



501 North Market
Maryville, MO 64468
660.562.0050

SAM, LLC Proposal

February 4, 2021

SUBMITTED TO:
Pleasant Hill, Missouri

PROPOSAL FOR:
Utility GIS Mapping

Proposal Contact:

Erin Allen
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Direct: 660.215.7091
erin.allen@sam.biz



Missy Gentry
Collections Clerk
City of Pleasant Hill
203 Paul St.
Pleasant Hill, MO 64080

Dear Missy,

Surveying And Mapping, LLC (SAM), formerly Midland GIS Solutions, respectfully submits this proposal to the City of Pleasant Hill, Missouri to provide professional GPS and GIS mapping services. SAM is ready to assist in your efforts to develop an accurate GIS program for the City's sanitary sewer network.

SAM proposes developing a comprehensive GIS program for Pleasant Hill for use in maintaining and managing the City's utility infrastructure assets. The following characteristics make SAM uniquely capable of overseeing this project for Pleasant Hill:

- SAM offers complete utility asset management solutions, from accurate GPS data collection and GIS mapping, to web-based GIS solutions with editing capabilities for easy and efficient system maintenance.
- SAM has provided GPS and GIS services to over 250 cities and utilities in the Midwest. Our dedicated field staff has GPS located over one million utility assets for seamless GIS integration for use in utility maintenance, daily workflow management and engineering models.
- SAM will dedicate an experienced project team of GPS Field Staff, GIS Technicians, GIS Specialists and Analysts, Programmers, Professional Land Surveyors and ArcGIS Server developers to ensure project efficiency and overall product quality.
- Kirk Larson, Director of GIS Operations, will personally manage and oversee your GIS project, which ensures open and complete communication throughout project development and implementation.

Thank you for the opportunity to present our company for this very important project. Our team of professionals has the experience and capabilities to make your GIS program successful and stands ready to form a partnership with the City of Pleasant Hill in that success.

Sincerely,

A handwritten signature in black ink, appearing to read 'Erin Allen', written in a cursive style.

Erin Allen
Business Development Manager
SAM, LLC

SAM COMPANIES

501 North Market / Maryville, MO 64468
660-562-0050 Office

sam.biz

Surveying And Mapping, LLC

Founded in Austin, Texas in 1994 and celebrating 26 years of providing quality services and deliverables, **Surveying And Mapping, LLC (SAM)** has expanded from its initial offering of professional land surveying services, to providing a complete suite of geospatial solutions and specialized construction phase services. With a guiding principle of providing only the highest quality services to our clients, SAM continually looks for opportunities to expand our geographic reach, introduce additional services and broaden the markets we serve.

To achieve this goal, SAM has acquired some of the most experienced and professional consulting firms across the United States, including our most recent addition to the SAM family of companies **Midland GIS Solutions**, a full service GIS development firm. Over the last 20 years, Midland GIS has grown through a vision that long-term GIS success is dependent on the highest level of accuracy, proper database design and the ability to ensure each and every department within an organization can benefit from their GIS.

Today, delivering GIS services as a single company, SAM has established a technical infrastructure to support and host web-based and mobile asset management programs, along with custom GIS applications. With these tools, SAM ensures that every client, regardless of size and resources, can implement an enterprise GIS program to manage everything from land parcels, transportation infrastructure, and utility assets to workorders in a secure, user-friendly website built on the latest Esri® technology.

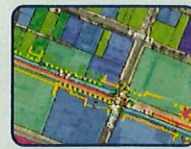
SAM's complete geospatial approach gives us the tools and skills to develop efficient and customized solutions for projects of any scale. This gives our clients the benefit of a single point of contact for a comprehensive set of GIS, surveying and mapping products. The size of our available workforce means we are able to use these tools effectively to accomplish even large-scale projects on accelerated schedules. With our focus on quality and timely delivery, we are proud to have a high rate of repeat business and positive client referrals.

GIS Services

SAM specializes in geospatial services for water & sewer, electric utilities and transportation infrastructure. With specialized teams of full-time, trained GPS field technicians, utilizing precision-accurate GPS equipment and cutting-edge Esri software, our staff is dedicated to accurately locating assets and completing inspections and condition assessments for the sole purpose of GIS data integration.

- GPS Field Mapping
- Utility/Infrastructure Data Collection
- Asset Management Programs
- Utility Inspections
- GIS Data Development
- Data Conversion
- Consulting
- SL-RAT Sewer Acoustic Inspection
- GIS Mapping
- Custom Programming
- Web-Based, Mobile GIS Programs
- Maintenance & Support
- Parcel Mapping
- Specialized Training
- 911 (NG911) GIS Services
- Vegetation Management

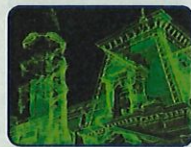
Professional Services



Geographic Information System (GIS) Services



Professional Land Surveying



Building Information Modeling (BIM)



Aerial Mapping & Photogrammetry



Subsurface Utility Engineering & Utility Coordination

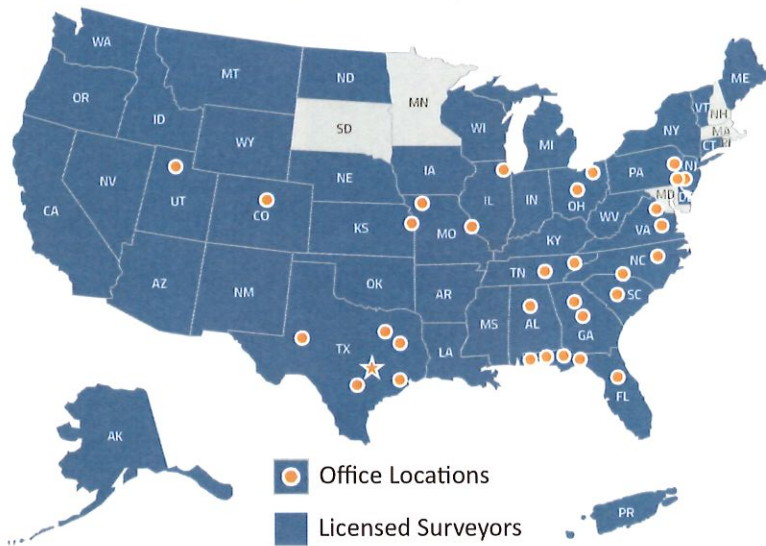


Airborne, Mobile & Terrestrial LiDAR



Construction Phase Services

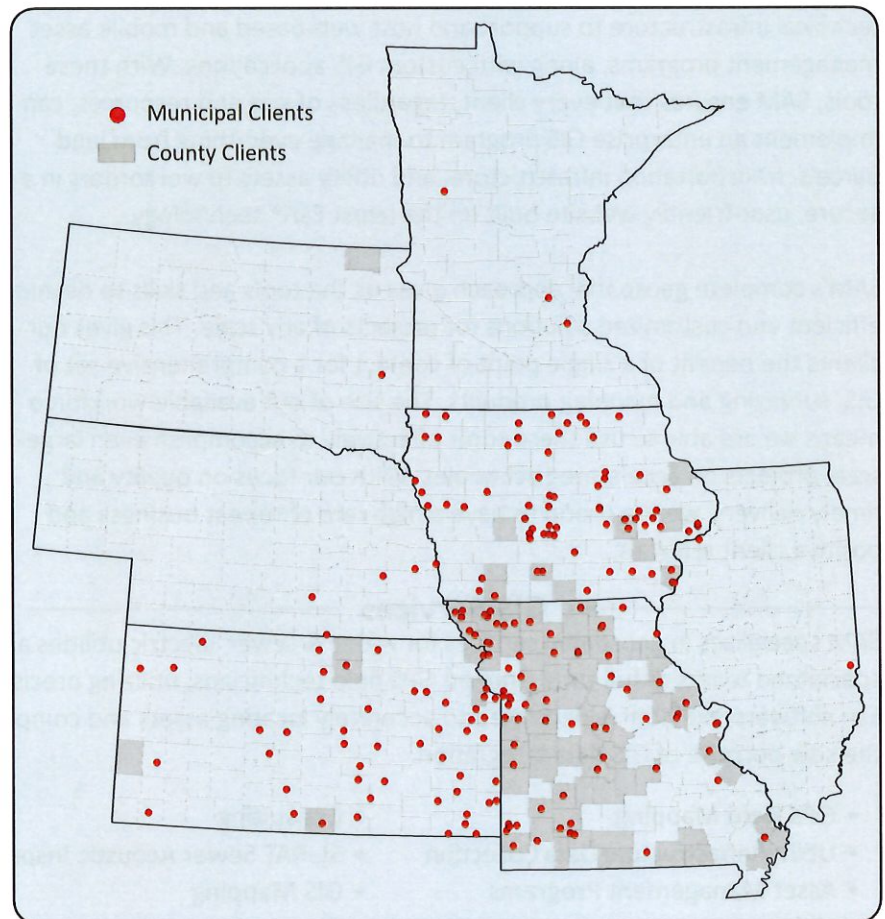
Geographic Range of SAM



Office Locations

- Austin, TX (Headquarters)
- Atlanta, GA (2)
- Birmingham, AL
- Brodheadsville, PA
- Charlotte, NC
- Chicago, IL
- Chipley, FL
- Columbia, SC
- Columbus, OH (2)
- Dallas, TX
- Denver, CO
- Gainesville, VA (NoVA)
- Houston, TX
- Kansas City, KS
- Knoxville, TN
- Macon, GA
- Maryville, MO
- Midland, TX
- Moorestown, NJ
- Nashville, TN
- Niceville, FL
- Orlando, FL
- Pensacola, FL
- Philadelphia, PA
- Raleigh, NC
- Richmond, VA
- St. Louis, MO
- Salt Lake City, UT
- San Antonio, TX
- Tallahassee, FL
- Tyler, TX
- Youngstown, OH

The inset map shows the 7-state region SAM regularly serves and is a testament to our experience in GIS and GPS mapping, data development and utility asset management solutions throughout the Midwest. Whether a community of 500, or a metropolitan city of 150,000+, SAM has the experience, equipment and manpower to serve you. SAM has designed and implemented over 225 successful utility GIS projects in this area, many of which are hosted on the Integrity GIS platform.



SAM is pleased to be a part of the Esri Partner Network and although we focus most of our GIS development, customization, and implementation efforts on Esri-based applications, we can easily handle data from, interface with, and deliver data to other GIS and CAD systems.

For over 20 years, SAM has designed reliable GIS programs on a foundation of the highest accuracy possible and our philosophy of **"Everything GIS. Done Right."** This ensures every project is uniquely designed to accommodate individual client needs and future plans. SAM is consistently hired by clients based on qualifications, as demonstrated by our long-standing experience.

CAPACITY TO ACCOMPLISH WORK

SAM has teams of full-time, trained GPS field technicians, each led by a GPS field crew chief, dedicated to accurately locating utilities and completing inspections for the sole purpose of GIS data integration. GPS field crews at SAM travel throughout the Midwest providing GPS utility collection services on a daily basis. Our service area extends more than 500 miles from our GIS office in Maryville, Missouri and typically includes all of Missouri, Iowa, Kansas, Nebraska, Minnesota and Illinois.

All GPS field and technical staff at SAM are highly trained in all areas of GPS field collection and utility inspections and utilize precision-accurate GPS equipment and cutting-edge Esri software. Additionally, field staff have completed OSHA and Federal Traffic Safety training.

In addition to our knowledgeable field staff, SAM also maintains the professional staff and capacity to provide technical support to more than 100 clients on an annual basis. We provide service and support to our clients long after the implementation of their GIS data and software solutions. Municipal and utility clients also rely on SAM to periodically maintain their utility GIS program with GPS field updates. We are confident in our ability to provide exceptional GIS data collection services on projects of all sizes and complexities, while providing timely and outstanding technical support to each and every client.



TECHNOLOGY

Since 2005, SAM has been an Esri Silver Business Partner and licensed reseller. This partnership ensures that our staff is trained and experienced in the latest GIS software available. Esri is the worldwide leader in GIS software platforms and we are proud to employ these technologies to develop every GIS program with the SAM name on it. Our professional staff specializes in a wide-range of GIS technologies and performs GIS development with Esri software and integration with third-party software platforms on a daily basis.

GPS field crews at SAM are experts in data collectors and Global Positioning Systems (GPS), both Real-Time Kinematic (RTK) survey-grade and mapping-grade technologies. Our GPS data collection division boasts a fleet of state-of-the-art, reliable technologies to support the efforts of our crews.

Our programmers and technicians are skilled in numerous programming languages specific to spatial data and asset management functionality. SAM personnel routinely take advantage of the latest training opportunities for GIS software and GPS technology, all significant steps toward efficiency in GIS data collection and development. This commitment to providing the very best in GIS has earned SAM the trust of countless organizations, and an extensive list of references and supporters around the region. This diverse technology expertise additionally ensures our team can consult on compatibility and integration issues with third-party software platforms and external data sources.



WEB SERVICE INFRASTRUCTURE

Above and beyond the in-house technology for GIS development and GPS data collection, SAM has a significant back-end server infrastructure at our GIS office in Maryville, Missouri. This system is designed to host and support hundreds of web-based and mobile GIS mapping programs. The web service team at SAM supports and securely maintains hundreds of independent web-based GIS and asset management programs for clients across the Midwest.

SAM maintains a secured, climate-controlled server room with a dedicated 50 MB upload and 50 MB download speed fiber connection. Websites and data are hosted in a virtual VMware ESXi environment run on a cluster of Dell PowerEdge R640 web servers and a Dell SAN SC4020 storage array. The server room is connected to a gas-powered generator to keep web servers up and running in case of a power outage. In addition, SAM provides an off-site backup service for all hosted data, which could be accessed if a catastrophic event affected our web servers. Our top priority is to ensure 24/7/365 access to your GIS data.

Programming Expertise

- SQL
- Visual Basic
- .NET
- HTML
- Java
- JavaScript
- C#
- Python
- Geocortex®

GPS Technology

- Sokkia
- Topcon
- Trimble
- Leica
- Carlson
- Juniper
- Allegro
- Collector for ArcGIS

Esri Technology

- ArcGIS 10.x
- ArcGIS Pro
- ArcGIS Enterprise
- ArcGIS Extensions
- ArcGIS Online

CONTROL & TIME MANAGEMENT

With over 250 successful data collection projects, the management team at SAM takes pride in our ability to consistently set costs and project schedules for our clients. **Throughout the history of the company, there has not been a single change order to our pricing.** Additionally, every project has been delivered to our clients by the negotiated deadlines. This is only possible with leadership that has several years of combined experience and a strong team of professionals who routinely develop and deploy state-of-the-art GIS programs.



With the extensive capacity of data our team consistently processes, efficiency is paramount. Our professionals constantly weigh the benefits of building automated programs to improve and streamline GIS development tasks, while avoiding those automated pitfalls that reduce or hinder our staff's ability to effectively recognize issues in the construction of good, clean spatial data.

Cost control issues are very important to our clients and SAM has a unique understanding of the skill set, technology and level of effort necessary to provide our clients with successful solutions. The use of the latest in GPS technology and software programs, research, development efforts, field standards and protocols enables SAM to deliver **everything GIS, done right** the first time.



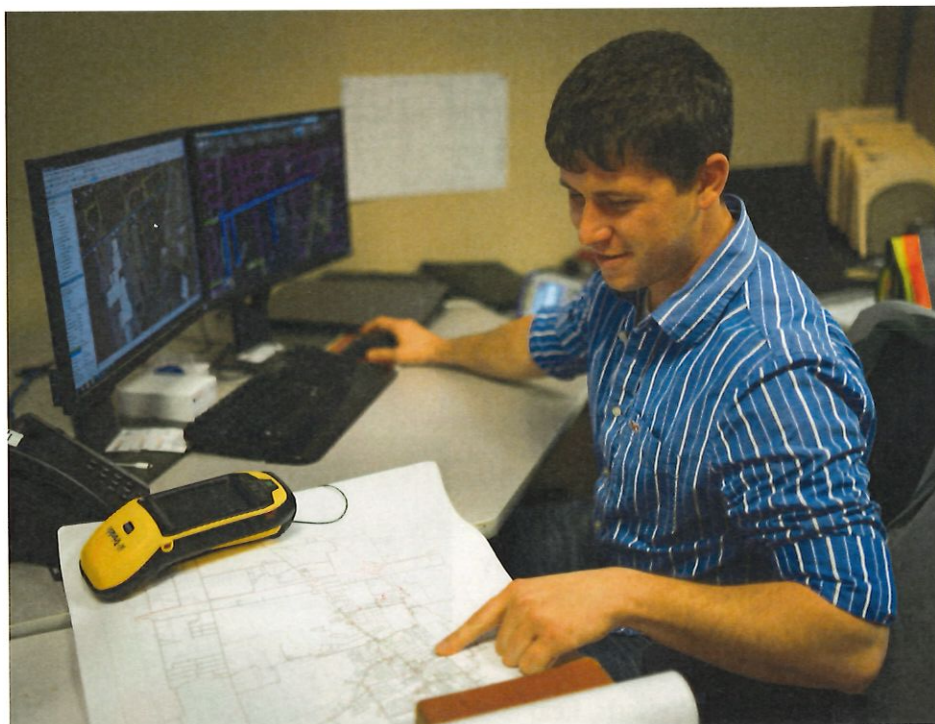
QUALITY ASSURANCE / QUALITY CONTROL

Effective Quality Assurance and Quality Control (QA/QC) procedures are crucial to the success and overall integrity of every project. Through the combined efforts of our project team, an emphasis on QA/QC is always a priority and each task executed has a system of checks and balances established for all personnel to follow. Elements of QA/QC can range from data collection checklists and GPS tolerance controls to analyzing network connectivity within the software environment.

As part of the QA/QC process, SAM will conduct a redundancy check on five (5) percent of the features previously shot during the project. After GPS locating the features a second time, SAM will compile and process the results against all data sets and verify that the required accuracy tolerance is being met.

Check plots are a crucial and unique step required in all SAM projects.

Although every effort is made to investigate, locate and properly map each asset, the input and feedback of the utility personnel is imperative to the approval of final data. Our project management team works with client staff to ensure we handle each piece of data properly and clients have the final say in how data is represented. Our efforts to ensure the highest quality products and services include:



- Custom QA/QC ArcGIS tools
- “Heads-up” QA/QC against base data or aerial photography
- Digital and hard-copy checks against field notes and as-built drawings
- Five (5)% redundancy check of all GPS collected data
- Printed check plots for review by the city
- Assurance that end product shows complete connectivity

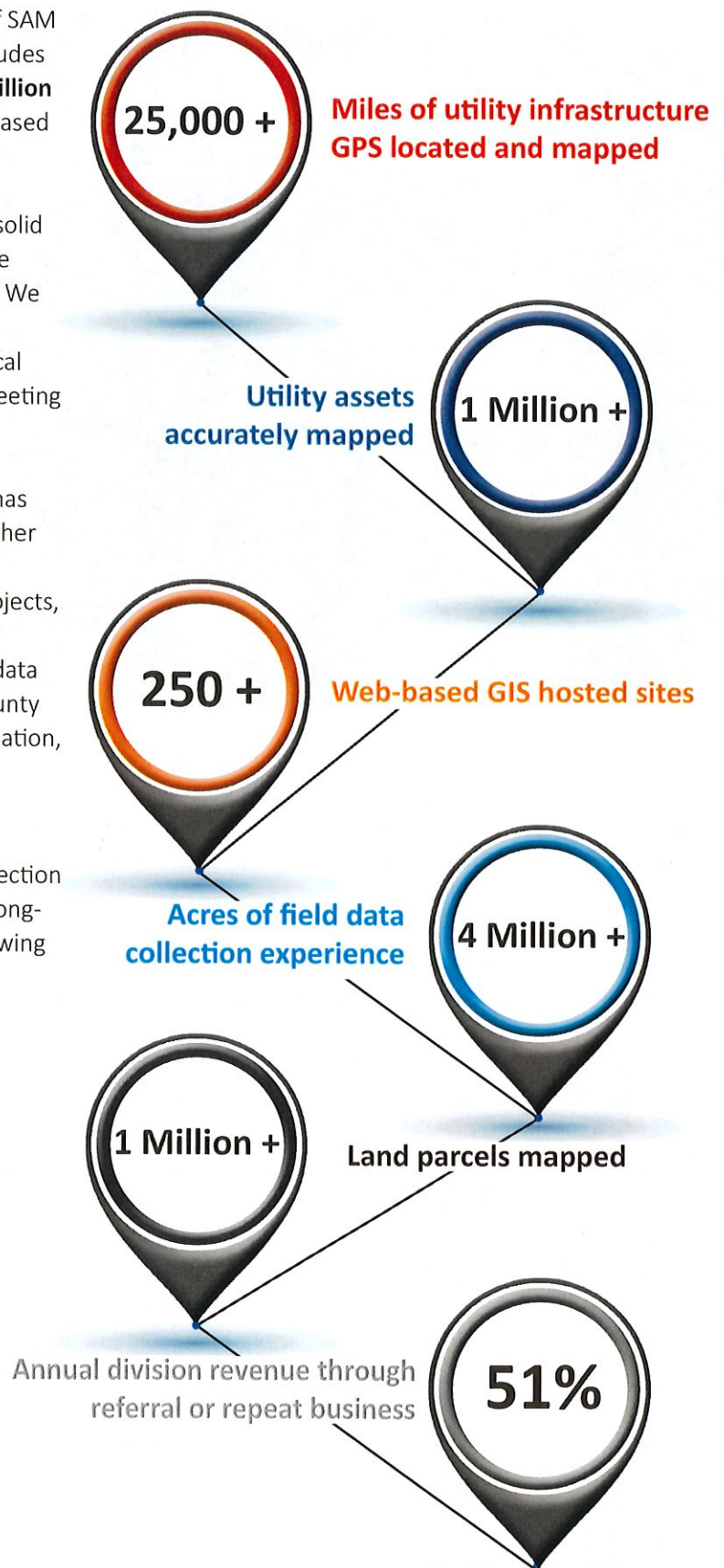
In the last five (5) years alone, the expert field crews of SAM have GPS mapped more than **822,000 assets**. This includes over **11,000 miles** of utility infrastructure across **2.4 million acres** of land. We have also built more than 200 web-based asset management and GIS programs.

As a full-service professional GIS firm, SAM provides a solid geospatial foundation for all of our clients to ensure the accuracy, integrity and longevity of their GIS programs. We provide exceptional GPS data collection on all projects, completing them on schedule with outstanding technical support. SAM is unsurpassed for project quality and meeting aggressive deadlines.

In addition to specializing in GPS data collection, SAM has worked with more counties in the Midwest than any other firm to accurately map over **one (1) million parcels** for countywide GIS development. On GIS development projects, our trained staff integrates the best aerial photography available into the digital mapping program. For utility data collection projects, our skilled technicians integrate county parcel and ownership data, planning and zoning information, state layers and much more.

The successful outcome of any GIS project requires a “**field to finish**” approach that starts with accurate collection of field data and leads to a GIS program that provides long-term solutions. SAM has set best practices for the following project-related activities in which we specialize:

- GPS data collection
- GIS mapping
- Parcel development
- Aerial photography integration
- Safety and procedures
- Establishing work sectors and timelines
- Public notification
- Geodatabase design
- Website maintenance
- Quality assurance and quality control
- Project status reports
- Inspections and condition assessment



SIKESTON BOARD OF MUNICIPAL UTILITIES

2016-PRESENT



UTILITY &
INFRASTRUCTURE
DATA COLLECTION



GIS DATA
DEVELOPMENT &
MAPPING



WEB-BASED,
MOBILE GIS & ASSET
MANAGEMENT



PROJECT CONTACT

Jeff Winders
Operations Manager
jwinders@sbmu.net
573.475.3234

Sikeston Board of Municipal Utilities (BMU) is a city-owned utility, operating the electric, water and sanitary sewer systems within the City of Sikeston, MO. In 2016, the Utility was seeking an experienced and professional GIS firm to accurately locate their sanitary sewer system, which serves approximately 7,500 customers. They selected SAM to GPS locate and complete detailed inspections of their sanitary sewer infrastructure.

Prior to commencing field work, SAM conducted a kick-off meeting with Sikeston BMU to obtain available aerial photography and existing GIS data for integration into the project geodatabase. Hard copy maps, utility as-builts and other existing data were obtained to use as reference material throughout the project.

- RTK Survey-grade GPS Data Collection
- Utility GPS Mapping
- Inventory & Inspection of all Utility Features
- Web-based Integrity™ GIS Implementation
- Web-based Asset Management

SAM utilized RTK survey-grade GPS technology to field locate manholes, force main lines, lift stations, ARVs and lamp holes. This technology resulted in centimeter-level accuracy (+/- 2 cm) of GPS positions on utility features. Manholes were opened and inspected. Some of the attribute data collected included rim elevation, manhole depth, invert elevation, manhole type and material, pipe type and size, and condition rating.

When data collection and mapping was complete, SAM developed and implemented an Integrity GIS website with mobile capabilities for Sikeston BMU. With Integrity, the utility has the ability to efficiently manage, maintain, analyze, edit and view their sanitary sewer utility system. In 2017, SAM was selected to GPS locate and map the waterline and electric utility networks managed by Sikeston BMU. The utility now has a comprehensive utility GIS program and is able to manage and maintain their utility infrastructure well into the future.

FARMINGTON, MO

POPULATION 18,425

2012-2018



UTILITY &
INFRASTRUCTURE
DATA COLLECTION



GIS DATA
DEVELOPMENT &
MAPPING



WEB-BASED,
MOBILE GIS & ASSET
MANAGEMENT



MAINTENANCE
& SUPPORT



Located just 70 miles southwest of St. Louis, MO, the City of Farmington, MO had maintained their utility data in CAD for years and decided to implement a more accurate utility mapping program, as well as a centralized web-based system to keep track of maintenance and operational activities. In 2012, Farmington selected SAM based on qualifications to GPS locate and map their primary electric utility network. SAM provided Farmington a complete and accurate GIS program of their electric utility network and integrated this data and aerial photography into a user-friendly, web-based GIS program for the city to efficiently manage and maintain their GIS data.

Additionally, Farmington contracted with SAM to GPS locate, inspect and map their sanitary sewer, water and storm water network. A thorough investigation of all infrastructure and connecting points was performed in the field in order to develop an accurate network of each utility. In conjunction with this project, LiDar was integrated into the GIS program to utilized by the client to identify drainage patterns where storm infrastructure was not present.

SAM utilized decimeter level accuracy (+/- 4 in) to field locate all features associated with the electric distribution network for the city. Real-Time Kinematic (RTK) survey-grade GPS methods were utilized to locate the sanitary sewer, storm water and water utility networks. This technology resulted in sub-centimeter accuracy of GPS positions on utility features.

Today, the city has an accurately mapped system of their entire utility infrastructure, complete with attribute and inspection data that can be utilized in engineering modeling projects and asset management tracking.

PROJECT CONTACT

Larry Lacy

Public Works Director

llacy@farmington-mo.gov

573-756-0608

- Utility GPS Mapping
- Inventory & Inspection of all Utility Features
- RTK Survey-grade & Mapping-grade Methods
- Web-based Integrity™ GIS Implementation
- Web-based Asset Management

RICHMOND, MO

POPULATION 5,655

2012-2015



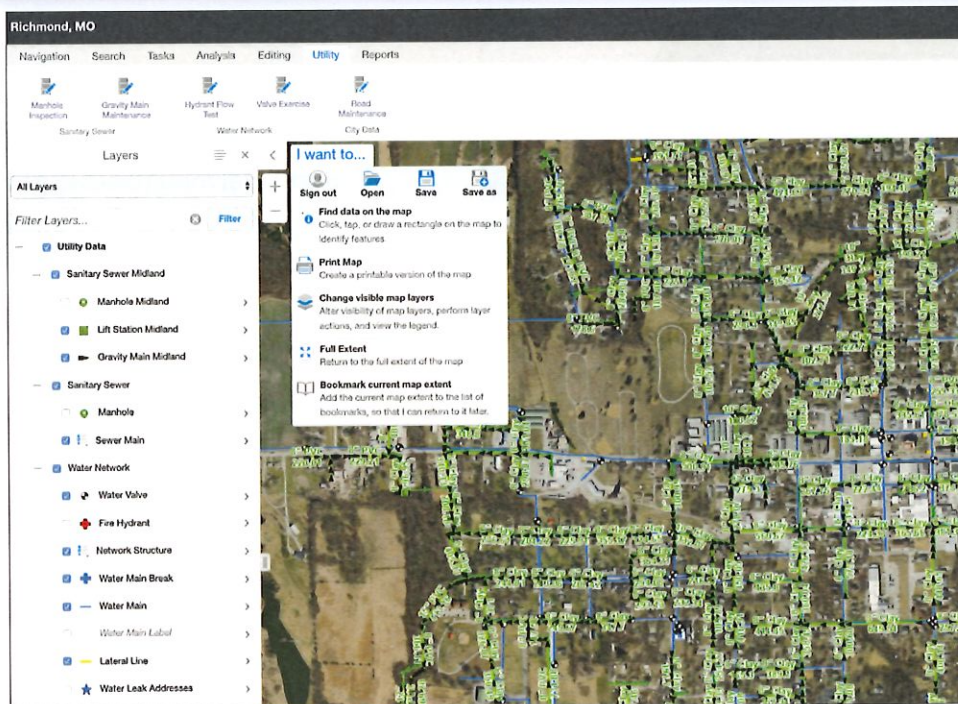
UTILITY &
INFRASTRUCTURE
DATA COLLECTION



GIS DATA
DEVELOPMENT &
MAPPING



WEB-BASED,
MOBILE GIS & ASSET
MANAGEMENT



PROJECT CONTACT

Lisa Hastings
Community Development
lhastings@cityofrichmondmo.org
816.776.5304



- Utility GPS Mapping
- RTK Survey-grade GPS Data Collection
- Cemetery GIS Development
- Web-based Integrity™ GIS Implementation
- Signs and Streets GIS Development

In 2012 the City of Richmond was faced with inaccurate utility maps combined of outdated built-ins, utility drawings and paper maps. The city had no way to accurately track or manage aging utility infrastructure and system maintenance. After seeking out a qualified GIS firm, SAM was selected to work on establishing zoning layers and implement a web-based GIS database for the city to have up-to-date and accurate information on their utility networks. In the years to come SAM provided further data collection on both water and sanitary sewer networks that was put into the Integrity™ program which SAM continues to host for the city.

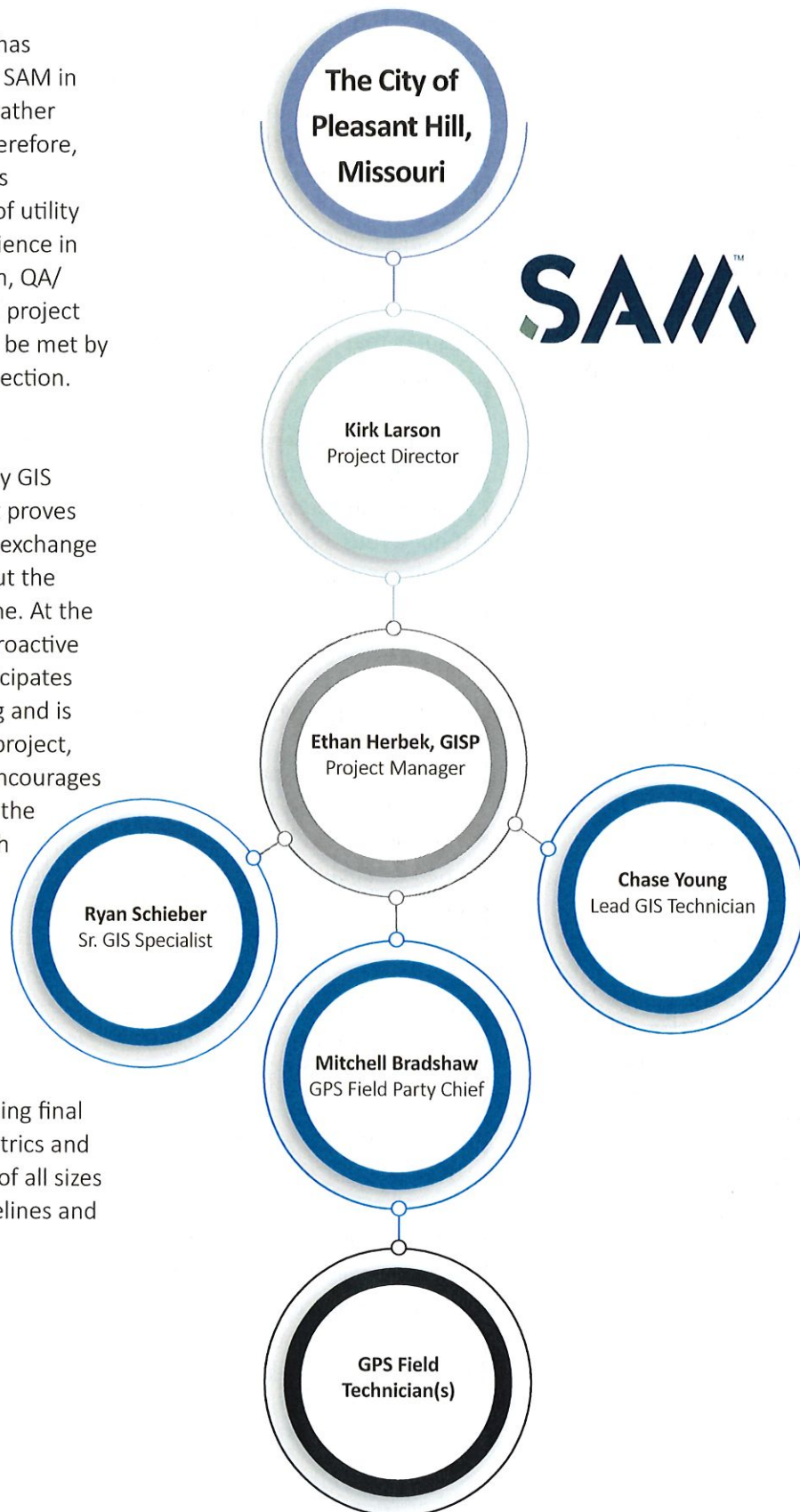
Richmond approached SAM once more in 2015 with a request to GPS map a major cemetery along with every sign and street that included asset management and condition rating. SAM gathered sign and street features including sign MUTCD code, sign size, sign visibility grade, post material, post size, direction facing and a condition rating. Street data included the material, drainage type, intersection type along with an evaluation of the sidewalk system along the streets. Data collection of the cemetery allowed Richmond the ability to maintain and manage cemetery assets and features from anywhere with Integrity™ for web and mobile.

The “client-focused” approach and experience in project management has been the cornerstone of success for SAM in a market that does not expect, but rather demands, a high level of service. Therefore, the proposed team members for this project have a unique combination of utility infrastructure knowledge and experience in project management, data collection, QA/QC procedures and GIS mapping. All project requirements and specifications will be met by the key personnel identified in this section.

PROJECT MANAGEMENT

The completion of hundreds of utility GIS projects by SAM across the Midwest proves the firm’s dedication to information exchange and open communication throughout the project to reach a successful outcome. At the foundation of this approach is our proactive management philosophy, which anticipates challenges, revolves around listening and is committed to partnering. On every project, SAM utilizes a team approach and encourages open communication channels with the client and their stakeholders to reach a successful outcome.

Project Manager, Ethan Herbek, will oversee all aspects of this data collection and GIS mapping project. This includes the kick-off meeting and geodatabase design, establishing cost controls and providing final deliverable and training. Internal metrics and procedures are in place for projects of all sizes and complexities to ensure that timelines and budgets are met.



Kirk Larson • Project Director • KIRK.LARSON@SAM.BIZ

EXPERIENCE

- SAM: 15 years
- Professional: 27 years

EDUCATION

B.S. Geography, NWMSU -
Maryville, MO

PROJECT MANAGEMENT

- 200+ municipal & utility GPS projects
- Coordinates resources & project schedules
- Administers cost controls
- Serves as contract administrator

Kirk Larson is a Director of GIS Operations at SAM. Since 2005, Kirk has overseen the development and implementation of more than 200 municipal and utility GPS projects. His experience includes working in local government as a GIS Coordinator and in the private sector in various project management roles.

As Project Director, Kirk is responsible for working closely with various levels of client personnel and stakeholders to solidify the scope of work and contractual obligations. On a daily basis, Kirk assists with project management tasks and ensures that project staff, technical planning, project schedules, budgeting, client communication and quality control expectations are being met and/or exceeded.

Kirk's unique understanding and knowledge of utility asset management and GPS field collection positions him as an expert in those fields. To share this expertise and successful approach to similar projects, Kirk attends and presents at numerous industry events on an annual basis that focus on sustaining and growing municipalities and utility companies throughout the Midwest.

Ethan Herbek, GISP • Project Manager • ETHAN.HERBEK@SAM.BIZ

EXPERIENCE

- SAM: 16 years
- Professional: 16 years

EDUCATION

B.S. Geography/GIS Minor,
NWMSU- Maryville, MO

CERTIFICATIONS

- GIS Professional (GISP) #71950
- National Association of Sewer Service Companies (NASSCO) – Completed Pipeline, Lateral and Manhole Assessment Certification Programs
- OSHA Certified in Occupational Safety and Health Training & Confined Spaces and Traffic Control for Field Engineering & Surveying

Ethan Herbek is experienced in GIS data development and GPS field data collection, serving in multiple management roles that include Municipal Project Supervisor, Field Supervisor, Utility GIS Specialist and Quality Control Manager. Ethan is capable of supervising and conducting all aspects of municipal GIS projects, from geodatabase design and GPS field data collection to GIS data integration and training.

On a daily basis, Ethan coordinates and manages GPS field personnel and GIS technicians. Ethan is also responsible for final geodatabase design to ensure that all aspects of GPS data and attribute collection are synchronized with the overall project plan. Ethan oversees and monitors all safety procedures and supervises day-to-day quality control during the GIS data creation portion of each data collection and asset inventory project.

As Project Manager, Ethan will be responsible for the overall daily management of field data collection and GPS field personnel. Ethan will ensure that all aspects of GPS data and attribute collection are synchronized with the overall project plan for the city. He will lead/attend on-site project meetings, integrate new data within the existing geodatabase and ensure that any web services are updated as well.

Ryan Schieber • Sr. GIS Specialist • RYAN.SCHIEBER@SAM.BIZ

EXPERIENCE

- SAM: 18 years
- Professional: 18 years

EDUCATION

B.S. Geography & GIS, NWMSU-
Maryville, MO

TECHNICAL EXPERTISE

- Esri ArcGIS Desktop, Pro, Enterprise
- Parcel fabric
- Geocortex®
- E911 addressing
- Geodatabase design
- Software installation and training
- Manages on-site & off-site backups

Ryan Schieber has more than 18 years of experience at SAM and provides a wide range of GIS development and conversion services. As Sr. GIS Specialist, Ryan manages the geodatabase design and coordinates the data development of all projects, oversees and assists with quality control procedures and provides technical support to clients on a daily basis. He is trained in the latest ArcGIS software and applications.

Ryan will use his vast experience in GIS data integration and development in overseeing the GIS program development portion of the project while providing any technical support issues. He will assist in quality control to ensure the final project deliverables exceed project requirements.

Chase Young • Lead GIS Technician • CHASE.YOUNG@SAM.BIZ

EXPERIENCE

- SAM: 6 years
- Professional: 6 years

EDUCATION

B.S. GIS, NWMSU - Maryville, MO

TECHNICAL EXPERTISE

- GPS hardware and software knowledge and support
- Quality control / technical support protocols
- Geodatabase design / maintenance
- Esri ArcGIS Desktop and Pro

As a Lead GIS Technician, Chase Young will serve as the lead GIS technician on data development of secondary municipal layers and utility data, Chase has served in multiple capacities since joining SAM including GPS field technician, crew chief as well as Phase Manager. Chase is responsible for GIS mapping assets and utilities, data conversion and integration, quality control and quality assurance and provides technical support to clients on a daily basis.

Throughout the project Chase will work with the GIS Project Manager and GPS field staff to accurately map field collected data and attribute information into the city's GIS mapping program.

Mitchell Bradshaw • GPS Field Crew Chief

EXPERIENCE

- SAM: 6 years
- Professional: 6 years

TECHNICAL EXPERTISE

- RTK survey-grade GPS- Sokkia GRX1 and GRX 2, Topcon HiPer SR
- Mapping-grade GPS – Trimble Geo7X and R2
- Carlson SurvCE & PC, Collector, ArcPAD

Mitchell Bradshaw has more than six (6) years of GPS field data collection and utility inspection experience with SAM. His knowledge in GPS data collection procedures and quality control measures ensures accuracy and efficiency on every project. As GPS Field Crew Chief, Mitchell trains all GPS Field Technicians in utilizing RTK survey-grade and mapping-grade GPS equipment. He is knowledgeable at identifying key components of all utility networks. Knowing critical asset types is essential in developing a clean and accurate geodatabase.

Mitchell will lead a GPS field crew to collect utility infrastructure data for the project. He will oversee data collection and inspections and field check all collected data prior to processing that information in the office. Mitchell will maintain communication with city staff when providing on-site GPS and GIS services.

PROJECT KICK-OFF

SAM will provide an on-site kick-off meeting and geodatabase design workshop with the City of Pleasant Hill to start the project. The kick-off meeting is essential to developing open communication with the client and will help establish the guidelines and procedures of SAM for coordinating the project. The following important topics will be discussed and determined at the kick-off meeting:

COLLECT EXISTING DATA

SAM will acquire copies of existing and available mapping records, such as relevant GIS data, AutoCAD drawings, hard-copy utility maps, as-built information and historical utility drawings for use as reference during the project. All hard-copy maps will be scanned and returned to the city in a timely manner.

SAFETY AND PROCEDURES

SAM will review safety and field procedures during the kick-off meeting to ensure the safety of field staff, city staff and the citizens of Pleasant Hill throughout the data collection phase of the project. SAM follows a strict safety and procedures manual and requires all SAM employees to attend internal quarterly safety meetings to review procedures and concerns.

At all times, field staff will be wearing the required Class II traffic safety vests and all field vehicles will be clearly marked with company information and have the required safety lights for operation while in public right-of-way. GPS field personnel have acquired OSHA training and certification for "Traffic Control for Field Engineering & Surveyors" and "Confined Spaces". Proper traffic control signage will be utilized when necessary while operating in public right-of-way. If required, due to traffic concerns, SAM will operate during non-peak hours to obtain field locates and inspections. If SAM staff has concerns about their safety, the appropriate city staff or local law enforcement will be contacted.



PROJECT TIMELINE AND MILESTONES

SAM will review and discuss the anticipated project timeline and milestones with the City of Pleasant Hill during the kick-off meeting. Any level of responsibility required of the city (i.e. providing existing data, pre-locating utilities, etc.) will be discussed and taken into consideration when finalizing the overall project timeline. Internal and external cost controls, along with any modifications to the proposed project schedule at the request of the city will be discussed during the kick-off meeting.

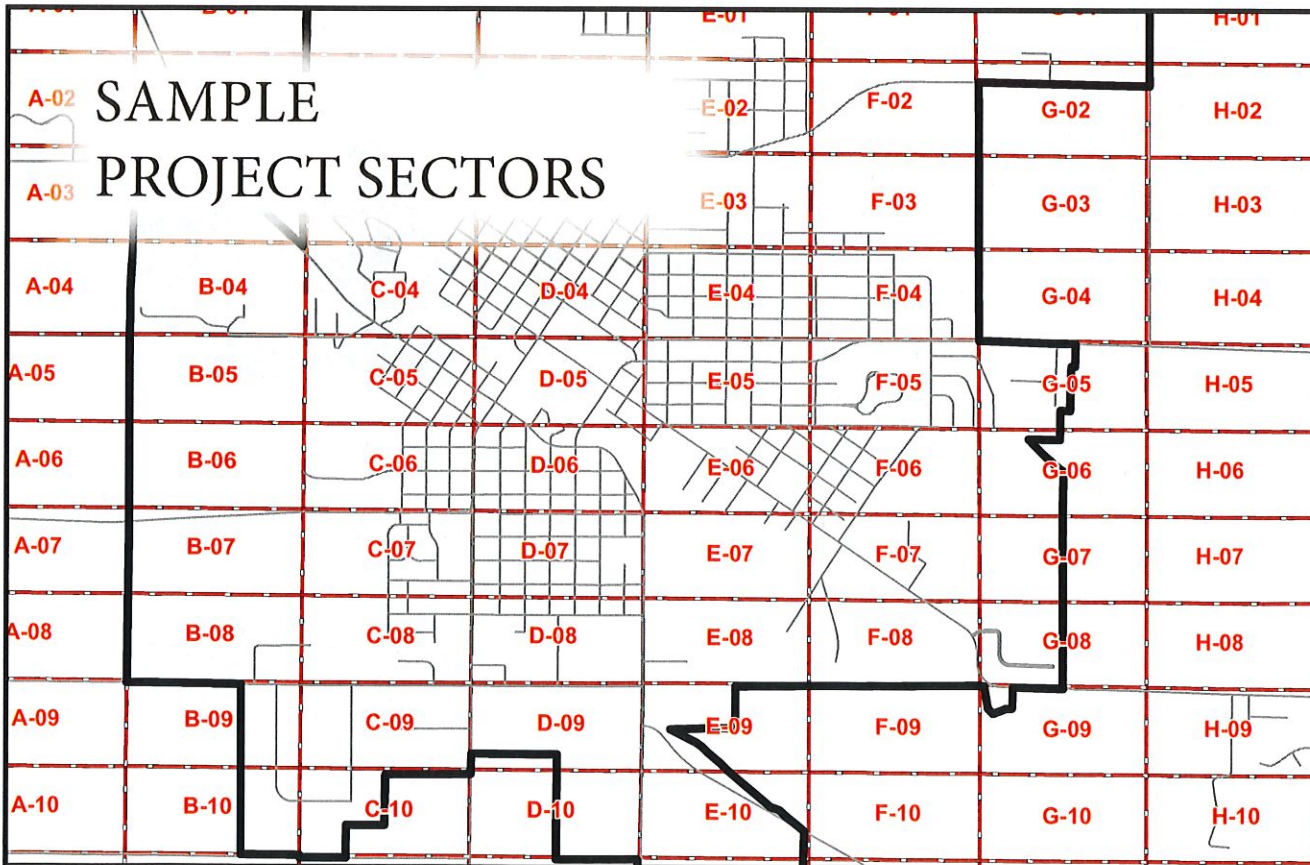
WORK SECTOR DEFINITION

SAM will work with city staff to define a grid and identify work sectors for the entire project area. The creation of these work sectors serves two very distinct and important roles during the project. First, the project sectors will be utilized by SAM field staff as a quality control measure. Field staff will work within each sector and complete all locates and inspections required prior to moving on the next sector. This allows for an efficient method of data collection and translates into cost savings and overall project quality.

Another benefit of working within project sectors is to provide city staff with an effective method to track progress and know exactly what part of the city SAM field staff is working in. The work sectors also facilitate preplanning during morning meetings for traffic control, city staff assistance and project reports to Pleasant Hill.

PUBLIC NOTIFICATION

SAM will work with city staff to ensure proper citizen notification. It has been our experience on similar projects that informing citizens about the field work will help to alleviate any concerns local residents may have. Notifications at City Hall, utility billing offices and the local newspaper or public access channel (if available) is highly recommended. SAM field staff will carry an informational letter on letterhead from the City of Pleasant Hill describing the project and the proper contact information in the event there are concerns from the public. It is also recommended that local law enforcement be notified about the project and that SAM field staff will be working in the area.



GEODATABASE DESIGN WORKSHOP

The most critical aspect of developing a functional GIS program is the development of the geodatabase. A geodatabase is a logical single-file format for organizing spatial data and corresponding datasets.

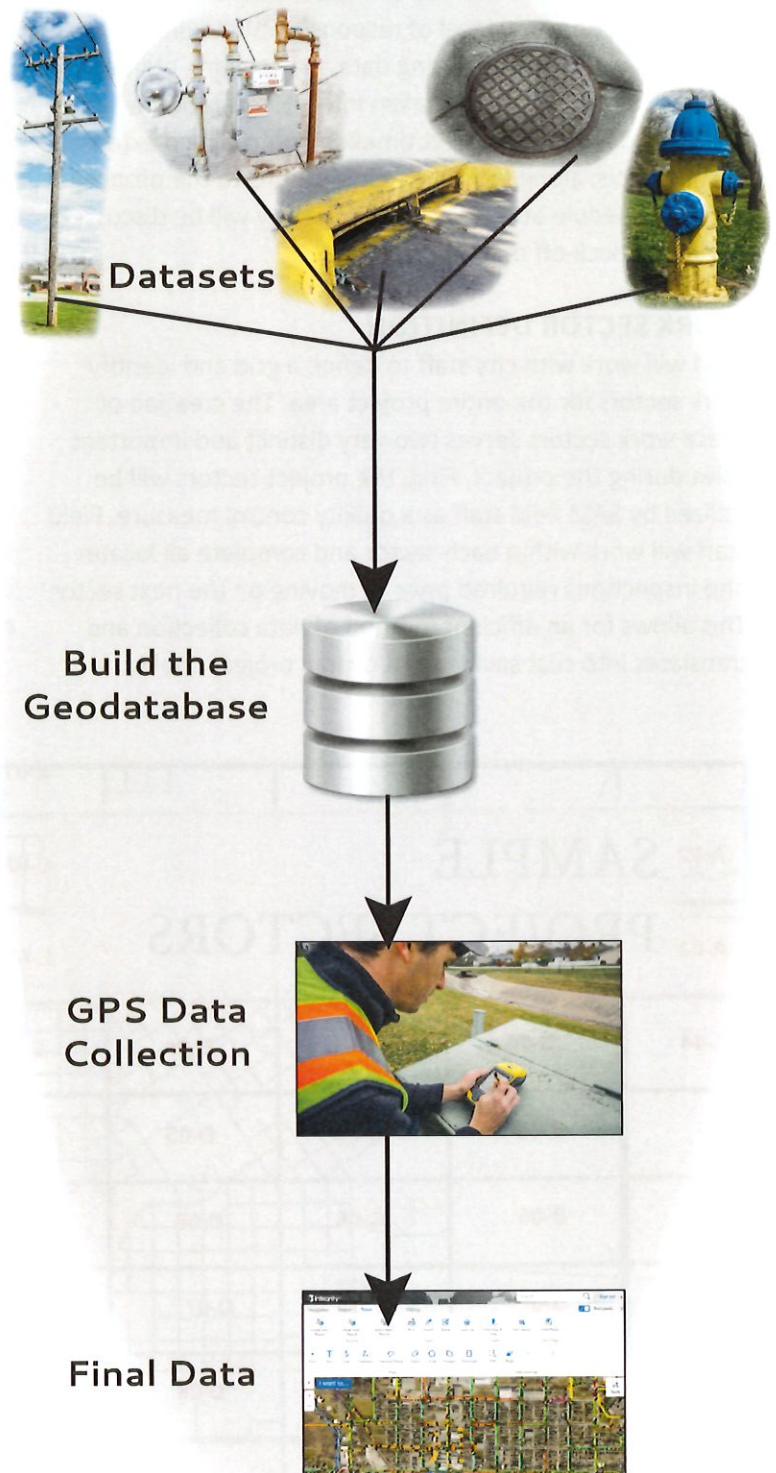
When creating the overall design of the geodatabase for Pleasant Hill, SAM will take into consideration the best model and structure to meet the needs of the city. The geodatabase will also be based on previous models from SAM, the published Esri utility model and future GIS needs, as identified by Pleasant Hill. Developing an accurate and functional geodatabase will enable users to:

- Store all GIS-related data in a centralized location
- Apply rules and relationships to the data
- Create a consistent and accurate database of spatial data
- Define relationship classes and topological enforcement rules
- Work in an environment that supports multi-user access and editing

Custom domains (pre-defined menus) will be built for each layer during the geodatabase design. These domains will be added to the custom field inspection application from SAM to ensure that field staff will collect clean and consistent data throughout the utility project. These domains will also be utilized by city staff for future management of the geodatabase to help simplify the editing and data management processes.

The upfront design process by SAM enables field personnel to collect data in a rule-based environment. This minimizes field coding errors by predefining attribute tables used in the field and maintains consistency in the data collection process.

Geodatabase Design



GPS Data Collection

SAM routinely utilizes Real-Time Kinematic (RTK) survey-grade and mapping-grade GPS technologies to locate utility infrastructure. RTK survey-grade technology is utilized for locating utility assets associated with sanitary sewer, storm water, gas and water features, resulting in centimeter-level accuracy (+/- 2 centimeters) and accurate elevations for sanitary sewer and storm water. Mapping-grade GPS equipment is utilized for locating electric and fiber utility infrastructure and provides decimeter-level accuracy (+/- 4 inches).



For this project, SAM will utilize RTK survey-grade GPS methods to locate the city's sanitary sewer utility network contained in the defined project limits. GPS surveys will be referenced to the Missouri State Plane Coordinate System to allow for direct insertion into the GIS program developed for Pleasant Hill. Horizontal (x,y) and vertical (z) coordinates will be obtained in the field for all utility features. Captured features through GPS surveys will include all features designated by Pleasant Hill during the planning phase of the project.

After thorough investigation by SAM field staff, a report containing all utility features to be located that were not found, or determined to be inaccessible, will be submitted to the City of Pleasant Hill. SAM will work with city staff to locate utility features during the clean-up phase of the project. This will allow SAM to collect features in a quicker and more efficient manner, translating into cost savings for Pleasant Hill and minimizing the impact on city staff.

DATA CONSISTENCY

SAM will employ our customized data collection field application that has been successfully used on other similar projects. All field data will be predefined for field staff to ensure accurate and consistent attribute collection. Field staff will run the custom application on the GPS controller unit to allow for quick and easy identification and navigation of the utility features.

DATA SECURITY & BACK UP

SAM will download and process the GPS field data for insertion into the project geodatabase. All data will be downloaded, transferred and backed up nightly via the internet to the SAM GIS office in Maryville, MO.

Every safeguard has been implemented to ensure that hardware or software failure does not interfere or risk our accurate data collection efforts in the field.

GPS REDUNDANCY CHECK

SAM will GPS locate five (5) percent of the features previously shot during the project. This process is part of the SAM standard field protocol and will be employed during the Pleasant Hill project. SAM will compile and process the results against the original dataset and verify the required accuracy tolerance is being met.





Sanitary Sewer Network GPS Field Data Collection

SAM will GPS locate the features associated with the city's sanitary sewer system. Typical features that are collected during this phase of the project include:

- Manholes
- Lift stations
- Force main valves
- Lamp holes (if present)
- Pre-located force main locations



In the event that Pleasant Hill is unable to identify the approximate location of the force main, as-built drawings will be utilized to retrace the location of the force main line. If the city's staff is unable to locate portions of the gravity main system during the cleanup phase, SAM will COGO as-built drawings into the GIS. This data will be loaded into the GPS controller and will be used to navigate to the approximate locations of the lost or buried manholes.

DATA COLLECTION SPECIFICATIONS:

- For consistency purposes, the north rim of the manhole will be located during the project.
- SAM will mark each manhole with survey marking paint after each manhole has been identified.
- Manholes that are inaccessible by GPS due to tree cover or satellite visibility will be noted and shot utilizing traditional survey methods (total station or level rod). All data will be coded as to the method of collection utilized.



How important is accurate GIS data for sanitary sewer?

The US received a **D+** overall for Sanitary Sewer Infrastructure according to the **American Society of Civil Engineers (ASCE)** Report Card for US in 2017.

56 million more people are expected to be added to a public sanitary sewer system by 2032 in the US – an increase of 23%.

There are over **800,000 miles** of public sewer lines in the US whose aging makes them more susceptible to structural failure, blockages and overflows.

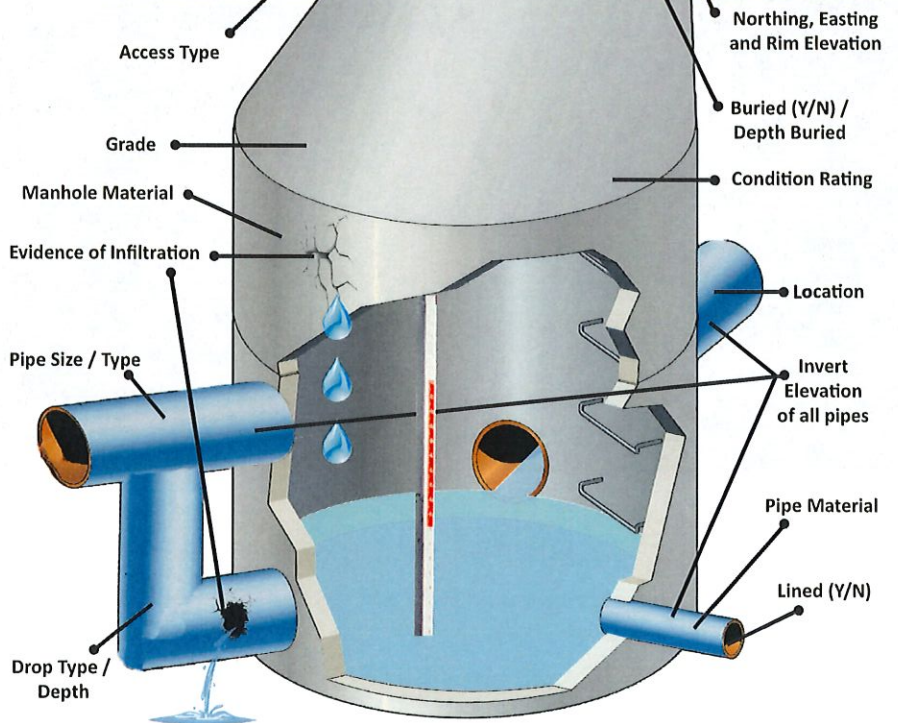
The ASCE recommends an asset management system for all utility networks.

SANITARY SEWER FIELD ATTRIBUTE COLLECTION

SAM will perform top-side manhole field inspections to collect manhole attribute data during this phase of the project. Manholes will be opened, inspected and attribute data collected. Any manholes that require further assistance in opening or gathering attribute data will be noted and SAM will work with city staff to gain access to the identified manholes.

Utilizing traditional survey measurement methods, SAM will obtain invert elevations for all incoming and outgoing mainlines, manhole depth and pipe size. This information will be collected by measuring down from the north rim location where the GPS elevation was acquired. Flow direction will be noted during the field inspection process. If during the inspection process SAM discovers any manholes that need immediate attention (back-ups, cave-ins, major obstructions or overflows), the appropriate staff will be immediately contacted.

All field data will be predefined during the kick-off meeting to ensure accurate and consistent attribute collection. Field staff will run the custom application on the GPS data collector to allow for quick and easy identification and navigation of the manholes.



The Environmental Protection Agency estimates that up to **75,000 sanitary sewer overflow** events occur in the US each year.

GIS Development | Pleasant Hill, Missouri

An essential step in the process of implementing a utility GIS program is integrating field data into a GIS mapping program and properly drawing the utility system to show network connectivity and a high-level overview of the city's infrastructure. SAM specializes in this "field to finish" approach for utility network development.

MAP AND DATA DEVELOPMENT

Sanitary sewer line segments will be created utilizing custom, in-house editing tools developed by the SAM development team. These tools will incorporate inspection data collected by field staff and will auto-generate sanitary sewer line segments illustrating flow direction, slope and exact length measurements. Quality assurance warnings have been built into these tools to verify positive slopes and to check for inconsistencies with pipe material and diameter.

The completion of all data collected and mapped by SAM personnel will not be final until approved by the City of Pleasant Hill. The QA/QC process listed in the Statement of Qualifications will provide appropriate communication and collaboration between the city and SAM to achieve accurate finalized data that the city can rely on.



Pleasant Hill, Missouri | Deliverables / Fee Schedule

After the staff at the City of Pleasant Hill has reviewed and approved all GPS located and attributed data, SAM will present a full set of deliverables to the city. All collected and mapped sanitary sewer data will be uploaded into the city's geodatabase and also integrated into the city's Integrity GIS website. The following deliverables will be provided:

- Esri ArcGIS Geodatabase containing datasets for sanitary sewer utility features.
- Esri map documents (.mxd)
 - 11x17 truck book map documents
 - 36x36 100-scale map documents
- Two (2) sets of bound 11x17 truck books
- One (1) full system wall map
- Three (3) Hours of remote Integrity training
- GPS Collection of new water infrastructure and GIS integration

GPS DATA COLLECTION & GIS DEVELOPMENT

Sanitary Sewer Utility Network	\$74,896.00
Water GPS Updates	\$500.00
Integrity Remote Training	\$500.00

**Fees are based on the number of estimated utility features as provided to SAM by the City of Pleasant Hill.*