

ASSOCIATION OF ENGINEERING GEOLOGISTS

SOUTHERN CALIFORNIA SECTION

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AUGUST 1996

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THIS MONTH'S MEETING

August 13, 1996

Tunnel Trilogy: Construction, Inspection, and Maintenance of Three Tunnels in the Denver Water System

presented by

Susan Steele Weir
AEG President

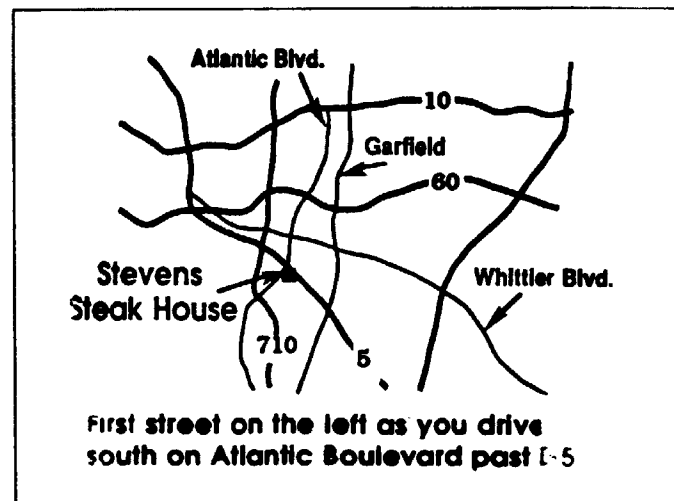
Reservations must be made by **Friday, August 9!**
Call GeoSoils at (818) 785-2158

Social Hour: 6:00 pm
Dinner: 7:00 pm
Meeting: 8:00 pm

Location:
Stevens' Steak House
5332 Stevens Place
Commerce

Cost: \$20.00
(\$10.00 for full-time students
with valid I.D.)

Map to Meeting



**Deadline for submittals to
the September Newsletter:
August 23**

AUGUST PROGRAM

Tunnel Trilogy: Construction, Inspection, and Maintenance of Three Tunnels in the Denver Water System

Susan Steele Weir

AEG President

*Chief Geologist, Denver Water Department
1600 W. 12th Avenue, Denver, CO 80254*

Water, or lack of it, has been a major concern of the Denver area since its humble beginnings as a collection of cabins and tepees along the banks of the South Platte River and Cherry Creek. The Denver Water Department's vast system of dams, tunnels, treatment plants, conduits, and pump stations was developed to serve the need for water supply to the semi-arid Denver environment. Critical components of the water distribution system are the water tunnels. Construction, inspection, and maintenance aspects of these critical components are illustrated utilizing three tunnels in the Denver Water system: 1) Foothills Tunnel, 2) Roberts Tunnel, and 3) Moffat Tunnel.



Golden, Colorado. In addition to her education, she has twenty five years experience in the field of engineering geology. At the Denver Water Department she plans, directs, and conducts professional geologic investigations as they pertain to the design, construction, and maintenance of water collection, storage, diversion, treatment, and distribution facilities. Prior to the Denver Water Department, she was employed by the U.S. Geological Survey. Her work with the U.S. Geological Survey was primarily engineering geology investigations for tunnel sites in support of the nuclear weapons testing program at the Nevada Test Site.

Ms. Weir has served on many boards including the Geology Advisory Board for Augustana College, Rock Island, Illinois, the Geology Advisory Board for the University of Colorado at Denver, and the Committee on the Critical Assessment of Solid Earth Sciences for the National Research Council, National Academy of Sciences. She is currently the chairman of the Colorado Geological Survey Advisory Committee appointed by Governor Roy Romer. ϕ

Biographical Information

Susan Steele Weir is President of the Association of Engineering Geologists and the Chief Geologist at the Denver Water Department, Denver, Colorado. She completed undergraduate studies in geology at Augustana College, Rock Island, Illinois and graduate studies in engineering geology at Colorado School of Mines,

CHAIRMAN'S COLUMN

by Joe Cota

Representing Southern California Section AEG as its Chairman for the past year has been an awesome learning experience. Our section's members define what engineering geology practice is, and there is no other AEG section or group of geologists in the world that have a greater impact to this profession than we do. Just one small example of how southern California engineers and geologists can do the impossible was presented to us

last month by **Richard Escandon** and **James Gallanes**. The geologic exploration that they have performed for the MWD Inland Feeder tunnel across the front range of the San Bernardino mountains encountered incredibly steep terrain requiring helicopter access, and 190 degree groundwater. They didn't quit, and no doubt, the project will be constructed, no matter what obstacles are encountered along the way.

I think that our Board of Registration will survive and we will retain our practice act. There is no question that the practice of geology needs to be governed by effective state law. The California legislature knows this as evidenced by their overwhelming support of SB 2031. I think that the Department of Consumer Affairs is finally starting to realize this! It is my understanding that they have backed down from trying to reduce the practice act to a title act, and I'm not sure yet if they have actually realized the necessity of retaining the practice act, as the legislature has, or if they just couldn't find anyone to attach their proposed amendments to one of the existing bills.

Now is the time to write the governor. The letter should be simple, short, and to the point. It should simply state who you are and that you expect that Senate Bill 2031 to pass the legislation based upon its unanimous support thus far in both the senate and assembly. Ask him to please sign the bill in its unamended form. And don't forget to thank him. Letters should go out this week. I'll most likely be going to Sacramento one or two times more this month to follow through with AEG's legislative involvement.

This year's winner of AEG's **Martin Stout Scholarship** goes to **Jake Holt**, an outstanding student member from California State University at Northridge. Jake will receive a \$500.00 award to aid

in further advancement of his studies in engineering geology. Jake was one of only four applicants from around the country. Congratulations Jake!

Congratulations to the following new section officers:

Dave Ebersold - Chairman

Thom Slosson - Vice Chairman

Mark Swiatek - Treasurer

Charles Nestle - Secretary

Thanks again for electing me to represent the greatest group of engineering geologists in the world. We are leaders in our profession. To stay up front, our section needs some of your time. We need volunteers to run this thing! Give me a call if you would like to become more involved, or if you know someone else that would. Your involvement can range from Chairperson to leading a field trip to peddling publications. Your professional advancement is what you make it. ϕ

NEWS

COUNTY REVIEW FEES INCREASED JULY 1

Los Angeles County Dept. of Public Works Materials Engineering Division has been charging separate fees for review of geology and soils reports for private development since July 1, 1991. At the beginning of each fiscal year these fees have been increased a small amount. The new review fees, as of July 1, 1996, are:

Engineering Geology Report:	\$280.90
Soils Report:	\$280.90
Combination Geology & Soils:	\$393.30
Building Plan/Site Review	\$72.90

COUNTY REVIEWERS NOW HAVE CALLING HOURS

Reviewers of geology and soils reports for private development can be reached by phone between the hours of 8 - 9 am and 3 - 4 pm Monday through Thursday (The Department of Public Works is closed on Friday). At all other times between 6:30 am and 5:15 pm messages may be left on the individual reviewer's voice mail. Messages will be returned during calling hours, or sooner if time permits. ϕ

LOST

If anyone has found, or knows the whereabouts of, a brown leather jacket that is presumed to have been lost at an AEG meeting last November or December, please contact Jeff Geraci at 714-770-2591. ϕ

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JOHN G. VEDDER, 4TH RECIPIENT OF THE DIBBLEE MEDAL

The annual AAPG meeting held in San Diego this year was a particularly memorable meeting for Thomas Wilson Dibblee, Jr., for he received Honorary Membership in AAPG at the awards ceremony. At the annual Dibblee Luncheon, held in conjunction with this year's AAPG meeting, the fourth recipient of the Dibblee Medal was awarded to John G. Vedder. This medal, presented by the Thomas Wilson Dibblee, Jr., Geological Foundation, underscores the importance of geologic field mapping as a means of solving complex geological problems and commemorates the extraordinary geologic mapping achievements of Tom Dibblee.

Some of the numerous accomplishments of Vedder's career were highlighted by his mapping colleague at the USGS, David Howell. Howell, who during his career has worked with more than 50 field geologists at the USGS, considers, "Jack the most accomplished stratigrapher and mapper of this elite group." Howell marked Vedder's education at the Webb School in Claremont, a short stint at Occidental College before coming under the influence of the legendary A.O. Woodford at Pomona College and Claremont Graduate School where he obtained both Bachelor's and Master's degrees followed by service in the Navy. In examining Vedder's work in California, he stated that, "Vedder is a recognized authority on Pacific margin geology. Among his special fields of study are the regional geologic framework and tectonic evolution of complex provinces such as the California Continental Borderland, southern Coast Ranges, western Transverse Ranges, and the northern Peninsular Ranges, as well as the Los Angeles, Ventura, Santa Maria, and Cuyama basins. His combined talent in field geology and biostratigraphy began coming to fruition just as new concepts of plate tectonics were unfolding for continental geology. Jack quickly grasped these new concepts and applied them to his mapping strategy resulting in important contributions to the knowledge of the stratigraphy and the tectonic framework and petroleum potential of southwestern California and the adjacent continental shelf. These contributions include numerous published detailed geologic maps and scientific papers supple-

mented by oral presentations at universities and national and sectional meetings of geological societies."

Howell outlined some of the other geographic areas that Vedder has worked as Chief Scientist (or co-Chief) and is considered an expert which include the western Caribbean, the borderland of California and northwestern Mexico, and a large segment of the Melanesian arc system (Solomon Islands and Papua New Guinea). In the latter he has just recently completed editing and contributing to a two volume publication on the geology of the Solomon Islands arc in the southwestern Pacific.

Howell, in presenting Vedder's role as a leader stated that he, "has contributed to the scientific direction of the Survey by serving as Deputy Chief, Office of Marine Geology, during which time he served as the Survey's representative on Interior, State, Navy, and on the Wayland and Miller Committees. Noteworthy was his leadership role in directing the Survey research activities into the 1969 Santa Barbara oil spill and the resulting Professional paper that provided an unbiased examination of the geologic conditions surrounding the blowout and lead to improved monitoring of offshore drilling.

In a highly complimentary summary of Vedder's working philosophy, Howell stated that Vedder was "focussed, flexible, dependable, always available, continually curious, painfully thorough, and above all a marvelous mentor."

In thanking Howell for his eloquent and laudatory testimonial, Vedder expressed his appreciation for the award by indicating he was caught completely by surprise, upon being notified that he was to receive the 1996 Dibblee Medal, as he said, "I reminded myself that for years I followed in Tom's footsteps (literally) through many parts of the Coast Ranges. I well remember Mase Hill chiding me, 'What in the world are you doing in the Caliente Range when Tom Dibblee has already mapped it?' Not only was I surprised, but also somewhat chagrined. From time to time I took a few verbal potshots at some of Tom's geologic interpretations and mapping philosophy with which I disagreed. Particularly at variance were the usage of several fault

names, explanation of deformed low-angle surfaces of dislocations, depositional versus tectonic nature of certain contacts, distribution and number of mappable landslides, and the identification of diachronous units. "With a grin that evinced all the spirited competition among field mappers, Vedder went on to wonder, 'How could I possibly be a deserving candidate?'"

Vedder went on to explain, "One primary difference between Tom's mapping and mine is that I had a great deal of help, whereas Tom worked alone. Most of my maps were co-authored by others, including Tom. For example, projects in the southern Coast Ranges could not have been accomplished without the contributions of U.S. Geological Survey colleagues, especially Chuck Repenning, Ed Clifton, and Bob Brown during the early years and more recently, David Howell, Hugh McLean, Rick Stanley, and Tom Wiley."

Noting the current backlog of unpublished USGS materials, Vedder went on to say, "I have few regrets other than that several field endeavors to which I devoted considerable effort may never be published in the form of finished colored maps. Among these are a depiction of rock units exposed on the sea floor off the western end of San Nicolas Island, a final version of the San Joaquin Hills-San Juan Capistrano area map, and the detailed geology of Santa Catalina Island. However, a number of uncolored preliminary maps of parts of the southern Coast Ranges are still in preparation for the Survey's Open-file series."

In conclusion, Vedder stated, "After years of reading and hearing that geologic mapping 'serves no useful purpose', is 'an exercise in futility', or is 'out of style', it is truly gratifying to be the recipient of this prestigious award. My heartfelt thanks to Tom, the Selection Committee, and the dauntless individuals who worked with me in the field." ϕ

— Dorothy L. Stout
Publicity, Thomas W. Dibblee Foundation
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Cypress, CA 90630
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gaea@netcom.com

California State University at Los Angeles
Department of Geological Sciences
Upper Division Electives and Graduate Courses
1996-1997

Course	Units	Course Title	Instructor	Day/Time
Fall, 1996				
GEOL 490	4	Coastal Processes	Colburn	TTh 4:20-6:00 p.m.
GEOL 570	4.5	Environmental Geochemistry	Hurst	MW 4:20-6:10 p.m.
Winter, 1997				
GEOL480	4	Geophysics	Colville	MW 4:20-6:00 p.m.
GEOL484	4	Hydrogeology	Weber	TTh 4:20-6:00 p.m.
GEOL530	4.5	Structural Geology Seminar	Ehlig	MW 6:10-7:50 p.m.
GEOL570	4.5	Metallogenesis	Davis	TTh 6:10-7:50 p.m.
Spring, 1997				
GEOL434	4	Volcanology	Stull	MW 4:20-6:00 p.m.
GEOL483	4	Photogeology	Bishop	TTh 4:20-7:00 p.m.
GEOL485	4	Groundwater Management and Models	Weber	MW 6:10-7:50 p.m.
GEOL581	4.5	Engineering Geology	Ehlig	TTh 6:10-7:50 p.m.

Dept. Office, (213) 343-2400 Undergraduate Adviser Pedro Ramirez (343-2417) R. J. Stull, Chair & Graduate Adviser, (213) 343-2408
 Department of Geological Sciences, California State University at Los Angeles, Los Angeles, CA 90032 Revised 6/4/96

ADVANCED COURSE ON GEOLOGIC HAZARDS FOR PROFESSIONAL GEOLOGISTS

University of Granada, Spain

May 1997

A landslide test given to about 50 professional geologists throughout the United States revealed that only four people could identify 75% of the landslides on aerial photographs of an area in California. In another infamous case, two teams of geologists spent two years studying dislocations in the vicinity of a nuclear reactor, where one team concluded that the dislocations were the slip surface of landslides whereas the other team argued just as strongly that the dislocations were thrust faults. Examples of incompetence and negligence abound in recent books by Stan Schumm, "To interpret the earth – ten ways to be wrong," Mark Monmonier's book "How to lie with maps," and in the book edited by Jim Slosson, Art Keene and Jeff Johnson, "Landslides/Landslide mitigation." The need is strong, therefore, to provide structured education, both on some fundamentals seemingly not taught in engineering geology courses as well as some state-of-the-art discussion of how best to cope with landslide and fault hazards. Accordingly, four senior practitioners have offered their services gratis to provide this instruction and to act as discussion leaders for a two-week course on landslide and fault hazards at a stunning and magnificent location in Spain. Professor Chacon, former Dean of the Faculty of Sciences at Granada University, is our principal collaborator. Localities nearby provide examples of slope stability and other environmental problems.

The course will be structured for practicing professional geologists, and is focused on practical problems of identifying fault and landslide hazards. A small number of University of Granada students will be admitted to the course as part of our collaboration with the University. The course will consist of four lectures in the morning and a lab, seminar, or field trip in the afternoon for a period of two weeks.

COURSE OUTLINE

INTRODUCTION

Lecturer: Professor J. Chacon

Professor Chacon directs research on the use of GIS techniques for preparing hazard maps in southern Spain and Morocco. He will discuss briefly the regional geology of the Granada area and the hazard activities at the University of Granada.

APPLICATIONS OF SOIL STRATIGRAPHY TO ENGINEERING AND ENVIRONMENTAL GEOLOGY

Lecturer: Roy J. Shlemon

Dr. Shlemon has his own consulting practice in southern California, specializing in Quaternary geology, geomorphology and soil stratigraphy, with applications to fault-activity (neotectonics), landslides and ground fissures. He has worked on siting of nuclear power plants, liquefied natural gas terminals, large dams, high- and low-level radioactive waste facilities, landfills, and assessment of ancient and modern landslides in the western United States, Middle East and Latin America. He has published 175 reports and articles and has received the "Best Paper" award from the Association of Engineering Geologists, and the "Richard H. Jahns Distinguished Lectureship Award" from the Geological Society of America.

INTRODUCTION: key literature/sources and applications

THE SOIL PROFILE

- A. Soil Horizon Nomenclature
- B. Major Soil Forming Factors (climate, parent material, topography/slope, vegetation, time).
- C. Relative Soil Profile Development

SOIL-GEOMORPHIC RELATIONSHIPS

- A. Relative Landscape Stability
- B. Fluvial and Marine Terrace Dating
- PALEOSOLS: (buried, relict, exhumed)
- SOILS AS STRATIGRAPHIC MARKERS
 - A. The Geosol Concept
 - B. Soil-Forming Intervals
 - C. Paleo-environmental Reconstruction
- SOILS AS FAULT-DATING MARKERS
 - A. Preservation of the Organic Horizon
 - B. Stages of Argillic and Calcic Horizon Development
 - C. TL and MRT Soil Dates: Applications and Uncertainties
- SOILS AS INDICATORS OF SLOPE STABILITY
 - A. Origin and Interpretation of Multiple Stonelines
 - B. Formation and Environmental Significance of Cumulic Profiles.
- SOILS AS TOOLS TO DELIMIT CONTAMINANT PATHWAYS
- ENGINEERING AND ENVIRONMENTAL GEOLOGY CASE STUDIES

GEOLOGICAL EVALUATION OF ACTIVE FAULTS FOR ENGINEERING AND ENVIRONMENTAL APPLICATIONS

Lecturer: Manuel G. Bonilla

Manuel Bonilla worked near half a century for the U. S. Geological Survey (USGS), primarily concerned with earthquake faults and how they affect important structures, until his retirement two years ago. He has investigated 19 earthquakes in North and Central America and Africa, and active faults in Taiwan and China. He has been a member of several teams and committees to provide advice on site hazards, evaluation, and standards for practice. He received the Claire Holdredge Award from the Association of Engineering Geologists in 1971 and the Distinguished Service Award from the U. S. Department of the Interior in 1996. He is a Certified Engineering Geologist in California, and has had nearly 50 reports published dealing with active faults and earthquakes.

INTRODUCTION

- A. Importance of faulting
- B. Comparison with other seismic effects

REVIEW OF THE EFFECTS OF FAULTING AT THE GROUND SURFACE

- A. Shearing
- B. Drag and other local deformation
- C. Fault creep
- D. Afterslip
- E. Regional deformation
- E. Examples of effects of faulting and distributed deformation on structures
 - Damage
 - Indirect costs

INVESTIGATIONS OF FAULTS

- A. General
 - Goals
 - Finding and using existing information
- B. Criteria for the recognition of faults
- C. Misleading evidence
- D. Remote sensing methods
- E. Computer-aided analysis of topography
- F. Aerial and Ground Reconnaissance
- G. Detailed Studies
 - Geologic mapping
 - Trenching
 - Drilling
 - Geophysical studies
 - Minie-Sosie

Ground-penetrating radar

H. The problem of blind thrusts

ESTIMATING FUTURE FAULTING

A. Minimum earthquake magnitude associated with surface faulting

B. Location and dimensions of expected deformation

C. Displacement on subsidiary faults

ESTIMATING SIZE OF FUTURE EARTHQUAKES

A. Past earthquakes, including paleoseismology

B. Segmentation of faults

C. Using empirical fault data

D. Using seismic moment

METHODS OF COPING WITH ACTIVE FAULTS

A. Avoidance of faults

Siting of individual projects

Zoning - Alquist-Priolo act in California

B. Examples of design of structures subject to faulting

REGIONAL LANDSLIDE ANALYSIS

Lecturer: Earl E. Brabb

Dr. Brabb worked his entire career with the U. S. Geological Survey from 1959 to 1994. During his retirement, he is completing geologic mapping in the San Francisco Bay region and landslide hazard mapping in New Mexico. He has been a keynote speaker at landslide sessions of the International Association of Engineering Geologists (Newcastle) and the International Landslide Symposium (Lausanne), and he was given the Distinguished Practice Award by the Geological Society of America and the Distinguished Service Award by the Department of Interior. He is co-editor of a book on the geographic and economic extent of landslides in the world and the author of a chapter on the extent of the landslide problem in the United States.

PREPARATION OF A REGIONAL LANDSLIDE INVENTORY

A. Definitions

B. Examples, Importance

C. Advantages and disadvantages

D. Significance of scale

E. Individual project - preparation of a landslide inventory (each person must bring a stereoscope)

F. Class analysis of the inventory

DIGITAL ELEVATION MODELS

A. Content

B. Reliability

C. Use in preparing slope and shaded relief maps

GEOLOGIC MAPS

A. Relation to landslides

B. Reliability problems

C. Problems in digitizing

REGIONAL LANDSLIDE SUSCEPTIBILITY MAPS

A. Different approaches

B. Advantages and disadvantages

C. Reliability

D. Use of GIS to prepare

INNOVATIVE LANDSLIDE MAPPING TECHNIQUES

CONTROVERSIAL LANDSLIDE PROBLEMS

FORENSIC STUDIES RELATED TO LANDSLIDES AND OTHER GEOLOGIC HAZARDS

Lecturer, James E. Slosson

Dr. Slosson has his own consulting firm in southern California. He was a professor of geology for more than 35 years, State Geologist for California, and is currently Vice-Chairman of the California Seismic Safety Commission. He is author of more than 100 reports on natural hazards and their consequences, including a book on "Forensic Engineering". He is a registered geologist in 7 states, and a member of 15 professional organizations. In 1992, he received the Distinguished Practice Award from the Geological Society of America.

INTRODUCTION

CASE STUDIES

Each case study will have the following components:

A. The event. This component is intended to provide a factual account of the disaster or failure. As many facts as possible are collected, cataloged, and reviewed.

B. The investigation. A description of techniques for effective and efficient investigation of the disaster or failure. Usually involves several disciplines.

C. Team analysis and technical input. The multiple working hypothesis is used by team members to consider and prepare written comments regarding possible causes for the disaster or failure.

LOGISTICS

Each participant would be expected to pay for transportation to and from Granada. The course will be given at the Granada Central Hotel, one of the top four hotels in the city. Using our University connection, the room cost (including breakfast) would be \$1300 for 13 days. Add \$390 for a spouse. Lunch and dinner are \$400 for 13 days, and a similar amount for a spouse. The course fee would be \$2,500, which will cover travel and per diem costs for the instructors, transportation on field trips, and perhaps some cultural events.

We expect to have a minibus available for a few geologic field trips during the course and for spouses at other times for trips to the Alhambra, Sierra Nevada, Seville, Cordova, Torremolinos, and possibly Ronda and Cadiz.

We need to hear from those people who might be interested in such a course. Please fill out the following questionnaire and return it to Earl Brabb, 3262 Ross Road, Palo Alto, CA 94303. Thanks.

() Yes, I am interested in the course (not a commitment on your part or ours).

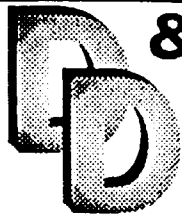
() If I come, my spouse would also come.

Name _____ Spouse _____

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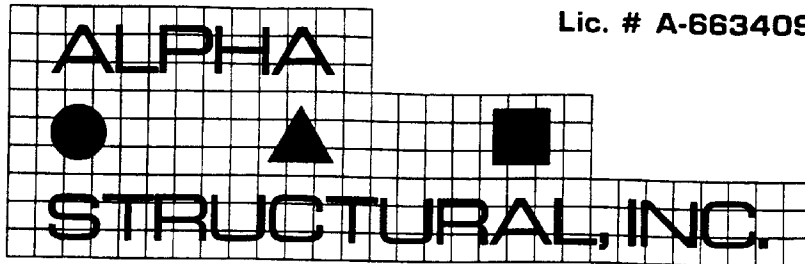
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FIRST CLASS POSTAGE

GEOQUOTE OF THE MONTH

"When you find a groundwater "table" in good shape, buy it for me and send it UPS collect to Rolla, Missouri. I'll have it refinished for use in class. In the meantime wash your mouth out with soap and call it what it is. Your choice....groundwater surface, piezometric surface, or potentiometric surface, as the real hydrologic situation dictates."

Dr. Allen W. Hatheway
Professor of Geological Engineering
University of Missouri-Rolla
