

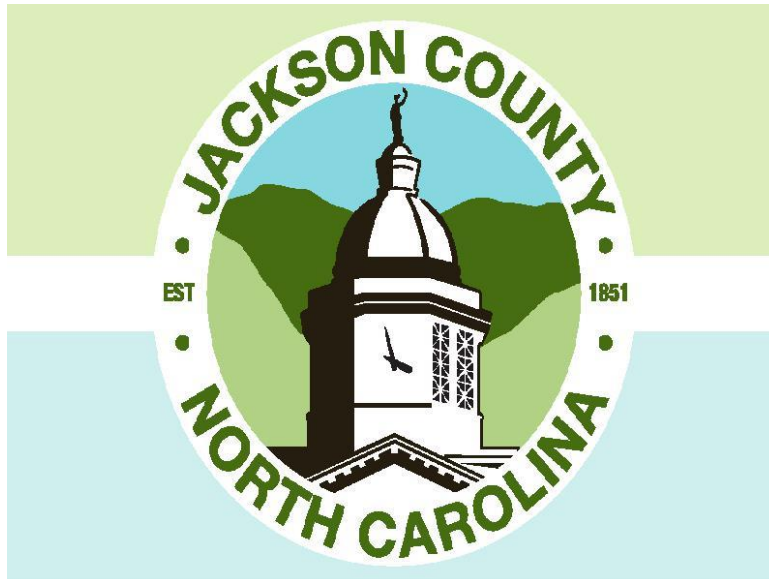
COUNTY OF JACKSON, NC

Jackson Health

A User Friendly GIS for Environmental Health

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How the willingness to let go of convention became a GIS success story.

Purpose

The Jackson Health GIS program was developed in house by Jackson County GIS to dynamically track well and septic permitting data. The goal of the project was to make Environmental Health self-sufficient in their research of historic well and septic permits by using an enterprise GIS and to enable the location of new well and septic sites by GPS. The scope of the project involved developing a specialized GIS for Environmental Health from the ground up while integrating tax administration and E911 addressing datasets into the new GIS for research. What makes this project exemplary is the willingness of The Department of Public Health to give up their fear of GIS and new technology while embracing an ambitious project. The faith placed in power of GIS has been the key to their success.

Background Information

The Environmental Health division of Jackson County Public Health was one of the last clients of Jackson County GIS to come online with enterprise GIS. Many challenges faced the employees of this department in the research of their historic well and septic permitting records. Veteran employees were retiring, taking with them knowledge of permits pulled throughout the decades. Field data was being kept on paper drawings only. A long orphaned PICK database was being used to track basic ownership and agent data taken when permits were opened. Confusion over changing parcel ID numbers in Tax Administration made it necessary to be in constant contact with Land Records to track down inactive PINs so that older site drawings could be located. Only a few Environmental Health Specialists were taking any kind of GPS coordinates in the field, and those coordinates were taken with recreational grade units with no GIS available to store the data. With the incredible growth in parcel count and permits pulled during the mid-2000's real estate market explosion, it became necessary to provide an efficient research tool for the Environmental Health staff. Enter GIS.

Problems Solved

Historic Research

The majority of research needed to track down permitting information can now be done in ArcMap. A historic parcel layer marking the centroid of inactive PINs is linked with historic permit scans. As new parcels are added, the historic parcel layer accounts for both new parcel IDs and those which become inactive. The parcel ID is used in conjunction with an index to pull images of paper permits.

Locational Data

Specialists are locating well and septic systems with GPS. The features are not survey accurate and only intended for viewing on orthophotography. Future generations of Specialists will be able to see inspection sites on aerial photography and obtain approximate coordinates for the sites. Scanned permits are also available via hyperlink on

those layers. Important attributes including who performed the inspection, the inspection date, and site information are readily available.

Maps in the Field

Land Records parcel boundaries, road centerlines, well, septic, and well buffer information are available in the field on the GPS units.

Implementation

By 2012, a solution had to be found for the problem of tracking historic permits. There were several events during this time which motivated the development of the Jackson Health GIS program:

1. The goal of the Public Health Director to bring the Environmental Health Department into the GIS age by building an enterprise GIS.
2. The need to expedite research of historic permitting data.
3. The desire to locate future well and septic sites in the GIS.
4. The arrival of a scanning project intended to archive historic, hand drawn permits.
5. The desire of the Board of Commissioners to implement a “one stop” permitting system intended to tie together Environmental Health, Code Enforcement, and Planning through specialized permitting software.

Jackson Health was ultimately developed to provide an easily used research tool and GPS workflow for the Environmental Health Specialists. The system would be tackled on two fronts. The first front was the development of an enterprise geodatabase geared to the department’s needs. This would include all vector data needed to track well and septic systems along with automated updates from the Land Records GIS and E911. The second front was the development of an easily used GPS workflow for the Specialists’ field work. The features collected would also be fed into comprehensive permitting software which encompasses building inspection, planning regulations, and environmental health in the near future. The historic parcel layer is already being used as the cornerstone of the GIS based permitting software being developed at ROK Technologies for Jackson County.

Enterprise Geodatabase Development

The first step was to assess the data collection needs of Environmental Health. This task was undertaken by Jackson County GIS Analyst Adam Blythe. Mr. Blythe spent much time with the Environmental Health Director and numerous Specialists determining the datasets needed to efficiently track the locations visited in the field.

The database development took close to a year to complete. The data had to be tailored to the number of regulations and phases of permitting, which required numerous site visits and planning sessions. The database was structured around the specific needs of the

Specialists and required flexibility to be updated as their needs changed. Some of the attributes taken in the field include Date Edited, Distance from Well or Septic, name of editor, the phase of permitting to which the edit belongs, and the Permit ID which ties the features together with the scanned permits.

The database development is constantly being updated, as rules and regulations change. Also, the growth of other database systems which depend on the GIS governs how the data is structured. For example, with the implementation of the “one stop” permitting system, much of the attribute data the Specialists collected in the field on GPS will no longer be necessary. It will already have been inputted electronically through the permitting database and can be related back to the GPSed features in the GIS through the Permit ID. Although the data collection workflow remains consistent, we will be able to trim back the time in the field by eliminating redundant attribute data. However, the attributes taken now had to be such that they can be fed back into the new permitting system when it officially comes online.

GPS Process

One of the biggest challenges in implementing Jackson Health was the development of a GPS process that did not greatly impact the workflow of the Specialists. The job of the Specialist is to enforce General Statutes and to assist the taxpayer in taking advantage of property rights. Although competent in the use of ArcMap, the Specialist should not be required to become a GIS/GPS expert. The learning curve and time expended in the field had to be minimal for GPS work as not to interfere with the real job at hand: issuing permits. The Specialists were to be able to check out any GPS unit at given any given time and expect consistency in how the units operate.

The products chosen for field collection were Trimble GeoXT 3000 GPS units running ArcPad 10. Since the GPS units were going to be used for initial site visits, differential correction was not required. Due to space and budgetary constraints, four GPS units were purchased along with one PC. Two obstacles had to be removed to allow the Specialists to use the GPS units: the complexity of the GPS data check in/checkout process through ArcPad and the limitations of Windows Mobile. This all had to be accomplished with existing software. Since Jackson County participates in the ESRI local government ELA program and ArcPad is part of the agreement, no purchases of software were necessary.

Multiple GPS Units With a Single PC

The solution for using multiple GPS units with a single PC was the use of DevCon command line utilities. DevCon commands can be used as an alternative to Windows Device Manager. The device number of each GPS was determined so that the units could all be docked to the PC simultaneously and addressed individually. To preserve data integrity, extracted AXFs used with Arc Pad were placed in the main memory of the Trimbles. This allowed complete control over the sync process. Using the same logic, AXFs containing collected data were copied from the GPS units, placed in a location for check in, and archived.

Data Collection

The ultimate goal of the GPS workflow was to make the units “grab and go.” The Specialists would be able to take the GPS off of its dock and go to work. Likewise, they would be able to return from the field, click one icon on the desktop, and check in their data to the enterprise. This was accomplished using Python scripting in conjunction with DevCon utilities.

Upon returning a GPS to the dock, a script is activated via an icon on the desktop. The script serves several functions. First of all, DevCon is leveraged to activate the specific GPS and move the edited AXF from the GPS to the PC. Next, the AXF is checked into an intermediate file geodatabase. The file geodatabase contains a checkout replica registered to the enterprise, adding a level of redundancy. The file geodatabase is then archived. Next, the checkout replica syncs with the enterprise geodatabase. A new checkout replica is then established. Finally, a fresh AXF is placed on the GPS. This eliminates any interaction the Specialist has to have with ArcGIS to check in data, thus removing human error. The result is a smooth, consistent desktop GPS workflow with built-in data redundancy that does not interfere with the real job of the Specialists.

The field inspection process for an onsite wastewater treatment specialist requires a great number of regulations which are dependent upon setbacks from different features. For example, a well must be a certain distance from a septic tank, building, or stream. One benefit of GPSing these features is that the Specialists have a visual representation of the lot layout and how it interacts with the data on surrounding properties.

Other GPS Benefits:

- Locating features buried in the ground for future repairs
- GIS integration provides a better on site product option for clients. Instead of reading hand drawn maps, a digital site drawing is now available at the discretion of the Specialist.
- GPS attributes include the use of date and time stamps so the Specialists and other researchers can look up the exact data and time the site was visited.

Replication

Enterprise geodatabase replication plays a large part in the functionality of the Jackson Health GIS. Since current parcel ID is the key to the updating process and research, the Land Records feature dataset must be replicated to the jackson_health database. A replica sync occurs nightly to keep all vector data up to date. A fresh tax ownership table is also imported into the jackson_health database so that ownership information can be tracked. Since the network between the main GIS server at our Justice Center facility and the Health Department can sometimes be problematic for replication, a failsafe is in place that sends a spatial view of real parcel ownership polygons to jackson_health using a delete/replace Python script.

Geoprocessing and Transact SQL

The key to tying the environmental health data to all other county data is tracking the current parcel identification number on the GPS features. This is accomplished by the use of geoprocessing and TSQL scripting. If the current PIN exists on the feature along with the existing attributes taken in the field, a wealth of information can be tied together.

Geoprocessing is used to attach the current PIN to well and septic features. The process flow is simple, but effective. If a feature class is point, a spatial join is performed joining the current PIN from the attributes of the most current Land Records mapping. If the environmental health feature class is polygon, the features convert to a point feature class. A spatial join is then performed to add the PIN from the parcel polygons. TSQL script then populates the current PINs within the production layers. TSQL is also used to build hyperlinks to permit scans and digital tax cards hosted on another server.

At the end of the process, spatially enabled views are created on the environmental health layers using tabular data from Tax Administration and 911 Addressing. Specialists now have access to permitting data, basic ownership data, scanned permits, and tax cards from their identification of a feature in ArcMap.

Geoprocessing is also used to assist the Specialists with well setbacks. Due to regulation, Specialists need to visualize both 50' and 100' buffers from existing wells. Geoprocessing is used nightly within the server automation to regenerate well buffers in both 50' and 100' intervals. The buffers are then loaded as a reference layer on the GPS units to give the Specialist an educated guess as to where they need to make measurement. The well buffers are also available in ArcMap on PCs throughout Environmental Health.

Organizational Impact

Jackson Health has been applied extensively in Environmental Health. All GPS units are checked out daily. In a county with roughly 40,000 parcels and a jump started real estate market, Specialists have located almost 600 new septic systems and 300 wells in the last two years using GPS and GIS. Phone calls to Land Records from Specialists and Environmental Health clerks for parcel research assistance have all but been eliminated. Environmental Health has become self-reliant in parcel research and location. Self-reliance has had a positive impact on productivity, especially with clerical and administrative work. It has also cut phone traffic in Land Records saving property mappers man hours.

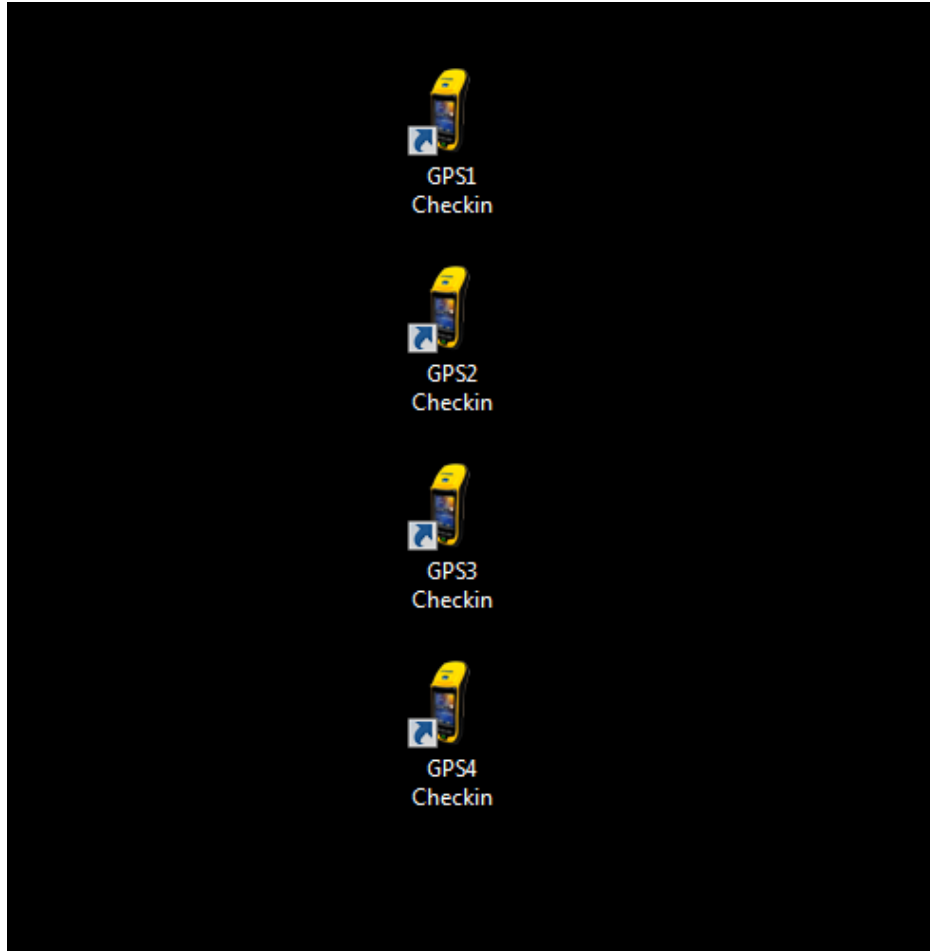
Specialists are now comfortable in mapping with GPS. This is a large achievement in that three years ago, everything in their workflow was paper based. Picking up a GPS and going into the field is now second nature to the Specialists. The data quality to this point has been very impressive. The department is on course to start using GIS to produce site drawings for the public in conjunction with a new GIS based permitting system. A department once dismissive of GIS/GPS technology has now embraced it as part of the future of their operation.

Appendix

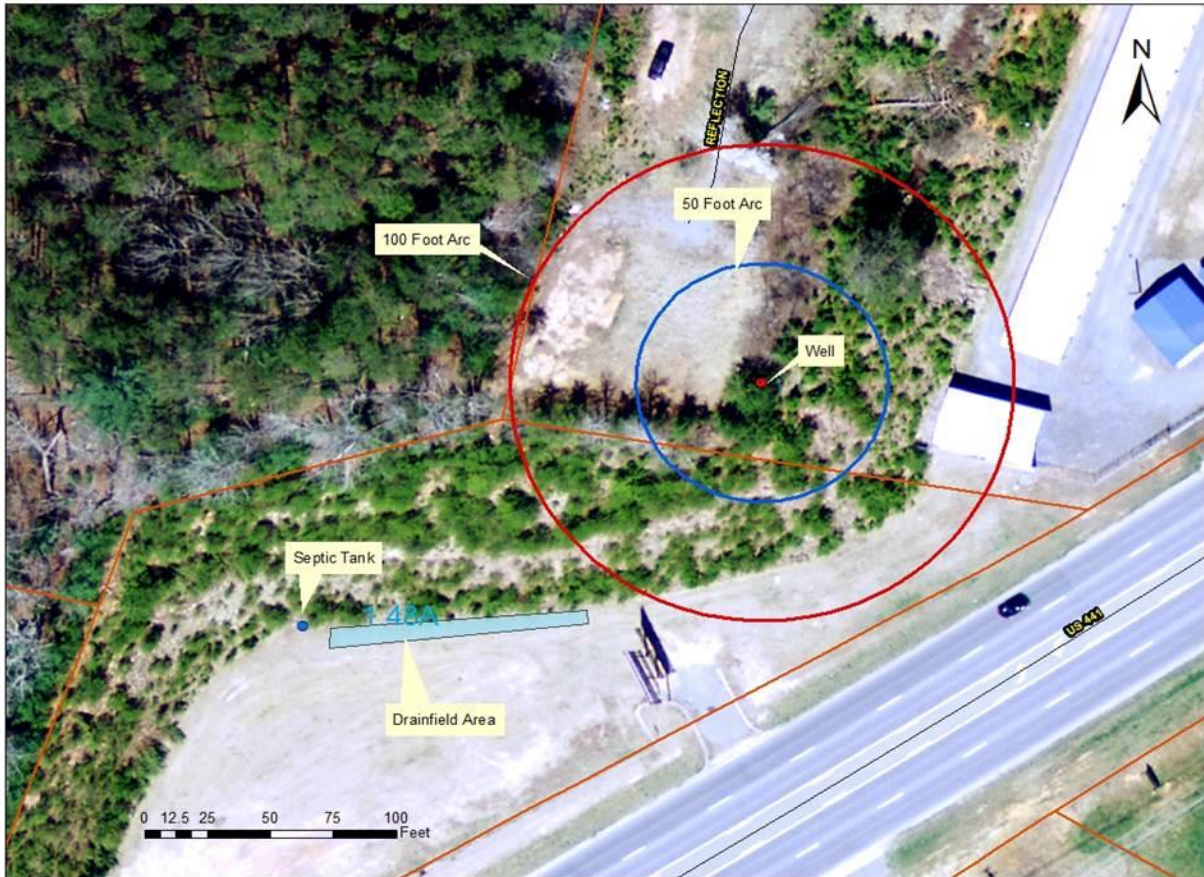
1. GPS Docking Station – One PC is used to control a central docking station for all GPS units. This allows GPS accessibility to all Specialists at any time. The GPS units are numbered and checked out on a log sheet.



2. GUI – The only GUI needed is a set of desktop shortcuts which launch the GPS control scripts. This comprehensive scripts handle GPS data retrieval, data archiving, data check in, and GPS data reload for the next field mission.



3. Located Well and Septic Systems with Well Buffers – 50' and 100' buffers are geoprocessed and refreshed nightly for newly GPSed wells. This is available through ArcMap in the office and Arc Pad in the field.



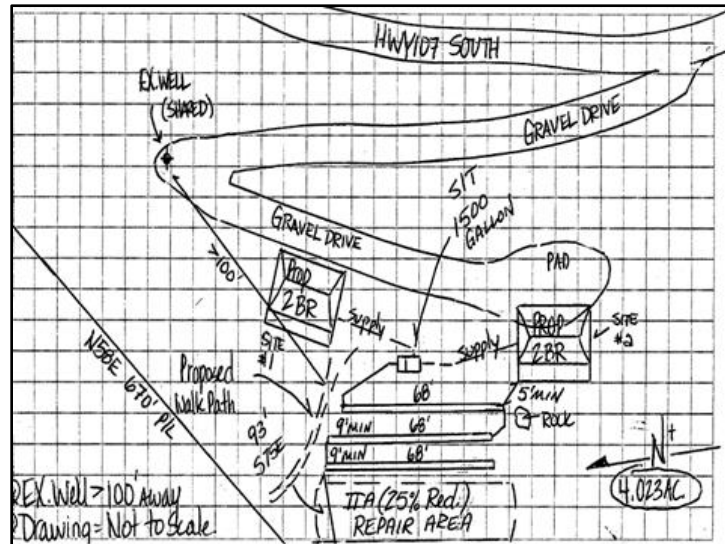
4. Permit Scans and Tax Cards – Permit scans and tax cards are now available via hyperlink through ArcMap:

The screenshot displays the ArcMap interface with several key components:

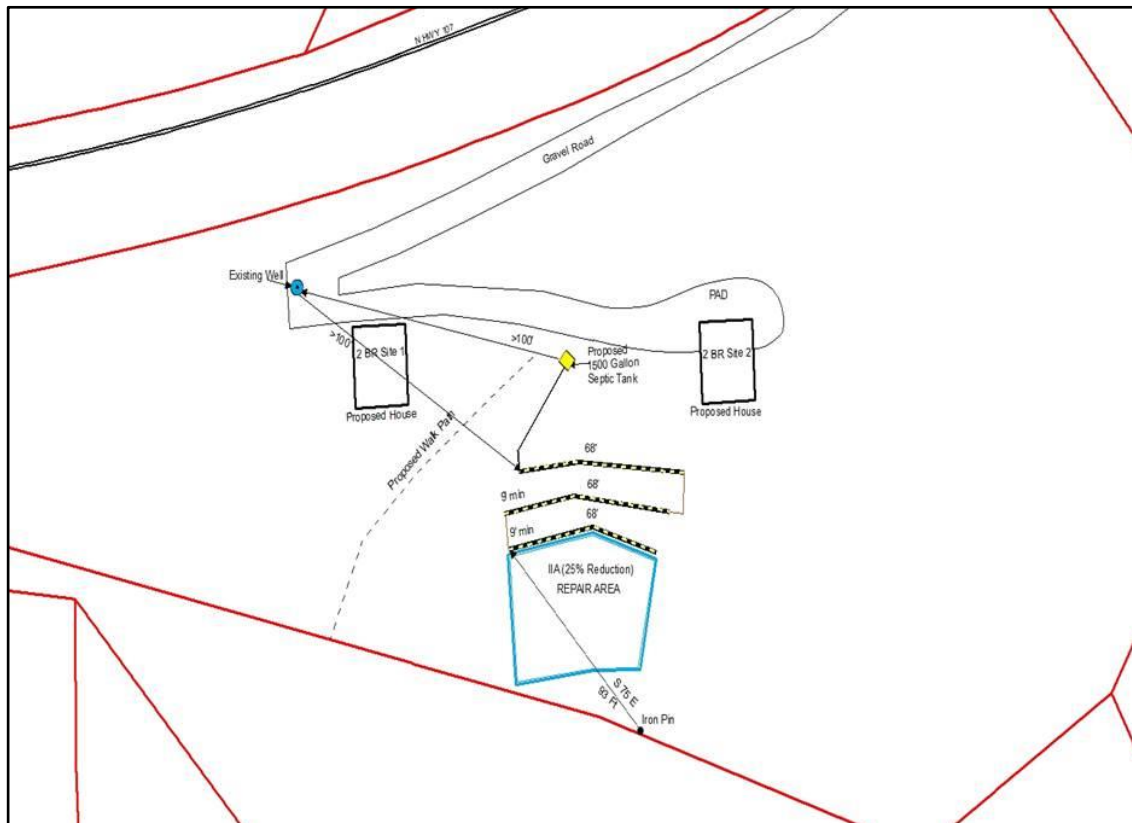
- Adobe Reader Window (J743700.pdf):** Shows a permit document for J743700. Key details include:
 - APPLICANT: PICTURE DEVELOPMENT, INC. LLC
 - ADDRESS: 5231 WATCHTOWER RD, JULIAN, NC 28774
 - PERMIT TYPE: OPERATIONS PERMIT
 - ISSUE DATE: 11.27.12
 - ISSUE NO: 8502-41-3863
 - ENGINEER: COLLEEN HAN, ELLIS HAROLD
 - REMARKS: Installed one 1050 gallon septic tank feeding 150' of IIA (Infiltrator-Quick 4-pus) system, consisting of (2) 75' drainlines.
 - INSTALLER: Installed by Jamie Wilson # 3868
- Map View:** An aerial map showing property boundaries and a red arrow pointing to a specific location labeled "INITIAL/REPAIR". Neighboring properties are labeled with owner names and addresses, such as "HAGAMAN, JOANN N 8502-41-3863" and "DALLAS, JOSEPH H ETAL 8502-41-6790".
- Find Window:** A search tool window with the following settings:
 - Find: 3743700
 - In: <Visible layers>
 - Search: All fields
 The results table below shows:

Value	Layer	Field
3743700	Septic_Tank	PER
3743700	Septic_Area	PER

5. GIS Based System Drawings – Several Specialists are electing to use the GIS to produce site drawings. The layers to produce the drawings are available on GPS and will eventually be integrated into the daily business flow:



Hand drawn site drawing



Same site drawing in the GIS

Acknowledgements

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