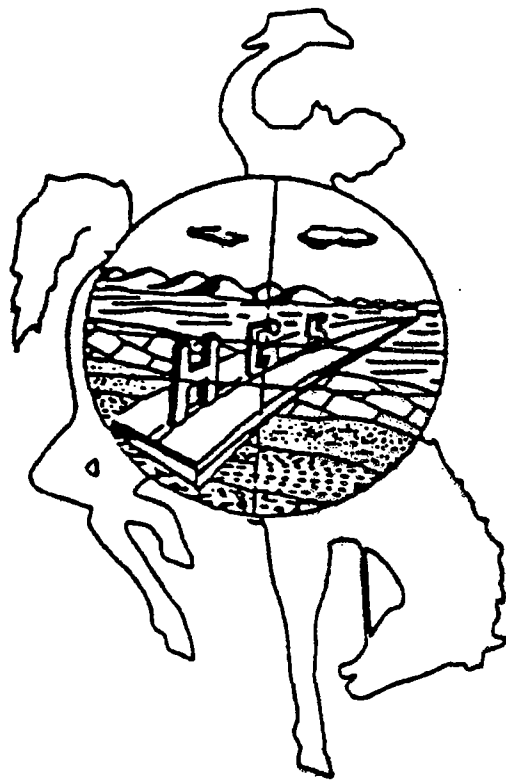


# 47th Highway Geology Symposium

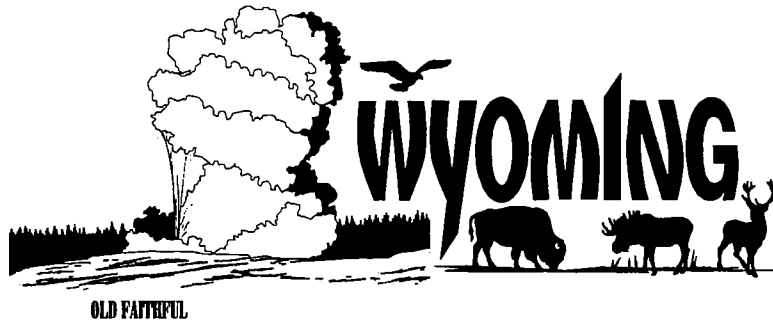
Cody, Wyoming  
September 6-9, 1996

## **PROCEEDINGS**



Ted Vredenburg and Mike Schulte, Proceedings Coordinators

Sponsored by:  
Wyoming Department of Transportation  
Wyoming Geological Survey



**47th Highway Geology Symposium**  
Cody, Wyoming  
September 6-9, 1996  
AGENDA

**Friday, September 6**

**7:00 p.m. to 10:00 p.m.** Welcoming Ice Breaker, Bandana Room  
*Compliments of Geo-Recovery Systems, Inc.*

**9:00 p.m. to 10:00 p.m.** Registration, Breezeway

**Saturday, September 7**

**7:00 a.m. to 5:00 p.m.** Registration, Breezeway

**8:00 a.m. to 6:00 p.m.** Exhibitor Display, Taggart's

**8:00 a.m. to 8:35 a.m.** **All Technical Sessions will be held in the Holiday Inn's Meeting Room**

Welcoming Remarks: HGS Steering Committee, WYDOT, Wyoming Geological Survey

Keynote Address: "*Geology and Minerals of Wyoming*", Gary B. Glass, Wyoming State Geologist

**Technical Session I**

**Landslides/Stability**

**Session Moderator: James Dahill, WYDOT**

**8:35 a.m. to 9:00 am** "*Earthflows, Debris Flows and Roads: The Aftermath of the Winter Storm of 1996, Portland Oregon*", Scott Burns, Portland State University

**9:00 a.m. to 9:25 a.m.** "*Landslide Hazards in New York State: A Geological Overview*", Robert Fickies, New York State Geological Survey

- 9:25 a.m. to 9:50 a.m.**     *"Peters Road Landslide"*, Wayne Adams and Dave Findley, Golder Associates; Steve Lowell, WASHDOT
- 9:50 a.m. to 10:20 a.m.**   **Coffee Break, Taggart's, Compliments of Central Mine Equipment**
- 10:20 a.m. to 10:45 a.m.**   *"Rock Slope Stabilization at Dunderberg Mt., Rockland County, New York"*, Henry Willems and Matthew Podniesinski, NY State DOT
- 10:45 a.m. to 11:10 a.m.**   *"Geologic Investigation of the Gordon Canyon Slide"*, Nick Priznar, ADOT; Kenneth Euge, Geological Consultants
- 11:10 a.m. to 11:35 a.m.**   *"Reinforced Earth Retaining Wall for Landslide Control, Snake River Canyon, Wyoming"*, J. P. Turner, R. N. Hasenkamp, and T. V. Edgar, Univeristy of Wyoming; James Dahill, WYDOT
- 11:35 a.m. to 12:00 p.m.**   *"Wedge Stability Analysis - Geometric and Groundwater Enhancements"*, Duncan Wyllie and W. Kielhorn, Golder Associates Ltd.
- 12:00 p.m. to 1:10 p.m.**   **Lunch, on your own**

<b>Technical Session II</b>
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**Geophysical & Geotechnical**

**Session Moderator: Harry Moore, Tennessee DOT**

- 1:10 p.m. to 1:35 p.m.**     *"Seismic Refraction as a Method for Determining Thickness of Organic Sediments"*, Priscilla Duskin, New York State DOT
- 1:35 p.m. to 2:00 p.m.**     *"Current and Potential Uses of Time Domain Reflectometry for Geotechnical Monitoring"*, Timothy J. Beck, California DOT; William F. Kane, University of the Pacific/Neil O. Anderson and Associates, Stockton, California
- 2:00 p.m. to 2:25 p.m.**     *"Instrumentation of a Shredded Tire Fill Used for a Landslide Repair, The Burning Issue"*, Bret Boundy and James Dahill, WYDOT
- 2:25 p.m. to 2:50 p.m.**     *"Integrated Geohazard Management- A Systemwide Approach"*, Donald V. Gaffney, Michael Baker Jr., Inc.; Matthew L. McCahan, Pennsylvania Turnpike Commission
- 2:50 p.m. to 3:15 p.m.**     *"SGH Form: Format for Early Collection of Essential Geotechnical Data"*, William R. Adams, Jr., Pennsylvania DOT; Christopher Ruppen, Michael Baker Jr., Inc.
- 3:15 p.m. to 3:45 p.m.**     **Refreshment Break, Breezeway, Compliments of all Exhibitors**

**Technical Session III**

**Retaining and/or Soil Anchoring Systems**  
**Session Moderator: Mark Falk, WYDOT**

- 3:45 p.m. to 4:10 p.m.**    *"Permanent and Temporary Earth Anchoring for Highway Applications"*, Kevin Heinert, Williams Form Engineering Corp.
- 4:10 p.m. to 4:35 p.m.**    *"Making a Soil Nail Wall Look Like Rock"*, Claus Ludwig, Schnabel Foundation Company
- 4:35 p.m.**                    *"Things to Come"*, Slide Show Presentation, WYDOT

**Evening Events**

- 5:00 p.m.**                    **Adjournment-Dinner, on your own**
- 7:00 p.m. to 10:00 p.m.**    **Mid-Meeting Mingler, Bandana Room**  
*Compliments of Michael Baker Jr., Inc.*

**Sunday, September 8**

**Field Trip to Sunlight Basin**

- 7:30 a.m.**                    **Leave from the Holiday Inn**
- Morning Break Compliments of Tensar Earth Technologies and Contech Construction Products*  
*Lunch Compliments of Brugg Cable Products, Inc.*  
*Afternoon Break Compliments of Golder Associates*
- 5:00 p.m.**                    **Return to Holiday Inn**

**Evening Events**

- 6:30 p.m.**                    **Banquet Social Hour Begins, Meeting Room**  
*Compliments of Nicholson Construction Company*
- 7:30 p.m.**                    **Banquet, Meeting Room**

8:30 p.m.

**Dinner Speaker:** *"A Dam is Built"*, A History of the Buffalo Bill Dam and Shoshone Reclamation Project; Beryl Churchill, Park County Commissioner

**Monday, September 9**

**Technical Session IV**

**Construction**

**Session Moderator: Vernon Bump, South Dakota DOT**

- 8:00 a.m. to 8:25 a.m.** *"The Use of Underbenching in Embankment Construction Through Mountainous Terrain, I-26, Unicoi County, Tennessee"*, Harry Moore, Tennessee DOT
- 8:25 a.m. to 8:50 a.m.** *"Rock Durability of Argillaceous Carbonate Rocks in Cut Slopes for Indiana Highways"*, Terry West and Hyuck Jin Park, Purdue University
- 8:50 a.m. to 9:15 a.m.** *"Flowable Fill Using Waste Products"*, C. W. Lovell, Purdue University
- 9:15 a.m. to 9:45 a.m.** **Coffee Break, Taggart's, Compliments of Michael Baker Jr., Inc.**
- 9:45 a.m. to 10:10 a.m.** *"Subsidence Definition and Effects on Surface Construction"*, Irving Studebaker and Susan Patton, Montana Tech Mining Dept.; Raymond Studebaker, Montana DOT
- 10:10 a.m. to 10:35 a.m.** *"Roadway Settlement Over Culverts: Causes and Cures"*, J. F. Lundvall, J. P. Turner, J. M. Stewart and T.V. Edgar, University of Wyoming
- 10:35 a.m. to 11:00 a.m.** *"Debris Flow Mitigation Using Flexible Barriers"*, John Duffy, California DOT; Jay DeNatale, California Polytechnic State University
- 11:00 a.m. to 11:25 a.m.** *"Preliminary Investigations Using ALROC Potliner Sand in Asphalt Concrete Mixtures"*, Kevin Hall, University of Arkansas
- Noon:** **Official Closure of the 47th Annual HGS Conference**

# TABLE OF CONTENTS

History, Organization and Function .....	i
HGS Steering Committee Officers .....	iii
HGS Steering Committee Membership List .....	iv
Emeritus Members of the HGS Steering Committee .....	viii
HGS Medallion Award Winners .....	ix
Future HGS Schedule .....	x
Sponsors .....	xi
Exhibitors .....	xii
Acknowledgement .....	xiii

## PROCEEDINGS PAPERS

<i>"Earthflows, Debris Flows and Roads: The Aftermath of the Winter Storm of 1996, Portland Oregon"</i> , Scott Burns, Portland State University .....	1
<i>"Landslide Hazards in New York State: a Geological Overview"</i> , Robert Fickies, New York State Geological Survey .....	10
<i>"Peters Road Landslide"</i> , Wayne Adams and Dave Findley, Golder Associates; Steve Lowell, WASHDOT .....	12
<i>"Rock Slope Stabilization at Dunderberg Mt., Rockland County, New York"</i> , Henry Willems and Matthew Podniesinski, NY State DOT .....	33
<i>"Geologic Investigation of the Gordon Canyon Slide"</i> , Nick Priznar, ADOT; Kenneth Euge, Geological Consultants .....	49
<i>"Reinforced Earth Retaining Wall for Landslide Control, Snake River Canyon, Wyoming"</i> , J. P. Turner, R. N. Hasenkamp, and T. V. Edgar, University of Wyoming; James Dahill, WYDOT .....	65
<i>"Wedge Stability Analysis - Geometric and Groundwater Enhancements"</i> , Duncan Wyllie and W. Kielhorn, Golder Associates .....	80
<i>"Seismic Refraction as a Method for Determining Thickness of Organic Sediments"</i> , Priscilla Duskin, NY State DOT .....	81
<i>"Current and Potential Uses of Time Domain Reflectometry for Geotechnical Monitoring"</i> , Timothy J. Beck, California DOT; William F. Kane, University of the Pacific/Neil O. Anderson & Assoc., Stockton, California .....	94

*"Instrumentation of a Shredded Tire Fill Used for a Landslide Repair, The Burning Issue"*, Bret Boundy and James Dahill, WYDOT ..... 104

*"Integrated Geohazard Management - A Systemwide Approach"*, Donald V. Gaffney, Michael Baker Jr., Inc.; Matthew L. McCahan, Pennsylvania Turnpike Commission ..... 116

*"SGH Form: Format for Early Collection of Essential Geotechnical Data"*, William R. Adams, Jr., Pennsylvania DOT; Christopher Ruppen, Michael Baker Jr., Inc. .... 126

*"Permanent and Temporary Earth Anchoring for Highway Applications"*, Kevin Heinert, Williams Form Engineering Corp. .... 142

*"Making a Soil Nail Wall Look Like Rock"*, Claus Ludwig, Schnabel Foundation Company ..... 157

*"The Use of Underbenching in Embankment Construction Through Mountainous Terrain, I-26, Unicoi County, Tennessee"*, Harry Moore, Tennessee DOT ..... 172

*"Rock Durability of Argillaceous Carbonate Rocks in Cut Slopes for Indiana Highways"*, Terry West and Hyuck Jin Park, Purdue University ..... 183

*"Flowable Fill Using Waste Products"*, C. W. Lovell, Purdue University ..... 206

*"Subsidence Definition and Effects on Surface Construction"*, Irving Studebaker and Susan Patton, Montana Tech Mining Dept.; Raymond Studebaker, Montana DOT ..... 216

*"Roadway Settlement Over Culverts: Causes and Cures"*, J. F. Lundvall, J. P. Turner, J. M. Stewart and T.V. Edgar, University of Wyoming ..... 230

*"Debris Flow Mitigation Using Flexible Barriers"*, John Duffy, California DOT; Jay DeNatale, California Polytechnic State University ..... 243

*"Preliminary Investigations Using ALROC Potliner Sand in Asphalt Concrete Mixtures"*, Kevin Hall, University of Arkansas ..... 253

**APPENDICES**

**APPENDIX A**  
Cumulative Index of HGS Proceedings ..... A-1

**APPENDIX B**  
HGS Proceedings Availability List ..... B-1

# HIGHWAY GEOLOGY SYMPOSIUM

## HISTORY, ORGANIZATION AND FUNCTION

Established to foster a better understanding and closer cooperation between geologists and civil engineers in the highway industry, the Highway Geology Symposium (HGS) was organized and held its first meeting on February 16, 1950, in Richmond, Virginia. Since then, 47 consecutive annual meetings have been held in 31 different states. Between 1950 and 1962, the meetings were held east of the Mississippi River, with Virginia, Ohio, West Virginia, Maryland, North Carolina, Pennsylvania, Georgia, Florida, and Tennessee serving as the host states.

In 1962, the Symposium moved west for the first time to Phoenix, Arizona. Since then, it has rotated, for the most part, back and forth from east to west. Following meetings in Texas and Missouri in 1963 and 1964, the Annual Symposium moved to different locations as follows:

<u>Year</u>	<u>HGS Location</u>	<u>Year</u>	<u>HGS Location</u>
1965	Lexington, KY	1966	Ames, IA
1967	Lafayette, IN	1968	Morgantown, WV
1969	Urbana, IL	1970	Lawrence, KS
1971	Norman, OK	1972	Old Point Comfort, VA
1973	Sheridan, WY	1974	Raleigh, NC
1975	Coeur d'Alene, ID	1976	Orlando, FL
1977	Rapid City, SD	1978	Annapolis, MD
1979	Portland, OR	1980	Austin, TX
1981	Gatlinburg, TN	1982	Vail, CO
1983	Stone Mountain, GA	1984	San Jose, CA
1985	Clarksville, IN	1986	Helena, MT
1987	Pittsburgh, PA	1988	Park City, UT
1989	Montgomery, AL	1990	Albuquerque, NM
1991	Albany, NY	1992	Fayetteville, AR
1993	Tampa, FL	1994	Portland, OR
1995	Charleston, WV	1996	Cody, WY

Unlike most groups and organizations that meet on a regular basis, the Highway Geology Symposium has no central headquarters, no annual dues, and no formal membership requirements. The governing body of the Symposium is a steering committee composed of approximately 20 engineering geologists and geotechnical engineers from state and federal agencies, colleges and universities, as well as private service companies and consulting firms throughout the country. Steering committee members are elected for three-year terms, with their elections and re-elections being determined principally by

their interests and participation in and contribution to the Symposium. The officers include a chairman, vice chairman, secretary, and treasurer, all of whom are elected for a two-year term. Officers except for the treasurer may only succeed themselves for one additional term.

A number of three-member standing committees conduct the affairs of the organization. The lack of rigid requirements, routing, and the relatively relaxed overall functioning of the organization is what attracts many of the participants.

Meeting sites are chosen two to four years in advance and are selected by the steering committee following presentations made by representatives of potential host states. These presentations are usually made at the steering committee meeting, which is held during the annual Symposium. Upon selection, the state representative becomes the state chairman and a member protem of the steering committee.

The Symposia are generally for two and one-half days, with a day-and-a-half for technical papers and a full day for the field trip. The Symposium usually begins on Wednesday morning. The field trip is usually Thursday, followed by the annual banquet that evening. The final technical session generally ends by noon on Friday.

The field trip is the focus of the meeting. In most cases, the trips cover approximately 150 to 200 miles, provide for six to eight scheduled stops, and require about eight hours. Occasionally, cultural stops are scheduled around geological and geotechnical points of interest. To cite a few examples, in Wyoming, the group viewed landslides in the Big Horn Mountains; Florida's trip included a tour of Cape Canaveral and the NASA space installation; the Idaho and South Dakota trips dealt principally with mining activities; North Carolina provided stops at a quarry site, a dam construction site, and a nuclear generating site; in Maryland, the group visited the Chesapeake Bay hydraulic model and the Goddard Space Center; the Oregon trip included visits to the Columbia River Gorge and Mount Hood; the Central Mineral Region was visited in Texas; and the Tennessee trip provided stops at several repaired landslides in Appalachia. The Colorado field trip consisted of stops at geological and geotechnical problem areas along Interstate 70 in Vail Pass and Glenwood Canyon; while the Georgia trip in 1983 concentrated on highway design and construction problems in the Atlanta urban environment. The 1984 field trip had stops in the San Francisco Bay area, which illustrated the planning, construction and maintenance of transportation systems. In 1985, the one day trip illustrated new highway construction procedures in the greater Louisville area. The 1986 field trip was through the Rockies on recent Interstate construction in the Boulder Batholith. The trip highlight was a stop at the Berkeley Pit in Butte, Montana, an open pit copper mine.

At the technical sessions, case histories and state-of-the-art papers are most common, with highly theoretical papers the exception. The papers presented at the technical sessions are published in the annual proceedings. Some of the more recent proceedings may be obtained from the Treasurer of the Symposium.

## HGS STEERING COMMITTEE OFFICERS

- Mr. Earl Wright, Chair 1997  
Engineering Geology Section Supervisor  
Geotechnical Branch, Division of Materials  
Department of Highways, Transportation Cabinet  
Frankfort, KY 40622  
PH: 502/564-2374
- Dr. C. William Lovell, Vice Chair 1997  
School of Civil Engineering  
Purdue University  
West Lafayette, IN 47907  
PH: 317/494-5034
- Dr. Pam Stinnette, Secretary 1997  
Department of Civil Engineering  
University of South Florida  
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Tampa, FL 33620  
PH: 813/974-5845
- Mr. Russell Glass, Treasurer Appointed by Chairman  
Area Geologist, Geotechnical Unit  
North Carolina Department of Transportation  
P. O. Box 3279  
Asheville, NC 28802  
PH: 704/298-3874

NOTE: Officers' terms expire at conclusion of 1997 Symposium.

## HGS STEERING COMMITTEE MEMBERSHIP LIST

<u>NAME</u>	<u>TERM EXPIRES</u>
Mr. Ken Ashton West Virginia Geological Survey P. O. Box 879 Morgantown, WV 26507-0879 PH: 304/594-2331	1997
Mr. John Baldwin West Virginia Division of Highways 312 Michigan Ave. Charlestown, WV 25311 PH: 304/558-3084	1998
Mr. Vernon Bump Division of Engineering Department of Transportation Pierre, SD 57501 PH: 605/773-3401	1996
Mr. Richard Cross New York State Thruway Authority 200 Southern Boulevard P. O. Box 189 Albany, NY 12201-0189 PH: 518/471-4277	1997
Mr. Jeff Dean Oklahoma Department of Transportation	1998
Mr. John B. Gilmore Colorado Highway Department 4340 East Louisiana Denver, CO 80222 PH: 303/757-9275	1997
Mr. Russell Glass North Carolina Department of Transportation Geotechnical Section P. O. Box 3279 Asheville, NC 28802 PH: 704/298-3874	1996

<u>NAME</u>	<u>TERM EXPIRES</u>
Mr. Robert E. Goddard Florida Department of Transportation 2006 N.E. Waldo Road Gainesville, FL 32609 PH: 904/372-5304	1996
Mr. G. Michael Hager Wyoming Department of Transportation P. O. Box 1708 Cheyenne, WY 82003-1708 PH: 307/777-4475	1996
Mr. Robert W. Henthorne Kansas Department of Transportation Box 498 411 W. 14th Street Chanute, KS 66720-0498 PH: 316/431-1000 Ext. 47	1996
Mr. Richard Humphries Golder & Associates 3730 Chamblee Tucker Rd. Atlanta, GA 30341 PH: 404/496-1893	1997
Mr. Charles T. Janik Pennsylvania Department of Transportation 1118 State Street Harrisburg, PA 17120 PH: 717/787-5405	1997
Dr. C. W. "Bill" Lovell, Research Engineer School of Civil Engineering Purdue University West Lafayette, IN 47907 PH: 317/494-5034	1998
Mr. Harry Ludowise 5308 NE 12th Avenue Vancouver, WA 98665 PH: 206/693-1617	1998

**NAME****TERM EXPIRES**

Mr. Henry Mathis Manager, Geotechnical Branch Kentucky Department of Highways Frankfort, KY 40622 PH: 502/564-2374	1998
Mr. Harry Moore Tennessee Department of Transportation P. O. Box 58 Knoxville, TN 37901 PH: 423/594-9436	1997
Mr. Willard L. Sitz Alabama Highway Department 1409 Coliseum Blvd. Montgomery, AL 36130 PH: 205/242-6527	1996
Dr. Pam Stinnett Department of Civil Engineering University of South Florida 4202 E. Fowler Ave. ENB 118 Tampa, FL 33620 PH: 813/974-2110	1997
Mr. James Stroud Senior Geologist, Mideast Division Vulcan Materials Company 4401 N. Patterson Avenue P. O. Box 4239 Winston-Salem, NC 27115 PH: 910/767-4600	1997
Mr. Steven E. Sweeney New York State Thruway Authority 200 Southern Blvd. Albany, NY 12209 PH: 518/471-4378	1996

**NAME****TERM EXPIRES**

Mr. Sam I. Thornton University of Arkansas Department of Civil Engineering Fayetteville, AR 72701 PH: 501/575-6024	1996
Dr. Terry West Associate Professor Earth and Atmospheric Science Department Purdue University West Lafayette, IN 47907 PH: 317/494-3296	1997
Mr. W. A. Wisner Florida Department of Transportation P. O. Box 1029 Gainesville, FL 32602 PH: 904/372-5304	1996
Mr. Earl Wright Geotechnical Branch Kentucky Department of Highways Frankfort, KY 40622 PH: 502/5674-2374	1996

EMERITUS MEMBERS OF THE STEERING COMMITTEE FOR THE  
HIGHWAY GEOLOGY SYMPOSIUM

R. F. Baker	Willard McCasland
David Bingham	David Mitchell
Virgil E. Burgat	W. T. Parrott *
Robert G. Charboneau *	Paul Price
Hugh Chase	David L Royster *
A. C. Dodson	Bill Sherman
Walter F. Fredericksen	Mitchell Smith
Joseph Gutierrez	Berke Thompson
John Lemish	Burrell Whitlow *
George S. Meadors, Jr. *	Ed J. Zeigler

Status granted by Steering Committee

\* deceased

