Cultural Resource Data Management and Mapping Using GIS

A unified approach for a large scale FERC relicensing project

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Topics

1) Motivation for standardized approach
2) Project used to develop the process (Merced ID)
3) Data structure developed
4) Map products developed
5) Symbology standards
Motivation

- HDR Inc. serves as primary consultant for FERC relicensing services on multiple, large hydropower projects
- Responsible for cultural resource assessment of large regions with complex historic and prehistoric sites
- High demand (internal and external) for spatial analysis and cartographic products
- Realized a need for spatial data management in one central repository
  - Logical organization is important and drove the design of the GIS solution
The Project

- Merced Irrigation District needed to renew FERC license to operate the McClure, McSwain reservoirs and dams
  - Area of Potential Effects: 11,500 acres
  - 115 mi of shoreline (changing water elevation)
  - 286 archeological sites, 258 isolated finds
  - 4,300+ features and artifacts
  - 5 years, 5 archaeologists, 15-20 field technicians

- GIS team consisted of 1 main analyst with support of 2 additional when necessary
The Project

- Central California
- Reservoir used for many recreational, commercial and public works purposes
Data Structure

- One data source/destination (geoDB)
  - Themed Feature Datasets
  - Common projection
  - Use of domains (mixed success)
  - Heavy use of Representations (to emulate traditional illustrated arch. sketch maps)
  - Map documents used combinations of queries, data driven pages and symbology to leverage single instance of database for many cartographic purposes

- Good solution for central management but not good for multi-user environment
Geodatabase Organization

Categories

- **Cultural**
  - Sites, artifacts, features
- **Historic Features**
  - Info Center research
  - Previously recorded resources
- **Non-cultural**
  - Modern map features
  - Natural objects (e.g. trees)
- **Administrative**
  - FERC project boundary
  - APE
  - Survey Coverage
- **Cartographic**
  - Data Driven Pages index
Map Products

- Many maps, one geodatabase
  - APE, survey coverage, location maps, sketch maps, site inventory maps, built environment, field maps
  - Satisfies reporting to CA OHP, BLM, Forest Service, FERC and client (MID)
- Attribute flags serve to filter data depending on cartographic needs (e.g. land ownership filters, HPMP report, addendum reports, retired/updated geometry).
- Data driven pages isolate features using page definitions, dynamic legend reduces clutter
Map Product Examples

- Multiple layers referencing the same source data
- Feature scaling handled using attribute flags and map specific zoom and reference scales
Map Product Examples

- MXD adapts to simple and complex sites
- Labeling is still mainly a manual process
Map Product Examples

- Large sites require compound maps to fully document resources
- (note breaks in site boundary)
Map Product Examples

- Map for National Registry reporting
- Symbology is basic but labeling, categories and scale are important
Map Product Examples

- 1:24,000 location map
- Symbology is basic but labeling and scale are important
Symbology

- Library of representations built
  - Provides consistency in appearance (both within project and as a company product)
  - Flexible to accommodate archaeologists’ preferences
  - Geometry rules adapt to unique situations

- Archaeology and USGS symbols used as templates for representations

- Scaling used to solve cartographic problem of relative feature sizes
Symbology Translated

Cultural Legend

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Legend</th>
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<tbody>
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<td>Exposed Rock</td>
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Map Symbols

- Site Datum
- Bearing and Distance
- Site Boundary
- Locus Boundary
- Survey Monument
- Bench Mark
- Political Boundary
- Property Line
- Artifact
- Feature
- Structure
- House Pit
- Lithic Scatter
- Bedrock Mortar
- Wooden Log Chute
- Railroad Grade
- Paved Road
- Dirt Road
- Skid Trail
- Trail
- Bridge
- Culvert
- Utility Line
- Fence
- Ditch
- Contour (With Elevation)
- Slope (Indicate Direction)
- Bank or Terrace Edge
- Knoll or Mound
- Depression
- Earthen Berm
- Boulders
- Cave
- Mine
- Tailings
Map Product Examples

- Changing shorelines create challenges for documentation that can be accommodated using unified geometry and specialized representations
- (note breaks in site boundary)
Final Remarks

- Approach has standardized process and product
- Template geodatabase and MXD files can be implemented quickly
- Both can adapt to project specifics
- Representations are portable and can be expanded as needed
Acknowledgements

- Bryan Kelley, Merced Irrigation District
- Sandra Flint, Archaeologist, HDR Inc.