Government of Western Australia
Department of Transport
and Major Infrastructure

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Generic Metocean Data Collection Scope

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Prepared for Department of Transport and Major Infrastructure (DTMI)

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Version control

Version No.	Date	Prepared by	Revision or issue descriptions	Issues to
Draft	10/04/2025	M P Rogers & Associates	Combined Draft for DoT review.	DoT
0	15/05/2025	M P Rogers & Associates	Updated with Client comments and issued for Client use.	DoT
1	16/06/2025	DoT	Additional updates from internal review	DTMI

Amendment record

This guidelines document is reviewed to ensure its continuing relevance to the systems and process that it describes. A record of contextual revisions is listed in the following table.

Page No.	Context	Revision	Date

Contents

Note

[It is expected that collection of specific metocean data is required for areas without existing data, or to assist with other tasks such as the detailed design of a coastal protection structure and/or numerical model development. For many coastal locations, there is already significant data available collected by government agencies including DoT and BoM for general assessment of metocean conditions. Specific collection of metocean data should occur only when available data does not suit required outcomes.]

Formatting Key

[Throughout this template three text colours have been used to distinguish between the following items.]

1. Recommended content.
2. [Guidance notes for the user to be deleted prior to use.]
3. Example text to be edited by the user prior to use.

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Aim / Objectives

[For the purposes of coastal monitoring, collection of metocean data is a broad topic. However, it is generally used for one of the following.

- To assist with design of coastal protection structures.
- To analyse conditions experienced and provide context to shoreline change.
- To create a background dataset for general metocean conditions.
- To calibrate or validate local wave or hydrodynamic models.

The LGA will need to determine the requirements of their data and update the scope as required.

Outline the required data and/or outcomes from metocean data collection here.]

The aim of specialised metocean data collection is to determine conditions to [LGA to confirm objectives e.g. design a protective structure or assess shoreline change]. The objectives and purpose of this metocean data collection are as follows.

- To obtain high-quality, site-specific metocean data to inform coastal management and infrastructure planning.
- To capture local wind data for the required locations.
- To capture local wave data for the required locations.
- To capture local current data for the required locations.
- To capture local water level data for the required locations (if required).
- To characterise local wave, wind, and current conditions over a defined period.
- Allow assessment of design events for sites within the LGA.
- Assess how metocean conditions impact the coastline.
- Provide data to inform design of coastal protection structures.

[The LGA is to include and remove objectives as required.]

Extent

[Provide a map outlining the area that requires specialised metocean data collection. This can be a significant portion of the LGA's coastline or focused on a specific area, depending on requirements of the LGA.

If the collection of data is to be used for construction of a coastal protection structure or in developing a model, input from the designer / modeller or an experienced coastal engineer should be sought to provide insight into preferred collection points.

If available, include details of the expected depth and hydrographic surveys of the area.]

The LGA manages approximately XX km of coast, stretching from XX to XX. Within this section of the coast, the LGA is specifically monitoring the whole coastline / the following areas (is planning on constructing coastal structures in the following areas.) and requires improved understanding of nearshore metocean conditions in the area(s) to inform future planning.

- Area one. [Include the LGAs priority areas.]
- Area two.
- Area three.

The location of these areas can be found in the following figures.

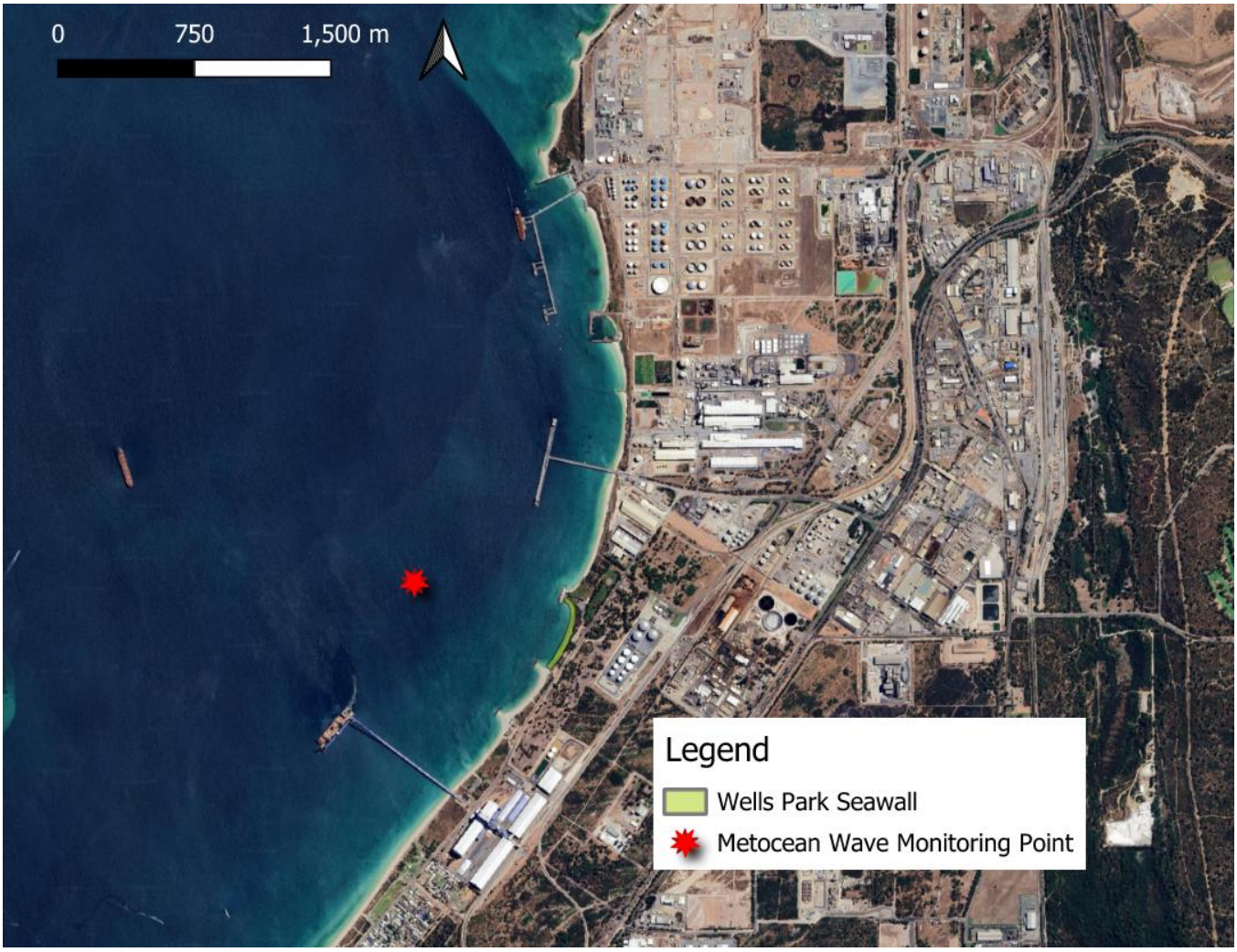

Figure 1 Kwinana Beach Revetment Wave Monitoring Location [Location selected to determine the wave conditions for the revetment repair design. Example from City of Kwinana CMAP.]

[Include other areas.]

Background

[Provide brief background for each area if required, including information such as access requirements and any other relevant information the LGA can provide.

An example background is included below.]

Area One Example

The City is planning on repairing the damaged revetment south of Wells Park. This revetment was constructed in stages between 1981 and 1997. Since its construction, the revetment has been damaged and shows signs of overtopping. A recent condition inspection identified the revetment as being in poor condition and recommended it be repaired and upgraded. As part of the repair and upgrade, extreme metocean conditions need to be understood. To complete this, a wave measurement device is proposed to be placed XX metres offshore from the existing structure for approximately 12 months, to provide a clear indication of local metocean conditions.

[Include other areas]

Tasks

[The tasks outlined in this section detail the required components of the metocean data collection.]

The following tasks are required for successful completion of the Metocean data collection program.

1. Task 1 – Site Selection and Deployment Planning.
2. Task 2 – Instrument Deployment/Retrieval.
3. Task 3 – Data Collection and Supply.

Task 1 – Site Selection and Deployment Planning

[The Collection of metocean data requires appropriate planning and consideration to achieve appropriate outcomes. Any specific needs by the LGA may change the data required. The Consultant should be made to carefully consider required outcomes and how data will be used, along with available details of the site and its access, to best inform site selection and planning.

Captured raw data will generally require post-processing to provide useful information. The collection of metocean data generally includes (but is not limited to) the following data types to be captured.

- Wave Data:
  - Significant wave height.
  - Peak wave period.
  - Mean wave period.
  - Wave direction.
  - Separation of the sea and swell components of the wave data would be beneficial.
  - Wave spectrum.
  - Long-period wave statistics.
- Wind Data:
  - Wind speed (at a specified height relative to mean sea level).
  - Wind direction.
  - Gust speed and direction.
- Current Data:
  - Speed.
  - Direction.
  - Current speed and direction across the water column (i.e. seabed, surface, depth-averaged).
- Water level data:
  - Water depth

The Consultant should consider and select required equipment to obtain the required data. Some available instruments are noted below. There are capabilities and limitations of each instrument. The consultant should know how to program the instrument(s) to extract suitable metocean parameters to best fit the desired purpose. The selection of equipment should generally be left to experienced consultants/personnel.

- Wave Measurements:
  - Wave buoys (e.g., Datawell Waverider, Spotter, TRIAXYS).
  - Radar-based wave sensors.
- Wind Measurements:
  - Wind anemometers.
  - LiDAR-based wind profilers.
- Current Measurements:
  - Acoustic Doppler Current Profilers (ADCPs).
  - Single-point current meters.
- Multi-parameter Oceanographic Sensors:
  - CTDs (Conductivity, Temperature, and Depth).
  - Acoustic Wave and Current Profiler (AWAC).
  - Wave-tide gauges.
- Water level measurements:
  - Tide gauges (e.g. Vega sensors)
  - Pressure sensors (e.g. RBR loggers)]

Other parameters not included in the above list may be collected such as dissolved oxygen, pH, and salinity data. The LGA is recommended to discuss the need for such parameters in a pre-scoping meeting with any prospective Consultant to identify whether additional data collection is required for their needs.

The Consultant is required to undertake specialised metocean data collection to provide the LGA with required Wave, Wind and Current data.

The required Wave, Wind and Current data to be collected and supplied are outlined below.

- Wave Data:
  - Significant wave height.
  - Peak wave period.
  - Mean wave period.
  - Wave direction (mean and peak).
- Wind Data:
  - Wind speed.
  - Wind direction.
  - Gust speed.
- Current Data (surface, seabed, and depth-averaged):
  - Speed.
  - Direction.
- Water level data:
  - Water depth.

The interval of each data record must be set appropriately for each measured parameter. The preferred intervals are:

- Waves: 30 minutes
- Wind: 15 minutes
- Currents: 10 minutes

- Water levels: 1 Hz or 5 minutes (depending on instrument type)

The following key components should be considered when planning metocean data collection.

- Identify suitable instruments to provide the LGA with required data.
- Identify suitable locations for instrument deployment based on project objectives, site conditions, and access requirements.
- Obtain necessary approvals and permits for deployment.
- Prepare a deployment plan detailing instrument types, mounting methods, mooring configurations, and expected deployment durations.
- Provide appropriate QA/QC, including calibration and metadata reporting of the selected devices.

Task 2 – Instrument Deployment/Retrieval

[The deployment and retrieval of measuring equipment should be completed by the Consultant. They are best placed to complete this work and should demonstrate suitable knowledge and experience.

Provide a generic description and include details of any LGA specific requirements for the deployment of instruments.]

The Consultant is to deploy instruments in-line with their deployment plan and all state or federal regulations/procedures/requirements. Generally, this will include the following aspects.

- Deploy metocean instruments following the approved deployment plan.
- Ensure instruments are prepared, securely anchored and positioned to minimise instrument displacement/damage and even potential loss of instruments, which can lead to data loss or corruption.
- Ensure instruments are correctly calibrated and recording data appropriately.
- Record deployment metadata, including GPS coordinates, water depth, orientation, and time of installation.
- Ensure all appropriate notices are in place and safety requirements are followed.

Task 3 – Data Collection and Supply

[The Consultant will need to collect metocean data and provide to the LGA in required formats. This will generally involve post processing to identify any corrupt or unreliable data, to be flagged accordingly.

Depending on the instrument(s), data may be collected in real time allowing continual monitoring of data for specific review following extreme events. This feature may result in additional costs to the LGA. Generally, it is expected that data can at least be supplied following instrument retrieval.]

The Consultant is to collect and supply metocean data to the LGA in required formats. Generally, this will involve the following.

- Collect data for a minimum of [insert duration, e.g., '12 months'] with regular servicing as required.
- Conduct maintenance visits to retrieve preliminary data, check instrument functionality, and replace batteries/memory where necessary.
- Supply data in agreed formats to the LGA including metadata and QA/QC results.

[The LGA should carefully consider what happens if the instrument is lost or data becomes unavailable for any period of time. This should be clarified up front with the Consultant including any proposed contingency.

The LGA will need to determine their requirements and adjust accordingly.

The LGA may consult DoT or other data custodians to assist in data storage/backup provision.]

Methodology

[Provide a brief overview of the metocean data collection methodology. The LGA should be cautious when prescribing a methodology as it may lead to additional cost and complications. The following methodology should be used as a guide.]

The Consultant is to develop a methodology for the metocean data collection to be approved by the LGA. The methodology may include the following aspects, noting that the following is to be used as a guideline for conducting the data collection only.

1. Step 1 – Planning and Site Selection.
   - Review historical Metocean data, bathymetry and existing studies to identify key locations.
   - Conduct a desktop study to assess environmental conditions, accessibility, diving requirements and deployment feasibility.
   - Confirm stakeholders' requirements to refine site selection and ensure alignment with project objectives.
   - Instrument programming according to the manufacturer's guidelines and project objectives.
   - Prepare a detailed deployment plan, including instrumentation requirements and safety measures for approval by the LGA.
2. Step 2 – Instrument Deployment/Retrieval.
   - Follow the approved deployment plan.
   - Deploy selected instruments following manufacturer guidelines and best practices.
   - Secure instruments with appropriate mooring systems to prevent displacement or damage.
   - Conduct initial calibration and functional tests to ensure data integrity.
   - Instrument deployment recording including metadata, GPS coordinates, deployment depth, sensor orientation, seabed condition and any other circumstances that may impact data quality. It is advisable to video the deployment process to confirm it was carried out to required standards.
   - Instrument retrieval record including the instrument location, seabed conditions and any circumstances that may impact data quality. Provide photo and video evidence.
3. Step 3 – Data Collection and Quality Assurance/Control.
   - Implement a data logging and transmission system to capture real-time continuous observations [if applicable.].
   - Conduct periodic site visits as required to inspect instruments, retrieve data, swap instruments/batteries, and perform maintenance.
   - Apply real-time and post-processing quality control measures, including data validation against regional and/or other local datasets.
   - Address sensor drift, signal noise, and other potential sources of error.
4. Step 4 – Data Processing, Quality Assurance/Control and Analysis.
   - Process raw data into standardised formats suitable for analysis and reporting.
   - Ensure data quality by implementing appropriate quality control measures.
   - Develop statistical summaries and visual representations of key metocean parameters.
   - Compare results with historical records to identify trends and anomalies.
   - Validate data using established hydrodynamic and atmospheric models [if applicable.].
5. Step 5 – Reporting and Data Supply.
   - Provide raw and processed datasets in industry-standard formats.

- Compile findings into a comprehensive report detailing methodology, observations, and key insights.
- Deliver data products suitable for integration into numerical modelling and decision-making frameworks.

Deliverables

[In this section the LGA should consider requirements of the data collection to ensure they are met within the deliverables.

The LGA is to confirm the requirements and uses of the data and adjust deliverables as required.]

The Consultant is required to provide the following deliverables.

1. Deployment Plan – including site selection rationale, manufacturer's technical specifications of the instrument(s), and deployment schedule.
2. Regular Progress Updates – summarising deployment status and preliminary data insights.
3. Final Report – including:
   - Overview of deployment and data collection methodology.
   - Time-series data summaries.
   - Quality control procedures and QA/QC results.
   - Interpretation of findings relevant to project objectives.
4. Raw and Processed Data – in a format suitable for further analysis.
5. (Include any requirements specific to the LGA).

Timeframe

[Use this section to request an estimate of the project's timeline or include a deadline if required.

The timing of the data recording and/or provision can also be specified here.]

The Consultant is to complete the data collection over (specify time e.g. 12 months) and provide an estimated date for supply of deliverables.

[OR]

(The Consultant is to complete the data collection over (specify time e.g. 12 months) and supply deliverables within XX weeks from the completion of data collection.)

Documents and Files to be Provided

[This is where the LGA can provide details of any documents and files that will assist the Consultant conducting data collection. Examples of these documents are included below. Ensure to check web-hosted data sources for your project that may provide useful information, such as DoT's historical tide and wave data portal.]

The following files (and documents) will be provided to the Consultant on the award of the works.

- Available hydrographic surveys. [If applicable.]

- Existing Metocean datasets [If available.]
- Data storage and formatting guidelines
- Details of any specific labelling requirements.
- Any relevant documents the LGA has access to.

Appendices

[Include any required documents, these could include any files containing monitoring requirements, preliminary design details or planned modelling.]