Cabarrus County Address Collaboration and GIS Implementation
By Cathy Cole

Abstract

The GIS conversion project started in Spring 2001 with the installation of ArcSDE and ArcGIS 8.0. This project began by converting existing ArcView shapefiles, creating a Geodatabase, identifying data with inaccuracies and resolving methods to correct the data. The next phase was streamlining procedures to update GIS data with Tax data in SQL/SDE. The goal was to convert parcel tile data from UNIX/Librarian to ArcSDE, and to use ArcGIS 8.3 for parcel edits. By moving to the new technology, our goal was to offer accurate data more efficiently to the public through ArcIMS applications and the Internet. The project was a multi-departmental collaboration that required new hardware, software and training. Upon completion of the GIS Implementation, GIS data will be more accurate, more efficiently maintained due to new business processes, and easier to access. More people can access the GIS data including Cabarrus County departments, municipalities, and the public at large.

Background

Cabarrus County, North Carolina, east of the foothills of the Blue Ridge Mountains, is part of the 16-county Charlotte region, made up of both North and South Carolina counties. The region is home to more than 1.8 million people and includes the cities of Kannapolis, Harrisburg, and Concord. With a landscape of rolling hills and largely a rural county, Cabarrus County's close proximity to the burgeoning city of Charlotte, North Carolina, has enabled its cities along highway and interstate corridors to grow at an increasingly fast pace. The county is steeped in history, from the first gold discovery at Reed Gold Mine in 1799 to the famous Cannon Mills, which was one of the first plants to process and sell cotton in the south. The "model mill village," which provided housing, churches, schools, and a hospital to the Cannon Mill employees became the city of Kannapolis. Most notoriously, Cabarrus County is home to many racing fans and houses Lowe's Motor Speedway. The speedway is home to NASCAR, IROC, IRL, World Karting, and Legends car racing. With over six million people living within a 100-mile radius of Charlotte, the area stands as the nation's fifth largest urban region.

Starting Point

GIS began monthly User Group meetings. When we discovered the County was using multiple address files, parcels didn't match orthos and an approximately 80% correct centerline file, an Address Meeting was called. The Tax Assessors, Land Records, ITS, Planning, and GIS staff, anyone who had anything to do with the address process got together to map out the business flow. We visited other offices to see how they handled addressing. We even put out inquiries on the Internet. We pinpointed data duplications, dead ends, and opportunities for change in issuing and entering addresses. Several options were proposed. We could use approved Preliminary Plats, register them to the parcel data, then issue addresses off the new parcels. Once the plat was recorded, Land Records would check the addresses and enter centerline data. But first we needed to obtain an accurate, up to date address file.
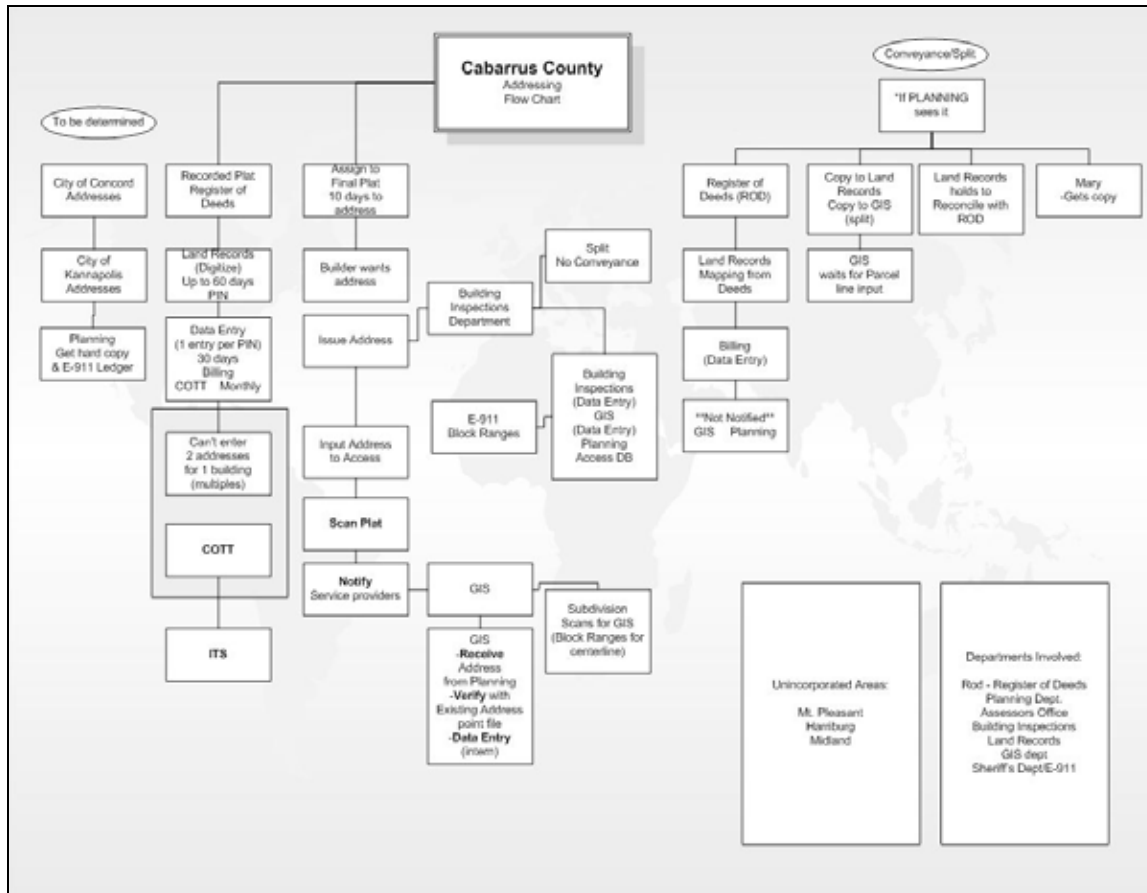
Cabarrus County
Addressing Flow Chart

Conveyance/Split

*If PLANNING sees it

To be determined

| City of Concord Addresses | Recorded Plat Register of Deeds | Assign to Final Plat 10 days to address | | | Register of Deeds (ROD) | Copy to Land Records Copy to GIS (split) | Land Records holds to Reconcile with ROD | Mary -Gets copy |

City of Kannapolis Addresses

Land Records (Digitize) Up to 60 days PIN

Builder wants address

Split No Conveyance

Land Records Mapping from Deeds

GIS waits for Parcel line input

Planning Get hard copy & E-911 Ledger

Data Entry (1 entry per PIN) 30 days Billing COTT Monthly

Issue Address

Building Inspections Department

Billing (Data Entry)

Can't enter 2 addresses for 1 building (multiples)

Input Address to Access

E-911 Block Ranges

Building Inspections (Data Entry) GIS (Data Entry) Planning Access DB

Not Notified GIS Planning

COTT

Scan Plat

Notify Service providers

GIS

Subdivision Scans for GIS (Block Ranges for centerline)

ITS

GIS -Receive Address from Planning -Verify with Existing Address point file -Data Entry (intern)

Unincorporated Areas:
Mt. Pleasant
Hamburg
Midland

Departments Involved:
Rod - Register of Deeds
Planning Dept.
Assessors Office
Building Inspections
Land Records
GIS dept
Sheriff's Dept/E-911

Figure 1. Address Flow Chart (p01811)

Parcels

When performing the quality control checks on the orthophotography, we noticed the parcel lines did not match the 2001 orthophotography. The next confirmation we had that the mapping required adjustments was during the County Line meetings with Mecklenburg and surrounding counties. It was discovered that digital parcel data from the 1988 conversion was accepted with uncorrected ROW errors. Land Records has not used aerials as a backdrop for mapping, or the COGO extension in the software. As part of the Implementation plan recommended by ROK Technologies, GIS is assisting ROK with the development of a new interface where the mappers will have the full benefit of these tools.

Correcting the parcels in house could take as much as 2 years to complete; GIS was hesitant to release the new aerials because the parcels don't match; If Land Records continued to use the current file, they would map to existing errors. GIS recommended developing a geodatabase with built-in safeguards, along with a new interface to facilitate the workflow. GIS made the decision to hire an outside agency to "best fit" the parcel data. We contracted with England -Thims & Miller to make the parcel adjustment, then set up a geodatabase for the parcels and convert the best fit data to a geodatabase. The end product replaced the original parcel data from its current format, UNIX-based Librarian tiles, to ArcSDE and Geodatabase, running with SQL on a Windows 2000 Sever.
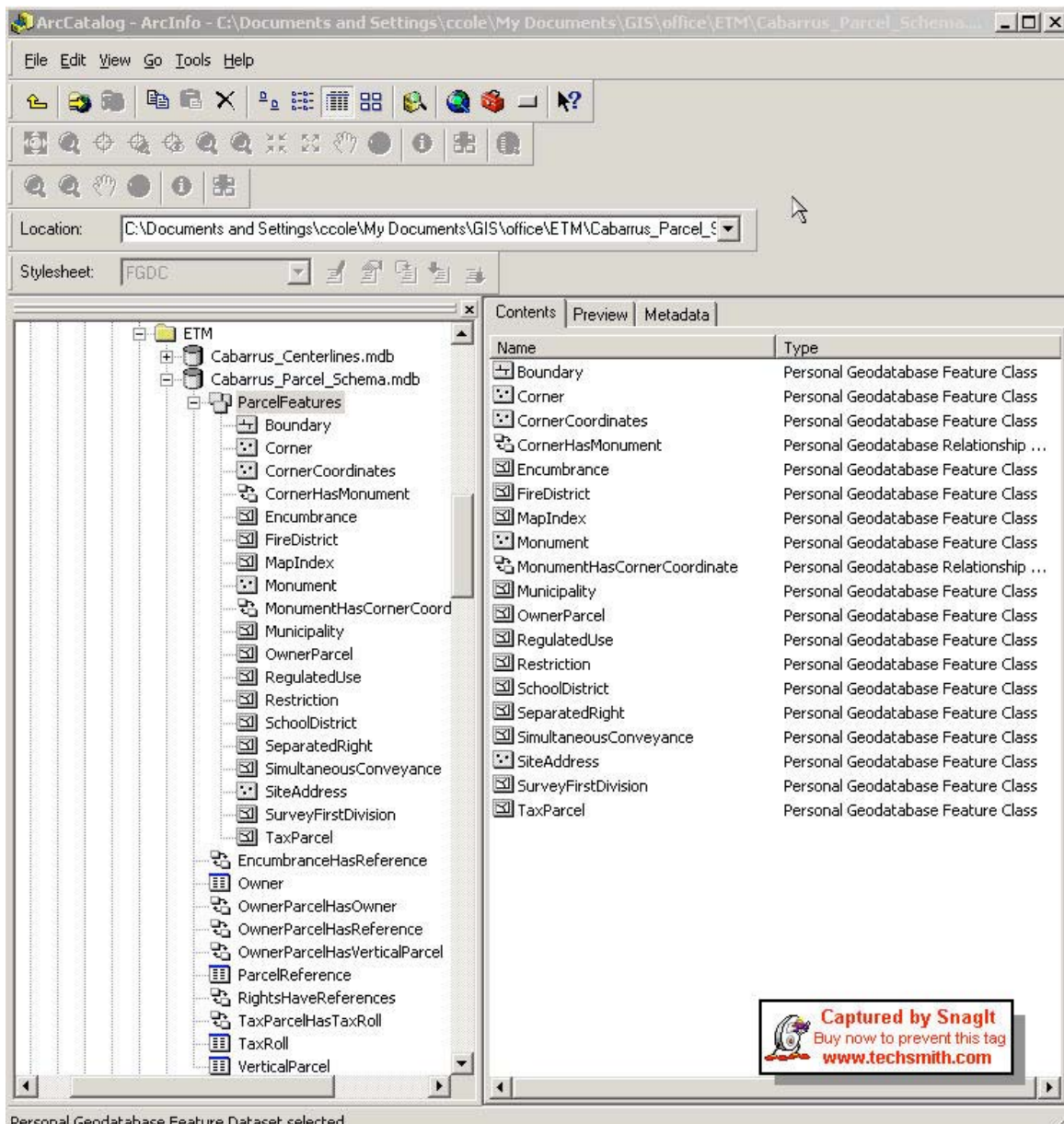
Figure 2. Parcel Schema Geodatabase designed by England – Thims & Miller. (p01812)

Centerline

To perform the changes required to "best fit" the parcel data to the 2001 orthophotography, it was necessary to start with a geographically correct centerline file. This file should contain all roads in the County that have names and addresses. The file should be comprised of road names, and address ranges, high and low numbers on the left and right sides of the road. A good centerline file can be used by E-911 to locate call origination. The centerline can also be used with other address data to establish patterns, such as crime occurrences, school attendance, and social service clients, without divulging any personal information. The address verification project required a current, updated centerline file to locate valid addresses and georeference data. At the time the project began, the centerline file had 1347 unnamed segments, and many segments without ranges. This data layer was not been maintained on a regular basis. ETM provided us with a centerline as part of their project. The QA/QC process was to correct any problem reports they found. Although we did not contract for it, Mobile Video included capture of the street centerline names and ranges as part of their project.

Cabarrus Street Centerline

Problem Resolution Report

PRR ID

2_1_554304   Area Image

Description:
Libby Ln. conflicts with woods. Road on aerial ends before woods. Shown between arrows.

Proposed Resolution:
None

Reviewers Comments: Delete. Easement exists but no addresses or road past clearing.

Resolved By: ccole

Date: 11/15/02

Figure 3. Centerline Problem Report (p01813)

GIS developed an application to assist with data entry of new centerlines and a method to identify new road segments so the address information can be entered. Land Records agreed to enter new centerlines when they enter subdivisions. GIS documented a routine in ArcMap to register an image of a subdivision plat to existing parcels for the purpose of adding streets and addresses at final plat approval. We are still working on the internal business flow to handle these additions. The City of Kannapolis, who has never maintained a digital address file, is very

excited about collaborating with us on this project. They have agreed to maintain a version of the address file. Cabarrus has taken the necessary steps to provide them with direct access to our GIS data server. We donated the ArcGIS 8.2 software from the NACo ESRI Technology Foundation Grant award to expedite the data sharing. As soon as the connection is complete from their office, we will load the address application into ArcMap, set up a Kannapolis version of the address and centerline files, and Kannapolis can edit the files directly. The former method of sending a spreadsheet of changes, which GIS manually adds to the data sets, will end. GIS will administer the original layer, updating as needed. Upon receipt of the final product, the centerline will be converted to geodatabase format.

Addressing

The County had multiple address files that weren't compatible. The objective of our Address meetings was to create one address file containing the physical address of each business and residence along with x, y coordinates, and to make this file available to all departments who use addresses. The new permit application project "hits" the GIS database to create work orders for the inspectors. Permitting found 817 addresses not in GIS database, as of 10/1/02. The address file had numerous data entry errors and incomplete information. GIS entered all addresses, and compared that file to other databases, then edited the differences. GIS created an application to enter new addresses, which will automatically enter the jurisdiction and zipcode.
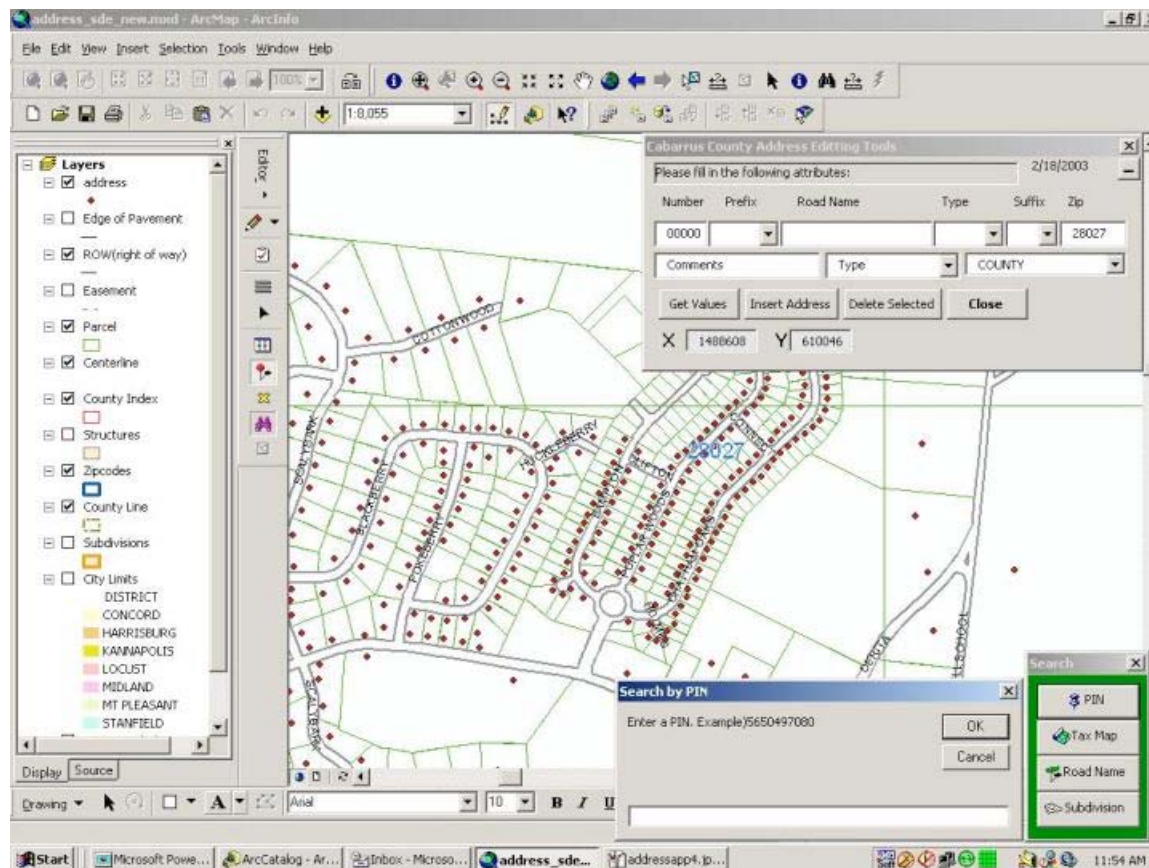

Figure 4. Cabarrus County Address Application (p01814)

We are working with Concord and Kannapolis to streamline the data exchange transfer, so updated files are more readily available to the public. In the future we hope addresses are entered from the final approved plat and are immediately available to the County Departments

and the Public via the Internet and Intranet. The company selected to verify the addresses, Mobile Video, also collected x, y coordinates, and an image of all residences and businesses. Included are capture of multiple addresses for apartments, condos and shopping centers, which are not in the current GIS database. ROK Technologies developed some routines to deal with multiples and simplify the update process.
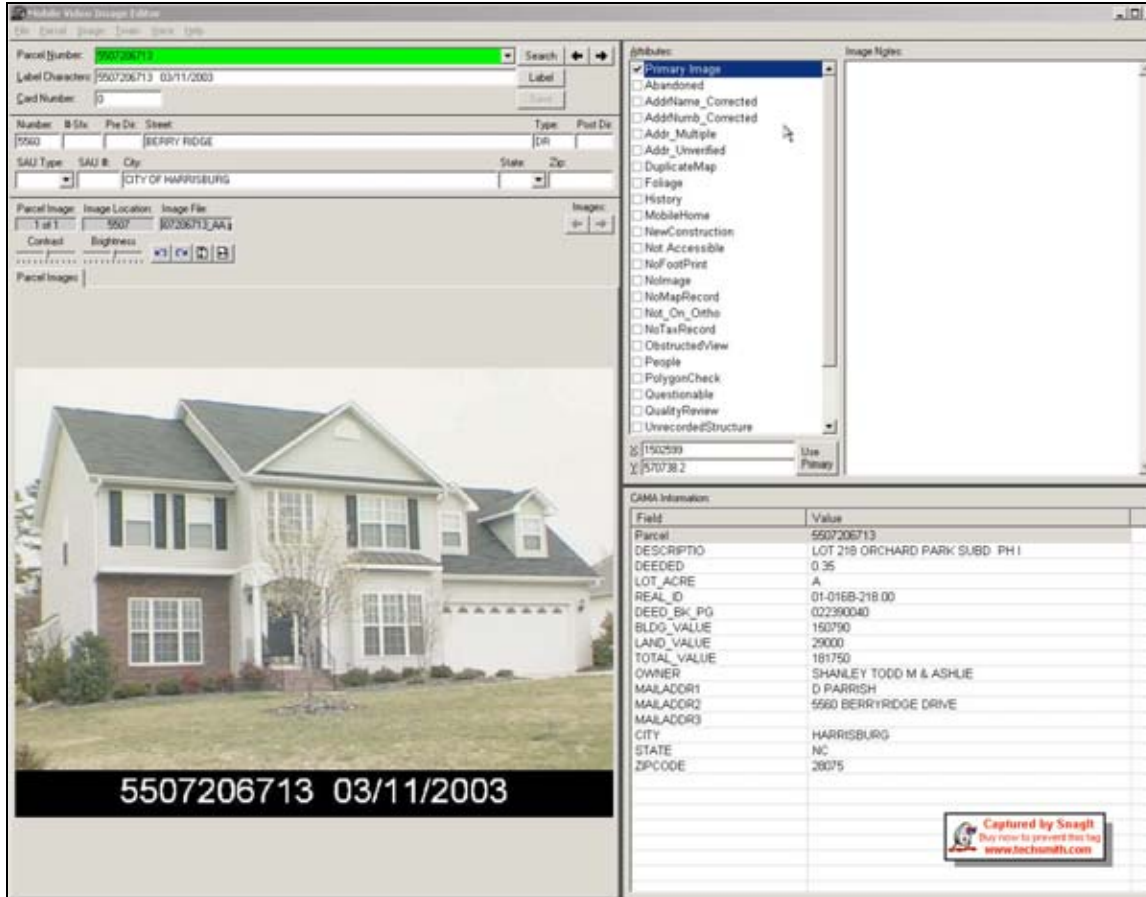

Figure 3. Mobile Video Editor Software (p01815)

GIS Implementation

This project began in early 2001 with a simple conversion of existing GIS to ArcSDE. Since my arrival, GIS has expanded our training and knowledge of ArcGIS; updated the Internet site; created two Intranet sites for County personnel to use for data access; assisted with training Land Records staff members in computer mapping ArcGIS 8.3; installed COGO (coordinate geometry) on Land Records PC's; created applications and routines to assist with data entry and editing of addresses and centerline; met with all departments using GIS to assist and share ideas.

The GIS Department has upgraded all PCs in the Land Records Department and the two PCs in Planning responsible for editing addresses. GIS has two new servers to house and test data. The project goals were to 1) standardize data and safe guard maintenance processes by using the internal Geodatabase relationships and rules; 2) expand the use of GIS data by making access faster and easier; 3) develop department-specific applications, some of which are delivered over the Intranet, which will reduce software & license costs. To meet these goals, a database model was established with the rules and relationships incorporated to safeguard the database. For example, the parcel data was setup so that some operations important to data integrity must be performed to continue editing. This will save time and protect the data

from mistakes. Since the entire data structure has changed with the release of the ArcGIS software, it was necessary to convert not only all of our data layers, but all of the application programs such as "Pin Project" written in other programming languages.
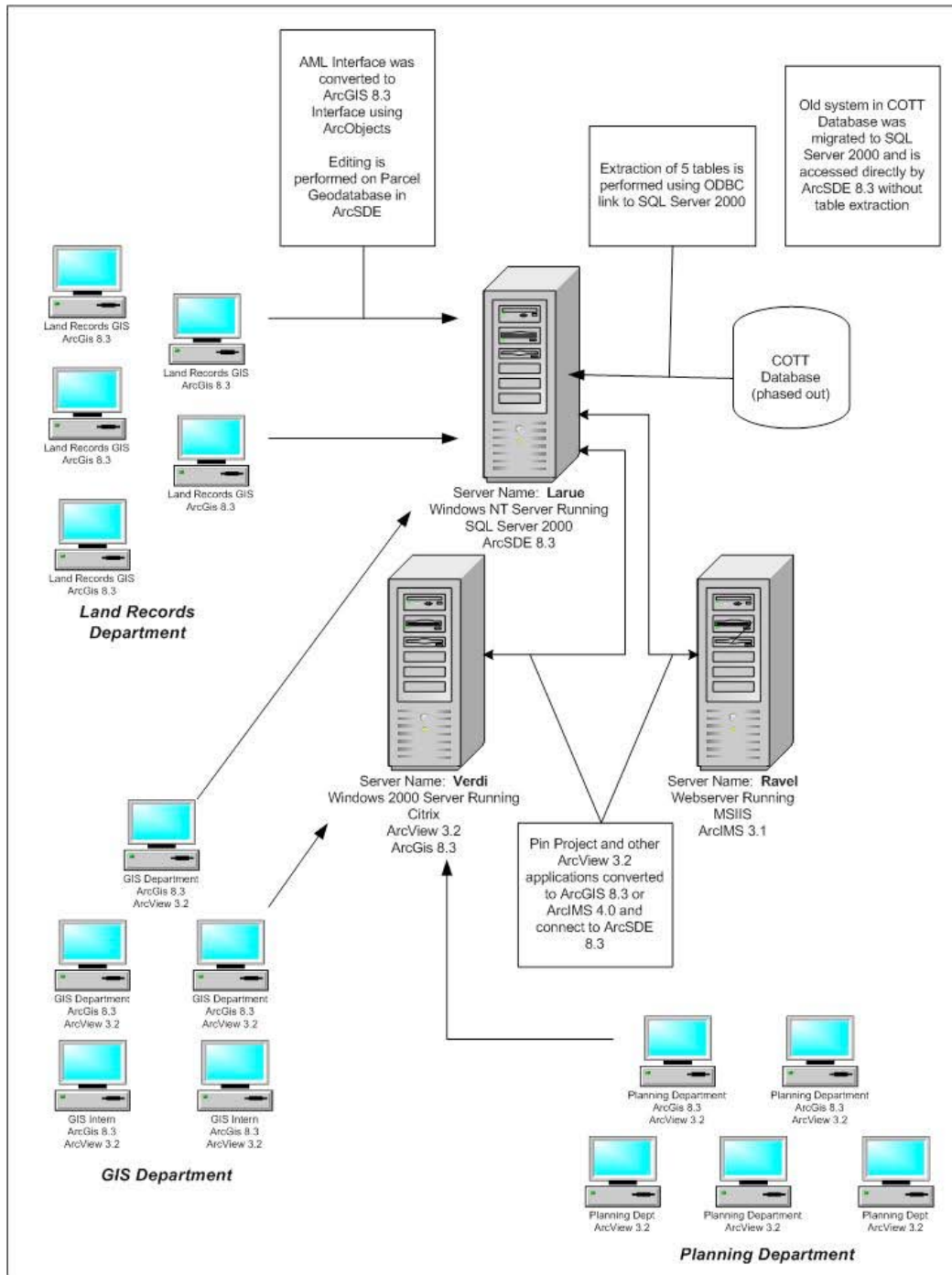

Figure 4. Hardware Connections (p01815)

Problems Encountered

Although public announcements about the imaging project were posted in the newspaper and television, we still had some phone calls from citizens. They asked questions like, "Is this legal?" and "What's the story on the strange car in front of house?" Other calls were from homeowners and schools with concerns over security issues. Either they didn't want

someone taking a picture of their property or have their home displayed over the internet (which we are not intending on doing at this time), or having a van parked briefly in front of a home or a school location. During this time, the Washington DC shootings were occurring, so we tried to dispel fear.

There were delays in image capture due to weather conditions. The County and consultants encountered some unforeseen technical difficulties with servers. The GIS Department had to learn some new skills to administer the data changes. Scheduling all the players in at appropriate times, depending on the turnaround of the data. The Tax Department is in the middle of a reval, so we had to make sure they could operate between the final extraction and data delivery. Two servers in GIS were rebuilt, one of which had to be replaced. And we had to continue with our regular workload and training while the QC process and data reconciliation occurred.

Summary

This was a collaboration of Cabarrus County ITS/GIS, Planning, Tax, Land Records and the Sheriff's Departments. We included Concord and Kannapolis in discussions on how to streamline the data exchange process. The GIS Conversion and Implementation will make data maintenance and editing faster and safer for all end-users. It allows us a better way to track historical changes. All departments are using the same address file and changes are automatically updated each night. GIS developed applications that can be served across the Intranet, which reduces costs in software, hardware and licenses in the future. Cabarrus County now has an accurate, spatially correct database and new methods for keeping the data more current than in the past. The responsible for maintaining parcels, centerlines and addresses have new PCs upgraded software. The City of Kannapolis has developed a plan to network with the GIS server. We have provided them with the Address Application, ArcGIS 8.2 and a version of the Address layer, which they can maintain digitally for the first time.
.	Consultants were hired; contracts were signed and mailed to England-Thims & Miller (Centerline and Parcel Fix), Mobile Video (addressing), and ROK Technologies (GIS Implementation). GIS sent centerline and address data, along with orthos to ETM. We gave the corrected centerline to Mobile Video to use for the address verification project. along with parcels, and existing addresses The commissioners approved the project and funds from the 2002 budget were reallocated. ITS/GIS and the Tax Departments agreed to reallocate funds from our budgets that covered the costs of the Parcel Adjustment and the GIS Implementation. Instead of requesting additional funding, the Sheriff's Department agreed to use E-911 funds for the address and centerline projects. Cabarrus County has three EMS organizations, which will all be able to use the addresses and images. According to the NC General Statue, address verification and the centerline database updates are legitimate expenditures of E-911 funds:
§ 62A-8. Payments from Fund. (a)Money from the Emergency Telephone System Fund shall be used only to pay for: (1) The lease, purchase, or maintenance of emergency telephone equipment, including necessary computer hardware, software and database provisioning, addressing, and nonrecurring costs of establishing a 911 system, and (2) The rates associated with the service supplier's 911 service and other service supplier recurring charges. (b) The following expenses are not eligible for payment from the Fund: the lease or purchase of real estate, cosmetic remodeling of emergency dispatch centers, hiring, training, and compensating dispatchers, and the purchase of mobile communications vehicles, ambulances, fire engines, or other emergency vehicles. (c) A local government may contract with a service supplier for any term negotiated by the service supplier and the local government and may make payments from the Emergency Telephone System Fund to provide any payments required by the contract. (1989, c. 587, s. 1.)

Although we experienced some delays, the project was a success. Below is the projected timeline.

Time Line for GIS Conversion and Data Update Projects

Oct.02	Nov.02	Dec.02	Jan.03	Feb.03	Mar.03	Apr03
Reallocate funds Ask for Board approval		Centerline data changes entered into geodatabase				
Add centerline edits Send centerline to ETM	Centerline returned for use w/Address Verification & Parcel model	Address entry done in Planning & Kannapolis				
Enter ALL address changes	Begin Address verification	Address verification continues	Address verification continues	Address Verification continues	Address-verification-check data changes/additions	Address Verification complete
Configure test server	ROK Builds parcel model & scripts – Begin testing	Continue testing parcels Begin testing GUIs from ROK	LR begins to use new GUIs in test environment	Parcel edits in Geodatabase LIVE	Testing for additions to Intranet Applications w/new data structure	Add address file to Geodatabase
Extract Parcels to send to ETM	LR still hits Librarian for parcel edits	Begin QA/QC for parcel fix project	ETM completes parcel alignment –do final extraction from Librarian to incorporate into geodatabase	ROK/GIS Train LR On new GUIs and Parcels in Geodatabase	End use of UNIX and Librarian	LR staff all working in digital environment
Configure new PCs	Install ArcGIS 8.3 Install Address/ Centerline Applications	Install new Parcel Editor GUIs				GIS Conversion and Implementation complete

Figure 7. Projected Timeline for Implementation

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