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Requirements for Installing and Commissioning Flood Warning Assets



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Revision history

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Feb 2021		2.1	Released	
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Acknowledgements

The Bureau acknowledges the Traditional Owners and Custodians of Country throughout Australia and acknowledges their continuing connection to land, sea, and community. We recognise the continuation of cultural and weather knowledge practices of First Nations people.

Disclaimer

The Bureau reserves the right to not issue station ID numbers if the data does not add value to the flood warning network and does not meet the [Flood Warning Infrastructure Standard](#).

Table of Contents

Revision history	2
Review status	2
Release history.....	2
Acknowledgements.....	2
Disclaimer	3
1. Introduction.....	5
2. Purpose and Scope	5
3. Flood Warning Station Approval Process	5
4. Installing a station	7
5. Commissioning a Station.....	9
5.1. All Stations.....	9
5.2. Rainfall stations	9
5.3. River level stations	9
5.3.1. Instructions	9
5.3.2. Information Provided.....	9
5.3.3. Hydrographic Survey results.....	10
6. Appendix	11
6.1. Exposure Classification	11
6.2. Rain Gauge (RN) station exposure evaluation	12
6.3. Application for Station ID Number	13
6.4. Maintenance Field Sheets	15

1. Introduction

The Bureau is responsible for issuing flood warnings as well as collecting and displaying river and rainfall data that Australian communities use during flood events. The data that is displayed on the Bureau website and used in flood forecasting models is derived from a collective of asset owners including the Bureau. As new stations get added to the flood network, it is critical that the Bureau plays a role to ensure the right infrastructure, technology and locations are selected so that the future flood warning network will be resilient, reliant and allow the Bureau to provide the most accurate and timely information to emergency services and communities.

2. Purpose and Scope

This document is applicable to all privately owned companies and government agencies who are planning to install river and rainfall gauges that have a primary purpose for flood forecasting and providing situational awareness around riverine flooding. This document outlines the process to follow when planning to install a new gauge, applying for Bureau station numbers and ALERT IDs and outlines the information that is required to be provided to the Bureau.

3. Flood Warning Station Approval Process

To ensure new flood warning infrastructure is compatible and complementary to the existing flood network, all planned installations of river and rainfall gauges that are intended to be displayed on the [Bureaus website](#) and form part of the Flood Warning Network (FWN) are required to apply for a Station ID Number with the Bureau of Meteorology. Applications for Station IDs can be made by submitting the APPLICATION FOR STATION ID (Appendix 6.3) to floodinfrastructure@bom.gov.au.

By submitting this form, the Bureau will assess if the location, communications, infrastructure and equipment being considered for the installations is suitable and will add value to the FWN. The Bureau may recommend changes to the station design, location, communications and/or equipment if deemed necessary.

The Bureau reserves the right to not issue station ID numbers if the data does not add value to the Flood Warning Network and does not meet the [Flood Warning Infrastructure Standard](#).

If the proposed station is to transmit data on the ERRTS/ALERT Network and appropriate radio pathway testing has been completed, the Bureau will also issue an ALERT or ALERT2 ID numbers for the station.

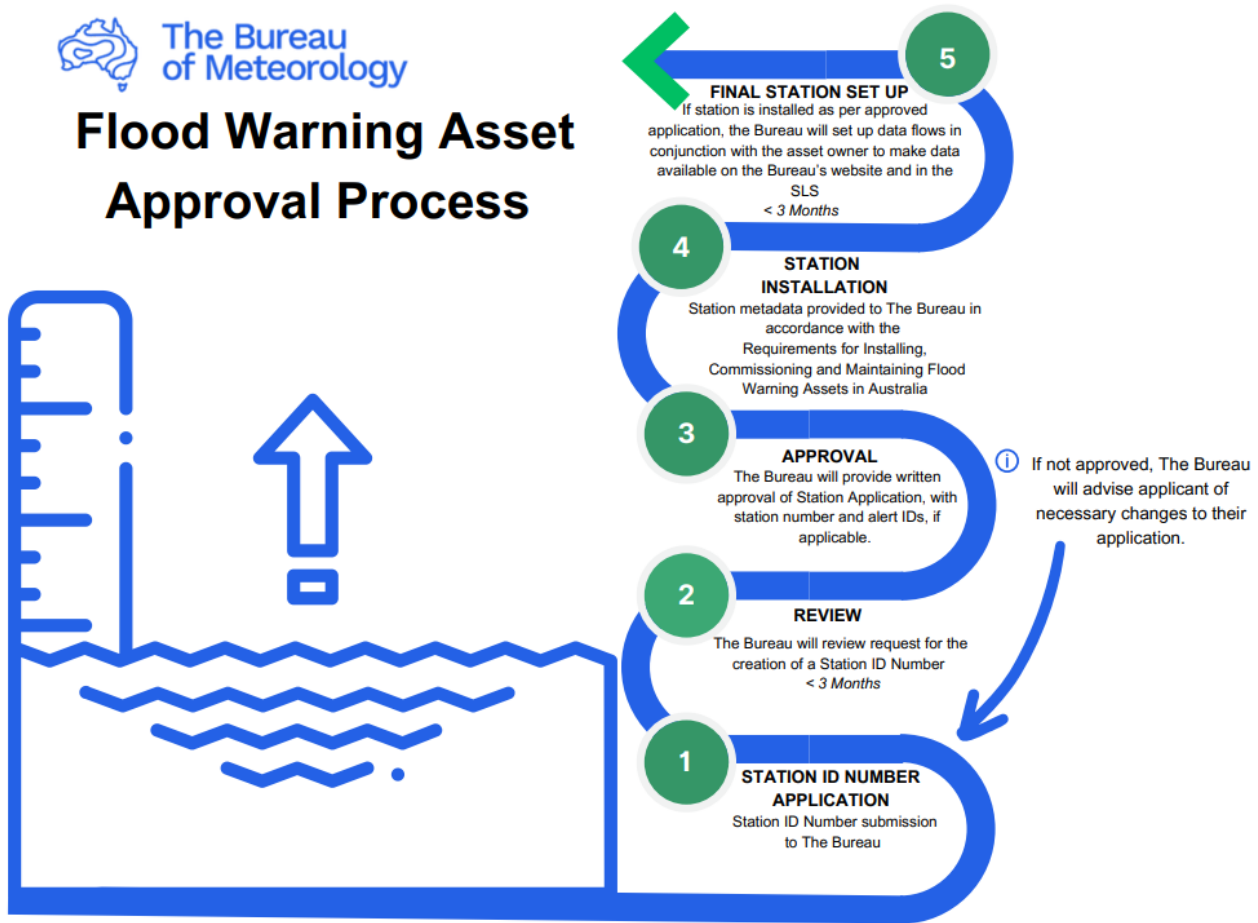
Going through the approval process takes a considerable amount of time and depending on operation requirements of Bureau staff, assessing requests may not be a priority. The Bureau may take up to 3-months to process an application. Bulk submissions (>5 stations) of Station ID Requests should be discussed with the Bureau (floodinfrastructure@bom.gov.au) prior so adequate resources can be assigned to the work. Additional resources and funding may need to be negotiated with bulk requests for Station IDs.

If the proposed station meets the infrastructure requirements and will add value to the Bureau's flood forecasting service, the applicant will be notified in writing once the station application process is complete. This process will provide confidence to the asset owner/installer that the planned installation is suitable for inclusion in the FWN. If the Bureau is not satisfied that proposed station will add value or it doesn't have suitable infrastructure or technology, feedback will be provided in writing within the 3-month timeframe. The applicant will need to consider this feedback and resubmit an updated APPLICATION FOR STATION ID form.

Following the installation and commissioning of the station, the station metadata outlined in section 5 must be provided to the Bureau. Once received, the Bureau will setup dataflows into our receiving software, undertake data quality assessments, cross-reference this data with the agreed station application form, setup dataflows into downstream products, update databases including the relevant Service Level Specification (SLS) with new station and sensor metadata. If incorrect metadata is provided or the Bureau has concerns on the quality of the water level or rainfall data, or the station does not match the initial request form, significant delays in completing the data onboarding process will occur. If the correct commissioning information is provided, the metadata agrees with the Station ID Application and the observed data is satisfactory, the final station setup will aim to be completed within a 3-month period.

If the station installation is located in QLD and funded by the QRA, installation should also proceed in accordance with their Flood Warning Gauge Network - Process for the installation of a new flood gauge guide https://www.qra.qld.gov.au/sites/default/files/2020-08/0204_procurement_guide_for_flood_gauges_a3_june20.pdf

Flood Warning Asset Approval Process



4. Installing a station

Following the approval in writing from the Bureau of Meteorology that the proposed station is suitable for the FWN, installations can begin.

In addition to meeting the [Flood Warning Infrastructure Standard](#), equipment manufacturers specifications, and the [National Industry Guidelines for hydrometric monitoring](#), the Bureau recommends the following:

- ❑ All River Level stations to have gauge boards with maximum height indicators across full range of expected levels and tied to a local gauge zero datum and surveyed AHD;
- ❑ Two benchmarks: One situated at a lower elevation and the other positioned above the maximum flood line.
- ❑ Secondary communications to be considered for all flood forecast and high priority locations
- ❑ Secondary water level sensor (low cost) in addition to primary gas bubbler to be considered for all flood forecast and high priority locations
- ❑ Stations using Radio communications to install equipment that is ALERT2 compatible
- ❑ Rain gauges to be installed away from obstacles meeting Class 1 or 2 of the WMO Station Classification (see Appendix 11Exposure Classification)

- Installation of Flood Warning station to be overseen by experienced industry professionals, preferably with hydrographic training and recognised competency including Australian Hydrographers Association Certified Practicing Hydrographers
- Instruments located above 1% AEP

5. Commissioning a Station

5.1. All Stations

To successfully onboard new flood warning stations, the Bureau requires evidence the installed sensors have passed field verification and calibrations. Examples of how the Bureau documents these tasks are shown in appendix 4.4. In addition to field verification and calibrations results, the following commissioning information must be provided to the Bureau:

- ❑ Accurate coordinates of the station to at least the nearest 10 m (e.g. Latitude: -31.9597, Longitude: 115.8572 to at least 4 decimal places)
- ❑ Name and contact details of installer
- ❑ Name and contact details of asset owner
- ❑ Name and contact details of asset maintainer
- ❑ Details of maintenance schedule
- ❑ Details of future capital upgrade plans and life expectancy of the station
- ❑ Make and model of all equipment installed including asset and SN
- ❑ Wiring diagrams (if more than 2 sensors)
- ❑ Photos of the station from N, S, E and W and general station photos
- ❑ Equipment photos
- ❑ Solar panel / mains charger size
- ❑ Check signal interval (i.e. how often is data sent with unchanged conditions, typically 1hr - 3hrs)
- ❑ For ALERT stations, confirm ALERT IDs and pass ranges (repeater only)

5.2. Rainfall stations

- ❑ Measuring point elevation (catch height above ground level e.g. 1m)
- ❑ Exposure Classification 1-5 (Appendix 6.1 and Appendix 6.2)
- ❑ Data type (typically Rain Event - instantaneous tip data)
- ❑ Tipping Bucket Size (typically 0.2 or 1mm accumulations)
- ❑ Measurement unit (typically Accumulator)
- ❑ Duration of measurement (typically Event Measurement - instantaneous)
- ❑ Send rate (i.e. how many tips before a signal is sent from the station)

5.3. River level stations

5.3.1. Instructions

- ❑ Gauge boards installed/set to match instrument, e.g. 1.5m reading on gauge board is 1.5m reading on the Bureau's website
- ❑ If offsets are stored or changed in Environmon the Bureau must be made aware within 24 hours via floodinfrastructure@bom.gov.au

5.3.2. Information Provided

- ❑ Measuring point elevation (instrument cabinet elevation e.g. 7m above Gauge Zero)
- ❑ Sample interval (e.g. check level every minute)

- Warmup time (e.g. equipment takes 10s to warm up before a reading)
- Send rate (i.e. how much does the river level have to change before a signal is sent from the station)
- Measurement unit (metres)
- Water Level Sensor Range (e.g. 0-10m)
- Station diagrams including the conduit route and benchmark locations
- Additional photos of; the channel cross section, upstream and downstream reaches, the river end and temporary benchmarks

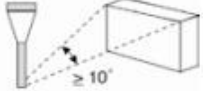
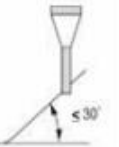
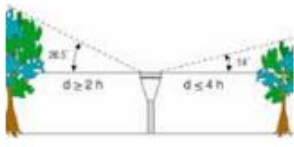
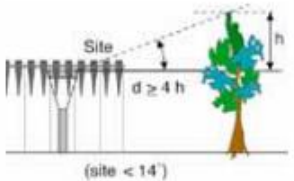
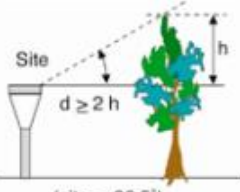
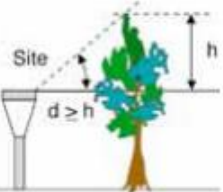
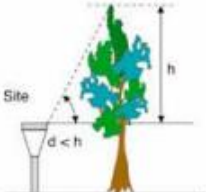
5.3.3. Hydrographic Survey results

- Orifice height in local gauge height (LGH)
- Gauge zero in AHD
- Benchmark values in LGH and AHD
- Base of instrument shelter and other noteworthy features such as bridge height, levee heights and cease to flow (CTF)
- Describe control type (if applicable) and channel and riverbank characteristics
- Cross section and slope if rating for station is required

6. Appendix

6.1. Exposure Classification

- Evaluate the station in terms of Rain Gauge exposure using the table below:

Class 1	Class 2	Class 3	Class 4	Class 5
Obstacle  Definition of an obstacle is any object with angular width $\geq 10^\circ$ viewed from the TBRG				
 Flat, open land slope $< \frac{1}{3}$ (19°)	 Flat, open land slope $< \frac{1}{3}$ (19°)	 Slope, open land slope $< \frac{1}{2}$ ($\leq 30^\circ$)	 Steep slope slope $> \frac{1}{2}$ ($> 30^\circ$)	Not used
Natural windbreak  Sheltered by obstacles of uniform height. $\leq 26.5^\circ$ when $d \geq 2h$ $\leq 14^\circ$ when $d \leq 4h$ Or with Artificial windbreak  Obstacles are further than at least $4h$	 (site $\leq 26.5^\circ$) Obstacles are further than at least twice their height or can be up to 26.5°	 (site $\leq 45^\circ$) Obstacles are further than their height or below at least 45°	 (site $> 45^\circ$) Obstacles are further than $\frac{1}{2}$ their height or above 45°	 Obstacles are closer than $\frac{1}{2}$ their height

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6.2. Rain Gauge (RN) station exposure evaluation

Enter the station condition against each requirement. If an item is not relevant draw a line through that table or requirement. Use Y or N, tick or cross to indicate status. If the station does not meet the requirement, specify the failure, e.g., 15m tree 11m NE. Include other relevant comments.

Rain Gauge station exposure evaluation		
Tipping Bucket Rain Gauge (TBRG)	Y or N	Station Condition:
RG Near centre of interest (GPS Coordinates)		
RG at mean altitude of representative area		
Collector rim is at height 300mm above ground if not provide collector rim height.		
Objects are 2 X h distant.		
Wide objects (>10deg azimuth when viewed from gauge) are 4 x height distant.		
Is RG raised above ground level?		If Y, indicate mean height of undergrowth:
No splash ground surfaces within 1m.		
Is RG mounted on large concrete, rock, or structure (e.g., roof).		If Y, brief description, and reason if known:

6.3. Application for Station ID Number

APPLICATION FOR STATION ID NUMBER

Email the completed application form to floodinfrastructure@bom.gov.au

APPLICANT DETAILS			
Name		Phone No	
Organisation			
Email		Station owner Station maintainer Station installer	
Reason for installation			
Requirements from Bureau? (Station ID, ALERT1 or 2 ID, setting up data flows, guidance on proposed locations, technology, infrastructure, or equipment)			
EQUIPMENT AND DATA DETAILS			
Proposed Station Name*			
Communication Type* (eg. 4G or ALERT, Sat, VHF)		Frequency (MHz / modem bands)	
Data transmission steps from station to user ingest* e.g Repeater or Base station		Signal Strength* (Fade Margin for VHF, else RSSI)	
Proposed equipment (e.g. gas bubbler unit and 0.2 mm TBRG)			
Height of proposed infrastructure (e.g. raised platform above highest know flood peak or 1/100 AEP)			
SENSOR DETAILS ✓ the appropriate box			
Sensor	ALERT Allocated ID (BOM Use Only)	Sensor	ALERT Allocated ID (BOM Use Only)

	Rain			Repeater	
	Digital River			Battery	
	Analogue River			Other (provide details below)	
LOCATION DETAILS					
Latitude*		Longitude*		Elevation* (m AHD)	
Catchment		River Basin		Catchment Area (km ²) (If available)	

6.4. Maintenance Field Sheets



Australian Government
Bureau of Meteorology

STATION INSPECTION FORM

ALERT

Station Details										Serial Numbers									
Station Name					Canister and version					ERT A2 F/W					TBRG				
CBM No					Build #					Water Level Sensor					Bubble Unit				
Co-ordinates					Key #					Power Supply									
Date					Initials														

Initial Data				Rain		River		Battery		Logger	
Time				Alert ID's							
Staff Gauge				Accumulator Values							

Battery		Rating (Ah)		Date Stamp		New: Rating (Ah)		Date Stamp	
Existing Battery(v)		Under Load (V)		Replacement Battery(v)		Under Load (V)			

Solar Panel		Power		w.		Solar LED; on arrival		at depart		Mains Supply	
Voltage	Output voltage at plug (v)	Short Circuit Current(ma)		Weather		Clean and undamaged ?					
Current	Consumption Static(ma)	Charge Current(ma)		Trickle Charge (ma)		Regulated Voltage (V)					

Individual / Combined

Rain						Antenna Tests					
Note: HS 10.0mm, Rimco 10.4mm						TX Size (watts)					
TBRG	YES	NO	Levelling	Checked	Funnel and Syphon clean	Forward (w)	Reflected (w)	SWR	Frequency		
Test OK						Existing Antenna					
TBRG	Start Accum	End Accum	Result			Replacement Antenna					
Calibration											
Details											

<1.5 = Good 1.5 - 2.0 = Fair >2.0 = Poor

Gas		Orifice Checked		Leak test on fitting to river line while purging		Tested for leaks	
Existing Cylinder	Cylinder Pressure (kPa)	Feed Pressure (kPa)		Bubble Rate (BPM)		Bubble Unit: Pressure Tested to m.H2O	
Replacement Cylinder	Cylinder Pressure (kPa)	Feed Pressure (kPa)		Bubble Rate (BPM)		System Purged	
Compressor	Pump Cycle to kPa	Status Normal Operation YES / NO		Fault Code:			

Final Reset Data				Rain		River		Battery		Logger	
Time				Alert ID's							
Staff Gauge survey carried out ?				YES		NO		Staff Gauge		Accumulator Values	
Enviromon Calibration: Date / /				Time : :		Div.		B. Offset		Zero Adj.	

Remarks									

Photos	On Web?	Excel	WO Comp	Meters	EAMS other	E'mon OP	DRS	Council
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ALERT BASE STATION

Base Station Details

Base Station Name

CBM No

Date

Time

Serial Numbers

Receiver
and version

Receiver
and version

Decoder
and version

Antenna Tests		TX Size (watts)	
	Frequency	Forward Power (watts)	Reflected Power (w)
Existing Antenna			
Existing Antenna			

Decoder Test

Expected output voltage is 24.0v. +/- 3.0v.

Measured output value =

Receiver Test

Frequency

Power Supplied from decoder

Measured value =

Receiver Test

Frequency

Power Supplied from decoder

Measured value =

Remarks

Photos ☐ Excel ☐ WO Comp ☐ Meters ☐ EAMS other ☐

[illegible][illegible]

Data Quality	Rain	Water Level
On Arrival		
On Departure		

Missing; Not Verified; Poor; Fair; Good

FADE MARGIN (dB)			
TIME	LOAD (dB)	TIPS (TBRG)	Received At Base
	0		
	3	1	
	6	2	
	9	3	
	12	4	
	15	5	
	18	6	
	21	7	
	24	8	
	27	9	
	30	10	

PATH MARGIN (dB)	
THIS VISIT	
ORIGINAL	

RAIN RECALIBRATION		
Start Accum.	End Accum.	Result



CAMPBELL DATA LOGGER

Station Details				Out In	Model and Serial Numbers	
Station Name					Logger	Modem
CBM No					OS & Program	Antenna & SIM
Date of Inspection		Initials			Solar Panel	TBRG
Office - tick here after SitesDb & HDB entry	Last Visit	Stock changes			Solar Regulator	River Sensor
Co-ordinates					Bubble Unit	Gas Druck

Initial Data				Rain	Battery	River	Sends?	RSSI
Time	Logger Time	Staff gauge height	Logger Values				Y / N	

Battery	Rating (Ah)	Date Stamp	New:	Rating (Ah)	Date Stamp
Existing Battery	Voltage (V)	Under Load (V)	Consumption Sleep (mA)	Consumption Interrogation (mA)	
Replacement Battery	Voltage (V)	Under Load (V)	Consumption Operating (mA)	Voltage at socket / RSSI	V dB
				Lithium Battery (min. 2.90 V)	

Solar Panel		Power (w.)	Mains Supply	
Output Voltage (V)	Short Circuit Current (mA)	Weather		
Solar Regulator (V)	Charge Current (mA)	Under Load (mA)	Clean and undamaged ?	

Rain							
Is gauge level ?	YES NO	Drains clear ?	YES NO	Syphon Cleaned	YES NO	Switch OK	YES NO
TBRG Tip Test	YES NO	Buckets Adjusted	YES NO	Calibration check	YES NO	Full calibration data overleaf Before: After:	

River			
Transmitter Type	Transmitter Range	Calibration check	YES NO
Staff gauges in good condition	YES NO	Staff gauge range	Staff gauge survey carried out ?
		YES NO	Current WL entered for IP Logger ?
		YES NO	YES NO

Gas		Orifice Checked	Leak test on fitting to river line while purging	Tested for leaks
Existing Cylinder	Cylinder Pressure (kPa)	Feed Pressure (kPa)	Bubble Rate (BPM)	Bubble Unit: Pressure Tested to m.H2O
Replacement Cylinder	Cylinder Pressure (kPa)	Feed Pressure (kPa)	Bubble Rate (BPM)	System Purged
Compressor	Pump Cycle to kPa	Status Normal Operation	YES / NO	Fault Code:

Final Data				Rain	Battery	River	Sends?	RSSI
Time	Logger Time	Staff gauge height	Logger Values				Y / N	
Check data coming in ?		YES NO	Logger Cleared ?	YES NO				

Comments									
Photos	On Web?	Excel	WO Comp	Meters	EAMS other	E'mon OP	DRS	Council	

TIPPING BUCKET RAIN GAUGE						
RAIN GAUGE TYPE:						
ACCURACY CHECK METHOD		HS Field Calibration Tool				
		Volume 653ml 730ml		Nozzle 200mm/hr 100mm/hr		
		Other				
INITIAL CALIBRATION						
Expected Result	Start Value	End Value	Result	Difference	% Error	
mm/ tips						
FINAL CALIBRATION						
Adj. made?	Expected End Value	Start Value	End Value	Result	Difference	% Error
YES	mm/					
NO	tips					
YES	mm/					
NO	tips					
YES	mm/					
NO	tips					
				Mean:		
Expected measurement using HS calibration tool Rimco: 20.2mm 101 tips HS: 20.8mm 104 tips						
<i>Note: Calibration adjustment should only be performed if the mean % error after 3 checks is greater than 6%.</i>						

DRUCK CALIBRATION		
DPI PUMP	LOGGER	ERROR (m.)

SHAFT ENCODER CALIBRATION			
REVOLUTIONS	START VALUE	END VALUE	RESULT

nb. Check DNRM level on WL3100 first.
One full revolution = 36.5 increments

Modmax RSSI
-105dB weak '-105 to -95dB OK '>-95 good

Data Quality	Rain	Water Level
On Arrival		
On Departure		

Missing; Not Verified; Poor; Fair; Good