

# The Hydrographic Survey Meta Database

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**Abstract** - In 2005, the design and future considerations of this Hydrographic Survey Metadata Data Base (HSMDB) were presented at the Marine Technology Society Proceedings. This paper will provide an update. The HSMDB now offers a user interface to previously unavailable hydrographic survey data, data products and metadata conveniently and freely over the internet. The product descriptive report images alone have had over 90,000 hits over the last year. Moreover, over 1,500 archived HSMDB records have become the source of Coastal Services Center (CSC) Geospatial one-stop entries. The most exciting new product is the addition of new bottom sample information. This paper will illustrate how to access and use the new HSMDB user interface. Several examples of queried HSMDB displays called survey rap sheets will be shown. Survey products will also be outlined. Lastly, future considerations of HSMDB use in hydrographic survey accuracy and geospatial overlays will be discussed.

## I. INTRODUCTION

From the first surveys accomplished in the 1830's to the surveys finished in the late 1990's, the inventory was comprised of paper descriptive reports and Mylar smooth sheet sounding plots while the survey records were stored in boxes. The digital age of hydrographic surveys and reports first appeared in the late 1990's. Beginning in 1997, the Hydrographic Survey Division (HSD) Descriptive Report Preservation Project scanned all of the completed survey descriptive reports into portable document format (pdf). The smooth sheets were then scanned into MrSid and Tiff image format. Some surveys have not been scanned because of their fragility. Approximately 800 fragile surveys are scheduled to be scanned after encapsulation. Since the early 2000's, hydrographic surveys are almost entirely digital with no paper copy descriptive report, Mylar smooth sheet or records for archive.

In this new digital milieu, the Hydrographic Survey Meta Database (HSMDB) is expanding the inventory of digital metadata by including the thousands of surveys that exist in paper or analog form with little or none digital components. The HSMDB uses a relational data base structure to enter, store and update hydrographic survey metadata. At present, there are over 1,700 hydrographic surveys (H10000 to present) fully populated and maintained in the HSMDB. However, there are also surveys before H10000 with incomplete metadata entries. Plans are to place HSMDB access and query of these surveys on the National Geophysical Data Center (NGDC) Map Service. The remainder of this paper will use many tables and figures to describe how the HSMDB metadata entry is performed and displayed. Finally, future HSMDB considerations will be addressed.

## II. HSMDB DATA ENTRY

The brunt of data entry is done using a Master Template. Fig. 1 shows the Hydrographic Survey Metadata Database Manager Template display of completed entry for one of our newest surveys H11591.

The Master Template enters metadata into sixteen (HSMDB) relational tables. There are seventeen additional HSMDB tables that are updated by individual templates. These separate templates will be either merged with the Master template or be included in a second Master template at a later date. Template modification or creation requires an enormous amount of man hours. Project resources must be focused on completing data entry first. The actual design and relation of the HSMDB tables were discussed in the 2005 Marine Technological Society presentation [1] and will not be duplicated here. However, to facilitate reader appreciation of the HSMDB, the actual tables used with some post 2005 additions are listed in Table 1 in alphabetical order. The descriptive table names in both lists suggest what the table is used for. All of these relational tables reside on the NGDC Hydrographic Data (Bobcat RW) Server.

Note that there are twelve dropdown menus for field entry in Fig. 1. Drop down menus expedite key entry and eliminate error. For example, Fig. 2 shows each of the four types of record insertion. An example of the location options is shown in Fig. 3. This is also an example of using refresh of the Master template to verify data entry.

**Hydrographic Survey Metadata Database Manager**

**SURVEY NUMBER:** H11591 ☐ DELETE this record?

**FIELD UNIT:** AHP SeaArk Launch 1210

**FIELD NUMBER:** None **SHEET:** None

**PROJECT NUMBER | NAME | DATE | PURPOSE - [Update](#)**  
OPR-H320-NRT2-06 | Canaveral and Ponce De Leon, Florida | 20060914 | Update Nautical Chart(s)

**STATE:** Florida [Update/Insert](#)

**LOCALITY:** Ponce De Leon

**SUBLOCALITY:** Ponce De Leon Inlet

**CHIEF OF PARTY:** David B. Elliott [Update/Insert](#)

**PLATFORM | INSTRUMENT | INST S/N | NAVIGATION | NAV S/N - [Update/Insert](#)**  
AHP Jensen Launch 1020 | Klein 3210 | 414 | Trimble DGPS Receiver | Not Available

**TIDE STATION | STATUS | EPOCH(NTDE) - [Update/Insert](#)**  
Ponce Del Leon Inlet South | Primary-Zoned Tide Correctors-(Tide Note) | 1983-2001

**TIDE NOTE:**  **TIDE ZONES:**

**VERTICAL DATUM:** MLLW **VERTICAL UNITS:** Feet **VERTICAL RESOLUTION:** 1

**HORIZONTAL COORDINATE SYSTEM:** Projected UTM 17 **HORIZONTAL DATUM:** North American Datum 1983

**HORIZONTAL UNITS:** Meters **HORIZONTAL RESOLUTION:** .1

**BOTTOM SAMPLES - [Update/Insert](#)**  
**CONTRACTOR INFO - [Update/Insert](#)**  
**DATA PROCESSING INFO - [Update/Insert](#)**  
**LOCATION | ACCESSION | BOX | TYPE | QUANTITY - [Update/Insert](#)**

**BEGIN DATE:** 20070319 (YYYYMMDD or UNKNOWN)

**END DATE:** 20070822 (YYYYMMDD or UNKNOWN)

**FINAL APPROVAL DATE:** 20080228 (YYYYMMDD or UNKNOWN)

**SCALE:** 10000 [Update/Insert](#)

**SOUND CORRECTION INFO - [Update/Insert](#)**  
**LIGHT CORRECTION INFO - [Update/Insert](#)**

Fig. 1: Hydrographic Survey Metadata Manager

Table 1: Master and Stand Alone Template Tables

MASTER TEMPLATE TABLE NAME	MASTER TEMPLATE TABLE NAME
DN.DR_ARCHIVE	HYDRO.DR_LIGHT_CORRECTION
DN.DR_CHARTS	HYDRO.DR_PLATFORM
DN.SURVEY_ENC_LOOKUP	HYDRO.DR_PROJECT
DN.SURVEY_JUNCTIONSUR_LOOKUP	HYDRO.DR_SCALE
HYDRO.DR_ACCESSION	HYDRO.DR_SOUND_CORRECTION
HYDRO.DR_BOTTOM_SAMPLES	HYDRO.DR_STATE
HYDRO.DR_CHARTS	HYDRO.DR_SURVEY
HYDRO.DR_CONTRACTOR	HYDRO.DR_SURV_PLAT_INST_NAV
HYDRO.DR_COORD_SYS	HYDRO.DR_SURV_TIDE
HYDRO.DR_DATA_PROCESSING	HYDRO.DR_TIDE_STATION
HYDRO.DR_FIELD_UNIT	
STAND ALONE TABLE NAME	STANDALONE TABLE NAME
DN.DR_PENDING_SURVEY	HYDRO.DR_NOAAPROGRAM
DN.DR_PRIORSURVEY_LOOKUP	HYDRO.DR_INSTRUMENT
DN.DR_PROJECT_SKETCH	HYDRO.DR_NAVIGATION
DN.DR_STATS	HYDROSURVEY_DATAFILES
DN.NAUTRICAL_CHARTS_SURVEYS-LOOKUP	HHYDRO.SURVEY_PRODUCTS
HYDRO.DR_GEODETIC	HYDRO.TBLSWMB
HYDRO.DR_HDEG	HYDRO.DR_SURVEY

ACCESSION: None Selected

LOCATION: None Selected

BOX: None Selected

TYPE: None Selected

QUANTITY:

Fig. 2: Insert Accession

LOCATION	ACCESSION	BOX	TYPE	QUANTITY
Federal Archives and Records Center Suitland, Md.	370-03-0009	9	Envelope(s)	1
Federal Archives and Records Center Suitland, Md.	370-03-0009	9	Envelope(s)	1
Federal Archives and Records Center Suitland, Md.	370-03-0009	9	Note Folder(s)	5
Federal Archives and Records Center Suitland, Md.	370-03-0009	9	Sonogram(s)	Not Available

Fig. 3: Location Dropdown Menu Verification

### III. HSMDB DATA DISPLAY

Before the main options of the Query Menu are discussed, for clarity the Readme File and Pending Survey Displays capabilities of Fig. 4 should be explained. The Readme file provides answers to the most frequently asked questions about surveys and descriptive reports. The pending file is a list of approximate metadata availability dates for surveys anticipated in the next 90 days.

The HSMDB user display is accessed through the Survey Metadata Query menu shown below in Fig. 4. Survey metadata, bottom sample information and product listings are displayed by typing in the five digit survey registry number and Clicking on option 1, 2 or 3 and Submit. The Rap Sheet display for H11591 is shown Fig. 5. There is a systematic approach to the way the information is displayed on the Rap Sheet. Note the range of date information from beginning and ending dates to archive submission. General survey information for geography and map medium follows. Next, the specifics of other affected surveys are listed followed by processing information. Last, survey correctors are shown with sound velocity and tides. The Command Ship and Project area are also provided for reference. The Rap Sheet second level detailed metadata display is accessed by clicking on the submit query button of the survey rap sheet. H11591 statistics, records storage inventory and location and platform fare shown in Fig. 6.

Welcome To The Hydrographic Survey Metadata Query Menu  
Please Browse the HSD Metadatabase Readme File  
Before Inputing Hydrographic Survey Number

[Click To Display Readme File](#)  
[Click to Display Pending Surveys](#)  
**Input Survey Number and Select One Display Option**

☐ Display Rap Sheet  
☐ Display Bottom Samples  
☐ Display Survey Products List

Fig. 4: Hydro Survey Metadata Query Menu

Bottom samples of individual surveys are displayed by typing the survey number and clicking the second option in Fig. 4. NGDC support in this area has been provided by Carla Moore geologist/web content manager for NGDC. She has transformed bottom sample information retrieved from the Smithsonian Institution in Washington, D.C. into a consistent easy to read format. NGDC has incorporated additional bottom type information into the data set, extracted from smooth sheets during the National Ocean Survey (NOS) and NGDC digitizing project, bringing the total number of bottom type descriptors available to 205,632.

This data set could be greatly expanded and its usefulness enhanced by coding bottom type descriptors from historic and recent surveys reports and by capturing digital data produced during new surveys. This information was sent for many years to the Smithsonian by NOS survey personnel, however this practice was discontinued. New bottom sample information is now posted in the descriptive report, shown on a detached bottom sample plot or is included in digital feature files. Work continues to locate missing and new bottom sample information and present them in the NGDC display format. Option 3 on the interactive menu list is the survey product list. The product lists show NGDC image files, headers and point data files of NOS hydrographic surveys that can be linked to. The product list for H11244 is shown in Table 2. During the period of January 1, 2008 through June 30, 2008 there were 168,443 HSMDb product requests. This is an average of 925 web site hits per day. The requests came from every continent on Earth.

Table 2: H11591 Product Listings

Survey Product List		
These data are not to be used for navigation. For navigation please refer to <a href="#">NOS Nautical Charts</a> .		
Downloads may take a long time, depending on file size and data transfer rates.		
File Name (click to view/download)	File Size	Description
Descriptive Report -----		
<a href="#">H11591.pdf</a>	2.9 MB	NOAA/NOS Descriptive Report in PDF format The report may be viewed using a free Adobe Reader.
<a href="#">H11591.pdf</a>	2.9 MB	NOAA/NOS Descriptive Report in PDF format The report may be viewed using a free Adobe Reader.
Bathymetry Attributed Grid (BAG) -----		
<a href="#">H11591_2m.bag</a>	81.5 MB	NOAA/NOS Bathymetry Attributed Grid (BAG) file The BAG is a gridded, multi-dimensional bathymetric data file ( <a href="http://www.opennavsurf.org/">http://www.opennavsurf.org/</a> ). <a href="#">Free Viewer</a>

HYDROGRAPHIC SURVEY = H11591 RAP SHEET

For More Detailed Metadata Click on Submit Query

H11591

Submit Query

Reset


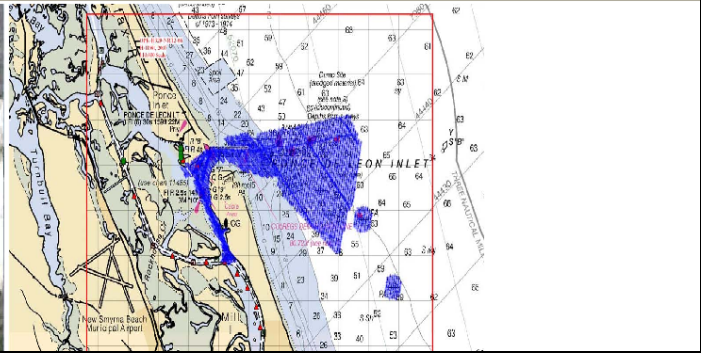
BEGIN DATE	END DATE	APPROVAL DATE	FIELD NUMBER	SHEET	DR NARA ARCHIVE DATE	SURVEY NARA ARCHIVE DATE	DR NGDC ARCHIVE DATE	MRSID NGDC ARCHIVE DATE	TIFF NGDC ARCHIVE DATE	CHIEF OF PARTY	SCALE	NOAA PROGRAM												
070319	20070822	20080228	None	None	Digital No Archive	HCELL No Archive	20080317	HCELL	HCELL	David B. Elliott	10000	None												
DATE	PROJECT NAME(S)	SUBLOCALITY	VERTICAL DATUM	HORIZONTAL DATUM	VERTICAL UNITS	VERTICAL RESOLUTION	PROJECTION																	
	ida	Canaveral and Ponce De Leon, Florida	Ponce De Leon Inlet MLLW	North American Datum 1983	Feet	1	Projected UTM 17																	
JTICAL CHARTS	JUNCTION SURVEYS	PRIOR SURVEYS	ELECTRONIC NAUTICAL CHARTS	PROJECT DATE	SURVEY PURPOSE																			
009			US4FL80M	2006-09-14 00:00:00.0	Update Nautical Chart(s)																			
INSTRUMENT(S) [SERIAL NUMBER(S)] [CASTS]																								
1m Digibar Sound Velocity Probe   98295-011007   Not Available																								
PROCESSING SOFTWARE	RAW DATA RECEIVED DATE	PROCESSED DATA RECEIVED DATE	TOTAL DATA SIZE GB	MAXIMUM PERCENT VERTICAL BEAM COVERAGE	MAXIMUM PERCENT MULTIBEAM COVERAGE	MAXIMUM PERCENT SIDESCAN COVERAGE	MAXIMUM PERCENT LIDAR COVERAGE	SURVEY PRODUCT LIST																
RIS HIPS	2007-10-10 00:00:00.0	2008-03-05 00:00:00.0	14.7			200		<a href="#">Link to H11591</a>																
LINK TO ORDER RAW DATA <a href="#">hydro.info@noaa.gov</a>																								
TIDE NOTE SELECTION TIDE ZONE SELECTION																								
Ponce De Leon Inlet South   Primary-Zoned Tide Correctors-(Tide Note)   1983-2001   <a href="#">Link to Tide Note</a>   <a href="#">Link to Tide Zoning</a>																								
<a href="#">to COOPS Tide Station Interactive Map</a>																								
COMMAND SHIP AHP SeaArk Launch 1210						PROJECT NUMBER(SURVEY) OPR-H320-NRT2-06(H11591).jpg																		
																								

Fig. 5: Survey H11591 Rap Sheet

DAYS OF ACQUISITION	TOTAL LINEAR NM	TOTAL SQUARE NM	LINEAR NM SIDESCAN	LINEAR NM MULTIBEAM	LINEAR NM VERTICAL BEAM	TOTAL LINEAR NM CROSSLINES	TOTAL SOUNDINGS	SELECTED SOUNDINGS	LINEAR_NM_BOTTOM_DRAG	SQUARE_NM_BOTTOM_DRAG	LINEAR NM CHAINDRAG	BOTTOM SAMPLES
	89	4				7						2
No Data Found												
Please use the "Back" button on your browser to return to the previous page and adjust your search criteria.												
SOUNDING TYPE	PLATFORM	SOUNDING INSTRUMENT	SERIAL NUMBER	NAVIGATION CONTROL	SERIAL NUMBER	SURVEYED BY						
Sidescan Sonar - tow	AHP Jensen Launch 1020	Klein 3210	414	Trimble DGPS Receiver	Not Available	Atlantic Hydrographic Party 4						
Sidescan Sonar - tow	AHP SeaArk Launch 1210	Klein 3000	Not Available	Unknown GPS	Not Available	Navigation Response Team 2						
Sidescan Sonar - tow	AHP SeaArk Launch 1210	Klein 3210	414	Trimble ProXRS DGPS Receiver	0224010201	Navigation Response Team 2						
Single Beam Echo Sounder	AHP SeaArk Launch 1210	Odom Echotrac CV2	23031	Trimble DGPS Receiver	00220261525	Navigation Response Team 2						
Single Beam Echo Sounder	AHP SeaArk Launch 1210	Odom Echotrac CV2	23031	Unknown GPS	Not Available	Navigation Response Team 2						
Single Beam Echo Sounder	AHP SeaArk Launch 1210	Odom Echotrac CV2	Not Available	Trimble ProXRS DGPS Receiver	0224010201	Navigation Response Team 2						

Fig. 6: H11591 Stats, Accession and Platform

#### IV. FUTURE CONSIDERATIONS

In the future, HSD will continue to pursue and expand interagency cooperation that HSMDB has forged in three areas. The first area is HSD and NGDC cooperation in the creation of FGDC format metadata records used to populate Geospatial one stop files from HSMDB database records. The key NGDC person helping HSD is LCDR James Bunn, NOS Hydrographic Data Manager at NGDC. These conversions are Federal Geographic Data Committee (FGDC) and International Organization for Standardization (ISO) 19139 compliant. Each conversion can also be rerun to update the xml file when new metadata information becomes available in HSMDB. The second area of cooperation is with Coast Survey Development Laboratory (CSDL) in use of HSMDB field headers for the Bathymetric Data Base hydrographic point data. The fields used are shown in Table 3.

HEADER FIELD	HEADER FIELD
FIELD UNIT	CHIEF OF PARTY
FIELD NUMBER	SCALE
BEGIN DATE	VERTICAL DATUM
END DATE	VERTICAL UNITS
FINAL APPROVEAL DATE	VERTICAL RESOLUTION
PROJECT NUMBER	HORIZONTAL COORDINATE SYSTEM
STATE	HORIZONTAL DATUM
LOCALITY	HORIZONTAL UNITS
SUBLOCALITY	HORIZONTAL RESOLUTION

Table 3: Bathymetric Data Base Header Fields

The third area of cooperation is with Center for Operational Oceanographic Products and Services (CO-OPS). Tide notes and zone images for each survey are displayed on the Survey Rap Sheet. This gives CO-OPS a fast and accurate way to access archived and active tide images.

Lastly, the HSMDB will also be utilized in the near future to provide hydrographic survey confidence levels and geospatial overlays. Survey accuracy or confidence levels may be determined using HSMDB fields such as equipment used, controls, sound and tide correctors as indicators. Discussion has started on which way to best evaluate these variables. Weighted approach has been proposed where each field used would be given a weight of 1 to 10 and then plugged into an algorithm to determine a score. Some feel a combination of algorithmic and subjective evaluation would be best. The confidence levels of each survey could be displayed using survey polygons that show outlines of the area covered by the survey. Planning of new survey project instructions could include use these accuracy overlays in deployment of surveying resources.

Geospatial overlays of survey accuracy could be generated from the survey polygons and algorithm results. In another application, color differentiated overlay layers of new surveys with junction and prior surveys could be contrasted against a nautical or electronic background.

#### REFERENCES

- [1] D.E. Neumann and G.G. Glover, "Customer Outreach Using an Authoritative Hydrographic Survey metadata Database," Oceans 05 MTS/IEEE., Washington, D.C. 2005.

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