Land Information New Zealand
Toitū te whenua

Preparing New Zealand for e-navigation

Implementation and Adoption of the S-100 UNIVERSAL HYDROGRAPHIC DATA MODEL

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New Zealand Hydrographic Authority

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This document introduces the International Hydrographic Office's new S-100 Hydrographic Data Model. It sets out the need for New Zealand to prepare for this new framework to fulfil its international obligations and capture all the benefits of S-100 navigation and marine geospatial data.

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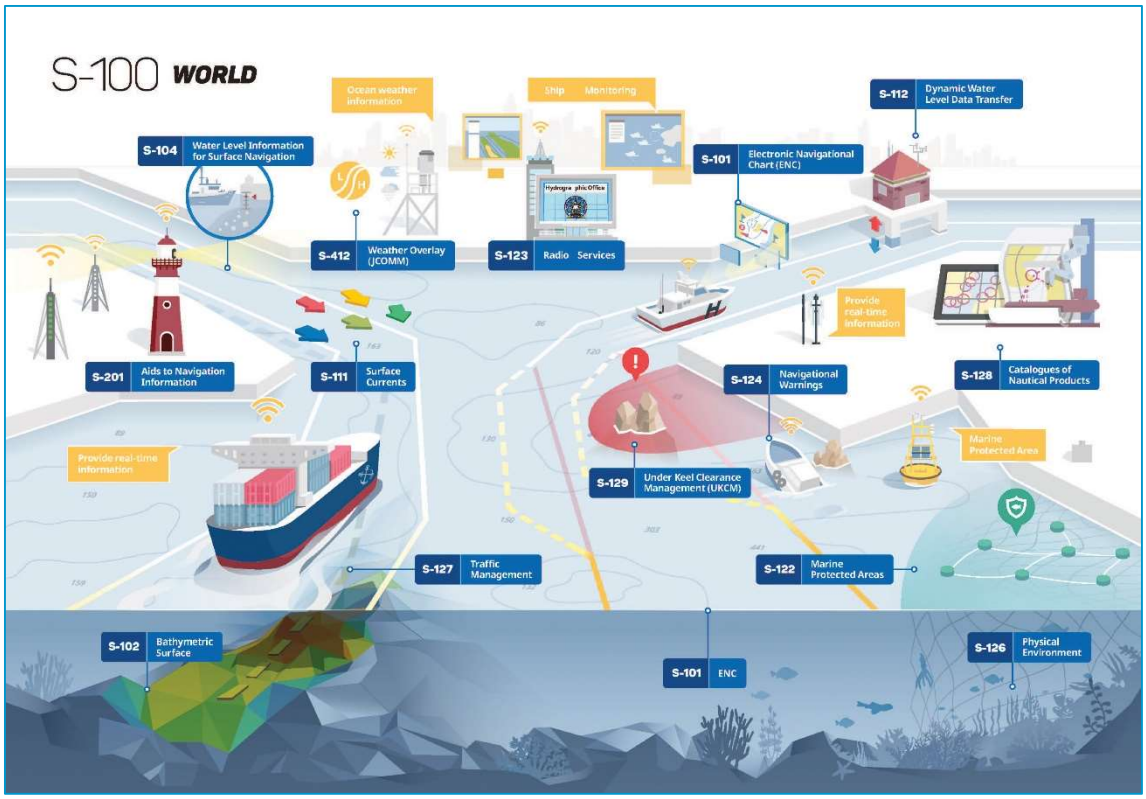
S100 – the opportunity

SAFE, SECURE AND EFFICIENT SHIPPING THROUGH e-NAVIGATION

The future of hydrographic data is digital. The International Hydrographic Office (IHO)[1] has developed a new S-100 Universal Hydrographic Data Model designed to support a greater range of hydrographic-related digital data sources and products for safe navigation.



Navigation products that follow the updated S-100 framework will allow many aspects of maritime navigation to be better connected. **Image credit**: Korea Hydrographic and Oceanographic Agency

This creates the opportunity for a global step-change for navigation and safety.

Modernised international standards, new techniques, equipment, and the introduction of automated technologies have changed the way hydrographic data is collected, stored, processed and released to users. These developments realise the great value of the New Zealand Hydrographic Authority's marine geospatial data. Primarily the NZHA's hydrographic data has been used for safety-of-life-at-sea (SOLAS) navigational products only. But increasingly, users of this data want it integrated with other relevant data such

[1] IHO is the intergovernmental organisation that works to ensure all the world's seas, oceans and navigable waters are surveyed and charted to support safety of navigation and the protection of the marine environment.

as tides and weather. The implementation of the S-100 data model will make integration possible delivering a range of defined maritime services that go beyond the scope of traditional hydrography[2]. The S-100 Standard is a framework document that is intended for the development of digital products and services for hydrographic, maritime and GIS communities.

With the adoption and implementation of S-100, seamless, integrated data and messaging will be delivered in real time, providing shipping and associated services with in-time information to ensure safe navigation both through open ocean and the narrow confines of port environments. This will include sending and receiving information about the environment (e.g. tides, weather, ice and other hazards), sharing information about berthing and land-side services, and maximising the efficiency of ports, ships and land-side transport providers, as illustrated on the previous page.

Once implemented, all maritime users operating in NZ waters will operate using the same dataset that is digitally and dynamically updated.

Other opportunities include:

- Autonomous vessels
- Users and aggregators accessing the information they want and need, and integrating this with other data to provide customised information for their own use
- New Zealand's ability to operate seamlessly with other hydrographic authorities and with other jurisdictions, for better economic outcomes and better security and environmental outcomes
- New Zealand will demonstrate it is a committed partner in meeting its international obligations.

Enhancing the Blue Economy

Our marine environment is central to the identity and prosperity of New Zealand. Not only does it provide a source of recreation, support a wide diversity of plants, animals and food resources, and help to regulate the environment, but it also generates employment and economic activity. For Māori as indigenous kaitiaki (guardians), the moana (ocean environment) is inextricably linked with identity, wellbeing and prosperity.

[2] See Appendix for the range of services that would be delivered to ships in future.

The Blue Economy covers a wide range of interlinked established and emerging sectors. Many of these sectors will be assisted by the enhanced and integrated data sets delivered through the S-100 implementation. The S-100 data model is the keystone foundation upon which other information can be layered.

For example, digital hydrographic information aligned with other geospatial data will enhance the planning, consenting and operation of aquaculture and mariculture sites, enable better assessment of the viability of sites for marine renewable energy, and the viability of blue biotechnology. These are uses beyond supporting safety of navigation and sit beyond the remit of the NZHA but are important opportunities for New Zealand to maximise the benefits from the new framework.

Sectors that may benefit include:

- marine environment protection
- maritime trade
- fishing, aquaculture and mariculture
- marine science
- maritime boundaries and border protection
- search and rescue
- mineral, oil and gas and renewable energy
- environmental protection and management
- marine spatial data planning, allowing greater compatibility with web-based services for acquiring, processing, analysing, accessing and presenting data
- maritime defence and security
- tsunami, flood and inundation hazard modellers
- coastal zone management, and
- tourism.

Supporting international and domestic trade

Trade and economic prosperity

New Zealand is a trading nation, far away from the markets it depends upon for its economic prosperity and growth. The importance of maritime supply chains for the maintenance of 'life as we know it' in New Zealand was highlighted through the disruption of supply chains during the first five months of 2020, due to COVID-19.

The value of NZ's exports exceeds $60B. Around 83% of exports by volume is shipped through New Zealand's ports, and 99% of imports arrive by ship. Anything that will enhance international ships visits to New Zealand ports is important.

International maritime fleet

We need the 'right' ships visiting our ports – modern, freight-efficient, safe, environmentally sound and using efficient routes – to be competitive as an exporting nation. As the marine environment is constantly changing (whether through environmental modifications, extreme events or the regular movement of water through tides and currents), hydrography helps countries monitor and predict such changes and adapt their activities. For ships with limited under keel clearance for example, 30cm extra water depth shown on a chart allows at least 2,000 tons more cargo to be carried[3] .

Vessels visiting New Zealand are becoming larger[4]. By the end of 2016, the largest vessel to visit a NZ port doubled in size from earlier in the year. This trend has also been seen in the size of cruise ships in summer months. The size of these vessels poses challenges – our ports are small by world standards, but for our economic prosperity, we need large efficient ships to carry our goods. Our large ports all have vulnerabilities, and we need to enable safe navigation to keep these ports open.

Coastal Shipping

Coastal shipping is only a small part of New Zealand's current freight network, but it is an important strategic part of New Zealand's resilience approach, for a range of reasons:

- Coastal shipping provides an alternative for maintaining supply lines when our land transport network is compromised by earthquakes, storms and outages from other natural hazards
- Enhanced safety of navigation
- Contributes to a lower environmental footprint.

International agencies and our obligations

International Hydrographic Organization (IHO)

New Zealand is a member of the IHO, which has developed the new standard. It works to ensure that all the world's seas, oceans and navigable waters are surveyed and charted to support the safety of navigation and protection of the marine environment. The IHO issues good practices guidelines and international standards to maximize the collection and use of hydrographic survey data and develops hydrographic capabilities in member countries.

[3] The IHO website

[4] The New Zealand Transport Outlook Current State, 2016, p40

International Maritime Organization (IMO)

Another key organisation in the marine environment is the International Maritime Organisation ('IMO'), which is the global standard-setting authority for the safety, security and environmental performance of international shipping. Its main role is to create a regulatory framework for the shipping industry that is fair and effective, universally adopted and universally implemented. Its role is to create a level playing field so that ship operators cannot address their financial issues by simply cutting corners and compromising on safety, security and environmental performance. Maritime NZ is the key conduit for NZ's engagement with the IMO.

New Zealand Hydrographic Authority (NZHA)

The NZHA is the New Zealand authority responsible for collecting, managing and sharing marine geospatial information for the New Zealand Exclusive Economic Zone (EEZ). It is located within Land Information New Zealand (LINZ). The NZHA is also the primary charting authority for five Pacific nations – Cook Islands, Samoa, Tonga, Niue and Tokelau. As part of the Pacific Regional Navigation Initiative (PRNI), LINZ has provided full sets of electronic charts to Niue, Tonga, Samoa, the Cook Islands and Tokelau. Until then these areas relied on paper charts only. Changes in international maritime standards means electronic charts are essential for shipping to continue in the region. This initiative receives funding support from the New Zealand Aid Programme. New Zealand, through the NZHA, is also the responsible agency for marine geospatial information to support NZ's jurisdictional responsibilities in the Antarctic.

The need to act

New Zealand's security and prosperity depend on the conditions in, and our connections with, the wider world. New Zealand cannot afford as a trading nation to lag behind other countries in this area. The consequences of not being ready for implementation are profound. More than 630,000 jobs depend on export markets, and our goods being delivered to other countries.

Impacts on shipping and trade.

Beyond 2030, all international trading vessels must carry S-100 compliant ECDIS bridge systems. If New Zealand is unable to support and interface with the new S-100 compliant ECDIS bridge systems, then modern vessels visiting and traversing our waters may start to decrease. This will have several effects:

- **Decreased trade** - New Zealand is likely to have increasing difficulty persuading shipping to visit as international vessels upgrade.
- **Impaired access to modern vessels** - New Zealand will increasingly not have access to modern vessels, meaning efficiencies that are available with new vessels and technology will not be available to New Zealand. Vessels that are fully enabled will likely carry fully integrated electronic systems that will be more efficient in terms of navigation, communication, safety and alerts, ship movement, loadings, integration with port information and authorities, and border clearances.
- **Risk to safety of navigation** - New Zealand will not be able to take advantage of safety advances that the new standards will enable, with particular effect in sub-Antarctic waters and the Pacific.
- **Increased environmental risk** - New Zealand will not be able to take advantage of other benefits of modern vessels, such as improved environmental performance, and reduced risk of hazardous events at sea that result in pollution events in New Zealand, the Pacific and Antarctica.

Undermining NZ's geopolitical position

The Government's Pacific Reset programme[5] and Statement of Commitment to Antarctica and the Southern Ocean[6] positions New Zealand as a partner working to ensure that the Pacific and Southern Oceans, and the Ross Dependency are effectively governed and sustainably managed. They are currently under threat, from fishers and maritime traffic operating outside international rules and norms, and the cumulative impact of marine pollution. New Zealand is the charting authority for five Pacific island countries, we have significant responsibilities and interests in the Ross Dependency of Antarctica. New Zealand's reputation as a good international citizen and as the Hydrographic Authority for a significant proportion of the global domain would be undermined and potentially put at risk, particularly in Antarctica.

New Zealand's ability to successfully patrol the ocean, track and trace illegal movements of vessels including unreported and unregulated fishing, will be impaired if New Zealand fails to effectively cater for future demands for digital products and services.

[5] https://www.mfat.govt.nz/en/media-and-resources/oia/proactive-release-cabinet-paper-and-related-minute-the-pacific-reset-the-first-year/

[6] https://www.mfat.govt.nz/assets/Environment/Antarctica-and-the-Southern-Ocean/Statement-of-Commitment-to-Antarctica-and-the-Southern-Ocean-2019.pdf

The NZHA's role

The NZHA is preparing for S-100 with the establishment of an internal initiative, Programme Janus. It has already commenced planning to deliver the technical solution to implement the new standards to meet international obligations, for hydrographic, maritime and GIS communities.

The NZHA is currently in an investigation and planning phase, and will:

- Update its hydrographic database and software to support the new S-100 Standard
- Update or develop NZHA digital products and services to take advantage of the LINZ Digital First, Data Centric framework
- Review and refine NZHA legacy products and services.

The NZHA intends to spend 18-24 months investigating the scope and scale of these changes, before developing a roadmap and proposal for investment.

The NZHA cannot deliver the changes required for the S-100 implementation alone.

Who else needs to be engaged and involved?

Introducing new maritime standards requires a long lead time (2 - 4 years), and as these regulations are an essential enabler for e-Navigation, work will need to commence as soon as possible, so that the new standards, technology, and regulations are aligned.

Safety of navigation requires more information than just what is included in ENCs. Navigational warnings, tides and currents, ice, weather…all this information needs to find its way digitally onto a ship's bridge, to be seamlessly integrated, to create a consistent image of the situation at hand.

Ministry of Transport and Maritime NZ

The current Maritime Rules must be amended by MoT/MNZ to reflect the shift to digital products and services. In particular, Rules 25 and 45 will need to be reviewed to ensure they are consistent with and support S-100 era ECDIS navigation. Indeed, with the decrease in paper chart sales and the digitisation of our whole information environment, commercial shipping, fishing, and recreational craft will go effectively paperless.

Metocean service providers

To ensure compatibility with the new ENCs, agencies that currently supply data and products in support of the maritime sector will need to be able to supply products and services in future to the S-100 standard. This will include metocean products such as ice coverage and meteorology from NZ Crown Research Institutes and private companies offering metocean services.

Central and local government

Agencies that will benefit from having datasets that can be incorporated into the new S-100 source database will need to ensure that appropriate digital product is supplied to NZHA. This will include the Department of Conservation (Marine Reserves), the Ministry of Business, Innovation and Employment (Exclusion Areas such as pipelines, cables, natural resource extraction sites and areas); and the Regional Councils (marine spatial planning, aquaculture).

Ports and Customs

Supply chain and border integrity - agencies that will benefit from the efficiencies that the full use of S-100 will create will need to be aware of the opportunity, and have time to plan and implement changes that will enable them to realise those benefits.

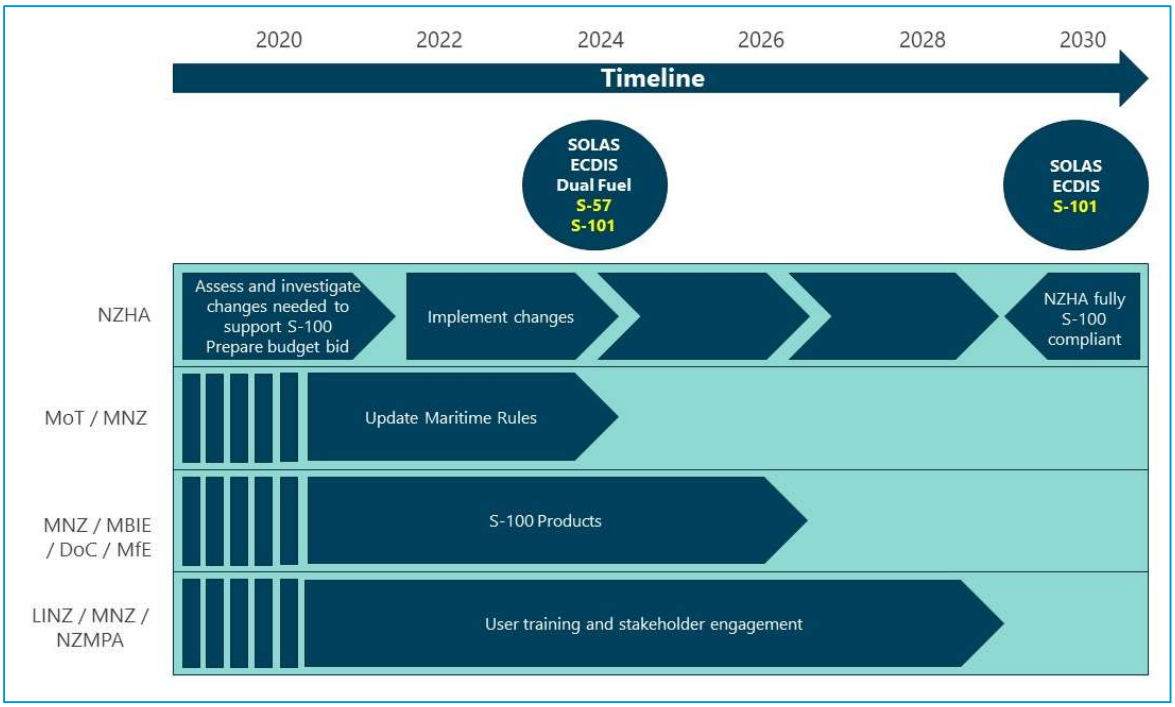
This is likely to include Ports, Customs, Border Control, and logistics managers amongst others.

Foreign Affairs and Defence

Agencies that oversee New Zealand's broader interests in Antarctica and the Pacific will need to be aware of the changing standards to operate effectively and efficiently beyond New Zealand's borders.

An indicative timetable is set out below.

Indicative Timetable



What's next?

Agencies will need to work together to deliver the changes in a co-ordinated way for New Zealand, but with individual agencies remaining accountable for their own actions.

An NZ Inc response is required - cross-agency engagement is required to ensure that the core work to deliver the changes remains aligned.

The key agencies (LINZ, MoT, MNZ) should connect as soon as possible, to maintain the momentum of the engagement to date.

Further work will be required to establish the interests of all the agencies identified in the section above, and how critical their changes are to maximising the benefits of the shift to S-100. LINZ will connect with relevant agencies to ensure they are aware of the changes, and understand the opportunities for their agency, and for New Zealand.

Appendix - Safe, Secure and Efficient Shipping through e-Navigation

The changes that will be unleashed by the implementation of the S-100 Universal Hydrographic Data Model, and the range of hydrographic-related digital data sources and products for safe navigation, is illustrated through the video issued by the Maritime and Port Authority of Singapore. It shows e-navigation as it will operate in future, with the exchange of data and information digitally as a ship travels from Oslo for Singapore.
Click here to watch video or visit https://youtu.be/WenDzWY-tXc