

USS Arizona Drawings and Underwater GPS Surveys Linked by ArcIMS



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Information Technology**

Outline

- Introduction
- Geodatabase Development
- Web Portal
- Document Management
- Future Work
- Pictorial Archive

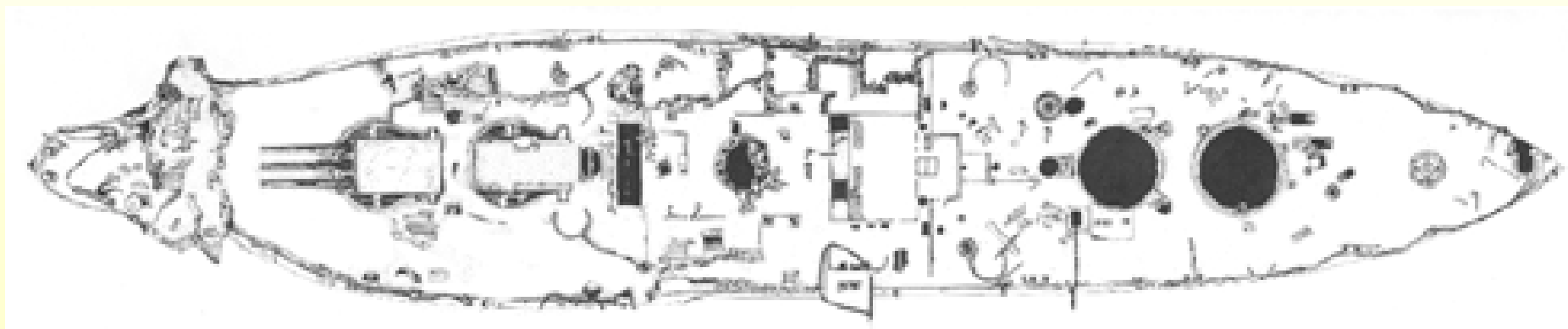
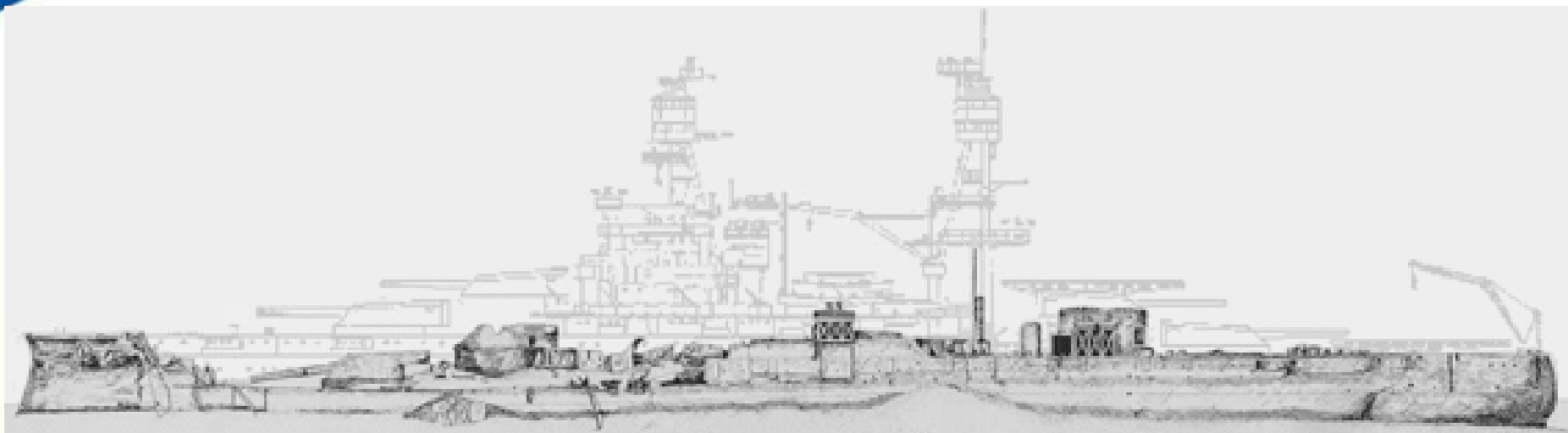


USS ARIZONA BB 39

Introduction

- The USS *Arizona*, a National Historic Landmark (NHL) – the highest level of national historic significance – is among the most recognized and visited war memorials in the nation. USS *Arizona* became a National Park Unit in 1980.
- Currently more than 1.5 million people annually visit the USS *Arizona* Memorial, tomb of more than 900 US sailors and the most visible warship lost in World War II.
- The National Park Service's Submerged Resources Center (SRC) is conducting research directed to understanding the nature and rate of natural processes affecting the deterioration of the USS *Arizona* in Pearl Harbor, Hawaii.
- The USS *Arizona* long-term management strategy designed to
 - 1) minimize environmental hazard from fuel oil release and
 - 2) provide the basic research required to make informed management decisions for long-term preservation.

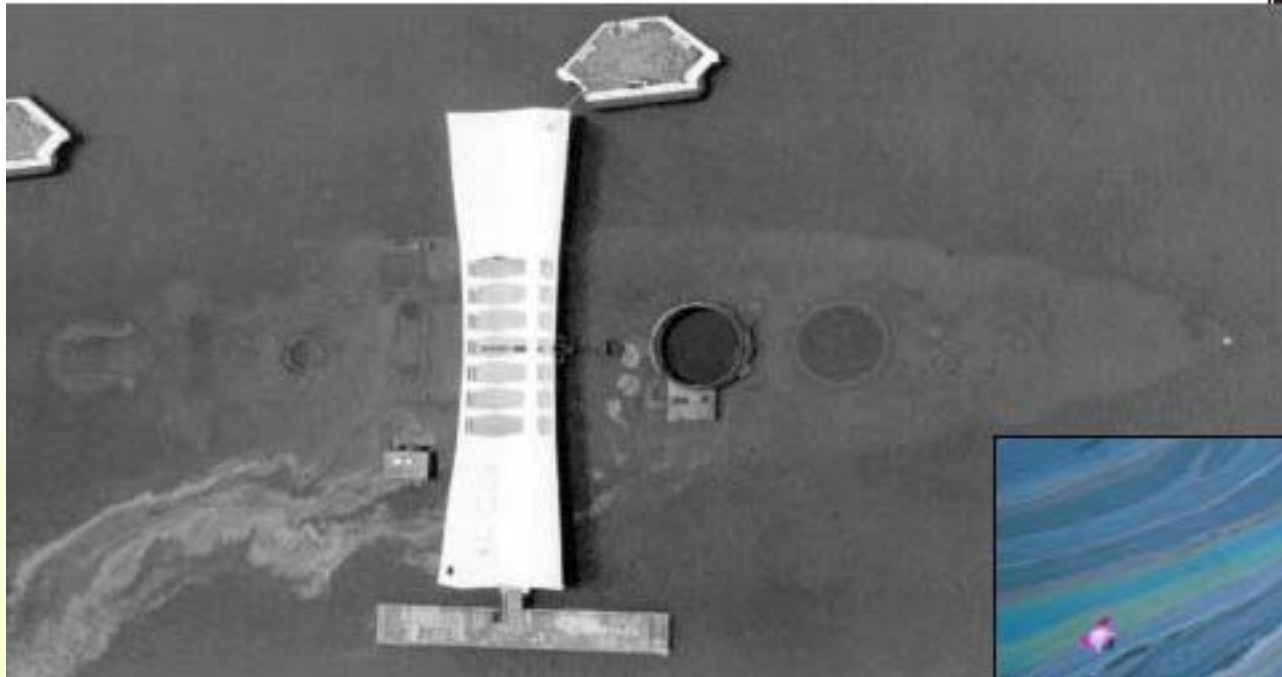
USS Arizona Different Views





USS Arizona Has Leaked Fuel Oil Since December 7, 1941

USS *Arizona* apparently contains several hundred thousand gallons of fuel oil



Understanding the complex and varied hull corrosion process and modeling structural changes and oil release patterns offers the best method of developing a solution to this potential hazard.

Project Objectives

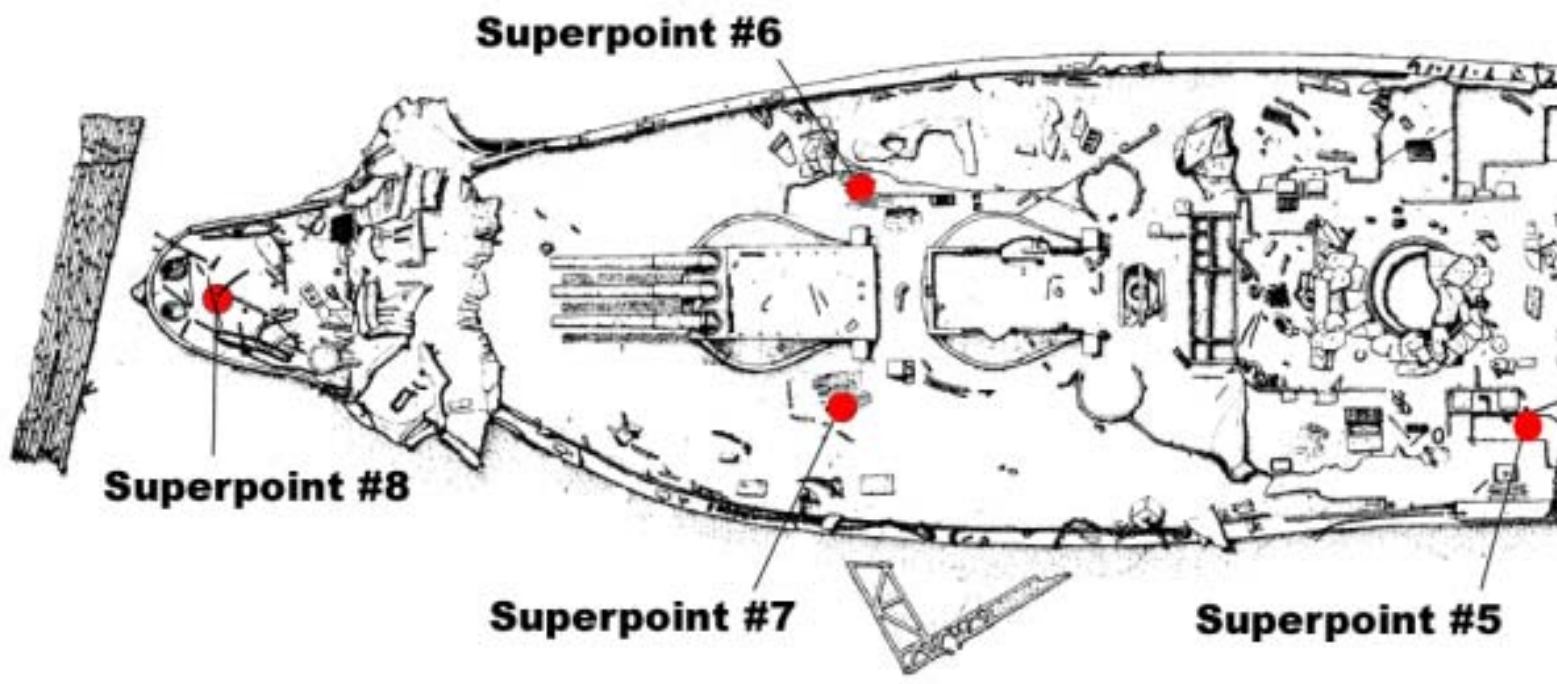
- Purpose:
 - Create a GIS to help the National Park Service's Submerged Resources Center (SRC) research the nature and rate of natural processes affecting the deterioration of the USS *Arizona* in Pearl Harbor, Hawaii.
- Goals:
 - Create geospatial baseline of current ship structure
 - Screen digitize vector layers from scanned geo-referenced as-built drawings of the 9 decks
 - Attribute rooms / compartments in each drawing
 - Develop a document management system to access 9,000 scanned drawings
 - Prototype a web interface to both data and imagery

Static GPS Survey Monitors Hull Movement

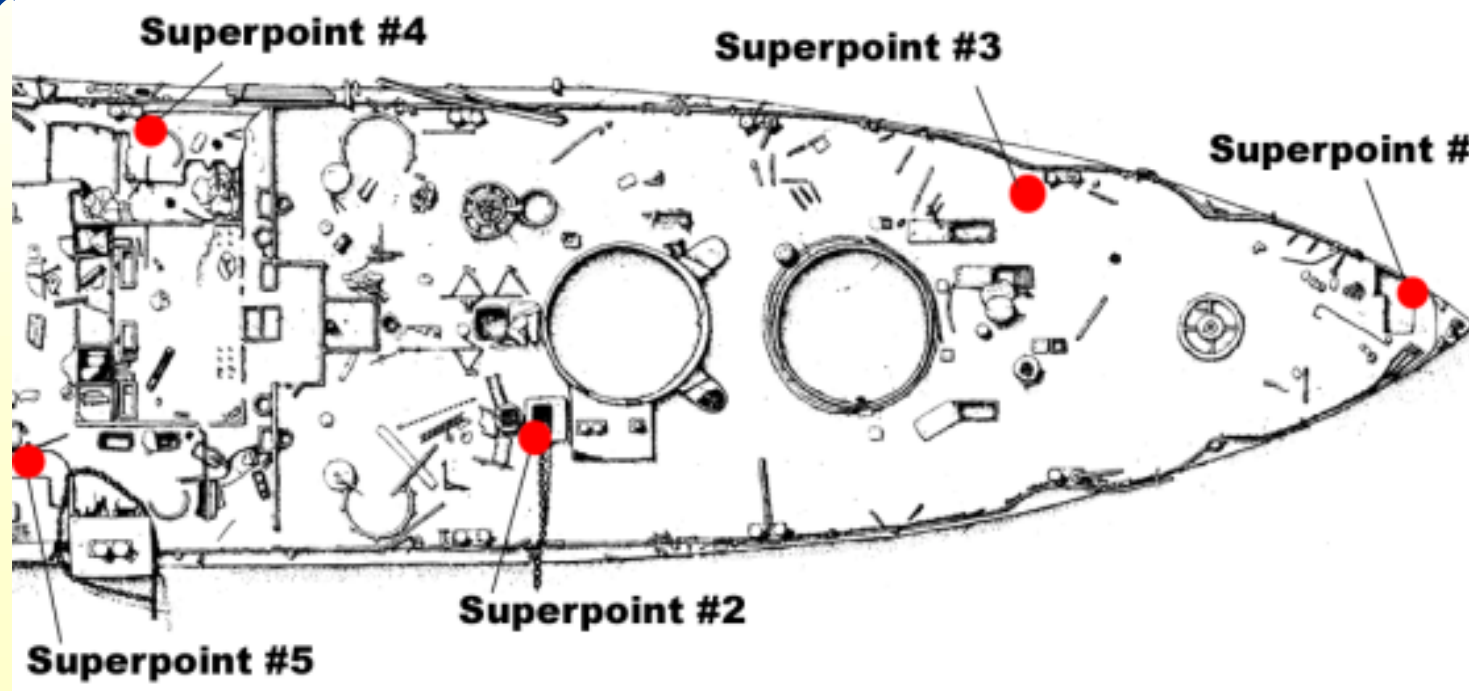


Sub-centimeter accuracy helps determine how much structural change has occurred in the hull





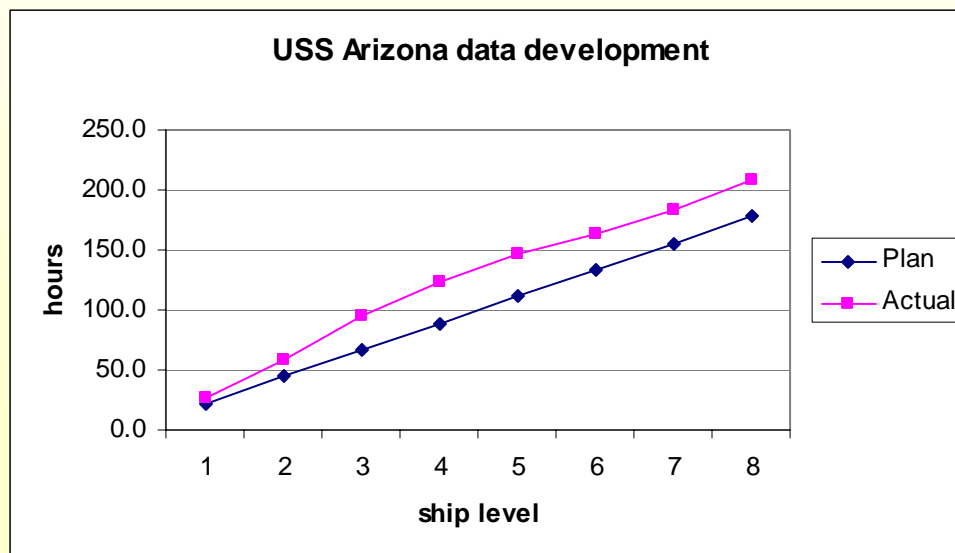
Sub-centimeter
Circle of Error
(5-6mm)





Geodatabase Development

- Screen digitize from scanned geo-rectified images
- Level of complexity varies from deck to deck
- Edit vectors
- Build polygon topology
- Attribute features: Unique ID, Description, Name, code from drawing
- 22.4 hours per deck, stayed pretty close to plan



Engineering Drawings

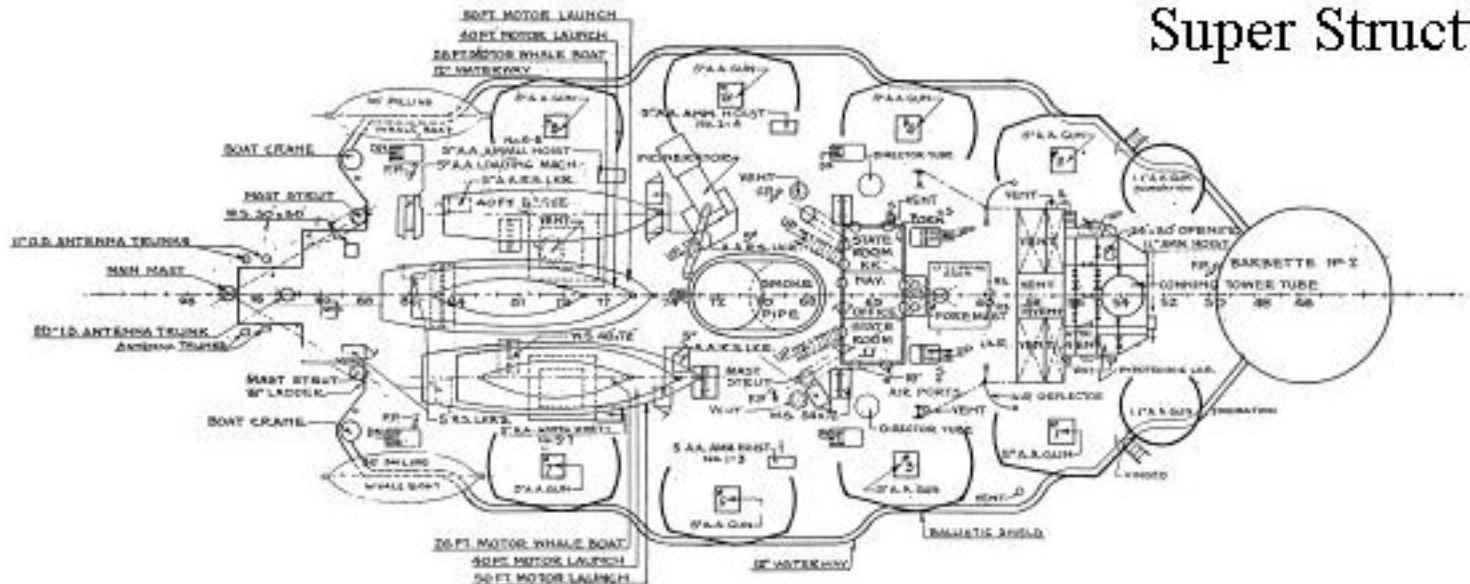
First Platform



From the Archives & Records of the
USS Arizona Memorial, National Park Service
World War II Museum, Honolulu

1/8" = 1'-0" (VERTICAL)
1/8" = 1'-0" (HORIZONTAL)
SCALE 1/8" = 1'-0"

Super Structure



Geodatabase

The screenshot displays the ArcCatalog interface. The title bar reads "ArcCatalog - ArcInfo - C:\DEMOS\USSArizona\USSArizona.mdb\UTM". The menu bar includes File, Edit, View, Go, Tools, and Help. The toolbar contains various icons for navigation and editing. The "Location" field shows "C:\DEMOS\USSArizona\USSArizona.mdb\UTM". The left pane shows a tree view of the file system, with the "USSArizona.mdb" folder expanded to show the "UTM" folder containing several feature classes: Double_Bottom, First_Platform, Hold, Main_Deck, Second_Deck, Second_Platform, Third_Deck, and Upper_Deck. The right pane shows the "Contents" tab for the "Personal Geodatabase Feature Dataset". It has three tabs: Description, Spatial, and Attributes. The "Description" tab is active, showing the following information:

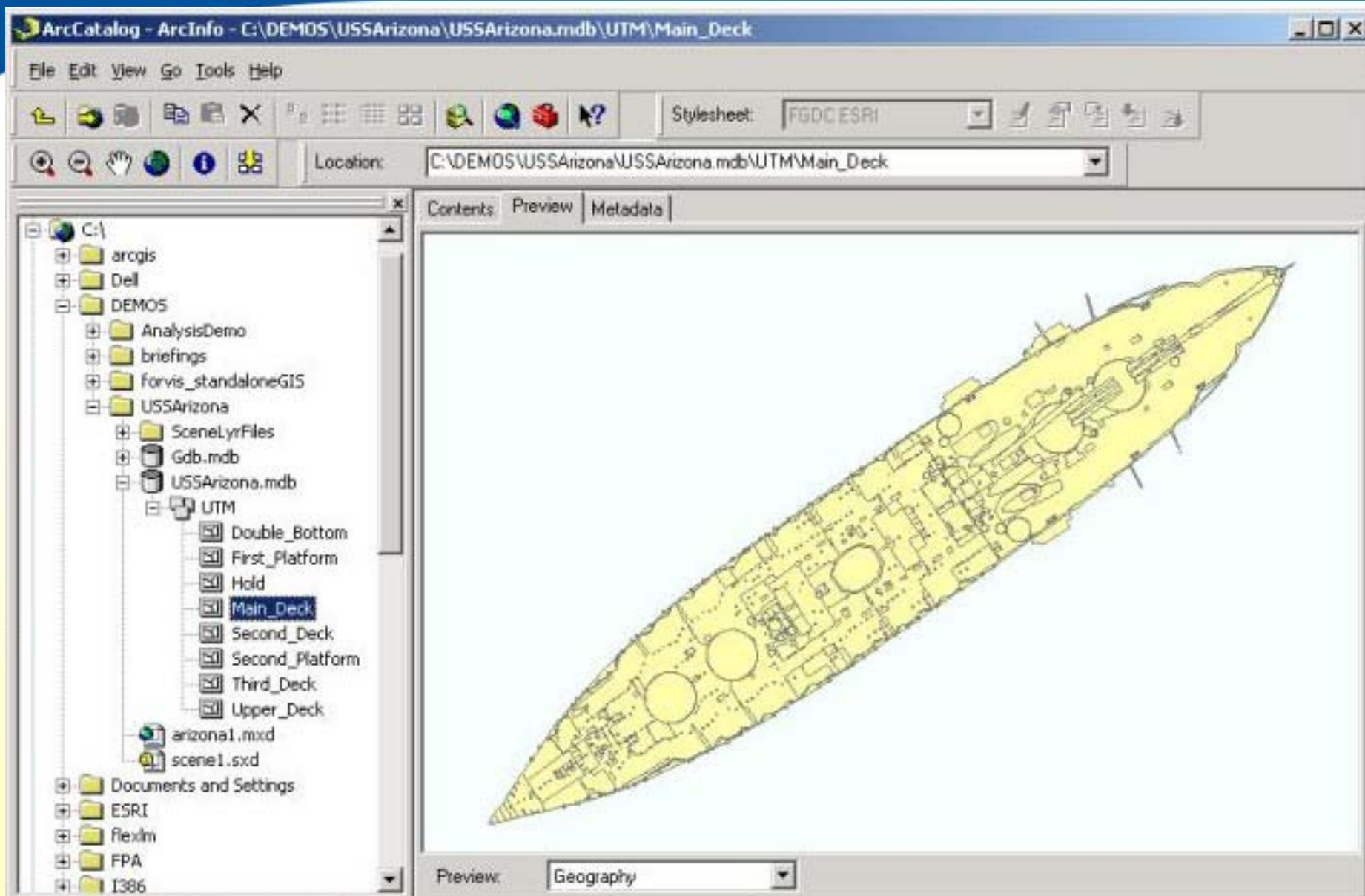
Keywords
Theme: USS Arizona
Place: Pearl Harbor, Hawaii

Description
Abstract
Vector polygon Feature Data Set of the USS Arizona decks. Eight feature classes are included in this data set. Data were screen digitized from as-built engineering drawings provided by National Park Service Submerged Resources Center. Feature Classes are available for the following 8 layers of the USS Arizona: Double Bottom, Hold, 2nd Platform, 1st Platform, 3rd Deck, 2nd Deck, Main Deck, Upper Deck (from bottom to top of the Ship).

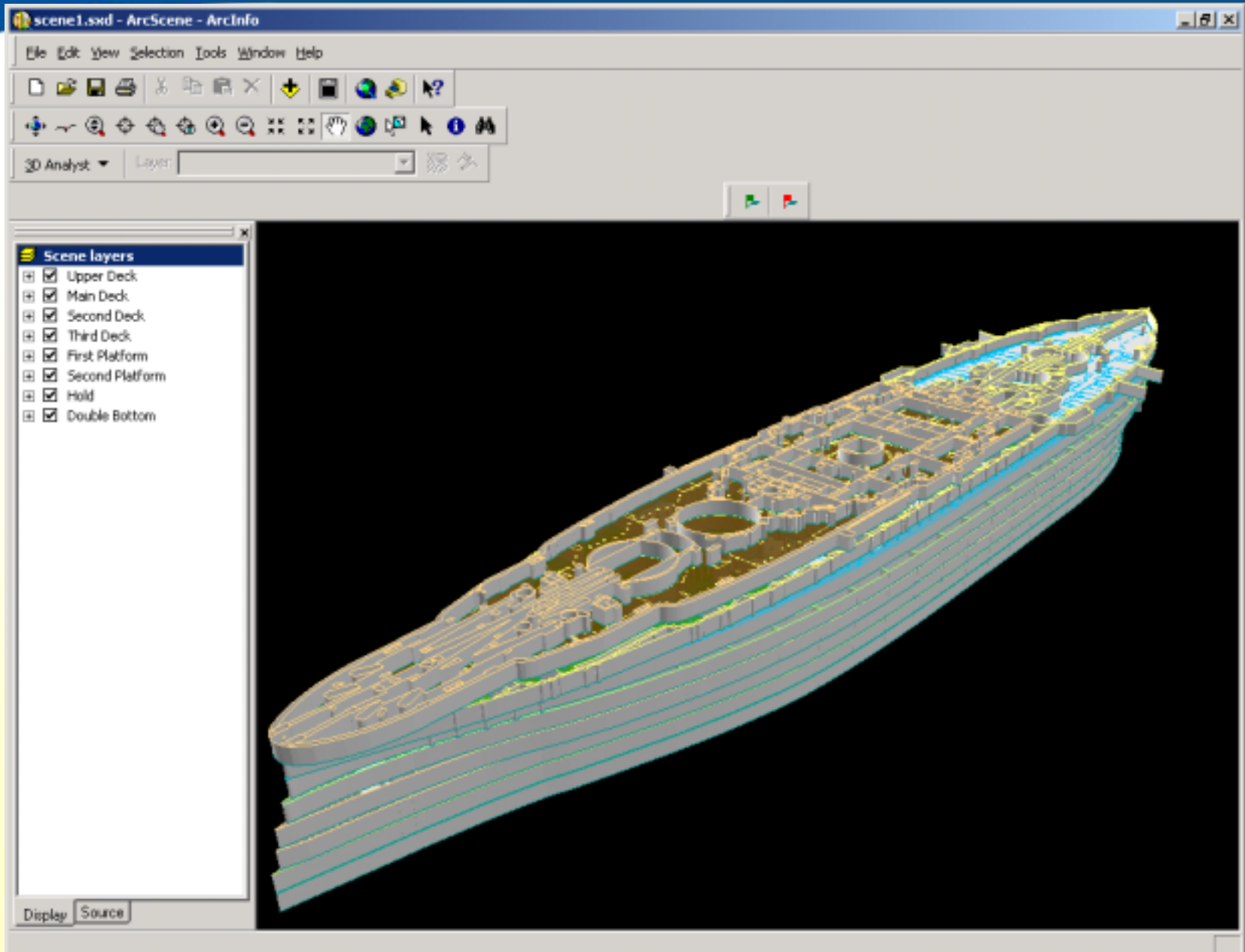
Purpose
To provide vector features for image linking and further scientific research such as ship deterioration

Personal Geodatabase Feature Dataset selected

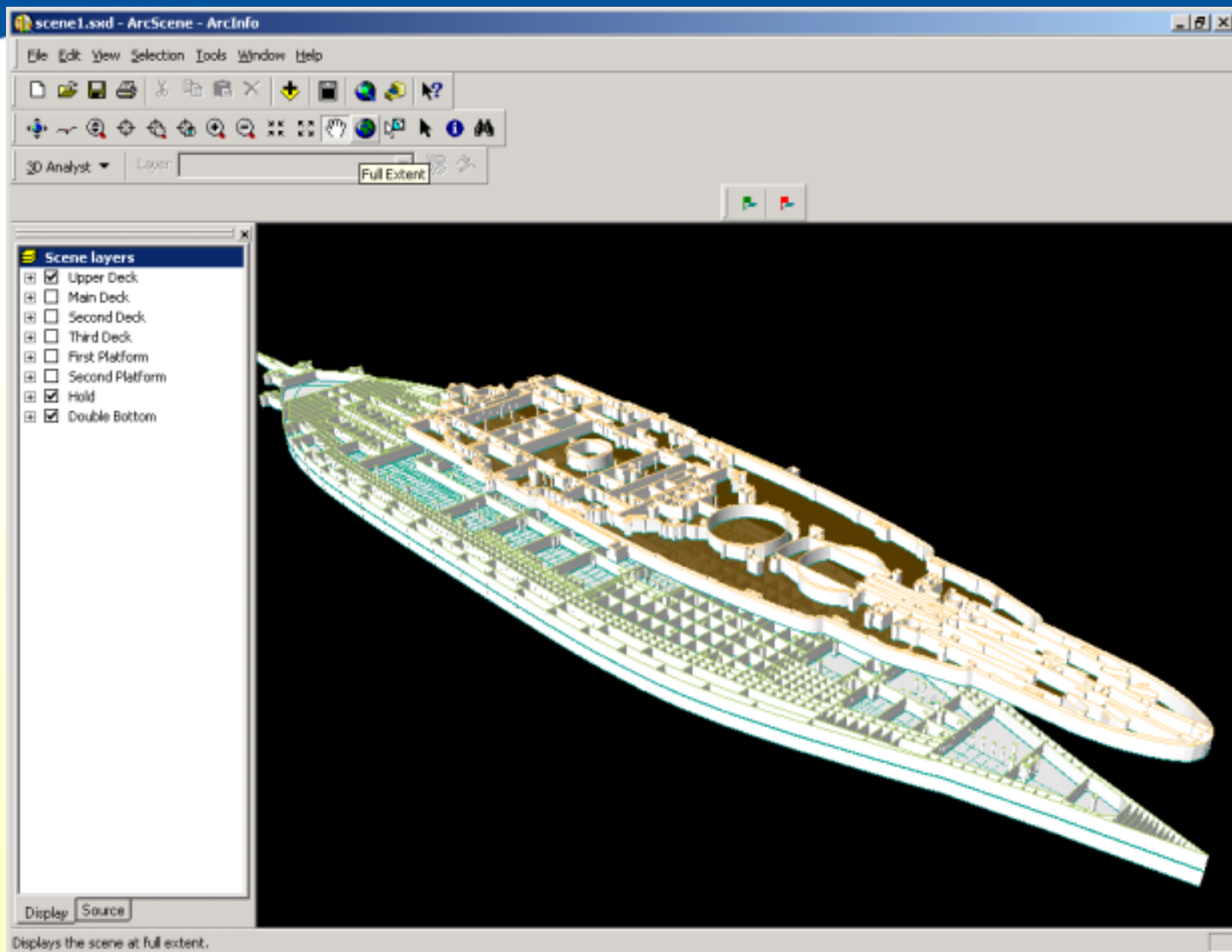
Geodatabase



Geodatabase - ArcScene



Geodatabase - ArcScene




Web Portal

ArcIMS Viewer - Microsoft Internet Explorer provided by Northrop Grumman Corporation

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites

Address <http://tblmirad4/website/USSArizona/viewer.htm> Go Links



*Legend
Layer List*

*Access Images:
By Feature
By Query*


*Zoom In
Zoom Out
Full Extent
Last Extent
Pan*


*Identify
Query
Find
Measure
Set Units*

*Select by:
Rectangle
Line / Polygon*

*Clear Selection
Zoom Out*

USS Arizona Memorial





National
Park
Service

Layers

Mobile Atlas

- cross_sections
- Upper_Deck
- Main_Deck
- Second_Deck
- Third_Deck
- First_Platform
- Second_Platform
- Hold
- Double_Bottom
- Aerial Photo

Refresh Map

[Link to LizardTech](#)
To download Mr. SID
browser plugin

Map: 608332.55 , 2362802.39 -- Image: 180 , 248 -- ScaleFactor: 2.9553710915646944


Local Intranet

DEFINING THE FUTURE

Microsoft Internet Explorer - Microsoft Internet Explorer provided by TRW

Address: http://lizardtech/webdata/US5Arizona/viewer.htm

USS Arizona Memorial



Legend Layer List


Access Images:
By Feature
By Query


Zoom In
Zoom Out
Full Extent
Last Extent
Pan

Identify Query
Find
Measure
Set Units

Select by:
Rectangle
Line / Polygon

Clear Selection
Print





National Park Service

Layers

Visible Active

- cross_sections
- Upper_Deck
- Main_Deck
- Second_Deck
- Third_Deck
- First_Platform
- Second_Platform
- Hold
- Double_Bottom

Refresh Map

Third_Deck

Rec	OBJECTID	NAME	DESCRIPTIO	FEATUREID	ID	SHAPE_LEN	SHAPE_AREA	IMAGE
1	944	Trunk	Trunk to Dynamo Room	99999	50944	10.8927794067	6 46672007001	False

Select Rectangle

Map: 500831.34, 2362671.66 -- Image: 459, 365 -- ScaleFactor: 0.03391992731294603

Local Intranet



National Park Service

Layers

- Visible Active
- cross_sections
 - Upper_Deck
 - Main_Deck
 - Second_Deck
 - Third_Deck
 - First_Platform
 - Second_Platform
 - Hold
 - Double_Bottom

Refresh Map

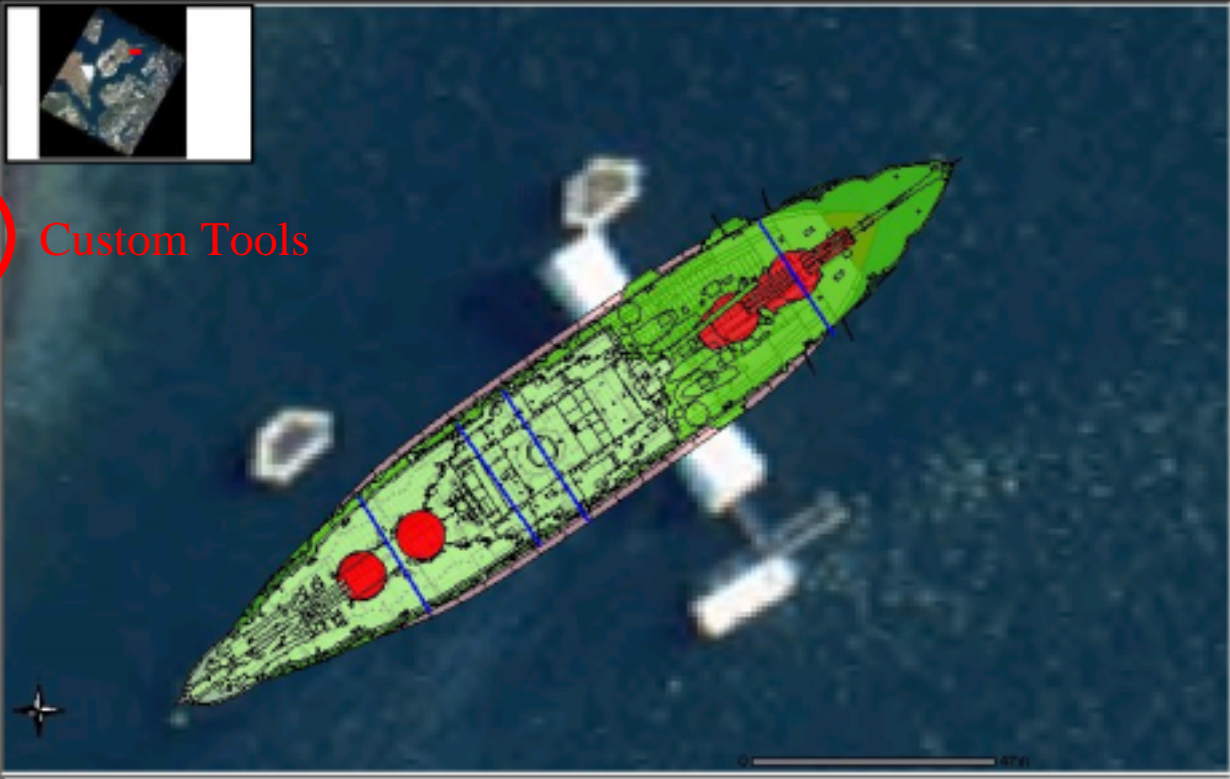
[Link to LizardTech](#)
To download Mr. SID browser plugin

ArcIMS Viewer - Microsoft Internet Explorer provided by Northrop Grumman Corporation

File Edit View Favorites Tools Help

Address <http://blmirad4/website/USSArizona/viewer.htm>

USS Arizona Memorial



Legend
Layer List

Access Images:
By Feature
By Query

Zoom In
Zoom Out
Full Extent
Last Extent
Pan

Identify
Query
Find
Measure
Set Units

Select by:
Rectangle
Line / Polygon

Clear Selection
Zoom In

Layers

Mobile Address

- cross_sections
- Upper_Deck
- Main_Deck
- Second_Deck
- Third_Deck
- First_Platform
- Second_Platform
- Hold
- Double_Bottom
- Aerial Photo

Refresh Map

[Link to LizardTech](#)
To download Mr. SID browser plugin

Map: 608917.43 , 2362837.89 -- Image: 535 , 385 -- ScaleFactor: 0.33041509891487

Local Intranet

Document Management

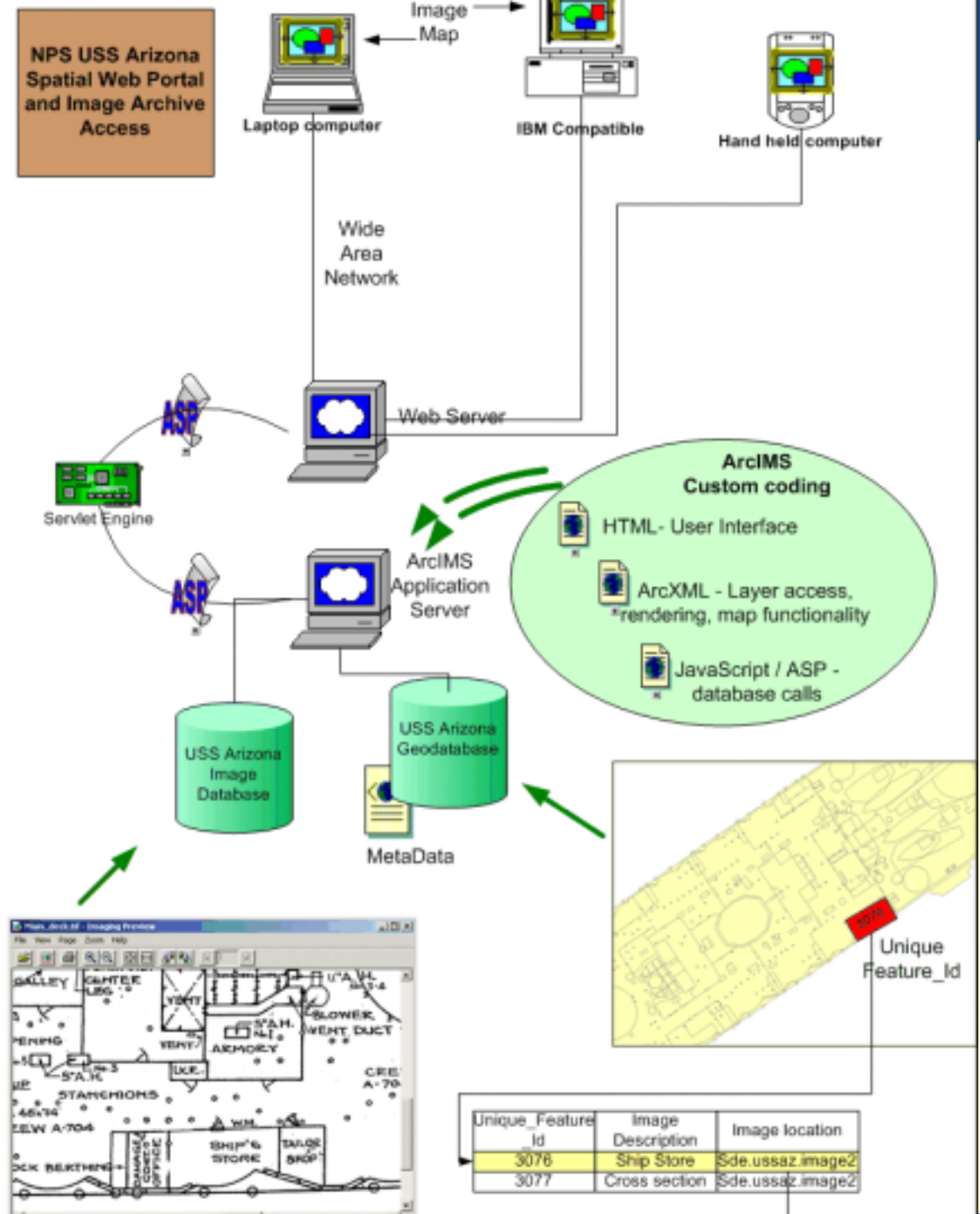
- NPS has 9,000 scanned images that relate to the USS Arizona
 - Original blue-print as-built plans
 - Existing plans and technical drawings
 - Photographs
 - Graphic and written results from archeological fieldwork and scientific and engineering analyses

- NPS research staff need a method to store these data in a centralized USARGIS database.

- Provide easy access to imagery through a web interface

NPS USS Arizona Spatial Web Portal and Image Archive Access

System Conceptual Architecture



Linking imagery with vectors

ArcGIS Viewer - Microsoft Internet Explorer provided by TRW

http://fahrad4/webaba_USSArizona/Viewer.htm

USS Arizona Memorial

National Park Service

Legend
Layer List

Access Imagery:
By Feature
By Query

Zoom In
Zoom Out
Full Extent
Last Extent
Pan

Identify
Query
Find
Measure
Set Units

Select by:
Rectangle
Line / Polygon

Clear Selection
Print

Select Point

1

Get features based on Feature ID: 60436

Accept Cancel

Num	theme	description
1	Cross Section View	Boiler Room

Layers

Visible Active

- cross_sections
- Upper_Deck
- Main_Deck
- Second_Deck
- Third_Deck
- First_Platform
- Second_Platform
- Hold
- Double_Bottom

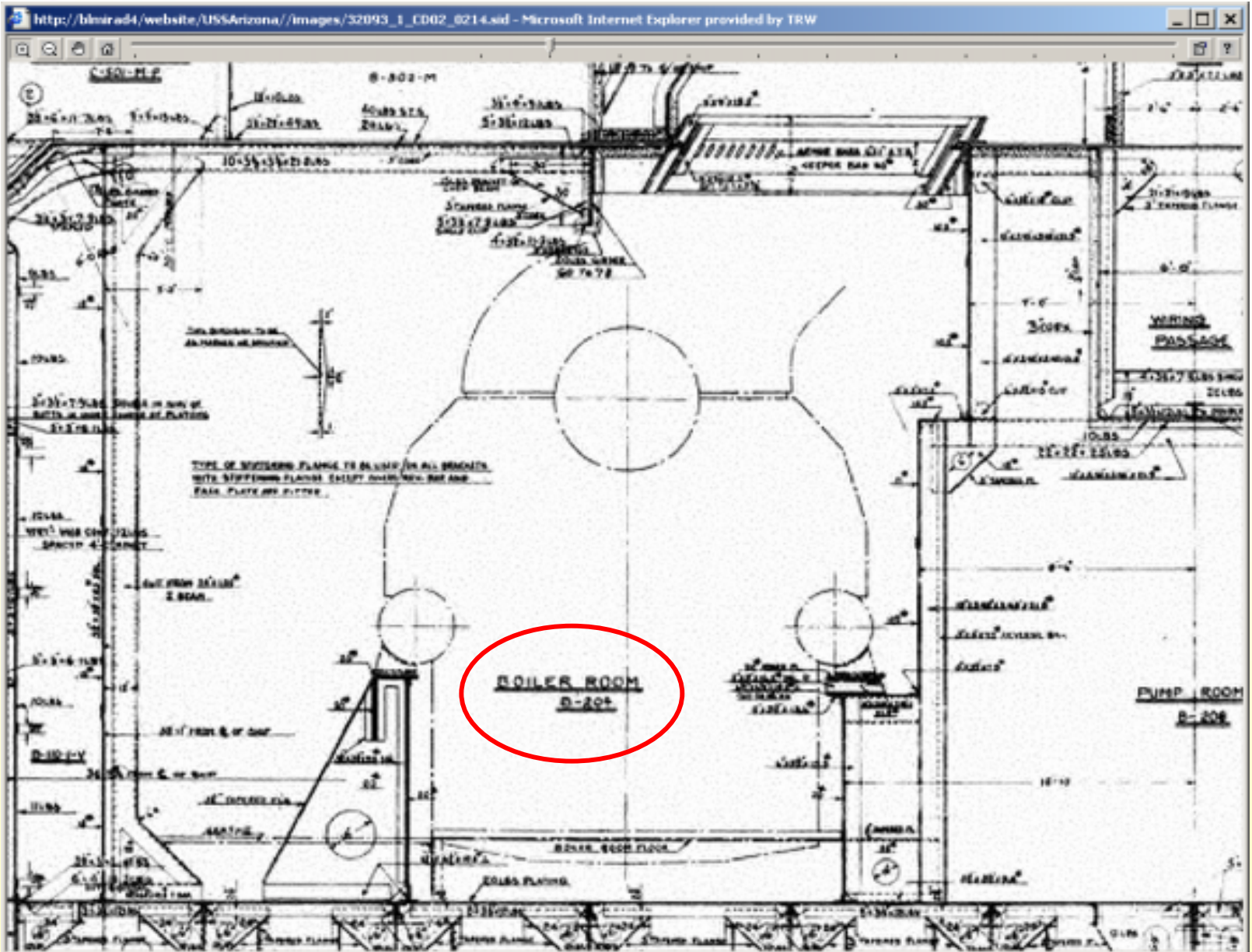
Refresh Map

First_Platform								
Rec	OBJECTID	NAME	DEScriptIO	FEATUREID	ID	SHAPE_LEN	SHAPE_AREA	IMAGE
1	436	Room	Boiler Room 4	B-204	60436	29.5118711568	33.5691880364	True

Map: 606846_43 , 2352060_13 -- Image: 469 , 418 -- ScaleFactor: 0.06753967462476126

Local Intranet

[Link to LizardTech](#)
To download Mr. SID
browser plugin



Select imagery by subject

The screenshot displays the USS Arizona Memorial website interface. The main content area shows a map of the memorial with a red rectangle highlighting a specific area. A dialog box titled "Select Picture Theme" is open, listing various themes. The "Gun Turret" theme is selected and circled in red. A red arrow points from the "By Query" option in the "Access Images" section to the dialog box.

Legend Layer List

Access Images:
By Feature
By Query

Zoom In
Zoom Out
Full Extent
Last Extent
Pan

Identify
Query
Find
Measure
Set Units

Select by:
Rectangle
Line / Polygon

Clear Selection
Print

Get Images

USS Arizona Memorial

National Park Service

Layers

Web Active

- cross_sections
- Upper_Deck
- Main_Deck
- Second_Deck
- Third_Deck
- First_Platform
- Second_Platform
- Hold
- Double_Bottom

Refresh Map

[Link to LizardTech](#)
To download Mr. SID browser plugin

Select Picture Theme

- Bottom Plating
- Cross Section View
- Engineering Deck Drawing
- Entire Ship
- Gun Turret**
- Hull
- Hull Design
- Hull, Armor
- Stem and Bow Framing
- Stern Post
- Torpedo Bulkheads
- Underwater bow mosaic
- Underwater picture
- USS Arizona Today

Accept Cancel

First_Platform
Selection cleared.

Map: 608628.93, 2362870.64 -- Image: 211, 381 -- ScaleFactor: 0.96763967462476326

Local intranet

Select imagery by subject

The screenshot shows a web browser window displaying a technical drawing of a ship's gun turret. The drawing is a plan view at the 4th level of the gun, showing various components and their arrangement. A red circle highlights the number '3' in the selection menu, and a red arrow points from this circle to the corresponding drawing area.

Num	Theme	Description
1	Gun Turret	Transverse section through axis of turret
2	Gun Turret	Plan View of Gun Turret at Shelf and Pan
3	Gun Turret	Plan View of Gun Turret at Shell Platform
4	Gun Turret	Plan View of Gun Turrets at 3rd Deck
5	Gun Turret	14 Inch Gun Turrets

Back Close

PLAN VIEW AT 4 OF GUN

PLAN VIEW AT DECK PLATIONS

NO OF SHELLS TO BE STORED
 1) 14 INCH GUN TURRET
 2) 14 INCH GUN TURRET
 3) 14 INCH GUN TURRET
 4) 14 INCH GUN TURRET
 5) 14 INCH GUN TURRET

Future Work

- Fully implement the geospatial web portal for the USS Arizona
- Support the NPS Submerged Resource Center with follow-up underwater diving research to track deterioration over time.
- Conduct spatial change detection on the deterioration of the ship