



STATEMENT OF QUALIFICATIONS

Geo-Energy Services, LLC

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Geo-Energy Services (GES):

Corporate:
14250 East Easter Place
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Centennial, Colorado 80112
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Affiliations:

Geothermal Heat Pump Consortium
International Ground Source Heat Pump
Association
Building Commissioning Association
ASHRAE
AEE

Point of Contact:

Trey Austin

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Josh Droege

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Anthony Hardman

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Geo-Energy Services, LLC is a global provider of leading and innovative GeoExchange solutions. Geo-Energy Services continues to develop projects with facility managers, architects, building owners, homeowners, engineers, contractors, ESCO companies, and regional partnerships.

Geo-Energy Services can assist clients to determine if GeoExchange is appropriate for various types of projects and applications. Our experience and knowledge of GeoExchange can enable your team to make informed decisions.

GES is well-versed in all aspects of geothermal system engineering design. We remain current in the latest applicable geothermal heat pump technologies, practices, and regulations. Critical to completing any project successfully is the qualified personnel that GES brings to the project.

Qualifications and Experience

Our company works with the owner team from design to construction to develop the right solution such that the owner is provided with an optimized GeoExchange system. Our philosophy, starting at the corporate-management level, is to enhance the success of the project and all its team members. We are committed to honoring deadlines, budgets, and other project performance expectations.

Qualifications Summary

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|---|---|
| 1. Firm experience in design and installation | GES's personnel resume have over 14 years of experience in GeoExchange design and installation. |
| 2. Staff Qualifications | GES's staff includes all the necessary engineering requirements, including a licensed Professional Engineer. GES's design team includes a Certified GeoExchange Designer (CGD). |

Geo-Energy Services can provide expertise in the following technical areas:

- ◆ Feasibility Studies, Energy Modeling/Simulations using eQUEST, TRACE 700 and others
- ◆ Complete GeoExchange System Design and Engineering
- ◆ GeoExchange System Commissioning
- ◆ Maintenance personnel training
- ◆ Field/forensic investigations
- ◆ Planning, and programming for GeoExchange systems: Phased, Campus, or Large Scale Projects
- ◆ Special Applications of GeoExchange systems
- ◆ GeoExchange, Photovoltaic or Solar Thermal system integration
- ◆ LEED Projects – Design, Energy Modeling, and or Building Commissioning services
- ◆ Thermal Conductivity Testing
- ◆ General Consulting to Owner/Contractor/ or A/E team
- ◆ Ground Loop Design; Ground Loop Heat Exchanger Types:
 - Vertical Boreholes
 - Pond Loops
 - Pallet Loops
 - Slinky Loops
 - Plate Heat Exchangers
 - Horizontal Trenches
 - Straight Loops
 - Vertical Slinky Loops
 - Horizontal Slinky Loops
 - Hybrid Loops
 - Standing Column Wells
 - Open Loop Systems

Recent Projects

Republic of Panama Playa Panamaes



Owner: Private

Status: Design/Construction 2010/2011

Services: Feasibility Study, Design/Build, Commissioning

Scope: Develop a sustainable method to cool resort buildings in a campus configuration. Designing a centralized ocean plate heat exchanger to cooling 40,000 m² of building space. System integration includes swimming pool and domestic hot water heating. The project is proceeding with LEED certification, expected to be the first LEED certified project in the country. Design includes a master site planning for a common ground heat exchanger with site distribution to over 50 buildings on site.

Owner: State of Colorado
Status: Completed 2008/09
Services: Design/Build

Scope: Design and install the ground heat exchanger for the 30,000 ft² Executive Mansion for Governor of Colorado. Subcontracted to Chevron Energy Solutions to design and install a vertical loop field underneath and existing driveway and yard. The ground heat exchanger system designed is 24-400' U-bend loops. The project was part of an ESPC project with the State of Colorado, Capital Building Campus.

**Governor's Mansion Borefield Project
Denver, CO**



**Tucumcari High School Addition
Tucumcari, NM**



Owner: Tucumcari School District
Status: Completed December 2009
Services: Ground Loop Design

Scope: Ground heat Exchanger design. The project will be phased for buildings. The ground heat exchanger is designed and will be installed to accommodate both buildings on a single vertical borefield. The project will include installation of an underground vault. The ground heat exchanger is 94 boreholes drilled 300' deep using 1" U-bend loops and thermal enhanced grout.

Owner: Private Owner
Status: Completed Feb 2009
Services: Ground Loop Design
Scope: Ground heat Exchanger design for a 40,00 ft² medical office building. The ground heat exchanger is 42 boreholes drilled 400' deep using 1-1/4" U-bend loops and thermal enhanced grout. The project will accommodate an additional 20,000 ft² building on the property for future use.

**Salud Family Health Center
Commerce City, CO**



**Colorado Northwester Community College
Craig, CO**



Owner: State of Colorado
Status: Design/Construction March 2010
Services: Ground Heat Exchanger Design
Scope: Provide a central ground heat exchanger to 15 buildings totaling nearly 500,000 sqft for a brand new college campus. Scope has included load estimating for future buildings as well as creating a master plan for potential phased ground heat exchanger installation.

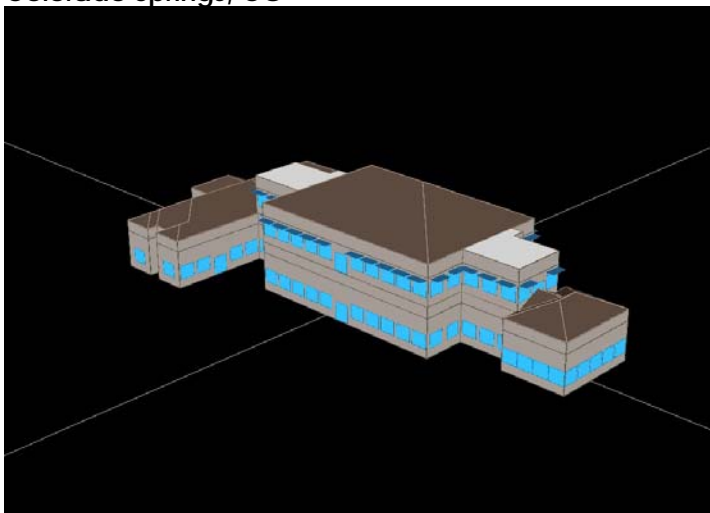
Owner: Private Owner
Status: Completed December 2009

Services: Design/Build
Scope: Complete GeoExchange system design and installation for a 9500 ft² building with mixed use. Project will include ground loop design, HVAC mechanical design and construction installation of the ground heat exchanger, HVAC work, and domestic hot water heating.

**Community Support Center
Highlands Ranch, CO**



**Colorado Springs Fire Station #21
Colorado Springs, CO**



Owner: City of Colorado Springs
Status: Currently In Design
Services: An innovative design for a new fire station with a goal to achieve LEED Platinum certification. The system will incorporate a GeoExchange system for space heating and cooling in occupied areas, radiant floor heating for the fire truck bays. The system will also look to integrate solar thermal and photovoltaic systems.

Personnel- Project Team Key Representatives

Warren (Trey) Austin, PE, CGD

Years Experience: 15

Education: BSME, 1996 Oklahoma State University
MSME, 1998 Oklahoma State University

Registration: 2002 Professional Engineer License (PE)
2000 Certified GeoExchange Designer (CGD)
1998 IGSHPA Accredited Installer
2004 Certified Energy Manager (CEM)
2004 LEED™ Accredited Professional (AP)
2005 Certified Green Building Engineer (GBE)



Positions Held: IGSHPA Advisory Council Member

Instructor: IGSHPA Accredited Installer Trainer

Mr. Austin has over 14 years experience in GeoExchange systems. He has a Master's Degree in Mechanical Engineering from Oklahoma State University, where the International Ground Source Heat Pump Association maintains its headquarters. Mr. Austin spent two years, as a graduate assistant, working on a research project at Oklahoma State University to develop a test procedure, a testing apparatus, and a computer model to determine the soil thermal conductivity in-situ that is required in all ground heat exchanger sizing software programs.

Mr. Austin's background consists of energy efficient HVAC systems design, including ground source heat pump systems and energy management (controls) systems. Mr. Austin has experience in practical applications for computer energy simulation of building systems, design of piping and HVAC systems, cost estimation, and Life Cycle Cost Analysis (LCCA). In addition, background experience in building and system level commissioning as well as operational training to facility personnell.

Mr. Austin obtained a Certified GeoExchange Designer (CGD) certification granted by the joint efforts of the AEE, IGSHPA and GHPC. He is also an Accredited IGSHPA Installer and an IGSHPA Accredited Trainer to proctor the Accredited Installer class. Mr. Austin continues to provide assistance to owners, architects, and other mechanical engineers in designing both simple and complex ground source heat pump systems.

His experience in GeoExchange with design, consulting, comissioning, and energy studies include over 300 projects of several different types of applications including: hot water/chilled water, vertical/horizontal water-to-air heat pumps, central, distributed, and a variety of ground heat exchanger configurations: vertical boreholes, horizontal (slinky and straight), pond/lake loops, and hybrid configurations.

Mr. Austin's presentation list includes: Colorado Renewable Energy Society's Annual Conference, the International Ground Source Heat Pump Association, the Rocky Mountain ASHRAE Chapter's Annual Technical Conference, Governor's Office of Energy Management and Conservation, Geothermal Resource Council's Annual Conference, and the National Conference on Building Commissioning. He also presented his paper, *Development of an In-Situ System and Analysis Procedure for Measuring Ground Thermal Properties*, at the February 2000 ASHRAE National Convention. In March of 2007, Mr. Austin was elected to IGSHPA's Advisory Council for a 3-year term.

Mr. Austin's Resume Experience:

- ◆ **Solix Biofuel Feasibility Study, Fort Collins, CO.** Scope of services was to provide baseline and alternative energy models in a feasibility study. The conventional system configuration heat/cool large scale low-depth ponds where clear plastic bags grow algae that is harvesting for the next generation of biofuels. The study evaluated the possibility of replacing conventional gas-fired

(fossil fuel) heaters with geothermal heat pump pumps. The study concluded that if enough land area was present, it was feasible to use GSHP systems.

- ◆ **City of Salida vs Ron McGlaughlin, et.al., Salida, CO.** Forensic evaluation of a existing high temperature geothermal source that was used to heat a series of three indoor hot springs swimming pools and spa. Expert consultant for defendant. Scope of services included complete system evaluation for operation issues reviewing case documentation. Site was not visited due to our of court settlement between parties.
 - ◆ **Jicarriala Apache Nation vs Layton Construction, Delcue, NM.** Forensic evaluation of a existing geothermal heat pump system that utilizes a series of horizontal slikiies buried in a preexisting, dried waste water lagoon basin. Expert consultant for defendant. Scope of services included complete system evaluation for operation issues with an on site survey, testing, and final report.
 - ◆ **Old Town Hot Springs, Steamboat Springs, CO.** Feasibility and design of a geothermal heat pump system using moderate temperature hot springs as a natural heat source to heat 3 swimming pools, 3 spas, and a one lap pool and heat/cool the attached building structure.
 - ◆ **Kinard Junior High School.** The LEED project is a new, state-of-the-art, high performance education facility utilizing a GeoExchange system (74 geothermal heat pumps distributed to local mechanical rooms for the classroom areas only), daylighting, and an energy recovery ventilation system. Mr. Austin's project involvement includes ground heat exchanger design, submittal reviews, and periodic inspection of the borefield installation.
 - ◆ **Feasibility Study and Borefield Project for Harmon Hall, United States Air Force Academy, USAFA, CO.** Scope of services provided in the study included documentation review of existing design, developing two energy models, approximating cost estimates, and using FAR and Air Force guideline requirements for final LCCA comparison. As the lead project manager and design engineer for the borefield project, a ground heat exchanger was designed capable of supporting the heating and cooling requirements for the ground source heat pumps for the Harmon Hall Renovation project (United States Air Force Academy Headquarters Bldg). The borefield will be located underneath an existing parking lot, composed of 121 boreholes, 300-ft deep (36,300 total feet of ground heat exchanger), manifolded together in an exterior polyethylene vault.
 - ◆ **Engineering Services for US 8th Army Division, Yongsan Army Base, Seoul, S. Korea.** The project was a designed GeoExchange system for 8 different buildings on the Yongsan base as part of an ESPC project. The retrofit design replaced all the existing HVAC work, DHW heating systems, and the necessary electrical upgrades. All eight buildings totaled 275 tons of capacity using 49,000 feet of ground heat exchanger. Mr Austin's involvement included the site survey of the buildings and site layouts, design of the ground heat exchangers, and building system HVAC configurations.
 - ◆ **United States Postal Service, Carrier Annex, Lincoln, NE.** Mechanical Engineer responsible for design of GHEx layout of new annex. Design of geothermal system incorporated AHUs and FCUs rather than typical heat pump units utilizing water-to-water heat pump units. Design also included the ground heat exchanger and interior piping.
 - ◆ **United States Postal Services, Main Post Office, Shawnee, OK.** Design retrofit of 1958 office building that converted existing chiller/boiler facility into a 80-ton GeoExchange HVAC system. Constant volume multizone air handlers were reconfigured into a VAV multizone AHU system. Mr. Austin performed feasibility study and complete design that included the ground heat exchanger and interior piping. The system uses 35-360' boreholes as the ground heat exchanger serving 4 20-ton water-to-water heat pumps that supply chilled water/hot water to the AHU coils for heating and cooling.
 - ◆ **GeoExchange Design of St. Isidore Traditional Catholic Church, Akron, CO.** Design engineer for a Geoexchange system for the St. Isidore Catholic Church to replace a conventional boiler/DX HVACE system. The redesign incorporated an air-to-air heat exchanger to recapture ventilated air for additional energy savings due to ventilation requirements that account for 65% of the heating and cooling loads. This GeoExchange system has 40 tons of heat pump capacity utilizing a 32-hole borefield.
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- ◆ **Lawton School District, Lawton, OK.** Design engineer for ground heat exchanger system for new construction middle school. The total GeoExchange system incorporated 530 tons of heat pump capacity and a 250-hole borefield for a total borehole footage of 80,000 feet.
- ◆ **Mustang School District, Mustang, OK.** . Design engineer for ground heat exchanger system for new construction middle school. Performed a thermal conductivity test and analysis and provided project management for the ground heat exchanger installation. The total GeoExchange system incorporated 250 tons of heat pump capacity and a 200-hole borefield for a total borehole footage of 35,000 feet.

Anthony Hardman, EIT, Staff Mechanical Engineer

Years of Experience: 5

Education: BSME, 2003 United States Air Force Academy

Mr. Hardman joined Geo-Energy Services (GES) in 2007 upon completion of a 4 year service commitment to the USAF for attending the Air Force Academy. While in the Air Force, he served in various engineering positions requiring extensive thermal analysis of widely diverse mechanical systems in addition to detailed computer modeling and simulation tasks. These fundamental skills were the impetus of his hiring and have contributed greatly to Geo-Energy Services' ability to analyze not only HVAC systems, but complex non-traditional applications using geothermal technology as well. Since joining GES, his skill set has expanded to include eQuest, Energy Plus, and Trace700 energy simulation software.

Mr. Hardman's HVAC experience is predominantly centered in Geothermal HVAC design but also includes retrofit analysis, feasibility studies, custom industrial applications and building commissioning. His projects range in size and complexity from the traditional residential forced air system to commercial hybrid geothermal - underfloor air distribution systems, totaling 13 in all. The scope of such projects often include cost estimation, life cycle cost analysis (LCCA), design alternatives, site visits and educational consultation.

Josh Droege, Staff Mechanical Engineer

Years of Experience: 5

Education: BS, 2002 Regis University
MSME, 2006 University of Colorado-Boulder

Mr. Droege began his career in the HVAC industry by working with an MEP firm in the Denver area after graduating from CU's Building Systems Graduate Program. Since joining Geo-Energy Services in 2006, Mr. Droege has worked on a number of ground source heat pump projects around the world. In addition, Mr. Droege has designed vertical loop ground heat exchangers, horizontal ground heat exchangers and ocean plate heat exchangers.

Mr. Droege's experience focuses on energy efficient HVAC systems, including ground source heat pump systems through applications of energy simulation software programs, design of HVAC systems, cost estimation, and Life Cycle Cost Analysis (LCCA).

His experience in this field with design, consulting, and energy studies include over 30 projects of several different types of GeoExchange applications including: hot water/chilled water, centralized and distributed vertical/horizontal water-to-air heat pumps, and a variety of ground heat exchanger configurations such as: vertical boreholes, horizontal (slinky), pond/lake loops (plate styles).

Geo-Energy Services' Project Experience	Sustainable Design and/or LEED Projects	Economic Analysis/ Energy Modeling	Design	Commissioning	Consultant
Solix Biofuels, Fort Collins, CO		X			
Stapleton III k-8 School, Denver Public School District, CO	X			X	
Paonia Public Library, Paonia, CO			X		
Fort Sumner Municipal Schools, Fort Sumner, NM			X		
Southern California Edison AgTAC, Tulare, CA			X		
F.E. Warren AFB Building 284 & 31, Cheyenne, WY		X			
Club Union, Panama City, Panama		X			
Wolf Creek Resort Development Feasibility Study, Wolf Creek, CO		X			
Diamond Livestock Office Building Loop Design, Casper, WY			X		
Creede America Development, Creede, CO			X		
ClimateMaster Engineering Handbook					X
Pool Systems, Phoenix, AZ		X			
Denver Museum of Nature & Science, Denver, CO		X			
Camp Humphreys GSHP Study, Seoul, South Korea		X			
RMR Ranch Development Feasibility Study		X			
Citizens Bank, Providence, RI		X			X
Private Residence, Ten Sleep, WY			X		
Caterpillar Learning and Training Center, Republic of Panama	X	X		X	X
Jicarilla Apache Nation vs. Layton Construction, Dulce, NM					X
Valley Brook Childcare Facility, Breckenridge, CO	X	X			
GroGreen Hydroponics Greenhouse Nutrient Tank Study, Salida, CO		X			
Private Residence, Grand Lake, CO			X		
Newbridge on the Charles, Dedham, MA					X
City of Salida vs Ron McLaughlin, et.al., Salida, CO					X
Panamaes Eco Project, Republic of Panama	X	X	X		
City of Steamboat Springs Activity Center, Steamboat Springs, CO	X			X	
Tucumcari High School Loop Field Design, Tucumcari, NM			X		
Old Town Hot Springs, Steamboat Springs, CO		X	X		
Case Western Reserve University, Cleveland, OH		X			
A & A Treehouse, Golden, CO	X			X	
Salud Family Health Center Loop Design, Commerce City, CO			X		
Montrose Recreation Annex, Montrose, CO		X			
Uinta Elementary School, Evanston, WY		X			
Hat Butte Ranch, Dubois, WY			X		
Torrington Office Feasibility Study, Torrington, WY		X			
Observatory Park Condos, Fort Collins, CO	X		X		
Office Building, Highlands Ranch, CO			X		
Ridgeway Golf Clubhouse Loop Design, Ridgeway, CO			X		