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Distribution Practice of Physical AIS AtoN in Qingdao Port of China

# INTRODUCTION

This paper introduces the distribution plan and experience of physical AIS AtoN in Qingdao port, which is an important port in northern China. Through case illustration, the distribution of physical AIS AtoNs at the entrance of the channels, port boundaries, important turning points, important warning areas, near the channel of the sunken ships, sunken and reef areas, adjacent channel shallow points or the deep water channel of the Qingdao port, so as to provide useful reference for Guideline of the navigators on the use of AtoN, to further improve the navigation effectiveness of the AtoN and ensure the navigation safety of vessels passing through these waters.

## Purpose of the document

Based on the distribution practice of physical AIS AtoN to navigation of our important port. The information contained in this document is expected to be reviewed and to provide useful reference for the section 7- the challenges and solution for mariners with marine AtoN of the guidance on marine aids to navigation (AtoN) training and awareness for mariners.

## Related documents

ARM14 WP TG-1 5 4\_Guidance on AtoN Training and Awareness for Mariners

# Background

Qingdao Port is adjacent to the Yellow Sea, its geographical coordinates are 36°04′00″N, 120°19′05″E. No silting, no freezing all the year round; it is an important port of transhipment coast of West Pacific, international trade port, and north and south China sea transport hub, it is also the largest port in Shandong province, however, there will be frequent sea fog. The annual average number of foggy days is 48.6, and the longest continuous fog day is 33 days, the city background lights at night are also intense, which is easy to cause confusion for navigators. Therefore, it is necessary to formulate a scientific and reasonable navigation standard distribution scheme, so as to ensure the good performance of navigation aids. The application of physical AIS AtoN can improve and increase the service of existing AtoNs to navigators, furthermore, the setting of physical AIS AtoN is the infrastructure construction for realizing the intelligent port, intelligent channel and intelligent navigation insurance. At the same time, according to the opinions of AtoN users’ survey, it is hoped that the physical AIS AtoN to be set at the key navigation routes and the important waters such as channel entrances or the port boundaries, so as to guarantee navigation safety of ships and protection of marine environment.

# Discussion

The distribution of AtoN should be optimized on the basis of satisfying the safe navigation for ships, as far as possible to provide high-quality navigation assistance, and fully considering the needs of navigation management to provide assistance to support and promote port production operations. The physical AIS AtoN can provide ships with accurate navigation information under adverse conditions such as rain, snow, heavy fog and strong background lights, and further enhance the navigation efficacy of the AtoN.

## The *status quo* of distribution of floating marks in Qingdao Port and approaches

The channels of Qingdao Port are divided into outside channels and inside channels. The outside channel is composed of the outside main channel and the channel for super large ships; the inside channel mainly includes the inside main channel in the port, the channel of Huangdao Oil Port and the channel of Qian Wan Port, etc. The nearby waters mainly include the waters of the Olympic Sailing Center and the waters near the southwest of Xiao Qingdao and the waters near Laoshu Reef.

## 3.1.1 The *status quo* of distribution of floating marks in Main Channel Outside Qingdao Port

The main channel outside Qingdao Port is the main channel for ships to enter and departure Qingdao Port. The channel is about 22 nautical miles long. There are 26 floating marks in this area, including 12 lateral marks, 1 safe water mark, 12 special marks for traffic separation scheme and 1 sunken floating mark. The channel is also equipped with 1 radar transponder. The distribution of floating marks is shown in Figure 3-1-1.

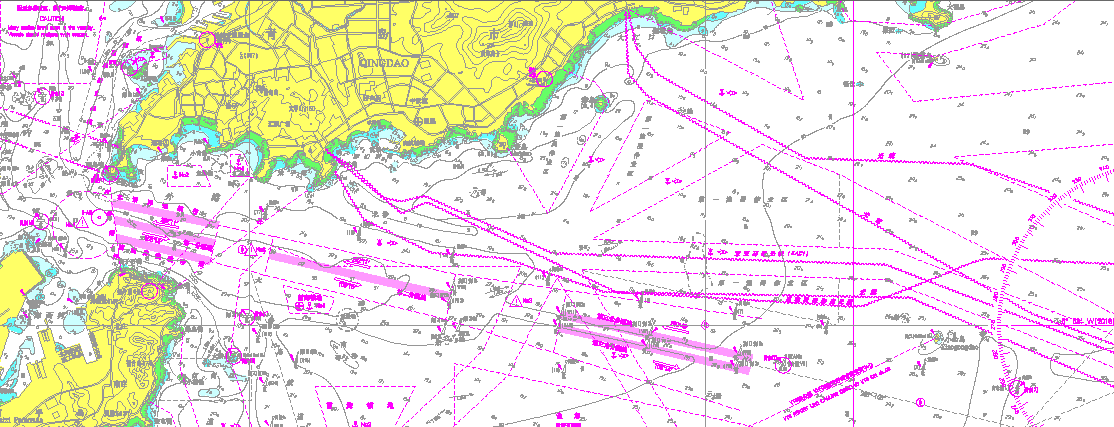


Fig. 3-1-1 Diagrammatic sketch distribution of floating marks in Main Channel Outside Qingdao Port

## 3.1.2 The *status quo* of distribution of floating marks in Ultra Large Ship Channel of Qingdao Port

The Ultra Large Ship Channel of Qingdao Port has a wide waterway with a water depth of more than -20 meters, which includes part of the fourth route and Daqiao Island channel. There are 16 floating marks, including 14 light buoys and 2 light ships. 3 radar transponders, respectively on the outer channel light ship, 501# light ship and 511 starboard hand mark. The distribution of floating marks is shown in Fig. 3-1-2.

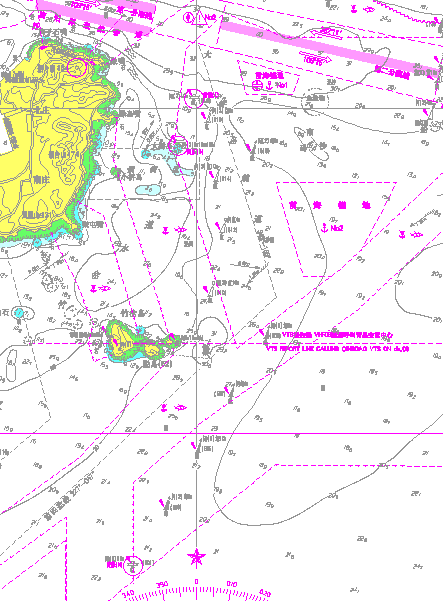


Fig. 3-1-2 Diagrammatic sketch distribution of floating marks in Ultra Large Ship Channel of Qingdao Port

## 3.1.3 The *status quo* of distribution of floating marks in Main Channel in Qingdao Port

The main channel in Qingdao Port refers to the channel that enters the Dagang Port, so it is called the Dagang channel. A total of 11 buoys are allocated, including 7 lateral marks and 4 cardinal marks. The distribution of floating marks is shown in Figure 3-1-3.

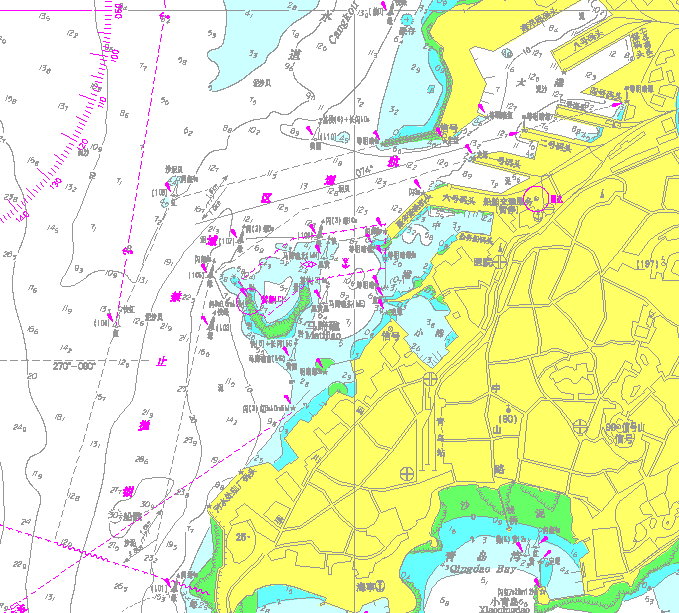


Fig. 3-1-3 Diagrammatic sketch distribution of floating marks in Main Channel in Qingdao Port

## 3.1.4 The *status quo* of distribution of floating marks in Huangdao Oil Port Area Waterway

The Huangdao Oil Port Channel of Qingdao Port is an important channel for oil tankers to enter Qingdao Port. There are 29 buoys in this channel, and the distribution of floating marks is shown in Figure 3-1-4.

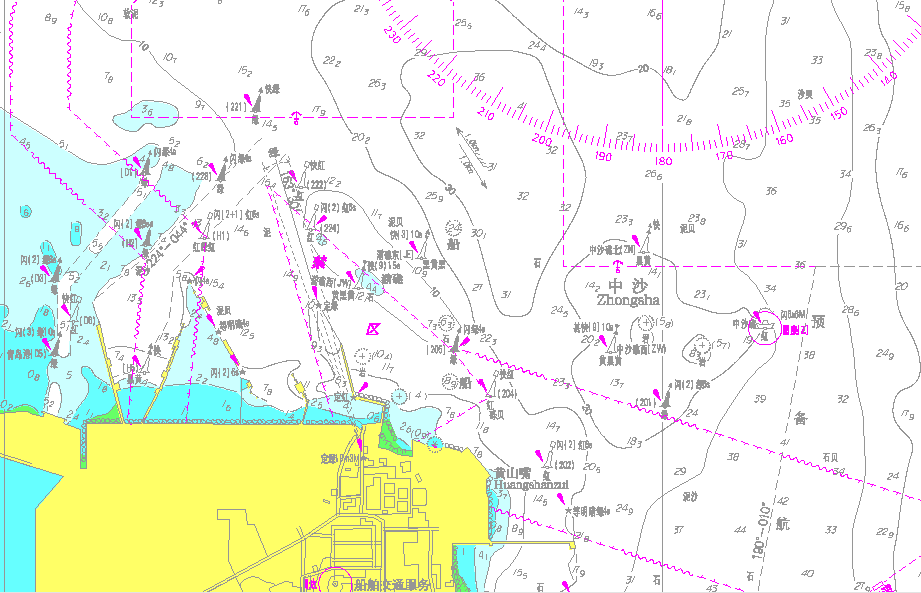


Fig. 3-1-4 Diagrammatic sketch distribution of floating marks in Huangdao Oil Port Area Waterway

## 3.1.5 The *status quo* of distribution of floating marks in Qian Wan Port and approaches

There are 15 AtoNs in the water area near Qingdao Qian Wan Port, including 13 light buoys and lamby(large navigational buoy), 1 radar transponder, and 1 AIS virtual AtoN. The navigation marks in the water are shown in Figure 3-1-5.

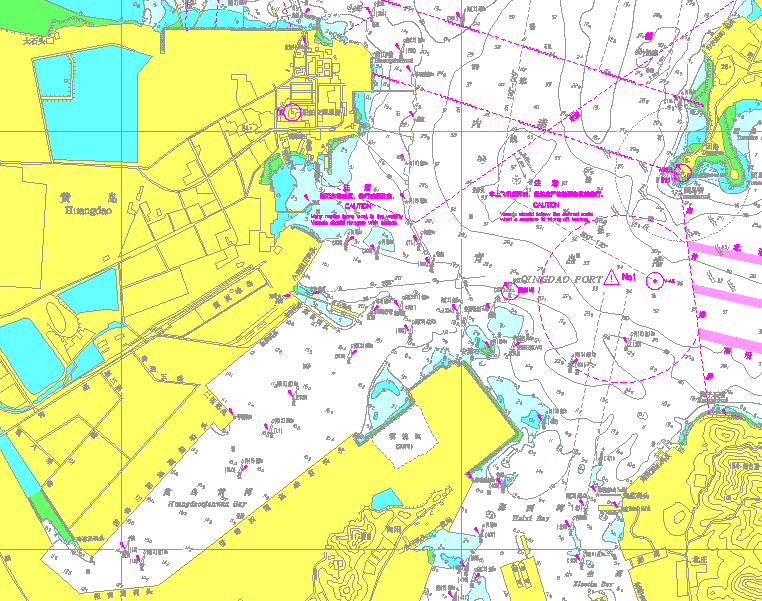


Fig. 3-1-5 Diagrammatic sketch distribution of floating marks in Qian Wan Port

## 3.1.6 The *status quo* of distribution of floating marks in the water near the Olympic Sailing Center

A total of 10 various types of AtoN in the water are distributed near the waters of the Olympic Sailing Center, including 9 light buoys and 1 radar transponder. The navigation marks in the water are shown in Figure 3-1-6.

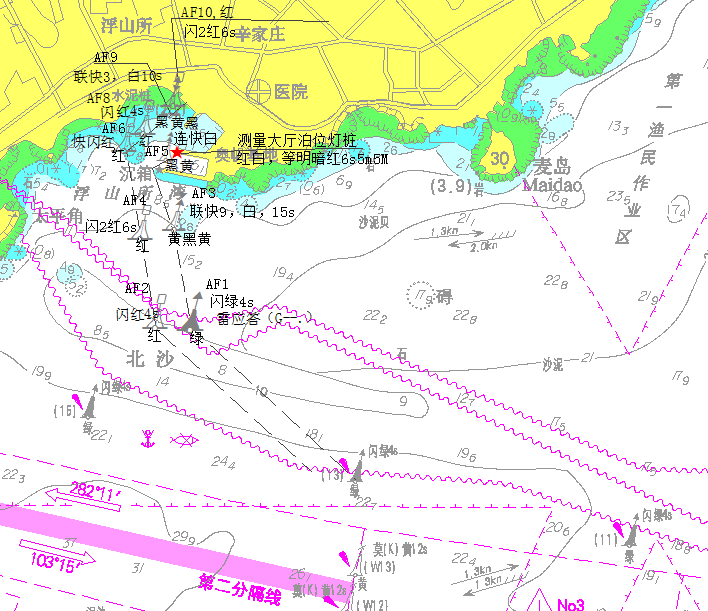


Fig. 3-1-6 Diagrammatic sketch distribution of floating marks in the waters near the Olympic Sailing Center

## 3.1.7 The *status quo* of distribution of floating marks in the waters near the southwest of Xiaoqingdao and the waters near the Laoshu Reef

There are a large number of ships gathering in the water area on the south side of Xiaoqingdao, which is the frequent intersection place of Marine tourist transport ships and other ships, and the navigable density of ships is high. Therefore, a floating mark -- Xiaoqingdao Safe Water Mark is set up near Xiaoqingdao. Badaguan Scenic Area is an important tourist spot in Qingdao. There is a reef, namely Laoshu Reef, at 200m near the shore on the south side of the reef. The whole reef is submerged under the water during the tidal surge, and it is difficult for ships sailing through this area to find its existence at the tidal surge. At the same time, this water area is an important turning point of the Fushan Bay to Qingdao Bay maritime tourism route, In view of the above situation, a floating mark - the south cardinal mark of the rat reef was set up near the Laoshu reef. The floating marks are shown in Figure 3-1-7.

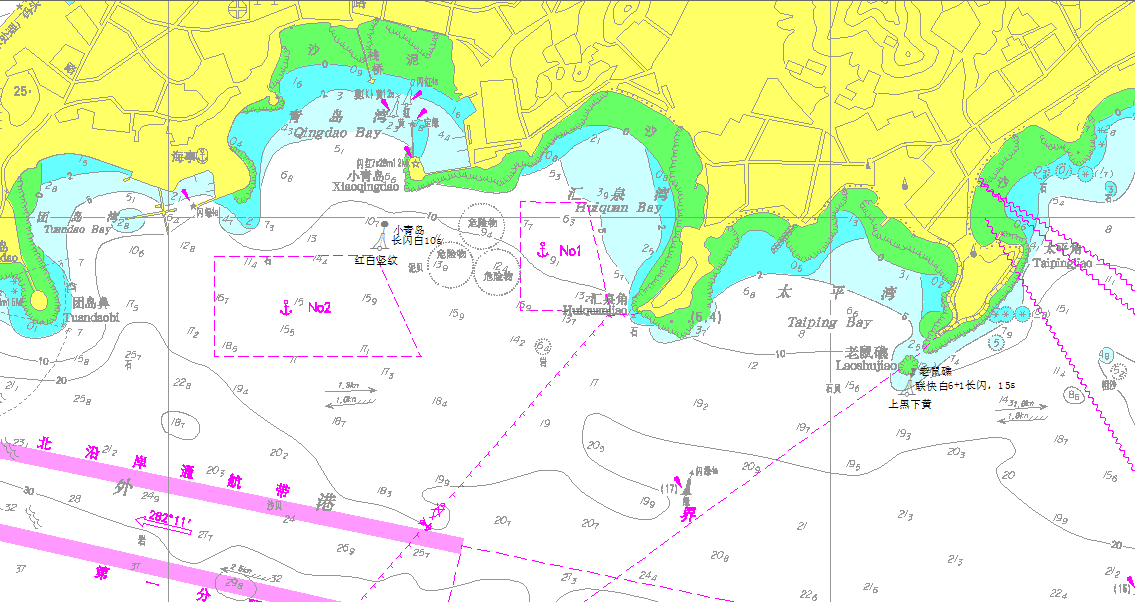


Fig. 3-1-7 Diagrammatic sketch distribution of floating marks near the southwest of Xiaoqingdao and the waters near the Laoshu Reef

## The distribution of Physical AIS AtoN

IMO proposes that AIS can be applied to navigation marks to further improve and enhance the service provided to navigators. AIS is defined as a tool used as a navigation mark in the sea.

After summarizing the survey opinions of AtoN users, it is found that most AtoN users have proposed the need to use physical AIS AtoN in areas such as key air routes and important waters, especially under adverse conditions, such as rain, snow, heavy fog, and intense background lights, since it can provide ships with all-weather navigation information to ensure ship navigation safety. Therefore, 37 physical AIS AtoNs have been set up at the entrance of the channels, port boundaries, important turning points, important warning areas, near the channel of the sunken ships, the sunken and reef areas, adjacent channel shallow points or the deep water channel of the Qingdao port, then can ensure the safety of ships navigating through the above-mentioned waters. The technical parameters of the physical AIS AtoN are shown in Table 3-2-1, and the specific positions are shown in Figures 3-2-1~6.

Table 3-2-1 The technical parameters of the physical AIS AtoN

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Serial number | Main area | Involved water area (channel) location | Quantity (seat) | Name | Purpose of use |
| 1 | Channel entrance、  Boundary and so on | Qingdao Port Main Channel and Deepwater Navigation Channel | 5 | Qingdao W2、W3#light buoy  Qingdao 9、13、17#light buoy | Qingdao W2# and W3# light buoys mark the deep-water navigation channel and the entrance; Qingdao 9#, 13# and 17# light buoys mark the port boundary. |
| Qingdao Port Dagang Channel | 3 | Qingdao 103、104、105#light buoy。 | Mark Qingdao Port Dagang Channel |
| Qingdao Port Qia Wan Channel | 2 | Qingdao 301#lamby、302#light buoy | Mark the entrance to the Qian Wan Channel. |
| Qingdao Port Bridge Island Channel | 4 | Qingdao 501 light ship、507、512、517#light buoy | Qingdao 501 light ship marks the entrance of channel; Qingdao 507#, 512#, 517# light buoys mark Daqiao Island channel |
| Channel of Qingdao Port Oil Port Zone 1 | 2 | Qingdao 204、205#light buoy | Mark the entrance to the channel of Qingdao Port Oil Port Zone 1. |
| Qingdao Port Oil Port Area Waterway | 2 | Qingdao 222、223#light buoy | Mark the entrance of the anchorage in Qingdao Port into the channel of the fuel oil dock. |
| 2 | important turning point | Qingdao Port Main Channel and Deepwater Navigation Channel | 1 | Qingdao 20#light buoy； | Mark the turning point from the main channel of Qingdao Port to the HAIXI Bay channel |
| Qingdao Port Dagang Channel | 2 | Qingdao 107、108#light buoy。 | Mark the turning point of Dagang Channel. |
| Qingdao Port Bridge Island Channel | 2 | Qingdao 511#light buoy、518 light ship、。 | Mark the turning point of the Daqiao island channel. |
| Qingdao Port Oil Port Area Waterway | 1 | Qingdao 221#light buoy | Mark the turning point of the channel in Qingdao Port Oil Port Area |
| 3 | important warning zone | Qingdao Port Main Channel and Deepwater Navigation Channel | 4 | Qingdao W10-W13#light buoy。 | Mark the warning zone of the main channel of Qingdao Port. |
| 4 | the reef area close to the channel | Qingdao Port Dagang Channel | 2 | North、South cardinal mark of the Horseshoe Reef | Mark the Mati Reef Area in Dagang Channel of Qingdao Port. |
| Qingdao Port Oil Port Area Waterway | 2 | Qianjiao east light buoy， Zhongsha Jiao light ship | Mark the navigable channel of Qingdao Port Oil Port Area, the Zhongsha Jiao light ship. |
| Qingdao Port Bridge Island Channel | 1 | Qingdao 508#light buoy。 | Identify the reef area near the Daqiao island channel. |
| Qingdao Port Bridge Island Channel | 1 | Qingdao 502#light buoy。 | Mark the shallow point of the Daqiao island channel. |
| Front sea area routing system | 1 | South cardinal mark of the rat reef | Mark Laoshu reef. |
| 5 | Other location | Qingdao Port Deepwater Navigation Channel | 2 | Qingdao W6、W7#light buoy； | Mark the channel entrance to the middle of the warning zone of the deep-water navigation channel. |
| Total |  |  | 37 |  |  |

Note: The physical AIS AtoNs are all located on the light buoys with the same number, and the technical parameters of the visual light buoys are also the same as those of the light buoys with the same number.

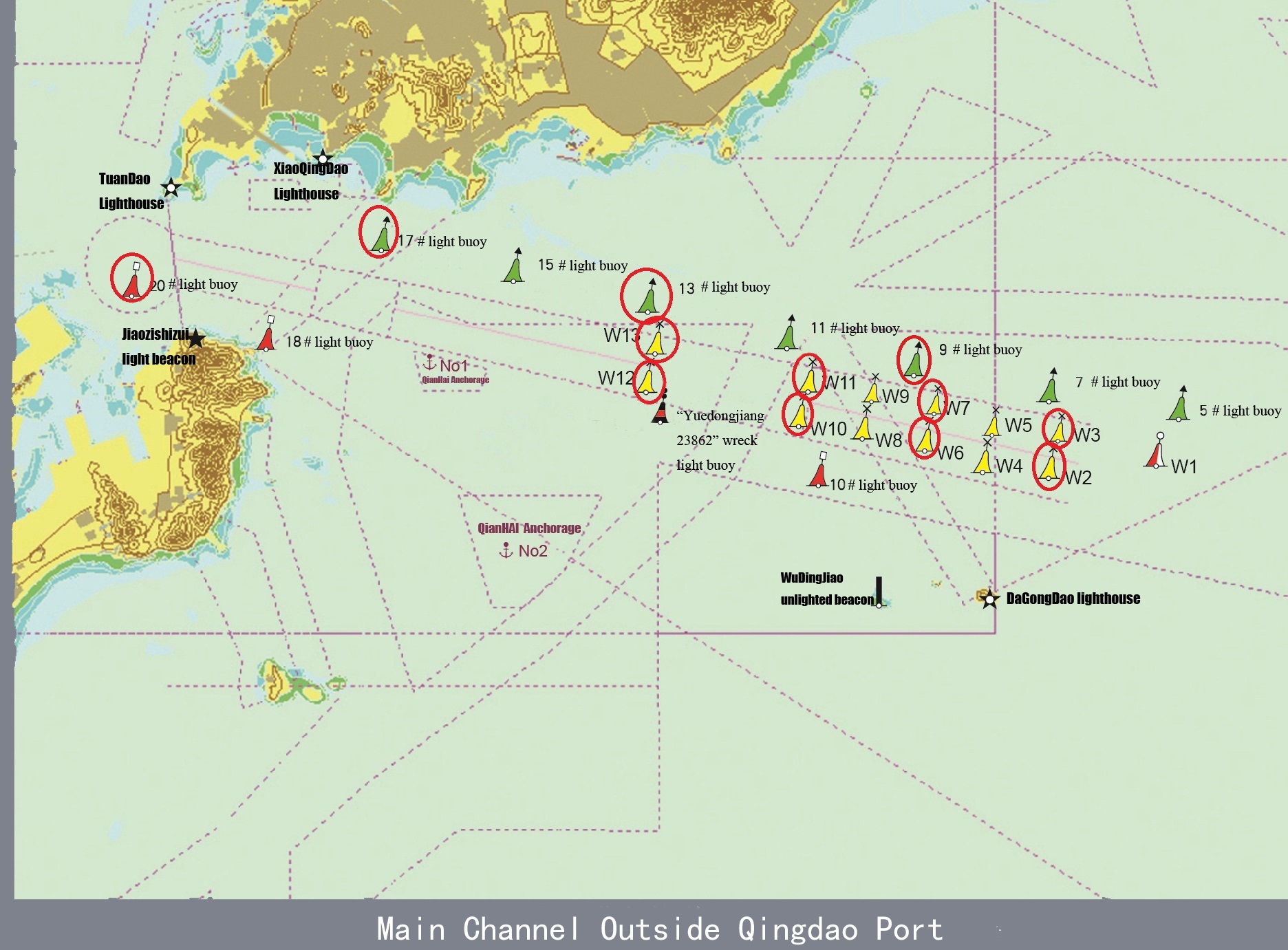


Fig. 3-2-1 Diagrammatic sketch distribution of physical AIS AtoN in Qingdao Port Main Channel

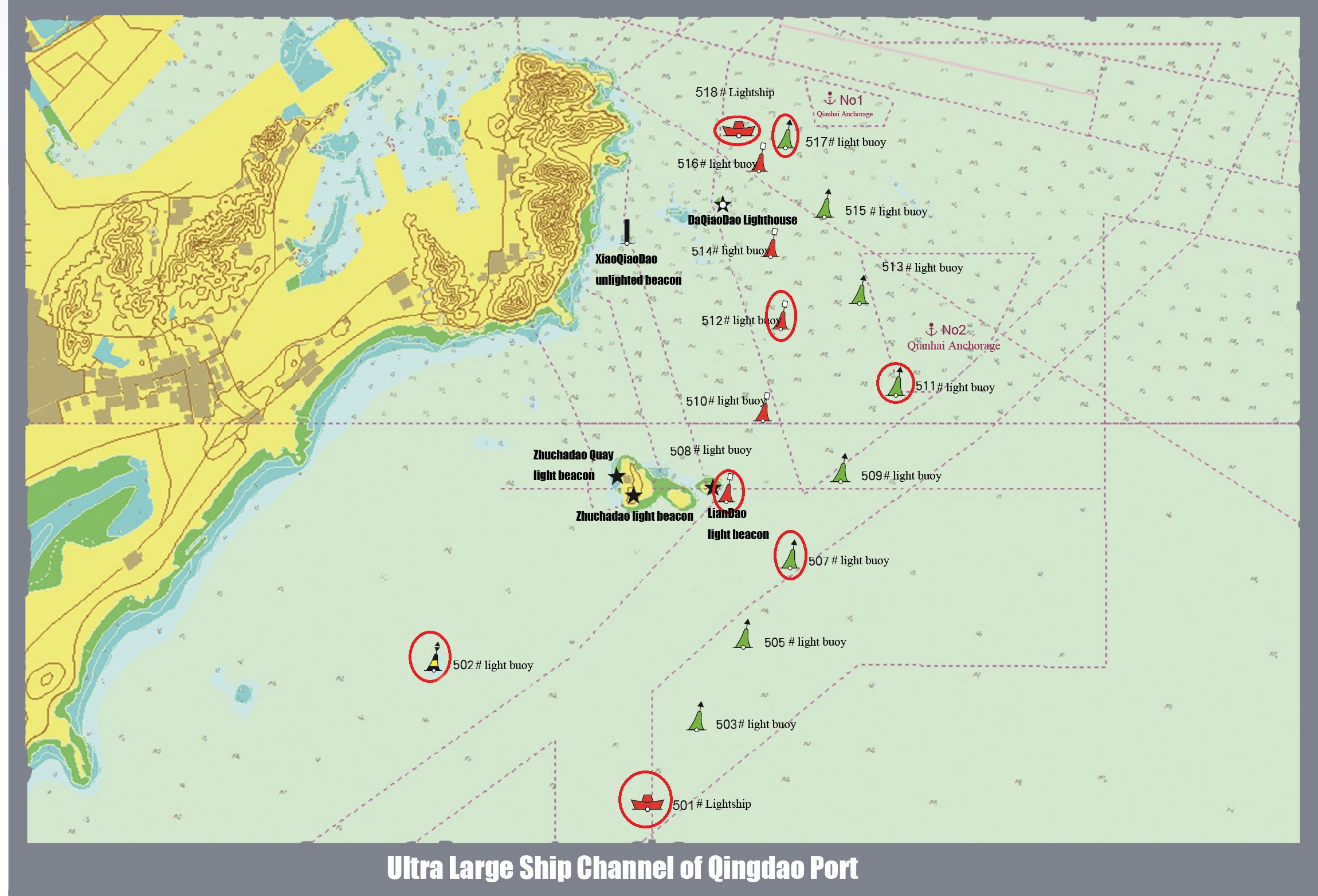


Fig. 3-2-2 Diagrammatic sketch distribution of physical AIS AtoN in Super Large Ship Channel of Qingdao Port

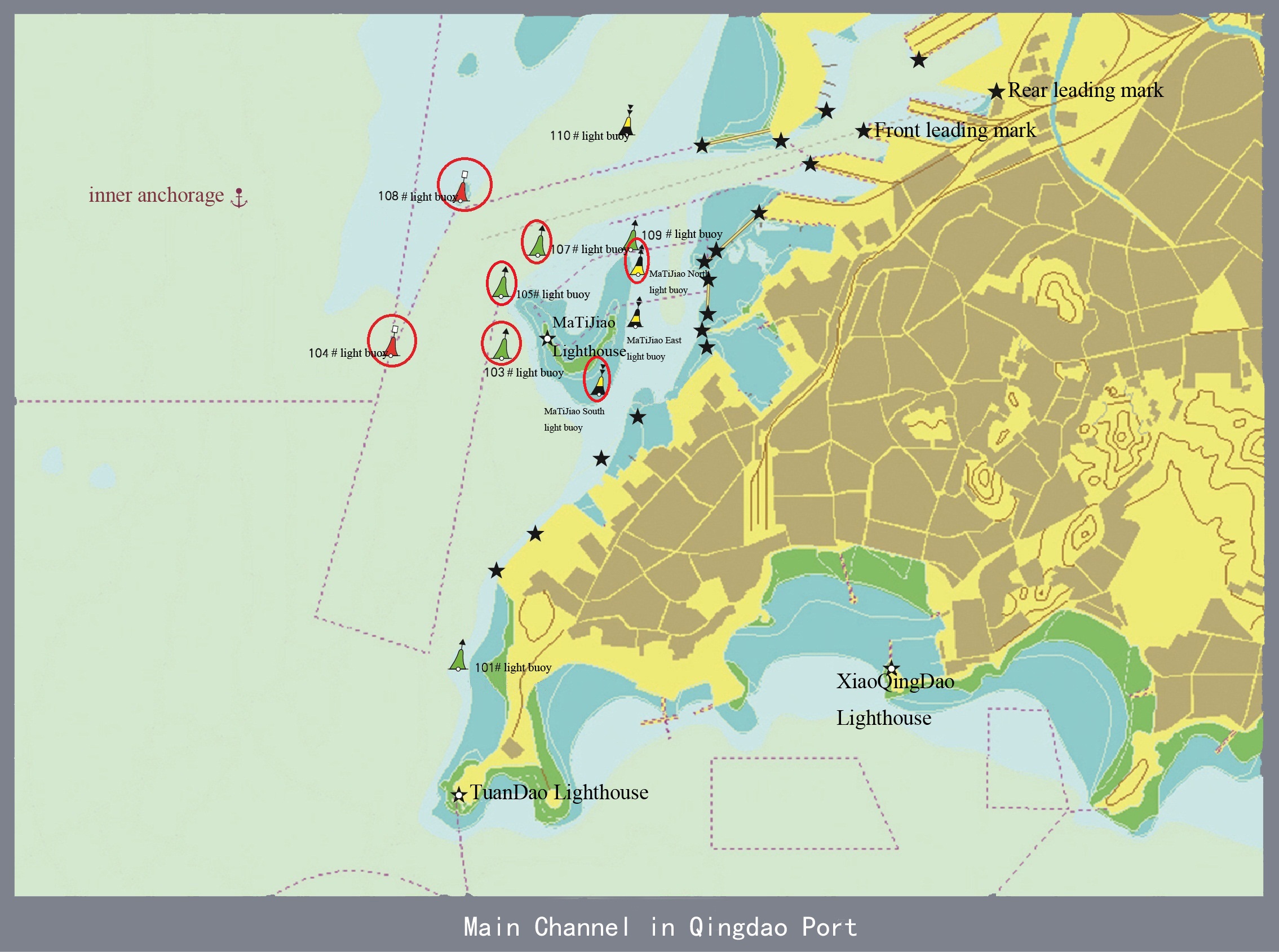


Fig. 3-2-3 Diagrammatic sketch distribution of physical AIS AtoN in Main Channel in Qingdao Port



Fig. 3-2-4 Diagrammatic sketch distribution of physical AIS AtoN in Qingdao Port Oil Port Channel

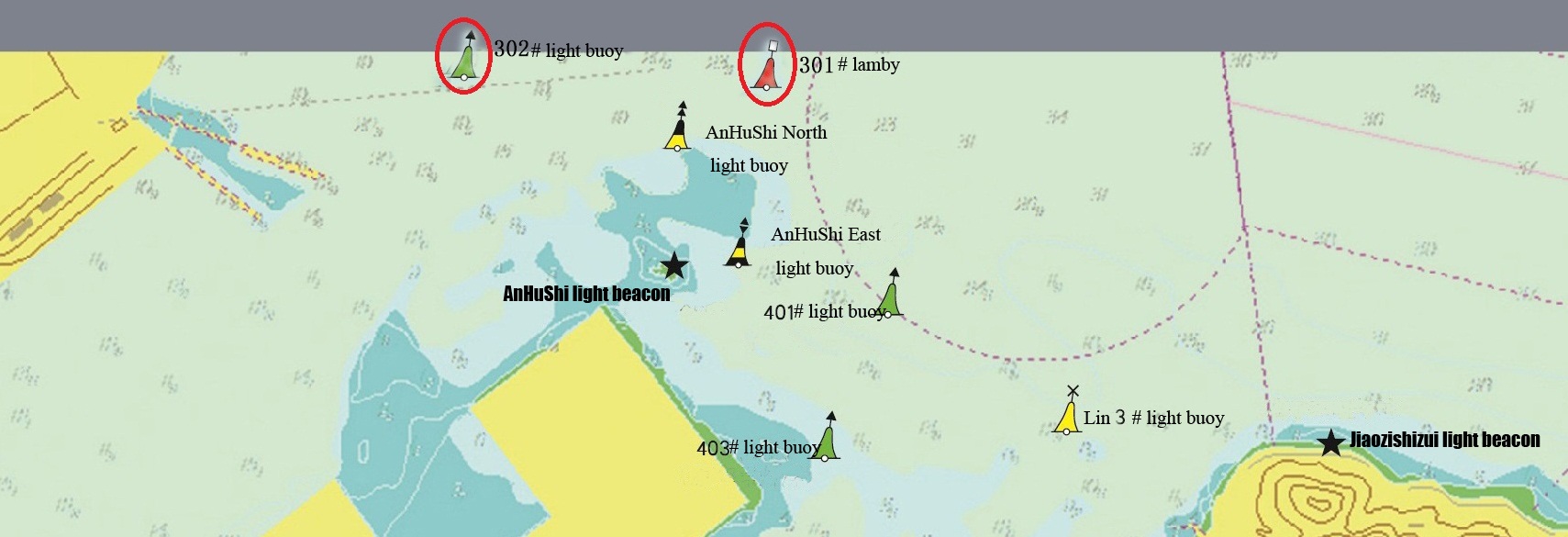


Fig. 3-2-5 Diagrammatic sketch distribution of physical AIS AtoN in Qingdao Port Front Bay Channel

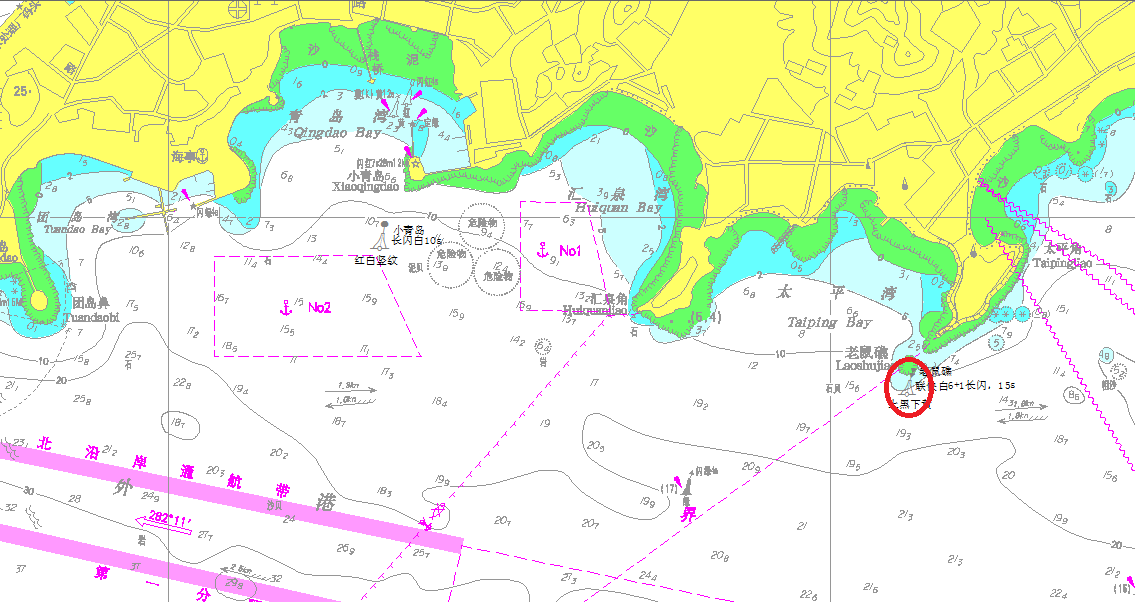
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Fig. 3-2-6 Diagrammatic sketch of Laoshu Reef physical AIS AtoN

On the whole, all kinds of AtoNs in Qingdao Port and adjacent waters are well and reasonably distributed, which can provide necessary warnings for the navigation safety of ships when they are sailing through this area, and navigators can better use navigational marks for safe sailing.

# References

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# Action requested of the Committee

The Committee is invited to note to China's work in Qingdao Port areas. This paper have include the practice of physical AIS AtoN in Qingdao Port and to provide cases for the section 7- the challenges and solution for mariners with marine AtoN of the guidance on marine aids to navigation (AtoN) training and awareness for mariners.

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