and background information.	This feedback from the CWG and from the community has assisted in the preparation of the Fine Screen MCA. The Fine Screen report provides more in depth discussions and explainations to aid the reader and improve transparency. The rating system and weightings used in the Fine Screen MCA have been updated to take this data into account.

Appendices

Appendix A – Detailed Issues Table

Individual topics or issues are listed below, together with the entity (member of the public or organisation) making the submission. Related topics have been grouped into grey header issues that have been addressed in the Discussion Section of the report.

It should be noted that the issues paraphrase comments from individual submissions. In many instances the text is a combination of the most representative and significant wording from individual submissions. Issues listed are not an attempt to record individual submissions word-for-word but are Council's best attempt to consolidate the number of issues, record those raising a similar issue, and enable responses to be drafted effectively.

The complete set of submissions received is bound under a separate cover "Submissions and feedback received – Water Supply Augmentation Project" and is available upon request.

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	Planning Issues	-	
	Demand Projections		
1	Demand has not increased in recent years despite increasing population. Why does Council expect demand to increase in the future if the trend is towards lower usage per person?	Spragg	See response in Discussion Section
	Population issues		
2A	Population expectations and projections used are considered too high for the Tweed's future sustainability. The assumption that the population needs to double is flawed. The community has not given its consent to doubling the population.		See response in Discussion Section
2.1	Population expectations and projections used are considered too high for the Tweed's future sustainability. The assumption that the population needs to double is flawed. The community has not given its consent to doubling the population.	Sledge; Sonnenschein; Cooney; Summers; Spragg; Jack; Hearder; Hayes; Bolten; Berg; Tweed District Residents & Ratepayers; Townsend; Sledge & Voinot; Watsford; Prince; Jack; Morrison; Martin; Ipsen; Tyman; Stuart; Riordan; Pearson; O'Reilly; McCormick; Gardner; TweedCAN; Fuhrmann; Caldera Environment Centre - Hopkins; Caldera Environment Centre; Uki Village & District Residents Association Incorporated; Thompson (CWG); Fingal Head Coastcare Inc; Rich; Whittingham	issue grouped for combined response
2.2	The CWG is concerned that the water supply augmentation options process is premised on population growth predictions that the CWG is	Community Working Group Report (March 2010); Ebehard (CWG)	issue grouped for combined response

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	not able to assess the validity of.		
2B	There is a lot of support for a population cap, but who will determine the cut-off point and how could this be enforced? Population can't be capped, but we can control growth to levels that our environment can handle by slowly staged development. The instruments for this are the Far North Coast Regional Strategy and the TSC Urban and Employment Strategy.	Cooney; Smith L	See response in Discussion Section
3	The population debate is an issue that will not go away. It needs to be addressed by a mechanism (eg inquiry) that identifies a sustainable population level for the Tweed.		See response in Discussion Section
3.1	The population debate is an issue that will not go away. It needs to be addressed by a mechanism (eg inquiry) that identifies a sustainable population level for the Tweed.	Ipsen; Hastings Point Progress Association; McNamara; Dawson; Findlay; Uki Village & District Residents Association Incorporated; Ebehard (CWG); Dawson (CWG); Name withheld	issue grouped for combined response
3.2	The water issue has been "thwarted" by the population debate.	Smith L	issue grouped for combined response
3.3	Tweed Population should be capped at existing levels. Increased demand is almost entirely due to population growth. Council simply needs to stop the amount of development allowed. Projections should be rounded down to satisfy the capacity of the Shire not the desires of the State government.	Hastings Point Progress Association; Sledge; Hollingsworth; Armfield; Pidgeon; Scanlan; Pearce; Name withheld; Hay; Sledge & Voinot; Purser; Ipsen; Tyman; McCormick; Hearder; Graf; Gardner; Findlay	issue grouped for combined response
3.4	It is one thing to cater for population needs, and another to plan overdevelopment and doubling of the population. The availability of resources should determine population, not the other way round.	Riordan; McNamara	issue grouped for combined response
3.5	Given time, the population can adjust to any situation but the rush to overdevelop the Shire at this time is unsustainable.	Symons	issue grouped for combined response
3.6	Water and population need to be linked. Without considering population growth in the context of ultimate resource scarcity, that is acknowledging there is a finite limit of water available to be trapped in the system (which can support a fixed number of people). Population growth at current levels is unsustainable. The current urban model is flawed. With controlled land release, money could be set aside for the best long	Community Working Group Report (March 2010)	issue grouped for combined response

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	term option rather than expediency.		
3.7	The best elements of urban planning need to be adopted by TSC (why can't TSC be leading edge?) in tandem with maintaining and enhancing the environmental values of the region. Enlightened LEP addressing the future needs of community and the environment. The Tweed Shire LEP should address the issue of preserving why people live or would wish to live in the Tweed. This includes those values, both environmentally and socially, which will be destroyed for future generations through a develop or bust approach, filling the pockets of a parochial few at the detriment of the greater good to meet their demands.	Community Working Group Report (March 2010)	issue grouped for combined response
4	If Council's population estimates are overestimated, then augmentation could be delayed and allow development of better water saving programs in the five new major developments and infill areas.	Hollingsworth DMS: Gardner; Graf; Havier and Addis; Hollingsworth; Munz and Maher; Pearson; Tweed Heads Environment Group - Murray	See response in Discussion Section
	Sustainability of new housing developments		
5	New developments should be permitted only if they are sustainable, self-sufficent and are not dependent on the Shire's water grid.	Cooney; Pidgeon; Jack; Beltrame; Hearder; Name withheld; Hayes; Bolten; Berg; Prince; Jack; Martin; Tyman	See response in Discussion Section
6	New developments should be permitted only if they are sustainable and their demand on the Shire's water grid can be limited via sustainable design.		See response in Discussion Section
6.1	New developments should be permitted only if they are sustainable and their demand on the Shire's water grid can be limited via sustainable design.	Cooney; Sledge & Voinot; Stuart; Fuhrmann; Turner; Fingal Head Coastcare Inc; Luca; ; Name withheld	issue grouped for combined response
6.2	Water resources and sewerage are inadequate for proposed developments.	Hastings Point Progress Association	issue grouped for combined response
6.3	The designs of Cobaki and Kings Forest are unsustainable and are pushing the requirement for a new source of water supply. Water demand should be limited via sustainable design.	Tweed District Residents & Ratepayers; Martin; Caldera Environment Centre; Turner; Smith B; Thompson (CWG)	issue grouped for combined response
6.4	Better more modern planning is required to enable collection and storing of water on individual properties.	O'Reilly	issue grouped for combined response
6.5	The Tweed community is concerned that council is taking too little	Community Working Group Report (March 2010)	issue grouped for

No.	ISSUE	RAISED BY:	REFER TO
	action in the total water cycle of new satellite cities which are expected to accommodate a predicted 76198 persons by 2036.		combined response
7	The proponents of Cobaki and Kings Forest initially proposed greywater recycling and dual reticulation but this was not supported by Council. Why didn't Council meet part of the costs with Leda?		See response in Discussion Section
7.1	The proponents of Cobaki and Kings Forest initially proposed greywater recycling and dual reticulation but this was not supported by Council. Why didn't Council meet part of the costs with Leda?	Tweed District Residents & Ratepayers; McCormick; Fuhrmann	issue grouped for combined response
7.2	Alternative water sources have been considered too expensive, but if developers are made to design and install these, there is not nett cost to Council.	McCormick	issue grouped for combined response
7.3	Immediate appointment of a Tweed Sustainability Commissioner as in VIC to oversee the planning of homes, towns and communities with sustainable and responsible water use.	Welling; Stuart; Outridge (Margo); Outridge (Mary Blane); Outridge (Mary Lou); Bonar	issue grouped for combined response
	Demand Management Strategy	-	
	Proposed Demand Management Actions		
8	The interdependencies between demand and supply need to be taken into account by Council when formulating recommendations for the future of the Tweed's water.		See response in Discussion Section
8.1	The interdependencies between demand and supply need to be taken into account by Council when formulating recommendations for the future of the Tweed's water.	McNamara	issue grouped for combined response
8.2	I do not support any of the options without first demonstration by council of tangible benefits in water management and recycling	Community Working Group Report (March 2010)	issue grouped for combined response
8.3	Endorsement of all demand management options being considered including rainwater tanks, auditing, and future water recycling where possible.	Wood	issue grouped for combined response
9	The Demand Management Strategy is just a mechanism for TSC to meet legislative requirements to build a dam.	Dawson	See response in Discussion Section
10	All demand management actions should be implemented before augmentation is considered. Time must be allowed for them to take effect, The timeframe for a decision on augmentation is too short.		See response in Discussion Section

No.	ISSUE	RAISED BY:	REFER TO
10.1	All demand management actions should be implemented before augmentation is considered. Time must be allowed for them to take effect, The timeframe for a decision on augmentation is too short.	TweedCAN	issue grouped for combined response
10.2	Council needs a holistic approach to water management.	Turner	issue grouped for combined response
	Demand Management – infrastructure issues	-	
	Infrastructure Upgrades		
11	Tweed's water reticulation is energy and cost inefficient and should not be exacerbated with new developments based on a similar approach. Full ecological costs associated with new developments should be factored into government planning including s94 and s64 developer contributions. All dwellings should be individually metered.		See response in Discussion Section
11.1	Tweed's water reticulation is energy and cost inefficient and should not be exacerbated with new developments based on a similar approach. Full ecological costs associated with new developments should be factored into government planning including s94 and s64 developer contributions.	Turner	issue grouped for combined response
11.2	All dwellings should be metered individually (which is not currently the case for some large complexes). Water wasters should be called to account.	Wuoti	issue grouped for combined response
	High volume rainwater collection		
12	That Council should make high volume rainwater collection for primary source of water compulsory in all new developments. A minimum of 10,000-20,000L tanks should be required in residential and 40,000L for non-residential (even 7,500-10,000 gallon prescribed).		See response in Discussion Section
12.1	That Council should make high volume rainwater collection for primary source of water compulsory in all new developments. A minimum of 10,000-20,000L tanks should be required in residential and 40,000L for non-residential (even 7,500-10,000 gallon prescribed).	Spragg; Beltrame; Hearder; Bolten; Berg; Lanham; Tweed District Residents & Ratepayers; Milligan; Jack (Marie); Jack (Elizabeth); McCormick; Hollingsworth; Havier; TweedCAN; Fuhrmann; Fingal Head Coastcare Inc	issue grouped for combined response
12.2	That Council should make high volume rainwater collection for primary	Cooney; Cornford; Summers; Hollingsworth; Armfield;	issue grouped for

No.	ISSUE	RAISED BY:	REFER TO
	source of water compulsory in new developments.	Spragg; Scanlan; Ray; Hudson; Yeomans; Prince; Jack; Martin; Ipsen; Welling; Tyman; Stuart; Moore; McNamara; Mayfield; Graf; Curtis; Caldera Environment Centre; Blunden; Uki Village & District Residents Association Incorporated; Vella; Smith B; Luca; Mayfield; Name withheld; Name withheld; Weber	combined response
13	Council has determined that a household of 4 requires 120,000L tank capacity to be self-sufficient. We could aim for 20,000L per household to supplement the reticulated supply enough to ensure existing infrastructure is adequate and avoid the need for new dams. Town water supply should only be as a backup.		See response in Discussion Section
13.1	Council has determined that a household of 4 requires 120,000L tank capacity to be self-sufficient. We could aim for 20,000L per household to supplement the reticulated supply enough to ensure existing infrastructure is adequate and avoid the need for new dams.	McCormick; TweedCAN	issue grouped for combined response
13.2	Town water supply should only be as a backup.	Cooney; McCormick	issue grouped for combined response
13.3	Rainwater tanks to be compulsary in all existing homes.	Hastings Point Progress Association; Wuoti; Armfield; Milligan; Hudson; Fuhrmann; Clarke	issue grouped for combined response
13.4	On the Tweed it is possible for rainwater tanks to make homes self-sustaining. Tweed has one of the highest rainfall rates in Australia and water can easilty be harvested and harnessed, but we fail to do it. The huge amount of roof area in the region needs to be utilised.	Wuoti; Pidgeon; Menzies; Milligan; Kaye; Pearson; Havier; Dawe; Findlay; Turner; Name withheld	issue grouped for combined response
13.5	Installation of rainwater tanks should be encouraged, although it is recognised that they will have a relatively small impact and are only good while it continues to rain.	Combined Tweed Rural Industries Association	issue grouped for combined response
13.6	Country people are able to live off rainwater tanks by being careful with their water use. It is achievable and should be enforced on all.	Jack; Berg; Menzies; Tyman; Pearson; McCormick; Hollingsworth; McInerny; Hoopman; Caldera Environment Centre	issue grouped for combined response
14	Promotion and funding of rainwater tanks is unacceptable to public health due to risks from Dengue fever. Existing tanks should be maintained through professional service providers reporting back to Council.	McConville	See response in Discussion Section

No.	ISSUE	RAISED BY:	REFER TO
15	High volume rainwater collection (self-suffiency) can be accomodated by ensuring the size of blocks of land is large enough and by using space saver tanks and bladders.	Turner (and others)	See response in Discussion Section
	Water substitution		
16	That Council should make all new developments self sustainable (energy and water).	Hastings Point Progress Association; Pearson	See response in Discussion Section
17	That Council should make water substitution methods compulsory in all new developments, in particular recycling water (effluent reuse) through dual reticulation, greywater reuse, and stormwater harvesting as they are in Pimpama/Coomera and Ballina.		See response in Discussion Section
17.1	That Council should make water substitution methods compulsory in all new developments, in particular recycling water (effluent reuse) through dual reticulation, greywater reuse, and stormwater harvesting as they are in Pimpama/Coomera and Ballina.	Cooney; Cornford; Hollingsworth; Armfield; Scanlan; Beltrame; Hearder; Name withheld; Hayes; Brodie; Bolten; Berg; Lanham; Menzies; Ray; Jack; Jack; Yeomans; Prince; Jack; Martin; Kaye; Jack (Marie); Welling; Tyman; Stuart; O'Reilly; McNamara; McCormick; Mayfield; Hearder; Havier; Graf; Gardner; Curtis; Findlay; Caldera Environment Centre - Hopkins; Caldera Environment Centre; Blunden; Uki Village & District Residents Association Incorporated; Fingal Head Coastcare Inc; Mayfield; Name withheld; Name withheld	issue grouped for combined response
17.2	There is no excuse for flushing potable water down the toilet.	Findlay	issue grouped for combined response
17.3	Rather than dams, rainwater should be captured from gutters, piped to pump stations and pumped to major catchment areas for treatment before entering the reticulation system.	Graf	issue grouped for combined response
17.4	Council should promote greywaterand stormwater harvesting for industrial and agricultural use.	Spragg	issue grouped for combined response
17.5	Large scale Recycling, Storm Water Harvesting & Large Water tanks are the only environmentally & socially sustainable way forward for Tweed Shires Water Management	Community Working Group Report (March 2010)	issue grouped for combined response
18	Promotion of independence and self-reliance, through on-site water collection and recycling, would help foster a sense of attachment to place and a feeling of unity to others in the community.	Caldera Environment Centre DMS: Caldera Environment Centre – Dawson; Caldera Environment Centre	See response in Discussion Section

No.	ISSUE	RAISED BY:	REFER TO
19	Recycled water use (dual reticulation) is only financially viable on larger new developments (such as Cobaki and Kings Forest). The opportunity to implement should not be lost.	Yeomans; Mayfield	See response in Discussion Section
	Alternative water sources		
20	Water recycling is required.	Ipsen; Stuart; Riordan; O'Reilly; Moore; McNamara; McCormick; Hearder; Havier; Dawe; Blackwell; Findlay; Smith B; Weber	See response in Discussion Section
21	That Council should procure alternative water sources such as indirect potable reuse (ie returning highly treated sewage effluent to Clarrie Hall Dam or Bray Park Weir for all uses including drinking). Returning to Bray Park Weir would make this option more financially viable. Insufficent rationale provided to justify removing Indirect Potable Reuse from the options.	Tyman; Gardner; Dawson	See response in Discussion Section
22	Council should procure direct potable reuse (ie returning highly treated sewage effluent directly to local reserviors in Tweed and Chinderah). For just $20mill more, the West Kingscliff Sewage Treatment Plant could have been upgraded to produce potable water quality. Insufficent rationale provided to justify removing Indirect Potable Reuse from the options.	Graf; Gardner; Dawson	See response in Discussion Section
23	If there are community concerns with direct potable recycled water, household rainwater tanks could supply drinking water.		See response in Discussion Section
23.1	If there are community concerns with direct potable recycled water, household rainwater tanks could supply drinking water.	Gardner	issue grouped for combined response
23.2	Statements that "there is not enough known about long term health risks" seem to ignore current best practice (eg Sydney Water water recycling).	McCormick	issue grouped for combined response
24	Greywater recycling to potable standard was discounted on technological grounds - but this is widely practiced in Europe. Why couldn't it be pumped directly into the Bray Park weir to run through the new Water Treatment Plant?		See response in Discussion Section
24.1	Greywater recycling to potable standard was discounted on technological grounds - but this is widely practiced in Europe. Why	Eriksen	issue grouped for combined response

No.	ISSUE	RAISED BY:	REFER TO
	couldn't it be pumped directly into the Bray Park weir to run through the new Water Treatment Plant?		
24.2	Recycling of greywater and blackwater should considered.	Dawson	issue grouped for combined response
24.3	Council should investigate dual reticulation (effluent reuse) in new subdivisions.	Combined Tweed Rural Industries Association	issue grouped for combined response
24.4	Other options beside dam construction have been inadequately addressed and show a lack of willingness/innovation to adopt other water saving and storage issues (storm water retention, recycling).	Community Working Group Report (March 2010)	issue grouped for combined response
	Other technologies		
25	Sewage effluent can be dumped vertically to generate hydro-electricity. This power, along with methane generated in digesters, can be used to pump effluent through filtration and UV and other purifying systems to produce water for re-use.	Caldera Environment Centre	See response in Discussion Section
26	The existing water supply is adequate for our current and projected population for at least 20 years, especially if 22,500L rainwater tanks and other on-site recycling systems including simple lowcost filters for drinking water were used.	Caldera Environment Centre	See response in Discussion Section
	Consultation with the community		
27	A vehicle for dissemination of more, clearer and more timely information into the community is required.		See response in Discussion Section
27.1	There is confusion in the community over the demand and supply "prongs" of Tweed's water strategy which needs clarification.	Weatherley; Hastings Point Progress Association	issue grouped for combined response
27.2	An easy to access website / webpage should be created so that people can access information, plans, etc.	Piper	issue grouped for combined response
27.3	Better marketing of the TSC Integrated water management strategy as a holistic package, and reducing the dominance of technical literature, are required so the Tweed community better understand the steps being taken to conserve, protect and augment the future needs of the Shire.	Community Working Group Report (March 2010)	issue grouped for combined response
27.4	When Council fails to provide information about the low Tweed River historic flows at Bray Park Weir, how can residents adequately respond on water supply issues in the Demand Management Strategy?	Tweed Heads Environment Group - Murray	issue grouped for combined response

No.	ISSUE	RAISED BY:	REFER TO
28	Community consultation was a sham - the decision to raise Clarrie Hall dam has already been made. It has been a deceitful process, pre-planned to achieve pre-determined outcomes.		See response in Discussion Section
28.1	Community consultation was a sham - the decision to raise Clarrie Hall dam has already been made. It has been a deceitful process, pre-planned to achieve pre-determined outcomes.	Watsford; Tyman; Summers; Pearson; Dawson	issue grouped for combined response
28.2	Council pushed through four shortlisted options without consulting the community about what those options should be. The four options were too limited. Earlier consultation on both the augmentation and demand management projects was required.	Summers; Berg; Tweed District Residents & Ratepayers; Prince; Martin; Jack; Hastings Point Progress Association; Tyman; Pearson; McQueen; Mayfield; Havier; Haffer; Gardner; Dawson; Fuhrmann; Fingal Head Coastcare Inc; Rich DMS: Prince; Fingal Head Coastcare Inc.; Jacobi; Mason; Prince; Tweed District Residents & Ratepayers; Hersovitch; Jack; Rifello; Ehrlich; Hearder; Pearson; Hearder	issue grouped for combined response
28.3	Community consultation was inadequate. Object to the way in which it has been carried out. Needed to be more open.	Townsend; Martin; Hastings Point Progress Association; Tyman; Stuart; Pearson; O'Reilly; Moore; McQueen; Haffer; Ehrlich; Caldera Environment Centre - Hopkins DMS: Stuart; Caldera Environment Centre - Hopkins; Whittingham	issue grouped for combined response
28.4	Affected residents and the community have not had enough time to comment on the project.	Possenti; Pearson	issue grouped for combined response
28.5	Disappointing that the process did not focus on and engage with the broader community.	Beck (CWG); Murray (CWG); Dawson (CWG); Thompson (CWG)	issue grouped for combined response
29	It would appear that Council has deliberately failed to inform the CWG that one of the options they have been given to consider is in fact specifically prohibited. This makes a mockery of the entire community consultation process regarding our future water supply options. Some have written to the Minister about this serious breach of transparency.	Jack; Townsend; Prince; Jack; Martin; Summers; Pearson; McCormick; Havier; Gardner; Dawson DMS: McCormick; Jack; Tweed Heads Environment Group - Murray	See response in Discussion Section
30	Needed a mechanism to better engage the broader community (eg referendum) who are generally complacent unless you discuss with them directly. The process required an extended timeframe, with better and earlier involvement of the community.		See response in Discussion Section

No.	ISSUE	RAISED BY:	REFER TO
30.1	Needed a mechanism to better engage the broader community who are generally complacent unless you discuss with them directly. Joanna has done far more consultation with the broader community than TSC eg Survey, Uki Meetings, Byrrill Creek Meetings, Newsletters & 100's of emails The process I feel has been tokenistic, due to the late involvement – and limited involvement, of the community.	Community Working Group Report (March 2010)	issue grouped for combined response
30.2	A referendum is needed canvassing all the options - including the sustainable ones.	Findlay	issue grouped for combined response
30.3	The input for the MCA needs further community consultation over an extended timeframe.	Dawson (CWG)	issue grouped for combined response
31	Council should be congratulated for being proactive in engaging the community. It has attempted to disseminate a vast amount of information, create debate, include community input and encourage feedback.		See response in Discussion Section
31.1	The CWG fully supports Council's desire to engage the community in the Tweed Water Supply Augmentation decision-making process.	Community Working Group Report (March 2010); Whittingham	issue grouped for combined response
31.2	Thank Council for the opportunity to contribute.	Uki Village & District Residents Association Incorporated	issue grouped for combined response
31.3	Thank and congratulate TSC for the information and approach. Much information was available prior to this phase and underpinned this first phase of assessing the short-listed options.	Smith L	issue grouped for combined response
31.4	Community consultation should draw upon those most affected, guided by clearely articulated and agreed upon processes for participation. This was generally the case. Council has been proactive in opening up to community consultation.	O'Flynn (Southern Cross University)	issue grouped for combined response
31.5	Valuable attempts to gather further input to the consultation participatory process included the advisory group of local representatives of varying experience and expertise, and three visits to local areas to ascertain feedback from and disseminate information to community members. The whole community consultation process has generated and disseminated a vast amount of valuable information.	O'Flynn (Southern Cross University)	issue grouped for combined response
31.6	It can be difficult for Council to justify expenditure on community	O'Flynn (Southern Cross University)	issue grouped for

No.	ISSUE	RAISED BY:	REFER TO
	consultation. Further resourcing was raised as an issue and addressed some areas of concern in relation to: a far-reaching survey tool, funding public meetings, meeting members' out-of-pocket expenses.		combined response
31.7	Commend Council officers attending community information sessions for their time and willingness to explain the processes involved.	McCormick	issue grouped for combined response
31.8	Majority of Community only speak out when there is something to complain about - So just implement radical water saving devices in each new development and rebate incentives for retrofitters	Community Working Group Report (March 2010)	issue grouped for combined response
	Demand Management – management issues	-	
	Water reduction initiatives		
32	Council should encourage water savings through community education implementation of waterwise initiatives in all dwellings and permanent water restrictions.		See response in Discussion Section
32.1	Council should encourage water savings through community education.	Combined Tweed Rural Industries Association; Armfield; Pearce; Brodie; Tweed District Residents & Ratepayers; Pearson; Hollingsworth; Havier; Dawson; Curtis; McInerny; Hoopman; Blunden; Uki Village & District Residents Association Incorporated; Fingal Head Coastcare Inc	issue grouped for combined response
32.2	Council should educate on the importance and value of waters and rivers.	Pearson; Name withheld	issue grouped for combined response
32.3	Council should implement waterwise initiatives in all dwellings.	Armfield; Pidgeon; Brodie; Havier	issue grouped for combined response
32.4	Council should encourage water savings through permanent water restrictions.	Pearce; Brodie	issue grouped for combined response
32.5	If all residents in the Tweed put their minds to it and reduced water usage there would be no need for expensive infrastructures like dams	Watsford	issue grouped for combined response
	Price of water		
33	Council should increase the base price of water and decrease the water volumes which trigger the step price increase for excess consumption. Council should also target water use of 150L/p/d or lower (such as in SEQ and Melbourne). Why is Tweed aiming at only 205L/p/d water		See response in Discussion Section

No.	ISSUE	RAISED BY:	REFER TO
	usage		
33.1	Council should increase the base price of water and decrease the water volumes which trigger the step price increase for excess consumption. Council should also target water use of 150L/p/d or lower (such as in SEQ and Melbourne). Why is Tweed aiming at only 205L/p/d water usage	Lanham; Tweed District Residents & Ratepayers; Sledge & Voinot; Welling; Tyman; Pearson; Hollingsworth; Fuhrmann; Caldera Environment Centre; Blunden; Fingal Head Coastcare Inc	issue grouped for combined response
33.2	User pays water pricing is required	Pidgeon; Tyman	issue grouped for combined response
	Rebates		
34	That Council should provide rebates for installation of rainwater tanks and retro-fitting of water efficient appliances.	Pidgeon; Tweed District Residents & Ratepayers; Prince; Jack; Hollingsworth; Havier	See response in Discussion Section
35	Instead of spending $75M at Bray Park and $35M on a dam ($110M total), Council could provide $500 rebates for rainwater tanks to all the houses projected to be in the shire in 2036.	Caldera Environment Centre	See response in Discussion Section
	Community Working Group (CWG)		
36	The make-up of the CWG did not adequately represent stakeholder groups. Not all members were open or committed.		See response in Discussion Section
36.1	CWG should comprise of a range of residents and technical experts.	Sledge	issue grouped for combined response
36.2	One local resident representative on the CWG for Byrrill Creek is not enough. The time pressures to organise a representative were not fair.	Sledge; Ipsen; Pearson	issue grouped for combined response
36.3	Two unpopular, pro-development councillors were inappropriately included on the CWG when they do not represent the environmentally conscious population. Phil Youngblutt should have been censured for his poor attendance.	Jack; Eriksen; Prince; Jack; Pearson	issue grouped for combined response
37	Some of the CWG felt all of the nine options and demand management options should have been part of the process from the beginning.		See response in Discussion Section
37.1	The CWG is limited to investigate the short-listed options. Some on the CWG felt boxed in not to look beyond supply.	Sledge; Prince; Jack; Martin; Hastings Point Progress Association; Tyman; Summers; Pearson; McQueen; Graf; Gardner; McInerney; Gardner (CWG)	issue grouped for combined response
37.2	Some of the CWG felt all of the nine options should have been part of the so called community consultation from the beginning.	Community Working Group Report (March 2010)	issue grouped for combined response
38	The CWG process was rushed and the time span was insufficient for		See response in

No.	ISSUE	RAISED BY:	REFER TO
	meaningful consultation. The community needs to see that recommendations from the CWG are followed or the process will be little more than a sham.		Discussion Section
38.1	Two thirds of the CWG endorsed no dam in Byrrill Creek. To go ahead would display a complete disregard for the community.	McInerney	issue grouped for combined response
38.2	The CWG feel they've been taken for a ride - the whole process was little more than a sham.	Watsford; Prince; Jack; Tyman; Dawson	issue grouped for combined response
38.3	The final CWG report under-reported the dissent and opposing views.	Summers	issue grouped for combined response
38.4	Decisions when rushed like this reinforce a sense of predeterminism. The time span was insufficient for meaningful consultation.	Dawson (CWG); Gardner (CWG)	issue grouped for combined response
39	There were instances where the CWG misunderstood the process. It was never the intention for the group to reach consensus - this was imperative for all voices being heard. That the majority penned a statement of their own was indication of frustration felt by some that their contribution to the process would otherwise be of little value.		See response in Discussion Section
39.1	The CWG is over-estimating its brief - we are providing recommendations for consideration by the Council who makes the decisions. The Terms of Reference were appropriate, but it was disappointing that they were not always met by all CWG members.	Smith L; Allsop (CWG)	issue grouped for combined response
39.2	Intentions of CWG are good but the process of each member getting past parochial viewpoints to think about the big picture is surprisingly difficult.	Allsop (CWG)	issue grouped for combined response
39.3	There were instances where the CWG misunderstood the process. It was never the intention for the group to reach consensus - this was imperative for all voices being heard. That the majority penned a statement of their own was indication of frustration felt by some that their contribution to the process would otherwise be of little value.	O'Flynn (Southern Cross University)	issue grouped for combined response
39.4	The purpose if the CWG is not to make a decision but to provide information to council to help them make a decision. It has been made clear that advice and information from members of the CWG is not relevant or difficult to incorporate into the decision making process.	Community Working Group Report (March 2010)	issue grouped for combined response
40	The time and effort of the independently selected members of the	Uki Village & District Residents Association Incorporated	See response in

No.	ISSUE	RAISED BY:	REFER TO
	Community Working Group should be acknowledged.		Discussion Section
41	The CWG process did not allow many members to discuss items of importance to them in a meaningful way. Greater clarity and better facilitation was required to better empower the group and improve the outcomes.		See response in Discussion Section
41.1	The role of the CWG has been unclear throughout the working group process and this has constrained our effectiveness.	Ebehard (CWG)	issue grouped for combined response
41.2	Some of the CWG felt constrained by the timing and time constraints, data limitations and focus of community input on ratings of 2 specific criteria (environmental and social) for 3 predetermined water supply options. Community consultation has not been properly achieved within the CWG : items many members wanted to discuss meaningfully were not allowed, or "that we would look at them later" (which didn't happen) & the "Agenda" took precedence.	Community Working Group Report (March 2010)	issue grouped for combined response
41.3	While the CWG has learnt a lot from the process adopted, the CWG felt uncomfortable speaking on behalf of the whole Tweed community, and encourages Council to seek additional ways to engage the whole community in this process in the future.	Community Working Group Report (March 2010)	issue grouped for combined response
41.4	The facilitator was generally able to facilitate idea sharing, opposing frictions, and development of new ideas. Council staff ably assisted. Some other projects have used two facilitators which have worked well in the past.	O'Flynn (Southern Cross University)	issue grouped for combined response
	Forward thinking Council		
42	Outdated unsustainable solutions of damming should not be pursued. Why doesn't Council lead the way with sustainable solutions?		See response in Discussion Section
42.1	Outdated unsustainable solutions of damming should not be pursued. Why doesn't Council lead the way with sustainable solutions?	Cooney; Cox; Sloane; Tyman; Stuart; Gardner; Dawson; McInerney; Mayfield DMS: Mason; Dawe; Stuart	issue grouped for combined response
42.2	Council and employees should search their souls and proceed with stewardship of such a special valley.	Outridge (Margo); Outridge (Mary Blane); Outridge (Mary Lou)	issue grouped for combined response
42.3	Sustainable options and kerbing population growth need to be more professionally reviewed.	O'Reilly	issue grouped for combined response

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42.4	Allowing engineers to have the final say is narrow minded in the extreme - their environmental credentials are poor.	Eriksen	issue grouped for combined response
43	Regulatory impediments to the enforcement of more stringent and sustainable water management must be removed.	Turner	See response in Discussion Section
44	The Demand Management, Drought Management and Supply Augmentation strategies were all produced by MWH, resulting in little opportunity for peer input or review. The recommendations in these strategies result in a mostly "business as usual", "dollar focussed" approach. MWH was involved with the background studies for the Traveston Dam which were disputed, and their studies on the Tweed may also be disputed. Council should follow the CWG's recommendation for an independent expert review of the proposed demand management and water augmentation approaches.		See response in Discussion Section
44.1	The Demand Management, Drought Management and Supply Augmentation strategies were all produced by MWH, resulting in little opportunity for peer input or review. The recommendations in these strategies result in a mostly "business as usual", "dollar focussed" approach. MWH was involved with the background studies for the Traveston Dam which were disputed, and their studies on the Tweed may also be disputed. Council should follow the CWG's recommendation for an independent expert review of the proposed demand management and water augmentation approaches.	Turner	issue grouped for combined response
44.2	The CWG would like assurance that Tweed SC's demand management strategy is benchmarked against national and international standards, and undergoes independent assessment to demonstrate this, otherwise a needless Dam option could proceed.	Community Working Group Report (March 2010)	issue grouped for combined response
44.3	Council should follow the CWG's recommendation for an independent expert review of the proposed demand management and water augmentation approaches.	Townsend; Prince; Jack; Morrison; Jack (Marie); Hastings Point Progress Association; Wrem; Summers; Stuart; Pearson; McNamara; Hearder; Graf; Gardner; Dawson; Bonar; McInerney; Turner DMS: Turner	issue grouped for combined response
45	The significant cost of the Bray Park WTP means that Council is not	Hollingsworth	See response in

No.	ISSUE	RAISED BY:	REFER TO
	prepared to support alternative water supply options that will not utilise (and pay for) water from the new plant.	DMS: Symons; Gardner; Graf; Hollingsworth; Munz and Maher; Pearson	Discussion Section
	Extension of time for submissions		
46	Community groups are under much pressure to respond within the scheduled timeframe.	Caldera Environment Centre - Hopkins	See response in Discussion Section
	Global best-practice water management		
47	Composting Toilets have not been given enough attention and Council should have designs which are approved and can implemented available for new and retro-fitted constructions.	Spragg; Ipsen; Havier; Dawe; Caldera Environment Centre - Hopkins; Caldera Environment Centre; Uki Village & District Residents Association Incorporated	See response in Discussion Section
	Water licenses		
48	The DMS should include better control over water extraction licenses for river and groundwater extraction by agriculture and other uses.	Spragg	See response in Discussion Section
	Draft Water Sharing Plan		
49	Until the Minister for Water finalises the Tweed Water Sharing Plan, Council doesn't have any options that can be considered for public comment. How can the public comment on options that have not been given the consent by the NSW Office of Water? Byrrill Creek Dam is prohibited, interstate and inter-region water exchange is prohibited and the environmental flow restrictions on Clarrie Hall dam may render it unviable.		See response in Discussion Section
49.1	Until the Minister for Water finalises the Tweed Water Sharing Plan, Council doesn't have any options that can be considered for public comment. How can the public comment on options that have not been given the consent by the NSW Office of Water? Byrrill Creek Dam is prohibited, interstate and inter-region water exchange is prohibited and the environmental flow restrictions on Clarrie Hall dam may render it unviable.	Symons; Pearson; Gardner	issue grouped for combined response
49.2	The draft Tweed River Area unregulated and alluvial Water Sharing Plan prohibits the damming of Byrrill Creek and therefore Byrrill Creek should not even be considered as an option.	Spragg; Jack; Townsend; Tyman; Summers; Pearson; Graf; Dawson; McInerney; Turner DMS: Pearson and Rifello; Pearson, Rifello and Rothwell; Peacock; Ehrlich; Gray; Hill; James; Lewin; McCormick; McNamara; Prince, Wilkens-Russel; Prince; Jack; Turner; Tweed Heads Environment Group - Murray	issue grouped for combined response

No.	ISSUE	RAISED BY:	REFER TO
49.3	The draft Tweed River Area unregulated and alluvial Water Sharing Plan prohibits all options except Clarrie Hall dam.	McInerney	issue grouped for combined response
49.4	Council officers, in support of long-standing TSC policy, requested state government to have the proposed prohibition lifted. This has caused a great deal of community unrest.	McNamara	issue grouped for combined response
	Water Augmentation Options	-	
	Existing situation		
50	If the Tweed currently consumes 12,000ML/a and our license is for 27,000ML/a then there is no need for dam options and Council has time to investigate other approaches.	Symons	See response in Discussion Section
51	If Clarrie Hall dam can hold 16,000ML and we're only using 10,500ML/yr then we have more than 5,000ML in excess, with one of the highest rainfalls in the state, and nothing needs to be done.	Pearson	See response in Discussion Section
52	Conflicting figures stating an extra 3,250ML/a is required, while the DMS states 5,250ML/a. Why to do we need options of 22,000ML at CHD or 36,000ML at BCD - isn't this excessive?	Gardner	See response in Discussion Section
53	Given that Clarrie Hall dam contains 16,000ML, the weir at Bray Park is able to supply 13,750ML/annum, and only 3250ML/annum additional supply is required until 2036 it would appear that we have enough water for a population of 500,000.	DMS: Smith L	See response in Discussion Section
	Process and Approach		
	It should be called a water stealing plan.	Carroll	issue grouped for combined response
54	Limited number of well thought out options - Lack of rigour in exploring other options. Too much emphasis has been placed on supply rather than demand options. The shortlisted options promote an unsustainable and wasteful lifestyle.		See response in Discussion Section
54.1	Limited number of well thought out options - Lack of rigour in exploring other options. Too much emphasis has been placed on supply rather than demand options. The shortlisted options promote an unsustainable and wasteful lifestyle.	Eriksen; Symons; Ipsen; Tyman; Moore; Havier; Dawson; Dawe; Findlay; TweedCAN; Fuhrmann; Uki Village & District Residents Association Incorporated; Learmonth (CWG); Mayfield	issue grouped for combined response
54.2	Only the four options were considered but other	Sledge; Armfield; Pidgeon; Berg; Townsend; Eriksen;	issue grouped for

No.	ISSUE	RAISED BY:	REFER TO
	simpler/cheaper/common sense sustainability options were not considered as a whole/part solution to the problem.	Menzies; Sledge & Voinot; Symons; Purser; Stuart; Riordan; Possenti; Pearson; Outridge (Margo); Outridge (Mary Blane); Outridge (Mary Lou); O'Reilly; Hearder; Haffer; Dawson; Dawe; Barron; Findlay; TweedCAN; McInerny; Hoopman; Fuhrmann; Caldera Environment Centre - Hopkins; Name withheld DMS: Stuart; Caldera Environment Centre - Hopkins; Jack; Rich	combined response
55	The current ratepayers will be paying for the future water users. A separate charge should be imposed on the new developments for the additional costs involved with the upgrade of the water supply. Rural areas are subsidising the unsustainable coastal fringe.		See response in Discussion Section
55.1	Who is paying for this? Those inconvenienced by the options (eg living near to or behind the dams) should not be made to pay through raised rates etc.	Piper; Tyman	issue grouped for combined response
55.2	The current ratepayers will be paying for the future water users. A separate charge should be imposed on the new developments for the additional costs involved with the upgrade of the water supply.	Community Working Group Report (March 2010)	issue grouped for combined response
55.3	Existing residents should not be made to pay for augmentation of the water supply through greater taxes, environmental degradation or reduced living standards due to poorer river health.	Cooney; Piper DMS: Turner	issue grouped for combined response
55.4	Existing residents will pay $5000 each for augmentatio, since developer contributions are $25,000 and there is a new cap of $20,000.	TweedCAN	issue grouped for combined response
55.5	Pipeline options or localised groundwater extraction in urbanising areas would be preferable to inundating irreplaceable rural areas that are currently subsidising the growth of coastal fringes.	Dawson	issue grouped for combined response
55.6	Those in the community who are self-sufficient (particularly rural allotments) pay rates which unfairly subsidise the capital works spending by Council for the benefit of new and future residents who are responsible for the environmental impacts of these options.	Tyman; Caldera Environment Centre DMS: Caldera Environment Centre	issue grouped for combined response
56	Concerns that the available data and information has been, and continues to be, insufficient to support the MCA analysis.		See response in Discussion Section
56.1	Some of the CWG felt a full Environmental Impact Assessments needed	Community Working Group Report (March 2010)	issue grouped for

No.	ISSUE	RAISED BY:	REFER TO
	to be carried out PRIOR to any decisions on the short-listed options to determine the preferred option.		combined response
56.2	No EIS has been carried out on any of the options.	Prince; Jack; Pearson DMS: Jack	issue grouped for combined response
56.3	Estimates have not adequately included for landholder compensation or relocation of roads and services.	Edwards (CWG)	issue grouped for combined response
56.4	The CWG has concerns that the available data and information (particularly social and economic information, but potentially also other criteria) is not sufficient to support the MCA analysis that takes Council from 4 short-listed options to 1 preferred option.	Ebehard (CWG)	issue grouped for combined response
57	The available data is adequate for this stage of the process. Council has taken a sensible, efficient approach.		See response in Discussion Section
57.1	Correct approach not spending excessively on lots of options - coarse screening was done first and the preferred decision is based on available information.	Allsop (CWG)	issue grouped for combined response
57.2	The evidence is more than adequate but is unfortunately unable to be easily interpreted. There are many questions about the assumptions made in the DMS reports such as water consumption and consumer preferences.	Dawson (CWG)	issue grouped for combined response
58	There is no consensus within the community on the most appropriate method(s) to augment the water supply in terms of reduced environmental, social and economic impacts.		See response in Discussion Section
58.1	I support and endorse all of the options and more.	Wood	See response in Discussion Section
58.2	The coarse selection of bulk water supply options was considered to be inadequate, with too few similar dam choices and no regard to other more suitable bulk water supply choices.	Gardner (CWG); Murray (CWG)	See response in Discussion Section
58.3	Incredibly, the singular 'Direct potable use' (Option 9) became a main Tweed option in the Coarse Screening Assessment.	Murray (CWG)	See response in Discussion Section
58.4	Option 9 (Direct Potable Reuse) is the least environmentally damaging, but even this relies on fossil fuels for pumping and purification.	Caldera Environment Centre - Hopkins DMS: Caldera Environment Centre - Hopkins	See response in Discussion Section
58.5	Unless more sustainable measures are implemented, cheaper and less sustainable solutions will prevail and ultimately delay the	O'Reilly	See response in Discussion Section

No.	ISSUE	RAISED BY:	REFER TO
	implementation and growth of sustainable development.		
58.6	Council did not consider stormwater harvesting, rainwater tank or recycling options.	McCormick	See response in Discussion Section
58.7	Only the cheapest options have been considered.	Graf; Gardner; Dawson	See response in Discussion Section
58.8	The cost of alternative water supply technologies (stormwater harvesting, greywater harvesting, water recycling, rainwater tanks) is miniscule in relation to the estimated cost of building a new dam.	Havier	See response in Discussion Section
58.9	The estimated costs of either dam are too high and totally unacceptable , particularly when other far less expensive and more environmentally sensitive options are avaiable.	Havier	See response in Discussion Section
59	The four options presented are contrary to Government policies and legislation (Northern Rivers Catchment Management Plan, Tweed Macro Water Sharing Plan, National Water Sensitive Cities Strategy).		See response in Discussion Section
59.1	The four options presented are contrary to NSW State Government policy and will cause unacceptable environmental and ecological damage.	Dawson; Caldera Environment Centre DMS: Caldera Environment Centre	issue grouped for combined response
59.2	Government policies and legislation (Northern Rivers Catchment Management Plan, Tweed Macro Water Sharing Plan, National Water Sensitive Cities Strategy) disqualify Council's preferred options due to the need for environmental flows, ecological damage to Byrrill Creek & National Parks, unsustainable & unapproved inter-catchment transfer of water, ignoring alternative sources used by other regions.	Symons; Riordan; Caldera Environment Centre; Thompson (CWG) DMS: Caldera Environment Centre	issue grouped for combined response
59.3	NSW Weirs Policy prohibits the building of new dams / extension of dams.	Riordan; Gardner; Dawson; McInerny; Hoopman	issue grouped for combined response
60	Contingency options should be reviewed every two years especially where new innovations in water recycling and use come on line and evidence that they are economically feasible to apply.	Community Working Group Report (March 2010)	See response in Discussion Section
61	Perception that the conclusions of the Demand Management Strategy are weighted specifically to create the promise that the Shire has no option other than to undertake some massive centralised water infrastructure project. There should be a shift from hard infrastructure towards decentralised supplies which cause less devastation.	Mayfield; Turner	See response in Discussion Section

No.	ISSUE	RAISED BY:	REFER TO
	Dams		
62	Dams are unsustainable, deplete our waterways and result in a decline of water quality. Dams only have a 50 year lifespan. For these reasons dams are being dismantled around the world wherever possible.	Brodie; Prince; Hearder; Turner DMS: Turner	See response in Discussion Section
63	Dams are outdated technology. Only the fastest/cheapest/easiest engineering solutions have been considered. London is an example of sustainability where the Thames River is its main water source and there is not dam supply.		See response in Discussion Section
63.1	Dams are outdated technology. Only the fastest/cheapest/easiest engineering solutions have been considered. London is an example of sustainability where the Thames River is its main water source and there is not dam supply.	Jack; Jack; Sloane; Dawson DMS: Dawson; Stuart (and others); Turner; Tweed Heads Environment Group - Murray	issue grouped for combined response
63.2	It is difficult to support dams as they flood native forest, farmland and residential land, and adversely affect the river system. Dams should be the last option considered.	Cooney; Pidgeon; Beltrame; Name withheld; Townsend; Smith L; Dawson; Dawson (CWG)	issue grouped for combined response
63.3	Dams have huge social and environmental impacts.	Gardner; TweedCAN; Vella; Smith B; Rich; Name withheld	issue grouped for combined response
63.4	Dams all have problems with water quality and emissions but we have not been given guidance on this.	Community Working Group Report (March 2010)	issue grouped for combined response
63.5	Dams are an integral part of developing a sustainable society.	Meath; Klaus; Rotary Club Kingscliff	issue grouped for combined response
	Raising Clarrie Hall Dam		
64	Is unacceptable as it will flood significant areas of native forest (and Native Park), significant vegetation, farmland, residential land, roads, sites of Aboriginal cultural heritage. It would mean 210ha of land would be flooded, affecting 24 property owners, and relocating McCabes bridge.	Spragg; Bolten; Lanham; Prince; Riordan; Pearson; Gardner; Dawson; Dawe; Blackwell; Blunden; Murray (CWG); Gardner (CWG); Duckworth; Fingal Head Coastcare Inc DMS: Fingal Head Coastcare Inc.; Lewin; Prince, van Steenwyk, Yeomans; Baker; Hersovitch; Sledge and Vionot; Chadwick; Jack; Dawe; Name withheld	See response in Discussion Section
64.1	Against the destruction of cultural heritage.	Rabbits	issue grouped for combined response
65	To increase the water Clarrie Hall dam can supply, Council should construct a holding pond on the Tweed River and pump water (run on	DMS: Smith L	See response in Discussion Section

No.	ISSUE	RAISED BY:	REFER TO
	solar energy) from this to the dam during periods of high flow.		
66	If demand management measures can not support the population, the most sensible choice is to raise Clarrie Hall Dam. Least environmentally damaging since the impacts have mainly already occurred. It will be important that the EIA process is comprehensive and mitigation measures are identified and implemented into the development conditions. Adequate emergency plans should also be put in place.		See response in Discussion Section
66.1	If demand management measures are not enough to support the existing population, the most sensible choice is to raise Clarrie Hall Dam.	Hastings Point Progress Association; Townsend; Hudson; Morrison	issue grouped for combined response
66.2	Preferred option is to raise Clarrie Hall Dam. It will be important that the EIA process is comprehensive and mitigation measures are identified and implemented into the development conditions.	Walton; Tyalgum Literary Institute and Progress Association; Campbell; Wood; Hay; Milligan; Smith L; Lucas; Styman; Piper; Pottsville Community Dune Care; Rotary Club Kingscliff	issue grouped for combined response
66.3	Least environmentally damaging since the impacts have mainly already occurred. However, further impacts will happen and these are concerning.	Symons; Prince; Piper; Morrison; Martin; Pearson; Moore; McQueen; Graf; Uki Village & District Residents Association Incorporated	issue grouped for combined response
66.4	Damage has already occurred and should be constrained to one area. However concerns over effects to native forest (and Native Park), farmland, residential land, and roads.	Hay; Symons; Piper; Morrison	issue grouped for combined response
66.5	It is better to impact on environmental and social values which have already been compromised, however being mindful of the people and environmental values which will be affected. By raising Clarrie Hall dam, Byrrill Creek will remain an environmental asset to the Shire. Least impact option and takes care of the required spillway fix. Clarrie Hall dam is preferred over Byrrill Creek if one of these options is to proceed.	Community Working Group Report (March 2010)	issue grouped for combined response
66.6	Easiest choice for now – path of least resistance.	Allsop (CWG)	issue grouped for combined response
66.7	As second option, Council should augment Clarrie Hall dam.	Combined Tweed Rural Industries Association; Cudgen Progress Association	issue grouped for combined response
66.8	In addition to demand management measures, Council should also raise	Wood	issue grouped for

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	the wall at Clarrie Hall Dam.		combined response
66.9	State and National water flow requirements will have to be adhered to, and adjusted accordingly. At CHD the denudation of vegetation should be done by barge to reduce the need for further road infrastructure, which creates more environmental damage.	Community Working Group Report (March 2010)	issue grouped for combined response
66.10	At CHD an emergency plan should be established for the village of Uki, and surrounding areas if the dam should fail; including during construction.	Community Working Group Report (March 2010)	issue grouped for combined response
66.11	A larger dam would have a greater risk of failure due to seismic activity. There is no adequate emergency plan in place should this occur.	Symons; Ingram	issue grouped for combined response
67	There are too many unanswered questions to support a solution. Will the dam affect access to Commissioners Creek Rd. Will construction affect the peace, access, and how long will it take?	Piper	See response in Discussion Section
68	Current dam releases polluted toxic foul-smelling water.	Jack; Clarke	See response in Discussion Section
69	The seven metre buffer currently proposed seems excessive and should be reduced if possible.	Meath; Evans	See response in Discussion Section
70	Council has been required since 2002 to enlarge the spillway but has delayed works pending the decision on whether or not to raise the dam wall. This work still needs to be done regardless of whether the wall is raised.	Gardner	See response in Discussion Section
71	Many landholders at Doon Doon Creek were dissatisfied with the way they were treated when Clarrie Hall Dam was constructed. The figures in the budget for compensation does not inspire confidence. Compensation to affected landholders needs to be appropriate and tailored to individuals. Fair financial compensation will be accpetable to most of the affected landholders. CHD landholders were burdened last time. Its time that burden passes to others.		See response in Discussion Section
71.1	Many landholders at Doon Doon Creek were dissatisfied with the way they were treated when Clarrie Hall Dam was constructed. The figures in the budget for compensation does not inspire confidence.	McInerny; Hoopman	issue grouped for combined response

No.	ISSUE	RAISED BY:	REFER TO
71.2	Concerns over compensation because the last time (at CHD) the council were, to say the least, economical with the truth.	Community Working Group Report (March 2010)	issue grouped for combined response
71.3	CH Dam area already damaged, less people to move, but people already disturbed will have their lives disrupted again. Fair financial compensation will be accpetable to most of the affected landholders.	Thompson (CWG); Anon	issue grouped for combined response
71.4	Compensation to affected landholders needs to be appropriate and tailored to individuals. Changed landuse practices would improve protection of dam catchment and landholders could be compensated by allowing rural residential zoning for smaller scale acerages.	Meath	issue grouped for combined response
71.5	CHD landholders were burdened last time. Its time that burden passes to others. CHD may be burdened again in 30 years time if raised then.	Beck (CWG); Duckworth	issue grouped for combined response
72	Investigate the feasibility of a micro-hydro power plant as part of the augmentation.	Walton; Campbell; Meath	See response in Discussion Section
	Byrrill Creek Dam		
73	Too high Social, Cultural Heritage & Environmental problems to be considered an option. From the evidence we have Byrrill Creek must be removed from the list of viable options Object as it will flood some of the highest conservation value land in the Tweed, is a regionally significant biodiversity hotspot adjacent to the Mt. Warning World Heritage National Park. Major drawcard for tourism. Road closures will occur. Residents and communities will be severely affected.		See response in Discussion Section
73.1	Object as it will flood some of the highest conservation value land in the Tweed, is a regionally significant biodiversity hotspot adjacent to the Mt. Warning World Heritage National Park. Major drawcard for tourism. Road closures will occur. Residents and communities will be severely affected.	Hollingsworth; Jack; Cox; Brodie; Bolten; Townsend; Hay; Sledge & Voinot; Sims; Ray; Hudson; Name withheld; Scorgie; Symons; Purser; Prince; Piper; Morrison; Martin; Kaye; James; Jack; Ipsen; Bram; Wrem; Summers; Riordan; Possenti; Pearson; Outridge (Margo); Outridge (Mary Blane); Outridge (Mary Lou); Moore; McQueen; McCormick; McConville; Mayfield; Havier; Haffer; Graf; Dawson; Dawe; Curtis; Blackwell; Barron; Barnett (Kellie); Barnett (Jade); Baker; TweedCAN; McInerny; Hoopman;	issue grouped for combined response

No.	ISSUE	RAISED BY:	REFER TO
		Fuhrmann; Turner; Blunden; Uki Village & District Residents Association Incorporated; Vella; Costello; Name withheld; Fingal Head Coastcare Inc; Luca; Mayfield; Name withheld; Weber DMS: Fingal Head Coastcare Inc.; Peacock; Sledge; Symons; Costello; Ehrlich; Gray; James; Lewin; Malecki; Mason; McCormick; McNamara; Moore; Prince, : van Steenwyk, Wilkens-Russel, Yeomans; Baker; Hersovitch; Sledge and Vionot; Chadwick; Jack; Kaye; Dawe; Blackwell; Outridge – Mary Blane; Turner; Dawson (CWG); Learmonth (CWG)	
73.2	Object as it will flood productive farmland.	Pearce; Bolten; McInerny; Hoopman	issue grouped for combined response
73.3	Too high Social, Cultural Heritage & Environmental problems to be considered an option. From the evidence we have Byrrill Creek must be removed from the list of viable options Byrrill Creek is designated as being of high conservation value including high diversity of Schedule 1 &2 wet fauna species and very high diversity of wet flora species by NPWS (DECC) in the Stressed Rivers Assessment Report. Conservation of Biological Integrity is about preserving natural areas of High Conservation Value for their intrinsic worth. Byrrill Creek is one such area. Toughest choice, but in terms of long term water security this may be our best option. Byrrill Creek Dam is contrary to state policy of no more dams and every effort must be made to protect the environment. It is more expensive than CH Dam and will have a lower capacity. If council approved the Byrrill Creek dam option, a high conservation area would be lost to future Tweed generations, as a place of beauty and tourist destination for visitors.	Community Working Group Report (March 2010)	issue grouped for combined response
73.4	Cons - Area is HCV	Community Working Group Report (March 2010); Lemaire (CWG)	issue grouped for combined response

No.	ISSUE	RAISED BY:	REFER TO
	- Local lifestyle disturbances - Best location for rehabilitation. - New road alignments required. - Rehabilitation works done.		
73.5	The High Conservation Value makes this a very difficult option, both locally, and on a National level. It will be very difficult to compensate for the area to be inundated at BCD The forestry plantations have economic value, and these have a benefit to the Shire financially, and in regards to carbon emissions.	Lemaire (CWG)	issue grouped for combined response
73.5	A dam at Byrrill Creek is unacceptable regardless of any demand management strategy or secure yield scenarios. The Tweed Riparian Restoration Prioritisation Report 2003 looked at 86 riparian sites within 6 sub catchments and ranked each according to their relative conservation and regeneration potentials. Byrrill Creek was ranked the highest of all the sub catchments and 10 of the top 30 highest priority sites of all the 6 sub catchments were located within the Byrrill Creek catchment. The total funding to date for riparian projects at Byrrill Creek amounts to $ 416.264 plus in kind labour contributions of $154.324 by Landcare members. Up to 21 ha of Mebbin National Park would be inundated. At least one known Aboriginal site would be affected.	Symons; Prince; Morrison; James; Jack; Bram; Summers; Riordan; Pearson; McCormick; Havier; Graf; Turner DMS: Symons; McCormick; Turner	issue grouped for combined response
73.6	Council purchased land at Byrrill Creek 25 years ago under very different circumstances. Building a dam may have been an acceptable position back then but it is not now.	James; Pearson DMS: Symons	issue grouped for combined response
73.7	Remove Byrrill Creek from the options for augmentation of the water supply.	Symons; Morrison; Bram; McCormick; Havier; Turner DMS: McCormick	issue grouped for combined response
73.8	Council owned land in Byrrill Creek will remain an asset for the community. It could be put to other beneficial uses or sold to National Parks.	Morrison	issue grouped for combined response
73.9	Two dams on adjacent valleys and both holding back headwaters to the Tweed River.	Gardner; McInerny; Hoopman	issue grouped for combined response
73.10	Against the destruction of cultural heritage.	Name withheld	issue grouped for

No.	ISSUE	RAISED BY:	REFER TO
			combined response
74	Are we damming our hinterland valleys to provide for coastal development that will ultimately be lost to the sea due to future climate change?	Dawson; Barnett (Kellie) DMS: Gardner	See response in Discussion Section
75	Building a dam at Byrrill Creek potentially provides positive outcomes: - Alternative catchment of rain - Council owns most of the land - Clean catchment, surrounded by State and National Parks - Water supply security - Reduced compensating costs - Quality in sourced water Building a dam at Byrrill Creek potentially provides nagative outcomes - Area is HCV - Local lifestyle disturbances - Best location for rehabilitation. - New road alignments required. - Rehabilitation works done.		See response in Discussion Section
75.1	Building a dam at Byrrill Creek potentially provides positive outcomes: - Alternative catchment of rain - Council owns most of the land - Clean catchment, surrounded by State and National Parks - Water supply security - Reduced compensating costs - Quality in sourced water Building a dam at Byrrill Creek potentially provides nagative outcomes - Area is HCV - Local lifestyle disturbances - Best location for rehabilitation. - New road alignments required. - Rehabilitation works done.	Community Working Group Report (March 2010); Lemaire (CWG)	issue grouped for combined response
75.2	Council should build the dam at Byrrill Creek - it is the only long term	Budd; Lanham; Wood; Cudgen Progress Association	issue grouped for

No.	ISSUE	RAISED BY:	REFER TO
	solution. Council has owned much of the land at the site for many years.		combined response
75.3	In addition to demand management measures, Council should also approach State Government to ensure restrictions are not placed on building a new dam at Byrrill Creek which has been planned for and land acquired since the 1960s.	Wood; Duckworth	issue grouped for combined response
75.4	Council should build the dam at Byrrill Creek - it is the only long term solution. Benefical impact on groundwater supplies and provides backup in case Clarrie Hall dam requires maintenance, etc	Combined Tweed Rural Industries Association; Lanham; Clarke; Duckworth	issue grouped for combined response
75.5	Minimum social impact relative to the betterment and future betterment of the entire Shire.	Beck (CWG); Duckworth	issue grouped for combined response
75.6	As second option, Council should build Byrrill Creek dam.	Campbell; Styman; Rotary Club Kingscliff	issue grouped for combined response
75.7	At 80% flows Byrrill Creek provides 5 million litres compared to Clarrie Hall's 2.5 million litres, and the Byrrill Creek dam would be deeper and provide better quality water.	Lanham	issue grouped for combined response
75.8	Whilst not a supporter of dams, but given TSC's long involvement at this site and the surprising pros put forward by the CWG, this option should stay on the table at this point in time.	Smith L; Lemaire (CWG)	issue grouped for combined response
76	Some residents will lose their homes. Others will be inconvenienced by property inundation or severence, closure of Byrrill Creek Road, alternative property access, spillway noise and construction impacts. Some residents were made aware of these issues when they purchased their land, others were not.		See response in Discussion Section
76.1	I have lived in the Byrrill Creek valley for over 50 years, and my home will be flooded if the dam goes ahead. I am opposed to the dam and feel Council is negligent and heartless not to consider residents' issues. There must be better solutions for the Tweed's water shortage that don't impact so much on people's lives.	Merchant	issue grouped for combined response
76.2	Existing residents have no security because of the caveats hanging over their land.	Pearson	issue grouped for combined response
76.3	When we purchased our land in 2004 we should have been, but were never, told about the possible encroachment onto our property.	Havier	issue grouped for combined response

No.	ISSUE	RAISED BY:	REFER TO
76.4	If the dam went ahead, noise from the spillway would be a concern and more information on this issue would be appreciated.	Urry	issue grouped for combined response
76.5	We (landholders in Byrrill Creek) are only a handful of people compared to the greater population of the Tweed and the decision makers will need to take this into account whilst ensuring the valley is better or at least the same.	Name withheld	issue grouped for combined response
76.6	Most residents of affected properties were well aware of the potential for the dam to be built when buying their properties and dwellings were positioned accordingly.	Name withheld	issue grouped for combined response
77	Investigate the feasibility of a micro-hydro power plant as part of the augmentation.	Campbell	See response in Discussion Section
	Pipeline to SEQ Water grid		
78	Unsatisfactory option: selling water to the Gold Coast robs the Tweed of needed water and promotes unsustainable development on the Gold Coast without them providing the necessary infrastructure. Desalination has large energy requirements. SEQ has even less water than the Tweed. QLD government has not given any agreement. It is risky and water may not be available when required (ie during drought).		See response in Discussion Section
78.1	Unsatisfactory option: selling water to the Gold Coast robs the Tweed of needed water and promotes unsustainable development on the Gold Coast without them providing the necessary infrastructure. Desalination has large energy requirements. SEQ has even less water than the Tweed.	Spragg; Cudgen Progress Association; Fingal Head Coastcare Inc; Pottsville Community Dune Care DMS: Fingal Head Coastcare Inc.; Prince; Sledge and Vionot; Jack; Dawe; Stuart; Turner	issue grouped for combined response
78.2	The SEQ option has no merit and the QLD government has not given any agreement. It is risky and water may not be available when required (ie during drought).	Graf; Townsend; Sledge & Voinot; Smith L; Prince; Jack; Tyman; Riordan; Pearson; McNamara; Graf; Gardner; McInerny; Hoopman; Murray (CWG); Edwards (CWG); Clarke; Weber	issue grouped for combined response
78.3	Not an option as consent has not been granted by the Minister for Water and part 13 of the draft Water Sharing Plan prohibits it.	Symons; Prince; Jack; Pearson; Murray (CWG); Edwards (CWG)	issue grouped for combined response
78.4	Politicians (Federal, Qld) have stated "NSW should look after its own water requirements", and the Qld Water Commission wrote it is recovering from drought and would not consider sale of water until it had at returned to at least 60% capacity.	Gardner	issue grouped for combined response

No.	ISSUE	RAISED BY:	REFER TO
78.5	Has excessive power requirements, the associated greenhouse gas emissions, and pollution created.	Summers; Stuart; Riordan; McNamara; Hearder; Graf; Gardner; McInerny; Hoopman	issue grouped for combined response
78.6	This ought to have a high environmental rating but a low Greenhouse gas rating.	Dawson (CWG)	issue grouped for combined response
79	Interbasin transfers are not the answer.	Hearder; Dawe; Carroll; Dawson (CWG); Weber	See response in Discussion Section
80	The SEQ pipeline option is not permitted under the draft Tweed Area Water Sharing Plan.	Townsend	issue grouped for combined response
80.1	Pipeline to SEQ very difficult politically and too many legislative problems. Plus large ongoing pumping cost, large carbon footprint, enviro problems (linked with Tugun Desal Plant) and Cultural Heritage problems. Ratings for the pipeline options should reflect the whole water supply system enabled by the pipeline linkage, not just the pipeline itself. Eg the energy costs associated with the SEQ pipeline regardless of whether this is adequately reflected in any contractual arrangement. SEQ will be dumping their waste (brine) on our doorstep. Desalination plants are a death sentence to marine life and power usage exacerbates the already fragile/unredeemable GHG situation When SEQ water Grid Manager has not guaranteed supply of bulk water supply why does the WaterTweed project persist with failed Pipe options when other more suitable side options for water supply are available?	Community Working Group Report (March 2010); Edwards (CWG)	issue grouped for combined response
81	The SEQ pipeline option should be more fully explored.		See response in Discussion Section
81.1	In addition to demand management measures, Council should investigate connection to South East Queensland water grid.	Wood	issue grouped for combined response
81.2	The SEQ pipeline option should be more fully explored.	Piper	issue grouped for combined response
81.3	More information is required to adequately assess the Pipeline to SEQ Water	Community Working Group Report (March 2010)	issue grouped for combined response
81.4	Pros - Cheap	Lemaire (CWG)	issue grouped for combined response

No.	ISSUE	RAISED BY:	REFER TO
	- Saves building dams - Quick fix - Doesn't require storage facility - Low environmental impacts Cons - Need approval to get the water - Only for new developments along the coast - Doesn't secure supply - No options for water treatment - Needs to be maintained		
82	Alternative routes A and B are unacceptable on environmental grounds. Route C could potentially have less impact given the Cobaki Lakes development.	Smith L	See response in Discussion Section
	Contingency Option		
83	Including a contingency option is good planning, however the current option is flawed.		See response in Discussion Section
83.1	Unsatisfactory information to comment.	Ebehard (CWG) DMS: Fingal Head Coastcare Inc.	issue grouped for combined response
83.2	Objection against the Contingency Option. It is not a realistic option.	Townsend; Sledge & Voinot; Prince; Jack; Tyman; Gardner (CWG); Edwards (CWG); Cudgen Progress Association DMS: Sledge and Vionot; Jack	issue grouped for combined response
83.3	Including a contingency option is good planning, however the current option is flawed.	Smith L; Lemaire (CWG)	issue grouped for combined response
84	Use of groundwater would deplete finite supplies necessary for agriculture, the environment, and has cultural heritage impacts.		See response in Discussion Section
84.1	Use of groundwater would deplete finite supplies necessary for agriculture and the environment.	Combined Tweed Rural Industries Association; Spragg; Smith L; Symons; Pearson; McNamara; Gardner DMS: Prince; Jack	issue grouped for combined response
84.2	Groundwater : Cultural Heritage problems , Enviro problems: impacts on greater water table unknown & Farmers don't want it. Rous Water doesn't have enough water for themselves let alone share it. When Rous Water has not guaranteed supply of bulk water supply why does the WaterTweed project persist with failed Pipe options when	Community Working Group Report (March 2010)	issue grouped for combined response

No.	ISSUE	RAISED BY:	REFER TO
	other more suitable side options for water supply are available? The CWG cannot recommend this option as it is a contingency.		
85	The pipeline link to Rous Water can only be considered if Rous increases its existing system capacity. If this were to occur, the option could be more sustainable, viable and cost effective than the SEQ pipeline. It could be a permanent contingency plan. There is no agreement with Rous Water for them to supply water to Tweed.		See response in Discussion Section
85.1	Rous Pipeline provides inadequate quantities of water. There is no agreement with Rous Water for them to supply water to Tweed.	Riordan; Gardner; McInerny; Hoopman; Murray (CWG)	issue grouped for combined response
85.2	The pipeline link to Rous Water can only be considered if Rous increases its existing system capacity. If this were to occur, the option could be more sustainable, viable and cost effective than the SEQ pipeline. It could be a permanent contingency plan.	Smith L	issue grouped for combined response
86	Pipeline options or localised groundwater extraction in urbanising areas would be preferable to inundating irreplaceable rural areas that are currently subsidising the growth of coastal fringes.	Piper DMS: Dawson	See response in Discussion Section
	Water-wise options		
87	Byrrill Creek Dam could be avoided by spending the $57M Byrrill Creek Dam would cost on rainwater tanks and composting toilets.	Dawe	See response in Discussion Section
88	Council should include the “water wise option” within the short-listed options.	Yeomans DMS: Prince; Fingal Head Coastcare Inc.	See response in Discussion Section
89	Waterwise options may be more expensive up front, but will be much cheaper in the long run.	Cooney; Graf	See response in Discussion Section
	Alternative Options		
90	Multiple smaller dams to be constructed on unproductive higher land throughout the valley to reduce impacts from a larger dam. Water could be used by intensive agriculture on the fertile valley below and excess fed back into the Bray park weir for domestic supply. Dam the Cobaki broadwater.		See response in Discussion Section
90.1	Multiple smaller dams to be constructed on unproductive higher land throughout the valley to reduce impacts from a larger dam. Water could be used by intensive agriculture on the fertile valley below and	McConville	issue grouped for combined response

No.	ISSUE	RAISED BY:	REFER TO
	excess fed back into the Bray park weir for domestic supply.		
90.2	Dam up the area of Cobaki broadwater - it is the most natural dam site and close to the areas of development.	O'Toole	issue grouped for combined response
	Sale of Tweed water		
91	Council only wants to sell water to SEQ or Rous Water and this should not be a reason for building new dams in the Tweed.		See response in Discussion Section
91.1	Council only wants to sell water to SEQ and this should not be a reason for building new dams in the Tweed.	Symons	issue grouped for combined response
91.2	Council wants to sell water to the Gold Coast or bottled “Coca-cola style”.	Murwillumbah Ratepayers Assoc; Gill; Lemaire	issue grouped for combined response
91.3	No agreement be struck with either SEQ or Rous Water.	Hastings Point Progress Association	issue grouped for combined response
	Environmental flows		
92	At its meeting 17 November 2009, Council approved further environmental flow restrictions on the Tweed River at Bray Park Weir: "The cessation level for flow bypass requirements at Bray Park Weir be set at a level of 50% of the capacity of the Clarrie Hall Dam".	Tweed Heads Environment Group - Murray	See response in Discussion Section
	Inclusion of external and flow-on effects		
93	External factors such as environmental costs and benefits have not been directly included in the economic and comparative analysis. The analysis should have included items such as reduced water discharges to sensitive receiving waters, reduced storm surcharges, creation of habitat. The cost of water recycling and dam construction cannot be fairly compared until environmental costs are incorporated into the overall dam costs.		See response in Discussion Section
93.1	External factors such as environmental costs and benefits have not been directly included in the economic and comparative analysis. The analysis should have included items such as reduced water discharges to sensitive receiving waters, reduced storm surcharges, creation of habitat through reedbeds, etc.	Lanham; Yeomans; Hollingsworth; Graf; Dawson; Turner; Whittingham	issue grouped for combined response
93.2	Cost considerations should be secondary to improved environmental outcomes.	Spragg	issue grouped for combined response
93.3	There are no figures on environmental cost. The cost of water recycling	Community Working Group Report (March 2010)	issue grouped for

No.	ISSUE	RAISED BY:	REFER TO
	and dam construction cannot be fairly compared until environmental costs are incorporated into the overall dam costs. A replacement value and opportunity cost need to be factored in to better reflect the environmental value. Dollar values are a coarse measure of environmental worth but would assist in making a fairer assessment between options. Once true environmental costs have been assessed the planning process needs to revisit the coarse screening model and re-evaluate $/ML.		combined response
93.4	We live in an area which has world heritage status – The environmental significance is what drew people here in the first place (over millennia). We have a sacred mountain in the middle. We must preserve it – to destroy it is mindless.	Community Working Group Report (March 2010)	issue grouped for combined response
94	Stormwater was discarded based on cost constraints alone. This is a skewed way of assessing pros and cons. Stormwater harvesting and reuse of water would reduce discharges to estuaries, and in some instances flood surge damage.	Tweed District Residents & Ratepayers; Eriksen; Jack (Marie); Findlay	See response in Discussion Section
95	Climate change and sea level effects have not been considered.		See response in Discussion Section
95.1	Climate change and sea level effects have not been considered.	Scanlan; Tweed District Residents & Ratepayers; Townsend; Prince; Jack; Welling; Hollingsworth; Gardner; Ebehard (CWG)	issue grouped for combined response
95.2	The CWG has not seen any evidence of how Tweed SC has considered climate change scenarios and impacts in their decision-making process.	Community Working Group Report (March 2010)	issue grouped for combined response
	Multi-Criteria Analysis (MCA)		
96	Both social and environmental impacts are significant. Half the CWG considered them to be equal in importance. Half considered environmental issues are more important. It was interesting that no one on the CWG considered social impacts ahead of environmental impacts.		See response in Discussion Section
96.1	Social impacts are not as big an issue as environmental impacts	Community Working Group Report (March 2010)	issue grouped for combined response
96.2	Within the CWG no one feels that the social criteria are more important	Community Working Group Report (March 2010)	issue grouped for

No.	ISSUE	RAISED BY:	REFER TO
	than the environmental criteria. Six members feel environment should be weighted more heavily, while six members believe social and environmental issues should have equal weightings. If there is no environment – there is no society		combined response
96.3	Environment is the most important factor. It is a complex problem. Social is highly critical. General consensus: we can't have one without the other.	Community Working Group Report (March 2010)	issue grouped for combined response
96.4	The overall list of criteria seems reasonable. However the process does not seem to have adequately considered climate change adaptation and mitigation	Community Working Group Report (March 2010)	issue grouped for combined response
96.5	The CWG acknowledges the complexity of the issues involved in considering the trade-offs inherent in these decisions.	Ebehard (CWG)	issue grouped for combined response
97	Suggested improvements to the MCA used in the coarse screening included: using a finer scoring system, refinement of weightings so that other criteria were weighted equal or greater to costs and secure yield, improving the transparency through inclusion of discussion and background information.		See response in Discussion Section
97.1	The MCA weightings and ratings are too coarse to gauge the finer details and disparities between the areas. It is not an adequate tool to make a qualified recommendation about the choices without further clarification and discussion.	Dawson (CWG); Gardner (CWG)	issue grouped for combined response
97.2	The ratings should be from 0 to 10 to give a finer approach, with 0 being an absolute no.	Thompson (CWG)	issue grouped for combined response
97.3	The MCA Process was discovered on 1970 and it has been considerably refined since. For complex group decisions we should be using Analytic Hierarchy Process where each decision is broken down into sub problems, pairs of sub headings are then compared with each other and given a rating. May need a computer programme to do the calculations. From my research this is a far more sophisticated way to go.	Thompson (CWG)	issue grouped for combined response
97.4	In the coarse screening: Only secure yield and costs were given high weightings Cultural heritage should have equal weightings to secure yield Greenhouse gas emissions should have a higher weighting	Gardner (CWG)	issue grouped for combined response

Appendix B –Notes from Public Information Sessions

Tweed District Water – Demand Management and Water Supply Augmentation

Public Information Session

Wednesday 10 February 2010
South Sea Islander Room, Tweed Heads Civic Centre, Brett Street, Tweed Heads
2:00pm – 7:15pm

CWG members and Tweed Shire Council staff in attendance:

CWG	*TSC*
Richard Murray	Anthony Burnham
Don Beck	Tim Mackney
Cr Holdom	Dan Walton
	Sascha Piotrkowski
	Marion Martin

The information session was attended by approximately 20 members of the public who were interested in discussing the Shire's Demand Management actions and strategy, and the approach to augmentation of the Water Supply.

Some of the topics discussed and opinions raised by individuals were:

1. Conservation focus, concerned about dam environmental impacts, population growth is ok, concern with current planning legislation being out of step with community direction – ie restrictive on both community and Council.

2. Tweed needs to develop water resources and hydro-electricity options.

3. Astonishment that Council might have difficulty gaining approval to construct Byrrill Creek Dam

4. Understanding and supportive of the need for augmentation

5. Concerns that population predictions are driving the need for a second dam. The person was opposed to Byrrill Creek on two fronts – environmental (obvious reasons) and social (if Council had the political strength to put a cap on population we wouldn't need a second dam).

6. Environmental and recycled water focus is wanted, but need to balance with costs and legislative constraints. Concerned that Council should not ultimately be shackled by these constraints

7. Particularly interested in the environmental issues. Has been following the process with interest, especially the CWG through the minutes and question register. Wants CWG to "get on with it" and not concentrate on "administrative" issues.

Three attendees placed their names on the Interested Parties Register, with several other attendees indicating that they were already on the register.

The following brochures and reports were available as handouts:

- Recycled Water
  - Tweed Shire Council Recycled Water Initiative – Fact Sheet No. 1
  - Tweed Shire Council Recycled Water Initiative – Case Study 1
  - Tweed Shire Council Recycled Water Initiative – Case Study 2

- Demand Management
  - Water Demand Management – Tweed Shire Demand Management Strategy
  - Water Demand Management – Progress to Date
  - Water Demand Management – Reducing Water Usage
  - Water Demand Management – User Pays Water Pricing 2009 – 2010
  - Integrated Water Cycle Management – Household Retrofit Program
  - Integrated Water Cycle Management – Water Modelling Activities

  - REPORT: Demand Management Strategy – Dec. 2009 – by MWH
  - REPORT: Demand Management Strategy – Stage 1 – by MWH
  - REPORT: Demand Management Strategy – Stage 2 – by MWH

- Water Supply Augmentation
  - Tweed District Water Supply Augmentation Factsheet 1 – Why does the Tweed need more water?
  - TSC Fact Sheet 1 – Why does the Tweed need more water?
  - TSC Fact Sheet 2 – Water Supply Augmentation to 2036
  - TSC Fact Sheet 3 – Community consultation to determine a preferred option
  - TSC Fact Sheet 4 – Community Working Group nominations
  - TSC Fact Sheet 5 – Water Supply Options
  - TSC Fact Sheet 6 – Short-listed Option 1: Raise Clarrie Hall Dam
  - TSC Fact Sheet 7 – Short-listed Option 2: Construct Byrrill Creek Dam
  - TSC Fact Sheet 8 – Short-listed Option 3: Pipeline connection to SE QLD
  - TSC Fact Sheet – Questions and answers to the Project

  - REPORT: Tweed District Water Supply Augmentation Options Study Stages 1 & 2 – by MWH

- Water Savings and Education
  - Tweed Shire Council – Water Wise Fact Sheet 1
  - Tweed Shire Council – Water Wise Fact Sheet 2
  - Tweed Shire Council – Recycled Water Initiative Fact Sheet 2
  - Tweed Shire Council – Water Wise Fact Sheet 6
  - Tweed Shire Council Fact sheet 3 – Rebates
  - Tweed Shire Council – Water Wise Fact Sheet 10 – Rainwater tanks
  - NSW Government - How Can Greywater be used?

- Joanna Gardner's (CWG member) Byrrill Creek Landowners Information
  Three (3) handouts
  - Environmental Effects and Considerations for the Proposed Byrrill Creek Dam
  - An Overview of the Byrrill Creek Dam Area
  - Byrrill Creek Dam Newsletter – February 3rd 2010

Tweed District Water – Demand Management and Water Supply Augmentation

Public Information Session

Thursday 18 February 2010
Canvas & Kettle Room, Murwillumbah Civic Centre, Murwillumbah
2:00pm – 9:00pm

CWG members and Tweed Shire Council staff in attendance:

CWG	***TSC***
Tony Thompson	Anthony Burnham
Colleen Edwards	Tim Mackney
Don Beck	Dan Walton
Cr Holdom	
Robyn Lemaire	
Joanna Gardner	

The information session was attended by approximately 12 members of the public who were interested in discussing the Shire's Demand Management actions and strategy, and the approach to augmentation of the Water Supply.

Colleen Edwards:

- Why 40m wide spillway on 70m CHD? Can it be larger?
- Blasting issues
- Dam compensation
- $ per kL

Jim Warburton:

- Rocky cutting – community consultation – no dams. Wave of community consultation. Water SE. Catchment Management Authority.
- Tweed River – mid estuary and fresh water in poor condition – stressed.
- Office of Water – presentation. Catchment management.
- Mandatory tanks.
- Top 5 – broad consultation as part rocky cutting.
- Community – NO DAMS.
- River already unhealthy. Fresh. E.g. red alert nutrients.
- Does the fish ladder work?
- Take rocky cutting dam off the list.
- Byrrill Creek Dam take off the list and sell land.
- Forest Plantation – reduces biodiversity.
- CAP – need to work to it. Policy Statement – no cross catchment.
- Need high flows for down stream area.
- Disconnect between the coastal and upper catchment values.
- Existing system struggling.

- Further population should not degrade the area further e.g. have 25 x nightcap villages (vs) standard development.
- Standard development not sustainable.
- Need big RWT. 22,500 L
- Dam – release temperature pollution.
- No more extraction from river.
- No more discharge to river.
- More recycling is preferred option.

Ron Duckworth:

- If CHD went ahead – road alignment at McCabbes Bridge is by far the preferred alignment.
- Extra length approximately 6 – 7 km plus 3 crossings.
- Noting trades change travel and hours making grazing and the like unuseable.
- Recommend to spread risk e.g. water quality.
- All other alternatives.
- CHD all farming country U/S.
- BCD – less developed catchment. Better water quality.
- CHD 27 properties affected approximately 18 cattle.
- Commercial impact
- Fencing required.
- Impoundment opportunity in CHD catchment at higher level but adjacent.
- Scaling of roads in Doon Doon Road and Commissioner Creek Roads to minimise sediment run off.
- Some commitments never followed through with PWD and Council.

Lady

- Appalled at only 4 options.
- Suspicious of process – just a way of building Byrrill Creek Dam.
- Commitment not to build BCD.
- Use $56mil to assist farmers and invest in other measures.
- TSC lagging behind
    - Grey water – facilitate this process. Minimise cost.
- Any saving water to reduce extraction.
- Storm water harvesting. Town areas recycling.
- Tweed Heads, Murwillumbah areas.
- Big buildings – capture as much as possible.
- RW Tanks. Retrofit. Assistance.
- Michael Mobbs.
- Avoid supply side.
- Pipeline SEQ grid. GHG emission. High rating given desalinisation.
- BCD.

Joanna – requested information for future Uki Meeting

Why nine options? Why some not proceeded with.

Demand Management – what are Council doing? What's still to be done?

Other notes

- Individual meters for each dwelling in:
- Retirement Villages and Multi-Unit Complexes.

- Tanks compulsory for industrial.
- Tighten up “step charge”.
- Encourage greywater use with reduction in sewer levy.
- Tank size based on no. of bedrooms, floor area of the house ie. not a blanket 5000L size.
- Water bills – make them like energy bills i.e. water meter challenge competition to encourage water saving reductions.

- Glad to see 40% reduction in water use since 1992
- Understands future savings will require more effort per litre saved (low-hanging fruit has been “picked” to some extent)

- Surprised that Council can’t force developers to implement recycled water in new developments. Queensland can do it – NSW push based around BASIX
- Rainwater is the best water in the world despite what NSW Health and Australian drinking guidelines say.

- Simple DIY greywater reuse at home – flexible hose attached to T-piece under laundry sink and runs out onto back lawn / garden. Changes position of hose every few days. Lawn is green as green all year round. When raining, turns valve so that water goes to sewer rather than water log yard.

The following brochures and reports were available as handouts:

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  - Water Demand Management – Progress to Date
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  - Water Demand Management – User Pays Water Pricing 2009 – 2010
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  - NSW Government - How Can Greywater be used?

- Joanna Gardner's (CWG member) Byrrill Creek Landowners Information
  Three (3) handouts
  - Environmental Effects and Considerations for the Proposed Byrrill Creek Dam
  - An Overview of the Byrrill Creek Dam Area
  - Byrrill Creek Dam Newsletter – February 3rd 2010

- Colleen Gardner's (CWG member) Clarrie Hall Dam Landowners Information
  One (1) handout
  - Impacts on the Community of Clarrie Hall Dam (Social, Commercial and Cultural)

Tweed District Water – Demand Management and Water Supply Augmentation

Public Information Session

Tuesday 23 February 2010
Pottsville Environment Centre, Centennial Drive, Pottsville
2:00pm – 7:00pm

CWG members and Tweed Shire Council staff in attendance:

CWG	*TSC*
Don Beck	Anthony Burnham
Rob Learmonth	Tim Mackney

The information session was attended by 5 members of the public who were interested in discussing the Shire's Demand Management actions and strategy, and the approach to augmentation of the Water Supply.

- Why lock yourself into a major option when in the near future say 5 – 10 years legislation etc may change to make currently ruled out or unconsidered options more feasible?
- Great that Council is looking at both demand and supply sides of water.
- Council engineers were at WUSD conference in QLD and are proactive – that's great.
- What additional regulations would help Council to enforce more demand management actions?
- The community has to hear more about WUSD
- Are the options really limited to the four?

The following brochures and reports were available as handouts:

- Recycled Water
  - Tweed Shire Council Recycled Water Initiative – Fact Sheet No. 1
  - Tweed Shire Council Recycled Water Initiative – Case Study 1
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  - NSW Government - How Can Greywater be used?

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  One (1) handout
  - Impacts on the Community of Clarrie Hall Dam (Social, Commercial and Cultural)

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TWEED
SHIRE COUNCIL

Customer Service | 1300 292 872 | (02) 6670 2400

tsc@tweed.nsw.gov.au
www.tweed.nsw.gov.au

Fax (02) 6670 2429
PO Box 816
Murwillumbah NSW 2484

TWEED SHIRE COUNCIL

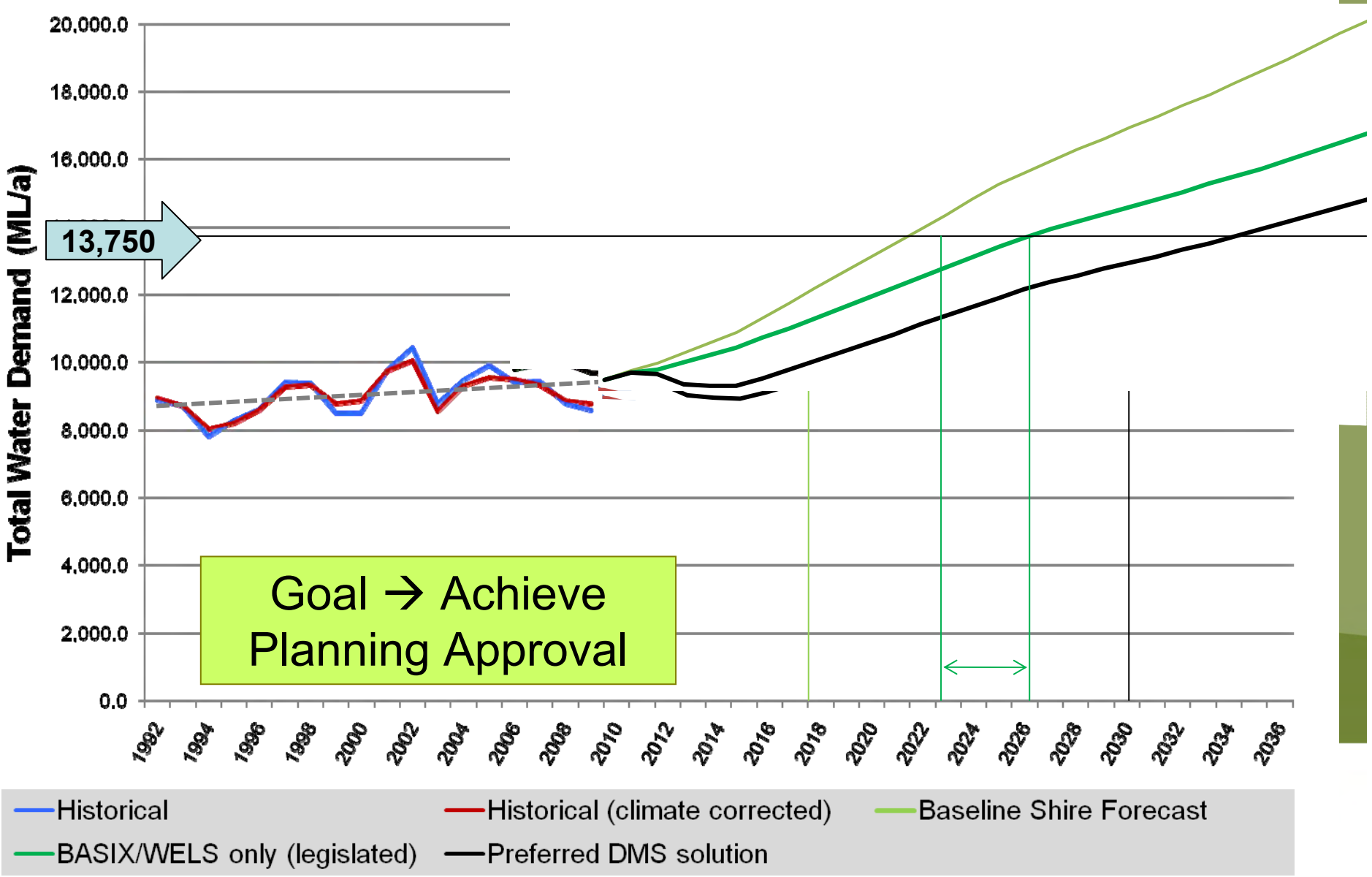
Water Supply Augmentation

Selecting a preferred option

Council Workshop

28th September 2010

Augmentation – why and when?

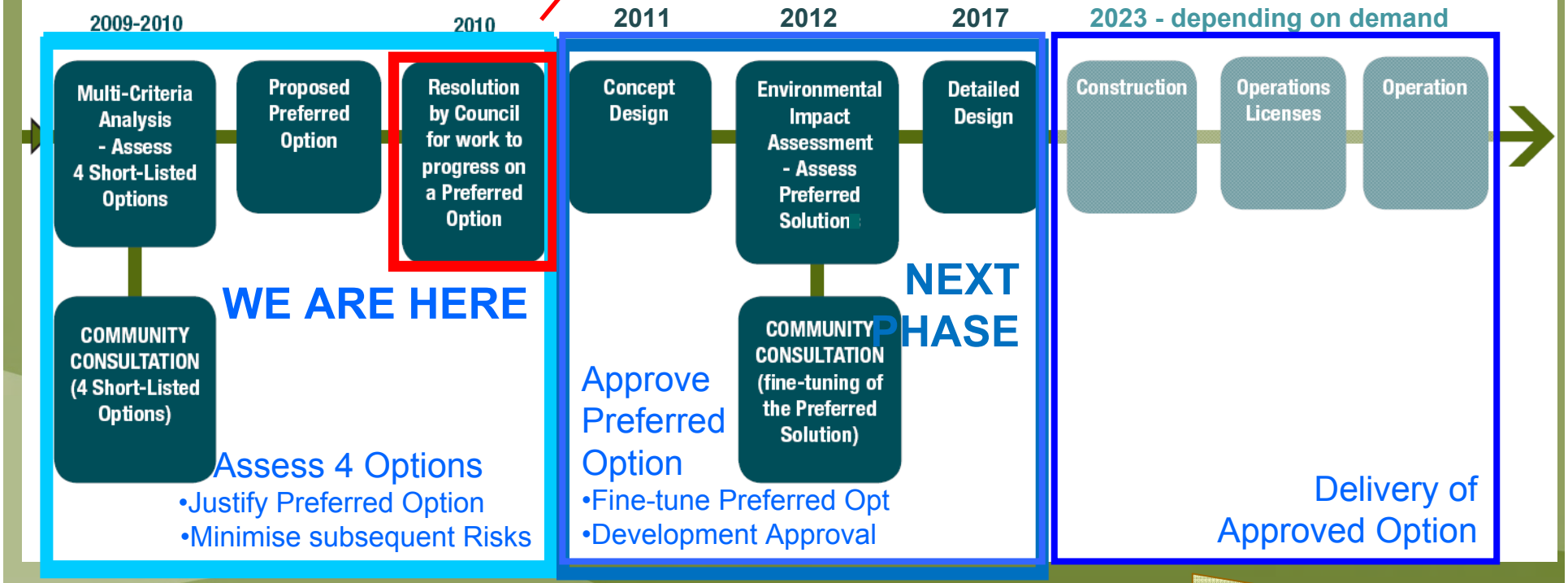


Council determines Preferred Option

Flowchart of the Process

Process outline and approximate timeframe to ensure the system is

Aim of this phase:
Provide Council with the certainty it needs to be able to make this decision



Increasing Commitment: Focus / Data / Costs

Augmentation options process (approved Aug 2009)

Involving:

Assessment

Coarse Screen

9 Options

Fine Screen

Shortlist + emergency

Preferred option

Environmental Assessment

Licenses

Detailed Design

BEGINS NEXT

Planning Approval

Reports	Site invest.	Community	Ref. Group	AAC	Govt dept.	Landholder	EA (EIS)	Approval
18	√			√	√			
45	√	√	√	√	√	√		
100	√	√	?	√	√	√	√	√

Fine-screen Assessment

Additional investigations, studies and reports

- Planning and environmental risks
- Cultural Heritage
- Ecological
- Environmental flows
- Cost estimates

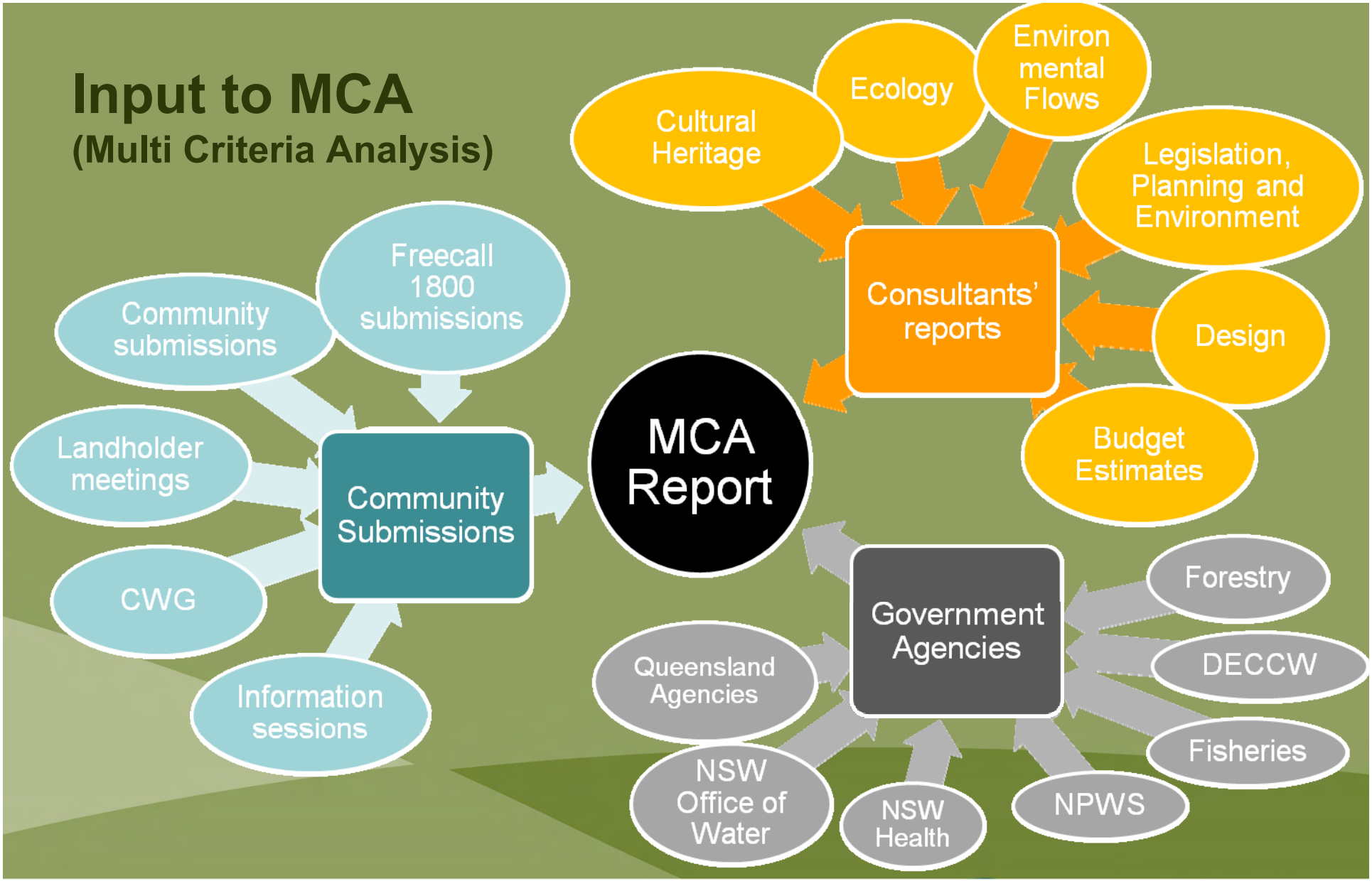
Additional information from the community

- Community Working Group
- Aboriginal Advisory Committee and wider community
- Landholder meetings
- Information sessions and 1800 number
- Approx 160 submissions

Additional feedback from Government Agencies

- Planning Focus Meeting
- Project Focus Group Meeting

Input to MCA
(Multi Criteria Analysis)

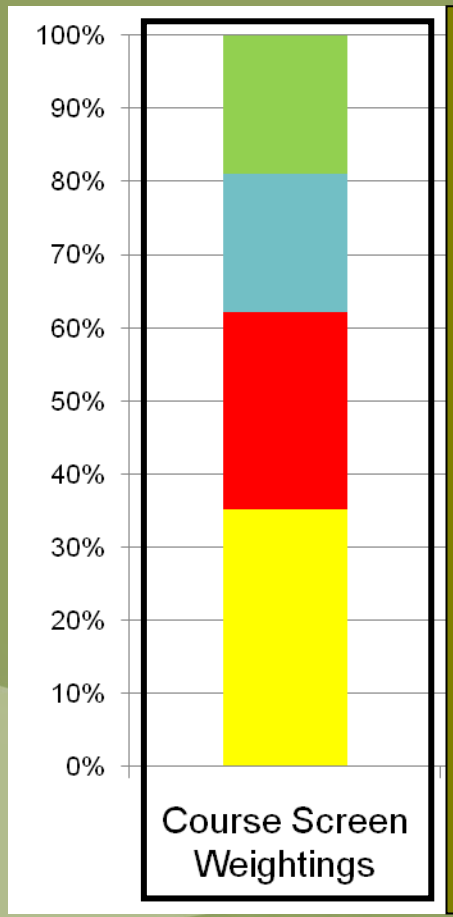


MCA – Process

RATING x **WEIGHTING FACTOR** = **SCORE**

Each option <u>rated</u> against 10 criteria x **Each criteria <u>weighted</u> according to significance** = **Score**

Incorporating issues in the MCA - WEIGHTINGS



- Environmental
- Social
- Economic
- Governance

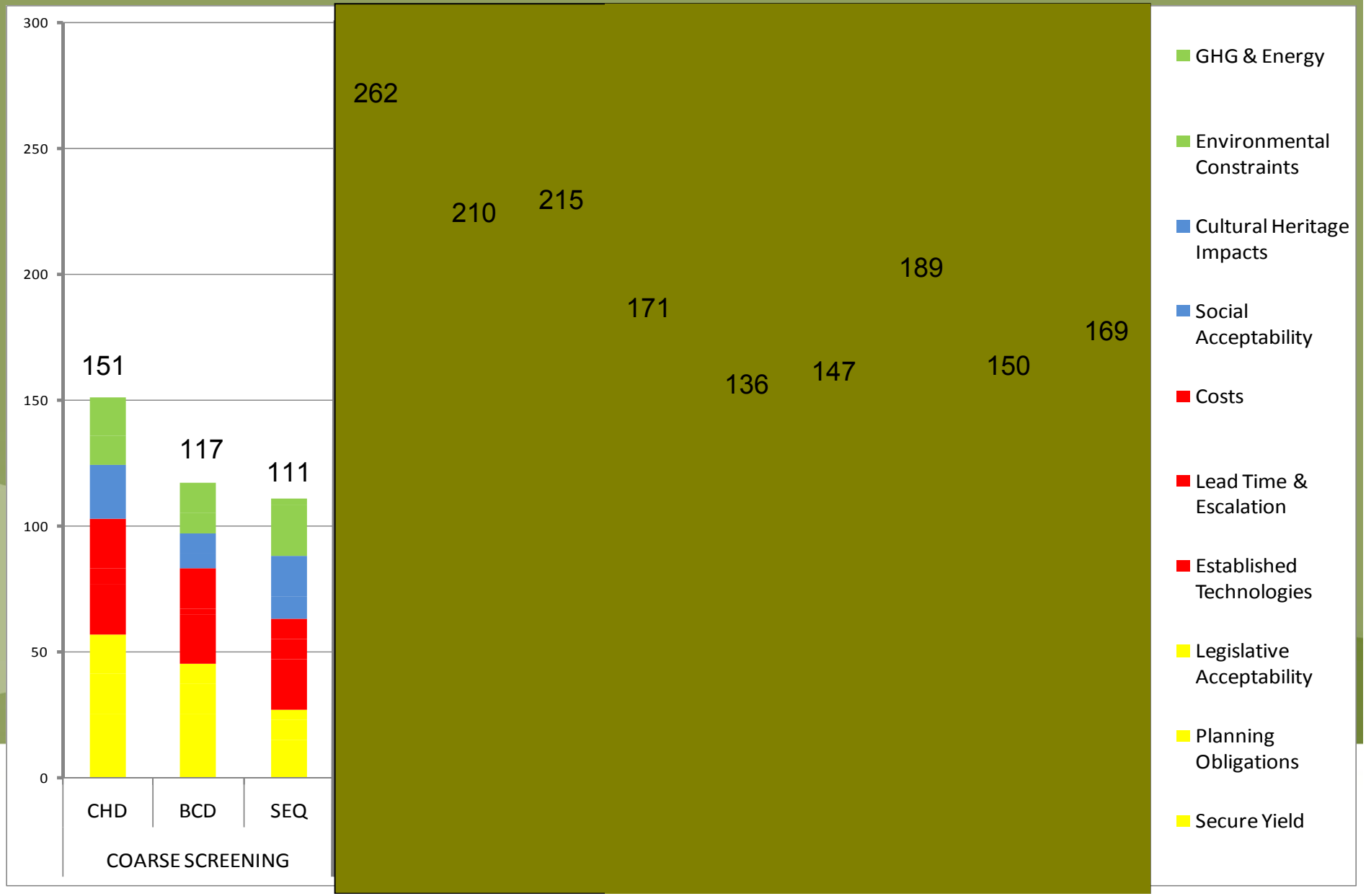
Coarse Screen Fine Screen → 3 variants – sensitivity analysis

Incorporating issues in the MCA - RATINGS

Option: / MCA Criteria:	Clarrie Hall Dam	SEQ pipeline	Byrrill Ck Dam	Combined* Emergency
Environmental Constraints	3	1 4	2	4
GHG & Energy	1 4	3	3	3
Social Impacts	2	1 4	2	4
Cultural Heritage Impacts	3	3	2	4
Established Technologies	1 5	1 5	1 5	4
Lead Time & Escalation	1 3	2	1	3
Costs	1 4	2	1 4	1
Secure Yield	1 5	3	1 5	2
Planning Obligations	3	2	2	3
Legislative Acceptability	1 4	1	2	3

* Ratings dependent on sub-option chosen

MCA results WEIGHTINGS x RATINGS = SCORE



Results Summary:

1. Clarrie Hall Dam is the preferred Water Supply Augmentation option

2. Byrrill Creek Dam scored equal or lower than CHD for every criteria, and has significant high risk issues

3. SEQ → risk of prolonged delays too high

4. Given probable timings → Contingency unlikely

Recommendations:

1. Monitor demand management actions with the aim of achieving at least BASIX/WELS reductions. Reporting to Council every two years on progress.

2. Adopt Clarrie Hall Dam as the preferred Water Supply Augmentation option

3. Now proceed with actions to achieve Planning Approval and Detailed Design for the raising of the Clarrie Hall Dam

4. Pursue dialog with SEQ in parallel as an alternative augmentation option and as a emergency drought option

Implications:

1. **Clarrie Hall Dam offers least risk option:**
   - Based on existing information
   - Further studies may uncover issues
   - Least risk ≠ Zero risk

2. **Significant planning, investigations and approvals phase**
   - Long timeframe (+5 years)
   - Significant costs ($4-6M depending on studies)

3. **Landholders will be affected**
   - Several Doon Doon Ck landholders looking to sell
   - Byrrill Creek landholders face uncertainty

Implications (cont):

4. **Clarrie Hall Dam spillway upgrade:**
   - Upgrade required by 2016
   - Dam Safety Committee may not grant further extension

5. **Emergency supplies**
   - Investigation of emergency supplies for prolonged drought or contamination events still required

Documents provided with Council Business Paper

Document	Contents	Date
Business Paper – WSA	Recommendations to Council	Oct 2010
Augmentation Options Study - Fine Screen Report	Recommendations to Council Original recommendations Detailed options assessment	Sep 2010
Appendix B - Fine Screen Report - Multi Criteria Analysis	Comparative overview of the main issues as assessed by the MCA	Sep 2010
Community Submissions Report - WSA	Summary of all issues raised in submissions and TSC responses	Aug 2010
Council Workshop Powerpoint Presentation	Overview of Water Supply Augmentation project and recommendations	28.09.2010

THANK YOU