NSW GOVERNMENT

Manly Hydraulics Laboratory

NSW COASTAL RAINFALL ANNUAL SUMMARY
2022–23

Report MHL2996
May 2024

Prepared for:

NSW Department of Climate Change, Energy, the Environment and Water - Biodiversity and Conservation

Cover photograph: Clover Hill rainfall station, Wollongong region

NSW COASTAL RAINFALL ANNUAL SUMMARY
2022–23

Report MHL2996
May 2024

Michael Galloway
Team Leader – Hydrometrics Operations
110b King Street
Manly Vale NSW 2093
T: 02 9949 0200
E: michael.galloway@mhl.nsw.gov.au
W: www.mhl.nsw.gov.au

Document control

Issue/ Revision	Author	Reviewer	Approved for issue	
			Name	Date
Draft	B Tse	S Dakin	A Joyner	30/10/2023
Final	B Tse	S Young, DCCEEW BC	M Galloway	3/05/2024

Report classification

☒	Public	Report existence and contents publicly available.
☐	Release by consent only	Report existence is known but contents are available only with consent by MHL's client and the MHL Director.
☐	Private	Report existence and content are strictly confidential.

Report No. MHL2996

ISSN: 2205-5576 (Online)

Manly Hydraulics Laboratory is Safety, Environment & Quality System Certified to AS/NZS 4801, ISO 14001 and ISO 9001

110B King Street

Manly Vale NSW 2093

T 02 9949 0200

ABN 27 578 976 844 www.mhl.nsw.gov.au

Foreword

Manly Hydraulics Laboratory (MHL) is a business unit within the Water Group of the NSW Department of Climate Change, Energy, the Environment and Water. The NSW rainfall database has been developed to support a number of programs associated with coastal, floodplain and estuary management for the NSW Department of Climate Change, Energy, the Environment and Water - Biodiversity and Conservation (DCCEEW BC).

This annual summary presents rainfall station measurements collected by MHL along NSW coastal estuaries and rivers from 1 July 2022 to 30 June 2023. It provides ready access to MHL's rainfall database and data analysis capabilities.

Direct requests for further information to:

Manager Environmental Data
Manly Hydraulics Laboratory
110b King Street
Manly Vale NSW 2093

Email : data-request@mhl.nsw.gov.au
WWW : http://www.mhl.nsw.gov.au/
Telephone : (02) 9949 0200

Other annual summaries in this series include:

- NSW Estuary and River Water Levels
  Annual Summary 2022–2023
  Manly Hydraulics Laboratory
  Report No. MHL2994
  ISSN: 2205-5525 (Print)
  ISSN: 2205-5533 (Online)
- NSW Wave Climate
  Annual Summary 2022–2023
  Manly Hydraulics Laboratory
  Report No. MHL2997
  ISSN: 2205-5584 (Print)
  ISSN: 2205-5592 (Online)
- NSW Ocean and River Entrance Tidal Levels and Air Pressure Annual Summary 2022–2023
  Manly Hydraulics Laboratory
  Report No. MHL2995
  ISSN: 2205-5541 (Print)
  ISSN: 2205-555X (Online)
- NSW Estuary and River Water Quality
  Annual Summary 2022–2023
  Manly Hydraulics Laboratory
  Report No. MHL2998
  ISSN: 2205-5606 (Print)
  ISSN: 2205-5614 (Online)

Download electronic copies of the reports in this series at http://www.mhl.nsw.gov.au/ under the 'Publications' link.

Executive summary

The *NSW Coastal Rainfall Annual Summary 2022–2023* presents rainfall station measurements collected by MHL along NSW coastal estuaries and rivers from 1 July 2022 to 30 June 2023. It provides an overview of MHL's historical rainfall database and data analysis capabilities.

The overall data capture across the network was 98.9% (for data processed to within ±10% of calibration). The target recovery rate of 95% and above is achieved for the 2022–23 reporting period.

This report contains:

- a brief description of the coastal rainfall monitoring program
- guidelines on how to use this report and access the database
- a review of significant program developments and rainfall events in 2022–23
- a list of all stations for which MHL collected rainfall data in 2022–23 (**Table 4-1**)
- the annual data summaries for each station
- **Appendix A**, which details the rainfall data available
- **Appendix B**, a list of publications which may be of interest.

Contents

TABLES

FIGURES

1 Rainfall monitoring program

The network of automatic recorders and the associated analysis routines enable efficient delivery of near-real time rainfall data from stations across NSW. Extracts from the historical database of rainfall data can also be made available on request (refer to **Appendix A**).

The present program is based on a network of automatic rainfall recording stations installed at various coastal sites (see **Section 4 Rainfall monitoring summary**). The network consists of 74 permanent stations funded by the NSW Department of Climate Change, Energy, the Environment and Water - Biodiversity and Conservation (DCCEEW BC). The network supplements the coverage provided by the Bureau of Meteorology (BoM), water authorities, other agencies and local government rainfall networks. The system utilises 0.2 mm, 0.5 mm and 1.0 mm tipping buckets and data loggers.

Rainfall data is transferred to MHL's databases, located in the NSW Government Data Centre, using a variety of telemetry techniques including internet protocols (IP) via cellular networks and event-reporting radio telemetry system (ERTS). The incoming raw data is then made available in near real time to external users to view online.

Data is stored in a database and subject to a quality assurance process which involves several control steps to maintain data quality as well as assignment of data quality codes. Computer programs are used to further format and analyse data.

Data is backed up daily and archived to offline storage at regular intervals.

2 How to use this report and access the database

The NSW coastline is divided into geographic regions based on river systems to present water monitoring information. Location maps display the station locations and the annual plots confirm the availability and suitability of data for the particular period of interest. A list of rainfall station data collected and stored online is included in **Appendix A**.

2.1 Data request

Once a choice has been made for the period of information required, data and services can be obtained in a variety of formats, according to their intended use. All data presented in this report are in Australian Eastern Standard Time (AEST). Allowance for daylight saving time needs to be made by the user of the data if required.

Available rainfall products include:

Tabulated output

- daily totals
- intensity/duration tables
- time of tips of rain gauge or short period fixed time step data.

Graphical plots

- hourly, daily, monthly and yearly hyetographs (a graphical representation of rainfall distribution over a period of time)
- intensity-frequency-duration curves using two methods defined in *Australian Rainfall and Runoff 1987* and *Australian Rainfall and Runoff 2019*.

2.2 Access data online

MHL provides a full online data access service via the internet for its clients, and a limited service for the general public at http://www.mhl.nsw.gov.au/.

Typically, the last seven days of data are available online in a non-quality controlled form to aid the fastest possible access to data records. The online service for clients can provide access to all data catalogued in **Appendix A**.

Quality controlled data may be ordered via the MHL web page (http://www.mhl.nsw.gov.au), by emailing data-request@mhl.nsw.gov.au, or via customised decision support tools that can be provided on request.

2.3 Rainfall data provision

Rainfall data is provided to the public via the following methods:

- MHL's public website, providing near real time access to a limited sample of data.
- MHL provides DCCEEW BC, NSW State Emergency Service (SES) and BoM officers access to near real time environmental data and our 'quality assured' historical database through the DCCEEW BC information portal, which is password-protected.
- NSW SES officers also receive automated SMS and email notifications from flood warning systems in NSW.
- A web-based data request system is available where electronic requests can be submitted via MHL's homepage at http://www.mhl.nsw.gov.au under the data request menu.

Data access also continues to assist the BoM, local government, SES, NSW Police, WaterNSW, NSW Surf Life Saving Association, universities, the NSW court system, private consultancies and Transport for NSW.

3 Significant events and developments

In the 2022–23 fiscal year, the rainfall stations which recorded the highest rainfall for each of the 11 durations selected between 5 minutes and 72 hours are presented in **Table 3-1**. To estimate the significance of these rainfall events, the intensities are compared against the Annual Exceedance Probability (AEP) curves for each station location sourced through BoM's Intensity Frequency Duration (IFD) service (http://www.bom.gov.au/water/designRainfalls/revised-ifd/). AEP is the probability that a given rainfall total accumulated over a given duration will be exceeded in any one year. An event with a 1% AEP is an event that has a 1% chance of being equalled or exceeded in any one year. Please note that estimated AEPs are often revised as additional data from extreme events become available.

Table 3-2 provides a summary of the number of rainfall stations that exceeded a total of 100 mm in 24 hours for any one day per month during 2022–23 on the NSW east coast. 100 mm of rain falling in a 24-hour period is adopted to illustrate a significant rain event.

Table 3-3 presents the maximum recorded rainfall for durations of 5 minutes to 72 hours at each station.

Table 3-1 Intensities of highest rainfall recorded for 11 durations

Duration	Station	Date	Rainfall (mm)	Rainfall (mm/hr)	AEP (%)
5min	Whitemans Ridge	23/03/2023	17.5	210.00	5
10min	Bateau Bay	9/02/2023	26.5	159.00	10
20min	Bateau Bay	9/02/2023	51.0	153.00	5
30min	Bateau Bay	9/02/2023	67.5	67.50	2
60min	Mount Elliot	9/02/2023	86.5	86.50	50
3hrs	Tuncurry DS	6/07/2022	141.5	47.17	2
6hrs	Tuncurry DS	6/07/2022	176.5	29.42	2
12hrs	Nabiac	6/07/2022	231.0	19.25	2
24hrs	Dombarton Loop	3/07/2022	285.5	11.90	10
48hrs	Dombarton Loop	3/07/2022	403.5	8.41	5
72hrs	Mount Pleasant	4/07/2022	510.5	7.09	1

Table 3-2 Number of rainfall stations per region where rainfall exceeds 100 mm in 24 hours at least once per month (2022–23)

Region (No. of stations in region)	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
Tweed and Brunswick Rivers (4)				4				2				
Richmond River (1)					*	*	*					
Bellinger River (8)	6*		8				*		1			
Nambucca River (2)	2		2	1								
Macleay and Hastings Rivers (3)	2								1			
Camden Haven (2)	2								1			
Karuah River (5)	5		1						2			
Hunter River (4)	2							2				
Macquarie-Tuggerah Lakes and Brisbane Water (21)	14*						*	1			*	*
Hawkesbury River (3)												
Sydney Coastal (2)												
Wollongong Coastal (16)	16							2				
South Coast (3)	1*	*	*	1*				1				

*Data loss of 1% or more during each month at one or more stations.

Table 3-3 Maximum recorded rainfall (mm) 2022–23

Station	Duration											Total yearly rainfall
	5 min	10 min	20 min	30 min	60 min	3 hrs	6 hrs	12 hrs	24 hrs	48 hrs	72 hrs	
Cudgera	24/02/2023 10.5	24/02/2023 14.5	4/01/2023 23.0	24/02/2023 32.0	24/02/2023 37.0	24/02/2023 56.0	24/02/2023 79.5	24/02/2023 124.0	24/02/2023 133.5	25/02/2023 146.0	22/06/2023 154.0	1439.0
Main Arm	5/01/2023 14.0	5/01/2023 23.0	5/01/2023 33.5	5/01/2023 40.5	14/02/2023 52.5	14/02/2023 84.0	14/02/2023 92.5	14/02/2023 94.0	24/10/2022 141.5	24/10/2022 161.5	24/10/2022 182.0	1589.0
Huonbrook	16/12/2022 8.5	17/10/2022 11.5	5/01/2023 19.5	5/01/2023 22.0	5/01/2023 30.5	23/10/2022 49.0	23/10/2022 77.0	24/10/2022 108.0	24/10/2022 157.0	24/10/2022 178.0	24/10/2022 196.0	1598.0
Myocum	31/01/2023 12.5	31/01/2023 20.0	31/01/2023 31.5	24/02/2023 37.5	31/01/2023 52.0	31/01/2023 70.5	31/01/2023 76.5	24/10/2022 105.5	24/10/2022 140.5	23/09/2022 155.5	24/10/2022 166.5	1572.5
Lake Ainsworth[1]	5/01/2023 10.0	5/01/2023 14.0	14/05/2023 18.5	14/05/2023 20.5	11/05/2023 23.0	23/10/2022 35.5	24/10/2022 62.0	24/10/2022 86.0	24/10/2022 122.5	24/10/2022 135.0	16/05/2023 137.0	1162.5
Wooli Sportsground[1]	22/09/2023 12.0	22/09/2023 18.0	22/09/2023 25.5	22/09/2023 29.5	22/09/2023 43.5	22/09/2023 90.0	22/09/2023 129.5	22/09/2023 164.0	23/09/2022 175.0	24/09/2022 196.5	24/09/2022 202.5	1094.0
Perry Drive[1]	28/11/2022 10.0	28/11/2022 15.5	28/11/2022 23.0	28/11/2022 24.0	21/10/2022 30.0	5/07/2022 51.5	5/07/2022 94.5	6/07/2022 119.5	6/07/2022 130.5	23/09/2022 138.5	24/10/2022 156.0	1538.5
Shephards Lane[2]	28/11/2022 8.0	28/11/2022 14.5	24/01/2023 21.5	24/01/2023 23.5	5/07/2022 26.5	5/07/2022 60.0	5/07/2022 106.0	6/07/2022 151.5	6/07/2022 182.5	7/07/2022 195.0	7/07/2022 196.0	1775.0
Red Hill	24/01/2023 7.5	24/01/2023 15.0	24/01/2023 24.5	24/01/2023 29.0	24/01/2023 30.0	5/07/2022 51.0	5/07/2022 87.5	6/07/2022 128.0	6/07/2022 156.0	23/09/2022 173.5	24/09/2022 180.5	1685.0
Newports Creek	21/10/2022 5.0	21/10/2022 9.5	21/10/2022 12.5	22/09/2022 14.5	5/07/2022 24.5	6/07/2022 59.0	5/07/2022 96.5	6/07/2022 157.5	6/07/2022 189.5	7/07/2022 205.0	7/07/2022 205.0	1752.5
Middle Boambee	25/10/2022 9.0	25/10/2022 15.0	28/09/2022 19.0	13/03/2023 21.0	13/03/2023 31.0	6/07/2022 61.0	6/07/2022 91.5	6/07/2022 159.5	6/07/2022 189.5	6/07/2022 192.5	8/07/2022 193.0	1725.5
North Bonville	12/12/2022 7.5	12/12/2022 13.5	24/01/2023 18.5	24/01/2023 25.5	13/03/2023 40.0	13/03/2023 99.5	13/03/2023 150.5	6/07/2022 185.0	6/07/2022 217.5	7/07/2022 234.0	7/07/2022 234.0	1899.0
Kooroowi Sharabel	12/12/2022 8.0	12/12/2022 10.0	27/02/2023 17.0	27/02/2023 21.0	21/10/2022 31.0	5/07/2022 42.5	6/07/2022 71.5	6/07/2022 127.0	6/07/2022 160.0	7/07/2022 168.0	7/07/2022 168.5	1388.5
Stuarts Island Downstream	21/10/2022 8.0	6/07/2022 14.5	21/10/2022 21.5	21/10/2022 23.5	21/10/2022 26.5	21/10/2022 60.0	21/10/2022 106.0	21/10/2022 151.5	6/07/2022 182.5	7/07/2022 195.0	7/07/2022 196.0	1473.5
Utungun	29/01/2023 13.0	29/01/2023 22.5	29/01/2023 12.5	29/01/2023 35.0	29/01/2023 38.5	21/10/2022 49.0	6/07/2022 69.5	6/07/2022 95.5	6/07/2022 146.0	7/07/2022 183.5	7/07/2022 186.0	1256.5
Aldavilla Downstream	24/01/2023 10.0	24/01/2023 18.0	24/01/2023 20.0	30/01/2023 22.0	30/01/2023 24.0	6/07/2022 41.0	6/07/2022 63.0	6/07/2022 101.0	6/07/2022 132.0	7/07/2022 177.0	7/07/2022 178.0	1034.0

Station	Duration											Total yearly rainfall
	5 min	10 min	20 min	30 min	60 min	3 hrs	6 hrs	12 hrs	24 hrs	48 hrs	72 hrs	
Green Valley	13/03/2023 11.0	12/03/2023 19.0	12/03/2023 34.0	12/03/2023 42.5	12/03/2023 85.5	13/03/2023 86.5	13/03/2023 98.5	23/02/2023 109.5	13/03/2023 167.0	14/03/2023 175.0	14/03/2023 180.0	1311.5
Telegraph Point	2/02/2023 7.5	2/02/2023 10.5	2/02/2023 18.5	2/02/2023 23.0	21/10/2022 23.0	21/10/2022 32.0	6/07/2022 43.5	6/07/2022 74.0	6/07/2022 130.0	7/07/2022 171.0	7/07/2022 171.5	1134.5
Logans Crossing	13/03/2023 8.5	13/03/2023 14.0	13/03/2023 27.5	13/03/2023 34.5	13/03/2023 56.0	13/03/2023 101.0	13/03/2023 113.5	7/07/2022 148.0	7/07/2022 210.5	7/07/2022 273.5	7/07/2022 273.5	1587.0
Mount George	12/12/2022 11.0	12/12/2022 14.5	12/12/2022 18.0	25/01/2023 28.5	25/01/2023 34.5	6/07/2022 55.0	7/07/2022 93.0	7/07/2022 122.5	7/07/2022 168.5	7/07/2022 224.0	7/07/2022 226.0	1013.0
Nabiac	12/12/2022 11.0	12/12/2022 17.0	13/03/2023 21.5	13/03/2023 26.0	13/03/2023 51.0	6/07/2022 101.0	6/07/2022 162.0	6/07/2022 231.0	7/07/2022 272.0	7/07/2022 319.0	7/07/2022 320.5	1316.5
Tuncurry Downstream	12/12/2022 10.0	6/07/2022 17.5	6/07/2022 34.0	6/07/2022 46.0	6/07/2022 77.0	6/07/2022 141.5	6/07/2022 176.5	6/07/2022 210.5	7/07/2022 252.5	7/07/2022 286.0	7/07/2022 286.5	1500.5
Pacific Palms Wharf	12/03/2023 9.0	12/03/2023 16.0	14/02/2023 22.5	14/02/2023 29.5	14/02/2023 35.0	14/02/2023 50.0	6/07/2022 78.0	6/07/2022 118.5	7/07/2022 145.0	7/07/2022 153.0	7/07/2022 154.0	1597.0
Tarbuck Bay	12/03/2023 8.5	4/04/2023 15.0	12/03/2023 18.0	3/04/2023 19.0	14/02/2023 27.5	22/01/2023 44.5	6/07/2022 68.0	6/07/2022 102.5	7/07/2022 124.0	7/07/2022 142.0	6/04/2023 144.5	1593.5
Bulahdelah	13/03/2023 10.0	13/03/2023 18.5	13/03/2023 28.5	13/03/2023 33.5	3/07/2022 45.5	3/07/2022 76.0	6/07/2022 97.5	6/07/2022 144.5	7/07/2022 176.5	7/07/2022 221.5	7/07/2022 229.5	1385.5
Gostwyck	4/01/2023 4.0	27/03/2023 7.0	27/03/2023 10.5	27/03/2023 15.0	3/07/2022 19.5	3/07/2022 37.5	3/07/2022 70.0	4/07/2022 109.0	4/07/2022 125.5	5/07/2022 153.0	6/07/2022 189.5	1001.0
Seaham	8/10/2022 12.0	8/10/2022 15.0	8/10/2022 17.5	8/10/2022 18.5	8/10/2022 22.5	3/07/2022 34.0	3/07/2022 51.0	3/07/2022 67.5	4/07/2022 90.5	5/07/2022 127.0	6/07/2022 155.0	1049.0
Belmore Bridge	7/04/2022 6.5	7/04/2022 11.5	24/12/2022 20.0	22/02/2023 25.0	22/02/2023 42.0	3/07/2022 67.5	3/07/2022 101.5	3/07/2022 113.0	4/07/2022 134.0	5/07/2022 151.5	6/07/2022 227.0	975.5
Hexham Bridge	22/02/2023 7.5	22/02/2023 12.5	22/02/2023 22.0	22/02/2023 30.0	22/02/2023 39.5	22/02/2023 57.0	22/02/2023 77.0	22/02/2023 99.0	22/02/2023 101.5	6/07/2022 146.0	6/07/2022 217.5	1056.0
Barnsley	20/10/2022 7.0	20/10/2022 11.0	20/10/2022 17.0	20/10/2022 26.5	22/02/2023 36.0	22/02/2023 81.0	22/02/2023 123.5	22/02/2023 140.0	22/02/2023 140.5	6/07/2022 192.5	6/07/2022 211.0	1240.0
Martinsville[1]	29/04/2023 6.5	6/01/2023 9.0	29/01/2023 14.5	29/01/2023 20.0	29/01/2023 25.0	5/07/2022 37.0	5/07/2022 62.5	5/07/2022 113.5	5/07/2022 171.0	6/07/2022 254.0	6/07/2022 292.5	1366.0
Mandalong[1]	25/03/2023 10.5	25/03/2023 19.0	25/03/2023 33.5	25/03/2023 39.5	25/03/2023 42.0	5/07/2022 53.5	5/07/2022 69.0	5/07/2022 107.0	5/07/2022 162.0	6/07/2022 258.5	6/07/2022 287.5	1339.0
Wyee	21/02/2023 10.5	9/02/2023 19.0	9/02/2023 33.5	9/02/2023 41.0	9/02/2023 42.5	9/02/2023 42.5	8/10/2022 54.5	5/07/2022 81.0	5/07/2022 115.0	6/07/2022 208.0	6/07/2022 229.0	1412.0

Station	Duration											Total yearly rainfall
	5 min	10 min	20 min	30 min	60 min	3 hrs	6 hrs	12 hrs	24 hrs	48 hrs	72 hrs	
Whitemans Ridge	23/03/2023 17.5	23/03/2023 22.0	23/03/2023 26.0	23/03/2023 26.5	16/10/2022 28.5	8/10/2022 45.5	5/07/2022 74.0	5/07/2022 121.0	5/07/2022 174.0	5/07/2022 268.0	6/07/2022 349.0	1465.5
Yarramalong[1]	12/12/2022 10.5	12/12/2022 16.0	28/09/2022 21.0	28/09/2022 25.0	8/10/2022 29.0	5/07/2022 52.5	5/07/2022 91.5	5/07/2022 131.5	5/07/2022 170.0	5/07/2022 275.0	6/07/2022 342.0	1327.0
Kulnura[3]	22/02/2023 7.5	8/10/2022 11.0	22/02/2023 18.5	22/02/2023 22.0	8/10/2022 25.5	5/07/2022 42.0	5/07/2022 73.5	5/07/2022 115.5	5/07/2022 160.0	5/07/2022 271.0	6/07/2022 346.5	1280.0
Kulnura at Pioneer Park[3]	25/03/2023 3.5	25/03/2023 6.5	25/03/2023 9.5	25/03/2023 11.0	25/03/2023 13.5	25/03/2023 16.5	25/03/2023 24.0	25/03/2023 30.0	25/03/2023 32.0	25/03/2023 39.0	27/03/2023 44.0	133.0
Toukley	16/10/2022 7.0	16/10/2022 12.5	16/10/2022 23.0	16/10/2022 33.5	16/10/2022 52.0	16/10/2022 52.5	17/10/2022 53.0	17/10/2022 56.5	5/07/2022 64.0	6/07/2022 96.5	5/07/2022 131.0	889.0
Hamlyn Terrace	9/02/2023 14.5	9/02/2023 23.5	9/02/2023 34.0	9/02/2023 41.0	9/02/2023 41.0	9/02/2023 41.0	8/10/2022 54.5	5/07/2022 76.5.0	5/07/2022 95.5	6/07/2022 153.0	5/07/2022 204.0	1285.5
Mardi Dam[1]	9/02/2023 10.0	21/02/2023 16.5	21/02/2023 25.0	21/02/2023 32.5	21/02/2023 38.5	8/10/2022 46.0	8/10/2022 73.0	5/07/2022 101.0	5/07/2022 124.0	5/07/2022 210.0	5/07/2022 285.0	1337.5
Sterland	23/03/2023 10.0	8/10/2022 15.5	21/02/2023 21.5	21/02/2023 29.5	21/02/2023 35.5	5/07/2022 47.5	5/07/2022 84.5	5/07/2022 128.5	5/07/2022 170.0	5/07/2022 288.5	6/07/2022 367.0	1471.5
Kangy Angy	9/02/2023 10.0	9/02/2023 19.5	9/02/2023 28.0	21/02/2023 38.0	21/02/2023 52.5	17/10/2022 56.0	5/07/2022 69.0	5/07/2022 107.5	4/07/2022 132.0	5/07/2022 255.0	5/07/2022 322.0	1523.0
Berkeley Vale	9/02/2023 11.0	9/02/2023 21.5	9/02/2023 34.5	21/02/2023 38.5	9/02/2023 67.5	9/02/2023 94.0	9/02/2023 94.5	5/07/2022 97.5	5/07/2022 114.0	5/07/2022 203.5	5/07/2022 258.5	1454.0
Bateau Bay	9/02/2023 14.0	9/02/2023 26.5	9/02/2023 51.0	9/02/2023 67.5	9/02/2023 73.5	9/02/2023 79.0	9/02/2023 79.0	9/02/2023 79.0	5/07/2022 94.5	5/07/2022 154.0	5/07/2022 209.0	1244.0
Lisarow	9/02/2023 13.5	9/02/2023 20.5	9/02/2023 31.5	21/02/2023 44.0	21/02/2023 74.5	21/02/2023 82.0	21/02/2023 83.0	22/02/2023 109.0	3/07/2022 134.0	5/07/2022 244.5	5/07/2022 301.5	1437.5
Strickland	21/02/2023 9.0	23/03/2023 15.5	21/02/2023 23.0	23/03/2023 34.5	21/02/2023 52.5	21/02/2023 60.5	21/02/2023 60.5	3/07/2022 101.5	4/07/2022 147.0	5/07/2022 253.5	5/07/2022 312.5	1369.5
Narara	23/03/2023 14.0	23/03/2023 24.0	23/03/2023 44.5	23/03/2023 52.0	21/02/2023 54.0	21/02/2023 64.5	21/02/2023 64.5	5/07/2022 96.5	4/07/2022 147.5	5/07/2022 253.0	5/07/2022 310.5	1417.0
Mount Elliot	9/02/2023 14.0	9/02/2023 23.5	9/02/2023 38.5	9/02/2023 55.0	9/02/2023 86.5	9/02/2023 93.5	9/02/2023 93.5	9/02/2023 93.5	3/07/2022 112.5	5/07/2022 200.0	5/07/2022 251.5	1473.0
Wyoming	23/03/2023 12.0	23/03/2023 22.5	9/02/2023 35.0	9/02/2023 43.5	9/02/2023 49.0	9/02/2023 49.0	8/10/2022 56.0	3/07/2022 85.5	4/07/2022 133.0	5/07/2022 225.5	5/07/2022 283.0	1404.0

Station	Duration											Total yearly rainfall
	5 min	10 min	20 min	30 min	60 min	3 hrs	6 hrs	12 hrs	24 hrs	48 hrs	72 hrs	
Kincumber	23/03/2023 10.0	23/03/2023 18.5	23/03/2023 29.5	2/04/2023 45.0	2/04/2023 76.0	2/04/2023 107.5	2/04/2023 122.0	2/04/2023 130.0	2/04/2023 137.0	5/07/2022 149.5	5/07/2022 204.5	1302.0
Webbs Creek	29/01/2023 11.0	29/01/2023 19.2	29/01/2023 26.8	29/01/2023 31.6	29/01/2023 34.0	22/02/2023 38.5	22/02/2023 61.0	22/02/2023 94.0	5/07/2022 130.0.0	5/07/2022 198.0	5/07/2022 245.5	1149.0
Colo Junction	29/01/2023 12.8	29/01/2023 23.6	29/01/2023 41.2	29/01/2023 48.4	29/01/2023 55.0	29/01/2023 56.0	29/01/2023 56.0	5/07/2022 87.0	5/07/2022 124.0	5/07/2022 187.0	5/07/2022 224.5	1021.0
Sackville Downstream	18/01/2023 5.6	18/01/2023 10.0	18/01/2023 14.2	18/01/2023 16.4	30/01/2023 23.4	4/07/2022 33.5	4/07/2022 55.0	5/07/2022 86.0	5/07/2022 127.5	5/07/2022 172.0	5/07/2022 212.5	984.4
Curl Curl	9/02/2023 6.5	9/02/2023 11.0	9/02/2023 15.5	9/02/2023 19.5	9/02/2023 28.0	21/02/2023 37.5	21/02/2023 42.0	22/02/2023 59.5	3/07/2022 77.0.0	4/07/2022 97.0	5/07/2022 125.5	1107.5
Kelso Creek	4/07/2022 5.5	4/07/2022 9.5	4/07/2022 16.0	4/07/2022 20.0	30/01/2023 28.5	30/01/2023 40.5	4/07/2022 57.5	2/07/2022 82.0	3/07/2022 144.0	4/07/2022 184.0	5/07/2022 270.5	1093.5
Rixons Pass	9/02/2023 9.0	9/02/2023 14.0	9/02/2023 19.0	9/02/2023 25.0	9/02/2023 36.0	9/02/2023 80.0	9/02/2023 84.5	3/07/2022 137.0	3/07/2022 238.0	3/07/2022 306.0	4/07/2022 420.0	1787.0
Russell Vale	5/12/2022 7.5	5/12/2022 13.0	5/12/2022 18.5	9/02/2023 27.0	9/02/2023 49.5	9/02/2023 88.0	9/02/2023 91.5	3/07/2022 146.0	3/07/2022 248.0	3/07/2022 318.5	4/07/2022 427.0	1676.5
Mount Pleasant	9/02/2023 7.0	9/02/2023 11.0	9/02/2023 18.5	9/02/2023 22.0	9/02/2023 35.0	9/02/2023 80.5	2/07/2022 91.5	2/07/2022 143.5	3/07/2022 270.0	3/07/2022 375.0	4/07/2022 510.5	2095.0
Mount Kembla	27/11/2022 8.0	13/03/2023 13.5	13/03/2023 19.5	9/02/2023 25.5	25/10/2022 29.5	9/02/2023 52.0	2/07/2022 59.0	2/07/2022 109.5	3/07/2022 209.0	3/07/2022 290.5	4/07/2022 362.0	1539.0
Dombarton Loop	20/10/2022 4.5	12/03/2023 7.5	13/03/2023 13.0	13/03/2023 17.0	13/03/2023 31.5	13/03/2023 54.5	2/07/2022 85.0	2/07/2022 156.0	3/07/2022 285.5	3/07/2022 403.5	4/07/2022 486.5	1710.5
Wongawilli	2/07/2022 4.5	27/11/2022 6.0	13/03/2023 10.5	13/03/2023 14.5	13/03/2023 25.5	13/03/2023 43.5	2/07/2022 65.5	2/07/2022 121.0	3/07/2022 223.5	3/07/2022 319.0	4/07/2022 395.5	1224.0
Port Kembla	14/05/2023 6.5	14/03/2023 12.0	28/09/2022 19.5	14/03/2023 30.5	14/03/2023 44.5	14/03/2023 57.0	14/03/2023 69.0	2/07/2022 90.5	2/07/2022 171.0	3/07/2022 240.5	4/07/2022 306.0	1419.0
Darkes Road[4]	24/10/2022 6.0	25/10/2022 10.5	25/10/2022 17.5	25/10/2022 22.5	13/03/2023 37.0	13/03/2023 61.0	2/07/2022 69.0	2/07/2022 123.5	3/07/2022 216.5	3/07/2022 302.0	4/07/2022 368.0	1370.0
Cleveland Road	7/04/2023 8.0	7/04/2023 13.5	7/04/2023 16.5	12/03/2023 16.5	13/03/2023 24.5	13/03/2023 48.5	2/07/2022 65.5	2/07/2022 122.5	2/07/2022 223	3/07/2022 316.0	4/07/2022 387.5	1327.0
Huntley Colliery	7/04/2023 6.0	7/04/2023 11.0	8/10/2022 13.0	8/10/2022 18.0	8/10/2022 26.0	2/07/2022 50.0	2/07/2022 78.0	2/07/2022 136.5	3/07/2022 239.5	3/07/2022 348.0	4/07/2022 423.5	1437.0

Station	Duration											Total yearly rainfall
	5 min	10 min	20 min	30 min	60 min	3 hrs	6 hrs	12 hrs	24 hrs	48 hrs	72 hrs	
Upper Calderwood	18/02/2023 7.0	18/02/2023 9.0	18/02/2023 12.0	31/10/2022 14.5	31/10/2022 17.5	30/12/2022 32.5	3/07/2022 57.0	3/07/2022 95.0	3/07/2022 178.0	3/07/2022 278.5	4/07/2022 356.5	1323.5
Little Lake Entrance	1/07/2022 9.5	2/07/2022 18.0	2/07/2022 26.5	2/07/2022 33.5	2/07/2022 46.0	2/07/2022 80.0	2/07/2022 118.5	2/07/2022 153.5	2/07/2022 220.0	3/07/2022 283.5	4/07/2022 334.0	1487.0
Nurrewin	22/10/2022 7.5	22/10/2022 13.5	22/10/2022 17.5	22/10/2022 19.0	22/10/2022 19.0	3/07/2022 40.5	3/07/2022 71.5	3/07/2022 112.5	3/07/2022 195.5	4/07/2022 297.0	4/07/2022 405.5	1694.0
Clover Hill	22/10/2022 10.5	22/10/2022 13.5	22/10/2022 18.0	22/10/2022 19.0	13/03/2023 22.0	3/07/2022 38.5	3/07/2022 68.5	3/07/2022 111.5	3/07/2022 197.0	4/07/2022 306.0	4/07/2022 404.5	1684.0
North Macquarie	24/01/2023 10.5	24/01/2023 20.5	24/01/2023 35.5	24/01/2023 36.5	24/01/2023 36.5	25/10/2022 50.5	3/07/2022 68.5	2/07/2022 109.5	3/07/2022 210.5	3/07/2022 322.5	4/07/2022 423.5	1431.0
Yellow Rock Road	24/01/2023 9.0	24/01/2023 17.5	9/02/2023 21.0	9/02/2023 22.5	8/02/2023 33.5	9/02/2023 48.5	2/07/2022 70.5	2/07/2022 122.5	2/07/2022 197.0	3/07/2022 298.5	4/07/2022 408.0	1762.0
Lake Conjola Downstream	9/02/2023 8.5	9/02/2023 15.0	9/02/2023 26.5	9/02/2023 37.5	8/10/2022 52.5	8/10/2022 90.0	9/02/2023 124.5	9/02/2023 162.5	2/07/2022 183.5	9/02/2023 189.5	4/07/2022 243.5	1680.0
Barlows Bay	13/04/2023 6.0	13/04/2023 7.0	28/09/2022 10.0	28/09/2022 13.5	28/09/2022 22.5	24/10/2022 28.5	8/02/2023 46.0	9/02/2023 60.0	9/02/2023 95.5	10/02/2023 116.0	10/02/2023 118.0	827.5
Regatta Point[1]	9/02/2023 4.5	9/02/2023 7.5	9/02/2023 13.5	9/02/2023 15.0	9/02/2023 24.0	9/02/2023 39.5	9/02/2023 52.5	9/02/2023 75.0	9/02/2023 86.5	10/02/2023 89.0	10/02/2023 89.5	455.0

[1] Some measure of data loss occurred at these stations. See individual plots for further details.

[2] Shephards Lane Station decommissioned 09:00 30 June 2023 due to construction of the Coffs Harbour Bypass. Relocation options are under review.

[3] Kulnura at Pioneer Park installation 21 March 2023 to replace Kulnura. Kulnura decommissioned 06 July 2023.

[4] Darkes Road decommissioned 09:00 9 June 2023 at the request of the landowner. Suitable agreements with other landholders in the area have been unsuccessful to date.

Note – the date listed refers to the time that the recorded total rainfall ends.

3.1 Data capture performance

Rainfall data presented by MHL is collected and analysed through a quality assurance process in accordance with MHL's internal standards and work instructions. Field verification of each rainfall gauge is performed by delivering a known volume of water in a controlled flow directly into the catch of the rain gauge using a field calibration device. The total number and rate of tips of the tipping bucket and the data recorded on the logger are then compared with the known volume. The percentage difference between the known volume and the recorded tips is used to assign a quality code to the data. Other observations such as any blockages in the rain gauge catch and comparison with nearby rainfall stations are also taken into consideration. **Table 3-1** presents definitions of the various quality codes.

During 2022–2023, the overall data capture across the network, for data with a quality code of 105 or better, was 98.9%. **Table 4-1** provides data capture percentages for each rainfall region. Missing or 208 quality coded data can result in gaps in the data record. This can be caused by a range of reasons, such as equipment damage or failure, power failure, or site specific environmental issues.

Automatic recorded rainfall data is recorded to a resolution equal to the size of the tipping bucket (0.2 mm, 0.5 mm or 1.0 mm). Each record or tip of the bucket is triggered when the tipping bucket is filled, which may occur over a period of time.

Table 3-4 MHL data quality code descriptions

Quality code		Rainfall*
5	Records processed to	±3% of calibration
55	Records processed to	±5% of calibration
100	Data from previous MHL database, processed to	±3% of calibration
105	Records processed to	±10% of calibration
208	Records processed to greater than	<-10% or >10% of calibration
150	Uncoded – data not yet quality controlled	Raw data from the instrument with only preliminary quality checks performed
1, 204, 205, 206, 207, 255	Data loss/data missing	

* A quality code is assigned based on infield status verification checks.

4 Rainfall monitoring summary

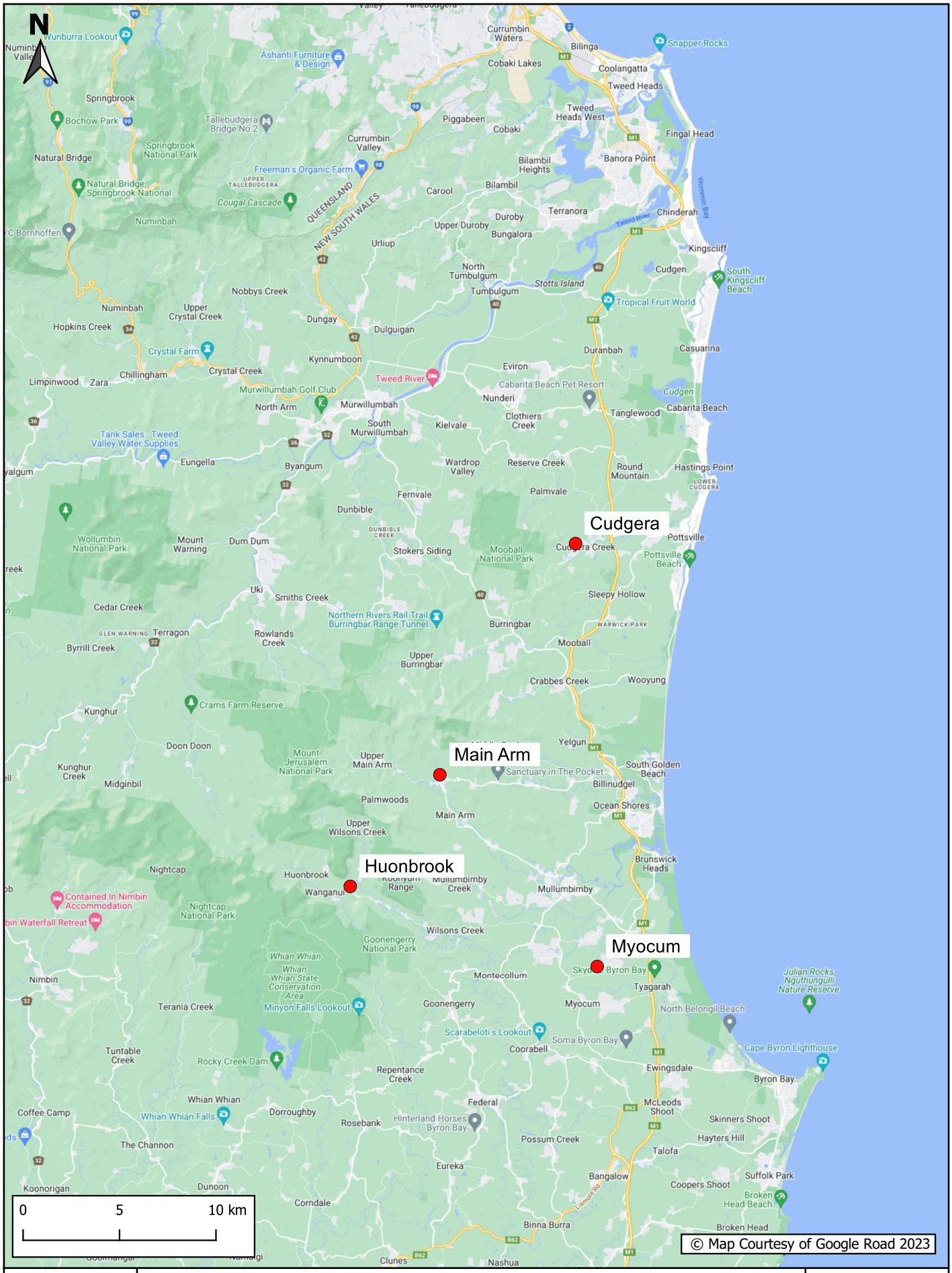
This section documents locality maps and quality assured rainfall monitoring summaries for each station. **Table 4-1** provides an index to the figures presented. The rainfall plots shown in **Figure 4-1** to **Figure 4-90** are presented as daily rainfall totals from midnight to midnight.

Table 4-1 Index of figures

Region	Station short name	Station no.	MGA	Easting	Northing	Capture %	Figure
Station Locality Map	Tweed River and Brunswick River Regions					100.0%	4-1
Tweed	Cudgera	558046	56	549668	6859164		4-2
Brunswick	Main Arm	558053	56	542469	6847276		4-3
Brunswick	Huonbrook	558049	56	537723	6841573		4-4
Brunswick	Myocum	558036	56	550528	6837390		4-5
Station Locality Map	Richmond River Region					75.6%	4-6
Richmond	Lake Ainsworth	203455	56	557863	6816160		4-7
Station Locality Map	Bellinger River Region (North)					97.0%	4-8
Bellinger	Wooli Sportsground	559071	56	525712	6696894		4-9
Station Locality Map	Bellinger River Region (South)					99.5%	4-10
Bellinger	Perry Drive	559019	56	510142	6650416		4-11
Bellinger	Shephards Lane	559017	56	508196	6650884		4-12
Bellinger	Red Hill	559016	56	506635	6649672		4-13
Bellinger	Newports Creek	559051	56	505893	6646680		4-14
Bellinger	Middle Boambee	559048	56	504720	6645291		4-15
Bellinger	North Bonville	559050	56	500593	6641143		4-16
Bellinger	Kooroowi Sharabel	559008	56	482562	6629162		4-17
Station Locality Map	Nambucca River Region					100.0%	4-18
Nambucca	Stuarts Island Downstream	205466	56	499519	6608564		4-19
Nambucca	Utungun	205414	56	485800	6600344		4-20
Station Locality Map	Macleay River and Hastings River Regions					100.0%	4-21
Macleay	Aldavilla Downstream	206459	56	479318	6561231		4-22
Hastings	Green Valley	207406	56	486416	6540068		4-23
Hastings	Telegraph Point	207415	56	481082	6534512		4-24
Station Locality Map	Camden Haven Region					100.0%	4-25
Camden Haven	Logans Crossing	207428	56	470913	6502295		4-26
Manning	Mount George	208440	56	419229	6472262		4-27
Station Locality Map	Karuah River Region					100.0%	4-28
Karuah	Nabiac	209404	56	436831	6446432		4-29
Karuah	Tuncurry Downstream	209401D	56	450368	6441819		4-30
Karuah	Pacific Palms Wharf	209406	56	455401	6422551		4-31
Karuah	Tarbuck Bay	209465	56	451548	6417906		4-32
Karuah	Bulahdelah	209460	56	425442	6413407		4-33

Region	Station short name	Station no.	MGA	Easting	Northing	Capture %	Figure
Station Locality Map	Hunter River Region					100.0%	4-34
Hunter	Gostwyck	210402	56	369088	6396074		4-35
Hunter	Seaham	210462	56	381105	6385316		4-36
Hunter	Belmore Bridge	210458	56	364492	6377780		4-37
Hunter	Hexham Bridge	210448	56	376568	6368156		4-38
Station Locality Map	Macquarie-Tuggerah Lakes (North) Region					98.4%	4-39
Macquarie-Tuggerah Lakes	Barnsley	561067	56	367906	6355834		4-40
Macquarie-Tuggerah Lakes	Martinsville	561083	56	351239	6341583		4-41
Macquarie-Tuggerah Lakes	Mandalong	561081	56	355224	6335165		4-42
Macquarie-Tuggerah Lakes	Wyee	561097	56	358608	6328268		4-43
Station Locality Map	Macquarie-Tuggerah Lakes (South) and Brisbane Water Regions					99.1%	4-44
Macquarie-Tuggerah Lakes	Whitemans Ridge	561026	56	343653	6324899		4-45
Macquarie-Tuggerah Lakes	Yarramalong	561137	56	338869	6322377		4-46
Macquarie-Tuggerah Lakes	Kulnura	561078	56	333796	6321517		4-47
Macquarie-Tuggerah Lakes	Kulnura at Pioneer Park	561078B	56	334371	6322157		4-48
Macquarie-Tuggerah Lakes	Toukley	211401	56	362599	6318531		4-49
Macquarie-Tuggerah Lakes	Hamlyn Terrace	561133	56	357399	6319854		4-50
Macquarie-Tuggerah Lakes	Mardi Dam	561082	56	351038	6314555		4-51
Macquarie-Tuggerah Lakes	Sterland	567138	56	342433	6315335		4-52
Macquarie-Tuggerah Lakes	Kangy Angy	561132	56	350168	6310609		4-53
Macquarie-Tuggerah Lakes	Berkeley Vale	561134	56	353191	6309376		4-54
Macquarie-Tuggerah Lakes	Bateau Bay	561069	56	358098	6305653		4-55
Macquarie-Tuggerah Lakes	Lisarow	561079	56	348900	6305317		4-56
Macquarie-Tuggerah Lakes	Strickland	561136	56	345377	6305541		4-57
Brisbane Water	Narara	561085	56	344310	6304220		4-58
Brisbane Water	Mount Elliot	561084	56	350646	6302980		4-59
Brisbane Water	Wyoming	561098	56	346415	6302026		4-60
Brisbane Water	Kincumber	561077	56	350387	6294461		4-61
Station Locality Map	Hawkesbury River Region					100.0%	4-62
Hawkesbury	Webbs Creek	212408	56	312331	6303939		4-63
Hawkesbury	Colo Junction	212407	56	303223	6298183		4-64
Hawkesbury	Sackville Downstream	212438	56	302769	6291566		4-65
Station Locality Map	Sydney Coastal Region					100.0%	4-66
Sydney Coastal	Curl Curl	213426	56	342094	6262459		4-67
Sydney Coastal	Kelso Creek	213430	56	313782	6241020		4-68
Station Locality Map	Wollongong Coastal Region					100.0%	4-69
Wollongong Coastal	Rixons Pass	568317	56	305281	6196889		4-70
Wollongong Coastal	Russell Vale	568318	56	306377	6196135		4-71
Wollongong Coastal	Mount Pleasant	568229	56	303026	6191630		4-72
Wollongong Coastal	Mount Kembla	568314	56	299550	6186441		4-73
Wollongong Coastal	Dombarton Loop	568307	56	294719	6185605		4-74
Wollongong Coastal	Wongawilli	568320	56	293261	6182388		4-75

Region	Station short name	Station no.	MGA	Easting	Northing	Capture %	Figure
Wollongong Coastal	Port Kembla	568316	56	306636	6182719		4-76
Wollongong Coastal	Darkes Road	568309	56	297450	6182477		4-77
Wollongong Coastal	Cleveland Road	568308	56	295800	6179726		4-78
Wollongong Coastal	Huntley Colliery	568311	56	290648	6178905		4-79
Wollongong Coastal	Upper Calderwood	568319	56	288750	6175160		4-80
Wollongong Coastal	Little Lake Entrance	214467	56	304250	6173571		4-81
Wollongong Coastal	Nurrewin	568228	56	284567	6173437		4-82
Wollongong Coastal	Clover Hill	568310	56	284233	6172392		4-83
Wollongong Coastal	North Macquarie	568315	56	291440	6171492		4-84
Wollongong Coastal	Yellow Rock Road	568321	56	292886	6167649		4-85
Station Locality Map	South Coast (North) Region					100.0%	4-86
South Coast	Lake Conjola Downstream	216420	56	272446	6094316		4-87
Station Locality Map	South Coast (Mid) Region					85.9%	4-88
South Coast	Barlows Bay	218415	56	239464	5988955		4-89
South Coast	Regatta Point	219405	56	236881	5971060		4-90

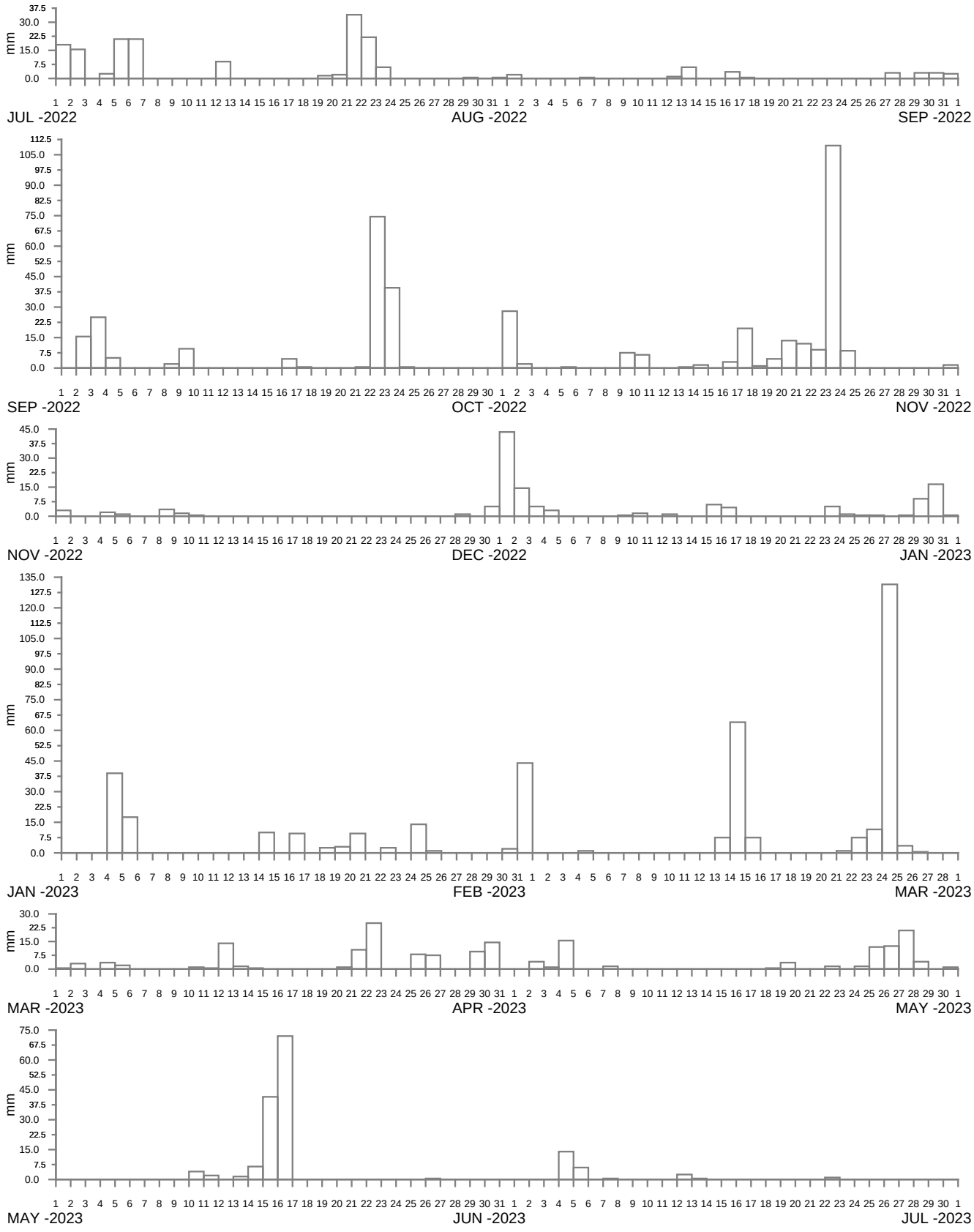


NSW GOVERNMENT

RAINFALL STATION LOCATIONS
TWEED RIVER AND BRUNSWICK RIVER REGIONS

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-1



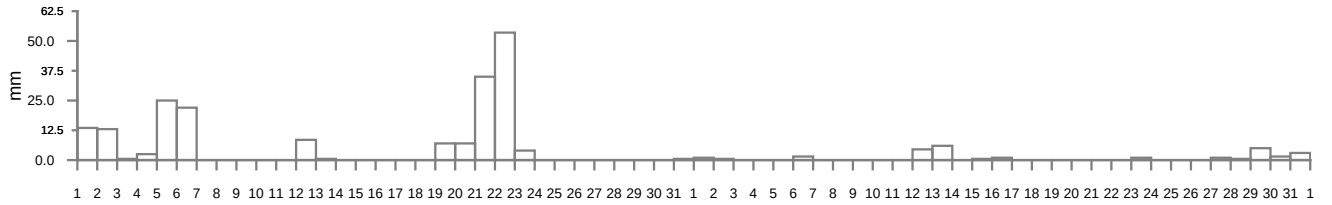
---------- DATA LOSS

NSW GOVERNMENT

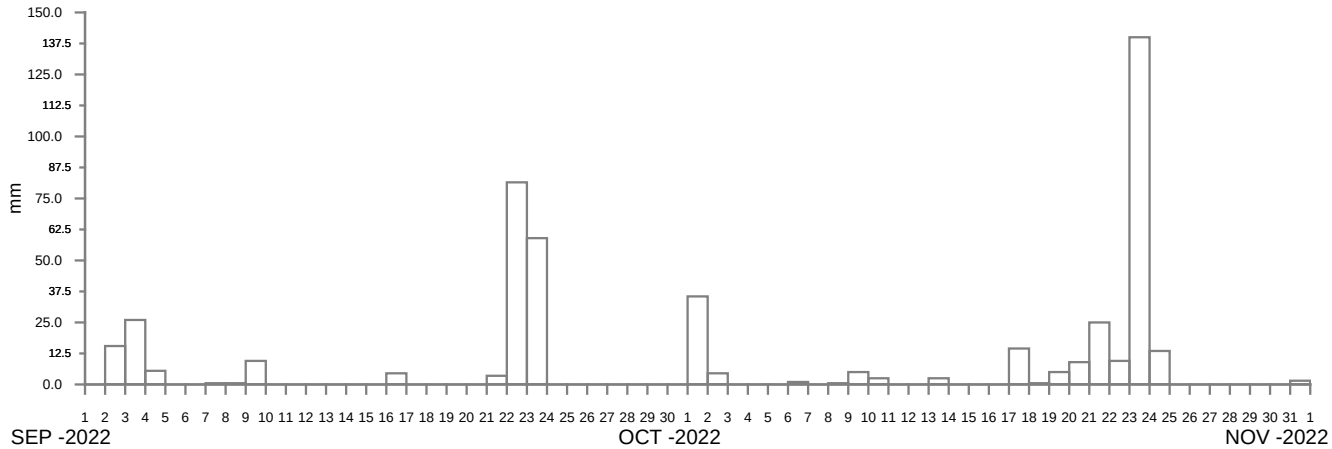
CUDGERA AT CABBAGE GUM ROAD
2022–23

Manly Hydraulics Laboratory

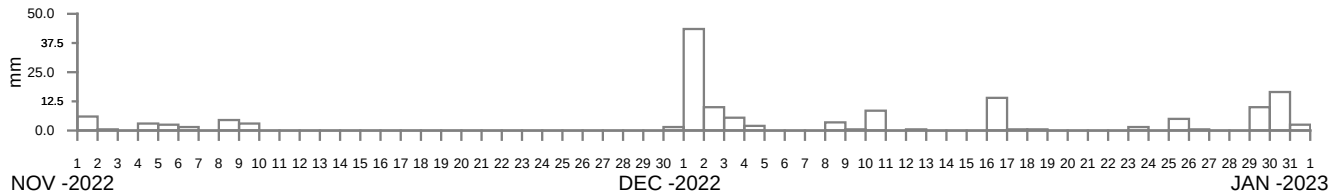
Report MHL2996
Figure
4-2



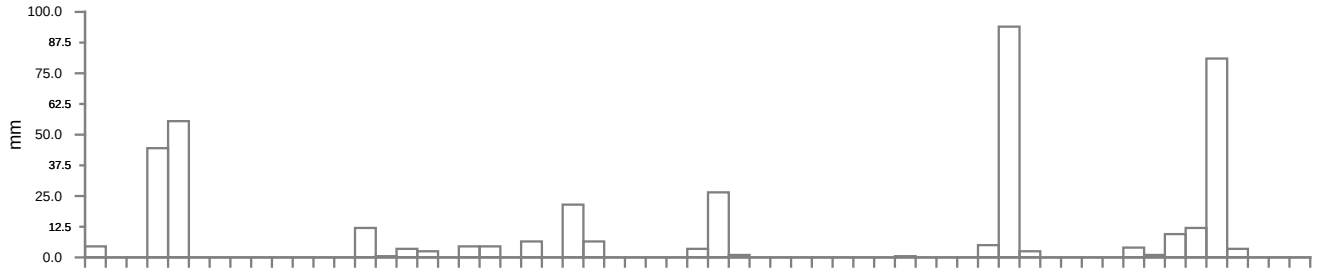
JUL -2022 AUG -2022 SEP -2022



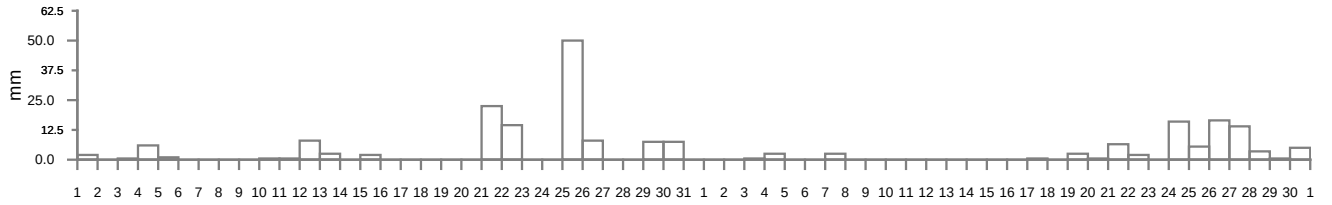
SEP -2022 OCT -2022 NOV -2022



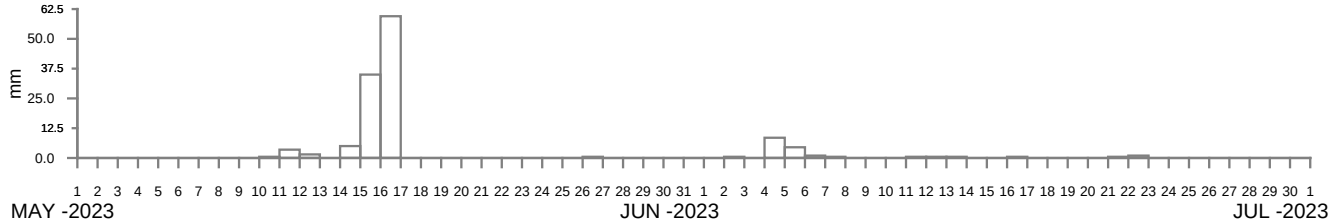
NOV -2022 DEC -2022 JAN -2023



JAN -2023 FEB -2023 MAR -2023



MAR -2023 APR -2023 MAY -2023



MAY -2023 JUN -2023 JUL -2023

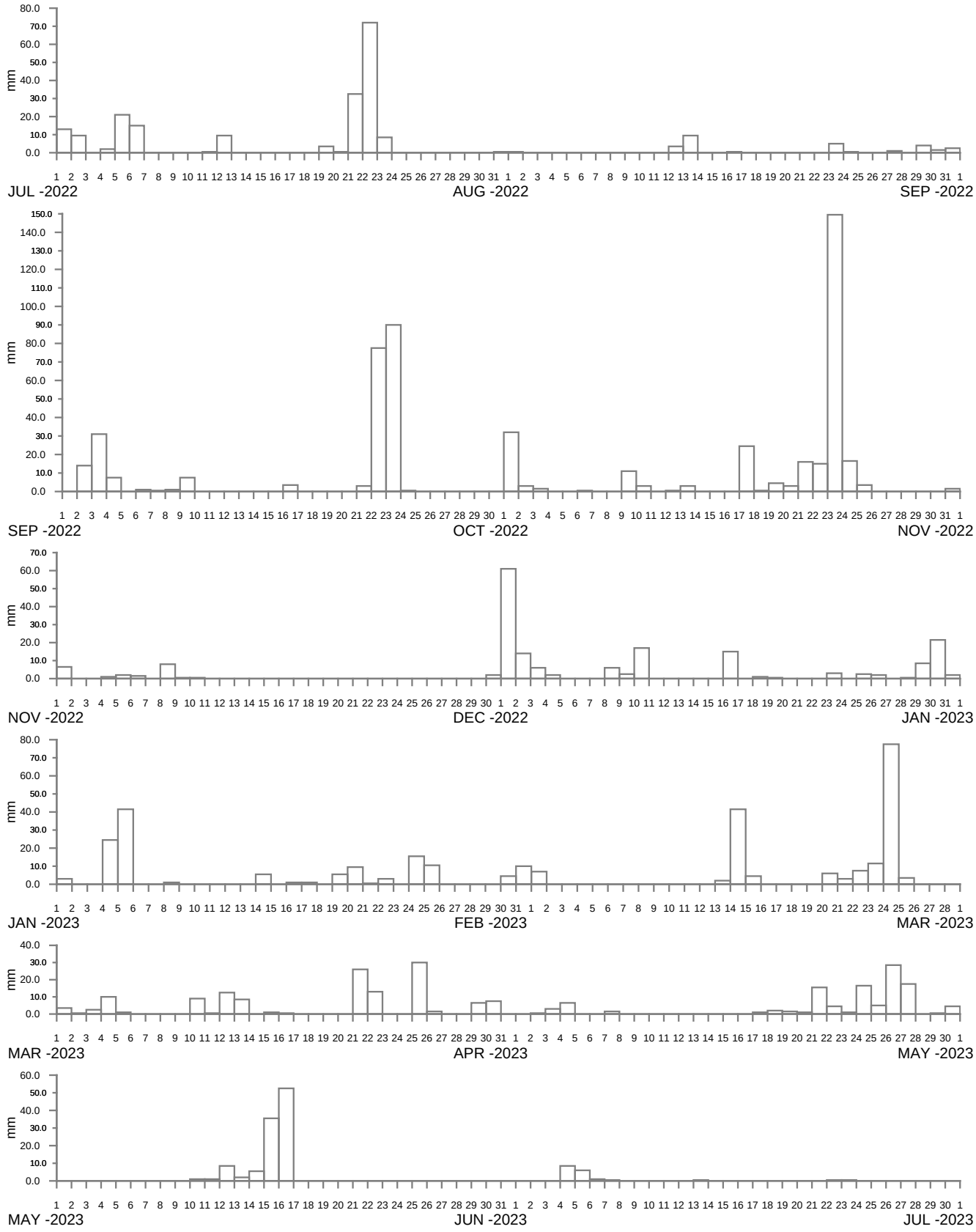
---------- DATA LOSS

NSW GOVERNMENT

MAIN ARM AT MAIN ARM ROAD
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-3



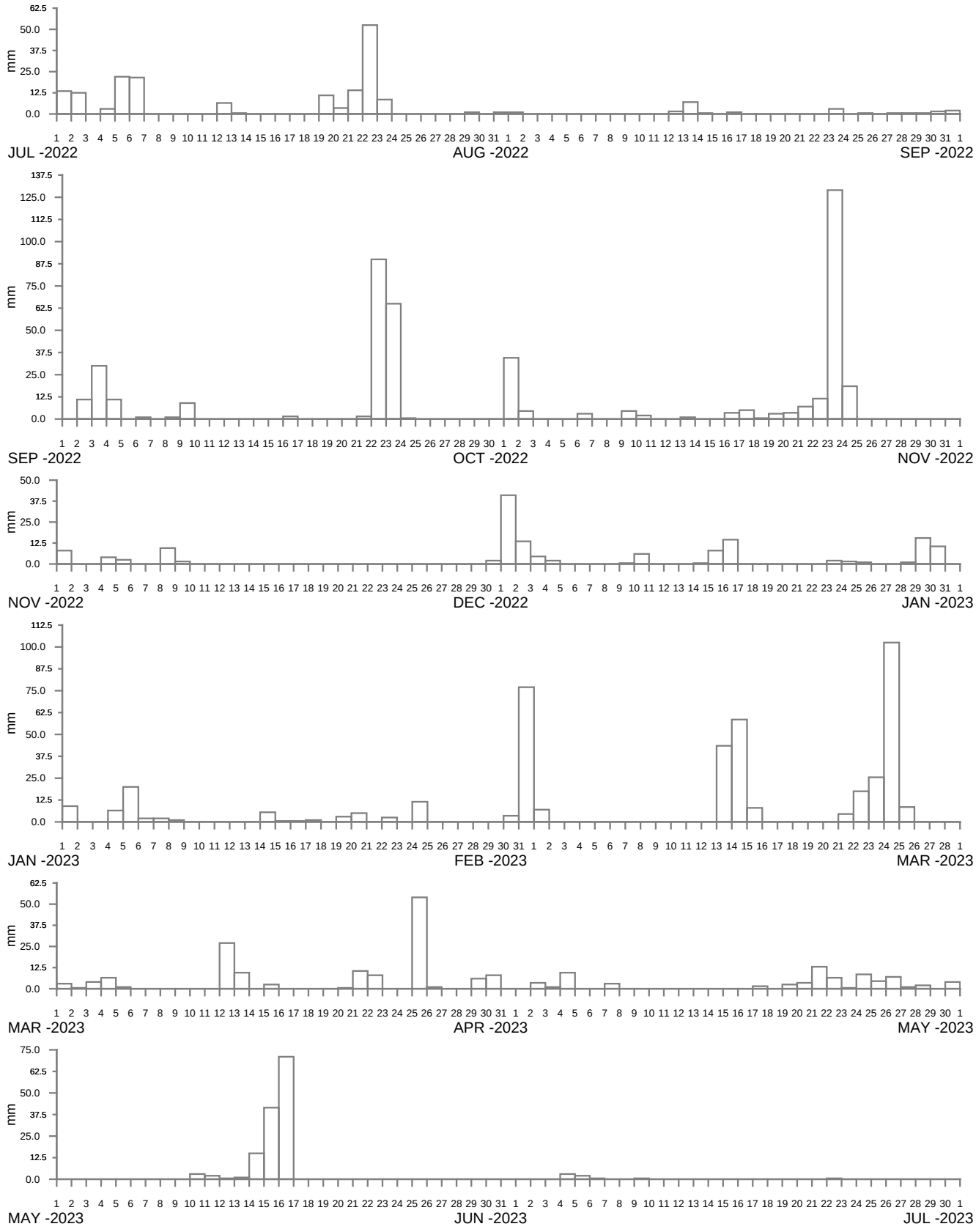
---------- DATA LOSS

NSW GOVERNMENT

HUONBROOK AT WILSONS CREEK ROAD
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-4



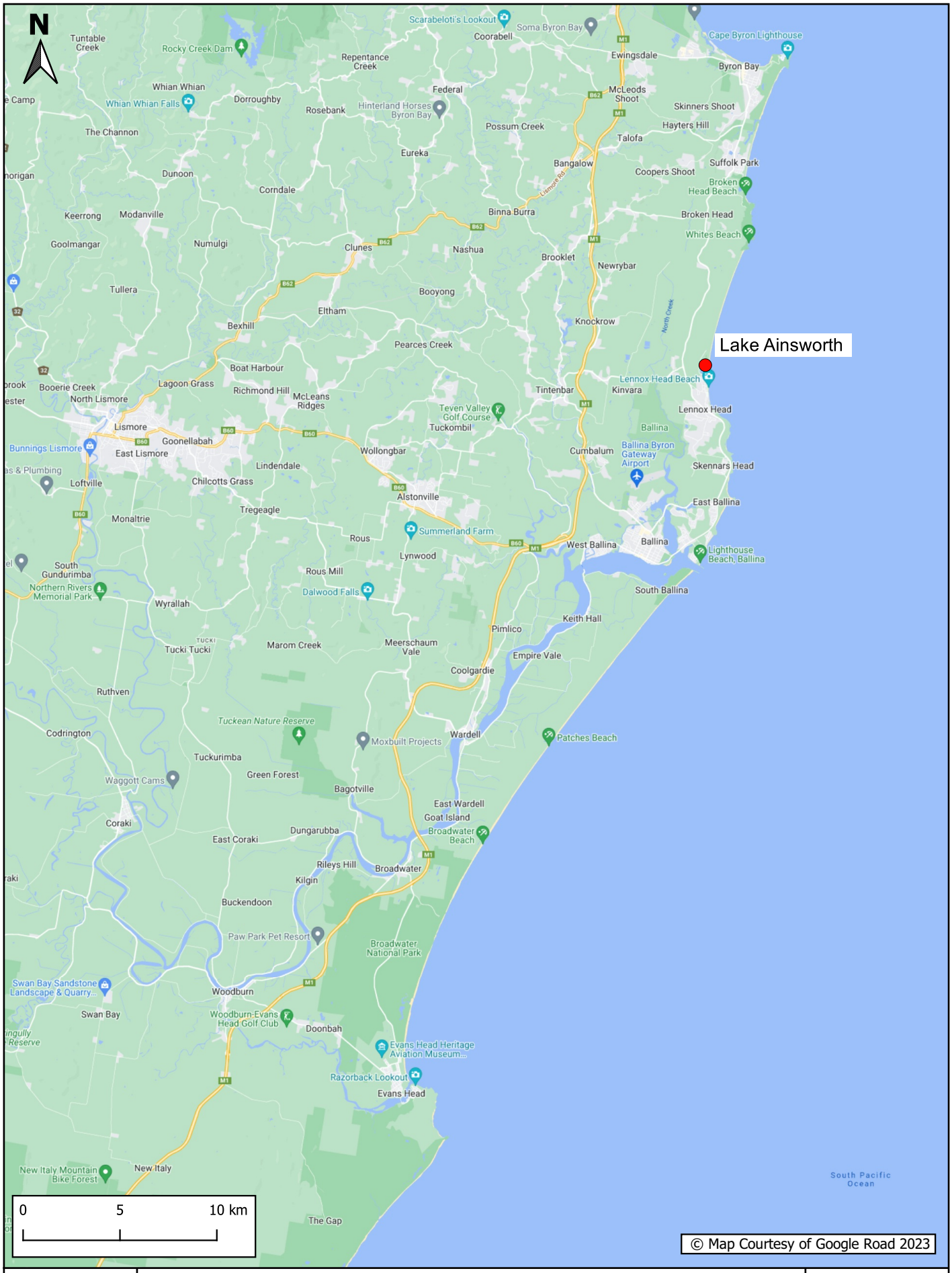
---------- DATA LOSS

NSW GOVERNMENT

MYOCUM AT KINGSVALE ROAD
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-5

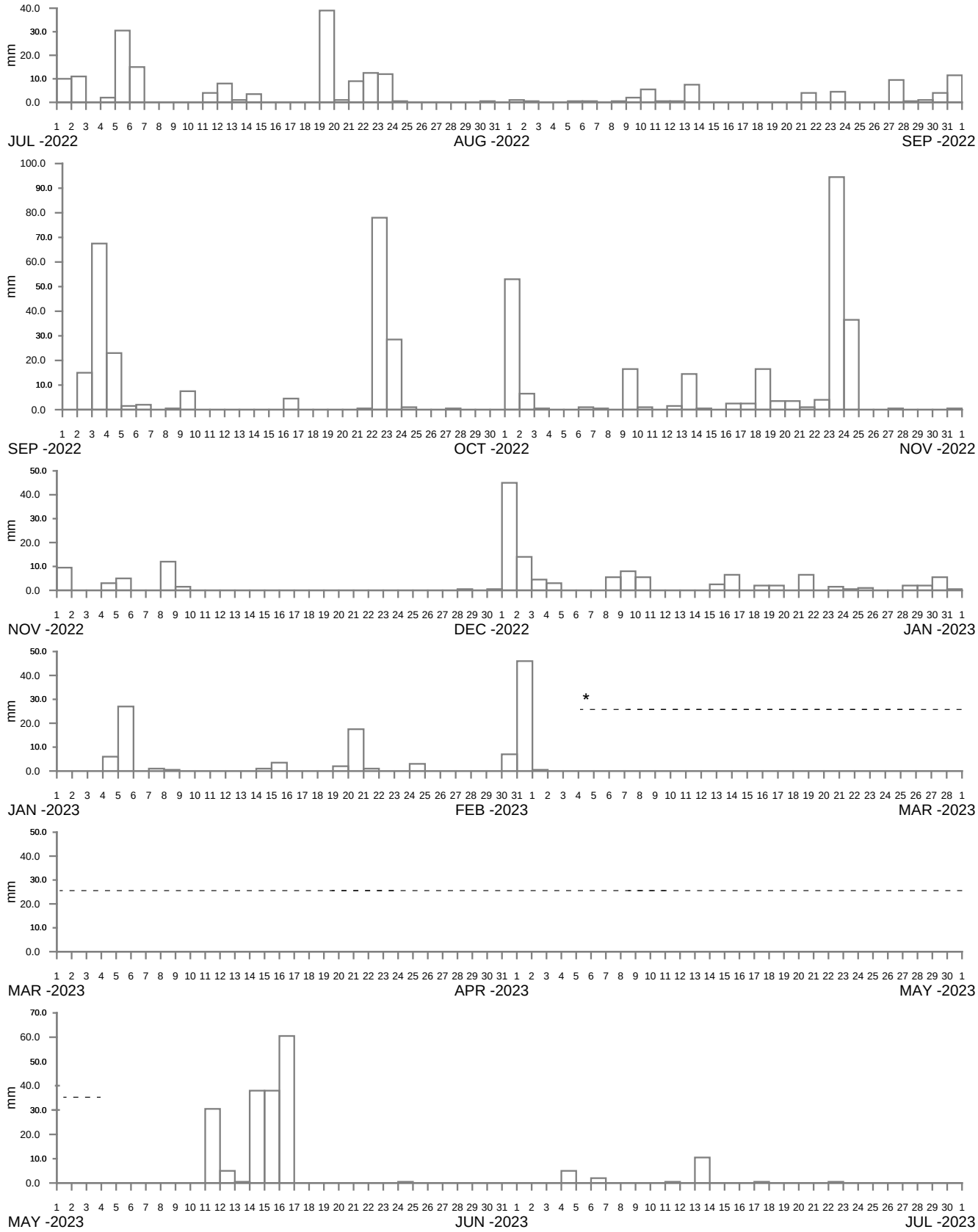


NSW GOVERNMENT

RAINFALL STATION LOCATIONS
RICHMOND RIVER REGION

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-6



DATA LOSS

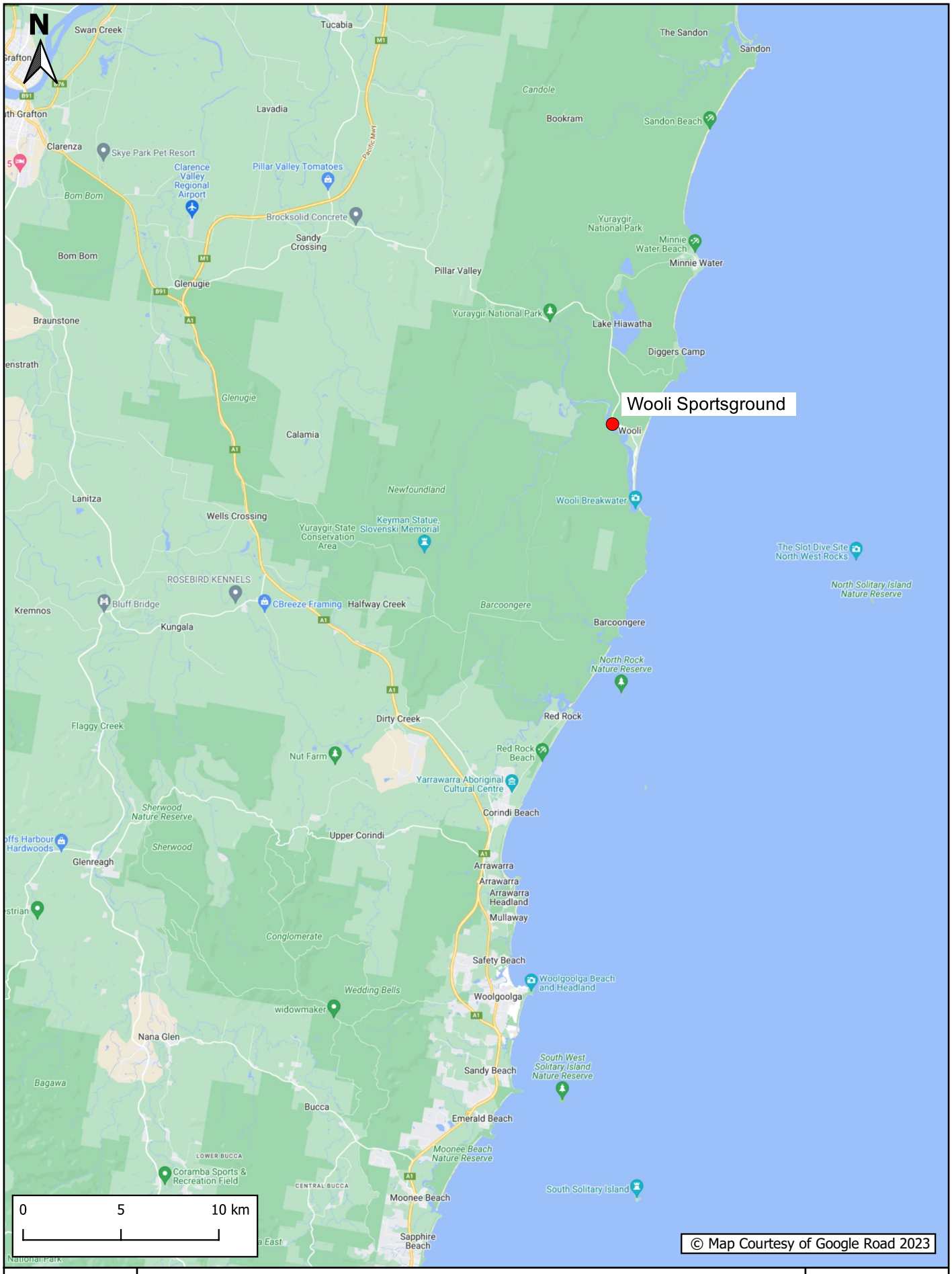
*Data loss due to rain gauge blockage

NSW GOVERNMENT

LAKE AINSWORTH AT LENNOX HEAD
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-7

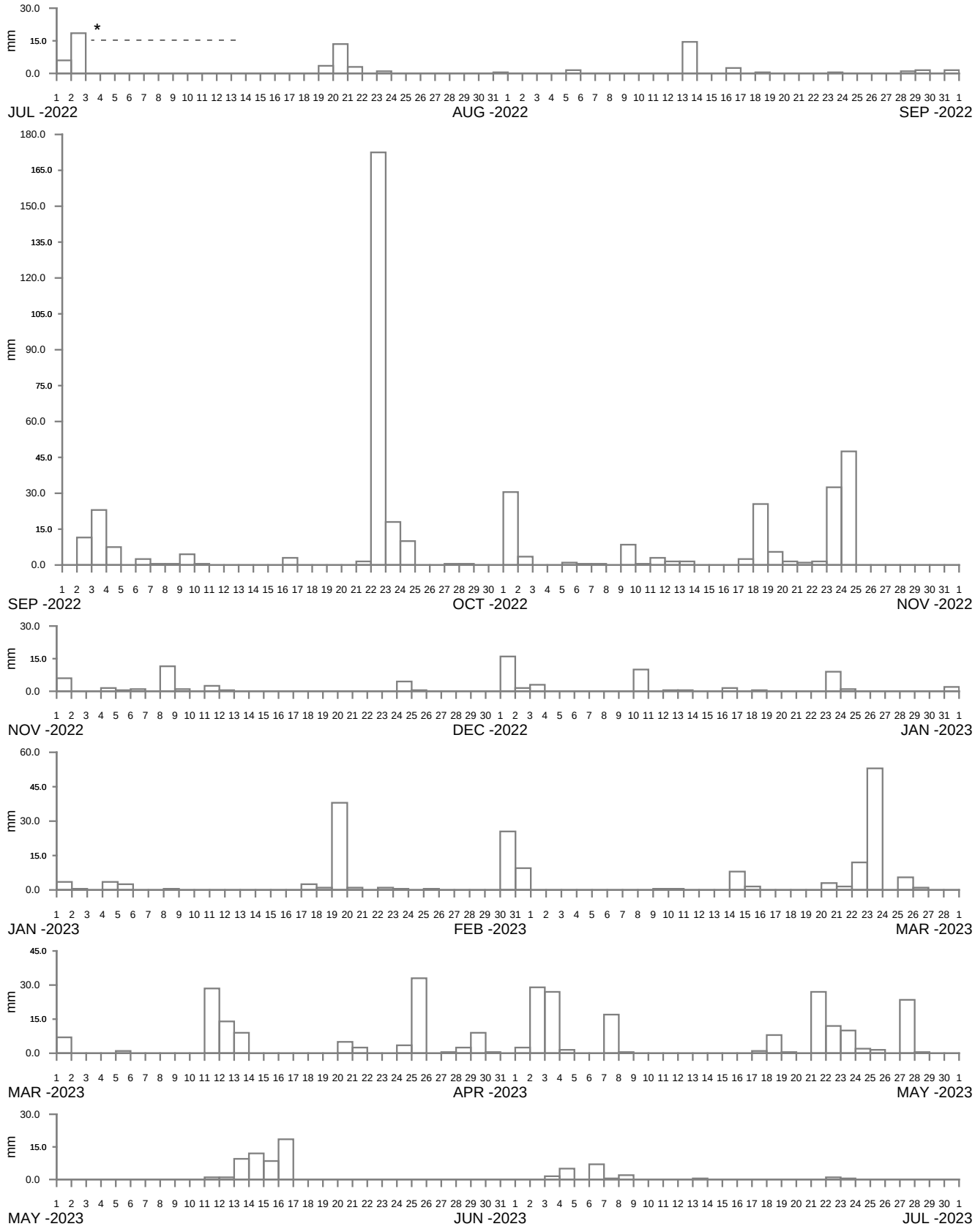


NSW GOVERNMENT

RAINFALL STATION LOCATIONS
BELLINGER RIVER REGION (NORTH)

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-8



---------- DATA LOSS

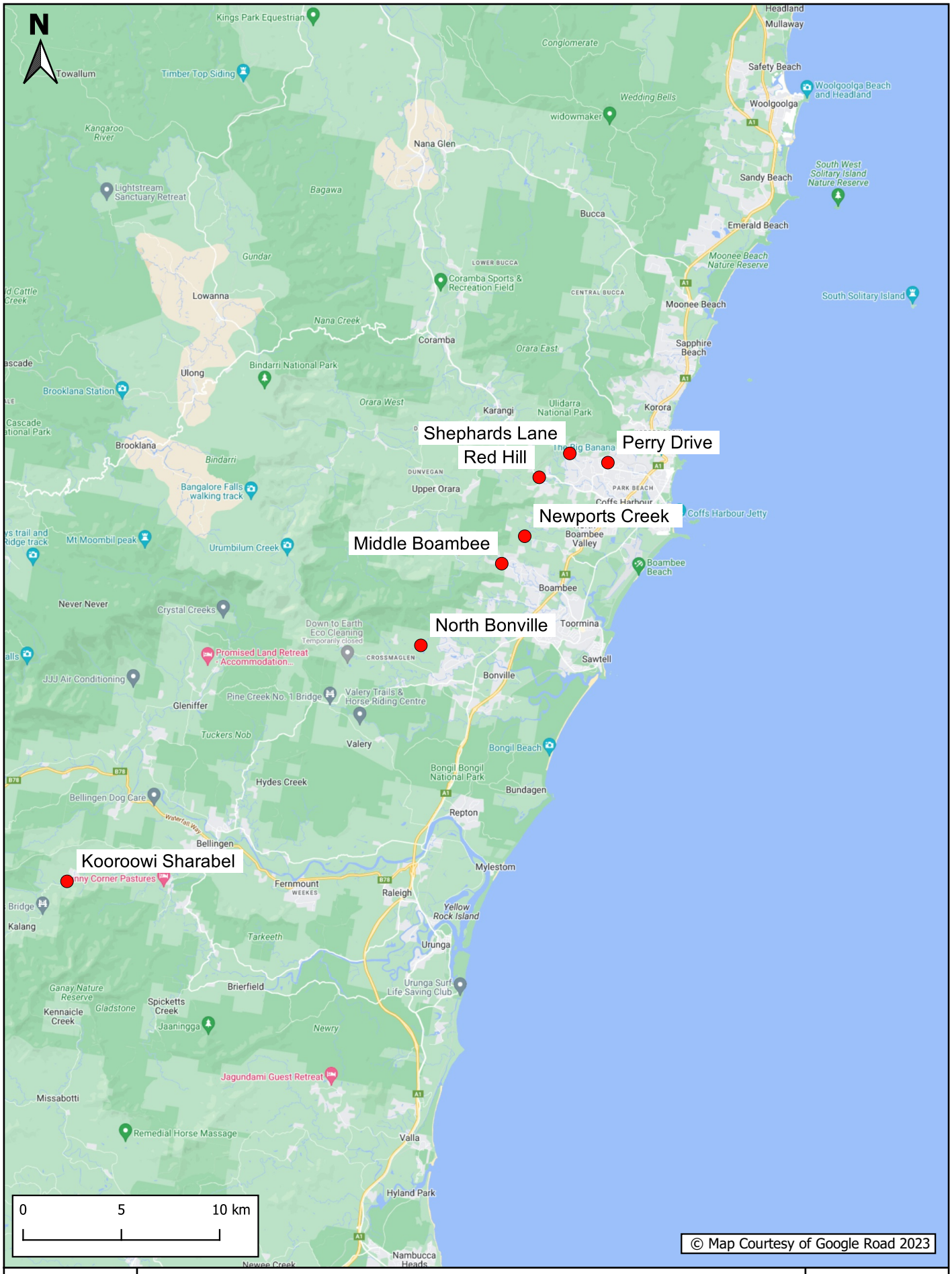
*Data loss due to battery failure

NSW GOVERNMENT

WOOLI SPORTSGROUND AT WOOLI RIVER
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-9

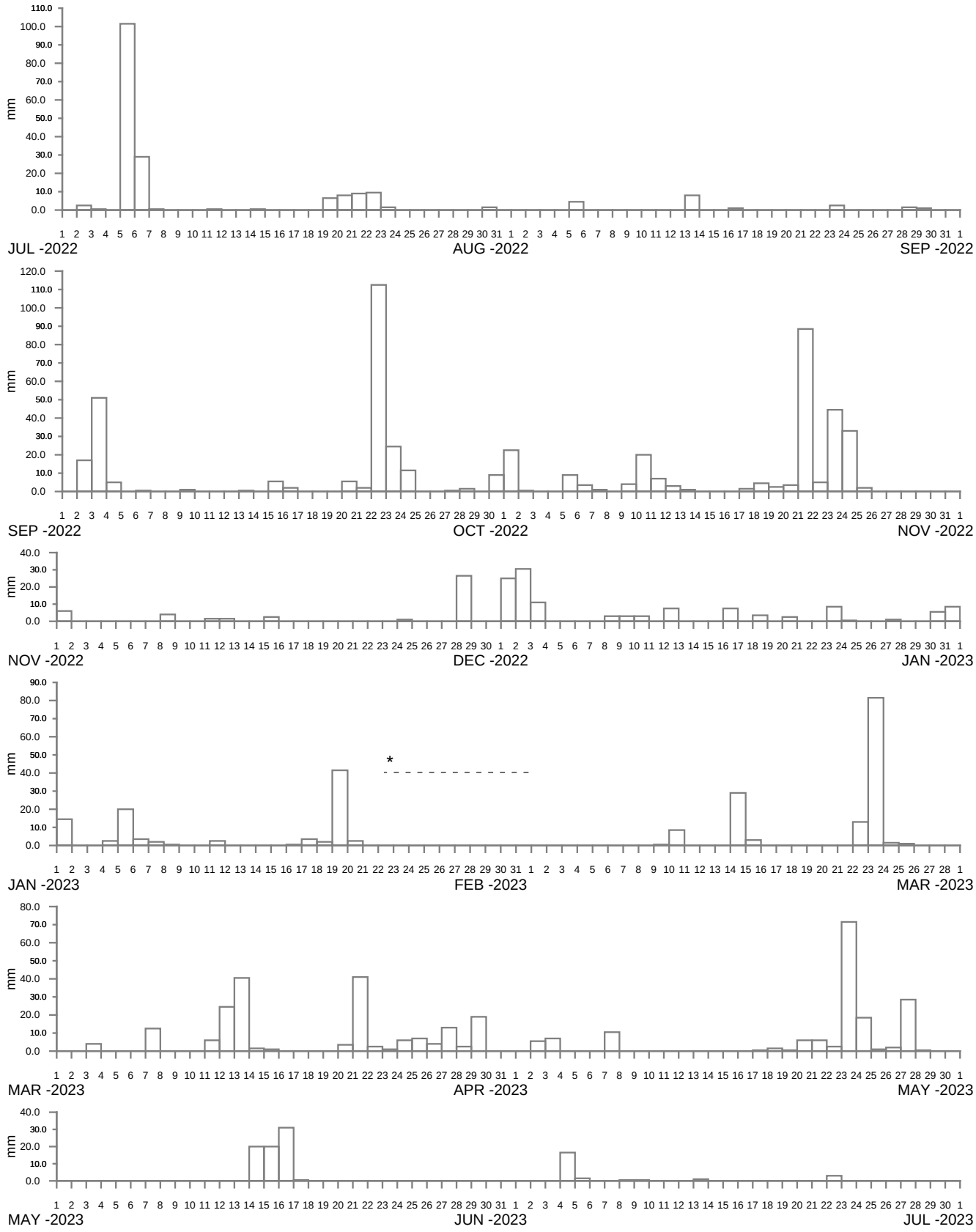


NSW GOVERNMENT

RAINFALL STATION LOCATIONS
BELLINGER RIVER REGION (SOUTH)

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-10



---------- DATA LOSS

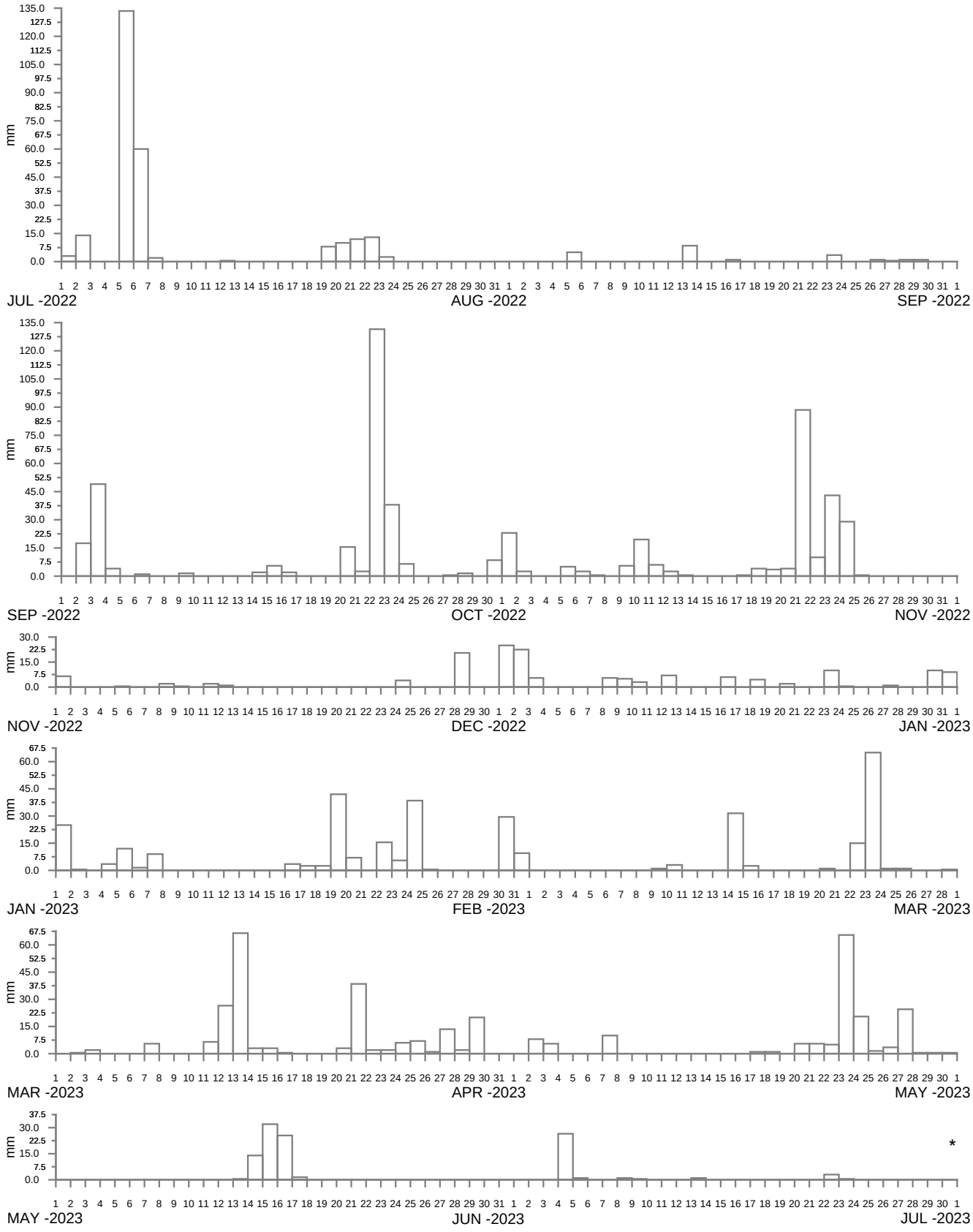
*Data loss due to tipping bucket failure

NSW GOVERNMENT

PERRY DRIVE AT COFFS HARBOUR
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-11



---------- DATA LOSS

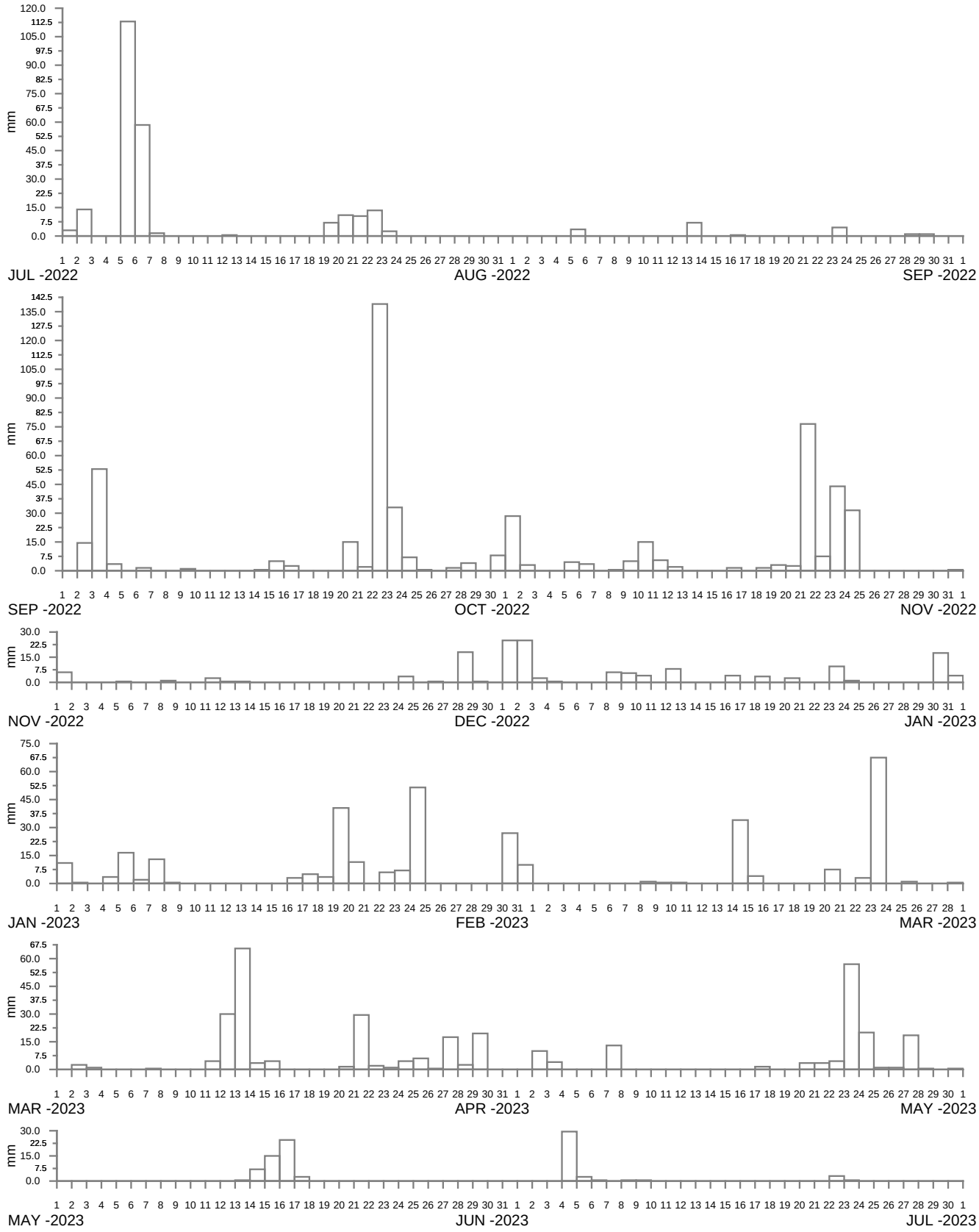
*Station decommissioning 09:00 June 2023 due to construction of the Coffs Harbour Bypass. Relocation options are under review.

NSW GOVERNMENT

SHEPHARDS LANE AT COFFS HARBOUR 2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-12



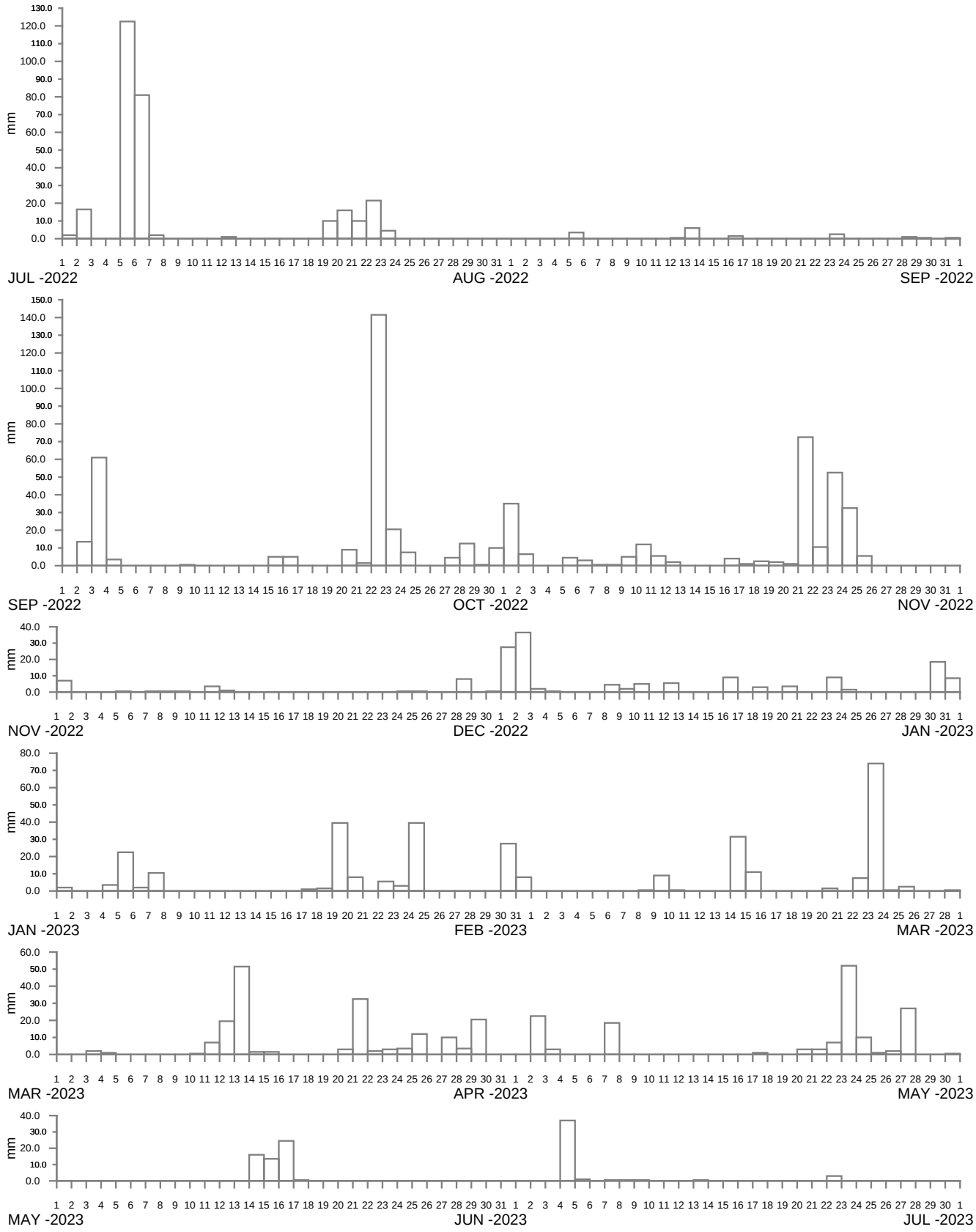
DATA LOSS

NSW GOVERNMENT

RED HILL AT COFFS HARBOUR
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-13



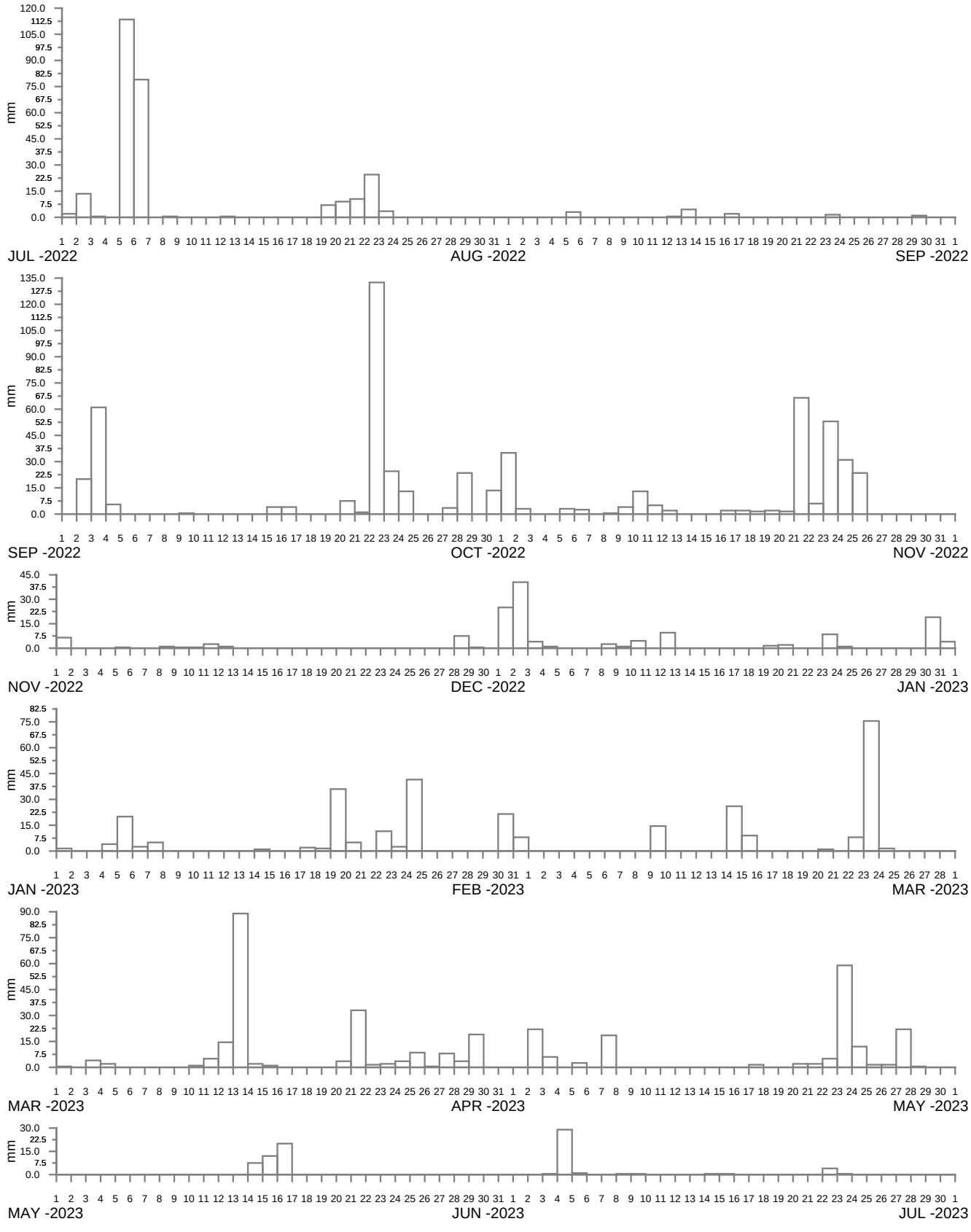
DATA LOSS

NSW GOVERNMENT

NEWPORTS CREEK AT ENGLANDS ROAD 2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-14



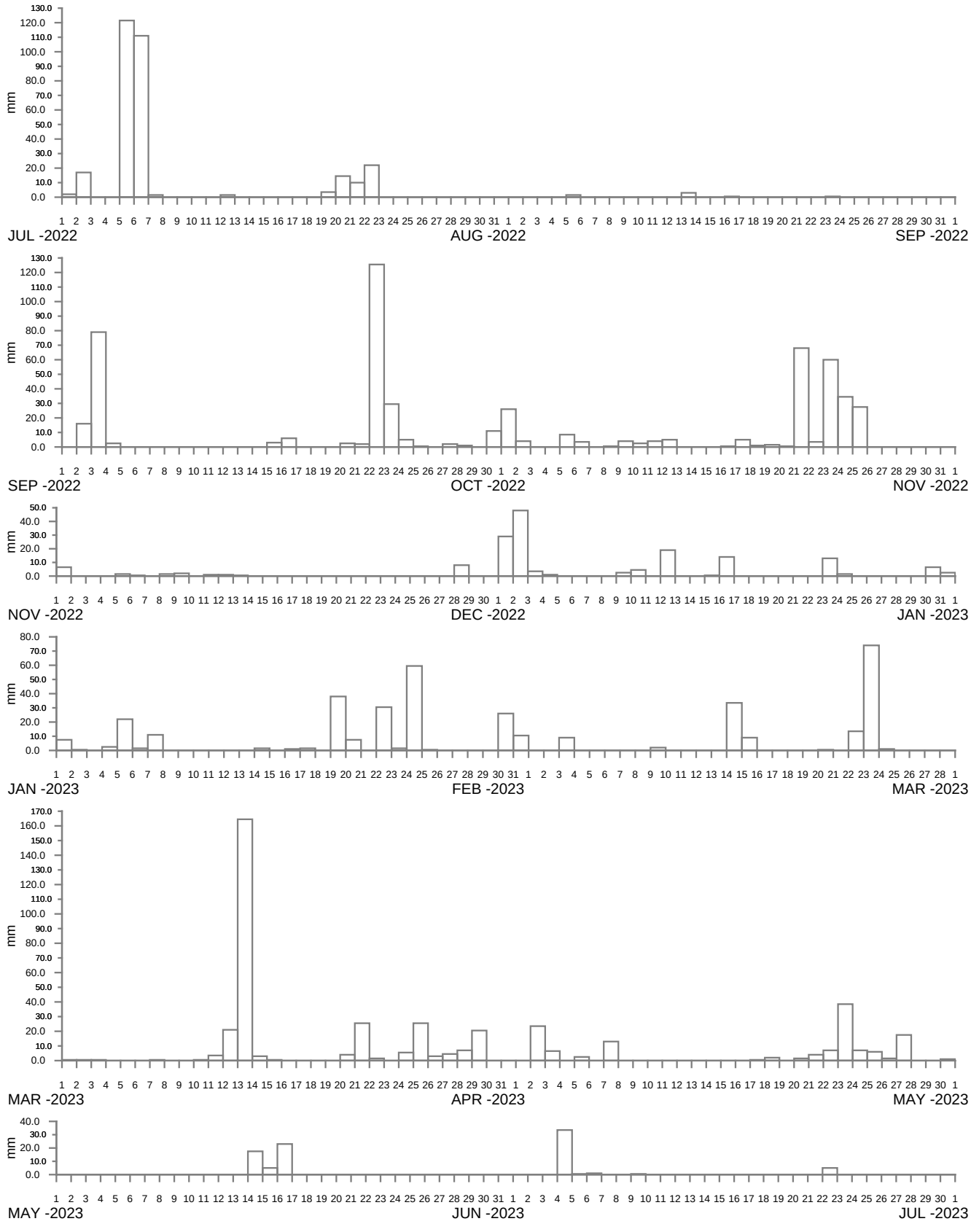
---------- DATA LOSS

NSW GOVERNMENT

MIDDLE BOAMBEE AT CEDARVALE ROAD
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-15



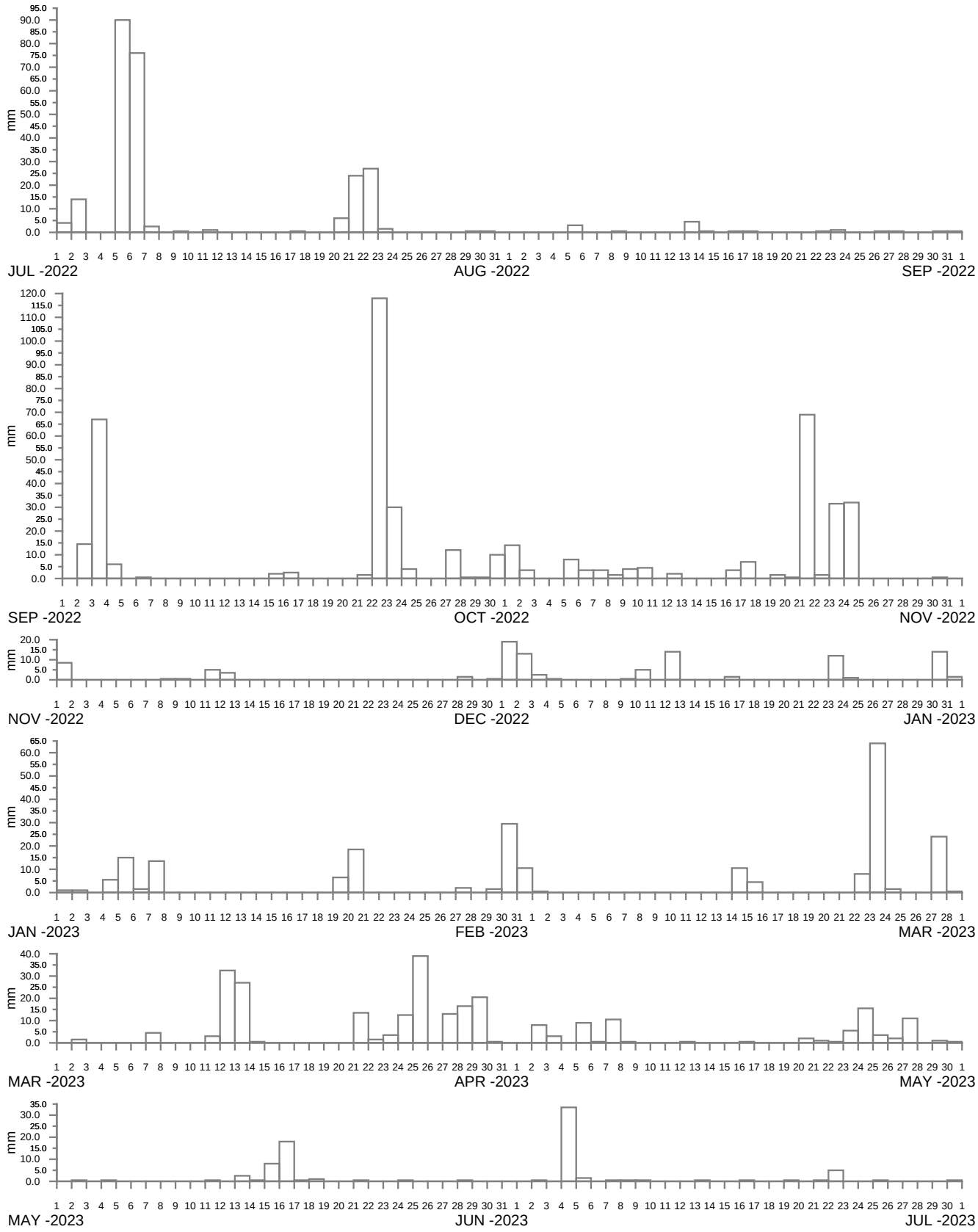
DATA LOSS

NSW GOVERNMENT

NORTH BONVILLE AT NORTH BONVILLE ROAD 2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-16



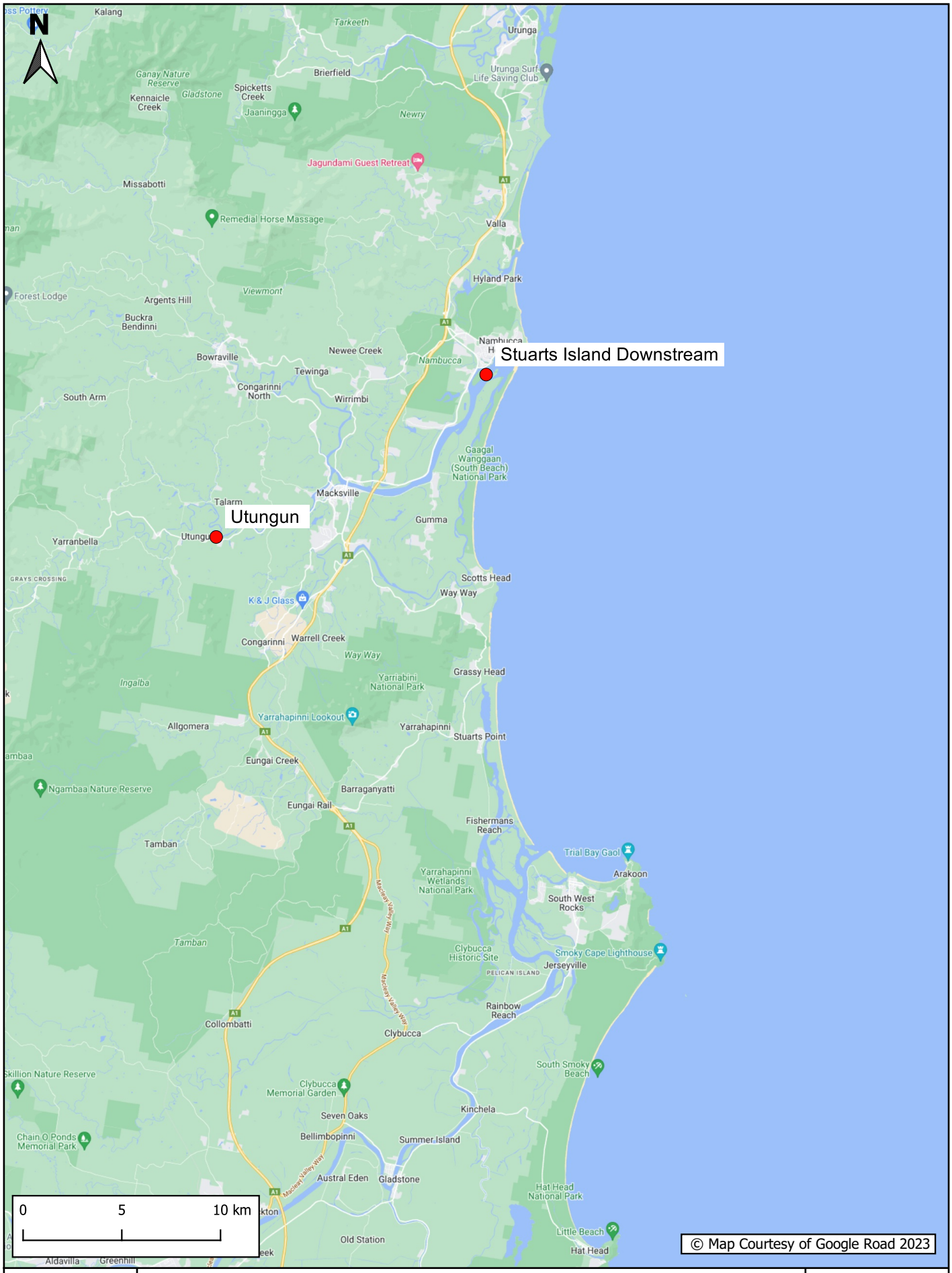
---------- DATA LOSS

NSW GOVERNMENT

KOOROOWI SHARABEL AT KALANG RIVER 2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-17

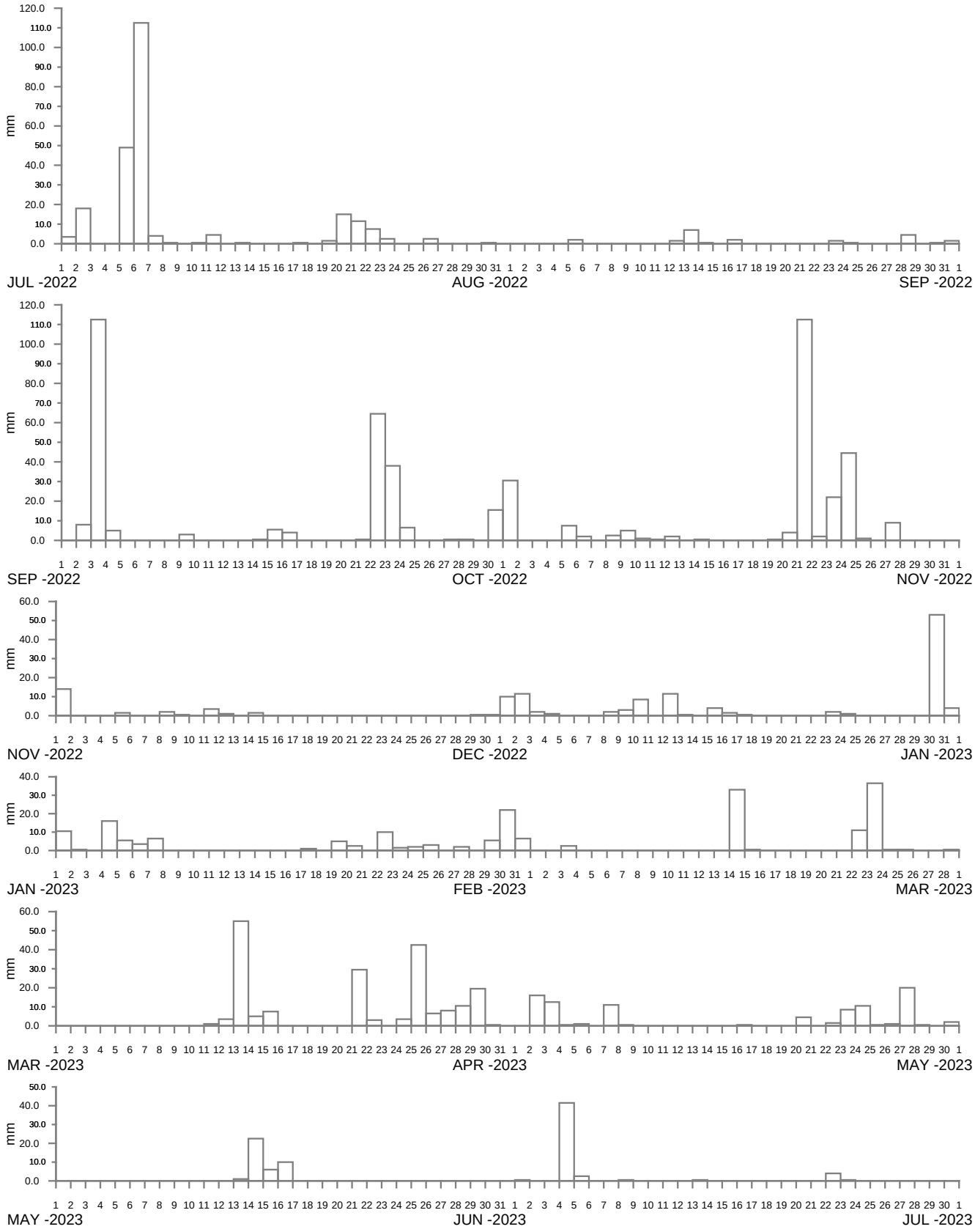


NSW GOVERNMENT

RAINFALL STATION LOCATIONS
NAMBUCCA RIVER REGION

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-18



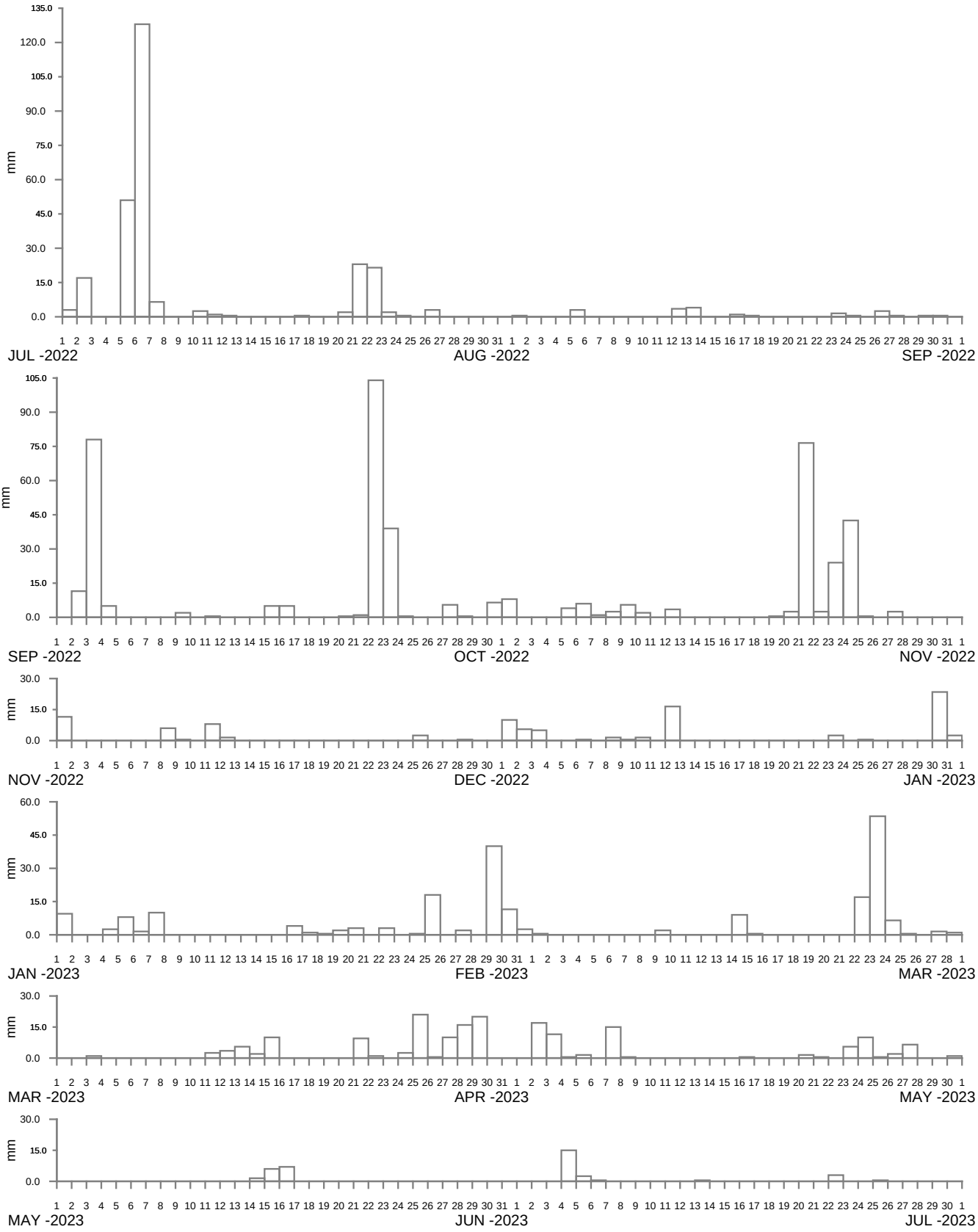
DATA LOSS

NSW GOVERNMENT

STUARTS ISLAND DOWNSTREAM AT NAMBUCCA 2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-19



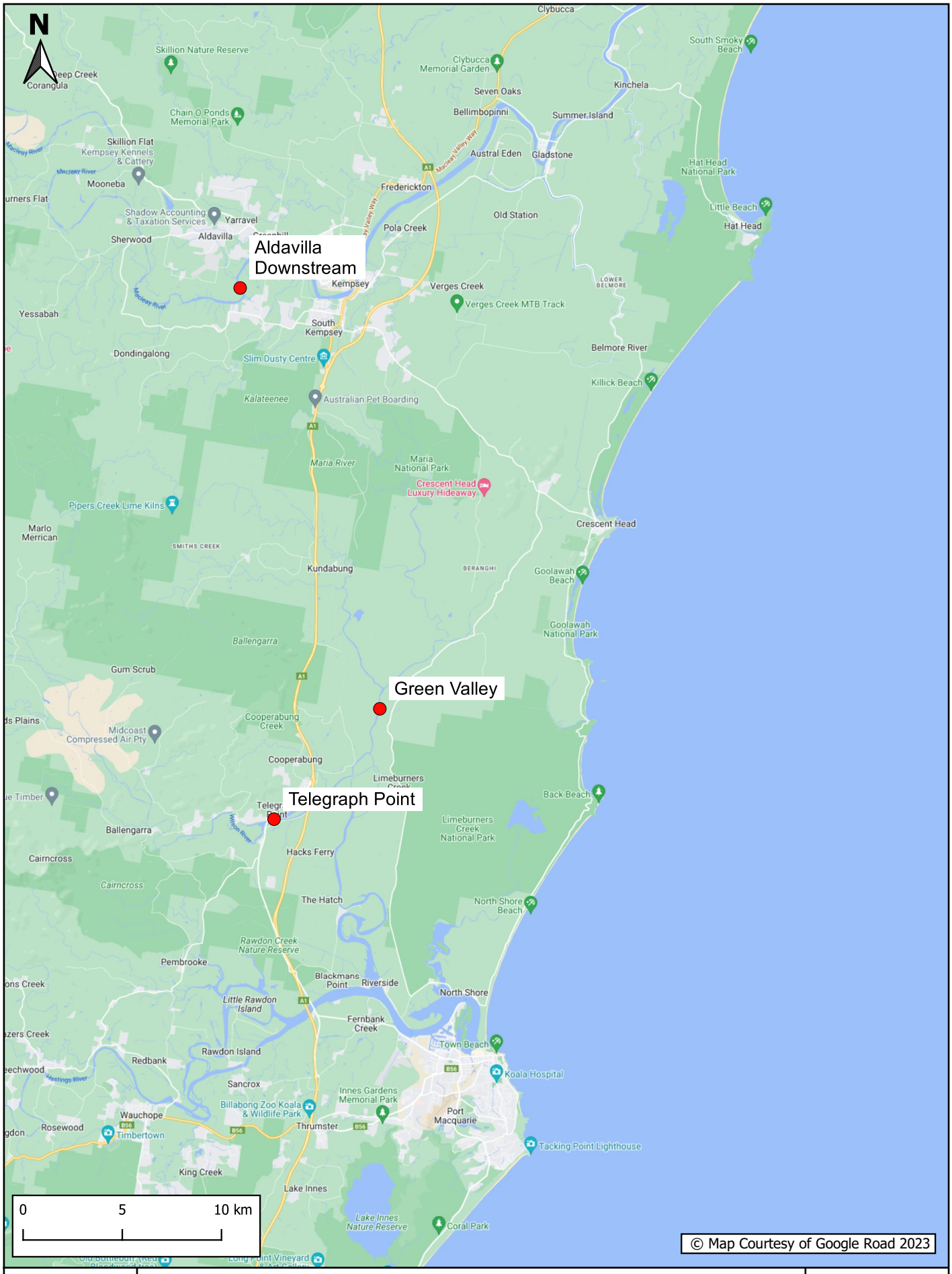
DATA LOSS

NSW GOVERNMENT

UTUNGUN AT TAYLORS ARM
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-20

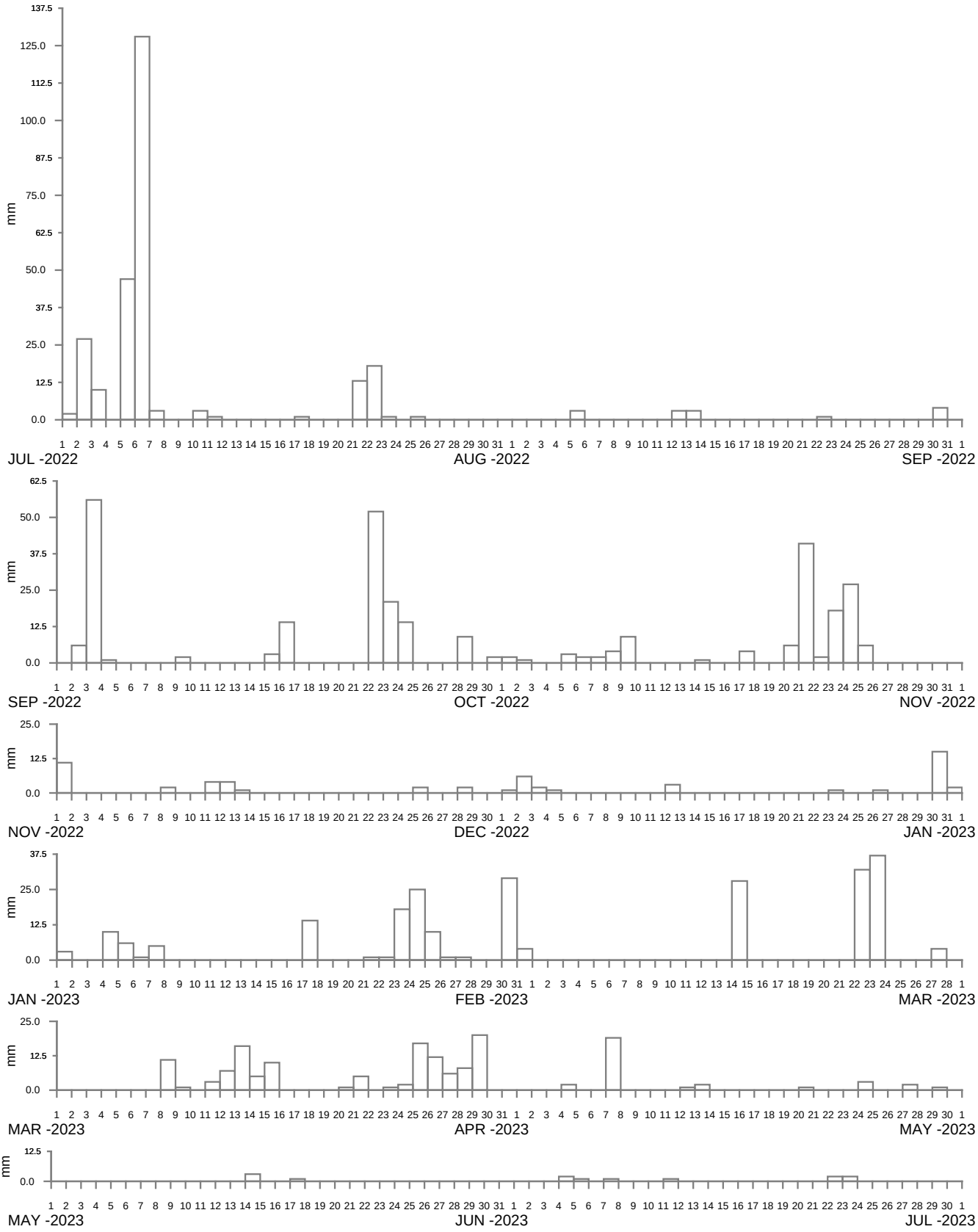


NSW GOVERNMENT

RAINFALL STATION LOCATIONS
MACLEAY RIVER AND HASTINGS RIVER REGIONS

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-21



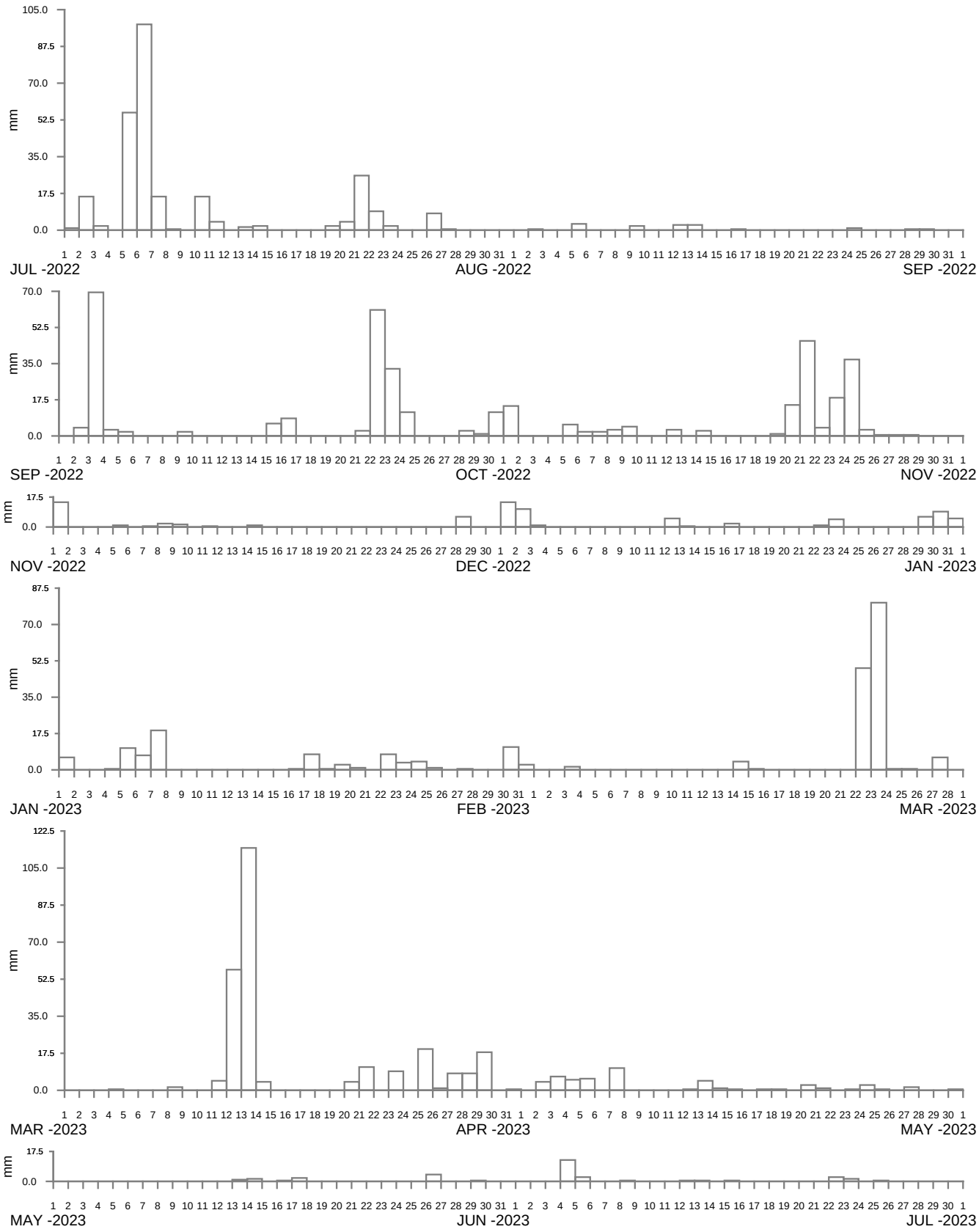
---------- DATA LOSS

NSW GOVERNMENT

ALDAVILLA DOWNSTREAM AT MACLEAY RIVER 2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-22



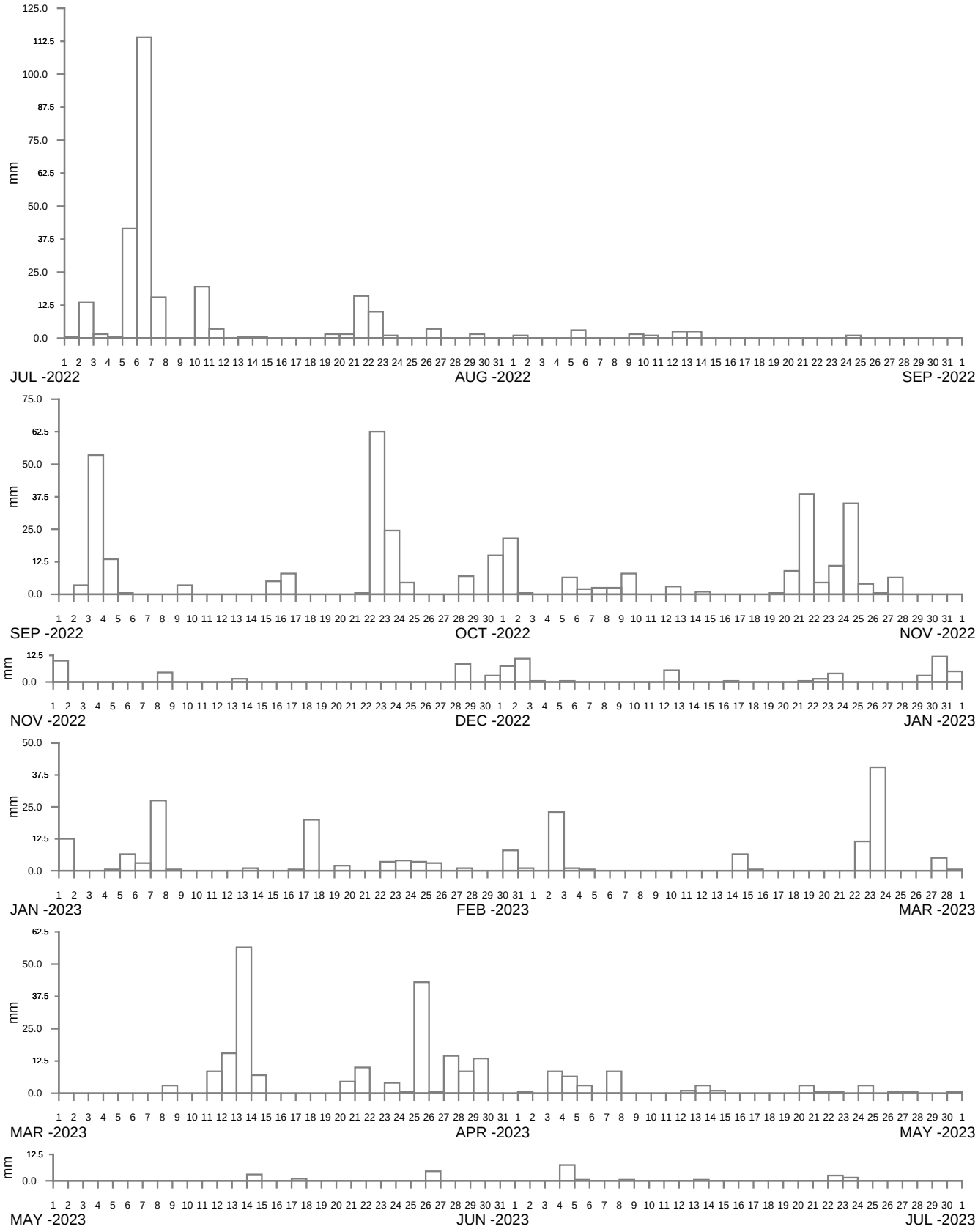
---------- DATA LOSS

NSW GOVERNMENT

GREEN VALLEY AT MARIA RIVER
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-23



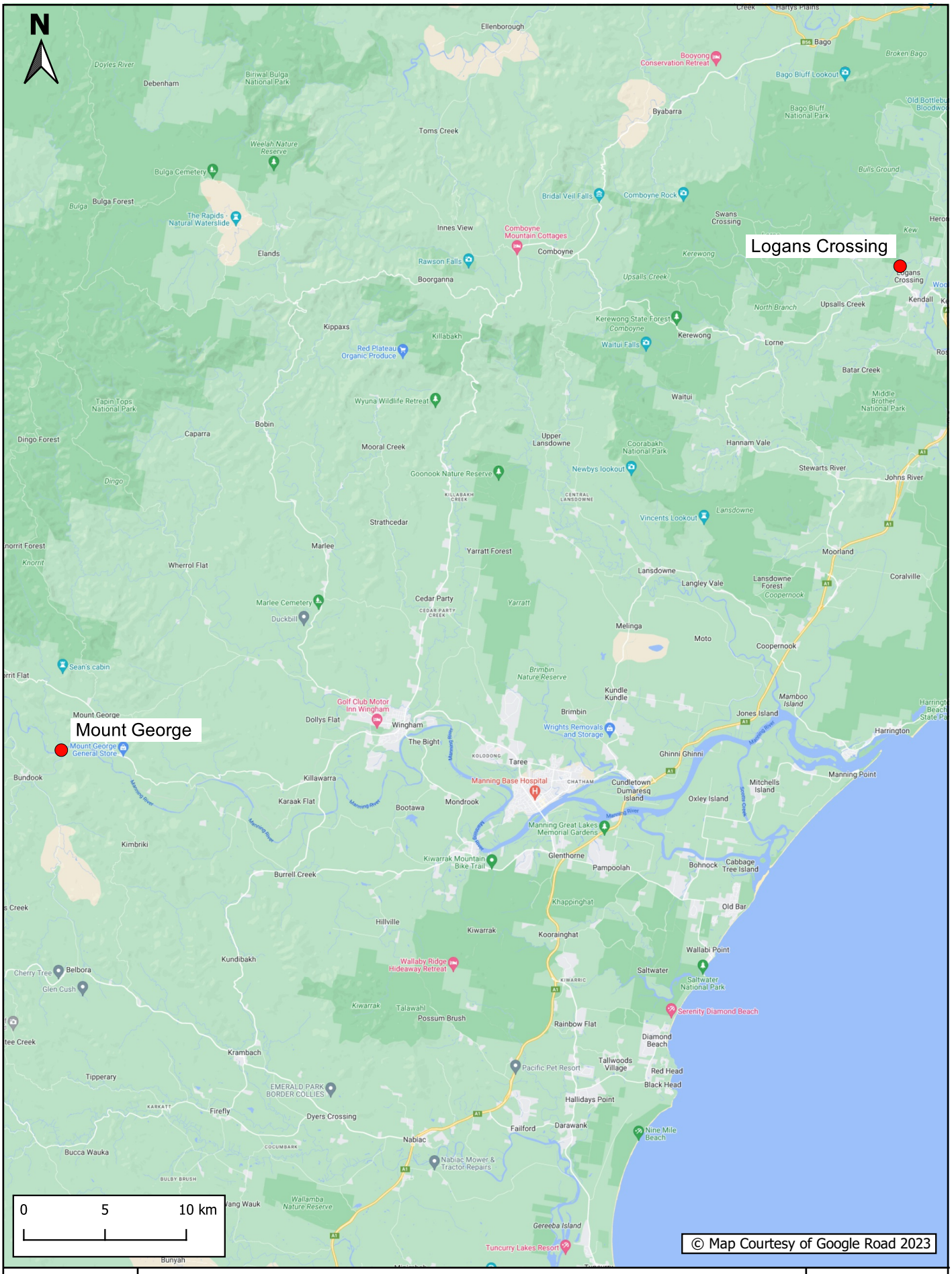
DATA LOSS

NSW GOVERNMENT

TELEGRAPH POINT AT WILSONS RIVER
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-24

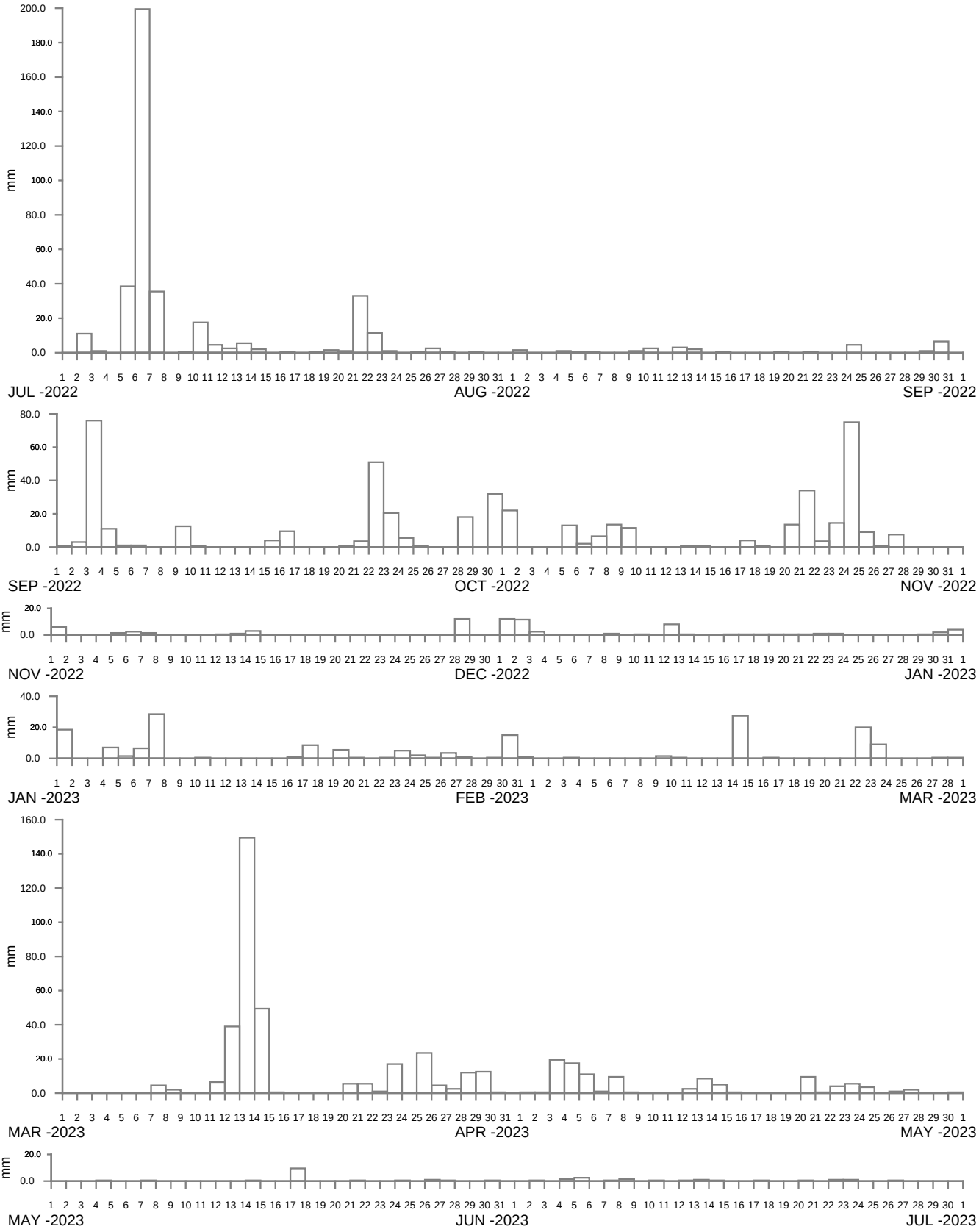


NSW GOVERNMENT

RAINFALL STATION LOCATIONS
CAMDEN HAVEN REGION

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-25



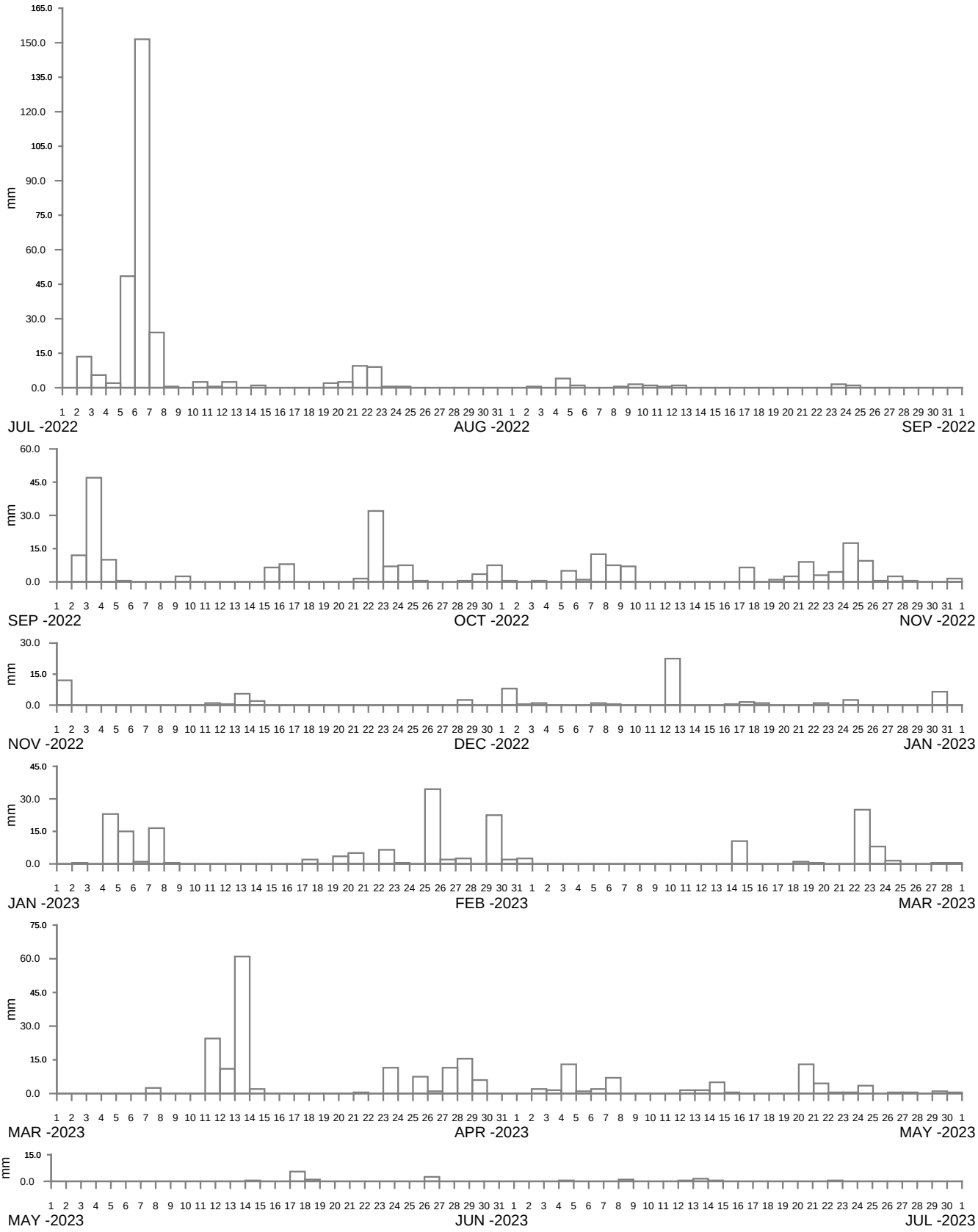
DATA LOSS

NSW GOVERNMENT

LOGANS CROSSING AT CAMDEN HAVEN RIVER 2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-26



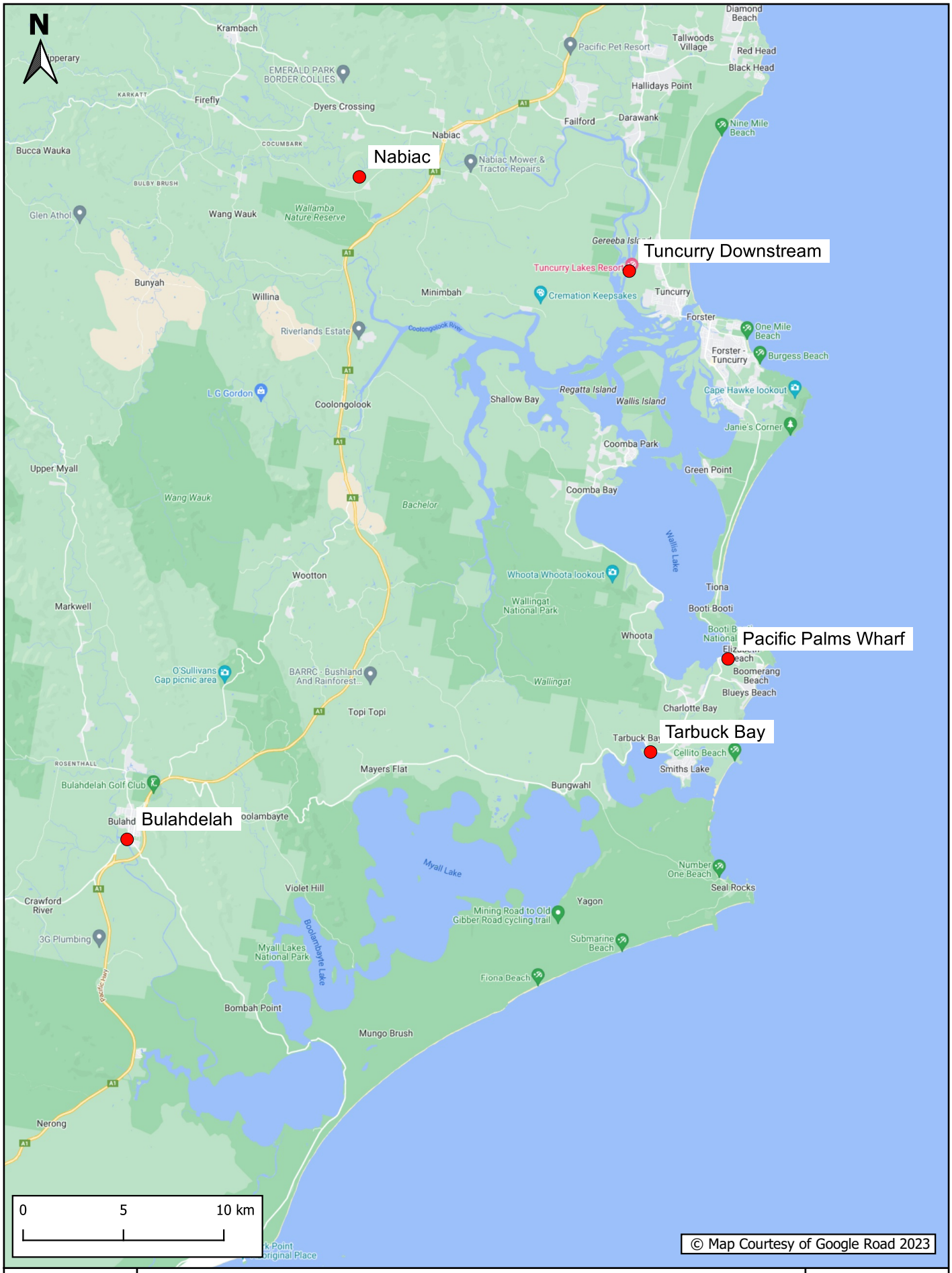
DATA LOSS

NSW GOVERNMENT

MOUNT GEORGE AT MANNING RIVER
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-27

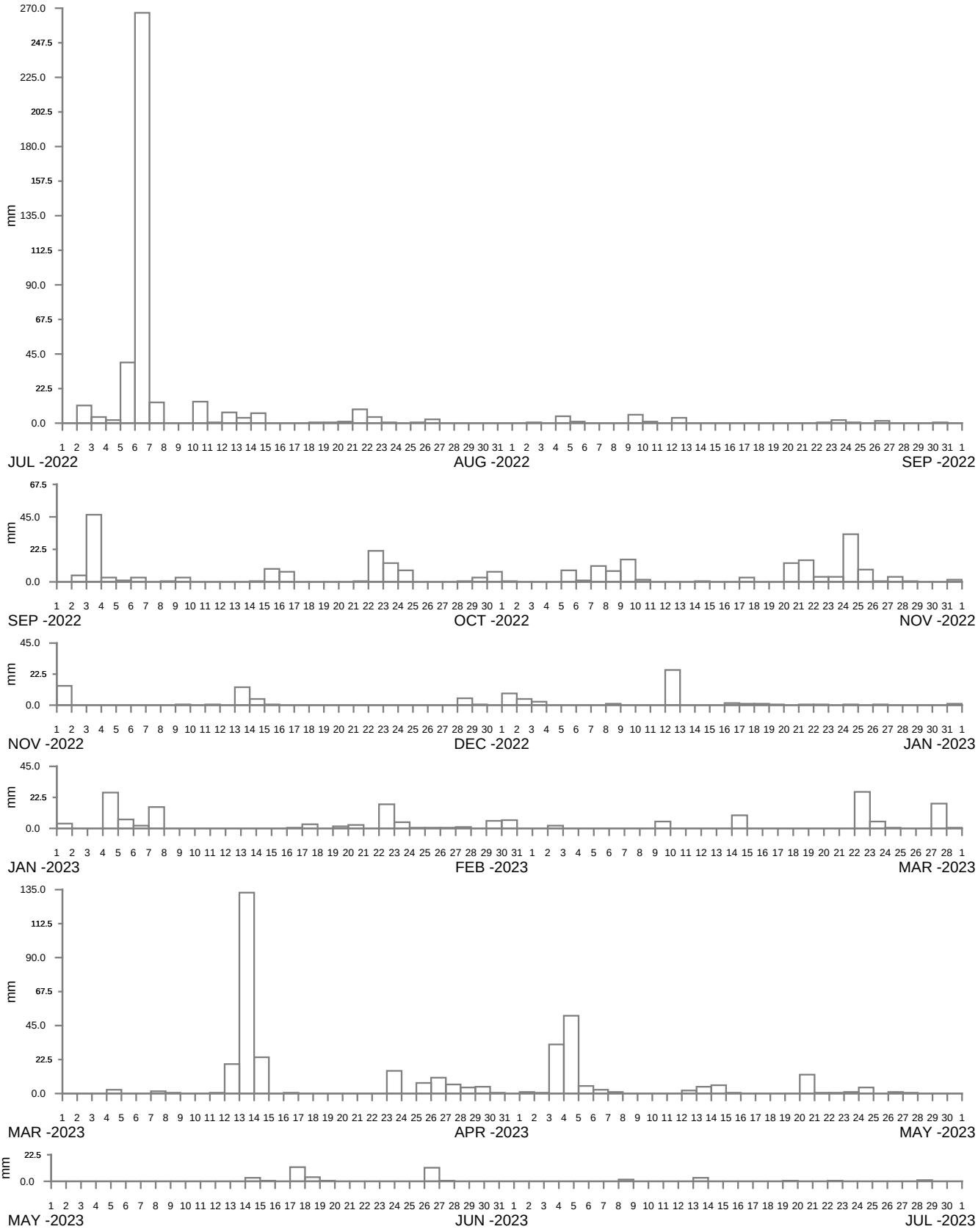


NSW GOVERNMENT

RAINFALL STATION LOCATIONS
KARUAH RIVER REGION

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-28

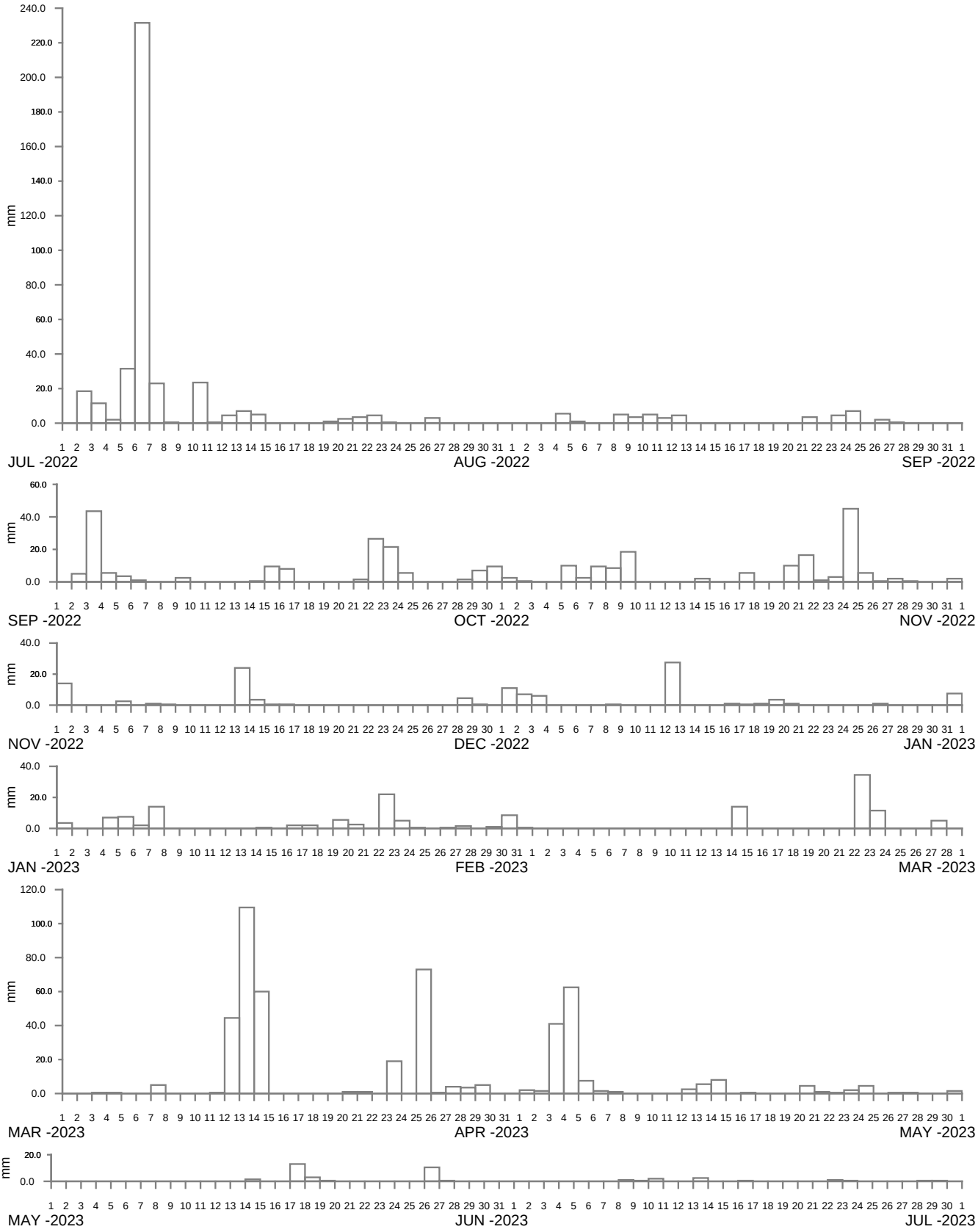


DATA LOSS

NABIAC AT WALLAMBA RIVER
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-29



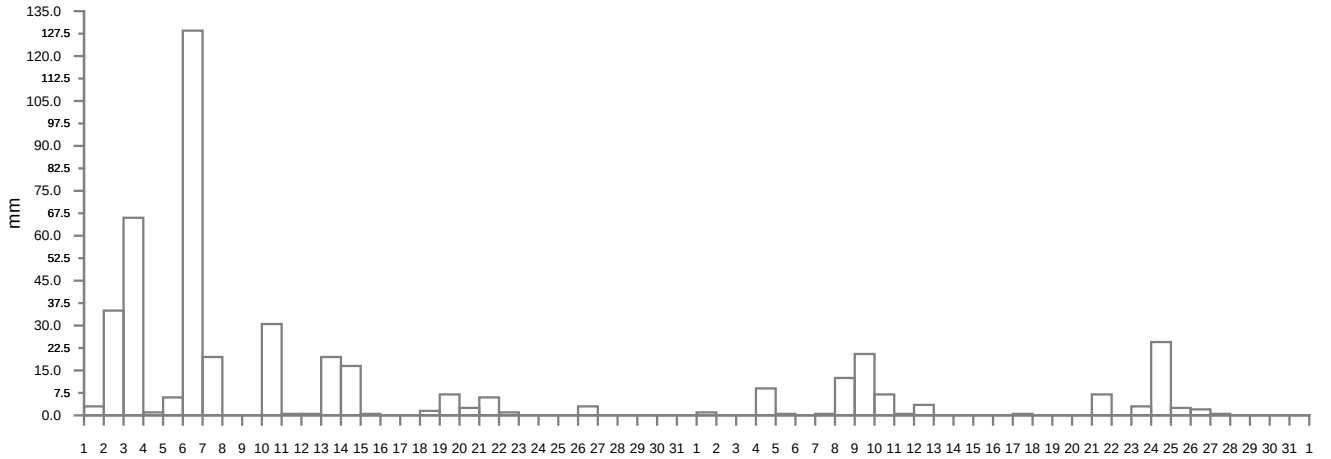
---------- DATA LOSS

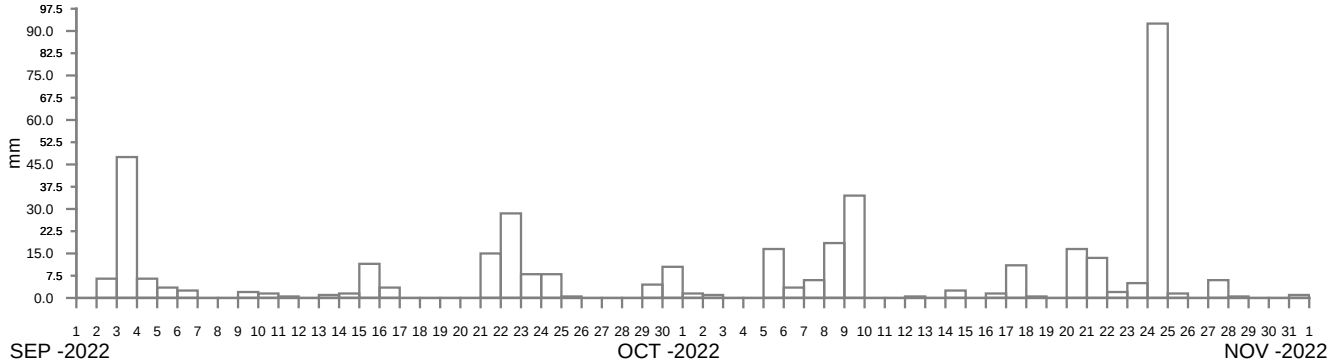
NSW GOVERNMENT

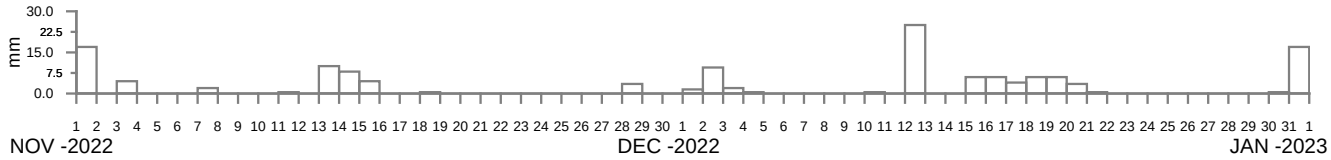
TUNCURRY DOWNSTREAM AT WALLAMBA RIVER 2022–23

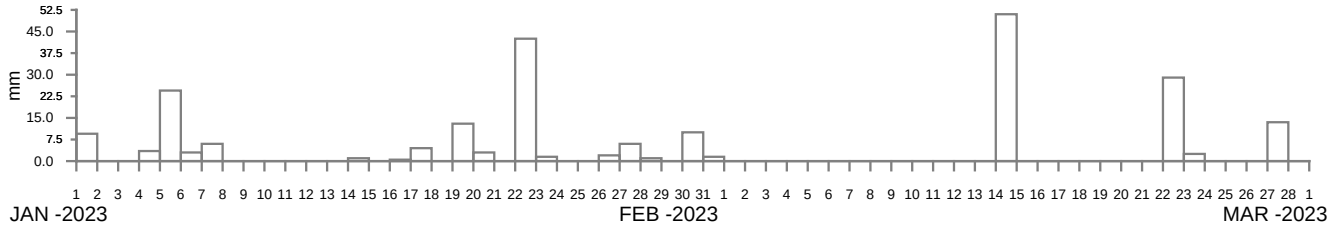
Manly Hydraulics Laboratory

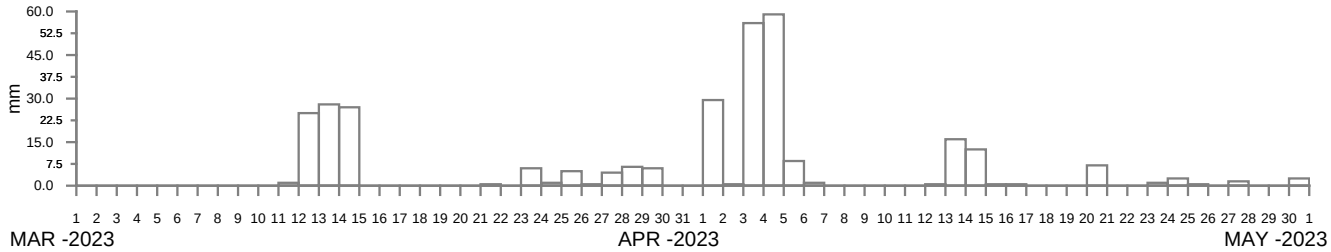
Report MHL2996
Figure
4-30

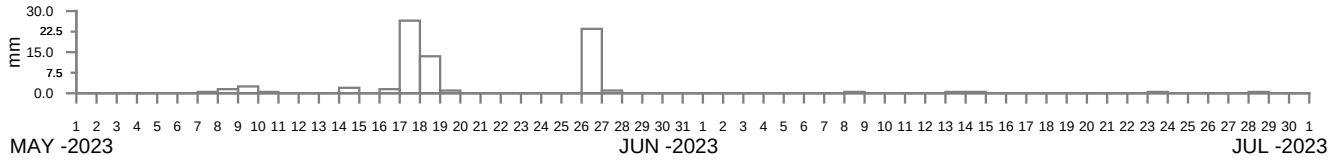












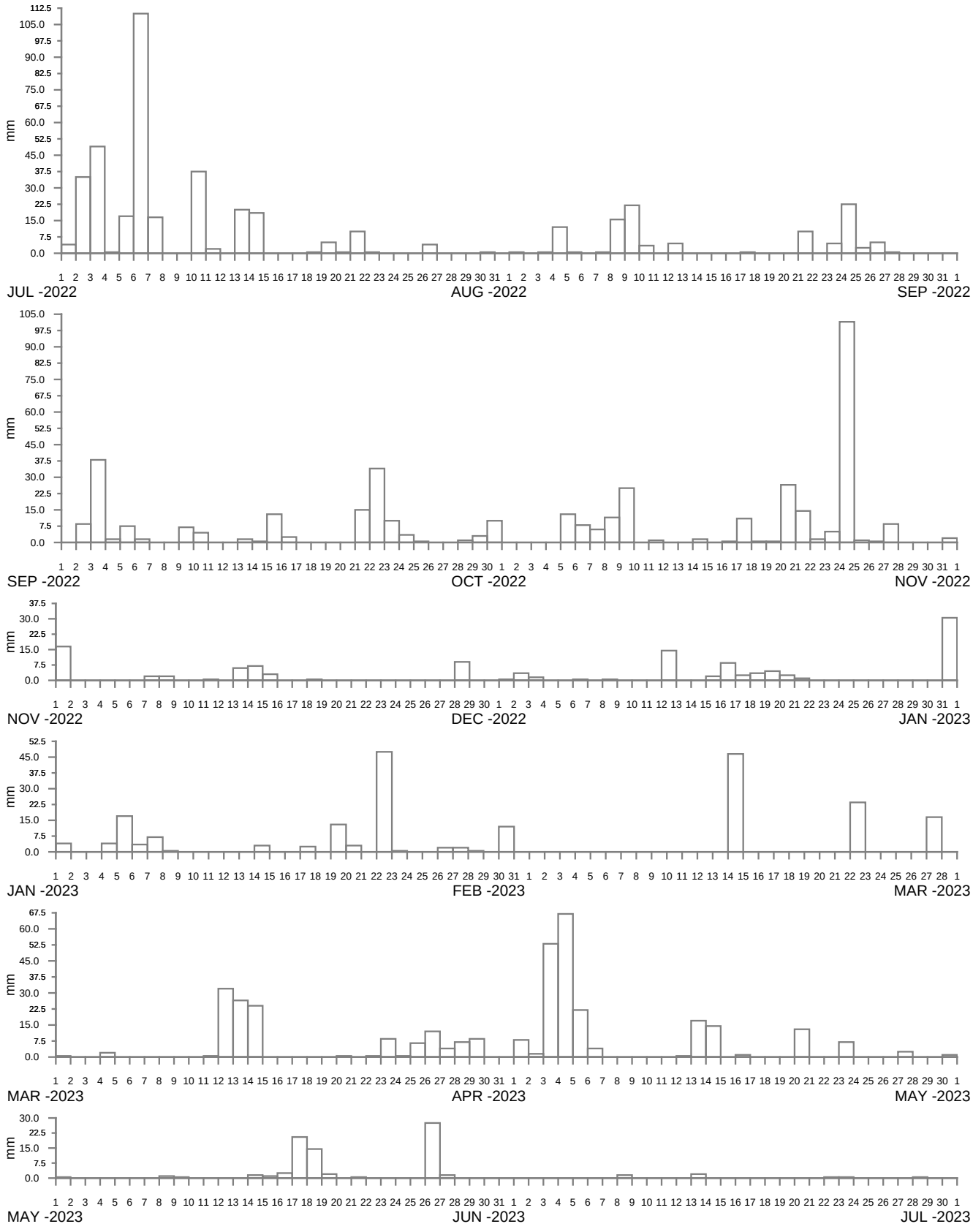
DATA LOSS

NSW GOVERNMENT

PACIFIC PALMS WHARF AT WALLIS LAKES
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-31



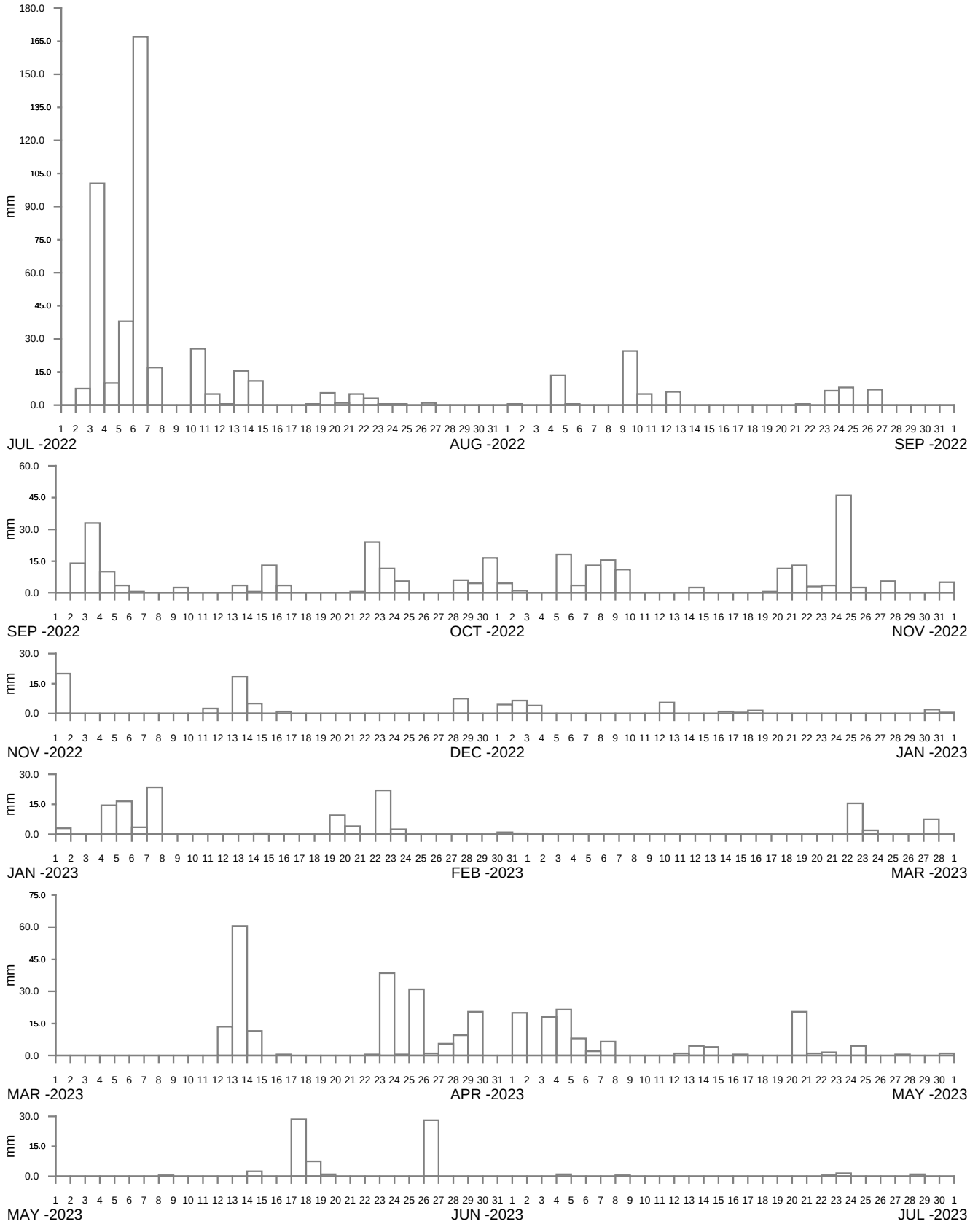
---------- DATA LOSS

NSW GOVERNMENT

TARBUCK BAY AT SMITHS LAKE
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-32



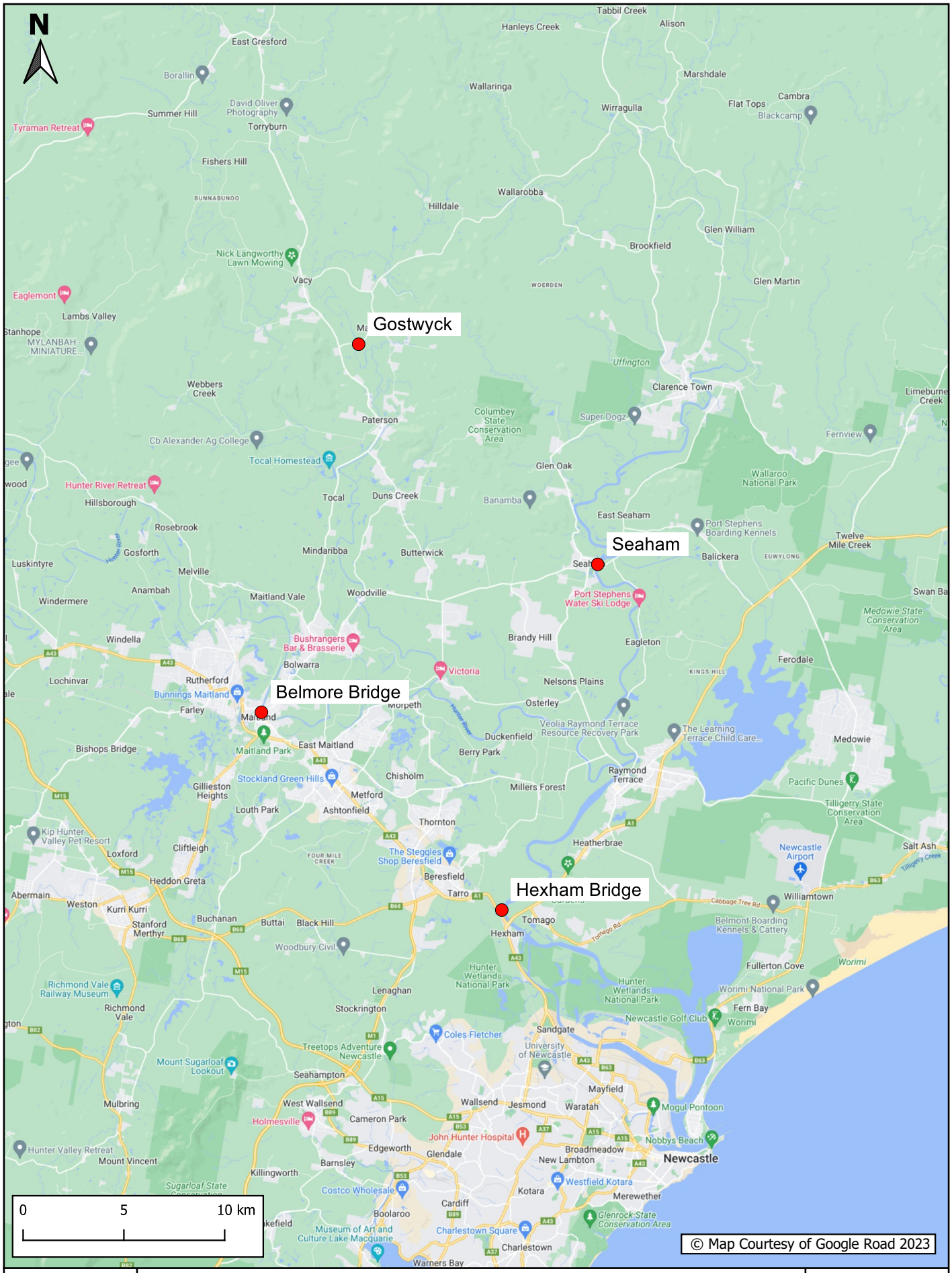
---------- DATA LOSS

NSW GOVERNMENT

BULAHDELAH AT MYALL RIVER
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-33

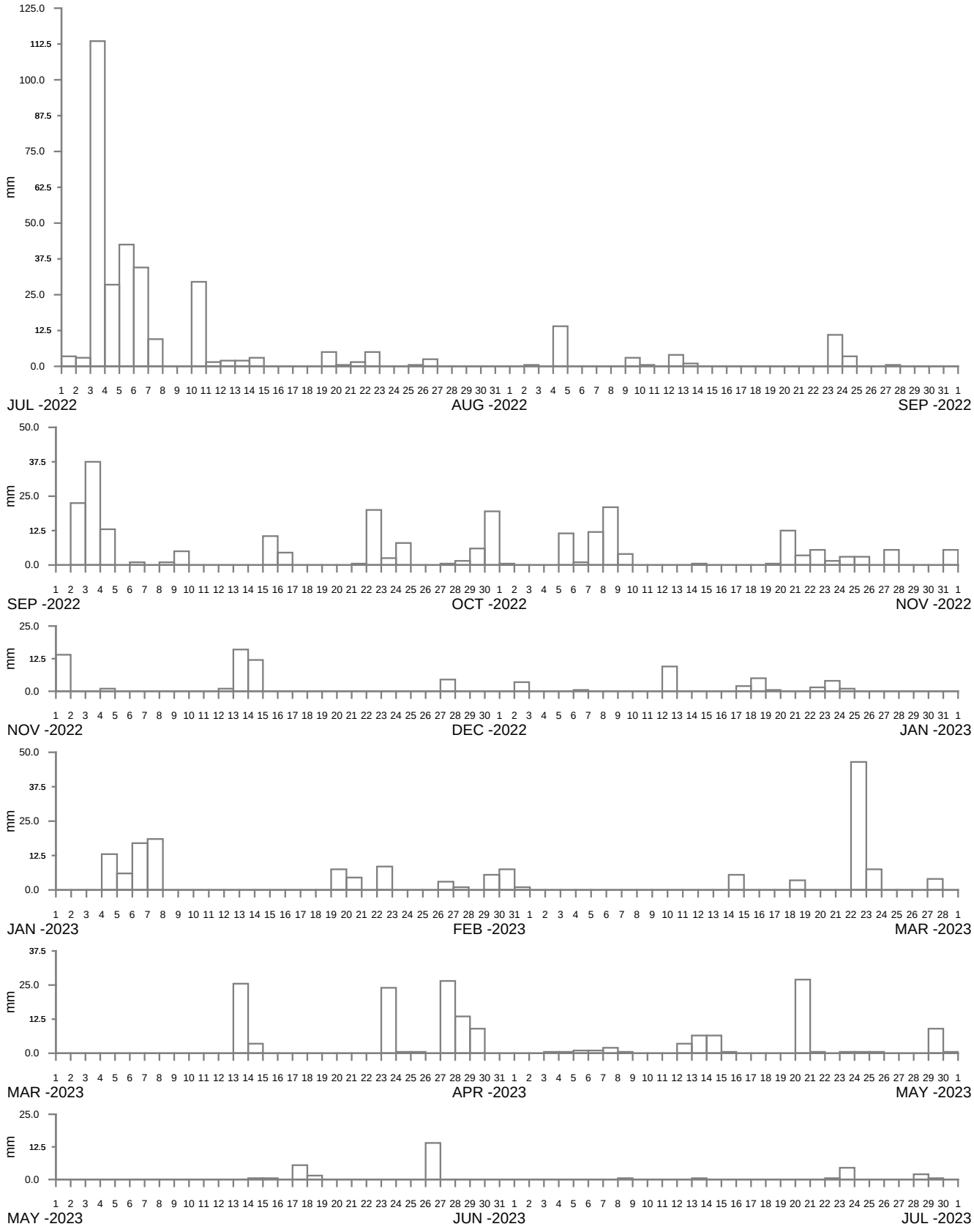


NSW GOVERNMENT

RAINFALL STATION LOCATIONS
HUNTER RIVER REGION

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-34

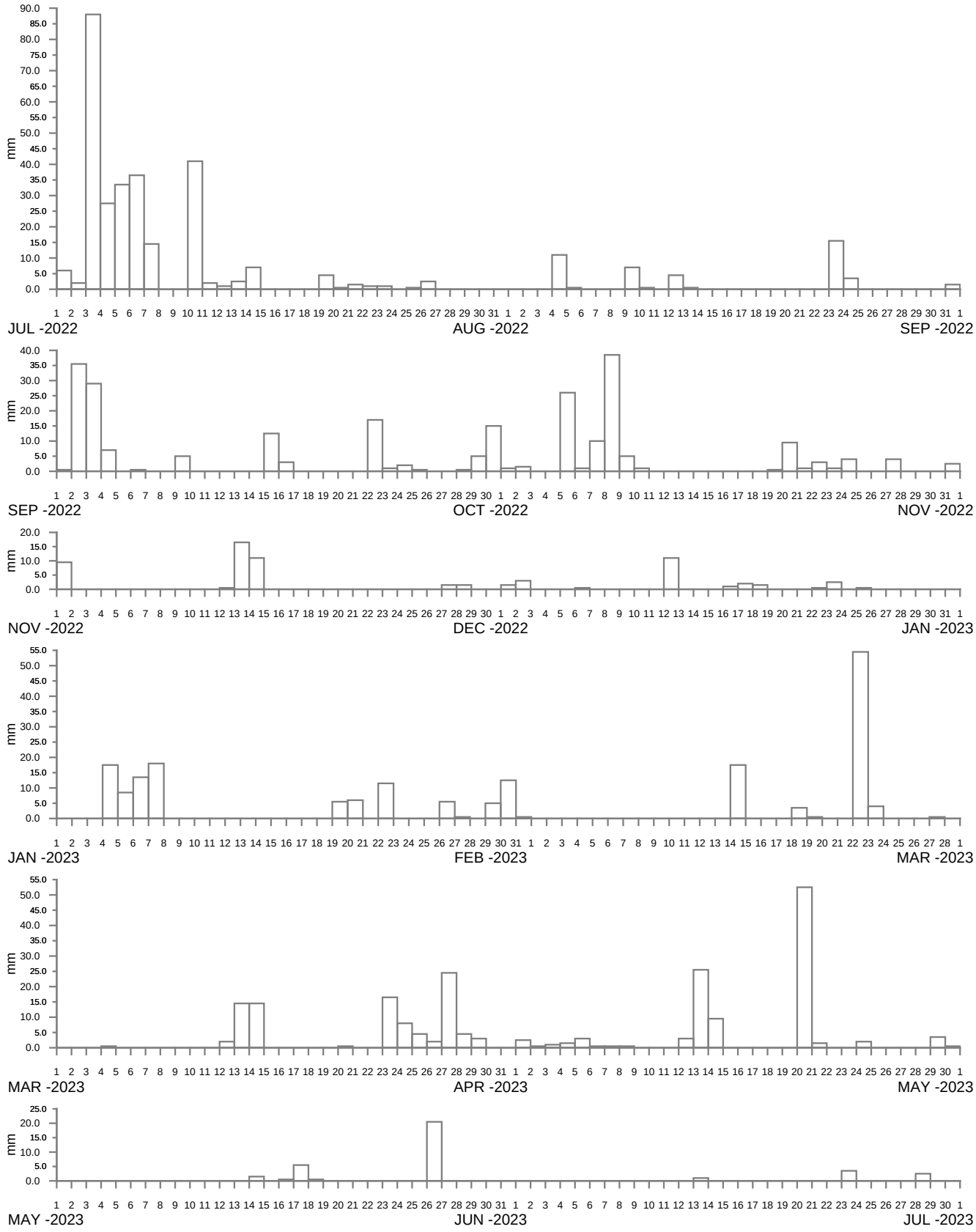


DATA LOSS

GOSTWYCK AT PATERSON RIVER
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-35



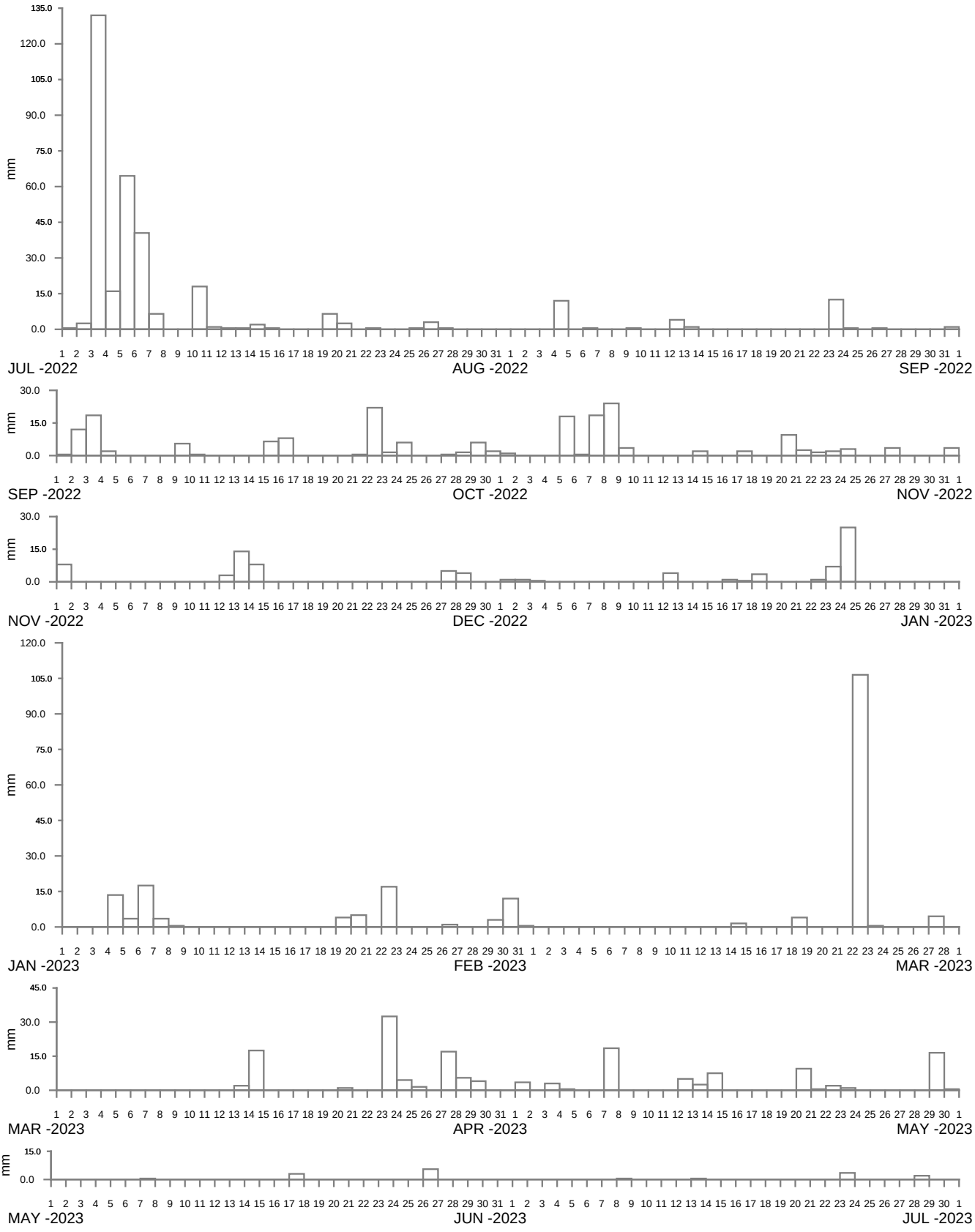
---------- DATA LOSS

NSW GOVERNMENT

SEAHAM AT WILLIAMS RIVER
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-36



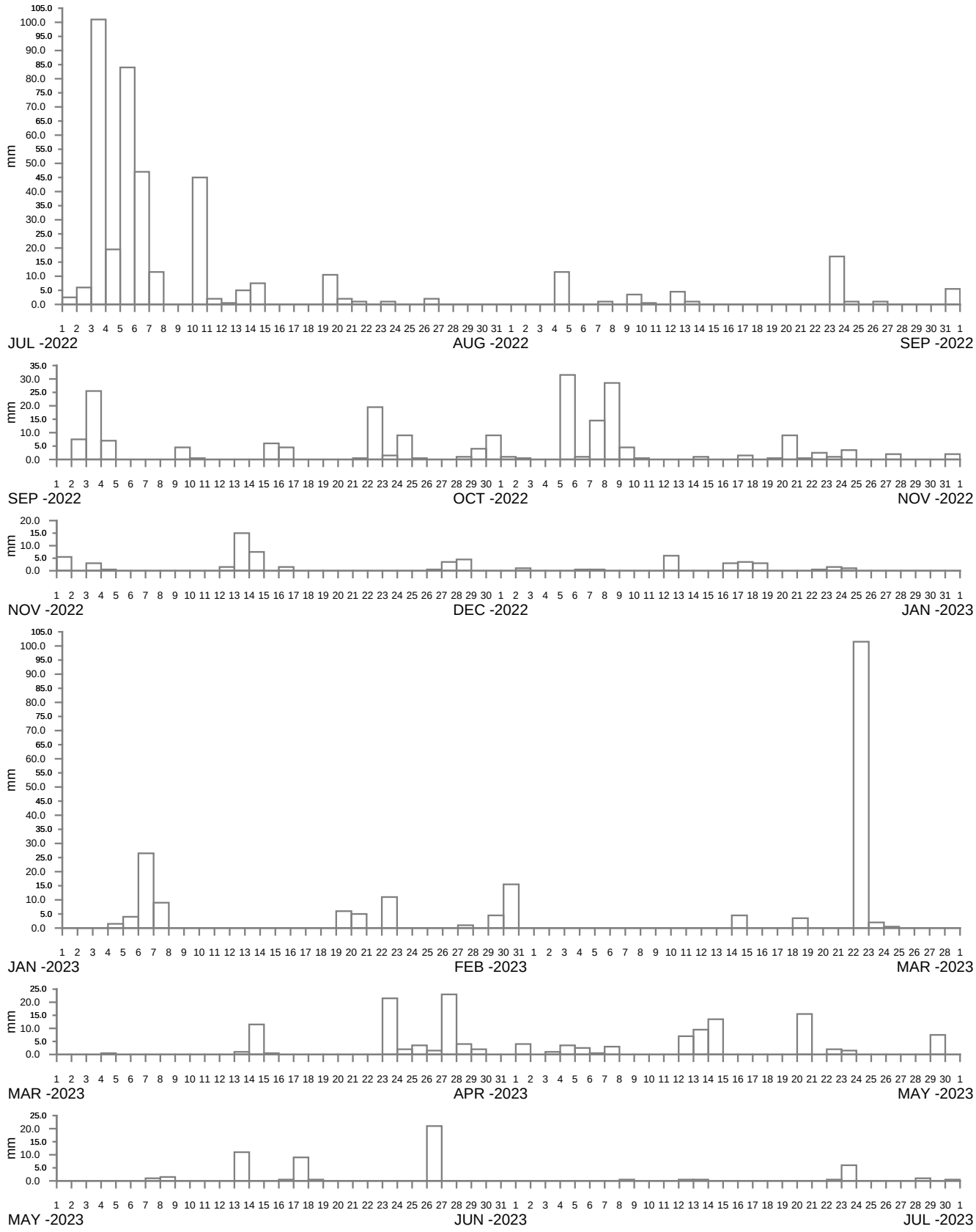
DATA LOSS

NSW GOVERNMENT

BELMORE BRIDGE AT HUNTER RIVER
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-37



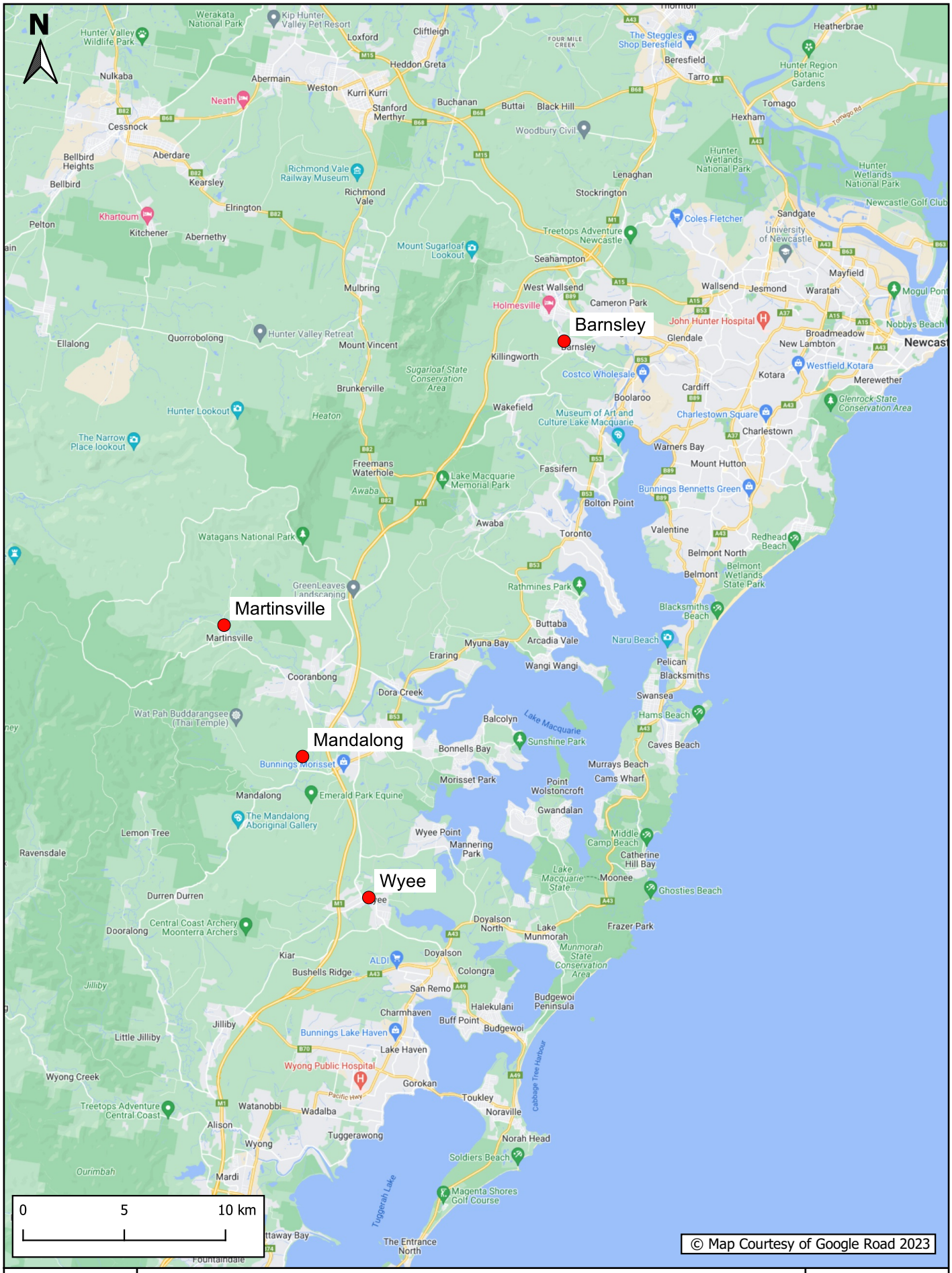
---------- DATA LOSS

NSW GOVERNMENT

HEXHAM BRIDGE AT HUNTER RIVER
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-38

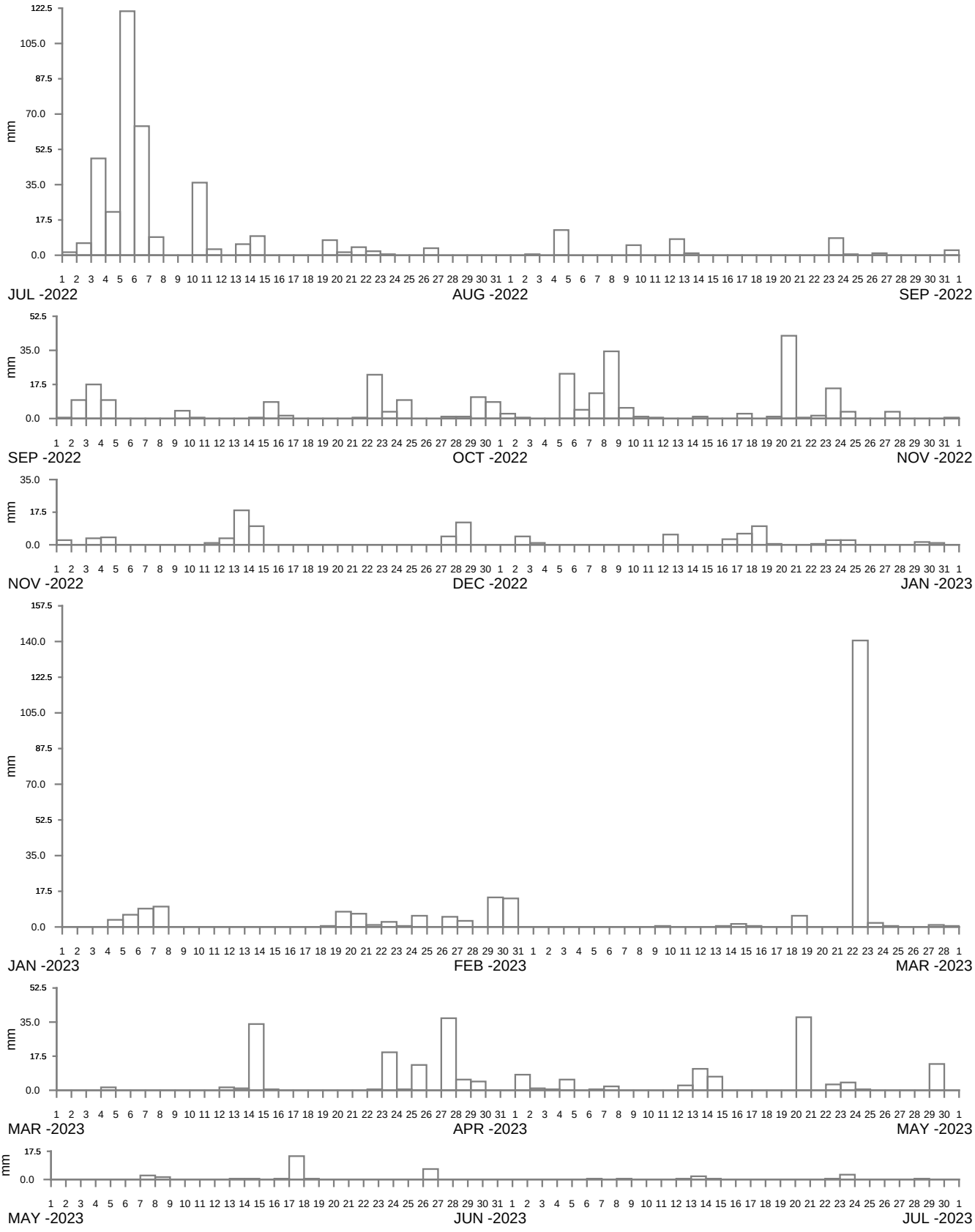


NSW GOVERNMENT

RAINFALL STATION LOCATIONS
MACQUARIE-TUGGERAH LAKES (NORTH) REGION

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-39



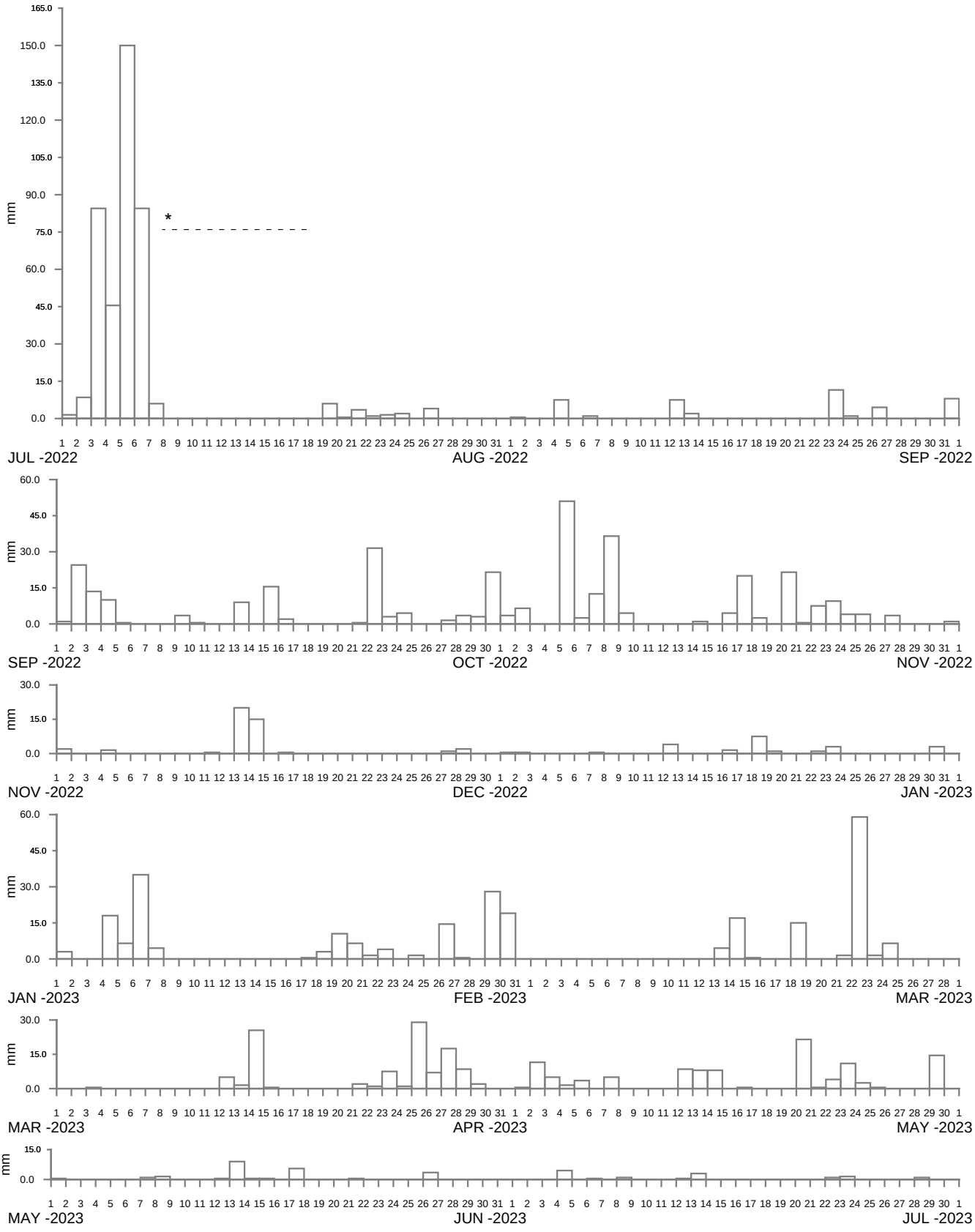
DATA LOSS

NSW GOVERNMENT

BARNSLEY AT JOHNSON AVENUE
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-40



---------- DATA LOSS

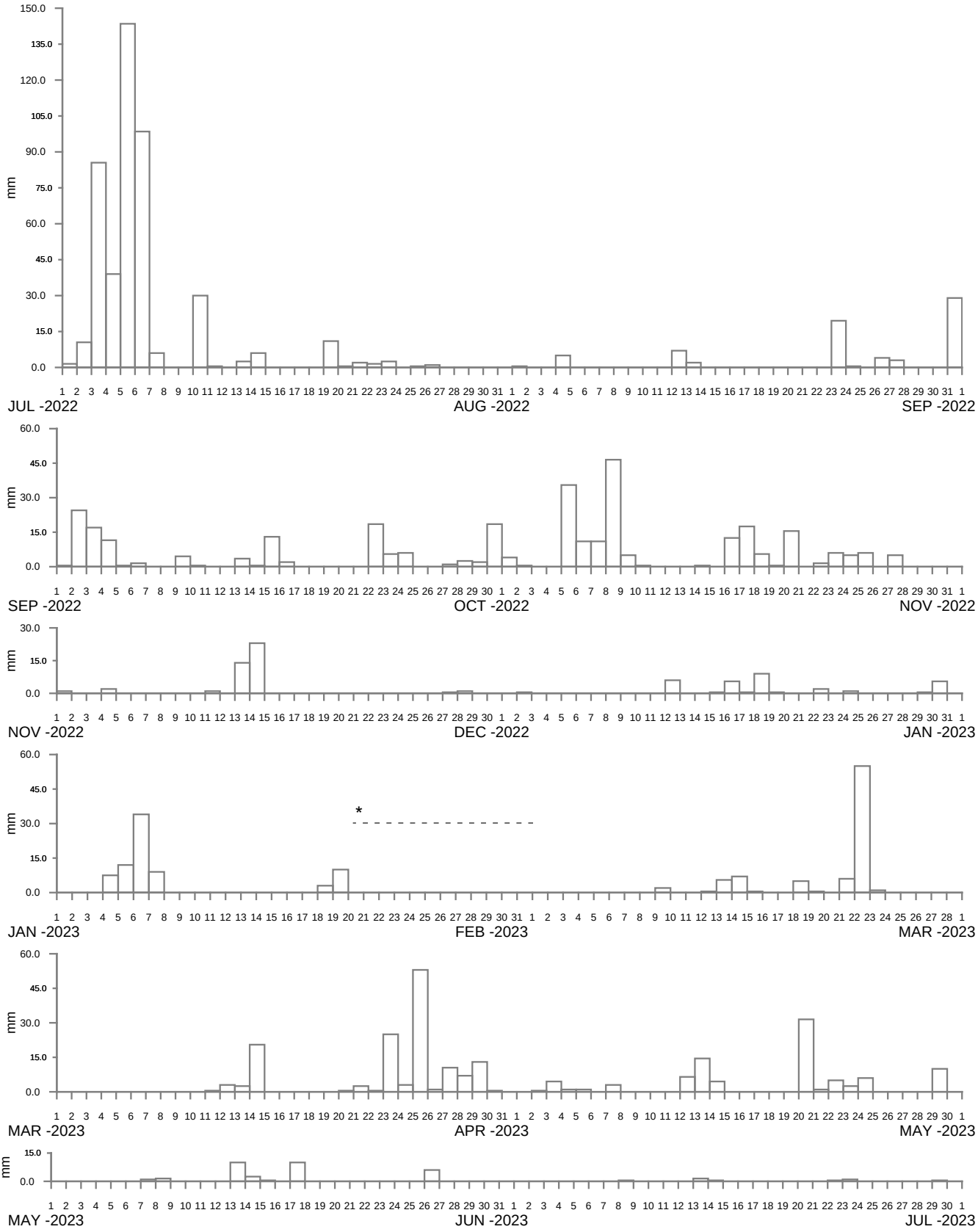
*Data loss due to logger failure

NSW GOVERNMENT

MARTINSVILLE AT MARTINSVILLE ROAD
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-41



DATA LOSS

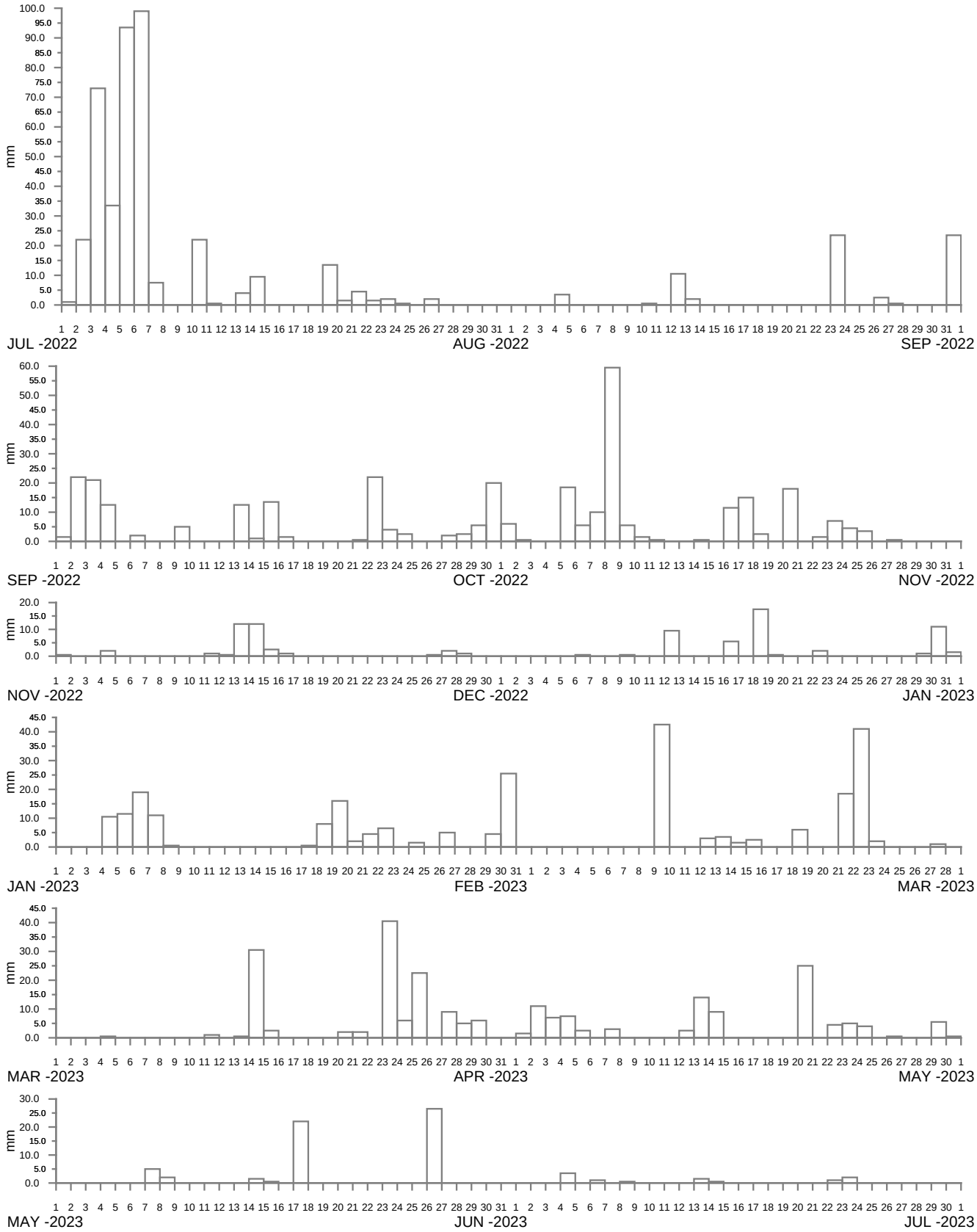
*Data loss due to logger failure

NSW GOVERNMENT

MANDALONG AT DEAVES ROAD
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-42



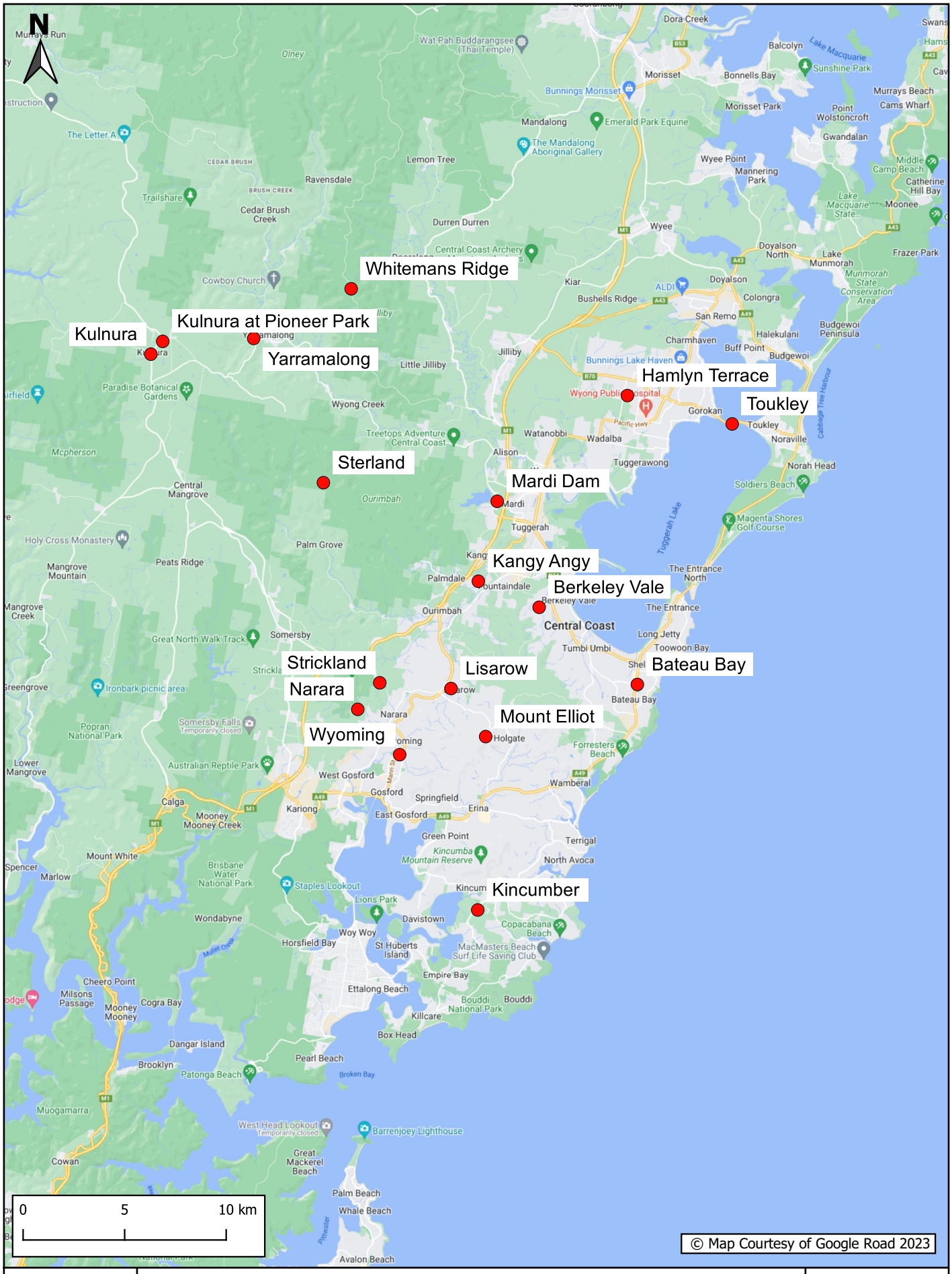
DATA LOSS

NSW GOVERNMENT

WYEE AT COLLUNGRA STREET
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-43

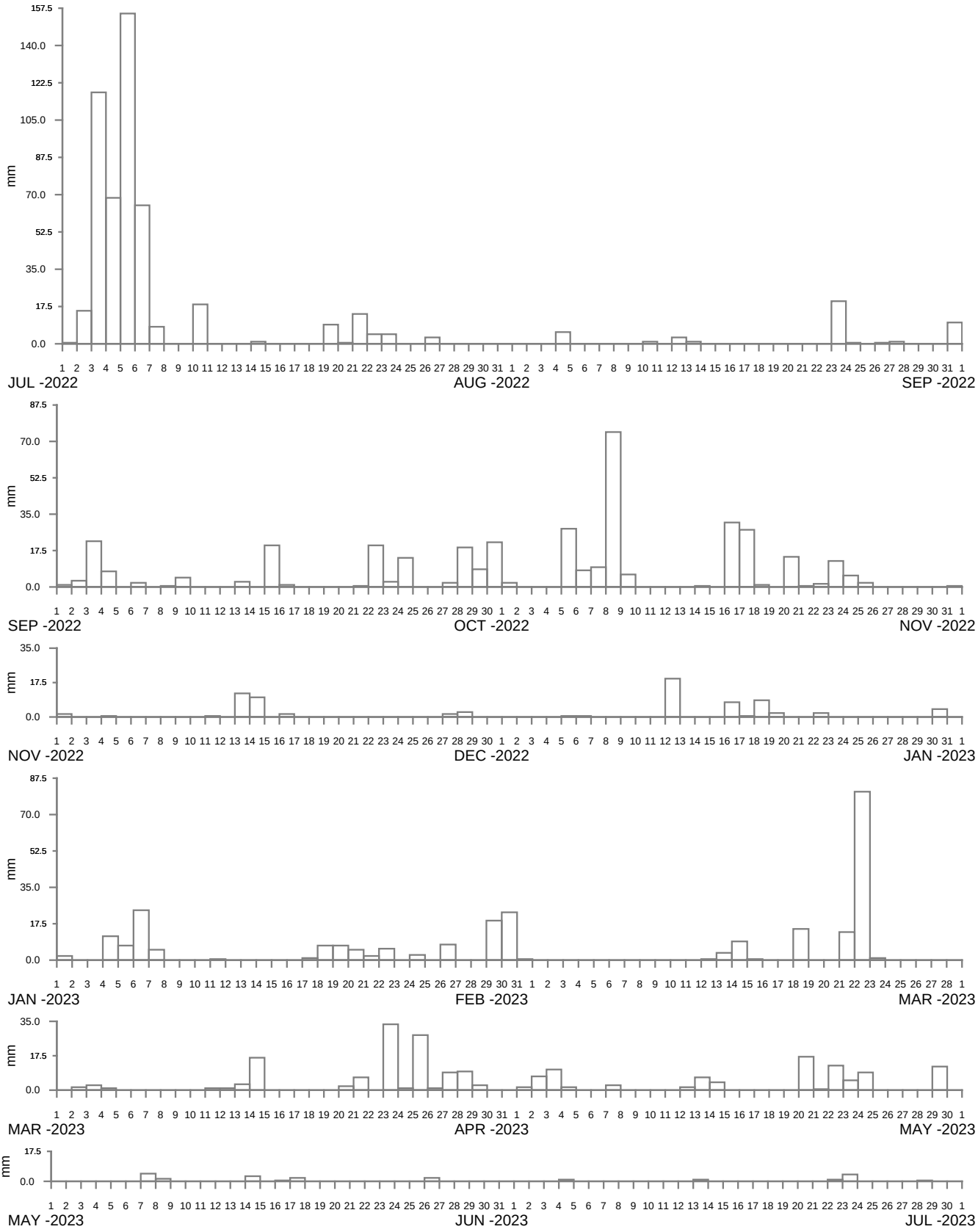


NSW GOVERNMENT

RAINFALL STATION LOCATIONS MACQUARIE-TUGGERAH LAKES (SOUTH) AND BRISBANE WATER REGIONS

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-44



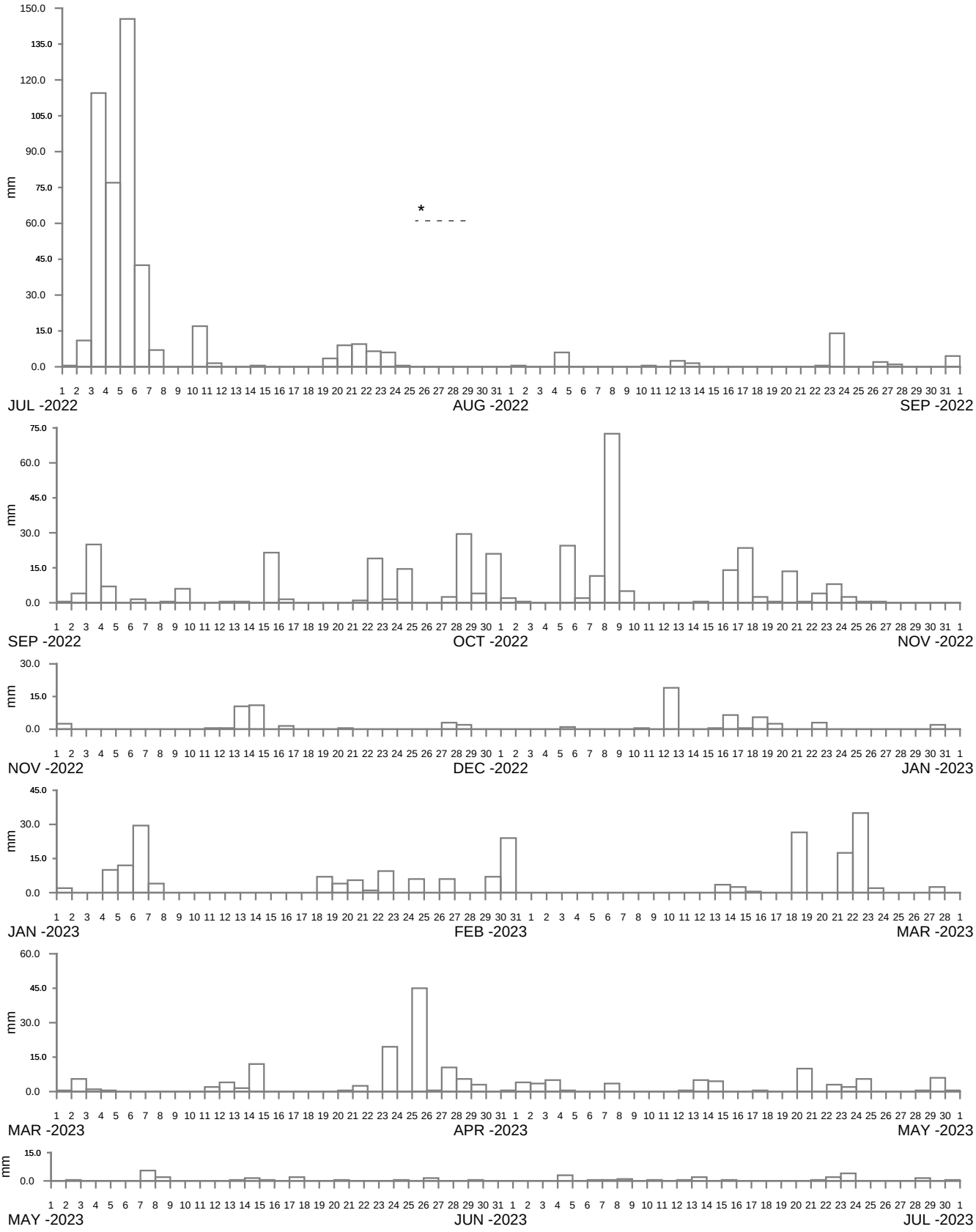
---------- DATA LOSS

NSW GOVERNMENT

WHITEMANS RIDGE AT WATAGANS FOREST DR 2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-45



* - - - - -

- - - - - - - - - - - DATA LOSS

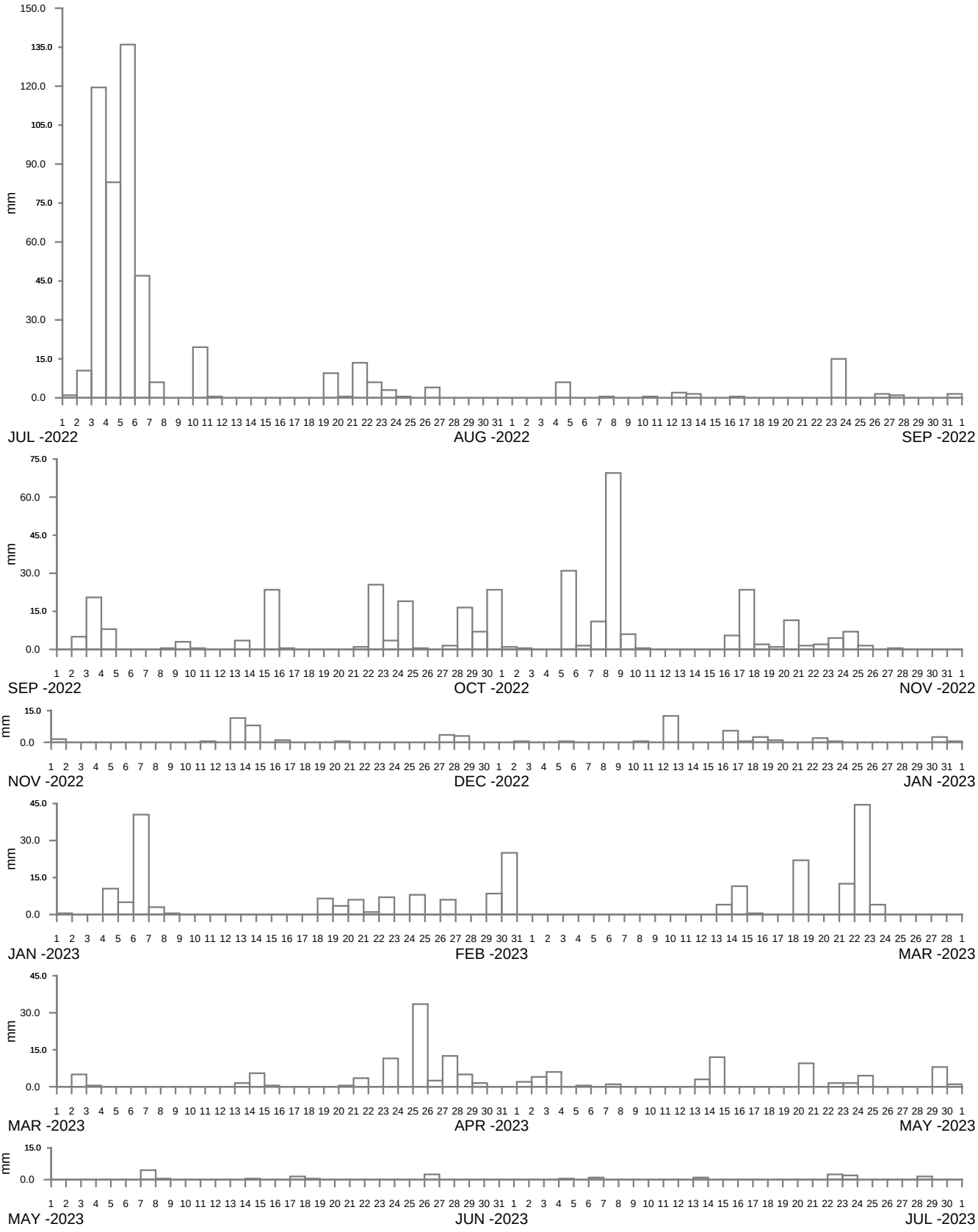
*Data loss due to rain gauge blockage

NSW GOVERNMENT

YARRAMALONG AT BUMBLE HILL ROAD
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-46



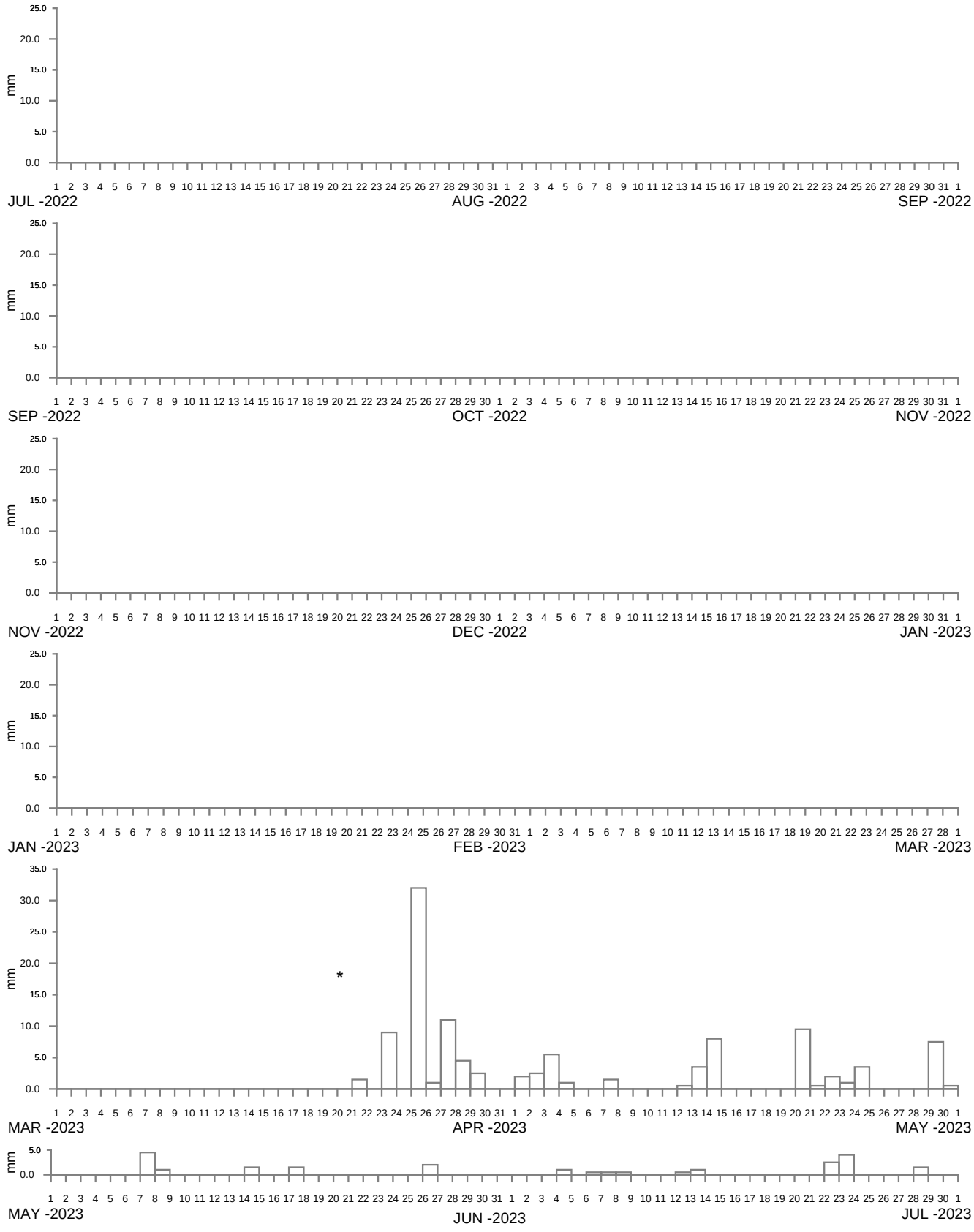
---------- DATA LOSS

NSW GOVERNMENT

KULNURA AT GEORGE DOWNS DRIVE
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-47



---------- DATA LOSS

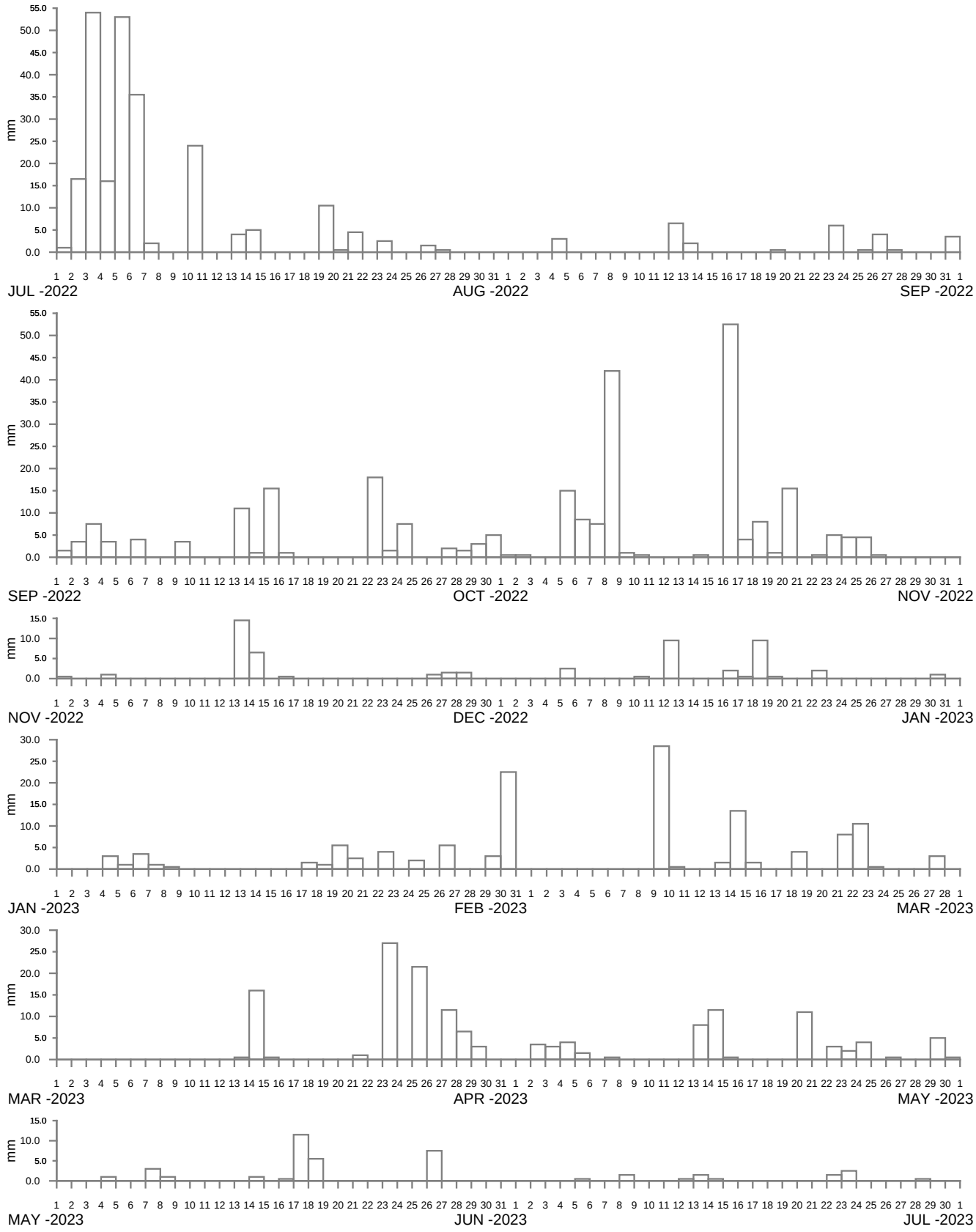
*Station commissioning 21 March 2023

NSW GOVERNMENT

KULNURA AT PIONEER PARK
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-48



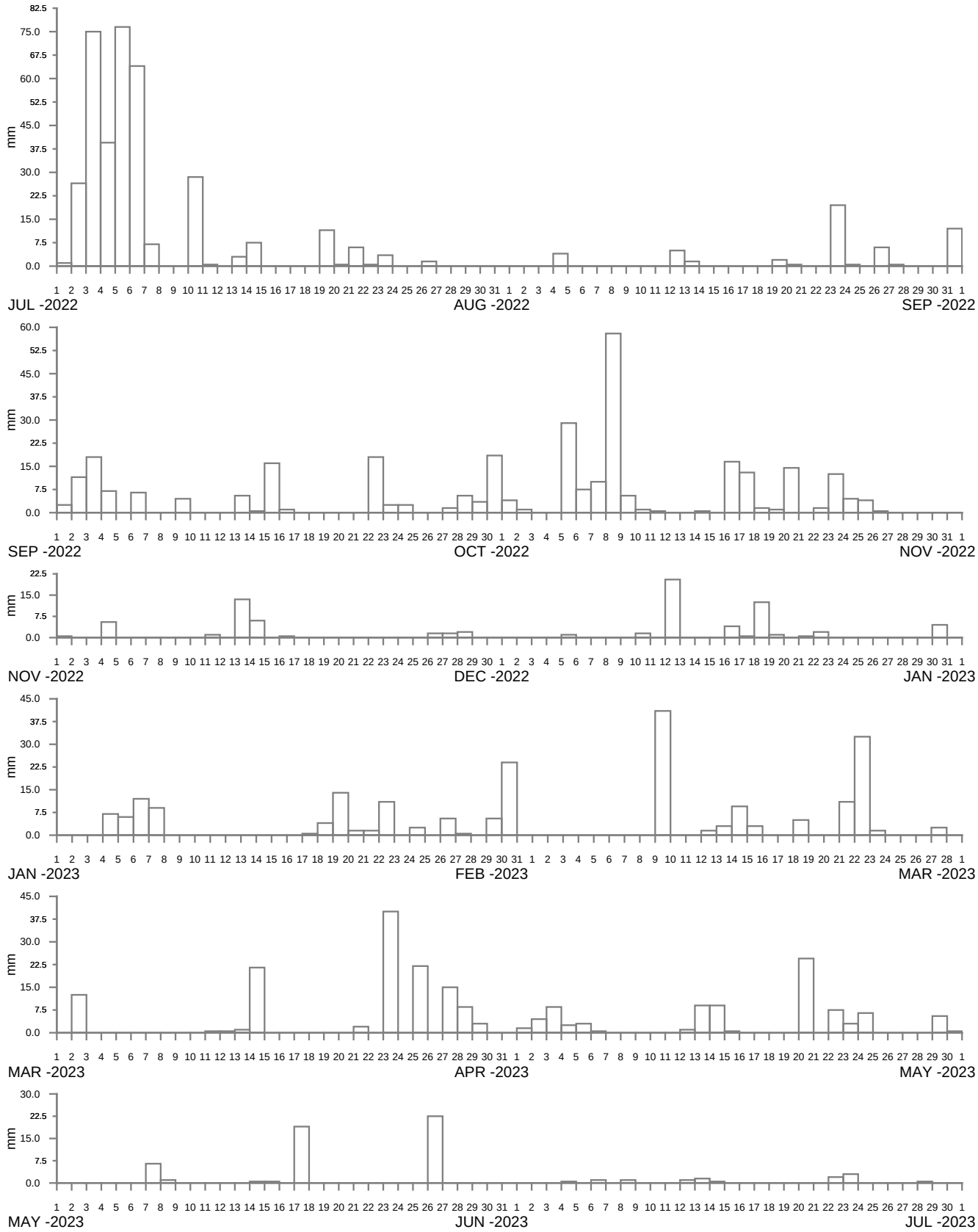
---------- DATA LOSS

NSW GOVERNMENT

TUGGERAH LAKE AT TOUKLEY
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-49



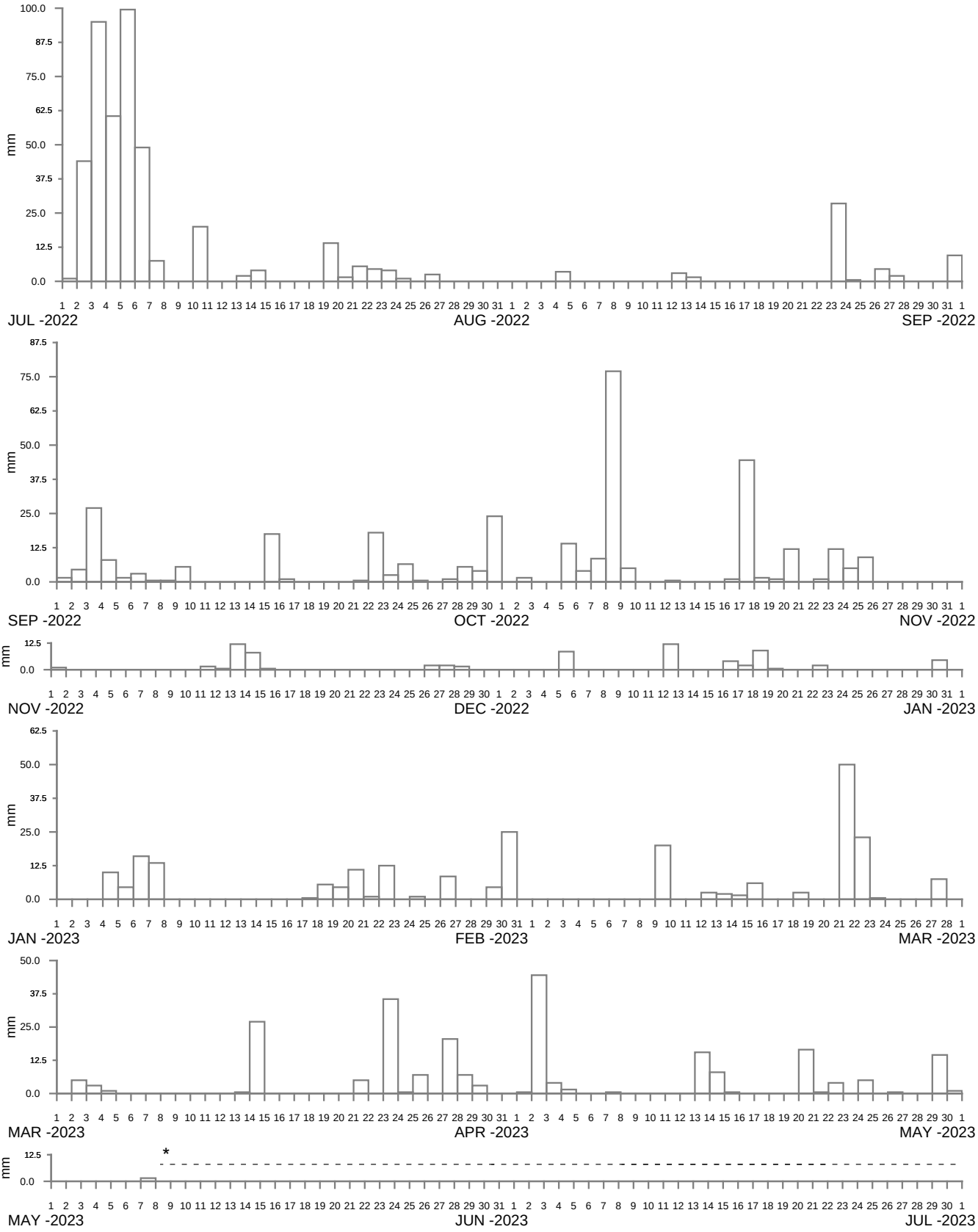
---------- DATA LOSS

NSW GOVERNMENT

HAMLYN TERRACE AT WARNERVALE ROAD
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-50



DATA LOSS

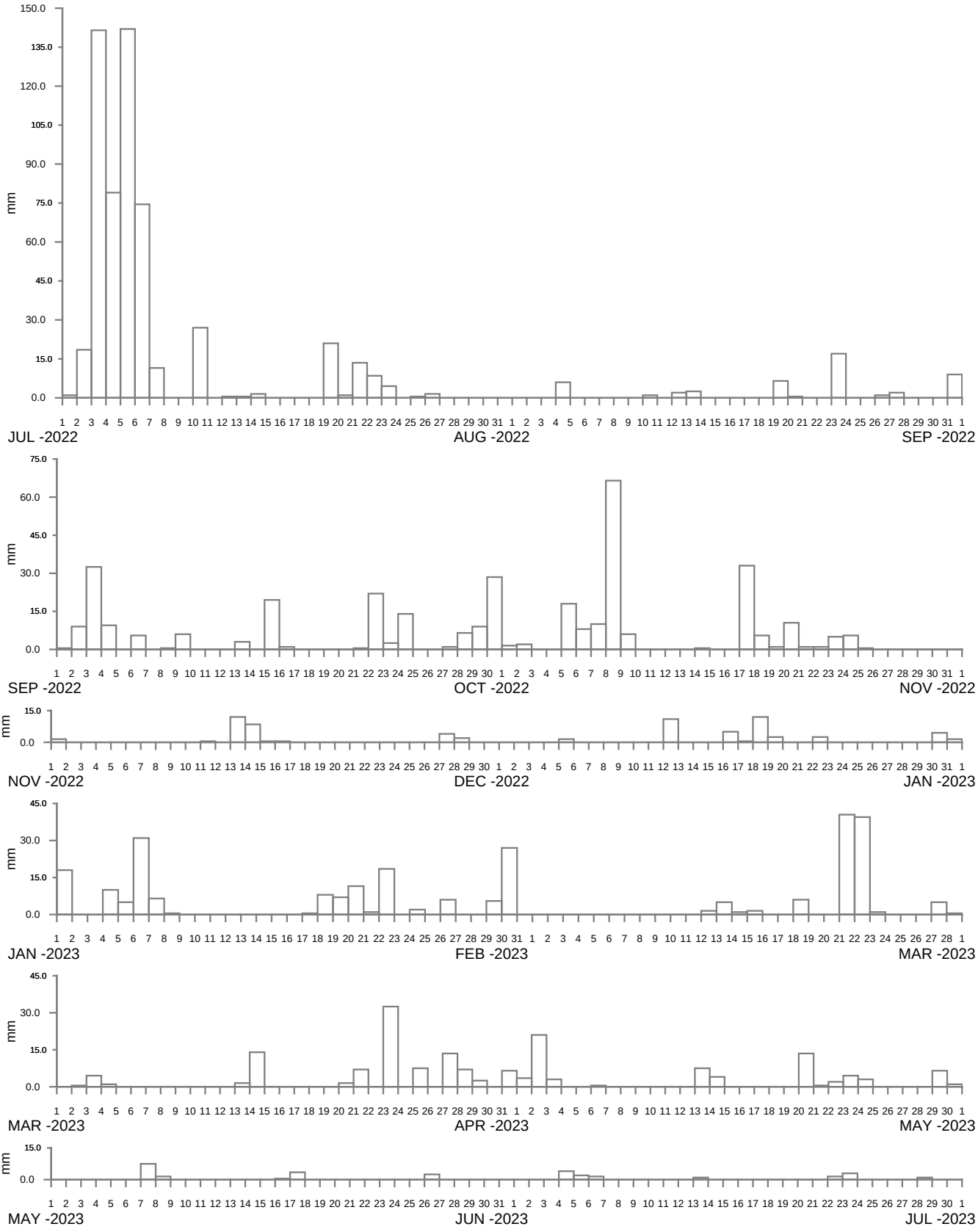
*Data loss due to rain gauge blockage

NSW GOVERNMENT

MARDI DAM AT OLD MAITLAND ROAD
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-51



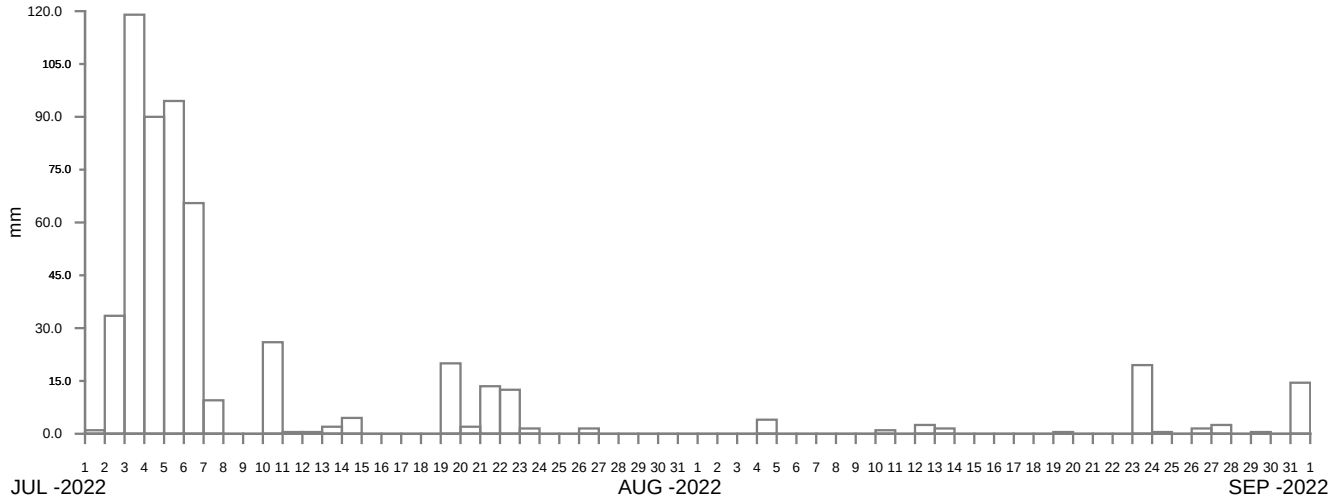
---------- DATA LOSS

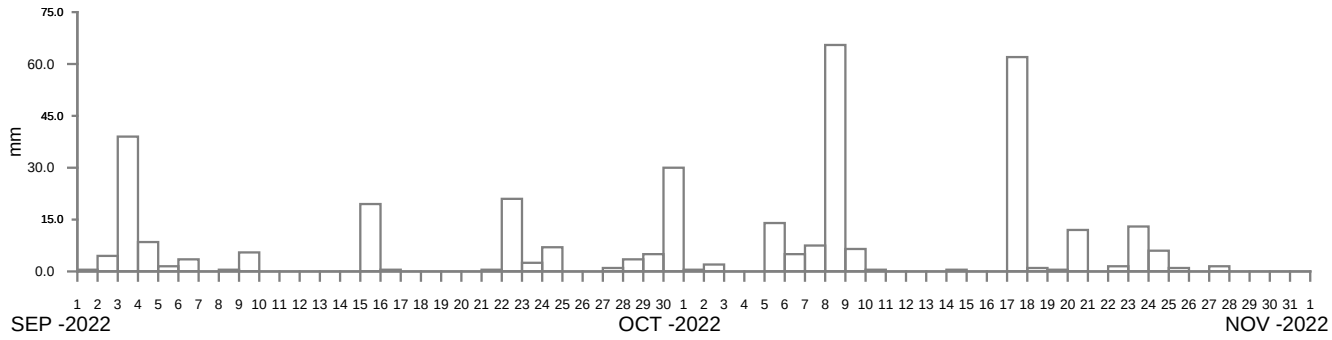
NSW GOVERNMENT

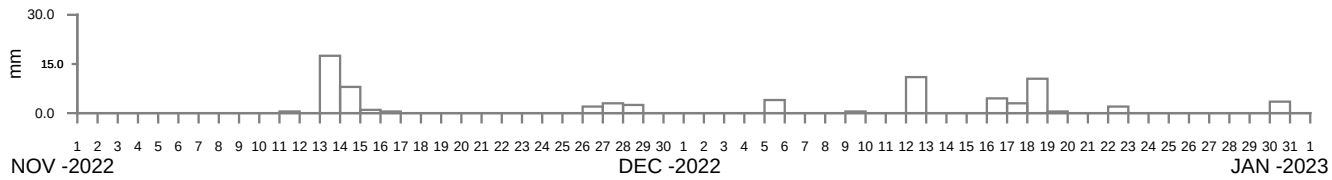
STERLAND AT RED HILL FOREST ROAD
2022–23

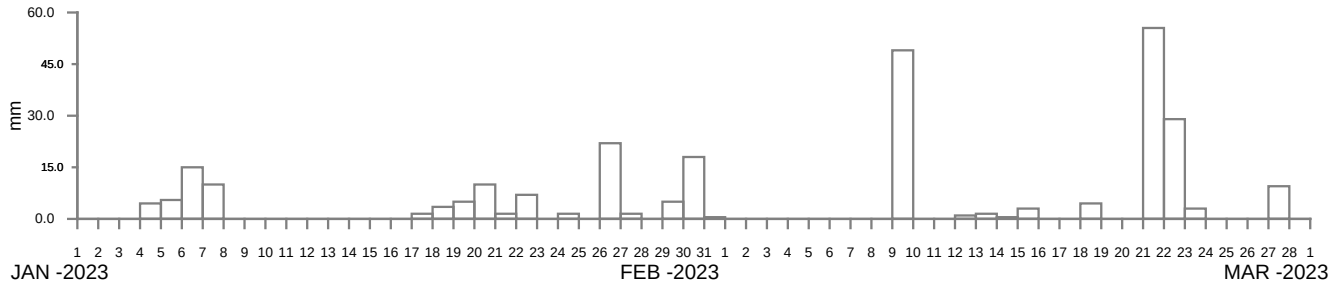
Manly Hydraulics Laboratory

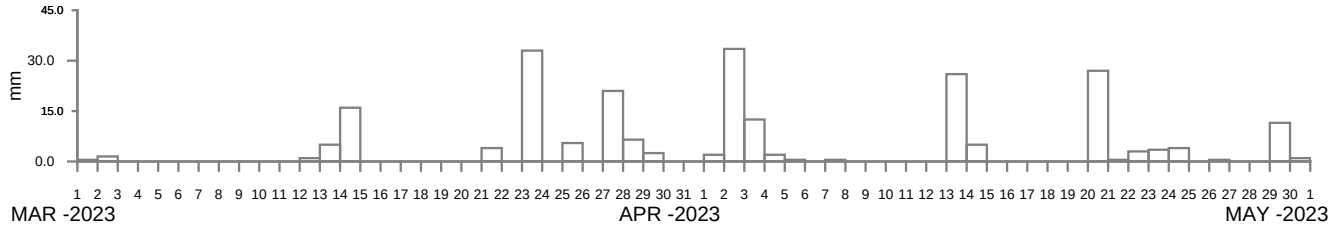
Report MHL2996
Figure
4-52

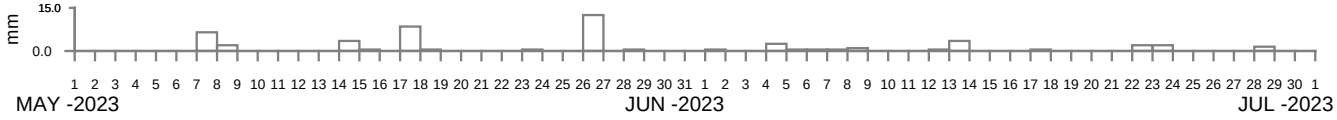












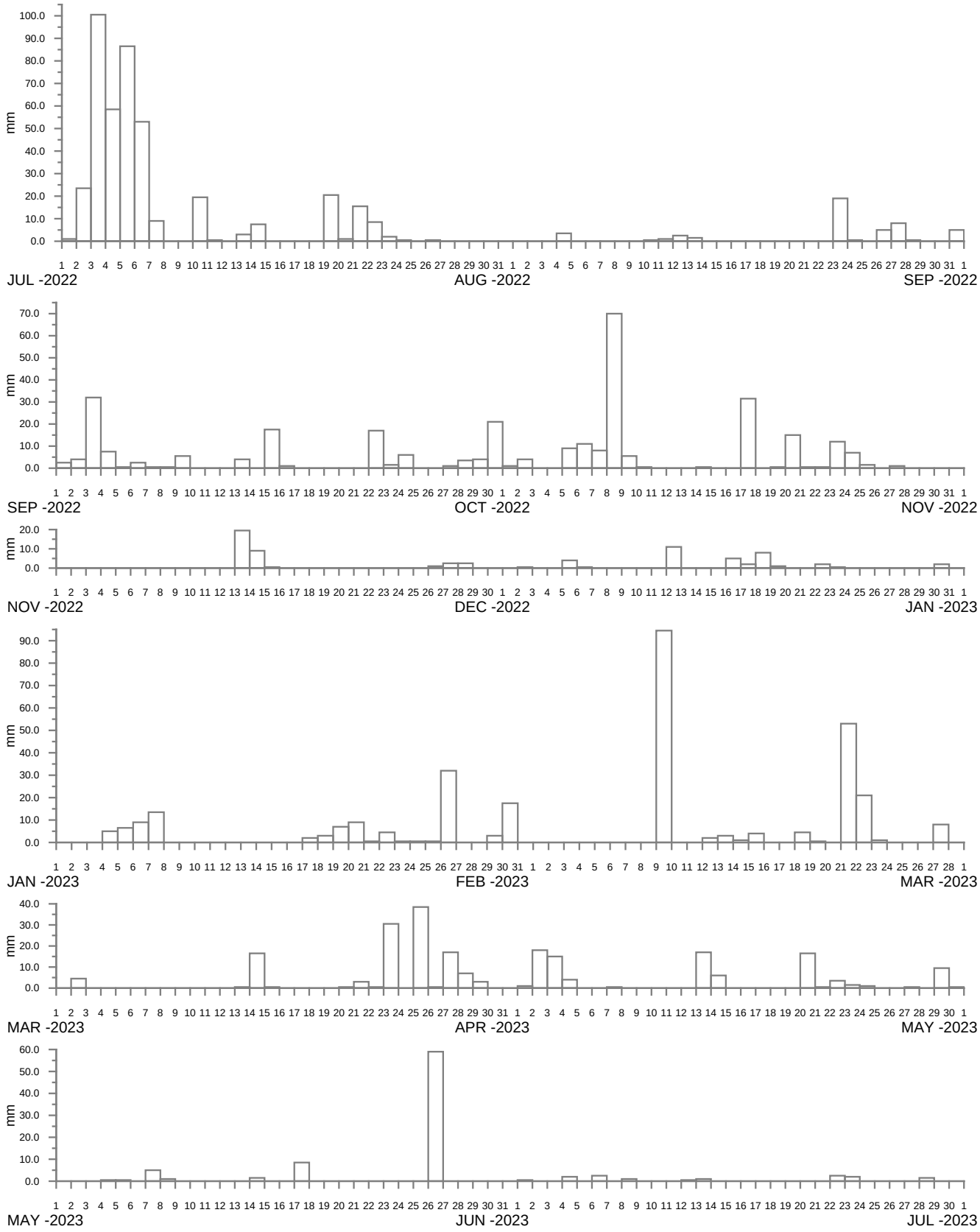
---------- DATA LOSS

NSW GOVERNMENT

KANGY ANGY AT ORCHARD ROAD
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-53



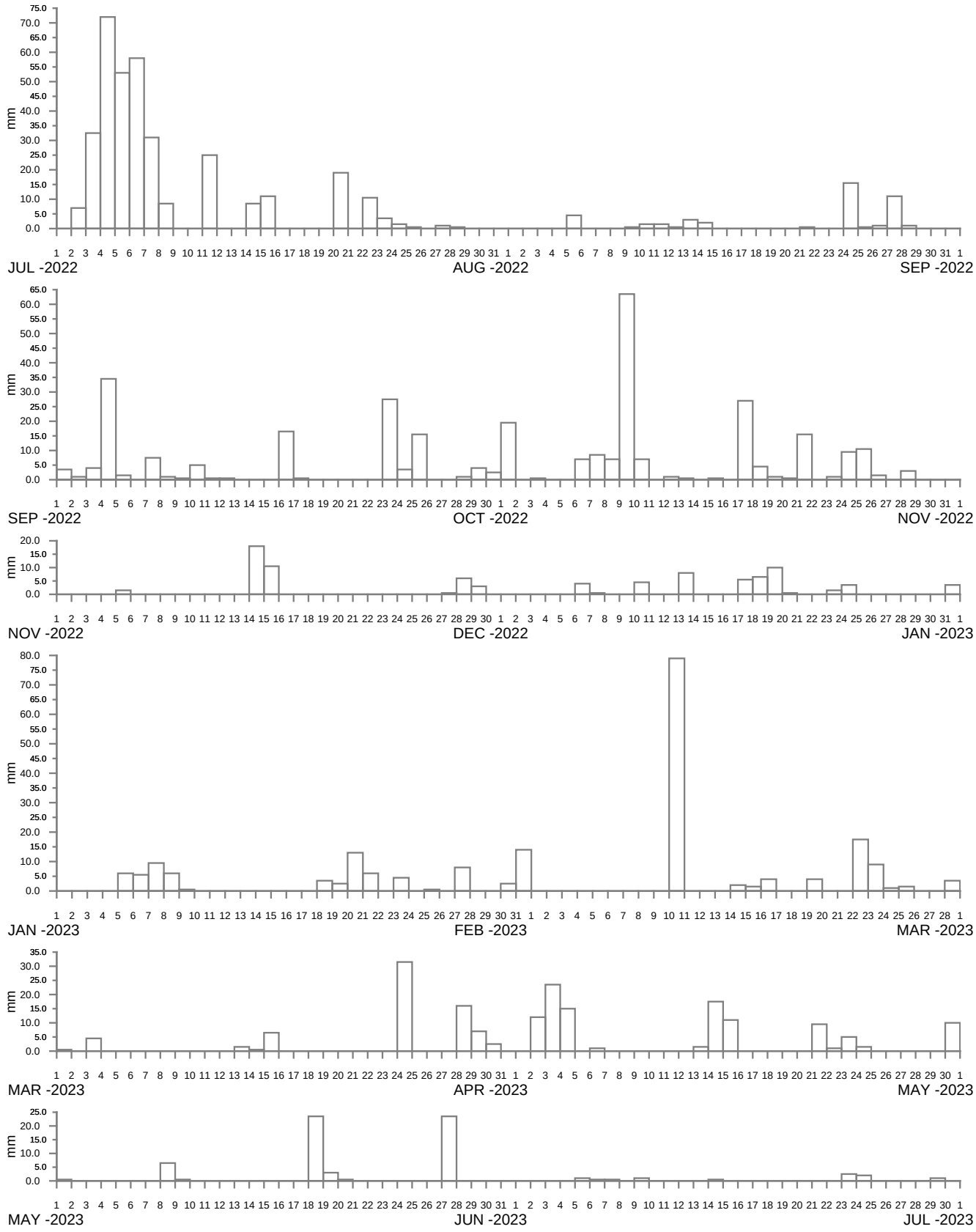
---------- DATA LOSS

NSW GOVERNMENT

BERKELEY VALE AT BERKELEY VALE ROAD
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-54



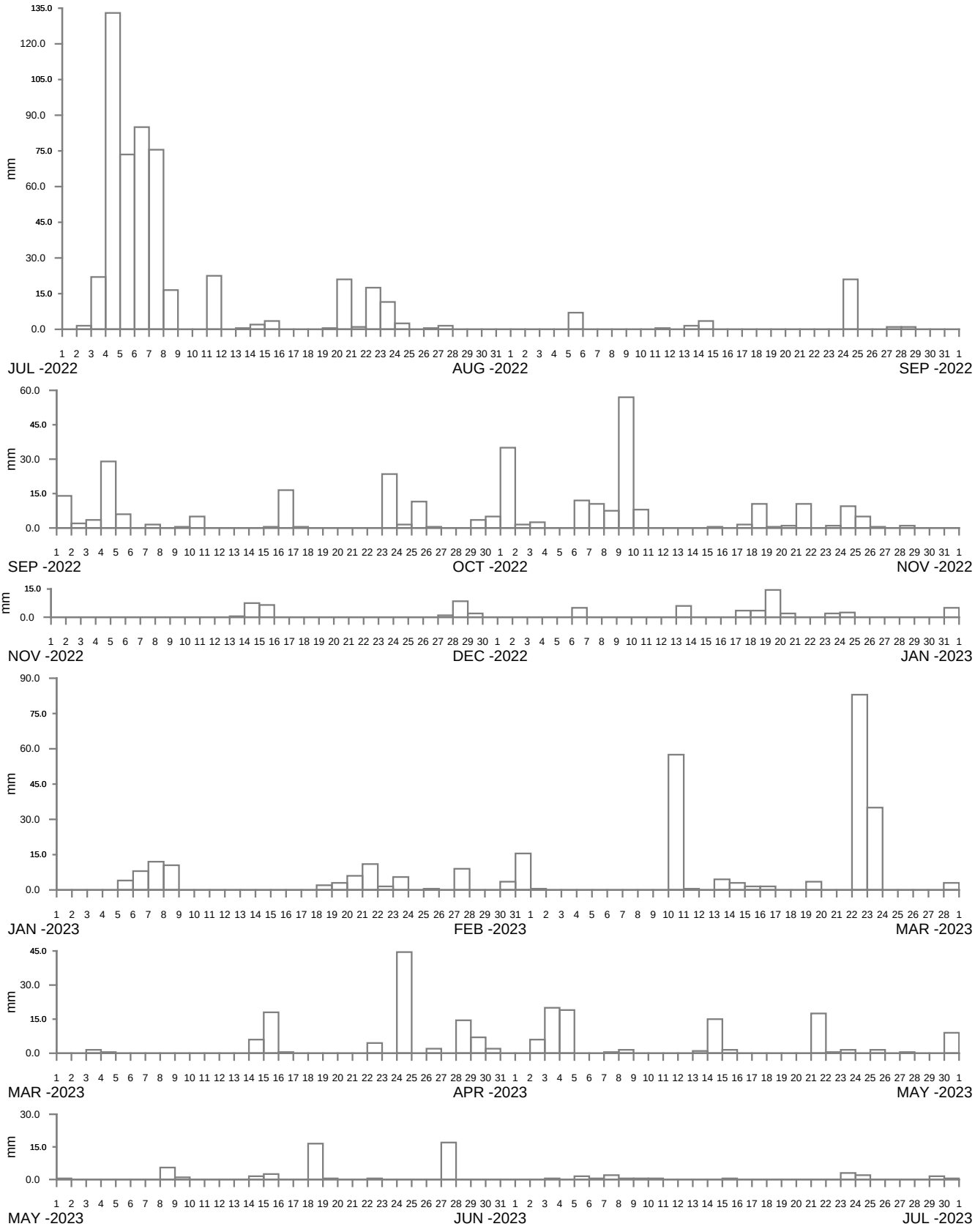
---------- DATA LOSS

NSW GOVERNMENT

BATEAU BAY AT SEWAGE TREATMENT WORKS 2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-55



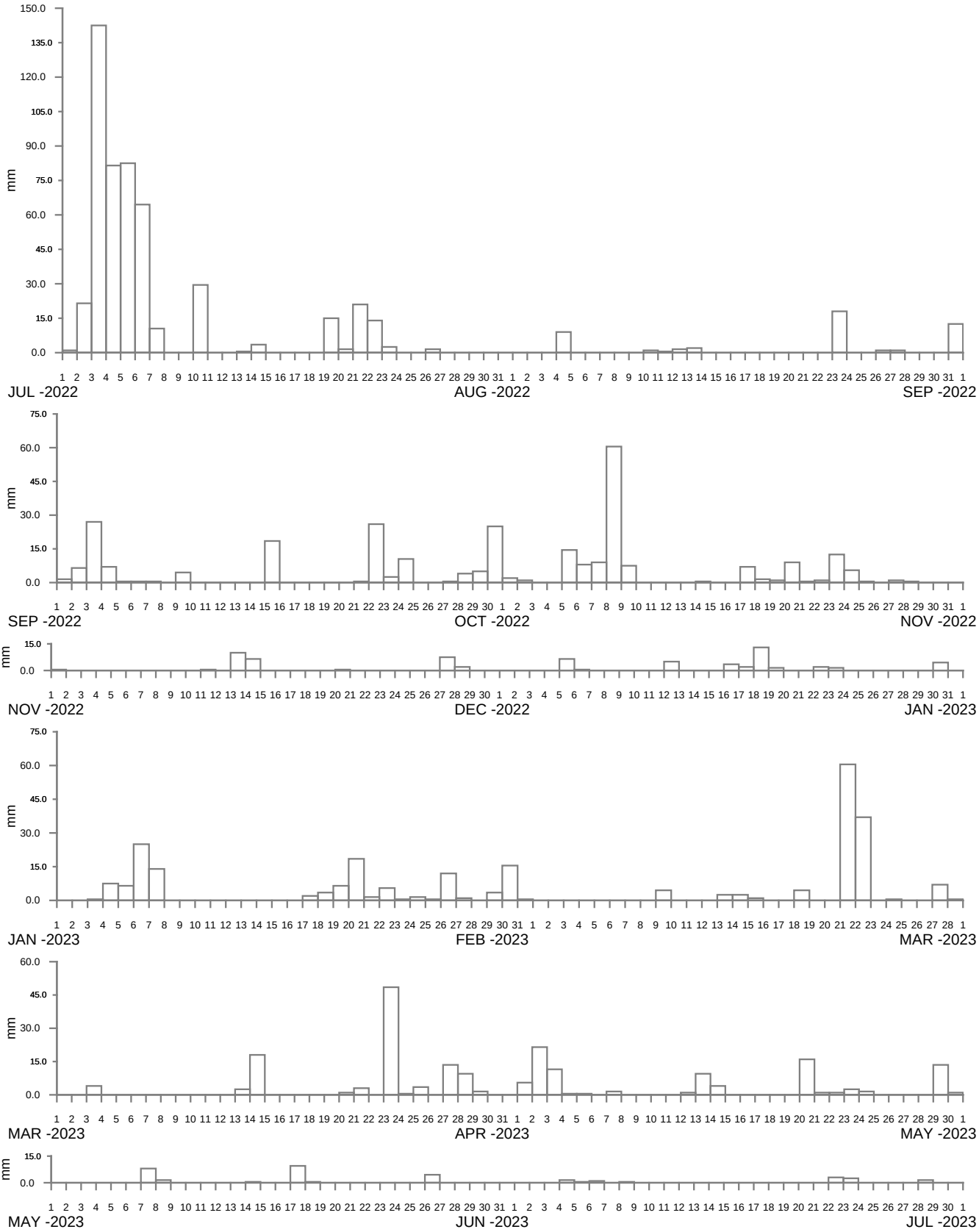
---------- DATA LOSS

NSW GOVERNMENT

LISAROW AT FAGANS ROAD
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-56



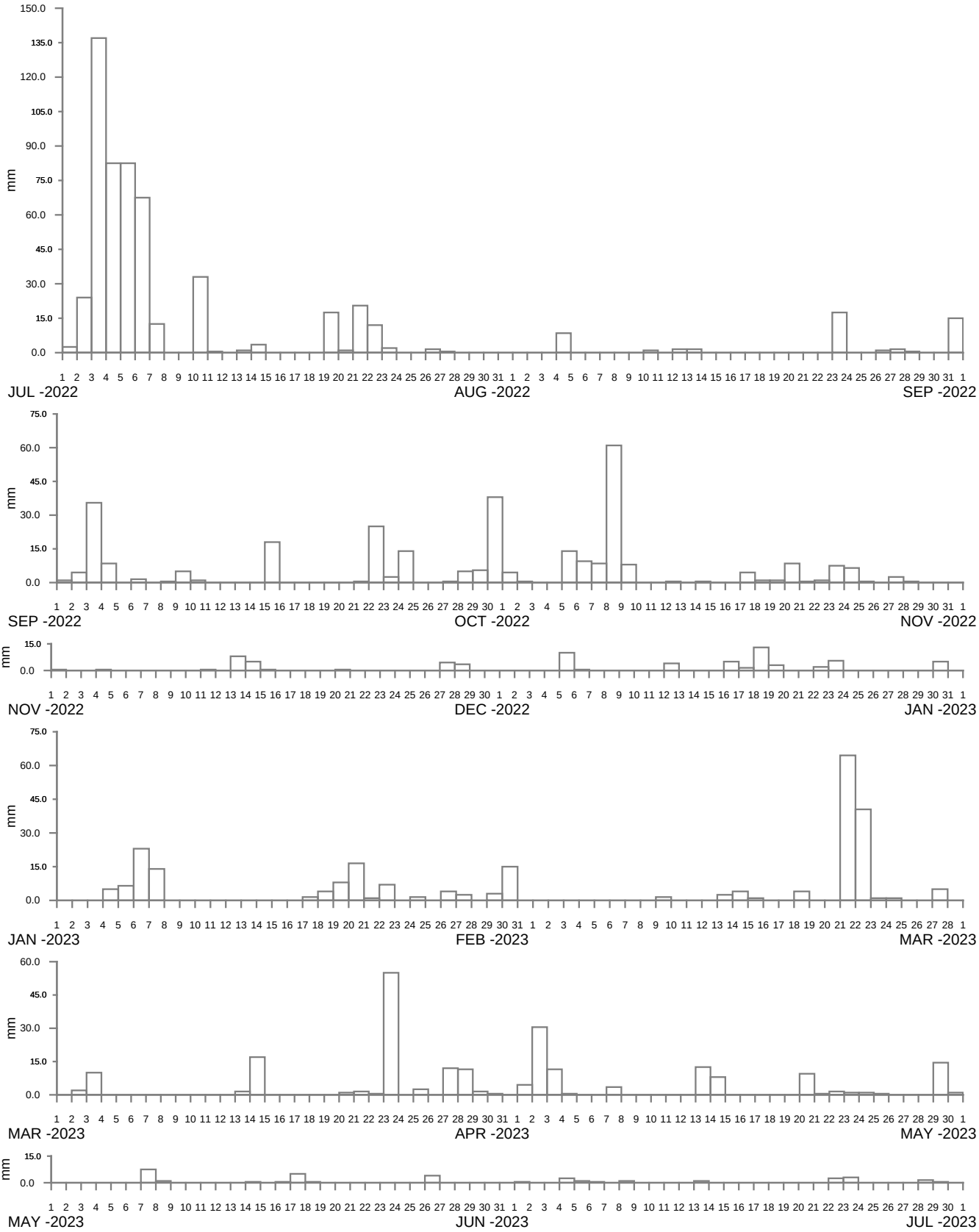
---------- DATA LOSS

NSW GOVERNMENT

STRICKLAND AT MANGROVE ROAD
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-57



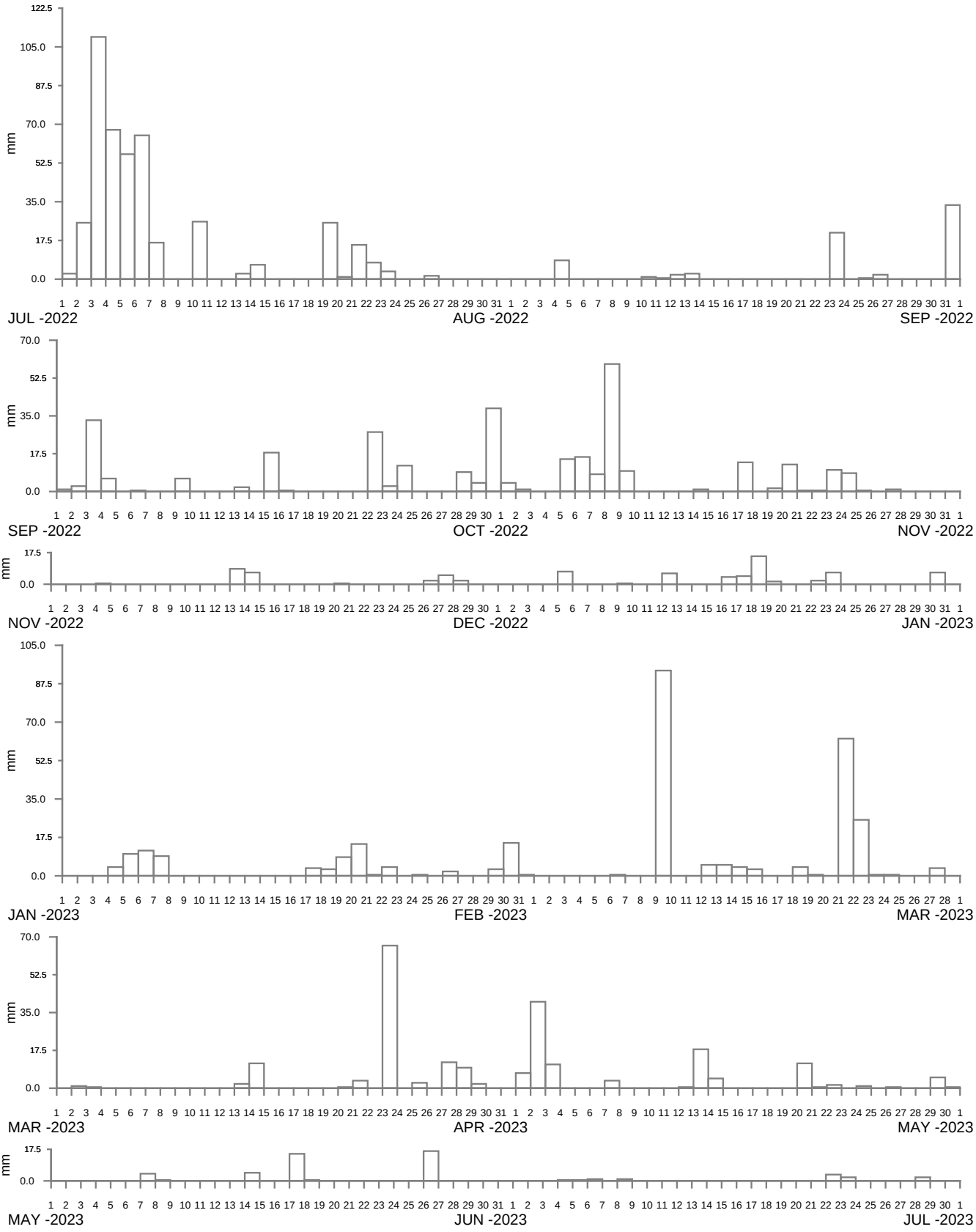
---------- DATA LOSS

NSW GOVERNMENT

NARARA AT RESEARCH ROAD
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-58



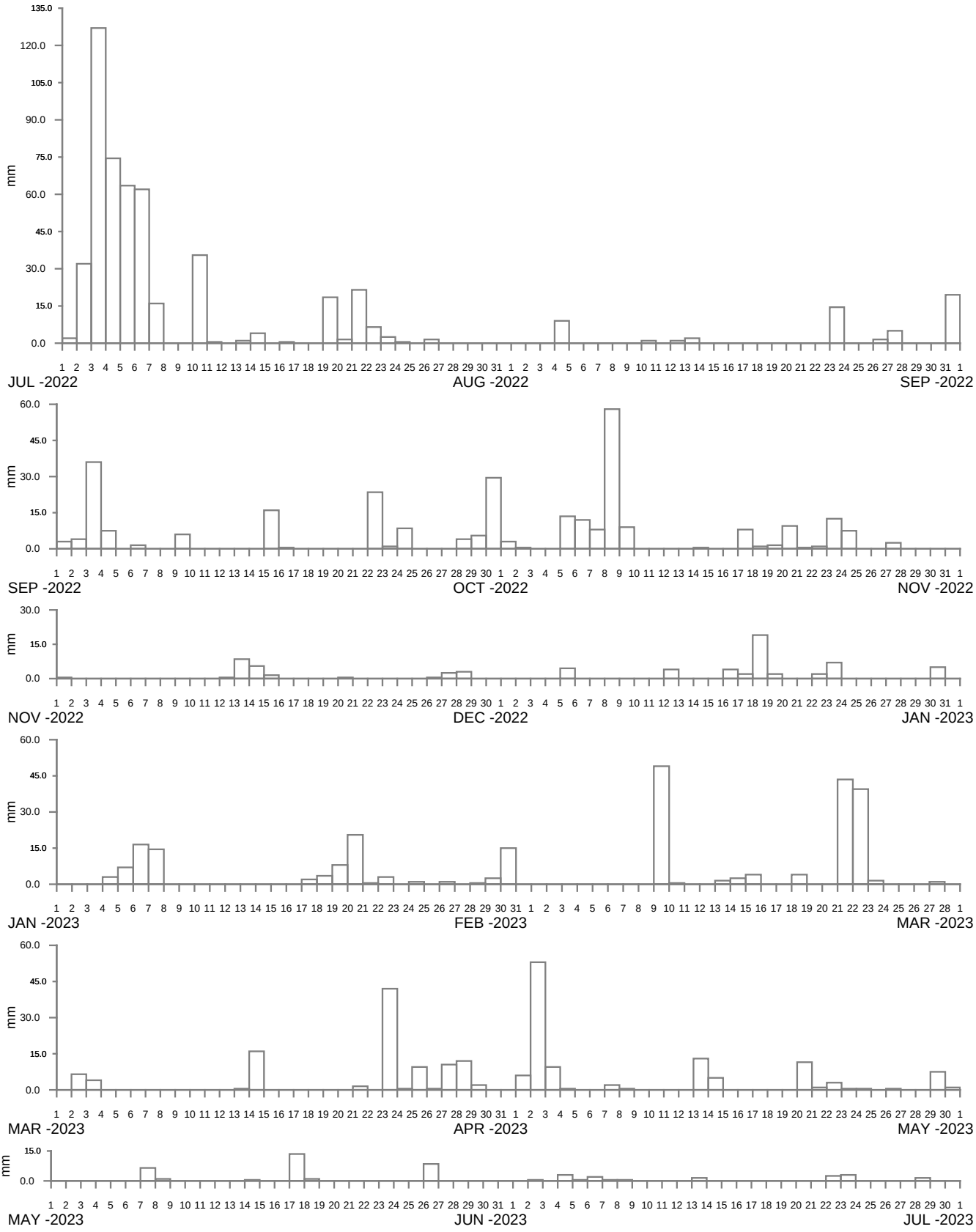
---------- DATA LOSS

NSW GOVERNMENT

MOUNT ELLIOT AT TOOMEYS ROAD
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-59



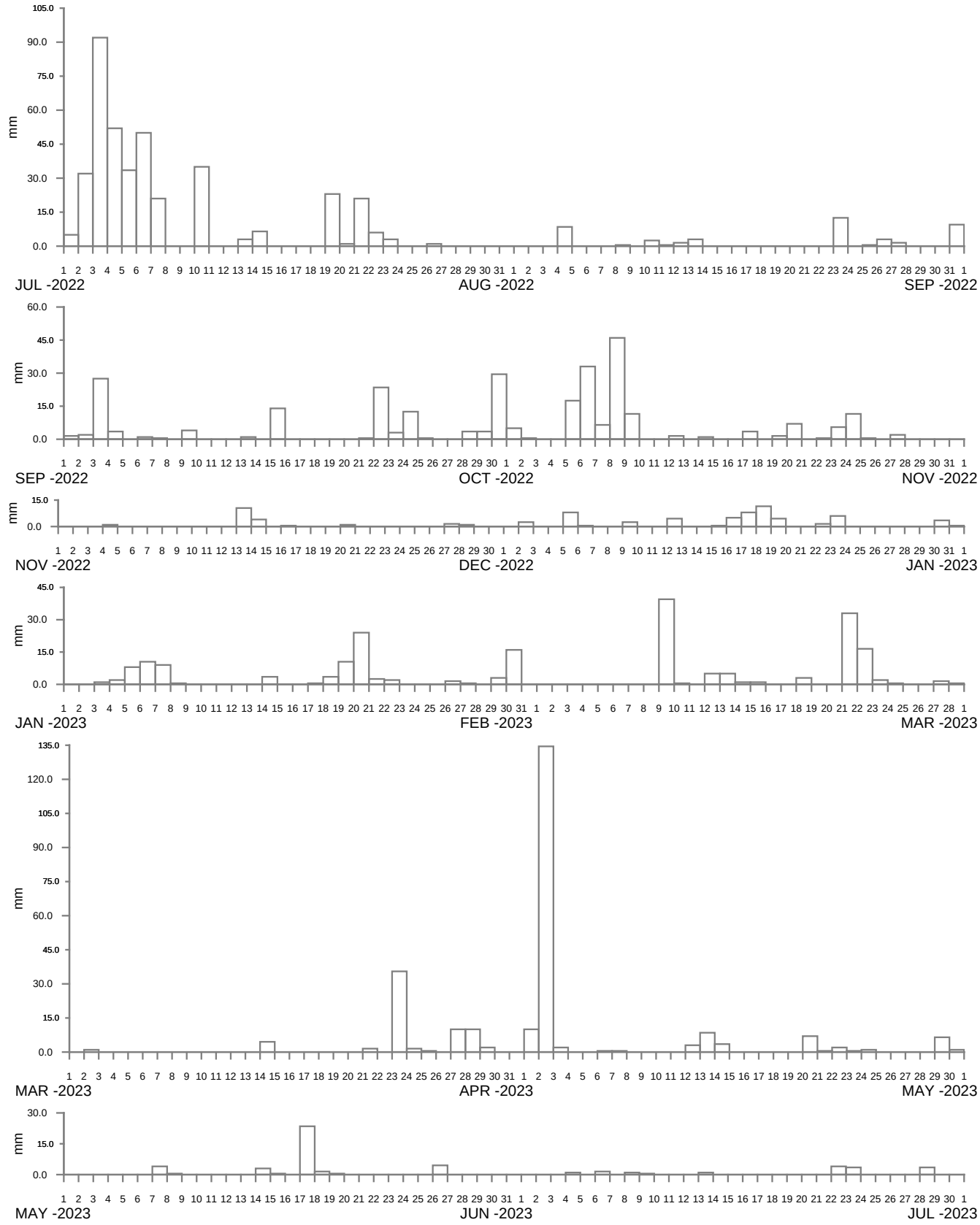
---------- DATA LOSS

NSW GOVERNMENT

WYOMING AT LAYCOCK STREET
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-60



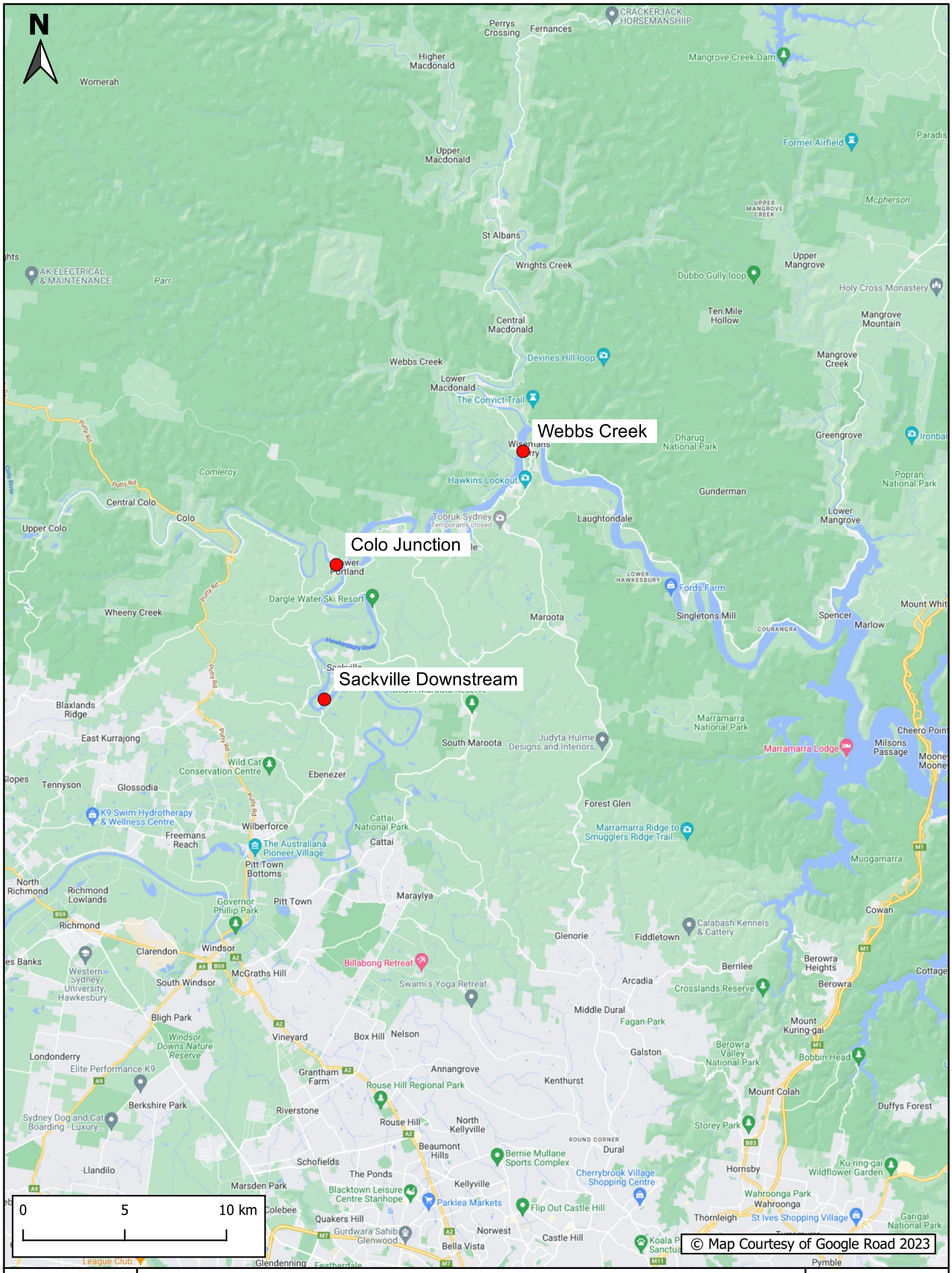
---------- DATA LOSS

NSW GOVERNMENT

KINCUMBER AT DOYLE STREET
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-61

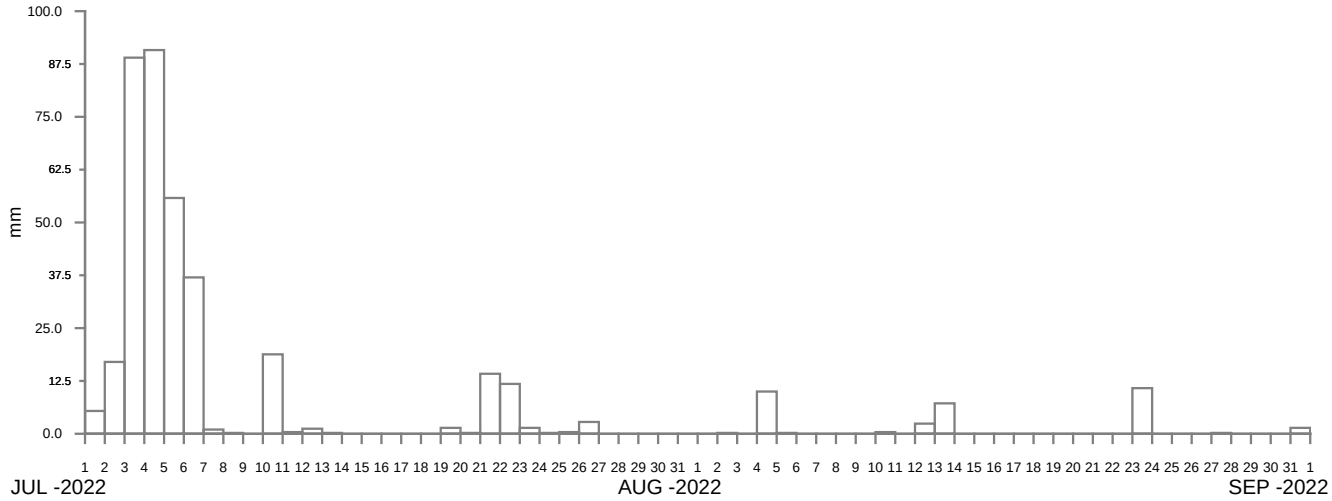


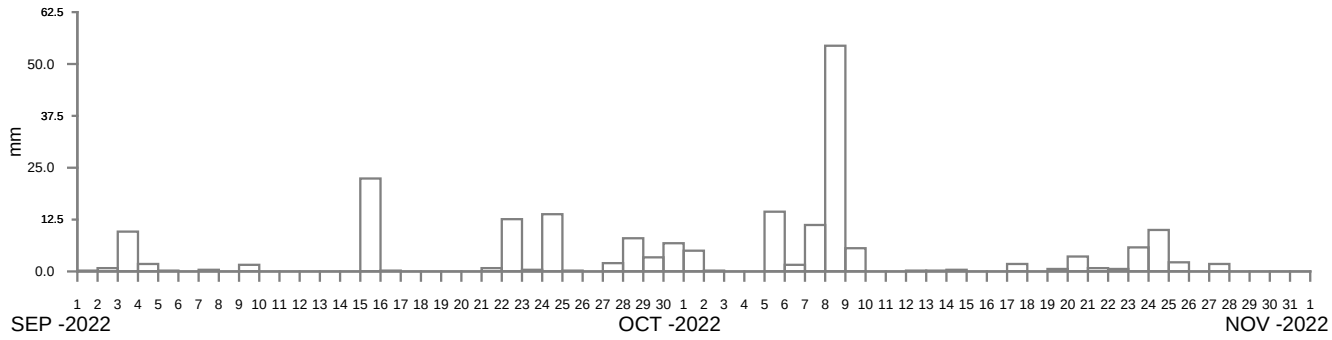
NSW GOVERNMENT

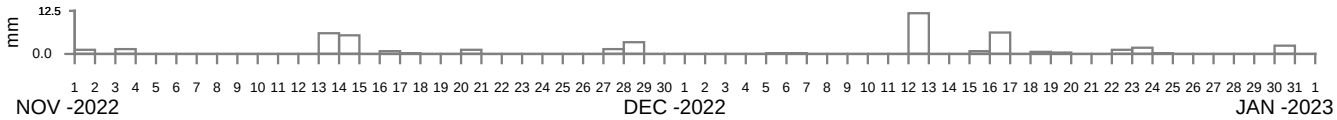
RAINFALL STATION LOCATIONS
HAWKESBURY RIVER REGION

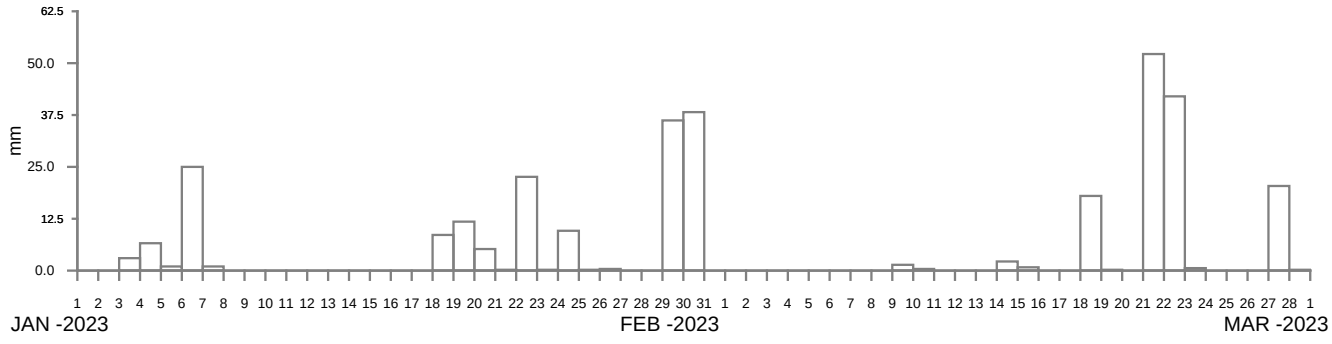
Manly Hydraulics Laboratory

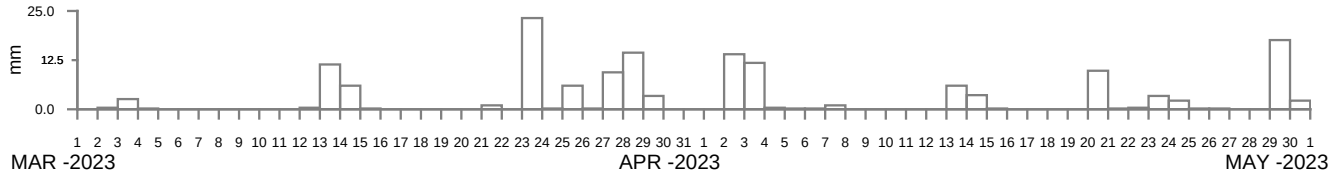
Report MHL2996
Figure
4-62

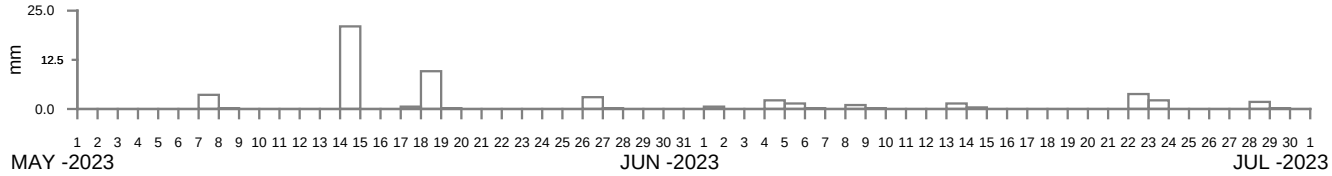












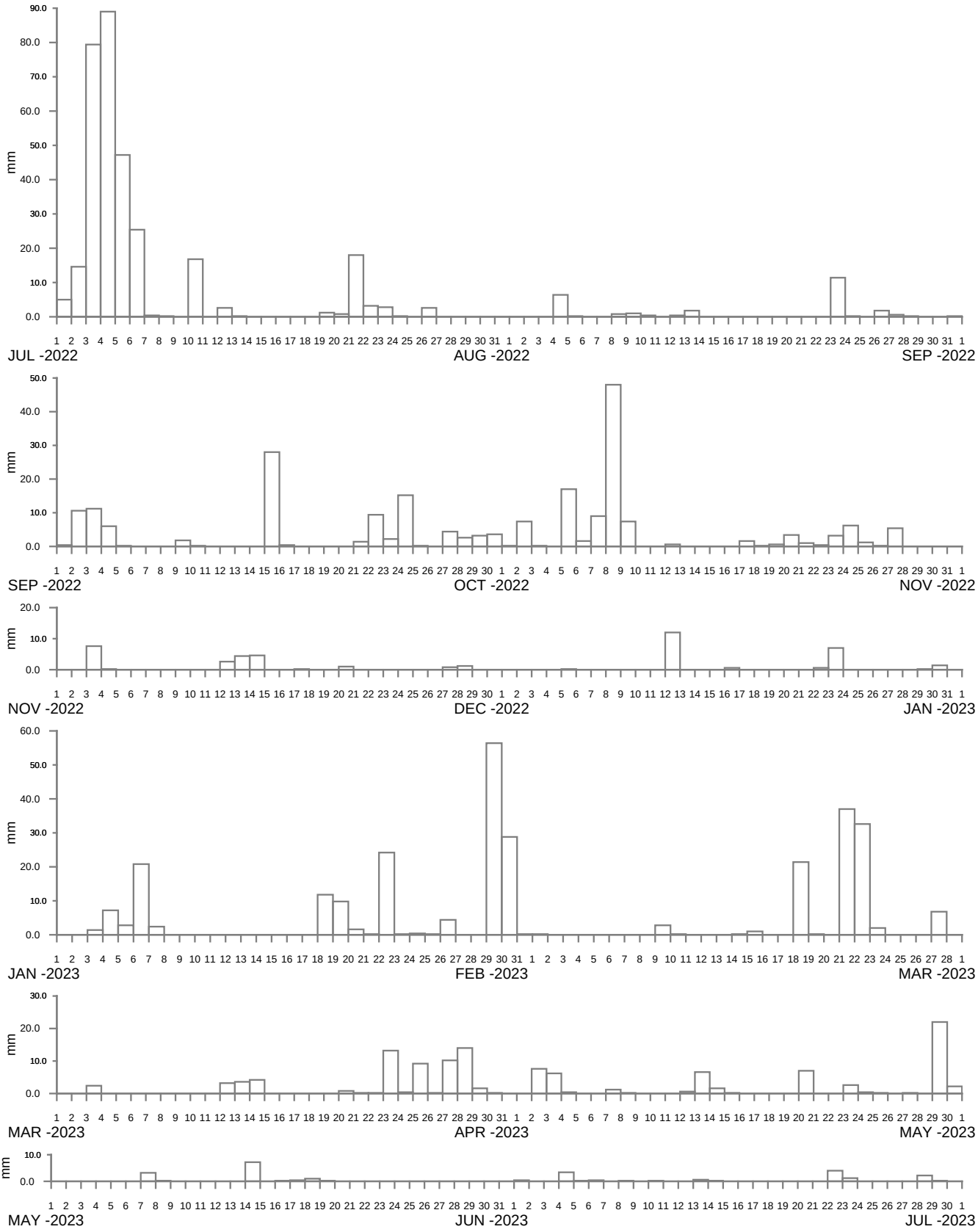
---------- DATA LOSS

NSW GOVERNMENT

WEBBS CREEK AT HAWKESBURY RIVER
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-63



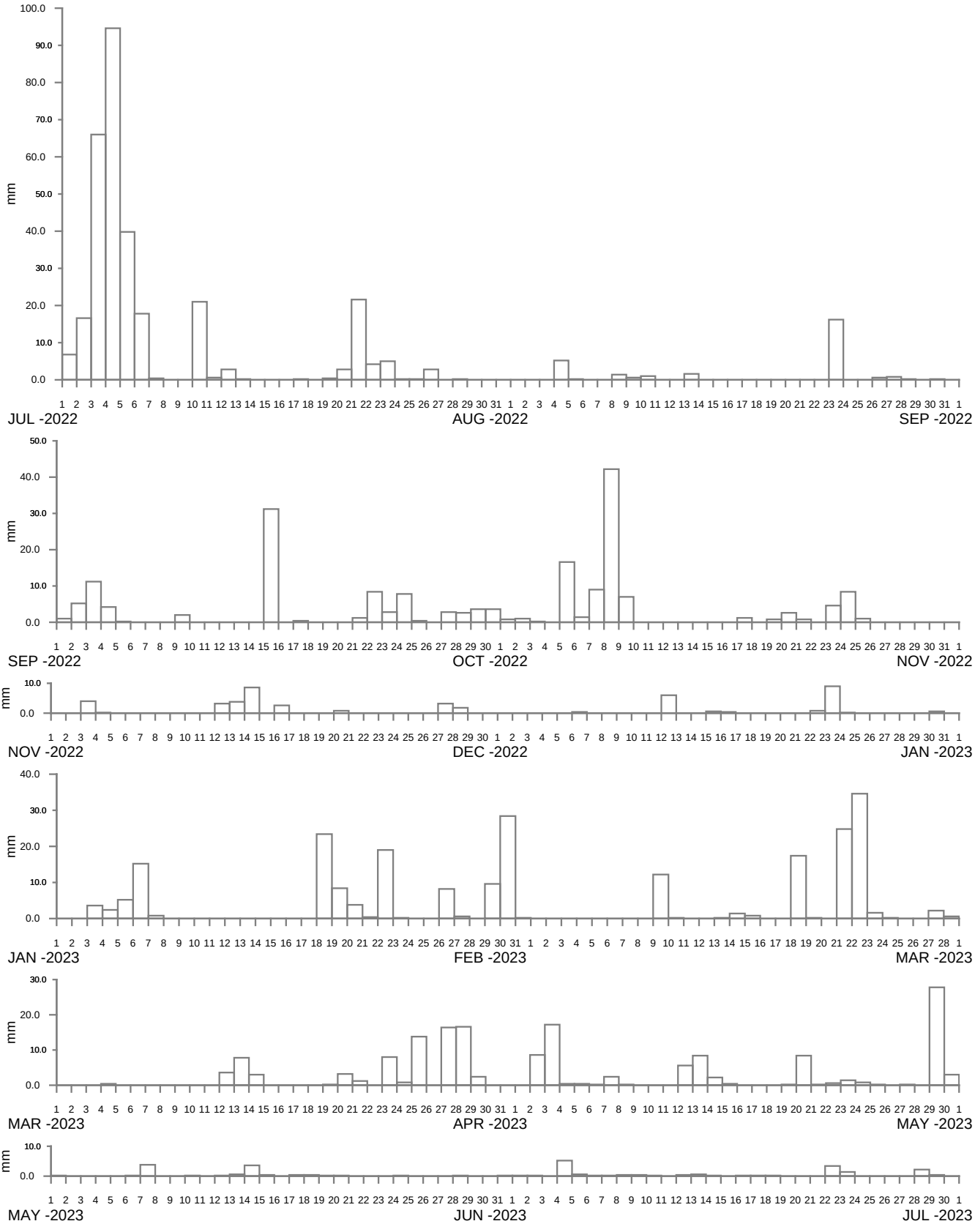
---------- DATA LOSS

NSW GOVERNMENT

COLO JUNCTION AT HAWKESBURY RIVER
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-64



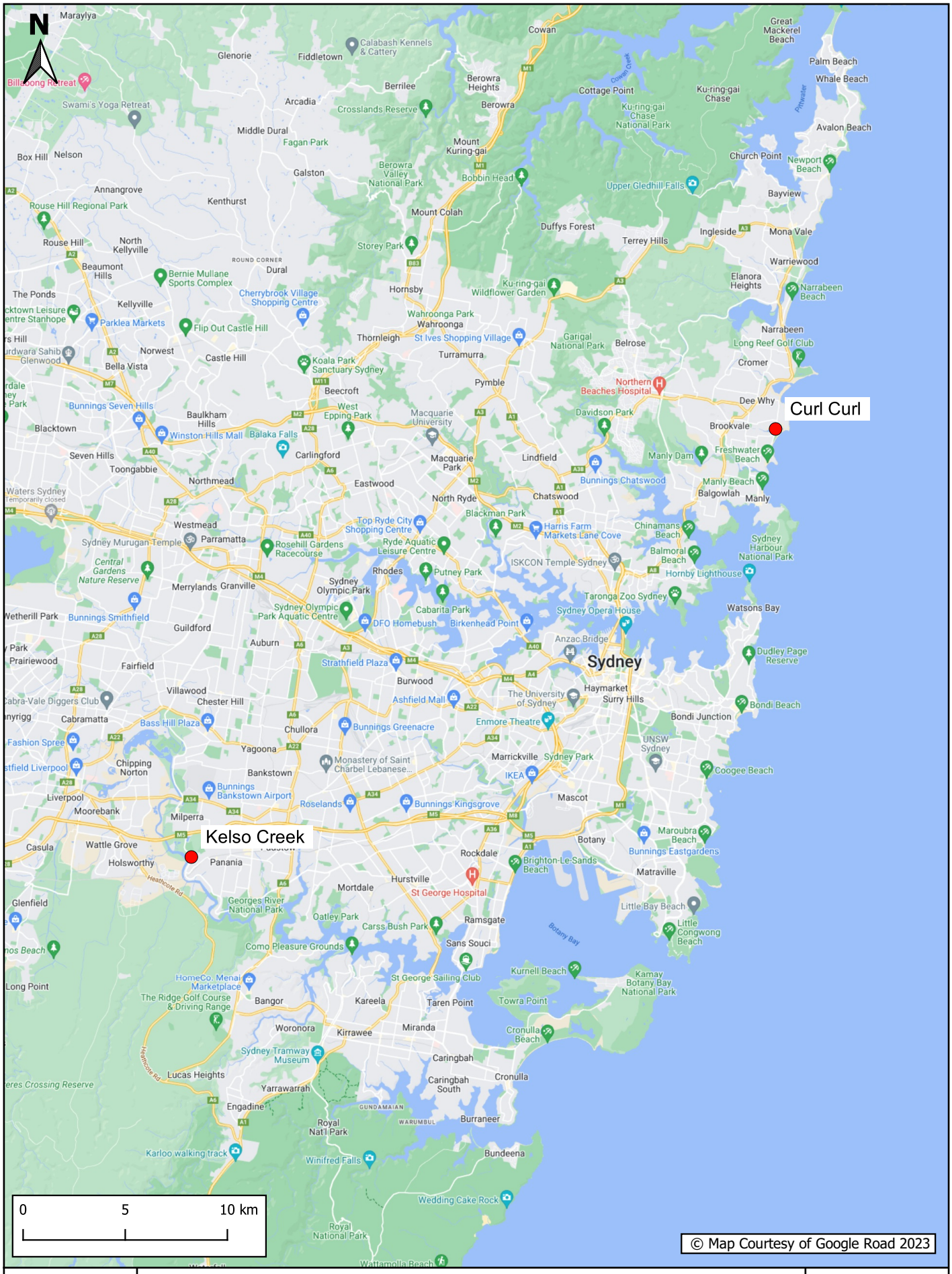
---------- DATA LOSS

NSW GOVERNMENT

SACKVILLE DOWNSTREAM AT HAWKESBURY RIVER 2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-65

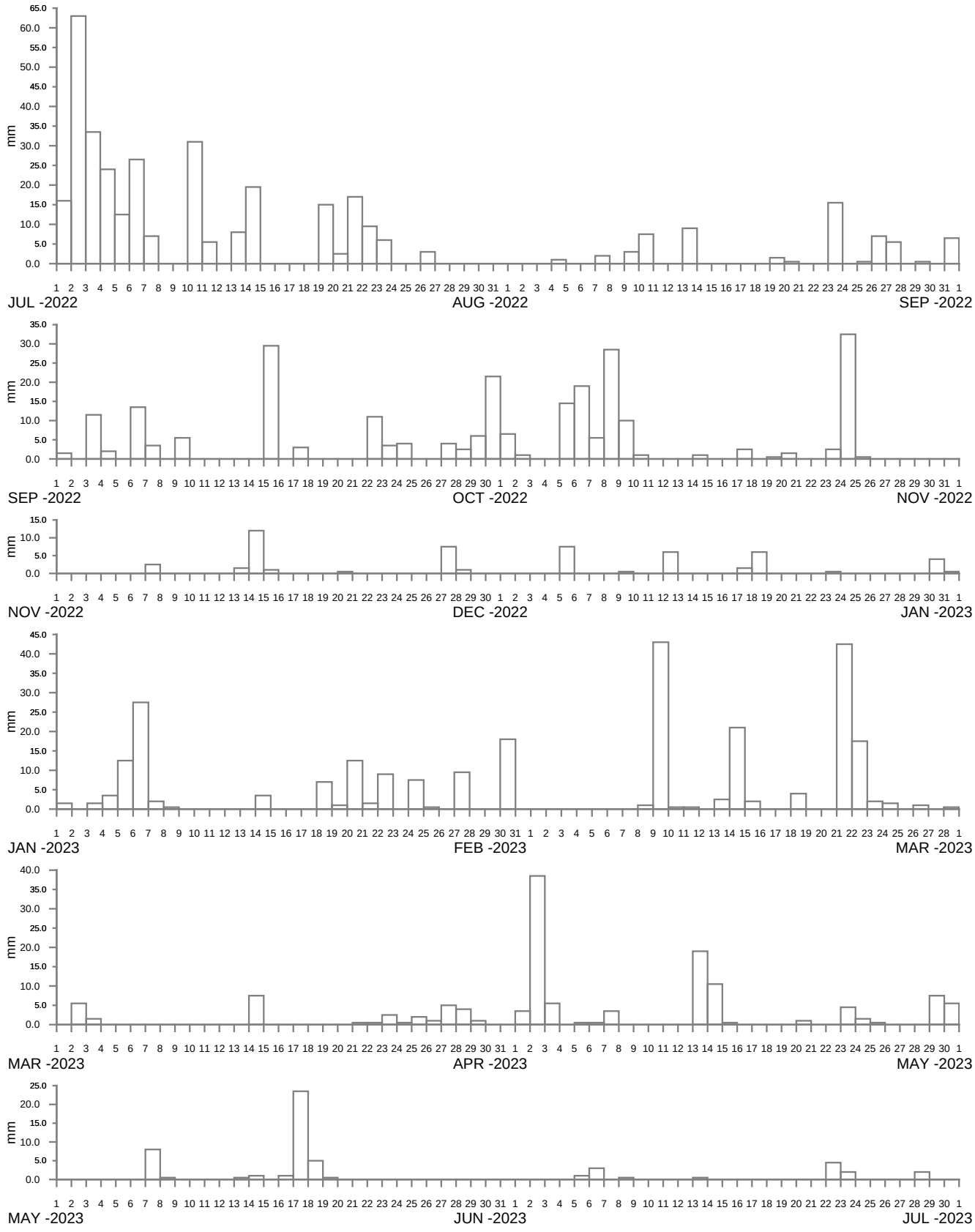


NSW GOVERNMENT

RAINFALL STATION LOCATIONS
SYDNEY COASTAL REGION

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-66



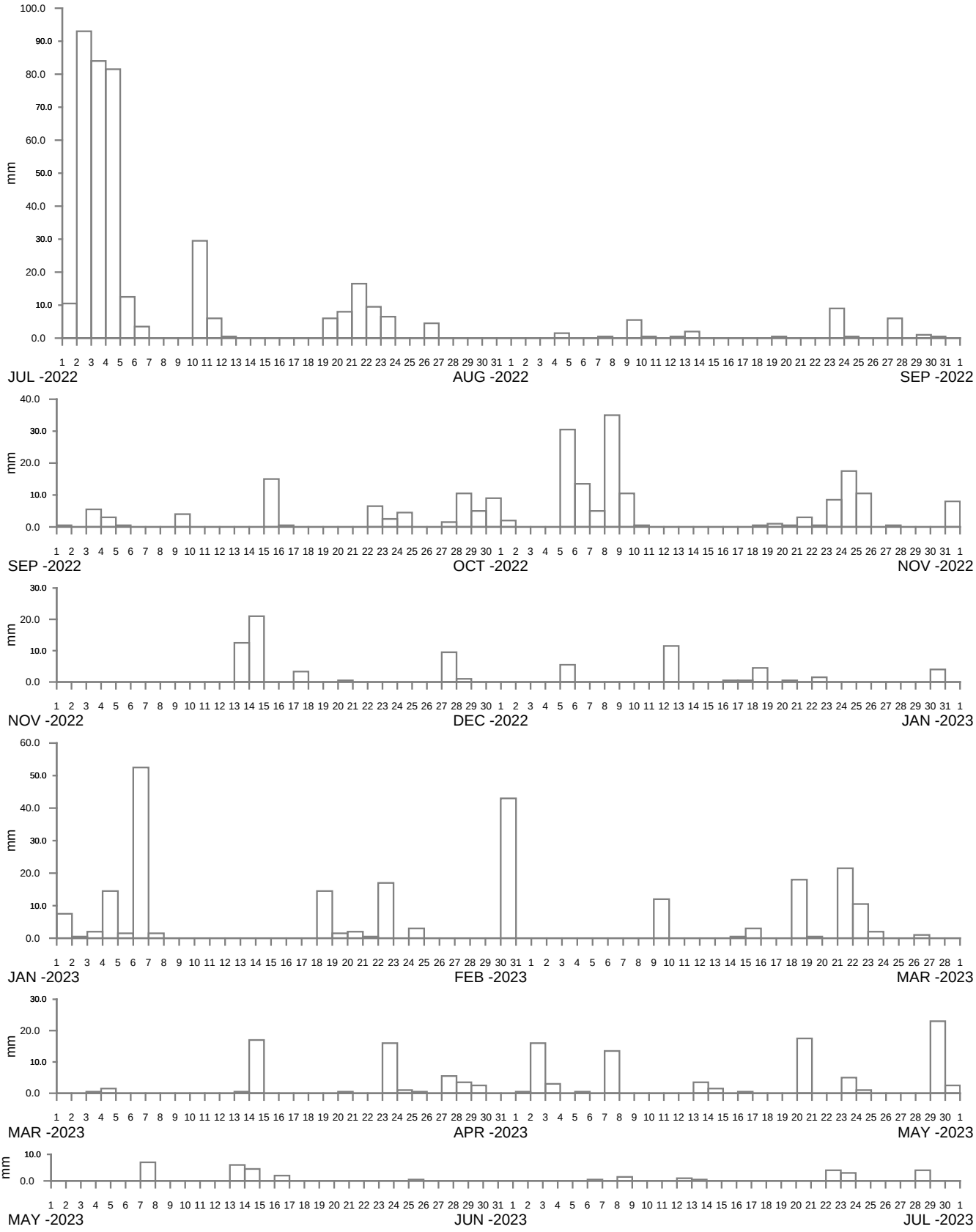
---------- DATA LOSS

NSW GOVERNMENT

CURL CURL AT CURL CURL LAGOON
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-67



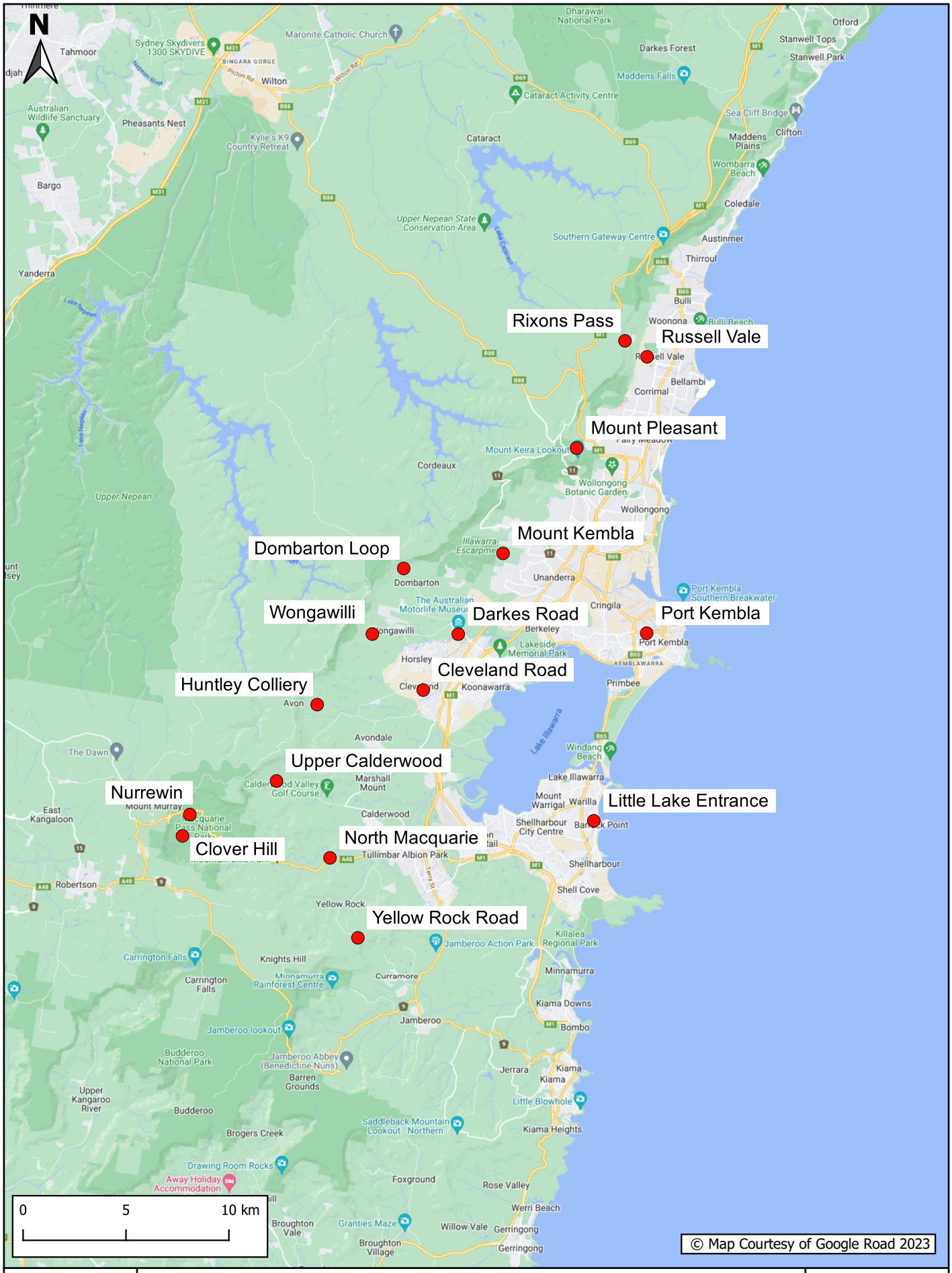
---------- DATA LOSS

NSW GOVERNMENT

KELSO CREEK AT KELSO CREEK
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-68

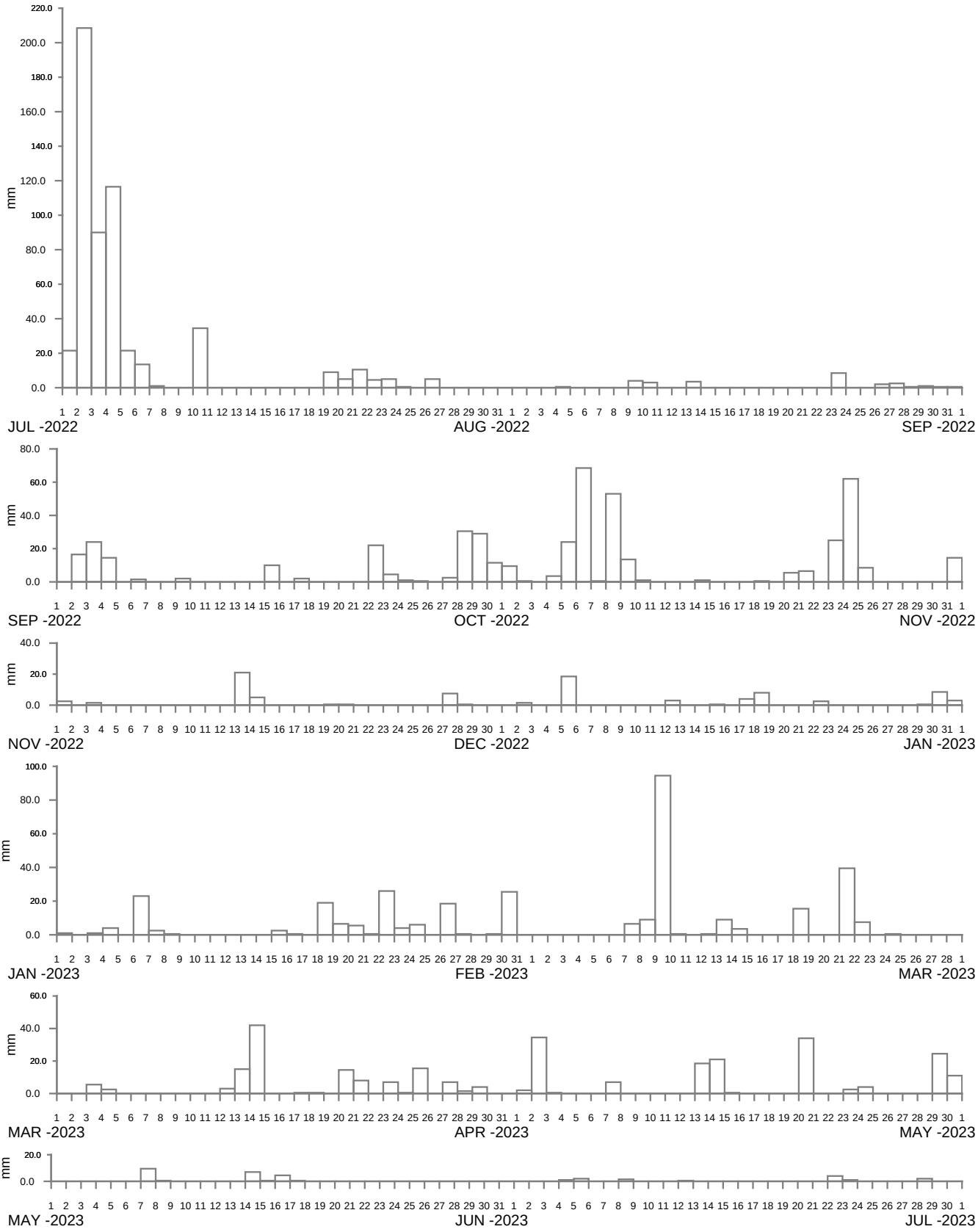


NSW GOVERNMENT

RAINFALL STATION LOCATIONS
WOLLONGONG COASTAL REGION

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-69



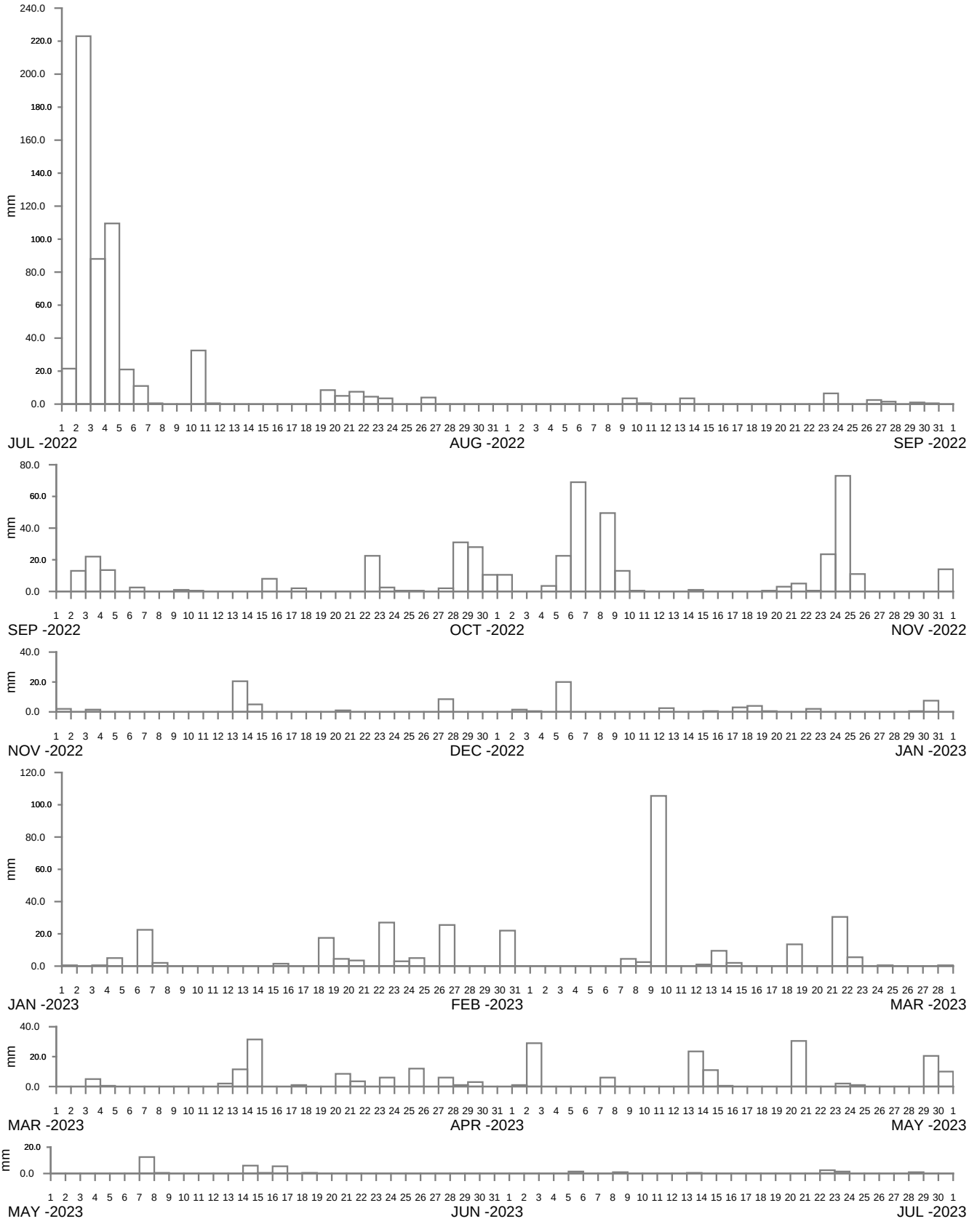
---------- DATA LOSS

NSW GOVERNMENT

RIXONS PASS AT RIXONS PASS ROAD
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-70



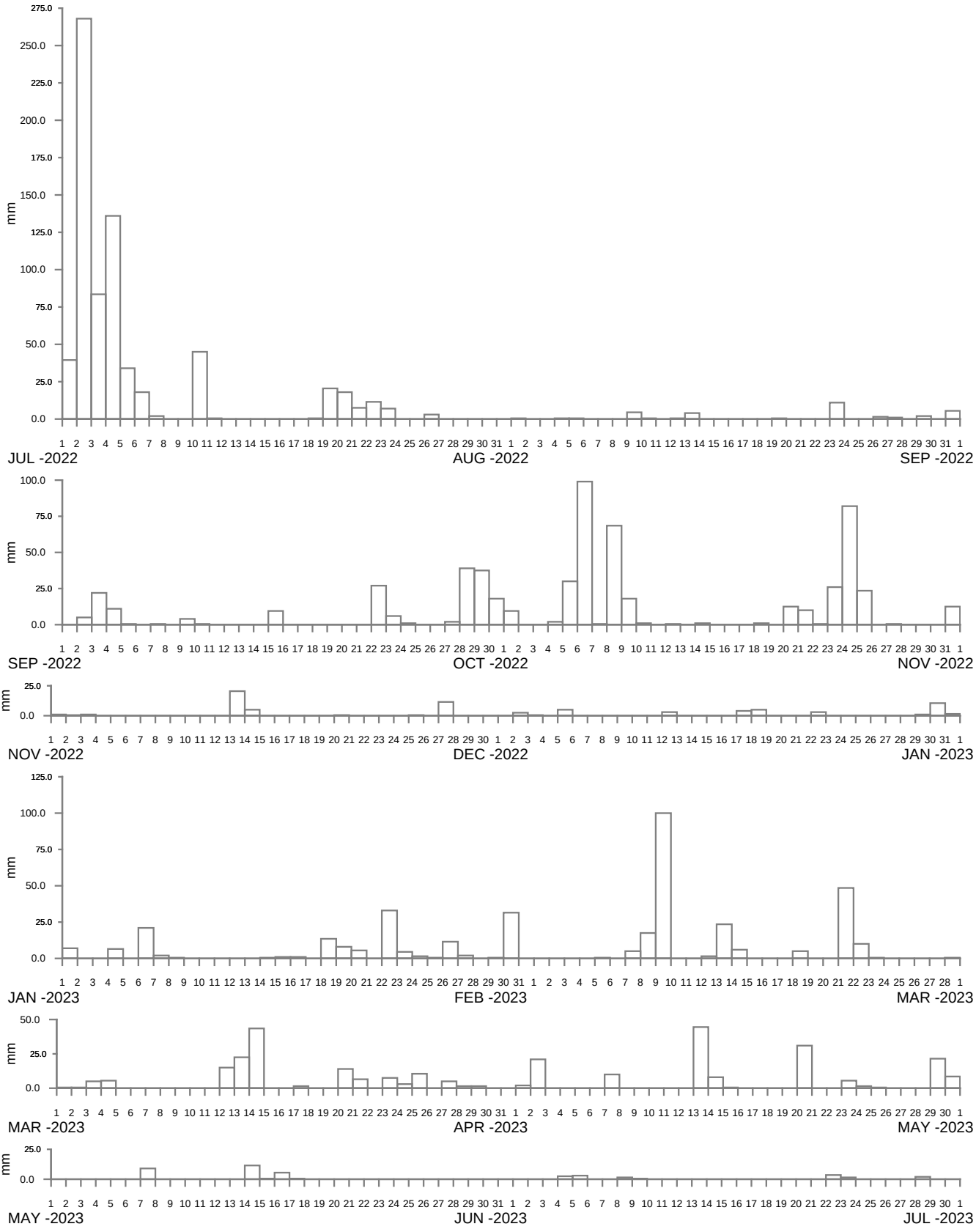
---------- DATA LOSS

NSW GOVERNMENT

RUSSELL VALE AT WHITING CRESCENT
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-71



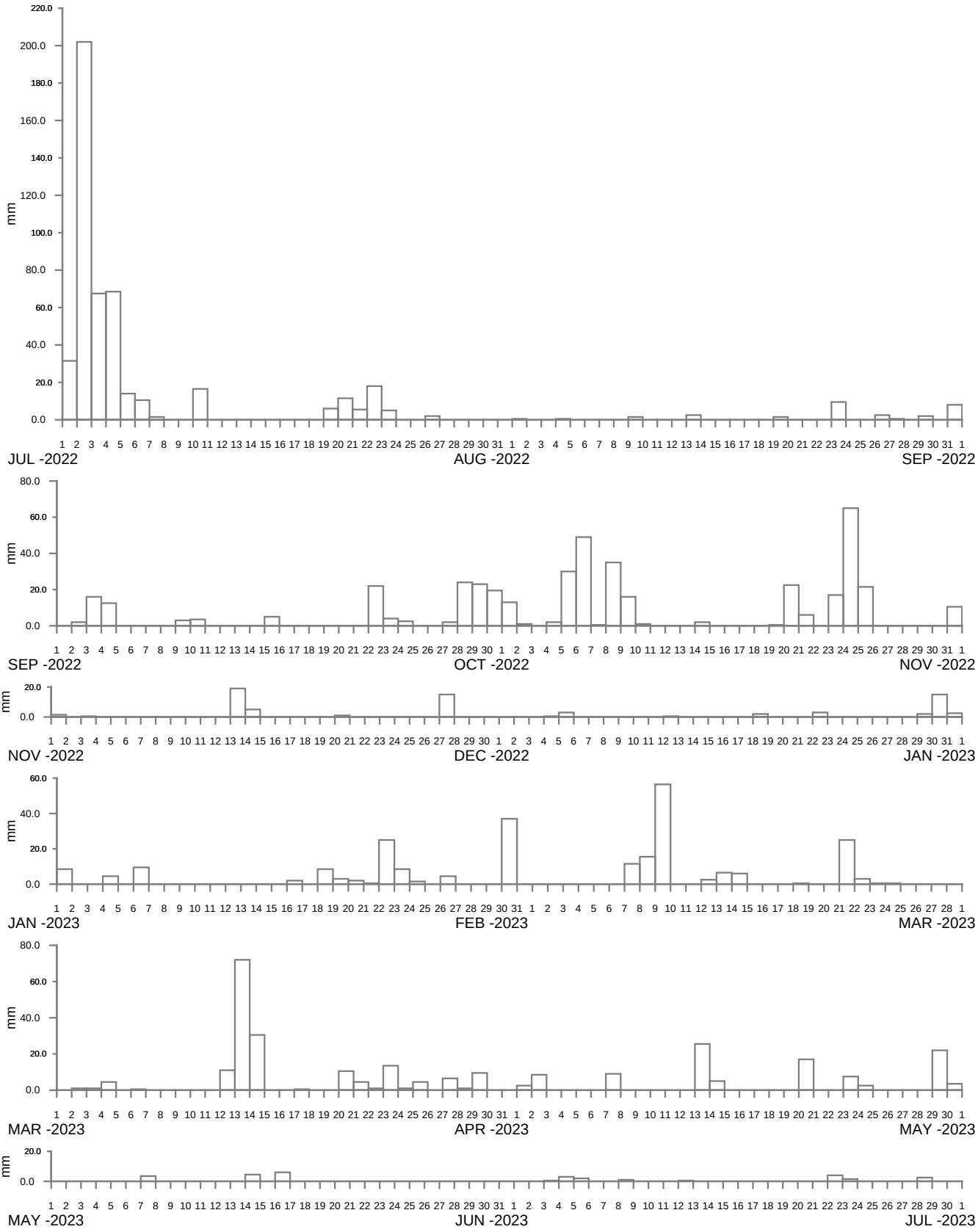
---------- DATA LOSS

NSW GOVERNMENT

MOUNT PLEASANT AT PARRISH AVENUE
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-72



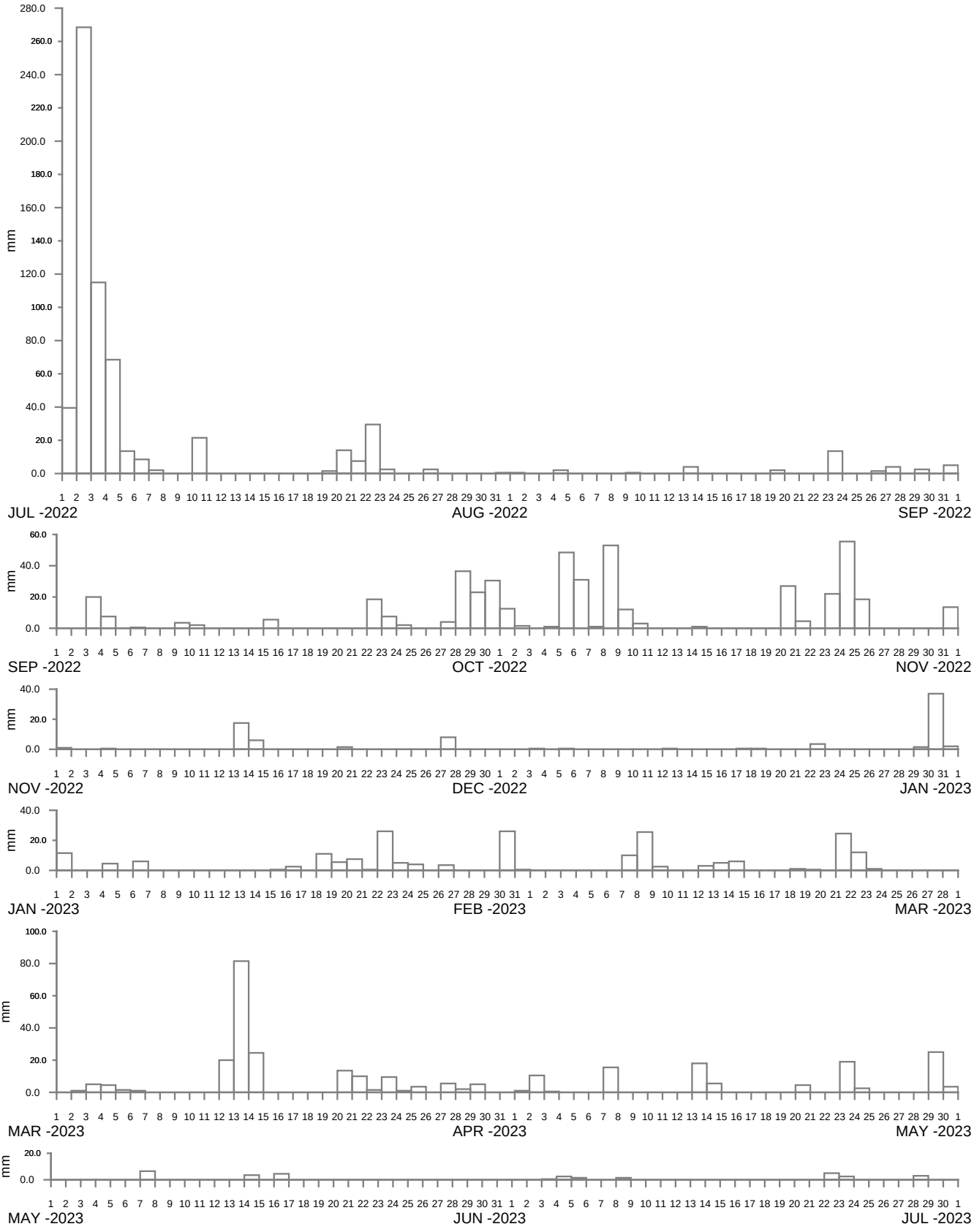
---------- DATA LOSS

NSW GOVERNMENT

MOUNT KEMBLA AT STAFF ROAD
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-73



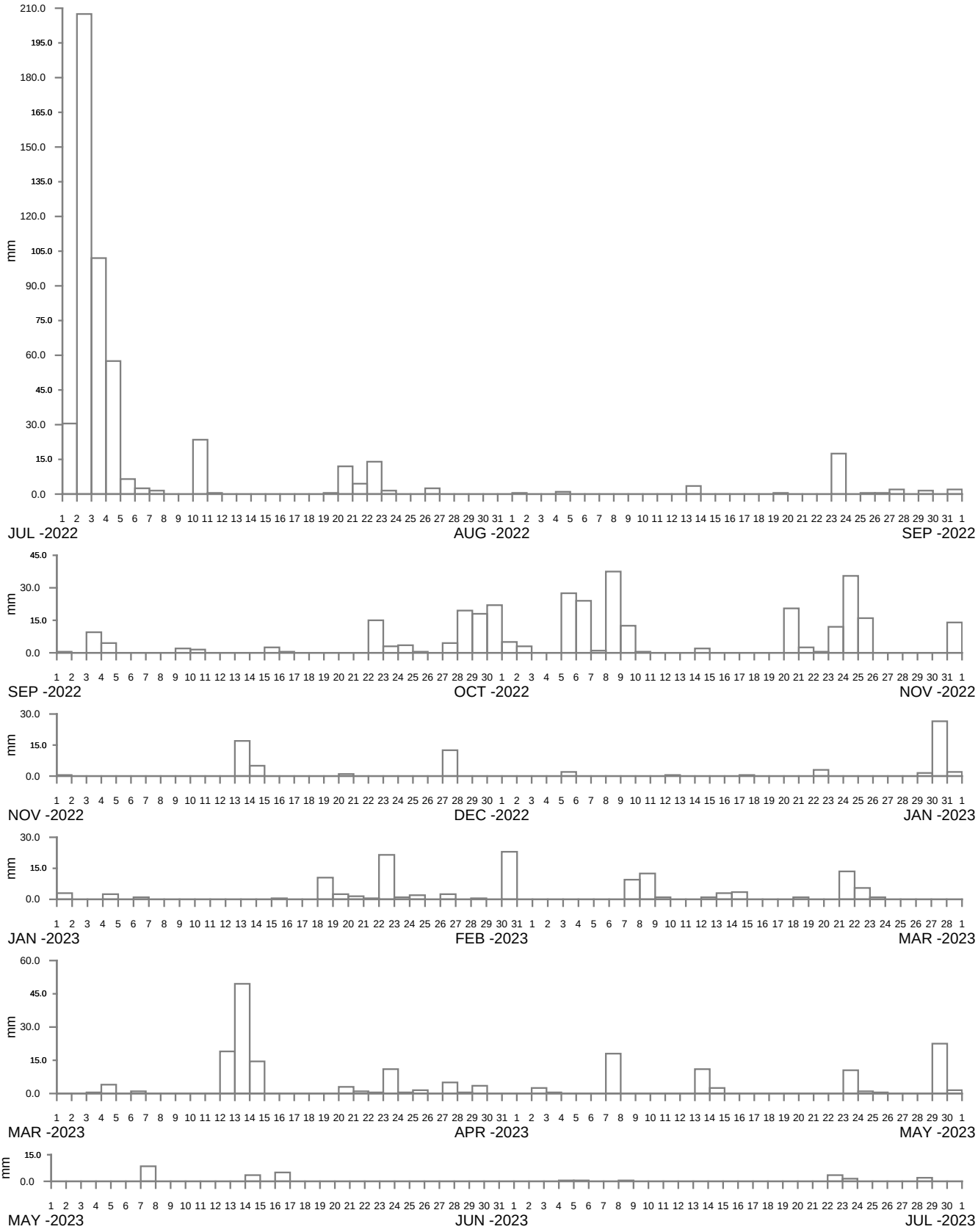
---------- DATA LOSS

NSW GOVERNMENT

DOMBARTON LOOP AT PAYNES ROAD
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-74



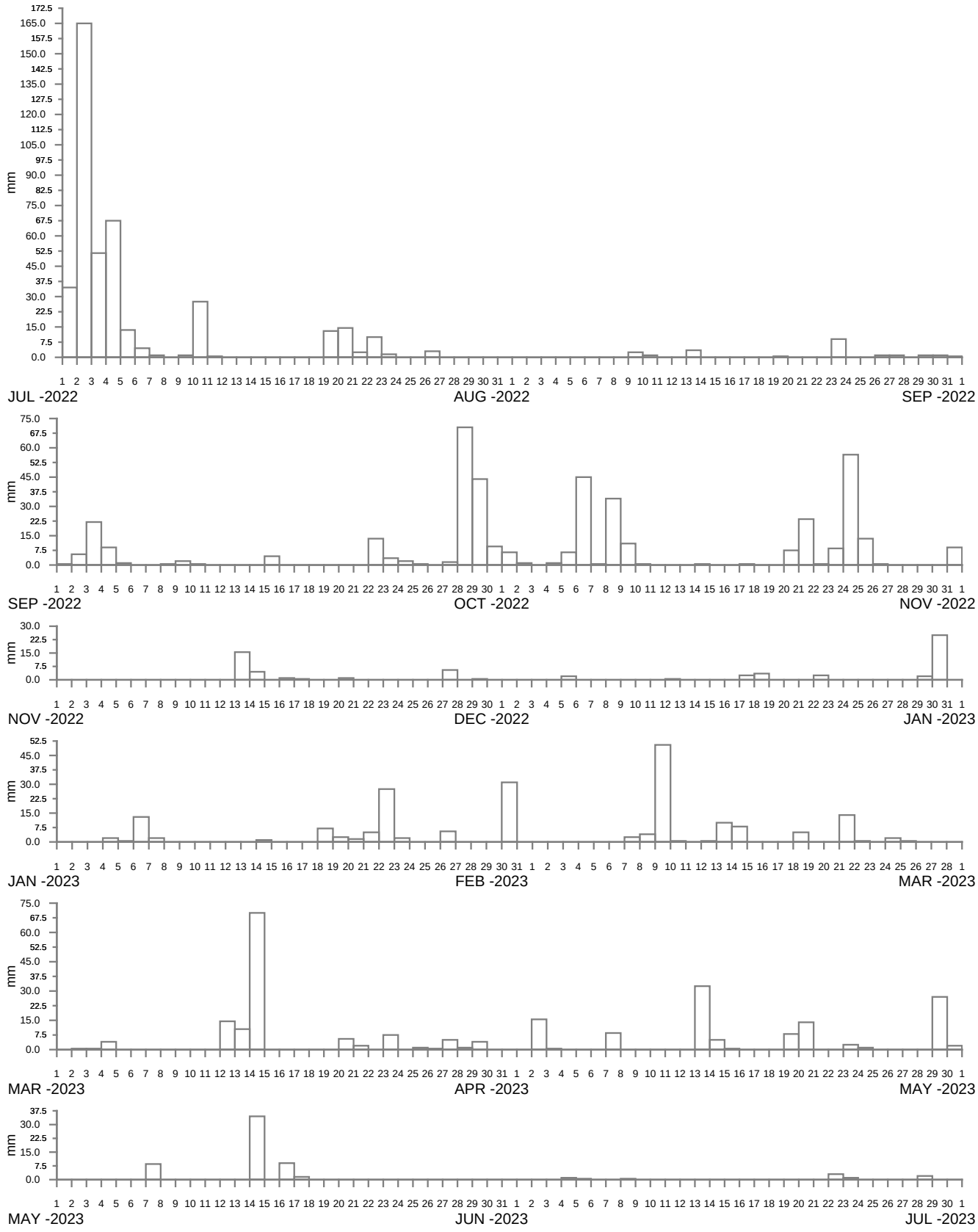
---------- DATA LOSS

NSW GOVERNMENT

WONGAWILLI AT JERSEY FARM ROAD
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-75



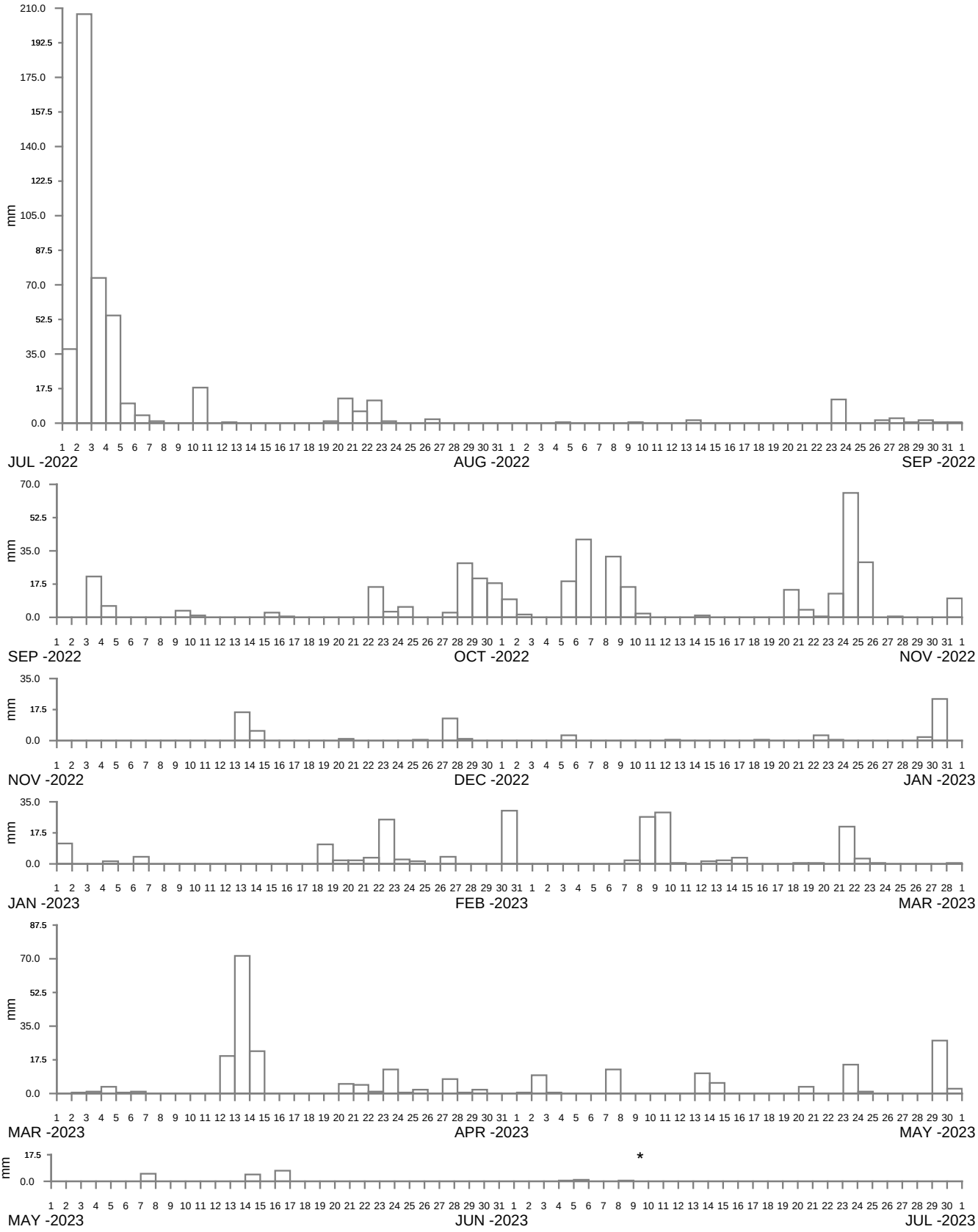
---------- DATA LOSS

NSW GOVERNMENT

PORT KEMBLA AT FIVE ISLANDS ROAD
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-76



---------- DATA LOSS

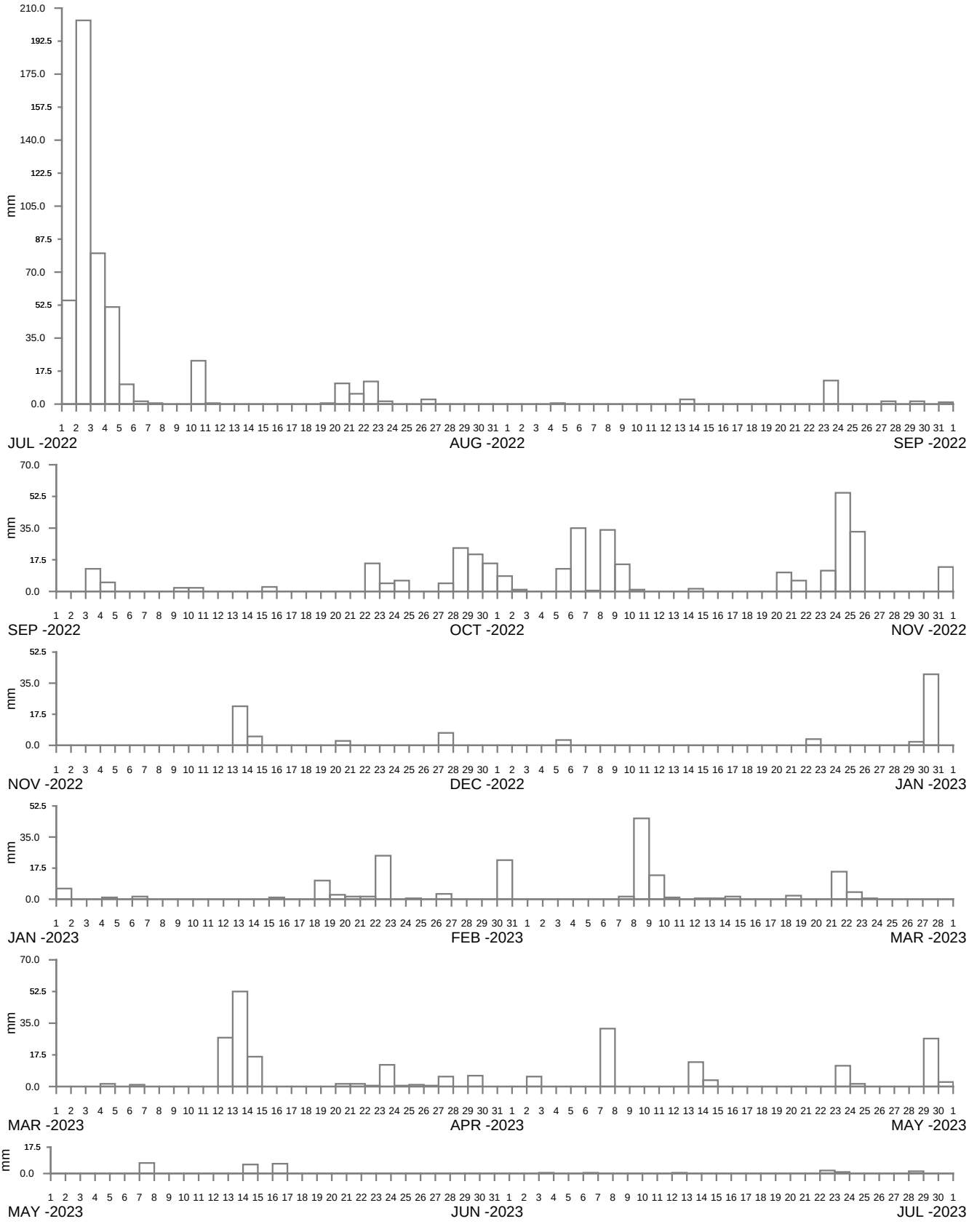
*Station decommissioning 09:00 9 June 2023 at the request of the landowner, suitable agreements with other landholders in the area have been unsuccessful to date.

NSW GOVERNMENT

DARKES ROAD AT DAPTO
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-77



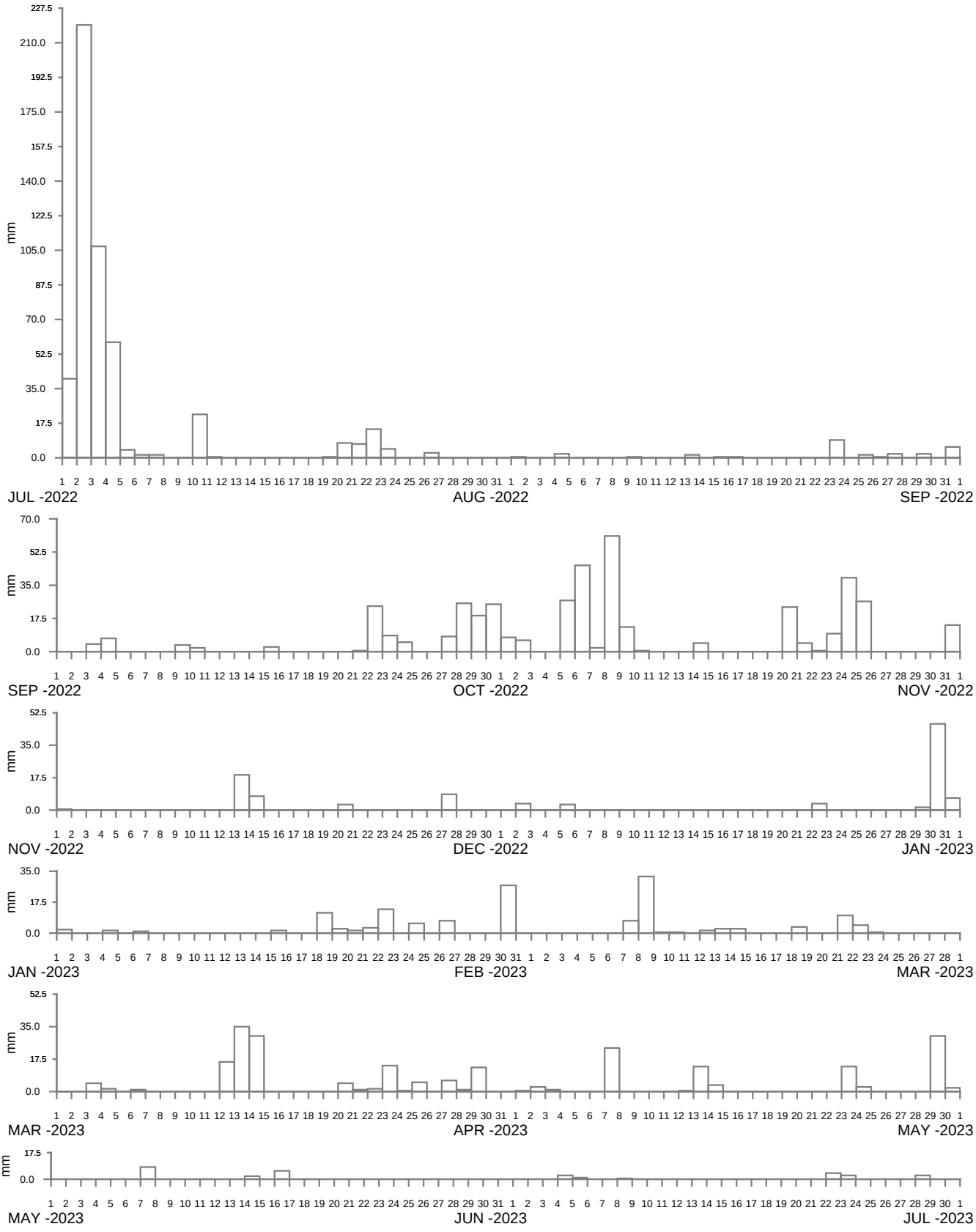
---------- DATA LOSS

NSW GOVERNMENT

CLEVELAND ROAD AT CLEVELAND ROAD
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-78



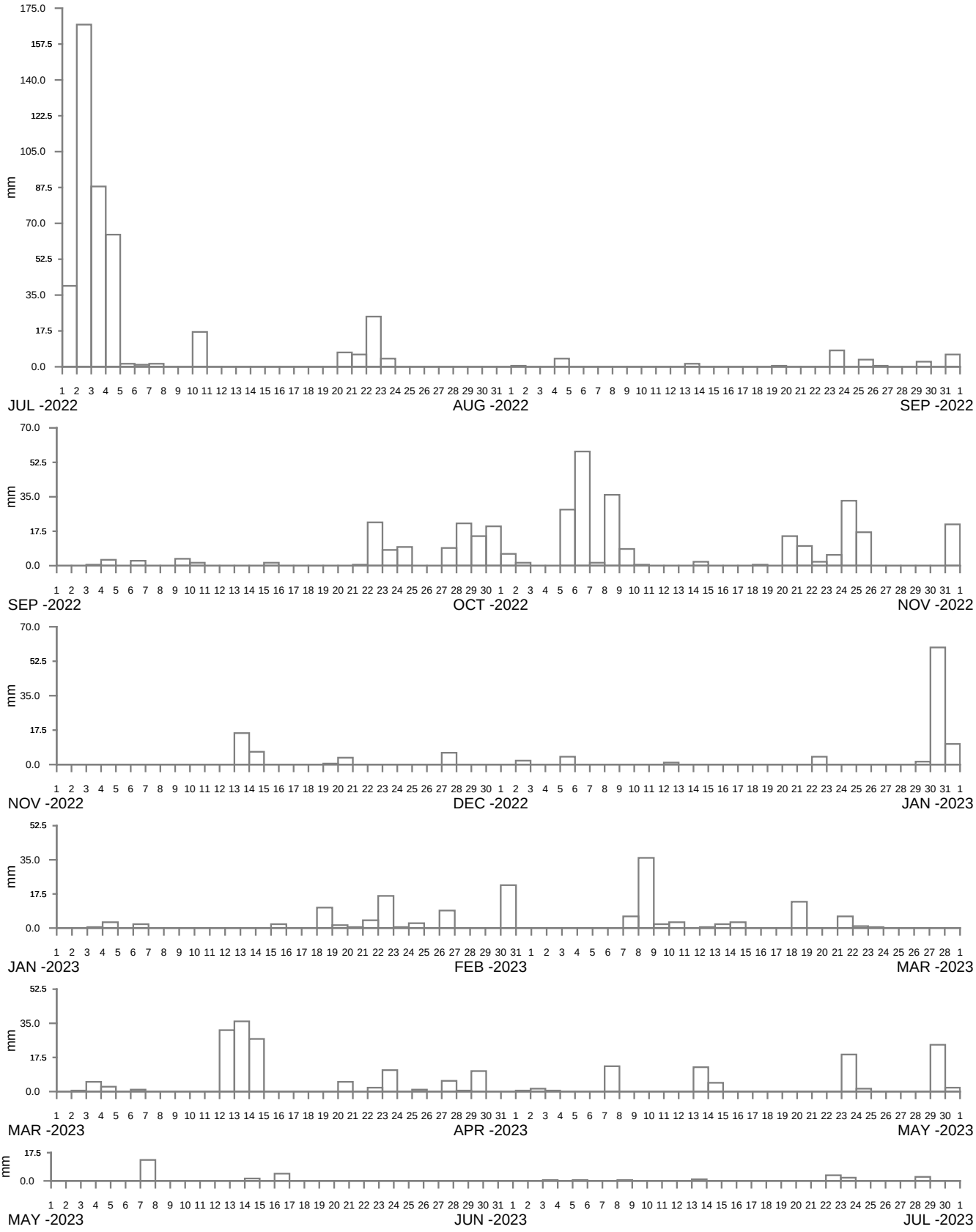
DATA LOSS

NSW GOVERNMENT

HUNTLEY COLLIERY AT AVONDALE ROAD
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-79



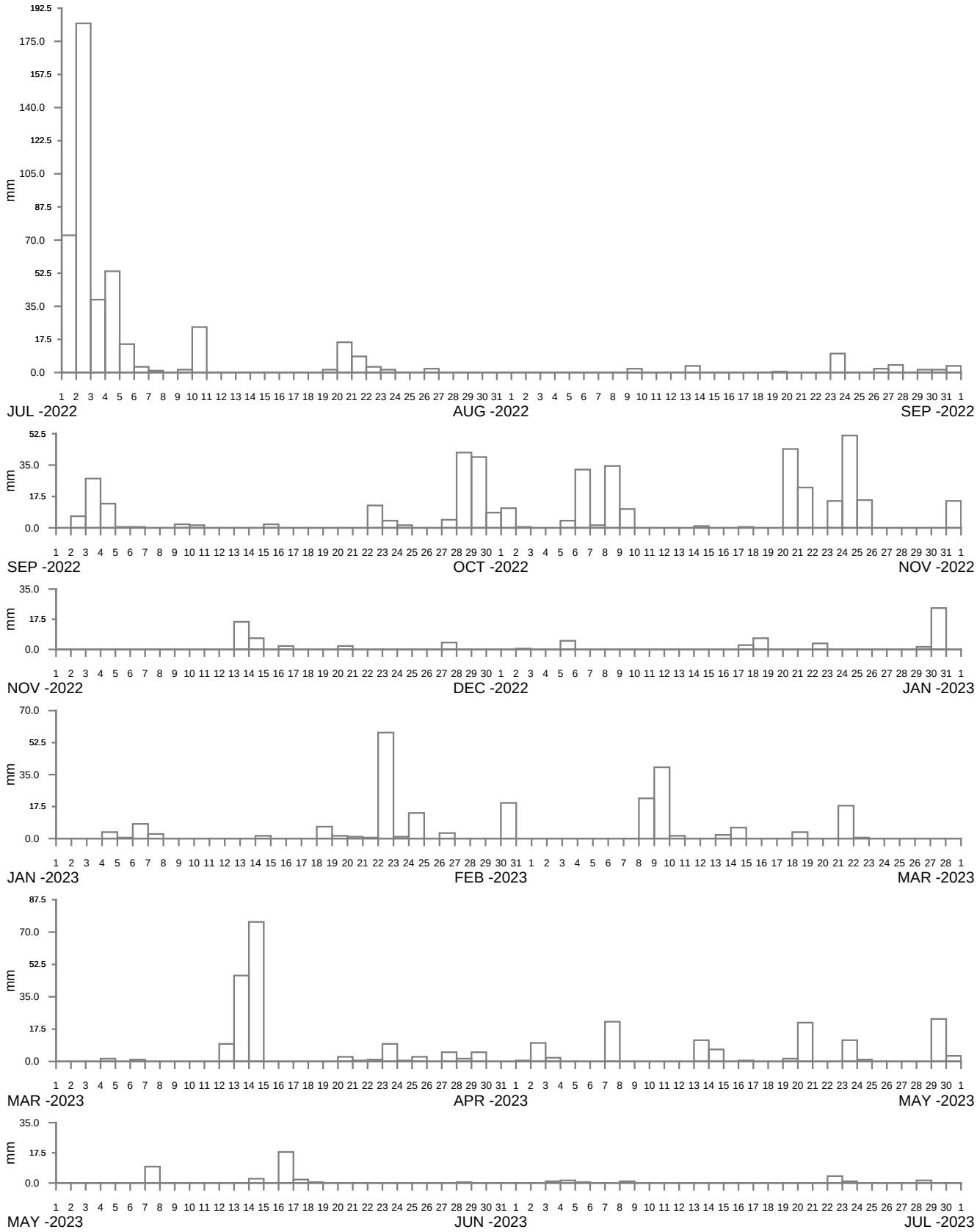
---------- DATA LOSS

NSW GOVERNMENT

UPPER CALDERWOOD AT CALDERWOOD ROAD 2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-80



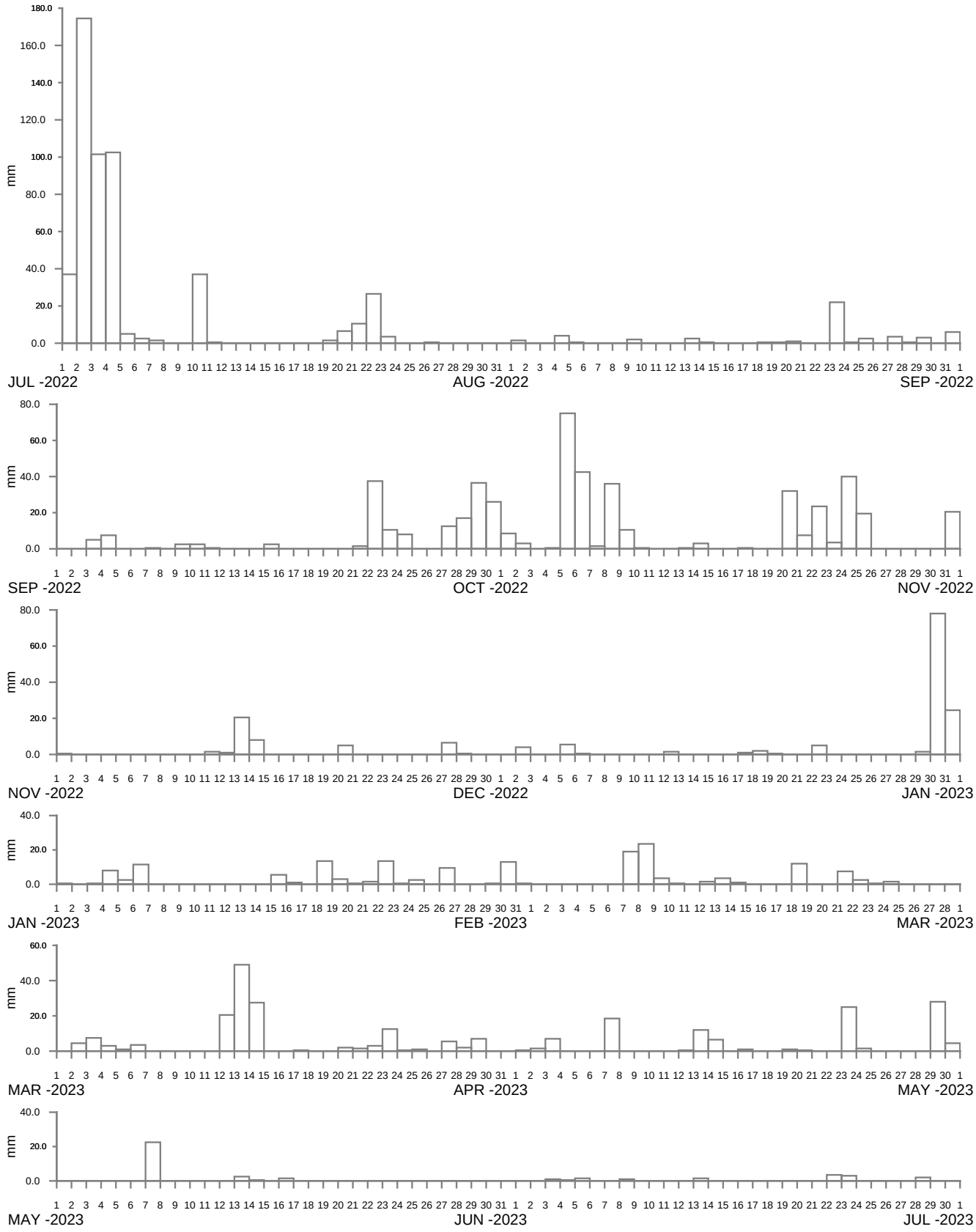
DATA LOSS

NSW GOVERNMENT

LITTLE LAKE ENTRANCE AT LITTLE LAKE
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-81



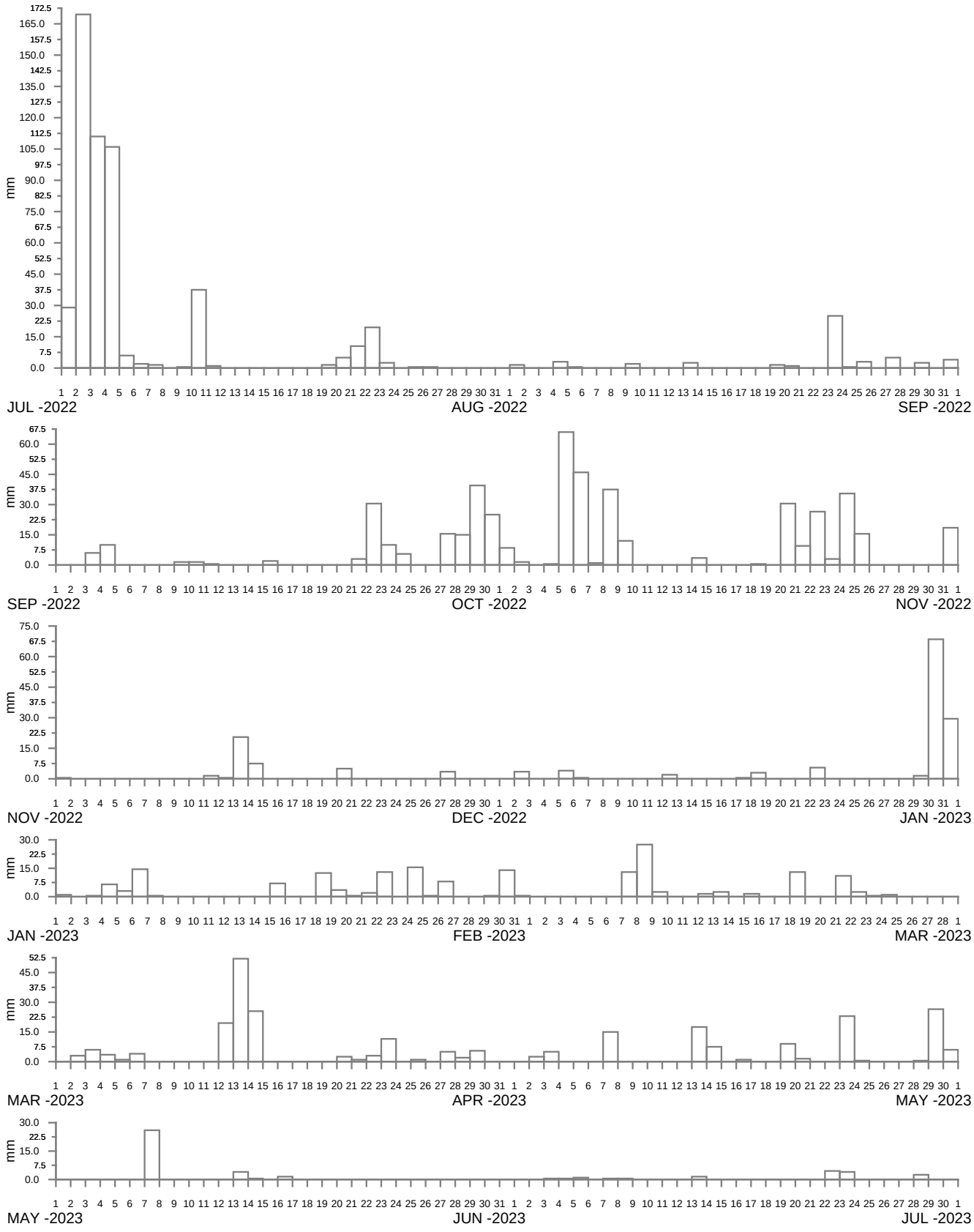
---------- DATA LOSS

NSW GOVERNMENT

NURREWIN AT ILLAWARRA HIGHWAY
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-82



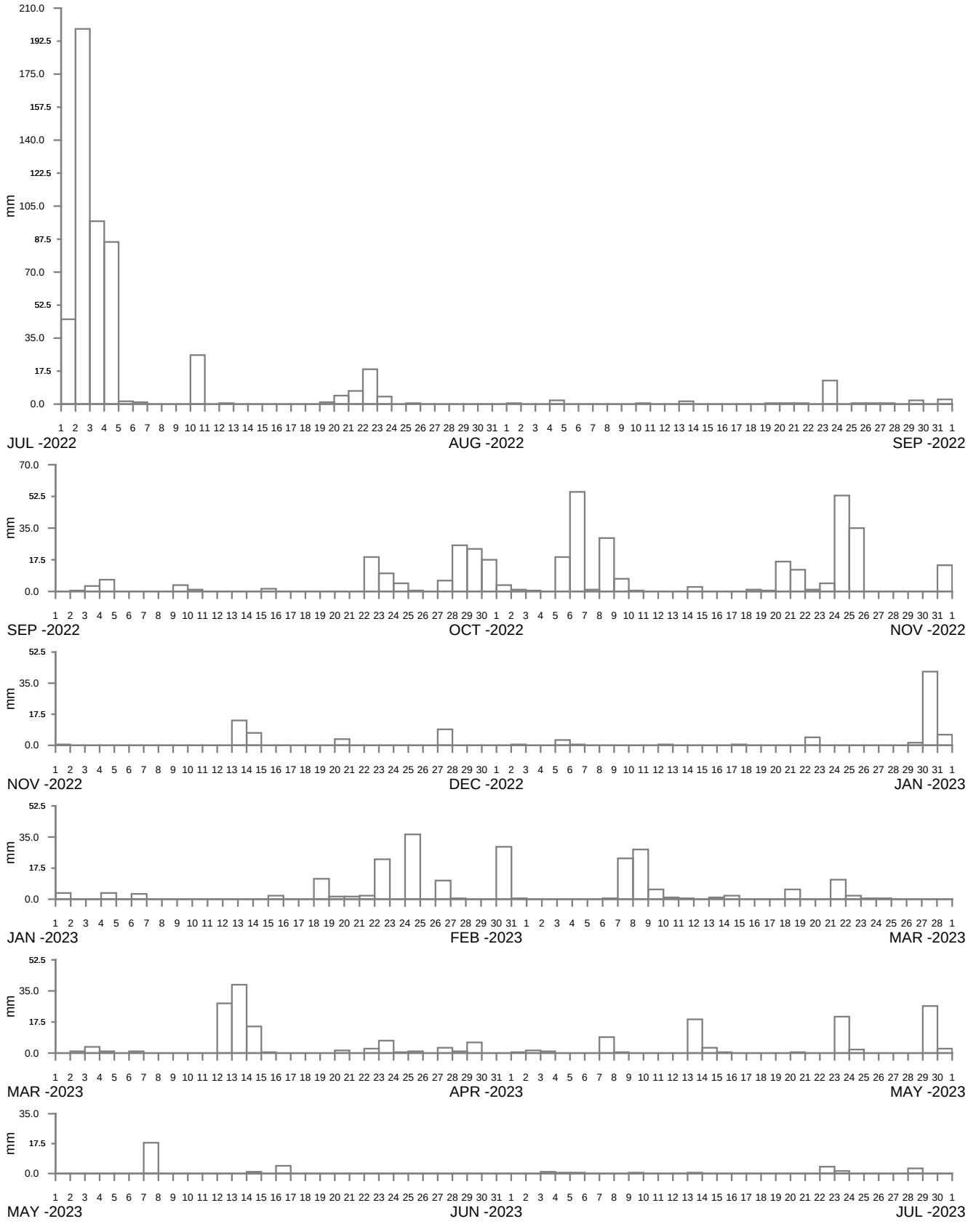
---------- DATA LOSS

NSW GOVERNMENT

CLOVER HILL AT CLOVER HILL ROAD
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-83



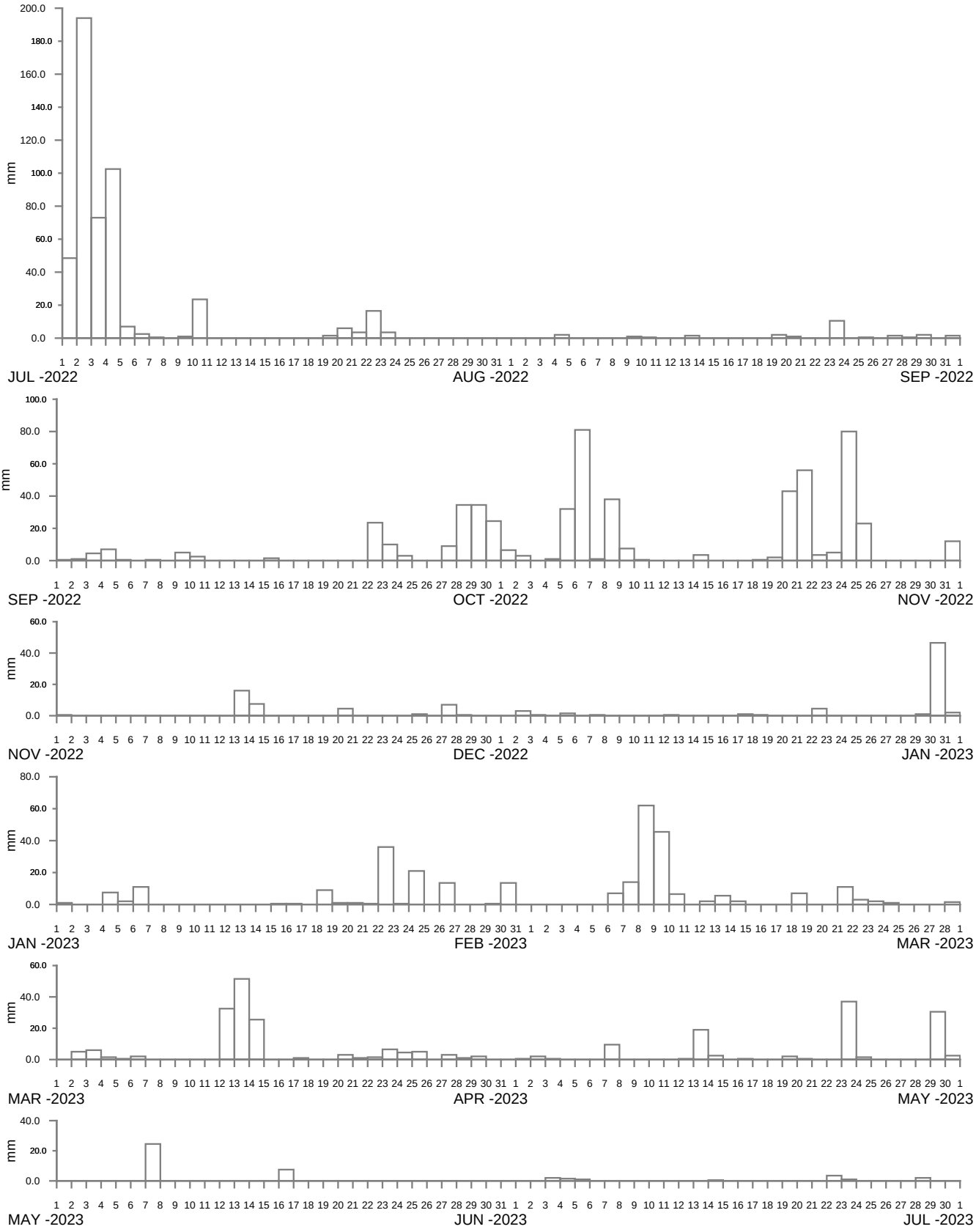
---------- DATA LOSS

NSW GOVERNMENT

NORTH MACQUARIE AT NORTH MACQUARIE ROAD 2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-84



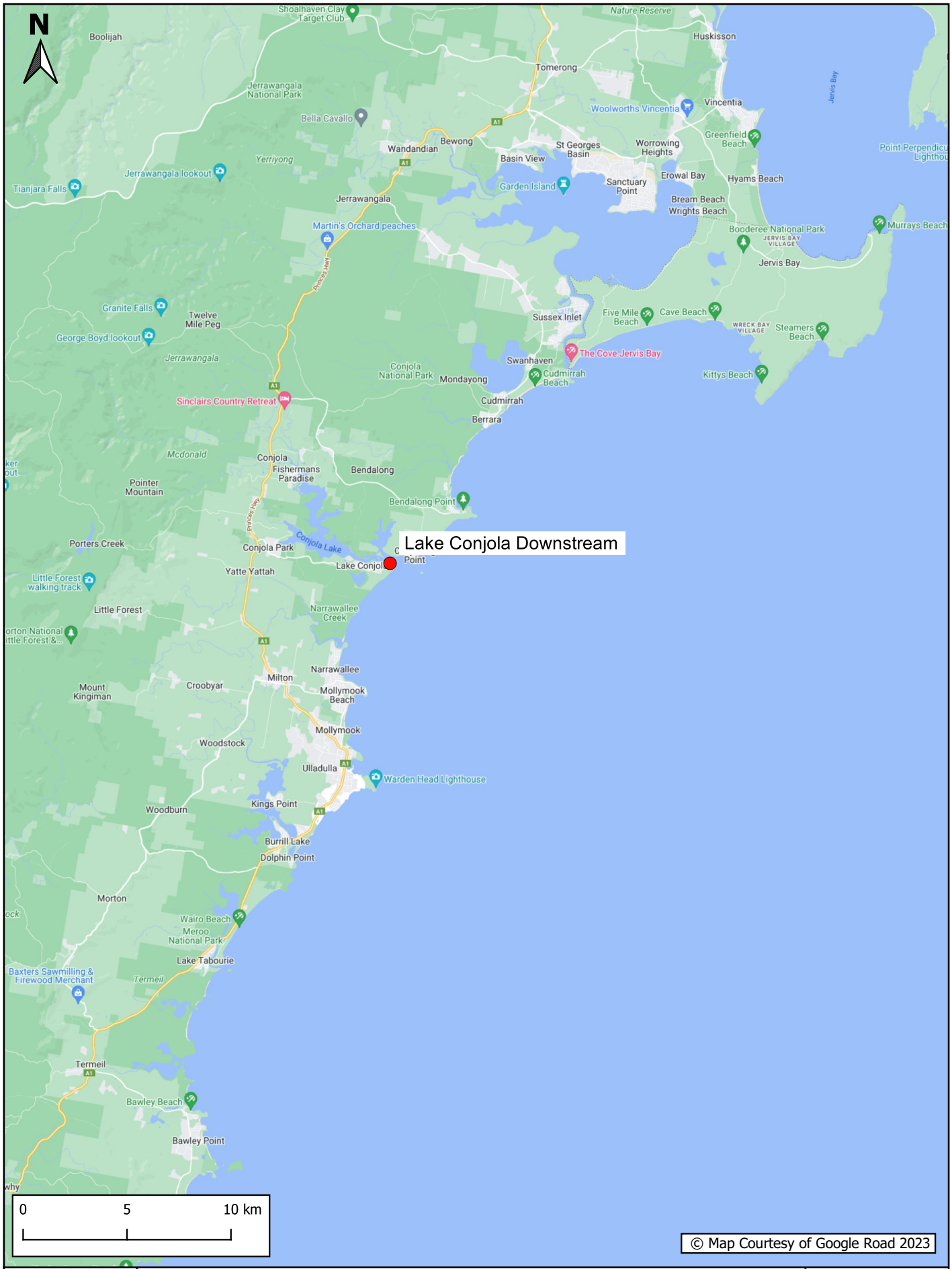
---------- DATA LOSS

NSW GOVERNMENT

YELLOW ROCK ROAD AT YELLOW ROCK ROAD 2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-85

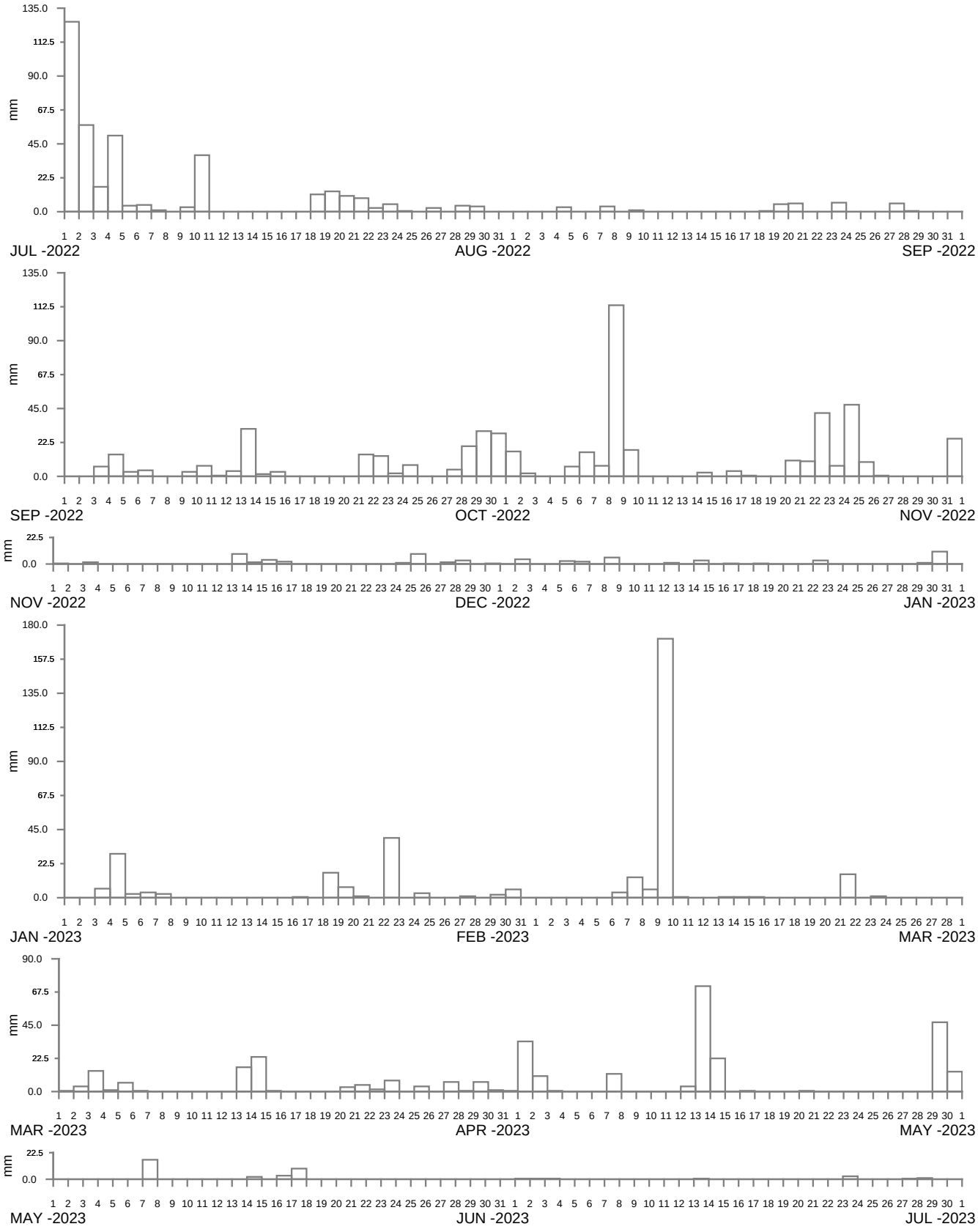


NSW GOVERNMENT

RAINFALL STATION LOCATIONS
SOUTH COAST (NORTH) REGION

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-86



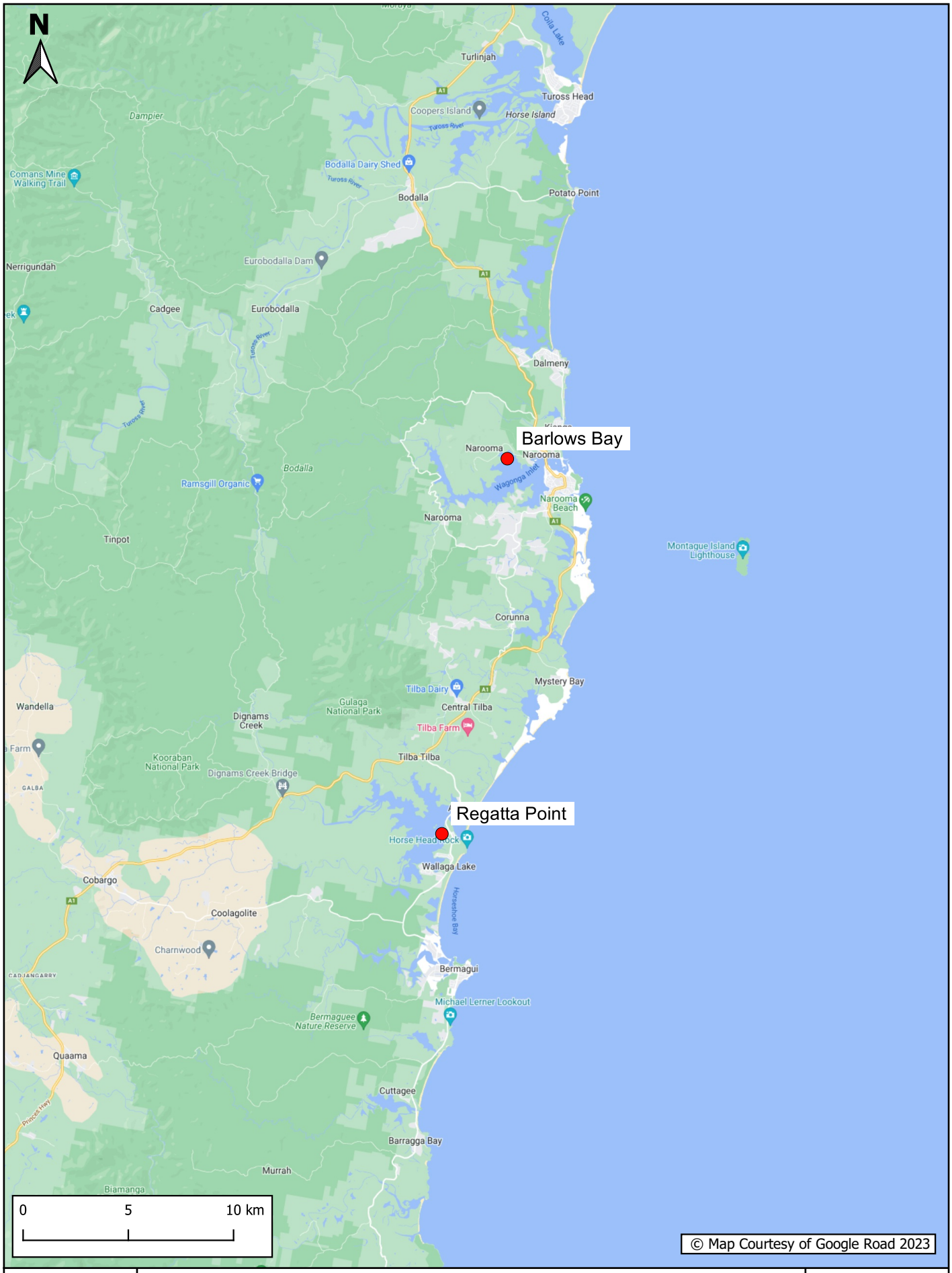
---------- DATA LOSS

NSW GOVERNMENT

LAKE CONJOLA DOWNSTREAM AT LAKE CONJOLA 2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-87

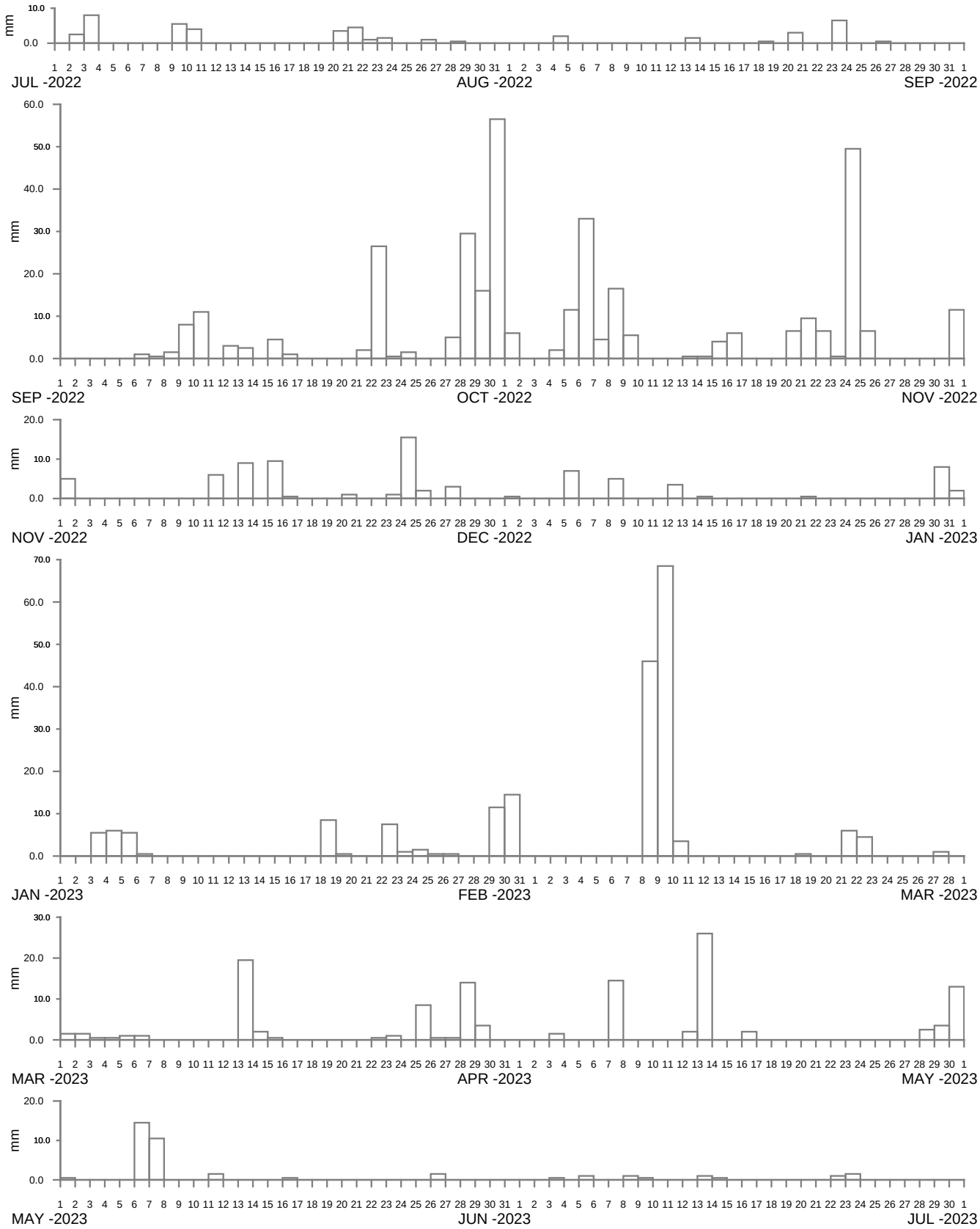


NSW GOVERNMENT

RAINFALL STATION LOCATIONS
SOUTH COAST (MID) REGION

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-88



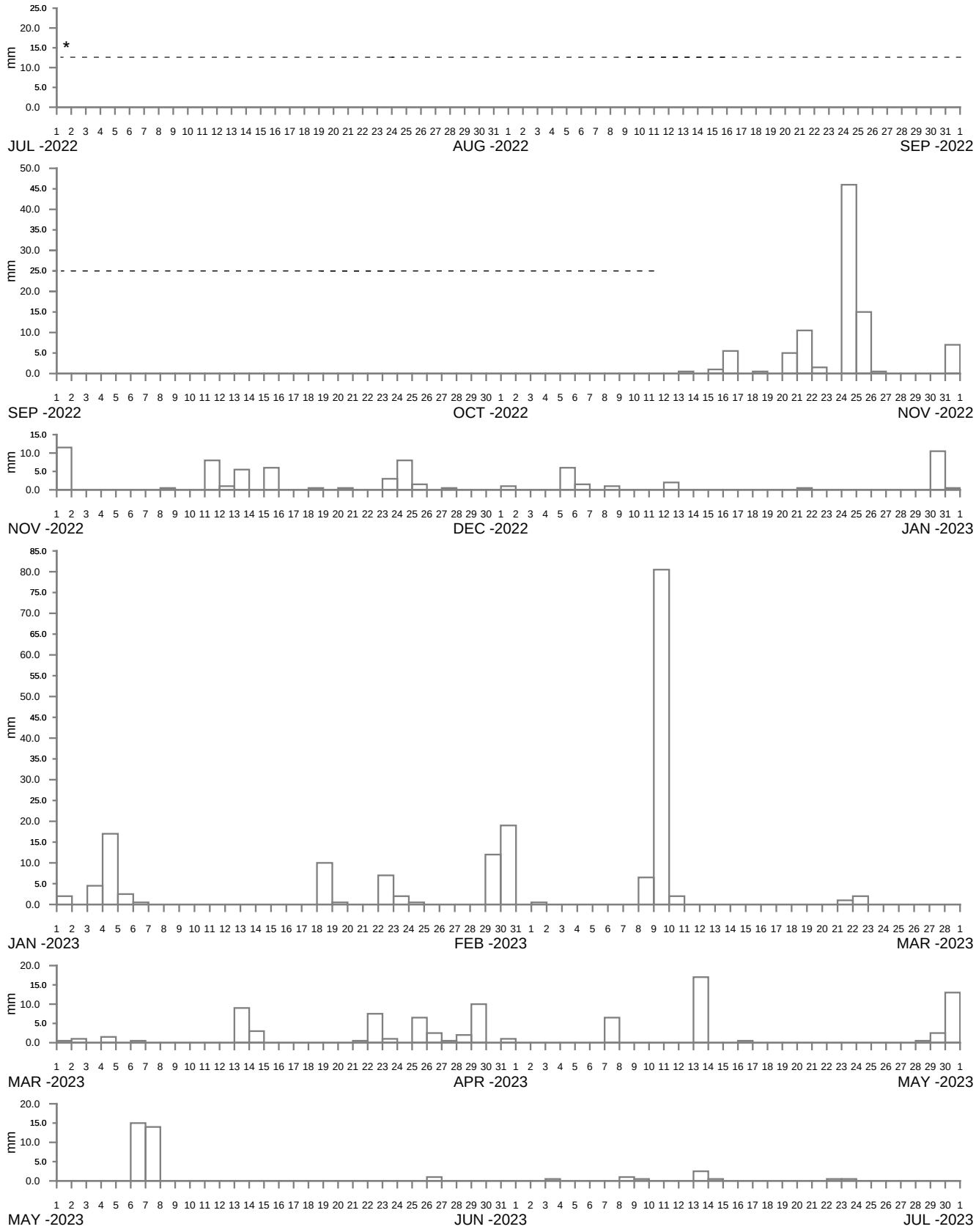
---------- DATA LOSS

NSW GOVERNMENT

BARLOWS BAY AT WAGONGA INLET
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-89



DATA LOSS

*Data loss due to faulty wiring

NSW GOVERNMENT

REGATTA POINT AT WALLAGA LAKE
2022–23

Manly Hydraulics Laboratory

Report MHL2996
Figure
4-90

Appendix A Station data online

Table A1 Station data online

Region	Station	Period of data
Tweed	Cudgera	Aug 1983–ongoing
Brunswick	Main Arm	Sep 1983–ongoing
Brunswick	Huonbrook	May 1986–ongoing
Brunswick	Myocum	Feb 1986–ongoing
Richmond	Lake Ainsworth	Oct 1994–ongoing
Richmond	Empire Vale	May 1998–Jul 2000
Richmond	Wollongbar	Jul 1992–Jul 1994
Clarence	Yamba	Apr 2002–ongoing
Clarence	Wyndora	Jan 1990–Jun 1991
Clarence	Roberts Creek	May 1994–Jun 1996
Clarence	Shannon Creek	Nov 2000–May 2008
Bellinger	Wooli Caravan Park	Jun 1997–Apr 2012
Bellinger	Wooli Sportsground	Apr 2012–ongoing
Bellinger	Perry Drive	Dec 1998–ongoing
Bellinger	Shephards Lane	Dec 1998–June 2023
Bellinger	Red Hill	Nov 1998–ongoing
Bellinger	Newports Creek	Dec 1990–ongoing
Bellinger	Middle Boambee	Dec 1990–ongoing
Bellinger	South Boambee	Apr 1991–April 2015
Bellinger	North Bonville	Dec 1990–ongoing
Bellinger	Gleniffer	Aug 1993–Feb 2007
Bellinger	Bellinger Council	Apr 1993–Jun 2001
Bellinger	Kooroowi	May 1991–Jun 2012
Bellinger	Kooroowi Sharabel	Jun 2012–ongoing
Bellinger	Thora	Feb 1993–ongoing
Nambucca	Bowraville	Jun 1993–Oct 2001
Nambucca	Stuarts Island Downstream	Oct 1998–ongoing
Nambucca	Utungun	Nov 1991–ongoing
Macleay	Euroka Upstream	Jul 1990–June 2011
Macleay	Aldavilla Downstream	Dec 2011–ongoing
Maria	Green Valley	Sep 1994–ongoing
Hastings	Telegraph Point	Nov 1990–ongoing
Hastings	Lake Cathie	Aug 1993–Jun 2001
Hastings	Ellenborough	Jun 1991–Sep 1999
Camden Haven	Logans Crossing	Dec 1989–ongoing
Manning	Mount George	Mar 1991–ongoing
Karuah	Nabiac	Jun 1983–ongoing
Karuah	Tuncurry	Aug 2002– Feb 2018
Karuah	Tuncurry Downstream	Jun 2016-ongoing
Karuah	Tiona	Jun 2002–Sep 2015
Karuah	Pacific Palms Wharf	Oct 2013–ongoing
Karuah	Tarbuck Bay	May 1996–ongoing
Karuah	Bulahdelah	Aug 1996–ongoing
Hunter	Gostwyck	Oct 1999–ongoing
Hunter	Seaham	Sep 1999–ongoing

Region	Station	Period of data
Hunter	Hexham Bridge	May 1998–ongoing
Hunter	Belmore Bridge	Sep 1995–ongoing
Hunter	Cardiff	Mar 1991–Dec 1995
Macquarie-Tuggerah Lakes	Barnsley	Jan 1988–ongoing
Macquarie-Tuggerah Lakes	Fassifern	Jan 1992–Dec 1997
Macquarie-Tuggerah Lakes	Dora Creek	May 1992–Jul 1999
Macquarie-Tuggerah Lakes	Martinsville	Mar 1988–ongoing
Macquarie-Tuggerah Lakes	Mandalong	Dec 1988–ongoing
Macquarie-Tuggerah Lakes	Wyee	May 1992–ongoing
Macquarie-Tuggerah Lakes	Whitemans Ridge	Apr 1989–ongoing
Macquarie-Tuggerah Lakes	Yarramalong	Nov 1988–ongoing
Macquarie-Tuggerah Lakes	Kulnura	Jun 1989–Jul 2023
Macquarie-Tuggerah Lakes	Kulnura at Pioneer Park	Mar 2023–ongoing
Macquarie-Tuggerah Lakes	Toukley	Feb 1985–ongoing
Macquarie-Tuggerah Lakes	Warnervale	Jan 1986–Apr 2010
Macquarie-Tuggerah lakes	Hamlyn Terrace	Mar 2010–ongoing
Macquarie-Tuggerah Lakes	Wyong Weir Upstream	Jan 1986–Apr 2008
Macquarie-Tuggerah Lakes	Wyong	Jan 1986–Apr 1991
Macquarie-Tuggerah Lakes	Kangy Angy	Aug 2010–ongoing
Macquarie-Tuggerah Lakes	Chittaway	Dec 1989–Aug 2010
Macquarie-Tuggerah Lakes	Berkeley Vale	Jun 1988–ongoing
Macquarie-Tuggerah Lakes	Mardi Dam	Oct 1988–ongoing
Macquarie-Tuggerah Lakes	Sterland	Apr 1989–ongoing
Macquarie-Tuggerah Lakes	Long Jetty	Sept 1992–Sept 1998
Macquarie-Tuggerah Lakes	Bateau Bay	Jan 1980–ongoing
Macquarie-Tuggerah Lakes	Lisarow	Apr 1989–ongoing
Brisbane Water	Strickland	Dec 1985–ongoing
Brisbane Water	Narara	Apr 1989–ongoing
Brisbane Water	Mount Elliot	Dec 1985–ongoing
Brisbane Water	Wyoming	Oct 1988–ongoing
Brisbane Water	Kincumber	May 1987–ongoing
Hawkesbury	Webbs Creek	Jul 1999–ongoing
Hawkesbury	Colo Junction	Jul 1999–ongoing
Hawkesbury	Sackville Downstream	Jun 1999–ongoing
Hawkesbury	Woy Woy	Jul 1991–Jul 1996
Hawkesbury	Brooklyn	Apr 1991–Dec 1995
Hawkesbury	Cowan	Jun 1991–Dec 1995
Hawkesbury	Penrith	Dec 1994–Jan 1995
Hawkesbury	Narellan Creek	Jan 1994–Sep 1996
Hawkesbury	Camden Life Centre	Mar 1994–Sep 1996
Hawkesbury	Mt Annan School	Feb 1994–Sep 1996
Blue Mountains	Mount Boyce	Nov 1992–Feb 1995
Blue Mountains	Clarence	Nov 1992–Feb 1995
Blue Mountains	Zig Zag	Nov 1992–Feb 1995
Sydney Coastal	Kuringai	Jan 1991–Sep 1996
Sydney Coastal	Wahroonga	Nov 1990–Dec 1995
Sydney Coastal	Beecroft	Sep 1992–Jul 1996
Sydney Coastal	Avalon	Jun 1994–ongoing
Sydney Coastal	Mona Vale	Jun 1994–ongoing
Sydney Coastal	Narrabeen Creek	May 1998–Sep 2010

Region	Station	Period of data
Sydney Coastal	Middle Creek	Apr 1995–ongoing
Sydney Coastal	Cromer	Mar 1994–ongoing
Sydney Coastal	Belrose	May 1994–ongoing
Sydney Coastal	Allambie	Jun 1999–ongoing
Sydney Coastal	Balgowlah	Aug 1999–Jul 2005
Sydney Coastal	Curl Curl	Feb 2014–ongoing
Sydney Coastal	North Manly	May 1995–ongoing
Sydney Coastal	Manly Dam	Nov 1995–ongoing
Sydney Coastal	Chatswood	Sep 1992–Jul 1996
Sydney Coastal	Denistone	Jan 1990–Jun 1996
Sydney Coastal	M4 Motorway	Jun 1993–Dec 1995
Sydney Coastal	Homebush Bay	Feb 1993–Mar 1994
Sydney Coastal	Kelso Creek	Nov 1996–ongoing
Wollongong Coastal	Bulli Pass	Jan 1983–Oct 1998
Wollongong Coastal	Rixons Pass	Jun 1985–ongoing
Wollongong Coastal	Russell Vale	Jul 1982–ongoing
Wollongong Coastal	Corrimal Colliery	Jun 1985–Dec 1993
Wollongong Coastal	Mount Pleasant	Jun 1997–ongoing
Wollongong Coastal	Mount Nebo	Nov 1982–Feb 1997
Wollongong Coastal	Mount Kembla	Jun 1985–ongoing
Wollongong Coastal	Dombarton Loop	Jun 1985–ongoing
Wollongong Coastal	Wongawilli	Jan 1983–ongoing
Wollongong Coastal	Port Kembla BHP	Jan 1993–ongoing
Wollongong Coastal	Port Kembla	Sep 1982–ongoing
Wollongong Coastal	Darkes Road	Feb 1994–Jun 2023
Wollongong Coastal	Cleveland Road	Jun 1985–ongoing
Wollongong Coastal	Huntley Colliery	Jan 1983–ongoing
Wollongong Coastal	Calderwood	Jan 1983–Jun 1985
Wollongong Coastal	Upper Calderwood	Jun 1985–ongoing
Wollongong Coastal	Little Lake	May 1992–Oct 2014
Wollongong Coastal	Little Lake Entrance	May 2014–ongoing
Wollongong Coastal	Airport	Jun 1991–Mar 1995
Wollongong Coastal	North Macquarie	Jul 1985–ongoing
Wollongong Coastal	Clover Hill	Dec 1985–ongoing
Wollongong Coastal	Nurrewin	Jan 2006–ongoing
Wollongong Coastal	Yellow Rock Road	Jan 1983–ongoing
Wollongong Coastal	Balgownie	Jul 1982–Jun 1987
Wollongong Coastal	Woonona	Jul 1982–Jun 1985
South Coast	Lake Wollumboola	Feb 1999–Oct 2000
South Coast	Lake Conjola Downstream	Jul 2016–ongoing
South Coast	Lake Conjola	Jan 1999–Jul 2017
South Coast	Barlows Bay (Narooma)	Jul 1999–ongoing
South Coast	Regatta Point	Jan 1999–ongoing
South Coast	Merimbula Wharf	Aug 1997–Sep 2001
South Coast	Agnew Wharf	Aug 1997–Jun 2000

Appendix B Publications of interest

Data reports

MHL annual coastal rainfall summaries available:

MHL Report Nos. 610 (90–91), .624 (91–92), 660 (92–93), 699 (93–94), 730 (94–95), 776 (95–96), 874 (96–97), 946 (97–98), 1015 (98–99), 1071 (99–00), 1131 (00–01), 1207 (01–02), 1278 (02–03), 1348 (03–04), 1424 (04–05), 1513 (05–06), 1765 (06–07), 1849 (07–08), 1934 (08–09), 2011 (09–10), 2090 (10–11), 2159 (11–12), 2220 (12–13), 2293 (13–14), 2385 (14–15), 2476 (15–16), 2575 (16–17), 2619 (17–18), 2694 (18–19), 2771 (19-20), 2857 (20–21), 2908 (21–22).

MHL annual estuary and river water levels summaries available:

MHL Report Nos. 555 (87–88), 564 (88–89), 582 (89–90), 601 (90–91), 625 (91–92), 659 (92–93), 698 (93–94), 731 (94–95), 778 (95–96), 875 (96–97), 947 (97–98), 1014 (98–99), 1070 (99–00), 1130 (00–01), 1206 (01–02), 1276 (02–03), 1346 (03–04), 1422 (04–05), 1511 (05–06), 1763 (06–07), 1847 (07–08), 1932 (08–09), 2009 (09–10), 2088 (10–11), 2157 (11–12), 2218 (12–13) 2291(13–14), 2383 (14–15), 2474 (15–16), 2573 (16–17), 2617 (17–18), 2692 (18–19), 2769 (19-20), 2855 (20–21), 2906 (21–22).

MHL annual ocean tide levels summaries available:

MHL Report Nos. 515 (86–87), 544 (87–88), 563 (88–89), 585 (89–90), 602 (90–91), 628 (91–92), 658 (92–93), 697 (93–94), 732 (94–95), 777 (95–96), 876 (96–97), 947 (97–98), 1013 (98–99), 1069 (99–00, 1129 (00–01), 1205 (01–02), 1277 (02–03), 1347 (03–04), 1423 (04–05), 1512 (05–06), 1764 (06–07), 1848 (07–08), 1933 (08–09), 2010 (09–10), 2089 (10–11), 2158 (11–12), 2219 (12–13) 2292 (13–14), 2384 (14–15), 2475 (15–16), 2574 (16–17), 2618 (17–18), 2693 (18–19) , 2770 (19-20), 2856 (20–21), 2907 (21–22).

MHL annual wave climate and coastal air pressure summaries available:

MHL Report Nos. 547 (87–88), 560 (88–89), 581 (89–90), 600 (90–91), 627 (91–92), 655 (92–93), 695 (93–94), 733 (94–95), 779 (95–96), 877 (96–97), 948 (97–98), 1016 (98–99), 1072 (99–00), 1132 (00–01), 1208 (01–02), 1279 (02–03), 1349 (03–04), 1425 (04–05), 1514 (05–06),1766 (06–07), 1850 (07–08), 1935 (08–09), 2012 (09–10), 2091 (10–11), 2160 (11–12), 2221 (12–13) 2294 (13–14), 2386 (14–15), 2477 (15–16), 2576 (16–17), 2620 (17–18), 2695 (18–19) , 2772 (19-20), 2858 (20–21), 2909 (21–22).

Flood reports

MHL flood reports:

- *New South Wales North Coast Flood Summary June 2005*, MHL Report No. 1426
- *Marshalls Creek Flood Event 30 June 2005,* MHL Report No. 1435
- *New South Wales North Coast January 2006 Flood Summary*, MHL Report No. 1469
- *New South Wales North Coast March 2006 Flood Summary*, MHL Report No. 1482
- *New South Wales Central Coast June 2007 Flood Summary*, MHL Report No. 1754

- *New South Wales Hunter Valley, Wallamba River and Myall River June 2007 Flood Summary*, MHL Report No. 1755
- *New South Wales Hawkesbury and Nepean June 2007 Flood Summary*, MHL Report No. 1756
- *New South Wales Tweed River January 2008 Flood Summary*, MHL Report No. 1801
- *New South Wales Richmond River January 2008 Flood Summary*, MHL Report No. 1802
- *New South Wales Clarence River January 2008 Flood Summary*, MHL Report No. 1803
- *New South Wales Coffs Harbour and Bellinger River Region January 2008 Flood Summary*, MHL Report No. 1804
- *New South Wales Coffs Harbour, Bellinger River and Nambucca River Regions February 2009 Flood Summary*, MHL Report No. 1908
- *New South Wales Coffs Harbour and Bellinger River Regions April 2009 Flood Summary*, MHL Report No. 1913
- *NSW Northern Rivers May 2009 Flood Report*, MHL Report No. 1965
- *NSW North Coast Flood Summary January–March 2013*, MHL Report No. 2202
- *NSW Hunter and Central Coast Flood Summary April–May 2015,* MHL Report No. 2364
- *NSW South Coast Flood Summary August 2015,* MHL Report No. 2397
- *NSW North Coast Flood Summary March 2017*, MHL Report No. 2535
- *NSW Coastal Flood Summary February 2020,* MHL Report No. 2752
- *NSW Coastal Flood Summary March 2021,* MHL Report No. 2809
- *NSW Coastal Flood Summary Feb March 2022,* MHL Report No. 2880
- *NSW Coastal Flood Summary March April 2022,* MHL Report No. 2895

Other references

Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I, (Editors) 2019, *Australian Rainfall and Runoff: A Guide to Flood Estimation*, Commonwealth of Australia,

The Institution of Engineers, Australia 1987, *Australian Rainfall and Runoff: A Guide to Flood Estimation*, Institute of Engineers Australia

110B King Street

Manly Vale NSW 2093