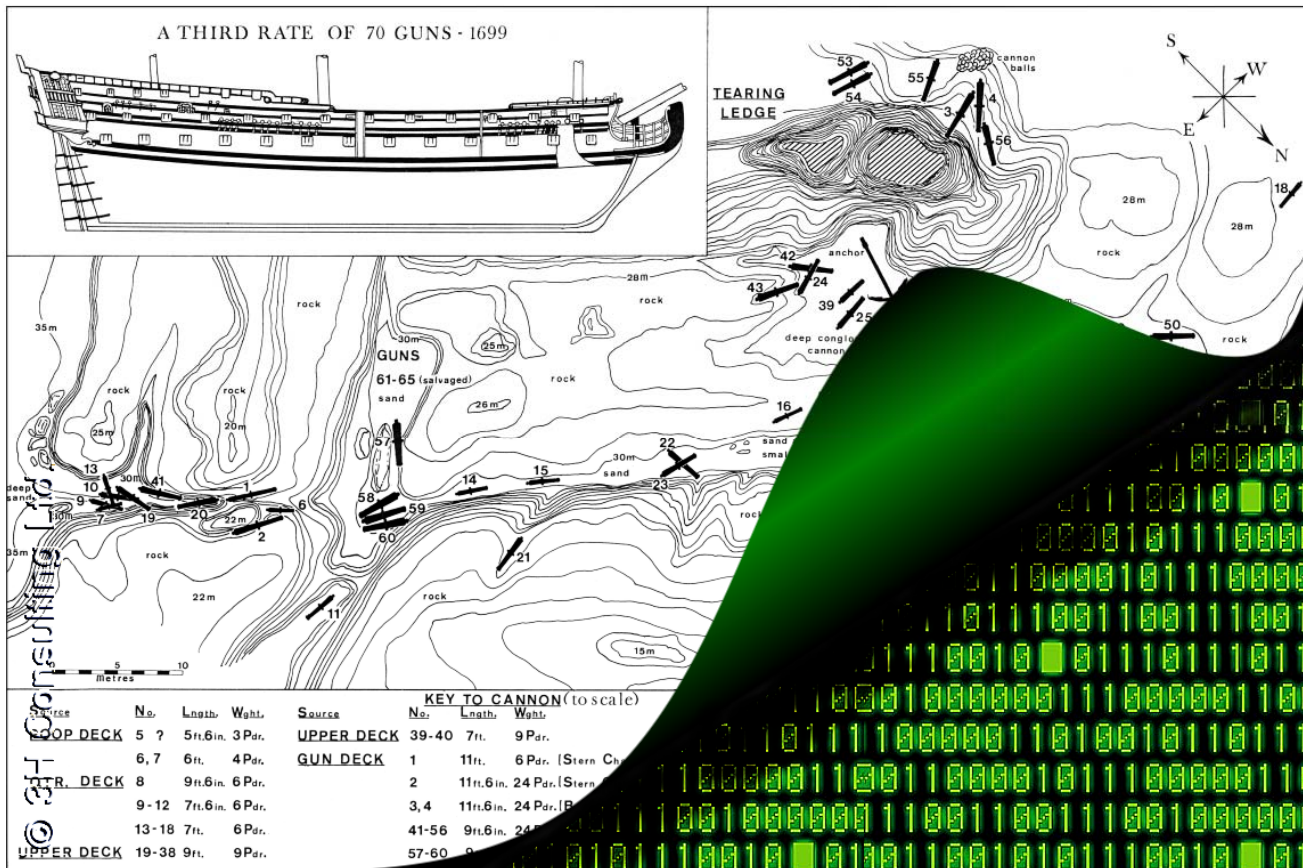
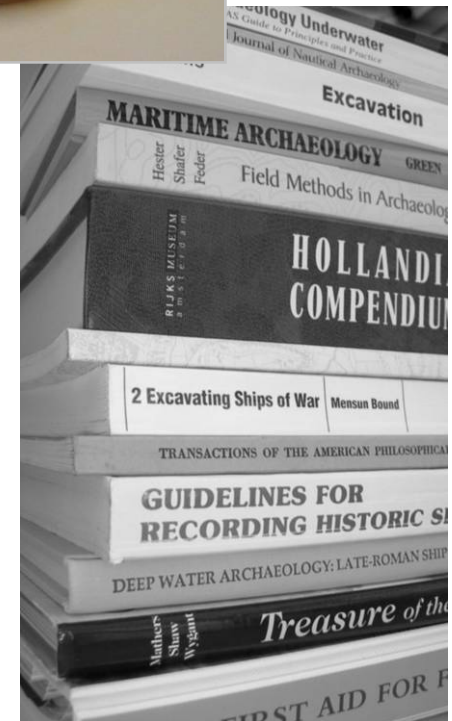


# Management of Digital Data in Maritime Archaeology



## The Site Archive

- Material Archive
  - Finds
  - Samples
- Documentary Archive
  - Initial project proposals
  - Project design documents
  - Primary records, finds records, dive logs
  - Drawings, photographs and video
  - Analysis results
  - Research reports and Interpretations
  - Publications
  - Computer generated models
  - Metadata





## 'Preservation by Record'

We need to record:

- The primary data, the original recordings taken at the site
- Activities, such as what has been done at the site
- Historical records, any documents or images relating to the site
- Reference documentation, information about similar sites and events

'We can record only a fraction,  
then publish even less'



## Recording System Types

- Paper recording systems
  - Notebooks
  - Pre-printed Forms
- Digital recording systems
  - Spreadsheet
  - Database
  - CAD System
  - Geographic Information System (GIS)
  - Information management System (IMS)



## Recording Systems – Paper Based Systems

### Benefits:

- Anyone can create them, anywhere
- They can be read or modified at any time
- They demonstrate that work has been done

### Drawbacks:

- Hard to copy and share
- Hard to find information
- Easy to lose or destroy





## Recording Systems – Spreadsheet

- A simple electronic recording system
- Information is recorded in rows and columns on a table
- Can be copied, searched, sorted and filtered
- Very easy to set up and use

The screenshot shows a Microsoft Excel spreadsheet titled "2000 Artifact.xls". The spreadsheet contains a table with the following columns: ID, Artifact Number, Simple Name, Full Name, Classification, Material, Date Found, Associated With, Recovery Date, Dive Reference, Location Reference, and Location Description. The data rows are numbered 1 through 55. The table lists various artifacts such as "Unidentified", "Concrete", "Tools and Eqpt.", "Ceramic - Iron", "Ceramic - China", "Ceramic - Stoneware", "Glass", "Ceramic - Brick", "Ceramic - Other", "Organic - Wood", "Metal - Silver", and "Glass".

ID	Artifact Number	Simple Name	Full Name	Classification	Material	Date Found	Associated With	Recovery Date	Dive Reference	Location Reference	Location Description
41	228 2000 A0059	Unidentified				70	Feature 2	06-Aug-00	TVH-2000-0070	B1AB	Outboard stern tr
42	200 2000 A0031	Concrete			Metal - Iron	59		04-Aug-00	TVH-2000-0059	B1AB	Trench 1 outboard
43	229 2000 A0060	Unidentified	Tools and Eqpt.		Ceramic - Other	70	Feature 2	06-Aug-00	TVH-2000-0070	B1AB	feature 2
44	230 2000 A0061	Unidentified	Tools and Eqpt.		Ceramic - China	70	Feature 2	06-Aug-00	TVH-2000-0070	B1AB	stern
45	231 2000 A0062	Unidentified	Environmental			70	F2	06-Aug-00	TVH-2000-0070	B1AB	feature 2
46	233 2000 A0064	Unidentified			Ceramic - Stoneware	70	Feature 2	06-Aug-00	TVH-2000-0070	B1AB	feature 2
47	227 2000 A0058	Unidentified	Tools and Eqpt.			70	Feature 2	06-Aug-00	TVH-2000-0070	B1AB	feature 2
48	237 2000 A0068	Bottle	Tools and Eqpt.	Cargo	Glass	70		06-Aug-00	TVH-2000-0070	B1AB	Outboard stern
49	232 2000 A0063	Unidentified			Ceramic - Stoneware	70	Feature 2	06-Aug-00	TVH-2000-0070	B1AB	trench 1
50	236 2000 A0067	Brick	Tools and Eqpt.	Cargo	Ceramic - Brick	70		06-Aug-00	TVH-2000-0070	B1AB	B1AB
51	216 2000 A0047	Pipe	Recreational	Cargo	Ceramic - Other	70	0046,0045, Feature 2	06-Aug-00	TVH-2000-0070	B1AB	concretion
52	209 2000 A0040	Unidentified			Organic - Wood	67		06-Aug-00	TVH-2000-0067	B1AB	
53	210 2000 A0041	Knife-handle	Tools and Eqpt.	Cargo	Organic - Wood	67		06-Aug-00	TVH-2000-0067	B1AB	concretion F2
54	211 2000 A0042	Ducaton	Specie		Metal - Silver	69	Feature 2	06-Aug-00	TVH-2000-0069	B1AB	outboard stern
55	212 2000 A0043	Bottle	Tools and Eqpt.		Glass	70	Feature 2	06-Aug-00	TVH-2000-0070	B1AB	???



## Recording Systems – Database

- Similar to a spreadsheet but more powerful
- Provides forms for manipulating data
- Queries provide sorting and filtering capability
- Requires more expertise to set up

**Artefact Record Form**

Site Code: TVH1735.00  
Artefact Number: 2000 A0024  
Part Number: [ ]  
Simple Name: Knife-handle  
Full Name: Tools and Eqpt.  
Classification: [ ]  
Material: Organic - Wood  
Create No: [ ]  
Associated With: 2000 A.0025, cu ferrule  
Feature Number: #Name?  
Recovered: 02 August 2000  
Dive Reference: TVH-2000-0057  
Seabed Type: Sand  
Loc'n Reference: B1B  
Loc'n Desc: Trench 1, north west.

Fix Number: [ ]  
Context: Outboard - Post Wreck  
Collection Met'd: Sieve  
Length: 95mm  
Width / Diameter: 35mm - 14m  
Height / Thickness: [ ]  
Weight: [ ]  
Condition: Excellent  
Completeness: 100%

Pre-Treatment: Untouched  
Storage Medium: Wrapped  
Location on Boat: [ ]  
Sent Ashore Date: [ ]  
U/W Photo: [ ]  
Photo 1: \Pictures\Camera\Artefar  
Photo 2: \Pictures\Camera\Artefar  
Photo 3: [ ]  
Object Drawing: [ ]  
Radiograph: [ ]  
Sample: [ ]  
Notes: Geometric patterns on handle. Concreted. Part of tang may still be in handle as concretion extruding from top. Very stained.

Record: 24 of 592

**Finds** Monument 10000

Find: 20000 NEW FIND

Type: HARPOON  
Material Type: BONE  
From: Early Mesolithic  
To: Early Mesolithic  
Location: British Museum  
EvUID: 30000  
FromCont: ?  
ToCont: ?  
UnknownDate:   
Location Ref: 1929.12-19.2

Summary: Was in the private collection of Mr. William Morfitt (Armstrong 1922). Maglemosian, later period (Boreal period - Zone V, or Late Boreal)

Description: 4 and 13/16 inches (0.1222m) long, 1/2 inch (0.0127m) wide, 1/4 inch (0.0064m) thick. Sharply pointed at one end and flattened at the other, which shows indications of an ancient fracture. 11 bars, arranged in two groups of eight and three. The group of 8 are cut triangular in section. The remainder of the harpoon is oval in section. A double space separates the two series of bars, which differ in character. The 8 are regularly spaced and delicately cut, the 3 are

General Detail  
Length: 22.20mm Width: 12.70mm Thickness: 6.40mm Diameter: [ ] Weight: [ ]

Artefact Condition  
Completeness: Incomplete  
Condition1: Broken - ancient  
Condition2: Good  
Condition3: [ ]

Ceramic Detail  
Form: [ ]  
Fabric: [ ]  
Sherd Type: [ ]  
Inclusions: [ ]

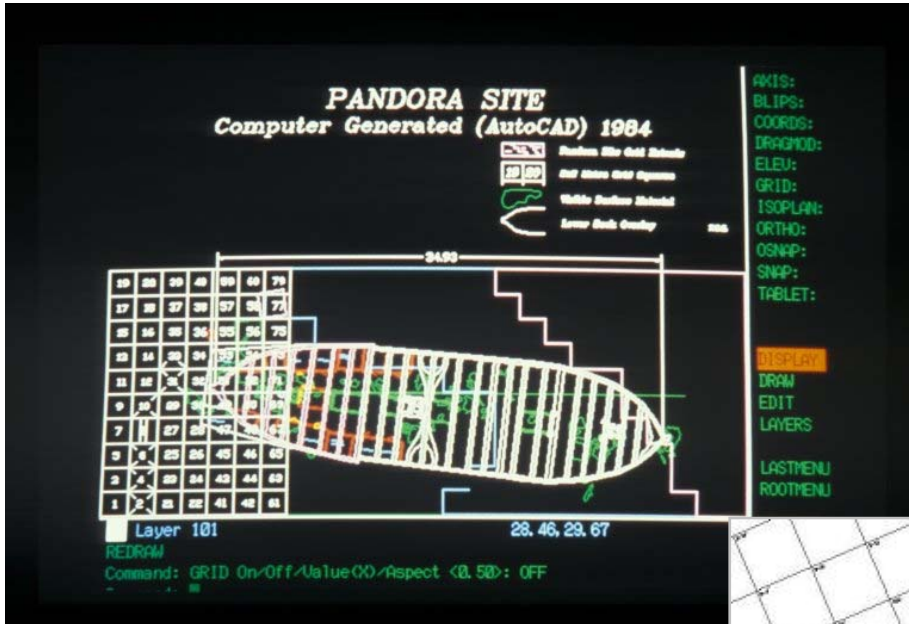
Flint/Stone Detail  
Flake Type: [ ]

Record: 1 of 1

References  
Status: Museum Accession Number  
StatusRef: 1929.12-19.2  
Note: British Museum

Record: 1 of 2

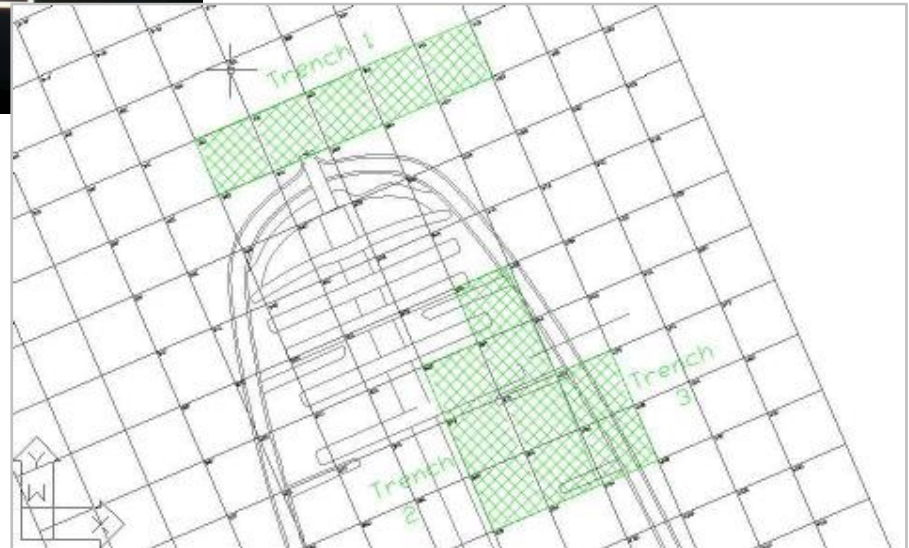
## Recording Systems – CAD System



*Pandora 1984*

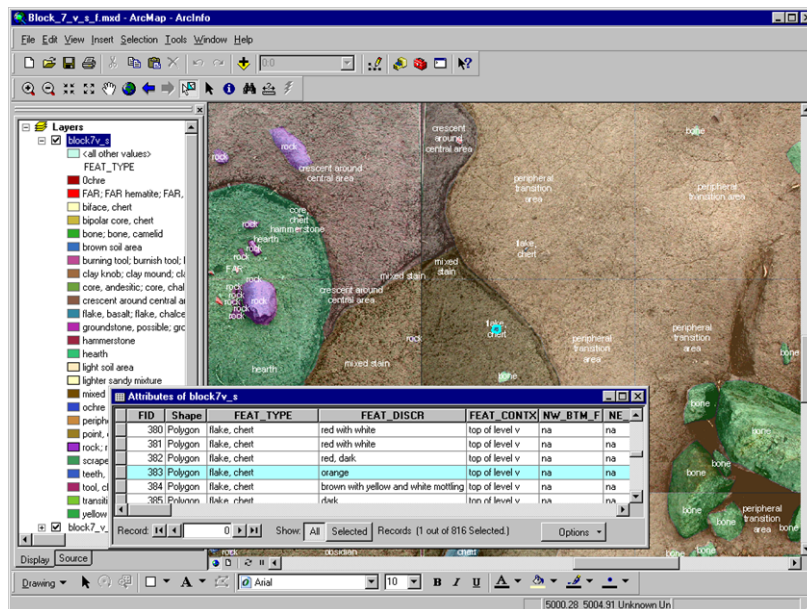
- Used for recording site plans and drawings
- Many types available from simple 2D systems to full 3D

*Vliegent Hart 2000*



## Recording Systems – Geographic Information System

- A GIS is effectively both a database and a CAD program
- Provides the data handling of a database with displays of spatial data
- Basic GIS is useful for display only
- Requires expertise to set up and use





## Recording Systems – Information Management System

- Information Management Systems are designed for specific applications
- Provides both display and processing capability with support tools
- Easier to set up and use than conventional GIS

The screenshot displays the 'USS Monitor 2008' software interface. The main window shows a 3D perspective view of the USS Monitor wreck. A toolbar is visible at the top. On the right, a tree view lists various data layers such as '1994 Season', '1993 Season', '1979 Areas', '1979 Test Excavation L', '1977 Season', 'General', 'ARCGIS', 'Hull Drawing', 'Hull Fouling', 'Hull Plating', 'Hull Bottom Plating', 'Hull Port Armor Belt', 'Hull Misc.', 'Hull Propeller', 'Hull Internal', 'Hull Turnet', 'Examples', 'Location', 'Wreck L', 'Sealed Features', 'Sanctuary', 'Moorings', '20MicContour', 'Coastline', and 'Sea'. A 'Preview - MON001.TIF' window shows a detailed image of a bottle. An 'Artefact - ANMS- 79-1' dialog box is open, showing details for a bottle found in 79 Area E on 3 Aug 1979.

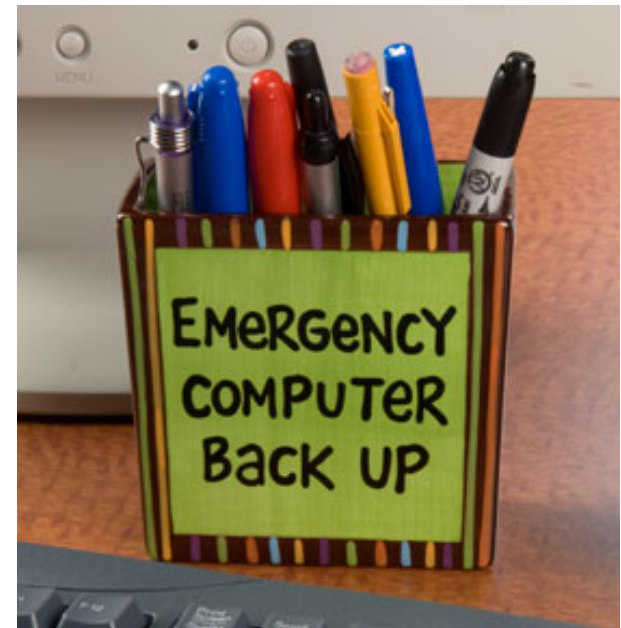
Id	Im	Name	Previous name(s)	Object Class	Object Type	Material	Description	Dive Found	Date Found	Dive Recovered	Date Recovered	Collect Method	Recovery
77-1	118			Tools and Equ.	Lamp								
77-2	117			Ship Structure	Hull - Plate								
79-1	116			Ship Stores	Bottle	Glass - Bottle	Bottle, Dark Green Glass, 11.25H	79 Area E	Not set	3 Aug 1979		Recovered	NDA/A/H/E
79-2	115			Ship Stores	Bottle							Recovered	NDA/A/H/E
79-3	114			Miscellaneous	Unidentified						17 Aug 1979	Recovered	NDA/A/H/E
79-4	113			Miscellaneous	Concretion						17 Aug 1979	Recovered	NDA/A/H/E
79-5	112			Miscellaneous	Unidentified	Composite	Wood Fragment...	79 Area A	Not set		17 Aug 1979	Recovered	NDA/A/H/E
79-6	111			Miscellaneous	Unidentified	Digirac: Wood	Wood Fragment	79 Area A	Not set		17 Aug 1979	Recovered	NDA/A/H/E
79-7	110			Ship Stores	Bottle	Glass - Bottle	Bottle, Light Gre...	79 Area D	Not set		17 Aug 1979	Recovered	NDA/A/H/E



## Digital Recording - Disadvantages

Disadvantages include:

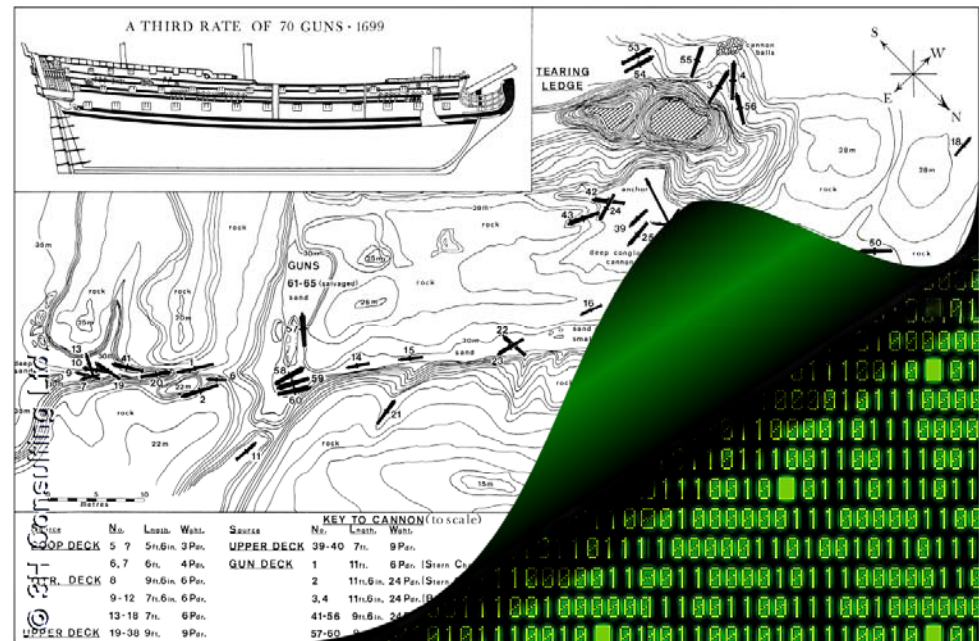
- Requires a computer
- Requires a power supply
- Some systems are over-complex
- Requires some computing skills





## Recording System Requirements

- Information capture
- Ease of use
- Sharing
- Backup and Archiving
- Searching, Sorting and Associating
- Data Validation
- Collection Management
- Publishing





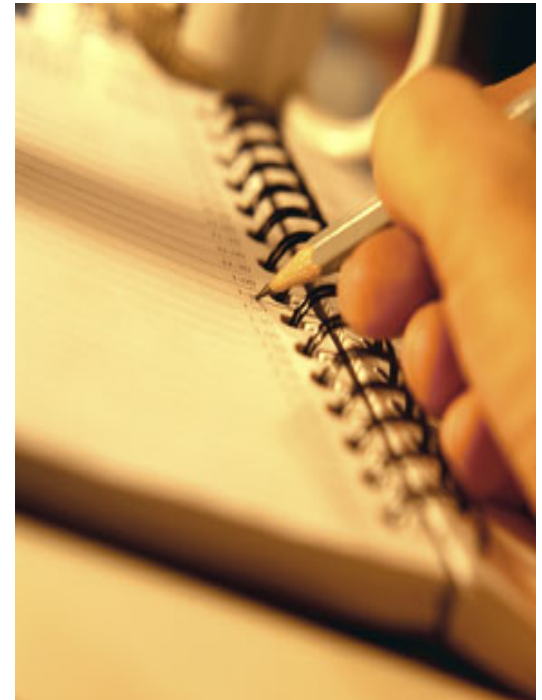
## Requirements – Information Capture

Information capture must be:

- Efficient
- Systematic
- Organised

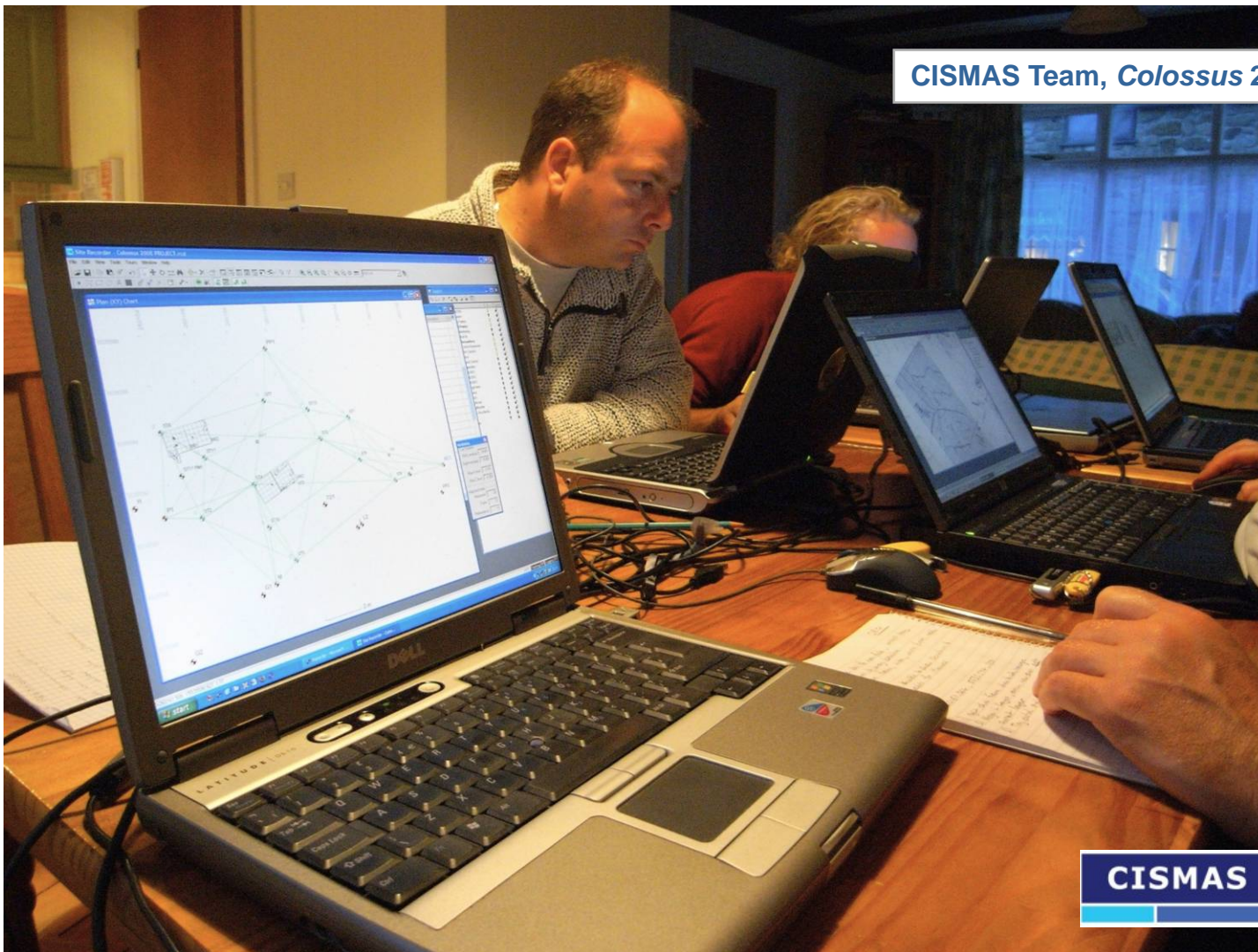
Separate hard facts from interpretation

Preservation by record demands high quality recording





## Requirements – Ease of Use



CISMAS Team, Colossus 2008





## Requirements - Sharing

- A complete set of site records can be stored on a few DVDs
- Digital files are easily copied
- Copying is cheap
- Allow widespread sharing of primary data
- Enable data re-use using open standards and metadata





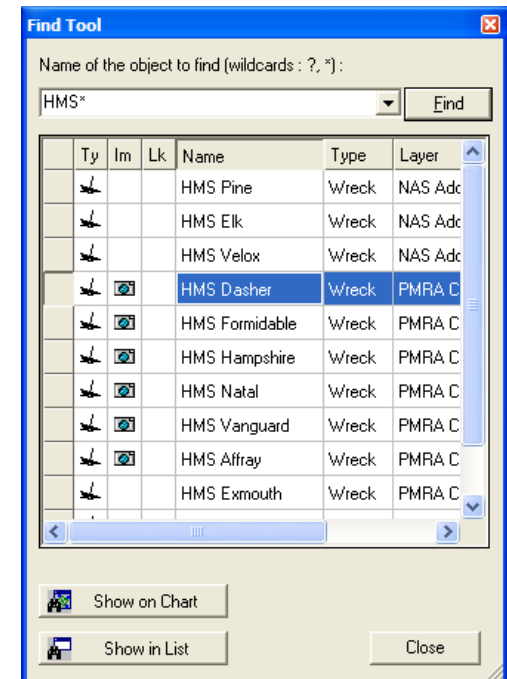
## Requirements - Backup and Archiving

- Backup site data during fieldwork
- Archive primary digital data sets
- Small size, easy to store
- Easy to copy, easy to share
- Can be updated
  
- Mitigates against loss or damage



## Requirements – Searching, Sorting and Associating

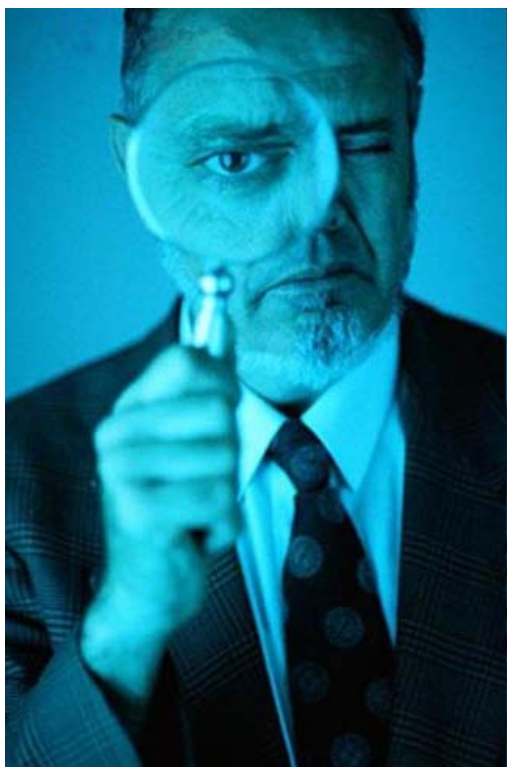
- Finding information is easy with digital data
- Searches are quick and accurate even with big data sets
- Wildcards allow flexible search queries
- Can quickly go to the required information
- Keywords can help searches work better



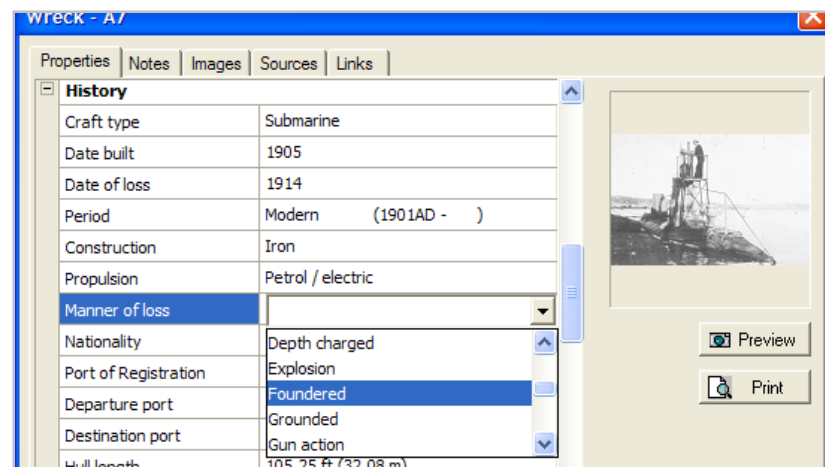


## Requirements - Data Validation

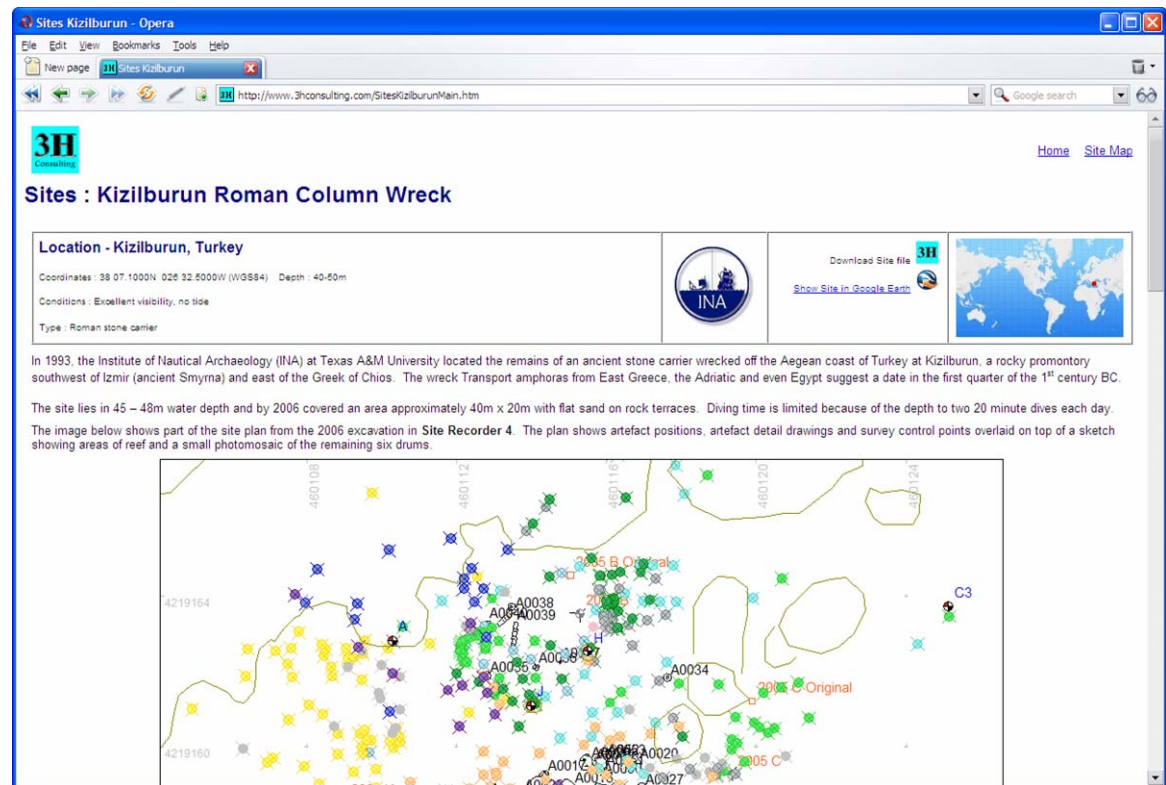
Validation restricts what is added by limiting the range of values that can be used



- Validation minimises mistakes
- Applies a recording standard
- Crucial for large teams
- Uses wordlists and thesauri



The Web can provide immediate public access to primary data



**Sites Kizilburun - Opera**

File Edit View Bookmarks Tools Help

New page 3H Sites Kizilburun

http://www.3hconsulting.com/SitesKizilburunMain.htm

Google search

**3H Consulting** [Home](#) [Site Map](#)




**Sites : Kizilburun Roman Column Wreck**

**Location - Kizilburun, Turkey**

Coordinates : 38 07.1000N 026 32.5000W (WGS84) Depth : 40-50m

Conditions : Excellent visibility, no tide

Type : Roman stone carrier

Download Site file [Show Site in Google Earth](#)

In 1993, the Institute of Nautical Archaeology (INA) at Texas A&M University located the remains of an ancient stone carrier wrecked off the Aegean coast of Turkey at Kizilburun, a rocky promontory southwest of Izmir (ancient Smyrna) and east of the Greek of Chios. The wreck Transport amphoras from East Greece, the Adriatic and even Egypt suggest a date in the first quarter of the 1<sup>st</sup> century BC.

The site lies in 45 – 48m water depth and by 2006 covered an area approximately 40m x 20m with flat sand on rock terraces. Diving time is limited because of the depth to two 20 minute dives each day.

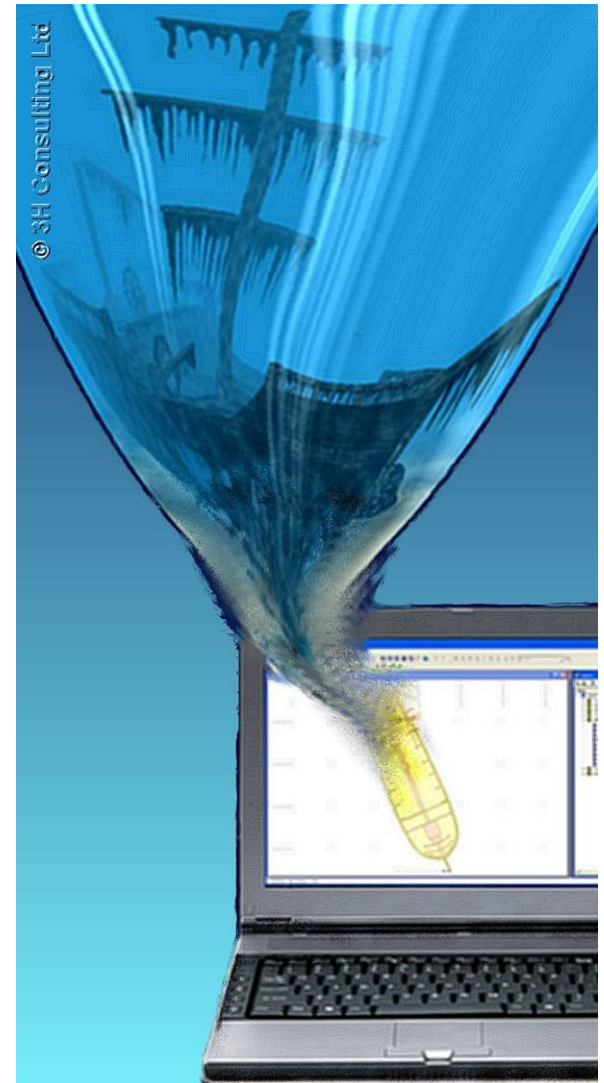
The image below shows part of the site plan from the 2006 excavation in **Site Recorder 4**. The plan shows artefact positions, artefact detail drawings and survey control points overlaid on top of a sketch showing areas of reef and a small photomosaic of the remaining six drums.



## Information Types

We need to record:

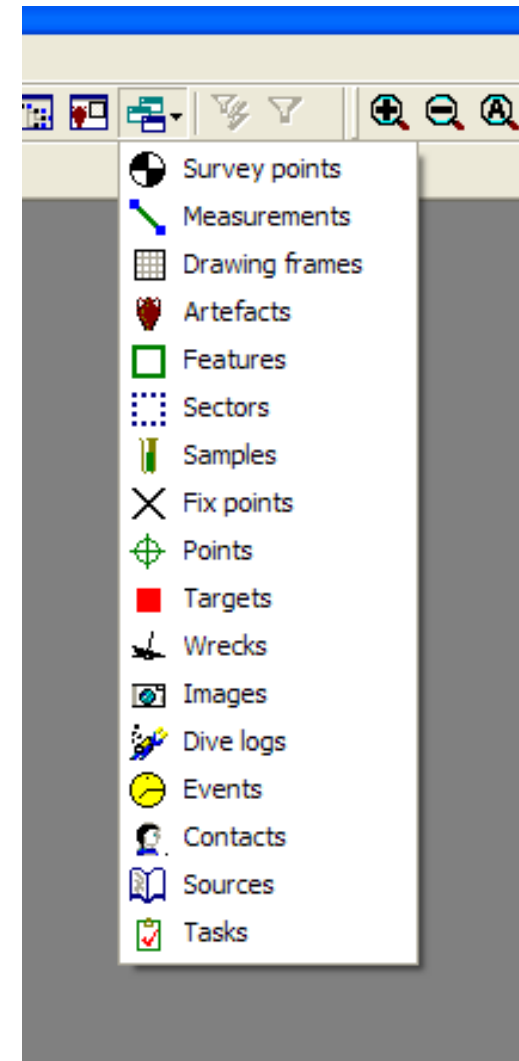
- The primary data
- Activities
- Historical records
- Reference documentation





## Records as 'Objects'

- Site plans
- Artefacts (finds) & Features
- Sectors (trenches, areas)
- Survey points & measurements
- Drawing frames
- Targets & Wrecks
- Images, Video & Image Basemaps (raster)
- Events & Dive Logs
- Contacts (people & organisations)
- Samples & Sources (documents)
- Tasks & Logbooks
- Sites, Projects & Layers





## Recording an Object

Artefact - POMR- 05T0052

Recording | Properties | Notes | Position | Images | Sources | Samples | Links

**Recording**

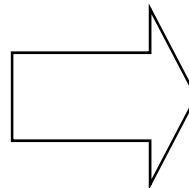

Name	05T0052
Previous name(s)	T0052
Object Class	Ship Structure
Object Type	Hull : Floor
Material	Organic : Wood
Description	U shaped piece of ships timber
Dive Found	
Date Found	1 Oct 2005
Dive Recovered	
Date Recovered	6 Oct 2005

**Description**  
A description of the source

Record: < < > >

Preview Print

OK Cancel Help



Property	Type
Name	Text (verified)
Previous name(s)	Text
Object Class	Wordlist
Object Type	Wordlist
Material	Wordlist
Description	Text
Dive Found	Object Link
Date Found	Date
Dive Recovered	Object Link

etc.

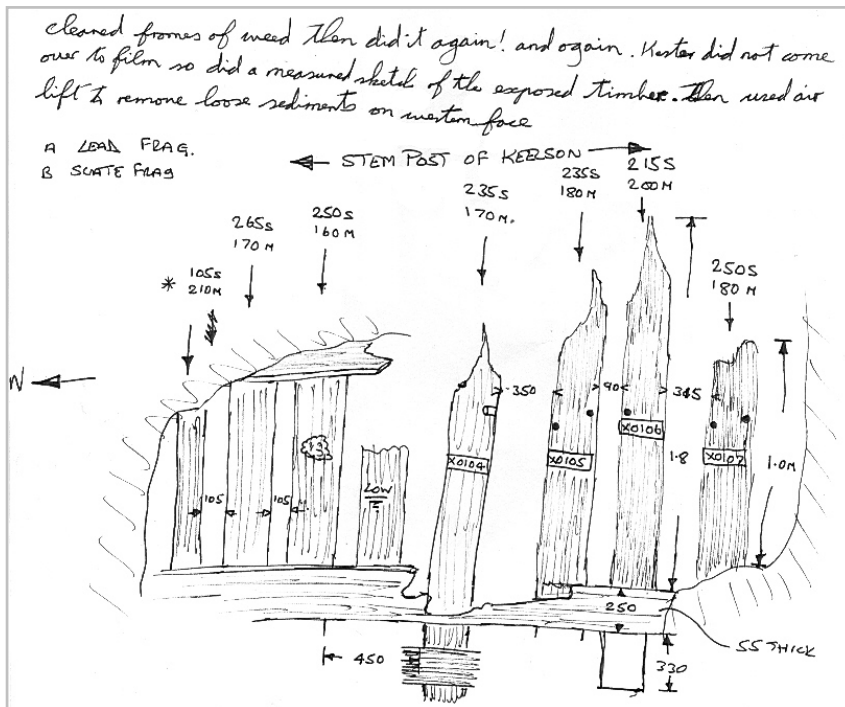


## Names and Object Identification

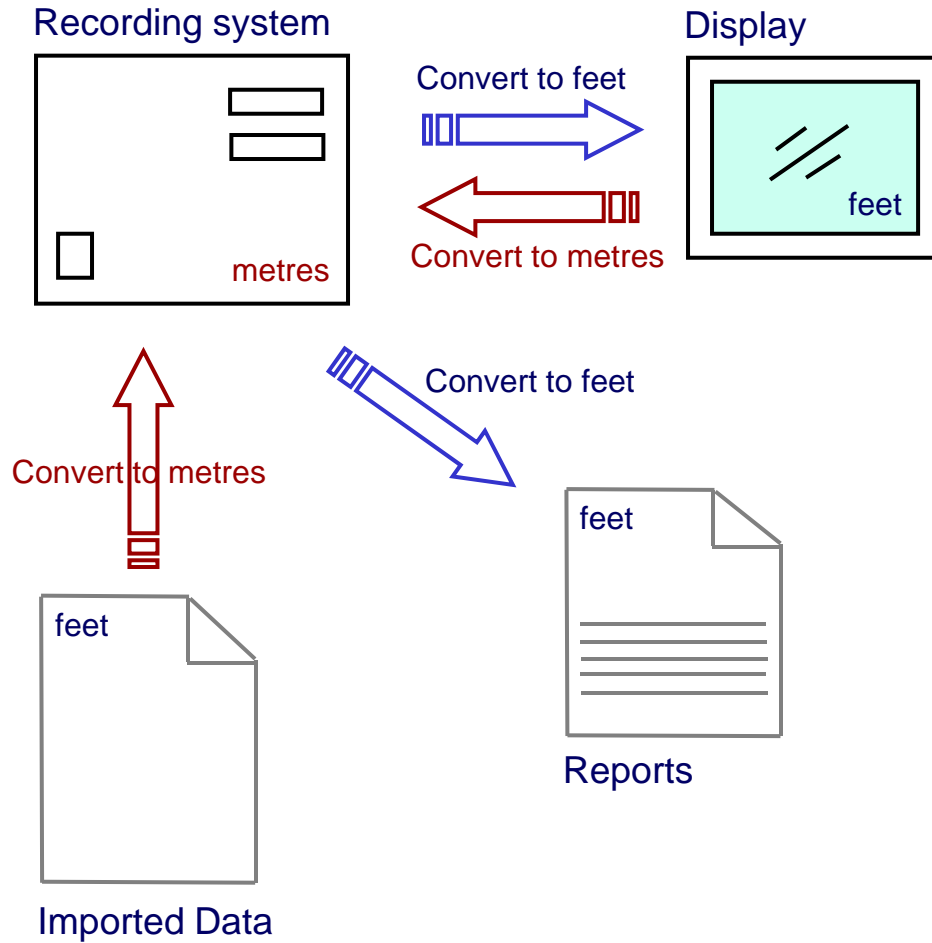
- Unique identifier for each object
- Allow flexible naming / numbering scheme
- Avoid fixed scheme using codes
- Use leading zeroes – ‘A00123’ not ‘A123’
- Use 2 digit year codes ‘08A00123’
- Use names for obvious features such as guns and anchors: ‘Gun12’, ‘Anchor 3’

Ty	Im	Name	Previous name(s)	Ob
♥		03A0138	A0138	
♥		03A0137	A0137	
♥	📷	03A0136	A0136	Sto
♥	📷	03A0135	A0135	Foc
♥		03A0134	A0134	Shi
♥		03A0133	A0133	Sto
♥		03A0132	A0132	Sto
♥		03A0131	A0131	
♥	📷	03A0130	A0130	
♥	📷	03A0129	A0129	
♥	📷	03A0128	A0128	
♥		03A0127	A0127	
♥		03A0126	A0126	
♥	📷	03A0124	A0124	Sto
♥		03A0010	A0010	
♥	📷	03A0012	A0012	Re
♥		03A0013	A0013	Shi
♥		03A0015	A0015	Tor
♥	📷	03A0016	A0016	
♥		03A0018	A0018	Shi
♥		03A0019	A0019	Shi
♥		03A0169	A0169	
♥	📷	03A0123	A0123	Foc
♥	📷	03A0122	A0122	Clo

- Free-form text
- Used to record 'anything else'
- Can be used for interpretation
- Can be used to record discussions

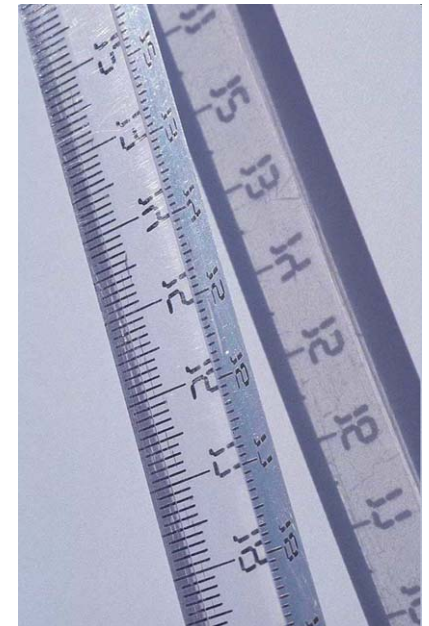


# Recording Units



## Units:

- Distance
- Weight
- Time
- Date



Draw artefacts, structure, trenches etc.

Show an artefact as:

- A simple point
- A 2D plan drawing
- A 3D wireframe drawing
- A 3D solid





## The Site Code

The site code uniquely defines each site

- Used when comparing or merging two datasets
- To identify objects with the same name from different sites
- Codes must be unique
- There are no agreed standards
- Code based on location and name, NOT date
- Can be prepended to object names: 'POMR 05A00213'

Example site codes:

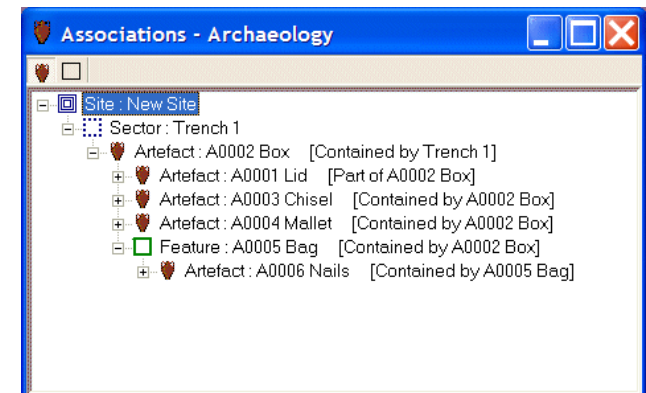
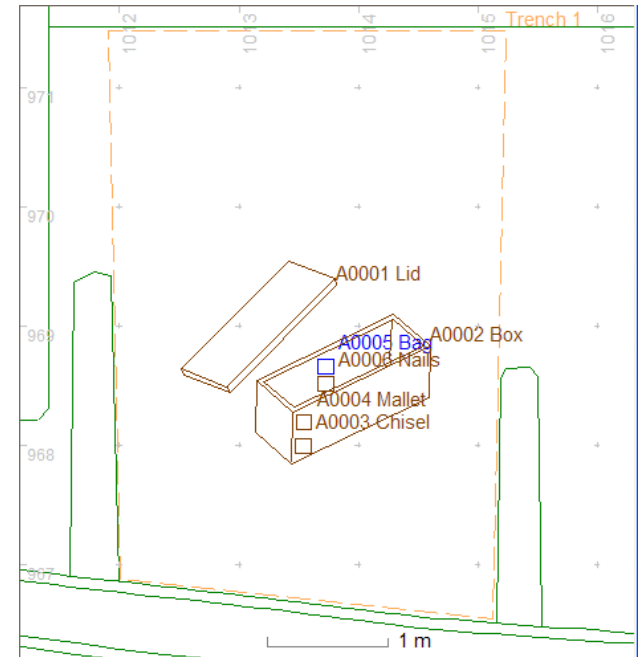
Mary Rose, Portsmouth	POMR
Cattewater, Plymouth	PLYCAT
USS Monitor	MNMS
Rooswijk, Goodwin Sands	GSRK

## Recording Associations

Record more about the relationship between objects  
Useful for later interpretation

Associations between objects include:

Next to	A loose spatial relationship
Above	More specific than 'Next to'
Below	More specific than 'Next to'
Contained by	A tight spatial relationship
Part of	A tight relationship



# Wordlists and Thesauri

Artefact - MRT- 05A0034

Recording | Properties | Notes | Position | Images | Sources | Samples | Links


**Recording**

Name	05A0034
Previous name(s)	A0034
Object Class	Ship Stores
Object Type	Glass
Material	Glass: Bottle
Description	Glass: Bottle Ceramic : Brick Ceramic : China Ceramic : Earthenware Ceramic : Other Ceramic : Stoneware Ceramic : Tile
Dive Found	
Date Found	1 October 2005
Dive Recovered	
Date Recovered	1 October 2005

**Material**  
The primary material the object is made of

Record:

OK Cancel Help



- A list of approved words
- Used for data validation

Table : Arch Material

Value
Ceramic : Brick
Ceramic : China
Ceramic : Earthenware
Ceramic : Other
Ceramic : Stoneware
Ceramic : Tile
Glass : Vessel
Glass : Bottle
Glass : Flat
Glass : Other
Metal : Copper
Metal : Copper Alloy
Metal : Gold
Metal : Iron
Metal : Iron : Cast
Metal : Iron : Wrought
Metal : Lead
Metal : Pewter
Metal : Silver
Metal : Tin
Metal : Other

Add Word  
Delete Word  
Sort Words  
Import CSV  
Export CSV  
Set Defaults

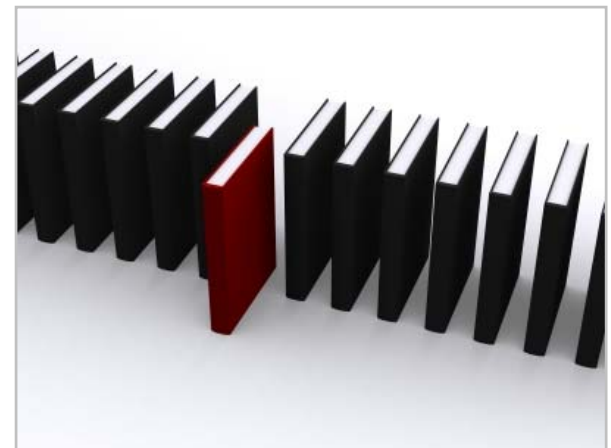
OK Cancel Help



## Version Control

‘The version number uniquely defines each data set’

- Each copy of the archive must have a version number
- The version number used to identify the latest version
- Update the version number when the dataset changes
- Clearly identify the master version of the dataset
- Avoid making changes to other versions





## Documenting the Archive

The documentation should include:

- Project title
- History of the project
- Purpose of the project
- Topics of research
- Geographic and temporal extents
- Information about Methods
- Methods used to create the dataset
- Finds recording methods
- Survey and geo-referencing methods
- Sampling strategy
- Details of Source Materials
- Archives used for initial assessment
- Maps and charts
- Descriptions of previous work on site
- Known copyrights

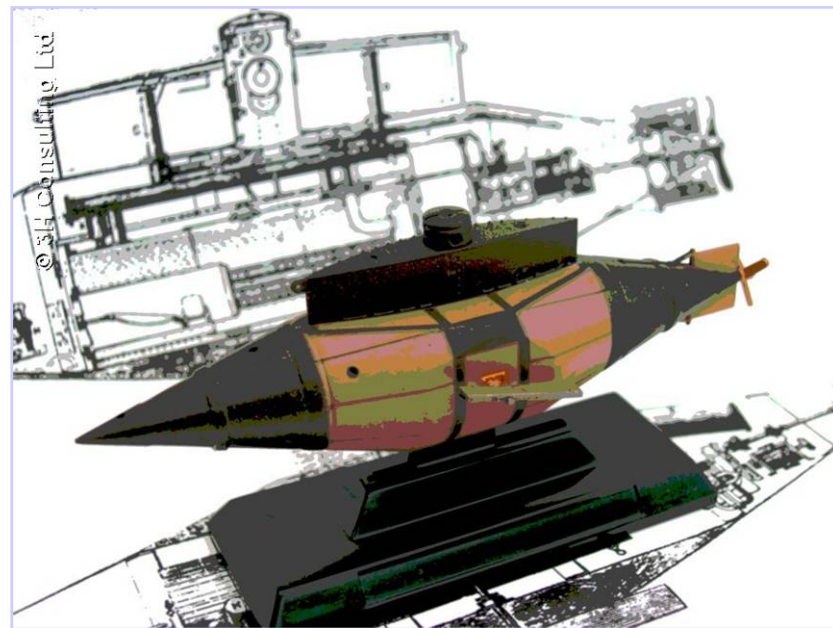
- Content and Structure
  - List of filenames and a description of contents
  - Description of naming convention
  - List of codes and what they mean (if used)
  - Description of any known errors
  - Description of any known areas of weakness
- Wordlists, thesauri
- Names of the primary project staff
- History of format changes to the dataset
- Archives and Publications
  - References to publications about the site
  - Information about any museums or archives which hold related material
  - Information about non-public related material



## Metadata

- Metadata is used to describe the archive
  - Allows others to see a summary of the contents
  - Identifies scope and relevance
  - Identifies versions
- 
- Standards defined by the Dublin Core

‘Metadata is data about data’





## Data Security

- Backup to an external hard drive or CD at the end of each day
- Clearly marked with contents, version and date of creation
- Use a separate external hard drive for the online backup
- Test the data recovery procedure (to be used after data loss)
- File Archiving should be used for all important projects
- Update the Site file version when the file is backed up
- Install up-to-date antivirus software





## Existing Standards



- Recording systems should comply with local or national standards
- Allows data use with no translation
- Minimises translation errors
- Makes use of knowledge and experience already in the existing system



## Data Sources for each Project Phase

### Planning and Assessment

↳ Search

↳ Survey and Monitoring

↳ Excavation

↳ Conservation

↳ Analysis and Interpretation

↳ Reporting and Archiving

Typical sources of information include:

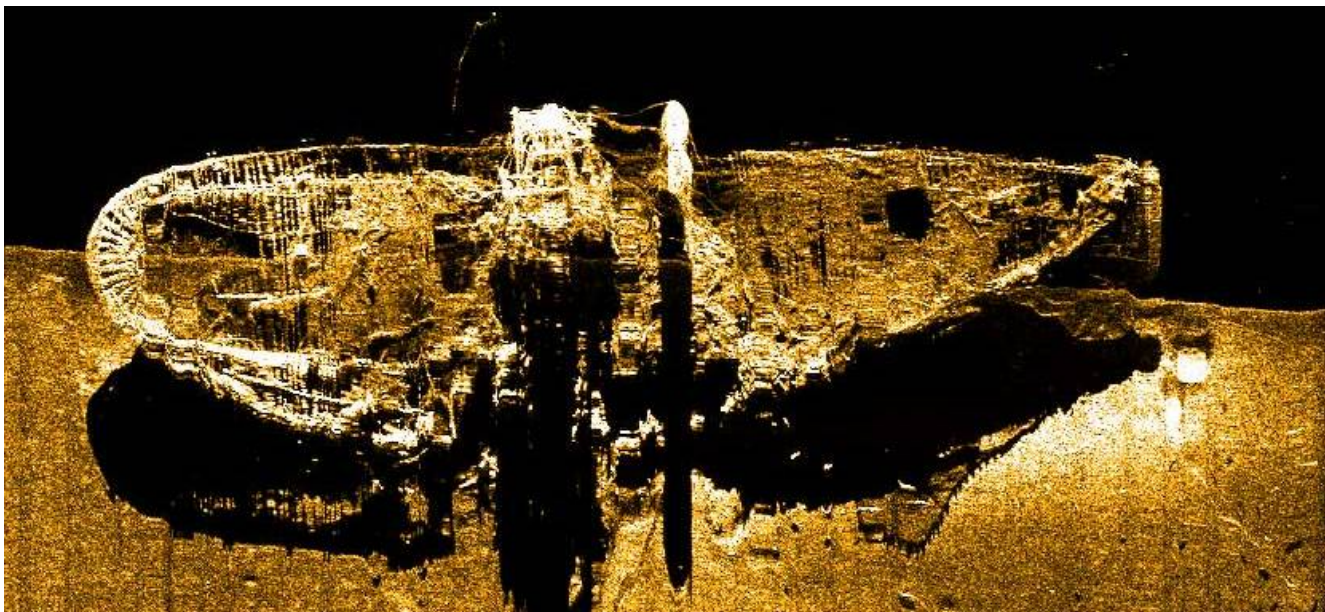
- Modern charts and maps
- Old charts and maps
- Reports from previous work
- Existing site plans
- Newspaper articles
- Web sites
- Environmental reports
- Photographs



## Data Sources - Search

Typical sources of information include:

- Raw magnetometer data
- Sub bottom profiler traces
- Multibeam (MBES) data as a post-processed image
- Sidescan sonar data as a post-processed mosaic
- Lists of targets



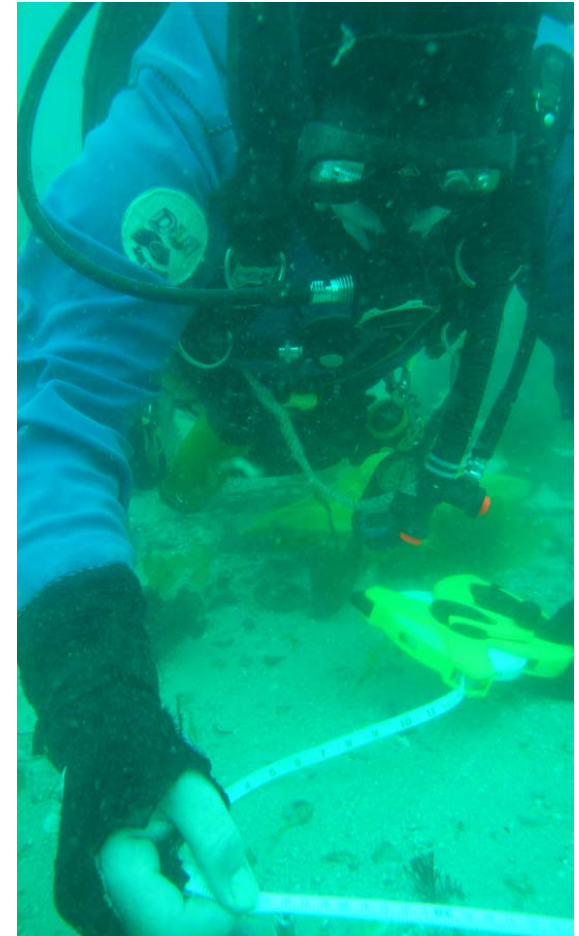
*Portland Wk*

## Data Sources – Survey and Monitoring

Typical sources of information include:

- Primary, secondary and detail control points
- Distance, depth, height, offset, ties and radial measurements
- Surface position measurements from GPS
- Subsea positions from an acoustic system (APS)
- Drawing frame drawings
- Photomosaics
- Point positions from 3D Photogrammetry
- Tide measurements for correcting depths
- Survey measurements defined above
- Sediment depth measurements

*Colossus 2008*



Typical sources of information include:

- Artefact records
- Artefact in-situ photographs and video
- Artefact recovery photographs and video
- Artefact registration photographs
- Artefact drawings
- Feature and context records
- Trenches and Areas
- Sample records
- General site photographs and video
- Sections and stratigraphic records
- Dive logs and ROV logs

*Mary Rose 1980*



Typical sources of information include:

- Pre and post conservation artefact records
- Artefact conservation process records
- Artefact pre and post conservation photographs

*Vliegent Hart 2000*



*Mary Rose 2004*



End

Photographs courtesy of:

- The Mary Rose Trust
- 3H Consulting Ltd
- CISMAS
- VOC Anniversary Shipwreck Project





## Standard Recording Schema

- Records 'core' information
- Makes data sharing easy
- Allows archiving
- Finding information is quick and efficient
- Allows direct comparison of data sets
- Makes distribution analysis easy
- 'Normalises' data sets
- Standard core recording schema
- Highlights errors and omissions