RFQ No. 003347

City of Columbus, Ohio, Department of Technology

GIS Technical Consulting Services

November 21, 2016

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Cover Letter

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November 17, 2016

H. Samuel Orth lll, Director & CIO
Department of Technology
City of Columbus, Ohio
The Jerry Hammond Center
1111 East Broad Street, Suite 300
Columbus, Ohio 43205

RE: GIS Technical Consulting Services

Dear Samuel:

I am pleased to submit this proposal, on behalf of the Woolpert team, to provide the Department of Technology (DoT) with continued support maintaining and enhancing its GIS. We have been directly supporting the DoT's GIS Division through application development, data acquisition, and business process analysis since the 90s. Most recently, Woolpert provided consulting and application development for the City's 2014 on-call GIS services contract, which supported the Department of Public Utilities (DPU). We are excited to expand on that work to assist the DoT in further advancing Columbus's citywide GIS and its related software capabilities.

I personally have been working with the City of Columbus for nearly 40 years—first as a city employee, and now as a GIS consultant. Having started my career as a maproom manager for the City and GIS manager for its DPU, I feel I bring to the team a unique perspective of both the City's processes and what it takes to keep up with emerging technology trends. I was also fortunate enough to be a part of the implementation team for the citywide GIS initiative in 1995, and a member of the City's GIS steering committee from 2000 to 2009. These experiences were integral in preparing me for my present position as a Project Director for one of the oldest and largest geospatial firms in the country. It is my hope to continue to bring that knowledge back to the City through projects and contracts such as this one.

Nationally recognized as a premier provider of architectural, engineering and geospatial (AEG) services, Woolpert provides multidisciplinary competencies in several GIS-specific services, such as application development, data conversion, integration, business process analysis, as well as related services such as surveying, data acquisition, asset management, permitting and licensing, urban planning, and water management. With our comprehensive knowledge of the services related to this contract and our successful record of performance, our team proves to be not only uniquely qualified but also an optimal, full-service solution to the DoT.

Legal structure. Established in 1911, Woolpert Inc. is a Corporation incorporated in the state of Ohio and operates throughout the United States. Woolpert's home office is located at 4454 Idea Center Boulevard, Dayton, OH 45430.1500 with a principal place of business located at One Easton Oval, Suite 310, Columbus, OH 43219-6062.

Tax identification. Woolpert's federal tax identification number is 20-1391406.

Contributing authors. Individuals who have contributed to this proposal include:

- Mike Merchant—Project Director
- Marianne Cardwell—Project Manager
- Crystal Childress—Project Coordinator
- Christina Mannix—Proposal Manager
- Amy Stiffler—Technical Writer

Summary of Proposed Solution. Our proposed solution is to leverage our past experience with the City of Columbus, which encompasses GIS, data acquisition, surveying and transportation design, to develop focused solutions for the departments the DoT supports—while also assisting the DoT in implementing solutions that will improve the City's GIS capabilities as a whole. Our

intimate knowledge of the City's past, present and future goals, paired with our cross-discipline expertise, will allow us to hit the ground running on any project the DoT may assign. From developing applications for the DPU or Public Services to collecting infrastructure data to feed the City's asset management system, and from business process analysis to empowering field staff with user-friendly GIS tools, we offer a one-stop-shop for any and all needs the City may have under this contract.

We are capable of providing all of these services in-house, or with the assistance of small, local business partners. Our team is comprised of GIS application developers, database specialists, systems analysts, information management specialists, GIS technicians, surveyors and project management professionals—many of whom have either worked directly on the previous on-call GIS services contract or on other projects for the City.

In addition to this dedicated project team, Woolpert is supported by over 25 GIS Professionals (GISPs), an additional 30 GIS specialists, and over 100 cross-trained staff, including Certified Scrum Masters, Esri Certified ArcGIS Desktop Developers, Certified Asset Management professionals, Licensed Surveyors and Network+ certified IT professionals.

In recognition of the DoT's expansion of the potential scope of work under this contract, we have introduced the following additional service offerings in Section One: Firm Introduction under the "other GIS-related tasks" heading:

- Feature extraction
- Mobile lidar
- Asset management
- Thermal imaging
- Unmanned aerial systems (UAS)

These represent only a portion of Woolpert's services; if any additional capabilities are desired, we are happy to provide more information.

Woolpert is also aware of the City's "Smart Columbus" initiative, which will rely heavily on mapping and GIS technology. We will continue to work in collaboration with the City to develop a "master map" of Columbus to support the Smart Columbus initiative, the Columbus Connected Transportation Network (CCTN) and the City's Autonomous Mobility Initiative. Given our past experience with the City and our multidisciplinary expertise in mapping, GIS development, planning and information management, Woolpert is capable of providing dynamic support during the City's transition to becoming the nation's first "Smart City."

Since our founding in 1911, Woolpert has continuously adapted our services to meet the needs of a changing world. Each decade has contributed to our heightened focus on the markets we serve and the services we perform. Today, our core technologies coincide well with the services you are seeking. With that in mind, thank you in advance for considering Woolpert. We hope that you will give us the opportunity to remain your partner in helping the City stay at the forefront of GIS technology and improve the level of services offered to its citizens.

Sincerely,

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Section One:

Firm Introduction

WOOLPERT

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Our Team

Woolpert has a strong history providing services to the City of Columbus and understands the importance of making the necessary investments to revitalize our City's infrastructure. Founded in 1911 in Dayton, Ohio, Woolpert has maintained an office in the City of Columbus for over 30 years. Our four Ohio offices are complemented by 19 other offices located throughout the United States, and they collectively include over 650 employees. Our Columbus office continues to expand, and currently employs 23 professionals locally. This office has been quickly growing, with five hires since June, and eight total since January.

Offeror Information	
Address:	One Easton Oval, Suite 310 Columbus, OH 43219
Telephone:	614.476.6000
CCCN#:	201391406

While Woolpert has the skills, equipment and capacity to accommodate the Department of Technology's (DoT) needs under this contract, we have long standing relationships with various local small businesses (SB), small disadvantaged businesses (SDB), and minority or woman owned business enterprises (MBE or WBE) and can augment our capacity with their services as needed. For this on-call project, we have added **Brown Enterprise Solutions, LLC (BES)**, a Columbus-based certified MBE, EDGE and DBE company in the state of Ohio. BES will support the Woolpert team by providing computer hardware and software solutions and consulting services. Established in 2001, BES is an approved MBE program participant under the Information Technology Services procurement category and currently holds two contracts with the City of Columbus to provide Dell and Lenovo desktop and laptop hardware. BES provides IT services that includes the installation, set-up and configuration, troubleshooting and issue-resolution for firewalls, anti-virus and security software; network assessment; wireless site evaluation; servers, printers and CPUs; CAT 5E or 6 cabling and hardware imaging. Their current assignment with the City involves installing computers and network cameras for the police department.

A provider of technology solutions for small, medium and large businesses, state and local government agencies, K12 clients and institutions of higher education, BES is well-respected within the geospatial community—and with the City of Columbus—ensuring the City receives the highest quality products. When project requests are received and fall within their areas of expertise, Woolpert will contact them to solicit their support.

We recognize the value of mutually beneficial relationship with small businesses and have demonstrated a commitment to actively seeking these relationships. It is a policy of Woolpert to continue to improve supplier diversity and to make good faith efforts to meet all goals as established in small business subcontracting plans.

While the City has not set forth specific small business goals for this contract, our team wants to emphasize its support for diversity and the City of Columbus's goals to provide M/W/DBE businesses with maximum practicable opportunity to participate in contracts awarded by the City. Similarly, it is also Woolpert's goal to support the communities in which we work by engaging the services of local subconsultants whenever practical.

The following chart illustrates our team's organization, hierarchy of communication, and distribution of responsibilities. The individuals shown possess the relevant experience, professional registrations, certifications, licensure and accreditations to successfully perform all of the required services and are expected to be the most involved in the GIS Technical Consulting Services contract.

Firm Overview

Woolpert, Inc.

Woolpert delivers dynamic consulting and design services, worldwide, to clients who require architectural/engineering assistance, technology integration, or a combination of both. Our clients range from nationwide military programs to small towns, and from college campuses to private industry. We solve clients' problems through results-focused consulting, creative yet practical design, and the appropriate use of technology.

Our clients benefit from Woolpert's professional expertise over a wide range of services in design, geospatial and IT management. Specific services that Woolpert provides include: architectural/engineering design, design-build, aviation design, energy solutions, sustainable design, planning, surveying, photogrammetry and mapping, remote sensing, information management, enterprise asset and maintenance management systems, GIS, permitting, watershed management, water/wastewater design and analysis, and regulatory compliance. Our multioffice, multidisciplinary capability distinguishes us from other firms. Woolpert has the relevant experience, expertise, technical support and quality review personnel to complete virtually any assignment in its given timeframe.

Geospatial/IT Services

At Woolpert, we don't wait for new geospatial/IT technology to arrive on the market; we create it. While our geospatial professionals are mapping and surveying tens of thousands of square miles each year for our clients across the country, our research and development group is finding new and better ways to visualize, analyze and deliver data. Our clients reap the benefits of Woolpert's visionary approach and state-of-the art services and products.

Woolpert_Labs. Woolpert is one of the only geospatial companies of our size with a dedicated Research & Development group. Coined "Woolpert_labs," this group is made of our own highly skilled technical experts who continuously monitor, test and advocate for emerging technologies in imaging, lidar, GIS and web services. A cross-functional group of industry leaders, our team brings together the power of the web, parallel computing, GIS, remote sensing and visualization to create new methods for analyzing and serving geospatial information.

Esri Business Partner. As a preferred Esri business partner, Woolpert provides industry-leading consulting and software development services to help communities improve their workflows for collecting, maintaining and sharing data. We use many different Esri products for GIS applications and thematic mapping, and to create interactive maps, web solutions and GIS databases. Our staff's proficiency in developing technology infrastructure solutions using Esri's technology as a platform is unparalleled.

We are leading the geospatial/IT industry by bringing you tomorrow's technology solutions at the same time we're delivering today's state-of-the-art services and products.

Commitment to Sustainable Practices

Woolpert believes that being an environmentally preferable offeror comes from a creative approach to our projects and the way we do business. As a firm, we strive to be responsible corporate citizens, neighbors, and stewards of the environment by leading by example, in alignment with our **corporate environmental principles**. Our sustainability program is employee-driven, with a diverse team of Woolpert professionals engaged in our "green initiative," which is backed at the CFO level.

Our employee green initiative has led to the following actions:

- Purchasing 100% green power since 2011
- Creating waste-reduction through robust recycling programs in each office

LEED certifying five of our offices since 2009

- Pursuing Energy Star in several offices where we occupy all or the majority of the building
- Greening our communities through employee-led, Woolpert-sponsored service projects
  - In Columbus, our office has been an "Adopt a Highway" participant since 2013
- Eliminating our paper-based processes in favor of a web-based ones

As a result of our commitment to promoting a green environment, Woolpert's Columbus office has received **Green Spot Certification**.

Project Approach

Staff and Resources

Woolpert brings a full spectrum of personnel and non-personnel resources—including experienced staff, available facilities and support infrastructure, and complete corporate commitment—to ensure a rapid initiation of any project under this contract.

To manage its projects effectively, Woolpert uses state-of-the-art programs that enable us to monitor, schedule and budget for each project or task order. We also use a resource management spreadsheet to track the workload of our personnel. Based on workload as a percentage of capacity, the spreadsheet indicates to managers whether various disciplines in our offices are under goal, on target, or overworked on their projects. This tracking method allows managers to see where problems or opportunities with workload exist and adjust their priorities accordingly.

Woolpert recognizes that a project plan is only as good as the staff and resources fueling it. That's why our project management starts before we even receive the project. When pursuing additional contracts, we evaluate our staff's current workload to verify that we have more than sufficient staff to complete the work in the given time-frame, and compare anticipated equipment needs with existing project timelines to ensure that necessary resources will be available without delay. In preparing this response, our discipline managers evaluated their teams' current workloads and the availability of necessary personnel, equipment and facilities; we are confident that we have the resources and capacity to meet or exceed expectations on this contract.

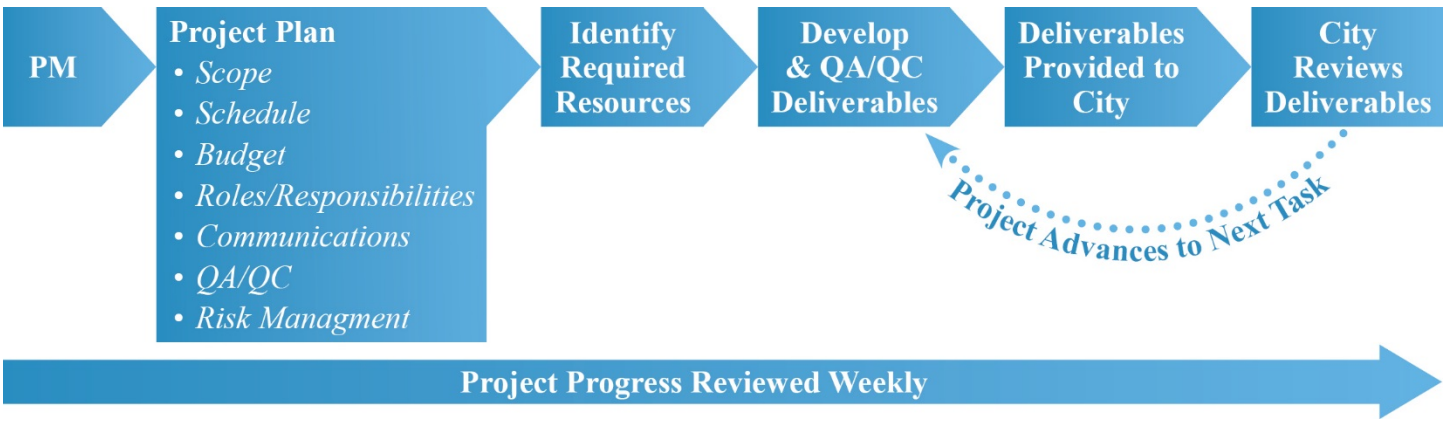
Contingency Staff

In the event that the DoT requests a task to be completed on an accelerated schedule, our proposed team has reach back support of over 100 cross-trained geospatial staff, as well as more than 50 GIS specialists and developers.

Overall Project Management Methodology

Through Woolpert's extensive experience with as-needed contracts similar to this project, we have developed a series of project management tools and techniques, which will be used throughout our work with the City. The most significant tool that the project management team will use is our cost accounting/management information system: **Deltek**. This system is capable of segregating project-related costs at an aggregate level, which allows charges to be queried by project, task, employee or description of work performed. Deltek allows us to monitor project milestones, identify deviations from budgeted costs and quickly develop corrective actions if needed. As a result of Woolpert's experience with this type of work, our team has a deep understanding of the associated (and expected) costs—and the management best suited for this contract.

Before starting an assignment, the Project Manager will prepare a Project Plan that includes the following components: scope, schedule, budget, roles/responsibilities, communications, quality control, and risk management. The Project Plan will be reviewed and approved by Woolpert's senior leadership. The project management team will identify all of the required resources necessary to complete the project successfully. All stages of the project deliverables will go through the quality control procedures established in the Project Plan before being released to the City for review and use. The project's progress and staffing needs will be reviewed weekly by the project manager. A visual representation of our project plan is as follows:



Additional Project Coordination Tools

In addition to Deltek, Woolpert's project management team utilizes collaborative, web-based communication tools, such as **Smartsheet** and **iMeetCentral**. These websites provide us with a centralized location, accessible by all parties, to develop, document and make changes to the project work plan; track issue logs; manage subconsultants and team resources; review critical path tasks with risk analysis and mitigation; control costs; and report progress. The result is a "project history" that is always accessible to the management team. Woolpert also utilizes **FogBugz**, a web-based solution used for tracking development tasks, from creation to completion. Woolpert's experience with these tools reduces overall project administration costs and offers significant time savings to our clients.

In addition to her role as Project Manager, Marianne Cardwell's experience also enables her to lead the software development and systems architecture team. This unique leadership/subject-matter-expert dual role will keep Marianne continually involved in all project aspects, ensuring a well-planned and well-executed integration of software requirements and functionality with business process improvements, using accurate and appropriately developed GIS data.

Project Management Team

Woolpert intends to use the same proven project methodology that we have successfully employed on the previous City of Columbus GIS technical consulting services contract. Our project methodology is based on our philosophy that a successful project requires a highly-skilled and experienced project management team. A seasoned Project Manager is essential for providing strong leadership and establishing clear lines of communication, authority, roles and responsibilities.

Woolpert's Project Manager ensures that project roles and responsibilities are defined in such a way that clear accountability is known to all project participants. In addition, the Project Manager actively involves key team members of project working groups in the decision-making process, giving the most knowledgeable people the opportunity to provide input. By closely coordinating with these key team members and obtaining their input, the Project Manager builds checks and balances into the decision-making process.

Mike Merchant, GISP, will serve as the team's Project Director, bringing years of experience in photogrammetry, surveying and GIS to his clients in the state, local and federal markets. He has supported numerous mapping and GIS projects in the state of Ohio, providing expertise in developing and implementing customized asset management solutions and supporting tasks that range from requirements gathering and business process analysis to conceptual designs, data migration, software configuration, implementation, testing and training. Mike will provide general oversight of the project and guidance to the City of Columbus, the DoT and Woolpert's project management staff. He will listen intently to the City's comments and concerns and work diligently to resolve any issues should they arise.

Marianne Cardwell, GISP, will serve as the Project Manager. She brings a thorough understanding of the DoT's needs and the requirements of the work, having served as Woolpert's PM for the current City of Columbus GIS on-call services contract. Marianne's primary responsibilities will be project planning; setting the schedule; determining and acquiring the needed resources; subcontractor management; monitoring budgets and schedules; monitoring tasks to ensure quality control; and establishing project expectations. As Project Manager, she is responsible for the overall success of the project and client satisfaction. Marianne will meet with the City and its designated stakeholders to develop a full understanding of the current project goals and expectations.

Crystal Childress, CP, GISP will be assisting Marianne with project management responsibilities**.** With a broad background in photogrammetry and GIS, Crystal serves as the Project Manager for a number of the firm's geospatial projects. She has assisted with operational duties for numerous projects, including the Ohio Statewide Imagery Program (OSIP) in 2016, giving her a solid understanding of the state's photogrammetric/GIS needs. Crystal will be the secondary contact for the day-to-day operation of the project, in the event that Marianne is not available. Crystal will not only provide Marianne assistance during this multi-year project, but will play a pivotal role as backup to ensure that quality, deadlines and customer service are achieved.

Proximity and Accessibility

Mike is located in our Columbus, Ohio, office, giving him close proximity to City management. Crystal is located in our Dayton, Ohio, office, which will provide her the opportunity to be directly involved with production tasks on a daily basis and if needed she can also be available onsite in Columbus within an hour. Woolpert's project management team will be fully dedicated for the duration of the program.

Below is the management team's contact information:

- Mike Merchant, GISP
  One Easton Oval, Columbus, Ohio 43219-6062
  7635 Interactive Way, Suite 100, Indianapolis, IN 46278.2731
  Phone: 614.827.6176; Mobile: 614.795.3865; mike.merchant@woolpert.com

- Marianne Cardwell, GISP
  Phone: 317.223.2252; Mobile: 703.623.9521; marianne.cardwell@woolpert.com

- Crystal Childress, CP, GISP
  4454 Idea Center Boulevard, Dayton, Ohio 45430.1500
  Phone: 937.531.1247; Mobile: 407.489.1104 ; crystal.childress@woolpert.com

Project Management Responsibilities

The key to a successful project methodology is having a skilled project management team with the background to leverage past experiences, intimate project knowledge, the use of technology, and effective communication with the client, subcontractors and internal staff to ensure a successful project.

Our proven project management style includes seven components:

1. Perform project planning
2. Establish project budgets
3. Set the schedule
4. Determine and acquire needed resources
5. Monitor budgets and schedules
6. Monitor tasks to ensure quality control
7. Establish project communications

We have outlined the requirements for all seven steps below to demonstrate the importance we place on project management for this assignment.

Step 1: Perform Project Planning. Marianne will begin planning each work assignment after the specifications for that assignment have been agreed upon and finalized in writing. Woolpert team members, with significant input and feedback from City staff, will thoroughly discuss the scope of work to gain a clear understanding of the requirements, goals and objectives for each assignment. Project planning requires that the work be divided into phases and subdivided into work tasks. Most importantly the inclusion and feedback from relevant personnel will be communicated, both internally for the Woolpert team, and externally to appropriate staff.

Step 2: Establish Project Budgets. Marianne—with input from Mike and Crystal—will assign a budget of work hours for each phase. These budgets help Woolpert monitor the financial status of each work assignment. The budgeting process has the following components:

- Identify labor categories required for each phase or task
- Estimate the number of hours
- Calculate fees and establish invoicing procedures

Step 3: Set the Schedule. Using this proposed schedule as a starting point, Woolpert and the City will arrive together at an incremental schedule that meets the needs of all parties.

Step 4: Determine and Acquire Needed Resources. Marianne—working with our production managers—will evaluate the staff and equipment available for the project, taking the following factors into account:

- Amount of equipment and number of staff available
- Available staff hours and equipment hours
- Hours budgeted for a phase or project
- Time to complete the work
- Existing workload

Step 5: Monitor Budgets and Schedule. Marianne's responsibility for project management doesn't end with project planning, budgeting and scheduling. In addition, she will monitor budgets and schedules to identify potential problems so that the project

stays on track. We use Microsoft Project to track milestones, timelines and budgets. The project Gantt chart is often included on a project website, as detailed later in this document.

Step 6: Monitor Tasks to Ensure Quality Control. Marianne—in concert with Mike and Crystal—will set the standards for quality products and is responsible for ensuring that quality control procedures are carried out continuously.

Step 7: Establish Project Communications. The level of communication and coordination required to successfully execute a project of this scope is extensive. For this reason, Woolpert uses a wide variety of communication techniques, including: telephone, email, FTP site, WebEx, onsite visits, meetings, progress reports, and a project website.

Through all of these methods, Marianne and Crystal can properly coordinate our team's efforts and give the City timely answers to questions. All these communication devices add up to an environment that allows our clients to stay well informed about the progress of demanding projects.

QA/QC Processes

Woolpert's Quality Management Program (QMP) is based on the International Organization for Standardization model ISO 9001:2008. ISO standards are used to certify the quality systems and processes of an organization. Woolpert has over a decade of experience working with ISO, and a portion of our company is certified.

By modeling our QMP after the requirements of ISO, Woolpert demonstrates consistency of products and services that meets our clients' expectations and applicable governmental statutes and regulations. Additionally, every document submitted to our clients is always first considered a draft. We always account for continuous feedback on our deliverables to ensure they meet expectations. Even before our deliverables are submitted, they go through a formal quality control checklist and grammar review.

Quality Assurance/Quality Control (QA/QC). Woolpert believes that quality is measured by our clients and is achieved when a service meets mutually agreed-upon requirements. We are committed to providing quality services and products to our clients. This commitment is more than quality control steps added to a process. It's a philosophy that is practiced by our Project Managers and production personnel. It's an integral part of each phase of a Woolpert-managed project.

Quality Controls. For product delivery, our Quality Assurance Plan (QAP) covers four important areas of quality assurance:

1. Assigning team responsibilities with individual accountability;
2. Formal internal review procedures to ensure compliance with scopes, standards and codes;
3. Internal tracking and weekly coordination to prevent delays and errors; and
4. Periodic overview of products, internal processes, team performance and client feedback to ensure continued optimum performance and client satisfaction.

Woolpert Project Managers develop and maintain project plans, which are key components of Woolpert's quality control plan. Project Managers' most crucial duties are to develop and maintain those plans. Proper planning helps Project Managers to divide their projects into manageable phases and tasks that can be accomplished over short periods of time. Most project plans contain work breakdown structures, fee budgets, schedules and project team organizations. All team members receive copies of the plans and amendments, and review the plans with his or her Project Manager.

Because the plan is essentially a map for the project, Project Managers monitor, evaluate, and amend their plans throughout the project. Monitoring a project's progress against its plan keeps both the project team and the client up-to-date. Frequent and consistent monitoring also reveals scheduling, staffing, and budgeting problems that may arise unexpectedly.

Woolpert believes that our consistent approach and the significant experience of our personnel are substantial reasons for our years of success. QA/QC is a term used to define the efforts put forth to produce quality products. Our reputation is built on the excellence of the work we have done in the past, and we strive each and every day to maintain that reputation. Quality assurance can only be provided with constant quality control throughout the project. As the layers of data are brought into the framework of the project, they are checked for compatibility with all other plan elements and the overall compatibility with your requirements.

Woolpert's QA/QC managers will take the lead in setting the quality standards, and will have the responsibility of ensuring that quality control procedures are continuously carried out. Another key component of quality control is maintaining constant communication with the client. By keeping the client informed of progress and the content of design deliverables, delays and conflicts can be mitigated. With this plan in mind, our QA/QC process always includes meetings (as required), progress updates, risk

questionnaires, and a teamwork approach with all involved in the process. Quality control will be exercised throughout the life of the contract. Data will be reviewed and checked for accuracy and compliance with the project scope.

Demonstrated Competency and Capabilities

Woolpert provides GIS services that include consulting, data creation, and application development—services that range from business process, workflow analyses implementation planning, and application development, to deployment, onsite operation, and maintenance of systems. Woolpert develops and administers geographic information systems that address all levels needed for client operations—from hardware acquisition through security protocols, and data optimization to application development and end-user training.

The following demonstrates our capabilities and typical processes for all services outlined in the RFP.

Data Conversion, Cleansing and Development

A premier provider of GIS services in Ohio, Woolpert specializes in GIS consulting for municipal clients and has provided conversion services on over 20 similar contracts over the past five years.

With over 20 Geographic Information Systems Professionals (GISP), an additional 30 GIS specialists, and over 100 cross-trained staff, Woolpert has the capability to meet the GIS needs of a diverse client base.

Data Conversion

Our specialization in data conversion means that our staff understands how geographic information systems are designed and built. This allows us to make intelligent decisions when building data conversion processes and workflows that will work seamlessly with geospatial applications and enterprise systems.

Data conversion at Woolpert begins with a review of existing source material. All of our technicians are comfortable reading and interpreting a multitude of source types. Sources include hardcopy and CAD construction drawings, property and easement data, address information, base map data such as orthophotography, planimetric and topographic mapping, and existing GIS data. Once the sources have been identified, the material is reviewed to determine the primary sources and how they will be used during the data conversion efforts.

Woolpert employs several methods for data construction. The two most prevalent methods are heads-up digitizing and dimensional construction.

Digitizing

Digitizing is the quickest method of developing GIS data. Digitizing has three basic steps:

1. **Data Preparation.** Drawings are scanned, and known points are registered on the drawings to corresponding points on the base map in a process known as geo-referencing. This allows the scanned source documents to be used as spatially correct background information during the heads-up digitizing process.
2. **Data Construction.** Woolpert uses a combination of out-of-the-box tools and custom applications to create data. These tools and applications allow for more efficient data conversion while implementing strict quality control standards. During conversion the source document information is captured to create digital layers that represent data on the hardcopy documents.
3. **Attribution Input.** Woolpert has designed and developed tools to automate the manual input of attribute data with maximum accuracy and minimum keystrokes. These tools are designed to follow domains lists, define prerequisites, and allow attributes to be incremented and persisted where necessary. In addition, they ensure attribute correctness and completeness, minimizing the need for extensive backend QA/QC.

Dimensional Construction

This method uses a complete base map and accurate source documentation. The base map should be a rectified or semi-rectified image; this is usually a digital orthophoto.

Data can then be digitally constructed using the orthophoto as a backdrop. Data can be placed in reference to the base mapping using dimensions supplied by the source documentation. For example, a fire hydrant is placed 15 feet from the street centerline.

Dimensional construction applies accuracy to subsurface features based on the accuracy of surface features. In addition to an accurate base map with limited planimetrics, source documentation must be up-to-date, consistent, and geographically and referentially accurate. While full dimensional construction is seldom used for data construction, some use of dimensional techniques are often employed.

Data Cleansing

Woolpert recognizes that a GIS is only as good as the quality of its data. We understand that individual datasets can present unique challenges for the cleansing of data. At Woolpert, we use a combination of manual, semi-automated and automated methods for data cleansing.

Manual

During manual cleansing, features are visually reviewed to ensure that they are appropriately drawn and located based on specified requirements. Visual inspection allows users the opportunity to review data against the appropriate source documentation. Manual review is typically employed against all data regardless of the method of capture.

In addition to visual review, manual review can be applied to attribution through database queries. These queries allow users to quickly identify errors such as null, incorrect, or incomplete attribute values. Often times, the attribution errors can be globally corrected using this method.

Semi-automated

Semi-automated cleansing takes advantage of built-in tools such as Esri's topology and geometric network generation to identify data anomalies In addition, Esri's Data Reviewer extension can be used to build rules that define the behavior of features in relationship to one another. Once the data errors have been identified, users can use additional out-of-the-box tools and the manual techniques described above to address the errors.

Automated

Automated data cleansing is achieved through the use of custom applications or commercial off-the-shelf (COTS) software such as Safe Software's FME. Custom applications are built specifically to the design of the data and can programmatically report and in some cases fix data issues. COTS software typically uses extract/transfer/load (ETL) techniques to move data from one state to another using workflow models. These models can be designed to apply data transfer rules ensuring the output meets the data requirements. Database design adherence, attribute assignment and validation, and data refinement, are just some of the functionality of the software.

Data Development

Woolpert understands that data development relies on sound database design. Woolpert has developed database design processes that rely heavily on the input of our clients. We accomplish this by conducting a series of database design workshops where client and Woolpert staff come together to build consensus on the design. The end result is a design that accommodates all of the needs and requirements necessary for the building of a quality GIS.

Custom databases can be built from the ground up using Esri's ArcCatalog and X-Ray extension or by using off-the-shelf software such as Microsoft Visio. Databases can also be built using predefined and standardized database models such as Esri's Local Government Information Model (LGIM). These models can serve as the foundation of the database and can easily be modified to meet the requirements of the client.

Field Data Collection

As a multidiscipline firm, surveying and field data collection cross over into nearly every project Woolpert performs. Our proposed team includes local staff that are well-versed in GPS field data collection for utilities, development and zoning using both traditional and emerging technologies. We have additional surveyors within the state and region available for reach-back support.

From aerial photography to utility designating and locating, Woolpert excels at tailoring solutions to project requirements using the most appropriate technology, equipment and personnel. Depending on the project purpose, timeline and budget, Woolpert deploys one or more of the following collection methods.

GPS/GNSS Field Data Collection Using Trimble Business Center

Woolpert has proven experience in developing and implementing GNSS control networks and procedures in accordance with the Ohio Department of Transportation's Mapping and Survey Specifications. We employ Rapid-Static GPS/GNSS surveying techniques for establishing primary control. For primary control survey missions, field crews utilize Woolpert-owned, Trimble Navigation R8

series and Trimble Navigation R10 series multi-frequency geodetic GPS/GNSS receivers. Our trained professionals process session baselines each day using Trimble Navigation's Trimble Business Center (TBC) version 3.7 baseline processor with the broadcast ephemeris. Daily processing allows for immediate feedback to field crews to discover any weak links in the control network and immediately schedule re-observations of the affected baselines.

Our team also takes full advantage of RTK GPS via Virtual Reference Systems throughout Ohio. These systems allow for the rover operator to connect and receive broadcasted correction information from a network of base stations. Because this procedure does not require a ground base station near the project location, it inherently reduces man power required to complete a project, provides greater productivity, and yields more accurate results.

Processing and Survey Adjustments

Each survey crew will be capable of performing data processing in the field. Crews carry laptop computers with wireless internet access for immediate uploads/downloads of data, email access, and for data processing. Data is/can be uploaded to secure FTP sites and downloaded from the field or office. Field laptop computers are equipped with data processing software such as Leica GeoOffice and/or Topcon Tools, AutoCad, MicroStation, etc. Technicians also have the ability to remote login to office computers to utilize software that is not available on the field laptops.

For GPS surveys, technicians using GPS processing software (Leica GeoOffice or Topcon Tools) export the Static data collected at the GPS base station to a RINEX file and send the file to NGS On-line User Positioning Service (OPUS). The data is automatically processed by OPUS and sent back via e-mail. Usually this process takes about 10 minutes, including downloading the GPS data from the card until the solution is received back from OPUS. The RMS values and ambiguity information of OPUS solution is reviewed and the position is either accepted or rejected based on the project specifications. The static baselines to published or known control near the site are then processed and the horizontal and vertical components of the position from the OPUS solution are compared to the positions derived from known baselines. The GPS base station position is then adjusted and the RTK data is adjusted to the corrected base station position. The data is then exported out of the GPS processing software and ready for input into CAD.

Asset Inventories Using Woolpert's Optech M1 Mobile Mapping System

Today's surveyors have a wide variety of high-tech tools at their disposal; one of these powerful technologies is mobile mapping. This collection method eliminates disruptions to motorists and removes surveyors from harm's way. Woolpert's unique system combines latest-generation lidar sensors, digital cameras, and position and orientation systems to collect fast, accurate and valuable 3D data. Woolpert has collected and processed tens of thousands of miles of mobile mapping data for the transportation, asset management, energy, aviation and disaster response industries.

Woolpert's Optech M1 mobile mapping system (MMS) is a safe, ideal tool for projects that require the capture of a large volume of assets and infrastructure. Our MMS incorporates state-of-the-art lidar sensors (1,000,000 points per second), multiple cameras (360° coverage) and precision positional/navigational equipment. These qualities make mobile mapping ideal for quickly and accurately mapping assets such as signs, traffic signals, power poles, light poles, parking meters, pavement markings, manholes, fire hydrants, curbs and sidewalks.

GPS Data Collection of Various Surface Infrastructure Features

All structure information collected in the infrastructure inventory will be done utilizing an appropriate GPS unit and pentablet computer. A two or three person field crew (depending on need) will navigate the project site utilizing source documents where available, locating desired infrastructure features. Once a feature is found, the crew will make appropriate measurements and attribute the feature accordingly.

During the inventory sweep, features will be classified as RTK GPS, Total Station, Impeded, or Not Found. This classification catalogs the type of inventory that is attained by the survey crews and can assist with locating problematic features for the reporting process. During the field collection, Woolpert will provide and review at project meetings a list of all structures designated as Impeded, or Not Found with City staff.

In the event that the GPS user is unable to position a feature using the GPS technique, the surveyor will 'manually position' the structure by placing or digitizing the structure. This is accomplished by referencing the structure to the planimetric base map that will be loaded onto the data collectors. The accuracy of the locations using this approach would be 5 to 15 feet, dependent upon existing nearby planimetric data.

For customer relations, field personnel will carry a letter from the City that authorizes the work for this project. An official temporary contractor's badge may also be helpful to inform property owners that the surveyors are working for the City. Woolpert will provide samples of these letters that previous clients have written for the City's review.

If access is hampered or made impossible due to high fence lines, trees or brush, right to trespass, paved over, parked cars, etc., Woolpert will address these issues with the City as defined below under the section entitled, Problematic Feature Reports.

Problematic Feature Reports. One attempt during the primary sweep will be made to gain access to the desired feature. If safe access cannot be gained or the feature cannot be found on the first attempt, it will be attributed as such. Problematic issues flagged by the field crews will be reported to the City via a project website and will be discussed in the project meetings. Problematic features will be grouped by delivery areas and posted on the project website after the first sweep is completed. The City will be notified of the posting and given rights to edit the data. Once the project team has determined the appropriate course of action to resolve the issues related to a 'problematic' feature, Woolpert will return to the field for one final visit to complete the inventory and update the resolved problematic feature. If for some reason the structure still cannot be inventoried, the feature will be annotated with the appropriate information and submitted to the City. We anticipate some City assistance throughout the field effort to deal with specific matters. Roles and responsibilities will be defined during the kick-off meeting and refined after the completion of the Pilot Test Area. Woolpert's experience has shown that often times schedules become delayed when dealing with these 'problematic' issues either as a result of a limited amount of resources available to the client or due to a breakdown in communication between project participants. In order to remain on schedule and maintain the flow of data throughout the inventory process, Woolpert suggests that a close review of this process be conducted by Woolpert and the City and that a mutually beneficial process be developed in order to avoid delays.

Accuracies and Tolerances. Woolpert surveyors recognizes the importance of setting data collection expectations. Accuracy is the definition of the "exactness" of the measurements taken. Tolerance is the "acceptable range" (plus and minus) for each piece of attribution. Typical accuracy requires that 90% of the field-checked measurements are correct, within the agreed upon tolerance range. This criterion differs for objective versus subjective attributes. The agreed upon accuracies and tolerances will dictate the field data collection efforts required and the final acceptance criteria for the data.

Data Development QA/QC. Quality control is built into every step of our methodology guaranteeing overall quality for the City of Columbus. Steps are taken to ensure quality control from the beginning of the field inventory, to the network connectivity and to the final delivery of data. As the City is well aware, "quality assurance" is defined as having the appropriate processes and procedures in place to allow for the collection and processing of the needed data. "Quality control" is the continuous checking of the data during the individual steps of the process to ensure the data is of the highest quality. This section identifies some of the many key quality assurance procedures that Woolpert will employ for this project. Quality control for this project is divided into two categories: (1) field quality control, and (2) office quality control. The two phases combined will provide accurate and consistent data for the City. Through a system of procedures, redundancies and verifications we can provide precise and accurate data to populate the database. Field quality control is the starting point for data collection, and every phase of data collection relies on the quality control procedures to ensure its accuracy. From the first attribute collected to the last, consistency is the key. The job of the field crew is to interpret and record data in a way that is duplicable to others. The process and resources used by Woolpert enables a high level of confidence in data capture.

Field Data Collection Using Esri's Collector for ArcGIS

Woolpert has been using Esri's Collector for ArcGIS software on projects since it was first released, and has been working with clients to identify opportunities to leverage the application in their GIS workflows ever since.

Our field staff uses the application on various mobile devices to record infrastructure such as utilities, potholes and signs. Collector taps into devices' location capabilities to collect points, lines, polygons and any other attributes associated with it, and prompts field staff to fill in customized, map-driven forms. As data is recorded, it can be sent directly to ArcGIS Online (AGOL) and immediately shared with office staff for quality control and inclusion into the GIS. With traditional survey techniques, field data often does not reach office staff until the end of the project—meaning that by the time errors are identified, equipment has already been packed up, or worse, remote crews have already left the site. This real-time data stream between field crews and office staff enables teams to catch and correct errors during the collection, which ultimately leads to a quicker project turn-around for clients.

In fact, Woolpert has been so successful at leveraging Collector to make projects more efficient that some of our clients have given us more work than they would have otherwise been able to afford. Collector's versatility, user-friendly interface and real-time data streaming enables us to complete work faster and with less manpower than traditional survey techniques.

Pairing Collector with External Hardware

Collector's accuracy is driven by the device on which it is used. When used with a typical modern mobile device, the application can achieve mapping grade accuracy, or about 10 to 15 feet. This accuracy level is sufficient for many uses, especially when incorporated as part of an everyday workflow. However, Collector also allows your mobile device to be paired with external GPS hardware to customize and enhance its accuracy level.

For instance, Woolpert uses Trimble R2 antennas with Collector to capture survey-grade data on pipeline mapping projects. We currently rent these antennas from a vendor in the Columbus area, but given the rising demand for deploying Collector, we plan to purchase one or more soon.

Collector Best Practices

While Collector is an affordable solution for large-scale mapping and surveying efforts, it is also ideal for maintaining GIS data on a day-to-day basis. Shortly before Collector came into the market, Woolpert worked with the City of Columbus's Department of Public Utilities (DPU) to analyze existing workflows for communicating GIS data between field and office staff. One of the DPU's key concerns was that the workflow for updating maps was cumbersome and, as a result, frequently neglected.

Collector is a viable solution for resolving this issue, as it gives each and every field staff member the ability to quickly and easily report data discrepancies back to the GIS office staff. Because the application is so user-friendly and the forms are straight-forward, it requires minimal training to teach field staff how to record data. The data can be immediately streamed to the office, eliminating the risk of valuable updates slipping through the cracks. This real-time data sharing between field crews and office staff enables teams to quickly identify and resolve discrepancies between existing GIS data and the reality in the field.

To assist the City in developing best practices for Collector, Woolpert would:

- Perform a needs assessment to identify opportunities for on-going data collection by staff who work in the field. For example, some staff might be able to capture or validate location data while performing work orders. Others might be in a position to report images and locations of damages when they are seen, which can then be attached to a work order for repairs.
- Evaluate existing workflows for field staff informing GIS staff of data discrepancies.
- Evaluate other existing workflows which are dependent on up-to-date GIS data.
- Provide recommendations based on stakeholder input, existing workflows and the City's technology environment.

Collector is highly-versatile, efficient, affordable and user-friendly—making it an excellent option for the clients who are looking for ways to better manage their in-house GIS data collection and maintenance processes. Woolpert looks forward to assisting the City in leveraging this technology.

Collector for Smart Cities

Collector/AGOL can also help Columbus in its initiative to become the nation's first "Smart City." We can help Columbus develop public-facing solutions that empower citizens to report problems—ranging from burnt out street lights to damaged curbs—right from their smart phone. For citizens who don't have a phone, we can develop geosurveys that can be filled out on a computer. Solutions such as this would help the City become aware of issues that need to be addressed without having to employ a labor force to identify them.

GIS Staff Augmentation

Few firms have the skills and organizational depth to successfully manage personnel on-site at remote client locations, but at Woolpert it's an everyday part of our business. Along with providing geospatial, engineering and design services, we place qualified, reliable, technical professionals on-site at your location. Unlike a staffing shop, we don't just put people in seats at job sites and leave them to fend for themselves. We provide our on-site professionals with managerial, technical and administrative support through a network of more than 20 offices across the country.

Woolpert's support network for on-site staff includes both your Woolpert Project Manager and Project Coordinator, whose purpose is personnel management. The benefits to you are immediate. While the on-site professionals focus on your technical tasks, our managers handle any other issues that arise. If additional technical expertise is needed, your on-site professionals and the Woolpert Project Manager collaborate to determine who has the capability to provide it. The Project Manager then secures the additional reach-back support. If a personnel issue occurs, the management works with the staff member to resolve it. Experience has taught us that keeping on-site personnel focused on the technical tasks at hand provides you with the results you need when you need them. Your projects run more smoothly, remaining on schedule and within budget.

The Project Manager is also focused on making sure our on-site staff stay technically competent and trained. Each year, Woolpert sends multiple staff members to various trainings and events so we can ensure that our skills stay sharp and we are providing the best up-to-date solutions for our clients.

In Section 3: Relevant Project Experience, many of the projects profiled involved providing on-site staff augmentation. These include the Architect of the Capitol (AOC); the City of Cleveland, OH; the City of Indianapolis/Marion County, IN; and Artex Oil.

Additional examples of projects for which we have deployed on-site staff include:

2008-2011 30SW IGI&S Support (Vandenberg AFB, CA)

- Woolpert **provided on-site GIS and mapping support** for the 30SW Geo-Integration Office. Under the direction of the Vandenberg AFB GeoBase Program Manager, Woolpert team members provided wing-wide geospatial support to all wing organizations and tenant organizations.
- Woolpert provided computer support to include geospatial mapping, GIS creation and maintenance of spatial databases, GPS collection, local area network (LAN) accountability, server administration, user management, system security, and related administrative tasks as defined in a very detailed Project Work Statement that includes specific metrics by which the team was measured.
- **On-site team members staffed the "help desk"** function at Vandenberg for 1,820 hours per year during the hours of 6:30am to 4:30pm five days each week.
- **On-site project team was supported by a "reach back" team of Woolpert professionals comprising of geospatial, database, network, and surveying skills.**

Miami-Dade Water and Sewer

- Woolpert first supported Miami-Dade Water and Sewer District (MDWASD) with onsite staff in 1999. Woolpert placed 20+ onsite staff to provide QA/QC review for the newly created utility GIS.
- Since January 2013, Woolpert has had 10 GIS technicians onsite at WASD providing GIS support services to assist WASD with the utility GIS backlog. Onsite staff are using a custom ArcGIS program (GAMS2) to enter new data; using GAMS2 to research and correct reported GIS data errors; using Esri tools to validate and modify GIS layers; interpreting water & sewer as-builts; researching using various WASD systems; and QA/QC various utility attribute and feature information.
- For nearly five years, Woolpert placed onsite staff at WASD to complete the Infor EAM Implementation (EAMS) project.
- For PortMiami in 2010, Woolpert placed an onsite GIS Woolpert employee (GIS technician/analyst) for a utility GIS mapping project for approximately 18 months.

GIS Needs Assessment and Business Process Analysis (BPA)

Woolpert staff take pride in providing quality services to its clients. As part of this, we strive to help make our clients' lives easier, not more complicated. In order to do this, we must become familiar with your current process, understand your organization's workflows, limitations, and culture, to provide you with a solution that fits your needs. Taking this custom approach may be more time-consuming than a one-size-fits-all approach, but we have found that it leads to a greater return on investment over the long run.

Needs Assessment

The first step is to discuss the City's needs with the City's project manager. We need to understand the overall problem and get a sense of the different parties involved. After this first overview, Woolpert staff will meet with the City's staff in one or more workshops to delve into the details of the current situation. By meeting with City staff, listening to what works and does not work, and asking the right questions, we can get a very clear picture of the current environment. At times, we may even want to "look over your shoulder" while you perform a specific task to truly understand all of the steps, and sometimes frustration, involved in getting the work done.

Gap Analysis

After meeting with the project's stakeholders, we will process all of the information we have gathered, summarize it, and propose one or more potential solutions to the identified need. This may require some prototyping or research to determine what is or is not technically feasible. The goal during this step is to provide the City with realistic options from which to choose. At times, the answer may be very clear, but at others, it may require some back and forth to truly determine the right approach. The proposed options

will be documented in a report, which will be presented to all stakeholders for feedback. Once all feedback has been received, Woolpert staff will review this feedback with the City's Project Manager and incorporate those thoughts and comments into the final report. This report will include recommendations regarding technology, gap analysis, cost/benefit analysis, and what, if any, business practices need to be modified.

Implementation Blueprint

The implementation blueprint identifies the detailed steps needed to implement the recommendations and create the organizational or operational changes. This plan will identify the specific tasks and procedures in a logical order, the responsible parties for each task, recommended start/finish dates for each task, and the budget required per task and each year. Based on discussions from the workshops, tasks will be phased to take into consideration internal City goals, budget constraints, and priorities.

All recommendations and their associated costs and levels of effort will be inputted into a Microsoft Project file. Schedules and sequencing can be manipulated to determine the best distribution of both budget and time requirements across a multi-year implementation period.

GIS Application Development

Application Development Approach

Software Requirements Specification

Woolpert recommends that for all application development and/or integration projects, a Software Requirements Specification (SRS) document be developed. This document summarizes the requirements, defines the look, feel and functionality of the application's interface. Whether you are integrating with another system or developing a new GIS application, the development of an SRS greatly reduces the inherent risks associated with writing customized software applications. An SRS is developed to completely describe the behavior of a system or application to be developed and eliminates risk between software development and systems integration.

Development Approach

Upon completion of the SRS and agreement from all stakeholders, Woolpert will design the application, determining the proposed software's architecture and technology components. This step includes the database design, development languages and coding libraries, and any integration points with other software, as necessary.

Once the application has been designed, development can begin in earnest. The Woolpert development team has adopted the Agile approach. Both the Project Manager, Marianne Cardwell and Senior Developer Dominik Medved have completed Agile Scrum training and become certified Scrum Masters. The training has allowed them to better lead technical teams and manage development projects. Following the Agile approach improves quality by:

- Encouraging communication among the development team. The development team meets daily in the morning, usually for just a few minutes, to discuss progress from the previous day, tasks to be completed, and any difficulties that have been encountered. These daily standup meetings ensure that developers are talking to each other and everyone is aware of how various tasks are implemented. It encourages dialogue between the developers, ensuring a common approach is followed throughout, thereby leading to a better end product with better structured code. It also ensures that mistakes are caught early, such as misinterpretations of requirements, avoiding potential cost overruns.
- Encouraging communication with City staff. The development lead typically meets with City staff on a weekly or bi-weekly basis to show progress, obtain input and discuss upcoming tasks. Even with the generation of mockups, it is often difficult to truly visualize how a new program will work. We have found that by regularly showing progress and allowing stakeholders to see and play with the software during the development process, new ideas are generated that can significantly improve the quality and usefulness of the end product.

Documentation, Deployment, and Support

Woolpert works with its clients to not only develop applications that meet the needs of the end users, but also to empower its IT and GIS staff to be able to support applications after development. In order to do so, Woolpert will work with the City's IT staff to deploy the application, taking the time to explain all of the components that make up the software solution. Woolpert will provide staff with deployment and administration documentation so that the City's IT staff can maintain and support the application without the need to reach out to Woolpert. Woolpert developers also take great care to limit any hard-coding and create clear and well-documented configuration files so that our clients can update any values, such as map service URLs or server names, themselves.

We understand, however, that taking ownership of a custom application can be difficult. Woolpert always includes support hours after deployment to support IT and GIS staff in case of issues that arise after deployment.

Developing New Applications Using Esri's Best Practices

Each year, Woolpert sends a number of developers to Esri's Developer Summit. Our developers know that our industry is very dynamic and changes quickly. Attending the Developer Summit provides us with an updated view of Esri's software offerings and standards and allows us to better serve our clients by taking into account not only the latest development but a more long-term view of our field. Attendance of this conference has, for example, allowed us to plan well in advance the transition from ArcGIS Server 9 to 10 for the City of Indianapolis. There were some significant changes between the two versions of the software that impacted the City's service oriented architecture, resulting in a conversion of many web services to Server-Object Extensions (SOE).

Woolpert developers have embraced Esri's ArcGIS Online, Portal for ArcGIS, Collector for ArcGIS and Web AppBuilder software suite. We have created a number of custom Web AppBuilder widgets, have stood up ArcGIS Online for our clients, and also use ArcGIS Online internally, both for sharing geographic information within our company and for field collecting data using Collector. Darren Johnson and Jennifer Starbuck are our primary and backup ArcGIS Online administrators and as such are intimately familiar with this software as a service.

Our current standard for any type of web development with Esri revolves around HTML 5 and JavaScript. When needed, we may develop web services or server-side code. Our internal standard development language is C#.NET, although we also have experience developing Node.js or Python services. We have used Esri's ArcGIS for JavaScript (JSAPI) since its inception in 2008. Most of our current development work is focused on 3.x but we have successfully used 4.x for the City of Indianapolis. We traditionally use other JavaScript libraries, such as Angular (1 and 2), Bootstrap, and Material Design. Angular's MVC framework has been very beneficial in providing a more robust infrastructure for our website development but also by making development faster by taking advantage of many of the library's functionality. Bootstrap and Material Design have become our standard responsive design libraries, which we have used with consistent success, especially when developing websites that will run on both mobile devices and desktop computers.

Developing Add-Ins and New Tools for ArcGIS Desktop

As a geospatial company, Woolpert extensively uses Esri software on a daily basis. With over 100 ArcGIS Desktop licenses in daily use, our staff is an expert with the software. At times, we identify areas where the development of custom tools would benefit our internal workflow. Woolpert developers not only support our "external" clients, but also our internal team of GIS analysts. Most of the custom add-ins we have developed for our internal staff revolve around QA/QC. These include:

- A tool that verifies all deliverables against a polygonal grid feature class, ensuring that file names, spatial references, etc. match each grid.
- A tool that splits vector data according to areas of interest so that the work can split into multiple teams and individuals.
- A tool that merges vector data back together (following the work done after the split tool described above).

Some examples of the tools we have developed for our clients include:

- An ArcMap extension that automatically populates attribute data after every edit, storing information such as a custom identifier, username, date, etc.
- A tool that synchronizes data edits between a selected set of feature classes and an Oracle-based master address database.
- A tool that checks text fields in an entire geodatabase for empty strings and converts those to NULL values.
- A tool that automatically populates a configurable set of fields based on a list of values in an Excel spreadsheet.

In addition to add-ins and other Desktop tools, our staff has extensive experience developing Server Object Extensions using ArcObjects.

ArcGIS Mobile Development

While the Collector for ArcGIS application cannot be modified, Woolpert does have extensive experience setting up data, services, and maps for use within Collector. Through our experience utilizing this software both internally and setting it up for our clients, we understand how to set up data and services to ensure the right information is accessible and editable. We work with our clients to determine permissions and offline (disconnected) editing settings.

Additionally, Woolpert has used and customized mobile applications since the ArcPad days. Today, we typically recommend Collector as a first solution, but there are cases where Collector is not suitable. When we encounter those situations, we evaluate the requirements and our client's environment to determine the best solution. It may involve the use of ArcMap on a laptop

computer in the field, a custom application developed using one of Esri's Runtime APIs, or even a custom website that can be used for data collection. At times, we have also used third-party applications, such as Fulcrum, when they matched the requirements and proved to be much more cost effective than a custom solution.

Migrate Legacy GIS & Non-GIS Applications

Technology is advancing at an incredible rate and the past 15 years have seen quite the evolution in web-based technologies. In the GIS field alone, looking at Esri software, we have gone from ArcIMS in the early 2000s to the WebADF based on .NET in the mid-2000s, to three web-based APIs (JavaScript, Flex, Silverlight) in the late 2000s and early 2010s, to an almost exclusive focus on HTML/JavaScript today. Woolpert developers have worked with all of those technologies and have performed their fair share of migrations.

For the City of Indianapolis/Marion County, we have upgraded eight web applications in the past year that used outdated technologies such as Flex or JSAPI 1.x libraries to JSAPI 4.x. In addition, we performed 16 web service upgrades, including many from an older version of the .NET Framework to the latest one. For Sandusky County, Ohio, we recently rewrote their Silverlight-based parcel viewer website to HTML5 and JSAPI 3.x. During that conversion, we made some changes to the overall look of the application, modernizing its look and making it responsive so it can be used on phones, tablets, and desktop computers.

Having legacy applications does not always mean upgrading whenever a new technology becomes available, it can also mean maintaining current applications so they are still useful to users. One such example involved Woolpert's support of the City of Columbus' GIS Dashboard. This application is a customized version of Esri's ArcGIS Viewer for Flex. Over the past two years, Woolpert has developed a number of new widgets as well as enhanced several existing widgets for the City.

Additional GIS Integration Solutions

In an enterprise environment, multiple software systems are in use, each for their own purpose. For example, most cities will have a maintenance management system, a permitting system, an accounting system, etc. While each system does what it is intended to do, they often only work within their own silo. In some cases, in order to share data between systems or streamlining workflows, software integrations need to be developed. While some systems may be configured to communicate with others, the need for a custom integration solution frequently arises. GIS can be the perfect hub—the perfect means with which to tie the various systems together.

Woolpert understands this need, and this understanding is a result of our demonstrated experience helping our clients solve their integration challenges. We develop smart solutions that integrate enterprise systems with the GIS, and together with each other, through the GIS.

Integration with GIS

Often a client's GIS lives in a vacuum, where it provides focused functionality through the development of custom applications, websites, and nice looking maps. These resources provide specific functionality, analysis capabilities, or show information in a way required by the end-user.

But just as citizens and staff can use GIS tools and data, so can other systems. In fact, these systems can use GIS functionality and information to streamline workflows, provide more accurate and automated analysis, and eliminate duplicate data. Woolpert has leveraged this capability with its clients to build solutions that tie the GIS together with these other systems.

Many systems deal with entities that have a physical location. This includes items such as building permits, work orders, service requests as well as physical assets like vehicles and equipment. Woolpert has developed solutions that allow systems to leverage GIS to better define the accuracy of their assets, gather attributes more effectively, reduce process workflows, and share information about their assets with the enterprise.

Spatial Web Services

One of Woolpert's most effective solutions was the creation of spatial web services that systems can consume retrieving data from GIS layers, all based upon a location. Woolpert built a series of web services that extend the capabilities of ArcGIS Server to query features that are within a proximity, or intersect with, or are nearest to a given location, such as an address. Systems can then utilize these services to retrieve information automatically upon creating items like a new work order or service request, perform some sort of spatial analysis behind the scenes such as jurisdiction checking, or return a validated, standardized address string. In these scenarios, these web services use GIS functionality to streamline and limit the need for manual data entry, promote more accurate data, and perform validation processes not available in the native system.

Automated Mapping Workflows

In other cases, clients have wanted to spatially track and analyze information created within enterprise systems. Mostly this is related to entities such as service requests, permits, and work orders – but nonetheless, clients have found it extremely useful to conduct automated mapping of these items within the GIS. For example, Woolpert has developed configurable services that allow for the creation of GIS features with corresponding geometry and attribute information. The result is a set of GIS layers containing service requests, permits, work orders, or even items like crime incidents, that staff can then analyze later or use in other applications to support the decision making process.

Integration through the GIS

Woolpert has also worked with clients to build solutions that take GIS integration to the next level. In these cases, GIS is an integral part of the overall flow of data in and out of the system, almost acting as the hub. Rather than simple queries to retrieve information or send data to the GIS, the workflows rely on the GIS for validation, analysis, and data visualization throughout.

Permitting and Notifications

Woolpert has developed services that perform this type of integration with Accela and its Address/Parcel/Owner (APO) service, configuring it to consume web services that pull this information from both the GIS and an address database. This interface is used throughout the permit creation process and once completed results in a permit mapped in the GIS. Another aspect of this workflow is the submittal of Zoning change permits to a separate notifications system from Accela through the GIS. This allows staff to view on a map those citizens who may be impacted based upon a spatial selection. Staff can then generate a mailing list to inform citizens of the zoning change.

Salesforce.com Integration

Another key integration solution through GIS that Woolpert has performed is with Salesforce.com and the RequestIndy citizen's portal with the City of Indianapolis. Indianapolis uses the Salesforce.com system for handling requests for service from citizens, and the RequestIndy portal integrates with Salesforce providing citizens the ability to create and submit service requests via the web. Not only is RequestIndy a map-centric application for end users to submit requests, it uses automated workflows to route the service request information to the City's Salesforce.com instance, as well as other subsequent systems down the line, including as a feature in the GIS.

While a user is creating a request, the portal is validating the address and jurisdiction through the GIS to ensure the request is within a maintainable area of the City. The portal also checks the new request against similar requests in the area in order to eliminate duplicate requests.

While RequestIndy is used by citizens, City staff use Salesforce.com to create new requests. Woolpert developed a Salesforce plugin that utilizes the same rules and workflows as RequestIndy, including a map visualization piece. The result is a direct, seamless integration between Salesforce and the GIS that pulls data from GIS layers that is necessary for the creation of a service request. Since the service requests are mapped, further analysis can be performed down the line for making informed decisions in the future.

Woolpert GIS Integration Development Process

Integrations can be complex, but they can also be powerful to the end-user. Woolpert understands the incredible power that enterprise software integrations can provide to our clients, and also understands the range of complexity that can be involved.

While our core approach to integration development is in line with the way we approach other development, integration work can pose some different challenges, and the process therefore benefits from some modifications. Building solutions such as these requires a well-defined process

Workflow and Data Requirements

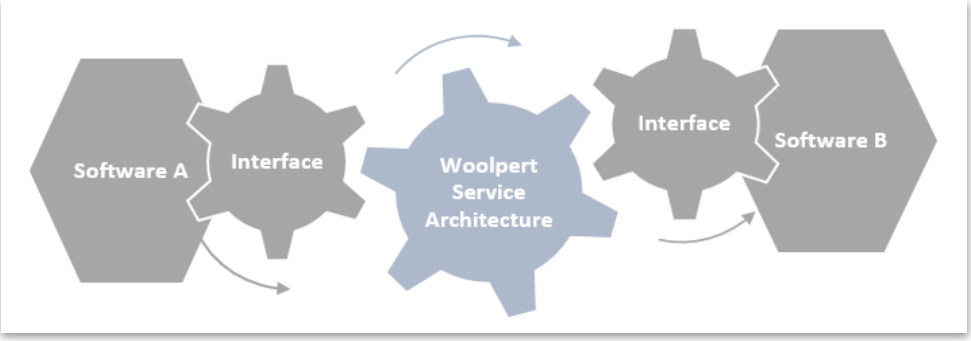
During requirements meetings, we lead stakeholders through discussions to identify what data should be sent back and forth, and what data should not. We determine when the data should be sent (every few minutes? Every night? When a user performs a specific action?), as well as what workflows are involved (public users submit data through a website; internal users create or close work orders; etc.) It is also very important to identify and plan for the inevitable alternate workflows, such as work orders being cancelled or permits being denied, and define how the integration should handle those scenarios.

The resulting Software Requirements Specification (SRS) is generally very similar to one produced for more traditional software development, with the exception that there are usually fewer items that can be considered low priority, or that could be rolled out

in a later deployment. The data has to get all the way from system A to system B, not just part way. So although we still employ the Agile methodology, we have to identify priorities according to core units of work.

Software Interfaces

A typical integration consists of software A and software B; an interface for each side, such as APIs, interface tables, flat file import/export, or custom development; and a mechanism that pulls, transforms, and pushes the data from one system to the other. One of our first tasks on an integration project is to identify what interfaces exist for the software involved. We use existing interfaces whenever available, and customize software when necessary. If the client engages another vendor or consultant to customize or configure a particular system, Woolpert will work with the client to identify the documentation and technical specifications they need from that vendor. Communication and clear documentation are critical to make sure that data being sent matches what is expected.



Integration Architecture

With the desired workflows defined and the interfaces identified, we then need to look at the mechanism for sending the data back and forth. For a complex integration, Woolpert typically employs an architecture based on the use of a messaging queue and service bus, which creates an integration that can do the following:

- Reliably send data when and where it is supposed to send it
- Gracefully handle normal networking challenges, such as a database being temporarily unavailable
- Raise active notification of critical errors for those who need to respond
- Log all integration activity

Deployment and Testing

Integration development often involves working against software for which Woolpert does not have a license, such as Oracle WAM. In that case, we can either develop the integration in the client's development environment through VPN access, or in a Woolpert environment. If we build in our environment, we create mock interfaces representing that software according to the technical specifications defining the interface. In that way, we are able to build and execute tests against all workflows, regardless of the software involved. Once that initial testing is complete, the software is ready for full system integration testing in the client environment, and testing is managed according to the standard process.

Documentation

Because software integrations often involve processes that have little or no user interaction, it is critical to provide system administrators with what they need to manage and monitor the services. A typical administrator's guide details the architecture of the system including components installed, database customizations, configuration options, and logging and troubleshooting information.

Other GIS-Related Tasks

A full-service AEG firm, Woolpert can offer the City a host of additional services, if requested.

Building and Impervious Surface Feature Extraction

As an industry leader in providing geospatial data, we are committed to the delivery of a high-quality product that supports the multidisciplinary data requirements of our clients. As an example, our impervious surface delineation process has been developed to provide a suitable, cost-efficient solution to successfully identify sources of storm water runoff and pollution.

Impervious surface mapping is a necessary component in conducting qualitative and quantitative storm water analysis relating to establishing storm water billing, identifying point and non-point source pollution sources, watershed characterization, hydrologic and hydraulic modeling (H&H) and master planning. In addition to providing impervious surface mapping models, Woolpert performs change detection in conjunction with existing impervious surface data to ensure the impervious surface database is current. By providing the capability to perform up-to-date analysis more cost effectively, our clients are equipped with reliable storm water billing and management systems to address NPDES requirements.

Woolpert has long sought a targeted solution to the problem of lidar exploitation, so we devised and developed a framework, **Automated Building Extraction (ABE)**, that uses open-source data toolkits and libraries to detect objects in lidar data, extract them and construct realistic surfaces representing solids within the point cloud. The main goal of this approach was to create a framework that extracts accurate polygons for use as a mapping product in GIS from lidar data of varying densities.

Toolkits such as the Point Cloud Library, GDAL, PDAL and libLAS were incorporated in the framework to overcome the challenges of unstructured point clouds and extract planes and edges of physical structures. Open-source tools are highly customizable and enable the detailed investigation of point cloud characteristics and manipulation of modeling parameters for the production of robust solutions.

This framework has been successfully used on multiple projects to extract building footprint polygons and derive information that could be used in other mapping applications.

Mobile Lidar Systems

Woolpert currently owns and operates the Optech Lynx M1 Mobile Mapping System (MMS). The Optech system is arguably the most versatile mobile lidar mapping system on the market due to its ability to be configured for specific types of projects. The system consists of two lidar sensors which collect lidar in a 360-degree pattern, with each sensor collecting up to 500,000 points per second for a total of 1,000,000 points per second. The M1 system also is equipped with four - 5-megapixel cameras which are able to be mounted in customizable – project specific positions to enable more accurate and detailed image capture. These cameras when configured for normal project types such as transportation corridor mapping, asset inventories, etc. are able to produce 360-degree coverage.

In addition to the two lidar sensors and four cameras, Woolpert's Optech M1 MMS is also equipped with a highly accurate and precise positioning and orientation system (POS) made up of two GPS/GNSS receivers, a 200 Hz Applanix POS LV inertial measurement unit (IMU) and a distance measuring indicator (DMI). Combined, this network provides highly accurate measurements and parameters of the vehicles movement and positioning which ultimately aids in the accuracy of the final mobile mapping data.

The MMS system is capable of being used in many different environments. Currently the system resides on our Sprinter van for collection of roads, bridges, assets, etc. Other optional collection vehicles such as a boat can be used for coastal and marine collections, an ATV for more rural—trail or limited access type applications and rail for collection of specific rail features that may support positive train control (PTC) design or enhancements.

Our team has extensive experience working successfully with more than a dozen different departments of transportation clients, asset management, energy, aviation, and disaster response and other state and local agencies across the United States from providing lidar and imagery acquisition to final CAD and GIS deliverables derived from the mobile lidar data.

With our vast experience we understand that each agency requires specific deliverable and support, such as customized GIS databases, database integration & migration, custom feature attribution, vector data, surface models, haul route documentation, as-built documentation, and more.

Woolpert's team of mobile mapping experts takes great pride in understanding the balance between client expectations, schedules and budgets. Therefore, Woolpert has invested heavily in researching and developing proprietary workflows such as smart control, enhanced drive planning and custom feature extraction algorithms to improve current industry guidelines and standards. This not only provides a safer work environment but it has reduced mobile mapping project costs and schedules while maintaining the necessary accuracies and deliverables sought by our clients.

Our proprietary workflows allow us to approach each project systematically, enabling us to identify the best course of action to deliver the best data possible.

Asset Management

Woolpert's Asset Management Program implementations and consulting services are focused on delivering a comprehensive set of technology tools based upon an asset management best practices methodology. Our asset management best practices methodology first works to understand your organizational asset management policy and defines the planned performance management strategies to achieve your policy. We then design the system implementation and management required to build the system to meet your goals, as well as to support sustained monitoring and continuous improvement activities that are aligned with your long-term Asset Management Program objectives.

In 2014, a multi-year effort through the International Organization for Standardization (ISO) led to the development of three international standards for Asset Management; ISO 55000 (overview), ISO 55001 (management systems), and ISO 55002 (guidelines). These standards, which are referred to collectively as ISO 55000x, are based on the PAS 55 and other international methodologies, and have become the best practice industry standards in asset management.

Woolpert has been a leader in using the PAS 55 and now, ISO 55000x methodologies in the practice of asset management for a number of years. Woolpert has 14 staff members currently certified by the Institute of Asset Management (IAM) in Asset Management Practice. This leads to projects which achieve their objectives in accomplishing long term improvements in operations of organizations worldwide. A superb illustration of the Asset Management Journey, as envisioned by IAM (and our certified IAM staff) can be found at: https://www.youtube.com/watch?v=8xM5P4CrUnY .

Cityworks Asset Analytics. Woolpert is a Cityworks Strategic Development Partner that integrates the software with other systems and builds custom add-ons to increase productivity. Cityworks has recently acquired the intellectual property rights of Woolpert's Infrastructure Optimization (IO) tool. IO is a GIS-centric planning tool that incorporates asset condition, risk, and levels of service into different infrastructure investment scenarios. IO enables planners, engineers, utility managers and other stakeholders to develop short, medium and long-range rehabilitation and replacement scenarios using methods recommended by the leading international asset management standards (ISO 55000 and PAS-55).

Recognizing the growing adoption of failure modes, levels of service, consequence of failure, probability of failure, and total lifecycle costs in rehabilitation and replacement planning, the IO acquisition helps Cityworks Asset Analytics meet the needs of customers. The expanded framework will enable customers to create budget scenarios and define capital projects using these metrics, regardless of creating them within Cityworks, in the GIS, or consuming them from other third-party modeling systems.

Read the Cityworks press release here: http://www.cityworks.com/2015/04/expansion-of-cityworks-asset-analytics-framework/.

Woolpert's Work with Accela. Woolpert has a proven track record for delivering the Accela Automation solution for more than 50 clients with our partner Accela. As such, Woolpert has more Accela implementation than any other Accela Business partner.

Accela, Inc. provides the leading civic engagement platforms, powering thousands of services and millions of transactions daily for large and small public agencies worldwide. Accela connects governments to people, and accelerates and streamlines core civic land management, licensing, asset management, and public health and safety processes.

Woolpert has successfully implemented dozens of municipal permitting systems, including some of the largest cities, counties and utilities in the United States. Technology is at the core of Woolpert's service profile. Woolpert is an experienced software system integrator with relevant experience implementing Asset Management, Land Management, Permitting, and Licensing Solutions.

Thermal Mapping Services

Digital thermal sensors technologies have matured rapidly in the last decade. The successful use of these sensors for industrial applications made the case for the aerial data acquisition industry to consider flying these highly sensitive sensors for aerial applications.

Woolpert has always been at the forefront of the mapping industry, adopting new technologies and exploring applications for existing sensors to push beyond the capabilities of traditional imagery. Thermal imagery is one of many technologies our researchers and geospatial experts have been refining—seeking new and expanded applications to tap into its full potential.

Although there are several companies that acquire aerial thermal imagery, only a few of them have succeeded in converting the aerial thermal imagery into a true geospatial product with defined positional accuracy to make it useful as a layer in today's GIS database. Woolpert is at the top of the list of these few companies as we invested from the early stages in harnessing the technology and in building the most efficient workflow. Woolpert developed a true thermal mapping system capable of mapping very large areas efficiently.

Woolpert uses the finest quality, large format, infrared camera systems, developed by FLIR Advanced Thermal Solutions (ATS) to meet the needs of the research and industrial communities. Such infrared camera systems are manufactured with cooled Indium Antimonide (InSb) detector to cover the shortwave and mid-wave infrared bands.

Woolpert's thermal mapping products are produced using a stringent photogrammetric workflow resulting in a seamless ortho-rectified mosaic with high geometric and radiometric fidelity. Woolpert ortho-rectified thermal products can be provided with 8 bits, 16 bits, and 32 bits format to fit the requirements of the mission at hand. In addition to the high quality ortho-rectified thermal products, Woolpert offers services to derive vector GIS datasets from thermal imagery.

Thermal Mosaic of University of Dayton Campus

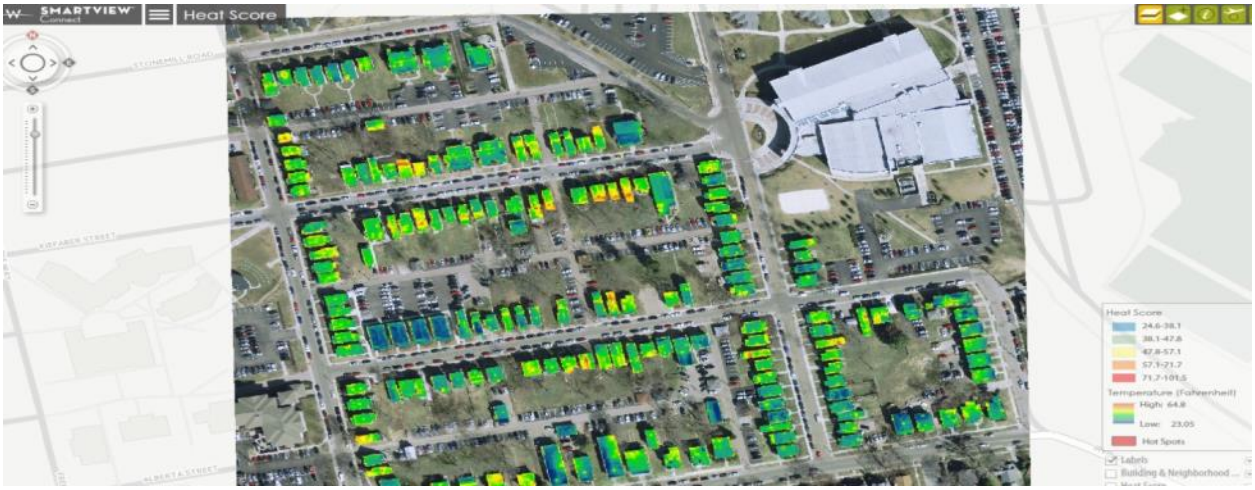
Our thermal applications include performing building condition analyses where we can identify variations in thermal images to identify potential moisture in roof structures, bad insulation and poor performance of individual roofing sections. Woolpert has used thermal imagery to help evaluate the performance of Heating, Ventilation and Air Conditioning (HVAC) units. During our

assessments, we have found that, in some cases, HVAC units were configured incorrectly—instead of heat being blown into a facility, interior heat was blown into the outdoors. In the field of energy auditing, Woolpert's energy specialists analyze thermal imagery along with utility bills, weather patterns, building use and HVAC load and building condition to address thermal anomalies so that better identification of energy conservation measure can be employed. We recognize that geospatially accurate thermal imagery is important, as understanding the intensity of the image along with its location help identify concerns and quantify impact.

Moreover, Woolpert's geo-referenced thermal infrared products are used to offer the following services, just to mention few:

- Assess roof condition to identify potential moisture in roof structures or bad insulation and to prioritize repairs
- Inspect active buried liquefied natural gas pipelines
- Perform buried steam and hot water systems analysis and inspection
- Conduct facility energy audit and Heat Score Map (HSM)
- Conduct lighting and HVAC assessments
- Identify unexpected or unexplained sources of heat loss in facilities and installations
- Investigate irrigation effectiveness
- Locate underground utilities and prioritize "worst-first" repairs
- Detect temperature pollution in the air and water
- Perform wildlife inventory

Woolpert strives to meet our clients' needs and works hard to provide them with efficient solutions for the situation at hand. Woolpert's Energy Group, for example, has recently seen higher demand for thermal imagery services as our subject-matter experts continue to develop effective workflows for applications ranging from performance and condition assessments to environmental analyses. Woolpert recently developed the Heat Score Map (HSM) to provide our utility clients and their customers with a way to evaluate energy use and a home's thermal insulation quality. The HSM is published as a user friendly portal where users can use the internet to access.



Woolpert Heat Score Map, web portal

Unmanned Aerial Systems/Vehicle (UAS/UAV)

Woolpert was the first surveying and mapping company to receive a Federal Aviation Administration (FAA) Section 333 Exemption to commercially fly UAS. We purchased its first UAS in 2012 and received our FAA Section 333 Exemption in 2014 and have worked closely with industry partners—including federal and state governments, academia and the private sector—to develop internal and client specific flight operation protocols, develop and test emerging sensor technology, and efficiently produce geospatial data to support the capability.

Woolpert is a UAS owner/operator and technology consulting firm, and our research and testing efforts with UAS manufacturer Altavian and sensor technology companies—including Imperx, Headwall and Nikon—provide valuable support. If UAS is a requested service under this OSIP contract, Woolpert brings to the state:

- Practical experience and insights regarding the use of UAS for aerial data acquisition, including the procedure currently required to conduct UAS operations;
- Documentation of how companies in the geospatial industry conduct aerial data acquisition, and how these scenarios will translate into the UAS domain, given the unique aspects of both UAS and aerial mapping operations;
- High-resolution lidar and imagery acquired using manned aircraft with the possibility of acquiring additional data as needed to support 3D terrain and airspace modeling; and
- Staff who possess a deep understanding of aerial data acquisition, and more generally how the disciplines of geodesy, surveying, geographic information systems (GIS) and software development can contribute to the UAS project.

Commercial Off-the Shelf (COTS) UAS. Woolpert's UAS vehicle capability includes an Altavian Nova Block 3 (now named the F6500) that is a 15-lb, fixed-wing UAV with a 3-pound payload capacity and flight endurance times of up to 90 minutes. The UAV is battery-powered and is capable of both land and marine operations.

Added to our UAS collection toolbox is a Kespry quad-copter. Our latest drone system offers a vertical take-off and landing (VTOL) platform and maps 60-90 acres in one flight and automatically creates multiple flights to map sites up to 600 acres. It features automatic take-off, auto flight path, and auto landing — no joystick required — with full safety controls. Aerial site photos are captured on the drone and automatically uploaded to the iPad tablet application and secure cloud storage for access by project teams. System specifications include data capture at a 2cm pixel resolution (RGB) at an altitude of 50-400 ft AGL a cruise speed of 9-18 mph (max speed 30 mph).

Woolpert's newest partnership with Kespry Drone Systems allows us to use quadcopters to safely collect aerial images, produce maps, as well as generate 2D/3D models and other valuable data. Those products can help our clients track construction site progress, measure stockpiles, manage resources, reduce downtime, track project status and more. This quadcopter features automatic take-off and landing, in addition to user friendly flight planning with full safety controls. Once the system lands, imagery is uploaded to a secure cloud and served out to project teams via an easy to use website.

Custom Platforms. Renaissance™ is a lightweight, portable, podded camera system for installation on low-flying, slow moving, manned aircraft such as a Cessna 172 or a Cessna 182. Released as Renaissance™ the surrogate UAS, closes the gap between detection and identification – delivering huge cost savings by extracting more identifiable information from your imagery than ever before. Renaissance™ acquires data with sensor payloads integrated into the pod. The fixed wing aircraft can collect imagery up to 1cm in resolution, depending on Lowest Safe Altitude (LSALT) restrictions.

Advancing our Firm in the UAS Industry. Woolpert is continuously improving its UAS capabilities to meet the operating altitude requirements. An example of how we are accomplishing this is through enhanced partnerships. A new partnership in Ohio is bringing together the resources and capabilities of four organizations for the purpose of expanding the development and use of unmanned aerial systems (UAS) for public and commercial applications.

Sinclair College's National UAS Training and Certification Center, the Ohio/Indiana UAS Center and Test Complex, Woolpert Inc., and Altavian Inc., have entered into an agreement that provides a pathway for joint operational collaborations, research, testing, and training in a concentrated effort to drive economic and technological development through the emerging use of UAS. This agreement facilitates the rapid advancement of commercial UAS operations in the state of Ohio, supporting areas including resource management, infrastructure monitoring, agriculture, mapping, and other areas leveraging precision aerial remote sensing. This has been made possible by the implementation of the Federal Aviation Administration's (FAA) Section 333 Exemption process, which allows commercial UAS activities for those who have received an exemption.

The following is a representative project example of aerial imagery collection employing UAS technology.

- **Senecaville Lake 2cm Imagery project.** In April 2015, Woolpert flew an UAS to capture high-resolution imagery of a well site, and to develop the corresponding 3D products from the imagery. The project area was approximately 200 acres and centered on a well site near Senecaville Lake, OH. Woolpert provided full support for this project (to include the UAS, pilot, and supporting equipment) and acquired color (RGB) imagery at 2-centimeter GSD using the Altavian Nova Block III UAS. Woolpert surveyed the area with horizontal and vertical ground control points, and recorded airborne GPS data to support digital orthomosaic production.

  After successful data capture, Woolpert processed the data using computer-vision workflow—software specific to small format UAS imagery. In addition to delivering traditional orthomosaics, Woolpert delivered 3D products that included a high-resolution 3D colorized point cloud and a Digital Surface Model (DSM) of the well site. The data collected for the proposed AOIs was compiled to exceed 25-centimeter horizontal accuracy at 95% confidence level.

The project data deliverable (GeoTIFF 3-band, 8-bit color imagery) allows the ability to simulate runoff scenarios to determine if designated retention ponds and infrastructure were collecting material as designed and to update of emergency ingress/egress procedures to the site.

*Project boundary indicated in **yellow***

Modifications and Clarifications

Woolpert has reviewed the terms of the RFP and generally finds the terms to be acceptable although Woolpert would like to have the opportunity to request the following clarifications and modifications if fortunate enough to be awarded the Project. Please note that the City and Woolpert have entered into numerous contracts and Woolpert is confident we will once again be able to agree on mutually acceptable terms.

- Information for Bidders, Contract and Bond, page 1. It is Woolpert's understanding that the parties shall enter into good faith contract negotiations and that a performance bond will not be required or in the event that a performance bond will be required, it shall be considered a separate reimbursable expense.
- Information for Bidders, Delivery, page 1. Please add the words "With respect to deliverable dates," to the beginning of the first sentence and delete the second sentence. In addition, please add language that clarifies that the Bidder shall not be responsible for delays caused by reasons beyond the reasonable control of the Bidder, including but not limited to acts of God, war, terrorism, or governmental or City delay.
- Information for Bidders, In the Event of a Contract, Section 6, page 2. Please add language that clarifies that the obligations of the provision shall not apply to any process, item, or method specifically required by the City nor shall the obligations apply to any misuse or modification of the deliverables by the City.
- Information for Bidders, In the Event of a Contract, Section 7, page 2. Please add language that clarifies that software, routines, specifications, data, and documentation are considered instruments of services and will be governed by the warranty for services.
- Information for Bidders, In the Event of a Contract, Section 13, page 2. Liability for indemnification should be tailored to a party's ability to control the risk. Woolpert can agree to indemnify and hold the City, and its officers, and employees harmless from claims, damages, liabilities, and costs, (including reasonable defense attorney's fees), to the extent caused by the negligence of Woolpert. Please revise the provision accordingly.

Section Two:

Qualified Project Staff

WOOLPERT

ARCHITECTURE | ENGINEERING | GEOSPATIAL

Qualified Project Staff

The proposed project team was assembled through careful consideration of the proposed scope of services compared to our team's expertise and experience working with municipal clients on related tasks. For ease of review, we have also included a personnel matrix which encompasses many of the desired competencies and experience identified in the RFP. Detailed information for these staff, including technical competencies and recent experience relative to the proposed scope of services, is also provided in this section.

	Data Conversion/Cleansing/Development				Field Data Collection		GIS Staff Augmentation	GIS Needs Assessment and Business Process Analysis (BPA)				GIS Application Development				Additional GIS Integration Solutions
Proposed Key Staff	Convert construction design plans into the GIS and editing of existing data	Develop new datasets from existing digital and hardcopy information	Develop automated routines to cleanse existing datasets	Geodatabase redesign/ standardization - Enterprise System Upgrade task	GPS data collection of various surface infrastructure features	Develop best practices for data collection using Esri's Collector app	Provide on-site staff support (duration will vary based on the assigned task)	Evaluate current GIS business practices utilizing industry best practices	Identify opportunities for business process improvement based on knowledge of GIS trends in municipal organizations	Reengineer workflows to facilitate data population and reliable data maintenance	Prepare documentation (SOP's, Training Docs, etc.)	Develop new applications using Esri's best practices leveraging against ArcGIS Online & Web App Builder; develop applications using JavaScript, HTML5, and .NET 4.0 and higher	Develop add-ins and new tools for ArcGIS Desktop	ArcGIS Mobile Development including customized Esri's Collector related applications	Migrate legacy GIS & non-GIS applications –Enterprise System Upgrade task	Support the integration of GIS with other business systems (311, permitting, work order asset mgmt, optimized routing) to ensure compliance with the City's overall IT vision and direction
Mike Merchant, GISP	■	■			■		■	■	■	■		■	■		■	■
Marianne Cardwell, GISP, CSM	■	■	■	■			■	■	■	■	■	■	■	■	■	■
Crystal Childress, CP, GISP	■	■	■				■	■	■	■	■					
Ken Chaffman, GISP	■	■	■	■				■	■	■	■					■
Ryan Butler, GISP	■	■		■												■
Darren Johnson, Security +			■		■	■				■		■		■	■	
Michael Morgan	■	■	■	■						■	■					
Cheryl Spencer		■	■					■	■		■					
Jennifer Starbuck	■	■	■		■	■				■	■					
David Hall					■	■										
Ryan Crosby					■											
Miles Kelly			■										■			■
Joe LaCombe		■	■					■	■	■	■	■		■	■	■
Dominik Medved, CSM		■	■		■						■	■	■		■	■
Julianna Castillo											■	■	■			■
Angie Causey, Security +							■	■			■	■	■		■	■
Zhenyang Hua	■	■	■				■	■	■	■	■	■	■		■	
Chris Morabito		■	■									■	■			
Daniel Ngoroi, CMS-RS, GISP		■	■										■			
Vince Sclafani, GISP, Security+, Network+			■	■			■	■	■	■	■	■	■	■	■	■
Brian Stevens, CP, GISP		■			■							■	■			
Jeff Pesler, AICP, IAM		■		■				■	■	■	■					■

Mike Merchant, GISP

Project Director

As a Project Director in Woolpert's geospatial services, Mike Merchant works closely with clients to deliver solutions to their mapping and GIS needs. He is adept at communicating with multiple levels of government to identify client needs and to ensure project teams accurately understand those needs. He has supported numerous mapping and GIS projects in the state of Ohio, providing expertise in developing and implementing customized asset management solutions and supporting tasks that range from requirements gathering and business process analysis to conceptual designs, data migration, software configuration, implementation, testing and training.

Prior to joining Woolpert, Mike served 30 years as a maproom manager for the City of Columbus and nearly six years as the GIS manager for the City's Department of Utilities. As a part of the City's GIS implementation team in 1995, he assisted in developing the plan for the citywide GIS, vetting and selecting contractors and vendors, and training city staff to facilitate a smooth transition. He further contributed to the development and maintenance of Columbus's GIS as a member of the City's GIS steering committee from 2000 to 2009. His extensive experience working with the City of Columbus as both a city employee and consultant give him a unique perspective regarding both the challenges the City faces and the progress they have achieved over the years.

Project Experience

3-Inch Orthophotos, Delaware County, Ohio—Countywide. Program Director who monitored the performance of the project team and reviewed project plans. Given his extensive past experience working with the City of Columbus, Mike also served as a client representative. Woolpert provided new countywide color, 8-bit, 4-band stacked digital orthoimagery encompassing the entire land area of Delaware County with a 100-foot buffer, for a total project area of 457 square miles.

Watershed Management Application Software Design Specifications, City of Columbus—Columbus, OH. Project Director and client liaison for this project to develop software design specifications for an application to replace the City's existing Access-based application. Mike assisted the project manager in determining the functional requirements of the application. This map-centric application will provide multiple levels of functionality, such as view-only, edit and administrator, and will meet the needs of the Watershed Management Department as well as the Recreation and Parks Department.

Digital Orthoimagery, Lidar, Contours and Hydrology, Licking County, Ohio—Countywide. Project Director and GIS Professional responsible for monitoring the progress of this project that included the creation of a hydrographic countywide layer that was digitized in the direction of flow. Hidden water line types were used to digitize water features that flow under structures. Rivers, streams and creeks greater than 8-feet wide were shown with both edges, while all smaller bodies of water were shown as a single line. Additional project deliverables included countywide color digital orthoimagery with a 3-inch pixel resolution, 1-meter lidar, and 2- and 4-foot contours.

USGS Lidar, Orthoimagery and Feature Extraction, Pennsylvania Department of Environmental Protection (DEP)—Lake Erie Drainage Basin. Project Director responsible for providing overall project oversight and supervising the automated land cover feature extraction process using COTS remote sensing software, proprietary software and applications to perform automated feature analysis incorporating the acquired imagery, lidar and other ancillary vector data.

Professional Data

Years of Experience

39 years

Technical Skills

ArcGIS Server, SDE, ArcGIS Desktop, ArcObjects, ArcView, ArcMap, ArcOnline, ArcPortal and ArcInfo, civil engineering, site development, hydrology, water resources, surveying, stormwater management

Professional Registration

Certified GIS Professional | #34034

Professional Memberships

Urban and Regional Information Systems Association (URISA), Ohio Chapter

Presentations and Publications

"Fusing Lidar and Ortho-Imagery to Determine Impervious Surfaces," Ohio GIS Conference 2008

"Use of Automated Impervious Area Calculations," presentation to Southeastern Stormwater Association (SeSWA)

Marianne Cardwell, GISP, CMS

Project Manager and Task Lead | GIS Needs Assessment and BPA

As a senior technical resource and Woolpert's Geospatial IT group manager, Marianne Cardwell directs a team of geospatial, web and integration developers in accomplishing client-established goals. Marianne is skilled at implementing Scrum's agile approach to software development to quickly produce quality deliverables within clients' budgetary and time constraints. Having been described as "highly approachable and team-oriented," Marianne's communication and networking skills are an asset not only to her team, but to her clients. She is skilled at stimulating open and creative discussions that allow her to glean an accurate and comprehensive awareness of her clients' needs; that awareness is reflected in the quality geospatial products that her team produces.

Project Experience

GIS Services, City of Columbus—Columbus, Ohio. Project Manager who has been managing GIS-development task orders for the City, including one project to maintain and update the City's internal GIS Dashboard. Marian ne gathered requirements and designed the systems for a number of web applications, including an Impervious Areas Viewer, a Valve Exercise website, and a Data Request website. She also developed a workflow to automate the processing of over 100,000 excavate/dig tickets.

GIS Consulting and Application Development Services, City of Indianapolis—Indianapolis, Indiana. Project Manager responsible for leading Woolpert in this project to assist the City in expanding and supporting its GIS through application development, data development and business process analyses. As a developer, she wrote a number of external and internal web applications, web, and Windows services, ArcMap extensions and Server-Object Extensions (SOEs). As a project manager, she manages the 3-person technical team dedicated to this client. She attends regular meetings, reviews time charged weekly, handles invoices and manages the overall project budget.

2015 Website Development, Sandusky County, OH—Sandusky County, Ohio. Project Manager who led the design and conversion of an existing Silverlight-based GIS website to JavaScript. This website, www.sanduskycountygis.org, provides citizens with cadastral information for the county. Besides ensuring existing functionality is retained, Woolpert also modernize the look of the site, ensuring it works on mobile devices such as phones and tablets.

OSU GIS Application Scoping and Analysis, The Ohio State University (OSU)—Columbus, Ohio. Geospatial Team Lead who assisted in requirements gathering and concept development for an enterprise GIS web application that enables students, staff, and faculty to access GIS data, building information, parking locations, public transportation, energy usage, information about interior space, building assessment data, and editing capability for utilities data. The application uses modern responsive design based on Bootstrap that makes it accessible on desktops, tablets, and smartphones alike.

Indianapolis Traffic Sign Inventory & Pavement Condition Assessment, City of Indianapolis DPW—Indianapolis, Indiana. Geospatial Team Lead who led the development of software to automatically extract signs, sign features and sign locations. Woolpert performed a traffic sign inventory and curb and sidewalk assessment utilizing our Mobile Mapping system and in-house feature extraction software for approximately 3,200 miles of roads and streets.

Professional Data

Years of Experience

17 years

Technical Skills

.NET, HTML, JavaScript, C#, VB, Dojo, Esri ArcGIS API for JavaScript, Bootstrap, ArcGIS Desktop, ArcGIS Server, ArcObjects, ArcSDE, ArcGIS Online, Portal for ArcGIS, Collector for ArcGIS

Education

Bachelor of Science | Geography,

Master of Science | Geographic & Cartographic Sciences

Professional Registration

Certified GIS Professional | #00045516

Certified ScrumMaster, National

Esri Certified ArcGIS Desktop Developer | National, MB1FRDECK1B41KPQ

Presentations and Publications

Maintenance Management to Asset Management, 2016 Illinois Airport Maintenance Association

City of Columbus--From Paper-Based to Electronic Tracking of Valve Exercises, 2016 Ohio GIS Conference

Custom Wayfinding & Public Interactive Maps, 2016 Indiana GIS Conference

Crystal Childress, CP, GISP

Project Coordinator

A Certified Photogrammetrist and GIS Professional, Crystal Childress provides GIS and mapping services to city and airport clients. She oversees Woolpert's mapping specialists—both in the field and in the office—on projects ranging from countywide mapping to airport obstruction surveys. Her expertise is with digital map database construction, quality control, database maintenance, product generation, output processing, and production workflow development.

Crystal also provides expertise in the creation and of FGDC-compliant metadata. She easily navigates the ArcGIS FGDC Metadata Editor to update all metadata components and verify that they conform to the FGDC metadata standard, and she is knowledgeable in the use of the USGS metadata parser in the Geospatial Metadata Validation Service.

Project Experience

BPA Call No 4 - HQ AFMC FY10 Support for IGI&S Program, USACE Omaha—Dayton, Ohio. Geospatial Phase Manager responsible for managing map production tasks for this contract to provide dynamic GIS consulting services to the Air Force Material Command (AFMC) Headquarters, Wright-Patterson Air Force Base to ensure all metadata was FGDC-compliant. Woolpert was contracted to assist the Corps of Engineers (COE) in deploying, enhancing and utilizing GIS technology.

UC West Campus Utility Infrastructure GIS Master Plan Update, University of Cincinnati—Cincinnati, Ohio. GIS Specialist who produced shapefiles and populated metadata for integration into the University of Cincinnati's data model. Woolpert provided an updated GIS Master Plan and created a GIS data model for the University. Other tasks included performing field surveys to locate utility infrastructure above and below the ground and creating a pilot area file geodatabase in ArcGIS with survey points and attributes. Woolpert consolidated existing GIS layers, AutoCAD and as-built drawings and other relevant information into the geodatabase file.

Indianapolis Traffic Sign Inventory & Pavement Condition Assessment, City of Indianapolis DPW—Indianapolis, Indiana. Geospatial specialist responsible for metadata creation and for processing collected data into a final geodatabase deliverable. Woolpert performed a traffic sign inventory and curb and sidewalk assessment utilizing our Mobile Mapping system for approximately 3,200 miles of roads and streets. Mobile lidar and still-frame digital photographs were used to extract signs, sign information, and their locations per MUTCD specifications. The resulting data was subsequently processed into a geodatabase and delivered to the client.

GIS Implementation Sequence 1 Project, City of Dayton, Ohio—Dayton, Ohio. GIS Specialist responsible for creating a base map deliverable in GeoTIFF format. Tasks included data and feature conversion and the development of attribute features. Woolpert implemented and deployed an enterprise GIS to support the needs of the airport, including increased efficiencies to everyday business practices, support of ongoing and future capital programs through powerful analytical tools, and unified data sharing.

Professional Data

Years of Experience

18 years

Technical Skills

ArcGIS Desktop, SDE, AutoCAD Map 3D and Civil 3D, ArcMap, ArcView, MicroStation, ERDAS Imagine, SAFE FME, TerraModeler, TerraScan, VROne

Education

Associates | General Studies,

Bachelor of Science | Geomatics,

Continuing Education

FAA Level 3 IDLE Certification | 20130315-266

Esri Introduction to GIS I

Esri Introduction to GIS II

Professional Registration

Certified Photogrammetrist | #1529

Certified GIS Professional | #91075

Professional Membership

Member | American Society for Photogrammetry and Remote Sensing

Kenneth Chaffman, GISP

Task Lead | Data Conversion/Cleansing/Development

Kenneth Chaffman manages a team of experts in designing and implementing cutting-edge GIS solutions for local government, oil, gas, and utilities clients. He also serves as a technical resource, responsible for designing, analyzing, and implementing processes, tools, and systems in support of GIS production and quality control efforts. These include developing applications, database structures, user documentation, and conversion and QA/QC processes.

Ken played a critical role in establishing Woolpert's Geospatial Discipline, and continues to develop improved processes and technologies to extend its capabilities. With over 30 years in the GIS industry, he brings to the team extensive knowledge that encompasses parcel, cadastral, and utility mapping; condition assessments; business process reengineering; and asset and facilities management.

Project Experience

UC West Campus Utility Infrastructure GIS Master Plan Update, University of Cincinnati—Cincinnati, Ohio. System Designer responsible for development of GIS database architecture. Woolpert provided an updated GIS Master Plan and created a GIS data model for the University of Cincinnati. Tasks included holding workshops with stakeholders, performing field surveys, data conversion and consolidation, and implementation planning and documentation.

GIS On-Site Support, Cleveland Department of Public Utilities—Cleveland, Ohio. Geospatial Team Lead who provided subject-matter expertise to the Cleveland Department of Public Utilities for interpreting as-builts, connection logs, village maps, legal descriptions and other documents used to accurately update the GIS with utility location and asset properties and using DPU systems to research and resolve data inconsistencies in the GIS.

Citywide GIS Design and Implementation, City of Cleveland | Cleveland, Ohio. System designer who assisted in designing and implementing an enterprise-wide GIS with a highly integrated suite of applications. This project included creating workflow models, developing database models and application designs, developing GIS standards and manuals, defining maintenance procedures, and providing training. Before citywide implementation, Woolpert conducted pilot projects to test base mapping, applications and data conversion processes.

Artex Data Cleanup, Artex Oil—Marietta, Ohio. Geospatial Team Lead responsible for overseeing the project team in building a structured enterprise data dictionary based on meetings with Artex staff, developing workflows to streamline SSI/GIS data integration, and providing on-site training.

dBASE Migration Assessment Services, Ohio Department of Transportation—Columbus, Ohio. Geospatial Phase Manager who provided GIS consulting services for this project to assess the current condition of, and document upgrade recommendations for, ODOT's roadway inventory and Highway Performance Monitoring System (HPMS) data management and reporting systems. These systems are currently based on a dBASE environment that is no longer sustainable. Woolpert and its subcontractor performed on-site data, script and technical environment reviews and developed a plan to transition from a dBASE environment to MS Access.

Professional Data

Years of Experience

31 years

Technical Skills

ArcGIS Server, ArcGIS Desktop, SDE, ArcObjects, ArcView, ArcInfo; Visual Basic, Oracle, SQL Server, Access, dBase

Continuing Education

Various Esri Training:

- ArcObjects with Visual Basic; ArcSDE using ArcInfo and ArcView; Introduction To Microstation; Using ArcInfo NETWORK, TIN, COGO, ArcStorm and ArcScan; Advanced ArcInfo; ArcInfo AML Development; ArcView GIS; Designing Geodatabases Using ArcInfo

Structured query language (SQL), Wright State University

Solaris advanced system administration training, Solaris Training Center

Visual Basic programming levels 1 and 2, Wright State University

Professional Registration

Certified GIS Professional, National, 00058402

Professional Membership

Southwest Ohio GIS Users Group

Jennifer Starbuck

Task Lead | Field Data Collection

As a GIS Analyst within Woolpert's Geospatial IT group, Jennifer Starbuck is responsible for collecting and processing field data and for assisting clients in implementing Esri technology to streamline data collection and sharing. She began her career with Woolpert tasked with processing and producing GIS data in the office for various federal and private clients, as well as for statewide imagery programs. When Esri's Collector hit the market, Jennifer started working in the field with energy clients to help them leverage the application in their GIS workflows. She primarily utilizes the application to collect field data, upload it into the ArcGIS Online environment, and provide on-site training to clients' field staff. Additionally, Jennifer develops thorough end-user training documentation to incorporate Collector into clients' GIS workflows.

She has played an integral role in achieving efficiencies through Esri technology that have reduced the time, cost and manpower required to complete projects. After seeing how successful it was for her clients—and how efficient it made Woolpert's own collection processes—Jennifer spearheaded an initiative to start using Collector internally. Since then, she has worked extensively with Woolpert's multiple disciplines to identify opportunities to use Collector in place of traditional survey methods.

Professional Data

Years of Experience

5 years

Technical Skills

ArcGIS Online, ArcGIS Desktop, Defense Mapping, 3D Analyst, Network Analyst, Spatial Analyst, Data Reviewer, Production Mapping, AutoCAD, geodatabase management and creation, GIS analysis, feature extraction, data conversion, editing, and attribution, on-site training, and training documentation

Education

Bachelor of Arts, Geological Science, Wright State University

Master of Science, Geographic Information Technology, Northeastern University

Continuing Education

Certificate, Advanced Technical Intelligence, 2010

SOCET GXT Training

ENVI Training

Project Experience

CRAA Wayfinding Signage Program Update, Columbus Regional Airport Authority—Columbus, Ohio. GIS Analyst who consulted with Woolpert's transportation engineers to develop a plan for using Esri's Collector. For this project, Woolpert is updating the CRAA's existing signage inventory using Esri's Collector application for field collection, designing signage improvements, and will assist the CRAA throughout the bid evaluation and selection process. What makes this project truly unique is that we are performing survey work—without putting any of our surveyors in the field.

Eclipse Water Meetings, Eclipse Resources Holdings—Ohio. GIS Analyst responsible for data collection using Esri's Collector, hosting data to ArcGIS Online, and providing AGOL training and support to the client. Woolpert collected field data and integrated it to the AGOL environment, performed deed research, attended weekly meetings to facilitate land use agreements, and performed water quality testing, flow testing and wetlands delineation.

ArcGIS Online Implementation, Artex Oil Company—Ohio. GIS Analyst who collected field data using Esri's Collector and configured the client's ArcGIS Online platform. Jennifer also developed Collector support documents and provided training to ensure end-users had the tools they needed to continue to leverage Collector and AGOL, independently. Woolpert provides ongoing, on-site and remote support to Artex staff on geospatial data management, editing, analysis and map production.

Gulfport Energy Field Routing and Verification, Gulfport Energy—Ohio. GIS Analyst who performed field route planning to support field data collection using Esri's Collector. Woolpert provided routing, field verification, and ArcGIS Online configuration for this energy client that operates in southeast Ohio.

GIS Database Development - Ohio Gas GIS Database Development and Related Services, Ohio Gas Company—Bryan, Ohio. GIS Analyst who examined and evaluated the use of existing sources for capturing location and attribute data for service-related features such meters and service lines and contributed to a summary of results. Woolpert worked with the Ohio Gas Company (OGC) to convert all legacy geospatial data into a standard format and build an associated GIS to storage, maintain, visualize, and analyze their gas system.

Joe LaCombe

Task Lead | GIS Application Development

Joe LaCombe has been designing and architecting complex GIS systems and Esri-based application solutions for municipal and public utility clients in the Midwest for more than 15 years. As GIS Application Developer within Woolpert's Geospatial IT group, Joe helps city clients identify opportunities to leverage GIS technology and software to overcome challenges, improve operational efficiencies, and provide quality, responsive services to their citizens. He has extensive experience developing and designing desktop, web-based, browser-based and mobile applications, including both user interfaces and the backend web-service frameworks for communication between the GIS and other business systems. Joe has also played an integral role in Woolpert's research and development efforts, and has advocated for software and technology investments that have enabled the firm to provide industry-leading geospatial and IT solutions. He brings to the team both an expertise in his craft and enthusiasm for learning that provides momentum and innovation to every project he works on.

Project Experience

GIS Consulting and Application Development Services, City of Indianapolis—Indianapolis, Indiana. GIS Application Developer who has assisted the City on more than 100 tasks to develop or enhance applications, perform research, cleanup data, and produce workflows for improved efficiencies. Joe architected and developed RequestIndy, a portal for citizens to report all non-emergency requests directly to the internal departments that would handle them. The solution was developed for Web, iOS, and Android. Other tasks have included a vacant housing viewer, intranet data viewer, polling place manager, My Neighborhood web portal, property assessment viewer, RebuildIndy, and a crime view application.

Architect of the Capital (AOC), TMA Systems—Washington, D.C. GIS Application Developer for a series of projects to create a GIS solution that simplifies the collection, visualization and analysis of facilities management data for the AOC—the facilities manager for Congress, the Library of Congress and the Supreme Court. In addition to assisting in setting up and configuring ArcGIS Server and developing and implementing the GIS, Joe was the lead application developer for a map-centric web-based interface that supports interactive 3D tours of the office suite and allows users to view building floors and suite views and to toggle building amenity layers on and off for enhanced suite selection capabilities.

Enterprise Asset Management Implementation, Des Moines Water Works—Des Moines, Iowa. GIS Application Developer who assisted in developing, documenting and implementing the system architecture and related applications to support it. This five-phased Enterprise Asset Management Implementation encompassed core system design, configuration, integration and testing. Woolpert also provided training and as-needed follow-up support to ensure a smooth transition.

GIS Consulting, Remetrix—Carmel, Indiana. GIS Application Developer who provided consulting services for architecture and configuration recommendations for ArcSDE and ArcGIS Server. Tasks included reviewing the client's current ArcSDE environment and needs; providing recommendations regarding geodatabase hardware, software, configuration, and tuning; recommendations outlining proper design and best practices for implementing ArcGIS Server; selecting the proper client side API and migrating the data; and recommendations on configuration and service.

Professional Data

Years of Experience

16 years

Technical Skills

ArcGIS Server, ArcGIS Desktop, SDE, Esri ArcPad, ArcObjects, ArcGIS Online, VB .NET, JavaScript, C#, Python, Visual Basic, HTML, SQL, Oracle PL/SQL, API Access, SQL Server, AutoCAD, Service Oriented Architecture (SOA), Asset Management Systems (AMS) and Computerized Maintenance Management Systems (CMMS), e311, route optimization

Education

Bachelor of Science | Geography and Earth Science

Continuing Education

ArcGIS Server Web Administration Using the .Net Framework

Developing Applications with ArcGIS Server Using the Microsoft .NET Framework

Programming Map Objects—Java Edition, Esri

Advanced ArcObjects Component Development II (.NET), Esri

Advanced ArcObjects Component Development with VB, Esri

Developing Microsoft ASP.NET Web Applications, Microsoft

Programming with ADO.NET, Microsoft

Miles Kelly

Task Lead | Additional GIS Integration Solutions

As a GIS Application Developer and Technical Architect within Woolpert's Geospatial IT group, Miles Kelly is primarily responsible for building integrations between GIS-centric Asset Management Solutions (AMS) and other systems to help clients fully leverage the power of their software investments in a distributed enterprise system. After graduating with a degree in urban planning, Miles began her career at Woolpert as a GIS Analyst, processing field data for stormwater clients. Her keen attention to detail, knack for automating processes, and continued interest in city planning led her to her current position, where she works directly with municipal clients to determine their needs, develop GIS-centric software solutions to meet them, and create automated processes for integrating data. She has led the programming and integration of numerous AMS implementations for city and county clients across the U.S., and is known for her strong organizational and communication skills, as well as her commitment to leaving clients with the knowledge and tools they need to manage their system independently.

Project Experience

Cityworks Service Request Configuration and Citizen Portal Deployment, City of Dublin—Dublin, Ohio. GIS Application Developer who performed on-site requirements gathering, facilitated discovery workshops with City staff, and developed configuration documentation to ensure Woolpert delivered a tailored and effective solution. Woolpert re-configured and expanded the functionality of the City's Cityworks MMS Service Requests and customized and deployed a Citizen Request Portal Application. Prior to deploying the configured systems to the City's production environment, Woolpert's GIS analysts and developers performed user acceptance testing and provided on-site training to city staff.

City Water D&M Hydraulics for Cityworks, City of Cleveland—Cleveland, Ohio. Senior Developer and Technical Lead for data integration. Miles has been assisting in data prep and Cityworks implementation for the City of Cleveland's Department of Public Utilities. The services support the Distribution/Maintenance, Hydraulics, Inventory/Warehouse, Plants/Facilities and Water Pollution Control divisions. The team integrated the AMS software application to meet activity requirements; established a stable, high-availability platform for program deployment; conducted discovery to establish project foundations; facilitated asset inventory data collection; and trained the staff on product use.

Maintenance Management System Implementation and Customer Information System Integration, Henrico County—Henrico, Virginia. GIS Application Developer who provided configuration, integration, testing and training support for the implementation of a computerized maintenance management system that tracks maintenance activities for their water, sewer, solid waste, meter service, and customer service divisions. For the customer information system, Miles developed and documented testing and acceptance plans—to include an overall plan for migrating data in manageable chunks, as well as detailed test scripts for confirming system functionality. She also ensured the successful migration of large volumes of data into a live system; performed coding, deployment, and testing; and managed software modifications and data cleanup.

Professional Data

Years of Experience

18 years

Technical Skills

ArcGIS Server, SQL Server, Oracle, Access, T-SQL, HTML, data integration, data migration, message-queuing, service-oriented-architecture, technical documentation, and on-site training

Education

Bachelor of Science, Urban & Regional Studies, Cornell University

Certificate, Graduate Certificate in GIS and Spatial Analysis, State University of New York at Albany

Darren Johnson, Security+

Database Specialist

As a Database Specialist with Woolpert's Geospatial IT group, Darren Johnson provides support to a variety of federal, aviation and municipal clients. He has extensive experience supporting complex Air Force GeoBase programs, including as a GeoBase Technician, GIS Analyst and Geospatial Database Specialist. Darren has also assisted in multiple airport GIS implementations and has worked with municipal and private sector clients to integrate utility features into existing GIS systems. Darren's experience includes developing geodatabase platforms, coordinating system upgrades, inputting GeoXT and GeoXH survey data into geospatial databases, and developing layered AutoCad maps depicting facilities, parcel boundaries, utilities, topography, and other features. Particularly fluent in Esri software, Darren has installed and configured the Web Adaptor for ArcGIS Server; HTTPS for ArcGIS Server; and Portal for ArcGIS. He has also configured reverse proxy servers to allow clients to make edits to enterprise geodatabase behind firewalls, and frequently implements web-based applications to support geospatial analysis, viewing, editing and routine maintenance for installation data owners.

Project Experience

Dayton International Airport GIS Implementation, City of Dayton—Dayton, Ohio. Team Member who is providing dynamic support for this project, including coordinating upgrades, inputting GeoXH data into the geospatial database and training DAY staff in the use of GeoXH and the organization of their data into the new GIS. Woolpert implemented an enterprise GIS to support the needs of the airport. The primary goals of DAY's enterprise GIS are to provide increased efficiencies to everyday business practices, support ongoing and future capital programs through powerful analytical tools, and be able to share a common set of data.

CRAA Wayfinding Signage Program Update, Columbus Regional Airport Authority—Columbus, Ohio. Team Member who configured an ArcGIS Online hosted feature service for field collection and demonstrated the application's capabilities to Woolpert's transportation engineers who are performing the signage inventory. Woolpert is updating the CRAA's existing signage inventory using Esri's Collector and designing signage improvements. What makes this project truly unique is that we are performing survey work—without putting any of our surveyors in the field.

ArcGIS Online Implementation, Artex Oil Company—Marietta, Ohio. Database Specialist who performed workflow scripting, AGOL configuration, hyperlink analysis and training to implement ArcGIS Online for the Artex Oil Company. Woolpert provides ongoing on-site and remote support to Artex Staff on geospatial data management, editing, analysis and map production.

GIS Implementation Study, Tucson Airport Authority—Tucson, Arizona. Database Specialist who performed on-site interviews and data gathering to identify GIS-related needs and develop a GIS implementation strategy and FAA AGIS data maintenance recommendations. As a result of this GIS implementation study, Tucson Airport Authority has received the necessary funding to move forward with implementation.

GIS Consent Decree for CMOM Program, Miami-Dade Water and Sewer Department (WASD)—Miami, Florida. Database Specialist for this task order to populate the WASD sanitary sewer GIS with manhole rime elevations and pipe inverts. Darren assisted in developing a workflow for managing the data edits and tested and implemented the process. Woolpert is assisting Miami-Dade County to comply with a Consent Decree from the USEPA, and Florida Department of Environmental Protection (FDEP).

Professional Data

Years of Experience

19 years

Technical Skills and Proficiencies

ArcGIS Server, SDE, ArcGIS Desktop, Portal for ArcGIS, Collector for ArcGIS and ArcGIS Online, ArcPad, and ArcObjects, Windows IIS, Ventyx Customer Suite v4.1, Oracle RDBMS, 11g, and 12c, C#, VBA, HTML, JavaScript (including Esri JavaScript API), ASP, PLSQL/SQL, XML, .NET, AutoCAD, Microstation, Trimble Geomatics Office, Reference Station, Pathfinder Office, GeoXT, ProXRS, 5700, and 5800, Geodimeter 608s, Auto-Level

Education

Associates | Construction Technology

Professional Registration

Security+ | COMP001020233468

Mike Morgan

GIS Technician

Mike Morgan analyzes satellite imagery and performs feature extraction using Esri's ArcMap software for Woolpert's Geospatial Discipline. He serves customers in the federal, state and local markets. Mike also performs all aspects of digital input, both graphic and non-graphic, in multiple operating system environments, and edits and corrects graphic design files to meet project specifications. Other duties include: processing and preparing data to be delivered to clients; providing project scheduling, pricing and budgeting recommendations; coordinating project priorities, monitoring schedules and budgets for project managers; addressing technical digital conversion questions; and designing and developing production, quality control and assurance-based utilities using software development tools. Prior to his current role, Mike was a technician in Woolpert's photogrammetry and remote sensing division, where he provided quality control of images and performed appropriate corrections to the imagery.

Project Experience

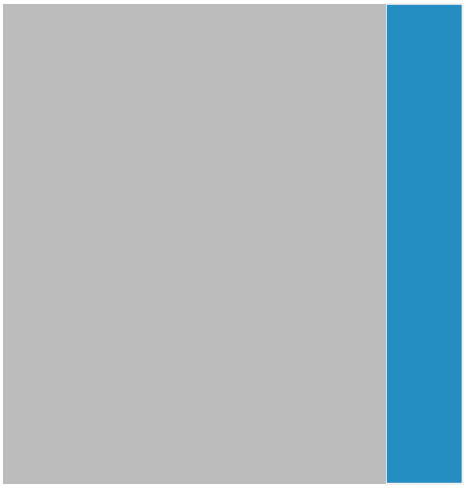
GIS Database Development and Related Services, Ohio Gas Company—Bryan, Ohio. GIS Technician responsible for converting legacy geospatial data into a standardized format to support this project to build a GIS to store, maintain, visualize and analyze their gas system. OGC is a privately owned utility company that provides natural gas service to a multi-county region of Northwest Ohio. Their operations date back to 1914 and, as such, their legacy geospatial data was extremely varied in accuracy, completeness, and format. OGC realized their need for accurate and dependable geospatial data, and partnered with Woolpert to convert legacy data and build a GIS.

UC West Campus Utility Infrastructure GIS Master Plan Update, University of Cincinnati—Cincinnati, Ohio. GIS Technician responsible for assisting in data model development and for converting legacy data. Woolpert provided an updated GIS Master Plan and created a GIS data model for the University of Cincinnati. Tasks included holding workshops with stakeholders, performing field surveys, data conversion and consolidation, and implementation planning and documentation.

AutoCAD-Esri Transition Plan, OSU—Columbus, Ohio. GIS Technician who developed the data model and performed data migration to Esri. The Ohio State University contracted Woolpert for services to support the transition of their Utilities GIS data management from AutoCAD/Oracle Spatial to the Esri platform.

Erie Water Works | Erie, Pennsylvania. GIS Specialist who supported this system wide implementation of a full GIS for the entire Erie Water Works' service area using. After completion of a needs assessment, implementation strategy and a pilot project, Woolpert provided professional mapping and surveying services, geodatabase design, Real-Time Differential GPS field data collection and creation of a system wide water network. Esri ArcGIS software was used while the entire team worked simultaneously within ArcSDE.

GIS Development and Asset Management System Implementation | Greene County, Ohio. Geospatial data analyst who participated in a phased approach to migrate the department from its existing CAD and hardcopy data environment to an Esri-based GIS. The project involved developing a detailed GIS development plan, followed by a pilot data creation project including the design of water and sewer data models, and ultimately, creation of a GIS covering their complete service area and implementation of a maintenance.



Professional Data

Years of Experience

16 years

Technical Skills

ArcGIS Server, SDE and Desktop, Esri ArcPad, ArcCatalog, ArcMap, ArcView and ArcInfo, Windows 2000/XP and IIS, AutoCAD Map 3D, SAFE FME, Pictometry, PLTS, GAIT, Titan CVC, MicroStation, OrthoPro and OrthoVista, SAS/Graph, 3-D SURFER, SPSS, Photoshop, and photo interpretation, as-builts, construction plans, engineer's drawings, CSIR drawings, building computers, and setting up networks

Education

Bachelor of Science | Geography-GIS

Continuing Education

Building Geodatabases, Esri

Dominik Medved, CMS

Senior GIS Application Developer, Systems Analyst

As a Senior GIS Application Developer and Systems Analyst with Woolpert's Geospatial IT group, Dominik Medved designs custom applications and software using the Agile Scrum development methodology. He is experienced in a host of programming languages and GIS-centric software packages, and frequently serves as a technical architect for GIS-centric software and web-development. Additionally, Dominik is proficient in integrating new systems with legacy systems such as Cityworks, SAP, FileNET and GranitXP.

Dominik has demonstrated experience in design and development of enterprise geospatial solutions; creation and management of map services and web-based content; and geodatabase design, development, configuration, tuning, and troubleshooting. Dominik also has a background in geodesy, water modeling, photogrammetry, digital cadastre, and cadastral and engineering field surveying.

Project Experience

OSU GIS Application Scoping and Analysis, Production of Maps, The Ohio State University (OSU)—Columbus, Ohio. GIS Application Developer and GIS Team Leader responsible for the development of an enterprise GIS web application that provides students, staff, and faculty a view into useful information about the campus as a whole. The information includes: GIS data, building information, parking locations, public transportation, energy usage, information about interior space, building assessment data, and editing capability for utilities data. The application uses modern responsive design based on Bootstrap that makes it accessible on desktops, tablets, and smartphones alike.

GIS Property Viewer Application Upgrade, Sandusky County—Fremont, Ohio. GIS Application Developer who co-created an updated application that provides citizens with quick and easy access to property information, maps, building sketches, and other relevant information. The existing application was ArcGIS Server web-based; Dominik and Julianna Castillo used Silverlight technology and the Esri Silverlight API to recreate and upgrade the application. Woolpert later converted the application to JavaScript, the result of which can be found at www.sanduskycountygis.org.

Impervious Areas Viewer, City of Columbus—Columbus, Ohio. Geospatial Information Specialist who provided subject matter expertise in the development of software requirements specifications and who is assisting in the subsequent application development. Woolpert developed an impervious area viewer for the City of Columbus. The viewer is a web-based application that allows customer service representatives (CSR) to answer customers' questions related to the impervious areas on their properties. The CSRs are able to link directly to the application using a button in the customer information system, as well as save a map and summary sheet about the customer's property to a pdf file. It is designed to be fast and provide only the information needed by the CSR to answer the customer's questions.

AutoCAD-Esri Transition Plan, OSU—Columbus, Ohio. Geospatial Information Specialist who provided development services. The Ohio State University contracted Woolpert for services to support the transition of their Utilities GIS data management from AutoCAD/Oracle Spatial to the Esri platform.

Professional Data

Years of Experience

17 years

Technical Skills

C#.NET, ASP.NET, JavaScript, AJAX, Bootstrap, jQuery, JSON, HTML, and SQL, SQL Server, Oracle and MS Access, ArcGIS, ArcGIS Server, ArcObjects, and ArcSDE

Education

Master of Science, Geography | Cartography/GIS

Bachelor of Science | Geodesy and Land Surveying

Continuing Education

Accela Partner and Developer Conference; March 3-5, 2014; Olympic Valley, California

Microsoft—2310 Developing Microsoft ASP.Net web applications/2389 Programming with ADO.NET

Esri—Advanced ArcObjects Component Development with VB

Professional Registration

Certified ScrumMaster, National

Professional Memberships

Scrum Alliance Member, Colorado

Brian Stevens

Certified Photogrammetrist

Brian Stevens is a GIS Professional and Photogrammetrist with 20 years of experience in the geospatial industry. As a Program Manager for countywide and statewide GIS/base mapping (lidar/orthoimagery) programs, Brian's role on projects is multi-faceted. He serves in the capacity of a technical project manager, building specialized teams and coordinating planning, acquisition and production of base mapping GIS data, while also engaging with clients on a daily basis to assess their needs and create responsive, effective and accurate solutions. He bridges the gap between clients and project staff to ensure scopes, schedules and budgets align with clients' needs, implements stringent QA/QC protocols, performs final QC of deliverables and works with the project team to trouble-shoot technical challenges and provide ongoing training.

As a part of his effort to continue to strengthen Woolpert's project teams, Brian remains active in industry organizations and seeks small business partners with niche services. He excels at securing in-state partners to keep clients' money in their local economies, and frequently collaborates with clients and subconsultants to increase awareness of emerging geospatial applications.

Professional Data

Years of Experience

21 years

Technical Skills

ArcGIS, MicroStation, Global Mapper, QT Modeller

Education

Bachelor of Science | Geography/GIS,

Professional Registrations

Certified Photogrammetrist | #1293

Certified GIS Professional | #67817

Professional Memberships

Member | American Society for Photogrammetry and Remote Sensing

Project Experience

Ohio Statewide Imagery Program (OSIP)—Locations throughout the state of Ohio. Certified Photogrammetrist and Program Manager responsible for production and deliverables associated with this program with a base requirement consisting of acquiring 4-band imagery covering the entire State - 44,825 square miles and delivering orthorectified and mosaicked imagery at a 30-cm GSD. In addition, Woolpert received 73 "buy-up" orders requiring additional airborne acquisition of data covering more than 8,000 square miles. Specifications for the buy-ups have include acquisition of lidar at a nominal GSD of 0.5-meter and 1-meter, 4-land EO imagery at pixel resolutions of 7.5-cm of 15-cm, Natural Color Oblique EO Imagery and feature extraction of 2D building footprints, land use/cover polygons, and impervious surface polygons.

USGS Lidar, Orthoimagery and Feature Extraction, Pennsylvania Department of Environemental Protection—Lake Erie Watershed, Pennsylvania. Project Manager responsible for the overall planning, scheduling, budgeting and QA/QC involving the acquisition of new digital orthoimagery and 1-meter lidar for the 512-square-mile project area. Woolpert also provided hydrographic layers and crest delineation.

Ohio Solar Potential Map, Ohio Department of Development—Columbus, Ohio. Project Manager who facilitated communication between Woolpert's developers and the client and who developed and monitored the project plan, schedule and budget. This interactive solar map website allows users to view the solar potential of over 250,000 structures across a 1,000-square-mile area.

3-Inch Orthoimagery, Lidar, and Impervious Surfaces, City of Columbus—Columbus, Ohio. Certified Photogrammetrist for the update of geospatial datasets for use by the City, county and the general public. Woolpert acquired new digital color orthoimagery with 3-inch pixel resolution and new 0.7-meter lidar data for 726 square miles.

2014-2018 Base Mapping—Fairfield County, Ohio. Directed the development/ updates of geospatial datasets for use by county agencies and the general public, and to provide these datasets for inclusion within the Ohio Geographically Referenced Information Program (OGRIP). The new color 8-bit, 4-band stacked digital orthoimagery and building outlines encompass the entire land area of (±508.5 square miles) including a 100-foot buffer zone outside the county boundary.

Zhenyang Hua

GIS Application Developer

As a GIS Application Developer within Woolpert's Geospatial/IT Discipline, Zhenyang Hua is responsible for designing user-friendly GIS web applications for municipal and airport clients. Zhenyang specializes in developing and deploying Google related web applications and designing and implementing data visualization through JavaScript. He brings to clients both an expertise in GIS application development and a passion for continuous improvement—ensuring quality products with exceptional aesthetics and usability. Zhenyang's project experience ranges from supporting municipal planning and development efforts through data collection, analysis and visualization to helping law enforcement agencies across the nation maximize situational awareness and visual organization for effective forensic analysis.

Project Experience

Footprint Software Implementation, University of Dayton Research Institute (UDRI)—Dayton, Ohio. GIS Application Developer responsible for co-developing this integrated 2D and 3D web-based visualization technology that ingests sensor data and display is for the user. The software, Footprint, is a geospatial video and data visualization platform for crime analytics that will be available to law enforcement agencies across the nation. Footprint interfaces with a department's existing video management software to georegister video feeds onto a map AND perform automated real-time and forensic analysis on each feed. Footprint is also powerful data management tool that warehouses, organizes, and displays crime data into the same map – allowing departments to visually organize their video and crime data into the same GUI. Woolpert was tasked to create a visualization framework that displays sensor feeds and other available data into the GUI. The viewer allows users to interface with sensors and data in a way that increases the user's situational awareness of the area of interest.

OSU GIS Maps 2.0 Developments, OSU—Columbus, Ohio. GIS Application Developer who provided enhancements to the existing OSU Maps web application, which Woolpert developed in 2014. This project was a follow-on to the systems requirements specifications Woolpert provided in May of 2016, and also included stand-alone data management tools and process automation enhancements.

2015 Website Development, Sandusky County, OH—Sandusky County, Ohio. GIS Application Developer responsible for developing the core functions and user interface of this mobile friendly County GIS Viewer. It uses ArcGIS JavaScript API for the mapping visualization and dojo-bootstrap for the front-end framework. It is mobile friendly and supports IE9 and most popular browsers. Woolpert converted an existing Silverlight-based GIS website to JavaScript. This website, www.sanduskycountygis.org, provides citizens with cadastral information for the county. Besides ensuring existing functionality is retained, Woolpert also modernized the look of the site, ensuring it works on mobile devices such as phones and tablets.

GIS Development Support, ATOS IT Solutions—Ft. Wayne, Indiana. GIS Application Developer who created a searchable election map viewer using ArcGIS JavaScript API for mapping visualization and dojo for front-end framework. This project required the integration of new GIS data, and included the addition of two custom Esri widgets: a polygon selection tool and a search on load tool.

Professional Data

Years of Experience

2 years

Technical Skills

ArcGIS Server, Desktop and SDE, ArcGIS Online and Portal for ArcGIS, RDBMS and WAM v.1.9, Windows IIS, Python 4, JavaScript 4, .NET Web API 3, PostgreSQL 4, MS SQL Server 3, Linus Server Administration 3

Education

Master of Science | Geographic Information Science and Cartography

Bachelor of Science in Education, Geographic Information Science and Cartography, Shanghai Normal University

Continuing Education

Google Maps Certified Deployment Specialist

Google Maps Deployment Specialist

Angie Causey, Security+

GIS Application Developer

As a GIS Application Developer supporting within Woolpert's Geospatial IT group, Angie Causey specializes in designing web-based geospatial and mapping applications. She leverages her more than 20 years of experience in graphic design to craft highly effective and user-friendly interfaces that allow clients to fully realize the capabilities of their applications. Clients appreciate her attention to detail and commitment to developing integrative solutions that meet their needs, while also complementing their existing business environments.

Angie's project experience encompasses a diverse range of applications for municipal, utility, and federal clients. She has extensive experience designing web applications for the Air Force, integrating software within servers that have stringent security policies. She also developed a GPS-based tablet application for an energy company, for which she also developed a custom tool to accurately communicate GPS data with the hardware of the client's existing tablets—a task no off the shelf software was able to accomplish.

Project Experience

GIS Dashboard, City of Columbus—Columbus, Ohio. GIS Application Developer who provided upgrades to the City's internal GIS Dashboard. All functionality targeted ArcGIS 10.0 and the Flex Viewer 3.3. Angie assisted in the development and implementation of a universal Google-type search box, theme selection widget, get coordinates widget, 'where am I widget', water valve isolation widget, sewer and storm upstream and downstream search widget, and an imagery slide base widget. She also made various other improvements and resolved bugs within the existing application.

Wright-Patterson GIS Application Development Services, General Services Administration—WPAFB, Ohio. GIS Developer who deployed and supported multiple Flex-based mapping tools, widgets and applications for the Air Force Special Operations Command (AFSOC) and the Air Force Military Command (AFMC). She assisted in the development of an ICEE framework, an operational environment that provides enterprise-wide asset awareness and management, controls and commands disparate sensors and systems, provides cyber security measures and allows device configuration on a secure network. For the ICEE framework, Angie created, integrated and tested a customized dashboard, assured secure operation on WPAFB CE VLAN and presented a path forward for GeoBase Interoperability. She also developed an Energy Audit Visualization tool for the AFMC, which included viewer products as well as customized energy and asset visualization tools and emergency response tools.

EMA Application Development, Fairfield County, Ohio EMA—Lancaster, Ohio. Lead Application Developer for a Flex website based on Esri's ArcGIS Viewer for Flex version 3.4 in conjunction with ArcGIS Server 10.2. The County's GIS data is stored in SDE with SQL Server as the backend database.

Indianapolis Traffic Sign Inventory & Pavement Condition Assessment, City of Indianapolis DPW—Indianapolis, Indiana. GIS Application Developer responsible for developing software to automatically extract signs, sign features and sign locations. Woolpert performed a traffic sign inventory and curb and sidewalk assessment utilizing our Mobile Mapping system and in-house feature extraction software for approximately 3,200 miles of roads and streets.

Professional Data

Years of Experience

20 years

Technical Skills

ArcGIS Server, SDE and Desktop v10.3.1, Oracle 11.2, Windows IIS, HTML, HTML5, CSS, JavaScript, Action Script, ASP .NET, C#, VB, WebAPI, Python, HTML/HTML5, XML, CSS, Visual Basic, PHP, SQL Server, MySQL and PostgreSQL, WebAPI, OData, Flex API's Angular, Node JS, JQuery, Leaflet and Google API, and Adobe Photoshop, Illustrator and Flash

Education

Bachelor of Arts | Communication Arts/Advertising

Associates | Computer Science

Professional Registration

Security+ | COMP001020437101

Chris Morabito

GIS Application Developer

Chris Morabito is an Application and Software Developer within Woolpert's Geospatial IT group. Chris is credited as the lead developer and system administrator of SmartView Connect (SVC), Woolpert's in-house webhosting platform. His conceptual and technical design and oversight pertaining to the development of SVC has played a critical role in the successful completion and outstanding QA/QC measures of many large scale aerial mapping projects. Its usability and simplicity allows for continual review, updates, and feedback—limiting the amount of re-work necessary and saving clients' time and money. With extensive project experience both at Woolpert and working at the Wright Brothers Institute Tec^Edge Innovation and Collaboration Center, Chris is equipped with a comprehensive knowledge of cutting edge technology and applications.

Project Experience

GIS Dashboard, City of Columbus—Columbus, Ohio. GIS Application Developer who provided support in upgrading the City's internal GIS dashboard. All functionality targeted ArcGIS 10.0 and the Flex Viewer 3.3. Woolpert developed and implemented a several widgets and resolved bugs.

Footprint Software Implementation, University of Dayton Research Institute (UDRI)—Dayton, Ohio. Application Developer responsible for co-developing this integrated 2D and 3D web-based visualization technology that ingests sensor data and display is for the user. The software, Footprint, is a geospatial video and data visualization platform for crime analytics that will be available to law enforcement agencies across the nation. Footprint interfaces with a department's existing video management software to georegister video feeds onto a map AND perform automated real-time and forensic analysis on each feed.

Northwest Ohio Solar Resource Map Ohio Solar Potential Map, Ohio Department of Development—Columbus, Ohio. Lead Application Developer for this interactive solar map website that allows users to view the solar potential of over 250,000 structures across a 1,000-square-mile area. He designed the website based on Woolpert's online imagery viewer and redlining tool, SmartView Connect, which Christopher also created. The website enables users to search for properties, see available rooftop areas and calculate structures' annual solar potential output. He worked closely with the client and Daniel to establish requirements; designed and developed the websites functionality and user-interface; deployed and tested the website at Woolpert; deployed and tested the website on OIT servers; and incorporated additional feedback into the design before final deployment. This project team consisted of two primary staff: Christopher for the web development and Daniel for the data development.

SmartView Connect, Internal (Woolpert) Technology Development—Dayton, Ohio. Lead Application Developer and System Administrator of SmartView Connect, Woolpert's in-house webhosting platform. His conceptual and technical design and oversight pertaining to the development of SmartView Connect has played a critical role in the successful completion and outstanding QA/QC measures of many large scale aerial mapping projects—including the Ohio Statewide Imagery Program (OSIP). Its usability and simplicity allows for continual review, updates and feedback—limiting the amount of rework necessary and saving clients' time and money. Chris provides ongoing support and training to help Woolpert and its clients leverage this valuable webhosting and QA/QC tool.

Professional Data

Years of Experience

11 years

Technical Skills

ArcGIS Server, SDE and Desktop, Esri ArcPad, ArcCatalog, ArcMap, ArcView and ArcInfo, C# and the .NET framework, C++, Java, Python, Apache Flex, Ruby, Oracle 11g SQL database and PostgreSQL, ASP.Net, Microsoft Visual Studio, GDAL, OpenLayers, Google Maps API, NASA World Wind, GeoServer, Google Earth Enterprise, and Open Consortium (OGC)

Education

Bachelor of Science, Computer Science, Wright State University

Juliana Castillo

GIS Web Developer

Juliana Castillo is an Application Developer with Woolpert's IT group. With 13 years of experience, Juliana's focus is web development. She works with municipal and federal clients to gather requirements, identify and resolve issues and develop/edit applications. Her extensive background in web development grants her a deep knowledge of a wide range of technologies, particularly HTML and JavaScript.

Julianna is adept at digging deep to find out what a client truly needs, finding and solving any existing issues, and developing tools that address them. She serves as a point of contact for clients, keeping them updated throughout the project and ensuring their questions and concerns are being addressed.

Project Experience

Architect of the Capitol House Moves Application, TMA Systems—Washington, Washington, DC. Lead Application Developer providing software production, training, workflow, and documentation necessary for the House Superintendent's Office and the Information Technology Division to independently manage and utilize a new web-based HTML and JavaScript interface which has interactive views of available office suites and enhanced suite selection capabilities. The application uses the Esri JavaScript library as well as Dojo and jQuery.

GIS Application Development and On Call Services, Metropolitan Sewer District (MSD)—Cincinnati, Ohio. Application Developer and Phase Manager who provided GIS consulting and application development services. Juliana led the development of modifications to the Dispatch Decision Support Tool and Cincinnati MSD currently utilizes an asset management system. She also assessed the functionality of existing and potential server-side and client-side remote access applications. Woolpert has been providing professional services including technical evaluation, workshop facilitation, training, gap analysis, and system configuration and guidance with MSD's Cityworks system.

GIS Property Viewer Application Upgrade, Sandusky County—Fremont, Ohio. Lead Application Developer who co-created an updated application that provides citizens with quick and easy access to property information, maps, building sketches, and other relevant information. The existing application was ArcGIS Server web-based; Dominik and Julianna Castillo used Silverlight technology and the Esri Silverlight API to recreate and upgrade the application. Woolpert later converted the application to JavaScript, the result of which can be found at www.sanduskycountygis.org.

GIS Development Support, ATOS IT Solutions —Ft. Wayne, Indiana. Application Developer who assisted in converting the existing searchable election map viewer from Silverlight to Esri-API JavaScript HTML for mapping visualization and dojo for front-end framework. This project required the integration of new GIS data, and included the addition of two custom Esri widgets: a polygon selection tool and a search on load tool.

GIS Consulting and Application Development Services, City of Indianapolis—Indianapolis, Indiana. Application Developer who provided dynamic application development services across multiple projects for the City. Juliana upgraded the existing public-facing Registered Organizations website from ArcIMS to an ArcGIS server 10.1. She also upgraded several spatial web serves to Services-Oriented Enterprise (SOE) to accommodate a change in the City's method of connecting to ArcGIS Server. Additionally Juliana installed and configured a Citizen's Dashboard JavaScript template application from Esri.

Professional Data

Years of Experience

13 years

Technical Skills

ArcGIS Server, SDE and Desktop, Esri's ArcObjects, and ArcInfo, HTML, ActiveX Connector, Visual Basic, Python, JavaScript, JavaScript API, Angular, Bootstrap, SQL Server Databases, ASP, JavaScript, Coldfusion, Access, Oracle 11.2 and RDBMS

Education

Master of Science | Geographic Information Sciences

Bachelor of Science | Systems Engineering

Awards

Apex Award of Excellence—2006

Award of Publication Excellence - Most improved web and intranet sites for Aerodrome - McGhee Tyson Airport Intranet Site

Cheryl Spencer

GIS Analyst/Web Developer

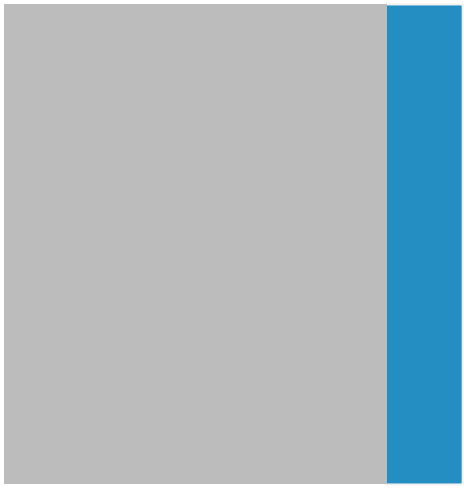
Cheryl Spencer is an accomplished GIS Analyst with Woolpert's Geospatial Discipline. With over 16 years of experience, Cheryl is an expert on the ArcGIS Suite, having worked with every version of the software since ArcGIS 9.1. Her extensive knowledge of ArcGIS includes, but is not limited to, multi-machine setups and security. She has extensive experience working with city clients, including providing onsite consulting, maintenance, and troubleshooting assistance. Cheryl's diverse background in GIS analysis, consulting, programming and application development allow her to easily assist project teams in implementing innovative solutions to a multitude of business-related challenges.

Project Experience

GIS Consulting and Application Development Services, City of Indianapolis—Indianapolis, Indiana. GIS Analyst and Web Developer who has been providing dynamic on-site support to install, administer, maintain and tune the City's ArcIMS and ArcGIS Server infrastructure, including multiple machine deployments. She has updated scripts, data and the GIS description list; developed a variety of new and existing applications; and configured, installed and tested various applications. Cheryl has been involved in dozens of task orders for the City, some of which have included a vacant housing viewer, intranet data viewer, polling place manager, My Neighborhood web portal, property assessment viewer, RebuildIndy, and a crime view application.

GIS/IT Support Services, City of Hamilton—Hamilton, Ohio. Application Developer who provided subject matter expertise on the City's ArcGIS Server upgrade. Woolpert provided GIS and IT consulting to the City in regards to the following elements of their technical environment: Oracle Database Server, Cityworks Server AMS, Cityworks Desktop, ArcGIS Server, ArcGIS Desktop, ArcGIS extension for infrastructure editing, and various Woolpert-developed tools.

City Water D&M Hydraulics for Cityworks, City of Cleveland—Cleveland, Ohio. GIS Analyst who has provided data prep support to the City of Cleveland's Department of Public Utilities for their AMS software implementation. The services support the Distribution/Maintenance, Hydraulics, Inventory/Warehouse, Plants/Facilities and Water Pollution Control divisions. The team integrated the AMS software application to meet activity requirements; established a stable, high-availability platform for program deployment; conducted discovery to establish project foundations; facilitated asset inventory data collection; and trained the staff on product use.



Professional Data

Years of Experience

16 years

Technical Skills

ArcGIS Server, SDE and Desktop v10.3.1, Windows IIS, Esri's ArcPad, Pictometry, HTML, CSS, ArcXML, Java Script, Dojo, Visual Basic, VB .NET, ASP, and ASP .NET

Education

Bachelor of Science | Earth Space Science

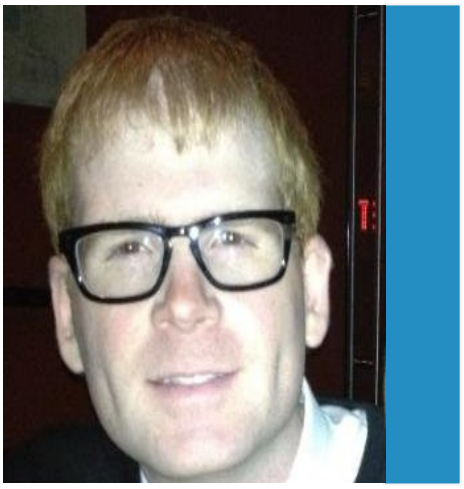
Presentations and Publications

Indy Snowfighter: Using GIS to Monitor Snow Removal and Track Costs, Indiana GIS Conference, Muncie IN, 2011

Transparent Government: Solving Citizen Problems through Efficiency and Accessibility, Indiana GIS Conference, Muncie IN, 2011

Ryan Butler, GISP

Business Systems Analyst



Ryan Butler is a Senior System Analyst responsible for data conversion and implementing best-in-practice asset management programs for utilities and airport clients. Ryan facilitates rapid learning by incorporating hands-on training and involvement throughout the entire implementation process. He also produces training materials and provides maintenance support after project completion. Clients appreciate Ryan's subject-matter expertise and effective communication, and credit him with being the "driving force on-site" for implementation, and the "BEST implementer" they've worked with. Ryan's experience includes performing all aspects of digital input, both graphic and non-graphic, in multiple operating system environments. He has created system-wide networks of GIS data; performed QA/QC for field data; and edited, updated and produced mapping data for numerous utilities and airports information management projects.

Project Experience

Field Data Needs Assessment, City of Columbus Department of Public Works—Columbus, Ohio. Systems Analyst who led the needs assessment and solution evaluation and assisted in the development of an implementation plan. Woolpert is assisting the City of Columbus in equipping its field staff with the technology and tools to simplify and automate the process of notification and data update from the field staff to the GIS staff.

GIS Development, Greene County—Xenia Ohio. Enterprise Information Management Technician responsible for the creation of a systemwide water and sewer network of GIS data. Woolpert developed a strategy to implement a water and sewer GIS and integrate it with the existing county GIS. GCSED serves approximately 15,000 water customers and 21,000 sewer customers throughout the county and part of southern Montgomery County. Woolpert determined the existing GIS-related conditions in the organization, identified needs, and developed recommendations to develop the GIS and implement a computerized asset management system. Woolpert converted both water and sewer data from existing source documents into a GIS environment, integrated the source documents themselves into the GIS, and trained county staff on the data creation and maintenance tasks.

Cityworks Implementation, Greene County—Xenia, Ohio. Senior Systems Analyst who developed and documented the core system design and configuration based on the required and desired functionalities identified through workshops with stakeholders. This project is the culmination of a several year effort to improve the Greene County Sanitary Engineering Department's (SED) GIS and Asset Management procedures. Project goals included utilizing Cityworks as an enterprise-wide repository for all maintenance activities performed on the system; reducing duplicative systems; and establishing Cityworks as enterprise-wide institutional memory for asset management. Woolpert provided staff training and support testing as well.

Cityworks Implementation, City of Toledo—Toledo, Ohio. Systems Analyst who supported the implementation of the Cityworks Server AMS as the City's new asset management system. The asset management system implementation included configuration planning and design, followed by a phased baseline implementation that included integration of asset and condition data. The implementation was performed across four divisions of the City's Department of Public Utilities: the water reclamation plant, the water treatment plant, water distribution, and sewer and drainage.

Professional Data

Years of Experience

11 years

Technical Skills

ArcGIS Server, SDE and Desktop v10.3.1, Windows IIS, ArcPad, Lucity

Education

Bachelor of Science | GIS

Bachelor of Arts | International Studies

GIS Post-Baccalaureate Certificate

Continuing Education

Asset Management guidelines (ISO 55000), International Institute of Asset Management, 2014

Professional Registration

Certified GIS Professional | #91092

Jeff Pesler, AICP, IAM

Information Management Specialist

Jeff Pesler is an Information Management who works with clients to develop and implement optimized asset management solutions that result in greater returns on their capital budgets. With over 15 years of consulting experience, Jeff has successfully lead implementation projects for a diverse range of clients in the public, private, and non-profit sectors. Jeff consistently delivers projects that are on time and within budget, and seeks to nurture long-lasting relationships with each client. Having successfully lead implementation projects for diverse clientele, he recognizes how critical it is to keep clients engaged and maintain project momentum through open communication. In his own words, "Our projects are not a 'one-and-done' kind of thing." His GIS background and experience with storm water analysis gives him greater insight to helping clients as evidenced by his work with the City of Cleveland..

Project Experience

City Water D&M Hydraulics for Cityworks, City of Cleveland—Cleveland, Ohio. Information Management Manager who facilitated communication between the client and Woolpert's team leads and technical staff; developed the overall project plan, schedule and budget; and monitored project tasks to ensure the successful outcome of the project. Woolpert was contracted by the City of Cleveland to prepare data and implement Cityworks for their Department of Public Utilities. The team integrated the AMS software application to meet activity requirements; established a stable, high-availability platform for program deployment; conducted discovery to establish project foundations; facilitated asset inventory data collection; and trained the staff on product use.

Cityworks Implementation, Greene County—Xenia, Ohio. Information Management Manager responsible for allocating Woolpert resources, managing the scope and schedule, and approving of task changes. This project is the culmination of a several year effort to improve the Greene County Sanitary Engineering Department's (SED) GIS and Asset Management procedures. Project goals included utilizing Cityworks as an enterprise-wide repository for all maintenance activities performed on the system; reducing duplicative systems; and establishing Cityworks as enterprise-wide institutional memory for asset management. Woolpert also provided staff training and support testing as well.

Utilities ArcGIS Server Installation, City of Carmel, Indiana—Carmel, Indiana. Information Management Manager responsible for project oversight and coordination. The City of Carmel planned to migrate their current GIS environment from Bentley's MicroStation GeoGraphics to Esri's ArcGIS platform.

AOC Enterprise GIS Part 2, TMA Systems, LLC—Washington DC. Information Management Manager who coordinated project tasks, communicated with the client and ensured that the project team had adequate resources to meet all scope requirements and schedules. For the Architect of the Capitol (AOC), Woolpert developed a custom web-based GIS application. The application is the foundation for other AOC GIS applications and integrations that will follow. The web-based GIS application will be used exclusively by internal AOC staff and approved contractors. Its intent is to become a critically important tool that pulls together a geographic view of data from multiple sources into a simple but powerful mapping tool that serves the needs of many users.

Professional Data

Years of Experience

18 years

Technical Skills

Cityworks, Acela AMS, Esri and TMA Systems

Education

Bachelor of Science | Natural Resources

Master of Urban Planning | Urban Planning, Design, and Development

Continuing Education

Modeling Geodatabases using CASE Tools—Esri

AutoCAD 2000i Fundamentals—Autodesk

Asset Assessor Training – Institute for Asset Management

American Institute of Certified Planners Certificate - American Planning Association

Professional Registration

Member | Certified Asset Management

American Institute of Certified Planners

Vincent Sclafani, GISP, Network+, Security+

GIS Researcher and Application Developer

Vincent Sclafani is an application developer and GIS professional with over 20 years of experience designing enterprise-wide GIS solutions for state, local, federal, and private clients. As a Technical Project Manager within Woolpert's Geospatial Discipline, Vince plans, designs, implements, and maintains custom GIS solutions to meet clients' diverse needs. He has excellent communication skills, and enjoys working with clients to examine specific needs and alternative solutions, so that they can make informed and empowered decisions for their organizations. Critical to Vince's successful systems design, data analysis, and integration is his strong background in computer science and software engineering, which includes the development of an enterprise system used by all branches of the Armed Services, worldwide, as well as the development of several GIS tools used at more than 30 Air Force Bases. He integrates an array of software, operating systems, and programming languages into his design processes, depending on his clients' needs and technology environments.

Project Experience

Integrated Civil Engineering Environment (ICEE) Development, General Services Administration (GSA)—WPAFB, Ohio. Technical Lead who provided GIS development and led all technical aspects of this project to integrate the infrastructure control systems of Wright-Patterson Air Force Base as a proof of concepts for future projects. Woolpert was contracted to develop an ICEE framework, which is an operational environment that provides enterprise-wide asset awareness and management, controls and commands disparate sensors and systems, provides cyber security measures and allows device configuration on a secure network. Woolpert created a customized dashboard, assured secure operation on WPAFB CE VLAN and presented a path forward for GeoBase interoperability.

IT/GIS Special Services Contract, PowerSouth Energy Cooperative—Andalusia, Alabama. GIS Specialist/subject matter expertise who oversaw the development of a cost-effective GIS solution for the management of PowerSouth's electrical generation and transmission system, associated properties, and records management. Services included creation of a mobile GIS environment and a mobile infrastructure inspection form for field inspections; creation of an intranet-based emergency GIS; enhancement of web-based viewers; and training and support of GIS capabilities.

Geographic Information Systems Enterprise GIS Development I – Onsite Mobile Alabama. GIS Project Manager for this task that to provide database administration support for the APEX and MapServer production environment that included installing Application Express 4.2, MapServer 6.2.1 and migrate 3 production Oracle schemas and data in the new environment. Assisted in designing an Oracle permissions agent database flexible enough to use multilayer authorization approach, beginning with the application, extending to the component and the allowing the user access to the data.

AFMC Installation Geospatial Information and Services (IGI&S) Program, Nationwide. GIS Data Support Specialist supporting sustainment and enhancement GeoBase capabilities at AFMC installations by updating existing data sets, creating new data sets, and improving GIS capability by adding modules to the AFMC Standard GeoBase Viewer. Tasks support AFMC and each of the nine installations in the command and include all facets of surveying, aerial data acquisition, utility condition evaluation, application development, deployment and documentation.

Professional Data

Years of Experience

21 years

Technical Skills

ArcGIS Server, Enterprise Advanced, SDE, Desktop Portal, Collector and Online, ArcPad, and ArcObjects, Windows IIS, Ventyx Customer Suite v4.1, Oracle RDBMS, 11g, and 12c, Solaris, Sun OS, IRIX, UNIX, DGUX, SCO, HP-UX, AIX, C++, .Net, C#, PERL, SQL, Visual Basic, ASP, and JavaScript

Education

Master of Science| Software Engineering

Bachelor of Science | Computer Science

Professional Registration

Certified GIS Professional | #54420

Security+ | CompTIA COMP001020410690

Network +| CompTIA COMP001020410690

Certified Esri Professional

Daniel Ngoroi, CMS, GISP

Application Developer

Daniel Ngoroi is responsible for leading a team of specialists and analysts, as well as managing the phases of remote sensing projects from conception to delivery. Originally tasked as an Application Developer for Woolpert, Daniel transitioned to remote sensing in 2011, and has since grown the service from a single person to a team of six. The scope of Daniel's project experience and skills ranges from creating and refining algorithms to extract specific features, such as swimming pools, headstones, forests, rivers, buildings and impervious surfaces, to providing clients guidance in the use of SmartView Connect (SVC), Woolpert's webhosting program. Daniel routinely leverages his background in application development to modify software used in data extraction and the production of derivatives. His ability to tailor existing cutting-edge technology allows him to implement effective, automated QA/QC measures, and quickly produce high-quality, accurate and complete datasets.

Project Experience

Indianapolis Traffic Sign Inventory & Pavement Condition Assessment, City of Indianapolis DPW—Indianapolis, Indiana. Application Developer and Remote Sensing Specialist who assisted in the development of a software to automatically extract signs, sign features and sign locations. Daniel provided dynamic support in bringing together remote sensing and GIS application development to produce an efficient system for collecting the required data. Woolpert performed a traffic sign inventory and curb and sidewalk assessment.

GIS/IT Strategy Development and Pilot Project Implementation, Stark County Sanitary Engineering Department—Canton, Ohio. Application Developer for a comprehensive, department-wide strategy for managing infrastructure data. Daniel assisted in the geodatabase design and the creation of a tool to programmatically place sewer laterals. After purchasing and installing ArcPad on the county's handheld data collection device, Woolpert developed documentation for collecting and editing data in the field and trained county personnel on its operation. Stark County serves approximately 43,000 sewer customers and 2,000 water customers in Stark County in central Ohio.

Northwest Ohio Solar Resource Map Ohio Solar Potential Map, Ohio Department of Development—Columbus, Ohio. Remote Sensing Specialist and Application Developer who developed feature extraction algorithms to extract and measure over 250,000 structures. He extracted 2D polygons of rooftops from the 2-meter lidar and 1-foot orthoimagery for areas in which existing building footprints were unavailable and merged the new rooftop polygons with existing building footprints to create a complete building layer of the 1,000-square-mile pilot area. He also created an elevation dataset for the building layer, extracted rooftop obstructions, and calculated available rooftop area to enable the calculation of solar potential for each structure. Daniel was one of two primary project staff; he completed the data development for integration into the website designed by Christopher. This interactive solar map website allows users to view the solar potential of over 250,000 structures across a 1,000-square-mile area.

Base Mapping and Crop Delineation, Fairfield County—Countywide. Remote Sensing Specialist who developed, refined and implemented remote sensing algorithms to delineate crop types and other land-cover features. The CAUV parcels were analyzed to create a new Esri Geodatabase format showing all CAUV parcels with a breakdown of information for each, including acreage of each crop within each CAUV parcel, total acreage of each CAUV parcel covered by identified crops, and percentage of each parcel covered by identified crops.

Professional Data

Years of Experience

15 years

Technical Skills

ArcGIS Server, SDE and Desktop v10.3.1, Oracle 11.2, Windows IIS, HTML, HTML5, CSS, JavaScript, Action Script, ASP .NET, C#, C++, Active Matlab, Fortran, MapObjects, OGC Services, Google Maps, Avenue, Microstation, ArcInfo, ArcView, FME, ERDAS IMAGINE, ENVI, eCognition, VB, WebAPI, Python, HTML/HTML5, XML, CSS, Visual Basic, PHP, SQL Server, MySQL and PostgreSQL, WebAPI, OData, and Flex API's Angular

Education

Master of Science | Geosciences - Remote Sensing

Bachelor of Science | Survey

Professional Registration

Certified GIS Professional | #65738

Certified Mapping Scientist, Remote Sensing | #RS212

Ryan Crosby

Field Surveyor

Ryan Crosby is a Survey Technician skilled at acquiring, processing and analyzing field survey data to help generate base maps with high accuracy attributes features and contours. Ryan combines remote sensing techniques with ground surface shots to ensure that all vector defects are noted and corrected. He collaborates effectively with the survey team to maintain GPS equipment and develop high resolution image products that meet and often exceed client satisfaction.

Ryan is proficient with Civil 3D, Trimble GNSS and Access Sync, and standard Unmanned Aerial Systems (UAS). He is currently a key personnel for the Parsons Group's UIS anchor replacement efforts across the country, and can perform tower plumb and twist analysis of the towers; conditions assessment; underground utility designation; and topographic data collection. Ryan's hands-on experience also includes dam assessments, cultural landscaping reports, and acquiring buried facility data with a pipe locator transmitter or contiguous metal pipe methods.

Project Experience

Muskingum River Locks & Dams Assessment/Improvement (Gannett Fleming, Inc.)—Marietta & Zanesville, Ohio. Survey Technician who assisted in ground data acquisition and imagery processing. Woolpert performed survey services for Gannett Fleming (GF), under a prime contract to the Ohio Department of Natural Resources (ODNR), which included typical control, static lidar scanning, and photogrammetric data collection. The team utilized a UAS, supplemented by conventional surveying to capture ground surface shots in areas of vegetation, spillway crests and marked utilities for the lock and dam assemblies on the Muskingum River as requested by the ODNR. Woolpert used the finalized high resolution image products in combination with remote sensing techniques to associate attributes such as length, width and area; an imagery technician reviewed and QA/QC'ed the final vectors.

Youngsholm Cultural Landscape Report (STRATA)—Wilberforce, Ohio. Survey Technician who obtained field survey measurements and data for two-foot contours. Woolpert was selected by STRATA Architecture and Preservation to complete a Cultural Landscape Report and Environmental Assessment (CLR/EA) for Youngsholm at Charles Young Buffalo Soldiers National Monument, Ohio, which was needed to define an appropriate treatment strategy for managing the historic property and accommodating visitor use and access. The team leveraged existing reports and data from National Park Service (the client); conducted remote research; completed a topographic survey for base map generation; and carried out a landscape analysis.

Destination Data Location Services (NiSource)—Columbus, Ohio. Survey Technician tasked with GPS data collection and QA/QC. Woolpert was engaged by NiSource to provide data collection services within the Columbus operation area of Columbia Gas of Ohio, Inc. The survey team utilized Trimble GNSS equipment to capture high accuracy geospatial and attribute data for the gas distribution facilities in client-assigned territories. This captured data was transmitted to NiSource via Trimble Access Sync for evaluation of accuracy. Woolpert also acquired data on buried facilities with a pipe locator transmitter/contiguous metal pipe. Gas mains and services were mapped during active integration with an Optimal Ranging SPAR unit. The final Trimble Access deliverable template had defined datum, a coordinate system, and feature code library with a geoid model file for vertical adjustment.

Professional Data

Years of Experience

4 years

Technical Skills

Civil 3D, Trimble GNSS and Access Sync, Unmanned Aerial Systems

Education

Associate of Science | Civil Engineering

David Hall

Field Surveyor

David Hall performs basic field calculations; assists with construction staking; accurately documents all crew time for billing purposes; coordinates with survey crew chiefs in adjacent areas for more efficient field work operations; records pertinent data into construction drawings and system maps; and prepares reports, maps and basic spreadsheets as needed. He also reviews, analyzes and summarizes recorded and collected data, and coordinates with the field crew to effectively perform data collection tasks. David is adeptly responsible for the accuracy and completeness of data collected. He is proficient with AutoCAD, Trimble, Esri, MicroStation and Woolpert-standard Unmanned Aerial Systems.

David is also responsible for data collection utilizing Ground Penetrating Radar, electromagnetic toning equipment and terrestrial laser scanning platforms. He performs utility designation services, SUE Level B, and SUE Level A vacuum excavation services to expose and map underground utility facilities.

Project Experience

Citywide Aerial Imagery/Lidar/DTM 1-Foot Contour—Columbus, Ohio. Survey Technician who recorded and quality assured data for ground control and one-foot contours. Woolpert was contracted by the City of Columbus and Franklin County to develop and update their geospatial datasets for use by city agencies and the general public. This project utilized existing 0.25-foot resolution aerial imagery and one-meter maximum density lidar in order to produce a citywide Digital Terrain Model (DTM) capable of generating 1-foot contour layers with a ±9-inch vertical accuracy, delivered in ESRI and AutoCAD formats. Approximately 75 new photo-identifiable GPS points were established and distributed evenly across the project area.

Ambulatory Care Center, Topographic & SUE Surveys--Columbus, Ohio. Survey Technician who assisted with site data collection and preparation of specifications. Woolpert performed a topographic and SUE survey at the Ambulatory Care Center in Columbus, Ohio. Having previously completed a survey at this project location, Woolpert validated the current topographic survey and performed a SUE survey. A drawing of the project area in AutoCAD was also provided.

Stelzer Road Phase II—Columbus, Ohio. Survey Technician who assisted in review and plan preparation utilizing collected data. Woolpert was selected by MS Consultants to perform a topographic survey including utilities per the City of Columbus survey standards; prepare an existing conditions base map in MicroStation format; prepare the necessary right-of-way plans; design the improvements scoped and prepare construction documents for the improvements north of 17th Avenue to the northerly end on the project limits and design and prepare construction documents for the entire corridor defining the necessary improvements to the signing and striping.

Dayton Wright Brothers Airport, New Entrance—Miamisburg, Ohio. Survey Technician who performed construction staking and utility data collection services. Woolpert was selected by the City of Dayton, Department of Aviation to install a new three-lane entrance for the Wright Brothers Airport. The installation of a new pipe culvert and relocation of any conflicting utilities was also required as part of this effort. Design services included coordination with ODOT in the preparation of standards and specifications, a geotechnical report, traffic analysis, topographic survey, utility coordination, roadway design, site lighting and landscaping/airport signage

Professional Data

Years of Experience

21 years

Technical Skills

AutoCAD, Trimble, Esri, MicroStation, Unmanned Aerial Systems

Continuing Education

American Red Cross First Aid/CPR/AED

Respirator Fit Test, 2007

Section Three:

Relevant Project Experience

WOOLPERT

ARCHITECTURE | ENGINEERING | GEOSPATIAL

Relevant Project Experience

Provided in this section are descriptions of current and past (<5 years) projects describing many of the services--and specifications—highlighted in the RFP. As an experienced consultant, our goal is to take a complex initiative and make it uncomplicated and straightforward. Because we have evolved with you over the past 20+ years, we understand the City's mission of supporting your stakeholders, and have tailored our approach based on intimate knowledge gained from the successful completion of projects involving application development, municipal utility mapping and GPS collection, data conversion and development, and staff augmentation under our current On-Call GIS Services program with the City of Columbus. We hope that in your review of these projects, you find that they substantiate our qualifications and experience in implementing GIS solutions within a municipal entity.

The following matrix identifies those key competencies and experiences showcased in the project profiles that follow.

	Data Conversion/Cleansing/Development				Field Data Collection		GIS Staff Augmentation	GIS Needs Assessment and Business Process Analysis (BPA)				GIS Application Development				Additional GIS Integration Solutions
Relevant Project Experience	Convert construction design plans into the GIS and editing of existing data	Develop new datasets from existing digital and hardcopy information	Develop automated routines to cleanse existing datasets	Geodatabase redesign/ standardization - Enterprise System Upgrade task	GPS data collection of various surface infrastructure features	Develop best practices for data collection using Esri's Collector app	Provide on-site staff support (duration will vary based on the assigned task)	Evaluate current GIS business practices utilizing industry best practices	Identify opportunities for business process improvement based on knowledge of GIS trends in municipal organizations	Reengineer workflows to facilitate data population and reliable data maintenance	Prepare documentation (SOP's, Training Docs, etc.)	Develop new applications using Esri's best practices leveraging against ArcGIS Online & Web App Builder; develop applications using JavaScript, HTML5, and .NET 4.0 and higher	Develop add-ins and new tools for ArcGIS Desktop	ArcGIS Mobile Development including customized Esri's Collector related applications	Migrate legacy GIS & non-GIS applications –Enterprise System Upgrade task	Support the integration of GIS with other business systems (311, permitting, work order asset mgmt, optimized routing) to ensure compliance with the City's overall IT vision and direction
Valves Exercising and Water Main Isolation Tools - *city of Columbus, Ohio*								■	■	■	■	■				
Columbus Watershed Management Application - Requirements Gathering - *city of Columbus, Ohio*								■	■	■	■					■
Columbus GIS Dashboard Web Application Upgrade and Support - *city of Columbus, Ohio*								■	■	■	■					■
Columbus Impervious Area Viewer - *city of Columbus, Ohio*								■	■	■	■	■				■
GIS Development, Implementation and Integration Services - *City of Indianapolis/Marion County, Indiana*		■	■				■	■	■	■	■	■	■	■	■	■
West Campus Utility Infrastructue GIS - *University of Cincinnti, Ohio*	■	■	■	■	■	■										
John Glen Columbus International Airport and Bolton Field Airport Wayfinding Signage Program Update - *Columbus Regional Airport Authority (CRAA), Ohio*					■	■								■		
Cleveland Water Cityworks Data Preparation and Implementation - *city of Cleveland, Ohio*							■									■
Ohio State University (OSU) GIS Support Services - *The Ohio State University (OSU)*											■	■	■		■	■
Architect of the Capitol Enterprise GIS Development - *Washngton, DC*							■				■	■	■			■
Onsite and Remote GIS Support Services - *Artex Oil Company*	■	■	■	■	■	■	■	■		■	■	■		■	■	■
GIS Database Development and Related Services - *Oil Gas Company*	■	■	■	■		■		■		■	■					

Valves Exercising and Water Main Isolation Tools

Columbus, Ohio

Woolpert created a web application for use by Department of Utilities staff to electronically log all valve exercises while in the field. Prior to the development of this application, staff logged this information on paper, making it difficult to track which valves had been exercised or easily query and visualize the historic records. The web application provides an easy way for staff to log exercises, provide details about each exercise, as well as perform simple queries. In addition to the valve exercise functionality, the application allows users to determine which valves must be shut off in case of issues and identify which critical facilities would be affected.

Project Data

Client

City of Columbus, Department of Public Utilities

Contact

Todd Pulsifer, GIS Manager
910 Dublin Road
Columbus, OH 43215
614.645.6810
tfpulsifer@columbus.gov

Date

2015 – 2016

Fee

$62,789

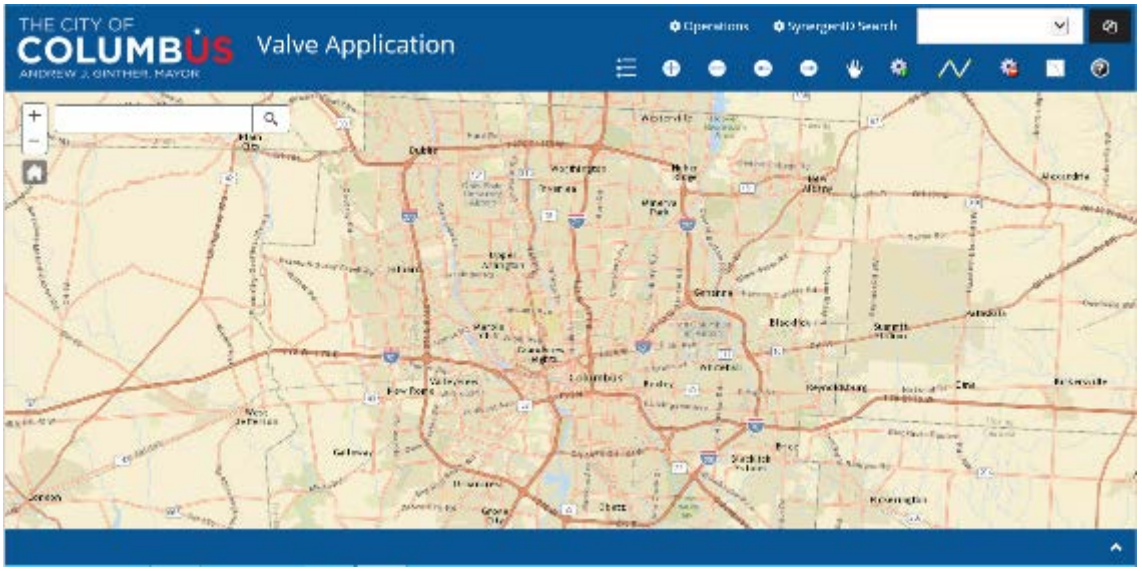
Nature of Work

Water valves are a very important element of a water system as they help start, stop, and regulate the flow of water. As part of their maintenance, water valves should be "exercised" on a regular basis. Exercising a valve involves opening and closing the valve to ensure that it does not rust shut and can be opened or closed in the case of an emergency.

The City of Columbus, Ohio, has historically tracked which valves have been exercised using paper records. Not keeping track of this electronically makes it very difficult to visualize where and when valves have been exercised. In order to improve the querying and visualization of this information to help ensure that all valves are getting exercised within a reasonable timeframe, the City wished to track the process electronically. To this end, Woolpert worked closely with the City to design the layout, functionality, and workflow of the web application. It was crucial that this new process not become an additional burden for field personnel. After multiple rounds of discussions and mockups, all parties were comfortable with how the new system would look and work.

As with all of its projects, Woolpert took an Agile approach to the development of this application, providing several opportunities to the City to view and try out the application as it was being developed. In addition to the valve exercise tracking functionality, the web application also offers users the ability to perform a main isolation trace. This task allows users to determine which valves must be closed to isolate a specific water main. All of the valves, water mains, service lines, curb stops, and meters connected to this section of the network are highlighted on the map display along with a list of critical customers that would be affected.

To develop this modern website, Woolpert used a combination of Esri's ArcGIS API for JavaScript and the Angular JavaScript framework. Woolpert also developed a detailed user guide to ensure users understand how to use the functionality of the site, which includes querying valves, seeing which valves have recently been exercised, viewing a valve's history and, of course, adding new valve exercise operations.



Columbus Watershed Management Application – Requirements Gathering

Columbus. Ohio

The City of Columbus currently uses an Access-based application to keep track of information related to the City's watershed management program. This application has two main functions: (1) to keep track of information about properties that border the three reservoirs the City manages (Griggs, O'Shaughnessy, and Hoover) and (2) to keep track of dock and stake permits at those three reservoirs. This application was developed many years ago with the data initially stored in Access and later converted to a SQL Server database.

The application has become troublesome to maintain and does not provide all of the functionality that the Watershed Management and Recreation and Parks departments require.

Project Data

Client

City of Columbus

Contact

Shoreh Elhami, GISP, MCRP
Citywide GIS Manager
109 N. Front Street
Columbus, OH 43215
614.645.2109
SHElhami@columbus.gov

Date

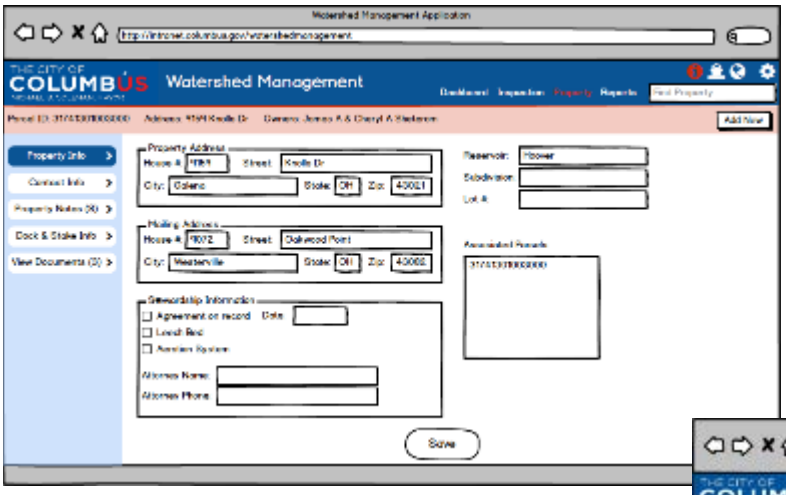
2016

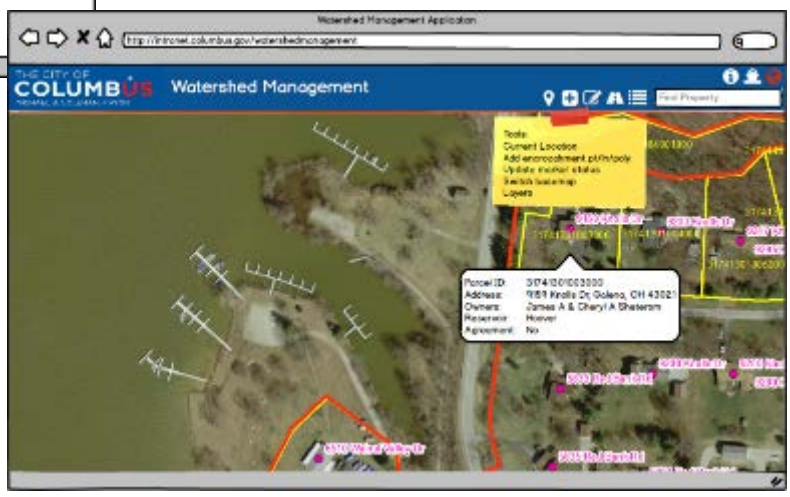
Fee

$13,684

Nature of Work

Over the course of multiple workshops, Woolpert met with GIS, Watershed Management, and Recreation and Parks departments to better understand the current application's functionality and determine the needs of the new application. After this round of workshops, Woolpert provided and presented to the City a detailed report listing all requirements, the proposed new database (going from 65 to 15 tables) as well as a vast number of mockups showing the proposed look and workflow. Woolpert incorporated the stakeholders' comments into a final version of the Software Design Specifications document.





Columbus GIS Dashboard Web Application Upgrade and Support

Columbus, Ohio

Woolpert provided assistance in upgrading and supporting the city of Columbus' Dashboard web application. City staff originally developed the GIS Dashboard using Esri's Flex Viewer.

Project Data

Client
City of Columbus, Ohio
Contact
Todd Pulsifer, GIS Manager
910 Dublin Road
Columbus, OH 43215
614.645.6810
tfpulsifer@columbus.gov
Date
2014 – 2016
Fee
$84,358

Nature of Work

Woolpert performed a number of tasks for the City, including:

- Developing a **universal Google-type search box** that allows users to select a category (address, parcel, etc.), entering search criteria, and zooming to that location.
- Developing a **theme selection widget** that allows users to select one of multiple themes (water, sewer, electric) to automatically turn on or off a predetermined set of layers.
- Developing a **save map settings widget** that allows user to save which layers are turned on/off as well as the map's extent.
- Developing a **coordinates widget** that allows user to select a point feature and save its coordinates to the clipboard as X,Y coordinates.
- Developing a Where Am I widget that provides functionality similar to Dubscovery's "What's Here" widget (http://maps.dublin.oh.us/dubscovery/).
- Developing a **water valve isolation widget** that allows users to determine which valves should be shut off to isolate a specific pipe.
- Developing a **sewer and storm upstream/downstream search widget**, which allows users to perform upstream and downstream traces in sewer and storm geometric networks.
- Developing a **slider bar widget** that allows users to switch between aerial photography from various years using a slider bar.
- Making modifications to a number of existing widgets, tweaking their functionality as desired by City staff, such as the Identify, Drawing, Print and Attribute Table widgets.
- Performing a number of fixes to existing widgets and dashboard functionality.
- Working with GIS staff during deployment, ensuring all configuration files are set up correctly.

Columbus Impervious Area Viewer

Columbus, Ohio

Under Woolpert's Master GIS Professional Services Agreement with the City, Woolpert developed an Impervious Area Viewer for the City of Columbus. The viewer is a new web-based application that allows customer service representatives (CSR) to answer customers' questions related to the impervious areas on their properties. The CSR links directly to the application using a button in the customer information system, as well as saves a map and summary sheet about the customer's property to a pdf file. The application, designed to be fast, provides only the information needed by the CSR to answer the customer's questions.

Over the course of many projects, Woolpert has formulated ways to make continuous client involvement and changing requirements a positive aspect of software development projects rather than one to be concerned about.

Project Data

Client

City of Columbus, Department of Public Utilities

Contact

Todd Pulsifer, GIS Manager

910 Dublin Road

Columbus, OH 43215

614.645.6810

tfpulsifer@columbus.gov

Date

2012

Fee

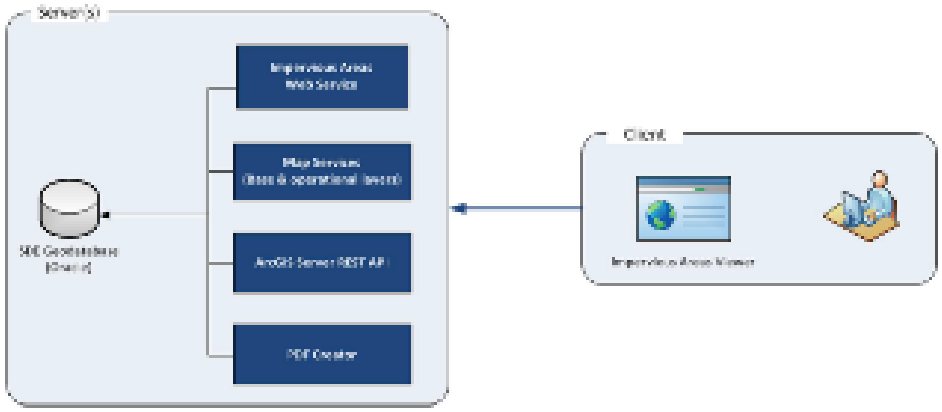
$44,390.40

Nature of Work

The Impervious Areas Viewer is a web application developed JavaScript. The client side code is used strictly for display purposes while server-side services contains the business logic.

GIS databases are queried to determine the parcels and impervious areas associated with a customer identifier number. With that, a number of services are required:

- **Map services**. These include at a minimum a basemap for background information as well as an operational map service used to display or highlight parcels and impervious areas.
- **ArcGIS Server REST API**. The REST API is used in conjunction with the map services for display purposes.
- **Geoprocessing Services**. These services were developed to query the GIS dataand obtain the necessary information to display in tabular format on the map as well as to determine which parcels and impervious areas are associated with the customer. In addition, the original website used a custom geoprocessing service for the generation of PDFs showing the customer's property on a map along with a table summarizing the impervious area information. In 2016, this geoprocessing service was replaced by built-in functionality when the entire application was upgraded to a more recent version of ArcGIS Server.



GIS Development, Implementation and Integration Services

City of Indianapolis/Marion County

The City of Indianapolis/Marion County GIS division (IndyGIS) is a mature geospatial services group and software system that has been in existence since 1986. Over the course of time, the geographic information system (GIS) evolved from a decentralized team of individuals in separate departments to a centralized division called IndyGIS. As the division grew, more and more layers of information were included in the GIS. As a result, more staff in various City departments including public works, planning, and parks began using the system. No longer an on-demand map shop, IndyGIS evolved into an enterprise-wide system, providing over 150 data layers to more than 500 GIS users throughout the City.

As the GIS grew, the City embraced the understanding and the need for GIS data and functionality throughout the City enterprise. Through the production of static maps and use of interactive mapping applications, City departments began to understand how GIS could be used behind the scenes to query and analyze data as well as provide a common, intuitive hub with which to integrate multiple systems. IndyGIS realized that the real power of GIS was the ability to leverage existing GIS information and functionality across multiple disciplines and departments, serving to support their needs and integrate GIS into their operations and with other departments. The result was a sophisticated and integrated enterprise GIS that continues to expand and evolve.

Project Data

Client

City of Indianapolis/Marion County

Contact

Geneva Roembke, Application Services Manager, Information Services Agency

200 E. Washington Street, Ste. 322

Indianapolis, IN 46204

317.327.2772;
geneva.roembke@indy.gov

Date

01/2003 – 11/2016 current/ongoing

Fee

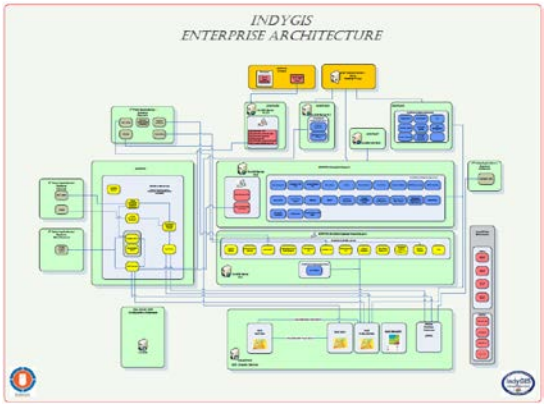
$715,260/year

Awards

Citizen-Engaged Community 2011-2013 Award from the Public Technology Institute to the City of Indianapolis, Indiana, for RequestIndy citizen access portal, created by Woolpert

Nature of Work

In 2002, IndyGIS selected Woolpert as a GIS consulting and application development firm to provide consulting services for its existing GIS environment including architecting a system to bring GIS to the public. Project leads from both IndyGIS and Woolpert worked together to create a standardized process for needs assessment, requirements gathering, planning, and implementation of projects that could be used for initiatives of any scale. In addition, Woolpert worked with IndyGIS staff to collectively define a vision for the GIS program including various needs and desires for the future evolution of the program. This spawned numerous initiatives from application development and system design to data development within the IndyGIS division that would define the foundation of the GIS program and its ability to grow in the years to come.



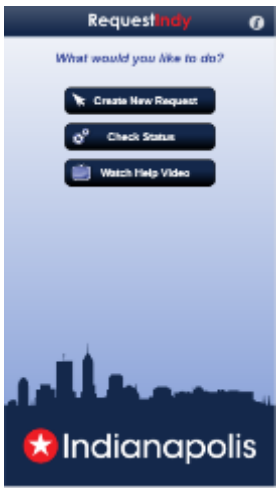
As a result, from January 2003 to the present, Woolpert has provided programming, system integration/architecture, data development and project management services for more than 150 separate project work orders.

Today, the City's enterprise-wide GIS solution continues to prosper and evolve. IndyGIS has become an embedded element across numerous City departments, such as the Mayor's Action Center, the Department of Public Works, Public Safety, County Assessors, and Voting/Elections just to name a few. IndyGIS has become about allowing staff and citizens the ability to navigate Indianapolis information through intuitive geospatial maps, apps and data.

Process

IndyGIS had the vision to bring GIS to the masses - to the citizens and staff of Indianapolis/Marion County. The goal was to make GIS a part of the process and use GIS functionality to provide a more efficient means of data visualization, retrieval, and analysis. To do this, IndyGIS chose to deploy a server-based GIS using ArcGIS Server, developing a "modular" Service-Oriented Architecture (SOA) where common GIS operations for data query and analysis were exposed as web services. Each web service developed could be used by multiple applications and systems for a similar purpose. The goal of this approach is to improve service delivery to internal GIS customers and be more responsive to the public (more accurate information delivered quickly) while better using GIS resources and

minimizing redundant code. Woolpert worked with the City to identify some key areas of functionality that were used commonly among GIS applications as well as those which may benefit non-GIS systems and users across the City. Woolpert then developed a series of web services to perform these key functions, from geocoding and address validation to printing, to spatial analysis/selection web services such as point in polygon analysis and buffer analysis. These web services together form a central, reusable, and maintainable architecture that can easily evolve with the technology, and provide the means for GIS to simply become a part of City operations.



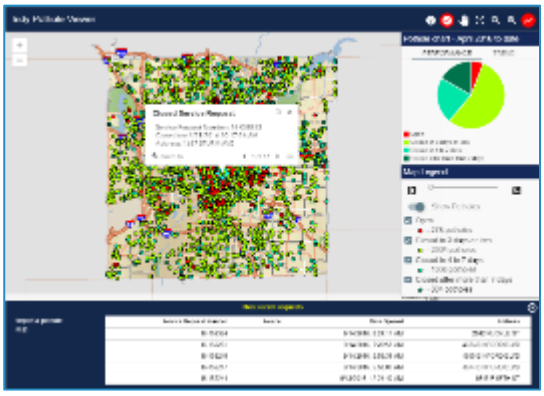
Today, these services not only continue to be an important piece of the IndyGIS environment, but various non-GIS agencies and departments within the City use these services to integrate GIS functionality with systems such as Hansen, Accela, and Salesforce.com.

In addition, GIS has provided the means to streamline processes through integrated workflows such as the City's citizen access portal, RequestIndy, which enables residents to submit service requests for issues they encounter—from potholes and high weeds to abandoned vehicles and more through an intuitive, map-centric interface.

Behind the scenes, workflows validate the jurisdiction and location, check for duplicates, and then route the requested information to the responsible back-end system for further processing, automatically. Citizens can then return to the site to check the status of their request. You can explore RequestIndy at: http://maps.indy.gov/RequestIndy .

Data

To have an effective data flow and visualization process, you need to have good data. IndyGIS spent years building their GIS layers and a Master Address Database (MAD), but they needed a way to maintain it and keep it up-to-date effectively and efficiently. Most applications within the City/County operate based upon address locations, often user-defined addresses. Web services were developed to validate these user-defined addresses against the GIS and the MAD, therefore the data needs to be accurate. Woolpert worked with IndyGIS to create an ArcMap extension containing a suite of tools for maintaining the various addressing GIS layers in conjunction with the Master Address Database keeping the data clean and in sync.



As GIS integration with the various systems increased, IndyGIS and City staff saw value in mapping items such as service requests, work orders and permits. However, hundreds of these items are created within their respective systems each week. Manually mapping these items real-time was simply not feasible, and any mapping that did occur happened in batches at irregular intervals resulting in data that was not up-to-date or incomplete. Woolpert worked with City staff to define automated workflows for these types of items using Esri's server-based technology that would automatically map service requests, work orders, and permits as they are created within their respective systems. All of this resulted in a more up-to-date, accurate, and almost self-maintaining set of GIS layers that could be used and analyzed by City staff.

Because of these automated mapping workflows and portals such as RequestIndy, spinoff applications have been developed allowing citizens to view status, track and analyze data resulting from citizen input, such as potholes.

Systems

With the process and the data tier in place resulting in solid integration of the GIS with other systems, it was time to take the GIS to the next level, expanding the system by developing map-centric applications for internal and public consumption that not only use GIS visually on the front-end for an intuitive user experience, but that also use the suite of geospatial web services and automated workflows on the backend resulting in a truly seamless and integrated environment. Using ArcGIS Server technology and the various web frameworks such as JavaScript, Flex, iOS and Android, Woolpert worked with IndyGIS to start creating a series of interactive applications and components to tie it all together.

Applications have been developed for numerous City/County agencies providing services ranging from citizen access and engagement, voting information, zoning notifications, to pothole maintenance and even snow

removal tracking. The Voter Information Portal allows citizens to not only see information about their polling place, but also verify their registration, view elected officials, candidates as well as sample ballots for their precinct. An interactive map is available tying all of this together. The Department of Metropolitan Development's Notifications application provides an effective means for staff to notify citizens of upcoming zoning changes.

The Department of Public Works (DPW) worked with IndyGIS and Woolpert to develop the Snowfighter application, which provides a map-centric interface for DPW staff to dispatch crews and monitor snow plowing efforts for City streets during a snow event. Streets are color-coded in the map based upon whether a crew is actively plowing, how long it has been since they were plowed, and tracks the personal and equipment resources used over the course of the event. All of this information is tracked and integrated directly into Hansen as work orders at the completion of each shift, allowing management not only the ability to more efficiently monitor operations during the snow event, but also provide the ability to better analyze the time/effort being spent and the associated cost during a snow event.

The Indy Snow Force Viewer (http://maps.indy.gov/IndySnowForceViewer) is a public facing application for Citizens to view the current progress of streets being plowed. These are just a few examples of how GIS has become integrated and part of the overall workflow with the enterprise-wide systems at the City of Indianapolis/Marion County.

Performance

Because of the RequestIndy citizen access portal, the City of Indianapolis received a Citizen-Engaged Community 2011-2013 Award from the Public Technology Institute. The City was honored for its use of citizen participation processes, integrated communication channels, integrated technology, and performance reporting.

Talented staff is a critical aspect of performance in an organization as complex as IndyGIS, and the performance demands on the GIS department's staff fluctuate. The need for experts in specific areas of application development, systems, and data changes with new projects and initiatives. Woolpert has provided onsite resources on an as-needed basis since 2003. These subject matter experts have assisted the City with tasks such as:

- Collection, field verification, and input of over 100,000 addresses
- Reconciliation of the GIS with the City's Hansen CMMS through Hansen's GeoAdministrator tool
- Input of backlogged infrastructure as-built information
- System design
- Application development

Through a partnering approach, Woolpert has become an extension of IndyGIS and an integral part of the Information Services Agency (ISA), allowing the organization to be more responsive and nimble when providing timely service to citizens and internal users while providing GIS application and system development direction and expertise. Additionally, the solutions we've developed with IndyGIS help City staff be more productive and allow the citizens to have a better user experience as well.

Snowfighter provides a solution where crews can be monitored more effectively, both in terms of location and time/cost. DPW staff can run reports at any time during the snow event and see how much time has been spent and how much salt has been used up to that point for that event. This is all possible through direct integration between the GIS and Hansen system.

The RequestIndy portal saves dispatchers and crews time by ensuring duplicate service requests are not submitted to a department's database. In the past, requests were transferred by email or paper, and each department had to re-enter the information in its respective system. Now, the portal sends the service request to a suite of integration services that pushes the information directly to the correct maintenance management, permitting, or animal control system. Once this information arrives, dispatchers are automatically notified to send crews to investigate and fix the problem. And, by enabling citizens to check the status of their service requests, and providing various means to use the application (website, iOS, and Android), it also helps the City reassure its citizens that their requests and involvement are important and their issues are being dealt with in a timely manner.

Woolpert is constantly working with the City to identify areas of improvement, whether it is through new applications, or increased efficiency and performance in current applications. Sometimes this involves leveraging new technologies, accommodating new platforms, and not being afraid to evolve and grow to support the ever increasing demands in the world today.

Woolpert and the City of Indianapolis have long embraced technology and using the right technology for the job, and in today's ever changing technical landscape, this trait is more important than ever. As a result, the City's enterprise GIS application suite continues to evolve. New technologies, frameworks, and techniques are constantly being adopted in order to best serve the citizens and staff of Indianapolis/Marion County.

University of Cincinnati West Campus Utility Infrastructure GIS

Cincinnati, Ohio

Woolpert provided an updated Geographic Information System (GIS) Master Plan and created a GIS data model for the University of Cincinnati. Prior to updating the GIS Master Plan and developing the data model, Woolpert conducted workshops with stakeholders. Other tasks included performing field surveys of a five-acre pilot area to locate utility infrastructure above and below the ground and creating a pilot area file geodatabase in ArcGIS with survey points and attributes. Data for the pilot area was converted to AutoCAD and Revit formats. Woolpert consolidated existing GIS layers, AutoCAD drawings, as-built drawings and other relevant information into the geodatabase file. Woolpert also delivered a written plan for the phased implementation of the GIS database for the remaining area of the West Campus.

Project Data

Client

University of Cincinnati

Contact

Andy Porter, Director of Space Management

University Hall, 6th Floor

51 Goodman Drive

Cincinnati, OH 45221

513.556.2812

porteras@us.edu

Date

2014 –2015

Fee

$101,000

Nature of Work

Survey Data Collection. Using Real-Time Kinematic (RTK) GPS surveying techniques to establish horizontal and vertical positions, each station was occupied twice to ensure the horizontal and vertical accuracies were being met. A robotic Trimble Vision "S" series total station with a Trimble TSfc3 data collector was used to locate and attribute features. Information was provided in ArcMap with electronic inventory fields included for all feature attributes collected. Attribute data included, but was not limited to: feature type, feature name, point number; unique ID number, size, material, disposition, remarks, source, and x, y and z coordinate values.

GIS Data Model. Woolpert designed and developed a customized database model based on UC's adoption of the Esri Local Government Information Model (LGIM). The model was augmented to include additional information required by UC and, based on the workshop, developed and designed a database that met the requirements for UC's environment and spatial data practices.

Evaluation of current University of Cincinnati Geographic Information System (UCGIS) Master Plan included reviewing and updating the Master Plan to provide a more detailed approach to collecting, maintaining and using the GIS data. Specifics included conducting two (2) workshops with UC personnel to understand and discuss how UC may want to use the GIS; determine UC's thoughts on ease of use of the system; document spatial standards for each of the GIS features; document sources of data to enhance GIS attribution; develop symbology standards for each of the features; address the current UCGIS web application and its relationship to the LGIM and future trends in web development; develop a method to work with outside entities such as CAGIS and City utilities to incorporate their GIS data into the UCGIS; develop standards for data incorporation into UCGIS as part of all new construction projects and test the standards against real projects; and develop methodology for data extraction from the GIS to provide digital data to UC business partners.

John Glen Columbus International Airport and Bolton Field Airport Wayfinding Signage Program Update

Columbus, Ohio

Woolpert has been providing dynamic, multidisciplinary services to the Columbus International Airport Authority (CRAA) over the past several years, including CADD/GIS conversion services, utilities relocations, obstruction surveys, pavement rehabilitation, storm water management and more.

For this project, Woolpert is updating the CRAA's existing signage inventory using Esri's Collector application for field collection, designing signage improvements, and will assist the CRAA throughout the bid evaluation and selection process. Woolpert will also provide project oversight for the fabrication and installation, construction and project close-out phases of the project.

What makes this project truly unique is that we are performing survey work—without putting any of our surveyors in the field. Woolpert's transportation engineers worked with two of our GIS specialists, Darren Johnson and Jennifer Starbuck, to develop a plan and tailor the feature service form for the Collector application to prompt the user to input the following information:

- Sign Number
- Northing
- Easting
- FHWA Sign Code
- Type of Mounting
- Install Date (if available)
- Foundation Type
- Type of Sheeting
- Sign Dimension
- Sign Mounting Height
- Retrore-flectivity (good/fair/poor)
- Notes

Project Data

Client

Columbus Regional Airport Authority (CRAA)

Contact

David Gotschall

4600 International Gateway

Columbus, OH 43219

Marietta, OH 45750

614.239.4012

dgotschall@port-columbus.com

Date

2016

Fee

$5,000

Once data fields for the signage inventory were set up, the engineering project team consulted with one of Woolpert's surveyors to determine the most cost-effective GPS solution for achieving sufficient accuracy. The team is using a Trimble R8-2 external GPS, which—when used in conjunction with a Virtual Reference Station (VRS) to tie into Ohio's Continuously Operating Reference Stations (CORS)—can achieve centimeter level accuracy. With a few hours of training on how to use the application and set up the external GPS, the project team is not only independently carrying out the field collection—but doing so easily and efficiently.

Once the field data collection is complete, Woolpert will update the existing signage inventory documentation, maps and records to reflect any changes, updates or modifications to the system inventory.

The next phase of the project will be to provide construction documents and bidding support for sign improvements.

Cleveland Water Cityworks Data Preparation and Implementation

Cleveland, Ohio

Woolpert was contracted to implement Cityworks hydraulics data preparation for the City of Cleveland. The project will include services provided for the Distribution and Maintenance plus Hydraulics unit. The system will support a multitude of service request, work order and inspection workflows. Workflows will be configured to support the range of maintenance activities including preventative maintenance, scheduled corrective maintenance and un-planned maintenance. This implementation will service approximately 310 people in the Distribution and Maintenance, 14 people in the warehouses, and 22 people in the Hydraulics Unit. This implementation is limited to the water distribution assets owned and maintained by the Division of Water, which are generally described as water mains, valves, hydrants and other appurtenances.

Project Data

Client

City of Cleveland, Department of Public Utilities

Contact

Stephane Hunsinger-Gorenc

Program Manager

1201 Lakeside Avenue

Cleveland, OH 44114

330.421.8527

Stephane.hunsinger@centricconsulting.com

Date

2016 – 2018 (est.)

Fee

$1,181,982

Nature of Work

Data Preparation

During the spring and summer of 2016, Woolpert performed data preparation for use in implementation planning and system design. After thoroughly reviewing information provided by the Cleveland Department of Public Utilities (DPU), Woolpert's specialists:

- Held data review workshops with key staff involved in Distribution and Maintenance (DM), Hydraulics, and Inventory and Warehouse business processes to determine the extent of data required to support the desired Cityworks functionality
- Performed on-site data collection to gather existing data and identify data gaps
- Developed database schemas for both activity-based data and asset-based data and subsequent plans to populate them
- Presented the database schemas and analysis of the condition and completeness of existing data
- Worked with the Cleveland DPU to establish plans for populating the database schemas

Implementation

Woolpert is currently in the implementation phase of this project, which is scheduled to be complete in October 2017. After data prep is complete, Woolpert will:

- Implement the Cityworks asset management system (AMS) software to meet the Cleveland DPU's business requirements
- Conduct workshops to train Cleveland DPU project team members on the features and functions of Cityworks
- Facilitate a series of implementation and configuration training courses to introduce Cityworks AMS software in greater detail to Cleveland DPU team members
- Configure the Cityworks AMS software based on results from the workshops and training courses
- Provide legacy data conversion
- Create custom reports and dashboards
- Work with the Cleveland DPU to deploy advanced mobile Cityworks AMS capabilities

Ohio State University (OSU) GIS Support Services

Columbus, Ohio

For the past three, years, Woolpert has provided a variety of GIS-related services to the Ohio State University (OSU).

OSU had previously developed individual stand-alone BIM models of each of the buildings on their Columbus campus. While those models were immensely valuable in visualization and planning for building renovations or improvements, as individual BIM files they did not provide all the functionality desired by the University.

Woolpert provided services to OSU to develop a GIS website for the public, staff, as well as faculty to view information about the campus. In addition to the public website, advanced GIS functionality has been provided to select groups of internal staff. Such functionality includes visualizing and obtaining reports about campus facilities and their condition, viewing and locating utilities, and viewing the campus in a 3D environment.

The following outlines some of the projects performed for OSU that are relevant to the type of work being requested under this city of Columbus GIS on-call services contract.

Project Data

Client
The Ohio State University (OSU)

Contact
Larisa Kruger
2003 Millikin Road, Suite 225
Columbus, OH 43210
614.292.9521
kruger.57@osu.edu

Date
2014 – 2016

Fee
$888,000

Nature of Work

AutoCAD Transition to Esri

The Ohio State University contracted with Woolpert for services to support the transition of their Utilities GIS data management from AutoCAD/Oracle Spatial to the Esri platform. Services provided meet OSU's business objectives with goals that included:

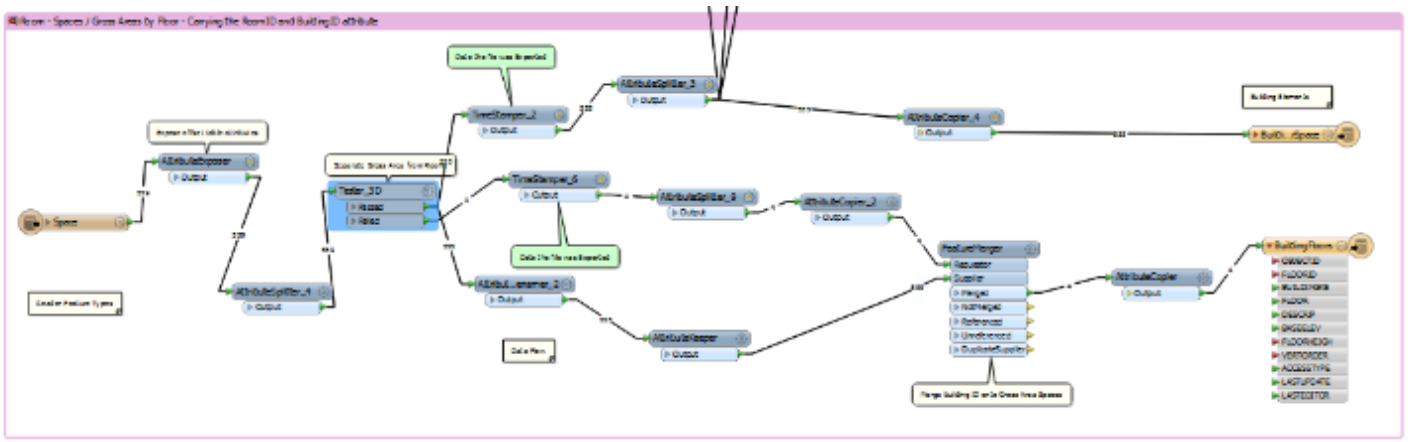
- Developing the key components necessary to facilitate the transition from the current AutoCAD/Oracle Spatial environment to the Esri environment for utilities.
- Developing improvements to current data maintenance procedures with the use of new software/technology (Esri).
- Development of a strategy to resolve the existing backlog of utilities updates.
- Documenting reasonable expectations for data management staff.

In support of these goals, Woolpert performed the following tasks:

- Developed a set of Esri data models to contain new utility data.
- Migrated the utility data from the current CAD/Oracle environment to an ArcSDE geodatabase.
- Conducted Esri data management training to supplement formal Esri training.
- Documented backlog resolution strategies and project associated efforts.
- Defined, documented, and trained on new survey processes for the Esri platform.
- Developed staff expectations report that defined what can reasonably be expected from the current staffing levels.

Enterprise GIS

Data Migration Workflow. To reduce the redundancy of maintaining a Revit BIM, CAD and GIS environment for each of the campus buildings, Woolpert used Safe Software's Feature Manipulation Engine (FME) to create a workflow that uses the Revit BIM files as the sole source to generate spatially accurate 2D and 3D GIS building data. Workflows were set up to update the enterprise geospatial database (building floor footprint and rooms, including custom attributes) every time a change occurs in the BIM. The enterprise geospatial database is the source for the 2D and 3D applications.

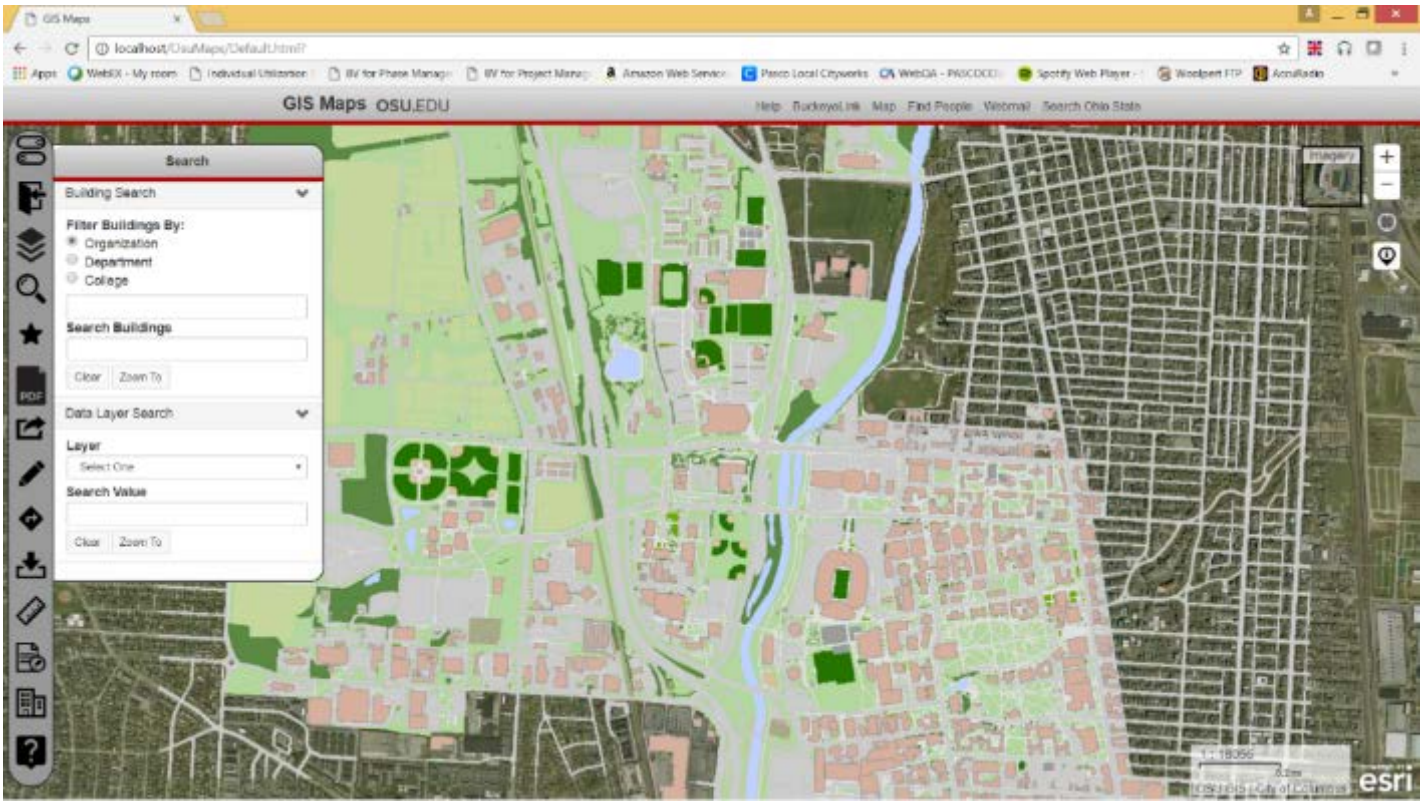


OSU Maps Application

Woolpert developed OSU Maps, an enterprise GIS web application developed to provide students, staff, and faculty the view into useful information about the campus as a whole. The application provides basic information such as GIS data, building information, parking locations, and public transportation routes. In addition, OSU Maps displays energy usage, information about interior space data, building assessment data and provides editing capability for utilities data. The application was developed using a modern responsive design approach that makes it accessible on desktops, tablets, and smartphones.

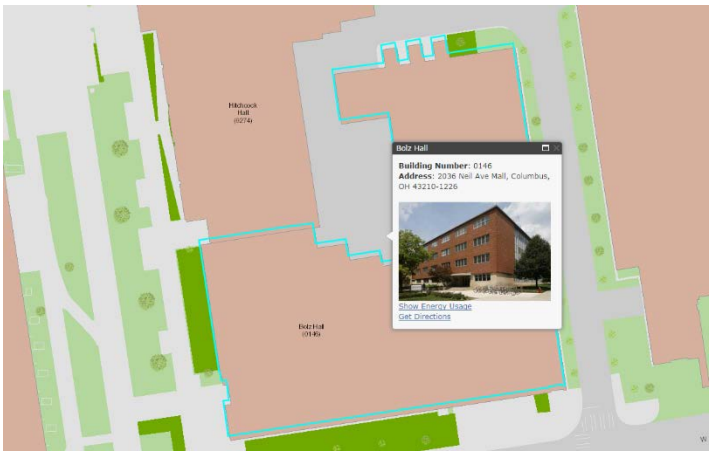
OSU Maps is built using:

- ESRI JavaScript API for ArcGIS Server
- JavaScript / HTML 5
- ASP.NET
- WCF REST enabled data services



The OSU Maps application includes the following capabilities:

- Basic 2D mapping capabilities of both exteriors and interiors of buildings using Esri's Local Government Information Model (LGIM) with modifications to incorporate additional feature classes.
- Visualization of and information about various bus lines (including real-time location), parking garages (including real-time space availability), student services points of interest and amenities.
- Building search functionality.
- Printable PDF map.
- Construction information.
- Integration of real-time building-level energy consumption data.
- Integration of building, floor, and room level Facility Condition Index (FCI) data, including advanced query and reporting functionality. (limited to staff)
- Advanced Utility query, visualization, and tracing (limited to staff)



3D GIS Viewing. Woolpert also deployed a 3D web-based model of the Columbus campus using the CityEngine web viewer for internal staff with the following functionality:

- Turn layers on/off
- Walls on/off comparison
- Setting sunlight based on time of day and year
- Setting feature shadows
- Generic out-of-the-box GIS search

Architect of the Capitol Enterprise GIS Development

Washington, DC

Since 1793, the Architect of the Capitol (AOC) has managed the facilities comprising the nation's Capital complex, responsible for maintaining nearly 17 million square feet of building space and grounds across 450 acres of land. Facilities under its authority include: U.S. Capitol Building, Library of Congress, U.S. Supreme Court, and the House and Senate Office Buildings.

Like many institutions made up of multiple structures and jurisdictions covering a significant geographic footprint, the AOC has its share of facilities management challenges. Facilities data exists in separate jurisdictions, and sometimes there are multiple databases in each one. In many cases, databases often support individuals (through adapted processes, tools and software) to perform specific job functions. As a result, data often exists in silos that cannot be easily acquired when needed by other facilities managers throughout the agency.

In both day-to-day operations and maintenance activities and longer term construction and preservation work, there is a pressing need for accurate, reliable information in order to support decision making and organizational performance metrics. Historically, this information has been very atomized across the Agency – held in a variety of databases, spreadsheets, hard copy documents and enterprise data systems and with individuals as corporate knowledge gleaned from years of experience.

Project Data

Client

Architect of the Capitol (through TMA Systems, LLC)

Contact

Ross Powell

5100 E. Skelly Drive

Tulsa, OK 74135

503.944.7404

ross.powell@tmasystems.com

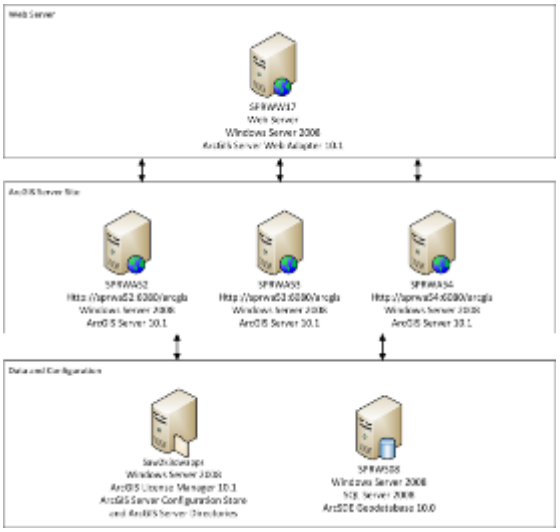
Date

2012– 11/2016 current/ongoing

Fee

$1,660,403

Nature of Work



As a subcontractor to TMA Systems, Woolpert has developed an Enterprise GIS for the Architect of the Capitol in Washington, DC. The work includes the design and development of a comprehensive geodatabase, migration of existing 2-D CAD data into a 3-D Esri GIS Geodatabase, development and deployment of an Enterprise GIS Server architecture, development of custom GIS applications, and onsite GIS support.

Data

For the AOC, an initial goal of the Enterprise GIS was to assign a location to features (e.g., rooms, floor plans, statuary, trees, etc.), providing the "where" component to what previously had only been a "what." The AOC realized the potential to expose existing data for the creation of specific functionality that meets its internal customers' needs. And, in doing so, the Enterprise GIS would allow the AOC to achieve its larger goal of true data transparency throughout the agency.

Woolpert has developed an Enterprise GIS to provide access to AOC's facility data in ways that has the end-user, and their information needs, in mind. This approach is focused on leveraging existing sources of basic facility data (CAD drawings, BIMs, and CMMS) to form a GIS foundation to overlay other business line data (grounds, historic preservation, utilities, equipment, emergency management, etc.). The GIS includes data from underground features (utilities, tunnels, parking garages, etc.), above ground features (paved surfaces, street furniture, security assets, buildings, trees, etc.), and 3-D interiors of all of the buildings on Capitol Hill, including the Capitol, House and Senate office buildings, Supreme Court, and Library of Congress. Interior features include all walls, doors, windows, and spaces, along with emergency equipment and selected mechanical/electrical equipment items. All spaces are attributed with a unique ID which provides the linkage to other information systems.

The resulting geodatabase incorporated a number of existing Esri geodatabase templates and extended the templates to support needs that were specific to AOC. Data was then migrated from over 1000 source documents using Safe Software's Feature Manipulation Engine (FME) and an elaborate set of scripts to automate the processing wherever possible. The result is a comprehensive spatial database of all of the features underground, on the surface, and inside the building across the entire agency complex. All of the spatial query, geo-processing, and analytical powers that are inherent in GIS can now be used to develop solutions to meet the specific needs of users across the organization.

Enterprise GIS Pilot Application—Congressional Office Moves Viewer (2012)

Launched in 2012, the Congressional Moves Office Viewer is the first example of how the AOC created specific GIS-based data to assist House members (and their staff) with the office selection process. As a supplement to the AOC's existing Congressional Lottery Moves process application, the new office viewer enabled the House to exploit spatial data about the office suites and reveal 3-D views of available suites.

Every two years when there's an election for the House, the newly elected House members have a four-week window where they can choose new office suites, based on seniority and other variables. For years, members have used an existing "moves" application to manage this process.

The GIS-enabled office viewer allowed authorized users to display a two-dimensional, standard map view of suites and their orientations within the building (floor number, location on the floor). End users could also toggle on additional amenities and view them on a map, providing visibility to restrooms, elevators, hearing and committee rooms, tunnels between buildings, parking, and more.

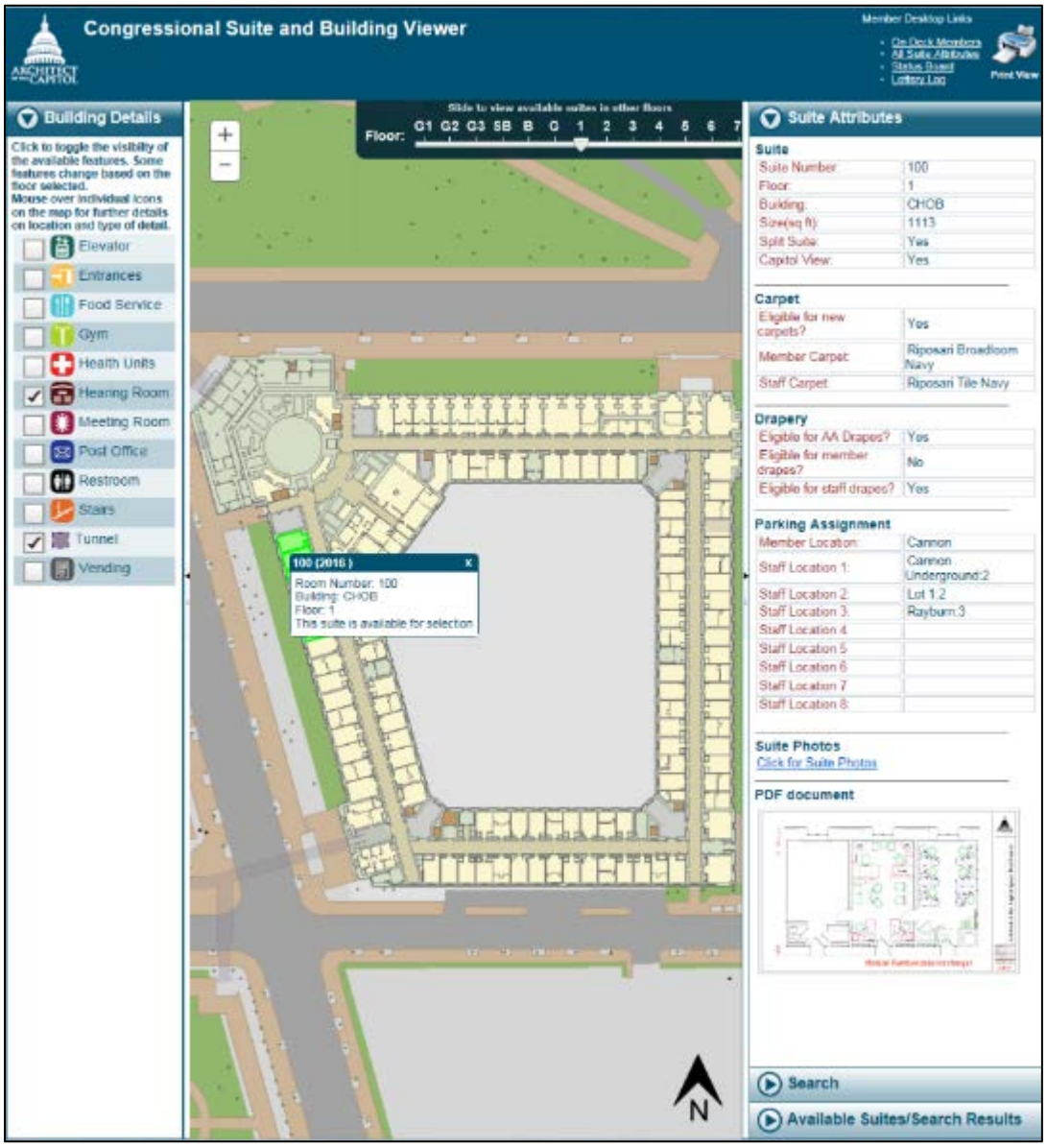
GIS data was converted into a 3-D model and used to generate static near-3-D images of each suite, allowing members to examine suites in various views, including: building, floor, and at least two different angles of each suite. Members could examine specific attributes about the suites (carpet, drapes, square footage, and scenic view of the Capitol) along with the spatial views of the suites themselves.

The office viewer preserved data in the original "moves" application by linking back to its existing videos and other still photos. To make the application functional on tablets or in standard browsers, it makes use of responsive design principles available in HTML5.

Congressional Office Moves Viewer (Phase 2 - 2014)

As part of the 2014 Congressional Office Moves Viewer, the existing application was updated to provide additional functionality to the House Moves GIS Viewer. The interface was now integrated with the existing AOC hosted Lottery Moves application in such a way that only available suites would be display as part of the interface. The Lottery Moves continued to be the primary interface although the GIS Viewer now allowed the users search and filtering of available suites.

The House Moves GIS Viewer is updated every 15 seconds with live data from the AOC Lottery Moves application. All available suites were displayed with a green highlight. Any taken suites would be highlighted in red on the map and removed from the interface after a few seconds (Set to 6, but configurable).

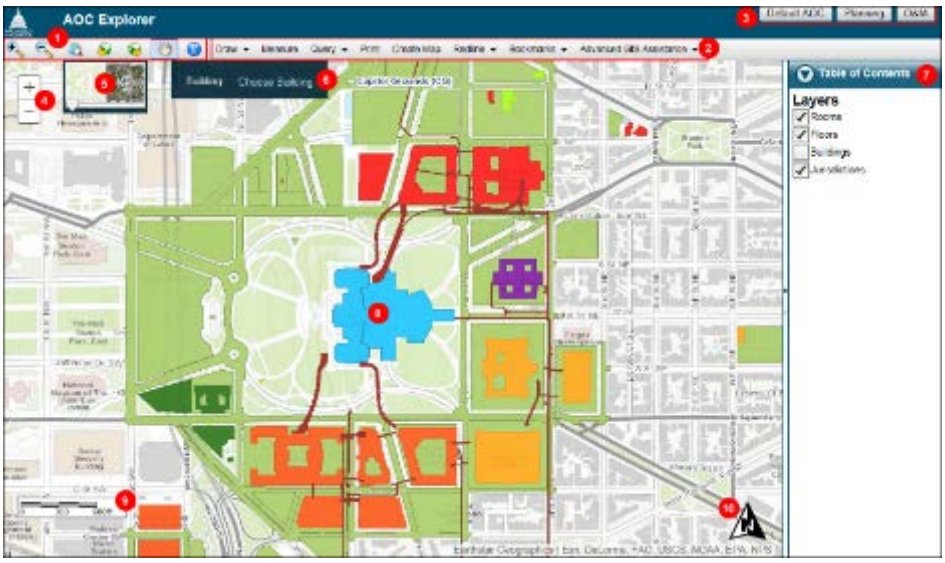


2016 House Moves Transition

Looking forward to the House Moves Transition in 2016 the GIS House Moves website may take a more active role in the selection process of the member suites. Once that happens, a failover and replication environment must be in place to provide high availability to the users.

AOC Explorer

In June 2015, the AOC Explorer web application was deployed. The purpose of this project is to provide new and comprehensive GIS functionality to all AOC employees. Available AOC GIS data was provided in three map themes to address the different levels of functionality required for general users, operations and maintenance (O&M), and planning staff. As additional GIS data becomes available, the themes will be updated.



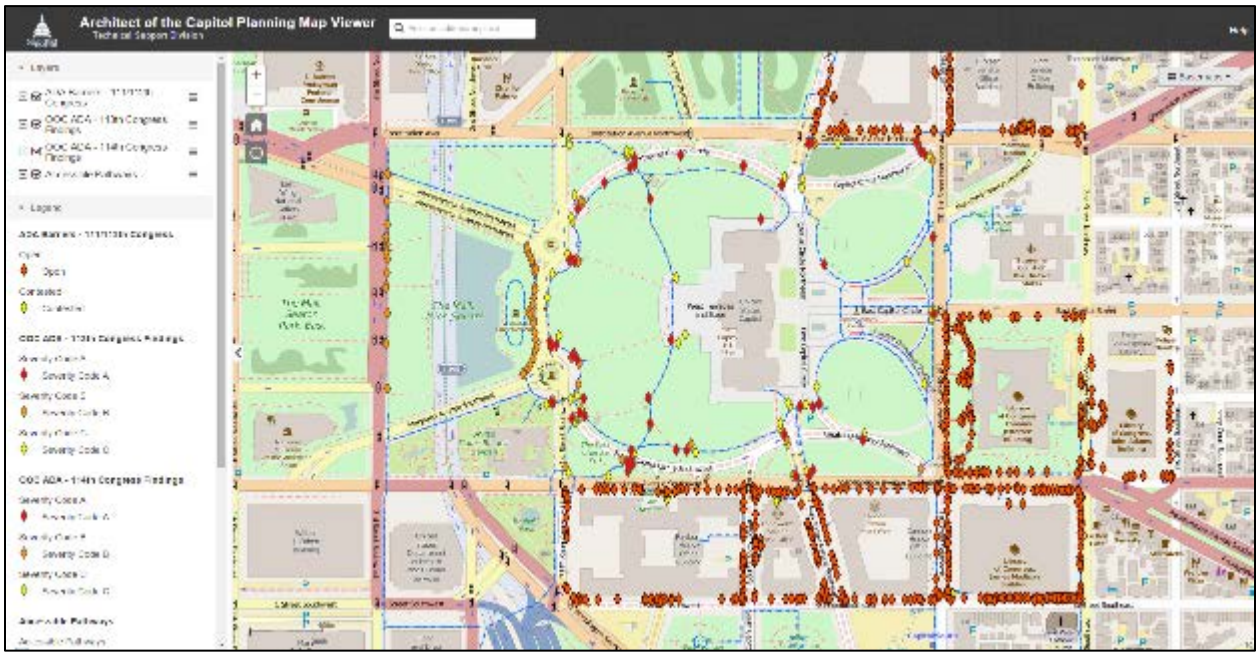
Users are able to navigate the map through standard panning and the ability to zoom to campus, building, floor, and suite level allowing the user to see information in relation to other buildings, rooms and amenities within the capitol complex. Users are able to navigate from building to building and transition from floor to floor displaying information on each floor of the building, which will be displayed as additional layers that the user can toggle on/off. This information is published live from the AOC GIS via ESRI's ArcGIS Server software. This application provides a core set of GIS tools for navigating the map, drawing/measuring tools, printing as well as searching and query tools.

Pilot Project: Project and Planning Management Map Viewer

Beginning in late 2014, a series of map viewers were created for the AOC's Planning and Project Management (PPM) division, used by master planners, for such use-cases such as determining whether barriers and accessible pathways comply with the American Disability Act (ADA) findings from the United States Congress Office of Compliance and symbolized based on open-closed or severity status.

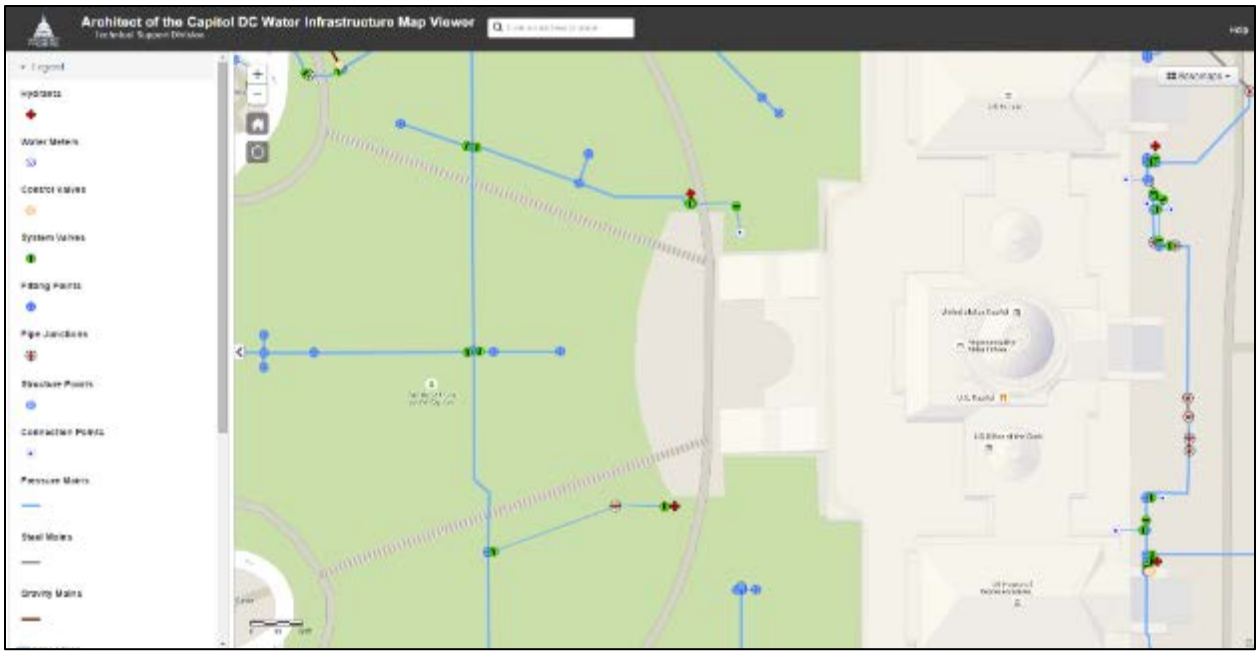
Using live data from the AOC GIS and using Esri's Javascript map viewer templates, the Planning map viewer provides an easy to use application for planners, who do not have prior GIS experience, to visualize ADA findings from source documents and spreadsheets, and visualize each finding on a map. Additionally, authorized users are able to directly add and update for each ADA finding in real-time.

PPM is interested in pulling CAD drawings of the entire campus to accurately depict pedestrian ramps, curb ramps, sidewalks, and accessible walkways into a custom basemap.



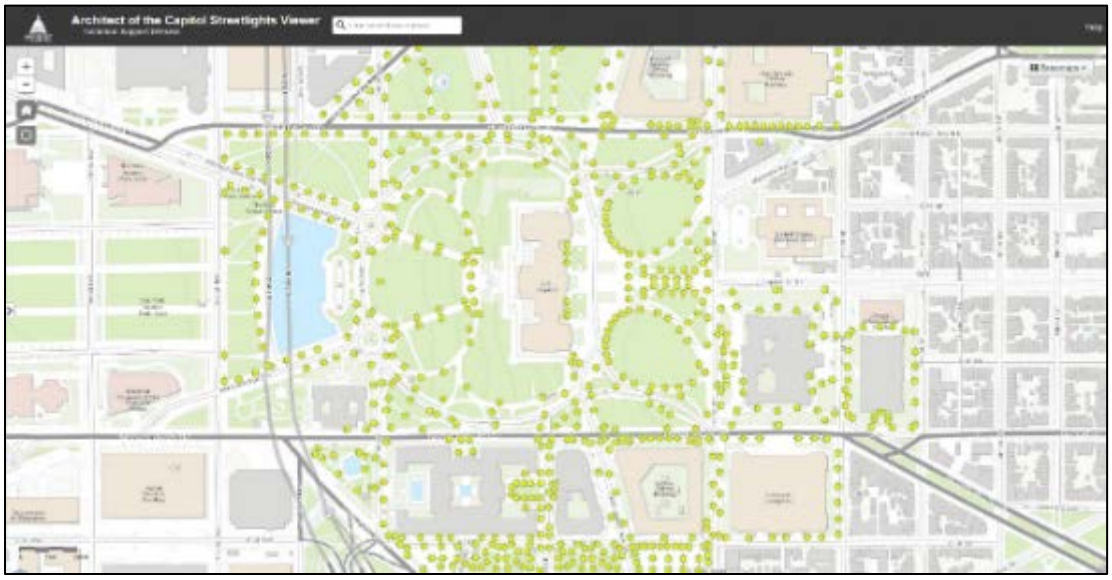
Pilot Project: DC Water and Sewer Authority (WASA) Map Viewers

In early 2015, stakeholders in the AOC's Energy, Sustainability, and Water Conservation Division (ESWC) were interested in visualizing the District of Columbia's Water and Sewer Authority's water, sewage, and catch basin locations in two map viewers, to separate water and sewage data. GIS Data was provided by DC's Office of the Chief Technology Officer. The ESWC Division plans to use these map viewers, with cooperation from WASA, to identify catch basins manholes that require cleaning and maintenance.



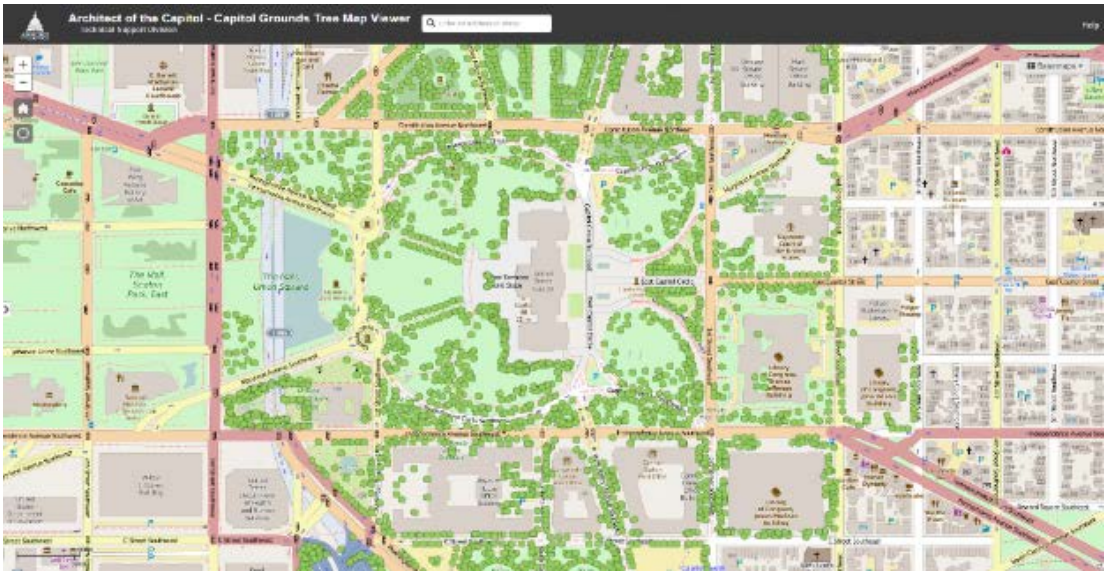
Pilot Project: Capitol Grounds Streetlights Map Viewer

AOC's Energy, Sustainability, and Water Conservation Division (ESWC) is interested in utilizing GIS to maintain and visualize the over 1,000 street lights under the AOCs jurisdiction. Discussion is currently underway to lockdown and finalize the data schema, including plans to barcode each streetlight for unique identification to tie into WebTMA and GIS.



Pilot Project: Capitol Grounds Trees Map Viewer

The Office of the Superintendent for Capitol Grounds is interested in migrating from their current desktop-only Davey Asset Management system to an enterprise system, such as the AOC's GIS enterprise system to maintain the over 4,000 trees under the AOC's jurisdiction. Several AOC Capitol Grounds employees met with the District of Colombia's Department of Transportation (DDOT) Urban Forestry Administration (UFA) arborist detailing a success story utilizing Collector for ArcGIS, ArcGIS Online/Portal for ArcGIS, and CityWorks to manage tree work requests and keeping tree information up-to-date directly in the field. A pilot map viewer was created as an introduction to show the capabilities of a GIS. Discussion is still on-going with interested stakeholders to utilize the GIS.



Onsite and Remote GIS Support Services

Marietta, Ohio

Woolpert was contracted to provide as-needed professional services that include but are not limited to: Geographic Information Systems (GIS), surveying, engineering, landman, aerial mapping and remote sensing, and architecture.

Project Data

Client
Artex Oil Company
Contact
Chad Spence
2337 State Route 821
Marietta, OH 45750
740.373.3313
cspence@artexoil.com
Date
06/2014 – 07/2017
Fee
$70,000

Nature of Work

The following highlights the specifics of the work being performed under this contract.

Ongoing GIS Support

Woolpert provides ongoing onsite and remote support to Artex staff on geospatial data management, editing, analysis, and map production. Typical tasks include spatial and attribute data editing, map production, data conversion and geoprocessing tasks.

Streamlined SSI / GIS Data Integration

SSI is an enterprise database used to store all lease hold information for Artex. Since SSI does not have a geospatial component, Artex followed a manual process to visualize lease data geographically. This workflow was time consuming, error-prone, and created lag in data currency. Woolpert worked to analyze the data and technical capabilities and limitations of the SSI software to determine a more efficient and timely method for integrating lease hold data into the GIS. Woolpert then suggested a new workflow to streamline SSI/GIS integration, created scripts and batch files to support the integration process and conducted onsite training.

Artex Data Dictionary Creation

During recent staff support visits, it become apparent that existing datasets contained little to no underlying data structure. This lack of structure applied to all levels of the geospatial data. Woolpert worked with Artex staff in documenting all desired data elements, and then built a logical/structured enterprise data dictionary for staff use. This data dictionary further refined the underlying data by limiting data input to known coded values and ranges. With the data dictionary complete, Woolpert staff created an Esri file geodatabase with all appropriate data elements, and loaded existing Artex geospatial datasets into the structured geodatabase.

Artex Legacy Lease/Parcel Data Adjustment

Artex staff had concerns regarding the underlying spatial and temporal accuracy of their legacy lease and parcel data. Woolpert reviewed the existing parcels datasets and determined their currency and accuracy. Woolpert then detailed various options for providing accurate parcel data for Artex's GIS. Options presented included: compiling existing publicly available parcel datasets, third party data providers, or digitization of legacy datasets. Once a valid parcel dataset was identified, Woolpert spatially adjusted existing lease polygons to properly align with underlying parcel datasets.

Artex Legacy Geospatial Data Cleanup and Adjustment

Beyond lease and parcel data, Artex has other legacy geospatial datasets. These datasets are comprised of various non-standard naming conventions, mismatched attribute fields and values, and are of an unknown source and currency. Woolpert investigated available datasets, and worked with Artex staff to identify all usable map data. Once the datasets were identified, Woolpert loaded all relevant datasets into the defined database schema and made spatial adjustments as appropriate. An outline provided by Artex served as a starting point for the analysis with some of the major datasets including pipelines, well locations, pad locations, drilling locations, fairways, plays, and other geological features. Woolpert provided Artex with a file geodatabase containing all of the relevant feature classes.

GIS Database Development and Related Services

Ohio Gas Company, Ohio

Ohio Gas Company (OGC) is a privately owned utility company that provides natural gas service to a multi-county region of Northwest Ohio. Their operations date back to 1914 and as such, their legacy geospatial data is extremely varied in accuracy, completeness, and format. OGC realized their need for accurate and dependable geospatial data, and partnered with Woolpert to convert all legacy geospatial data into a standard format and build an associated GIS to storage, maintain, visualize, and analyze their gas system.

Project Data

Client

Ohio Gas Company

Contact

Adam Pietrzyk, PE

715 E. Wilson St

Bryan, Ohio 43506

419.636.1117

Adam.pietrzyk@ohiogas.com

Date

2015 – 2016 current/ongoing

Fee

$570,000

Nature of Work

This process started with database design and source document review to completely understand OGC's legacy data and ultimate end goal. The review incorporated a wide range of datasets, from CAD files and GPS data, to paper maps and ancillary scanned documents. These varied legacy datasets were used in the compilation of both spatial and attribute data for OGC. Woolpert also worked with OGC to define logical pilot projects for the overall effort to ensure project success.

For this conversion project, Woolpert utilized all available base map data – both internal and external to OGC. Because of the abundance and complexity of the source materials available for this project, Woolpert used a hierarchical approach to capture and process system data. The data conversion began with the most detailed and spatially accurate data available and worked through to secondary sources.

Based on past experience, Woolpert utilized a complete "compilation" or re–digitization of data rather than adjustment of existing data. This method reduced additional complexities and errors that can ultimately increase time and costs associated with the conversion process. In OGC's case, compiling data from the source documents was the most economical approach to provide accurate GIS data. During digitization, data creation rules and quality control measures will be in place to ensure that the most complete and accurate data is created.

Section Four:

Proposed Rates

WOOLPERT

ARCHITECTURE | ENGINEERING | GEOSPATIAL

Proposed Rates

Per the requirements of the RFP, labor classifications and associated descriptions that include minimum education and/or certifications, average years of experience and typical responsibilities for each personnel category have been provided.

Personnel Category | Description of Service	2017	2018	2019
Project Director | BA/BS with 12 years' experience, MA/MS with 10 years' experience, or 16 years' experience. Project responsibilities include maintaining client relationships and ensuring services are performed in a manner compatible with being an industry leader.	$205.00	$210.13	$215.38
Project Manager | BA/BS with 8 years' experience, MA/MS with 4 years' experience or 12 years' experience. Project responsibilities include serving as primary point of contact with client, and managing project team, scope, schedule, and budget.	$200.00	$205.00	$210.13
Project Coordinator | BA/BS and 6 years' related experience, MA/MS and 4 years' years related experience, or 8 years' related experience. Possesses a certification in data creation and data dissemination with strong organizational skills and a keen sense of detail, accuracy and follow-through. This position is primarily responsible for defining, enhancing and guiding technical advancement at the geospatial department level with responsibilities that include helping to define optimal workflow processes, assisting in identifying technology needs, assisting in the development and implementation of geospatial QA/QC standards providing technical expertise and leadership in the project definition and planning phases.	$113.00	$115.83	$118.72
Senior Developer | BA/BS with 12 years' experience, MA/MS with 10 years' experience, or 16 years' experience. Project responsibilities include application development; providing technical expertise and leadership in project definition and planning phases; coordinating the technical execution of complex, diversified projects; communicating developments and practices through appropriate firm channels; developing and documenting standard practices; coaching and mentoring other team members in skill development areas; and performing project QA/QC.	$183.00	$187.58	$192.26
Mid-Level Developer | BA/BS with 6 years' experience, MA/MS with 4 years' experience, or 10 years' experience. Project responsibilities include application development, providing technical expertise in project definition and planning phases, coaching and mentoring other team members in skill development areas; and performing project QA/QC.	$156.00	$159.90	$163.90
Junior Developer | Associates degree or 2 years' experience. Project responsibilities include application development.	$137.00	$140.43	$143.94
Senior GIS Analyst |BA/BS with 6 years' experience, MA/MS with 4 years' experience, or 8 years' experience. Project responsibilities include providing technical expertise and leadership for data conversion, cleansing, and development projects; geodatabase design; preparation of complex data transformation models; ArcSDE administration; preparation and monitoring of budgets and schedules; develop end-user documentation; conduct client training, and performing project QA/QC.	$128.00	$131.20	$134.48
Mid-Level GIS Analyst | BA/BS with 3 years' experience, MA/MS with 1 years' experience, or 5 years' experience. Project responsibilities include providing technical expertise for data conversion, cleansing, and development projects; geodatabase design support; preparation of transformation models; and perform project QA/QC	$93.00	$95.33	$97.71
Junior GIS Analyst | Associates degree or 2 years' experience. Project responsibilities include data conversion, cleansing, and development.	$62.00	$63.55	$65.14
Database Administrator | BA/BS with 4 years' experience, MA/MS with 2 years' experience, or 8 years' experience. Project responsibilities include database	$153.00	$156.83	$160.75

Personnel Category | Description of Service	2017	2018	2019
administration, geodatabase design, ArcGIS Server administration, Portal for ArcGIS and ArcGIS Online administration.			
Remote Sensing Specialist | BA/BS with 5 years' experience or MA/MS with 3 years' experience. Project responsibilities include image processing, image interpretation, feature extraction, data development, spatial analysis and problem solving. Additional skills in project management, research and development are also required.	$165.00	$169.13	$173.35
Professional Surveyor | BA/BS and 4 years' related experience, MA/MS and 2 years' related experience or 8 years' related experience and possess a Professional Survey License and applicable OSHA certifications. Responsible for performing advanced surveying work on a variety of office and field projects.	$128.00	$131.20	$134.48
Field Survey Technician | Associates degree or 2 years' experience and applicable OSHA certifications. Project responsibilities include data collection using electronic total stations, Global Positioning System receivers, digital levels, and ground-based laser scanners in the field.	$62.00	$63.55	$65.14
Geospatial Technician | BA/BS and 4 years' related experience, MA/MS and 2 years' related experience or 6 years' related experience. Responsibilities include performing geospatial mapping tasks (ie: orthophotography, lidar edits, compilation, cartography, etc.) on projects to include the management of computer data in multiple operating system environments.	$93.00	$95.33	$97.71
Senior Administrative Staff | BA/BS with 4 years' experience, MA/S with 2 years' experience or 8 years' experience. Depending upon the specific project role, responsibilities may include accounting and business administration.	$115.00	$117.88	$120.82
Mid-Level Administrative Staff | BA/BS or 4 years' experience. Depending upon the specific project role, responsibilities may include accounting, billing, business administration, human resources, purchasing, record keeping, and IT support.	$80.00	$82.00	$84.05
Junior Administrative Staff | Associates degree or 2 years' experience. Depending upon the specific project role, responsibilities may include accounting, billing, business administration, human resources, purchasing, record keeping, and IT support.	$63.00	$64.58	$66.19

- *Hourly Cost Multiplier (HCM) used to calculate the rates is 3.5%*