TPG ARTICLES

AIPG needs quality articles for future issues of *The Professional Geologist*. Members are encouraged to submit articles or call Headquarters and recommend individuals who should be asked to submit articles. Submissions should be 800 to 1600 words in length. Articles submitted on diskette along with a hard copy are appreciated. Headquarters uses DOS, WordPerfect 5.1, and can utilize 3 1/2 or 5 1/4 diskettes. Photographs, figures, tables, etc. are welcome. Photographs enhance articles and make great TPG covers. Be sure to send photographs when possible with your articles OR send your favorite photograph for consideration as the cover for a future TPG issue. Submission deadline is six weeks preceding month of issue.

EDITORIAL EMPHASIS

TECHNICAL TOPICS
Mining Geology January
Petroleum Geology March
Hydrogeology July
Environmental Geology September
Geophysics/Engineering November

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The August TPG will include articles submitted by the AIPG Officer nominees. All members should receive ballots by July 31, 1994; please be sure to vote.

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The Professional GEOLOGIST

FEATURES

Special Report... Hydrogeology - Part 1

Alternatives To Monitoring Wells - Innovative Methods For Hydrogeological Investigations
John W. Jengo, CPG-8139

The Versatile Hydrogeologist
Kathryn S. Makeig, CPG-6137

Reflections On Water Of An Old Geologist, Hydrogeologist, Or Geohydrologist
Philip A. Emery, CPG-6775

Thinking Remediation During The Investigation
David E. Fulton, CPG-8187

The Role Of The Hydrogeologist In Drainage Divide Wetland Restoration
Donald Brice, CPG-7986

AIPG National Officer Nominees

AIPG 1994 Award Recipients

COVER - De Soto Falls, De Soto State Park, DeKalb County, Alabama. The rocks are the sandstones of the Pennsylvanian Pottsville Formation. The creek is the West Fork of Little River. The height of the main falls is 110 feet. Photograph by Paul H. Moser, CPG-1982.

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SPECIAL REPORT

Hydrogeology - Part 1

Fulmer Falls, Childs State Forest in Pennsylvania's Pocono Mountains. Water flows along weakened bedding planes and fractures in the sandstones and siltstones that comprise the Devonian-age Trimmers Rock Formation.

Photograph by John W. Jengo, CPG-8139
Alternatives To Monitoring Wells - Innovative Methods For Hydrogeological Investigations

John W. Jengo, CPG-8139

Introduction

The monitoring well is one of the fundamental tools in environmental investigations, and its use for determining aquifer characteristics, delineating ground water conditions, and evaluating remediation progress has been well documented. However, monitoring wells can be difficult to decommission once they have been incorporated into a ground water sampling program and regulatory agencies have grown accustomed to their presence. Therefore, environmental consultants should utilize innovative methods for hydrogeological investigations and ground water sampling that do not require monitoring well installation. Many of these methodologies are not cost-effective alternatives for investigating small sites but are more suitable for large sites over complex hydrogeological terrain.

Most investigations of industrial sites that incorporate monitoring well installation have focused on individual areas of concern (AOCs) or solid waste management units (SWMUs) where products or wastes were handled, stored, or disposed. Although this can be an effective approach to initially define the environmental impact of specific areas, it does not allow sites to be examined holistically. A better alternative would be to conduct an investigation to characterize the stratigraphy, hydrogeology, ground water conditions, and the distribution of non-aqueous phase liquids (NAPL's) underlying the entire site. After determining the hydrogeological framework of the entire site, the consultant could then assess the site-wide impact from the individual AOCs and SWMUs. Essential hydrogeological characteristics and the methods used to determine them include:

- Depth, thickness, and continuity of aquifers and confining units using borehole geophysics and cone penetrometer testing; and,
- Delineation of NAPL's and contaminated ground water plumes using infrared thermography, vertical induction profiling, and the geoprobe in conjunction with gas chromatograph (GC) screening.

The following discussion relates primarily to petroleum or petrochemical sites overlying unconsolidated sediments such as coastal plain deposits, glacial drift/outrwash, or alluvium. Sites underlain by fractured bedrock would require methodologies different than what are discussed herein.

Development of a Hydrogeologic Framework

A number of investigative tools are available to develop a hydrogeologic framework of sediments underlying a site. Essentially, the depth, thickness, and continuity of the aquifers and confining units underlying the site must be defined so that subsequent ground water sampling can be accurately located to evaluate representative ground water conditions.

Borehole Geophysics

If water production wells or monitoring wells from a previous investigation already exist on-site, these wells should be geophysically logged to characterize the site stratigraphy and possibly eliminate the need for additional exploratory drilling (see July 1993 issue of The Professional Geologist for a detailed discussion of this approach). If there are no existing wells on-site, exploratory drilling, in conjunction with borehole geophysics, should be implemented at representative areas within and at the perimeter of the site. Using the acquired logging data, a series of cross-sections would be developed for
stratigraphic and hydrogeologic correlations. This involves recognizing aquifers and confining units and identifying the continuity of these sediments beneath the site. After completion of the cross-sections, the consultant will be able to identify areas where more information is needed to fully characterize the underlying stratigraphy and either gather that data with additional borehole logging or, if applicable, with cone penetrometer testing. Geophysical tools used in the logging of existing wells should consist of natural gamma ray and, if the wells were constructed using PVC materials, electromagnetic induction. Geophysical tools used in the logging of exploratory boreholes should include natural gamma ray, resistivity, spontaneous-potential, and electromagnetic induction.

**Cone Penetrometer Testing**

In areas of the site where additional stratigraphic information is needed, cone penetrometer testing would be implemented. The cone penetrometer was developed as an engineering tool for determining the capacity of soils to support foundation pilings and is a quick and reliable method for determining stratigraphy. Cone penetrometer testing is a continuous penetration test that uses a cone-shaped rod that is forcibly pushed into the soil with hydraulic rams. The measurements of resistance at the end and along the sides of the cone tip, almost exclusively a function of the relative density of the sediment, are then correlated with soil textures (i.e., silty clay, sand, etc.) to determine subsurface stratigraphy. Tip resistances are typically higher in compacted and sandy soil strata, lower and more variable in transitional type soils (e.g., stratified sands, silts, and clays), and very low in soft clays. In some cases (such as firm clays), high tip resistance and high friction sleeve measurements may be observed, and so comparisons with borehole geophysical logs may be necessary to delineate the lithologic characteristics that result in high tip resistance measurements. Therefore, selected cone penetrometer testing would be needed adjacent to geophysically logged boreholes or existing monitoring wells to validate the correlation between the cone penetrometer data and the borehole geophysical logging data. Pore pressure dissipation tests, where cone penetrometer advancement is stopped during a test and the dissipation rate of excess pore pressure is monitored, can also be performed to characterize the relative hydraulic conductivity of subsurface sediments.
Delineation of Ground Water Contamination

Upon completion of the hydrogeologic framework, a ground water investigation should be initiated throughout the site to define and delineate areas of ground water contamination. Only by conducting a site-wide investigation can the actual scope of ground water contamination be ascertained and remediation solutions devised. The site-wide ground water investigation can consist primarily of infrared thermography, vertical induction profiling, and confirmatory ground water sampling using the geoprobe. Because of space limitations, infrared thermography and vertical induction profiling cannot be discussed in detail herein but, in summary, both methods are capable of locating hydrocarbon plumes over large areas.

Infrared Thermography and Vertical Induction Profiling

Infrared thermography can recognize ground surface temperature anomalies caused by the presence of hydrocarbons. The measurement of the thermal energy that is released by all subsurface materials, such as soils, buried objects or hydrocarbons, can be accomplished by either ground detectors or a site flyover. Vertical induction profiling remotely images complex natural and man-made subsurface conditions by continuously measuring the electromagnetic field across a depth profile between a surface transmitter coil and a downhole receiver. The downhole receiver can detect changes in resistivity below the transmitter source as it is raised up a temporary boring or existing well and will provide a three-dimensional view of hydrocarbon distribution.

Geoprobe Sampling

The results of infrared thermography and vertical induction profiling or other geophysical methods such as micro-magnetics would be used to provide two- and three-dimensional representations of the hydrocarbon plumes underlying the site. These data would be interpreted to detect locations where confirmatory ground water and NAPL characterization samples can be collected using the geoprobe. The hydrogeologic framework developed by borehole geophysics and cone penetrometer testing would also be interpreted to determine the stratigraphy at the locations where the geoprobe would be advanced to collect ground water or NAPL characterization samples.

The geoprobe is a system capable of hydraulically driving a hollow steel probe with a retractable screen near the tip to a depth that will intercept a NAPL or contaminated ground water plume. The probe is then raised slightly to expose the retractable screen and a sample is collected through the hollow probe. Samples can be collected by one of three methods depending on analytical requirements and depth to the NAPL or ground water. These methods include using a (1) peristaltic or vacuum pump equipped with polyethylene tubing, (2) miniature stainless-steel bailer, or (3) polyethylene tubing equipped with a check valve assembly.
Ground water samples collected from the probe can be analyzed in an analytical laboratory or in the field using a portable GC. The laboratory or field data can be used to confirm the presence, areal limits, and chemical makeup of the plumes that were initially delineated by aforementioned geophysical methods. The consultant should certainly propose to use the geoprobe in lieu of monitoring wells within NAPL plumes because the sampling objective is to obtain a product sample for characterization, and wells are not needed to obtain such an obviously contaminated sample for analyses. Regulators who have difficulty approving alternative sampling methods should be made aware that the geoprobe also provides representative samples of ground water because the hole produced by the geoprobe did not exist until moments before sampling and, thus, there is no stagnant water to invalidate the analyses. If needed, predominant direction of ground water flow and influence of tidal fluctuations can be ascertained using geoprobe-driven temporary piezometers.

Summary

After the completion of the hydrogeologic framework and NAPL/ground water plume delineation, the consultant will have identified areas across the site that pose an immediate environmental impact. In these areas, corrective action would then be initiated to remediate source areas and prevent impact to off-site receptors. If the client has limited funds, the site-wide investigation will enable the consultant to prioritize and then address those areas that are the primary sources of contamination or pose the greatest risk to human health and environment. In summary, the monitoring well will remain a valuable tool in environmental investigations but should be used primarily for long-term monitoring of contaminant migration at the site perimeter as there are more effective methods to determine the hydrogeologic framework and ground water conditions across an entire site. With each well not installed, the costs to survey, sample, maintain, redevelop and ultimately abandon the well will be saved, and the client’s funds used to expedite closure or remediation of their units or facility.

John W. Jengo, CPG-8139. is Senior Hydrogeologist/Project Manager at Remediation Technologies, Inc. (RETEC) in King of Prussia, Pennsylvania.

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The Versatile Hydrogeologist

Kathryn S. Makeig, CPG-6137

The ink of the signatures on my AIPG certificate is fading as I re-evaluate my career. Several months ago I decided to start my own consulting firm and have gone through some serious assessment as to who I am and what services I can offer the often reluctant client. And as I look to my colleagues for ideas, I find a hydrogeologist in practically every aspect of the environmental consulting business and in some pretty unlikely other places, as well.

I was schooled with a classical education in hydrogeology, discussing long-dead pioneers in the field such as King Hubbert (wasn't he the monarch of Liechtenstein at one time?) or Darcy (did he ever have a first name?). I struggled through those nonsensical units of measure that cause every hydrogeologist to shake his or her head in despair, like the "darcy" or (my personal favorite) the "mienzer". I have spent the last 15 or so years of my career dealing with various aspects of hazardous and solid waste. This was all learned on the job, as I went to school before RCRA, CERCLA, and the rest of the alphabet soup that makes up the framework of environmental regulations.

However, practically everywhere I turn I run into a geologist or hydrogeologist in the most unlikely professional positions. Hydrogeologists, of course, are heavily into regulatory roles. Lowering the regulatory hammer on some poor, unsuspecting industrialist may give the hydrogeologist some justified pleasure for too long having been the poor step-child in the traditional engineering firm. But more often than not, the versatile hydrogeologist is also a lawyer, a QA/QC specialist, a health and safety coordinator, a teacher, a lobbyist, a writer, a company president, or in a wide array of other professions. What about the hydrogeologists' training makes them such versatile professionals? One thing that comes to mind is our ability to use our imaginations. Ground water is not as visible as a bridge is, for instance, to an engineer. Imagining parts per billion in ground water is even a further stretch. Hydrogeologists also are down to earth (no pun intended). We are practical scientists who evaluate information and data and draw conclusions to solve a problem. We also like to drink beer quite a bit.

I found myself confronted with my own versatility squarely last month as I embarked on putting together a pollution-prevention program for a large research-and-development client. I was asked point-blank by the client if I had ever done this type of program before and heard myself answering, without hesitation, "No, but how hard can it be?" This is a long way from the security of the mienzer.


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Reflections On Water Of An Old Geologist, Hydrogeologist, Or Geohydrologist

Philip A. Emery, CPG-6775

My first job after graduation, (B.S. & M.S. Geology University of Kansas) was with the U.S. Geological Survey’s Water Resources Division in Lincoln, Nebraska in 1962. At that time there was little public awareness of ground water and its use or its contamination.

In the 60s I developed (thanks to USGS) one of the early ground-water models (Emery, 1966). At that time we used electric-analog models, and it was “necessary” that initial input for hydrologic parameters be as correct as possible. Why? -- because changing them involved removing many wires and changing capacitors and/or resistors. Naturally, this difficulty in adjusting values of storage and transmissivity resulted in a tendency to first change input such as recharge, discharge and head until a reasonable balance was achieved. However, I do recall using wire cutters to modify stream-aquifer connection.

By the early 70s the digital computer was replacing the electric analog model (Eredchoeft & Pinder, 1973) and we soon discovered that one could manipulate the basic hydrologic parameters at will. Some early digital models were developed using negative transmissivities! Alas, models had reached the stage where they were perhaps being misused, abused or at least overused. They were, and still are --- See Alley & Emery, 1986; Konikow, 1986; Konikow & Eredchoeft, 1992; Oreskes, et.al. 1994.

I believe the principal reason that models became so popular was they gave water manager “clear-cut” answers. The answers were accepted because they came from a “computer”. Many modelers soon forgot that the models were mainly tools to help them understand the flow system. Instead, the model often became the final product of the investigation. The “clients” who paid for the models were delighted to have clear-cut computer-derived answers, and the modelers, in many cases, were delighted to manipulate hydrologic parameters until the clients were even more delighted.

As the years passed, I worked with USGS in Colorado, California, Kentucky and Alaska. By the early 70s the public became aware of ground water. EPA was created, pollution of streams excited interest, and the public became at least semi-informed. At first EPA’s interest was mainly focused on streams. I remember meeting with 3 EPA officials in Atlanta around 1977, when I hope I convinced them that the ground water in Louisville’s alluvial aquifer was in hydraulic connection with the Ohio River.

During the 80s the public and EPA became more fully informed that ground water existed --- furthermore --- some of it was contaminated! Soon, EPA and environmental groups set out to protect the ground water. But, it was too late in many instances. However, such things as “Super Fund” were created. Super Fund, in my opinion, represents the all-too-often-used approach to solve problems by “throwing money” at them --- as much---and as fast---as possible. Millions (or is it billions?) have been spent, but results have been disappointing, or at least questionable. Perhaps too much money has been spent on cure and too little on prevention. While many geohydrologists, hydrogeologists, geologists, engineers, and other “practitioners” have gained employment --- the bulk of the dollars have gone, and continue to go to the legal profession.
Meanwhile, the abuse, misuse, and overuse of groundwater resources, models, and legislative processes continues.

What can be done to improve the situation? Consultants and governmental agencies need to make it clear up front to "clients" that models are only as good as the input data and the understanding of the ground-water flow system. Also, the "real world" aquifer system can change. For example, pumpage stress can change flow and storage characteristics. It is vital to convince clients that management models need constant upgrading if they are to be used to make timely management decisions. Therefore clients need to understand that long-term data collection is often advisable and necessary, and will improve the model. Models indicate the type of data needed. More time and money should be spent on field data collection. Too many models have been developed using poorly estimated aquifer parameters and other questionable input data.

Super Fund appropriations should be cut in half, and more funding should be made available to assist States and Cities in locating suitable sites for landfills, toxic waste disposal, etc.

A greater effort should be made to educate water managers, the media, legislators and staffs, and water users about ground water, as well as uses and abuses of models.

Before environmental legislation is presented, and before rules and regulations are adopted by regulatory agencies, the bills, and regulations should be more carefully reviewed by professionals (Federal, State, Private sector, and University).

References

Philip A. Emery, CPG-6775, Independent, Lake Havasu City, Arizona.

IN MEMORIAM

Dr. Thomas S. Mackey

Dr. Thomas S. Mackey, CPG-2534, died on February 25, 1994, in Towson, MD. He was 63.

Educated as an attorney, metallurgist and professional engineer, Dr. Mackey obtained a bachelor of science with honors from Manhattan College, a master of engineering with honors from Columbia University, a Ph.D. from Rice University, a doctorate in jurisprudence from South Texas College of Law, and a Master of Law degree from The University of Houston. He was a Fellow of the American Institute of Chemists and a Fellow of the Institute of Mining and Metallurgy, U.K., and a member of AIPG since 1973.

Dr. Mackey was a world leader in the field of pigments and non-ferrous metals for more than 40 years. He was active in various successful tin, titanium, tantalum, and lead projects throughout the world. He worked in the design, construction and operation of processes in the areas of tin mining, milling, concentration, by-product recovery of accompanying minerals, as well as tin smelting and marketing of the finished products. He was a consultant to numerous tin mining and smelting operations in South America and Southeast Asia.

Dr. Mackey was past chairman of The Metallurgical Society World Symposium on Lead-Zinc-Tin. His list of publications includes some 25 articles related to various non-ferrous metals and minerals.

He is survived by his wife, Catherine, five daughters, two sons and thirteen grandchildren. In his memory the Family has established the Thomas S. Mackey Education Fund, Trust Department, P.O. Box 179 Street, Galveston, Texas 77553-0179.
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Thinking Remediation During The Investigation

A Hydrogeological Approach

David E. Fulton, CPG-8187

As technical capabilities and state-of-the-art technologies continue to grow, so does the market pressure to implement cost-effective solutions that achieve clean-up goals in an acceptable timeframe. Federal and State enactments over the last two decades have set into motion an increasing number of environmental laws, regulations, and regulatory agencies that confront businesses with substantial financial consequences for compliance. Subsequently, environmental professionals (corporate managers, consultants, and regulators) must strive to continuously improve the process by which state-of-the-art technologies are selected by better integrating the investigative phase with the remedial phase. This approach will diminish the likelihood of incomplete site characterization and unnecessary follow-up studies.

The intent of this paper is to present some technical considerations for designing and implementing a site characterization program. Soil and groundwater can be impacted through the release of contaminants from accidental spills, buried drums, or leakage from underground storage tanks. Investigating with the end in mind (remedial strategy) significantly affects the magnitude of the total project cost. While the expenditures associated with the investigative phase represent a smaller percentage of the total project cost, the data collected directly impacts the commitment to a remedial design, which constitutes the largest expenditure with the least control over costs.

To accomplish the goal of implementing cost-effective solutions, a proactive approach is required during the investigative phase that encompasses the following key components:

1. The nature (physical and chemical properties) of the contaminants released.
2. The distribution of contaminants in the subsurface.
3. Subsurface geology and hydrogeology.

4. Remedial objective.
Successful remediation of subsurface soils and groundwater depends on the ability to accurately define these components.

The nature (physical and chemical properties) of the contaminants released. Investigations into the nature of the contaminants released should identify where the leak event occurred (source area) and the volume released (if possible). Information pertaining to the release rate and duration will describe the manner in which the subsurface was impacted. It is important to assess the physical and chemical properties through both field activities and literature review. Field activities would include interviews with on-site personnel, product sample analysis such as chromatographic fingerprinting, review of inventory reconciliation reports, and obtaining Material Safety Data Sheets. Literature review involves using chemical reference handbooks to identify relevant physical properties that determine how the compound will interact and partition in the subsurface. The four primary contaminant phases are as vapors in the pore space of unsaturated sediments, as residual liquid adsorbed onto and trapped between soil particles, as a liquid layer floating on top or

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resting on the bottom of a water-bearing zone, and as dissolved liquid in pore water or groundwater. Understanding the nature and partitioning effect describes how mobile the various contaminant phases are and directly affects the choice of corrective action technology to be implemented at a site. The contaminant-specific parameters of interest include:

- Chemical formula (carbon content) and molecular weight
- Vapor pressure
- Vapor density
- Henry’s constant
- Liquid density
- Solubility in water
- Soil sorption coefficient (Koc)

These parameters are not intended to be all inclusive and should be expanded if the contaminant of interest exhibits other unique properties. Based on the parameters listed above, the major processes affecting contaminant distribution in the subsurface (unsaturated and saturated zone) include immiscible flow (vapor and liquid density), dispersion (vapor pressure and solubility), adsorption (log Koc), and volatilization (vapor pressure and Henry’s constant).

The applicability of various technology-based remedial approaches such as soil vapor extraction, soil washing, biodegradation, air sparging, chemical fixation or alteration, and groundwater extraction can be put into perspective. In addition, the ability to meet stringent Federal and/or State clean-up levels can be assessed as well as preliminary treatment technologies for contaminants of interest. The next step is to supplement the information about the nature of the contaminant with site characterization data that focuses on acquiring remedial design data.

**The distribution of contaminants in the subsurface.** A clear understanding of the type, quantity and rate of contaminant released; partitioning effects; and mobility of the contaminants are used to design a cost-effective subsurface investigation. This information is usually acquired through the implementation of a soil boring/monitor well program followed by a soil and groundwater sampling program. In addition to determining the vertical and horizontal extent of contamination, quantifying the mass distribution of each contaminant phase determines the framework for selecting the appropriate remedial response. Numerous calculations have been presented in literature sources by the American Petroleum Institute, CONCAWE, and others to derive the volume of soil required to immobilize a volume of liquid, the maximum depth of liquid hydrocarbon penetration, the maximum spreading of liquid hydrocarbons on the water table, and the apparent volume of liquid hydrocarbon present within the formation.

**Subsurface geology and hydrogeology.** When a spill occurs, seepage through the unsaturated zone occurs under the influence of gravity until it reaches either equilibrium (100% retention capacity) or the capillary fringe above the water table. Lighter than water contaminants will spread laterally on top of the capillary fringe, while denser than water compounds continue to migrate vertically. Primary factors affecting the amount of lateral and vertical spreading include the rate of release, the volume released, and the presence of significant permeability barriers. Permeability barriers are lithologic conditions such as stratification and facies changes. Therefore a conceptual understanding of the subsurface geology and hydrogeology is needed to accurately assess remedial alternatives. Geologic factors affecting contaminant distribution include:

- soil lithology
- soil porosity/permeability
- organic carbon content
- bulk density
- degree of sorting
- soil moisture

The optimum time to acquire this data is during the implementation of a soil boring and monitor well program. Typically, split spoon samples are collected (ASTM Method D1586) to describe lithologic characteristics, penetration rates, the degree of moisture, and other pertinent features. For a nominal cost, additional parameters
NOMINEES FOR AIPG PRESIDENT-ELECT 1995

RUSSELL R. DUTCHER
CPG-1644

Statement of purpose or goals for AIPG:
It is my hope that the membership can work actively to educate the lay public on the values of and the need for sound geologic input in the environmental-industrial arena. Continuing education must be a key part of this effort, along with geologic advice in public policy formulation.

COLLEGE:
University of Connecticut
B.A. 1951
University of Massachusetts
M.S. 1953
The Pennsylvania State University
Ph.D. 1960

PROFESSIONAL HISTORY:
University of Massachusetts
Teaching Fellow 1951-52
University of Massachusetts
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The Pennsylvania State University
Graduate Assistant 1953-56
The Pennsylvania State University
Research Assistant (Full-time) 1956-63
The Pennsylvania State University
Research Associate 1963-66
The Pennsylvania State University
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The Pennsylvania State University
Professor and Dept. Chair 1970-82
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ROBERT K. MERRILL
CPG-4984

Statement of purpose or goals for AIPG:
Goals I have for AIPG include: 1) Pursuing effective ways to communicate geologic information to the public and private sectors, 2) continued activism on geological issues to influence public policy, 3) expansion of inter-profession and inter-society communication, and 4) expanding international programs.

COLLEGE:
Otterby College
A.B., Geology 1967
Arizona State University
M.S., Geology 1970
Arizona State University
Ph.D., Geology 1974

PROFESSIONAL HISTORY:
American Stratigraphic Company
Stratigrapher 1969-70
CITICS Service Company
Instructor of Geology 1973-74
Ox USA, Inc.
Exploration Geologist 1974-87
UNOCAL
Senior Geological Associate 1987-89
Enron/Enron Geologist Consultant 1989-present

AIPG ACTIVITIES:
Colorado Section
AIPG National
1994-85
National Annual Meeting Co-Chr.
Reg. 1986
Membership Chr
1987
National Annual Meeting Co-Chr.
Reg. 1998
Secretary-Treasurer
1989
Vice-President and President-Elect
1995
President
1991
Secretary
1989-93

Sugar Land, Texas

NOMINEES FOR AIPG TREASURER 1995-96

RICHARD M. POWERS
CPG-6765

Statement of purpose or goals for AIPG:
To enhance the public perception/understanding of the geologist's contribution to society; to encourage AIPG members to become actively involved at the state and local levels concerning geologic and environmental issues; to monitor the fiscal operations of the Institute and provide the Executive Committee accurate and timely financial information.

COLLEGE:
Boston University
B.A., Geology 1974

PROFESSIONAL HISTORY:
Century Geophysical Corp.
Supervisor-Geologist 1975-77
Mullen Engineering
Project Geologist 1977-79
Tennessee Valley Authority
Senior Project Geologist 1979-80
BCI (Bromwell & Carrier, Inc.)
Senior Geologist 1981-84
BCI (Bromwell & Carrier, Inc.)
Vice President-Geological Services 1984-87
BCI (Bromwell & Carrier, Inc.)
Vice President-Principal Geologist 1987-89
BCI (Bromwell & Carrier, Inc.)
Executive Vice President-Director 1989-93
BCI (Bromwell & Carrier, Inc.)
President-Director 1994-present

AIPG ACTIVITIES:
Florida Section
Screening Committee 1985
Florida Section
Screening Committee Chair 1986
Florida Section
President-Program Chair 1990
Florida Section
President 1991
Florida Section
Exemplary Service Award 1991
AIPG National
Advisory Board Representative 1991
AIPG National
Advisory Board Delegate 1991-93
Florida Section
Executive Committee 1992
Florida Section
Student Affairs/Special Programs 1992
AIPG National
Environmental Subcomm. 1992
AIPG National
AIPG Rep. to AGI Environmental

Lakeland, Florida

LAWRENCE C. WEBER
CPG-7102

Statement of purpose or goals for AIPG:
AIPG is uniquely positioned to advance the professional interests of all geologists. We must promote professional development, ethics and continuing education. We must speak out publicly and politically on issues that involve and affect our profession. We must build strength through membership and service.

COLLEGE:
Tennessee Tech. University
B.S., Education/Geography 1971
Eastern Kentucky University
M.S., Geology 1974

PROFESSIONAL HISTORY:
Geological Associates, Inc.
Staff Geologist 1974-78
The EDCGe Group
Sr. Engineering Geologist 1978-83
Executive Vice President 1983-85
Principal, Director 1986-88
Principal Geologist 1988-91

AIPG ACTIVITIES:
Tennessee Section
Vice President-Program Chair 1986
Tennessee Section
Advisory Board Delegate 1988
Tennessee Section
President 1990
Tennessee Section
Advisory Board Delegate 1990
Tennessee Section
Program Chair 1991
AIPG National
AIPG Annual Meeting General Chair 1991
AIPG National
State Affairs and Registration Comm. 1992
AIPG National
Annual Meetings Comm. 1992
AIPG National
Certificate of Merit 1992
Tennessee Section
Advisory Board Delegate 1993
Tennessee Section

Nashville, Tennessee
THOMAS FAILS
CPG-3174

Statement of purpose or goals for AIPG:
Three goals for 1995: 1) increased AIPG involvement in governmental/political relations at national, state and local levels; 2) improved public awareness of geologists’ role in protection of public health, safety and economic welfare; 3) increased involvement of younger members in Section activities and management.

Denver, Colorado

LISA CURCI WORTHINGTON
CPG-6298

Statement of purpose or goals for AIPG:
To increase involvement in the political arena and to become a more visible profession to the public; To take a more active role in the registration processes of the state boards. To insure programs offered meet the changing needs of the membership and help attract new members.

Paradise Valley, Arizona

COLLEGE: Ocho State University
COLORADO SCHOOL OF MINES
COLUMBIA UNIVERSITY

DEGREES: Geological Engineer
M.A., Geology

DATES: 1948-50
1952-54
1954-55

PROFESSIONAL HISTORY:
Shell Oil Company
Trend Exploration Ltd
Independent Petroleum Geologist

Geologist/ Sr. Geologist
Vice President
President, Raven Exploration
President, Hagley Resources

1955-58
1967-75
1975-

present

AIPG ACTIVITIES:
AIPG National
AIPG National
Colorado Section
Colorado Section
Colorado Section
Colorado Section
Colorado Section
Colorado Section
Colorado Section
Colorado Section

Citizen Ambassador Group to USSR
International Affairs Comm., Member
Legislative Review Comm., Member
Governmental Relations Comm
Colorado Geol. Survey Comm., Chrm
Principal Author, "State Geological Survey Evaluation Report"
Colorado Section Adv. Board, Member
First Legislative Reception, Co-Chrm.
Legislative Award Comm., Chrm.
Chrm., Political Relations Symposium

1990
1991
1990-91
1991-present
1991-present
1992
1993
1993-present
1994
1994

CONGRATULATIONS!
The American Institute of Professional Geologists Announces 1994 Award Recipients

The American Institute of Professional Geologists is pleased to announce that the following individuals have been named 1994 honors and awards recipients:

BEN H. PARKER MEMORIAL MEDAL
Frank W. Harrison, Jr., CPG-2500

MARTIN VAN COUVERING MEMORIAL AWARD
Daniel N. Miller, Jr., CPG-0064

JOHN T. GALEY, SR. MEMORIAL PUBLIC SERVICE AWARD
Morris W. Leighton, CPG-3572

AWARD OF HONORARY MEMBERSHIP
Richard Fox

Awards will be given to recipients at the AIPG Annual Meeting in Flagstaff, Arizona. The Awards Luncheon will be held on October 13, 1994.
can be determined from field samples such as degree of sorting (sie analysis ASTM D452-85), bulk density (ASTM Method D4254), organic carbon content (Method 415.1), porosity (Method 160.3 MOD), and soil moisture (ASTM Method D2216). Representative "field-derived" values add validity to calculations used to assess mass volume and mobility. Additional analyses may be prudent if a contaminant-specific remediation technique has been identified (i.e. soil vapor extraction, air sparging, or biodegradation). In these instances, shely tube (ASTM Practice D1587) or ring-lined samples (ASTM Practice D3550) may be appropriate to collect undisturbed samples for laboratory analysis.

When you consider the potential for contaminated soils to act as a long-term source of groundwater contamination or an exposure pathway to sensitive receptors, significant effort should be directed towards developing an efficient data collection strategy.

To complete the site characterization, the site's hydrogeology must be understood in order to analyze the distribution and mobility of contaminants within the saturated zone. Pertinent information includes:

- depth to the water-bearing zone
- the rate and direction of groundwater movement
- hydraulic gradient
- thickness of the saturated zone of interest
- lithology of the water-bearing zone
- hydraulic properties of the water-bearing zone
- hydraulic properties of underlying aquitards or aquicludes
- presence or absence of perching zones or significant permeability barriers
- background water quality (pH, temperature, total hardness, iron, calcium, manganese, dissolved oxygen, total dissolved solids)

### Contaminant Phase Distribution and Associated Remediation Technologies

<table>
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<th>Vapor</th>
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<td>air sparging</td>
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<td>biodegradation</td>
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<td>solidification/ stabilization</td>
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- Manmade barriers (foundations) or conduits (utilities/backfill)

**Remedial strategy.** The development and implementation of a successful remedial strategy is directly related to acquiring valid site characterization information pertaining to the nature of the contaminants, mass distribution and volume estimation of each contaminant phase, and an accurate understanding of the geologic and hydrogeologic processes affecting plume mobility. Collecting sufficient data is a prerequisite for establishing realistic clean-up goals and selecting the appropriate remediation technologies.

As illustrated above, identification of the contaminant phase distribution can be incorporated into the framework of the remedial strategy with a greater degree of confidence.

For example, volume estimations may indicate that 80% of the contaminants are adsorbed onto soil particles in the unsaturated zone, 15% is liquid phase product on the water table, and the remaining 5% is dissolved liquid in the groundwater. This distribution would suggest that the primary restoration approach should focus on mobilizing the contaminants in the unsaturated zone via soil vapor extraction (based on the vapor pressure and Henry's constant) or soil washing (based on the Koc and solubility). Implementation of other mutually compatible technologies would emphasize liquid phase removal via product skimming and dissolved phase removal via air sparging or pump and treat techniques. Removing the contaminant mass from the unsaturated zone and as liquid phase product is a relatively short term and cost-effective process that addresses approximately 95% of the mass released. Proper system design using accurate site characterization data will minimize the larger remediation cost of recovering the remaining 5% of dissolved phase contaminants.

In summary, the most cost-effective and technically sound approach to remediating chemical releases is to view the entire process (from characterization to remedial design) as a series of integrated steps. This involves site investigation and characterization strategies that are focused towards collecting data that will enhance the determination and selection of compatible remediation technologies. Such activities have the greatest cost/benefit implication in reducing overall project costs. At the start of your next project, remember to think remediation during the investigation.

David E. Fulton, CPG-8187, is a Senior Project Hydrogeologist for OHM Remediations Services located at 200 Horizon Center, Trenton, New Jersey 08650.
The Role Of The Hydrogeologist In Drainage Divide Wetland Restoration

Donald Brice, CPG-7986

Abstract

Wetland restoration and creation activities have increased in volume and importance due to both economic and environmental factors. While the need to perform these activities is usually not welcomed by developers, they are a necessary part of completing many projects on time within the scope of existing regulations. Hydrogeologists play key roles in evaluating potential mitigation sites, in determining if hydrologic modifications of an area are required, designing those modifications, and monitoring the project to determine the success or failure. In the Midwest United States, many wetlands occur on till plains at or near drainage divides. Evaluating potential wetland restoration or creation sites includes an understanding of the site-specific water budget and geology. Hydrologic modifications of suitable sites should be geared towards retaining the available water on site for the required hydroperiod, minimizing erosion and maintenance, and enhancing long-term stability. Monitoring hydrologic conditions establishes whether or not a project is a success or a failure. Monitoring networks should be kept as simple as possible while still supplying sufficient information for decision making.

Introduction

Wetland restoration and creation activities have increased in volume and importance due to both economic and environmental factors. A wide range of influences contributes to the increase, including political statements guaranteeing no net loss of wetlands, lack of consensus between government agencies in wetland delineation protocols, or an increased awareness of the importance of wetlands to the natural ecosystems of a region. Section 404 of the Water Pollution Control Act of 1972 (Clean Water Act) has been interpreted to include activities affecting wetlands, giving the U.S. Army Corps of Engineers (COE) jurisdiction over those activities.

The bulk of activities which can affect wetlands regulated under the Clean Water Act can be categorized as draining or filling so that the land can be put to some alternate use. Section 404 as interpreted and enforced by the COE requires that parties draining or filling wetlands for an approved purpose replace those wetlands (mitigate the impact of the wetland loss) at some specified ratio determined on a site-specific basis. Regardless of the current status of political or scientific debates concerning problems in wetland definition and delineation (for example, see Lehr, 1991), mitigation activities are an unavoidable requirement for the timely completion of projects which include impacts to wetlands.

Cowardin, et al. (1979) proposed a hierarchical classification system for wetlands based on hydrologic, geomorphologic, chemical, or biological factors. The duration and time of inundation or saturation (hydroperiod) is a critical factor in determining the success or failure of wetland restoration/creation projects. Assessing the factors controlling the hydroperiod and designing techniques to modify those methods are tasks for which the hydrogeologist is uniquely qualified.
Prior to colonization and subsequent deforestation by settlers, much of the glaciated-till plains of the midwest were covered with ponds and marshes. Removal of forest cover, dredging of streams, and installation of artificial drainage systems resulted in the drainage of many of these palustrine-forested wetlands and their subsequent use for agricultural purposes. The change in land use also resulted in changes in water-storage capacity and surface-water runoff patterns. As a consequence of land development, surface-water runoff has become flashier, with higher peak flows, lower mean flows, and quicker response to runoff events (Hartke, et al. 1980).

Present-day development and construction in the midwestern U.S. often results in unavoidable impacts to existing palustrine-forested wetlands. Many of these wetlands occur at or near drainage divides on relatively-flat till plains which are also prime areas for development. Mitigation-in-kind requires that impacts to these wetlands be mitigated by restoration or creation of similar wetlands. Restoration/creation of wetlands in these areas requires that the hydrology be modified to approximate that existing prior to the influx of white settlers.

**Water Budget**

The primary process for evaluating the hydrogeology of potential mitigation sites is the water budget. This is the process of identifying all water sources and sinks for an area, and estimating the volume of water entering or leaving the system through each pathway. The process is simplified somewhat along drainage divides, as precipitation is the only natural water source. As potential mitigation areas incorporate more of a drainage basin, the water budget process is complicated by local ground-water discharge areas and surface-water run-on.

The accuracy and precision of a water budget will vary widely, depending on the level of effort spent in data collection. Site-specific meteorological information, vertical and horizontal hydraulic conductivity data, surface-water runoff data, and evapotranspiration data can be collected. However, this is usually not feasible due to limits imposed by project schedules and budgets.

A less accurate and precise, but usually adequate method of conducting a water budget for an area relies heavily on available sources of information. Meteorological information, especially precipitation and temperature, are available from the National Climatic Data Center in Asheville, North Carolina, from local National Oceanic and Atmospheric Administration (NOAA) facilities, from certain local television and radio stations, and various other local sources.

Meteorological information critical to the long-term success and self-sustainability of a mitigation project includes the average amount and distribution of rainfall, the average temperature and wind conditions preceding and during the portion of the growing season when hydrologic criteria for the proposed type of wetland will be met, and the average amount of sunlight immediately preceding and during this period. These data are used to determine the amount of water available through precipitation, the number of runoff-producing rainfall events, water loss through evaporation, and runoff.

Streamflow data are available from annual U.S. Geological Survey Water Resources Data reports for each state. These data can be used to correlate streamflow and runoff with precipitation, and to compare runoff characteristics between drainage basins of various size with similar surface soils, geology, and land cover.

Hydraulic conductivity data for specific soil types are available through the U.S. Soil Conservation Service. These data can be used to estimate the volume of water expected to be lost to vertical seepage and to identify difference in hydraulic properties between soil types. It should be remembered that the vertical hydraulic conductivity of the rooted portion of the unconsolidated zone is the most important for determining if the required volume of water can be retained. Other soils data, such as changes in texture with depth and the presence or absence of hardpans, are also important factors to consider in site evaluation.

Evapotranspiration data are available for a number of agricultural crop types in U.S. Department of Agriculture publications. Van der
Leeden, et al. (1990) lists evapotranspiration data for some common plant types and average lake evaporation data for a number of cities in the U.S. These data are used to refine evaporation estimates. Jones (1992) discusses direct measurement of and methods to estimate evaporation.

**Hydrologic Modifications**

The primary goal in any attempt to alter the hydroperiod of a potential wetland mitigation site is to retain the water at or near the land surface for the prescribed time period. Water lost to infiltration will be affected by the grain-size distribution of the unconsolidated zone, the vertical hydraulic conductivity, and antecedent moisture conditions. However, in most cases it is not practical to affect changes in grain-size distribution or vertical hydraulic conductivity over a large area, especially where trees will be planted with roots which would soon penetrate any modified horizon. Antecedent moisture conditions depend on climatic conditions immediately preceding the measurement period.

The volume of runoff from a rainfall event can be estimated using U.S. Soil Conservation Service (1986) methods, or can be measured directly. Retention of runoff is the most viable method of achieving required moisture conditions on till plains near drainage divides. This means decreasing the runoff velocity by increasing the travel distance, which in effect reduces the gradient, or by increasing the area through which surface runoff passes (encouraging overland flow in place of channel flow).

Many wetland restoration projects rely on drainage retention structures of various complexity to achieve the desired hydroperiod. All of these structures have some degree of inherent instability. More complex structures require periodic maintenance and repair. Ideally, the use of artificial drainage-control structures should be minimized in order for a wetland to be self-sustaining. Simple, hydraulically stable low, flat berms are preferable to more complicated dams and spillways because they are less expensive to construct, are less intrusive, and, with proper design and placement, should be more stable with time. Berms should be designed to spread out the flow of water in the horizontal direction perpendicular to the direction of flow, which will cause a decrease in velocity and the volume of water passing through a specific area, resulting in a corresponding decrease in the erosive power of the runoff. Berms may also be used in downslope areas to pitate water laterally from one drainage area to another, resulting in an increase in the amount of available water.

Drainage of agricultural fields is often enhanced by the use of drainage ditches or tiles. Plugging these tiles and ditches increases the area through which surface runoff is discharged, resulting in a decrease in velocity and an increase in retention time.

**Monitoring**

The success or failure of a wetland restoration/creation project is established through monitoring. Shallow piezometers and tensiometers are useful tools to monitor wetland hydrology. Design of the monitoring network should take topographic variations; changes in soil type; proximity to known streams, drainage ditches, tiles and berms; and similar criteria into account. Monitoring points should be established at a sufficient number of points to allow a three-dimensional evaluation of shallow hydrologic conditions, especially near the proposed wetland boundaries.

Piezometers should be designed as simply as possible since their only use will probably be water-level measurement. Hydraulic testing and water-quality sampling are usually not required and often impractical for the zones monitored. Commercially available driven well-points are one option for water-level measuring points. Small-diameter rigid poly-vinyl chloride (PVC) pipe with hand-cut slots or manufactured well-screen glued to PVC pipe are a second option. End caps should be used, and the monitored zone should be less than one-foot long. A borehole sealer, such as hydrated bentonite, should be used to seal the annulus above the piezometer opening.

Setting shallow piezometer pairs provides useful information on the vertical hydraulic gradient. The shallow piezometer should monitor immediately below the plow zone and be at or above the invert of any drainage tile. The deep piezometer should monitor a zone a foot or more below the shallow piezometer and below any drainage tile. Upward gradients indicate flow to a shallow high-permeability zone, and often can be traced to unplugged drainage tile. The presence of coarse-grained
lenses within till can also be determined in this fashion. Extremely steep downward gradients may indicate absence of a confining layer. This can be confirmed if the shallow piezometer goes dry soon after a large rainfall. If the shallow piezometer does not go dry, a high downward vertical gradient indicates little hydraulic connection between the upper and lower zones (i.e. very low vertical hydraulic conductivity).

Tensiometers are used to measure the amount of suction exerted by the soil surrounding a porous, water-filled cup. High suction can be correlated to drier conditions, while a suction of zero indicates no movement of water between the cup and the soil, or soil saturation. Capillary saturation can be estimated when tensiometers are used in conjunction with shallow piezometers. If the soil suction is at or near zero, but the water level in the corresponding shallow piezometer is below the level of the porous cup, then the interval is probably saturated with capillary water.

**Conclusion**

Successful wetland restoration/creation requires that defining hydrologic criteria for the intended type of wetland be met. Proper site selection is probably the most important factor in determining the eventual success or failure of a project. The hydrogeologist is uniquely qualified to play an important role in evaluating potential wetland restoration/creation sites. Evaluating water-budget parameters, hydraulic properties of shallow soils, geomorphic changes, and monitoring data are an integral part of the process. Design of the monitoring network requires an understanding of the dynamics of shallow saturated and unsaturated flow. All of these tasks are within the ability and understanding of the qualified hydrogeologist.

**References**


**Donald A. Brice, CPG-7986, Cincinnati, Ohio.**

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**Geological Survey Receives Grant To Study The Leucite Hills Near Rock Springs**

The Wyoming State Geological Survey recently received a $5,000 grant from Union Pacific Resources to examine the Leucite Hills north of Rock Springs, Wyoming, for diamonds. According to W. Dan Hausel, Senior Economic Geologist with the Survey, the Leucite Hills contain some very rare volcanic rocks known as lamproite that are similar to lamprophyrite (lamprophyrite is a rock type that geologists commonly associate with diamond). The present interest in the Leucite Hills stems from the fact that similar lamproites in Western Australia and in Murfreesboro, Arkansas, are diamond-bearing. The Argyle lamproite in Western Australia contains more diamonds per ton than any other host rock in the world.

The State Geological Survey is equipped with one of the only government-owned diamond extraction facilities in North America. The State Survey will process a few tons of olivine lamproite from the Leucite Hills on their grease table (diamonds are grease attractive) for diamonds, and will also collect other heavy minerals for geochemical studies.

At least four companies have acquired mineral rights in the Leucite Hills. Some companies are also exploring to the south near the Utah-Wyoming border where numerous heavy mineral anomalies, possibly associated with diamonds, have been found in ant hills. Hausel said that both Colorado and Wyoming are currently experiencing a diamond rush. Several companies have also acquired land in the Colorado-Wyoming State Line district south of Laramie where more than 100,000 gem and industrial diamonds have been mined since 1979. According to recent articles in the *Denver Post* and *Los Angeles Times*, the optimism is running very high that one or more small-to moderate-sized diamond mines may result from the activity.

Nearly all of the companies have contacted the Wyoming State Geological Survey for information because of their extensive data base on potential diamond deposits in Wyoming and Colorado. This data base has been developed over the past 16 years. According to Hausel, the State Survey has information on geophysical, remote sensing, and heavy mineral anomalies that might be related to diamond deposits. More than 300 heavy mineral anomalies have been discovered by the Wyoming State Geological Survey in the Medicine Bow, and Seminoe mountain areas.
LOUISIANA H 223
AUTHOR: Gunn
SUMMARY: Relates to the tax on the severance of oil; reduces the tax on oil produced from wells incapable of producing more than twenty five barrels per producing day; eliminates the tax on oil produced from wells incapable of producing ten or more barrels per producing day.
STATUS: 04/28/94 INTRODUCED.

LOUISIANA S 31
AUTHOR: Warner
SUMMARY: Relates to severance tax on oil and gas production; provides economic incentives to stimulate exploration and production.
INTRODUCED: 04/25/94
LAST AMEND: 05/04/94

MICHIGAN H 5520
AUTHOR: Wheeler
SUMMARY: Repeals regulation of community planners.
STATUS: 05/20/94

MONTANA 2277
AGENCY: Department of Natural Resources and Conservation/Board of Oil and Gas Conservation
TOPIC: ENERGY -- 7
SUMMARY: Relates to horizontal wells; and enhanced recovery tax incentive; includes certification of horizontal wells; certification of enhanced recovery projects; application contents and requirements, determination of production decline rate, filing fees and definitions.
AGENCY CONTACT: Tom Richmond, Oil and Gas Division, Dept. of Natural Res. and Conservation, 2335 St. Johns Ave., Billings, MT 59102
CITATION: Rules I through VI Horizontal Wells and Enhanced Recovery Tax Incentives.
PROPOSED DATE: 04/14/94
COMMENT DEADLINE: 04/18/94
HEARING DATE: 05/18/94/05/12/94

MONTANA 2276
AGENCY CONTACT: Department of State Lands/Board of Land Commissioners
TOPIC: POLITICS AND GOVERNMENT -- 15
SUMMARY: Relates to the implementation of the Openpit Mining Act; includes applicability, definitions, approval or disapproval of an application for a contract; amendment and revision of contracts, annual progress report, penalties, bond or other security, site information, mining and reclamation plan, landowner's consent to reclamation and additional requirements for bentonite mines.
AGENCY CONTACT: Arthur Clinch, Commissioner of State lands, Department of State Lands, P.O. Box 201601, Helena, MT 59620-1601
PROPOSED DATE: 04/14/94
COMMENT DEADLINE: 05/16/94

NEW JERSEY A 1630
AUTHOR: Ragon
SUMMARY: Provides job training programs for site remediation professionals.
STATUS: 04/25/94 INTRODUCED.

NEW JERSEY 6946
AGENCY: Department of Environmental Protection and Environmental Division of Water Quality
TOPIC: ENVIRON. PROTECTION AND POLLUTION CONTROL -- 6
SUMMARY: Establishes a permitting program for various types of discharges including surface water discharges, sanitary landfills, indirect discharges to public and private wastewater treatment plants, industrial waste management facilities, land application of residuals, and ground water discharges, including underground injection wells, surface impoundments, infiltration percolation lagoons, land application of effluent by overland flow, and land application of effluent by spray irrigation the Department of Environmental Protection and Energy.
AGENCY CONTACT: Janis Hoagland, Esq., Administrative Practice Officer, Department of Environmental Protection and Energy, CN 402, Trenton, NJ 08625
CITATION: NJAC 7:14A Pollutant Discharge Elimination System.
PROPOSED DATE: 09/21/94
F. B. "Ted" Mullin, CPG-1716

Last Monday was D-Day. There are many of you who can remember what that day meant to the world. Just as there are many of you who were not even born at that time. I know that the history books do not do the event justice. I remember my teacher entering the classroom and telling us that the war in Europe was just getting started. I remember saving “tinfoll” and rubber bands, and collecting milkweed pods for life preservers. I lived in New Hampshire and we had a Prisoner of War Camp not too far from where I lived.

The Monday morning paper was full of stories of experiences from survivors of D-Day. I was too young for that one, but not too young for the next. In fact we’ve been in a war of one kind or another continuously since D-Day.

Today in Washington, the Committee is meeting to mark-up and write a new mining law. There are about fifteen laws proposed that will ban the manufacture and sale of handguns, rifles, and shotguns. There is a war brewing over a national healthcare. There are trade problems with the European Community, NAFTA, Japan and China. Other, more serious problems with North and South Korea are tormenting this administration. To top all this good news off—the administration is reorganizing the government and the situation gets worse and worse. The answer is that “times are changing, and these things have to be done”.

On June 10, behind a closed door session, the Interior Appropriations Committee approved a $13.5 billion spending bill for Fiscal 1995. This draft is about $200 million less than the President requested and about $200 million less than Congress allocated for 1994. The Committee also included a moratorium on processing Mineral patent applications in the draft.

The Chairman’s mark for mining law reform also included some wording to allow the oil and gas industry royalty relief. Plop, Plop, Fizz, Fizz!!

And Now, Federal Register Goodies

Vol. 59, No. 84, 5-3-94. Environmental Protection Agency, 40 CFR Part 59, Field Citation Program. Notice of Proposed Rulemaking.

For further information contact: Jane Engert, Stationary Source Compliance Div., Office of Air and Radiation, USEPA, 410 M St., Washington, D.C. 20460.

This sounds like a “pay me now or pay me much more later” program.

Vol. 59, No. 85, 5-4-94, Part II, Pages 23098-23111. Department of Interior, Office of the Secretary, 43 CFR Part 11. Natural Resources Damage Assessments; Proposed Rule. Notice of Proposed Rulemaking. Involves proposed revisions of regulations for assessing damage resulting from oil spills into navigable waters under the CWA, or other materials under CERCLA.

For further information contact: Mary Morton or David Rosenberger at (202) 208-3301.


For further information contact: Frank Bruno (202) 452-0350, or Roger Haskins, (702) 785-6576.

All the latest in regs. for the mining law. They will be particularly valuable for anyone moving to Pahrump, NV.


This amends the regulations governing the information that must be submitted in a permit application concerning premining and postmining land use.

So much for the humor this month!!•
Licensing ("registration") Examinations - Results Show A Disturbing Trend

William V. Knight, CPG-0153

The latest Examination Workshop of the National Association of State Boards of Geology (ASBOG) was held early in May in St. Louis. The purpose of this semi-annual workshop is to review the results of the latest (April, in this case) examinations given by those states which are using the national examination being developed by ASBOG. In April it was given in Arizona, South Carolina and Wyoming.

The reviewing panel consists of professional geologists from the member states of ASBOG, along with representatives of those geological societies who have elected to become affiliated with ASBOG in an advisory or monitoring capacity. Of the geologists participating in this review session, seventy percent are AIPG Members, officially representing various constituencies, including state boards and organizations such as AIPG, Association of Engineering Geologists (AEG), and Association of Ground Water Scientists and Engineers (AGWSE). Unofficially, the mining and petroleum geologists were also represented by members of their fields of practice.

The eighty questions ("items") on the "Principles and Practice" examination are divided into thirteen "domains": Research, Field Methods and Communications; Mineralogy; Petrography/Petrology; Geochemistry; Stratigraphy/Historical Geology; Structural Geology; Paleontology; Geomorphology; Geophysics; Hydrogeology; Engineering Geology; Mining Geology; and Petroleum Geology. Each of the thirteen "domains" is weighted, from a minimum of 2% to a maximum of 15%, to reach a total of 100%. The last five of the "domains" represent 40% of the total weighting. The "Fundamentals" examination has one hundred questions ("items"), from the same "domains", similarly weighted and totalling 100%, with the last five representing 27%.

The group of reviewers is divided into two teams of equal size. One reviews the examination for Fundamentals, while the other reviews that for Principles and Practices. The procedure is for each participant to review each of the examination questions ("items") that had not been reviewed in a previous workshop.

As the participants (reviewers) are answering the "items", thus, in effect, taking the examination, they rate each "item" by asking themselves the following questions: (1) Is there only one correct or best answer? (2) Is it related to the practice of geology? (3) Does it relate to protection of the public? (4) Is the language clear? (5) Is it written at the appropriate level of difficulty? (6) Does the stem (all questions are multiple choice) adequately describe a plausible problem or situation? (7) Is it free of "trickery"? and (8) Does it avoid assessing "trivia"?

Along with this, each reviewer estimates, "item" by "item", what percentage of the examinees should be expected to answer each "item" correctly. Having done this, the reviewers compare their estimates, discuss their differences, the nature of the "items", etc., the actual results among the examinees who sat for the examination, and decide by consensus whether or not to recommend to the examinee's State Board whether the "item" should be counted. When it seems advisable, "items" are restructured or reworded for the next time they are used. All in all, it is a rather lengthy and intense operation. But, there is a very conscientious effort to see that the examination is a fair and reasonable assessment of the examinee's knowledge of geology.

As with all examinations, especially multiple choice, the "test-wise" examinee has an advantage. This seems unavoidable, but in wording the "items", efforts are made to minimize this as much as possible.

As noted, not all of the State Boards are using this examination yet. But, it seems to be in the process of adoption by several more for the October 21 offering. So, its use is expected to spread. The best advice I can offer one preparing for the examinations is to reread your first-year geology texts and to have a fairly good working knowledge of the last five "domains". According to the weighting, practicing Engineering Geologists and Hydrogeologists should have the advantage. This is because relatively more of the work they do is perceived to be related to public protection.

The disturbing trend implied in the subtitle of this column is the "pass rate". Geologists now have a history of approximately 25 years of "licensing" examinations. The accompanying graphs show the experience of one state. Discussions at the ASBOG meetings indicate that the trends shown in these graphs are typical of most, if not all, of the licensing/certifying states. The large number of petroleum geologists being displaced to other fields has been offered as the primary explanation for the large number of examinees in the years since the mid-eighties. This seems to have peaked in 1991. This is not implied as a reflection on these geologists' professional capabilities. Many of these geologists may have been "too long out of school" and not as accustomed as they once were to taking examinations. On the other hand, the results during this period do not show any particularly anomalous pattern. The trend has been falling on
a fairly straight line since the outset, with periodic ups and downs. In fact, it is smoothing a bit.

The Screening Committees of AIPG have noticed a somewhat parallel trend in recent years. They are seeing an increasing number of applicants whose training and experience are much narrower than in past years. Too many are not really geologists in the classical sense of having studied and practiced enough in the "core" subjects of geology. They have tended to specialize too early in their educational and professional careers. The result is that, increasingly, we see "geotech" posing as "geologists", and honestly (because they know not otherwise) expecting to be considered professional geologists. The proliferation of "environmental science" curricula, which have been described as "a mile wide and an inch deep" is leading to a generation of "scientists" who are insufficiently educated to professionally qualify in any one field. Add to this the tendency of some firms to be unidimensional. We saw this phenomenon in the oil industry during the recent "boom", though to a significantly lesser degree. Then, when the bottom fell out, the narrowly trained and experienced people had nowhere to go.

AIPG stresses the importance of a strong education and body of experience in the fundamental "core" subjects of the science. We discourage early specialization, i.e., "tracking" into a field of practice.

In order to truly practice geology with competence, integrity, and ethics, one must be well founded in the fundamentals. Else, one cannot really understand many of the geologic implications of the problem at hand. A person may appear to be an excellent site-specific geologist, but actually be completely lost when asked to explain how the site relates to the geology of the region and the significance of this relationship, both for the site and for the region. The fact that, increasingly, many of the applicants and examinees are not well founded is reflected in the examination results and in the rejection rate by AIPG. This is the disturbing trend.
Wanted - Political Partners

Lynn Graf, AIPG Legislative Affairs Advisor

One of the main charges to AIPG is to maintain an effective government relations program. The AIPG Policy on Advocacy listed in the membership directory states that the "Institute has a responsibility to its Members to adopt positions of advocacy on public issues involving the geological sciences or their application to public issues. Such advocacy will be based solely on the merit of each issue and the needs of the public."

This is a challenge because natural resource and environmental issues face stiff competition for public interest from issues of gang violence, health care reform and huge budget deficits. However, there are critical areas where AIPG Members can make a difference.

It is important to remind the government that working with geologists, especially AIPG Members, is good government business. Through AIPG Members, politicians learn to involve geologists in efforts to build a state's economy and tax base with effective resource management and development. They also discover that this partnership makes sense when formulating policy decisions about natural resource and environmental issues.

AIPG is generally the only professional group that represents the geological community in the legislature and other state government departments. This position will continue to make the Sections' involvement in a government relations advocacy program critical to the future of geologists living in the United States.

AIPG runs a campaign of advocacy for geologists in parallel with candidate and issue campaigns. Politicians are also learning that geologists, their friends and colleagues are an informed constituency worthy of attention.

Traditionally, the most effective advocacy groups have a strong "grass roots" organization that is ready to provide information and other assistance to all levels of the government process. This and future articles will offer suggestions to AIPG state sections to develop ground level political impact and positions of advocacy on geologic issues.

Role In Elections

Associations like AIPG are sought by campaign groups to endorse candidates or ballot issues because they represent an organized group of educated professionals who can help solicit support. Members of AIPG Sections are already successfully participating in campaigns for state elections.

Politically involved Members also have personal skills important to successful campaigns, including knowledge of good organization principles, objective points of view, common sense, and bottom line oriented results. They recognize that their activities are important to the future of employment for their profession.

Each AIPG section is responsible for its own positions on issues and candidates, provided they do not conflict with AIPG National's positions. Sections rarely give public support to individual candidates, but often do so by inference when they publicize issues and encourage candidates to support and endorse these positions in campaigns.

All positions on issues and, if appropriate, candidates must be approved by the Section's Executive Committee after reasonable polling of its Members before any written or oral statements are given outside AIPG membership.

AIPG Evaluation

The first step in analyzing the Section's position on any campaign is to gather as much information on issues and candidates as possible, especially the issues' impact on the geologic profession, e.g., employment of geologists. The second step is to research the campaign itself.

Resources for this information can be the state's election commission, lobbyists and other political activists, the League of Women Voters, the Republican or Democratic parties, chambers of commerce, and public libraries, as well as sources within the profession and industries in which geologists are employed.

A successful campaign will have certain ingredients that provide for a strong position when recruiting support. Important organizational components for any campaign include written policy statements, advance planning, adequate funds to campaign, good public relations, competent staff, volunteer planning and workers, a positive climate, and on-going evaluations to indicate needed changes in direction.

Following the example of parallel campaigns discussed in the introduction of this article, both the Section's and the candidate's campaigns will need to show each other that they can efficiently handle important local problems, build a strong foundation for the future, attract a representative group of supporters, foster name recognition and command the backing of leaders from every level of the community. This means that AIPG will need to show that employment for geologists will do all of the things listed in the previous sentence. Candidates and advocates of issues would provide the same information to AIPG about why Members should vote for them or their issue.

AIPG Commitment

The Executive Committee can choose one of three basic paths when making decisions about Committee involvement in political issues: (1) It can support or oppose the issue/candidate either publicly or in the background, publish positions statements and provide resources to support its position. (2) It can take a position of neutrality and only provide available information to Members if they request it. (3) The Committee can decide that it lacks the resources to have any involvement.

If the Section Executive Committee decides to provide direct involvement or Member support on a specific campaign, the next step is to develop a plan of action, including measurable objectives, corresponding budget, and identification of available AIPG Members who will be responsible for carrying out the Executive Committee's decision.
The Section's involvement in a campaign can include direct financial assistance (check your state's lobbying laws first), position papers, letters of support and Members as speakers.

Recruiting Votes
If AIPG and/or its Members are involved in recruiting volunteers, soliciting money or asking for votes, a personal contribution should always be made first to demonstrate a commitment before asking others.

It is important to understand that people join political campaigns because there are rewards and issues that affect them personally. These can include a desire to make a contribution to society or a wish to impact issues that impact their profession and career.

When Members participate, they need to listen, draw people out, and clarify their concerns when talking to people about AIPG's positions. A personal approach that is targeted at groups supportive of the issue is generally most effective. State that it is both an AIPG position and/or an individual member belief in support of the issue or candidate.

Always follow up faithfully with a supporter or contact. Send a personal thank you if a voter gave a gift at your request. Read background materials on issues and candidates carefully. Know all of the facts; if you don’t know, say you will find out. If you make a mistake admit it and move on.

Geologist Networks
A Section can organize its Members and those of other groups with similar interests in the state into a group that is available to assist with campaign activities. This network can be used in many ways during any campaign including informal receptions to raise contributions, a grass roots advocacy group at county or state fairs, and a source of support letters. Legislatore running for office will generally welcome AIPG Members as campaign resources and valuable participants. When Members volunteer for a candidate it is helpful if the Member is a registered voter in the candidate's district.

Members should make sure the candidate is aware of their involvement not only in the campaign but in AIPG as well. This helps to establish credibility with candidates so they know if they can rely on your word and professionalism after they are elected and in the position of making policy decisions. Candidate's awareness and appreciation for AIPG's position and credibility is critical when negotiating on policy issues after the election is over.

Other professional, industry, and issue coalitions are important to political campaigns because they also have valuable networks. Let the campaign staff know of other groups that would like to hear presentations on the issue or candidate.

Media And Community Relations
The media is an integral player in political campaigns and will have a major impact on how the public views a candidate or issue. Thus, AIPG committees and Members need to be aware of certain basic principles of community relations when working on campaigns, especially if they are asked to provide information or speak at public gatherings.

It is important to make sure that there is not just media coverage, but a proactive plan to effectively use all types of community relations. The Section's Executive Committee should appoint one person or committee, on an issue-by-issue basis, that represents the Section in political, media and community contacts. This discourages other Members and staff from talking "off the cuff" to curious reporters and provides consistency in all messages given to the public. Everything that is shared with a reporter must be considered suitable for publication; nothing should be off the record.

Put all press releases and other communication in the proper format that includes the five w's: who, what, when, where, and why. A plan of action to handle crisis situations as they arise will be necessary because various crises are inevitable during the normal course of any campaign. The section should strive to include AIPG and its areas of interest in media coverage of candidates and issues.

Media coverage is appropriate for political rallies and other public events, press conferences, feature stories, interviews/talk shows, letters to the editor, meetings the editorial boards, and special announcement programs that offer free bulletin boards.

Other Volunteer Involvement
Individual members and family and friends can participate in several campaign projects including research, stuffing envelopes, manning telephone banks, attending political rallies, planning activities, bookkeeping, arranging speaking engagements, and other activities mentioned in this article.

Be aware that many campaigns are temporary in nature, quickly formed, not always well organized, and very confusing at times. Some of this is due to the fast-paced activities inherent in all campaigns. The ability to respond quickly with good problem solving skills is critical.

A candidate's and section's best interest are always served by volunteers that practice ethics and integrity as contained in the AIPG mission statement.

It is important to be sure that the good candidates stay in office and the others find a worthy opponent. If there is no one acceptable in the race, it is appropriate that AIPG members help to find someone suitable. Strive to provide an opponent for all unacceptable candidates.

The bottom line is that geologists have a role to play in the upcoming elections. The potential benefits are mutual for both the candidates and geologists. Some of the contacts made during the campaign process could result in successful, on-going relationships between geologists and legislators on policy issues dealing with employment and other industry concerns. Successful campaigns need votes and they appreciate all the help they can get.

Please call the national office at the phone number in the front of this magazine if you have any questions or would like additional information.

Lynn Graf is a government relations consultant with over 20 years of experience in community and government relations. She has served as lobbyist for the AIPG Colorado Section since 1990 and worked on a variety of issues including oil and gas, mining, geologic hazards, water, financial planning, water/mineral appraisals, land use planning, economic development, and professional licensing/registration.
AIPG MEMBERSHIP BENEFITS

Certification
AIPG certifies the qualifications of professional geologists prior to admitting them into membership. By means of a rigorous and thorough peer review process, the Institute investigates applicants who voluntarily apply for self-regulation through the Institute. This screening carefully evaluates their education, experience, technical competence, and ethical conduct. If they meet AIPG's high standards, applicants are granted Certification and the title of "Certified Professional Geologist" (CPG). When the letters CPG follow an individual's name, they proclaim to the public that this person has met the standards and subscribes to the Institute's Code of Ethics and By-laws.

Representation
Members are represented by qualified geological professionals. Congress, Legislatures, and Federal and State agencies are lobbied on specific mining, petroleum, water, environmental and other issues of special interest to geologists.

A portion of AIPG's monthly magazine The Professional Geologist (TPG) is devoted to reporting developments at all government levels. Thirty-six sections of AIPG provide group representation on a state or regional level and offer opportunities to meet, work and exchange ideas and information with colleagues.

Education
At the national and section level, AIPG provides materials designed to enhance the professional knowledge and skills of its members. Educational opportunities range from seminars and short courses to sectional and national meetings. To encourage high standards of educational programs, the Institute recently established a program of Accreditation of Continuing Education opportunities offered by other organizations.

The Institute prepares and distributes comprehensive publications giving background and scientific explanations on geologically-related matters of public concern. Topics include: ground water, radioactive waste, and hazardous waste.


Insurance
Professional liability, health, and life insurance are available to members.

Information
AIPG disseminates information to its members and to the public in a number of ways on a wide variety of topics. The Institute publishes a monthly magazine The Professional Geologist (TPG). It is mailed to members and interested individuals, businesses, and political leaders. Subscriptions are available to non-members.

A comprehensive Membership Directory is published annually. Copies are sent to federal, state, regional and local governments, libraries, consulting firms, corporations, and other potential users of geologic services throughout the United States and abroad. The Directory may also be purchased by non-members.

REQUEST FOR APPLICATION AND ADDITIONAL INFORMATION

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Arvada, CO 80003-2125
(303) 431-0831 • FAX (303) 431-1332

Please send me information on:

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Jul. 27-29. Introduction to Mine and Quarry Valuation Workshop, Chicago, IL. Contact: AAO, 130 E. Randolph St., Ste. 850, Chicago, IL 60601, Ph.: (312) 819-6100.

Aug. 2-4. Ground Control in Mining, Lakeview Resort & Conference Center, Morgantown, WV. Contact: Dr. S. Peng, Dept. Mining Eng., College of Mineral & Energy Res., West Virginia University, P.O. Box 6070, Morgantown, WV 26505, Fax: (304) 293-5708.


Aug. 21-24. AAPG International Conference/Exhibition, Kuala Lumpur, Malaysia. Contact: AAPG Convention Dept., P.O. Box 879, Tulsa, OK 74101, Ph.: (918) 584-2555.


Aug. 29 - Sep. 1. Third International Conference on Environmental Issues and Waste Management in Energy and Mineral Production, Perth, Western Australia. Contact: Co-Ordinated Functions Pty Ltd., P.O. Box 1305, West Perth, WA 6872 Australia, Ph.: (+61) 342 2555.


Oct. 3-5. 1994 Focus Conference on Eastern Regional Ground Water Issues, Burlington, VT. Contact: National Ground Water Association, P.O. Box 182039, Dept. #017, Columbus, OH 43218-2039, Ph.: (614) 551-7379.


Oct. 5-7. ISO 9000 ...Moving Industrial Minerals Into The 21st Century, Nashville, TN. Meetings Dept., SME, P.O. Box 625002, Littleton, CO 80162-5002, Ph.: (303) 873-9550.

Oct. 11-13. 8th Annual Regional Environmental Business & Management Conference & Expo Beyond 2000: Organizing for Environmental Compliance, Denver, CO. Contact: Environmental Resource Specialists, P.O. Box 440112, Aurora, CO 80044, Ph.: (303) 690-4245.


Nov. 1-4. Covers and Liners for Landfills, Mobile, AL. Contact: Dan Thompson, The University of AL, Box 870388, Tuscaloosa, AL 35487, Ph.: (205) 348-9327.

Nov. 2-4. Petroleum Hydrocarbons and Organic Chemicals in Ground Water: Protection, Detection, and Remediation, Houston, TX. Contact: National Ground Water Association, P.O. Box 182039, Dept. #017, Columbus, OH 43218-2039, Ph.: (614) 551-7379.


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Mar. 28-29. The Arnes Structure and Similar Features, Norman, OK. Call for papers. Submission deadline is September 1, 1994. Contact: Kenneth Johnson, OK Geological Survey, 100 E. Boyd St., Rm N-131, Norman, OK 73019, Ph.: (405) 325-3031.

May 2-5. International Trade Fair and Congress for the Geosciences and Geotechnology, Cologne, Germany. The correspondence address: Alfred-Wegener-Stiftung, Wissenschaftszentrum, Ahrstrasse 45, D-53175 Bonn.


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1994 AIPG Annual Meeting
Flagstaff, Arizona - October 12-15

Cliff of Permian Kaibab Formation, South Rim of Grand Canyon.
Photograph by Larry D. Fellows, CPG-4447

Field Trips

Flagstaff, Arizona was chosen as the site for the 1994 Annual AIPG Meeting because it has excellent facilities and because it is near the Grand Canyon and other spectacular geologic features. Attendees can, therefore, enjoy some of Arizona’s very best geology and scenery, in addition to participating in the technical, professional, and spousal activities. Three all-day field trips are being offered: (1) Grand Canyon -- South Rim; (2) Meteor Crater, Painted Desert, and Petrified Forest; and (3) Oak Creek Canyon, Sedona, Verde River Valley, and Jerome.

Each trip leader is fully familiar with the local geology, geography, and history. The leaders will also provide non-technical information that will be of interest to non-geologist spouses. There will be many photo opportunities.

If you are planning to attend the meeting and are interested in going on a field trip, please complete and return the form below, if you have not already responded.

Field Trip Interest
Name_________________________ AIPG #__________________
Company_________________________________________
Address__________________________________________
City_________________________ State,_____ ZIP___________
Country__________________________________________
Phone_________________________ FAX________________

Trips I would attend:
1. Grand Canyon - South Rim Pre (Oct. 12)___
       Post (Oct. 15)____
2. Oak Creek, Sedona, Verde River Valley, and Jerome Pre (Oct. 12)___
       Post (Oct. 15)____
3. Meteor Crater, Painted Desert, and Petrified Forest Post (Oct. 15)____

Please return this form to: Erick F. Weiland, 5531 East Kelso Street, Tucson, AZ 85712 (602) 296-5940 • FAX (602) 721-7431.