Snowy 2.0 Main Works

February - August 2024 Environmental Water Report

Prepared for Snowy Hydro Limited

October 2024

Snowy 2.0 Main Works

February - August 2024 Environmental Water Report

Snowy Hydro Limited

E230052 RP3

October 2024

Version	Date	Prepared by	Reviewed by	Comments
V1	1 October 2024	Rachel Truscott	Henry Noakes	

Approved by

Henry Noakes
Associate Hydrogeologist
15/10/2024

Ground floor 20 Chandos Street
St Leonards NSW 2065
ABN: 28 141 736 558

TABLE OF CONTENTS

1 Introduction 1

1.1 Purpose of this report 1

1.2 Reporting period 2

1.3 Project updates 2

2 Existing environment 9

2.1 Climate 9

2.2 Drainage and catchments 11

2.3 Hydrogeology 12

2.4 Groundwater dependent ecosystems 13

3 Monitoring program 15

3.1 Overview 15

3.2 Trigger criteria 15

3.3 Water quality 16

4 Conclusions 17

References 18

Appendices

Appendix A Groundwater level and quality trigger values A.1

Appendix B Groundwater quality trigger value groups B.1

Appendix C Groundwater level hydrographs C.1

Tables

Table 1.1 Construction progress update 3

Table 2.1 Monthly rainfall observations between August 2023 and August 2024 9

Table A.1 Conventional monitoring bores – Summary of installation and associated trigger values A.2

Table A.2 Shallow swamp piezometers – Summary of installation and associated trigger values A.6

Table A.3 Production bores – Summary of installation and associated trigger values A.9

Table A.4 Vibrating wire piezometers – Summary of installation and associated trigger values A.10

Table B.1 Groundwater quality trigger value groups B.2

Figures

Figure 1.1 Groundwater monitoring network – Overview 4

Figure 1.2	Groundwater monitoring network - Tantangara and Zinc Ridge	5
Figure 1.3	Groundwater monitoring network – Gooandra	6
Figure 1.4	Groundwater monitoring network – Marica	7
Figure 1.5	Groundwater monitoring network – Lobs Hole	8
Figure 2.1	Monthly rainfall and cumulative deviation from mean rainfall at Cabramurra weather station (BoM: 072161)	11

1 Introduction

Snowy Hydro Limited (SHL) is constructing the Snowy 2.0 project (the project), forming an expansion of the existing Snowy Mountains Hydro-electric Scheme. The project will increase the generation capacity of the existing scheme by an additional 2,000 megawatts (MW), and at full capacity will provide approximately 350,000 MWh of large-scale energy storage to the National Electricity Market.

The project is predominantly located underground and will link the existing Tantangara (upstream) and Talbingo (downstream) reservoirs. Key features of the project include:

- a head-race tunnel (HRT) between the Tantangara Reservoir and the penstock tunnels, comprising an approximately 19 km long, concrete-lined tunnel
- penstock tunnels between the HRT and the power station, comprising six steel-lined tunnels conveying water to the generation units
- an underground power station, housing the power generation facility, contained within an underground excavation approximately 22 m (wide) by 50 m (high) by 250 m (long)
- ancillary access and passage tunnels, totalling approximately 20 km of tunnels, including a:
    - main access tunnel (MAT), providing personnel and equipment access to the power station
    - electrical, cabling and ventilation tunnel (ECVT), facilitating power transmission from the generator
- a tail-race tunnel (TRT) between the power station and Talbingo Reservoir, comprising an approximately 8 km long, concrete-lined tunnel
- intake and outlet structures at the Tantangara and Talbingo reservoirs, respectively.

SHL engaged Future Generation Joint Venture (FGJV, comprising Webuild, Clough and Lane) to deliver the project. In August 2023, the contract between SHL and FGJV was reset, which included a transfer of select environmental reporting obligations to be managed by SHL. This environmental water report (EWR) forms the second report undertaken by SHL following the contract reset.

1.1 Purpose of this report

This EWR has been prepared in accordance with the approved groundwater management plan (GMP), as collated by FGJV (document reference *S2-FGJV-ENV-PLN-0012*, (FGJV 2020)) in accordance with Schedule 3, Condition 31 (d) of the critical state significant infrastructure approval for the project (DPIE 2020a).

This EWR focuses on:

- providing an update of relevant project activities undertaken (i.e. potential groundwater affecting activities)
- provision of groundwater level hydrographs, with specific consideration for recent project activities and climate data
- a comparison of groundwater data to site-specific trigger values (SSTV's), as presented in the GMP.

This EWR will be uploaded to the Snowy 2.0 project website.

1.2 Reporting period

This EWR provides a groundwater update for the period between 7 February and 7 August 2024.

1.3 Project updates

1.3.1 Overview

The project area is divided into four construction areas, broadly comprising the key features of the project which interact or have the potential to interact with groundwater resources. These include:

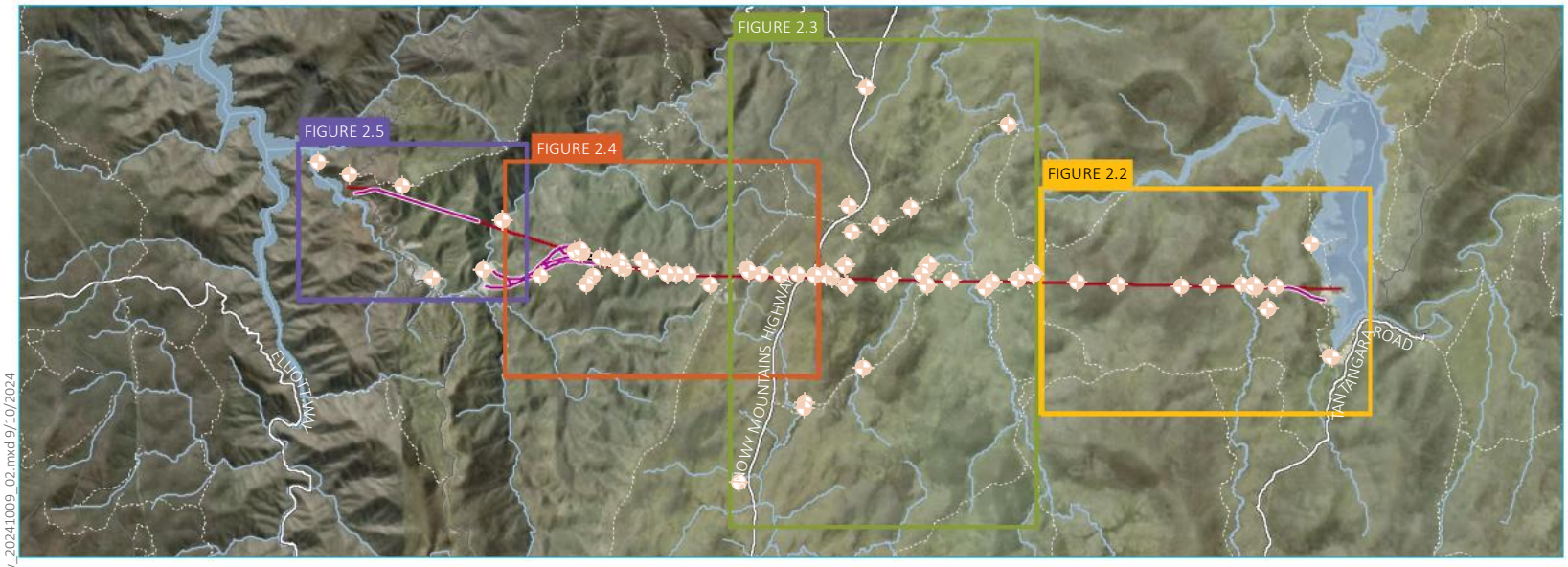
- Tantangara, near the Tantangara Reservoir, including:
  - the intake structure
  - a portion of the head-race tunnel
  - the head-race tunnel adit
- the Plateau, located between the Snowy Mountains Highway and Tantangara Reservoir, overlying the majority of the head-race tunnel
- Marica, located west of the Plateau, including:
  - a portion of the head-race tunnel
  - the MAT
  - the ECVT
  - an underground power station
  - a ventilation shaft to the underground power station
  - the head-race surge shafts
  - the tail-race surge shaft
  - a portion of the tail-race tunnel
- Lobs Hole, located near Talbingo reservoir, including:
  - emplacement areas for spoil generated during construction
  - a portion of the tail-race tunnel
  - the outtake structure into the Talbingo Reservoir.

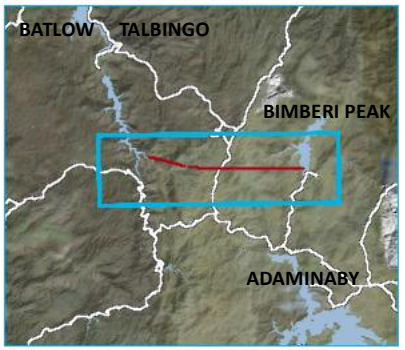
1.3.2 Project progress

Project progression is summarised in Table 1.1 and shown on Figure 1.1–Figure 1.5.

Table 1.1 Construction progress update

Area	Construction element	Status	Progress comments
Tantangara	Intake structure	In progress	Excavated to approximately 45 m depth.
	Head-race tunnel adit	In progress	TBM Florence excavated approximately 1,280 m. Including completion of head-race adit inlet and ~280 m of headrace tunnel.
The Plateau	Head-race tunnel	Not commenced	-
Marica	MAT	Complete	-
	ECVT	Complete	-
	Underground power station	In progress	Drilling and blasting of cross tunnels and passages underway.
	Ventilation shaft	Not commenced	-
	Head-race surge-shaft	In progress	Excavated to approximately 90 m depth.
	Tail-race surge shafts	Not commenced	-
Lobs Hole	Tail-race tunnel	In progress	TBM Eileen was excavated from approximately 1,660 m - 2,940 m during the reporting period. Excavation occurred from the junction with the tail race adit, progressing east towards Marica.
	Tail-race tunnel adit	Complete	-
	Out-take structure	Not commenced	TBC
	Spoil emplacement areas	In progress	TBC





KEY

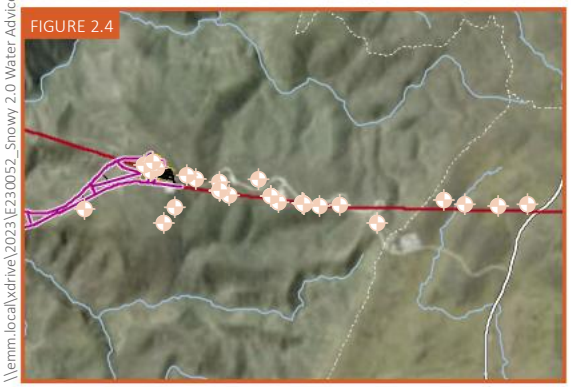
- Monitoring network
- Excavated tunnel
- Access tunnel
- Construction tunnel
- Hydraulic tunnel

Existing environment

- Major road
- Minor road
- Vehicular track
- Named watercourse
- Named waterbody

INSET KEY

- Major road
- Hydraulic tunnel



0 5 10 km

GDA2020 MGA Zone 55

N

Source: EMM (2024); DCSSS (2024); MetroMap (2024); ESRI (2024)

\\emm.local\xdrive\2023\E230052_Snowy 2.0 Water Advice\GIS\02_Maps_GW\EWR\0101 GW001_NetworkOverview_20241009_02.mxd 9/10/2024

Groundwater monitoring network - Overview

Snowy 2.0 Main Works
Q3 - 2024 Environmental Water Report
Figure 1.1

EMM
creating opportunities

KEY

- Monitoring network
- Excavated tunnel
- Construction tunnel
- Hydraulic tunnel

Existing environment

- Major road
- Minor road
- Vehicular track
- Named watercourse
- Named waterbody

Surface Geology

- Adaminaby Group
- Kellys Plain Volcanics
- Peppercorn Formation
- Tantangara Formation
- Temperance Formation

INSET KEY

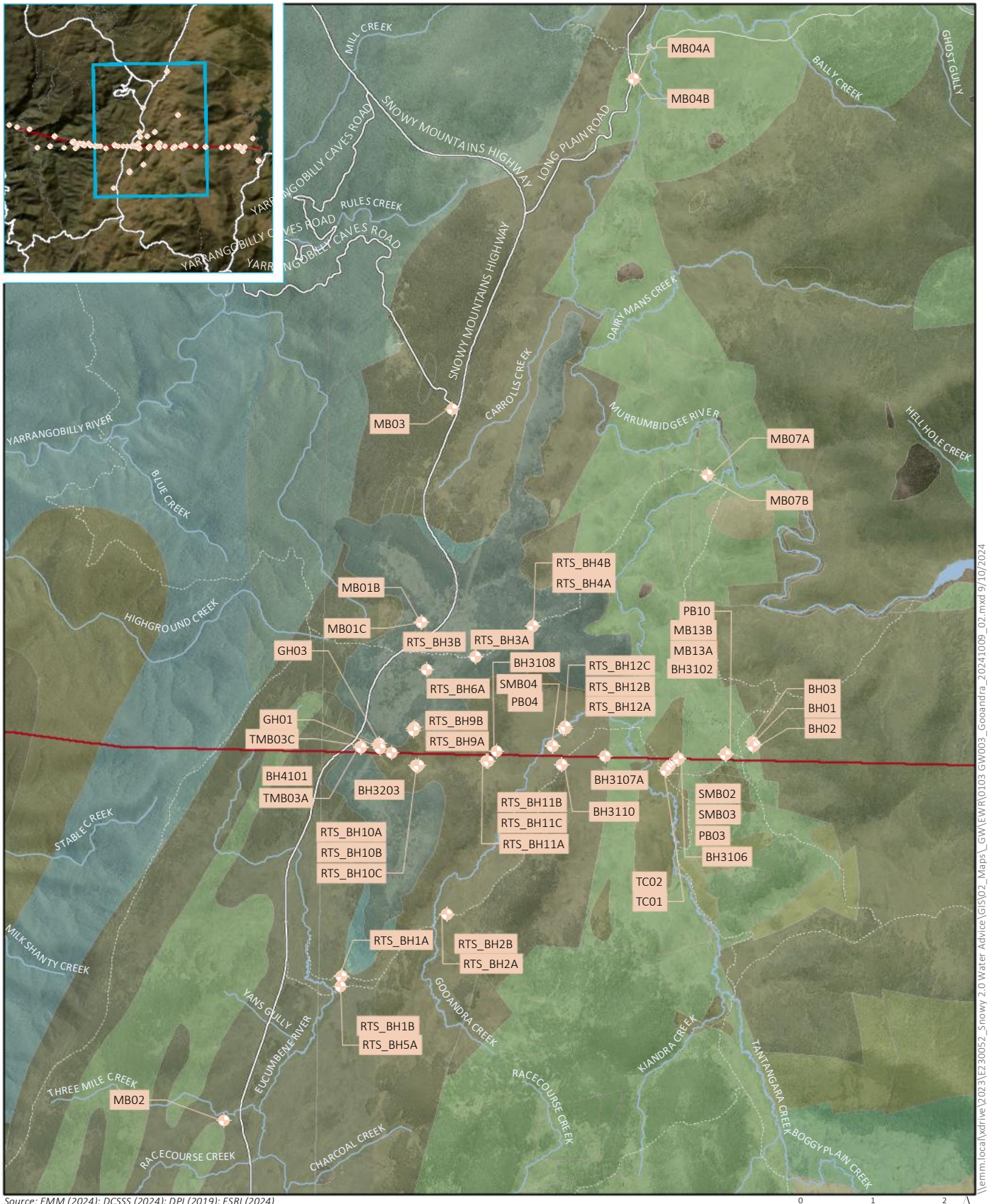
- Major road
- Monitoring network
- Hydraulic tunnel

Groundwater monitoring network - Tantangara and Zinc Ridge

Snowy 2.0 Main Works
Q3 - 2024 Environmental Water Report
Figure 1.2

Source: EMM (2024); DCSSS (2024); DPI (2019); MetroMap (2024); ESRI (2024)

\\emm.local\xdrive\2023\E230052_Snowy 2.0 Water Advice\GIS\02_Maps_GW\EWR\0102 GW002_TantangaraZincRidge_20241009_02.mxd 9/10/2024



Source: EMM (2024); DCSSS (2024); DPI (2019); ESRI (2024)

0 1 2 km

GDA2020 MGA Zone 55

N

\\emm.local\xdrive\2023\E230052_Snowy 2.0 Water Advice\GIS\02_Maps_GW\EWR\0103 GW003_Gooandra_20241009_02.mxd 9/10/2024

KEY

- Monitoring network
- Hydraulic tunnel

Existing environment

- Major road
- Minor road
- Vehicular track
- Named watercourse
- Named waterbody

Surface Geology

- Adaminaby Group
- Boggy Plain Adamellite
- Boggy Plain Suite
- Gooandra Volcanics
- Goobarragandra Volcanics
- Hell Hole Creek Adamellite
- Ravine Beds/Yarrangobilly Limestone
- Shaw Hill Gabbro
- Tantangara Formation
- Temperance Formation

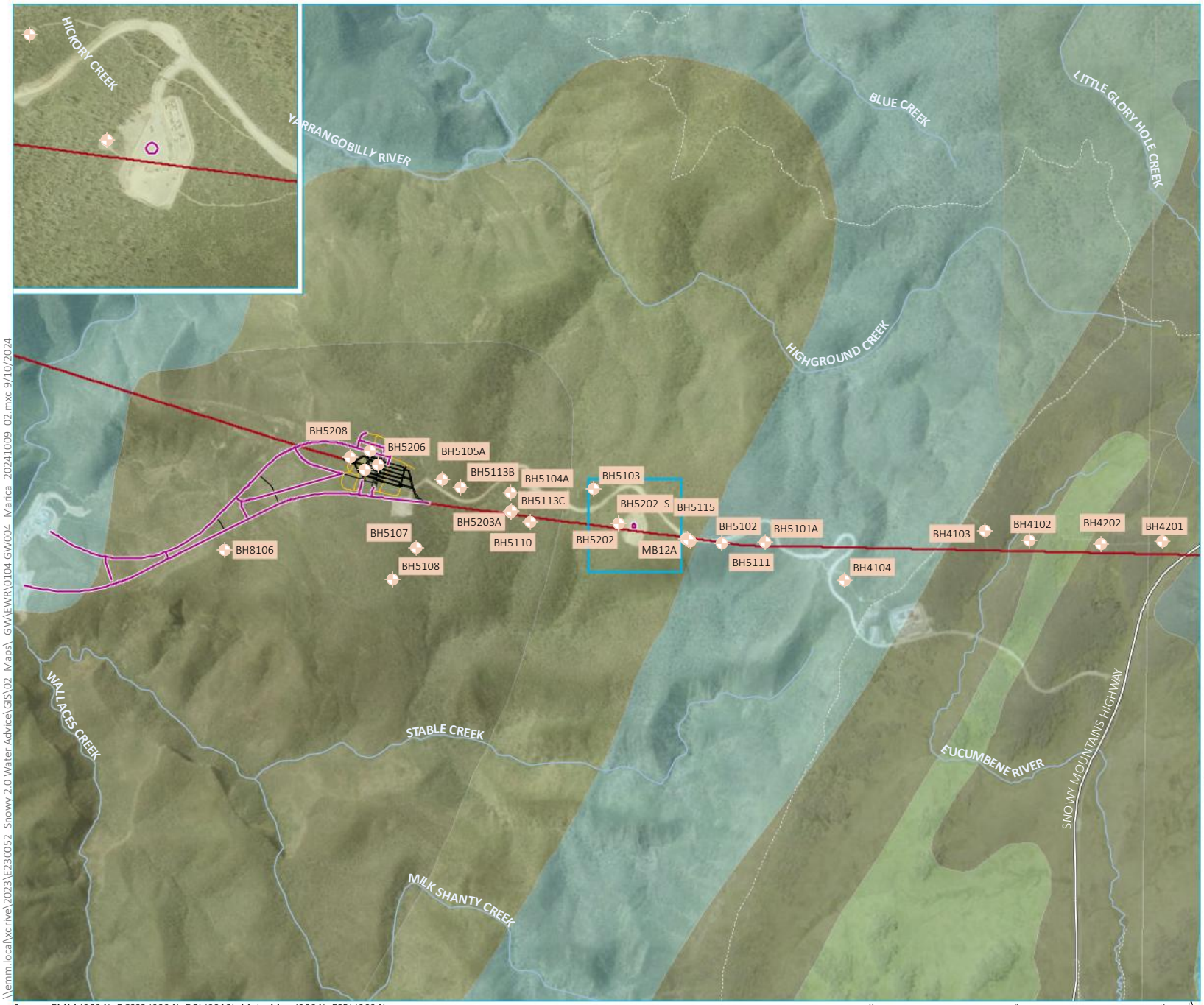
INSET KEY

- Major road
- Monitoring network
- Hydraulic tunnel

Groundwater monitoring network - Gooandra

Snowy 2.0 Main Works
Q3 - 2024 Environmental Water Report
Figure 1.3

EMM creating opportunities



KEY

- Monitoring network
- Excavated tunnel
- Access tunnel
- Construction tunnel
- Hydraulic tunnel

Existing environment

- Major road
- Vehicular track
- Named watercourse

Surface Geology

- Alluvial sediments
- Boraig Group
- Byron range group
- Cabramurra Basalt
- Gooandra Volcanics
- Goobarragandra Volcanics
- Ravine Beds/Yarrangobilly Limestone
- Shaw Hill Gabbro

INSET LEGEND

- Monitoring network
- Hydraulic tunnel

Groundwater monitoring network - Marica

Snowy 2.0 Main Works
Q3 - 2024 Environmental Water Report
Figure 1.4

EMM creating opportunities

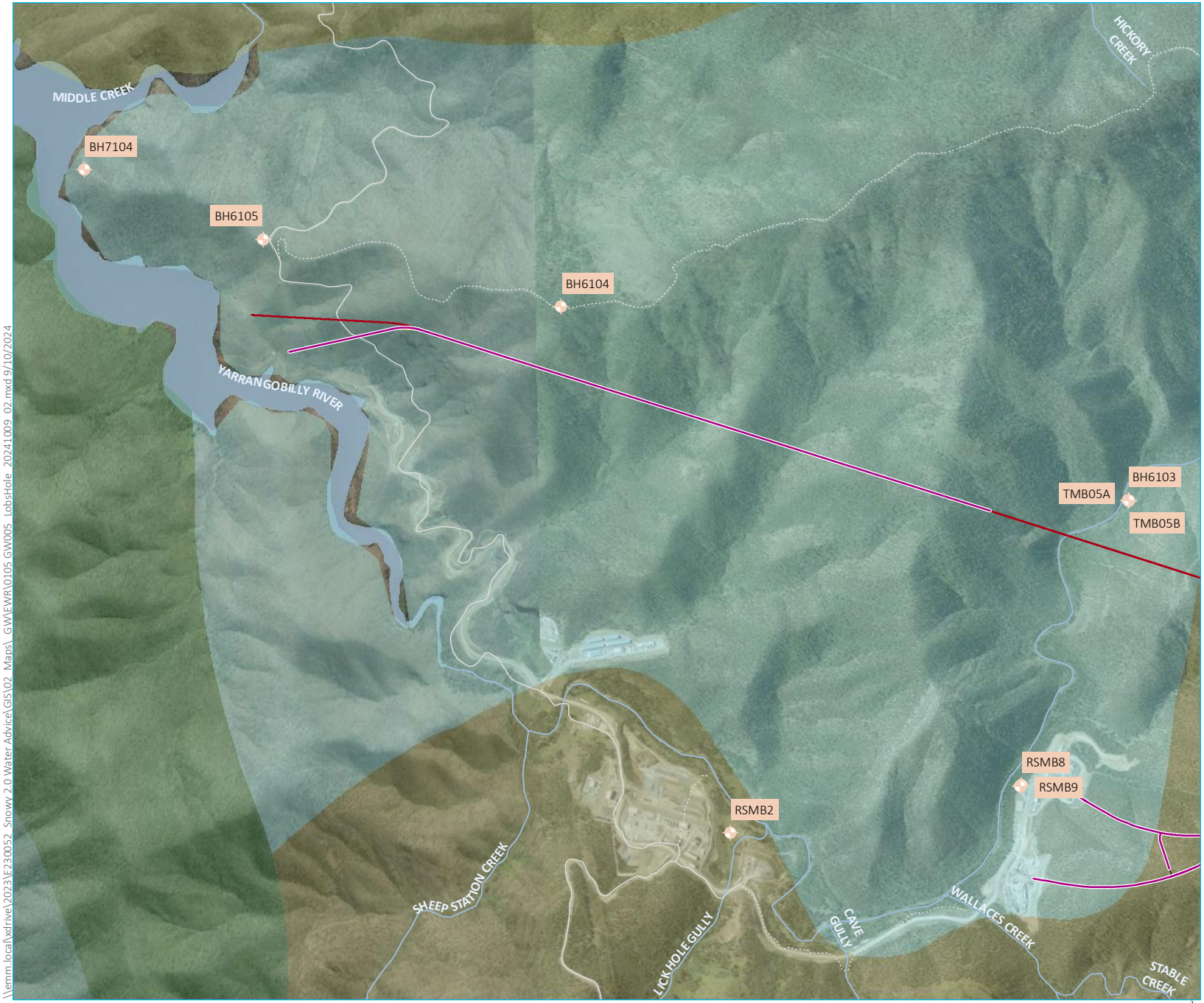
Source: EMM (2024); DCSSS (2024); DPI (2019); MetroMap (2024); ESRI (2024)

0 1 2 km

GDA2020 MGA Zone 55

N

\\emm.local\xdrive\2023\E230052_Snowy 2.0 Water Advice\GIS\02_Maps_GW\EWR\0104 GW004_Marica_20241009_02.mxd 9/10/2024



KEY

- Monitoring network
- Excavated tunnel
- Access tunnel
- Construction tunnel
- Hydraulic tunnel

Existing environment

- Minor road
- Vehicular track
- Named watercourse
- Named waterbody

Surface Geology

- Boraig Group
- Byron range group
- Jackalass Slate
- Ravine Beds/Yarrangobilly Limestone
- Tumut Ponds Sepentinite

INSET KEY

- Major road
- Monitoring network
- Hydraulic tunnel

Groundwater monitoring network - Lobs Hole

Snowy 2.0 Main Works
Q3 - 2024 Environmental Water Report
Figure 1.5

EMM creating opportunities

Source: EMM (2024); DCSSS (2024); DPI (2019); MetroMap (2024); ESRI (2024)

0 1 2 km

GDA2020 MGA Zone 55

N

\\emm.local\xdrive\2023\E230052_Snowy 2.0 Water Advice\GIS\02_Maps_GW\EWR\0105 GW005_LobsHole_20241009_02.mxd 9/10/2024

2 Existing environment

2.1 Climate

The project area has an alpine climate that is characterised by cool summers and cold, damp, and snowy winters. Rainfall occurs mainly in winter to early spring and generally increases with elevation. Summer and autumn are generally drier and experience greater variation in monthly rainfall. Summer rainfall is generally of higher intensity over a shorter duration than in winter.

Monthly rainfall data was sourced from the Bureau of Meteorology (BoM) climate data portal (BoM 2024), at the Cabramurra climate station (station ID 072161), located approximately 23 km south of Lobs Hole at an elevation of 1,482 m AHD.

Climate data has been assessed over a 12-month period to give an indication of climate trends and cycles leading into the reporting period. Rainfall was generally below average for most months, with the exception of:

- October 2023 (1.7 mm above average)
- November 2023 (18.3 mm above average)
- January 2024 (37 mm above average)
- April 2024 (2.9 mm above average)
- July 2024 (19.1 mm above average).

Monthly rainfall is summarised in Table 2.1, for the previous year including the reporting period (7 February – 7 August 2024).

Table 2.1 Monthly rainfall observations between August 2023 and August 2024

Month/Year	Monthly rainfall at Cabramurra weather station (mm)		Difference (mm) (Measured – Average)
	Measured	[1]Average	
August 2023	78.2	125.7	-47.5
September 2023	31.4	123.0	-91.6
October 2023	113.4	111.7	1.7
November 2023	141.2	122.9	18.3
December 2023	80.6	89.8	-9.2
January 2024	114.0	77.0	37
February 2024	65.0	78.9	-13.9
March 2024	52.4	85.6	-33.2
April 2024	79.4	76.5	2.9
May 2024	29.6	91.8	-62.2
June 2024	103.8	123.8	-20
July 2024	133.6	114.5	19.1

Table 2.1 Monthly rainfall observations between August 2023 and August 2024

Month/Year	Monthly rainfall at Cabramurra weather station (mm)		Difference (mm) (Measured – Average)
	Measured	[1]Average	
August 2024	72.4	125.7	-53.3

Notes: 1. Observation period between December 1996 and August 2024.

Measured monthly rainfall and historical average monthly rainfall (based on data between December 1996 and February 2024) was used to undertake a cumulative deviation from mean (CDFM) analysis. CDFM analysis provides an indication of wet or dry periods, as inferred by an upward trend (wetter than average period) or downward trend (drier than average period).

CDFM analysis of monthly rainfall data at the Cabramurra weather station (BoM 2024) indicates:

- wetter than average periods between:
  - October and November 2023
  - December 2023 and January 2024
  - March and April 2024
  - June and July 2024
- drier than average periods between:
  - August and October 2023
  - November and December 2023
  - January and March 2024
  - April and June 2024
  - July and August 2024

Measured monthly rainfall, historical average monthly rainfall (based on data between December 1996 and February 2024) and CDFM results are presented on Figure 2.1 Monthly rainfall and cumulative deviation from mean rainfall at Cabramurra weather station (BoM: 072161)

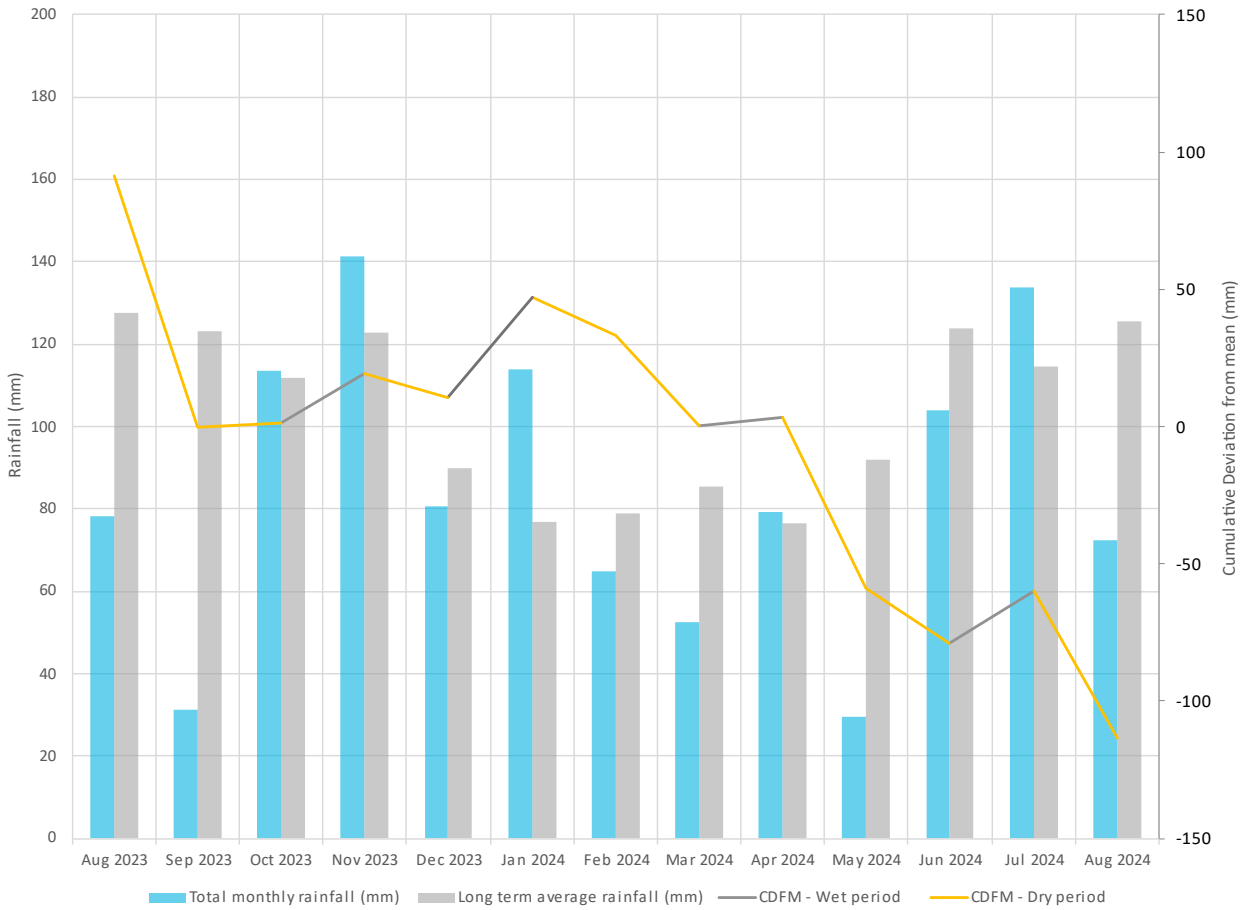


Figure 2.1 **Monthly rainfall and cumulative deviation from mean rainfall at Cabramurra weather station (BoM: 072161)**

2.2 Drainage and catchments

All watercourses are characterised as receiving baseflow from groundwater (referred to as gaining streams). The Long Plain Fault (LPF) forms the main topographic divide between the Ravine (west of the LPF) and the Plateau (east of the LPF).

Watercourses within the Ravine generally flow to Talbingo Reservoir (west-ward) and watercourses within the Plateau generally flow to Tantangara Reservoir (east-ward).

2.2.1 Ravine

Within the Ravine, the Yarrangobilly River is the major ephemeral watercourse that flows into Talbingo Reservoir, downstream of Lobs Hole. Its catchment has an area of 271 square kilometres (km^2) that is wholly within the Kosciusko National Park (KNP). The Yarrangobilly River has a number of tributaries within the Ravine, including Wallaces Creek, Stable Creek, Sheep Station Creek and Highground Creek. The majority of annual stream flow occurs in late winter and early spring, which is typical for rivers in the Australian Alps.

2.2.2 Plateau

The Plateau is within the upper reaches of the Murrumbidgee and Eucumbene River catchments, wholly within the KNP. The headwaters of the Eucumbene River are in the western Plateau, and the river flows from the north of the Plateau in a south-easterly direction into Tantangara Reservoir.

A number of perennial waterways are present across the Plateau, that either flow north into the Murrumbidgee River or directly into Tantangara Reservoir, including Gooandra Creek, Tantangara Creek, Nungar Creek and Kellys Plains Creek.

2.3 Hydrogeology

The hydrogeological units of the project consist of the following:

- Alluvium, colluvium and weathered rock: these shallow units are generally recharged by moderate to high rainfall, flooding for alluvial areas and snow melt.
- Shallow weathered fractured rock: these units have low to moderate permeability and are recharged by moderate to high rainfall and snow melt (occurring when soil moisture conditions are exceeded).
- Deep fractured rock: recharged by infiltration of rainfall migrating from shallow groundwater systems. Permeability is generally lowest in the central section of the plateau and higher in the east and western areas of the plateau. There is downward flow of groundwater in recharge areas and upward flow in discharge areas.

Measurements from the baseline groundwater monitoring network vary from approximately 1,470 m AHD in the topographically elevated terrain associated with the Plateau, to approximately 570 m AHD in the topographically lower terrain near Lobs Hole. Groundwater levels may fall outside of this measured range in areas of higher relief and in some of the lower drainage lines, such as the interface between the Yarrangobilly River and Talbingo Reservoir where levels are likely at or close to surface levels of about 545 m AHD.

2.3.1 Ravine

Along the proposed power waterway alignment, groundwater levels within the Ravine Beds vary from approximately 1,325 m AHD in the topographically elevated terrain adjacent to the Plateau in the east, to approximately 570 m AHD in the topographically lower terrain near Lobs Hole. Groundwater flow direction is generally from east to west, with the Long Plain Fault area acting as a groundwater divide between the ravine and plateau areas.

Groundwater levels within the ravine do not typically show an obvious response to rainfall events or flow events within the Yarrangobilly River.

2.3.2 Plateau

Along the proposed headrace tunnel transect, groundwater levels vary from approximately 1,470 m AHD in the elevated areas to the west, to approximately 1,170 m AHD in the lower elevated area near Tantangara Creek. Overall, groundwater levels observed along the proposed tunnel alignment indicate that groundwater flow direction is generally west to east.

Groundwater levels within the plateau show a moderate to strong response to rainfall events, indicating a moderate to strong connection between surface and the regional groundwater system.

2.4 Groundwater dependent ecosystems

The following discussion regarding groundwater dependant ecosystems (GDE) has been extracted from the GMP (FGJV 2020).

2.4.1 High priority groundwater dependant ecosystems

Based on the Water Sharing Plan for the Lachlan Fold Belt Murray Darling Basin Fractured Rock groundwater source (DPIE 2020b), the nearest High Priority groundwater dependant ecosystem (GDE) is the Yarrangobilly Caves, located approximately 5 km north of the nearest infrastructure feature of the project.

2.4.2 Subterranean groundwater dependant ecosystems (Stygofauna)

A stygofauna assessment was undertaken as part of the environmental impact statement (EMM 2019) and identified a total of five specimens, from two families, likely to be obligate (fully groundwater-dependent) stygofauna representatives.

A further 80 specimens from five groups, with potential to be obligate stygofauna representatives, were collected from 4 of the 11 fractured rock groundwater system monitoring locations sites and 4 of the 5 alpine bog and fen monitoring locations.

Limited stygofauna studies have been undertaken within fractured rock aquifers of the region, thus there is limited data for comparison. The stygofauna found in the aquifers in the Snowy 2.0 Project area are noted to be similar to those encountered in other fractured rock systems in NSW.

2.4.3 Aquatic groundwater dependant ecosystems

Aquatic GDEs are dependent on baseflow in non-perennial rivers and creeks. Across the project region, all rivers comprise both runoff and baseflow components as shallow groundwater tables are consistently above creek bed elevations. All creeks are therefore considered to support aquatic GDEs. In particular, plant community type (PCT) 300 occur along drainage lines on mid-slopes across the project area and PCTs 285, 299 and 302 occur in riparian zones and gullies where there is likely to be some near-surface expression of groundwater.

2.4.4 Terrestrial groundwater dependant ecosystems

Terrestrial GDEs include vegetation that access groundwater to maintain ecosystem function. These are classified according to their proportional (temporal) dependence on groundwater. Plant communities with varying degrees of groundwater dependence within the project area include:

- entirely/obligate terrestrial groundwater dependant ecosystems, comprising:
    - PCT 637 - Alpine and sub-alpine peatlands, damp herbfields and fens, South Eastern Highlands Bioregion and Australian Alps Bioregion
    - PCT 1225 - Sub-alpine grasslands of valley floors, southern South Eastern Highlands Bioregion and Australian Alps Bioregion.
- facultative – proportional terrestrial groundwater dependant ecosystems, comprising:
    - PCT 285 - Broad-leaved Sally grass - sedge woodland on valley flats and swamps in the NSW South Western Slopes Bioregion and adjoining South Eastern Highlands Bioregion
    - PCT 299 - Riparian Ribbon Gum - Robertsons Peppermint - Apple Box riverine very tall open forest of the NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion

- PCT 302 - Riparian Blakely's Red Gum - Broad-leaved Sally woodland – teatree - bottlebrush - wattle shrubland wetland of the NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion

- facultative – opportunistic terrestrial groundwater dependant ecosystems, comprising:

  - PCT 300 - Ribbon Gum - Narrow-leaved (Robertsons) Peppermint montane fern - grass tall open forest on deep clay loam soils in the upper NSW South Western Slopes Bioregion and western Kosciuszko escarpment

  - PCT 303 - Black Sally grassy low woodland in valleys in the upper slopes subregion of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion

  - PCT 679 - Black Sallee - Snow Gum low woodland of montane valleys, South Eastern Highlands Bioregion and Australian Alps Bioregion.

3 Monitoring program

3.1 Overview

The GMP monitoring network comprises 136 monitoring locations, including:

- fifty-seven conventional monitoring bores, facilitating groundwater level and chemistry monitoring at discrete intervals within the shallow and deeper groundwater systems
- thirty-five shallow swamp piezometers, monitoring the shallow bogs and fens (typically associated with obligate GDE's, refer Section 2.4)
- nine production bores, used for aquifer testing and/or water supply for the project
- thirty-five VWP locations, totalling 105 VWP sensors, monitoring groundwater levels within/between deep and shallow groundwater systems.

Decommissioned bores include:

- four conventional monitoring bores (BH8101, 8102, 8105 and 8108)
- five shallow swamp piezometers (BP1–4 and RtS_BH8A)
- two production bores (PB05 and EWPB3).

Bores proposed for decommissioning include:

- two EPL monitoring bores (RSMB6 and RSMB7)
- two production bores (PB06 and PB09).

The groundwater monitoring network is provided on Figure 1.1–Figure 1.5.

3.2 Trigger criteria

i Groundwater level trigger criteria

Groundwater level trigger values are presented in Section 6.4 of the GMP (FGJV 2020) and have been applied to monitoring locations that are responding to project stressors. Groundwater level trigger values have been derived from the numerical model and baseline data, in accordance with the following methodology:

1. Maximum predicted groundwater drawdown (measured in metres) was extracted from the numerical model at nodes representing the relevant groundwater monitoring location.
2. An inferred minimum natural groundwater level (in metres above Australian height datum) was inferred from the baseline data set (comprising the data up to an observed drawdown response as a result of the project).
3. The maximum predicted groundwater drawdown was subtracted from the minimum natural groundwater level, resulting in an exceedance trigger level for groundwater drawdown (i.e. greater drawdown than predicted by the numerical model).

Groundwater level trigger values for VWP locations have been applied to the shallowest sensor at each location (i.e. providing the greatest measurement of water table fluctuation), noting project impacts (EMM 2019) are predicted as a result of water table drawdown.

Groundwater trigger values are presented in Table A.1–Table A.4 (attached as Appendix A).

ii Groundwater quality trigger criteria

Preference under the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018) is given to site-specific guidelines determined through a comprehensive assessment of baseline data for a minimum period of two years (24 months).

Groundwater quality sampling was undertaken prior to project approval (EMM 2021). Regular and routine water quality sampling is not a post-approval requirement, with samples only obtained in response to a groundwater level exceedance.

Groundwater quality trigger values are assigned to geological units intercepted by the project. Monitoring locations within each geological unit is presented in Table A.1–Table A.4 (attached as Appendix A). Representative groundwater quality trigger values, per geological unit, is presented in Table B.1 (attached as Appendix B).

3.2.2 Groundwater level trigger exceedances

Groundwater levels were below the exceedance trigger at BH6104 between 29 May and 7 August 2024. In accordance with Level 3a trigger level response under the Trigger Action Response Plan (TARP), a trigger notification report (TNR) (EMM Consulting 2024) was issued to the Department of Planning, Housing and Infrastructure (DPHI) on 25 June 2024.

A subsequent trigger exceedance report (TER), provided to Snowy Hydro assessed the impact of the exceedance, concluding that:

- nearby bores did not indicate regional groundwater drawdown propagation
- impacts to sensitive groundwater receptors in the vicinity were considered negligible
- BH6104 is not a designated level 1 monitoring location
- grouting efforts were effective in reducing groundwater inflow
- no further action is required.

Groundwater level hydrographs are attached as Appendix C.

3.3 Water quality

In accordance with the GMP (FGJV 2020), groundwater quality samples were not obtained during the reporting period, noting an absence of groundwater level trigger exceedances in level 1 monitoring locations that would instigate a response to acquire groundwater samples.

4 Conclusions

Groundwater level exceedances were assessed over the reporting period (7 February and 7 August 2024).

Groundwater levels triggered exceedance and warning criteria at BH6104. The exceedance was reported to DCCEEW and the effects of the groundwater level exceedance assessed. Impacts of the drawdown to groundwater receptors was considered negligible and no groundwater drawdown propagation was identified. No further action is required, however the TER suggested that water levels are monitored closely, and groundwater quality samples are collected from BH6104.

References

ANZG 2018, *Australian and New Zealand Guidelines for frest and marine quality*, Guideline, Australian and New Zealand Environment and Conservation Council, National Water Quality Management Strategy, Canberra.

BoM 2024, *Climate Data Online*, viewed 01 December 2023, <http://www.bom.gov.au/climate/data/>.

DPIE 2020a, *Development for the Snowy 2.0 and Transmission Project as described in Clause 9 of Schedule 5 of State Environmental Planning Policy (State and Regional Development) 2011*, Approval and conditions, Department of Planning, Industry and Environment, Minister for Planning and Public Spaces, Parramatta.

DPIE 2020b, *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources Order 2020*, Department of Planning and Environment, Parramatta.

EMM 2019, *Snowy 2.0 Main Works EIS - Water assessment*, EMM Consulting Pty Ltd, Sydney.

EMM 2021, *Snowy 2.0 Main Works - Stage 4 groundwater monitoring bore drilling completion report*, Factual report, EMM Consulting Pty Ltd, Sydney.

EMM Consulting 2023, *Snowy 2.0 Main Works November 2022 - November 2023 Environmental Water Report*.

EMM Consulting 2024, *Snowy 2.0 Main Works November 2023 - February 2024 Environmental Water Report*.

EMM Consulting 2024, *Snowy 2.0 Main Works Trigger Exceedance Report - BH6104*.

FGJV 2020, *Snowy 2.0 Main Works - Groudnwater Management Plan*, Future Generation Joint Venture.

Appendix A

Groundwater level and quality trigger values

EMM
creating opportunities

Table A.1 Conventional monitoring bores – Summary of installation and associated trigger values

Target formation	Bore ID	Ground level (mAHD)	Total depth (mbgl)	Screened interval (mbgl)		Target lithology	Groundwater level trigger (mAHD)		Groundwater quality trigger value
				Top	Bottom		Warning	Exceedance	Group (refer Table B.1)
Ravine Beds	BH6104	860.0	441.3	81.0	96.0	Siltstone	826.6	825.4	-
	BH6105	668.0	189.2	81.5	96.5	Siltstone	-	-	-
	BH7104	583.0	92.2	80.2	89.2	Siltstone	-	-	-
	BH8101	610.0	68.4	53.4	65.4	Siltstone	-	-	Ravine Beds West
	BH8102	608.0	68.6	53.6	65.6	Siltstone	-	-	Ravine Beds West
	BH8105	621.0	58.9	43.9	55.9	Siltstone	-	-	-
	BH8108	629.0	60.0	45.0	57.0	Siltstone	-	-	-
	RSMB6	581.0	40.0	31.0	40.0	Siltstone/sandstone	-	-	-
	RSMB7	581.0	40.0	31.0	40.0	Siltstone/sandstone	-	-	-
	RSMB8	583.0	40.0	31.0	40.0	Siltstone/sandstone	-	-	-
	RSMB9	583.0	40.0	31.0	40.0	Siltstone/sandstone	-	-	-
	TMB05A	603.0	21.0	12.0	18.0	Weathered siltstone	-	-	Ravine Beds West
	TMB05B	603.0	77.0	68.0	74.0	Siltstone	-	-	Ravine Beds West
	MB12A	1,329.0	36.0	26.0	35.0	Siltstone	-	-	Ravine Beds East
	MB12B	1,330.5	180.0	149.0	179.0	Siltstone	-	-	Ravine Beds East

Table A.1 Conventional monitoring bores – Summary of installation and associated trigger values

Target formation	Bore ID	Ground level (mAHD)	Total depth (mbgl)	Screened interval (mbgl)		Target lithology	Groundwater level trigger (mAHD)		Groundwater quality trigger value
				Top	Bottom		Warning	Exceedance	Group (refer Table B.1)
	TMB01B	581.8	72.0	63.0	69.0	Siltstone	-	-	Ravine Beds West
Boraig Group	MB06A	1,145.0	14.0	9.0	12.0	Weathered volcanic	-	-	-
	MB06B	1,145.0	72.0	64.0	70.0	Volcanic	-	-	-
Byron Range Group	BH5105A	1,198.5	110.0	97.0	109.0	Ignimbrite	-	-	-
	RSMB2	570.0	30.0	27.0	30.0	Siltstone/sandstone	-	-	-
Cabramurra Basalt	MB01B	1,464.0	7.5	5.3	6.8	Basalt	-	-	Tertiary basalt
	RtS_BH3A	1,467.0	50.0	40.0	49.0	Basalt	-	-	-
	RtS_BH4A	1,427.0	78.0	68.0	77.0	Basalt	-	-	-
Gooandra Volcanics	BH3110	1,346.0	257.3	165.9	177.9	Diorite	-	-	-
	MB01C	1,464.0	52.0	45.0	51.0	Volcanics	-	-	Gooandra Volcanics
	MB02	1,387.0	150.0	141.0	147.0	Chloritic schist	-	-	Gooandra Volcanics
	MB03	1,373.0	101.0	92.0	98.0	Chloritic schist	-	-	Gooandra Volcanics
	MB11A	1,485.0	7.5	17.0	23.0	Weathered basalt	-	-	Gooandra Volcanics
	SMB04	1,342.0	180.0	170.0	179.0	Chloritic schist	-	-	Gooandra Volcanics
	SMB05	1,342.0	50.0	40.0	49.0	Basalt	-	-	Gooandra Volcanics

Table A.1 Conventional monitoring bores – Summary of installation and associated trigger values

Target formation	Bore ID	Ground level (mAHD)	Total depth (mbgl)	Screened interval (mbgl)		Target lithology	Groundwater level trigger (mAHD)		Groundwater quality trigger value
				Top	Bottom		Warning	Exceedance	Group (refer Table B.1)
	TMB02A	1,470.0	15.0	11.0	14.0	Weathered basalt	-	-	Gooandra Volcanics
	TMB02B	1,472.0	200.0	191.0	197.0	Chloritic schist	-	-	Gooandra Volcanics
	TMB03A	1,478.0	34.0	29.5	32.5	Weathered basalt	-	-	Gooandra Volcanics
	TMB03B	1,478.0	150.0	141.0	147.0	Chloritic schist	-	-	Gooandra Volcanics
	TMB04	1,346.0	200.0	191.0	197.0	Basalt	-	-	Gooandra Volcanics
	RtS_BH1A	1,390.0	50.0	40.0	48.0	Chloritic schist	-	-	-
	RtS_BH1B	1,390.0	316.0	308.0	314.0	Chloritic schist	-	-	-
	RtS_BH2A	1,396.0	50.0	42.0	48.0	Basalt	-	-	-
	RtS_BH2B	1,396.0	314.0	306.0	312.0	Chloritic schist	-	-	-
	RtS_BH3B	1,466.0	316.4	309.0	315.0	Chloritic schist	-	-	-
	RtS_BH4B	1,427.0	150.0	143.0	149.0	Chloritic schist	-	-	-
Temperance Formation	BH3102	1,383.0	91.0	82.0	88.0	Sandstone	-	-	-
	MB04A	1,330.0	30.0	23.0	29.0	Basalt	-	-	Temperance Formation
	MB04B	1,330.0	102.5	93.5	99.5	Chloritic schist	-	-	Temperance Formation
	MB13A	1,382.0	60.0	50.0	59.0	Weathered siltstone	-	-	Temperance Formation

Table A.1 Conventional monitoring bores – Summary of installation and associated trigger values

Target formation	Bore ID	Ground level (mAHD)	Total depth (mbgl)	Screened interval (mbgl)		Target lithology	Groundwater level trigger (mAHD)		Groundwater quality trigger value
				Top	Bottom		Warning	Exceedance	Group (refer Table B.1)
	MB13B	1,382.0	190.0	169.0	189.0	Siltstone	-	-	Temperance Formation
	MB07A	1,265.0	15.0	10.0	13.0	Sandstone	-	-	Temperance Formation
	MB07B	1,265.0	60.0	51.0	57.0	Weathered siltstone	-	-	Temperance Formation
	SMB03	1,335.0	50.0	40.0	49.0	Sandstone	-	-	Temperance Formation
Boggy Plain Suite	SMB02	1,335.0	195.0	182.0	194.0	Sandstone	-	-	Boggy Plain Suite
Tantangara Formation	BH2103	1,264.0	103.3	94.3	100.3	Sandstone	-	-	-
	BH3101	1,418.0	85.6	76.6	82.6	Sandstone	-	-	-
	MB08A	1,435.0	30.0	20.0	29.0	Weathered siltstone	-	-	Tantangara Formation
	MB08B	1,436.0	298.0	277.0	297.0	Sandstone	-	-	Tantangara Formation
Kellys Plains Volcanics	BH2101	1,314.0	169.9	154.6	166.6	Siltstone	-	-	-
	RtS_BH7B	1,236.0	49.0	41.0	47.0	Siltstone	-	-	-
	RtS_BH8B	1,228.0	65.0	57.0	63.0	Siltstone	-	-	-

Table A.2 Shallow swamp piezometers – Summary of installation and associated trigger values

Target formation	Bore ID	Ground level (mAHD)	Total depth (mbgl)	Screened interval (mbgl)		Target lithology	Groundwater level trigger (mAHD)		Groundwater quality trigger
				Top	Bottom		Warning	Exceedance	Group (refer Table B.1)
Surficial sediments	GH01	1,456.0	1.0	0.5	1.0	Alluvium/colluvium	-	-	Plateau bogs/fens
	GH02	1,456.0	0.9	0.5	0.9	Alluvium/colluvium	-	-	Plateau bogs/fens
	GH03	1,456.0	0.6	0.3	0.6	Alluvium/colluvium	-	-	Plateau bogs/fens
	TC01	1,324.0	1.0	0.6	1.0	Alluvium/colluvium	-	-	Plateau bogs/fens
	TC02	1,322.0	1.1	0.7	1.1	Alluvium/colluvium	-	-	Plateau bogs/fens
	TC03	1,321.0	0.8	0.5	0.8	Alluvium/colluvium	-	-	Plateau bogs/fens
	BP1	1,366.0	1.8	1.5	1.8	Alluvium/colluvium	-	-	-
	BP2	1,364.0	1.8	1.5	1.8	Alluvium/colluvium	-	-	-
	BP3	1,364.0	1.8	1.5	1.8	Alluvium/colluvium	-	-	-
	BP4	1,363.0	1.8	1.5	1.8	Alluvium/colluvium	-	-	-
	BH01	1,351.0	0.4	0.2	0.4	Alluvium/colluvium	-	-	Plateau bogs/fens
	BH02	1,352.0	0.9	0.6	0.9	Alluvium/colluvium	-	-	Plateau bogs/fens
	BH03	1,350.0	0.7	0.5	0.7	Alluvium/colluvium	-	-	Plateau bogs/fens
	NC01	1,237.0	0.8	0.5	0.8	Alluvium/colluvium	-	-	-
	NC02	1,237.0	1.1	0.8	1.1	Alluvium/colluvium	-	-	-

Table A.2 Shallow swamp piezometers – Summary of installation and associated trigger values

Target formation	Bore ID	Ground level (mAHD)	Total depth (mbgl)	Screened interval (mbgl)		Target lithology	Groundwater level trigger (mAHD)		Groundwater quality trigger
				Top	Bottom		Warning	Exceedance	Group (refer Table B.1)
	NC03	1,237.0	1.0	0.7	1.0	Alluvium/colluvium	-	-	-
	RtS_BH5A	1,384.0	0.9	0.6	0.9	Alluvium/colluvium	-	-	-
	RtS_BH6A	1,448.0	1.4	1.1	1.4	Alluvium/colluvium	-	-	-
	RtS_BH7A	1,231.0	1.3	1.0	1.3	Alluvium/colluvium	-	-	-
	RtS_BH8A	1,219.0	2.6	2.1	2.6	Alluvium/colluvium	-	-	-
	RtS_BH9A	1,458.0	1.0	0.7	1.0	Alluvium/colluvium	-	-	-
	RtS_BH9B	1,458.0	1.2	0.9	1.2	Alluvium/colluvium	-	-	-
	RtS_BH9C	1,457.0	1.2	0.9	1.2	Alluvium/colluvium	-	-	-
	RtS_BH10A	1,420.0	1.2	0.9	1.2	Alluvium/colluvium	-	-	-
	RtS_BH10B	1,419.0	1.2	0.9	1.2	Alluvium/colluvium	-	-	-
	RtS_BH10C	1,419.0	1.2	0.9	1.2	Alluvium/colluvium	-	-	-
	RtS_BH11A	1,353.0	1.2	0.9	1.2	Alluvium/colluvium	-	-	-
	RtS_BH11B	1,353.0	1.2	0.9	1.2	Alluvium/colluvium	-	-	-
	RtS_BH11C	1,352.0	1.2	0.9	1.2	Alluvium/colluvium	-	-	-
	RtS_BH12A	1,316.0	1.2	0.9	1.2	Alluvium/colluvium	-	-	-

Table A.2 Shallow swamp piezometers – Summary of installation and associated trigger values

Target formation	Bore ID	Ground level (mAHD)	Total depth (mbgl)	Screened interval (mbgl)		Target lithology	Groundwater level trigger (mAHD)		Groundwater quality trigger
				Top	Bottom		Warning	Exceedance	Group (refer Table B.1)
	RtS_BH12B	1,316.0	1.2	0.9	1.2	Alluvium/colluvium	-	-	-
	RtS_BH12C	1,316.0	1.2	0.9	1.2	Alluvium/colluvium	-	-	-
	RtS_BH13A	1,263.0	1.2	0.9	1.2	Alluvium/colluvium	-	-	-
	RtS_BH13B	1,236.0	1.2	0.9	1.2	Alluvium/colluvium	-	-	-
	RtS_BH13C	1,262.0	1.2	0.9	1.2	Alluvium/colluvium	-	-	-

Notes: Grey text indicates decomissioned or inactive locations.

Table A.3 Production bores – Summary of installation and associated trigger values

Target formation	Bore ID	Ground level (mAHD)	Total depth (mbgl)	Screened interval (mbgl)		Target lithology	Groundwater level trigger (mAHD)		Groundwater quality trigger
				Top	Bottom		Warning	Exceedance	Group (refer Table B.1)
Gooandra Volcanics	PB04	1341.0	200.0	185.0	200.0	Chloritic schist	-	-	Gooandra Volcanics
	TMB03C	1478.0	250.0	237.0	249.0	Chloritic schist	-	-	Gooandra Volcanics
Temperance Formation	PB10	1382.0	230.0	210.0	230.0	Chloritic schist	-	-	Temperance Formation
Tantangara Formation	PB06	1436.0	318.0	298.0	318.0	Sandstone	-	-	Tantangara Formation
	PB01	1231.5	60.0	30.0	60.0	Dacite	-	-	Tantangara Formation
Ravine Beds	PB09	1330.0	300.0	200.0	300.0	Siltstone	-	-	Ravine Beds East
	PB05	614.3	50.0	100.0	100.0	Siltstone/sandstone	-	-	Ravine Beds West
	EWPB1	563.2	96.0	36.0	42.0	Shale/sandstone	-	-	Ravine Beds West
	EWPB3	559.7	54.0	24.0	54.0	Siltstone	-	-	Ravine Beds West

Table A.4 Vibrating wire piezometers – Summary of installation and associated trigger values

Target formation	Bore ID	Ground level (mAHD)	Total depth (mbgl)	Sensor depth (mbgl)			Target lithology	Groundwater level trigger (mAHD)	
				Deep sensor depth (mbgl)	Intermediate sensor depth (mbgl)	Shallow sensor depth (mbgl)		Warning	Exceedance
Ravine Beds	BH4104	1,484.0	917.0	628.4	506.6	-	Siltstone	-	-
	BH5101A	1,390.0	1,011.0	248.0	-	-	Siltstone	-	-
	BH5111	1,351.0	272.0	232.4	180.7	116.5	Siltstone, sandstone	-	-
	BH6103	602.0	220.0	218.7	131.2	-	Siltstone, sandstone	-	-
Boraig Group	BH5102	1,329.0	949.0	818.8	619.1	419.4	Siltstone, sandstone	-	-
	BH5103	1,272.0	882.0	765.0	562.0	352.0	Mixed sediments	-	-
	BH5115	1,330.0	789.0	292.0	192.0	-	Siltstone	-	-
	BH5202	1,261.0	280.0	1,031.2	-	-	Siltstone	-	-
	BH5202_S	1,261.0	140.0	214.0	-	-	Siltstone	-	-
Byron Range Group	BH5104	1,187.0	848.0	807.0	707.0	507.0	Siltstone, sandstone	-	-
	BH5107	1,163.0	774.0	737.5	554.5	381.4	Siltstone, sandstone	-	-
	BH5108	1,141.0	764.0	666.0	431.0	380.3	Siltstone	850.7	814.0
	BH5110	1,196.0	799.0	687.5	435.4	267.3	Mixed sediments	-	-
	BH5113B	1,182.0	799.0	903.2	480.7	-	Mixed sediments	-	-
	BH5113C	1,182.0	699.0	884.6	758.0	-	Mixed sediments	1,076.2	1,055.7
	BH5203A	1,181.0	512.0	946.4	887.7	803.8	Mixed sediments	-	-

Table A.4 Vibrating wire piezometers – Summary of installation and associated trigger values

Target formation	Bore ID	Ground level (mAHD)	Total depth (mbgl)	Sensor depth (mbgl)			Target lithology	Groundwater level trigger (mAHD)	
				Deep sensor depth (mbgl)	Intermediate sensor depth (mbgl)	Shallow sensor depth (mbgl)		Warning	Exceedance
	BH5204	1,196.0	755.0	642.5	548.5	-	Mixed sediments	944.9	905.6
	BH5206	1,158.0	781.0	558.4	478.4	-	Mixed sediments	-	-
	BH5207	1,163.0	783.0	483.8	-	-	Mixed sediments	535.5	444.6
	BH5208	1,145.0	743.0	870.8	620.8	-	Mixed sediments	1,007.0	988.2
	BH5209	1,149.0	768.0	799.3	499.3	-	Mixed sediments	895.8	861.9
	BH8106	1,096.0	673.0	669.0	431.0	-	Siltstone, sandstone	695.0	658.1
Gooandra Volcanics	BH3107A	1,324.0	241.0	1,191.1	1,124.3	-	Siltstone/sandstone	-	-
	BH3108	1,369.0	998.0	620.0	342.0	250.0	Schist	-	-
	BH3203	1,461.0	400.0	1,351.6	1,261.6	1,111.6	Schist	-	-
	BH4101	1,479.0	1,100.0	883.9	729.6	542.5	Meta-rhyolite	-	-
	BH4102	1,460.0	534.0	455.6	374.3	246.3	Gneiss, phyllite	-	-
	BH4103	1,471.0	388.0	335.6	232.2	139.5	Metatuff, tuff, gneiss	-	-
	BH4201	1,464.0	485.0	1,155.2	1,101.8	-	Schist	-	-
	BH4202	1,464.0	501.0	1,233.0	1,087.2	-	Schist	-	-
Boggy Plain Suite	BH3106	1,335.0	247.0	194.3	150.1	-	Pyroxenite, diorite	-	-

Table A.4 Vibrating wire piezometers – Summary of installation and associated trigger values

Target formation	Bore ID	Ground level (mAHD)	Total depth (mbgl)	Sensor depth (mbgl)			Target lithology	Groundwater level trigger (mAHD)	
				Deep sensor depth (mbgl)	Intermediate sensor depth (mbgl)	Shallow sensor depth (mbgl)		Warning	Exceedance
Tantangara Formation	BH2102	1,246.0	145.0	107.2	41.8	-	Meta-siltstone/sandstone	1183.7	1168.7
	BH3104	1,436.0	339.0	287.0	174.0	72.9	Siltstone/sandstone	-	-
	BH3111	1,501.0	406.0	1,146.9	1,249.0	-	Schist	-	-
	BH3113	1,334.0	234.0	184.8	94.9	-	Meta-siltstone/sandstone	-	-

Appendix B

Groundwater quality trigger value groups

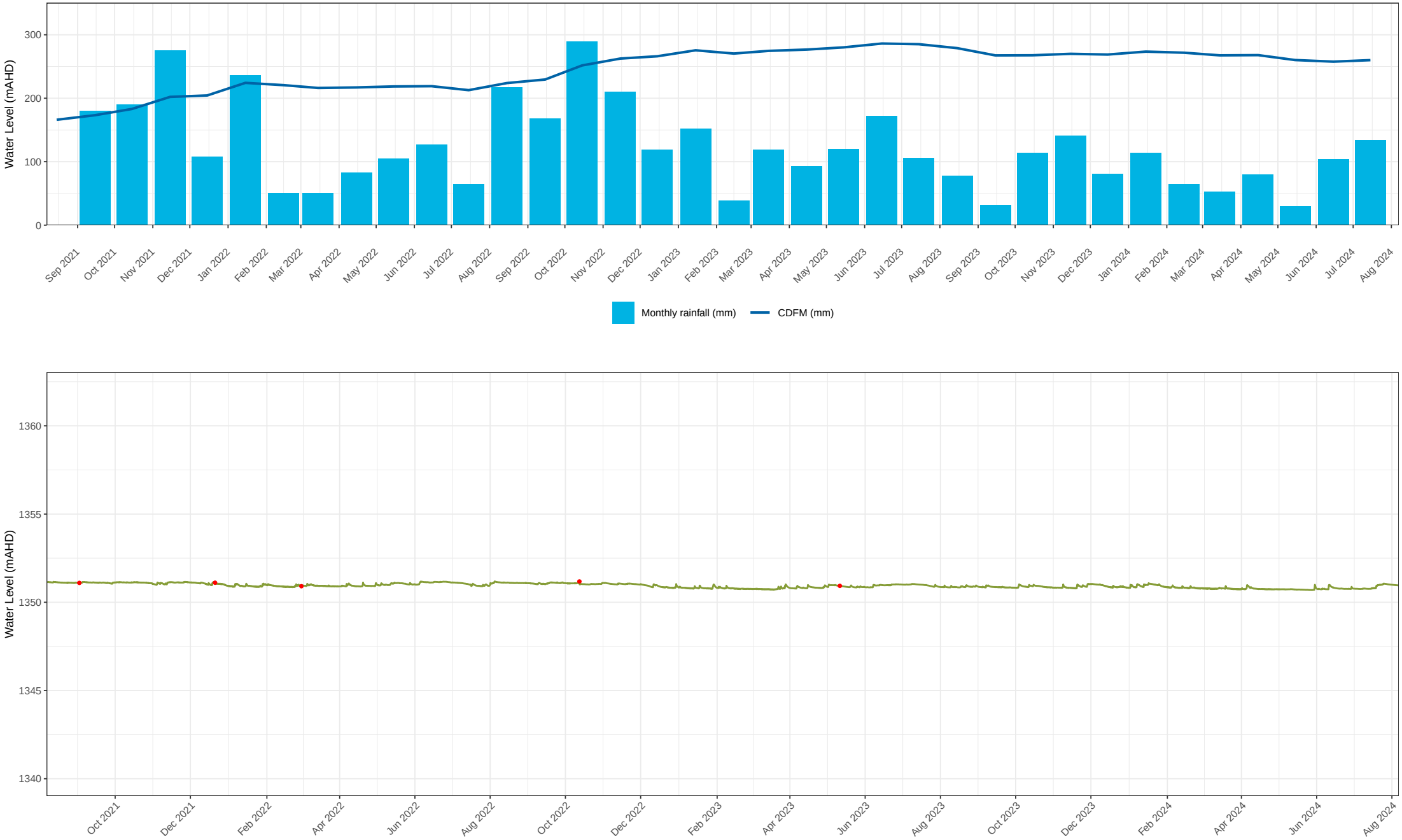
EMM
creating opportunities

Table B.1 Groundwater quality trigger value groups

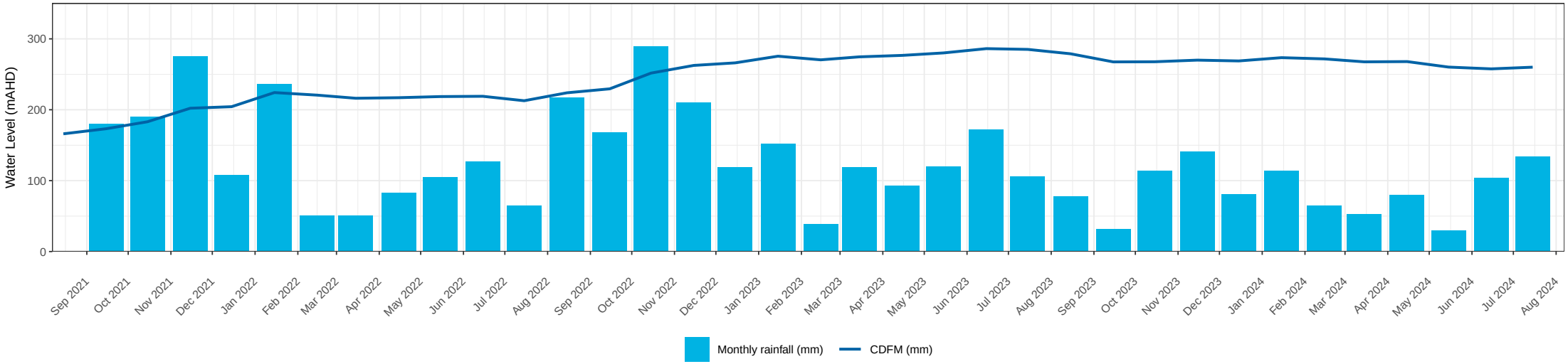
Analyte	Unit	Gooandra Volcanics	Temperance Formation	Boggy Plain Suite	Tantangara Formation	Kellys Plain Volcanics	Tertiary basalt	Plateau bogs/fens	Ravine Beds East	Ravine Beds West	Boraig Group	Yarrangobilly Caves
Field Parameters												
Electrical conductivity	µS/cm	30-350	*SSTV*	30-350	30-350	30-350	30-350	30-350	30-350	*SSTV*	30-350	30-350
pH	-	6.5-8.0	6.5-8.0	6.5-8.0	6.5-8.0	6.5-8.0	6.5-8.0	*SSTV*	6.5-8.0	6.5-8.0	6.5-8.0	6.5-8.0
Analytical results – nutrients												
Total nitrogen	µg/L	0.25	0.25	*SSTV*	0.25	0.25	0.25	*SSTV*	0.25	0.25	0.25	0.25
Reactive phosphorus	µg/L	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Analytical results – metals (dissolved)												
Aluminium (Al)	µg/L	0.027	0.027	*SSTV*	0.027	0.027	0.027	*SSTV*	0.027	0.027	0.027	*SSTV*
Copper (Cu)	µg/L	*SSTV*	*SSTV*	*SSTV*	0.001	0.001	*SSTV*	0.001	0.001	0.001	*SSTV*	*SSTV*
Iron (Fe)	µg/L	0.34	0.34	0.34	0.34	0.34	0.34	*SSTV*	0.34	0.34	0.34	0.34
Lead (Pb)	µg/L	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Manganese (Mn)	µg/L	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Nickel (Ni)	µg/L	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
Silver (Ag)	µg/L	0.000026	0.000026	0.000026	0.000026	0.000026	0.000026	0.000026	0.000026	0.000026	0.000026	0.000026
Zinc (Zn)	µg/L	*SSTV*	*SSTV*	*SSTV*	0.00246	0.00246	*SSTV*	*SSTV*	0.00246	0.00246	*SSTV*	0.002

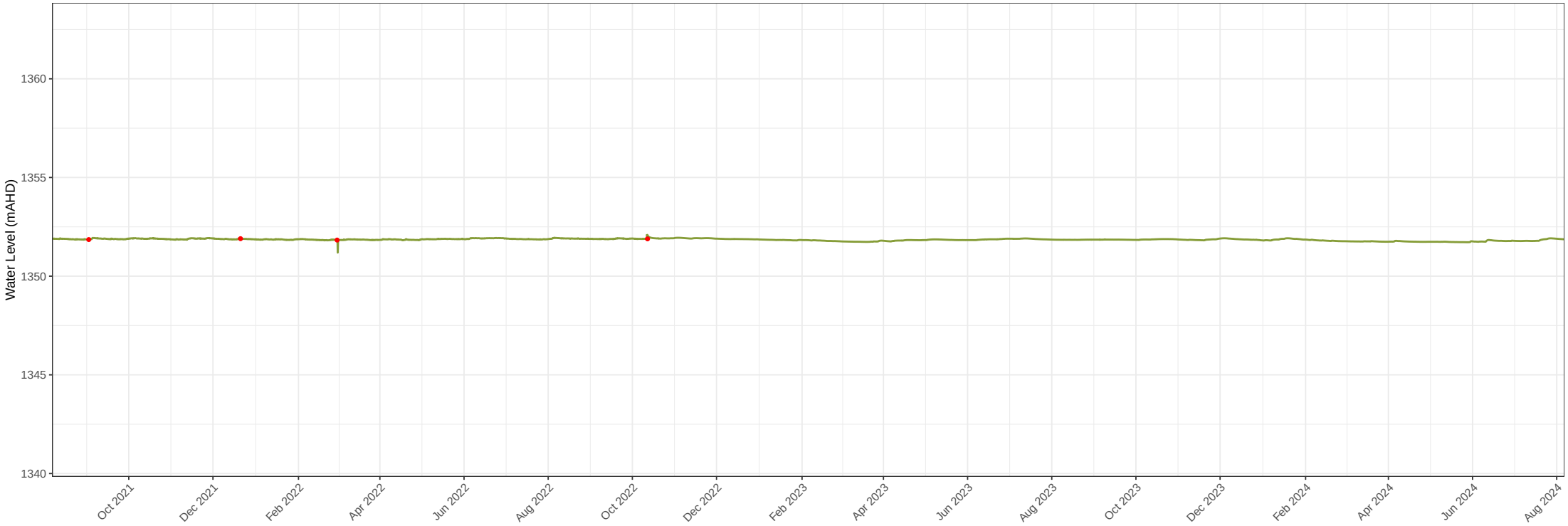
Appendix C
Groundwater level hydrographs

EMM
creating opportunities

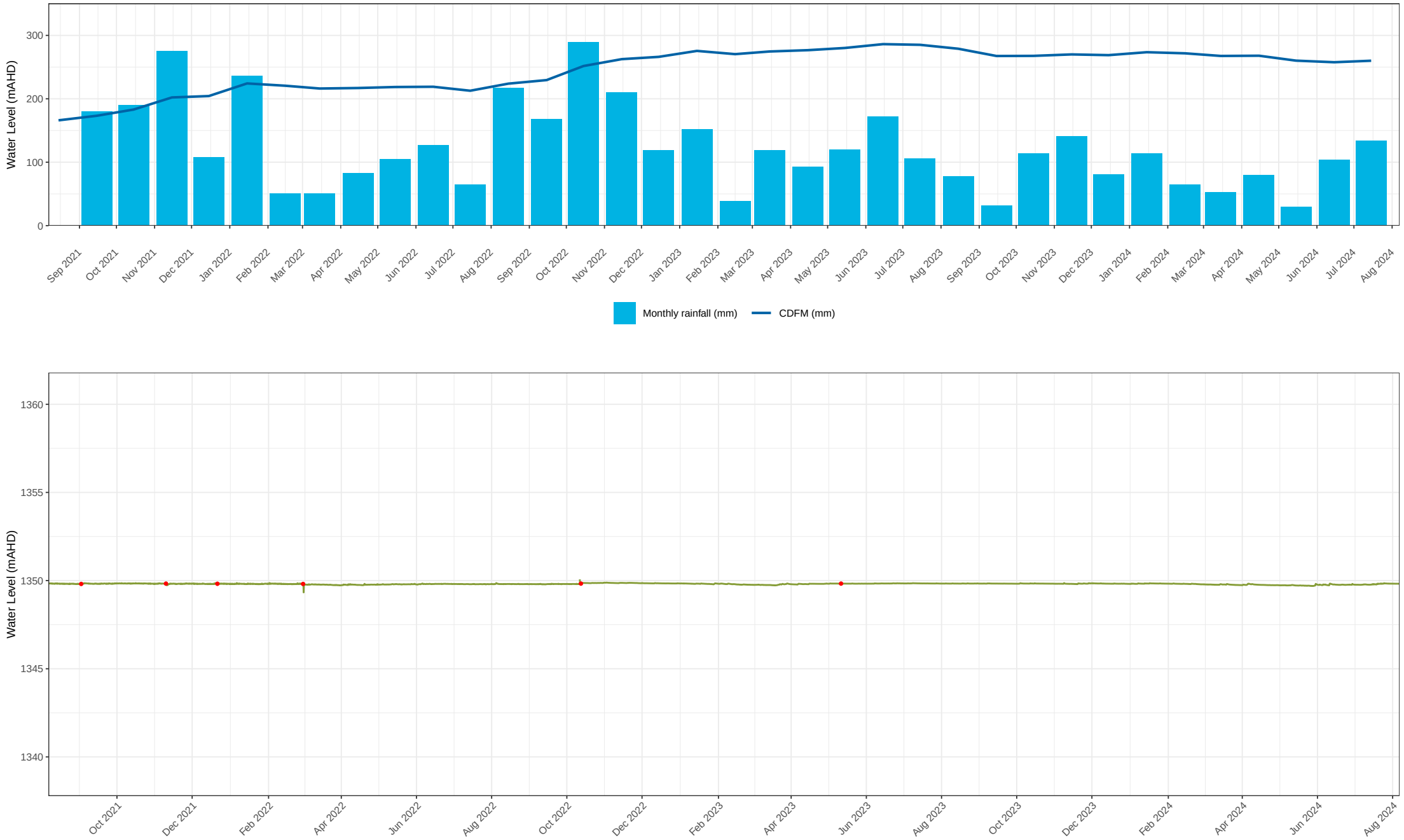


BH01 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 1

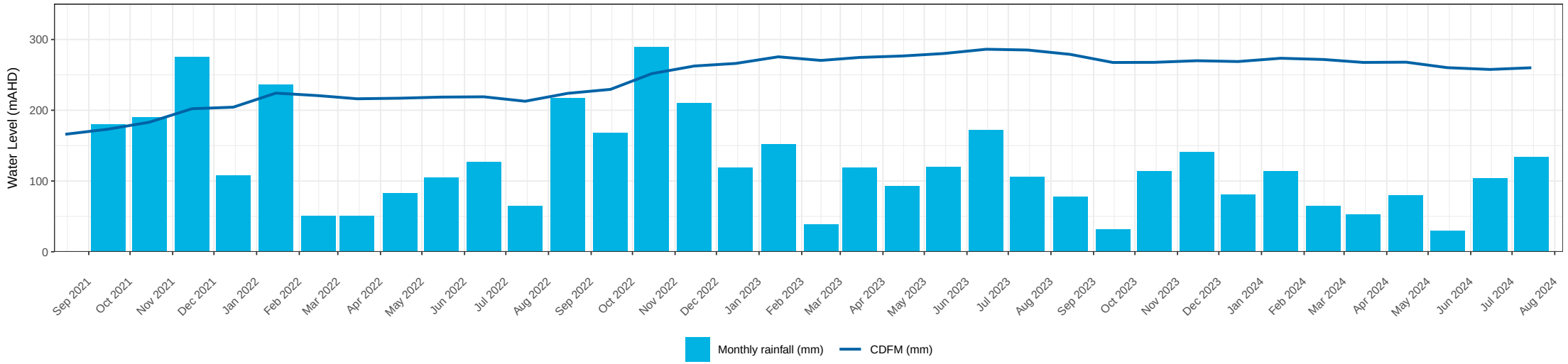


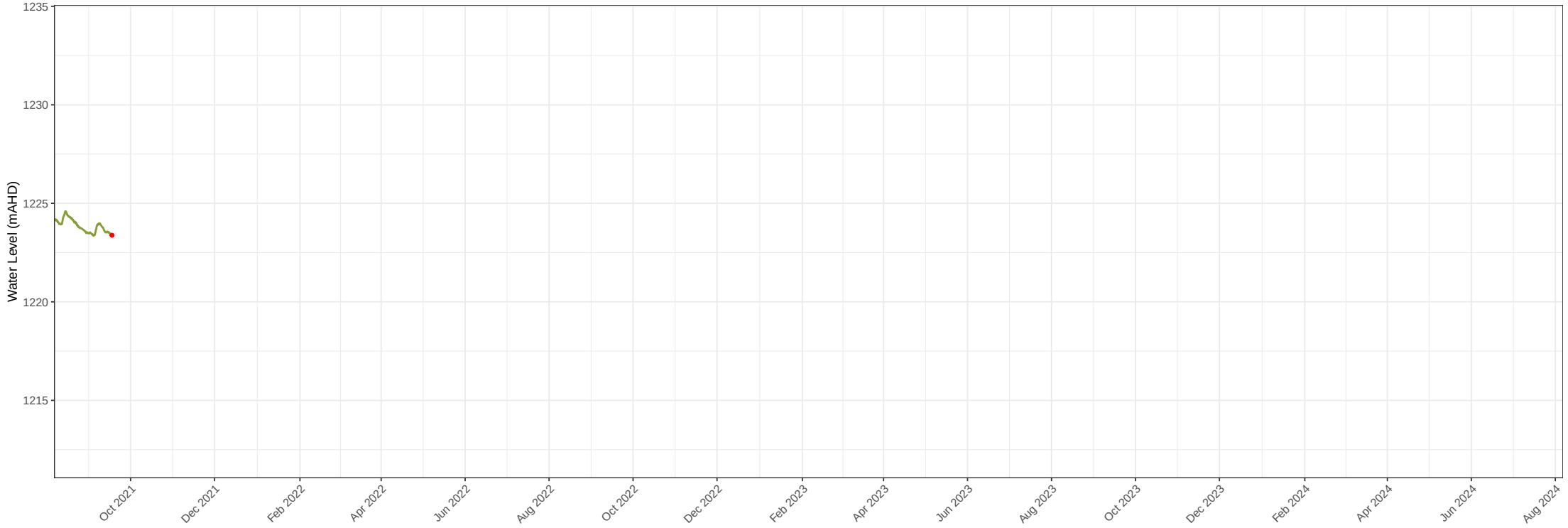


BH02 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 2

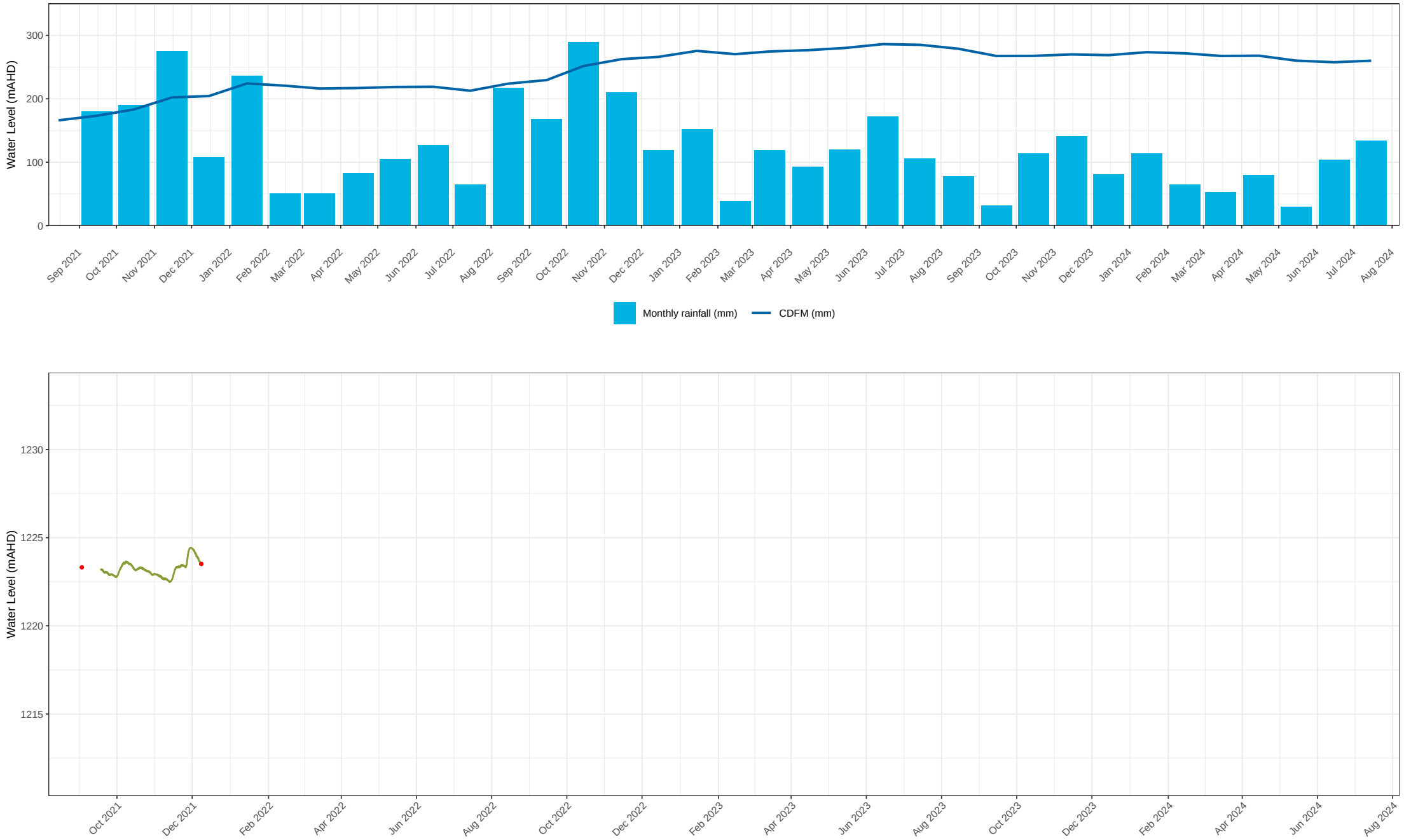


BH03 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 3

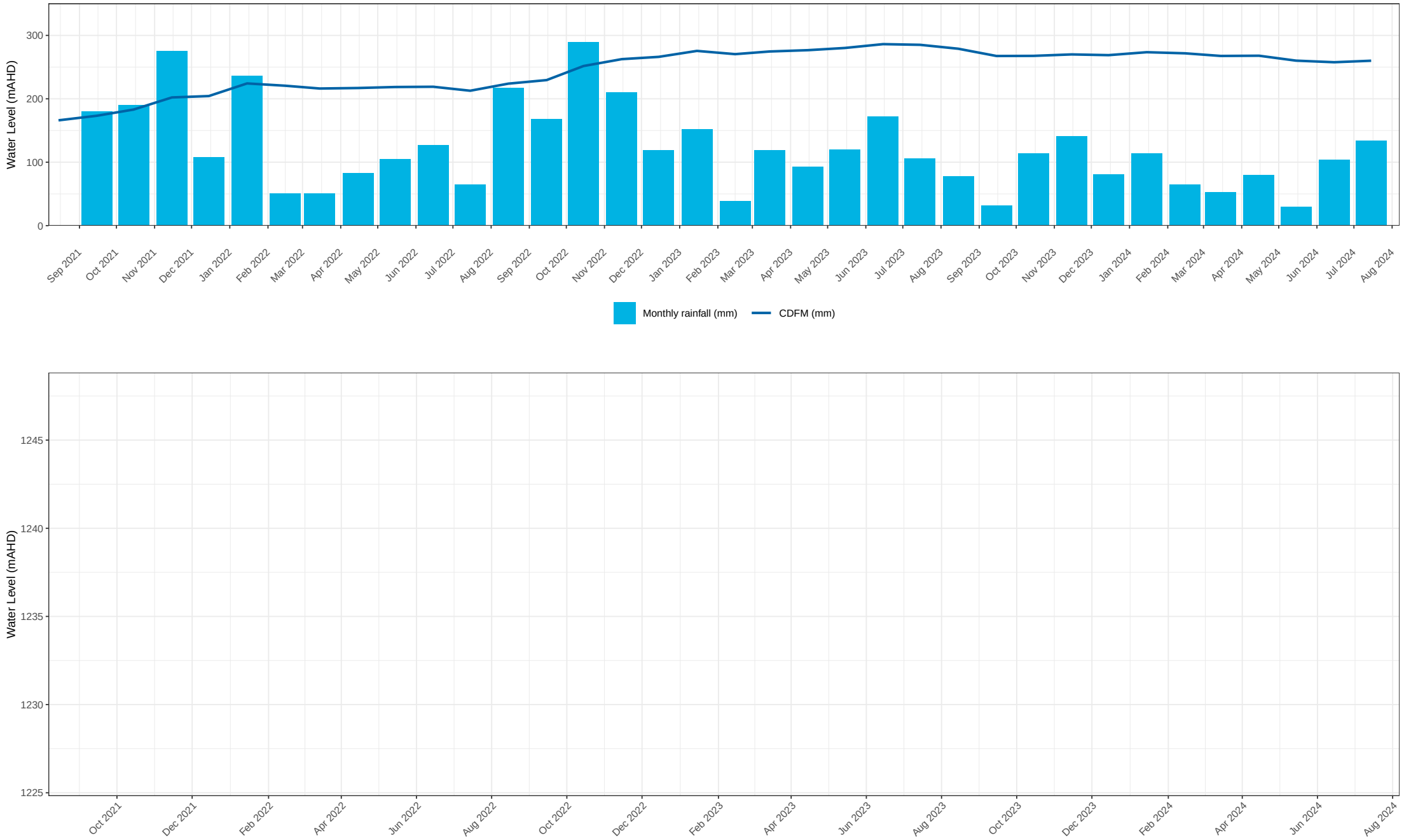




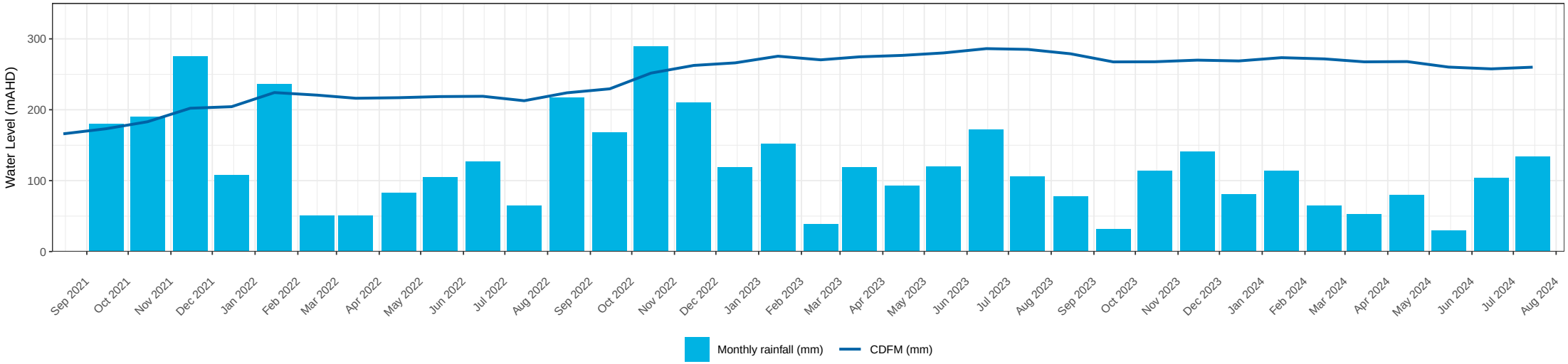
BH1115 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 4

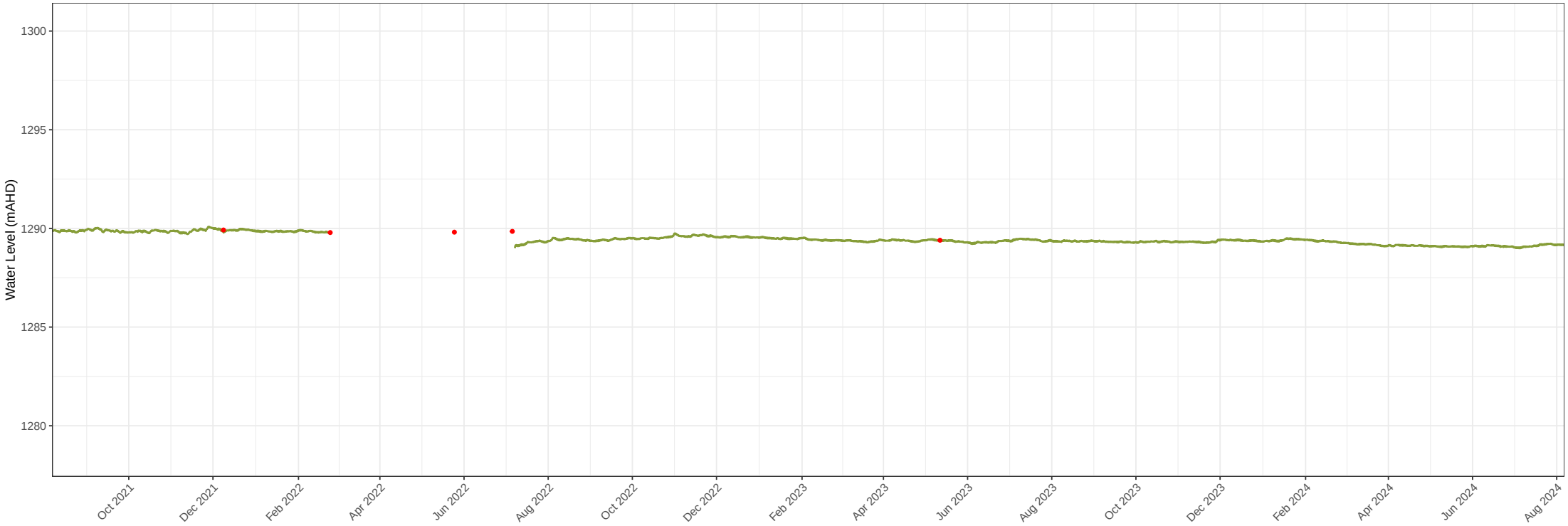


BH1116 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 5

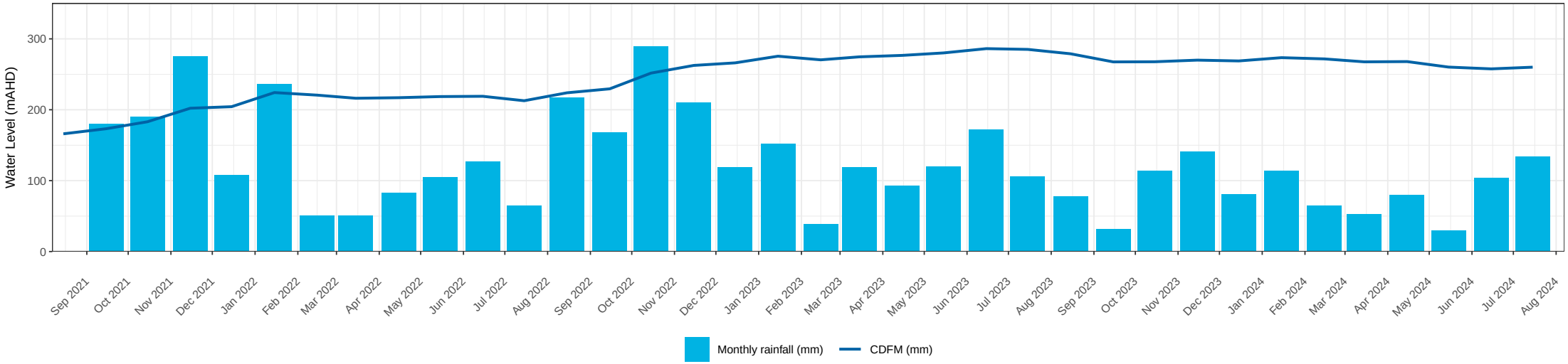


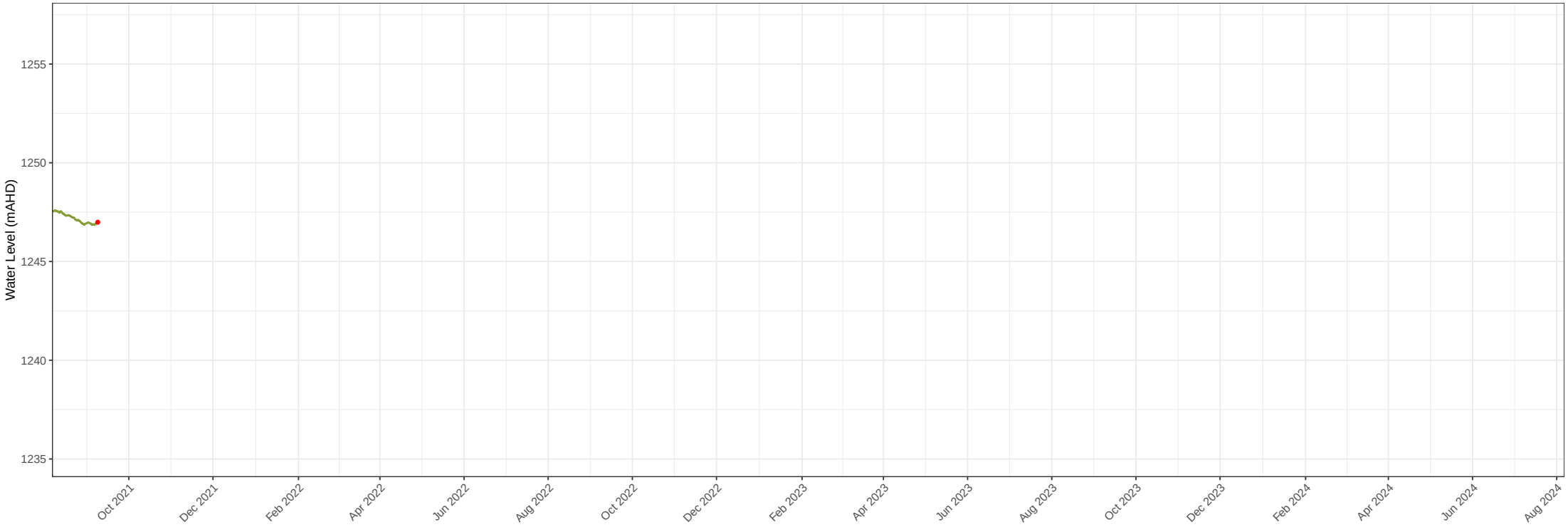
BH1117 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 6



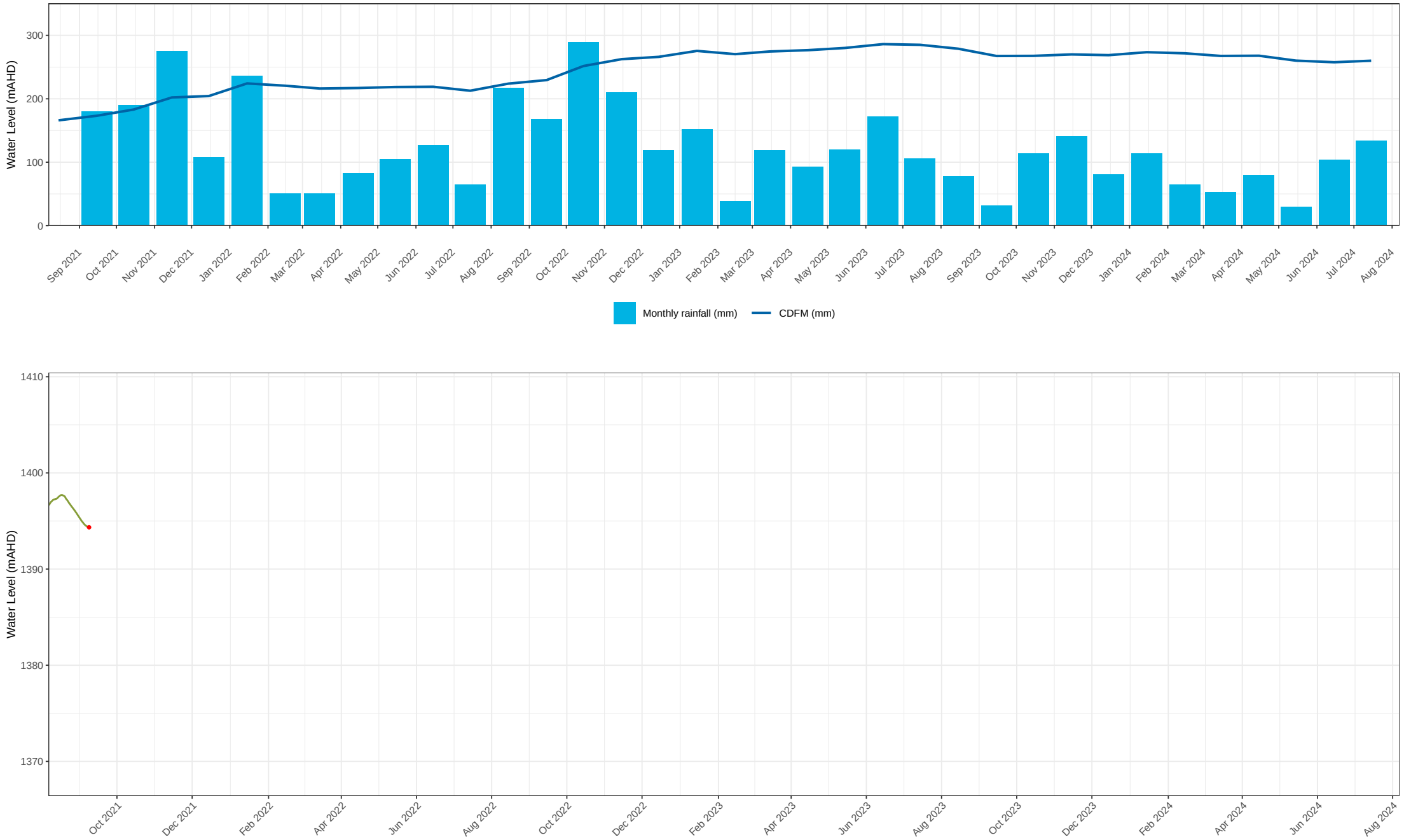


BH2101 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 7

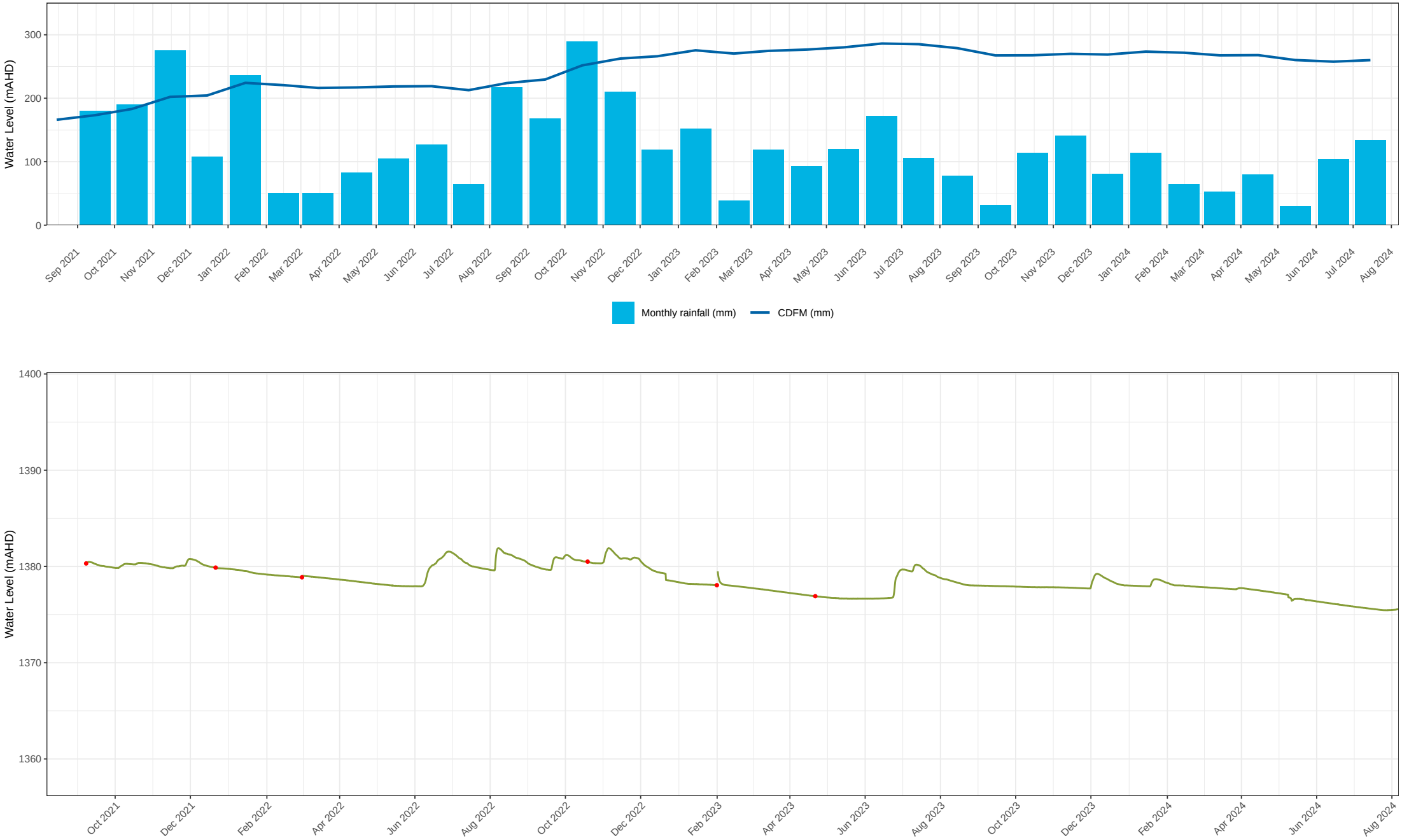




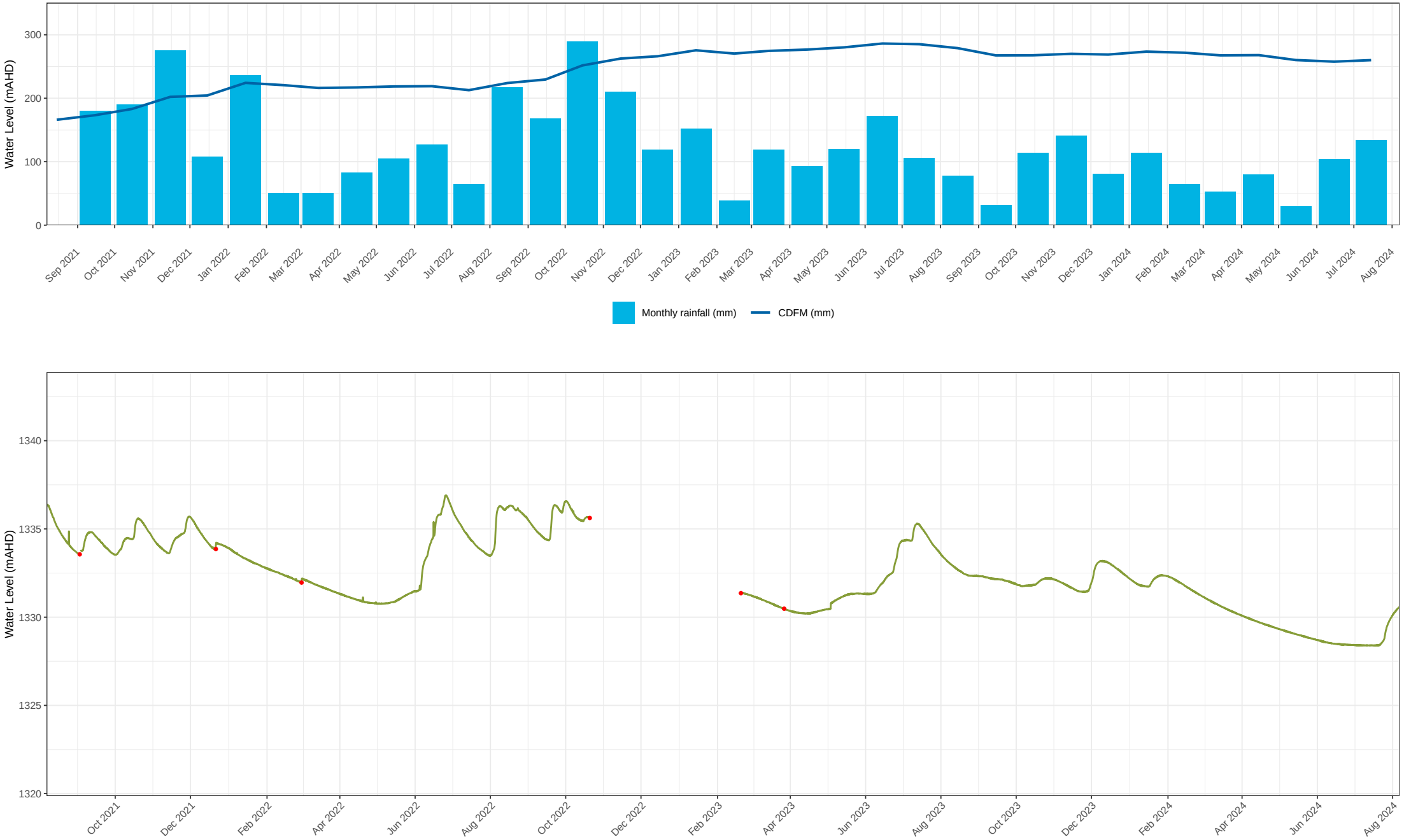
BH2103 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 8



BH3101 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 9



BH3102 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 10

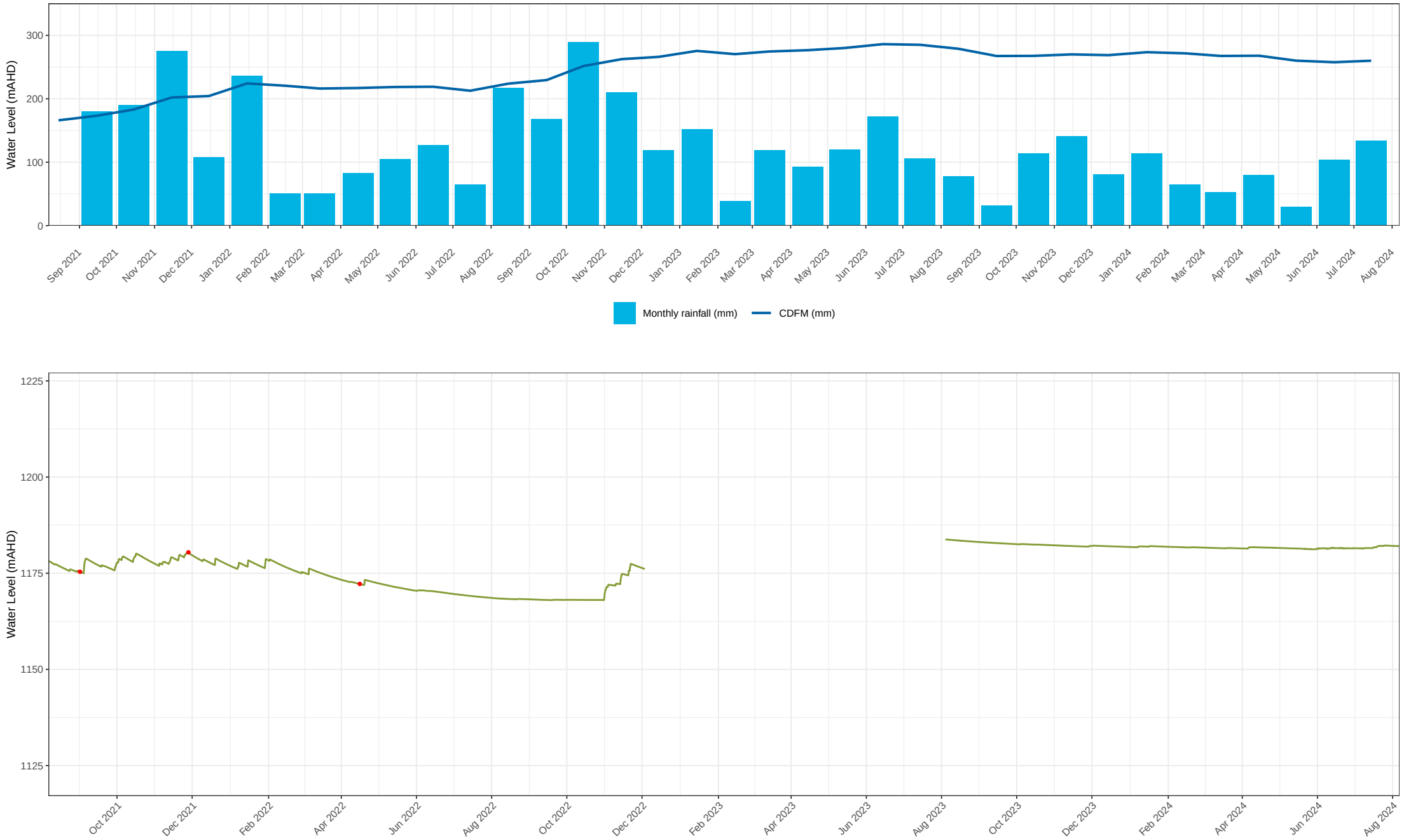


BH3110 groundwater level times series data

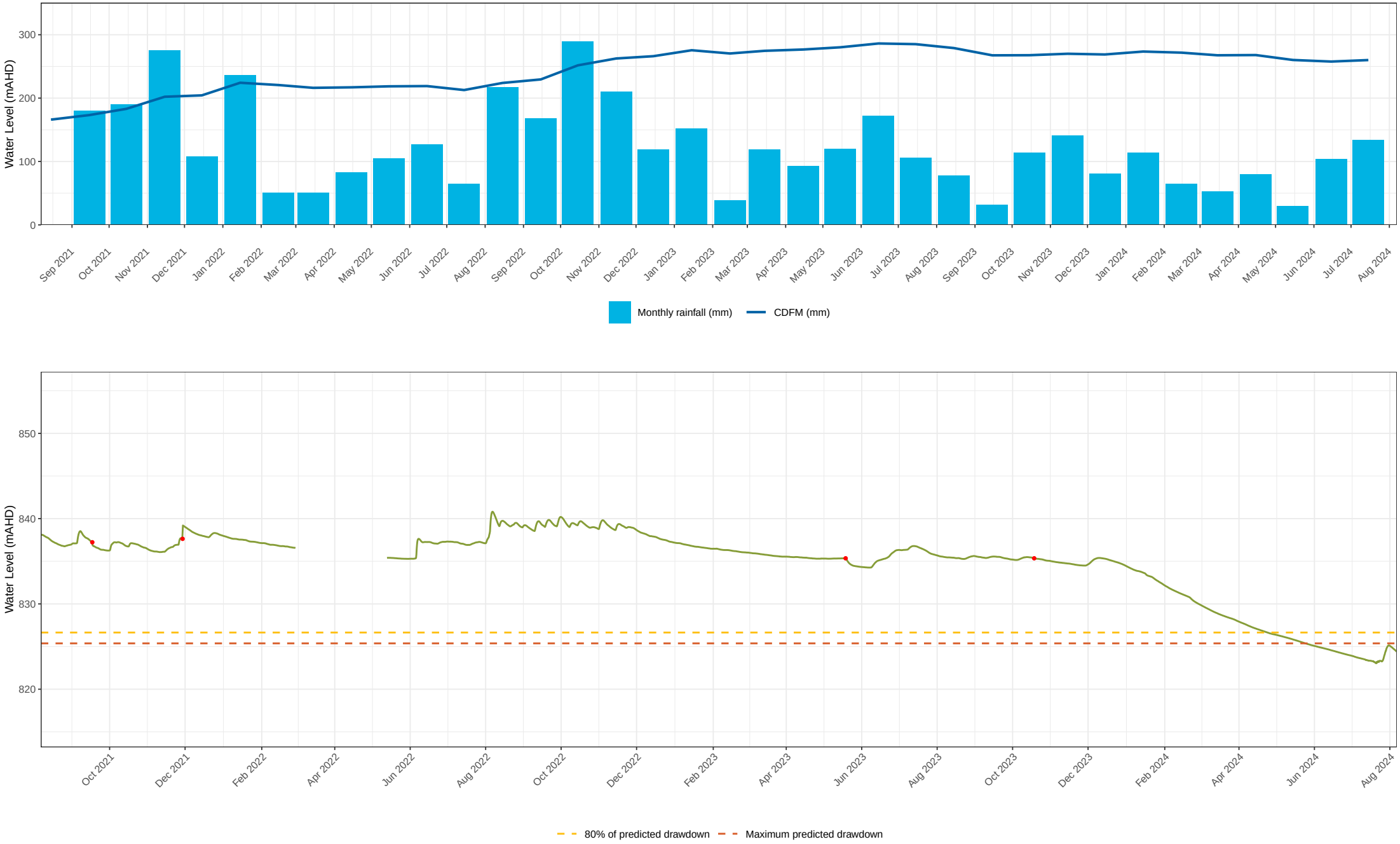
Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 11



BH5105A groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 12

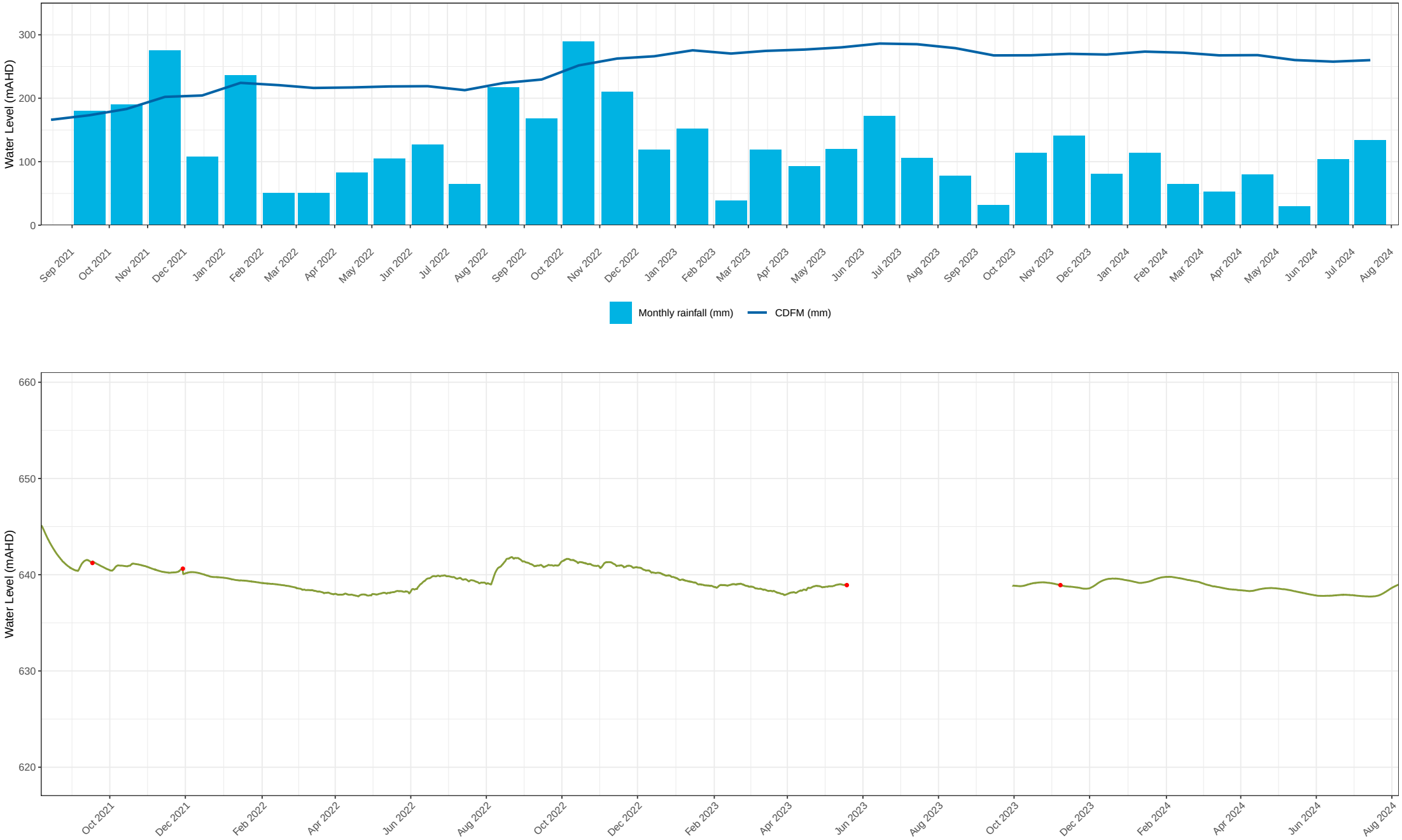


BH6104 groundwater level times series data

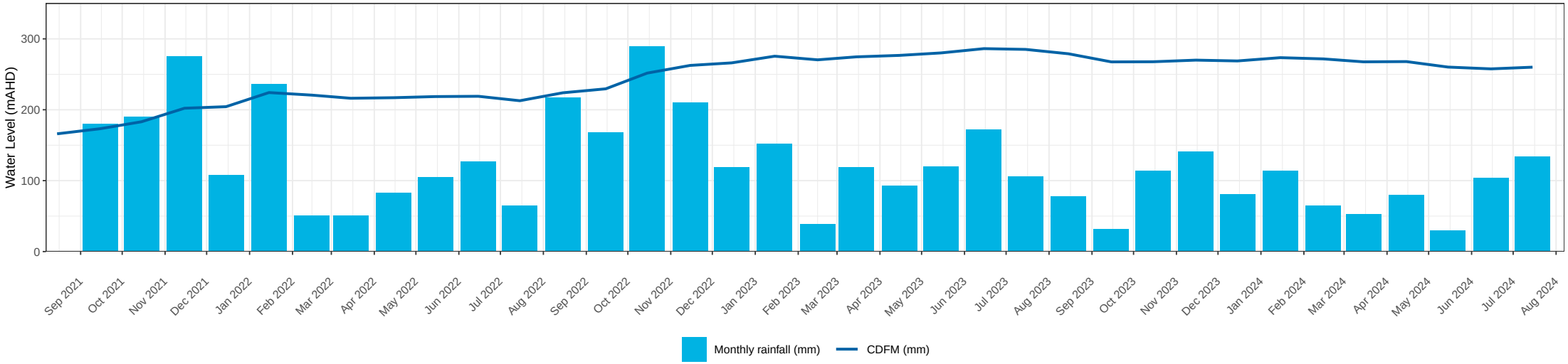
Snowy 2.0 − Snowy Hydro Limited

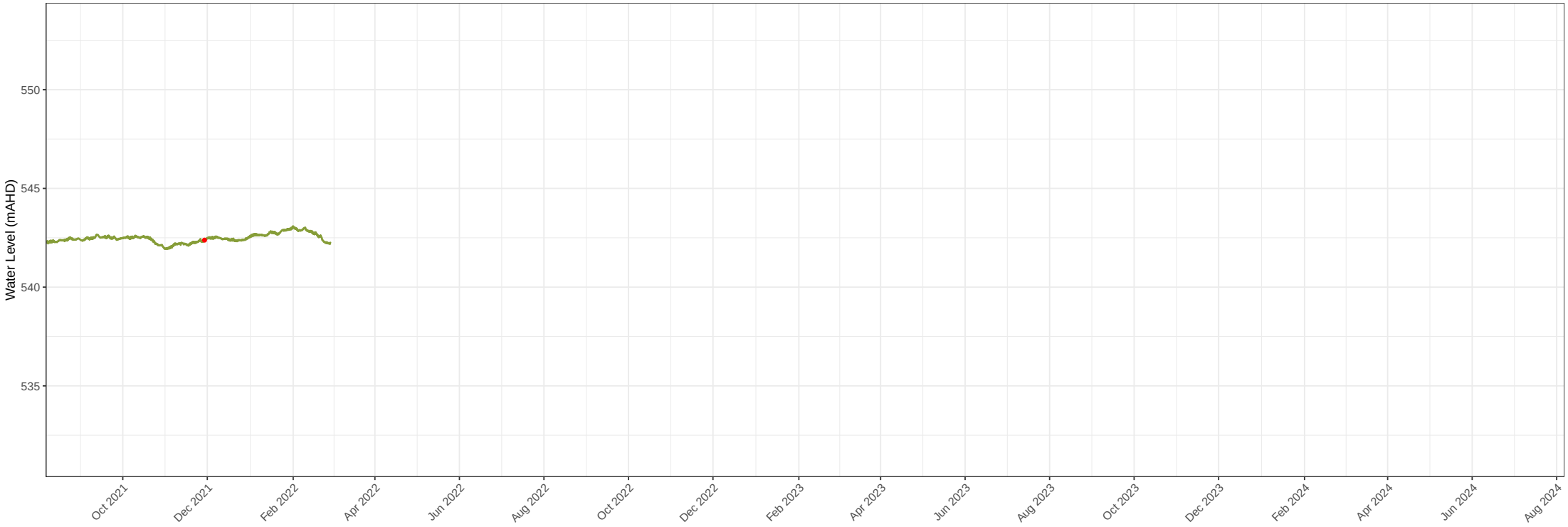
Groundwater monitoring and management

Figure 1. 13

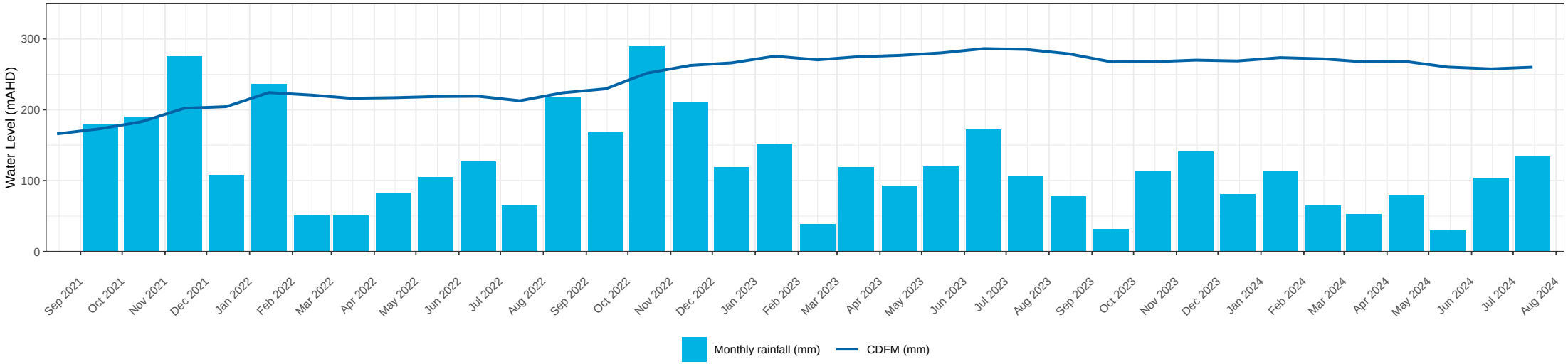


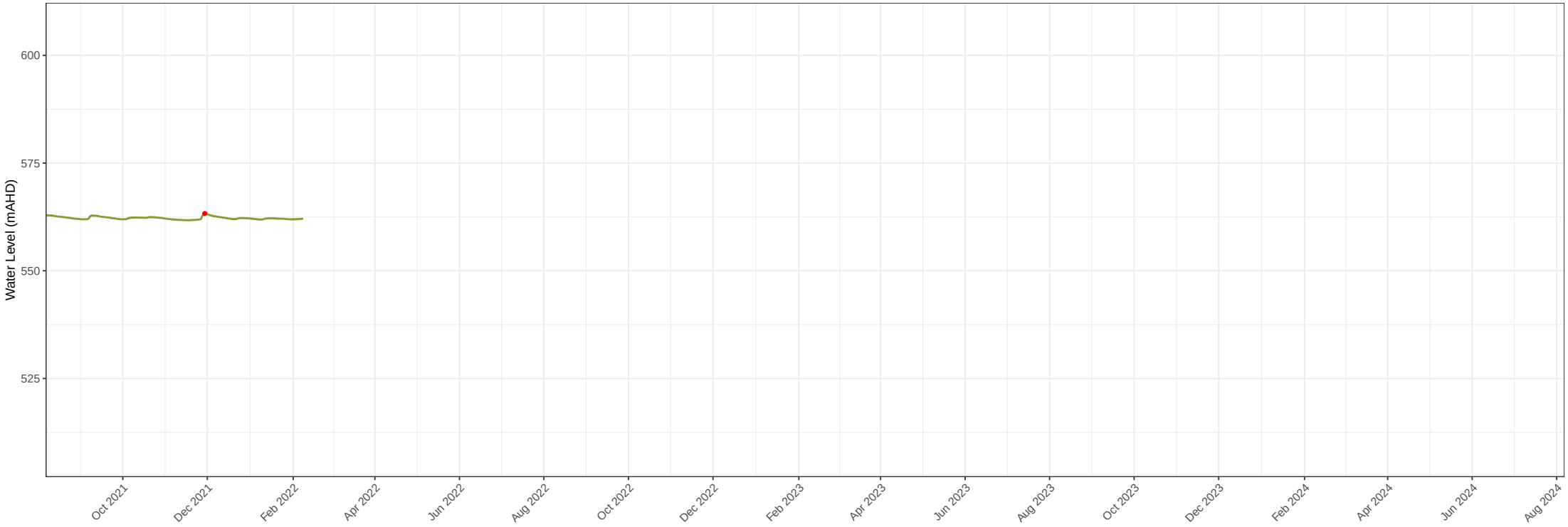
BH6105 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 14



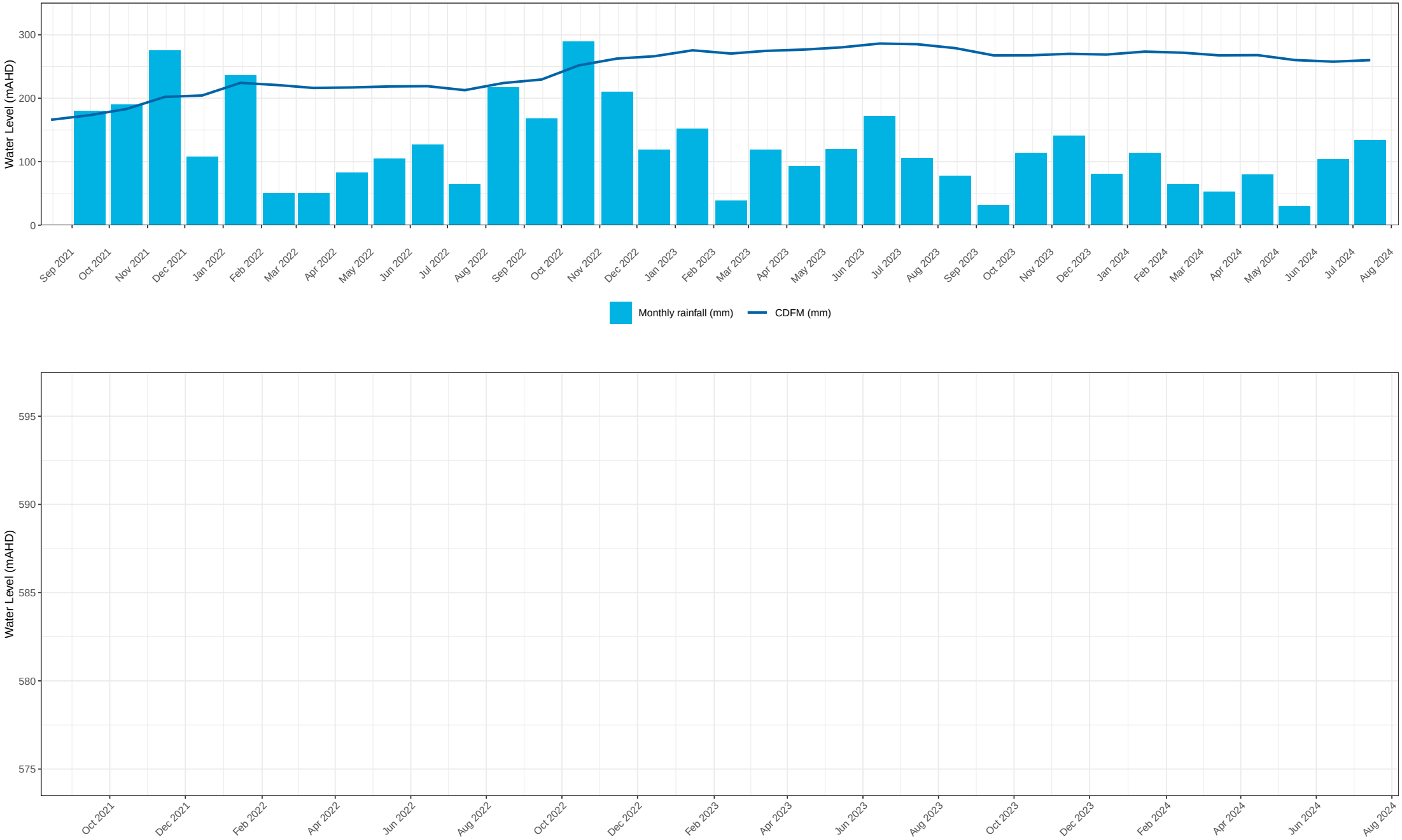


BH7104 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 15

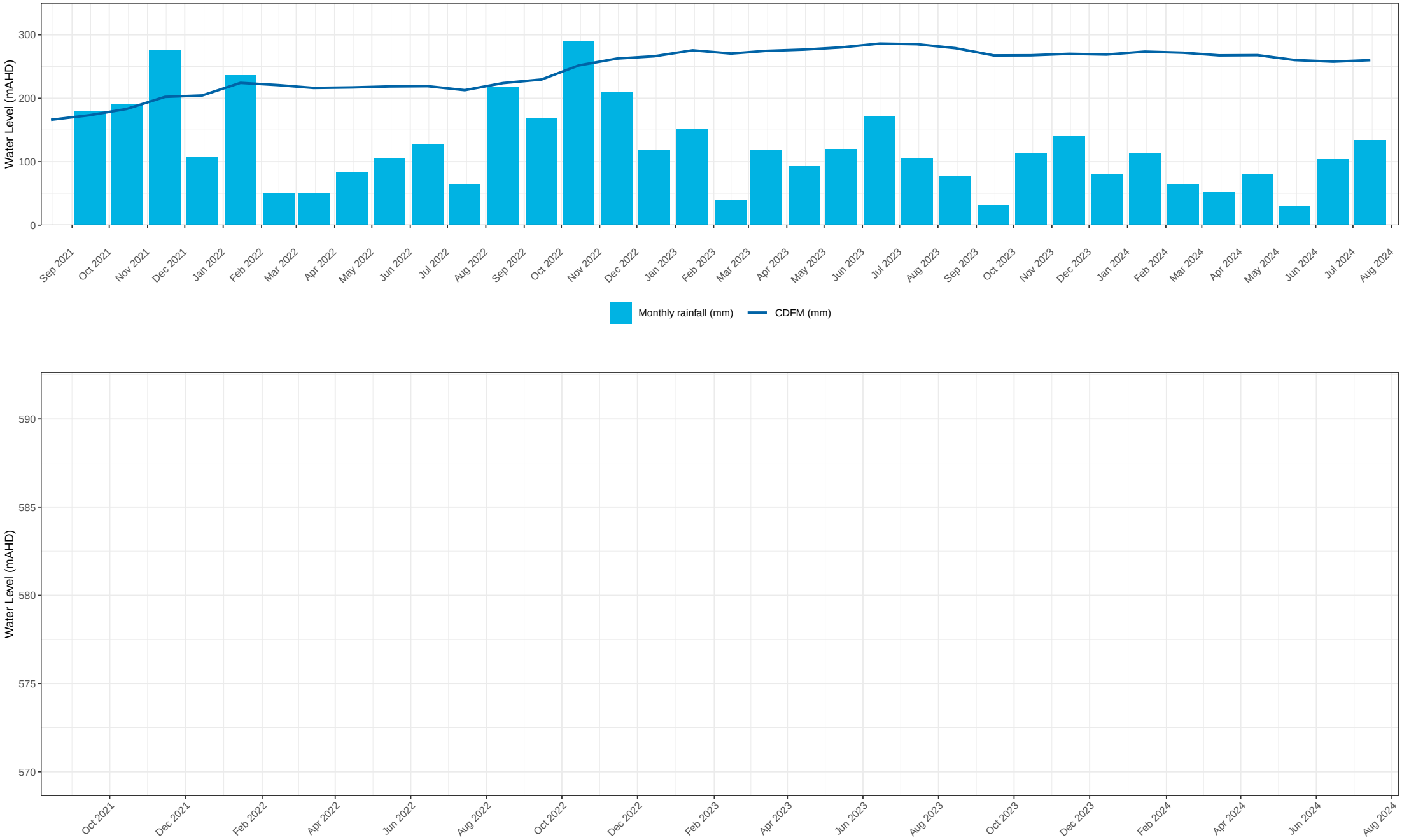




BH7106 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 16



BH8101 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 17

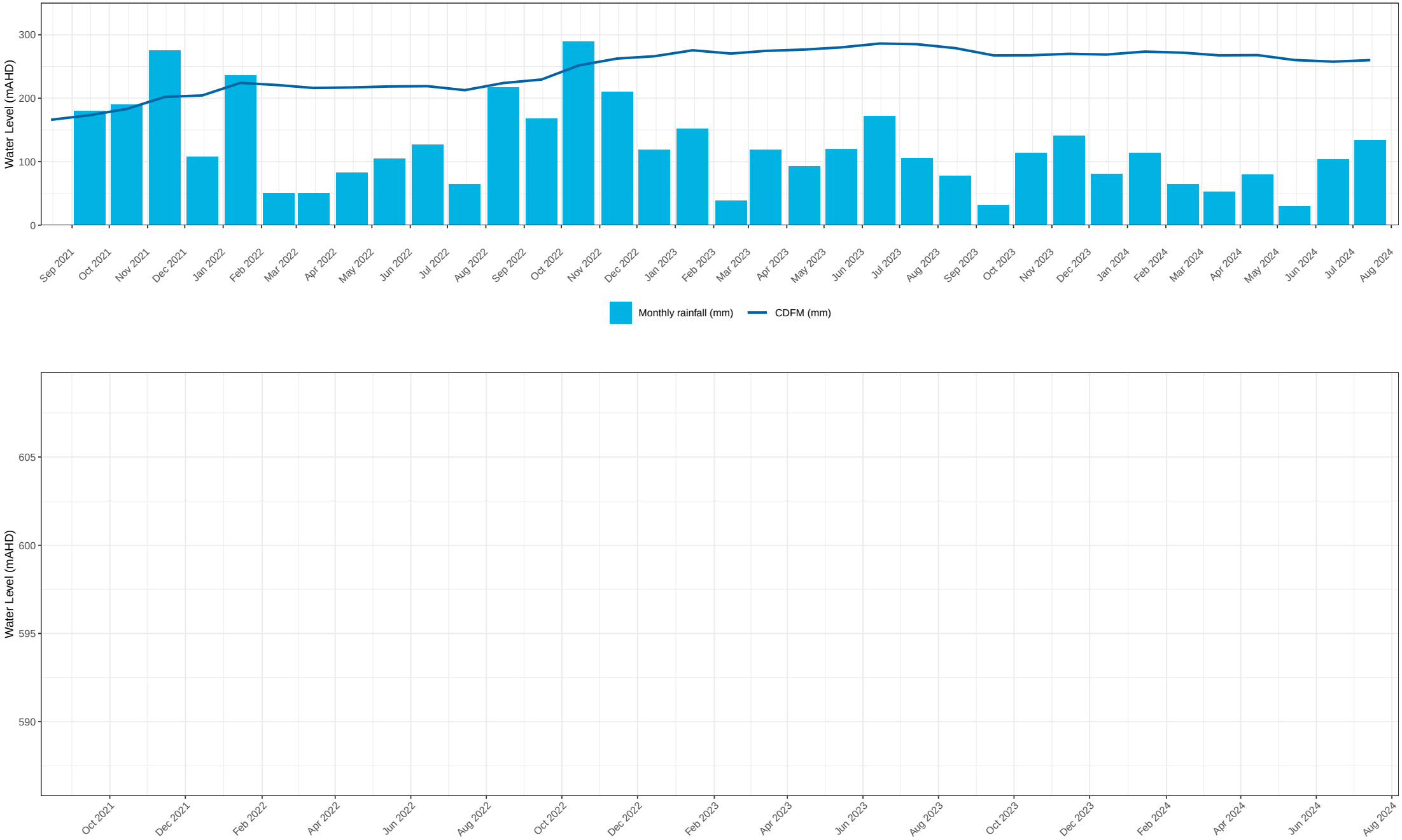


BH8102 groundwater level times series data

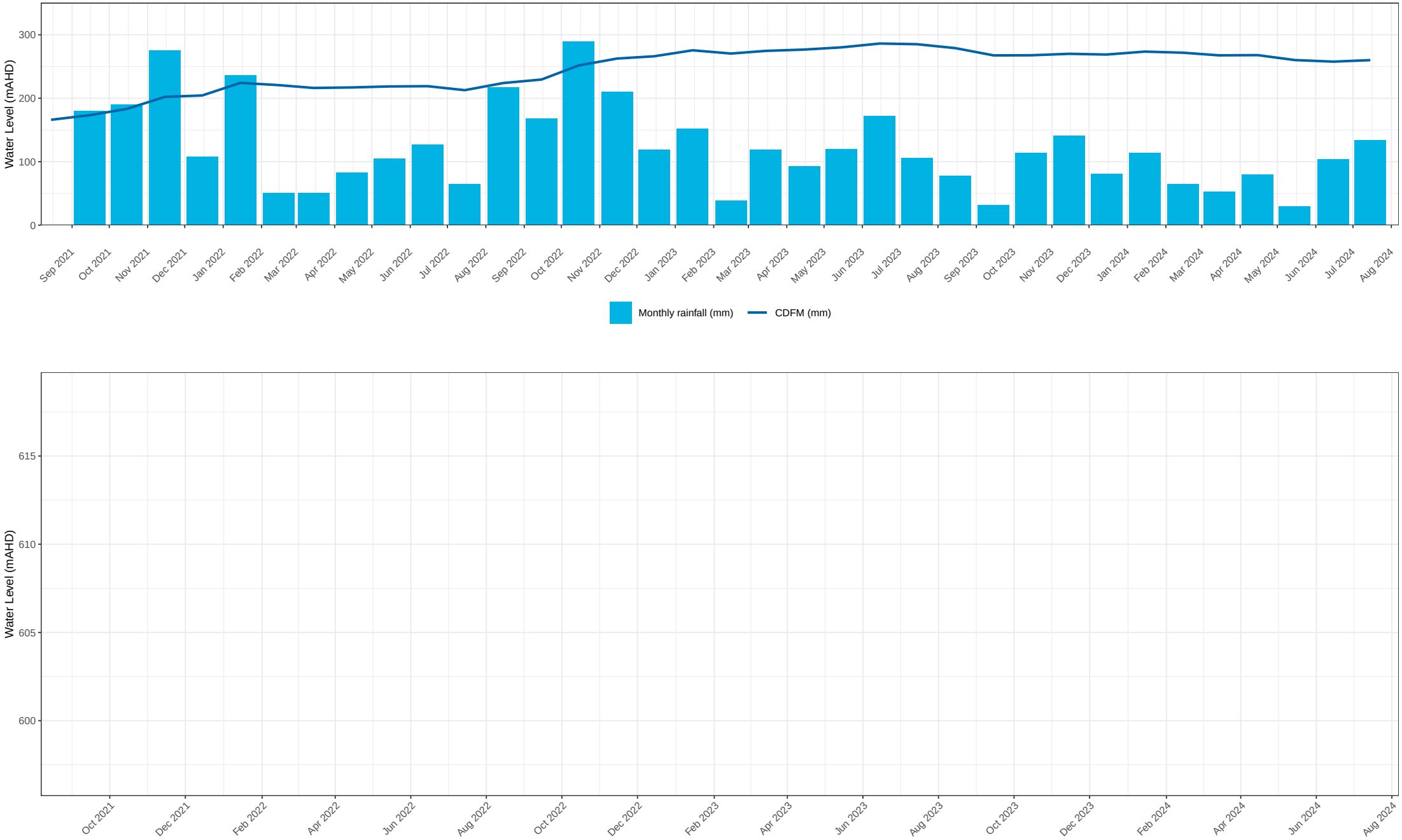
Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 18



BH8105 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 19

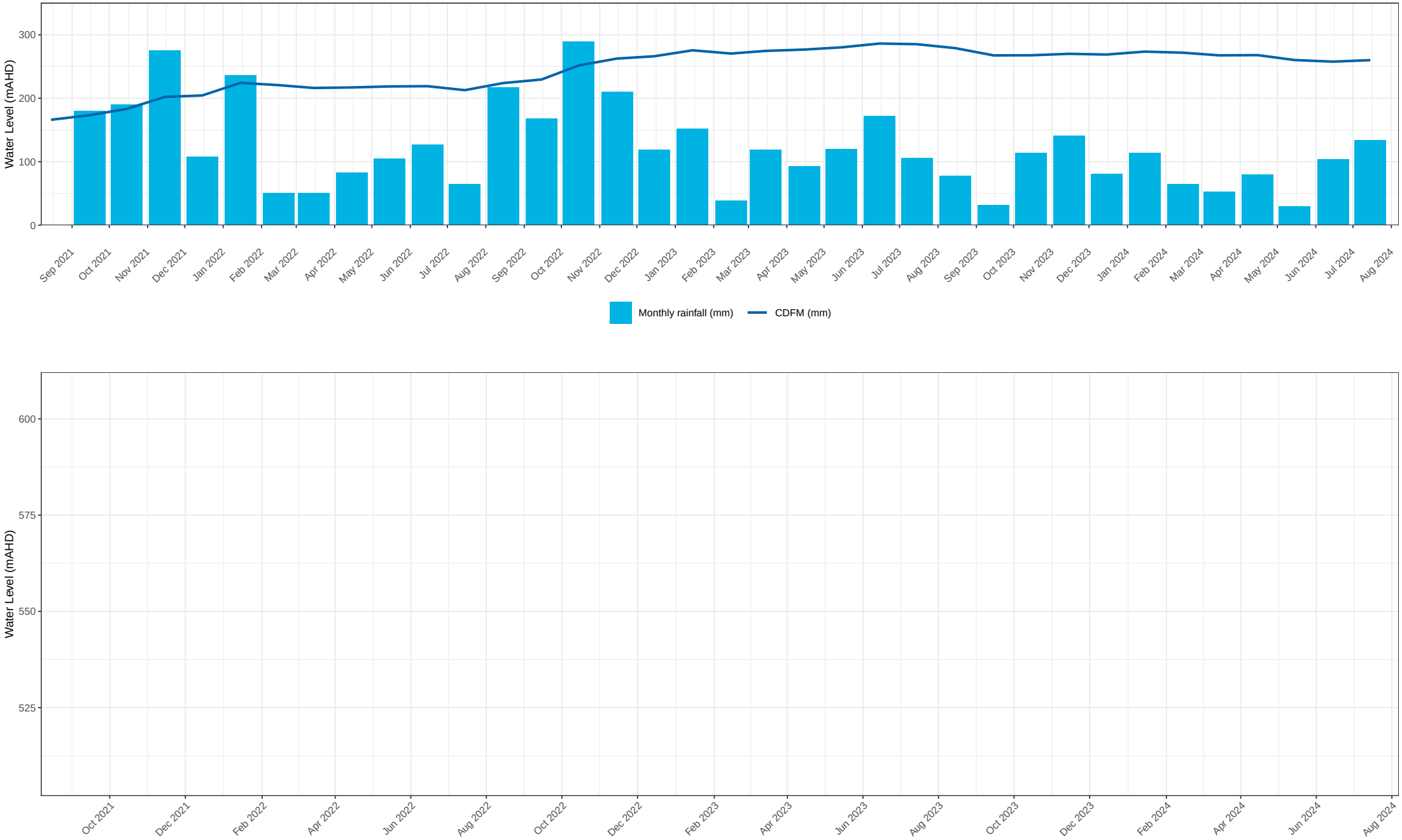


BH8108 groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 20

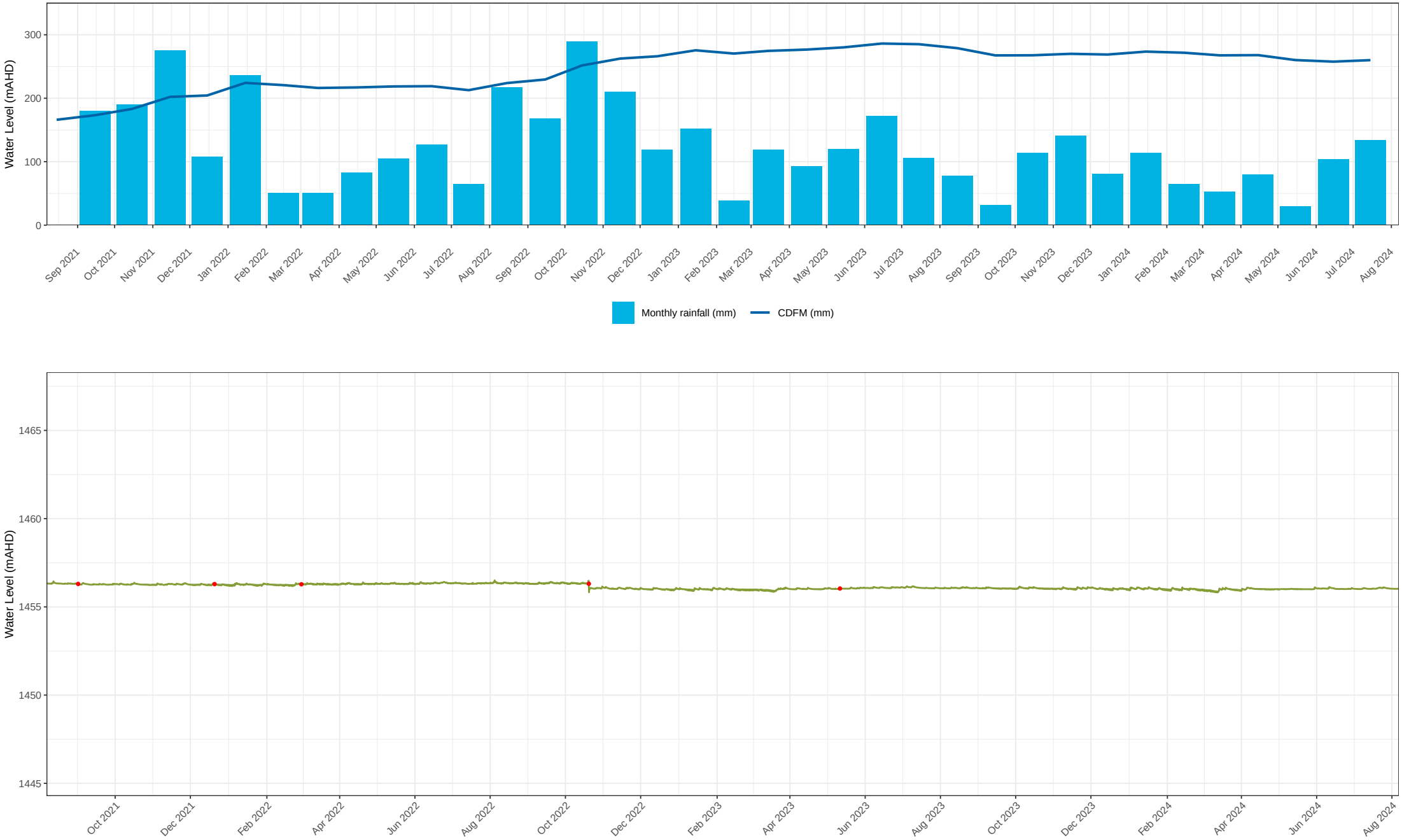


EWPB3 groundwater level times series data

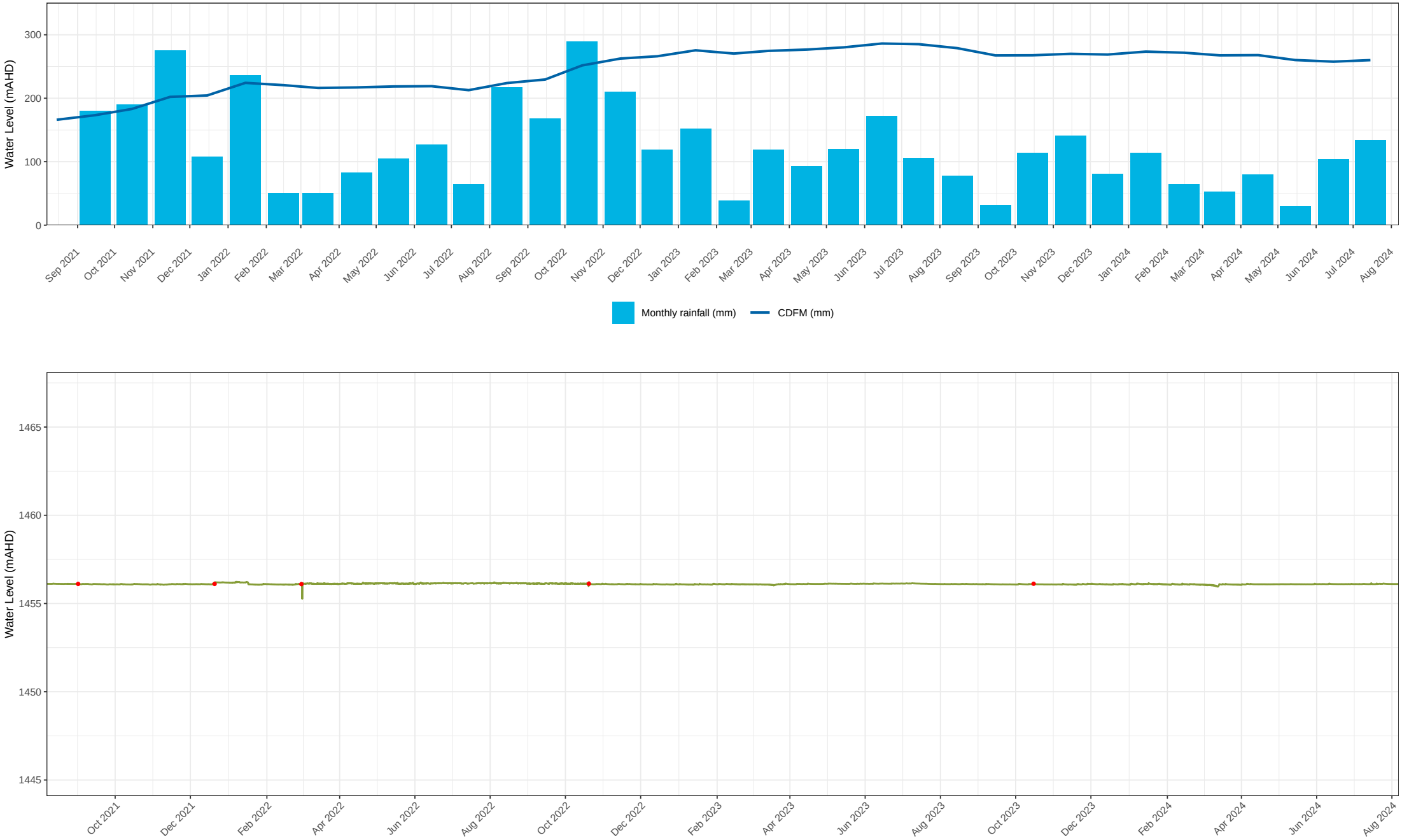
Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

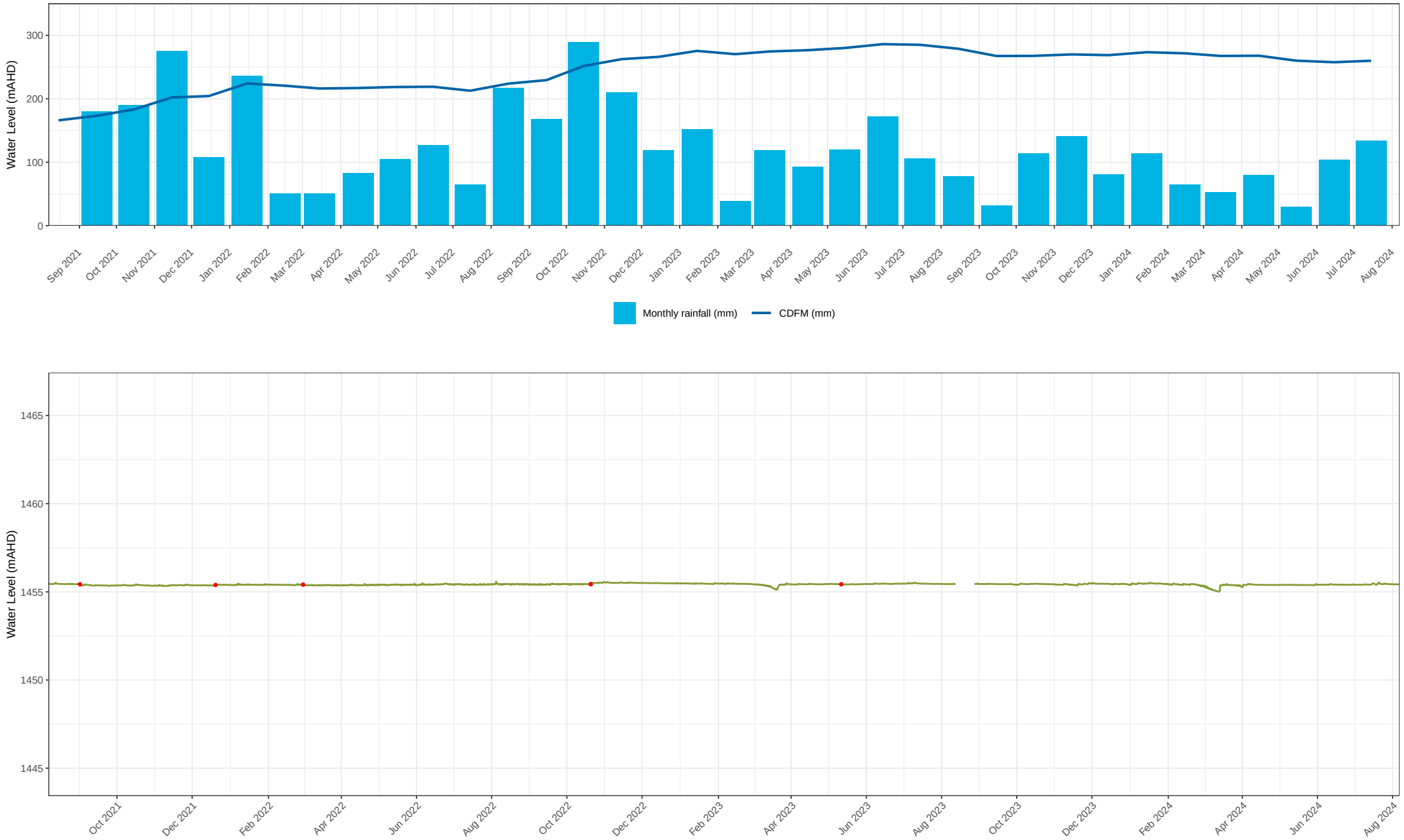
Figure 1. 21



GH01 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 22



GH02 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 23

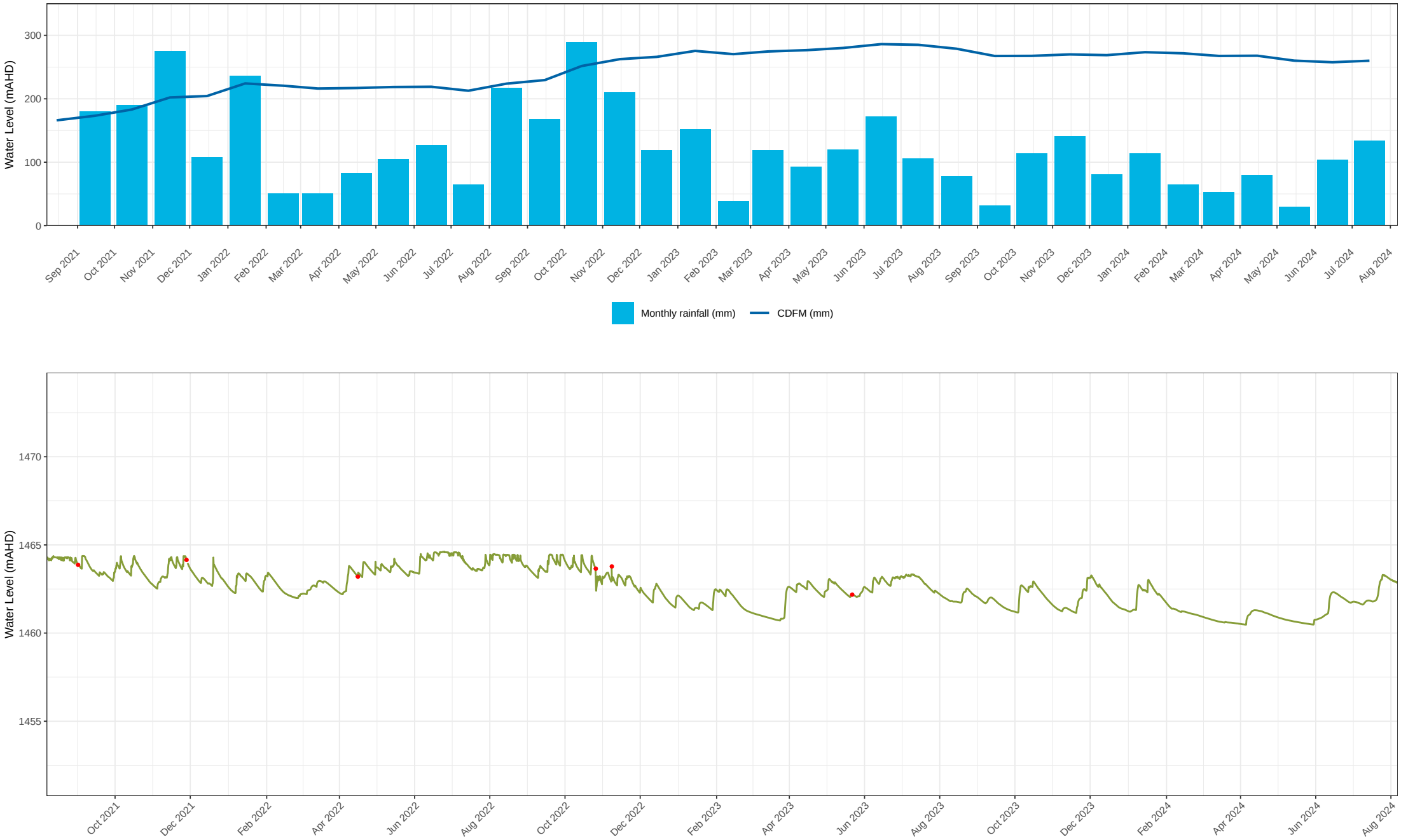


GH03 groundwater level times series data

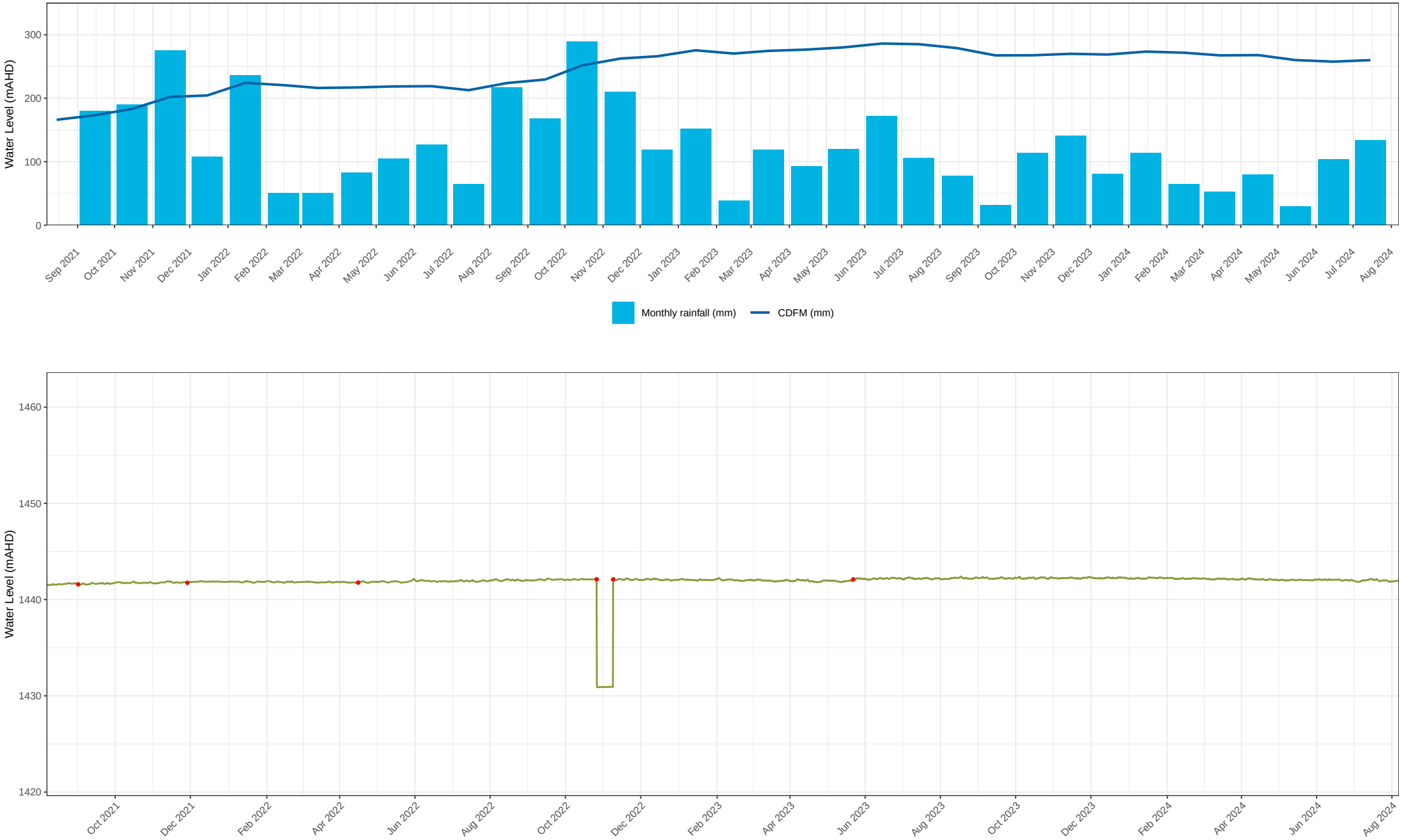
Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

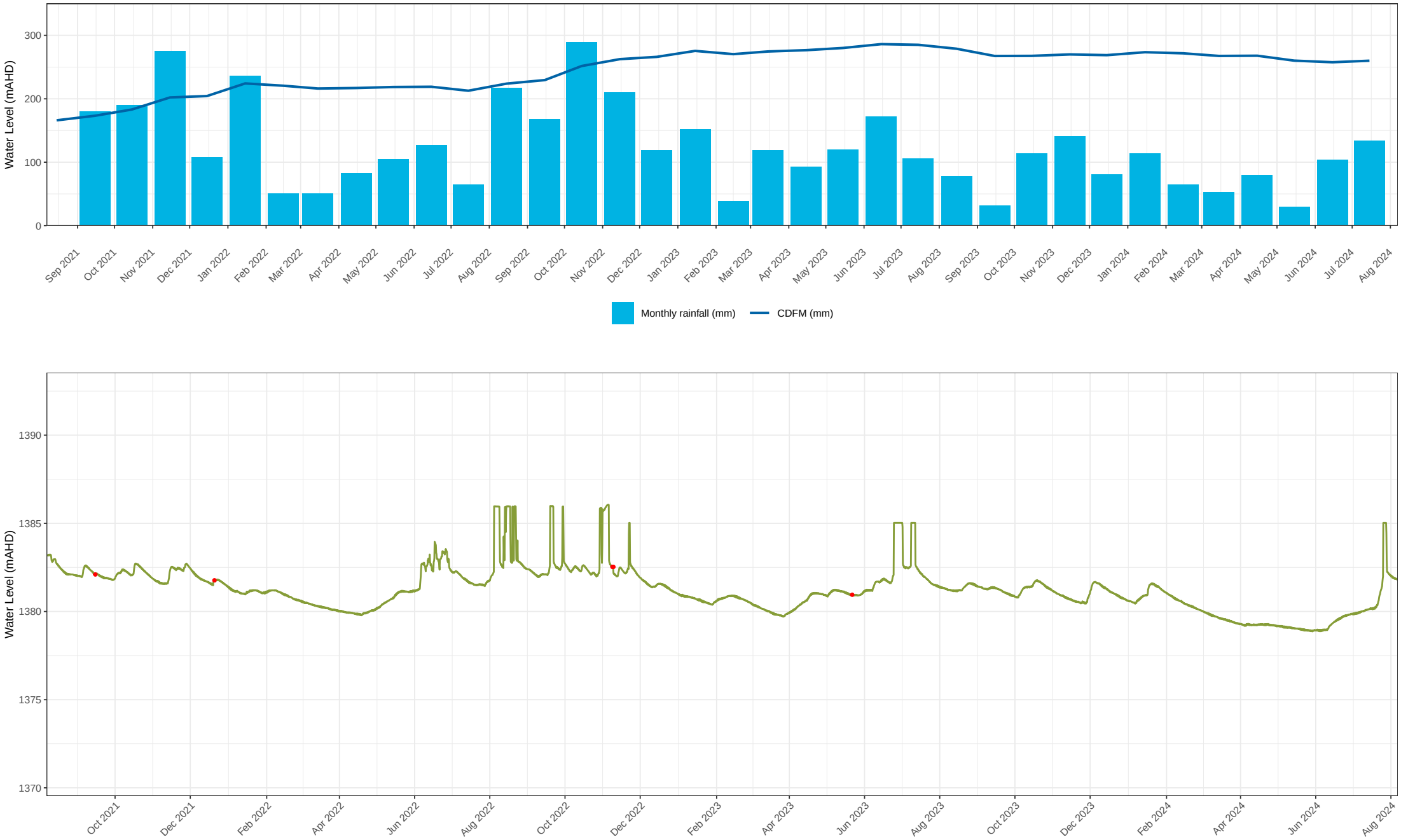
Figure 1. 24



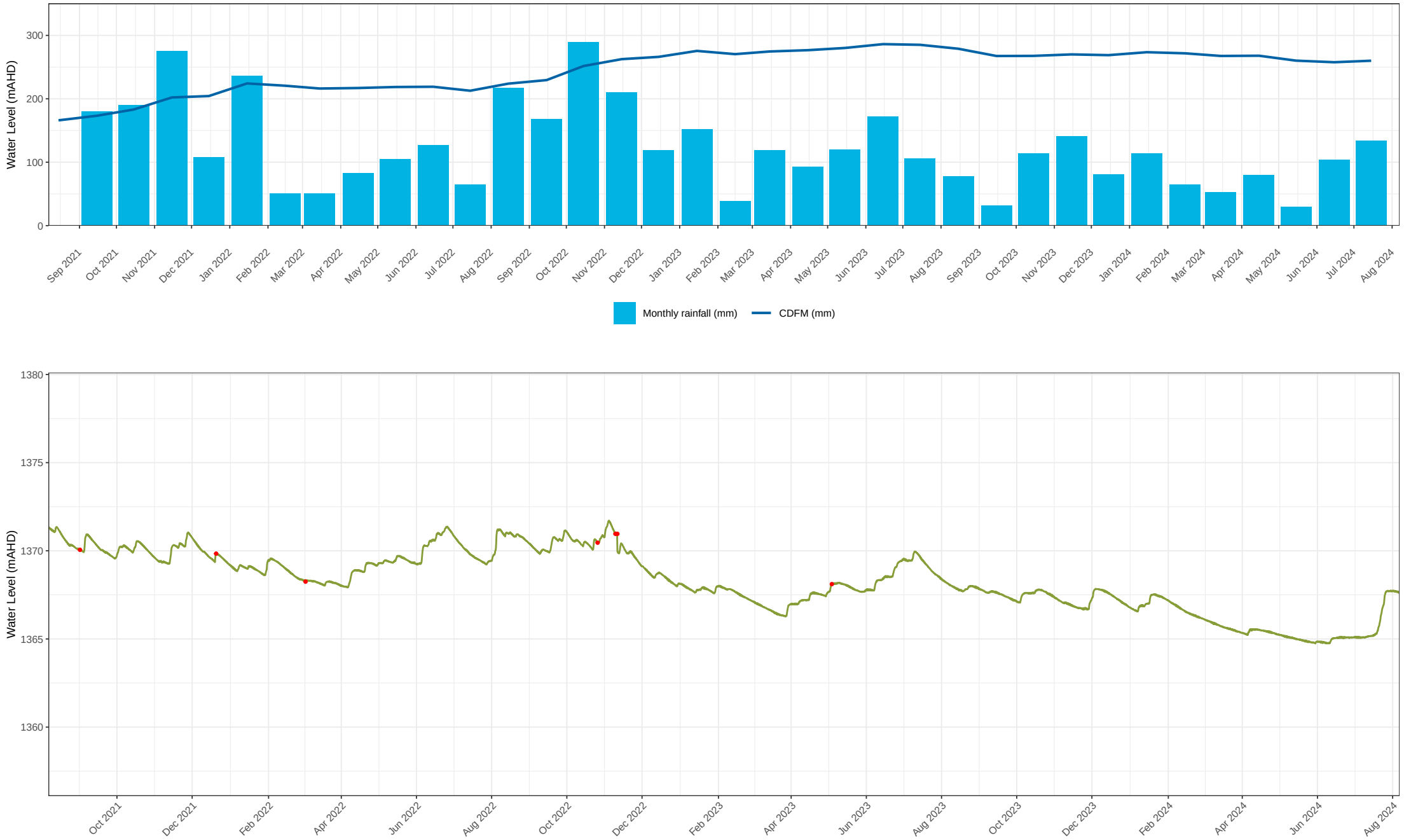
MB01B groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 25



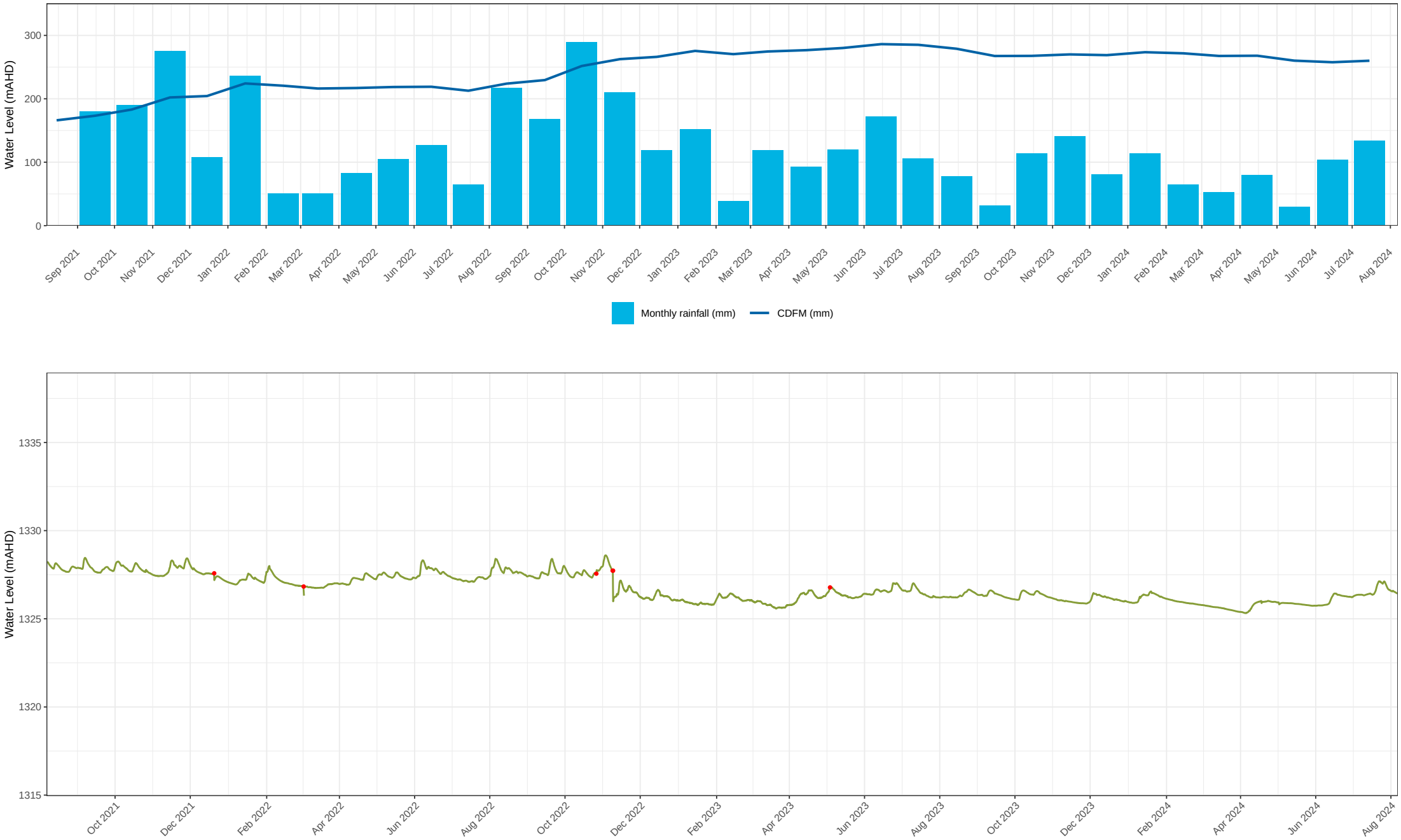
MB01C groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 26



MB02 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 27



MB03 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 28

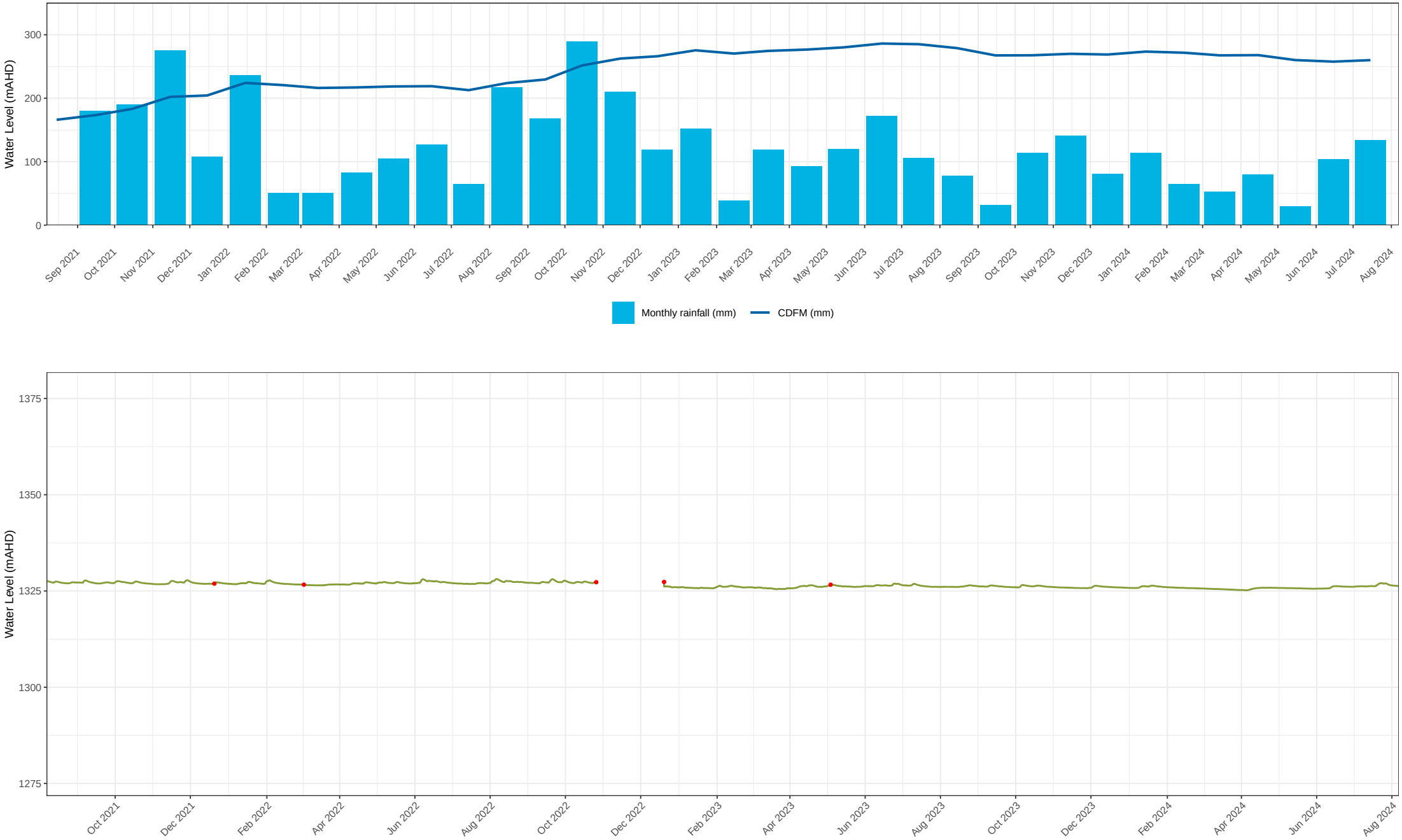


MB04A groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 29

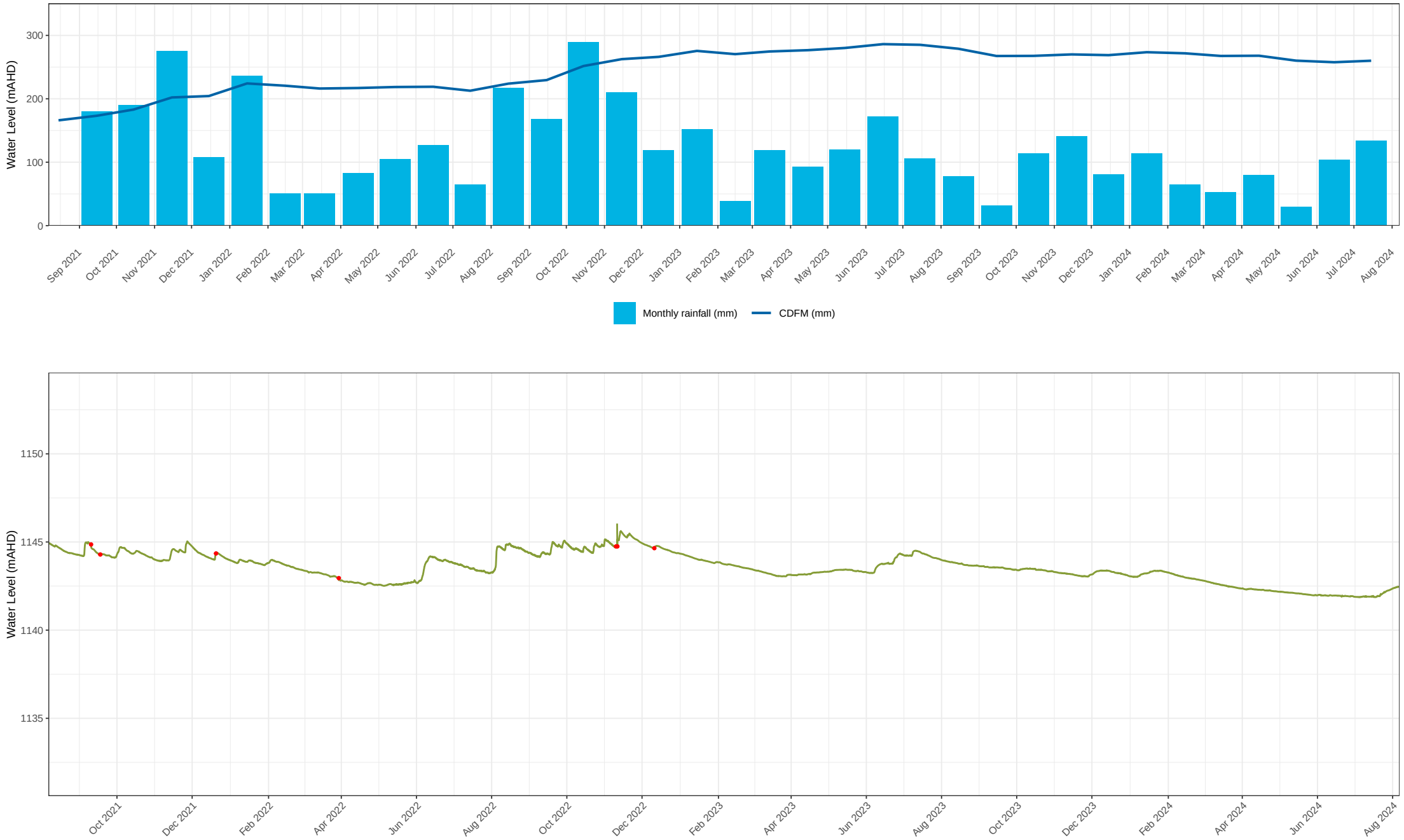


MB04B groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 30

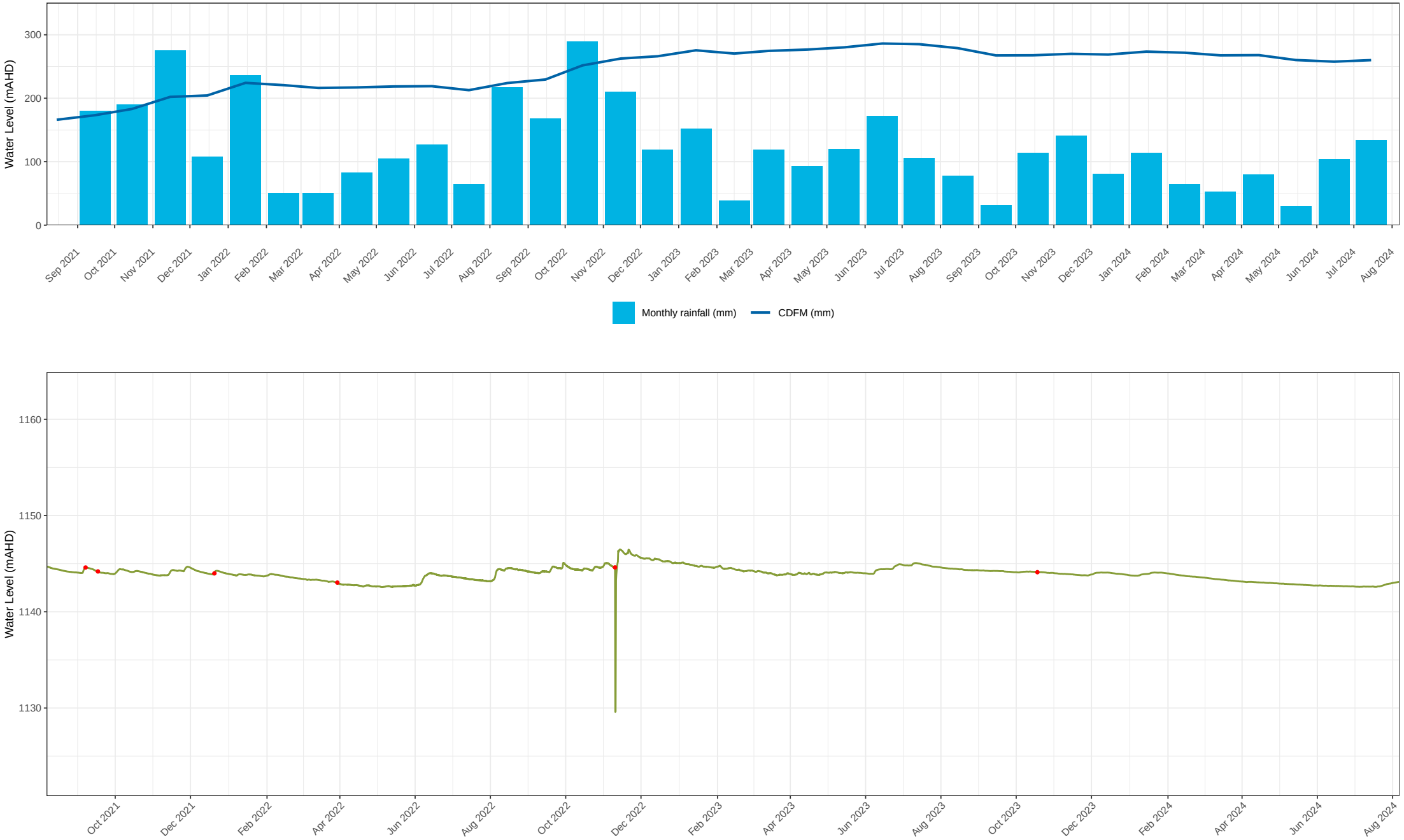


MB06A groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 31

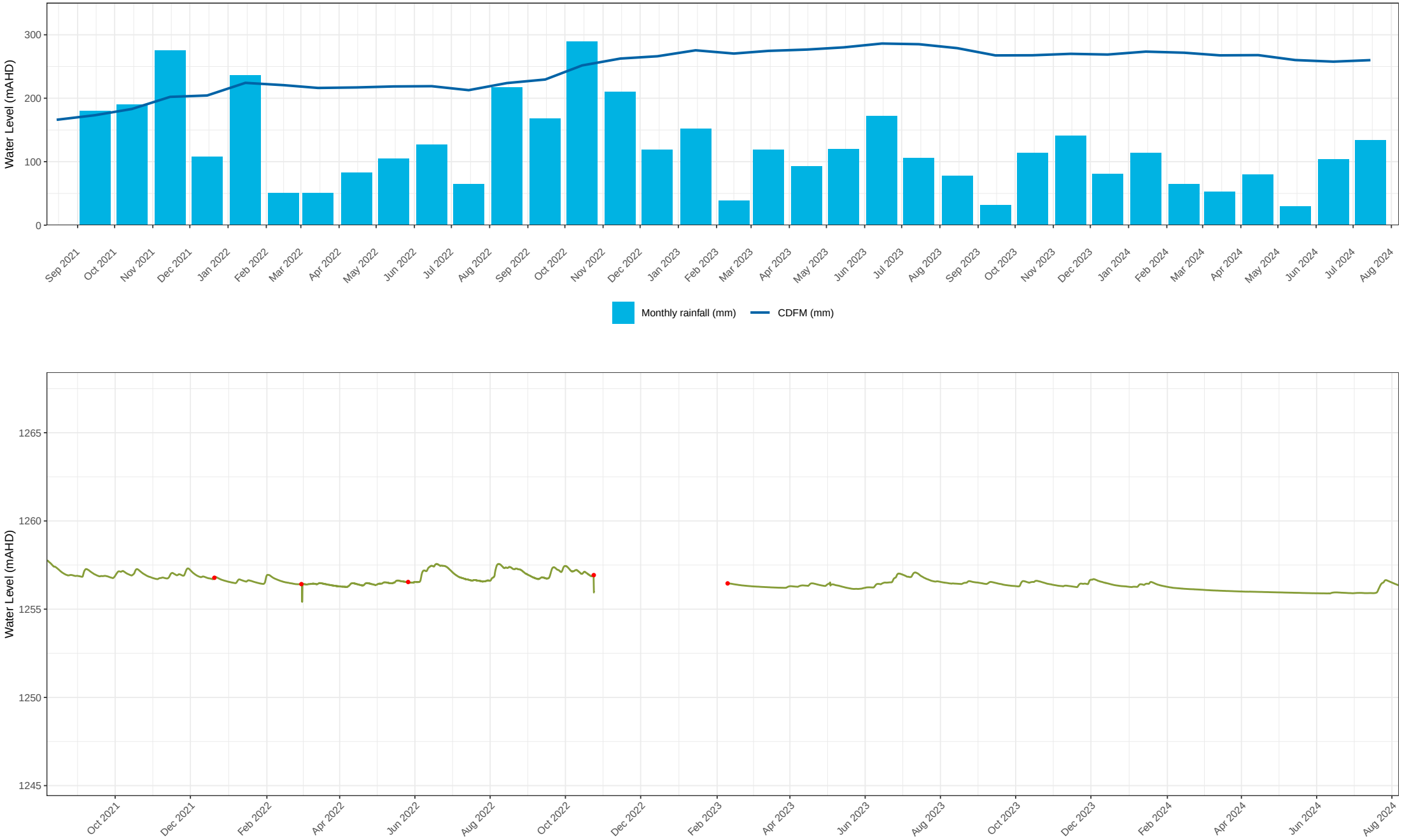


MB06B groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 32

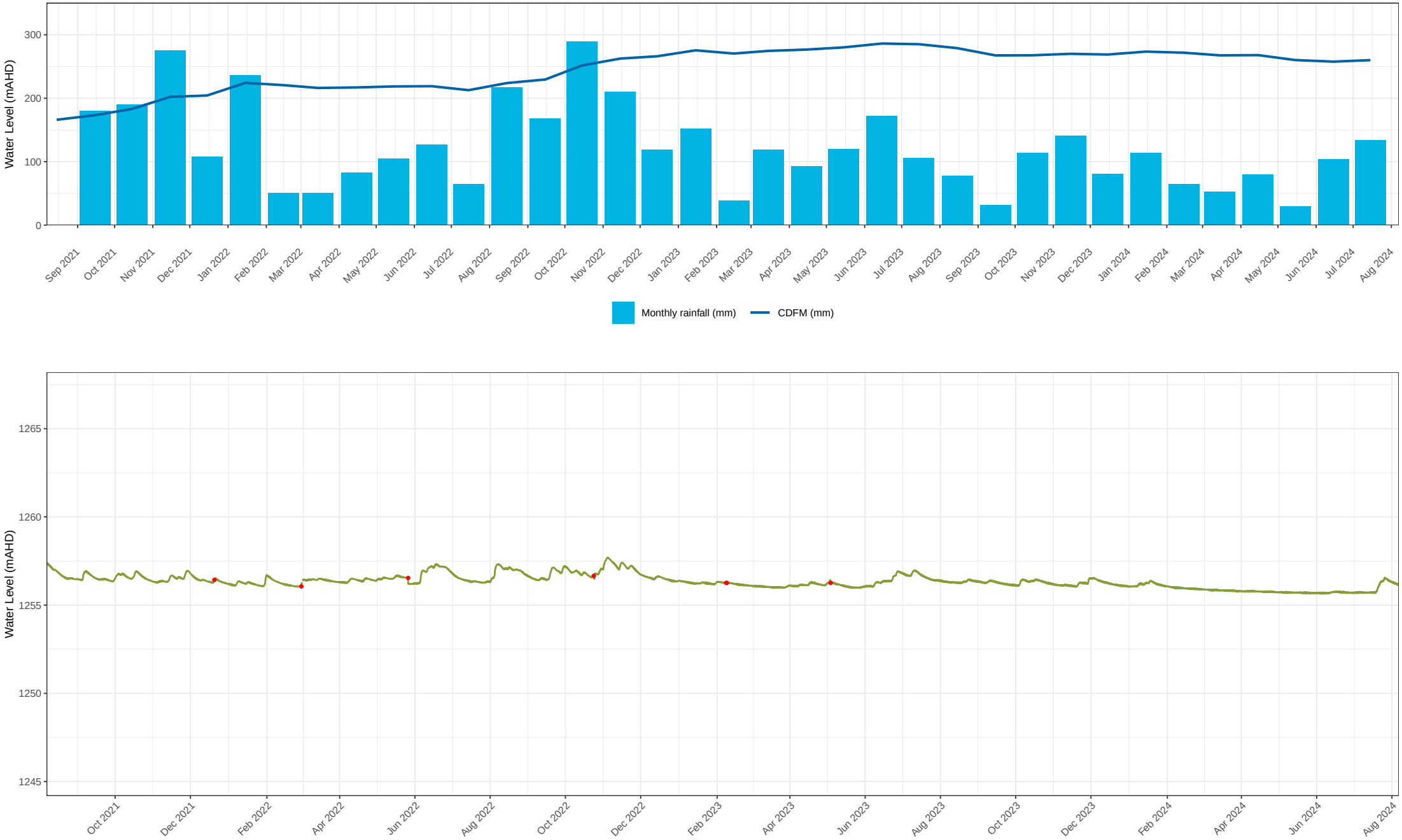


MB07A groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 33

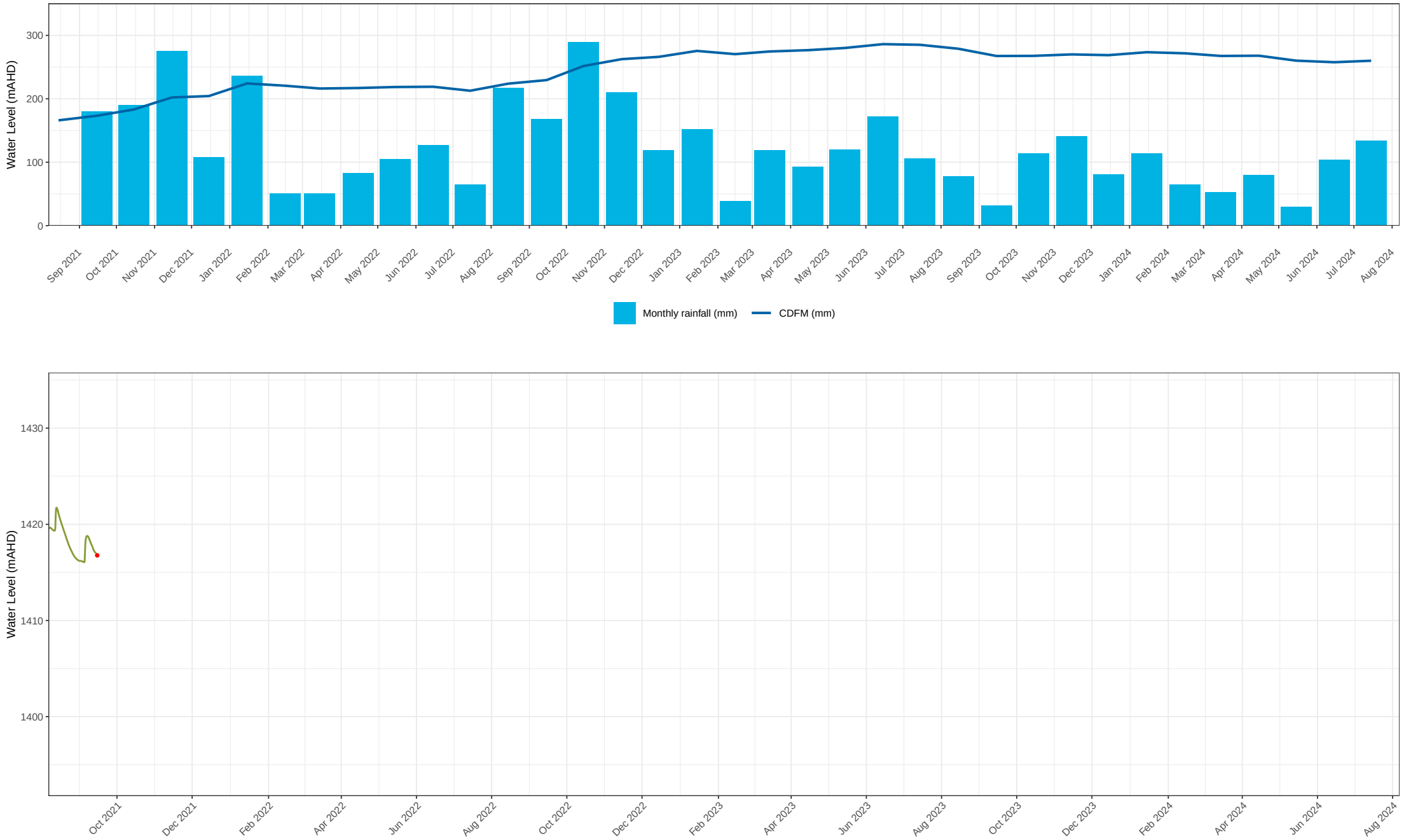


MB07B groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 34

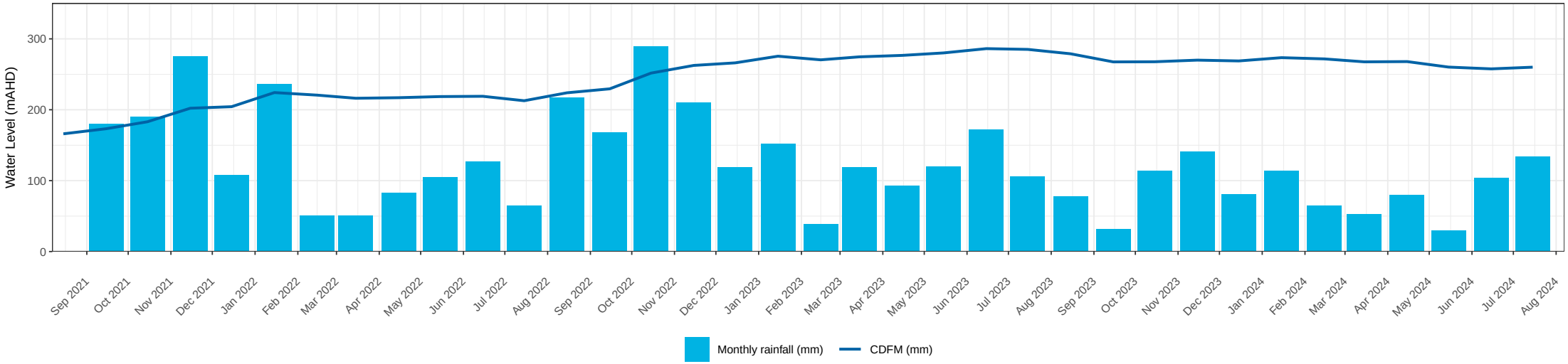


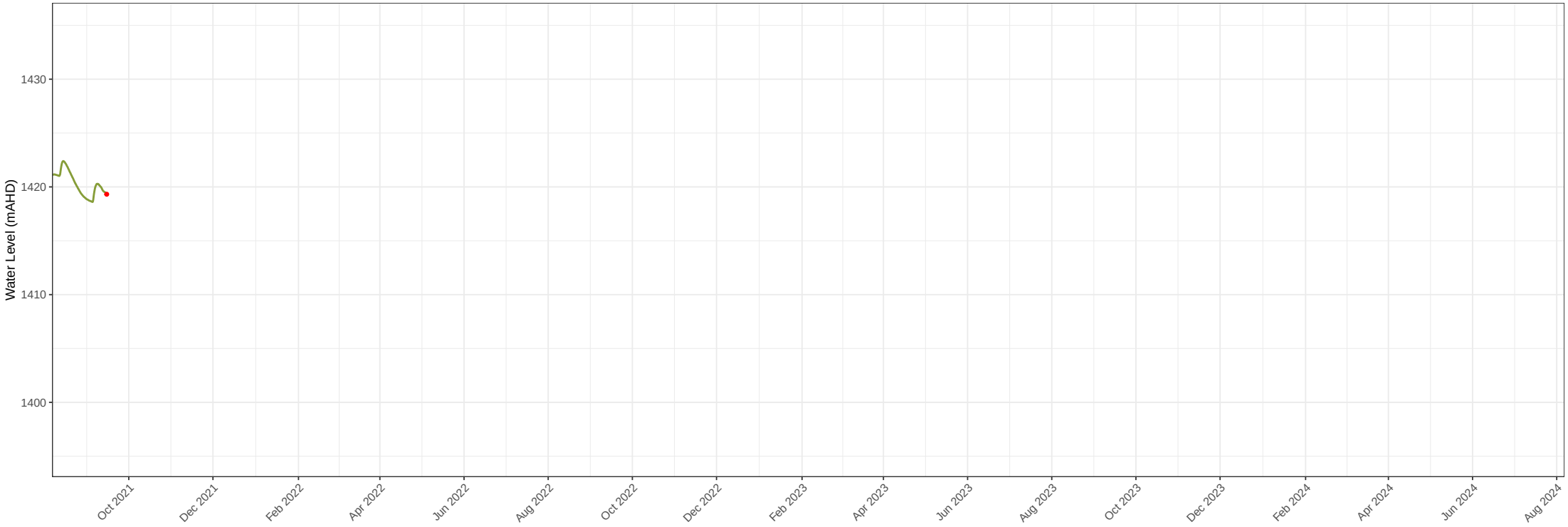
MB08A groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 35



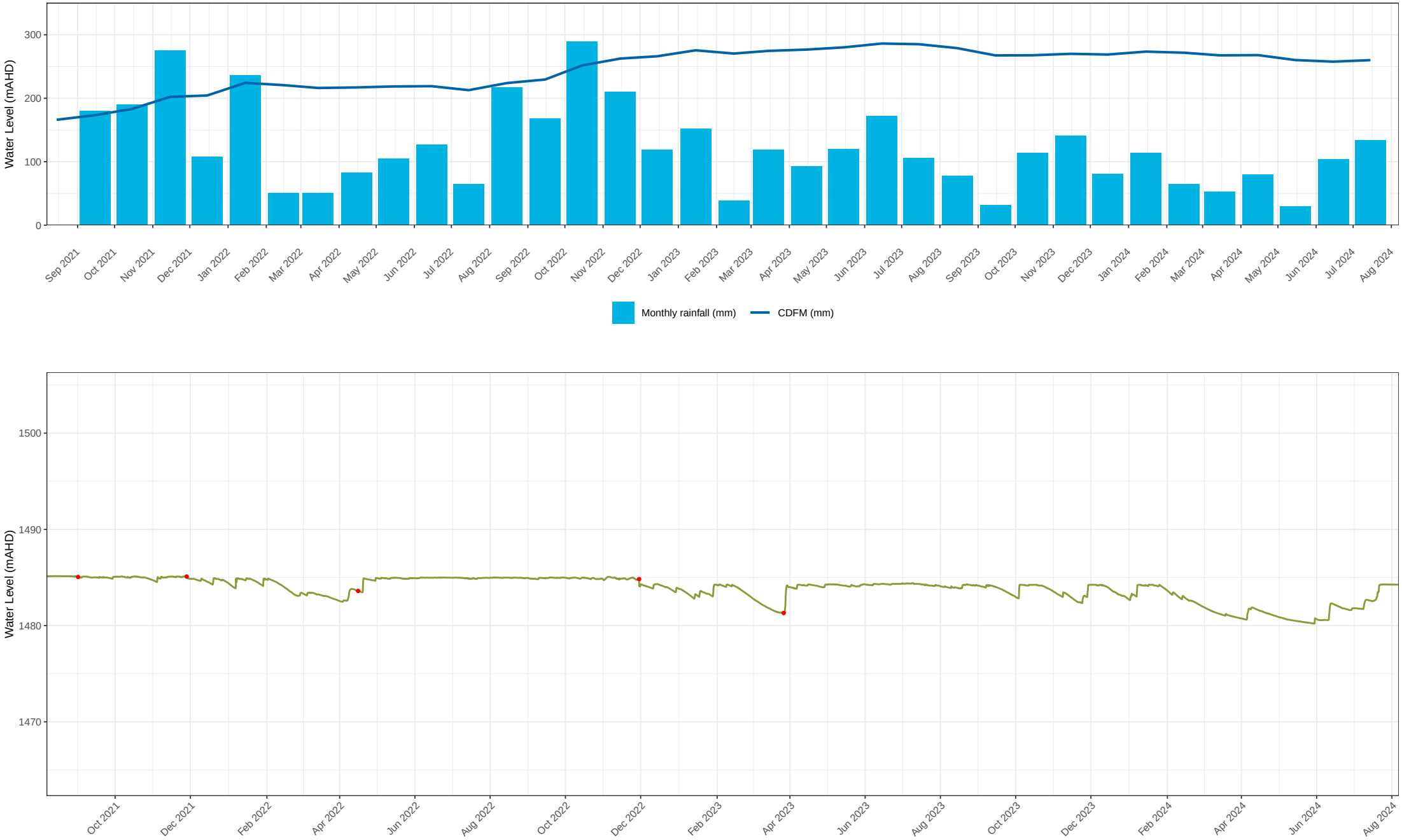


MB08B groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 36

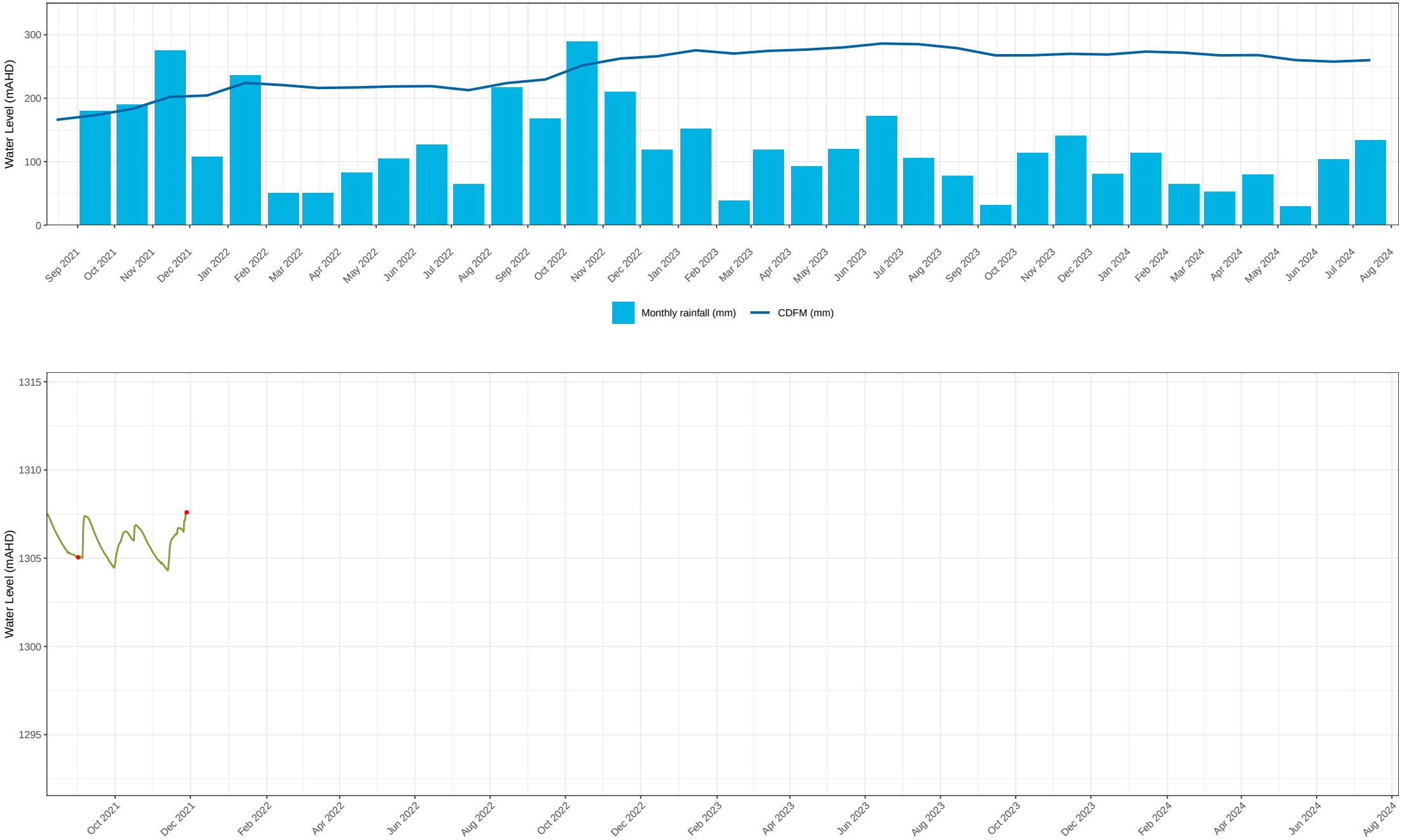


MB11A groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 37

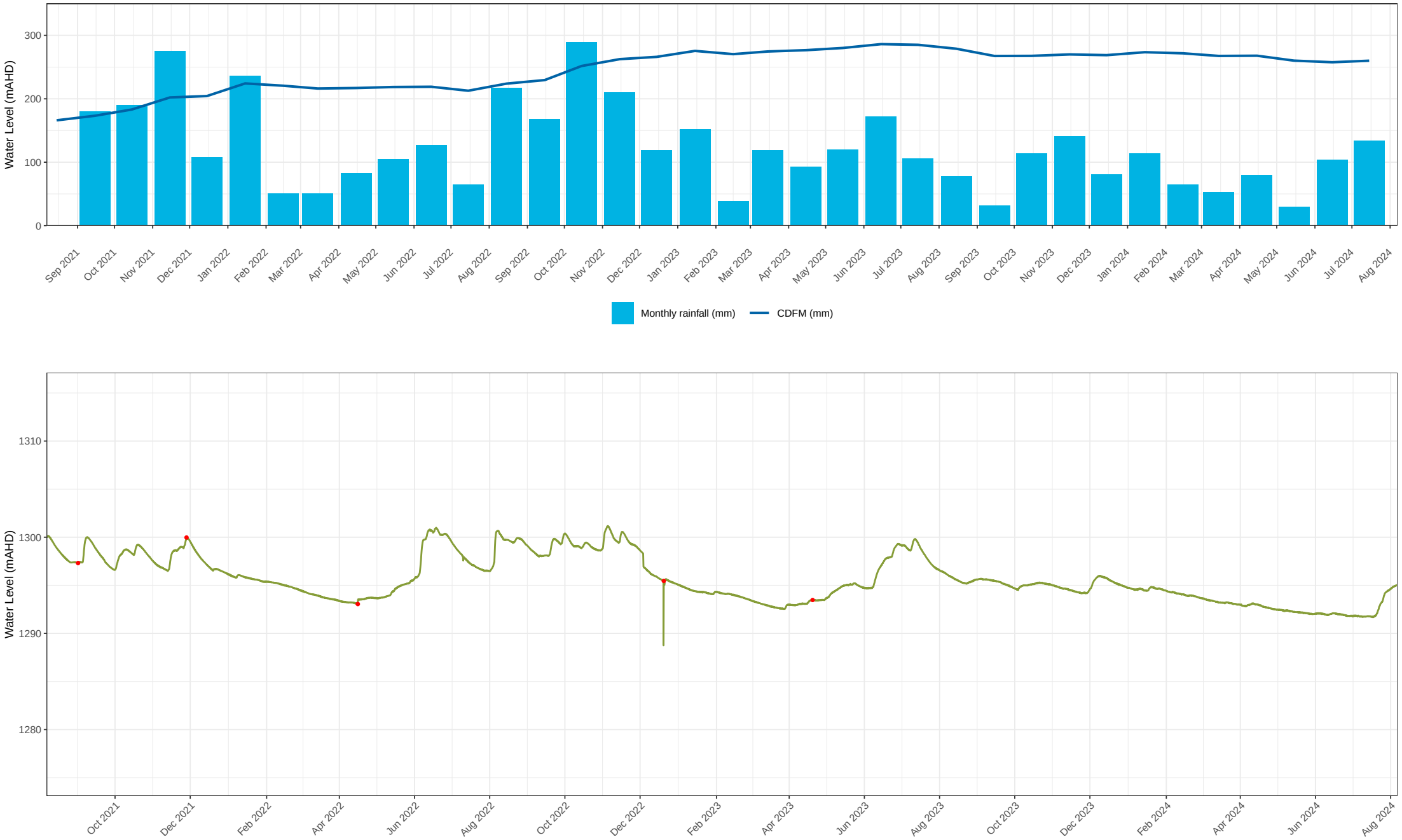


MB12A groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 38

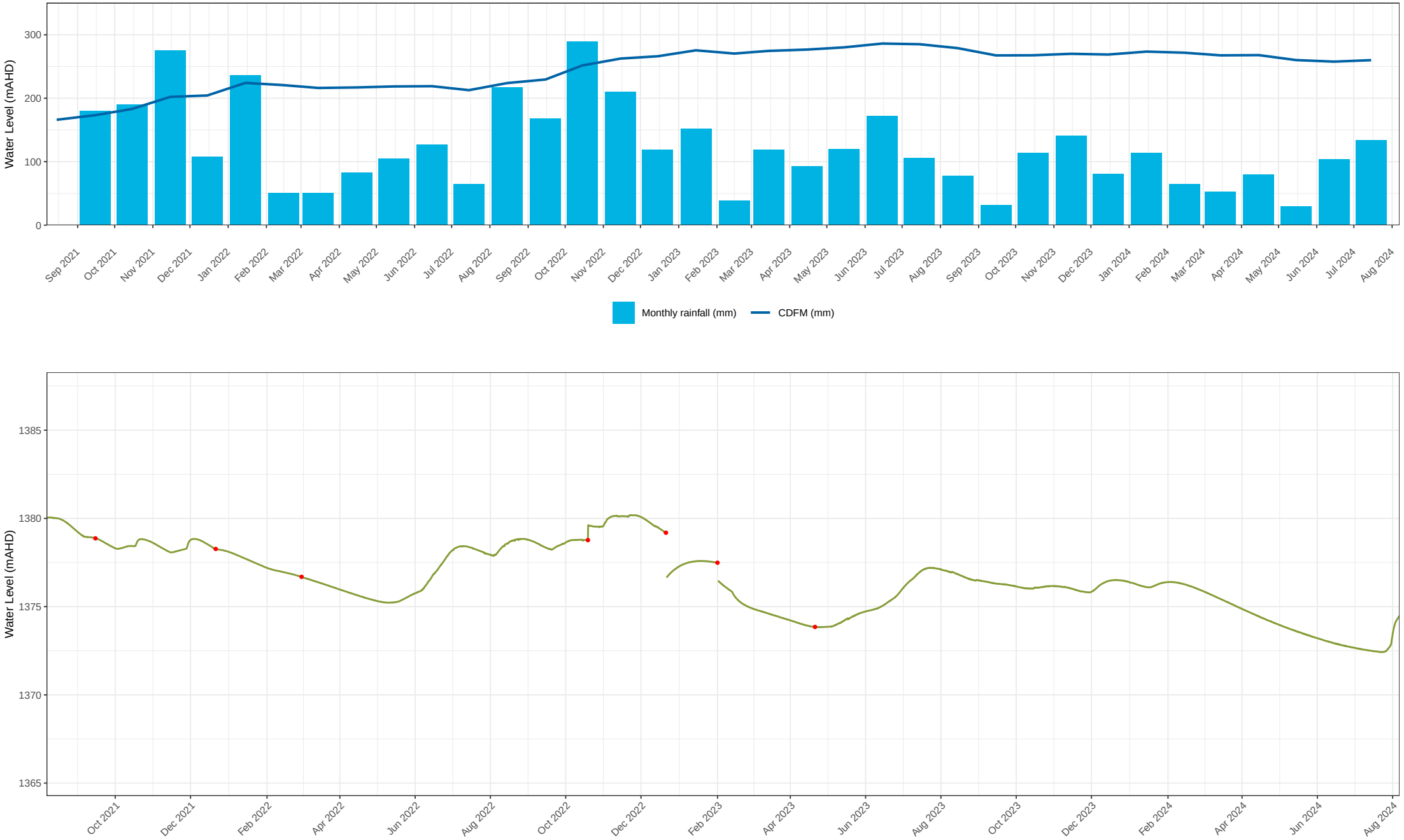


MB12B groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 39

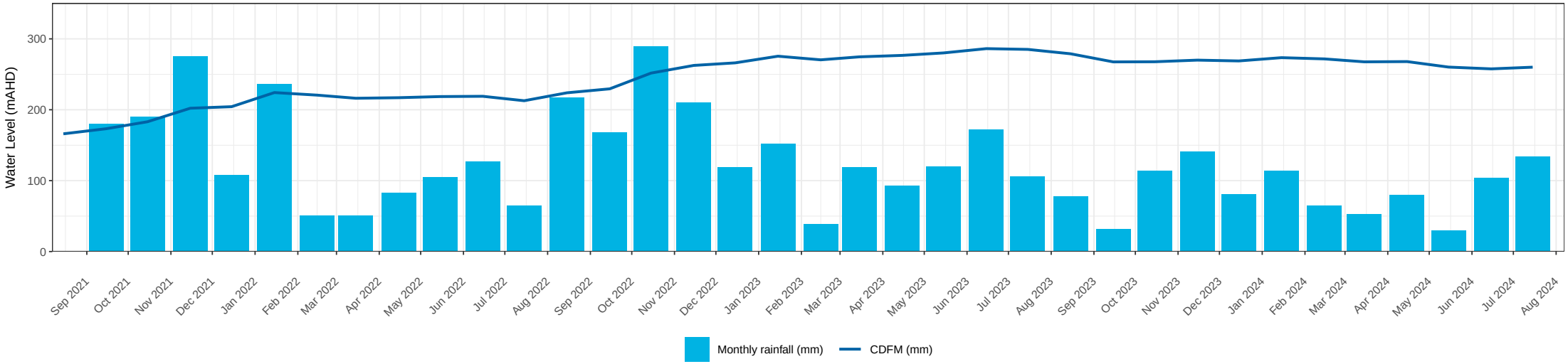


MB13A groundwater level times series data

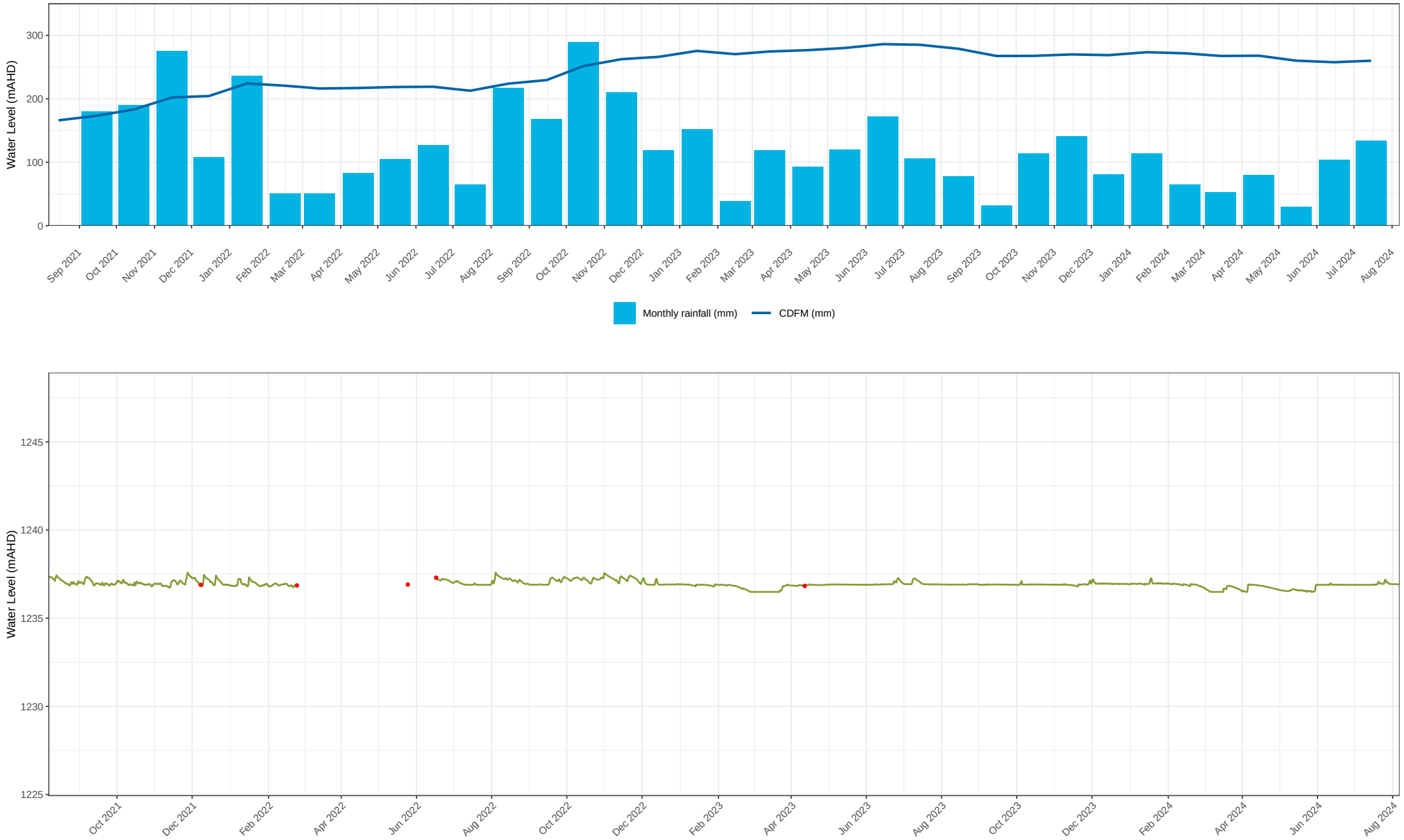
Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

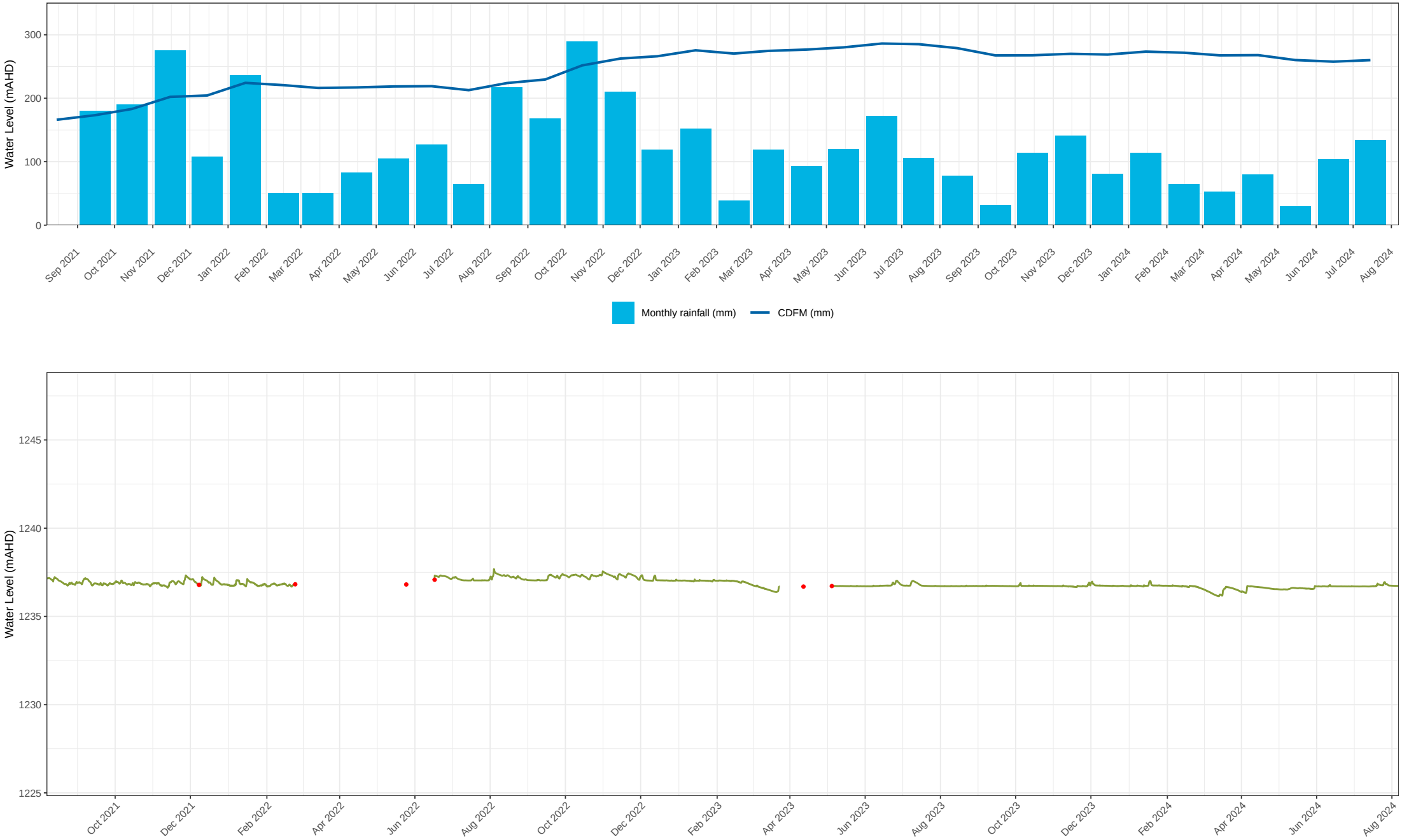
Figure 1. 40



MB13B groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 41



NC01 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 42

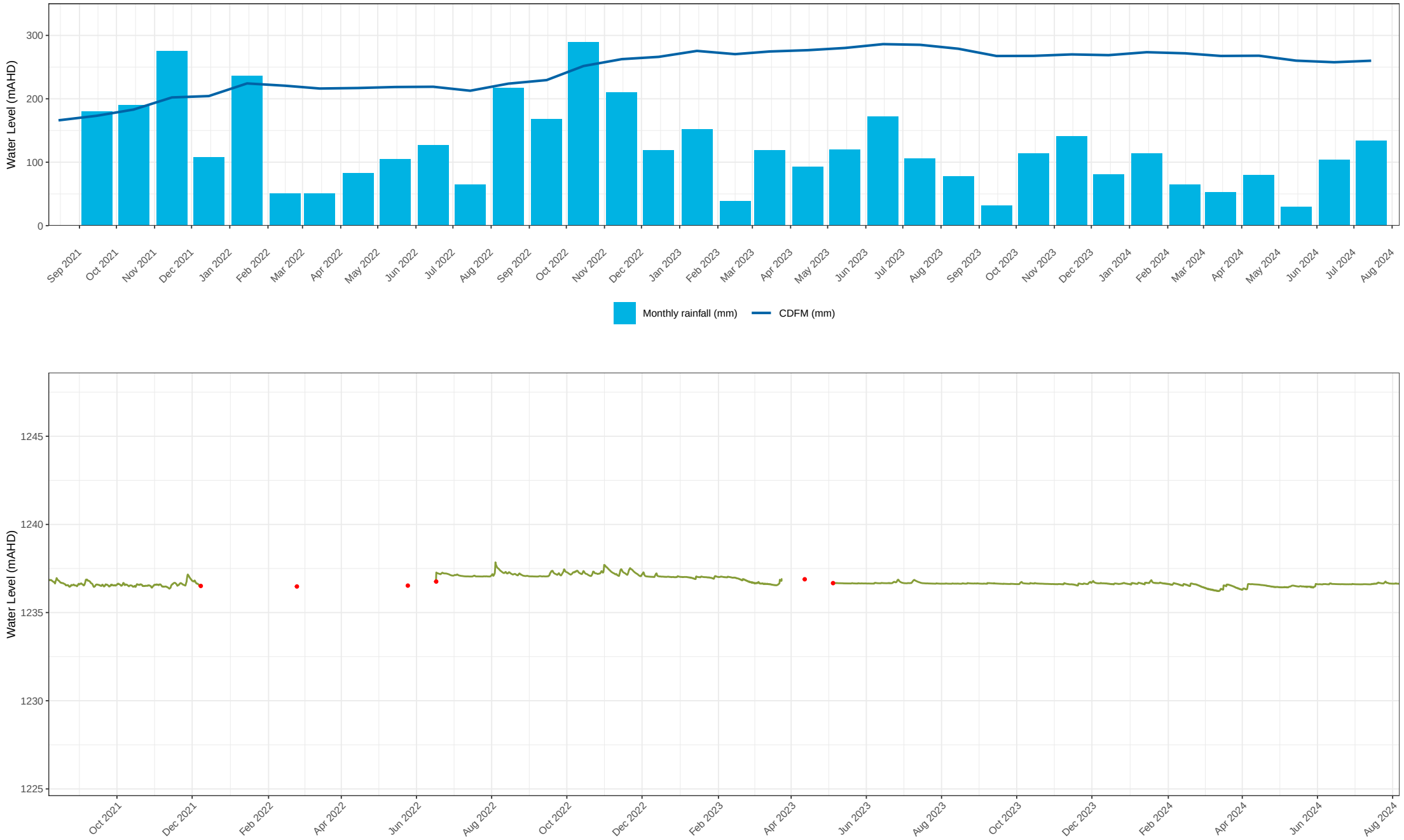


NC02 groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 43

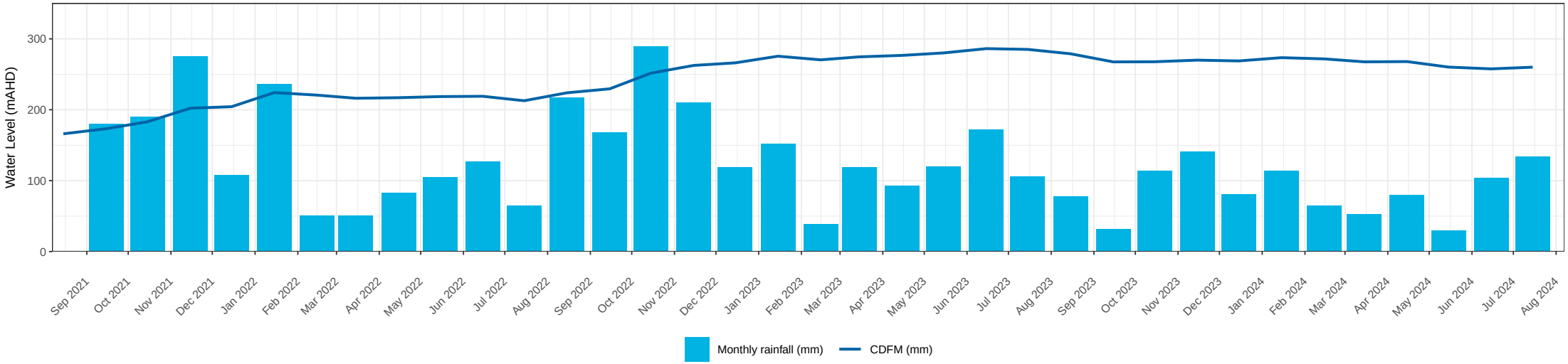


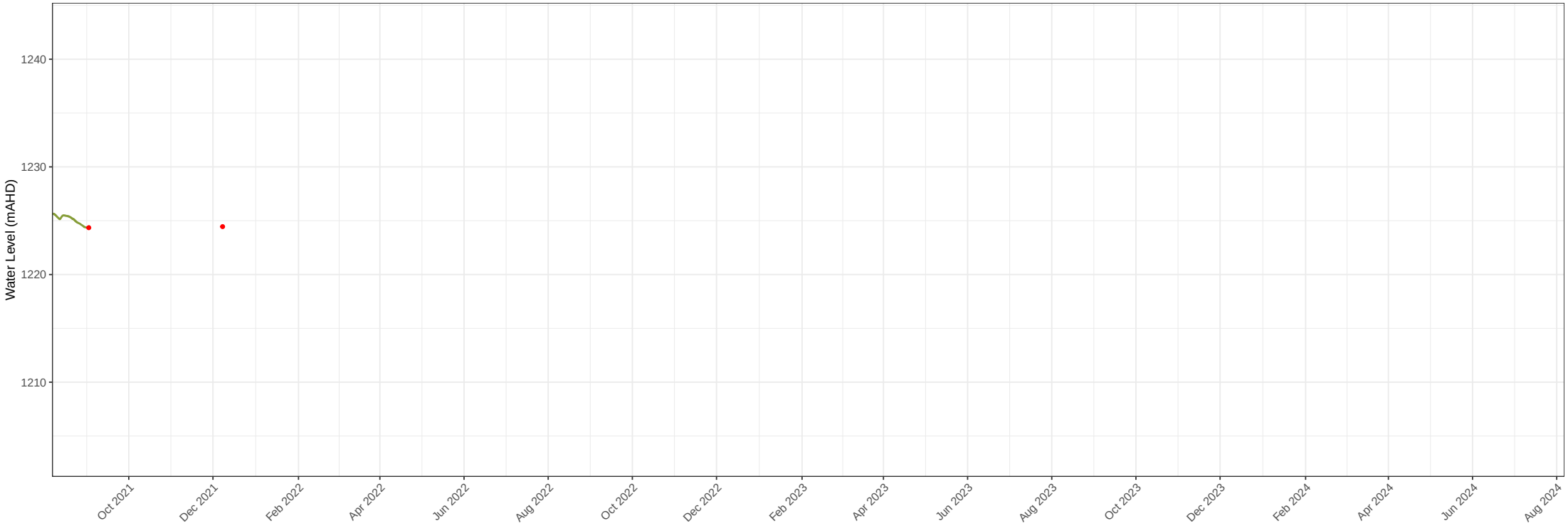
NC03 groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 44



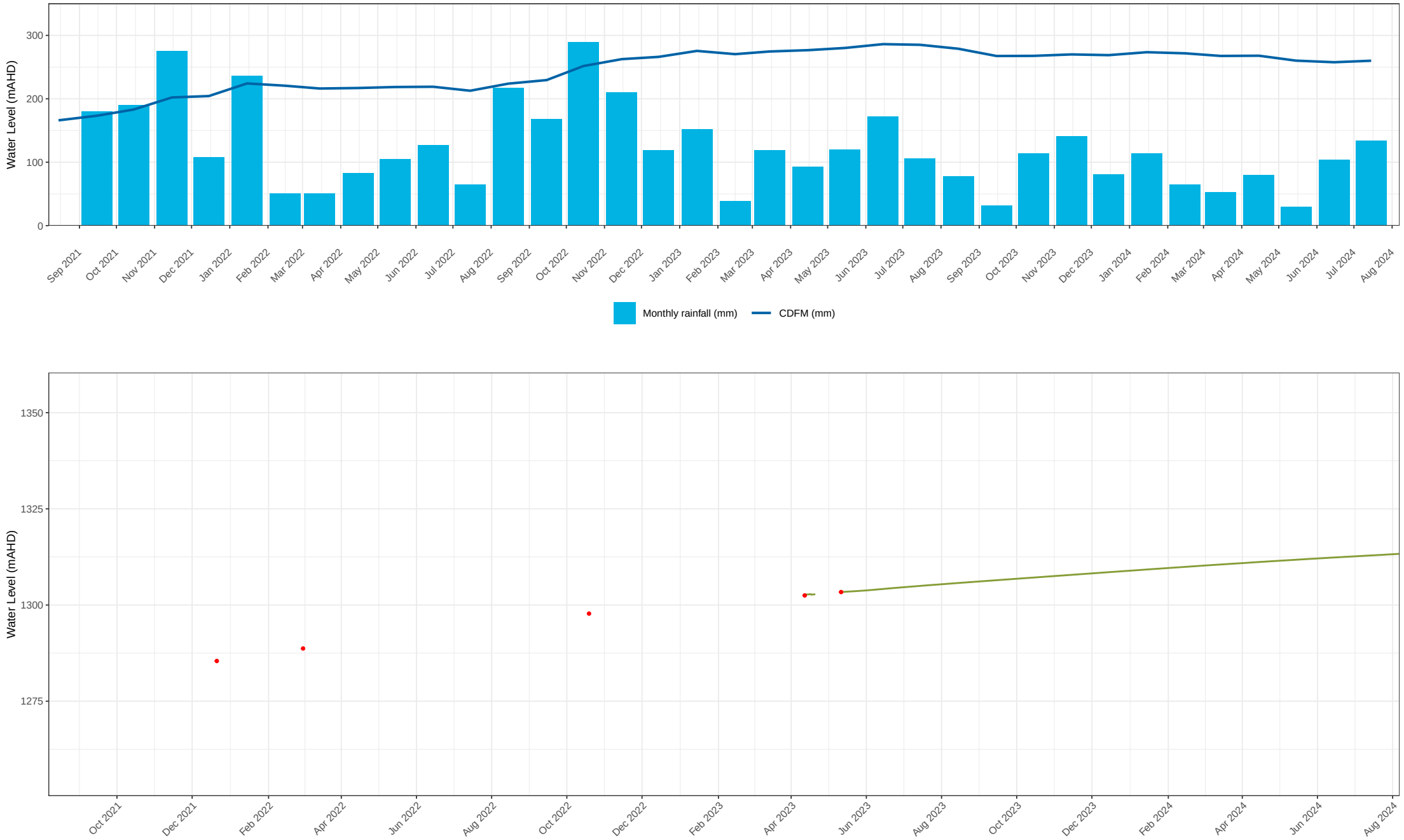


PB01 groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 45

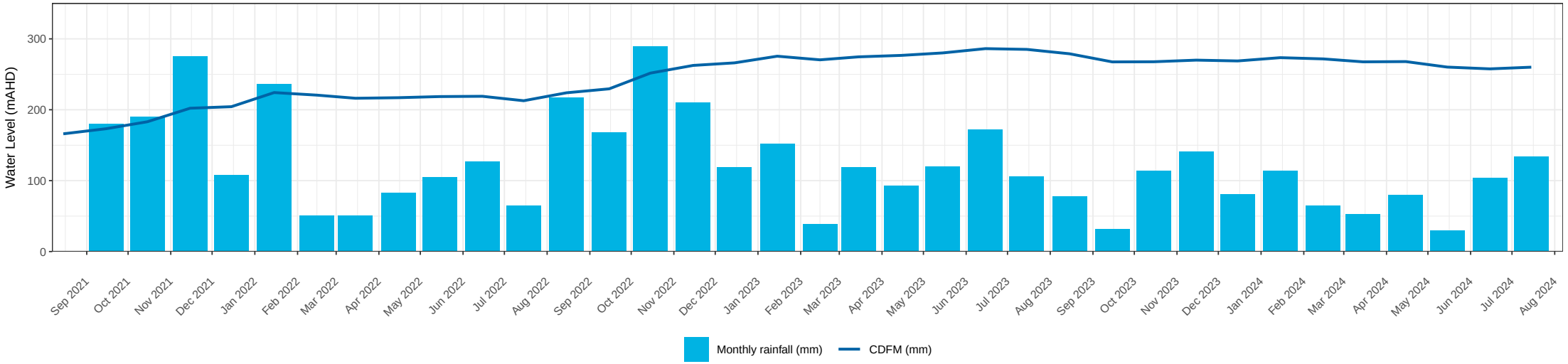


PB03 groundwater level times series data

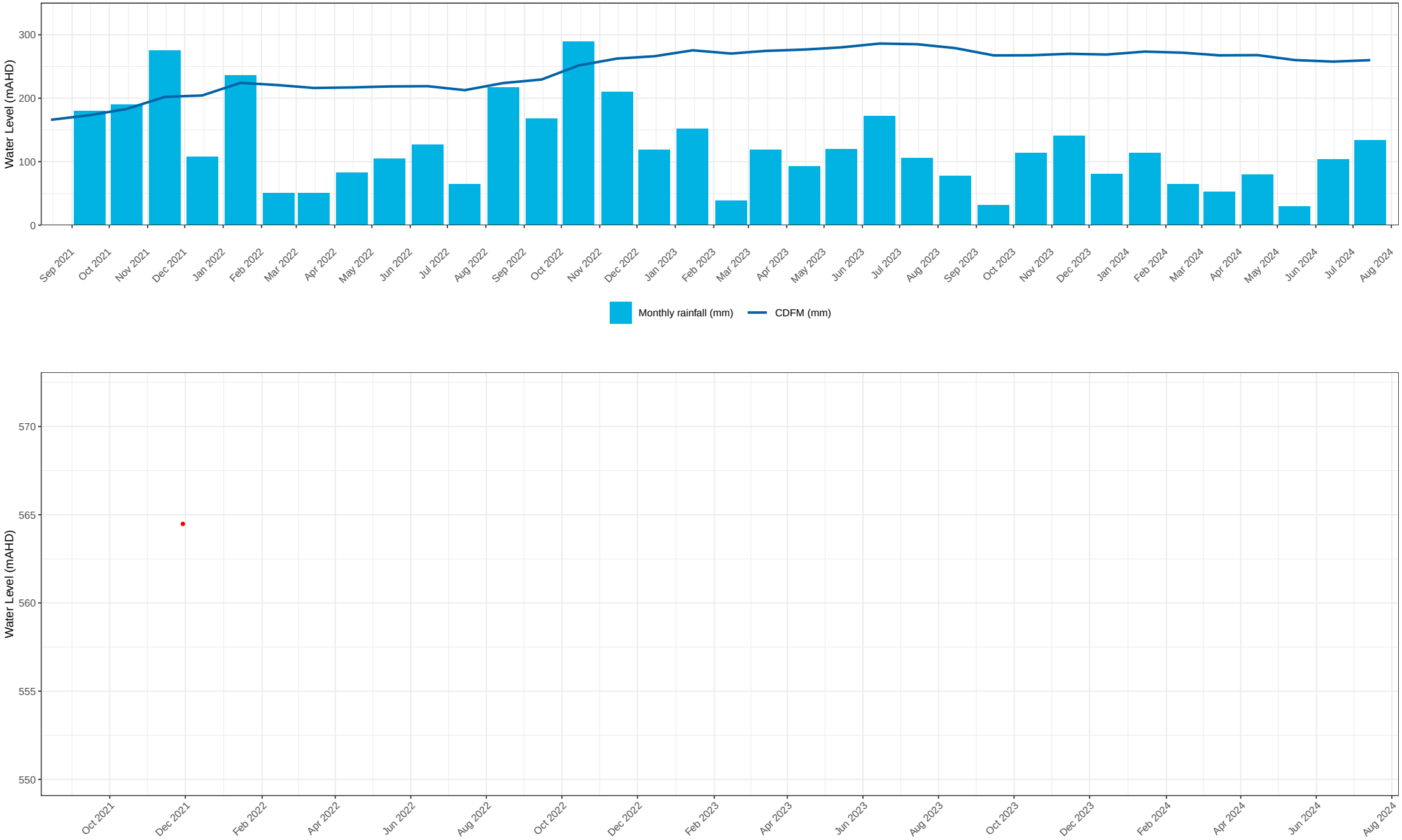
Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 46



PB04 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 47

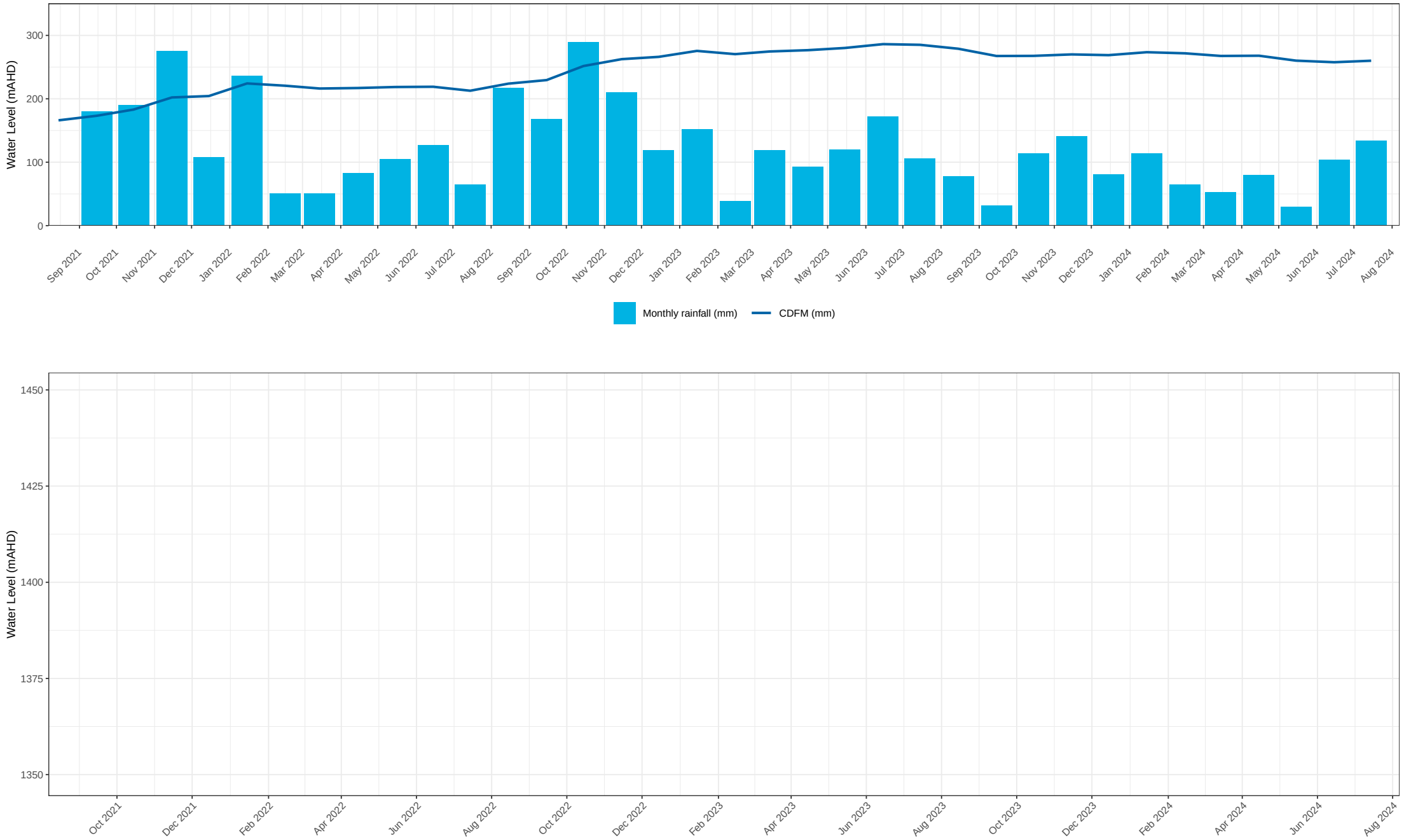


PB05 groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 48

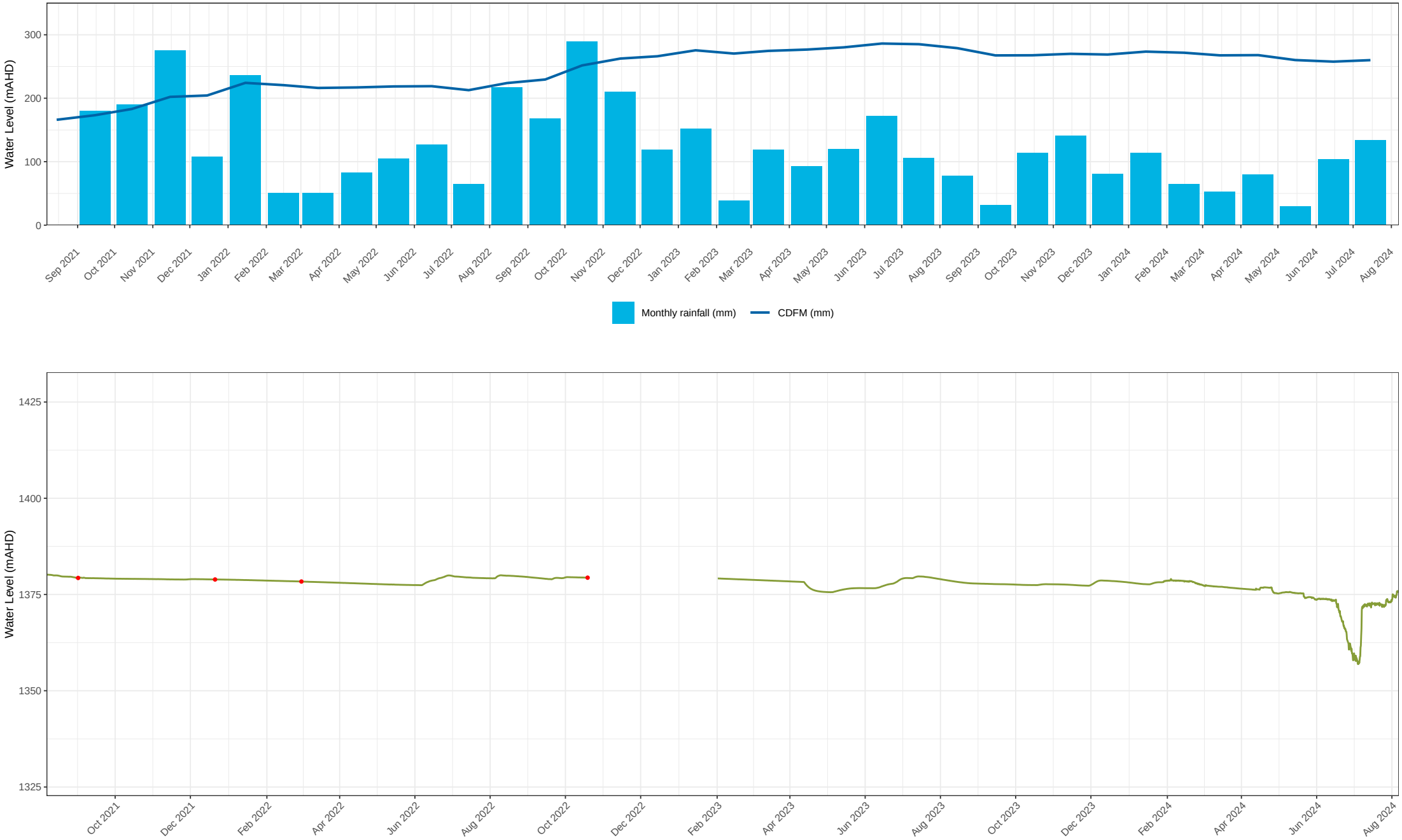


PB06 groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 49

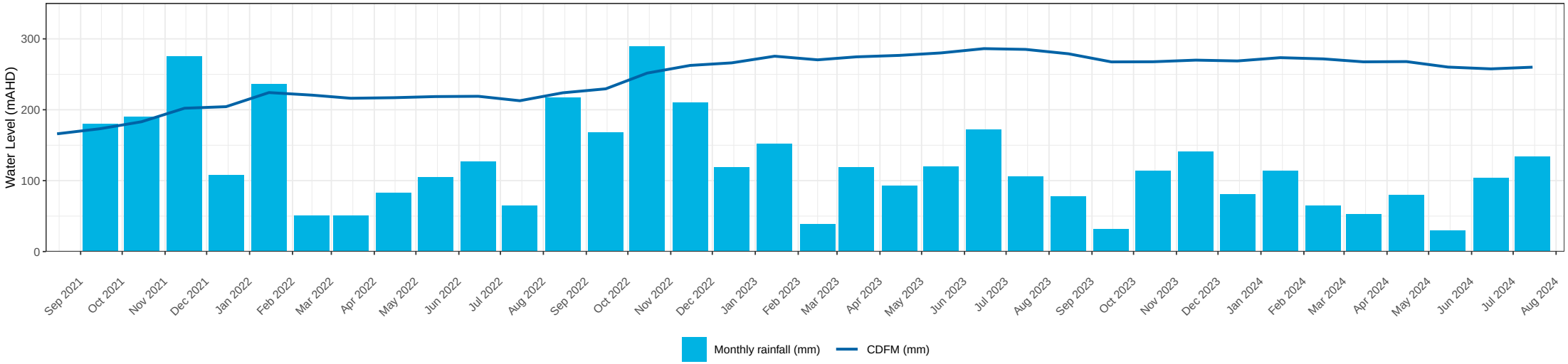


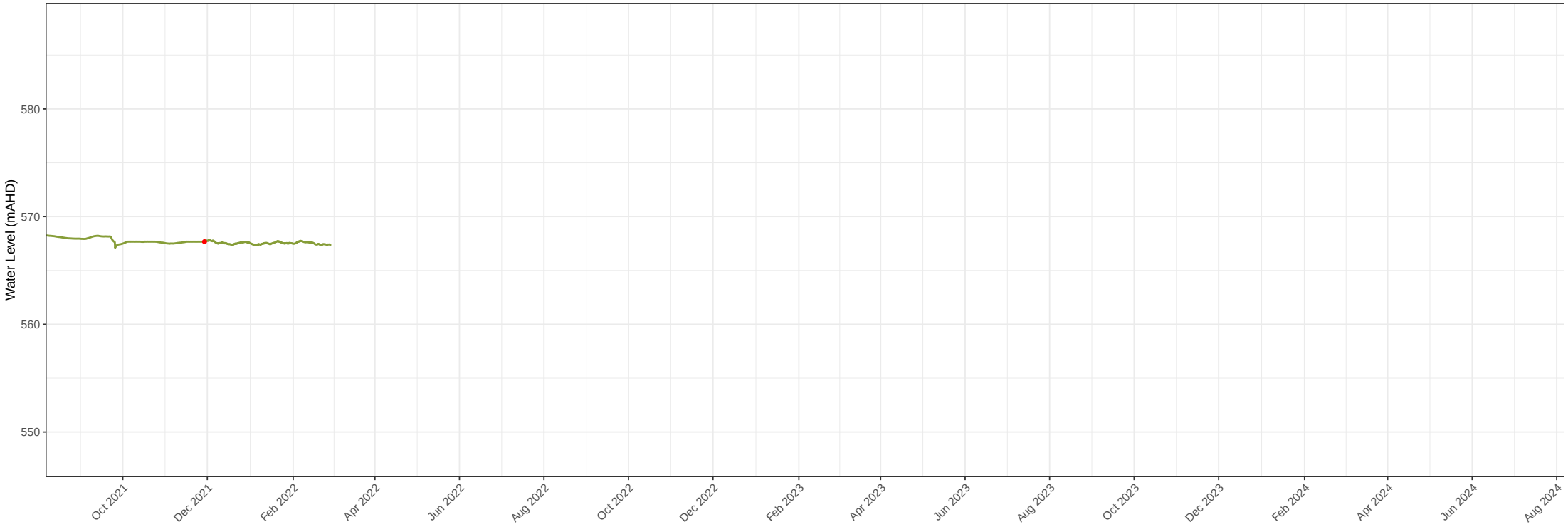
PB10 groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

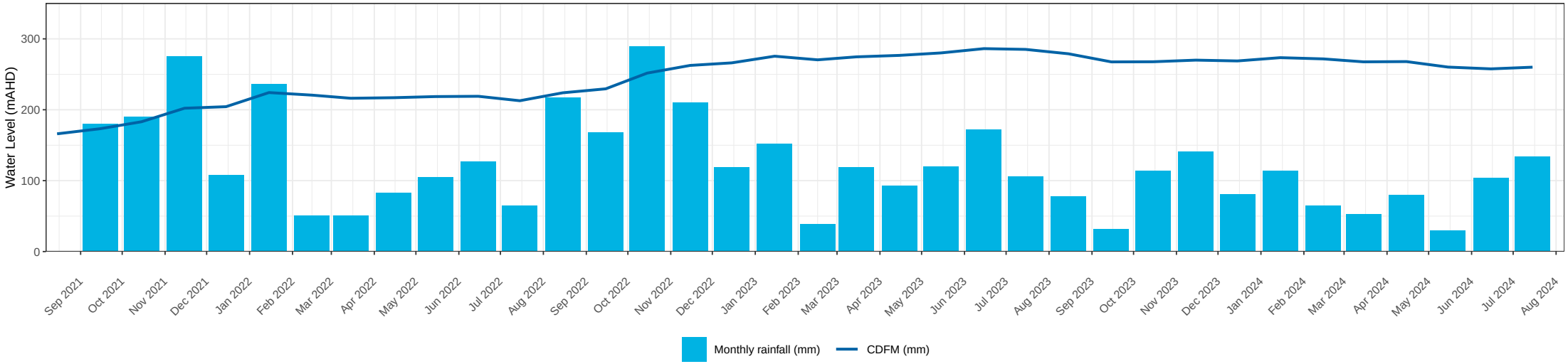
Groundwater monitoring and management

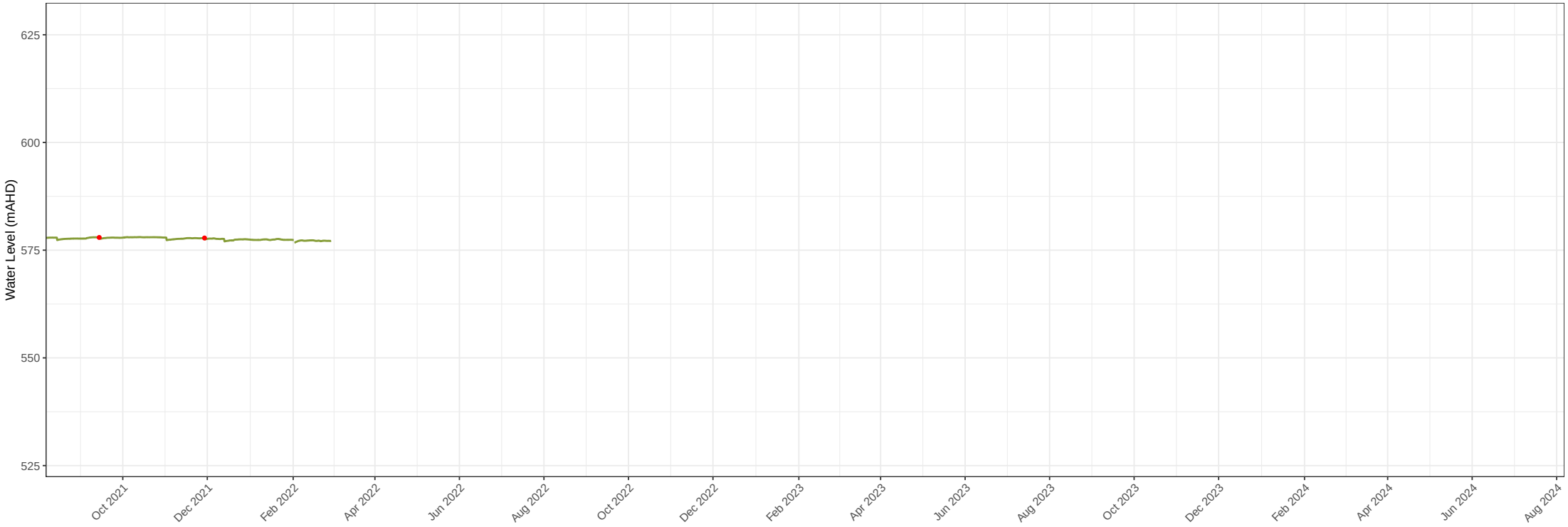
Figure 1. 50



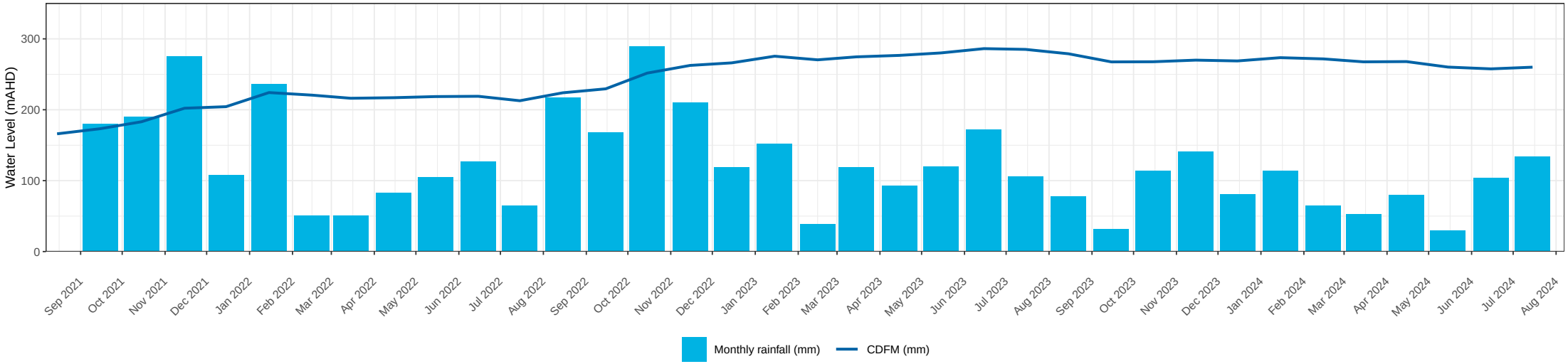


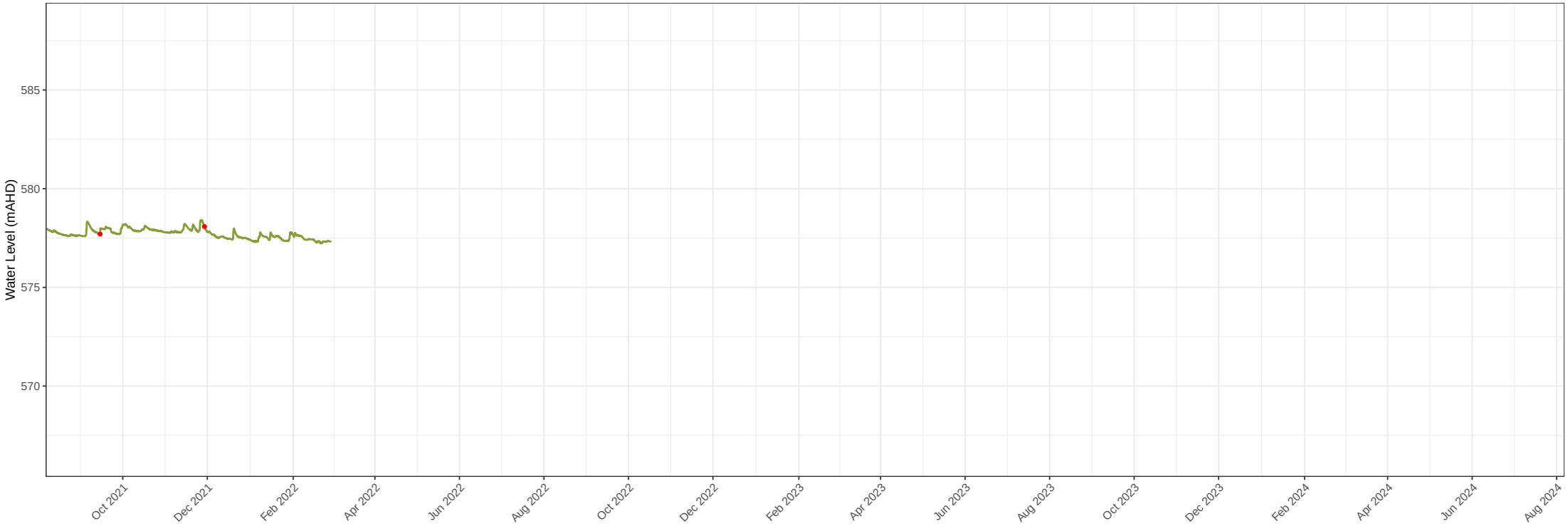
RSMB2 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 51



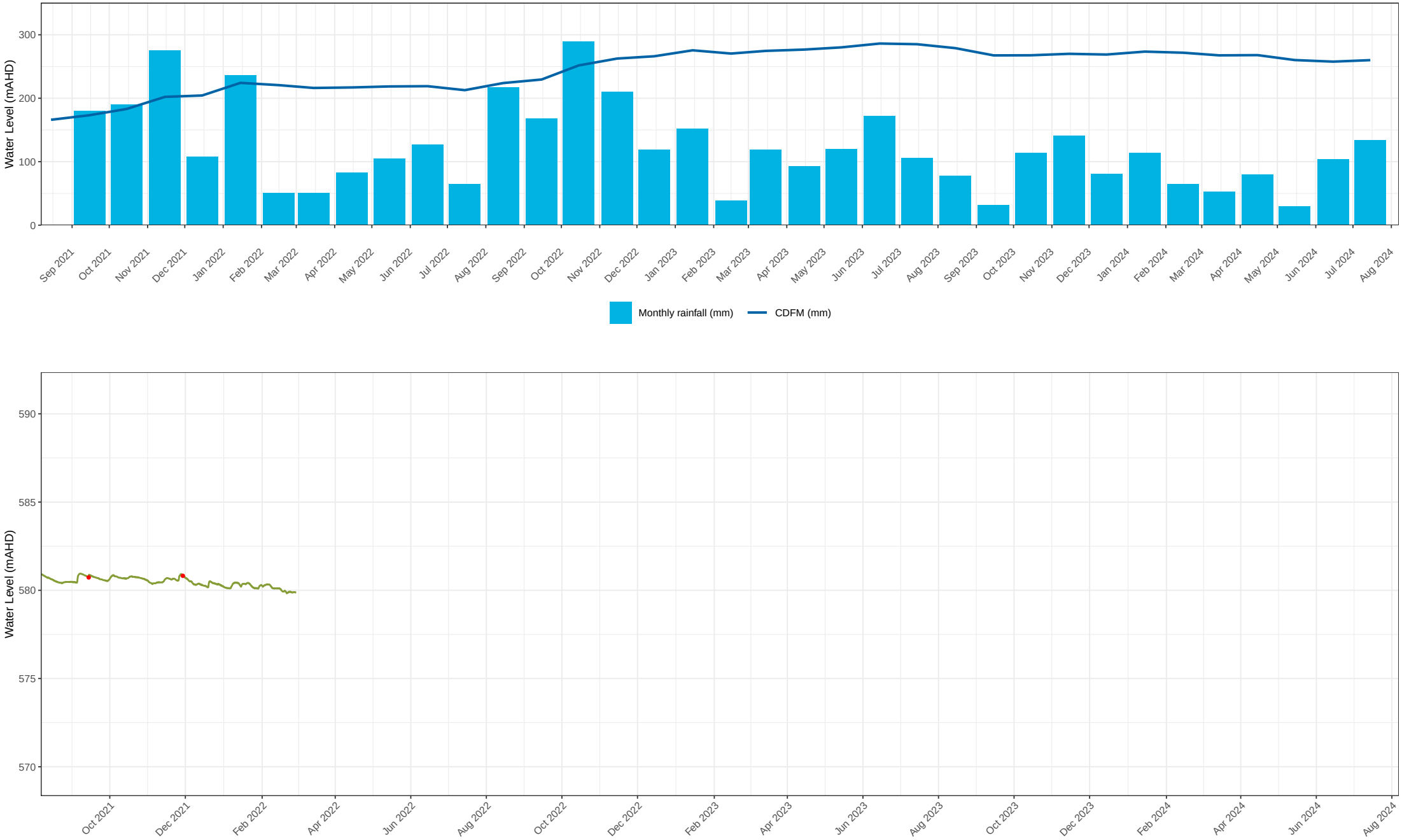


RSMB6 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 52





RSMB7 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 53

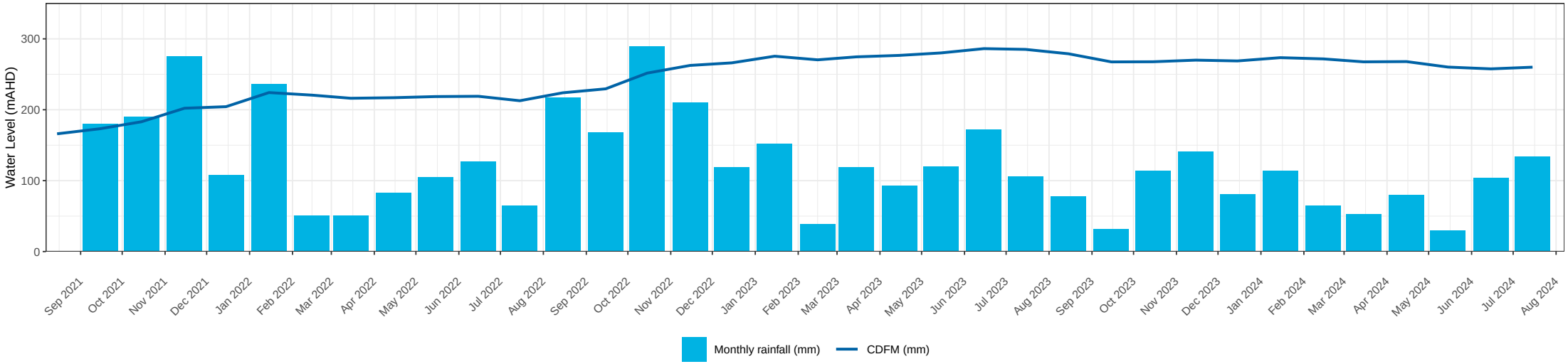


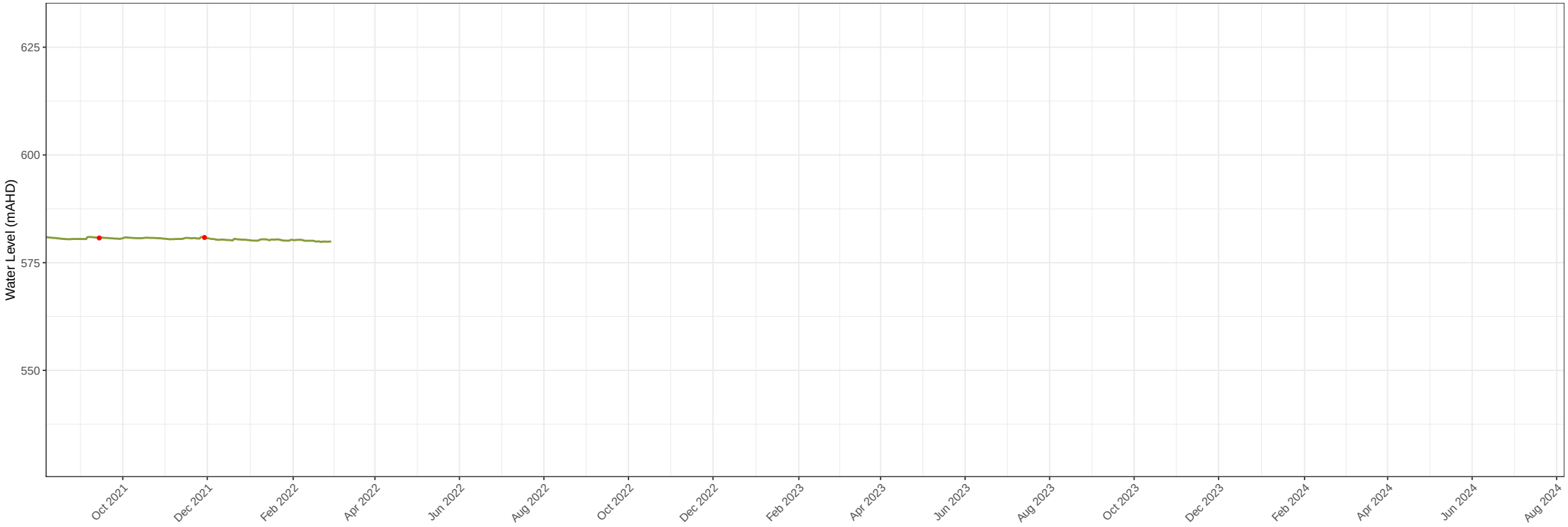
RSMB8 groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

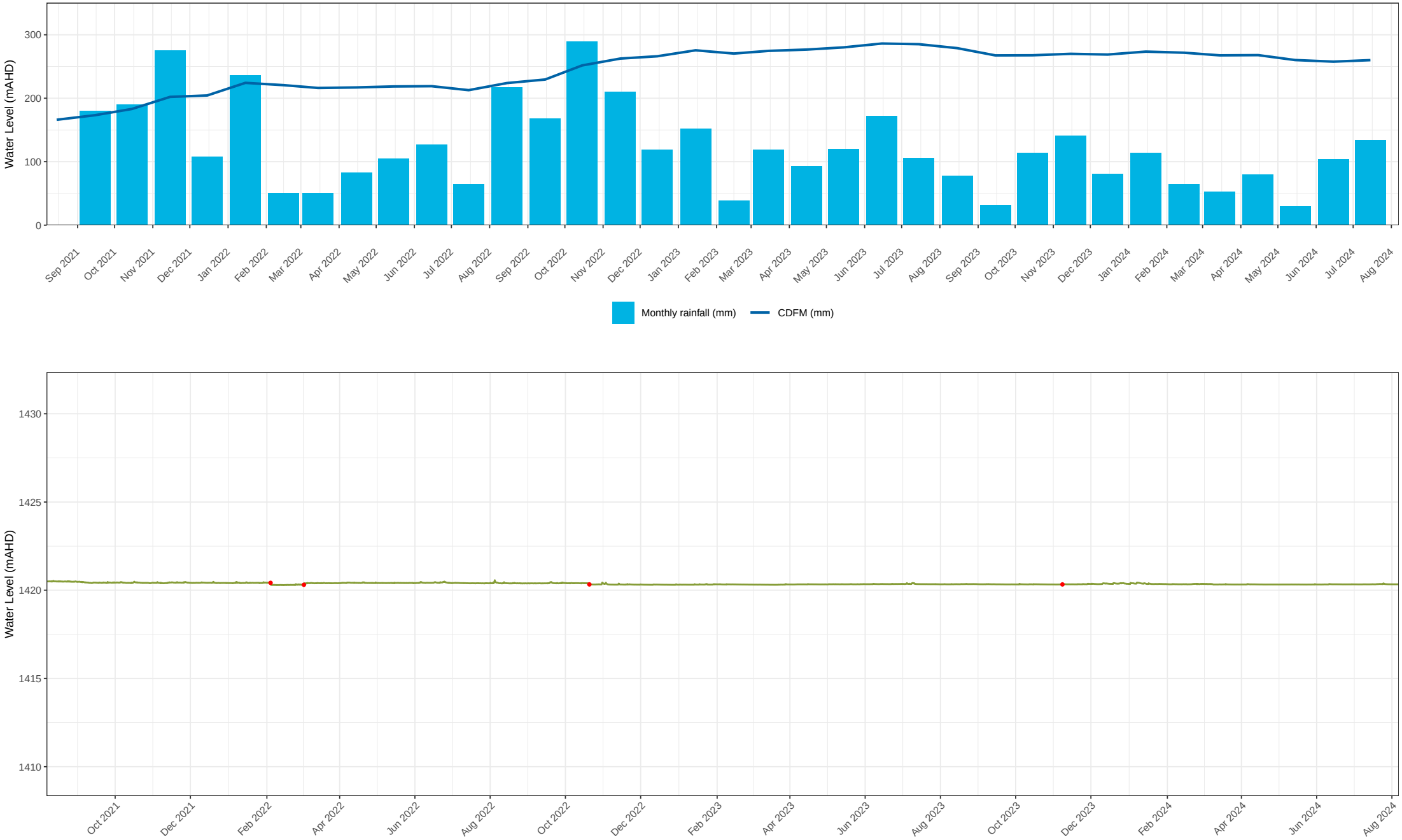
Groundwater monitoring and management

Figure 1. 54





RSMB9 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 55

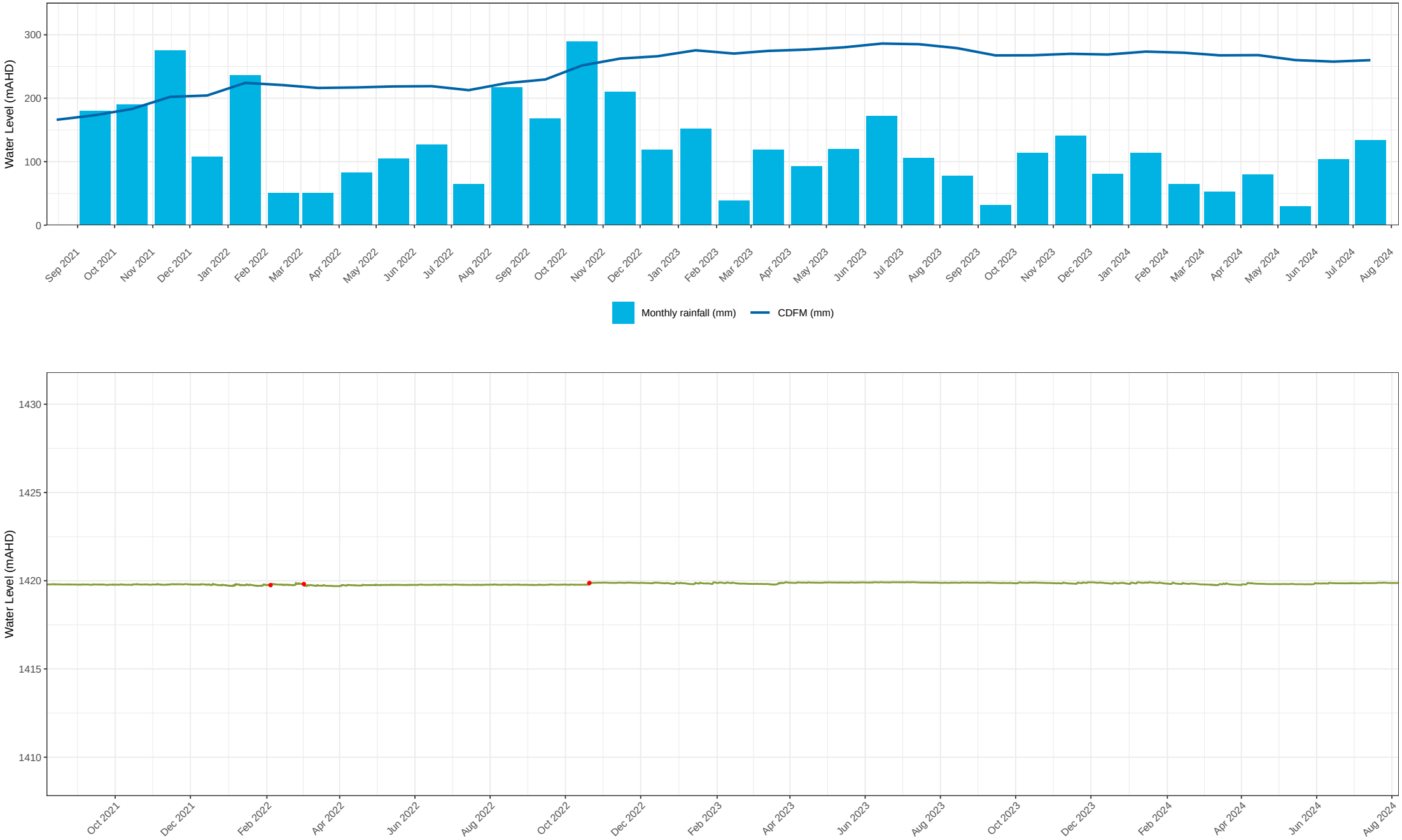


RtS_BH10A groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 56

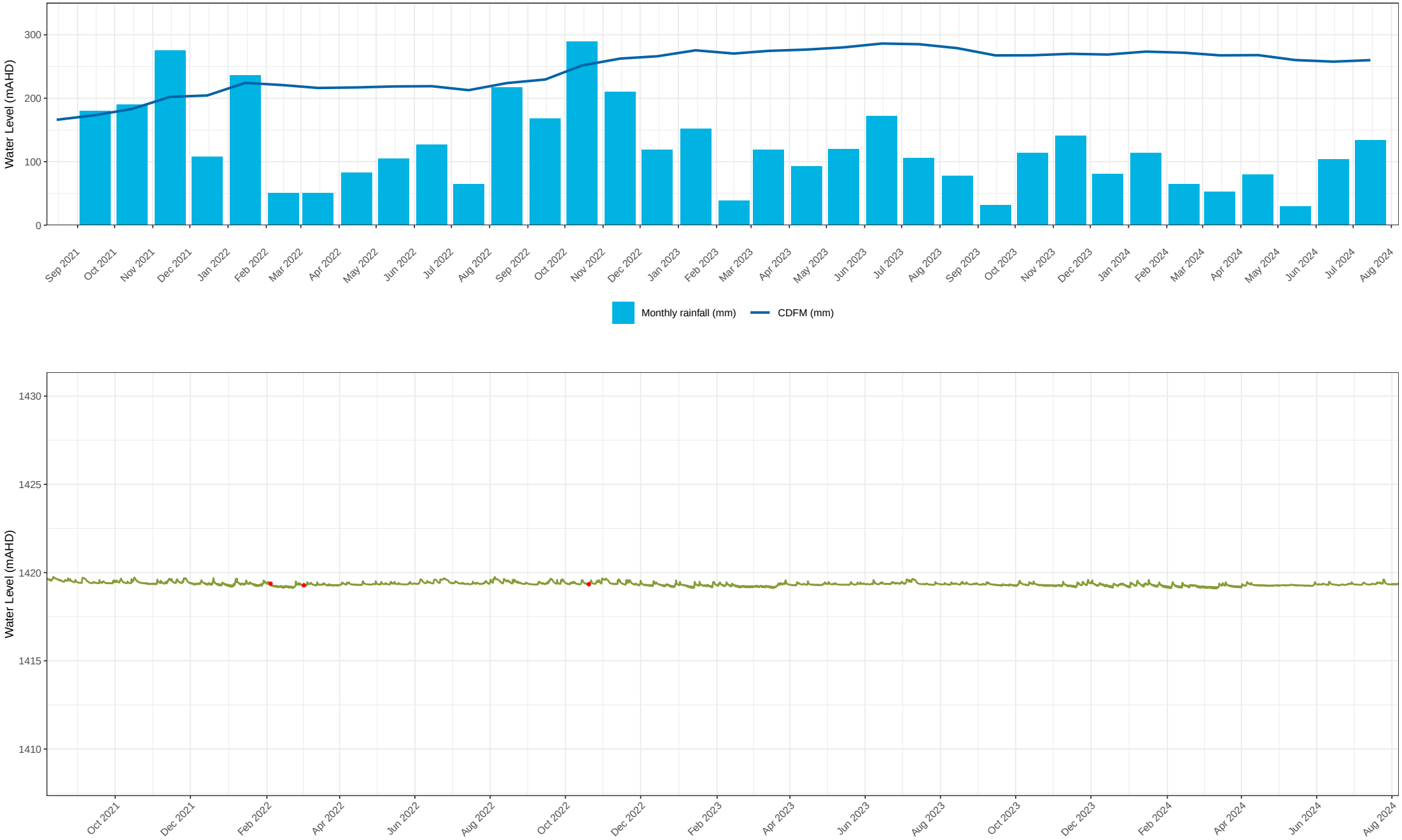


RtS_BH10B groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 57

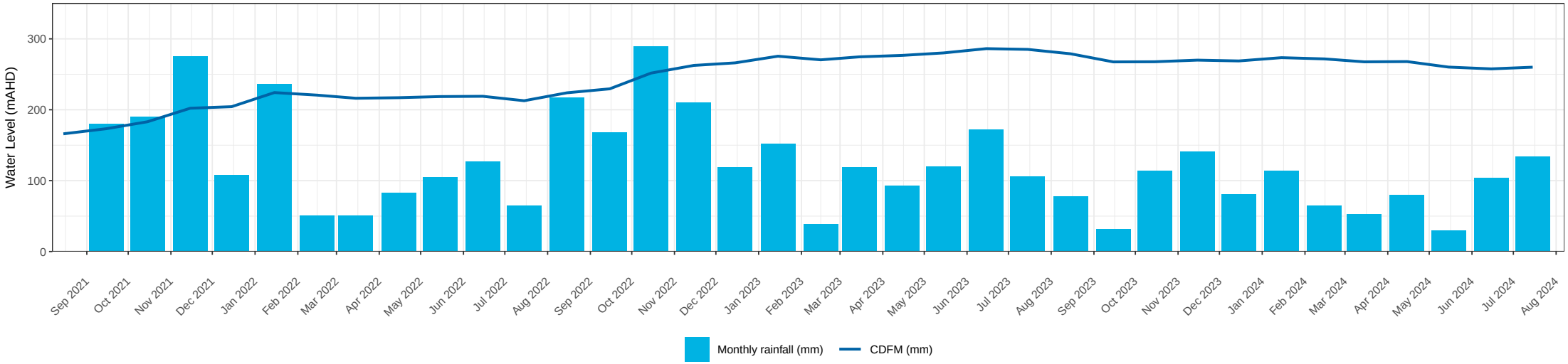


RtS_BH10C groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 58

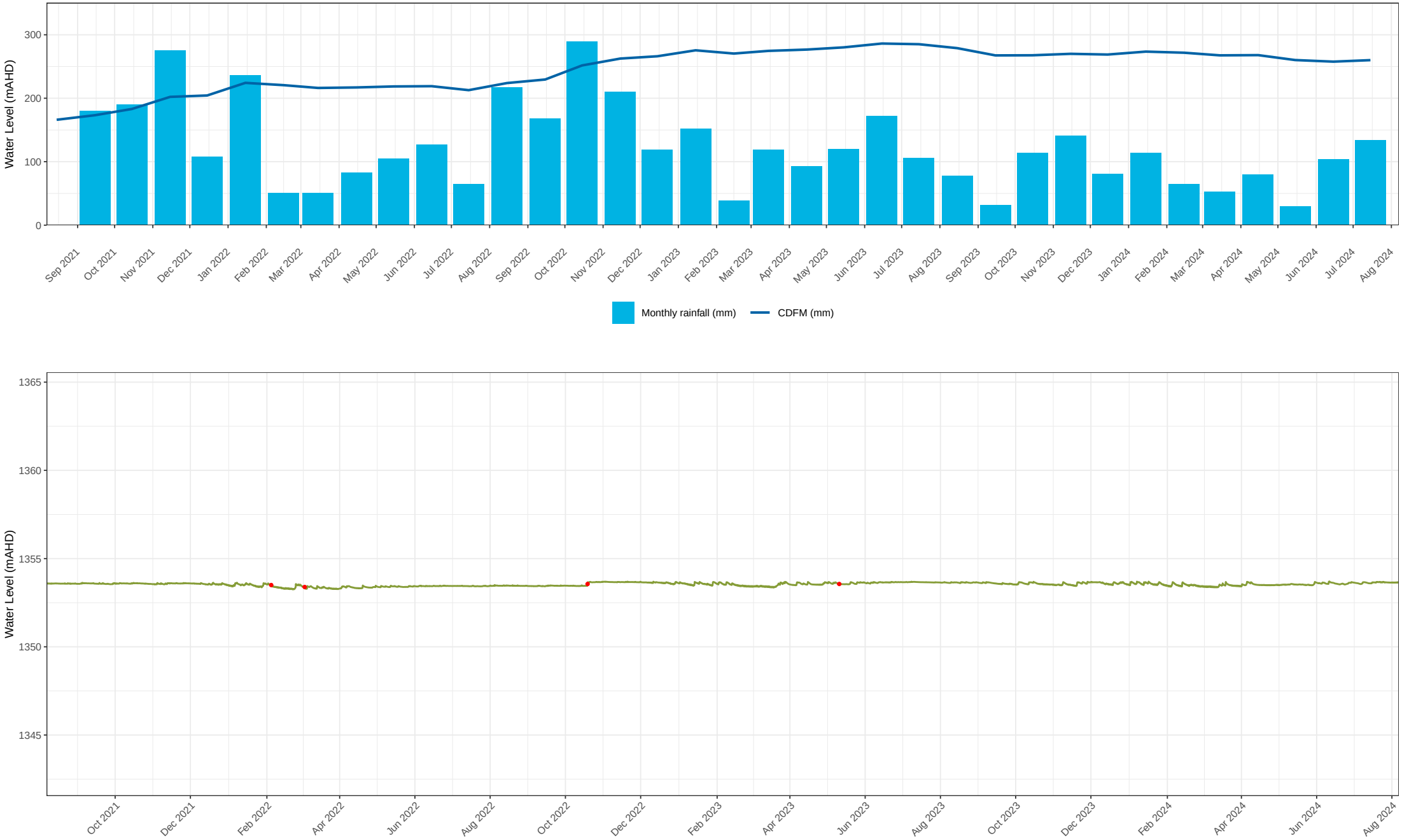


RtS_BH11A groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 59

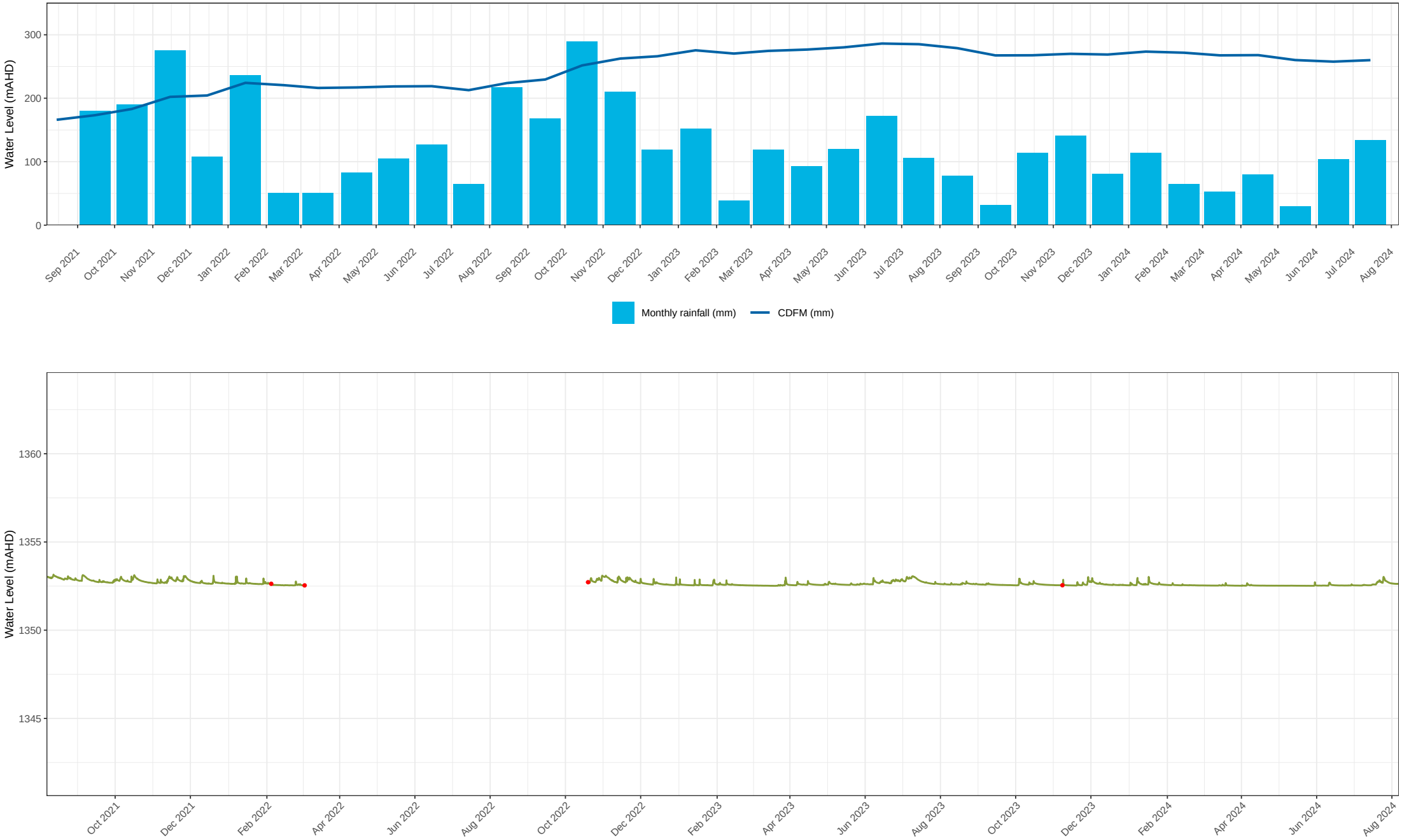


RtS_BH11B groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 60

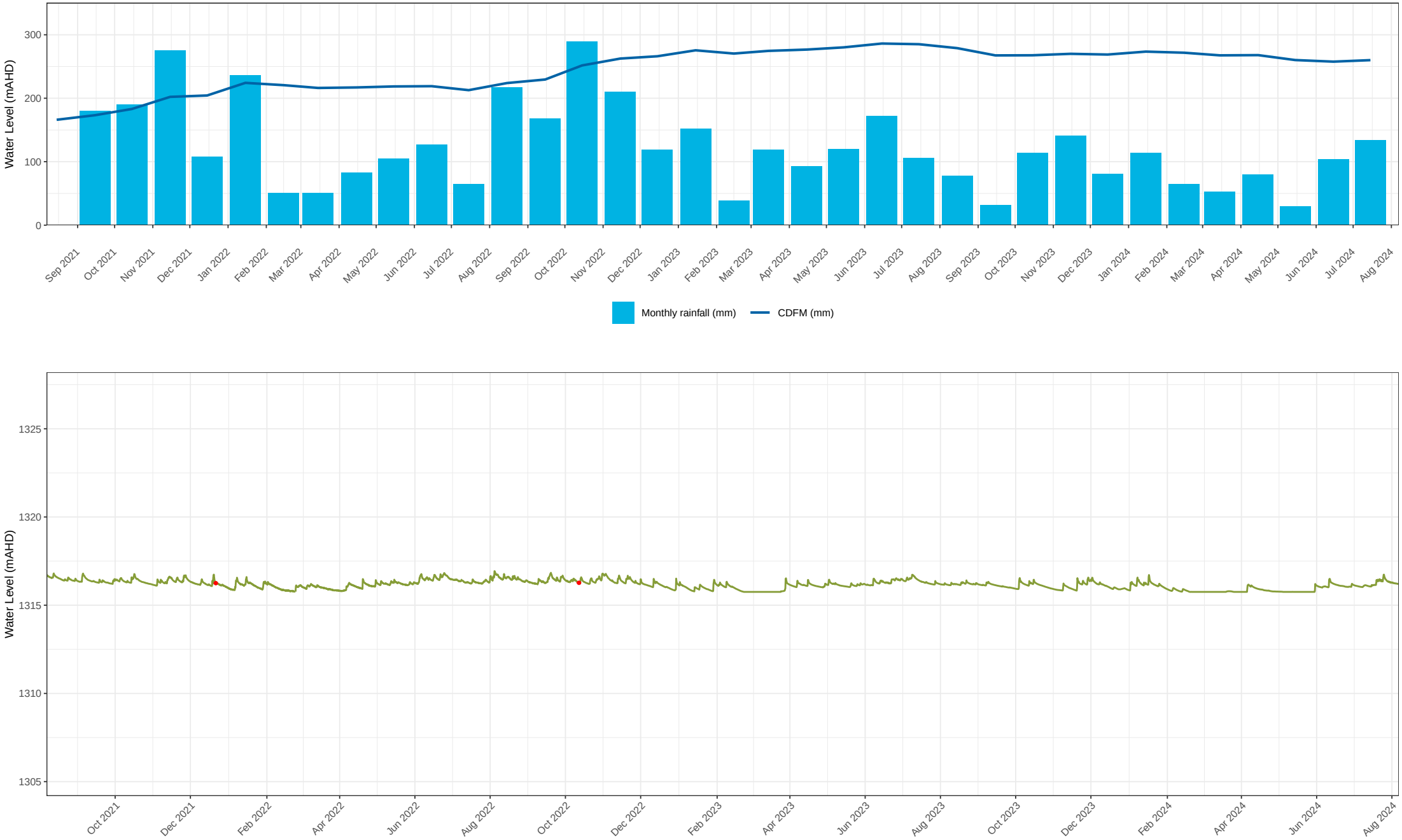


RtS_BH11C groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 61

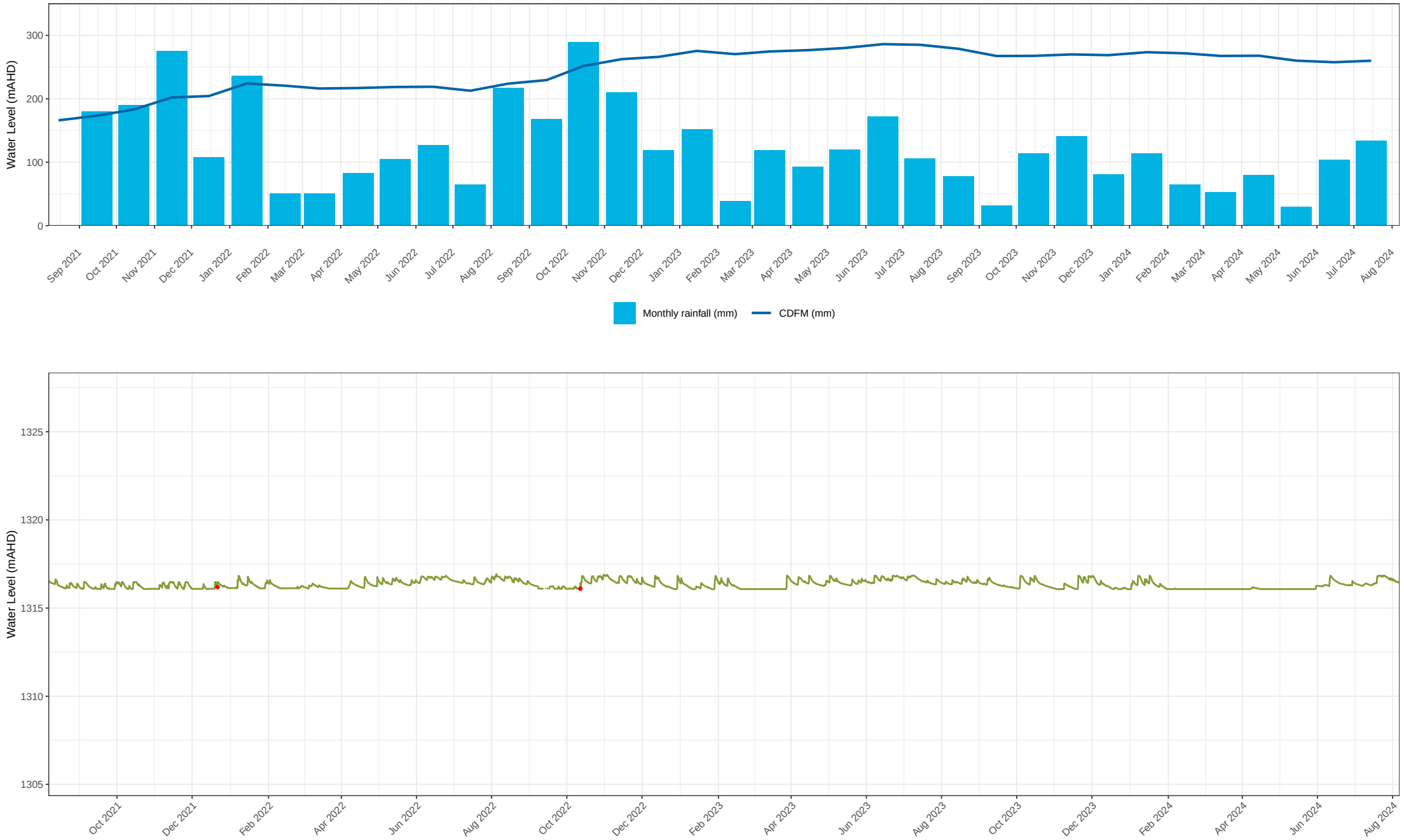


RtS_BH12A groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 62

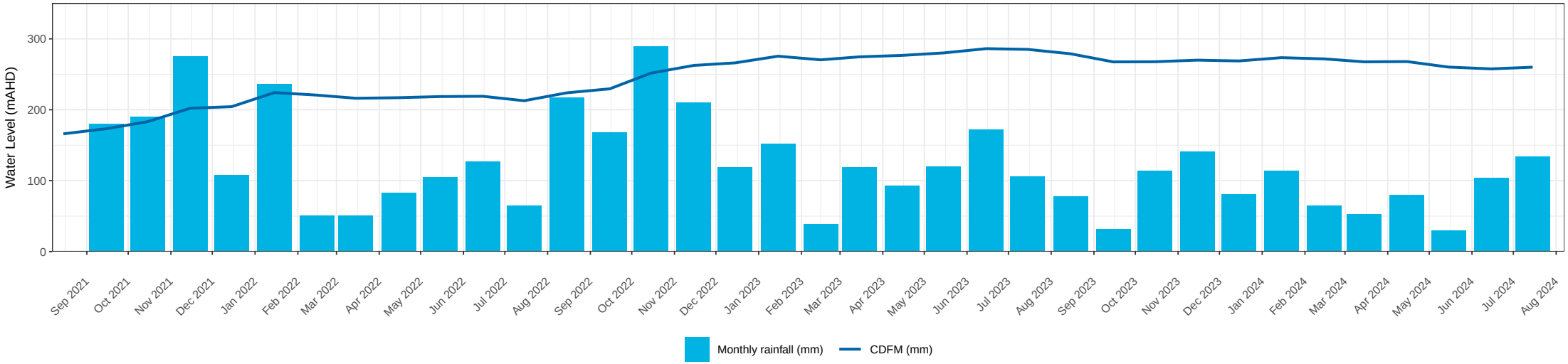


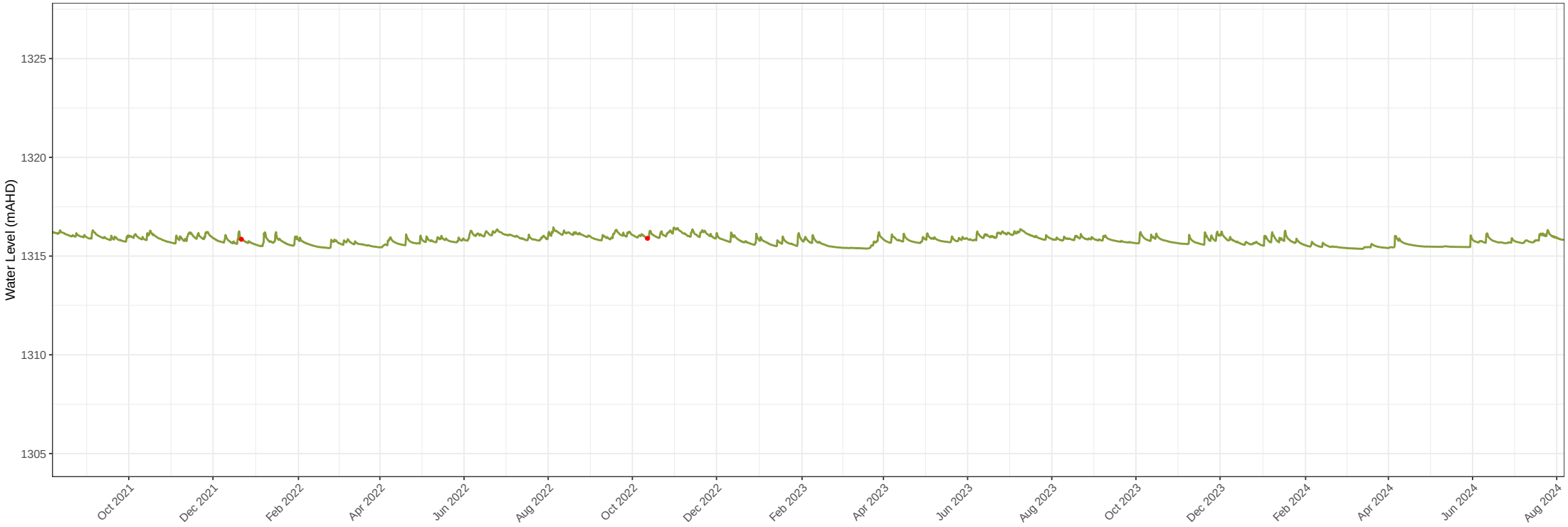
RtS_BH12B groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 63



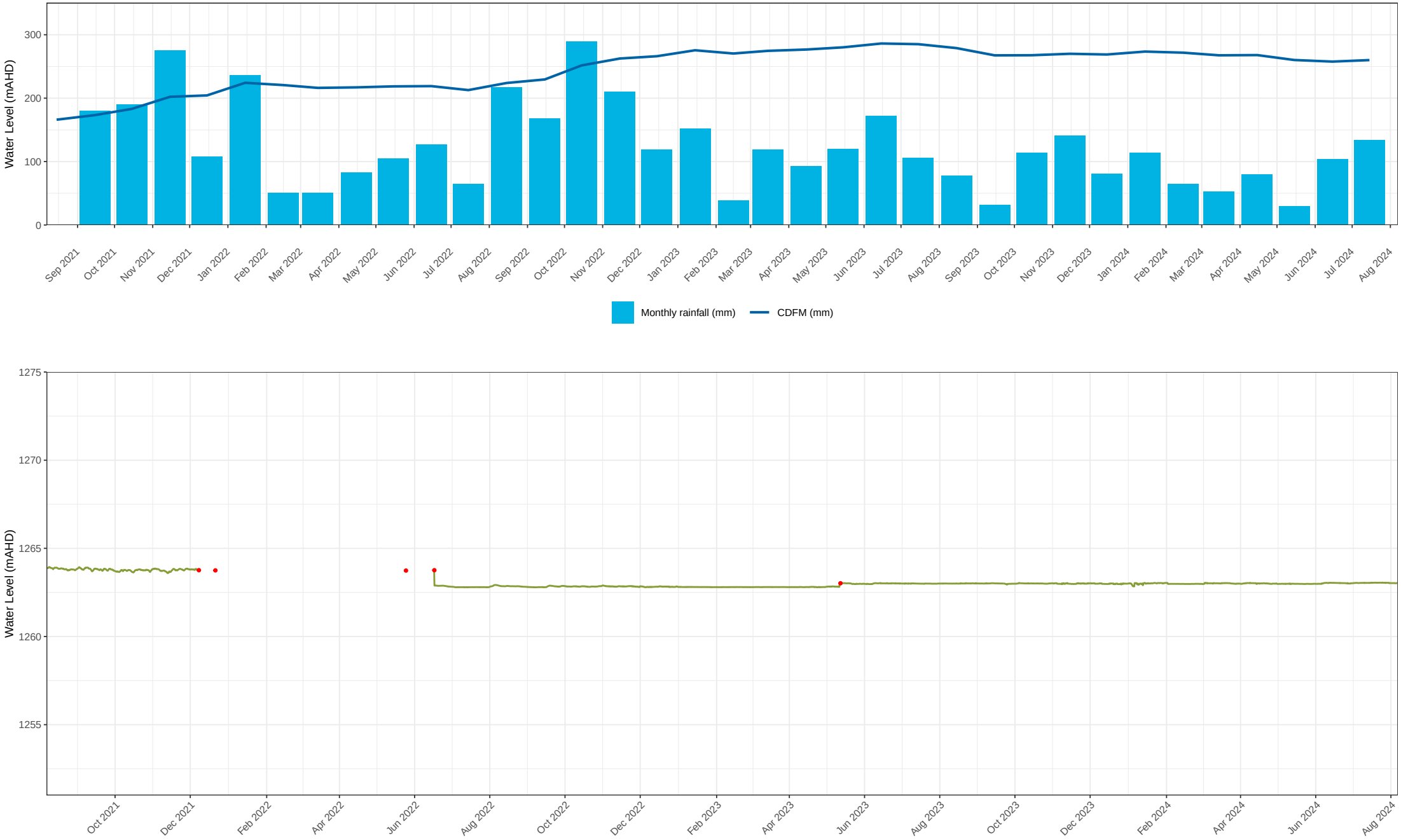


RtS_BH12C groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 64

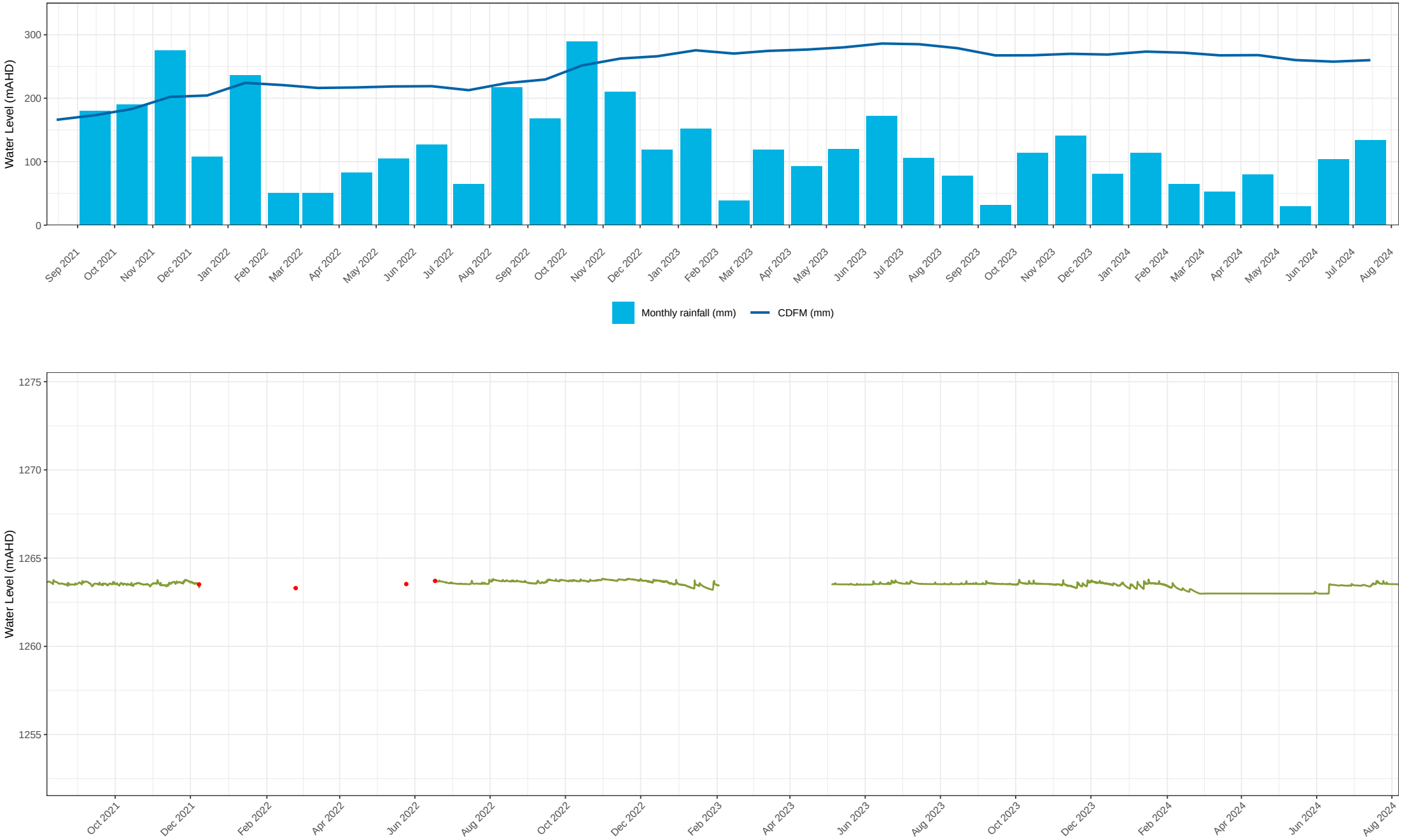


RtS_BH13A groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 65

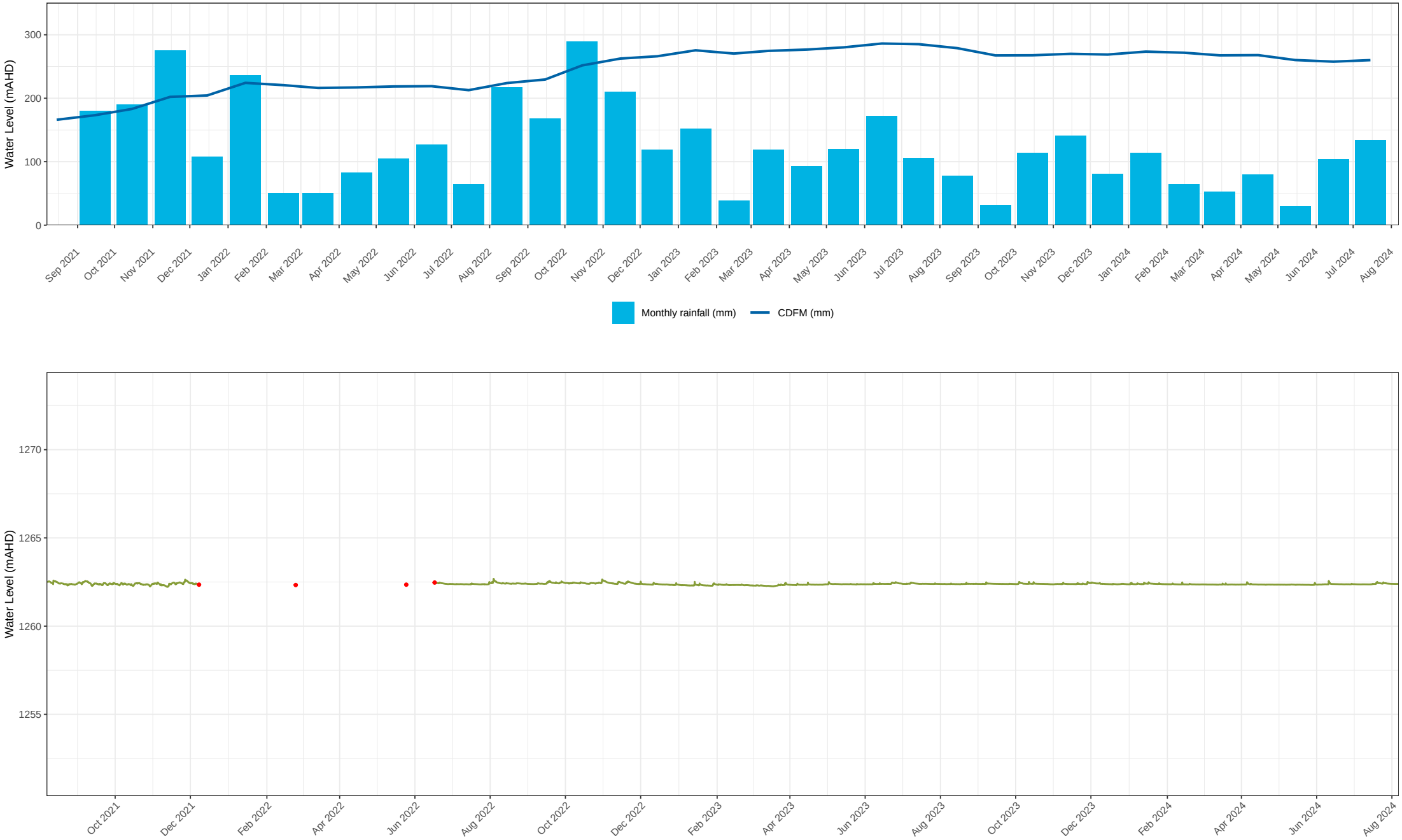


RtS_BH13B groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 66

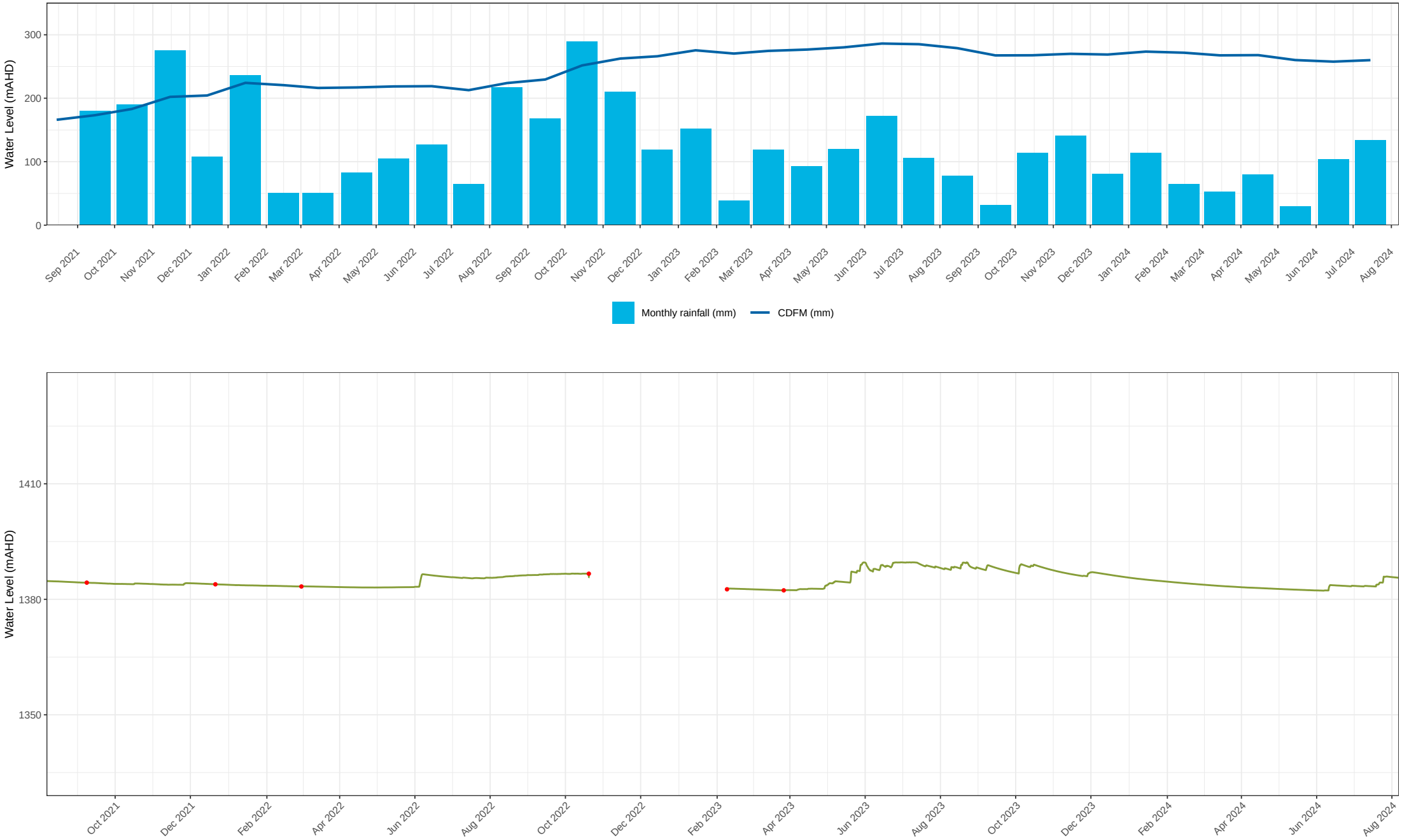


RtS_BH13C groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 67

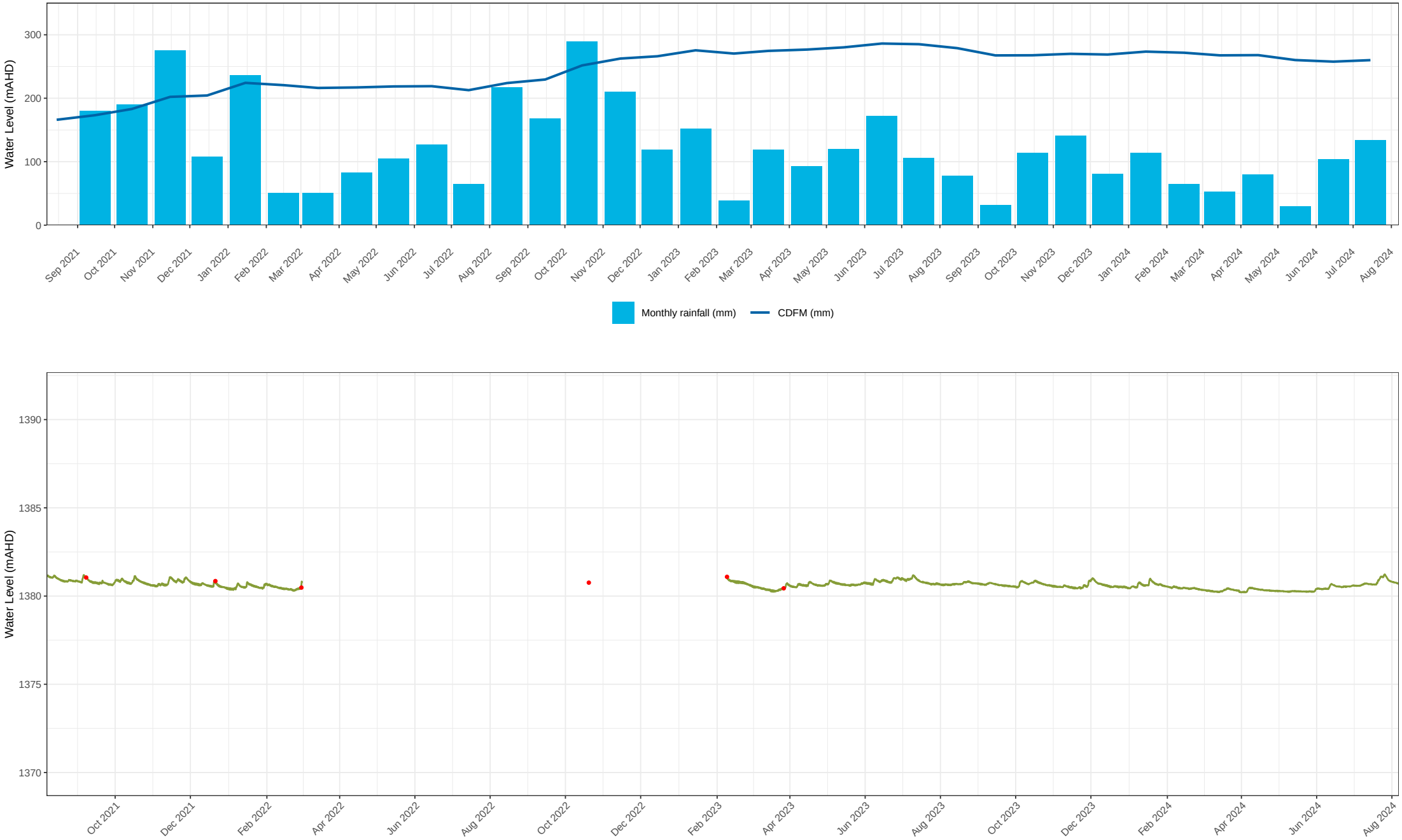


RtS_BH1A groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 68

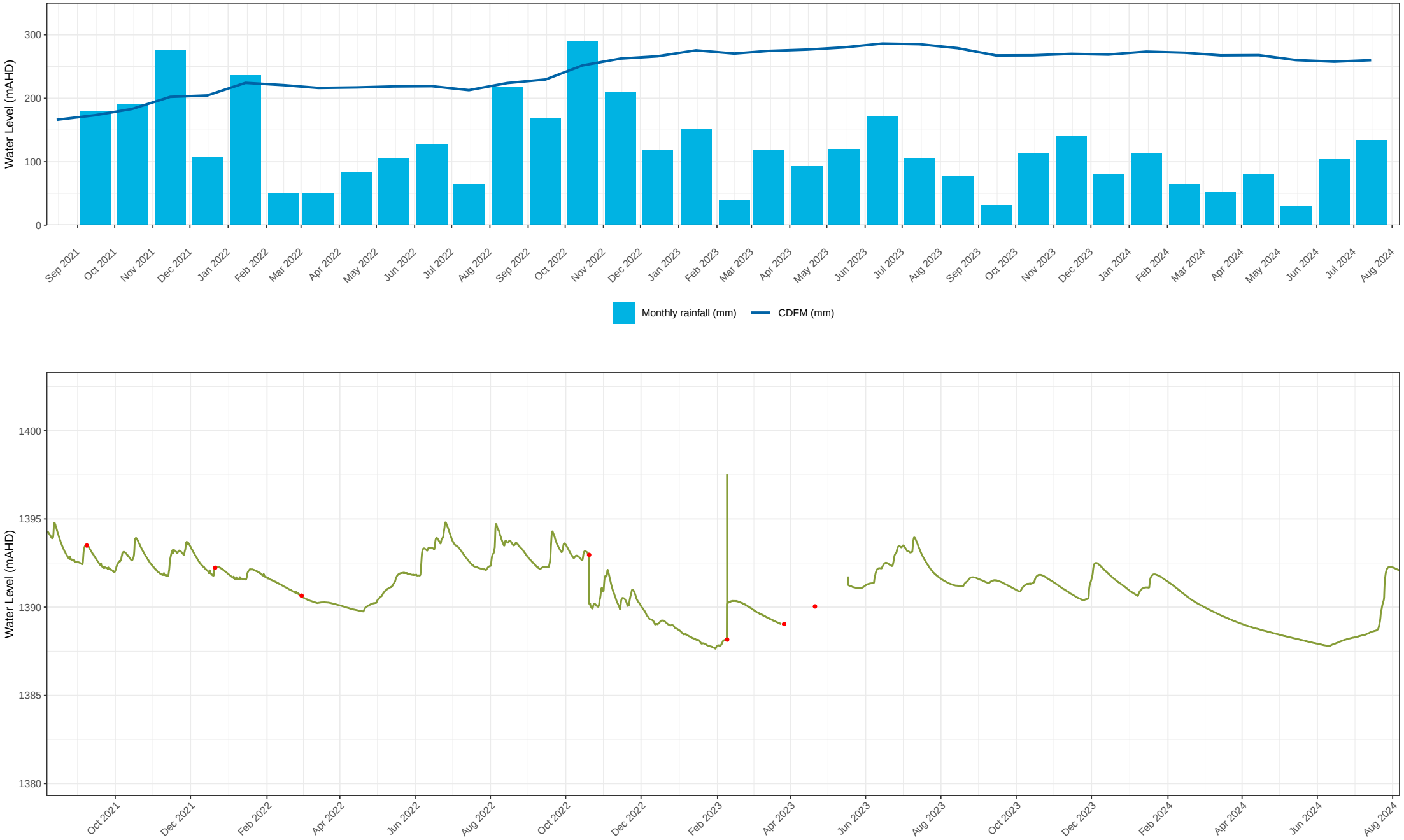


RtS_BH1B groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 69

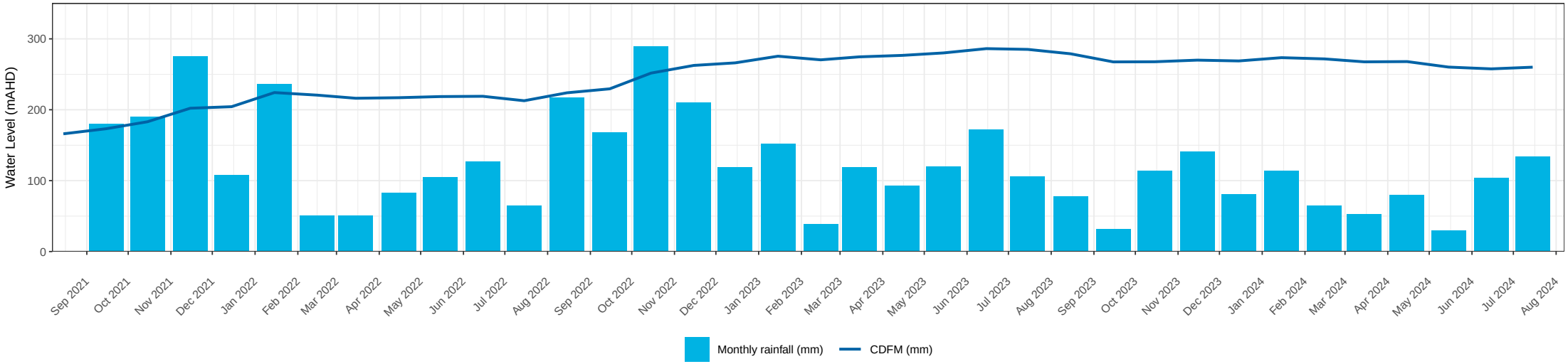


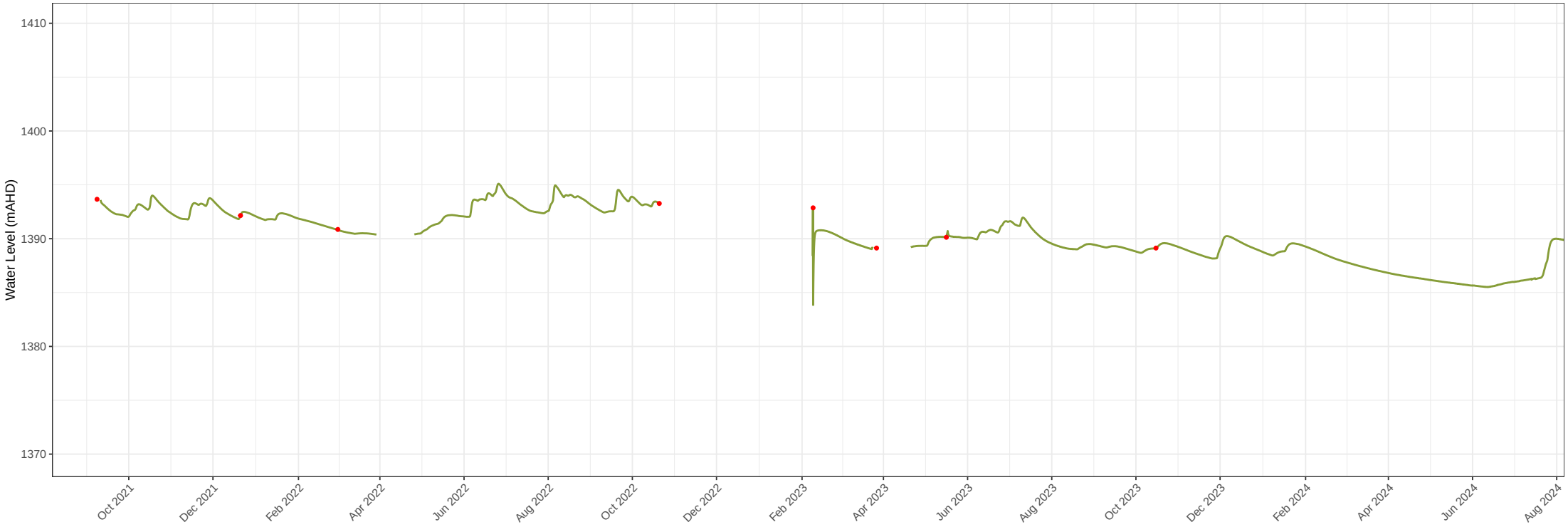
RtS_BH2A groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 70



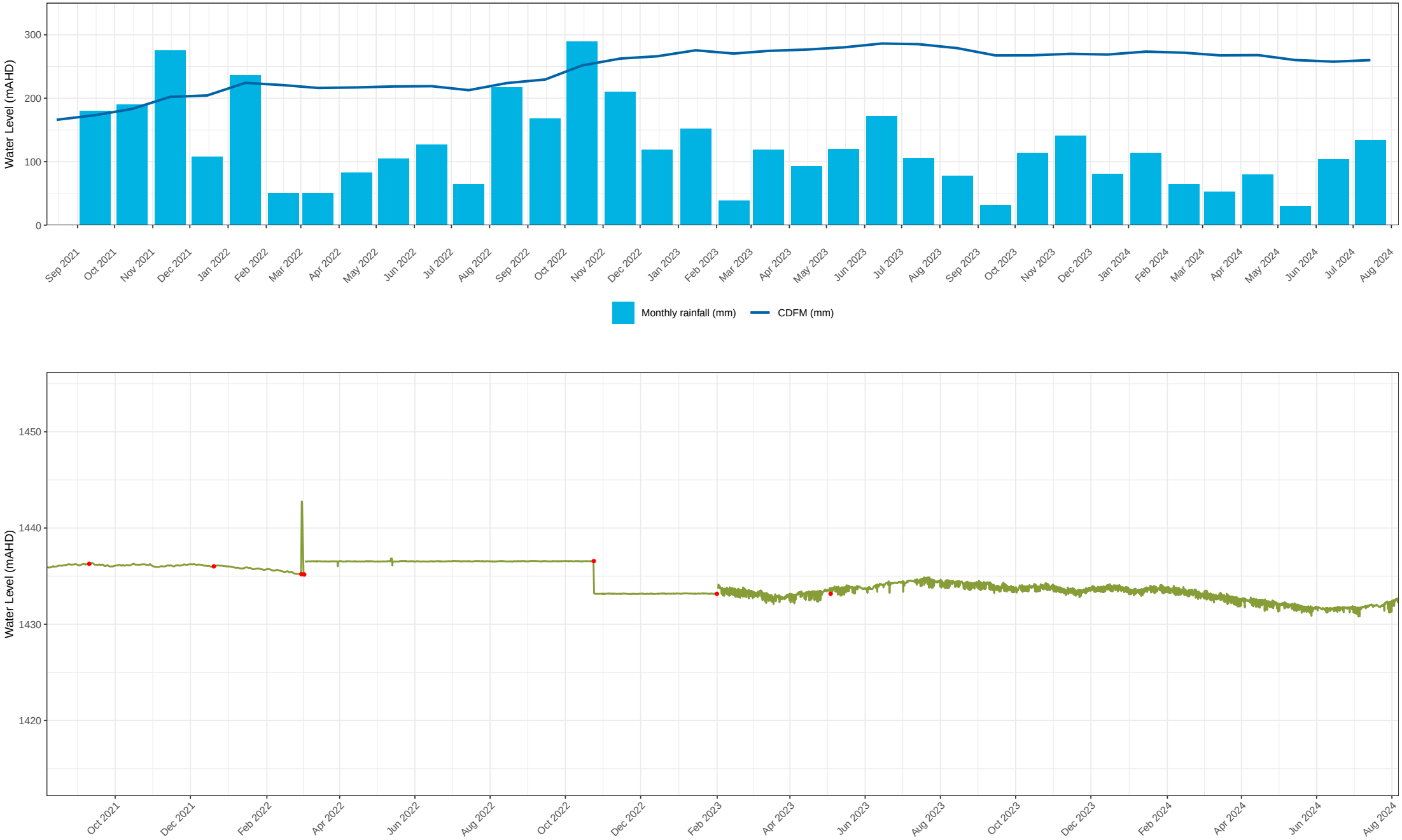


RtS_BH2B groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 71

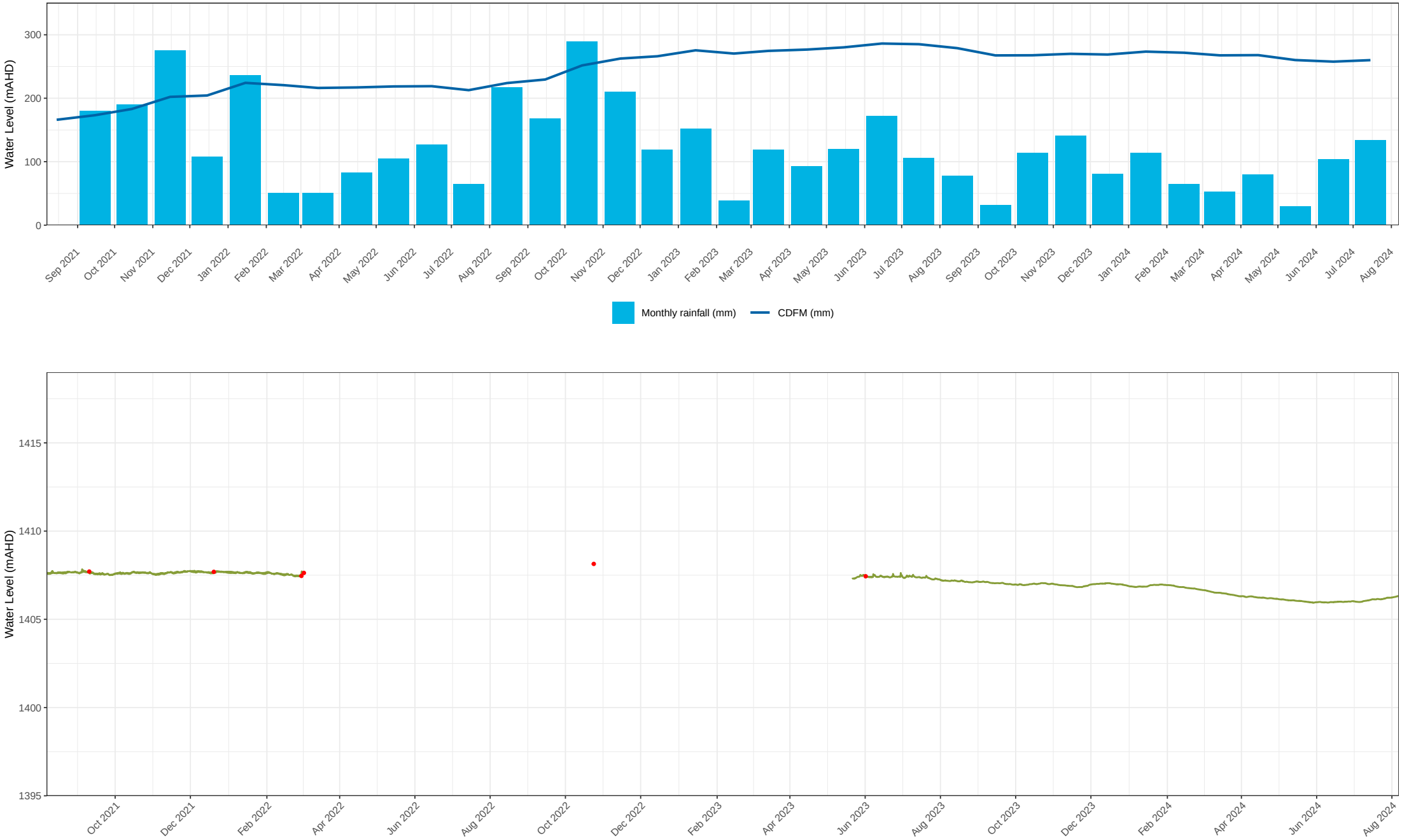


RtS_BH3A groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 72

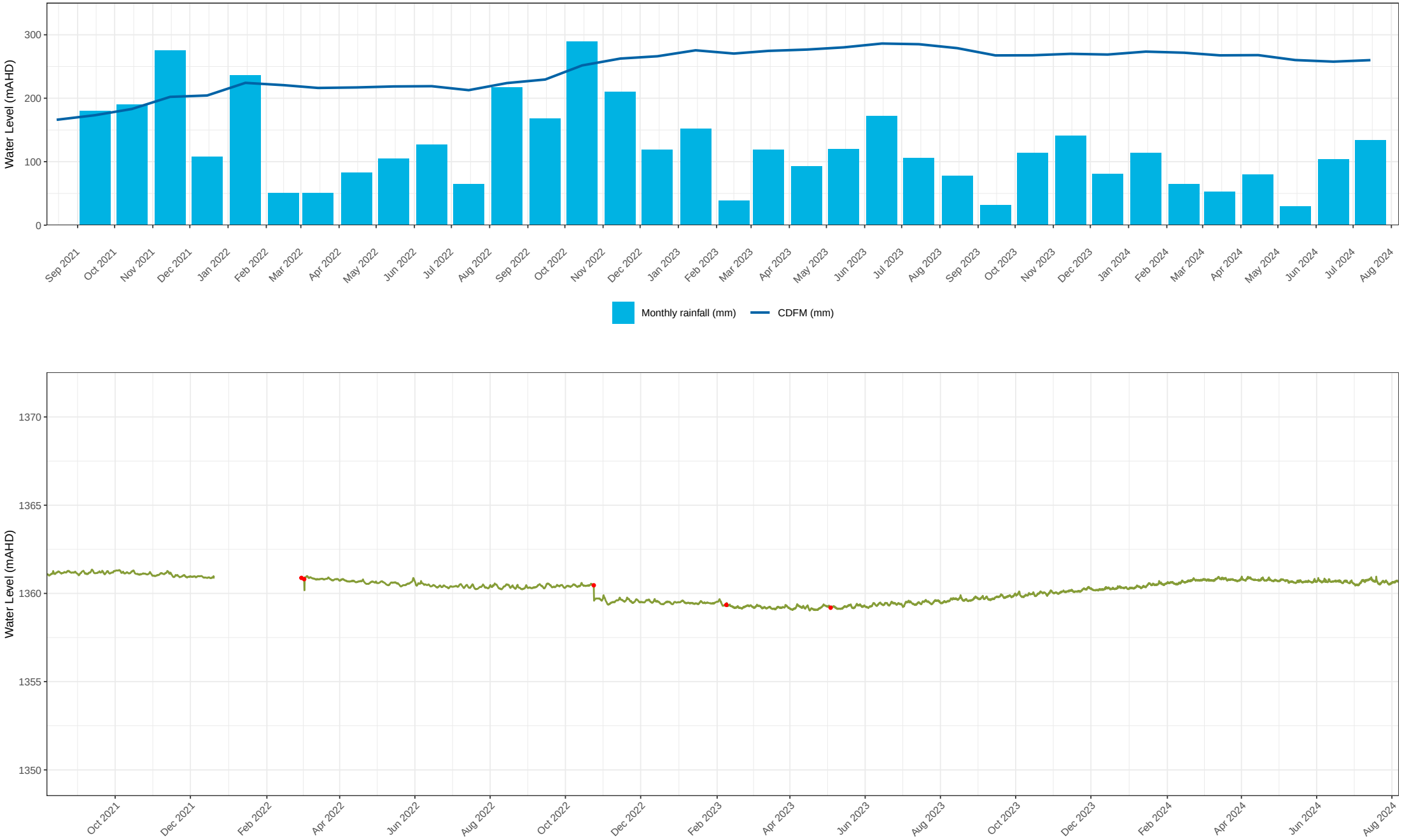


RtS_BH3B groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 73

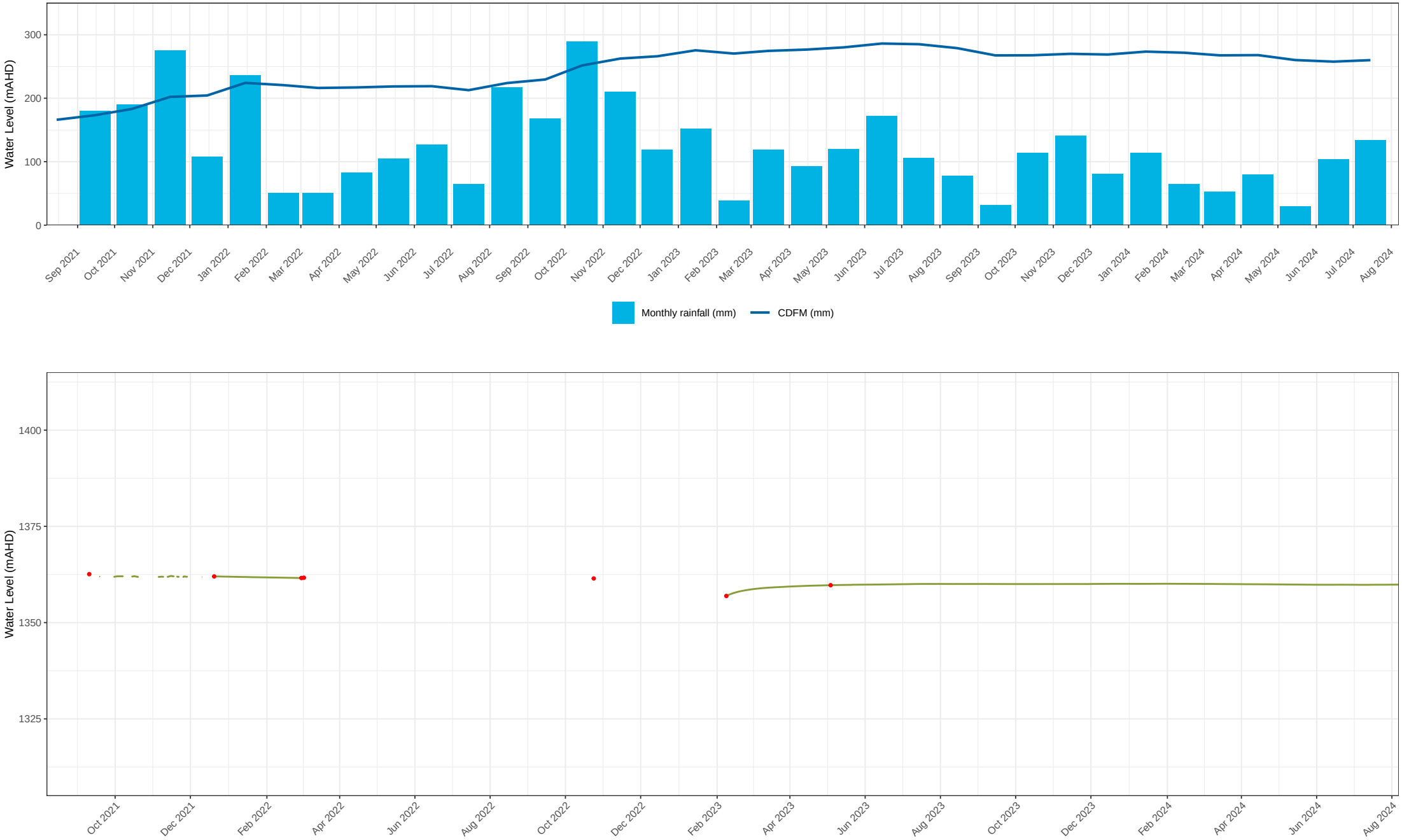


RtS_BH4A groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 74

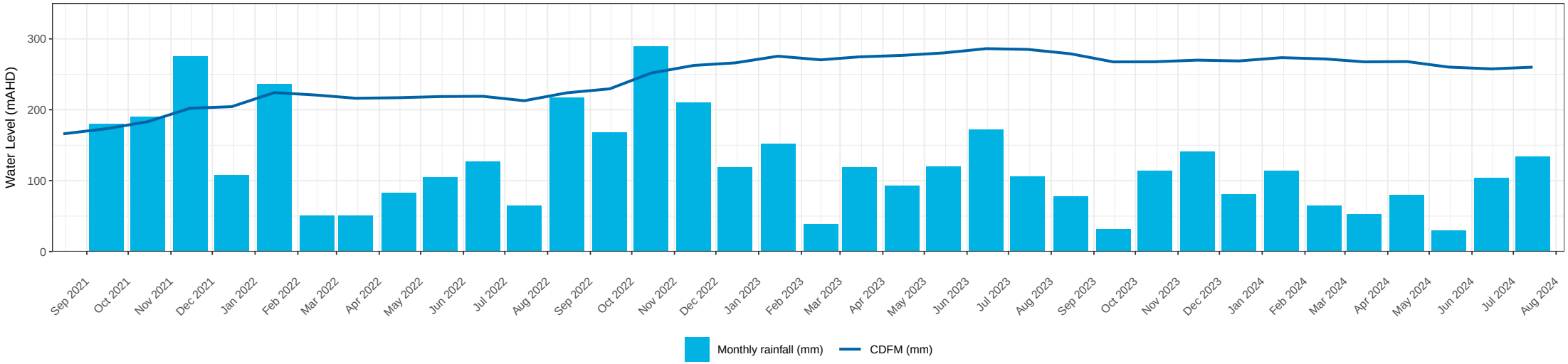


RtS_BH4B groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 75

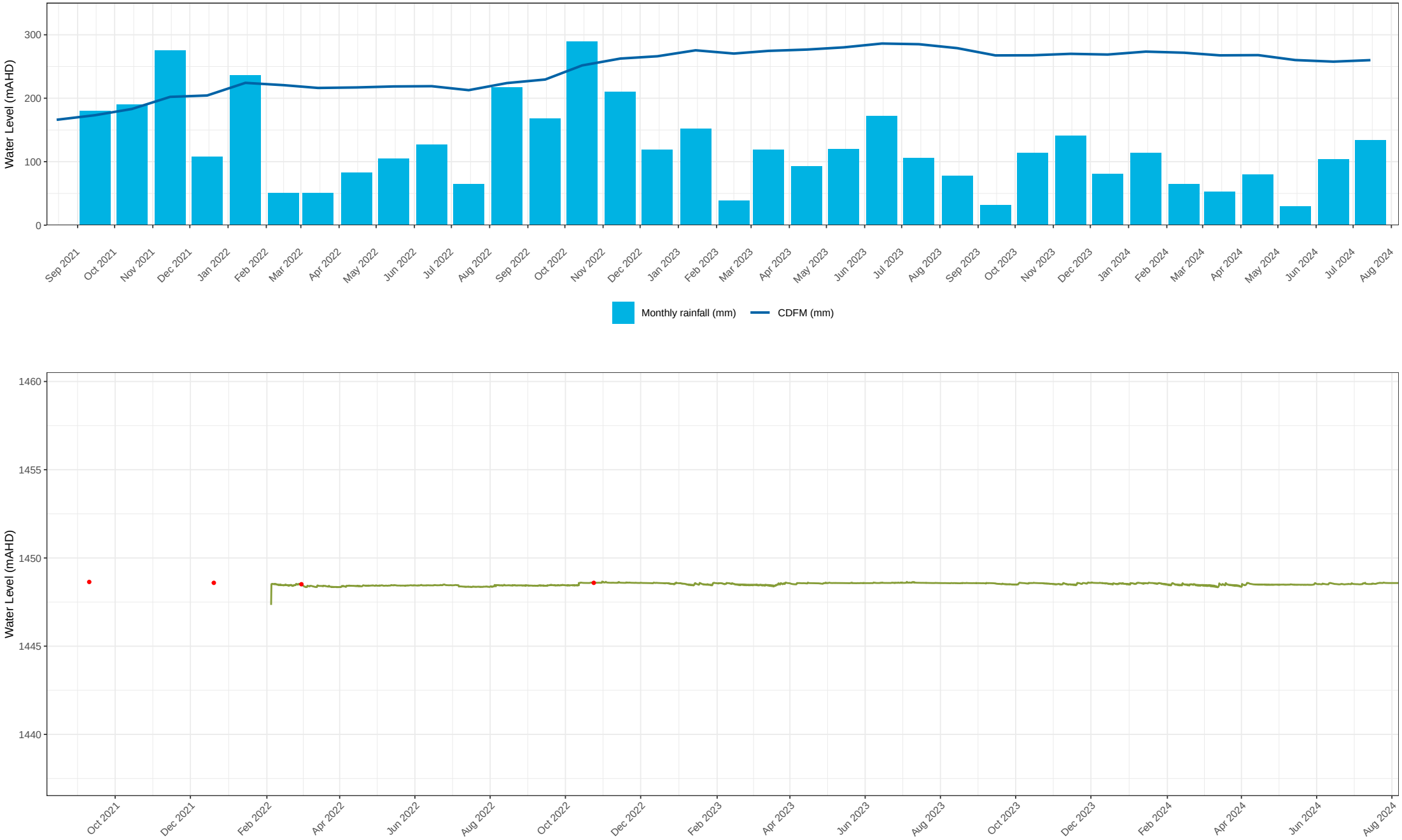


RtS_BH5A groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 76

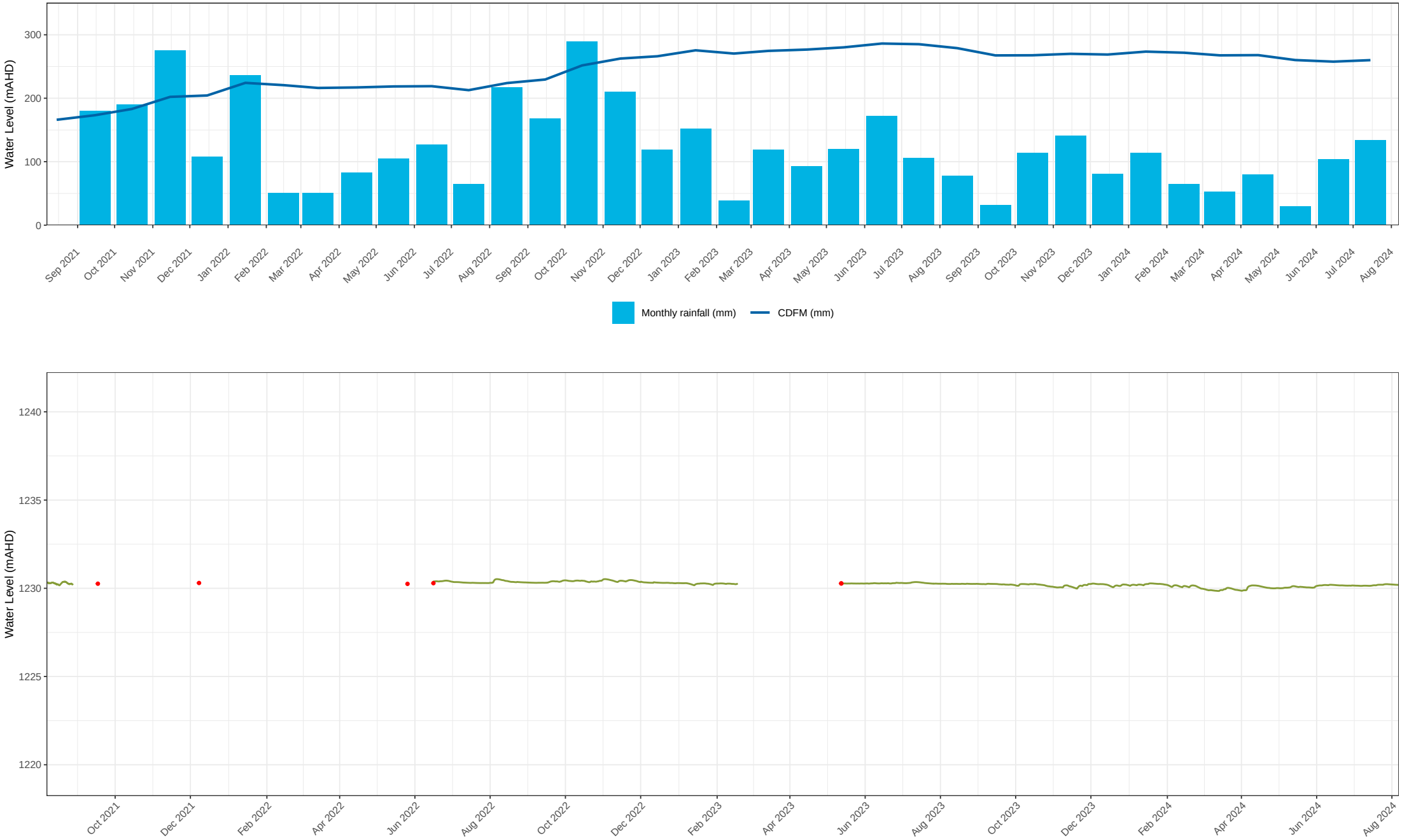


RtS_BH6A groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 77

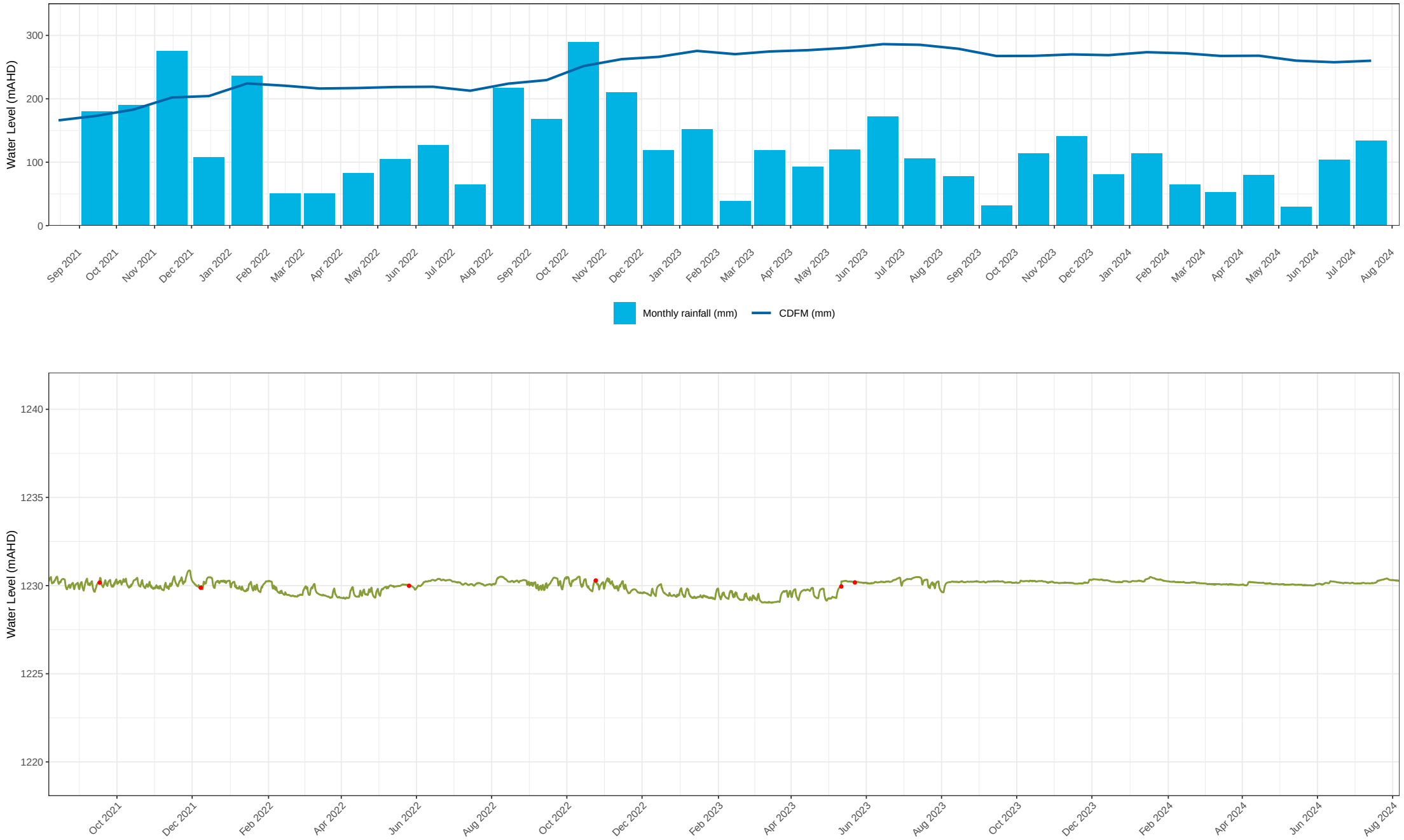


RtS_BH7A groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 78

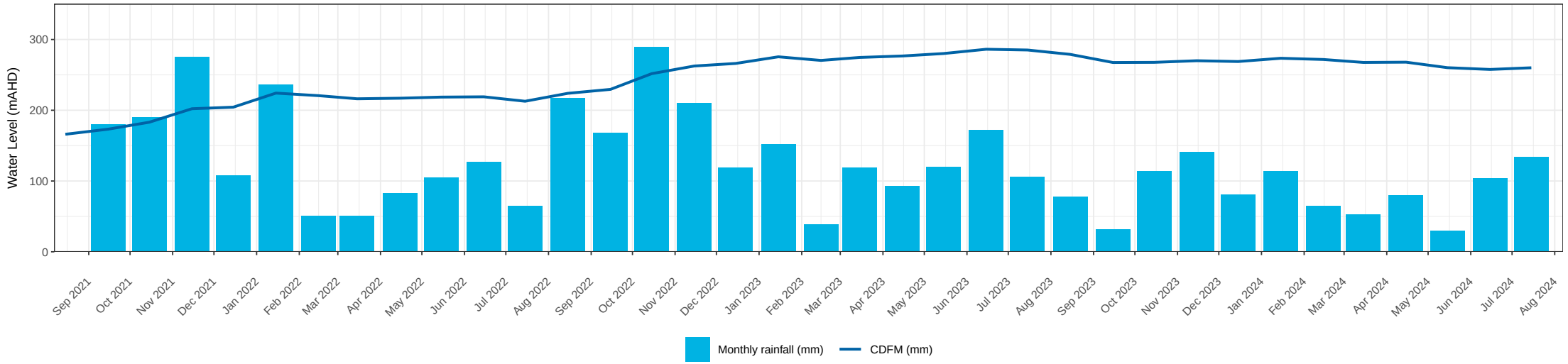


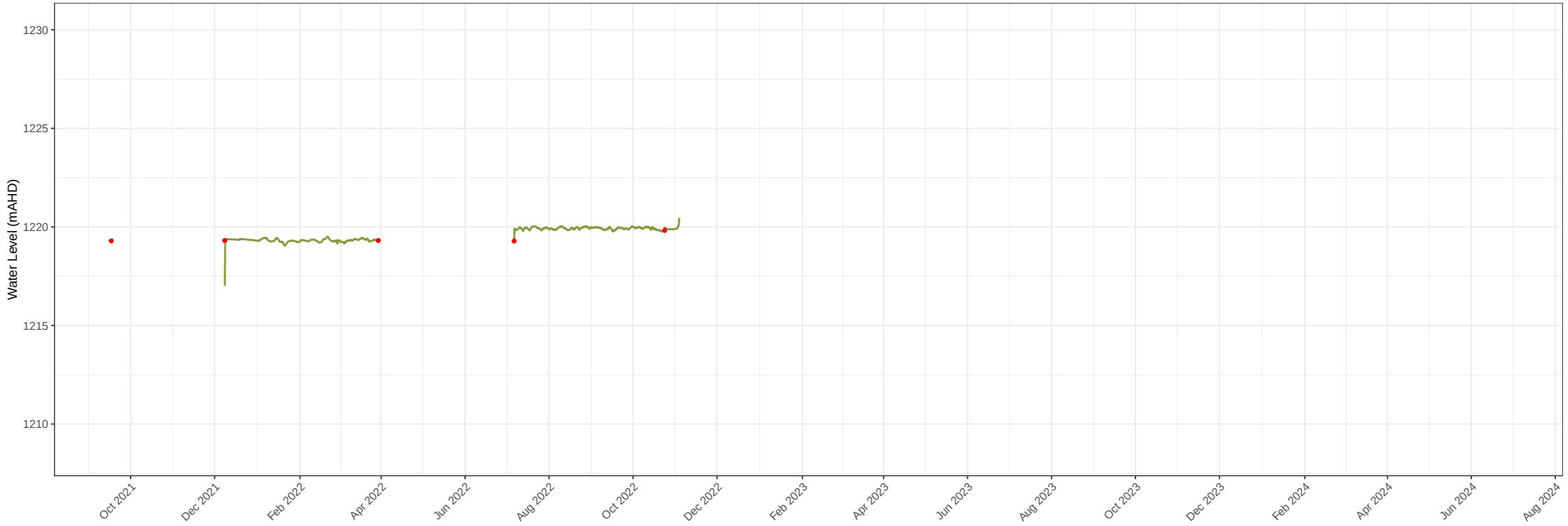
RtS_BH7B groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 79



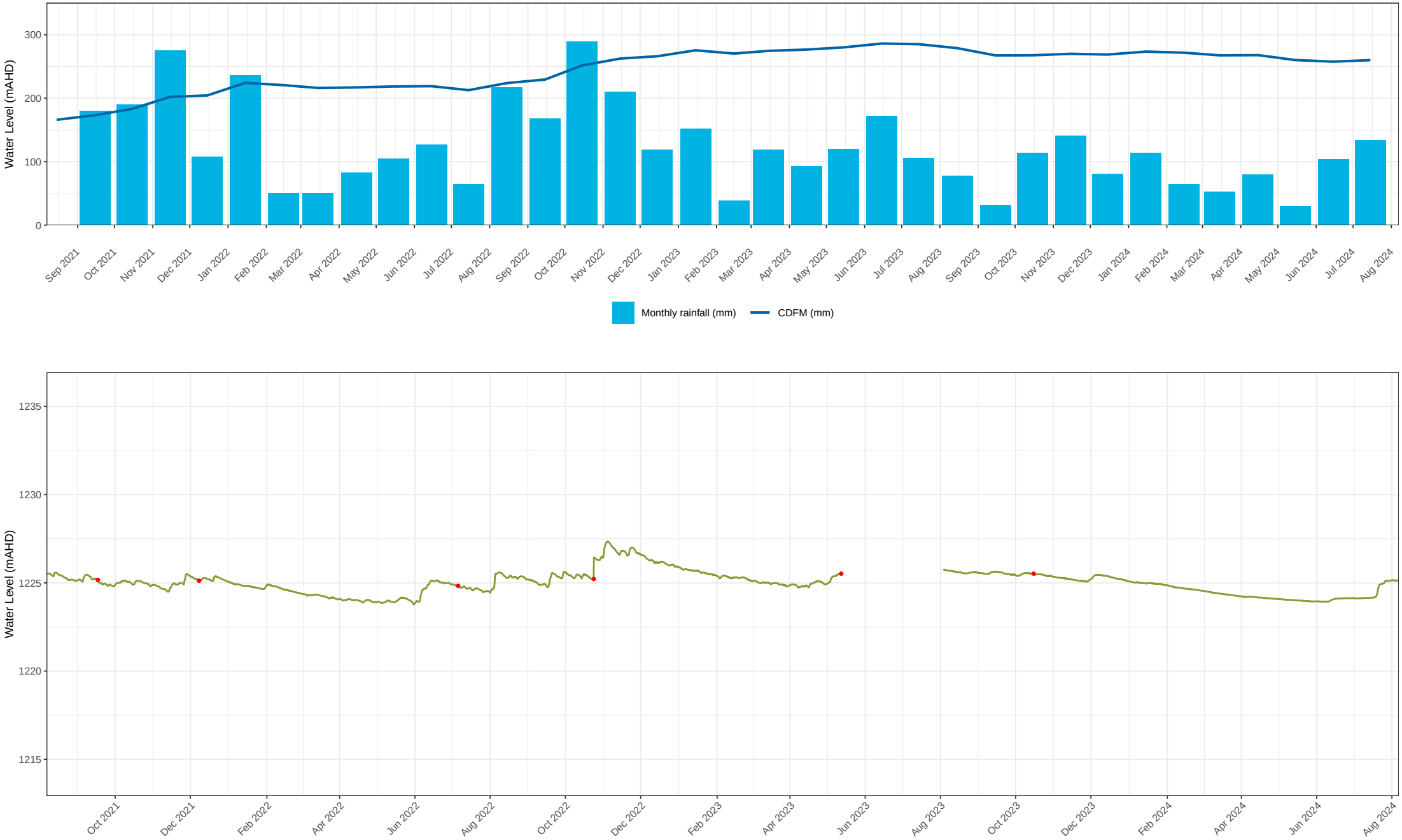


RtS_BH8A groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 80

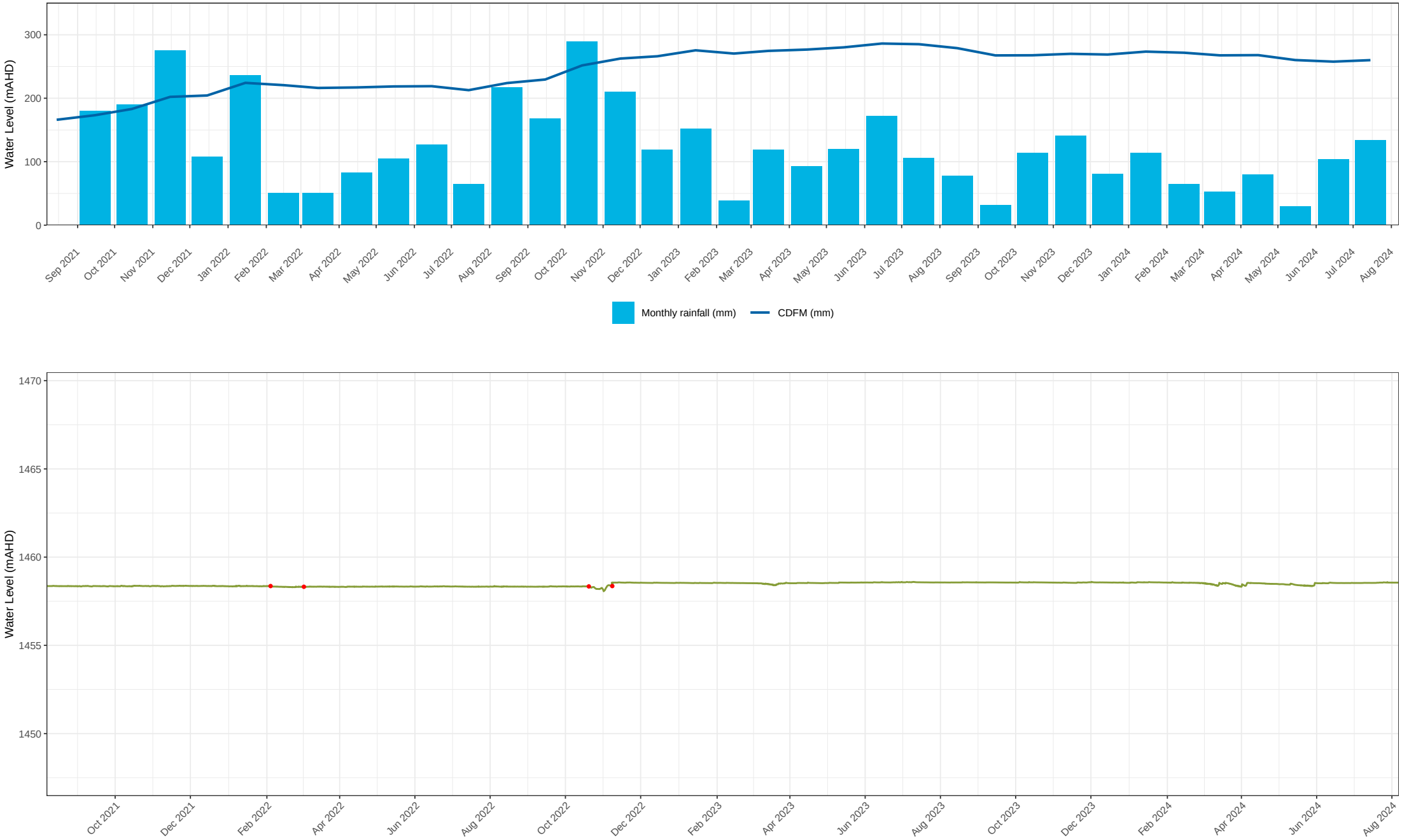


RtS_BH8B groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 81

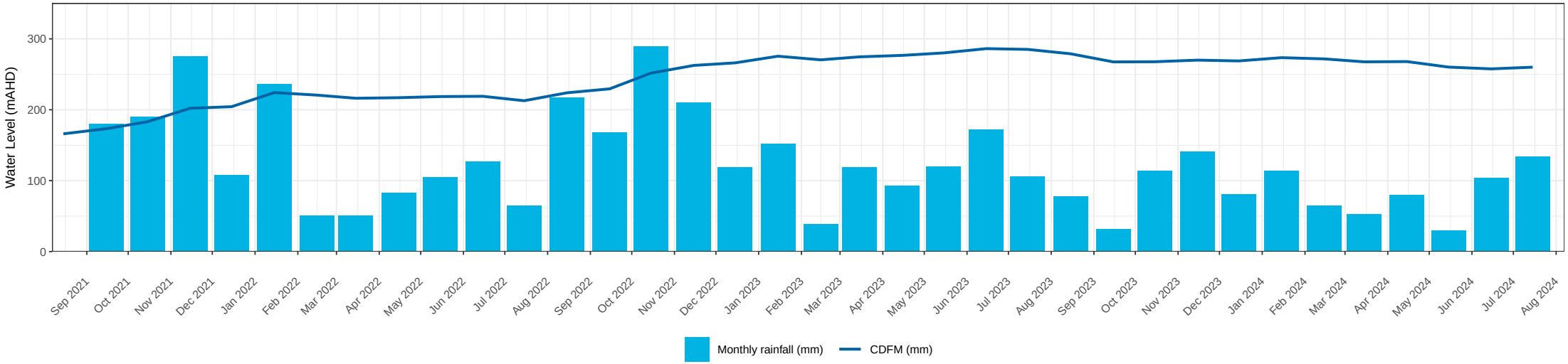


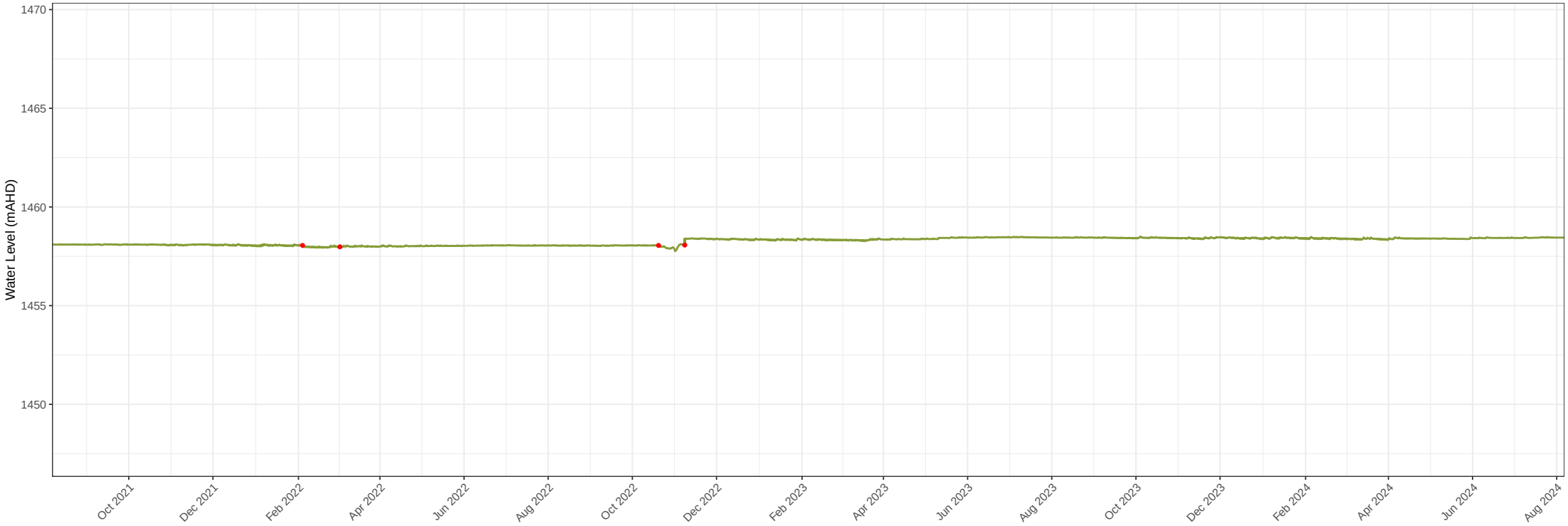
RtS_BH9A groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 82



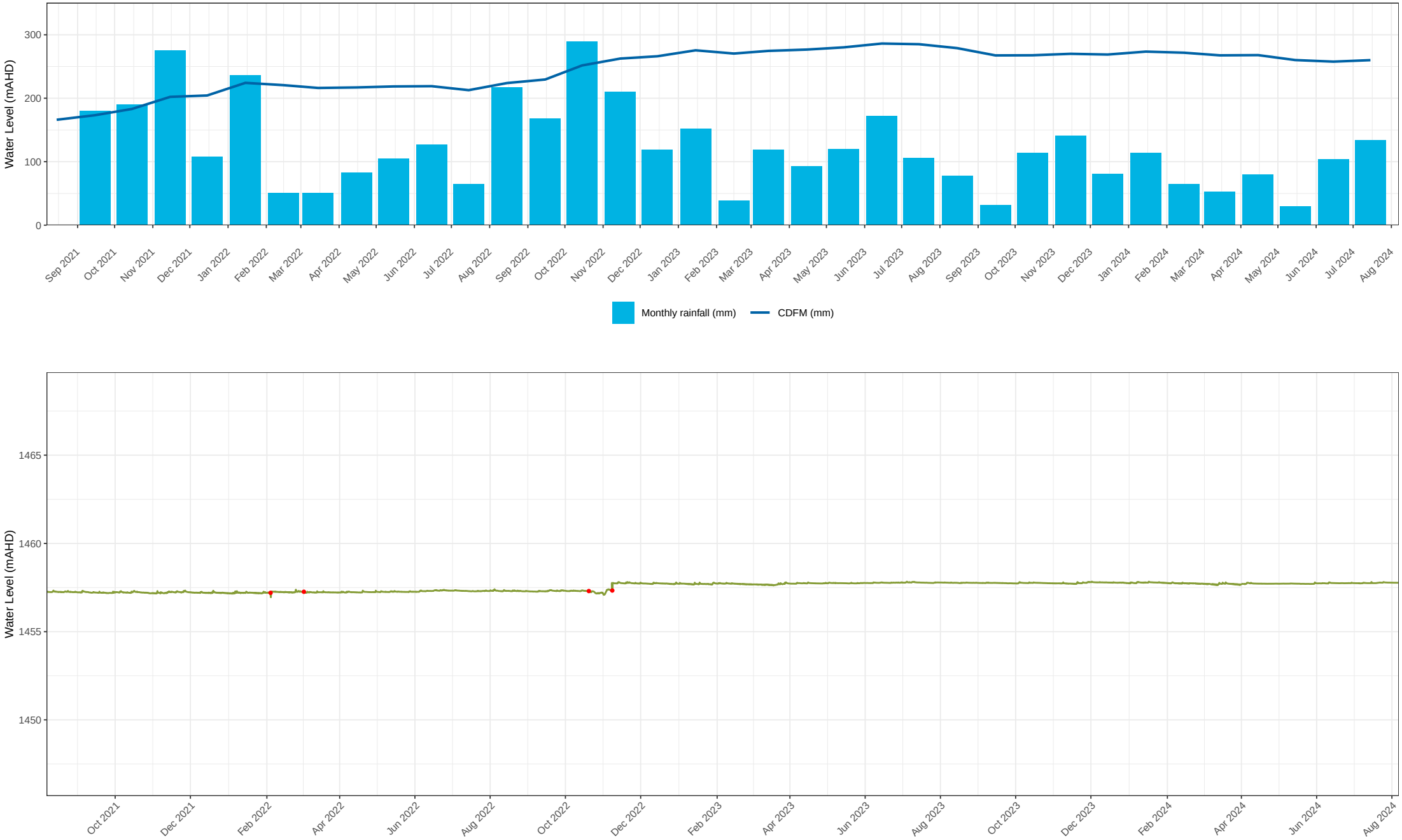


RtS_BH9B groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 83

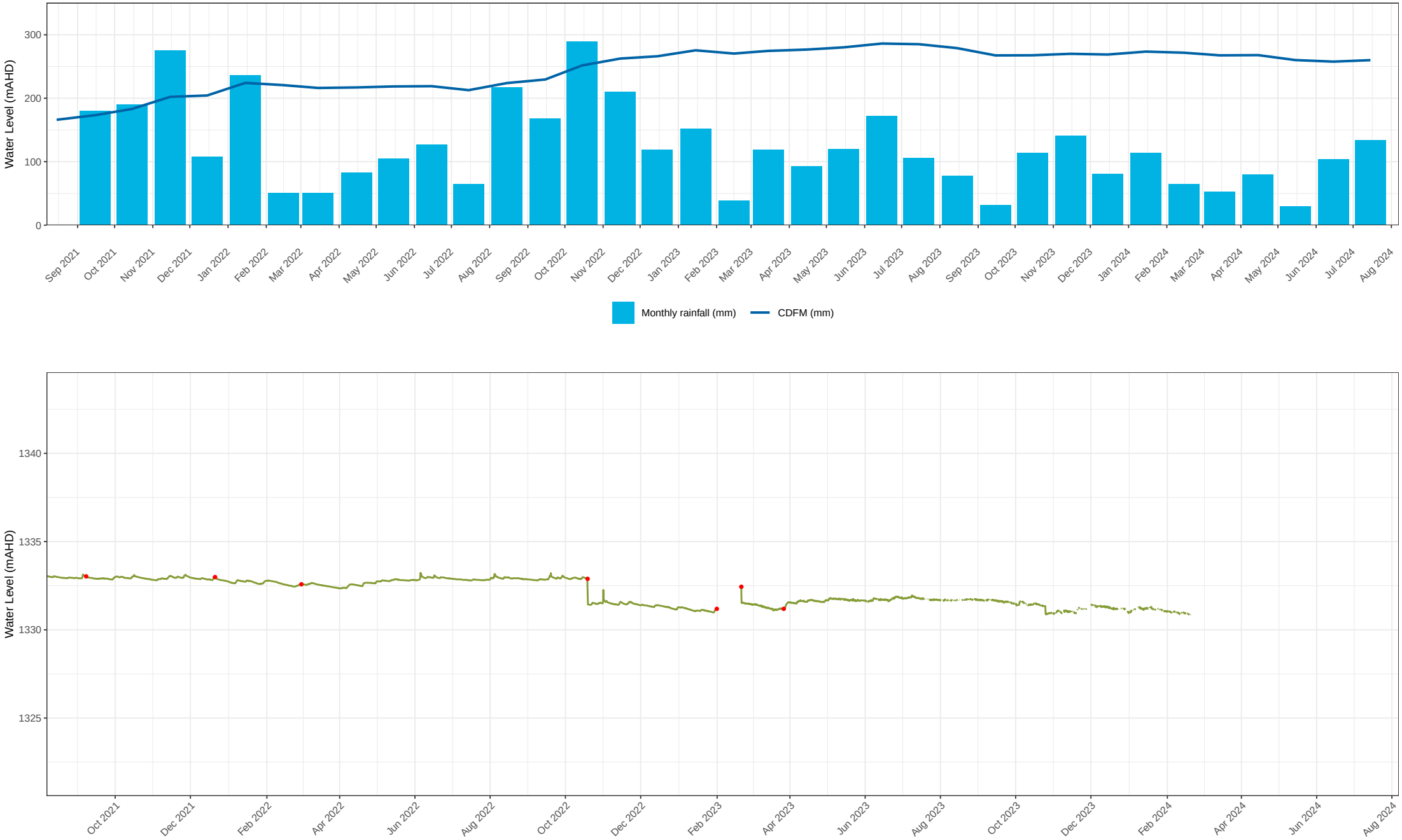


RtS_BH9C groundwater level times series data

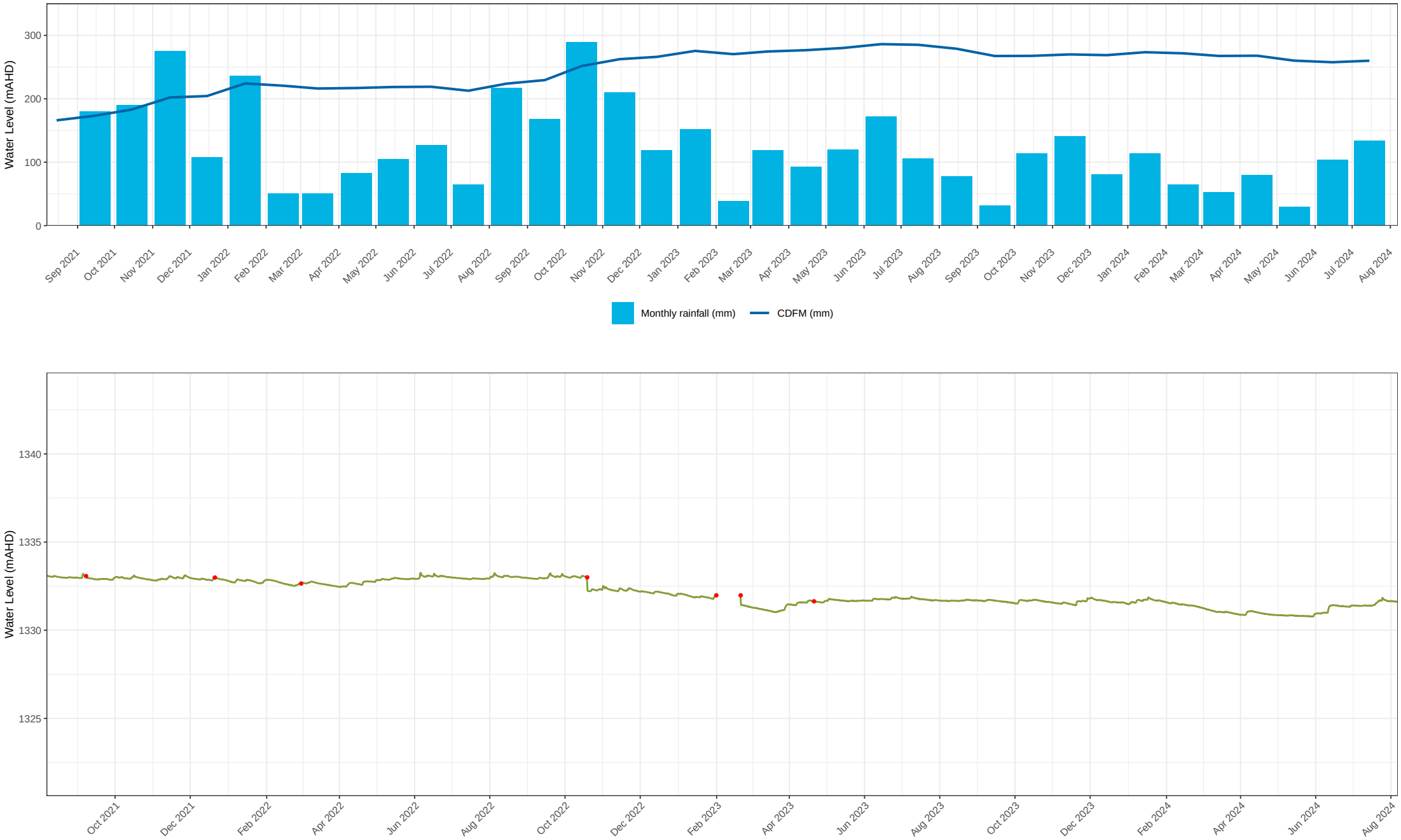
Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 84



SMB02 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 85

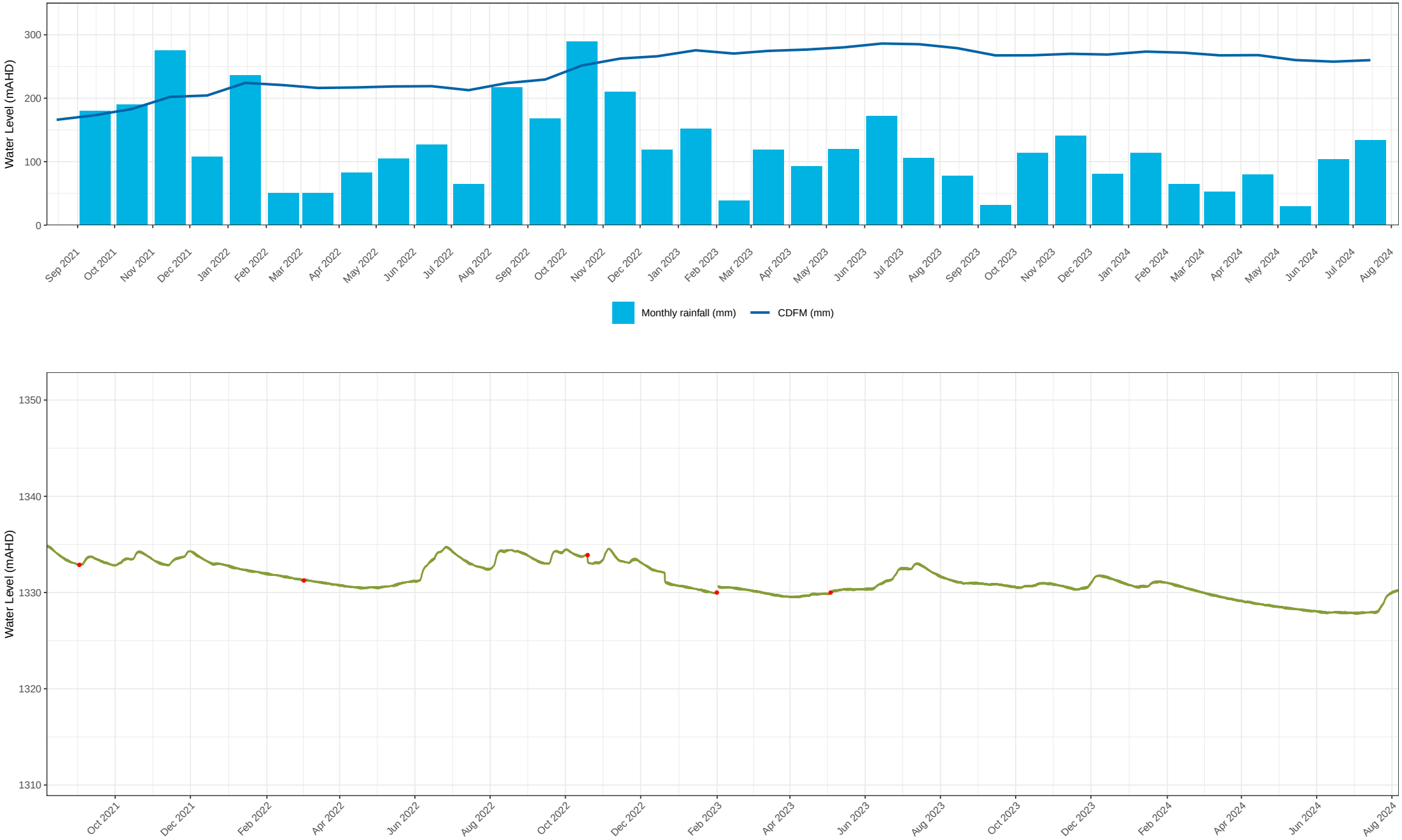


SMB03 groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 86

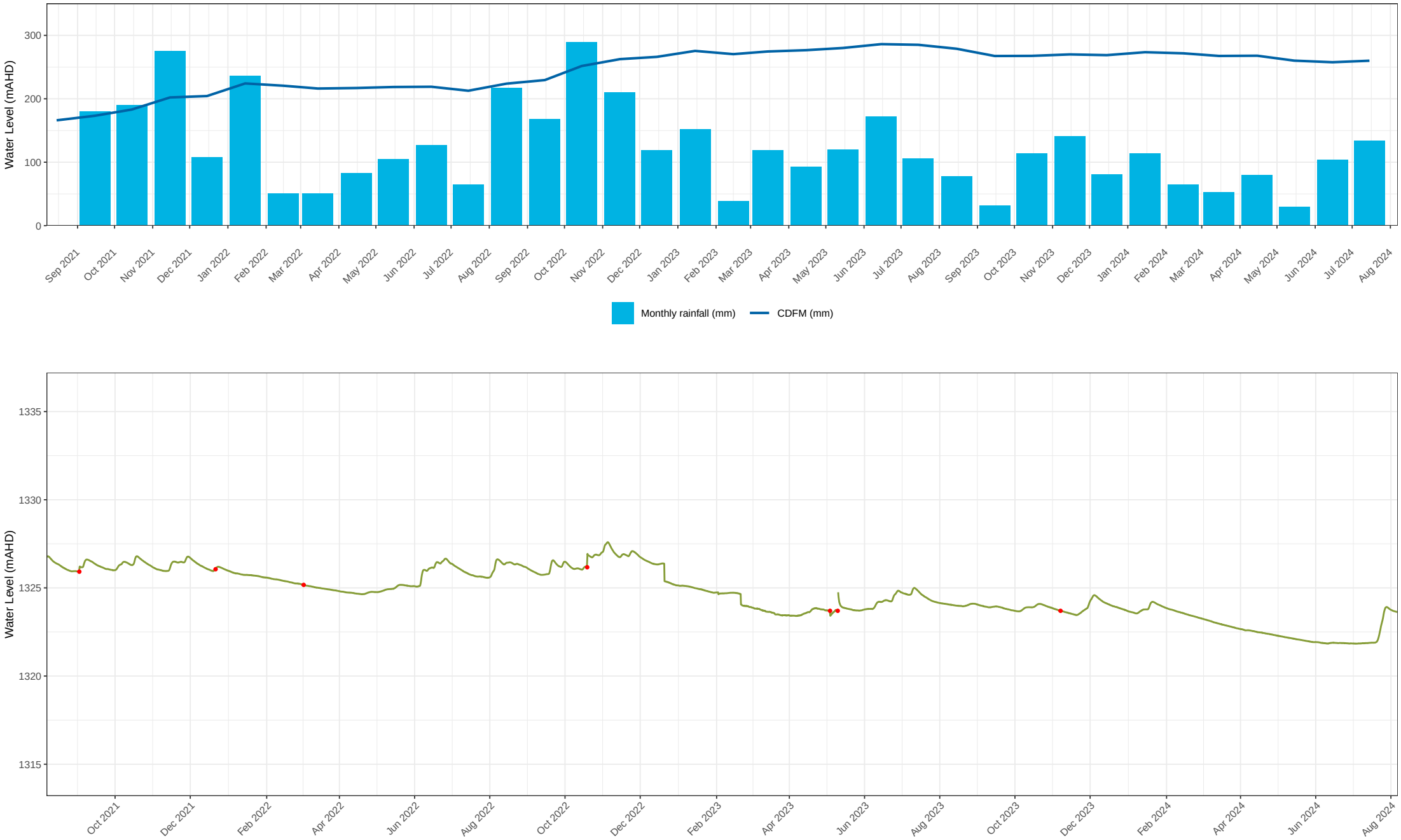


SMB04 groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 87

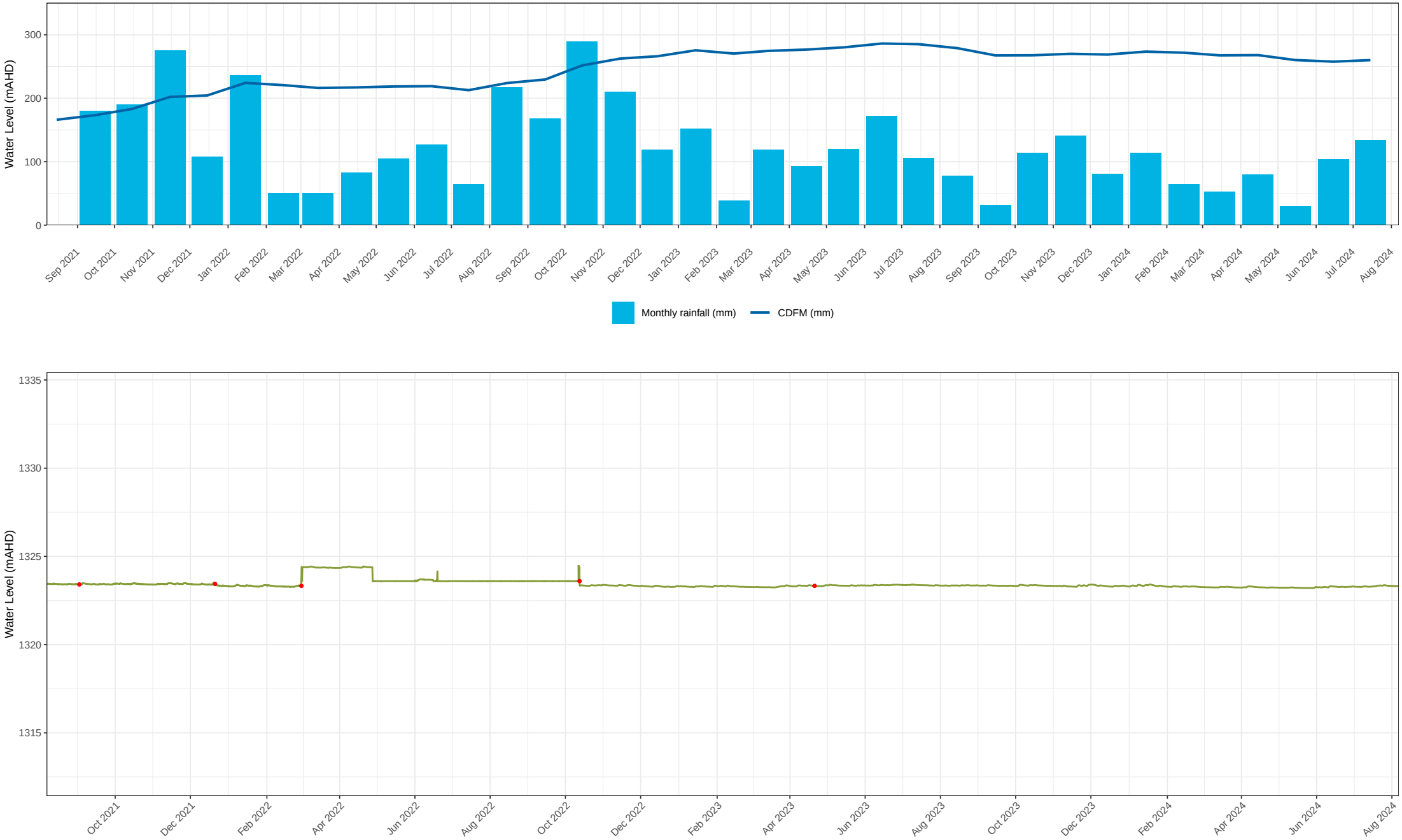


SMB05 groundwater level times series data

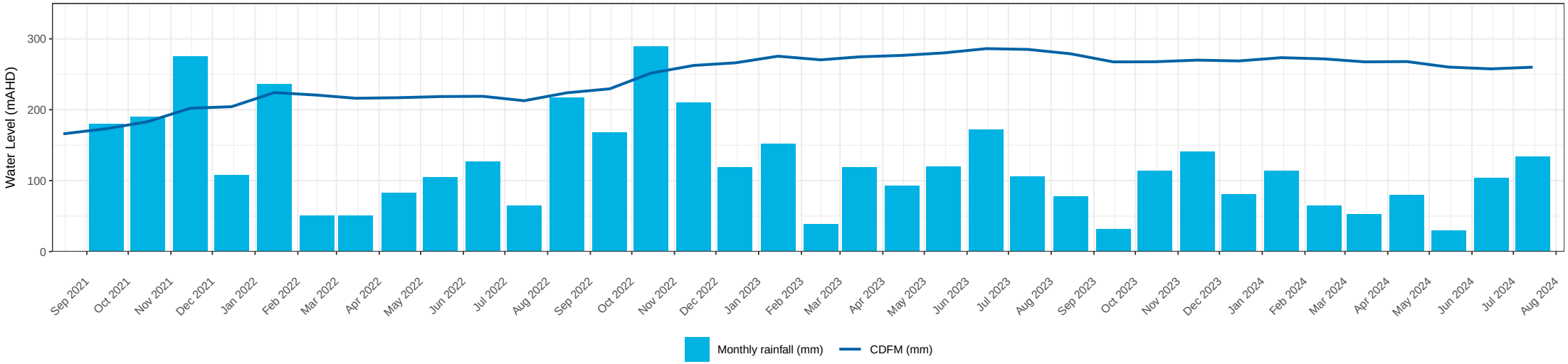
Snowy 2.0 − Snowy Hydro Limited

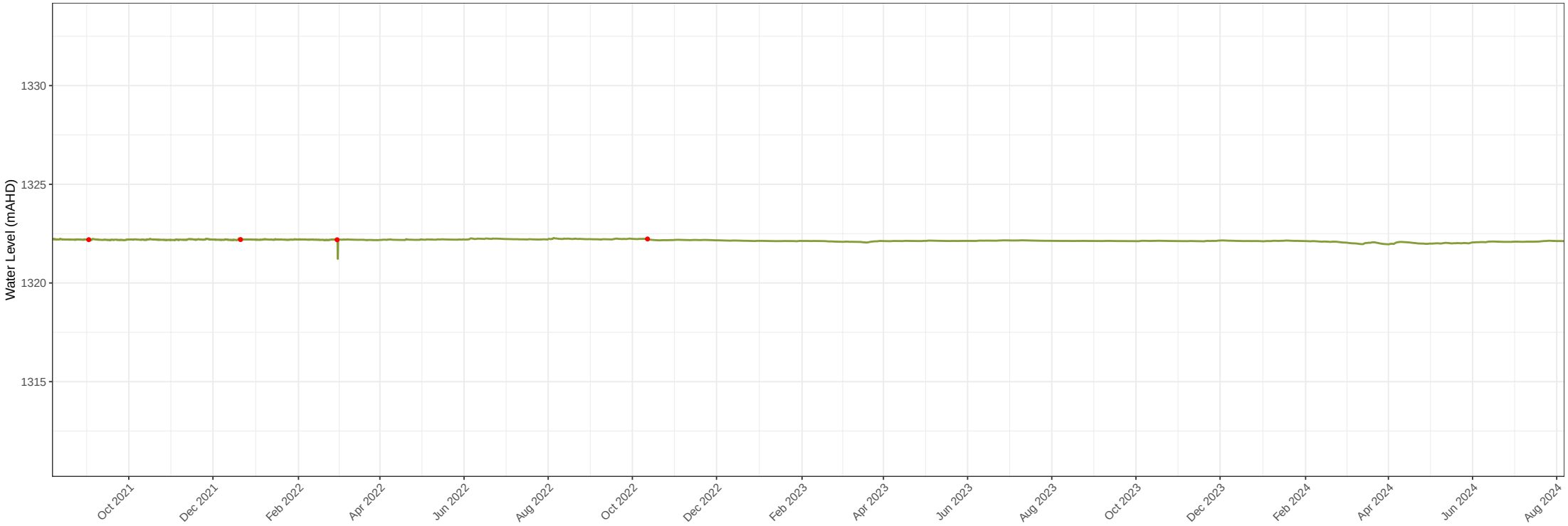
Groundwater monitoring and management

Figure 1. 88

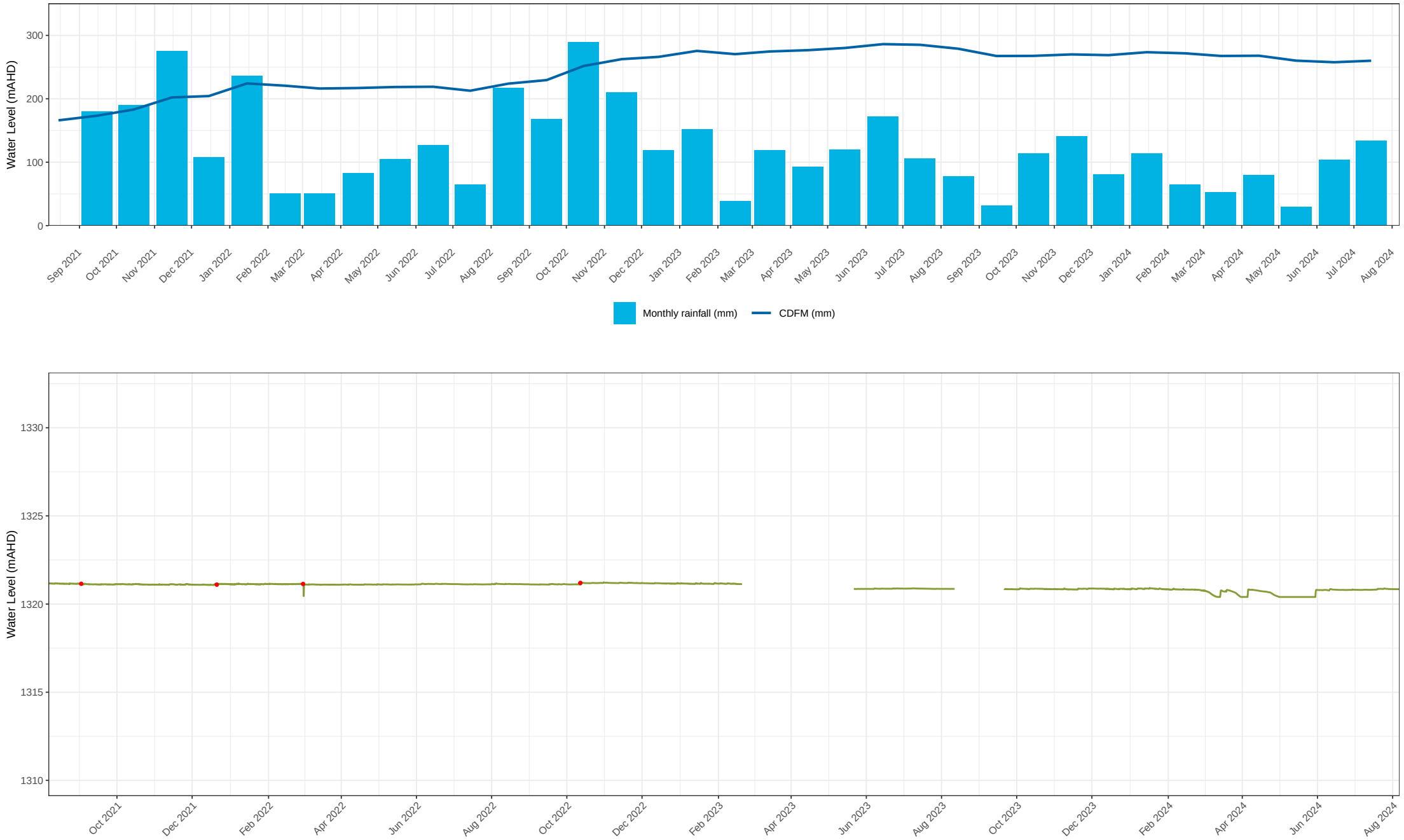


TC01 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 89

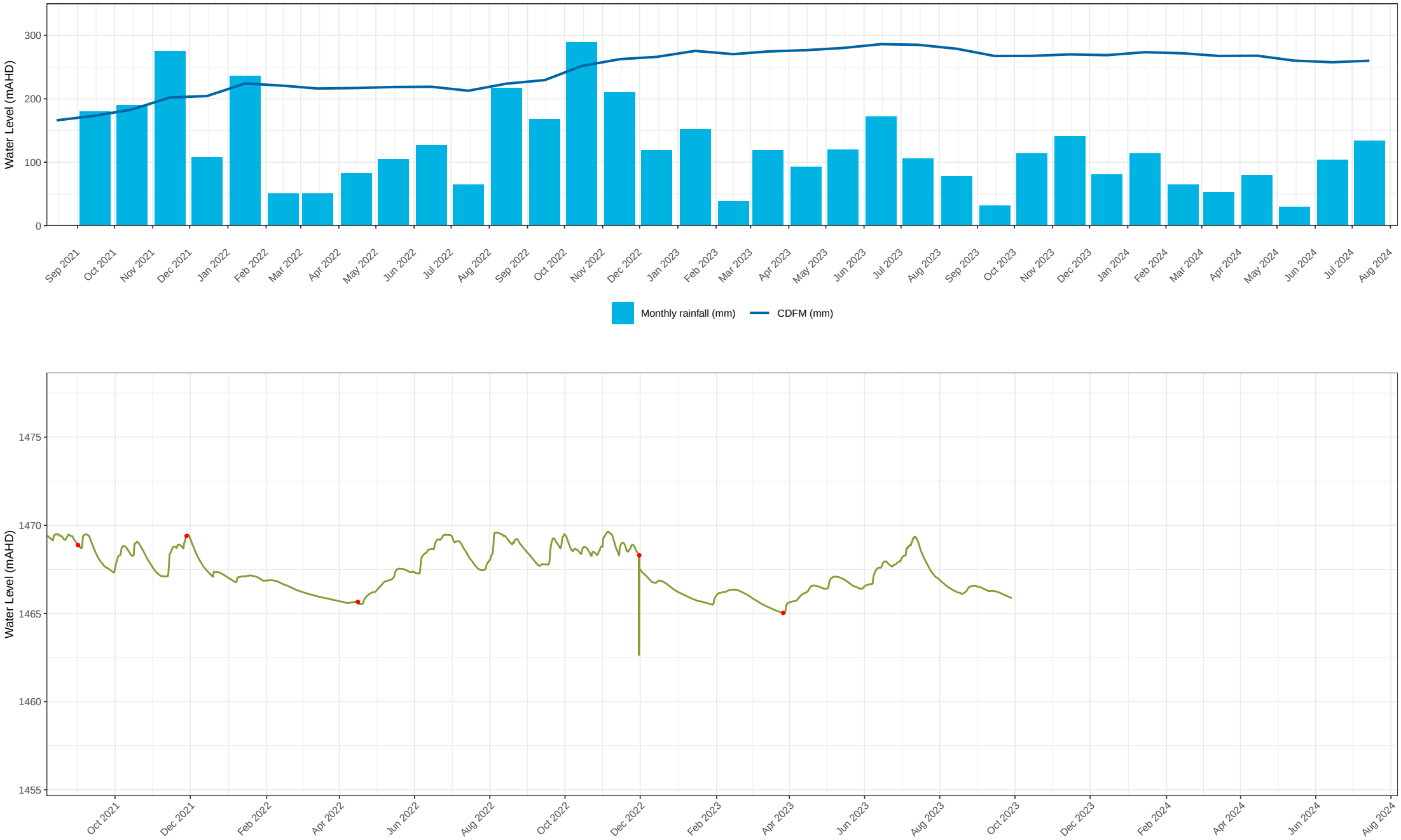




TC02 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 90



TC03 groundwater level times series data
Snowy 2.0 − Snowy Hydro Limited
Groundwater monitoring and management
Figure 1. 91

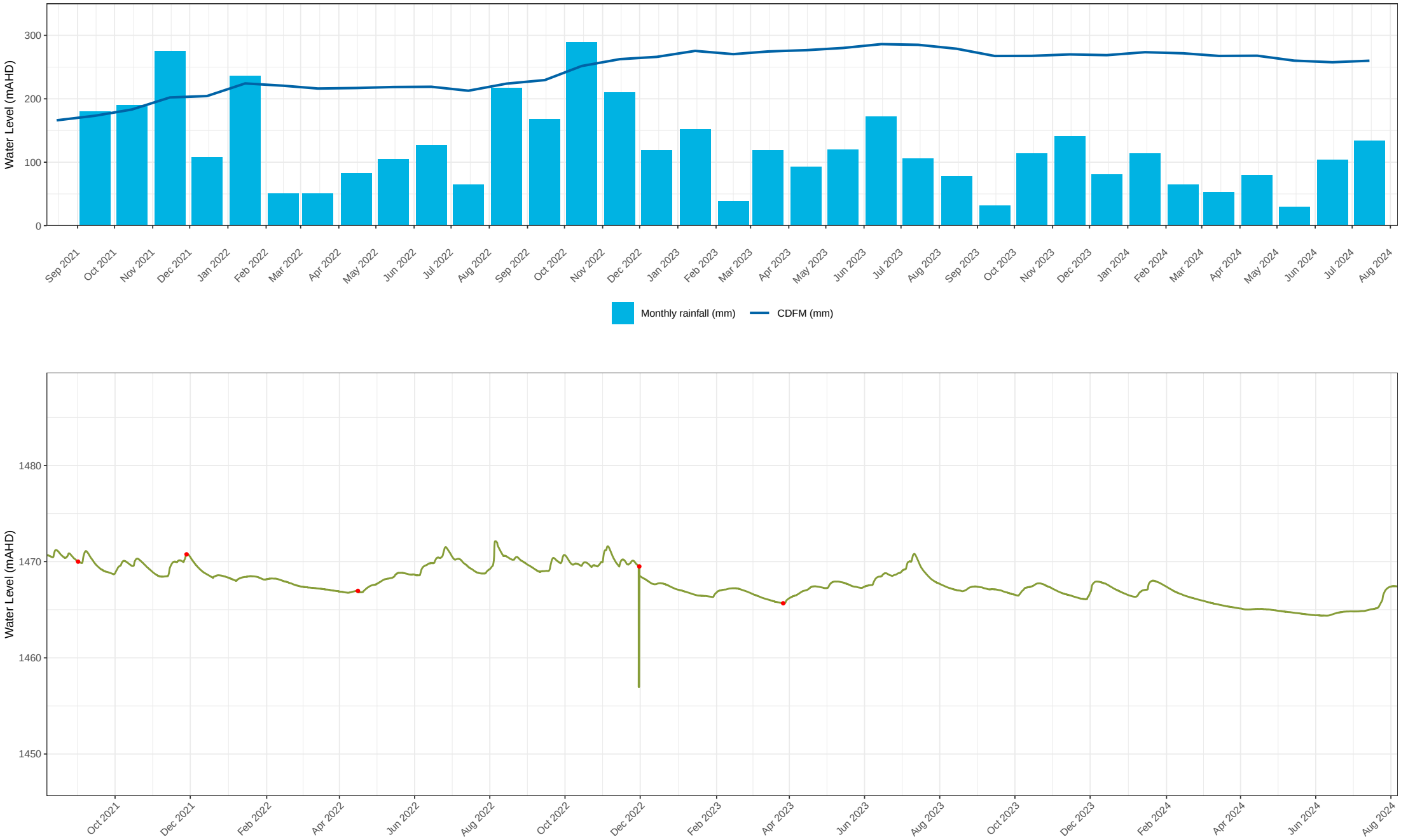


TMB02A groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 92

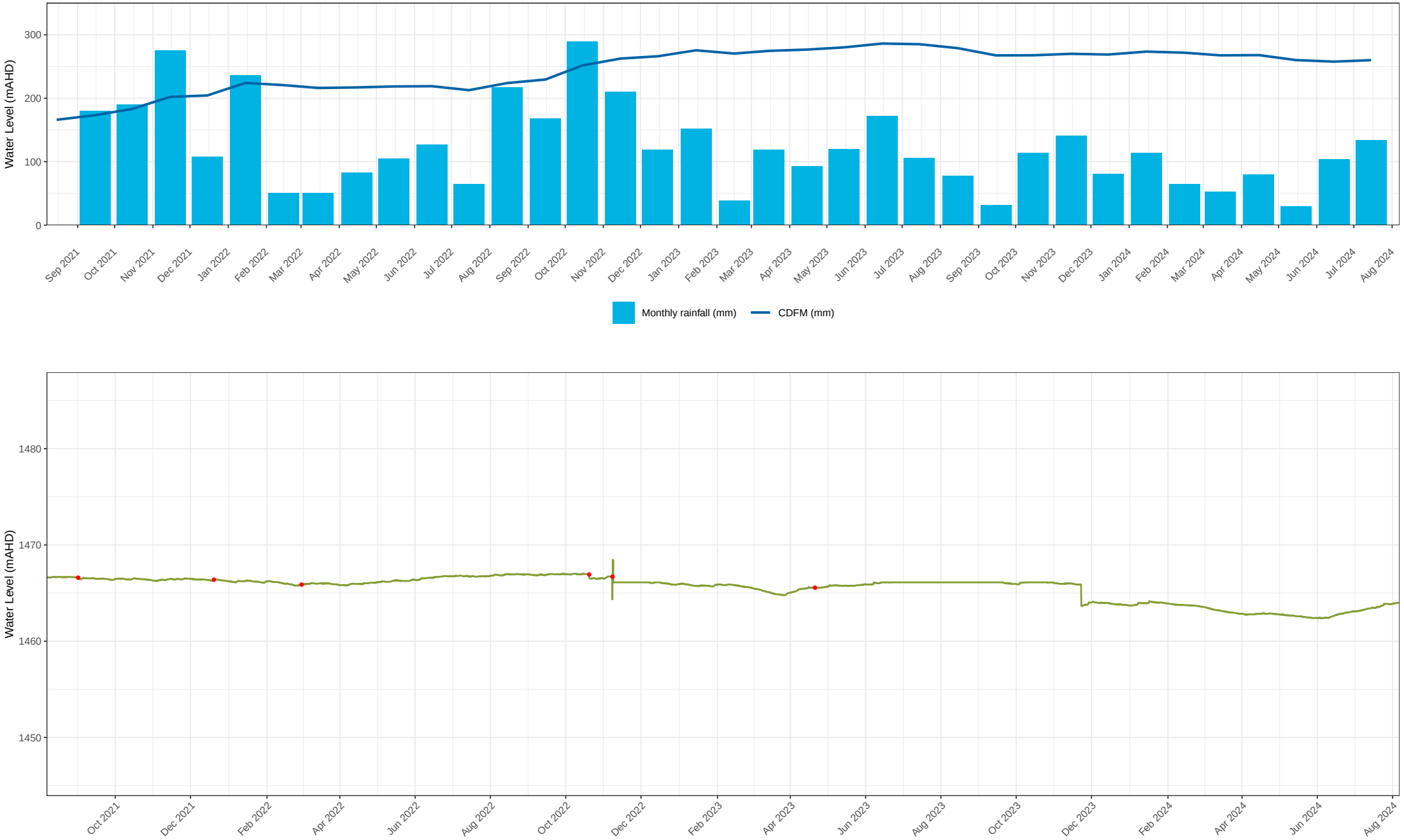


TMB02B groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 93

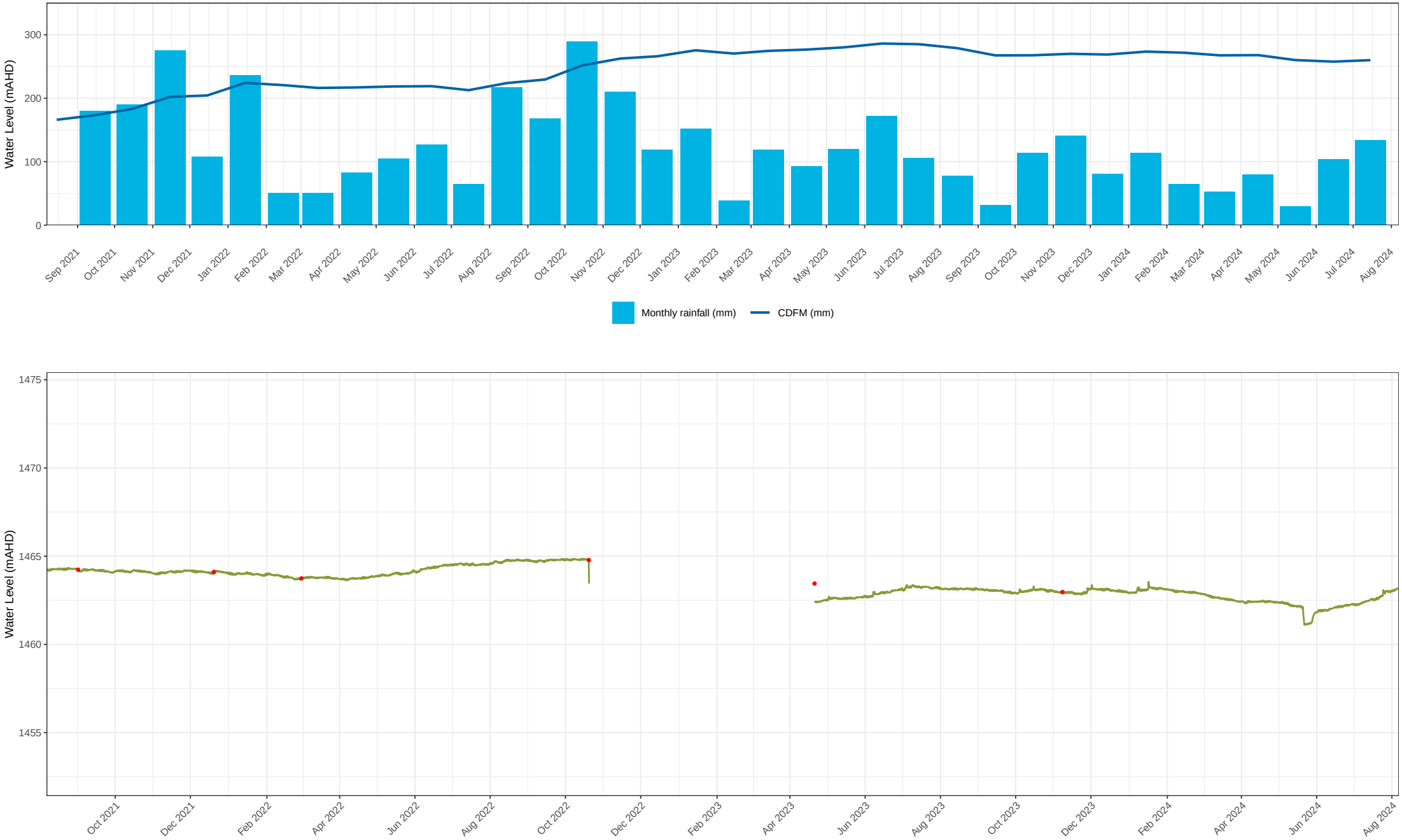


TMB03A groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 94

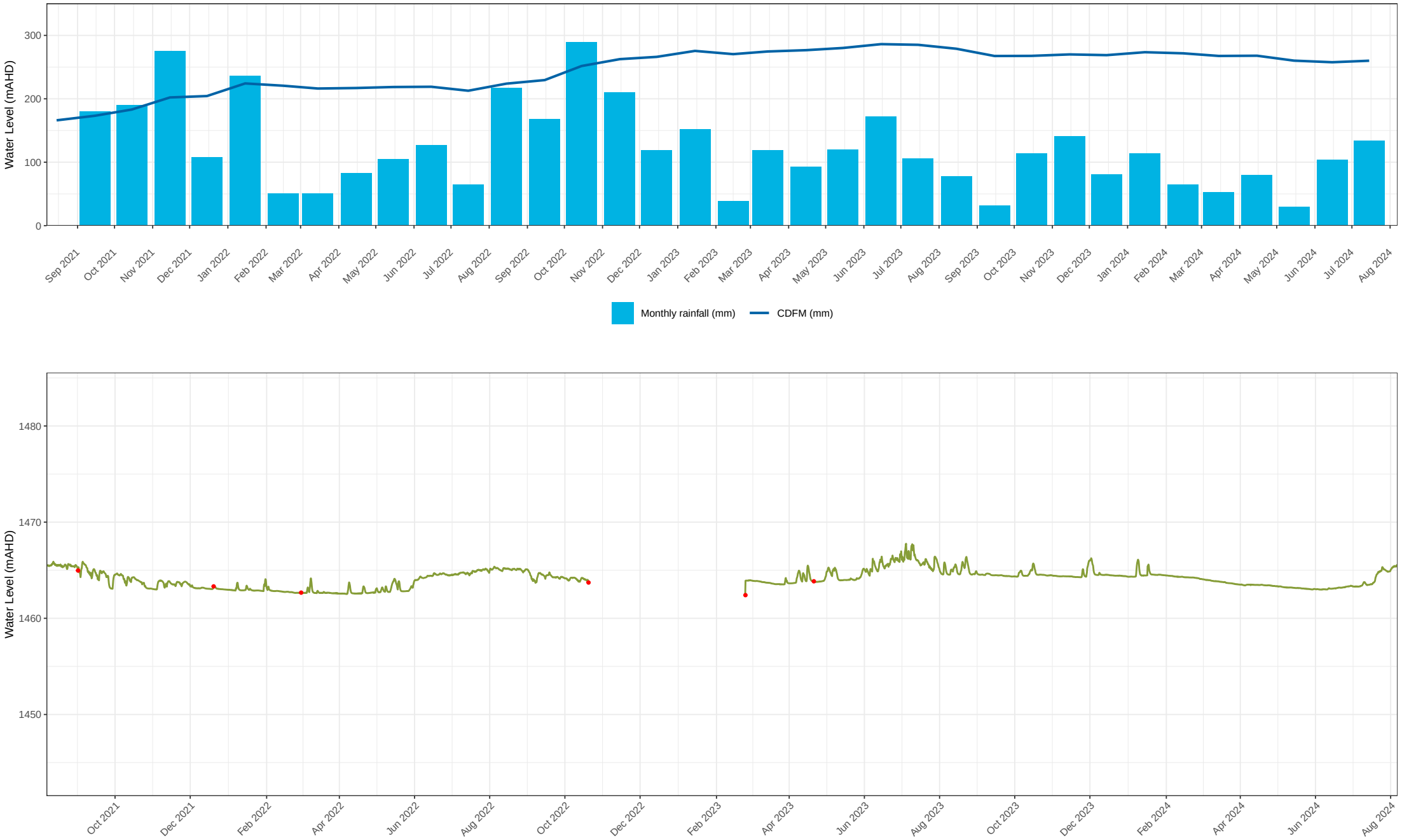


TMB03B groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 95

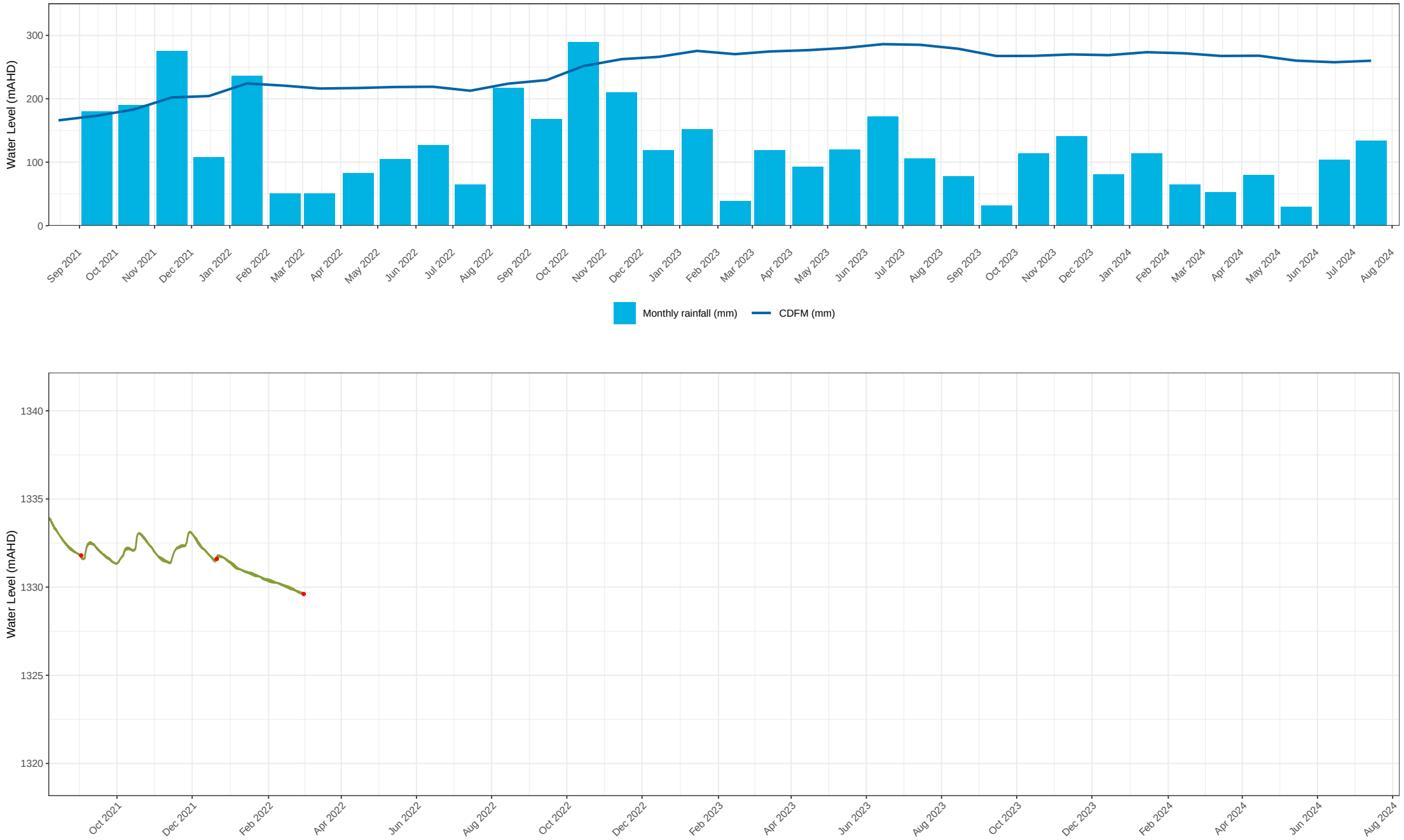


TMB03C groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 96

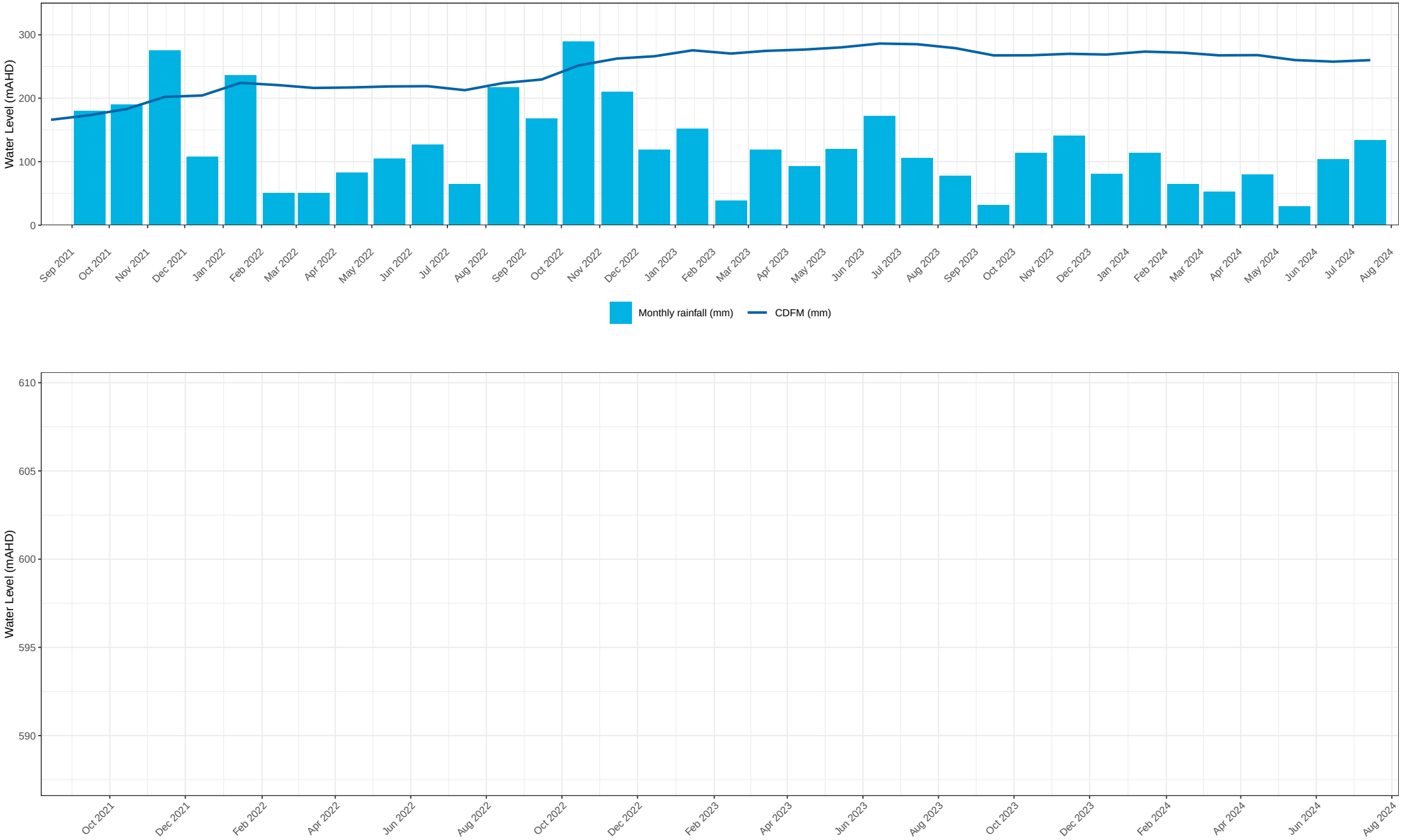


TMB04 groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 97

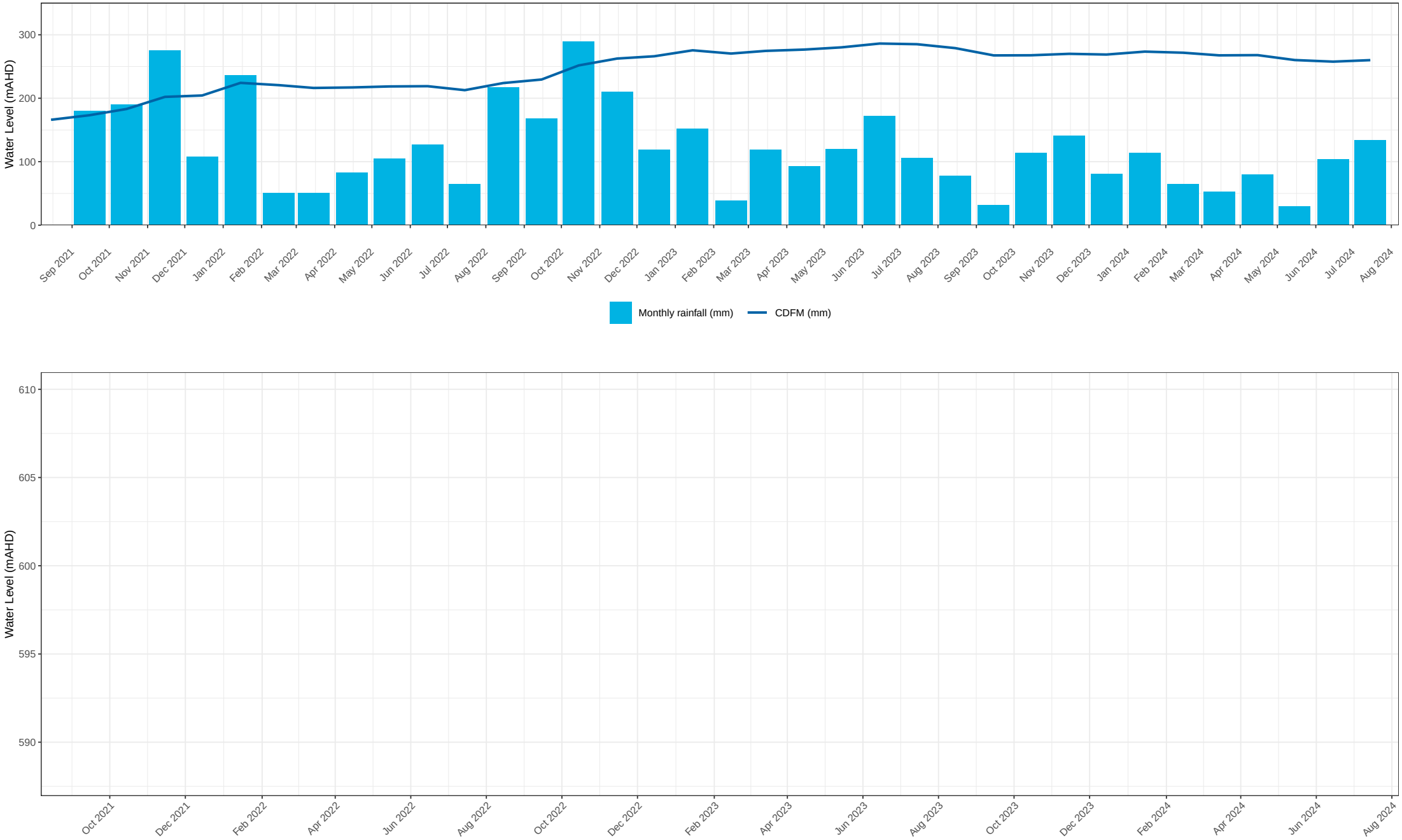


TMB05A groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

Groundwater monitoring and management

Figure 1. 98

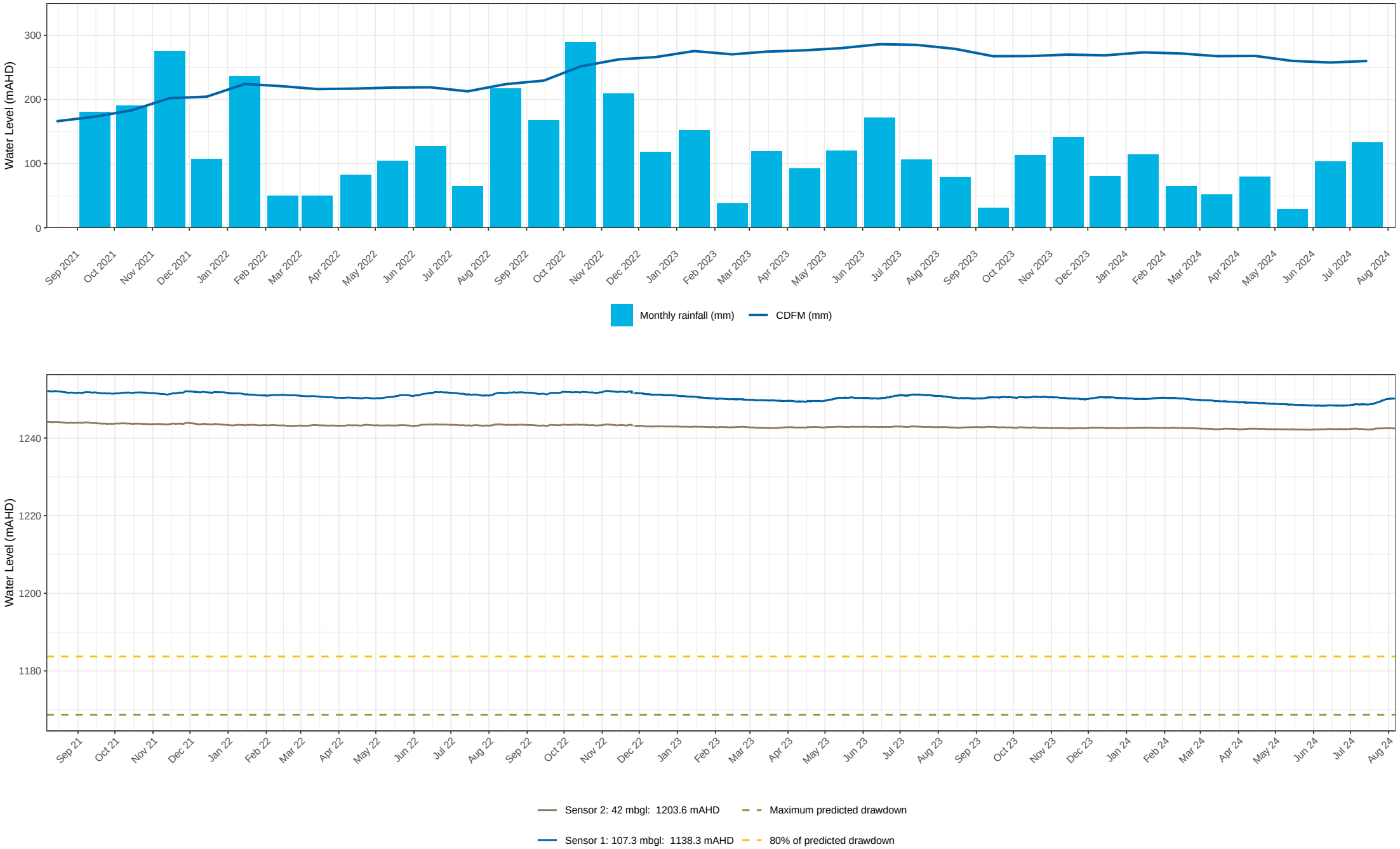


TMB05B groundwater level times series data

Snowy 2.0 − Snowy Hydro Limited

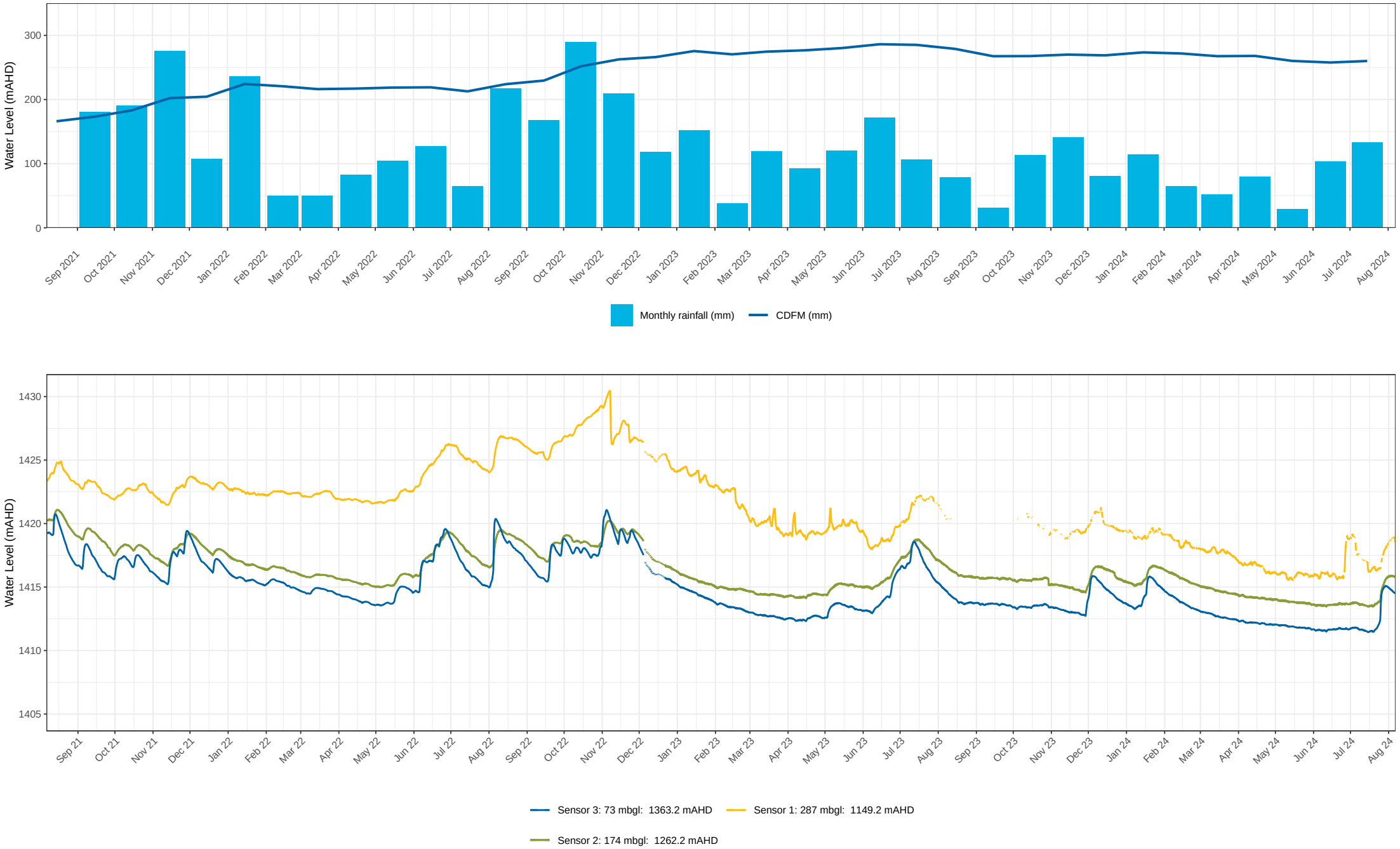
Groundwater monitoring and management

Figure 1. 99



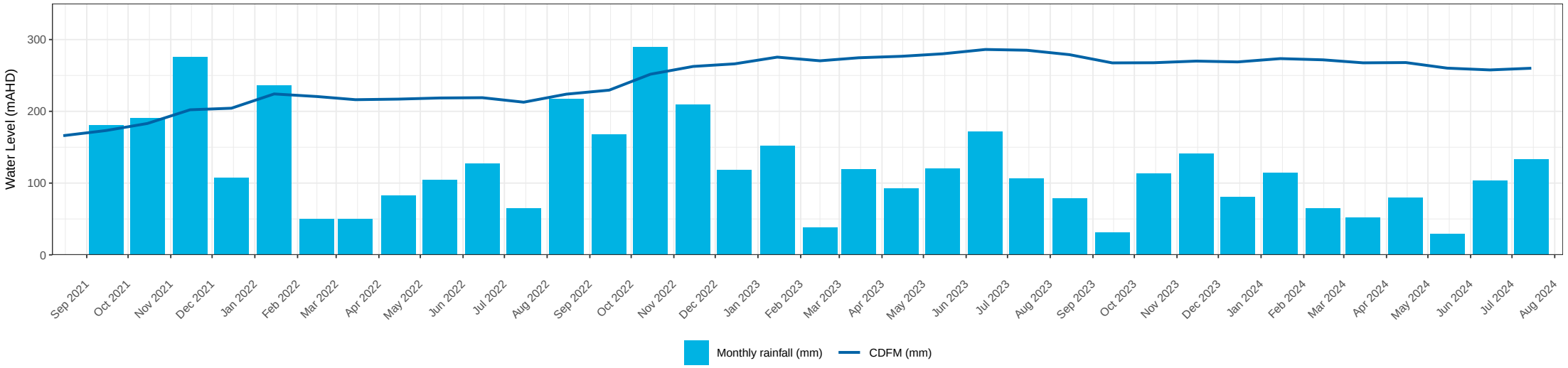
Notes

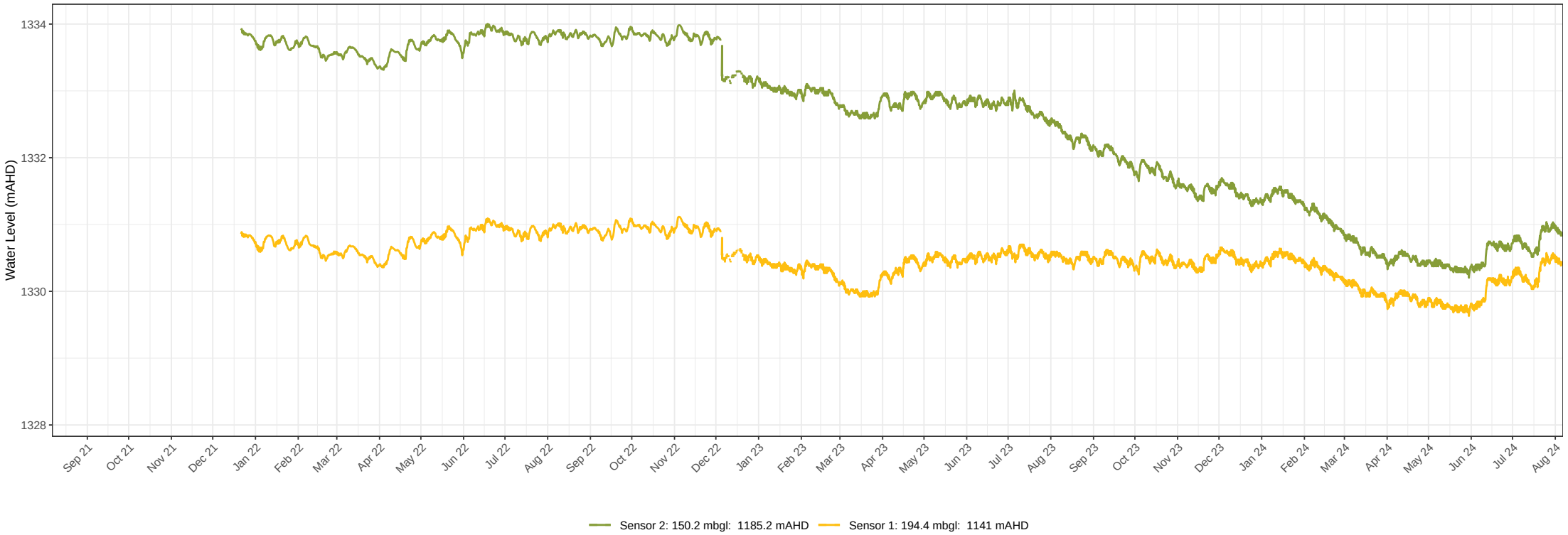
BH2102 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 100



Notes

BH3104 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 101

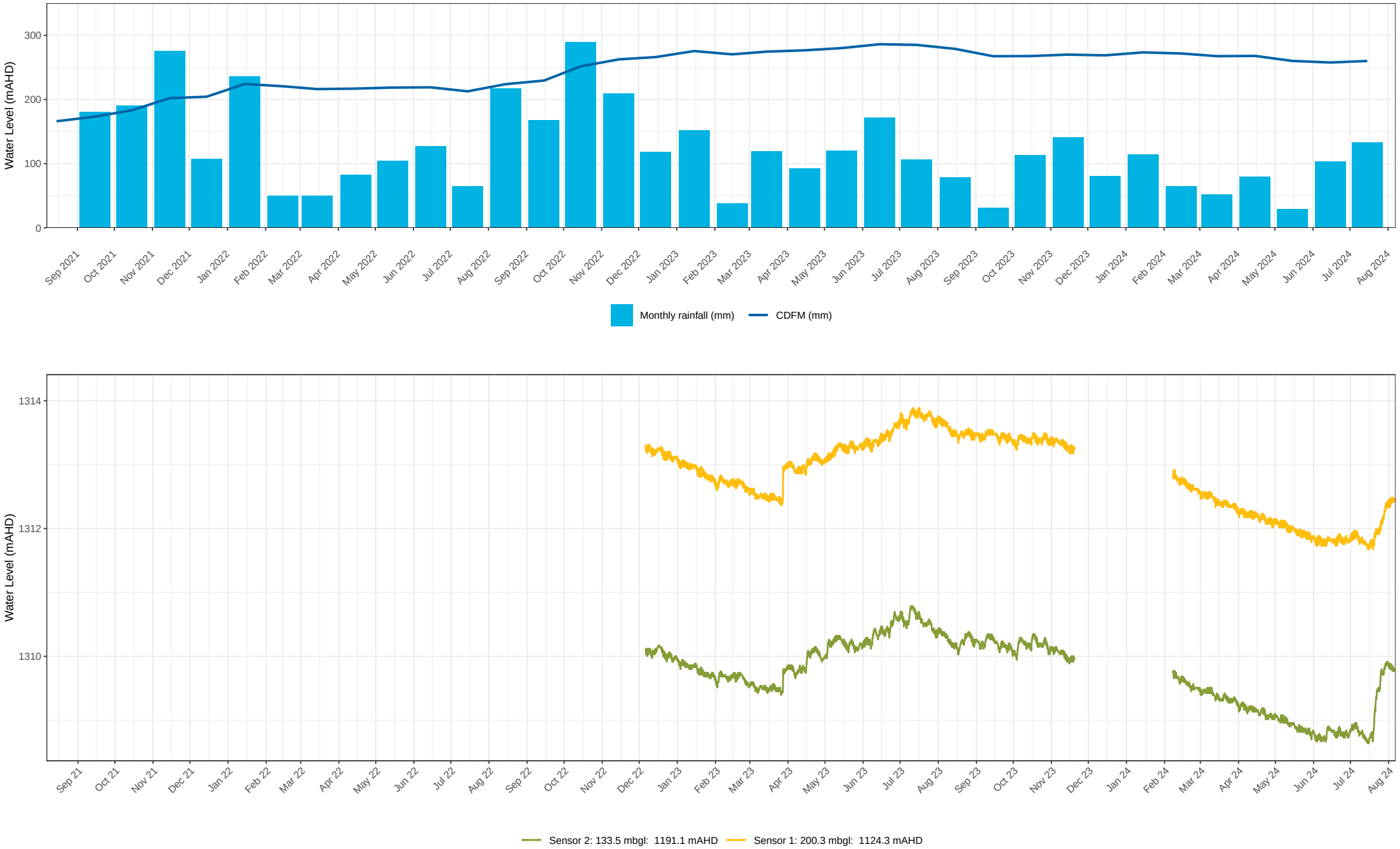




creating opportunities

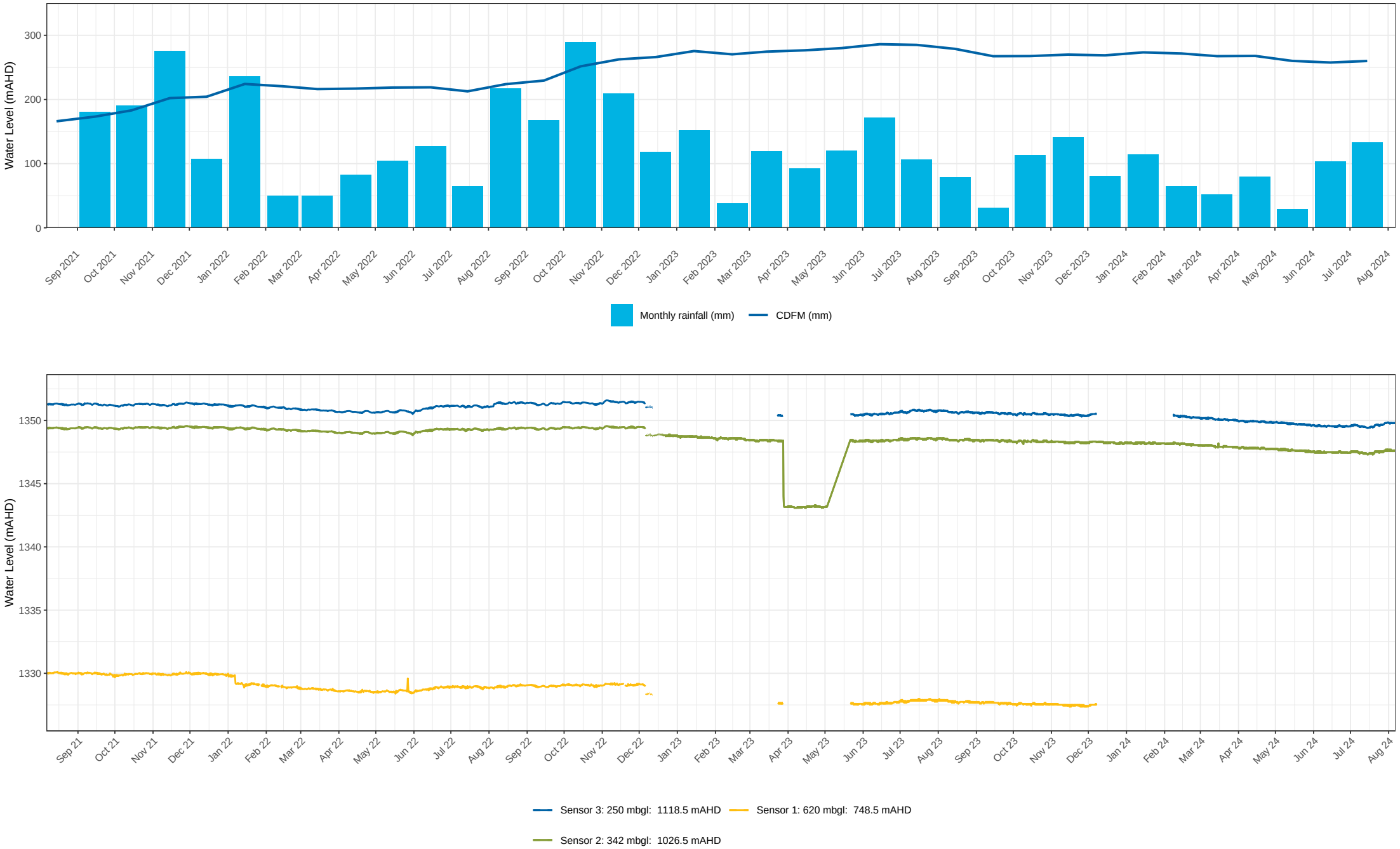
Notes

BH3106 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 102



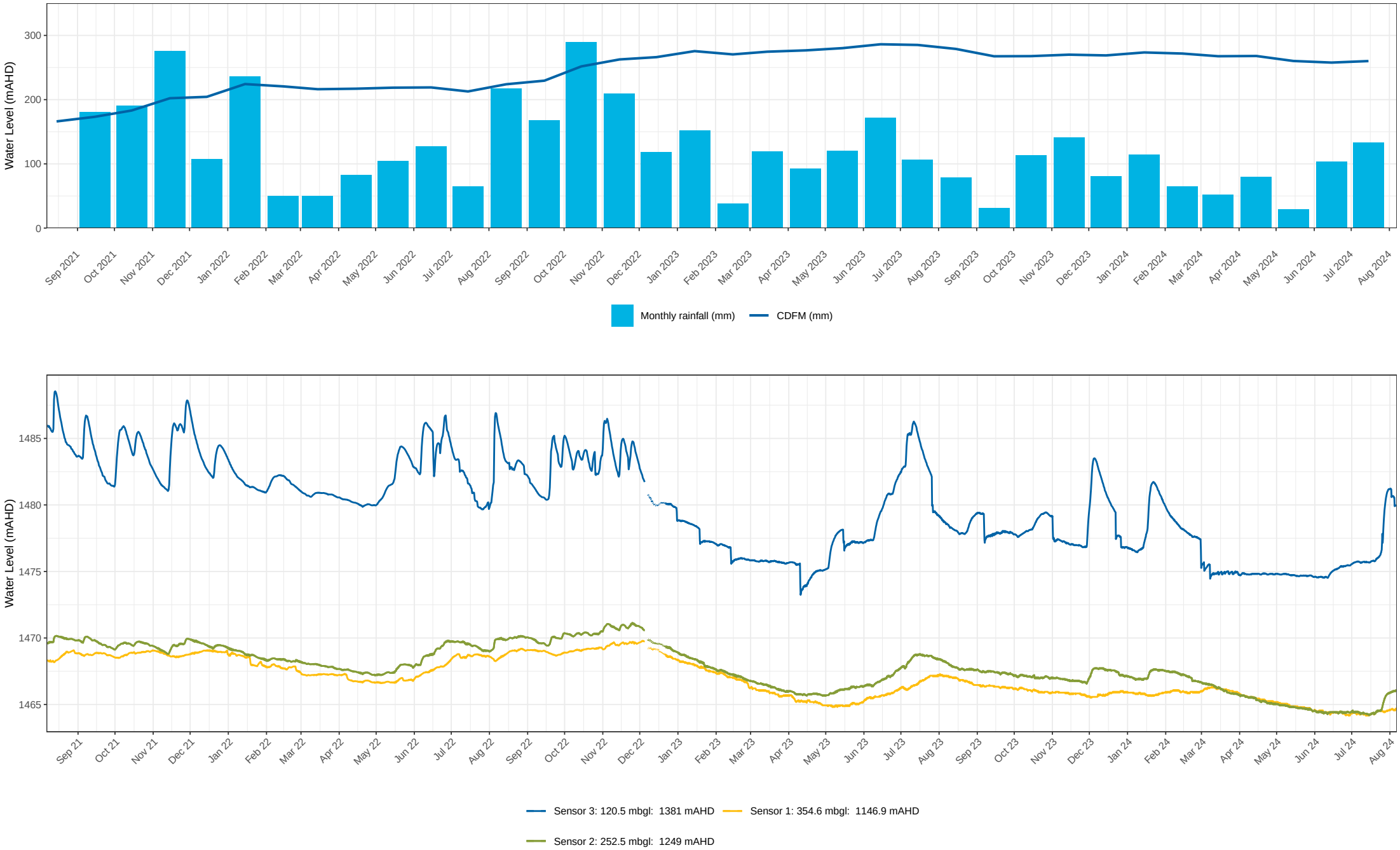
Notes

BH3107A groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 103



Notes

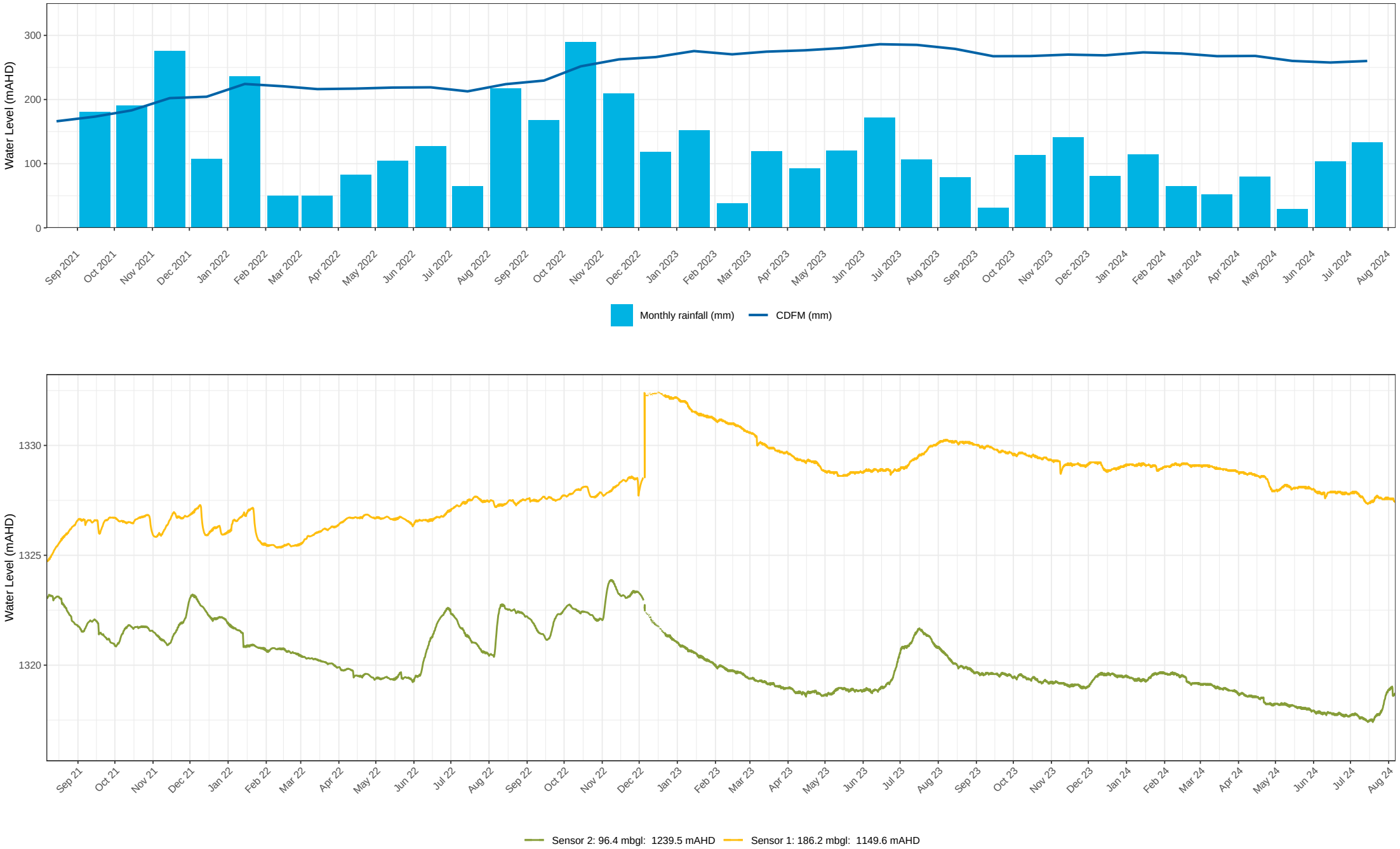
BH3108 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 104



creating opportunities

Notes

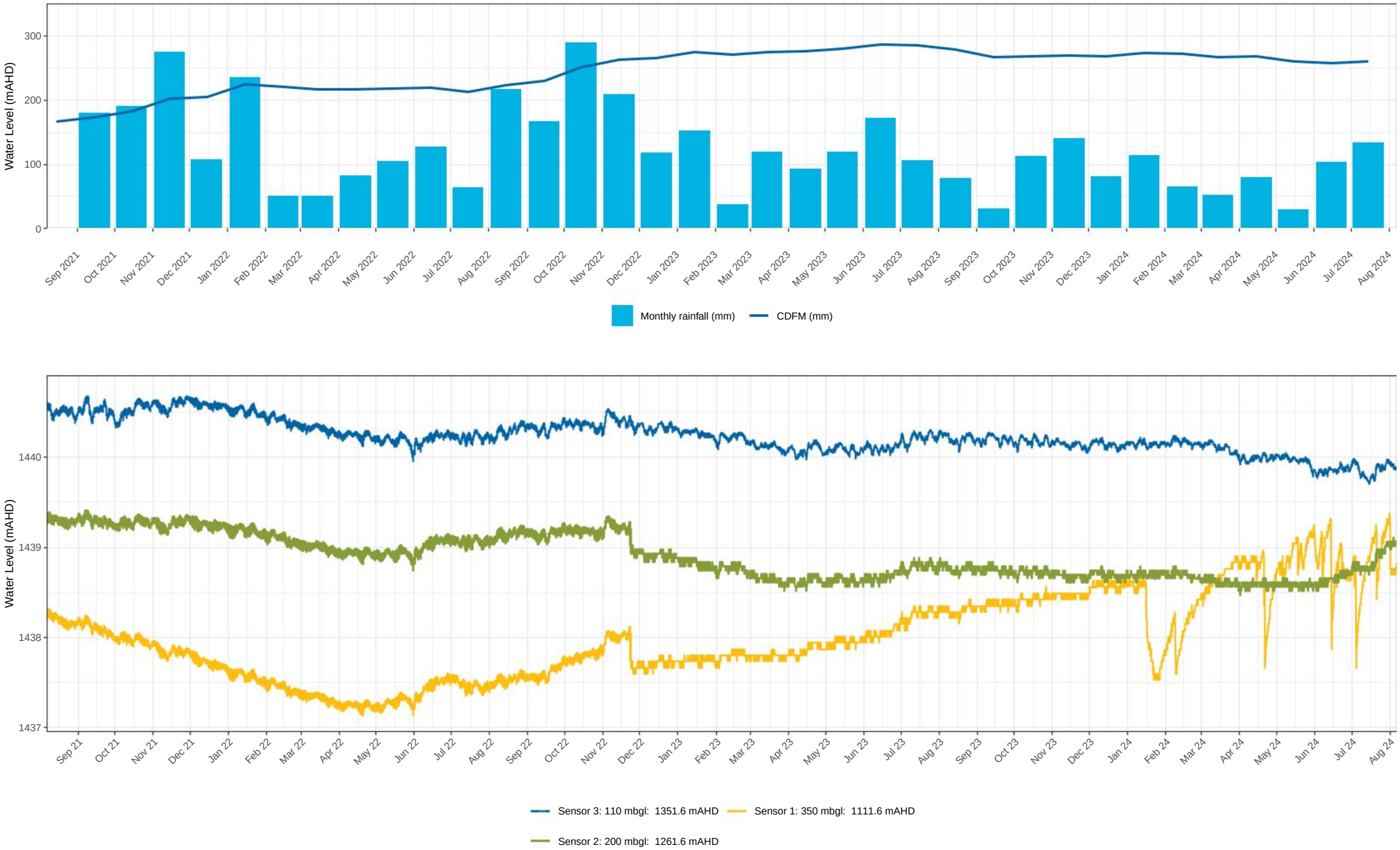
BH3111 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 105



creating opportunities

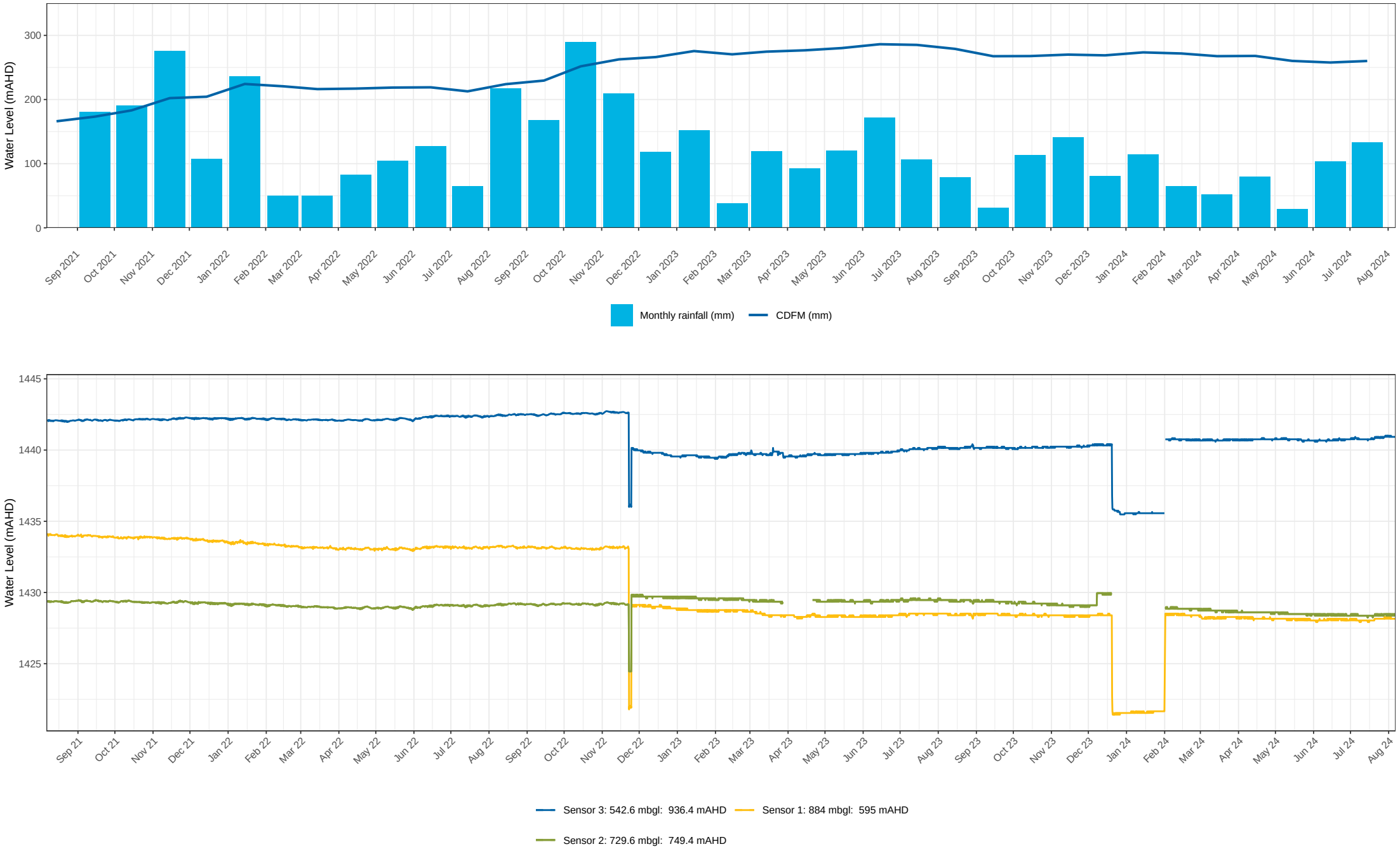
Notes

BH3113 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 106



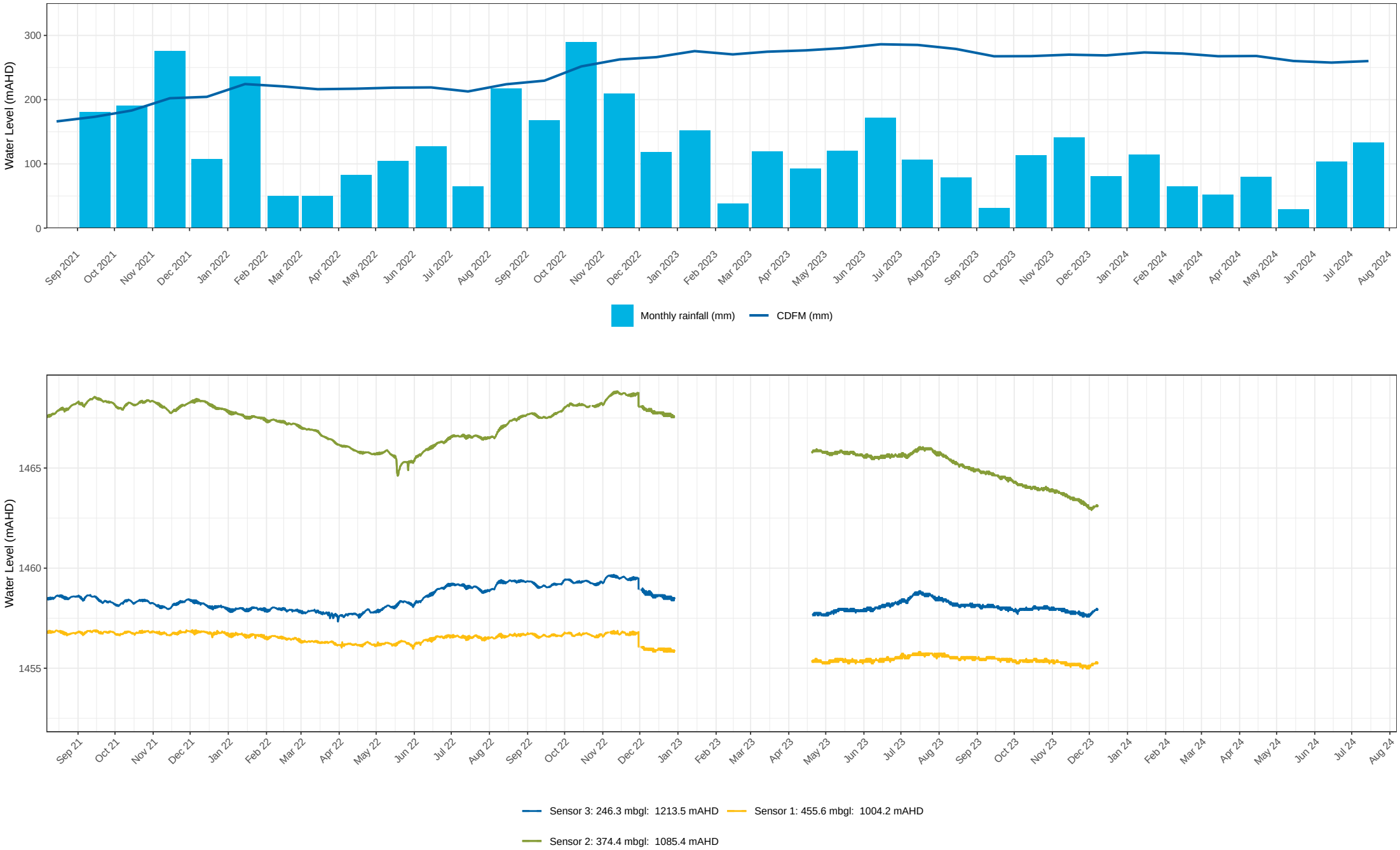
Notes

BH3203 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 107



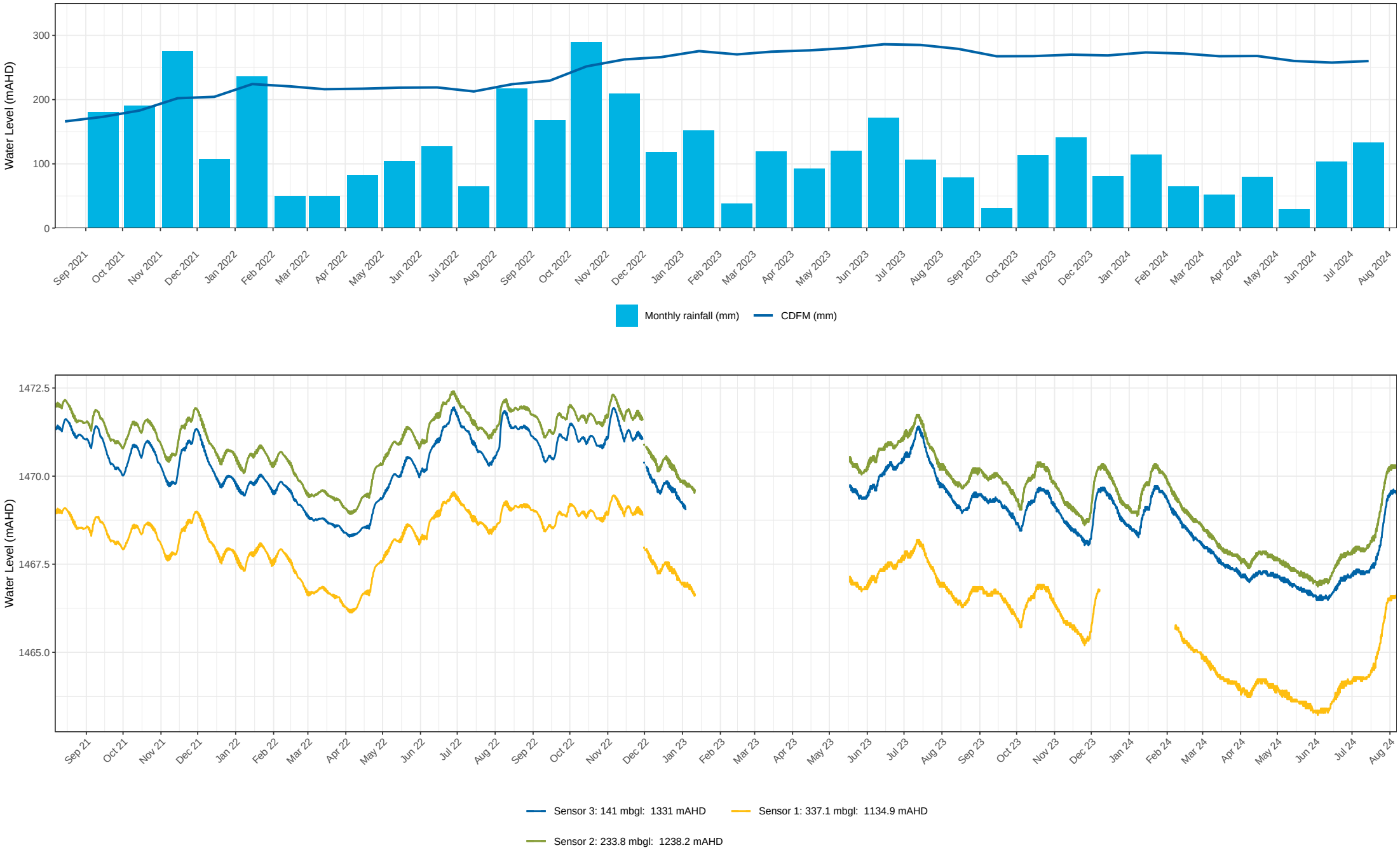
Notes

BH4101 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 108



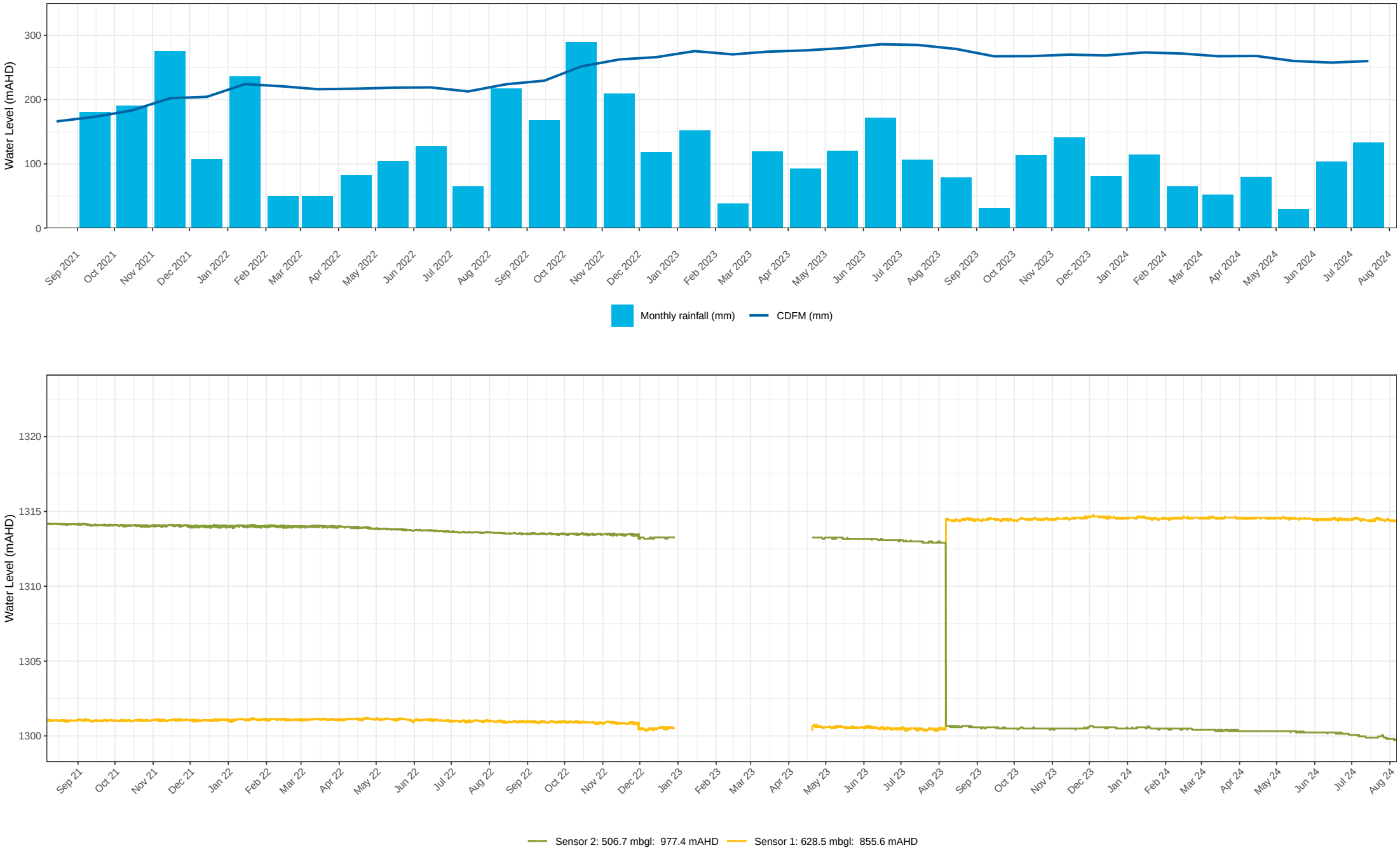
Notes

BH4102 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 109



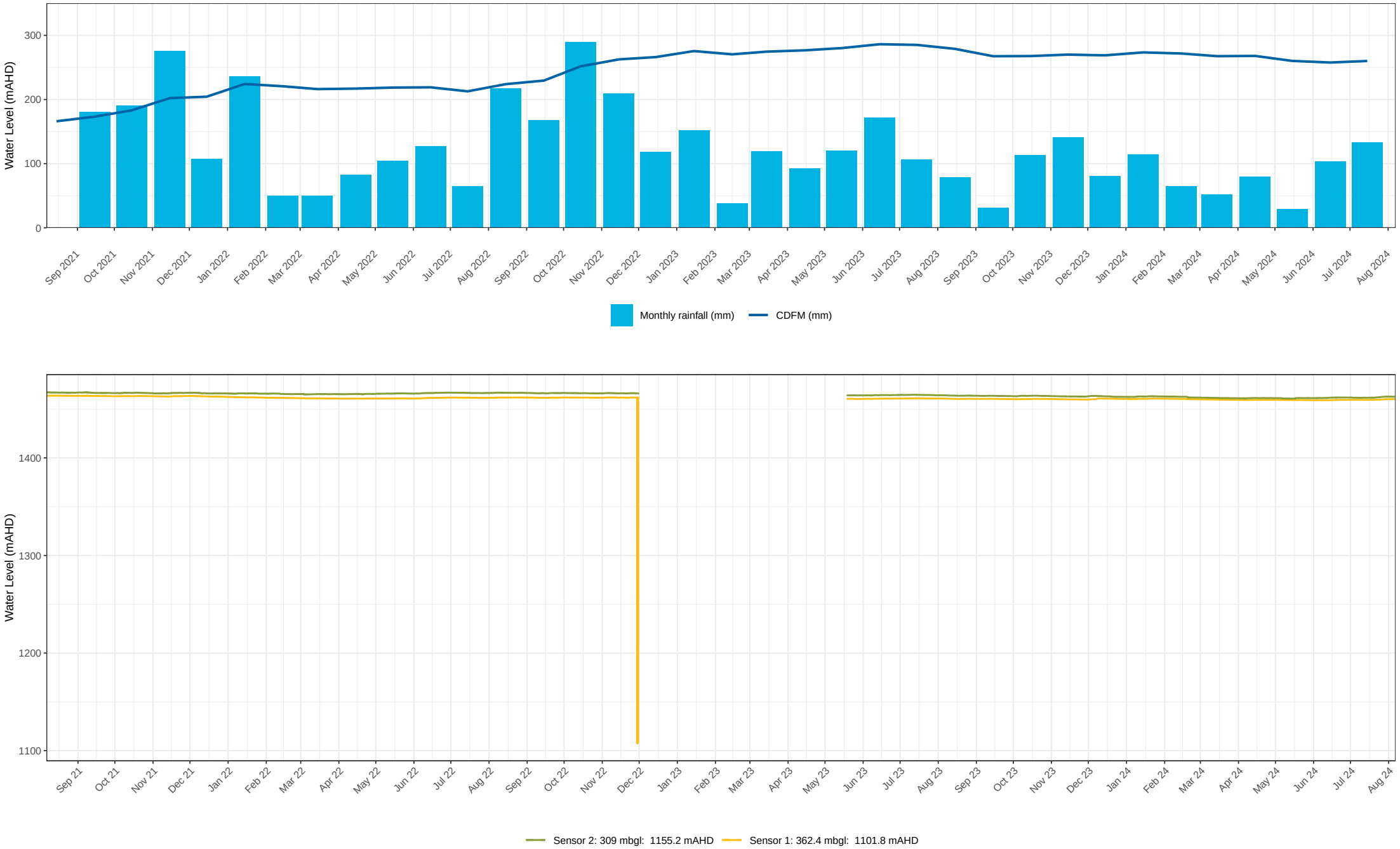
Notes

BH4103 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 110



Notes

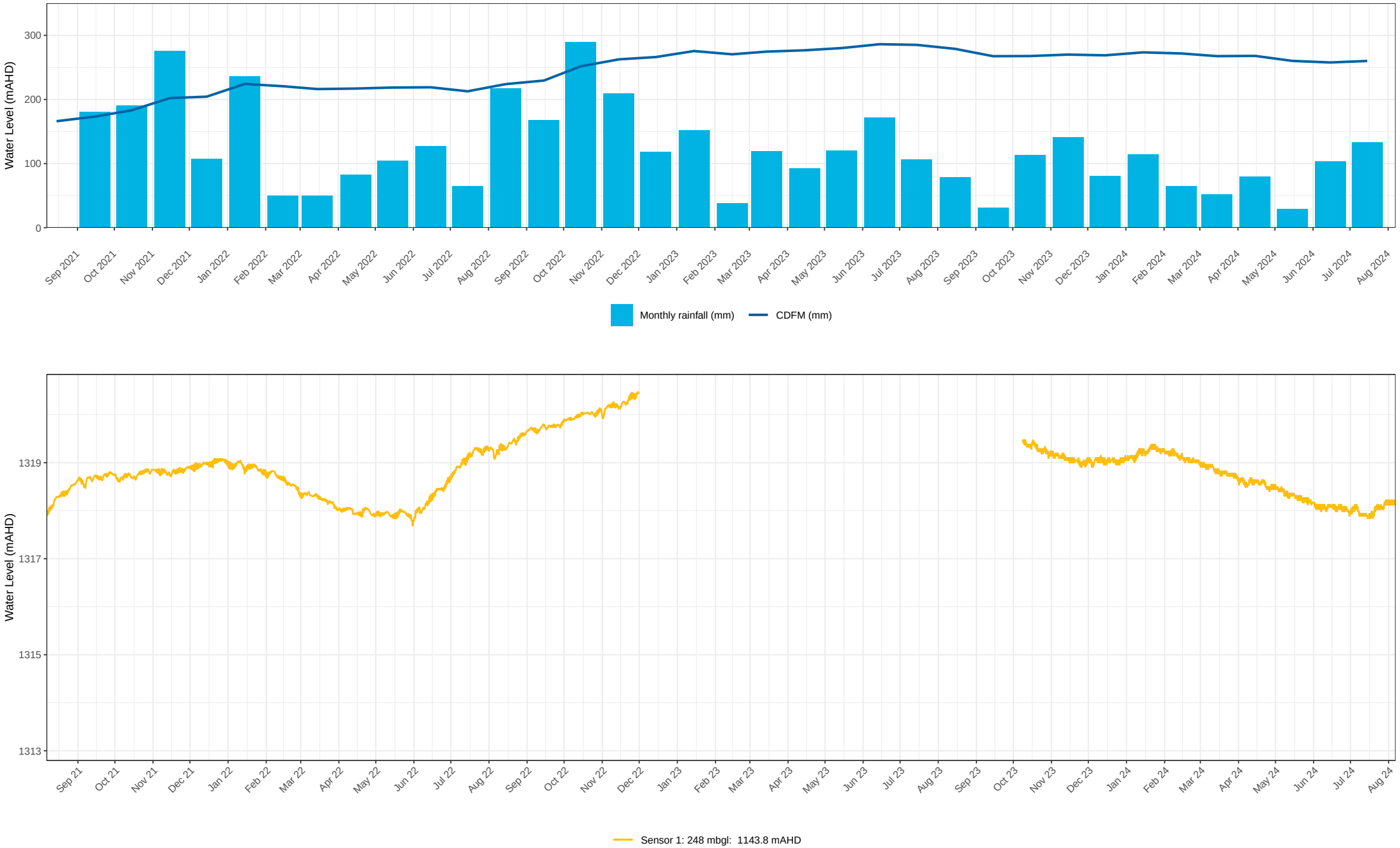
BH4104 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 111



creating opportunities

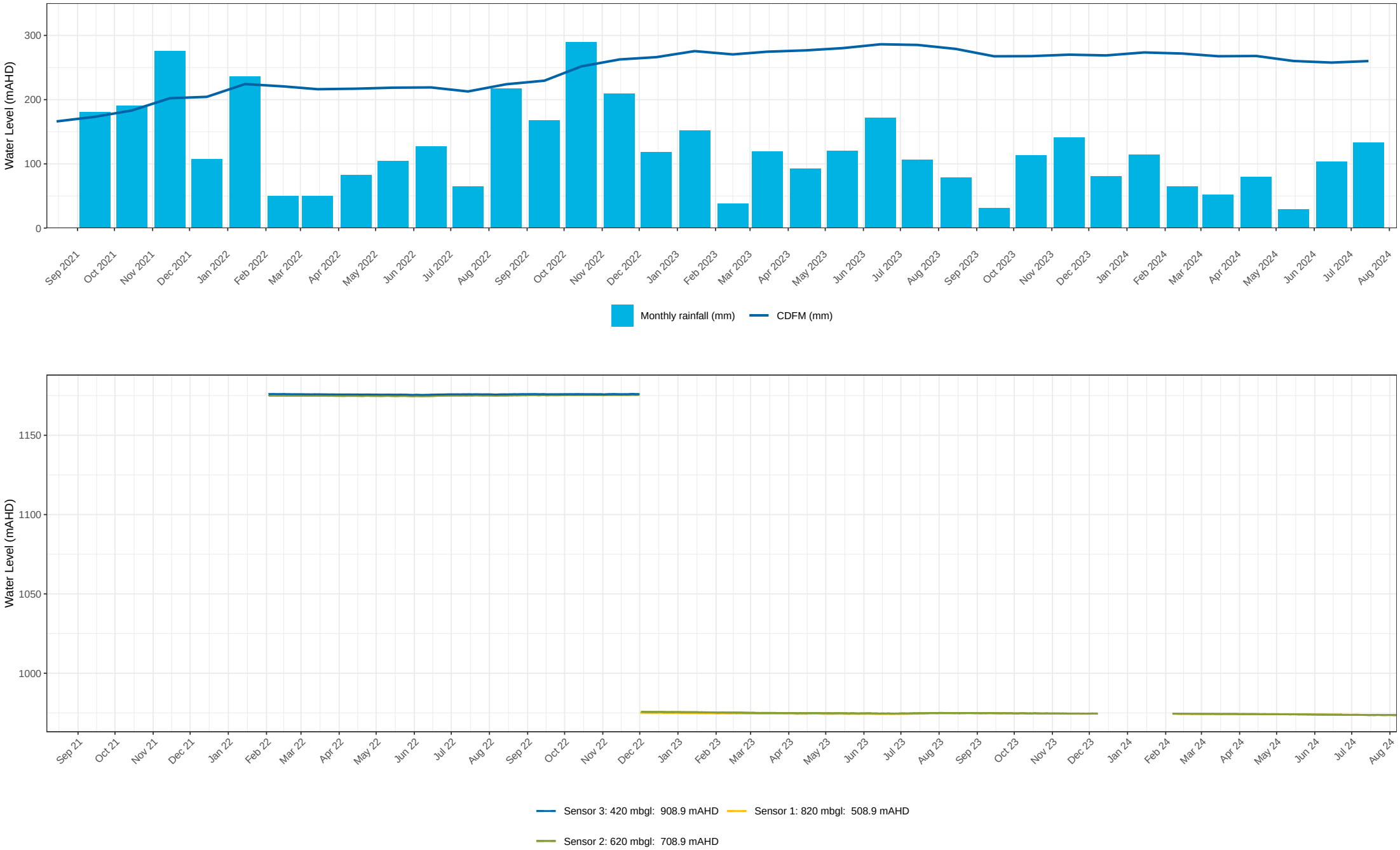
Notes

BH4201 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 112



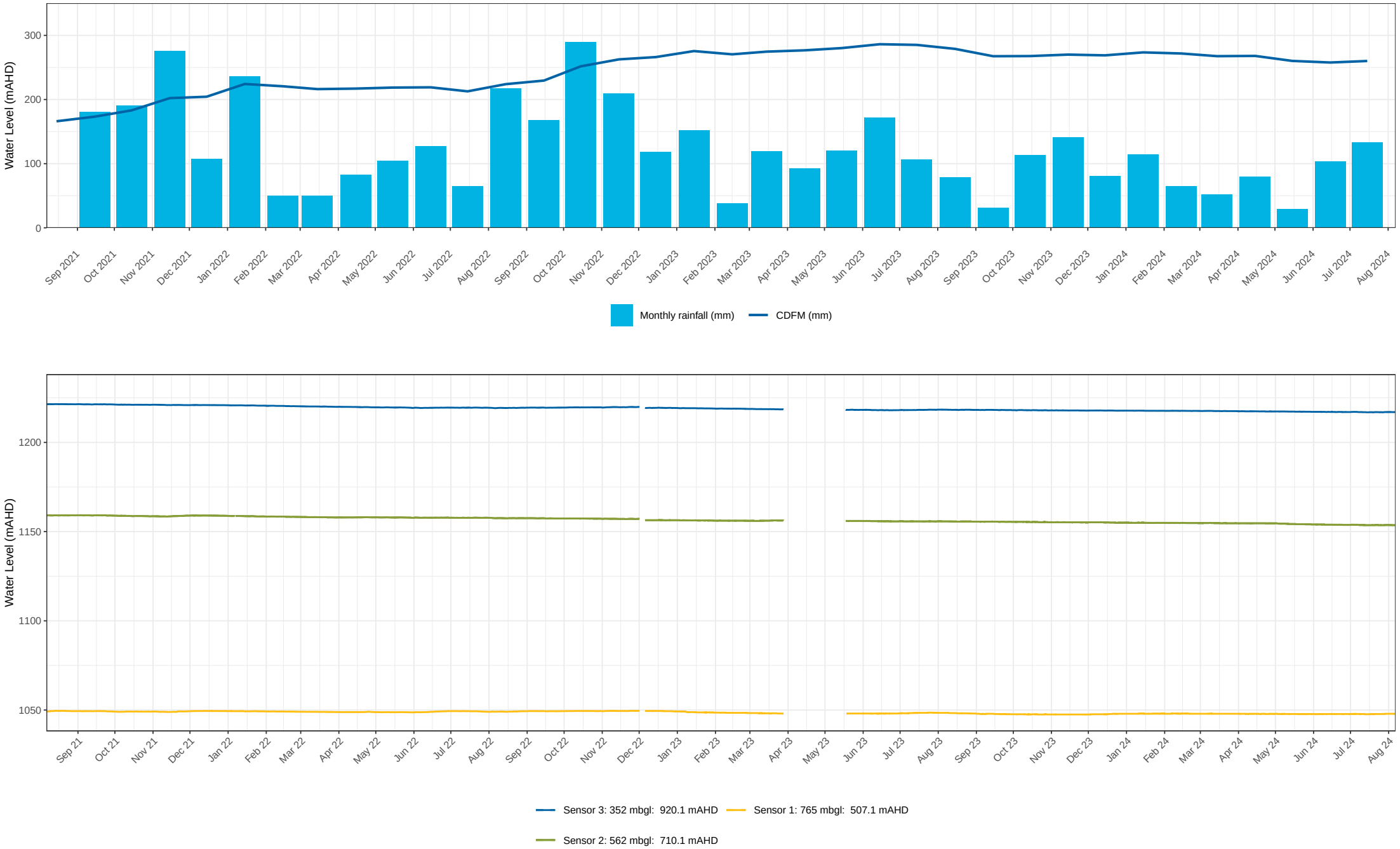
Notes

BH5101 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 113



Notes

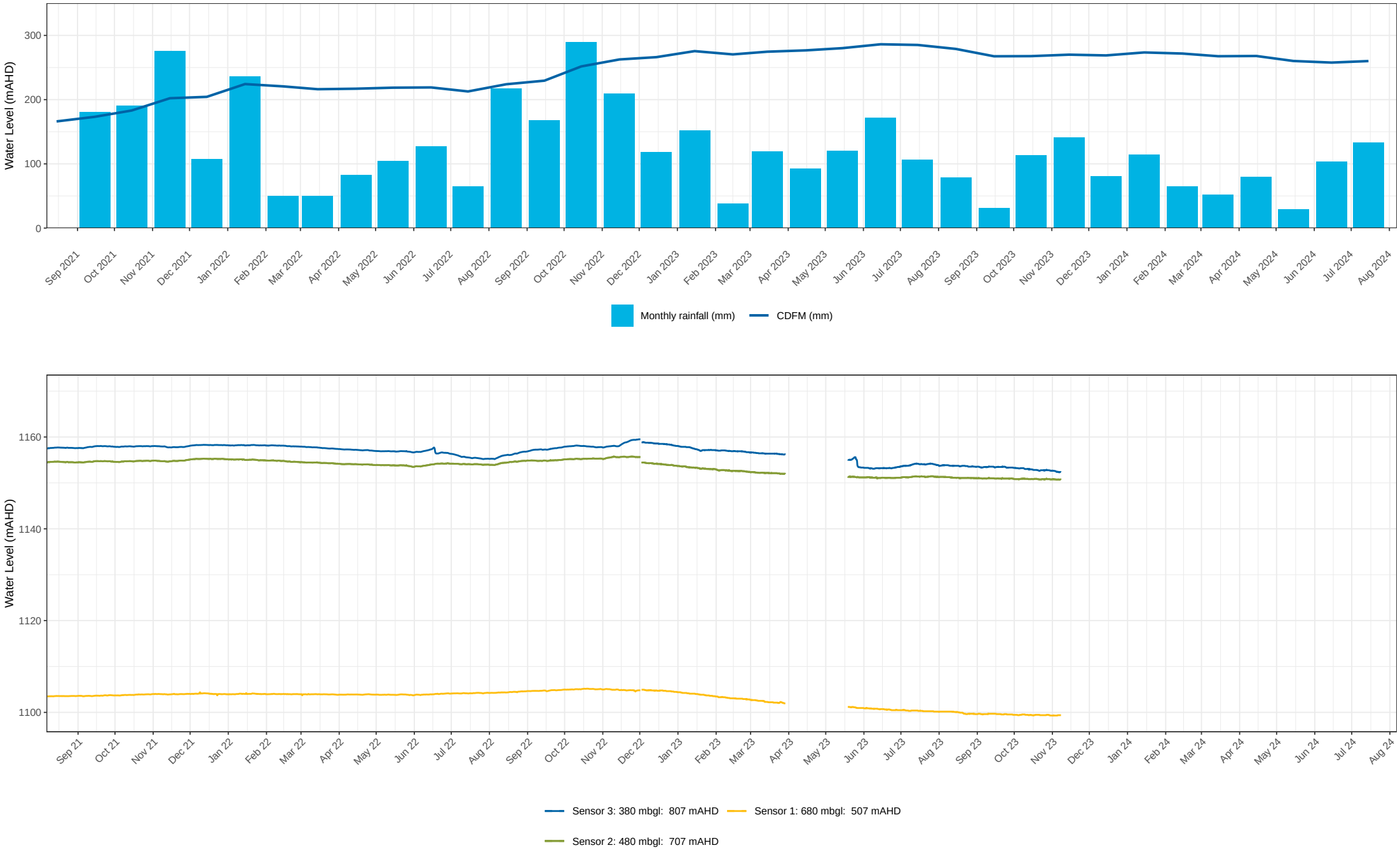
BH5102 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 114



creating opportunities

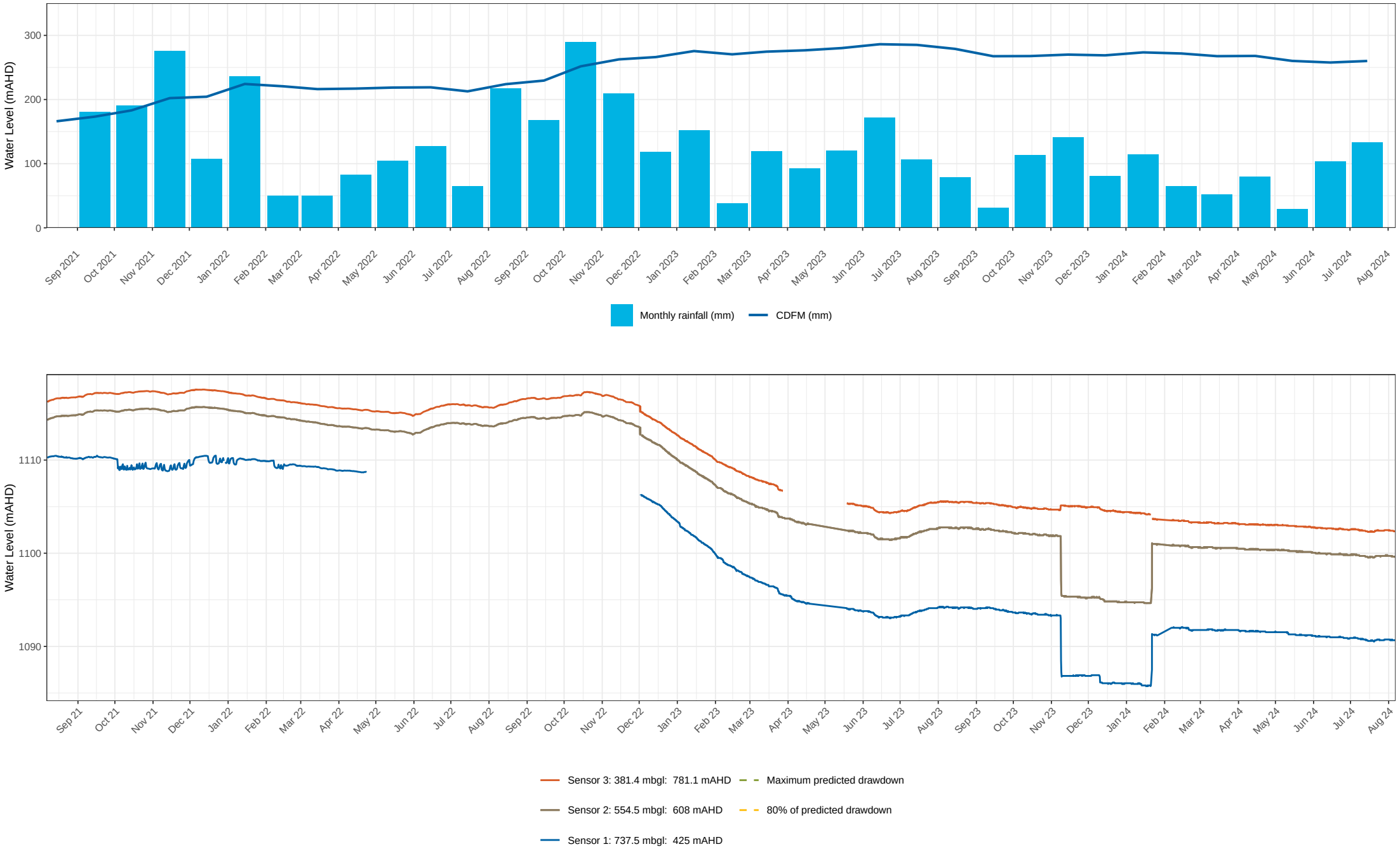
Notes

BH5103 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 115



Notes

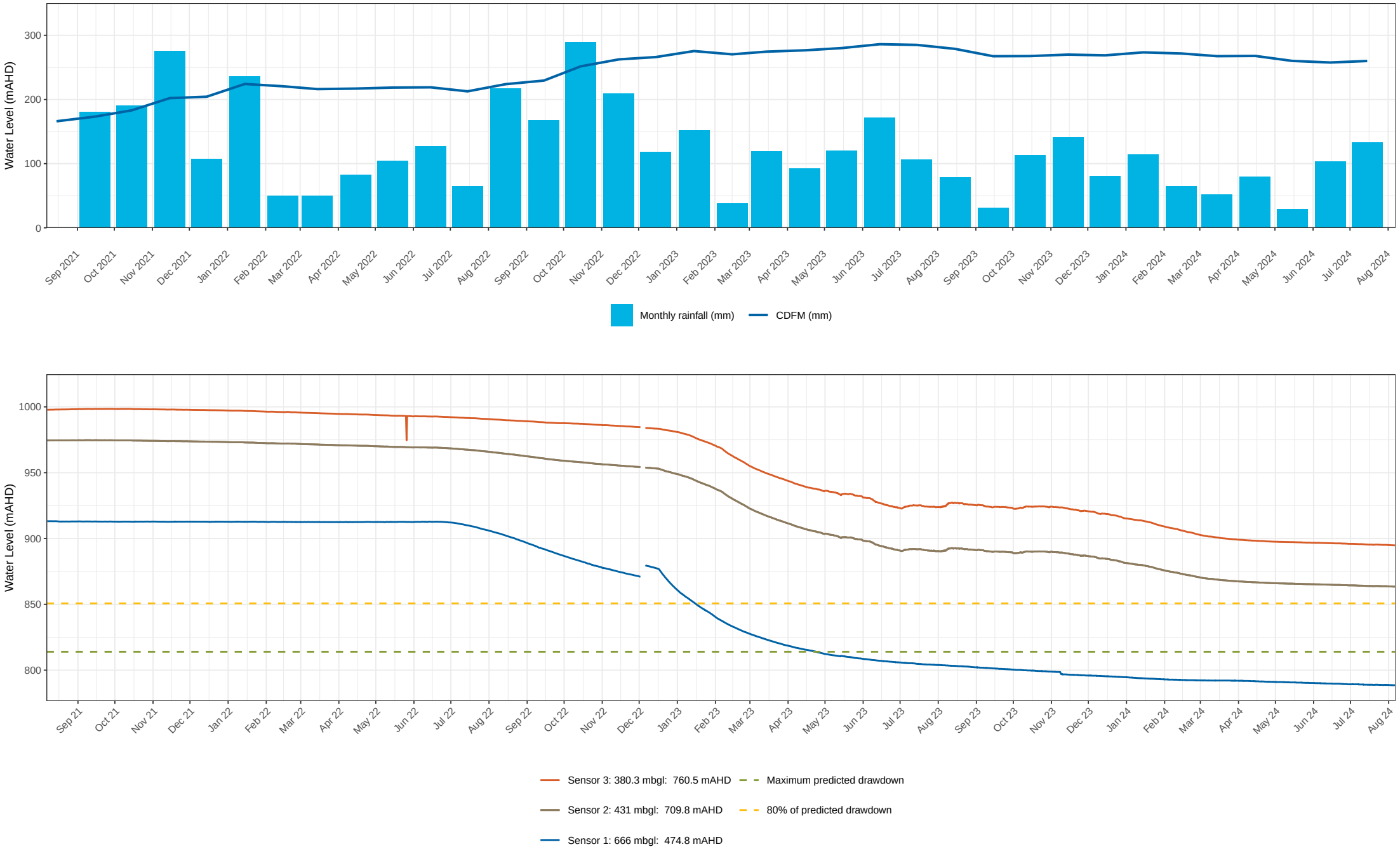
BH5104 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 116



creating opportunities

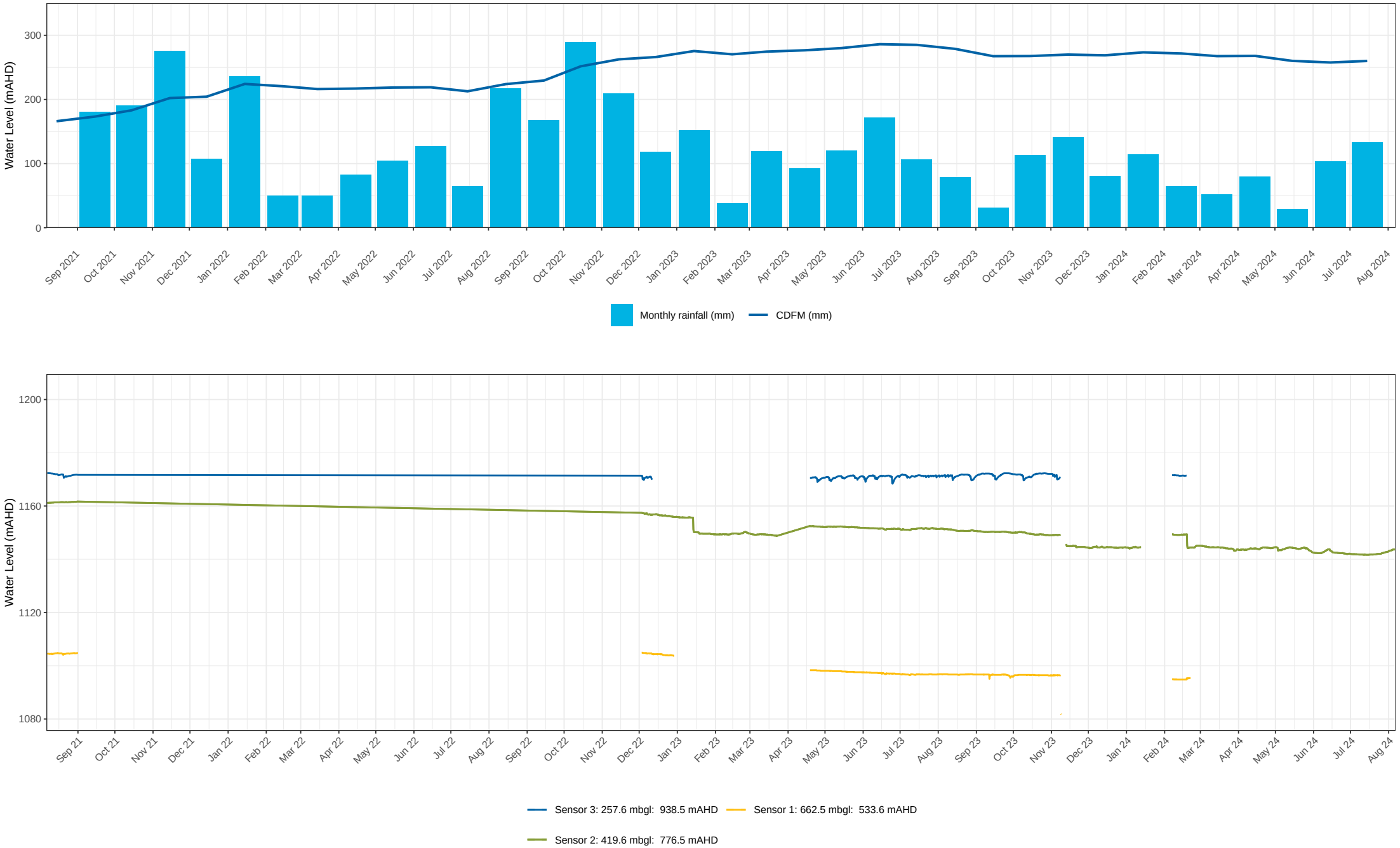
Notes

BH5107 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 117



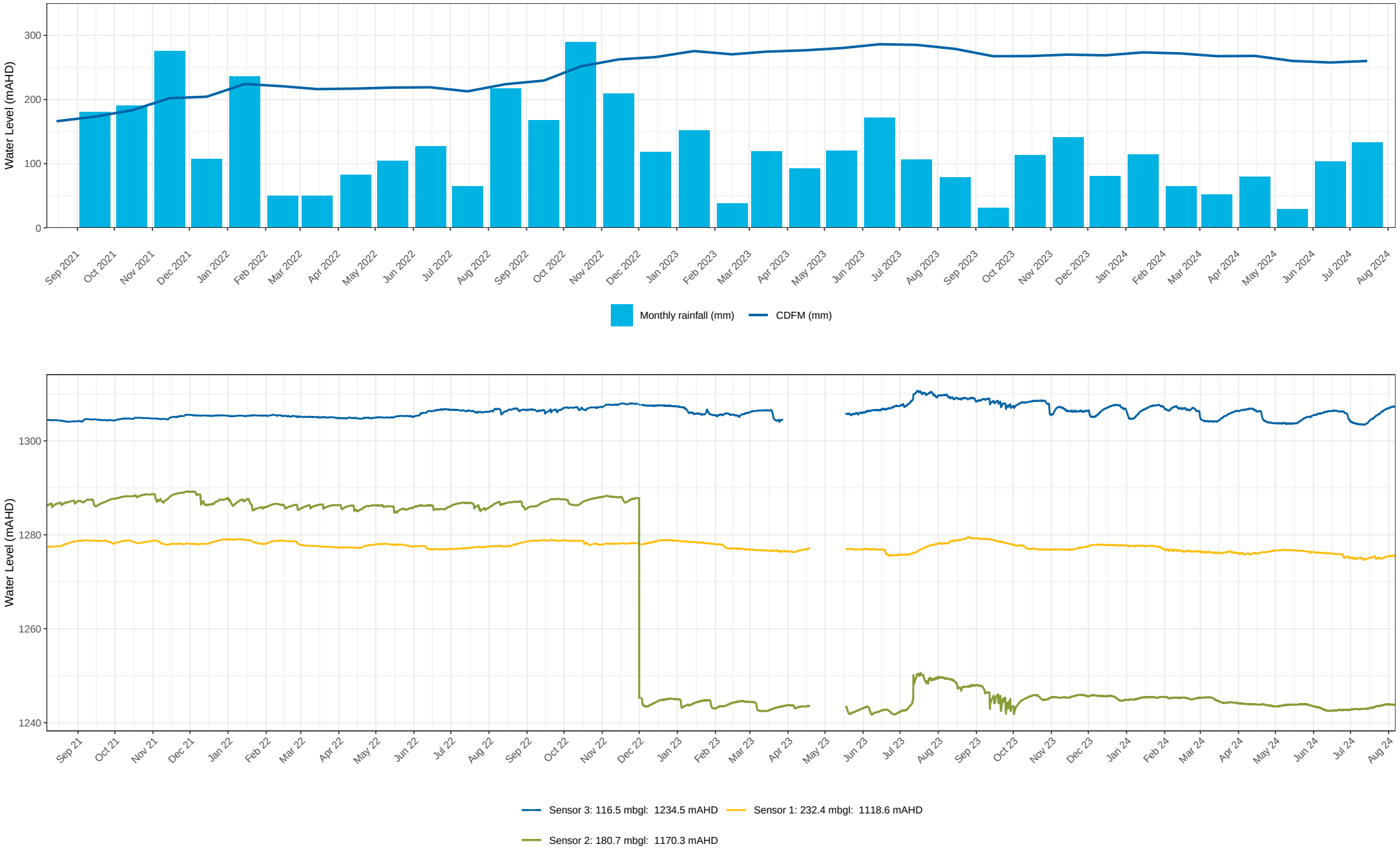
Notes

BH5108 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 118



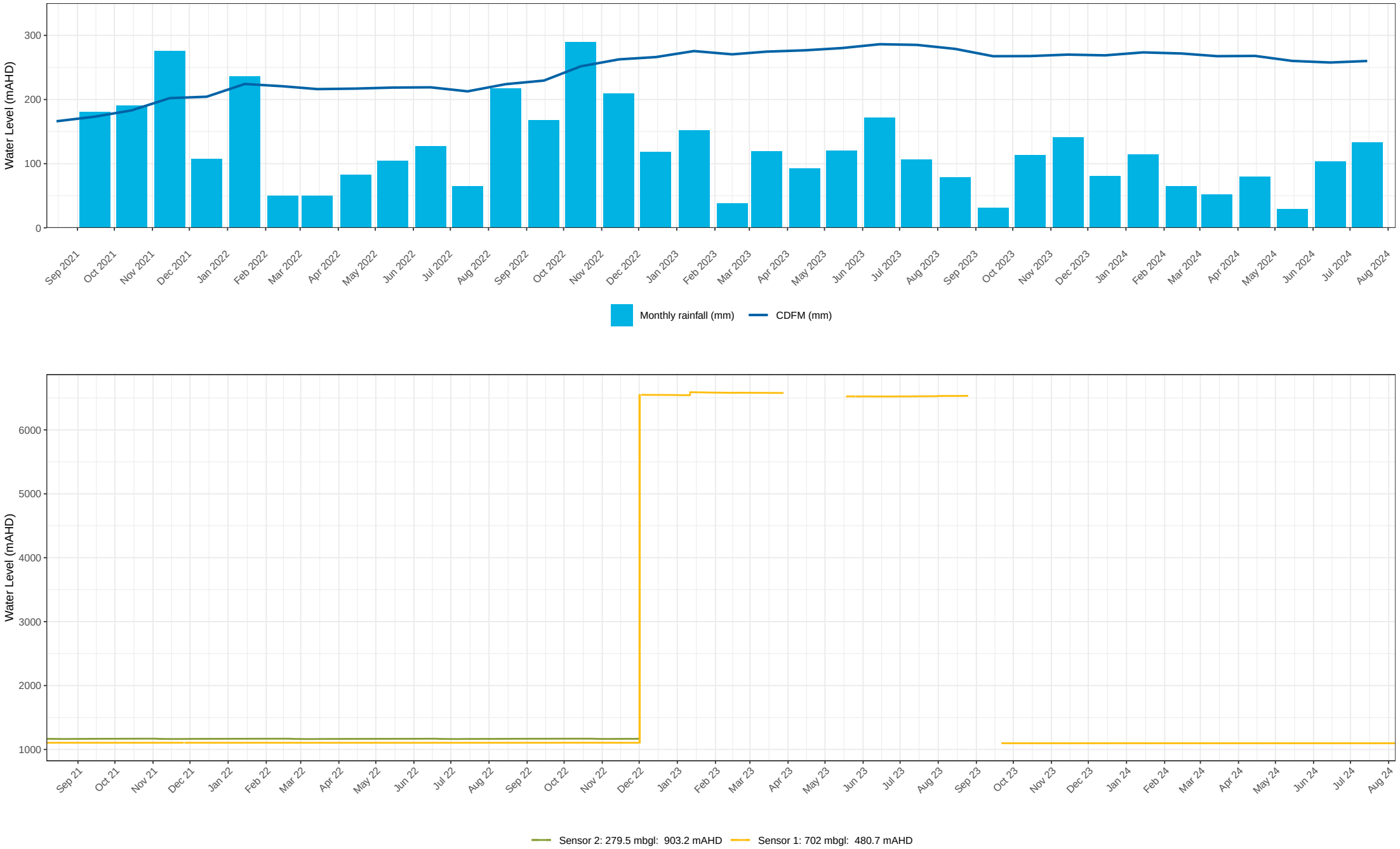
Notes

BH5110 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 119



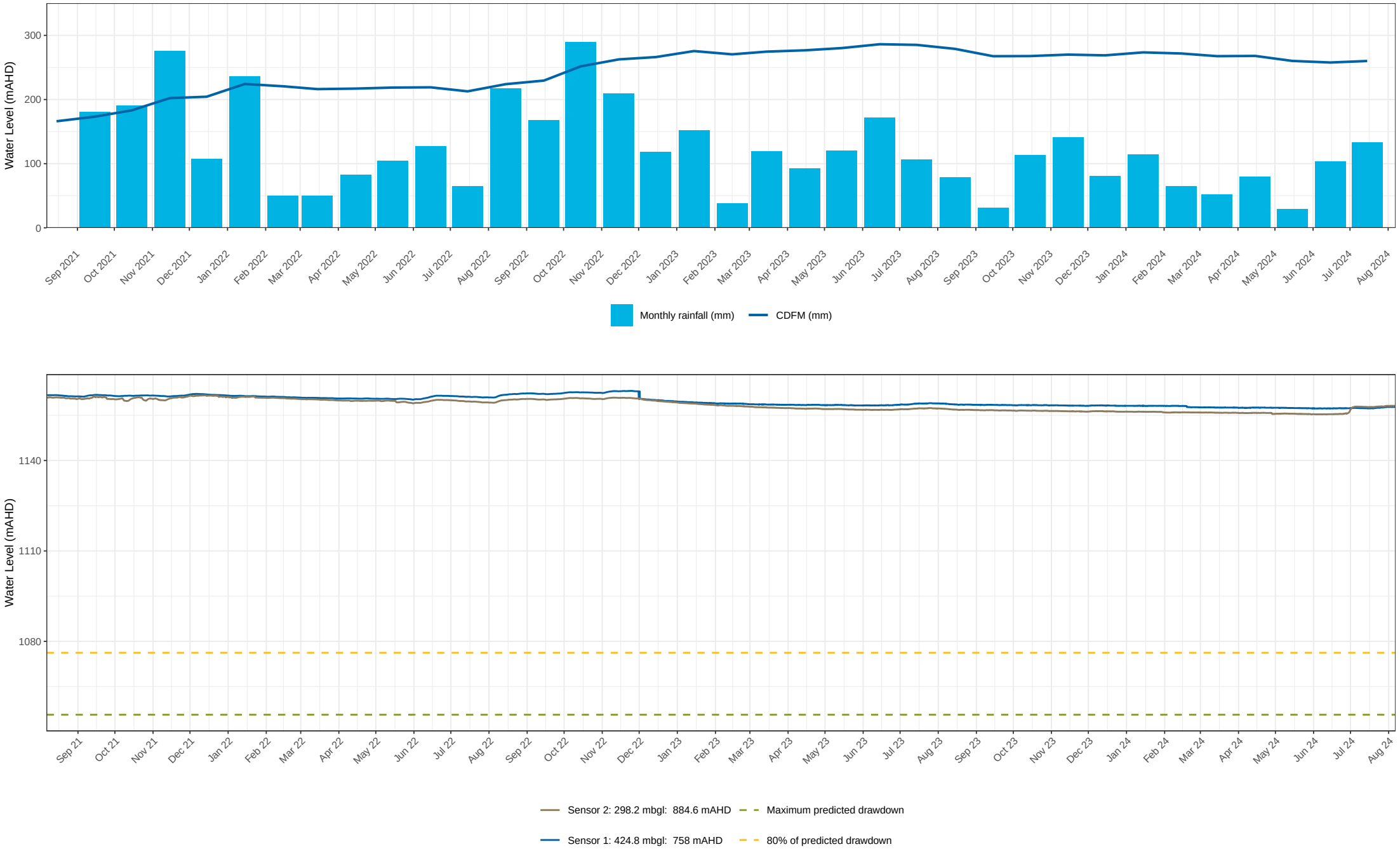
Notes

BH5111 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 120



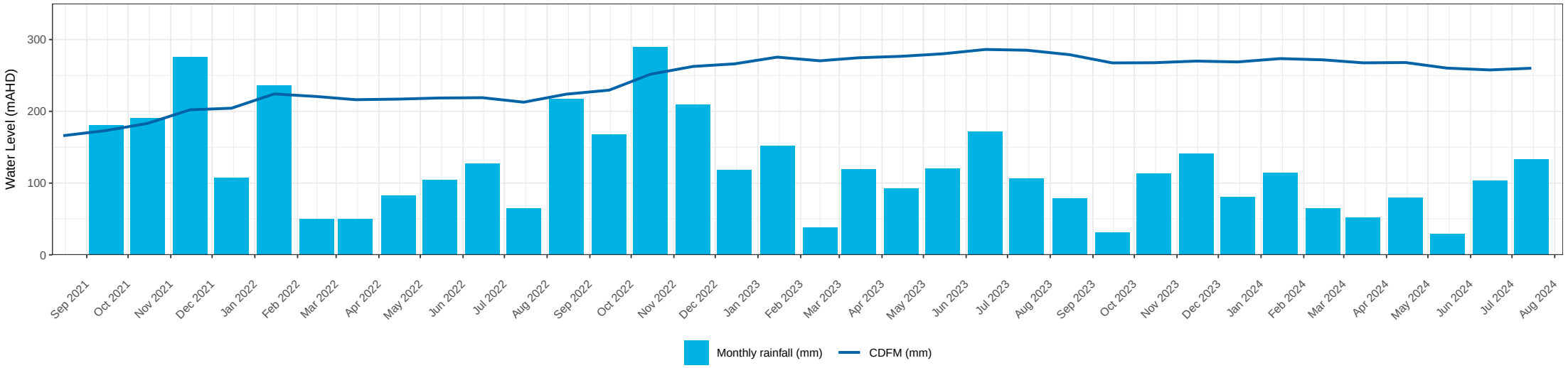
Notes

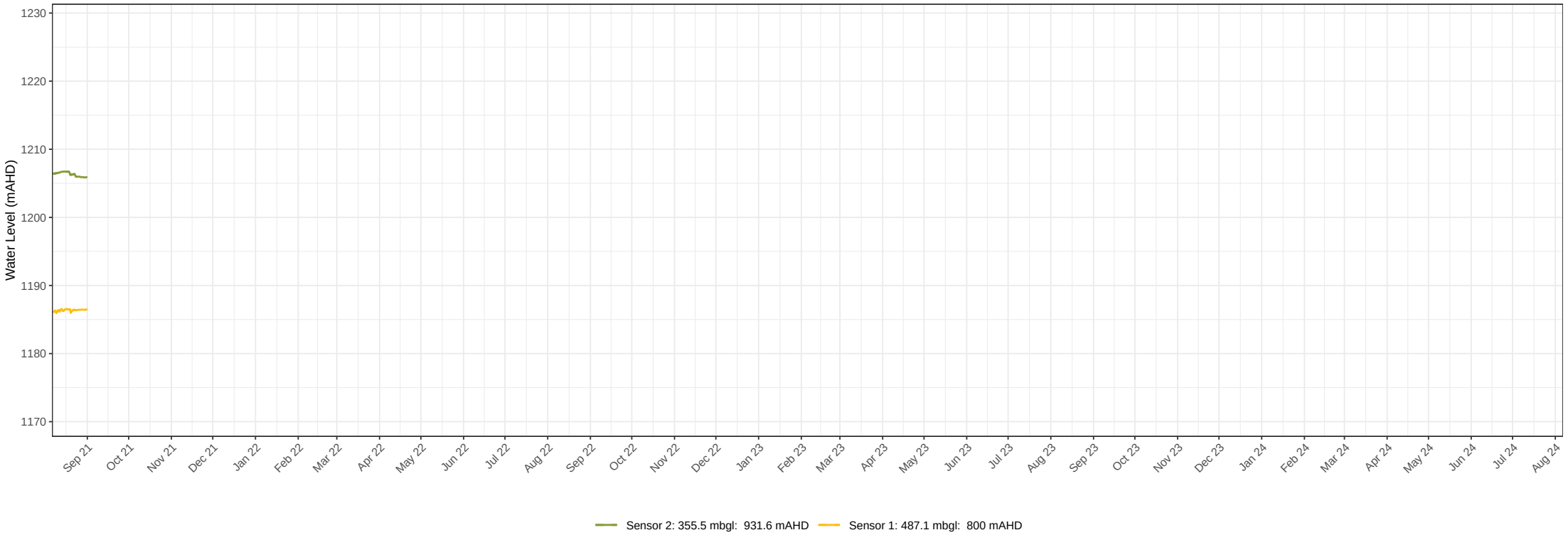
BH5113B groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 121



Notes

BH5113C groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 122

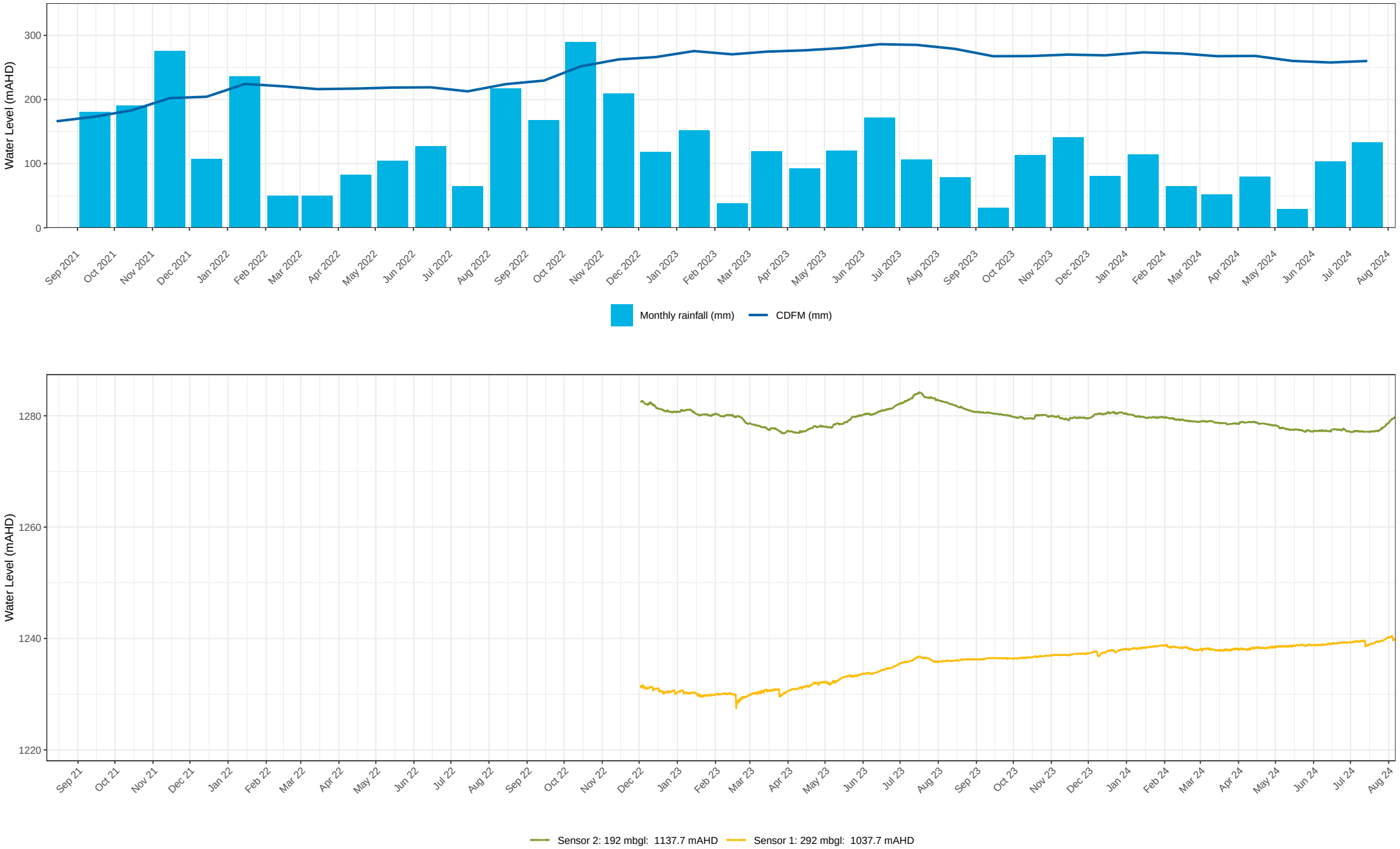




creating opportunities

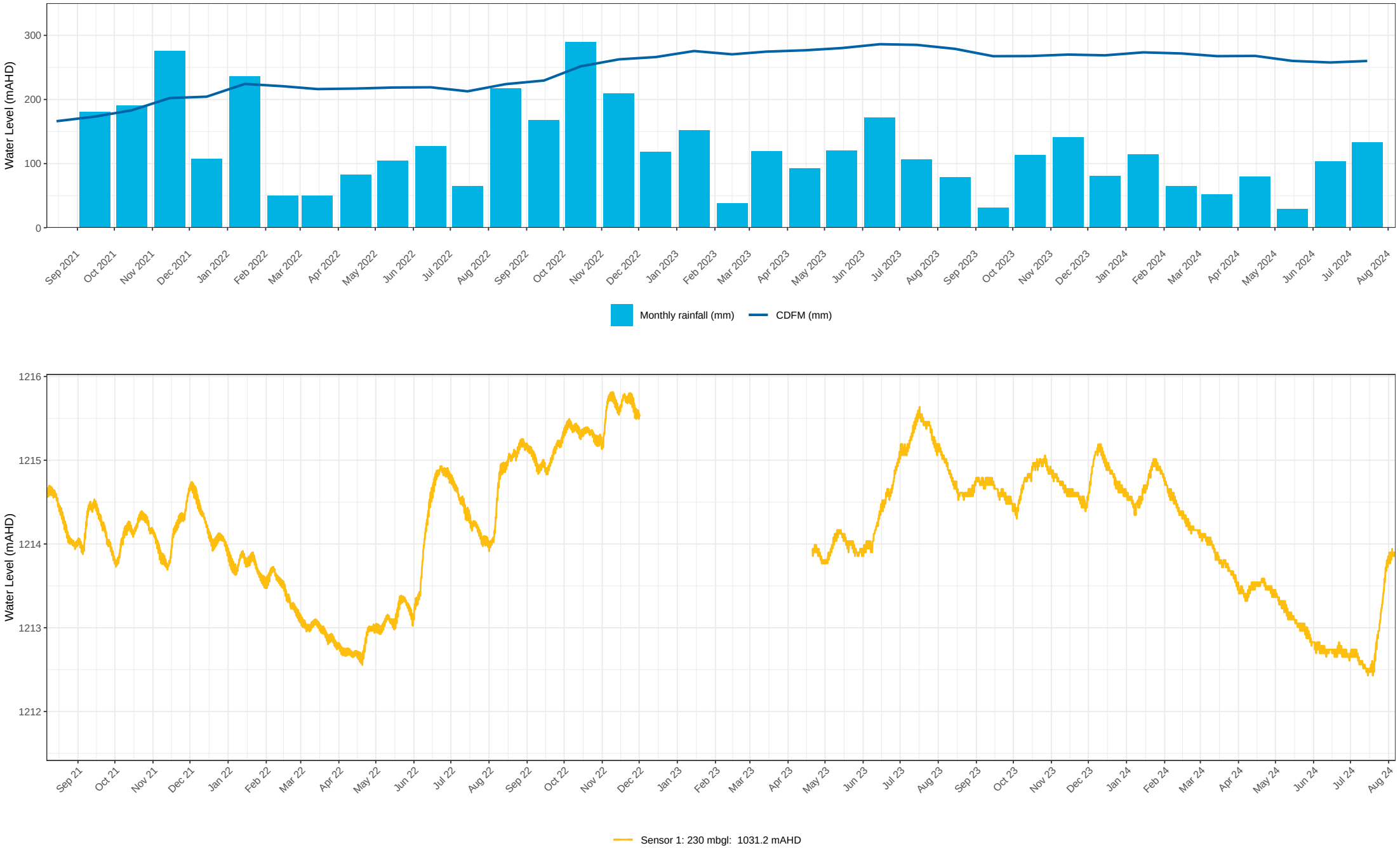
Notes

BH5114 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 123



Notes

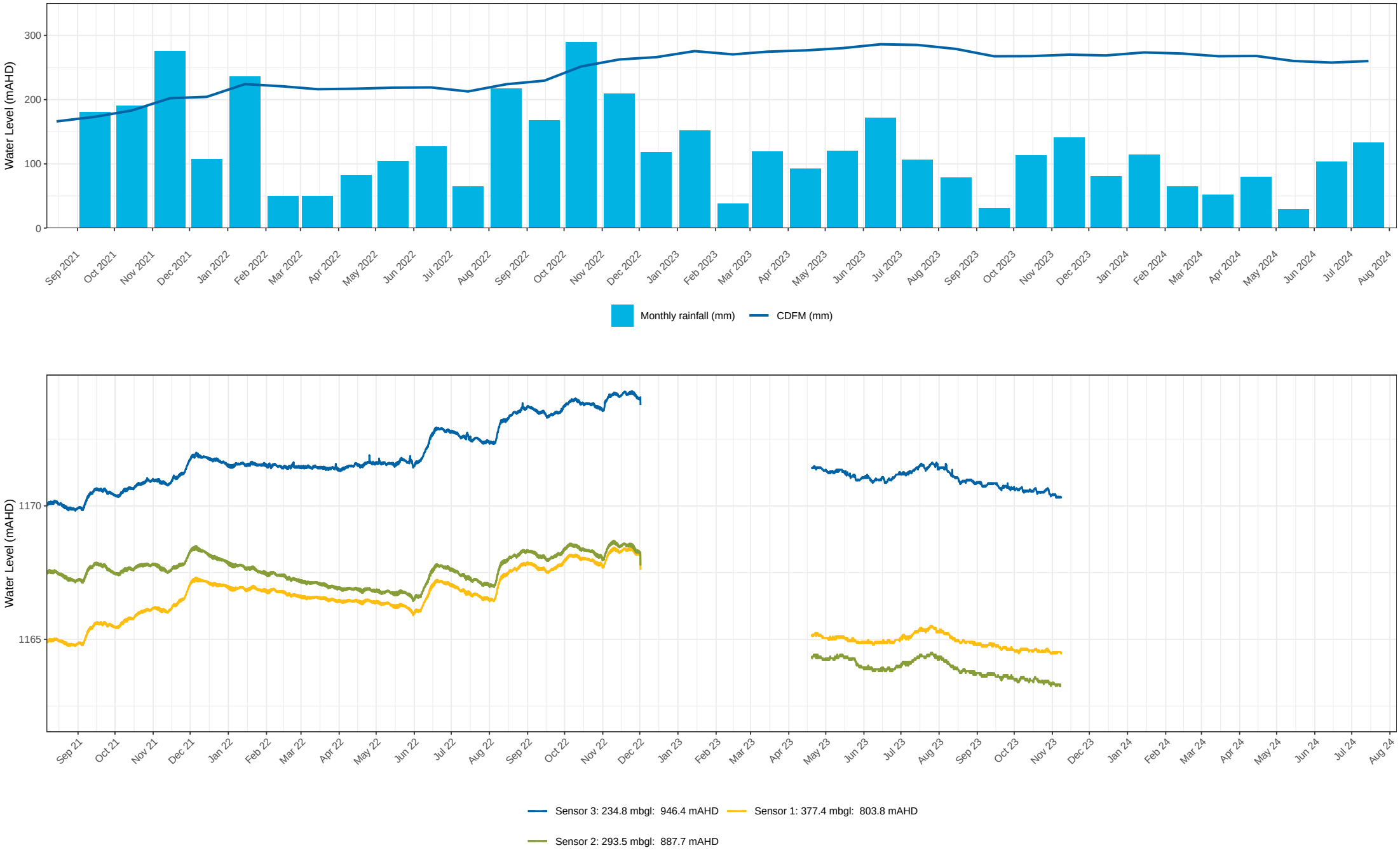
BH5115 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 124



creating opportunities

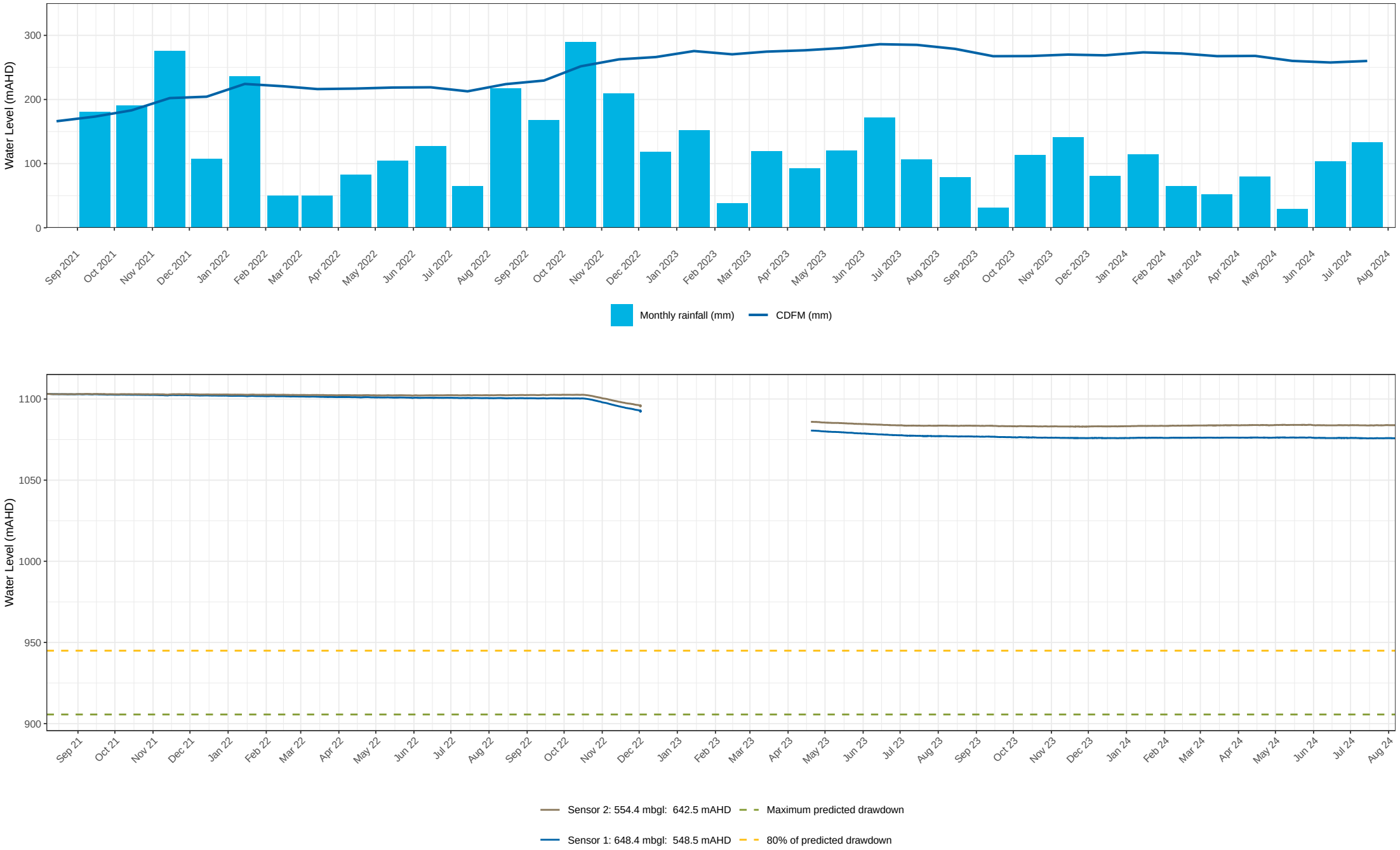
Notes

BH5202 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 125



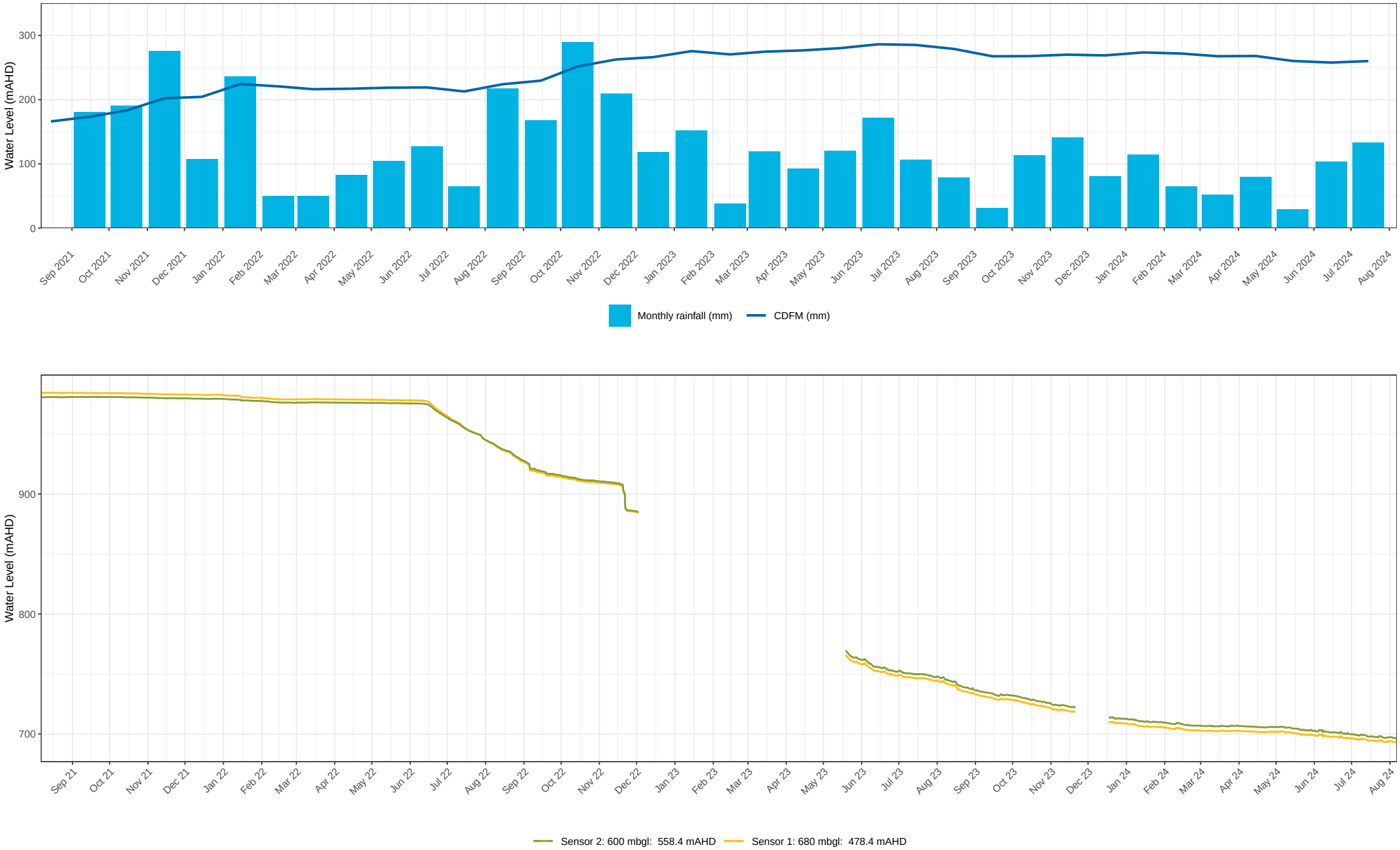
Notes

BH5203A groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 126



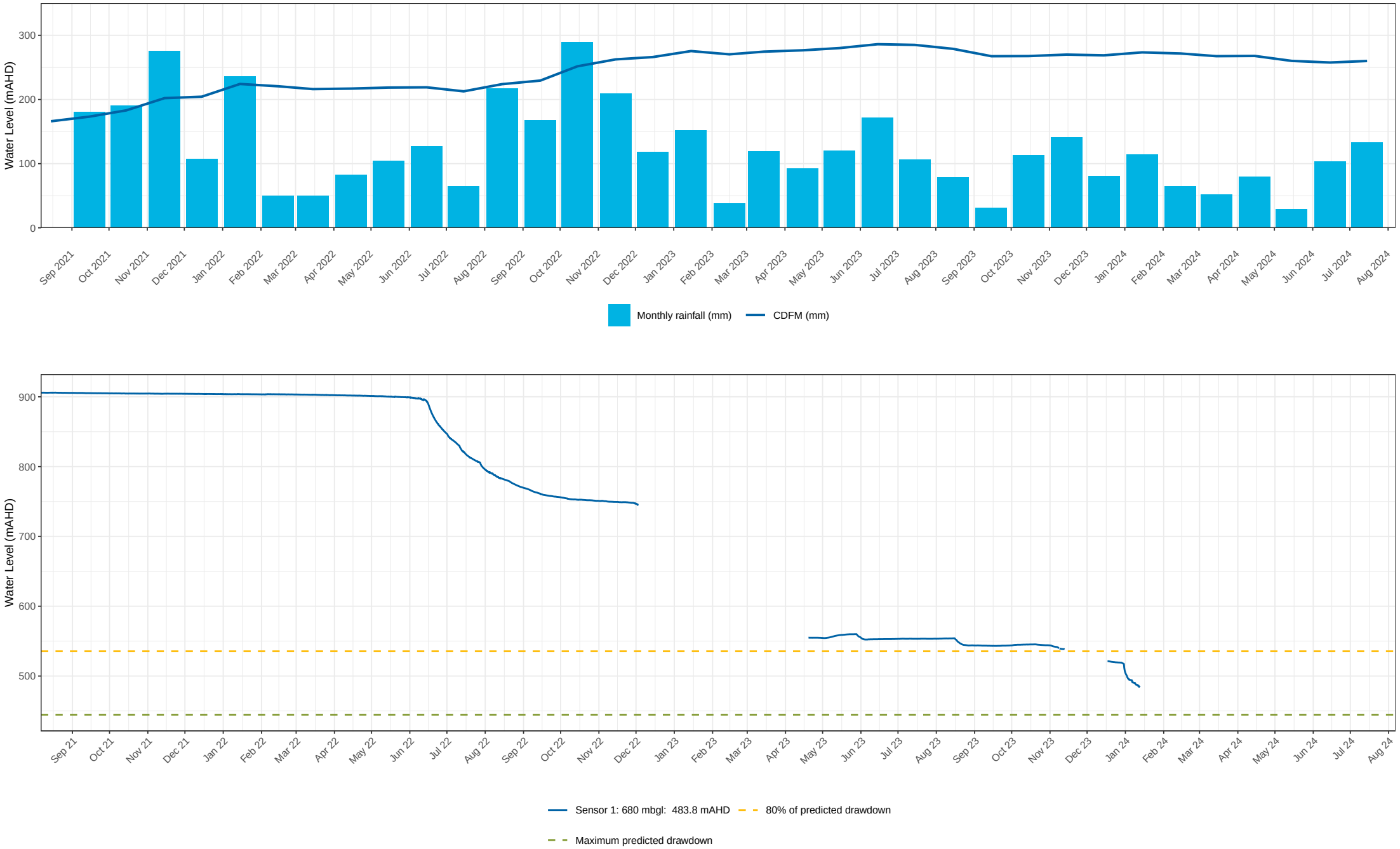
Notes

BH5204 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 127



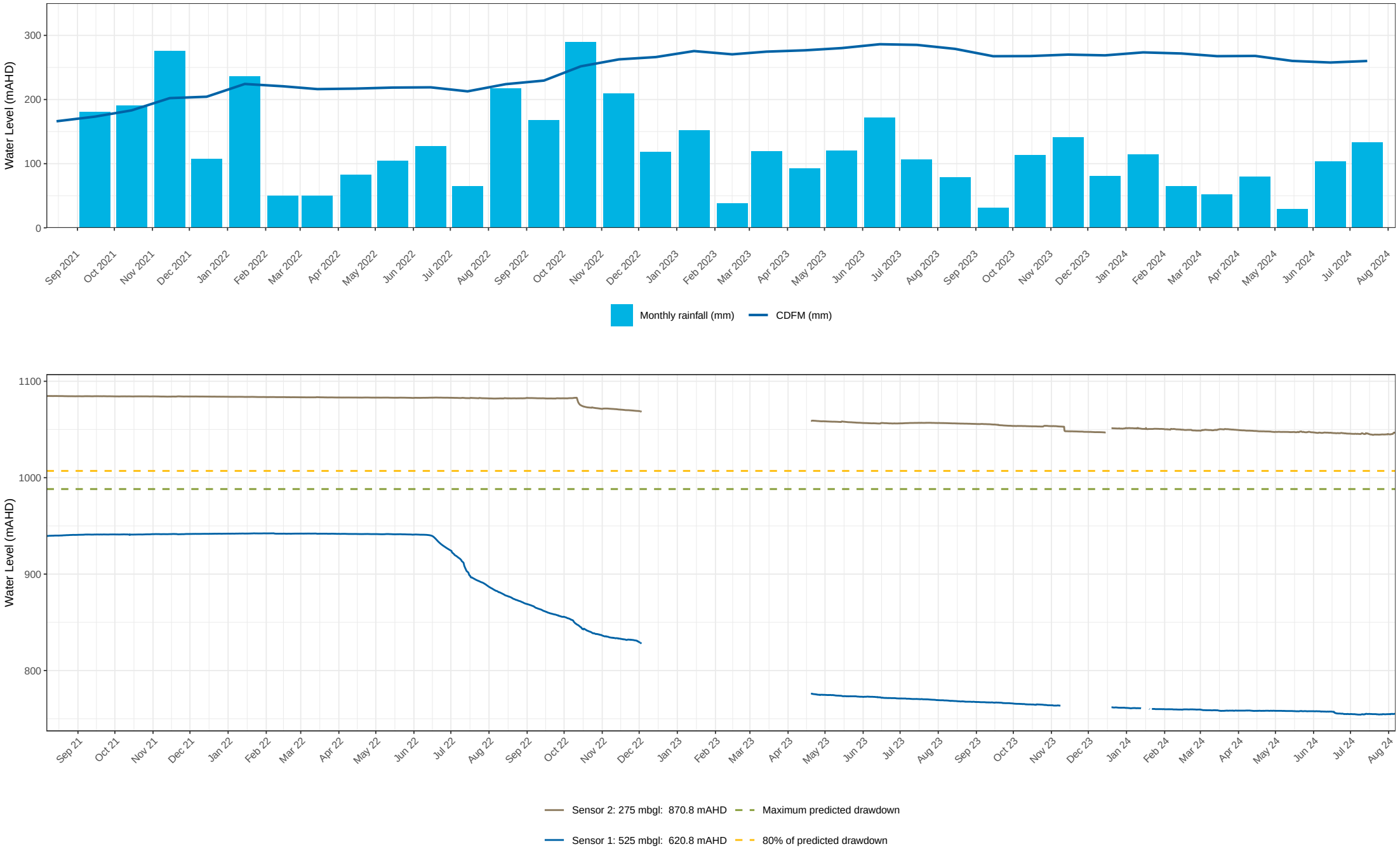
Notes

BH5206 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 128



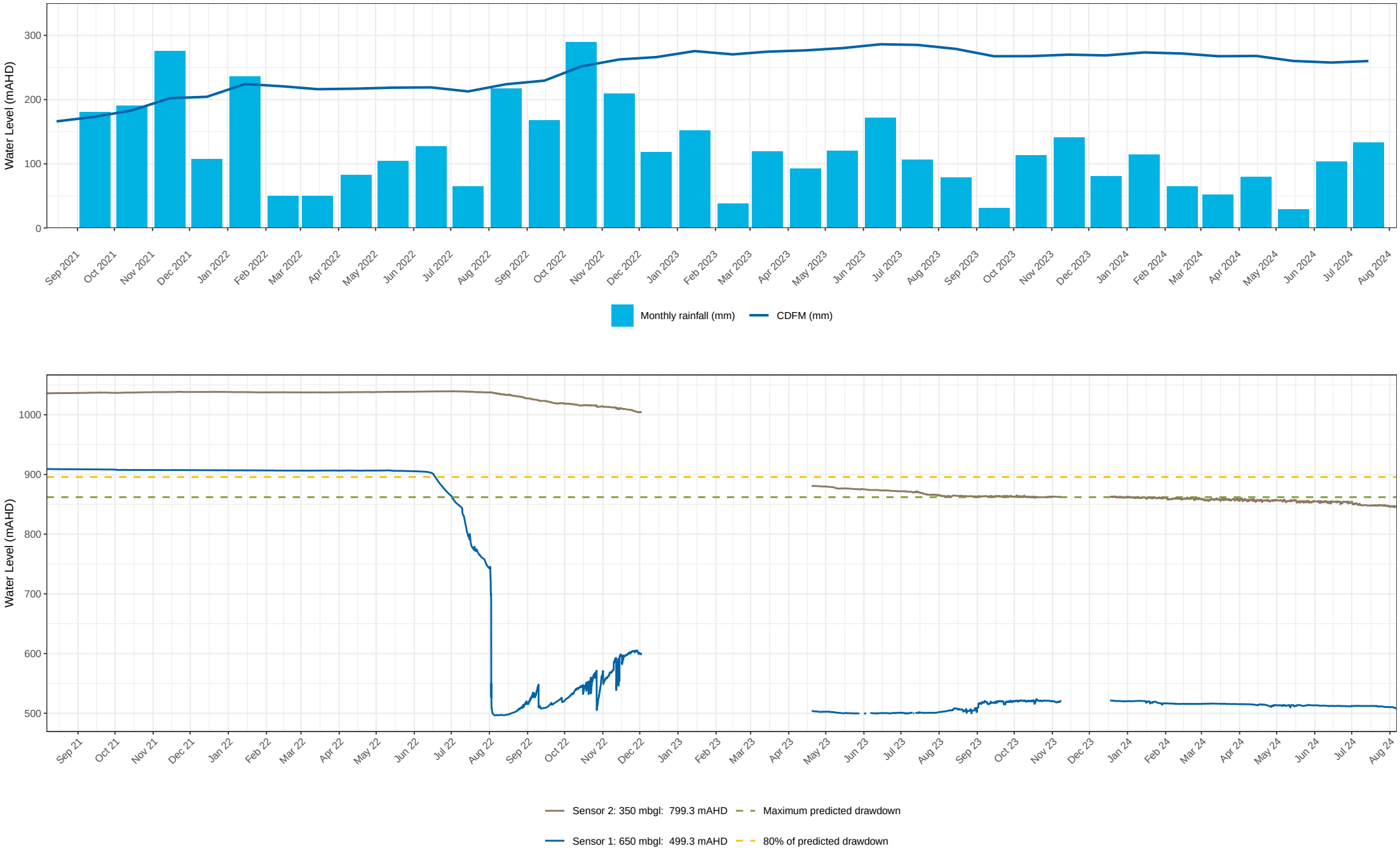
Notes

BH5207 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 129



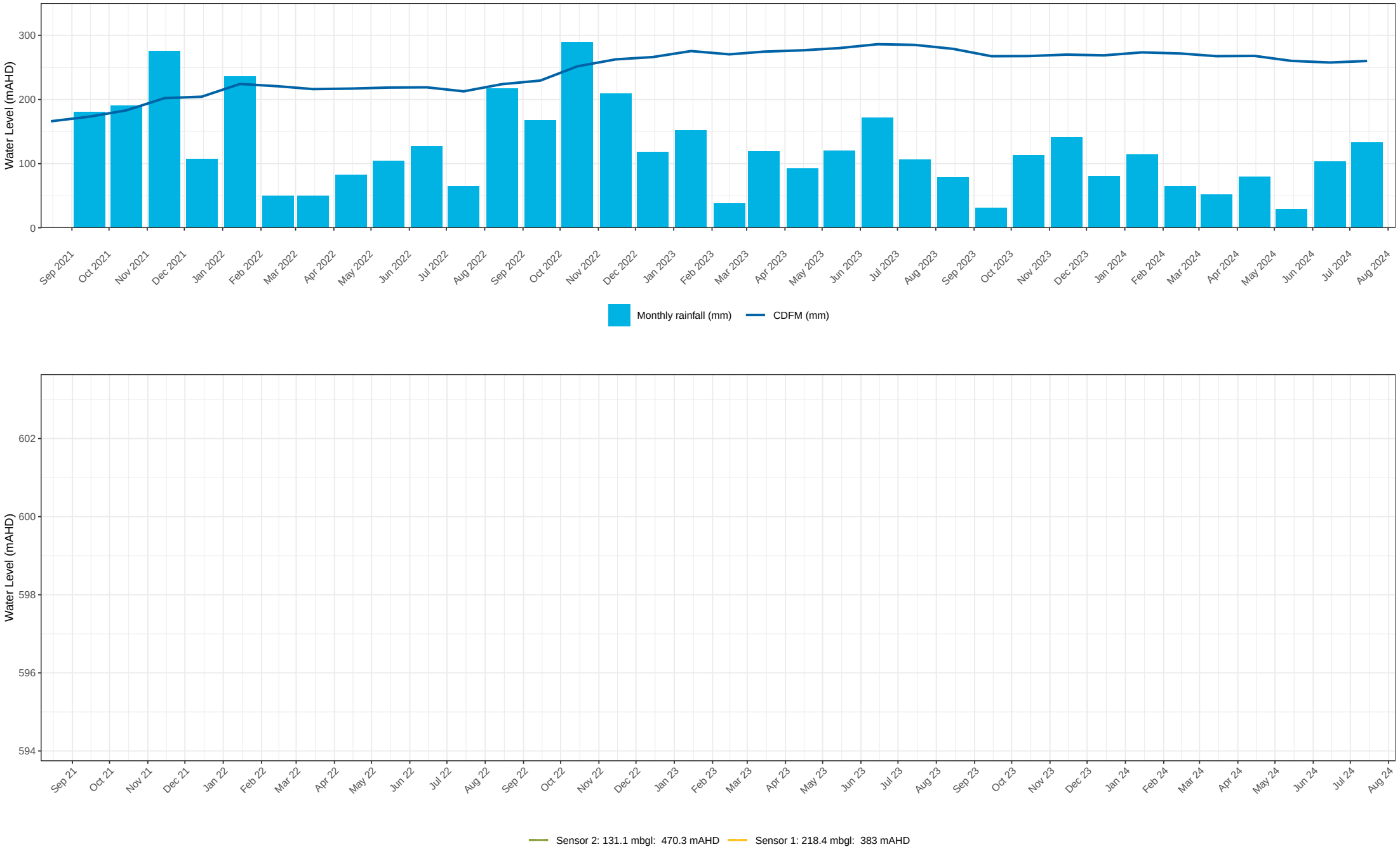
Notes

BH5208 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 130



Notes

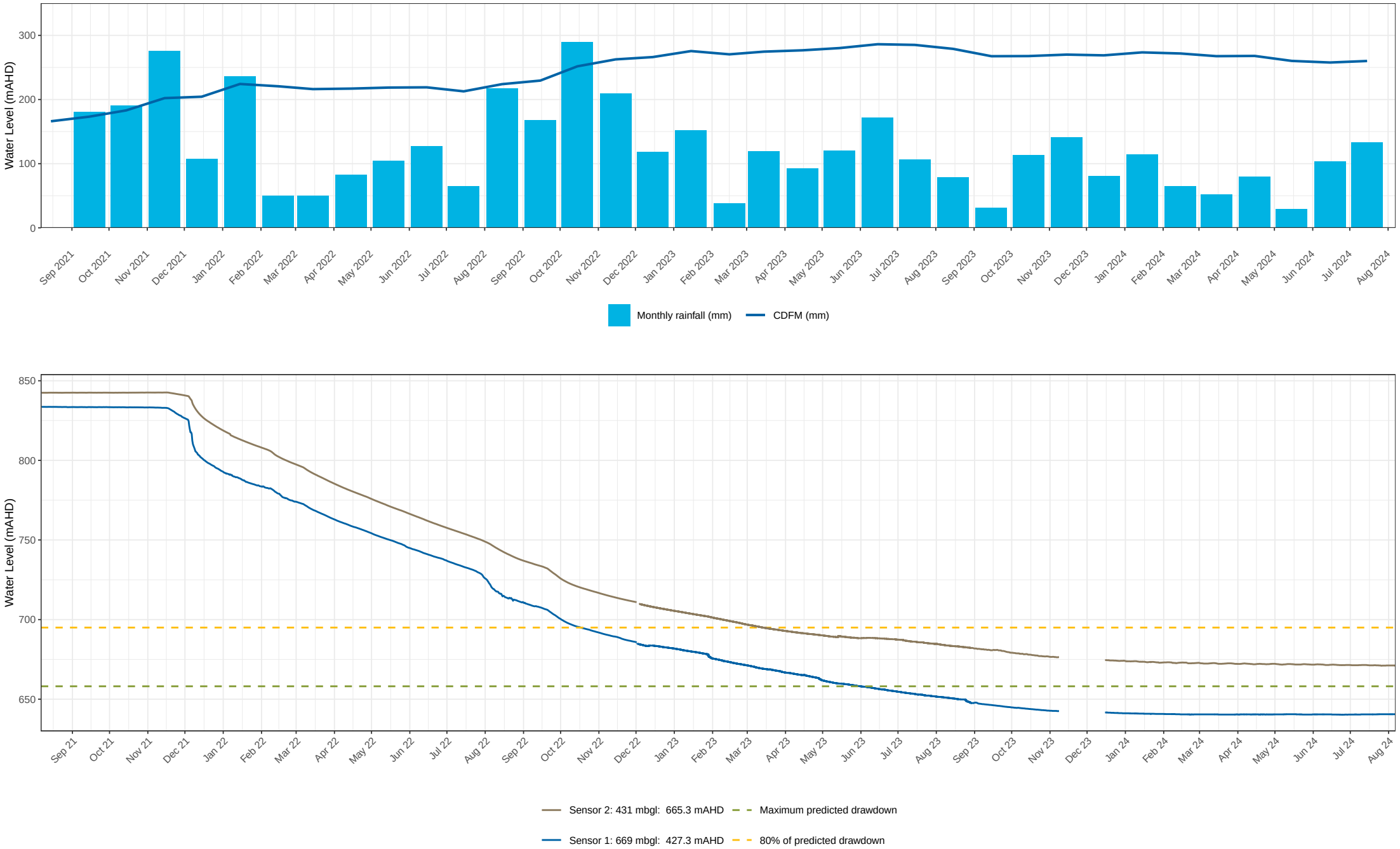
BH5209 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 131



creating opportunities

Notes

BH6103 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 132



Notes

BH8106 groundwater level times series data
Snowy Hydro 2.0 − Snowy Hydro Lmited
Groundwater monitoring and management
Figure 1. 133

Australia

SYDNEY
Ground floor 20 Chandos Street
St Leonards NSW 2065
T 02 9493 9500

NEWCASTLE
Level 3 175 Scott Street
Newcastle NSW 2300
T 02 4907 4800

BRISBANE
Level 1 87 Wickham Terrace
Spring Hill QLD 4000
T 07 3648 1200

CANBERRA
Suite 2.04 Level 2
15 London Circuit
Canberra City ACT 2601

ADELAIDE
Level 4 74 Pirie Street
Adelaide SA 5000
T 08 8232 2253

MELBOURNE
Suite 9.01 Level 9
454 Collins Street
Melbourne VIC 3000
T 03 9993 1900

PERTH
Suite 3.03
111 St Georges Terrace
Perth WA 6000
T 08 6430 4800

Canada

TORONTO
2345 Yonge Street Suite 300
Toronto ON M4P 2E5
T 647 467 1605

VANCOUVER
422 Richards Street Unit 170
Vancouver BC V6B 2Z4
T 604 999 8297

CALGARY
606 4th Street SW 11 Floor
Calgary Alberta T2P 1T1

linkedin.com/company/emm-consulting-pty-limited

emmconsulting.com.au