Document Revisions

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**On**

**The application of maritime surface picture for analysis in risk assessment and the provision of Aids to Navigation**

**Edition 1**

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Revisions to the IALA Document are to be noted in the table prior to the issue of a revised document.

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**The application of maritime surface picture for analysis in risk assessment and the provision of Aids to Navigation**

# INTRODUCTION

The use of Geographic Information Systems (GIS) to enhance the overall maritime surface picture allows for a more thorough assessment of the risk presented to the Mariner. As a consequence, the decision making process for any reaction by an Aid to Navigation (AtoN) provider will be assisted and supported by a documented record.

# SCOPE

This document provides guidance on the use of GIS to assess the requirement and impact of AtoN’s in the area of interest. It will cover incorporation of Charting overlays with new and amplification of existing dangers, AIS vessel traffic information, leisure and fishing activities, together with existing and proposals for formal routing measures.

This document is a general guide only and is not intended to be a defined prescriptive document on the provision of AtoNs using GIS. The guidance introduces various potential applications for GIS data analysis in conjunction with more traditional methods to assist the AtoN provider to make a well informed decision based on all the quantitative and qualitative data available. The options discussed are not an exhaustive list and the AtoN providers should always look to use any additional information available to them.

# 3 ACRONYMS AND DEFINITIONS

AtoN Aid to Navigation

GIS Geographic Information Systems

AIS Automatic Identification Systems

# 4 OVERVIEW OF GIS METHODOLOGY

**To be inserted**

# 5 APPLICATIONS

## 5.1 Emergency Wreck or Obstruction Marking

When a new wreck or obstruction has been announced a formal assessment must be made on;

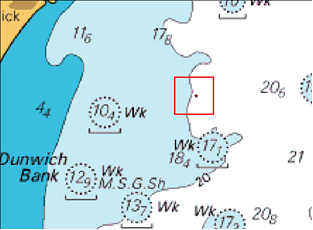
* whether a vessel and personal need to be deployed to accurately survey the wreck
* whether an appropriate AtoN needs to be deployed to mark the wreck

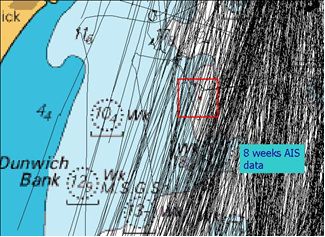
Before traffic data was available this decision relied almost entirely on the expertise of the assessor with no supporting evidence to underpin the decision. Information is and has been available for many years regarding vessel trading routes which helped to inform the process but this information was not able to provide quantitative data on specific traffic lines or indeed an assessment of the size of vessels actually passing over a particular location.

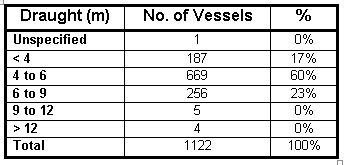
Considering each situation, the assessor of requirements must make a rapid but informed decision on the worst possible situation. With a wreck this means that the overall length of the vessel could in exceptional circumstances be the actual height above the seabed. An assessment of the clearance between the wreck and the sea surface at chart datum or lowest astronomical tide (LAT) must be made and consequently a determination of the risk to the mariner, based on the worst case scenario.

Using an appropriate analysis tool, and compiling AIS traffic data over a significant period, the assessor is able to extract the volume of vessels over a specific draft that pass in the vicinity of the wreck.

As an example, referring to Figure 1. If we consider an obstruction that has been reported with a maximum height above the sea bed of 10 metres, which is located in an area with surrounding depths of 20 metres. Then the available depth over the obstruction is 10 metres and this is the delineating draft to be assessed (RB- paragraph needs editing with Portland Bill example)

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**RB – Replace with ‘Portland Bill’ example**

Figure 1 Example of an obstruction with AIS data overlay and statistical vessel traffic analysis

Based on this information a decision can be made whether a lighthouse tender must be deployed immediately to carry out a survey and secondly whether floating marks are also required.

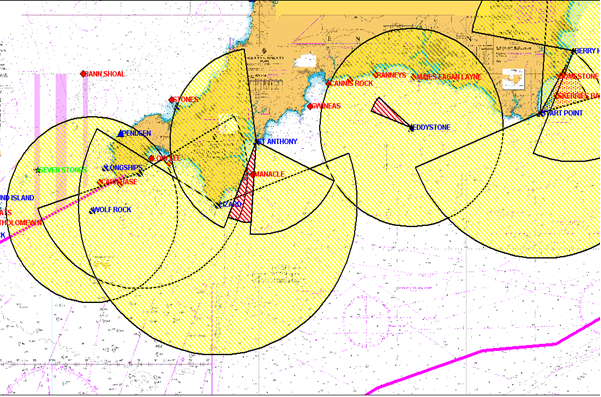
## 5.2 Determining the appropriate overall requirements, number and mix of Aids to Navigation in existing and new applications

SOLAS Chapter 5, Regulation 13, states that:

*Each Contracting Government undertakes to provide, as it deems practical and necessary either individually or in co-operation with other Contracting Governments, such aids to navigation as the volume of traffic justifies and the degree of risk requires.*

By considering the actual coverage of current AtoNs provided, including accurate assessment of nominal ranges of both charted and uncharted sectors of fixed lights, then combining this data with up to date traffic patterns an informed decision on the on-going requirements for existing AtoNs and the requirement for additional or different AtoNs can be made.

An on-going assessment will always be required to ensure that any changes, including bathymetry changes are addressed to ensure the continued safety of the Mariner.



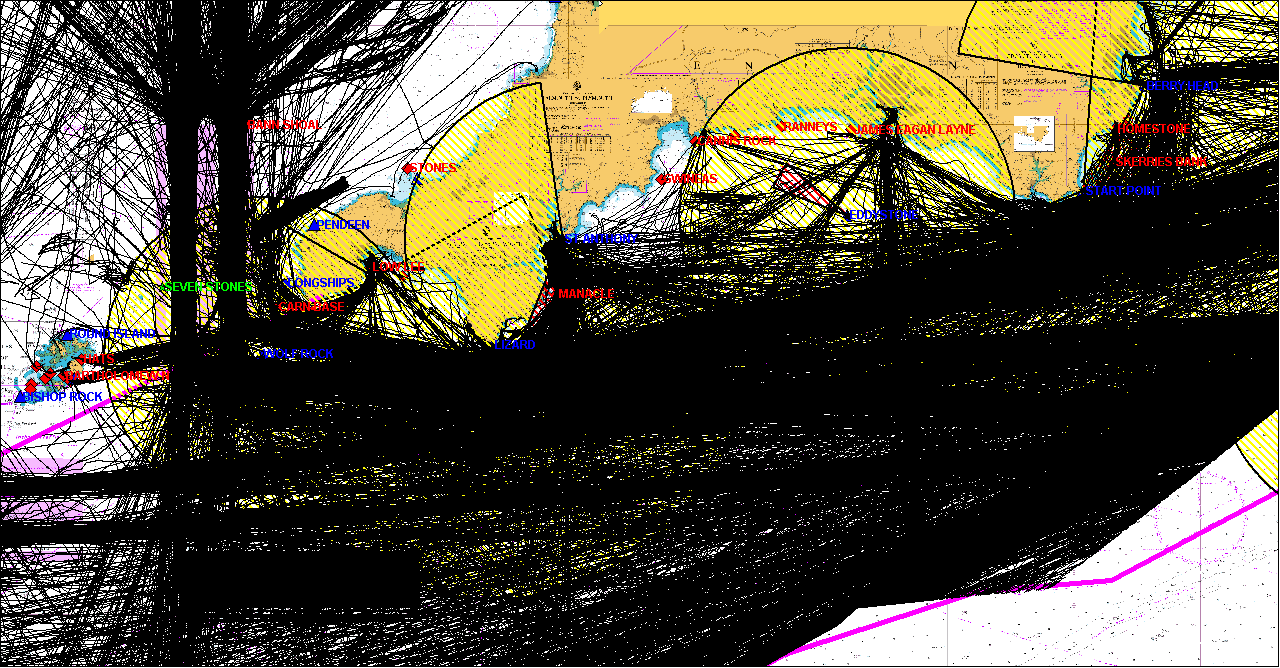


Figure 2: Overlay of AtoN nominal ranges and AIS data

With reference to figure 2, the AIS data displayed in its current form is meaningless without further analysis over perhaps a shorter time period to determine such factors as type of craft, draught of vessel, factoring out regular/scheduled sailing of the same vessel etc. Only once this more rigorous analysis is completed can an informed decision be made on the suitability or possible reduction in number or nominal range of the existing AtoN’s

**RB – To insert better worked ‘step’ approach example graphics and remove the last paragraph of this section**

## 5.3 Assessment of marking requirements for new or existing shoals and shallow areas subsequent to hydrographic survey

When new survey information is received which has relevance to the AtoN deployed by an AtoN Authority, a decision is required on whether new or amended marking is required and importantly if changes are required, the time frame within which they must be carried out.

When new survey information is received the authority shall assess the situation taking into account the existing AtoNs and AIS data available for the area in question. A proper analysis of the data will assist the authority in the decision process. For example the number of vessels, the type of the vessels, the draught of the vessels, etc will have an impact on the decision for amending the current location of the AtoN or deploying a new one, or indeed changing the type of AtoN.

## 5.4 Determining the need for new routing measures or traffic separation scheme.

AIS data and other traffic information can assist in determining whether a new routing measure or separation scheme is required in a certain area or not. The responsible authority, by analysing the AIS data for a specific area of interest, can determine the shipping pattern and the shipping lanes used by different types of vessels.

**RB to insert worked example graphics – Figure 3**

## 5.5 Post Implementation Analysis

Once changes to the shipping routes or the AtoNs have been implemented, AIS overlays provide a useful tool to measure the effectiveness of the new measure(s) introduced.

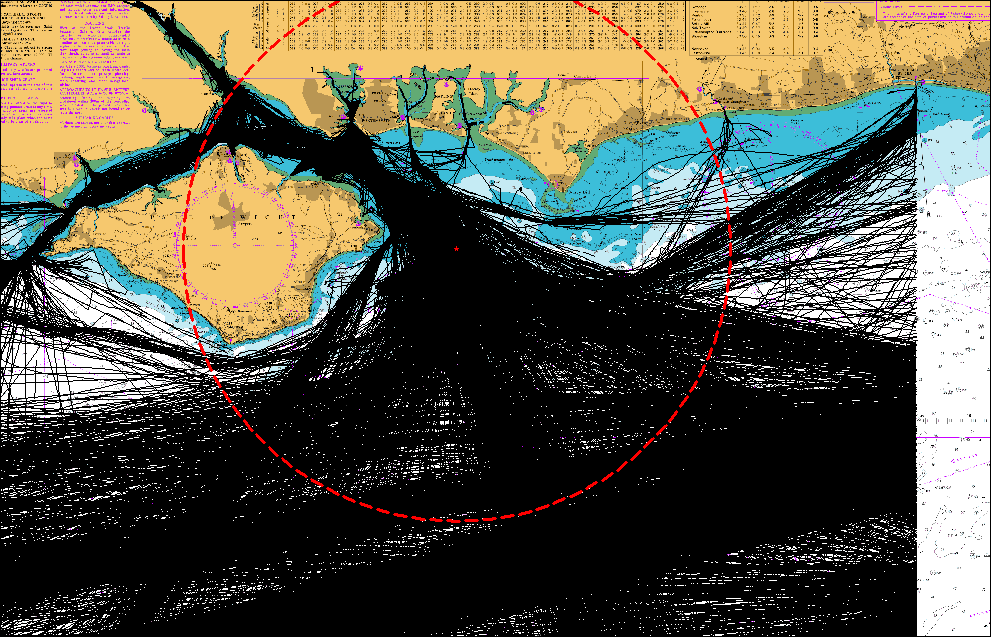
**RB to insert worked example graphics – Figure 4**

# 6 OTHER CONSIDERATIONS

**6.1**  **Possible limitations to be considered with AIS data**

The data and information that is gained through AIS traffic analysis must be treated with a certain amount of caution.

* The data received from the vessel, other than position information, will always be dependent on the input from the vessel. There are many instances where draft, Port of destination and type of vessel inputs are incorrect or suspect
* Many Mariners/users of AtoNs are not required to carry AIS transceivers. Although many leisure craft now carry AIS class B, this is not mandatory and as such this sector of the user community must be further considered using other data inputs. for example a yachting routing atlas, once again with GIS overlays, to consider the requirements.
* AIS data is generally received from a network of base stations using VHF frequencies. As such the data will become less reliable as the area being considered is further offshore. One problem here is that there is not a firm line between good and bad data with differing atmospheric conditions affecting reception at different times. As such data received from further offshore must be treated with caution.



# 7 CONCLUSION

The assessment process for the provision of AtoNs must rely mainly on the qualitative assessment of experts. The diversity of the various aspects that have to be considered will include the vast assortment and variety of vessels, the experience of the Mariners involved and the very different parameters that exist at the different locations.

This qualitative assessment can, however, now be informed by the quantitative elements provided by AIS traffic analysis data and GIS overlays whilst also being aware of the possible inaccuracies in AIS data and limitations on the proliferation of AIS transponders on certain vessel classes.

It is considered essential that every opportunity is taken to provide the correct control measures to mitigate the risk which include the most appropriate mix of both physical and electronic AtoNs and in consideration of Navigation Aids available aboard the vessels in question.

It is also essential that resources are used appropriately. As recorded earlier, without any detrimental effect on the Safety of the Mariner, in depth AIS traffic analysis can inform decisions to ensure that maximum efficiencies are achieved in all areas.

1. Annex Title

Guidelines should have Annexes. Appendices are attached to Annexes.

ANNEX HEAD1