Dallas/Fort Worth International Airport

Utilizing GIS for Historical Preservation and Site Analysis

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Abstract

Historical preservation in and of itself is a tedious task laden with fine details at best and subtle clues at the very least. While a great deal of GIS efforts focus on the location of present day objects there is still a “when” that is inextricably associated with the “where” which can be utilized to shape decision making processes.

ArcGIS has provided the Dallas / Fort Worth International Airport the ability to organize and sort through decades of historical maps, aerial photography, documentation, and camera photos in order to create an understanding of the twenty eight square miles of land prior to it becoming an aviation hub.

By doing so, issues surrounding environmental and development decisions can be answered quickly and logically so as to preserve historical sites while providing archaeologists and airport personnel the ability to grant an area for development or mitigate when necessary.
DFW Airport at a glance

- DFW Airport.....
  - Covers twenty-eight square miles
  - Currently is part of five cities and two counties
  - Approximately 65% of land is cleared or currently developed
  - Historically had four communities no longer in existence within its boundary and five additional overlapping communities
  - Four existing cemeteries within airport boundary with internments dating back to before 1870
  - Evidence of prehistoric activity, Native American activity, and pre - Republic of Texas settlers
Why look at the past?

- When looking at using a particular area of land for development the airport is required to consider all environmental impacts. Studies are performed in compliance with National Environmental Policy Act to investigate where any potential archaeological or historical impacts could occur.
- When an airport project receives federal funding or makes a modification to the Airport Layout Plan the Federal Aviation Administration requires a review under NEPA, including Section 106 of the National Historic Preservation Act of 1966 and the Antiquities Code of Texas.
- Objective is to locate any cultural resources in a project area with potential impacts to existing or potential registered historical sites and identify them to determine if they are to be included in the National Register of Historic Places or as a State Archaeological Landmark.
Why look at the past?

- At DFW there are still many examples of pre-airport development that remain. Understanding what was there and when it was there allows for timely fact finding and decision making.
- Environmental concerns such as possible ground wells, cisterns, and buried tanks can be researched to rapidly expedite their necessary compliance or mitigation. GIS helps in defining age “windows” for structures and features of concern.
- GIS provides the ability to simultaneously investigate and record the past while helping guide decision making for the future.
How GIS became involved in history at the airport

- GIS was asked if they had records of a specific cemetery on airport property.
- When work was conducted in heavily developed cargo area documentation was repeatedly requested to show how cemetery would be avoided. This was a time and resource consuming process each time work was performed.
- Research determined recorded survey abstract A-324 was one digit off. Two adjacent abstracts had same name. Correct abstract was A-323
How GIS became involved in history at the airport

- Utilized historical maps and aerial photos to determine approximate location of Lipscomb Cemetery.
- Interview with the person tasked with relocation of cemetery in 1968 gave detailed descriptions of location to aid in narrowing the location of the former site.
- GIS allowed multiple layers of referenced information to be interchanged creating a strong case for the correct location of the cemetery.
- Subsequent studies showed the approximate location to be within 30 feet of correct location.
Data gathering and creation

- Started creating data to help resolve any possible future historical questions.
- Focused on easily identifiable features: Roads, Structures, Hydrology, Rail, Fence lines
- Key items to include
  - Name
  - Alias
  - Year Built and Demolished
  - Earliest and Latest Documents
  - Currently Visible
  - Building Type / Use
  - Miscellaneous Notes
Data gathering and creation

Aerials and maps
- Aerial photos and maps can be obtained from internet, commercial sales, scanning and reproduction from a variety of sources such as libraries and historical societies.
- Older maps can have a wide range of accuracy depending on the scale, date, and source.
- Aerial photo registration should be done most recent to oldest in order to find reliable objects to serve as control points.
- Try to have at least one source per decade.
DFW AIRPORT GIS

Data gathering and creation

- Local Historical Societies
- Public Archives
- Libraries – Public and Universities
- Historical Forums and email
- Interviews with seniors
- Published books
- Exhaustive internet research
Data gathering and creation

County filed appraisal information was available for roughly 65% of the airport property from acquisitions in the early 1970’s

Appraisal data included
- Legal Description of land
- Owner history and last tenants listed
- Description of improvements including age, building materials, utility services (butane, oil, well, septic), building floor plans
- Detailed sketches and case file maps
- Date of acquisition
- Photos of structures and surrounding area
Data gathering and creation

- Additional work allowed for addition of parcel tracts and photo points of origin
- Point data in Personal Geodatabase with view orientation, point-of-view (ground level or oblique), associated parcel number, and image inserted as a Raster data type
In 2005 DFW Airport began investigation to allow natural gas drilling on airport property.

An environmental team, including archaeologists, were called upon to review historic and prehistoric sites encountered during pipeline and pad site survey and make recommendations.

Multiple agencies such as FAA, owner cities, drilling company, survey and construction contractors, and various airport departments needed consistent GIS data of both current conditions and historical record.

Historical maps, aerial photos, user provided CAD data, and GIS data were often compiled into layered PDFs for ease of use in field studies and distribution to multiple personnel.
Historical information put to work

Study and record included eight prehistoric sites, Fifteen historical sites, and one cemetery with an undetermined boundary. Additional sites were studied for cultural resources.
Determining the age of a site

1959 – USGS 7.5' QUADRANGLE MAP – GRAPEVINE, TX

1953 AERIAL PHOTO – ARMY MAPPING SERVICE
Determining the age of a site

Archaeologist Site Sketch

Appraisal Description

The appraisal cost of the small office building located on the subject site has been calculated by a real estate appraiser following the Society of Real Estate Appraisers, Federal contractors, and building material specifications.

The total estimated reproduction cost of the building including the land, permits, demolition, and value is $22,000.

Based on the total reproduction cost, the depreciation of the building is estimated as of the date with the depreciation factor taken from the definition of real estate valuing. It is estimated that the building has a useful life of approximately 30 years. Assuming that this property had been included in the Regional Airport site, it is estimated that the building would be developed to a higher and better use, including the foreseeable value of the general area.

It is anticipated that the stamping would take place in no more than 10 years. At that time, the office building with normal maintenance would have an effective age of approximately 25 years. The building's effective age and estimated value results in a depreciation rate of 45%, or say $9,900. This yields a net value of $12,100, or the building of $22,000.

Improvements No. 1 looking north. April, 1970

Appraisal Photographs

A view of the subject property looking north from Old State Highway 114.

April, 1970
Studies provide a better understanding

- Result studies utilizing GIS allowed for the creation of layers representing potential for archaeological impacts.
- Facilitates rapid delivery of historically relevant information to assist land development planning, survey and engineering, and environmental services.
- Existing historical themed GIS layers were able to accelerate the project by nine months because of reduction in research time.
Positive effects of GIS utilization

- Historical and archaeological information in GIS provides a baseline of relevant locations and other environmental constraints.
- Avoids duplicative, costly, and potentially conflicting research.
- Enhances review of historic documentation and streamlines review of potential development sites.
- Ease in creating exhibits and reporting requirements reducing cost and time incurred.
- Provides readily available consistent platform to reach more users.
- GIS embeds the institutional knowledge from multiple sources that disappear with employee changes and attrition. GIS does not forget.
- Archaeologists on the project now use GIS to aid in their endeavors.
Thank you!

Questions?

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July 15th, 2009  
ESRI User Conference  
San Diego, CA