



2012 SOQ

ZONGE INTERNATIONAL, INC.

*Celebrating 40 years of
Worldwide Geophysical
Field Services and
Instrument Sales*

*Arizona, Alaska, Colorado,
Nevada, Oregon*

www.zonge.com

www.1800geophysics.com

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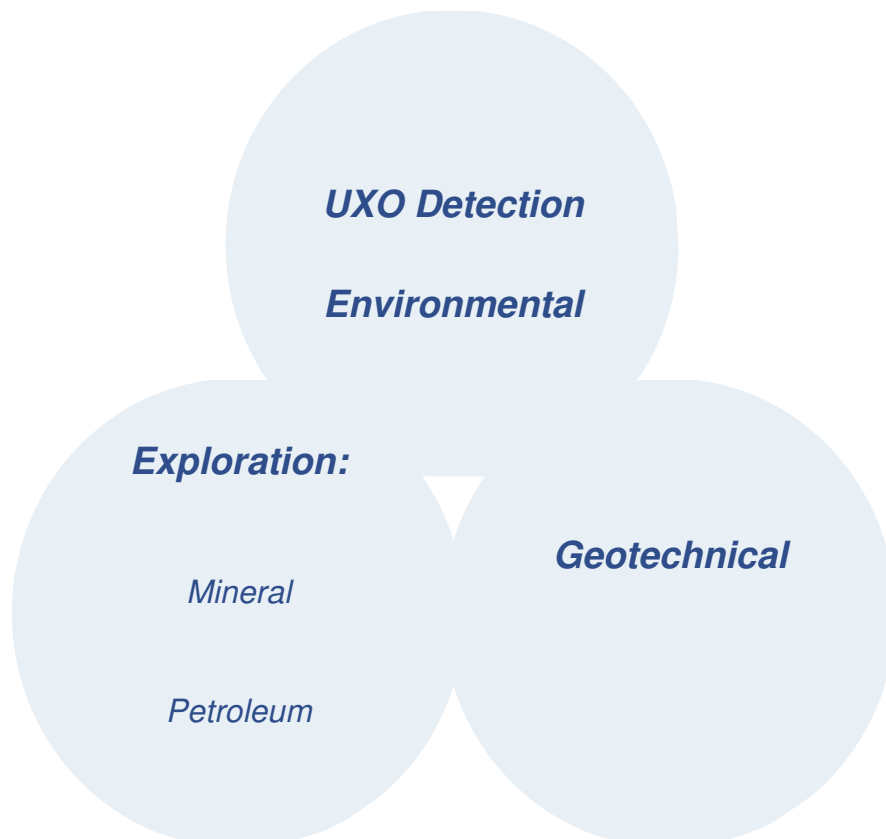
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Introduction

Zonge International is an employee-owned geophysical services company. Zonge, with more than 40 years experience is involved in the development of advanced geophysical instrumentation for the application of geophysical technology to environmental, geotechnical and hydrologic problems, as well as mineral and energy exploration. Zonge's advanced geophysical technology is used to provide subsurface imaging, information on rock properties, and detection of anomalous subsurface conditions. These anomalies may be caused by diverse sources such as ground water, unexploded ordnance (UXO), contaminants, or mineral deposits. Zonge's clients include engineering, hydrology and environmental consulting companies, mining, petroleum and geothermal exploration companies, and federal, state and local governmental agencies.



Research and Development

Zonge has an ongoing commitment to research and development for the advancement of subsurface imaging and detection technologies. During the past 11 years, Zonge's R & D budget has exceeded 10 percent of its gross revenue. This commitment places us at the forefront of geophysical technology for electromagnetic applications.

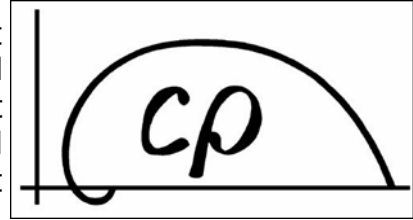
Currently, Zonge is in the final development stages of the Zonge Dynamic NanoTEM[®] (DNT), a next-generation multi-time gate, time-domain electromagnetic (EM) instrument. Several projects have already been completed using the DNT for unexploded ordnance detection as well as continuous resistivity profiling.

In 2010, Zonge completed development on the 24-bit GDP-32/24 receiver, the newest product in a long line of rugged, multi-channel receivers for acquisition of controlled- and natural-source geo-electric and EM data.

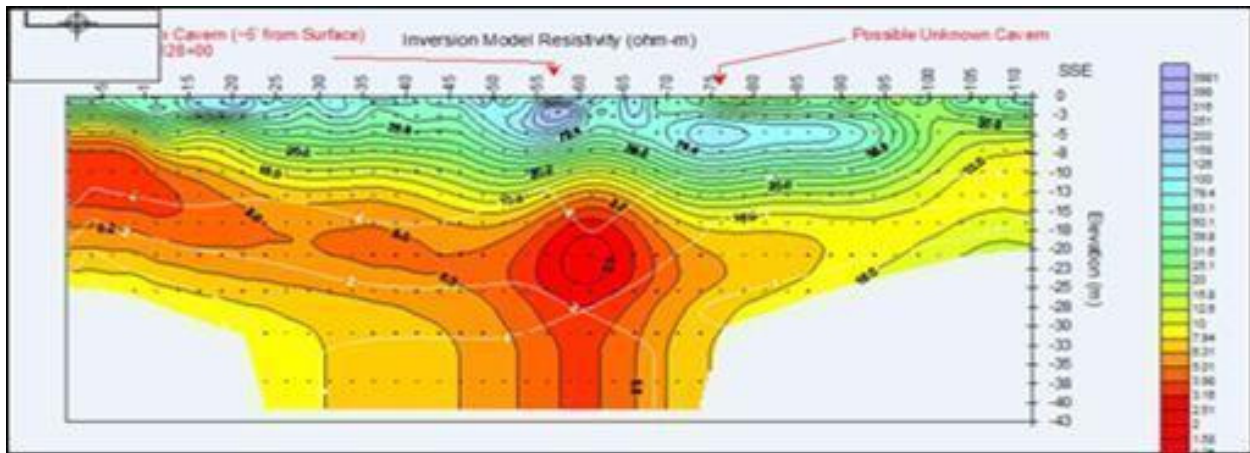
Research is also underway on the source of low-amplitude IP effects associated with some buried wastes and the non-linear IP effects in detection and discrimination of groundwater contaminants.

Geophysical Instrumentation

Zonge manufactures a complete line of state-of-the-art multi-function geophysical equipment for electrical and electromagnetic surveys. Zonge developed the first commercially available digital, electrical geophysical receiver that is backpack portable. The most recent addition to the product line is the GDP-32/24 receiver capable of high-resolution electrical and electromagnetic data. The GDP-32 is not exclusively dedicated to any particular survey type, it can acquire data for all presently used electrical and electromagnetic methods and can be programmed for research and special applications.



Zonge Manufacturing Logo



From the small 500 watt battery-powered NanoTEM transmitter to the 30 kW GGT transmitter, we are capable of transmitting frequencies in the range of DC to 10 kHz. Motor generators and auxiliary components are also manufactured by Zonge for a complete suite of electrical and electromagnetic geophysical systems.



GDP-32/24 Receiver



GGT-30 Transmitter

The Dynamic NanoTEM[®] System

UXO Detection

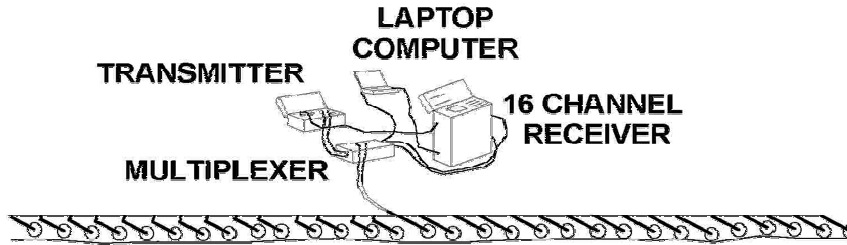


Levee Analysis

The Dynamic NanoTEM[®] (DNT) is a very fast, multi-channel, transient electromagnetic system capable of high-resolution electromagnetic imaging of the subsurface. This system is scalable in transmitter and detector/receiver dimensions to optimize detectability of a target based on the target's anticipated size, orientation, and depth; a valuable feature for UXO investigations.



The Zonge Zeta* System



Typical Setup:

Electrodes: 30
Station Spacing: 1/2 Dipole
N-spacings: 12 per diagonal (n=0.5, 1, 1.5, 2, ...)
Data points per Spread: 234
Typical Reading Time: 19 minutes
Number of Spreads per day: 15 to 20

Zonge Engineering's ZETATM (Zonge Electrical Tomography Acquisition) system acquires Induced Polarization (IP) and resistivity data utilizing multiple (up to 30) electrodes (or station) on one setup. The speed of data acquisition is greatly increased with the implementation of the ZETA system. The increase in speed has decreased the overall cost of running an IP and resistivity survey for the shallow subsurface.



ZETA system

**The Zonge Electrical Tomography Acquisition (ZETATM) system provides rapid, high density, DC-resistivity and induced polarization data for high-resolution subsurface electrical imaging.*

Geophysical Services

Zonge provides geophysical services for a wide range of applications both domestically and internationally. The full suite of services include survey design, data acquisition, and interpretation. Thanks to the adaptability of the GDP-32II, field crews are able to modify parameters and survey type in the field to respond to evolving survey requirements needed to meet site-specific conditions. Often the success of a geophysical survey is dependent upon rapid modification of survey parameters that are based on initial survey results. Zonge provides on-site data processing, imaging, and interpretation capabilities.

Exploration

Environmental Applications

Hydrological Investigation

Geotechnical Applications

In addition to electrical and electromagnetic surveys, Zonge has extensive experience in the application of gravity, magnetic, radiometric, shallow seismic, and ground penetrating radar methods. A survey-grade global positioning system (GPS) is coupled to the geophysical surveys to provide spatial control for the survey area. During the 40 years of operations, Zonge has successfully completed more than 2,000 surveys worldwide.



Exploration:

- ✦ Minerals
- ✦ Petroleum
- ✦ Geothermal

Exploration

Zonge has been a leader in the application of electrical and electromagnetic geophysics for the exploration of economic mineral deposits since 1972.

Zonge geophysical surveys have detected, delineated, and mapped numerous mining districts worldwide. Targets are base- and precious- metal deposits as well as industrial minerals.

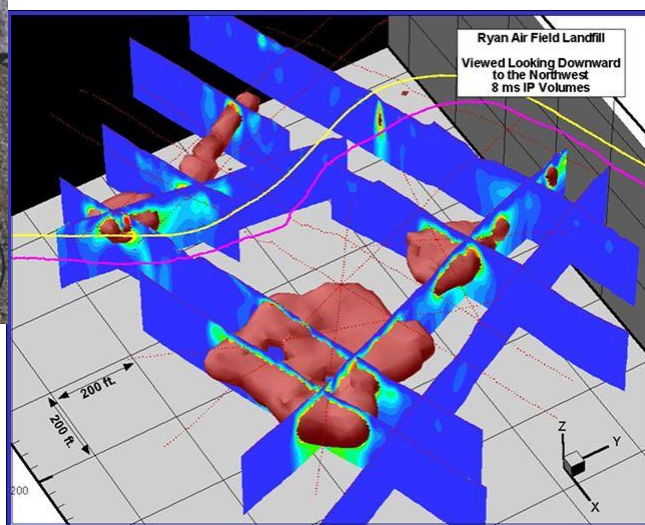
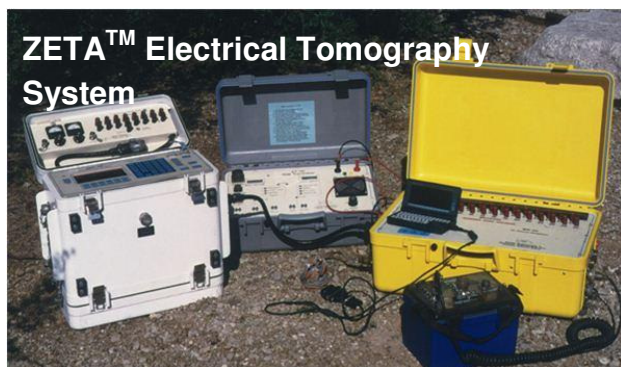


- ✓ Induced Polarization (IP) methods using time and frequency domains for detection of disseminated sulfides, graphite, or clay minerals.
- ✓ Controlled Source Audio-Magnetotelluric (CSAMT) investigations to detect massive sulfides, silicified zones or map subsurface lithology.
- ✓ Transient Electromagnetic (TEM) investigations—both surface and borehole—for mapping conducting features, including massive sulfides, clay deposits, and coal seams.
- ✓ Magnetotelluric methods for deep electrical resistivity investigations for petroleum in non-seismic areas, geothermal exploration, and mineral projects at depths greater than one kilometer.
- ✓ High-resolution gravity surveys to map variations in basement topography.
- ✓ Integrated ground magnetic/GPS survey for rapid investigation of local subsurface structure.

Environmental Applications

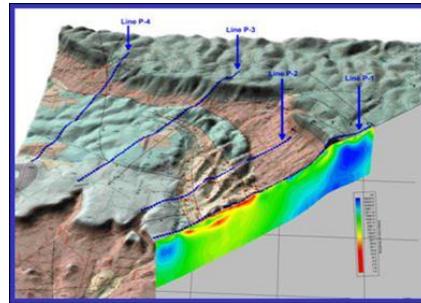
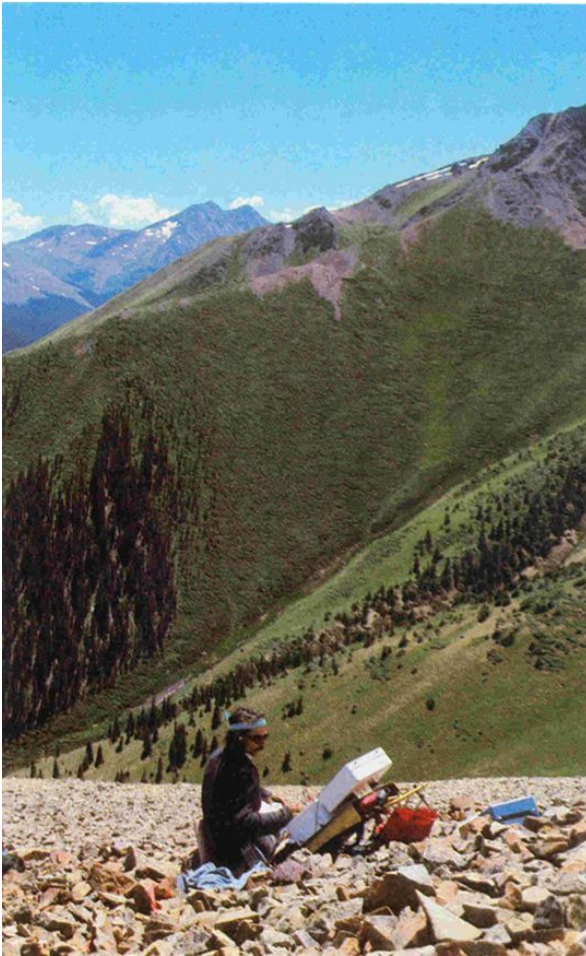
Geophysical technology is well suited to environmental applications because there is a good contrast between the host material and the environmental problem, such as: groundwater contamination, leaks in containment ponds or pipes, buried landfills, buried non-metallic waste, abandoned wells, and buried drums.

- ✓ Detection and delineation of groundwater contaminant plumes using the ZETA™ system.
- ✓ Detection of undocumented buried landfills using ground magnetic, ZETA™ and NanoTEM® surveys.
- ✓ Detection and delineation of non-metallic buried waste based on low-amplitude induced polarization response using the ZETA™ system.
- ✓ Detection and location of abandoned water wells.
- ✓ Detection of old, uncased wells in advance of tertiary oil recovery by steam injection.
- ✓ Detection and location of leaks in pond liners, embankments, and pipelines.
- ✓ Determination of basin geometry for groundwater exploration and groundwater flow modeling.
- ✓ Detection of underground storage tanks (UST's) and associated pipelines.



Hydrological Investigations

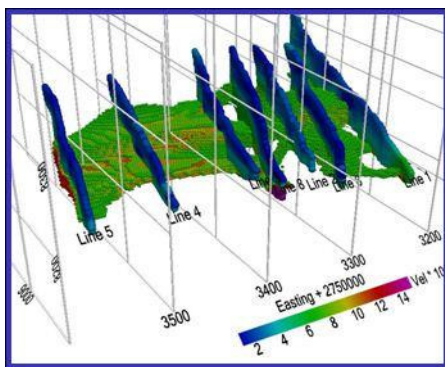
The electrical geophysical equipment, processing software, and data presentation tools by Zonge are widely used in geo-hydrologic and water resource investigations around the world. Borehole velocity surveys, and refraction and reflection seismic methods are suitable geophysical methods for delineating basement topography features that may include faults and fault zones.



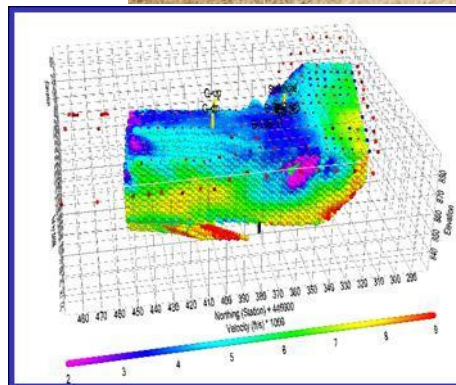
- ✓ Basin structure, and depth-to-bedrock mapping.
- ✓ Aquifer characterization such as defining the water table, Total Dissolved Solids (TDS) trends, and lateral and vertical resolution of saturated zones.
- ✓ Regional watershed studies.
- ✓ Salt water intrusion mapping, both terrestrial and littoral.
- ✓ Delineation of basement topography features and fissure prediction.
- ✓ Mapping contaminant plumes, brine plumes, leachates emanating from landfills, mine working, and military disposal sites.

Geotechnical Applications

Zonge has extensive experience in the application of geophysics to geotechnical and construction engineering applications. Geophysical survey data are translated into engineering and design needs such as Young's and Bulk modulus, Poisson's ratio, and rippability estimates. Reflection imaging can map faults and fractures in rock mass, while refraction data can provide important velocity information.



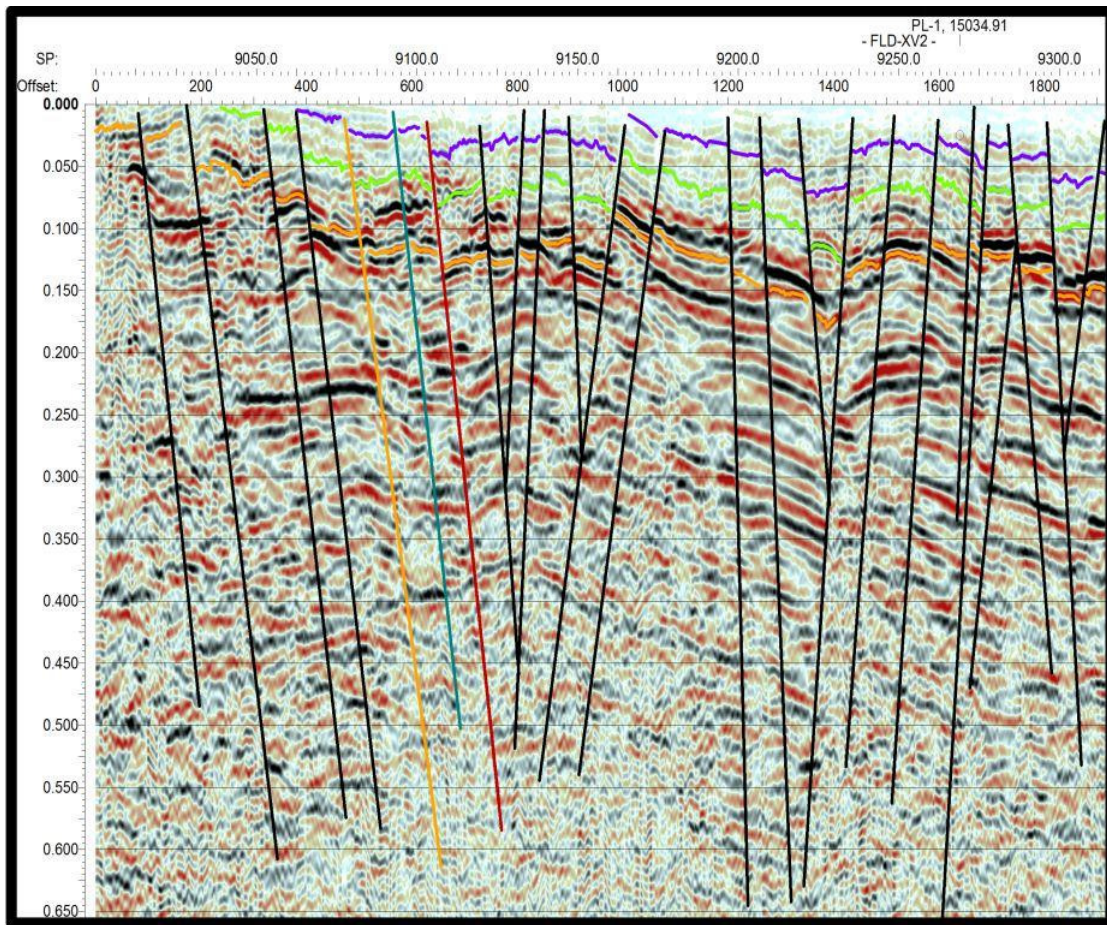
2D and 3D Surveys



- ✓ Evaluation of top-of-rock, rippability, and rock quality estimates.
- ✓ Detection of karst, caves, caverns, and abandoned mine workings.
- ✓ Determination of ground resistivity for design of electrical grounding systems at power plants.
- ✓ Non-intrusive surveys for mapping the integrity of levees, dams, mine tailings, and impoundment structures using EM / Resistivity / Seismic techniques.

Seismic Reflection

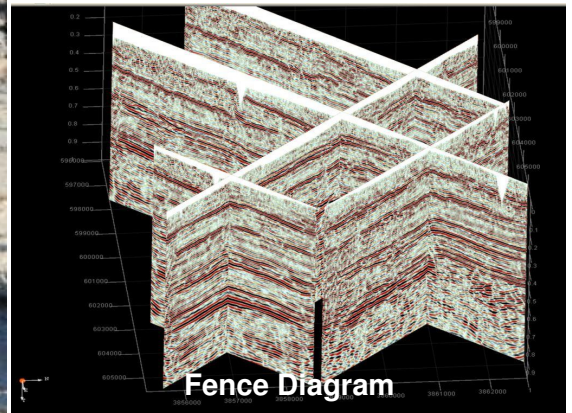
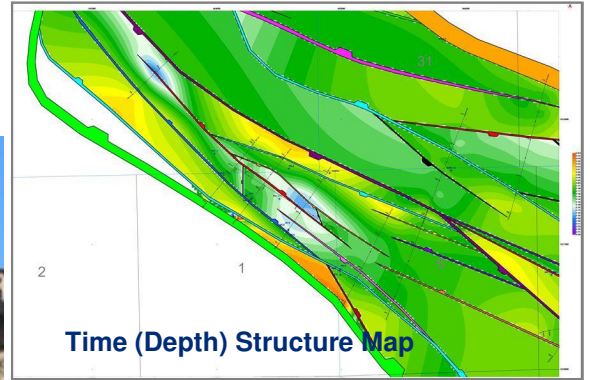
Zonge leads with innovative and trusted methods in the field of seismic reflection. For almost 10 years our objective in seismic reflection has been to collect quality data with trusted technology at a fair cost. Beyond the older cable systems Zonge now uses the WSI RT-1000, the only wireless recording system that collects seismic data in real-time.



- ✓ Shallow subsurface mapping (100-1000') using reflection
- ✓ Fault location for mining hazards and resource exploitation
- ✓ 2 and 3 dimensional resource location from 500' to 10000' depth
- ✓ Minimal survey footprint without cables
- ✓ Efficient surveys in areas of severe topography

Seismic Equipment

US Alliance AF450
Impact Seismic



RT-1000 Wireless
Seismic System

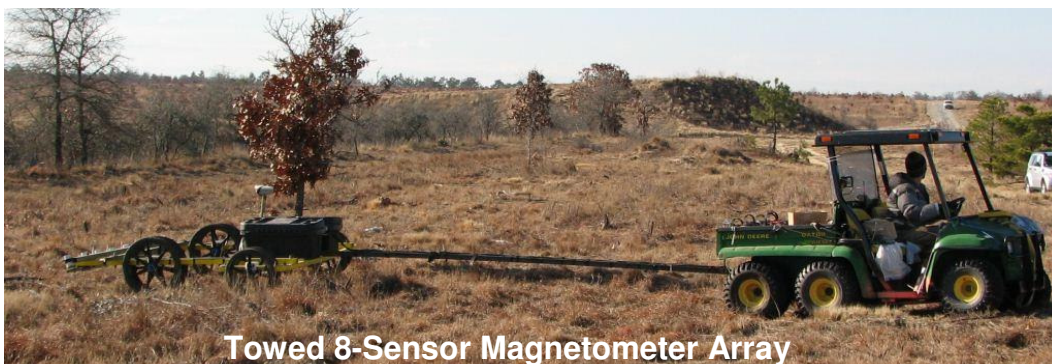


Unexploded Ordnance Detection

Zonge has been active for more than eight years in the application of geophysical methods to the detection of unexploded ordnance. Numerous projects have been successfully completed during this period, and the challenges of each project led to the refinements of the geophysical methods and optimization of the interface between the geophysical data and client/contractor requirements. Over the years Zonge has gained extensive experience in conducting both EM and magnetic surveys for UXO. Development of in-house software has led to the ability to prioritize UXO dig lists with the end goal of reducing overall project costs.



- ✓ Development of customized software and hardware solutions for detection of metallic objects in difficult environments, including soils with high iron content, and sea water.
- ✓ Digital geophysical investigations including electromagnetic and magnetic throughout the U.S.
- ✓ Third party QC of data collected by other contractors.



Software Development

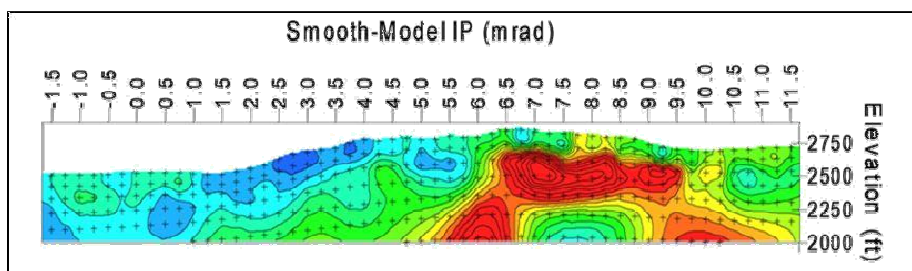
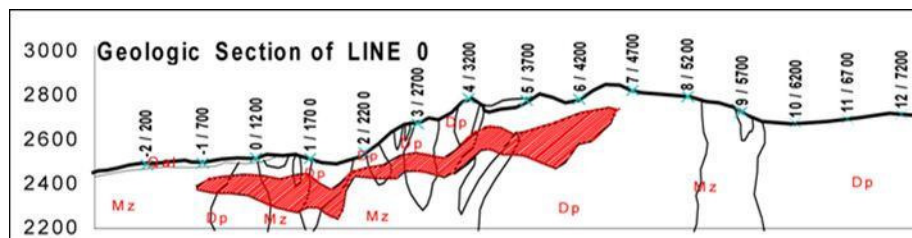
Zonge actively develops software programs to support new geophysical field methods and instrumentation. This development program produces software for electrical and electromagnetic subsurface imaging and target discrimination. Some of these programs are commercially available through Zonge or in cooperation with third party software providers.

$$\mathbf{EMF}_C = M_{TC} \frac{dI_T}{dt} \quad \text{Faraday's Law}$$

$$\mathbf{J} = -\sigma \frac{dV}{dh} \quad \text{Ohm's Law}$$

Zonge Software:

- ✓ Spatial Analysis of fast transient electromagnetic induction data for UXO detection,
- ✓ Two-dimensional inversion of subsurface and borehole resistivity and IP data,
- ✓ One-dimensional inversion of transient electromagnetic induction data ,
- ✓ One and Two-dimensional inversion of controlled source and natural source magnetotelluric data,
- ✓ Digital signal processing and analysis for electromagnetic induction data.

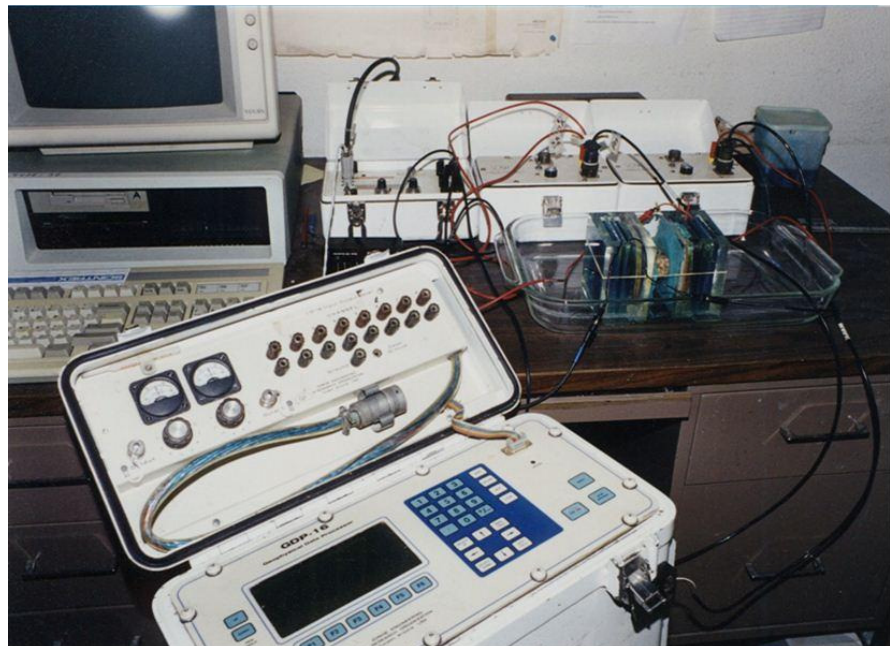


Physical Property Laboratory

Zonge maintains a rock physical property laboratory in the office at Tucson, Arizona. Physical property measurements of electrical resistivity, induced polarization/complex resistivity, magnetic susceptibility, density, and porosity are made on rock core and surface samples. These measurements are used to correlate with surface geophysical surveys, or to aid in the design of geophysical surveys for specific targets.



Preparing a rock sample for analysis



Analytical equipment in the laboratory

Professional Staff

Our professional staff is comprised of nearly 52 individuals with Bachelor, Master, and Doctorate degrees in geophysics, physics, mathematics, geology, and engineering. They have diverse experience with geophysical methods and applications. Their experience with these methods and applications enhance our Research and Development program. The following table exemplifies the type of professionals on staff at Zonge, and lists only a few of the key personnel. We have nearly 98 personnel worldwide.

Name	Title	BS/BA	MS	PhD/DSc	Discipline
Scott A. Urquhart	President, Managing Geophysicist	X	X		Geology & Geophysics
Chester S. Lide	Managing Geophysicist / VP	X	X		Geology & Geophysics
Phil Sirls	Managing Geophysicist / VP	X	X		Geology & Geophysics
Norman R. Carlson	Chief Geophysicist	X			Geophysics
JB Shawver	Managing Geophysicist	X	X		Geophysics
Bill Graves	Senior Design Engineer	X			Electrical Engineering
Emmett Van Reed	Program Geophysicist/COB	X	X		Math, Physics & Aerospace
Rowland French	Program Geophysicist	X	X	X	Physics & Geosciences
David Butler	Program Geophysicist	X		X	Geology & Geophysics
Gary Oppliger	Program Geophysicist	X	X	X	Geophysics
Jennifer Hare	Program Geophysicist	X	X	X	Geophysics
John Fleming	Sr. Geophysicist / Hydrologist	X	X	X	Geophysics & Hydrology
Scott C. MacInnes	Senior Geophysicist	X	X	X	Geology & Geophysics
Todd Meglich	Senior Geophysicist	X			UXO Geophysics
Les Beard	Senior Geophysicist	X	X	X	Math, Physics & Geophysics
Jacob Sheehan	Senior Geophysicist	X	X		Physics & Geophysics
Francisco P. Romero	Senior Geologist	X	X		Geology
Dexin Liu	Project Geophysicist	X			Geophysics
Nicole Pendrigh	Project Geophysicist	X	X		Geology & Geophysics
Mayo Thompson	Project Geophysicist	X	X		Geophysics
Anna Szidarovzsky	Project Geophysicist	X	X		Math & Geology
Marc Benoit	Project Geophysicist	X	X		Geophysics
Craig Markey	Geophysical Crew Manager	X			Geophysics
Paul Barojas	Staff Geologist	X	X		Geology
Marco Zamudo-Vega	Staff Geologist	X			Geology

List of Selected Clients

Aberfoyle Resources, Ltd.
Aerodata
Al-Aquitaine Exploration, Ltd
Alaska Earth Sciences
AMAX Exploration, Inc.
Amoco Production Company
Anaconda Production Company
Anadarko Production Company
Anglo-American Prospecting Serv. Pty., Ltd
AngloGold, North America, Inc.
ARCO Oil and Gas Exploration
Arcadis [GM], Inc.
Asamera, Inc.
Asarco, Inc.
Barr Engineering
Barrick Goldstrike Mines, Inc.
Beijing Orangelamp Navigation Technology
Development
Bendix Corporation
Bishimetal Corporation
Black Eagle Consulting, Inc.
Black and Veatch, Inc.
Boise State University
British Petroleum Minerals
Cairo University
Campbell Resources, Inc.
Canadian Hunter Exploration, Ltd.
Canterra Energy, Ltd.
Cella-Barr Associates, Inc.
Central South University of Tech, Changsha,
China
Chevron Resources Company
China Nuclear, Beijing, China
Cities Service Minerals Corporation
City of Tucson
Climax Molybdenum Company
Codelco Mines, Inc.
Comesa
Cominco American, Inc.
Compania de Pesquisas de Recursos Minerali
Consejo de los Recursos Minerales
Continental Oil Company
CRA Exploration Pty., Ltd.
Cyprus Miami Mining Corporation
Cyprus Sierrita Mining Corporation
Departamento Nacional de Producao Mineral
Desert Research Institute
Dowa Kosan Company, Ltd.
Dowell Schlumberger, Inc.
Dresser Minerals International
Duval Corporation
Egyptian Geological Survey
Elliot Geophysics
Energy Fuels Nuclear, Inc.
ENSAFE, Inc.
ENSCO, Inc.
Entrée Gold
Environmental Engineering Consultants, Inc.
ESI Brady Hot Springs, Inc.
ESI San Emidio, Inc.
ESI Vale, Inc.
Esso Eastern, Inc.
Eureka Resource Associates, Inc.
Exxon Minerals Company
Exxon Production Research
First Mississippi Corporation
FMC Corporation
General Mining-Union Corporation, South
Africa
Geodatos
Geodass
Goevaluaciones
Geological Survey of Japan
Geological Survey of Pakistan
Geosource, Inc.
Geoterrex
GeothermEx, Inc.
Goldfields of South Africa, Ltd.
Golder & Associates
Gradient S.R.O.
Groundwater Resources Consultants, Inc.
Gulf Energy and Minerals Company
Gulf Research and Development
Hanna Mining Company
Holmes and Narver, Inc.
Hudson Bay Oil and Gas Company
Hudson Bay Exploration
HydoGeoChem, Inc.
Hydrosystems, Inc.
IEG, Ltd.
Industrial Compliance Technologies, Inc.
Ingeneria y Exploration Geologica
Inland Gold and Silver
IT Corporation
Japan International Cooperation Agency
Johannesburg Consolidated Investments
Kakioka Magnetic Observatory, JMA
Kennecott Exploration Company

List of Selected Clients (continued)

Kenya Power & Light
Kerr-McGee, Inc.
Korean Inst. of Geol., Mining and Minerals
LAC Minerals
Las Encinas
Lawrence Livermore National Laboratory
Ike Lovelady, Inc.
Macquarie University
Magma Copper Company
Marathon Oil Company
Matthews Oil Company
McFarland & Associates
Metal Mining Agency of Japan
Milestone Petroleum, Inc.
Minatome Corporation
Mindeco
Minerals Exploration Company
Minsearch, Inc.
Mobil Oil Company
Molycorp, Inc.
Montana Technological University
NAFTA Gas (Yugoslavia)
Natural Resources Authority (Jordan)
Naval Research Laboratories
New Energy Dev. Org. (Japan)
Newcrest Mining
Newmont Exploration, Ltd.
Nikko Exploration & Development Co., Ltd.
Noranda Exploration, Inc.
Nufuels Corporation
Occidental Petroleum
Pathfinder Mines Corporation
Pennzoil Sulphur Company
Petroleum Investors Company
Phelps Dodge Corporation
Placer Development, Ltd.
Placid Oil Company
Poseidon
Puma Geothermal Venture, Inc.
Quadrant Geophysics
Quaterra Resources, Inc.
Rio Tinto Exploration
Rocky Mountain Exploration
Rocky Mountain Fuels
Rocky Management Services Pty., Ltd.
Salt River Project
Sandia National Laboratory
Santa Fe Mining, Inc.
SERU Nucleaire Limitee
Southern California Edison
St. Joe Minerals Corporation
Sumitomo Metal Mining Company
Sunmark Exploration Company
Teck Resources, Ltd.
The Termo Company
Texas Gulf Minerals Exploration Company
Tohono O'Odham Nation
Trans-Pacific Geothermal Corporation
Union Oil Company of California
UNITEX (Thailand)
University of Alaska
University of Arizona
University of Missouri, Rolla
University of Oregon
University of Utah
University of Wisconsin
U.S. Borax & Chemical Corporation
U.S. Bureau of Mines
U.S. Bureau of Reclamation
U.S. Environmental Protection Agency
U.S. Geological Survey
U.S. Geological Survey, Saudi Arabia
Usibelli Coal Mines, AK
Utah International, Inc.
Utah Mines, Ltd.
UVI Industries, Inc.
Venada National, Inc.
Vidler Water Company
Western Australia School of Mines
Western Mining Corporation
WGM, Inc.
Wyoming Fuels Corporation
Wyoming Department of Environmental Quality

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Our corporate office is located in the heart of the old west, Tucson, Arizona. We are diversified in the technical staff within each office, and our Geosciences offices are located throughout the U.S. to service our domestic clients.

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