



Cannon

Pipelines

Reliable Responsive Solutions

Relentless Pursuit of the *Elegant* Solution

Elegant ['ɛlɪɡənt] *adj*: simple, refined, appropriate, harmonious. We strive for it in all we do.

Our team of professionals includes:

- Mechanical Engineers
- Civil Engineers
- Agricultural Engineers
- Chemical Engineers
- Petroleum Engineers
- Process Engineers
- Structural Engineers
- Electrical Engineers
- Land Surveyors
- Land Use Planners
- Technicians and Designers
- Automation and Controls Engineers

We have provided Reliable Responsive Solutions to clients for projects large and small since 1976.

Safety

Ensuring safety is critical; it's not just about keeping records and maintaining programs. We are committed to providing a safe and healthful workplace, incorporating "best practices" in our policies and procedures, and identifying and correcting risks. Our safety programs and commitment to safety are intended to foster an injury-free, productive workplace. We are proud to have earned the industry's highest safety ratings and our Experience Modification Rating (EMR) places us as a leader amongst our peers.

In addition to providing an enjoyable, safe, and healthful work environment, we encourage and support employee health and wellness through a variety of fitness-related company activities throughout the year.

Safety and wellness are more than just policies at Cannon—they are cornerstones to how we work in the field and in our offices.

Pipelines

Overview

- Gas Transmission and Distribution
- Urban/Cross Country
- Subsea
- Trenchless Technology
- Compressor Stations
- Meter/Regulator Stations
- Crossings

Services

- Engineering and Design
- Structural Engineering
- Routing and Right-of-Way
- Automation
- Surveying and Mapping
- Geographic Information Systems
- Inspection
 - » Pipeline Integrity Program and Services
 - » Smart-Pig Planning, Coordination and Review
- Launcher and Receiver Stations
- Leak Detection
- Feasibility Studies and Cost Estimates
- Due Diligence Studies
- Permitting and Regulatory
- Bid and Procurement Support
- Program/Project Management
- Construction Management
- Commissioning and startup
- Process Hazard Analysis
- Environmental Services
- 3D Laser Scanning

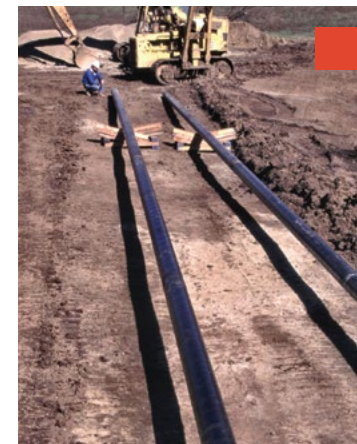
Projects



70 Miles of Pipeline Renewals, Relocations, and Lowering

Contra Costa County, Stanislaus County, Merced County, Fresno County, San Luis Obispo County, Kern County, and Santa Barbara County, California

Cannon has provided engineering and surveying services for approximately 70 miles of pipeline renewals and relocations throughout the State of California. With most of these pipeline renewal and relocations projects, Cannon provided the engineering plans and specifications, assisted with permitting and agency approvals, and provided surveying services including topographic, aerial, boundary, and control surveys; as-built drawings; legal descriptions; and construction staking.



4 Mile Natural Gas Pipeline

Fresno County, California

This 4 mile, 10-inch carbon steel pipeline transports utility grade natural gas across agricultural land northeast of Coalinga and west of California State Highway I-5. The line begins at an existing PG&E source and terminates at the existing San Ardo Pipeline bullpen facilities. The pipeline was designed to operate at a pressure of 500 to 800 psig and have a peak day flow rate of 30 to 40 MMCF. This pipeline is classified as a DOT transmission line.

Services included survey and staking of the right-of-way; clearing and grading; trenching; pipe stringing, bending, and welding; lowering the pipeline into the trench; backfilling the trench; hydrostatic testing; and cleanup / restoration. Cannon also designed two above ground facilities as part of this project, which included a meter, related piping, a "pig launcher" at the start and end of the pipeline, and block valves that would allow the pipeline to be isolated, if needed.



Swordfish Subsea Pipeline

Off-Shore, Gulf of Mexico

Mariner Energy required construction of eight miles of new pipeline in depths of up to 4,700 feet on the seafloor in the Gulf of Mexico. This pipeline expansion project included eight miles of new 10-inch and 6-inch subsea pipelines to transport produced fluids and gas from a new field to an offshore petroleum processing platform. Cannon provided subsea pipeline design services on this project. The scope included produced alignment sheets, plans, and profiles. Cannon designed connections for the wellheads and the platform, prepared cost estimates for various options, and coordinated bidding activities for installation contractors.



30-Mile Point Pedernales Pipelines

Lompoc to Orcutt, California

This project consisted of several components including an offshore oil platform and derrick located five miles off the coast. Another feature consisted of three pipelines that transport crude oil, water, and gas between an oil and a heating, separating, and pumping (HSP) facility in Lompoc. The project also included a waterline, which feeds the HSP facility, and an oil line that transports product from the HSP to a pump station in Orcutt, California.

The scope of work included engineering, planning, and surveying services for various aspects of the project. Engineering services included investigating and mapping utilities within the construction corridor, route evaluation and coordination with the County and other regulatory agencies.

Pipeline Integrity

Services

Pipeline System Review

- Applicable Code Review
- Pipeline Relative Risk Ranking
- Fit for Service Evaluation

Integrity Program Development

- Monitoring and Inspection Requirements
- Construction/Repair Checklists
- Regulatory Jurisdiction Determination
- Initial Hydrotest Planning and Rating

Pipeline Review

- Smart Pig/Confirmation Dig Planning and Execution Support
- Smart Pig Survey Analysis and Comparison
- Hydraulic and Thermodynamic Calculations
- Stress Analysis
- Pipeline Failure Analysis and Repair

Pipeline Engineering

- Design
 - » Plan and Profile Drawings
 - » Cathodic Protection
 - » Material Selection
 - » Road Bores and Directional Drill
 - » Pipe Bursting and Related Technologies
 - » Conversion of Service
- Permitting
 - » Right-of-Way Acquisition
 - » Survey and Legal Descriptions
- Construction Management

Mapping & GIS

Overview

Surveys

- Boundary
- Construction
- Topographic
- Control
- As-Built
- ALTA/ACSM
- GPS-Based Geodetic
- Well Borings
- Subsidence/Settlement Monitoring
- GIS Data Collection
- Right-of-Way/ Route Survey

Documents

- Certificates of Compliance
- Legal Descriptions
- Building Certifications
- Oil Well Location Surveys/ DOGGR Certifications

Mapping

- Final Maps
- Tentative Maps
- Parcel Maps
- Topographic Maps
- Aerial Mapping
- Record of Survey Maps
- Lot Line Adjustments
- ALTA Maps
- Mapping and Platting
- Constraints Analysis
- Right-of-Way Mapping

Projects



Utility Mapping for New Base Family Housing and Renovations

Lompoc, California

Cannon was selected to provide topographic survey, construction staking, and utility mark-out services for the new Base Housing and Housing Renovations Phases of the VAFB West Housing Project, as well as the new 6,608 square foot Community Center.

Cannon's survey crews provided a detailed topographic field survey of the project area, which included locating all surface and underground utilities such as gas, water, sewer, storm drain, storm drain grate inlets and outfalls; electrical pull boxes and transformer pads; street lights; and telephone and cable TV lines and risers. Utility information included pipe invert elevations at all manhole land cleanout locations. Utility features were located using GPS, which was based on horizontal and vertical control referenced to VAFB's Geodetic Control Network.

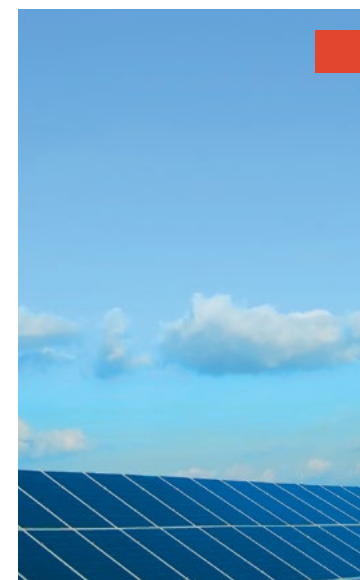


45-Mile Gas Transmission Lines (300 A and 300 B)

Kern County, California

PG&E needed precise as-built alignment and depth data as well as permanent survey control points for Line 300A and 300B corridor. This corridor spans approximately 45 miles south-southeast of Arvin, California in the vicinity of Tower Line Road and the Arvin-Edison Canal, to a point in the vicinity of Lerdo Highway, west of Shafter, California.

Cannon used GPS to acquire the necessary survey control in two tiers. We then tied the data to two of the best available NGS control monuments supplemented by seven CORS stations using the latest CSRC position data. In the field, Cannon conducted monument reconnaissance and placement, made GPS observations for 20 permanent monuments, and located aboveground markers (AGMs) and ground profile points. Project deliverables included a survey report with final coordinate values published in both CCS, Zone 5 (feet) NAD'83, and UTM Zone 10, NAD'83 (horizontal in meters, vertical in feet NAVD'88); as well CAD mapping exhibiting results of the GPS survey.



Boundary Survey for Trilobite Solar Project

Barstow, California

Pacific Gas & Electric (PG&E), in conjunction with the Bureau of Land Management (BLM), designated tracts of U.S. public lands as potential zones for utility-scale solar energy development. The Secretary of the Interior proposed to withdraw approximately 676,048 acres of public lands from settlement, sale, location, or entry under the general land laws, including the mining laws, on behalf of the BLM to protect and preserve solar energy study areas for future solar energy development. The Barstow Trilobite project is one of the project areas studied in the California desert for environmental and resource suitability for large-scale solar energy production, with capability of producing 10 or more megawatts of electricity for distribution to customers through existing and expanded transmission grid system.

The Trilobite Solar Project covers approximately 6,000 acres and is situated in the County of San Bernardino. Cannon established horizontal and vertical control and placed approximately 80 aerial panels on the site to provide ground control for photogrammetry mapping. Cannon conducted a field survey of the property to recover boundary evidence. Record boundary data was obtained from County and State agencies. This information was used in the preparation of a Record of Survey Map and historical ties used to retrace and re-establish the boundaries.

Automation

Services

- SCADA and HMI
- Panel Fabrication
- Control Philosophies
- Control Narratives
- PLC Programming
- Distributed Control Systems
- Instrument Specification
- Process Optimization
- System Integration and Startup Support
- Process Control Troubleshooting and Analysis
- VFD Integration and Programming
- Control System Training
- System Documentation
- Record Drawings
- Factory Acceptance Test
- Site Acceptance Test
- Emergency Shutdown Systems
- Network Design
- Field Service
- Instrument Calibration, Troubleshooting and Maintenance

Overview

- Utilities
- Water and Wastewater
- Industrial
- Agricultural
- Oil & Gas Extraction
- Petroleum Refineries
- Food & Beverage
- Pipeline
- Power Generation

Projects



Crockett Cogeneration Plant Fuel Gas Compressor

Crockett, California

Cannon was called upon to assist, support, design and integrate the new fuel gas compressor into the cogeneration plant. The goal for this project was to provide reliable fuel gas pressure to the Plant's 240 Mega Watt Electric power generator so that it could meet demand during peak power periods. Cannon assisted in providing the specifications and locating the compressor, designed the foundation for the compressor skid, and designed the entire electrical infrastructure to deliver 4160 volt power to the soft start motor controller for the 1250 hp prime mover of the compressor. Additionally, Cannon designed the sound retarding compressor enclosure, its "lower explosion limit" detecting system, and ventilation systems.

Automation features included: Modbus multi-drop network to capture data from added units; data formats with Invensys engineer to interface the compressor and related systems into the Foxboro DCS system; interfaces through the plant to make the control system functional and useable; assistance with start up and fine tuning of the remote control and monitoring of the Gas Compressor.



25-Site SCADA System Design and Implementation

Orcutt, California

PCEC selected Cannon to design and build a secure wireless Ethernet and TCP/IP communications system for its oil producing system. Cannon provided instrumentation and electrical engineering, SCADA design and installation, and programming to create two SCADA control room work stations each with four screens to monitor and control the complex operations as they were brought on-line. In addition, Cannon selected software and hardware upgrades for the server tower; developed and implemented a master process of over 10,000 tags; a communication system consisting of fiber network; wireless Ethernet infrastructure (Motorola Canopy) and RF radios; multiple stainless steel communication panels; and designed, constructed and installed remote I/O panels for the oil system and the water system.

Cannon provides on-going service and maintenance for the entire Orcutt Diatomite Project including installing and calibrating multiple instruments, integrating new process equipment into the SCADA system, and troubleshooting and repairing the SCADA system. Cannon provides this service to the Client as an on-call service, responding to calls during the days, evenings, and on weekends.



SCADA Upgrade for Treatment Facility

Solvang, California

Cannon combined two existing control systems and tied in the Alisal Lift Station into this new SCADA system. The scope of work included using Motorola Canopy communication network; reverse engineering the SBR control system; programming the replacement PLC control logic and the ability to monitor and control the SBR and new SCADA software before decommissioning the existing controls; providing operator training, operation manuals, and all program documentation including commented PLC code.

Notable Project Elements included the design and construction of communication panels, programming of Allen Bradley PLCs, programming of Rockwell Automation SCADA software, set up of database servers, installation of wireless radio communication system using Motorola Subscriber Module, and installation and integration of new DO probes into SCADA system.



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