PCPG Newsletter

Communicating Key Information & Concerns to Geologists and Environmental Professionals

Issue 2 / 2018

BOARD OF DIRECTORS

General Information: info@pcpg.org

INSIDE THIS ISSUE...

MESSAGE FROM THE PRESIDENT

Welcome to summer!

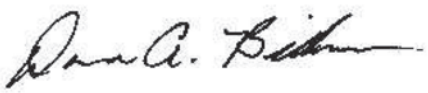
Here we are at last - the season when we geologists typically find ourselves in the great outdoors, juggling field work, family fun time and personal pursuits.

As you know, the Pennsylvania State Registration Board of Professional Engineers, Land Surveyors and Geologists includes members from all three professions and responsibilities include the review of licensure applications, and hearing complaints brought against licensed professionals. The importance of effective P.G. representation on the Board cannot be overstated. I want to take this opportunity to extend PCPG's thanks to our colleagues who have been serving on the Board:

- A debt of gratitude is owed to Tom Gillespie, P.G., who has served for 12 years on the State Registration Board, ending his second, six-year term at the end of June 2017. Tom's substantial commitments of time, travel and effort and his pursuit of excellence have made a positive and lasting impact on our profession. Thank you, Tom, for all you've accomplished.
- PCPG's continued thanks go to Ted Tesler, P.G. who has been serving alongside Tom and whose second, six-year term expires at the end of 2019. Ted currently serves as the State Registration Board president.
- Lastly, we acknowledge and congratulate Joe McNally, P.G. who was nominated by Governor Wolfe and confirmed by the Senate of Pennsylvania, as the newest Professional Geologist on the State Registration Board of Professional Engineers, Land Surveyors and Geologists. PCPG endorsed Joe's appointment, and we are confident he will do well for the profession.

The combined service of these three scientists to our profession is admirable and very much appreciated. Let's be inspired – there are multiple ways to give back to our profession.

This summer, as you make the most of Pennsylvania's natural resources, be it in the field, on the road, at the beach, on the river or lake, on the golf course or on the hiking trails, be sure to stay safe and enjoy.



Dan Billman, P.G.
PCPG President

Upcoming Events

PCPG Webinar
August 16, 2018
1:00 - 2:00 PM EST

A Road Map to Earning the Professional Geologist License in PA

REGISTER

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

First Annual (2018) PCPG Student Poster Session and Competition – A Resounding Success!

Rick Wardrop, P.G., Committee Chair

At PCPG's Annual Meeting in Harrisburg on March 20, 2018, the Council hosted our first Student Poster Session and Competition. In previous years we held a Student Essay Competition and invited the first and second place winners to read their essay at the annual meeting. The Poster Session and Competition was created to better meet the primary intent of the Student Essay (that of PCPG involvement with undergraduate students in the geosciences), by creating a forum within which PCPG's members would have more direct interaction with more students.

The first step in the process was to have students submit a poster abstract of their undergraduate research within the broad topic area of "the geosciences." From those submissions, ten students were selected to present their posters at the annual meeting. The posters, mounted in a hallway outside our general session room at the Red Lion Hotel, were displayed throughout the day for examination by PCPG members. A panel of six judges, selected from past PCPG Board Members and Presidents, engaged each student to discuss and grade their poster. Part of the grading involved the student's one-on-one presentation of their research. Based on the grading, first and second place winners were selected and the awards were announced that day, at the end of the annual meeting.

Liam Doyle discussing his award winning poster with PCPG representative Peter Muller. Behind them PCPG founders Joe Casey and Dr. Lane Schultz judging the poster of Beau Hagg.

As expected, in response to the broad topic area we had ten posters covering a wide range of studies. The level of scientific research presented in the undergraduate student posters was outstanding and PCPG member interaction with the students more than met our expectations. First prize went to Liam Doyle of Kutztown University and second prize went to Lara Ilsemann, also from Kutztown. The students who participated, their affiliations and poster titles are listed, as follows:

STUDENT	INSTITUTION	POSTER TITLE
Alex Chipman	West Chester	Effects of Microplastic Content in Soil Heat Flux
Zachary Czuprynksi	Penn State	Predicting Glacial Recession and Extinction in the Tropical Andes
Liam Doyle (1)	Kutztown	Detecting Hydrothermal Alterations of coarse-grained igneous rock in drill core with portable XRF
James Fisher	Dickenson	Quantification of Shortening of the Juniata Culmination
Beau Haag	Kutztown	Pyrite-Induced Redox Precipitation of Uranium in a Dolomite Breccia
Lara Ilsemann (2)	Kutztown	Comparison of Carbonate Vein/Dike with East Ore Body Carbonate
Nicole Kelley	IUP	Electrical Resisitivity Imaging of Preferred Subsurface Flowpaths to Monitor Passive Acid Mine Drainage Mitigation Site Contaminants
Samual Louderback	Pitt-Johnstown	Bailing out the Technicians: Assessing Purge Volume Protocols
Augusta Mery	Temple	Petrographic and Geochemical Evaluation of the Upper Ordovician Juniata Formation in Central Pennsylvania
Kyle Sherbine	Penn State	Linking Microbial Composition and Abundance to Methane Flux in Andean Wetland Systems

Notes: (1) First place winner (2) Second place winner

Given the success of this year's event, we look forward to conducting our second annual Student Poster and Competition in 2019.

See more photos from the event on Page 4

Participants in the PCPG 2018 Poster Session and Competition. From left to right (front row) Lara Ilsemann, Nicole Kelly, and Liam Doyle; (back row) Beau Haag, Samuel Louderback, Alex Chipman, James Fisher, Rick Wardrop (Committee Chair), Augusta Mery, Zachery Czuprynksi, and Kyle Sherbine.

Samuel Louderback discusses his poster with PCPG Board Member Dr. Martin Helmke.

Member Spotlight: GEI Consultants, Inc.

GEI Consultants, Inc. is a nationally recognized engineering firm that employs over 800 professionals in 37 offices across the country, including Toronto, Canada. GEI is a leader in environmental, geotechnical, water resources, and ecological science and engineering, and has completed projects across all 50 states. Founded as a geotechnical engineering firm in 1970, we are highly experienced in investigating, evaluating and navigating the risk and uncertainty of the underground to overcome challenges presented to both routine and complex projects by variable soil, rock, and groundwater conditions; fast-track schedules; and sensitive adjacent buildings and infrastructure. We are ranked number 92 on Engineering News Record's (ENR) 2018 Top 500 Design Firms list, having risen 25 positions since 2014, and 173 positions since 2007. We are also ranked No. 66 on ENR's 2016 Top 100 Pure Designers list, up 23 positions from No. 89 in 2014.

Our services span the spectrum of activities from project planning and design to construction management and operations and maintenance. GEI has completed thousands of geotechnical, water resources, ecological, and environmental consulting and engineering projects for clients throughout the U.S. We offer a variety of compliance and process-related services, as well as remedial design and construction oversight for contaminated sites. We maintain strong professional working relationships with regulatory agencies to help better define and perform scopes of work that meet the requirements of applicable environmental statutes and regulations.

Our environmental services are often integrated with our Geotechnical practice area services, as well as our Water Resources and Ecological Services when appropriate. This integration better enables innovative solutions that are more effective, efficient and reduce overall project costs. Some of our key services include:

- *Real Estate and Brownfields Development Support* – GEI provides solutions for brownfields sites to achieve predictable timely cleanups, economic redevelopment, liability clarity, public/private partnerships, and finality. We integrate geotechnical services to evaluate how subsurface conditions impact building activities, foundation design, and construction costs. Our local experience focuses on the Act 2 program in Pennsylvania and ISRA and the TRSR (7:26E), in New Jersey.

- *Oil & Gas Industry* – Since our inception in 1970, we have expanded our capabilities to work with our oil and gas clients on solutions to meet the evolving technical and regulatory requirements associated with planning, siting, constructing, operating, upgrading, decommissioning, restoration, and/or

Eco-Energy, Inc. Ethanol Terminal – Philadelphia, Pennsylvania

Schneider National, Inc. UST Removal and Installation – Carlisle, Pennsylvania

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GEI CONSULTANTS *Continued from Page 3*

monitoring of oil and gas industry projects. We have broad multi-sector experience with various oil and gas clients including those within exploration and production; refining; transportation (pipelines, gas plants, compressor stations, terminals, aviation, trucking); and marketing (bulk plants, terminals, underground storage tanks/above-ground storage tanks). We also specialize in Horizontal Direction Drilling (HDD) design and oversight.

- *Compliance and Permitting* – GEI helps clients identify all federal, state, and local environmental regulatory requirements applicable to a facility/site, and assess the current compliance status of the facility/site. Through our regulatory compliance and permitting experience, GEI is well positioned to help clients meet all applicable environmental regulations. Our local experience focuses on the Chapter 102 and Chapter 105 permitting in Pennsylvania.

- *Expert Services* – GEI's staff has extensive experience in regulatory agency negotiation and litigation support, including environmental case research and development, expert witness testimony, and mediation support. Recognized as experts in evaluation and remediation of hazardous waste contamination, GEI is frequently retained by Potentially Responsible Parties (PRP), PRP Committees, insurance companies, and attorneys. We also provide expert services for issues related to geotechnical engineering and building foundations.

We service the Pennsylvania and New Jersey areas from our local offices:

Pennsylvania - 100 Campbell Boulevard, Suite 103, Exton, PA 19341 ph. 484-872-7000

New Jersey - 18000 Horizon Way, Suite 200, Mt. Laurel, NJ 08054 ph. 856-608-6860

For more information please visit our website at www.geiconsultants.com or contact Mr. Jamey Stynchula, PG, LSRP jstynchula@geiconsultants.com.

DRONES OVER CENTRALIA

Martin F. Helmke, PhD, PG - Professor of Hydrogeology, West Chester University of Pennsylvania
Daniel M. Bochicchio, MS, GIT - Co-Founder, Skybernetics, LLC
Thomas A. D'Lauro - BS Geosciences Major, West Chester University of Pennsylvania

The use of drone-mounted thermal imagery and visible light photogrammetry is providing geologists with new perspectives on the dynamics of coal fires. Although thermal infrared surveys of coal fires have been conducted for decades, the recent advancement of light weight, radiometric thermal infrared cameras and unoccupied aerial systems (UAS, or "drones") guided by precision GPS has provided an opportunity to map fire fronts more frequently, at higher resolution, and at a fraction of the cost of traditional methods (Figure 1).

Of the approximately 38 coal fires currently burning in Pennsylvania, the most famous is the coal fire of Centralia. Located in the Western Middle Anthracite Field of Columbia County, the Centralia fire was ignited by trash burning in May 1962. After a number of extensive albeit unsuccessful attempts to extinguish the fire, the threat of subsidence and elevated indoor concentrations of carbon monoxide led to the relocation of approximately 1,200 residents from Centralia Borough and nearby Byrnesville by 1992. Today, most of the buildings in Centralia have been razed and only a handful of residents remain.

The labyrinth of mines beneath Centralia provides near ideal conditions for a coal fire. The coal beneath and adjacent to Centralia Borough was extensively mined by room and pillar methods during the second half of the 19th and early 20th centuries. Miners exploited ten coal beds (from the Buck Mountain to the Holmes) within an east/west-striking syncline of the Pennsylvanian Llewellyn Formation. The Centralia Tunnel was driven in the 1860s to drain groundwater from the mines into the Mahanoy Creek Watershed one mile to the southeast. This tunnel lowered the water table approximately 230 ft (PADEP, 2018) and introduced air, providing combustible conditions for the coal fire (Figure 2).

Since 1962 the coal fire spread within the Buck Mountain bed along strike to the west, southwest, and east. By the 1980s the fire had established four fronts: fire front 1 just south of the Centralia Borough border, fire front 2 northwest of (former) Highway 61 south of Centralia, fire front 3 near Byrnesville, and fire front 4 east of Centralia. In the 1980s ground vent temperatures exceeded 600°F and the fire advanced 65 to 75 feet per year (GAI Consultants, 1983). Early

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Figure 1.
Centralia drone research team showcasing the DJI Inspire 1 UAS with FLIR Vue Pro R thermal imagery camera during flights over Centralia.

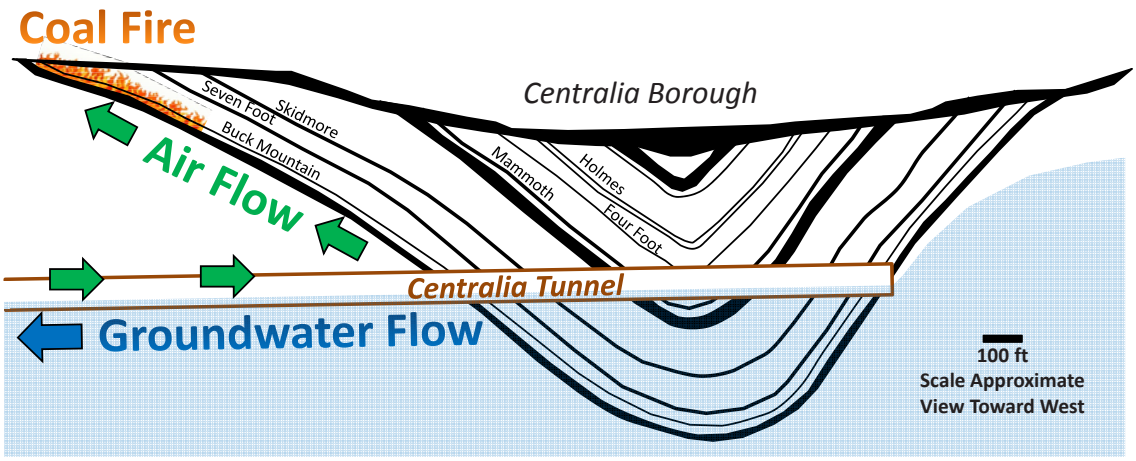

Figure 2.
Schematic cross section of the mined coal beds within the Centralia Syncline. The Centralia Tunnel lowered the water table and introduced air to the mine workings, allowing the coal fire to burn.

DRONES *Continued from Page 8*

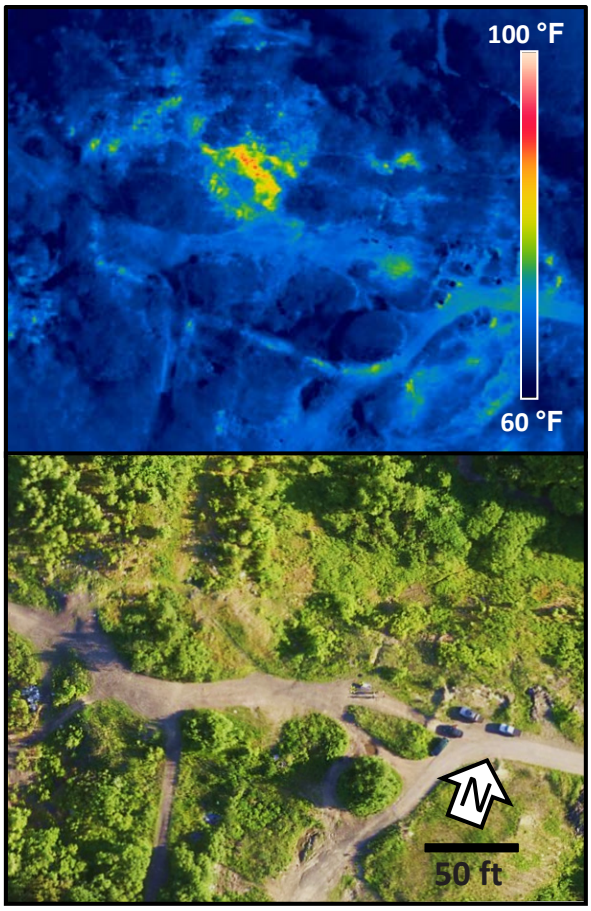

Figure 3.
Drone thermal infrared image (top) and visible light image (bottom) of fire front 1 collected June 15, 2018. Vent temperatures are generally below 100 °F, much cooler than reported in the 1980s.

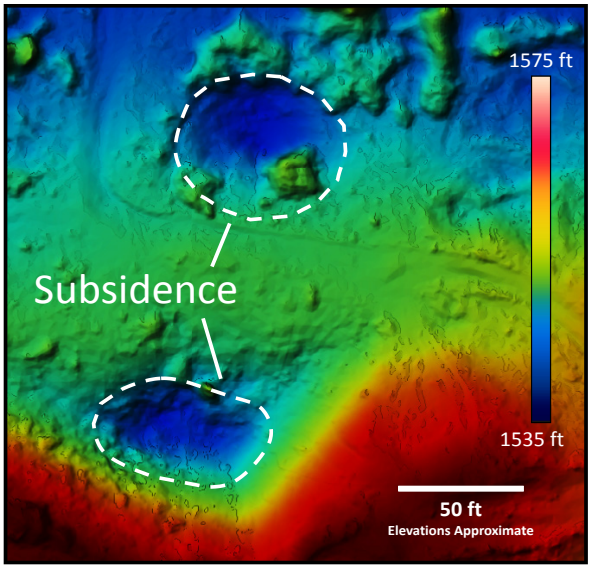

Figure 4. Drone visible light photogrammetry indicating fire-induced mine subsidence near fire front 1.

estimates predicted the coal fire could encompass 3,700 acres and burn for 100 years. By 2011, however, the fire had cooled significantly (vent temperatures less than 150°F), fire front 1 had slowed to six feet per year, fire fronts 2 and 4 were stationary, and fire front 3 had self-extinguished (Elick, 2011). To date, the fire has only consumed approximately 400 acres (PADEP, 2018).

Thermal drone flights were conducted in February, March, April, and June 2018 using a FLIR Vue Pro R thermal imaging camera. The camera was mounted to a DJI Inspire 1 2.0 UAS flown in a pre-programmed pattern at an elevation of 300 ft above ground level. The thermal images of fire front 1 revealed that ground temperatures continue to diminish, reaching a maximum temperature of 100°F across the study area (Figure 3).

Visible light images were stitched into composite orthophoto maps and 3D models using photogrammetric software. Models of surface elevations showed a number of pronounced enclosed depressions (Figure 4), suggesting mine subsidence continues as the fire weakens coal pillars. This process has been identified by previous research (Elick, 2013), emphasizing the advantage of frequent aerial monitoring.

Drone-based thermal infrared imagery has confirmed that the Centralia coal fire appears to be rapidly cooling and diminishing in aerial extent. Although this is encouraging news, there is still a significant risk for the fire to spread beyond the Buck Mountain coal bed. Consumer-grade drones and readily-available photogrammetric software provide geologists with a cost-effective and safe method for monitoring mine subsidence. We encourage geologists and environmental professionals to take full advantage of this emerging technology.

Acknowledgements

We would like to thank Dr. Sandra Mather (West Chester University, retired) for donating the drone system for this research; FLIR for providing the thermal infrared camera; James Andrews (PADEP), Daniel Koury (PADEP), and Robert Hughes (EPCAMR) for their contribution to this research; Dr. Jennifer Elick (Susquehanna University) for her groundbreaking publications; and the past and current residents of Centralia for their gracious hospitality.

References

Elick, J. M. 2011. Mapping the Coal Fire at Centralia, Pa Using Thermal Infrared Imagery. International Journal of Coal Geology, 87, 197-203.

Elick, J. M. 2013. The Effect of Abundant Precipitation on Coal Fire Subsidence and its Implications in Centralia, Pa. International Journal of Coal Geology, 105, 110-119.

GAI Consultants, Inc. 1983. Engineering Analysis and Evaluation of the Centralia Mine Fire. Office of Surface Mining, 1 and 2. United States Department of the Interior, Monroeville, PA.

PADEP. 2018. The Centralia Mine Fire Frequently Asked Questions/Answers. Pennsylvania Department of Environmental Protection Bureau of Abandoned Mine Reclamation, http://files.dep.state.pa.us/Mining/.../CentraliaFrequentlyAskedQuestions.pdf, accessed 6/24/2018, 14 p.

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 OUR NEXT NEWSLETTER IS SEPT. 7, 2018

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Thank you!

Special thanks to our 2018 Student Poster Judges. We appreciate their ongoing contributions in support of PCPG's mission of advocacy, education, and networking.

Joe Casey, P.G.
Rich Hazenstab, P.G.
Kelly Kinkaid, P.G.
Paul Nachlas, P.G.
Jay Parrish, Ph.D., P.G.
Lane Schultz, Ph.D., P.G.

Our judges barely had time to grab a bite to eat, but reported enormous satisfaction from the experience after spending the day in discussions with the students.