Association of Engineering Geologists

Southern California Section

NEWSLETTER - January 1990

Dinner Meeting *Tuesday January 9th*

- ❑ **The Quiet Cannon Restaurant**
  901 North Via San Clemente
  Montebello
- ❑ **Cost - $20.00 (Full-Time Students - Free)**
- ❑ **For reservations call by January 5th**
  Charles Daughtery (818) 796-3933 (Leave Your Name & Number of People in Your Party if Answering Machine)

Make reservations by Noon on the Friday before the Meeting

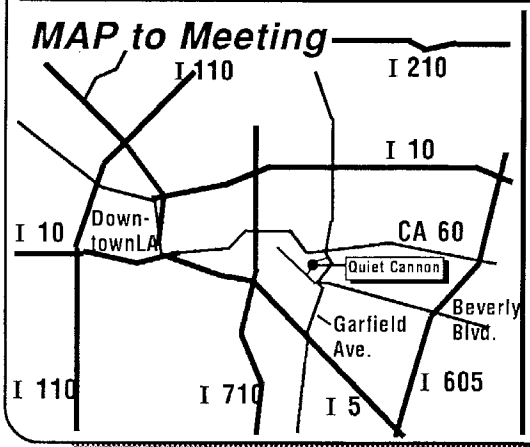
- ❑ **5:30 Social Hour**
- ❑ **6:45 Dinner**
  7:30 Announcements
- ❑ **8:00 Program**
  9:00 Section Affairs

Program

TOPIC **International Decade for Natural Disaster Reduction**

SPEAKER **Shirley Mattingly, Planner**
City of Los Angeles

MAP to Meeting



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(Full-Time Students $10/year)
(714) 474-9344
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c/o Geraghty & Miller, Inc.
Ground-Water Consultants
17800 Castleton Street, Suite 175
City of Industry, CA 91748
Amer.Geop.Union TELENET
KOSMOS Computer Mail
Username: KROWE

2550 Beverly Blvd.
Los Angeles, CA 90057

Program

Topic & Speaker

International Decade for Natural Disaster Reduction

Shirley Mattingly

This month's topic, as we enter 1990, will introduce the **International Decade for Natural Disaster Reduction (IDNDR)**, and how it is being implemented here in Southern California. The concept of a cooperative program to reduce the impact of natural hazards was first presented by **Dr. Frank Press** in his keynote address to the **Eighth Worlds Conference on Earthquake Engineering in 1984**. The 1980's have seen some truly devastating geologic events. It is the goal of the **IDNDR** to sponsor a cooperative program of research, information dissemination, technical assistance, and education that will serve the world in minimizing these disasters. As engineering geologists, we are in the forefront of geologic hazard abatement, and we should all be aware of this effort, **co-sponsored by the UN, the USGS, the State of California, and the City of Los Angeles.**

Shirley Mattingly is the Director of Emergency Management for the City of Los Angeles, and the alternate member (for Mayor Tom Bradley) to the U.S. National Committee for the IDNDR. She received her B.S. from Occidental and her M.S. from UCLA, and was a Fulbright Scholar in Quito, Ecuador. **Ms. Mattingly is Vice-Chairperson for the Policy Advisory Board of SCEPP, Chairperson for the Emergency Preparedness Commission for both the County and City of Los Angeles**, and thoroughly familiar with those "what if?" questions that we have all been asking ourselves since October 17th.

THIS MONTH

January 1990

KellyERowe
Hydrogeologist

This month's speaker, **Shirley Mattingly**, will provide some insight to the goals of the **International Decade for Natural Disaster Reduction**. She will discuss the plans the **City and County of Los Angeles** have toward reducing the problems resulting from, for example, our earthquakes and floods. These issues are continuing to become more complex as developments expand into less desirable areas. If natural disasters are not considered in the development process many lives will be lost and economic hardships will occur.

Last month **Fred Chen, President of MAA Engineering Consultants, Inc.**, discussed the techniques being employed to stabilize soils in areas that have dredged spoil fill material. He focused on the work taking place in Los Angles harbor area. An area of about 190 acres, to be expanded with fill material over the next few decades all the way to the breakwater. A few of the techniques discussed to stabalize the soil included: 5,000-10,000 psi pressure grouting; soil mixing walls; and gravel drain piers/piles. **Fred** appeared to be most pleased with the results from the gravel drain pier method.

Rick Lynsky, with **Leighton & Assoc., Inc.**, also showed slides taken following the **Loma Prieta (Santa Cruz) Earthquake**. Many ground ruptures and liquifaction damage were evident and many large redwood trees showed "topping", i.e., the trees shook so much from the earthquake that they snapped/broke off a few tens of feet above the ground surface.

Charles G. Sudduth, a geotechnical engineer for **Los Angeles County**, at last month's meeting said that he took exception to the protest **AEG** gave toward the changes to the building code he authored. From the procedures he described he followed the appropriate steps in soliciting comments or questions about the proposed changes, however, it is evident that these procedures need to be updated to include solicitation of opinions from active **AEG** members.

Ed Kiesling (CDMG - LA office) came to the December meeting with several copies of a couple of publications he picked up at the **USGS LA office**. These related to the **Loma Prieta Earthquake: USGS Circular 1045 "Lessons Learned from the Loma Prieta, California, Earthquake of October 17, 1989."** and a USGS pamphlet that describes through graphics and text a brief geologic view of what caused the Loma Prieta earthquake and implications for future California earthquakes. The **1045 Circular is free** and can be obtained from the **LA office or from U.S. Geological Survey, Books and Open-File Reports, Federal Center, Box 25425, Denver, CO 80225.** The quality of the layouts and speed that these publications were done is impressive.

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Because the last three years produced below average precipitation, 1988-89 one of the driest in record, it is assumed that record-low volumes of water recharged in our ground-water basins. This year's record so far indicates that once again we will have another dry year. Many basins now have record low ground-water elevations. This increases the pressure on the water community to provide adequate supplies for this undervalued commodity. Monies and labor to deepen wells and pumps, and to prepare for recharging ground-water basins need to be planned for before crises arrive. If anyone has (serious) predictions on what the weather will be like in the next few months, please call **Kelly Rowe (714) 474-9344** and it will be reported in this newsletter.

As we progress through this year please remember two of our goals.

- ❑ Strongly encourage participation of interested students in engineering geology. This will be accomplished through **1) a $10/year fee** for full-time students for the newsletter and **2) a free dinner for full-time students at the monthly meetings.** Members should actively invite students to come to the meetings, free of charge. We need to encourage bright and potentially bright students to get into the interesting and rewarding field of engineering geology rather than other less fun professions.

- ❑ Encourage participation of members who are reluctant or unable to come to the Montebello restaurant location for the monthly meetings. This will be accomplished through **1) a meeting located in the Mission Viejo/Irvine area in May, and 2) a meeting located in the northern San Fernando Valley area in September.** If anyone has suggestions on suitable meeting locations for these events please call Eldon Gath at (818) 965-4874 or Bob Hollingsworth at (818) 889-0844.

You probably noticed on the cover of the newsletter the logo in the lower-left corner. It is the logo for the 1992 Los Angeles AEG Meeting. **The theme for the 1992 Meeting is "Urban Geology for the 21st Century".**

In the next few months plans for composing the "Special Publication: **Engineering Geology in Southern California - Volume II**" will be described in this newsletter. Similar to the classic 1966 and 1973 special publications, this new volume will encapsulate state-of-the-science work to compliment the October 1992 Meeting. Members are encouraged to plan far ahead so they may possibly be included in this volume. It will be published with modern desktop publishing methods. This includes manipulation of scanned images and transfer of text and graphics between different types of file formats and computers.

The **Geology Alumni Assoc. from San Diego State Univ.** (SDSU) will hold their **4th annual field trip on Feb. 23-25, in Painted Canyon.** It is located about 5-1/2 miles northeast from the town of Mecca, and about 34 miles southeast from Palm Springs. Because there are no facilities you will have to bring everything you need. If you need additional information call Bill Elliott (619) 586-0870.

You may notice that the last page of the newsletter advertises for you to renew your annual fees. The newsletter, from January to February, will be sent out to all International AEG members listed in the Southern California Section to encourage that they participate locally. Please note that your local section fees operate the section's activities and the annual fees to International AEG do not help operate the section. Therefore, based upon the response we get from the returned mail you will simply be on or off the newsletter mailing list. In the interest of saving printing & postage costs you will not get an invoice notifying you of your renewal opportunity. If you have any questions about getting onto the mailing list feel free to call the Secretary/Newsletter Editor - Kelly E. Rowe (714)474-9344 or (818) 965-4048.

Hugh Robertson, AEG Southern California Section Legislative Chairman, took time recently to visit with **William J. Keese** in Sacramento. **Mr. Keese** is our legislative advocate (lobbyist) for AEG members in California. **Hugh** provided the following update on **Mr. Keese's** activities during the past year and plans for the upcoming year.

The 1988-89 legislative session concluded with no legislation adverse to geologists be passed. Our number one priority continues to be a rebuttal of the assertion that there is no need for registration of geologists. The two bodies most concerned with our registration are the **Senate Business and Professions Committee** (B & P) and the **Assembly Government Efficiency and Consumer Protection Committee (CONPROT).** These legislative policy making committees held hearing at the end of October and the first part of December but Geologists and the registration of Geologists were not on their agendas. **Mr. Keese** feels he has convinced legislators and staff members on these committees of the absolute need for geologists licensure. However, there may be efforts to merge the **Board of Registration for Geologists and Geophysicists (Registration Board)** with another board for greater efficiency. However, the **Department of Consumer Affairs** centralizes activities such as personnel, fiscal and legal and therefore there is no benefit which would arise out of merger with another board.

A meeting was held in Sacramento on December 4, 1989 with Bill Keese and the Legislation Chairman of the Sacramento and San Francisco Sections. The areas of interest to the association were discussed and we need input from the members. *What are your priorities?* The four areas of interest discussed at the meeting included: **1) Persons** practicing in the environmental geology field who are **not licensed or not experienced**; 2) Apparent **pressures to eliminate** the need for **Certified Engineering Geologists in codes** and building departments by allowing geotechnical engineers to perform our work; 3) **The lack of enforcement action by the Registration Board** and problems with funding and; 4) **Professional Liability.** With respect to enforcement, there may be a need to modify present procedures to have different level of disciplinary measures, short of loss of licensing. Areas of liability include both obtaining insurance and the Certificate of Merit which was discussed early this year. **Mr. Keese feels that the AEG needs to move to a political presence. This can be accomplished with Mr. Keese's help and making contacts with local legislators.** *Do you have a friend or contact in the legislature?*

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The Inland Geological Society (IGS), in the San Bernardino area, now has available an IGS publication on "Landslides in a Semi-Arid Environment - Volume 2". It is available for $21.25 at their monthly meetings or from Peter M. Sadler, Dept. of Earth Sciences, U. of California, Riverside, CA 92521 , if you also add tax and shipping.

IGS also announces the first Call for Papers for the fourth annual Mojave Desert Quaternary Research Symposium. Papers: May 18 &19 (Fri. & Sat.) Field Trip: May 20 & 21 (Sun. & Mon.). Contact: Jennifer Reynolds, Editor, (714) 798-8570, MDQRC, San Bernardino County Museum, 2024 Orange Tree Lane, Redlands, CA 92374.

The following agreement on "Areas of Expertise" was adopted by the Board of Registration for Civil Engineers on October 6, 1989. It will be voted upon by our Board of Registration for Geologists and Geophysicists (BRGG) at their regular Board Meeting on January 10, 1990. This document was worked-out by a joint committee between ASCE and the Professional Practices Committee of the BRGG. AEG was represented by Glenn Brown and Howard (Buzz) Spellman. Your comments and evaluation of how this agreement will affect your business and your practice of Engineering Geology should be sent to: State Board of Registration for Geologists and Geophysicists, 1021 "O" Street, Sacramento, CA 95814. Your letter should reach the Board ASAP.

Forward..."...The purpose of this document is to review the "gray" areas where civil engineering and engineering geology overlap and list activities which are done by each and which can be performed by both. It is noted that these classifications and tables are guidelines for the boards' executive officers and staff when a jurisdictional dispute or complaint is filed with either board. This memorandum is an internal office document which has no legal status and can be used, modified or disregarded depending on the circumstances.

Modifications for Fields of Expertise

Registered Geologist (R.G.) or Engineering Geologist (C.E.G.)	Both	Civil Engineer Competent to Practice Geotechnical Engineering

(1) Classification & Physical Properties

Rock description & classification	Visual soil description	Testing of earth materials for classification, and physical properties
Origins of rock	Wentworth - Unified	
Source area	Soil Classification System	

(2) Rock Mechanics

Descriptive	In-situ studies	Quantitative performance of rock masses, e.g., rock testing, stability analysis, stress distribution and rebound evaluation
Rock structure and jointing	Regional-Local	
Qualitative performance of rock masses		
Configuration		
Attitude in nature (joints, fractures, bedding, etc.)		

(3) Slope Stability

Interpretative stability of natural rock cut slopes	Excavation in hilly terrain	Quantitative slope stability analysis utilizing developed material properties, hydrostatic forces and configuration
Geologic analyses-geometrics	Causative agents	
Spatial relationship		

(4) Soil & Rock Mapping

Geologic mapping	Geometric relationships	Soil type mapping
Air photo interpretations		
Geomorphology		
Subsurface geology		

(5) Project Planning

Development of geologic parameters	Analysis of effects of geologic conditions on proposed projects	Engineering analysis of effects of subsurface conditions on proposed project
Geologic feasibility		Economics

(6) Surface Waters

	Stream description	Volume and rate of runoff
	Silting potential	Design of works for control
	Erosion potential	Coastal and river engineering
	Source of base flow	Hydrology
	Sedimentary processes	
	Source of material	

(7) Groundwater

Hydrogeology	Drainage	Engineering hydrology
Occurrence	Contamination	Mathematical treatment of well systems
Geologic structural controls	Well design	Development concepts
Direction of movement	Subsidence	Design of dewatering systems
	Field permeability	Regulation of supply
	Transmissivity	Economic considerations
	Specific yield	Laboratory permeability
Underflow studies	Storage computation	
Characteristics of water-bearing and non-water bearing materials		

(8) Earthquakes and Ground Vibrations

Location of faults	Seismicity	Response of soil and rock materials to seismic activity
Evaluation of potential fault activity	Historic record of earthquakes	Seismic design criteria for structures
Qualitative ground vibration analysis		Laboratory soil dynamics tests
		Quantitative ground vibration analysis

(9) Subsurface Exploration

Logging of rock material	Planning	Planning program as related to proposed project and structural loads
Down-hole observations for structure geometry	Supervision	
	Observation	
	Logging of soil borings	
	Sampling	

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(10) Construction Observation

Excavation in rock material
Grouting
Tunnel construction
Conduits
Structural foundation conditions
Earth and earth/rock embankments
Pavements

(11) Expansive Materials

Expansive bedrock
Visual identification
Geochemical effects
Lab testing
Evaluation of expansion potential under project loadings
Preparation of parameters for limiting
Development of mitigating solutions

(12) Embankment Fill

Visual Classification
Qualitative evaluation of borrow material
Design and construction quality
Specifications
Evaluation of potential deformations
Evaluation of stability
Seepage control measure

Qualitative evaluation of removal of unsuitable material
Removal of unsuitable material
Quantitative evaluation of removal of unsuitable material

(13) Instrumentation

Vadose zone monitoring
Water level recorders
Slope inclinometers
Rock stress and deformation devices
Piezometers and observation wells
Settlement movements
Seismometers and accelerometers
Water quality monitoring
Tiltmeters
Meteorology stations
Stream gages
Pore water pressure monitoring
Soil pressure devices
Vibration monitoring and analysis
Pile load testing
Tensioning tie-backs

(14) Regulatory Requirements

Provide engineering geology input as required
Provide engineering analysis as required

(15) Joint Efforts

Site selections
Planning investigations
Conducting samples for testing
Interpreting data
Describing and explaining site conditions
Stability of natural slopes
Constriction observation
Input to Urban Planning
Input to environmental studies

(16) Hazardous Waste Reports

Water wells
Geotechnical borings
Monitoring wells
Toxic pits
Resources Conservation and Recovery Act (RCRA)
Toxic fluid monitoring
Underground tanks
Solid waste disposal sites
Waste discharge to land
Broad studies encompassing planning, coordination of disciplines including professional engineers, analysis and findings; preparation of conclusions and recommendations

Positions Available

Advertisements for Student & Part-Time "Positions Available" are Welcome. There is no charge for advertisement.

Career Opportunity For

Hydrogeologists, Geologists & Environmental Engineers

Openings are available for entry level (1-4 yrs experience) Hydrogeologists, Geologists and for senior level Environmental Engineers. Openings are available in the City of Industry office and the expanded Newport Beach office. In addition, positions for experienced ground water and soils remediation specialists are available in offices throughout the United States. Salary is negotiable and is commensurate with experience.

CONTACT: (818) 965-4048
or send resume to:

Geraghty & Miller, Inc.
Attention: N. Thomas Sheahan
17800 Castleton St. #175
City of Industry, CA 91748

Career Opportunity For

Geotechnical Engineer

Openings are available for Geotechnical Engineer: Salary - $3,977 - $4,941 and $4,323 - $5,371/mo. Duties are to direct or assist in direction of Geotechnical Engineering Unit; directs the preparation of, and in some cases, reviews comprehensive and complex geotechnical reports, and may coordinate the preparation and review of geotechnical and geological reports with Engineering Geologists.. Requirements are authority to use the title Geotechnical Engineer issued by the California Board of Registration. Candidates to file for the April 1990 examination.

CONTACT: (213) 485-2442
or send resume to:

City of Los Angeles Dept. of Building & Safety
Personnel Dept. Room 100
City Hall South
111 E. First St.
Los Angeles, CA 90012
or Van Nuys Branch City Hall
14410 Sylvan Street

Career Opportunities For

Engineering Geologists

Several positions are available in the LA County DPW. **Engineering Geology Assistant**: Salary - $2,611 - $3,233/mo, Requires BS/BA in geology or engineering geology. **Senior Engineering Geology Assistant**: Salary - $2,754 - $3,411/mo, Requires BS/BA in geology or engineering geology and one year related experience. **Principal Engineering Geology Assistant**: Salary - $3,065 - $3,797/mo, Requires BS/BA in geology or engineering geology and three years related experience in problems in design, construction and O&M of structures. **Engineering Geologist**: Salary - $2,611 - $4,260/mo, Requires California Certification as an Engineering Geologist

CONTACT: (818) 458-2141 or (800) LACoDPW
or send resume to:

Los Angeles County Dept. of Public Works
Recruitment & Selection Sect.
900 South Fremont Avenue
Alhambra, CA 91803

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Career Opportunity For

Senior Engineering Geologist

Opening is available for a Senior Engineering Geologist. Duties will include planning and supervision of comprehensive engineering geological studies and be the Senior Consultant on complex multi-disciplinary projects. Requirements are M.S degree, 5+ years experience C.E.G. and excellent technical and communication skills. Salary is negotiable and is commensurate with experience.

CONTACT: (805) 644-5535
or send resume to:

McClelland Consultants.
Attention: Michael R. Ploessel
2140 Eastman Avenue
Ventura, CA 93003

Career Opportunity For

Geoenvironmental Project Managers

Openings are available for Geoenvironmental/Waste Management Project Managers in Ventura, Los Angeles, and Sacramento offices. Duties will include development and management of environmental assessment, soil and groundwater contamination/ remediation projects. Requirements are a record of successful project development and management; B.S or M.S degree (preferred), 3+ years experience registration and excellent technical and communication skills. Salary is negotiable and is commensurate with experience.

CONTACT: (805) 644-5535
or send resume to:

McClelland Consultants.
Attention: Michael R. Ploessel
2140 Eastman Avenue
Ventura, CA 93003

Career Opportunity For

Geotechnical Engineers

Immediate opening available for entry level to senior level geotechnical engineers, Project to Senior level geotechnical engineers, and Project to Senior level engineering geologists for its southern California offices. M.S. degrees preferred. California registration desirable for project and senior positions. Excellent communication skills required.
Send resume to:

Schaefer Dixon Associates, Inc.
Attention: A. M. Best
22 Mauchly
Irvine, CA 92718

Career Opportunity For

Hydrogeologist

Immediate opening available for a Hydrogeologist - Groundwater Resources Manager. Requirements: 5-10 years diverse professional experience in groundwater studies, B.S. in geology or hydrology; mathematical modeling experience desirable; and excellent technical and communication skills. Responsible for but not limited to: collection, modeling and analysis of hydrologic data, development and operation, and short- and long-range master plans for groundwater quantity and quality protection. Salary to $45,000/yr DOQ/DOE.
Call (805) 525-4431 or send resume to:

United Water Conservation District
Attention: Frederick J. Gientke
General Manager
725 E. Main Street
Santa Paula, CA 93060

Seminars/Meetings/FieldTrips

JANUARY 1990

7-12"**IBM PC Applications in Ground Water Pollution and Hydrology: A Hands-On Short Course**" Dublin, OH. Assoc. of Ground Water Scientists and Engineers (NWWA). CONTACT: NWWA (614)761-1711/P.O. Box 182039/Dept. #017/ Columbus, Ohio 43218.

29-2/3"**22nd Annual Fundamentals of Shallow Foundation Design**" Orlando, FL. Univ. of Missouri at Rolla Continuing Education (UMRCE). CONTACT: UMRCE (800)752-5057 Continuing Education, 119 Mechanical Engineering Annex, UMR, Rolla 65401-0249

FEBRUARY 1990

1-3"**International Symposium on Borehole Geophysics for Petroleum, Hydrogeology, Mining, and Geological Engineering Applications**" Tucson, AZ. CONTACT: Dept. of Mining & Geological Engineering, University of Arizona, Tucson, AZ 85721.

4-9"**Operation Precipitation Estimation & Prediction (In conjunction with 70th Annual AMS Meeting).**" Anaheim, CA. CONTACT: Dr. Constantine P. Georgakakos, Iowa Inst. of Hydraulic Research, The University of Iowa, Iowa City, IA 52242 (319) 335-5222.

12-16"**Groundwater Pollution and Hydrology**" San Francisco, CA. CONTACT: Groundwater Associates of Princeton, Omni Environmental Corp., The Princeton Corporate Center, 3 Independence Way, Princeton, NJ 08540 (609)243-9399

19-23"**Introduction to Groundwater Monitoring**" Indianapolis, IN . International Ground Water Modeling Center (IGWMC). CONTACT: IGWMC (317)283-9458 Holcomb Research Institute, Butler University, 4600 Sunset Ave., Indianapolis, IN 46208

23-25"**4th Annual San Diego State Univ. Geology Alumni Association Field Trip in Painted Canyon - Mecca Hills**" North of Salton Sea. CONTACT: (619)586-0870 William J. Elliott, Field Trip Chairman 1989-90, P.O. Box 541, Solana Beach, CA 92075

MARCH 1990

12-15"**3rd Annual Symposium on Application of Geophysics to Engineering and Environmental Problems (SAGEEP '90).**" Colorado School of Mines, Golden. CONTACT: Sageep '90. c/o Colorado ARC Enterprises, Ltd., 133 S. Van Gordon, Suite 200, Lakewood, CO 80228 (303-980-1648

19-23"**5th Seismic Design and Analysis of Small and Medium Earth and rockfill Dams**" St. Louis, MO. Univ. of Missouri at Rolla Continuing Education (UMRCE). CONTACT: UMRCE (800)752-5057 Continuing Education, 119 Mechanical Engineering Annex, UMR, Rolla 65401-0249

Note"Day In The Field With Tom Dibblee" has been rescheduled for "some time in the Spring '90" CONTACT: (213) 598-0595 U.S. Geologic Services - Arthur R. (Dick) Brown

APRIL 1990

2-6"**12th Annual Groundwater Analysis and the Design of Dewatering Systems**" Orlando, FL. Univ. of Missouri at Rolla Continuing Education (UMRCE). CONTACT: UMRCE (800)752-5057 Continuing Education, 119 Mechanical Engineering Annex, UMR, Rolla 65401-0249

2-6"**4th Annual Short Course on Soil Dynamics and Foundation Engineering**" St. Louis, MO. Univ. of Missouri at Rolla Continuing Education (UMRCE). CONTACT: UMRCE (800)752-5057 Continuing Education, 119 Mechanical Engineering Annex, UMR, Rolla 65401-0249

8-12"**High Level Radioactive Waste Management**" CONTACT: ASCE.

16-20"**14th Embankment Dams-Soil Aspects**" **Orlando, FL. Univ.** of Missouri at Rolla Continuing Education (UMRCE). CONTACT: UMRCE (800)752-5057 Continuing Education, 119 Mechanical Engineering Annex, UMR, Rolla 65401-0249

22 "EARTH DAY - 20 YEARS LATER", at locations throughout the U.S. and around the world. Theme: What has happened over the last 20 years and what direction are we going to preserve and improve our living space.

30-5/4"**12th Annual Fundamentals of Grouting**" Denver, CO. Univ. of Missouri at Rolla Continuing Education (UMRCE). CONTACT: UMRCE (800)752-5057 Continuing Education, 119 Mechanical Engineering Annex, UMR, Rolla 65401-0249

MAY 1990

14-18"**Hands-on 5-day Laboratory May 19-24**" Rolla, MO. Univ. of Missouri at Rolla Continuing Education (UMRCE). CONTACT: UMRCE (800)752-5057 Continuing Education, 119 Mechanical Engineering Annex, UMR, Rolla 65401-0249

JUNE 1990

21-22"**International Symposium on Mapping & Geographic Information Systems**" San Francisco, CA CONTACT: A. Ivan Johnson, A. Ivan Johnson, Inc., 7474 Upham CT. Arvada, CO 80003 (303)425-5610.

AUGUST 1990

12-15"**CONSERV 90: The National Conference & Expo. Focusing on Water Supply Solutions for the 1990s.**" Phoenix, AZ CONTACT: Conserve 90, 6375 Riverside Dr., Dublin, OH 43017 (614)761-1711

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Gregory T. Farrand
Principal Geologist

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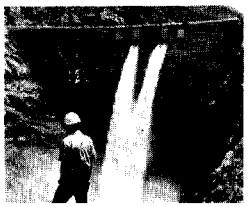
San Diego, California 92121
Phone (619) 457-0400 • Fax (619) 558-1236

DID IT MOVE, OR DIDN'T IT?



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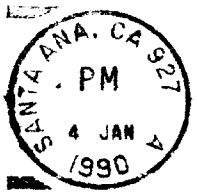

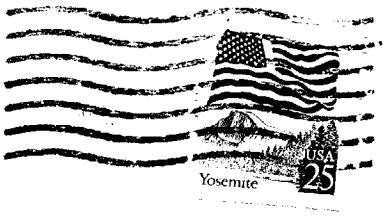

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