

## Implementation of a Hydrographic Product Database Solution: Challenges and Efficiency Gains

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### Introduction

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- LINZ Hydrographic Services
- Hydrographic Data Infrastructure – HDI Project
- Hydrographic Systems Implementation – HSI Project (Production Database)
- Challenges
- Future

## LINZ Hydrographic Services



### Team members



**Adam Greenland**  
National Hydrographer



**Carol Kohl**  
Nautical Cartographer



**Christine Collings**  
Nautical Publications & ENCs



**Gareth Hodkinson**  
Charting & NtM Production



**Glen Rowe**  
Geodesy & Tides



**Jenny Ryan**  
Production Database & ENC Production



**Kristian Jones**  
System Admin & NtM Production



**Stuart Caie**  
Hydrographic Survey & NtM Assessment



**Tina Papenfuss**  
Production Database & ENC Production



**Verena Borsos**  
Production Database & ENC Production Manager



## LINZ Hydrographic Services – cont.



### Roles & Responsibilities

- Charting NZ area of responsibility for the purpose of Safety of Life at Sea – NZ, SWP & RSR
- Providing Hydrographic Services to international standards
- Provision and maintenance of nautical charts and publications
- Provision of tidal information
- NAVAREA XIV Coordinator
- Survey Data Validation



## Hydrographic Data Infrastructure



- Used to support the capture, access, management, maintenance of hydrographic information - VISION
- In 2006 the existing infrastructure inherited from 1996 was identified as being inadequate to meet future requirements
- The need to provide ENC coverage for certain classes of vessels (2008, 2012)
- Ability to respond to increases in volume of survey data (MBES)
- More efficient delivery of products and meeting increasing expectations through the use of modern technology



## HDI Project



- Hydrographic Data Infrastructure project started (2006)
- Good timing to take advantage of second-generation software tools
- Current trend to move from 'product-centric' to 'source-centric' processes
- Tenders were invited for the provision of this system



## CARIS

- CARIS awarded contract:
  - Solution for the management of List of lights
  - Online Chart Catalogue
  - Database approach to ENC and Chart production
  - Notices to Mariners system
- This presentation will focus on the CARIS Hydrographic Production Database (HPD) solution for the production of ENCs and Paper Charts



## CARIS HPD Overview

- Integrated application suite:
  - HPD Server
  - HPD Source Editor
  - HPD S-57 ENC Editor
  - HPD Paper Chart Editor
- Applications allow:
  - display in various projections of a number of raster and vector formats
  - selection and import of data from external files in a number of vector formats



## CARIS HPD Overview – cont.



- Data model hosted on Oracle Spatial database allows:
  - Storage of complex spatial and attribute data in a seamless database
  - Simultaneous data access and processing by multiple users
  - Ability to track changes between source data and multiple products
- Model supports real-world objects defined by a combination of descriptive and spatial characteristics based on the S-57 data structure



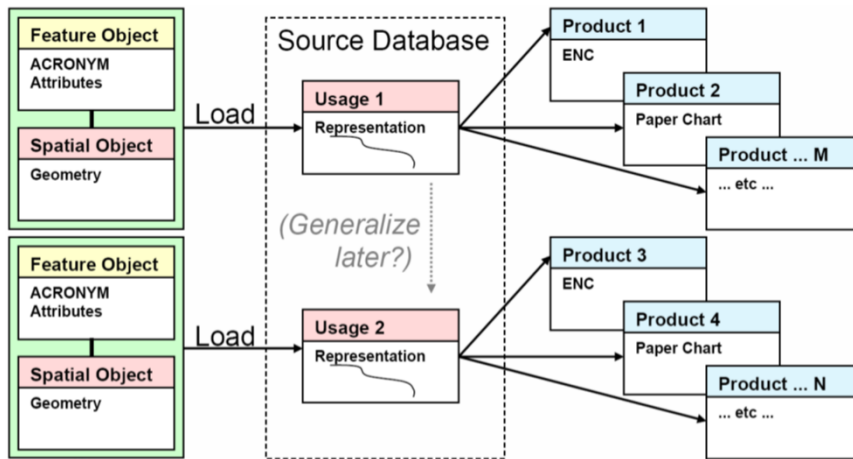
## CARIS HPD Key Features



- Ability to store features once, and create multiple representations of these features for different products by storing data on different layers in the HPD database called 'usages'.
- ENC and Paper Chart products can be created from the same source data stored in the database.
- More efficient update of source data and products via 'Compare Product to Source' function.
- HPD Paper Chart editor uses the S-57 based vector data stored in the database.



## HPD 'Representations'



## HPD Implementation – Key Stages

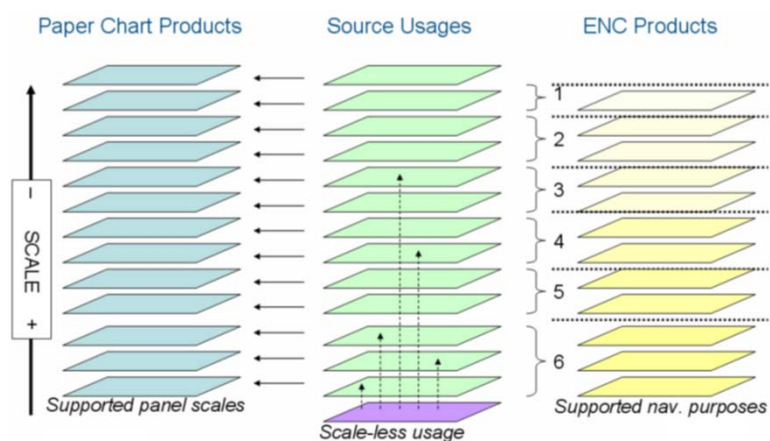
- Source S-57 datasets (used to populate the db)
  - Existing set of ENCs available based on our paper charts
  - External providers contracted to provide new datasets
  - Loaded in staged approach as per release schedule
- Training
  - On site training by CARIS staggered over several months
  - A week of training for each of the 4 applications
  - Plus 4 separate weeks on-site assistance
- User Acceptance testing
  - 2 Conditional Acceptances
  - Final Formal Acceptance June 2009
- Production Process, Documentation, Planning (Pilot ENCs / Paper Charts)
  - 2 pilot stages for ENCs (Auckland and Wellington), pilot for Paper Charts much later
  - Tested and validated our database setup and production processes

## HPD Implementation – Key Stages cont.

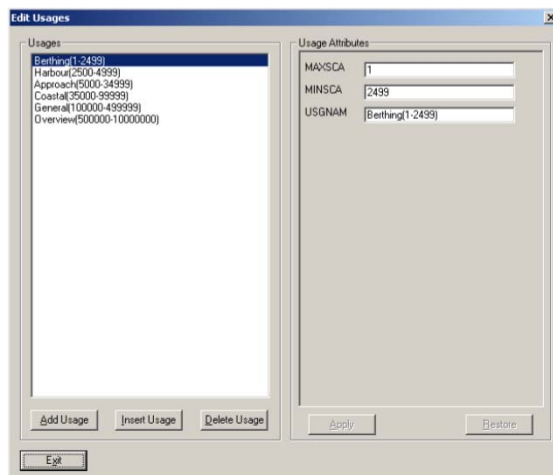
- Database setup
  - Custom attributes
    - UKHO List of Lights International number – Vol K
    - Source information number (i.e. which dataset was loaded)
    - Extended set of attributes for survey information
  - HPD Usages
    - Choice of usages is related to the purpose of the database and intended product types and scales it will be used to create
    - The HPD usages chosen need to support the production of both ENC's and Paper Chart products (40 diff. scales on LINZ charts)
    - No overlapping chart panel data is loaded onto the same usage
    - Significantly more usages than the six required for ENC production to support Paper Chart production



## HPD Usages and Production of ENC's and Paper Charts



## Default HPD Usages



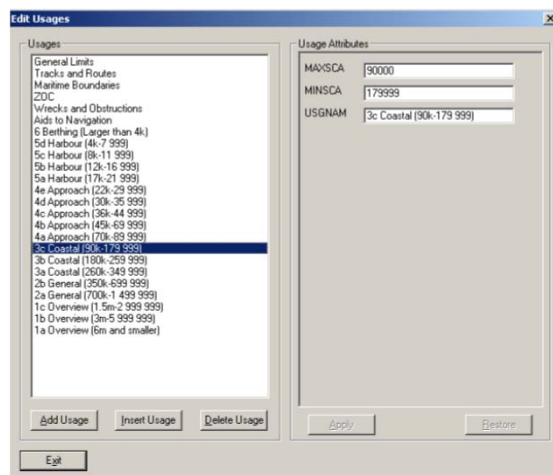
The 'Edit Usages' dialog box displays a list of default HPD usages on the left and their attributes on the right.

Usage	Usage Attributes
Berthing(1-2499)	MAVSCA: 1
Harbour(2500-4999)	MINSCA: 2499
Approach(5000-34999)	USGNAM: Berthing(1-2499)
Coastal(35000-99999)	
General(100000-499999)	
Overview(500000-10000000)	

Buttons: Add Usage, Insert Usage, Delete Usage, Apply, Restore, Exit.



## HPD Usages Defined by LINZ



The 'Edit Usages' dialog box displays a list of HPD usages defined by LINZ on the left and their attributes on the right.

Usage	Usage Attributes
General Limits	MAVSCA: 90000
Tracks and Routes	MINSCA: 179999
Maritime Boundaries	USGNAM: 3c Coastal (90k-179 999)
ZOC	
Wrecks and Obstructions	
Aids to Navigation	
6 Berthing (Larger than 4k)	
5d Harbour (4k-7 999)	
5c Harbour (8k-11 999)	
5b Harbour (12k-16 999)	
5a Harbour (17k-21 999)	
4e Approach (22k-29 999)	
4d Approach (30k-35 999)	
4c Approach (36k-44 999)	
4b Approach (45k-69 999)	
4a Approach (70k-89 999)	
3c Coastal (90k-259 999)	
3a Coastal (260k-349 999)	
2b General (350k-699 999)	
2a General (700k-1 499 999)	
1c Overview (1 500k-399 999)	
1b Overview (3m-5 999 999)	
1a Overview (6m and smaller)	

Buttons: Add Usage, Insert Usage, Delete Usage, Apply, Restore, Exit.





## Challenges

- Human Resources
  - Small team means difficult to progress with production as quickly as desired, but this has also made us more adaptable
  - Paper charts require much more staff time than ENC's
- HPD upgrades & communication
  - Hotfixes and upgrades supplied frequently
  - Software Change Approval process, and lines of communication lengthy
- Support from CARIS
  - Some significant updates have been delivered late, causing delays to the project
  - CARIS online Service Desk very helpful, although time zone differences can affect response times for critical issues



## Challenges cont.

- Review of HPD Usages
  - IHO recommended scale ranges do not reflect the type of navigation that NZ charts were intended for.
  - Too many overlapping charts within single navigation purpose meaning we are currently maintaining data for only Paper Chart products.
  - Challenge to review our charting schema and usage scale ranges. Technical challenge to adjust the HPD system to suite a new schema.
- Source S-57 datasets
  - Inconsistent encoding practices between contractors
  - Edge matching issues
  - Horizontal and vertical consistency issues

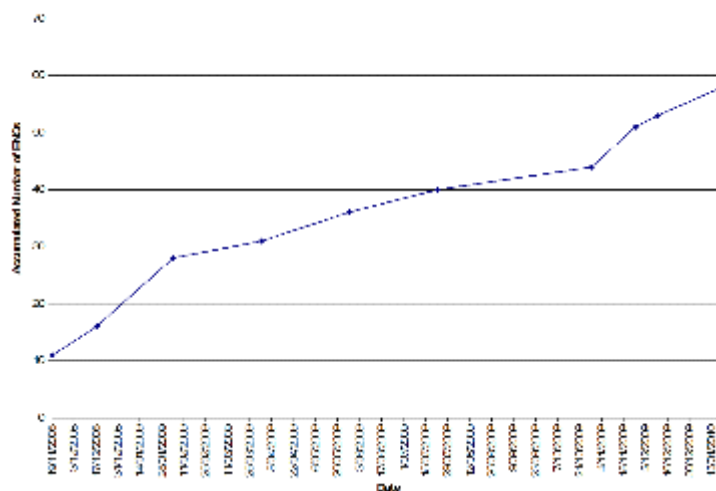


## HPD Implementation - Timeline

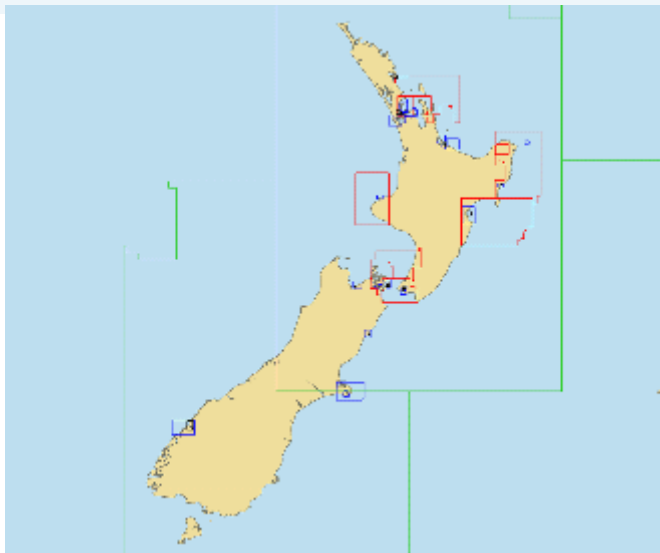
- Oct 2006 – Request for Proposals issued
- Dec 2006 – CARIS awarded contract to provide LINZ with the HDI system
- Aug 2007 – HPD System Admin training  
– HPD Source Editor training
- Oct 2007 – HPD ENC Editor training
- Nov 2007 – HPD Paper Chart training  
– User Acceptance Testing
- Feb 2008 – CARIS assistance in database setup and preparation
- Mar 2008 – Conditional acceptance of HPD v2.6
- Apr 2008 – Priority areas for the first release of ENCs identified
- May 2008 – Production processes for implementation tested in development environment for the first release of ENCs with two run-throughs
- Jun 2008 – Production environment in a go-live state  
– Database schema setup begins with appropriate users, usages, and custom attributes added  
– Data loading into the production environment begins for the first priority area
- Aug 2008 – Conditional acceptance of HPD v2.7
- Nov 2008 – Release of first official ENCs from HPD
- May 2009 – HPD Paper Chart Editor refresher training
- Jun 2009 – Final acceptance of HPD
- Oct 2009 – Release of first official paper chart from HPD



## Release of ENCs from HPD



## Release of ENC's from HPD



## Future

- Once a complete folio of ENC is released by LINZ, focus will change from loading data, to managing the source data within the database including:
  - incorporation of new source data
  - updates for NtMs
  - new charts
  - new editions
  - further work improving data consistency
- Paper Charts take longer to produce than ENC's due to the additional work involved. However, as more charts are published from HPD, we will be able to create new charts or editions much more easily, providing LINZ with efficiency gains.



## Conclusion

- A lot of knowledge has been gained by staff during the implementation of HPD and ENC production. It has challenged our traditional view of hydrographic products: from product-centric to source-centric.
- Challenges remain: building capacity within the team (training and staff numbers), the transition from our legacy systems, and increasing our productivity.
- System has provided considerable benefits to LINZ and the maritime community. A large number of ENCs have already been released. Further efficiency gains are also anticipated through the use of HPD for paper chart production.



**Thank you**