TWEED SHIRE COUNCIL APPENDIX A

TWEED DISTRICT WATER SUPPLY AUGMENTATION OPTIONS STUDY

ASSESSMENT OF OPTIONS REV 5

ASSESSMENT CRITERIA	Option 1: Raising Clarrie Hall Dam	Option 2: New Byrrill Creek Dam	Option 3: New Oxley River Dam	Option 4: Pipeline Link to Rous Water
SECURE YIELD	Raising dam to FSL 70 m provides storage of 42,300 ML with an overall secure yield of 22,000 ML/annum, which satisfies the 2036 population of 157,000.	Construction of new dam to FSL 115.5 m provides storage of 16,300 ML, with an additional secure yield of 9,000 ML/annum, which satisfies the 2036 population of 157,000.	Construction of new dam to FSL 56 m provides storage of 35,000 ML, with an additional secure yield of 20,000 ML/annum, which satisfies the 2036 population of 157,000.	Construction of new 18.3 km pipeline (300-mm dia.) provides an additional 1,800 ML/annum (5 ML/day), which is insufficient for the year 2036 planning horizon.
PLANNING OBLIGATIONS	The dam wall is zoned Rural 1(a). Division 24 of State Environmental Planning Policy (Infrastructure) 2007 enables development for the purposes of water storage without development consent. Immediately downstream of the dam wall, the area is zoned 7(i) Environmental Protection (habitat).	The dam wall is zoned Rural 1(a). Division 24 of State Environmental Planning Policy (Infrastructure) 2007 enables development for the purposes of water storage without development consent. Land zoned Rural 1(a) will be inundated.	The river itself is unzoned. The land is zoned 7(i) Environmental Protection (habitat) on the northern side of the river and Rural 1(a) on the southern side of the proposed wall. The following land zonings are likely to be inundated: Rural 1(a), 5(a) Forestry and 7(i) Environmental Protection (habitat).	Due to SEPP Infrastructure 2007, the pipeline is able to be constructed without development consent. Reticulation for water supply can be constructed without consent in any land zoning. It is noted that the road adjoins areas that are zoned: Environmental Protection 7(a) (wetlands and littoral rainforest), Environment Protection 7(f) (coastal lands) and Zone 8(a) National Park.
ESTABLISHED TECHNOLOGIES & FEASIBILITY	CFRD raising feasible, additional rockfill from new spillway on left abutment, tower raised and strengthened.	Earth & rockfill type dam previously studied is feasible, spillway excavation on right abutment will supply some materials.	Concrete gravity, CFRD, or earth & rockfill is feasible, 80m wide spillway excavation will supply material for embankment.	Pipeline construction feasible adjacent to road, easily accessible for construction trenching and laying pipes. Depending on hydraulics, an associated pumping facility may be required. The pipeline can be designed to flow both ways if required.
ENVIRONMENTAL CONSTRAINTS	Raising existing dam, not new construction site, access and rockfill sources are within site. Archaeological overview done - some significant sites found. Flora & fauna overview done - some signifiant forest and threatened species found, will need further assesment. EIS to be prepared.	New dam construction, access and works facilities required. Clearing of site is a major issue. Much of land to be inundated is owned by Council. Upper reaches of inundated area encroaches into Mebbin State Forest.	New dam construction access and works facilities required. Clearing of site is a major issue. National park and private land issues, as well as flora & fauna and cultural heritage need to be addressed.	New pipeline construction in already disturbed areas. Possibility that acid sulphate soils will be encountered.
Aquatic	Clarrie Hall Dam is a fish barrier and has impacted the aquatic environment. Upstream inundation of aquatic habitat occurs with the raising.	Creation of a new fish barrier will occur on Byrrill Creek. Inundation of aquatic habitat including pool and riffle sequences for a large stretch of the river will also occur.	Creation of a new fish barrier will occur on the Oxley River. Inundation of aquatic habitat including pool and riffle sequences for a large stretch of the river will also occur.	Minimal impacts. Construction will need to be managed to ensure that adjoining waterways are not impacted.
Terrestrial Ecology	A preliminary ecological investigation has indicated that there would be inundation of some significant vegetation communities and fauna habitats. Two Endangered Ecological Communities could partially be impacted (Lowland Forest on the Floodplain and Coastal Freshwater Wetland on the Floodplain). Several threatened fauna species habitat may be impacted, including the Comb-crested Jacana, which inhabits the shallow wetlands, but new shallow wetlands would establish around the new lake margins.	High potential for impacting threatened flora species and threatened fauna species habitat (records of threatened flora/fauna occur in/or near the dam site. Large portions of the inundation area have been cleared previously. However, riparian vegetation has been retained adjacent to the creek line, which provides a vegetated corridor and contains some rainforest (potentially Lowland Rainforest EEC).	High potential for impacting threatened flora species and threatened fauna species habitat (records of threatened flora/fauna occur in/or near the dam site. Mixture of cleared and vegetated areas will be inundated. Some significant vegetation communities likely to be impacted (potentially Lowland Rainforest EEC).	The pipeline will be constructed within the cleared road reserve of a public road (northern section of the pipeline). There is the potential for minimal clearance of coastal vegetation. Some clearing is likely in the closed road area (southern section of the pipeline). This would need to be minimised due to the location being in the Nature Reserve. There are 5 threatened plant species, which occur in the Billinudgel Nature Reserve (several plants occur less than 1 km from the pipeline corridor). 44 Threatened fauna species have been recorded in the reserve.
Conservation Areas	Part of the eastern side of the inundation area occurs near the boundary of Mount Jerusalem National Park.	The south western end of the inundation area is close to the boundary of Mebbin National Park.	No National Park is impacted. Mount Warning National Park boundary occurs south of the inundation area.	The pipeline route is adjacent to a public road (Coast Road) and a closed road (Old Coast Road), which is now an unsealed track (with the intent to totally close the track in the north of the Billinudgel Nature Reserve. Coastal Road is located in Wooyung Nature Reserve and Old Coast Road is located in Billinudgel Nature Reserve. The Billinudgel Nature Reserve policy states that Non-NPWS infrastructure developments within the Reserve will be prohibited where the proposal may adversely impact on natural and cultural heritage values, conflict with the objectives of the Plan of Management, or are not consistent with the NP&W Act and NPWS policies. Therefore, for the pipeline to be approved, it will be required to meet these conditions.
Services / Roads	Minimal impacts. Road bridge raising may be required	Byrrill Creek Road will require relocation to the north and will involve short-term disruption to the local community.	The public road will be required to be relocated.	A Telstra cable runs along the Coast and Old Coast Roads.
SOCIAL ACCEPTAILITY	Benefit to community from increase in storage and maintenance of secure yield for future demand. Minor political impact due to Clarrie Hall Dam being an existing dam. Raising the dam to RL 70 m and associated flood surcharge will not inundate private properties.	Additional storage will compliment Clarrie Hall storage to provide secure for many years in the future. New dam site likely to be a major political issue. NSW Weirs Policy discourages construction of new on-river storages. Council owns a large portion of the area. Some land acquisition will be required, including the site of the dam.	Benefit to community from increase in storage and maintenance of secure yield for future demand. New dam site likely to be a major political issue. NSW Weirs Policy discourages construction of new on-river storages. Road relocation is required. Village of Tyalgum impacted by increasing flooding. Future augmentation of the dam would have significant impacts on the village. Land acquisition will be required and several rural residences will be impacted.	Additional security of water, which could delay requirements for new or additional storage. The southern section of the pipeline is in the Nature Reserve. There is potential for opposition to works in a Nature Reserve. The northern section of the pipeline should be able to be contained within the public road reserve. Potential for designing the pipeline to flow both ways, which could benefit both Tweed and Rous communities.
LEGISLATIVE ACCEPTABILITY	Raising on the site of the existing dam wall does not present significant additional legislative hurdles.	NSW Weirs Policy discourages construction of new on-river storages. This, together with the requirement for new acquisitions will require the careful application of legislative procedures.	This site will require the full force of legislation to overcome significant social and environmental concerns.	The proximity of environmentaly significant areas is likely to attract opposition to this scheme and require the careful application of legislative procedures.
CULTURAL HERITAGE IMPACTS	Known Aboriginal sites will be inundated, or within the increased flood level (11 sites including shelter sites).	The site requires survey, however it is likely Aboriginal sites will be inundated due to proximity to a water source. It is understood that archaeological sites occur at the western end of the storage.	The site requires survey, however it is likely that Aboriginal sites will be inundated due to their usual proximity to a water source.	The pipeline route requires archaeological survey. The majority of the pipeline would be located in areas previously disturbed for road construction, or previous sand mining. This would minimise the risk of impacting sites. There are at least 16 recorded Aboriginal sites in the Billinudgel Reserve plus a mythological site. The main sites include a scar tree, bora ring, stone artefact scatters and isolated finds which indicate camp sites, hunting and gathering activities and travel routes (NPWS Plan of Management).
LEAD TIME FOR CONSTRUCTION & POTENTIAL FOR ESCALATION OF COSTS	Need to consider the time required to conduct environmental investigations and achieve approvals. 1 to 2 years pre-construction, 1 year construction, potential for cost escalation depends on contractor method. Highest risk in M&E items.	Need to consider the time required to conduct environmental investigations and achieve approvals. 1 to 2 years pre-construction, 1.5 years construction, potential for cost escalation depends on contractor method. Highest risk in M&E items.	Need to consider the time required to conduct environmental investigations and achieve approvals. 2- to 3 years pre-construction, 2 years construction taking into account remoteness of site, high chance of cost escalation. Also high risk in M&E items.	Need to consider the time required to conduct environmental investigations and achieve approvals. 6 months pre-construction, 6 months construction, but high potential for cost escalation due to rapid rise in pipework costs.
CAPITAL, OPERATIONS, NPV & COST / KL	Based on D&C 2007 report, **capital cost** is $30 million to increase storage by 26,300 ML = $1.15/kL. Assume the **annual operating costs** of $200/ML If the works are constructed in 2014/15, the discount rate of 7 %, the **NPV** over 30 years to 2015 is $42.1 million. **Annualised Cost ($/ML)** over 30 years is $569/ML.	Based on D&C 2004 report, **capital cost** is $38 million (2007 prices) for 16,300 ML storage = $2.33/kL. Assume the **annual operating costs** of $200/ML If the works are constructed in 2014/15, the discount rate of 7 %, the **NPV** over 30 years to 2015 is $50.8 million. **Annualised Cost ($/ML)** over 30 years is $653/ML.	Based on SMEC 2007 report, **capital cost** is $50 million for 35,000 ML storage. Suggests $1.42/kL. Assume the **annual operating costs** of $200/ML If the works are constructed in 2014/15, the discount rate of 7 %, the **NPV** over 30 years to 2015 is $64.4 million. **Annualised Cost ($/ML)** over 30 years is $696/ML.	Based on current costs, **capital cost** for 300-mm steel pipeline = $11.3 million. Plus Billinudgel pump station = Plus Billinudgel pump station = $0.5 million **Total capital cost** of scheme is approx. $11.8 million. Assume bulk cost of water is $2,000/ML. **Operating costs** are approx. $50,000/annum, or $28/ML. If the works are constructed in 2014/15, the discount rate of 7 %, the **NPV** over 30 years to 2015 is $51.3 million. **Annualised Cost ($/ML)** over 30 years is $2,444/ML.
GREENHOUSE GAS & ENERGY CONSUMPTION	Electricity to power M&E items. No greenhouse gas emission under normal operation. Clearing of site, excavation and other construction activities will contribute significantly to GHG emissions. Unless vegetation in new inundated areas is entirely cleared and mulched for rehabilitation works, GHG emissions is also an issue with decomposition.	Electricity to power M&E items. No greenhouse gas emission under normal operation. Clearing of site, excavation and other construction activities will contribute significantly to GHG emissions. Unless vegetation in new inundated areas is entirely cleared and mulched for rehabilitation works, GHG emissions is also an issue with decomposition.	Electricity to power M&E items. No greenhouse gas emission under normal operation. Clearing of site, excavation and other construction activities will contribute significantly to GHG emissions. Unless vegetation in new inundated areas is entirely cleared and mulched for rehabilitation works, GHG emissions is also an issue with decomposition.	Clearing of site, excavation and other construction activities will contribute significantly to GHG emissions.
ASSESSMENT CRITERIA	**Option 1: Raising Clarrie Hall Dam**	**Option 2: Byrill Creek Dam Construction**	**Option 3: Oxley River Dam Construction**	**Option 4: Pipeline Link to Rous Water**

ASSESSMENT CRITERIA	Option 5: Pipeline to S E Queensland Water Grid	Option 6: Desalination	Option 8: Indirect Potable Reuse	Option 9: Direct Potable Reuse
SECURE YIELD	Construction of new 7 km pipeline (500-mm dia.) via the future Cobaki Lakes development provides an additional 7,500 ML/annum (20 ML/day), which is sufficient for the year 2036 planning horizon.	Construction of desalination plants at either Condong (20 ML/d from Tweed River), or Cudgen (two 10 ML/d stages - brackish groundwater), or Kinfgscliff (two 10 ML/d stages - seawater), by 2012 provides an additional 7,500 ML/annum, which is sufficient for the year 2036 planning horizon.	Construction of 20 ML/d and 8 ML/d MF/RO advanced recycled water treatment plants at Banora Point STP and Kingscliff STP and a 50 km pipeline and 4 pumping stations to Clarrie Hall Dam, by 2012 provides an additional 10,200 ML/annum, which is sufficient for the year 2036 planning horizon.	Construction of 20 ML/d and 8 ML/d MF/RO advanced recycled water treatment plants at Banora Point STP and Kingscliff STP and a 2.8 km pipelines and pumping stations, provides an additional 10,200 ML/annum, which is sufficient for the year 2036 planning horizon.
PLANNING OBLIGATIONS	Need for Federal ***Environmental Protection and Biodiversity Conservatrion (EPBC) Act 1999*** approval with lead time normally 6 to 12 months (or more). If the alignment is adopted through the future Cobaki Lakes development, then the pipeline will be located in the road reserve when the development proceeds.	This would be a major project under the NSW major projects assessment system of: ***Part 3A*** of the ***Environmental Planning and Assessment (EP&A) Act 1979*** and ***State Environmental Planning Policy (Major Projects) 2005.*** Projects that come under this system require Department of Planning assessment and Ministerial approval due to their: Significance to NSW as a whole; Environmental impact; Strategic location; Essential infrastructure; Large water infrastructure projects in excess of $30 million capital value come under the scrutiny of Part 3A of the EP&A Act.	This would be a major project under the NSW major projects assessment system of: ***Part 3A*** of the ***Environmental Planning and Assessment (EP&A) Act 1979*** and ***State Environmental Planning Policy (Major Projects) 2005.*** Projects that come under this system require Department of Planning assessment and Ministerial approval due to their: Significance to NSW as a whole; Environmental impact; Strategic location; Essential infrastructure; Large water infrastructure projects in excess of $30 million capital value come under the scrutiny of Part 3A of the EP&A Act.	Renewed water to conform to the **National Recycled Water Guidelines.** State legislative framework not yet developed in NSW. Similar framework in Queensland exists: **Public Health Amendment Regulation No. 1 2008**, Sections 18AD and Schedule 3B. **Water Supply (Safety & Reliability) Act 2008,** effective from 1 July 2008. This may also be a major project under the NSW major projects assessment system as per IPR.
ESTABLISHED TECHNOLOGIES & FEASIBILITY	Pipeline construction feasible adjacent to road, easily accessible for construction trenching and laying pipes. A 120 kW pumping station has been allowed in the estimates. Need to under-bore the Tugun By-pass.	Both thermal and membrane desalination for water treatment plants are now recognised technologies - such as plants under construction at Tugun, Qld and in operation in WA.	MF/RO advanced water treatment plants for indirect potable reuse schemes are now recognised technologies - such as part of the SE Qld Water Grid. The pipelines and pumping stations are established technologies.	Same process as IPR with issues of disposal of the toxins in the concentrate, such as ammonia, chloramine, anionic surfactants.
ENVIRONMENTAL CONSTRAINTS	New pipeline construction in already disturbed areas and some parts in sensitive wetlands. Probability that acid sulphate soils will be encountered with risks asociated with ASS disposal.	Acquisition of some private lands, as well as flora & fauna and cultural heritage issues need to be addressed. Possibility that acid sulphate soils will be encountered at the Cudgen site with risks asociated with ASS disposal. Disposal of the brine by-product to sea (Kingscliff or Bogangar) likely to arouse significant concerns.	Toxicity of waste concentrate is an issue for disposal options. Acquisition of some private lands, as well as flora & fauna and cultural heritage issues need to be addressed. Probability that acid sulphate soils will be encountered with risks asociated with ASS disposal.	Toxicity of waste concentrate is an issue for disposal options.
Aquatic	Endangered frogs were an issue with the Tugun By-pass approvals process.	Lowering of the groundwater reserves at Cudgen is an issue with the Cudgen Nature Reserve. Abstraction of 20 ML/d from the Tweed River at Condong will have impacts on fish species.	450-mm underbore of Tweed River expected to be in an environmentally sensitive area.	Minimal impacts.
Terrestrial Ecology	Scheduled plant and animal species were an issue with the Tugun By-pass approvals process.	18 km of brine waste pipeline from Condong, along Clothiers Creek Road to Norries Head will impact significant vegetation communities.	Scheduled plant and animal species are expected to be an issue over the 50 km pipeline to Clarrie Hall Dam. Some significant vegetation communities likely to be impacted (potentially Lowland Rainforest EEC).	Minimal impacts.
Conservation Areas	The pipeline route is adjacent to the Tugun By-pass section of the Pacific Motorway and possibly in a future railway easement.	Lowering of the groundwater reserves at Cudgen is an issue with the Cudgen Nature Reserve.	The pipeline route between Uki and CHD is adjacent to State forests with significant flora, fauna and cultural heritage values.	Minimal impacts.
Services / Roads	Power and Telstra cables are along the Tugun By-pass.	Minimal impacts.	Power, Telstra and other utility services are located in proximity to the pipeline route.	Minimal impacts.
SOCIAL ACCEPTABILITY	Need for cross border approvals coordination. Water transfer from NSW into Queensland has been politicised previously - this scheme sends water in the reverse direction, from the recently commissioned Queensland Water Grid. The Queensland Water Grid has excess capacity from the Tugun Desalination Plant for the foreseeable future. Need to work with community and local conservation groups.	Consultation with local community groups will be required to overcome the issues arising from efficiencies associated with the relatively high energy consumption to support the treatment processes, and also the environmental concerns over disposal of the brine waste stream to either Norries Head, or at the northern end of Bogangar Beach. Land acquisitions will be required for the plant footprint.	Need to work with community and local conservation groups. Land acquisitions will be required and several rural properties will be impacted. Similar IPR schemes have been rejected by communities in Toowoomba and Caboolture, Qld.	Difficulties in convincing the community to accept the second DPR scheme worldwide (after Windhoek, Namibia), when other options exist.
LEGISLATIVE ACCEPTABILITY	Agreement to the transfer of water between the States, particularly when one party is under the influence of a drought is a significant risk to this scheme.	The requirements for disposal of the waste brine will require the careful application of legislative procedures. Ministerial discretionary powers may be required for a project of this nature and size.	The requirements for disposal of the waste brine will require the careful application of legislative procedures. Ministerial discretionary powers may be required for a project of this nature and size.	Legislative framework in NSW is yet untested and this scheme is likely to present significant additional legislative hurdles.
CULTURAL HERITAGE IMPACTS	Archaeological surveys over part of the route have been conducted as part of the EIS for the Tugun By-pass. The majority of the pipeline would be located in areas previously disturbed for road construction. Significant length remains in undisturbed land. Need to allow time to deal with Traditional Owner groups under two State sets of legislation.	Archaeological surveys over the 18 km route of the brine waste pipeline from Condong, along Clothiers Creek Road to Norries Head will be required.	The majority of the pipeline would be located in areas previously disturbed for road construction. Need to allow time to deal with Traditional Owner groups.	Minimal impacts.
LEAD TIME FOR CONSTRUCTION & POTENTIAL FOR ESCALATION OF COSTS	Need to consider the time required to conduct environmental investigations and achieve approvals. 6 months pre-construction, 6 months construction, but high potential for cost escalation due to rapid rise in pipework costs.	Relatively long lead-time required to conduct environmental investigations, community consultation, land acquisitions and achieve approvals under Part 3A of the EP&A Act.	Relatively long lead-time required to conduct environmental investigations, community consultation, land acquisitions and achieve approvals under Part 3A of the EP&A Act. 2- to 3 years pre-construction, 3 years construction with high chance of cost escalation. Also high risk in M&E items.	Need to consider the time required to conduct environmental investigations and achieve approvals. 2- to 3 years pre-construction, 2 years construction with high chance of cost escalation. Also high risk in M&E items.
CAPITAL, OPERATIONS, NPV & COST / KL	7.0 km of 500-mm steel pipes, = $8.3 M and 120 kW pumping station = $0.8 million. **Total capital cost** = $9.1 million. Assume bulk cost of water is $2,000/ML. Assume the **operating costs** of $57,000 per annum. If the works are constructed in 2014/15, the discount rate of 7 %, the **NPV** over 30 years to 2015 is $115.6 million. **Annualised Cost ($/ML)** over 30 years is $1,655/ML.	Based on DEUS 2005 report, **capital costs** are: Condong desal = $167 million = $8.4 million / ML/d. Cudgern desal = $79 million St 1 = $7.9 million / ML/d. Kingscliff desal = $93 million St 1 = $9.3 million / ML/d. Assume the **annual operating costs** of $400/ML If the works are constructed in 2014/15, the discount rate of 7 %, the **NPV** over 30 years to 2015 is $194.2 million. **Annualised Cost ($/ML)** over 30 years is $2,782/ML.	Capital costs of MF/RO WTPs are: Banora Point STP: $8 million / ML/d. Say $156 million. Kingscliff STP: $8 million / ML/d. Say $66 million. Four pumping stations: $3.7 million. 50 km of 300-mm, 450-mm and 600-mm rising mains and discharge structure at CHD: $70.7 million. **Total capital cost** of scheme is approx. $296 million. **Operating costs** are approx. $250,000/annum, or $25/ML. If the works are constructed in 2014/15, the discount rate of 7 %, the **NPV** over 30 years to 2015 is $331.0 million. **Annualised Cost ($/ML)** over 30 years is $3,579/ML.	Capital costs of MF/RO & advanced oxidation WRP are: Banora Point STP: $9.5 million / ML/d. Say $187 million. Kingscliff STP: $9.5 million / ML/d. Say $79 million. Banora Point & Kingscliff pumping stations: $2.2 million. 1.3 km of 450-mm rising mains from Banora PS to Fraser Dve - $1.5 million. 1.5 km of 375-mm rising mains from Kingscliff PS to Tweed Valley Way - $1.4 million. **Total capital cost** of scheme is approx. $270 million. **Operating costs** are approx. $150,000/annum, or $12/ML. If the works are constructed in 2014/15, the discount rate of 7 %, the **NPV** over 30 years to 2015 is $306.8 million. **Annualised Cost ($/ML)** over 30 years is $3,318/ML.
GREENHOUSE GAS & ENERGY CONSUMPTION	Clearing of site, excavation and other construction activities will contribute significantly to GHG emissions.	Electricity to power M&E items will contribute significantly to GHG emissions. Construction activities will contribute significantly to GHG emissions.	Electricity to power M&E items will contribute significantly to GHG emissions. Clearing of site, excavation and other construction activities will contribute significantly to GHG emissions.	Electricity to power M&E items will contribute significantly to GHG emissions. Construction activities will contribute significantly to GHG emissions.
ASSESSMENT CRITERIA	**Option 5: Pipeline to S E Queensland Water Grid**	**Option 6: Desalination**	**Option 8: Indirect Potable Reuse**	**Option 9: Direct Potable Reuse**

TWEED SHIRE COUNCIL **APPENDIX A**

TWEED DISTRICT WATER SUPPLY AUGMENTATION OPTIONS STUDY

ASSESSMENT OF OPTIONS REV 5

ASSESSMENT CRITERIA	Option 7: Groundwater		
SECURE YIELD	Construction of new borefield in the vicinity of either Bray Park (20 m deep in alluvium aquifer), or adjacent to existing trunk system along the coast (dune sand aquifer) by 2013, provides an additional 1,470 ML/annum (4.3 ML/day), which is insufficient for the year 2036 planning horizon.		
PLANNING OBLIGATIONS	Development of groundwater resources involves three legislative frameworks administered by the **Department of Water & Energy (DWE)** in NSW: ***(i) Water Act 1912*** - being phased out and replaced by Water Management Act 2000. ***(ii) Water Management Act 2000*** involves 'water sharing plans' for groundwater licences and approvals, which are based on protecting the sustainability of the aquifer and reserving a proportion of the average annual recharge for the environment. ***(iii) National Water Initiative (NWI)***, endorsed by COAG in 2004. The **DWE** would require any groundwater resource for TSC to conform to the above framework AND include an environmental assessment to ensure protection of the groundwater resource against: Seawater intrusion or induced acid sulfate soils (ASS) impacts; Impacts of connected stream flows, wetlands, etc; Abstraction of other users; Well-head contamination. In addition to the above NSW State framework, the **Federal EPA** may intervene where it considers that a groundwater project for urban purposes is of national environmental significance. The provisions of the **Environmental Protection and Biodiversity Conservation (EPBC) Act 1999** would then be invoked.		
ESTABLISHED TECHNOLOGIES & FEASIBILITY	Borefield construction is feasible where the following assumptions are made: Host aquifer is in proximity to existing distribution system; Salinity is < 1,000 mg/L, and preferably < 500 mg/L; Bore yield > 5 L/sec in alluvium systems; Location is accessible as public lands to host borefields and pipelines; No direct conflict with other existing groundwater users.		
ENVIRONMENTAL CONSTRAINTS	Under the provisions of the above-mentioned EPBC Act 1999 the following environmental criteria would need to be upheld: Borefield is > 500 metres from a site of known or potential contamination; Borefield is > 500 metres from a significant wetland.		
Aquatic	***NWI*** to be upheld involving an environmental assessment to ensure protection of the groundwater resource against impacts of connected stream flows, wetlands, seawater intrusion, groundwater level reduction, etc. ***EPBC Act 1999*** would need to be upheld whereby borefield is > 500 metres from a significant wetland.		
Terrestrial Ecology	There is the potential for minimal clearance of coastal vegetation. Groundwater level reduction can adversely affect dependent terrestrial vegetation - Melaleuca and Allocassuarina sp.		
Conservation Areas	**EPBC Act 1999** would need to be upheld whereby borefield is > 500 metres from a significant wetland.		
Services / Roads	Power and road access is required to the borefield site.		
SOCIAL ACCEPTABILITY	Extraction to be within rates that do not harm the environment, whereby concerns are raised over unacceptable environmental impact. The need to impose well-head protection zones through town planning instruments and exclude potentially contaminating activities from the vicinity of the borefield. Proposed borefields to be > 200 m from significant concentrations of existing domestic bores, particularly in the dune sand aquifers along the developed coastal strip. Borefield is > 500 metres from sites of potential contamination, such as municipal landfill sites, septic tanks and agricultural chemicals, etc.		
LEGISLATIVE ACCEPTABILITY	There is an increasing legislative complexity being applied to the harvesting of groundwatewr resources.		
CULTURAL HERITAGE IMPACTS	Traditional owners generally regard groundwater resources of particular cultural significance. The views of traditional owner groups should be included as part of the overall project impact.		
LEAD TIME FOR CONSTRUCTION & POTENTIAL FOR ESCALATION OF COSTS	Lead time is subject to variables such as: The extent of hydrogeological investigations through modelling, monitoring bores and permitting. Time required to conduct environmental investigations, community consultation and achieve approvals. Allowances for treatment facilities and connecting infrastructure. Time allowed for all investigations through to commissioning is 3.5 years (EHA Table 3.3).		
CAPITAL, OPERATIONS, NPV & COST / KL	Costs are subject to many variables such as: Number of bores to target 50 L/sec (4 ML/d); Proximity of borefield to existing major reticulation; Required spacing between individual bores and monitoring systems to maintain sustainable draw-down; Nature of treatment (potentially for iron, salinity & disinfection). Compare with BCAA on Bribie Island *with full treatment*: **Capital costs** of a 4.32 ML/d borefield is $39 million, or $9 million / ML/d. **Operating costs** are approximately $320,000/annum, or $218/ML. If the works are constructed in 2014/15, the discount rate of 7 %, the **NPV** over 30 years to 2015 is $43.9 million. **Annualised Cost ($/ML)** over 30 years is $2,535/ML.		
GREENHOUSE GAS & ENERGY CONSUMPTION	Clearing of site and other construction activities will emit some gases. Electricity to power M&E items - bore pumps, water treatment facilities and booster pumps.		
ASSESSMENT CRITERIA	**Option 7: Groundwater**		