

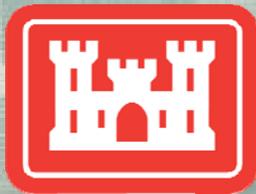
2015 Navigation RARG Meeting

Inland Electronic Navigational Charts (IENC)

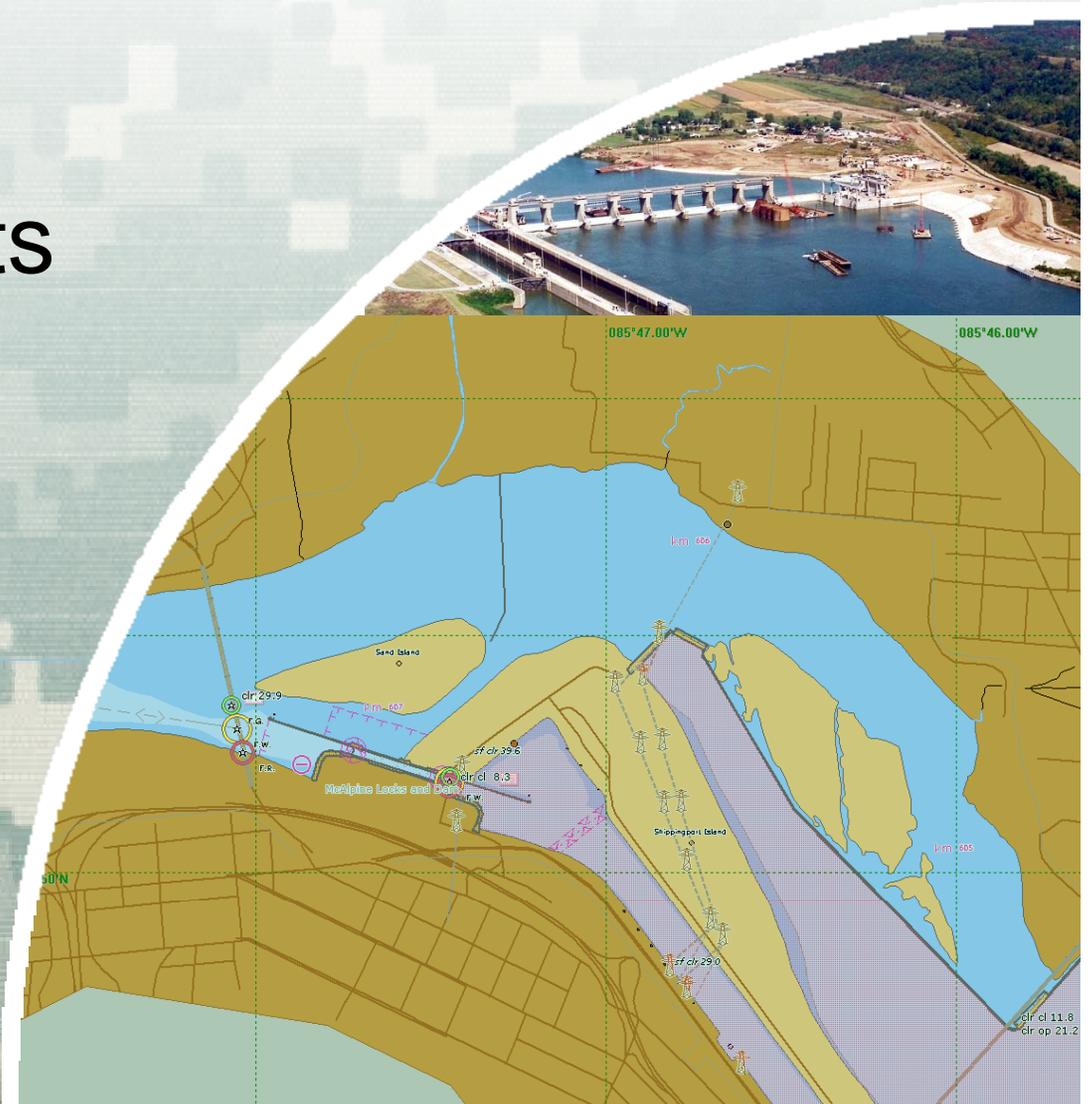
Dale Dodson

QA Manager

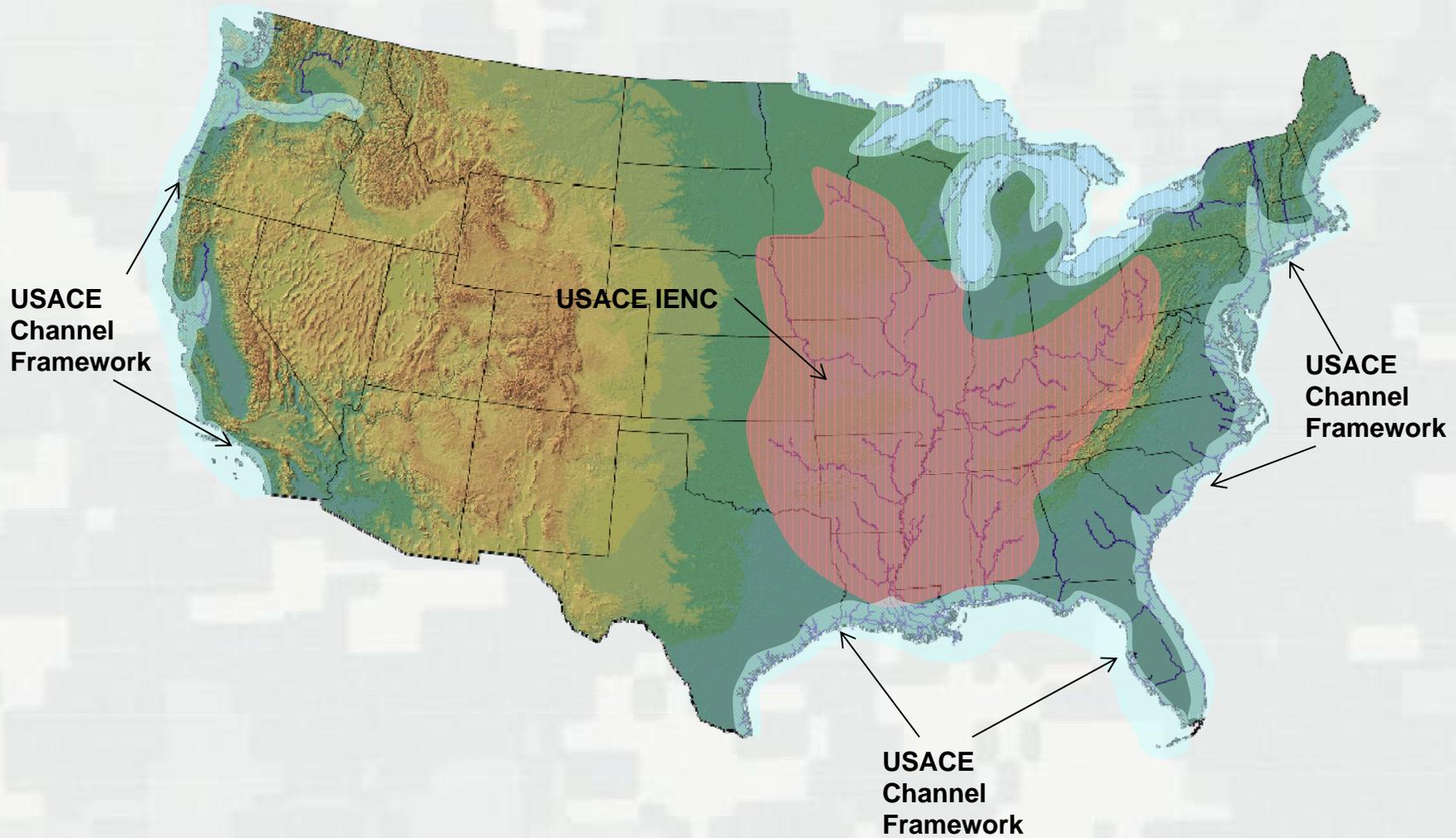
8 April 2015



US Army Corps of Engineers
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USACE Navigation Mission



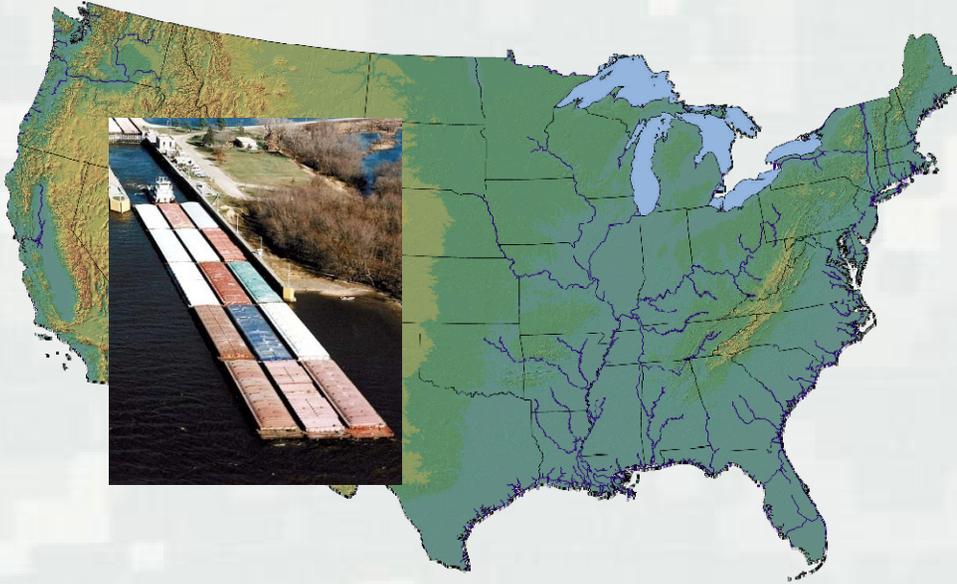
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IENC Program Status

- *Program managed by Army Geospatial Center*
- *Funding from Navigation Business Line in O&M / 3M*
- *IENC EM 1110-2-6055 completed FY14*
- *Production managed by Louisville District*
- *Data acquisition by districts and contractors*
- *QA and chart publication by AGC*
- *100% traceable audit trail for source data*
- *International recognition as experts on inland standards*
- *Will be available on smartphones, mobile devices, etc*
- *All IENC data on Amazon Cloud, Amazon Web Service*
- *Over 182,000 downloads since moving to Amazon cloud*



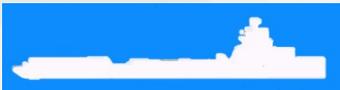
U.S. Navigation Statistics*



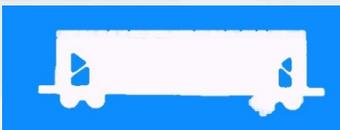
- 25,000 miles of waterways (includes coastal/harbor channels)
- 257 lock chambers lifting 6,100'
- 3,254 million tons of commodities
 - ▷ 42% petroleum
 - ▷ 17% coal / coke
 - ▷ 16% other raw materials
 - ▷ 10% food & farm products
 - ▷ 8% manufactured products
 - ▷ 7% chemicals

Equivalent Units

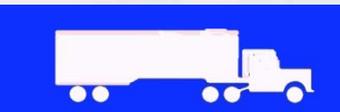
22,500 Tons =



One 15 Barge Tow



225 Railroad Cars



900 Large Semi Trucks



* from the Navigation Data Center "TRANSPORTATION FACTS", Dec. 2012

15 USACE Districts Involved in the IENC Program



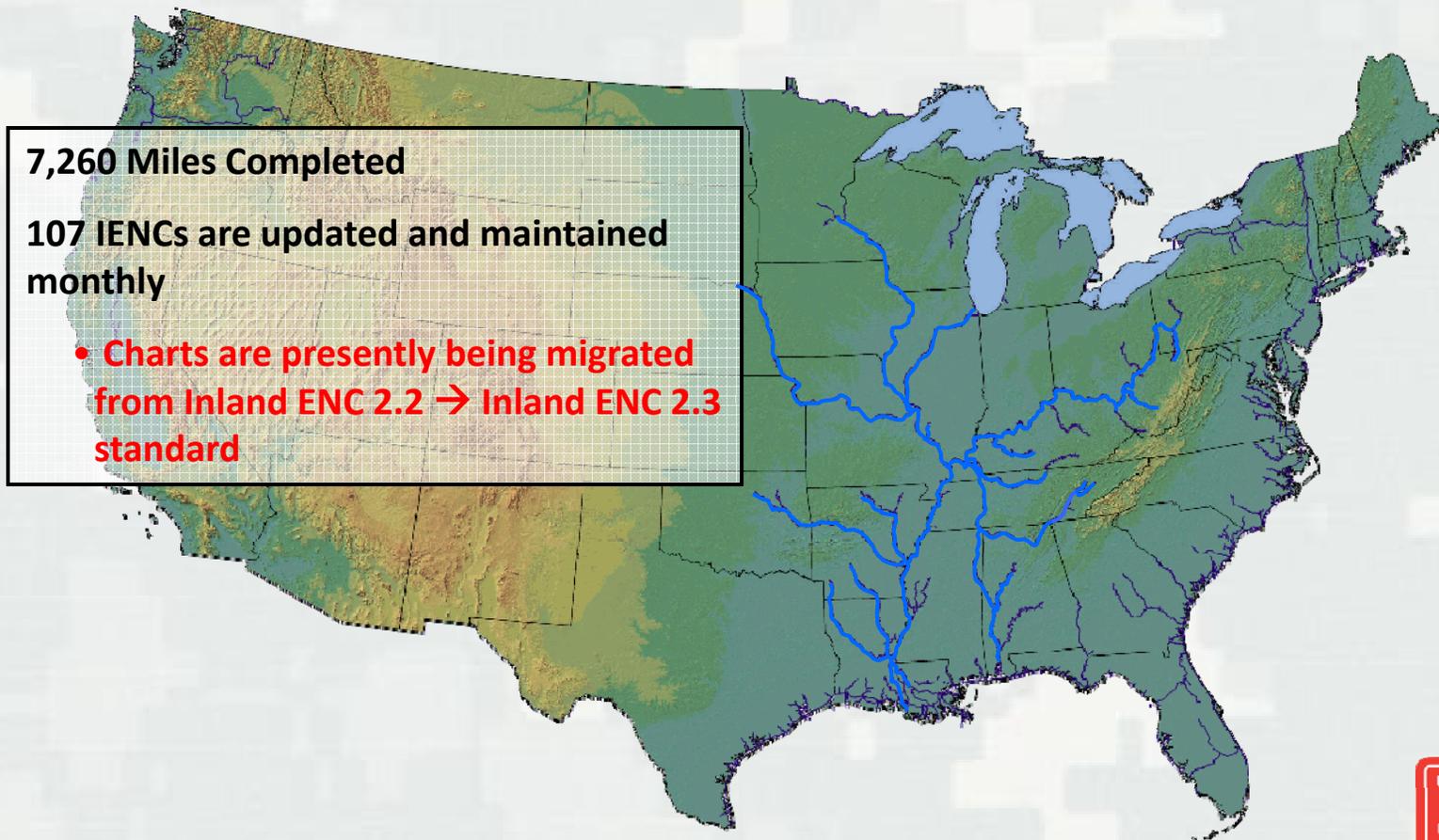
- Centrally Funded from HQUSACE thru Louisville District
- 85% of Hydrographic & Feature Surveys Performed by Contract (15% in-house)



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Inland ENC Coverage in USA

7,260 miles of inland waterways are scheduled for Inland ENC coverage



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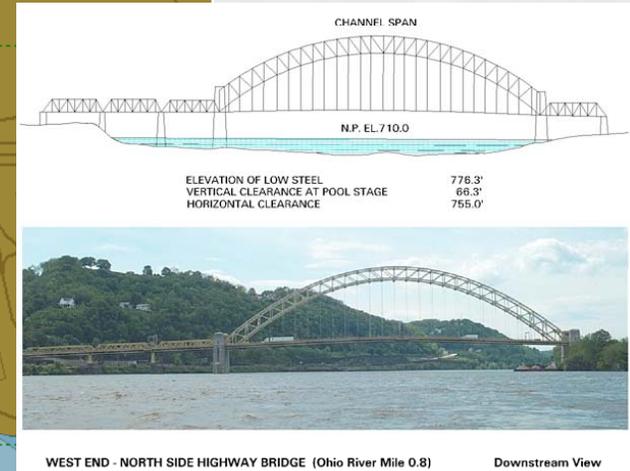
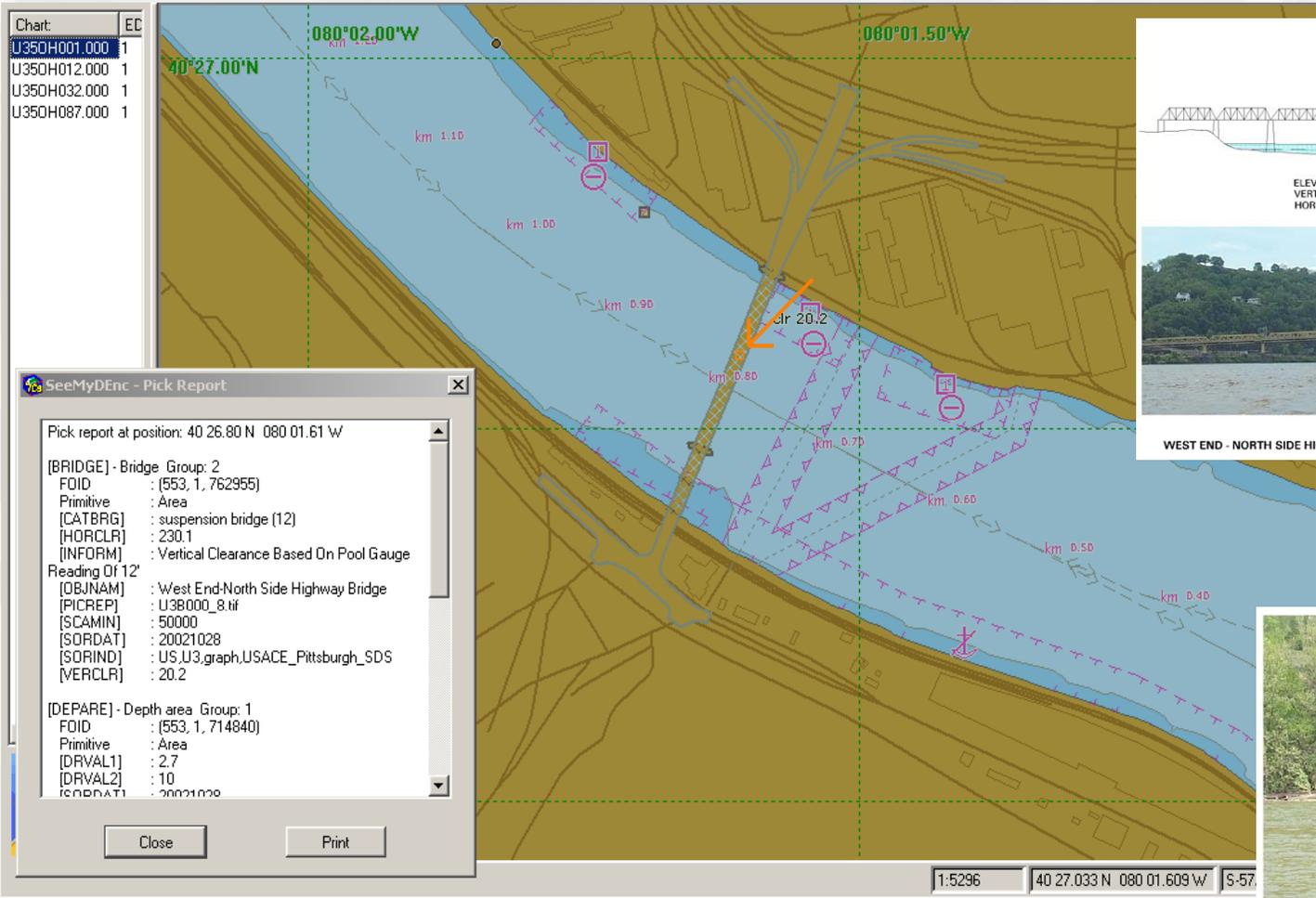
Inland ENC Coverage in USA

River / Waterway	Miles	Kilometers	Inland ENC 2.2
Allegheny River	60	97	Published
Arkansas River	445	716	Published
Atchafalaya River	118	190	Published
Black Warrior River	235	378	Published
Cumberland River	381	613	Published
Green River	108	174	Published
Illinois Waterway	337	542	Published
Kanawha River	91	146	Published
Kaskaskia River	36	58	Published
Lower Mississippi River	715	1,151	Published
Missouri River	733	1,180	Published
Mobile / Tombigbee Rivers	217	349	Published
Monongahela River	129	208	Published
Ohio River	981	1,579	Published
Ouachita River	351	565	Published
Red River	237	381	Published
Tennessee River	765	1,231	Published
Tenn-Tom Waterway	225	362	Published
Upper Mississippi River	866	1,394	Published
White River	245	394	Published
Total	7,260	11,683	



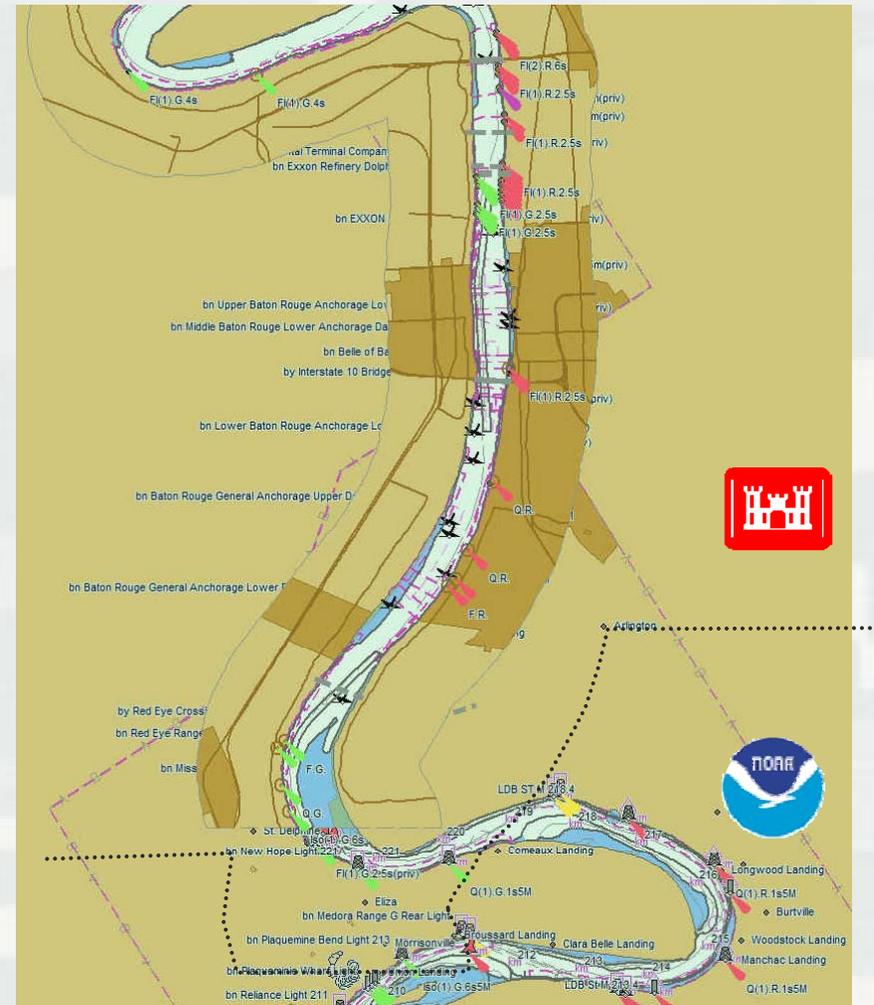
Inland Electronic Navigational Charts (IENCs)

Accurate, up-to-date information on inland waterways

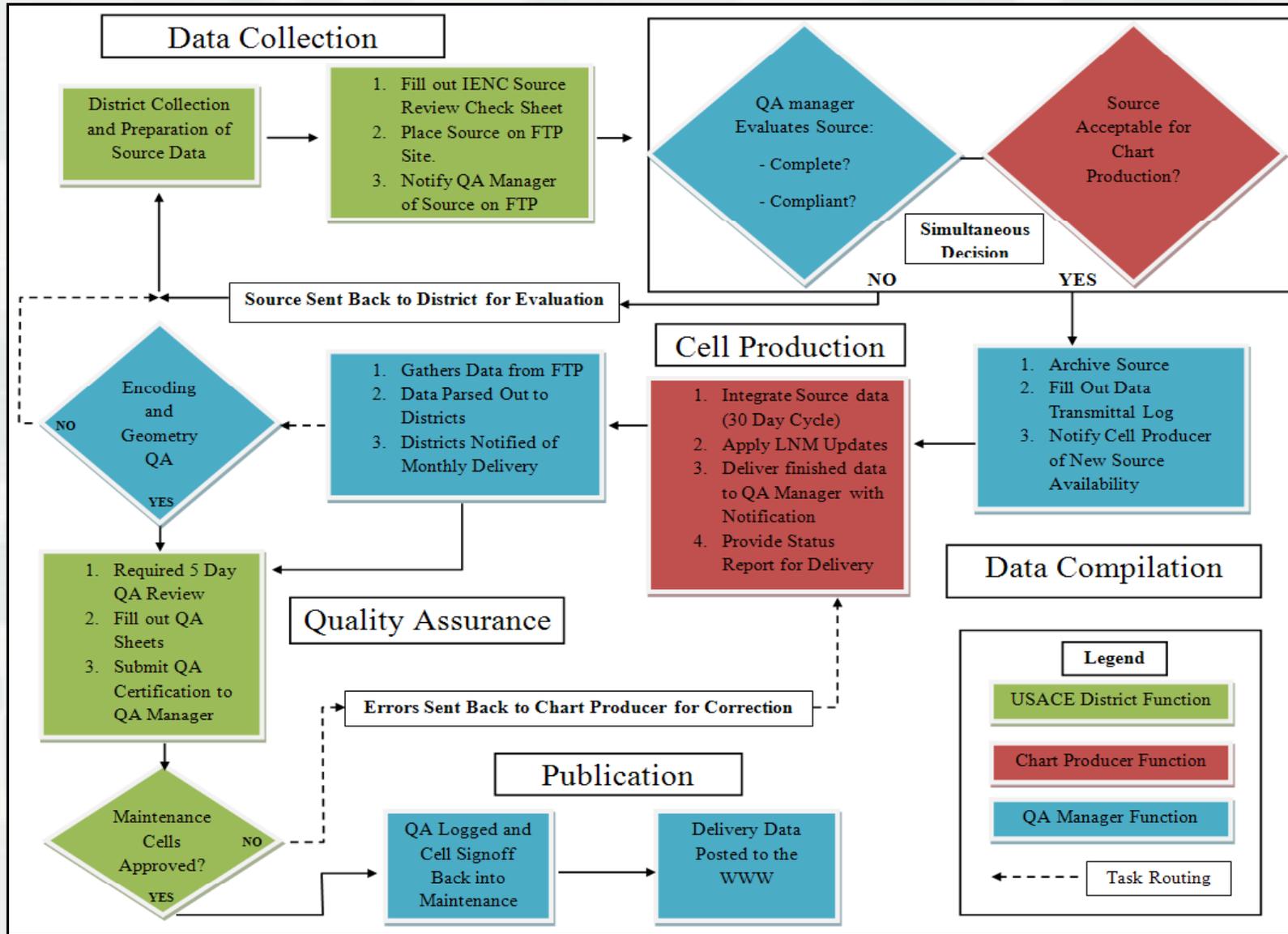


Update and Maintenance of US IENC Cells

- One hundred-seven (107) Inland ENC's, totaling 7,260 miles (11,684 km) covering 20 waterways have been produced
- All cells are updated and maintained on a monthly basis
 - 46 in-house, 61 by a contractor
 - charts are checked and cleared through the USACE Chart Center prior to release
- Monthly maintenance involves:
 - Applying new source data (feature or hydrographic surveys) provided by USACE Districts
 - Updating information obtained from USCG Local Notice to Mariners



IENC Program Workflow



IENC Production Process

- Hydrographic/Feature data collected by 15 Districts
- Source Data is sent to chart producer
- Chart Producer applies source and LNM updates and returns to Districts/AGC for QA
- QA Manager encodes data and notifies Districts for 5 day review period
- Districts required to perform QA and sign off
- QA Manager approves data and then posts to web



What is meant by an Inland Standard?

❖ Examples of unique features found in waterways which are not found in maritime waters

- Casino / Gaming Boats

- Fleeting Areas

- Ice Breakers

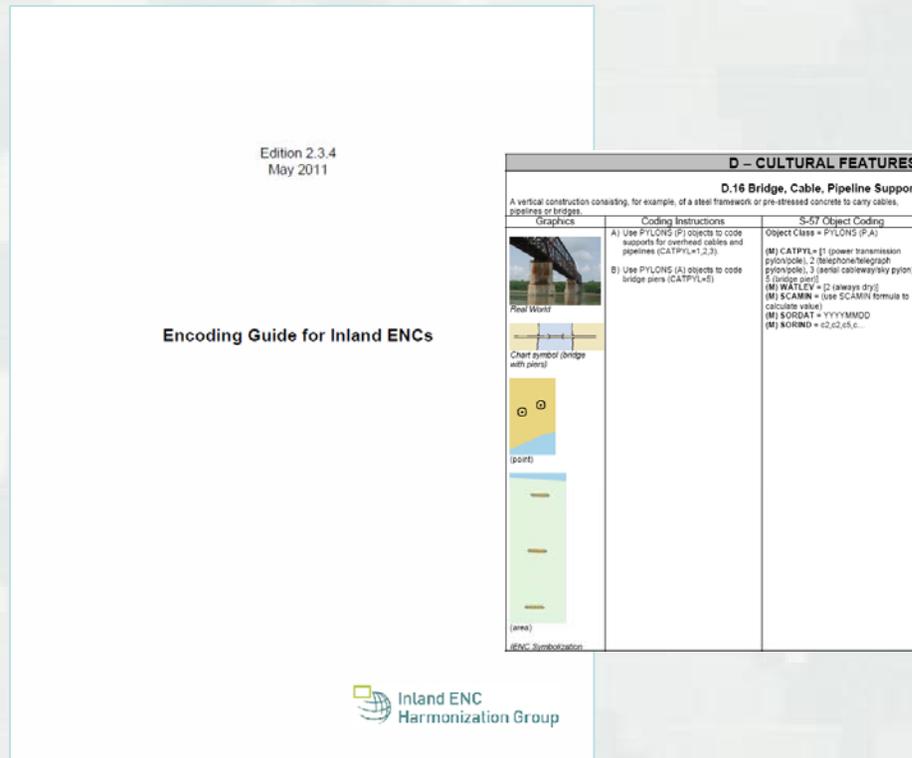
- Lock Guide Walls

- Exceptional Navigation Structures (Lift bridges/viaducts)



IENC Encoding Guide

- ❖ For all object classes, attributes and enumerations that are used in conjunction with an IENC, the Encoding Guide:



- Provides a basis for its creation
- Describes its relationship to a real-world entity feature
- Provides criteria for proper usage
- Gives specific encoding examples/instructions



IENC On-line Feature Catalogue

Provides an on-line feature catalogue reference similar to S-57.com (www.S-57.com)

Object: Administration Area (Named) <input type="text"/>	Attribute: Jurisdiction <input type="text"/>
Acronym: ADMARE <input type="text"/>	Acronym: JURSDIN <input type="text"/>
Code: 1 <input type="text"/> help	Code: 103 <input type="text"/> help

<p>Geometric primitives: A</p> <p>Set Attribute_A: (!)JRSDTN; NATION; NOBJNM; OBJNAM;</p> <p>Set Attribute_B: INFORM; NINFOM; NTXTDS; PICREP; (?)SCAMAX; SCAMIN; TXTDSC;</p> <p>Set Attribute_C: (?)RECDAT; (?)RECIND; SORDAT; SORIND;</p> <p>Definition: A defined (and possibly named) administrative area.</p> <p>References: INT 1: not specified; M 4: not specified</p> <p>Remarks: Distinction: land region; contiguous zone; continental shelf area; exclusive economic zone; fishery zone; territorial sea area;</p>	<p>Attribute type: I <input type="text"/> Used in: ADMARE</p> <p>Expected input:</p> <table border="1"> <thead> <tr> <th>ID</th> <th>Meaning</th> <th>INT 1</th> <th>M 4</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>international</td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>national</td> <td></td> <td></td> </tr> <tr> <td>3</td> <td>national sub-division</td> <td></td> <td></td> </tr> </tbody> </table> <p>Definition: The jurisdiction applicable to an administrative area.</p> <p>Remarks: No remarks;</p> <p style="text-align: right;">(www.S-57.com)</p>	ID	Meaning	INT 1	M 4	1	international			2	national			3	national sub-division		
ID	Meaning	INT 1	M 4														
1	international																
2	national																
3	national sub-division																

<http://ienccloud.us/ienc/web/s-57/>

IENC Feature Catalog 2.3

<http://ienccloud.us/ienc/web/s-57/>

Features:

Feature Name:

Acronym:

Feature Code:

Attributes:

Attribute Name:

Acronym:

Attribute Code:

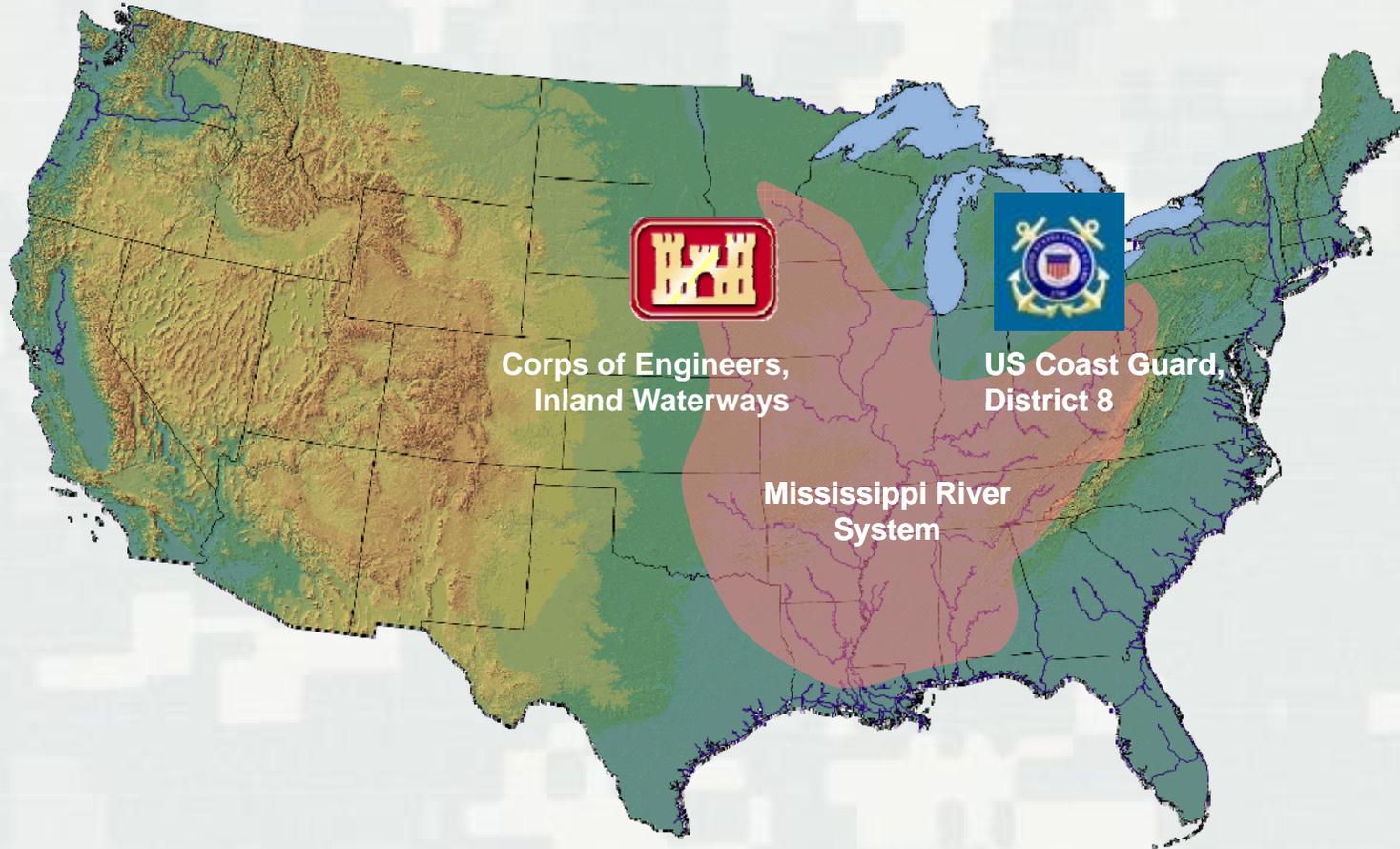
Current Uses of IENC Data & Special Products

❖ Who uses IENC data:

- US Coast Guard
- Charting Vendors
- NOAA
- USACE Districts
- General Public (Recreation)
- State Agencies
- US Towing Industry
- Department of Homeland Security
- Academia



Partnering: US Coast Guard Buoy Placement



USACE → USCG Survey Data for “problem” areas.

USCG → USACE Buoy Locations from USCG Cutters



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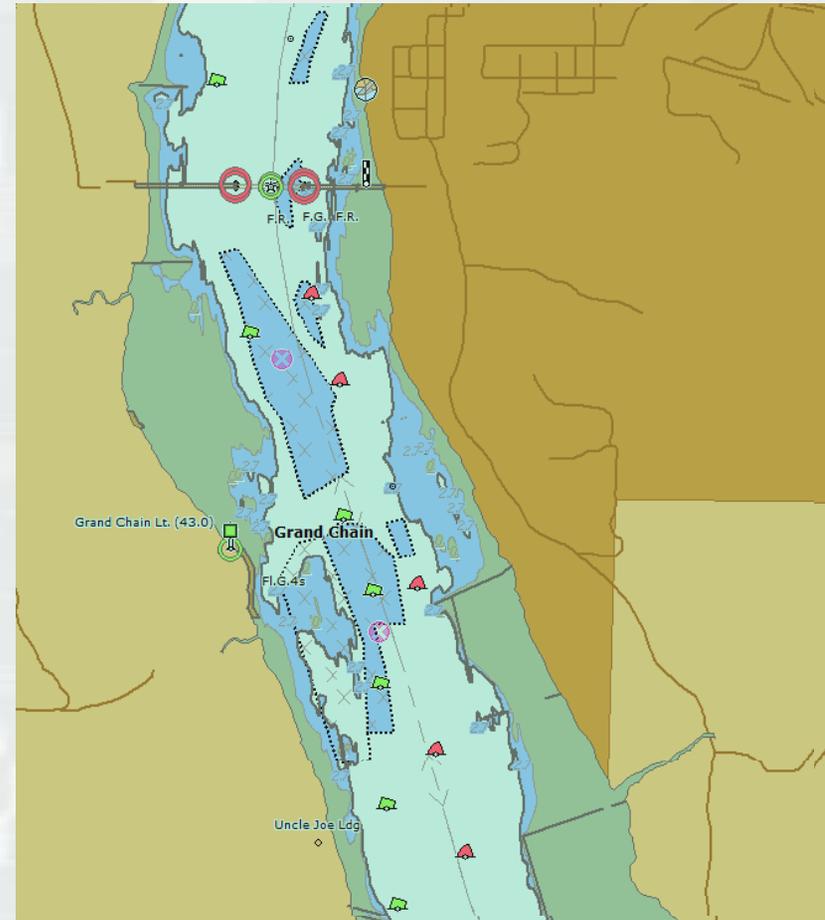
IENC Overlays: USCG Buoys

- Buoy acquisition software installed on 15 USCG Cutters
- Server software installed on Army Geospatial Center server in Amazon Cloud.
- Ability to upload buoys (USCG) to server and download to files (USACE)
- Release of first Buoy Overlay file occurred in April 2013
- USACE updates and publishes Buoy Overlay files weekly (every Monday)

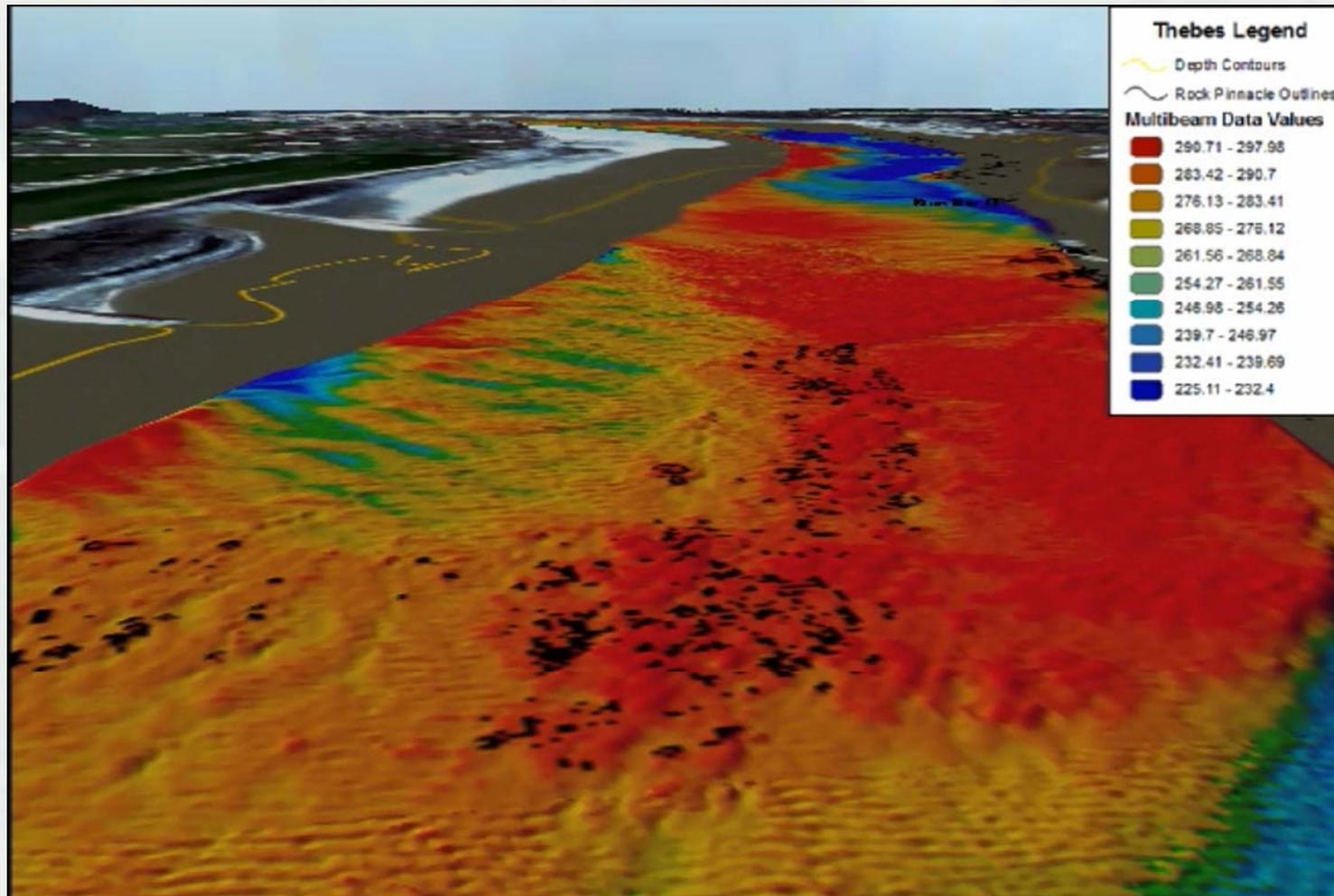


IENC Overlays: USCG Buoy Placement During Low Water Event

- USACE Survey data → USCG for rock pinnacle area on Upper Miss River near Grand Chain/Thebes
- USCG Cutters used surveys to place buoys
- USCG → Excel file with Buoy Locations/Attributes
- USACE created Buoy Overlay for USCG & Towing Industry

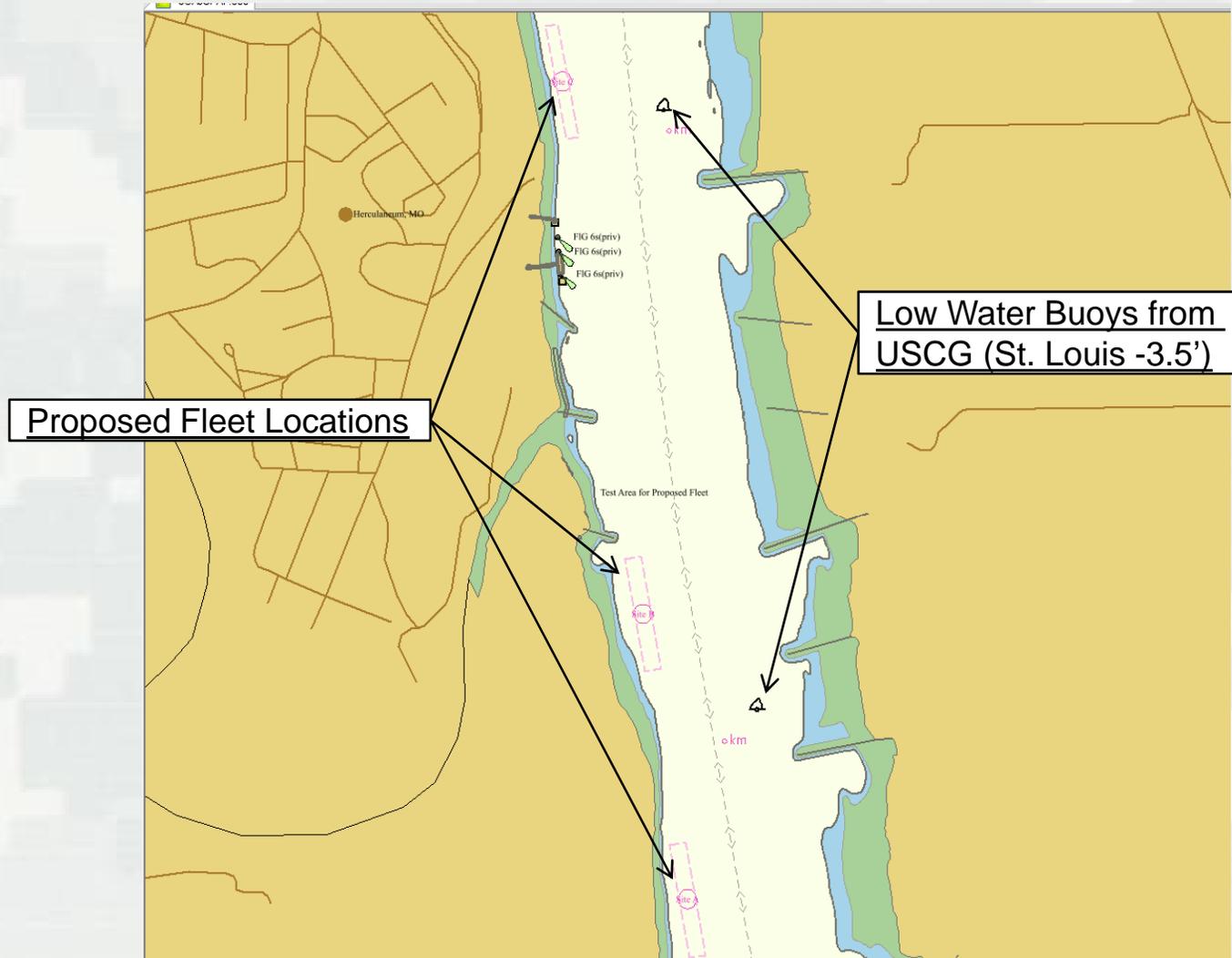


IENC Overlays: USCG Buoy Placement During Low Water Event

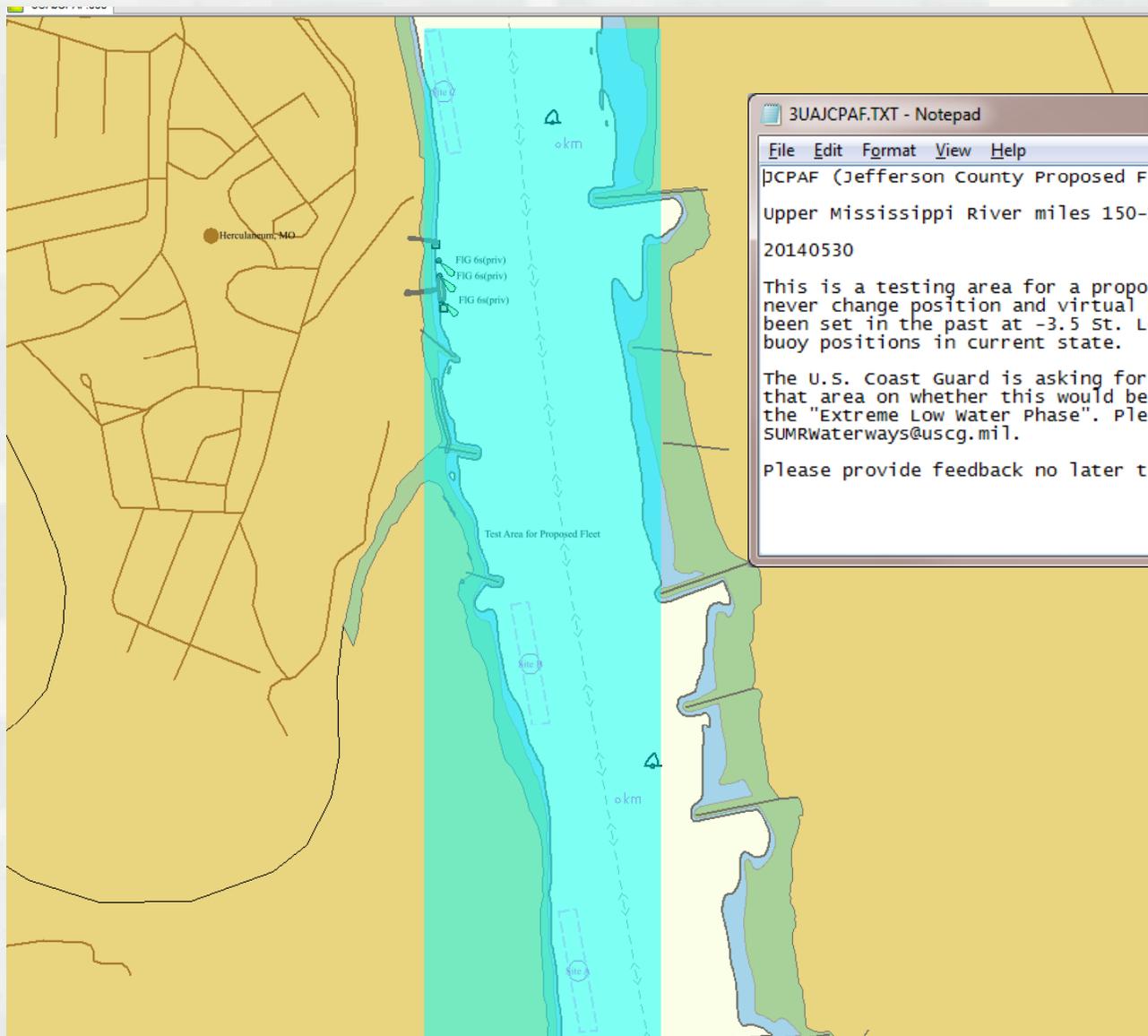


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IENC Overlays: Chart U37UM079 with Proposed Fleet & Low Water Buoy Overlay



IENC Overlay: Chart 3UAJCPAF Overlay Area & Text Description



3UAJCPAF.TXT - Notepad

File Edit Format View Help

3CPAF (Jefferson County Proposed Fleet)

Upper Mississippi River miles 150-153

20140530

This is a testing area for a proposed fleet. The virtual fleets will never change position and virtual buoys are indicative of where they have been set in the past at -3.5 St. Louis River Gage. This is not the actual buoy positions in current state.

The U.S. Coast Guard is asking for feedback from all pilots transiting that area on whether this would be considered a hazard to navigation in the "Extreme Low Water Phase". Please send feedback to SUMRwaterways@uscg.mil.

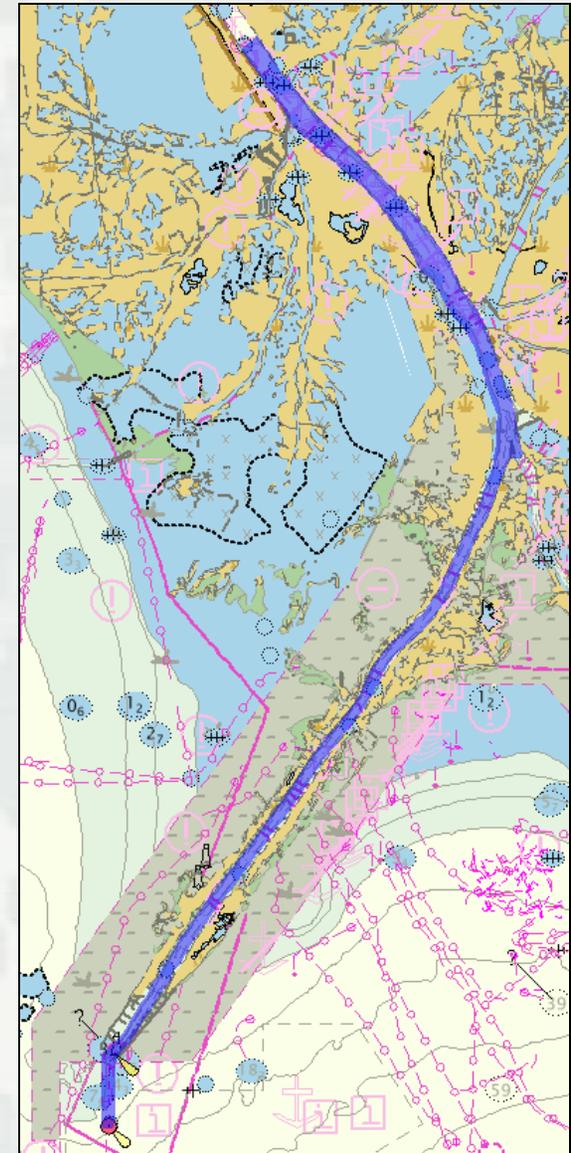
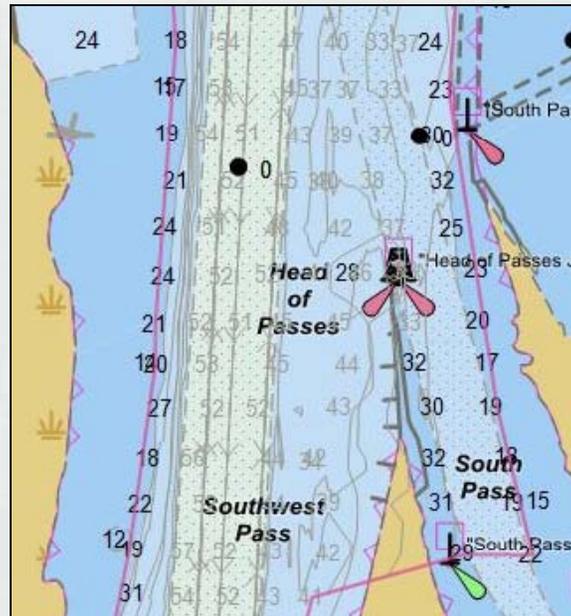
Please provide feedback no later than 11 June 2014.



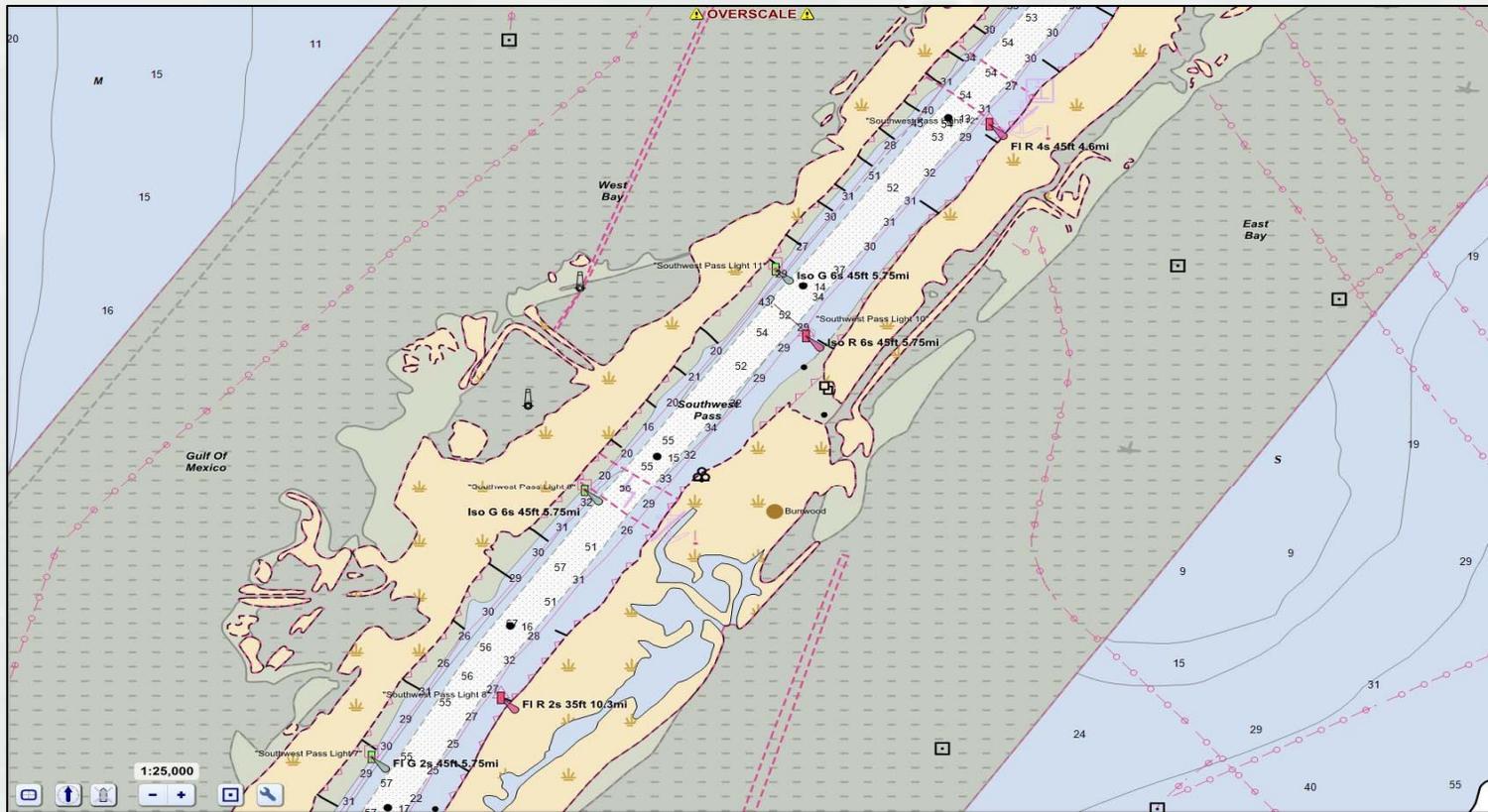
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IENC Overlay: Mississippi River (Southwest Pass)

- USACE Survey data for SW Pass → updated weekly, uploaded to web
- IENC Overlay containing scalable depth contours and sounding data
- Overlay file, 3UASW000 overlays on NOAA ENC's (US4LA30M & US4LA33M)
- Presently developing additional IENC overlays for other areas on the Lower Miss River



IENC Overlay: Mississippi River (Southwest Pass)



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IENC Data Download Services/Website



The screenshot shows the website interface for the IENC Program Overview. At the top, there is a header for the Army Geospatial Center and the US Army Corps of Engineers, including a search bar and a navigation menu. The main content area features a title 'IENC Program Overview' and a map of a river system. To the right of the map is a detailed text description of the U.S. inland navigation system. On the left side, there is an 'Echart Menu' with links to various services like 'Chart Discrepancy Reports' and 'Product Downloads'.

ARMY GEOSPATIAL CENTER

US Army Corps of Engineers

Search AGC

HOME > MISSIONS > ECHARTS

Echart Menu

- Chart Discrepancy Reports
- Inland Chart Books
- Inland Electronic Navigation Charts
- Product Downloads

IENC Program Overview



The U.S. inland navigation system consists of 8,200 miles of rivers maintained by the Corps of Engineers in 22 states, and includes 276 lock chambers with a total lift of 6,100 feet. The highly adaptable and effective system of barge navigation moves over 625 million tons of commodities annually, which includes coal, petroleum products, various other raw materials, food and farm products, chemicals, and manufactured goods (Reference Corps Navigation Data Center). The shallow draft waterways have many unique characteristics and difficulties over coastal harbor and ocean navigation; river levels can change by over 30 feet in a seasonal cycle, the navigation channel can shift significantly within the river banks, and shifting yet ever present river currents pose constant challenges in these confined waterways. Electronic chart systems can offer significant benefits to vessels including accurate and real-time display of vessel position relative to waterway features, voyage planning and monitoring, training tools for new personnel and integrated display of river charts, radar, and Automatic Identification Systems.

<http://www.agc.army.mil/Missions/Echarts.aspx>



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IENC Data Download Services

- Products Catalog - S-57, esri and KML
 - XML based: universal and flexible
 - Incorporates NOAA structure and attributes
 - Allows automated data updates for software clients
 - Allows automated querying of available products
 - Expandable and scalable to accommodate future products and services

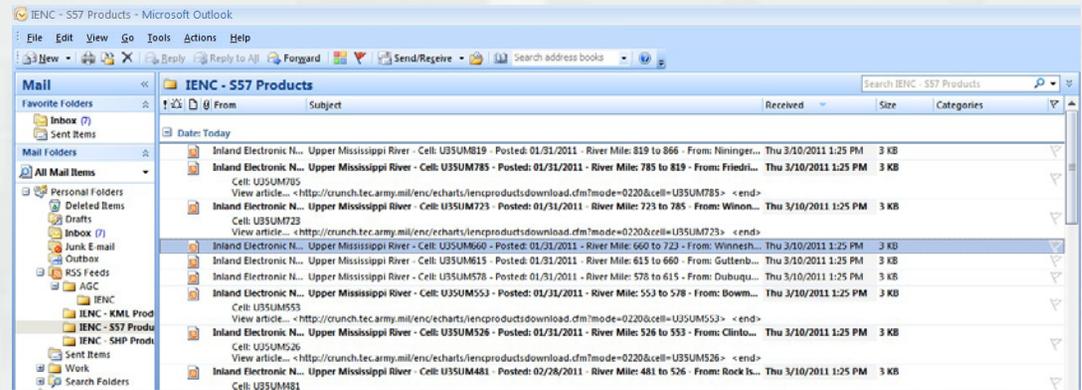


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  <time_created>11:29:17</time_created>
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  <ref_spec_vers>1.0</ref_spec_vers>
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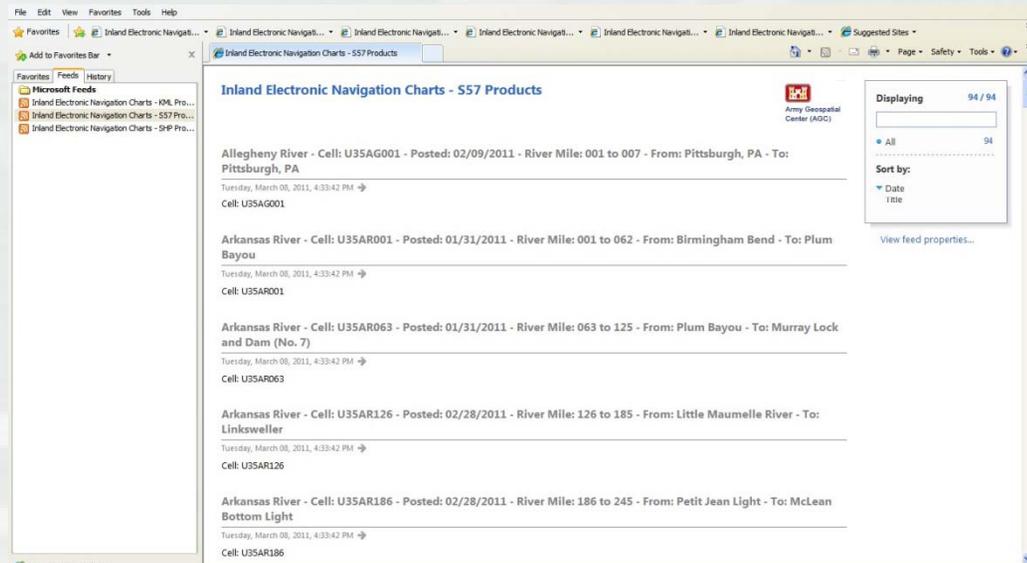


IENC Data Download Services

- RSS feeds - S-57, esri and KML
 - RSS based: universal and flexible
 - Catalog service driven
 - Automatic data status updates to users PC
 - Allows data download from users' desktops
 - Supported on a wide range of clients: browsers, free and commercial RSS readers, Outlook, and other email clients.



Outlook Client

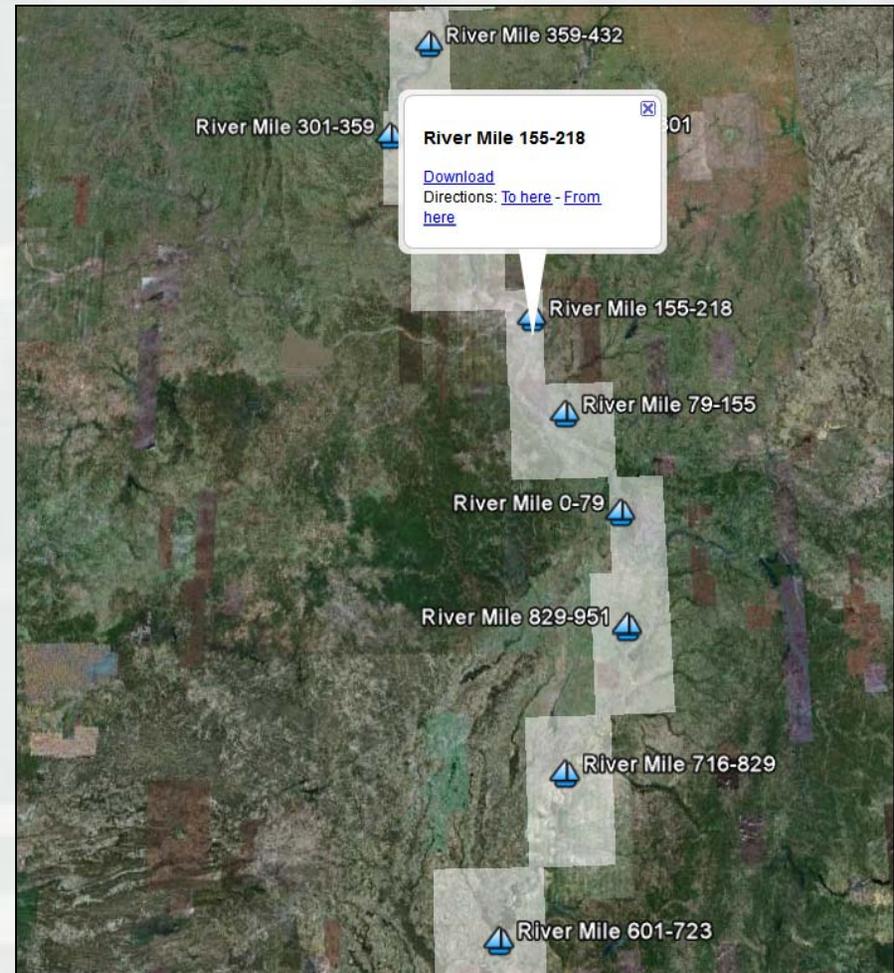


Browser Client



IENC Data Download Services

- Graphical Interfaces
 - Supports Multiple Clients
 - Public and Commercial (e.g. ArcExplorer, Google Map/Earth, ArcGIS, etc.)
 - All products available for download
 - IENC, KML, SHP
 - Accommodates real time navigation and data download concurrently
 - River system knowledge not required though it would always help.



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Chart Reports (Discrepancy Error Reporting)

The screenshot shows the home page of the IENC Chart Reporting System. At the top left is the US Army Corps of Engineers logo and the text "US Army Corps of Engineers IENC Chart Reporting System". To the right is a "menu" icon and the slogan "BUILDING STRONG®". Below the header is a navigation bar with a "Home" link and a "Login" button. On the left side, there are "Reference Links" for "About Our Program", "Help", and "Contact Information". The main content area features a "Welcome to the IENC Chart Reporting System" message, a brief description of the system, and two sections: "Do You Need An Account?" with a "Register For An Account" button, and "Registered Users:" with a "Login To My Account" button.

- Users provide feedback / report errors on IENCs
- District POC, Production and QA Manager will receive email that an error has been reported
- District determines if error is legitimate and makes corrections to IENCs as necessary
- System maintains incident updates

The screenshot shows a report form titled "Marina Facility". In the top right corner, it displays "Report ID: 4004" and "SubReport ID: NEW". The form is divided into several sections:
1. Why is this report being provided? (Check all that apply)
This section contains five checkboxes: "Marina Facility is on chart but was not found", "Charted object is a Marina Facility but not charted as a Marina Facility", "Marina Facility is not on chart", "Marina Facility location is incorrect", and "Marina Facility information is missing".
2. Location
This section includes fields for "Select the GPS Profile:" (a dropdown menu), "Latitude (North):" (a text input), "Required format for Latitude" (DD MM.MMM or DD MM SS.SS), "Longitude (West):" (a text input), "Required format for Longitude" (DDD MM.MMM or DDD MM SS.SS), "River Mile:" (a text input), and "Bank Side:" (a dropdown menu).
3. Identification Information
This section includes text input fields for "Name of Marina:" and "Proprietor:".
4. Comments (Optional)
This section features a large text area for user comments.
5. Upload Support Files (Optional)
This section includes a note about accepted file formats (.gif, .pdf, .jpg, or .txt) and a maximum file size of 4MB. Below this, there is a table with six rows, each representing a file upload slot. Each row has a "delete" checkbox, a text input field, and a "Browse..." button.



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Mobile IENC

Purpose:

Provide a low-cost mobile platform for US inland water navigation and information management which traditionally require an expensive and dedicated ECS.

Products/Result(s):

- Android-based mobile application
- Back-end web services to support the mobile devices
- Geo-dataset and services provisioned for lightweight clients

Requirement :

- Navigation data dissemination requirement from USACE Civil Works
- Cloud computing and mobile platforms initiatives

Transition Milestones:

- Distributed data services and mobile application products available to government agencies and the public.



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Other Uses of IENC Charts/Data

- Assess and prototype hazardous chemical spill scenarios on US inland waterways.
 - Impacted infrastructure and shoreline construction
- IENC Charts have been used by Department of Homeland Security to assess US river system facilities for potential smuggling operations.
- Data has been shared with Homeland Infrastructure Foundation – Level Data (HIFLD) Working group and included in the Homeland Security Infrastructure Program (HSIP) Gold 2013/2015 data release.



Future Plans

- Develop IENC mobile apps (Android and iPhone)
- Complete bridge heights surveys
- River Information Objects layers (Safety, Ice etc)
- Incorporate eHydro processes for standard hydrographic data processing
- Complete MOA for print-on-demand (POD) charts
- Contribute data to USACE Geospatial Platform <http://geoplatform.usace.army.mil/home/> and data.gov



Questions?

Dale.K.Dodson@usace.army.mil



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