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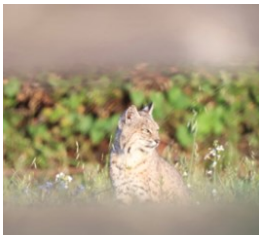
TJCAA's Business Certifications

- Alameda County Small, Local Emerging Business
- Bay Area Green Business Program
- California DGS SBE
- City of Colton SBE
- City of Los Angeles SBE
- City of Oakland LBE
- Eastern Municipal Water District SBE
- Inland Empire Utilities Agency SBE
- Metropolitan Water District of Southern California SBE
- Sacramento Municipal Utilities District (SMUD) SEED Vendor
- San Diego County Water Authority SBE
- Port of Long Beach SBE
- Port of Oakland LIABE/SBE/VSBE
- PWC Registration—Dept of Industrial Relations (DIR)
- West Basin Municipal Water District SBE

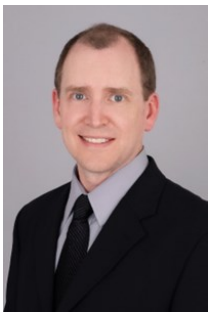
Message from the President, Gianna Zappettini



A recent trip to Point Reyes National Seashore provided the perfect opportunity to immerse ourselves in nature: a bobcat sitting in a field, a great blue heron seeking its next meal, lupines blooming amongst poppies, raptors soaring above the seashore, and tule elk grazing on a hilltop. The break from work was appreciated but all too soon we were back and occupied by engineering tasks.

Fortunately, we are working on some great projects in collaboration with our clients, and that makes the time go by quickly until our next outdoor adventure. Feel free to send us a picture of your favorite encounters with nature, and do not hesitate to contact us if we can assist with your engineering needs.

TJCAA Welcomes Andrae Rauch, P.E.



Andrae Rauch is a licensed Control Systems engineer in our Control Systems Programming group. He joined us in February, bringing extensive experience in industrial automation. He has provided application software design, development, and commissioning of industrial control systems consisting of PLC (programmable logic controller) programming, SCADA applications, instrumentation, and wired and wireless communication systems for process control including water and wastewater treatment processes, food processing, engine management, motion control, machine control, electrical substation and switchgear monitoring, and smart motor control center integration for numerous projects in Northern California.

We're delighted to have him in TJCAA's CSP group, because he's a "soup to nuts" kind of guy when it comes to

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TJCAA Welcomes Andrae Rauch, P.E.

control systems. He didn't start out intending to go that route, however. A native of South Dakota, Andrae started working in the semiconductor industry in California directly out of college. After a few years, he relocated closer to his roots and worked in the central western states as a communications specialist for Montana-Dakota Utilities Company. Traveling extensively through Montana, North Dakota, South Dakota, Wyoming, and Colorado, he kept communications running to support monitoring and control of MDU's natural gas infrastructure.

"MDU is involved in natural gas exploration, collection, storage, transportation, and distribution all the way to households," Andrae explains. "All of these functions involved SCADA applications to keep everything operating." SCADA, automated reports, telemetry, remote telemetry units, and even the phone systems were his responsibility at different times.

The various SCADA systems required monitoring remote locations across all five states, including individual systems with radio communications to over 1,000 wellheads. "I really wasn't involved much with the control system programming, and then one day one of the controls engineers said, 'Can you make this change?' and I got to update an active PLC program."

"I had an interest in software development since high school, and I had messed around with programming as a hobby, but at work, I hadn't programmed a lot." Andrae continues, "This was eye-opening. Here was programming that was going to make a real-world change in the way a live system operated." He got some PLC programming training to ramp up his skills but learned mostly by "lots of reading help files and looking at other people's code."

Andrae's career in CSP blasted off when he and his wife moved and he took a position with MCC Control Systems in Vacaville, California as a Systems Software Engineer. At MCC (now Primex Controls, a systems integrator with which TJCAA has teamed on many successful projects), Andrae had a software focus. His skills in software developed rapidly, as he performed programming, bench testing, factory testing, and system startups. He sometimes worked on a 24/7, on-call basis, and his involvement with client work was "all the way through," which allowed him to know his programming projects—primarily in water and wastewater—inside and out.

An opportunity to lead a team for a WWTP expansion project took Andrae to a large consulting firm, where he led programming services and instrumentation and control system application design. He gained valuable experience, not only in technical skills such as development of standards and control system implementation, but also in project management.

Now with TJCAA, Andrae is performing CSP design, programming, and implementation. "This is interesting and different, and is offering me an opportunity to grow, both as an engineer and as a project leader." He tells us that he is excited about the variety of things he will get to work on. "Conduit routing? That's totally different than programming. I'm gaining a lot of knowledge."

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TJCAA Welcomes Andrae Rauch, P.E.

Did You Know? What's a Voltage Phase Imbalance?

One of his current projects also provides a chance to make a major improvement in a client's facility. "We're updating a control system that was installed during a 1989 WWTP improvement project." At 33+ years old, some of that control system equipment is downright *ancient*. "Reliability and maintainability are the first priorities with this old equipment," he points out. "With new hardware and migrated programming, the client can keep operating with confidence and add more control programs as the plant expands."

Andrae tells us that he's enjoying our small-company environment. "I like knowing everybody, and I enjoy the efficiency with respect to how information flows." He adds, "Large companies can be great places to work, but in a small company like TJCAA, there's more of a strong, healthy focus on the work and the client."

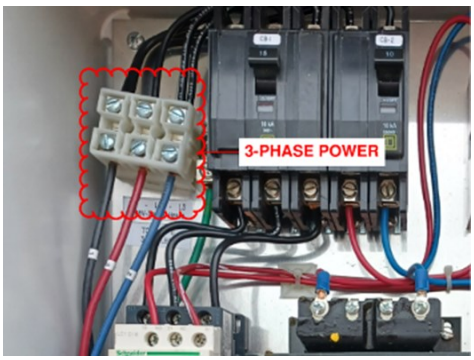
A focus on family keeps life full outside of work, too. Being a parent of two boys keeps him busy, as does his active volunteer role at church. In addition, he has a passion for DIY. "I love to create and fix things," he says, "and I like doing some things myself—like our kitchen remodel—so it's done just right."

We've found that he also has a passion for providing robust system solutions to address real-world needs. We're very glad he's here, doing things just right.

Did You Know? What's a Voltage Phase Imbalance?

On a recent Monday, our Oakland office received a notice from the building's management team saying that the building was "experiencing a utility voltage phase imbalance building-wide." PG&E had been contacted, they told us, and building management recommended that we save our work regularly and turn off any devices we were not actively using until we were in the clear. So, what exactly is a voltage phase imbalance?

Anne Broughton, P.E., a Senior Electrical Engineer at TJCAA, explains that PG&E generates, and electricity can be delivered, in a 3-phase system. Each of 3 wires carries one phase of the power, and the load should be approximately equal on each phase. Once it's operational, Anne says, "The load balance shouldn't change much at all unless something fails. If one phase fails, the other two phases must push through that much more current."



When an imbalance occurs in a 3-phase system, equipment running on two or three phases, such as motors and controllers, will not operate reliably and could be damaged. *Electrical*

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Construction & Maintenance notes that "In general, the difference between the highest and lowest voltages should not be more than 4% of the lowest voltage. Greater imbalances may cause overheating of components—especially motors—and intermittent shutdown of motor controllers. Motors operated on unbalanced voltages will overheat, and many overload relays can't sense the overheating." (ecmweb.com)

Anne points out that for some equipment, the damage could take a while to become problematic. "The windings will overheat. The motor might not fail right away, but if the imbalance continues for a while, it will decrease the life expectancy of the motor." She adds, "and equipment that would normally use only a single phase would simply not run if its phase failed."

The types of damage or shutdowns resulting from voltage phase imbalances could cause operational interruptions for some facilities. We're happy to say that our staff was not affected by the imbalance at the office that day. If you would like to discuss your power supply and needs, please give us a call.

TJCAA's Instrumentation, Controls, and Electrical Group Stays Up to Date

Members of TJCAA's Instrumentation, Controls, and Electrical Group attended the IEEE (Institute of Electrical and Electronics Engineers) San Francisco Industry Applications Society's 25th Electrical Power Engineering Seminar. This informative seminar included six topics: an NEC Update; Power Monitoring Applications; Pre-Fabrication and Modular Power Equipment; Open Channel Busway Applications; EV Charging Applications; and DC Control Power for Critical Power Distribution Equipment. That's a full day!

Members of TJCAA's ICE Group
L to R: Eileen Nakamura, Anne Broughton, Andrae Rauch, Brian Yazolino, Jacqui Arama, and McKenzie Campagna.

SAM Seeks Higher Ground

The Sewer Authority Mid-Coastside is planning improvements at its wastewater treatment plant in Half Moon Bay, California, to update aging electrical equipment and reduce the risk of electrical outages caused by flooding. The WWTP provides wastewater treatment services for around 27,000 people in the City of Half Moon Bay, El Granada, Miramar, Montara, Moss Beach, and Princeton Harbor. As part of SAM's Electrical Reliability Improvements Project, TJCAA developed and evaluated potential alternatives for improvements and recommended an approach for increasing reliability of the WWTP's electrical service components.

TJCAA's Project Manager, Jacqui Arama, P.E., explains that the electrical service components consist of a PG&E pad-mounted transformer, PG&E's connecting 480 V bus duct, and SAM's

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SAM Seeks Higher Ground

equipment: a 480 V main service switchgear; a 480 V, 800 kW standby generator; and a portable generator connection receptacle. Much of the equipment is obsolete, making maintenance a challenge and almost certainly presenting arc flash hazards. In addition, each of these aging components represents a possible single point of failure to the electrical service, and the clincher: every one of them is at risk of flooding.

The WWTP's scenic location next to Elmar Beach is at a low elevation relative to its service areas, for gravity flow. The electrical equipment is also in

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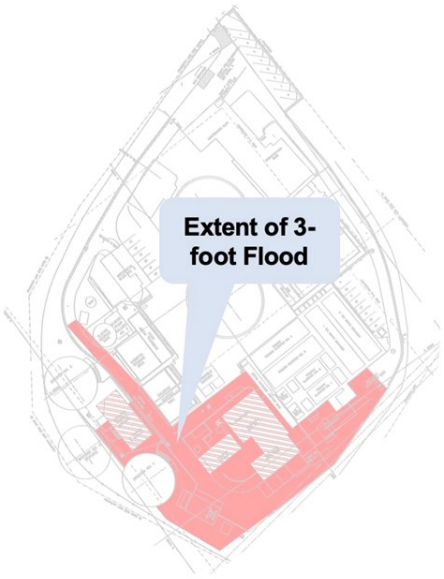

the lowest part of the plant, which is below potential 3-foot flood levels. This type of flood could occur after a storm, when flows in the adjacent Pilarcitos Creek are at high levels, or could be caused by ocean high tides.

The existing configuration cannot be taken out of service without a full plant outage. As a result, preventive maintenance on the electrical service equipment is very disruptive to plant operations and extremely difficult to implement in practice. Because of this, the old equipment presents another vulnerability: flooding with incoming wastewater. The plant processes the incoming flows, but only when it has power.

If pumping is unavailable due to an electrical outage, incoming wastewater can flood the plant rapidly. The switchgear area could flood in just a half a day during normal dry weather flows,

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SAM Seeks Higher Ground

and within a few hours in wet weather. Failure of the electrical service equipment could thus result in flooding of the WWTP, significant disruption or failure of the treatment process, and extended water quality violations.

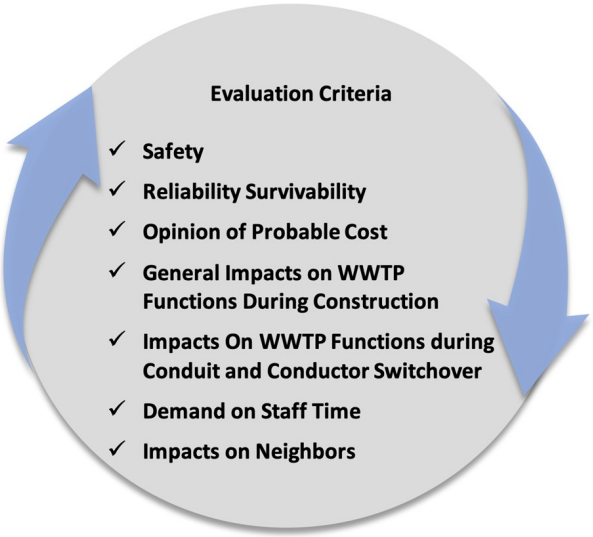
TJCAA reviewed methods for improving the electrical service infrastructure at the plant. Our engineers' objectives included replacing and relocating the existing 480 V main service switchgear and the 480 V, 800 kW standby generator; relocating the PG&E transformer to mitigate flood risks; and modifying the main electrical distribution configuration to eliminate selected single points of failure.

"We developed four siting alternatives," Jacqui tells us. "The first one would make improvements only within the existing electrical room. The second alternative would put equipment on a new elevated platform in the shop building. The third one would use a temporary chemical area and a new elevated platform in the odor control area. In the fourth alternative, all the electrical service equipment would be placed in a new building next to the Administration Building." The alternatives would differ in cost and in complexity, with some being easier to implement than others.

To provide a clear, comprehensive method for comparing the alternatives, TJCAA evaluated them based on the following criteria: safety, reliability, survivability, opinion of probable construction cost, general impacts on WWTP functions during construction, impacts on WWTP functions during conduit and conductor switchover, demand on SAM staff time, and impacts on neighbors.

There are some big differences in the alternatives from an electrical design perspective. Jacqui tells us, for example, that the alternatives featuring relocation of equipment to elevated structures present simpler conduit routing solutions than the fourth (the new electrical building), which would require significant rerouting. Likewise, the switchover impacts would differ quite a bit. Three of the alternatives would have minimal impact on plant functions during the switchover, but with one of the "elevated" alternatives, downtime of many processes would be required to relocate loads and associated conduits.

TJCAA recommended Alternative 4, which would replace the old main service switchgear with new equipment to mitigate arc flash hazards, remove a single point of failure by creating a "main-tie-main" configuration, and address the potential for flooding of the main electrical service components by



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relocating them to a new building constructed above flood level.

Jacqui reports that SAM prefers Alternative 4, as well. "The new building would make this alternative the most expensive," Jacqui says, "However, it would have the best survivability of the four alternatives with respect to reliability. The relocation to a new building would also result in the smoothest transition, because the building and new outdoor conduits could be constructed while keeping the plant operational."

While they are not part of the current project, the process-level motor control centers and control systems have reliability issues like those of the electrical service components. Electrical improvements at the SAM WWTP are anticipated to occur in two or three phases, which will help prioritize reliability improvements while managing costs. The initial phase will encompass replacement of the main electrical switchgear and backup standby generator, as well as relocation of the existing PG&E service transformer.

Subsequent phases will eliminate single points of failure on electrical equipment such as motor control centers, and/or relocate or enhance control system components to eliminate flooding vulnerabilities.

If you are concerned about the age and/or vulnerabilities of your electrical equipment, please contact us.

TJCAA Fun Fact: NASA Rocket Launches

TJCAA Structural Designer James Myers, P.E. has seen many, many rocket launches. "Too many to count," he tells us. "SpaceX by themselves probably had upwards of 30–40 launches while I was there." Where was he? He was working on-site at NASA's Kennedy Space Center in Merritt Island, Florida. As a project engineer with Bragg Crane and Rigging during 2016–2020, he was retrofitting existing launch towers to work with new rocket systems. "We were retrofitting the abandoned ARES project to work with the new Space Launch System rocket for NASA and retrofitting one of the old space shuttle

Photo by NASA

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launch towers to work with SpaceX's new crew capsule."

James explains that the mobile launch tower he worked on is intended to move from the park site (where it sits when not in use) into the Vehicle Assembly Building so a rocket can be stacked on it. Then the mobile launcher and the rocket move to the launch pad. After the rocket launches, the mobile launcher goes back to the park site to get ready for the next launch.

He worked in a site trailer near the VAB, which was built for the assembly of the Apollo/Saturn V moon rocket. The VAB is one of the world's largest buildings: it covers 8 acres! According to NASA, "The iconic facility serves as the central hub of NASA's premier multi-user spaceport, capable of hosting several different kinds of rockets and spacecraft at the same time. Whether the rockets and spacecraft are going into Earth orbit or being sent into deep space, the VAB will have the infrastructure to prepare them for their missions." (nasa.gov)

We asked James which was his favorite launch. He said, "SpaceX's first Falcon Heavy was by far my favorite. It was the loudest, and watching the two first-stage boosters come back and land side-by-side was amazing. I got to watch from the top of the SLS tower at the park site by the VAB, about 3 miles from the launch pad and 6 miles from the landing site with a pretty much unobstructed view of both." Pretty cool, huh?

Dates to Note

Jun 21	Summer Solstice
Jun 23	International Women in Engineering Day
Jun 27–Jul 10	135th Wimbledon Championships, London
Jun 23	NBA Draft
July 1	2022 California Building Code (in effect Jan 2023)
Jul 1–24	109th Tour de France
Jul 10	Nikola Tesla's birthday
Jul 14–17	150th Open Championship, St. Andrews, Scotland
Jul 21–23	2022 IEEE Women in Engineering International Leadership Summit (WIE ILS), San Juan, Puerto Rico
Aug 11–12	Perseid Meteor Shower
Aug 29–Sep 11	US Open Tennis, Queens, NY
Aug 30–Sep 3	2022 SEAOC Convention Indian Wells, CA
Sep 8	103rd NFL Season Opener (Rams vs Buffalo Bills)
Sep 11–14	AWWA Water Infrastructure Conference, Portland, OR
Sep 11–21	2022 ICC Annual Conference, Hearings, Expo, Louisville, KY
Sep 22–25	Presidents Cup, Charlotte, NC

TJCAA Fun Fact: NASA Rocket Launches

Dates to Note

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