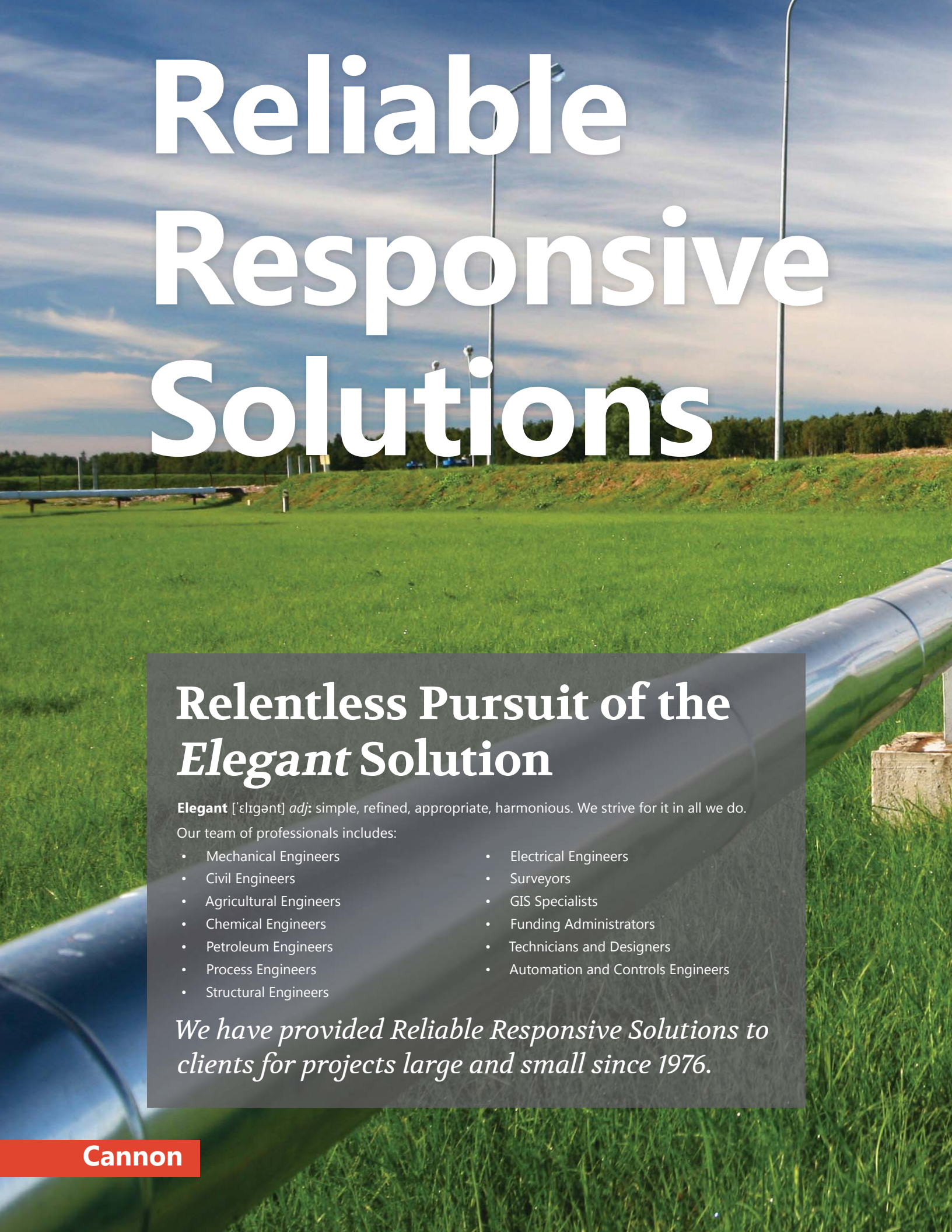
Cannon

Oil & Gas



Reliable Responsive Solutions

Relentless Pursuit of the *Elegant* Solution

Elegant ['ɛlɪgənt] *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
- Surveyors
- GIS Specialists
- Funding Administrators
- Technicians and Designers
- Automation and Controls Engineers

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

Cannon

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
- Crossings
- Compressor Stations
- Meter/Regulator Stations

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 Start-up
- Process Hazard Analysis
- Environmental Services
- 3D Laser Scanning

Cannon

Projects

70 Miles of Pipeline Renewals and Relocations

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 relocation 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.

BETA Transition Assistance

Long Beach, California

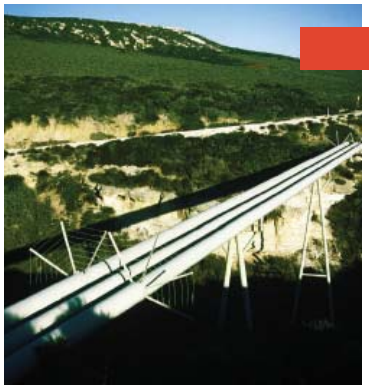
Cannon was selected to assist with the takeover of operations of the Beta platforms located offshore of Long Beach. The Beta platforms consist of platforms Elly, Ellen, and Eureka and produce over 7,000 barrels/day when at full capacity.

Cannon was chosen to provide facilities and pipeline engineering, planning, project management, and construction management services. The scope of work included preparation of piping drawings, material takeoffs, P&IDs and revisions to Process Flow Diagrams. The scope of work also included facilitation, coordination, and permitting assistance with various Federal, State, and local agencies. Cannon was also responsible for coordination with contractors to monitor work progress and maintain quality control, as well as provide on-site support and supervision.

Swordfish Subsea Pipeline

Offshore, 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 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 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

Platform Irene 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.

Upstream

Overview

- Heavy Crude
- Tight Oil
- Water and Wastewater
- Process Heating Systems
- Oil, Gas, and Water Separators
- Gas Dehydration/Sweetening
- Gas Compression
- Natural Gas Storage
- Pipeline Facilities
- Offshore Facilities
- Crude Oil Dehydration/Treatment
- Fuel Gas Treatment Units
- Potable Water Systems
- LACT and Metering Units
- Cogeneration and Distributed Generation

Services

- Engineering and Design
- Structural Engineering
- Process and Facility Design and Review
- Steam Generation and Distribution
- Capacity and Expansion Evaluations
- Due Diligence
- Site Development
- Roads and Infrastructure Design
- Process Optimization
- Permitting and Regulatory
- Bid and Procurement Support
- Program/Project Management
- Construction Management
- Cost Estimating
- Commissioning and Startup
- Process Hazard Analysis
- High Voltage Electrical
- Automation
- 3D Laser Scanning
- Surveying and Mapping
- Environmental Services

Cannon

Projects

Lynch Canyon Facility Expansion

Monterey County, California

Eagle Petroleum expanded production of the Lynch Canyon field from 400 barrels of oil per day (BOPD) to 2,500 BOPD. The new facility included a new tank battery with tank vapor recovery equipment to handle increased oil, wastewater, and gas production; produced water handling equipment; new steam generator site and water filtration/softening equipment; expanded wastewater injection system; electrical, instrumentation and control infrastructure; H_2S treatment equipment; and pipelines connecting the new facilities to existing field facilities. Cannon provided all needed engineering and design services from concept through construction, including planning and permitting assistance.

Orcutt Hill Oilfield Expansion

Orcutt, California

For one of the oldest, continually operated oilfields in California, Pacific Coast Energy Company contracted Cannon to assist with efforts to increase production from their Diatomite Formation, and to integrate the facility operations with other formation production and with mid-stream transportation.

Improvements included a Water Plant, an Oil Plant, and a Steam Plant, along with upgrades to the electrical infrastructure, drill sites, and field infrastructure. Cannon provided detailed engineering design and construction oversight from start to finish.

Careaga Field Expansion

Santa Barbara County, California

Cannon was selected to provide engineering design and support for the expansion of an existing oil processing facility and field. The plan includes expanding the existing facility to handle production from an additional 120 wells. New features include a water processing plant, additional gas handling equipment, and steam generation.

Cannon is responsible for engineering the facility and field improvements, which include mechanical, electrical, process, civil, structural, piping, and instrumentation, as well as land surveying.

Thermal Oilfield Expansion

Arroyo Grande, California

As a key member of an integrated project delivery team which includes engineers and contractors, Cannon provided site design and permitting for the development of a major oilfield expansion. This expansion involved approximately 400 new wells in a very space-constrained site with significant environmental issues, biological constraints, and unstable soil conditions, as well as a major public roadway bisecting the site. Cannon designed several underground road-crossings in executing this project. In addition to Cannon's direct role with this expansion project, Cannon also provided assistance to the international vendor of the central water treatment plant as part of a Design/Build/Operate contract.

Construction Services

Cannon

Overview

- Utilities
- Industrial Water and Wastewater
- Industrial Processes
- Agricultural Processes
- Oil & Gas Production
- Pipelines
- Power Generation

Services

- Selection and Analysis
- Feasibility and Screening Studies
- Appraisal, Cost, and Risk Analysis
- Schedule Development
- Technology Assessment and Selection
- Contract Strategy Development
- Project Execution Planning
- Financial Analysis
- Process Review
- Constructability Analysis
- Permitting
- Program and Project Management
- Engineering, Procurement, and Construction Management
- Quality Assurance Management
- Quantity Surveys and Cost Controls
- Forensics
- Project Close-Out Planning

Site Development

Overview

Civil and Structural Design

- Grading and Drainage
- Access Road Design
- Construction Permits
- Pad/Site Development
- Trenches and Vaults
- Retaining Walls
- Pipe Supports
- Platforms and Catwalks
- Stairs and Stiles
- Equipment Support Structures
- Pipe Bridges
- Shallow and Deep Foundation Design
- Slope Stability Analysis
- Holding Basins
- Reservoirs
- Wastewater
- Embankment Design
- Septic Systems
- Seismic Hazards Investigations Using Probalistic and Deterministic Methods
- Liquefaction Analysis
- Pavement Design Using AASHTO and CalTrans Methods

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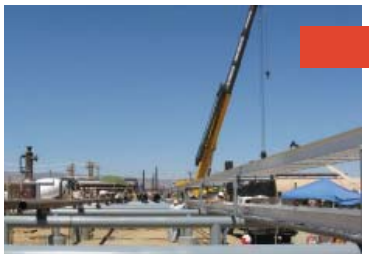
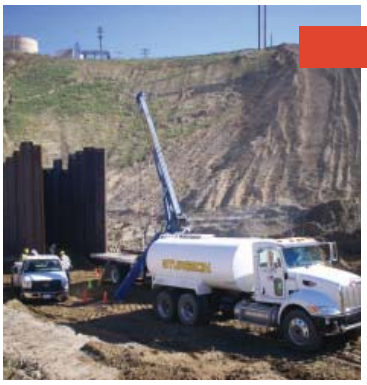
Projects



Tank Farm Structural Retrofit

Bakersfield, California

In order to demolish a large tank that was structurally connected to other tanks and structures, Aera Energy hired Cannon to provide structural engineering services. The scope of work included design modifications to stairs, catwalks, pipe supports, and foundations. The design included seismic analysis and considerations for keeping remaining facilities in operation during demolition and construction activities.



Central Treatment Complex

San Ardo, California

Working as part of a design team, Cannon provides assistance in the development of a new facility that includes Oil Dehydration, Gas Sweetening, Steam Generation, Vapor Recovery, and Oil Storage Plants. Cannon's contributions to the project include assistance in the preliminary design phase, topographic surveying, record boundary mapping, facility layout, and earthwork balancing design. Cannon provided detailed grading and drainage plans, site accessibility design, as well as agency compliance support which included a floodplain and drainage study, and regulatory exhibits. Cannon also provided civil and structural detailed design as part of a complex ground infiltration system for water plant discharge.

Storm Damage Repairs

Ventura, California

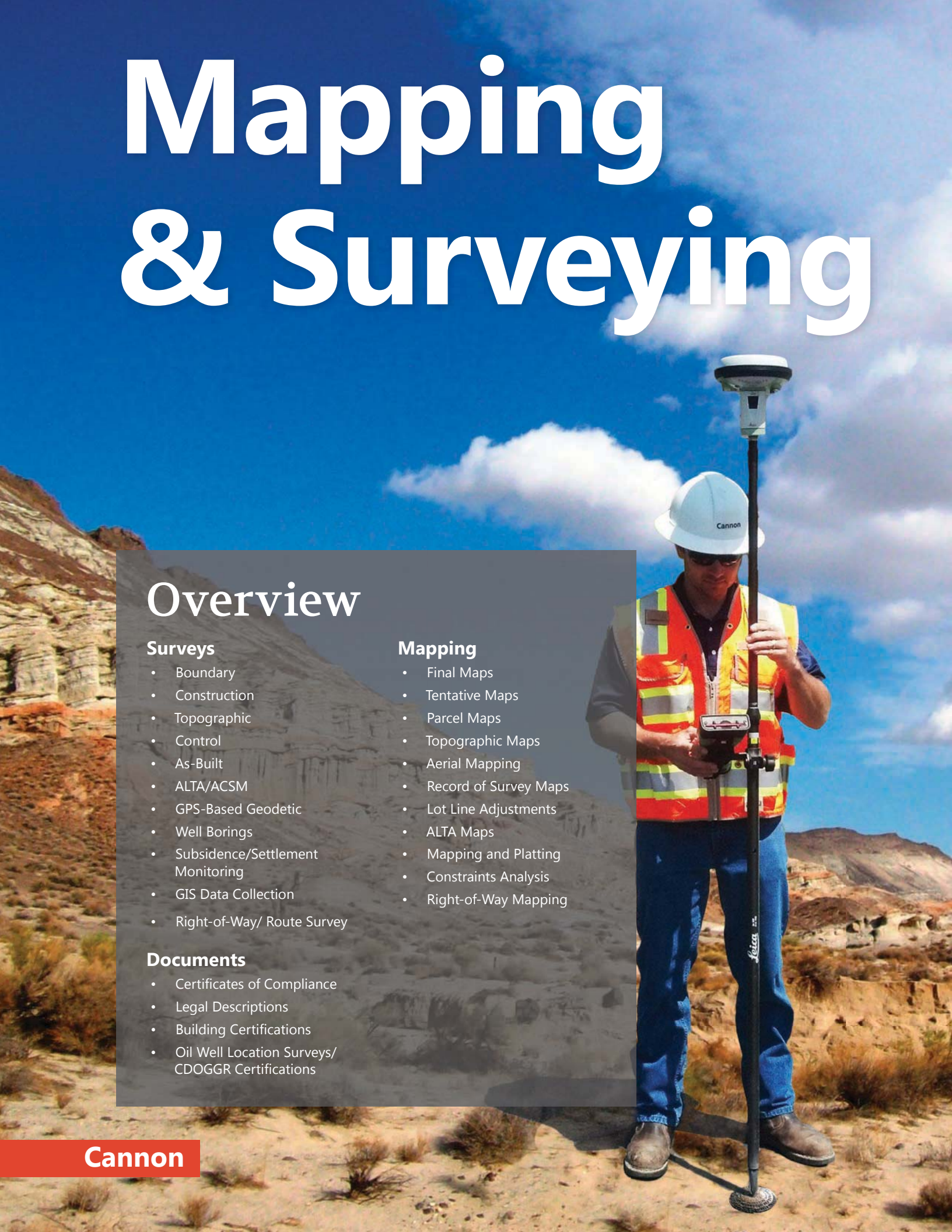
Heavy winter storms caused landslides and significant damage to roads, well locations, and facilities on the Aera Ventura Lease Site. Cannon was selected to develop repair plans for twelve sites, and manage an overall corrective action program to address related damages. Beginning with the highest priority areas, Cannon prepared site specific topographic maps and coordinated geotechnical evaluations. Cannon coordinated local, State, and Federal permitting, prepared drainage studies, and developed grading and drainage plans to repair each affected site. The sites typically required recommendations and plans describing the drainage, regrading, and road surface repair. Some required shoring and other hill stabilization options, culvert repair design, road repair plans, and design of catch basins. The scope of work included structural, civil, and mechanical engineering, along with surveying. Structural engineering work included design of soldier pile and tie-back retaining wall systems and shoring systems to allow access to wells damaged by landslides, as well as coordination of geotechnical engineering.

Steam Generation Site

San Ardo, California

Cannon provided initial project siting assistance. This facility houses 10 steam generators located on hilly terrain. Cannon was hired to assist with initial project siting of this facility. Factors included maximizing site efficiency due to process elevation constraints, site accessibility, and earthwork balancing. Cannon provided civil design and survey services, including detailed grading and drainage design and phased construction plans for agency permit acquisition and construction. Cannon's site development design role involved identification of site constraints, including on-going and future drilling development constraints.

Mapping & Surveying



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

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

Documents

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

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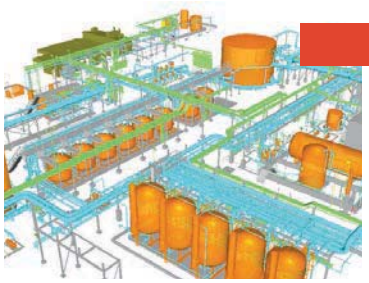
Projects



3D Laser Scan of Aera Belridge Dehy 20 Facility

Bakersfield, California

Cannon conducted a 3D laser scan of the Dehy 20 facility to document the existing condition of the 21-acre site for future design purposes. The scope of work included preparation and registration of one point cloud and importing the data into PDMS and CADWorx Plant Professional. Cannon ensured that the horizontal and vertical control was in alignment with the existing plant coordinates for Aera Energy. The scan included all equipment pads, tanks, pipe supports, pumps, FWKO, ISS vessels, walnut filters, foundations, piping, and components.

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

Kern County, California

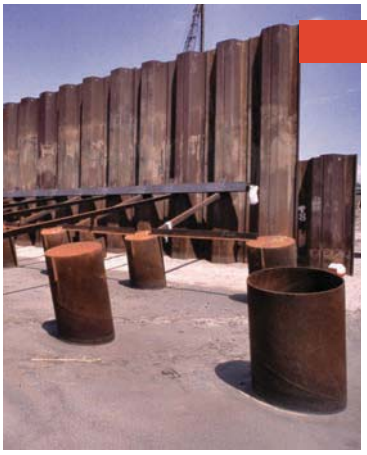
PG&E needed precise as-built alignment and depth data as well as permanent survey control points for Line 300A and 300B corridor, which spans approximately 45 miles.

Cannon used GPS to acquire the necessary survey control in two tiers. The data was tied 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 above ground 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 as CAD mapping exhibiting results of the GPS survey.

Sump Location and Remediation

Santa Maria, California

In an effort to clean up the land for agricultural, commercial, and residential uses, backfilled sumps were located for remediation purposes. Cannon was retained to provide engineering, surveying, permitting, and compliance services for the remediation of over 300 sumps in the Santa Maria Valley. The survey scope of work included location of potential sumps (based on remote sensing) using GPS, preparation of topographic survey of the excavation, calculation of excavation volumes, and as-built drawings and mapping for land access agreements.



Large-Scale Site Remediation

Avila Beach, California

Pipelines for the Avila Beach offshore loading facility ran under the main street of this coastal resort town. During years of operation, the pipelines leaked diesel, gasoline, crude oil, and gas, causing soil contamination in the area. After years of debate, excavation and remediation of the hydrocarbon affected sand took place with the removal, demolition, and replacement of the town of Avila Beach.

Unocal selected Cannon to provide engineering, surveying, planning, and permitting for portions of this large-scale remediation project. Survey scope of work included obtaining coordinate/positioning information to map leak plumes and groundwater contamination, monitoring wells, and property line information within the contaminated area. Steel sheet piling was used extensively because of the high groundwater levels and was surveyed to monitor potential movement during excavation.

Automation & Electrical

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

Cannon

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 a reliable fuel gas pressure to the plant's 240 mega watt electric power generator. 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.

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

Cannon was selected to design and build a secure wireless Ethernet, TCP/IP communications system for this oil producing system. Cannon provided instrumentation and electrical engineering, SCADA design, installation, and programming. 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 that consisted of fiber network, wireless Ethernet infrastructure (Motorola Canopy), and RF radios—and multiple communication panels; and designed, constructed, and installed remote I/O panels for the oil system and the water system. Cannon continues to provide on-going service and maintenance for the project site.

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; as well as providing operator training, operation manuals, and all program documentation including commented PLC code.

Petroleum Production Field Expansion

Lost Hills, California

Cannon provided project management, instrumentation and electrical engineering, and survey services to expand production from 300 barrels per day to 45,000 barrels per day. Cannon provided over ten miles of main corridor pipeline design for steam, gross production, natural gas, and water. The project included conceptual design, well siting, extensive surveying, road layout and design, SCADA system, a 69kV electrical substation, field electrical distribution, production facility design, extensive equipment specification and procurement, controls system, and close coordination with construction contractors.

Reliable Responsive Solutions[SM]

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