

Tide Gauge Survey Instructions and Form

1.1 Instructions

1. Work to be Carried Out at each Tide Gauge

In accordance with the procedures and recommendations contained in these instructions, carry out the following work:

- 1.1. Subject to the owners agreement calibrate each automatic recorder.
- 1.2. Complete "Tide Gauge Details" sheets for each tide gauge.
- 1.3. Inspect existing benchmarks and, where necessary, install additional or supplementary marks to bring the number of stable marks in the vicinity of each gauge to at least three.
- 1.4. Determine the difference in height between each of the tide gauge benchmarks and the zero of the tide staff and/or recorder at each installation.
- 1.5. If not already, and where reasonably possible, connect the tide gauge benchmarks to a level traverse of the national Levelling Survey.
- 1.6. Make a photographic record of each automatic recorder, the tide staff and nearby features.
- 1.7. Prepare a plan of each tide gauge installation.
- 1.8. If necessary, identify each gauge and the benchmarks on aerial photography.
- 1.9. Discuss with the owners and/or operators of the gauges any faults found with and possible improvements to each gauge and its records.
- 1.10. Send a copy of all documentation to the PCTMSL as soon as possible after installation.

2. Calibration of Automatic Recorders

Automatic recorders may be calibrated in accordance with the following procedure:

- 2.1. Each gauge should be calibrated both before and after cleaning of the sensor or stilling well inlets unless inspection shows them to be clear.
- 2.2. Use the "Tide Gauge Calibration" forms provided to record the level of the sea inside the stilling well as indicated by the automatic recorder, the level of the sea outside the well as indicated by the tide staff, and the date and time of observation, and other relevant details, every 1/4 hour on the 1/4 hour, continuously for a period of the complete tide range including both the rising and falling tide, ideally at springs.
- 2.3. Clean the sensor or stilling well inlets and repeat the test.
- 2.4. Where the tide staff is not conveniently placed to enable observation of the recorder height and the tide staff height to be simultaneous, a

Tide Gauge Survey Instructions and Form

temporary tide staff is to be established in a suitable position and its height is to be related to the existing tide staff.

- 2.5. A careful inspection of the tide staff should be made to see that it is firmly fixed and in a vertical position. If necessary, but only with the agreement and co - operation of the operator of the gauge, the tide staff should be firmly secured in a vertical position without disturbing the height of the tide staff zero. Any work carried out on the tide staff should be noted on both the tide gauge chart and the calibration record.
- 2.6. In exposed locations or in rough water the tide staff may be difficult to read without adequate stilling precautions. If necessary, a length of 1/2 inch diameter clear plastic tube, open at the top and fitted with a suitable notched plug at the lower end, may be fixed to the tide staff so that the water level in the tube can be read. It is essential to ensure that the tube does not become clogged and that there is sufficient opening at the lower end. It there is any wave movement on the outside, the water in the tube should show perceptible oscillation.
- 2.7. Record wind speed and direction and atmospheric pressure during the calibration period at 6 hourly intervals, unless readings are available from an nearby meteorological station
- 2.8. Make arrangements, if possible, with the owner or operator of the gauge for the supply to the Permanent Committee on Tides and Mean Sea Level of a copy of at least that portion of the recorder chart and or digitally recorded readings covering the period of the calibrations.

3. Tide Gauge Details Sheets

- 3.1. In consultation with the owner and or the operator of the gauge and by personal inspection and observation complete the 4 pages of "Tide Gauge Details" in as much detail as possible.
- 3.2. These sheets serve as a permanent record of the tide gauge installation and it is important that as much information as possible be obtained and that the information is accurate.
- 3.3. If any information differs from previous records attempt to find out when the changes occurred and note. Do not destroy the old information.
- 3.4. With reference to environmental effects (Question 28) describe in detail any feature which may limit exposure of the gauge to open water (e.g. shallows narrows etc.).

4. Benchmarking

- 4.1. Inspect existing permanent benchmarks in the vicinity of each tide gauge and if these are inadequate in number and/or quality establish new permanent marks so that at least three marks of good quality and stability are available at each gauge.

Tide Gauge Survey Instructions and Form

- 4.2. New marks should be about 100 metres apart and away from any anticipated construction activity or other possible cause of disturbance.
- 4.3. Marks established as tide gauge benchmarks should preferably be constructed of brass rod set at least 150 mm into solid rock concrete foundations or other suitable structures the top of the rod protruding not more than 5 mm and indicated by a brass numbering plate. If no suitable rock or structure is available benchmarks are to be established in accordance with Part C "Recommended Marking Practices" of the ICSM Special Publication 1 "Standards and Practices for Control Surveys Version 1.7 September 2007
- 4.4. The identification number allocated to each new benchmark is to be legibly stamped on the brass numbering plate.
- 4.5. Each new benchmark is to be fully described in the field level book and a Permanent benchmark Record is to be prepared for each new mark on the forms provided.
- 4.6. Benchmarks established during the level observations from the tide gauge benchmarks to National Levelling, Survey traverses shall be constructed in accordance with the above Schedule.
- 4.7. Supply a copy of all Permanent Benchmark Records to the State Survey Authority.

5. Levelling to the Zero of Tide Staffs

- 5.1. The differences in height between all tide gauge benchmarks and the zero of the tide staff is to be determined in accordance with section 6.1 and 6.2 below.
- 5.2. A diagram showing the differences in height between the tide gauge zero and the tide gauge benchmarks is to be prepared for each gauge.
- 5.3. Information relating to any change in the position of the tide staff or damage to it in recent years should be sought from the gauge owner or operator and included in the report on the tide gauge.
- 5.4. Check the graduations on the tide staff itself for accuracy and note any anomalies.

6. Connection to the National Levelling Survey

- 6.1. If the tide gauge benchmarks have not already been connected to a traverse of the National Levelling Survey such a connection shall be carried out to class LC in accordance with Part B Best Practice Guidelines for Surveys and Reductions sub section 2.4 Differential Levelling of the ICSM Special Publication 1 "Standards and Practices for Control Surveys Version 1.7 September 2007
- 6.2. All levelling is to be checked and a summary completed before leaving the site of the survey.

Tide Gauge Survey Instructions and Form

- 6.3. The levelling summary should be submitted to the State Survey Authority for incorporation into the National Levelling Survey adjustment.
- 6.4. An Ellipsoidal height should be available on at least one of the TGBM's. If not, attempts should be made to observe an "Absolute" ellipsoidal height with GPS see 2.6.14 of ICSM Special Publication 1 "Standards and Practices for Control Surveys Version 1.7 September 2007. Heights to be entered into the tide gauge meta-data sheet.

7. Photographic Record of the Tide Gauge

- 7.1. Two photographs of each tide gauge benchmark shall be taken. One photograph shall be a close - up of the actual mark and the other shall show the detail of the area surrounding the mark.
- 7.2. Two photographs of the tide gauge recorder hut shall be taken, from different directions.
- 7.3. Two photographs of the tide staff shall be taken, one a close - up of the tide staff and the other, if possible, showing both the tide staff and the recorder hut.
- 7.4. Two photographs showing the recorder inside the hut shall be taken from different positions.
- 7.5. Two or more photographs shall be taken from a considerable distance and shall show the tide gauge installation in relation to other prominent local features.
- 7.6. A record of the exposures in their correct sequence is to be kept on the photography record sheet provided.
- 7.7. On completion of a film it is to be labelled with the names of the photographed tide gauges on both the wrapping paper and the cassette or container.

8. Plan of the Gauge Installation

- 8.1. The position of the recorder, the tide staff and all benchmarks shall be shown on a large scale plan of the area.
- 8.2. A suitable map of the area can usually be obtained from local authorities. Where such plans or maps are unobtainable a sketch shall be prepared showing the recorder hut, the tide staff, the benchmarks and other local features in their proper relative positions and identify their location on aerial photography as described below.
- 8.3. The automatic recorder and all benchmarks shall be identified on aerial photography by pricking their positions on the photos with a fine needle and by suitable annotation.

Where an identification is in doubt, an easily identifiable point nearby shall be identified. The photo annotation shall refer to this nearby point as the "Photo

Tide Gauge Survey Instructions and Form

Reference Point" and shall indicate its bearing and distance from the recorder and the benchmarks.

8.4. The plan of tide gauge installation should be included with the Tide Gauge Details sheets.

9. Discussion with Owners and Operators

9.1. The owners of the gauges should be advised well in advance by letter that the survey party from a designated organisation will be visiting each gauge. A few days before the party is expected to arrive at each gauge the party leader shall try and contact the operator by telephone to let him know when to expect the party.

9.2. Any faults in the gauge or the records shall be discussed with the owner and or operator but no adjustments are to be made without the agreement of the owner or operator.

10. Permanent Committee on Tides and Mean Sea Level

10.1. Supply a copy of the Tide Gauge Details sheets, plan of installation, annotated aerial photograph (if applicable) and height connection diagram (see paragraph 5.3) to the PCTMSL as soon as possible after installation.

10.2. If any changes occur to the details provided or the gauge is removed, the PCTMSL should be informed immediately.

Tide Gauge Details

In addition to details of the site, type of gauge, owner and operator, the "Tide Gauge Details" form requests technical details of the gauge, the frequency and method of connection to benchmarks, and environmental effects, the last referring in particular to any impediment to the exposure of the gauge to open water which may reduce the accuracy of the records obtained. This information is required to facilitate comparison and interpretation of the tide gauge records.

Operators are invited to refer to the committee any difficulties encountered in completing the form any suggestions as to how it might be improved.

Tide Gauge Survey Instructions and Form

<i>Station Number</i>			<i>Name</i>		
<i>Latitude</i>		<i>Longitude</i>		<i>Horizontal Datum</i>	
<i>1 : 100, 000 Map Name</i>			<i>Number</i>		
<i>M.G.A. Northing</i>			<i>M.G.A. Easting</i>		

<i>Site description</i>	
<i>Operator's Name</i>	
<i>Address</i>	
<i>Telephone</i>	
<i>Type of Recorder</i>	
<i>Makers Name</i>	
<i>Date of manufacture</i>	
<i>Serial Number</i>	
<i>Range of Gauge</i>	
<i>Commencement of Operation</i>	
<i>Period for which continuous records are available</i>	
<i>Period of intended operation of gauge</i>	
<i>Frequency of recorder chart change</i>	
<i>Frequency of height check</i>	

Tide Gauge Survey Instructions and Form

<i>Frequency of time check</i>	
<i>Method of height check</i>	
<i>Method of time check</i>	
<i>Tide staff graduations</i>	
<i>Chart height scale</i>	
<i>Chart time scale</i>	
<i>Type of record</i>	
<i>Records stored at</i>	

<i>Float operated gauge:</i>	
<i>Diameter of float</i>	
<i>Diameter of well</i>	
<i>Height of inlet above the sea bed</i>	
<i>Specifications and configuration of inlet/s</i>	

<i>Pressure operated gauge: (Strain gauge, gas purge, etc)</i>	
<i>Type of sensor/s</i>	
<i>Depth of sensor/s below gauge zero</i>	
<i>Distance of sensor/s from recorder</i>	
<i>Method of pressure transmission</i>	

Tide Gauge Survey Instructions and Form

<i>Pulse flight time operated sensor (downward looking radar or acoustic pulse sensor)</i>	
<i>Type of Sensor/s</i>	
<i>Height of sensor above gauge zero</i>	
<i>Distance of sensor from recorder</i>	

<i>Are water density, temperature and salinity measured? If yes, how often:</i>	
---	--

<i>Recorder Calibrated:</i>	
<i>Period</i>	
<i>Method</i>	

<i>Environmental effects on gauge</i>	
---------------------------------------	--

<i>Description of benchmarks</i>	
<i>Height of benchmarks in metres:</i>	
<i>Above tide staff zero</i>	
<i>Above recorder zero</i>	
<i>Above Australian Height Datum</i>	
<i>Above Hydrographic chart datum</i>	

Tide Gauge Survey Instructions and Form

<i>Above the Ellipsoid</i>	
<i>Above Low Water Datum</i>	
<i>Above Other Datum (Specify)</i>	

<i>A.H.D. height in metres of:</i>	
<i>Tide Staff Zero</i>	
<i>Recorder Zero</i>	

<i>Levelling Section (A.H.D. connection)</i>	
<i>Number</i>	
<i>Levelling by</i>	
<i>Level Books</i>	
<i>Levelling Date</i>	
<i>Ellipsoidal height in metres of:</i>	
<i>Tide Staff Zero</i>	
<i>Recorder Zero</i>	
<i>Ellipsoidal Heights Information (SPI Section 2.6.14)</i>	
<i>ITRF Epoch (MMM/YYYY)</i>	
<i>ITRF Height above BM</i>	
<i>ITRF Height above TGZ is</i>	
<i>Length of GPS Observations</i>	
<i>Method of determination</i>	

Tide Gauge Survey Instructions and Form

<i>Reference to Ellipsoid (preferably the Australian Datum at the date of Survey)</i>	
<i>Name of Ellipsoid</i>	
<i>Date of Survey</i>	
<i>Field Record ID</i>	
<i>Elevation calculation record id</i>	
<i>List of elevation control marks with elevation</i>	
<i>Nature of elevation calculation (constrained or unconstrained to elevation control marks)</i>	

<i>Other relevant details</i>	
-------------------------------	--

<i>Issue</i>		<i>Prepared By</i>		<i>Date</i>	
--------------	--	--------------------	--	-------------	--

Tide Gauge Survey Instructions and Form

Name:			Number:		
Date	Standard Time	Recorder Time	Recorder (m)	Staff (m)	Weather Conditions
Observer				Time	
				Zone	

