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The Professional GEOLOGIST

GEOLOGIC INPUT TO SUPPORT CLEAN-UP STRATEGIES:
The Plantwide Baseline Human Health Risk Assessment
and Its Role in Making Decisions about Managing Risk

EARTH SCIENCE OUTREACH and EARTH SCIENCE WEEK

The Rattle in Seattle – Earthquake as Artist

EVOLUTION GRADES FOR THE STATES

Hot Spots Across the U.S.

BALLOT

The June issue of *The Professional Geologist* will include the AIPG Candidate Articles, Biographicals, and the Ballot to elect AIPG National Officers.

Only AIPG Members that have the right to vote will receive a ballot in their issue.

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VOTE!**

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The Professional GEOLOGIST

PEER REVIEWED ARTICLE

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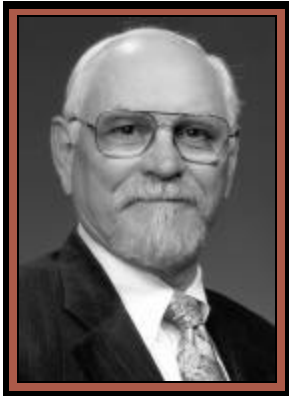
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FRONT COVER—Wingate Sandstone Cliffs in a tributary to Spring Creek in Capitol Reef National Park, Utah. The basalt boulder in foreground is from quaternary lava flows on the aquarius plateau to the west. Photograph by Neil M. Croxton, CPG-08827.

INSIDE BACK COVER—Photography is provided courtesy of the St. Louis Convention & Visitors Commission.

QUICKY HANDBOOKS AND STRATIGRAPHIC CODES MANUALS OF PROFESSIONAL PRACTICE

Robert H. Fakundiny, CPG-04977



The first of four priority functions of AIPG, as identified in the current long-range planning process, is Direct Services to Members. I have some ideas about some services that might be useful to the membership and would like your reaction to one—A series of concise and current instruction manuals that can be downloaded from the AIPG website might be a useful service to the practitioners of professional geology. These manuals would address common practices, such as “How to sit a well” or “How to design a drilling program for groundwater investigation.” I realize that most of you know most of these types of practices, but you may not know them all. At least I do not.

I can remember one of the first field jobs I was assigned after joining the New York State Geological Survey, and just out of graduate school. The Survey, along with a couple of research institutions, was performing a hydrofrac experiment in a wildcat well in western New York during which the principal investigator was called away. I was assigned the job of going out to supervise the end of the project, which was to extract an impression packer that had become stuck in the hole and to plug the well. It would have been great to have had quick access to a manual about oil-well drilling, since I knew nothing about the business. (I know that it is not good professional practice to work on a job that you know nothing about.

But time is money, and there was no one else available to look after the interests of the Survey.) To end the story, we did not get the packer out, but I was there to make the decision about when to stop trying and to make sure the plugging was done properly. That experience showed me how little I knew about a lot of common professional practices. What would I do the next time I was sent out on an emergency mission?

What can one do when assigned a job that one has not performed for a long time or never before? One can go back to school, attend a short course at an AIPG meeting, or get some textbooks and manuals. But these approaches take time. What if one has only a few hours to get “up to speed,” as I did? One should be able to go to a website and get the information needed, and possibly the name of one or two expert AIPG members who are available to consult. I propose that we look into the feasibility of building a library of manuals on all sorts of topics that are addressed by professional geologists. I have made my own list and come up with more than 50 topics, for example, “How to evaluate and estimate reserves of a sand and gravel deposit,” “How to perform standard engineering soils tests,” “How to design and manage a sanitary landfill,” or “How to stabilize a landslide.” I have had to face each of these problems on short notice without any current educational or practical experience. These manuals would serve a similar purpose as some other AIPG publications, such as “Appraisal of Construction Rocks,” but would be more concise, have few bibliographic references, be cheaper, and be designed for emergency projects.

I know that the partial list above addresses common, everyday practices with which we should all be familiar. But I’m not up to date on many of the practices that are a part of the usual professional geologist’s toolbox, and would bet that many of you also are not. This may be particularly true if you are concerned with fields into which you have not delved lately, or if you are a

young professional just out of school with little practical experience.

What do you think of providing such manuals? Is this a good idea? Maybe the study and use of these manuals can be incorporated into the CAMP process. Send your reactions to me and the Executive Committee and I will respond accordingly.

NORTH AMERICAN STRATIGRAPHIC CODE

The February, 2001 issue of the *Bulletin of the American Association of Petroleum Geologists* contains Notes 63 and 64 on pages 366-375. These notes suggest changes and additions to the North American Stratigraphic Code (Code.) I urge all of you to review those suggestions and submit comments. A uniform approach to stratigraphic studies is important to much of our professional work. I recommend that all professional geologists be familiar with and Code and use it, and that those of you who are working internationally also be aware of the International Stratigraphic Guide. The references are:

North American Commission on Stratigraphic Nomenclature, 1993. North American Stratigraphic Code: *AAPG Bulletin*, 67:841-875.

International Subcommittee on Stratigraphic Classification (IUGS International Commission on Stratigraphy), A. Salvador, ed., 1994. *International Stratigraphic Guide: Trondheim, Norway*, The International Union of Geological Sciences, and Boulder, Colorado, The Geological Society of America, 214 p.

I hope to see many of you at the Washington, D.C. Fly-In.

In Memory

Daniel N. Miller, Jr., CPG-00064, passed away March 26, 2001, at his home in Chapel Hill, North Carolina. Dan is an AIPG Past President and was awarded AIPG’s most distinguished award the Ben H. Parker Memorial Medal in 1993. (Word of Dan’s passing was received just prior to printing.)

GEOLOGIC INPUT TO SUPPORT CLEAN-UP STRATEGIES:

The Plantwide Baseline Human Health Risk Assessment and Its Role in Making Decisions about Managing Risk

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The results of a single risk assessment can play a major and even dominant role in helping project managers, engineers, and regulators to decide whether to keep geologists employed at an environmental site. This paper discusses the results of a plant-wide Baseline Human Health Risk Assessment (BHHRA) and how project managers made cleanup decisions that ultimately affected employment opportunities for various environmental professionals (including geologists). As projects become increasingly large, complex, and compartmentalized, employment opportunities will favor individuals possessing multidisciplinary skills and having the ability to interact and communicate with professionals from other scientific and technical disciplines.

A BHHRA estimates risks and hazards to human health presented by contaminant contributions from multiple sources and provides information to support development of remediation decisions at these sources. It also estimates future and current risks and hazards from exposures to contaminants that are present at or expected to migrate to selected points (termed integrator points). Standard baseline human health risk assessments (e.g., Steinhauff and Bonczek, 1998) do not provide the same types of information about future risks nor about risks posed to potential off-site receptors by contaminant contributions from multiple sources.

This paper explains how geologists and other scientists estimated future risks and hazards at an industrial facility in southern Ohio for a period extending from the present to 10,000 years from now. Input from geologists was used to site the eleven integrator points used for the assessment (Fig. 1A). An integrator point is a point of potential contact with contaminants where contributions from several sources may have

combined. The eleven integrator points were selected next to surface water bodies such as streams and holding ponds to assess the potential for contaminants to migrate off the site. Current risks to human health at the integrator points also were evaluated. In addition, a parallel study evaluated current risks and future risks to ecological receptors at the integrator points (Bonczek *et al.*, 1994; Steinhauff, 1995).

Geologic Input

Geologic information used with professional judgment helped evaluate data used in exposure assessment and risk characterization, and in making geologic interpretations.

Moreover, geologists and hydrologists played a critical role in characterizing the site geology, establishing the limits of stratigraphic and hydrologic units (Fig. 2), and in providing input data for the Multimedia Environmental Pollutant Assessment System (MEPAS). Site specific geologic input data were collected following U.S. Environmental Protection Agency [EPA (1989)]. The quality of these data conformed to standards set forth by EPA (1986) and EPA (1987a,b, c). Table 1 shows typical input parameters established by geologists and hydrologists that were used in the ground water portion of the MEPAS modeling. In addition, geologists and hydrologists helped define the stratigraphic and lateral distribution of source types (Fig. 2) used to model future risks posed to integrator units. The MEPAS model could not allocate contamination from source areas to more than one integrator point. Therefore, geologists and other model operators decided the proportion of contamination allocated from each source area based on site specific information.

SWMUs Presenting Risks > 1.0E-04
During the First 70-year Interval

Location of Integrator Points at an Industrial Facility in Southern Ohio

SWMUs Presenting Risks > 1.0E-04
Between 500 and 1,000 years

SWMUs Presenting Risks > 1.0E-04
Beyond 1,000 years

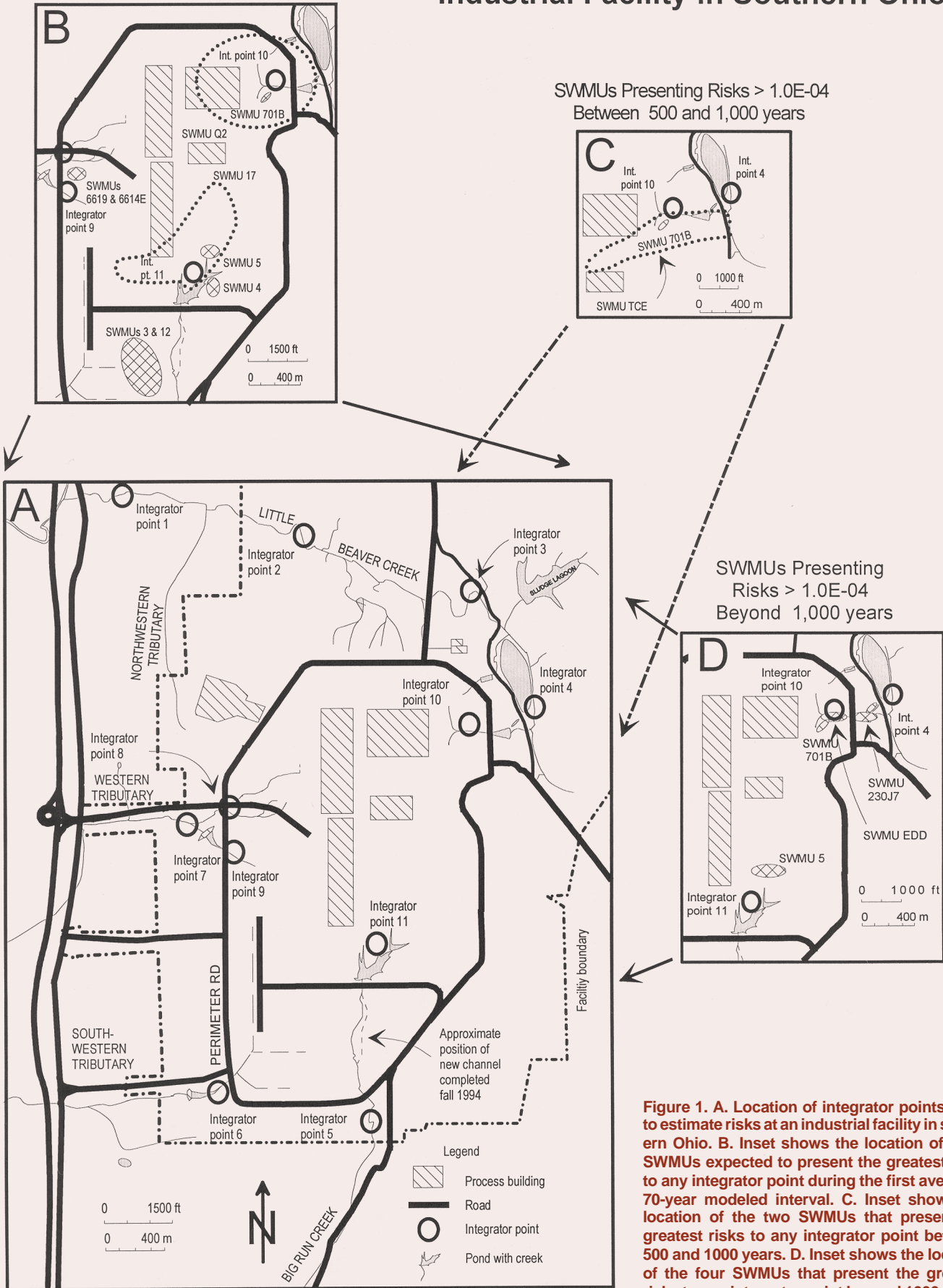


Figure 1. A. Location of integrator points used to estimate risks at an industrial facility in southern Ohio. **B.** Inset shows the location of eight SWMUs expected to present the greatest risks to any integrator point during the first averaged 70-year modeled interval. **C.** Inset shows the location of the two SWMUs that present the greatest risks to any integrator point between 500 and 1000 years. **D.** Inset shows the location of the four SWMUs that present the greatest risks to any integrator point beyond 1000 years.

Relationship of Stratigraphy to Modeled Source Types

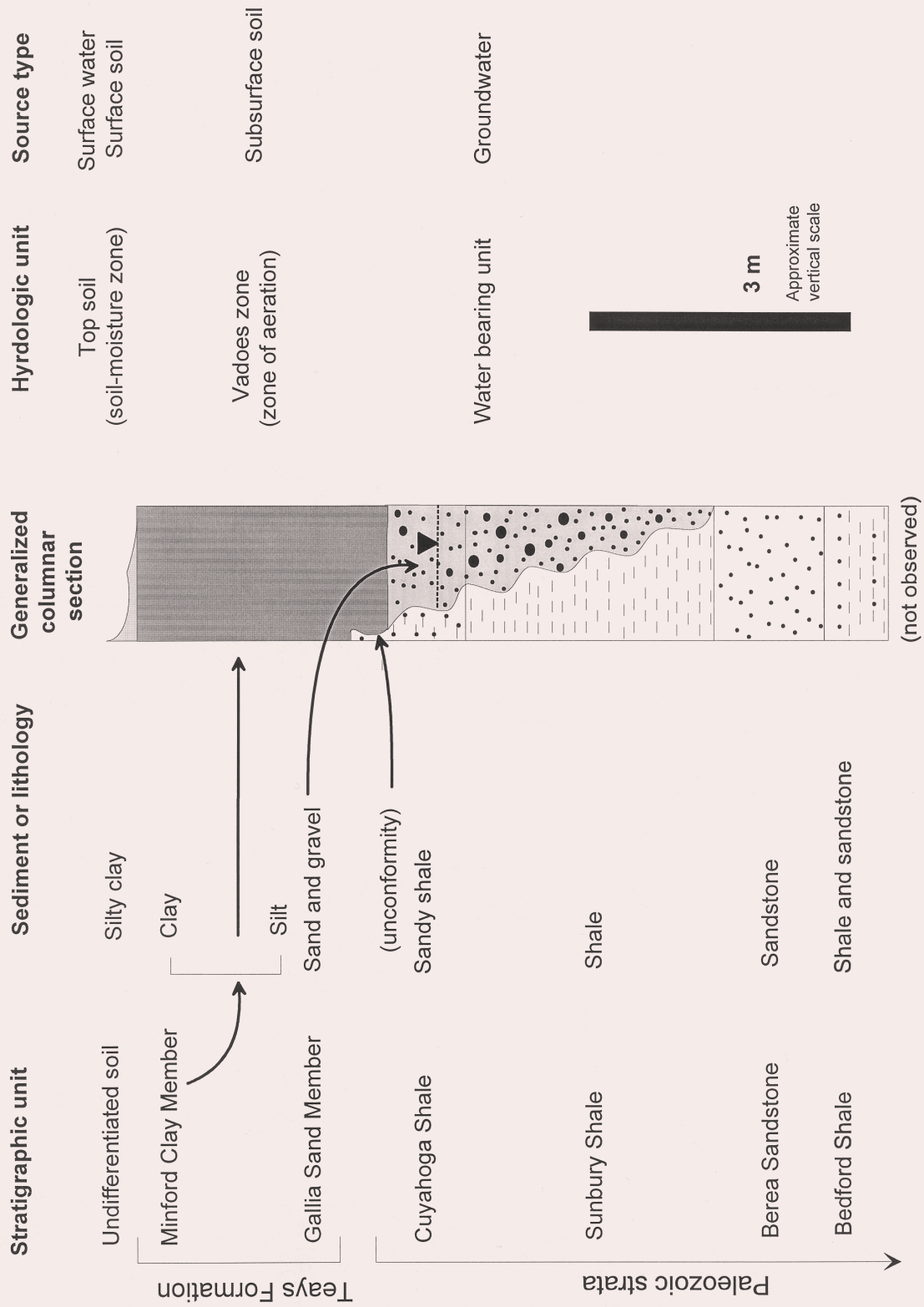


Figure 2. Columnar section for the Industrial facility showing how stratigraphic units; sediment and lithology; and hydrologic units are related to the three modeled source types (1) surface soil, (2) subsurface soil, and (3) groundwater.

Figure 2 shows that the industrial facility is partially underlain by a 3-m thick confining unit, the Mississippian Sunbury Shale, that is unconformably overlain by the Plio-Pleistocene Teays Formation. Note, however, that the Sunbury is typically continuous beneath the developed portions of the facility (where buildings and roads are located). The Teays comprises a 1-m-thick confined or semiconfined aquifer at its base (fluvial Gallia Sand Member), overlain by 2.3 m of confining silt, which is in turn overlain by 5 m of confining clay (lacustrine Minford Clay Member). The conceptual site model identified unconsolidated clay and silt in the upper Minford Member as the secondary source of contamination (Steinhauff and Bonczek, 1998).

Methods: MEPAS Modeling from SWMUs to Integrator Points

A solid-waste management unit (SWMU) is any unit used for the treatment, storage, or disposal of solid waste at anytime and includes areas contaminated by routine and systematic releases of waste or hazardous constituents, excluding one-time accidental spills that are immediately remediated and cannot be linked to solid waste management activities. Transport of contaminants from SWMUs to integrator points was simulated using MEPAS, a one dimensional transport model. In one dimensional transport, the model assumes that contaminant movement proceeds as a straight line from SWMU to integrator and the model does not account for movement perpendicular to this transport direction. Pacific Northwest Laboratories maintains a web site devoted to MEPAS (<http://mepas.pnl.gov:2080/MEPINDEX.HTM>). The MEPAS model is a personal computer code that can model transport of contaminants from a site to an integrator point via multiple transport media. It calculates cumulative doses and potential risks to receptors at the integrator point. The model consists of a system of interconnected ground water, surface water, and atmospheric transport models that interface with exposure and dose models. The four reasons for selecting MEPAS include (1) it was the only model available at the time the study was conducted that could model simultaneous transport of numerous contaminants; (2) the algorithms are well documented [the algorithms meet precision and accuracy criteria for multimedia models as set by the U.S. Environmental Protection Agency guidelines (Whelan *et al.*, 1992)]; (3) runtimes were deemed acceptable; and (4) both chemicals and radionuclides can be modeled. In addition, the use of the MEPAS model at this particular site was justified because the site geology is relatively simple (Fig. 2) and MEPAS modeled results of selected individual contaminants compared favorably with results obtained using two dimensional ground water models.

Modeling assumptions and limitations — Modeling assumptions are the primary limitation of MEPAS modeling. Foremost among these is that MEPAS does not partition con-

Table 1. Typical values for ground water data listed by source type, hydrologic unit, and stratigraphic unit, that were input to the ground water portion of MEPAS

Source type	Surface soil and surface water	Subsurface soil and vadoes water	Subsurface soil and ground water
Hydrologic unit	Top soil (soil-moisture zone)	Vadoes zone (zone of aeration)	Water bearing unit
Stratigraphic unit	Undifferentiated soil	Minford clay member	Gallia sand member
Texture type of sediment or lithology	Silty clay	Silt and clay	Loamy sand
Sand (%)	8	8 to 44	12 to 84
Silt (%)	44	44	12
Clay (%)	48	48	4
Organic matter (%)	0.68	0.08	0 to 0.0235
Iron (%)	8	8	0
pH	5.7	5.7	6.7 to 7
Thickness (ft)	-	20	2 to 10
Bulk density (g/cm ³)	-	1.67	2.78
Field capacity (%)	-	40	-
Longitudinal dispersivity (ft)	-	0.2	-
Hydraulic conductivity (ft/day)	-	0.0042 0.0042	-
Waste liquid infiltration (ft/d)	-	0.01	-
Effective porosity %	-	-	25 to 20
Darcy velocity ft/d	-	-	0.0136 to 0.34
“-” indicates that data input for modeling are not needed for that medium			

taminants between the transport pathways. The code assumes that all contamination at a source is released to one pathway media. This assumption can result in an overestimation of risk when multiple transport scenarios are combined. As stated previously (in the section about geologic input), geologists and other model operators decided how to allocate contamination from the source areas based on site specific information. These professional judgements helped reduce the degree to which the model may have violated the law of mass balance and therefore helped to reduce error in the risk estimates.

In modeling contaminant transport to the ground water, the release rate was calculated using the site's average annual infiltration rate, the adsorption coefficient of the contaminant, the contaminant concentration, and the field capacity of the soil, which is the ability of the soil to retain water against a gravitational pull. Values used for average infiltration rates were derived from an unpublished plant-wide water budget survey that considered average regional rainfall and regional and local soil characteristics. The rate at which a contaminant is leached from the release source was modeled as a different constant for each contaminant. This leach rate was used until all of the contamination had been released, at which point the release rate was set to zero. Contaminant-specific leach rates depended upon contaminant solubility. Another limitation was

that MEPAS was not able to account for biodegradation nor complexing of inorganic compounds. For example, the model assumed that all the trichloroethene in ground water eventually migrates to the integrator points and that no biodegradation of trichloroethene occurs (e.g., Wilson *et al.*, 1983, Kleopfer *et al.*, 1985).

Modeling from SWMUs to integrator points — The model used chemicals and radionuclides present at a total of 117 SWMUs or SWMU groups to estimate the future contaminant concentrations expected to be present at the integrator points. The exposure assessment and risk characterization performed for modeled concentrations followed that contained in U. S. Environmental Protection Agency guidance (1989). Risk was calculated at 70-year intervals for 10,000 years.

The MEPAS model simulated the transport of contaminants from SWMUs to integrator points for 143 modeling intervals of 70 years each (a duration of 10,000 years). Source data delineate sources and volumes of contamination at the SWMUs, which are considered potential release sites. Each site was assigned to one or more of four source types. The four categories of source types are based on the geologic and physical characteristics of the SWMU and include (1) surface soil, (2) subsurface soil, (3) ground water, and (4) surface water (Fig. 2). For example, a buried waste facility that already had a contaminated ground water plume associated with it was assigned to both a subsurface soil contamination source and ground water contamination source.

Table 2 Solid waste management units (SWMUs) or SWMU groups presenting cancer risks greater than 10⁻⁴ at integrator points during the first 70-year modeled interval in rank order

Solid Waste Management Unit (SWMU) or SWMU Group	Receiving Integrator Point(s)	Cancer Risk
X-701B Holding Pond	10	3.9E-03
SWMU 3 (Training Facility Complex and Contaminated Materials Disposal Area)	6	2.7E-03
SWMU 3 (Training Facility Complex and Contaminated Materials Disposal Area)	5	2.6E-03
X-701B Holding Pond	1, 2, and 3	2.6E-03
X-6619 and X-6614E Sewage Treatment Facility SWMU group	9	2.1E-03
X-701B Holding Pond	4	1.3E-03
X-6619 and X-6614E Sewage Treatment Facility SWMU group	7	1.2E-03
SWMU 6 Oil Biodegradation Plot	5	1.1E-03
Quadrant II Investigative Area SWMU ground water	10	8.1E-04
SWMU 17 ground water	5	1.9E-04

Table 3. SWMUs or SWMU groups presenting cancer risks greater than 1.0E-04 at integrator points, over all source types, when risk is expected to be greatest in rank order

SWMU or SWMU Group	Receiving Integrator Point(s)	Modeled Interval (years)	Cancer Risk
X-701B Holding Pond	1, 2, 3	105	8.4E-03
X-701B Holding Pond	4	105	4.4E-03
X-701B Holding Pond	10	105	3.9E-03
SWMU 3 (Training Facility Complex and Contaminated Materials Disposal Area)	6	70	2.7E-03
SWMU 3 (Training Facility Complex and Contaminated Materials Disposal Area)	5	70	2.6E-03
X-6619 and X-6614E Sewage Treatment Facility SWMU group	9	70	2.1E-03
X-6619 and X-6614E Sewage Treatment Facility SWMU group	7	70	1.2E-03
SWMU 6 (Oil Biodegradation Plot)	5	70	1.1E-03
SWMU 5 (Oil Biodegradation Plot)	11	1720	9.9E-04
Quadrant II Investigative Area SWMU ground water	10	70	8.1E-04
TCE SWMU (Trichloroethene ground water source under X-701B)	1, 2, 3, and 4	105	4.2E-04
Quadrant II Investigative Area SWMU ground water	1, 2, 3, and 4	105	4.0E-04
SWMU 17 ground water source	5	70	1.9E-04
SWMU 17 ground water source	6	70	1.7E-04

Flow from SWMUs to Integrator Points 5, 6, and 11

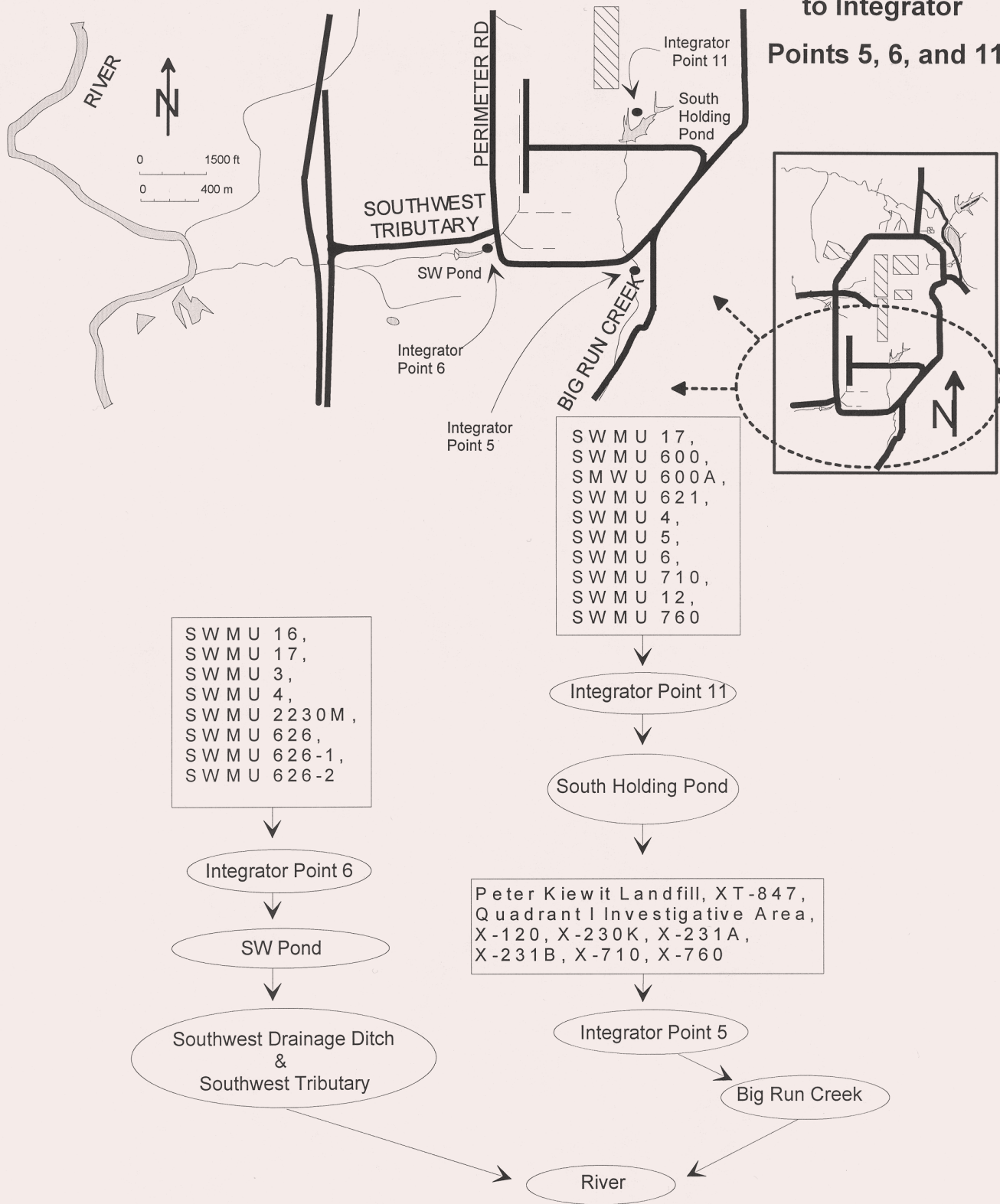


Figure 3. Inset and map show location of integrator points 5, 6, and 11 in the southern part of the industrial facility. Flow diagram shows the order that solid waste units contribute to each integrator point.

Total Hazard Index as a Function of Time

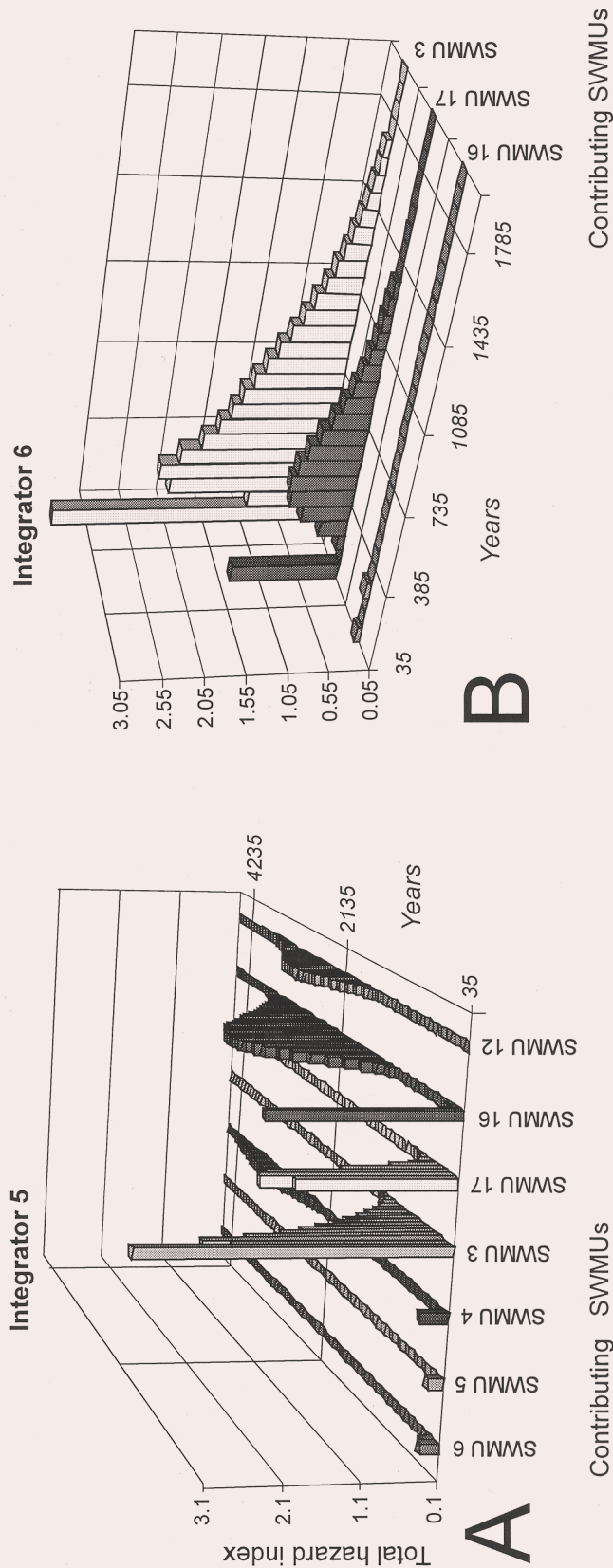


Figure 6. A. Total hazard index at Integrator 5 as a function of time. B. Total hazard index at Integrator 6 from contributing SWMUs as a function of time.

17 at integrator point 6 are expected to contribute peak hazards during the first averaged 70-year interval. Figure 5B also indicates that contaminants from SWMU 3 will contribute a peak HI of more than 3.0 during the first averaged 70-year interval. Note that Figure 4 and Table 2 indicate that other SWMUs generally present greater risks to the integrator points than SWMU 16.

Risk Management

Cleanup decisions were reached for SWMU 16, a former land fill, and the adjacent Big Run Creek based on the results of a site specific human health and ecological risk assessment that suggested possible current risk to human health and the ecology. The remedial activity included rerouting 1,000 ft of Big Run Creek into a limestone-cobble-lined channel (Fig. 1A). In addition, a seepage collection system was installed between the creek and the land fill, a cap was constructed to contain waste and reduce infiltration, and a vertical barrier was installed to reduce lateral migration of contaminants. The decision to move part of the creek was based on a combination of factors with perceived future risk being one factor. However, this decision did not consider that other SWMU's present much higher human health and ecological risks to the integrator points and that these risks were not mitigated by simply moving part of the creek. If risk managers had been aware that SWMU 16 would not present high future risks compared with other SWMUs or SWMU groups, it is likely that they may have decided that a different remedy at the landfill was appropriate and that it would be more beneficial to allocate limited resources to remediate other SWMUs expected to pose greater risks in the next 70 years.

Discussion and Summary

Earth scientists should help decide how risk assessors apply output parameters from geologic and hydrologic models to estimate current and future risks. In this example, input from geologists was integral to completing this plantwide baseline risk assessment. Geologic input helped determine appropriate input values for MEPAS modeling, provided guidance for determining integrator point locations, and helped evaluate the appropriateness and limitations of using the MEPAS model. In addition, geologic interpretations played an integral role in communicating the modeled risks to risk managers. The latter were especially important because future modeled risks spanned a near geologic time scale (10,000 years). Now armed with this analysis, risk managers have elected to

focus on immediate impacts projected to pose risks in the next 70 years and to give secondary consideration to longer term geological processes operating at the Earth's surface.

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AIPG

- OFFERS PROFESSIONAL CERTIFICATION
- ENGAGES in NATIONAL ADVOCACY
- PROMOTES ACADEMIC LIAISON
- AWARDS STUDENT SCHOLARSHIPS
- FACILITATES NETWORKING
- ACTS as OMBUDSMAN for GEOLOGISTS
- PROMOTES ETHICS
- SPONSORS ANNUAL PRESIDENT'S AWARDS
- DEVELOPS INTERNATIONAL COMITY
- PROVIDES LEGISLATIVE AFFAIRS TRAINING
- CONDUCTS an ANNUAL D.C. FLY-IN
- ACTS as LIAISON with STATE AGENCIES
- PROVIDES REGISTRATION SUPPORT



COMPETENCE...INTEGRITY...
ETHICS...

Earth Science Outreach and Earth Science Week

Lynn F. Kantner, CPG-06205

AIPG is a Supporting Member Society of American Geological Institute's (AGI) Earth Science Outreach Advisory Committee and Earth Science Week. This year's Earth Science Outreach Advisory Committee met at AGI Headquarters in Alexandria, Virginia, Saturday, March 10, 2001. The Earth Science Outreach Advisory Committee assists in the development of strategies for increasing public awareness and understanding of the vital role the geosciences play in meeting society's needs. Julia A. Jackson is AGI's Program Manager for Earth Science Week and the Outreach Committee. Terry Twyman, representing the Association for Women Geoscientists, is the Outreach Advisory Committee Chairman. The Outreach Advisory Committee is comprised of 24 representatives from supporting members of AGI and the Geoscience community.

Earth Science Week was a major agenda topic. Earth Science Week takes place each year during the second full week of October, and the dates this year are October 7-13. This year's Earth Science Week theme is EVOLUTION IN EARTH HISTORY, a timely topic!

During the next few months the Committee will be developing a strategic plan for Earth Science Week. As part of the strategic planning process, the Committee is inviting comments and observations on Earth Science Week. A SWOT Analysis Form was distributed to member representatives to collect their comments on the internal strengths and weaknesses and the external opportunities and threats that confront Earth Science Week.

The Committee also is designing a new "Ideas and Activities booklet for Earth Science Week 2001," and putting together more outreach materials related to evolution. AGI's newest publication, *Evolution and the Fossil Record*, is available at <http://www.agiweb.org/news/evolution.pdf>. The 32-page booklet is also available in print for \$8.95, or for members of AGI member societies and teachers, \$6.95. As always, bulk order discounts are available. Contact Perle Dorr at pmd@agiweb.org or (703) 379-2480 ext 216.

The December 2000 issue of *Geotimes* focused on evolution. All of the articles are interesting and informative but I especially like the article by David Applegate and how the Fordham Foundation report graded evolution teaching in each state's science standards. Check out your state's "grade" elsewhere in this issue of *TPG*

Karst education also is going to have a big role in outreach and in Earth Science Week 2001. The new poster, "Living with Karst", will be included in the kit. This beautiful and informative poster was developed by The National Speleological Society (NSS), AGI and several other groups and organizations. Carol Zokaites, the NSS representative to the Outreach Committee and the Director of Project Underground, presented some of the educational materials that are available about karst and caves. MacGillivray Freeman Films, the production company that produced the IMAX theatre film, *EVERST*, has produced a new one, *Journey Into Amazing Caves*, available soon and premiering in 11 IMAX locations around the country, including Cincinnati, Ohio. Also available is a teacher's guide to the movie. All kinds of information is available on the NSS website, www.caves.org.

Judy Scotchmoor, representing the Society of Vertebrate Paleontology, presented some of the opportunities and resources on evolution available for this year's ESW. One of the most exciting is an upcoming series on PBS Primetime Television on evolution. The seven-part series, being produced by WGBH in Boston, is scheduled to air in September and October, right on time for Earth Science Week. Perhaps the greatest resource opportunity this year for AIPG members involved with Earth Science Week is the chance to partner with biologists for carrying out activities for Evolution in Earth History. Excellent sources for evolution issues are the American Institute of Biological Sciences and the Ecological Society of America.

David Applegate, MEM-0002, AGI Director of Government Affairs Program (GAP) and author of GAP Review in *TPG*, reported on the government affairs issues this year and concerns about projected cuts to the U.S. Geological Survey budget. The GAP Web site alerts the Geoscience community to policy issues and concerns.

Christina Reed, Associate Editor of *Geotimes*, reported on the new directions for *Geotimes*. Emily Crum, representing AGI's education department, presented examples of the new middle-school curriculum, Investigating Earth Systems, and the high-school curriculum, EarthComm: Earth System Science in the Community.

Evolution Grades for the States

By David Applegate, MEM-0002

For geologists, plate tectonic theory is the central organizing principle and framework for studying and understanding Earth. Evolutionary theory serves the same role for the biological sciences, including paleontology and other geoscience subdisciplines. But many parents, teachers, and religious leaders view evolutionary theory as the single most inflammatory notion ever produced by science, and they do not want it taught in schools.

Most scientists — and indeed most people in general — are unaware of how active this cultural debate is until it flares up where they live or erupts on the national stage, as it did in Kansas last year. The debate manifests itself in many ways: textbook disclaimers, legislation and the lesson plans of individual teachers. In Kansas, the State Board of Education last August passed state science education standards that removed all mention of evolution or the age of Earth and the universe.

How has the evolution debate affected science education standards in other states? After all, what fueled the intense national interest in the Kansas story was a sense that if it can happen there, it can happen anywhere.

A new report attempts to measure how well state science education standards address evolution and, by extension, how much the swirling debate has affected the quality of science education in the United States. Its findings are both heartening and troublesome. All but a few of the state standards show the scars of opposition to the teaching of evolution, but most do a fairly good job of addressing geologic evolution and a majority do at least an adequate job of addressing biological evolution. However, a sizeable minority of the states received unsatisfactory to failing ratings.

The report, called *Good Science, Bad Science: Teaching Evolution in the States*, was written by Lawrence S. Lerner, professor emeritus of physics and astronomy at California State University, Long Beach. An active par-

ticipant in developing science education standards in California, Lerner is the author of two previous reports assessing state science education standards across the nation. All three reports were sponsored by the Thomas B. Fordham Foundation, a private foundation that focuses on K-12 education reform.

Lerner's first two reports found that a failure to adequately address evolution weakened many state science education standards. The latest report, Fordham officials write in a foreword to *Good Science, Bad Science*, follows up on this finding. Another Fordham report, called *Politicizing Science Education* and written by University of Virginia professor Paul Gross, also found that opposition to the teaching of evolution inhibited the overall quality of science education. The Gross report places the evolution debate in a broader political context, where standards are often the battleground for differing ideologies — such as how American history should be taught.

Grading the States

Since nothing serves to focus people's attention better than a report card, Lerner takes that approach in assessing the 49 states that have science standards (Iowa does not have any), and the District of Columbia. Lerner based his ratings on the typical ways that school standards yield to creationist pressure, such as discussing some evolution-related concepts without ever using the "E-word" itself. The criteria focus on the three "historical" sciences: biology, geology and cosmology. They include:

- Use — or lack — of the word "evolution" in the standards.
- Treatment of biological evolution.
- Treatment of human evolution (i.e. whether biological evolution is tied to our own species).
- Treatment of geological evolution (i.e., plate tectonics and the history the Earth).
- Treatment of cosmology (i.e., evolution of stars, the Big Bang theory, stellar events).

- Teaching connections among the different historical sciences.
- Use of creationist jargon to cast doubt on evolutionary theory.
- Requirement for a disclaimer if evolution is taught.

Lerner concludes that, on the whole, most states do a reasonable job of addressing the evolution of Earth and the solar system, although most ignore the rest of the universe and with it the cosmological knowledge gained over the past century. The real sins of omission were in the biology standards.

Thirty states and the District of Columbia are doing at least a satisfactory job of teaching evolution, receiving at least a C, and 10 states did well enough to score an A. Of the remaining 19 states, six received D's and 12 received F's. The standards adopted by Kansas in 1999 earned that state an F-. The minus sign is for ignoring virtually all historical aspects of biology, geology, and cosmology. The grades do not fall into a geographic pattern. Both good and bad marks are found in all regions of the country.

How Good a Measure?

The Lerner report provides a useful baseline for judging the present and future impact of the debate over the teaching of evolution. Its utility, however, is limited by how well state standards reflect the quality of teaching in individual science classrooms.

As supporters of the 1999 Kansas standards were quick to point out, removing evolution from standards only meant that statewide tests would not include it — the teaching of evolution was not banned, but simply left to local school districts.

But such an assessment fails to consider the many ways, both direct and indirect, that standards influence how and what children are taught. With an increasing emphasis on performance, standards and state tests often become the mark by which individual schools will be judged, thus discouraging deviation from the the subjects standards pre-

scribe. State standards have a major impact on textbook writing, particularly in large states, as well as on standardized tests and curriculum design. Finally, standards play an important role in establishing the environment in which subjects will be taught, casting an official imprimatur on subject matter, whether history, language or, in this case, science. Voluntary national standards, such as those developed by the National Academy of Sciences and AAAS, seek to accomplish exactly that — a stamp from the scientific community on what subject matter is most important.

Given that the most politically effective attacks on evolution have come from the right, the added value of the Lerner report is that it comes from an organization with conservative credentials. Although nonpartisan, the Fordham Foundation is affiliated with the right-

leaning Manhattan Institute think tank, and foundation president Chester E. Finn, Jr. was an education official for the Reagan administration. Consequently, this report should be a valuable tool for officeholders seeking to defuse conservative opposition to evolution.

Point of reference

State standards are a moving target, continually being updated and revised. Scientists and science educators successfully kept evolution in South Carolina standards last year (Geotimes, September 2000), but face an uphill struggle in Alabama. The recent electoral victories of pro-evolution candidates in Kansas appear to ensure a return of standards that include evolution. The original team of scientists and educators released standards in early 1999 that received an A from Lerner.

Those standards could replace what the board passed last year, as the results of the Nov. 7 elections created a board that favors evolution 7-3. Kansas may move from the back of the bus to the head of the class. And if it can happen there, it could happen everywhere.

Applegate is Director of Government Affairs for the American Geological Institute and is Editor of *Geotimes*. E-mail: applegate@agiweb.org. Good Science, Bad Science is available on the Web at <http://www.edexcellence.net>. This article reprinted with permission from *Geotimes*, copyright 2000, American Geological Institute.

Politics and Religion ... and Science

The largest obstacle to public acceptance for the teaching of evolution is the perception that science and religion conflict. And the attitudes of scientists are at least partly to blame, according to several of the speakers at a Sept. 26 forum in Washington, D.C. accompanying the release of Lerner's report. Sponsored by the AAAS Program of Dialogue on Science, Ethics and Religion, and the Thomas B. Fordham Foundation, the forum was called "The Teaching of Evolution in U.S. Schools: Where Politics, Religion and Science Converge."

A recurrent theme at the forum was that scientists can be their own worst enemy if they project an anti-religious attitude in a nation where over 90 percent of the population identify themselves as believers, the vast majority as Christians. The report itself states that "scientists, alas, can be as intolerant of religion as creationists are of evolution."

Eugenie Scott, executive director of the National Center for Science Education, a pro-evolution watchdog group, stated that if evolution is presented as a two-sided choice with faith, science loses. She encouraged teaching evolution with sensitivity, teaching the nature of science, and distinguishing between the scientific method of naturalism, or accepting only natural explanations, and philosophical naturalism, which claims there is nothing besides the natural world.

Ted Davis, a historian at Messiah College in Pennsylvania, cited examples of how prominent scientists have used science to advance their own philosophical views. An example he cited was Carl

Sagan's opening statement for his television series "Cosmos": "The universe is all there is, all there was, and all there will ever be."

Lisa Graham Keegan, the Arizona State Superintendent of Public Instruction, credited University of Arizona scientists with showing her serious deficiencies in her state's science education standards and helping to correct them (Arizona's current standards received a B from Lerner). But she too cautioned that some scientists came across as anti-religious, presenting a major political obstacle for her to overcome.

Also attending were representatives of the two largest U.S. Christian denominations: the Catholic and Southern Baptist churches. David Byers, who works for the U.S. Catholic Conference, noted the Pope's statements supporting evolution and his belief that the separate truths of science and religion cannot be opposed. But he added that science should observe its proper limitations and not seek to disprove religion.

Barrett Duke of the Southern Baptist Convention, on the other hand, stated that an impasse between science and religion is imminent. He laid partial blame for the nation's moral decay on what he called the devaluation of humanity caused by the teaching of evolution. The shift in the Southern Baptist church toward more conservative evangelism is here to stay, he said, "so we had better find a way to co-exist." He urged scientists not to lose touch with their souls.

DA

State and Grade

Alabama	F	Montana	B
Alaska	D	Nebraska	C
Arizona	B	Nevada	C
Arkansas	D	New Hamp.	F
California	A	New Jersey	A
Colorado	B	New Mexico	C
Connecticut	A	New York	C
Delaware	A	N. Carolina	A
D.C.	B	North Dakota	F
Florida	F	Ohio	F
Georgia	F	Oklahoma	F
Hawaii	A	Oregon	B
Idaho	B	Pennsylvania	A
Illinois	D	Rhode Island	A
Indiana	A	S. Carolina	A
Iowa	No grade	South Dakota	B
Kansas	F-	Tennessee	F
Kentucky	D	Texas	C
Louisiana	C	Utah	B
Maine	F	Vermont	B
Maryland	C	Virginia	D
Mass.	B	Washington	B
Michigan	B	West Virginia	F
Minnesota	B	Wisconsin	D
Mississippi	F	Wyoming	F
Missouri	B		

Caption: How the Fordham Foundation report graded evolution teaching in each state's science standards.

Hot Spots Across the U.S.

By Kristina Bartlett

The controversy over teaching evolution or creationism appears in many forms and in almost every state. Below is a sampling of recent events.

Alabama

Early next year, the Alabama State Board of Education is expected to vote on a new draft of the state's science standards. Alabama made national headlines in 1995 when its state board of education voted to include a disclaimer in new biology textbooks. The disclaimer reads, in part: "This textbook discusses evolution, a controversial theory, which some scientists present as scientific explanation for the origin of living things, such as plants and humans. No one was present when life first appeared on earth. Therefore, any statement about life's origins should be considered as theory, not fact." The board adopted this disclaimer because textbooks that addressed evolution contrasted with the science standards the board adopted in 1995, which did not support teaching evolution. The disclaimer still appears in Alabama textbooks.

California

In February, Nigel Hughes, an associate professor of paleobiology at the University of California-Riverside, was watching his local PBS station. A special production featured John McIntosh, a science teacher at Colton High School in Colton, Calif., explaining how he used his search for the biblical Noah's Ark as a way to teach his students the scientific method. Hughes and other scientists were concerned and wrote a letter to the high school's principal. After many phone calls, an offer from the PBS station to go on the air with a rebuttal to McIntosh's message, and a letter from the Church State Council of Westlake, Calif., threatening legal action, Hughes got a letter in May from the school district's superintendent. The letter said McIntosh had been instructed not to

incorporate religious beliefs into his teaching.

Kansas

Last year, the Kansas State Board of Education voted to eliminate references to evolution, the age of Earth and the origin of the universe from its science standards. This year, voters elected moderate school board candidates who campaigned on their support for evolution. Scientists who had drafted a "pro-evolution" set of standards early last year are hopeful that the new board will replace the year-old standards with a set that includes evolution.

Kentucky

The Kentucky-based Answers in Genesis group plans to build a creationism museum that would include displays of dinosaurs and humans living together. The museum, to be built near the Cincinnati-Northern Kentucky International Airport, gained regulatory approval in March. In January, the Kentucky Science Teachers Association asked the state board of education to put the word "evolution" back into the state's science guidelines. Last year, the state's education department replaced the word evolution with the phrase "change over time" in portions of the life sciences guidelines, making the change after the final curriculum was approved.

New Mexico

On Oct. 9, 1999, the state board of education in New Mexico mandated teaching evolution as part of its science curriculum, making its standards match national standards. In 1996, the board ruled that evolution need not be taught with the life sciences. Soon after the vote, a group of scientists formed the Coalition

for Excellence in Science Education. The coalition worked to put scientists on the school board. Marshall Berman, a senior manager at Sandia National Labs, is vice president of the school board. "Marshall's tenure has certainly helped to keep New Mexico safe from pseudoscience," says Steve Brugge, a science teacher and member of the Coalition. "One scientist in the right place can make a huge difference."

New York

A publicly funded charter school opening next fall in Rochester, N.Y., plans to teach creationism. John R. Walker, a business professor at a Rochester Christian college and sponsor of the school's charter application, has been quoted as saying evolution remains unproven so the charter school will teach creationism as an alternative to evolution. The Rochester school earned its charter in January from State University of New York officials. The school, called the Rochester Leadership Academy, is run by National Heritage Academies, a company based in Grand Rapids, Mich., that operates 22 charter schools in Michigan and North Carolina. Last year, the American Civil Liberties Union, acting on behalf of five parents, sued one of the company's schools, the Vanguard Charter School Academy in Michigan, for violating the separation of church and state. A federal judge dismissed the lawsuit in September.

Ohio

In May, Rep. Ron Hood (R-Cantfield) of the Ohio House of Representatives proposed legislation that would require a teacher, when teaching evolution, to explain evidence that does and does not support it. Hood proposed similar legis-

lation in 1996, but then and now his proposal didn't make it out of committee. But Steve Edinger, an Ohio University biological sciences instructor who has rallied scientists against Hood's campaign, isn't relaxing yet. "Ron Hood has vowed to keep introducing this bill every session until it's finally passed into law," Edinger says. A joint council of the Department of Education and Ohio Board of Regents is reviewing the proficiency tests Ohio twelfth-graders take, and the science requirements could be reviewed early next year, Edinger says. Meanwhile, the Ohio Academy of Science has been working to get the word evolution into the state's science standards. The State Board of Education voted in March that teachers must use the "E-word" when they teach the evolution of Earth and the universe, but the section on biological evolution still uses the phrase "change over time."

Oklahoma

Last year, the Oklahoma Textbook Committee voted to include the Alabama disclaimer (see Alabama below) in the state's biology textbooks. But this February, Oklahoma Attorney General Drew Edmondson ruled the committee had no authority to require the disclaimer. Science textbooks in Oklahoma won't be up for review again until 2005.

South Carolina

South Carolina's science standards came up for review last year, and scientists were ready. The standards were open to public review Jan. 12, and the board's science coordinator, Linda Sinclair, enlisted the help of scientists to respond to any creationist opposition. The scientists attended public comment periods and board meetings to support evolution. The board adopted new science standards that are based on the National Science Education Standards and include evolution. (*Geotimes*, September 2000).

Kristina Bartlett is managing editor of *Geotimes*. This article reprinted with permission from *Geotimes*, copyright 2000, American Geological Institute.

Hot Spots: An Update

By Mary Patterson

Since the publication of this article in *Geotimes* in December 2000, new developments have occurred in Alabama and Kansas. On February 8, 2001, the Alabama School Board approved new and somewhat improved science standards. The standards no longer require the textbook disclaimer, but still label evolution as a controversial theory. Six days later, the Kansas State Board of Education voted 7-3 to reinstate the teaching of biological evolution and the origin of the earth into the state's science education standards. With this vote, the board adopted science education standards that nullify the controversial 1999 standards. The new standards include teaching guidelines for all grades that include required understanding of biological evolution, the significance of fossils, the geologic time scale, and scientific theories regarding the origins of the Earth.

Other recent events around the country:

Arkansas

The Arkansas legislature considered a bill on March 23, 2001 that would outlaw government agencies from purchasing materials that contain "information that has been proven false or fraudulent." Under the bill, if teachers come across such information they are required to instruct students to make marginal notes that the information is fraudulent, or is a theory that could later be proven false. Section C of HB 2548 lists examples of information that would be affected by this legislation, which include the theory of the age of the earth, the theory of the origin of life, the "geologic column," and radiometric dating. The bill failed in the Arkansas House of Representatives, falling six votes shy of the number needed for passage.

Georgia

In Georgia, a bill was introduced to amend the state code to reform the teaching of "scientific theories of the origins about life and living things". The bill, HB 391, states that evolutionary theory as presented in current science textbooks does not convey enough clear and precise language for children to discern theory from fact. Without exposure to this specific information children are at risk of becoming

indoctrinated. Under this bill, teachers would have the right to "present and critique any and all scientific theories about origins and all facts thereof." Teachers also would be "encouraged to make distinctions between philosophical materialism and authentic science." The bill was sent to the House Education Committee of the Georgia General Assembly on February 13, 2001.

Michigan

A bill to alter the Michigan state science standards was referred to the State Legislature Education Committee on February 28, 2001. Section 10 of HB 4382 would change the science curriculum standards to require that students are exposed to the "competing theories of evolution and natural selection based on random mutation and the theory that life is the result of the purposeful, intelligent design of a creator." The bill states that references to "evolution" and "natural selection" in science standards at all grade levels will be changed to show that these are unproved theories by adding the phrase: "Describe how life may be the result of the purposeful, intelligent design of a creator."

Montana

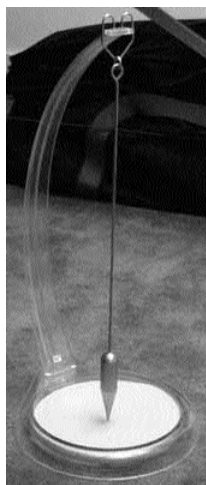
On February 19, 2001, the Montana House Committee on State Administration in a 14-4 vote defeated a bill that would have required Montana's science teachers to present additional theories of origin along with evolution. HB 588 would have changed Montana's present administrative rules in which evolution is taught exclusively. Supporters of the bill wanted to "ensure that children are exposed to all theories of human existence." Many in the state were surprised that the debate was even occurring. The spokesman for the State Office of Instruction, Joe Lamson, said in amazement: "We don't put nonscientific things in a science class."

Mary Patterson is an AGI/AAPG semester intern with AGI's Government Affairs Program. She is a geoscience major at the University of Nevada, Reno.

For more information on the evolution debate, please visit the AGI website at <http://www.agiweb.org/gap>.

The Rattle In Seattle Earthquake As Artist

Norman MacLeod, Port Townsend, Washington



On February 28, 2001, a magnitude 6.8 earthquake, located some 30 miles below the surface of the earth and a few miles away from Olympia Washington, moved the ground for a bit more than half a minute.

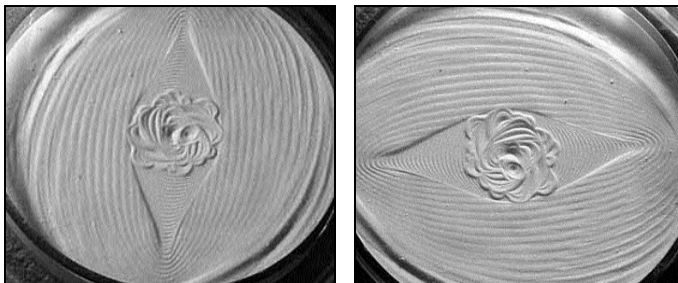
A sand tracing pendulum, located at a shop in Port Townsend called Mind Over Matter, produced some very interesting patterns (Contact: 888-385-3853 or via e-mail at mom@olympus.net.)

Those of us who have performed disaster relief work after major earthquakes don't often think of them as having an artistic bent, but the tracings the pendulum made during this quake demonstrate that they can be rather creative when they have an appropriate tool at hand!

Since originally sending a less fully designed page to a couple of seismologists and a geomorphologist on the evening of the event, these photos have really made the rounds! After hearing from people all over the world, we've decided to provide a bit more information for those of you who are interested.

Mind Over Matter has a source for the pendulums, should you wish to purchase one. Please feel free to contact them, using the above information, for more information.

Here are some of the photos taken shortly after the ground stopped moving:



Photographs by Norman MacLeod, Gaelic Wolf Consulting

The smooth curves you see to the outside of the "earthquake rose" are what you normally see when the pendulum moves according to the laws of Newtonian physics...and without seismic assistance. You can see the patterns left when someone started the pendulum on two separate occasions before the earthquake.

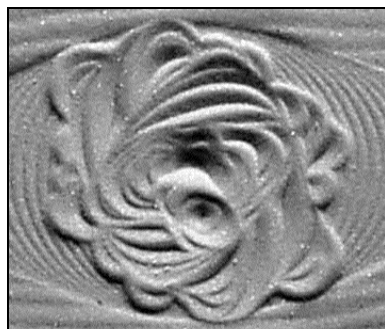
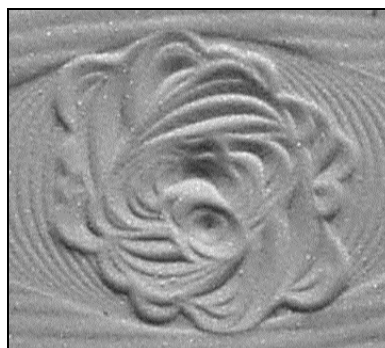
The earthquake's handiwork is the design in the center.

According to one of the geophysicists we sent the photos to, "The images are quite esthetically pleasing. I had not thought about the possibility of creating art in this way."

"The sand preserves two features of the earthquake waves quite nicely. The "flower" in the center records the surface movements associated with the higher frequency waves that arrived first. The outer larger amplitude oscillations record the lower frequency waves that arrived later. I suspect that the axis of these oscillations was almost north-south (ie directed towards the epicenter)."

Of course, once everything started to slow down after the shaking stopped, the pendulum slowed to a stop, gradually "overwriting" the pattern in tighter circles as it moved back to its natural center. If you look at it closely, you'll note that the pendulum was apparently centering in one spot, and then moved a final time to come to rest in a slightly different location. As a result, we're thinking that there may have been a bit of last minute settling in the ground, and there will be an engineer coming to check the building for signs of problems.

The following two images are close-ups of the design made by the quake. The second is contrast enhanced to help you see more detail.



Photographs by Norman MacLeod, Gaelic Wolf Consulting

We've had several positive comments from all over the globe about this unique peek at the effects of an earthquake. We were fortunate to come through this one with as little damage and injury as we did, and we hope you share our sense of awe at what beauty can come from even the destructive forces of nature. Our hearts go out to those whose experience with earthquakes has been far more painful than what we went through with this one.

Norman MacLeod,
Gaelic Wolf Consulting,
Port Townsend,
Washington,

<<http://www.gaelicwolf.com/>>

ABSTRACTS

from the
AIPG 37th Annual Meeting
October 2000 - Milwaukee, Wisconsin
Part 2 of 3

ENVIRONMENTAL CORRECTIVE ACTION

Development of a Monitoring Program for a Phytoremediation System at a Chemical Distribution Facility

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Phytoremediation is an emerging technology in which plants are used to remediate contaminated soil and ground water. Many laboratory and pilot-scale studies have been performed, but relatively few full-scale installations have been constructed. At a chemical distribution site in Milwaukee, a full-scale phytoremediation system was installed to treat contaminated soil in the source (former tank farm) and a portion of the plume of contaminated ground water downgradient of the source. The remedial objectives for the site were threefold:

- Remove residual contamination from soil in the source area.
- Reduce recharge through the soil in the former source area.
- Reduce discharge of contaminated ground water to the Menomonee River.

The remedy consisted of planting deep-rooted hybrid poplar trees in the soil treatment zone (in holes 5 ft deep) and in the ground water treatment zone (in holes 10 ft deep). A major hurdle encountered in designing the remedy was developing a monitoring plan that was acceptable to the regulatory agency for documenting that the remedial objectives at the site were being met. The monitoring program at the site includes annual chemical analysis of soil samples in the soil treatment zone to document decreases of contaminant concentrations in soil; continuous monitoring of soil moisture in the soil treatment zone to estimate the amount of recharge; and continuous water level measurements in the ground water treatment zone to assess uptake of groundwater by the trees.

Monitoring also is being performed to assess the health of the trees. Biweekly site visits are performed to assess the health of the trees. Root growth also is being monitored via clear acrylic access tubes installed in boreholes next to the trees. Pore gas chemistry is monitored monthly to assess the effectiveness of a root aeration system. Soil and leaf tissue samples will be collected on an annual basis to assess whether

soil amendments are required. Environmental monitoring at phytoremediation sites should be tailored to site conditions. The monitoring must document that the remedial objectives are being met and that the trees remain healthy.

Geologic Factors Applied to the Successful Design of In-Situ Environmental Remediation Using Jetting Technology

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In-situ environmental remediation is optimized when geologic factors such as lithology, permeability, porosity, contaminant, soil and ground water chemistry are fully evaluated and integrated into the design and implementation of a remediation program. The largest percentage of environmentally contaminated sites lie on shallow soil and uncompacted soil of alluvial and coastal plains where subsurface conditions consist of complex interstratified sediments. Therefore, a thorough understanding of geologic conditions is critical in designing in-situ remediation processes and in determining the preferred flow pathways and subsequent transportation of contaminants in the subsurface.

Jetting is a remediation delivery technology originally developed over 50 years ago as high-pressure tree-root feeder systems. Improvements and updates in the delivery equipment have allowed jetting to introduce liquids for a variety of chemical and biological processes to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or ground water. The in-situ remediation is accomplished by adding liquids to oxidize, bioremediate, neutralize or precipitate contaminants in the subsurface without digging and handling of the soil or water.

Jetting is usually a more economical and less disruptive to site activities than the more conventional approaches. The main benefits of in-situ remediation systems over conventional methods are the lower final cost for remediation, minimum cost for operations and maintenance, no moving parts that could break and no discharge permits or waste disposal of liquids for in-situ

ground water treatment. The injection holes are then sealed with cement grout or bentonite, as needed. Jetting can be used for both in-situ, as well as ex-situ applications, such as a treating soil piles. Jetting is especially effective in treating localized areas of high contamination, often called "hot spots." Case studies using the Remediation Injection Process (RIP®) will summarize the delivery capability in various soil conditions using oxidation and bioremediation technology. Case studies will feature a variety of contaminants, including gasoline, diesel, tetrachloroethylene (PCE), trichloroethylene (TCE), dichloroethylene (DCE), and toluene.

NOTES: RIP® is a trademark of FAST-TEK Engineering Support Services.

River Sediment Remediation at the Alliant Energy Former MGP Site in Baraboo, WI

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Alliant Energy completed the Baraboo River sediment remediation project in the summer of 2000 with the final grading, seeding, and landscaping of the riverbanks. The project began in the fall of 1998. At that time, the Wisconsin Department of Natural Resources (WDNR) found tar in the sediment behind the Oak Street dam. The WDNR was planning to remove the dam in December 1998, but they were concerned about tar-contaminated sediment moving downstream. They delayed the dam removal for a year.

The WDNR requested that Alliant Energy remove the affected sediment. Alliant is the owner of the adjacent Manufactured Gas Plant (MGP) site thought to be the source of the tar. From the beginning, the WDNR, Alliant, and RMT acted as a team. Alliant and RMT implemented a fast-track investigation to determine the volume of affected sediment. They used vibratory cores and probes to assess the tar in the soft sediment. As a result, they outlined an affected area of about 32,000 sq ft.

The WDNR and Alliant collaborated on setting a reasonable performance standard and on developing remedial design concepts. Alliant removed the tar that would not be buried by at least a foot of unaffected sediment after dam removal. In this way, they met their mutual goals of short-term protection and long-term enhancement of the environment.

Alliant and the WDNR used the same contractor to remove the sediment and the dam. This saved time and money by preventing downtime and by streamlining communications. The contractor started removing sediment in December 1999. They constructed a cofferdam around the target area and then breached the dam. After the river level dropped, the contractor removed the sediment "in the dry", mixed it with fly ash provided by Alliant to improve handling, and disposed of it as a solid waste. They completed the job by removing 4,500 cu yd. of sediment by February 2000.

After the affected sediment was gone, the contractor removed the rest of the dam. This sequencing prevented the

downstream migration of the tar, protected the environment, and kept to the WDNR's dam-removal schedule. No further action is needed.

Enhanced Closure of a TCE Site Using Injectible Hydrogen Release Compound (HRCT)

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Clay-silt soils were contaminated with trichloroethene (TCE) at a former industrial-filter-manufacturing site in Rochester, New York. 2-PHASET Extraction had reduced contaminant concentrations below clean-up criteria, except in the core source area. The regulatory agency agreed to testing of an innovative in-situ technology as an alternative to additional enhancements to the extraction system, and as a last step leading to site closure. Hydrogen Release Compound (HRCT) was injected into the subsurface utilizing Geoprobe direct-push methods. Fifteen months of post-injection data indicate significant decreases in TCE concentrations with corresponding increases, then decreases in daughter product concentrations. Data has shown HRC to still be present 15 months after injection. The regulatory agency has recommended site closure pending the results of the final sampling round.

Hyperspectral Remote Sensing for Environmental Characterization and Corrective Action: International Smelter and Bauer Mill, Utah

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The environmental community has been relatively slow to engage the investigatory capabilities of remote sensing in general for the purpose of site characterization and prioritization. Aerial photography has been used to some degree, but there has been very limited use of spectral data from ground and airborne sensors. Hyperspectral remote sensing technology now is moving from the research to the operational realm, with the potential for application to characterization of environmental study areas, both unreclaimed and reclaimed sites. Hyperspectral data can provide unique and comprehensive analyses of surface materials at such sites that allow better overall analysis of sites and prioritization for corrective action. The ability to spectrally sample an entire study area, not just spot or random samples on the ground, leads to efficient targeting of ground sampling and other studies that typically are done without the benefit of an overall understanding of the site and its sometimes subtle variations.

Work conducted under a NASA Earth Observations Commercial Applications Program (EOCAP) project has focused on the use of hyperspectral data for mineralogical and

vegetation analysis of mine and mill waste areas as a means of identifying environmentally important material differences (different wastes and background versus wastes). This presentation will discuss two study areas as examples of how hyperspectral data can aid in identification of inadequate reclamation of sites and for targeting corrective action at both reclaimed and unreclaimed sites.

The two sites which will be used as examples are the International Smelter complex east of Tooele, Utah, and the Bauer Mill and tailings areas southwest of Tooele. The potential impact of windblown tailings from the Bauer tailings ponds and on-site and downstream impacts of unremediated wastes at International all became topics of interest during our investigations. Ultimately, it was found that the wastes could be differentiated mineralogically from the surrounding background materials and that chemical relationships to mineralogy (potential and actual acid production and potential toxic metals releases) could be established for all these areas. Bauer is releasing windblown tailings off site which have been documented to contain high levels of arsenic. Studies are continuing at Bauer as part of thesis work at CSM. In the International Smelter area, most revegetation has been effective or at least acceptable. However, resurgent sulfidic wastes and other unremediated wastes are damaging flora and fauna and have the potential to impact a downstream community during wet periods. The results of this project can be used by environmental and land management agencies to prioritize further site assessment and eventual remediation activities.

In Situ Remediation of Hexavalent Chromium with Ferrous Iron

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There is an increasing demand for innovative, cost-effective, remedial technologies that can be integrated into risk-based management decisions for contaminated properties. For metals-contaminated soil and ground water the remedial technologies can often take advantage of the chemistry of the metals to achieve reductions in mobility and toxicity by changing the electrochemical properties of the metals. This approach is

illustrated with a former industrial site where chromium contamination of soil and ground water required remedial action.

Chrome-plating began at a Midwestern facility in 1943 and continued until 1995 when the plant was closed. The site is in a river valley filled with about 10 ft of silt and clay over 100 ft of sand and gravel. Public and private water supplies are obtained from the aquifer. Historical practices released chromium to the environment. Unsaturated soil beneath the plating building contained 1,000's of mg/kg of hexavalent chromium (Cr^{6+}). Ground water flow had carried the Cr^{6+} about 3,000 feet from the plant. Concentrations of Cr^{6+} in the ground-water were ≤ 30 mg/L. The mitigation of off-site Cr^{6+} migration was immediately initiated prior to plant closure as an interim remedial action. Six recovery wells were placed at the property line to capture the plume. Peak concentrations in the wells reached 160 mg/L. Pumped water was treated by ion exchange with off-site disposition of regenerant. In the 3 years between 1996 and 1999 the system recovered about 3,300 lbs of chromium.

A state-approved remediation plan for the chromium plume incorporated groundwater use restrictions and monitored natural attenuation for the chromium in the ground water beyond the property line of the facility as long as continued releases from the facility met state groundwater quality standards. The interim chromium pumping system met the objective of stopping releases however, the operation and maintenance cost was relatively high. The closed plating building was demolished, with debris sent to hazardous or solid waste landfills. An amendment to the remediation plan called for the in situ treatment of an estimated 6,000 to 12,000 pounds of Cr^{6+} with ferrous iron to convert the Cr^{6+} to Cr^{3+} . The trivalent form of chromium is essentially non-toxic and under typical environmental conditions immobile as it forms iron-chromium oxyhydroxides. A backhoe and a MITU-12 machine were used to apply ferrous sulfate. Cr^{6+} concentrations were reduced to ≤ 2 mg/kg from 7,500 mg/kg. The treated area was then paved. The solution saved an estimated \$600,000 over excavation and off-site disposal. Ground water concentrations have declined from 160 mg/L to typically less than 0.6 mg/L through 1999. Operation and maintenance costs have decreased by about a factor of eight as a result of the soil treatment. Once ground water goals are reached at the property line (0.1 mg/L) the chromium pumping and treatment system will be turned off.

GEOLOGY'S ROLE IN PROPERTY TRANSFERS AND BROWNFIELD DEVELOPMENT

The U.S. EPA Brownfields Program in the Menomonee Valley

Deborah Orr, USEPA Region V, Brown fields Coordinator

Brownfields sites are abandoned, idled or under-used industrial and commercial facilities where expansion, reuse and/or redevelopment is complicated by real or perceived environmental contamination.

EPA's efforts in Brownfields can be grouped into four broad categories:

- providing grants
- clarifying liability
- building partnerships, and
- fostering jobs.

Federal funding is available at least once a year for a variety of grants including brownfield assessment and demonstration pilots, revolving loan fund pilots and job training. The next request for proposals will appear in the federal register in the next few weeks.

One of Region 5 environmental priorities is to promote sustainable urban development and reuse of brownfields:

- sprawl
- sprawl consequences
- statutory authority.

Other EPA assistance:

- geophysical surveys
- geoprobe
- lab service
- information
- public outreach.

For additional information regarding this and other EPA programs visit our web pages at:

<www.epa.gov/brownfields> or
<www.epa.gov/seahome/resources>.

Ground Water Modeling for the Menomonee Valley Brownfield Project

Charles Dunning, U.S. Geological Survey, Water Resources Division, Wisconsin District

A understanding of the Menomonee River Valley geologic setting is prerequisite to simulating the shallow ground water flow system, which in turn provides a basis for designing an appropriate contaminant sampling program. The Menomonee River Valley (MRV) is the name given to that area of the Menomonee River Valley south and southwest of Milwaukee's downtown. The MRV is the natural outlet of the Menomonee River to Lake Michigan, but since the late 1800's has been altered significantly to meet the needs of the growing city. Today, the path of the river is controlled and the depth of the channel maintained over much of the MRV. A wide variety of industrial activities have been centered in the MRV over the decades, but at present the area is partially abandoned and underutilized. A Brownfields Assessment Demonstration Pilot is underway for the MRV, directed by the City of Milwaukee and in cooperation with the U. S. Environmental Protection Agency Region 5. The goal of the demonstration pilot is to find innovative ways to address area-wide contamination in this once thriving industrial center, and to lay the foundation for its redevelopment.

The geologic setting of the area of southeastern Wisconsin containing the Menomonee Valley is that of unlithified Pleistocene and Holocene deposits overlying Silurian bedrock. The pre-Pleistocene topography (top of the Silurian Niagara Dolomite) of the study area is defined by a valley with relief of about 100 to 150 ft. The distribution of the Pleistocene glacial deposits, which fill the valley is controlled by both the pre-Pleistocene topography, and the extent of specific glacial environments. Glacial deposits are comprised largely of tills and pro-glacial lake deposits. The pre-Holocene topography of the valley has relief of about 75 ft. The deposition of Holocene

estuarine and alluvial sediments occurred within this well-defined valley. The natural topography of the valley has been altered in the last century by man's activities. The bluffs along the valley have been cut and reduced in many places, and natural and man-made fill has been added to large areas of the valley.

The Wisconsin District of the U.S. Geological Survey has developed a one-layer, steady-state, analytic element model to simulate flow in the Holocene sediments comprising the shallow aquifer in the MRV. Simulation of the shallow groundwater flow system considers the hydrogeology of the unlithified Holocene sediments, the interaction of ground water and surface-water features, and the presence of the Milwaukee Metropolitan Sewer District Inline Storage System (ISS) constructed in the Silurian dolomite underneath the valley. Model simulations suggest that the presence of the ISS influences shallow groundwater flow in a significant portion of the valley. Recharge falling on the Menomonee Valley will ultimately discharge to the ISS or surface-water features within the valley.

Smart Growth for the Menomonee Valley

Brian Reilly, City of Milwaukee, Menomonee Valley Redevelopment Project Manager

These days, urban sprawl continues to put development pressures on farmland and natural areas on the far exurban edge, while at the same time, other challenges leave an increasing amount of urban land underused. The results create social, economic and environmental drains. "Smart Growth" seeks to yield multiple benefits from re-using urban land, developing within existing infrastructure and allowing existing open space to remain undeveloped.

The Redevelopment of the Menomonee River Valley, historically used for manufacturing, seeks to re-use this urban land and bring it back into productive use. Land reuse strategies include changing common perceptions as well as reducing technical and financial hurdles. Redevelopment strategies include construction techniques, including "green building", cleaner production processes and day-to-day environmental management systems to ensure we do not create the next generation of brownfields on recently-cleaned land. Other efficiencies and benefits gained from this deliberate kind of redevelopment include less air pollution from commuting workers when work is closer to where workers live, cost savings to business from pollution prevention, avoided disposal and environmental compliance costs, among others.

Smart growth can build more competitive companies and create more livable communities. The redevelopment of the Menomonee River Valley seeks to demonstrate many such practices in one place to serve as a real-world demonstration of the viability of these and other best practices and the role of the public, non-profit and private sectors in bringing them about.

More information about the Menomonee Valley Redevelopment can be found at <www.mkedcd.org/valley/>.

The “Hillside Strangler” Project: A Case Study of Preliminary Environmental Site Assessment and Hazard Analysis Techniques for Expedited, Large-Scale, Infrastructure Planning.

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The day after he was sworn in as the Governor of the State of Illinois, George H. Ryan announced an ambitious plan to alleviate a traffic snarl in a portion of the western Chicago suburbs known locally as the “Hillside Strangler.” This election promise to commuters became the top-priority transportation infrastructure project for Governor Ryan’s administration and is slated for completion by January of 2002. This fast-track project addresses what is nationally recognized as one of the worst expressway traffic-congested areas in the United States. The “Strangler,” given its name because of a bottleneck of expressways, involves the interchanges of the I-290/Eisenhower Expressway with the I-294/ Tri-State and I-88/East-West Tollways near six communities, including major portions of Hillside, Westchester, and Bellwood. U.S. Routes 12/20/45 (Mannheim Road) and Illinois Route 38 (Roosevelt Road) also intersect within this project area. Under an inter-agency contract, potential hazardous material and natural hazard associations are investigated for potential Illinois Department of Transportation (IDOT) projects statewide by the Illinois State Geological Survey (ISGS). The resulting preliminary environmental site assessment report provided to IDOT by the ISGS for the “Hillside Strangler” was completed in less than half the time normally allotted a project of this scope. Streamlining assessment techniques were applied in both background research and field screening areas. This information was provided on deadline to assist IDOT in planning the land acquisitions from about 77 properties (\$15 million) and to help insure the efficient construction of this \$140 million infrastructure project.

Planning Successful Risk-Based Corrective Actions at LUST and SRP Sites in the State of Illinois

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The Illinois Environmental Protection Agency (IEPA) has adopted a unified approach to determining risk-based remediation levels for contaminants in soils (e.g., “how clean is clean”). The approach was promulgated as a regulation in 1997 as Chapter 742 of Title 35 of the Illinois Administrative Code titled: “Tiered Approach to Corrective Action Objectives” and is generally known as TACO. All remediation programs in the IEPA Bureau of Land, including the Leaking Underground Storage Tank (LUST) Program and the Site Remediation Program (SRP) use the TACO approach to determine soil cleanup objectives. The LUST Program and the SRP are the primary state environmental programs controlling property transfer and brownfield development.

Many of the initial projects reviewed under the TACO regulation involved what is known as a ‘Tier 1’ or ‘lookup table’ approach to determining soil cleanup levels and did not require the knowledge of, or use of geological or hydrogeological information. As most of the ‘simple’ sites have now been addressed, many of the current sites involved in property transfer or considered for brownfield development require ‘Tier 2’ or ‘Tier 3’ analyses. The TACO regulation allows two general algorithmic approaches to be used in determining Tier 2 or Tier 3 soil cleanup levels. These are: 1) the USEPA’s Soil Screening Level calculations, and 2) the ASTM’s Risk-based Corrective Action (RBCA) calculations. Both of these approaches require site-specific geological and hydrological information.

This presentation gives a short description of the Illinois TACO regulations with respect to the role of geological and hydrogeological information in developing risk-based soil cleanup objectives and discusses the sensitivity of soil cleanup levels to geological and hydrogeological information through the use of case studies. The authors discuss insights into what the IEPA regulators consider to be important aspects of a TACO analysis – insights gained from preparing and gaining the approval of over 20 TACO projects. Finally, the authors present what has evolved as an efficient approach to obtaining and using geological and hydrogeological information in the TACO process.

The Milwaukee Art Museum Expansion: Environmental Challenges and Solutions in Urban Shoreline Redevelopment

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The Milwaukee River and Lake Michigan shorelines are the focal point for much of the exciting redevelopment occurring in the downtown area. Many of these properties were created at the turn of the century on wetlands and by extending shorelines with a variety of fill and waste materials. These wastes can present major impediments to redevelopment when excavations are required for building foundations and below-ground floor levels. The management of waste materials, soil and ground water had major implications on the site development for the Milwaukee Art Museum Expansion project, which is funded exclusively through private donations.

The expansion project required excavation of more than one hundred thousand cubic yards of fill, foundry sand, and miscellaneous waste materials for the building footprint. During the project planning phases, waste materials were discovered that could potentially be classified as hazardous, due to elevated lead concentrations.

A sampling strategy was developed based on protocols recognized under Wisconsin Department of Natural Resources hazardous waste rules to re-characterize and ultimately manage excavated waste within the confines of the site and an adjacent approved location. This approach resulted in significantly lower costs by avoiding hazardous waste management costs and allowing re-disposition of the material on-site rather

than at a solid waste facility. As a result, original cost estimates for management of the fill material at an off-site location were reduced on the order of \$1 million.

Dewatering within the building footprint area was also required due to high ground water elevations relative to foundation elevations. Ground water impacted by heavy metals and petroleum hydrocarbon precluded discharging from the dewatering areas directly into Lake Michigan or the harbor area. Barrier sheet piling with special enhancements was used to reduce long term discharge flows to the Milwaukee Metropolitan Sewerage District with a savings on the order of \$2 million compared to on-site treatment and/or off-site transport. Overall, potential environmental costs were significantly reduced through up-front planning, agency flexibility, and continued cost control during construction by working closely with the construction manager in a shared responsibility role.

Soil and ground water management practices and applicable regulations which are sensitive to development needs; locating and permitting alternative fill disposal locations; and cost control practices implemented by the project team will be discussed.

Wisconsin Brownfields Programs and the Role of the Geologist

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Wisconsin has an estimated 18,000 contaminated sites, with 8-10,000 of those sites potential brownfields. Brownfields are abandoned or underused properties with real or perceived contamination. Remediation and redevelopment of these properties have presented interesting challenges for owners, developers, municipalities, and state and federal regulating agencies. Wisconsin has responded to the challenges presented by these sites through legislative and programmatic changes over the last six years. This has resulted in legal and financial incentives, improved technical regulations and policies, and increased public/private partnerships. It does appear that many difficult sites are moving forward and solutions are being found where none previously appeared to exist.

The Wisconsin Department of Natural Resources has a variety of tools available to help assist with clean up and redevelopment of brownfields sites. These tools include liability clarification letters, liability exemptions from the state Spill Law, funding for assessment and clean up, and programs for local governments and voluntary parties. The DNR's brownfields staff can provide technical, financial, and public education assistance to help owners and environmental consultants put together a remediation and redevelopment package. Efficient yet thorough site investigations remain an essential part of any brownfields project, as illustrated by a couple of local examples.

Refining a Petroleum Tank Farm— The River Bend Business Park Project

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The City of St. Paul is healthier, in a sense, because another brownfield in its midst has become a marketable property. The cleanup of contaminated soil at a former petroleum tank farm metamorphosed the un-usable property into a viable commercial locality now called the River Bend Business Park. The brownfield site encompassed approximately 22 acres of land located west of downtown St. Paul, Minnesota along the Mississippi River. Formerly owned by Citgo Petroleum Corporation, it was the home of a bulk petroleum facility since 1947 and had as many as 20 above-ground storage tanks (ASTs) and a dozen underground storage tanks (USTs).

Use of the site as a tank farm left considerable pollution, mainly in the form of petroleum contamination in the soils from leaks and spills. Other pollutants in the soil included lead and asbestos-containing materials. In addition, drums of tank bottom waste sludge had been buried throughout the site. In a fortunate set of circumstances, the silt and clay river sediments, typical of this area, provided some containment of pollutants, preventing them from significantly impacting the ground water.

The Saint Paul Port Authority, current owners, indicated work on the site had to focus on the attainment of three critical goals: removing heavily contaminated soil from the site, eliminating concerns for vapor migration into buildings and direct exposure of future site users, and preparing the site geotechnically for future deep foundation construction. However, the biggest problem was how best to identify and manage the vast amount of contaminated soil located on the land.

American Engineering Testing, Inc. (AET) identified soil and ground water contamination concerns and assessed its horizontal and vertical extent. This work also characterized the site soil conditions as being comprised of fill materials overlying interbedded layers of silt, clay, and peat and then competent bedrock. As it was not financially feasible to excavate the soft alluvial soils, consideration was given to a deep foundation system of piling to support future building construction.

Ultimately, a sizeable volume of soil had to be relocated and/or removed. Approximately 150,000 cubic yards of petroleum-contaminated soil, roughly 3,100 cubic yards lead-contaminated soil and 65 drums of tank bottom waste oil were excavated and disposed at local landfills. Finally, about 6,250 cubic yards of asbestos-contaminated soil were excavated and relocated on site for treatment.

AET approached the project with aggressive, innovative strategies and tactics that made the project a success from all perspectives. Employing on-site testing with immunoassay techniques was one example, while another tactic was the presentation of an alternative plan to the Minnesota Pollution Control Agency (MPCA) for handling asbestos-contaminated soil.

Originally, the MPCA prescribed costly transfer of this soil to a landfill. AET proposed on-site management based on the vast amount of soil involved and test results showing that the level of contamination could be safely dealt with according to its alternate approach. The proposal was accepted by the MPCA and marks one of the first sites in the state of Minnesota where this type of contamination was successfully remediated in this manner.

Because the business park is on the river, final cleanup activities included placement of 12 feet of fill over the site to finalize grade above the 500 year flood plain level.

The River Bend Redevelopment is Saint Paul Port Authority's fourteenth brownfield-to-business-center project and represents a powerful means of revitalizing the St. Paul metropolitan area. There are two potential buyers, both with the ability to bring as many as 600 new jobs to the business park and defining River Bend as the next inspiring story of rebirth in the city.

The Onikul Property/City of Baraboo Public Works Facility: A Brownfield Project Case Study

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Brownfield redevelopment is a multi-dimensional process involving many aspects far beyond the scope of a typical geological investigation. The environmental professional for this project needed to exercise facilitation, negotiation, grantsmanship, and public relation skills as well as the typical scientific technical abilities in remediating contaminated property.

In 1997 the City of Baraboo, Wisconsin (population 10,000) identified an underutilized, blighted property of approximately 7 acres as a possible location for a new public works facility. The city was concerned about potential liabilities associated with the sites previous use as a former railroad roundhouse and scrap yard. An environmental site investigation revealed soil and ground water contamination from volatile organic compounds, lead and polynuclear aromatic hydrocarbon compounds. Remediation costs could have potentially eliminated the site from further consideration as the new public works facility. Through meetings with state regulatory agencies, commerce officials, and the city and its environmental professionals, a plan was developed that would allow

for capping and redeveloping the site without active remediation of most of the contamination. The city applied for various brownfields grants through the Department of Commerce and Department of Natural Resources to defray the costs of the required remedial activities. Construction of the new public works facility is scheduled to begin in Fall 2000. Remedial activities will be performed concurrent with construction.

Brownfield Redevelopment: Two Wisconsin Case Studies

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Development for an effective approach for the redevelopment of a brownfield site requires an understanding of site geology and environmental quality, as well as project timing, potential funding sources, and redevelopment goals. Through two case studies these aspects of redevelopment will be discussed for two sites in Wisconsin: a mostly vacant suburban strip mall and an underutilized downtown property in a redeveloping area.

While the contaminants of concern are the same for both sites, selection of remediation approaches and subsequent redevelopment has been strongly influenced by the geologic conditions and funding mechanisms. For the strip mall site, the selection of the remedial approach was primarily geology-based. Geology of the strip mall site consists primarily of a silty clay glacial till with a continuous sand unit of varying thickness. The presence of a saturated conductive unit allowed the successful use of an innovative in-situ remedial technique, which was more cost-effective and produced results more quickly than conventional techniques. Like the strip mall redevelopment, site geology will influence the site redevelopment approach of the downtown property. Geology of the downtown property is dominated by fill materials, sandy silt/silty sand, and clay. Site geology and a shallow ground water table will limit remedial options. Funding mechanisms were instrumental in project redevelopment at both sites and included the creation of tax incremental financing (TIF) district, state tax incentives, and state funding programs.

By combining environmental remediation and site redevelopment efforts, the mostly vacant suburban strip mall has been redeveloped into a newly constructed strip mall. While the underutilized downtown property has not been physically redeveloped, the foundation for redevelopment has been laid.

AIPG/AEG JOINT ANNUAL MEETING

September 30 - October 7, 2001

"Geology: Central to Society's Needs"

The Missouri Section of AIPG and the St. Louis Section of AEG have joined forces to bring together our two organizations for the first ever joint annual meeting. Tentative events include:

Fields Trips - The New Madrid Seismic Zone; Ozark Plateau Karst Features; and an Underground Mine trip to the Viburnum Trend Lead-Zinc Mining District.

Spouse/Guest Tours - Missouri Wine country; The world-famous Missouri Botanical Gardens; The Gateway Arch and the Jefferson Expansion National Monument; Forest Park, site of the 1904 World's Fair; and many other St. Louis and Missouri sights.

Joint Awards Banquet and Society Activities

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For more information: <www.aipg.org> or (303) 412-6205

MORE PERSPECTIVE ON REGISTRATION

William J. Siok, CPG-04773



Philosophically, it's not difficult to appreciate the perspective of some of our professional colleagues who oppose registration. Their thoughtful arguments harken to a time (not too long ago) when all geologists either found careers in resources exploration and development or in academia. However, the world of professional geology, like so many other professions, continues to experience radical change. Registration, like it or not, is here to stay. AIPG's job, in the face of it, is to make certain that as new states enact legislation, the best interests of the geologists, as well as the public, are taken into consideration.

There's a rather subtle aspect of registration and its consequences, which is nettlesome. In states where registration has already been enacted, the statutes provide exceptions for practitioners of geology who specifically wish to be excluded. These are primarily petroleum geologists, those in extractive industries, academics, and government employees. This leaves a rather narrow group of geologists falling under the requirements. (Of course, those who are exempt from registration requirements do have the prerogative of registering should they desire.) The nettle is in the fact that a few who are adamantly opposed to registration don't necessarily appreciate

the necessity of registration for those who support it.

For the rather large number of practitioners who earn their bread and butter by working side-by-side with our civil engineer colleagues, licensure is one mechanism which allows geologists to be accorded the same recognition (legal, professional, and public) as our more numerous engineering colleagues. Those of you who have recently been associated with successful registration efforts, or who are engaged now, are especially close to the daily issues partially addressed by registration.

It's certainly appropriate to promote the view, which is contrary to registration, our entire political system is after all predicated upon freedom of expression. But I would like to prevail upon those geologists who don't support registration of geologists to at least refrain from thwarting efforts to enact legislation. For those geologists who are convinced it's the wrong way to go, I suggest you get involved in the early efforts to craft the language of proposed registration bills so that your particular concerns can be taken into consideration. It strikes me as somewhat short-sighted and perhaps self-centered to oppose an activity which, among other benefits, will contribute to the availability of employment opportunities for many geologists. (Yes, I have heard, and do not dismiss, arguments that registration is in essence a restriction on trade in the professional services. I also believe that we professional geologists must do what is necessary legally to secure a place for the practitioner of the future.)

Overall, I prefer to believe that the issue of registration will not continue to be a wedge between segments of the geologic community. I would encourage geologists who have a deep-seated philosophical opposition to provide constructive support to those who see no alternative but to devise the best legislation to serve both the public and the profession.

Free Posters and Flyers

Thanks to AGI, AIPG has, for distribution, colored 8½ x 11 flyers announcing Earth Science Week 2001. If you are able to use some of these announcements, or know an educator or other interested individual or group who would have an interest, please contact AIPG headquarters for details. The announcements are available at no cost.

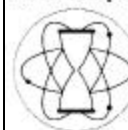
Also, AIPG has a beautiful educational poster, created by AGI, entitled "Minerals - Foundations of Society." The poster has a colorful collage on one side and some mineral picture/word associations on the reverse side. The poster is designed to be an introduction to the wide use of rocks and minerals in basic everyday life. These are also available for educational use and at no cost. **NEW KARST POSTER AVAILABLE!** Please contact headquarters for details.

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Monthly review prepared by Margaret Baker, David Applegate, MEM-0002, AGI Government Affairs Program, and AGI/AAPG Geoscience Policy Intern Mary Patterson

FEBRUARY 2001

- Comprehensive Energy Legislation Introduced in Senate
- Science Faces Uphill Budget Battle
- Threatened Cut to USGS Sparks Strong Response
- Evolution Returns to Kansas; Other States Face Issue
- New National Monuments To Remain, Face Revised Management
- Second IPCC Report Focuses on Climate Change Impacts
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Comprehensive Energy Legislation Introduced in Senate

On February 27th, Senate Energy and Natural Resources Committee Chairman Frank Murkowski (R-AK) formally introduced the National Energy Security Act of 2001 (S.388 and S.389), calling it "the starting point for what will be an important debate during this session of the 107th Congress." The pair of bills, cosponsored by twelve senators, including Sen. John Breaux (D-LA) as the lone Democrat, aim to decrease the nation's reliance on foreign oil to 50% by 2011 through a suite of policy changes. Press attention has focused on the proposed opening of the Arctic National Wildlife Refuge (ANWR) for oil exploration. Several senators have already expressed their opposition to any energy bill that includes petroleum exploration in ANWR. Other provisions in S. 388 and S. 389 include tax incentives for domestic oil and gas production, measures to expedite construction of gas pipelines, measures to promote energy conservation, incentives for research and development into "clean coal" technology, and many others addressing a range of energy sources. S. 388 contains the entire energy package and was referred to the Energy and Natural Resources Committee. S. 389 contains only the tax provisions and has been referred to the Senate Finance Committee. Because Vice President Cheney's task force is expected to spend several months developing the administration's energy proposal, Senate Majority Leader Trent Lott (R-MS) has indicated that full Senate action on these bills will not take place before the summer. A PDF file of the full text of the National Energy Security Act of 2001 can be viewed at <http://www.senate.gov/~murkowski/pdfs/NatEnergySecurityAct.pdf>. A section by section summary is available at http://www.senate.gov/~murkowski/pdfs/section_by_section.pdf.

With the California energy crisis still in full swing, energy policy has been the subject of numerous congressional hearings. The House Subcommittee on Energy and Air Quality held a hearing February 15th to compare the market structure of

different states that have deregulated electricity markets. On February 27th, the same subcommittee held the first in a series of hearings focusing on different energy resources, beginning with natural gas. Subcommittee Chair Joe Barton (R-TX) stated that the hearings would lead to the development of comprehensive energy legislation. The hearing record is being submitted to the Cheney task force. More at <http://www.agi-web.org/gap/legis107/energy.html>

Science Faces Uphill Budget Battle

An AGI Special Update on February 28th reported on the release of President Bush's budget outline for fiscal year (FY) 2002. Entitled "A Blueprint for New Beginnings: A Responsible Budget for America's Priorities," the document only reveals funding levels for broad budgetary categories and for agency totals. Detailed numbers will be provided on April 3rd. The special update inadvertently left out NASA, which is slated for a 2-percent increase over FY 2001 levels to \$14.5 billion. The web version of the special update contains NASA-related language from the President's proposal: <http://www.agi-web.org/gap/legis107/bushbudget0201.html>.

As previously reported in the Wall Street Journal, the president's budget proposal limits the National Science Foundation (NSF) to a one-percent increase over FY 2001 with "no new starts or major facility projects in 2002." In response to an AGI alert, many geoscientists have written to the White House Office of Management and Budget (OMB) expressing their concern over the below-inflation increase, which would further delay implementation of the Earthscope project. AGI has again signed on to a statement by the Coalition for National Science Funding — a network of over 70 scientific and engineering societies and university associations — in support of doubling the NSF budget over the coming decade. The statement is available at <http://www.cnsfweb.org>.

The release of the president's budget plan is the starting gun for the congressional budget season. Both the House and Senate Budget Committees have begun work on the allocations for appropriations and other government spending. While praising the president's overall goals of tax cuts and limited spending, Senate Budget Committee Chairman Pete Domenici (R-NM) cautions that the budget request does not provide adequate support for key programs. For his part, Bush has threatened to veto any appropriations bill that exceeds his budget numbers. Let the games begin.

Threatened Cut to USGS Sparks Strong Response

Many thanks to the more than 200 geoscientists who have copied us on letters to Interior Secretary Gale Norton and OMB Director Mitchell Daniels opposing large cuts to the USGS budget. These letters make a strong case for the value of the Survey's work and demonstrate that the USGS has a vocal constituency. No specific numbers were provided for USGS in the president's budget outline, but it does propose to "better target" USGS programs to support other Interior

Department bureaus. The specific numbers for USGS will not be released until April 3rd. If you have not sent a letter yet, you can still have an impact. A sample letter and contact information are available as part of the alert at http://www.agiweb.org/gap/legis107/usgs_alert0201.html.

Evolution Returns to Kansas; Other States Face Issue

In a February 14th valentine to good science, the Kansas State Board of Education voted 7-3 to reinstate the teaching of biological evolution and the origin of the Earth into the state's science education standards. With this vote, the board adopts science education standards that nullify the controversial 1999 standards, which had de-emphasized evolution and removed the age of the Earth and Big Bang theory from teaching requirements. The Kansas Science Education Standards include teaching guidelines for all grades. The introductory statement, the eighth grade standards, and the twelfth grade standards include specific reference to students understanding biological evolution, the significance of fossils, the geologic time scale, and theories regarding the origins of the Earth. Although the board's favorable vote has been applauded by many science organizations, the Kansas board has received many complaints from those opposed to the new standards. Geoscientists, especially those residing in Kansas, are encouraged to thank those school board members who voted for the new standards: Board Chairman Sonny Rundell, Vice Chairman Janet Waugh, Bruce Wyatt, Sue Gamble, Carol Rupe, Bill Wagon, and Val DeFever. Their contact information is at <http://www.ksde.org/commiss/bdaddr.html>. The new standards can be viewed at <http://www.ksbe.state.ks.us/>.

On February 19th, the Montana House Committee on State Administration voted 14-4 to defeat a bill that would have required Montana's science teachers to present additional theories of origin along with evolution. House Bill (HB) 588 would have changed Montana's present administrative rules in which evolution is taught exclusively. Supporters of the bill want to "ensure that children are exposed to all theories of human existence." Many in the state were surprised that the debate was even occurring. The spokesman for the State Office of Instruction, Joe Lamson, said in amazement: "We don't put nonscientific things in a science class."

A bill introduced this month in the Georgia state legislature seeks to amend the official state code to reform the teaching of "scientific theories of the origins about life and living things." The final section of the bill (HB 391) repeals all laws in conflict with it, presumably including the Constitution.

New National Monuments To Remain, Face Revised Management

Secretary of the Interior Gale Norton has stated that she will not seek to overturn any of the national monument designations created by President Clinton. In a Washington Post interview, she criticized the previous administration for moving too quickly: "The monument designations were more show than substance. We now have to provide the substance." She has pledged to work with state and local governments as well as landowners to ensure that the monuments are managed to suit local needs and circumstances. On Capitol Hill, House Resources Committee Chairman James Hanson (R-UT) sent a letter to encourage House members who are unhappy with monuments in their districts to draft legislation challenging

the designations. More at <http://www.agiweb.org/gap/legis107/natmon.html>.

Second IPCC Report Focuses on Climate Change Impacts

On February 19th, the Intergovernmental Panel on Climate Change (IPCC) released a Summary for Policymakers (SPM) of its second report in the ongoing Third Assessment. Prepared by IPCC Working Group II, this report focuses on potential effects of climate change on ecosystems, water resources, and human systems (energy, industry, financial services, and health), as they are presently understood. All 100 IPCC member countries approved the SPM, which notes the difficulty of separating changes caused by land-use alteration, pollution, and increasing human population from changes caused by global warming. Other uncertainties relate to the future responses of human and natural systems to climate change and the rate at which change occurs. Many of the consequences of global warming will provide improvements in some regions while worsening conditions elsewhere. It is unclear how much the beneficial changes that occur in one region or season will offset damages that occur in another region or at a different time of the year. The report recommends that further research include complete regional studies of the effects of climate change. The full SPM can be downloaded from <http://www.usgcrp.gov/ipcc/wg2spm.pdf>. AGI's update on this topic provides more information on how IPCC creates its reports: <http://www.agiweb.org/gap/legis107/climate.html>.

Working Group I released their SPM detailing the state of climate change science in January. Working Group III is slated to release their summary, which focuses on actions that can be taken to mitigate the impacts of climate change, in early March. Reuters reports that the third report "predicts that if international governments implement measures to limit carbon emissions, the oil and coal industries could be 'forced into decline'."

According to EPA Administrator Christine Todd Whitman, the Bush Administration recognizes that problems associated with global warming are real. She said, "while scientists can't predict where the droughts will occur, where the flooding will occur, or when, we know they will occur. The science is strong there." As for emissions control, Bush may support regulating power plant emissions of carbon dioxide under a "multi-pollutant" approach to the Clean Air Act.

Brownfields Breakthrough on the Horizon?

On February 27th, the Senate Subcommittee on Superfund, Waste Control, and Risk Assessment held a hearing on The Brownfield Revitalization and Environmental Restoration Act of 2001 (S.350). The popular bill encourages assessment and cleanup of brownfield sites through revolving loan funds, grants, enhancement of state programs, and non-liability measures to protect landowners. Brownfields have historically been included in Superfund legislation, but S.350 allows the lower toxicity sites to stand alone. A similar bill last Congress got stuck in committee because some felt that the legislation should be part of broader Superfund reform. In her debut performance before the committee as EPA Administrator, Christine Todd Whitman announced that the Administration supports S. 350: "Brownfields clean-up is an important redevelopment tool that provides an alternative to development of greenfields." With 67 co-sponsors in the Senate and support from the

Administration, S.350 may break through legislative gridlock this session. A full committee vote is scheduled for the coming week. The House Energy and Commerce Committee also has pledged to take up the brownfields issue. More on the hearing at http://www.senate.gov/~epw/super_107.htm.

Report Notes Importance of Science for National Security

The U.S. Commission on National Security for the 21st Century — a congressionally mandated commission to review the nation's security structure — stresses the importance of basic science research and education. In its final report, "Road Map for National Security: Imperative for Change," the commission states: "Our system of basic scientific research and education are in serious crisis, while other countries are redoubling their efforts. In the next quarter century, we will likely see ourselves surpassed, and in relative decline, unless we make a conscious national commitment to maintain our edge." Chaired by former senators Warren Rudman (R-NH) and Gary Hart (D-CO), the bipartisan commission makes a series of recommendations and reforms that the government should take into account to better address the nation's future security. More information on the commission is available at <http://www.nssg.gov>. A summary of the report and recommendations are available from the American Institute of Physics at <http://www.aip.org/enews/fyi/2001/>.

Special Update on New Faces in Congress, Administration

AGI sent out a Special Update on February 10th summarizing the recent changes in leadership in Congress and federal agencies. Many of the key players on issues affecting the geosciences have changed in both Congress and the Administration. This special update provides a snapshot of the new leaders. Freshly confirmed Secretaries of the Interior and Energy are in place along with the new EPA Administrator, but virtually all non-Cabinet level appointments are still waiting to be filled, including the president's science advisor and NOAA Administrator. In the House of Representatives, a six-year term limit for committee chairs, set in 1995 when Republicans gained the majority, has resulted in a sizeable turnover. The Senate has experienced less change in terms of committee chairs, but the even split between the parties has led to numerous shifts in committee procedures and assignments. See http://www.agi-web.org/gap/legis107/newfaces_update0201.html.

Since the update, the Senate unanimously confirmed Joe Allbaugh as Director of the Federal Emergency Management Agency (FEMA). In the previous administration the FEMA director was elevated to Cabinet status, but it is not known if President Bush will do the same. Less than two weeks into his tenure, Allbaugh was sent to Seattle, WA, to assess the damage of the magnitude 6.8 earthquake that hit the area on February 28th causing upwards of \$2 billion in damage but very few casualties.

Schedule of Upcoming GAP Activities

- May 1-2, SET Congressional Visits Day, Washington DC
- May 3-4, AAAS Colloquium, Washington DC

New Material on Web Site

The following updates and reports were added to the Government Affairs portion of AGI's web site <http://www.agi-web.org> since the last monthly update:

- Climate Change Policy Update (3-2-01)
- Energy Policy Update (3-2-01)
- Arctic National Wildlife Refuge (ANWR) Update (3-1-01)
- Geotimes Political Scene: Confronting Natural Disasters (3/01)
- Special Update: President Bush Releases Fiscal Year 2002 Budget Blueprint (2-28-01)
- Public Land Issues Update (2-18-01)
- Challenges to the Teaching of Evolution Update (2-20-01)
- NRC Report Summary: Future Roles and Opportunities for the U.S. Geological Survey (2-18-01)
- NRC Report Summary: Basic Research Opportunities in Earth Science (2-18-01)
- National Forests Roadless Initiative Update (2-18-01)
- Action Alert: Bush Administration Threatens Major Cut to USGS Budget (Posted: 2-17-01)
- Special Update: New Faces in Congressional and Administration Leadership (2-10-01)
- List of Expired or Expiring Geoscience Related Authorization Bills (2-7-01)
- Geotimes Political Scene: The Road Ahead (2/01)
- Senate Hearing on California Power Crisis (2-2-01)

Sources: American Geophysical Union, American Institute of Physics, Associated Press, EENews, Greenwire, Intergovernmental Panel on Climate Change, Reuters, U.S. Senate, White House.

UPDATE AIPG Web Site

The AIPG web site has a new look <www.aipg.org>. Check it out! The site now includes a new feature called "Geology In The News" which is changed daily and links to current news items. Also added are links to rental car agencies, travel arrangements, insurance, and maps. The new drop down menu has links to members web sites, member resumes, section web sites, 2001 Annual Meeting information, and more. If you have any comments or suggestions for improving the web site please contact the National Headquarters office at <aipg@aipg.org> or (303) 412-6205.

Compiled by David M. Abbott, Jr., CPG-04570, Ethics Committee Chairman, 2266 Forest Street, Denver, CO 80207-3831, 303-394-0321, fax 303-394-0543, DMAgeol@aol.com



Does Using Out-of-date Methodology Constitute Malpractice? (Column 62, Mar '01)

I received two comments on this topic. Before getting to them, I want to restate that **Steven P. Maslansky**, CPG, felt constrained in making his original comments by some confidentiality considerations and the focus on curve analysis resulted from my interpretation of the facts presented, not from

Maslansky. Maslansky informed me that his "original concern was with using the wrong methodology (*i.e.*, analytical method for determining aquifer characteristics in an unconfined aquifer versus a confined aquifer), not hand plotting versus computer plotting." The following comments address hand versus computer plotting, a legitimate topic. If anyone has comments on changes in analytical methods for determining aquifer characteristics and the use of old versus new methods, those would be most welcome.

Perry H. Rahn CPG, commented, "The March issue of *TPG* contained a note by Steven Maslansky. I don't think it is necessarily malpractice or unethical to use 15-year old methodology. It all depends. Of course a physician should be up-to-date when prescribing drugs because of constantly changing knowledge of side effects, etc. But the case cited here involves the analysis of drawdown around a pumped well. The old fashioned method is by plotting drawdown vs. time on log-log paper, superimposing this on a Theis type curve, and using equations to determine transmissivity (T) and storativity (S). This curve-matching is done manually, best fitting (by eye), so there is some operator variability. The new method is to enter the drawdown/time data into a computer program (such as AQTESOLV) and the computer solves for T and S. But the computer is not necessarily better. For example, if the data is manually plotted and a couple points show to be off the general curve, it may be because some error occurred during the pump test. Perhaps a different tape was used, or a new man came on duty and measured drawdown from the ground instead of the top of the casing. These odd points can then be eliminated during the curve matching. But the computer uses all data unless instructed otherwise. My point is that using 15-year-old techniques is not necessarily wrong, and wouldn't constitute malpractice or be unethical."

Robert A. Hall, CPG, wrote, "In response to the issue raised in your column by Steven P. Maslansky. From what you excerpted from Mr. Maslansky's letter it appears that his opinion is that the 'old' curve matching techniques are no longer a valid form of interpretation for aquifer evaluation. His comments seem to imply that the 'new' computer generated methodology is better.

"In response, there are two points to be made. The first point is the thought that 'a computer program' somehow contains better science than manual techniques of data analysis.

Computer programs use approximations of standard formulas for data evaluation. The primary explanation for this is that a computer is just a very fast adding machine. An approximation is required, because it is not possible to solve the integral equations required for precise solutions to complicated mathematical equations by simple addition and subtraction. A 'good' computer estimation of the complicated equations can be achieved, because the number of calculations that can be completed in a short time is so immense. This does not mean that a computer program provides 'better' analysis of the scientific problem than the 'old' manual techniques. What computer programs can provide is better illustrations of data by various graphical techniques, which in the old days, '10 to 15 years ago', could only be achieved through time consuming and expensive drafting methods. I would comment that the use of 'old' manual method is not unethical provided the data has been collected properly and the methods applied correctly.

"The second point is an issue of money. Mr. Maslansky's comments do not indicate the amount of the budget allowed by the land developer for the first evaluation. Anyone who has worked with clients for any length of time has had at least one client that underestimates the amount of effort involved to provide a complete evaluation of a complex problem. I can remember several clients, which when provided an estimate of the cost for a project only authorized a small portion of the expenditure. In order to get the work I, like many other professionals, completed an evaluation, within the budget and time constraints allowed, delivering the best result possible. In some cases, the more general evaluation was successful for the client and in other cases, the client did not achieve his goals based upon the limited evaluation.

"I have been sued for incompetence by a client that limited the budget. When I was sued, the client did not like the results of a low budget general evaluation. The fact that the client asserted that I was incompetent did not mean that I did an incompetent job, it only meant that the client did not like the outcome. I would comment that in a commercial application of geologic knowledge there will be time and budget constraints that may prevent collection of information that could provide the result desired by the client.

"In many cases the new computer methodology that is 'promoted as better' may not be better science, but better graphics. As professionals that are asked to make presentations to lay people, we must look at our final output for clarity and artistic content. I do not intend to convey that we should all become artists, but we must do a good job of communicating our results. As a graduate student in the late 1970s, I took a class in Graphics for Land Use Planning. One of the 'tricks' of presentation provided by the professor was to generate our reports using an electronic typewriter with a dot matrix output. The basis of the 'trick' was that most of the computers at that time used 8-pin dot matrix printers and that by simulating the computer output on a typewriter our reports would appear to be computer generated. The public perception was and still is that a 'computer generated report' is 'better' than a manually generated report.

"A person can be a 'competent geologist' but lack the presentation skills or hardware needed to communicate effectively a complex concept to the public. We must be careful when evaluating the competence of our fellow professionals. We must assure that we are not making the judgement based upon artistic capabilities, but on technical capabilities.

"I would like to thank the unknown computer programmer that provide the grammar corrections sub-routine in my word processing program to assist me providing the competent output of this letter. I just hope that unknown person has kept up with the changes in the English language and I am not relying on old out-dated grammatically rules while using this word processing program. Oh, and by the way, to that same programmer, I believe that it is allowed to write in English in the first person syntax, although your program still marks all of the 'T's' as errors."

Both Rahn and Hall address the fact that hand-drawn curve analysis can be just as valid as analysis of computer generated curves. As Rahn points out, "*It depends.*" I italicized "it depends" because this is the primary phrase emphasized by **L. Graham Closs**, CPG, in a course he teaches on geologic data analysis; you have to think about the geology in order to interpret what the computer analysis is telling you.

Hall addresses two additional important issues, the budgetary constraints one is working under and effective communication by computer or otherwise. I feel that these two topics are sufficiently important to address as separate discussion topics.

Budgetary Constraints on Professional Work

Robert A. Hall, CPG, in his comments above notes that a client's budgetary restraints affect the amount and type(s) of work that can be done. As Hall notes, anyone who has been in consulting for any length of time has run into this problem. Nor is this a problem restricted to consulting. Hall also notes that such constraints can lead to situations where clients are unhappy with the results and this can lead to assertions of incompetent practice.

Two provisions of the AIPG Ethics Code relate to this situation. Rule 3.3.2 states, "A Member shall not give a professional opinion or submit a report without being as thoroughly informed as might be reasonably expected, considering the purpose for which the opinion or report is requested." And Rule 3.3.3 states, "A Member shall engage, or advise an employer or client to engage, and cooperate with other experts and specialists whenever the employer's or client's interests would be best served by such service." The situation Hall refers to occurs where budgetary considerations preclude the collection of one or more types of data, or its thorough analysis in completing the job. It strikes me that Rule 3.3.2 suggests that when budgetary considerations restrict what can be done, that we are obliged to point out to the employer or client the consequences of the budgetary restrictions on our ability to fully answer the ultimate questions asked. And the spirit of Rule 3.3.3 in this case is that we describe the additional work required and the answers it can provide, whether or not we are individually capable of doing the additional recommended work.

Often work is phased, and one of the purposes of early phases is to identify what types of additional work are warranted in later phases. But where this is not the case, we should inform the employer or client of the limitations placed on what we are able to do. In addition, the fact that the scope of work was limited should be stated in the report of the work, so that

those using the report, whomever they eventually turn out to be, understand the limitations. As Hall notes, when the client wants the \$1,000 job done for \$10, this can lead to unhappy results. It may be that we need to decline the job. But this doesn't help after the job has begun. Clear communication is required in such cases. If nothing else, accurate description of the scope of work and the resulting limitations can help defend the character of the work that was done. In such cases, the "recommendations for further work" section of a report can be particularly important.

Further discussions and examples of such situations are most welcome.

Effective Communication With and Without Computer Assistance

Robert A. Hall, CPG, in his comments above addressed the issue of effective communication and the fact that the appearance of a report can be an important factor in a report's perceived quality and professionalism. There is nothing particularly new about comments on the neatness of presentation. Recall the comments most of us received on the neatness of our field notes during field camp and similar exercises. Figure 1 comes from my father's student notebooks from 1936.

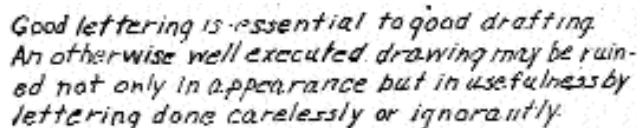


Figure 1: one of thirteen repetitions of the same hand-lettered sentences from one of my father's geology student notebooks in 1936. The instructor's comment was "Improve lettering."

I suspect that most of us received similar comments at one time or another. My lettering was never good and, since I type most of the time now, it's worse.

The techniques of effective presentation are important. The computer has made some of the mechanics of presentation easier and more attractive. I recently saw a copy of a thesis that had just been submitted. The general format of this thesis looked very similar to the one I submitted many years ago. But the current ability to include high quality digital pictures and graphics were a vast improvement over what used to be the norm. And word processing has made the writing and, particularly, the editing of text far easier. The same is true of professional reports today compared to those of 20+ years ago.

Presentation software has radically changed the character of slides presented at professional meetings (whether actual slides, transparencies, or computer projection is actually used—and if you remember lantern slides, you've got white hair).

But improved technology has not changed the fundamentals of good presentation and effective communication. Clarity of writing does not depend on how the words are put on paper. The principles of good illustration graphics have not changed. At a recent annual meeting of one of the geoscientific societies, I sat through a session of a number of presentations that contained important information, which tended to get lost in poor presentation techniques. The slides were too busy or parts were too small. Presentations were read in a monotone rather than given in interesting, conversational manner. A couple of people were clearly unfamiliar with the mechanics of using a PowerPoint™ slide show. I was shocked at how unprofessional several individuals of otherwise high professional standing came off.

Hall pointed out our professional competence is frequently judged by the quality of our presentations. Regardless of whether you agree that this should be so, accept the truth of the statement and make sure that your presentations and reports look good. If you have any doubts, ask someone that you know does a good job to critique your work or presentation before it goes "public." Make time to do it right!

Charles J. Mankin **New Energy Center** **Director**

Dr. Charles J. Mankin, CPG-01415, (Past AIPG President) director of the Oklahoma Geological Survey since 1967 and PTTC South Midcontinent Region program manager, is adding an additional assignment at the University of Oklahoma to his activities.

Mankin was named Director of the Sarkeys Energy Center by the OU Board of Regents at their October meeting, and officially assumed the office on November 1.

"Charles Mankin is nationally and internationally respected by both government and private sector leaders in the energy field," OU President David Boren said, noting Mankin's years of experience as an OU faculty member and OGS director. "Given his unparalleled knowledge of the entire history of the Sarkeys Energy Center and a clear understanding of its mission, Charles Mankin is the best possible person to provide leadership for the energy center as it moves to an even higher level of performance."

The mission of the Sarkeys Energy Center is to foster world-class interdisciplinary energy research and education and, through various means of technology transfer, strengthen and enhance regional economic growth as well as national energy and economic security. The Energy Center programs include six interdisciplinary institutes and a special institute which focuses on the Western Hemisphere. These institutes incorporate faculty from the colleges of Geosciences, Arts and Sciences, Law, Business, and Engineering to develop programs and technology that advance the energy industry in the state and throughout the world.

*Source: Oklahoma Geological Survey Web site
<<http://www.ou.edu/special/ogs-pttc/>>*

THANK YOU! **ASSOCIATE EDITORS**

AIPG's Associate Editors play an important part in making *The Professional Geologist* (TPG) the high quality journal that it is. Peer-reviewed articles in TPG are reviewed by at least three associate editors before they are printed.

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Jun. 9-13. A Geo-Odyssey, Virginia Tech, Blacksburg, VA. A Geo-Institute conference on foundations and ground improvement. Contact: Professor J. Michael Duncan, CEE Dept., 200 Patton Hall, Virginia Tech, Blacksburg, VA 24061; (540) 231-5103, e-mail: <jmd@vit.edu> or <http://cgpr.ce.vt.edu/geo2001/>

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Jun. 19-22. 17th International Mining

Congress and Exhibition of Turkey, Ankara, Turkey. Contact: Bahtiyar Unver, Co-Chr., Organizing Comm., Dept. of Mining Engineering, Hacettepe Univ., Beytepe Ankara, 06532 Turkey; 90-312-297-7696.

Jun. 24-28. A global meeting presented by the Geological Society of America and the Geological Society of London, *Earth System Processes*, Edinburgh, Scotland. For further details see the web page at <www.geosociety.org/meetings/edinburgh>.

Jul. 7-10. American Rock Mechanics Association's DC Rocks 2001, 38th U.S. Rock Mechanics Symposium, Washington, DC. Contact: John Tinucci, Technical Program Chr., PanTechnica Corp.; (952) 937-5879.

Aug. 7-10. International Tsunami Symposium 2001, Seattle, WA. Contact: E.N. Bernard, NOAA/PMEL, 7600 Sand Point Way NE, Seattle, WA 98115; (206) 526-6800; e-mail: <bernard@pmel.noaa.gov>; >http://www.pmel.noaa.gov/its2001>.

Sep. 9-14. SEG International Exposition & 71st Annual Meeting, San Antonio, TX, by the Society of Exploration Geophysicists. Contact: Dibbi Hyer, 8801 S. Yale, Tulsa, OK 74137; (918) 497-5500, e-mail: <dhyer@seg.org>; <http://meeting.seg.org>

Sep. 23-26. The Society of Organic Petrology (TSOP), 18th Annual Meeting, *Geochemistry of the Deep-Water Gulf of Mexico*, Houston, TX. Contact: Dr. Coleman Robison, Texaco Group, Inc., E&P Technology Div., 3901 Briarpark Dr., Houston, TX 77042, (713) 432-6828, <robis-cr@texaco.com>, <www.tsop.org>.

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Nov. 5-8. Geological Society of America Annual Meeting, Boston, MA. Contact: GSA Meetings, Boulder, CO 80201; (303) 447-2020; <http://www.geosociety.org>

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