Proposal for GIS Services for

SYSTEM MAPPING & GIS DATABASE

PREPARED FOR

Brian Lee
San Antonio Canyon Water Company
139 North Euclid Avenue
Upland, CA 91786

PREPARED BY

PACE
Advanced Water Engineering
17520 Newhope Street, Suite 200
Fountain Valley, CA 92708
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#B580 | August 29, 2019

PACE
Advanced Water Engineering

August 29, 2019

Brian Lee
San Antonio Canyon Water Company | 139 North Euclid Avenue - Upland, CA 91786
blee@sawaterco.com

Re: **2019 Mapping and GIS**
Professional GIS Services Proposal

Dear Mr. Lee,

We invite you to review the enclosed Professional Geographic Information System Services proposal we prepared following the instructions of your Request for Proposal document. Our proposal is based on our experience and expertise in both GIS database development and water infrastructure engineering and management, which will lead to a highly user-friendly logical system for you and your staff.

We appreciate the opportunity to be of service to the San Antonio Water Company and look forward to partnering with you to deliver valuable services to the Company. Please contact me if there are any questions or if we may provide any additional information.

Tony Howze
GIS Project Manager

mobile: (714) 599-1977 *office: (714) 481-7225* *e-mail: thowze@pacewater.com*
17520 Newhope Street, Suite 200 - Fountain Valley, CA 92708

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executive summary

EXECUTIVE SUMMARY

The San Antonio Water Company (the Company) recognizes the vast positive potential of a Geographic Information System (GIS) and would like to create a reliable, visual and centralized source of data for its domestic water and irrigation distribution system. The Company desires to consolidate its digital, hardcopy and photo records of assets within a simple-to-use GIS platform. ***PACE offers unique experience and expertise that includes water resource engineering services combined with GIS data development and support that will lead to a well-thought-out, organized and user-friendly GIS database that achieves full staff acceptance and adoption***. PACE has designed GIS applications specifically for water infrastructure networks and will collaborate with the Company to develop a logical and easy to maintain system for their infrastructure.

PACE GIS is a dedicated division of PACE that supports a wide array of water engineering needs using GIS. PACE GIS is well-versed in the various infrastructure components in water and irrigation distribution systems, as well as day-to-day operational and maintenance needs. These two areas of expertise will be combined to produce a logical data management system for the Company. ***Our team will be led by Tony Howze who manages PACE GIS and has over 20 years of GIS water resource management experience***. Our team offers several benefits to the Company for completing this effort and providing on-going maintenance support including:

- ***Demonstrated success with numerous completed water department projects*** provides in depth understanding of water department structure and needs.
- ***25+ years of experience producing hundreds of databases*** including pipeline networks, hydraulic and hydrology modeling results, project inventory, and application development.
- ***Currently maintain multiple levels of databases*** including 27 project-level file geodatabases, six enterprise-level databases on SQL Server, and our company project and client SQL Server database.
- ***Well-versed at training GIS procedures*** to ensure in-house GIS databases are easy to use by client staff.
- ***Web development, web design and online mapping application expertise*** ensures user-friendly interface for the Company staff.

Through research into the Company's existing infrastructure, review of available documentation and discussion with your staff, we have developed a proposed approach that uses the sophistication of GIS technology but produces a database inventory that is straightforward and highly logical to utilize. Highlights of our project delivery approach include:

Detailed Data Inventory of Existing Infrastructure

Hard copy reference records (as-builts, various documents, etc.) and digital records (AutoCAD drawings, etc.) will be methodically collected and converted for database input to ensure all existing records are captured and accurately identified.

Centralized Data Storage

The GIS data inventory will be located in a centralized cloud-based system where office and field staff will have access to all of the same datasets.

Familiar Data Organization Structure

System organization will incorporate naming standards and organization methods currently in use by the Company, where appropriate. Team will interview key users and stakeholders including administrative, operations and maintenance staff to ensure a naming and organizational structure is developed that works best for the Company.

Simple to Use Interface

Complete data inventory incorporating existing CAD and As-Built data (and other docs) converted into a user-friendly GIS system that doesn't require GIS expertise to operate.

Mobile- and Desktop-Ready

The GIS mapping application will be accessible in office and on location via mobile devices through a versatile interface. The application grants mobile users the option to work offline if cell coverage in the area is unavailable.

Defined Process for Identifying Data Update Needs

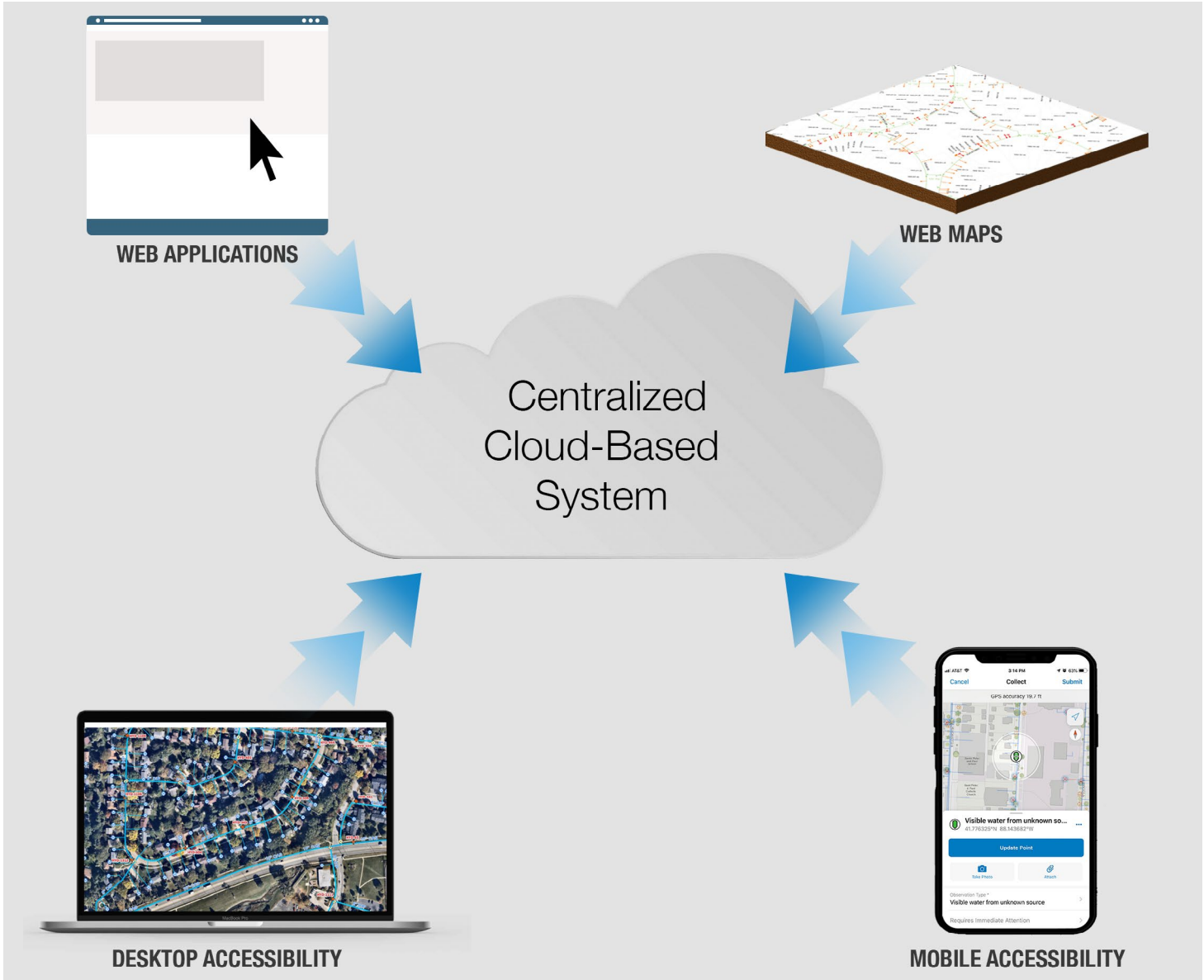
Field staff will be able to pin-point "water issues" such as maintenance needs, attribute and spatial discrepancies, directly into the GIS system that can later be referenced and updated by Consultant team.

Experienced Trainers

Former ESRI trainer will conduct multiple training sessions for both office and field staff including in-the-field training using mobile devices simulating real-world scenarios.

We have summarized key relevant and local experience within the enclosed proposal and you will see our GIS and water engineering experience ranges from small community / operational support to large county-wide inventory and planning efforts. Lessons learned from both small and large efforts will benefit the Company and will lead to a system that will be well-documented and easy for all staff in-office and in the field to use on a daily basis.

Our team is prepared to commence immediately on your project effort and will collaborate closely with staff to gain key insight into the goals with this database system and execute the project efficiently.



Cloud-Based Centrailized System

firm background and experience

FIRM BACKGROUND AND EXPERIENCE

About PACE

PACE (Pacific Advanced Civil Engineering, Inc.) is a specialized civil engineering firm offering advanced water resource services and GIS specialization. We offer a wide range of engineering services related to stormwater management, water, wastewater, water resource permitting and regulatory compliance to ensure projects are both economically viable and environmentally sustainable. Our engineering approach focuses on maximizing value by creating multi-use infrastructure systems, cost-effective phasing strategies and systems that include environmental, aesthetic and recreation uses. PACE staff members include licensed professional engineers with PhDs, scientists, university instructors and policy-makers in the water resource arena.

PACE specializes in Advanced technology applications with Geographic Information Systems (GIS), providing understanding of complex data through unique mapping and analytical techniques. GIS provides customized solutions and advanced presentation of data. Data can be managed and analyzed efficiently to discover trends and provide answers to challenging questions using specialized GIS procedures. Advanced analyses and modeling techniques are provided utilizing this powerful tool through focused expertise in water resources.

CORPORATE STATISTICS

Size: 75 employees (approx.)

California Office:
17520 Newhope St., Suite 200
Fountain Valley, CA 92708

Arizona Office:
8723 E Via de Commercio #B-102
Scottsdale, AZ 85258

Incorporation Year: 1987

State of Incorporation: California

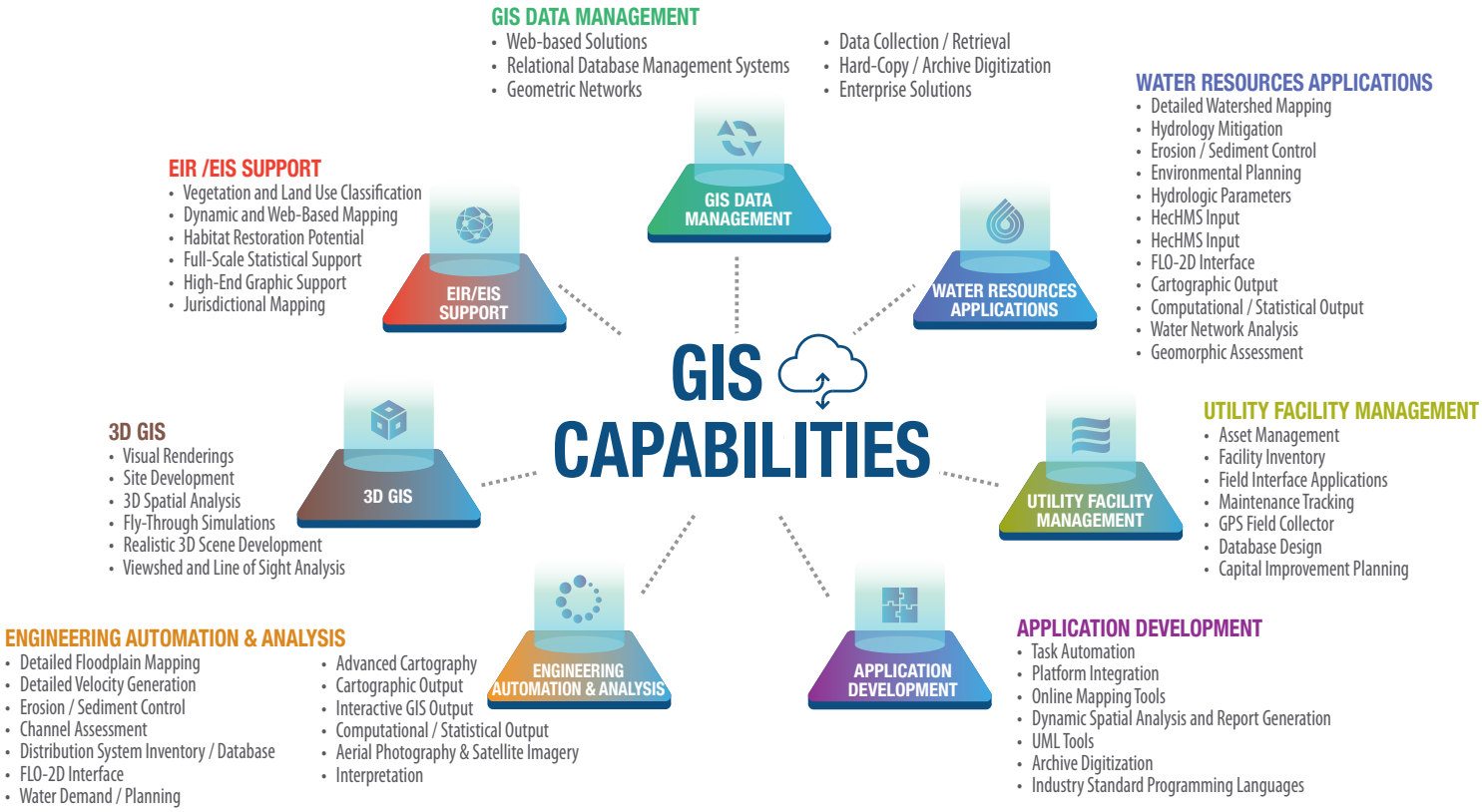
Firm Type: Environmental / Civil Engineering

Employees located in Orange County: 68

Proximity to the Company's Office: Approximately 40 miles (same day responsiveness)

CA DIR Registration #: 10000017902

GIS Capabilities Include:



Unique Qualifications

PACE's extensive experience in water systems engineering and onsite construction and operations, coupled with a focus on advanced research and development capabilities, provides unique and high value civil engineering projects.

- ***Demonstrated success with numerous completed water department projects*** provides in depth understanding of water department structure and needs.
- ***25+ years of experience producing hundreds of databases*** including pipeline networks, hydraulic and hydrology modeling results, project inventory, and application development.
- ***Currently maintain multiple levels of databases*** including 27 project-level file geodatabases, six enterprise-level databases on SQL Server, and our company project and client SQL Server database.
- ***Well-versed at training GIS procedures*** to ensure in-house GIS databases are easily maintainable by client staff.
- ***Web development, web design and online mapping application expertise*** ensures user-friendly interface for Company staff.

Subconsultant - Database Server Development / Support

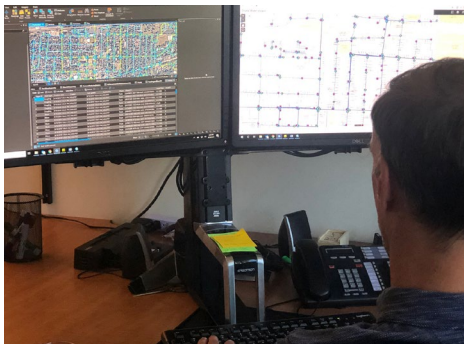
IThinkSource is a specialty firm entirely focused on providing technology support services for businesses based in Orange County. The company's forte is complex business/technology environments (high speed data/networking, multiple server environments, complex LAN/WAN networking, etc.). IThinkSource's current base of clients exceeds 100 firms and the company founder, Gary Tolosa has been active in the business technology space for over 30 years.

The company's focus is to not just be an outside IT support team. Rather, they prefer to work as part of your team, providing technology support and guidance to ensure clients are properly positioned (from a technology perspective), for the future. Thus, they take the time to get to know our clients, their specific needs as a business, and work directly with them to provide optimal technology implementations/solutions.

IThinkSource will support the team with the development of the database server and supporting IT infrastructure.

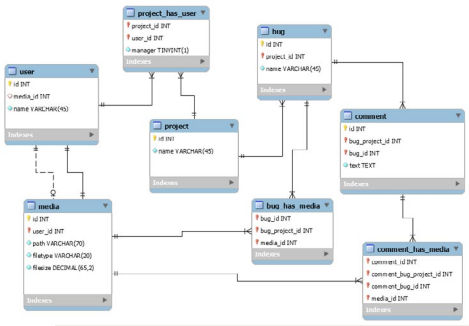
Experience with Developing and Maintaining a GIS Database

PACE GIS has produced hundreds of databases throughout our 25 years of cumulative experience including pipeline networks, hydraulic and hydrology modeling results, project inventory, and application development, to name a few. PACE GIS is currently operating and maintaining 27 project-level file geodatabases, six enterprise-level databases on SQL Server, and is responsible for maintaining our company project and client SQL Server database used for a company-wide intranet application. Our day-to-day operations include using many of our databases to produce project analysis, prepare reports, and make sure all developed applications are up-to-date and issue free. In addition, PACE has developed multiple day training sessions to help explain GIS procedures to client staff in order to have in-house maintenance of the GIS databases. This experience gives PACE GIS a deep understanding of how to tackle the most complex projects and design a database for successful GIS projects.



Experience Developing Policies and Procedures

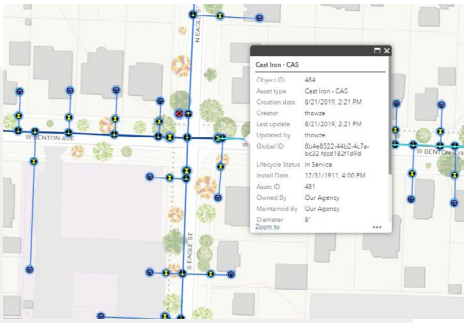
Database policies and procedures are an important aspect of successful database design and maintenance. At the start of each large database design, it is important to establish the goals of the database and any applications that may be utilizing the information.



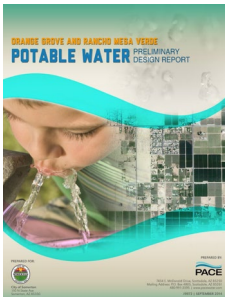
Database Schemas

Database Schemas are important to the design process of the database. To put this simply, the Schema is used to get everyone and everything on the same page. A database schema dictates what tables are produced, how the data will be formatted, what attribute fields will be available, what those attributes will contain, and it determines how database relationships are managed. PACE GIS has used many of the water resources and water distribution database schemas available. The water distribution schema creates features for mains, fittings, valves, wells, pumps, laterals, meters and more. Each of these geographic layers will contain a number of attributes that will help add intelligence to the data. For instance, the water distribution mains will contain fields such as facility ID, length, material, size, date installed, status, and etc. The lateral's attributes will look similar to the main pipeline attributes, but will also contain a Main ID and Meter ID. This Main ID and Meter ID will relate to the main line and meter that the lateral connects. This is one of the examples of how the schema database design establishes the relationships between these features. The schema also dictates how the data is inputted by directing the user input and connection rules.

Geometric Networks



A geometric network is a feature available in geodatabases. The geometric network is set of rules for databases for network design such as water distribution. The geometric network maintains data integrity by establishing attribute and data connection rules. For example, when a user inputs a new customer, the network will need a new meter, the meter will need a lateral connected, and the lateral must connect to a main with a fitting. If the user fails to input any one of these items, the geometric network validation process will inform the user items are missing. Additionally, the network can be optimized for data input with general assumptions. For instance, when a user inputs a new distribution main, defaults can be established such as 12" PVC Schedule 40 with a 12" coupling at either end of the pipeline. These default values can help reduce tedious attribute inputs for the data editors.



Experience in Water System Planning

PACE is uniquely positioned to support the Company with their GIS project goals as a firm that is focused in water engineering needs, with extensive water system planning, engineering, construction and operation, as well as utilizing GIS tools to support all water system functions. We have been on many sides of the water system planning such as preparing construction drawings for water delivery systems, designing water treatment facilities, preparing water balance models, creating water distribution GIS databases, and have prepared training for GIS operation of distribution systems. This experience dovetails into the Company's goals of converting existing paper maps and digital data into a functioning GIS, developing an inventory database of all the Water Company's facilities, creating an online tool for field staff, and training the Company staff on how to operate and get the most of the application.

Similar Projects with Other Water Departments / Districts and Local Experience

The PACE team has worked with numerous water departments, districts and agencies on projects that involved GIS services, and we also have a wide range of experience on projects throughout the local region both recently and currently. This experience gives us a great understanding of local conditions, constraints and requirements leading to the application of the best practices and most efficient project execution on the Company projects. Select experience is highlighted on the following page along with the GIS related services performed on those projects.

WATER DEPARTMENTS / LOCAL PROJECTS	Database Development	Utilities Mapping	Data Inventory	Utility Network Development	Data Conversion	Site Characteristics	Field Survey Data Management	Online User Interface Development
Barona Water Authority	●	●	●	●	●	●	●	●
City of Somerton	●	●	●	●	●		●	
Orange County Public Works Watershed Management Division	●	●	●		●	●	●	●
City of Long Beach	●	●	●	●	●	●	●	●
Tri-City Sanitation District	●	●	●		●		●	●
Jurupa Valley Riverbend Stormwater Management	●	●	●		●		●	●
Banning Atwell Stormwater Management	●	●	●		●		●	●
Orange County Water District		●	●					
Los Angeles County Dept of Public Works Water Resources Division and Fire Dept		●			●			
City of Redondo Beach		●			●			
Ventura County Watershed Protection District	●	●			●	●		
Riverside County Flood Control and Water Conservation District	●		●		●	●	●	
Metropolitan Water District of Orange County	●		●		●	●		
Mountain House Community Services District	●	●			●			
Rancho Mission Viejo Mutual Water Company		●			●			
City of Rialto		●	●					

Procedures and/or Policies Associated with or Related to Work Quality and Cost Control

Work quality and cost control for GIS projects is an important aspect of having a successful project. The first thing PACE does with each project is to develop a clear understanding with the client on expectations and project goals. Many problems with cost control and work quality happen when there is a misunderstanding of the final product between client and consultant. For this reason, we will try to be as direct as possible on what items will be delivered in this proposal, we layout all assumed deliverables and welcome input from the client after review.

careful budget planning

We will develop a work cost matrix for each task to determine hourly cost for each task deliverable. We will determine the cost effective staff member to perform certain tasks that fit their experience level. In addition, PACE has a well-developed internship program that provides inexpensive labor for supervised tasks such as database data collection and input.

on-going communication

Status meetings at routine intervals will keep the client team informed of the project's progress. If any unforeseen roadblocks or issues develop, they will be communicated to the client immediately.

work quality assurance procedures

Work quality can also be greatly enhanced by a well thought out database design. This design includes rules for attribution and policies and procedures for data development. Detailed connectivity rules in a geometric network can help make sure data integrity is being maintained. Finally, all data will be reviewed by senior staff and be sent to the client for review before final submission is delivered.

Management and Organizational Capabilities

PACE GIS is supported by 65+ technical and administrative staff located in the company's headquarters office all specializing or supporting water infrastructure engineering. The team can help with interpretation of water system as-built documents, database organization structure to best accommodate operations needs and support the project directly with staffing needs to achieve project goals.

Verification of Professional Liability Insurance

PACE verifies insurance for coverage of no less than $1,000,000. See details below:

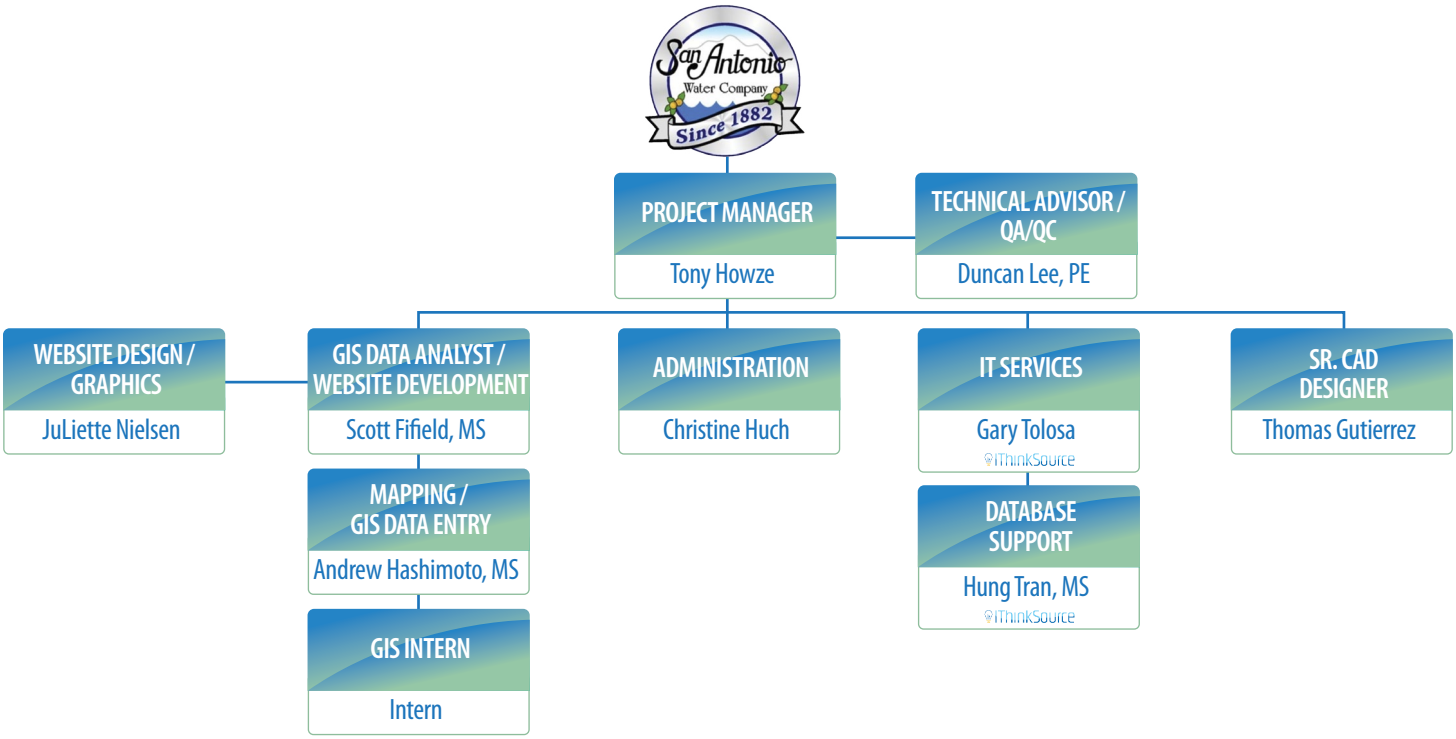
- General Liability: $1,000,000 per occurrence / $2,000,000 aggregate
- Automobile Liability: $1,000,000 (combined single limit - each accident)
- Excess Liability: $10,000,000 each occurrence/aggregate
- Worker's Compensation and Employers' Liability: $1,000,000 (EL each accident, EL disease - each employee, EL disease - policy limit)
- Professional Liability: $3,000,000 each claim / $6,000,000 aggregate

project organization and experience of the project team

PROJECT ORGANIZATION & EXPERIENCE OF THE TEAM

Project Organization Chart

Below is an organization chart of all team members that may be assigned to a project for the San Antonio Water Company including their identification and responsibilities. The Project Manager and proposed personnel's experience is included in their resumes on the following pages.



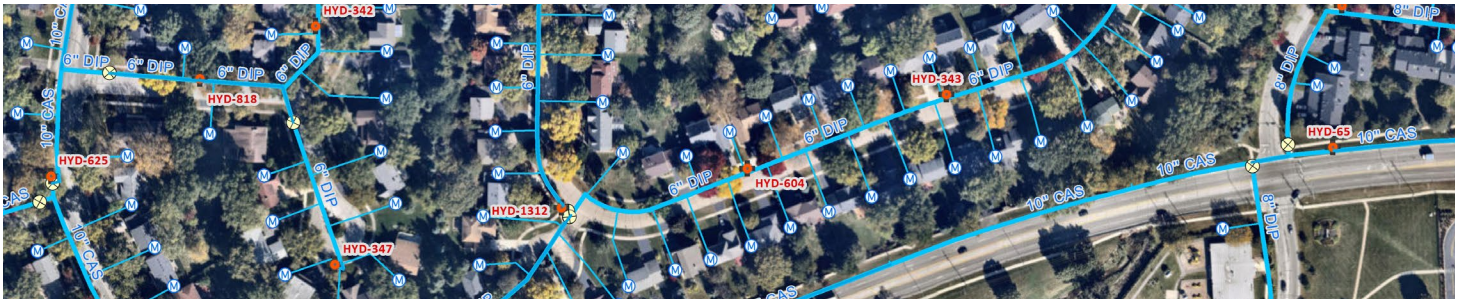
Project Management Approach

Our approach to the project execution will include the following basic elements:

- Completion of all work efforts out of headquarter office in Fountain Valley, CA.
- Training and implementation will take place on-site at the Company's office.
- Assign experienced and qualified team members to the project to provide the Company with a quality product and meet the schedule for completion.
- Maintain a close, interactive relationship between the Company and Project Team.
- Provide a cost-effective approach.
- Assurance that our analyses consider all the critical elements of the project to assure the success of all applications of the system.
- Produce thorough and complete documentation.

subconsultant management

Agreements with our subconsultants will be followed by detailed task orders delineating the budget, schedule, and scope. These task orders will be monitored for progress and compliance. We will track the resources and the costs against the planned targets to ensure the resources are efficiently employed. Our subconsultant selection within the team depends on a well-organized planning and conceptual design process that uses staff only when needed for as long as needed and is delineated by the specific project requirements and locations.



the QA/QC process

The Quality Assurance / Quality Control Program places responsibility at the level of the organization closest to production of each work element. A peer reviewer is designated to check/ back check, make conclusions on design/programming methods and decisions. The designer and peers are encouraged to discuss approach and identify points of agreement and disagreement. Areas of disagreement will be noted and discussed with the Project Manager.

levels of review

Independent senior level reviews are designed to go beyond a "2+2" check format to provide guidance on alternatives to the design, logic checks of the design assumptions and conclusions, and to review compatibility with other disciplines' work which may affect the task. The independent reviewers are expected to comment on functionality, compare implementation cost to budget and suggest potential cost savings. Finally, the Project Manager checks each submittal to assure design standards and conformance with project concepts as well implementation and ongoing maintenance costs. In addition, PACE conducts quality assurance and quality control reviews of subconsultant work.

San Antonio Water Company coordination

The Project Manager will be the project's primary source contact with the Company. All correspondence to the Company, whether incoming or outgoing, will be through the Project Manager. The Project Manager will keep the Company informed of the project progress on a monthly basis unless otherwise indicated in the work plan or contract work scope. The monthly progress reports will at a minimum include:

- Schedule status
- Work planned for upcoming month
- Progress to date
- List of issues which may affect the project

In addition to the progress reports, an Action Items Matrix (AIM) will be prepared and monthly updated provided to the Company. The AIM will identify actions to be accomplished, description of the activity, date for completion and lead person / agency responsible for ensuring the action is completed.

schedule and budget control

Adherence to the project schedule is achieved by managing the project through a continuous analysis of staffing requirements and production cost / schedule monitoring. Taking into account the information contained in the detailed production schedule and transforming it into staffing requirements results in a staffing requirements plan. During the project, we will employ time-tested techniques of scope control management. Upon resolution and incorporation of any of the Company review comments on the database design, the PACE Team will follow the Company's standards for milestone submittals and final design completion, and we will design to the cost standard developed. Internal variance thresholds will allow the project team to identify potential issues and to prepare workarounds before they impact the progress of the overall project. External thresholds will be used to ensure timely notification to the Company of issues requiring collaboration.

TONY HOWZE

PROJECT MANAGER

Tony Howze has more than 22 years of GIS experience with public works, planning, and engineering. Mr. Howze has a Bachelor of Arts degree in Geography along with numerous certificates in the field of GIS: Application Development, Hydrology and Hydraulics Analysis, Spatial Analysis, 3D Analysis. He has specialized skills in database design, database management, and application development. He leads the GIS and Drone Services group which provides GIS support for spatial analysis, hydrologic modeling applications, map production, and all sUAV products such as digital elevation models, detailed aerial photography, and video production.

EDUCATION

B.A. Geography, California State University, Long Beach

YEARS OF EXPERIENCE

Joined PACE in 2005

With others over 8 years.

AFFILIATIONS

American Association of Geographers (AAG)

Floodplain Management Association (FMA)

American Water Resource Association (AWRA)

SCOPE RELATED EXPERTISE

GIS Hydrology & Hydraulics Analysis
GIS Spatial Analysis
GIS Application Development
GIS Database Development
GIS Data Administration
Web Mapping Applications
Geometric Network Design
Asset Inventory

RELATED EXPERIENCE

Barona GIS Mapping – Lakeside, CA

Mr. Howze served as the Sr. GIS Analyst to develop an accurate GIS-based asset inventory to support overall infrastructure asset and maintenance management for the Barona Band of Mission Indians. Infrastructure information was mapped and verified in the field for the water and sewer systems, house connections, and septic systems. There were approximately 300 homes, 5 water tanks, 32 water wells and 220 hydrants that served the area. PACE also developed a training program and data and procedural standards to enable Barona staff to gather data in sensitive areas, and to maintain the database in the future. Mr. Howze also created an online mapping application of the water distribution system for staff to review, locate facilities, and help plan future maintenance.

Orange County Watershed Hydromodification and Infiltration Management Plan – Orange County, CA

Mr. Howze compiled a comprehensive GIS database for all of Orange County, which was organized in order to perform an assessment of hydromodification susceptibility, infiltration potential, and potential BMP location. Mr. Howze and his team created thousands of subbasins, modified and updated storm drains, and developed a user application that performs a preliminary hydromodification site assessment for the existing and proposed land uses. The application is being developed for the County's website for public use.

City of Somerton Sewer Master Plan – Somerton, AZ

Mr. Howze developed a new technique to produce a sewer system capacity analysis within GIS. The strategy was to quantify the volumetric and flow difference between actual condition and capacity at each individual main segment. The tool enables a user to change from existing condition to build-out scenarios in order to flag any main that hits our capacity threshold of 90%. The master plan used the information provided by the GIS group to plan improvements needed for future growth.

Tri-City Sanitary District Proposed Sewer System – Miami/Claypool/Globe, AZ

Currently, the existing facilities within the service area are privately owned septic systems and cesspools. Due to failure of many of the existing septic systems and cesspools, TRSD wanted to propose a wastewater collection and treatment system. Mr. Howze led the GIS team to generate a sewer system alignment with the maximum amount of connections. The data was generated to be incorporated into a facilities management software with unique asset identification, connectivity rules, and industry-standard utility attributes. The database is designed to grow with the District and their operation procedures as the sewer system is built.

River Islands Urban Stormwater Management System / Pump Station System – Lathrop, CA

Mr. Howze developed a new technique to produce a sewer system capacity analysis within GIS. The strategy was to quantify the volumetric and flow difference between actual condition and capacity at each individual main segment. The tool enables a user to change from existing condition to build-out scenarios in order to flag any main that hits our capacity threshold of 90%.

SCOTT FIFIELD, MS

GIS ANALYST

EDUCATION

M.S. Information Systems with a focus in GIS, Claremont Graduate University

B.A. Finance with a minor in Information systems, California State University, Long Beach

YEARS OF EXPERIENCE

4 years

Joined PACE in 2015

SCOPE RELATED EXPERTISE

GIS Database Administration

GIS Data Editing

CAD to GIS Conversion

Website Development

Web Mapping Creation

Scott Fifield has over 4 years of GIS experience with public works, planning, and engineering. Mr. Fifield has a Master of Science degree in Information Systems with a specialization in Geographic Information Systems. Mr. Fifield specializes in cartography, database management, and application development. As a strong asset to the GIS team, Mr. Fifield provides GIS support for spatial analysis, hydrologic modeling applications, map production, and data management.

RELATED EXPERIENCE

Orange County Watershed Hydromodification and Infiltration Management Plan – Orange County, CA

Mr. Fifield served as the GIS Analyst to create thousands of subbasins, modification of storm drains, and oversaw the development of a user application to perform a preliminary hydromodification site assessment for existing and proposed land uses. The application is being developed for the County's website for citizen use.

City of Somerton Sewer Master Plan – Somerton, AZ

As the GIS Analyst, Mr. Fifield assisted in the developed a new technique to produce a sewer system capacity analysis within GIS. The strategy was to quantify the volumetric and flow difference between actual condition and capacity at each individual main segment. The tool enables a user to change from existing condition to build-out scenarios in order to flag any main that hits our capacity threshold of 90%. From the results enabled from this technique, Mr. Fifield produced dozens on maps.

Tri-City Sanitary District Proposed Sewer System – Miami/Claypool/Globe, AZ

As the GIS Analyst, Mr. Fifield worked with lead Engineers and clients to generate a sewer system alignment with the maximum amount of connections. The data was generated to be incorporated into a facilities management software with unique asset identification, connectivity rules, and industry-standard utility attributes. The database is designed to grow with the District and their operation procedures as the sewer system is built. Mr. Fifield developed hundreds of exhibits for both internal analysis and demonstration of the sewer system alignment to the client.

Floriani Ranch 1750 Acer Master Plan Development – San Benito County, CA

Mr. Fifield assisted in the development and maintenance of several topographic models used for the creation of watersheds, floodplains, and topographic workmaps. These results were in turn used to develop multiple sets of hydrologic parameters for further analysis. He worked with the engineering group to develop several HECRAS models of the Pajaro River for floodplain, flow depth, and velocity generation. Additionally, Mr. Fifield worked on the creation of several exhibits for visualization of the analysis efforts by the GIS and engineering groups. He is also responsible for the development, organization, and maintenance of the GIS database leveraged for this project.

Butterfield Ranch Regional Flood Control Master Planning - Banning, CA

As this project is separated into multiple phases, Mr. Fifield developed several exhibits and web applications for the visualization of the different site layouts, hydrologic parameters, hydraulics, and grading plans over the lifespan of the entire project. Due to the extensive and rapidly-changing nature of this project, data management is of the upmost importance. Mr. Fifield has developed the GIS database to be consistently up to date to insure that all GIS data matches the CAD and engineering data. Mr. Fifield has also supported the engineering group through floodplain, flow depth, and velocity analysis for each phase of the project.

ANDREW HASHIMOTO, MS

GIS TECHNICIAN

Andrew Hashimoto has over 3 years of GIS experience with public works and engineering projects. With his Master of Science Degree in Geographical Information Systems, Mr. Hashimoto applies his expertise in database management and editing to every project. Recently, for the Tri-City, Mr. Hashimoto was the main database editor updating and creating sewer alignments, sewer sheds and parcel connections in our enterprise-wide SQL Server Database. Mr. Hashimoto has taken the Tri-City data and helped post the information to PACE's ArcGIS Online Organizational Account and helped author the client viewed web maps and applications.

RELATED EXPERIENCE

Orange County Watershed Hydromodification and Infiltration Management Plan – Orange County, CA

PACE compiled a comprehensive GIS database for all of Orange County in order to perform an assessment of hydromodification susceptibility, infiltration potential, and potential BMP location. The team created thousands of subbasins, modified and updated storm drains, and developed a user application that performs a preliminary hydromodification site assessment for existing and proposed land uses. Mr. Hashimoto served as the GIS Technician to geocoded 7,000 existing best management practice (BMP) locations throughout the County, as well as created and modified a contributing area for each BMP to find how much acreage was being treated from the existing BMPs. This application is being developed for the County's website for citizen use.

City of Somerton Sewer Master Plan – Somerton, AZ

PACE developed a new technique to produce a sewer system capacity analysis within GIS. The strategy was to quantify the volumetric and flow difference between actual condition and capacity at each individual main segment. As the GIS Technician, Mr. Hashimoto created and edited the proposed sewer line/parcel data in the GIS database. He also input data into the existing building footprints to include the number of levels. This allowed more accurate calculation of the EDU for each parcel. The tool enables a user to change from existing condition to build-out scenarios in order to flag any main that hits our capacity threshold of 90%. The master plan used the information provided by the GIS group to plan improvements needed for future growth.

Tri-City Sanitary District (TDRS) Proposed Sewer System – Miami/Claypool/Globe, AZ

Currently, the existing facilities within the service are privately owned septic systems and cesspools. Due to failure of many of the existing septic systems and cesspools, TRSD wanted to propose a wastewater collection and treatment system. PACE generated a sewer system alignment with the maximum amount of connections. Mr. Hashimoto served as the GIS Technician to create and edit the proposed sewer line/parcel data and worked with the tabular data within the GIS database. This data showed which parcels the proposed sewer line went in front of or passed through, where easements would be needed, where to build larger diameter pipes, where to install pump stations, and where to build force mains. The data was generated to be incorporated into the facilities management software with unique asset identification, connectivity rules, and industry-standard utility attributes. The database is designed to grow with the District and their operation procedures as the sewer system is built. Mr. Hashimoto also visited the project location prior to the opening of the voting polls to measure the notice posting locations using a Trimble Geo 7x to confirm the signs were spaced properly in accordance to regulations.

EDUCATION

M.S. Geographical Information Systems, California State University, Long Beach

B.A. Geography Environmental Studies with minor in GIS, University of California, Los Angeles

YEARS OF EXPERIENCE

2 years
Joined PACE in 2017

SCOPE RELATED EXPERTISE

Data Input
Database Editing
Web Map Conversions
GIS Map Production
GIS Data Conversion

DUNCAN LEE, PE

TECHNICAL ADVISOR / QA/QC

EDUCATION
B.S. Civil Engineering
California State University, Long Beach / 1985

YEARS OF EXPERIENCE
30+ Years
Joined PACE in 2018

REGISTRATIONS
Professional Engineer / CA
1989 / 44825

Duncan Lee has extensive design, constrution, fincancial management, asset management, and operation and maintenance experience as he has served in several public agencies for nearly 30 years. His last role was about 17 years as the Principal Civil Engineer, in charge of the Water Engineering Systems for the City of Huntington Beach. His knowledge and understanding in both the water and wastewater industry includes master planning, design, construction, and rate studies, but his value is most felt in his proven ability unite engineering, operation, maintenance, and consultants in a productive and collaborative environment. Duncan adds significant value on a wide range of utility projects serving as the Principal / CA/QC Manager.

RELATED EXPERIENCE

City of Manhattan Beach Larsson Street Booster Pump Station and 2nd Street Pump Station Upgrades – Redondo Beach, CA

The City of Manhattan Beach needed to increase their potable water delivery capacity and reliability for the Hill Area Pressure Zone (HAPZ) as well as rehabilitate the Larsson Booster Pump Station. Mr. Lee is serving as the Principal QA/QC for the design of four pumps with vertically-mounted, end-suction pumping equipment and modern motor controllers for the Larsson Booster Pump Station to increase the delivery capacity to as much as 4,400 gpm, while maintaining a small footprint within their existing volt. PACE conducted a preliminary assessment of the aging 2nd street pump station and confirmed that a new pump station was necessary for the 2nd street pump station as well, not only to resolve the vibration and maintenance issues, but to improve the reliability of the engine and to modernize the aging equipment. PACE is currently generating drawings for the two new pump stations including the preferred sequence of construction to minimize any impact to the current operations of the facility.

Peck Reservoir Pump Station Improvements – Huntington Beach, CA

Mr. Lee served the City Engineer for an improvement design prepared by another firm and then final design plans and construction services of the structural, mechanical, and electrical modifications for the booster pump station to allow for build-out of a new hybrid pumping system. The hybrid pumping system includes four new electric motors coupled to the booster pumps, which have the ability to use either electric powered motors, or natural gas engines for providing pumping needs.

Downtown Huntington Beach Alleyway Cast Iron Water Main Replacement – Huntington Beach, CA

Mr. Lee served as the City Engineer for this cast iron pipe in alleyway replacement program, identified in the City's Water Master Plan. Approximately 9 miles of cast iron pipe was replaced with PVC and ductile iron pipe with diameters ranging from 6" to 12". Construction was difficult with numerous existing underground utilites in narrow right-of-way, and often required highlining as new pipe had to be placed back within the original cast iron pipe alignment. Many segments required approval by the state health department due to potable pipe to sewer separation. Since typical residential garages face the alleys, off-site temporary parking were arranged during construction activities, and numerous townhall meetings were held to minimize impacts to residents. Since pipeline construction with heavy equipment inevitably damaged existing alleys, which were already in poor condition, nearly all alleys were fully rehabilitated or required asphalt overlay.

Huntington Beach Well 9 GAC Filtration System – Huntington Beach, CA

Mr. Lee served as the City Engineer for the analysis and design of a complete 2,500 gpm (3.5 MGD) Granular Activated Carbon (GAC) filtration system treatment facility. The project included multiple phases of project development, lab services, piloting, concept development, water treatment engineering, startup, and operations support on this unique treatment system. A 200 ft. long and 8 in. wide PVC sewer pipeline was installed under Warner Avenue, a busy street with three lanes, to allow wastewater to be diverted into the new sewer line. To minimize odor and cost, PACE designed the pipeline using a shallow sewer line connection with a drop bowl assembly to create a smoother flow to minimize splashing, resulting in decreased odor.

THOMAS GUTIERREZ

SR. CAD DESIGNER

EDUCATION

A.A. / Applied Science, Computer Aided Drafting Technology
ITT Technical Institute, 1994

YEARS OF EXPERIENCE

25+ years
Joined PACE in 2001
With others more than 7 years

Thomas Gutierrez has more than 25 years of experience in design and preparation of mechanical plans, sections and details for engineered construction documents within water / wastewater industry. He has in depth knowledge of pumping systems layout, mechanical assemblies, fittings, valving, pipe materials and ratings, site grading, drainage, and utility plan/profile design (pressure and gravity systems). Mr. Gutierrez also has in-depth experience with design of mechanical 3D models of pump stations and treatment plants for construction drawings. His 3D design and modeling experience includes design and draft BIM-ready civil 3D pipe networks, surface models, grading and basic corridors for earthwork calculations and cross sections, process piping for complete plant layouts, and mechanical process equipment (i.e. blowers, pumps, etc.). Mr. Gutierrez is an advanced user of Autodesk AutoCAD 2011, Civil 3D 2011, and MEP 2011. He also has the responsibility of directing CAD staff and engineers to ensure project documents are accurate, professional and meet project goals. He is responsible for communicating with engineers and production staff to ensure all needs are met, this includes support, training and solving critical task obstacles.

RELATED EXPERIENCE

City of Somerton Potable Water System and Water Master Plan – Somerton, AZ

Mr. Gutierrez served as the Sr. CAD Designer for the design of the City of Somerton's new water infrastructure for the Orange Grove and Rancho Mesa Verde (OG/RMV) subdivisions to the City's existing water system. The infrastructure consists of a 1,500 gpm potable water and fire booster pump station and 180,000-gallon reservoir with backup power generation, site security, SCADA automation and controls and three segments of new piping (approximately 8,500 linear feet).

Potable Water Pipeline and Treatment System Improvements – LACFD Fire Camps 11, 13, 14, 19, and Henninger Flats Campground – Los Angeles County, CA

Mr. Gutierrez served as Sr. CAD Designer to design upgrades to aging potable water treatment systems for five remote sites owned by the Los Angeles County Fire Department to meet current Los Angeles County Department of Public Health regulations. Thousands of feet of potable water and irrigation pipeline improvements were also designed. A design was also developed of a modular surface water treatment facility that could be tailored to each site to achieve consistency of equipment and functionality and reduce overall maintenance costs for the Fire Department.

Peck Reservoir Pump Station Improvements – Huntington Beach, CA

To increase pump station reliability and redundancy, the City of Huntington Beach hired PACE to perform value engineering of an improvement design prepared by another firm and then final design plans and construction services of the structural, mechanical, and electrical modifications for the booster pump station to allow for build-out of a new hybrid pumping system. Mr. Gutierrez served as the Sr. CAD Designer for the hybrid pumping system, including four new electric motors coupled to the booster pumps, which have the ability to use either electric powered motors, or natural gas engines for providing pumping needs. The station design allows for flexibility, reliability and redundancy with multiple pumps, all capable of running in the event of a power outage, earthquake, natural gas line break, or an engine failure.

Lathrop Potable Water Storage Tank and Booster Pump Station – Lathrop, CA

Mr. Gutierrez prepared the design and construction documents for a new 3.6 MGD low-height welded steel storage tank and associated 7,500 gpm booster station to be constructed near the levee in Lathrop, CA.

Mesa Water District Pumping Infrastructure – Costa Mesa, CA

Mr. Gutierrez was the Production Manager for the upgrade of six northwest wells using AutoCAD Civil 3D. The wells have been improved with infrastructure to improve drinking water treatment and conveyance into the district's distribution system. The improvements included civil, mechanical, process, and electrical/controls upgrades.

GARY TOLOSA

PRESIDENT, ITHINKSOURCE CORPORATION

EDUCATION

B.A. Computer Information Systems
California State Polytechnic University, Pomona

YEARS OF EXPERIENCE

Worked with PACE 15 years,
30+ years in Business IT/Technology.

Gary Tolosa has more than 30 years of experience with business technology supporting complex enterprise and mid-sized computing environments. As President of IThinkSource, Mr. Tolosa oversees the computing environments of over 80 firms in Southern California. IThinkSource provides professional technology support and guidance for businesses located in Orange County, CA. IThinkSource provides technology support services for Pacific Advanced Civil Engineering (PACE) and in turn functions as a subconsultant for any technology related project work/needs for PACE.

RELATED EXPERIENCE

Pacific Advanced Civil Engineering – PACE, Fountain Valley, CA

Through IThinkSource, Mr Tolosa provides overall technology guidance, day to day technical support, planning and implementation of all infrastructure upgrades, as well as IT budgeting. The technical scope of effort goes beyond support of the technical infrastructure and all employees, but also includes technology support and guidance for PACE project work. Through IThinkSource, Mr. Tolosa is able to provide effective planning and support of the hardware/software needs of GIS applications/data, Controls systems, Monitoring systems, and advanced engineering modeling/simulation software. Mr. Tolosa has been providing technology support services for PACE in excess of 15 years.

SAN server infrastructure implementation/management – PACE, Fountain Valley, CA

Implementation of high speed, high redundancy virtualized storage infrastructure to accommodate the needs of high speed data access. PACE projects demand large scale data/software (ESRI – ARCGIS, Autodesk – CAD, Civil 3D, etc.) usage. Designed and implemented a specialized configuration to meet the heavy data demands. The configuration needed to provide the proper throughput to meet the heavy modeling needs while providing a highly reliable and secure computing environment. Dell EqualLogic hardware was utilized along with proper planning and configuration to properly meet these needs today, and into the future.

Server and Storage General Implementations – Southern California

As president of IThinkSource, Mr. Tolosa has managed the implementation of over 100 servers. Each implementation will have specific needs/requirements that must be accommodated, tested, and move to production. Servers and related technical infrastructures have been implemented in the following business markets: Manufacturing, Legal, Drone Surveying, Wealth Management, Import/Export, Construction, Distribution, Engineering, Insurance, Health Care, Paleontology/Archaeology, Software Development, Real Estate, Non-Profit, Marketing, etc.).

Application Implementations and Upgrades – Southern California

Beyond server infrastructure configurations, the installation, configuration, testing and implementations of software applications and databases has also been provided. This includes extensive email migrations, accounting/finance implementations and migrations. The list of software/application experience is varied and extensive, here is a partial list: Microsoft Server 2019 and prior, Microsoft SQL Server, Microsoft 365, ESRI – ArcGIS, Autodesk – CAD and Suites, Sage Software, BioWin EnviroSim, AES, Deltek – Ajera, Bentley products, Microsoft Exchange and 365, WordPress, etc. Implementations include: email migrations, database migrations, COTS application installations and migrations, web site development, engineering modeling systems, remote access, security, and backups/restoration of data.

HUNG TRAN, MS

VICE PRESIDENT TECHNICAL SERVICES, ITHINKSOURCE CORPORATION

EDUCATION

M.S. Information Systems

California State University, Fullerton

YEARS OF EXPERIENCE

Worked with PACE 15 years,

20+ years in Business IT/Technology.

Hung Tran has more than 19 years of experience in the IT and Information Systems industry with 14 of those years in supporting MSP managed environments. As Vice President of Technical Services for IThinkSource, Mr. Tran manages the implementation and maintenance of all aspects of computing systems and networking components for various firms in Southern California.

RELATED EXPERIENCE

Pacific Advanced Civil Engineering – PACE, Fountain Valley, CA

Through IThinkSource, Mr Tran provides planning, implementation, and support of all infrastructure (hardware and software).

Key Projects:

- SAN Upgrade
- 10G backbone
- Microsoft SQL database servers supporting ArcGIS
- Microsoft Exchange Upgrade

SAN server infrastructure implementation/management – PACE, Fountain Valley, CA

Implementation of high speed, high redundancy virtualized storage infrastructure to accommodate the needs of high speed data access. 10G ethernet backbone was designed and implemented to meet the heavy data demands. This provided the proper throughput to meet the heavy modeling needs while providing a highly reliable and secure computing environment. Dell hardware (multiple SANs) and Cisco Catalyst enterprise switches were utilized with proper planning and configuration to meet today's requirements in addition to being able to scale for future needs.

Server, Storage, and Networking General Implementations – Southern California

- Implementations and upgrades that include:
  - High availability, virtualization (VMware Vsphere, Hyper-V)
  - Servers (HP, DELL, IBM)
  - SANs (Dell EqualLogic, HP MSA)
  - Networking (Cisco, HP, Dell)
  - Next-generation firewalls and VPN (Cisco ASA, Fortigate, Sonicwall, PFSense).
  - Multi-site routing (MPLS, VPN tunnel)

Application Implementations and Upgrades – Southern California

- Implementations and upgrades that include:
  - Microsoft Solutions (Windows Server, SQL, Exchange, Skype for Business, Office 365, Sharepoint, Remote Desktop Services)
  - Cloud Hosted Environment (AWS, Azure)
  - Linux (Red Hat, Ubuntu)
  - PBX (Asterisk)
  - Web Hosting

project understanding and approach

PROJECT UNDERSTANDING AND APPROACH

Project Understanding

PACE understands that the San Antonio Water Company (Company) would like to develop a GIS-based asset inventory to support overall infrastructure asset and maintenance management. Infrastructure information will be converted from existing CAD drawings and reference documents including, but not limited to As-Built drawings. Attribute information will be derived from CAD text labels, CAD layering format, and reference documents. Approximately 1,000 sheets of reference documents will need to be scanned and organized. Additionally, the GIS database will be compatible with existing InfoWater software, asset management database, and existing accounting software.

Deliverables and Key Project Efforts:

1. Conduct a technical audit of relevant Company information regarding existing infrastructure including CAD drawings, paper maps, and other resources.
2. Prepare a database schema to address the Company's goals with the GIS database.
3. Develop an optimal strategy for data conversion from CAD and static resources to a GIS database.
4. Convert current AutoCAD drawings and paper-based map infrastructure to a GIS data inventory database.
5. Validate and update existing infrastructure records based on current documentation.
6. Provide a simple-to-use mapping application for office staff and field operators to view, print, and query mapped infrastructure.
7. Data will be centralized so all staff view the exact same information.
8. Develop training programs for both office staff and field crews to operate the mapping applications.
9. Integrate object data to include facility attributes from CAD and As-Built drawings:
   a. For linear features, attributes where appropriate (main, laterals, etc.):
      - Asset System (domestic or irrigation)
      - Asset Type (Transmission main, distribution main, fire hydrant lateral, domestic service lateral, fire service lateral, blow-off lateral, air-vac lateral, air release lateral, irrigation service lateral, etc.)
      - Diameter (inches)
      - Materials (Steel, CIP, DI, PVC, HDPE, AC, Copper, etc.)
      - Year Installed (if known)
      - HWL Pressure Elevation
      - Asset Status (Active, Inactive, Failed, Abandoned, etc.)

   b. For point feature, attributes where appropriate (isolation valves, pumps, meters, wells, backflow devices, fire hydrants, reservoirs, PRV valves, etc.):
      - Asset Type
      - Size
      - Normal Valve Position (Open, Closed)
      - Turns to Close Valve
      - Year installed (if known)
      - Manufacturer
      - Model #
      - Asset Status (Active, Inactive, Failed, Abandoned, etc.)
      - Asset ID
      - Account ID
      - Meter #
      - Latitude
      - Longitude

   c. For polygon features, attributes where appropriate (tanks, reservoirs, pump stations, pressure relief stations, lots, pressure zones, boundaries, etc.):
      - Type
      - Name
      - Year Built
      - Asset Status (Active, Inactive, Failed, Abandoned, etc.)
      - Facility ID
10. Data will be delivered in California State Plane NAD 1983, Zone V.

ASSUMPTIONS

The following are key assumptions for this Asset Inventory and GIS Development project:

1. There are two systems, consisting of the domestic and irrigation distribution systems.
2. The domestic supply contains 25 miles of pipelines, five reservoirs, and six booster pumps.
3. The irrigation supply has 21 miles of pipeline, seven wells, and four reservoirs.
4. The Company will provide existing AutoCAD sheets (approximately 36 unique files) in a digital dwg format.
5. The AutoCAD data is of reasonable spatial accuracy that meets the standards of the Company for this proposal.
6. The AutoCAD drawings are in a known standard coordinate system such as State Plane Zone V, with units in feet. If data is in a local coordinate system, an appropriate translation file will be provided to place the data into standard space.
7. The Company will provide As-Built drawing files with infrastructure elements in legible quality.
8. As-Built drawing information used to attribute the infrastructure will be considered accurate and will hold precedent over AutoCAD data unless the Company states otherwise.
9. The Company will provide appropriate ID values from the accounting software and asset depreciation databases to make appropriate relationships to facilities.
10. All office staff desktop computers will have internet access.
11. The Company will provide an appropriate training facility that includes all software and hardware necessary for successful instruction.
12. The office staff have at least basic level skills regarding Windows operating system and web site navigation.
13. Field staff have at least basic level skills regarding IOS operating system and web site navigation.
14. No field verification of infrastructure will be performed unless the Company authorizes PACE to perform optional field verification task described in Scope of Services.

Project Approach

A project delivery approach has been developed for the Company based on previous successful similar projects and key lessons learned that will help guide an efficient development of the GIS database. The key elements of the approach are as follows:

Obtain Staff Input to Determine Key Aspects of the GIS Database All successful projects begin with a clear understanding of expectations between a client and consultant. In order to begin this project, PACE staff will meet with the Company staff to go over all issues discussed in the scope of work. The objective of the meeting(s) will be to establish aspects of the GIS data inventory based on the Company's goals for the database including and not limited to GIS database features and fields, naming convention of scanned documents, workflow details essential to complete the project. PACE will prepare and deliver a Preliminary Deliverable Objective memo (PDO) that will summarize all findings. After the PDO is agreed upon by PACE and the Company, PACE will prepare a workflow to convert the AutoCAD drawing files to a water utility network within a GIS database. The database components will be refined by the PDO, but it is assumed at minimum to include all distribution and transmission lines, valves, hydrants, laterals, meters, wells, etc. The attributes of fields within the database will be determined in the PDO, and a list of preliminarily assumed attributes can be found in the Deliverables section.

Develop Well-Defined Data Organization Structure Much of this GIS conversion will depend on how the infrastructure items are organized within the AutoCAD drawing files. PACE will establish a technical review of the drawing files in order to develop a consistent data conversion work plan. First, the AutoCAD drawing files use a layering method for symbol weight and color. This layering is directly transferrable to GIS as an attribute. Based on the drawing files in the RFP, it appears the files are layered on pressure zones for the domestic lines and valves, active or inactive irrigation lines, blow-off, hydrant, air-vacuum valves, service laterals and meters. PACE will use this information to fill the appropriate attributes in the GIS. Text labels within the drawing files add more information we can input such as: PSI, diameter of the lines, other valves not within the legend, and more. Scripts and Geoprocessing tools will be developed to automate much of this process, but PACE is expecting a large manual effort to ensure data conversion accuracy.

Detailed Data Conversion Process PACE will scan each of the reference documents which are estimated at 1,000 hard-copy documents into a digital format. The scans will have a unique naming convention that will use document reference information. PACE will work with staff to develop a naming convention that uses familiar references, if possible. PACE will define this convention in the PDO. PACE will use the reference information to attribute the converted GIS features in the utility network. PACE will use the reference documents to QA/QC the spatial information, and will log any discrepancies between the documents and AutoCAD data. The discrepancies will be listed and sent to the Company for direction, when necessary. For each GIS feature, PACE will include the unique identifier of the reference drawing that was used to attribute the feature. This will allow the Company staff to search for the appropriate document on the Company's file server. This reference document connection will be designed to enable a geographic document management system at a later date, outside of this scope of work. The final data deliverable will be compatible with InfoWater data due to the fact InfoWater produces GIS data in shapefile format within the modeling software. The new utility network database will be a GIS Geodatabase format which both can be loaded and viewed in all GIS software packages. Additionally, PACE proposes to insert the account ID used in the Tyler utility billing software into the meter data within the GIS using exported tables of APN and account ID. PACE will also provide a detailed memo that documents the methodology to connect the asset management and depreciating asset database.

Cost-Effective and Easy to Maintain Cloud-Based Data Storage PACE will create a centralized data repository in a cloud-based application called ArcGIS Online (AGOL). This cost-effective solution operates online and is usable on desktop and mobile devices. The Company's AGOL organization account will be curated by PACE and PACE will customize the home page with the Company's logo, banner,

and the Company description. PACE will organize the web maps and applications for the Company staff based on two distinctions: Office and Field Staff. The centralized nature of this system allows staff to viewand utilize the same information in real-time as it is updated by PACE or with user notes. The web mapping applications will be suited to each staff member's needs. The field staff maps will be configured for mobile devices, and these applications will allow the user to add field notes of leaks, data discrepancies, positional discrepancies and more. The office staff will have web mapping applications to easily view the data inventory, search by address or parcel ID, and have customized pop-ups that provide essential information for their day-to-day operations.

Hands-On Training by Experienced Instructors to Ensure Full Adoption by Staff

Lastly, PACE will provide multiple training sessions to Company staff by an experienced former ESRI Trainer. There will be one four-hour session for office staff on how to navigate through the AGOL web site, how to operate the web mapping applications, and how to report updates needed to the system to PACE. The field staff will have two sessions, one four-hour session similar to the office staff training session and another four-hour session will be organized in the field to go over real-world scenarios. PACE will develop training materials for the classes and provide a manual of operation for both staff groups.

Data Inventory Map Example

Scope of Work

Task 01	**Project Management** This task includes our overall project management services including meetings, presentations, data standards, operations, maintenance, and quality assurance and quality control procedures of the GIS system.
1.1	**Bi-Weekly Meetings** Regular one-hour bi-weekly teleconference meetings will be scheduled for the duration of the project, estimated up to 16 meetings total. The meetings will include PACE and appropriate Company staff to provide updates on progress, issue resolution, and obtain feedback from Company staff, where appropriate. Additionally, PACE proposes to have up to eight in-person meetings at the Client offices to discuss any issues or items that often arise during a lengthy project, such as this. As experience dictates, PACE will need a contact from the Company that has experience and expertise on the Company's facilities and operations that we can discuss issues with on an as-needed basis. This communication with the Client's contact will be through email or phone conversations for issues such as, but not limited to, attribute discrepancy, as-built legibility issues, missing data and/or as-built plans, and more. PACE will make efforts to only contact staff on major issues that can delay production.
1.2	**Software and Hardware Recommendation Memo** In this proposal, PACE is recommending a cloud-based mapping solution. One of the many advantages to this solution is there will be no desktop software installed, only applications for mobile devices. PACE assumes all machines will have internet access. PACE will work with our IT subconsultant, IThinkSource to provide a memo for the recommended minimum standards each machine should meet in regards to internet access. In addition, PACE will need the Company IT staff person to provide upload and download speeds for each machine, in order to make sure bandwidth is appropriate. If necessary, a memo will prepared that includes recommendations of appropriate upgrades to the Company's IT infrastructure.
1.3	**GIS Data and System Manual** PACE will deliver a GIS Data and System Manual that will document all aspects of the GIS database and mapping application project. The document will contain chapters on data standards, database schema and conversion work plan.

DELIVERABLES:

a. Bi-Weekly meetings (Total of 16) and in-person meetings (Total of 8).
b. Software and Hardware Recommendation Memo.
c. GIS Data and System Manual.

Task 02	**Data Gathering and System Evaluation** This task includes the data gathering and system evaluation process including reviewing all materials, data, and documents associated with the GIS database conversion.
2.1	**Preliminary Deliverable Objective Memo** Before PACE proceeds to full scale production, PACE will meet with the Client's contact person to fully understand all aspects of required deliverables, including and not limited to GIS database fields, naming convention of scanned files, and workflow details essential to complete the project. PACE will prepare a Preliminary Deliverable Objective Memo (PDO) that will comprise all findings. Upon approval by the Company, PACE will then proceed to full scale operation.
2.2	**Scanning** Based on conversations with the Company there are roughly 1,200 documents the Company uses, with approximately 1,000 related to the GIS data conversion effort. All estimates within this proposal are assuming there will be 1,000 hard-copy drawings at various sizes with full scale up to 24" x 36". PACE also assumes there are no digital copies of these documents, and these drawings will need to be scanned and organized. PACE proposes to scan and organize 1,000 reference documents including As-Built drawings. PACE will gather a group of 200 hard-copy maps at a time, scan then return, in order to be as least intrusive as possible to the Company's day to day operations. The block of hard-copy maps will be scanned with a large format scanner. If a local provider is available PACE may choose to stay in the local area of the Company and complete the project using this provider. The resultant scans will be delivered to the Company via an external hard-drive. As an alternative, the Company can choose to work with a local provider and deliver PACE the scanned documents. PACE could adjust the scope and budget to only include the file organization if the Company chooses to self-perform the scanning effort.

2.3	**Technical Audit and Data Conversion Work Plan** Based on documents in the RFP and conversations with the Company, PACE assumes within this proposal there are 36 AutoCAD drawing files of the Company's infrastructure that need to be converted into the GIS database. It is assumed that these AutoCAD drawing files will be within a standard coordinate system such as State Plane NAD 83, Zone V, with units in feet. If the data resides in a local coordinate system, it will be assumed the Company can obtain suitable translation files to place in proper coordinates. It is also assumed that the data within the AutoCAD files is of suitable spatial accuracy for the Company's purposes. PACE will use the estimated 1,000 reference drawings to provide detailed information regarding the data features. The attributes will be directed by the PDO established at the beginning of the document.
2.4	**Technical Audit of the Accounting Software, Tyler Incode** PACE will review and work with Company staff to prepare a means to connect routine exports of accounting data and link to the GIS data. It is assumed the Assessor Parcel Number (APN) is available in the customer database, and a method will be known by County staff to export a table of customer APN and meter or account ID numbers as a CSV or equivalent table format.
2.5	**Technical Audit of Asset Management and Depreciating Asset Database (AMDA)** Typically, many assets fall in public right-of-way, and do not have corresponding APN or other spatial references to connect to geographic features GIS. PACE will need to spend time and collaborate with Company staff to understand how the Company locates features, how the Company uses the software, and what information the Company will routinely export to link to the GIS. PACE will send its staff with asset management experience in both the public and private sector as well as staff with GIS experience to meet with the AMDA experienced Company staff. PACE proposes to have up to three days of meetings. PACE will research asset management systems, contact vendors, contact users. Due to the many unknowns and the necessary discovery with this task PACE will propose to prepare an approach in a detailed memo that will discuss the organization of the AMDA, the organization of the GIS features, and document a recommended methodology to connect routine output from the AMDA to the GIS features.

DELIVERABLES:

a. Preliminary Deliverable Objective Memo (PDO)
b. Technical audit of existing Autocad data and reference documents, and a work plan for conversion.
c. Techincal audit of Tyler Incode the Accounting Sofware and a means connect to routine output.
d. Technical audit of the asset management and depreciating asset database and provide a detailed memo for connection methodology.
e. Complete database schema and approach.

Task 03	Database Creation
3.1	**GIS Data Conversion** PACE will develop a seamless utility network within a GIS database for the Company's potable and irrigation distribution systems including all layers and attributes agreed upon in the PDO. At minimum, this will include tanks, wells, mains, laterals, valves, meters and other features they control. PACE will use python scripts and geoprocessing models to help automate a portion of the data conversion. PACE will produce enhanced QA/QC measures to ensure the spatial location of the CAD data to the GIS data matches to a sub-centimeter tolerance. PACE will also extend any lines, move points, and connect features to ensure data integrity. All features will be connected to either a point or line, meaning the end point of the line and x and y location of a point feature will be synonymous. PACE will log any issues such as questionable positional accuracy, missing data in the CAD files, etc. and provide the log to the Company for input and direction.
3.2	**Reference Document Data Input** PACE will use the estimated 1,000 reference drawings to provide information for each appropriate attribute field as agreed upon within the PDO. PACE will include a field in the database that will contain the reference document information that was used to identify the key attributes.. PACE will log any issues that may arise such as legibility, questionable information, data inconsistencies between CAD and as-built drawings, and missing information, in order to present to the Company for direction, if needed. Data quality control measures will include reviewing data connectivity of the GIS features, comparing AutoCAD data attributes and spatial consistency, and reviewing reference documents against the data inputted into the GIS.

3.3	**Tyler Incode Accounting/Financial Software Connection Tables** PACE will have a means to connect to routinely exported tables from the Accounting software, Tyler Incode, to the meters in the GIS database. It will be assumed there are known methods to export the APN number and meter ID or account number by Company staff. PACE expects some inconsistencies between the accounting software and GIS data, so PACE proposes to catalog all discrepancies and issues when they develop such as incorrect APN, multiple meters to one parcel, unknown meter or account ID's, missing data, and inactive meters. PACE will provide the Company with maps and lists of these discrepancies, and look to the Company for a method of resolution such as field verification. It is assumed field collection by PACE of missing GIS data will be out of this scope of work.

DELIVERABLES:

a. Initial Utility Network GIS Database of converted CAD with spatial connection.
b. Report of spatial inconsistencies.
c. Final Utility Network GIS Database with all attributes from reference documents included.
d. Report of data inconsistencies.
e. Connection of Accounting software output to GIS assets.

Task 04	Implementation
4.1	**GIS Data Conversion** Based on the Company's goals of having the database viewable by both office and field staff, along with low annual costs for a mapping solution, PACE proposes the Company invest in an Organizational Account for ArcGIS Online (AGOL). An ArcGIS Online Organization Account with a user license purchased for all staff members will be needed for this solution. One viewer license is $100/year which allows the user to only view and interact with team maps as reference. One Creator license will be $500/year and this role will be for the editor & manager of the web mapping applications for the team to view and use. The Company may consider Field Worker licenses at $350/year which enables users to use apps for data collection for inspection. PACE will discuss the needs of the field worker and additional user roles when appropriate. The company may visit https://www.esri.com/en-us/arcgis/products/arcgis-online/pricing for a detailed listing of roles and pricing. It is assumed the Company will handle the purchasing for this software based on recommendations by PACE and collaboration with the Company. PACE proposes to create a "Headless Creator Account", or an account not specifically for one person to control. The credentials of the Creator account will be shared with the appropriate Company staff member with the understanding these credentials should not be shared amongst the group and only be used in certain circumstances. PACE will use the Creator account to manage the AGOL user experience for Company office and field staff. PACE will customize the AGOL home page with the Company logo(s), custom Company banner, and Company descriptive text. PACE will perform all data organization including data symbology, data labels, pop-up configuration, data uploading, web map creation, and application development on the AGOL site. PACE will configure all computers with a desktop icon for the appropriate web application. In addition, PACE will assist with installation of the appropriate application on mobile devices and configuration to the AGOL account. PACE will produce the AGOL to fit the Water Distribution Foundation web schema which includes maps and apps designed specifically for water distribution organizations that require both a desktop and mobile experience. The desktop application will enable users to access all attributes within the system by a simple click on the feature. The AGOL field maps will include a method for field crews to signify "Water Issues" within the system. These "Water Issues" can include a Company agreed upon list such as visible, non-visible leaks, replacement needs, data inconsistency issues, etc. The desktop version will use a shortcut on the desktop that links to the AGOL web address. The field crew will access the web maps via a free-downloadable application on smart phone or tablet devices. This application will link to the Company AGOL account, and will enable the field crew to input point locations of "Water Issues" based on device GPS or manual location on the applications map.
4.2	**Office Staff Training** PACE will conduct one training session for office staff for up to four hours. The session will go over user account roles, ArcGIS Online Groups, Web Maps, and Web Applications. The training will show staff how to interact with the software, how to retrieve information, how to navigate through the map, how to search for locations, and more. PACE will provide training materials for the training session. PACE will deliver an office staff training manual that will describe all features discussed in the training sessions which will include basic operation instructions for the AGOL application. The manual will be delivered in a PDF format. It is assumed the Company will provide the necessary facilities to accommodate the training session such as computers, projector, desks and meeting room.

4.3	**Field Staff Training** The field training sessions will have two components totaling eight hours: 1) one 4-hour in-house session to go over the basics of the system similar to the office staff training session 2) one 4 hour in-field training session with user mobile devices. The course will demonstrate how to download the data to work offline, add indicators for leaks, replacements, and data inconsistencies to the database, and how to upload offline data. PACE will deliver a field staff training manual that will describe all features discussed in the training sessions which will include basic operation of the AGOL application. The manual will be delivered in a PDF format.

DELIVERABLES:

a. Configured office staff computers and field staff mobile devices.
b. ArcGIS Online account configured with home page, user groups, web maps, and web applications.
c. 4-hour training session for office staff with PDF training manual.
d. 2 x 4-hour training sessions for field staff with PDF training manual.

Task 05 Maintenance

5.1	**Ongoing GIS Maintenance** PACE will use detailed QA/QC procedures and methods to ensure data integrity, however, PACE's input will be as good as the aged as-built drawings and the AutoCAD data provided. PACE will ensure that accurate CAD and reference document information is represented in the GIS database, but some data discrepancy issues are expected to arise from field and staff during day-to-day system use based on incorrect CAD or reference document information. Additionally, PACE expects additions, abandonments, and replacements to occur within the system over the course of time. It is important for staff to trust the data within the system, so PACE proposes to have an on-call as needed task for maintenance. The budget for this support assumes 16 hours of staff time per quarter for two years to address maintenance needs.

DELIVERABLES:

- On-call, as needed maintenance (budgeted at 16 hours per quarter for two years).

Optional Task

Due to the unknown spatial accuracy of the CAD data, we recommend taking verification points using a Global Positioning System (GPS) at select locations of the distribution systems. These points will be compared to the GIS data as it relates to the features' on-ground position. PACE proposes to use the RTK engineering grade GPS Trimble unit to collect the spatial location of exposed equipment within the Company's water system. PACE has estimated the need for 100 points dispersed throughout the system. PACE will prepare a report to show the positional difference on an average per existing AutoCAD drawing sheet which is the basis of the spatial location information. With this information the Company will know what level of accuracy the CAD data represents and use this to determine if a full-scale GPS survey of the system is needed.

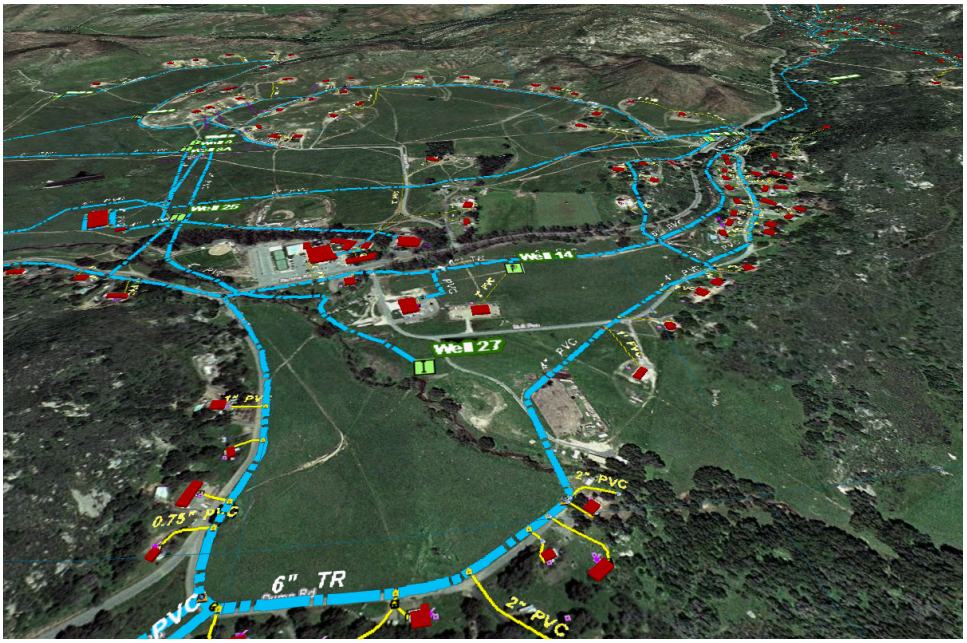
DELIVERABLES:

a. 100 field verification points.
b. Report describing mean error per each sheet including maps showing discrepancies.

past projects

PAST PROJECTS

Barona GIS Mapping *Lakeside, CA*



Relevant Features

- Detailed database schema for enterprise integration.
- Geometric network designed with connectivity rules for feature to feature maintenance.
- Flow analysis tools to help analyze system characteristics and maintenance planning.
- Custom hyperlink application linking GIS features to over 5,000 field photographs, well logs, and as-built drawings.
- ArcGIS online web mapping for staff dissemination
- Performed multiple training sessions on database maintenance, editing, and operation

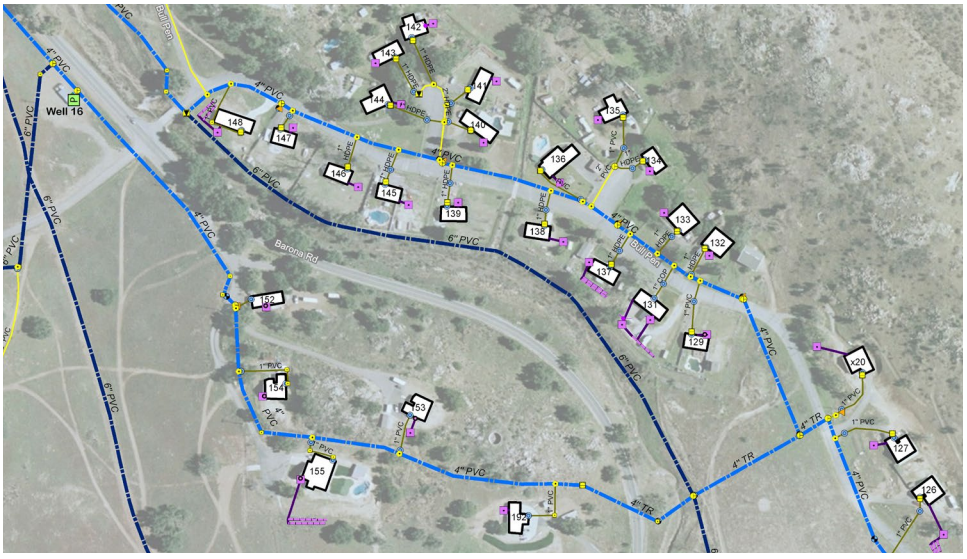
PACE developed an accurate GIS-based asset inventory to support overall infrastructure asset and maintenance management for the Barona Band of Mission Indians. Infrastructure information was mapped and verified in the field for the water and sewer systems, house connections, and septic systems. There were approximately 300 homes, 5 water tanks, 1,066 fittings, 796 valves, 24 wells, 26 pumps, and 96 hydrants that serve the area. PACE also developed a training program and data and procedural standards to enable Barona staff to gather data in sensitive areas, and to maintain the database in the future. PACE created an online mapping application of the water distribution system for staff to review, locate facilities, and help plan future maintenance.

Owner
Barona Tribal Water Authority

Contact
Curt Crook Director
(619) 443-6612

Project Size
Approx. 40 miles of water distribution data collection with a total of > 45 miles of linear data

Team Members
Tony Howze Sr. GIS Analyst
James Matthews, PE Principal / QA/QC
Scott Fifield, MS GIS Analyst
Gary Tolosa IT Services
Thomas Gutierrez Sr. CAD Designer



Somerton Wastewater Master Plan *Somerton, AZ*

Relevant Features

- GIS database schema development: data conversion
- Geometric network development
- Based inventory of customer sewer generation
- GIS capacity analysis tool & dynamic display

PACE provided an updated Water and Wastewater Master Plan to the City of Somerton. The wastewater master plan assessed the City's existing and projected wastewater generation against the existing sewer infrastructure, such as the collection systems, sewer lift stations, and wastewater treatment systems, to determine whether the existing capacity and treatment process will meet the City's current and future wastewater treatment needs. PACE developed a wastewater model to identify flow capacity within the existing collection system using GIS. Duties included field verification and calibration in support of the model to identify the existing pipe dimensions and material, the existing locations of equipment, pipe lines, valves, meters, etc., verify flow and pressure within force mains, verifying quantity and capacity of equipment. PACE developed a GIS database from existing GIS data, existing CAD drawing files and field survey of all the cities facilities. PACE added flow connectivity within the GIS, similar to 3rd party modeling software such as SewerGems, but without the high sticker price. Python scripts and geoprocessing tools were used to place all pipelines in the appropriate flow direction based on upstream and downstream connection points. PACE worked closely with the City to verify indeterminate directions and pipeline locations.

PACE was able to determine flow capacity based on the pipe size, roughness coefficient, and slope all attributes within the GIS. In comparison, PACE connected all sewer mains with laterals using unique IDs, then connected the laterals to the associated customer's parcels. A cumulative flow was generated using the parcel to lateral to connect over 3,896 existing and future development parcels within the GIS to determine actual flow. With the actual flow and capacity both quantified within the GIS, PACE was able to show existing capacity issues within the system. Additionally, the database allowed us to input future wastewater generations based on population projections, zoning, and general plan estimates to any line in the system. The model allowed us to run multiple build-out scenarios and helped determine where improvements to the system will need to be focused based on build-out scenario.

Owner

City of Somerton

Contact

Sam Palacios Public Works Director
(928) 722-7371

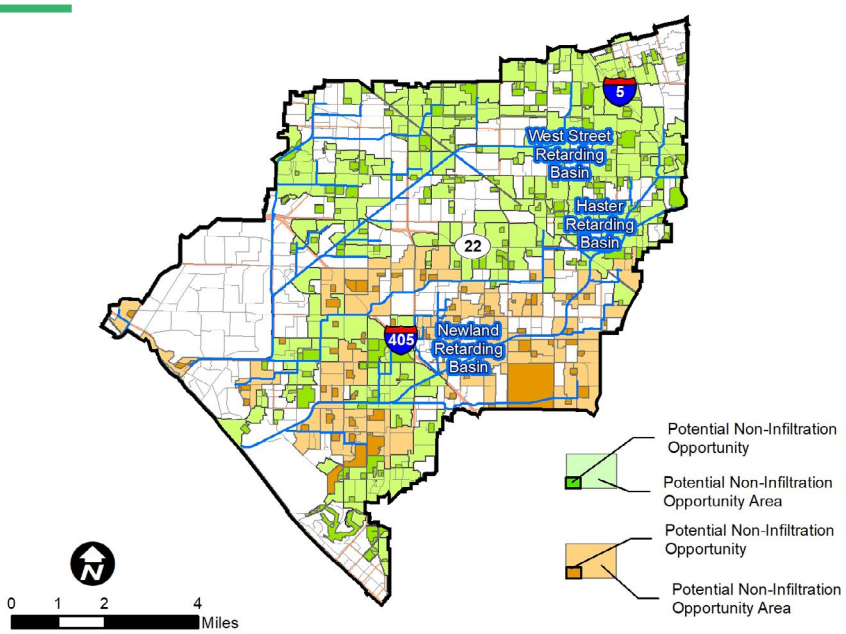
Project Size

34 miles of pipeline and 18 miles of sewer laterals

Team Members

Tony Howze Sr. GIS Analyst
James Matthews, PE Principal / QA/QC
Scott Fifield, MS GIS Analyst
Andrew Hashimoto, MS GIS Technician
Thomas Gutierrez Sr. CAD Designer

County of Orange Watershed Infiltration Hydromodification Management Plan (WIHMP) GIS Database *Orange, CA*



Relevant Features

- GIS database of existing drainage facilities
- GIS based mapping of watershed sub-areas
- Database design for watershed connectivity for intelligent watershed mapping
- Web-based watershed facility calculation tools
- Mapping database characteristics and constraints to assist a site-specific user
- Identification of areas with ability to participate in regional / sub-regional BMP opportunities

Over the past 10 years PACE GIS has been working closely with the County of Orange to help with the National Pollutant Discharge Elimination System (NPDES) Stormwater Program Watershed Management Plans and Water Quality Improvement Plans. PACE produced a large database of all system facilities including storm drain channels, pipes, culverts, natural drainage, inlets and sub basins. The database was used for a County-wide BMP prioritization tool. The tool designated over 2,000 potential BMP sites based on appropriate land uses. The database was used to link nearby storm water conveyance to potential BMP locations, and score each BMP relative to multiple parameters. The database has roughly 135 tables and GIS feature layers that all work within in concert to produce real-time results. One critical component of the database is the dynamic nature that has been established with the database schema. Many of the original datasets came from various County departments, public domain resources, other jurisdictions, and internal PACE efforts. It was understood early on that data can and will be updated, and a flexible environment was necessary for when this occurs to easily swap out data layers when it was appropriate. GIS information can be updated via replacement or editing, cumulative layers and be updated with a series of python scripts, and scoring parameter and weights can be adjusted on-the-fly to produce updated prioritization results within minutes.

The efforts resulted in locating a series of viable BMP stormwater projects that have been introduced to various stakeholders, and are currently seeking grant funding for implementation. One such project was in conjunction with the Orange County Water District (OCWD). The prioritization database found a likely project adjacent to an existing OCWD recharge facility called Burris Basin. Burris Basin is a very large recharge basin, 2,600 acre-feet of capacity, and currently stores water from the Orange County Groundwater Replenishment System and Prado Dam releases. Chantilly Storm Drain delivers dry-weather and storm water run-off downstream of the Burris Basin facility directly into the Santa Ana River thus bypassing any recharge. Through the prioritization tool and associated as-built drawings of the channel we were able to see that the storm drain was a 10x10 channel, had a watershed of roughly 1,100 acres, and was only 1,000' from the Burris Basin. We worked closely with OCWD by presenting the project concept of diverting the water directly into their recharge facility. We were able to estimate that the dry-weather flow coupled with the 85th percentile storms throughout the year could generate up to 645 acre feet per year. Using our engineering cost-estimate for the project and our understanding of operation and maintenance amortized over 30 years we determined the price for an acre foot of water was $60, significantly lower than the retail value of water. This project will provide multi-benefits from increasing supply for indirect potable water, dry-weather flow, and first flush permit compliance.

Owner

Orange County Public Works Department – Stormwater Program

Contact

Sarah Chiang Environmental Resources Specialist
(714) 955-0672

Project Size

530 square miles

Team Members

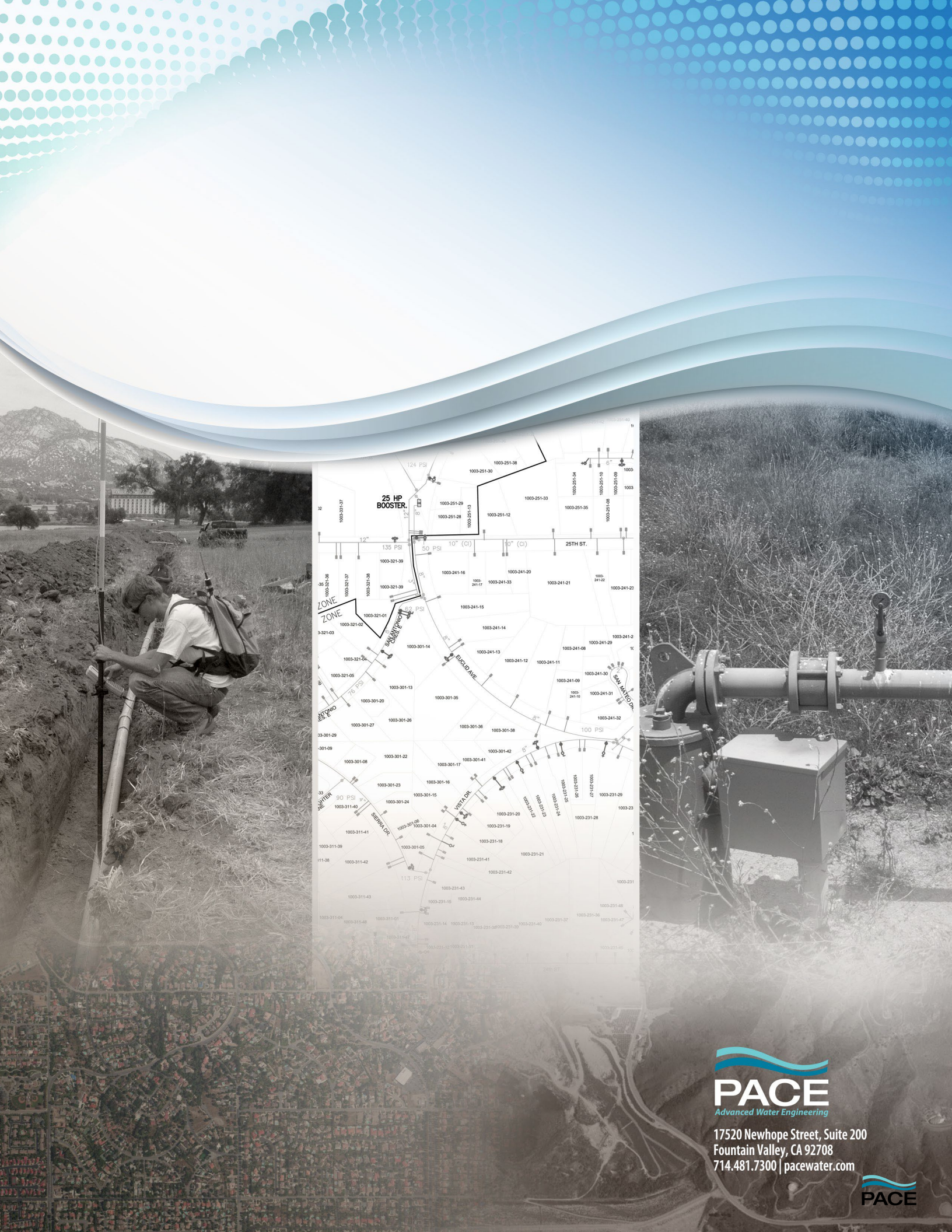
Tony Howze Sr. GIS Analyst
Scott Fifield, MS GIS Analyst
Andrew Hashimoto, MS GIS Technician
Hung Tran, MS Database Support / IT Services

exceptions


25 HP
BOOSTER.
25TH ST.
135 PSI
50 PSI
82 PSI
76 PSI
90 PSI
100 PSI
113 PSI
EUCLID AVE.
VISTA DR.
SIERRA DR.
SAN ANTONIO CREEK
ZONE
ZONE

EXCEPTIONS

PACE takes no exceptions to this RFP including, but not limited to, the Consultant Services Agreement.



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PACE