Irrigation Price Review Submission

Appendix J

Headworks Utilisation Factors Technical Paper

Public
6 November 2018

Table of Contents

Overview

The Headworks Utilisation Factors (HUFs) first approved by the Queensland Competition Authority (QCA) in 2011 have been reviewed in 2018.

This document consolidates the technical methodology aspects previously outlined in a number of separate previous technical papers:

1. a Technical Paper first issued by SunWater on 3 September 2010
2. an Addendum first issued by SunWater on 12 May 2011
3. a Combined Technical Paper and Addendum published on 16 May 2011 which sets out the methodologies approved by the QCA in 2011 and used to determine HUFs for Seqwater and SunWater schemes[1]
4. additional steps to address schemes that are subject to 'in-year cut-off rules'.

A summary of schemes where the HUFs have changed are presented in Table 1. For schemes not listed in Table 1, the HUF has not changed. Details of these can be found in the 2011 HUF report (on the QCA website).

Table 1: Updated Headworks Utilisation Factors for Water Supply Schemes operated by SunWater

Water Supply Scheme	Headworks Utilisation Factors (%) and volume of water allocation relating to each priority group (ML) for each Water Allocation Priority Group in each Water Supply Scheme				
Barker Barambah WSS	Medium Priority (32079 ML) 72%	High Priority (2236 ML) 28%			
Boyne River and Tarong WSS[1]	Medium Priority (7161 ML) 4%	High Priority (34850 ML) 96%			
Bundaberg WSS (SunWater Headworks)	Medium Priority (211957 ML) 62%	High Priority (24372 ML) 38%			
Bundaberg WSS (Burnett Water Headworks)	Medium Priority (124000 ML) 54%	High Priority (20000 ML) 46%			
Callide Valley WSS	Medium Priority (Groundwater) (13558 ML) 27%	Risk Priority (Surface Water) (514 ML) 1%	High-A Priority (Surface Water) (4311 ML) 58%	High-B Priority (1066 ML) 14%	
Dawson Valley WSS	Medium Priority (36719 ML) 40%	Medium A Priority (19339 ML) 21%	High Priority (5679 ML) (39%)		

[1] Note that the methodology was further modified by the QCA for the Central Brisbane Water Supply Scheme.

Water Supply Scheme	Headworks Utilisation Factors (%) and volume of water allocation relating to each priority group (ML) for each Water Allocation Priority Group in each Water Supply Scheme				
Lower Mary WSS*	Medium Priority (32650 ML) 48%	High Priority (1809) 52%			
Nogoa Mackenzie WSS[1]	Medium Priority (156113 ML) 28%	High Priority (56000 ML) 72%			
Pioneer River WSS	High B Priority (47357 ML) 38%	High A Priority (30753 ML) 62%			
Three Moon Creek WSS	Medium Priority (Surface Water) (1940 ML) 9%	Medium Priority (Groundwater) (13021 ML) 52%	High Priority (Groundwater) (380 ML) 39%		
Upper Burnett WSS (SunWater Headworks)	Medium Priority (25460 ML) 64%	High Priority (1530 ML) 36%			
Upper Burnett WSS (Burnett Water Headworks)	Medium Priority (9531 ML) 100%	High Priority (0 ML) 0%			
Upper Condamine WSS	Medium Priority (22328 ML) 8%	Risk A Priority (7320 ML) 0%	Risk B Priority (925 ML) 0%	High A Priority (3262 ML) 89%	High B Priority (125 ML) 3%

1. Water allocation volumes based on current medium priority water allocation being converted to high priority water allocation as provided for in the respective Resource Operations Plan (ROP) or operations manual as applicable. Refer to the calculation details in this report.

1 Introduction to Headworks Utilisation Factors

A robust methodology has been developed and applied for determining 'Headworks Utilisation Factors' ('HUFs') that apportion each water supply scheme's ('WSS') storage headworks volumetric capacity[2] utilised by each water entitlement[3] priority group in the scheme. This is a key consideration in the allocation of the relevant capital costs (i.e. asset value and renewal costs) associated with SunWater's bulk water assets.

1.1 Rationale

Attachment A sets out background information relating to the nature of water access entitlements in Queensland supplemented water supply schemes (particularly with respect to how priority groups work in conjunction with statutory water sharing rules and other operational requirements to define a water entitlement's access to water supplies).

It then outlines the rationale for using HUFs to apportion bulk water asset costs between priority groups of water access entitlements within a scheme.

In general, the HUF allocates a greater proportion of capital costs per megalitre of high priority due to a better understanding of the storage aspects required to service high priority entitlements.

1.2 Methodology

Attachment A sets out an overview of the technical methodology for deriving Headworks Utilisation Factors within a water supply scheme having regard to:

- the volumes and priority groups of water entitlements within the scheme (including the potential for conversion between priority groups where applicable)
- the water sharing and water accounting rules (including taking into account announced allocation and continuous sharing arrangements)
- the critical water supply arrangements (CWSAs) including storage cut-off rules
- other Resource Operations Plan (ROP) requirements relating to instream storage infrastructure operations (including discharge release rules, environmental flow requirements as well as inter-storage management arrangements)
- an analysis of hydrologic performance of headworks storages (in terms of the probability of storages actually holding various volumes of water during critical periods).

1.3 Guide to determining the Headworks Utilisation Factor

Attachment A sets out a detailed step-by-step guide to the methodology for calculating the HUFs and the values of key input data and the details of other scheme specific information relevant to the calculation of the HUFs for each water supply scheme. This includes additional steps to address those schemes that have water sharing rules that are subject to 'in-year cut-off rules'.

---

2 Headworks volumetric capacity in this context includes the useable storage of all dams and weirs within a scheme.

3 The term 'water entitlement' is used throughout this report and has the same meaning as 'water access entitlement' as defined under the National Water Initiative and 'water allocation' as defined in the *Water Act 2000* (Qld).

1.4 Review of Headworks Utilisation Factor considerations for 2019–2024 price path

Attachment B sets out the assessment of the inputs into the HUFs. It compares the inputs into the 2011 HUFs against the current situation applying to each Water Supply Scheme (WSS) and identifies which HUFs required a revision. Table 1.1 identifies the reasons for revising the HUF for the schemes outlined in this report.

Table 1.1: Summary of reasons for revising HUF

Water Supply Scheme	Reasons for revisions
Barker Barambah WSS	• New water sharing rules • Model simulation period has changed • New IQQM hydrologic model
Boyne River and Tarong WSS	• Change in water entitlement grouping • Model simulation period has changed • New IQQM hydrologic model • New HUF methodology for medium priority cut-off rule
Bundaberg WSS	• New water sharing rules • Model simulation period has changed • New IQQM hydrologic model • Environmental release rule changed • Significant change to High Priority Reserve
Callide Dam WSS	• New water sharing rules • Change to High Priority Reserve • Significant changes in water allocation entitlement groupings • New IQQM hydrologic model
Dawson Valley WSS	• Change to water allocation entitlement groupings • New IQQM hydrologic model • Updated calculation of MP0 for Upper Dawson Subscheme
Lower Mary River WSS	• New water sharing rules • Teddington Weir WSS created
Nogoa Mackenzie WSS	• Change to water allocation entitlement groupings • New IQQM hydrologic model • Deflation of Bedford Weir fabridam
Pioneer River WSS	• Deflation of fabridams on Dumbleton and Mirani Weirs • New IQQM hydrologic model
Three Moon Creek WSS	• High Priority interim water allocations surrendered • DNRME in process of converting to medium priority
Upper Burnett WSS	• Deflation of fabridam at Claude Wharton Weir • New water sharing rules give more access to medium priority • New IQQM hydrologic model
Upper Condamine WSS	• New HUF methodology for medium priority cut-off rule

2 Results

2.1 Barker Barambah Water Supply Scheme

2.1.1 Input data from water allocation register (DNRME)

Water Entitlement Priority Group (in ROP or IROL)	Nominal Volume		Water Entitlement Grouping (in HUF calc):		
Medium Priority	32079 ML	→	= MPA	ROP Conversion Factor = N/A	MPAmin = 32079 ML
High Priority	2236 ML	→	= HPA		HPAmax = 2236 ML

2.1.2 Water sharing rules and operational requirements

MP0 AA	Announced allocation water sharing rules give minimum storage volume in the scheme above which medium priority announced allocation is greater than 0% at the commencement of the water year = 12952 ML	
Adjustments	• none	
MP0	= max (MPA AA, CWSA Adjustment)	12952 ML

MP100 AA	= Water sharing rules give minimum storage volume in the scheme at which medium priority announced allocation is at a maximum (100%) at the commencement of the water year = 67510 ML	
Adjustments	• None	
MP100	= min (MP100 AA, Adjustment Volume)	67510 ML

FSV Hwks	= to the full supply volume of the major headworks storage/s in the scheme	136190 ML
DSV Hwks	= to the dead storage volume of the major headworks storage/s in the scheme	1122 ML

2.1.3 Probability of utilisation

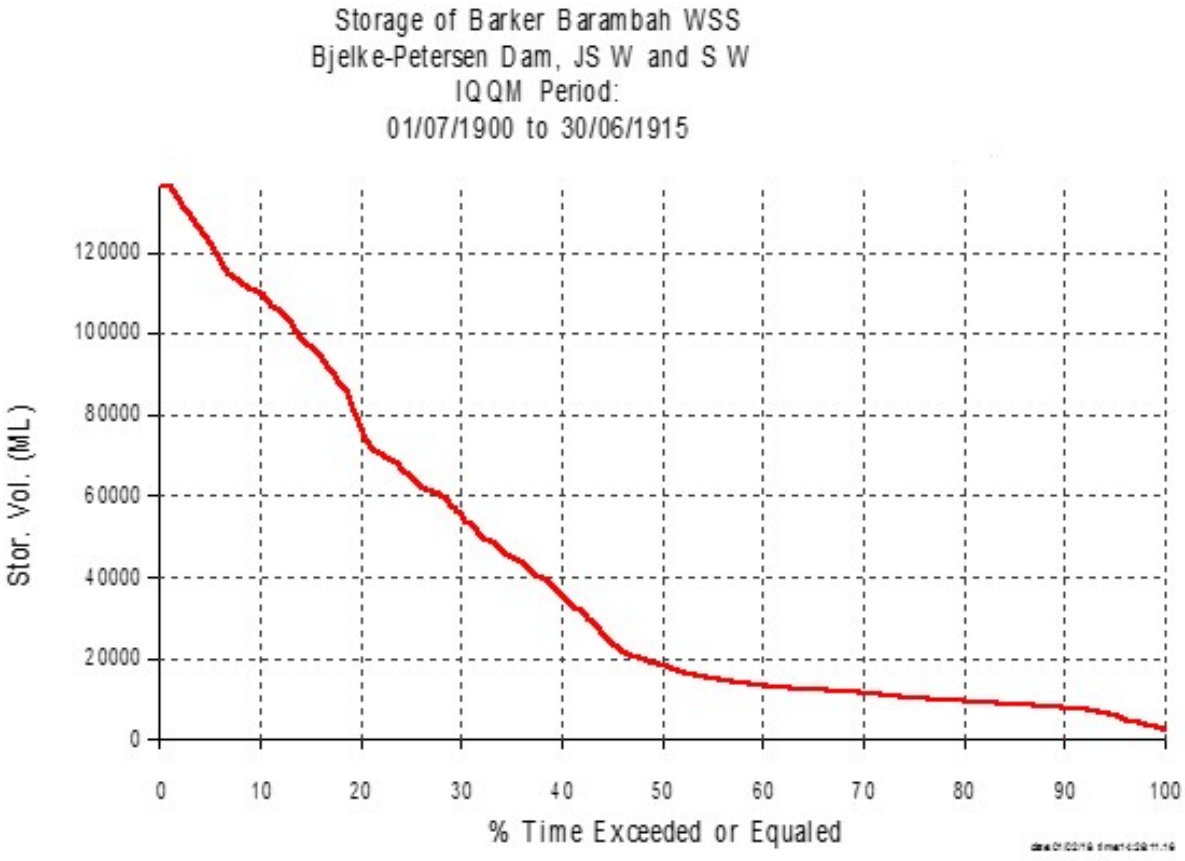
Storage component of capacity volumes:		Probability of Utilisation:	Utilised storage component volumes:	
MP2 = 64205 ML	HP2 = 4475 ML	→ P3 = 12%	→ MP2util = 7936 ML	HP2util = 553 ML
MP1 = 54558 ML		→ P2 = 38%	→ MP1util = 20694 ML	
HP1 = 11830 ML		→ P1 = 88%	→ HP1util = 10387 ML	

2.1.4 HUF Results

Water Entitlement Grouping (in HUF calc):	Headworks Utilisation Factor for Grouping		Water Entitlement Priority Group (in ROP or IROL):	Headworks Utilisation Factor for Priority Group
MPA	72%	→	Medium Priority	72%
HPA	28%	→	High Priority	28%

2.1.5 Exceedance curve used for Barker Barambah WSS

Figure 2.1: Barker Barambah WSS exceedance curve



2.2 Boyne River and Tarong Water Supply Scheme

2.2.1 Input data from water allocation register (DNRME)

Water Entitlement Priority Group (in ROP or IROL)	Nominal Volume		Water Entitlement Grouping (in HUF calc):		
Medium Priority	9485 ML	→	= MPA	ROP Conversion Factor = Burnett ROP Nov 2014 - Conversion Factor (Att 4.4H) = 2.5	MPAmin = 7161 ML*
High Priority	33920 ML	→	= HPA		HPAmax = 34850 ML

Note * MPAmin and MPAmax forecast based on conversion of MP to HP done since the last HUF review in 2011 (future conversions assumed to be of a similar volume).

2.2.2 Water sharing rules and operational requirements

MP0 AA	Announced allocation water sharing rules give minimum storage volume in the scheme above which medium priority announced allocation is greater than 0% at the commencement of the water year = 121501 ML	
MP0 nom	= Maximum headworks storage volume at the start of the water year below which the headworks storage volume is forecast to reach the medium priority cut-off level (which equates to volume in storage of 70,000 ML) on the last day of that water year assuming minimum inflows (based on Boondooma Dam Forecast Storage Model) = 128217 ML **This parameter is only relevant to storages that have a medium priority cut-off rule such as Boondooma Dam.**	
If MP0 nom > MP0 AA	= MP0 nom	128217 ML

MP100 AA	= Water sharing rules give minimum storage volume in the scheme at which medium priority announced allocation is at a maximum (100%) at the commencement of the water year = 135047 ML	
Adjustments	• None	
MP100	= min (MP100 AA, Adjustment Volume)	135047 ML

FSV Hwks	= to the full supply volume of the major headworks storage/s in the scheme	204200 ML
DSV Hwks	= to the dead storage volume of the major headworks storage/s in the scheme	8360 ML

2.2.3 Probability of utilisation (Refer to Fig 2.15 in Appendix A3)

Storage component capacity volumes:		Probability of Utilisation	Utilised storage component volumes	
MP2 = 15112 ML	HP2 = 54041 ML	P3 = 6%	MP2util = 901 ML	HP2util = 3223 ML
MP1-B = 6830 ML		P2-B = 15%	MP1-B_util = 998 ML	
MP1-A = 3358 ML	HP1-A = 3358 ML	P2-A = 20%	MP1-A_util = 661 ML	HP1-A_util = 661 ML
HP1 = 113141 ML		P1 = 52%	HP1util = 58776 ML	

2.2.4 HUF Results

Water Entitlement Grouping (in HUF calc):	Headworks Utilisation Factor for Grouping	Water Entitlement Priority Group (in ROP or IROL):	Headworks Utilisation Factor for Priority Group
MPA	4%	Medium Priority	4%
HPA	96%	High Priority	96%

2.2.5 Exceedance curve and MPO nom used for Boyne River and Tarong WSS

Figure 2.2: Boondooma Dam exceedance curve

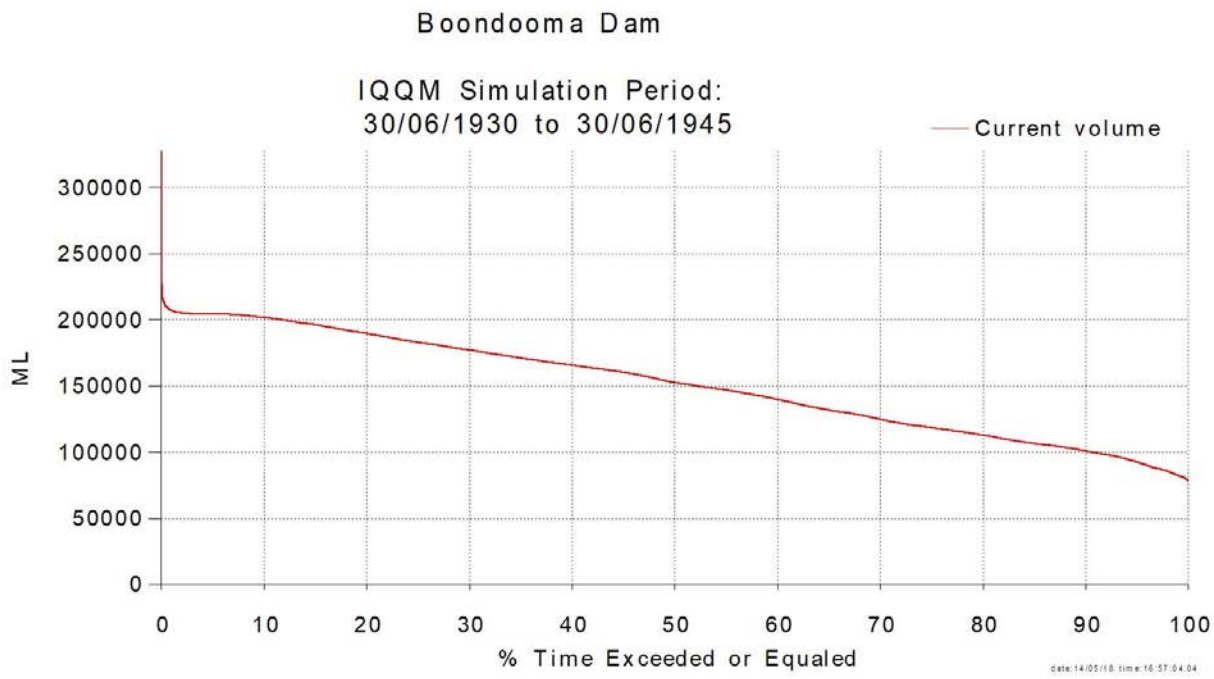
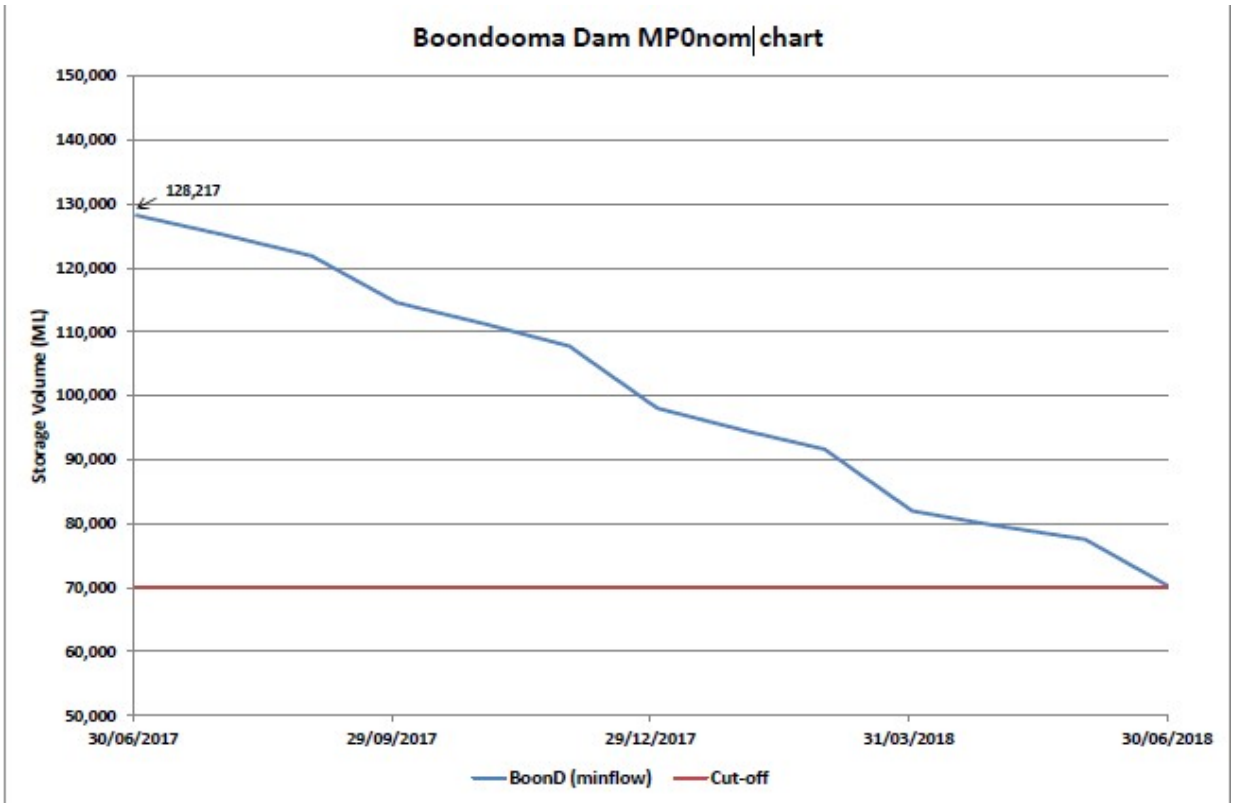


Figure 2.3: Boondooma Dam MPO nom chart



2.3 Bundaberg Water Supply Scheme

2.3.1 Input data from water allocation register (DNRME)

Water Entitlement Priority Group (in ROP or IROL)	Nominal Volume
Medium Priority (SunWater)	211957 ML
High Priority (SunWater)	24372 ML
Medium Priority (Burnett Water)	124000 ML
High Priority (Burnett Water)	20000 ML

Water Entitlement Grouping (in HUF calc):		
MPA = 335957 ML	ROP Conversion Factor = N/A	MPAmin = 335957 ML
HPA = 44372 ML		HPAmax = 44372 ML

2.3.2 Water sharing rules and operational requirements

MP0 AA (KOLAN SUBSCHEME)	Announced allocation water sharing rules give minimum storage volume in the sub-scheme above which medium priority announced allocation is greater than 0% at the commencement of the water year. The relevant bulk share proportion (85%) of Fred Haigh Dam has been utilised. = 32187 ML	
Adjustments	Bucca Weir release rule as per Sch 9, s 21 Water Plan (Burnett Basin) 2014: The number of days between 1995 and mid 2017 Bucca Weir was above 2.32 m is 26.6% of the days. (35 ML x 52 weeks x 26.6%) = 484 ML	
MP0_kolan	= (MP0 AA + Bucca Adjustment)	32671 ML

MP0 AA (BURNETT SUBSCHEME)	Announced allocation water sharing rules give minimum storage volume in the sub-scheme above which medium priority announced allocation is greater than 0% at the commencement of the water year. The relevant bulk share proportion (15%) of Fred Haigh Dam has been utilised. = 136187 ML	
Adjustments	• None	
MP0_burnett	= MP0 AA	136187 ML

MP0	= MP0_kolan + MP0_burnett	168858 ML

MP100 AA (KOLAN SUBSCHEME)	Announced allocation water sharing rules give minimum storage volume in the sub-scheme above which medium priority announced allocation is greater than 0% at the commencement of the water year = 188062 ML
Adjustments	Bucca Weir release rule as per Sch 9, s 21 Water Plan (Burnett Basin) 2014: The number of days between 1995 and mid 2017 Bucca Weir was above 2.32 m is 26.6% of the days. (35 ML x 52 weeks x 26.6%) = 484 ML

MP100_kolan	= (MP0 AA + Bucca Adjustment)	188546 ML

MP100 AA (BURNETT SUBSCHEME)	Announced allocation water sharing rules give minimum storage volume in the sub-scheme above which medium priority announced allocation is greater than 0% at the commencement of the water year = 433768 ML	
Adjustments	• None	
MP100_burnett	= MP0 AA	433768 ML

MP100	= MP100_kolan + MP100_burnett	622314 ML

FSV Hwks	Full supply volume of the major headworks storage/s in the scheme	937420 ML
DSV Hwks	Dead storage volume of the major headworks storage/s in the scheme	29590 ML

2.3.3 Probability of utilisation

Storage component of capacity volumes:		Probability of Utilisation:	Utilised storage component volumes:	
MP2 = 278343 ML	HP2 = 36763 ML	P3 = 0.7%	MP2util = 1870 ML	HP2util = 247 ML
MP1 = 453456 ML		P2 = 42%	MP1util = 190448 ML	
HP1 = 139268 ML		P1 = 95%	HP1util = 131708 ML	

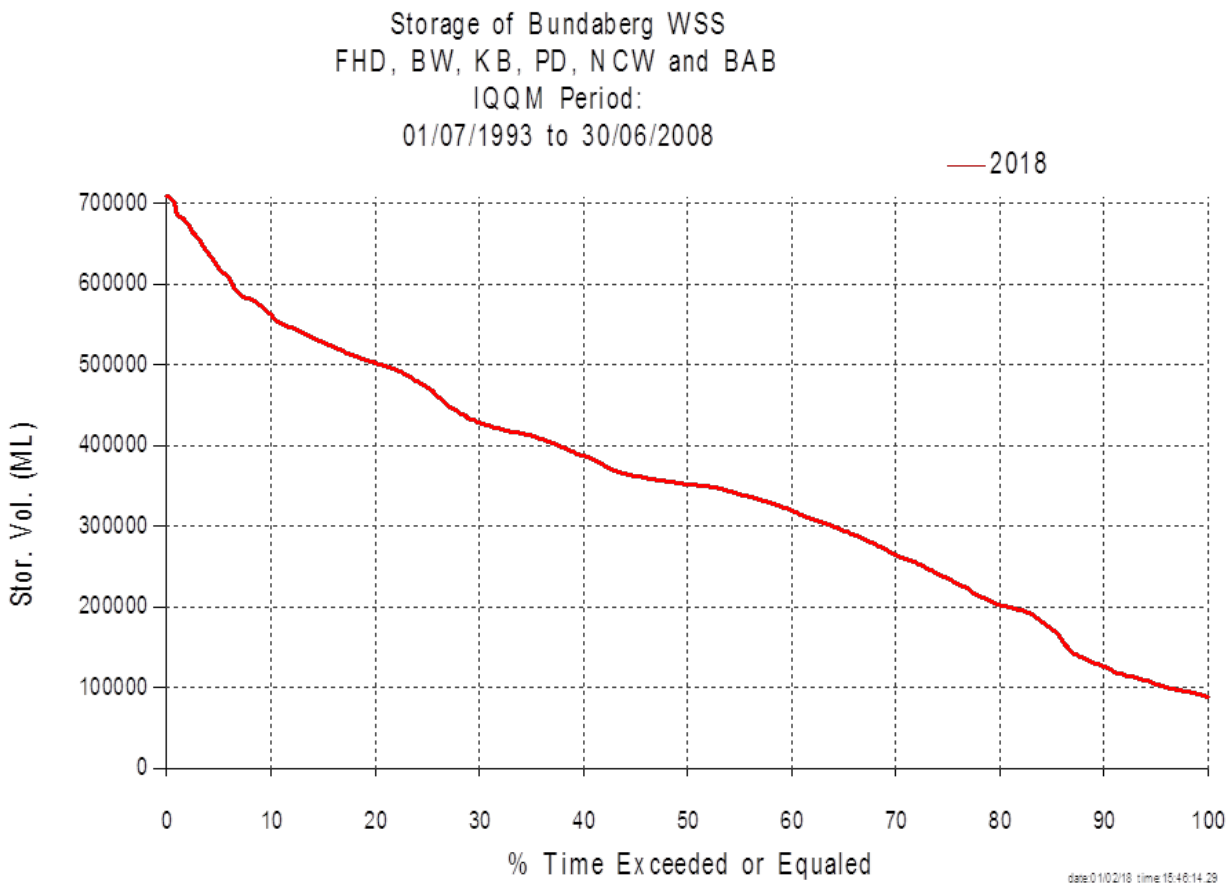
2.3.4 HUF Results

Water Entitlement Grouping (in HUF calc):	Headworks Utilisation Factor for Grouping	Disaggregating for SunWater and Burnett Water Infrastructure[4]	Water Entitlement Priority Group (in ROP or IROL):	Headworks Utilisation Factor for Priority Group
MPA	59%		Medium Priority (SunWater)	62%
HPA	41%		High Priority (SunWater)	38%
			Medium Priority (Burnett Water)	54%
			High Priority (Burnett Water)	46%

[4] HUF result disaggregated in proportion to the volume of water entitlements in the respective grouping and then expressed as a percentage totalling 100% for each headworks.

2.3.5 Exceedance curve used for Bundaberg WSS

Figure 2.4: Bundaberg WSS exceedance curve



2.4 Callide Valley Water Supply Scheme

2.4.1 Input data from water allocation register (DNRME)

Water Entitlement Priority Group (in ROP or IROL)	Nominal Volume
Medium Priority (Groundwater)	13558 ML
Risk Priority (Surface water)*	514 ML
High A Priority**	4311 ML
High B Priority***	1066 ML

Water Entitlement Grouping (in HUF calc):		
MPA = 14072 ML	ROP Conversion Factor = N/A	MPAmin = 14072 ML
HPA = 5377 ML		HPAmax = 5377 ML

Note *As described in s 11 of the Callide Valley WSS Operations Manual (June 2018), Risk Priority (Surface Water) is generally available as a result of releases from Callide Dam and is therefore considered to be a comparable product to Medium Priority (Groundwater) for the purpose of HUF analysis.

**High-A Priority not subject to an announced allocation determined by groundwater levels as outlined in section 8(2)(a) of the Callide Valley WSS Operations Manual (June 2018). However, the volume is included in the HPA because High-A Priority allocations are located in Callide A zone (Callide Dam to the effective upstream limit of Callide Dam).

***High-B Priority not subject an announced allocation determined by groundwater levels as outlined in section 8(2)(b) of the Callide Valley WSS Operations Manual (June 2018). High-B Priority allocations are located in Callide 3B and 5 zones which rely on groundwater downstream of Callide Dam.

2.4.2 Water sharing rules and operational requirements

MP0 AA	Announced allocation water sharing rules give minimum storage volume in the scheme above which medium priority announced allocation is greater than 0% at the commencement of the water year = NOT APPLICABLE	
Adjustments	• 20000 ML = storage volume for HP reserve (section 6 of the Callide Valley WSS Operations Manual (June 2018))	
MP0	= max (MPA AA, Reserve Adjustment)	20000 ML

MP100 AA	= Water sharing rules give minimum storage volume in the scheme at which medium priority announced allocation is at a maximum (100%) at the commencement of the water year = NOT APPLICABLE	
Adjustments	Volume in Callide Dam required to increase the groundwater levels to yield 100% for medium priority announced allocation as per section 9 of the Callide Valley WSS Operations Manual (June 2018). The adjustment is based on historical groundwater and Callide Dam levels. Each groundwater zone responds differenctly to releases from Callide Dam and 81852 ML has been adopted as a best fit.[5]	
MP100	= min (MP100 AA, Adjustment Volume)	81852 ML

[5] Please refer to the Callide Valley WSS HUF Investigation HB#2277694.

FSV Hwks	= to the full supply volume of the major headworks storage/s in the scheme	136370 ML
DSV Hwks	= to the dead storage volume of the major headworks storage/s in the scheme	2880 ML

2.4.3 Probability of utilisation

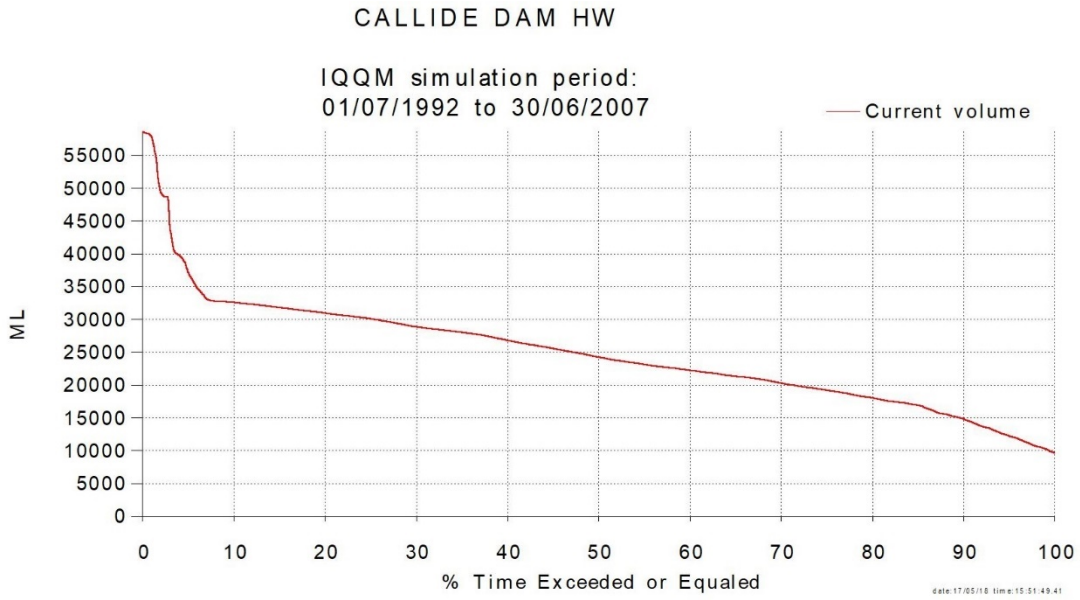
Storage component of capacity volumes:		Probability of Utilisation:	Utilised storage component volumes:	
MP2 = 41312 ML	HP2 = 13136 ML	P3 = 0%	MP2util = 0 ML	HP2util = 0 ML
MP1 = 61852 ML		P2 = 10%	MP1util = 6049 ML	
HP1 = 17120 ML		P1 = 93%	HP1util = 15914 ML	

2.4.4 HUF Results

Water Entitlement Grouping (in HUF calc):	Headworks Utilisation Factor for Grouping	Disaggregating[6]	Water Entitlement Priority Group (in ROP or IROL):	Headworks Utilisation Factor for Priority Group
MPA	28%		Medium Priority (Groundwater)	27%
HPA	72%		Risk Priority (Surface water)	1%
			High A Priority	58%
			High B Priority	14%

2.4.5 Exceedance curve used for Callide Valley WSS

Figure 2.5: Callide Dam exceedance curve



[6] HUF result disaggregated in proportion to the volume of water entitlements in the respective grouping and then expressed as a percentage totalling 100% for each headworks.

2.5 Dawson Valley Water Supply Scheme

2.5.1 Input data from water allocation register (DNRME)

Water Entitlement Priority Group (in ROP or IROL)	Nominal Volume
Medium Priority	36719 ML
Medium A Priority*	19339 ML
High Priority	5679 ML

Water Entitlement Grouping (in HUF calc):		
MPA = 56058 ML	ROP Conversion Factor = N/A	MPAmin = 56058 ML
HPA = 5679 ML		HPAmax = 5679 ML

Note * With reference to water sharing rules in section 12 of the Dawson Valley WSS Operations Manual (June 2018), Medium-A Priority and Medium Priority are considered to be comparable products for the purposes of this HUF analysis

2.5.2 Water sharing rules and operational requirements

MP0 AA (UPPER DAWSON SUBSCHEME)	Announced allocation water sharing rules give minimum storage volume in the scheme above which the combined medium priority announced allocation is greater than 0% at the commencement of the water year = 15871 ML	
Adjustments	• None	
MP0_upper	= max (MP0 AA + Adjustment)	15871 ML

MP0 AA (LOWER DAWSON SUBSCHEME)	Announced allocation water sharing rules give minimum storage volume in the scheme above which medium priority announced allocation is greater than 0% at the commencement of the water year = 4063 ML	
Adjustments	• None	
MP0_lower	= max (MP0 AA, Adjustment)	4063 ML

MP0	= MP0_upper + MP0_lower	19934 ML

MP100 AA	= Water sharing rules give minimum storage volume in the scheme at which medium priority announced allocation is at a maximum (100%) at the commencement of the water year = NOT APPLICABLE	
Adjustments	• The sum of the weir full suppply volumes in both Upper and Lower Dawson subschemes = 60126 ML (excluding Orange Creek Weir which is not included in the water sharing rules as per section 12 of the Dawson Valley WSS Operations Manual (June 2018)	
MP100	= min (MP100 + Adjustment)	60126 ML

FSV Hwks	Full supply volume of the major headworks storage/s in the scheme	60126 ML
DSV Hwks	Dead storage volume of the major headworks storage/s in the scheme	4760 ML

2.5.3 Probability of utilisation

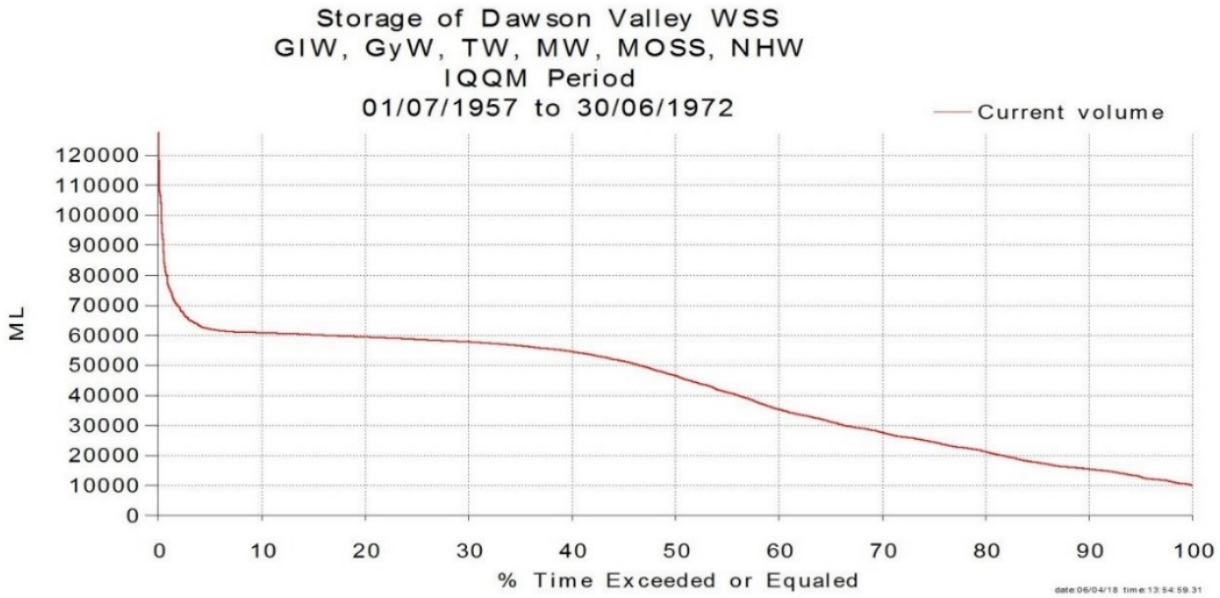
Storage component of capacity volumes:		Probability of Utilisation:	Utilised storage component volumes:	
MP2 = 0 ML	HP2 = 0 ML	P3 = 0%	MP2util = 0 ML	HP2util = 0 ML
MP1 = 40192 ML		P2 = 55%	MP1util = 22073 ML	
HP1 = 15174 ML		P1 = 94%	HP1util = 14236 ML	

2.5.4 HUF Results

Water Entitlement Grouping (in HUF calc):	Headworks Utilisation Factor for Grouping	Disaggregating[7]	Water Entitlement Priority Group (in ROP or IROL):	Headworks Utilisation Factor for Priority Group
MPA	61%		Medium Priority	40%
HPA	39%		Medium A Priority	21%
			High Priority	39%

2.5.5 Exceedance curve used for Dawson Valley WSS

Figure 2.6: Dawson Valley WSS exceedance curve

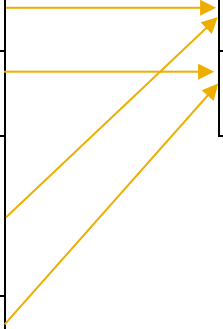


[7] HUF result disaggregated in proportion to the volume of water entitlements in the respective grouping and then expressed as a percentage totalling 100% for each headworks.

2.6 Lower Mary River Water Supply Scheme

2.6.1 Input data from water allocation register (DNRME)

Water Entitlement Priority Group (in ROP or IROL)*	Nominal Volume
Medium Priority (Lower Mary)	29960 ML
High Priority (Lower Mary)	449 ML
Medium Priority (Teddington Weir WSS)	2690 ML
High Priority (Teddington Weir WSS)	1360 ML (= 8179 – 6819)



Water Entitlement Grouping (in HUF calc):		
MPA = 32650 ML	ROP Conversion Factor = N/A	MPAmin = 32650 ML
HPA = 1809 ML		HPAmax = 1809 ML

Note *For the purposes of this HUF analysis water allocations volumes for Lower Mary WSS include medium priority held in Teddington Weir WSS and a proportion of high priority held in Teddington Weir (to ensure consistency with section 113 of the Mary Basin Resource Operations Plan 2011). SunWater prepare the announced allocation for customers in Teddington Weir WSS as per section 109 of the Mary Basin ROP and can only supply a maximum of 1360 ML via the Teddington Pipeline.

2.6.2 Water sharing rules and operational requirements

MP0 AA	Announced allocation water sharing rules give minimum storage volume in the scheme above which medium priority announced allocation is greater than 0% at the commencement of the water year = 11705 ML	
Adjustments	• none	
MP0	= max (MPA AA, Adjustment)	11705 ML

MP100 AA	= Water sharing rules give minimum storage volume in the scheme at which medium priority announced allocation is at a maximum (100%) at the commencement of the water year = 16750 ML	
Adjustments	• None	
MP100	= min (MP100 AA, Adjustment)	16750 ML

FSV Hwks	= to the full supply volume of the major headworks storage/s in the scheme	16750 ML
DSV Hwks	= to the dead storage volume of the major headworks storage/s in the scheme	7065 ML

2.6.3 Probability of utilisation

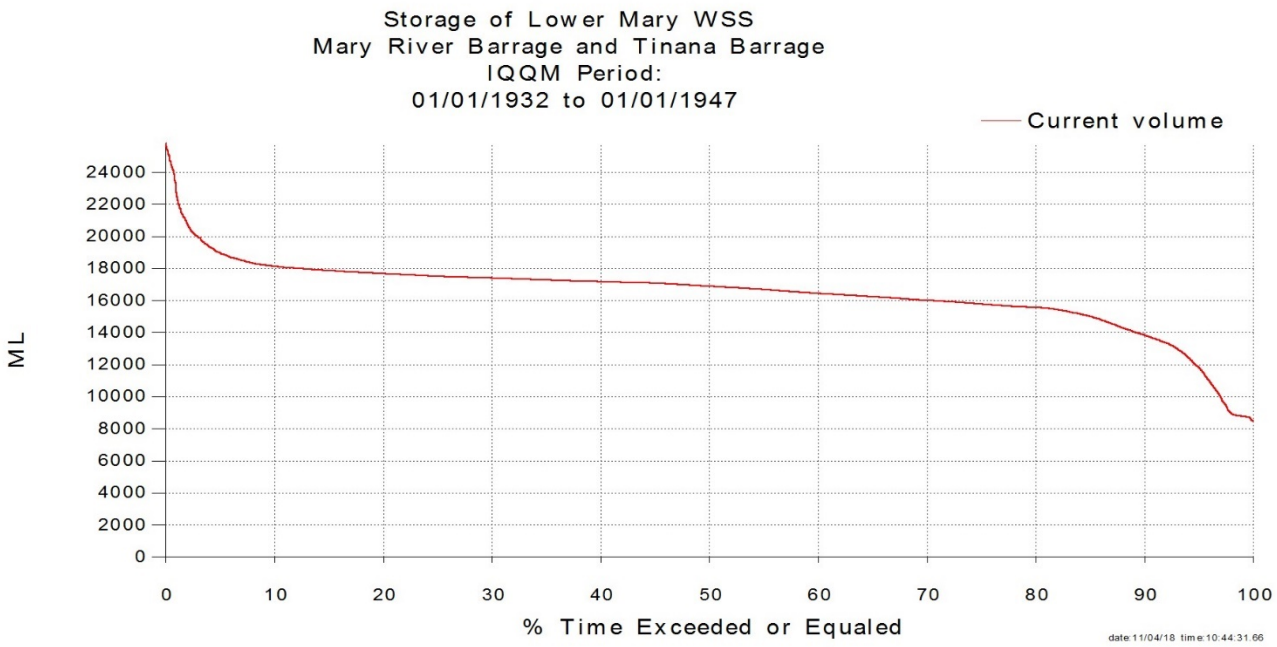
Storage component of capacity volumes:		Probability of Utilisation:	Utilised storage component volumes:	
MP2 = 0 ML	HP2 = 0 ML	P3 = 0%	MP2util = 0 ML	HP2util = 0 ML
MP1 = 5045 ML		P2 = 82%	MP1util = 4125 ML	
HP1 = 4640 ML		P1 = 98%	HP1util = 4534 ML	

2.6.4 HUF Results

Water Entitlement Grouping (in HUF calc):	Headworks Utilisation Factor for Grouping	Water Entitlement Priority Group (in ROP or IROL):	Headworks Utilisation Factor for Priority Group
MPA	48%	Medium Priority	48%
HPA	52%	High Priority	52%

2.6.5 Exceedance curve used for Lower Mary River WSS

Figure 2.7: Lower Mary River WSS exceedance curve



2.7 Nogoa Mackenzie Water Supply Scheme

2.7.1 Input data from water allocation register (DNRME)

Water Entitlement Priority Group (in ROP or IROL)	Nominal Volume		Water Entitlement Grouping (in HUF calc):		
Medium Priority	185732 ML	→	= MPA	ROP Conversion Factor =3.0 (section 24 of the Fitzroy Basin Water Mangagement Protocol – June 2018)	MPAmin = 156113 ML
High Priority	46127 ML	→	= HPA		HPAmax = 56000 ML

2.7.2 Water sharing rules and operational requirements

MP0 AA	Announced allocation water sharing rules give minimum storage volume in the scheme above which medium priority announced allocation is greater than 0% at the commencement of the water year = 268115 ML	
Adjustments	• none	
MP0	= max (MPA AA, Adjustment)	268115 ML

MP100 AA	= Water sharing rules give minimum storage volume in the scheme at which medium priority announced allocation is at a maximum (100%) at the commencement of the water year = 475429 ML	
Adjustments	• None	
MP100	= min (MP100 AA, Adjustment Volume)	475429 ML

FSV Hwks	= full supply volume of the major headworks storage/s in the scheme*	1339033 ML
DSV Hwks	= to the dead storage volume of the major headworks storage/s in the scheme	19520 ML

Note * The FSV Hwks takes into account the deflation of the fabridam at Bedford Weir.

2.7.3 Probability of utilisation

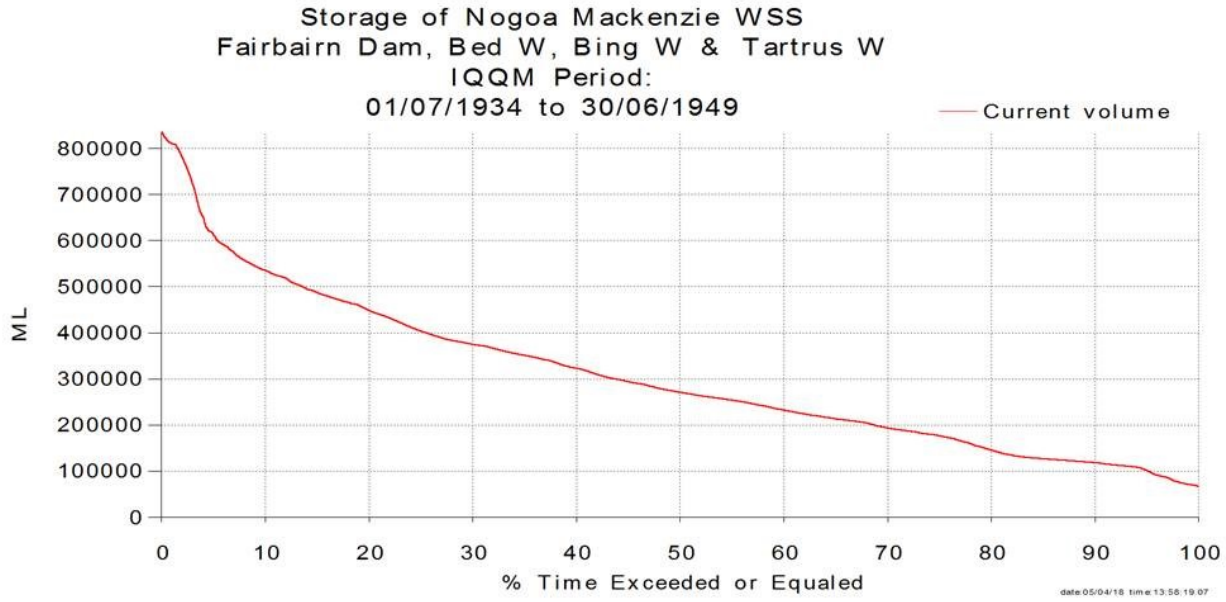
Storage component of capacity volumes:		Probability of Utilisation:	Utilised storage component volumes:	
MP2 = 691795 ML	HP2 = 171809 ML	→ P3 = 2%	→ MP2util = 15276 ML	HP2util = 3794 ML
MP1 = 207314 ML		→ P2 = 32%	→ MP1util = 65227 ML	
HP1 = 248595 ML		→ P1 = 81%	→ HP1util = 200814	

2.7.4 HUF Results

Water Entitlement Grouping (in HUF calc):	Headworks Utilisation Factor for Grouping		Water Entitlement Priority Group (in ROP or IROL):	Headworks Utilisation Factor for Priority Group
MPA	28%	→	Medium Priority	28%
HPA	72%	→	High Priority	72%

2.7.5 Exceedance curve used for Nogoa Mackenzie WSS

Figure 2.8: Nogoa Mackenzie WSS exceedance curve



2.8 Pioneer Valley Water Supply Scheme

2.8.1 Input data from water allocation register (DNRME)

Water Entitlement Priority Group (in ROP or IROL)	Nominal Volume		Water Entitlement Grouping (in HUF calc):		
High B Priority	47357 ML	→	= MPA	ROP Conversion Factor = N/A	MPAmin = 47357 ML
High A Priority	30753 ML	→	= HPA		HPAmax = 30753 ML

2.8.2 Water sharing rules and operational requirements

MP0 AA	Announced allocation water sharing rules give minimum storage volume in the scheme above which medium priority announced allocation is greater than 0% at the commencement of the water year = 48104 ML. The corresponding high priority announced allocation at this volume at the commencement of the water year is 80%.	
Adjustments	• Under water sharing rules in s100 and 101 of the Pioneer Valley ROP, the storage volume at which high priority announced allocation is 100% is 60657 ML which is 12553 ML greater than MP0 AA. The corresponding medium priority announced allocation at this volume at the commencement of the water year is 10%. • Adjustment = 7092 ML = 12553 x ((100% - 80%) x 30753) / (10% x 47357 + (100% - 80%) x 30753)	
MP0	= max (MP0 AA, Adjustment)	55196 ML

MP100 AA	= Water sharing rules give minimum storage volume in the scheme at which medium priority announced allocation is at a maximum (100%) at the commencement of the water year = 106453 ML	
Adjustments	None	
MP100	= min (MP100 AA, Adjustment)	106453 ML

FSV Hwks	= full supply volume of the major headworks storage/s in the scheme*	160310 ML
DSV Hwks	= to the dead storage volume of the major headworks storage/s in the scheme	8950 ML

Note *The FSV Hwks takes into account the deflation of the fabridams at Dumbleton Weir and Mirani Weir.

2.8.3 Probability of utilisation

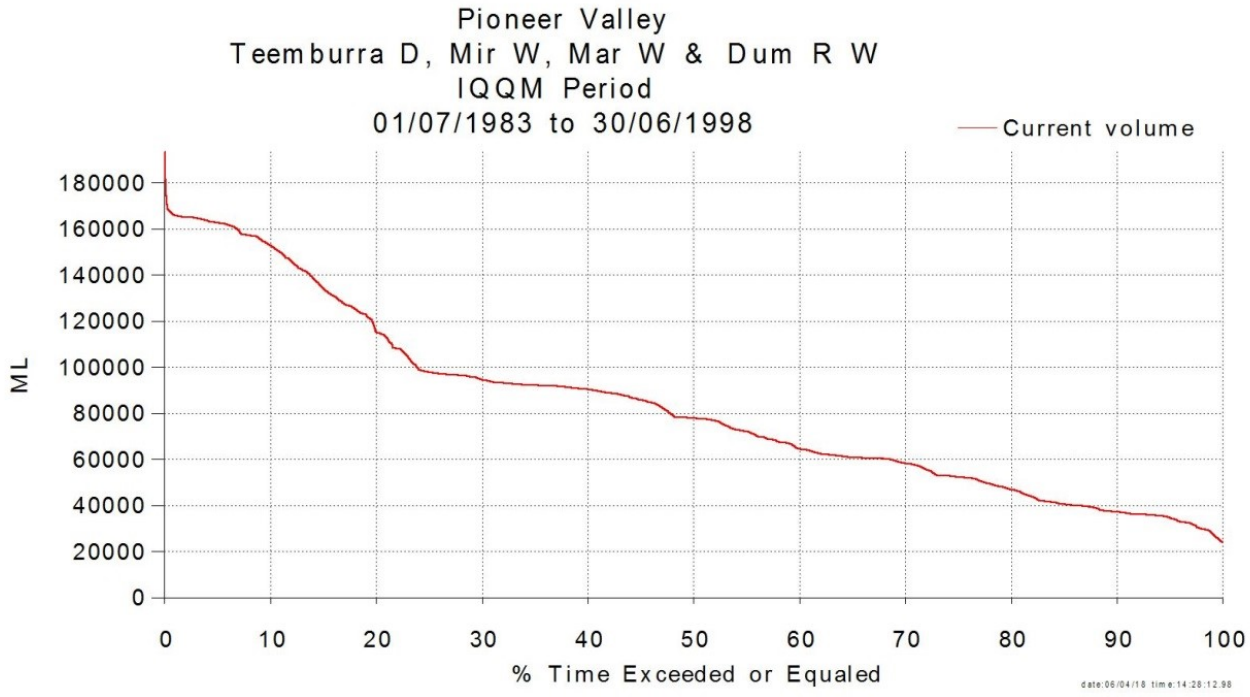
Storage component of capacity volumes:		Probability of Utilisation:	Utilised storage component volumes:	
MP2 = 32695 ML	HP2 = 21231 ML	→ P3 = 15% →	MP2util = 4747 ML	HP2util = 3083 ML
MP1 = 51257 ML		→ P2 = 43% →	MP1util = 22048 ML	
HP1 = 46246 ML		→ P1 = 90% →	HP1util = 41534 ML	

2.8.4 HUF Results

Water Entitlement Grouping (in HUF calc):	Headworks Utilisation Factor for Grouping		Water Entitlement Priority Group (in ROP or IROL):	Headworks Utilisation Factor for Priority Group
MPA	38%	→	Medium Priority	38%
HPA	62%	→	High Priority	62%

2.8.5 Exceedance curve used for Pioneer Valley WSS

Figure 2.9: Exceedance curve for Pioneer Valley WSS



2.9 Three Moon Creek Water Supply Scheme

2.9.1 Input data from water allocation register (DNRME)

Water Entitlement Priority Group (in ROP or IROL)	Nominal Volume
Medium Priority (Surface water)*	1940 ML
Medium Priority (Groundwater)*	12621 ML + 400 ML[9]
High Priority (Groundwater)	580 ML – 200 ML[10]

Water Entitlement Grouping (in HUF calc):		
MPA = 14561 ML + 400 ML[8]	ROP Conversion Factor = N/A	MPAmin =14961 ML
= HPA		HPAmax = 380 ML

Note * As described in s2.1 of the Three Moon Creek Interim Resource Operations Licence (IROL), Medium Priority (Surface Water) and Medium Priority (Groundwater) are both classified as Medium Priority

2.9.2 Water sharing rules and operational requirements

MP0 AA	Announced allocation water sharing rules give minimum storage volume in the scheme above which medium priority announced allocation is greater than 0% at the commencement of the water year = NOT APPLICABLE	
Adjustments	• 6650 ML = Effective reserve volume (Three Moon Creek IROL June 2008, s 2.3 and s 1.1(2)(c)	
MP0	= max (MPA AA, Reserve Adjustment)	6650 ML

MP100 AA	= Water sharing rules give minimum storage volume in the scheme at which medium priority announced allocation is at a maximum (100%) at the commencement of the water year = NOT APPLICABLE	
Adjustments	• 26715 ML = Volume equivalent to storage level of 319.18 m AHD (Three Moon Ck IROL June 2008, s2.3)	
MP100	= min (MP100 AA, Adjustment)	26715 ML

FSV Hwks	= to the full supply volume of the major headworks storage/s in the scheme	88500 ML
DSV Hwks	= to the dead storage volume of the major headworks storage/s in the scheme	650 ML

[8] Combined volume of surface water and groundwater MP increased by 400 ML to account for HP IWA surrendered. HP converted to MP using a factor of 2.0.

[9] Combined volume of surface water and groundwater MP increased by 400 ML to account for HP IWA surrendered. HP converted to MP using a factor of 2.0.

[10] Volume of 580 ML HP reduced to account for 200 ML of HP IWA surrendered. To be converted to MP using a conversion factor of 2.0.

2.9.3 Probability of utilisation

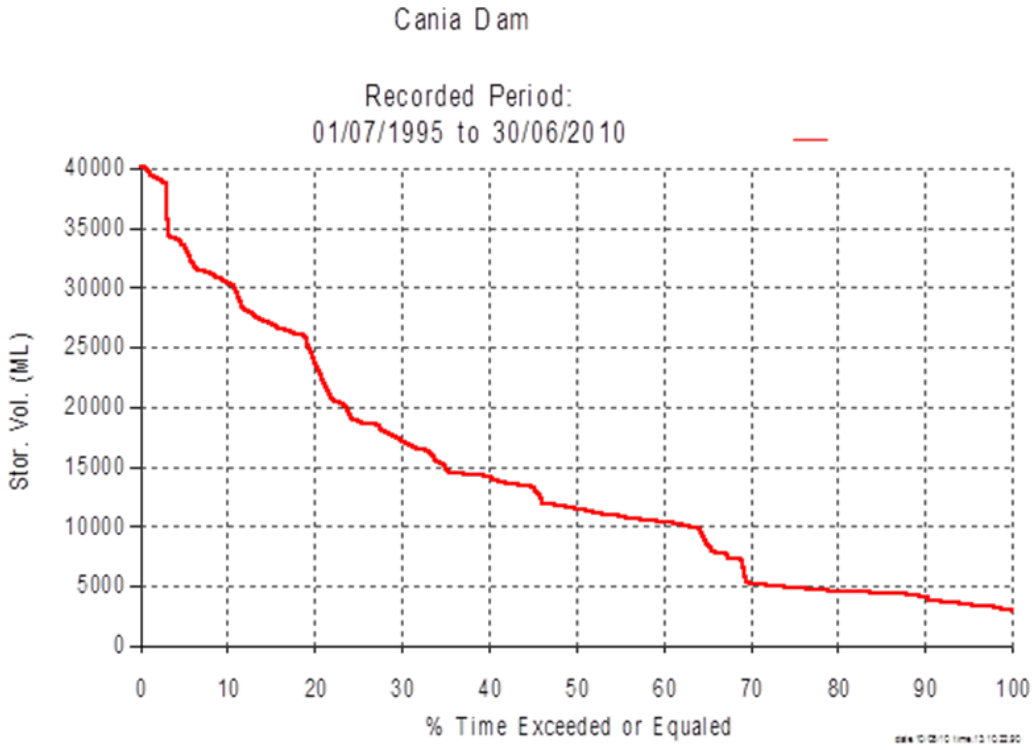
Storage component of capacity volumes:		Probability of Utilisation:	Utilised storage component volumes:	
MP2 = 60255 ML	HP2 = 1530 ML	P3 = 1%	MP2util = 831 ML	HP2util = 21 ML
MP1 = 20065 ML		P2 = 37%	MP1util = 7363 ML	
HP1 = 6000 ML		P1 = 88%	HP1util = 5267 ML	

2.9.4 HUF Results

Water Entitlement Grouping (in HUF calc):	Headworks Utilisation Factor for Grouping	Disaggregating[11]	Water Entitlement Priority Group (in ROP or IROL):	Headworks Utilisation Factor for Priority Group
MPA	61%		Medium Priority (Surface water)	9%
HPA	39%		Medium Priority (Groundwater)	52%
			High Priority (Groundwater)	39%

2.9.5 Exceedance curve for Three Moon Creek WSS

Figure 2.10: Cania Dam exceedance curve



Note * Recorded data for Cania Dam utilised for HUF calculation because the scheme is managed under an IROL rather than ROL and modelled data is not available.

[11] HUF result disaggregated in proportion to the volume of water entitlements in the respective grouping and then expressed as a percentage totalling 100% for each headworks.

2.10 Upper Burnett Water Supply Scheme

2.10.1 Input data from water allocation register (DNRME)

Water Entitlement Priority Group (in ROP or IROL)*	Nominal Volume
Medium Priority (SunWater)	25460 ML
High Priority (SunWater)	1530 ML
Medium Priority (Burnett Water) 10469 ML to be converted to low priority	9531 ML
Low Priority** (Burnett Water)	10469 ML[12]
High Priority (Burnett Water)	0 ML

Water Entitlement Grouping (in HUF calc):		
MPA = 34991 ML	ROP Conversion Factor = N/A	MPAmin = 34991 ML
HPA = 1530		HPAmax = 1530 ML

Note * Water entitlements in Upper Burnett WSS consist of SunWater allocations and Burnett Water allocations. Excludes water allocations in the John Goleby sub-scheme because ROP zones OD and PA only receive benefit from John Goleby Weir.

** Low priority arising from deflation of the fabridam on Claude Wharton Weir (s 63 Burnett Basin Water Plan 2014)

2.10.2 Water sharing rules and operational requirements

MP0 AA	Announced allocation water sharing rules give minimum storage volume in the scheme above which medium priority announced allocation is greater than 0% at the commencement of the water year = 8611 ML	
Adjustments	none	
MP0	= max (MPA AA, Adjustment)	8611 ML

MP100 AA	= Water sharing rules give minimum storage volume in the scheme at which medium priority announced allocation is at a maximum (100%) at the commencement of the water year = 65929 ML	
Adjustments	None	
MP100	= min (MP100 AA, Adjustment Volume)	65929 ML

FSV Hwks	= to the full supply volume of the major headworks storage/s in the scheme*	186740 ML
DSV Hwks	= to the dead storage volume of the major headworks storage/s in the scheme	2581 ML

[12] Not included further in the HUF calculation.

Note * Excludes volume due to deflation of Claude Wharton Weir farbridam.

2.10.3 Probability of utilisation

Storage component of capacity volumes:		Probability of Utilisation:	Utilised storage component volumes:	
MP2 = 115750 ML	HP2 = 5061 ML	P3 = 0%	MP2util = 0 ML	HP2util = 0 ML
MP1 = 57318 ML		P2 = 23%	MP1util = 13023 ML	
HP1 = 6030 ML		P1 = 87%	HP1util = 5256 ML	

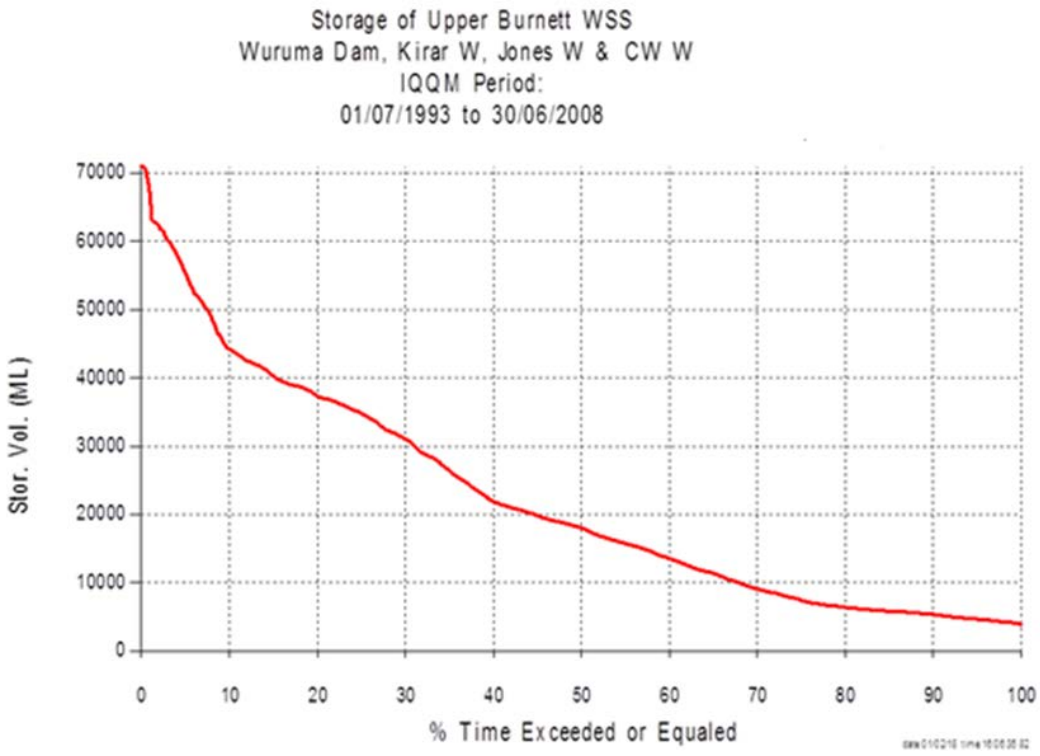
2.10.4 HUF Results

Water Entitlement Grouping (in HUF calc):	Headworks Utilisation Factor for Grouping	Disaggregating for SunWater and Burnett Water Infrastructure[13]	Water Entitlement Priority Group (in ROP or IROL):	Headworks Utilisation Factor for Priority Group
MPA	71%		Medium Priority (SunWater)	64%
HPA	29%		High Priority (SunWater)	36%
			Medium Priority (Burnett Water)	100%
			High Priority (Burnett Water)	0%

[13] HUF result disaggregated in proportion to the volume of water entitlements in the respective grouping and then expressed as a percentage totalling 100% for each headworks.

2.10.5 Exceedance curve used for Upper Burnett WSS

Figure 2.11: Upper Burnett WSS exceedance curve



2.11 Upper Condamine Water Supply Scheme

2.11.1 Input data from water allocation register (DNRME)

Water Entitlement Priority Group (in ROP or IROL)*	Nominal Volume
Medium Priority	22328 ML
High A Priority*	3262 ML
High B Priority*	125 ML
Risk A**	7320 ML[14]
Risk B**	925 ML[15]

Water Entitlement Grouping (in HUF calc):		
= MPA	ROP Conversion Factor = N/A	MPAmin = 22328 ML
HPA = 3387 ML		HPAmax = 3387 ML

Note * With reference to water sharing rules for UCWSS (Condamine & Balonne ROP July 2015, s 175), High Class A Priority and High Class B Priority are considered to be comparable products for the purposes of this HUF analysis. These are both intended to be urban supplies.

Note ** With reference to water access rules for UCWSS (Condamine & Balonne ROP July 2015 s 175 and s 176), Risk Class A Priority and Risk Class B Priority are considered to be comparable products for the purposes of this HUF analysis. Risk Class A is a streamflow product (available on an opportunistic, run-of-the-river basis and is not related to storage capacity). Risk Class B is a low value water product which is not expected to result in significant access to water over the period of analysis.

2.11.2 Water sharing rules and operational requirements

MP0 AA	Announced allocation water sharing rules give minimum storage volume in the scheme above which medium priority announced allocation is greater than 0% at the commencement of the water year = 21400 ML	
MP0 nom	= Maximum headworks storage volume at the start of the water year below which the headworks storage volume is forecast to reach the medium priority cut-off level (which equates to volume in storage of 15,005 ML) on the last day of that water year assuming minimum inflows (based on Leslie Dam Forecast Storage Model) = 28000 ML **This parameter is only relevant to storages that have an MP cut-off rule such as Leslie Dam.**	
If MP0 nom > MP0 AA	= MP0 nom	28000 ML

MP100 AA	= Water sharing rules give minimum storage volume in the scheme at which medium priority announced allocation is at a maximum (100%) at the commencement of the water year = 59429 ML	
Adjustments	• None	

[14] Not included further in this HUF calculation.
[15] Not included further in this HUF calculation.

MP100	= min (MP100 AA, Adjustment)	59429 ML

FSV Hwks	= to the full supply volume of the major headworks storage/s in the scheme	106200 ML
DSV Hwks	= to the dead storage volume of the major headworks storage/s in the scheme	2130 ML

2.11.3 Probability of utilisation (refer to Fig 2.15 in Appendix A3)

Storage component capacity volumes:		Probability of Utilisation	Utilised storage component volumes	
MP2 = 40610 ML	HP2 = 6160 ML	P3 = 0%	MP2util = 0 ML	HP2util = 0 ML
MP1-B = 31429 ML		P2-B = 2%	MP1-B_util = 732 ML	
MP1-A = 3300 ML	HP1-A = 3300 ML	P2-A = 17%	MP1-A_util = 548 ML	HP1-A_util = 548 ML
HP1 = 19270 ML		P1 = 78%	HP1util = 14951 ML	

2.11.4 HUF Results

Water Entitlement Grouping (in HUF calc):	Headworks Utilisation Factor for Grouping	Disaggregating[16]	Water Entitlement Priority Group (in ROP or IROL):	Headworks Utilisation Factor for Priority Group
MPA	9%		Medium Priority	8%
HPA	92%		High A Priority	89%
			High B Priority*	3%
			Risk A[17]	0%
			Risk B[18]	0%

16 HUF result disaggregated in proportion to the volume of water entitlements in the respective grouping and then expressed as a percentage totalling 100% for each headworks.

17 Not included.

18 Not included.

2.11.5 Exceedance curve and MP0 nom used for Upper Condamine WSS

Figure 2.12: Leslie Dam exceedance curve

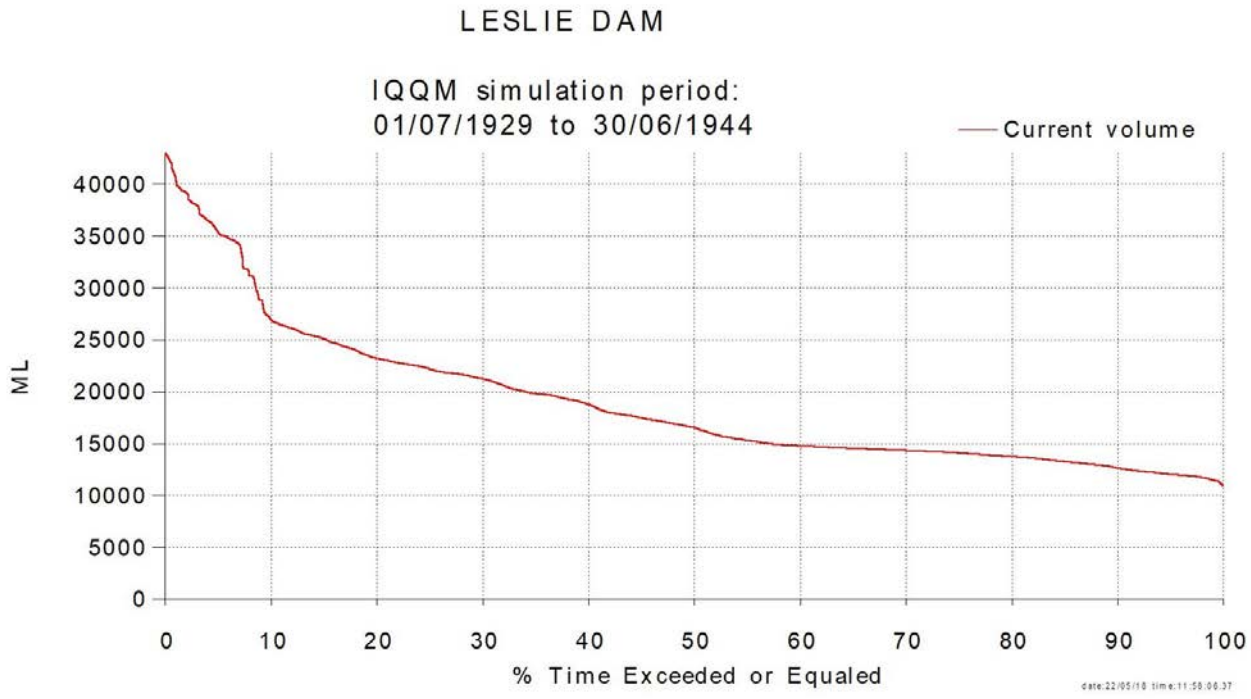
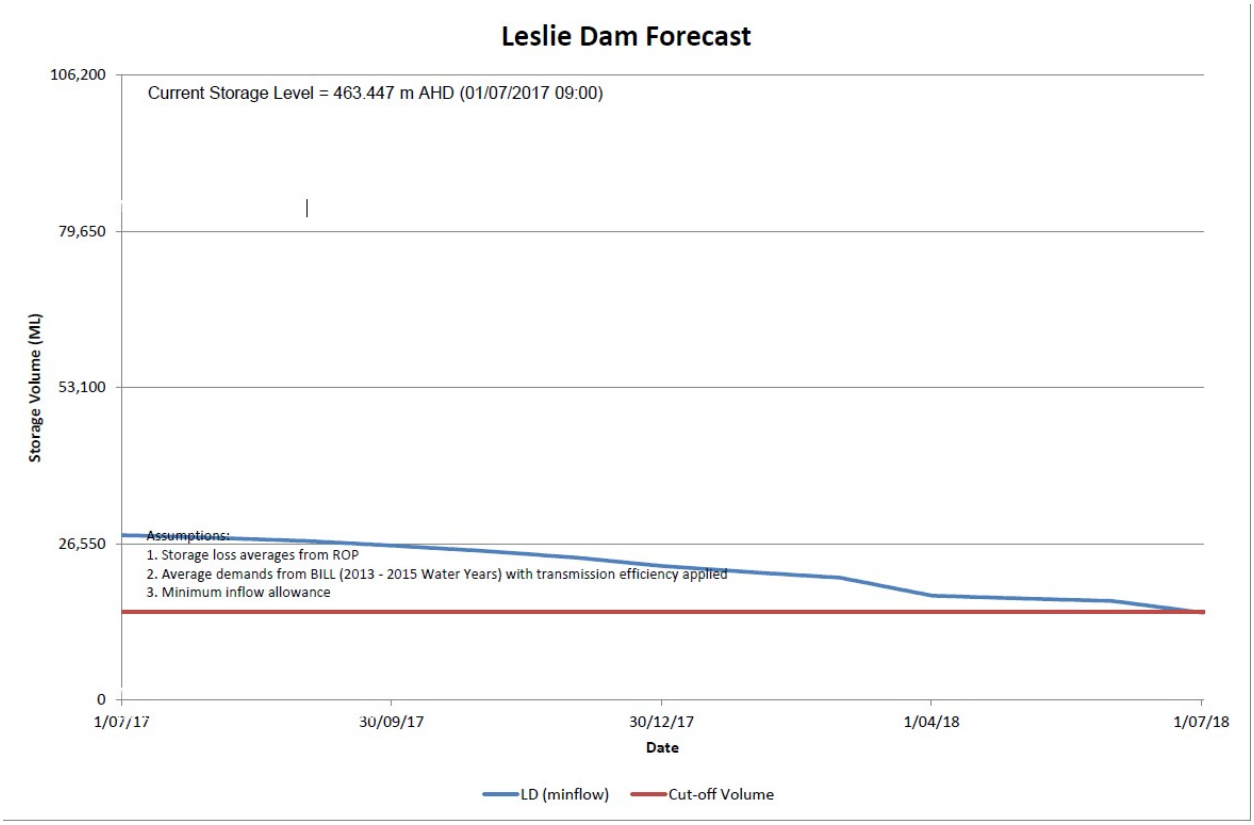


Figure 2.13: Leslie Dam MP0 nom chart



Attachment A

Headworks Utilisation Factor methodology

A.1 Rationale

Background to water entitlements and priority groups

Each water user that draws water from a supplemented water supply scheme is able to do so because either:

- they own or lease a water entitlement that authorises the holder to take water subject to certain conditions, or
- they have secured access within a water year by way of a seasonal water assignment from the owner of a water access entitlement.

Each water entitlement in a scheme belongs to a "priority group" which is defined under the Water Act 2000 to mean water allocations that have the same water allocation security objective.[19]

A water entitlement's priority group is important both in:

- determining the volume of water that may be made available to the water entitlement under the scheme's water sharing rules, and
- identifying the conditions under which supply to that water may be allowed or restricted.

These rules and other operational requirements are defined in statutory catchment-based Resource Operations Plans (ROPs) which are prepared by the Department of Natural Resources, Mines and Energy (DNRME) and approved by the Governor-in-Council in accordance with Water Resource Plan provisions under the Water Act 2000.

The performance, numbers, types and names of priority groups differ between each of the water supply schemes reflecting the unique arrangements that have been defined within the applicable ROP. Most schemes have just two water entitlement priority groups, namely High Priority, and Medium Priority[20] although some schemes have just one priority group (Julius Dam WSS) and others may have as many as five (Upper Condamine WSS).

Generally, the water sharing rules within the ROP provide a holder of a high priority water entitlement with superior access to the nominal volume[21] specified on their water entitlement. That is, a holder of a high priority water allocation will usually be able to access a quantity of water equal to their nominal volume more frequently and with less restriction on their water availability than the holder of a water entitlement within a medium or other lesser priority group.[22]

This superior performance is achieved through a number of mechanisms including:

- sharing rules that give high priority water entitlements first access to available water
- reserve volumes that specify volumes of stored water to be set aside for future use by high priority water entitlements
- storage cut-off rules that restrict access to water supplies by medium priority water entitlements once water storage levels fall below defined levels.

In addition, there may be Critical Water Supply Arrangements (CWSAs)[23] that, once triggered, effectively replace the "normal" water sharing rules and other operational requirements during extended drought

---

19 A water allocation security objective (WASO) is based on the probability of being able to obtain water. Target values of WASO (usually in terms of minimum mandatory values and/or target ranges) are specified in a Water Resource Plan for each priority group of water entitlements within a catchment.

20 Although the names of priority groups generally give an indication of their relative access to water supplies within a scheme, this is not always the case, particularly in supplemented groundwater schemes where both groundwater and surface water allocations exist.

21 The term "nominal volume" is defined in the Act to mean "the number used to calculate the allocation's share of the water available to be taken by holders of water allocations in the same priority group".

22 Exceptions to this may occur in some supplemented groundwater schemes where medium priority allocations accessing groundwater and surface water supplies may be able to access water supplies more often than high priority water allocations that are entirely reliant on surface water supplies.

23 CWSAs are approved by DNRM in accordance with processes and requirements established within ROPs.

periods. The CWSAs therefore give further priority to reserving or allocating dwindling supplies to high priority entitlements. In such situations, environmental flow provisions are also typically suspended by the CWSAs. These arrangements mean that medium priority entitlement holders may be cut off from accessing stored water supplies for extended periods of time during extended droughts, while high priority entitlement holders continue to access the water stored by the headworks.

In very severe water shortage situations, the Minister may exercise powers under the Water Act to disallow all water entitlements from accessing water, and restrict water use to "essential" purposes only (such as domestic/drinking, power generation etc.).

When to use Headworks Utilisation Factors?

The Headworks Utilisation Factors are used to apportion the bulk water capital costs in accordance with the benefit or "level of service" attributable to each water entitlement priority group.

The discussion in the previous section regarding water sharing arrangements illustrates how high priority water entitlement holders clearly derive more benefit from bulk water infrastructure than other lesser priority water entitlement holders. Indeed, the proportion of the overall benefit derived from storage headworks by high priority water entitlements is typically greater than their proportion of the total nominal volume of entitlements in a scheme. In other words, the benefits derived from bulk water assets are not shared uniformly between all water entitlements.

It follows that high priority water entitlements should therefore be apportioned a share of the storage assets that is proportionate to this increased utilisation.

Headworks Utilisation Factors are defined as "the percentages of a scheme's storage headworks volumetric capacity able to be utilised by each priority group of water entitlements in that scheme, taking into consideration:

- the application of operational requirements, water sharing rules and Critical Water Supply Arrangements associated with the relevant Resource Operations Plan (ROP) or interim resource operations plan (IROL); and
- the probability of utilisation of the scheme storages under conditions of relative supply shortage".

A Headworks Utilisation Factor does not represent a priority group's proportional share of a scheme's overall "hydrologic yield" nor reflect any proportional demand for – or usage of – operational services. In general, the HUF allocates a greater proportion of capital costs to high priority due to a more detailed assessment of the storage required to service high priority entitlements.

For supplemented water supply schemes, the benefit derived from bulk water assets essentially relates to the ability of the storage headworks to store flows during wet periods and then subsequently make releases during dry periods and combine with (i.e. supplement) natural flows within a scheme thereby ultimately meeting the water demands of water entitlement holders.

Headworks Utilisation Factors specifically exclude water entitlement groups that are not included in the scheme's water sharing rules thereby deriving little or no benefit from the scheme's bulk water infrastructure (e.g. "risk-A priority" in some schemes).

How do Headworks Utilisation Factors differ from Conversion Factors?

Water Pricing Conversion Factors

Headworks Utilisation Factors are considered to be more appropriate for apportioning bulk water asset costs between water entitlement priority groups than the "water pricing conversion factors" that were used in the previous 2005-2010 water pricing round.

This is because the water pricing conversion factors used in the previous pricing round sought to establish a simple relationship between medium priority and high priority water entitlements as a means to allocating total lower bound costs between different customer sectors within scheme segments.

The water pricing conversion factors[24] were based purely on long-term hydrologic modelling of water entitlement performance (generally averaged over periods of more than 90 years). The conversion factors failed to take account of how the water sharing rules, critical water supply arrangements, storage cut-off rules/triggers and other rules gave preferential access to high priority entitlements during periods of prolonged or recurring critical water supply shortages like those experienced in recent years.

Unlike Headworks Utilisation Factors, the water pricing conversion factors were not designed – or appropriate – for apportioning bulk water asset costs between the various water entitlement priority groups that benefit from the bulk water service.

Water Management Protocol Conversion Factors

It should also be noted that a few Resource Operations Plans (or Operations Manuals) contain "ROP Conversion Factors" that are not the same as the old water pricing conversion factors. ROP conversion factors represent the rate at which medium priority water entitlements may be converted to high priority water entitlements and vice versa. However, where ROPs specify conversion factors, they also place limits on the maximum volumes of each priority group of water entitlements that may exist at any one time. These limits are usually very restrictive.

ROP conversion factors and their associated restrictive limits are designed to allow for limited conversion from one priority group to another without causing unintended third-party impacts on either the performance of other water entitlements or on riverine environmental flow regimes.[25] The ROP conversion factors are not designed for apportioning bulk water asset costs between different priority groups of water entitlements within a scheme.

When not to use Headworks Utilisation Factors

It is appropriate at this point to advise caution against the broad-scale adoption of HUF's as the basis of the allocation of other non-headworks and non-asset related headworks costs.

Bulk water operational costs are not related to extent to which storage headworks volumetric capacity is able to be utilised by a priority group of water entitlements. Such costs are driven by operational elements such as scheduling and delivering water, meter reading and maintenance, environmental management obligations, data management, compliance reporting, customer support and billing.

Such functions relate to the entire bulk water scheme (including those only accessing a share of natural flows) and not just the headworks. Furthermore, these costs will not change if the amounts of high or medium priority entitlements in a scheme change.

The determination of the appropriate drivers for the apportionment of these other costs is the subject of a separate discussion paper.

[24] Water pricing conversion factors used in the previous pricing round essentially equalled the ratio of the volume of all water entitlements in a scheme modelled at medium priority reliabilities divided by the volume of all water entitlements in the scheme modelled at high priority reliabilities. The calculation was based on the ratio of two modelled numbers that were neither based in reality nor compliant with Water Resource Plan Environmental Flow Objectives or Water Allocation Security Objectives.

[25] The criteria and mandatory performance standards for assessing such impacts are specified in terms of Water Allocation Security Objectives and Environmental Flow Objectives within Water Resource Plans.

A.2 Methodology

Overview

The following section provides a detailed step-by-step guide to the approach for deriving Headworks Utilisation Factors. This approach may be summarised as involving the following main steps:[26]

1. **Identify the water entitlement groupings** – for each water supply scheme, establish which water entitlement priority groups are to be considered in the "high priority" versus "medium priority" groupings for the purposes of this analysis.

   In most schemes where there are high and medium water entitlement priority groups this step is straightforward. However, in some schemes there are more than two types of priority groups with a variety of names, some of which may (for the purposes of this analysis) utilise scheme headworks to a similar extent and therefore may be assembled together under either the high or medium priority group.

   The conditions attached to some other water entitlement priority groups may be such that they utilise storage headworks to either little or no extent (such as those entitlements with access that is wholly conditional on the existence of run of river flows) and therefore excluded from the analysis (and assigned a HUF of zero).

1. **Determine the volumes of the identified water entitlement groupings** – for each water entitlement grouping that has been identified in a water supply scheme, establish the total volume of water entitlements included in each grouping.

   Again, for most schemes this step is straightforward with the volume simply being equivalent to the total nominal volume of the relevant water entitlement priority group (or groups where more than one has been assembled together under one grouping).

   However, some ROPs provide for the conversion of limited volumes of water entitlements from medium priority to high priority using a conversion factor. Where this is the case, the analysis takes account of this by setting the high priority nominal volume to the maximum allowable under the ROP rules and calculating the reduced medium priority nominal volume by applying the ROP conversion factor.

   This step ensures that the headworks utilisation factors take account of the effect of converting medium priority water entitlements to high priority water entitlements.

2. **Determine the extent to which water sharing rules, critical water sharing rules and other operational requirements give the different water entitlement priority groups exclusive or shared access to components of storage capacity** – the ROP rules and requirements are analysed to establish the (bottom) volume of storage that is effectively reserved for supplying high priority water entitlements, the (next) volume of storage (above that effectively reserved for high priority) that is available for use by medium priority water entitlements, and the (top) volume of storage shared between priority groups. Figure 1 below includes a conceptual diagram of this.

   Examples of rules and requirements that influence these volumes include the water sharing (i.e. announced allocation) rules, split/joint sub-scheme provisions, critical water supply arrangements (including storage cut-off and trigger rules), and other ROP requirements relating to instream storage infrastructure operations including discharge release rules, low-flow environmental release requirements, hydro release rules as well as inter-storage water level management requirements.

3. **Assess the hydrologic performance of each component of headworks storage** – ROP-based hydrologic models (based on Integrated Quantity Quality Models or IQQM) are used to assess the probabilities of each component of headworks storage being accessible to the relevant water entitlement priority group during periods of relative supply shortage. These probabilities are used to

[26] For water supply schemes where continuous sharing has been implemented through a ROP (viz. St George and Macintyre Brook Water Supply Schemes, steps 1 through 4 do not apply because the volumes of headworks storage attributable to each water entitlement priority group can be directly inferred from the Continuous Share Volumes stated in the relevant ROP.

determine the volumes of components of headworks storage effectively utilised by different water entitlement priority groups.

This is an important step because the probability of the lower layers of the headworks storage storing water is likely to be greater than the probability of upper layers of headworks storage storing water. This in turn means that high priority water entitlements effectively have access to – and therefore are able to utilise – headworks storage capacity more often and with less restriction than medium priority water entitlements.

Probabilities were derived by extracting the modelled headworks storage levels for the driest contiguous fifteen-year critical period (the "standard period"). Recent storage levels actually observed were also checked for the driest fifteen-year period. A fifteen-year period was considered an appropriate duration for the purposes of this analysis and is consistent with short and medium term planning periods used in contemporary climate scenario modelling in Australia.[27] A fifteen-year period is also representative of the typical horizon over which irrigation enterprises plan for and base their business investment decisions.

4. **Determine the Headworks Utilisation Factors** – using the parameters established and derived in steps 1 to 4 above, calculate the Headworks Utilisation Factors for each of the medium and high priority water entitlement groups.

   In some instances, water sharing rules are common to two water supply schemes (such as the Lower Fitzroy and Fitzroy Barrage Water Supply Schemes) or to water entitlement priority groups arising from specific headworks infrastructure within a scheme (such as pre-existing and new groups of water entitlements in the Bundaberg Water Supply Scheme). In such cases, Headworks Utilisation Factors are disaggregated and apportioned to the relevant headworks storage capacity.

   In those schemes where different priority groups of water entitlements were (for the purposes of analysis) assembled together under either the "high" or "medium" priority group, the Headworks Utilisation Factors are disaggregated in proportion to the nominal volumes of the priority groups that were assembled together

   A sensitivity analysis was undertaken to assess the effect of changing the duration of the standard period by performing HUF calculations using both ten year and twenty year critical periods. The summary results of the sensitivity analysis was presented in the original version of this methodology.

   For the calculations using a ten year critical period, the HUFmp in 15 schemes (out of a total 23 schemes) varied by 2% or less from the HUFmp calculated using the standard 15 year critical period. Twenty-two schemes varied by less than 10% from the standard period results and only one scheme varied by greater than 10% (16%).

   For the calculations using a twenty-year critical period, the HUFmp in 17 schemes varied by 2% or less from the HUFmp calculated using the standard 15 year critical period. Twenty-two schemes varied by less than 10% from the standard period results and only one scheme varied by greater than 10% (12%).

[27] See Chiew FHS, Cai W and Smith IN, 2009. Advice on defining climate scenarios for use in Murray-Darling Basin Authority Basin Plan modelling, CSIRO report for the Murray-Darling Basin Authority.

A.3 Guide to determining the Headworks Utilisation Factor

Identify the water entitlement groupings

1. Establish the existing volumes of the highest (typically described as high) priority group of water entitlements
    a. Referenced from DNRME's water entitlement register
    b. Usually equivalent to the nominal volume of high priority water entitlements (with any exceptions to be noted)
    c. = "HPA"
2. Establish the existing volume of the second highest (typically described as medium) priority group of water entitlements
    a. Usually equivalent to the nominal volume of medium priority water entitlements (with any exceptions to be noted)
    b. Where more than two priority groups of water entitlements exist in a scheme, the purpose, water sharing rules and other characteristics differentiating the groups are taken into account in determining whether to include them in the HPA, MPA or neither group
    c. = "MPA"

Determine the volumes of the identified water entitlement groupings

1. Establish the medium priority to high priority ROP conversion factor (if applicable)
    a. Only applicable where a ROP includes a ROP medium priority to high priority water entitlement conversion factor
    b. = "ROPCF"
    c. Note that ROPCF is normally specified in terms of a number greater than one, where 1 ML high priority is worth (1* ROPCF) ML medium priority. In some ROPs the ROPCF is specified as less than one (e.g. Section 106 of the Burdekin Basin ROP where ROPCF= 0.565), in which case 1 ML high priority is worth (1/ ROPCF) ML medium priority
    d. Also note that some ROPs allow conversion in both directions i.e. medium to high and vice versa. However, the current water market trend is for conversion from medium to high and hence this approach has been adopted for the purposes of this HUF analysis.
2. Determine the maximum volume of high priority water entitlement that can exist (if applicable)
    a. Only different from HPA where a ROP specifies the maximum allowable volume of high priority entitlements that may be converted from medium priority water entitlements in a scheme
    b. = "HPA max"
3. Determine the volume of medium priority water entitlements corresponding to the maximum volume of high priority water entitlements determined above (if applicable).
    a. (If applicable) based on reducing the volume of medium priority water entitlements by the volume of the increase in high priority water entitlements multiplied by the ROP conversion factor
    b. = "MPA min" = MPA – (HPA max – HPA) x ROPCF (or x 1/ROPCF for those ROPs that specify the ROPCF as a number less than 1)

Determine exclusive or shared access of water entitlement groupings

1. Determine the volume of scheme storage below which the water sharing rules effectively make water unavailable to medium priority water entitlements by reserving for high priority entitlements

   a. Calculated as the minimum storage volume in the scheme above which medium priority announced allocation is greater than 0% at the commencement of the water year
   b. Calculation based on applying water sharing rules to HPA max ML of high priority water entitlements and MPA min ML of medium priority water entitlements, with previous year's carryover and projected inflows both assumed to be zero
   c. = "MP0 AA"
2. Check existence of any critical water supply arrangements, storage cut-off rules or other operational requirements likely to increase the volume effectively reserved for high priority entitlements (and therefore unavailable to medium priority water entitlements)
   a. Despite the "normal" water sharing rules, the critical water supply arrangements or other operational rules may increase the storage volume below which access to medium priority water entitlements is effectively cut-off;[28]
   b. Where future (non pass-through) low-flow environmental release provisions, hydro releases or other reserve volumes outlined in a ROP are not explicitly or fully included as a term in the water sharing rules, the total volume of the required release is added to the volume effectively reserved for high priority entitlements and therefore unavailable to medium priority water entitlements;
   c. = "MP0"
3. Determine the minimum volume of scheme storage required before water sharing rules effectively give medium priority water entitlements maximum water availability
   a. Calculated as the minimum storage volume in the scheme at which medium priority announced allocation is at a maximum (usually 100%) at the commencement of the water year
   b. Calculation again based on applying water sharing rules to HPA max ML of high priority water entitlements and MPA min ML of medium priority water entitlements, with previous year's carryover and projected inflows both assumed to be zero
   c. = "MP100 AA" (cannot exceed scheme full supply volume)
4. Check existence of any operational requirements likely to increase the minimum volume of scheme storage required before water sharing rules effectively give medium priority water entitlements maximum water availability
   a. Despite the "normal" water sharing rules, the critical water supply arrangements or other operational rules may increase the storage volume at which medium priority water entitlements can access their full water availability;
   b. = "MP100" (cannot exceed scheme full supply volume)
5. Establish full supply volume of the major headworks storages in the scheme
   a. Generally equivalent to the cumulative full supply volume of the major headworks storage/s (dam/s and weir/s) in the scheme. Note that the storage volumes of downstream weirs are included in the HUF analysis only when these are specifically included in the relevant ROP (or IROL) water sharing rules
   b. Where there is no major dam in a scheme, the sum of the full supply volumes of the weirs is used (such exceptions should be noted)
   c. = "FSV hwks"
6. Establish dead storage volume of the major headworks storage in the scheme

[28] In the case of the Pioneer Valley Water Supply Scheme, the water sharing rules provide some access to high-B priority water entitlements below the level at which high-A priority announced allocations equal 100%.

a. Generally equivalent to the cumulative dead storage volume of the major headworks storage/s (dam/s and weir/s) in the scheme

b. Where there is no major dam in a scheme, the sum of the dead storage volumes of the weirs is used (such exceptions should be noted)

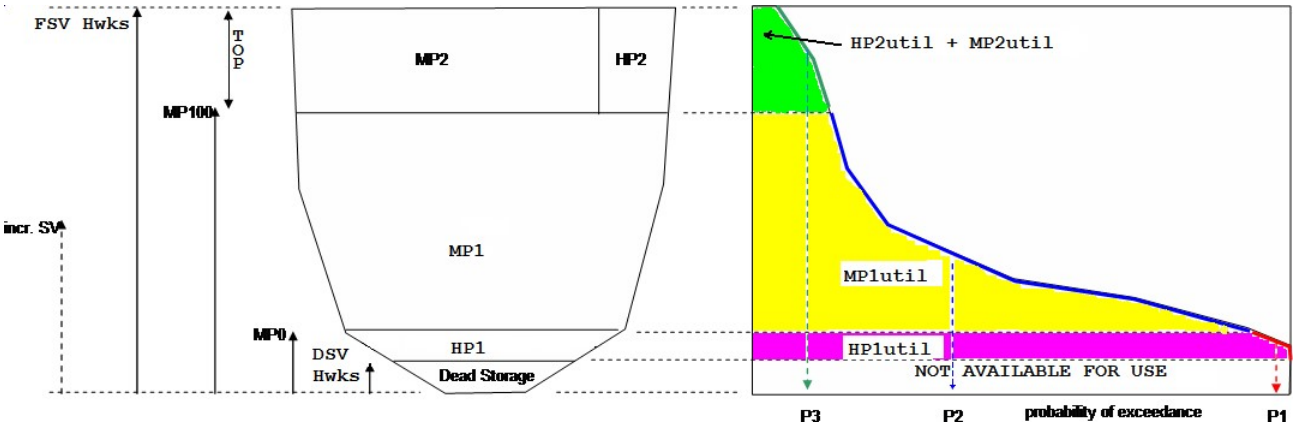
c. = “DSV hwks”

7. Calculate the capacity volume of the bottom horizontal layer of the headworks storage effectively reserved for high priority

a. Figure 3.1 shows conceptual breakdown and apportionment of headworks storage capacity

b. = “HP1” = MP0 - hwks

Figure 2.14: Relationship between parameters used in the calculation of Headwords utilisation Factors



8. Calculate the capacity volume of the next horizontal layer of the headworks storage effectively available for medium priority

a. See Figure 3.1

b. = “MP1” = minimum of { (MP100 – MP0) and (FSV hwks – MP0) }

9. Calculate the capacity volume of the top horizontal layer of the headworks storage effectively available for sharing between medium and high priority

a. = “TOP” = maximum of { (FSV hwks-MP100) , 0 }

b. The top layer is apportioned between medium and high priority in the same proportions as the respective nominal volumes of each priority group used in the above analysis[29]

10. Calculate the proportion of the capacity volume of the top horizontal layer of the headworks storage effectively available for high priority

a. See Figure 3.1

b. = “HP2” = HPAmax/(MPAmin+HPAmax) x TOP

11. Calculate the proportion of the volume of the top horizontal layer of the headworks storage effectively available for medium priority

a. See Figure 3.1

b. = “MP2” = MPAmin/(MPAmin+HPAmax) x TOP

[29] This incorporates changes to the original methodology as recommended by the QCA in 2011.

Assess the hydrologic performance of each component of headworks storage

1. For each water supply scheme, extract multiple 15 year sequences of combined daily storage volume data (for those dams and weirs referred to in the scheme's water sharing rules) starting each of the 15 year sequences on the first day of the water year (defined in the corresponding ROP or IROL) from:
    a. The long-term IQQM simulation of the scheme under the current ROP or IROL conditions; and
    b. The recent recorded daily storage data (if available) which mostly corresponds to the last 30- 40 years.

    Then for each of these fifteen year sequences, calculate (b) through (j) below.
2. Assess the probability of the headworks storage being in the bottom (high priority) horizontal layer of the headworks storage volume
    a. = "P1"
3. Assess the probability of the headworks storage being in the next (medium priority) horizontal layer of the headworks storage volume
    a. = "P2"Assess the probability of the headworks storage being in the top (shared medium and high priority) horizontal layer of the headworks storage volume
    b. = "P3"
4. Determine the utilised volume of the bottom horizontal layer of the headworks storage by applying the high priority probability for that bottom layer
    a. = "HP1util" = HP1 x P1
5. Determine the utilised volume of the next horizontal layer of the headworks storage by applying the medium priority probability in that next layer
    a. = "MP1util" = MP1 x P2
6. Determine the utilised proportion of the volume of the top horizontal layer of the headworks storage effectively available for high priority, by applying the high priority probability in that top horizontal layer
    a. = "HP2util" = HP2 x P3
7. Determine the utilised proportion of the volume of the top horizontal layer of the headworks storage effectively available for medium priority, by applying the medium priority probability in that top horizontal layer
    a. = "MP2util" = MP2 x P3

Determine the Headworks Utilisation Factors

1. For each of the fifteen-year sequences analysed in Step 4, calculate the medium priority and high priority Headworks Utilisation Factors
    a. = "HUFmp" = (MP1util + MP2util) / (MP1util + MP2util + HP1util + HP2util) %
2. Set the HUFmp to equal the minimum of these HUFmp values. Note that the adopted 15 year critical period may not always correspond to the driest rainfall period due other factors such as ROP rules, headworks water storage levels at the start of the water year, etc. The adopted period exceedance curves for the headworks storages in each scheme should be documented.
3. Calculate the high priority Headworks Utilisation Factor
    a. "HUFhp" = 1 – HUFmp
4. (If applicable) Disaggregate the Headworks Utilisation Factors to apportion subsets of water priority water entitlements to the relevant headworks storage capacity (such exceptions should be noted where applicable). For example:

a. The overall HUF results for **Bundaberg WSS** are disaggregated into two separate sets of results:

   (i) water allocations associated with the original scheme (pre Paradise Dam); and

   (ii) water allocations associated with Burnett Water Pty Ltd (based on Paradise Dam)

   For Bundaberg WSS, the process of disaggregation is simply based on an apportioning of the overall scheme HUF factors each into two components on the basis of the water allocation volumes in the relevant grouping (SunWater vs. Burnett Water). A similar approach is used for the Upper Burnett WSS since it also has infrastructure owned by Burnett Water Pty Ltd.

b. The operational rules outlined in the Fitzroy Basin ROP necessitated the calculation of overall HUF results for the combined Lower Fitzroy and Fitzroy Barrage schemes. The overall HUF results were then disaggregated so that only the results for the water allocations in the **Lower Fitzroy WSS** (operated by SunWater) are provided. Results for Fitzroy Barrage WSS (operated by Fitzroy River Water) are not provided.

   For the Fitzroy, the process of disaggregation is simply based on an apportioning of the combined Lower Fitzroy WSS and Fitzroy Barrage WSS HUF factors each into two components on the basis of the water allocation volumes in the relevant water supply scheme.

Adjustment to Headworks Utilisation Factor Method to address 'within water-year headworks storage cut-off rules'

Alternative steps should be taken to address the situation where a water supply scheme's water sharing rules are subject to "within water-year headworks storage cut-off rules" (i.e. that have the effect of disallowing continuing access to announced allocation within a water year once headwater storage water levels have fallen below a defined trigger level).

Explicit cut-off rules within scheme sharing rules have been found to impact the volume of medium priority water that is actually available to be taken by irrigators within a water year (irrespective of the initial announced allocation percentage calculated and published at the start of the water year). For example, this occurs in:

- the Upper Condamine (Leslie Dam)
- the Boyne Tarong (Boondooma Dam)

In these schemes, the water utility may develop arrangements for allowing a start-of-water-year announced allocation to be made that applies for a period of less than 12 months. These arrangements are applied when forecasts suggest that the headworks cut-off levels are likely to be reached within the coming water year. This suggests that in such instances, headworks utilisation is effectively being shared between high and medium priority water allocations within a definable band of storage volume values.

It is therefore recommended that the HUF methodology be adjusted to recognise this band of shared benefit as follows:

1. calculate the maximum headworks storage volume at the start of a water year below which the headworks storage volume is forecast to reach the medium priority cut-off level on the last day of that water year (referred to here as MP0-nominal or "MP0 nom'). It is suggested that water utilities might use either their forecast storage models to estimate this volume, by assuming minimum inflows throughout the water year and other assumptions as published online for the relevant dam forecast storage model (e.g. Leslie Dam Storage Forecast Model or the Boondooma Dam Storage Forecast Model) or historical storage drawdown information where forecast models are not available. If the value of MP0-nom is greater than MP0 AA, then proceed with the following steps to calculate the adjusted HUFs (if not, then no adjustment is recommended to the existing HUF calculations):

   a. Set MP0 = MP0 AA;

   b. Calculate MP100 AA and MP100 in the usual way;

   c. Record FSV Hwks and DSV Hwks in the usual way;

d. Calculate HP1 in the usual way;

e. Calculate MP2 and HP2 in the usual way;

f. Calculate MP1-B to = MP100 – MP0 nom;

g. Calculate MP1-A to = 0.5 x (MP nom – MP0);

h. Calculate HP1-A to = 0.5 x (MP nom – MP0);

i. Calculate P1 and P3 in the usual way

j. Calculate P2-A and P2-B for the ranges between MP0 to MP0 nom and MP0 nom to MP100 respectively

k. Calculate MP2util, HP2util and HP1util in the usual way

l. Calculate MP1-Autil to = MP1-A x P2-A

m. Calculate HP1-Autil to = HP1-A x P2-A

n. Calculate MP1-Butil to = MP1-B x P2-B

o. Calculate MPA = (MP2util + MP1-Autil + MP1-Butil) /

p. (MP2util + MP1-Autil + MP1-Butil + HP2util + HP1util + HP1-Autil) x 100%

q. Calculate HPA = (HP2util + HP1util + HP1-Autil) /

r. (MP2util + MP1-Autil + MP1-Butil + HP2util + HP1util + HP1-Autil) X 100%

s. Disaggregate into priority groups in the usual way.

2. Note that the reserve (RE) parameters used in calculating MP0 AA values should be those published in the ROP (i.e. not modified to be the cut-off volumes).

3. The new MP0 nom volume represents the start-of-water-year headworks volume below which:

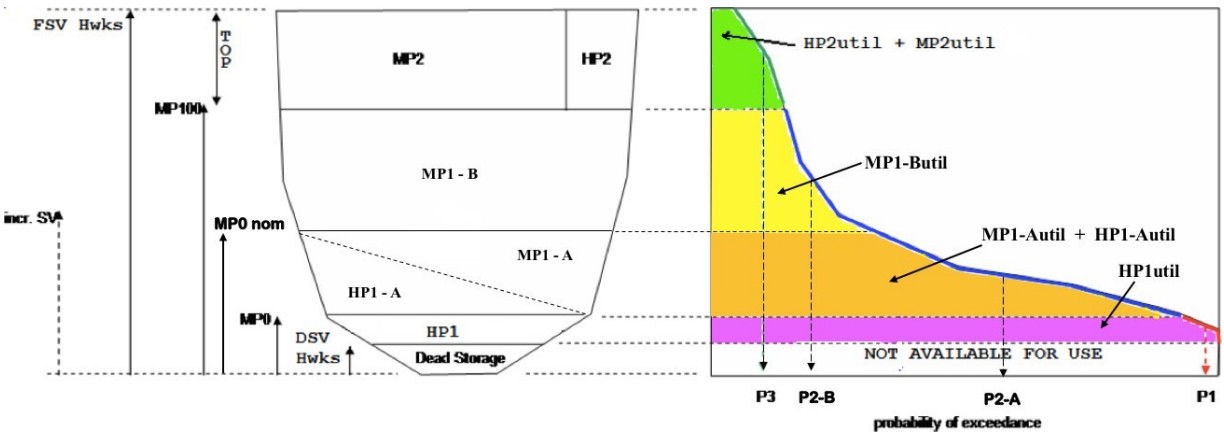
   a. supply of a twelve-month period medium priority announced allocation might be considered to be at risk of being cut-off during the water year as a result of the headworks storage volume reaching the medium priority cut-off level during that water year;

   b. sharing arrangements would apply whereby a start-of-water-year announced allocation would be made that would apply for a period of less than 12 months

4. Supply to medium priority announced allocation might be considered unlikely to be cut-off during the water year in years when the start-of-water-year headworks volume is above the new MP0 adjustment volume.

5. A revised conceptual diagram that describes the above is presented in Figure 3.2 below.

Figure 2.15: Relationship between parameters used in the calculation of Headworks Utilisation Factors for situations where in a 'in-year MP cut-off rule' applies.



Attachment B

Review of Headworks Utilisation Factor considerations for the 2019–2024 price path

B.1 Comparison of Headworks Utilisation Factor considerations, 2010–2018

Table B.1: Comparison of Headworks Utilisation Factor considerations 2010-2018

Water Supply Scheme	Water Entitlement Groupings		Exclusive and shared access of storage capacity		Hydrological Performance (Simulation Period)		Review Recommended	Comments
	2010	2018	2010	2018	2010	2018		
Barker Barambah WSS	Medium Priority (32079 ML) High Priority (2236 ML)	Medium Priority (32079 ML) High Priority (2236 ML)	• CWSA 12000 ML	• CWSA 12000 ML removed • New water sharing rules	• 1890-1997	• 1890-2008 • New IQQM due to revision of Water Plan (Burnet Basin) 2014	✓	• New water sharing rules • Simulation period has changed • New IQQM
Bowen Broken WSS	Medium Priority (5676 ML) High A1 Priority (11649 ML) High A2 Priority (21605 ML)	Medium Priority (5676 ML) High A1 Priority (11649 ML) High A2 Priority (21605 ML)		• No change from 2010	• 1890-2004	• 1890-2004	×	• No significant change
Boyne River and Tarong WSS	Medium Priority (11809 ML) High Priority (32990 ML)	Medium Priority (9485 ML) High Priority (33920 ML)		• No change from 2010	• 1890-1997	• 1890-2008 • New IQQM due to revision of Water Plan (Burnett Basin) 2014 (Qld)	✓	• Change in water entitlement grouping • Simulation period has changed • New IQQM • New HUF methodology for medium priority cut-off schemes

Water Supply Scheme	Water Entitlement Groupings		Exclusive and shared access of storage capacity		Hydrological Performance (Simulation Period)		Review Recommended	Comments
	2010	2018	2010	2018	2010	2018		
Bundaberg WSS	Medium Priority (335957 ML) High Priority (44372 ML)	Medium Priority (335957 ML) High Priority (44372 ML)	• Bucca Weir release rule 45600 ML/year • 1 July High Priority reserve of 0 ML	• Bucca Weir release rule amended to approximately 484 ML/year • New water sharing rules • 1 July High Priority reserve of 44372 ML	• 1890-1997	• 1890-2008 • New IQQM due to revision of Water Plan (Burnett Basin) 2014	✓	• New water sharing rules • Simulation period has changed • New IQQM • Environmental release rule changed • Significant change to High Priority Reserve
Burdekin Haughton WSS	Medium Priority (979594 ML) High Priority (99998 ML)	Medium Priority (979594 ML) High Priority (99998 ML)		• No change from 2010	• 1890-2004	• 1890-2004	×	• No significant change
Callide Dam WSS	Medium Priority (19527 ML) Risk Priority Surface water (443 ML) High Priority (4311 ML)	Medium Priority Groundwater (13558 ML) High B Priority (1066 ML) Risk Priority Surface water (514) High A Priority Surface water (4311 ML)	• 26500 ML High Priority reserve	• 20000 ML High Priority Reserve	• 1900-1995	• 1889-2007 • New IQQM due to revision of Water Plan (Fitzroy Basin) 2011	✓	• New water sharing rules • Change to High Priority Reserve • Significant changes in water allocation entitlement groupings • New IQQM

Water Supply Scheme	Water Entitlement Groupings		Exclusive and shared access of storage capacity		Hydrological Performance (Simulation Period)		Review Recommended	Comments
	2010	2018	2010	2018	2010	2018		
Chinchilla Weir WSS	Medium Priority (2884 ML) High Priority (1165 ML)	Medium Priority (2884 ML) High Priority (1165 ML)		• No change from 2010	• 1895-2006	• 1895-2006	×	• No significant change
Cunnamulla WSS	Medium Priority (2612 ML) High Priority (0 ML)	Medium Priority (2612 ML) High Priority (0 ML)						• Scheme is all Medium Priority
Dawson Valley WSS	Medium Priority (37049 ML) Medium A Priority (19309 ML) High Priority (5579 ML)	Medium Priority (36719 ML) Medium A Priority (19339 ML) High Priority (5679 ML)		• No significant change.	• 1900-1995	• 1889-2007 • New IQQM due to revision of Water Plan (Fitzroy Basin) 2011	✓	• Change to water allocation entitlement groupings • New IQQM • Error identified in 2011 calculation of MP0 for Upper Dawson Subscheme
Eton WSS	High A Priority (3089 ML) High B Priority (58970 ML) Risk (504 ML)	High A Priority (3089 ML) High B Priority (58970 ML) Risk (504 ML)		• No significant change.	• 1890-1996	• 1890-1996	×	• No significant change

Water Supply Scheme	Water Entitlement Groupings		Exclusive and shared access of storage capacity		Hydrological Performance (Simulation Period)		Review Recommended	Comments
	2010	2018	2010	2018	2010	2018		
Lower Fitzroy WSS	Medium Priority Lower Fitzroy WSS (3101 ML) Medium Priority Fitzroy Barrage WSS (11610 ML) High Priority Lower Fitzroy Barrage (25520 ML) High Priority Fitzroy Barrage WSS (50483 ML)	Medium Priority Lower Fitzroy WSS (3101 ML) Medium Priority Fitzroy Barrage WSS (11610 ML) High Priority Lower Fitzroy Barrage (25520 ML) High Priority Fitzroy Barrage WSS (50483 ML)		• No significant change	• 1900-1995	• 1889-2007	×	• No significant change
Macintyre Brook WSS	Medium Priority (24509 ML) High Priority (488 ML)	Medium Priority (24509 ML) High Priority (488 ML)		• No significant change			×	• No significant change
Mareeba Dimbulah WSS	Medium Priority (190399 ML) High Priority (14026 ML)	Medium Priority (190399 ML) High Priority (14026 ML)		• No significant change	• 1913-1995	• 1913-1995	×	• No significant change
Maranoa WSS	Medium Priority (805 ML) High Priority (0 ML)	Medium Priority (805 ML) High Priority (0 ML)					×	• All medium priority

Water Supply Scheme	Water Entitlement Groupings		Exclusive and shared access of storage capacity		Hydrological Performance (Simulation Period)		Review Recommended	Comments
	2010	2018	2010	2018	2010	2018		
Lower Mary River WSS	Medium Priority (32688 ML) High Priority (1809 ML)	Medium Priority (32650 ML) High Priority (1809 ML)		• New water sharing rules	• 1890-1999	• 1890-1999	✓	• New water sharing rules • Teddington Weir WSS created
Nogoa Mackenzie WSS	Medium Priority (190620 ML) High Priority (44703 ML)	Medium Priority (185732 ML) High Priority (46127 ML)		• No significant change	• 1898-1995	• 1889-2007 • New IQQM due to revision of Water Plan (Fitzroy Basin) 2011	✓	• New IQQM • Change to water allocation entitlement groupings • Deflation of Bedford Weir Fabridam
Pioneer River WSS	High B Priority (47357 ML) High A Priority (30753 ML)	High B Priority (47357 ML) High A Priority (30753 ML)		• No significant change	• 1900-1996	• 1900-2008	✓	• Deflation of fabridams and Dumbleton and Mirani Weirs • New IQQM

Water Supply Scheme	Water Entitlement Groupings		Exclusive and shared access of storage capacity		Hydrological Performance (Simulation Period)		Review Recommended	Comments
	2010	2018	2010	2018	2010	2018		
Proserpine River WSS	Medium Priority (38075 ML) High Priority (22000 ML)	Medium A1 Priority (27876 ML) Medium A2 Priority (3000 ML) Medium A3 Priority (10000 ML) High A Priority (22000 ML)		• No significant change	• 1890-2004	• 1890-2004	×	• No significant change
St George WSS	Medium Priority (81575 ML) High Priority (3000 ML)	Medium Priority (81575 ML) High Priority (3000 ML)					×	• Continuous sharing scheme • No significant change
Three Moon Creek WSS	Medium Priority Surface Water (1940 ML) Medium Priority Groundwater (12621 ML) High Priority Groundwater (580 ML)	Medium Priority Surface Water (1940 ML) Medium Priority Groundwater (12621 ML) High Priority Groundwater (580 ML)		• No significant change	• 1890-2000	• 1890-2008	✓	• High Priority IWA surrendered • DNRME in process of converting to medium priority

Water Supply Scheme	Water Entitlement Groupings		Exclusive and shared access of storage capacity		Hydrological Performance (Simulation Period)		Review Recommended	Comments
	2010	2018	2010	2018	2010	2018		
Upper Burnett WSS	Medium Priority (45400 ML) High Priority (1720 ML)	Medium Priority (34991 ML) Low Priority (10469 ML) High Priority (1530 ML)	• CWSA volume of 24524 ML	• New water sharing rules • CWSA volume of 24524 ML removed	• 1890-1997	• 1890-2008 • New IQQM due to revision of Water Plan (Burnett Basin) 2014	✓	• Deflation of fabridam at Claude Wharton Weir • New water sharing rules give more access to medium priority • New IQQM
John Goleby WSS	Medium Priority (1560 ML) High Priority (0 ML)	Medium Priority (1560 ML) High Priority (0 ML)					×	• All medium priority
Upper Condamine WSS	Medium Priority (22165 ML) High A Priority (3262 ML) High B Priority (125 ML) Risk A Priority (7320 ML) Risk B Priority (925 ML)	Medium Priority (22328 ML) High A Priority (3262 ML) High B Priority (125 ML) Risk A Priority (7320 ML) Risk B Priority (925 ML)		• No significant change	• 1895-2006	• 1895-2006	✓	• New HUF methodology for MP cut-off rule