Public Works
Manly Hydraulics Laboratory

NSW COASTAL RAINFALL ANNUAL SUMMARY
2014–2015

Report MHL2385
October 2015

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NSW Office of Environment and Heritage

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Cover photograph: Russell Vale Rainfall Station, Wollongong

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Foreword

Manly Hydraulics Laboratory is a business group within NSW Public Works, a division of the Department of Finance, Services and Innovation. The NSW rainfall database has been developed to support a number of NSW Office of Environment and Heritage (OEH) programs associated with coastal, floodplain and estuary management. The monitoring service is available to local government and other organisations, both in Australia and overseas.

This annual summary presents the results of rainfall monitoring obtained by the automatic rainfall recording stations along the coastal estuaries and rivers of New South Wales over the period 1 July 2014 to 30 June 2015, and catalogues data collected in NSW by Manly Hydraulics Laboratory.

This summary has been prepared to provide ready access to Manly Hydraulics Laboratory's rainfall database and its data analysis capabilities.

Requests for further information should be directed to:

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Manly Vale NSW 2093	Facsimile	:	(02) 9948 6185

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Summary

This report contains:

- a brief description of the coastal rainfall monitoring program
- guidelines on how to use this report
- information on how to access the database
- a review of significant program developments and rainfall events in 2014–2015
- a list of all stations for which Manly Hydraulics Laboratory collected rainfall data in 2014–2015 (Table 5.1)
- the annual data summaries for each site
- Appendix A, which details the rainfall data available
- Appendix B, outlining some of the data analysis suites and presentation formats available
- Appendix C, a list of publications which may be of interest.

Contents

1. Rainfall Monitoring Program

This report presents the thirtieth year of rainfall data collected by Manly Hydraulics Laboratory (MHL). The network of automatic recorders and the associated analysis routines enable efficient delivery of rainfall data. As well as near real time rainfall information at over 80 stations in NSW, extracts from the historical database of rainfall data can 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 5 Station Location Maps). The network consists of 73 permanent stations funded by OEH and this network supplements the coverage provided by the Bureau of Meteorology's rainfall network. The system utilises 0.2 mm and 0.5 mm tipping buckets and data loggers, shown in Figure 1.

Rainfall data is transferred to the NSW Data Collection Warehouse, Data Centre 1 and to MHL's data server using a variety of telemetry techniques including internet protocol (IP), landline telephone, cellular networks and event-reporting radio telemetry system (ERTS). The incoming raw data is then immediately available to external users to view online as schematised in Figure 2.

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

Data is backed up daily and data archived to magnetic tape as a security measure at regular intervals. A backup database is also kept at Data Centre 1.

2. How to Use This Report

This report aims to streamline access to MHL's services and to the rainfall database.

The NSW coastline has been divided into geographic regions based on river systems. 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 data collected and stored online is included in Appendix A.

Once a choice has been made of the period for which information is required, data and services can be obtained in a variety of formats, according to their intended use.

Appendix B provides examples of data analysis and presentation formats available from MHL. Available rainfall products include:

Tabulated Output

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

Graphical Plots

- hourly, daily, monthly and yearly hyetographs
- intensity-frequency-duration curves.

3. How to Access the Data

MHL provides a full online data access service via the internet for its clients, and a restricted service for the general public at http://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 upon request.

4. Significant Events and Developments 2014–2015

This section outlines events and developments which have influenced rainfall data monitoring during this reporting period.

The following stations were upgraded during the fiscal year:

- Curl Curl – a rain gauge was installed in February 2014 for greater coverage of the Sydney coastal region
- Tiona – in July 2014 this station was decommissioned due to safe access issues
- Lisarow – the rain gauge was relocated from the roof of Lisarow Public School to the car park in November 2014 for safer access and improved site conditions
- Russell Vale – the station blew over in strong winds and data was lost between 04/07/2014 and 21/07/2014. The station was rebuilt on 21/07/2014
- South Boambee – the station was decommissioned on request in April 2015.

In the 2014–2015 fiscal year, the maximum recorded rainfall intensities for 11 durations between 5 minutes and 72 hours occurred at four different sites across the OEH rainfall network (Table 4.1). To determine the significance of a rainfall event, the intensities are compared against the Annual Exceedance Probability (AEP), where the AEP is the probability of an event occurring in any one year at a particular duration. 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.

A summary of rainfall events during 2014–2015 on the NSW east coast is provided in Table 4.2.

The maximum recorded rainfall for durations of 5 minutes to 72 hours at each station for 2014–2015 is presented in Table 4.3.

Table 4.1 Maximum Recorded Intensities for all Stations 2014–2015

Duration	Station	Date	Rainfall (mm)	Rainfall (mm/hr)	AEP (%)
5min	Logans Crossing	19/01/2015	21.5	258.0	~1
10min	Mount George	25/12/2014	35.0	210.0	~1
20min	Mount George	25/12/2014	63.5	190.5	~1
30min	Belmore Bridge	21/04/2015	84.5	169.0	~1
60min	Belmore Bridge	21/04/2015	148.0	148.0	~1
3hrs	Belmore Bridge	21/04/2015	240.0	80.0	~1
6hrs	Belmore Bridge	21/04/2015	264.0	44.0	~1
12hrs	Belmore Bridge	21/04/2015	305.0	25.4	~1
24hrs	Belmore Bridge	21/04/2015	386.4	16.1	~1
48hrs	Belmore Bridge	22/04/2015	438.2	9.1	~1
72hrs	Belmore Bridge	22/04/2015	452.2	6.3	~1

Table 4.2 lists significant rainfall events that occurred in the 2014–2015 fiscal year. 100 mm of rain falling in a 24-hour period has been deemed a suitably significant rain event by OEH.

Table 4.2 2014–2015 Summary of Rainfall Events

Month	Summary of Rainfall Events
July 2014	No events exceeding 100 mm in 24 hours occurred this month
August 2014	Daily rainfall exceeding 100 mm in 24 hours occurred at three sites in the Coffs region and nine sites in the Wollongong region
September 2014	No events exceeding 100 mm in 24 hours occurred this month
October 2014	Daily rainfall exceeding 100 mm in 24 hours occurred at Regatta Point and Barlows Bay
November 2014	No events exceeding 100 mm in 24 hours occurred this month
December 2014	Daily rainfall exceeding 100 mm in 24 hours occurred at Cudgera
January 2015	Daily rainfall exceeding 100 mm in 24 hours occurred at two sites in the Coffs Harbour region, two sites in the Macleay-Hastings region, three sites in the Tuggerah Lakes region and one Hawkesbury region site
February 2015	Daily rainfall exceeding 100 mm in 24 hours occurred at Lake Ainsworth
March 2015	Daily rainfall exceeding 100 mm in 24 hours occurred at three sites in the Hastings-Camden Haven region
April 2015	Daily rainfall exceeding 100 mm in 24 hours occurred at five sites in the Hunter region, 12 Macquarie-Tuggerah Lakes region sites, seven Hawkesbury sites and two Sydney-Wollongong region sites
May 2015	Daily rainfall exceeding 100 mm in 24 hours occurred at nine Tweed-Coffs Harbour region sites
June 2015	No events exceeding 100 mm in 24 hours occurred this month

4.1 Southern Oscillation Index

The Southern Oscillation Index (SOI) is a calculation of monthly or seasonal shifts in the air pressure between Darwin and Tahiti (source: Bureau of Meteorology). As well as being linked to the temperature of the Pacific Ocean and the strength of Pacific Trade winds, the SOI is also associated with rainfall and can be used to predict whether higher or lower than average rainfall may occur in northern and eastern Australia.

A La Niña episode occurs when there are ongoing positive SOI values, and increases the probability of higher than average rainfall in northern and eastern Australia. Sustained negative SOI values have been coined El Niño events, and are associated with a reduction in rainfall over northern and eastern Australia. Even low to moderate El Niño events can lead to severe droughts in Australia. The SOI for the period July 1995 to June 2015 is graphically represented in Figure 3.

4.2 Data Provision

Rainfall data is provided to the public on behalf of OEH, via:

- MHL's public internet home pages, providing near real time access to a limited sample of data. Other methods of disseminating data include email correspondence and File Transfer Protocol (FTP)
- the NSW Government Water Information website at http://waterinfo.nsw.gov.au/ which provides a link to MHL's webpage for access to near real time rainfall data
- MHL provides OEH and NSW SES officers access to near real time environmental data and our 'quality assured' historical database through the OEH Wiski Web portal, which is password protected
- NSW SES officers also receive automated notifications for flood warning systems in NSW
- a web-based data request system has been established where electronic requests can be submitted via MHL's homepage at http://mhl.nsw.gov.au under the data request menu.

Statistics

- This year, in excess of 165,000 public and customer webpage hits per month were served by MHL.
- MHL has approximately 120,000 visits per month to its website.
- In excess of 2 million individual webpage hits have been recorded in 2014–2015.
- Data access also continues to assist the Bureau of Meteorology, local government authorities, State Emergency Service, NSW Police, Water NSW, NSW Surf Life Saving Association, universities, the NSW court system, private consultancies, NSW Roads and Maritime Services and the Natural Resources Commission.
- A number of communities across Australia continue to receive environmental data from MHL.

Table 4.3 2014-2015 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	20/01/2015 10.0	20/01/2015 18.5	20/01/2015 25.0	20/01/2015 29.0	22/03/2015 42.0	22/03/2015 65.0	28/12/2014 92.0	28/12/2014 128.5	28/12/2014 161.5	22/02/2015 192.0	22/02/2015 223.9	1779.0
Main Arm	9/12/2014 9.5	9/12/2014 18.5	9/12/2014 23.0	22/03/2015 25.5	1/01/2015 34.0	1/05/2015 55.5	1/05/2015 80.0	1/05/2015 105.5	2/05/2015 144.5	21/02/2015 169.9	21/02/2015 196.6	1871.0
Huonbrook	21/03/2015 10.5	21/03/2015 19.5	21/03/2015 32.5	21/03/2015 41.0	21/03/2015 44.5	1/01/2015 75.0	1/01/2015 113.5	2/05/2015 123.5	2/05/2015 167.5	21/02/2015 203.5	22/02/2015 244.8	1954.5
Myocum	1/01/2015 10.0	1/01/2015 19.5	1/01/2015 33.0	1/01/2015 42.5	1/01/2015 54.0	1/01/2015 92.0	1/01/2015 125.0	1/01/2015 126.5	2/05/2015 142.1	2/05/2015 179.0	2/05/2015 183.6	1873.0
Lake Ainsworth	22/03/2015 9.5	31/01/2015 14.5	22/03/2015 21.5	22/03/2015 26.5	22/03/2015 33.0	17/08/2014 60.0	20/02/2015 93.0	28/08/2014 150.5	20/02/2015 183.1	1/05/2015 240.0	2/05/2015 293.0	2145.0
Wooli Caravan Park	2/05/2015 15.0	2/05/2015 27.5	2/05/2015 46.5	2/05/2015 65.0	26/01/2015 77.5	20/11/2014 135.0	20/11/2014 186.5	20/11/2014 188.5	2/05/2015 223.0	2/05/2015 273.6	2/05/2015 421.2	2156.5
Perry Drive	29/12/2014 10.5	2/02/2015 16.5	8/03/2015 28.0	8/03/2015 38.5	13/03/2015 50.0	28/04/2015 95.0	13/03/2015 123.0	13/03/2015 135.5	2/05/2015 170.4	3/05/2015 237.6	3/05/2015 267.8	2298.0
Shepards Lane	26/01/2015 9.5	26/01/2015 17.5	3/04/2015 29.0	3/04/2015 40.0	26/01/2015 46.0	28/04/2015 62.5	13/03/2015 80.0	27/01/2015 104.5	2/05/2015 157.0	3/05/2015 229.4	3/05/2015 261.4	2204.0
Red Hill	18/12/2014 7.5	2/05/2015 12.5	2/05/2015 22.5	2/05/2015 28.5	2/05/2015 45.5	26/01/2015 70.5	27/01/2015 82.0	27/01/2015 119.5	2/05/2015 163.0	3/05/2015 241.0	3/05/2015 269.3	2184.5
Newports Creek	11/12/2014 10.5	27/08/2014 16.0	18/12/2014 25.0	18/12/2014 35.5	2/05/2015 43.0	2/05/2015 55.5	2/05/2015 79.5	2/05/2015 110.5	2/05/2015 197.0	2/05/2015 227.5	3/05/2015 265.0	2187.5
Middle Boambee	2/05/2015 12.5	2/05/2015 21.5	2/05/2015 33.5	2/05/2015 41.5	2/05/2015 53.0	2/05/2015 64.5	2/05/2015 90.0	2/05/2015 130.6	2/05/2015 210.5	2/05/2015 241.4	3/05/2015 263.5	2188.0
South Boambee	21/01/2015 10.0	21/01/2015 17.5	21/01/2015 25.0	18/12/2014 33.5	18/12/2014 39.5	27/08/2014 53.5	27/08/2014 75.0	27/08/2014 105.0	27/08/2014 171.0	28/08/2014 218.5	28/08/2014 223.5	1651.0 01/04/2015[2]
North Bonville[1]	29/12/2014 10.5	26/12/2014 19.0	26/01/2015 34.5	26/01/2015 45.5	26/01/2015 62.0	26/01/2015 73.5	27/01/2015 84.5	27/01/2015 152.5	27/01/2015 175.9	28/08/2014 208.8	23/02/2015 233.3	2227.5
Kooroowi	14/10/2014 10.0	14/10/2014 19.5	14/10/2014 27.0	14/10/2014 28.5	19/01/2015 33.5	19/01/2015 65.0	19/01/2015 113.0	19/01/2015 119.5	19/01/2015 130.6	22/04/2015 228.0	22/04/2015 254.9	1993.5

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	
Stuarts Island Downstream	26/01/2015 10.0	26/01/2015 17.5	26/01/2015 29.0	26/01/2015 37.5	1/02/2015 59.0	1/02/2015 96.5	2/02/2015 105.0	2/02/2015 114.5	28/08/2014 123.0	3/02/2015 177.0	3/02/2015 177.0	1525.0
Utungun	1/01/2015 9.0	1/01/2015 14.0	5/11/2014 21.5	5/11/2014 28.5	1/02/2015 42.0	1/02/2015 60.0	27/08/2014 88.5	27/08/2014 112.6	27/08/2014 139.4	2/05/2015 194.4	2/05/2015 213.8	1550.5
Aldavilla Downstream	21/03/2015 13.0	21/03/2015 19.0	21/03/2015 27.0	19/01/2015 31.0	19/01/2015 46.0	19/01/2015 71.0	19/01/2015 98.0	20/01/2015 108.0	20/01/2015 164.0	20/01/2015 166.0	22/01/2015 201.0	1309.0
Green Valley	21/03/2015 10.5	1/02/2015 16.5	26/01/2015 24.5	26/01/2015 28.5	21/03/2015 48.5	21/03/2015 67.5	22/03/2015 94.0	22/03/2015 123.0	22/03/2015 131.0	2/05/2015 165.6	2/05/2015 184.3	1481.5
Telegraph Point	20/01/2015 12.0	20/01/2015 20.5	20/01/2015 29.0	26/01/2015 42.0	20/01/2015 55.0	20/01/2015 120.0	20/01/2015 140.0	20/01/2015 146.0	20/01/2015 193.9	20/01/2015 217.4	22/01/2015 223.9	1682.0
Logans Crossing	19/01/2015 21.5	19/01/2015 30.0	19/01/2015 30.5	26/01/2015 35.5	26/01/2015 52.5	22/03/2015 70.0	22/03/2015 77.5	22/03/2015 106.0	22/03/2015 116.4	23/03/2015 133.0	23/03/2015 133.2	1383.5
Mount George[1]	25/12/2014 19.5	25/12/2014 35.0	25/12/2014 63.5	25/12/2014 71.0	25/12/2014 73.5	25/12/2014 77.0	22/03/2015 100.5	22/03/2015 127.6	22/03/2015 133.9	22/03/2015 137.3	22/03/2015 137.5	1444.5
Nabiac	8/12/2014 12.5	8/12/2014 23.5	1/03/2015 32.5	1/03/2015 34.0	13/03/2015 41.5	13/03/2015 52.0	13/03/2015 53.5	22/03/2015 62.0	22/03/2015 68.4	3/05/2015 99.4	3/05/2015 104.4	1077.0
Tuncurry	27/11/2014 7.5	20/01/2015 12.5	20/01/2015 19.0	20/01/2015 20.0	20/01/2015 36.5	20/01/2015 63.0	20/01/2015 69.0	20/01/2015 69.5	20/01/2015 70.1	22/01/2015 72.5	23/01/2015 102.2	1106.0
Pacific Palms Wharf	18/12/2014 11.5	18/12/2014 21.0	1/03/2015 30.0	1/03/2015 40.5	1/03/2015 49.5	20/04/2015 52.0	20/04/2015 59.5	20/04/2015 75.0	20/04/2015 85.0	20/04/2015 99.5	2/05/2015 111.0	1385.0
Tarbuck Bay[1]	1/03/2015 8.5	1/03/2015 14.5	1/03/2015 22.5	1/03/2015 29.5	3/05/2015 37.0	3/05/2015 41.5	3/05/2015 42.0	4/05/2015 46.0	31/03/2015 68.4	4/05/2015 76.3	3/05/2015 104.4	1231.0
Bulahdelah	20/04/2015 7.5	20/04/2015 13.5	20/04/2015 22.0	20/04/2015 27.0	21/04/2015 33.5	21/04/2015 62.5	21/04/2015 79.5	21/04/2015 93.0	21/04/2015 100.6	21/04/2015 101.3	22/04/2015 104.4	967.0
Gostwyck[1]	21/04/2015 14.0	21/04/2015 27.0	21/04/2015 44.0	21/04/2015 57.5	21/04/2015 78.0	21/04/2015 171.0	21/04/2015 213.5	21/04/2015 288.0	21/04/2015 363.1	22/04/2015 412.8	23/04/2015 429.8	1098.5
Seaham[1]	21/04/2015 14.0	21/04/2015 25.0	21/04/2015 37.0	21/04/2015 51.5	21/04/2015 81.5	21/04/2015 197.0	21/04/2015 228.0	21/04/2015 283.6	21/04/2015 361.4	22/04/2015 414.2	22/04/2015 434.2	1177.5
Belmore Bridge	21/04/2015 17.0	21/04/2015 31.5	21/04/2015 60.0	21/04/2015 84.5	21/04/2015 148.0	21/04/2015 240.0	21/04/2015 264.0	21/04/2015 305.0	21/04/2015 386.4	22/04/2015 438.2	22/04/2015 452.2	1215.0

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	
Hexham Bridge	25/04/2015 8.0	19/01/2015 13.5	19/01/2015 21.5	19/01/2015 25.5	19/01/2015 41.5	19/01/2015 63.5	21/04/2015 68.5	21/04/2015 110.0	21/04/2015 205.4	22/04/2015 263.5	22/04/2015 283.7	1237.0
Barnsley	5/12/2014 17.5	5/12/2014 25.5	5/12/2014 34.0	5/12/2014 35.0	5/12/2014 37.0	5/12/2014 42.0	21/04/2015 54.0	21/04/2015 87.0	21/04/2015 157.0	22/04/2015 236.6	23/04/2015 269.3	1305.5
Martinsville	27/08/2014 8.0	27/08/2014 11.5	27/08/2014 15.0	27/08/2014 25.5	27/08/2014 29.0	25/12/2014 42.5	21/04/2015 66.0	4/04/2015 101.5	21/04/2015 165.5	22/04/2015 239.5	22/04/2015 252.5	1402.0
Mandalong	25/12/2014 7.0	25/12/2014 14.0	25/12/2014 22.5	25/12/2014 25.0	20/01/2015 29.5	21/04/2015 47.0	21/04/2015 67.5	21/04/2015 103.0	21/04/2015 173.0	22/04/2015 249.1	22/04/2015 260.6	1335.0
Wyee	19/01/2015 14.5	19/01/2015 26.0	19/01/2015 43.5	19/01/2015 51.0	19/01/2015 57.5	19/01/2015 77.0	19/01/2015 107.0	19/01/2015 119.0	21/04/2015 150.5	22/04/2015 215.5	22/04/2015 228.2	1561.5
Whitemans Ridge	24/03/2015 9.5	24/03/2015 15.5	24/03/2015 17.0	19/01/2015 17.5	19/01/2015 23.0	25/12/2014 42.0	28/01/2015 66.0	4/04/2015 108.0	4/04/2015 136.5	22/04/2015 215.0	22/04/2015 231.5	1507.0
Yarramalong	24/03/2015 10.5	24/03/2015 19.5	24/03/2015 33.5	24/03/2015 38.5	24/03/2015 42.0	25/12/2014 51.0	25/12/2014 65.0	21/04/2015 91.5	21/04/2015 149.0	22/04/2015 235.5	22/04/2015 252.5	1428.0
Kulnura	24/03/2015 9.5	24/03/2015 18.0	24/03/2015 31.5	24/03/2015 44.5	24/03/2015 50.5	24/03/2015 54.0	21/04/2015 61.0	21/04/2015 107.0	21/04/2015 160.6	22/04/2015 275.0	22/04/2015 295.9	1353.5
Toukley	14/09/2014 7.0	24/03/2015 11.5	14/09/2014 19.0	24/03/2015 21.0	24/03/2015 33.5	24/03/2015 43.5	27/01/2015 49.5	28/01/2015 72.5	28/01/2015 108.5	28/01/2015 119.5	28/01/2015 120.2	1035.0
Hamlyn Terrace	19/01/2015 11.0	19/01/2015 21.0	19/01/2015 36.0	19/01/2015 39.0	19/01/2015 52.0	19/01/2015 55.0	27/01/2015 59.5	28/01/2015 98.5	28/01/2015 153.6	22/04/2015 183.4	22/04/2015 205.2	1541.0
Mardi Dam	24/03/2015 8.5	24/03/2015 15.0	24/03/2015 23.5	24/03/2015 27.5	24/03/2015 34.0	25/12/2014 47.5	28/01/2015 69.5	28/01/2015 99.0	28/01/2015 131.0	22/04/2015 213.1	22/04/2015 238.3	1573.5
Sterland	6/04/2015 8.5	6/04/2015 16.0	6/04/2015 26.0	24/03/2015 30.0	24/03/2015 42.0	24/03/2015 49.5	21/04/2015 68.5	21/04/2015 108.5	21/04/2015 171.0	22/04/2015 291.5	22/04/2015 310.0	1653.5
Kangy Angy	24/03/2015 9.0	24/03/2015 13.5	24/03/2015 25.5	24/03/2015 31.5	24/03/2015 42.5	24/03/2015 48.5	19/01/2015 57.5	22/04/2015 83.0	22/04/2015 124.5	22/04/2015 190.0	22/04/2015 208.5	1565.5
Berkeley Vale[1]	24/03/2015 8.0	24/03/2015 16.0	24/03/2015 26.0	24/03/2015 34.5	24/03/2015 45.0	24/03/2015 49.5	19/01/2015 58.5	4/04/2015 77.0	21/04/2015 107.5	22/04/2015 196.8	22/04/2015 217.4	1439.5
Bateau Bay	22/04/2015 8.5	20/04/2015 12.5	15/10/2014 22.0	24/03/2015 29.0	24/03/2015 44.5	15/10/2014 53.5	15/10/2014 62.0	4/04/2015 74.5	4/04/2015 101.0	22/04/2015 195.8	22/04/2015 223.9	1617.5

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	
Lisarow[1]	22/04/2015 9.5	22/04/2015 12.5	31/03/2015 17.5	31/03/2015 19.5	22/04/2015 27.5	19/01/2015 34.0	22/04/2015 47.5	22/04/2015 82.6	22/04/2015 120.0	22/04/2015 219.4	22/04/2015 242.6	1397.5
Strickland	17/03/2015 6.5	19/01/2015 11.5	19/01/2015 16.0	19/01/2015 19.5	19/01/2015 26.0	19/01/2015 39.5	21/04/2015 52.5	22/04/2015 86.0	22/04/2015 124.0	22/04/2015 240.5	22/04/2015 266.5	1550.5
Narara	24/03/2015 7.5	24/03/2015 11.0	22/04/2015 15.0	22/04/2015 19.0	22/04/2015 29.0	22/04/2015 37.0	21/04/2015 55.5	21/04/2015 90.5	21/04/2015 130.1	22/04/2015 253.0	22/04/2015 275.8	1605.0
Mount Elliot	19/01/2015 11.5	19/01/2015 20.0	19/01/2015 31.0	19/01/2015 35.5	19/01/2015 46.0	19/01/2015 75.5	19/01/2015 94.0	19/01/2015 110.5	4/04/2015 127.9	22/04/2015 222.7	22/04/2015 246.2	1729.0
Wyoming	19/01/2015 8.5	19/01/2015 15.5	19/01/2015 23.0	19/01/2015 27.5	19/01/2015 30.0	19/01/2015 54.5	19/01/2015 67.5	21/04/2015 106.6	21/04/2015 150.5	22/04/2015 282.7	22/04/2015 312.5	1676.5
Kincumber	14/10/2014 10.0	14/10/2014 19.5	14/10/2014 27.0	14/10/2014 28.5	19/01/2015 33.5	19/01/2015 65.0	19/01/2015 113.0	19/01/2015 119.5	19/01/2015 130.6	22/04/2015 228.0	22/04/2015 254.9	1826.0
Webbs Creek	6/12/2014 9.6	6/12/2014 15.8	6/12/2014 25.6	6/12/2014 29.4	6/12/2014 35.2	6/12/2014 43.0	21/04/2015 58.6	21/04/2015 102.8	21/04/2015 156.7	22/04/2015 249.1	22/04/2015 263.5	1175.6
Colo Junction	1/02/2015 6.6	1/02/2015 12.4	1/02/2015 15.8	1/02/2015 17.8	6/12/2014 26.0	20/04/2015 47.8	20/04/2015 63.2	21/04/2015 105.0	21/04/2015 151.0	22/04/2015 248.2	22/04/2015 270.0	1068.6
Sackville D/S	7/12/2014 9.6	25/06/2015 12.8	25/06/2015 16.2	7/12/2014 17.2	20/04/2015 22.6	20/04/2015 53.8	20/04/2015 66.4	21/04/2015 98.2	21/04/2015 131.0	22/04/2015 207.4	22/04/2015 229.7	935.4
Kelso Creek	10/01/2015 10.5	10/01/2015 21.0	10/01/2015 30.5	10/01/2015 33.0	10/01/2015 34.5	14/10/2014 53.0	15/10/2014 66.5	22/04/2015 84.5	22/04/2015 103.4	22/04/2015 174.7	22/04/2015 190.8	955.0
Rixons Pass	14/10/2014 10.5	14/10/2014 17.0	14/10/2014 27.5	14/10/2014 33.0	14/10/2014 43.5	14/10/2014 58.0	14/10/2014 67.5	22/04/2015 76.0	18/08/2014 120.0	18/08/2014 199.2	19/08/2014 236.9	1527.5
Russell Vale[1]	17/08/2014 7.5	17/08/2014 13.5	14/10/2014 21.0	14/10/2014 27.5	14/10/2014 38.0	14/10/2014 52.5	14/10/2014 61.5	22/04/2015 73.5	17/08/2014 113.5	18/08/2014 178.0	19/08/2014 210.0	1365.5
Mount Pleasant[1]	14/10/2014 11.5	14/10/2014 21.0	14/10/2014 34.5	14/10/2014 45.0	14/10/2014 58.0	14/10/2014 71.5	14/10/2014 79.0	22/04/2015 93.0	22/04/2015 131.5	22/04/2015 216.5	22/04/2015 272.9	1303.0
Mount Kembla	1/03/2015 9.5	4/12/2014 14.5	1/03/2015 18.5	24/03/2015 20.0	14/10/2014 28.5	24/03/2015 45.0	24/03/2015 52.5	20/04/2015 73.0	22/04/2015 95.0	18/08/2014 160.8	22/04/2015 204.5	1451.5
Dombarton Loop	10/01/2015 7.5	10/01/2015 14.0	10/01/2015 20.0	21/01/2015 23.5	21/01/2015 30.5	5/02/2015 43.5	5/02/2015 57.0	20/04/2015 70.6	17/08/2014 114.5	18/08/2014 192.5	19/08/2014 217.4	1657.0

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	
Wongawilli	29/12/2014 8.5	29/12/2014 12.0	4/12/2014 13.0	4/12/2014 15.0	4/12/2014 17.5	4/12/2014 32.5	4/12/2014 45.5	20/04/2015 53.5	17/08/2014 80.4	18/08/2014 140.6	19/08/2014 154.8	1147.0
Port Kembla[1]	20/02/2015 9.5	20/02/2015 16.5	14/10/2014 23.5	14/10/2014 28.5	14/10/2014 43.5	14/10/2014 60.0	14/10/2014 71.0	15/10/2014 82.0	22/04/2015 95.0	22/04/2015 135.8	22/04/2015 184.3	1115.0
Darkes Road	22/04/2015 8.0	22/04/2015 10.0	4/12/2014 15.5	4/12/2014 18.5	25/02/2015 25.0	5/02/2015 35.0	5/02/2015 49.5	20/04/2015 62.0	17/08/2014 85.4	18/08/2014 145.9	19/08/2014 167.8	1228.5
Cleveland Road	4/12/2014 6.0	4/12/2014 10.5	4/12/2014 15.5	4/12/2014 18.0	4/02/2015 22.0	4/12/2014 39.0	4/12/2014 50.0	20/04/2015 57.5	17/08/2014 88.1	18/08/2014 147.4	19/08/2014 166.3	1222.5
Huntley Colliery[2]	4/12/2014 8.0	4/12/2014 16.0	4/12/2014 22.5	4/12/2014 24.5	4/12/2014 34.5	4/12/2014 47.0	4/12/2014 64.5	5/12/2014 66.0	17/08/2014 106.6	18/08/2014 168.0	19/08/2014 182.9	1307.0
Upper Calderwood	1/12/2014 10.0	1/12/2014 13.5	23/12/2014 17.5	23/12/2014 20.0	23/12/2014 24.5	26/08/2014 34.0	26/08/2014 56.5	26/08/2014 81.5	26/08/2014 115.4	18/08/2014 169.0	19/08/2014 187.2	1296.5
Little Lake	9/04/2015 18.0	9/04/2015 21.0	20/01/2015 25.5	20/01/2015 29.0	20/01/2015 31.0	1/12/2014 42.5	20/04/2015 47.0	20/04/2015 67.0	20/04/2015 76.0	22/04/2015 111.0	22/04/2015 154.0	323.5
North Macquarie	2/04/2015 8.5	2/04/2015 13.0	2/04/2015 15.0	26/08/2014 18.5	26/08/2014 30.0	26/08/2014 44.5	26/08/2014 56.0	26/08/2014 73.0	17/08/2014 107.0	18/08/2014 190.1	19/08/2014 207.4	1224.5
Clover Hill	11/06/2015 9.5	11/06/2015 18.5	23/12/2014 26.0	23/12/2014 35.5	23/12/2014 43.0	17/08/2014 60.0	17/08/2014 71.0	17/08/2014 106.0	18/08/2014 160.1	19/08/2014 266.4	19/08/2014 311.0	1742.0
Nurrewin	23/12/2014 9.5	23/12/2014 16.5	23/12/2014 27.0	23/12/2014 37.5	23/12/2014 44.5	17/08/2014 46.5	17/08/2014 63.0	17/08/2014 101.5	18/08/2014 149.5	19/08/2014 241.0	19/08/2014 283.7	1681.5
Yellow Rock Road	1/12/2014 10.0	10/01/2015 18.5	10/01/2015 32.0	10/01/2015 34.5	10/01/2015 37.0	10/01/2015 38.5	26/08/2014 61.0	26/08/2014 82.0	26/08/2014 107.0	18/08/2014 196.3	19/08/2014 226.1	1486.5
Barlows Bay	7/12/2014 7.0	7/12/2014 12.0	14/10/2014 17.0	14/10/2014 23.0	14/10/2014 40.0	14/10/2014 109.0	14/10/2014 174.0	14/10/2014 195.0	14/10/2014 205.4	14/10/2014 215.5	14/10/2014 215.3	1165.0
Regatta Point	14/10/2014 7.0	14/10/2014 12.0	14/10/2014 20.5	14/10/2014 29.5	14/10/2014 51.5	14/10/2014 92.0	14/10/2014 122.0	14/10/2014 148.0	14/10/2014 165.1	14/10/2014 177.1	15/10/2014 177.8	1075.5

[1] Some measure of data loss occurred at these sites. See individual plots for further details
[2] Date listed refers to the time that the recorded total rainfall ends.

5. Rainfall Monitoring Summary

This section documents locality maps and quality assured rainfall monitoring summaries for each station. Tables 5.1 and 5.2 provide indexes to the figures presented.

Table 5.1 Index of Figures

	Figure
Typical Pluviometer Station	1
Data Transfer Schematic	2
Southern Oscillation Index, June 1995-June 2015	3

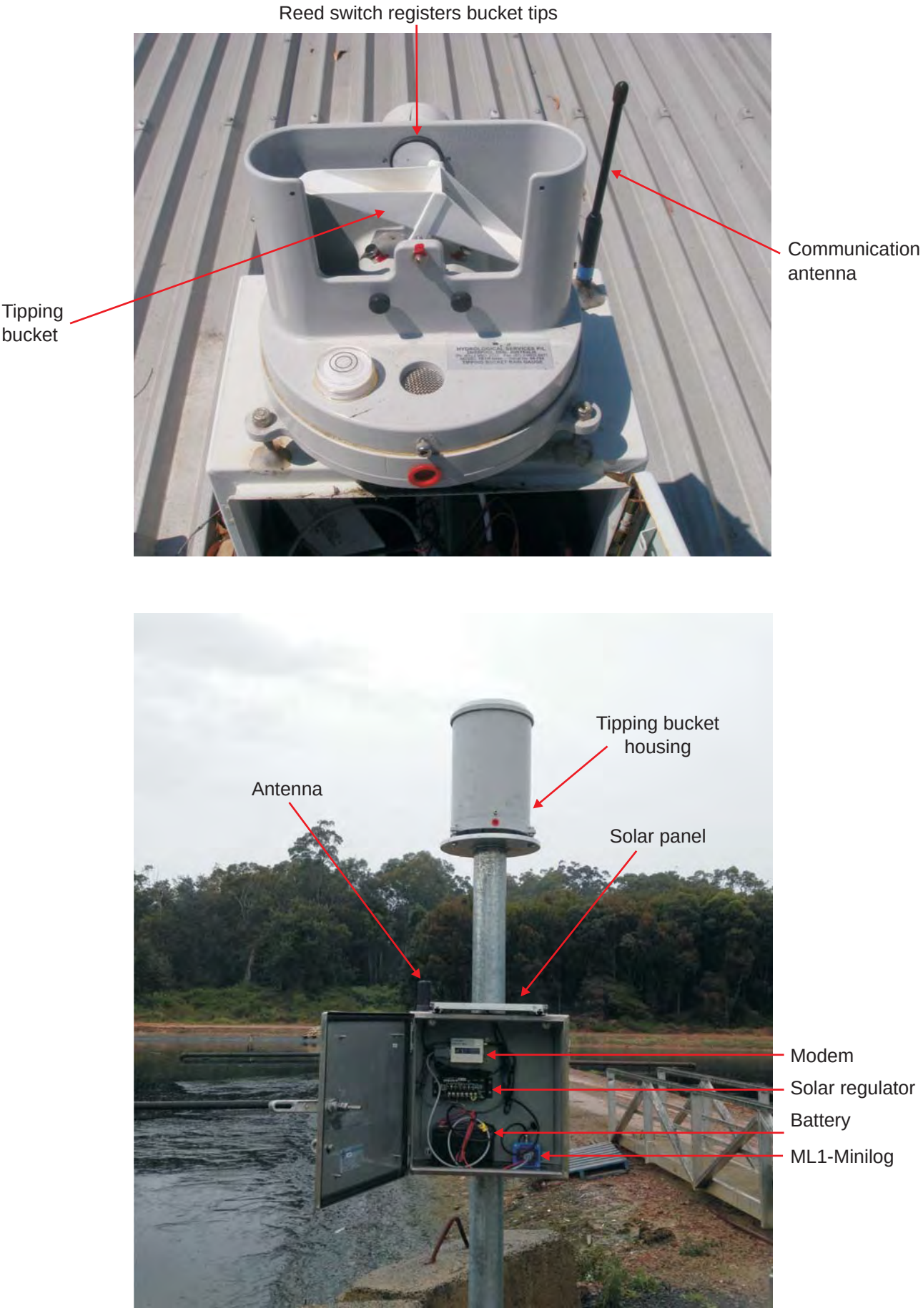
Region	Short Name	Station No.	MGA	Easting	Northing	Figure
Station Locality Map	Tweed River and Brunswick River Regions					4
Tweed	Cudgera	558046	56	549668	6859164	5
Brunswick	Main Arm	558053	56	542469	6847276	6
Brunswick	Huonbrook	558049	56	537723	6841573	7
Brunswick	Myocum	558036	56	550528	6837390	8
Station Locality Map	Richmond River Region					9
Richmond	Lake Ainsworth	203455	56	557863	6816160	10
Station Locality Map	Bellinger River Region (North)					11
Bellinger	Wooli Caravan Park	205463	56	524551	6697797	12
Station Locality Map	Bellinger River Region					13
Bellinger	Perry Drive	559019	56	510142	6650416	14
Bellinger	Shepards Lane	559017	56	508196	6650884	15
Bellinger	Red Hill	559016	56	506635	6649672	16
Bellinger	Newports Creek	559051	56	505893	6646680	17
Bellinger	Middle Boambee	559048	56	504720	6645291	18
Bellinger	South Boambee	559049	56	504826	6643617	19
Bellinger	North Bonville	559050	56	500593	6641143	20
Bellinger	Kooroowi	205440	56	482967	6629647	21
Station Locality Map	Nambucca River Region					22
Nambucca	Stuarts Island Downstream	205466	56	499519	6608564	23
Nambucca	Utungun	205414	56	485800	6600344	24
Station Locality Map	Macleay River and Hastings River Regions					25
Macleay	Aldavilla Downstream	206459	56	479318	6561231	26
Hastings	Green Valley	207406	56	486416	6540068	27
Hastings	Telegraph Point	207415	56	481082	6534512	28

Region	Short Name	Station No.	MGA	Easting	Northing	Figure
Station Locality Map	Camden Haven Region					29
Camden Haven	Logans Crossing	207428	56	470913	6502295	30
Manning	Mount George	208440	56	419229	6472262	31
Station Locality Map	Karuah River Region					32
Karuah	Nabiac	209404	56	436831	6446432	33
Karuah	Tuncurry	209401	56	450568	6442279	34
Karuah	Pacific Palms Wharf	209406	56	455401	6422551	35
Karuah	Tarbuck Bay	209465	56	451548	6417906	36
Karuah	Bulahdelah	209460	56	425442	6413407	37
Station Locality Map	Hunter River (North) Region					38
Hunter	Gostwyck	210402	56	369088	6396074	39
Hunter	Seaham	210462	56	381105	6385316	40
Hunter	Belmore Bridge	210458	56	364492	6377780	41
Hunter	Hexham Bridge	210448	56	376568	6368156	42
Station Locality Map	Macquarie-Tuggerah Lakes (North) Region					43
Macquarie-Tuggerah Lakes	Barnsley	561067	56	367906	6355834	44
Macquarie-Tuggerah Lakes	Martinsville	561083	56	351239	6341583	45
Macquarie-Tuggerah Lakes	Mandalong	561081	56	355224	6335165	46
Macquarie-Tuggerah Lakes	Wyee	561097	56	358608	6328268	47
Station Locality Map	Macquarie-Tuggerah Lakes (South) and Hawkesbury River Regions					48
Macquarie-Tuggerah Lakes	Whitemans Ridge	561026	56	343653	6324899	49
Macquarie-Tuggerah Lakes	Yarramalong	561137	56	338869	6322377	50
Macquarie-Tuggerah Lakes	Kulnura	561078	56	333796	6321517	51
Macquarie-Tuggerah Lakes	Toukley	211401	56	362599	6318531	52
Macquarie-Tuggerah Lakes	Hamlyn Terrace	561133	56	357399	6319854	53
Macquarie-Tuggerah Lakes	Mardi Dam	561082	56	351038	6314555	54
Macquarie-Tuggerah Lakes	Sterland	567138	56	342433	6315335	55
Macquarie-Tuggerah Lakes	Kangy Angy	561132	56	350168	6310609	56
Macquarie-Tuggerah Lakes	Berkeley Vale	561134	56	353191	6309376	57
Macquarie-Tuggerah Lakes	Bateau Bay	561069	56	358098	6305653	58
Macquarie-Tuggerah Lakes	Lisarow	561079	56	348900	6305317	59
Hawkesbury	Strickland	561136	56	345377	6305541	60
Hawkesbury	Narara	561085	56	344310	6304220	61
Hawkesbury	Mount Elliot	561084	56	350646	6302980	62
Hawkesbury	Wyoming	561098	56	346415	6302026	63
Hawkesbury	Kincumber	561077	56	350387	6294461	64
Station Locality Map	Hawkesbury River (Mid) Region					65
Hawkesbury	Webbs Creek	212408	56	312331	6303939	66
Hawkesbury	Colo Junction	212407	56	303223	6298183	67
Hawkesbury	Sackville Downstream	212438	56	302769	6291566	68

Region	Short Name	Station No.	MGA	Easting	Northing	Figure
Station Locality Map	Sydney Coastal Region					69
Sydney Coastal	Curl Curl	213426	56	342094	6262459	70
Sydney Coastal	Kelso Creek	213430	56	313782	6241020	71
Station Locality Map	Wollongong Coastal Region					72
Wollongong Coastal	Rixons Pass	568317	56	305281	6196889	73
Wollongong Coastal	Russell Vale	568318	56	306377	6196135	74
Wollongong Coastal	Mount Pleasant	568229	56	303026	6191630	75
Wollongong Coastal	Mount Kembla	568314	56	299550	6186441	76
Wollongong Coastal	Dombarton Loop	568307	56	294719	6185605	77
Wollongong Coastal	Wongawilli	568320	56	293261	6182388	78
Wollongong Coastal	Port Kembla	568316	56	306636	6182719	79
Wollongong Coastal	Darkes Road	568309	56	297450	6182477	80
Wollongong Coastal	Cleveland Road	568308	56	295800	6179726	81
Wollongong Coastal	Huntley Colliery	568311	56	290648	6178905	82
Wollongong Coastal	Upper Calderwood	568319	56	288750	6175160	83
Wollongong Coastal	Little Lake Entrance	214467	56	304250	6173571	84
Wollongong Coastal	Nurrewin	568228	56	284567	6173437	85
Wollongong Coastal	Clover Hill	568310	56	284233	6172392	86
Wollongong Coastal	North Macquarie	568315	56	291440	6171492	87
Wollongong Coastal	Yellow Rock Road	568321	56	292886	6167649	88
Station Locality Map	South Coast (Mid) Region					89
South Coast	Barlows Bay	218415	56	239464	5988955	90
South Coast	Regatta Point	219405	56	236881	5971060	91

Table 5.2 Index of Appendix B Figures

Sample Rainfall Data Outputs	Figure
Sample Daily and Monthly Rainfall Plots	B1
Sample Intensity-Frequency-Duration formulated in 1987	B2
Sample Intensity-Frequency-Duration formulated in 2013	B3
Sample Rain Gauge Tip Times	B4



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TYPICAL PLUVIOMETER STATION

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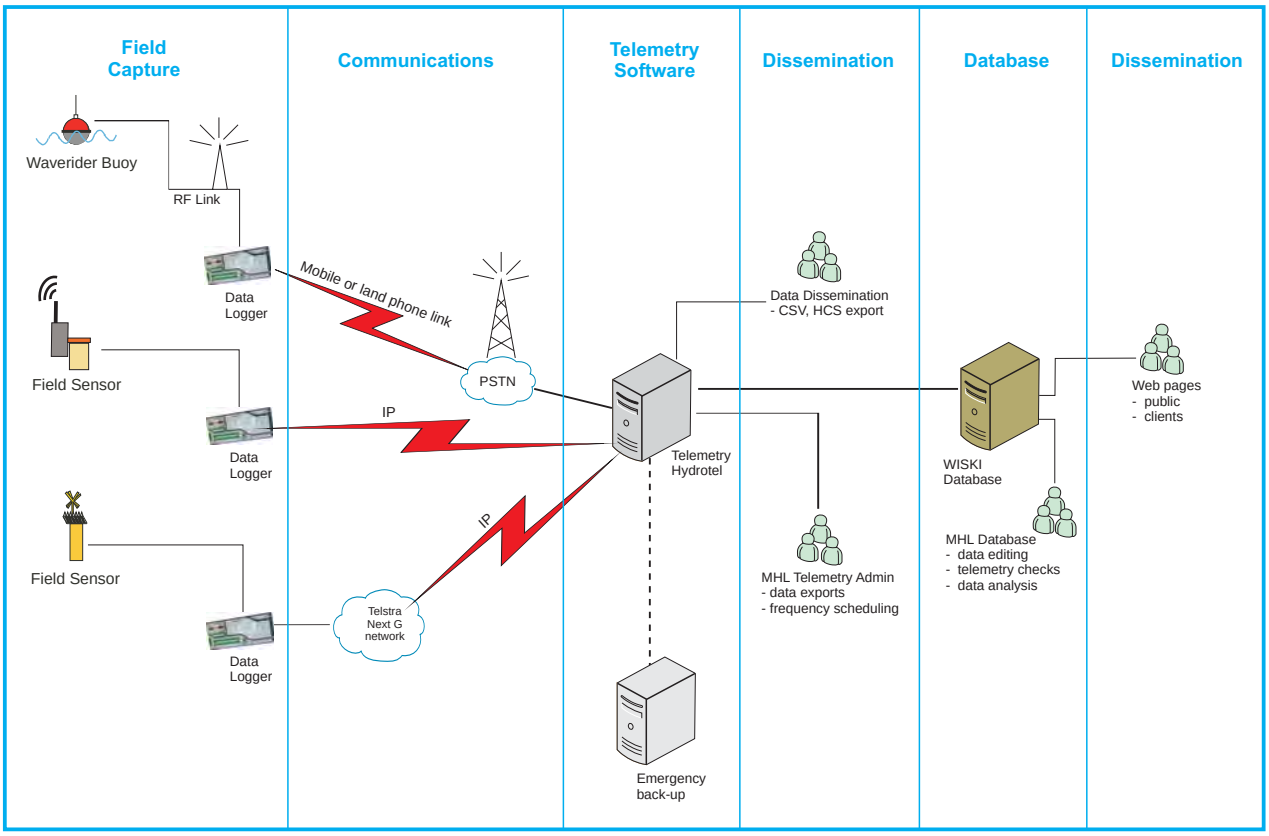
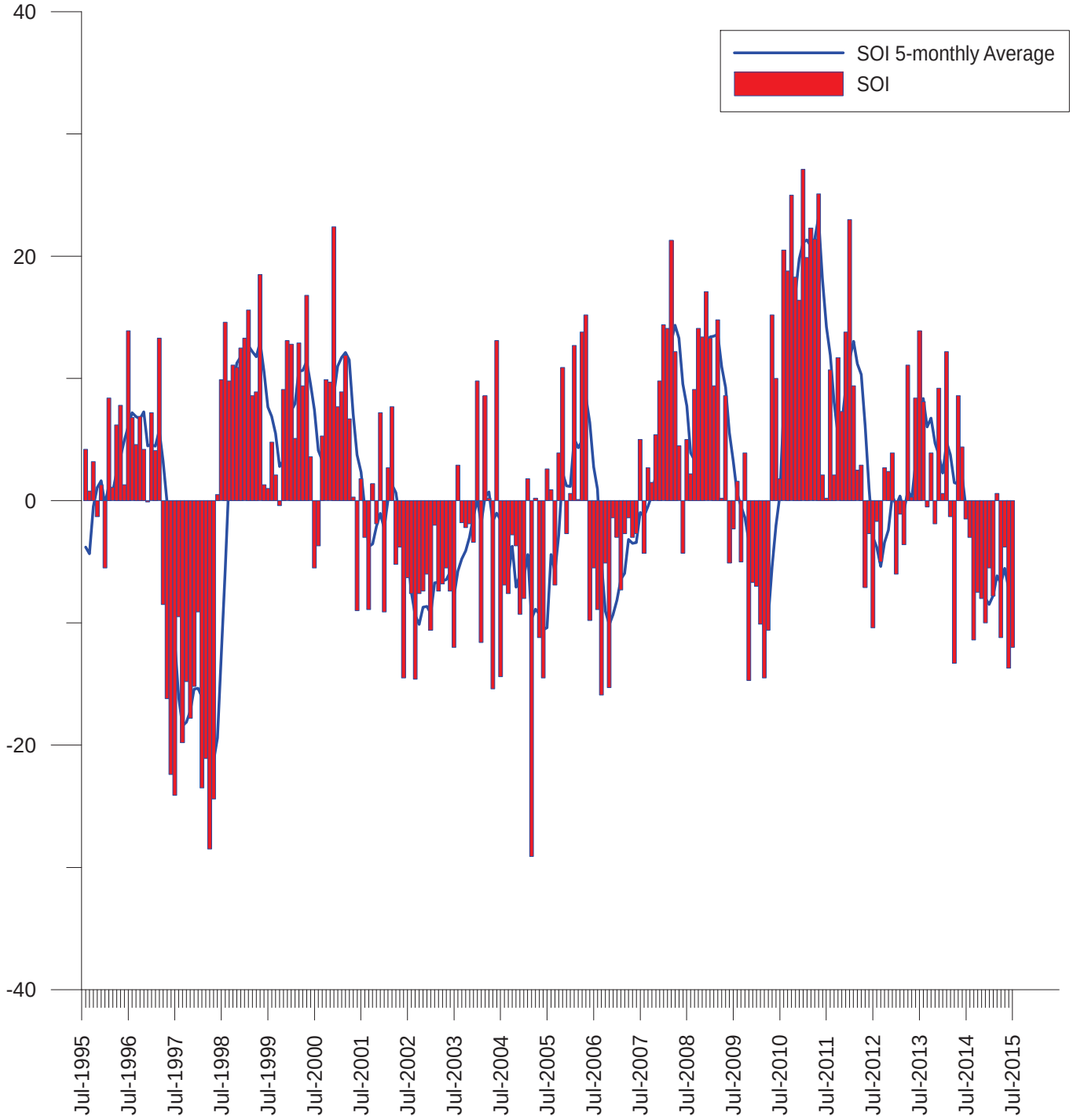
Figure 1

DRAWING 2385-01.cdr


Field Capture
Communications
Telemetry Software
Dissemination
Database
Dissemination
Waverider Buoy
RF Link
Data Logger
Mobile or land phone link
PSTN
Field Sensor
IP
Data Logger
Telemetry Hydrotel
Data Dissemination
- CSV, HCS export
Web pages
- public
- clients
WISKI Database
Field Sensor
IP
Telstra Next G network
Data Logger
MHL Telemetry Admin
- data exports
- frequency scheduling
MHL Database
- data editing
- telemetry checks
- data analysis
Emergency back-up



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SOUTHERN OSCILLATION INDEX
JULY 1995–JUNE 2015

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Figure 3
DRAWING 2385-01.cdr

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RAINFALL STATION LOCATIONS
TWEED RIVER AND BRUNSWICK RIVER REGIONS

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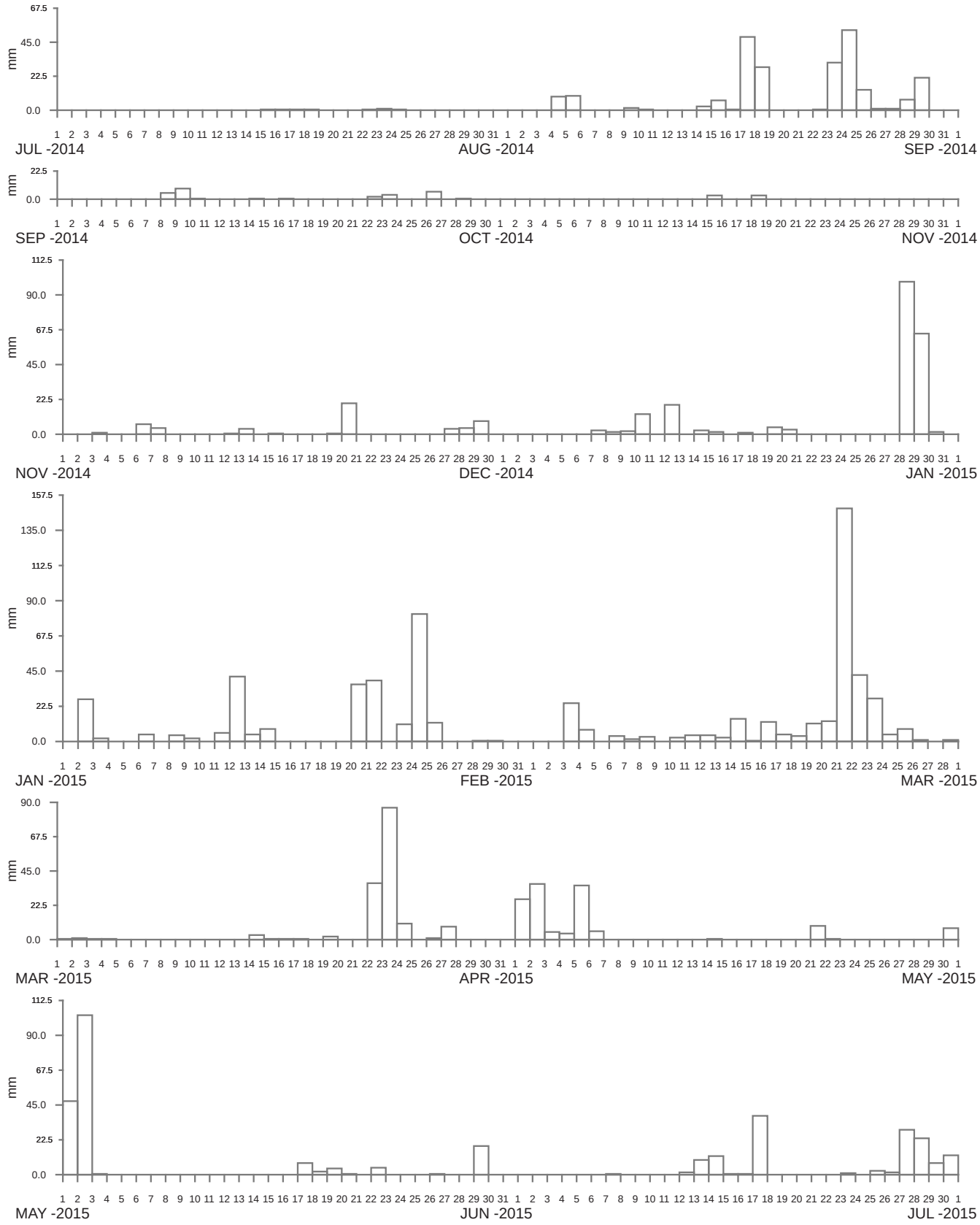
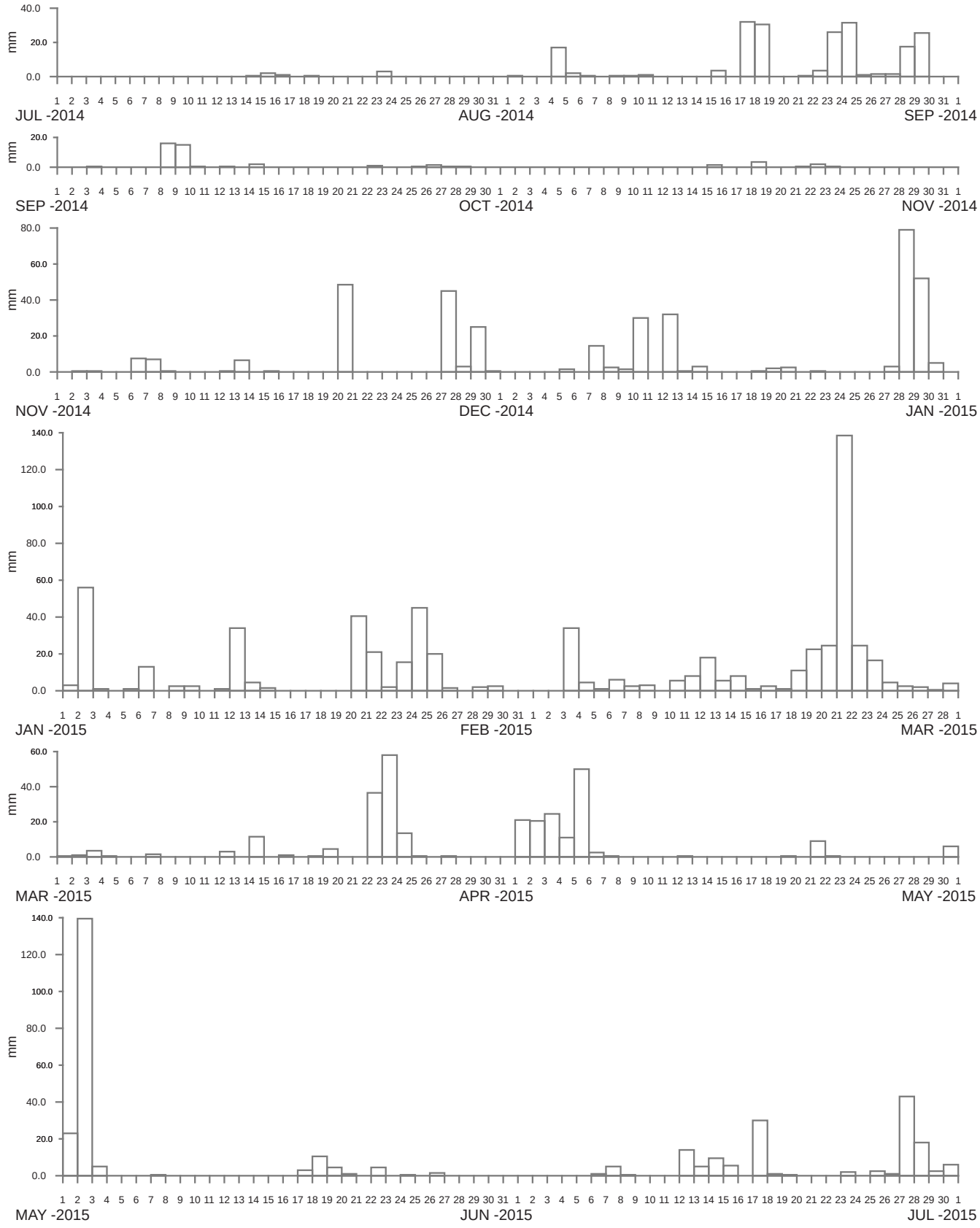
Figure 4

DRAWING 2385-04.cdr



DATA LOSS

NSW GOVERNMENT Public Works Manly Hydraulics Laboratory	CUDGERA AT CABBAGE GUM ROAD 2014–2015	MHL Report 2385 Figure 5 DRAWING 2385-5



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

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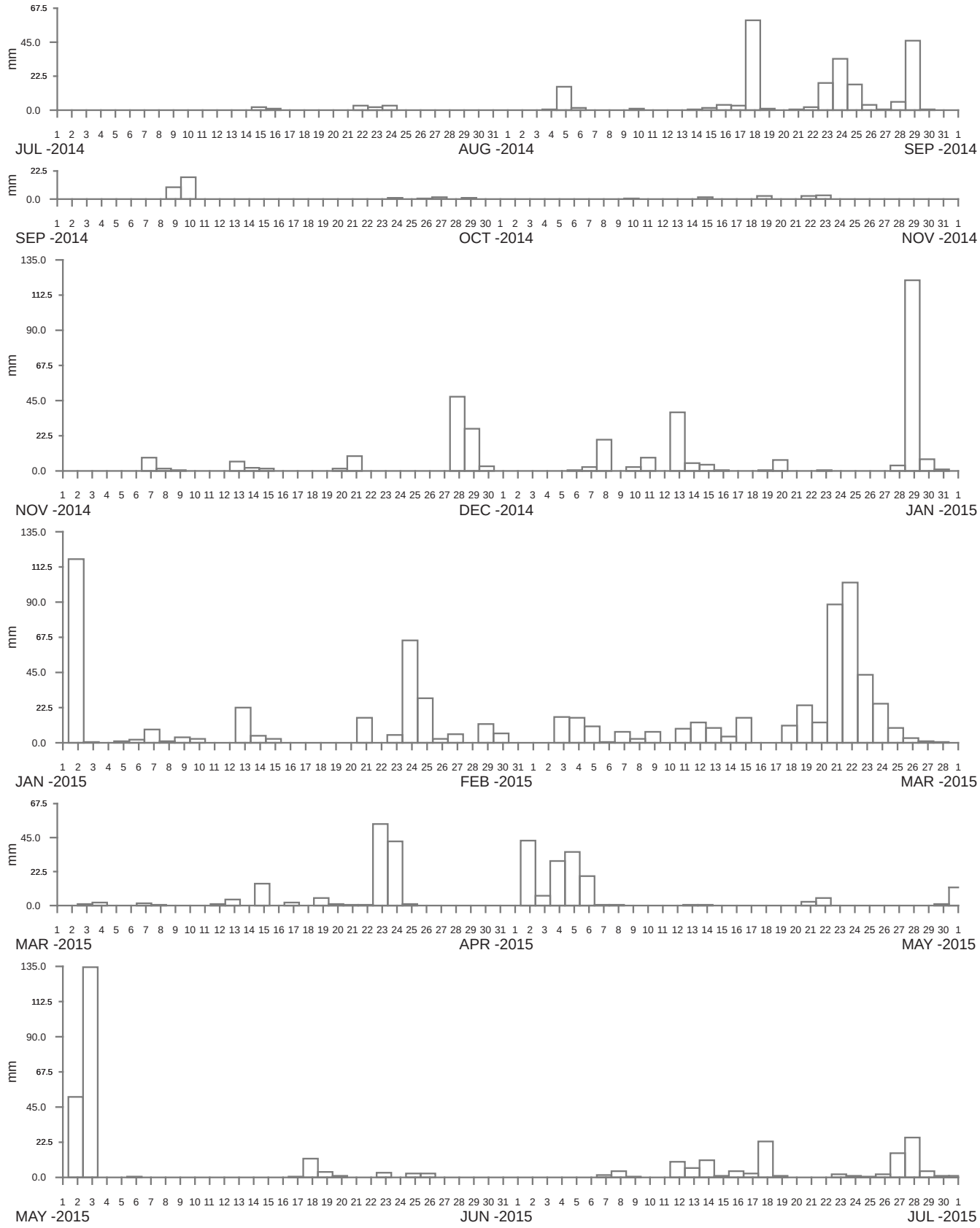
MAIN ARM AT MAIN ARM ROAD
2014–2015

MHL Report 2385
Figure 6
DRAWING 2385-6



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HUONBROOK AT WILSONS CREEK ROAD
2014–2015

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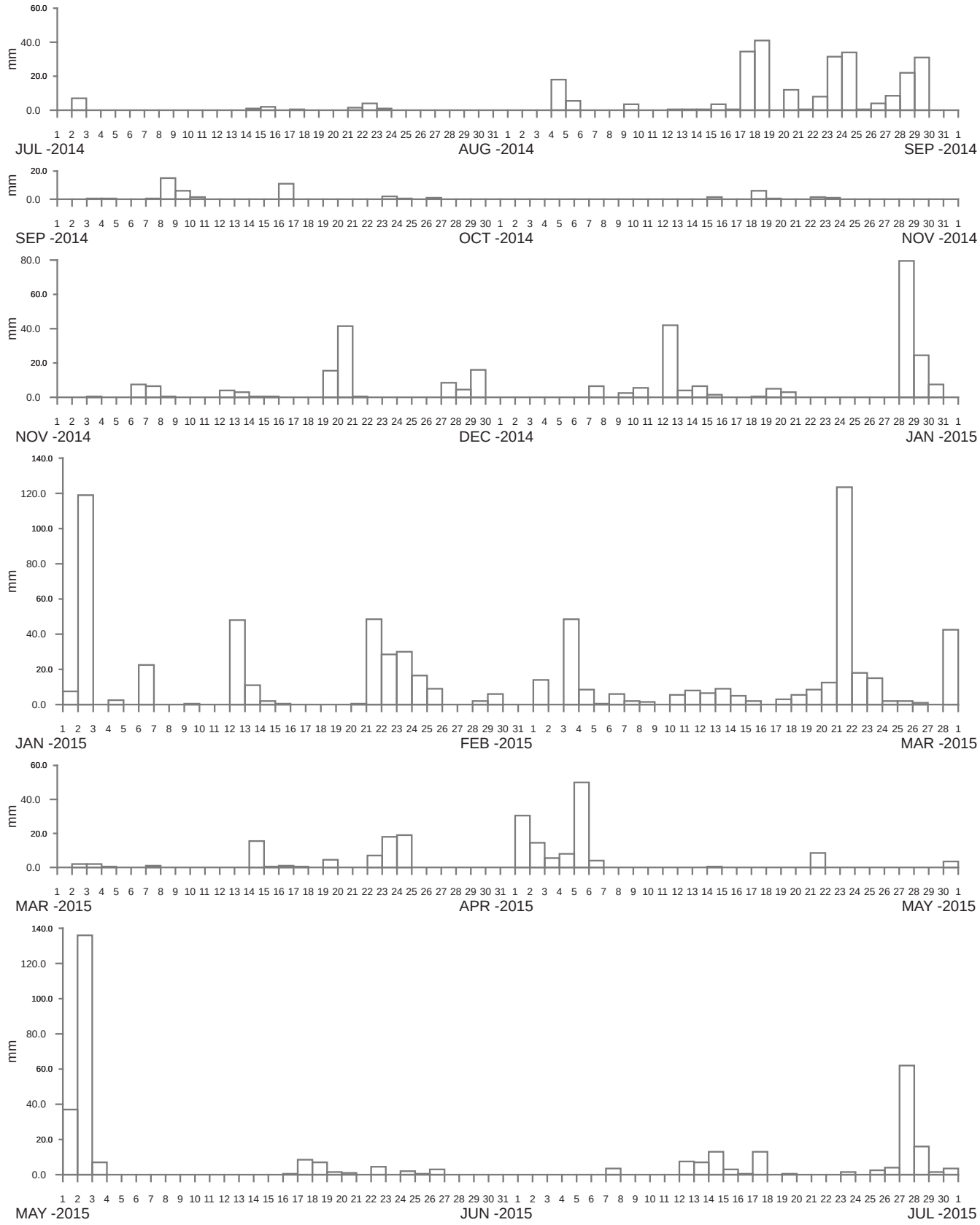
Figure 7
DRAWING 2385-7



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

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MYOCUM AT KINGSVALE ROAD
2014–2015

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Figure 8
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RAINFALL STATION LOCATIONS
RICHMOND RIVER REGION

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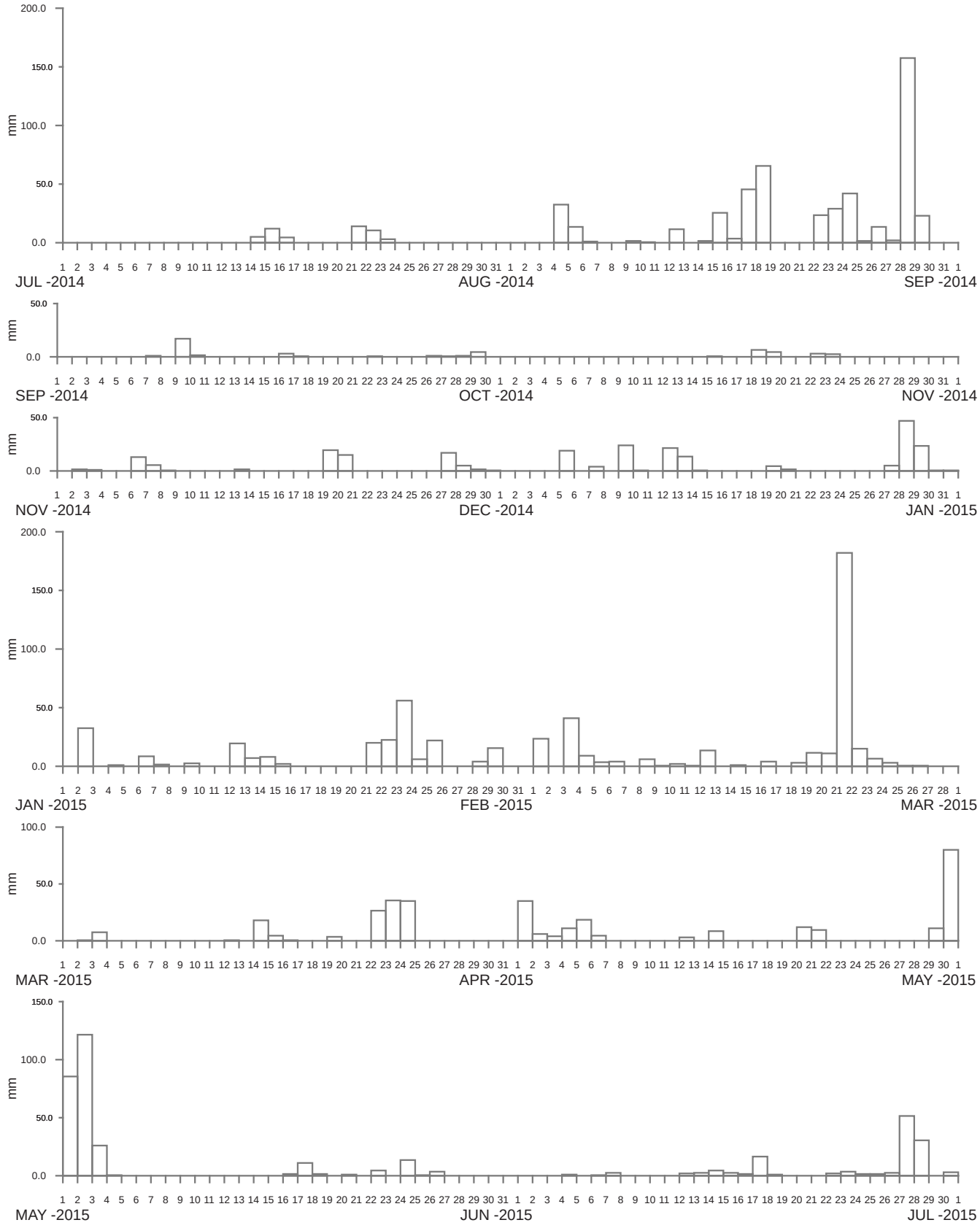
Figure 9

DRAWING 2385-09.cdr



DATA LOSS

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LENNOX HEAD AT LAKE AINSWORTH
2014–2015

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Figure 10

DRAWING 2385-10

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RAINFALL STATION LOCATIONS
BELLINGER RIVER REGION (NORTH)

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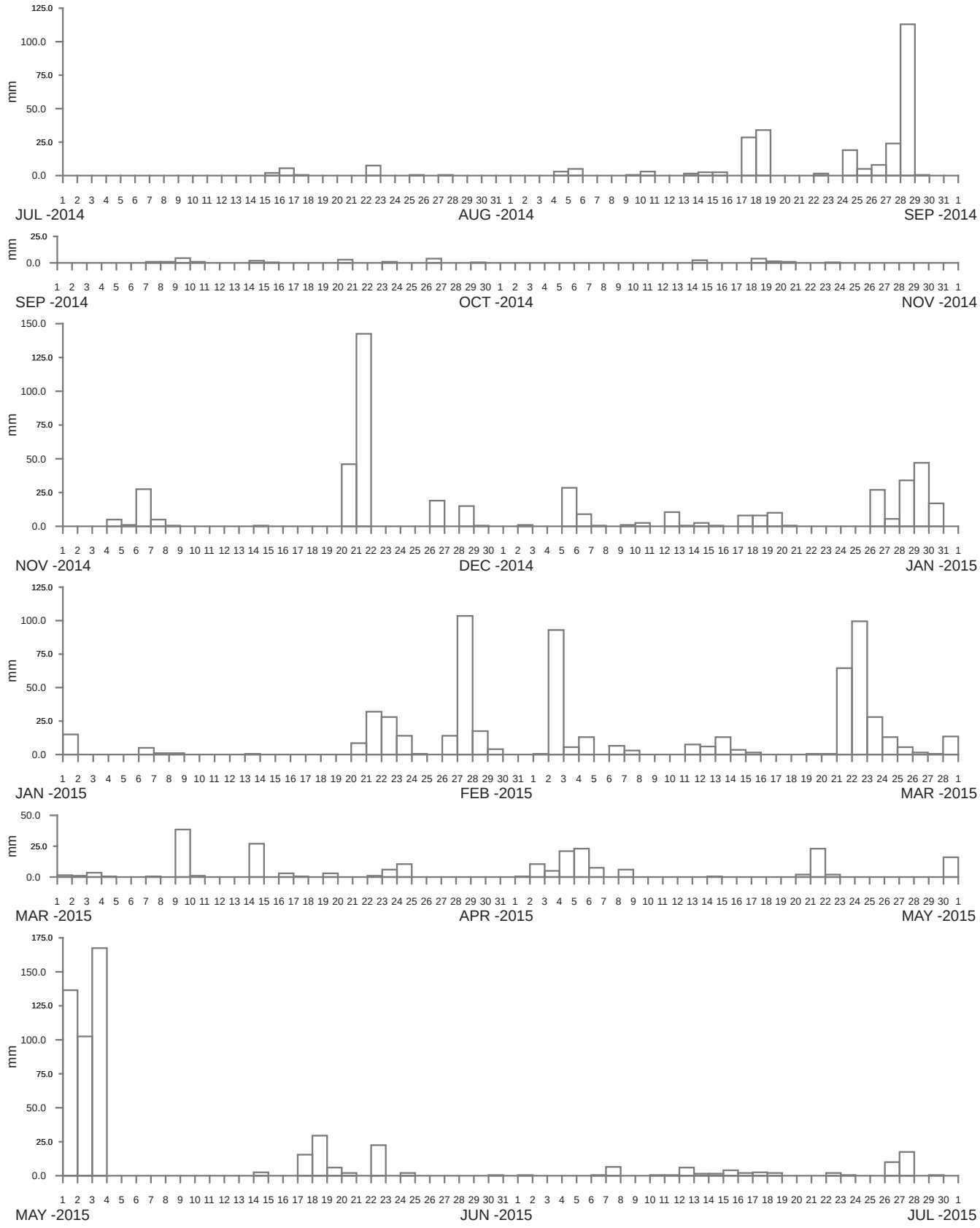
Figure 11

DRAWING 2385-11.cdr



DATA LOSS

Public Works
Manly Hydraulics Laboratory

WOOLI RIVER AT WOOLI CARAVAN PARK
2014–2015

MHL Report 2385
Figure 12
DRAWING 2385-12

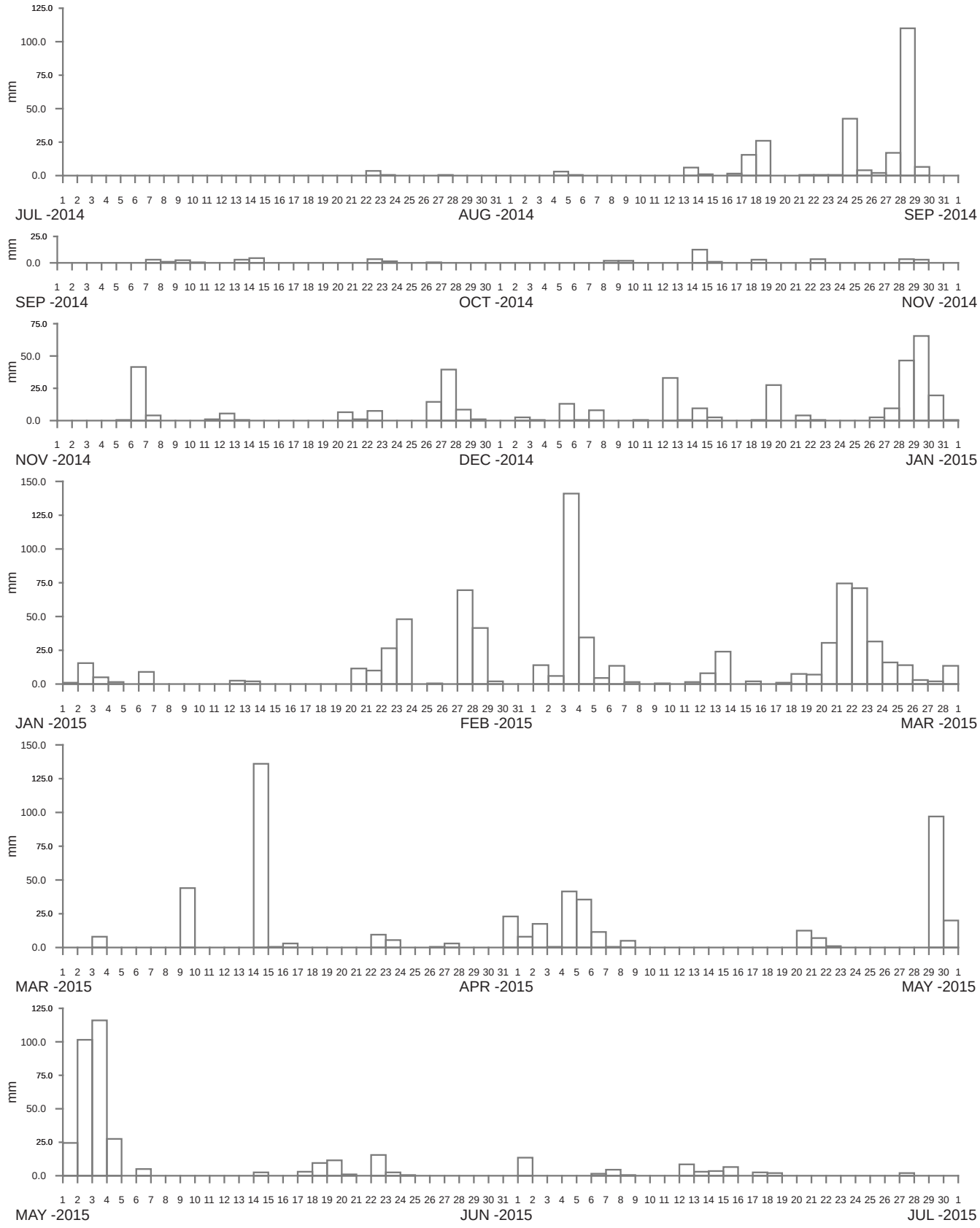
Public Works
Manly Hydraulics Laboratory

RAINFALL STATION LOCATIONS
BELLINGER RIVER REGION

MHL Report 2385

Figure 13

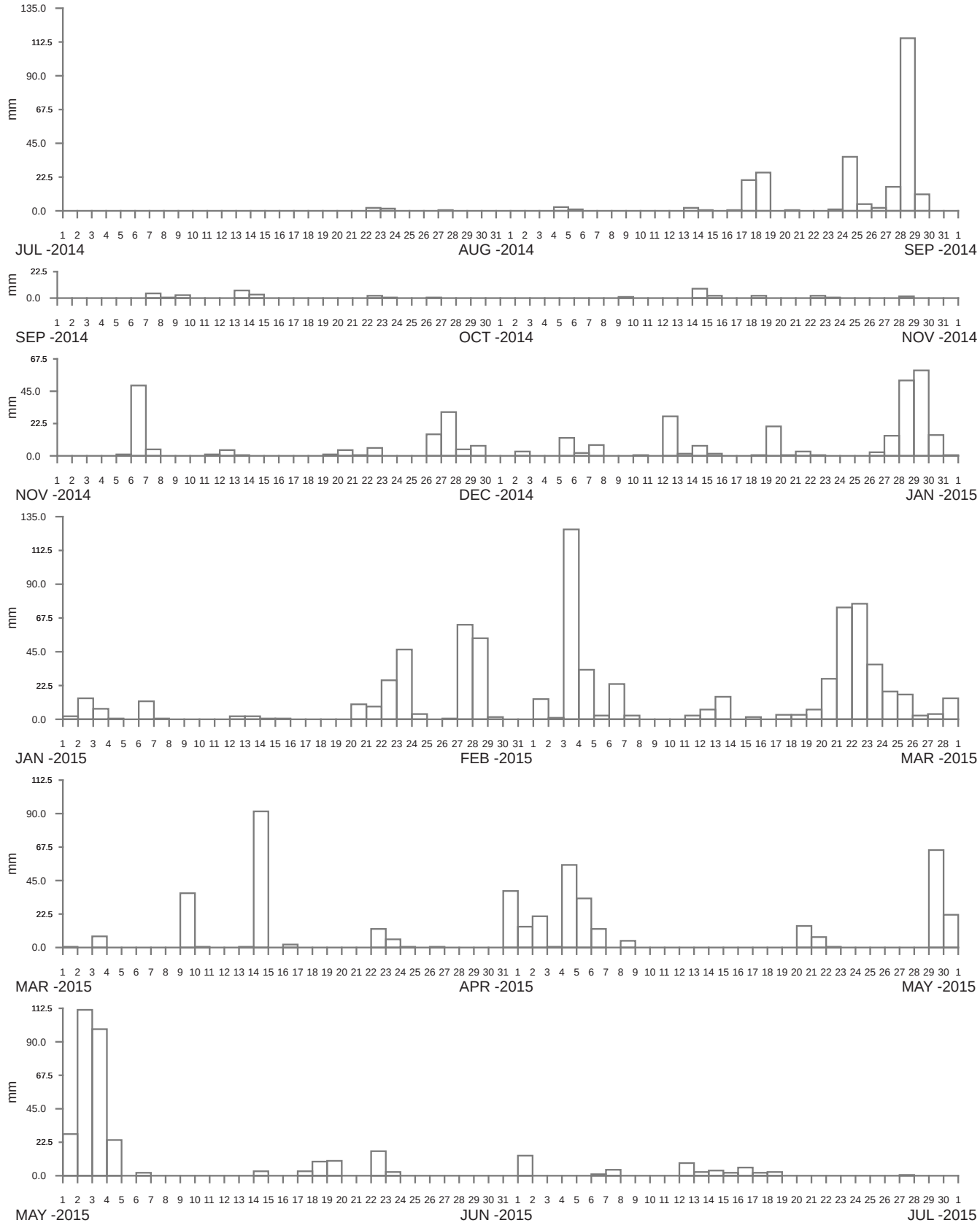
DRAWING 2385-13.cdr



Public Works
Manly Hydraulics Laboratory

COFFS HARBOUR AT PERRY DRIVE
2014–2015

MHL Report 2385
Figure 14
DRAWING 2385-14

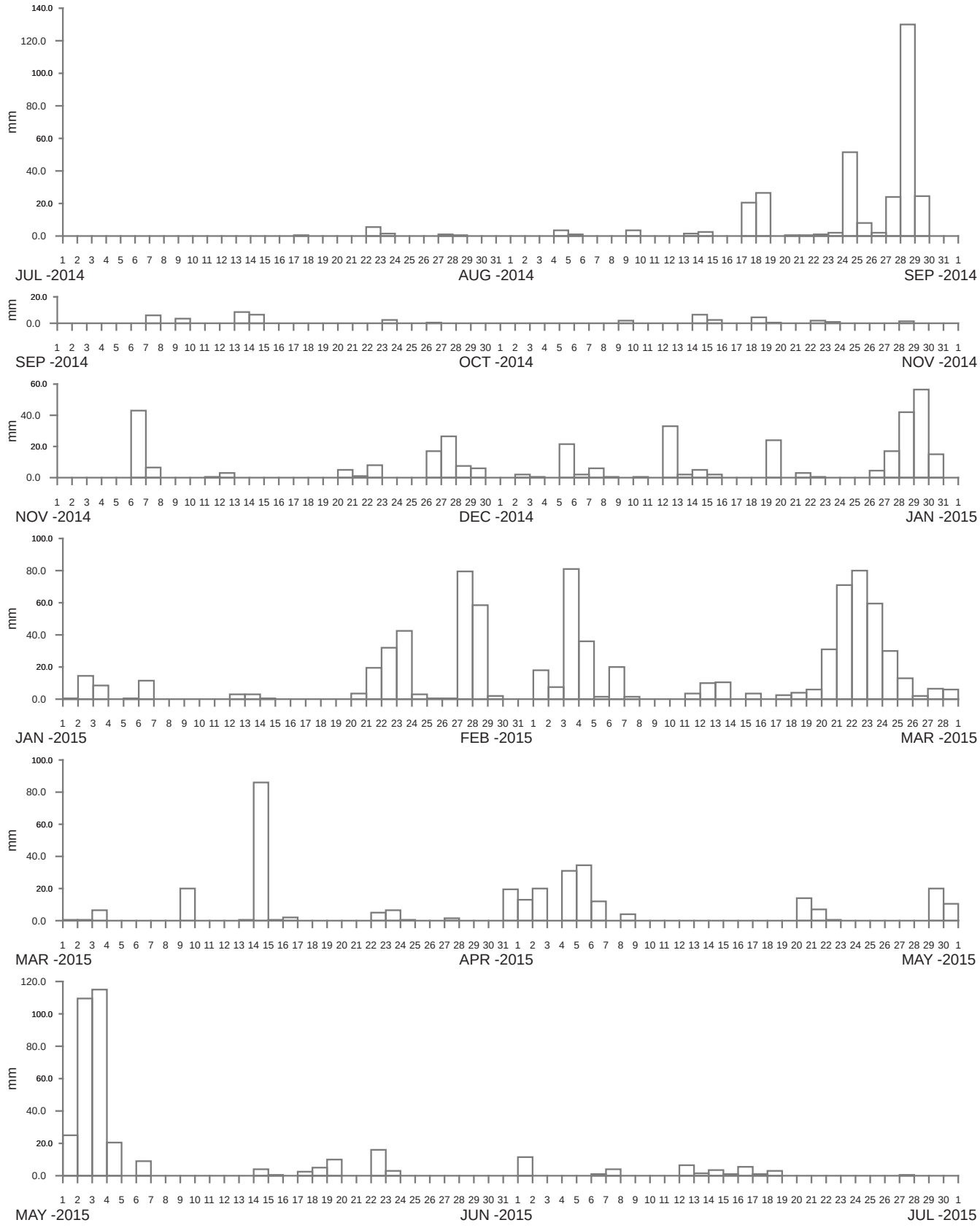


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

COFFS HARBOUR AT SHEPARDS LANE
2014–2015

MHL Report 2385
Figure 15
DRAWING 2385-15



DATA LOSS

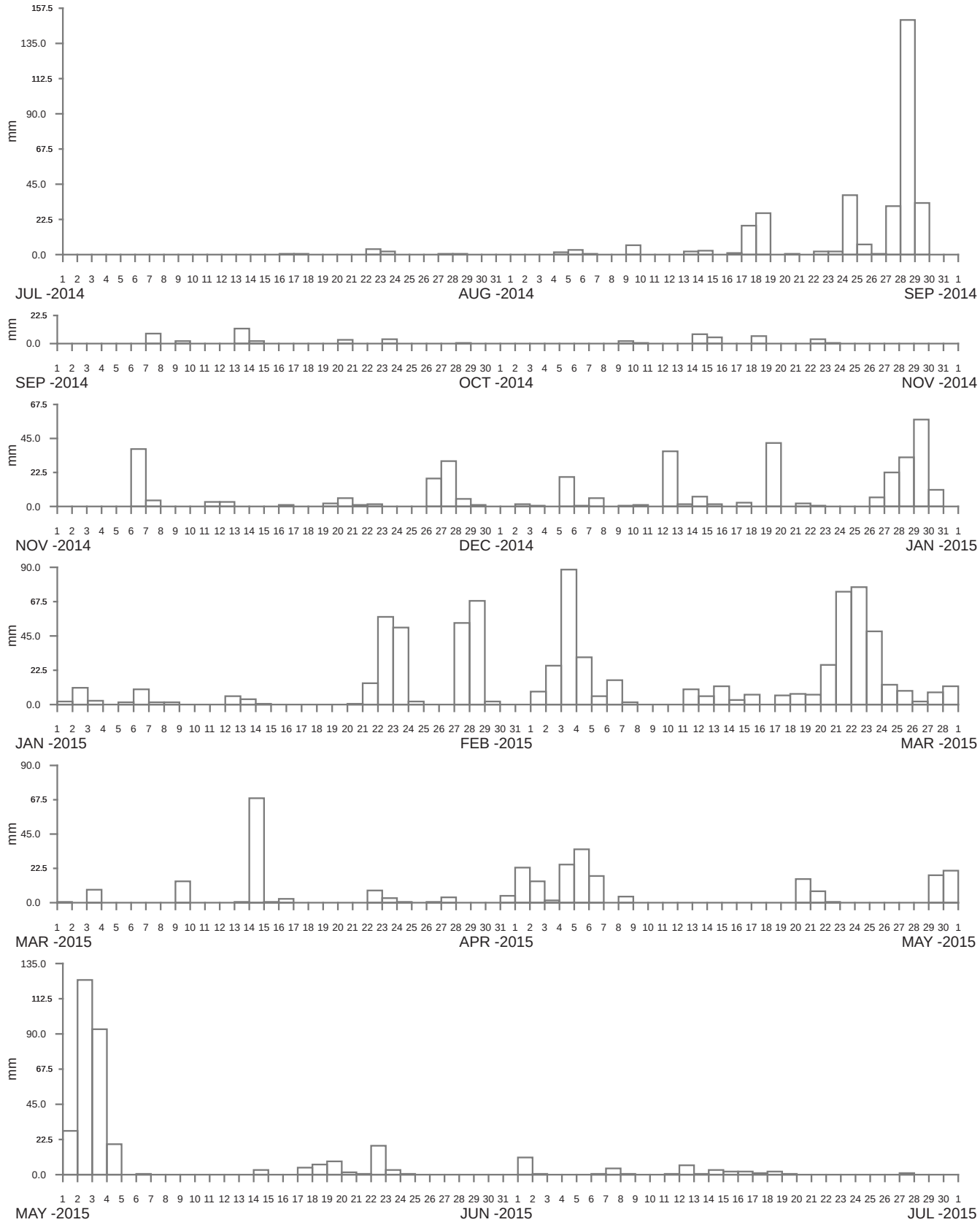
Public Works
Manly Hydraulics Laboratory

COFFS HARBOUR AT RED HILL
2014–2015

MHL Report 2385

Figure 16

DRAWING 2385-16

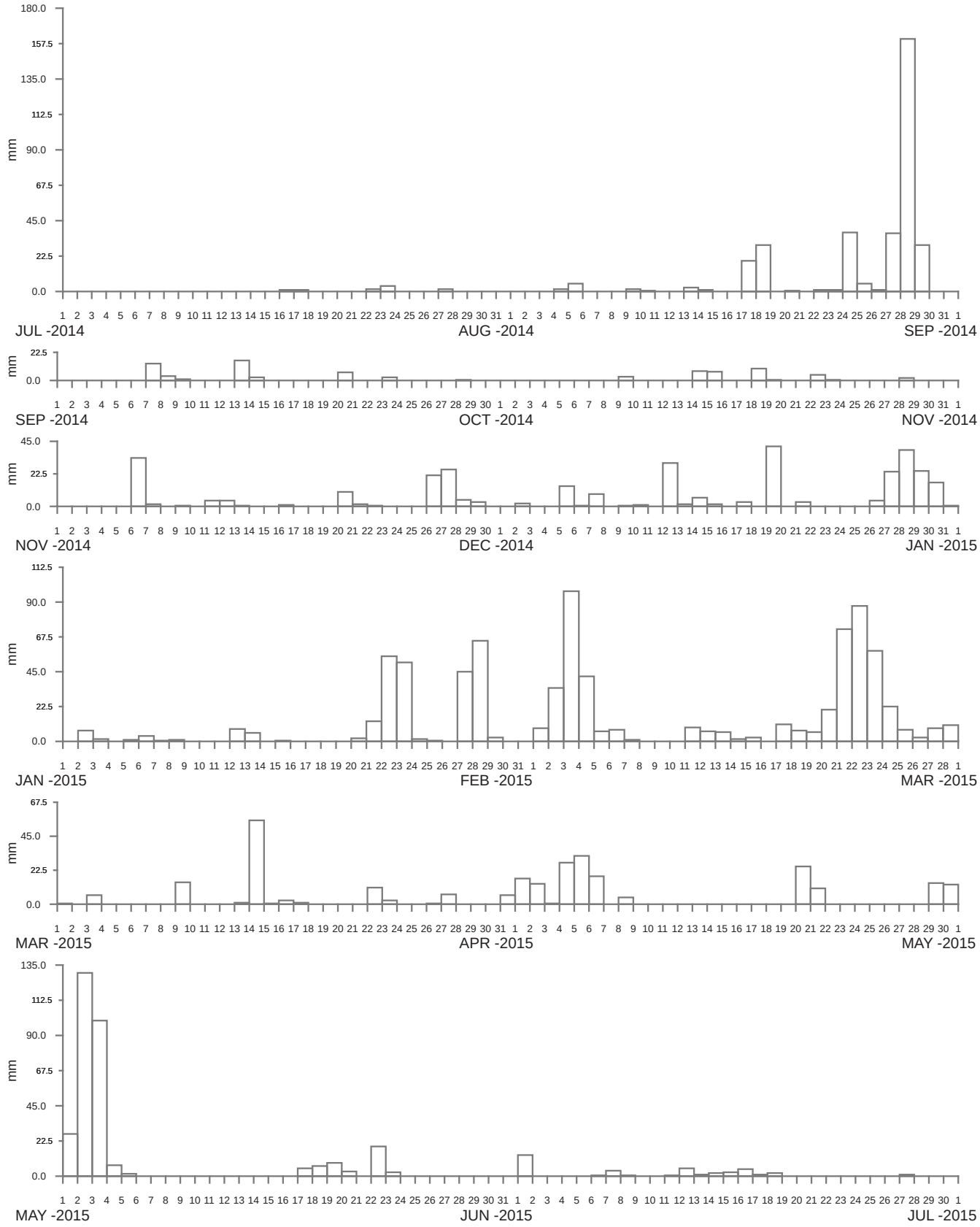


DATA LOSS

Public Works
Manly Hydraulics Laboratory

NEWPORTS CREEK AT ENGLANDS ROAD
2014–2015

MHL Report 2385
Figure 17
DRAWING 2385-17

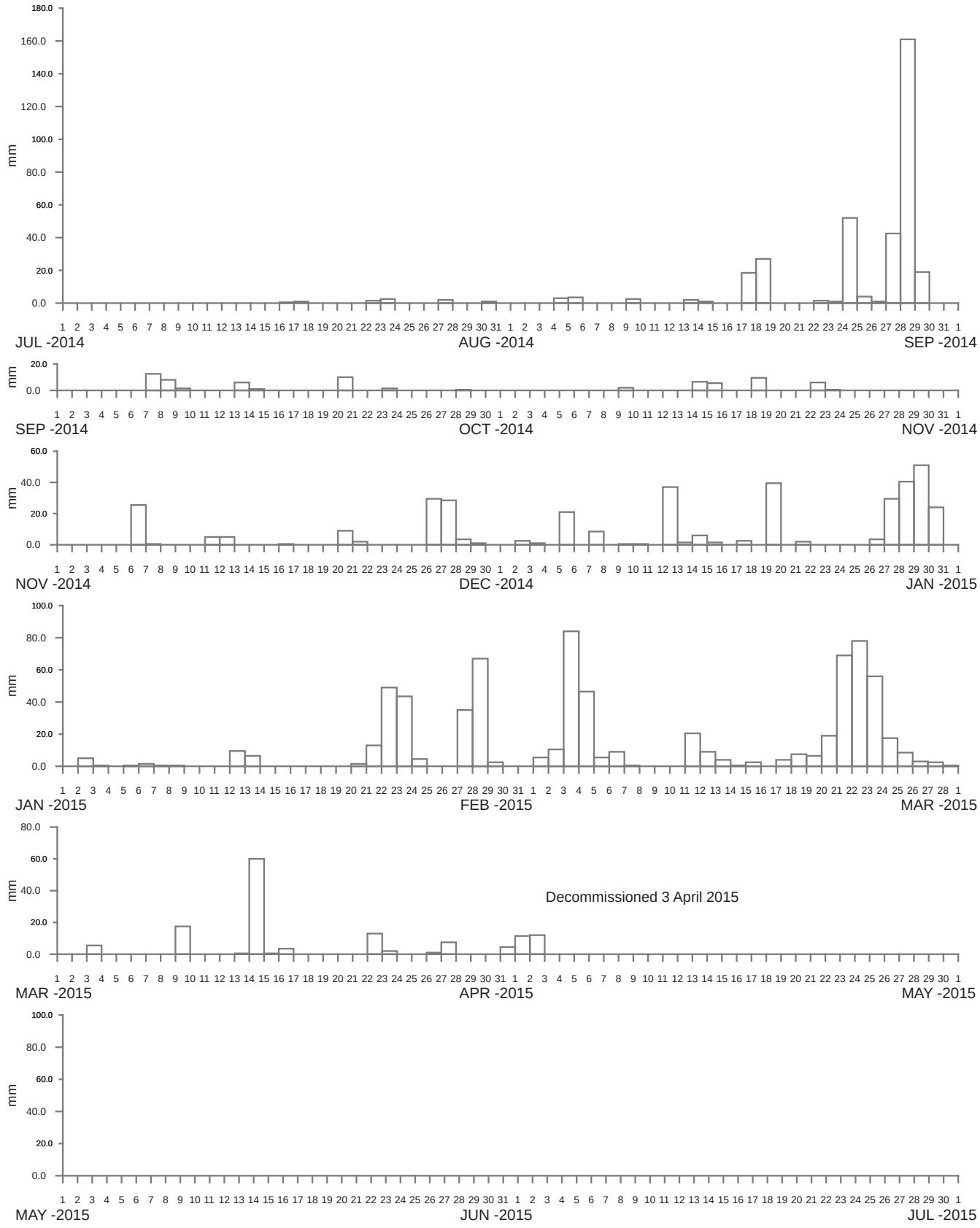


DATA LOSS

Public Works
Manly Hydraulics Laboratory

MIDDLE BOAMBEE AT CEDARVALE ROAD
2014–2015

MHL Report 2385
Figure 18
DRAWING 2385-18



DATA LOSS

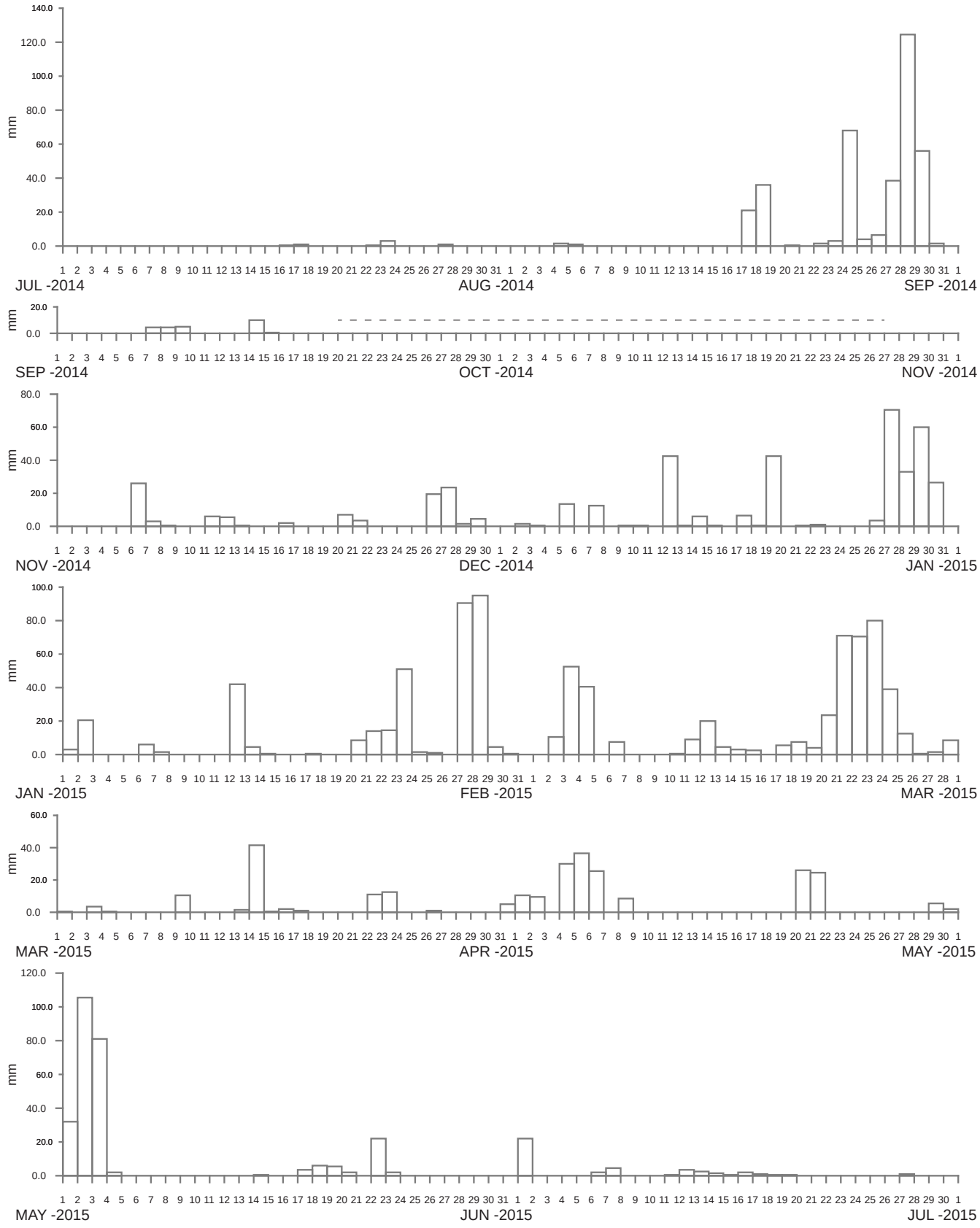
Public Works
Manly Hydraulics Laboratory

SOUTH BOAMBEE AT SOUTH BOAMBEE ROAD
2014–2015

MHL Report 2385

Figure 19

DRAWING 2385-19



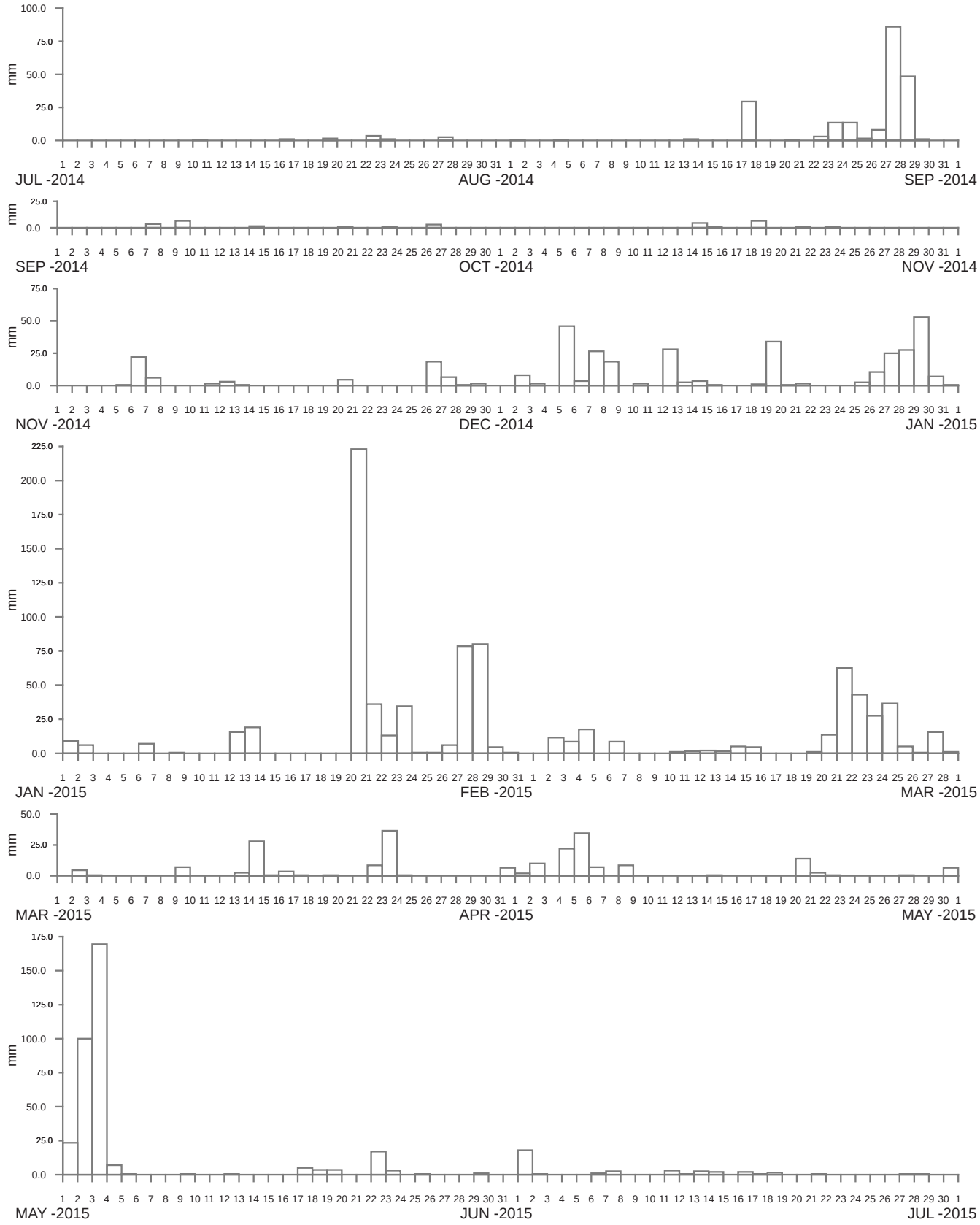
Public Works
Manly Hydraulics Laboratory

NORTH BONVILLE AT NORTH BONVILLE ROAD
2014–2015

MHL Report 2385

Figure 20

DRAWING 2385-20



Public Works
Manly Hydraulics Laboratory

KALANG RIVER AT KOOROOWI
2014–2015

MHL Report 2385
Figure 21
DRAWING 2385-21

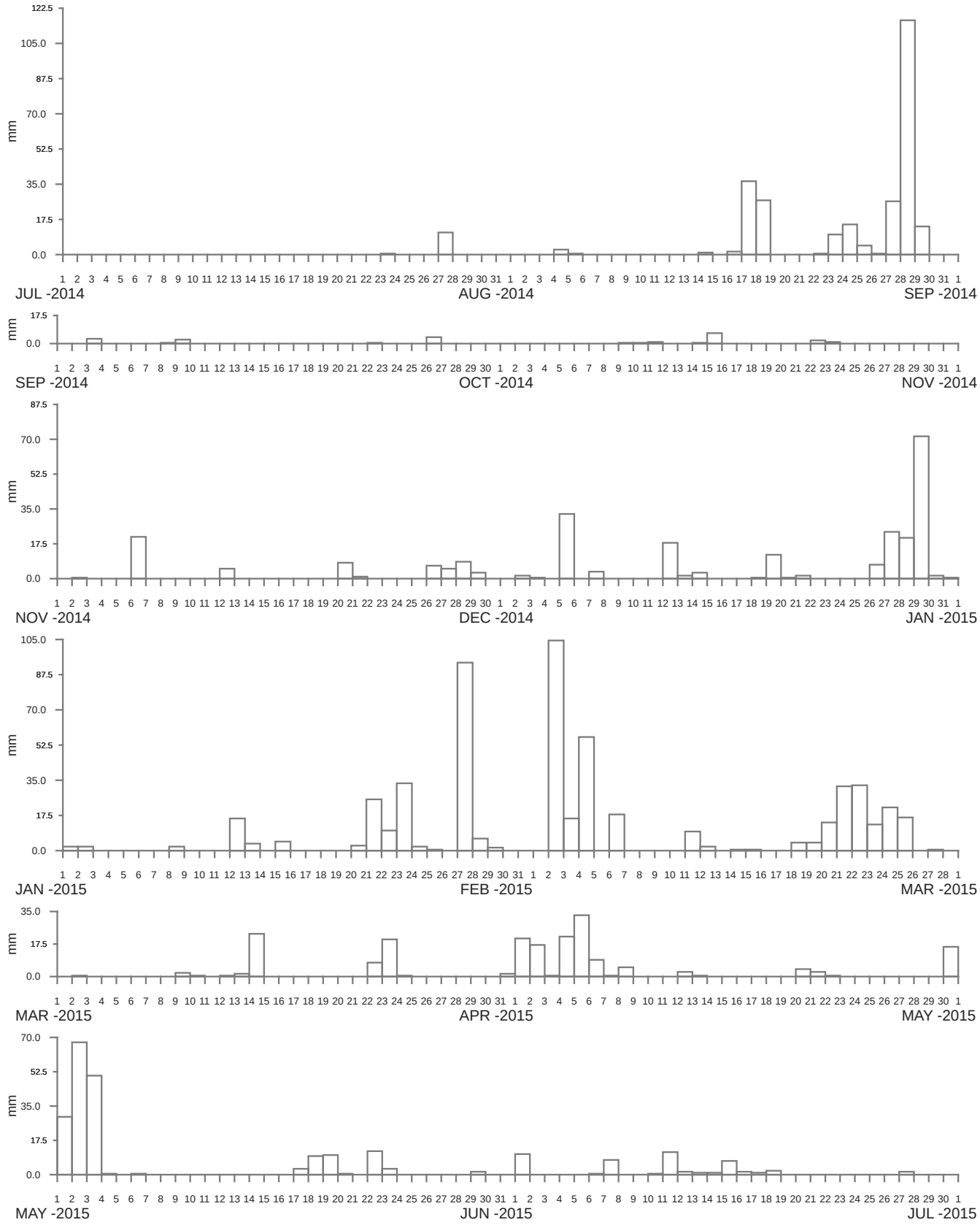
Public Works
Manly Hydraulics Laboratory

RAINFALL STATION LOCATIONS
NAMBUCCA RIVER REGION

MHL Report 2385

Figure 22

DRAWING 2385-22.cdr

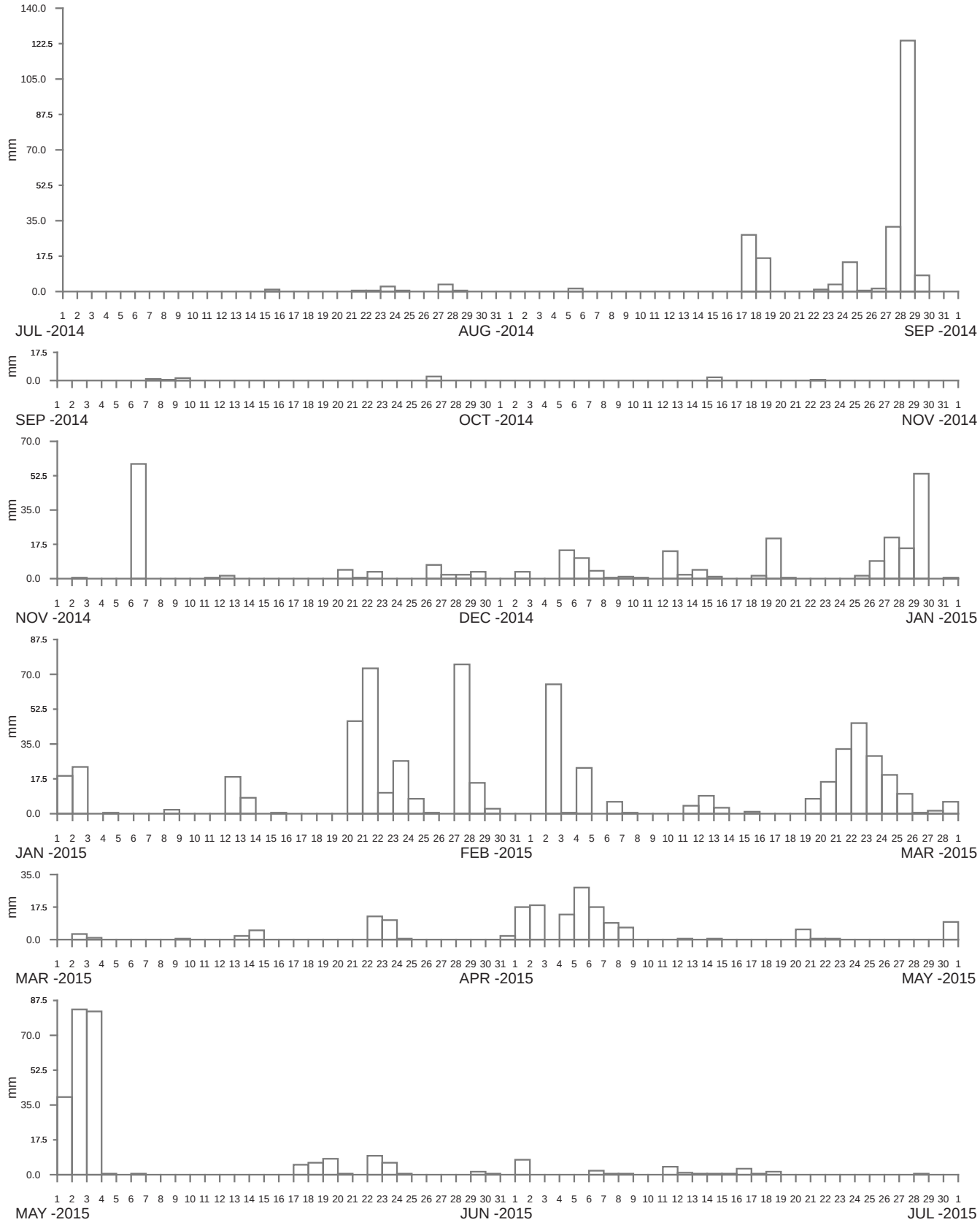


DATA LOSS

Public Works
Manly Hydraulics Laboratory

NAMBUCCA RIVER AT STUARTS ISLAND DOWNSTREAM
2014–2015

MHL Report 2385
Figure 23
DRAWING 2385-23



Public Works
Manly Hydraulics Laboratory

NAMBUCCA RIVER AT UTUNGUN
2014–2015

MHL Report 2385
Figure 24
DRAWING 2385-24

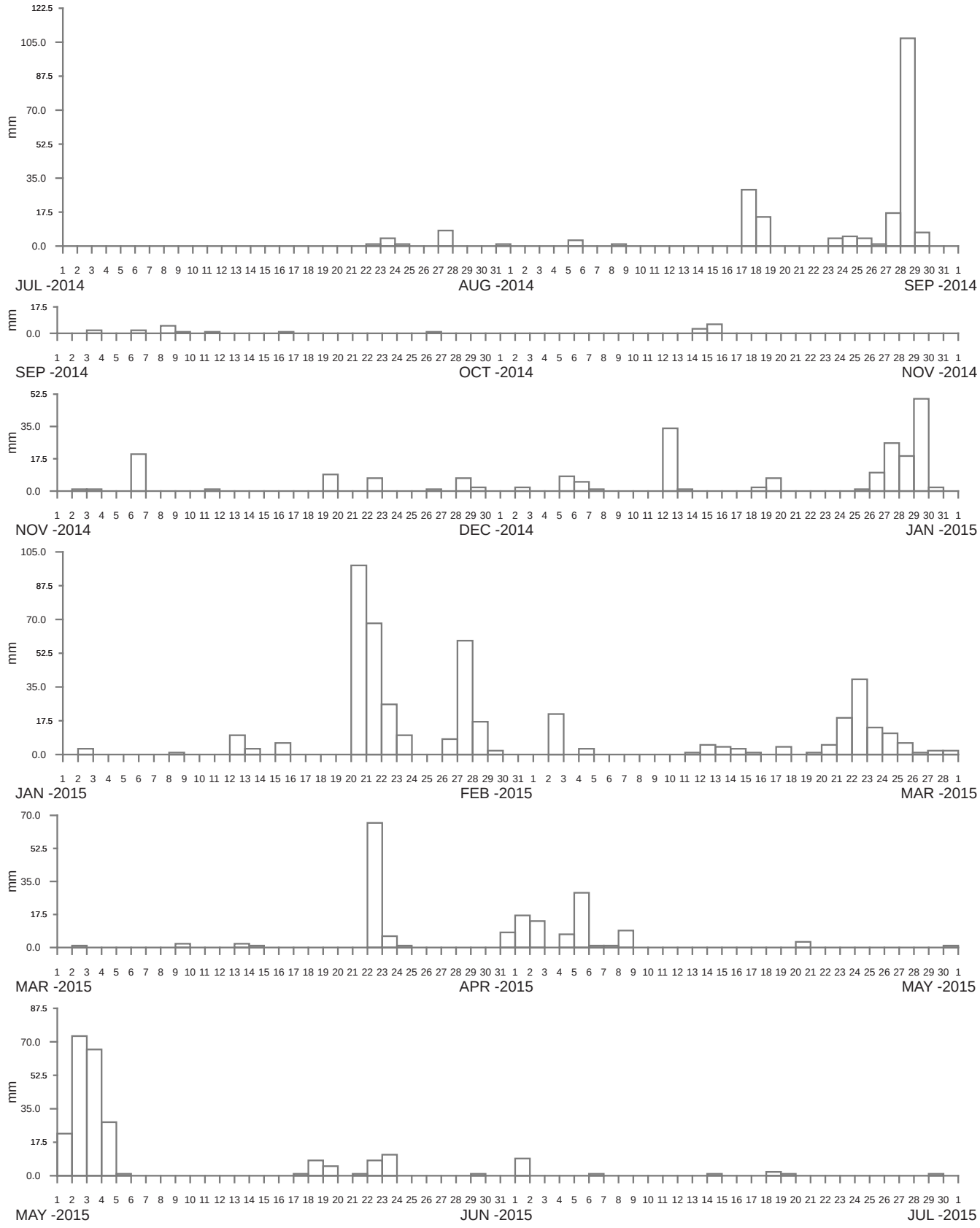
Public Works
Manly Hydraulics Laboratory

RAINFALL STATION LOCATIONS
MACLEAY RIVER AND HASTINGS RIVER REGION

MHL Report 2385

Figure 25

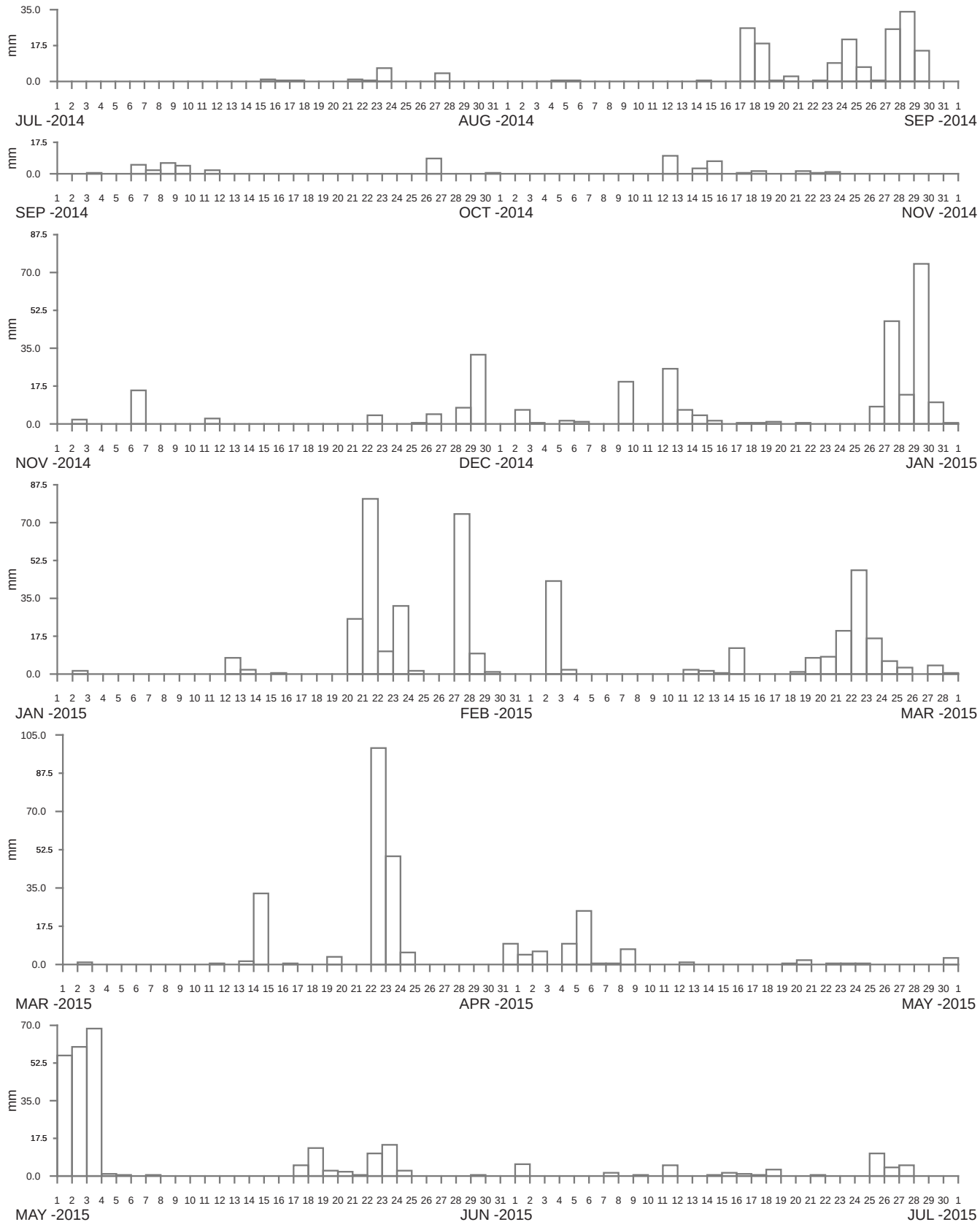
DRAWING 2385-25.cdr



Public Works
Manly Hydraulics Laboratory

MACLEAY RIVER AT ALDAVILLA DOWNSTREAM
2014–2015

MHL Report 2385
Figure 26
DRAWING 2385-26

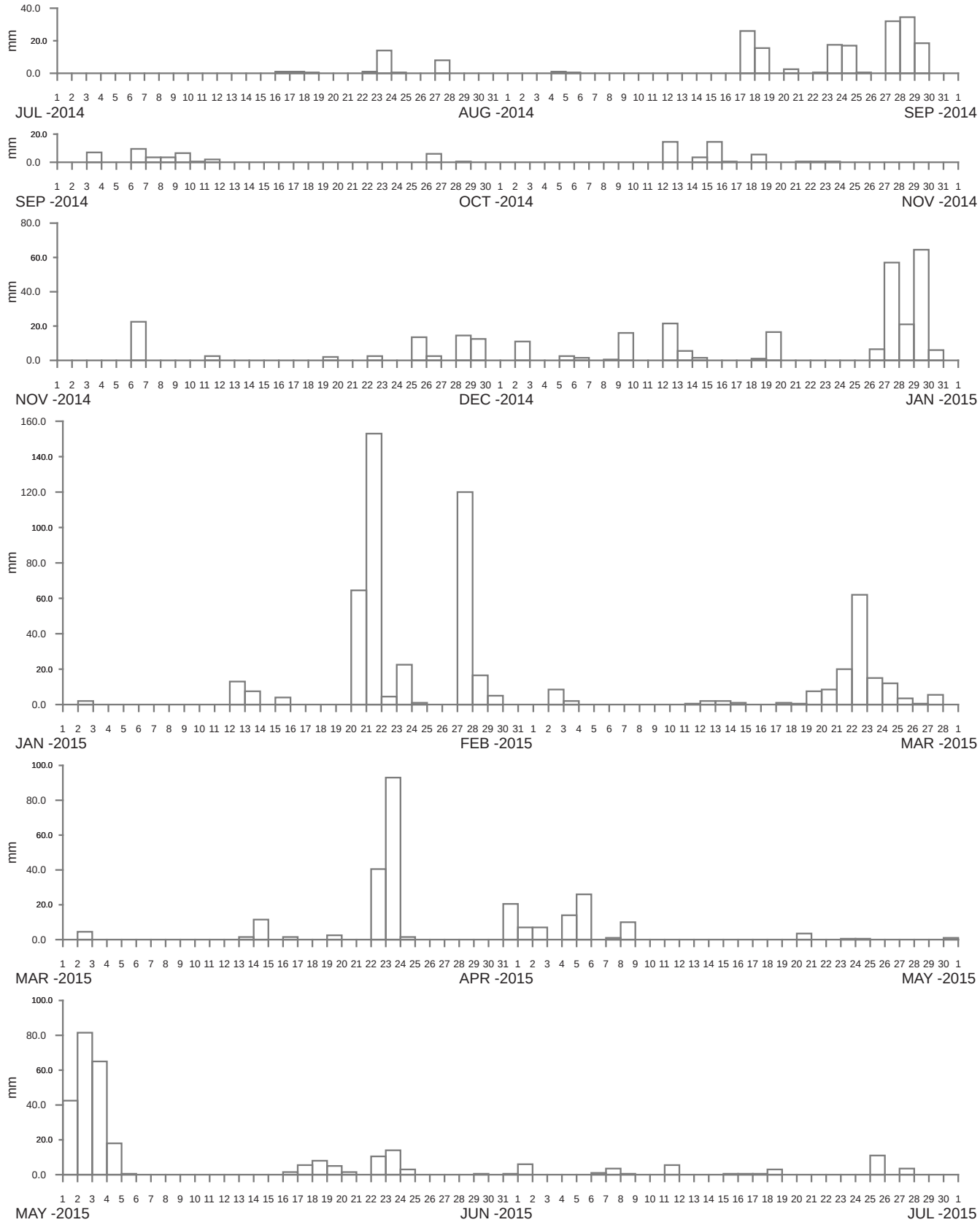


DATA LOSS

Public Works
Manly Hydraulics Laboratory

MARIA RIVER AT GREEN VALLEY
2014–2015

MHL Report 2385
Figure 27
DRAWING 2385-27



DATA LOSS

Public Works
Manly Hydraulics Laboratory

WILSONS RIVER AT TELEGRAPH POINT
2014–2015

MHL Report 2385
Figure 28
DRAWING 2385-28

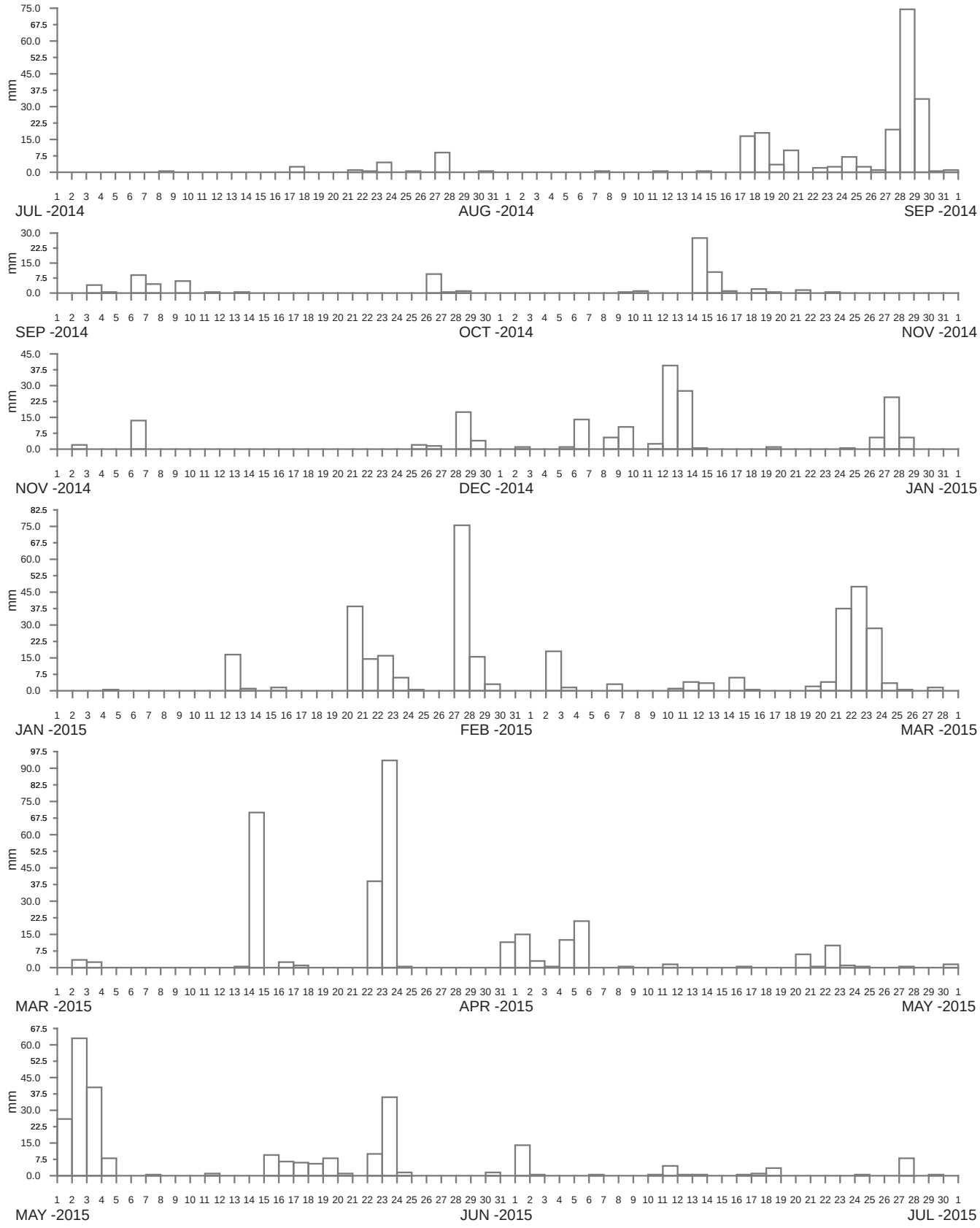
Public Works
Manly Hydraulics Laboratory

RAINFALL STATION LOCATIONS
CAMDEN HAVEN REGION

MHL Report 2385

Figure 29

DRAWING 2385-29.cdr

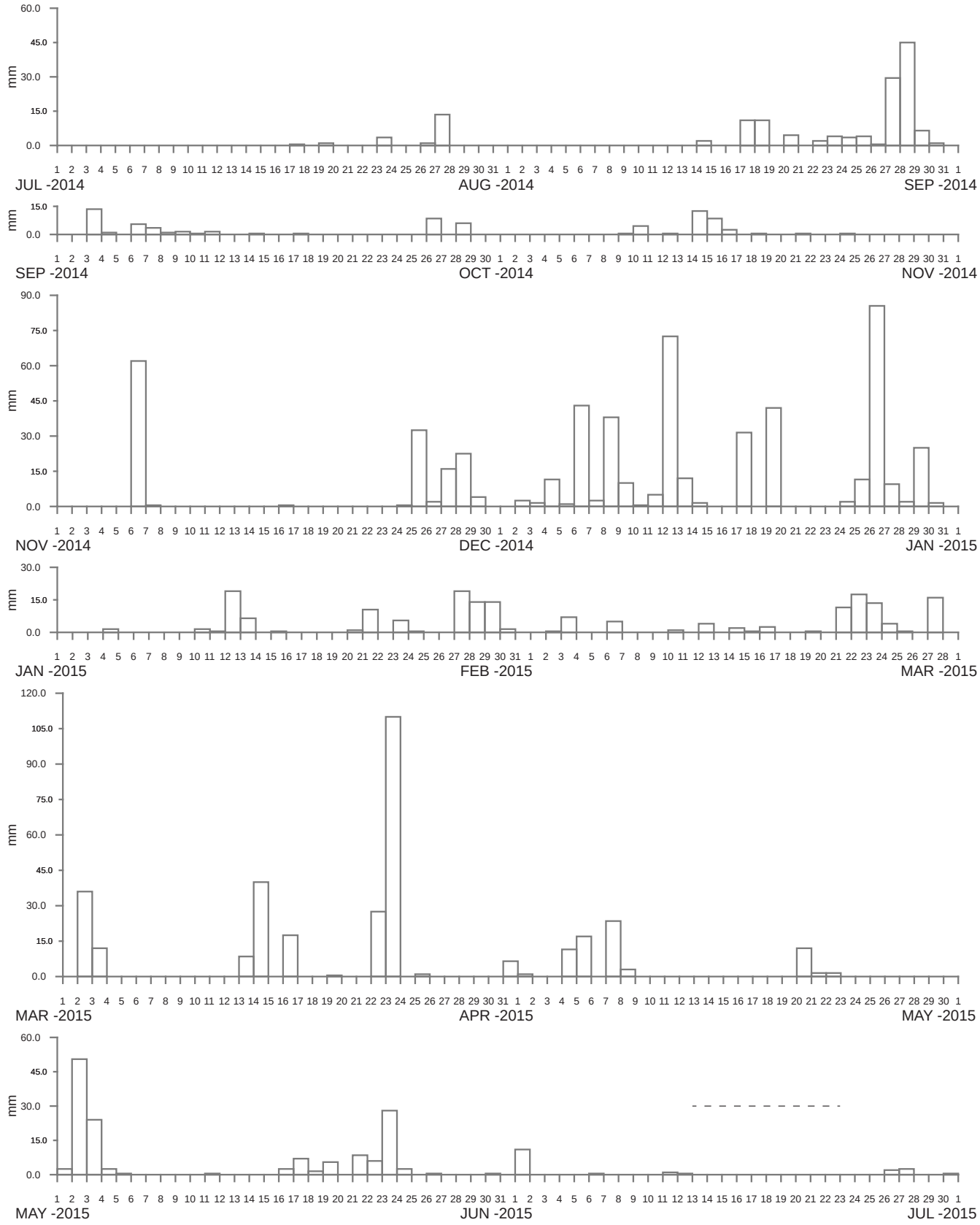


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

CAMDEN HAVEN AT LOGANS CROSSING
2014–2015

MHL Report 2385
Figure 30
DRAWING 2385-30

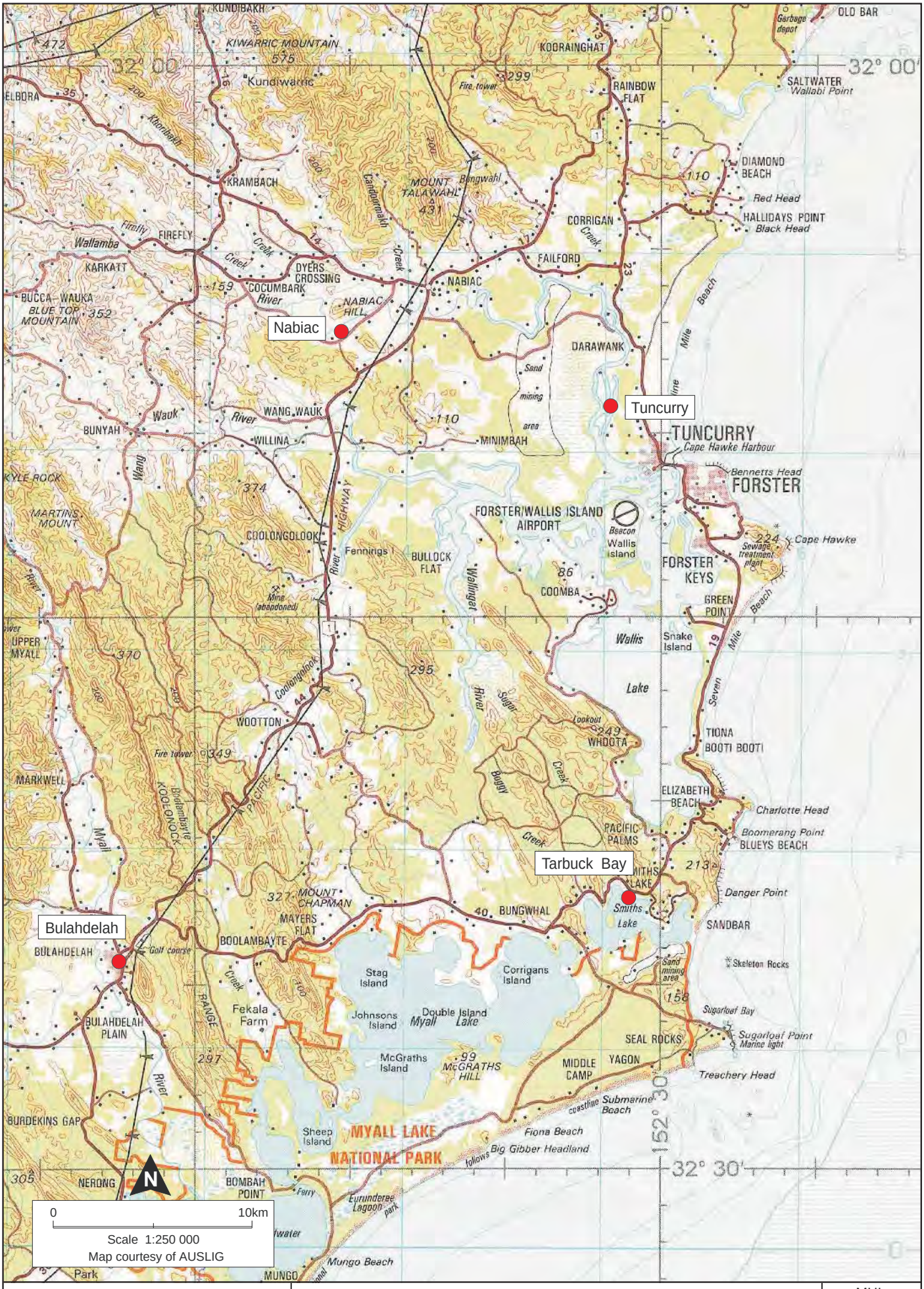


DATA LOSS

Public Works
Manly Hydraulics Laboratory

MANNING RIVER AT MT GEORGE
2014–2015

MHL Report 2385
Figure 31
DRAWING 2385-31



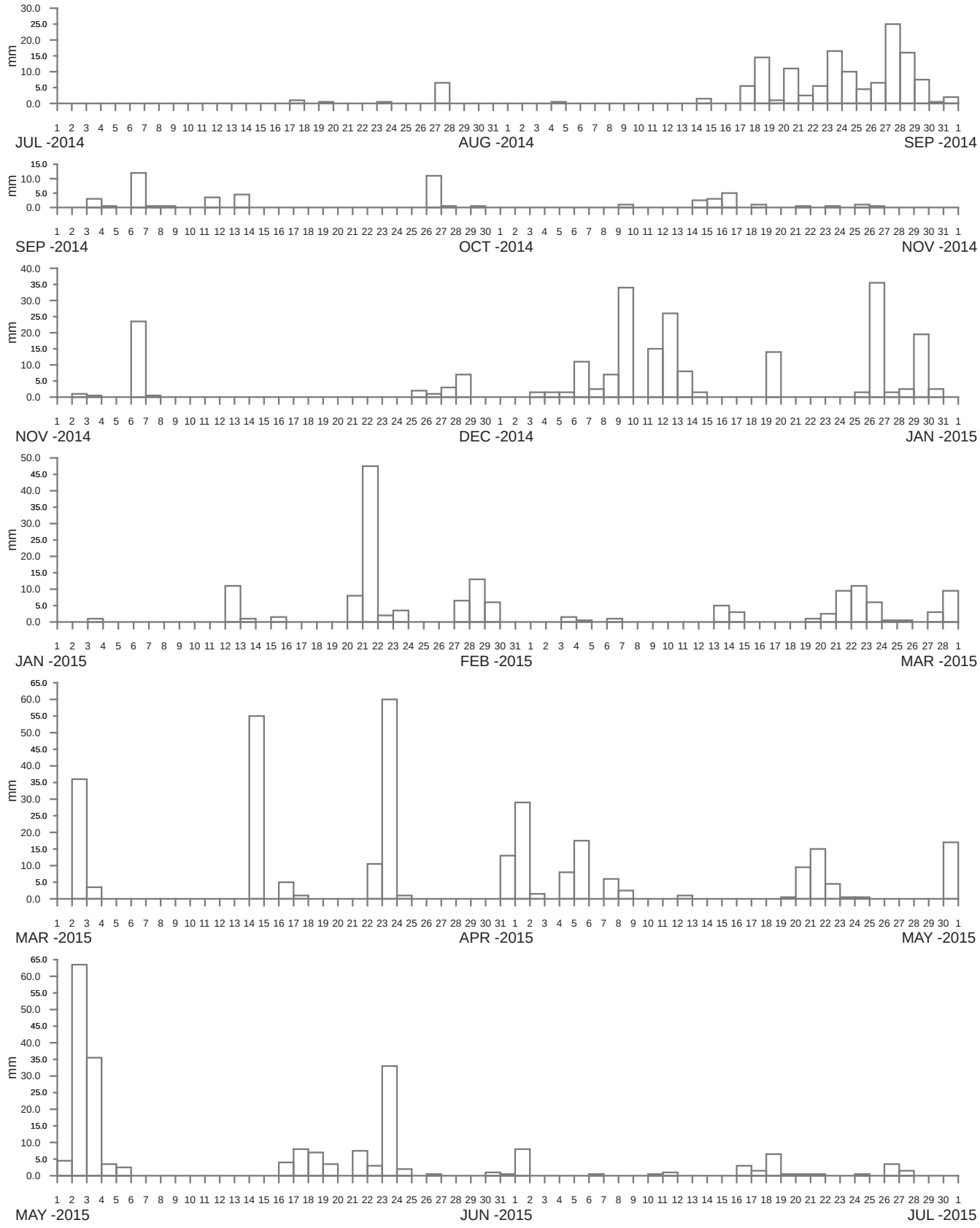
Public Works
Manly Hydraulics Laboratory

RAINFALL STATION LOCATIONS
KARUAH RIVER REGION

MHL Report 2385

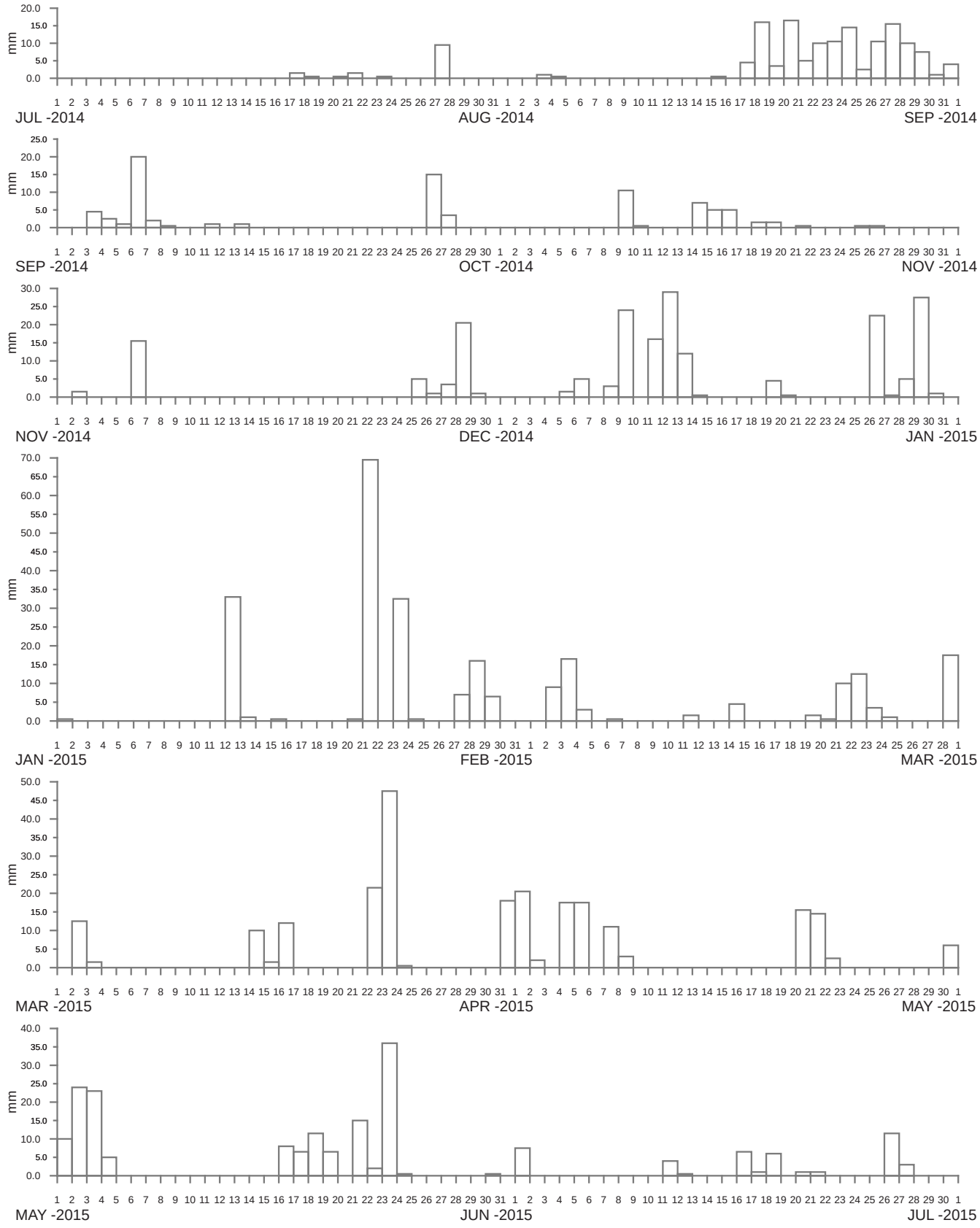
Figure 32

DRAWING 2385-32.cdr



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

NSW GOVERNMENT Public Works Manly Hydraulics Laboratory	WALLAMBA RIVER AT NABIAC 2014–2015	MHL Report 2385 Figure 33 DRAWING 2385-33

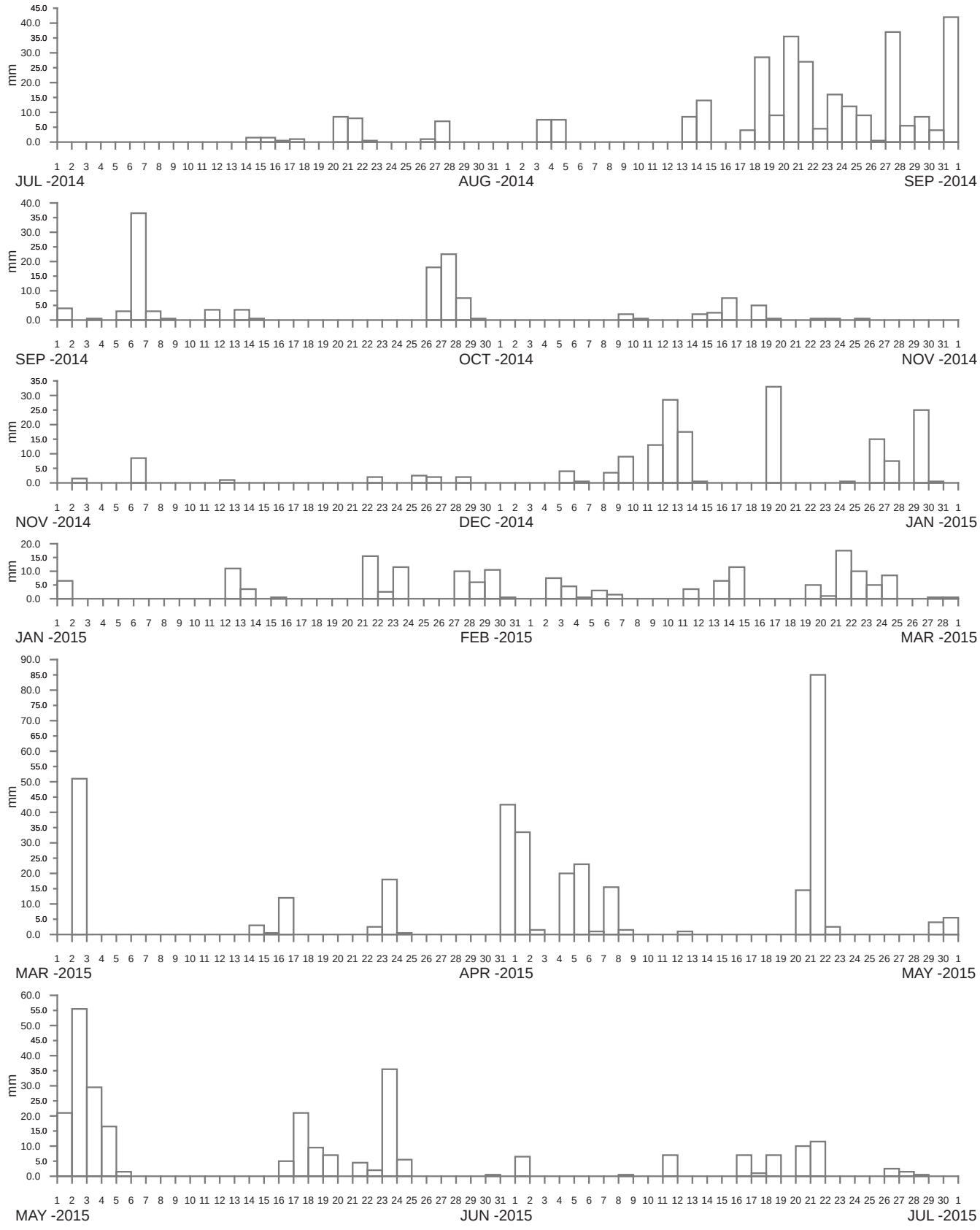


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

WALLAMBA RIVER AT TUNCURRY
2014–2015

MHL Report 2385
Figure 34
DRAWING 2385-34

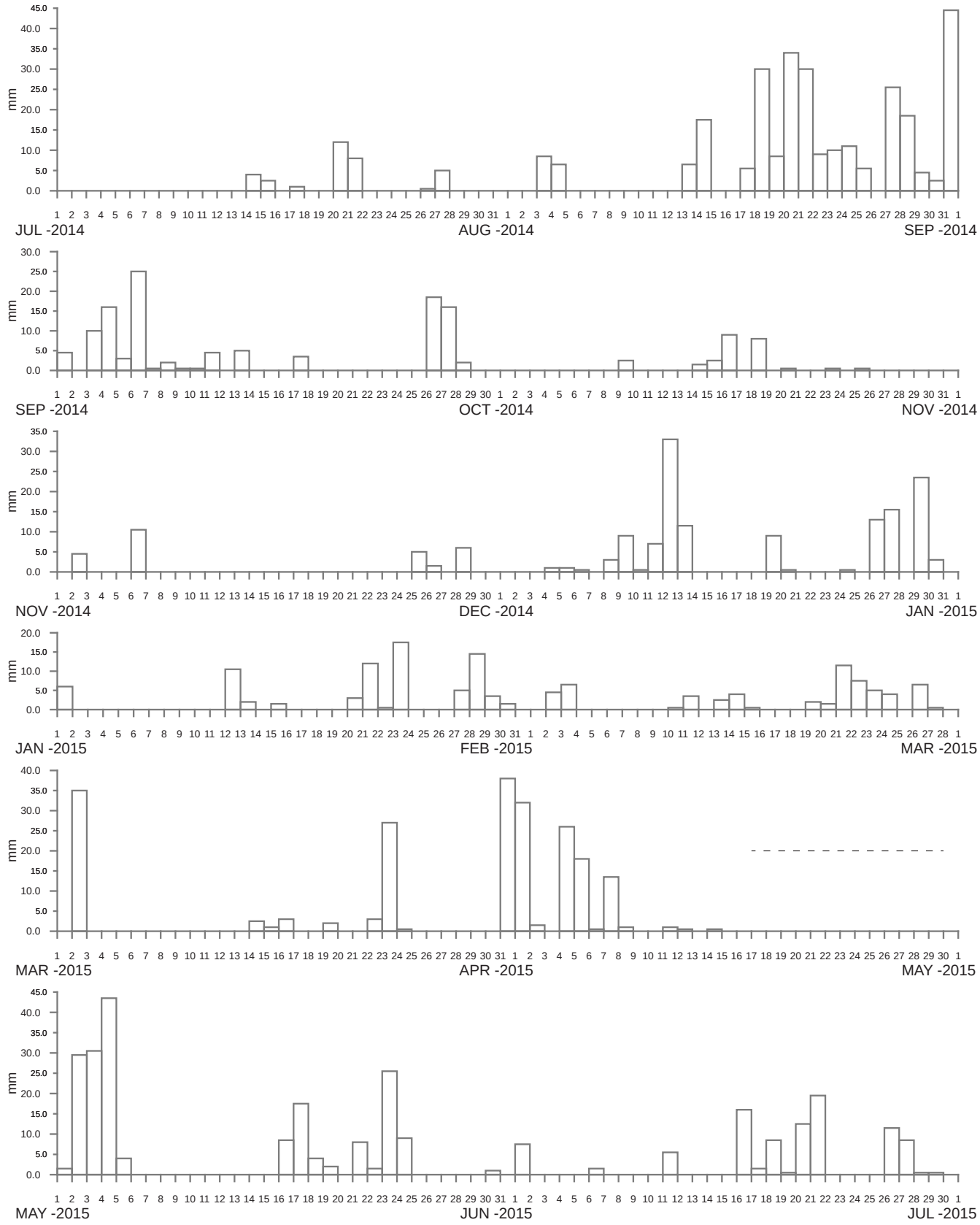


DATA LOSS

Public Works
Manly Hydraulics Laboratory

WALLIS LAKES AT PACIFIC PALMS WHARF
2014–2015

MHL Report 2385
Figure 35
DRAWING 2385-35

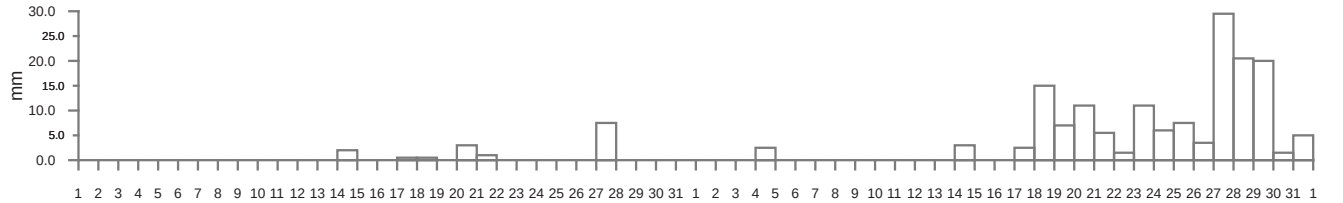


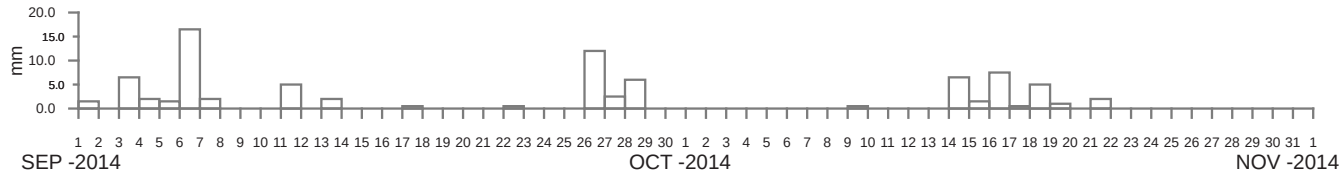
---------- DATA LOSS

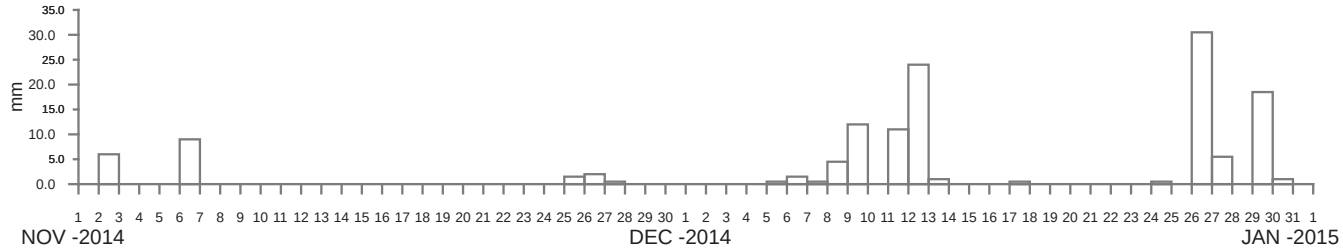
Public Works
Manly Hydraulics Laboratory

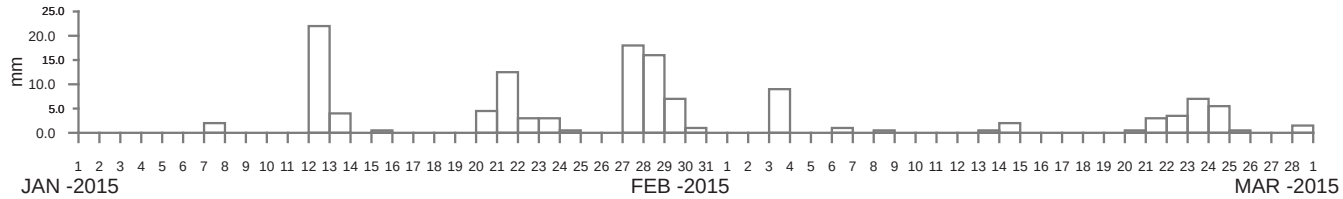
SMITHS LAKE AT TARBUCK BAY
2014–2015

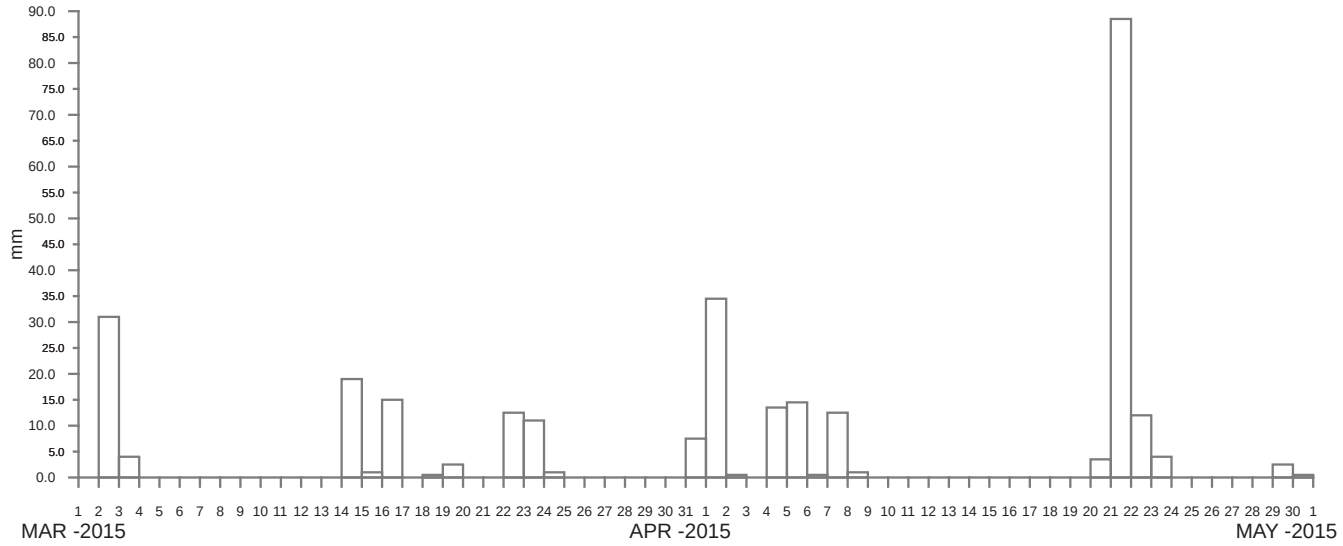
MHL Report 2385
Figure 36
DRAWING 2385-36

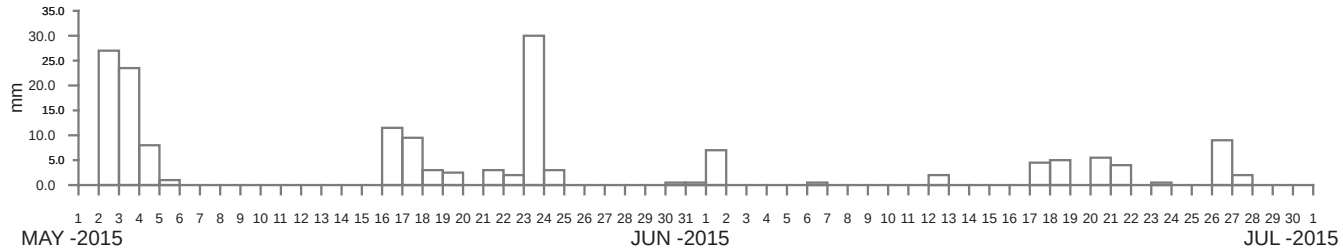










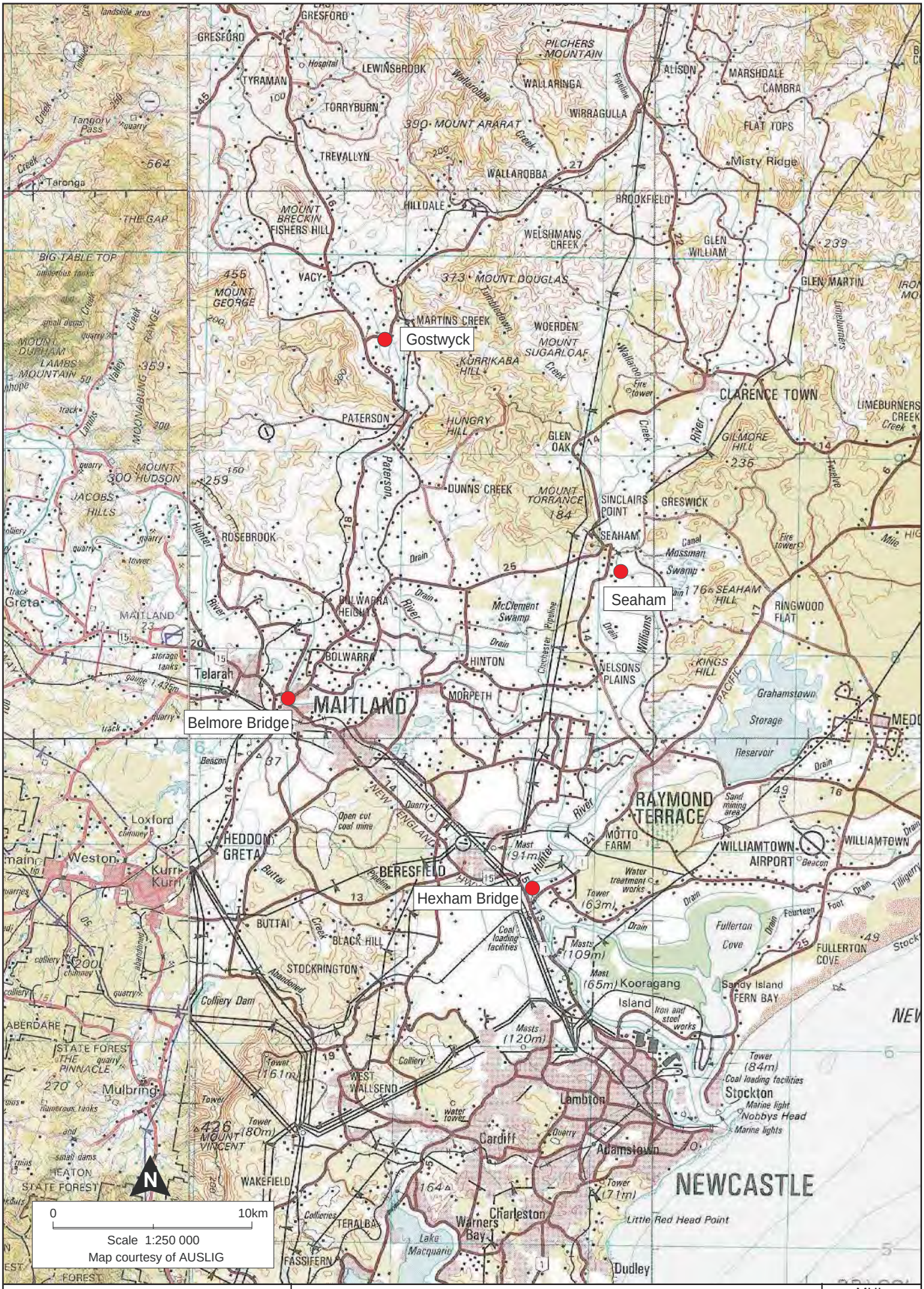


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

MYALL RIVER AT BULAHDELAH
2014–2015

MHL Report 2385
Figure 37
DRAWING 2385-37



NSW GOVERNMENT

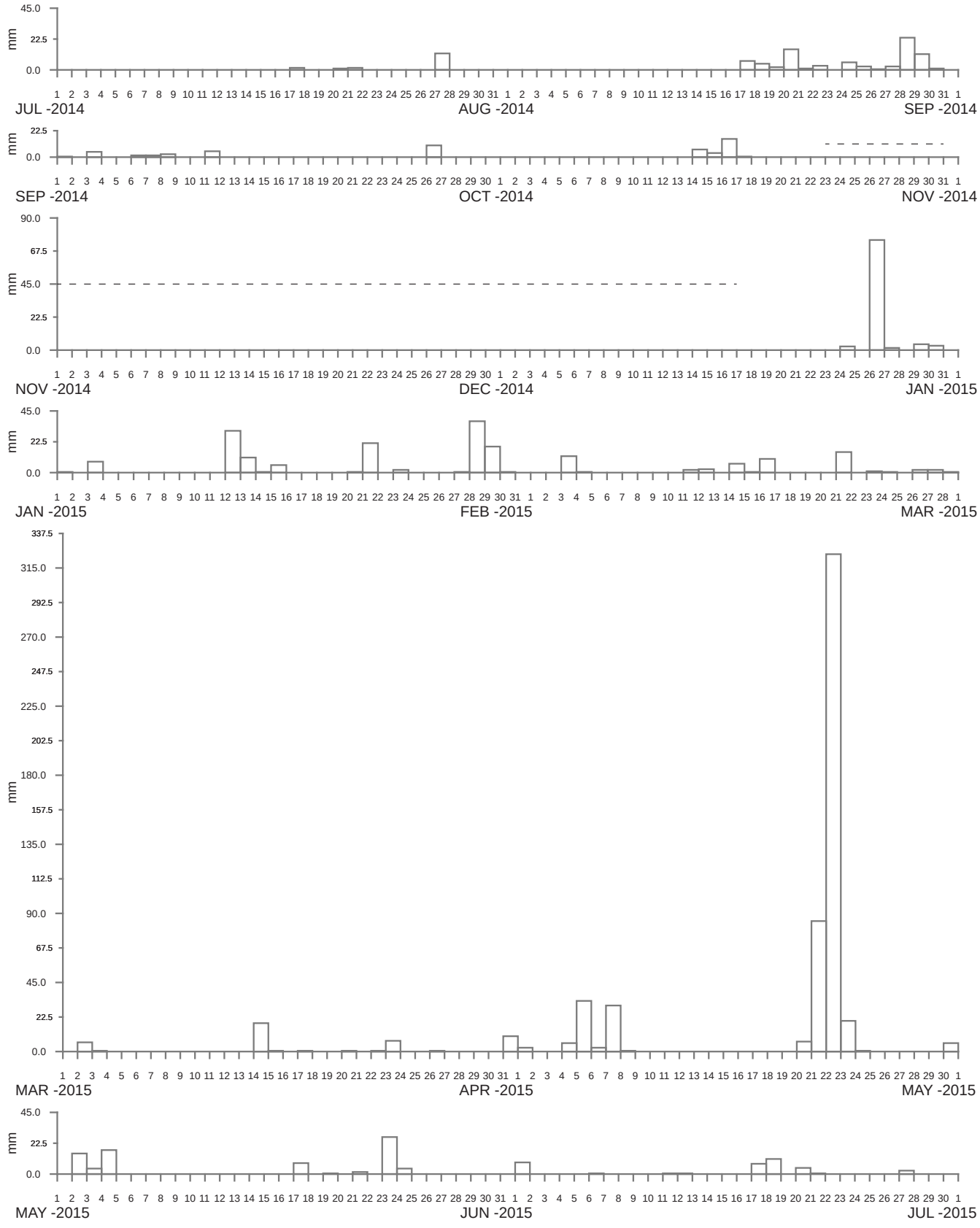
Public Works
Manly Hydraulics Laboratory

RAINFALL STATION LOCATIONS
HUNTER RIVER (NORTH) REGION

MHL Report 2385

Figure 38

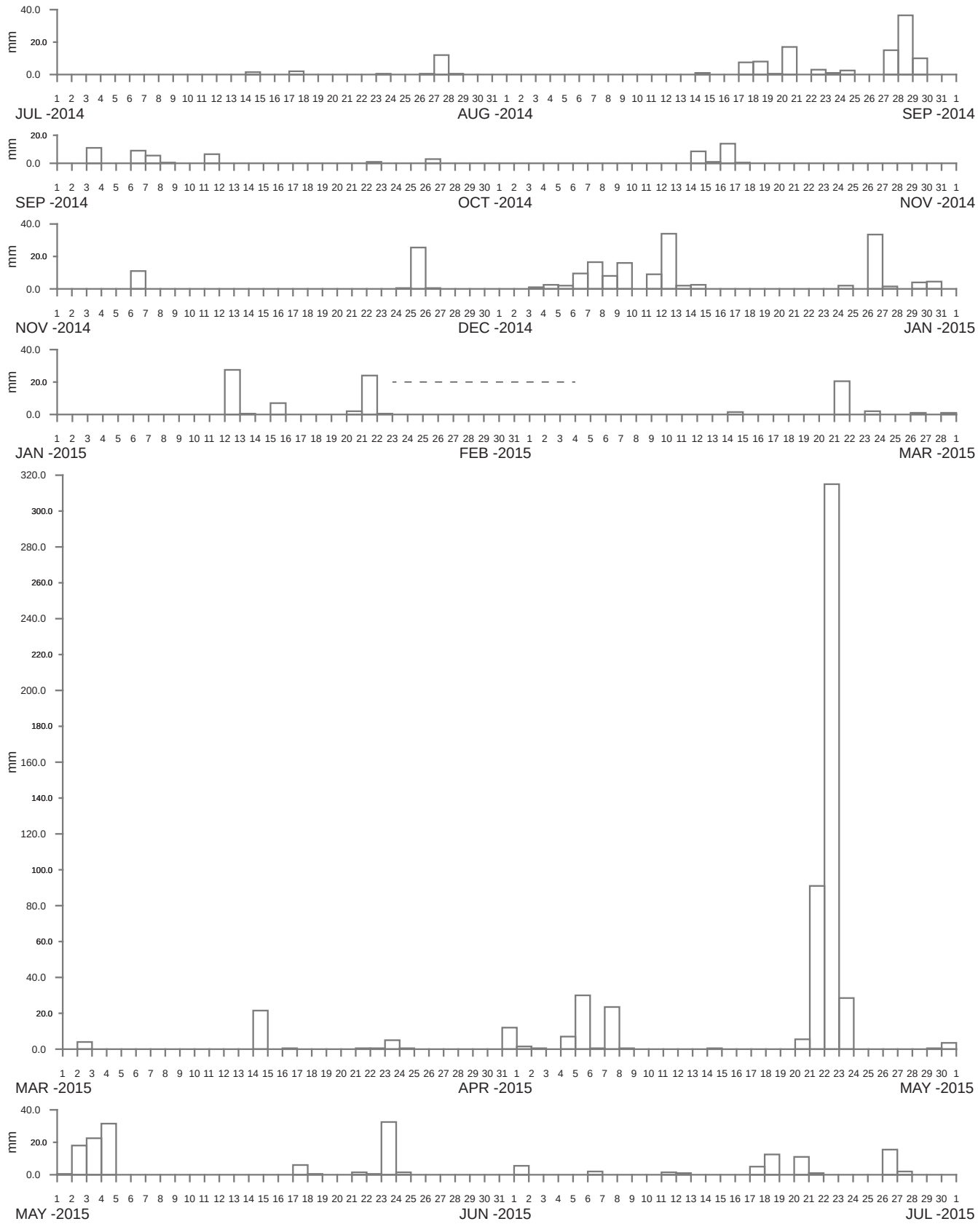
DRAWING 2385-38.cdr



Public Works
Manly Hydraulics Laboratory

PATERSON RIVER AT GOSTWYCK
2014–2015

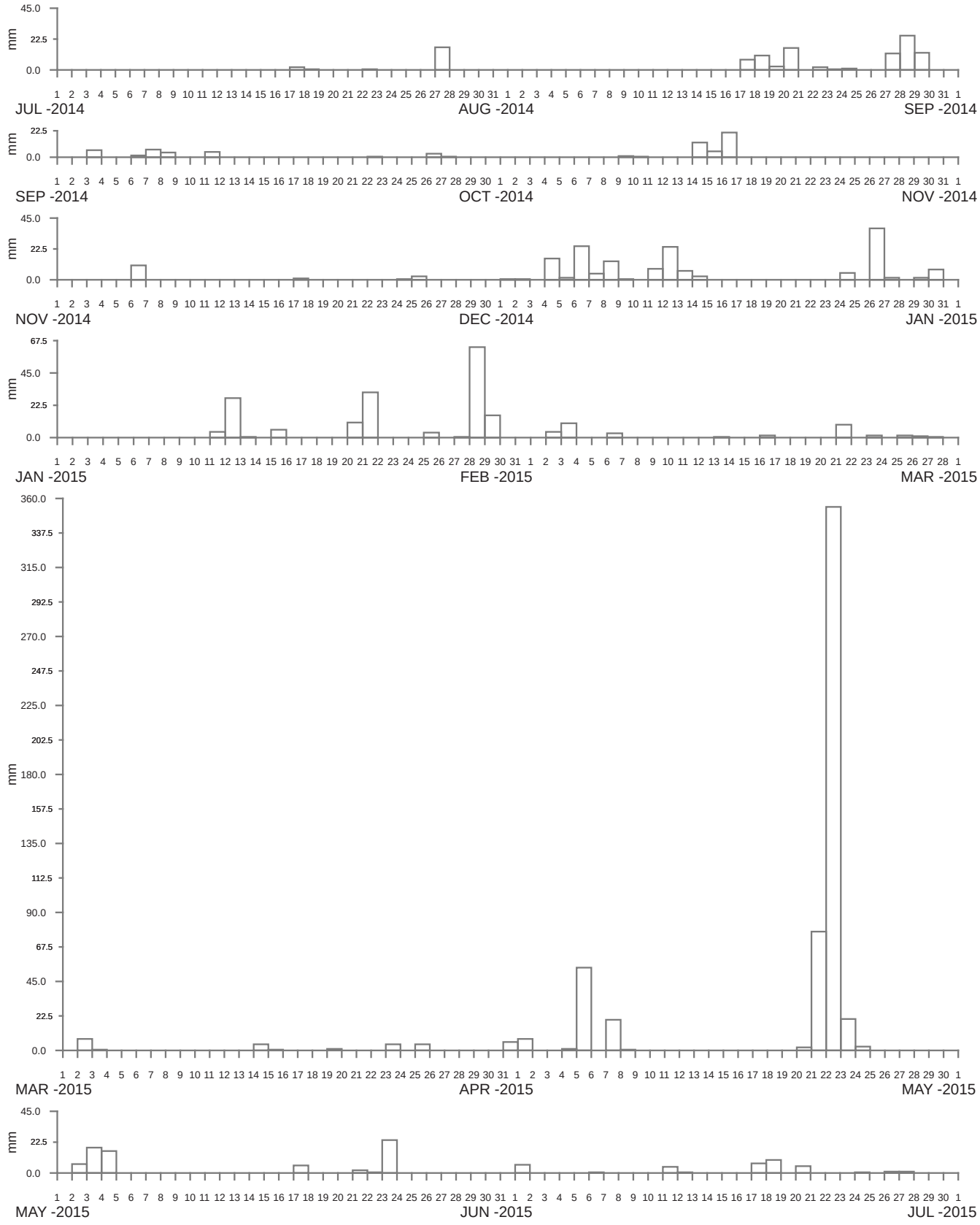
MHL Report 2385
Figure 39
DRAWING 2385-39



NSW GOVERNMENT
Public Works
Manly Hydraulics Laboratory

WILLIAMS RIVER AT SEAHAM
2014–2015

MHL Report 2385
Figure 40
DRAWING 2385-40

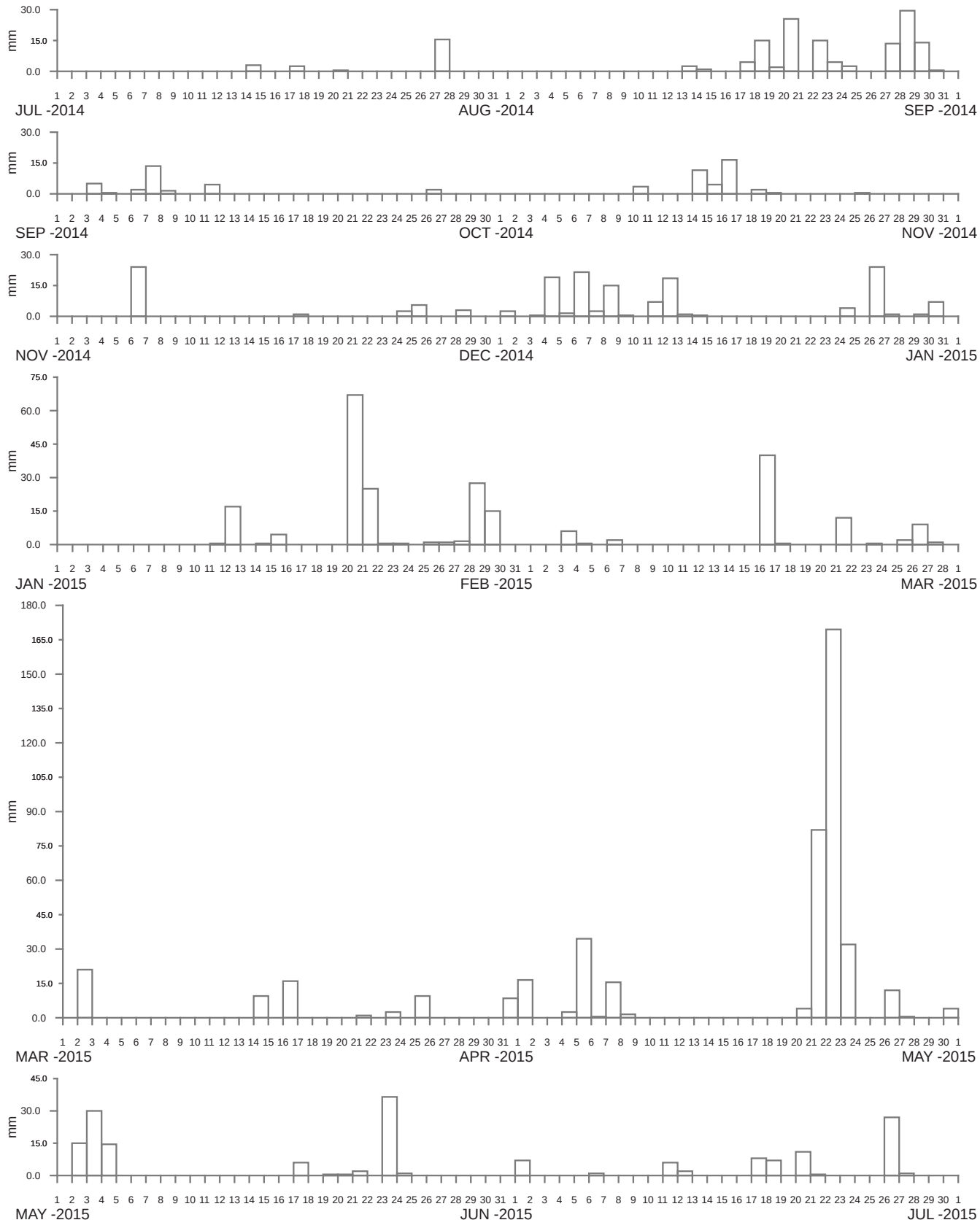


DATA LOSS

Public Works
Manly Hydraulics Laboratory

HUNTER RIVER AT BELMORE BRIDGE
2014–2015

MHL Report 2385
Figure 41
DRAWING 2385-41

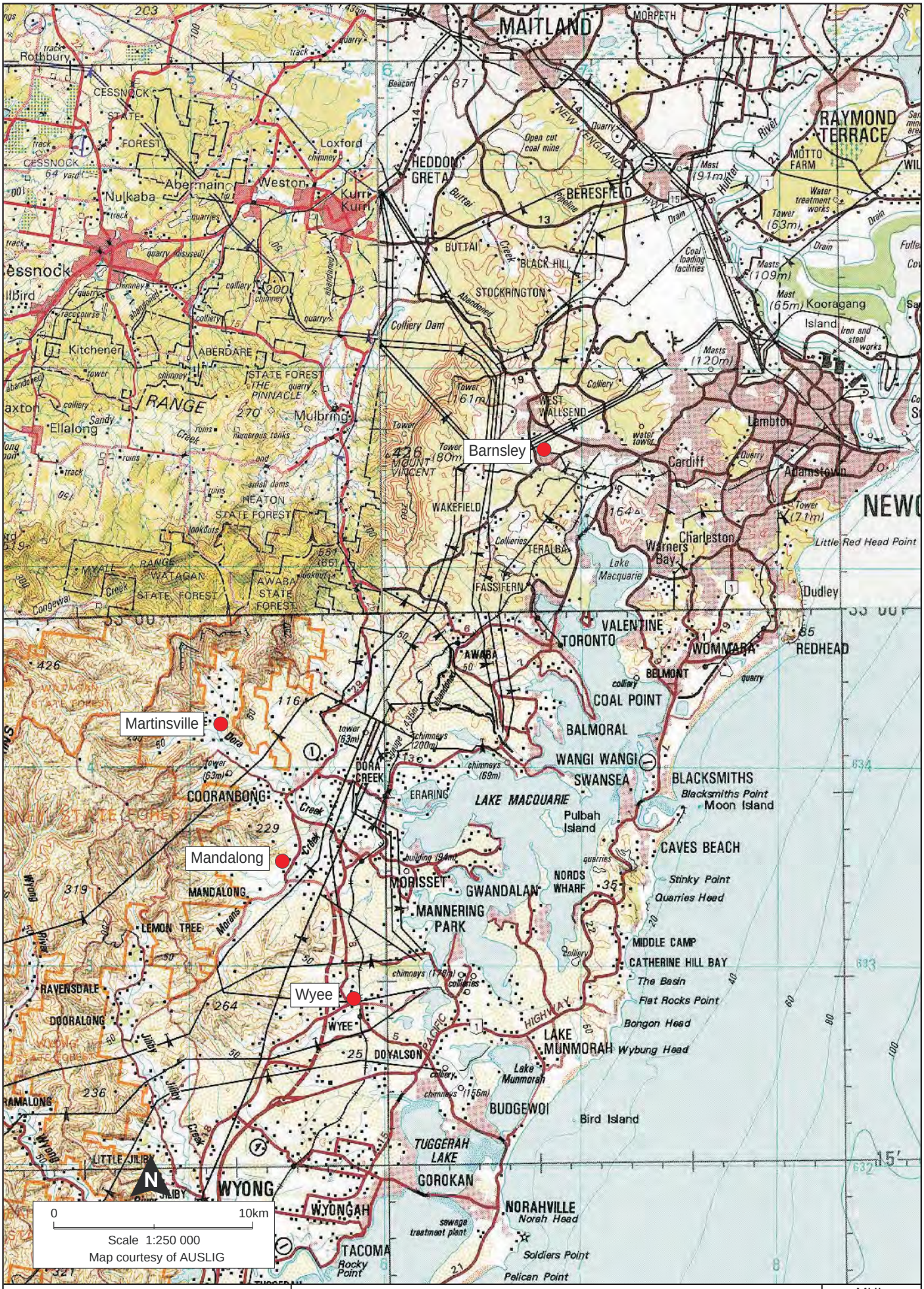


DATA LOSS

Public Works
Manly Hydraulics Laboratory

HUNTER RIVER AT HEXHAM BRIDGE
2014–2015

MHL Report 2385
Figure 42
DRAWING 2385-42



NSW GOVERNMENT

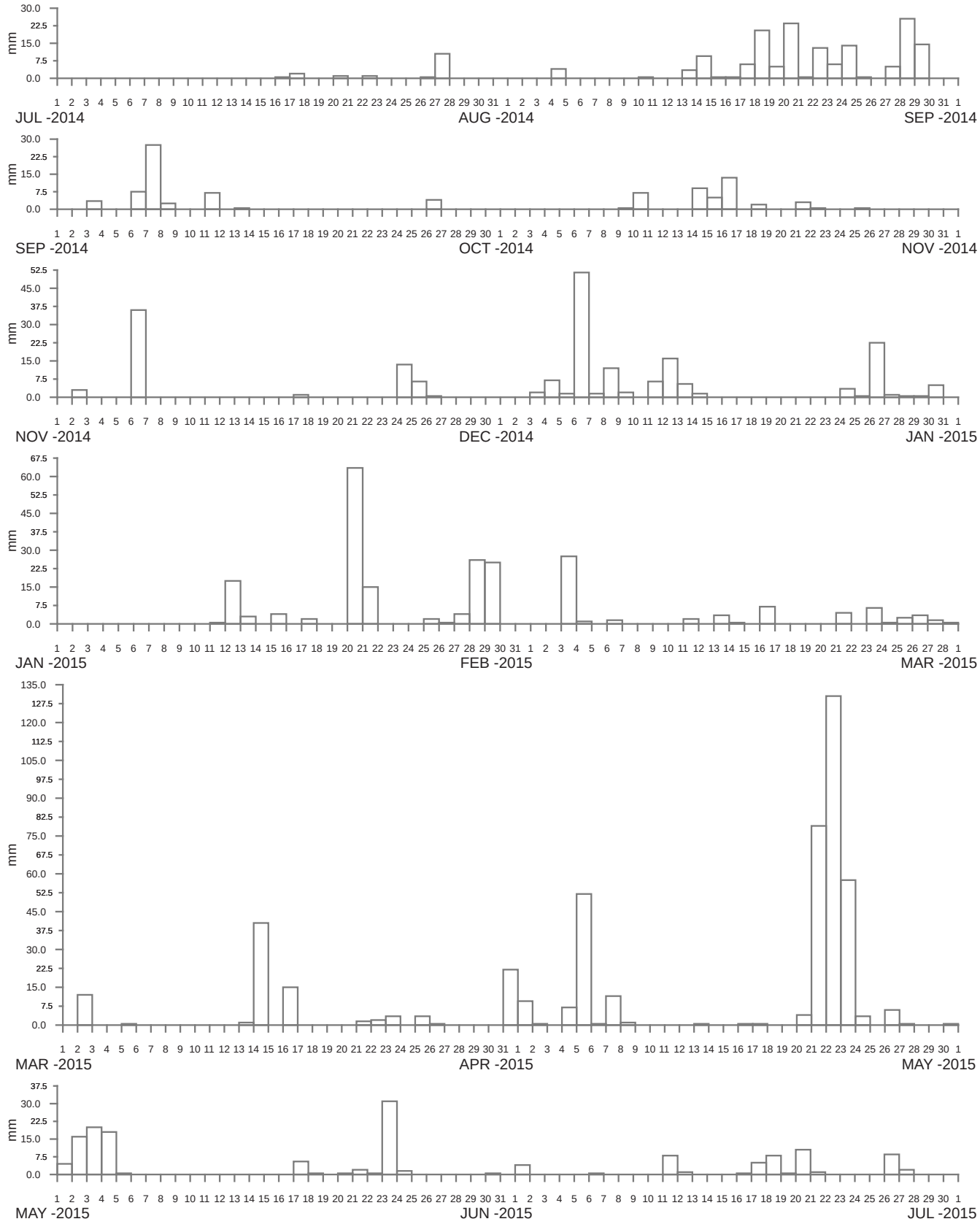
Public Works
Manly Hydraulics Laboratory

RAINFALL STATION LOCATIONS
MACQUARIE-TUGGERAH LAKES (NORTH) REGION

MHL Report 2385

Figure 43

DRAWING 2385-43.cdr

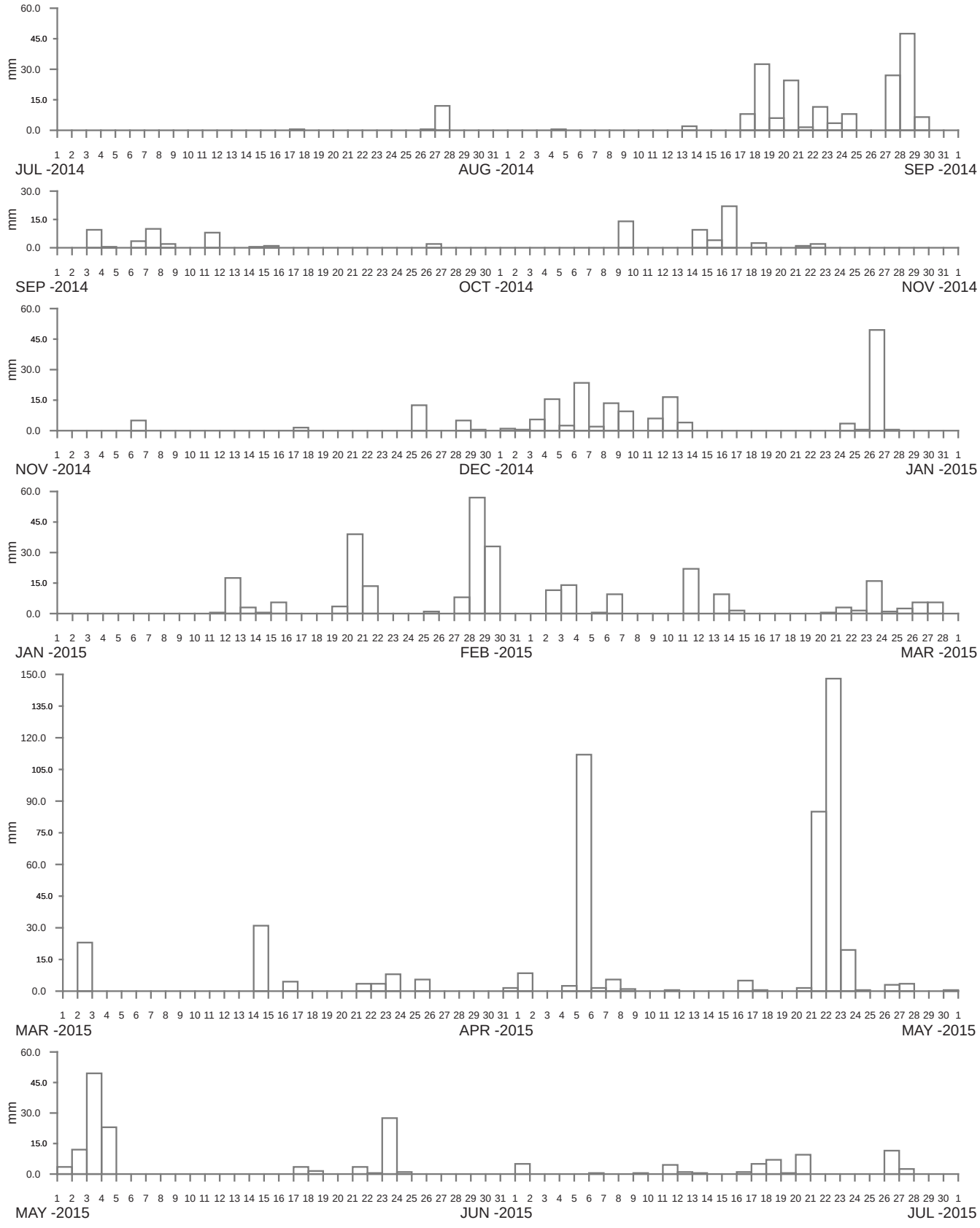


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

BARNSLEY AT JOHNSON AVENUE
2014–2015

MHL Report 2385
Figure 44
DRAWING 2385-44

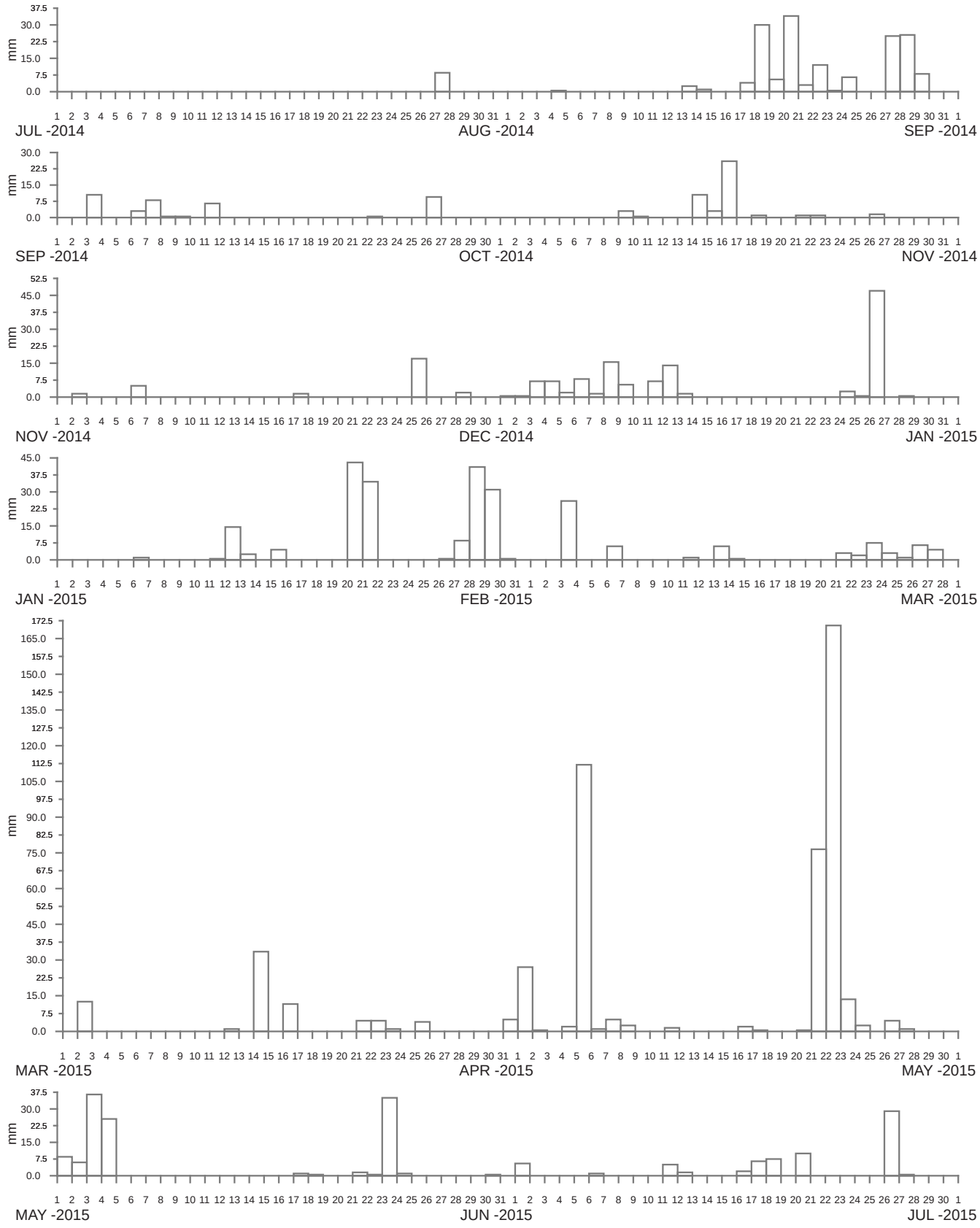


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

MARTINSVILLE AT MARTINSVILLE ROAD
2014–2015

MHL Report 2385
Figure 45
DRAWING 2385-45

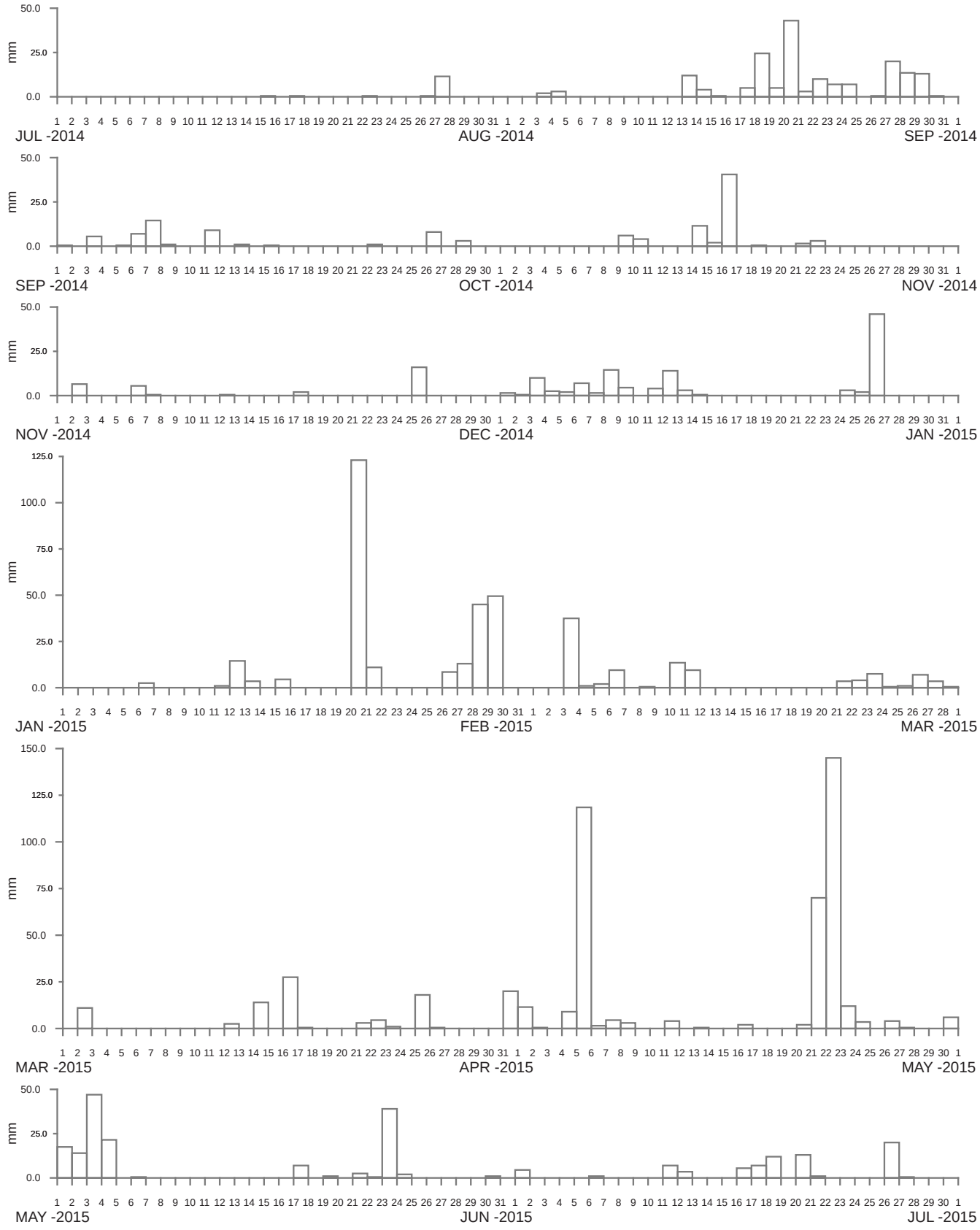


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

MANDALONG AT DEAVES ROAD
2014–2015

MHL Report 2385
Figure 46
DRAWING 2385-46



Public Works
Manly Hydraulics Laboratory

WYEE AT COLLUNGRA STREET
2014–2015

MHL Report 2385
Figure 47
DRAWING 2385-47

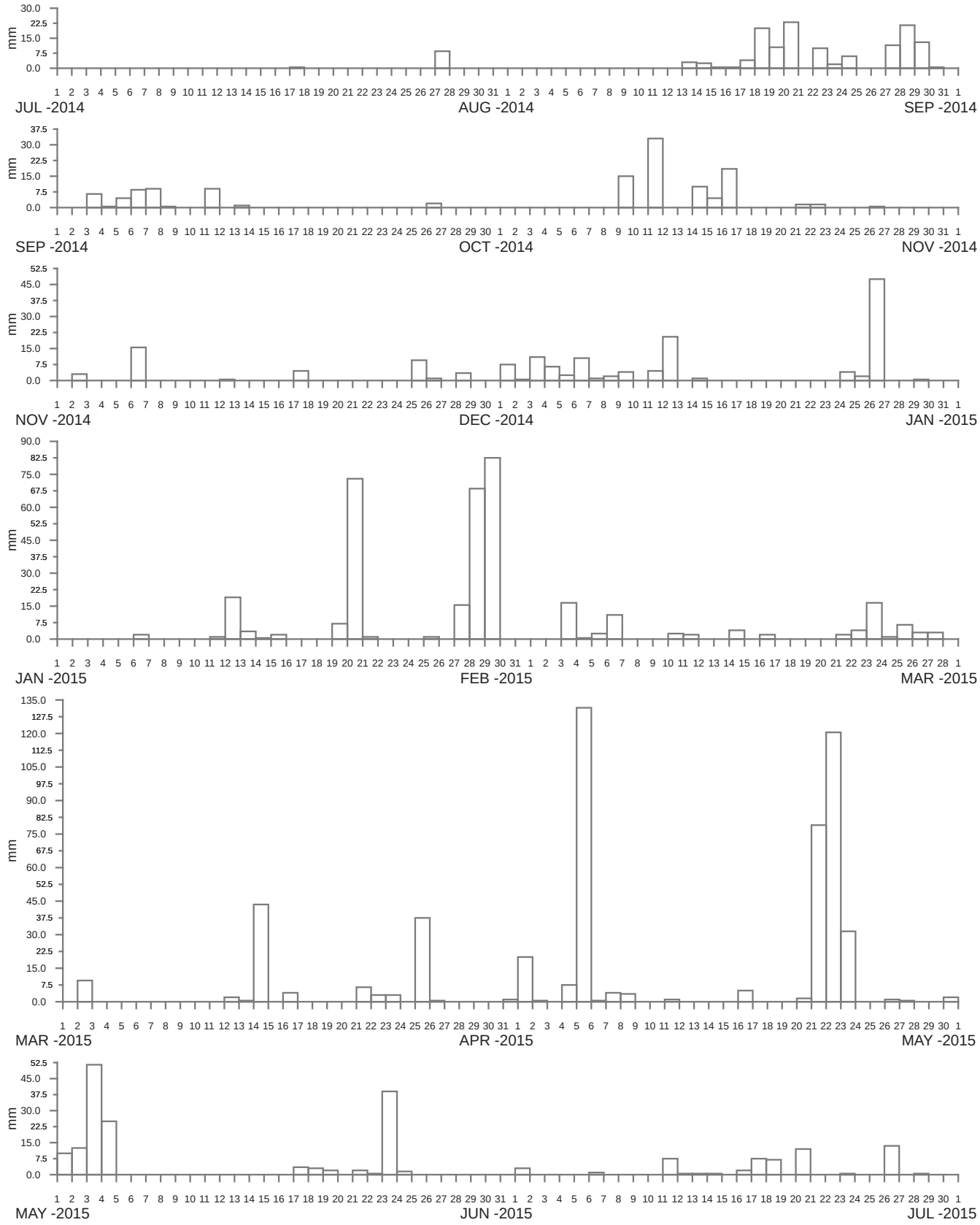
Public Works
Manly Hydraulics Laboratory

RAINFALL STATION LOCATIONS MACQUARIE-TUGGERAH LAKES (SOUTH) AND HAWKESBURY RIVER REGIONS

MHL Report 2385

Figure 48

DRAWING 2385-48.cdr

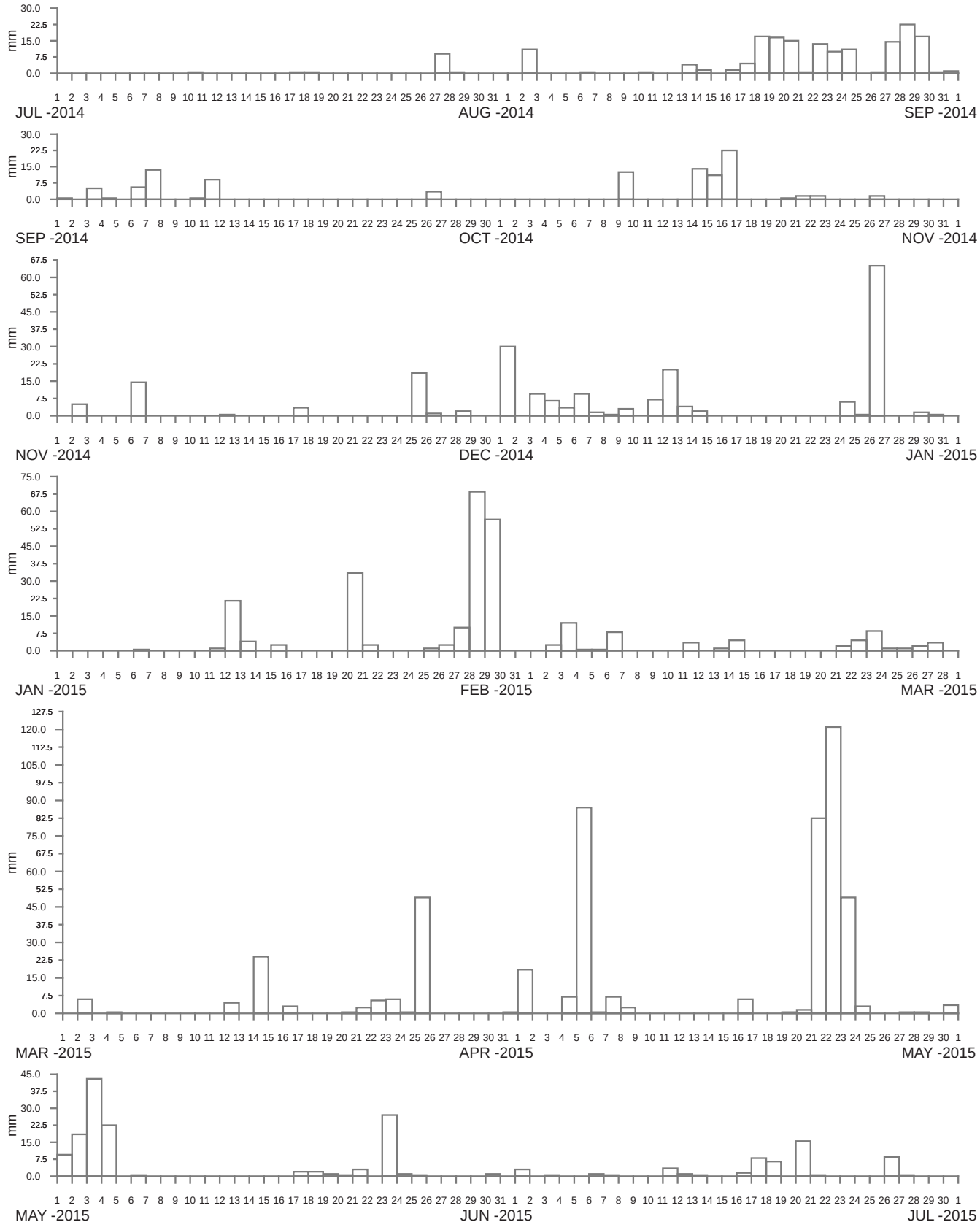


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

WHITEMANS RIDGE AT WATAGANS FOREST DRIVE
2014–2015

MHL Report 2385
Figure 49
DRAWING 2385-49

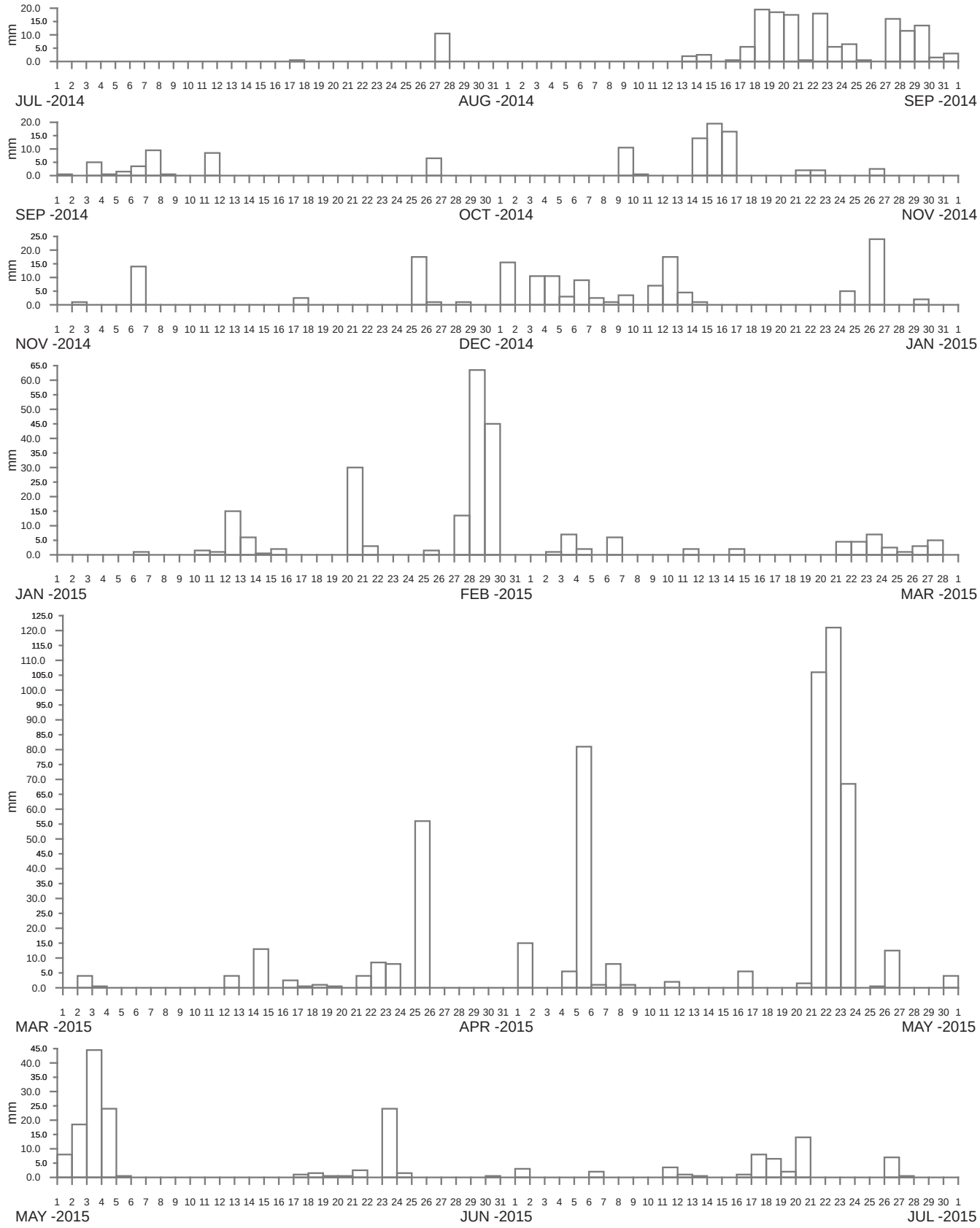


DATA LOSS

Public Works
Manly Hydraulics Laboratory

YARRAMALONG AT BUMBLE HILL ROAD
2014–2015

MHL Report 2385
Figure 50
DRAWING 2385-50

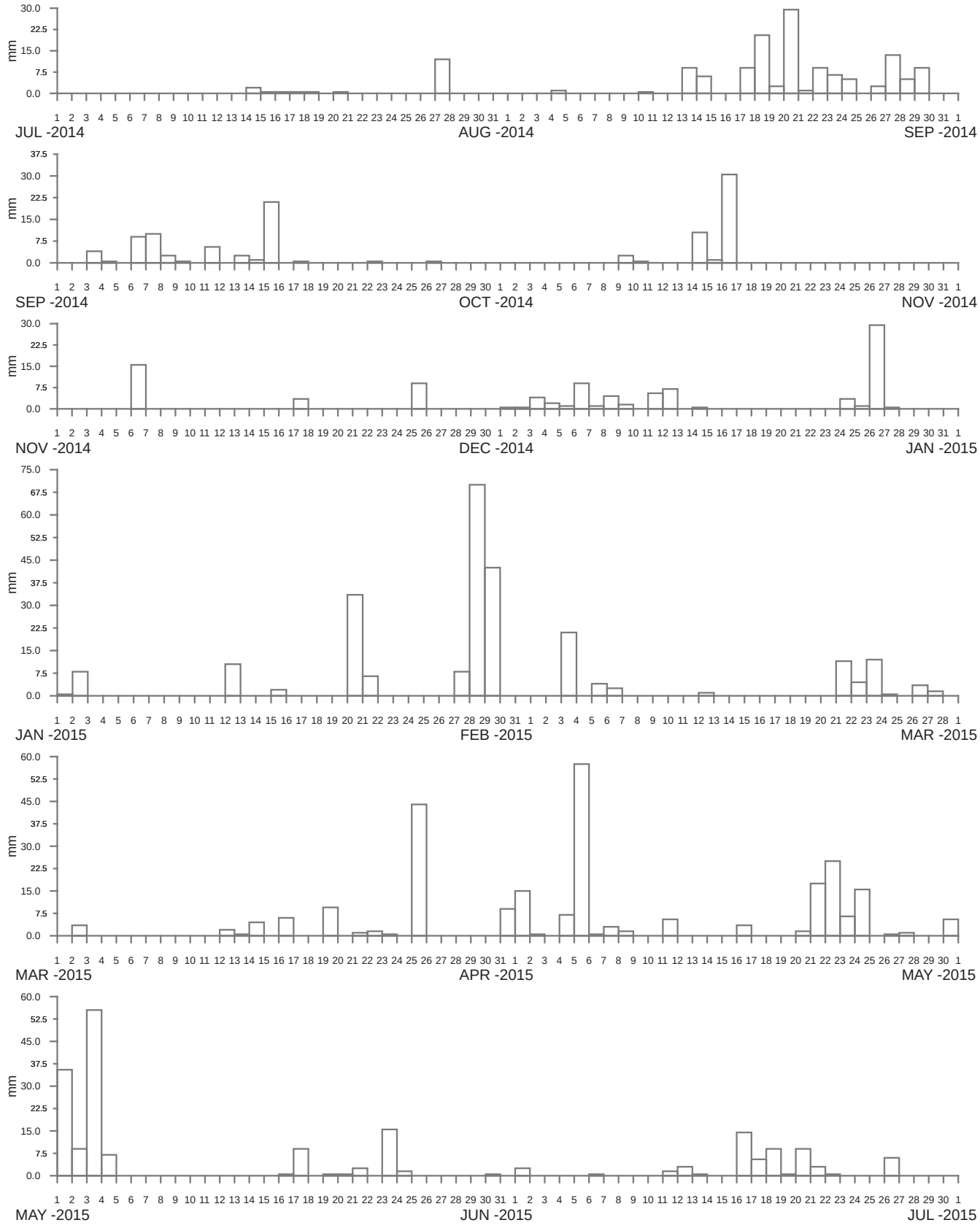


DATA LOSS

Public Works
Manly Hydraulics Laboratory

KULNURA AT GEORGE DOWNS DRIVE
2014–2015

MHL Report 2385
Figure 51
DRAWING 2385-51

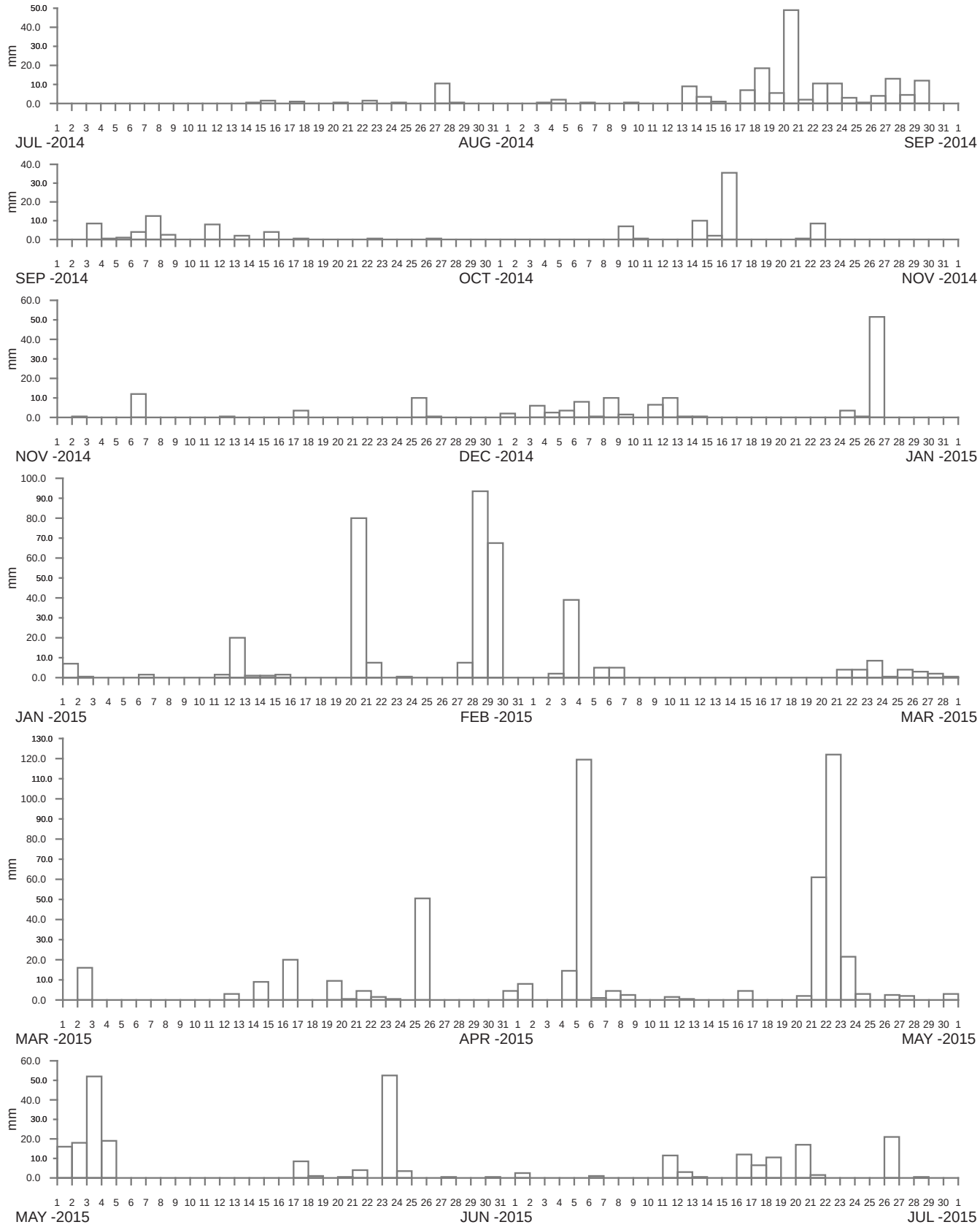


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

TUGGERAH LAKE AT TOUKLEY
2014–2015

MHL Report 2385
Figure 52
DRAWING 2385-52

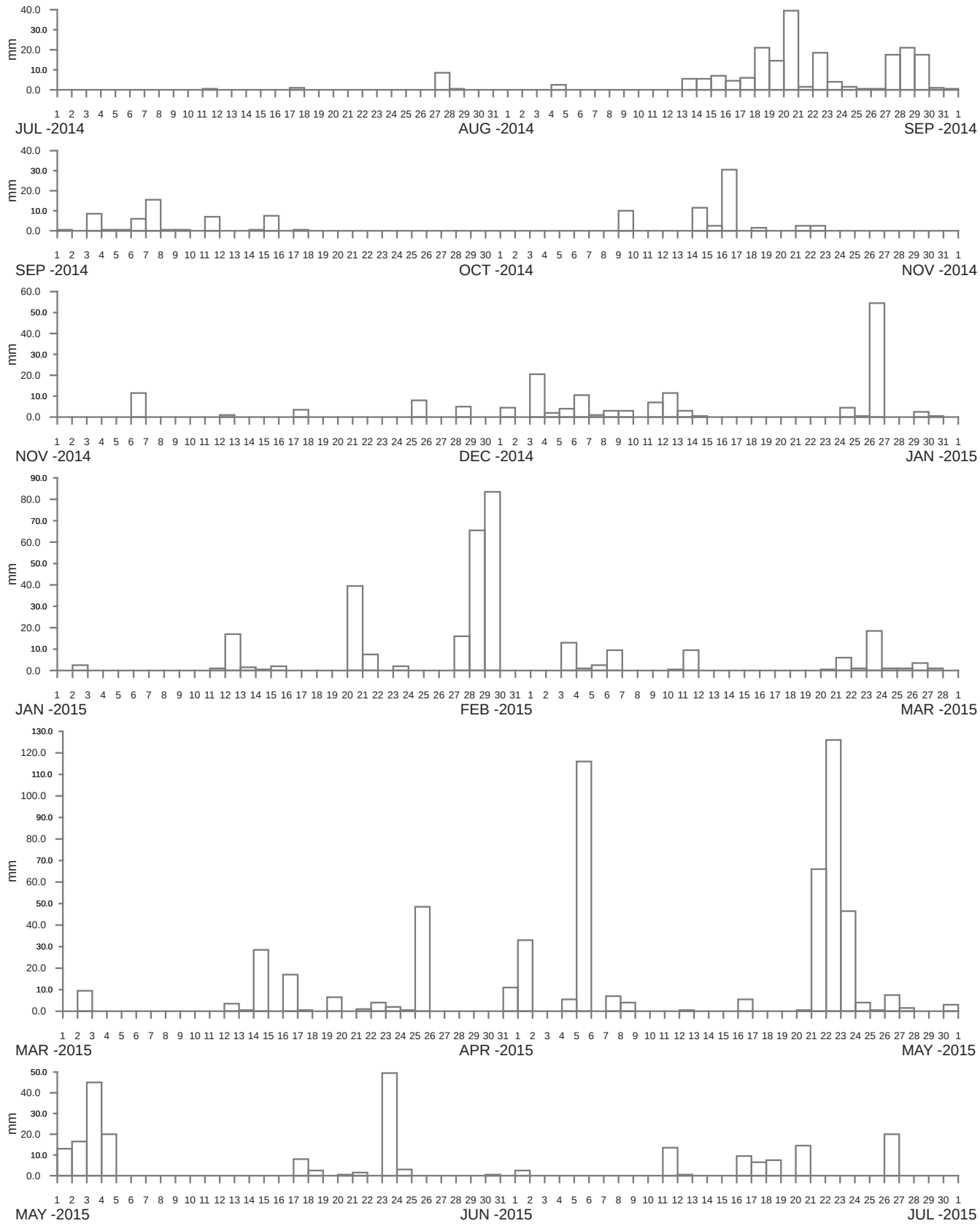


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

HAMLYN TERRACE AT WARNERVALE ROAD
2014–2015

MHL Report 2385
Figure 53
DRAWING 2385-53

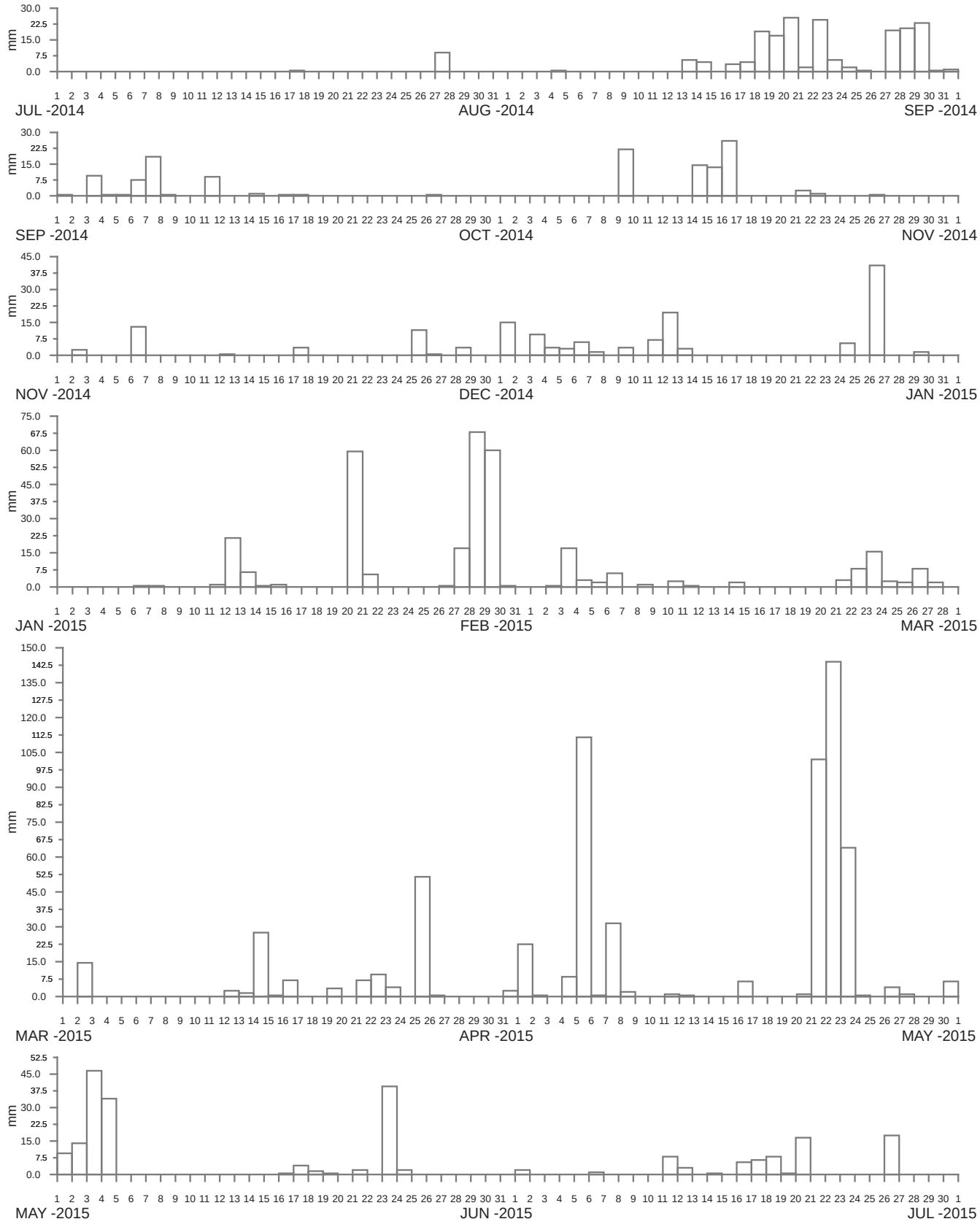


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

MARDI DAM AT OLD MAITLAND ROAD
2014–2015

MHL Report 2385
Figure 54
DRAWING 2385-54

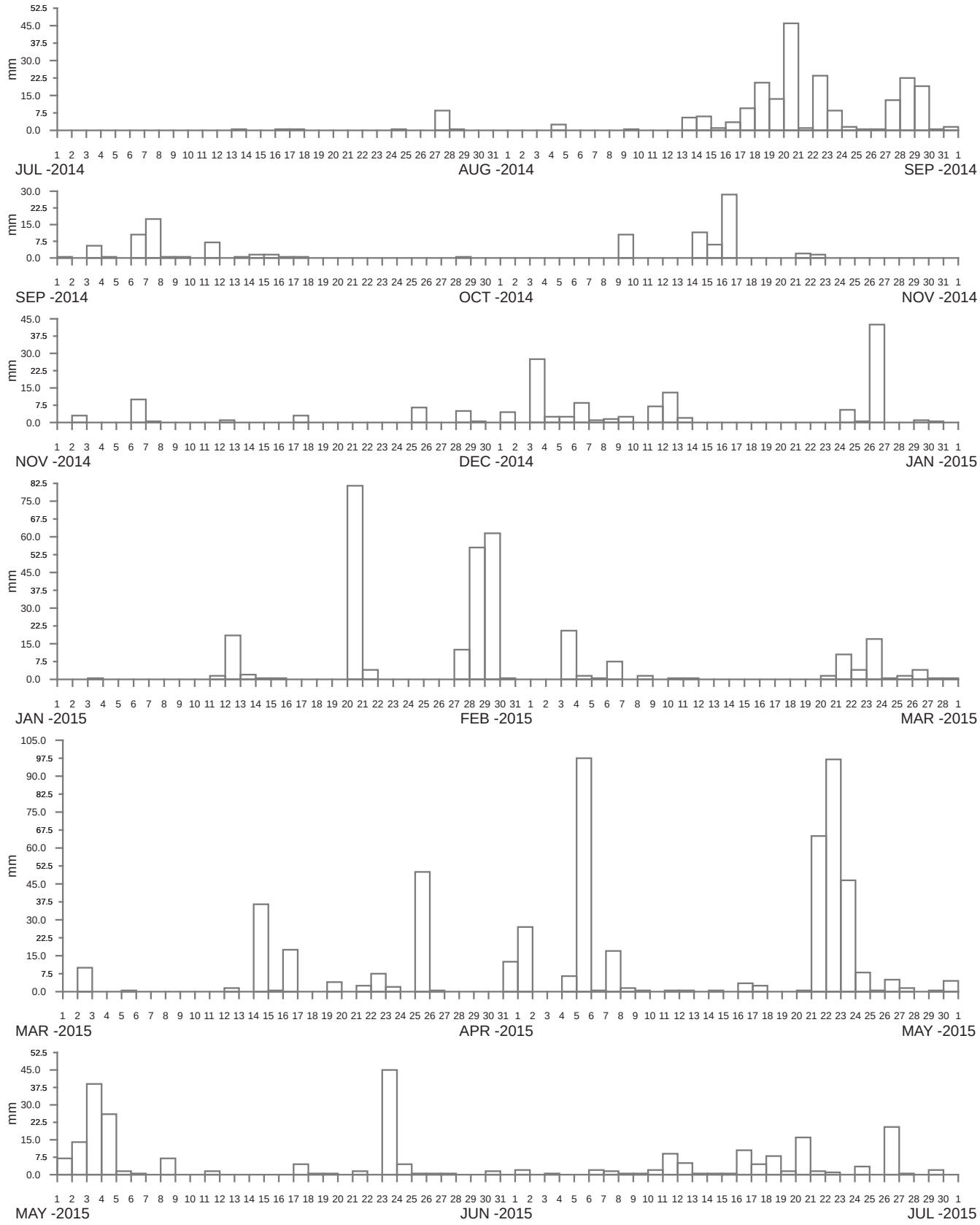


DATA LOSS

Public Works
Manly Hydraulics Laboratory

STERLAND AT RED HILL FOREST ROAD
2014–2015

MHL Report 2385
Figure 55
DRAWING 2385-55

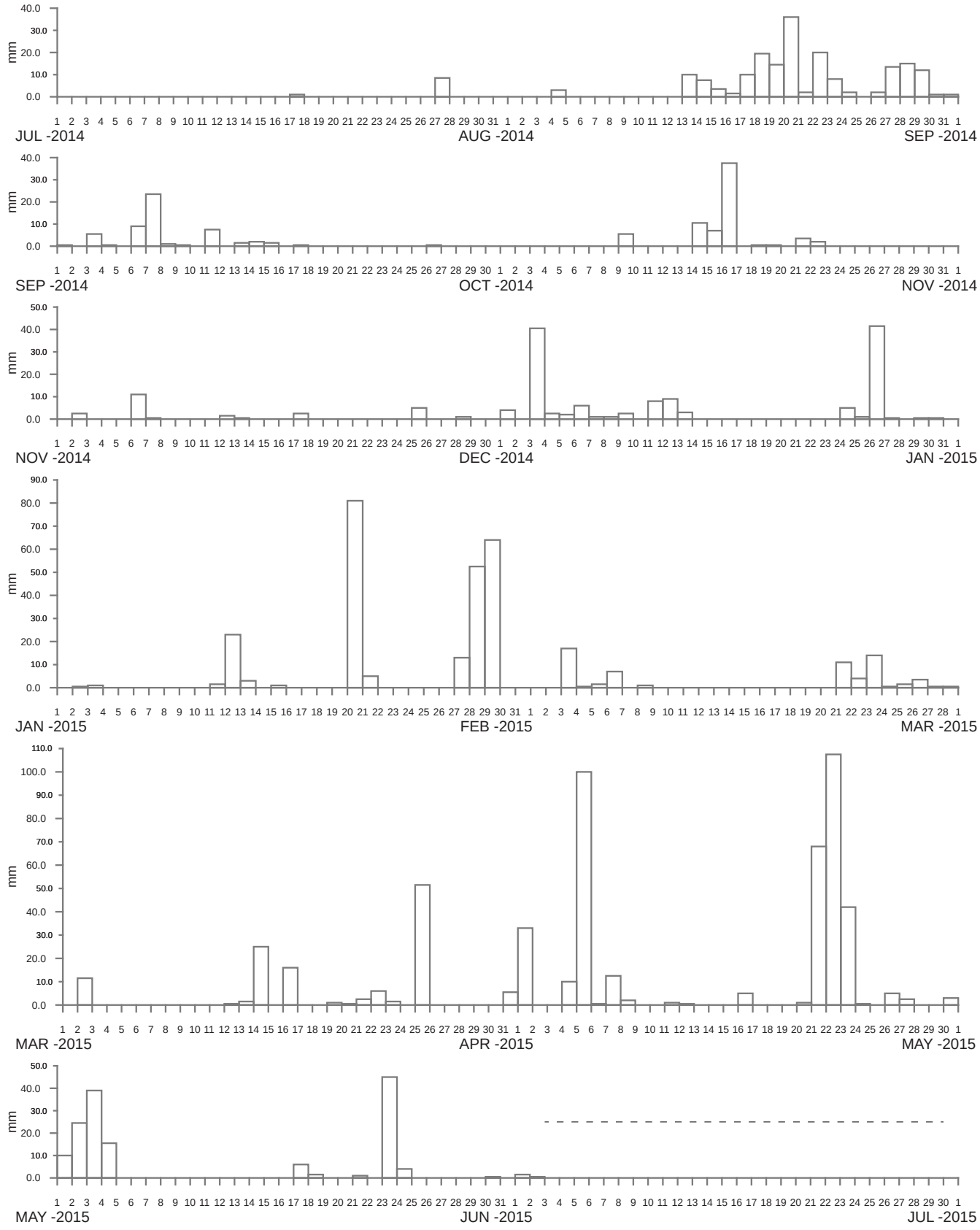


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

KANGY ANGY AT ORCHARD ROAD
2014–2015

MHL Report 2385
Figure 56
DRAWING 2385-56

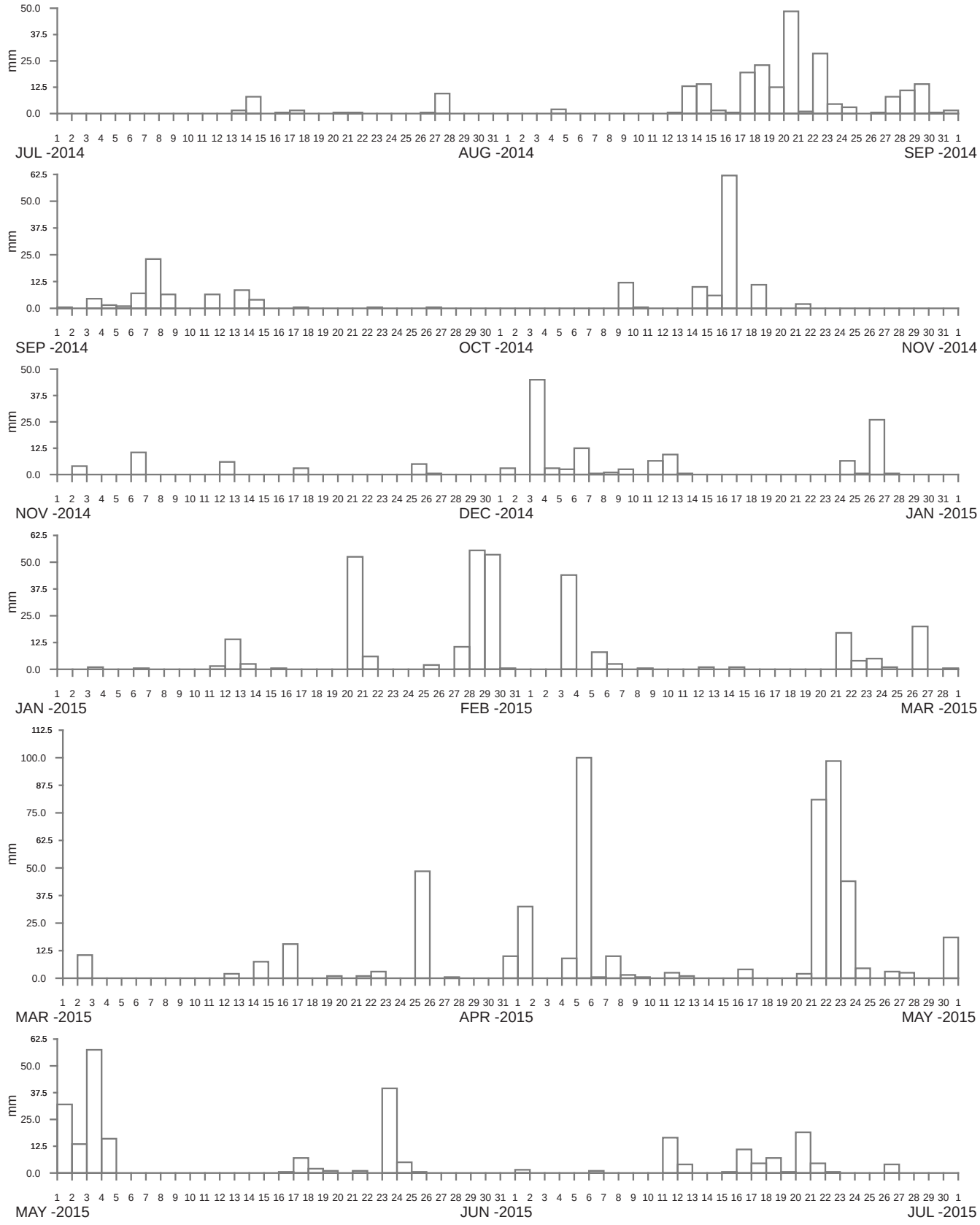


DATA LOSS

Public Works
Manly Hydraulics Laboratory

BERKELEY VALE AT BERKELEY VALE ROAD
2014–2015

MHL Report 2385
Figure 57
DRAWING 2385-57

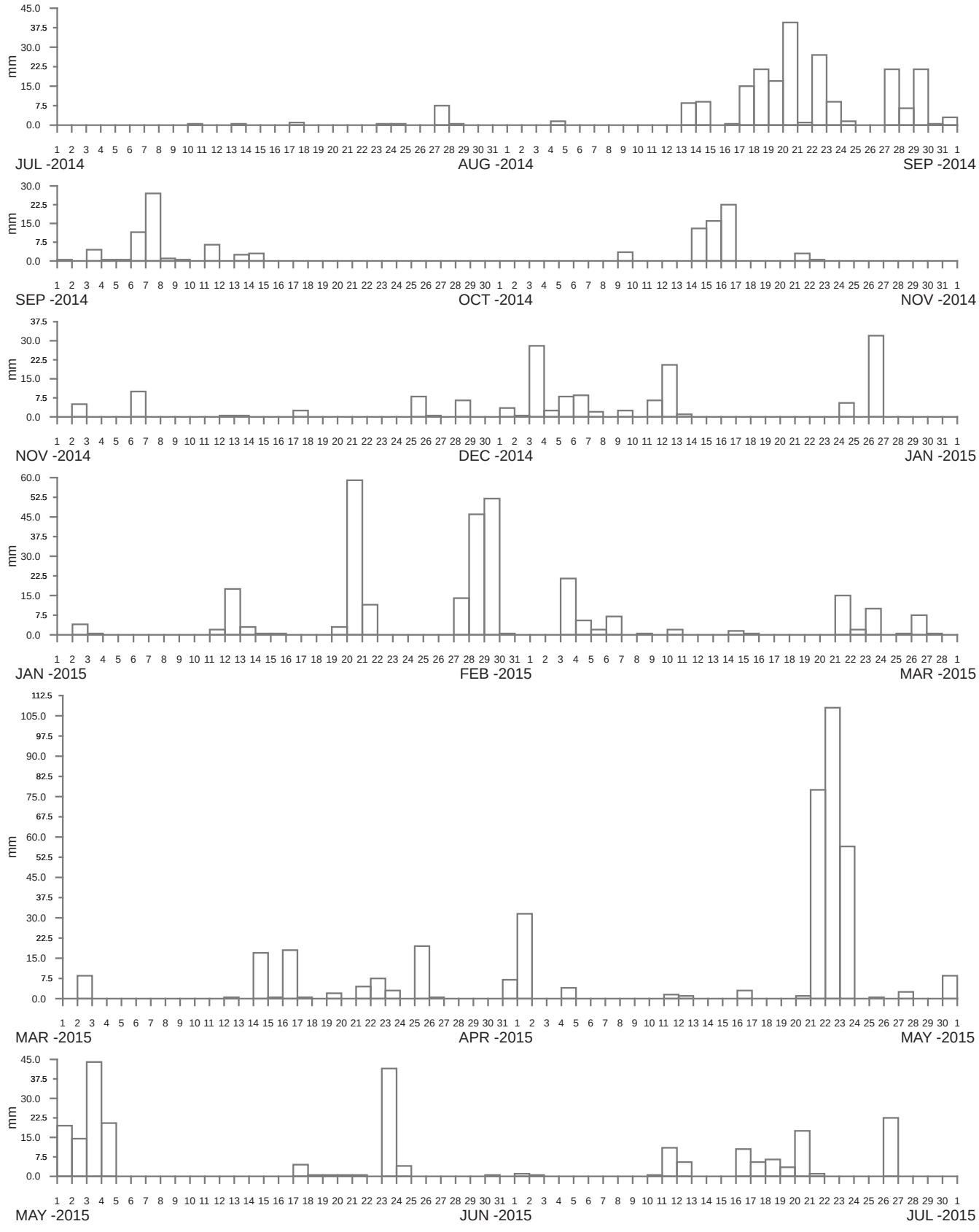


DATA LOSS

Public Works
Manly Hydraulics Laboratory

BATEAU BAY AT SEWAGE TREATMENT WORKS
2014–2015

MHL Report 2385
Figure 58
DRAWING 2385-58

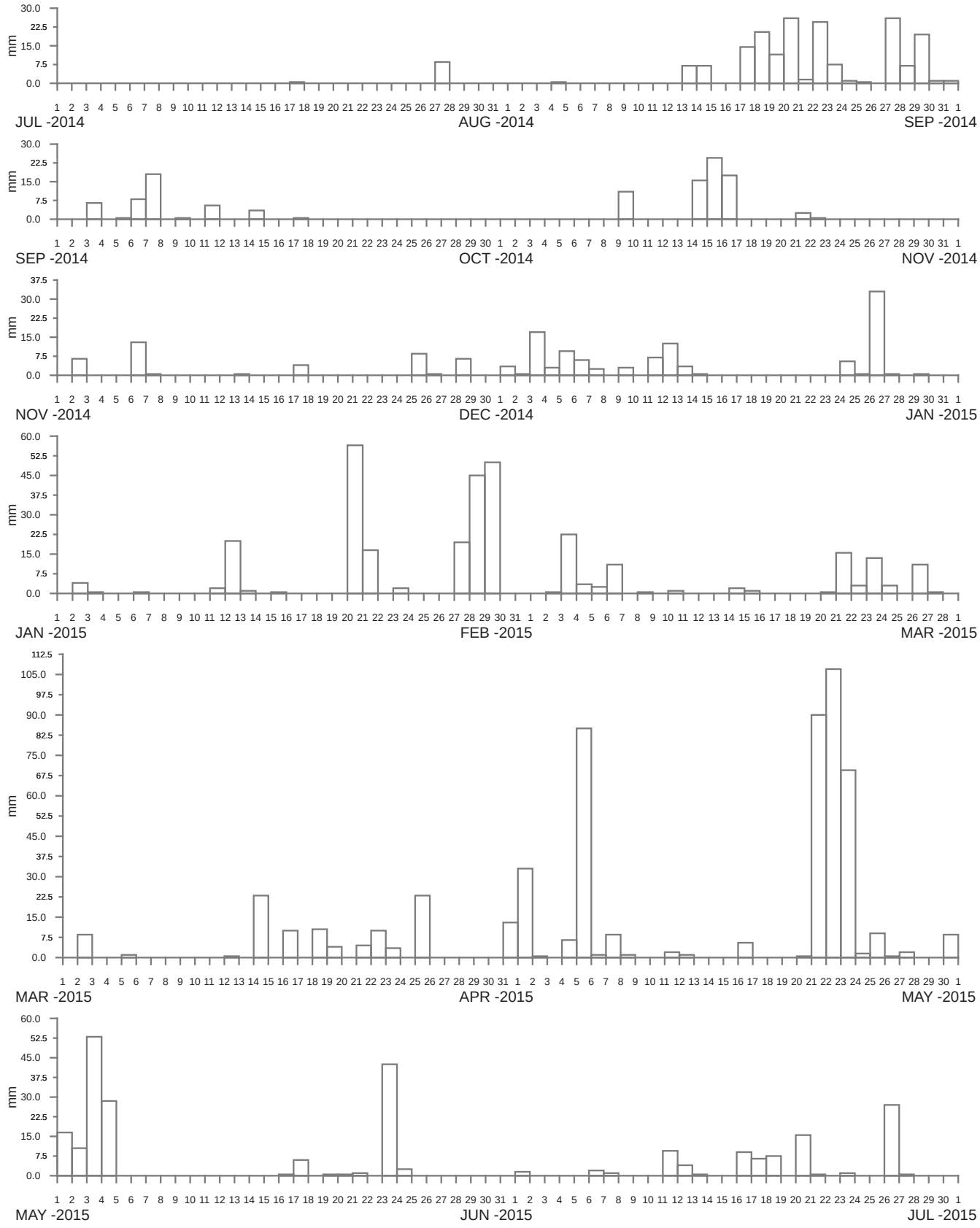


DATA LOSS

Public Works
Manly Hydraulics Laboratory

LISAROW AT FAGANS ROAD
2014–2015

MHL Report 2385
Figure 59
DRAWING 2385-59

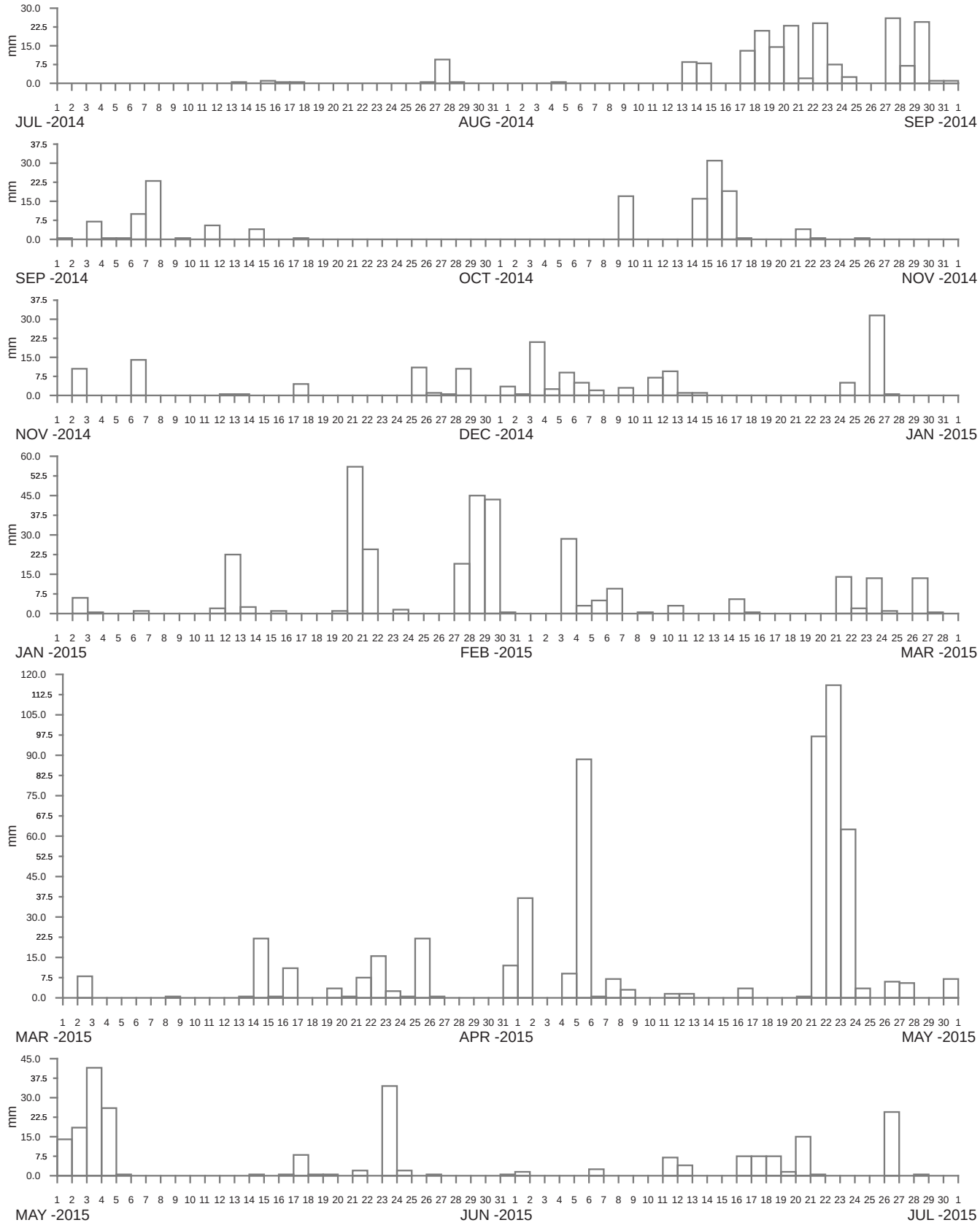


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

STRICKLAND AT MANGROVE ROAD
2014–2015

MHL Report 2385
Figure 60
DRAWING 2385-60



DATA LOSS

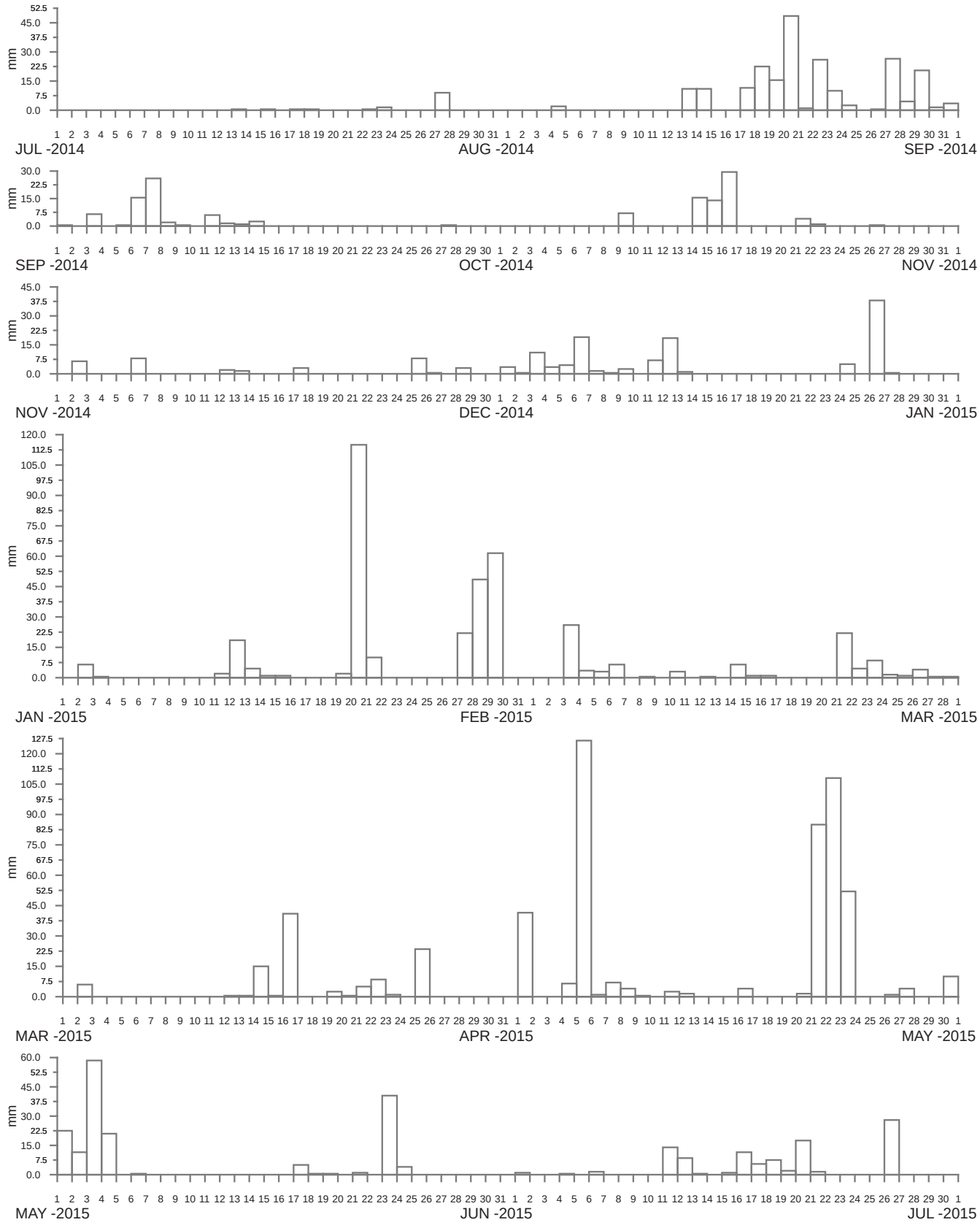
Public Works
Manly Hydraulics Laboratory

NARARA AT RESEARCH ROAD
2014–2015

MHL Report 2385

Figure 61

DRAWING 2385-61

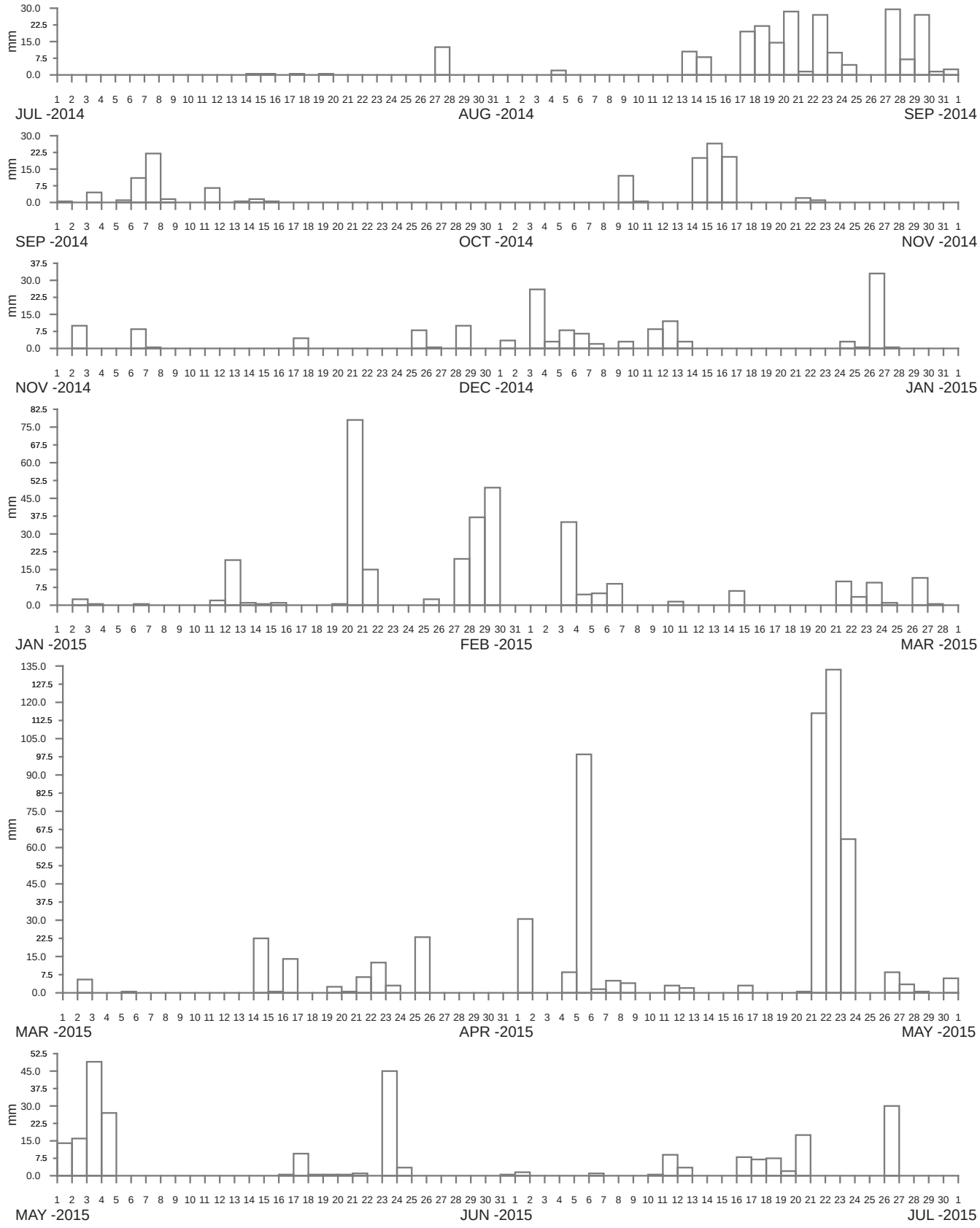


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

MOUNT ELLIOT AT TOOMEYS ROAD
2014–2015

MHL Report 2385
Figure 62
DRAWING 2385-62

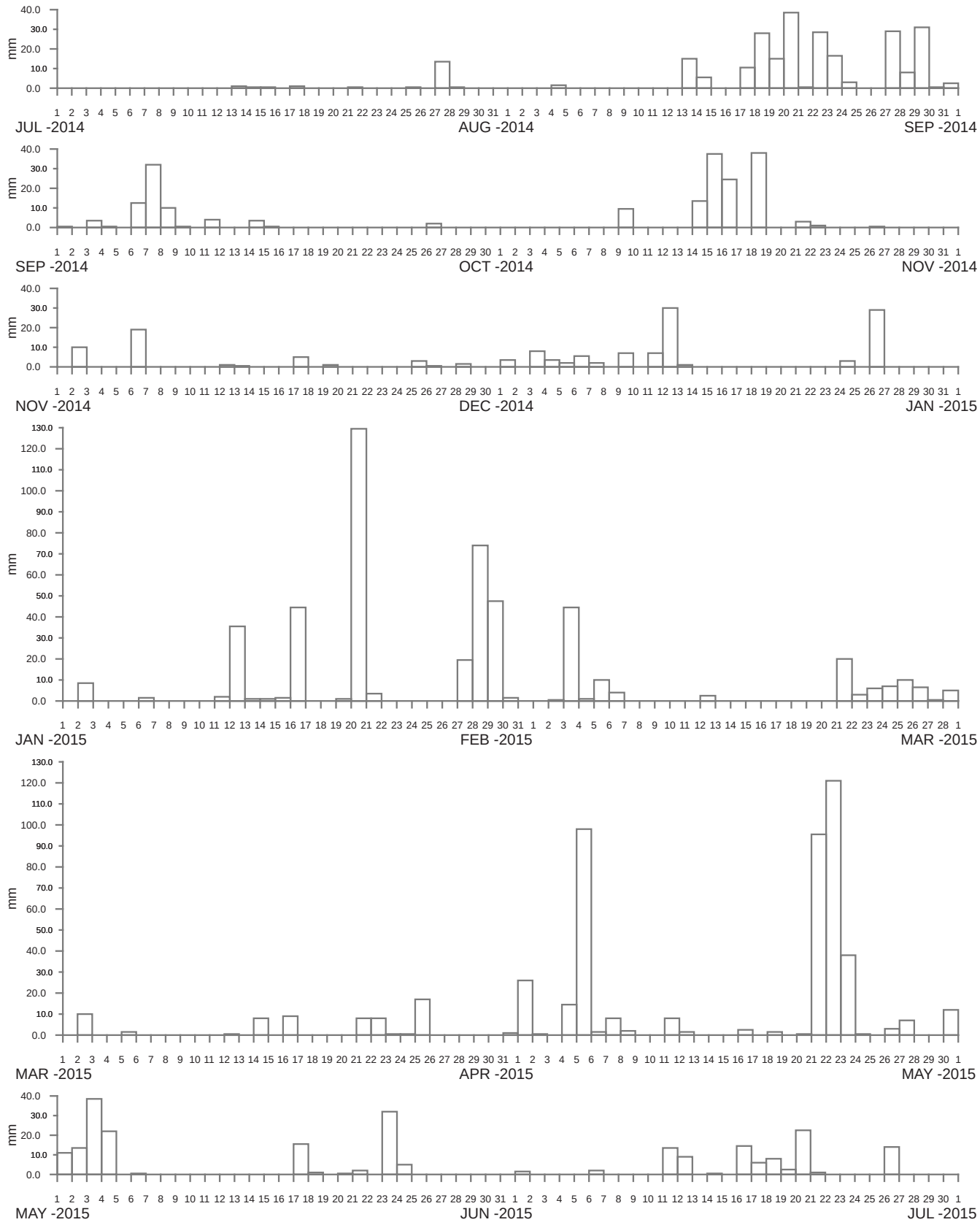


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

WYOMING AT LAYCOCK STREET
2014–2015

MHL Report 2385
Figure 63
DRAWING 2385-63

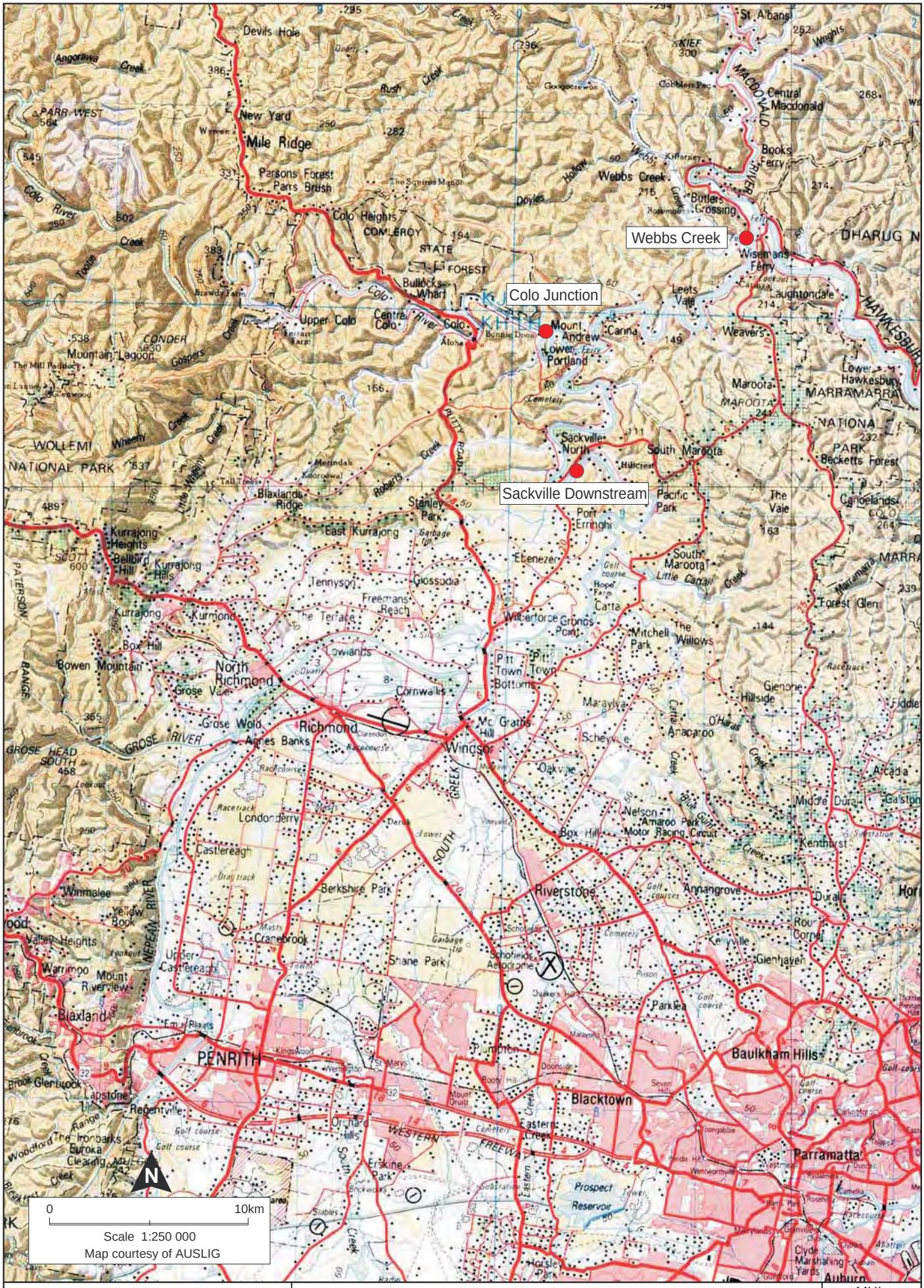


DATA LOSS

Public Works
Manly Hydraulics Laboratory

KINCUMBER AT DOYLE STREET
2014–2015

MHL Report 2385
Figure 64
DRAWING 2385-64



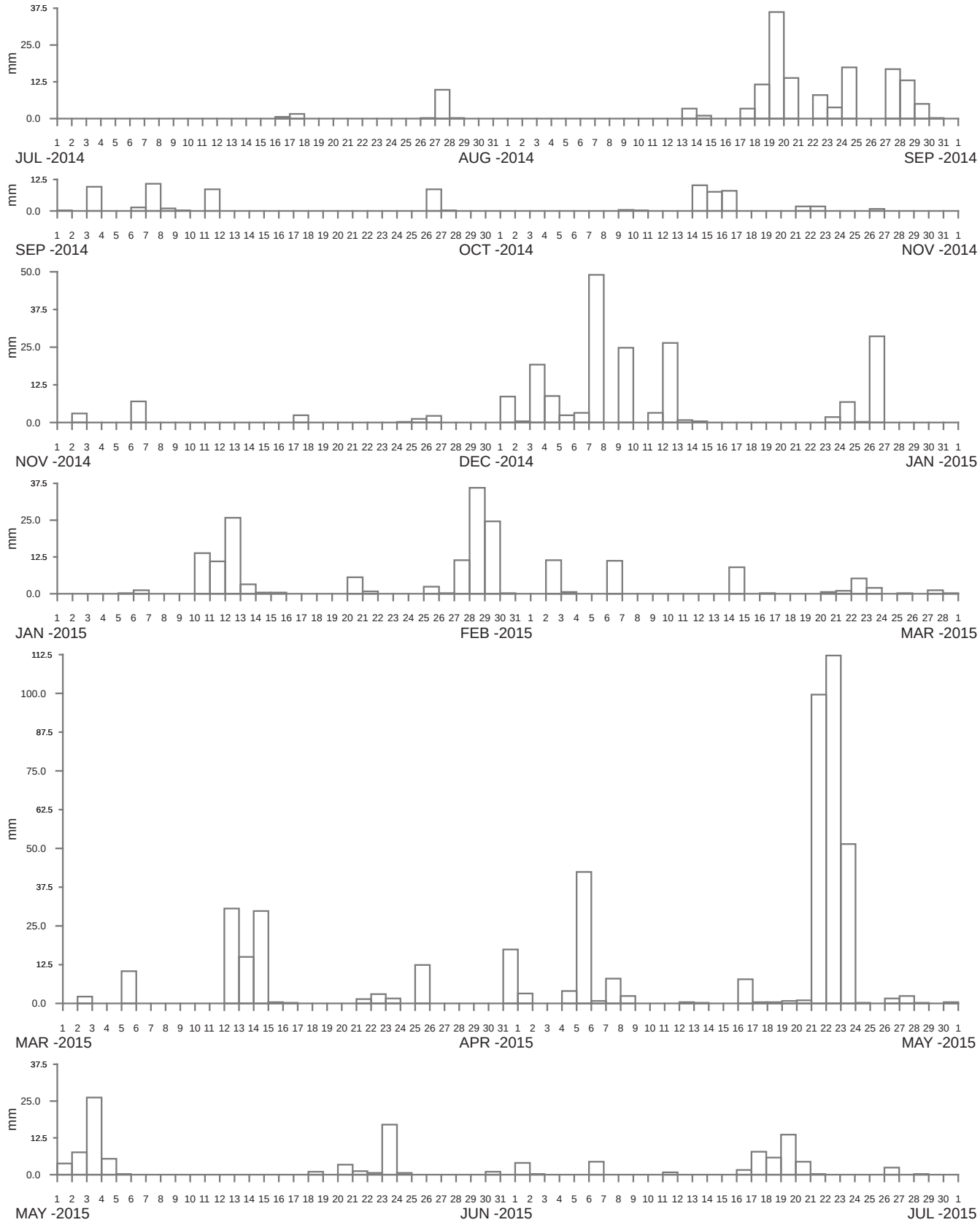
Public Works
Manly Hydraulics Laboratory

RAINFALL STATION LOCATIONS
HAWKESBURY RIVER (MID) REGION

MHL Report 2385

Figure 65

DRAWING 2385-65.cdr

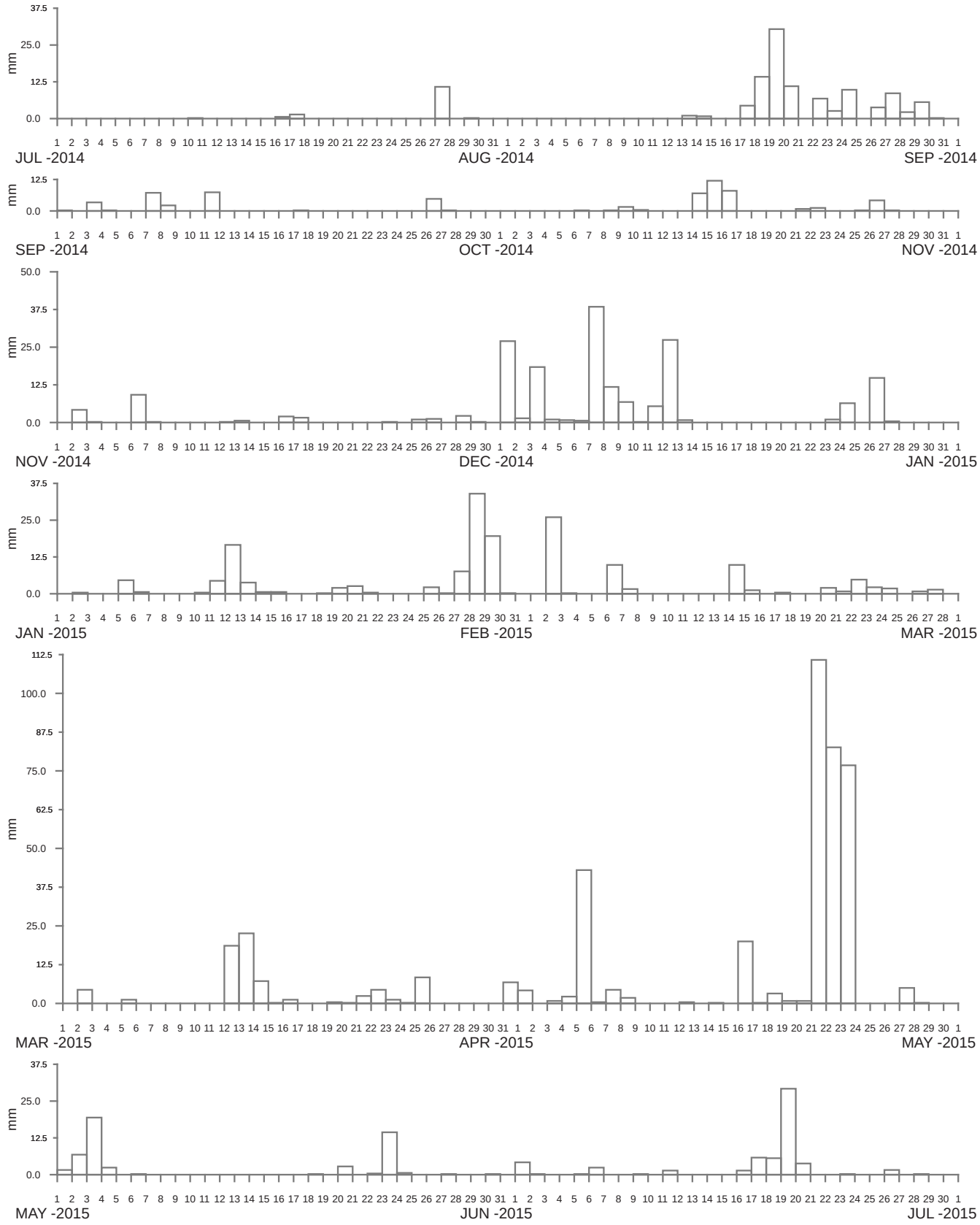


DATA LOSS

Public Works
Manly Hydraulics Laboratory

HAWKESBURY RIVER AT WEBBS CREEK
2014–2015

MHL Report 2385
Figure 66
DRAWING 2385-66



DATA LOSS

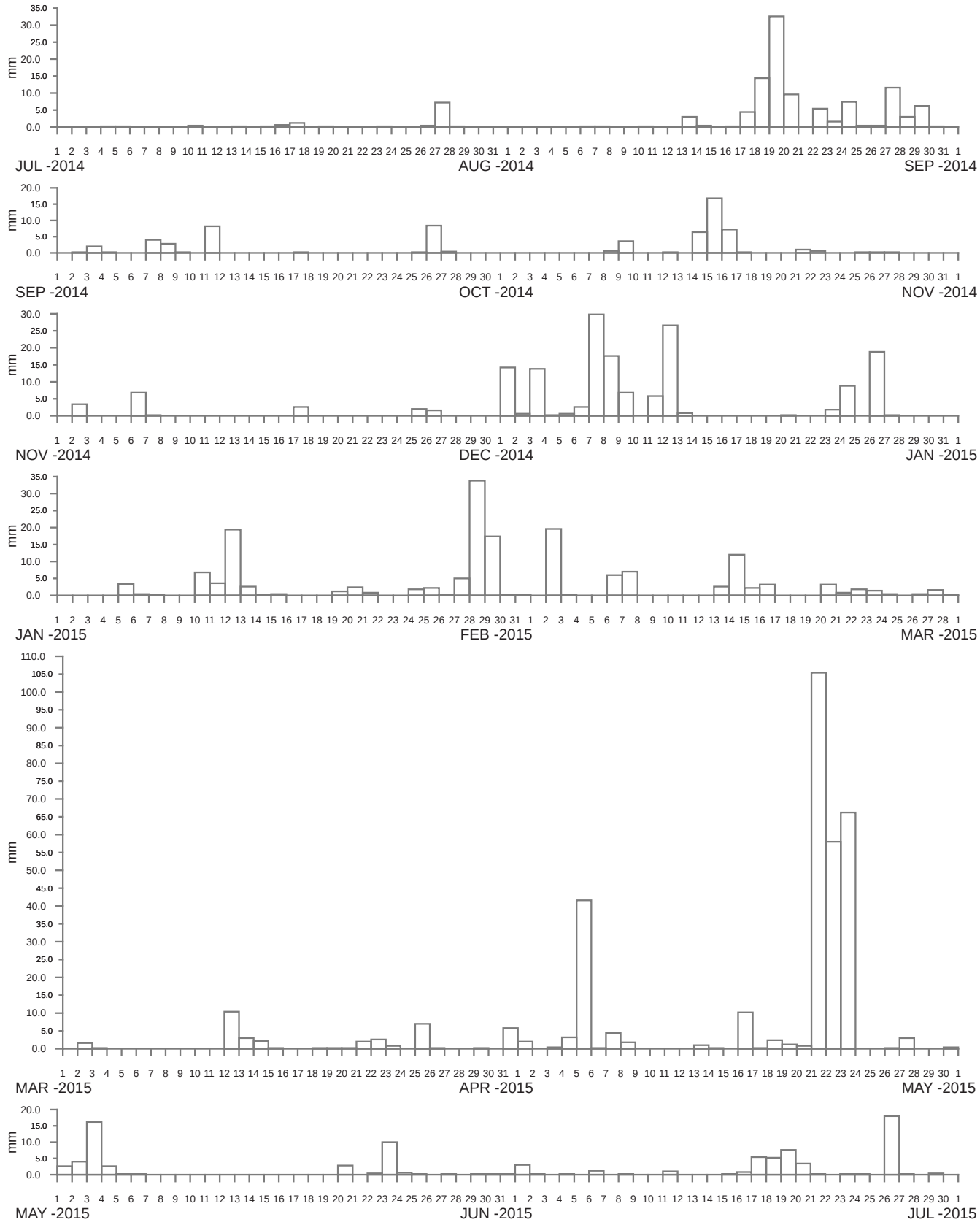
Public Works
Manly Hydraulics Laboratory

HAWKESBURY RIVER AT COLO JUNCTION
2014–2015

MHL Report 2385

Figure 67

DRAWING 2385-67

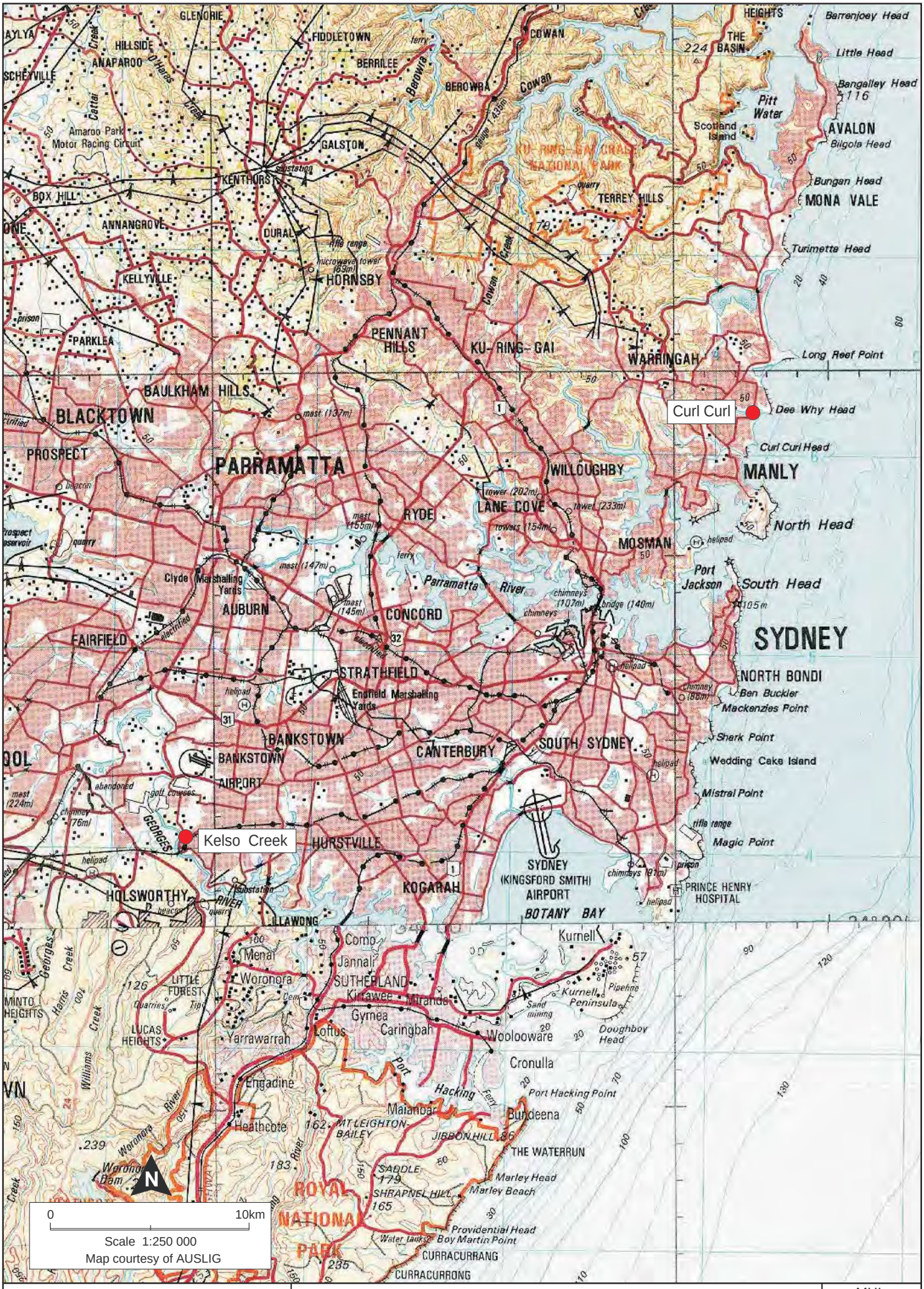


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

HAWKESBURY RIVER AT SACKVILLE DOWNSTREAM
2014–2015

MHL Report 2385
Figure 68
DRAWING 2385-68



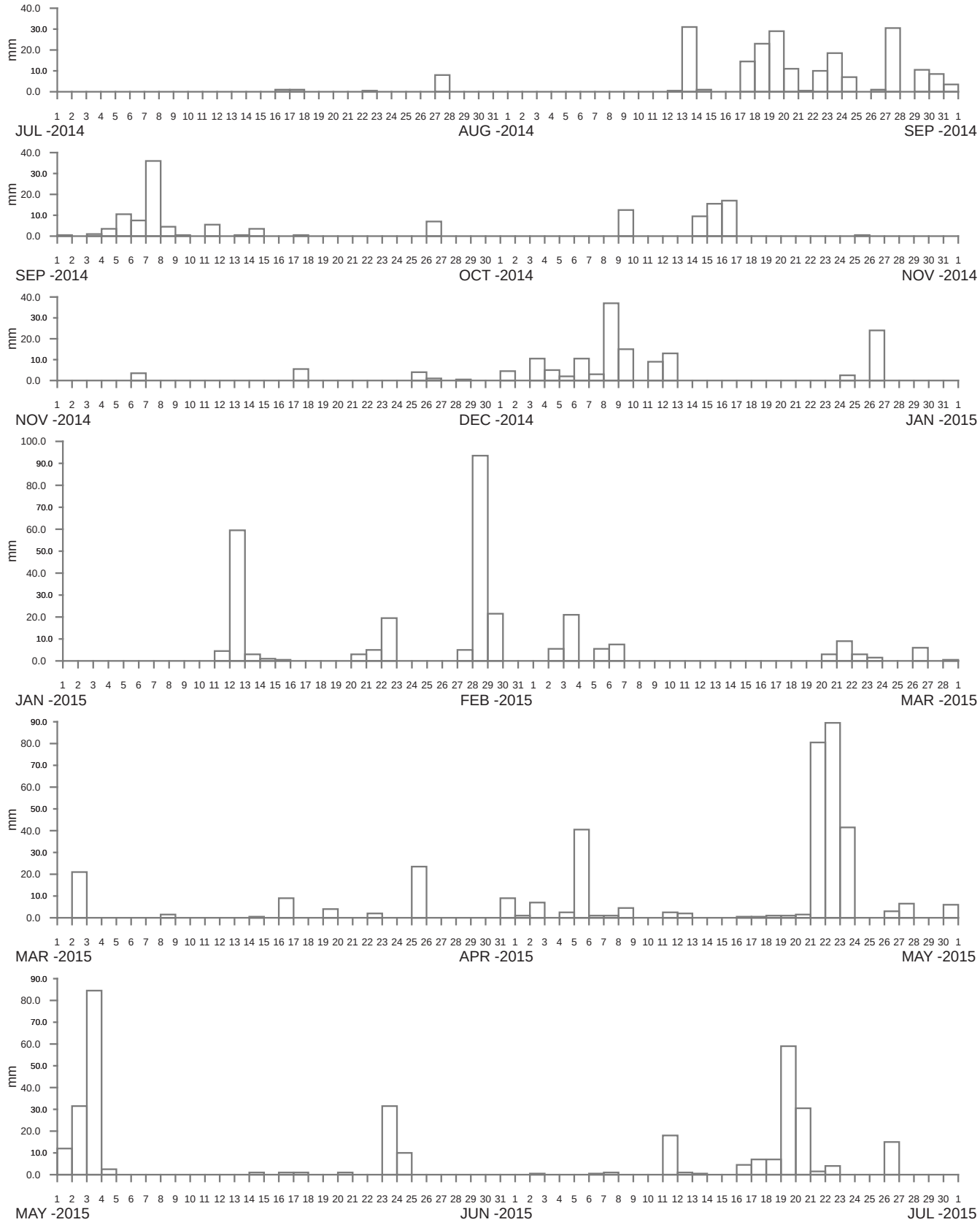
Public Works
Manly Hydraulics Laboratory

RAINFALL STATION LOCATIONS
SYDNEY COASTAL REGION

MHL Report 2385

Figure 69

DRAWING 2385-69.cdr



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

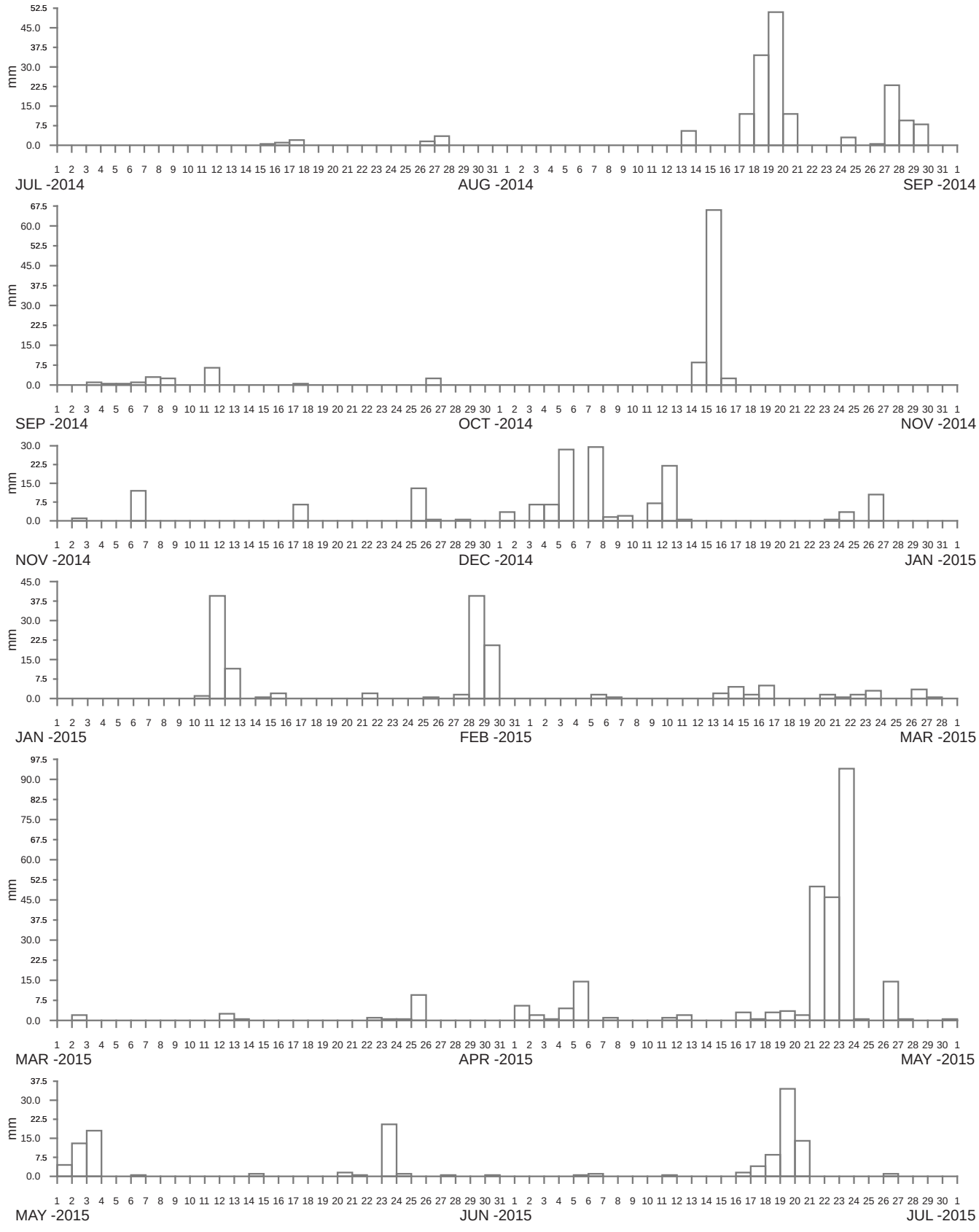
Public Works
Manly Hydraulics Laboratory

CURL CURL LAGOON AT CURL CURL
2014–2015

MHL Report 2385

Figure 70

DRAWING 2385-70

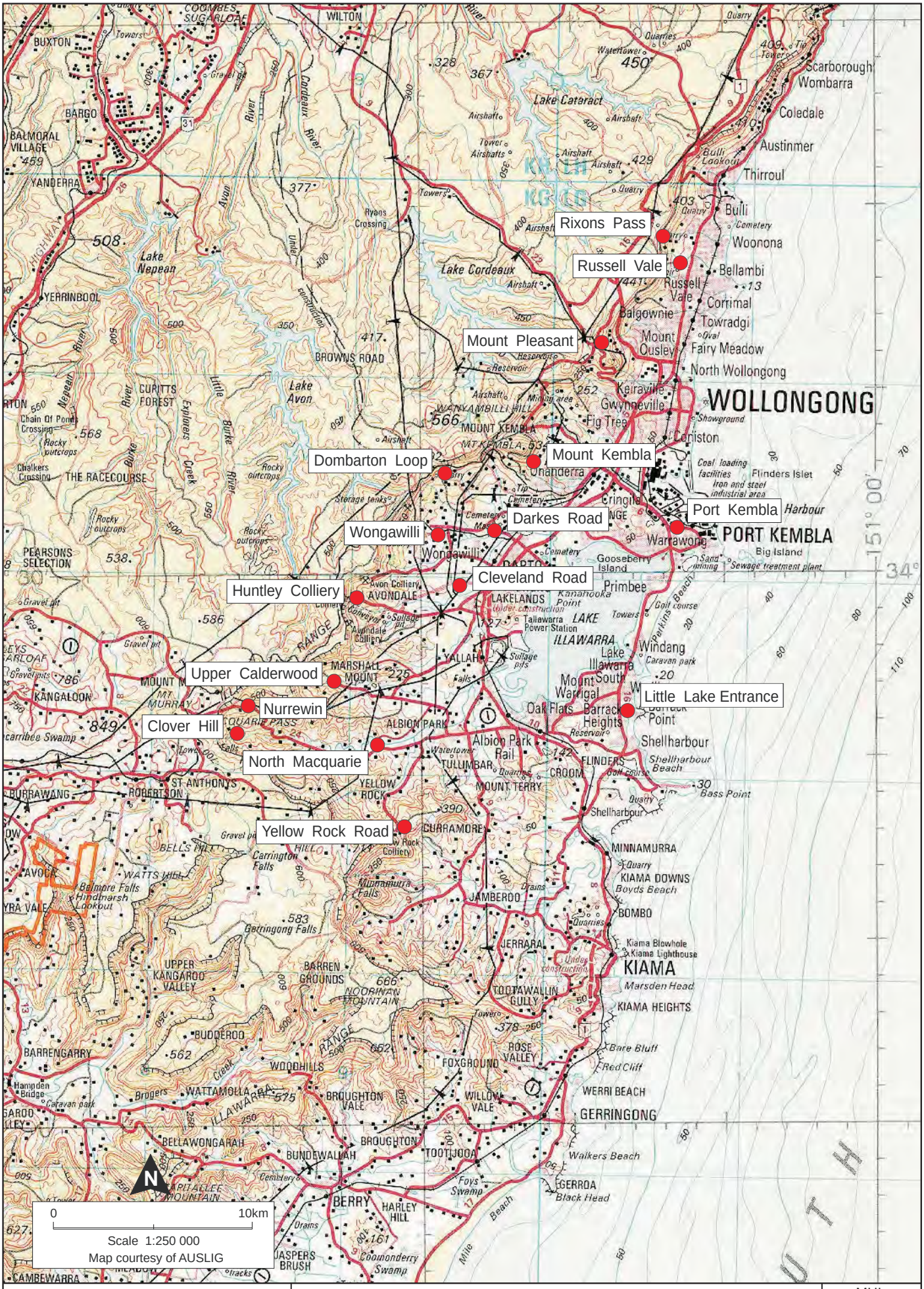


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

KELSO CREEK AT KELSO CREEK
2014–2015

MHL Report 2385
Figure 71
DRAWING 2385-71



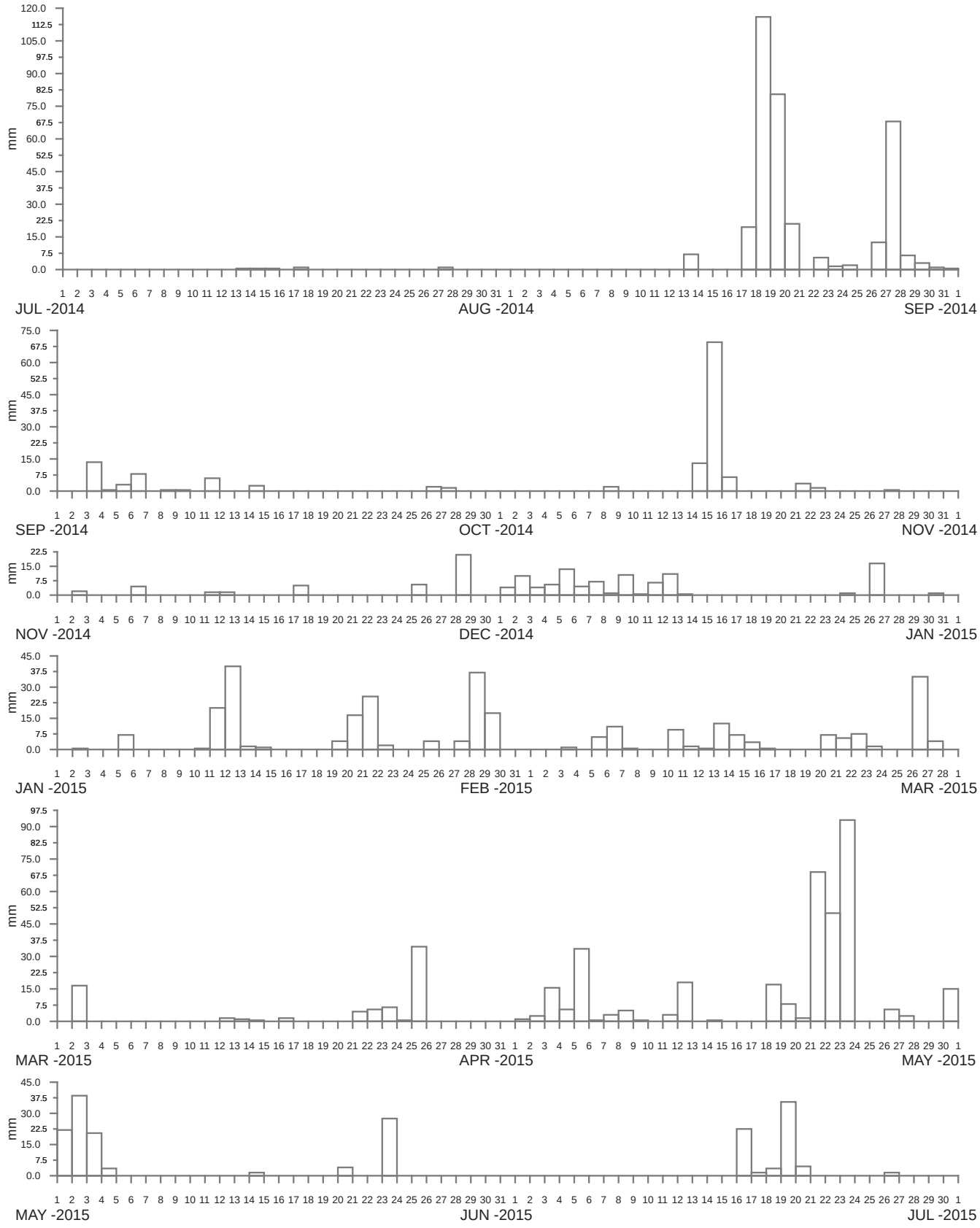
Public Works
Manly Hydraulics Laboratory

RAINFALL STATION LOCATIONS
WOLLONGONG COASTAL REGION

MHL Report 2385

Figure 72

DRAWING 2385-72.cdr

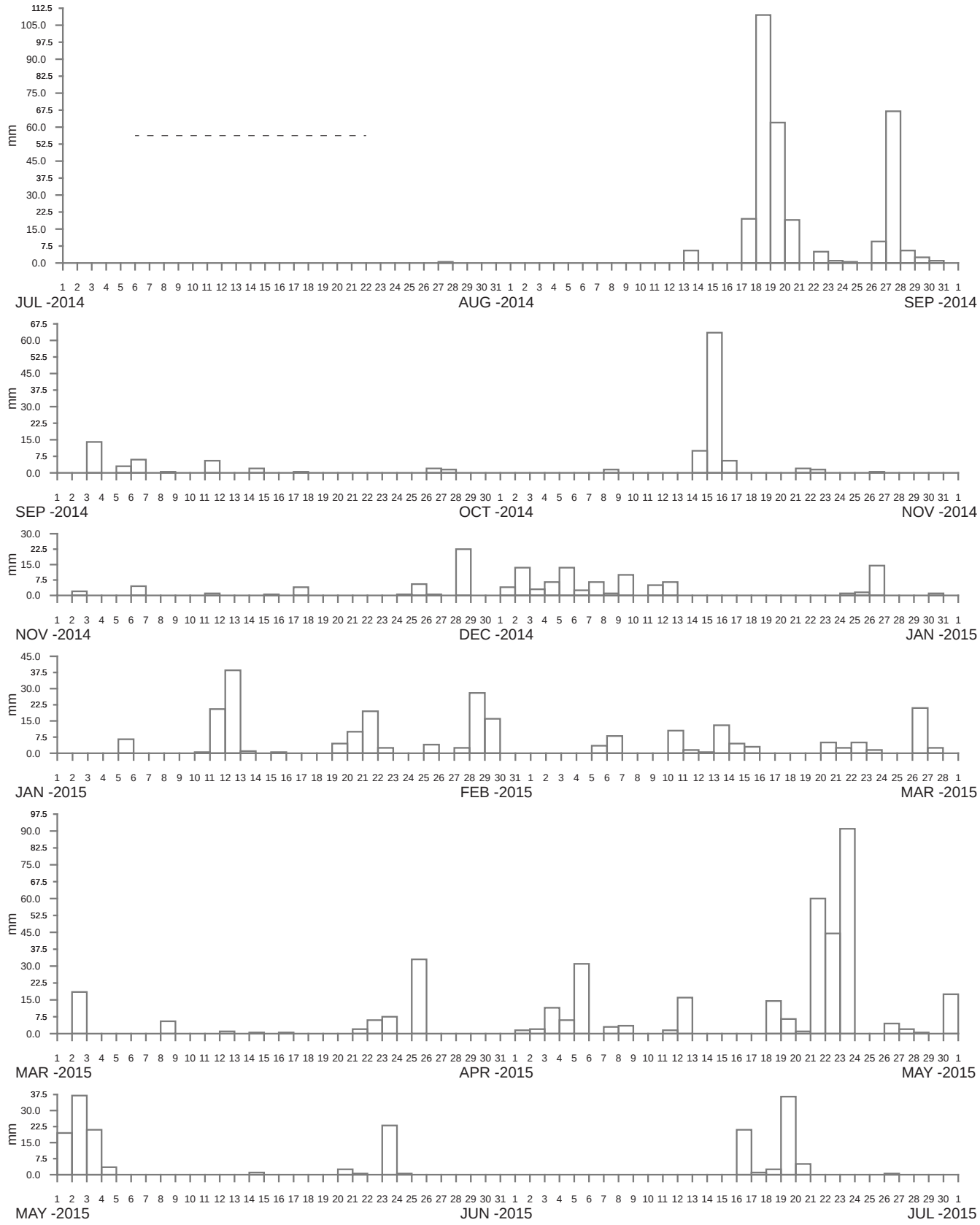


DATA LOSS

Public Works
Manly Hydraulics Laboratory

RIXONS PASS AT RIXONS PASS ROAD
2014–2015

MHL Report 2385
Figure 73
DRAWING 2385-73



DATA LOSS

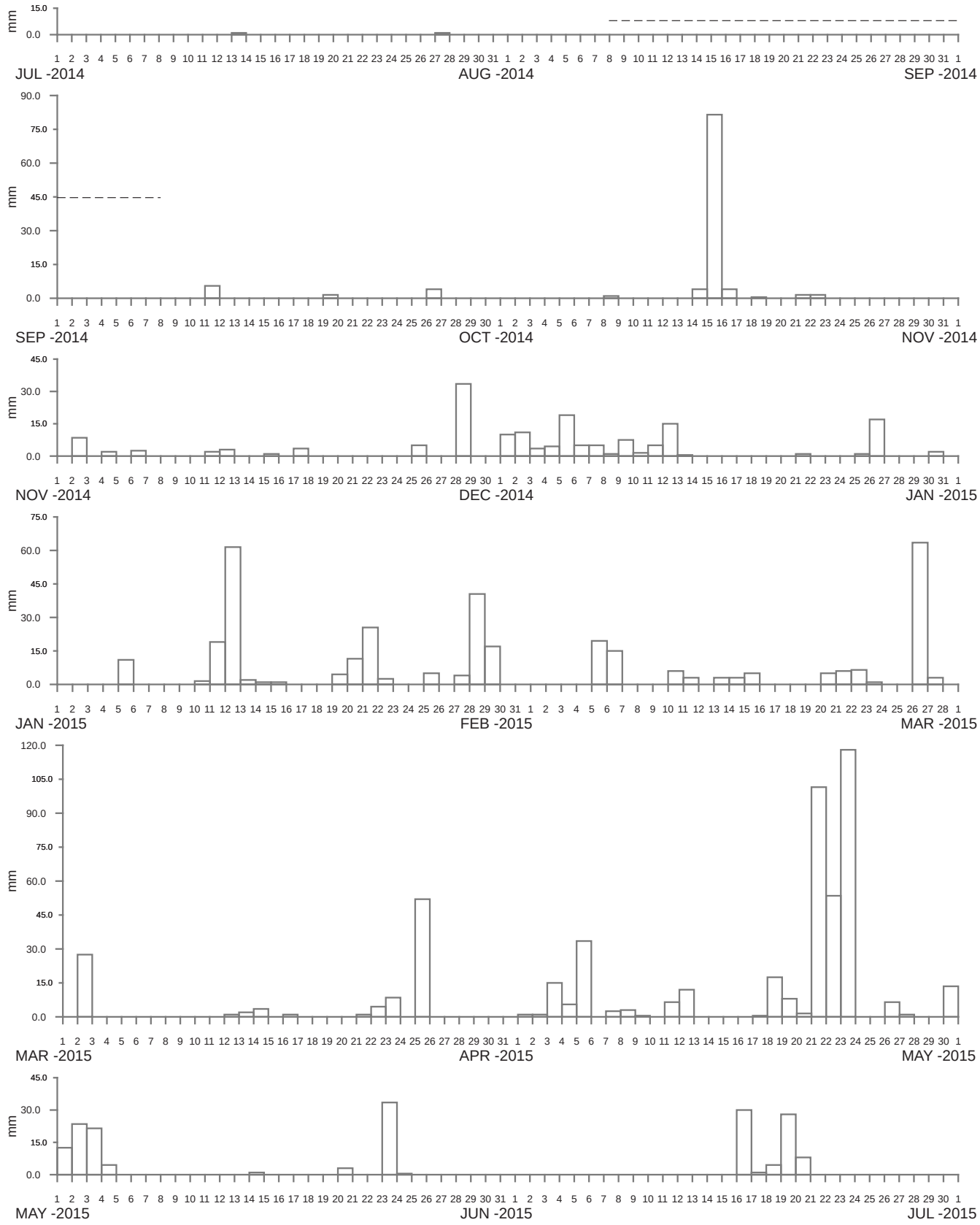
Public Works
Manly Hydraulics Laboratory

RUSSELL VALE AT WHITING CRESCENT
2014–2015

MHL Report 2385

Figure 74

DRAWING 2385-74

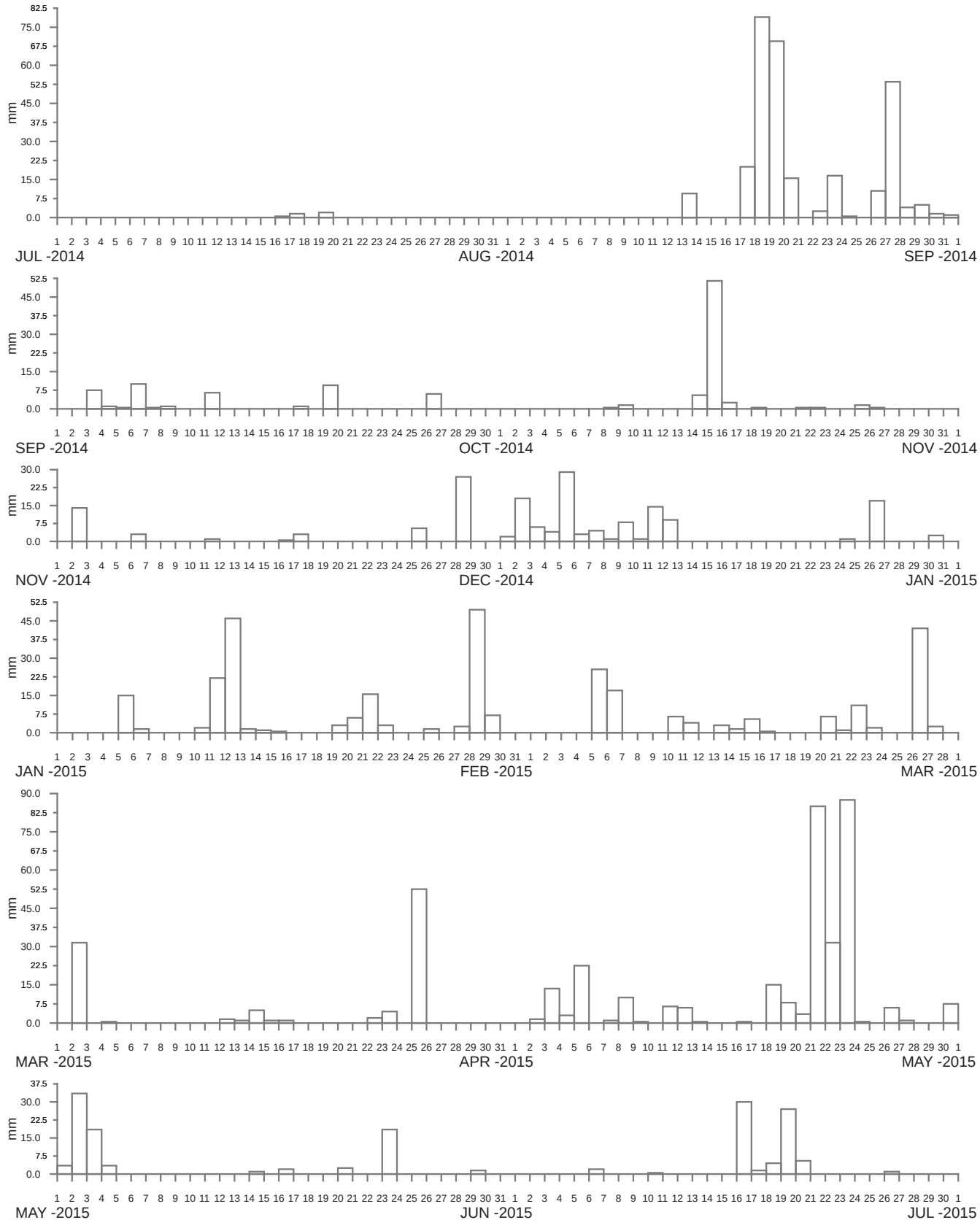


DATA LOSS

Public Works
Manly Hydraulics Laboratory

MOUNT PLEASANT AT PARRISH AVENUE
2014–2015

MHL Report 2385
Figure 75
DRAWING 2385-75

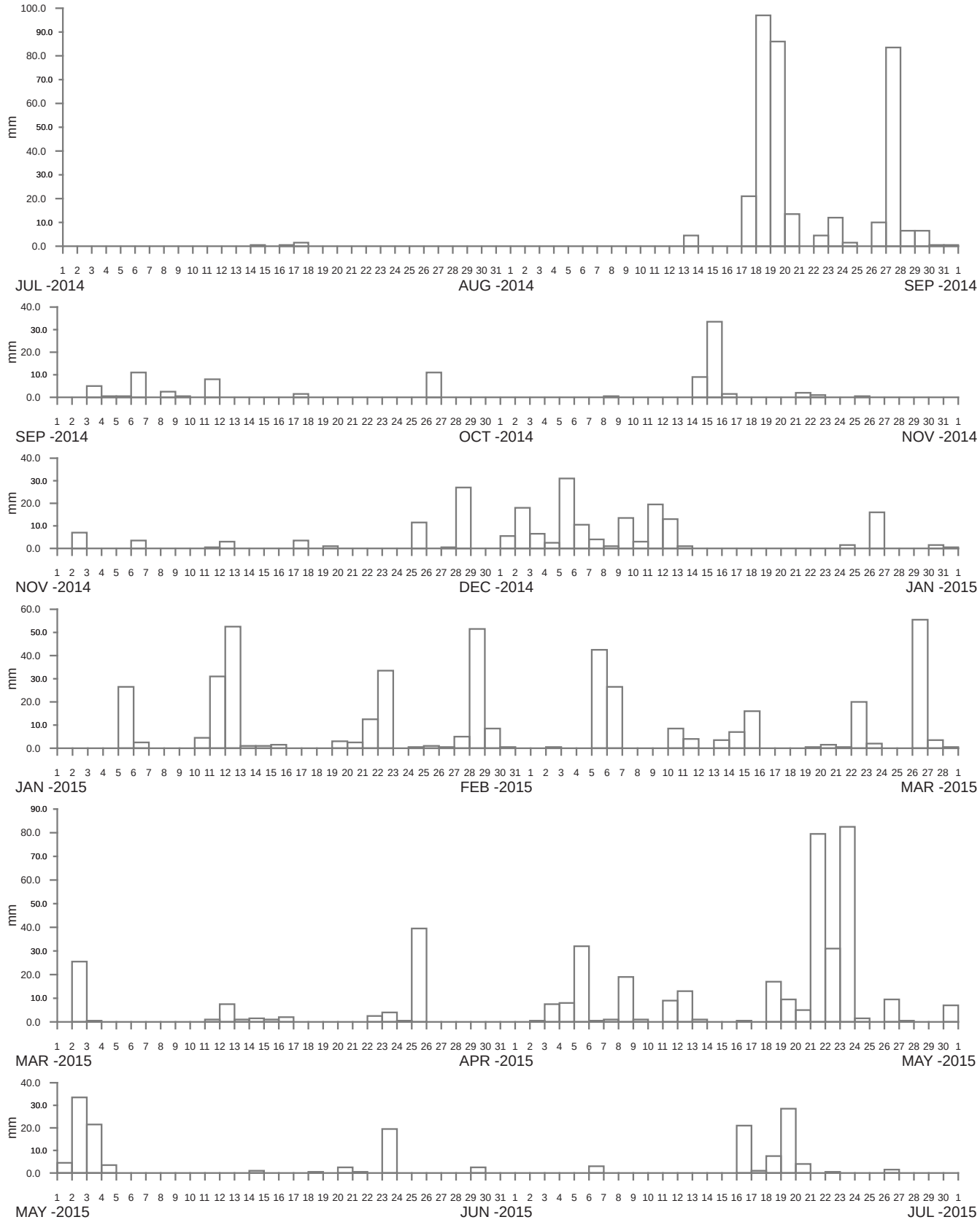


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

MOUNT KEMBLA AT STAFF ROAD
2014–2015

MHL Report 2385
Figure 76
DRAWING 2385-76

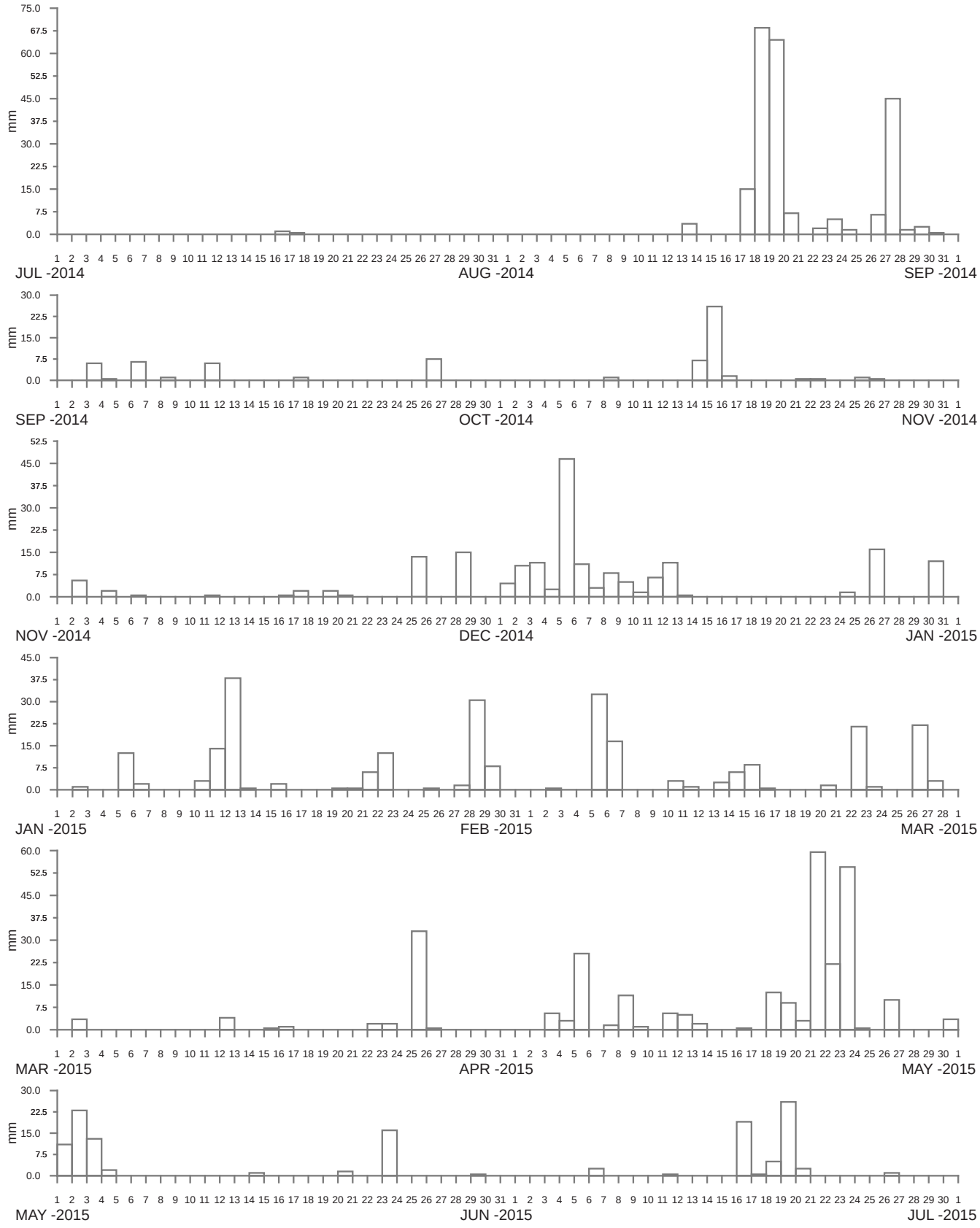


DATA LOSS

Public Works
Manly Hydraulics Laboratory

DOMBARTON LOOP AT PAYNES ROAD
2014–2015

MHL Report 2385
Figure 77
DRAWING 2385-77

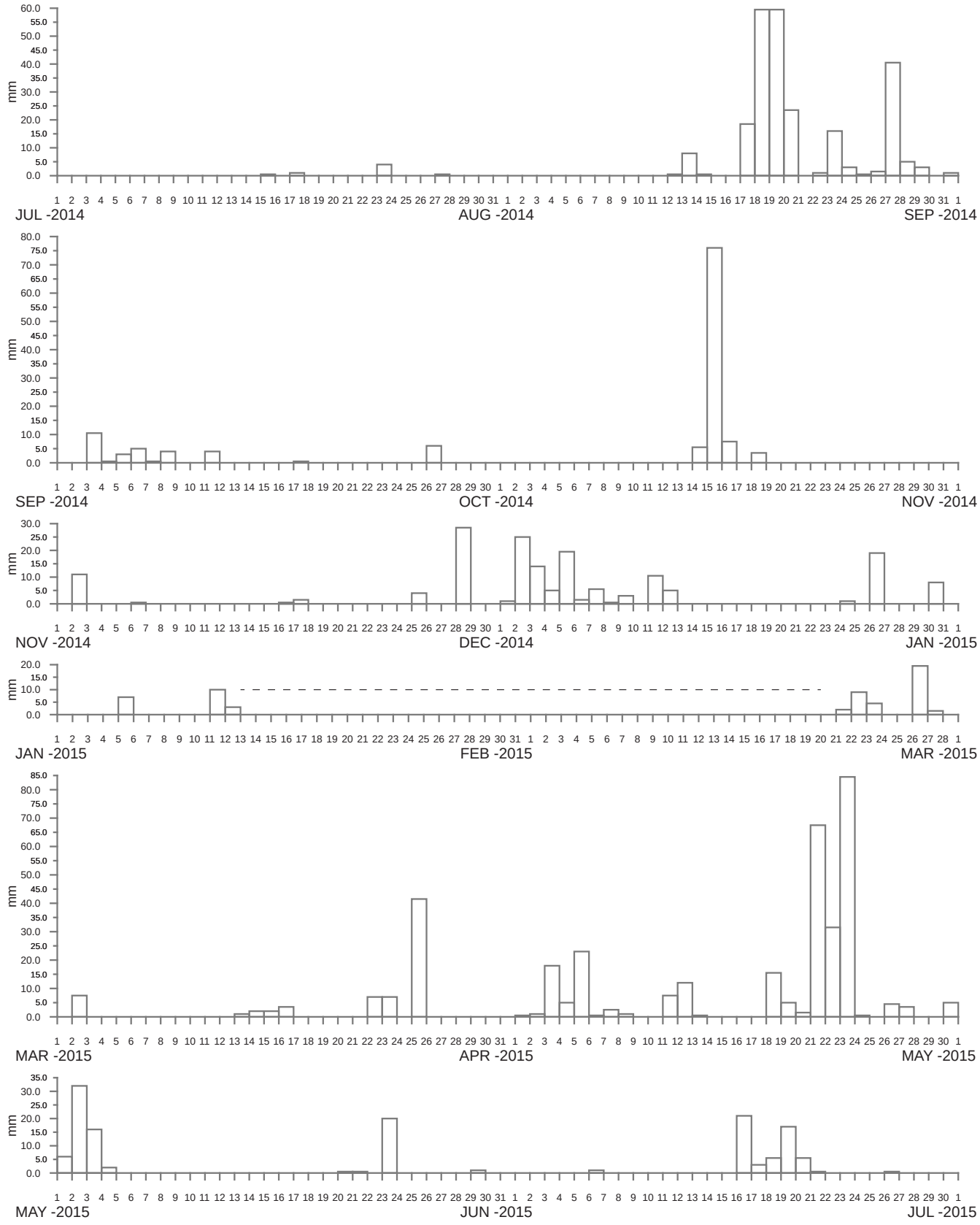


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

WONGAWILLI AT JERSEY FARM ROAD
2014–2015

MHL Report 2385
Figure 78
DRAWING 2385-78

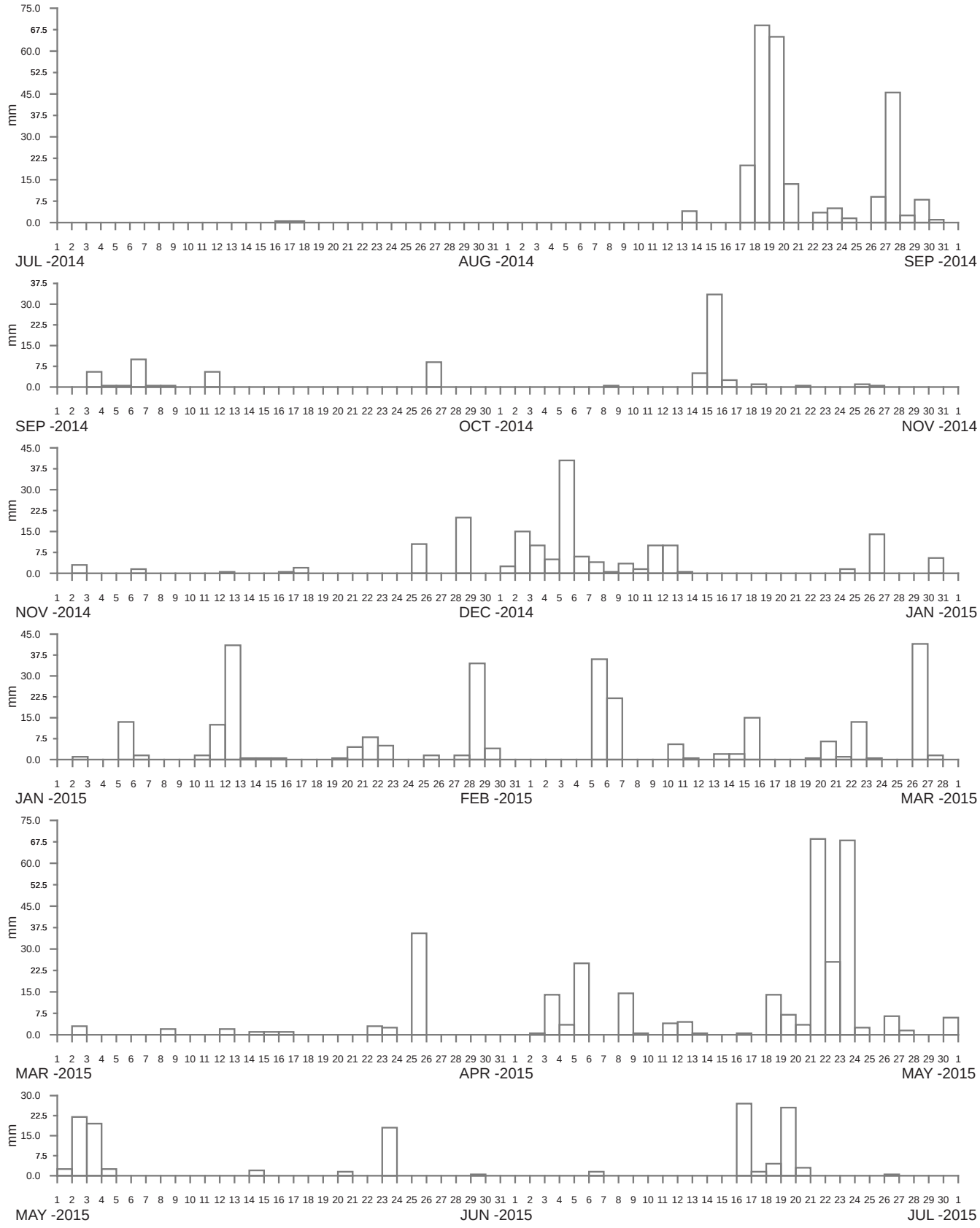


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

PORT KEMBLA AT FIVE ISLANDS ROAD
2014–2015

MHL Report 2385
Figure 79
DRAWING 2385-79

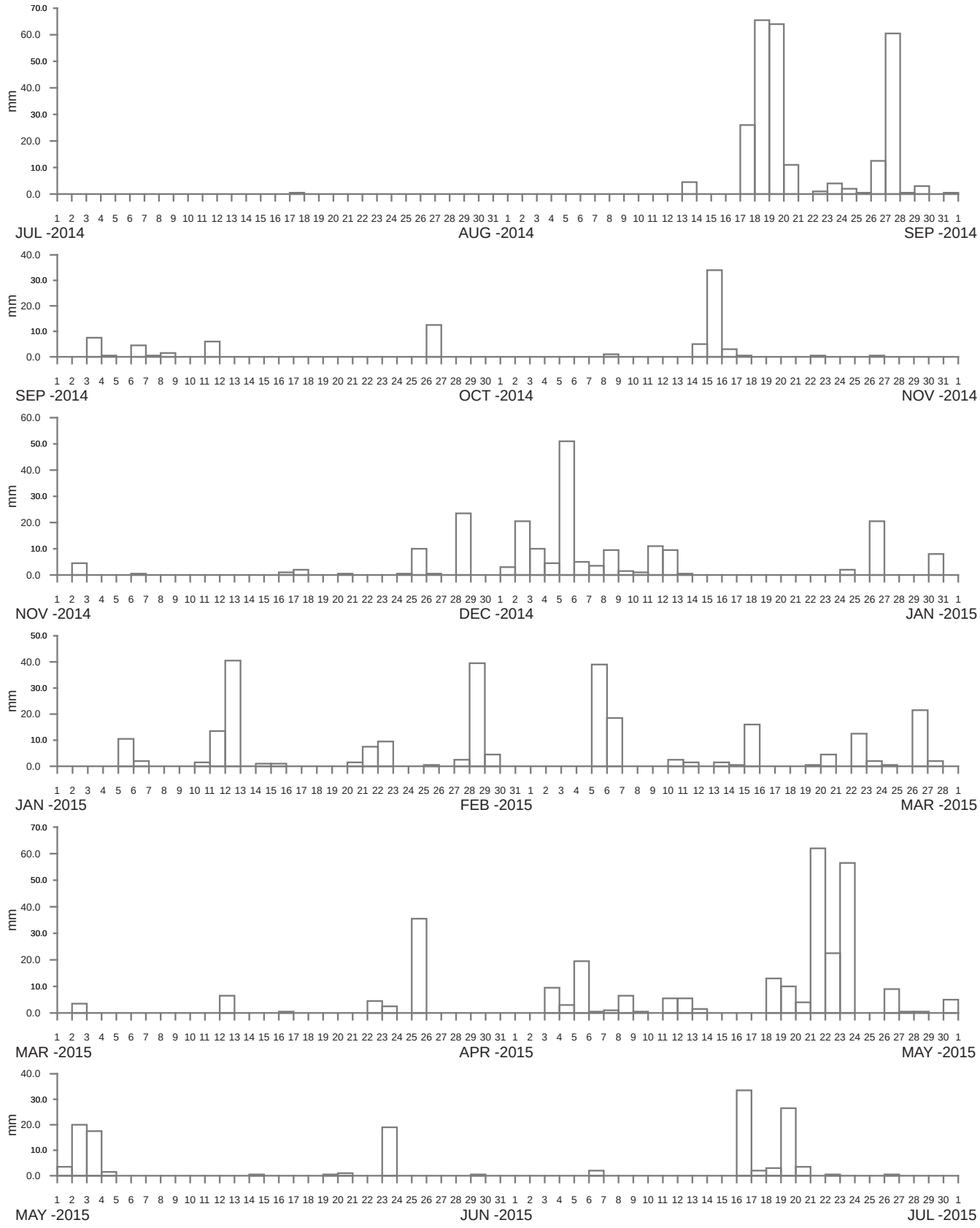


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

DAPTO AT DARKES ROAD
2014–2015

MHL Report 2385
Figure 80
DRAWING 2385-80

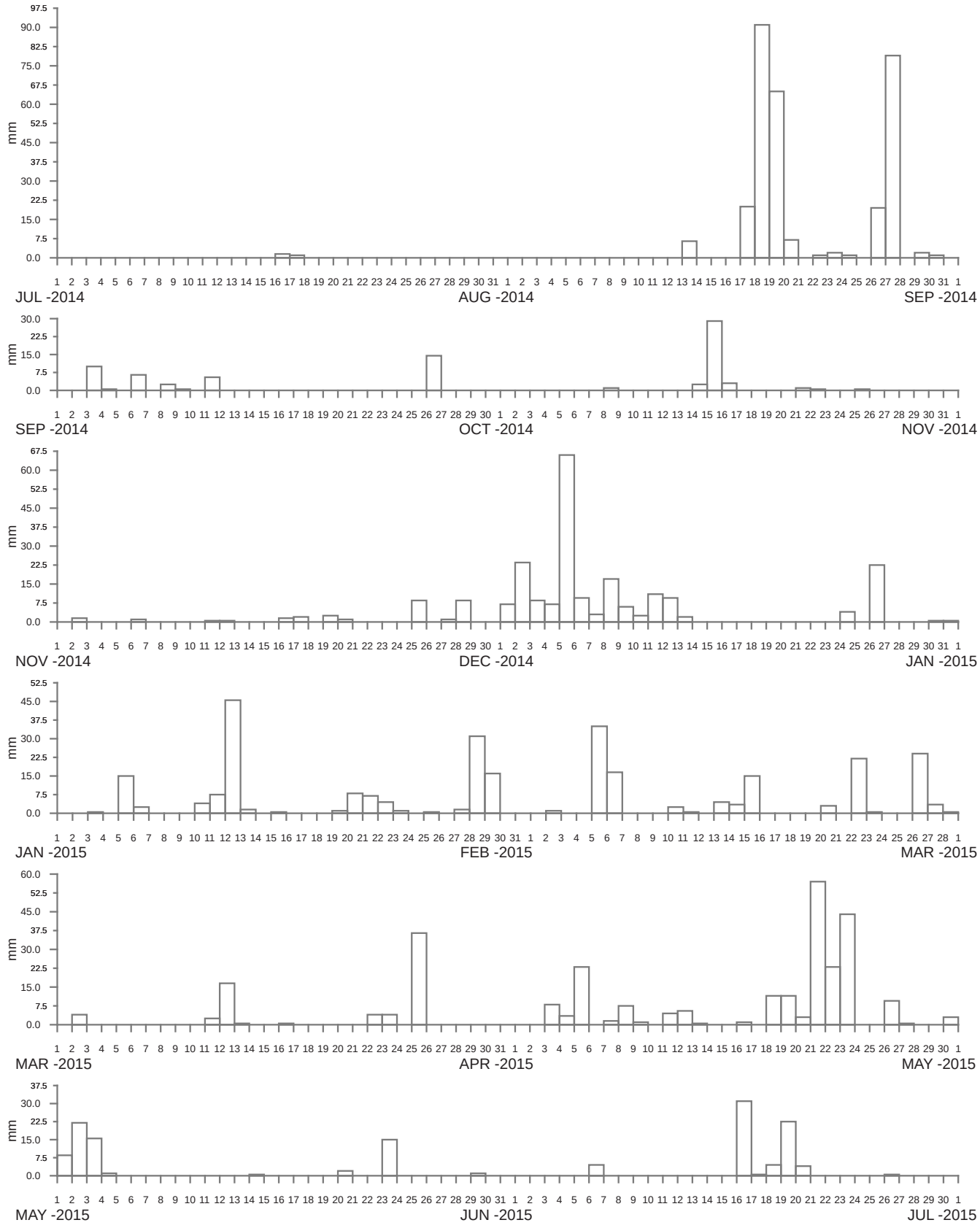


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

CLEVELAND ROAD AT CLEVELAND ROAD
2014–2015

MHL Report 2385
Figure 81
DRAWING 2385-81

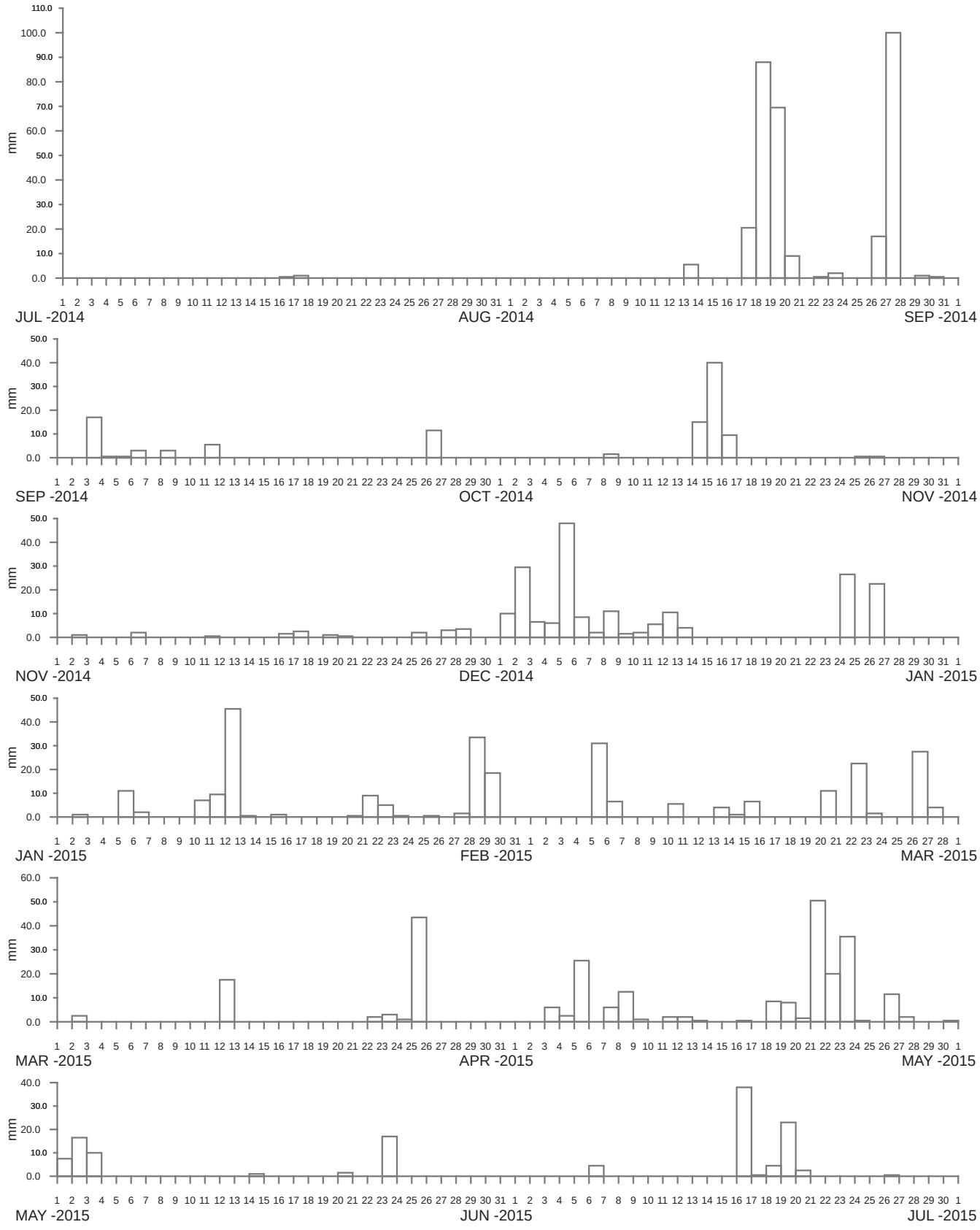


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

HUNTLEY COLLIERY AT AVONDALE ROAD
2014–2015

MHL Report 2385
Figure 82
DRAWING 2385-82

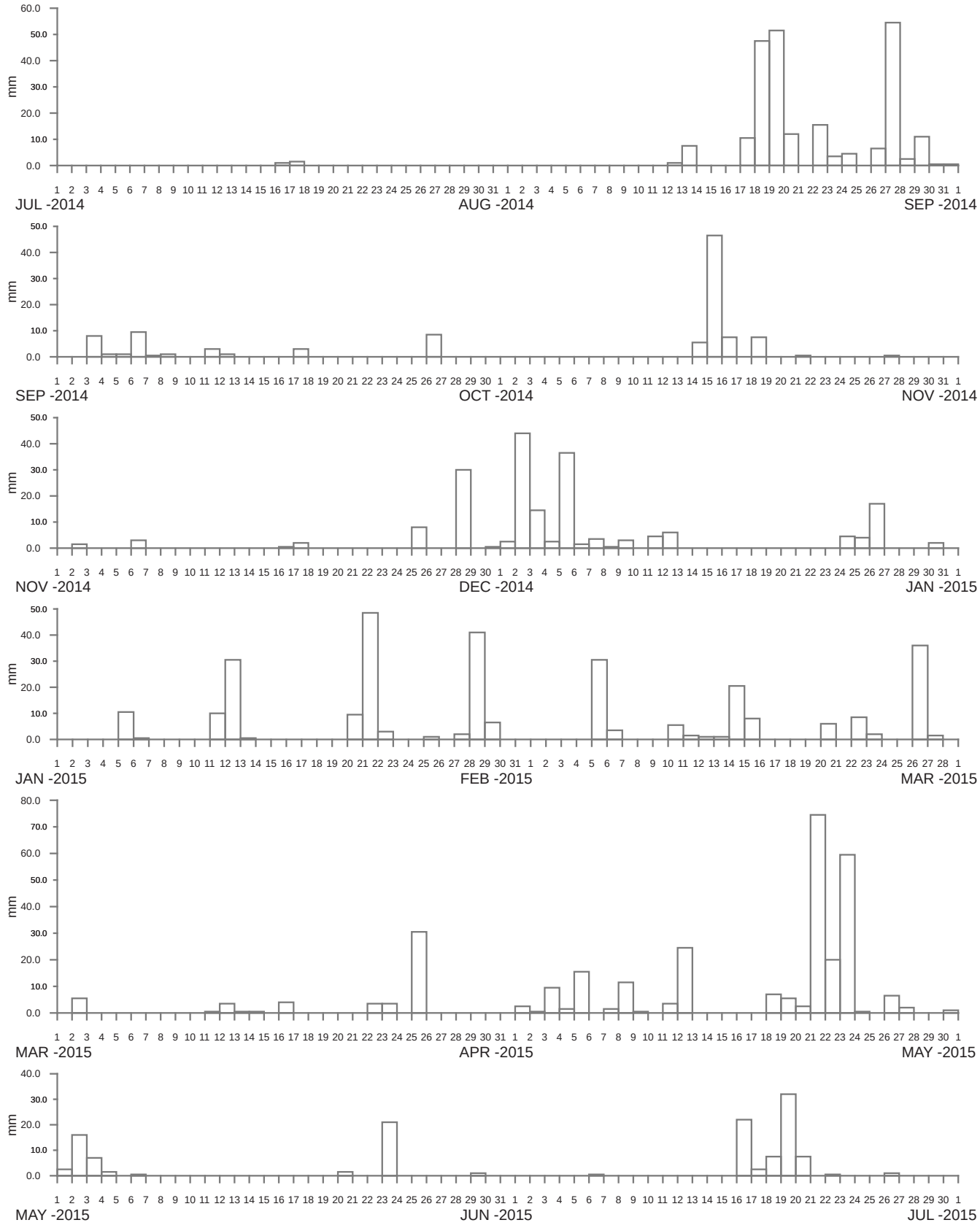


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

UPPER CALDERWOOD AT CALDERWOOD ROAD
2014–2015

MHL Report 2385
Figure 83
DRAWING 2385-83

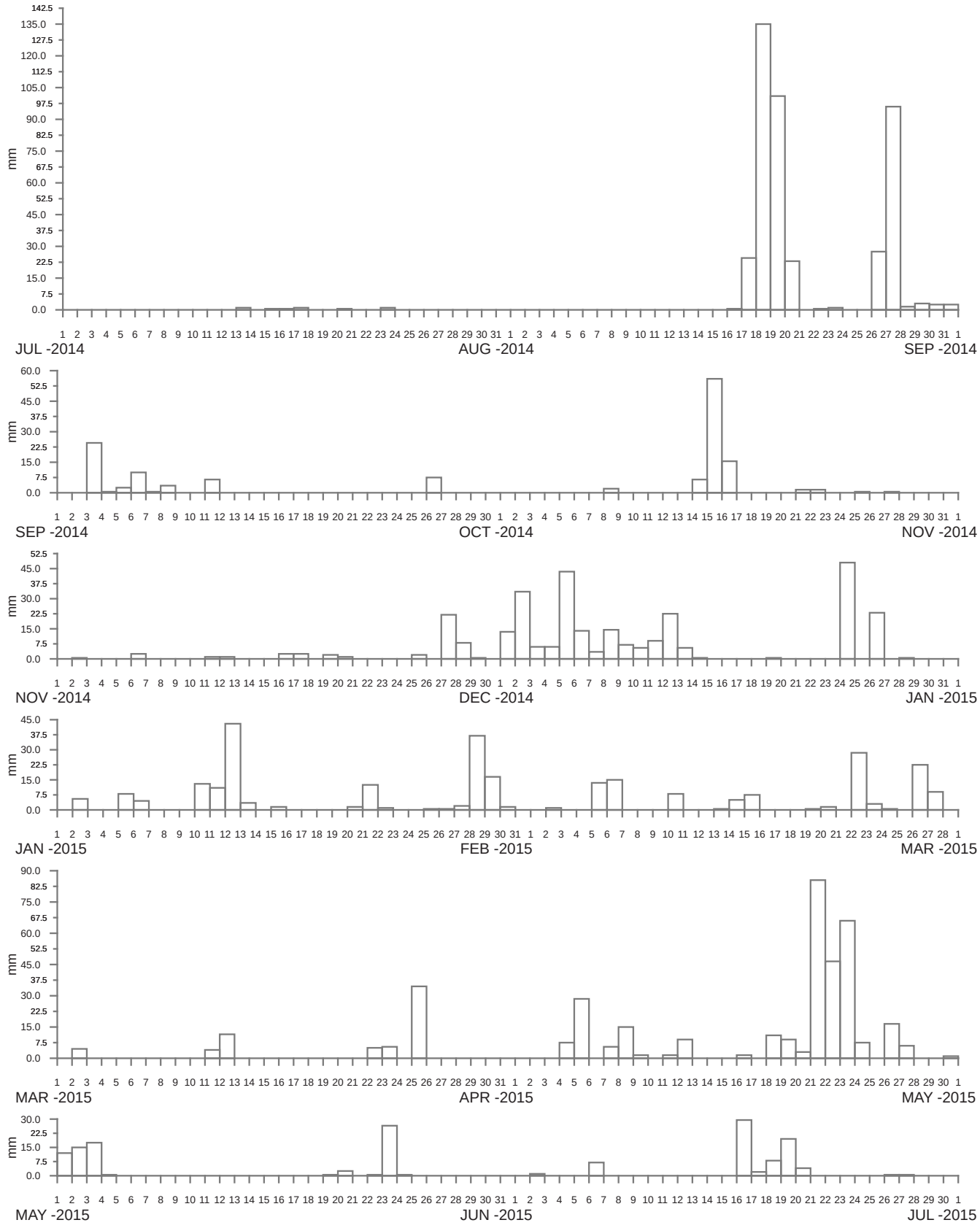


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

LITTLE LAKE ENTRANCE AT LITTLE LAKE
2014–2015

MHL Report 2385
Figure 84
DRAWING 2385-84

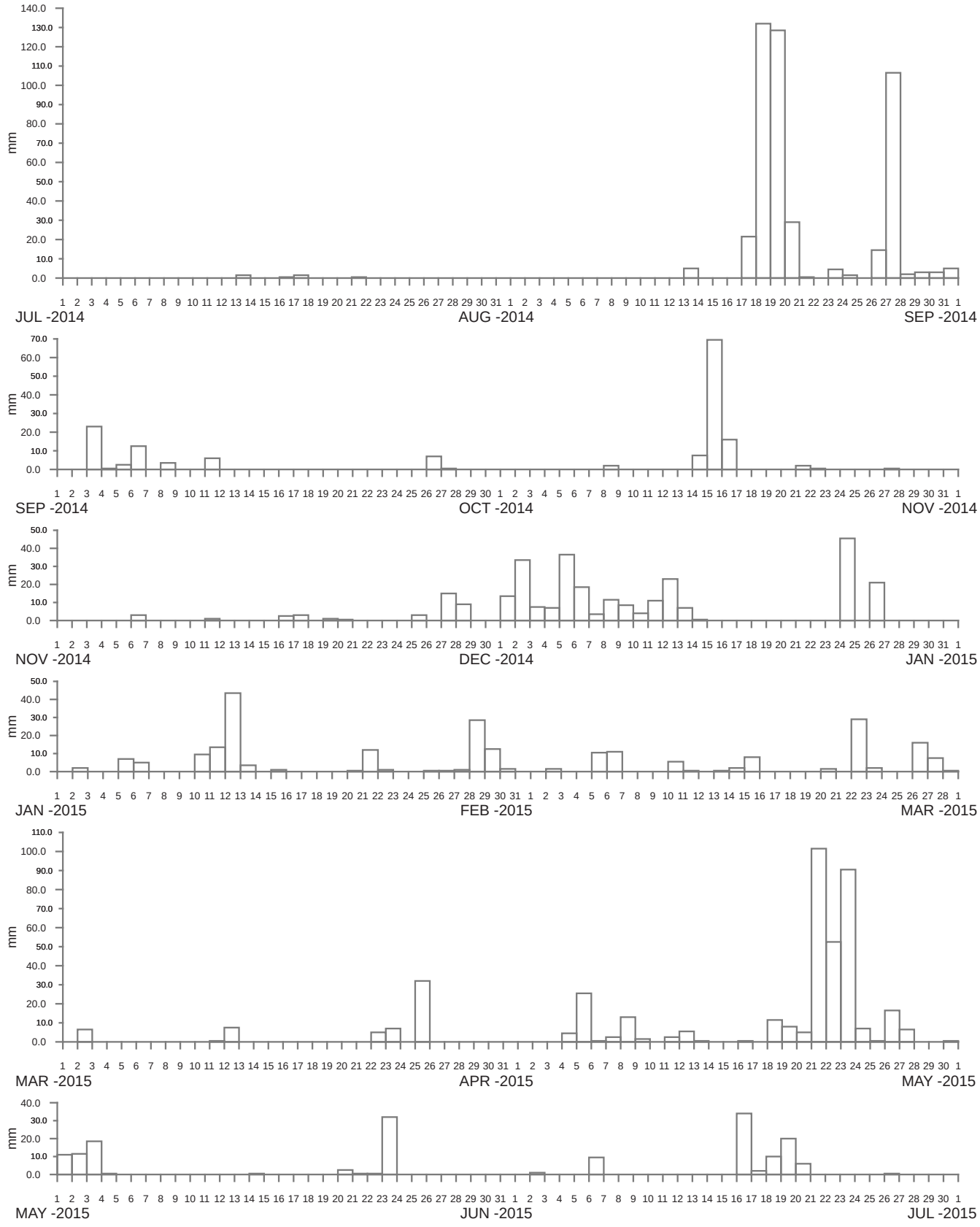


DATA LOSS

Public Works
Manly Hydraulics Laboratory

NURREWIN AT ILLAWARRA HIGHWAY
2014–2015

MHL Report 2385
Figure 85
DRAWING 2385-85

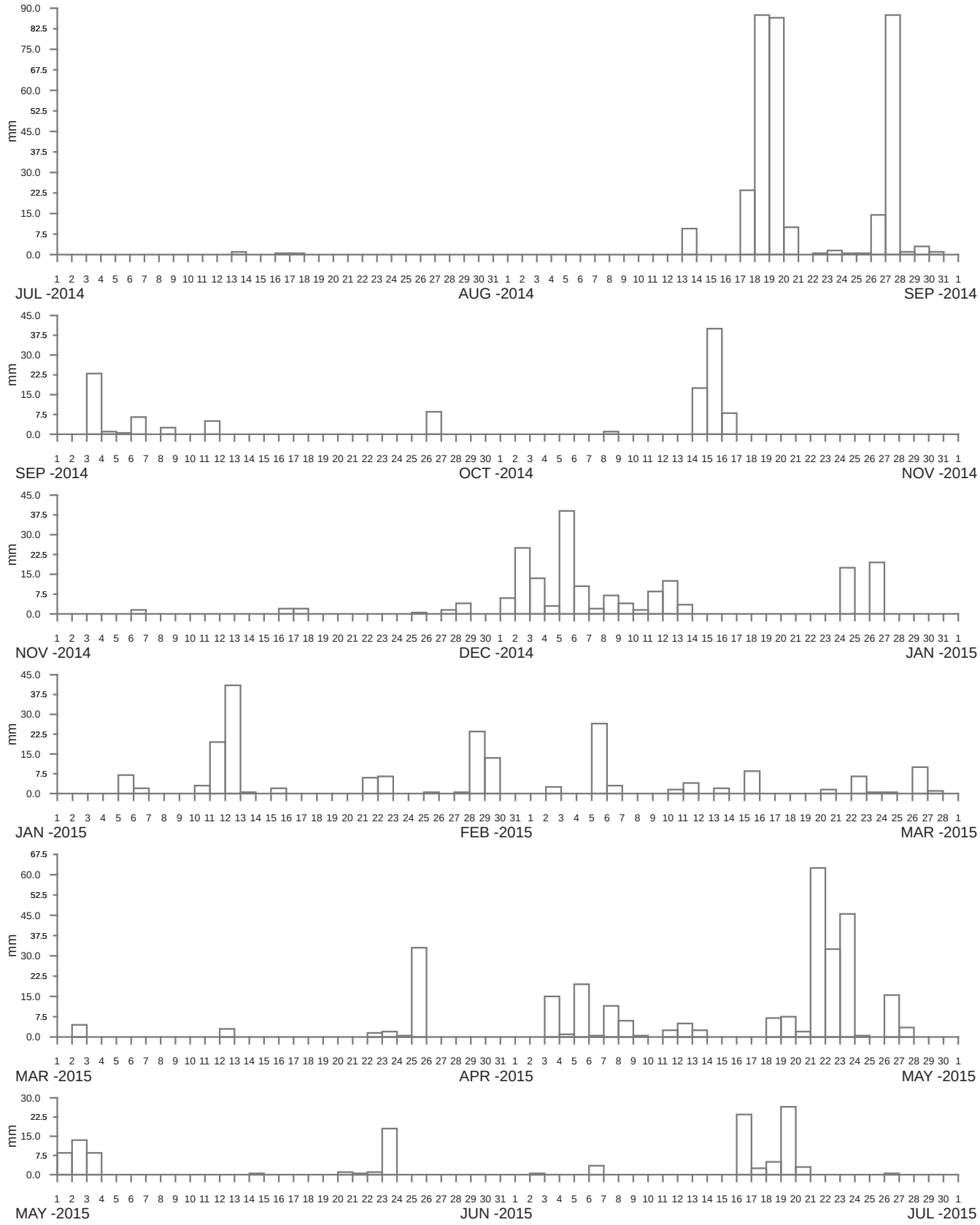


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

CLOVER HILL AT CLOVER HILL ROAD
2014–2015

MHL Report 2385
Figure 86
DRAWING 2385-86

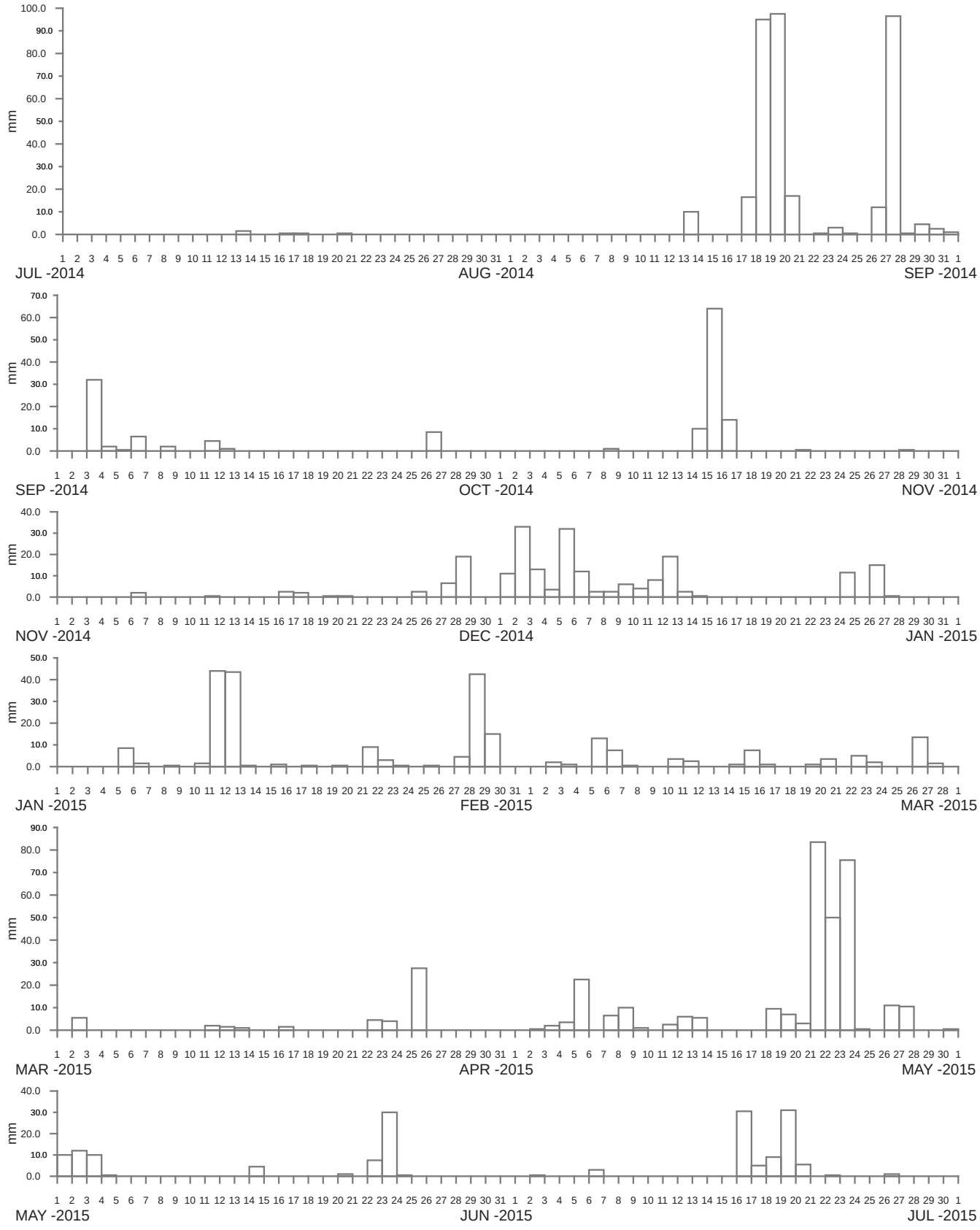


---------- DATA LOSS

Public Works
Manly Hydraulics Laboratory

NORTH MACQUARIE AT NORTH MACQUARIE ROAD
2014–2015

MHL Report 2385
Figure 87
DRAWING 2385-87



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

Public Works
Manly Hydraulics Laboratory

YELLOW ROCK ROAD AT YELLOW ROCK ROAD
2014–2015

MHL Report 2385
Figure 88
DRAWING 2385-88

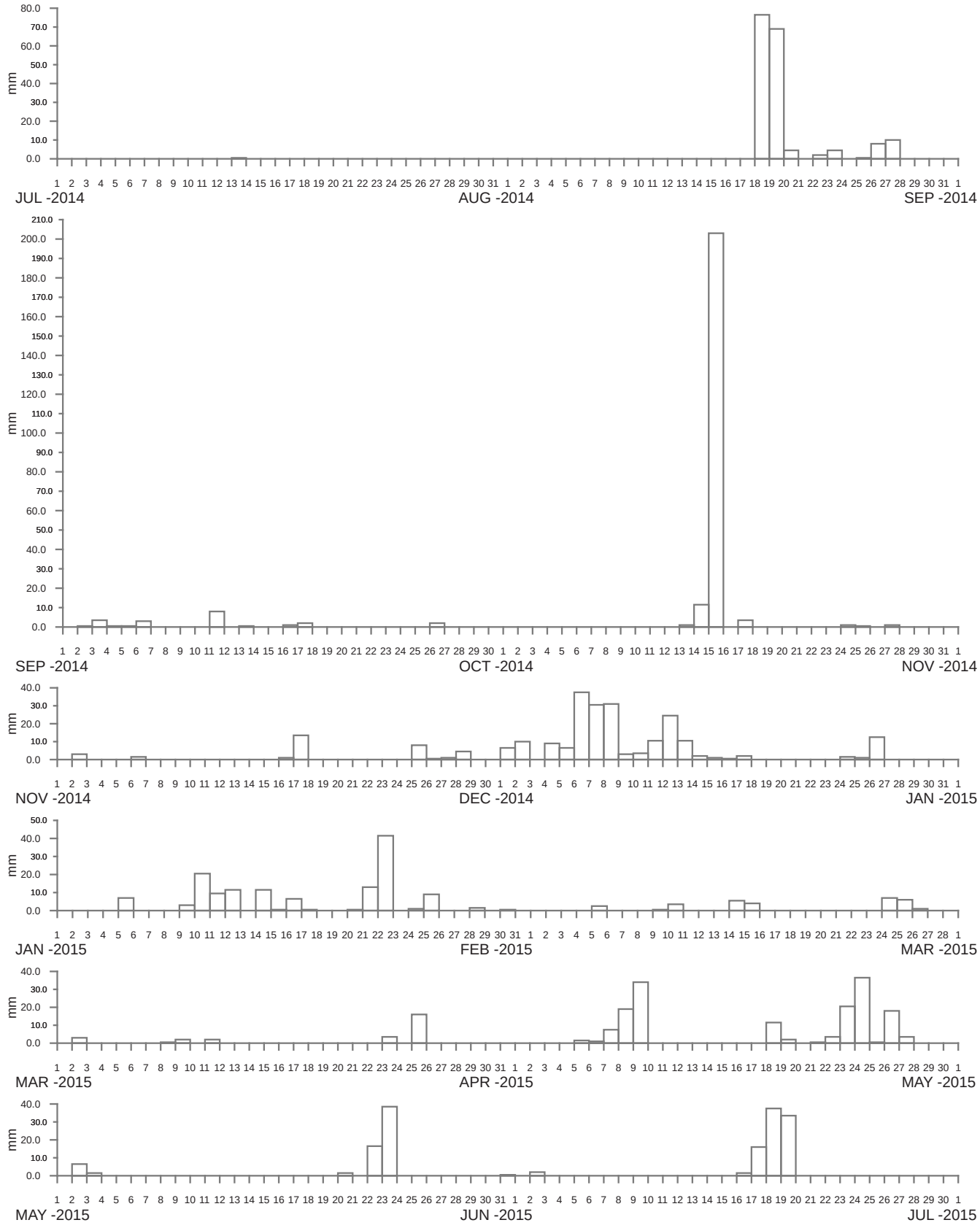
Public Works
Manly Hydraulics Laboratory

RAINFALL STATION LOCATIONS
SOUTH COAST (MID) REGION

MHL Report 2385

Figure 89

DRAWING 2385-89.cdr



DATA LOSS

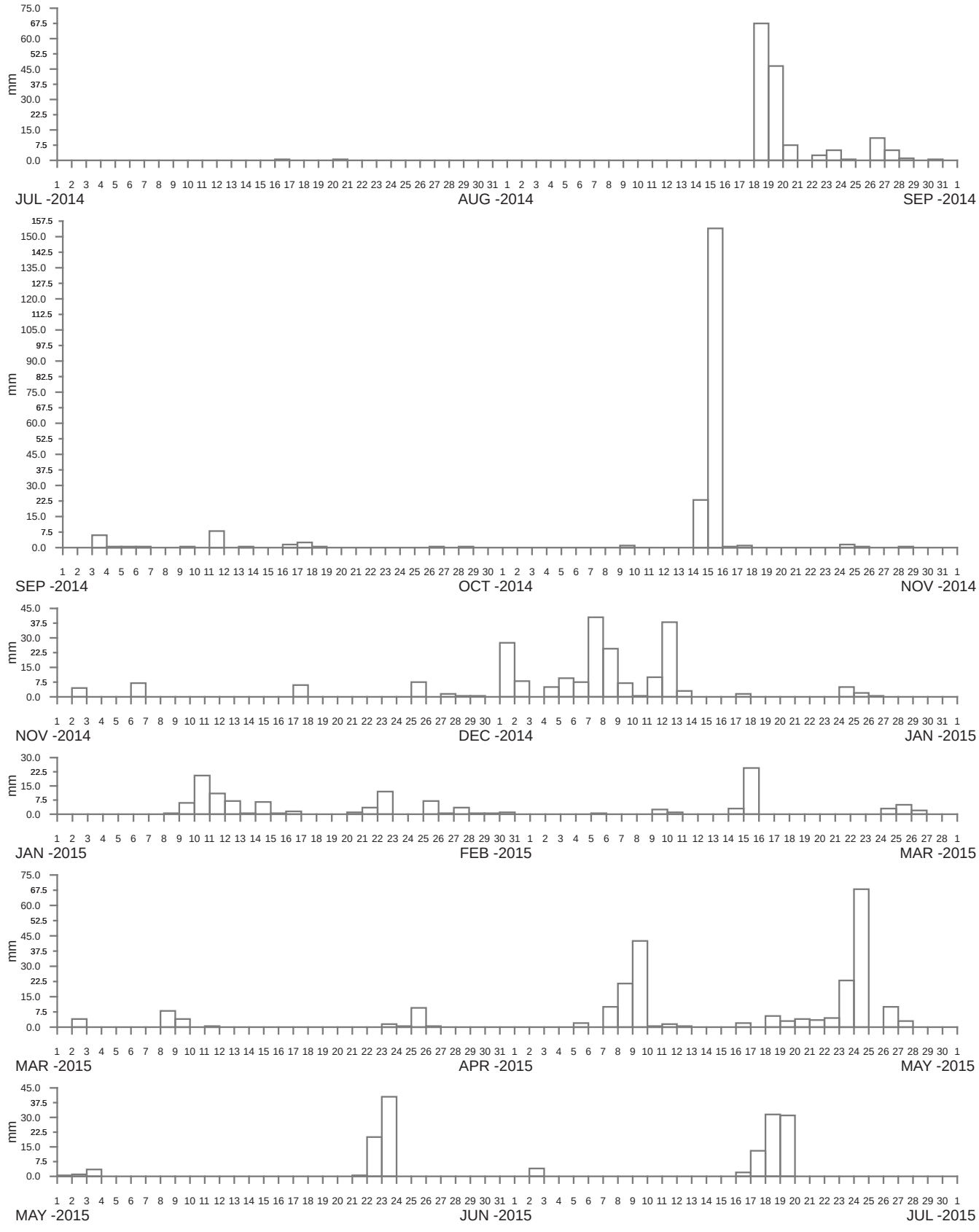
Public Works
Manly Hydraulics Laboratory

WAGONGA INLET AT BARLOWS BAY
2014–2015

MHL Report 2385

Figure 90

DRAWING 2385-90



DATA LOSS

Public Works
Manly Hydraulics Laboratory

WALLAGA LAKE AT REGATTA POINT
2014–2015

MHL Report 2385

Figure 91

DRAWING 2385-91

Appendix A

Data Online

Table A1 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–ongoing
Bellinger	Perry Drive	Dec 1998–ongoing
Bellinger	Shepards 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–ongoing
Bellinger	Thora	Feb 1993–ongoing
Nambucca	Bowraville	Jun 1993–Oct 2001
Nambucca	Utungun	Dec 1991–ongoing
Macleay	Euroka U/S	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 1984–ongoing
Karuah	Tuncurry	Aug 2002–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
Hunter	Hexham Bridge	May 1998–ongoing
Hunter	Belmore Bridge	Sep 1995–ongoing
Hunter	Cardiff	Mar 1991–Sept 1996
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

Region	Station	Period of Data
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	Feb 1987–ongoing
Macquarie-Tuggerah Lakes	Kulnura	Mar 1989–ongoing
Macquarie-Tuggerah Lakes	Toukley	Dec 1985–ongoing
Macquarie-Tuggerah Lakes	Warnervale	Jan 1986–Apr 2010
Macquarie-Tuggerah lakes	Hamlyn Terrace	Mar 2010–ongoing
Macquarie-Tuggerah Lakes	Wyong Weir	Jan 1986–Apr 2008
Macquarie-Tuggerah Lakes	Wyong	Jan 1986–Apr 1991
Macquarie-Tuggerah Lakes	Kangy Angy	Aug 2010–ongoing
Macquarie-Tuggerah Lakes	Chittaway	May 1989–Aug 2010
Macquarie-Tuggerah Lakes	Berkeley Vale	Jun 1988–ongoing
Macquarie-Tuggerah Lakes	Mardi Dam	Jun 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	Mar 1989–ongoing
Hawkesbury	Strickland	Dec 1985–ongoing
Hawkesbury	Narara	Apr 1989–ongoing
Hawkesbury	Mount Elliot	Dec 1985–ongoing
Hawkesbury	Wyoming	Aug 1988–ongoing
Hawkesbury	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–Jul 1996
Hawkesbury	Cowan	Jun 1991–Jul 1996
Hawkesbury	Penrith	Nov 1990–ongoing
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–Jul 1996
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–ongoing
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–May 2005
Sydney Coastal	Curl Curl	Feb 2014–ongoing
Sydney Coastal	North Manly	May 1995–ongoing
Sydney Coastal	Manly Dam	Nov 1995–ongoing

Region	Station	Period of Data
Sydney Coastal	Chatswood	Sep 1992–Jul 1996
Sydney Coastal	Denistone	Jan 1990–Jun 1996
Sydney Coastal	M4 Motorway	Jun 1993–Sep 1996
Sydney Coastal	Homebush Bay	Feb 1993–Mar 1994
Sydney Coastal	Kelso Creek	Nov 1996–ongoing
Wollongong Coastal	Bulli Pass	Sep 1982–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	Sep 1982–Feb 1997
Wollongong Coastal	Mount Kembla	Jun 1985–ongoing
Wollongong Coastal	Dombarton Loop	Jun 1985–ongoing
Wollongong Coastal	Wongawilli	Sep 1982–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	Jun 1982–ongoing
Wollongong Coastal	Calderwood	Jan 1983–Jun 1985
Wollongong Coastal	Upper Calderwood	Jun 1985–ongoing
Wollongong Coastal	Little Lake	May 1991–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	Aug 1985–ongoing
Wollongong Coastal	Nurrewin	May 2005–ongoing
Wollongong Coastal	Yellow Rock Road	Jun 1982–ongoing
Wollongong Coastal	Balgownie	Jul 1982–Jun 1987
Wollongong Coastal	Woonona	Jul 1982–Jun 1985
South Coast	Lake Wollumboula	Feb 1999–Oct 2000
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

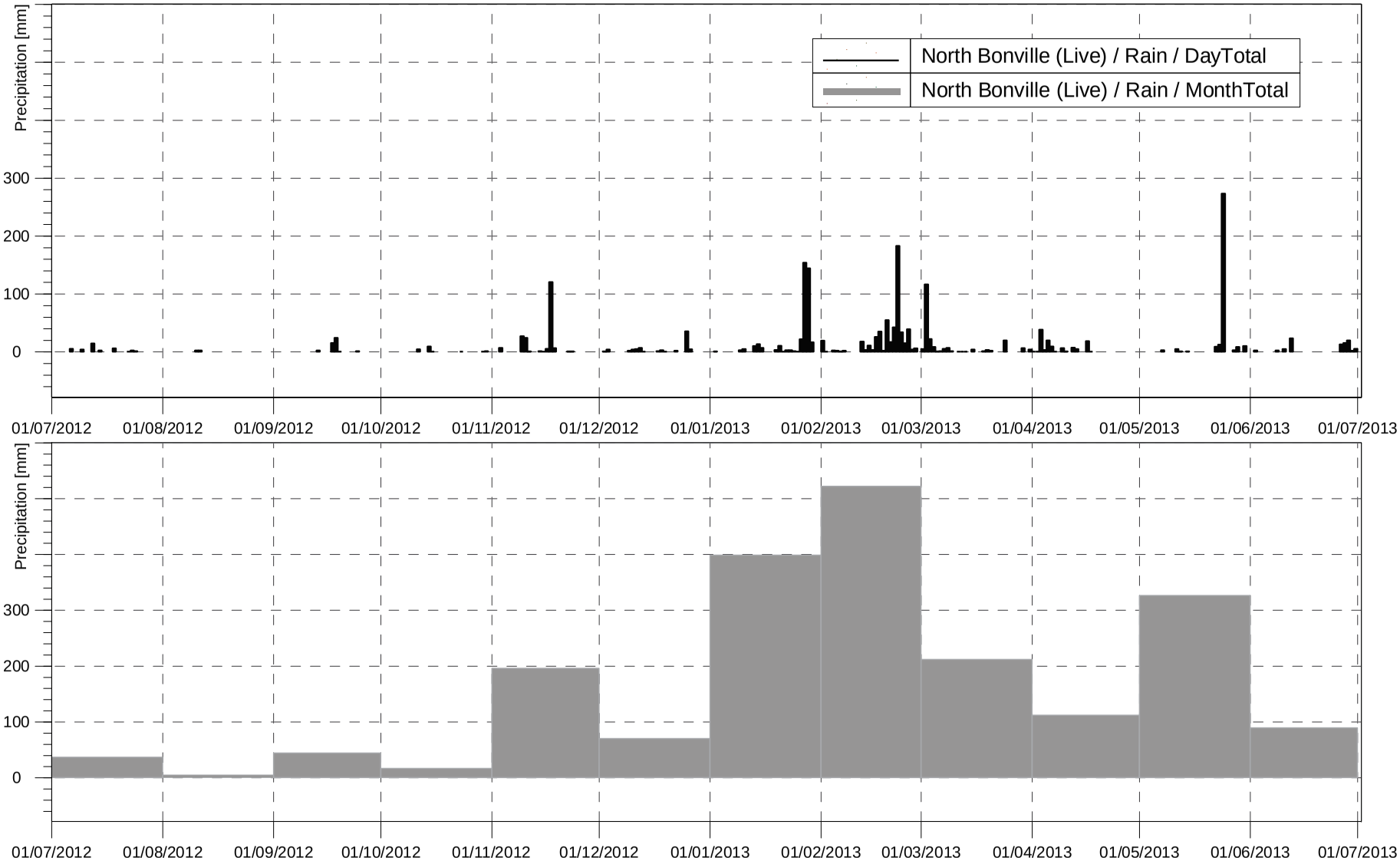
Appendix B

Sample Rainfall Data Outputs

NSW GOVERNMENT

Public Works
Manly Hydraulics Laboratory

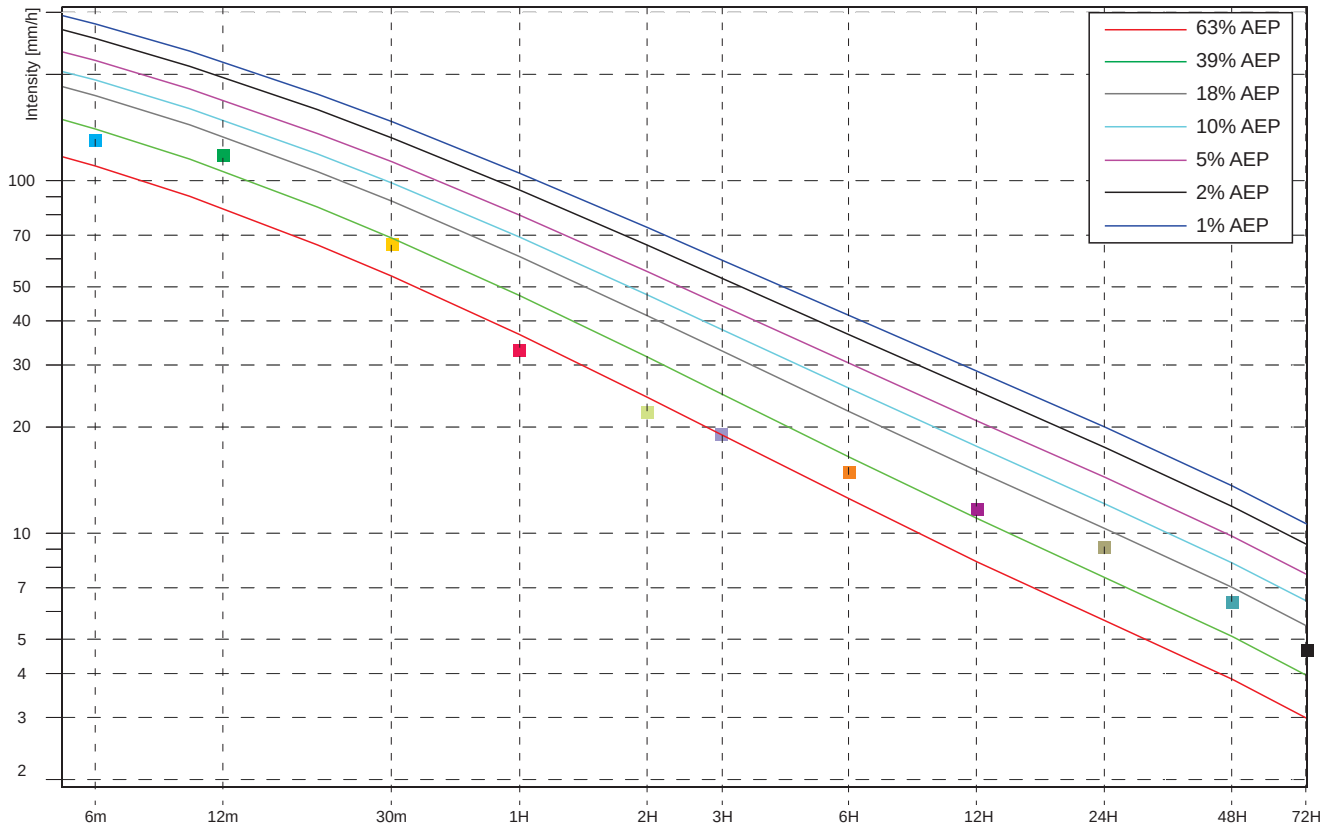
SAMPLE DAILY AND MONTHLY RAINFALL PLOTS



MHL Report 2385

Figure B1

DRAWING 2385-B1.cdr



Duration
(minutes: m, hours: H)
Reference: Australian Rainfall and Runoff 1987

North Bonville Rainfall Intensity 21 January-21 March 2013		
Duration (minutes: m) (hours: H)	**Intensity (mm/hr)**	**Date/Time**
6m	130.00	17/02/2013 17:14
12m	117.50	17/02/2013 17:14
30m	66.00	17/02/2013 17:26
1H	33.00	17/02/2013 17:26
2H	22.00	22/02/2013 14:44
3H	19.00	22/02/2013 14:42
6H	14.83	22/02/2013 16:40
12H	11.67	22/02/2013 19:56
24H	9.08	28/01/2013 11:12
48H	6.35	28/01/2013 21:46
72H	4.64	29/01/2013 5:54

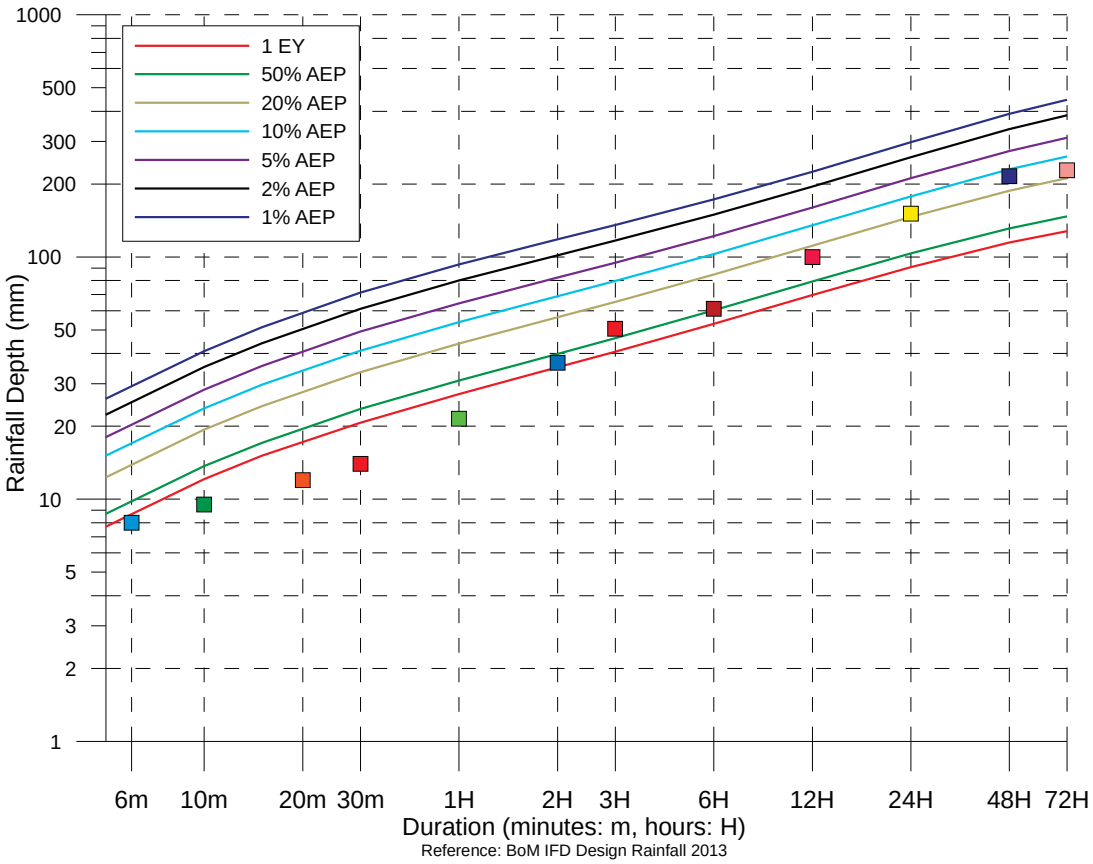
Australian Rainfall and Runoff (Institute of Engineers Australia 1987) states:
Use of the terms 'recurrence interval' and 'return period' has been criticised as leading to confusion in the minds of some decision-makers and members of the public. Although the terms are simple superficially, they are sometimes misinterpreted as implying that the associated magnitude is only exceeded at regular intervals, and that they are referring to the elapsed time to the next exceedance.

The use of the term 'Average Recurrence Interval' (ARI) can lead to confusion. It is preferable, therefore, to express the rarity of a rainfall event in terms of Annual Exceedance Probability (AEP). For example, 'a rainfall total of 60mm falling in 3 hours at Cudgera has a 0.010 (i.e. 1%) probability of being equalled or exceeded in any one year' can be easier to understand than the equivalent statement of 'rainfall total of 60mm in 3 hours has an ARI of 100 years'.

Adapted from: http://www.bom.gov.au/water/designRainfalls/ifd/glossary.shtml

Site owner: MHL Latitude: -33.1752 Longitude: 151.4835

AEP= Annual Exceedance Probability
EY = Exceedance per Year



Reference: BoM IFD Design Rainfall 2013

Wyee Basin Rainfall Depth 01 April 2015 – 05 May 2015		
Duration (minutes: m) (hours: H)	**Rainfall Depth (mm)**	**Time/Date**
6m	8.0	01:24_04/04/2015
10m	9.5	01:20_04/04/2015
20m	12.0	01:12_04/04/2015
30m	14.0	20:56_21/04/2015
1H	21.5	20:58_20/04/2015
2H	36.5	20:16_21/04/2015
3H	50.5	20:14_21/04/2015
6H	61.0	20:00_20/04/2015
12H	100.0	01:16_04/04/2015
24H	151.0	23:22_20/04/2015
48H	215.5	01:48_20/04/2015
72H	228.0	22:36_19/04/2015

The Bureau of Meteorology (with reference to the Australian Rainfall and Runoff, Institute of Engineers 2013) states: *AEP is defined as The probability that a given rainfall total accumulated over a given duration will be exceeded in any one year.*
- The term Annual Exceedance Probability (AEP) will be used for design events (rainfalls and floods) including and rarer (less frequent) than those with a 10% AEP.
- Events that are more frequent than those with a 50% AEP will be expressed as X Exceedances per Year (EY). For example, a design event (rainfall or flood) with a 6-month recurrence interval will be expressed as having 2 Exceedances per Year (2EY).
- The use of Average Recurrence Interval (ARI) is discouraged as it is problematic for frequent events in seasonal climates and leads to confusion with the public for rare events.

For further information on the relationship between EY, AEP, ARI, and uses in engineering design, please refer to BoM Frequently Asked Questions under New AR&R probability terminology: http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml

Station Name	North Bonville (Live)
Station Number	559050
MGA Easting (m zone 56)	500592.91
MGA Northing (m zone 56)	6641143.16

Date	Time	Value [mm]	State of value
26/01/2013	2:35:17	0.5	5 (Very Good)
26/01/2013	2:40:12	0.5	5 (Very Good)
26/01/2013	4:04:04	0.5	5 (Very Good)
26/01/2013	4:04:53	0.5	5 (Very Good)
26/01/2013	4:07:48	0.5	5 (Very Good)
26/01/2013	5:56:18	0.5	5 (Very Good)
26/01/2013	5:57:42	0.5	5 (Very Good)
26/01/2013	5:59:16	0.5	5 (Very Good)
26/01/2013	6:00:32	0.5	5 (Very Good)
26/01/2013	6:01:22	0.5	5 (Very Good)
26/01/2013	6:02:22	0.5	5 (Very Good)
26/01/2013	12:20:33	0.5	5 (Very Good)
26/01/2013	12:20:51	0.5	5 (Very Good)
26/01/2013	12:21:32	0.5	5 (Very Good)
26/01/2013	12:22:02	0.5	5 (Very Good)
26/01/2013	12:22:42	0.5	5 (Very Good)
26/01/2013	12:23:49	0.5	5 (Very Good)
26/01/2013	12:24:37	0.5	5 (Very Good)
26/01/2013	12:25:42	0.5	5 (Very Good)
26/01/2013	12:35:17	0.5	5 (Very Good)
26/01/2013	19:16:58	0.5	5 (Very Good)
26/01/2013	19:49:01	0.5	5 (Very Good)
26/01/2013	19:51:13	0.5	5 (Very Good)
26/01/2013	21:12:07	0.5	5 (Very Good)
26/01/2013	21:55:36	0.5	5 (Very Good)
26/01/2013	22:01:34	0.5	5 (Very Good)
26/01/2013	22:05:28	0.5	5 (Very Good)
26/01/2013	22:10:31	0.5	5 (Very Good)
26/01/2013	22:12:16	0.5	5 (Very Good)
26/01/2013	22:13:47	0.5	5 (Very Good)
26/01/2013	22:15:34	0.5	5 (Very Good)
26/01/2013	22:17:57	0.5	5 (Very Good)

Appendix C

Publications of Interest

Appendix C 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).

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).

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).

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).

Flood Reports

MHL Flood Reports:

- *NSW North Coast Flood Summary January–March 2013*, MHL Report No. 2202
- *Northern Rivers May 2009 Flood Report*, MHL Report No. 1965
- *NSW Coffs Harbour and Bellinger River Regions April 2009 Flood Summary*, MHL Report No. 1913
- *NSW Coffs Harbour, Bellinger and Nambucca Rivers Region February 2009 Flood Summary*, MHL Report No. 1908

- *Bellinger and Coffs Harbour Regions January 2008 Flood Summary*, MHL Report No. 1804
- *Clarence River January 2008 Flood Summary*, MHL Report No. 1803
- *Richmond River January 2008 Flood Summary*, MHL Report No. 1802
- *Tweed and Brunswick Rivers January 2008 Flood Summary*, MHL Report No. 1802
- *NSW Hawkesbury and Nepean June 2007 Flood Summary*, MHL Report No. 1756
- *NSW Hunter Valley, Wallamba River and Myall River June 2007 Flood Summary*, MHL Report No. 1755
- *NSW Central Coast June 2007 Flood Summary*, MHL Report No. 1754
- *NSW North Coast March 2006 Flood Summary*, MHL Report No. 1482
- *NSW North Coast January 2007 Flood Summary*, MHL Report No. 1469
- *NSW North Coast Flood Summary June 2005*, MHL Report No. 1426
- *NSW Hunter and Central Coast Flood Summary April 2015,* MHL Report No. 2364

Other References

Bureau of Meteorology 2002, 'Climate Glossary – Southern Oscillation Index' *Australian Government*. Retrieved from http://www.bom.gov.au/climate/glossary/soi.shtml

The Institution of Engineers 1987, *Australian Rainfall and Runoff*

Engineers Australia and Bureau of Meteorology 2013, *Australian Rainfall and Runoff (Revision Project 1)*

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