Issue
03
2012

PCPG Newsletter

Communicating Key Information & Concerns to Geologists & Environmental Professionals

Can you identify this feature?
(View the full image on page 6 in our FCOPG article)

this issue

Message from the President

You're a geologist? What is it you do again?

On December 16th we celebrated PG day, which commemorates 20 years of the PG License in PA. No small feat from my perspective, and when looked back upon, much has been accomplished by the geological profession in Pennsylvania. But one area where I find we can do better is teaching earth sciences in primary and secondary education.

In today's society the role of the geologist is ever expanding with increasing population and accelerating technology in many fields. Society relies on earth scientists for our most basic needs (water, building materials, and energy), our advanced needs (aerospace materials, computers, and cell phones) and all things in between. Perhaps this is my own biased geo-ego-centric perspective, but when I look around and observe all we use that comes from the earth, I am truly amazed. The briefest way I can describe this is as follows: If you can't grow it, a geologist was involved in its provision. Even what is grown is geologically linked, as without much thought I can picture fertile limestone valleys and exotic coffee growing on volcanic slopes. And the food we eat? Yep, full of minerals. With all this dependence upon the earth, why is there a basic lack of knowledge about the geological profession? Once when asked about my occupation, the questioner quipped "Oh hey, a geologist! What's the capital of Sweden again?" I have found this sentiment elsewhere as I have explained to others what it is that I do for a living (It is also a sad commentary on the state of geographical knowledge). Is geology "Jurassic Park"? or that quirky whiny guy on "Friends" who is a paleontologist? or Pierce Brosnan in "Dante's Peak"? While we may ascribe our physical attributes to the latter (well, maybe not the lady PGs), this is not who we are or typically what we do. I am simply astounded by the lack of the public's understanding about what geologists do and their role in society.

By now you're thinking "Thanks for the rant Lou, but what's your point?" A tenet of my PCPG presidency has been outreach to universities stressing the need for scientifically-

(continued on Page 5)

PA DCNR and PCPG Begin Preparing a Response to *Ground Water* Article Describing Potential Aquifer Contamination from Hydraulic Fracturing in Unconventional Shale

-- *Kristin M. Carter, P.G., Chief, Petroleum and Subsurface Geology Section, PA DCNR, and Louis F. Vittorio, Jr. PG, President, PCPG.*

PCPG's Shale Gas Committee has been active the last several years with the rapid pace of information being disseminated by industry, institutions, professional associations and environmental groups. Part of the committee's work is to review and distribute topical information for follow-up discussion. Sometimes this information goes out, and little response comes back through committee. Then there are times when distributed information strikes a chord and received responses generate useful discussion and analysis. The recent article titled *Potential Contaminant Pathways from Hydraulically Fractured Shale to Aquifers* by Tom Myers (*Ground Water* Vol. 50, Issue 6, Nov-Dec 2012) is an example of the latter, where a number of varied professionals have provided initial feedback without any prompting.

The initial response has piqued our interest, and so we have read several pieces associated with this paper to get a better overview: the original article, comments, a discussion and a rebuttal. (*NOTE: NGWA member access required to follow article, discussion and rebuttal links*) The author, Tom Myers (a groundwater modeler and hydrologic consultant from Nevada), attempted to show through modeling that potable aquifer contamination from hydraulic fracturing is expected and that such contamination may occur in less than 10 years. Given that unconventional deep shale hydraulic fracturing has been ongoing for "less than 10 years" in the Appalachian basin, this implies that aquifer contamination is practically upon us, and due to processes already set in motion, there is not much we can do at this point to stop it, except for monitoring its inevitability. This is quite an astonishing and polarizing conclusion, which is based upon a groundwater model that contains very limited real world data. The model and the conclusions of the article are therefore being questioned, as scientific studies typically are, or championed, depending on your point of view.

We believe that modeling can be a useful tool for theorizing an answer to a question, but a system cannot be properly modeled without sufficient real-world data collected from the study area. When completed properly, such models can be predictive; but they can also serve to identify data gaps. In this latter aspect, the author, the initial commenters, and we agree.

However, owing to what we see as several shortcomings with respect to the geologic characterization and modeling described in Myers' paper, PCPG has joined with the Pennsylvania Geological Survey to begin preparation of a more formal response. Our comments will address various issues, including: the flawed and over-simplistic nature of Myers' conceptual geologic model, incorrect choice of modeling software for the task at hand, and insufficient modeling approach (from assumptions to parameterization to lack of model calibration). We also invite comments from our members and knowledgeable professionals as we prepare a formal response. We anticipate that this response will be a white paper published on PCPG's Shale Gas web page, but are currently evaluating other media outlets and journals as may be appropriate.

Should you wish to provide comments for consideration, please email them to our attention at lvittorio@earthres.com by January 15, 2013. We look forward to hearing from you regarding this important issue.

PCPG Unveils New Booth!

PCPG served as a sponsor of the Pennsylvania Brownfields Conference on December 10 – 12, 2012 in Monroeville, PA, and took this opportunity to unveil our new booth in the Exhibit Hall. **A BIG THANKS to Rose Jeffries and Jim LaRegina** for spearheading our efforts to update our exhibit booth. Below is a picture showing the new display (at left), and another of our mentor-in-chief, PCPG President Lou Vittorio chatting with some high school science students (at right). Also, BIG THANKS to all of our Board members that helped to staff the booth during this event – Lou Vittorio, Jen O'Reilly, and Sean Chelius.

Member Spotlight: Moody and Associates, Inc.

Moody and Associates, Inc., located in Meadville, Pennsylvania, was a charter firm in the establishment of PCPG, and the firm has been an active supporter of PCPG from its inception.

Jeff Moody, the current President of Moody and Associates, Inc. (Moody), is the fourth generation family member to direct company operations, which have now spanned into a third century. Jeff's great grandfather, James, began to drill water wells in 1891 with a horse-drawn, steam-driven drilling rig that was acquired as payment for a bad debt. The first 55 years of drilling operations were devoted to the completion of water wells for farms and homes in northwestern Pennsylvania. Dwight Moody, James's grandson, assumed operation of the Moody Drilling Company in 1946 and began to pursue larger projects, with completion of commercial, industrial and municipal water well projects throughout Pennsylvania and adjoining states. Dwight was in the forefront of adopting the latest technology and methods to enhance yields of water wells. In 1964, Moody Drilling was the first firm in Pennsylvania to adopt the newly-identified fracture trace method of locating high capacity water wells that was developed by Penn State geology professors Dr. L.H. Lattman and Dr. R.R. Parizek.

The scope of services offered by the company expanded in 1965 when the first geologist was hired as a full-time employee to provide geological expertise in locating water wells, completing ground water studies and aquifer evaluations. Moody opened a branch office in Harrisburg, Pennsylvania in 1968, which was staffed by two geologists. In addition to ground water supply development, the firm broadened its geological services in the emerging environmental market. Continued development of the client base and the scope of geological and ground water services led to an increase in staff, and by 1975, a total of 24 geologists were employed in the Meadville and Harrisburg offices. The professional staff further expanded, and specialized hydrogeological services were developed in 1978 that applied to a wide array of projects in the underground coal mining industry.

Jeff Moody became president of Moody in 1985 and continued to increase their services, offices and professional staff. The conventional gas well drilling boom which occurred in northwestern Pennsylvania in the late 1980's and early 1990's, coupled with Moody's ground water expertise, was instrumental in the firm completing thousands of pre-drilling surveys in advance of gas well drilling.

Further growth led to the opening of a branch office in Rochester, New York in 1999 that specialized in ground water development services throughout the state of New York. A third office opened in 2002 in Washington, Pennsylvania that primarily served the coal industry. The advent of development of natural gas from the Marcellus Shale led to the establishment of a fourth office in Waverly, New York in 2010 to provide geological and environmental support services to the natural gas industry. The opening of the Waverly office was followed by the opening of a Canton, Ohio office in early 2012 to further serve the natural gas industry in Ohio. Currently, all four Moody offices are actively engaged in providing specialized geological and environmental services for the unconventional gas industry in several states.

The name Moody continues to be associated with all aspects of ground water science, ground water development and ground water protection in Pennsylvania, New York, Ohio and West Virginia.

To learn more about Moody and Associates, Inc. please visit: **www.moody-s.com**.

(PRESIDENT'S MESSAGE -- continued from Page 1)

trained geologists and environmental scientists (see my 1st quarter President's Column). In essence we need such scientists, and those classically-trained in the sciences - including healthy doses of math, chemistry, physics, biology and engineering - have been finding gainful employment after graduation *because their skills are needed by our expanding technological society*. I believe we need to continue PCPG's education effort at the college level (and we are) and also take the message to primary and secondary schools via outreach by our members. Without earth sciences being taught in primary and secondary curricula, we will continue to struggle with attracting and educating geologists at the university level. Although this is a symptom of the larger issue of declining math and science skills of Americans compared to other nations, there is something we can do to make a difference.

To that end, I ask you to contact your local school's science department and ask if you can speak to the class about geology, careers in the earth sciences and their application in our current and future society. Contact us, let us know what you are thinking and how we can support your efforts with topics and display materials. Check out the below resources provided for free by the PA DCNR, the USGS and AAPG and AGI; they are quite useful. On our end, we are looking to engage state educators is Harrisburg to discuss and promote earth science curricula in schools and join fellow societies in these efforts.

On the 20th anniversary of the PG in Pennsylvania, practicing professional geologists can truly give thanks to the accomplishments of our profession. But we can't be complacent and we need to further the profession through education of our future selves. With continued effort, I am hopeful that when asked about our profession, we can proudly have an enlightened discourse on the role and need for geologists in society, and also discuss geography if the topic arises.

Regards,

Louis F. Vittorio, Jr. P.G.
PCPG President

Education Outreach Resources:

PA DCNR - Geology in the Classroom, Resources for Students and Teachers
http://www.dcnr.state.pa.us/topogeo/classroom/index.aspx

USGS - Primary and Secondary Education Resources
http://education.usgs.gov/index.html

AAPG/ AGI - Outreach Guide for Geoscience Professionals
http://www.agiweb.org/education/aapg/index.html

AGI - Earth Science Education Resources
http://www.agiweb.org/geoeducation.html

2012 Field Conference of Pennsylvania Geologists

-- Brett McLaurin, Ph.D., P.G. (Bloomsburg University)

The 77th Annual Field Conference of Pennsylvania Geologists was held October 18 through October 20, 2012, and headquartered at the Shawnee Inn and Golf Resort, in Shawnee-on-Delaware, PA. The field conference topic was "Journey Along the Taconic Unconformity, Northeastern Pennsylvania, New Jersey and Southeastern New York," and included approximately 150 attendees. This event was hosted by the Pennsylvania Geological Survey, the U.S. Geological Survey, and the New Jersey Geological Survey. While there was minor rain during the first day of the trip, sunshine and a beautiful display of fall colors greeted participants throughout the rest of the field conference.

The Day 1 stops were led by Jack Epstein and Chris Oest and focused on the stratigraphy and deformation of Ordovician-Silurian rocks that included the Martinsburg/ Windsor Township Formation, Tuscarora/Shawangunk Formation, Clinton Formation and the Bloomsburg Red Beds. At Schuylkill Gap, the relationships between sedimentary structures and cleavage in the Bloomsburg Red Beds were observed and there was discussion of the angular unconformity/fault contact between the older Windsor Township Formation and the overlying Tuscarora Formation. Other Day 1 stops highlighted the folding and faulting within the Martinsburg Formation and its contact with the overlying Shawangunk Formation at both Lehigh and the Delaware Water Gaps. The evening banquet featured a presentation by Jack Epstein on his experiences as a witness to the 1959 Hebgen Lake, Montana earthquake.

***Photograph above**: Attendees listen to a discussion of the Martinsburg-Shawangunk contact at Lehigh Gap, PA*

***Photograph above:** Attendees examining the angular unconformity between the Martinsburg Formation and the overlying Shawangunk Formation.*

Day 2 of the field conference ventured into New Jersey with a stop at the Yards Creek Facility where cleavage and bedding relationships within the Martinsburg Formation were discussed and evaluated. Additional examples of deformation within the Martinsburg Formation were presented by Don Monteverde and Greg Herman, who provided a discussion on the Alleghanian deformation associated with the development of the Grand Union klippe near Newton, NJ. The trip also included stops at the Beemerville complex, which is a series of nepheline syenite intrusions within the Martinsburg Formation. The distribution of syenite boulders was presented by Ron Witte as a guide for the direction of ice flow during the Late Wisconsinan glaciation

The Day 2 lunch stop at High Point State Park in Sussex County, NJ provided a vista to discuss aspects of the bedrock and glacial geology of northern New Jersey. The final stop of the field conference examined the contact between the Martinsburg and Shawangunk formations; an excellent field example of the angular unconformity between these units is exposed and preserves a thin diamictite.

The 2013 FCOPG will be September 26th – 28th and will feature the geology of the Nippenose Valley. For more information, visit: http://fcopg.org/

UPCOMING EVENTS

January 15, 2013
PCPG Annual Meeting
(Followed by Networking Mixer)
Harrisburg, PA

January 22, 2013
Vibration Measurement and Analysis
Harrisburg, PA

February 7 - 8, 2013
PG Review Course for the Practicing PG and ASBOG Exam Candidate
Mars, PA

February 27, 2013
Resistivity/IP/SP for Environmental and Engineering Applications
Harrisburg, PA

May 9 - 10, 2013
Basic and Advanced Principles of Groundwater Hydrogeology
Bethlehem, PA

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Don't forget to check the "Courses & Events" link on PCPG's home page frequently for up to date information on upcoming educational opportunities.

PCPG 4th Quarter University Outreach Events

-- Communications Committee

PCPG Board members recently made visits to Lock Haven University and West Virginia University as part of our ongoing young geologist mentoring efforts.

At the invitation of Jacob Pierson, President of the Lock Haven Paleo Club and Treasurer of their Geoscience Club, President-elect Jennifer O'Reilly and Board member Gary Kribbs visited Lock Haven University on November 9, 2012, to discuss career opportunities for graduates with geology and related degrees, and the importance of obtaining your P.G. license. While there, they presented a check in memory of the late John Way, P.G. from PCPG to the "Lock Haven University Foundation Geology Progress Fund."

Photograph (above left): PCPG President-Elect Jen O'Reilly presents Dr. Thomas Wynn a donation to the Lock Haven University Foundation Geology Progress Fund. Photograph (above right): Jen O'Reilly (center) and Gary Kribbs (3rd from right) are joined by Lock Haven Geology students and Drs. Khalequzzaman (far left) and Wynn (4th from left).

PCPG President Lou Vittorio and Board member Dan Billman visited the Geology department at Dan's alma mater, West Virginia University, on December 4, 2012. The event was organized by the Geology and Geography Department Chair, Dr. Steven Kite.

Mr. Vittorio and Mr. Billman spoke to a geology seminar class for seniors, although other students and faculty members sat in on the discussion which covered topics including the ASBOG process, how to go about sitting for the Fundamentals portion of the exam, and the benefits of obtaining your GIT while still in college mode. After their presentation, they answered questions from students and everyone enjoyed pizza and soda provided by the Department.

An interesting note for our members, WVU's Geology Department is headquartered in newly-renovated Brooks Hall. Brooks Hall (pictured to the right) is the first building on WVU's campus to incorporate "green roof" technology into its "green" building design.

Microseismic Monitoring For Marcellus Shale Development

-- Jeffrey Leberfinger, P.G., TerranearPMC and Jeff Bruce, MicroSeismic Inc.

The Marcellus Shale play in this region of the country has been greatly benefited by the development of horizontal well drilling and the capability of hydraulic fracturing of the shale reservoirs. Microseismic techniques are being utilized to map the horizontal and vertical extent of the fracture propagation during the fracturing operations in a well. As the rock is forced open by the hydraulic pressure, the rock cracks causing a small microseismic event. Geophones located either in a vertical well near the well that is being fractured or geophones placed on or near the land surface near the well can detect these events. As the fractures open and propagate away from the horizontal well, each tiny event is detected by the geophones and recorded. The data can then be processed and the subsurface positions of the microseismic events are revealed, effectively delineating the growth of fractures both horizontally and vertically.

Microseismic monitoring has become an important facilitator to the development of shale fields. As many as 5% of the hydraulic fracture treatments performed in the United States are now monitored, with some operators choosing to monitor every well as they develop their field. Driving the increased utilization of this technology is an appreciation of the complexity of shales. The response of the rocks is seen to vary from well to well and stage to stage. The need to monitor more wells at a lower unit cost has also led to the deployment of permanent monitoring arrays.

Another important development has been to draw deeper conclusions from the gathered data. The original analysis was more directed at getting a better fracturing design. Recent developments are directed at producing a better understanding of how the reservoir will perform as a result of the fracturing. Such analysis consists first of extracting the failure mechanism of each microseismic event from the data as well as its magnitude. The nature of the failure mechanism indicates the stress regime in the reservoir. The distribution of event magnitudes also helps determine whether new fractures are being created or existing fractures are being reactivated.

Taking this analysis further, it is possible to model the fracture planes that created the microseismic events. With an assignment of permeability, the fracture model can be upscaled to a grid model that then can be used in a reservoir production simulation model to begin predicting well and field performance.

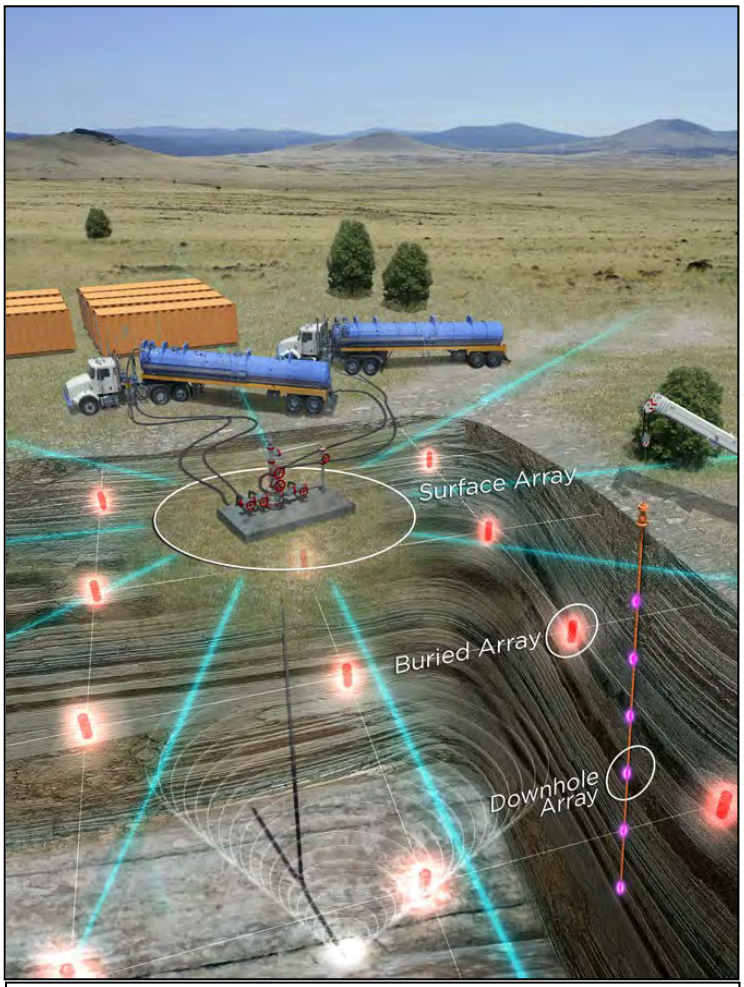


Image above shows a schematic of various arrays for collecting microseismic data.

continued on Page 9

continued from Page 8

Microseismic data is not only a valuable tool for evaluating shale reservoir development, but the data can also be used to demonstrate to local property owners and other stakeholders that the propagation of fractures is not extending to the near-surface where it can cause environmental problems to the communities in the vicinity of gas wells.

For more information about microseismic, contact Jeff Bruce of MicroSeismic Inc. at jbruce@microseismic.com or visit www.microseismic.com.

PCPG's Annual Meeting Plans Finalized

-- Louis F. Vittorio, Jr., P.G. (PCPG President)

This past year has seen much progress at PCPG with a full schedule continuing education (CE) seminars, outreach opportunities and networking events having been successfully completed. To cap off last year's achievements and kick-off 2013, PCPG is holding our Annual Membership Meeting on **Tuesday, January 15, 2012** at 11:30 PM in the Holiday Inn East, 4751 Lindle Road, Harrisburg, PA. Join your fellow members for lunch and an afternoon of top notch speaker presentations. A wrap-up of PCPG's business for 2012 will be provided, along with the results of the Board of Director elections and announcement of our Scholarship Essay winner.

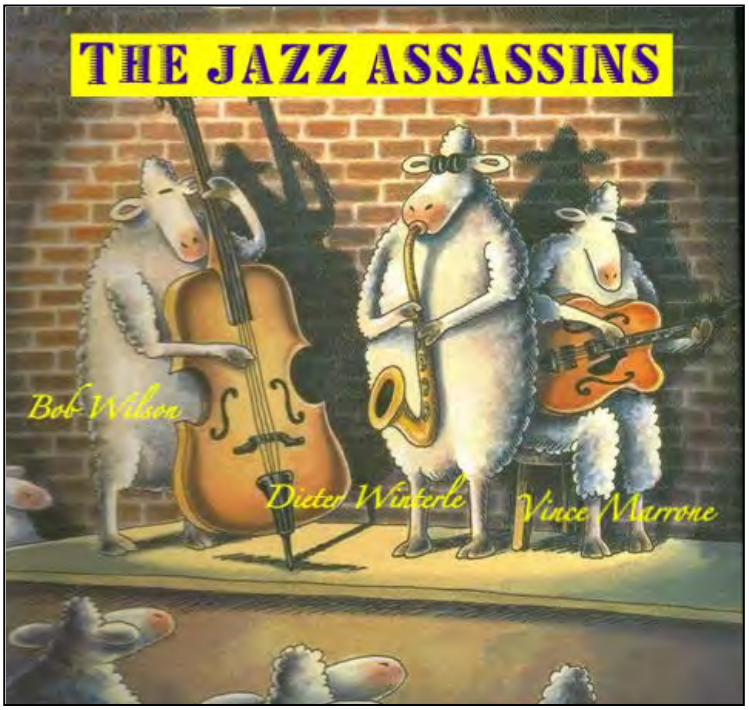
Following the Keynote Address, ***Celebrating the 20th Anniversary of the PG License*** presented by **Richard E. Wright, PG,** (PCPG's Founding President), the afternoon speakers will provide the following presentations (approximately 2.5 PDHs can be logged):

- **William J. Kosmer, PG** (PADEP) - *The Occurrence, Investigation and Mitigation of Stray Gas Related to Shale Gas Exploration*
- **George E. Love, PG** (PA State Geologist) - *Current Activities within DCNR's Topographic and Geologic Survey*
- **Dr. Martin F. Helmke** (West Chester University) - *Ground-Source Heat Pump Systems: Everybody's Geothermal Energy*
- **Rose-Anna Behr, PG and Kristen Hand** (PA Geologic Survey) - *The Benefits of Core supplemented Bedrock Mapping*

The day will feature special awards and door prize giveaways. A complimentary reception with entertainment by Jazz Assassins (image lower right) will end the day and provide everyone a chance to catch up with colleagues in a relaxed setting.

Last year's meeting was a great success and we are planning a similar fun and informative affair this year (open to members and non-members alike). Be sure to register now at www.pcpg.org to come out and meet some new friends, get reacquainted with your colleagues and find out what PCPG has been doing to advance the professional practice of Geology.

I look forward to seeing you in Harrisburg on January 15th.



DON'T FORGET TO VOTE!!!

PCPG members, our Board of Director elections are upon us!

An e-mail from PCPG with a link to your ballot should have arrived in early December and ***elections close on December 31st!!***

The current election will be held entirely online. PCPG members in good standing are eligible to vote, so be sure to cast your vote and have your say in the leadership of PCPG! If you have not received an election e-mail, please contact Jim LaRegina at jlaregina@hrg-inc.com.

We have an excellent slate of candidates, including the following:

Dan Billman, PG (incumbent)
Bill Gough, PG
Jeff Leberfinger, PG
John Storb, Jr., PG
Barbara Dunst, PG
Valerie Holliday, PG (incumbent)
Bryan McConnell, PG
Louis Vittorio, PG

Bios for each candidate are provided when you link to the voting website.

Did we mention…

DON'T FORGET TO VOTE!!!

News of the Pennsylvania Bureau of Topographic and Geologic Survey

-- George Love, P.G. (Pennsylvania State Geologist)

The Bureau of Topographic and Geologic Survey (aka BTGS or PA Geologic Survey) continues its activities to serve the citizens of Pennsylvania by collecting, preserving, and disseminating impartial information on the Commonwealth's geology, geologic resources, and topography in order to contribute to the understanding, wise use, and conservation of its land and included resources.

Our recent activities include:

- Geothermal Database – This data is available at http://geothermaldata.org/, but broken links and "page not found" errors are common. Once the website is up and running efficiently, data from all 50 states will be available, and will include more than just "geothermal" themed topics. BTGS has submitted all current borehole temperature data (from oil and gas wells) and is currently submitting aqueous geochemistry data that we compiled along with such data from USEPA, USGS, DEP and NURE (National Uranium Resource Evaluation program). The BTGS may abandon plans of logging deep municipal wells (up to 800 feet in depth) as we have found that deeper wells are needed to better evaluate geothermal gradients.

- PAMAP Data – While the program is no longer collecting new data, DCNR is planning to renew its contract with PSU to provide support to users and resolve issues with the voluminous LIDAR data files, and archive the data. All of the images collected and all of the processed LIDAR data are available through PASDA (*www.pasda.psu.edu)*. The last report on use, November of 2012, shows the number of downloads from the site continues to increase as more people realize the value of the data. An index to the data and download tool is available on the DCNR website at http://www.pamap.dcnr.state.pa.us/pamap/

- Geologic Mapping – Under the STATEMAP cooperative geologic mapping grant from the USGS, BTGS is conducting bedrock geologic mapping in the Laporte and Mingoville quadrangles, and surficial mapping in the East Troy and Ulster quadrangles. Other ongoing mapping projects include Ohiopyle State Park and surrounding area, Middletown quadrangle, Middleburg quadrangle, and the Martinsburg and allochthonous rocks of the Great Valley in Dauphin and Lebanon counties. A presentation of recent work in the Troy area will be made at the PCPG annual meeting in January.

- DCNR's Data-sharing Web-mapping Application – Working with the Bureau of Information Technology, BTGS recently unveiled its page on DCNR's data-sharing web-mapping application, where users can view and download digital geologic data (view at: http://www.gis.dcnr.state.pa.us/maps/index.html?geology=true). This simple geologic application is a preview of things to come as the BTGS constructs a all-inclusive web-mapping application that will provide a comprehensive interpretation of Pennsylvania's geology, provide access to nearly 500 of our publications, and allow users to access and download virtually all of our data. Interactive access to our publications should roll out in late January 2013.

- Sullivan County Water Resources – This water resources project is progressing. The Bureau of Oil and Gas Management has completed their portion and BTGS will soon be completing the groundwater quality assessment of the 2,000 samples of pre-drill data. Depth-to-water maps and summaries of groundwater quantity are being developed. It's anticipated that an open-file report will be available in March 2013.

540 Minutes of PDH Presentations for only $160

Pennsylvania Ground Water Association's
2013 Winter Conference
Harrisburg/Hershey Holiday Inn *in Grantville, PA*
at Exit 80 on I-81 (16 miles from Harrisburg)

THURSDAY JANUARY 24, 2013	
8:00 am – **1:30** pm	**REGISTRATION OPEN**
1:30 am – **7:30** pm	**EXHIBIT HALL OPEN**
11:30 pm – **12:30** pm	**LUNCH ON YOUR OWN**
12:30 – 1:30 pm	*Keynote Address:* **Water Well Hydraulic Stimulation is NOT Hydrofracking –** by Todd Giddings, Ph.D., P.G., *Todd Giddings and Associates, Inc.*
1:30 – 2:30 pm	**PDC Drill Bits: A Closer Look –** Kevin Christenson, *Palmer Bit Co.*
2:30 – 3:30 pm	**Baseline Water Quality in Groundwater Wells Across the Marcellus Region of PA –** Bryan Swistock, *PSU Extension*
3:30 – 4:30 pm	**Case-As-You-Drill Through Caving Overburden –** by Todd Giddings, Ph.D., P.G., *Todd Giddings and Associates, Inc.*
4:30 pm – **7:30** pm	**RECEPTION & SCHOLARSHIP AUCTION in the Exhibit Hall**

FRIDAY JANUARY 25, 2013	
7:30 am – **9:00** am	**BREAKFAST** *(provided)* and **General Membership Meeting**
9:00 – 10:00 am	**Hydrogeologic Guidelines for Large-Scale Geothermal Heat Pump Systems –** Nina Baird, *Carnegie Mellon University*
10:00 – 11:00 am	**How Variable Flow Increases the Performance of Geo-thermal Heat Pump Systems –** Eric Kravitz, *HVAC Distributors, Inc.*
11:00 – 12:00 pm	**Groundwater Protection Measures Associated With Shale Energy Development –** Dave Yoxtheimer, *PSU Extension*
12:00 pm – **1:00** pm	**LUNCH** *(provided)*
1:00 – 2:00 pm	**Proper Disinfection of Water Wells –** David T. Hanson, *Design Water Technologies*
2:00 – 3:00 pm	**Polymer "Mud" Rotary Drilling Through Caving Overburden –** Todd Giddings, Ph.D., P.G., *Todd Giddings and Associates, Inc.*
3:00 pm	**CONFERENCE ADJOURNS**

Go to **www.pgwa.org**
for more information, and to print a registration form
to mail ***before*** **January 11, 2013.**

The Holiday Inn Harrisburg/Hershey (in Grantville) has a block of discounted sleeping rooms at **$91** *until* **January 9, 2013.** Call **(717) 469-0661** to make your hotel reservation today!

www.pgwa.org

Don't Forget to Contribute to the PA GEOPAC!

Through PA GEOPAC, the official political action committee (PAC) of PCPG, you have an effective way to lend financial support to candidates and legislators who support the legislative goals of our organization, or who are willing to lend an ear to our members. More than 200 trade and professional organizations in the state have formed PACs including doctors, dentists, lawyers, bankers, and builders.

Your donation will help to strengthen our voice when and where it is needed most... right now at the state Capitol, where decisions are being made regarding many topics that affect the business of geology in Pennsylvania.

Mail your check made payable to GEOPAC :

GEOPAC, 116 Forest Drive, Camp Hill, PA 17011

Contributions may be made by personal check or company check only if from a sole proprietorship or partnership. Otherwise, no corporate or business checks may be accepted.

DEADLINE FOR 1st QUARTER 2013 NEWSLETTER IS MARCH 1, 2013

For more information, contact our PCPG Newsletter Editor and Communications Committee Chairperson,
Kelly Lee Kinkaid, P.G., by E-mail or by telephone at 610-375-9301.

2013 PCPG MEMBER AD RATES
(Rates are listed as amount per issue)

Size	Commitment:	1x	4x
1/2 Page		$225	$150
1/4 Page		$140	$95
Business Card (H or V)		$75	$50

2013 PCPG NON-MEMBER AD RATES
(Rates are listed as amount per issue)

Size	Commitment:	1x	4x
1/2 Page		$300	$240
1/4 Page		$185	$150
Business Card (H or V)		$100	$80

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Pennsylvania Council of Professional Geologists

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