Planning for the Future of the South-East Queensland Bulk Water Supply Grid – A Complex Challenge

SOURCE STORE SUPPLY

seqwater
WATER FOR LIFE

Introduction

- This presentation provides an overview of how Seqwater have approached planning for the bulk water supply grid
- In particular through the example of a specific project – the Network Assessment Project (NAP)
- The grid has been in place for 10 years, but it has taken some time to develop our approach to this point
- Connecting many sources, treatment plants and networks has created a complex system which is difficult to analyse
- The role of the treated water network has changed and we have had to develop new planning methods

Presentation Overview

- History of the grid and SEQ water industry
- The role of the grid and how it is operated
- Planning criteria
- Planning for each performance “limit state”
- Integrated needs assessment
- Conclusions

History of the grid

- Was created in response to the Millennium Drought to improve water security by providing ability to share water between regions
- Prior to that water sources, treatment and transport were the responsibilities of individual Local Governments
- 11 water treatment plants and sources including Gold Coast Desalination
- Western Corridor Recycled Water Scheme
- Interconnector pipelines between sub-regions

Overview of the grid

Legend

- Northern Pipeline Interconnector
- Western Corridor Recycled Water Scheme
- Southern Regional Water Pipeline
- Eastern Pipeline Interconnector
- Network Integration Pipeline
- Other bulk water pipelines connecting the SEQ water grid
- Local government boundary

- Reservoirs
- Water Treatment Plants (WTP) – connected to grid
- Water Treatment Plants (WTP) – off-grid
- Water Treatment Plants (WTP) – other
- Western Corridor Recycled Water Scheme
- Desalination plant

Water Treatment Plants (WTP)

1 Amity Point WTP
2 Atkinson Dam WTP
3 Banksia Beach WTP
4 Beaudesert WTP
5 Boonah Kalbar WTP
6 Borumba Dam WTP
7 Canungra WTP
8 Capalaba WTP
9 Dayboro WTP
10 Dunwich WTP
11 East Bank (Mt Crosby) WTP
12 Enoggera WTP
13 Esk WTP
14 Ewen Maddock WTP
15 Hinze Dam WTP
16 Image Flat WTP
17 Jimna WTP
18 Kenilworth WTP
19 Kilcoy WTP
20 Kirkleagh WTP
21 Kooralbyn WTP
22 Landers Shute WTP
23 Linville WTP
24 Lowood WTP
25 Maroon Dam WTP
26 Molendinar WTP
27 Moogerah Dam WTP
28 Mudgeeraba WTP
29 Noosa WTP
30 North Pine WTP
31 North Stradbroke Island WTP
32 Petrie WTP
33 Point Lookout WTP
34 Rathdowney WTP
35 Somerset Dam (Township) WTP
36 West Bank (Mt Crosby) WTP
37 Wivenhoe Dam WTP

Western Corridor Recycled Water Scheme

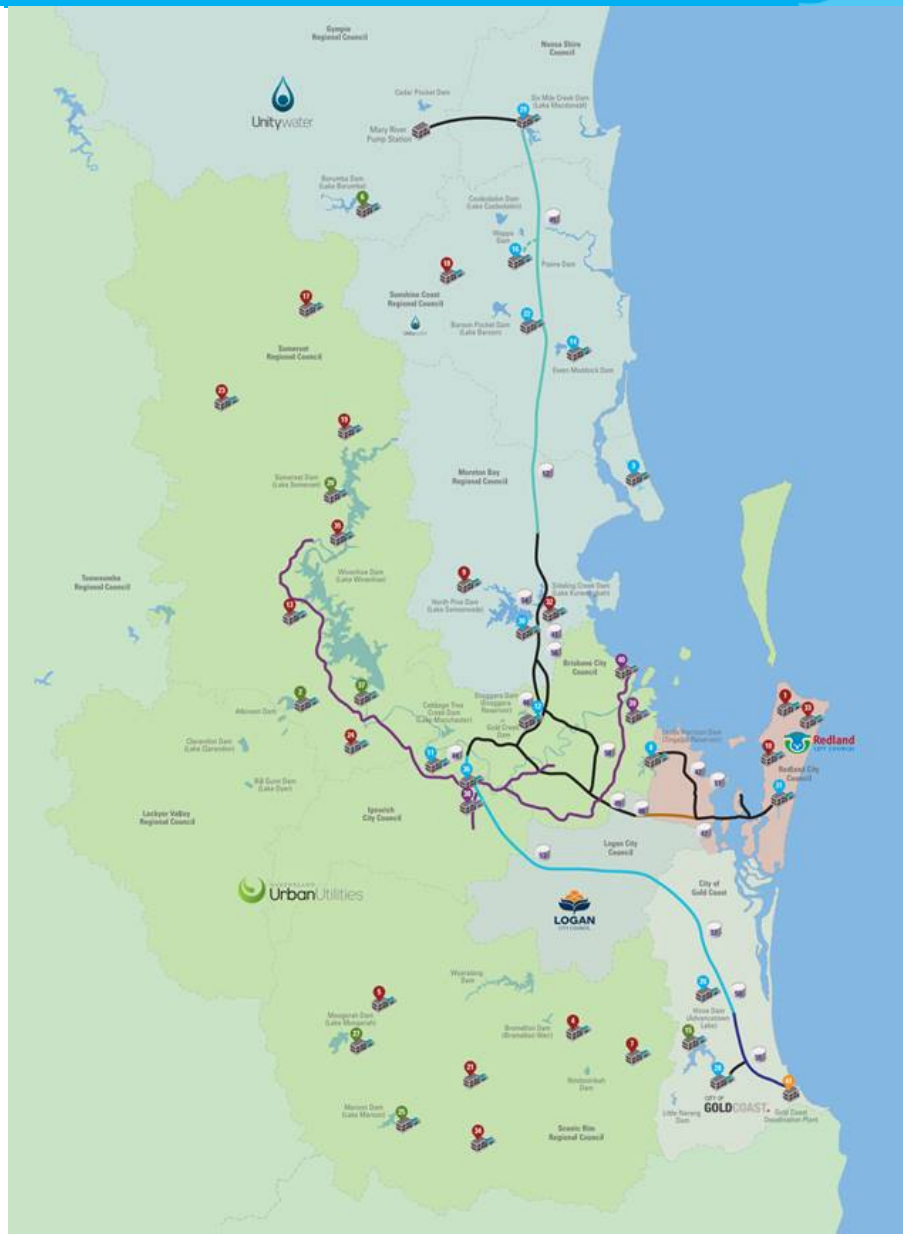
38 Bundamba Advanced Water Treatment Plant (AWTP)
39 Gibson Island AWTP
40 Luggage Point AWTP

Desalination Plant

41 Gold Coast Desalination Plant

Reservoirs

42 Alexandra Hills Reservoirs
43 Aspley Reservoir
44 Camerons Hill Reservoir
45 Ferntree Reservoir
46 Green Hill Reservoirs
47 Heinemann Road Reservoirs
48 Kimberley Park Reservoirs
49 Kuraby Reservoir
50 Molendinar Reservoir
51 Mt Cotton Reservoir
52 Narangba Reservoirs
53 North Beaudesert Reservoirs
54 North Pine Reservoirs
55 Robina Reservoir
56 Sparkes Hill Reservoirs
57 Stapylton Reservoir
58 Wellers Hill Reservoirs



The role of the grid and its operation

- The grid is the bulk water supply system that sources, treats and transports water to the Water Service Provider (retailer) reticulation
- Allows water to be shared across the region, by moving water from where there is excess capacity to where there is a deficit
- When dams are full it is primarily operated to minimise operating cost
- When dams are falling the philosophy is to draw them all down together – needs the grid to support dams that are lower

The role of the grid and its operation

- The grid can also be used to share capacity during peak demand and emergency situations.
- Each source and/or treatment plant does not necessarily have to be 100% reliable as the grid provides some redundancy/ resilience – efficiencies can be gained where appropriate
- The grid operation also influences water quality (disinfection residual) and certain operations are made to maintain or improve it.

Planning criteria

- The role of the treated water network has changed compared to pre-grid times
- Connecting multiple sources, treatment plants and networks together creates inter-dependence
- They can no longer be planned for separately
- The treated water network now plays a role in source reliability (drought), treatment capacity and reliability, and whole of system reliability.
- For the bulk supply network at least, maximum flow is no longer necessarily peak demand

Planning criteria

- Criteria need to be defined to measure how the bulk supply network performs in these new roles
- We created 4 performance “limit states”:
  - Peak demand – traditional peak day and MDMM
  - Water security – having enough source water through a range of climatic conditions (LOS criteria and drought response)
  - Reliability/resilience – keeping system failures to an acceptable level
  - Water quality – maintaining adequate disinfection

Planning for peak demand

- The bulk supply system needs to be capable of providing mean day maximum month (MDMM) demand
- Some local areas also need to meet peak day/hour
- Bulk water balances are performed first to determine the balance of treatment production
- Hydraulic modelling to assess how the network performs for those bulk water balances
- Any improvement needs identified

Planning for water security

- Water balance modelling for the grid including storages using the Regional Stochastic Model (RSM) to determine probable performance for a range of climate conditions
- Assess against regulated Levels of Service Objectives (need to pass 1 in 10,000 year drought and not enforce restrictions more than once in 10 years)
- Develop a drought response contingency plan in case drought is worse (you don’t know until it is too late)
- Test critical operations in the hydraulic model and identify any improvement needs

Planning for reliability/resilience

- At the moment as an industry we don’t have defined criteria for this
- The NAP has analysed individual WTP outages (planned and unplanned) for information and identify any obvious risks
- Water balance and hydraulic modelling were used to assess the consequences of each outage
- The intent is to develop some criteria in future and assess performance against these

Planning for water quality

- Seqwater operates to the relevant water quality requirements, however the minimum disinfection residual specifications are more relevant to the customer tap than the bulk supply network
- Seqwater does not currently have disinfection residual planning criteria for the bulk supply network
- Assessment was done using water age modelling for various operating scenarios and reviewing the change in age to identify potential issues

Integrated needs assessment

- Assessments for each performance limit state identified many improvement needs over the next 30 years
- Many of the needs interact with each other – resolving one need may resolve others as well, or make them worse
- Problem has too many variables to be solved using traditional approach (eg MCA)
- Adopted approach divides needs into 5 tiers and solves for Tier 1 first
- Following adoption of Tier 1 strategy, lower order needs will be resolved

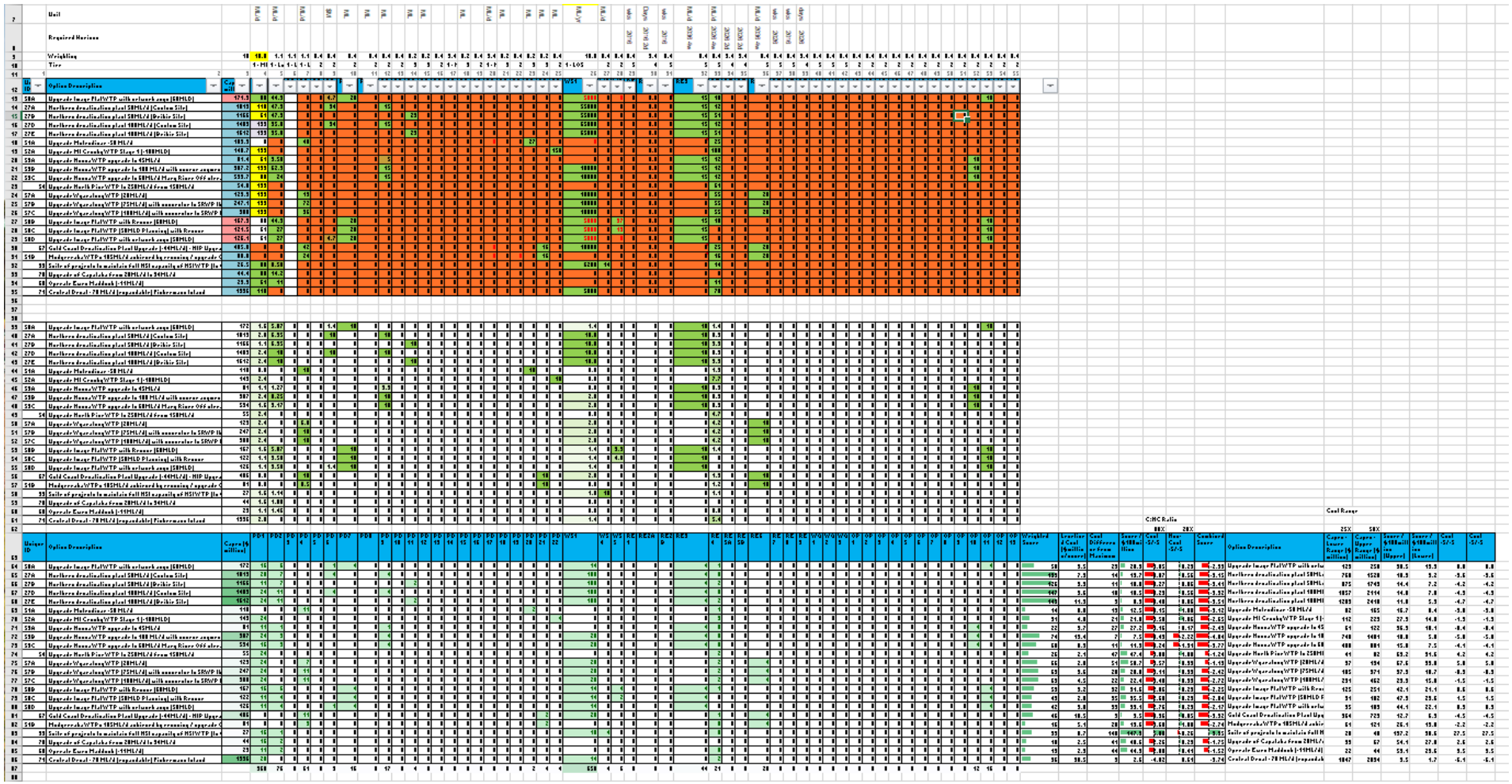
Assessment tiers

- Tier 1 - Source, treatment and major transfer related needs at the whole-of-grid scale as prescribed by the Planning Criteria e.g. LOS and MDMM
- Tier 2 - Transfer and distribution related needs which have the potential to interact with Tier 1 as prescribed by the Planning Criteria e.g. bulk transfer capacity, regional storage
- Tier 3 - Independent localised issues as prescribed by the Planning Criteria e.g. supply reservoir storage
- Tier 4 - Interactive issues for which there are no planning criteria, therefore no definitive requirement to solve it but there is a recognised potential for risk e.g. WTP resilience during 48hr shutdown
- Tier 5 - Interactive issues for which there are no planning criteria, therefore no definitive requirement to solve it, no recognised risk but there is benefit in improving the situation opportunistically through works justified for other reasons identified during the NAP e.g. water quality and WTP resilience during 28d shutdown

Tier 1 assessment approach

- Tier 1 approach resolves each need chronologically as failure occurs
- Options are identified and the benefit provided to resolving each need quantified
- Benefits are weighted and summed
- Benefit cost ratio for each option indexed and added to indexed qualitative (eg social, environmental impact) ratings
- The most cost effective option selected as preferred and assessment progressed to next point of failure and process is repeated

“The Matrix”



“The Matrix” – quantified performance

Total MDMM need (2046 MDMM - Existing Treatment Capac	382
Total MDMM need (2046 MDMM - 2022 MDMM)	553

p	Positive interaction - this option helps to resolve the secondary need
u	Neutral interaction - this option does not interact with the secondary need
n	Negative interaction - this option makes resolving the secondary need more difficult

Unique ID	Option Description	Capex ($ million)	PD1	PD2	PD3	PD4	PD5	PD6	PD7	PD8	PD9	PD10	PD11	PD12	PD13	PD14	PD15	PD16	PD17	PD18	PD19	PD20	PD21	PD22
																			x					
	Total Need		552	75.5		28		34	20	30	15		29	37			13			18		27	16	150
	Unit		ML/d	ML/d		ML/d		$M	ML	ML	ML		ML	ML			ML		ML/d	ML		ML	ML	ML
	Required Horizon																							
	Weighting	10	10.0	1.1	1.1	1.1	0.4	0.4	0.4	0.4	0.4	0.4	0.2	0.2	0.4	3.4	0.2	0.4	3.4	0.2	0.4	0.2	0.2	0.4
	Tier		1 - MI[	1 - Lo	1 - L	1 - L	2	2	2	2	2	2	3	3	2	1 - N	3	2	1 - N	3	2	3	3	2
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
50A	Upgrade Image Flat WTP with network augs (68MLD)	171.9	88	44.3		0	0	4.7	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27A	Northern desalination plant 50ML/d (Coolum Site)	1013	110	47.9		0	0	34	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0
27B	Northern desalination plant 50ML/d (Bribie Site)	1166	61	47.9		0	0	0	0	0	0	0	29	0	0	0	0	0	0	0	0	0	0	0
27D	Northern desalination plant 100ML/d (Coolum Site)	1409	133	95.8		0	0	34	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0
27E	Northern desalination plant 100ML/d (Bribie Site)	1612	133	95.8		0	0	0	0	0	0	0	29	0	0	0	0	0	0	0	0	0	0	0
51A	Upgrade Molendinar +50 ML/d	109.9	0	0		48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27	0	0
52A	Upgrade Mt Crosby WTP Stage 1 (+100MLD)	148.7	133	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	150
53A	Upgrade Noosa WTP upgrade to 45ML/d	81.4	61	9.58		0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0
53B	Upgrade Noosa WTP upgrade to 100 ML/d with source augm	987.2	133	62.3		0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0
53C	Upgrade Noosa WTP upgrade to 60ML/d Mary River Off stre	533.7	88	24		0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0
54	Upgrade North Pine WTP to 250ML/d from 150ML/d	54.8	133	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57A	Upgrade Wyaralong WTP (20ML/d)	129.3	133	0		19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57B	Upgrade Wyaralong WTP (75ML/d) with connector to SRWP	247.1	133	0		72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57C	Upgrade Wyaralong WTP (100ML/d) with connector to SRWP	308	133	0		96	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50B	Upgrade Image Flat WTP with Rezone (68MLD)	167.3	88	44.3		0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50C	Upgrade Image Flat WTP (50MLD Planning) with Rezone	121.5	61	27		0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50D	Upgrade Image Flat WTP with network augs (50MLD)	126.1	61	27		0	0	4.7	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	Gold Coast Desalination Plant Upgrade (+44ML/d) + NIP Up	485.8	0	0		42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0
51B	Mudgeeraba WTPs 105ML/d achieved by rezoning / upgrade	80.8	0	0		24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0
39	Suite of projects to maintain full NSI capacity of NSI WTP (t	26.5	88	8.58		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	Upgrade of Capalaba from 20ML/d to 34ML/d	44.4	88	14.2		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	Operate Ewen Maddock (+11ML/d)	29.3	61	11		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	Central Desal - 70 ML/d (expandable) Fishermans Island	1396	110	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Unique ID	Option Description	WS1	WS4	WS5	RE1	RE2A	RE2B	RE3	RE4	RE5A	RE5B	RE6	RE7	RE8	RE9
		513555													
	Total Need	35,281	14	40	4	1.71	4	14.8	130	2	2	20	4	4	2
	Unit	ML/yr	ML/d		wks	Days	wks	ML/d	ML/d			ML/d	wks	wks	days
	Required Horizon				2016	2016 2d	2016	2036 4w	2026 4w	2026 2d	2026 2d	2036 4w	2026	2016	2026
	Weighting	10.0	0.4	0.4	0.4	3.4	0.4	0.4	0.4	3.4	3.4	0.4	0.4	0.4	3.4
	Tier	1 - LOS	2	2	5	4	5	5	5	4	4	5	5	5	4
1	2	26	27	28	29	30	31	32	33	34	35	36	37	38	39
50A	Upgrade Image Flat WTP with network augs (68MLD)	5000	0	0	0	0.0	0	15	18	0	0	0	0	0	0
27A	Northern desalination plant 50ML/d (Coolum Site)	55000	0	0	0	0.0	0	15	12	0	0	0	0	0	0
27B	Northern desalination plant 50ML/d (Bribie Site)	55000	0	0	0	0.0	0	15	51	0	0	0	0	0	0
27D	Northern desalination plant 100ML/d (Coolum Site)	65000	0	0	0	0.0	0	15	12	0	0	0	0	0	0
27E	Northern desalination plant 100ML/d (Bribie Site)	65000	0	0	0	0.0	0	15	51	0	0	0	0	0	0
51A	Upgrade Molendinar +50 ML/d	0	0	0	0	0.0	0	0	25	0	0	0	0	0	0
52A	Upgrade Mt Crosby WTP Stage 1 (+100MLD)	0	0	0	0	0.0	0	0	100	0	0	0	0	0	0
53A	Upgrade Noosa WTP upgrade to 45ML/d	0	0	0	0	0.0	0	15	12	0	0	0	0	0	0
53B	Upgrade Noosa WTP upgrade to 100 ML/d with source augm	10000	0	0	0	0.0	0	15	12	0	0	0	0	0	0
53C	Upgrade Noosa WTP upgrade to 60ML/d Mary River Off stre	10000	0	0	0	0.0	0	15	12	0	0	0	0	0	0
54	Upgrade North Pine WTP to 250ML/d from 150ML/d	0	0	0	0	0.0	0	0	61	0	0	0	0	0	0
57A	Upgrade Wyaralong WTP (20ML/d)	10000	0	0	0	0.0	0	0	55	0	0	20	0	0	0
57B	Upgrade Wyaralong WTP (75ML/d) with connector to SRWP	10000	0	0	0	0.0	0	0	55	0	0	20	0	0	0
57C	Upgrade Wyaralong WTP (100ML/d) with connector to SRWP	10000	0	0	0	0.0	0	0	55	0	0	20	0	0	0
50B	Upgrade Image Flat WTP with Rezone (68MLD)	5000	0	37	0	0.0	0	15	18	0	0	0	0	0	0
50C	Upgrade Image Flat WTP (50MLD Planning) with Rezone	5000	0	19	0	0.0	0	15	0	0	0	0	0	0	0
50D	Upgrade Image Flat WTP with network augs (50MLD)	5000	0	0	0	0.0	0	15	0	0	0	0	0	0	0
67	Gold Coast Desalination Plant Upgrade (+44ML/d) + NIP Up	10000	0	0	0	0.0	0	0	25	0	0	20	0	0	0
51B	Mudgeeraba WTPs 105ML/d achieved by rezoning / upgrade	0	0	0	0	0.0	0	0	16	0	0	20	0	0	0
39	Suite of projects to maintain full NSI capacity of NSI WTP (t	6200	14	0	0	0.0	0	0	14	0	0	0	0	0	0
70	Upgrade of Capalaba from 20ML/d to 34ML/d	0	0	0	0	0.0	0	0	0	0	0	0	0	0	0
68	Operate Ewen Maddock (+11ML/d)	0	0	0	0	0.0	0	0	11	0	0	0	0	0	0
71	Central Desal - 70 ML/d (expandable) Fishermans Island	5000	0	0	0	0.0	0	0	70	0	0	0	0	0	0

Unique ID	Option Description	WQ1	WQ2	WQ3	OP1	OP2	OP3	OP4	OP5	OP6	OP7	OP8	OP9	OP10	OP11	OP12	OP13
	Weighting	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	Tier	5	5	5	2	2	2	2	2	2	2	2	2	2	2	2	2
1	2	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55
50A	Upgrade Image Flat WTP with network augs (68MLD)	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0
27A	Northern desalination plant 50ML/d (Coolum Site)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27B	Northern desalination plant 50ML/d (Bribie Site)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27D	Northern desalination plant 100ML/d (Coolum Site)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27E	Northern desalination plant 100ML/d (Bribie Site)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51A	Upgrade Molendinar +50 ML/d	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52A	Upgrade Mt Crosby WTP Stage 1 (+100MLD)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53A	Upgrade Noosa WTP upgrade to 45ML/d	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0
53B	Upgrade Noosa WTP upgrade to 100 ML/d with source augm	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0
53C	Upgrade Noosa WTP upgrade to 60ML/d Mary River Off stre	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0
54	Upgrade North Pine WTP to 250ML/d from 150ML/d	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57A	Upgrade Wyaralong WTP (20ML/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57B	Upgrade Wyaralong WTP (75ML/d) with connector to SRWP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57C	Upgrade Wyaralong WTP (100ML/d) with connector to SRWP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50B	Upgrade Image Flat WTP with Rezone (68MLD)	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0
50C	Upgrade Image Flat WTP (50MLD Planning) with Rezone	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0
50D	Upgrade Image Flat WTP with network augs (50MLD)	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0
67	Gold Coast Desalination Plant Upgrade (+44ML/d) + NIP Up	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51B	Mudgeeraba WTPs 105ML/d achieved by rezoning / upgrade	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	Suite of projects to maintain full NSI capacity of NSI WTP (t	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	Upgrade of Capalaba from 20ML/d to 34ML/d	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	Operate Ewen Maddock (+11ML/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	Central Desal - 70 ML/d (expandable) Fishermans Island	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

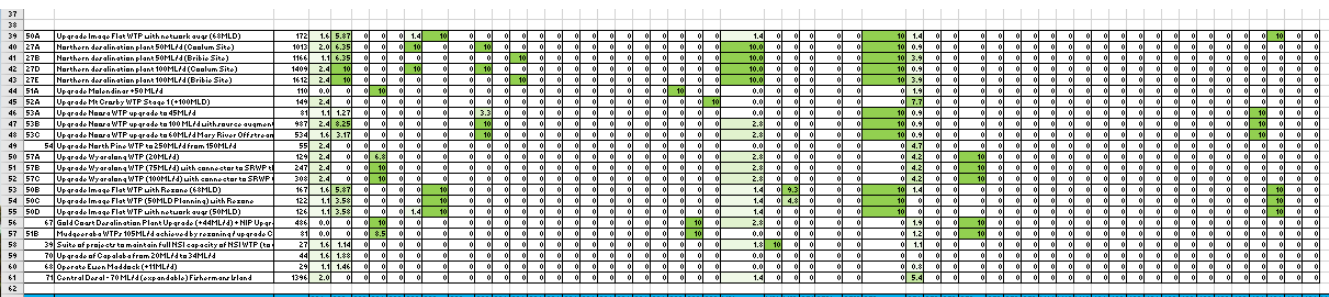
“The Matrix” – levelised performance

	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG
34	68	Operate Ewen Maddock (+11ML/d)	29.3	61	11		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	71	Central Desal - 70 ML/d (expandable) Fishermans Island	1396	110	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5000	0	0	0	0.0	0	0	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36																																																								
37																																																								
38																																																								
39	50A	Upgrade Image Flat WTP with network augs (68MLD)	172	1.6	5.87	0	0	0	1.4	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.4	0	0	0	0	0	10	1.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0
40	27A	Northern desalination plant 50ML/d (Coolum Site)	1013	2.0	6.35	0	0	0	10	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	10.0	0	0	0	0	0	10	0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	27B	Northern desalination plant 50ML/d (Bribie Site)	1166	1.1	6.35	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	10.0	0	0	0	0	0	10	3.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	27D	Northern desalination plant 100ML/d (Coolum Site)	1409	2.4	10	0	0	0	10	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	10.0	0	0	0	0	0	10	0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43	27E	Northern desalination plant 100ML/d (Bribie Site)	1612	2.4	10	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	10.0	0	0	0	0	0	10	3.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	51A	Upgrade Molendinar +50 ML/d	110	0.0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0.0	0	0	0	0	0	0	1.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	52A	Upgrade Mt Crosby WTP Stage 1 (+100MLD)	149	2.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0.0	0	0	0	0	0	0	7.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46	53A	Upgrade Noosa WTP upgrade to 45ML/d	81	1.1	1.27	0	0	0	0	0	0	3.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	10	0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0
47	53B	Upgrade Noosa WTP upgrade to 100 ML/d with source augn	987	2.4	8.25	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	2.8	0	0	0	0	0	10	0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0
48	53C	Upgrade Noosa WTP upgrade to 60ML/d Mary River Off stre	534	1.6	3.17	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	2.8	0	0	0	0	0	10	0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0
49	54	Upgrade North Pine WTP to 250ML/d from 150ML/d	55	2.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	4.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	57A	Upgrade Wyaralong WTP (20ML/d)	129	2.4	0	0	6.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.8	0	0	0	0	0	0	4.2	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51	57B	Upgrade Wyaralong WTP (75ML/d) with connector to SRWP	247	2.4	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.8	0	0	0	0	0	0	4.2	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52	57C	Upgrade Wyaralong WTP (100ML/d) with connector to SRWP	308	2.4	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.8	0	0	0	0	0	0	4.2	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	50B	Upgrade Image Flat WTP with Rezone (68MLD)	167	1.6	5.87	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.4	0	9.3	0	0	0	10	1.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0
54	50C	Upgrade Image Flat WTP (50MLD Planning) with Rezone	122	1.1	3.58	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.4	0	4.8	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0
55	50D	Upgrade Image Flat WTP with network augs (50MLD)	126	1.1	3.58	0	0	0	1.4	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.4	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0
56	67	Gold Coast Desalination Plant Upgrade (+44ML/d) + NIP Up	486	0.0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	2.8	0	0	0	0	0	0	1.9	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57	51B	Mudgeeraba WTPs 105ML/d achieved by rezoning / upgrad	81	0.0	0	0	8.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0.0	0	0	0	0	0	0	1.2	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58	39	Suite of projects to maintain full NSI capacity of NSI WTP (t	27	1.6	1.14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.8	10	0	0	0	0	0	1.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
59	70	Upgrade of Capalaba from 20ML/d to 34ML/d	44	1.6	1.88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60	68	Operate Ewen Maddock (+11ML/d)	29	1.1	1.46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61	71	Central Desal - 70 ML/d (expandable) Fishermans Island	1396	2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.4	0	0	0	0	0	0	5.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62																																																						

	Unique ID	Option Description	Capex ($ million)	PD1	PD2	PD3	PD4	PD5	PD6	PD7	PD8	PD9	PD10	PD11	PD12	PD13	PD14	PD15	PD16	PD17	PD18	PD19	PD20	PD21	PD22	WS1	WS4	WS5	RE1	RE2A	RE2B	RE3	RE4	RE5A	RE5B	RE6	RE7	RE8	RE9	WQ1	WQ2	WQ3	OP1	OP2	OP3	OP4	OP5	OP6	OP7	OP8	OP9	OP10	OP11	OP12	OP13	W Sc
63																																																							
64	50A	Upgrade Image Flat WTP with network augs (68MLD)	172	16	6	0	0	0	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	
65	27A	Northern desalination plant 50ML/d (Coolum Site)	1013	20	7	0	0	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
66	27B	Northern desalination plant 50ML/d (Bribie Site)	1166	11	7	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
67	27D	Northern desalination plant 100ML/d (Coolum Site)	1409	24	11	0	0	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
68	27E	Northern desalination plant 100ML/d (Bribie Site)	1612	24	11	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
69	51A	Upgrade Molendinar +50 ML/d	110	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
70	52A	Upgrade Mt Crosby WTP Stage 1 (+100MLD)	149	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
71	53A	Upgrade Noosa WTP upgrade to 45ML/d	81	11	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	
72	53B	Upgrade Noosa WTP upgrade to 100 ML/d with source augn	987	24	9	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	28	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	
73	53C	Upgrade Noosa WTP upgrade to 60ML/d Mary River Off stre	534	16	3	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	28	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	
74	54	Upgrade North Pine WTP to 250ML/d from 150ML/d	55	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Plot Area

“The Matrix” – benefit/cost ratio



	Option ID	Option Description	Capex ($ million)	PD1	PD2	PD3	PD4	PD5	PD6	PD7	PD8	PD9	PD10	PD11	PD12	PD13	PD14	PD15	PD16	PD17	PD18	PD19	PD20	PD21	PD22	WS1	WS4	WS5	RE1	RE2A	RE2B	RE3	RE4	RE5	RE6	RE7	RE8	RE9	WQ1	WQ2	WQ3	OP1	OP2	OP3	OP4	OP5	OP6	OP7	OP8	OP9	OP10	OP11	OP12	OP13	Weighted Score	Levelised Cost ($million/ Asset)	Cost Difference from Maximum	Score / $100million	Cost $/$	Raw Cost $/$	Combined Score
64	59A	Upgrade Image Flat WTP with network expansion (68MLD)	172	16	6	0	0	0	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	50	3.5	29	28.9	$0.05	0.23	-2.39
65	27A	Northern desalination plant 50MLd (Caoulum Site)	1012	20	7	0	0	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	139	7.3	14	13.7	$0.07	0.56	-3.15
66	27B	Northern desalination plant 50MLd (Bribie Site)	1164	11	7	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	124	9.3	11	10.7	$0.27	0.96	-3.41
67	27D	Northern desalination plant 100MLd (Caoulum Site)	1409	24	11	0	0	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	147	9.6	10	10.5	$0.29	0.54	-3.32
68	27E	Northern desalination plant 100MLd (Bribie Site)	1612	24	11	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	143	11.2	9	8.9	$0.40	0.84	-3.51
69	51A	Upgrade Melandinar +50 MLd	110	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	8.0	13	12.5	$4.15	31.00	-3.12
70	52A	Upgrade Mt Crosby WTP Stage 1 (+100MLD)	149	24	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	4.8	21	21.0	$2.58	21.06	-2.65
71	53A	Upgrade Nmare WTP upgrade to 45MLd	81	11	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	22	3.7	27	27.2	$2.16	10.17	-2.49
72	53B	Upgrade Nmare WTP upgrade to 100MLd with source augmentation	987	24	9	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	28	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	74	10.4	7	7.5	$4.49	2.22	-4.04
73	53C	Upgrade Nmare WTP upgrade to 60MLd (Mary River Offstream)	534	16	3	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	28	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	60	8.9	11	11.3	$1.24	11.91	-3.77
74	54	Upgrade North Pine WTP to 250MLd from 150MLd	55	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26	2.1	47	47.4	$1.80	31.00	-1.24
75	57A	Upgrade Wyaralong WTP (20MLd)	129	24	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	0	0	0	0	0	0	0	2	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	66	2.0	51	50.7	$1.57	10.33	-1.19
76	57B	Upgrade Wyaralong WTP (75MLd) with connector to SRWP to	247	24	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	0	0	0	0	0	0	0	2	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69	3.6	28	28.0	$3.11	10.33	-2.42
77	57C	Upgrade Wyaralong WTP (100MLd) with connector to SRWP t	398	24	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	0	0	0	0	0	0	0	2	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69	4.5	22	22.4	$5.48	10.33	-2.72
78	59B	Upgrade Image Flat WTP with Rosanna (68MLD)	167	16	6	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	4	0	0	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	53	3.2	32	31.4	$3.36	10.23	-2.25
79	59C	Upgrade Image Flat WTP (50MLD Planning) with Rosanna	122	11	4	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	2	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	43	2.8	35	35.5	$2.60	10.23	-2.64
80	59D	Upgrade Image Flat WTP with network expansion (50MLD)	124	11	4	0	0	0	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	42	3.0	33	33.4	$2.76	10.23	-2.17
81	67	Gold Coast Desalination Plant Upgrade (+44MLd) + NIP Upgr	486	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	0	0	0	0	0	0	0	1	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	46	10.5	9	9.5	$5.36	10.35	-3.32
82	51B	Mudgeeraba WTP to 105MLd achieved by rezoning if upgrade C	81	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	5.1	20	19.1	$3.68	31.00	-2.74
83	39	Suite of projects to maintain full NSI capacity of NSI WTP (ta	27	16	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39	0.7	140	147.3	$.00	10.26	-3.95
84	70	Upgrade of Capalaba from 20MLd to 34MLd	44	16	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	2.5	41	40.6	$6.26	10.29	-1.75
85	68	Operate Essen Maddock (+11MLd)	29	11	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	2.3	44	44.3	$6.00	10.41	-1.52
86	71	Central Dural - 70 MLd (expandable) Fitzhermans Island	1396	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36	38.5	3	2.6	-4.02	0.61	-3.74
87				348	76	0	61	0	9	16	0	17	0	4	0	0	0	0	0	0	0	0	2	4	4	656	4	5	0	0	0	44	21	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	16	0	0							

	Option ID	Option Description	Capex-Lower Range ($ million)	Capex-Upper Range ($ million)	Score / $100million [Lower]	Score / $100million [Upper]	Cost $/$	Cost $/$
64	59A	Upgrade Image Flat WTP with network expansion (68MLD)	129	258	38.5	19.3	0.0	0.0
65	27A	Northern desalination plant 50MLd (Caoulum Site)	760	1520	18.3	9.2	-3.6	-3.6
66	27B	Northern desalination plant 50MLd (Bribie Site)	875	1749	14.4	7.2	-4.2	-4.2
67	27D	Northern desalination plant 100MLd (Caoulum Site)	1057	2114	14.0	7.0	-4.3	-4.3
68	27E	Northern desalination plant 100MLd (Bribie Site)	1209	2418	11.8	5.9	-4.7	-4.7
69	51A	Upgrade Melandinar +50 MLd	82	165	16.7	8.4	-3.8	-3.8
70	52A	Upgrade Mt Crosby WTP Stage 1 (+100MLD)	112	223	27.9	14.0	-1.9	-1.9
71	53A	Upgrade Nmare WTP upgrade to 45MLd	61	122	36.3	18.1	-0.4	-0.4
72	53B	Upgrade Nmare WTP upgrade to 100MLd with source augmentation	740	1481	10.0	5.0	-5.0	-5.0
73	53C	Upgrade Nmare WTP upgrade to 60MLd (Mary River Offstream)	400	801	15.0	7.5	-4.1	-4.1
74	54	Upgrade North Pine WTP to 250MLd from 150MLd	41	82	63.2	31.6	4.2	4.2
75	57A	Upgrade Wyaralong WTP (20MLd)	97	194	67.6	33.8	5.0	5.0
76	57B	Upgrade Wyaralong WTP (75MLd) with connector to SRWP to	185	371	37.3	18.7	-0.3	-0.3
77	57C	Upgrade Wyaralong WTP (100MLd) with connector to SRWP t	231	462	29.9	15.0	-1.5	-1.5
78	59B	Upgrade Image Flat WTP with Rosanna (68MLD)	125	251	42.1	21.1	0.6	0.6
79	59C	Upgrade Image Flat WTP (50MLD Planning) with Rosanna	91	182	47.3	23.6	1.5	1.5
80	59D	Upgrade Image Flat WTP with network expansion (50MLD)	95	189	44.1	22.1	0.9	0.9
81	67	Gold Coast Desalination Plant Upgrade (+44MLd) + NIP Upgr	364	729	12.7	6.3	-4.5	-4.5
82	51B	Mudgeeraba WTP to 105MLd achieved by rezoning if upgrade C	61	121	26.1	13.0	-2.2	-2.2
83	39	Suite of projects to maintain full NSI capacity of NSI WTP (ta	20	40	197.2	98.6	27.5	27.5
84	70	Upgrade of Capalaba from 20MLd to 34MLd	33	67	54.1	27.0	2.6	2.6
85	68	Operate Essen Maddock (+11MLd)	22	44	59.1	29.6	3.5	3.5
86	71	Central Dural - 70 MLd (expandable) Fitzhermans Island	1047	2094	3.5	1.7	-6.1	-6.1

Tier 2 approach

- Tier 2 and 3 needs were not resolved within the NAP
- Highly interactive between Seqwater and Water Service Provider networks
- Options will involve actions in either network or both
- Collaborative approach is required
- Tier 2 and 3 needs assembled into planning projects requiring action (local area plans)
- Two of these projects have been completed to date and another is about to commence

Project outcomes

- A servicing strategy at the bulk supply level was developed, which will allow more detailed planning at the network and facility level to progress
- A program of proposed capital works was developed – source, treatment and network augmentations
- A program of future planning studies was developed
- We now have a process that can be used to assess performance of inter-related system components

Conclusions

- The role of the treated water network within the grid has changed
- Supply can be balanced in many ways
- For the bulk supply system, the needs of water security, reliability/resilience and water quality also need to be assessed in addition to peak demand
- Many of the needs are highly interactive
- Seqwater and the Water Service Providers need to work collaboratively to plan the interface regions

Thank you for listening

- Any questions?