NSW GOVERNMENT

Manly Hydraulics Laboratory

NSW COASTAL RAINFALL ANNUAL SUMMARY
2021–2022

Report MHL2908
May 2023

Prepared for:

NSW Department of Planning and Environment
Biodiversity and Conservation Division

Cover photograph: Cudgera rainfall station, Tweed River region

NSW COASTAL RAINFALL ANNUAL SUMMARY
2021–2022

Report MHL2908
May 2023

Michael Galloway
Hydrometric Team Leader
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	Bernard Tse	Sarah Dakin	Adam Joyner	1/11/2022
Final	Bernard Tse	Stuart Young, DPE BCD	Adam Joyner	30/5/2023

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. MHL2908

ISSN: 2205-5568 (Print)

ISSN: 2205-5576 (Online)

First published May 2023

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 20 770 707 468 www.mhl.nsw.gov.au

Foreword

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

This annual summary presents rainfall station measurements collected by MHL along NSW coastal estuaries and rivers from 1 July 2021 to 30 June 2022. 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 2021–2022
  Manly Hydraulics Laboratory
  Report No. MHL2906
  ISSN: 2205-5525 (Print)
  ISSN: 2205-5533 (Online)
- NSW Wave Climate Annual Summary 2021–2022
  Manly Hydraulics Laboratory
  Report No. MHL2909
  ISSN: 2205-5584 (Print)
  ISSN: 2205-5592 (online)
- NSW Ocean and River Entrance Tidal Levels and Air Pressure Annual Summary 2021–2022
  Manly Hydraulics Laboratory
  Report No. MHL2907
  ISSN: 2205-5541 (Print)
  ISSN: 2205-555X (Online)
- NSW Estuary and River Water Quality Annual Summary 2021–2022
  Manly Hydraulics Laboratory
  Report No. MHL2910
  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 2021–2022* presents rainfall station measurements collected by MHL along NSW coastal estuaries and rivers from 1 July 2021 to 30 June 2022. It provides an overview of MHL's historical rainfall database and data analysis capabilities.

The overall data capture across the network was 99.1% (for data processed to within ±10% of calibration). The target recovery rate of 95% and above is achieved for the 2021–2022 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 2021–2022
- a list of all stations for which MHL collected rainfall data in 2021–2022 (**Table 5**)
- 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

1 Rainfall monitoring program

This report presents the thirty-sixth year of NSW coastal rainfall data collected by Manly Hydraulics Laboratory (MHL). 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 73 permanent stations funded by the NSW Department of Planning and Environment's Biodiversity and Conservation Division (BCD). 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), landline telephone, 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 on behalf of BCD via the following methods:

- MHL's public website, providing near real time access to a limited sample of data.
- MHL provides BCD, NSW State Emergency Service (SES) and BoM officers access to near real time environmental data and our 'quality assured' historical database through the BCD 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 2021–2022 fiscal year, the maximum recorded rainfall intensities for 11 durations between 5 minutes and 72 hours occurred at three different stations across the BCD rainfall network (**Table 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 (or the 100-year rainfall) 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 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 2021–2022 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 presents the maximum recorded rainfall for durations of 5 minutes to 72 hours at each station.

Table 1 Maximum recorded intensities for all stations

Duration	Station	Date	Rainfall (mm)	Rainfall (mm/hr)	AEP (%)
5min	Regatta Point	27/04/2022	19.5	234.0	2
10min	Webbs Creek	9/12/2021	29.8	178.8	2
20min	Regatta Point	27/04/2022	54.0	162.0	0.5
30min	Regatta Point	27/04/2022	77.5	155.0	0.2
60min	Regatta Point	27/04/2022	110.5	110.5	0.1
3hrs	Huonbrook	28/02/2022	149.5	74.8	5
6hrs	Huonbrook	28/02/2022	193.0	64.3	5
12hrs	Huonbrook	28/02/2022	316.5	52.8	5
24hrs	Huonbrook	28/02/2022	518.0	43.2	2
48hrs	Huonbrook	28/02/2022	822.0	34.3	0.5
72hrs	Huonbrook	28/02/2022	1011.5	21.1	0.2

Table 2 Number of rainfall stations per region where rainfall exceeds 100 mm in 24 hours at least once per month (2021-2022)

Region (No. of stations in region)	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22
Tweed and Brunswick Rivers (4)								4*	3*	*		
Richmond River (1)								1	1*	*	*	*
Bellinger River (8)				*	*			8	7			
Nambucca River (2)								1	2			
Macleay and Hastings Rivers (3)					*				2			
Camden Haven (2)								1	1			
Karuah River (5)									3			
Hunter River (4)												
Macquarie-Tuggerah Lakes (20)								8*	5*	1		
Hawkesbury River (3)									3			
Sydney Coastal (2)									2			
Wollongong Coastal (16)									11	14		
South Coast (3)						1			1	1		

*Data loss of 1% or more during this period at one or more stations.

Table 3 2021–2022 Maximum recorded rainfall (mm)

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	28/02/2022 14.0	28/02/2022 25.0	28/02/2022 44.5	28/02/2022 58.0	28/02/2022 73.5	28/02/2022 124.5	28/02/2022 206.5	28/02/2022 357.0	28/02/2022 557.0	28/02/2022 692.5	1/03/2022 743.5	3132.0
Main Arm[1]	4/12/2021 11.0	4/12/2021 19.0	4/12/2021 30.5	26/11/2021 41.5	26/11/2021 70.0	26/11/2021 89.5	27/11/2021 89.5	24/02/2022 129.0	24/02/2022 174.0	25/02/2022 217.5	25/02/2022 234.0	2161.0
Huonbrook	28/02/2022 13.0	28/02/2022 24.0	28/02/2022 40.5	28/02/2022 55.5	28/02/2022 85.5	28/02/2022 193.0	28/02/2022 316.5	28/02/2022 518.0	28/02/2022 822.0	28/02/2022 1011.5	28/02/2022 1059.0	3811.0
Myocum	16/05/2022 14.0	16/05/2022 21.5	16/05/2022 24.0	27/02/2022 30.5	27/02/2022 52.5	29/03/2022 99.0	30/03/2022 132.0	30/03/2022 195.5	28/02/2022 294.5	28/02/2022 460.0	1/03/2022 496.5	2893.0
Lake Ainsworth[1]	6/03/2022 14.5	6/03/2022 25.5	6/03/2022 38.5	6/03/2022 46.5	6/03/2022 55.5	6/03/2022 75.5	29/03/2022 85.0	27/02/2022 143.5	28/02/2022 182.5	28/02/2022 296.5	1/03/2022 308.5	2175.0
Wooli Sportsground	28/10/2021 10.5	28/10/2021 17.0	1/01/2022 24.0	1/01/2022 32.5	1/01/2022 43.0	28/02/2022 77.5	28/02/2022 104.0	28/02/2022 139.0	28/02/2022 254.0	1/03/2022 367.5	28/02/2022 396.0	2232.5
Perry Drive	25/10/2021 11.5	25/10/2021 18.0	25/10/2021 24.0	3/04/2022 29.0	3/04/2022 38.0	29/03/2022 84.0	29/03/2022 115.0	28/02/2022 174.5	30/03/2022 213.0	28/02/2022 298.5	1/03/2022 339.5	2733.0
Shephards Lane	12/08/2021 9.0	25/10/2021 13.0	3/04/2022 19.0	3/04/2022 25.5	28/02/2022 36.5	29/03/2022 82.5	28/02/2022 128.0	28/02/2022 198.5	30/03/2022 239.0	31/03/2022 346.5	1/03/2022 389.0	2912.5
Red Hill	23/10/2021 9.0	23/10/2021 15.0	28/02/2022 21.0	28/02/2022 24.5	28/02/2022 37.0	28/02/2022 83.0	28/02/2022 134.5	28/02/2022 209.5	28/02/2022 241.0	31/03/2022 362.5	30/03/2022 388.5	2773.0
Newports Creek[1]	24/02/2022 10.0	25/12/2021 16.0	24/02/2022 25.5	24/02/2022 35.5	24/02/2022 38.0	24/02/2022 68.5	28/02/2022 115.5	28/02/2022 183.0	28/02/2022 218.0	28/02/2022 311.0	28/02/2022 350.5	2578.0
Middle Boambee	23/10/2021 15.5	23/10/2021 23.5	24/02/2022 28.5	24/02/2022 41.5	24/02/2022 44.5	24/02/2022 83.0	28/02/2022 106.0	28/02/2022 172.5	30/03/2022 233.5	31/03/2022 337.5	30/03/2022 360.0	2936.0
North Bonville	20/10/2021 13.5	20/10/2021 22.0	17/12/2021 36.0	17/12/2021 53.5	17/12/2021 78.0	17/12/2021 84.0	28/02/2022 99.5	28/02/2022 143.0	30/03/2022 228.0	31/03/2022 324.0	31/03/2022 333.5	3045.5
Kooroowi Sharabel	9/12/2021 9.5	9/12/2021 14.0	18/02/2022 18.5	17/12/2021 22.5	17/12/2021 33.5	27/12/2021 54.0	29/03/2022 83.5	29/03/2022 137.5	30/03/2022 246.5	31/03/2022 316.0	31/03/2022 324.0	2491.5
Stuarts Island Downstream	28/05/2022 10.0	28/05/2022 18.0	17/12/2021 26.5	17/12/2021 32.5	17/12/2021 40.5	30/03/2022 68.0	30/03/2022 84.5	30/03/2022 115.5	30/03/2022 158.0	31/03/2022 241.5	30/03/2022 252.0	2078.0
Utungun	7/11/2021 10.0	24/02/2022 17.0	22/11/2021 26.0	22/11/2021 35.5	22/11/2021 55.0	22/11/2021 63.5	24/02/2022 88.5	24/02/2022 115.0	30/03/2022 184.0	30/03/2022 242.5	31/03/2022 247.0	2146.0
Aldavilla Downstream	16/07/2021 7.0	7/03/2022 9.0	1/03/2022 16.0	1/03/2022 21.0	1/03/2022 27.0	23/03/2022 34.0	29/03/2022 42.0	29/03/2022 66.0	30/03/2022 99.0	30/03/2022 148.0	31/03/2022 154.0	1420.0

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[1]	1/03/2022 9.5	1/03/2022 16.0	4/12/2021 26.5	23/03/2022 29.5	1/03/2022 37.0	1/03/2022 58.0	1/03/2022 100.5	1/03/2022 140.5	1/03/2022 202.5	2/03/2022 237.0	2/03/2022 271.5	1838.5
Telegraph Point	22/02/2022 8.5	23/03/2022 14.5	23/03/2022 22.0	23/03/2022 25.5	1/03/2022 38.5	24/03/2022 56.0	24/03/2022 64.5	1/03/2022 93.5	1/03/2022 154.0	1/03/2022 187.0	2/03/2022 228.5	1960.5
Logans Crossing	23/03/2022 9.5	20/11/2021 17.0	1/03/2022 26.5	1/03/2022 35.0	1/03/2022 43.5	30/03/2022 64.5	30/03/2022 103.5	30/03/2022 130.5	31/03/2022 179.0	31/03/2022 223.5	31/03/2022 256.0	2093.5
Mount George	7/11/2021 11.5	7/11/2021 18.5	24/03/2022 21.5	3/03/2022 26.0	3/03/2022 38.0	3/03/2022 47.5	3/03/2022 56.5	1/03/2022 78.5	2/03/2022 112.0	3/03/2022 158.0	4/03/2022 207.0	1640.5
Nabiac	24/03/2022 12.0	24/03/2022 15.5	24/03/2022 19.0	24/03/2022 19.5	7/03/2022 21.0	1/03/2022 36.0	1/03/2022 48.0	1/03/2022 77.0	2/03/2022 104.5	2/03/2022 147.0	3/03/2022 174.5	1439.5
Tuncurry Downstream	24/03/2022 12.0	24/03/2022 18.5	19/02/2022 21.5	19/02/2022 22.5	1/03/2022 32.0	1/03/2022 51.5	1/03/2022 81.5	1/03/2022 107.0	2/03/2022 136.0	2/03/2022 189.0	3/03/2022 221.0	1635.0
Pacific Palms Wharf	1/03/2022 11.5	1/03/2022 19.5	1/03/2022 31.0	1/03/2022 39.0	1/03/2022 51.0	1/03/2022 73.0	1/03/2022 99.5	1/03/2022 135.0	1/03/2022 153.5	2/03/2022 166.0	3/03/2022 229.5	1709.0
Tarbuck Bay	22/05/2022 10.5	10/11/2021 14.0	1/03/2022 24.0	1/03/2022 31.5	1/03/2022 45.0	1/03/2022 58.0	1/03/2022 89.0	1/03/2022 122.5	2/03/2022 137.5	22/05/2022 174.5	4/03/2022 261.5	1941.5
Bulahdelah	9/12/2021 9.0	9/12/2021 13.0	23/10/2021 19.0	9/12/2021 20.5	9/12/2021 24.0	31/03/2022 28.5	31/03/2022 38.5	4/03/2022 58.0	4/03/2022 88.5	4/03/2022 96.0	4/03/2022 135.0	1611.5
Gostwyck	17/02/2022 9.0	17/02/2022 13.0	17/02/2022 18.0	17/02/2022 19.0	3/03/2022 24.5	3/03/2022 43.5	3/03/2022 63.0	3/03/2022 78.5	4/03/2022 106.5	4/03/2022 122.0	4/03/2022 131.0	1262.5
Seaham	26/11/2021 12.0	26/11/2021 16.5	24/03/2022 20.0	24/03/2022 24.0	24/03/2022 26.5	24/03/2022 50.5	24/03/2022 76.5	24/03/2022 87.5	24/03/2022 91.5	26/03/2022 101.0	26/03/2022 113.5	1136.5
Belmore Bridge	17/02/2022 12.0	17/02/2022 17.5	17/02/2022 29.5	17/02/2022 37.0	17/02/2022 39.0	7/11/2021 42.0	12/11/2021 49.5	24/03/2022 56.5	24/03/2022 58.0	12/11/2021 79.0	26/03/2022 82.0	1003.5
Hexham Bridge	1/10/2021 8.5	11/02/2022 12.5	11/02/2022 17.5	8/03/2022 19.0	8/03/2022 29.0	12/11/2021 40.5	12/11/2021 59.0	12/11/2021 67.0	12/11/2021 68.5	12/11/2021 92.0	4/03/2022 96.5	1187.0
Barnsley	25/03/2022 10.0	24/02/2022 19.0	24/02/2022 29.5	24/02/2022 36.0	24/02/2022 55.5	24/02/2022 94.0	24/02/2022 109.0	25/02/2022 116.0	25/02/2022 121.0	24/02/2022 156.0	25/02/2022 196.0	1196.0
Martinsville	11/02/2022 7.5	11/02/2022 12.0	11/02/2022 16.5	11/02/2022 19.0	11/02/2022 31.0	11/02/2022 39.0	11/02/2022 59.5	8/04/2022 78.0	8/04/2022 85.5	8/03/2022 101.0	9/03/2022 121.5	1464.0
Mandalong	10/11/2021 12.5	10/11/2021 15.5	6/03/2022 20.5	6/03/2022 25.5	11/02/2022 33.5	11/02/2022 42.5	11/02/2022 51.5	7/04/2022 60.0	3/03/2022 84.5	8/03/2022 108.0	9/03/2022 142.0	1552.0
Wyee	22/05/2022 7.5	17/02/2022 11.0	7/01/2022 16.0	8/01/2022 19.5	2/03/2022 28.5	2/03/2022 46.5	2/03/2022 60.5	2/03/2022 71.5	3/03/2022 102.5	3/03/2022 127.5	4/03/2022 150.0	1569.5

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	22/02/2022 9.5	22/02/2022 16.0	22/02/2022 28.0	22/02/2022 36.5	2/03/2022 51.5	22/02/2022 101.5	22/02/2022 106.0	22/02/2022 119.0	3/03/2022 160.0	4/03/2022 204.0	4/03/2022 241.0	1831.0
Yarramalong	22/02/2022 10.5	22/02/2022 19.0	22/02/2022 31.5	22/02/2022 40.5	22/02/2022 53.5	22/02/2022 96.5	22/02/2022 149.0	22/02/2022 152.5	22/02/2022 178.0	3/03/2022 232.5	3/03/2022 260.5	1687.0
Kulnura	2/03/2022 9.5	2/03/2022 18.5	2/03/2022 29.0	2/03/2022 39.0	2/03/2022 53.0	2/03/2022 80.0	2/03/2022 104.0	2/03/2022 125.5	3/03/2022 181.5	3/03/2022 256.0	3/03/2022 286.0	1585.5
Toukley	6/03/2022 11.0	7/12/2021 20.0	7/12/2021 32.5	7/12/2021 36.0	7/12/2021 36.5	29/03/2022 51.0	29/03/2022 55.0	7/04/2022 83.0	7/04/2022 89.0	8/04/2022 98.5	9/04/2022 103.0	1145.5
Hamlyn Terrace	26/03/2022 11.0	6/03/2022 17.0	7/12/2021 26.0	6/03/2022 31.0	6/03/2022 33.0	9/12/2021 44.5	10/12/2021 54.5	7/04/2022 71.5	8/04/2022 77.5	4/03/2022 90.0	3/03/2022 105.5	1595.0
Mardi Dam	20/03/2021 7.0	24/10/2020 11.0	20/03/2021 13.5	20/03/2021 16.5	21/03/2021 25.0	26/07/2020 43.0	26/07/2020 68.0	26/07/2020 94.5	21/03/2021 138.0	21/03/2021 238.5	21/03/2021 278.0	1625.0
Sterland	8/12/2021 13.0	8/12/2021 20.5	8/12/2021 23.5	22/02/2022 25.5	22/02/2022 30.5	22/02/2022 62.0	22/02/2022 71.5	22/02/2022 82.0	22/02/2022 103.5	23/02/2022 115.0	24/02/2022 116.5	1502.0
Kangy Angy	17/02/2022 7.0	23/12/2021 10.0	31/03/2022 14.0	31/03/2022 16.0	31/03/2022 24.5	7/04/2022 43.5	7/04/2022 72.0	7/04/2022 90.5	8/04/2022 93.0	4/03/2022 115.5	4/03/2022 137.0	1669.5
Berkeley Vale	13/04/2022 7.5	13/04/2022 11.5	13/04/2022 16.0	13/04/2022 17.5	4/02/2022 26.5	4/02/2022 55.0	7/04/2022 70.5	7/04/2022 90.5	8/04/2022 93.5	31/03/2022 123.5	31/03/2022 136.5	1732.5
Bateau Bay	25/03/2022 10.0	24/02/2022 19.0	24/02/2022 29.5	24/02/2022 36.0	24/02/2022 55.5	24/02/2022 94.0	24/02/2022 109.0	25/02/2022 116.0	25/02/2022 121.0	24/02/2022 156.0	25/02/2022 196.0	1787.0
Lisarow	22/02/2022 9.0	22/02/2022 16.0	22/02/2022 17.5	24/02/2022 20.5	23/05/2022 25.5	7/04/2022 51.0	7/04/2022 76.5	7/04/2022 94.5	8/04/2022 96.0	4/03/2022 129.0	4/03/2022 147.0	1859.0
Strickland	23/12/2021 11.0	23/12/2021 21.5	23/12/2021 32.5	23/12/2021 38.5	23/12/2021 44.0	23/12/2021 55.0	22/02/2022 73.0	7/04/2022 81.0	23/02/2022 108.5	4/03/2022 136.5	25/02/2022 164.0	1805.0
Narara	22/02/2022 12.0	22/02/2022 20.0	22/02/2022 33.0	22/02/2022 42.0	22/02/2022 52.0	22/02/2022 63.5	22/02/2022 94.0	22/02/2022 96.5	23/02/2022 116.0	4/03/2022 140.5	25/02/2022 163.5	1836.0
Mount Elliot	24/02/2022 10.5	24/02/2022 16.5	24/02/2022 24.0	24/02/2022 34.0	24/02/2022 50.0	24/02/2022 87.0	24/02/2022 104.0	25/02/2022 108.5	25/02/2022 125.0	26/02/2022 160.5	25/02/2022 210.5	2112.0
Wyoming	22/02/2022 13.0	22/02/2022 25.5	22/02/2022 34.5	22/02/2022 45.0	22/02/2022 54.5	22/02/2022 65.5	22/02/2022 87.0	22/02/2022 91.0	23/02/2022 120.0	23/02/2022 137.0	25/02/2022 202.5	1901.0
Kincumber	9/12/2021 12.5	9/12/2021 21.5	9/12/2021 33.5	9/12/2021 39.0	9/12/2021 50.0	7/04/2022 69.5	2/03/2022 92.5	7/04/2022 124.0	7/04/2022 129.5	4/03/2022 163.0	4/03/2022 191.5	1991.0

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	
Webbs Creek	9/12/2021 18.6	9/12/2021 29.8	9/12/2021 41.0	9/12/2021 45.4	22/02/2022 59.0	22/02/2022 85.8	2/03/2022 98.0	2/03/2022 137.8	3/03/2022 179.0	4/03/2022 214.4	4/03/2022 227.8	1456.8
Colo Junction	6/03/2022 9.0	6/03/2022 15.4	6/03/2022 24.2	6/03/2022 26.2	6/03/2022 31.8	6/03/2022 52.8	2/03/2022 81.4	2/03/2022 130.2	3/03/2022 169.6	3/03/2022 198.4	8/03/2022 221.8	1511.4
Sackville Downstream	6/03/2022 10.8	6/03/2022 19.6	6/03/2022 24.4	6/03/2022 26.8	6/03/2022 32.6	6/03/2022 62.6	2/03/2022 82.0	2/03/2022 127.8	3/03/2022 170.0	4/03/2022 204.6	8/03/2022 232.6	1514.0
Curl Curl	7/04/2022 10.0	8/03/2022 18.0	8/03/2022 29.5	8/03/2022 42.5	8/03/2022 62.5	8/03/2022 114.0	8/03/2022 138.5	8/03/2022 198.0	8/03/2022 242.0	8/03/2022 294.5	9/03/2022 353.0	1928.0
Kelso Creek	21/05/2022 9.5	7/03/2022 14.0	7/03/2022 26.5	7/03/2022 31.0	7/03/2022 32.0	7/03/2022 58.5	8/03/2022 76.5	8/03/2022 90.5	8/03/2022 145.0	8/03/2022 188.0	8/03/2022 211.0	1523.5
Rixons Pass	14/10/2021 11.5	14/10/2021 15.0	7/04/2022 19.5	7/04/2022 27.5	7/04/2022 40.5	7/04/2022 87.5	7/04/2022 126.0	7/04/2022 177.5	7/04/2022 225.5	8/04/2022 253.0	9/04/2022 289.0	2209.5
Russell Vale	14/10/2021 9.0	26/03/2022 12.5	7/04/2022 19.0	7/04/2022 27.5	7/04/2022 38.5	7/04/2022 78.5	7/04/2022 113.5	7/04/2022 163.5	7/04/2022 200.5	8/04/2022 218.5	9/04/2022 247.0	2019.0
Mount Pleasant	7/04/2022 10.0	7/04/2022 19.5	7/04/2022 29.0	7/04/2022 34.0	7/04/2022 53.0	7/04/2022 121.5	7/04/2022 168.0	7/04/2022 214.5	7/04/2022 269.0	8/04/2022 307.0	9/04/2022 340.0	2606.5
Mount Kembla	14/10/2021 8.5	7/03/2022 15.0	7/03/2022 27.5	7/03/2022 34.0	7/03/2022 51.0	7/03/2022 97.0	8/03/2022 107.5	7/04/2022 132.0	7/04/2022 180.5	8/04/2022 224.0	8/03/2022 258.0	2123.0
Dombarton Loop	1/03/2022 7.0	7/03/2022 12.0	7/03/2022 23.0	7/03/2022 31.5	7/03/2022 45.5	7/03/2022 78.0	7/04/2022 106.0	7/04/2022 146.0	7/04/2022 194.0	7/04/2022 245.5	8/04/2022 284.5	2329.5
Wongawilli	23/10/2021 7.0	7/03/2022 10.0	7/03/2022 15.0	7/03/2022 17.5	7/04/2022 22.0	7/03/2022 44.5	7/04/2022 80.5	7/04/2022 118.5	7/04/2022 165.5	8/04/2022 207.5	9/04/2022 227.0	1727.5
Port Kembla	14/10/2021 14.5	14/10/2021 23.0	14/10/2021 27.0	14/10/2021 27.0	14/10/2021 27.0	7/03/2022 53.0	7/04/2022 60.0	7/04/2022 77.0	7/04/2022 100.5	8/03/2022 137.0	25/02/2022 189.5	1875.5
Darkes Road	6/04/2022 10.0	1/03/2022 14.0	6/04/2022 16.5	7/03/2022 20.5	7/03/2022 30.0	7/03/2022 55.0	7/04/2022 77.0	7/04/2022 112.0	7/04/2022 165.5	8/04/2022 195.0	9/04/2022 209.5	1824.0
Cleveland Road	15/01/2022 11.0	15/01/2022 18.0	15/01/2022 30.0	15/01/2022 37.0	15/01/2022 49.0	7/03/2022 62.5	7/04/2022 75.0	7/04/2022 118.5	7/04/2022 161.5	8/04/2022 203.0	9/04/2022 219.0	1828.0
Huntley Colliery	7/04/2022 7.5	7/04/2022 13.5	7/04/2022 19.0	7/04/2022 24.5	7/04/2022 43.0	7/04/2022 75.5	7/04/2022 99.5	7/04/2022 169.5	7/04/2022 231.5	7/04/2022 267.5	9/04/2022 290.0	2110.0
Upper Calderwood	9/12/2021 9.0	7/04/2022 13.5	2/03/2022 22.0	2/03/2022 29.0	2/03/2022 39.0	2/03/2022 64.0	2/03/2022 106.0	7/04/2022 157.5	7/04/2022 249.0	7/04/2022 274.0	3/03/2022 298.5	1971.5

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	
Little Lake Entrance	15/01/2022 10.5	15/01/2022 17.0	15/01/2022 28.0	15/01/2022 30.0	15/01/2022 30.0	24/02/2022 41.5	24/02/2022 56.5	8/03/2022 64.0	23/02/2022 105.0	8/03/2022 142.0	25/02/2022 202.0	1809.0
Nurrewin	9/12/2021 10.0	9/12/2021 17.0	2/03/2022 24.5	2/03/2022 32.5	2/03/2022 44.5	2/03/2022 80.5	2/03/2022 127.5	7/04/2022 190.5	7/04/2022 269.0	3/03/2022 348.0	4/03/2022 414.0	2518.0
Clover Hill	9/12/2021 11.0	2/03/2022 15.5	2/03/2022 29.0	2/03/2022 36.5	2/03/2022 46.5	2/03/2022 88.5	2/03/2022 136.5	2/03/2022 186.0	2/03/2022 246.0	3/03/2022 331.0	4/03/2022 391.0	2432.0
North Macquarie	11/01/2022 12.0	11/01/2022 22.5	11/01/2022 36.5	11/01/2022 50.0	11/01/2022 71.0	11/01/2022 82.5	2/03/2022 86.0	2/03/2022 111.5	2/03/2022 155.5	3/03/2022 210.5	4/03/2022 256.5	1859.5
Yellow Rock Road	15/01/2022 10.5	15/01/2022 14.0	7/04/2022 15.5	7/03/2022 20.5	7/03/2022 28.0	24/02/2022 57.5	2/03/2022 80.0	2/03/2022 102.5	2/03/2022 139.5	4/03/2022 211.5	4/03/2022 265.0	1988.5
Lake Conjola Downstream	7/01/2022 8.0	7/01/2022 13.5	8/03/2022 22.5	10/12/2021 32.5	10/12/2021 56.5	10/12/2021 110.0	10/12/2021 161.0	10/12/2021 197.5	10/12/2021 209.5	8/03/2022 262.5	8/03/2022 288.5	1843.0
Barlows Bay	20/10/2021 7.5	20/10/2021 11.5	20/10/2021 17.0	20/10/2021 20.5	20/10/2021 26.5	20/10/2021 38.0	26/02/2022 46.5	20/10/2021 71.5	7/04/2022 103.5	8/03/2022 151.0	8/03/2022 190.0	1444.0
Regatta Point[1]	27/04/2022 19.5	3/03/2022 29.5	27/04/2022 54.0	27/04/2022 77.5	27/04/2022 110.5	28/04/2022 137.0	28/04/2022 174.5	28/04/2022 175.5	28/04/2022 175.5	27/04/2022 181.0	8/03/2022 204.5	1584.5

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

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 4** presents definitions of the various quality codes.

During 2021–2022, the overall data capture across the network, for data with a quality code of 105 or better, was 99.1%. **Table 5** *Index of figures* 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 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

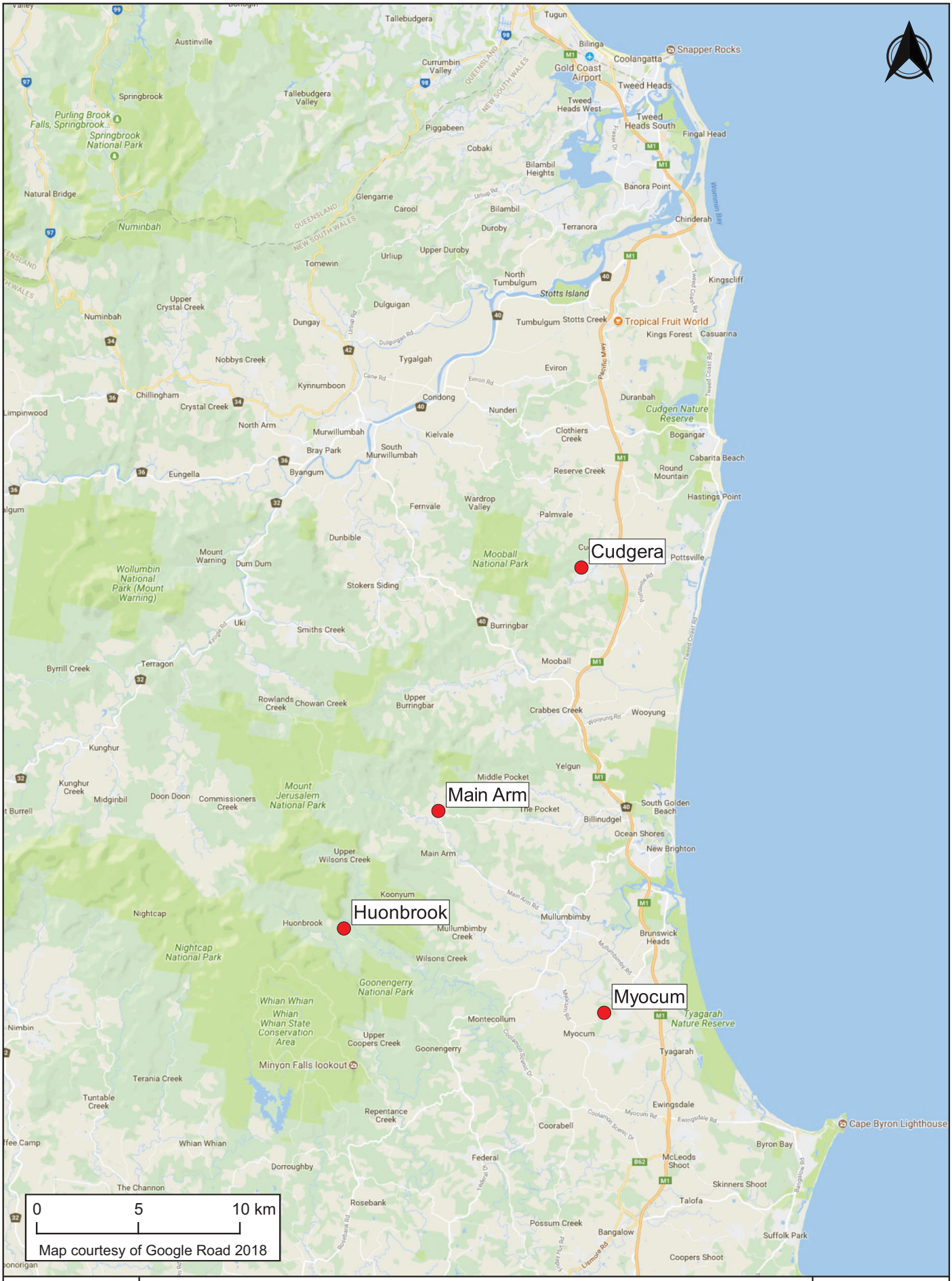
This section documents locality maps and quality assured rainfall monitoring summaries for each station. **Table 5** provides an index to the figures presented. The rainfall plots shown in **Figure 1** to **Figure 89** are presented as daily rainfall totals from midnight to midnight.

Table 5 Index of figures

Region	Station short name	Station no.	MGA	Easting	Northing	Capture %	Figure
Station Locality Map	Tweed River and Brunswick River Regions					96.9%	**1**
Tweed	Cudgera	558046	56	549668	6859164		2
Brunswick	Main Arm	558053	56	542469	6847276		3
Brunswick	Huonbrook	558049	56	537723	6841573		4
Brunswick	Myocum	558036	56	550528	6837390		5
Station Locality Map	Richmond River Region					74.8%	**6**
Richmond	Lake Ainsworth	203455	56	557863	6816160		7
Station Locality Map	Bellinger River Region (North)					100.0%	**8**
Bellinger	Wooli Sportsground	559071	56	525712	6696894		9
Station Locality Map	Bellinger River Region (South)					99.2%	**10**
Bellinger	Perry Drive	559019	56	510142	6650416		11
Bellinger	Shephards Lane	559017	56	508196	6650884		12
Bellinger	Red Hill	559016	56	506635	6649672		13
Bellinger	Newports Creek	559051	56	505893	6646680		14
Bellinger	Middle Boambee	559048	56	504720	6645291		15
Bellinger	North Bonville	559050	56	500593	6641143		16
Bellinger	Kooroowi Sharabel	559008	56	482562	6629162		17
Station Locality Map	Nambucca River Region					100.0%	**18**
Nambucca	Stuarts Island Downstream	205466	56	499519	6608564		19
Nambucca	Utungun	205414	56	485800	6600344		20
Station Locality Map	Macleay River and Hastings River Regions					99.8%	**21**
Macleay	Aldavilla Downstream	206459	56	479318	6561231		22
Hastings	Green Valley	207406	56	486416	6540068		23
Hastings	Telegraph Point	207415	56	481082	6534512		24
Station Locality Map	Camden Haven Region					100.0%	**25**
Camden Haven	Logans Crossing	207428	56	470913	6502295		26
Manning	Mount George	208440	56	419229	6472262		27
Station Locality Map	Karuah River Region					100.0%	**28**
Karuah	Nabiac	209404	56	436831	6446432		29
Karuah	Tuncurry Downstream	209401D	56	450368	6441819		30
Karuah	Pacific Palms Wharf	209406	56	455401	6422551		31
Karuah	Tarbuck Bay	209465	56	451548	6417906		32
Karuah	Bulahdelah	209460	56	425442	6413407		33

Region	Station short name	Station no.	MGA	Easting	Northing	Capture %	Figure
Station Locality Map	Hunter River Region					100.0%	**34**
Hunter	Gostwyck	210402	56	369088	6396074		35
Hunter	Seaham	210462	56	381105	6385316		36
Hunter	Belmore Bridge	210458	56	364492	6377780		37
Hunter	Hexham Bridge	210448	56	376568	6368156		38
Station Locality Map	Macquarie-Tuggerah Lakes (North) Region					100.0%	**39**
Macquarie-Tuggerah Lakes	Barnsley	561067	56	367906	6355834		40
Macquarie-Tuggerah Lakes	Martinsville	561083	56	351239	6341583		41
Macquarie-Tuggerah Lakes	Mandalong	561081	56	355224	6335165		42
Macquarie-Tuggerah Lakes	Wyee	561097	56	358608	6328268		43
Station Locality Map	Macquarie-Tuggerah Lakes (South), Brisbane Water Regions					99.9%	**44**
Macquarie-Tuggerah Lakes	Whitemans Ridge	561026	56	343653	6324899		45
Macquarie-Tuggerah Lakes	Yarramalong	561137	56	338869	6322377		46
Macquarie-Tuggerah Lakes	Kulnura	561078	56	333796	6321517		47
Macquarie-Tuggerah Lakes	Toukley	211401	56	362599	6318531		48
Macquarie-Tuggerah Lakes	Hamlyn Terrace	561133	56	357399	6319854		49
Macquarie-Tuggerah Lakes	Mardi Dam	561082	56	351038	6314555		50
Macquarie-Tuggerah Lakes	Sterland	567138	56	342433	6315335		51
Macquarie-Tuggerah Lakes	Kangy Angy	561132	56	350168	6310609		52
Macquarie-Tuggerah Lakes	Berkeley Vale	561134	56	353191	6309376		53
Macquarie-Tuggerah Lakes	Bateau Bay	561069	56	358098	6305653		54
Macquarie-Tuggerah Lakes	Lisarow	561079	56	348900	6305317		55
Macquarie-Tuggerah Lakes	Strickland	561136	56	345377	6305541		56
Brisbane Water	Narara	561085	56	344310	6304220		57
Brisbane Water	Mount Elliot	561084	56	350646	6302980		58
Brisbane Water	Wyoming	561098	56	346415	6302026		59
Brisbane Water	Kincumber	561077	56	350387	6294461		60
Station Locality Map	Hawkesbury River Region					100.0%	**61**
Hawkesbury	Webbs Creek	212408	56	312331	6303939		62
Hawkesbury	Colo Junction	212407	56	303223	6298183		63
Hawkesbury	Sackville Downstream	212438	56	302769	6291566		64
Station Locality Map	Sydney Coastal Region					100.0%	**65**
Sydney Coastal	Curl Curl	213426	56	342094	6262459		66
Sydney Coastal	Kelso Creek	213430	56	313782	6241020		67
Station Locality Map	Wollongong Coastal Region					100.0%	**68**
Wollongong Coastal	Rixons Pass	568317	56	305281	6196889		69
Wollongong Coastal	Russell Vale	568318	56	306377	6196135		70
Wollongong Coastal	Mount Pleasant	568229	56	303026	6191630		71
Wollongong Coastal	Mount Kembla	568314	56	299550	6186441		72
Wollongong Coastal	Dombarton Loop	568307	56	294719	6185605		73
Wollongong Coastal	Wongawilli	568320	56	293261	6182388		74

Region	Station short name	Station no.	MGA	Easting	Northing	Capture %	Figure
Wollongong Coastal	Port Kembla	568316	56	306636	6182719		75
Wollongong Coastal	Darkes Road	568309	56	297450	6182477		76
Wollongong Coastal	Cleveland Road	568308	56	295800	6179726		77
Wollongong Coastal	Huntley Colliery	568311	56	290648	6178905		78
Wollongong Coastal	Upper Calderwood	568319	56	288750	6175160		79
Wollongong Coastal	Little Lake Entrance	214467	56	304250	6173571		80
Wollongong Coastal	Nurrewin	568228	56	284567	6173437		81
Wollongong Coastal	Clover Hill	568310	56	284233	6172392		82
Wollongong Coastal	North Macquarie	568315	56	291440	6171492		83
Wollongong Coastal	Yellow Rock Road	568321	56	292886	6167649		84
Station Locality Map	South Coast (North) Region					100.0%	**85**
South Coast	Lake Conjola Downstream	216420	56	272446	6094316		86
Station Locality Map	South Coast (Mid) Region					91.4%	**87**
South Coast	Barlows Bay	218415	56	239464	5988955		88
South Coast	Regatta Point	219405	56	236881	5971060		89



NSW GOVERNMENT

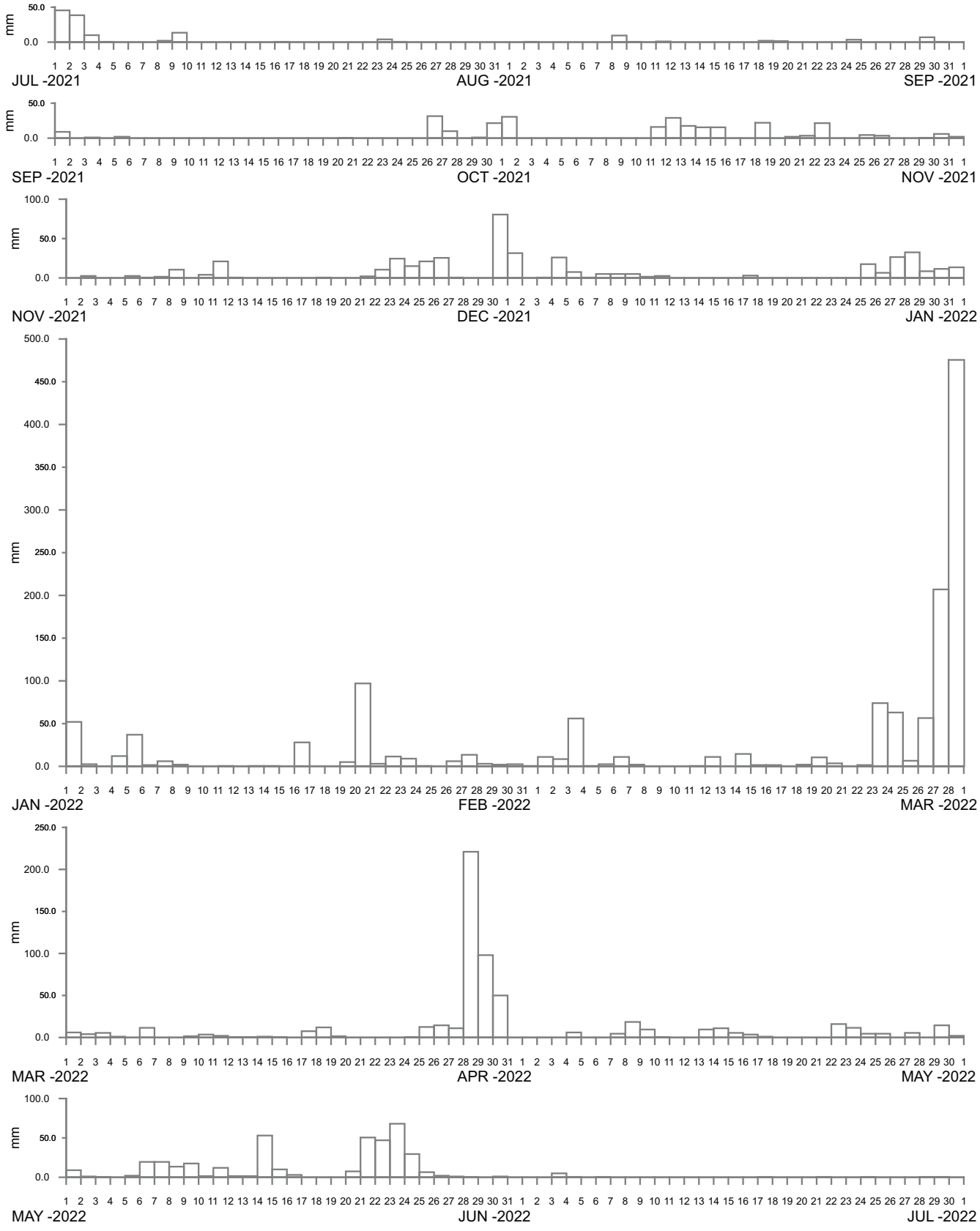
RAINFALL STATION LOCATIONS
TWEED RIVER AND BRUNSWICK RIVER REGIONS

Manly Hydraulics Laboratory

Report MHL2908

Figure 1

DRAWING 2908-01.cdr



NSW GOVERNMENT

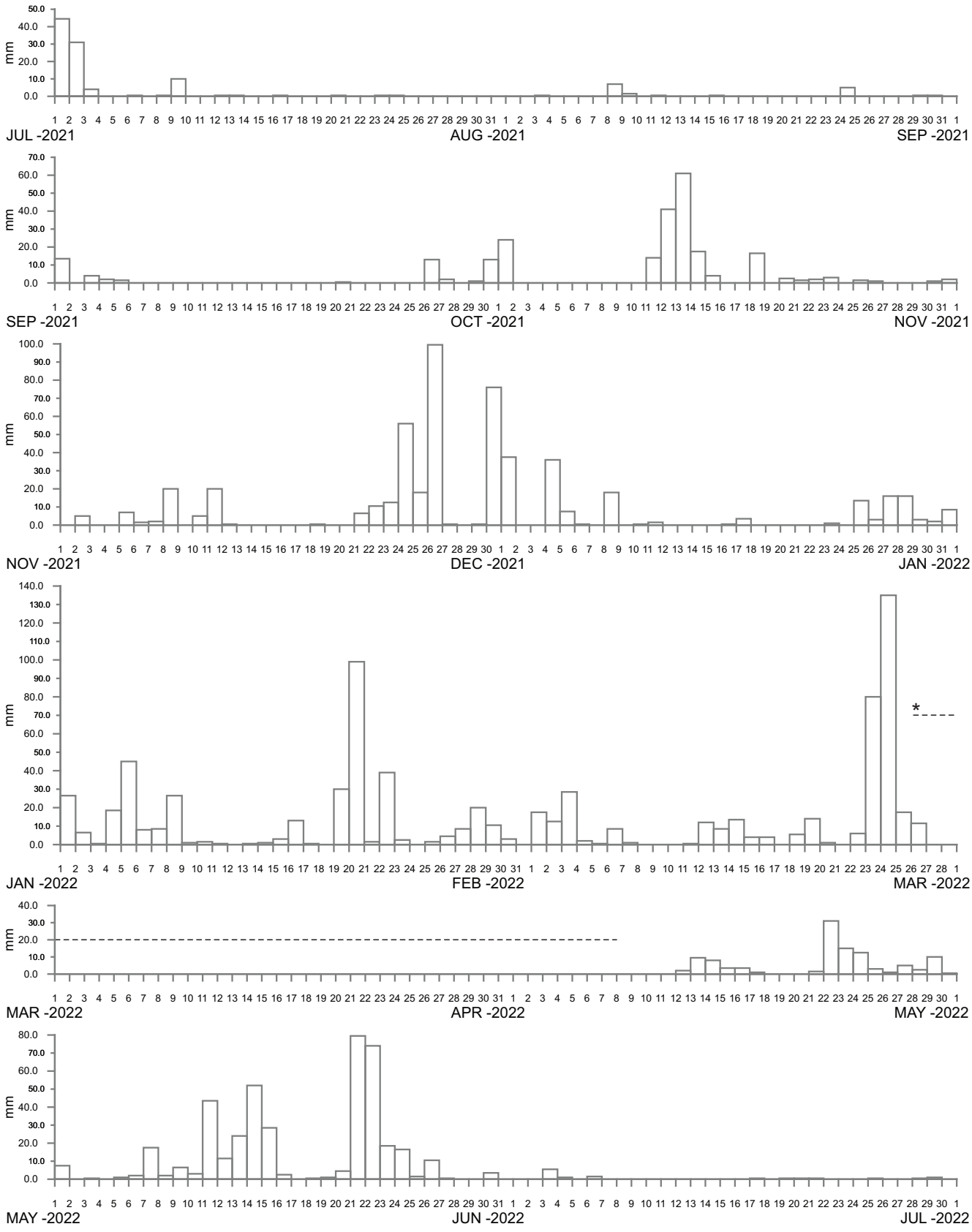
CUDGERA AT CABBAGE GUM ROAD
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 2

DRAWING 2908-02.cdr



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

*Data loss due to blocked tipping bucket

NSW GOVERNMENT

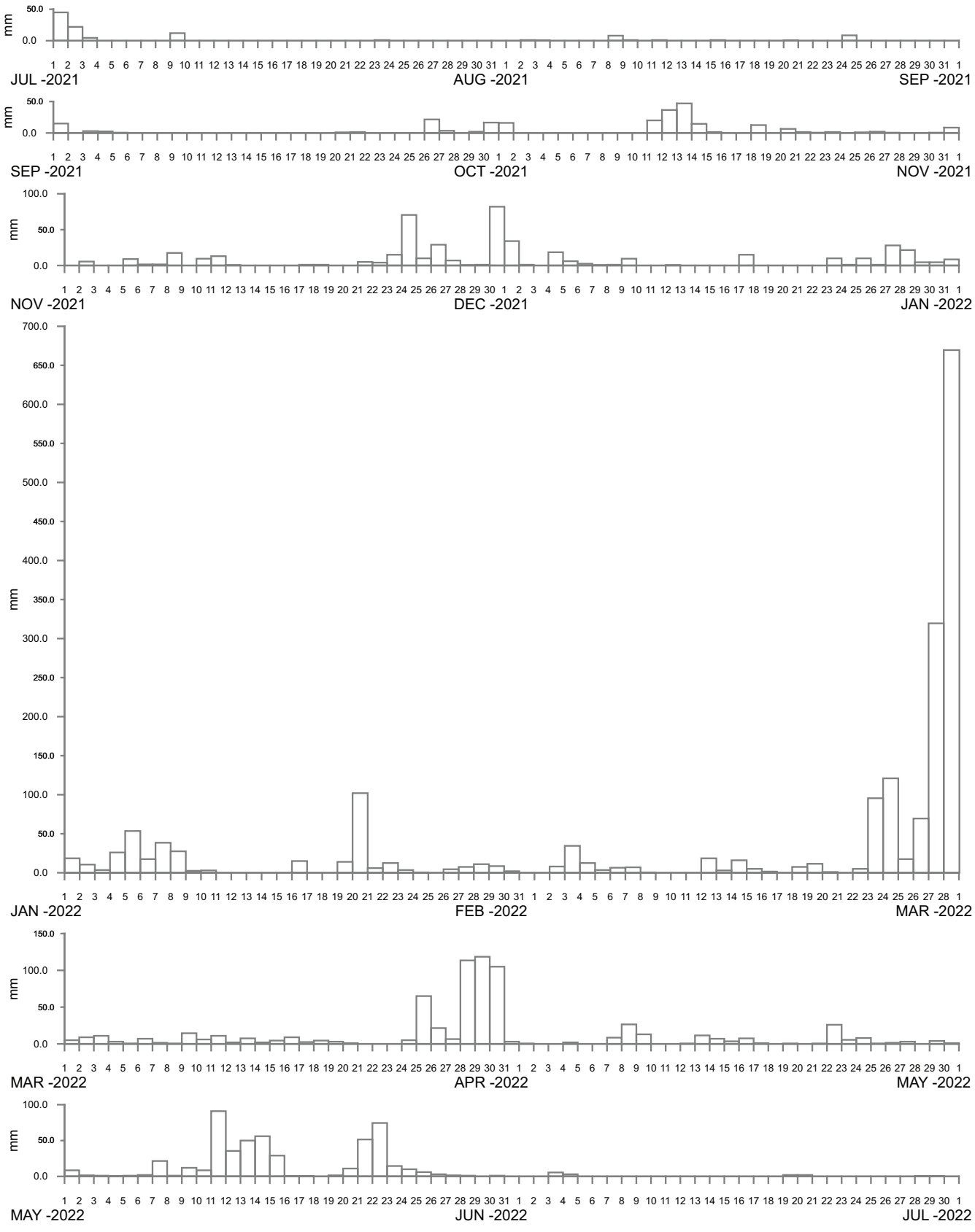
MAIN ARM AT MAIN ARM ROAD
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 3

DRAWING 2908-03.cdr



NSW GOVERNMENT

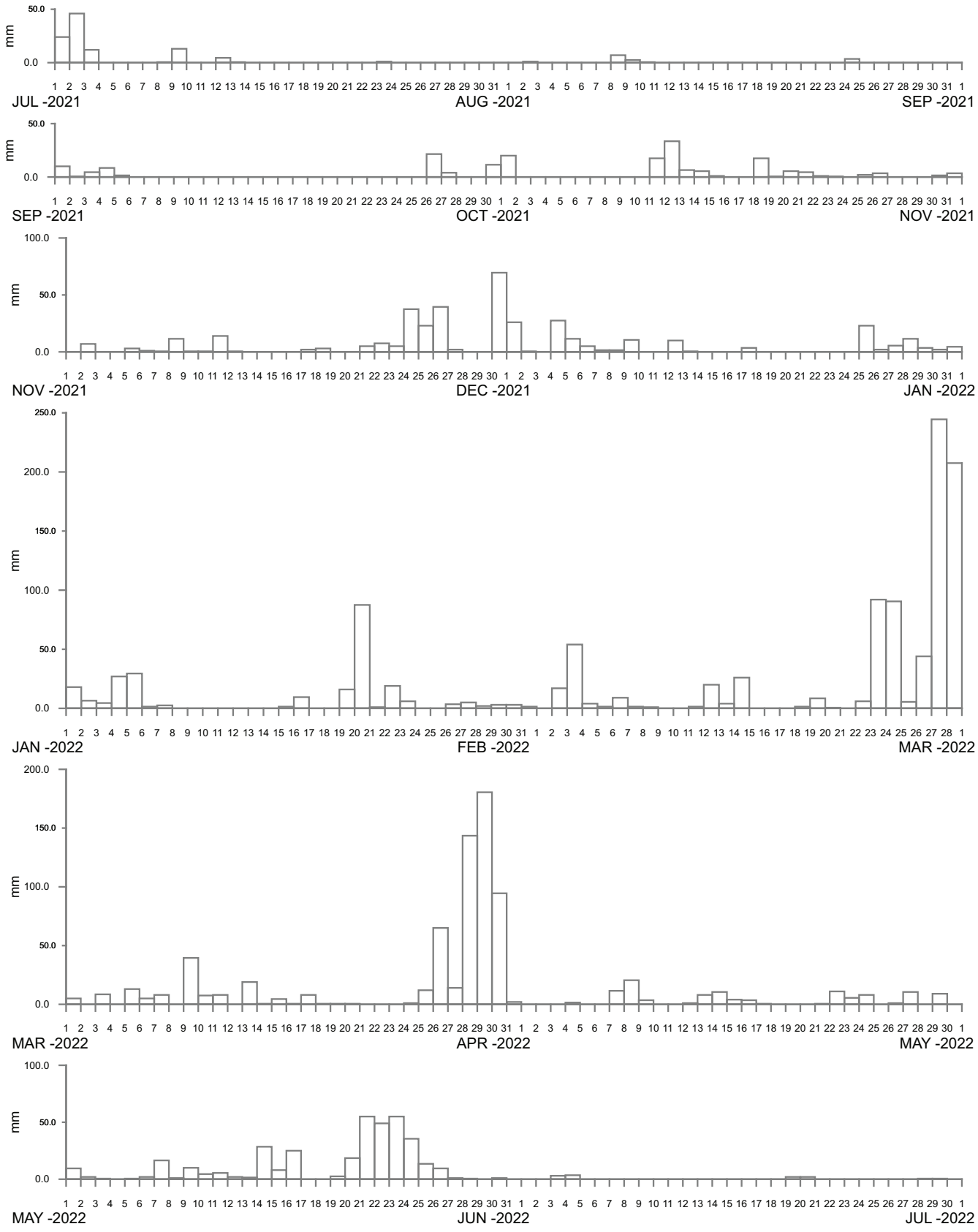
HUONBROOK AT WILSONS CREEK ROAD
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 4

DRAWING 2908-04.cdr



NSW GOVERNMENT

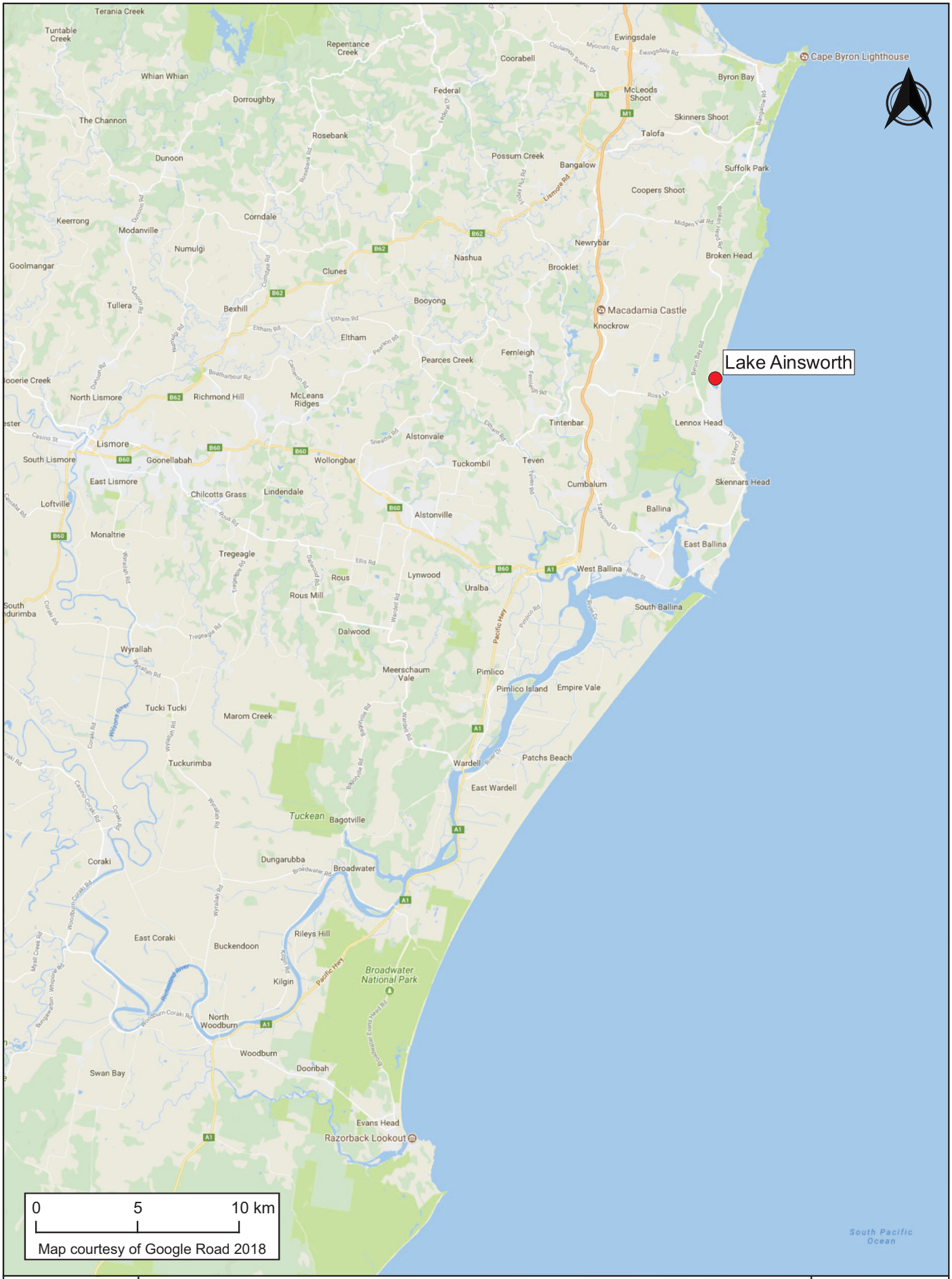
MYOCUM AT KINGSVALE ROAD
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 5

DRAWING 2908-05.cdr



NSW GOVERNMENT

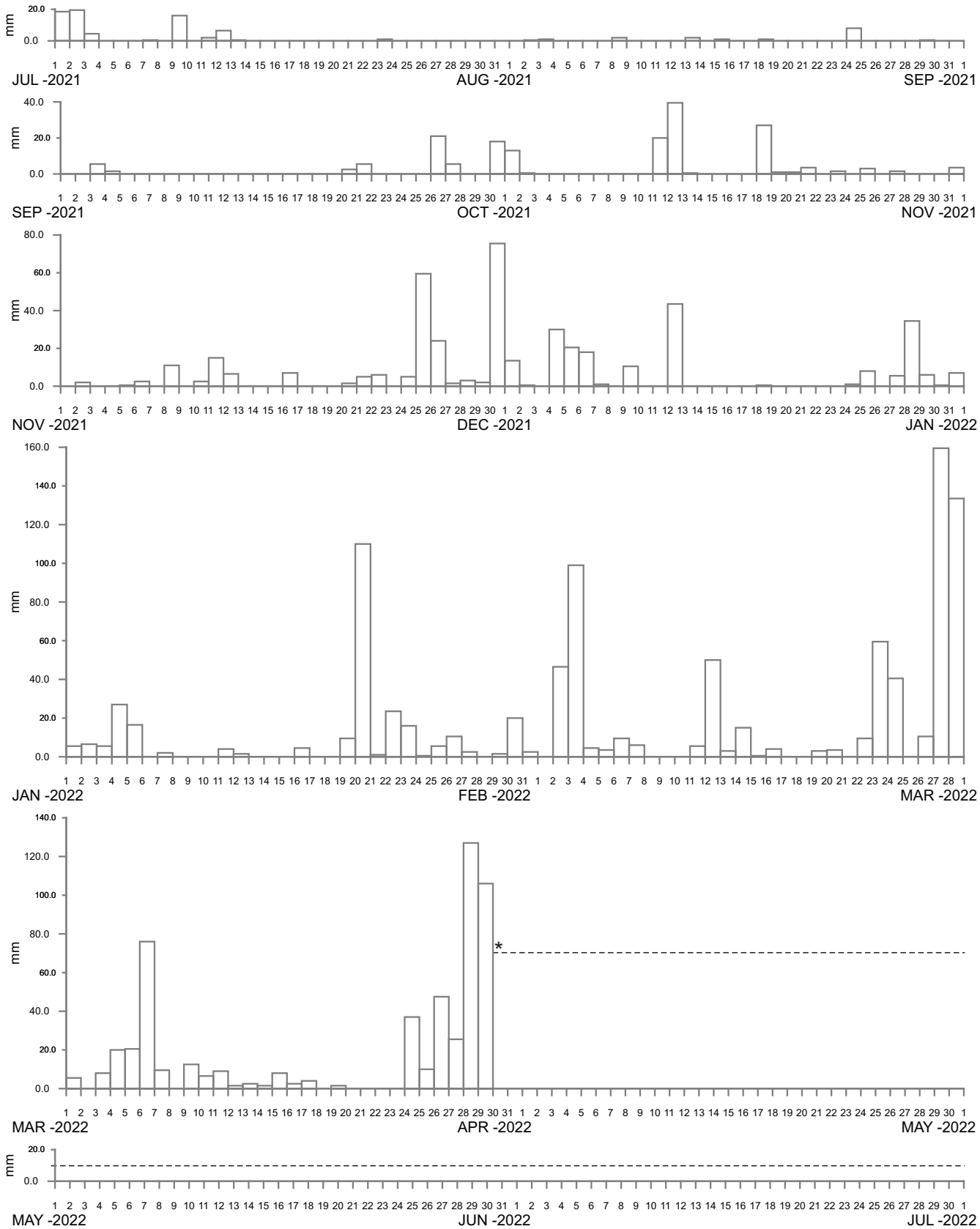
RAINFALL STATION LOCATIONS
RICHMOND RIVER REGION

Manly Hydraulics Laboratory

Report MHL2908

Figure 6

DRAWING 2908-06.cdr



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

*Data loss due to blocked tipping bucket

NSW GOVERNMENT

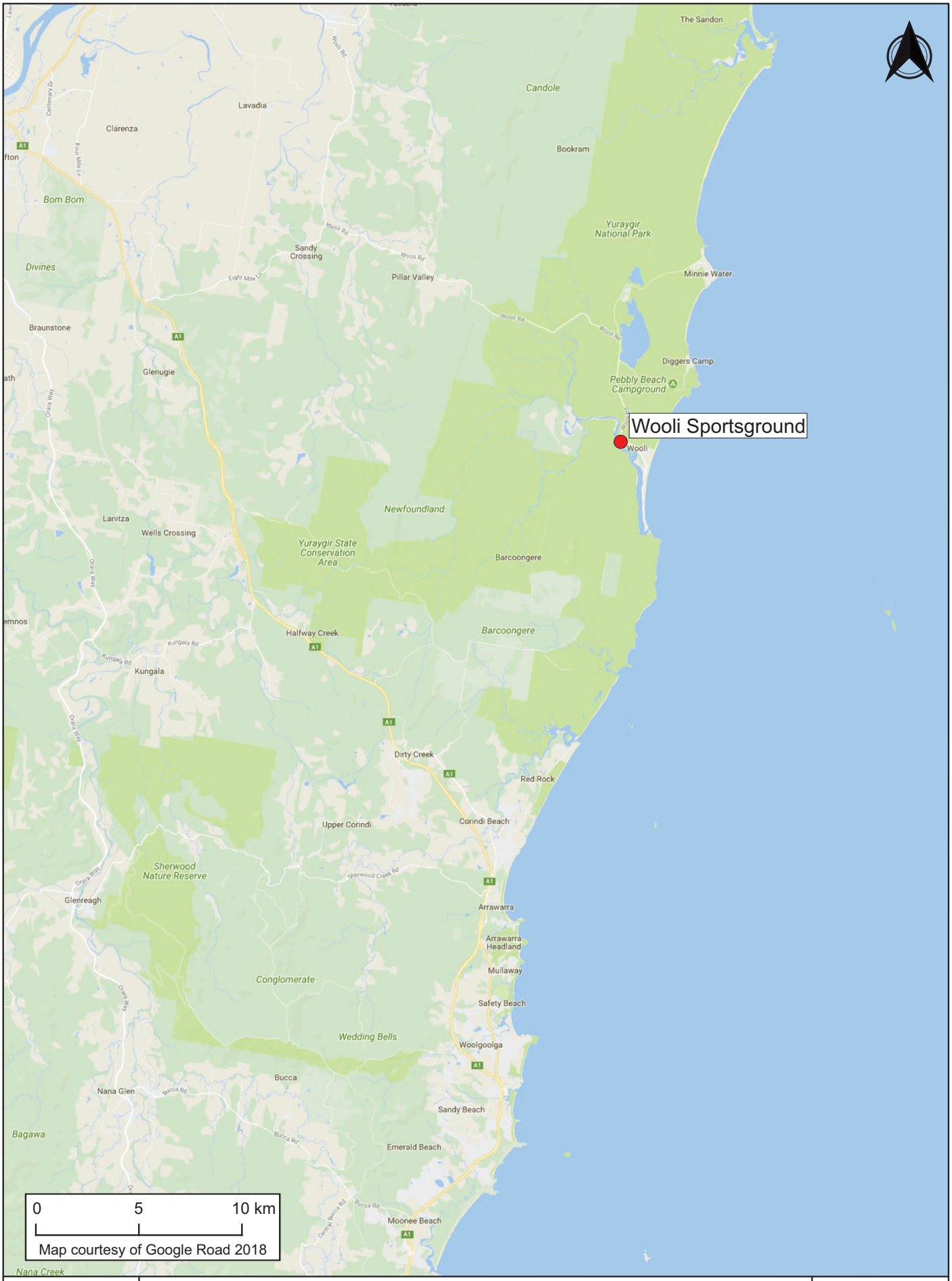
LENNOX HEAD AT LAKE AINSWORTH
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 7

DRAWING 2908-07.cdr



NSW GOVERNMENT

RAINFALL STATION LOCATIONS
BELLINGER RIVER REGION (NORTH)

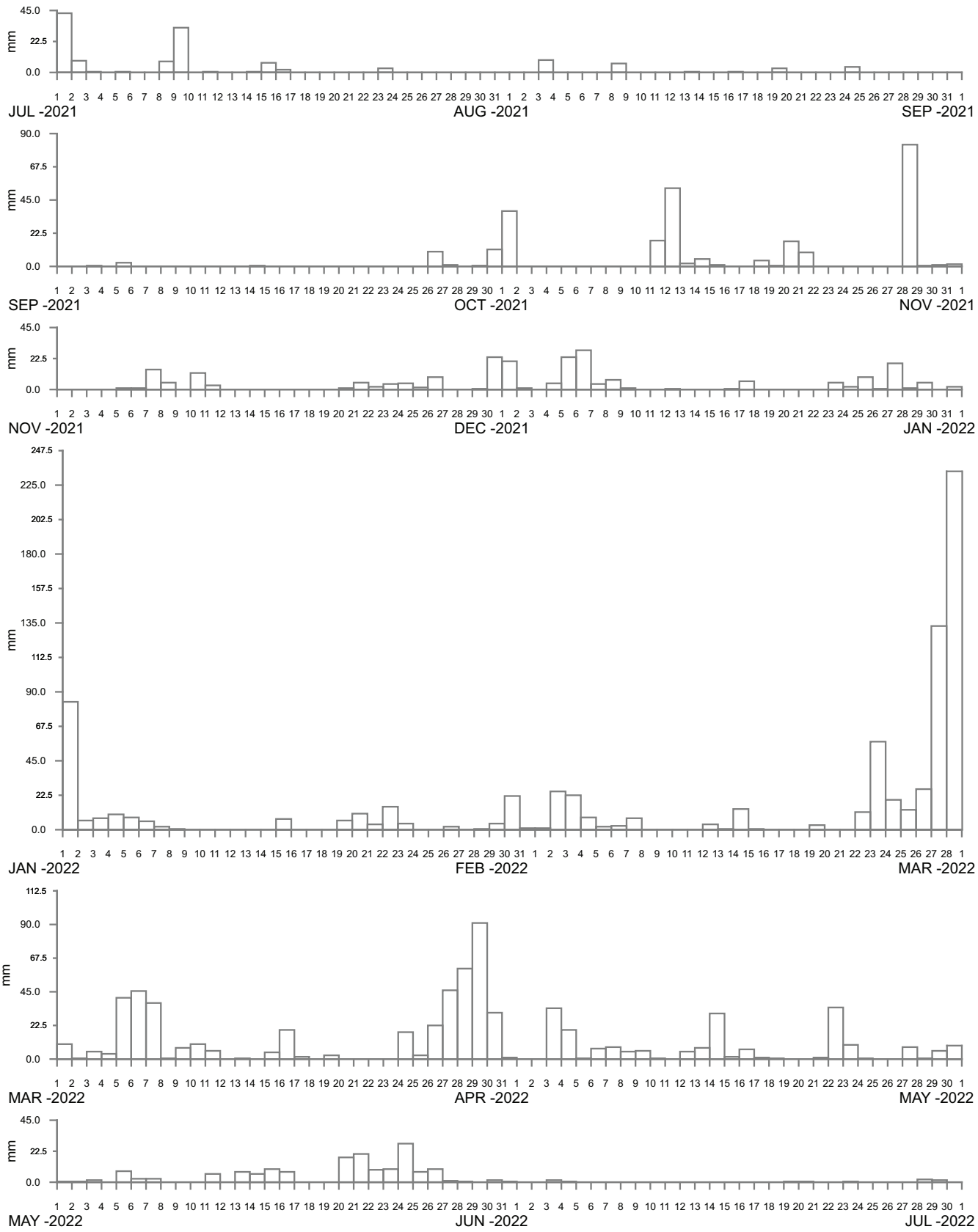
Manly Hydraulics Laboratory

Report MHL2908

Figure

8

DRAWING 2908-08.cdr



NSW GOVERNMENT

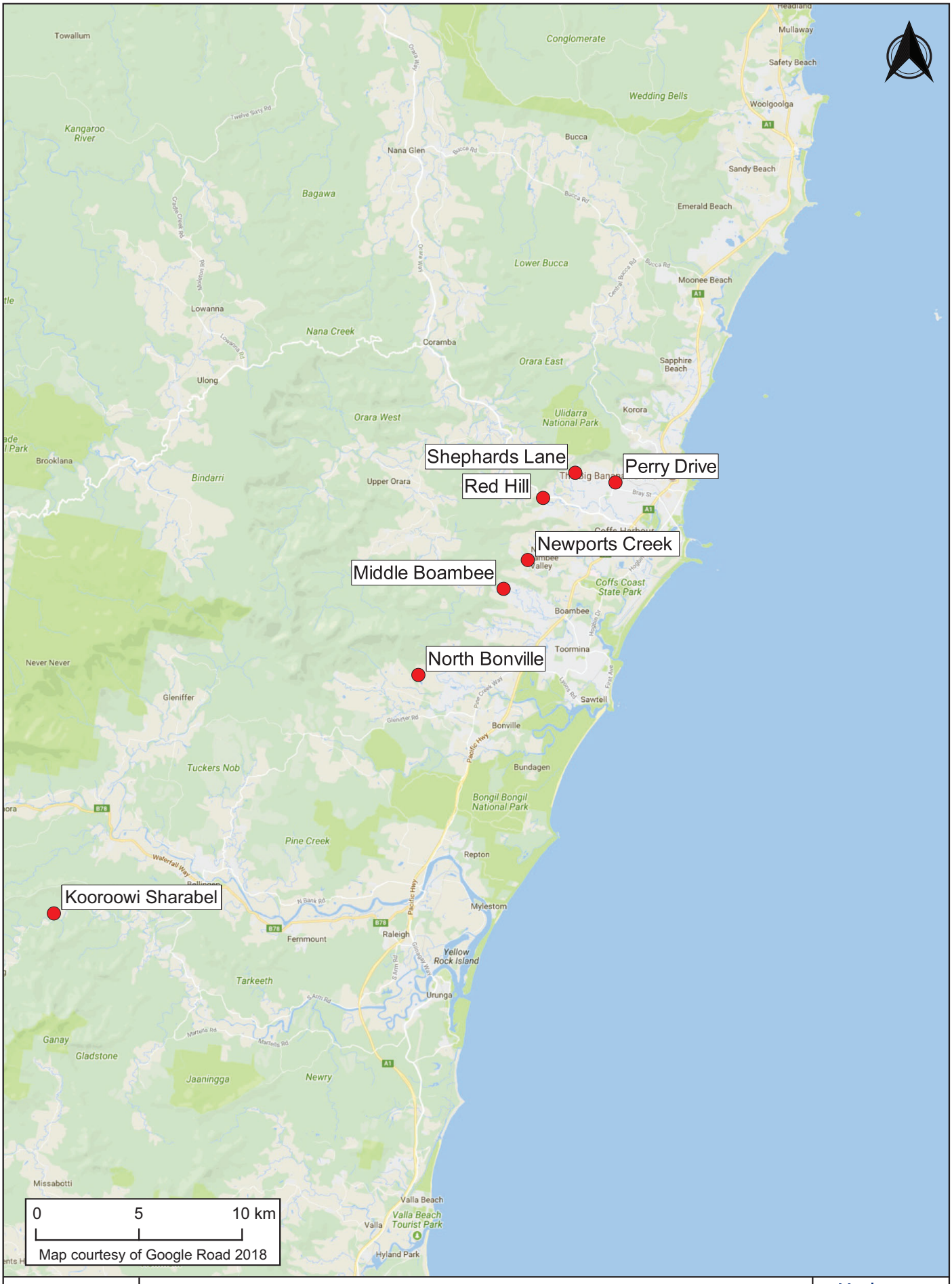
WOOLI SPORTSGROUND AT WOOLI RIVER
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 9

DRAWING 2908-09.cdr



NSW GOVERNMENT

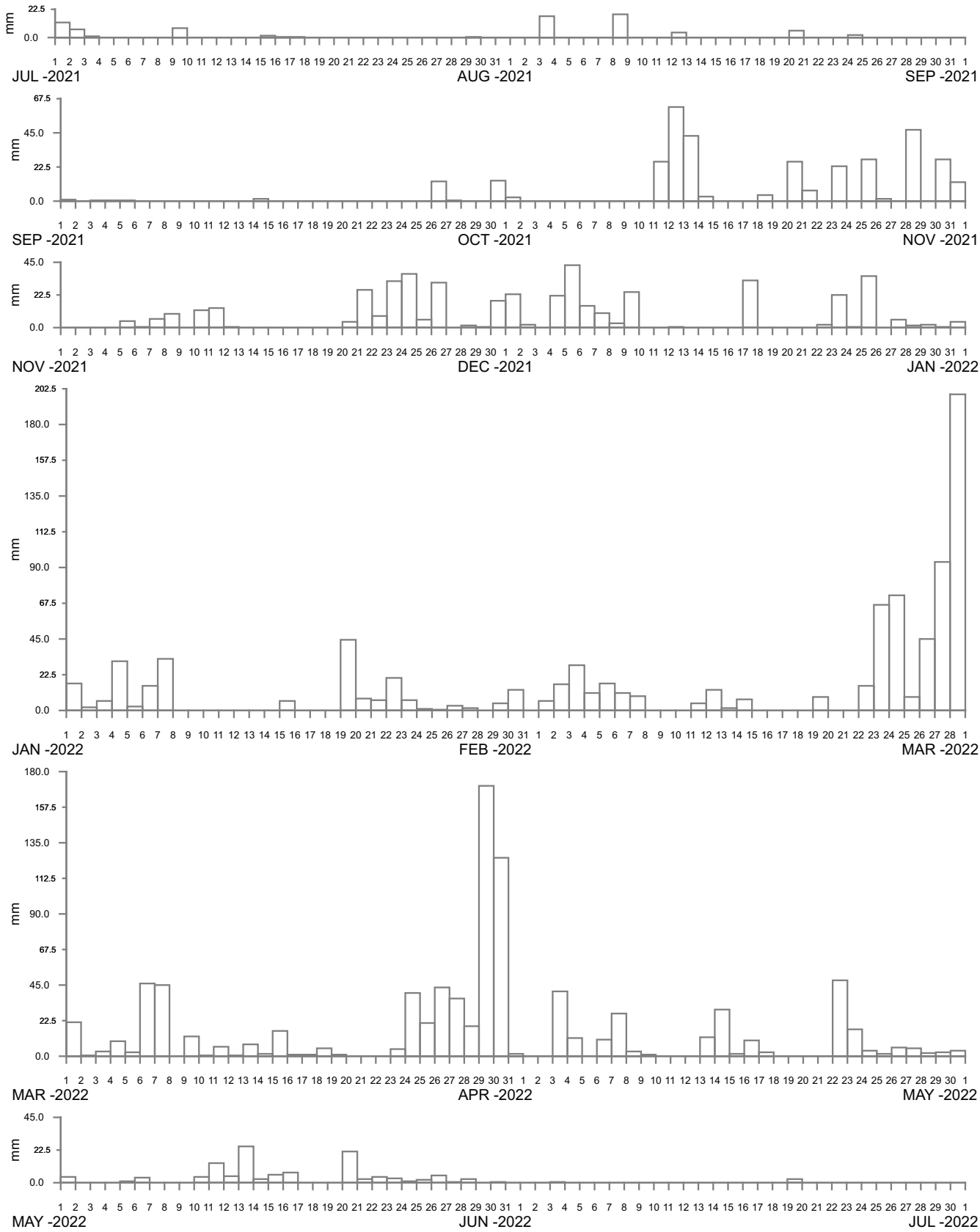
RAINFALL STATION LOCATIONS
BELLINGER RIVER REGION (SOUTH)

Manly Hydraulics Laboratory

Report MHL2908

Figure 10

DRAWING 2908-10.cdr



NSW GOVERNMENT

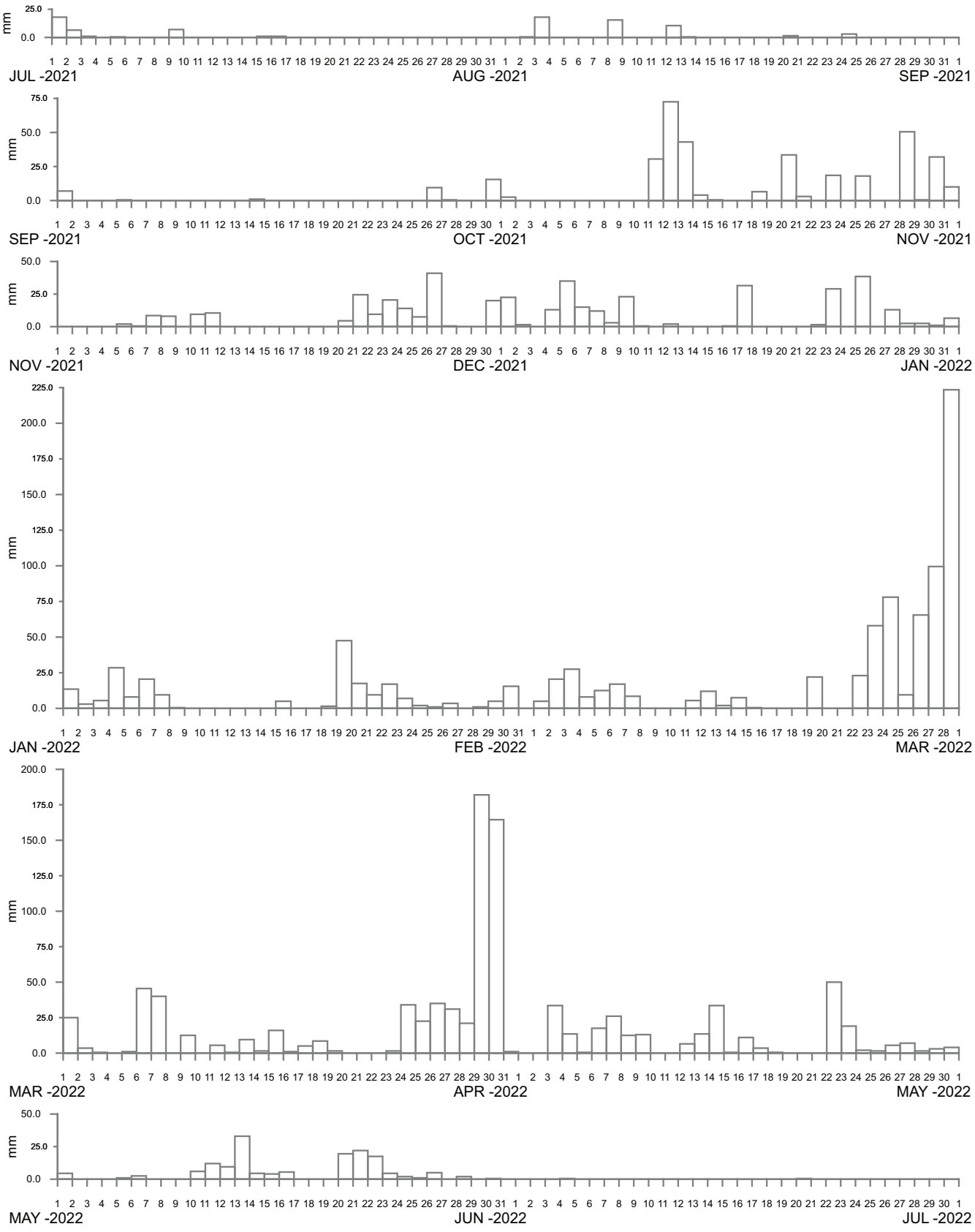
PERRY DRIVE AT COFFS HARBOUR
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 11

DRAWING 2908-11.cdr



NSW GOVERNMENT

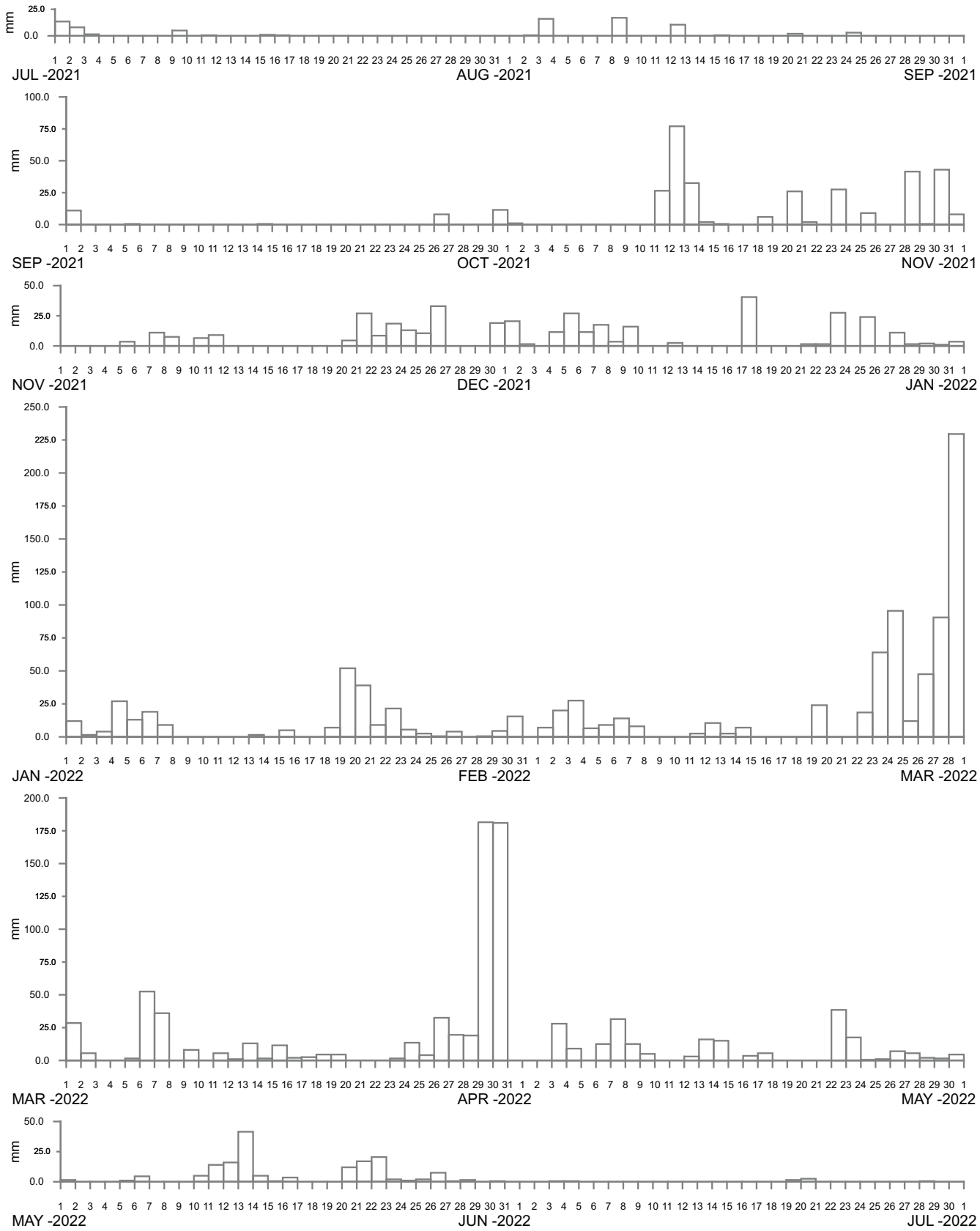
SHEPARDS LANE AT COFFS HARBOUR
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 12

DRAWING 2908-12.cdr



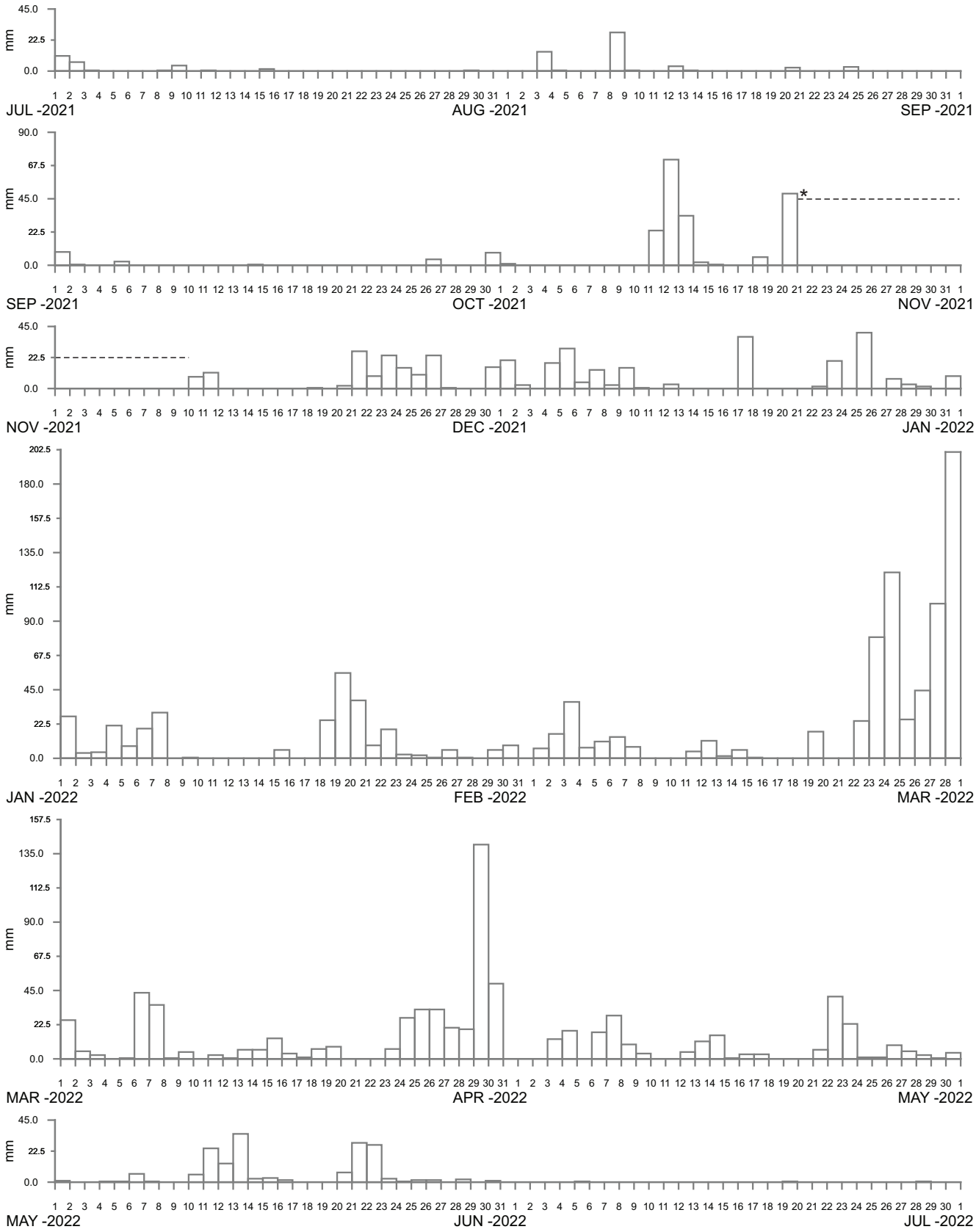
RED HILL AT COFFS HARBOUR
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 13

DRAWING 2908-13.cdr



DATA LOSS

*Data loss due to battery failure

NSW GOVERNMENT

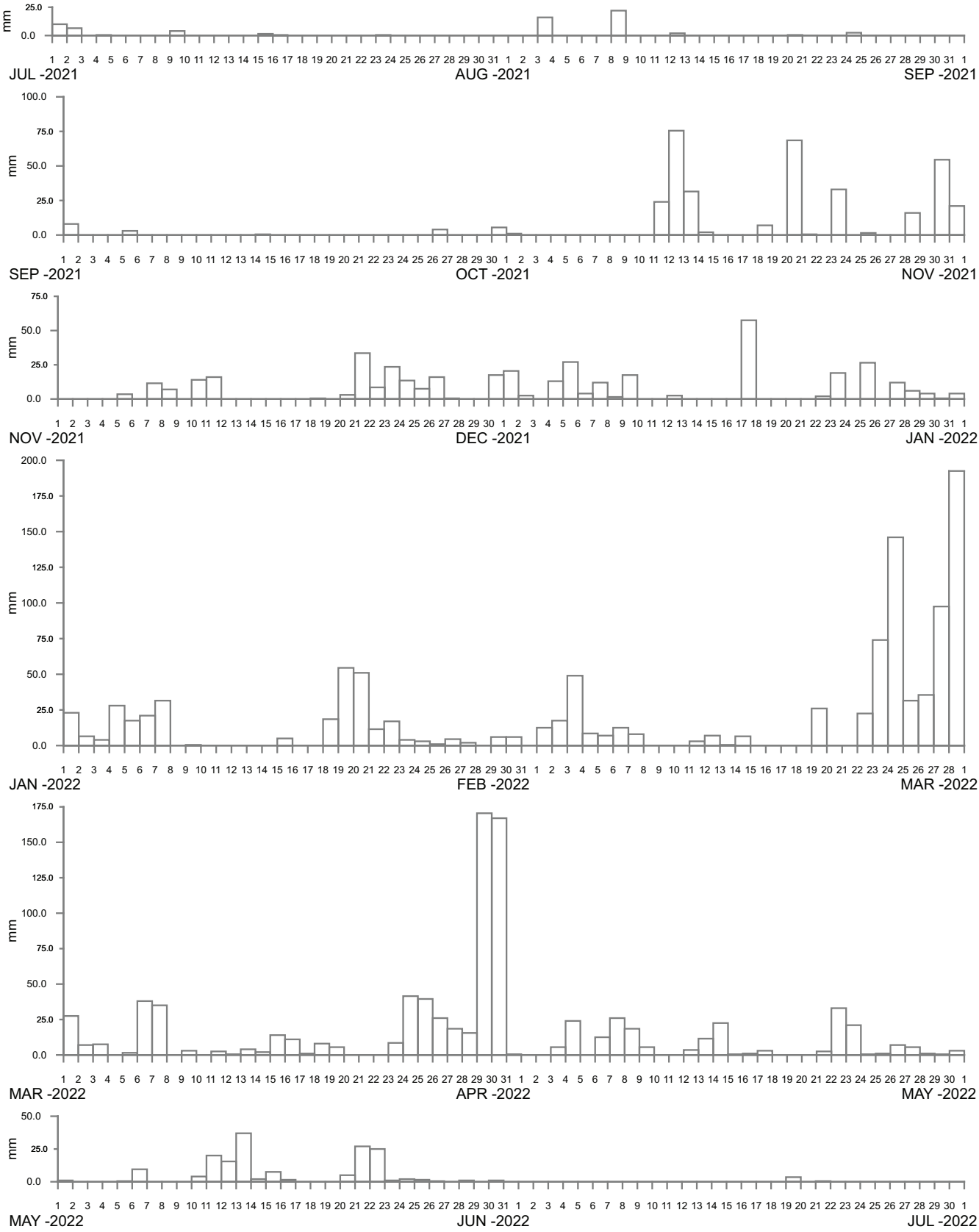
NEWPORTS CREEK AT ENGLANDS ROAD 2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 14

DRAWING 2908-14.cdr



DATA LOSS

NSW GOVERNMENT

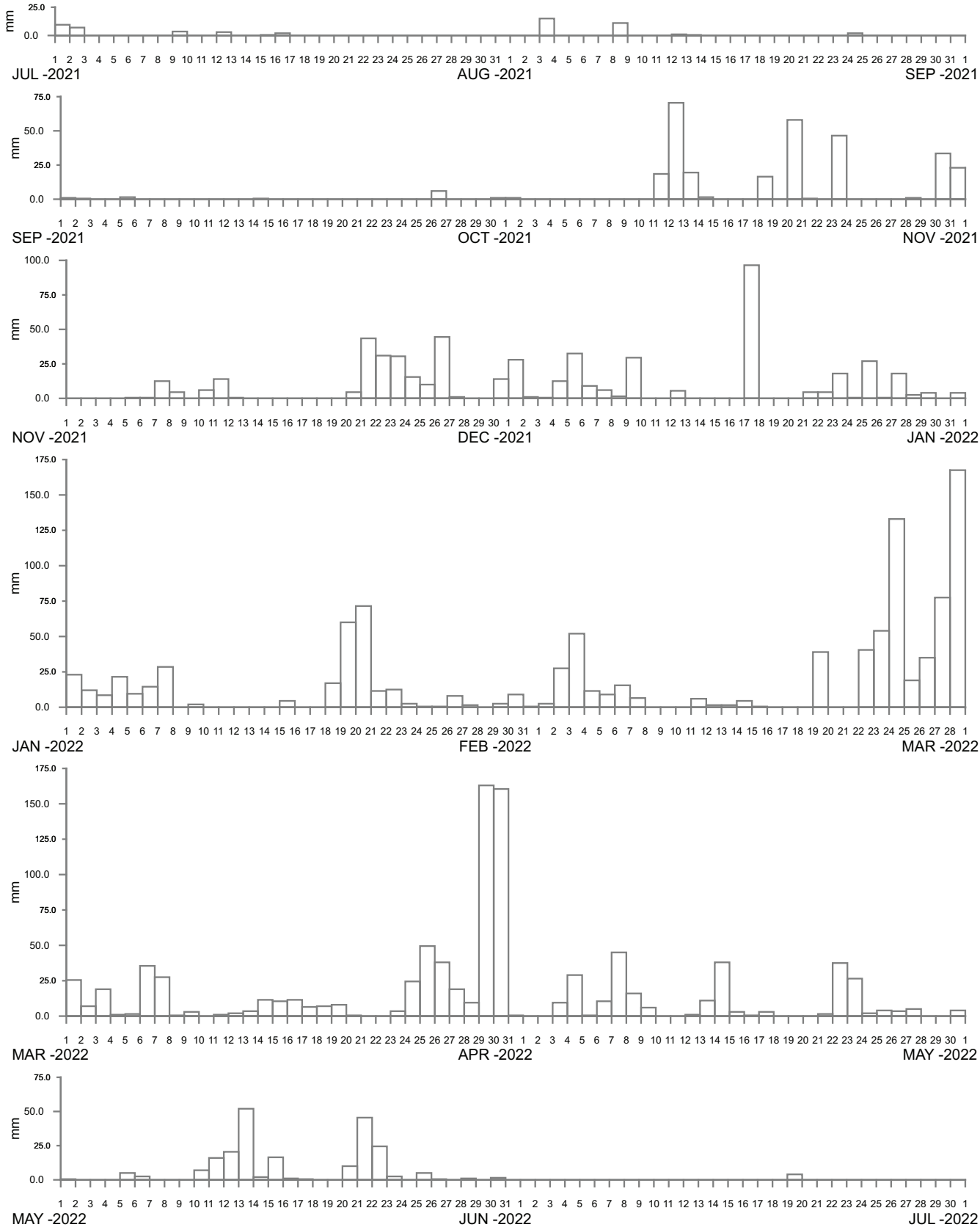
MIDDLE BOAMBEE AT CEDARVALE ROAD 2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 15

DRAWING 2908-15.cdr



NSW GOVERNMENT

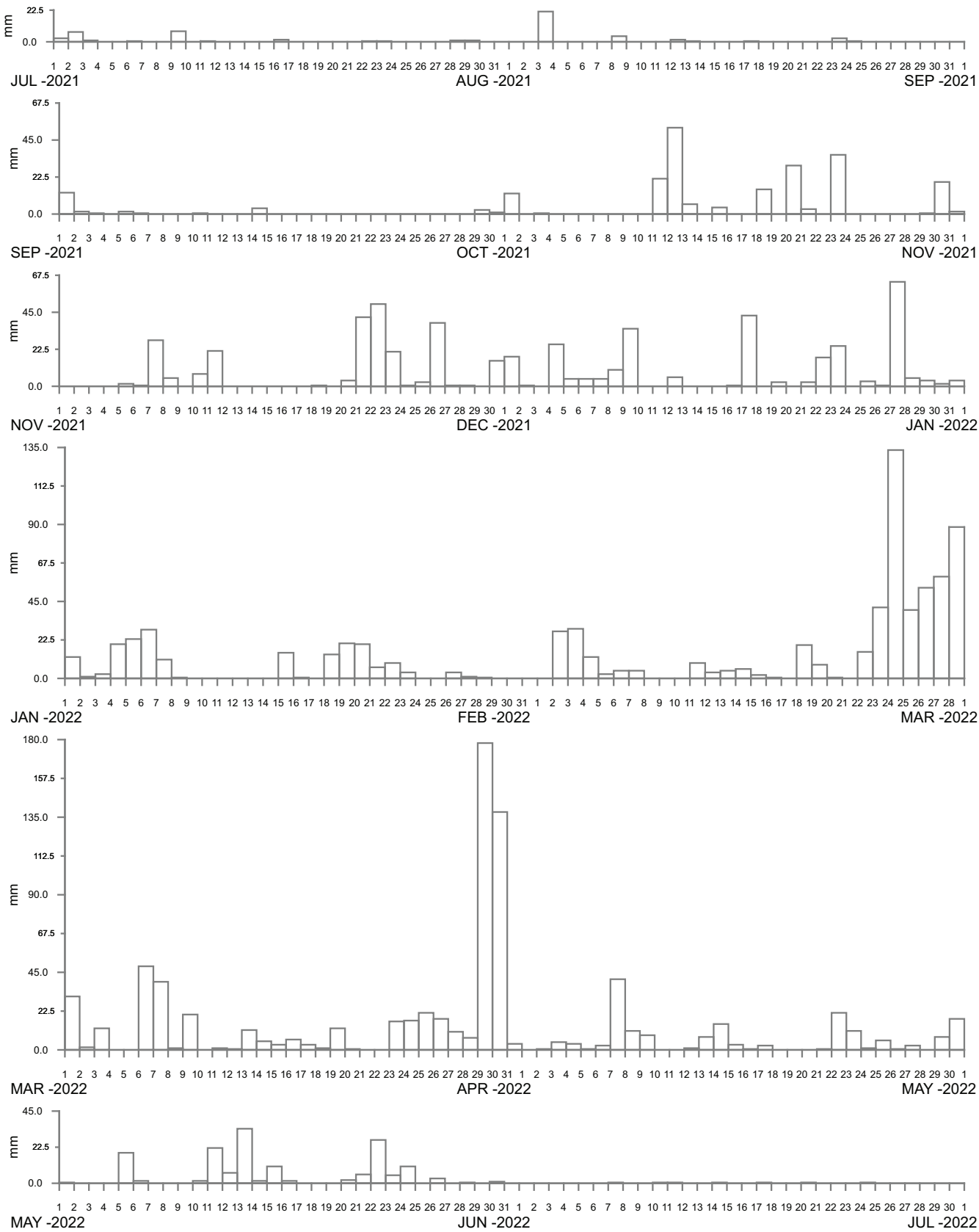
NORTH BONVILLE AT NORTH BONVILLE ROAD
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 16

DRAWING 2908-16.cdr



NSW GOVERNMENT

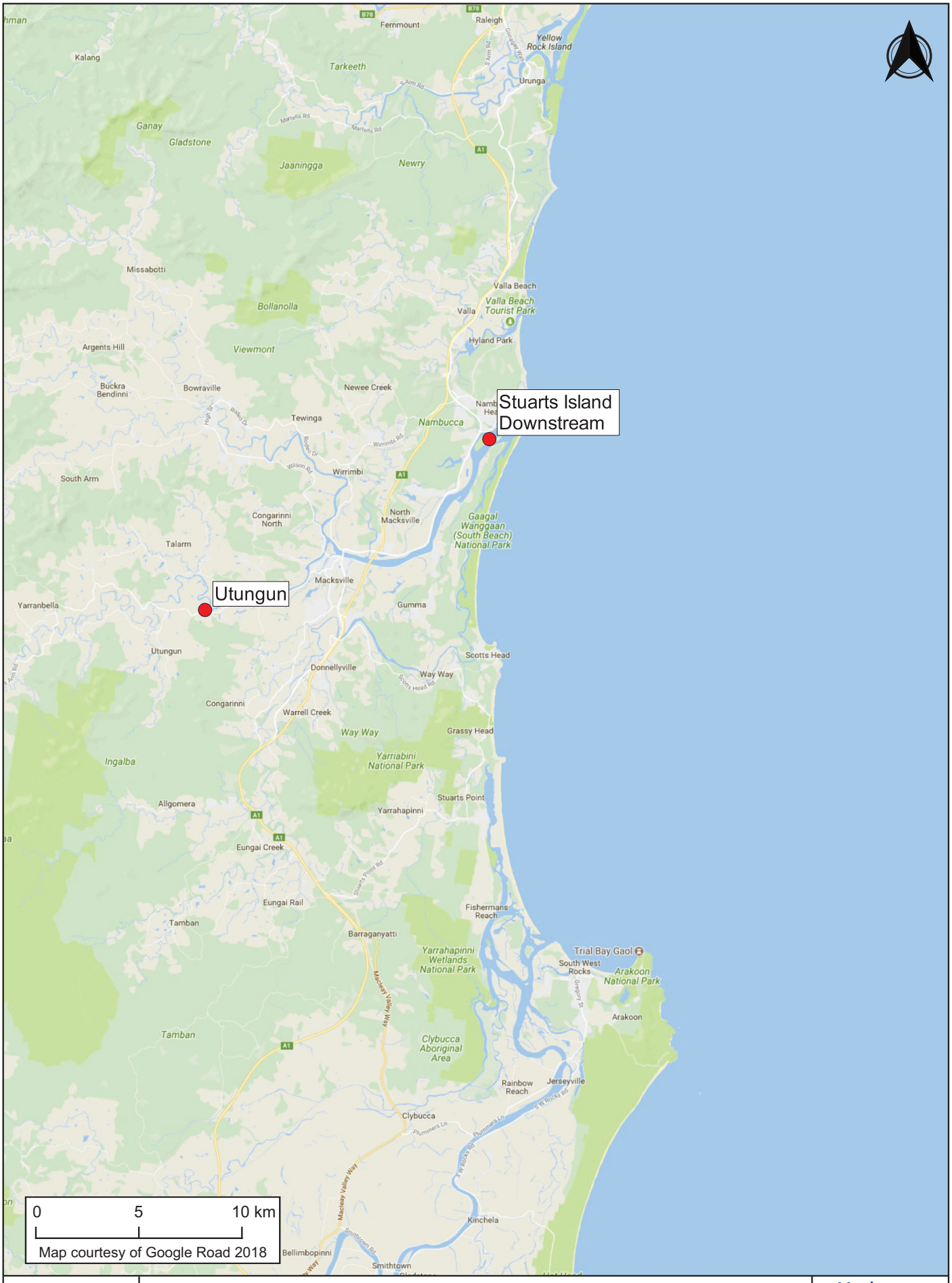
KOOROOWI SHARABEL AT KALANG RIVER 2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 17

DRAWING 2908-17.cdr



NSW GOVERNMENT

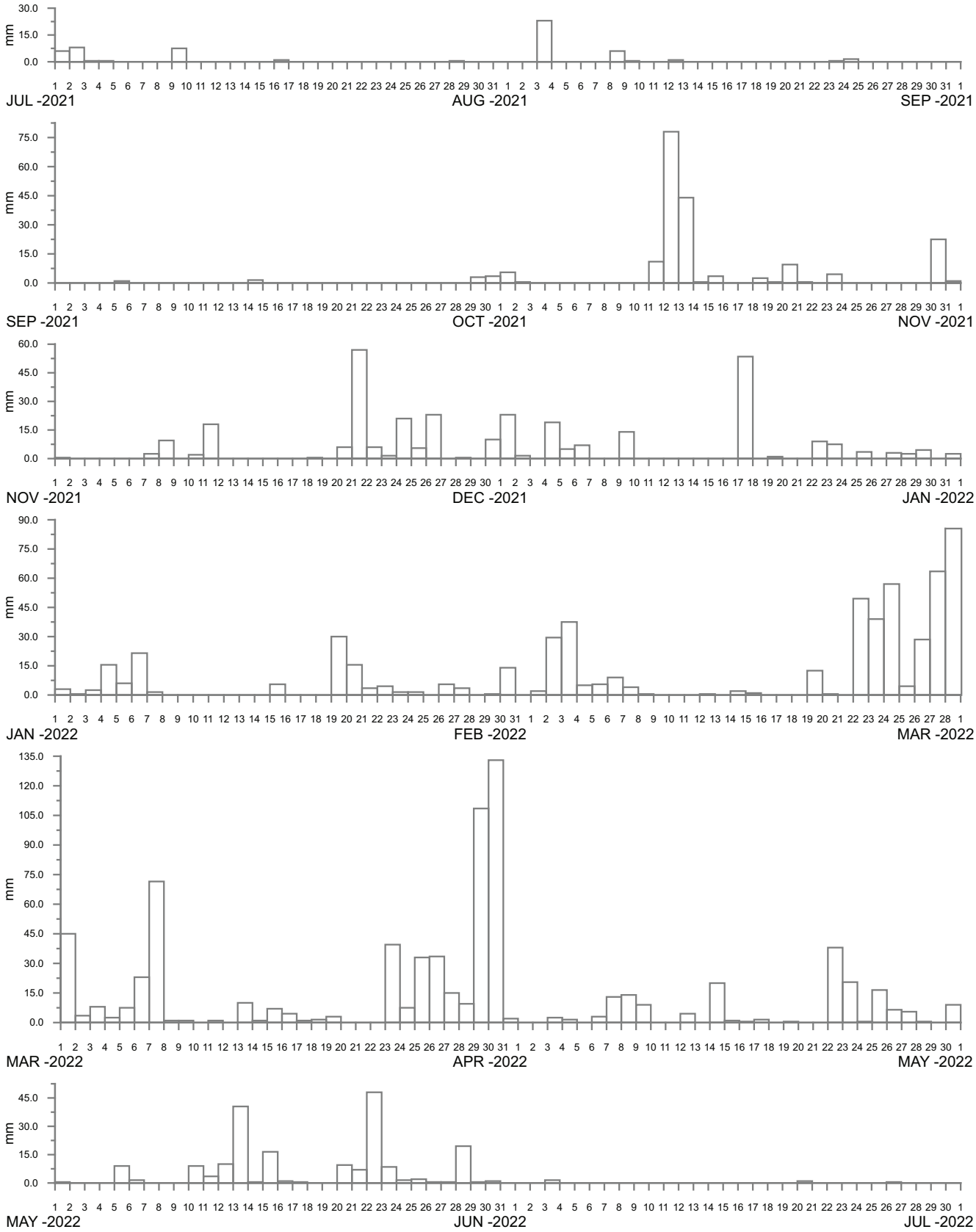
RAINFALL STATION LOCATIONS
NAMBUCCA RIVER REGION

Manly Hydraulics Laboratory

Report MHL2908

Figure 18

DRAWING 2908-18.cdr



NSW GOVERNMENT

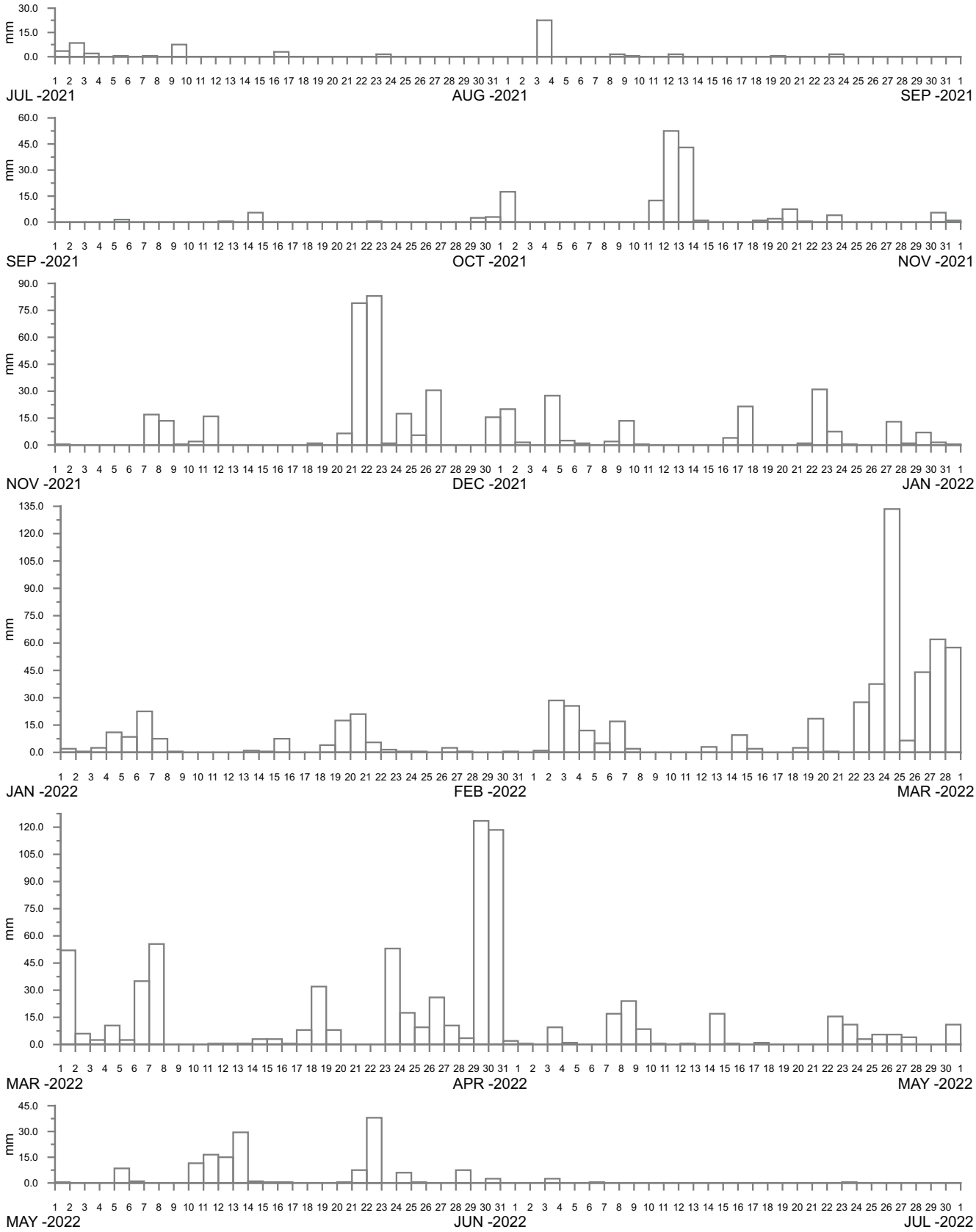
STUARTS ISLAND DOWNSTREAM AT NAMBUCCA HEADS 2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 19

DRAWING 2908-19.cdr



NSW GOVERNMENT

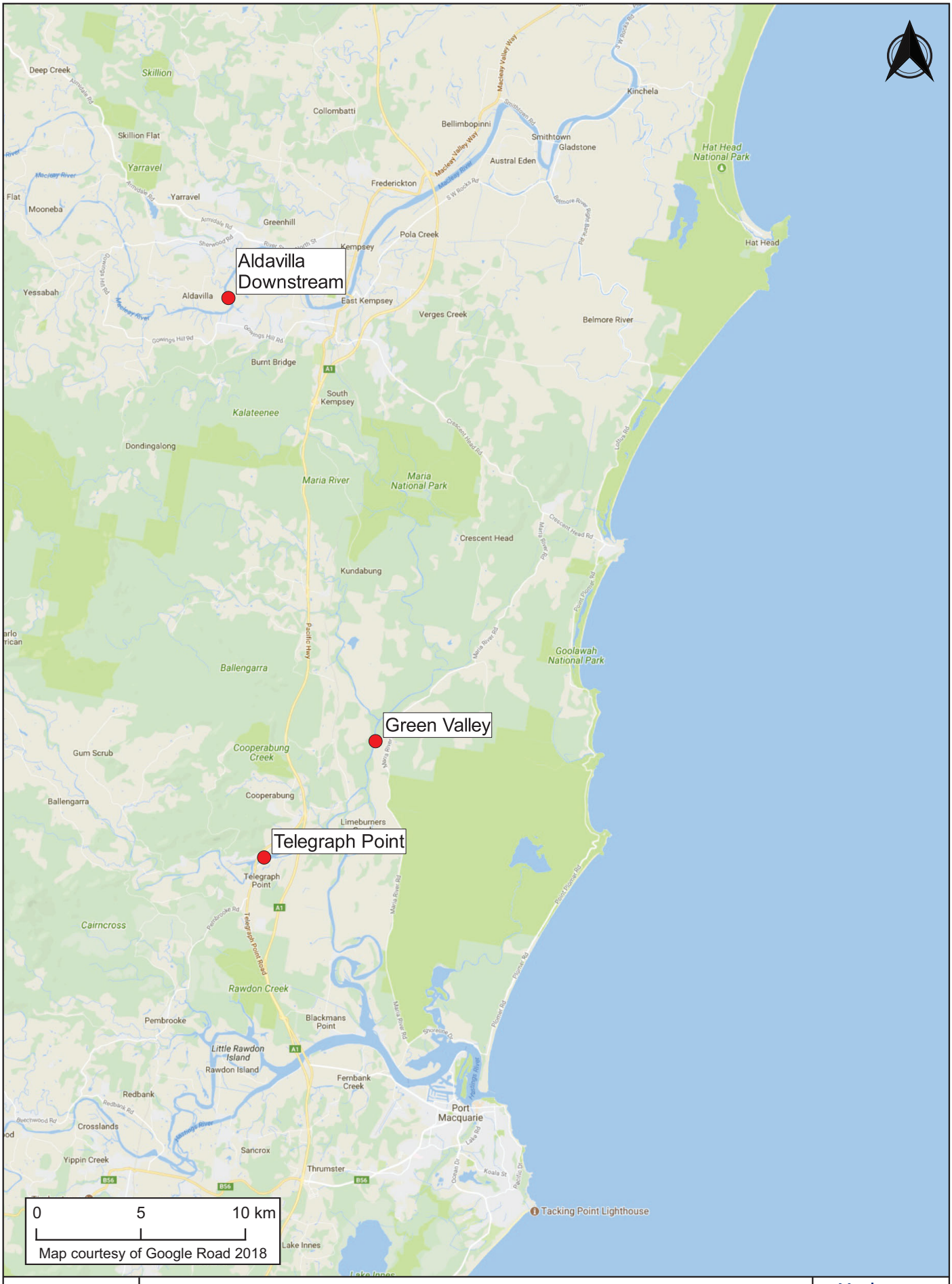
UTUNGUN AT TAYLORS ARM
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 20

DRAWING 2908-20.cdr



NSW GOVERNMENT

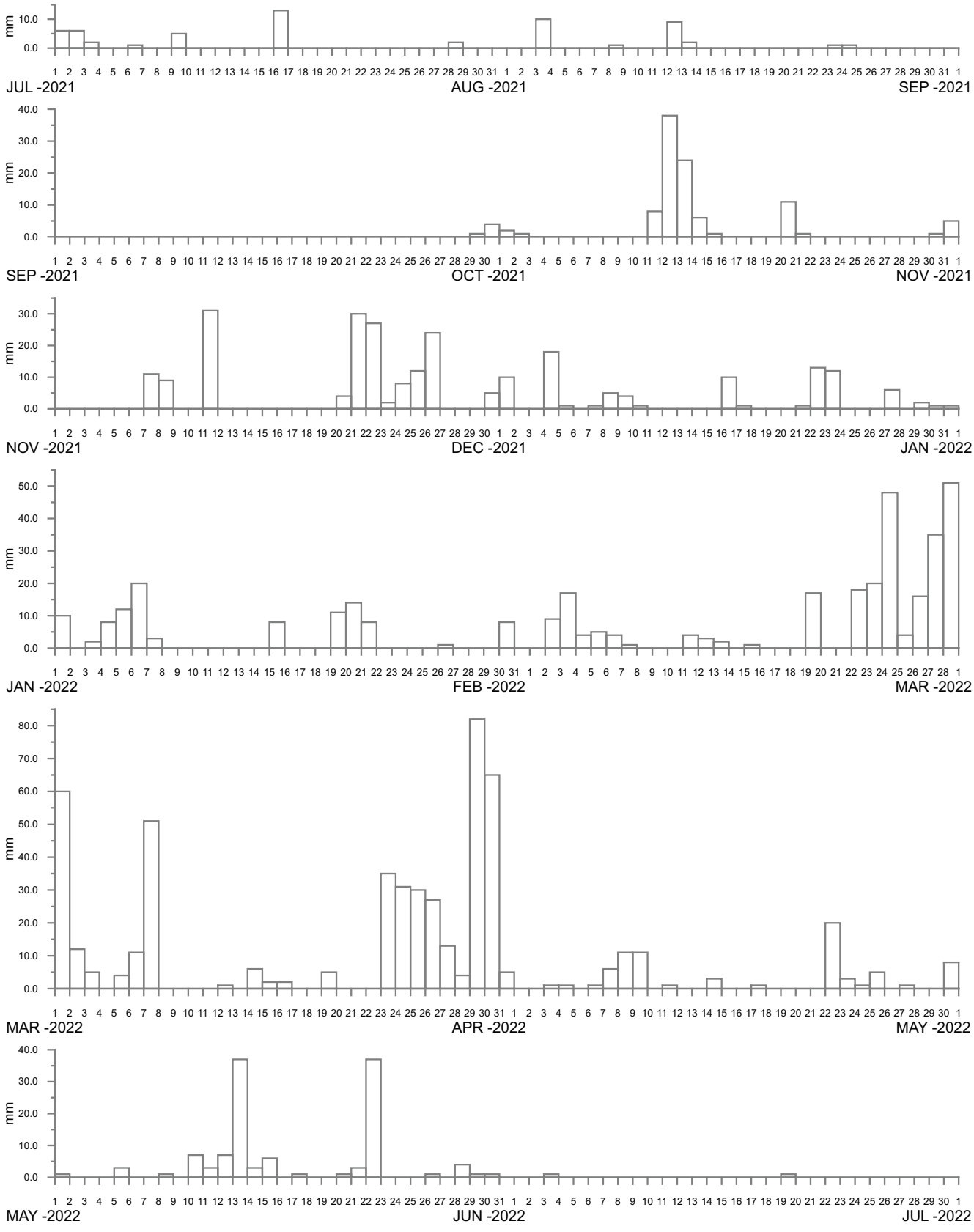
RAINFALL STATION LOCATIONS
MACLEAY RIVER AND HASTINGS RIVER REGIONS

Manly Hydraulics Laboratory

Report MHL2908

Figure 21

DRAWING 2908-21.cdr



DATA LOSS

NSW GOVERNMENT

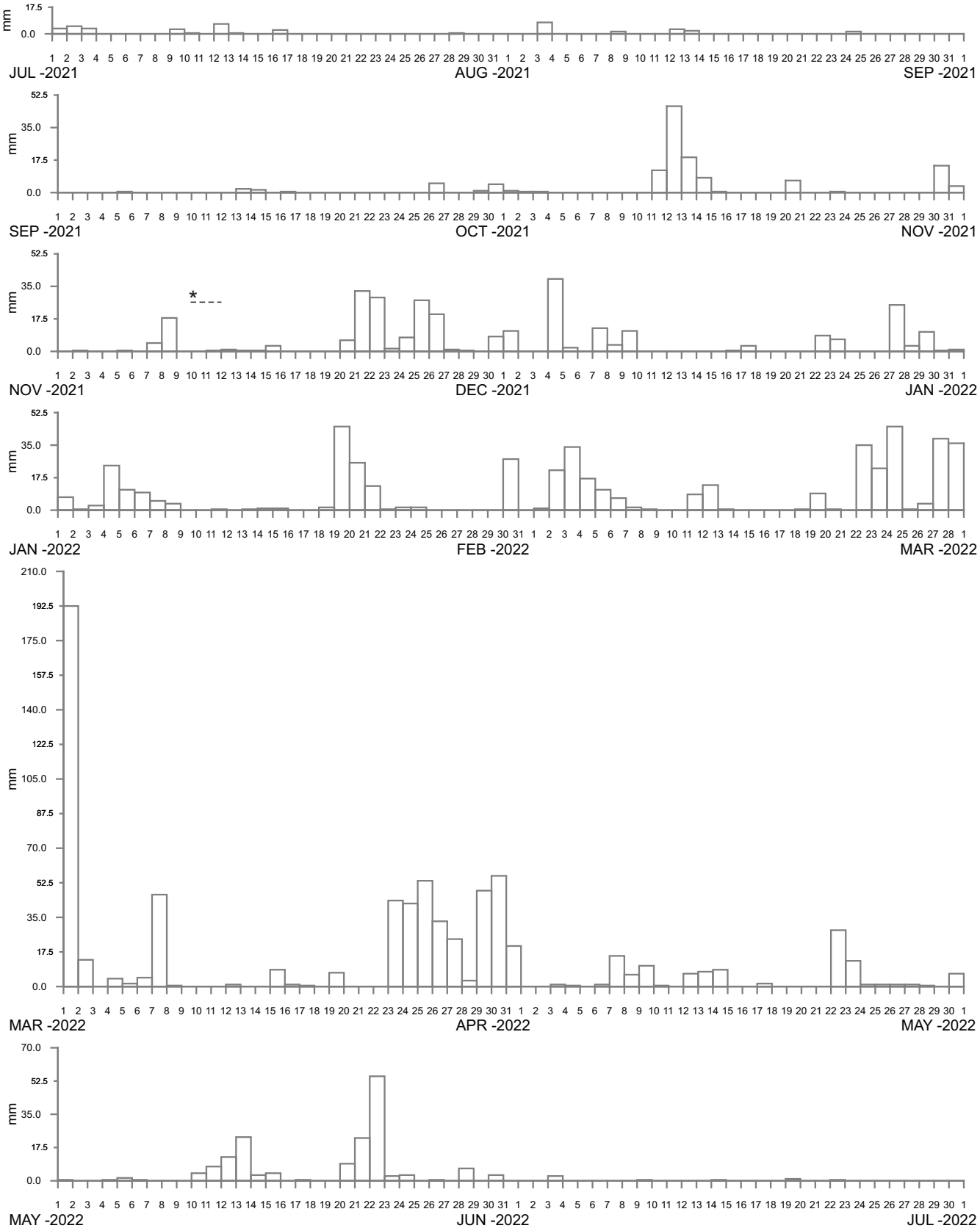
ALDAVILLA DOWNSTREAM AT MACLEAY RIVER 2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 22

DRAWING 2908-22.cdr



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

*Data loss due to suspect behaviour, temporary issue

NSW GOVERNMENT

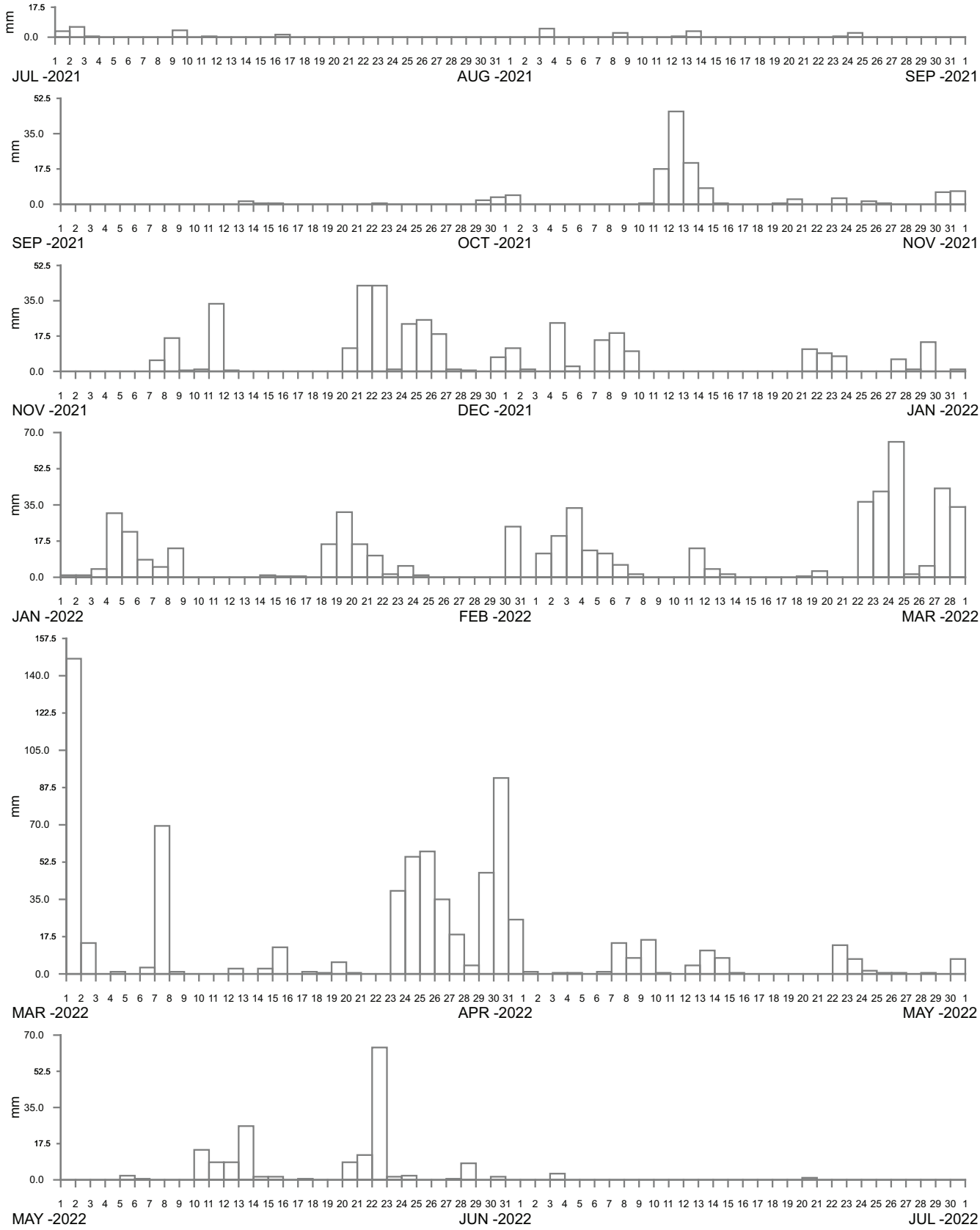
GREEN VALLEY AT MARIA RIVER
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 23

DRAWING 2908-23.cdr



NSW GOVERNMENT

TELEGRAPH POINT AT WILSONS RIVER
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure

24

DRAWING 2908-24.cdr

NSW GOVERNMENT

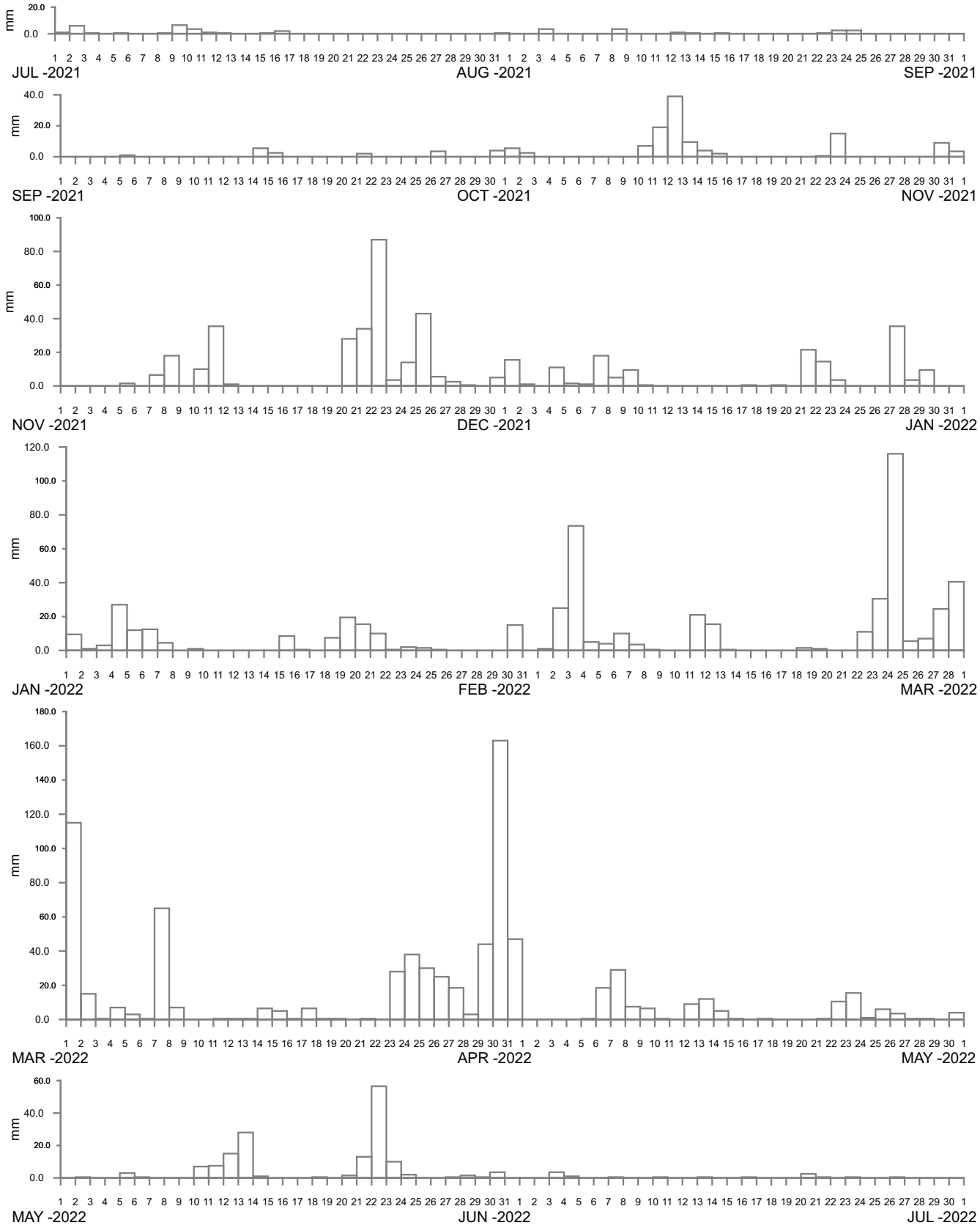
RAINFALL STATION LOCATIONS
CAMDEN HAVEN REGION

Manly Hydraulics Laboratory

Report MHL2908

Figure 25

DRAWING 2857-25.cdr



NSW GOVERNMENT

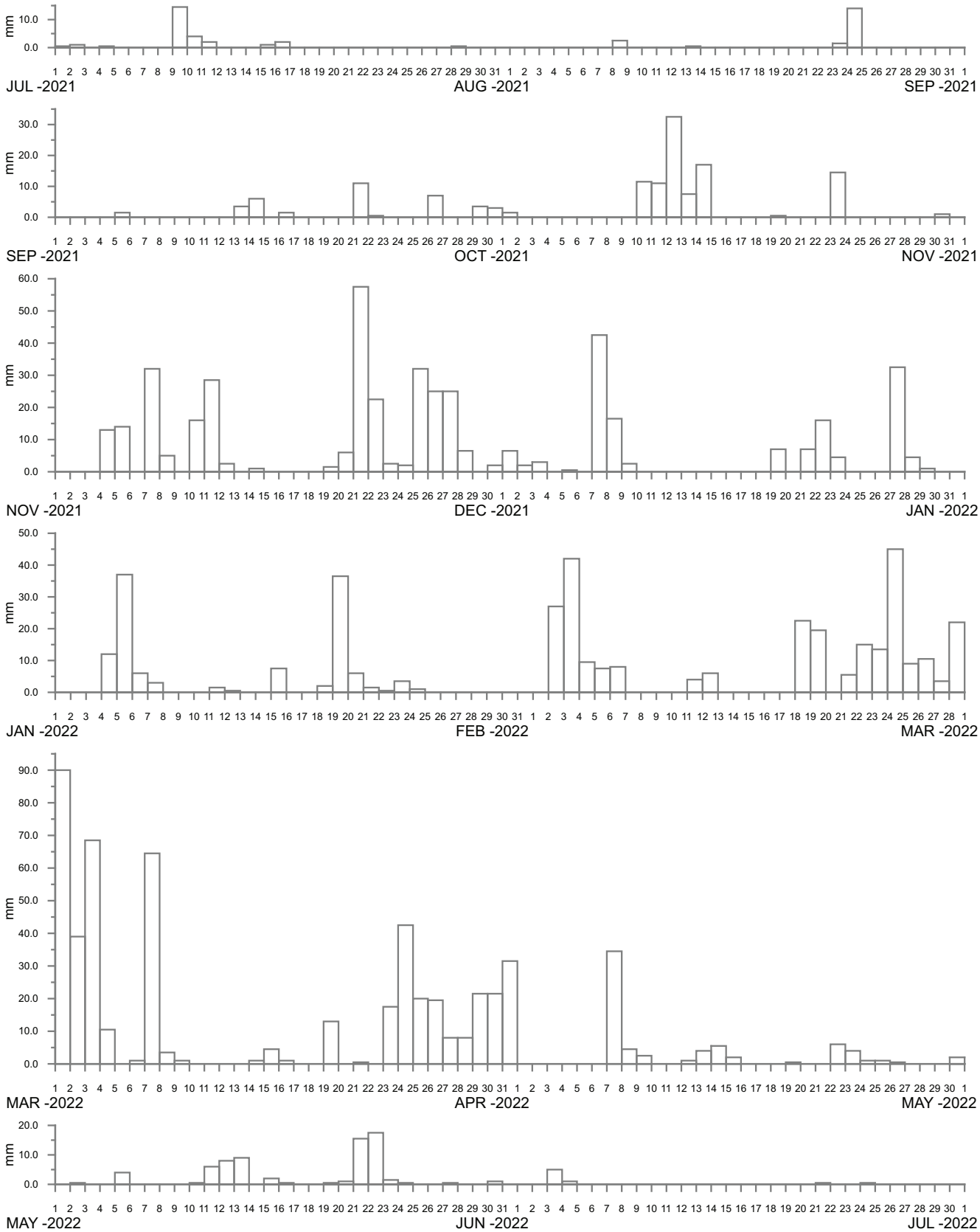
LOGANS CROSSING AT CAMDEN HAVEN
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 26

DRAWING 2908-26.cdr



DATA LOSS

NSW GOVERNMENT

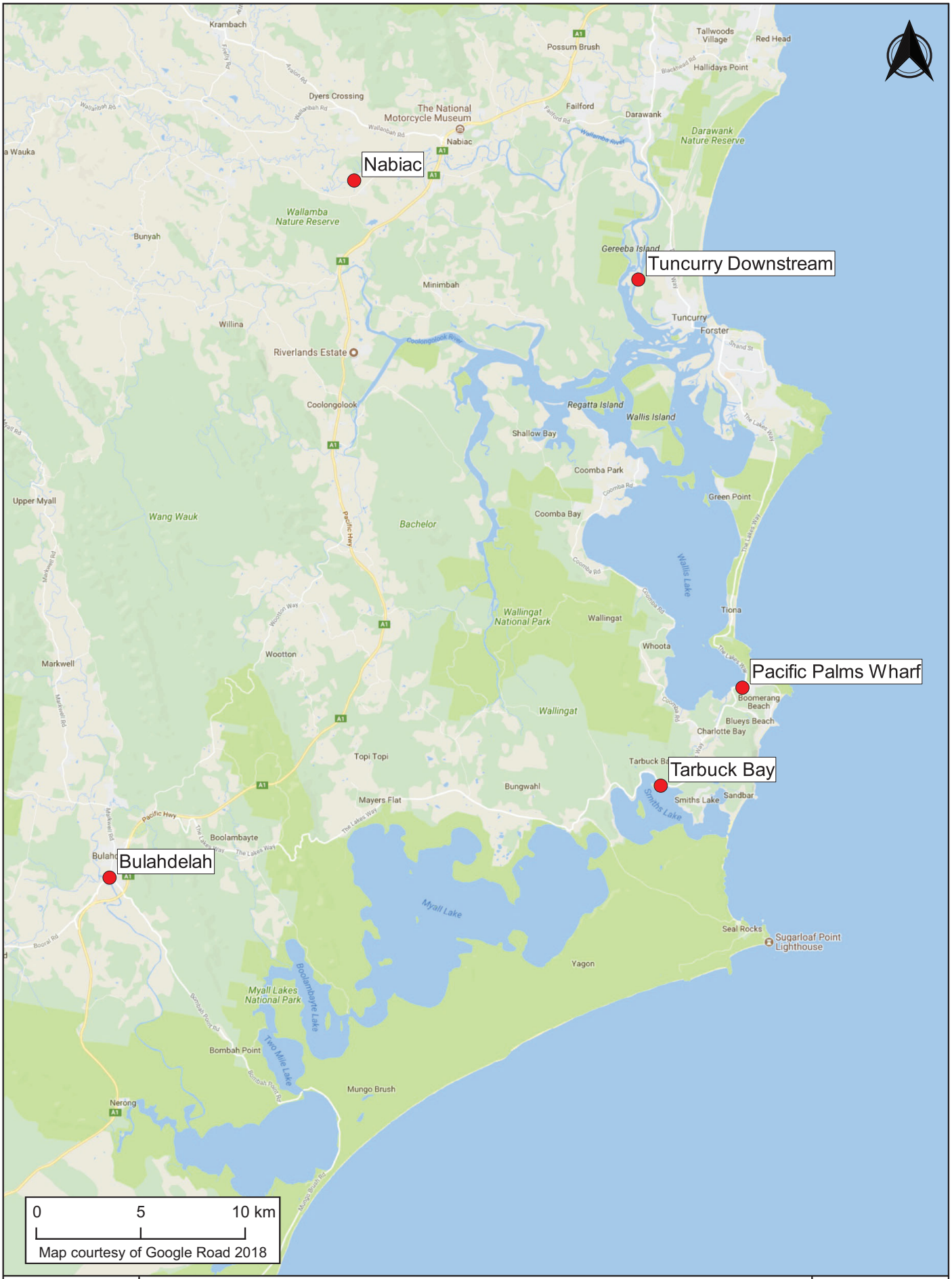
MOUNT GEORGE AT MANNING RIVER
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 27

DRAWING 2908-27.cdr



NSW GOVERNMENT

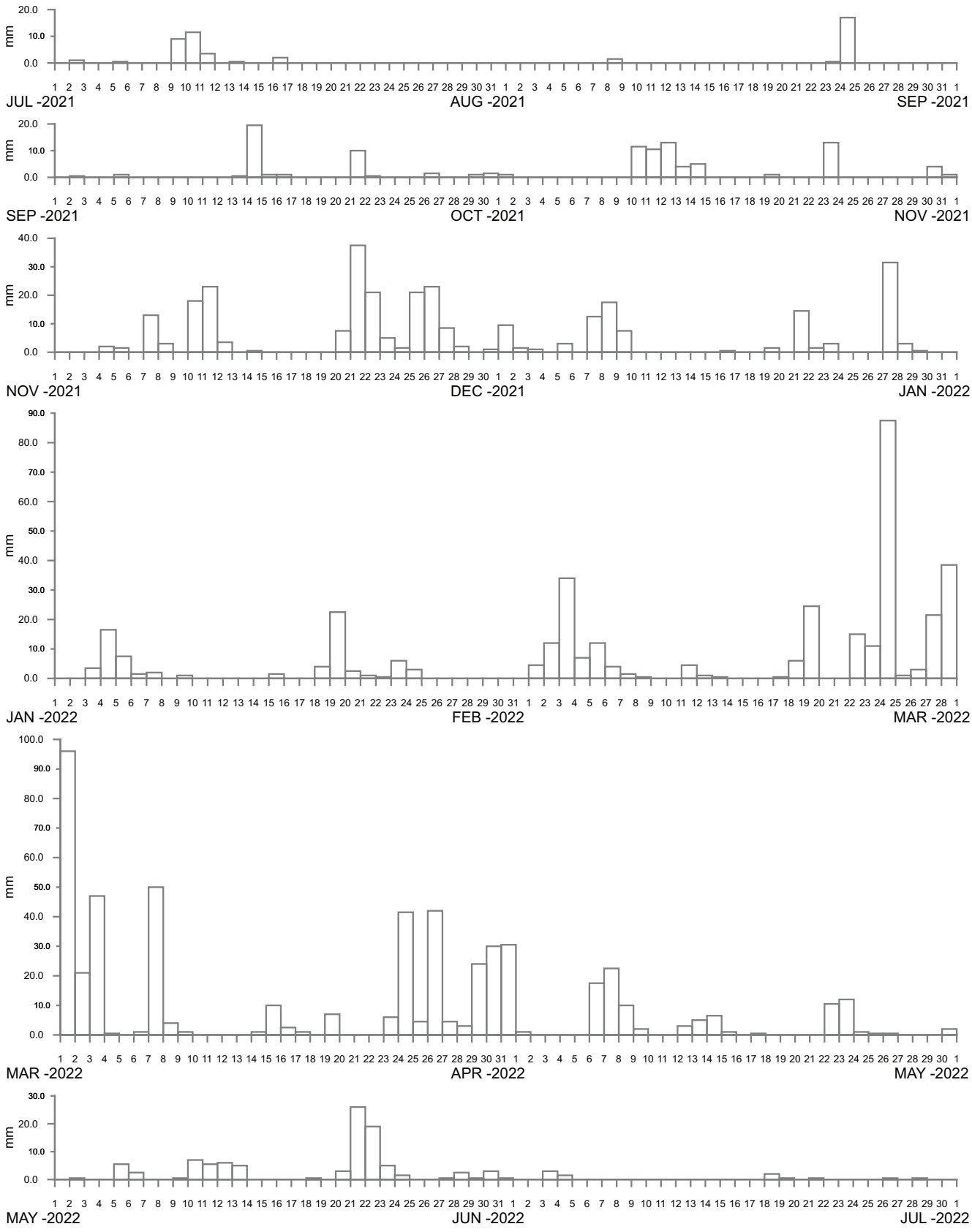
RAINFALL STATION LOCATIONS
KARUAH RIVER REGION

Manly Hydraulics Laboratory

Report MHL2908

Figure 28

DRAWING 2908-28.cdr



NSW GOVERNMENT

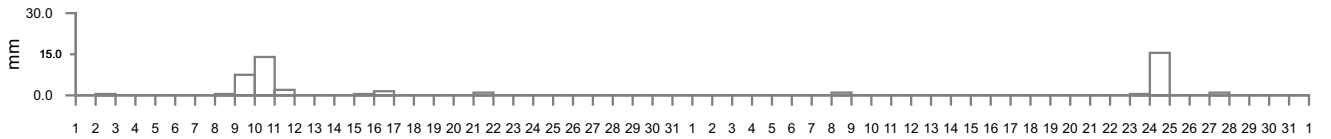
NABIAC AT WALLAMBA RIVER
2021–2022

Manly Hydraulics Laboratory

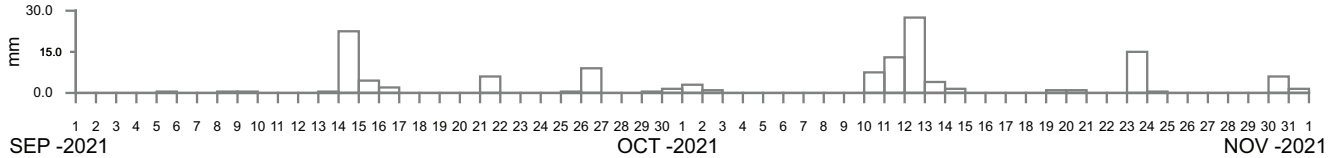
Report MHL2908

Figure 29

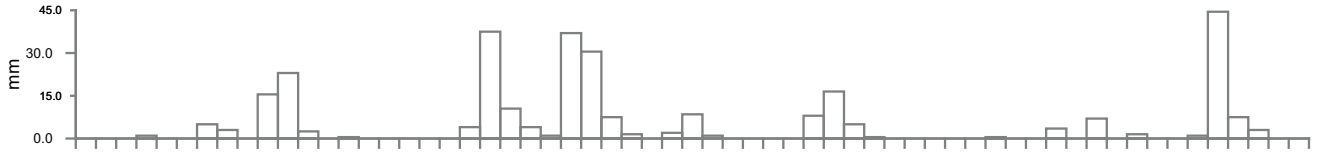
DRAWING 2908-29.cdr



JUL -2021 AUG -2021 SEP -2021



SEP -2021 OCT -2021 NOV -2021



NOV -2021 DEC -2021 JAN -2022

JAN -2022 FEB -2022 MAR -2022

MAR -2022 APR -2022 MAY -2022

MAY -2022 JUN -2022 JUL -2022

DATA LOSS

NSW GOVERNMENT

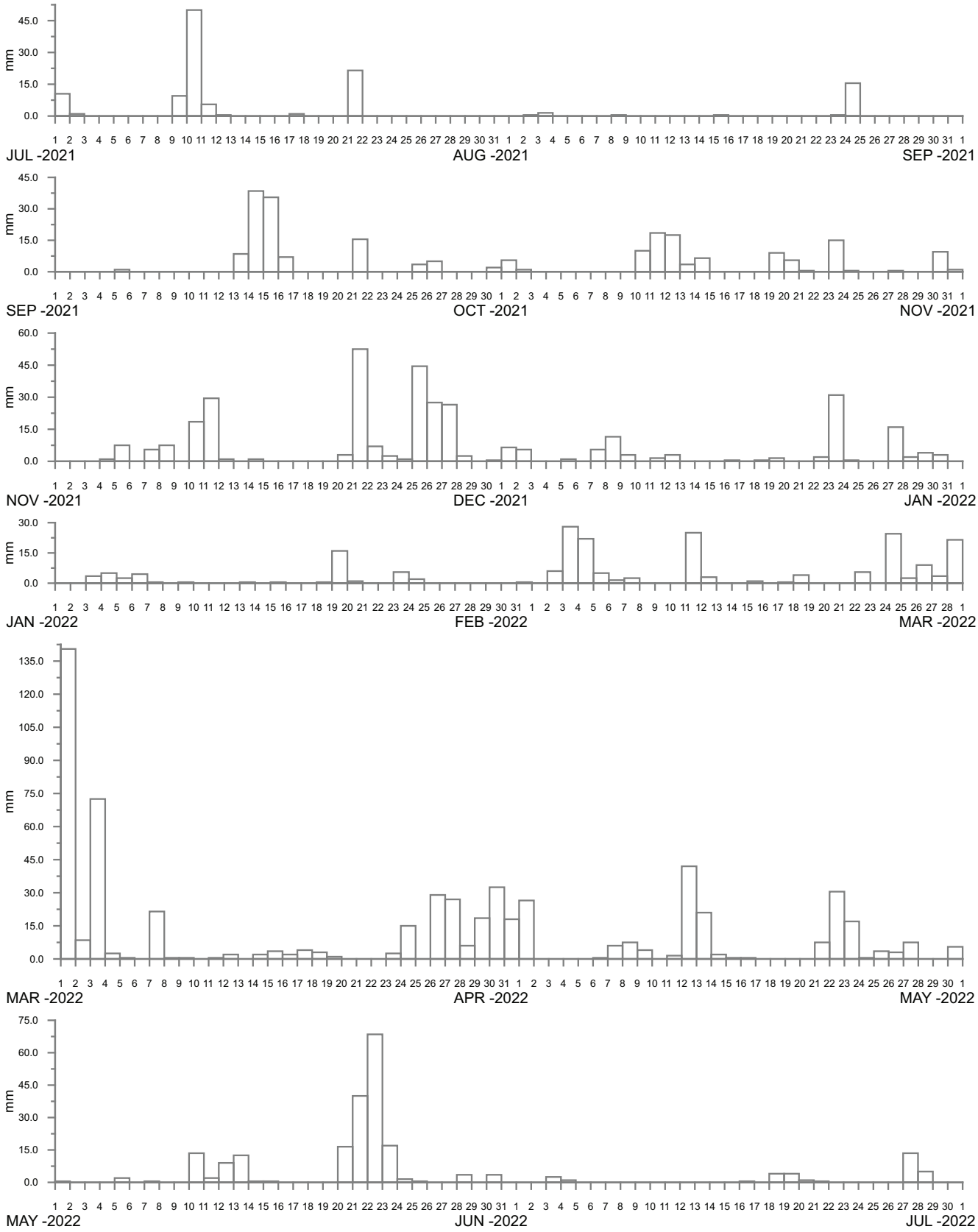
TUNCURRY DOWNSTREAM AT WALLAMBA RIVER 2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 30

DRAWING 2908-30.cdr



DATA LOSS

NSW GOVERNMENT

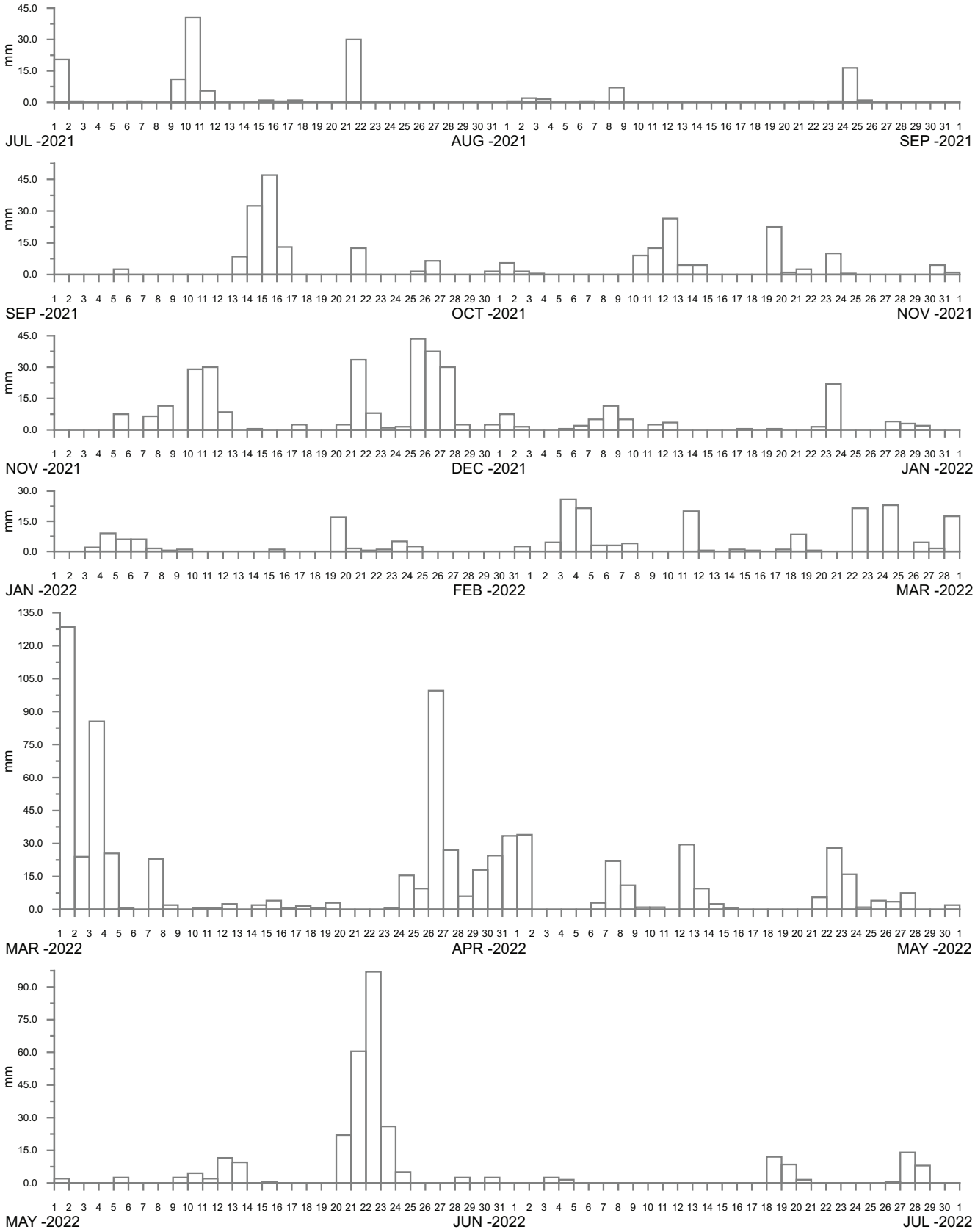
PACIFIC PALMS WHARF AT WALLIS LAKES
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 31

DRAWING 2908-31.cdr



NSW GOVERNMENT

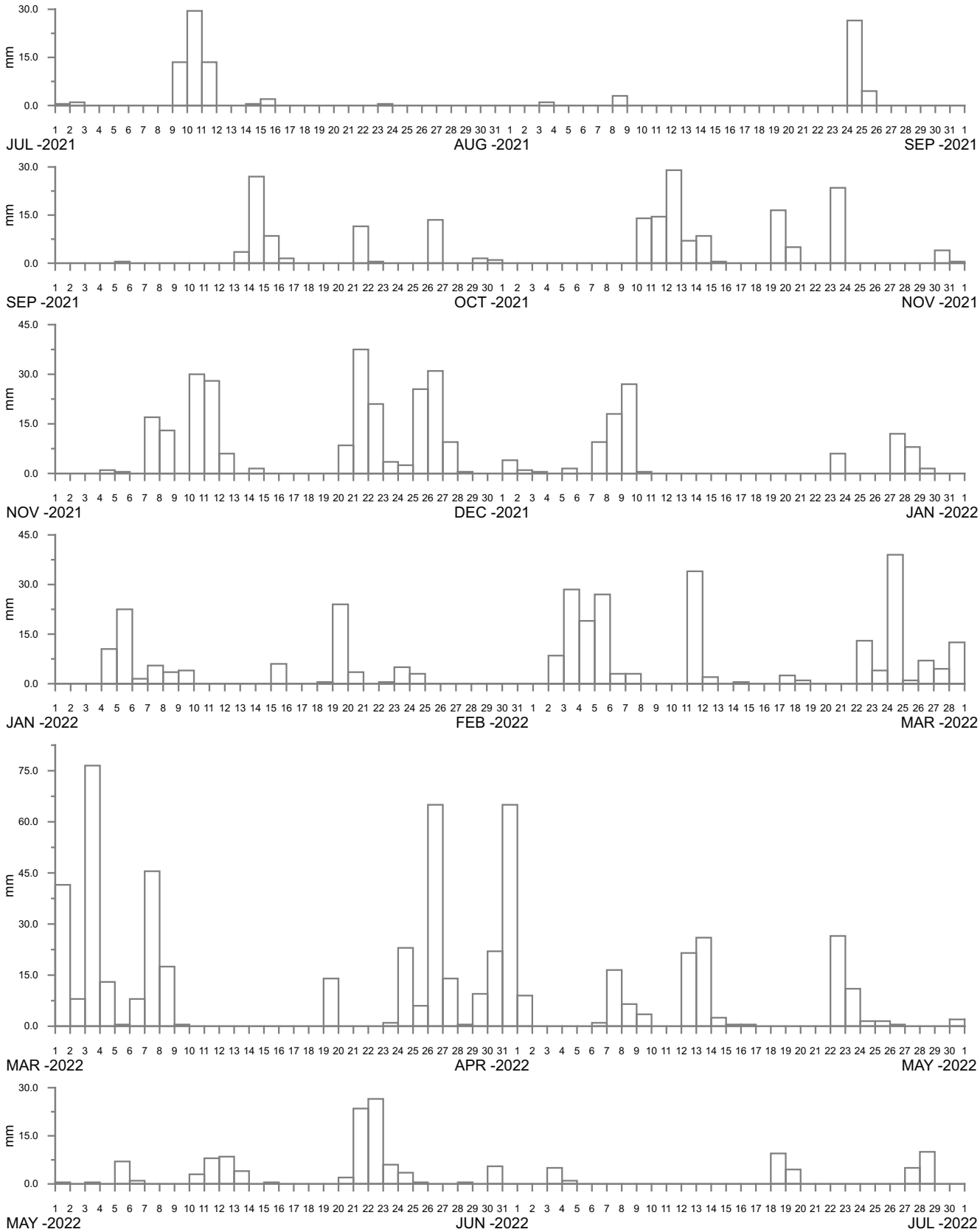
TARBUCK BAY AT SMITHS LAKE
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 32

DRAWING 2908-32.cdr



NSW GOVERNMENT

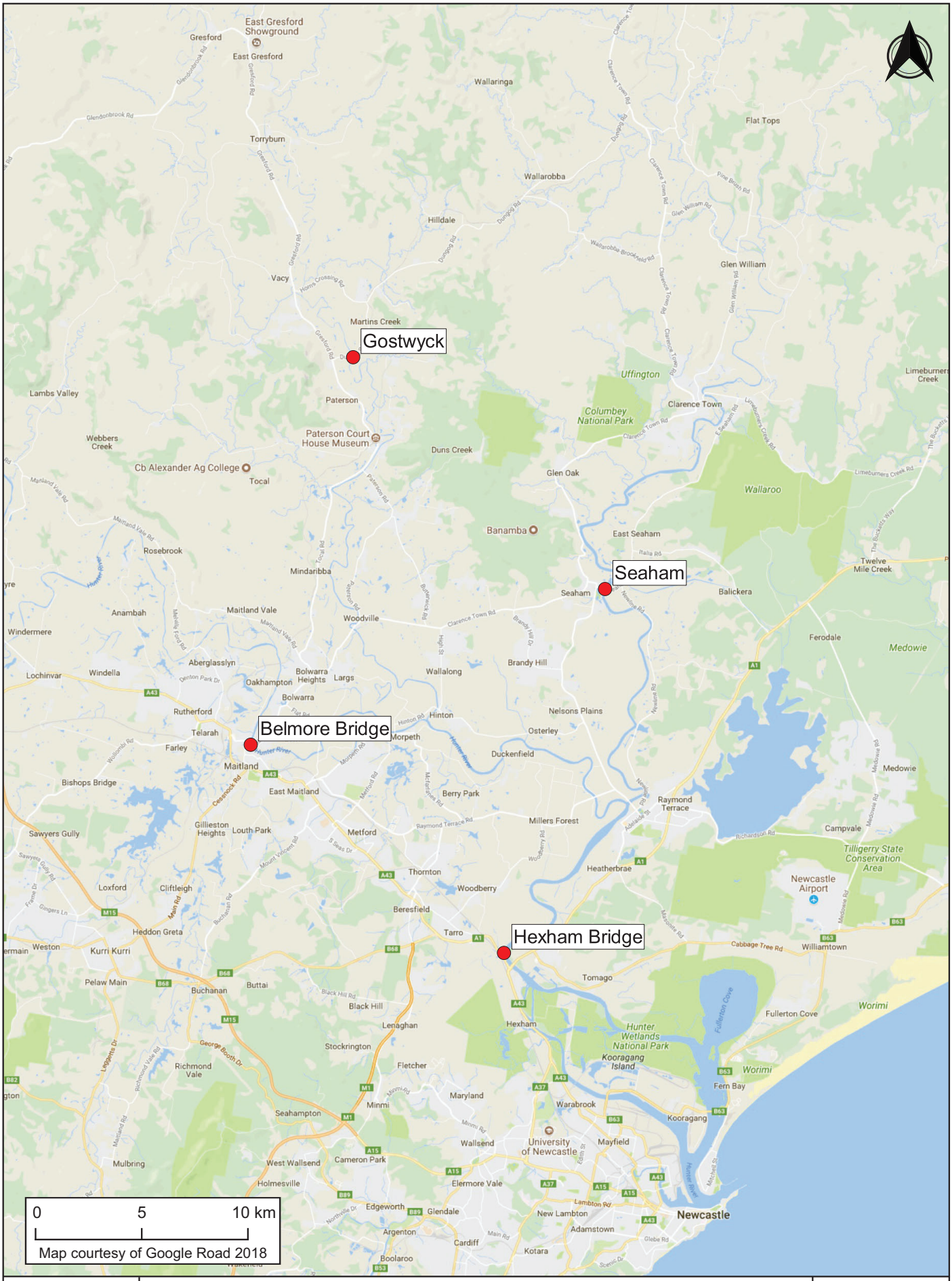
BULAHDELAH AT MYALL RIVER
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 33

DRAWING 2908-33.cdr



NSW GOVERNMENT

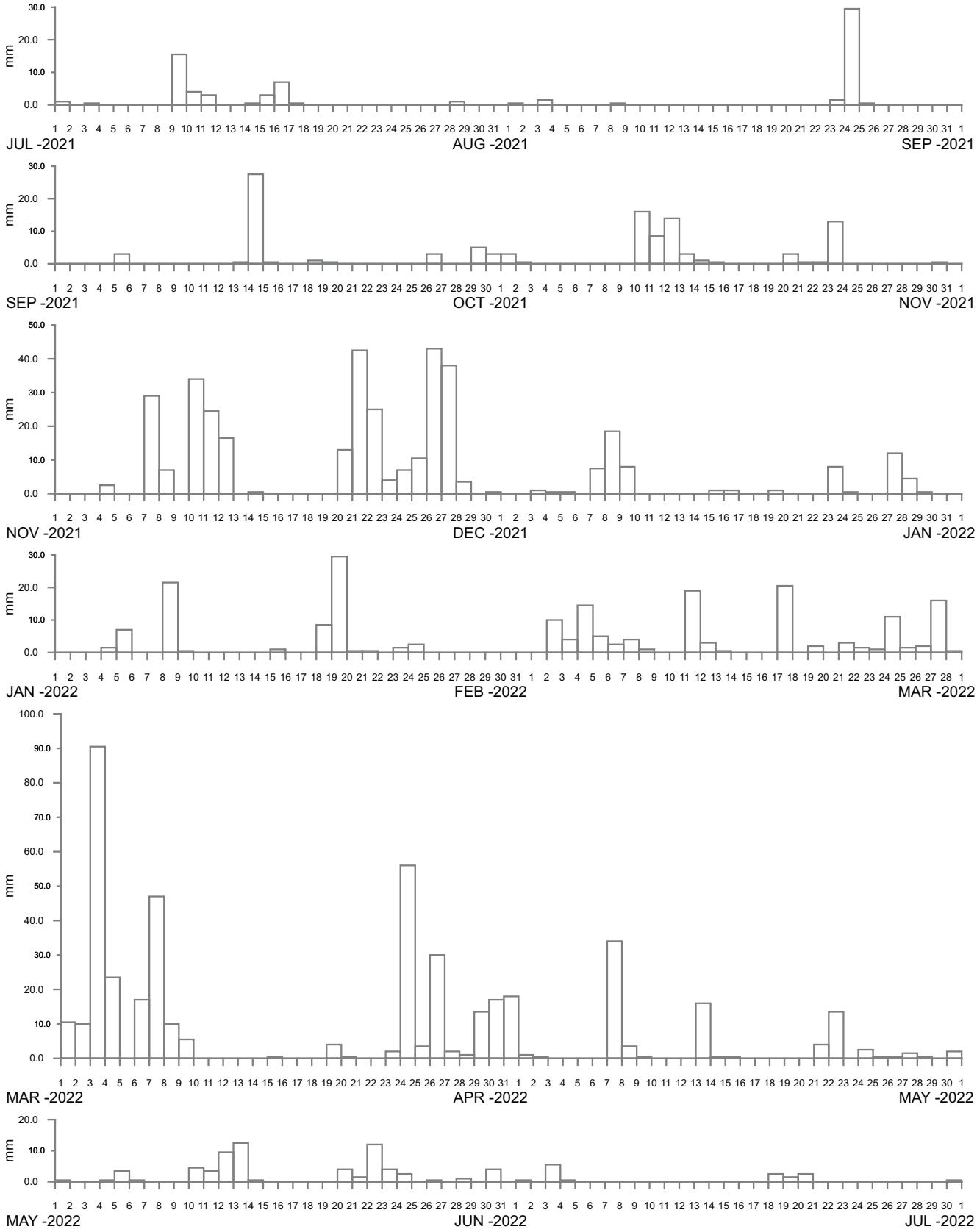
RAINFALL STATION LOCATIONS
HUNTER RIVER REGION

Manly Hydraulics Laboratory

Report MHL2908

Figure 34

DRAWING 2908-34.cdr



NSW GOVERNMENT

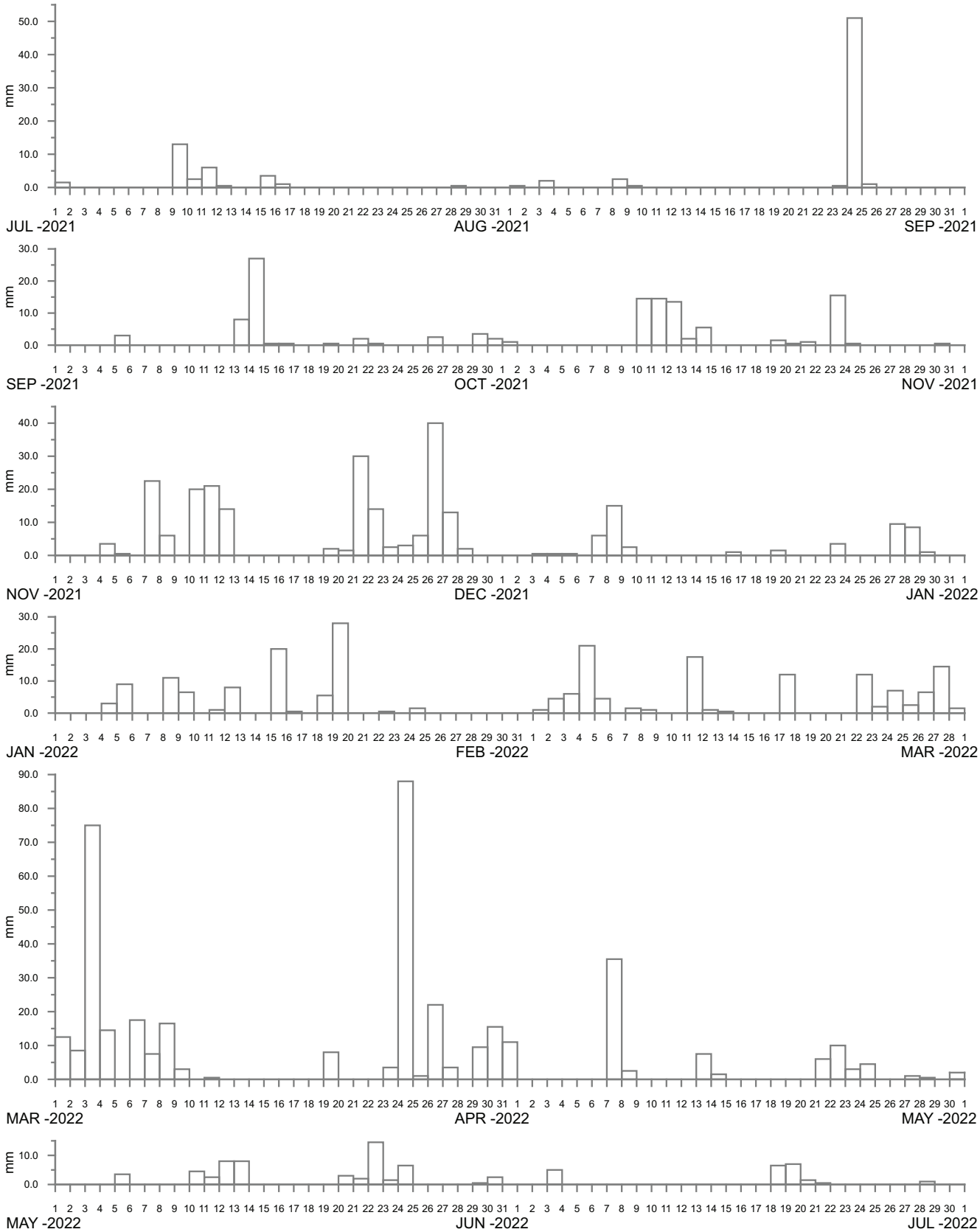
GOSTWYCK AT PATERSON RIVER
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 35

DRAWING 2908-35.cdr



NSW GOVERNMENT

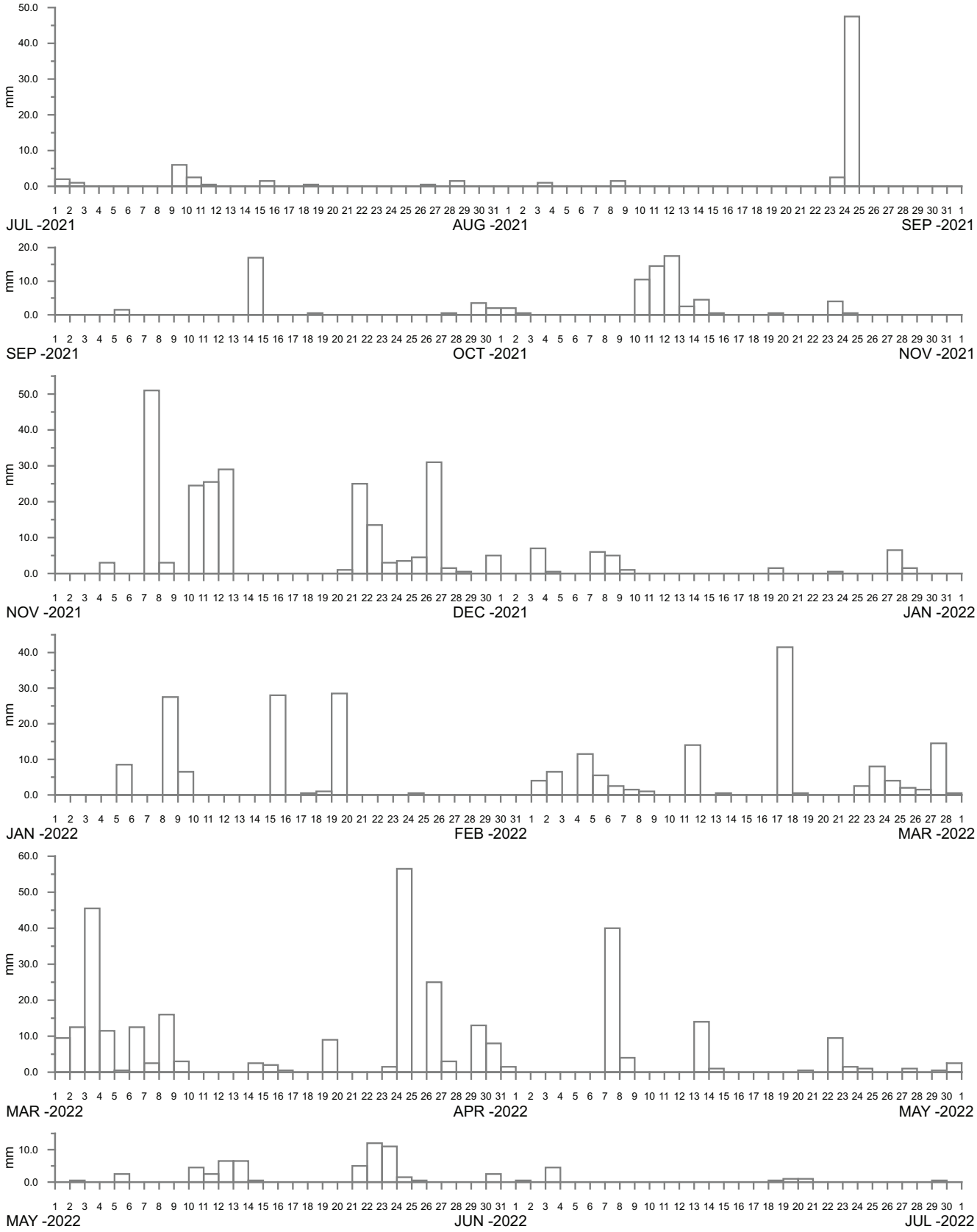
SEAHAM AT WILLIAMS RIVER
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 36

DRAWING 2908-36.cdr



NSW GOVERNMENT

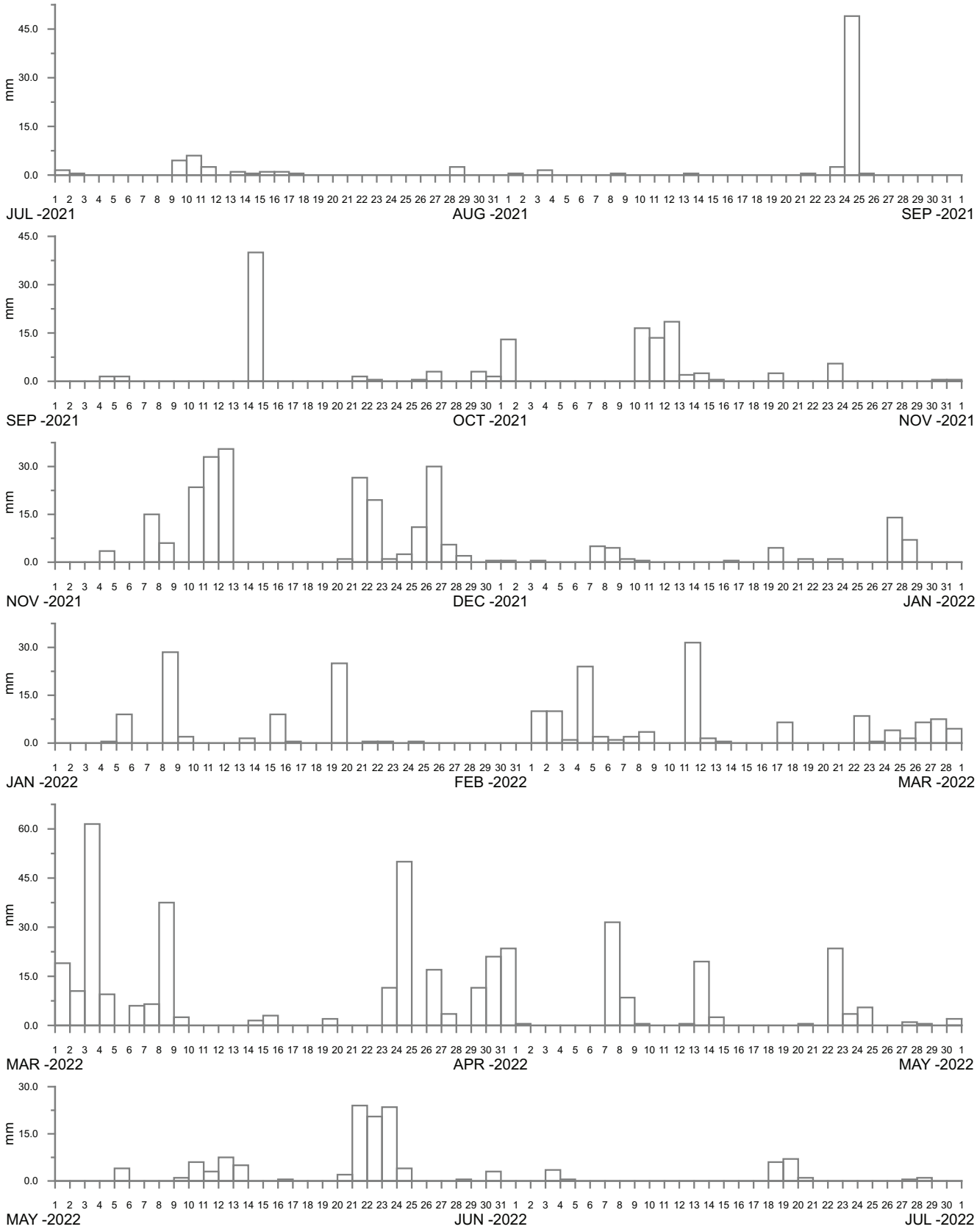
BELMORE BRIDGE AT HUNTER RIVER
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 37

DRAWING 2908-37.cdr



NSW GOVERNMENT

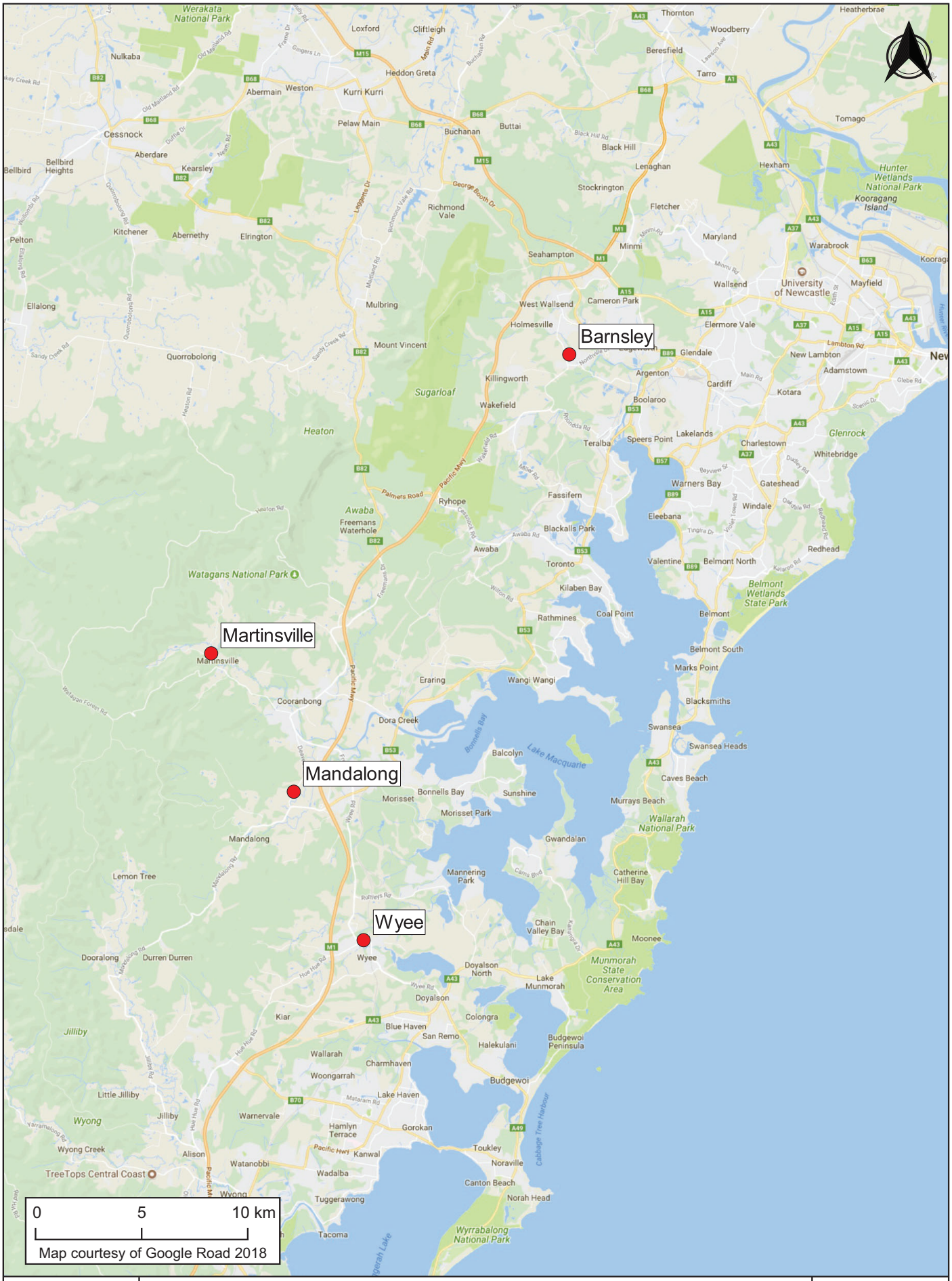
HEXHAM BRIDGE AT HUNTER RIVER
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 38

DRAWING 2908-38.cdr



NSW GOVERNMENT

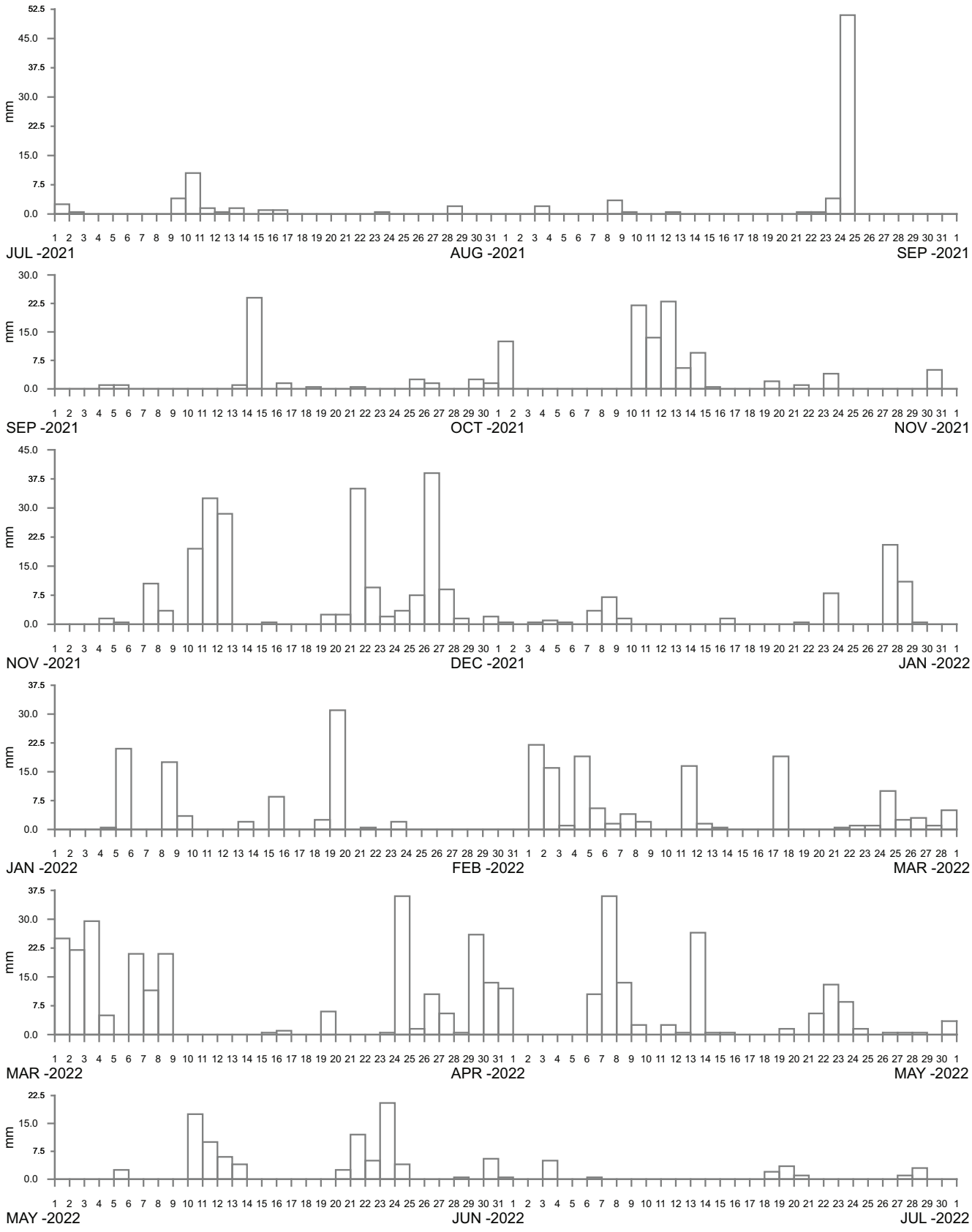
RAINFALL STATION LOCATIONS
MACQUARIE-TUGGERAH LAKES (NORTH) REGION

Manly Hydraulics Laboratory

Report MHL2908

Figure 39

DRAWING 2908-39.cdr



NSW GOVERNMENT

BARNSLEY AT JOHNSON AVENUE
2021–2022

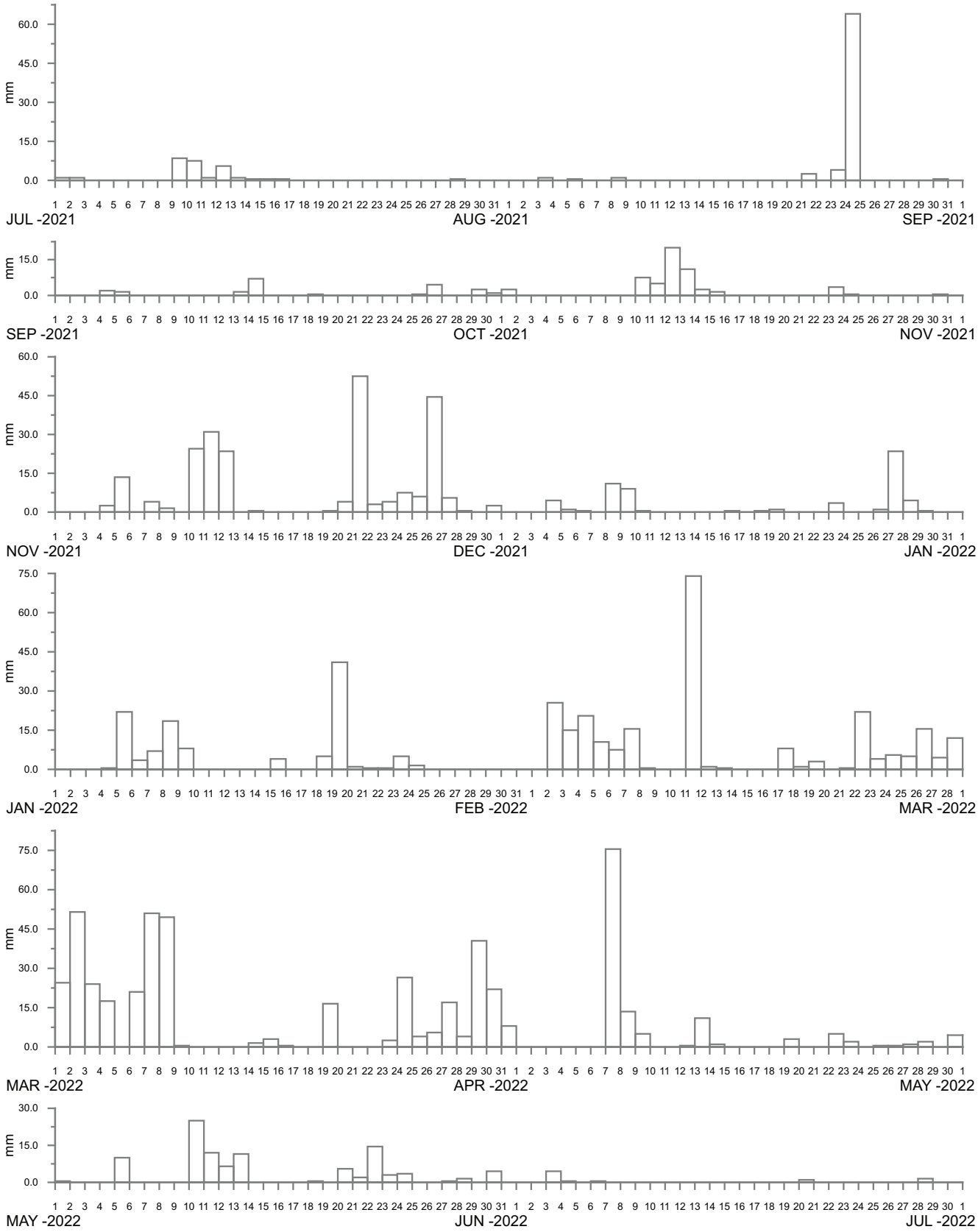
Manly Hydraulics Laboratory

Report MHL2908

Figure

40

DRAWING 2908-40.cdr



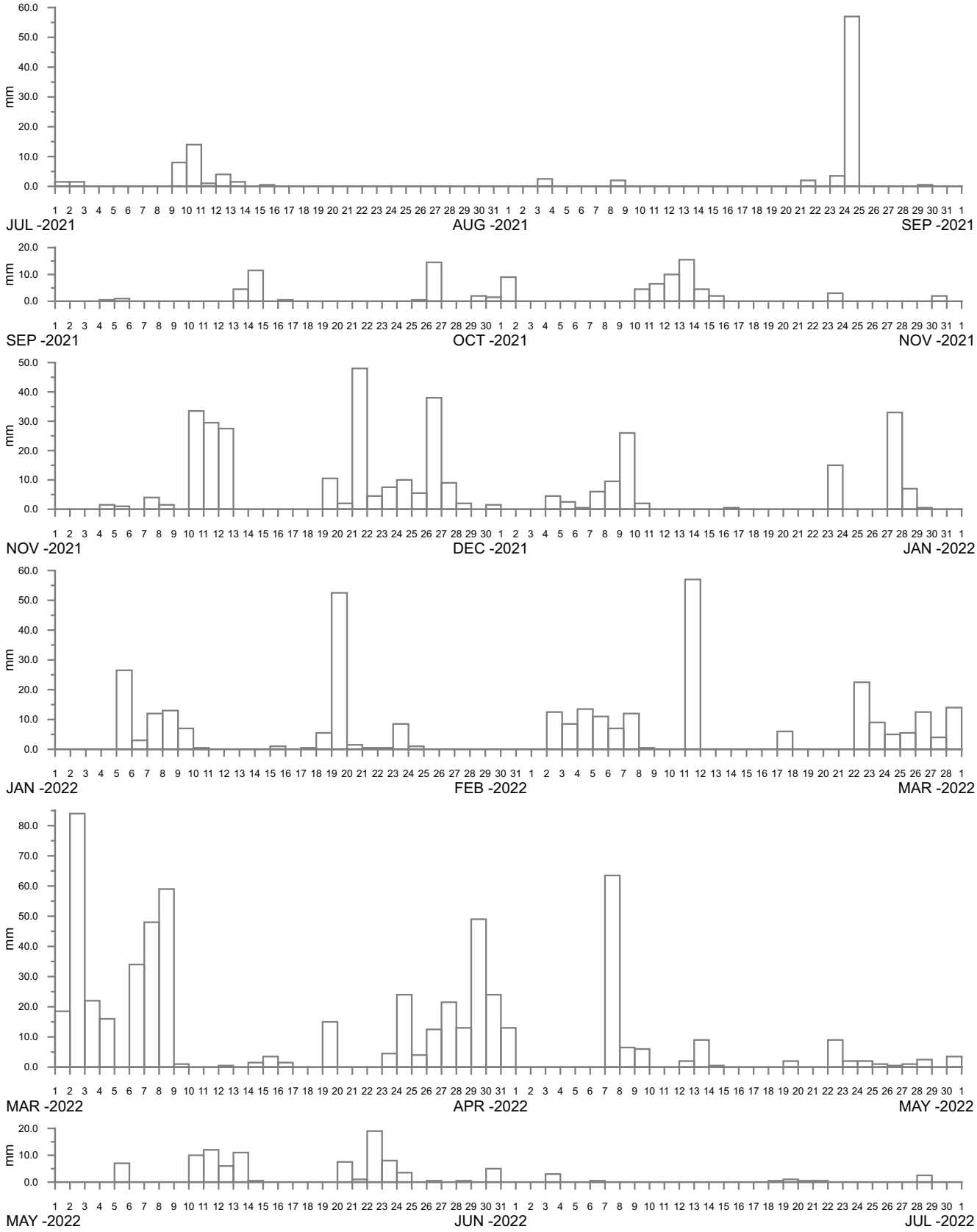
MARTINSVILLE AT MARTINSVILLE ROAD
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 41

DRAWING 2908-41.cdr



NSW GOVERNMENT

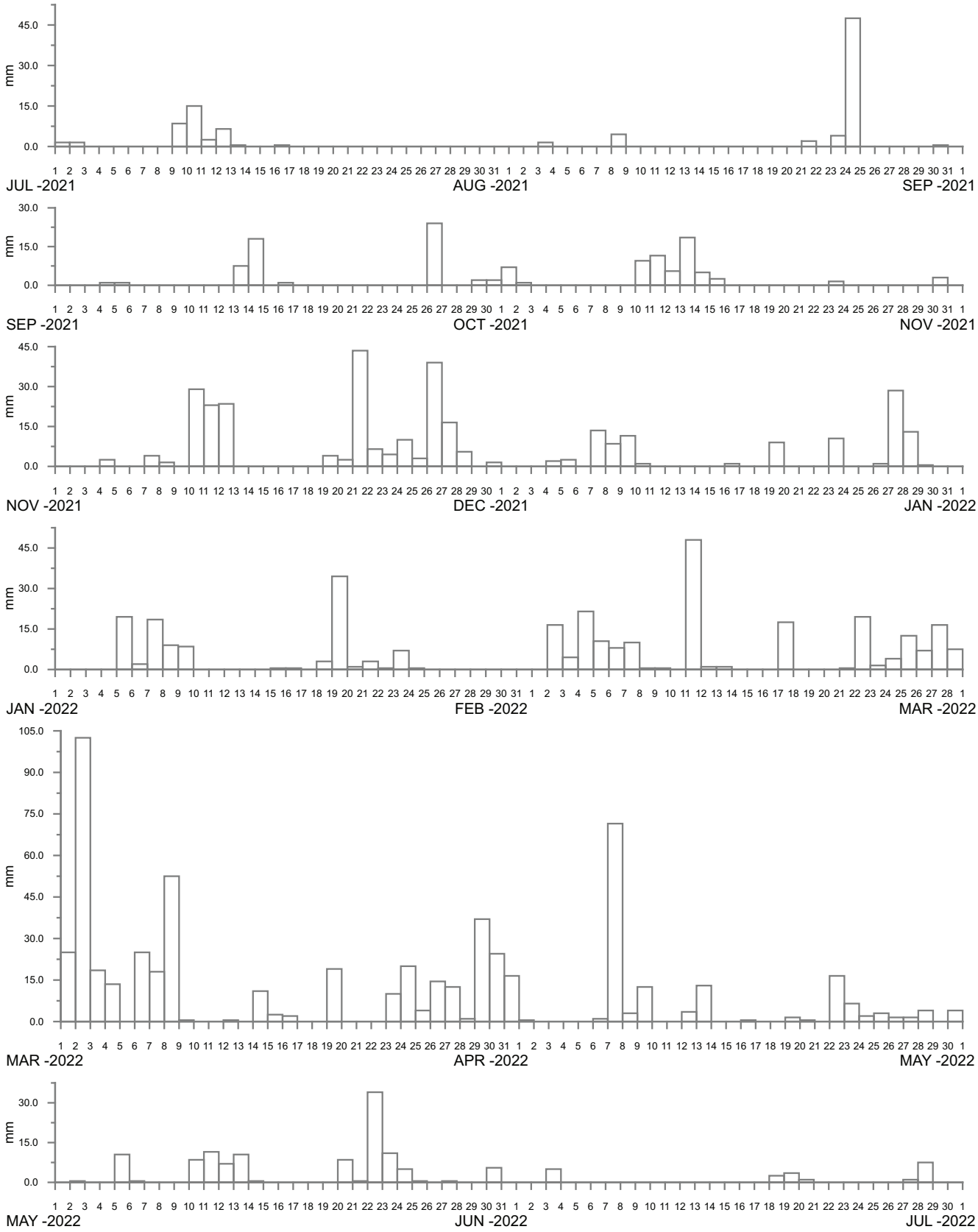
MANDALONG AT DEAVES ROAD
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 42

DRAWING 2908-42.cdr



NSW GOVERNMENT

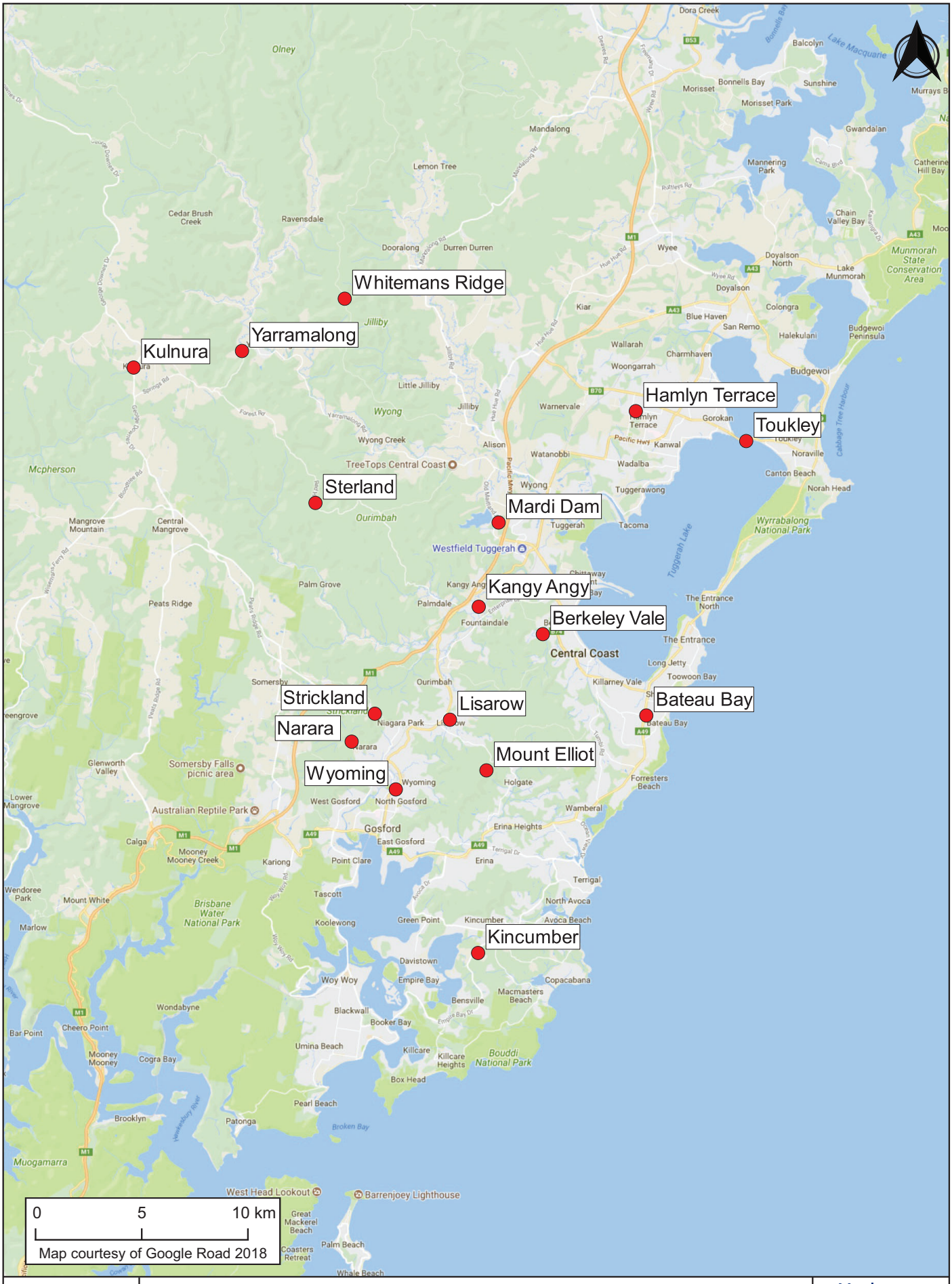
WYEE AT COLLUNGRA STREET
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 43

DRAWING 2908-43.cdr



NSW GOVERNMENT

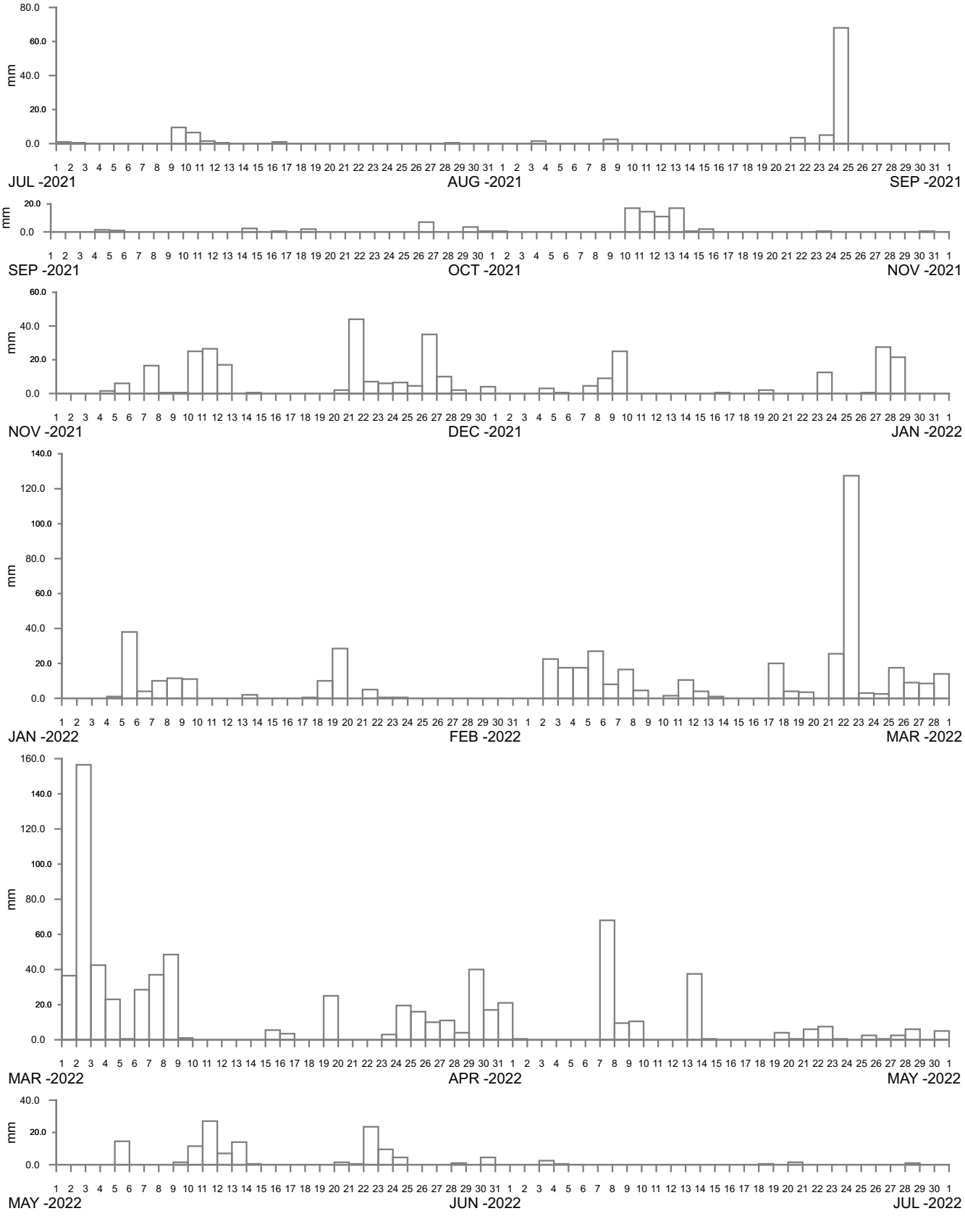
RAINFALL STATION LOCATIONS MACQUARIE-TUGGERAH LAKES (SOUTH) AND BRISBANE WATER REGIONS

Manly Hydraulics Laboratory

Report MHL2908

Figure 44

DRAWING 2908-44.cdr



NSW GOVERNMENT

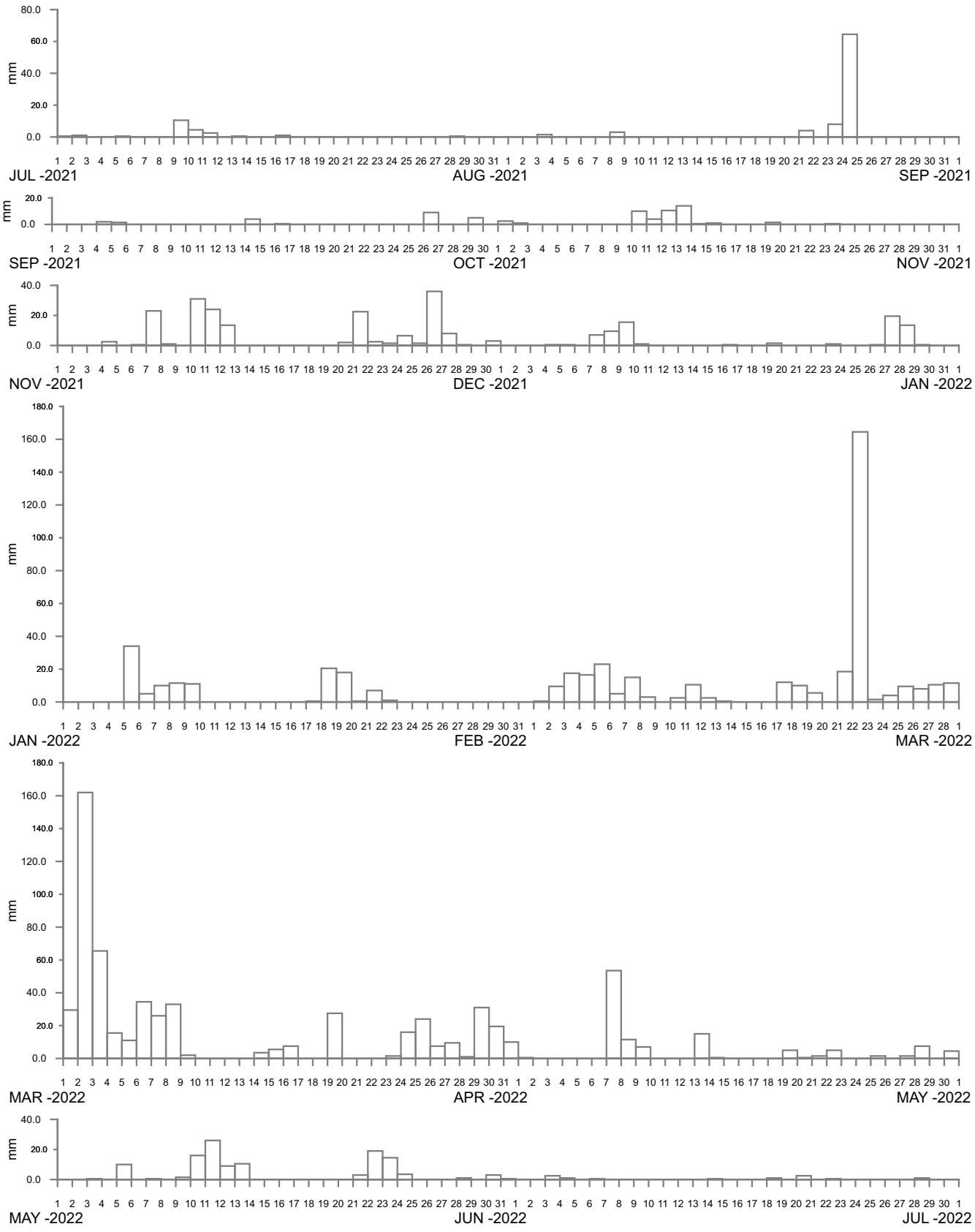
WHITEMANS RIDGE AT WATAGANS FOREST DRIVE 2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 45

DRAWING 2908-45.cdr



NSW GOVERNMENT

YARRAMALONG AT BUMBLE HILL ROAD
2021–2022

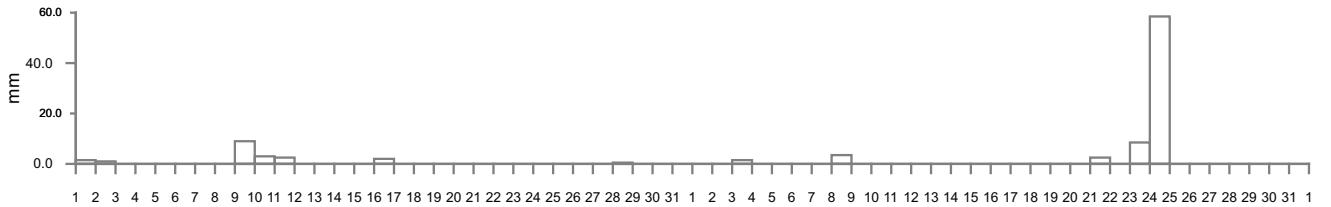
Manly Hydraulics Laboratory

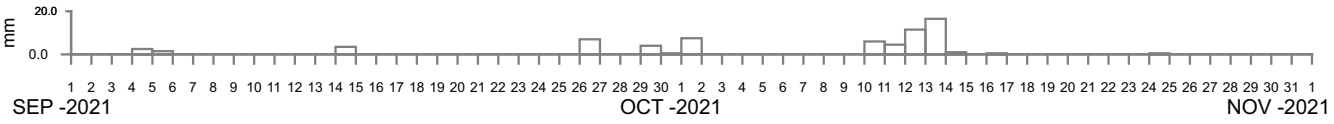
Report MHL2908

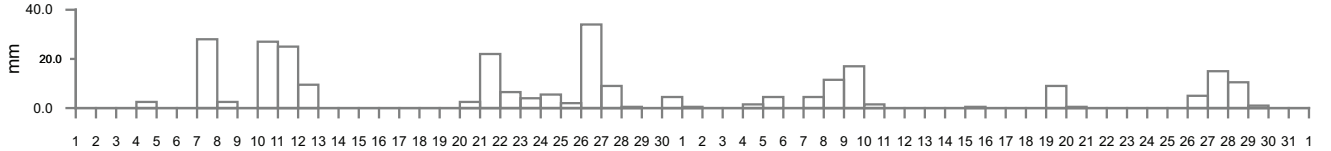
Figure

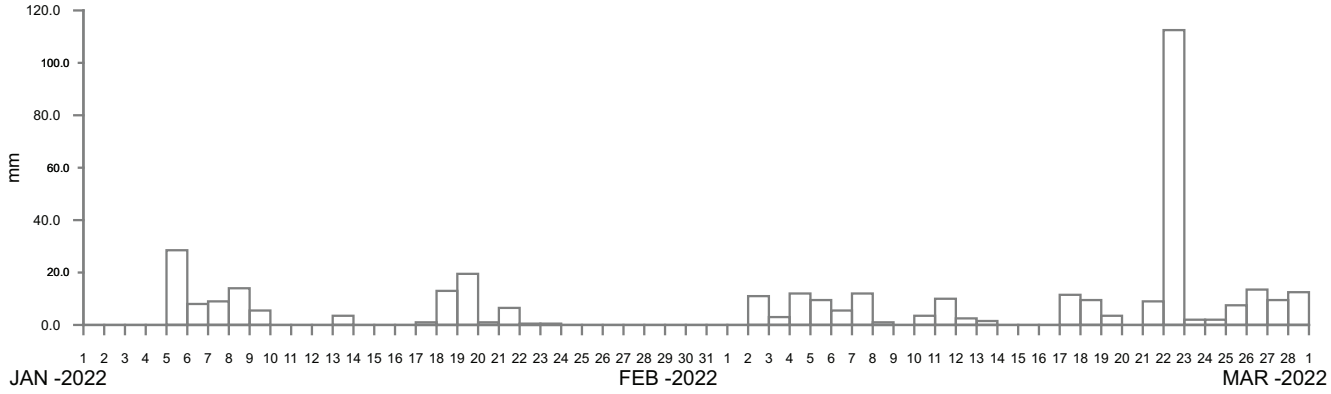
46

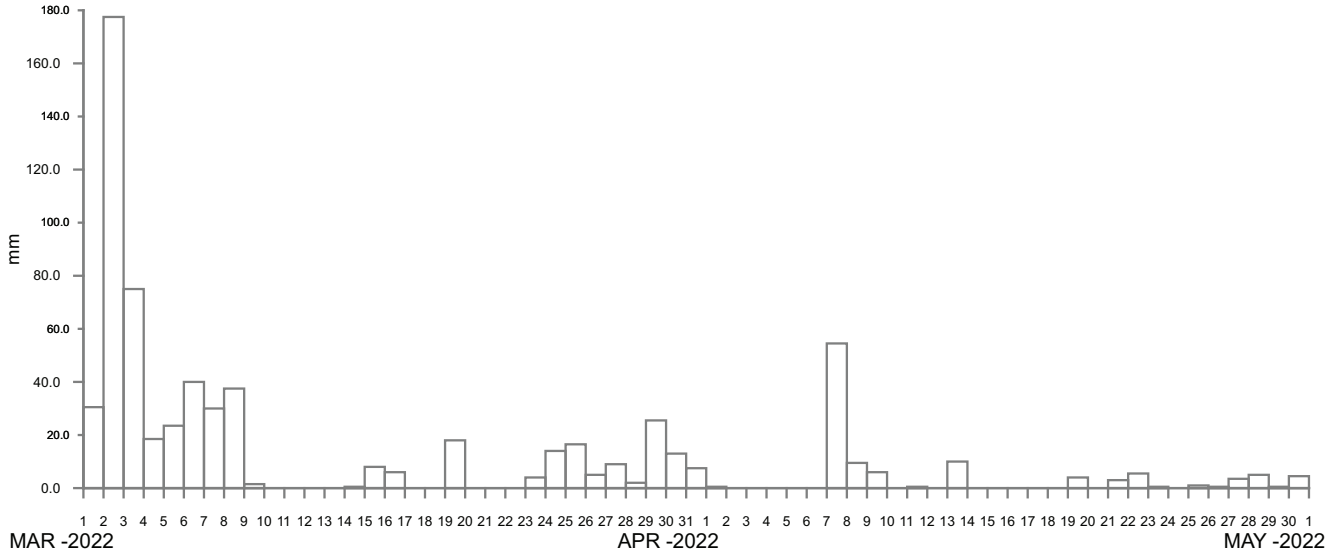
DRAWING 2908-46.cdr

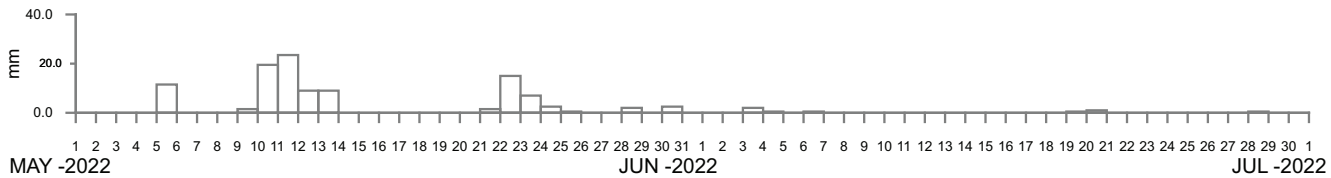












DATA LOSS

NSW GOVERNMENT

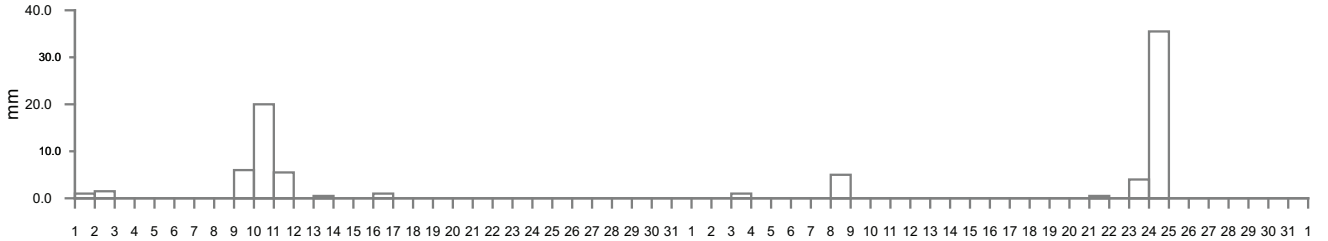
KULNURA AT GEORGE DOWNS DRIVE
2021–2022

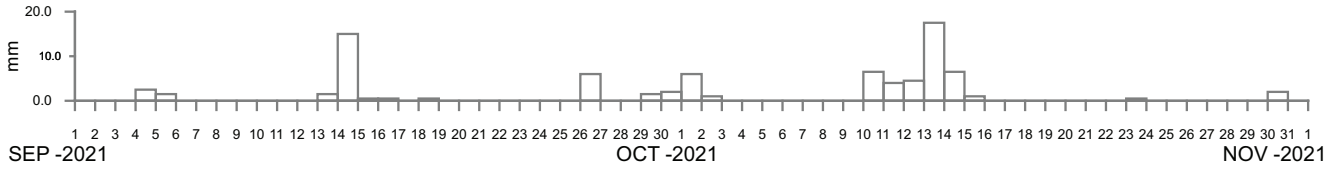
Manly Hydraulics Laboratory

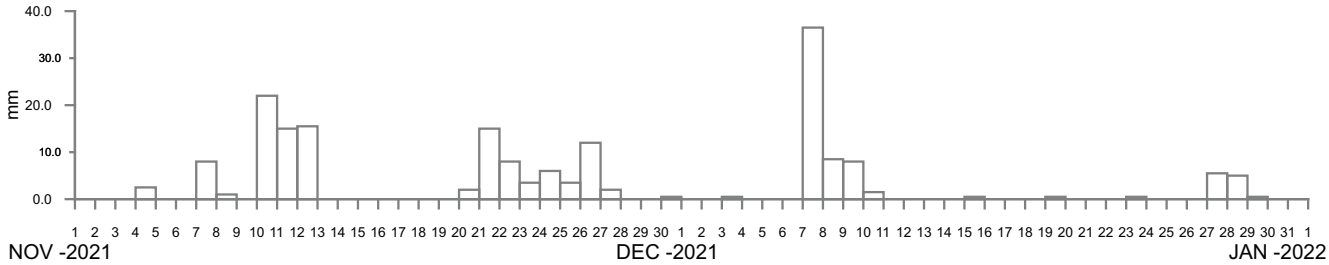
Report MHL2908

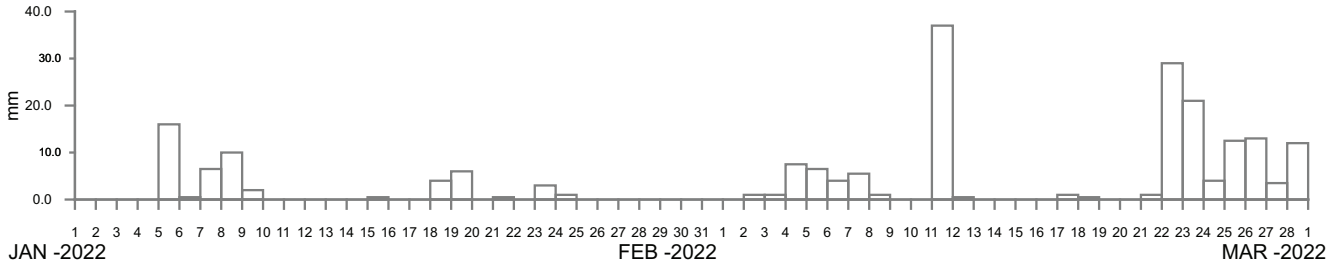
Figure 47

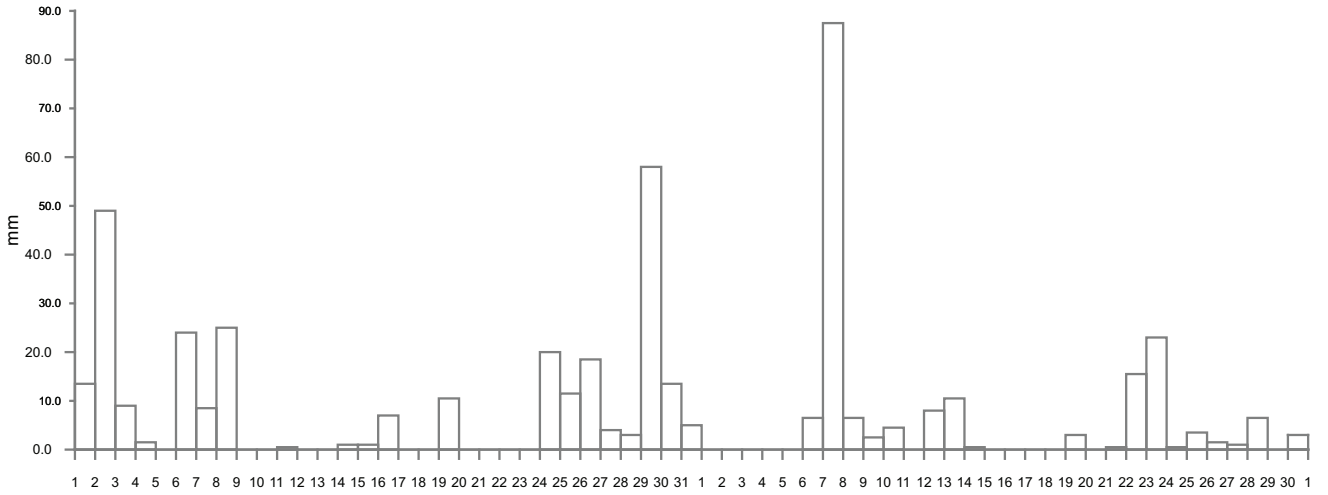
DRAWING 2908-47.cdr

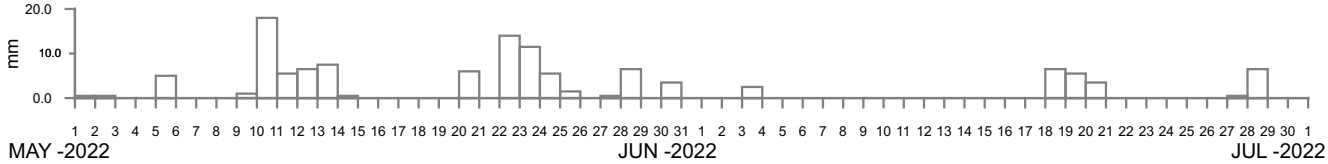












DATA LOSS

NSW GOVERNMENT

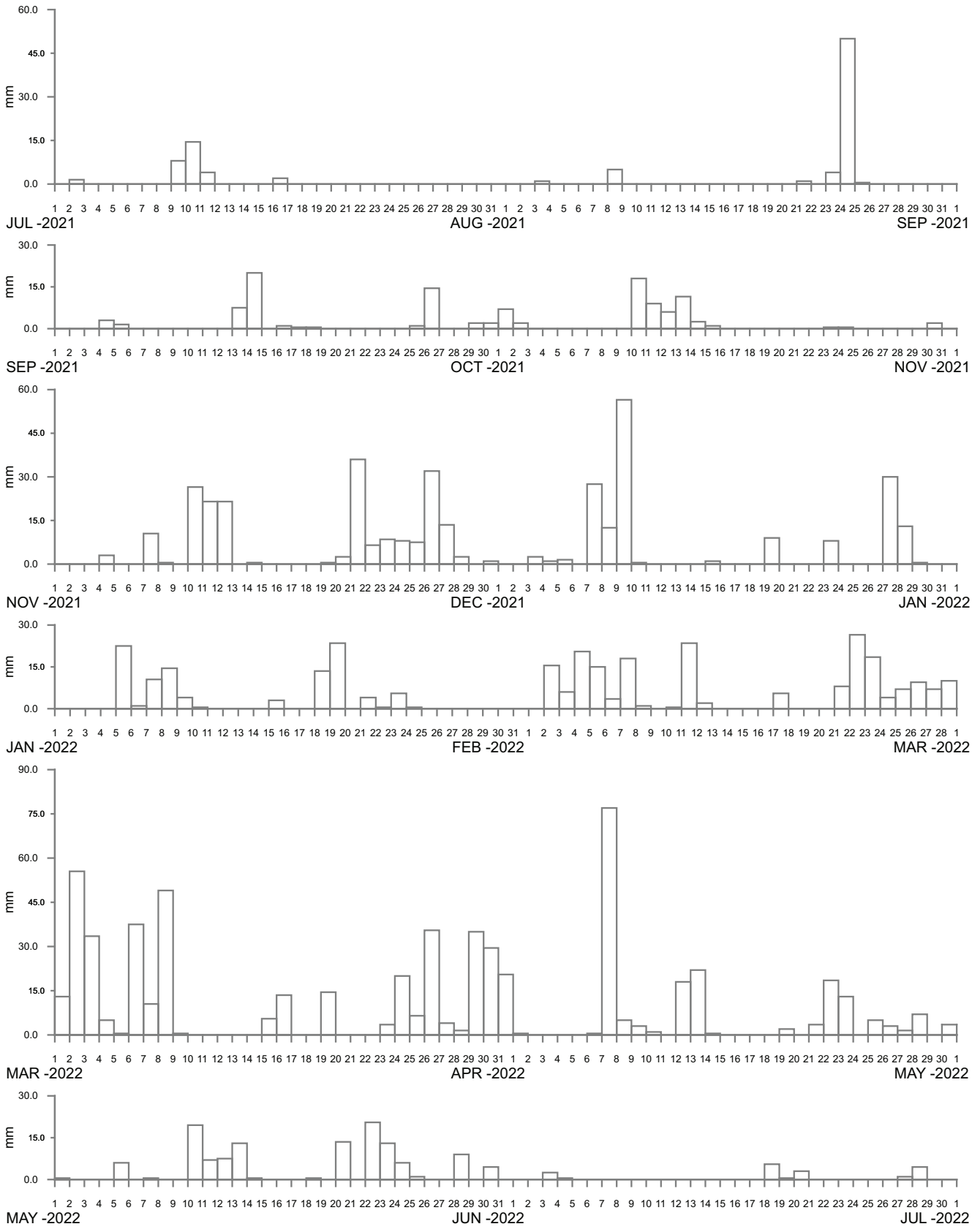
TOUKLEY AT TUGGERAH LAKE
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 48

DRAWING 2908-48.cdr



NSW GOVERNMENT

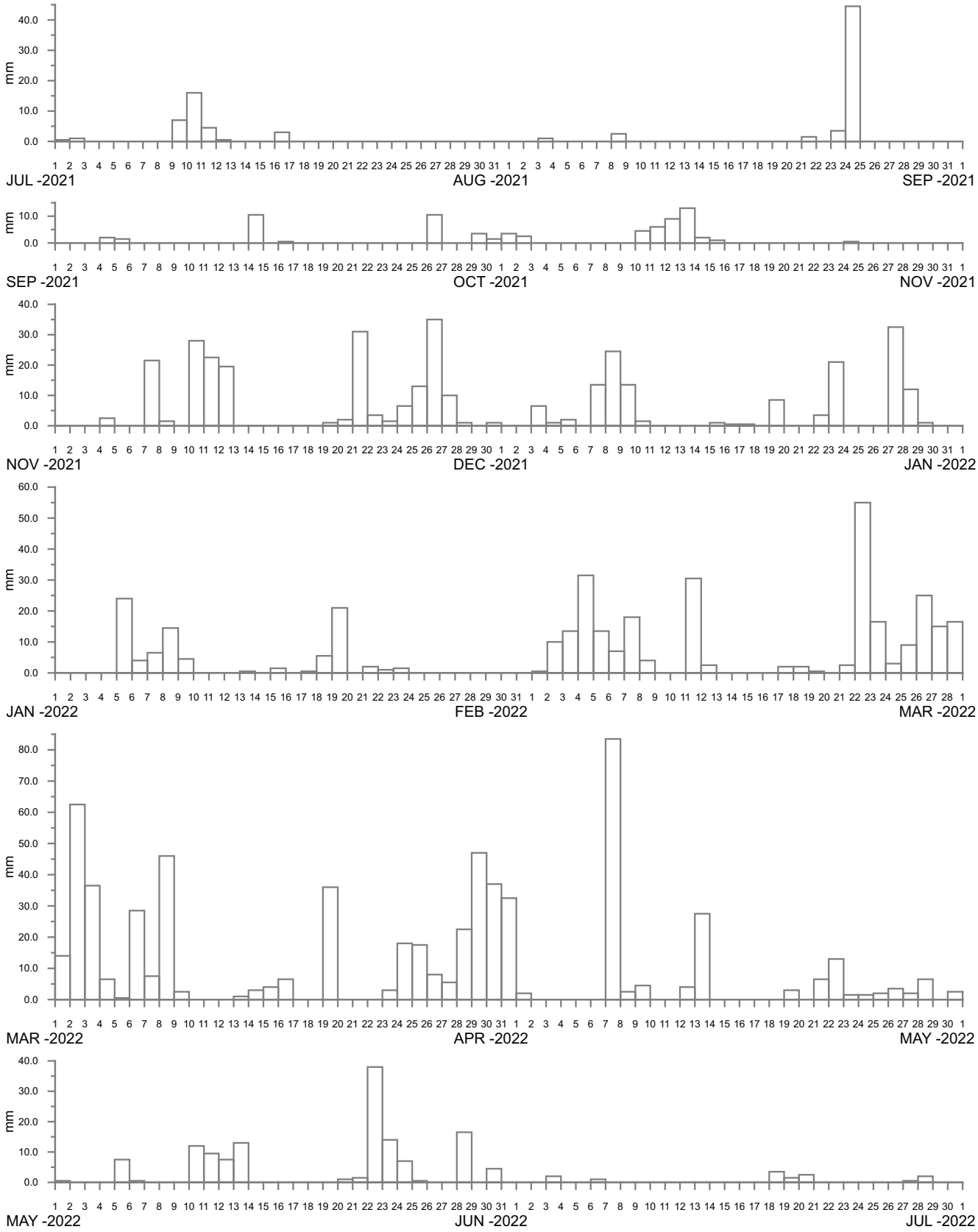
HAMLYN TERRACE AT WARNERVALE ROAD
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 49

DRAWING 2908-49.cdr



NSW GOVERNMENT

MARDI DAM AT OLD MAITLAND ROAD
2021–2022

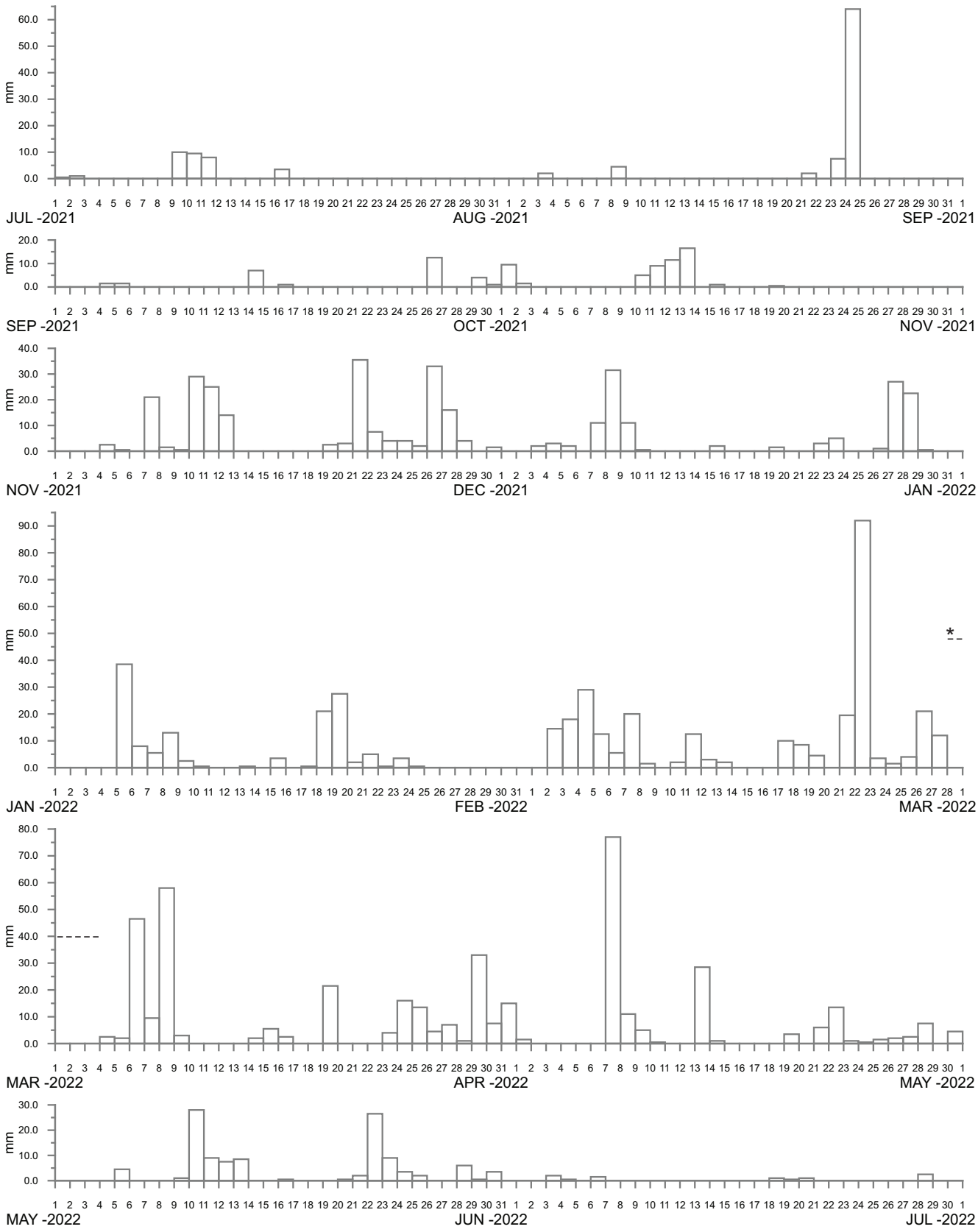
Manly Hydraulics Laboratory

Report MHL2908

Figure

50

DRAWING 2908-50.cdr



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

*Data loss due to cabinet door opened

NSW GOVERNMENT

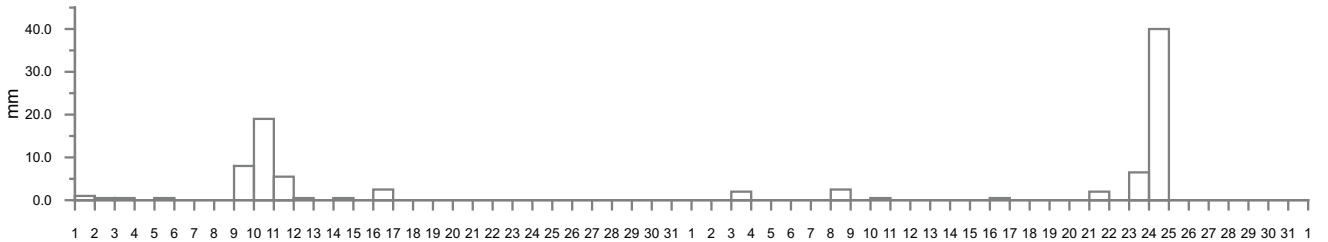
STERLAND AT RED HILL FOREST ROAD
2021–2022

Manly Hydraulics Laboratory

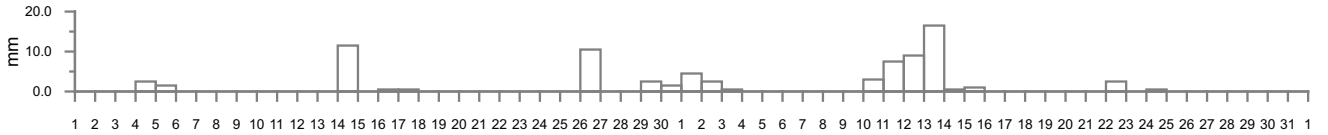
Report MHL2908

Figure 51

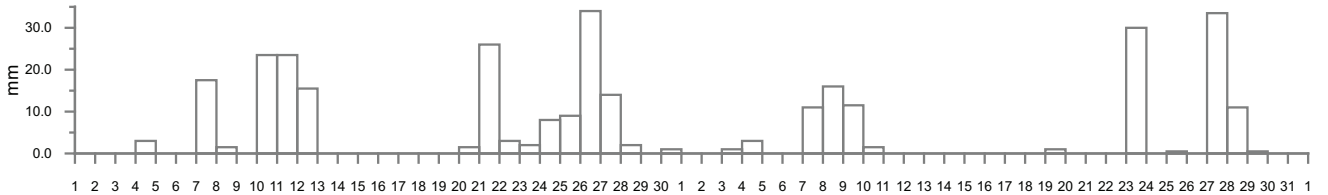
DRAWING 2908-51.cdr



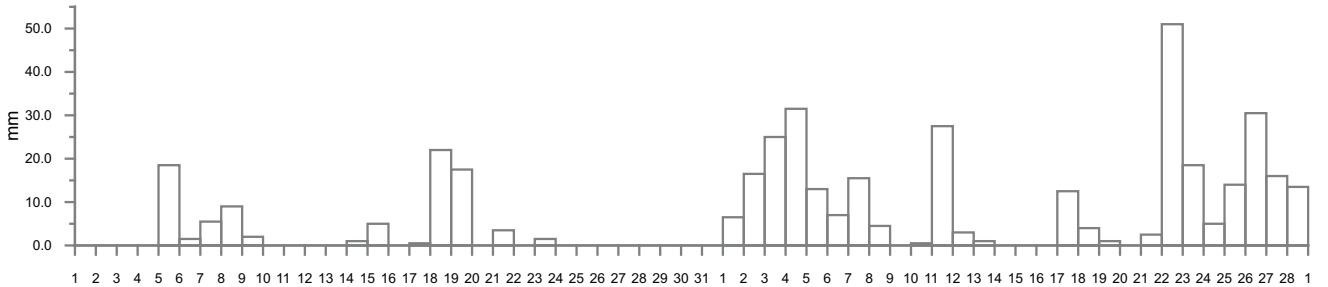
JUL -2021 AUG -2021 SEP -2021



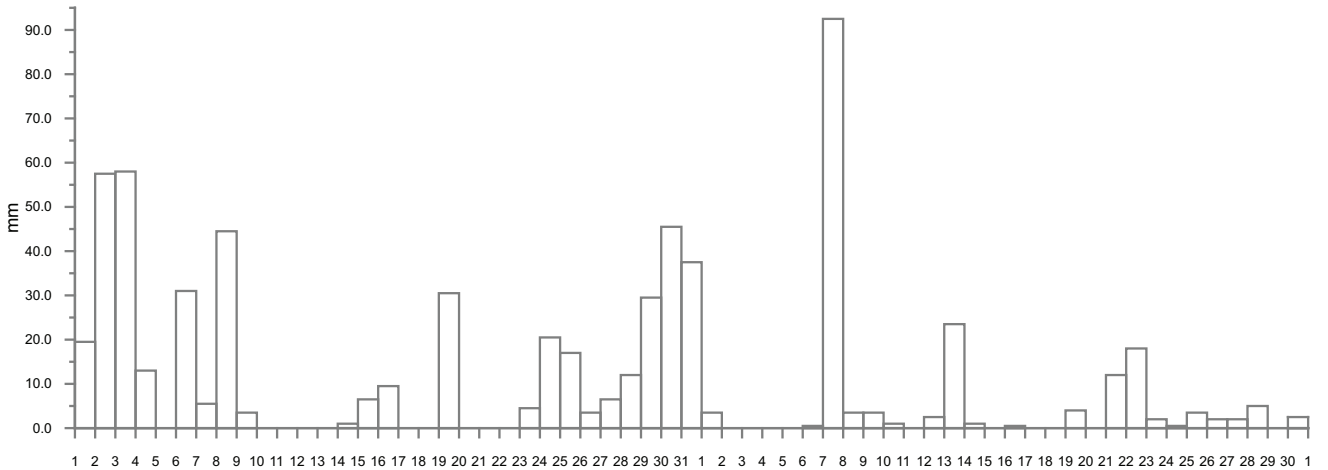
SEP -2021 OCT -2021 NOV -2021



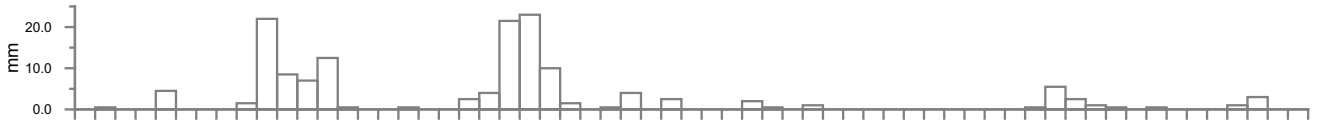
NOV -2021 DEC -2021 JAN -2022



JAN -2022 FEB -2022 MAR -2022



MAR -2022 APR -2022 MAY -2022



MAY -2022 JUN -2022 JUL -2022

DATA LOSS

NSW GOVERNMENT

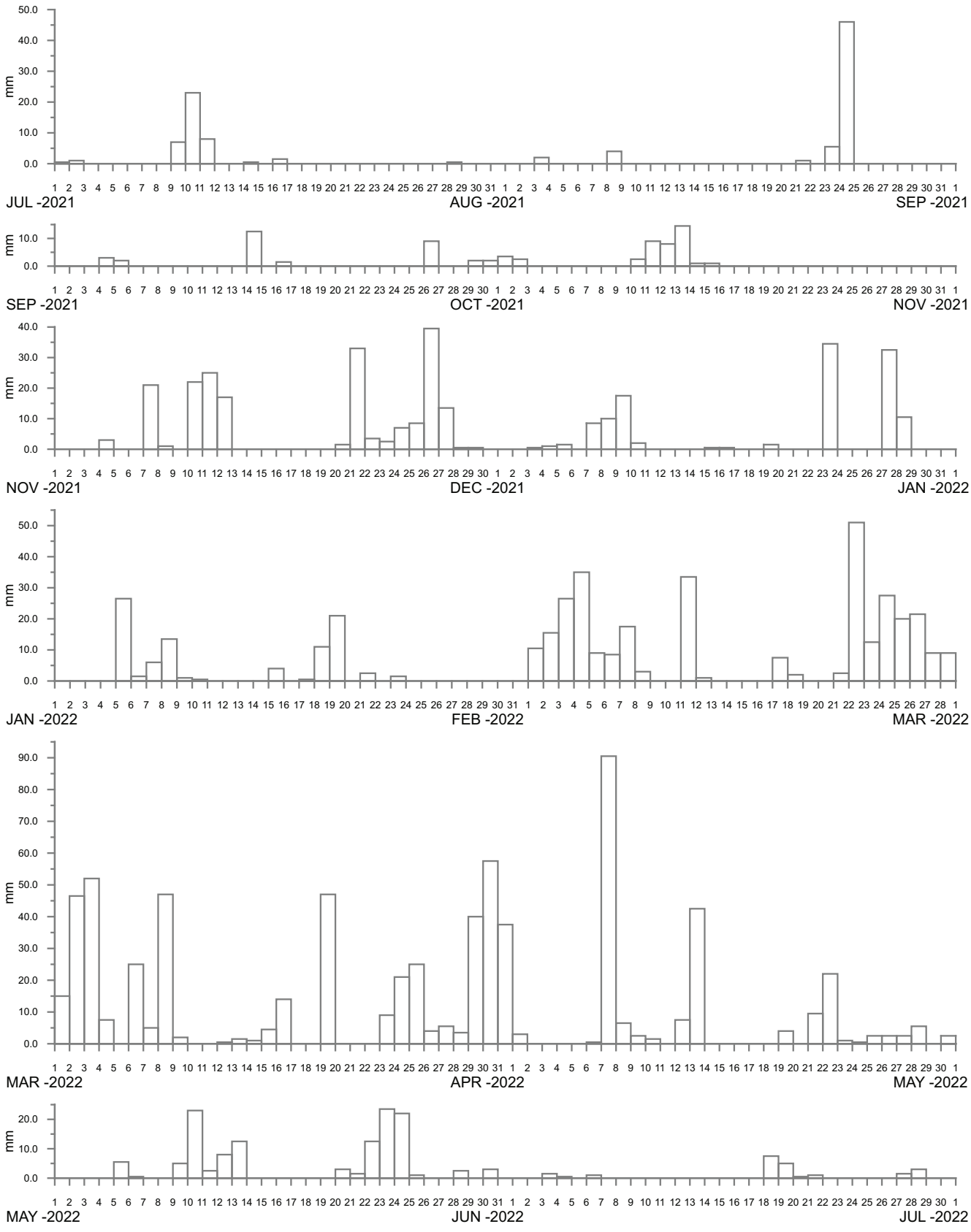
KANGY ANGY AT ORCHARD ROAD
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 52

DRAWING 2908-52.cdr



DATA LOSS

NSW GOVERNMENT

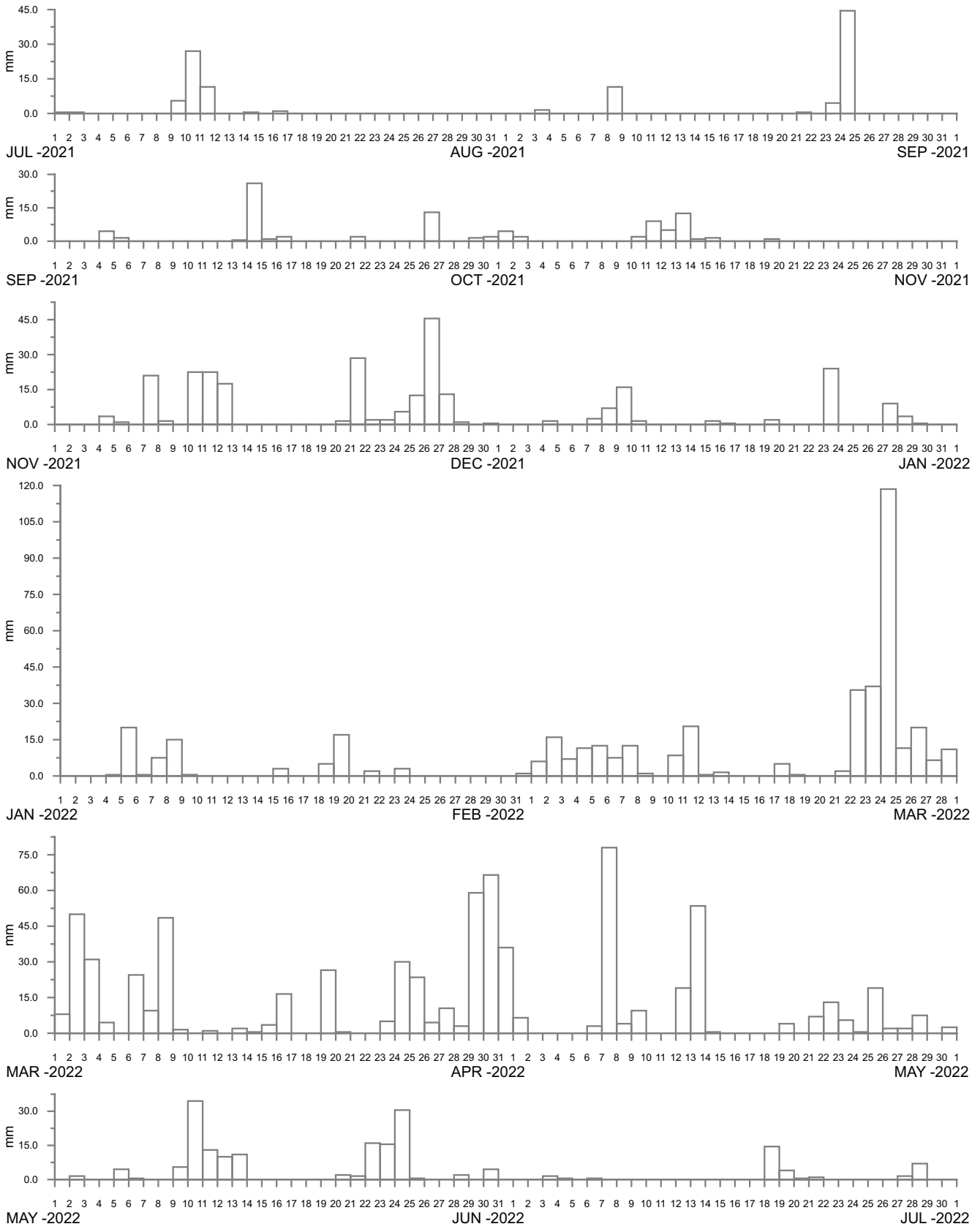
BERKELEY VALE AT BERKELEY VALE ROAD
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 53

DRAWING 2908-53.cdr



NSW GOVERNMENT

BATEAU BAY AT SEWAGE TREATMENT WORKS
2021–2022

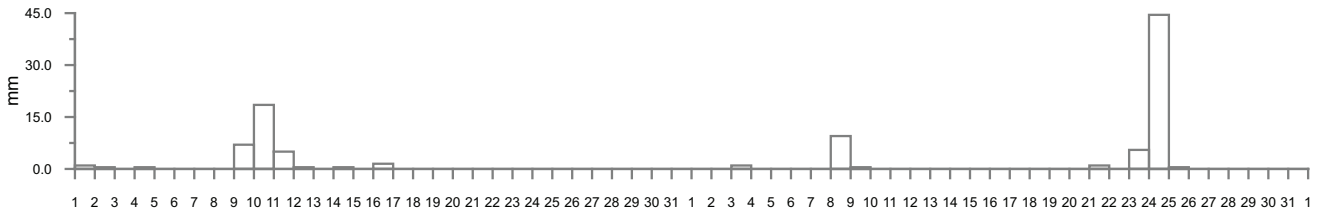
Manly Hydraulics Laboratory

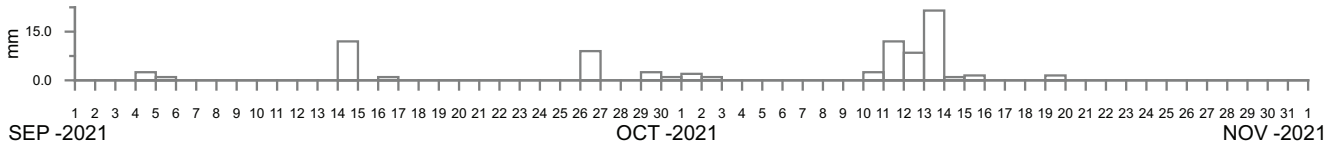
Report MHL2908

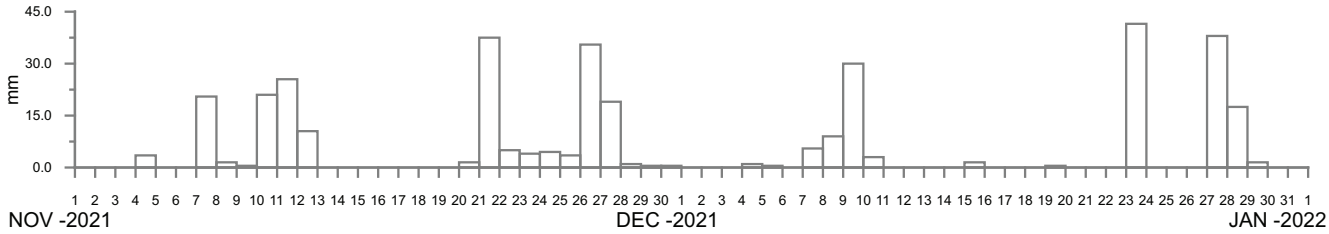
Figure

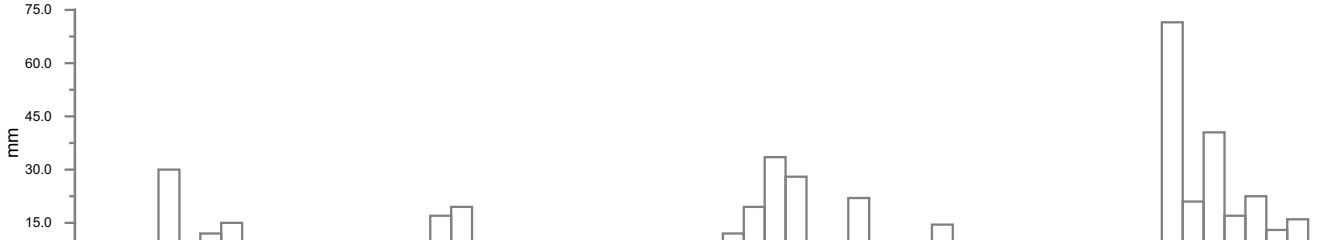
54

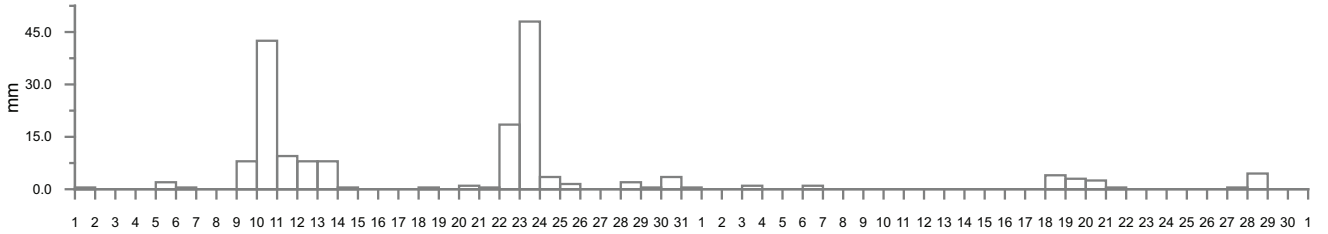
DRAWING 2908-54.cdr











DATA LOSS

NSW GOVERNMENT

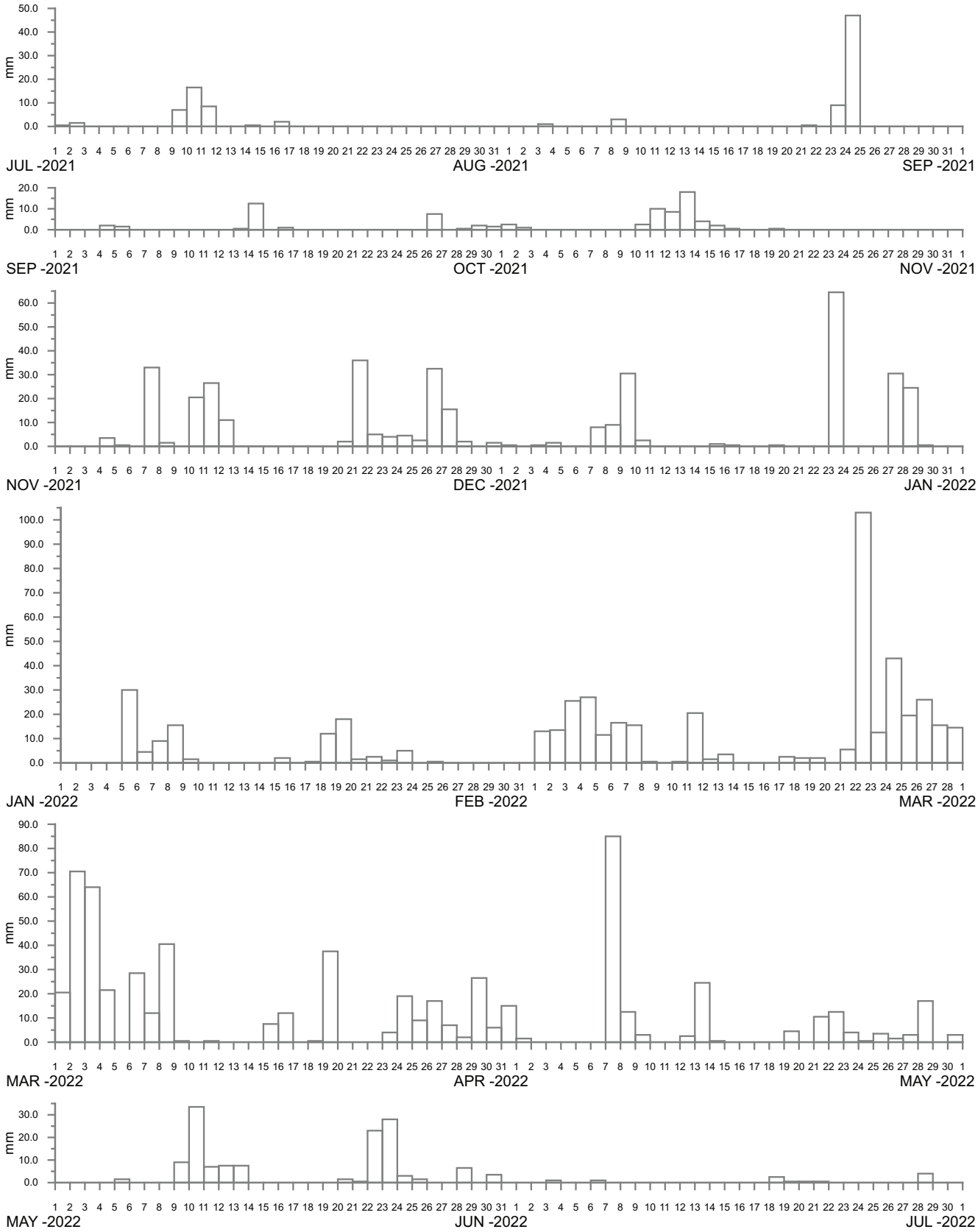
LISAROW AT FAGANS ROAD
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 55

DRAWING 2908-55.cdr



DATA LOSS

NSW GOVERNMENT

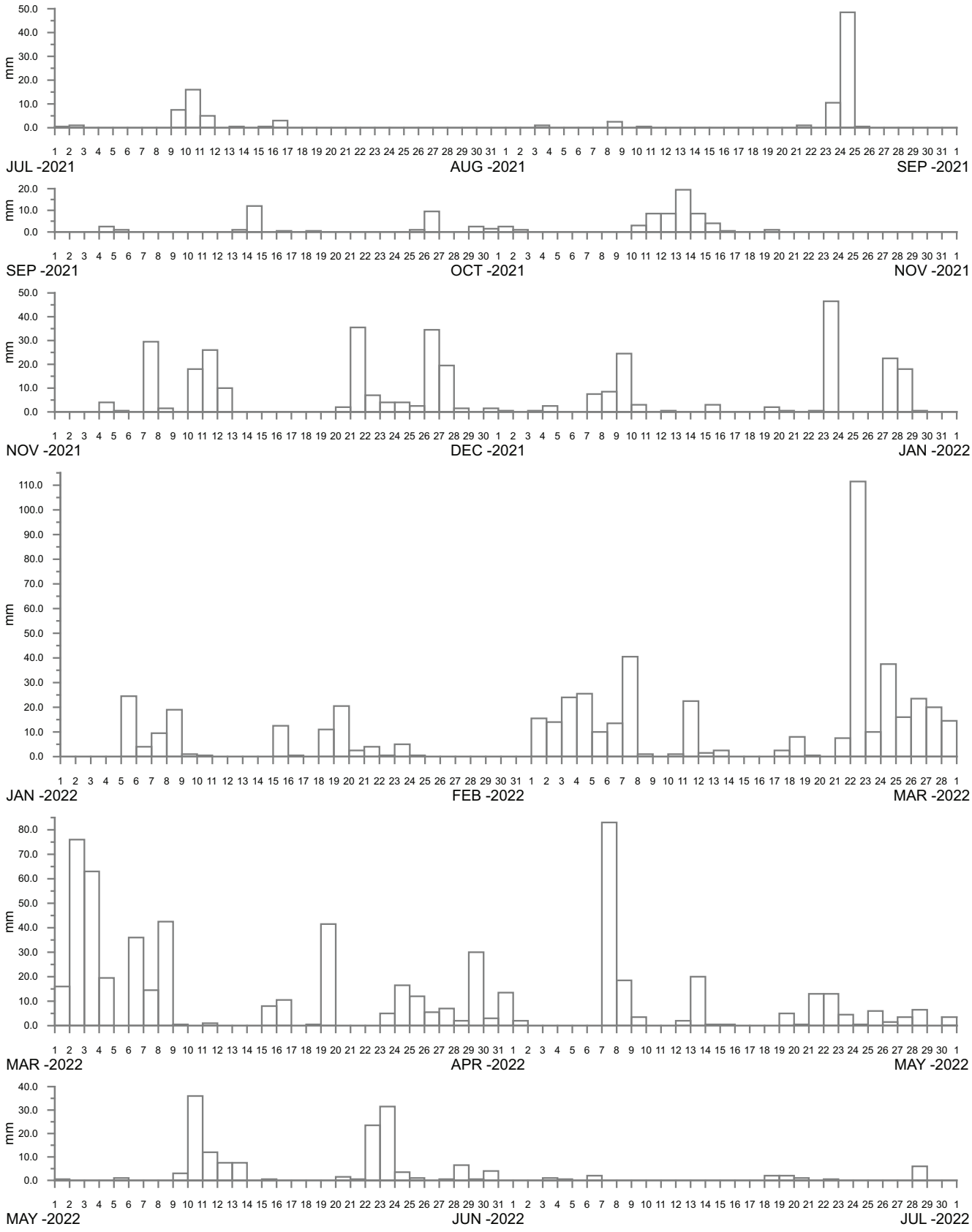
STRICKLAND AT MANGROVE ROAD
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 56

DRAWING 2908-56.cdr



NSW GOVERNMENT

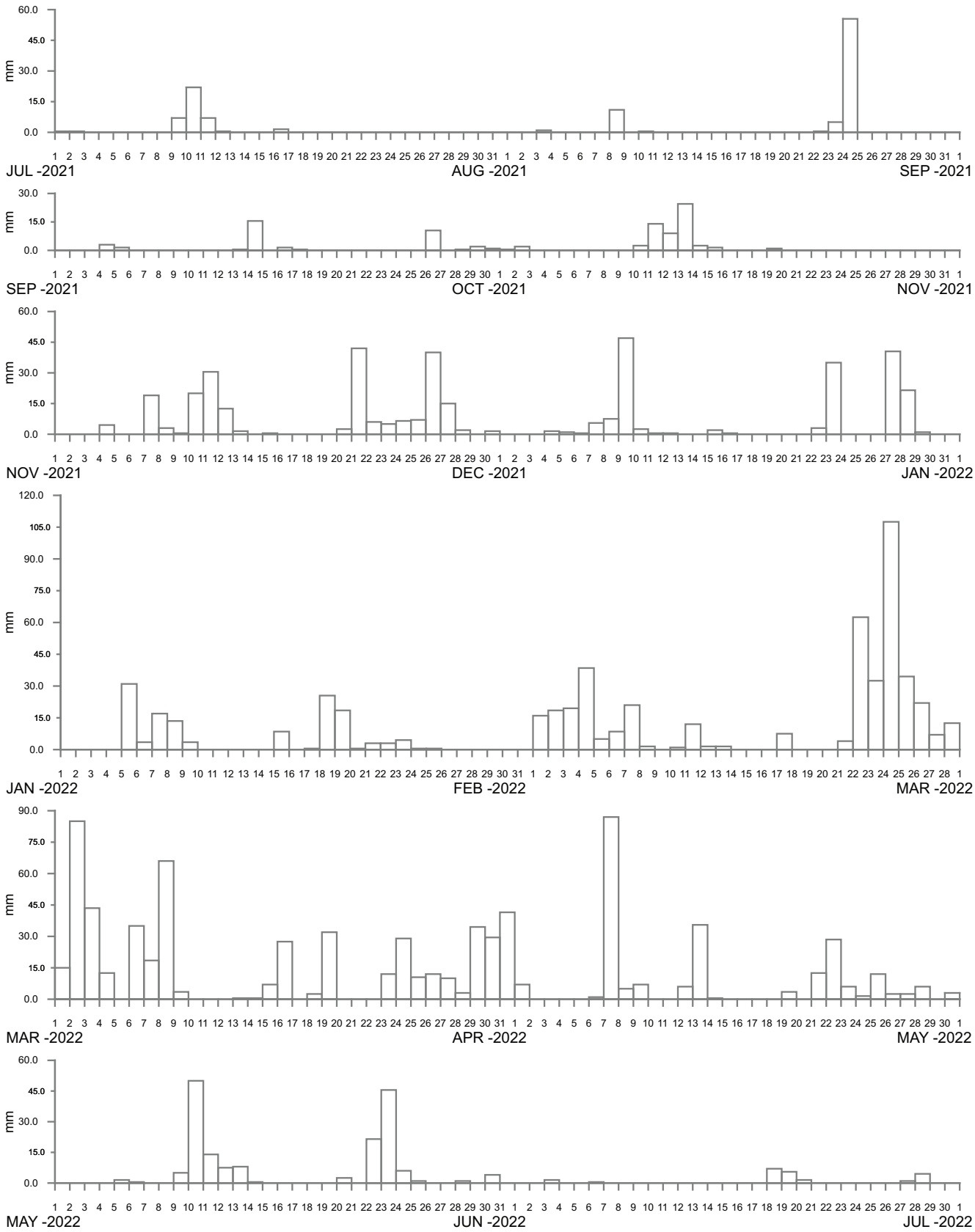
NARARA AT RESEARCH ROAD
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 57

DRAWING 2908-57.cdr



NSW GOVERNMENT

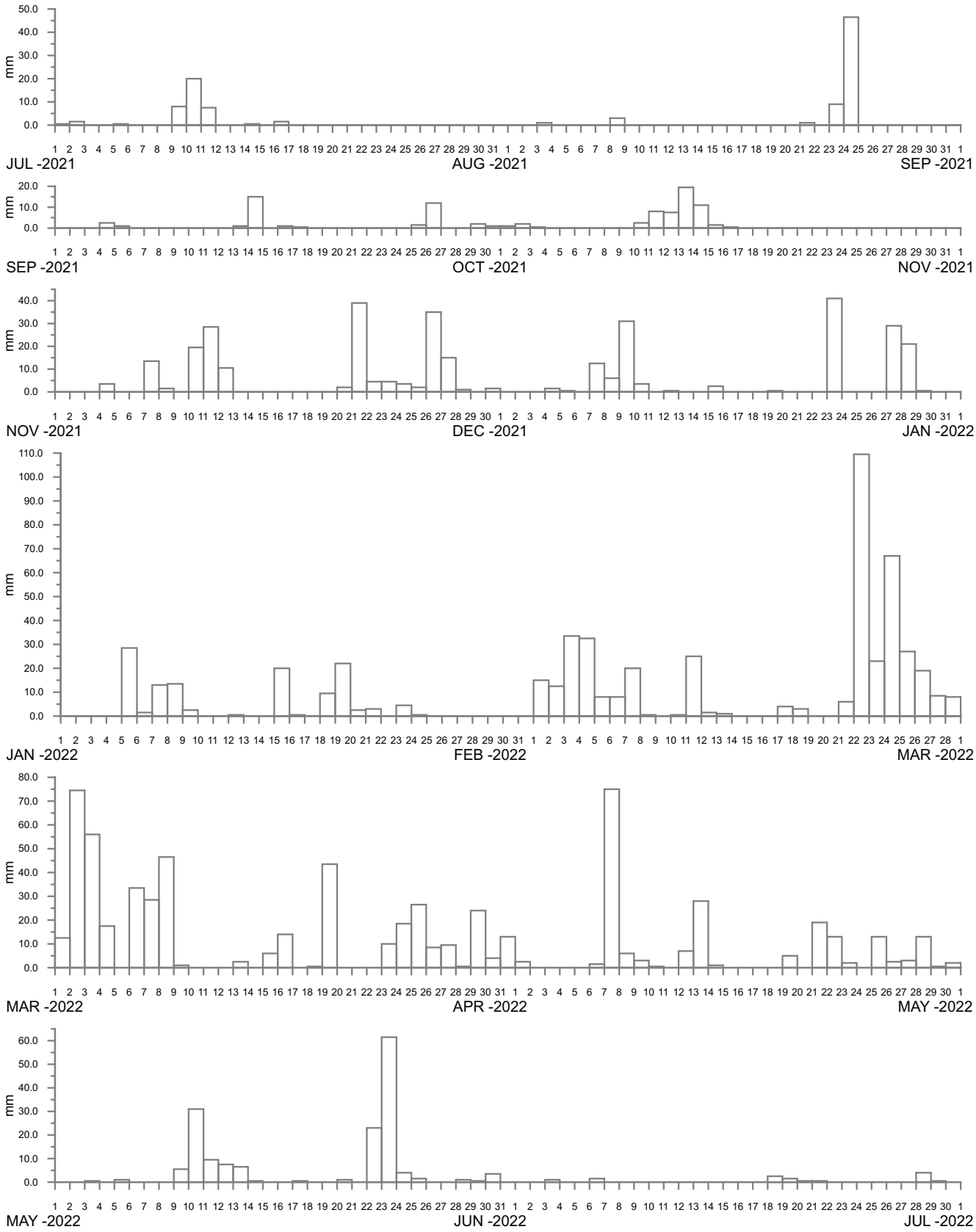
MOUNT ELLIOT AT TOOMEYS ROAD
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 58

DRAWING 2908-58.cdr



NSW GOVERNMENT

WYOMING AT LAYCOCK STREET
2021–2022

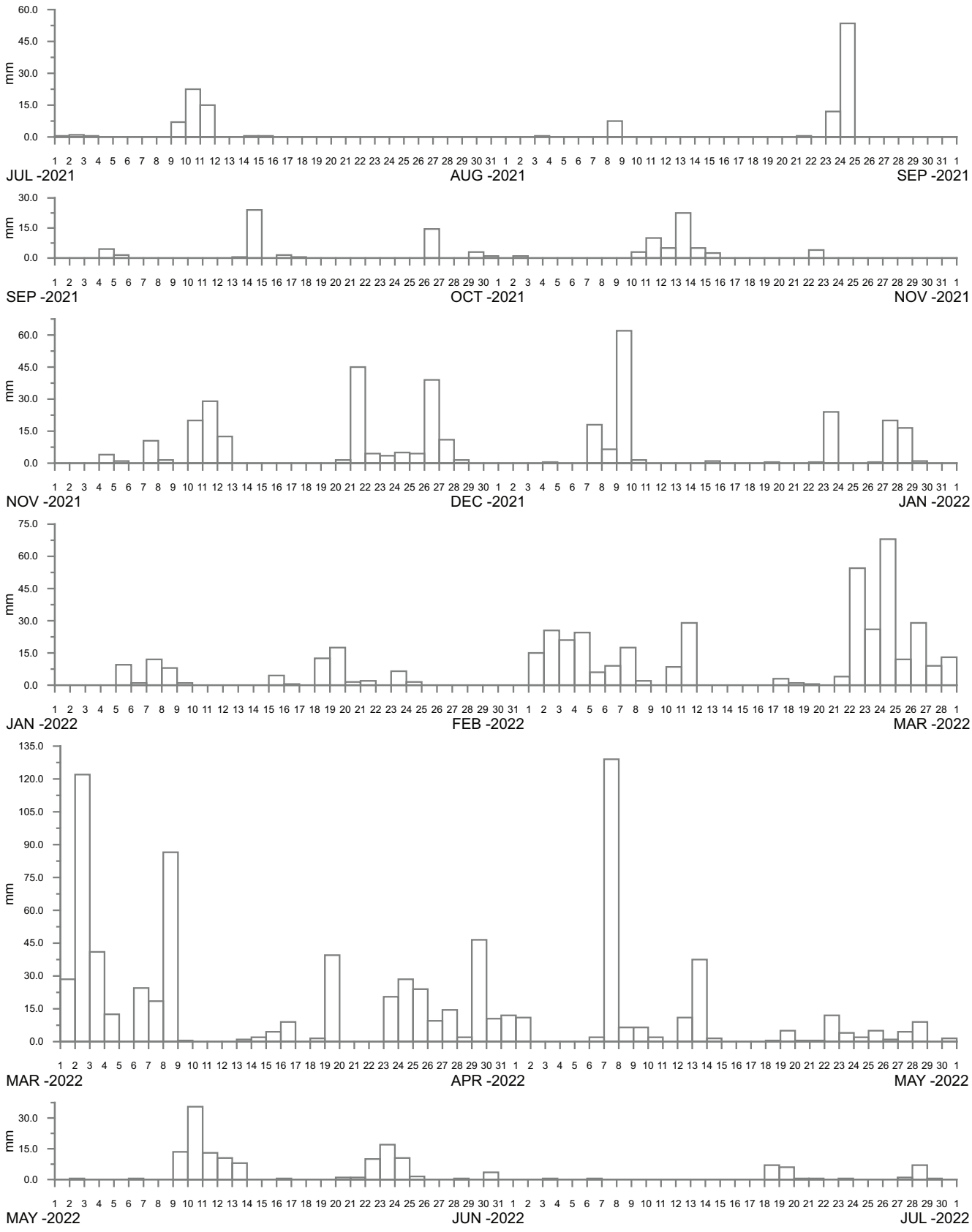
Manly Hydraulics Laboratory

Report MHL2908

Figure

59

DRAWING 2908-59.cdr



NSW GOVERNMENT

KINCUMBER AT DOYLE STREET
2021–2022

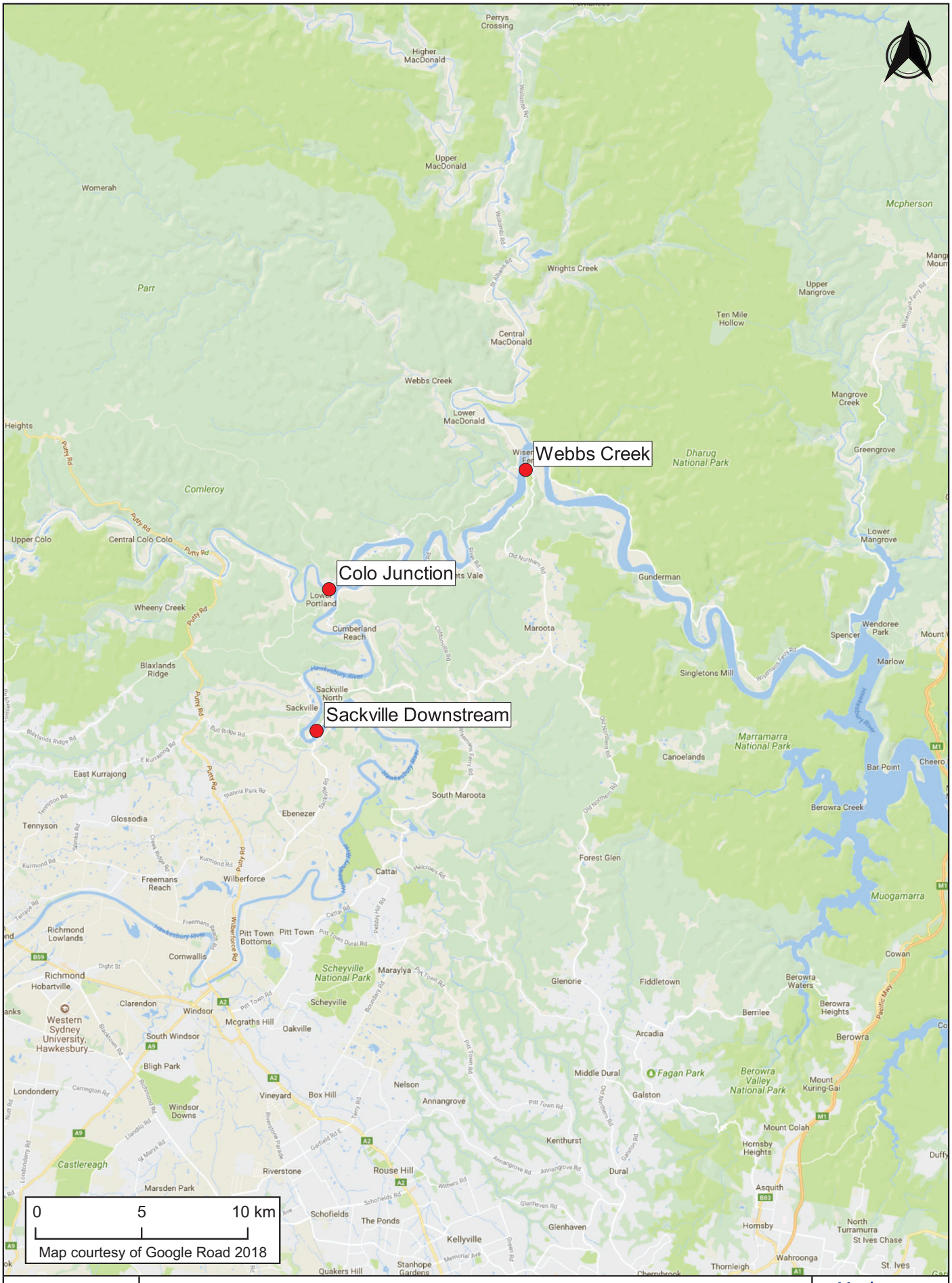
Manly Hydraulics Laboratory

Report MHL2908

Figure

60

DRAWING 2908-60.cdr



NSW GOVERNMENT

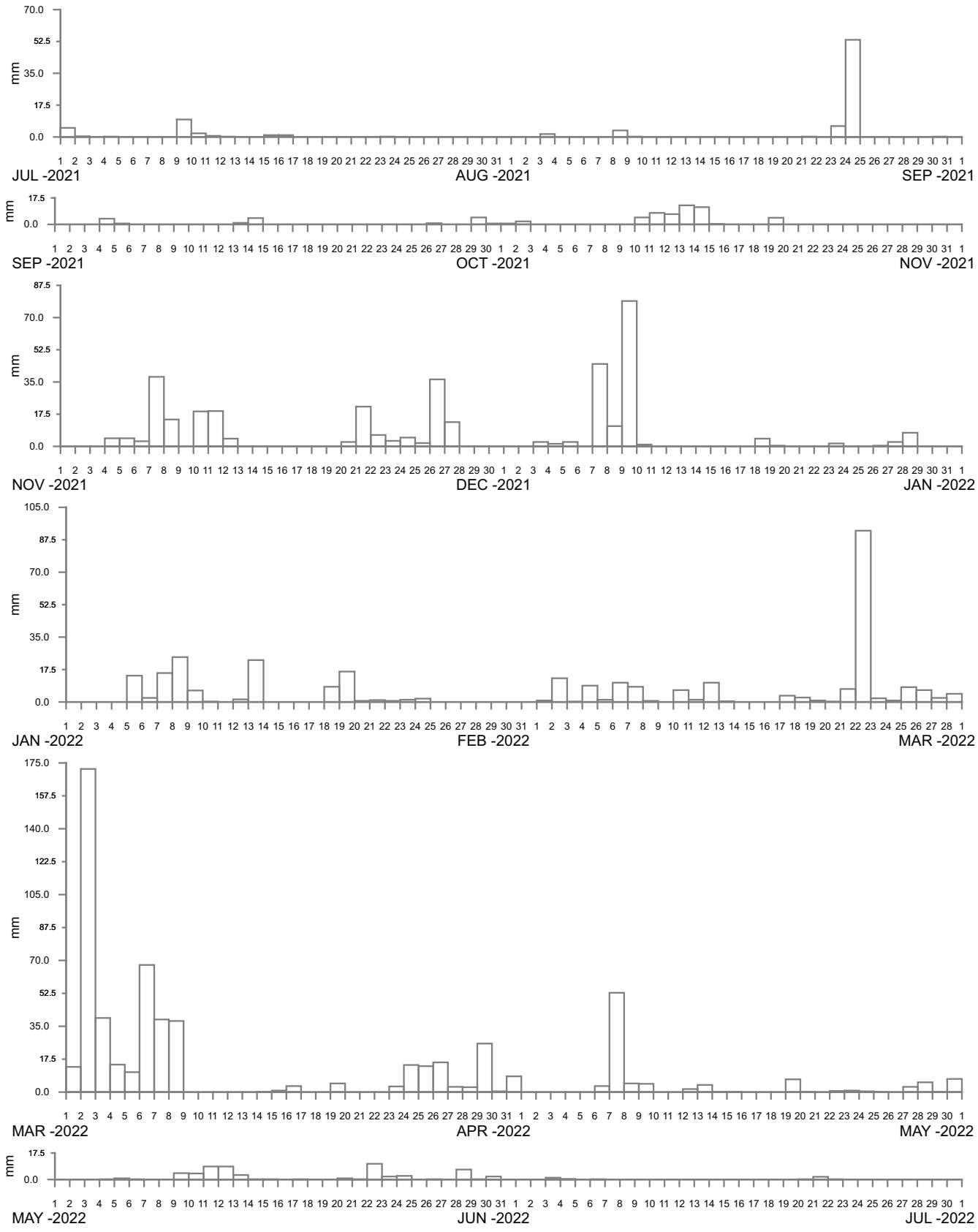
RAINFALL STATION LOCATIONS
HAWKESBURY RIVER REGION

Manly Hydraulics Laboratory

Report MHL2908

Figure 61

DRAWING 2908-61.cdr



NSW GOVERNMENT

WEBBS CREEK AT HAWKESBURY RIVER
2021–2022

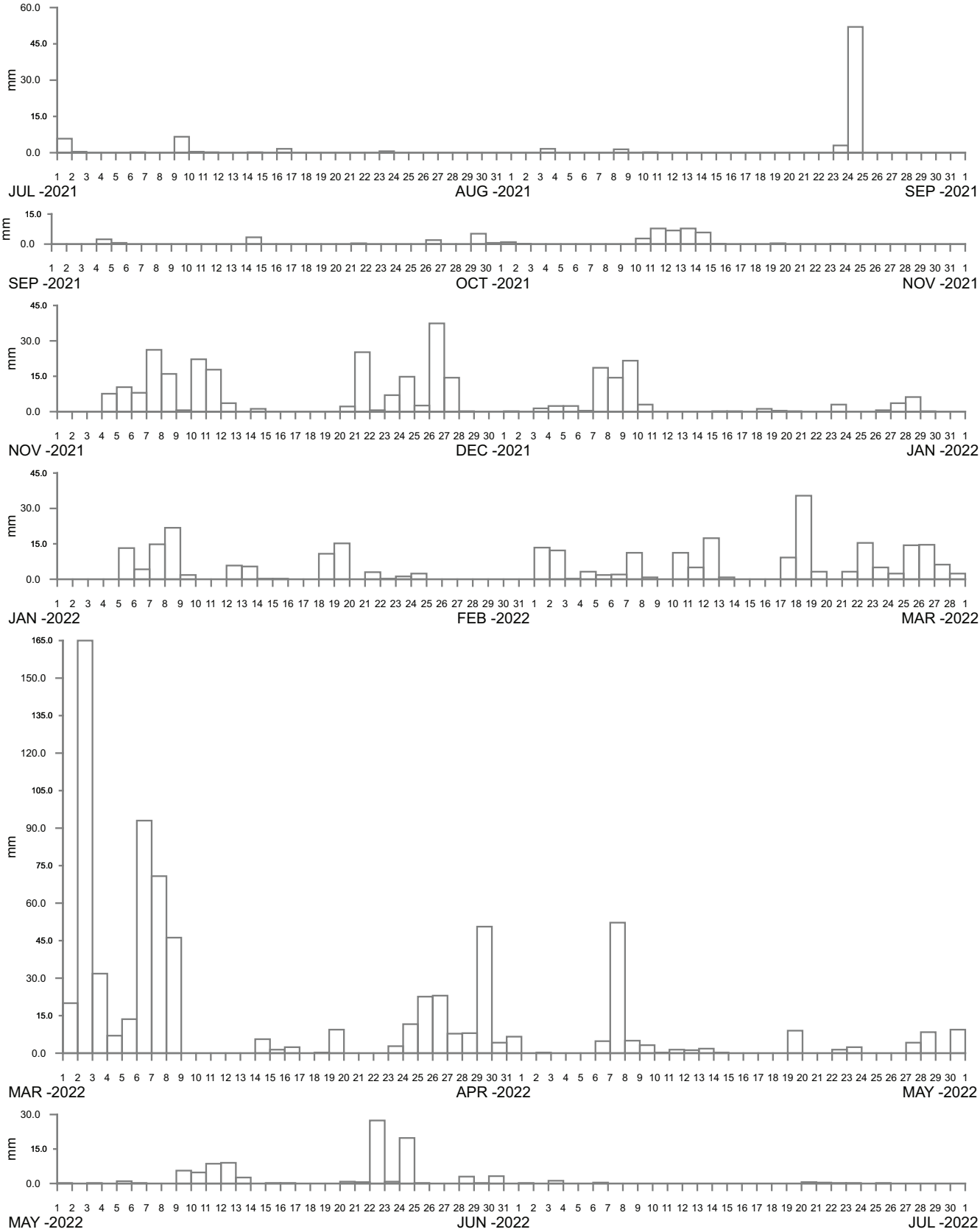
Manly Hydraulics Laboratory

Report MHL2908

Figure

62

DRAWING 2908-62.cdr



NSW GOVERNMENT

COLO JUNCTION AT HAWKESBURY RIVER
2021–2022

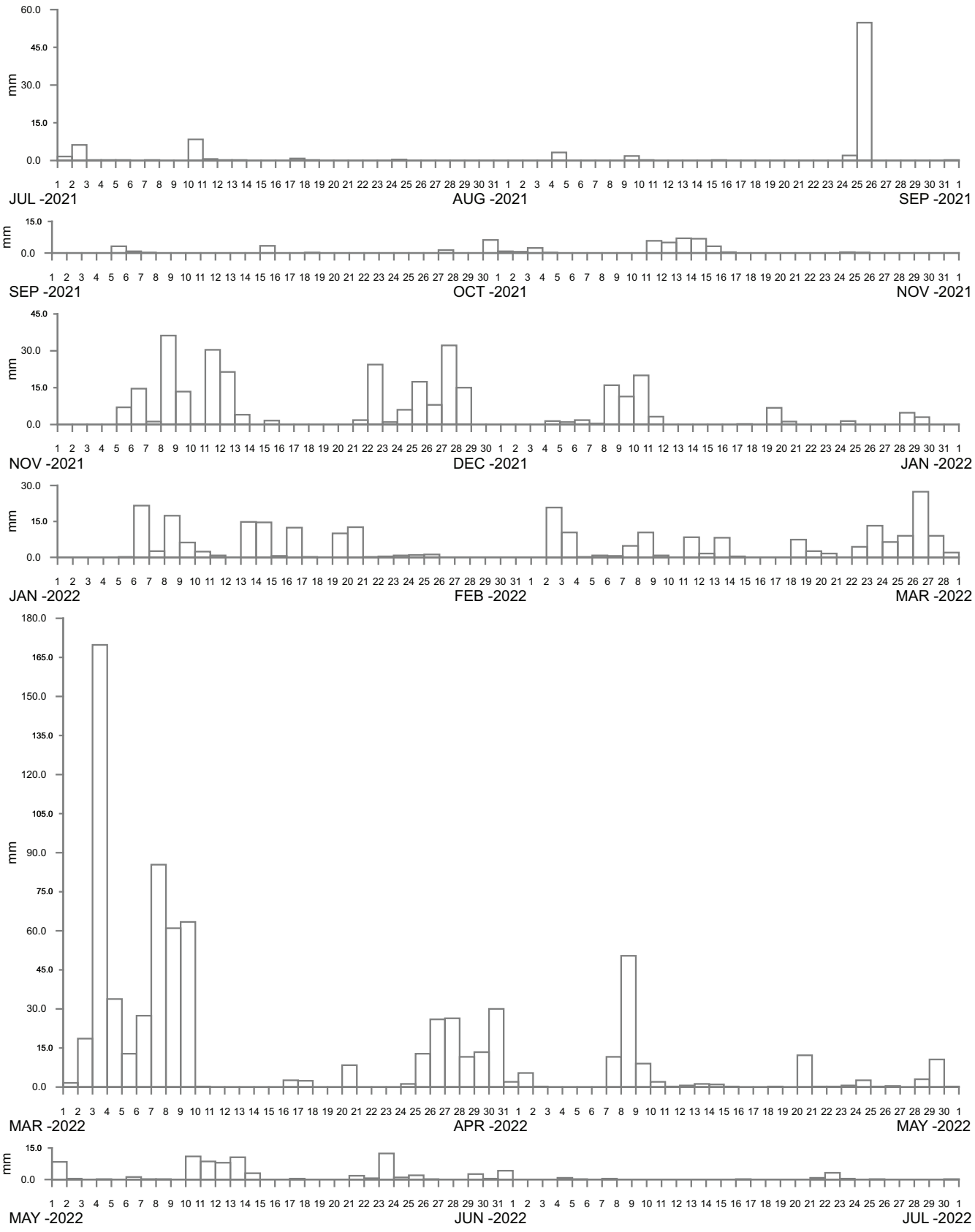
Manly Hydraulics Laboratory

Report MHL2908

Figure

63

DRAWING 2908-63.cdr



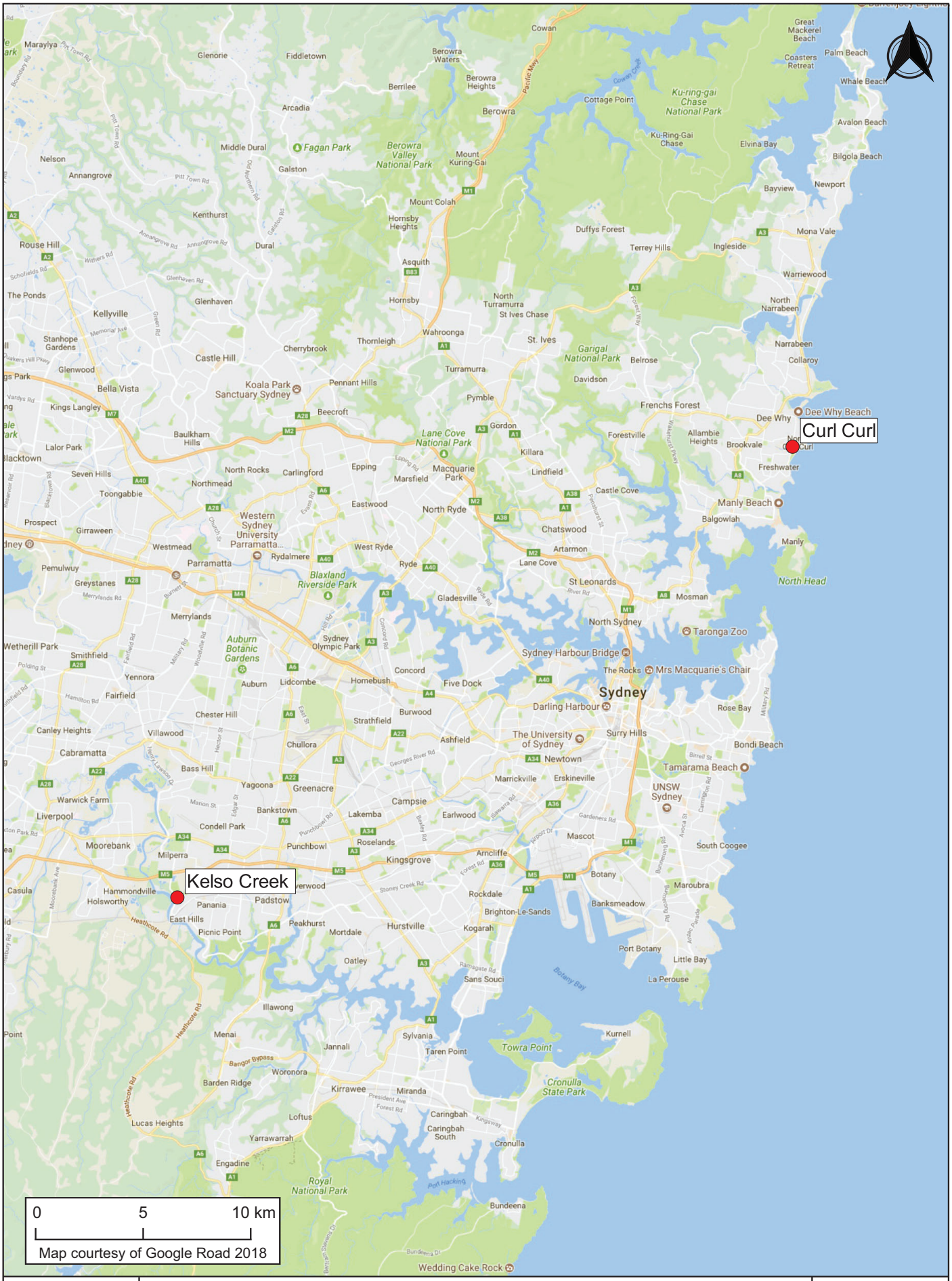
SACKVILLE DOWNSTREAM AT HAWKESBURY RIVER
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 64

DRAWING 2908-64.cdr



NSW GOVERNMENT

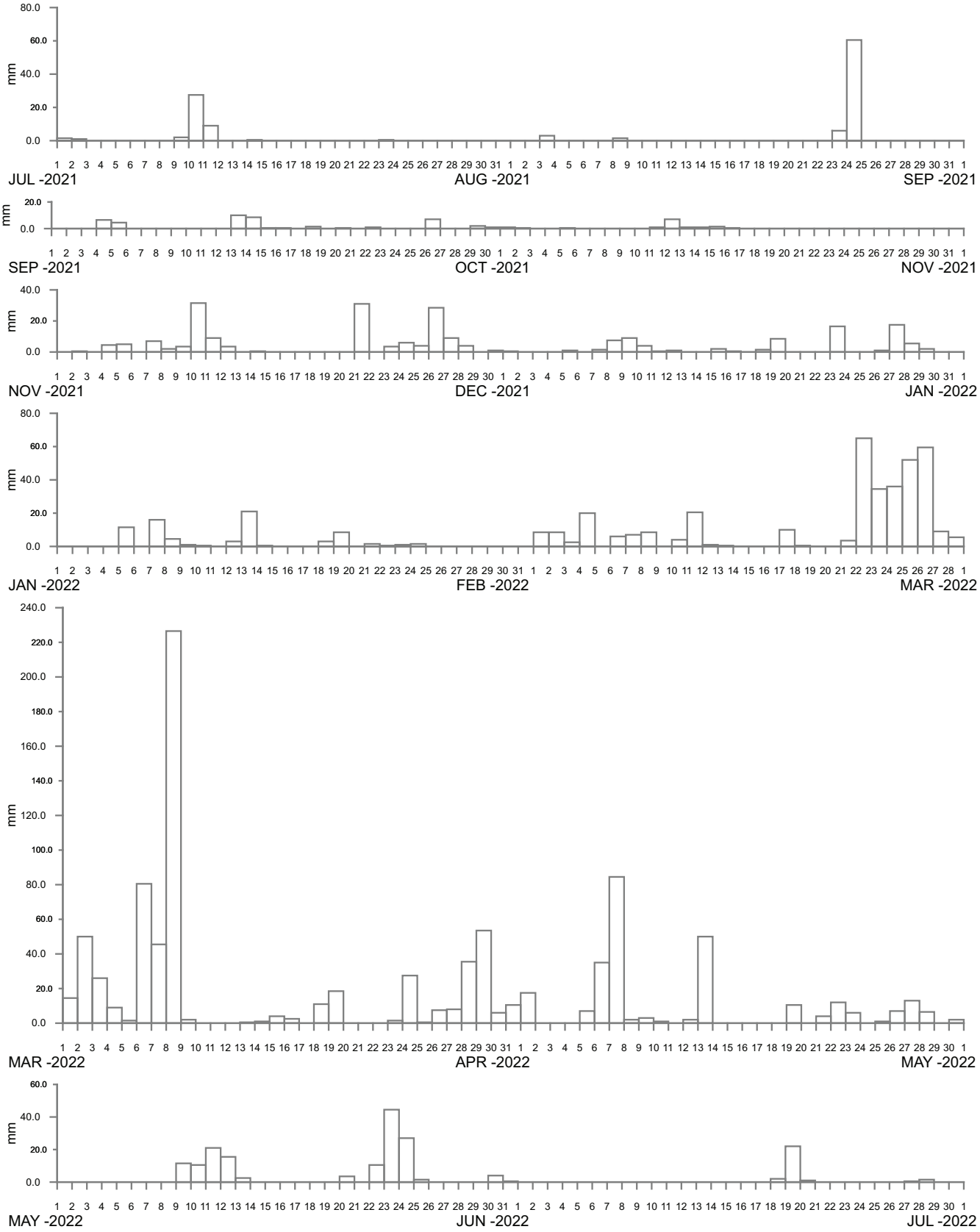
RAINFALL STATION LOCATIONS
SYDNEY COASTAL REGION

Manly Hydraulics Laboratory

Report MHL2908

Figure 65

DRAWING 2908-65.cdr



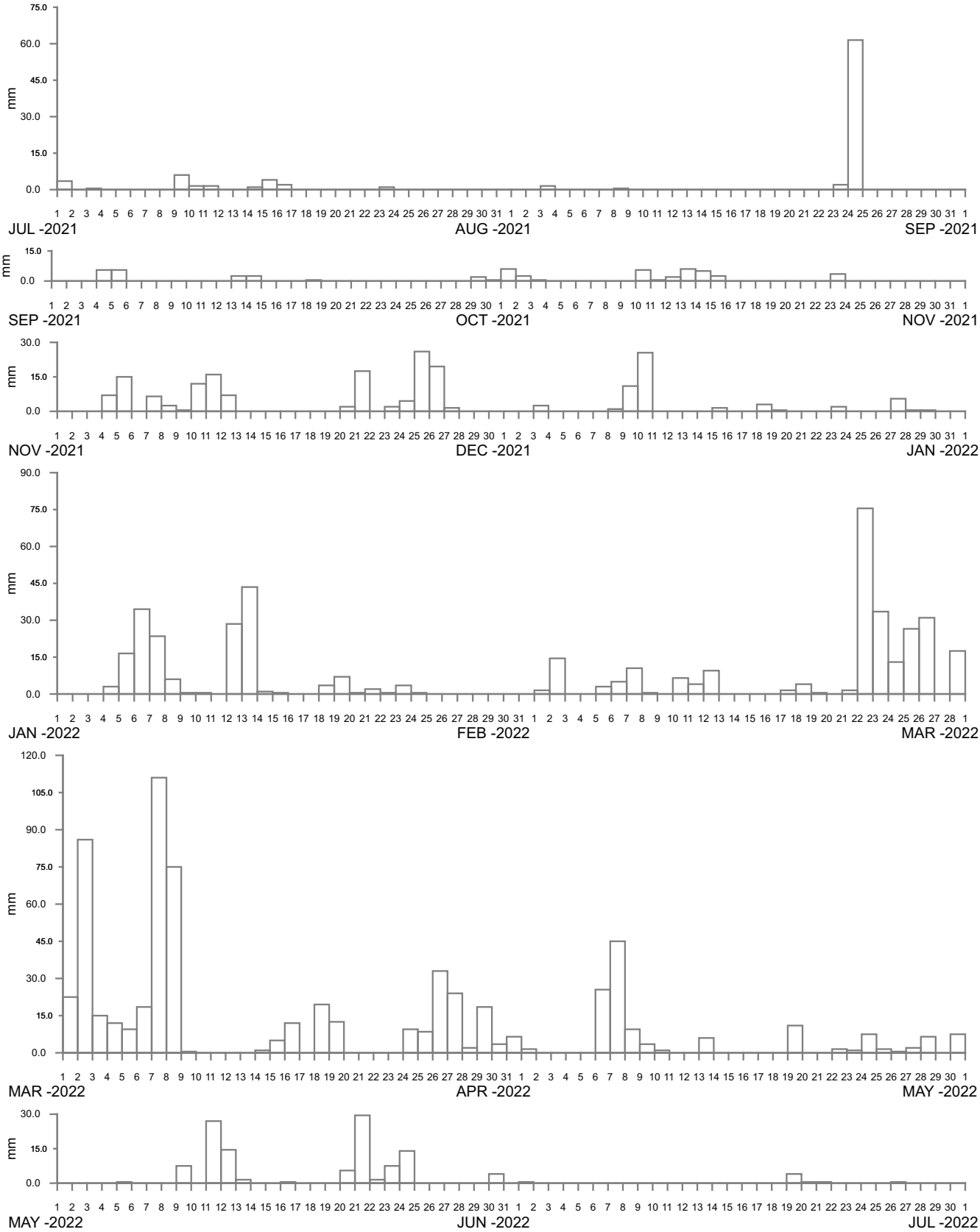
CURL CURL AT CURL CURL LAGOON
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 66

DRAWING 2908-66.cdr



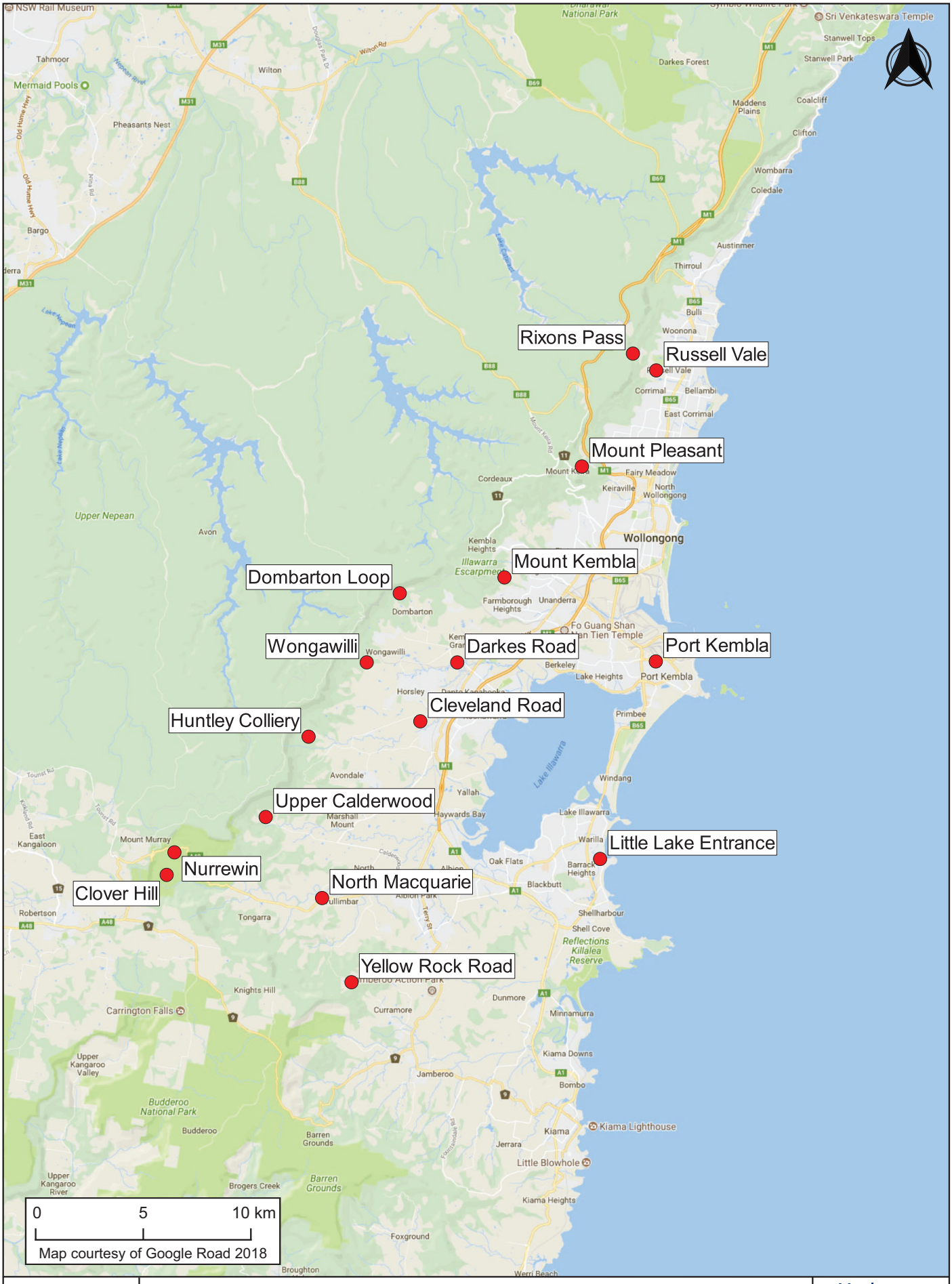
KELSO CREEK AT KELSO CREEK
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 67

DRAWING 2908-67.cdr

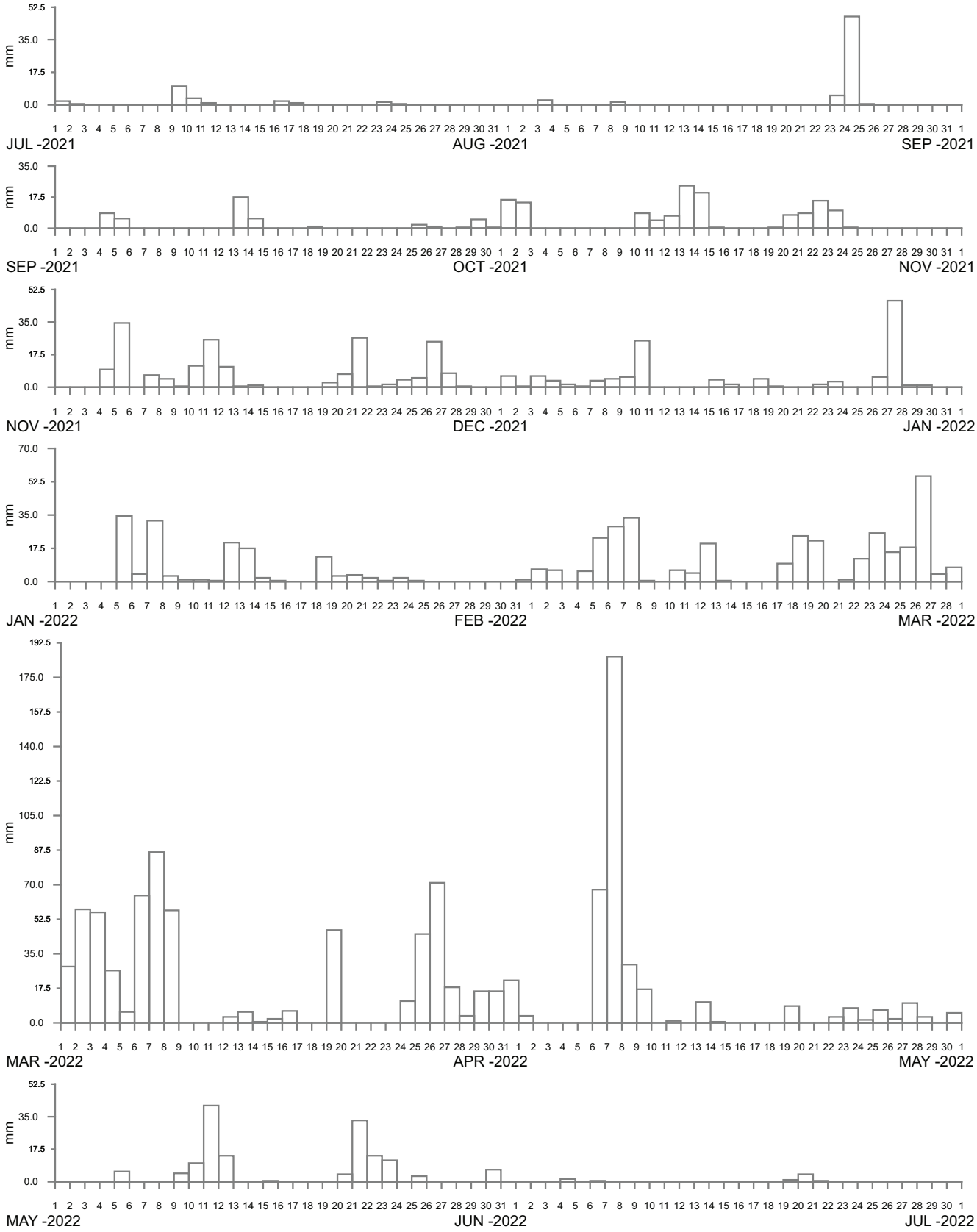


RAINFALL STATION LOCATIONS
WOLLONGONG COASTAL REGION

Manly Hydraulics Laboratory

Report MHL2908
Figure
68

DRAWING 2908-68.cdr



NSW GOVERNMENT

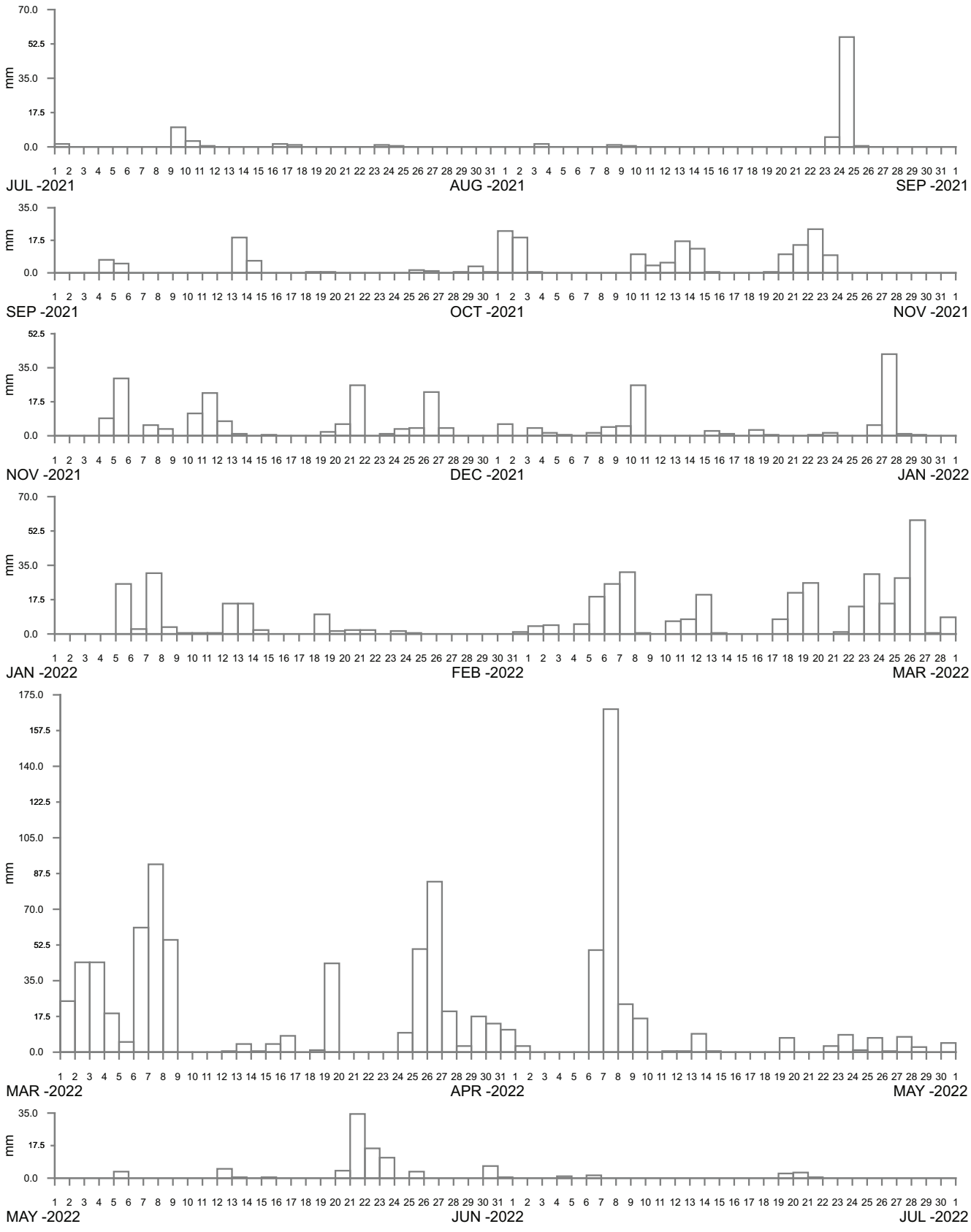
RIXONS PASS AT RIXONS PASS ROAD
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 69

DRAWING 2908-69.cdr



NSW GOVERNMENT

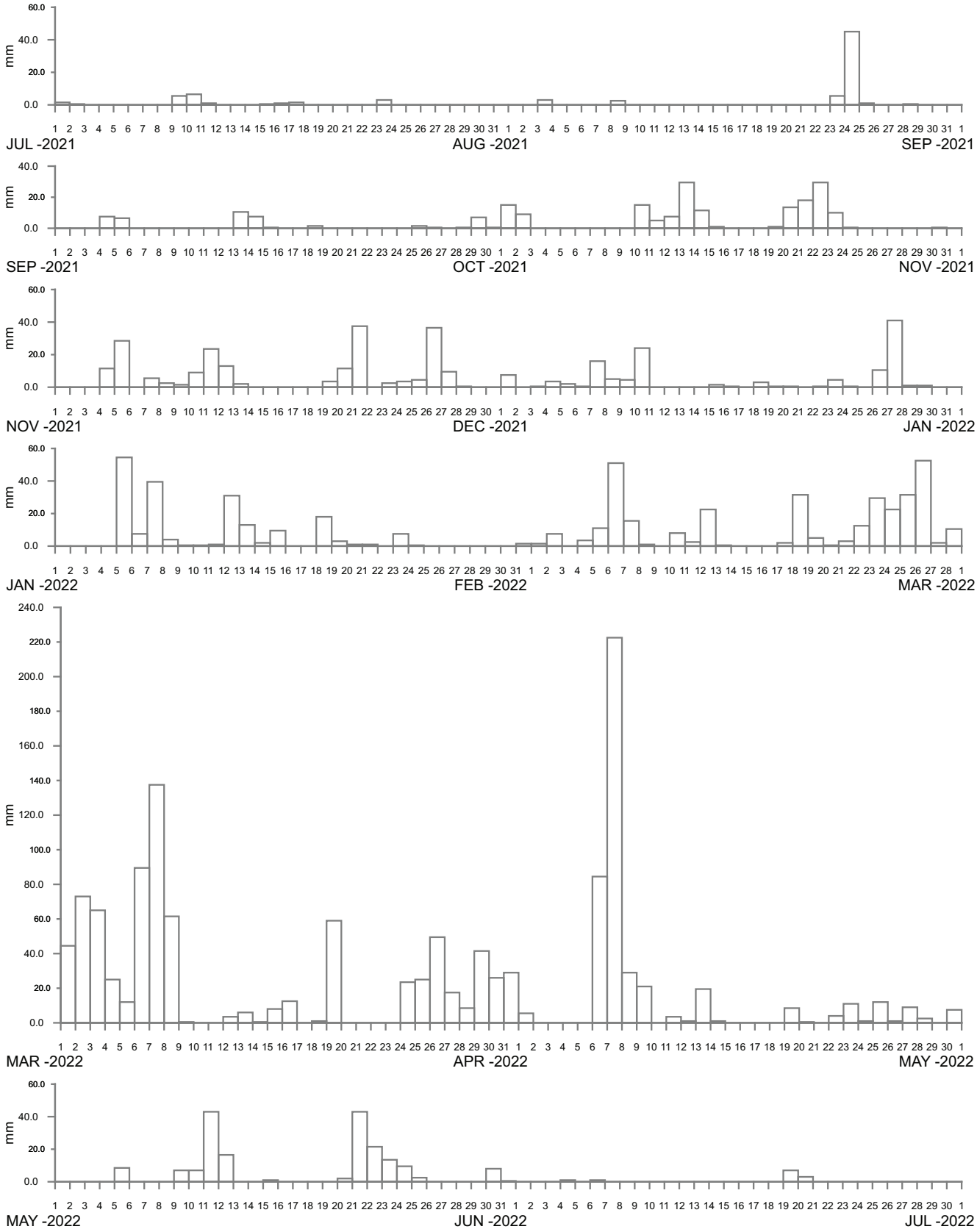
RUSSELL VALE AT WHITING CRESCENT
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 70

DRAWING 2908-70.cdr



NSW GOVERNMENT

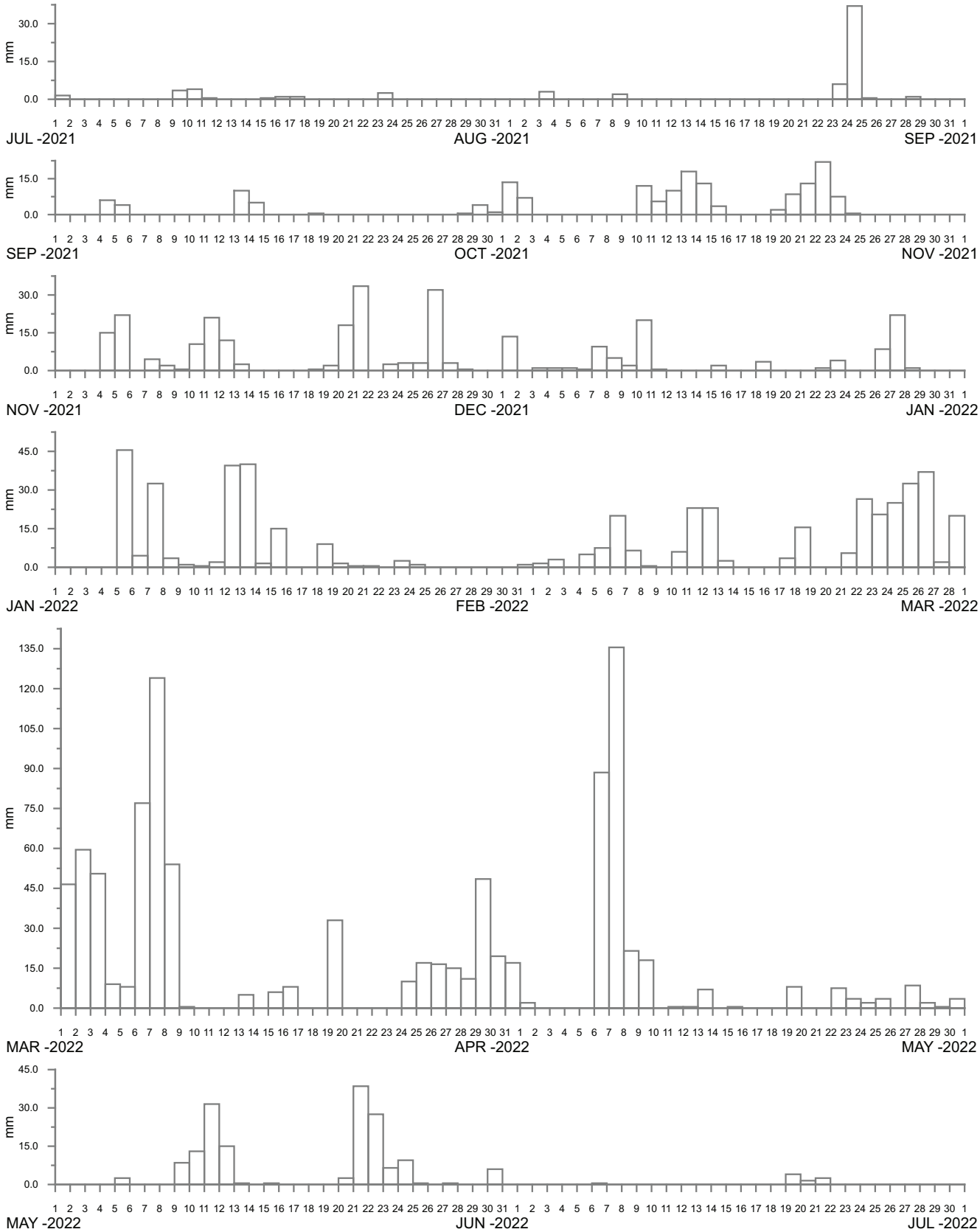
MOUNT PLEASANT AT PARRISH AVENUE
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 71

DRAWING 2908-71.cdr



DATA LOSS

NSW GOVERNMENT

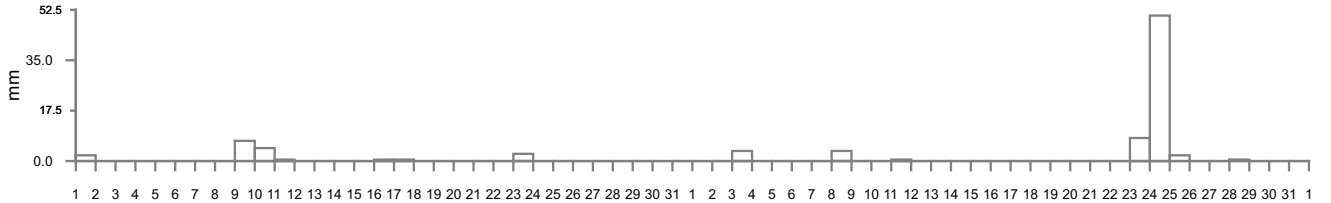
MOUNT KEMBLA AT STAFF ROAD
2021–2022

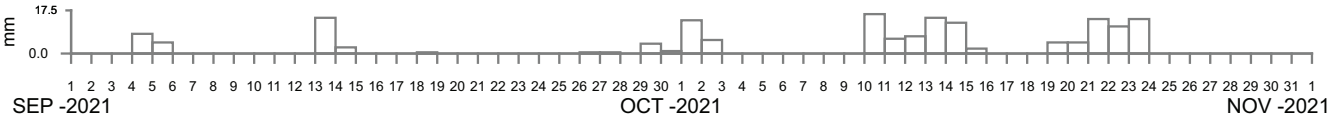
Manly Hydraulics Laboratory

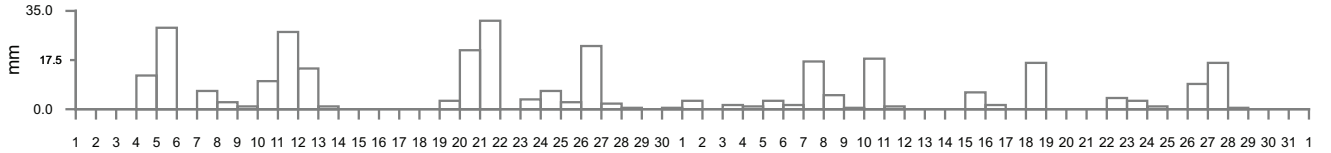
Report MHL2908

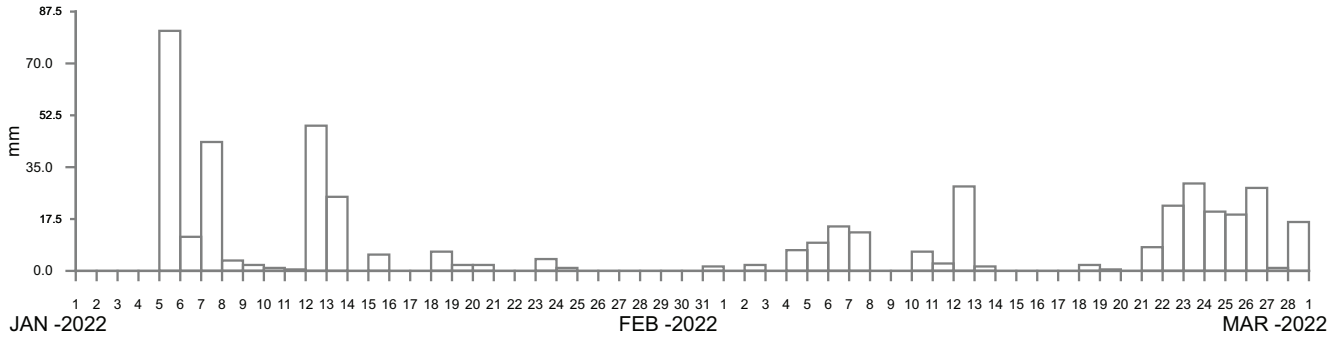
Figure 72

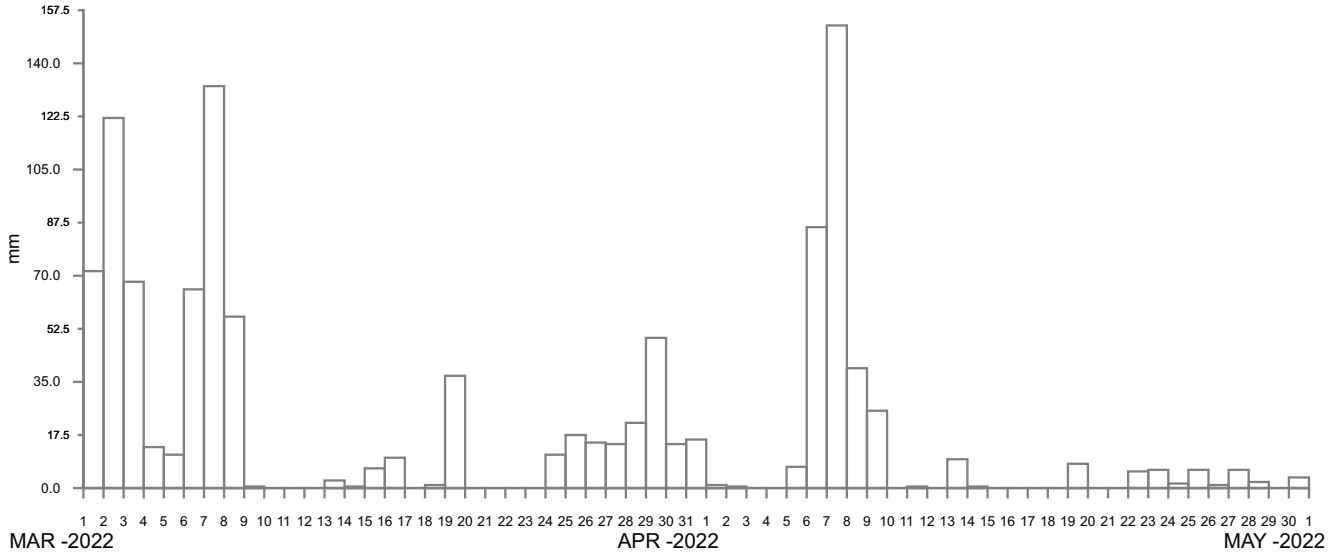
DRAWING 2908-72.cdr

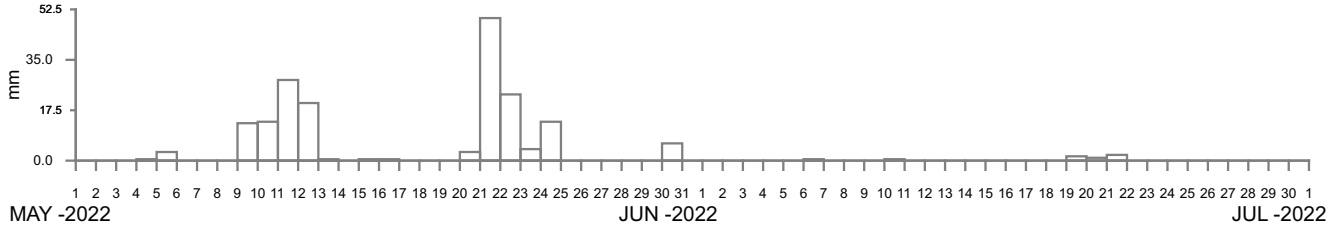












DATA LOSS

NSW GOVERNMENT

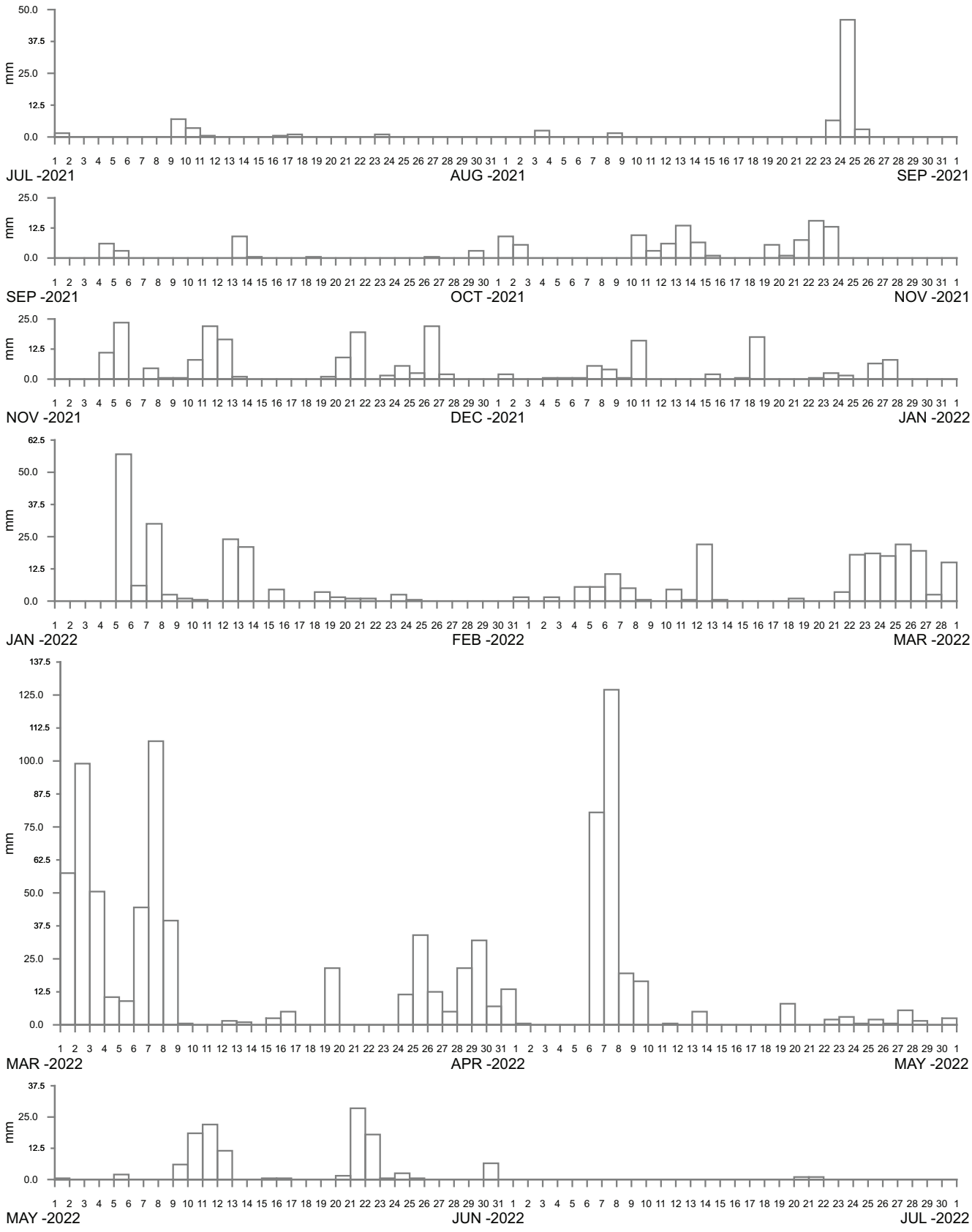
DOMBARTON LOOP AT PAYNES ROAD
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 73

DRAWING 2908-73.cdr



DATA LOSS

NSW GOVERNMENT

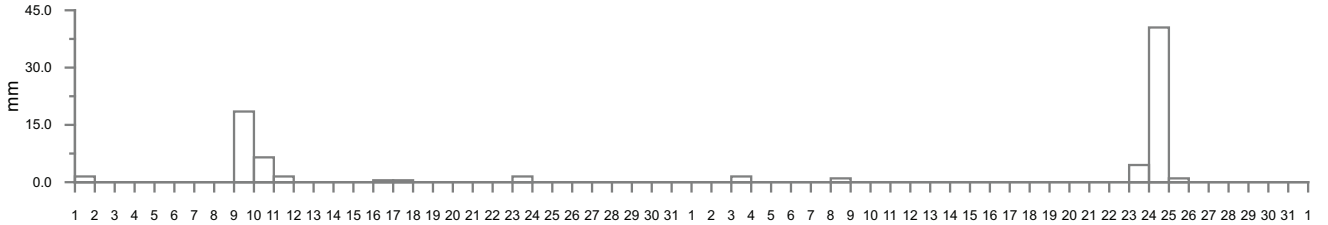
WONGAWILLI AT JERSEY FARM ROAD
2021–2022

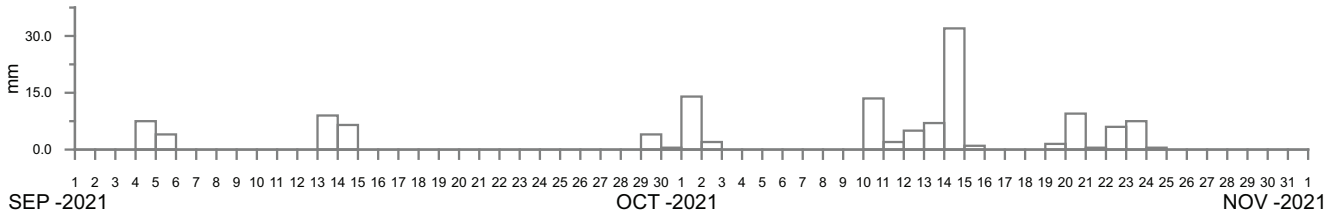
Manly Hydraulics Laboratory

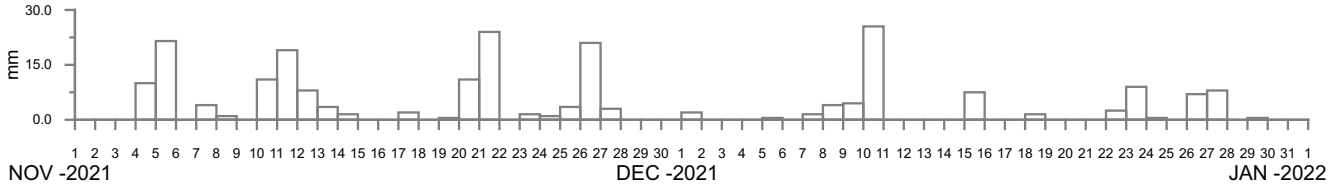
Report MHL2908

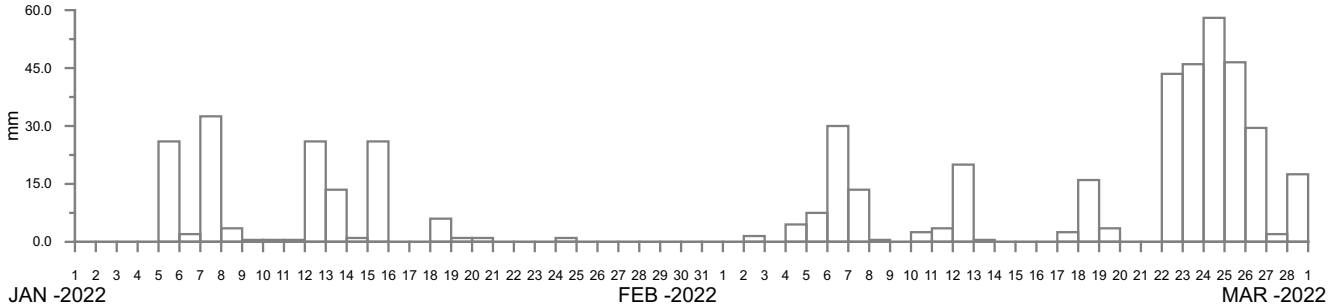
Figure 74

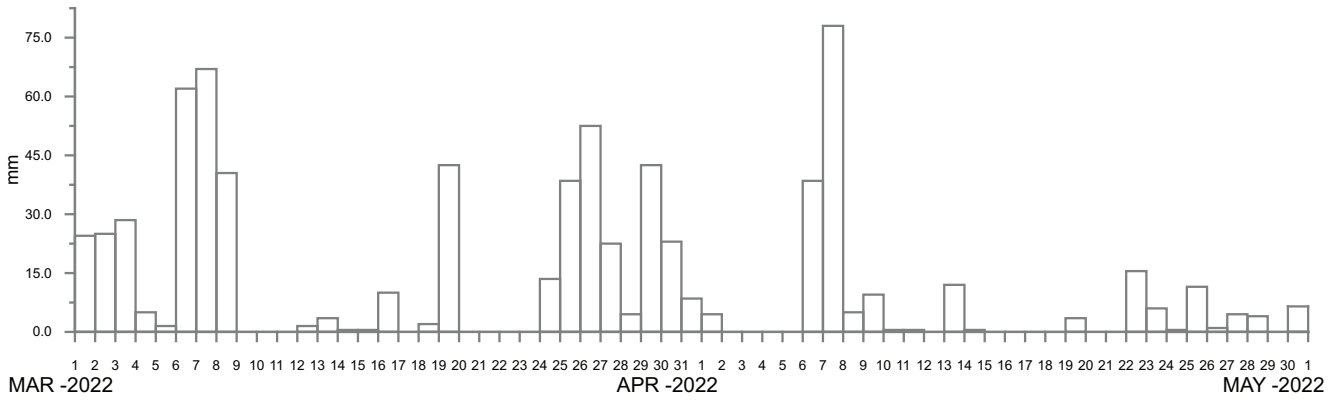
DRAWING 2908-74.cdr

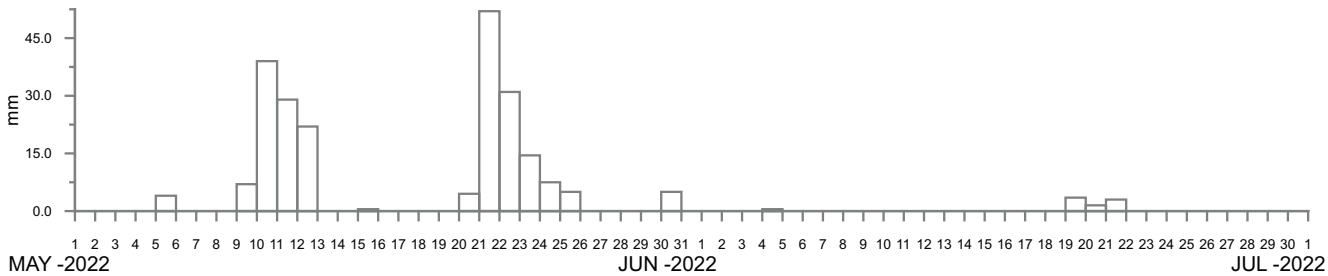












DATA LOSS

NSW GOVERNMENT

PORT KEMBLA AT FIVE ISLANDS ROAD
2021–2022

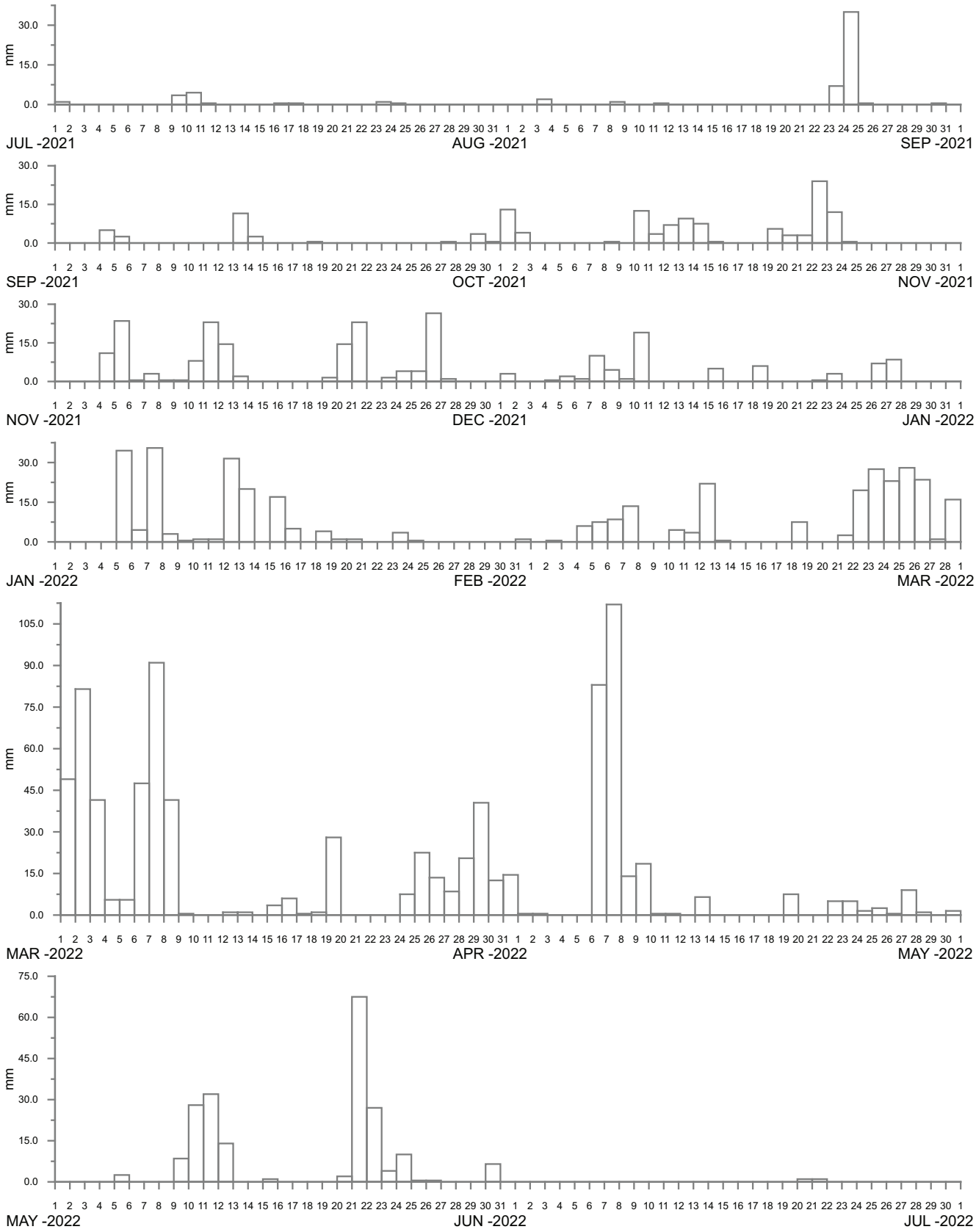
Manly Hydraulics Laboratory

Report MHL2908

Figure

75

DRAWING 2908-75.cdr



NSW GOVERNMENT

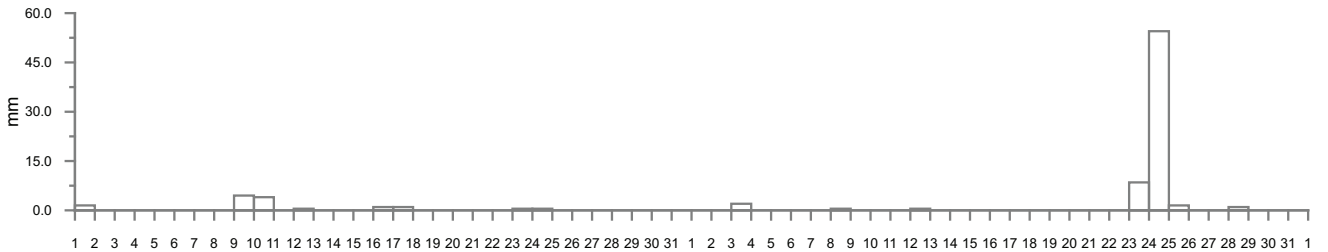
DARKES ROAD AT DAPTO
2021–2022

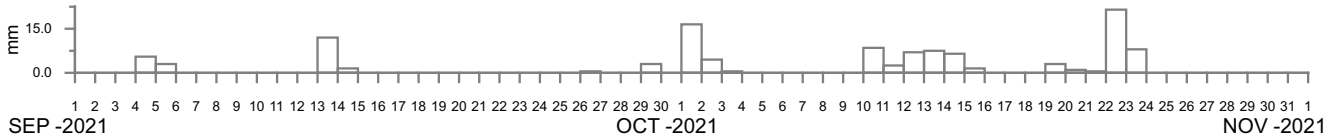
Manly Hydraulics Laboratory

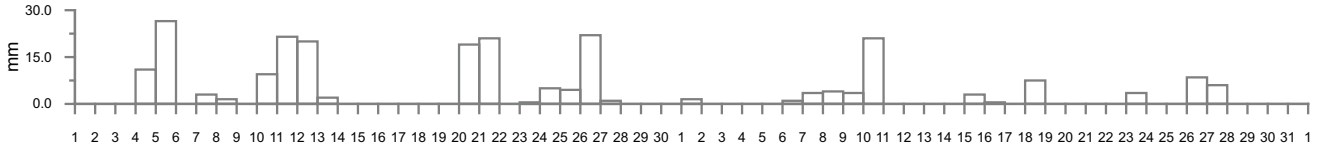
Report MHL2908

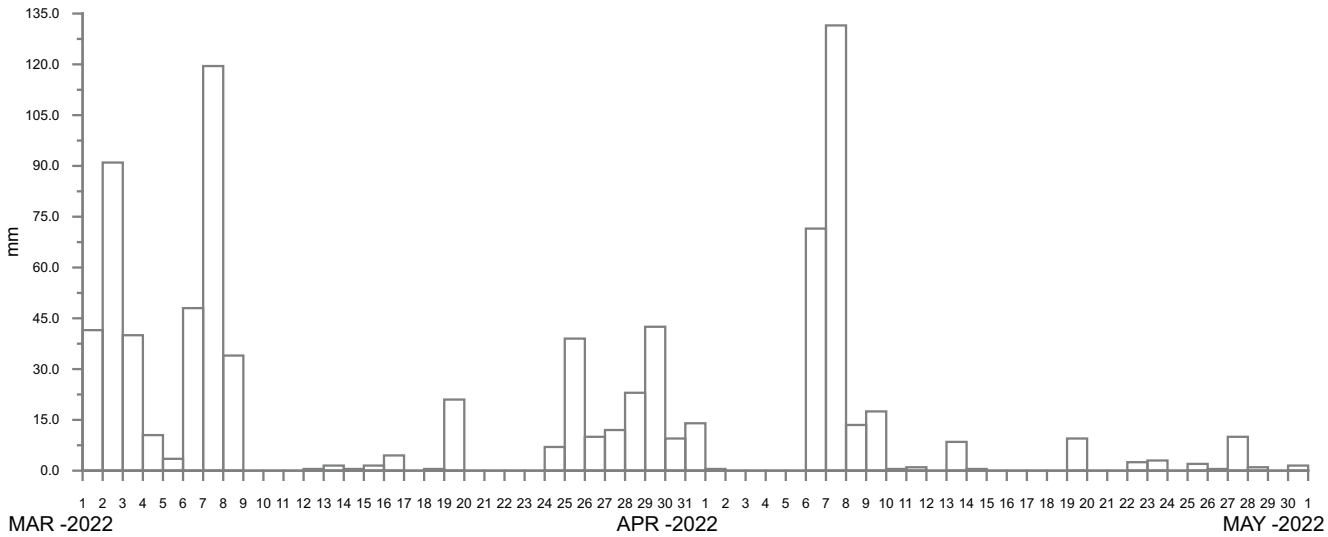
Figure 76

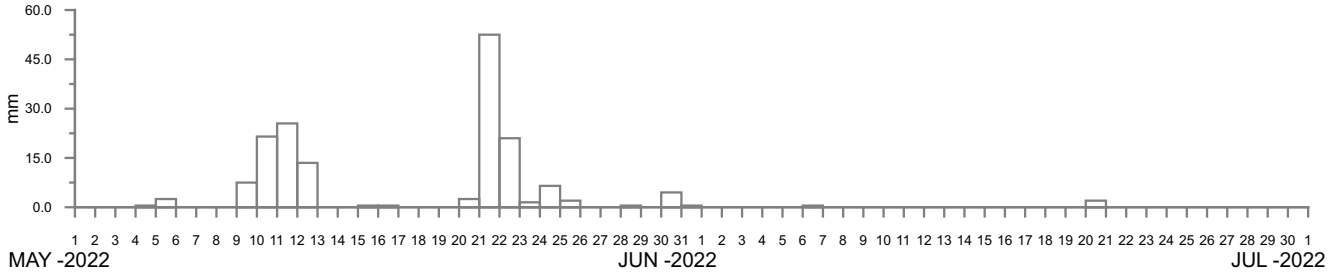
DRAWING 2908-76.cdr











DATA LOSS

NSW GOVERNMENT

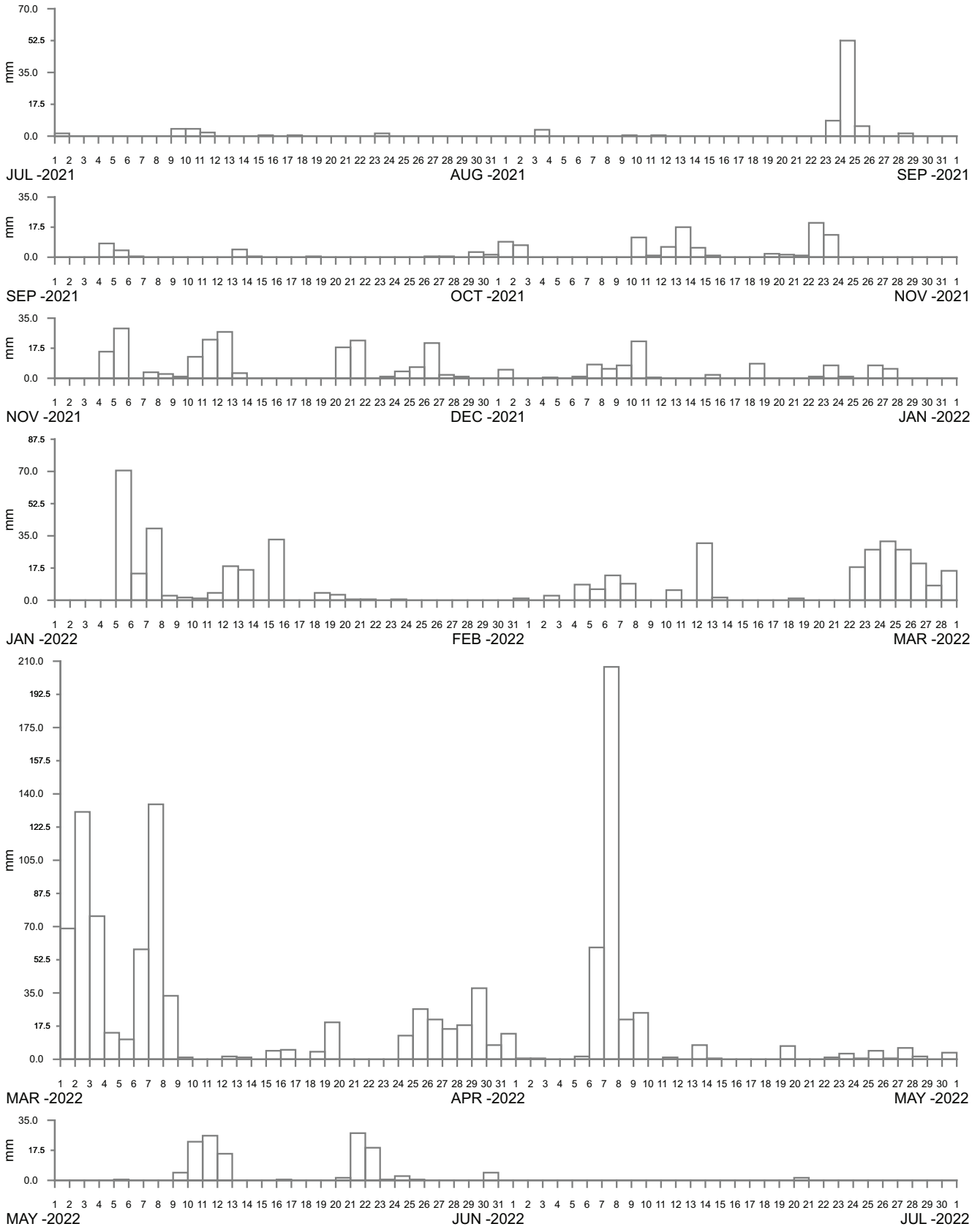
CLEVELAND ROAD AT CLEVELAND ROAD
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 77

DRAWING 2908-77.cdr



NSW GOVERNMENT

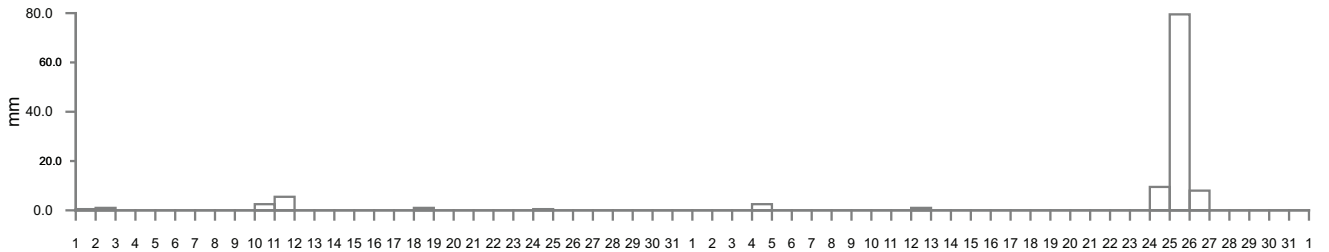
HUNTLEY COLLIERY AT AVONDALE ROAD
2021–2022

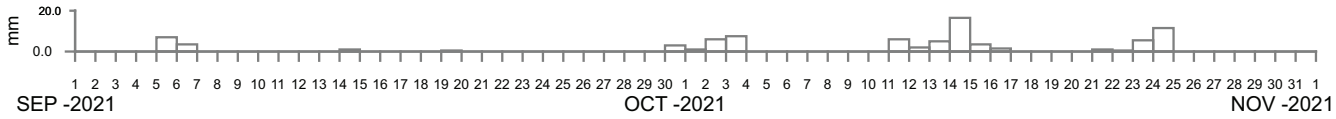
Manly Hydraulics Laboratory

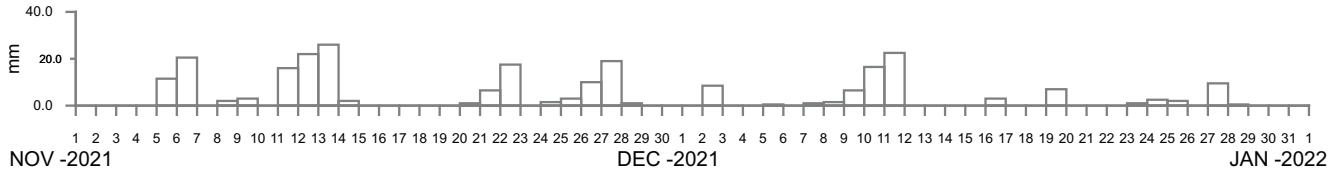
Report MHL2908

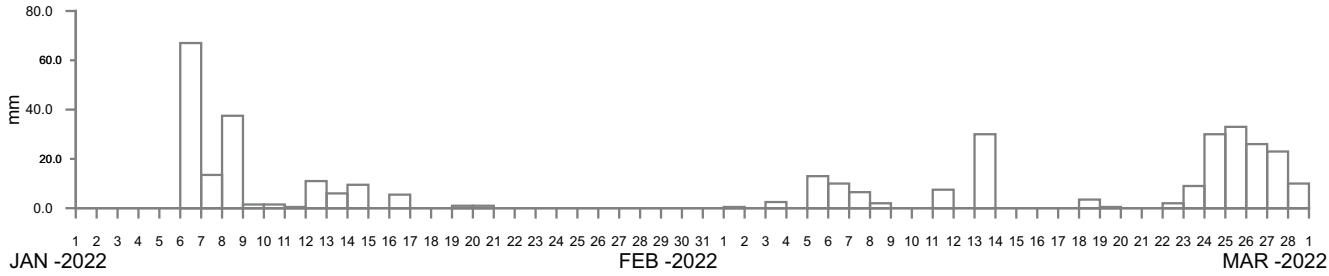
Figure 78

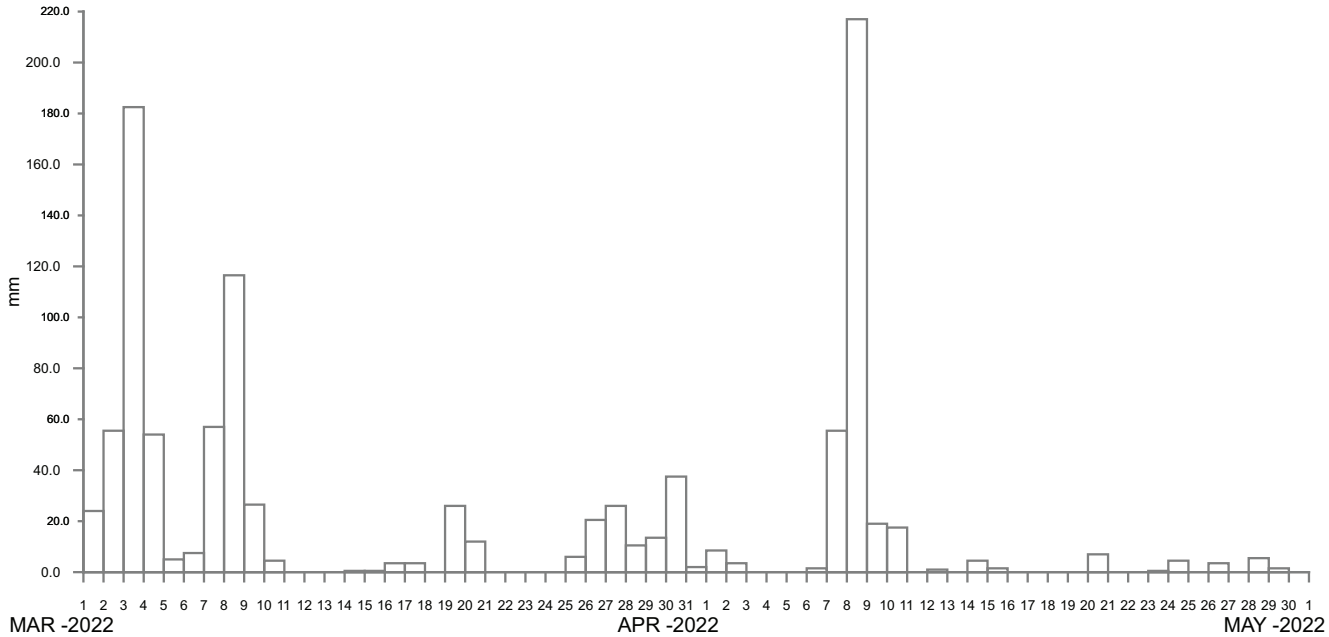
DRAWING 2908-78.cdr

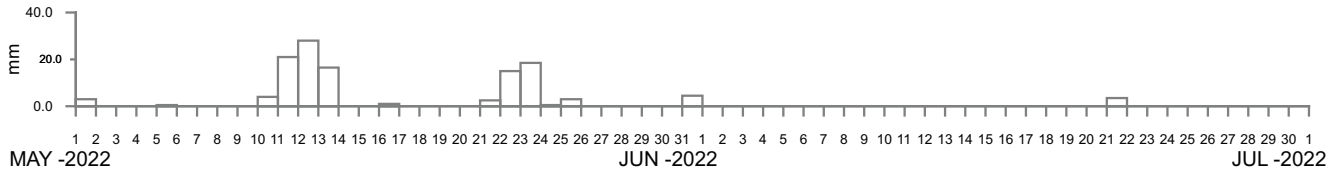












DATA LOSS

NSW GOVERNMENT

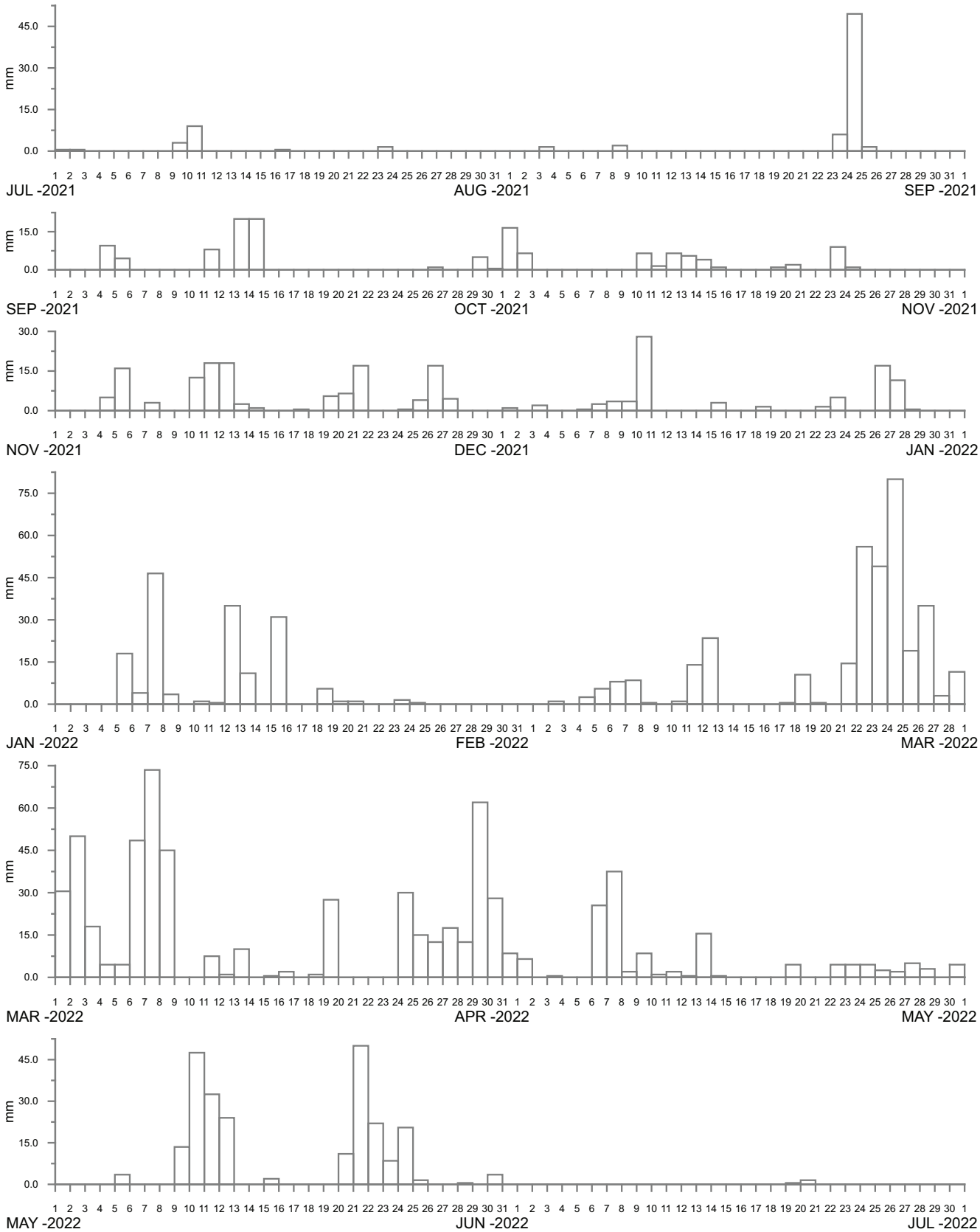
UPPER CALDERWOOD AT CALDERWOOD ROAD 2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 79

DRAWING 2908-79.cdr



NSW GOVERNMENT

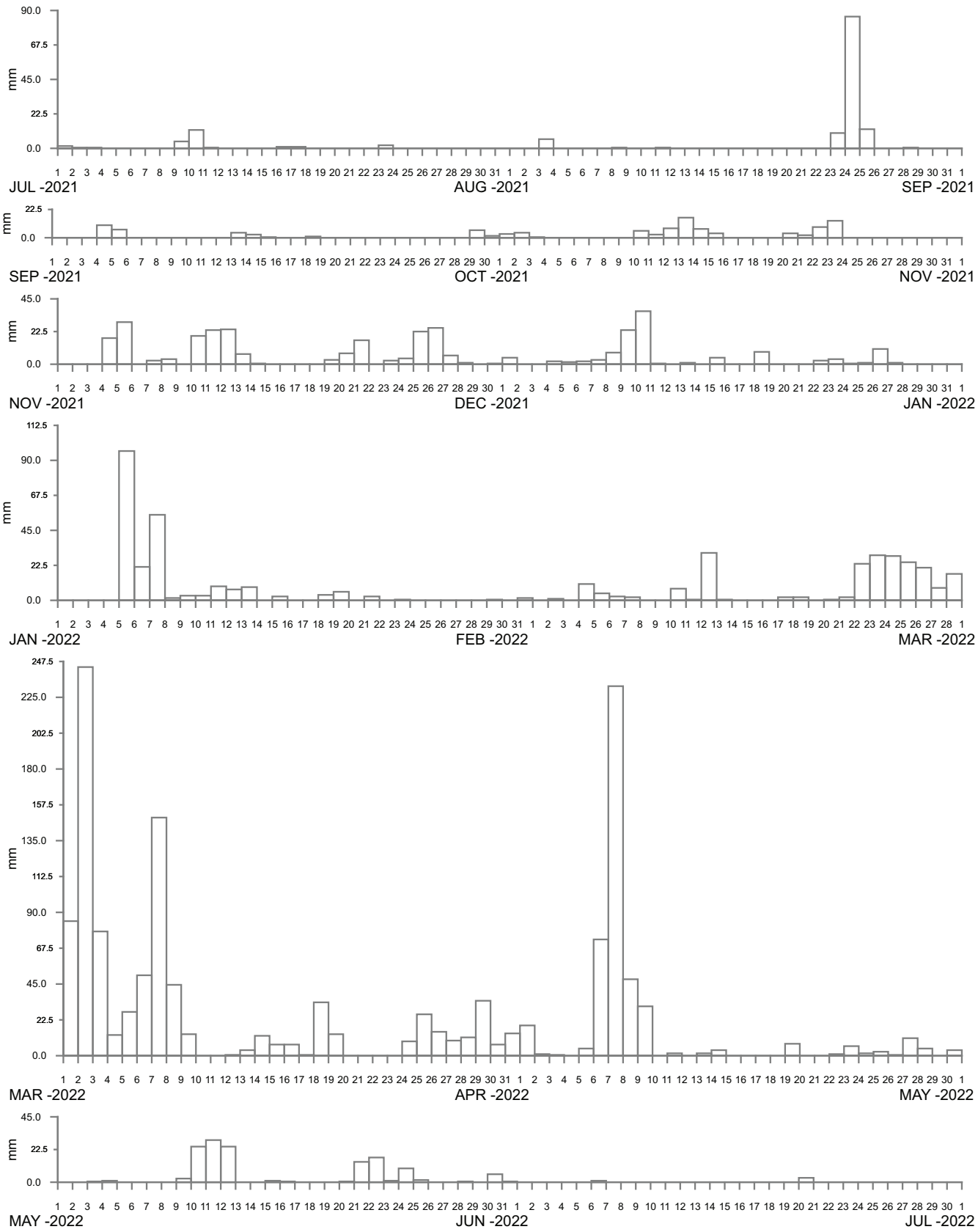
LITTLE LAKE ENTRANCE AT LITTLE LAKE
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 80

DRAWING 2908-80.cdr



DATA LOSS

NSW GOVERNMENT

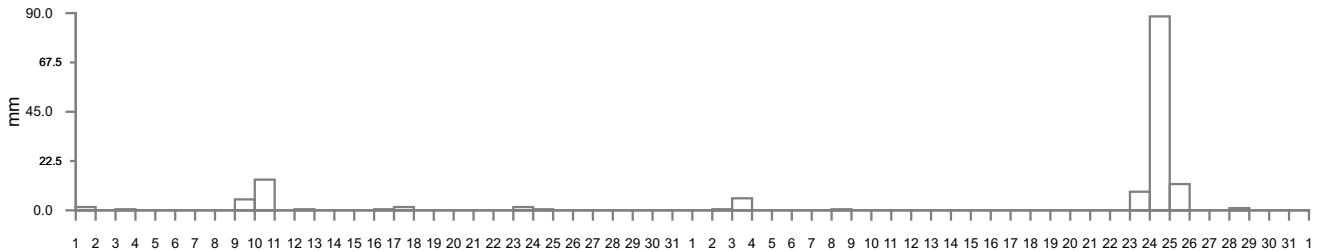
NURREWIN AT ILLAWARRA HIGHWAY
2021–2022

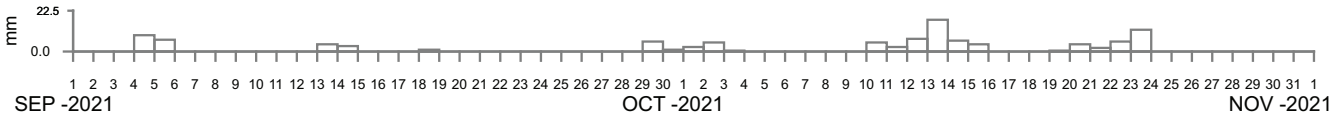
Manly Hydraulics Laboratory

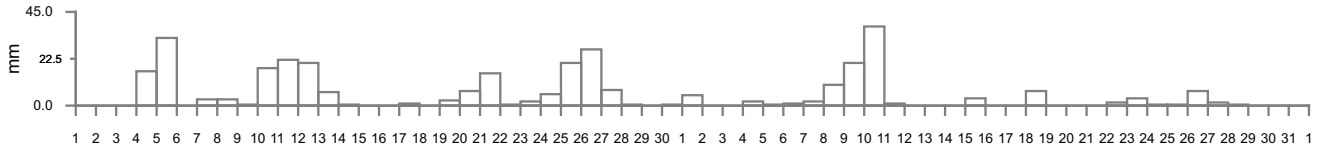
Report MHL2908

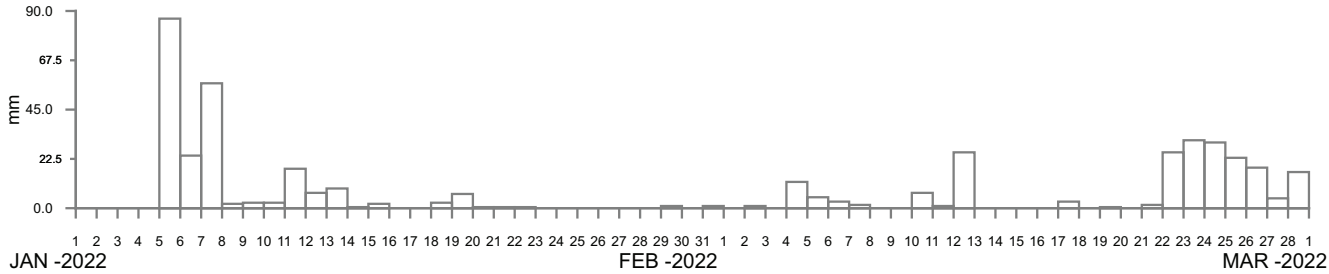
Figure 81

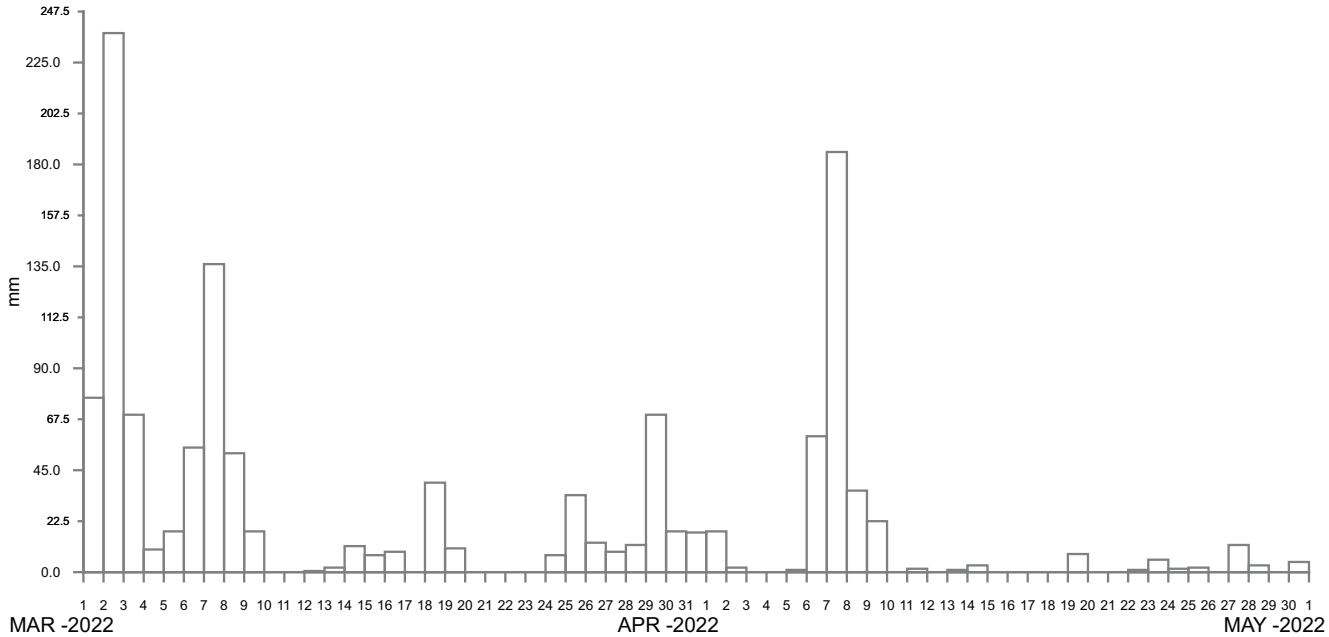
DRAWING 2908-81.cdr

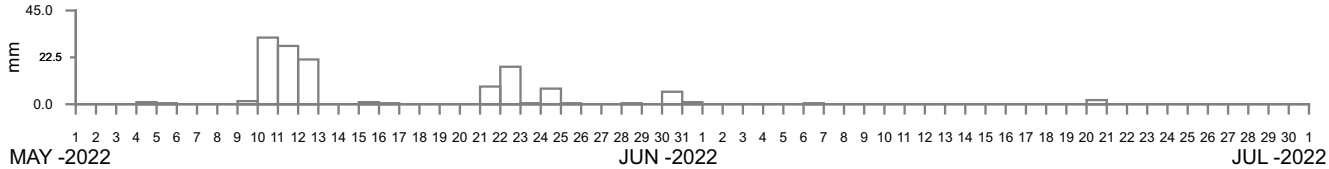












DATA LOSS

NSW GOVERNMENT

CLOVER HILL AT CLOVER HILL ROAD
2021–2022

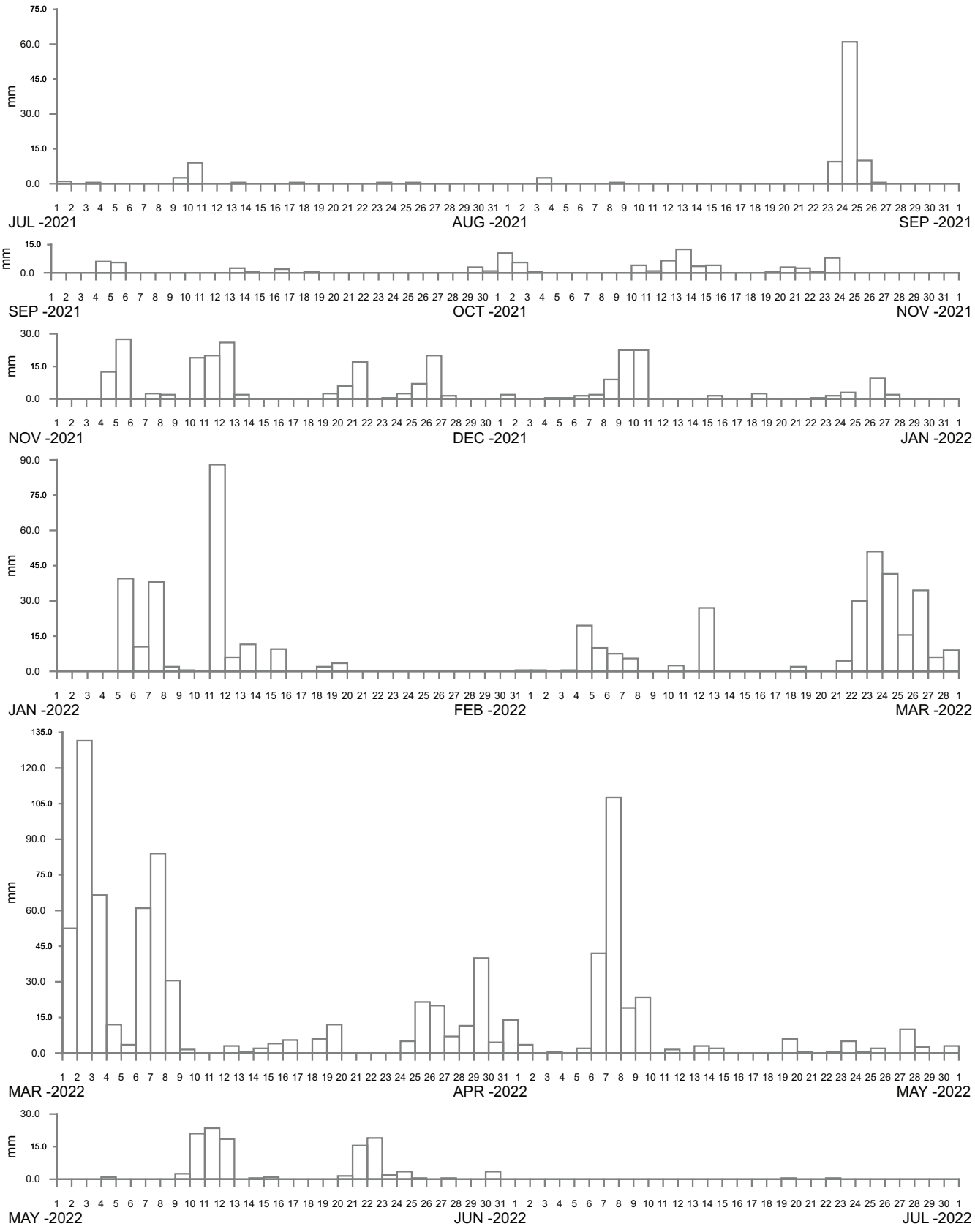
Manly Hydraulics Laboratory

Report MHL2908

Figure

82

DRAWING 2908-82.cdr



DATA LOSS

NSW GOVERNMENT

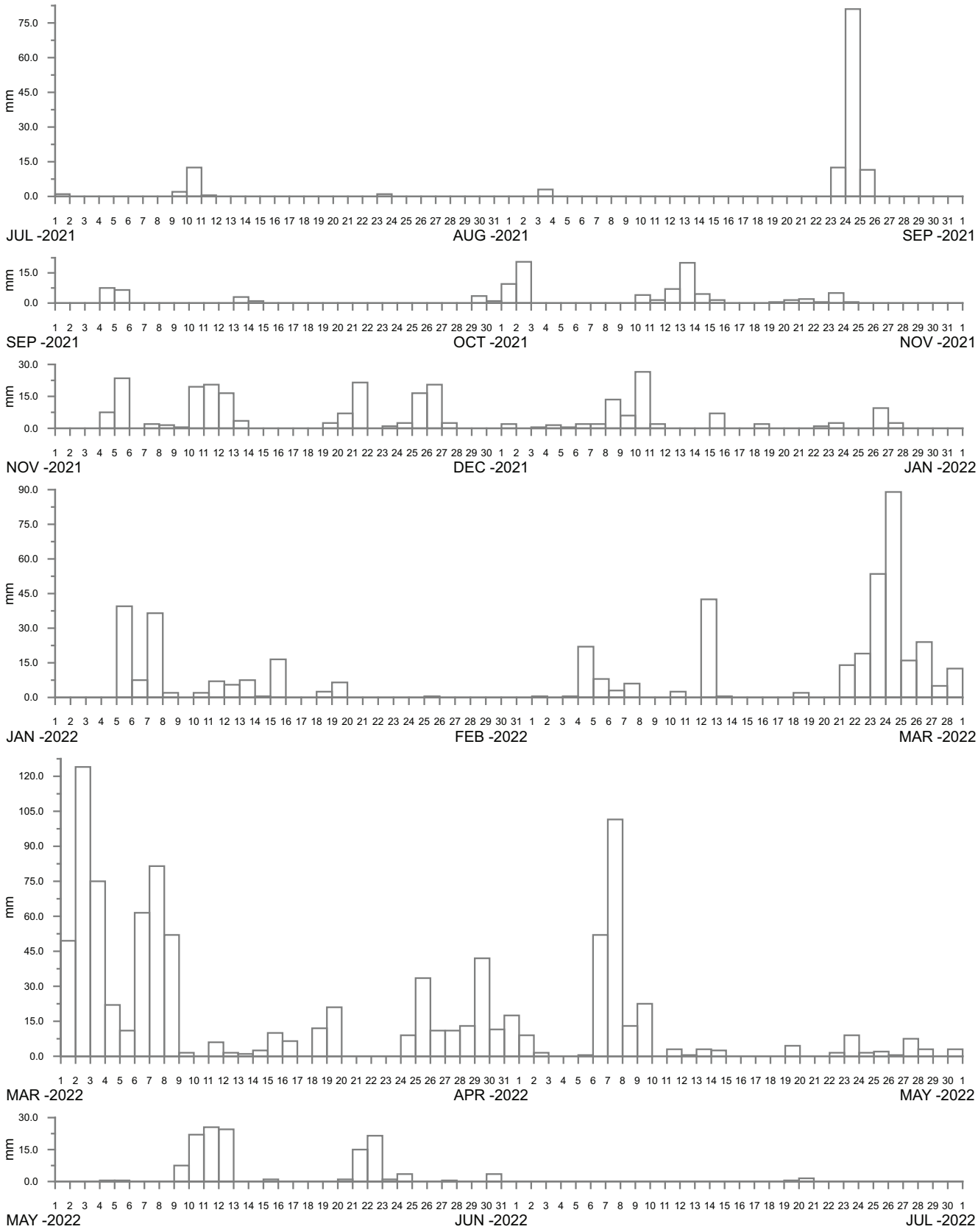
NORTH MACQUARIE AT NORTH MACQUARIE ROAD 2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 83

DRAWING 2908-83.cdr



DATA LOSS

NSW GOVERNMENT

YELLOW ROCK ROAD AT YELLOW ROCK ROAD
2021–2022

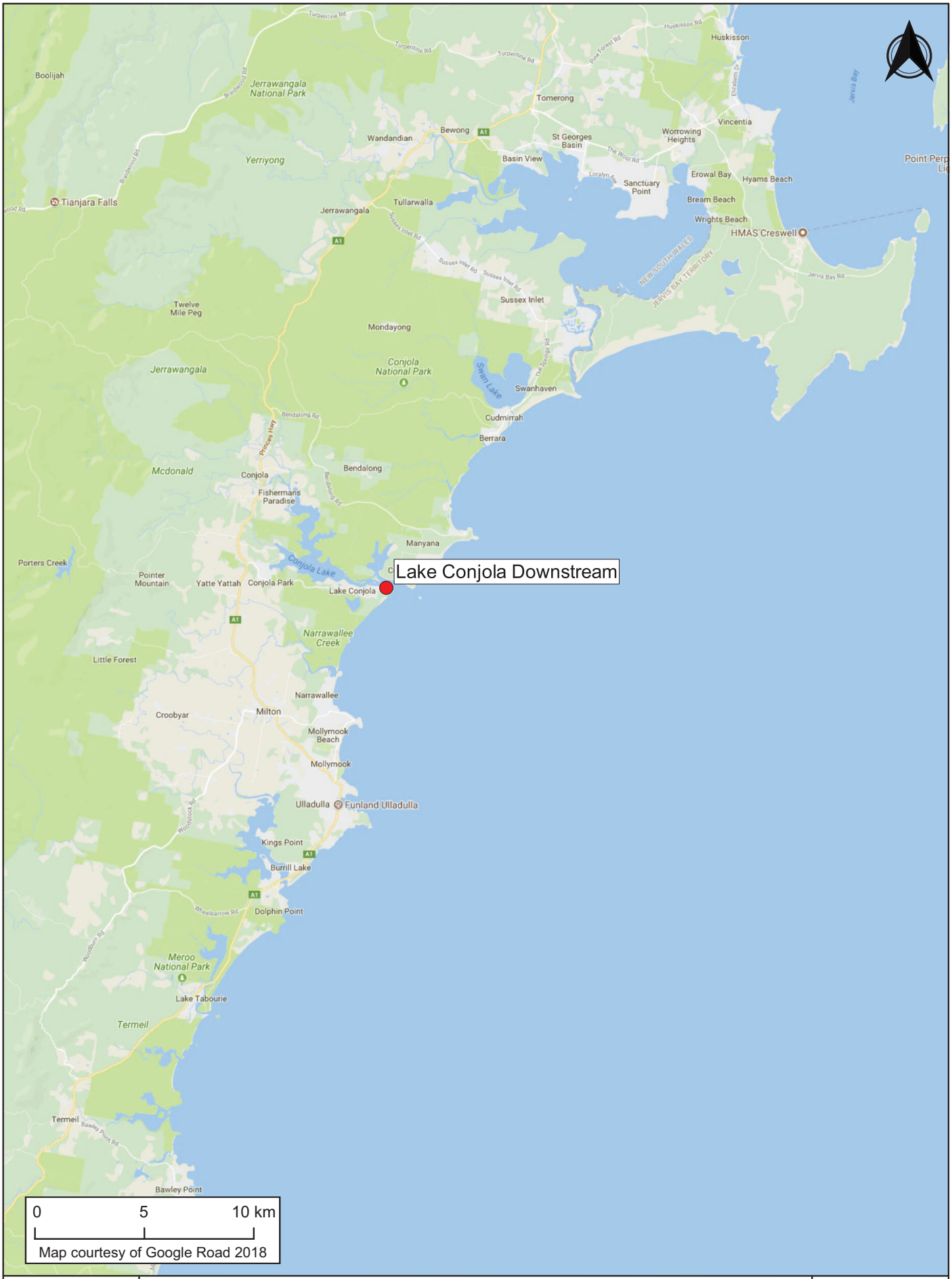
Manly Hydraulics Laboratory

Report MHL2908

Figure

84

DRAWING 2908-84.cdr



NSW GOVERNMENT

RAINFALL STATION LOCATIONS
SOUTH COAST (NORTH) REGION

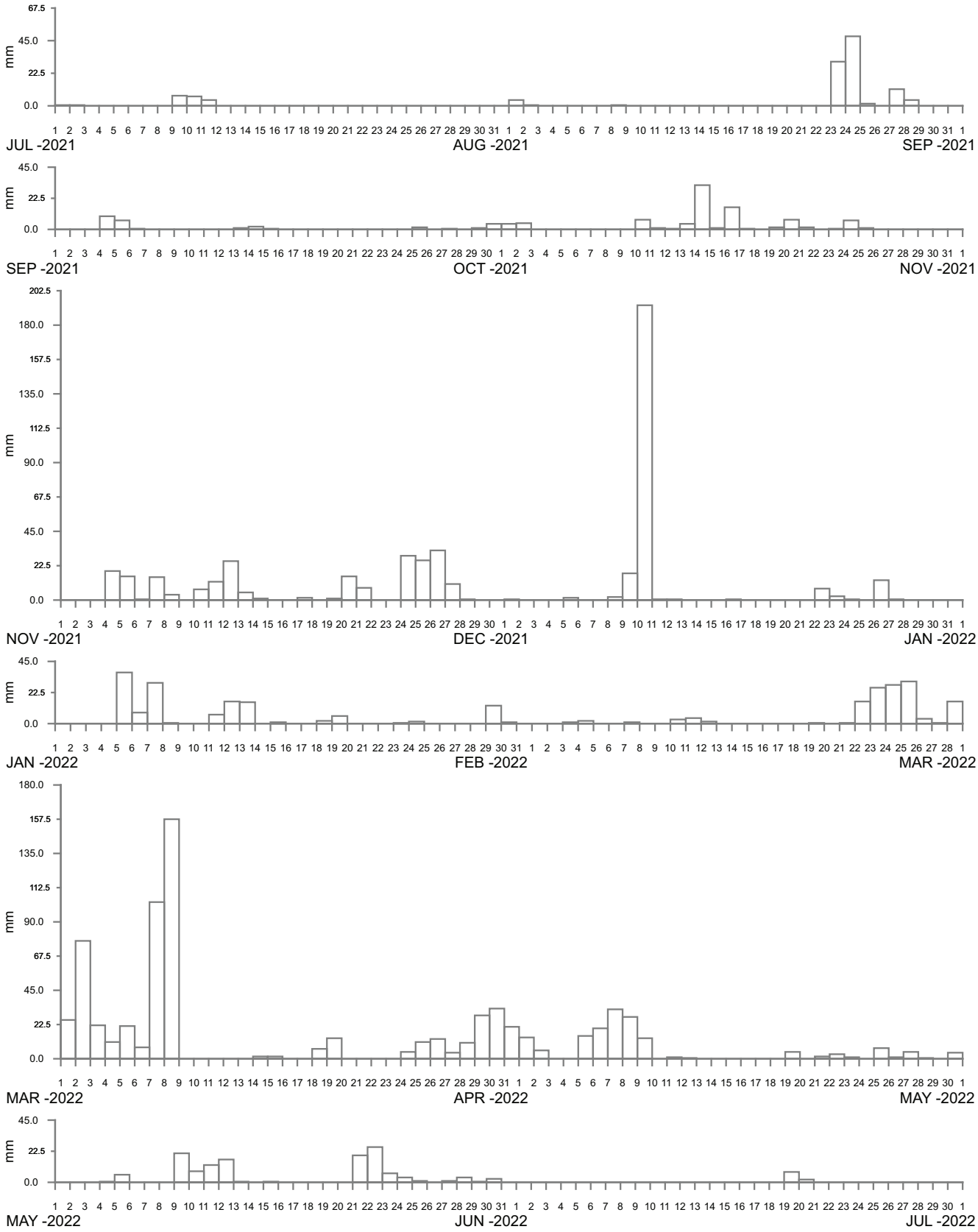
Manly Hydraulics Laboratory

Report MHL2908

Figure

85

DRAWING 2908-85.cdr



NSW GOVERNMENT

LAKE CONJOLA DOWNSTREAM AT CONJOLA LAKE
2021–2022

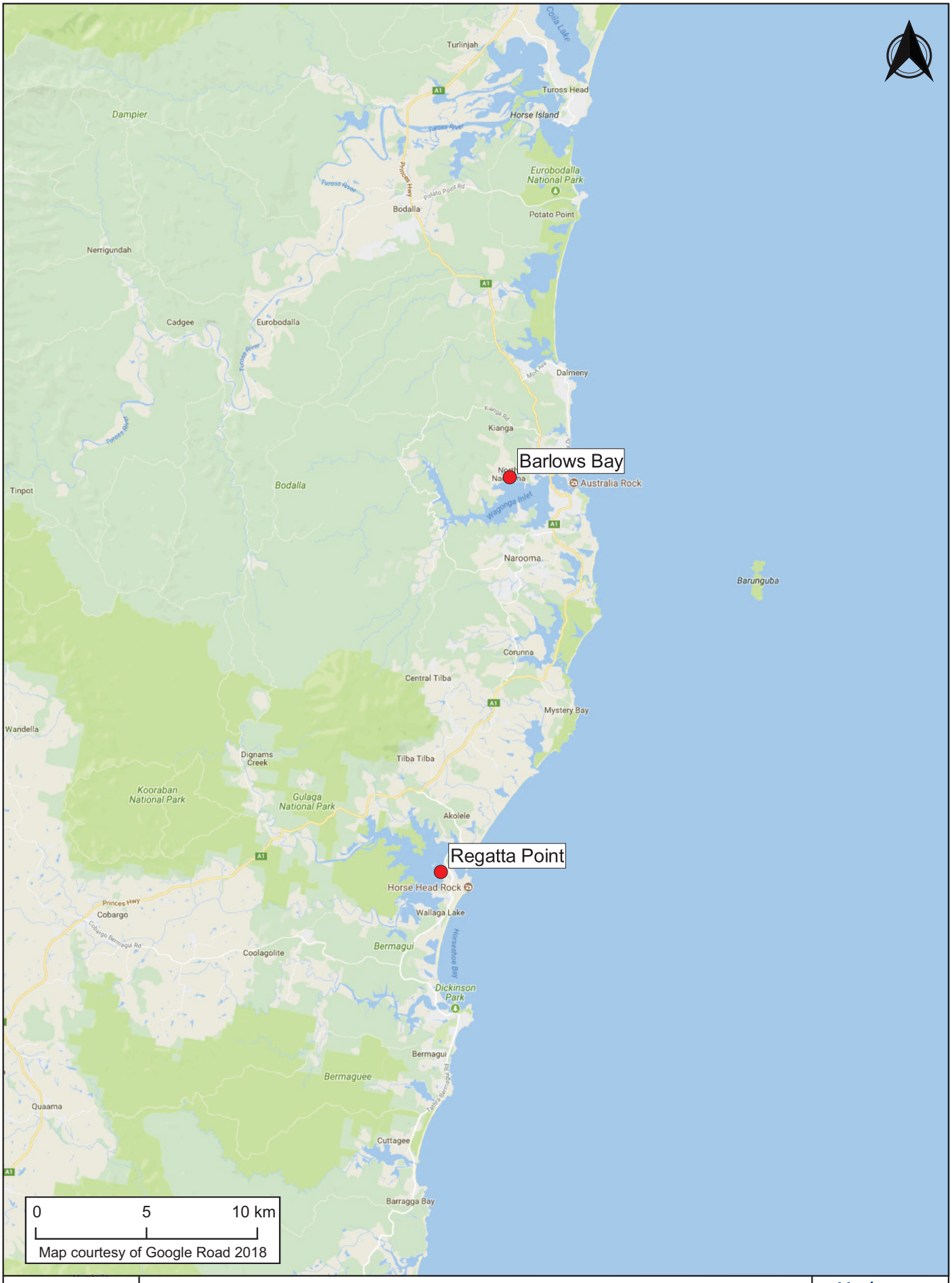
Manly Hydraulics Laboratory

Report MHL2908

Figure

86

DRAWING 2908-86.cdr



NSW GOVERNMENT

RAINFALL STATION LOCATIONS
SOUTH COAST (MID) REGION

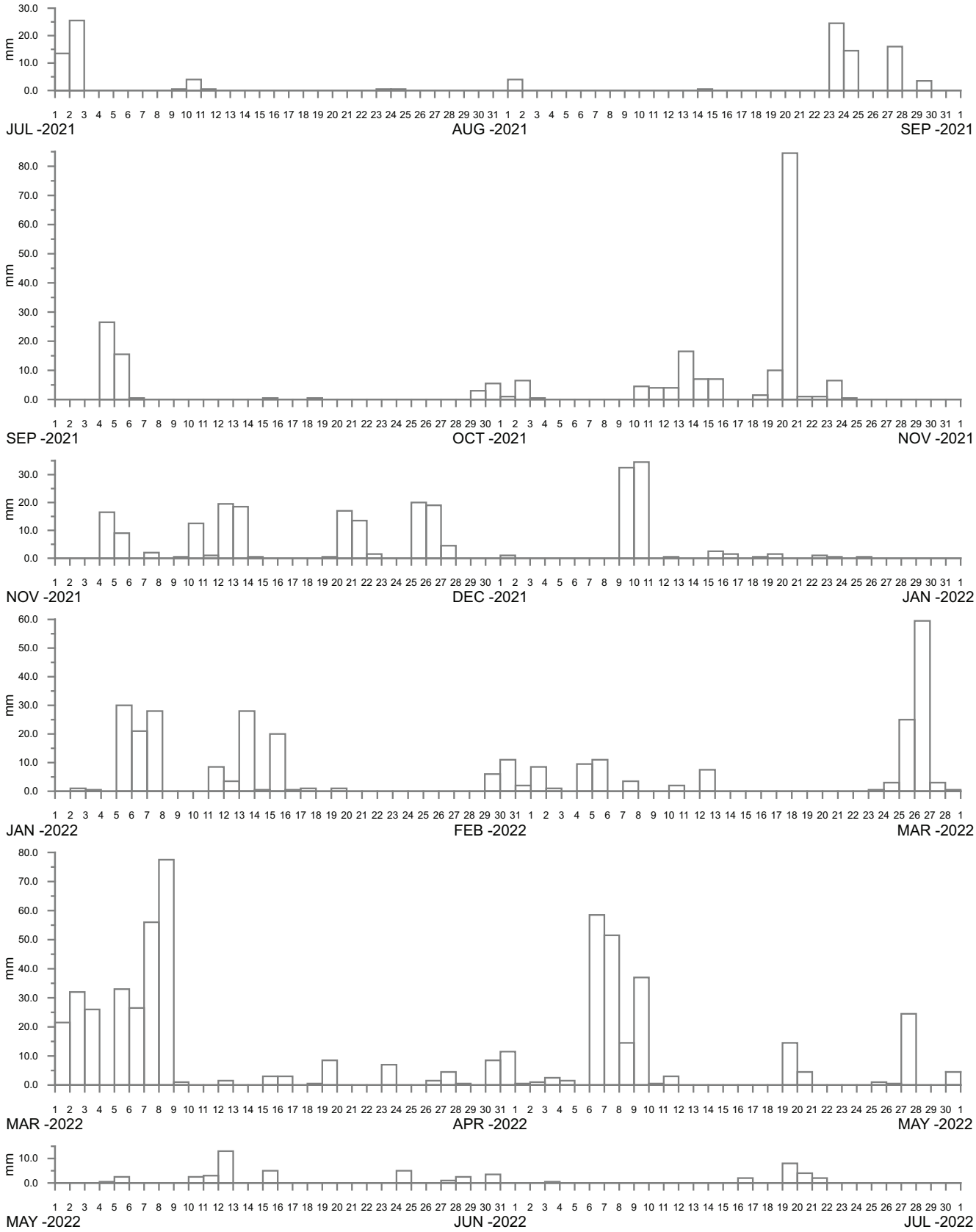
Manly Hydraulics Laboratory

Report MHL2908

Figure

87

DRAWING 2908-87.cdr



BARLOWS BAY AT WAGONGA INLET
2021–2022

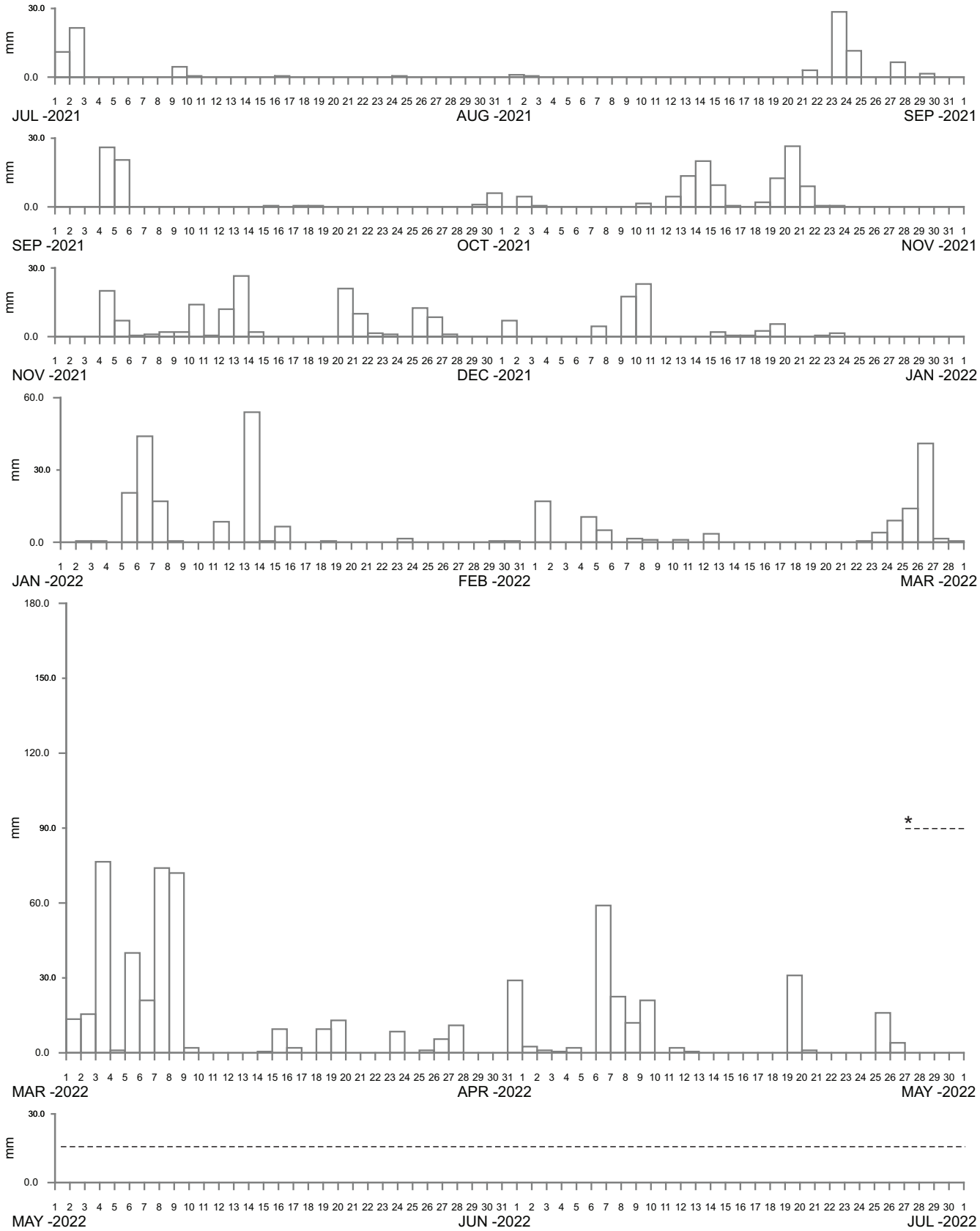
NSW GOVERNMENT

Manly Hydraulics Laboratory

Report MHL2908

Figure 88

DRAWING 2908-88.cdr



DATA LOSS

*Data loss due to blocked tipping bucket

NSW GOVERNMENT

REGATTA POINT AT WALLAGA LAKE
2021–2022

Manly Hydraulics Laboratory

Report MHL2908

Figure 89

DRAWING 2908-89.cdr

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–ongoing
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–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
Sydney Coastal	Middle Creek	Apr 1995–ongoing

Region	Station	Period of data
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–ongoing
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).

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).

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).

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).

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