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.

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Mining Geology  January
Petroleum Geology  March
Hydrogeology  July
Environmental Geology  September
Engineering Geology  November

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For many years we have been selling our Issues and Answers Series for $3.00 each and our monographs and booklets for $2.00 each to members. However, both printing and mailing costs have risen dramatically over the past few years, necessitating a revision in our price schedule. Effective October 15, we will be doubling both member and non-member prices for these items.

Charles Wm. Dimmick

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Mail has been returned from the following members:

Douglas W. Charlton
Converse Environmental West
55 Hawthorne St., #500
San Francisco, CA 94105

Thomas R. Eschner
P.O. Box 7131
Portland, ME 04112

Emil J. Maciass, Jr.
3775 Partridge Lane
Baton Rouge, LA 70809

John D. Morton
Box 225, Georgetown
Ontario, CANADA M7G 1J5

Donald P. Shanahan
410 Arteaga #E
Oaxaca MEXICO

AIPG Membership Totals

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September, 1993
Volume 30, Number 10

The Professional GEOLOGIST

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Joseph D. Martinez, CPG-2050

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SPECIAL REPORT

Environmental Geology

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Benefits and Hazards Of Salt Dome Utilization

Joseph D. Martinez, CPG-2050

Benefits

The more than 500 salt domes in the U.S. Gulf Coast represent an enormous resource base both for the region and the nation. The existence of salt domes in the U.S. was unknown prior to the 1860s, although salt had been mined in Europe for over 1000 years. Rock salt was discovered in 1862 on Avery Island, Louisiana. This was followed by the development of room and pillar mining on that salt dome in 1867. A large commercial deposit of sulphur was discovered on a salt dome in southeast Louisiana in 1867 and was first successfully produced in 1894. Its commercial production was stimulated by the discovery in 1901 of oil on the Spindletop dome which provided the cheap energy to fuel the Frasch process (Hawkins and Jirik, 1966). Thus in a relatively short period, three major resource developments associated with salt domes were begun.

Existing and potential modes of salt dome utilization are diagrammed on Figure 1 from Martinez and Thoms (1978). Room and pillar mining of rock salt is one of the modes of salt dome use. In 1966 six salt domes in Louisiana and two in Texas were being mined by this method. Three of those mines in Louisiana domes are no longer in operation. Two were flooded accidentally and one intentionally. Salt is also extracted from salt domes by solution mining. By 1975 brine was produced in this manner from 29 salt domes in Alabama, Louisiana, and Texas.

Solution-mined cavities in salt domes also provide very useful and valuable storage for a variety of liquid and gaseous hydrocarbons. Liquified petroleum gas (LPG) was
first stored in a Louisiana dome in 1951. By 1975 there were LPG storage operations in 24 salt domes in Louisiana, Texas, and Mississippi. Product types that have been stored include propane, butane, ethane, ethylene, natural gas; and crude oil. By 1975 sixty-four percent of the total U.S. underground storage capacity was in salt domes in these three states.

Figure 2 from Hawkins and Jirik, 1966, shows the principle of operation of such a storage operation. Approximately seven barrels of fresh water are required to dissolve one barrel of space in salt. In the operation of such a storage facility brine is used to displace stored products, which are maintained in the cavity in liquified form (except for natural gas). This requires establishment of large ponds at the surface to store sufficient brine after the cavern is developed.

The Congress of the United States mandated in 1975 the creation of the Strategic Petroleum Reserve (SPR). The original objective was to develop a storage capacity of one billion barrels of crude oil, the current goal is to store 750 million barrels. On April 29, 1993 there were 581.5 million barrels of oil stored in five salt domes in Louisiana and Texas.

In the assessment of means for isolation of high level nuclear waste, it was recognized at an early date that salt deposits were particularly suitable. This was because of the impermeability, thermal conductivity, and plasticity in response to long term stress of salt. The evaluation of the utility of salt domes for this purpose began in the mid 1970’s. Largely because of public perception and political considerations this effort was abandoned in the 1980’s. It may be revived in the distant future.
A relatively new use of salt dome caverns is for compressed air storage to provide peaking power to smooth out secular variations in the demand for electrical energy. A schematic diagram that compares the compressed air energy storage system with a conventional gas turbine used for peaking power is shown in Figure 3 (Lang, 1977). This concept was eventually implemented with the construction at Huntorf in the Federal Republic of Germany of a 290-megawatt gas turbine air storage peaking plant that uses two solution-mined caverns, with a total capacity of about 10 million cubic feet, for air storage (Mattick et al., 1975). This plant became operational in late 1978 (Allen et al., 1982).

A similar plant has been constructed at the McIntosh salt dome in Alabama.

Hazards

The positive benefits derived from salt dome utilization is not without adverse effects. After sulphur was found in its pure form in the caprock of a salt dome near Lake Charles, Louisiana, its importance was recognized by Hilgard, a Louisiana geologist. Several attempts were made to mine this deposit by drilling a shaft to the caprock which contained the sulphur. In the final fruitless attempt in 1890, a tragedy occurred in which 5 men were asphyxiated by hydrogen sulphide, (Haynes, 1959). This dome, now called Sulphur Mines, became the site of the first successful salt dome sulphur mine using the Frasch process. The removal of sulphur typically results in surficial collapse. Approximately 30 domes have been mined by the Frasch process in the Gulf Coast; and subsidence is generally an associated feature.

A much larger collapse occurred on the Bayou Choctaw dome in Louisiana in 1954 in the course of brine production. The failure to prevent leaching upward by proper isolation with an oil pad was the cause of this collapse, with resulted in formation of a deep crater about 800 feet in diameter (See Martinez, 1971, and Magorian, 1980).

A calamity occurred on the coast of Louisiana on March of 1968 when a shaft fire occurred in the Belle Isle Salt Mine. Twenty-one miners died in that event. Other grave incidents happened later here. In 1973 there was a shaft collapse at this mine in which the head frame tumbled into the crater and debris poured into the mine, which was at a depth of about 1300 ft. This was caused by a water leak in the shaft.

It is very important in salt mining to consider the mechanical and other properties of the salt as it exists in the mine. The developed openings are huge. Typical rooms at one modern mine are on the order of 100 ft. wide by 100 ft. high by thousands of feet long (Voigt, 1988). Because salt
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tends to creep under confining pressure, it moves slowly toward these openings, producing brittle failure in the zone next to the opening. Large cracks and major rock falls can result. Therefore, blocks of salt that tend to fall from the ceilings and room corners must be regularly removed by a process called scaling. Even so, accidents have resulted.

Although the salt is remarkably pure, there are linear elements called anomalous zones by Kupfer (1980). Water leaks and blowouts (outbursts) are associated with these zones. Attention was directed to these latter features by Thomas and Martinez (1980). These blowouts are almost always associated with blasting, which causes an unravelling of loose salt from a generally vertical chimney. Molinda (1988) described these as a "conical spiral that almost always propagates up into the roof and rib", and states that they vary from one to more than 100 feet in diameter. Their height is as much as 280 feet or possibly higher. Molinda believes that they are at least partly methane-driven. This poses a serious hazard.

Figure 4 Periphery of gas-affected area from a blowout in 1979 in the Belle Isle salt mine in south Louisiana. From a report by the U.S. Mine Safety and Health Administration.

Such an outburst occurred in the Belle Isle Mine on June 8, 1979. Five miners were killed in an explosion that occurred ten minutes after the time of the outburst. Figure 4 from a U.S. Mine Safety and Health Administration (MSHA) report (Plimpton et al., 1977) illustrates the extent of this gas release. Personnel are no longer permitted in salt dome mines when blasting is done. The Belle Isle mine was finally abandoned by deliberate flooding in February, 1984.

The first Gulf Coast salt mine to have been accidently flooded and lost was in the Winnfield dome in North Louisiana. A much more dramatic incident of this sort was the Jefferson Island mine inundation of November 20, 1980. An oil well which had a target of flank production on the Jefferson Island dome inadvertently drilled into the salt above the -1300’ level and into or possibly not far above the ceiling. An inflow of water into the mine occurred which drained a shallow overlying body of water, connected to the Gulf of Mexico by a canal, as well as water though the canal from the Gulf itself. The lake was drained and a large crater was formed (Figure 5 from Martinez et al. 1981). A tugboat, barges, and two oil rigs were carried down into this crater.* The August 13, 1981 report on the Jefferson Island Mine inundation by MSHA (Nichols et al., 1981) mentioned three possible causes that had been proposed:

1. That continual mining activities resulted in a weakened structure that developed into a catastrophic failure.
2. That the drill rig itself was the triggering action for the sudden failure.
3. That the drilling operation either penetrated or came near the mine in an area of structural weakness.

MSHA concluded that it was not possible to determine the exact cause of the inundation. Fortunately, there was no loss of life, due to a well-planned and executed evacuation.

Underground storage operations in salt domes have also caused loss of life, property, and financial resources. The weak link in the system of cavern storage is constituted by the casing and tubing shown in Figure 2. If the tubing should break above the brine-product interface, the product would be forced under very high pressure into the brine storage pond where it might be ignited, explode and burn. One such incident occurred at an underground storage facility in the Sorrento dome a short distance from Baton Rouge, Louisiana. This resulted in the death of one person.

The casing of cavern storage wells is also subject to corrosion, particularly where it penetrates a porous caprock. This kind of accident happened at the Barber's Hill Salt dome, over which is situated the Town of Mont Belvieu, Texas, about 20 miles east of Houston. This salt dome contains the world's largest salt-cavern hydrocarbon storage operation. Nine companies were reported by Seni and others (1984) to have stored almost 160 million barrels of light hydrocarbons in 137 caverns in that dome.

*On a personal note, a colleague of mine, Dr. R. L. Thomas, and two of his students were in the mine along with 48 miners at the time of the flooding. After their safe evacuation, we flew over the area and photographed the latter phase of this remarkable event. Figure 5 was one of many of these photographs. We were able to see a large waterfall caused by the reversed flow from the Gulf into this crater along with large barges caught up in a great whirlpool in the bottom.
In late August or early September of 1980 there was a gas leak from a hole in the casing of one of these storage wells that resulted from corrosion. This release was at a depth of about 575 feet, and allowed gas to enter the porous and permeable caprock and a home in Mont Belvieu, burning an occupant. This leak resulted in the loss of about 500,000 barrels of ethylene and propane mix which formed a plume in the ground water at a depth of 20 feet and reached a distance of 2700 feet from the well. Figure 6 from Hubble and Pereira (1988) shows the modern casing program designed to prevent this problem. However, it was not effective in the Mont Belvieu incident.

There has been a history of other accidents on this dome. Because of this the town has been largely deserted by buyouts by the various operators.

Lessons to be learned from this partial litany of accidents are that great care must be taken in the design, construction, and operation of structures built in salt domes. There is still much to be learned about the properties and characteristics of these domes and their utilization. Exchange of information between operators and independent investigators is most desirable; and proper regulation by governmental agencies, state and federal, is essential. Finally, it is very important for proper and adequate communication to be maintained between multiple operators on the salt dome.

References


U.S. Department of Labor, Mine Safety and Health Administration, H. G. Plimpton et al., 1979, Final report of mine explosion disaster, Belle Isle mine Cargill, Franklin, St. Mary Parish, Louisiana, June 8, 1979, 156p.


Geologic Skills Used In The Site Characterization Of Environmental/Hazardous Waste Projects

Robert J. Melvin, CPG-8686

With a steady decline of positions in the oil and gas profession, more geologists seek an alternative to an uncertain future. Many are turning to the environmental industry. The purpose of this article is to briefly describe the nature of the work that is performed in an environmental investigation, illustrating how skills are transferable between geologic disciplines. This article outlines the general steps in characterizing a site with an emphasis towards geology and hydrogeology. These steps are illustrated in Figure 1. The steps outlined below are in no way the only steps to be considered; nor do all of the steps apply to all environmental investigations. Geologic conditions and the type of contamination vary between sites. Therefore, the steps of an investigation, and the methodologies that are followed, need to be adjusted to sitespecific and contaminant-specific conditions.

Background Information Search:
As with any type of investigation, a background search of existing information is crucial. This information helps to determine the steps that need to be carried out to characterize the site and to determine if any gaps in the data exist. The search includes the review of any previous site-specific investigative reports (such as Preliminary Assessments), areal and regional geology reports, an assessment of the suspected contaminants to determine appropriate methodologies for analysis and, if needed, research of areas with similar geologic features or conditions. Important informational sources that are often overlooked include the U.S. Geological Survey, state geological agencies, water resource departments and graduate theses.

Soil Gas Survey: If Volatile Organic Compounds (VOCs) are known to occur on site or are suspected, plan to conduct a soil gas survey. VOCs include benzene, toluene, trichloroethylene and xylene, to name a few. These chemicals are generally associated with petroleum hydrocarbons and solvents, the two most common forms of contaminants encountered. If the water table is shallow, (less than 2 feet), a common approach is to place a series of passive collectors over a surveyed grid. This method consists of placing a specially treated charcoal-coated tip wire mounted on cork several inches below ground surface and then covering the passive collector with a decontaminated glass.
The collectors are then allowed to set for 24 hours.

The most common soil gas survey method applicable for where the water table is in excess of four feet is to drill or push a small-diameter probe into the soil. This miniature gas-sampling well is purged prior to sampling. A vacuum draws a quantity of soil gas for immediate analysis with a mobile laboratory or field gas chromatograph (GC).

A third less common approach consists of a multileveled or tiered well. This type of gas well requires a drill rig for installation. The purpose is to sample specific layers or depths for contaminants. This type of well is commonly used at landfills or in areas where depth to groundwater is in excess of hundreds of feet.

**Surface/Subsurface Geophysics:** A wide variety of methods exist to examine and assess a site with the use of geophysical instruments. Most of these instruments had their start in the exploration of natural resources but have now been adapted for environmental investigations. One principal difference is the depth being investigated; for environmental projects the depth is shallow compared to typical exploration projects. The method or methods typically used are dependent upon the purpose of the investigation. These methods are outlined in Table 1.

**Surface Soil Investigation:** To delineate possible spill areas and to define suspect areas, surface soil samples are collected. The samples are usually collected with stainless steel sampling tools that are decontaminated between sampling locations. The depth of these samples varies from less than an inch down to about six inches. In addition to defining areas of contamination, the soil investigation obtains background information to support the Risk Assessment. This assessment evaluates the risk to people and animals who could come in contact with this site.

**Surface Water Investigation:** To assess the extent of surface contaminant runoff from the site, samples are collected from nearby bodies of water (i.e. streams, ponds). Samples are collected upgradient as well as

**TABLE 1 COMMON SURFACE/SUBSURFACE GEOPHYSICAL METHODS**

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<thead>
<tr>
<th>SURVEY METHOD</th>
<th>APPLICATIONS</th>
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<tr>
<td>Magnetic</td>
<td>Locate buried metallic objects and utilities, map buried channels and depth to bedrock if magnetic minerals are present and locate faults and fractures.</td>
</tr>
<tr>
<td>Electromagnetic (EM)</td>
<td>Locate contaminant plumes, boundaries of landfills, buried metallic objects or utilities and locate fractures and faults.</td>
</tr>
<tr>
<td>Electrical Resistivity</td>
<td>Locate contaminant plumes, the water table and locate fractures and faults.</td>
</tr>
<tr>
<td>Gravity</td>
<td>Determine overburden thickness, map bedrock topography and locate fractures and faults.</td>
</tr>
<tr>
<td>Seismic (Reflection and Refraction)</td>
<td>Determine overburden thickness, locate the water table, lithologic boundaries, fractures and faults.</td>
</tr>
<tr>
<td>Ground Penetrating Radar (GPR)</td>
<td>Locate buried objects whether metallic or structures or boundaries of landfills and can assist in locating contaminant plumes, fractures, faults and karst topography.</td>
</tr>
</tbody>
</table>

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downgradient to assess potential source areas of contamination, other than the site under investigation. The data collected during this phase of the investigation are also applied to the Risk Assessment for evaluation.

**Subsurface Soil Investigation:** The purpose of this phase of the investigation is to visually examine the subsurface (i.e., stratigraphy, lithology, depth to water) and to collect samples for physical and chemical analyses. This information is necessary to determine the horizontal and vertical extent of contamination, the rate of transport of contamination, and to examine the possible interaction of the contaminants with the underlying sediment. The placement of the soil borings or test pits (less expensive than monitoring wells) are decided from the information obtained prior to this phase of the investigation. If no information is available, the Resource Conservation and Recovery Act (RCRA) Technical Enforcement Guidance Document (TEGD, USEPA 1986a) states to place four borings in opposite directions around the suspect area, thereby surrounding the suspect site.

Three forms of subsurface soil samples are generally collected: grab, split-spoon and undisturbed (Thin-Wall/Shelby Tube). The undisturbed Shelby Tube samples are the most representative samples of the site and are collected for permeability as well as other analyses in a laboratory. The split-spoon samples assist in the visual analysis of the subsurface strata and to collect samples for chemical analysis from specific and designated depths. The grab samples, whether from dry cuttings or collected from the circulating mud, are the simplest and least expensive method of collection. However, these samples are not recommended for detailed studies, because these samples are mixed and agitated prior to reaching the surface. Therefore, a question exists as to the actual depth and composition of the substrata. In addition, this type of sampling is inappropriate for collecting subsurface soil samples for VOC analyses.

In addition to subsurface soil sampling, in situ sampling of groundwater with either a Hydropunch or BAT probe may be beneficial in determining the placement of the monitoring well screen; if one is attempting to locate the most concentrated area of contamination. Another important tool to assess subsurface conditions is the Cone Penetrometer Test (CPT). The sensor is pushed through the soil, measuring friction and pore pressure. This yields information as to the identification and stratigraphic distribution of soils, and moisture content.

In areas where the bedrock is shallow, or known contamination has traveled into bedrock along fractures, then rock coring needs to be considered. The total depth of rock coring is dependent upon site conditions and the project objectives. On projects where thick alluvium deposits exist above bedrock, and contamination is suspected of either direct penetration

<table>
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<th>SURVEY METHOD</th>
<th>APPLICATIONS</th>
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<tr>
<td>Caliper Logs</td>
<td>Determine lithologic and stratigraphic correlations, fractures and solution openings and the construction of existing wells.</td>
</tr>
<tr>
<td>Electric (Resistivity and Spontaneous Potential) Logs</td>
<td>Determine lithologic and stratigraphic correlations, grain size and effective porosity and locate water level and saturated zones.</td>
</tr>
<tr>
<td>Natural Gamma</td>
<td>Determine depth and concentration of clay or shale.</td>
</tr>
<tr>
<td>Gamma-Gamma</td>
<td>Determine total porosity or bulk density, locate water level and saturated zones and the construction of existing wells.</td>
</tr>
<tr>
<td>Neutron</td>
<td>Determine total porosity or bulk density, specific yields of unconfined aquifers, moisture content, infiltration, and to locate water level and saturated zones.</td>
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</tbody>
</table>

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into the bedrock surface or through fractures, then the core is generally between five and 20 feet into bedrock. This is to confirm the presence of bedrock, contamination and the presence of fractures. For projects where rock is the principal subsurface medium for the contamination to pass through, the parameters of the investigation need to be determined from site-specific information. An emphasize on fracture studies and possible tracer studies is discussed under groundwater investigations, below.

**Borehole Geophysics:** With the completion of the first soil boring and prior to well installation, borehole geophysical surveys are commonly used on larger projects. The common borehole geophysical methods are outlined in Table 2.

In addition to actual geophysical methods, borehole inspection with a video camera is another approach at examining subsurface conditions. The two principal areas of usage for the camera include the examination of fractures in rock and the inspection of existing wells.

**Groundwater Investigation:** With the completion of the subsurface soil investigation, the placement and the construction details of the monitoring wells are determined. These wells are placed around the outer perimeter of the suggested source area to evaluate the horizontal extent of contamination, and within the area of contamination to evaluate the vertical extent of contamination. Under shallow groundwater conditions, the well screen may be placed so as to cut across the saturated and vadous zones to compensate for seasonal fluctuation of the water level. This needs to be taken into account if floating contaminants (e.g. petroleum) are present and future periodic sampling is anticipated. After the wells are installed they need to be properly developed so as to establish an equilibrium between the water in the well and the aquifer. Purging of the well prior to sampling is necessary to remove stagnant water from the well and to return the well to a state of equilibrium with the aquifer.

The chemical contaminants of concern vary between sites. Therefore, the quantities, holding times, preservatives and sampling containers vary. This information is listed in the CFR 40 Part 136 and EPA 600/4-79/020. The reader is directed to the following EPA documents for a better understanding of the protocols of sampling for chemical contaminants: the Contract Laboratory Program (USEPA, 1986b) and A Compendium of Superfund Field Operations Methods (USEPA, 1987a).

The most representative method to determine the hydraulic conductivity (K) of the aquifer across the site is to conduct an aquifer pump test. A Step Draw Down Test is first conducted to determine the optimum pump rate prior to running the long term, constant rate pump test. If horizontal and vertical gradational changes of the lithologic unit vary significantly across the site, and if the aquifer K is expected to range between $10^{-2}$ and $10^{-6}$ cm/sec, aquifer slug tests may be applicable. It should be emphasized that this test determines the K only around the screened interval of the well. With knowledge of the thickness of the aquifer and proper placement of the well screen, transmissivity and storage capacity of the aquifer can be determined.

If seeps or springs exist downgradient and a possible conduit is suspected between the site and these resurfacing waters, tracer studies are generally conducted. Tracer studies may use fluorescent dyes, slightly radioactive material or microbiological organisms as tracers that are not detrimental to the environment.

**EPILOGUE**

Many skills learned in other disciplines of geology are transferable to the environmental industry. However, the individual must learn how to reapply old skills to new problems and challenges. Methods learned in the oil fields or other geologic disciplines may or may not be applicable.

In general the area of investigation is shallow in depth, ranging from a few tens of feet to less than 200 feet, unlike other geologic disciplines that explore thousands of feet. The geologist must become more adept at understanding chemistry. One must be comfortable with working with large teams of engineers, scientists, government regulators and clients.

**Recommended References**

American Society for Testing and Materials, Annual Book of ASTM Standards
U.S. Environmental Protection Agency, 1985b, Guidance on Feasibility Studies Under CERCLA, EPA/540/G-85/003
U.S. Environmental Protection Agency, 1986b, User's Guide to the Contract Laboratory Program
U.S. Environmental Protection Agency, 1987a, A Compendium of Superfund Field Operations Methods, EPA/540/P-87/001
U.S. Environmental Protection Agency, 1987b, Surface Geophysical Techniques for Aquifer andWellhead Protection Area Delineation, EPA/440/12-87/016
U.S. Environmental Protection Agency, 1990, Volume I, Ground Water and Contamination, EPA/625/6-90/016a
U.S. Environmental Protection Agency, 1991, Ground Water Volume II: Methodology, EPA/625/6-90/016b

Robert J. Melvin, CPG-8686 is presently a senior hydrogeologist with ICF Kaiser Engineers, who for the past seven years has worked in the environmental industry. Prior to entering the environmental industry, Mr. Melvin worked in mineral exploration, mining geology and engineering geology for eight years. Comments and suggestions to this article were given by Ms. Kristine Uhlman, also of ICF.
The ENVIRONMENTAL CONSULTANT: A TOOLBOX for the Attorney

N. Thomas Sheahan, CPG-2481

Often, the sudden need for expert witnesses, or the need for completion of a Phase I environmental assessment, triggers a flurry of activity by an attorney to seek help from a firm of consulting scientists and engineers. Not only does this delay in seeking help reduce the opportunity to acquire the best help available, but also such a delay can rob the attorney of the technical assistance necessary for early evaluation of the elements of a case, or effectively completing environmental due-diligence during the transactional phase of property acquisition.

Environmental consultants can provide early assistance in the liability-avoidance or risk-reduction aspects of an attorney’s environmental practice, in the pre-litigation or litigation-planning stages, as well as during the trial-preparation or actual litigation phase of a cause of action or defense. Knowledge of the services available in all of these areas of practice can help the attorney decide which services are needed, the type of firm to choose, the type of contract to select, and the timing for bringing the consultant on board as a member of the attorney’s team.

Liability Avoidance Or Risk Reduction

Environmental counsel are often called upon to advise industrial clients concerning compliance with regulations for the handling and disposing of hazardous materials, the closure of underground storage tanks, and the discharges of contaminants to the atmosphere from operating equipment. Due to the wide variety of potential environmental risks, covering a wide variety of technical disciplines, the attorney can best benefit from the assistance of a full-service environmental consultant with specialists in geology, engineering, chemistry, hydrogeology, and air quality. The consultant can advise the attorney of existing or potential technical problems, possible violations of regulatory requirements, failures to comply with reporting requirements, and potential health and safety concerns.

Generally, the senior staff members of the environmental consulting firm have considerable experience dealing with regulatory agencies. The attorney can frequently utilize this experience by having the consultant interact with the local regulatory agency’s technical staff, on the client’s behalf, often avoiding unnecessary posturing by the agency, harsher-than-necessary directives, and the delays and excess costs associated with more-formal agency interaction by the attorney.

Records reviews can often be completed more effectively by the technical staff of a consultant than by the attorney’s own staff. The consultant’s ability to use relatively-low-cost, staff-level professionals in this effort can provide the attorney with a more-efficient, cost-effective means to acquire such information. Many consulting firms can provide Bates-stamped documents or simple copies for the attorney’s use. Furthermore, the consultant can act as custodian of records for these documents to provide testimonial evidence as to which documents were -- or were not -- in agency files as of the date of records review.

Pre-Litigation Or Litigation-planning

Long before it is necessary to declare expert witnesses, or even decide if expert testimony is needed, the attorney can benefit from the environmental consultant’s skills in reviewing the technical data pertinent to the matter. Most environmental-litigation cases involve results of laboratory testing of soil, water, or air. It can be critical to an attorney, early in the litigation-planning stage, to know that the data being relied upon are technically sound. The consultant can critically review reports by other consultants and distinguish between the data and the interpretations made from the

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data. While the data may be accurate and correct, the interpretations may be incorrect or incomplete.

Trial counsel can benefit from involving the consultant in the strategy-planning sessions during the pre-litigation stage. The consultant can help identify the available data that support legal theories, or point out discrepancies in the data that the attorney must be prepared to address. If additional data and/or interpretations are needed to further the cause of action or defense, the consultant can develop the additional information to complete the factual basis supporting the case.

If the consultant for the opposing counsel is performing field investigations, the attorney’s own environmental consultant can review work plans, protocols, and methodology, and can observe field activities and collect duplicate samples for independent analysis. This process gives the attorney a first-hand look at the opposing counsel’s approach to developing factual data as evidence, and may help avoid surprises later in the proceedings.

**Assistance During Trial**

If expert testimony is needed, the consultant can frequently provide appropriate senior professionals from within the consultant’s own firm to serve as experts in the various scientific and engineering disciplines needed. If the particular expertise is not available within the consultant’s firm, or if there are more qualified professionals elsewhere, the consultant can identify these individuals, and can assist in preparing specific information, and in providing an adequate basis for the experts’ opinions.

The consultant’s technical staff can also assist by reviewing background and qualifications of opposing experts, preparing questions for use at depositions, reviewing transcripts from depositions of other experts, and occasionally by attending and communicating with the attorney during the deposition of opposing experts. Similarly, the consultant can review depositions of percipient witnesses to help reconstruct prior practices, activities, and industrial processes.

Most larger environmental consulting firms can provide a wide array of assistance in developing and preparing audio-visual/video-animation evidence. The visual-arts specialists available through the larger environmental consulting firms are experienced at representing complex technical concepts in easily-understood graphics. Three-dimensional diagrams, animation, and incorporation of still photography within video presentations are only a few of the types of evidence that can be provided through the consultant’s visual-arts capabilities.

During trial, the attorney may ask the consultant to listen to the testimony of experts for deviations from depositional testimony, and for facts and opinions not previously brought out during discovery. If additional investigations or data evaluations are required during these times, a participating consultant can respond more quickly and more effectively, avoiding the problems that may otherwise occur from these surprises.

**Summary**

The environmental consultant can be a valuable member of the attorney’s team over the full course of the attorney’s involvement with environmental problems -- from initial reviews of regulatory compliance and due-diligence assessments, through courtroom proceedings. Full-service consultants provide a wide variety of tools for the attorney’s use, and can broaden the attorney’s technical capabilities and provide efficient and cost-effective support in many areas.

**Endnotes**

1. Phase I, Phase II, and Phase III environmental assessment reports are commonly prepared to identify, assess, and quantify the environmental risks associated with a parcel of real property. See Federal Home Loan Bank Board, Thrift Bulletin No. 16 (Feb. 6, 1989).


3. Three-party agreements are becoming more widely used, granting the attorney the right to direct the consultant’s work and the authority to authorize work, while reserving for the client the responsibilities of paying invoices and providing indemnity under the consultant’s standard terms and conditions. See Andrews, D.R., “Hiring Environmental Expertise”, California Lawyer, (October 1991), and Machiowitz, D.S., “Hiring, Supervising -- and Firing Environmental Consultants”, ACCA Docket, (Summer 1992).


6. Regulations concerning discharges to the atmosphere appear in the rules and regulations of applicable Air quality Management Districts and/or Air Pollution Control Districts.

7. Documentation of the findings of a regulatory compliance audit may produce discoverable evidence of noncompliance or violation of environmental laws. It may be appropriate to obtain the results in an oral presentation prior to ordering that a report be prepared. Note that the assertion of the attorney-work-product privilege and/or the attorney-client privilege may not always be successful.

8. See CAL.EVIDENCE CODE §§ 720 et seq., and FED.RULES OF EVIDENCE, Rule 702 et seq.

9. It is only necessary that the expert be given sufficient information to provide an adequate basis for his opinion. See CAL.EVIDENCE CODE §§ 801 through 805.


N. Thomas Sheahan, CPG-2481, is Consulting Hydrogeologist for Dames & Moore, Inc., Ontario, California. He is a Registered Geologist and Certified Engineering Geologist in California and Oregon, and a Registered Geophysicist in California. Mr. Sheahan received his Bachelor of Science in Geology and Geography from the University of Missouri, and his Juris Doctor from the University of La Verne, California. Mr. Sheahan is also a member of the California State Bar.
FLORIDA 12394
AGENCY: Department of Revenues/Sales and Use Tax
TOPIC: ENERGY
SUMMARY: Provides that natural gas purchased for certain agricultural purposes is exempt from sales and use tax; requires purchasers to provide the seller with a certificate stating that the natural gas is used for agricultural purposes.
AGENCY CONTACT: Charles B. Strausser, Chief, Bureau of Technical Assistance and Training, P.O. Box 7443, Tallahassee, FL 32314-7443
CITATION: FAC 12A-1.059 Fuels and Lubricants
PROPOSAL DATE: 6/25/93
HEARING DATE: 7/20/93

IDAHO 1356
AGENCY: Department of Health and Welfare
TOPIC: ENVIRONMENTAL PROTECTION AND POLLUTION CONTROL
SUMMARY: Governs mining exploration and surface mining as it relates to water quality.
AGENCY CONTACT: Mark Shrum, Department of Health and Welfare, Boise, ID 83701, (208) 334-0238
CITATION: (UNCODIFIED) Water Quality - Mining
PROPOSAL DATE: 7/05/93
COMMENT DEADLINE: 8/05/93

MASSACHUSETTS H 5282
AUTHOR: Local Sponsor
TOPIC: BUSINESS AND CORPORATIONS
SUBTOPIC: SPECIFIC INDUSTRIES, OCCUPATIONS
SUMMARY: Relates to the registration of professional engineers.
STATUS: 7/01/93 INTRODUCED.

MICHIGAN H 4971
AUTHOR: Middagh
TOPIC: RESOURCE MANAGEMENT AND PRESERVATION
SUBTOPIC: WATER SUPPLY AND PRESERVATION
SUMMARY: Regulates, protects, and conserves the water resources of the State; provides for the control over the pollution of any waters of the State and the Great Lakes; provides for the control of the alteration of the watercourses and the floodplains of all rivers and streams; creates a Water Resources Commission; prescribes the powers and duties of certain State agencies and officials; requires the registration of production materials and waste products where certain wastes are discharged.
STATUS: 7/23/93 INTRODUCED.

MICHIGAN H 4928
AUTHOR: Gustafson
TOPIC: ENVIRONMENTAL PROTECTION AND POLLUTION CONTROL
SUBTOPIC: SOLID WASTE
SUMMARY: Defines qualified landfill gas.
STATUS: 7/08/93 INTRODUCED.

NEBRASKA 2378
AGENCY: Department of Environmental Quality
TOPIC: ENVIRONMENTAL PROTECTION AND POLLUTION CONTROL
SUMMARY: Outlines the regulations for the management of wastes; includes rules on waste management permits and licenses, fertilizer and manure manure, land application of effluent, sludge, and manure, existing activities and operations, and the transfer and denial of permits and licenses; defines pertinent terms, such as "manure manure", "application rate", "best management practices". and "generator", includes regulations for fertilizer and pesticide washer.
TEXAS 11860
AGENCY: Board of Registration for Professional Engineers
TOPIC: BUSINESS AND CORPORATIONS
SUMMARY: Concerns criminal convictions of applicants for engineering licenses.
AGENCY CONTACT: Charles E. Nemir, P.E., Executive Director, Board of Registration for Professional Engineers, P.O. Box Drawer 18329, Austin, TX 78790
CITATION: 22 TAC 131.120 Board of Review of Application
PROPOSAL DATE: 6/11/93
COMMENT DEADLINE: 7/11/93

TEXAS 11861
AGENCY: Board of Registration for Professional Engineers
TOPIC: BUSINESS AND CORPORATIONS
SUMMARY: Concerns disciplinary actions; concerns the Board of Registration for Professional Engineers.
AGENCY CONTACT: Charles E. Nemir, P.E., Executive Director, Board of Registration for Professional Engineers, P.O. Box Drawer 18329, Austin, TX 78790
CITATION: 22 TAC 131.137 Registration
PROPOSAL DATE: 6/11/93
COMMENT DEADLINE: 7/11/93

TEXAS 11863
AGENCY: Board of Registration for Professional Engineers
TOPIC: BUSINESS AND CORPORATIONS
SUMMARY: Concerns administrative procedures for contested case registration hearings; includes Board of Registration Professional Engineers responsibilities.
AGENCY CONTACT: Charles E. Nemir, P.E., Executive Director, Board of Registration for Professional Engineers, P.O. Drawer 18229, Austin, TX 78790
CITATION: 22 TAC 131.181-186, 188, 191-195, 197, 198, 201, 202, 204, 215, 224 Contested Case Hearings
PROPOSAL DATE: 6/1/93
COMMENT DEADLINE: 7/1/93

TEXAS 11917
AGENCY: Board of Registration for Professional Engineers
TOPIC: BUSINESS AND CORPORATIONS
SUMMARY: Concerns engineering licensure applications; includes the provision that a completed questionnaire on the provisions of the Texas Engineering Practice Act, the Board Rules of Practice and Procedure, and Professional Conduct and Ethics Regulations must accompany an application for registration as a professional engineer.
AGENCY CONTACT: Charles Nemir, P.E., Executive Director, Board of Registration for Professional Engineers, P.O. Drawer 18329, Austin, TX 78760, (512) 440-7723
CITATION: 22 TAC 131.54 Application for Registration
PROPOSAL DATE: 6/22/93
COMMENT DEADLINE: 7/22/93

TEXAS 11918
AGENCY: Board of Registration for Professional Engineers
TOPIC: BUSINESS AND CORPORATIONS
SUMMARY: Concerns educational requirements for engineers; clarifies the educational requirements for registration under the Texas Engineering Practice Act which will permit persons who were previously not eligible under the section to begin taking the Fundamentals of Engineering Examination in October 1993.
AGENCY CONTACT: Charles Nemir, P.E., Executive Director, Board of Registration for Professional Engineers, P.O. Drawer 18329, Austin, TX 78760, (512) 440-7723
CITATION: 22 TAC 131.91 Education
PROPOSAL DATE: 6/22/93
COMMENT DEADLINE: 7/22/93
ADOPTION DATE: 6/22/93
EFFECTIVE DATE: 6/14/93
EXPIRATION DATE: 10/14/93
MESSAGE: EMERGENCY RULE, SIMULTANEOUSLY PROPOSED FOR PERMANENT ADOPTION.

TEXAS 11928
AGENCY: Board of Registration for Professional Engineers
TOPIC: BUSINESS AND CORPORATIONS
SUMMARY: Relates to the withdrawal of an application for registration for professional engineers; engineering experience evaluation; relates to education; clarifies that applicants with foreign degrees must meet the requirements of the Texas Engineering Practice Act; clarifies that an applicant with foreign degree may apply under the Act but must meet the registration requirements; clarifies that an official transcript must be provided from each school from which an engineering degree is claimed on an application for registration; concerns engineering examination required for registration as a professional engineer.
AGENCY CONTACT: Charles E. Nemir, P.E., Executive Director, Board of Registration for Professional Engineers, P.O. Drawer 18329, Austin, TX 78760, (512) 440-7723
CITATION: 22 TAC 131.68, 131.81, 131.91 - 131.93, 131.101 Practice and Procedures
PROPOSAL DATE: 6/25/93
COMMENT DEADLINE: 7/25/93

UTAH 5101
AGENCY: Department of Environmental Quality/Division of Drinking Water
TOPIC: ENVIRONMENTAL PROTECTION AND POLLUTION CONTROL
SUMMARY: Relates to source development; deletes portions of this rule which pertains to Drinking Water Source Protection; includes authority and purpose; general; surface water; ground water-wells; ground water springs; and definitions.
AGENCY CONTACT: William B. Birkes, Division of Drinking Water, Department of Environmental Quality, 288 North 1460 West, 3rd Floor, Salt Lake City, UT 84114-8390, (801) 538-6940
CITATION: R 309 -106-1 through 7 Source Development:
PROPOSAL DATE: 6/15/93
COMMENT DEADLINE: 7/15/93

UTAH 5102
AGENCY: Dept. of Envr. Qual/Div. of Envr. Response and Remediation
TOPIC: ENVIRONMENTAL PROTECTION AND POLLUTION CONTROL
SUMMARY: Relates to administrative procedures for Underground Storage Tank Act (USTA) adjudicative proceedings; provides supplementary procedures for the specific needs of USTA agency actions and proceedings unless conduct informal adjudicative proceedings; includes general provisions; presiding proceedings; conversion of proceedings; preliminary matters to adjudicative proceeding; commencement of proceeding, motions; record submission, review, discovery; prehearing conference; conduct of formal hearings; rules of evidence and recommended orders.
AGENCY CONTACT: Bryan Whitaker/Sandra Allen, Division of Environmental Response and Remediation, Department of Environmental Quality, 150 North 1950 West, Second Floor, Salt Lake City, UT 84116, (801) 536-4100
CITATION: R 311 -210-1 through 14 Administrative Procedures for Underground Storage Tank Act Adjudicative Proceedings
PROPOSAL DATE: 6/15/93
COMMENT DEADLINE: 7/15/93
HEARING DATE: 7/14/93

UTAH 5114
AGENCY: Dept. of Community and Economic Devol./Div. of State History
TOPIC: BUSINESS AND CORPORATIONS
SUMMARY: Relates to changes in professional qualification reference in regards to archaeological and Paleontological permits includes purpose; applicability; definitions; permit of survey and excavation of archaeological and critical paleontological resources; permit provisions; application review; appeal of decision; violations of statute or rule; records access; and exceptions.
AGENCY CONTACT: Dynette Llyod, Division of State History, Department of Community and Economic Development, 300 Rio Grande, Salt Lake City, UT 84101, (801) 533-3556
CITATION: R 212 -4-1 through -11 Archaeological and Paleontological Permits
PROPOSAL DATE: 7/10/93
COMMENT DEADLINE: 8/2/93

WEST VIRGINIA 1445
AGENCY: Commercial Hazardous Waste Management Facility Siting Board
TOPIC: ENVIRONMENTAL PROTECTION AND POLLUTION CONTROL
SUMMARY: Relates to certification requirements of Commercial Hazardous Waste Management Facility Siting Board.
AGENCY CONTACT: Office of Waste Management, Department of Environmental Protection, 1356 Hensford Street, Charleston, WV 25301
CITATION: Rule 57, Series 1 Certification Requirements
PROPOSAL DATE: 7/10/93
COMMENT DEADLINE: 8/10/93
HEARING DATE: 8/10/93
TODAY IN WASHINGTON

F. B. "Ted" Mullin, CPG-1716

Well now, we’re back in business after a move that has had the usual disruptions and frustrations. I doubt that many even noticed that our office was out of business for about two weeks. However, the remainder of the federal government seemed to continue to function in its usual fashion.

There seems to be a resurgence of new and unusual offices and positions within the fed now. At least, I’ve not run into them before. The NOAA Marine Fisheries folks have an Office of Protected Resources, the Department of Commerce has an Office of Countervailing Investigations, the FCC has a Mass Media Bureau, and the Wonderful Department of Defense has a Director of Net Assessment (a tennis player no doubt), and an Assistant Secretary of Defense for Democracy and Peacekeeping. I will let you think about that one.

According to the Washington Post (7-22-93), the Clinton administration nominated Robert Perciasepe to be the EPA’s new Assistant Administrator for Water. He served as the head of Maryland’s Department of the Environment and will take over the office during the critical period dealing with the reauthorization of the Clean Water Act, and the Safe Drinking Water Act etc.

The Washington Post reported on 7-23-93, that Former Secretary of Interior Hickel, and now Governor of Alaska, has filed a $29 billion lawsuit alleging the government improperly withheld that much money by ending mining on 100 million acres of federal land. According to Alaska’s Statehood Act, the federal government would pay to the State 90% of all mining revenues from Alaska. Congress voted to stop much of this mining, but Governor Hickel believes that the State, not Congress should decide where and how much to mine. Congress also voted to charge Alaska for administrative costs for conducting a mining sale; Hickel wants that money back too. A spokesman for Secretary Babbitt said "There may be a political basis for the suit, but there is clearly no legal basis". I guess that’s a matter of legal opinion. It doesn’t seem to make any difference anyway. The “public” wants everything locked up in wilderness where there can be no mining, and the Congress goes right along with it. Colorado just had another 612,000 acres added to 2.1 million acres of wilderness -- that’s about 700,000 more acres than are in the states of Delaware and Rhode Island combined.

An now comes the gleanings from the Federal Registers.

Vol. 58, No. 118, 6-22-93 - Nuclear Regulatory Commission - 10 CFR Part 61, Licensing Requirements for Land Disposal of Radioactive Wastes Final Rule This regulation received six responses to the Proposed Rule. Not much interest for such a "HOT" topic. For Further Information Contact: Mel Silberberg, Office of Nuclear Regulatory Research, USNRC, Washington, D.C. 20555; Phone 301-492-3810.

And in the same volume at pg. 33893 is a rule from the FAA "that requires a one-time high frequency eddy current inspection to detect cracks in the outer flap center hinge fitting". I certainly hope so!

And not to be outdone--The USDA Cooperative State Research Service (pg. 33925) is soliciting applications for a cooperative agreement to determine whether trimming or washing is more efficient to remove fecal contamination from beef carcass surfaces. Why is it there in the first place?

My favorite this month comes from Vol. 58, No. 129, Part VIII- Presidential Proclamation 5679- To implement an accelerated Tariff Schedule of Duty Elimination and to modify Rules of Origin Under the United

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States-Canada Free-Trade Agreement. There has been a lot of press on this subject.

Here are some of the items that are listed: Bottoms certified by the importer as intended for use in insect control devices, Bedpan liner dispenser racks, Bedpan support racks, Gold-plated or silver-plated saddle trim, Lutes and Lute parts, Bowling bags, and last but not least-golf club shafts. These are not all of the items listed, nor are they the most important—they are just some of the items we can’t live without.

Vol. 58, No. 130, 7-9-93 - Nuclear Regulatory Commission - 10 CFR Part 60. Disposal of High-Level Radioactive Wastes in Geologic Repositories; Investigation and Evaluation of Potentially Adverse Conditions. PROPOSED RULE

For Information Contact: Mark Deliggati, Division of High-Level Waste Management, Office of Nuclear Material Safeguards, USNRC, Rockville, MD 20852, 301-504-2430.

Comments must be submitted by October 7, 1993.

It seems to me that some of you might have some comments on this subject.

Vol. 58, No. 131, 7-12-93, pg 37483 - Federal Trade Commission - ASFE the Association of Engineering Firms Practicing in the Geosciences; Prohibited Trade practices, and Affirmative Corrective Actions. CONSENT ORDER - This agreement was previously reported on in this column. The parties were given 60 days to comment and submit suggestions or objections to the cease and desist order proposed. None were filed. The order to cease and desist has been officially entered. HMMMM - Must have had no defense.


For Further Information Contact: Roger Haskins at 702-785-6576. Roger, CPG-6598, will bend over backwards to answer all of your questions.

From the halls of the Congress

The subcommittees of Energy and Mineral Development and Oversight and Investigations of the House Committee on Natural Resources met on August 5, 1993. The subject discussed was Unreclaimed Hardrock Mine Sites.

The members in attendance: Miller (D-CA); Lehman (D-CA); Rahall (D-WV); Farr (D-CA); Barlow (D-KY); Barrett (D-WI); Vucanovich (R-NV); Smith (R-OR); Thomas (R-WY); and Allard (R-CO).

Chairman Miller referred to his recent report, entitled "Deep Pockets; Taxpayer Liability for Environmental Contamination," and said that he wants to work with industry to address the issue in a comprehensive and efficient way. Congresswoman Vucanovich commented that it was to accomplish cleanup, but she felt that the Ways and Means Committee and the Energy and Commerce Committee would need to weigh in on the issue of another excise tax or the so-called "reclamation fee" proposed by the Mineral Policy Center. Congressman Smith said he was suspicious of all the Democrats' good intention in this: he's concerned that it's a concerted effort to stop extracted uses on Federal lands. Congressman Rahall said that SMCRA requires that coal miners pay a pension fee for reclamation and he believes that hardrock miners should pay some fee, as well.

Bob Armstrong, Assistant Secretary for Lands and Minerals Management, Department of Interior, said that the abandoned hardrock mines problem should be addressed as part of the reform of the mining law.

Other witnesses included: Dianne R. Neilson, Western Governor's Association; Phil Hocker, Mineral Policy Center; Graham M. Clark, Newmont Mining Corp. and the American Mining Congress; and Maxine Stewart, Womens' Mining Coalition.

Executive Director's Itinerary

(subject to change)

The Executive Director is visiting various Sections, agencies, campuses, and other organizations. He is talking, listening, and exchanging information and ideas. Members are encouraged to attend these meetings wherever and whenever possible. His itinerary for the next several months, as presently scheduled, is:

Sep. 21: Dakota Section, Rapid City, SD
Sep. 22: Iowa-Nebraska Section, Omaha or Lincoln, NE
Sep. 23: Kansas Section, Wichita, KS
Sep. 29: Illinois-Indiana and Wisconsin Section, Chicago, IL
Oct. 12: Executive Committee, Springfield, MA
Oct. 13-16: AIPG Annual Meeting, Springfield, MA
Oct. 18-22: Northeast Section, sites to be identified
Oct. 25-28: Geol. Soc. of Amer. Convention, Boston, MA
Nov. 8: GeoEnvironmental Forum, Houston, TX
Nov. 11-14: Assn. of State Boards of Geology, Phoenix, AZ
Nov. 30-Dec. 3: North West Mining Asnn. Convention, Spokane, WA
Jan. 22: Executive Committee, Arvada, CO (tentative date)
Feb. 14-17: Society for Mining, Metallurgy & Exploration Convention, Albuquerque, NM
Is It Relevant?

The technical societies to which AIPG's Members belong, e.g., AAPG, AEG, AGWSE, SEG, GSA, etc., do a wonderful job of increasing the knowledge and competence within the geologic profession. They devote much less of their resources to promoting the interests of the total profession in the larger society. There is a limited amount of certifying of practitioners, and of lobbying. This is, and has always been, AIPG's principal function.

When AIPG was first organized, it was dreamed of as the association which would represent the geologic profession before the world, certifying its practitioners as to their competence, integrity and ethics. Our certification program was expected to make unnecessary the "registration" of geologists on a state-by-state basis. Thus, our profession would have a status and mobility enjoyed by almost none other. This has been partially successful. Alaska and Indiana, containing more than 1/6 of the total area of the United States, recognize AIPG's certification in their statutes. Some federal and state agencies and courts have recognized AIPG in regulations and qualifications. Otherwise, state legislatures have tended to be very jealous of their authority. Also, other professions, whose practices interface with ours, have objected to the granting of privileges which they do not enjoy. "How can they be qualified when they do not have to 'jump through the hoops we do'?" is the cry. (Never mind how relevant those hoops may be.)

So, while we still try to get the legislatures, agencies and courts to recognize AIPG certification (and the list of successes is slowly growing) we also accept the fact that this is not always possible. We have helped several of our Sections in their efforts to gain state "registration" that will be as workable as possible, given the realities of each situation.

The relevance of AIPG increasingly lies in the area of serving as the unofficial "ombudsman" or "lobbyist" for our profession.

Many of us are members of our industry associations, such as those serving the petroleum, construction, water, mining, environmental and academic communities. That is good. We should. But, do these organizations serve geology, specifically? Most would do without geologists if they could. How many jobs have been saved or created, with geologists specifically in mind, through the efforts of these industry organizations?

Take an objective look at the medical profession. (It's hard to be objective with your own.) The pharmaceutical industry does not really care whether it is a medical doctor, an osteopath, a nurse, or the neighborhood busybody who recommends its products. But, it will certainly do its best to encourage every professional working within it to join and support its lobbying organizations. In return, it may even give their professional organizations some support, but not much of its total budget.

In July, AIPG took its booth to the National Conference of State Legislatures (6,500 registrants). We talked to individual legislators and regulators from most of the states. There were trade association representatives from all of the communities mentioned above. But, many if not most of those legislators and regulators to whom we talked did not realize that geologists are important to all of those communities. The communities were promoting their products, not the occupations that serve them. Their product is not geological services. Ours is.

AIPG's relevance is specific and real. It fills a definite need. The members of our profession must recognize that need and support efforts to fill it. To do otherwise will be fatal to geology as a viable profession.
Some Considerations On Picking A Graduate Advisor
And Research/Thesis Topic
(A minority view?)

PART 1

William B. Hall, CPG-0322

Pick your major professor by finding someone with whom you are comfortable, and who does not make unreasonable demands upon your time or dignity. Pick one who respects your views although he may vigorously dispute them. If you are not considered a colleague or potential colleague, he cannot send you beyond his level of personal achievement, and you may not wish to be limited to his level.

Select a thesis topic because you are enthused about it, or can see a fascinating puzzle that can be addressed with a possible reward of greater understanding of some facet of science. Do not pick a topic because there is funding available, but which carries obligations to do work which to you is not exciting, or which will not interest you. If you select a topic which is not exciting or fascinating from the start, your momentum and enthusiasm may well diminish during the later stages of its execution, and the work will not be a real indicator of your potential. You are much more likely to abandon such a project after considerable time and effort has been invested, simply to "get out of under" a distasteful situation, in order to undertake something more appealing.

It is not hard to see that you may pay a tremendous penalty for doing an assigned or restricted topic just because it may offer financial support at a subsistence level for a year or two. If you finish it because you are determined to "see it through" rather than because you are really excited about its potential contribution to your career and/or understanding, you may not be proud of your work.

If you cannot tolerate the conditions as the project develops you will give it up, and perhaps lose a year or two in reaching your professional goal. and be frustrated in addition. Consider what a two-year delay might mean at the other end, in terms of money you might have been earning in those two years. Two years of salary would dwarf any graduate research stipend. Much as borrowing might not appeal to you, it only places you under an obligation to pay back the loan, not to do a certain type of project. You can continue as a "free agent" to follow your own interests, and tailor your thesis topic to provide research experience in your own favorite specialization.

Unlike as it may seem, the graduate school years often can be the most cherished of your professional career. You can increase the likelihood of that by making some wise decisions early on.

THESIS CATEGORIES

General Mapping
You could select a small area which offers a range of geologic units, and a variety of structures which would oblige you to work over a spectrum of geologic disciplines, and develop your field skills in a broad way. This is the most difficult of the choices, relatively time-consuming (often taking two or more field seasons), but the most beneficial in terms of overall geologic maturation. You are quite likely to make mistakes in judgement because you are covering so many aspects of interpretation. But that is the normal situation in any large project of broad scope. One of the benefits of this approach is that it gives you the base to become a general field geologist; and there are very few professionals these days who possess those skills.

Specialized Mapping
You could decide to concentrate on a structural problem in a specific area, or over a series of different geographic sites. or you could do a photogeologic problem, with only minimal field time as compared to conventional mapping. Or you could do a stratigraphic/geomorphic relationship mapping project, where you try to relate the landforms or operation of certain surface processes to the lithologic properties of various units. Or you might undertake a geomorphic mapping project, wherein you map the landforms and the surficial deposits like outwash, till, landslide, loess, or dunes in order to determine the Pliocene and Pleistocene history.

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Women In Mining Fire Back At Wilderness Society

The criticism by Joanne Carter, assistant regional director of the Wilderness Society (Letters, May 14) of the involvement of women in mining with the mining law reform issue is truly disturbing. As women in the mining industry, we, along with thousands of other Americans, face losing our jobs if legislation proposed by Representative Rahall, D-W.Va., or Senator Bumpers, D-Ark., is enacted.

Surely a politically correct group such as the Wilderness Society would normally support the political empowerment of women. How odd that in this, the purported Year of the Woman, Ms. Carter would criticize us for exercising our political voice in an attempt to influence the outcome of a political decision that will drastically affect our careers and the well-being of our families.

It is truly unfortunate that Ms. Carter’s letter only serves to perpetuate the anti-mining rhetoric, distortion and misinformation which have compromised productive discussion of this issue. Our industry has told Secretary of Interior Bruce Babbitt and the Congress that we support mining law reform legislation which includes a fair royalty to generate revenue for the federal treasury, which preserves American jobs, which promotes environmentally responsible mining, and which allows the American mining industry to remain economically viable and competitive in the world market.

Ms. Carter’s spurious claim that there are no environmental controls on mining is ludicrous and reflect her society’s ideological opposition to mining or other industries on federal land. The truth is that our industry is regulated by stringent federal and state regulations to protect ground water, surface water, air quality, wildlife, and human health and safety, and we spend millions on reclamation.

Ms Carter is right — mining law reform is not a gender issue. It’s an issue of keeping American men and women employed, keeping our economy strong, and providing our country with the mined materials needed for our national security. Ms. Carter’s objections to women’s involvement in this issue simply reflects the Wilderness Society’s and other preservationist groups’ callous disregard for the economic implications of ill-conceived legislation hidden by a green facade, and the human hardship and suffering precipitated by the resulting loss of jobs and economic prosperity in communities throughout this country.

Kathleen Benedetto, CPG-7853
Ruth Carracher
Debra Struhsacker
Women’s Mining Coalition
Denver
CALENDAR

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Oct. 3-6. Society of Petroleum Engineers, Oil & Gas Strategies in the 21st Century, Houston, TX. Contact: Programming Dept., SPE, P.O. Box 833981, Richardson, TX 75081.


Oct. 10-12. AAPG Mid-Continental Section, Amarillo, TX. Contact: AAPG Convention Dept., P.O. Box 979, Tulsa, OK 74101, Ph.: (918) 584-2555.


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Feb. 9-12. New Developments Regarding the K/T Event and Other Catastrophes in Earth History, Houston, TX. Contact: K/T Event, Lunar and Planetary Institute, 3600 Bay Area Blvd., Houston, TX 77058, Ph.: (713) 466-2149.

Feb. 15-18. 25th Annual Conference and Trade Exposition, Reno, NV. Contact: International Erosion Control Assoc., P.O. Box 4504, 625 S. Lincoln Ave. #103B, Steamboat Springs, CO 80477, Ph.: (303) 879-3010.


Mar. 21-24. SEG/EGS Cairo '94 Pan African/Middle East Exploration/Development Conference & Exposition, Cairo, Egypt. Contact: David L. Yowell, P.O. Box 702740, Tulsa, OK 74170, Ph.: (918) 493-3516.


Apr. 10-13. Toxic Substances and the Hydrologic Sciences, Austin, TX. Contact: AIG, 3416 Univ. Ave. SE, Minneapolis, MN 55414, Ph.: (612) 379-1030.

Apr. 25-30. VIIth International Symposium on the Observation of the Continental Crust Through Drilling, Santa Fe, NM. Contact: Earl Hoskins, DOE/SECC, College of Geosciences and Maritime Studies, Texas A&M University, College Station, TX 77843-1549.

May 4-6. 1994 Rocky Mountain Section Meeting of the Geological Society of America, Durango, CO.
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AGU's first electronic index on disk is now available. The Earth and Space Index (EASI) Version 1.0 (1991-1992) comes with search and retrieval software, has nearly 10,000 references, and is the only database of all AGU publications. Users can find full bibliographic references including journal articles, book titles, individual articles within books, translation articles, maps, and articles from Eos. EASI sells for $24.00 list and $16.00 for AGU members. The package includes two 3-1/2" diskettes for either IBM-PC (MS-DOS) or Macintosh computers.

Users can draw items into their word processing or other "authoring" software and manipulate data elements to match the styles of the different journals to which they submit papers.

If you have any questions, e-mail Ghassan Ras-sam (grassam@kosmos.agu.org) or call AGU at 202-462-6900 x235.

Geraghty & Miller Joint Venture Signs Contract For First Soil Washing Project In U.S.

Geraghty & Miller, Inc. announced that its 50% joint venture, Alternative Remedial Technologies, Inc. (ART) in Tampa, FL, has been selected to perform the first full-scale soil washing project in the United States. ART is a joint venture between Geraghty & Miller and Heidemij, a major Dutch engineering and environmental firm located in Arnhem, the Netherlands.

The project involves The King of Prussia (KOP) Technical Corporation site located in Winslow Township, NJ. The KOP Technical Site Coordinating Group for this site has signed a contract for more than $10 million to proceed on this multi-year project. ART is the prime contractor and Geraghty & Miller will act as its subcontractor in performing the ground water portion of the project.

The remedy for the site will consist of soil washing of the contaminated soils and return of the clean soils to the site. Additionally, ground water will be collected, treated and re-injected. The project is now in the design phase and field work will commence in the first quarter of 1993.

DOE's Environmental Management Program

DOE's Environmental Management Program is the largest environmental program in the world at an FY 1994 budget request of approximately $6.5 billion. Through this program, the Department of Energy is responsible for cleaning up tens of thousands of acres of wastes, contaminated soil, groundwater, and structures, at 120 sites in 36 states and territories. The Environmental Management Program has spent approximately $15 billion since it was established in 1989... We need to do a much better job of determining the safety, health, and environmental risks at our facilities. The Department needs to work with Federal and State regulatory agencies to continue to improve the health and safety basis for standards and regulation.

Thomas Grumbly, Assistant Secretary for Environmental Restoration and Waste Management, before the Subcommittee on Energy of the House Committee on Science, Space and Technology. DOE Rostrum•
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