



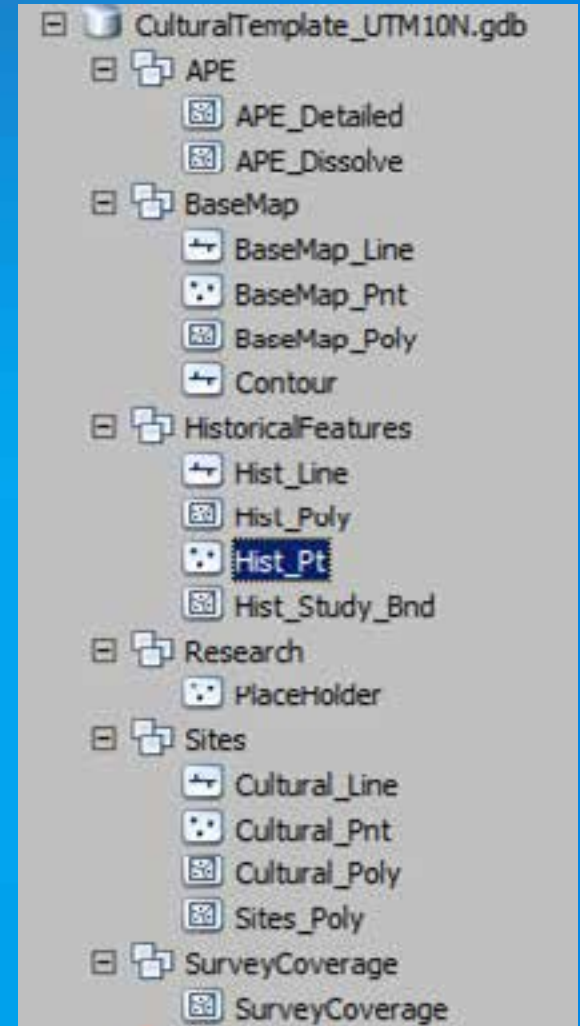
Cultural Resource Data Management and Mapping Using GIS

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

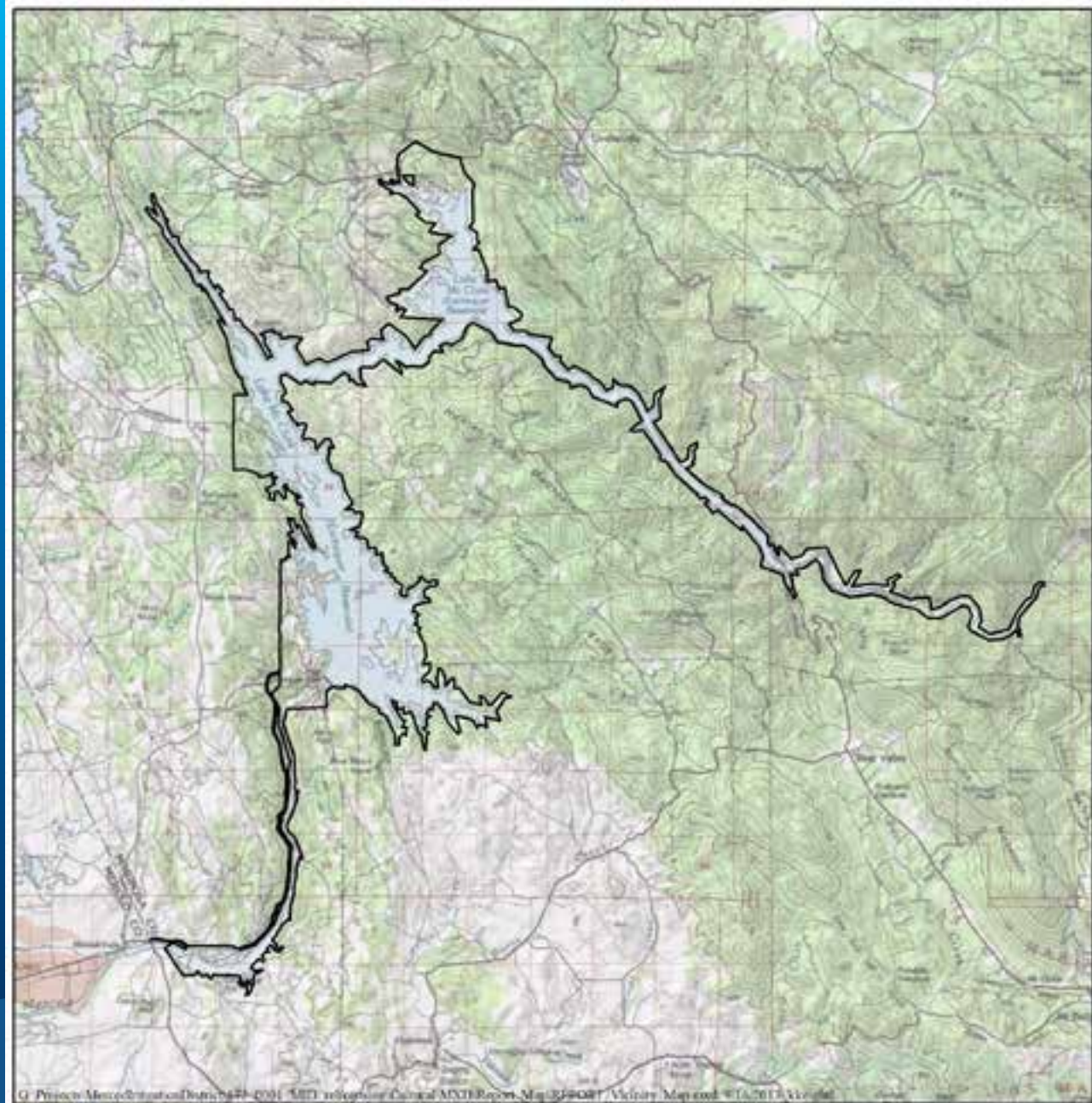
- HDR Inc. serves as primary consultant for FERC relicensing services on multiple, large hydropower projects
- Responsible for cultural resource assessment of large regions with complex historic and prehistoric sites
- High demand (internal and external) for spatial analysis and cartographic products
- 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



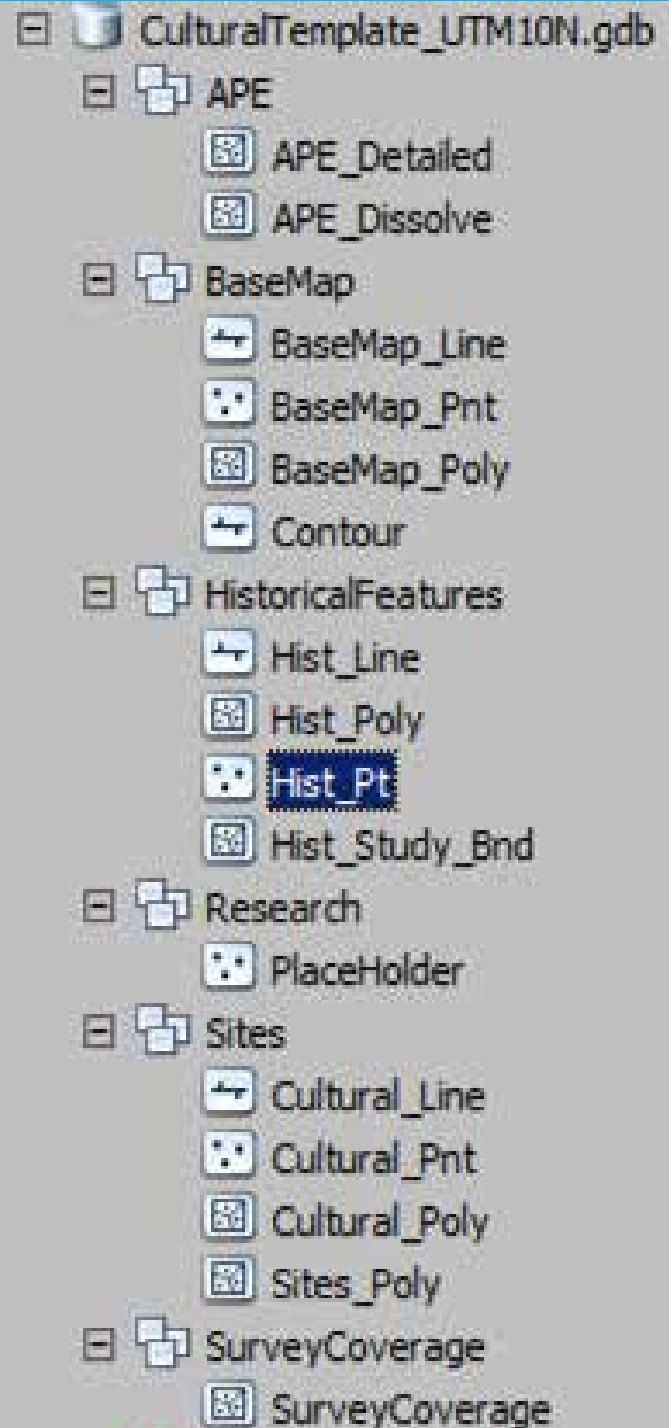
Data Structure

- **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

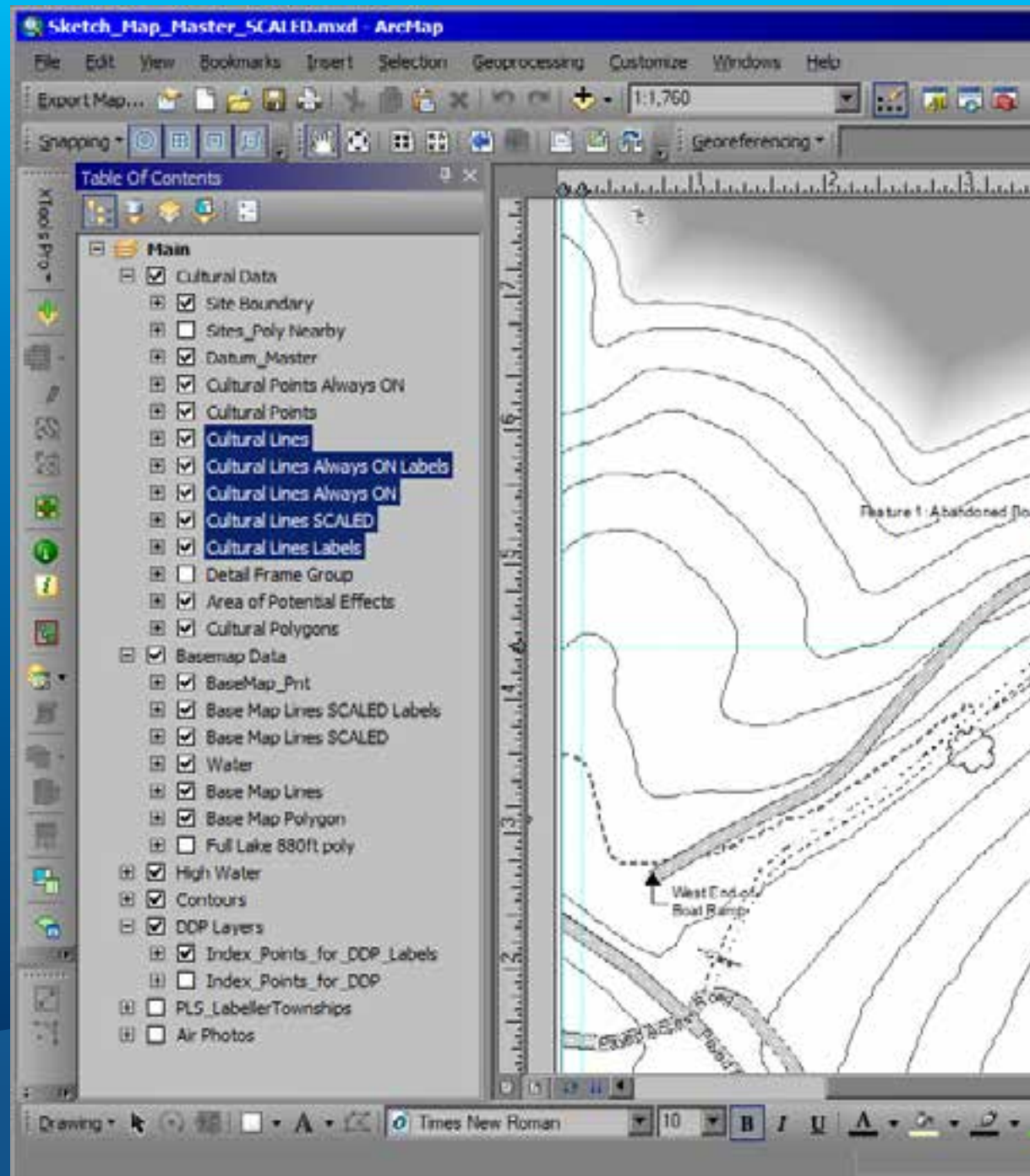


Map Products

- **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**

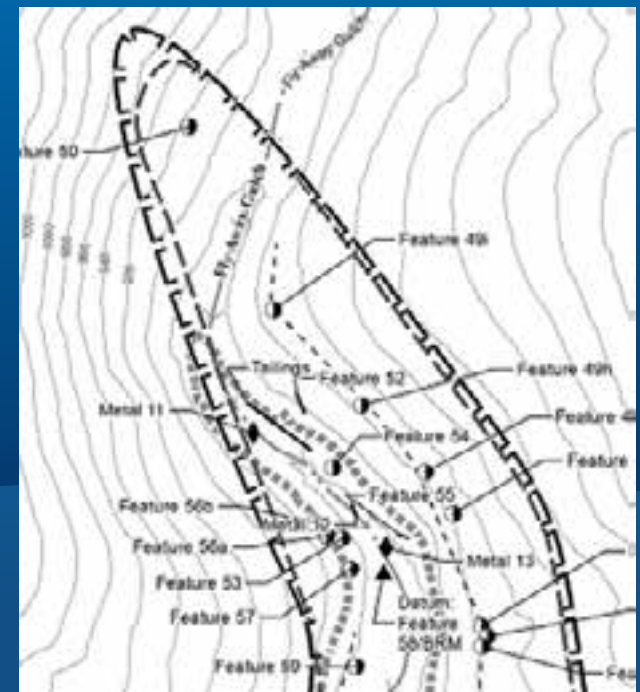
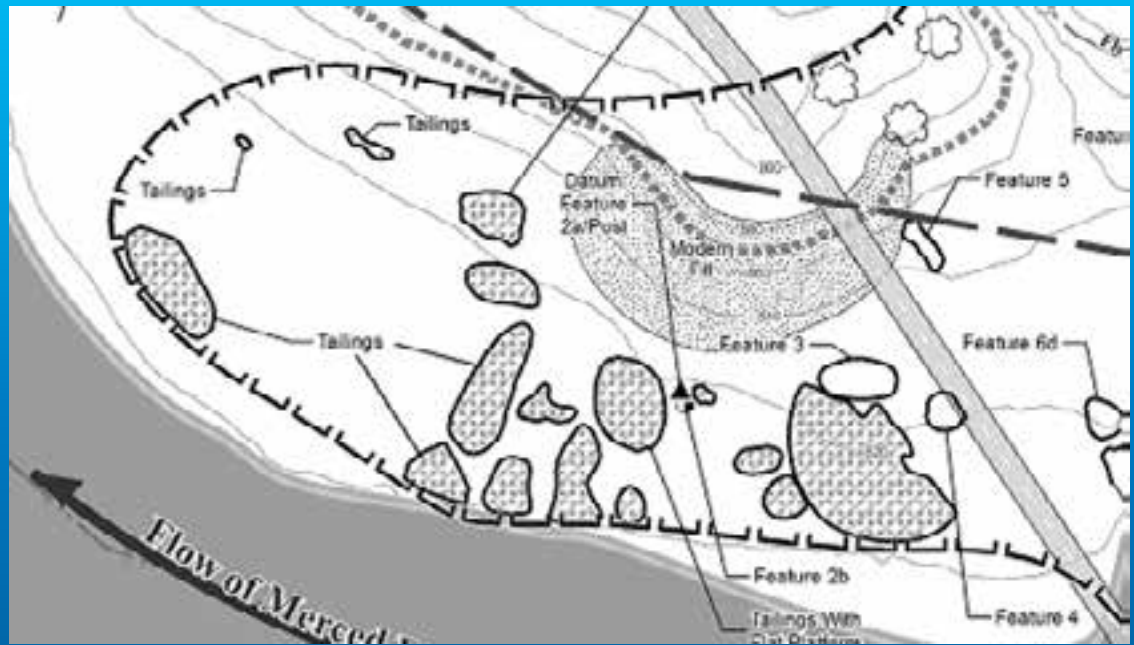
Map Product Examples

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



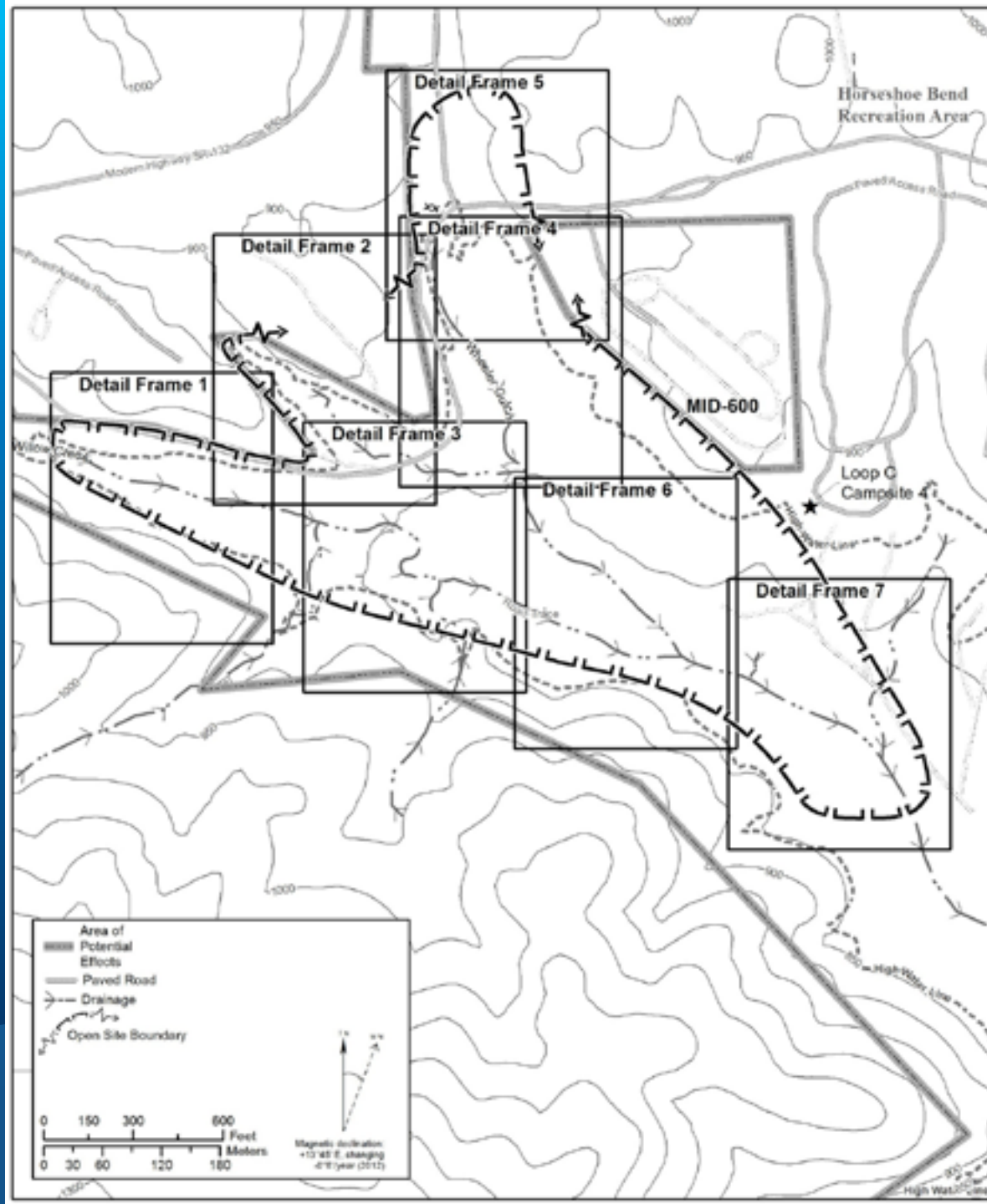
Map Product Examples

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



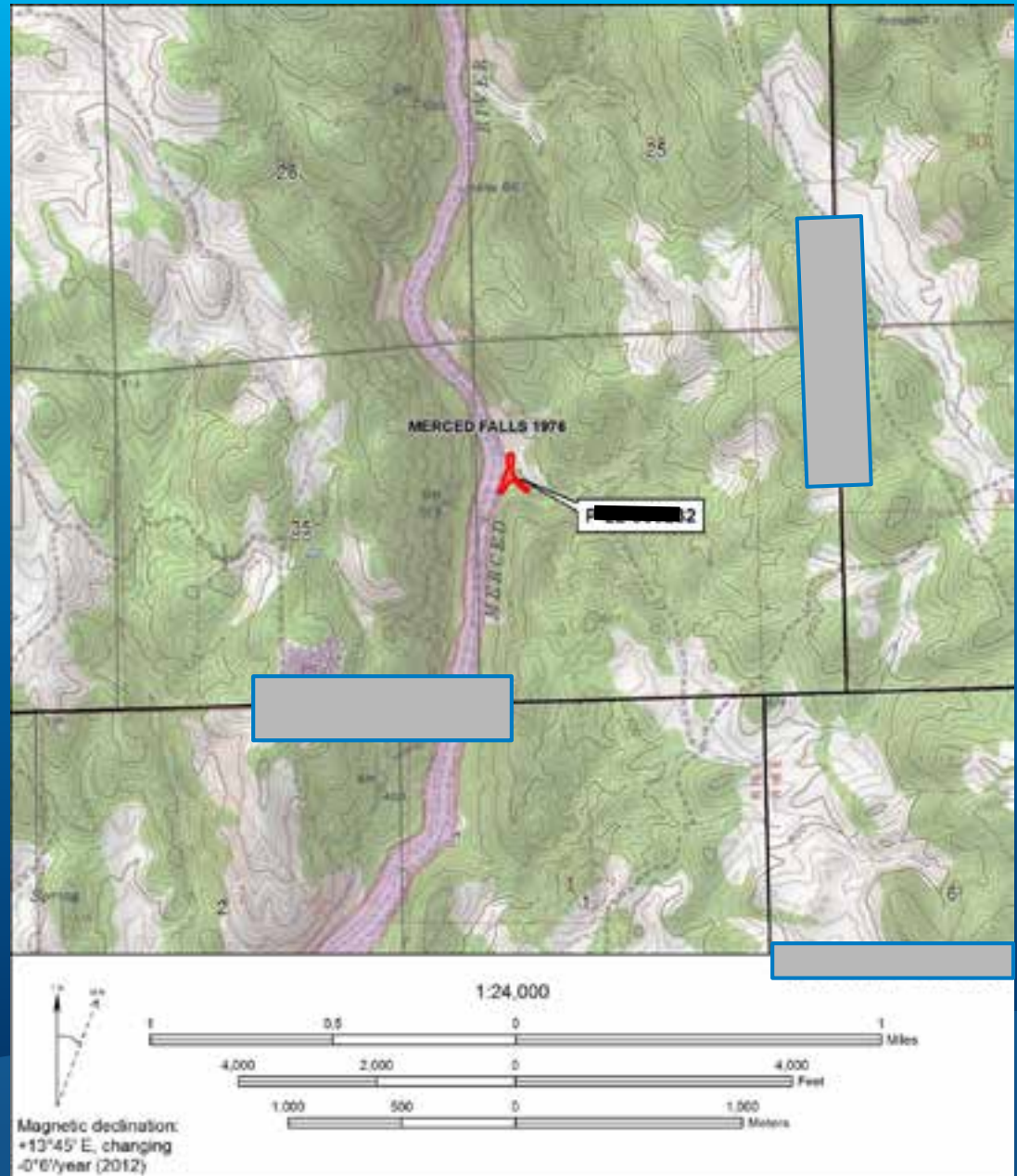
Map Product Examples

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



Map Product Examples

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



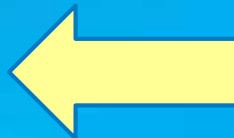
Symbology

- **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

	Adit		Boundary
	Prospect		Dirt Trail
	Datum		Fence 2
	Feature		Unpaved Road
	Other		Road Paved 1
	Structure		Road Paved 2
	Boulders		Stream ephemeral
	Debris		Transmission Line2
	Grass/Meadow		Railroad
	Mine		Trail
	Spring		Canal
	Tree Large Conif		Ditch
	Tree Large Decid		Dry Wash
	Artifact		Prospect Trench
	Datum / Feature		Locus
	Caim		Boundary/Concentration
	Crystal		Mound/Knoll
	Burial		Depression
	Rock Circle		Site Boundary (Halo)
	Rock Art		Tailings
	Scraper		Waste Rock
	Milling Station		Disturbance
			Exposed Rock



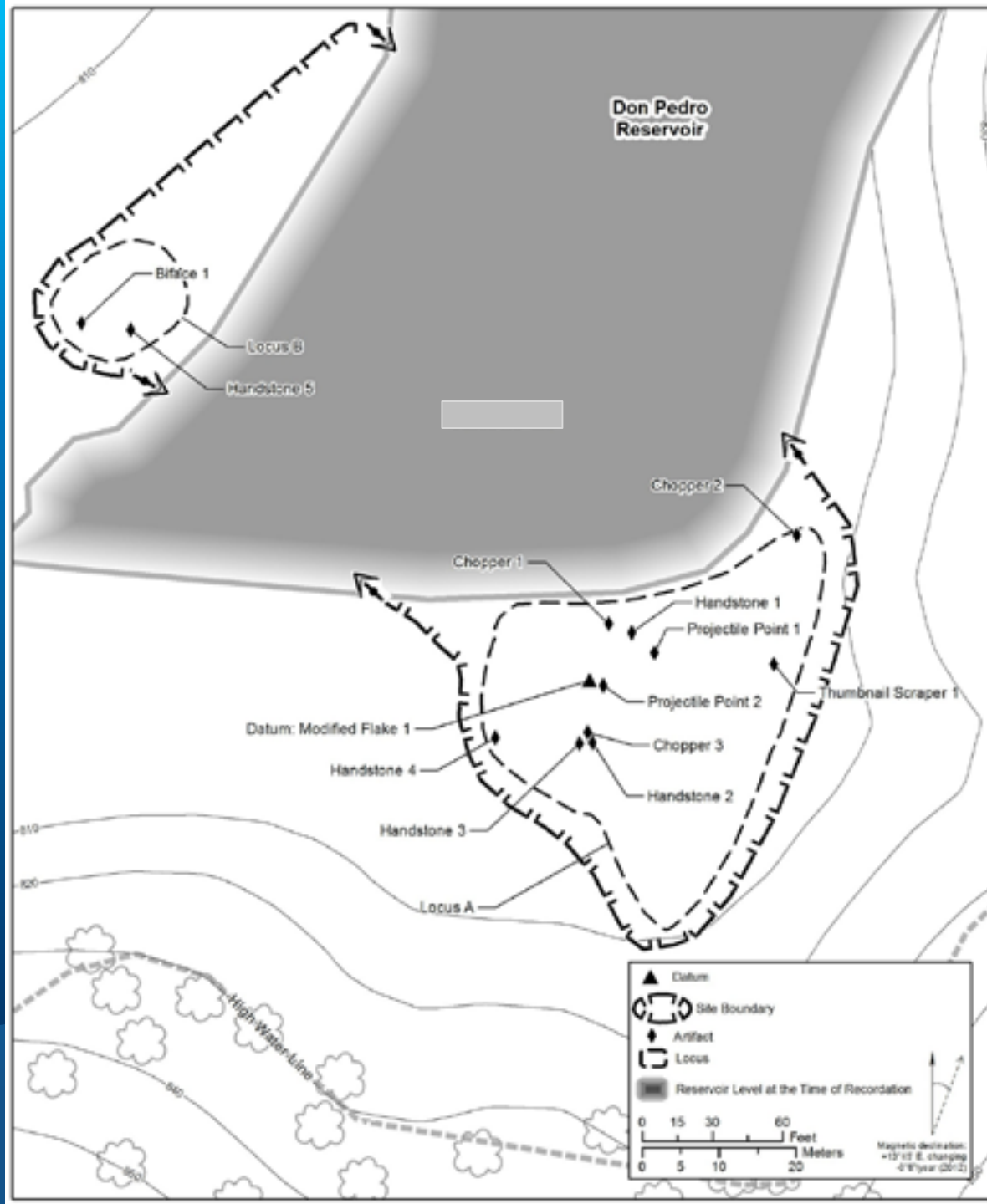
Map Symbols

	Site Datum		Spring
	Bearing and Distance		Perennial Stream
	Site Boundary		Intermittent Stream
	Locus Boundary		Ephemeral Stream
	Survey Monument		Shoreline
	Bench Mark		Waterfall
	Political Boundary		Forest Edge
	Property Line		Conifer
	Artifact		Small Tree
	Feature		Deciduous Tree
	Structure		Dead Tree or Snag
	House Pit		Fallen Log
	Midden		Stump
	Lithic Scatter		Brush
	Bedrock Mortar		Grass or Meadow
	Wooden Log Chute		Marsh
	Railroad Grade		Contour (With Elevation)
	Paved Road		Slope (Indicate Direction)
	Dirt Road		Bank or Terrace Edge
	Skid Trail		Knoll or Mound
	Trail		Depression
	Bridge		Earthen Berm
	Culvert		Boulders
	Utility Line		Cave
	Fence		Mine
	Ditch		Tailings

Figure 1

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
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