

Geologically Speaking

A Michigan Section AIPG Publication

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Highlights of the 17th Annual Golf Outing

Field Trip Guide: Geological Excursions Around the
Manistique Area, Schoolcraft and Delta Counties

Regulatory Roundup

Marquette 2022: Annual Meeting Information

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Front Cover: Laughing Whitefish Falls, in Laughing Whitefish Falls State Park in Rock River Township, Alger County. The caprock of the falls is the early Ordovician Au Train Formation, while the sloped portion of the falls is the Cambrian age Miners Castle member of the Munising Formation. Photo taken by Adam Heft in 2020.

Geology Crossword #6 Solution

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Across

- 1. Compression
- 5. Slate
- 8. Schist
- 11. Deformation
- 12. Fold
- 13. Stress
- 15. Temperature
- 18. Strain
- 19. Boudins
- 21. Regional

Down

- 1. Crenulation
- 2. Phyllite
- 3. Nodes
- 4. Faulting
- 6. Extension
- 7. Foliated
- 9. Contact
- 10. Kinks
- 14. Shear
- 16. Pressure
- 17. Gneiss
- 20. Zone

From the President's Desk

Hello AIPG Michigan Geologists,

The year is winding down, a year where many of us may have been thinking that things were going to be much better than the previous with regards to the Covid virus. Although conditions have improved, we still have a long way to go to get ahead of it. After a year and a half, we were able to hold an in person section meeting, which is an accomplishment in itself. Nobody wanted another "Zoom" type Section meeting with me trying to fill time. The workshop was held virtually. The golf outing was held again, but pushed back again from the usual May date. We have adapted and tried to make the best out of situations that were in front of us. We are moving forward with our scheduled annual section meeting at Weber's on December 2 (Mark your calendar!).

I am asked by members on occasion; What can, or does AIPG do for me? My response generally involves asking about how much this person participates in Section and National events. We pay dues and each AIPG event: Section Meetings, Annual Conference, Golf Outing, Field Trips, Workshop, to name several, consume time and resources. Will my employer encourage membership and/or reimburse expenses? There are many factors that come into play as to why we have chosen to be members of AIPG.

Some of us are members because of a requirement for work related issues. That is why I applied to AIPG, needing the Certified Professional Geologist designation to be able to sign off on MUSTFA reports. (Who remembers MUSTFA?) I always teased for years that I was just a participant, not really a contributor to the association. Over the years, I was asked, nudged, encouraged to put my name in the hat, so to speak, to contribute and run for section office. Hesitancy did not necessarily decrease, but over time I wanted to change my level of involvement with the association, because of how I have benefited from my membership.

This, in a roundabout way, brings me back to, What does AIPG do for me? AIPG does things that impact all of us as members, many of which go unnoticed. As Vice President, I had to attend the National Executive Committee meeting last fall. With National postponed, the meeting was conducted over a "Zoom" type platform. It was very interesting to learn and/or be updated on all of the things that National is working on. I think it would surprise many.

I am a big believer that to get something out of anything, you have to give back in some way. The more you participate, the more you can potentially get out of it. There are many ways to get involved that may not necessarily take a great amount of time: The golf outing and workshop could always use more volunteers, write an article for Geologically Speaking, visit one of our Student Sections, work with our Early Career Professional (ECP) committee, coordinate a field trip for the section, etc. There are many ways to contribute and give back to the

association on both the section and national levels. And by the way, don't forget to throw your name in the hat for a term of section officer!

I would like to thank all of our members for their devoted work as geologists and contributing in such a positive manner to make our world a better and safer place to live. A special thanks to the members of this year's Section Executive Committee for putting up with me this year (and the previous three years). We are so fortunate to have such a dedicated and caring group of geologists guiding our section!

Most years, the Section President has had a personal mission, or message that they try to promote which has particular importance to them. When my term started I had hoped to promote public outreach regarding what geologists do and their incredible contribution to society. However, with the current conditions, meetings with the public have not been accessible. I ask that each of you, please, when given the opportunity, promote the geosciences and the honest hard work that we all do! Because if we do not get the word out, who will?

In closing, thank you for the opportunity to give back to the Association! Hope to see you in Sacramento!

Rock On!

Bill Mitchell

Check Out the AIPG Mentoring Program

Mentoring is an experience that promotes personal growth, creates meaningful connections, and sparks creative innovations. AIPG offers an opportunity to connect mentees with mentors. To sign up for the program is easy and can be done when paying your annual dues or updating your online profile. You may check the box on your paper dues renewal form that you send in via mail or log into your account at www.aipg.org and update your member profile. Be sure to check whether you would like to be a mentor or mentee and the fields of expertise. The system allows individuals to search for people with similar interests and connect via email. Check it out today!

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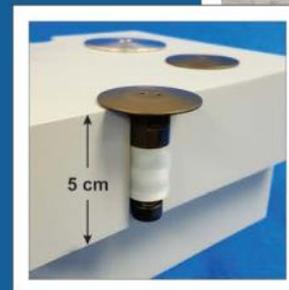
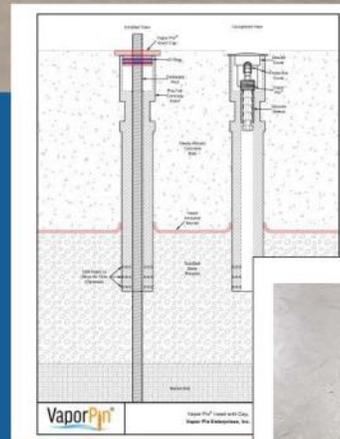


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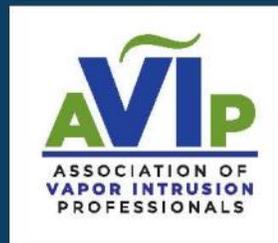
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17th Annual Golf Outing Highlights

August 24th, 2021 proved to be another great day in the books, with perfect weather for the 17th annual AIPG Michigan Chapter Golf Outing. A total of 79 players making up 20 teams swung their A-game out on the links for a chance to make new connections, support a great cause, and earn some potential bragging rights...or at least some everlasting funny memories. The event took place at the beautiful Lyon Oaks Golf Course in Wixom, Michigan with perfect Michigan summer (despite the scorching temperatures) weather. As always, the net proceeds from this year's event, with a grand total of over \$1,400, supports many AIPG-sponsored K-12 educational grants.

All players were greeted with an enthusiastic registration table comprised of excited volunteers and given a goodie bag that included golf balls, tee's, socks, and much more! And of course many joined the excitement of the 50-50/prize raffle contest, mulligan purchases, putt-for-dough contest, skins, longest drive, closest-to-pin, and the ever-exciting Vegas hole. The skill prize winners for the longest drive were Joseph Konrad and Andrea Galli, while the closest-to-pin winners were Jared Jonckheere and Jennifer Lagerbohm. Some of the winners were lucky to receive golf bags, golf clubs, range finders, golf gloves and many more! The 50-50/prize raffle raised a total of \$395, the Vegas hole raised \$460, and the mulligans raised \$310. Thank you to all who contributed to these exciting prizes, congrats to the winners, and to the losers...better luck next year!



The winning golf team, TSP Environmental, won with 12-under par! They won a variety of 4 brand new putters (although they didn't need them).

2nd place was won by the Environmental Resources Group (ERG). Their prizes included a case of different

color Volvik® golf balls.



3rd place included the team from TCE. Their prizes included a variety of goofy Caddy Shack golf towels.



Rounding last, but certainly not least, was the group from MCE. Who were honored with various boisterous golf club covers, including a kitty cat, superman, and even mighty mouse!

This event would not be possible without all of our perennial and new sponsors. A very big thank you to the following:

- Job Site Services (JSS) (Primary/Executive Level Event Sponsor)
- Fibertec Environmental Services (Breakfast and Lunch Sponsor)
- TSP Environmental (Beverage Sponsor)



- Environmental Resources Group (ERG) (Men's Longest Drive and Team Photos)
- Eco-rental Solutions (Tee Box Sponsor)
- Eurofins Scientific (Tee Box Sponsor)
- Hamp Matthews & Associates (Tee Box Sponsor)
- Meridian Contracting and Excavating (Tee Box Sponsor)
- Moore Insurance Services (Tee Box Sponsor)
- Pace Analytical (Tee Box Sponsor)
- PM Environmental (Tee Box Sponsor)
- SK & Associates (Tee Box Sponsor)
- Stantec (Tee Box Sponsor)

An especially big thank you to some of our sponsors

listed above who supported the big changeup this year and provided raffle gift baskets with exciting and valuable contents that were raffled off. The gift baskets included themes such as Detroit Tigers gear and tickets, The Office, BBQ'ing, gift cards, alcohol (of course), and many more! A LARGE congratulations to Fibertec Environmental Services who won the "We brought the biggest gift basket contest" which was awarded a special prize of a monster high-five from Kalan Briggs! The gift basket donations raised a total of \$540!

This event also would not be successful without the support and participation of all the volunteers as well; Cheri DeLyon and Heather Smith (Fibertec) for assisting with registration, photos, and raffles, Duane Hattem (Pace Analytical) for administering the putting contest, Gail Carr (Eurofins US) for helping with the hole-in-one grand prize hole, Andy Foerg (ECS) for the Las Vegas hole, Jacob Henning (ERG) with team photographs, Roger Pendry (JSS), and of course the energy behind (and in front) of the event, Laura Lambert (ERG), who assisted with everything including the initial set-up and coordination, raffles, and entertained us with her excellent MC skills! We'd also like to thank the staff at Lyon Oaks Golf Course for the service and hospitality (and patience) provided for our event.

The Michigan AIPG Executive Committee would like to thank your golf co-chairs Bob Reichenbach (ERG) and Kalan Briggs (EGLE RRD) for steering this outing to success and completion despite the global circumstances. Bob, thank you for your years of service and everlasting support for this event and the AIPG. The proceeds will be spent wisely and with due care. We hope to see everyone next year and look forward to another successful event!

Section Website Reminders

The Michigan Section has created a database of geologic photographs on our website. Please submit photographs that you are willing to share to Adam Heft at adam.heft@wsp.com. Don't forget to include your name and a short explanation of what the photograph depicts. The photographs will be uploaded to the website periodically.

If you have suggestions on other items that should be included on the History page, please let a member of the Section Executive Committee know.

Minerals for Sale!

Long-time Michigan mineral collector and dealer, Bill Micols, is selling his lifetime collection of material. Bill is in Milford. For additional details, please see the full-page flyer on the following page.

SALE

50 year life time collection



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Did You Know?

This article is intended to remind members of various aspects of AIPG and benefits of membership. If there is something you would like to see featured in this column, please contact the Editor...

The AIPG Bylaws were revised last year to change the Young Professional Member to the Early Career Professional. Here are the requirements of the ECP member category:

2.3.4. Requirements to be a Early Career Professional Member

Early Career Professional Members are recent graduates during their initial years as professional geoscientists. The requirements to be an Early Career Professional Member shall include

1. a baccalaureate or higher degree in a geological science; with
2. a minimum of thirty semester hours or forty-five quarter hours, or the academic equivalent thereof, in one or more

of the geological sciences, and, at the discretion of the Executive Committee, acceptable continuing education to demonstrate a currency with technical, regulatory, and economic factors affecting the profession. In lieu of 1 and 2 above, evidence satisfactory to the Executive Committee of the applicant's sound knowledge and proficiency in a field of geological science may be substituted.

3. applicable during the first five (5) years or sixty (60) months upon earning a baccalaureate, master's, or doctorate degree. The 60-month period of Early Career Professional status need not be filled consecutively if interrupted by enrollment for another degree. Thereafter the Early Career Professional Member will automatically be upgraded to Professional Member.

Membership Dues for the Early Career Professional Member will be at one-half (1/2) the Professional Member rate. The first year of ECP membership is free.

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Where in Michigan?

The August 2021 edition of *Geologically Speaking* featured a photograph of the Precambrian aged, 1.0 Ga Jacobsville Sandstone with a joint featuring reduction banding. The outcrop shown is located on the south side of Presque Isle Park in Marquette. The photograph was correctly identified by Kevin Ringwelski.

This edition of *Geologically Speaking* features a new photograph **at right** - not the photo on the cover page. The first person to correctly identify what the photograph depicts (feature name, location, formation, and age) will win AIPG swag! Submit your entry via email to the editor; only one per person per issue please.

Don't forget to check out the feature article "Geology in Michigan" in this issue (as well as the last several editions) that presents a geologic feature of interest as a mini field guide. One of the best parts about being a geologist is field trips, and we are hoping that in your travels around the state or country you include these featured spots as a stop. Why not incorporate them into a family vacation or bring friends who may not be geologists and share these locations that make Michigan unique? We hope you enjoy reading about it, and more importantly, go see it in person! We invite you to share unique geologic features that you know about and submit a "mini field guide" to share with our members in future editions.



Invitation to Our Members!

Do you have a case study to share?

The Michigan Section AIPG promotes knowledge sharing and would like to feature case studies from projects where others may benefit from successes as well as lessons learned. We feel as professionals that learning from each other is a great opportunity that AIPG offers our members. AIPG offers connection with other professionals and their experiences in the work we do every day. This case study represents what we would like to offer more to our members, not only as a way to solve problems, but unify us as professional geologists. Additionally, do you have a suggestion for other types of information to share that would be of interest to our membership?

Please send your case studies and suggestions for future publication in upcoming editions of *Geologically Speaking* to the Editor.

Update Your Information!

Please be sure that you continue to receive the Section's *Geologically Speaking* publication and other announcements. Submit an updated e-mail address to Adam Heft at adam.heft@wsp.com. If you move or change places of employment, don't forget to send your new contact information to both the Section and to National. If you are not receiving announcements directly from the Editor, it is because your email address is not up to date with the Michigan Section.

Please help the Editor by making sure that your email address doesn't bounce when the next announcement is sent. And be sure to cc Dorothy Combs, National AIPG Membership Director at aipg@aipg.org when you update your contact information. Thank you!

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Regulatory Roundup

Another fiscal year has come and gone. Fiscal year 2022 has just started and the State's budget has passed, but there is still more funding to be sorted out. Emerging contaminants are still making headlines and are the subject of two new bills.

EGLE's 2022 budget targets the items that made headlines in the past few years with a major focus on infrastructure. Gongwer's September 21, 2021, article below highlights where the department will be focusing efforts this year.

EGLE Budget Targets Dams, PFAS And Lead Service Line Replacement

Much of what is outlined in the Department of Environment, Great Lakes and Energy's 2021-22 fiscal year budget comes as a response to the last few years' struggle with PFAS in Michigan's drinking water and aging, lead-coated water infrastructure.

EGLE will see about \$689.8 million in gross funds (\$153.4 million General Fund) under the conference agreement adopted Tuesday.

Of that money, \$14 million has been allotted to remediate PFAS in drinking water systems, with \$10 million going to Benton Harbor for the purposes of lead service line replacements. Another \$192,1000 General Fund would support EGLE staff replacing lead service lines.

The committee concurred with executive recommendations for the transfer of 10 FTE positions to Land and Water Interface Permit Programs and 4 FTE positions to the National Pollutant Discharge Elimination System Non-stormwater program to meet EGLE's needs to the tune of just over \$70 million gross.

Another \$6 million in one-time General Fund would create a new fund to respond to dam emergencies where an owner has not adequately maintained their dam. One-time high water infrastructure grants would also be provided in the amount of \$14.3 million General Fund.

Water infrastructure improvements would also be addressed with \$45 million in federal funds meant to address water treatment plant improvements, service line and water meter replacement, distribution system upgrades and corrosion control, as well as other infrastructure needs.

Emerging contaminants and extending the statute of limitations for people exposed to them is a topic of two newly introduced bills. Gongwer published the following story on October 12, 2021.

PFAS Statute Of Limitations May Change Under Hazardous Chemicals Bills

Victims of PFAS contamination could see a change in when the clock starts on the statute of limitations for hazardous material exposure under two bills introduced in the

Senate last week.

The bills, SB 676 and SB 677, both sponsored by Sen. Winnie Brinks (D-Grand Rapids), look to give those exposed to PFAS and other long-lived chemicals more time to seek damages from those responsible for the release.

"This was identified by legal experts as an area that really needed attention, so, it was one place that we decided to start with bill drafts," Ms. Brinks said during a media event Tuesday sponsored by the Great Lakes PFAS Action Network. "Every state has different regulations and different laws on the books, and so we do look to other states ... and we are in the process of looking at many of these other concepts and putting them into bills."

Under the first bill, the state could seek damages on behalf of the public for contaminants such as PFAS at sites where work is underway to remove other contaminants. While the state would still only have six years to initiate claims, that time would start once the on-site work to address the discovered contaminant begins.

The second bill would postpone the start of the statute of limitations clock, allowing for those sickened by PFAS or other toxic chemicals, especially those not regulated as a hazardous substance before July 2, 1994, the ability to still seek relief long after those substances leached into the environment.

Neither bill explicitly mentions PFAS, which Ms. Brinks says was done on purpose.

"That's the very nature of emerging contaminants: We don't understand them or know about their damage until later," she said. "And so, the bill is written to accommodate for things that become part of our knowledge that are causing harm."

The bills were discussed as part of the Great Lakes PFAS Action Network's action agenda against the chemicals, which includes preventing future contamination and allotting better protections for PFAS-impacted communities.

Article continues on Page 13

WANTED!

Your Articles for *The Professional Geologist*

- Technical
- Opinion
- Peer-Reviewed
- Michigan Geology

Please submit your draft article to the Editor, Adam Heft at: adam.heft@wsp.com. Technical requirements may be found on the AIPG website.

Ms. Brinks said the bills did not have bipartisan support and called the lack of Republican buy-in unfortunate, noting that "their communities have been impacted just as much as Democratic communities."

Her package currently sits in the Senate Environmental Quality Committee Track and Ms. Brinks remained hopeful that it could see a hearing, saying that it was "not unusual for good legislation to take multiple terms in order to make progress."

Ms. Brinks said her bills were similar to legislation introduced last session but did not pass both chambers before the end of the year.

"The state Constitution requires us to make laws that protect the health and well being of our constituents and that's our constitutional responsibility," Ms. Brinks said. "When we have known contamination in so many parts of the state because of this family of chemicals, it's really incumbent upon us to look at the best ways to address that."

In the last issue of Geologically Speaking, we focused on funding for the Michigan Geological Survey. Michigan's survey has lacked adequate funding for years and because it has not been made a priority, Michigan has lagged far behind the surrounding states in mapping efforts and staying current. Senate Bills SB 488 and SB 565 were introduced earlier this year promoting appropriations for the survey. The AIPG Michigan Section Executive Committee has sent letters in support to the sponsors of the survey and has sent communications to the membership encouraging each of you to reach out in support of the state's geological survey efforts. It is not too late to make your voice heard. The legislators are considering appropriating federal funding to fill the funding needs.

AIPG prepares this column to encourage our professionals to lend your expertise and experience to those in the policy making arena. We as scientists and experts in this area are needed to lend our voices to the legislative processes to ensure that expert knowledge is conveyed and incorporated into laws and rules. This is a clear example of one such opportunity to reach out to your senators and representatives and let them know just how important a viable geological survey is to Michigan.

There are many more bills that have been introduced this year on the topics including water and infrastructure, solid waste, bottle deposit funding, fracking, and more.

Be sure to look through the list of bills for items of interest to you and the work you do.

Proposed Rules

Natural Resources and Environmental Protection Act, PA 451 of 1994, as amended, [bill search](#)

Safe Drinking Water Act, PA 399 of 1976, as amended, [bill search](#)

Gas Safety Standards, PA 165 of 1969, as amended, [bill search](#)

Geology professor runs 40 miles on 40th birthday to raise money for students

Excerpted from September 20, 2021 Today@Wayne...

As Wayne State University Department of Environmental Science and Geology associate professor Sarah Brownlee's 40th trip around the sun approached, she did what anyone would do — run 40 miles in a day to celebrate.

But instead of running for herself (and not a mid-life crisis), Brownlee also did what any good professor would do — help their students. On Sept. 10, Brownlee finished her nearly double marathon in seven hours and 52 minutes at an 11:48/mile pace while also raising \$4,630 — exceeding her original \$4,000 goal — for Run 4 the Rocks, the fun run Brownlee created to celebrate her birthday and benefit the Environmental Science and Geology Field Trip Fund. The fund supports WSU undergraduate field trips in environmental science and geology.

Read the full article at: <https://go.wayne.edu/40-miles-40th-birthday-ln>.



Geology in Michigan – Geological Excursions Around the Manistique Area, Schoolcraft and Delta Counties, Michigan

By Allan Blaske, CPG-10529

This field trip guide visits three easily accessible locations in the area surrounding Manistique, Michigan. It showcases the largest freshwater spring in Michigan, a cross-section of the Burnt Bluff formation, and a location for the collection of gypsum at a somewhat obscure quarry within the Hiawatha National Forest. The directions for all three locations begin at Manistique, located along U.S. Highway 2 (US-2), approximately 86 miles west of St. Ignace, and approximately 54 miles east of Escanaba. The Manistique area is home to a thin layer of glacial overburden and shallow bedrock, providing for the commercial extraction of limestone and dolomite from many quarries; most of these are currently inactive and inaccessible. Manistique is nicknamed "The Emerald City," a name which is believed to be derived from the emerald-green waters of the nearby Kitch-iti-kipi spring. The Manistique Area Schools athletic teams are referred to as the "Emeralds."

Stop 1: Kitch-iti-kipi

Latitude: 46°00'14.69"N; Longitude: 86°22'56.18"W
(spring)

Latitude: 46°00'17.03"N; Longitude: 86°23'06.19"W
(Palms Book State Park entrance)

Section 25, T42N, R17W, Schoolcraft County

Directions

Editors Note: From Marquette, follow US-41 south for approximately 50 miles to the junction with US-2 at Rapid River. Turn left (east) and follow US-2 for about 39 miles to the US-2/M-94 intersection. However, the distance to Highway 194 is only about 33 miles...

From the intersection of US-2 and M-94 in Manistique, follow M-94 north through Manistique for approximately 1.75 miles. Continue straight onto County Road 442 (M-94 will turn north). Continue along 442 for 4.25 miles, where 442 ends and becomes County Road 149. Continue straight (west) on 149 for 3.4 miles, then turn north onto 149. Follow 149 another 4.5 miles to Palms Book State Park. Follow the signs! They are abundant and pro-

vide good direction to the park. Figure 1 illustrates the location of the park. Once at the state park (an entrance fee applies), the spring is a short walk from the parking area. A self-operated observation raft allows you to float across the spring overlooking the underwater features.

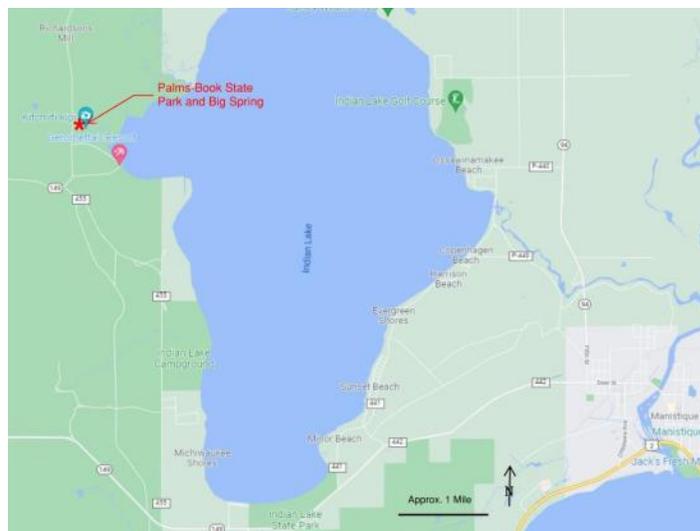


Figure 1: Location of Palm Book State Park and Big Spring. Adapted from Google Maps.

Description

Kitch-iti-kipi is Michigan's largest natural freshwater spring. The name means "big cold spring" or the "Mirror of Heaven" in the language of the Ojibwe. It is most commonly known as the "Big Spring" (possibly because Kitch-iti-kipi is difficult to pronounce!).

The Big Spring is an oval pool approximately 300 feet by 175 feet and is about 40 feet deep. Water emanates from the spring from fissures in underlying limestone and flows at approximately 10,000 gallons per minute throughout the year. The water is a constant temperature of 45 °F. Sand boils can be seen on the bottom of the spring. The water is an emerald-green color, and ancient

tree trunks with mineral and algae encrusted branches can be seen, as well as fish (most commonly lake trout, brown trout and brook trout) which can often be seen swimming about in the spring. Figures 2 and 3 illustrate the spring. Water from the spring discharges through an outlet channel on the east side of the spring (approximately 50 to 60 feet wide), and is connected to Indian Lake, located approximately 0.5 miles downstream of the spring. A review of USGS topographic maps reveals that several other springs are present in the area around Indian Lake, although none as large as the Big Spring.



Figure 2: Big Spring as seen from the walkway from the parking area. The spring water discharges through the river on the far side of the photograph to Indian Lake.

The spring is a result of a connection to an artesian aquifer system, where the hydrostatic pressure within the aquifer is sufficient to reach the surface. Water wells at the park and in the surrounding area indicate that there is a thin layer of unconsolidated glacial soil (clay and sand), underlain by broken limestone. The glacial deposits range between approximately 35 and 50 feet thick. Sinclair (1959) maps the bedrock beneath the spring as the Burnt Bluff Group (middle Silurian) and the underlying Cabot Head Shale of the Cataract Group (Early Silurian). GeoWebFace (accessed September 2021) indicates that the underlying bedrock is the Cabot Head Shale, but the presence of limestone in well logs in the area of the state



Figure 3: Big Spring, looking down from the raft. Note the "sand boils" on the bottom of the spring where spring water continuously enters the spring from below. Also note the fish suspended in the water column.

park indicate that at least a thin layer of the Burnt Bluff group is present above the Cabot Head Shale below the spring. The Lime Island formation is the lowest member of the Burnt Bluff Group and consists of limestone and dolomite.

The Burnt Bluff Group is the most important aquifer in Schoolcraft County. Wells drilled into these rocks obtain water from openings formed by solution and weathering when the rocks are exposed at the surface, and from permeable zones developed within the limestone by solution-activity (Sinclair, 1959). Water in the formation is generally confined and under artesian pressure. The Burnt Bluff Group is therefore a likely source for at least a portion of the water to the Big Spring.

Beneath the Burnt Bluff Group is the Cabot Head Shale of the Cataract Group. This formation is permeable as a result of solution openings which have been developed through the dissolution of gypsum beds (Sinclair 1959). While the upper portions of the Cataract Group are predominantly shale and dolomite, groundwater is present, but usually saline and of poor quality, so it is not a source of fresh water in the county.

Sinclair (1959) and Poindexter (1936) indicate that water from the Big Spring is high in calcium, sulfate, and total dissolved solids. This indicates that a significant quantity of the water which emanates from the spring is sourced from the Cabot Head Shale within the Cataract Group, where the dissolution of gypsum is the source of the high calcium and sulfate content of the spring water. Interpretive signage at Palms Book State Park indicates the source of the water to be the Cataract Group rocks (Figure 4).

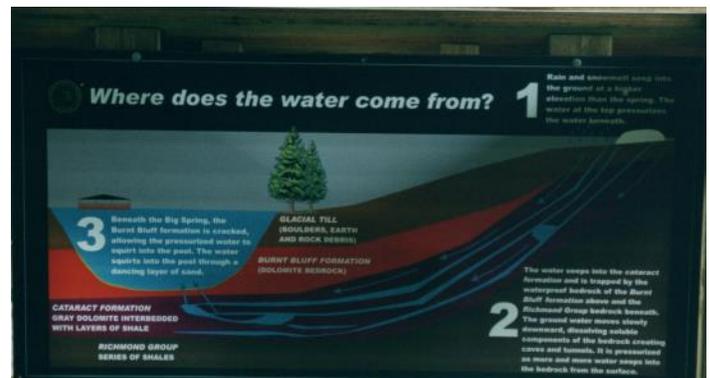


Figure 4: Interpretive sign on the raft, illustrating the hydrogeology of the Big Spring.

Stop 2: Stoney Cut Quarry Road Cut

Latitude: 46°01'45.82"N; Longitude: 86°16'19.06"W

Section 14, T42N, R16W, Schoolcraft County

Directions

This exposure is located on the east side of Michigan Highway 94 (M-94), north of Manistique, in Schoolcraft County, in the NE ¼ of the SW ¼ of Section 14, T42N, R16W. From the intersection of US-2 and M-94 in Manistique, follow M-94 north through Manistique and travel approximately 6.4 miles. The outcrop will be on the right

(east) side of M-94. Figure 5 illustrates the location of this road cut. Adjacent to the outcrop of the roadcut, small quarries are located on either side of M-94. These quarries are private property and should not be entered without permission of the owners.

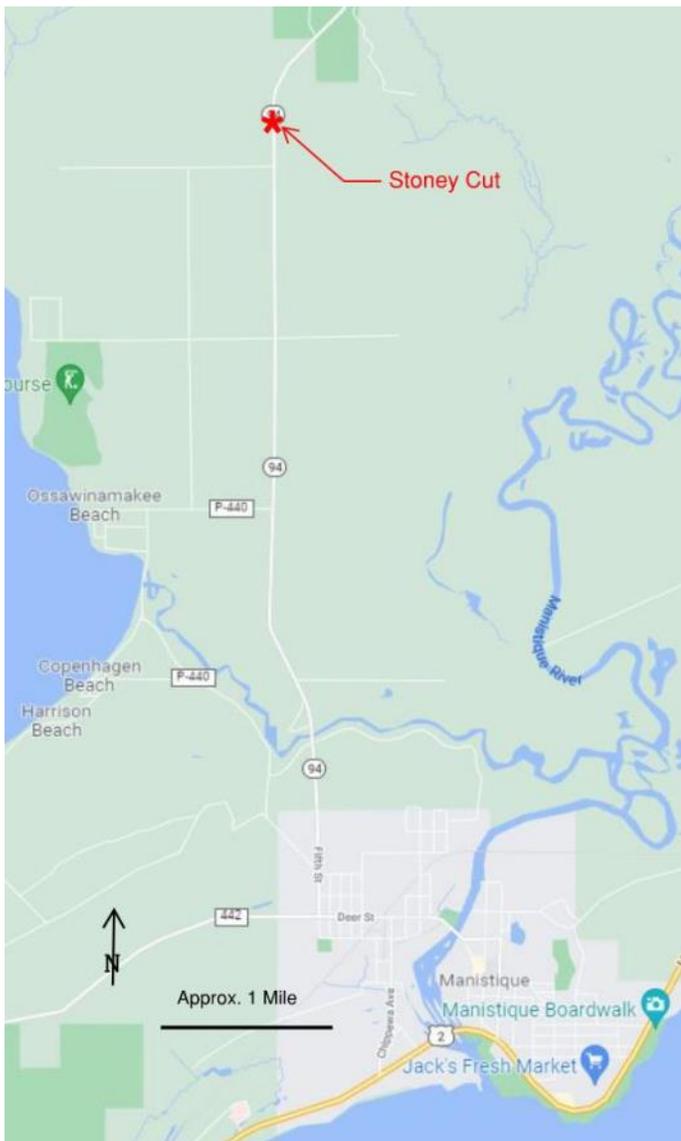


Figure 5: Location of Stoney Cut outcrop. Adapted from Google Maps.

Description

The highway at this outcrop goes downhill to the north, providing a road cut through the nearly flat-lying strata with increasing thickness toward the north. The outcrop is approximately 250 feet long. Because of the slope of the roadway, the upper parts of the strata are easily observed on the south end, with increasingly deeper sections of the strata exposed to the north. The outcrop and quarries are developed into the north-facing Niagara escarpment outcrop of the rock units. In addition to the Stoney Cut Quarry and road cut, this exposure has been called the "Big Hill Bluff" by some (Poindexter, 1936). The adjacent quarry is also known as the Sawheidle Quarry (Voice, et. al., 2017).

The rocks exposed at this location are the upper por-

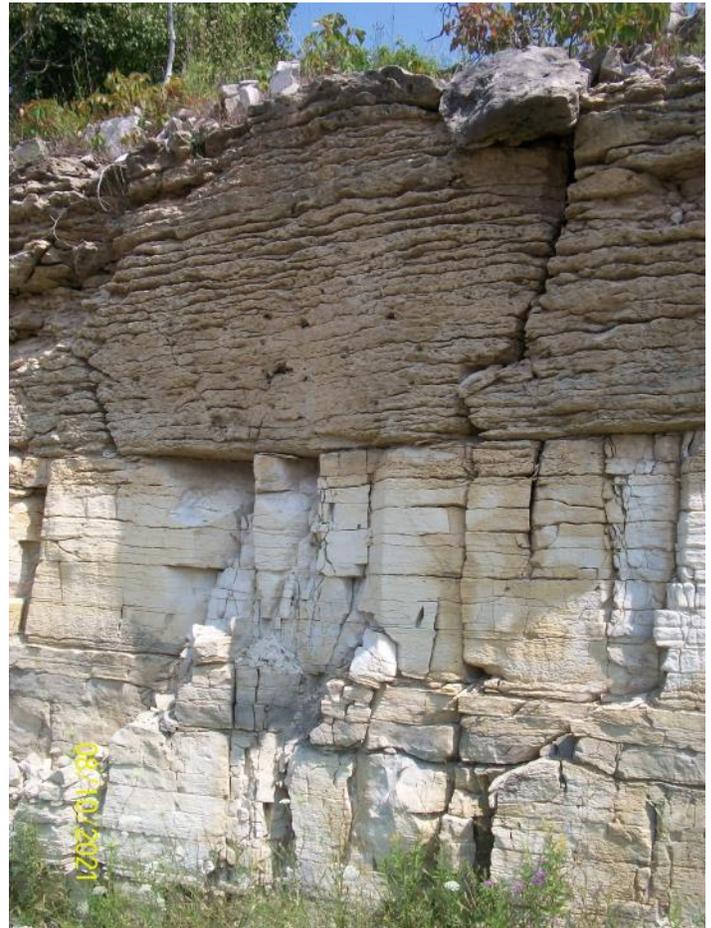


Figure 6: Cross-sectional view of Stoney Cut outcrop. Wavy-bedded dolomite overlying thick-bedded dolomite.

tions of the Burnt Bluff group of middle-Silurian age. Several formations within the Burnt Bluff are quarried at several locations in the southern Upper Peninsula, but the majority of these quarries are off-limits. This exposure provides an opportunity to observe the portions of the Hendricks and Byron formations of the Burnt Bluff Group.



Figure 7: Bryozoan and coral fossils on bedding surface of thick-bedded dolomite at the Stoney Cut outcrop.

The exposure is approximately 25 feet thick at the north end of the road cut. As you travel north (downhill),

successively deeper parts can be examined. The upper parts consist of wavy-laminated light buff colored dolomite, which easily splits into thin layers. Because of the weathering of the outcrop surface, this wavy lamination is obvious at the southern end of the outcrop. This unit comprises the upper 8 to 10 feet of the outcrop. Below the upper wavy-laminated dolomite, a brown to buff dolomite is present to the base of the outcrop (Figure 6). This dolomite is thick-bedded (up to 1-foot thick) and contains bryozoan, coral, stromatoporoids, crinoid columns, and brachiopod fossils (Dorr and Eschman, 1970), although none were found to be particularly well preserved by the author (Figure 7). Deeper portions of the Burnt Bluff group are exposed in the adjacent quarries. Brown-gray nodules of chert (some banded) are present in the strata underlying the road cut level, within the adjacent quarries. Voice, et. al. (2017) provides a very detailed discussion and description of the depositional environments of these units.

Stop 3: Forest Service Quarry

Latitude: 45°56'41.40"N; Longitude: 86°39'45.18"W

Section 15, T41N, R19W, Delta County

Directions

This exposure is located in the Hiawatha National Forest, in the SE ¼ of Section 15, T41N, R19W, in Delta County, Michigan. From the intersection of US-2 and M-94 in Manistique, travel approximately 24 miles west on US-2 to Nahma Junction. Turn north (right) onto Forest Service Highway 13 (NF-13) and continue approximately 3.3 miles. Turn east onto 28 Road (often labeled USFS 2231 on some maps). Continue along this well-maintained gravel road for approximately 2.6 miles. The quarry is located on the north side of 28 Road, at the northeast corner of the intersection of 28 Road and USFS 2740 Road. Figure 8 illustrates the location of the quarry. Be aware that these forest service roads are heavily used by ATVs, and there are many hills and turns on 28 Road. Travel carefully.

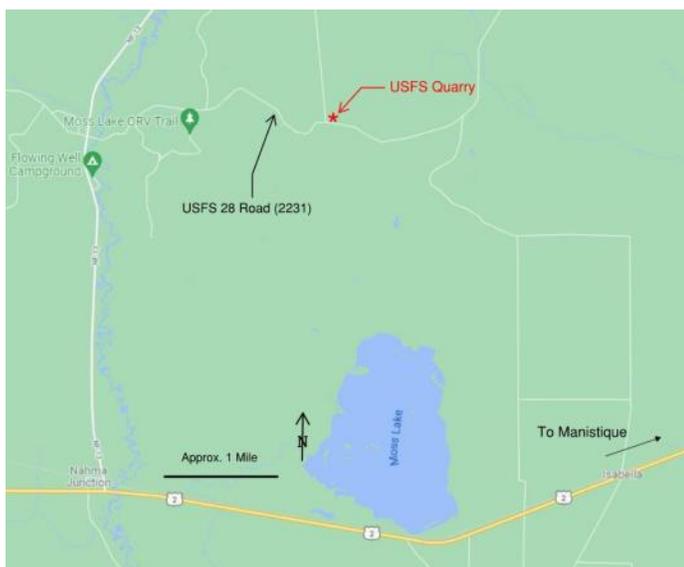


Figure 8: Location of small quarry on U.S. Forest Service Land, north and northeast of Nahma Junction. Adapted from Google Maps.

Description

The quarry is a small clearing in the forest and is basically a small (approximately ½ acre) excavation into the underlying bedrock. This location is not much of a quarry, as there has been very little excavation. Bedrock is exposed on the ground surface, with minimal vegetation growth. Interestingly, this location is listed in Kesling (1975) where he mentions that the quarry was “the same size as when I last saw it in 1957”. Kesling also states “Nevertheless, it was remarkably free of weeds and young shrubs and still displayed the evaporite minerals in fine preservation”. The quarry is in similar condition in 2021, as illustrated in the photograph of Figure 9. So after more than 60 years, little has changed at this location!



Figure 9: View of bedrock exposure at U.S. Forest Service quarry, looking north from USFS 28 Road.

The rocks exposed at this quarry are dolomitic facies of the early Silurian-aged Cabot Head Shale of the Catact Group. The rocks here include gray, thin-bedded dolomite and gray to tan argillaceous shale and dolomite. The shale contains gypsum. This gypsum consists of thin layers along bedding planes and fractures throughout the shale, as well as small nodules. The thin layers of gypsum are of the “satin spar” variety and range from ¼” thick to over 2 inches in thickness. White to cream colored nodules and lumps of fine-grained gypsum are also present. Crude crystals of clear selenite can be found, usually included with brown mud. These can be seen along cleavage surfaces of the crystals as the shale is broken apart.

The “satin spar” gypsum is the main reason to travel to this location, unless you happen to be very interested in observing one of the only outcrops of the Cabot Head Shale in the state of Michigan! The satin spar gypsum is found in layers up to 2 or more inches in thickness (Figure 10). It consists of thin gypsum crystals in parallel growth habit, oriented perpendicular to the seam or vein, and has a silky and fibrous appearance. The thicker layers of satin spar gypsum are often formed into small domes on the quarry floor, where the gypsum layer is domed up several inches (and hollow beneath) in an area a foot or more in diameter. These dome structures were also noted by Kesling (1975). Gypsum is soluble in water. Therefore, the occurrence of gypsum at the surface of this quarry in veins and layers within the shale for more

than 60+ years suggests that the gypsum may be recrystallizing near the ground surface. The domal structures also suggest the recrystallization of gypsum, as the gypsum crystallizes into thicker layers of satin spar, forcing the overlying shale and dolomite into domes by the force of crystallization.



Figure 10: Gypsum (variety "satin spar") on floor of U.S. Forest Service quarry. Note domed structure of gypsum bed, which is hollow beneath. Gypsum bed is approximately 2 inches thick.

The total amount of gypsum at this location is not great. If you choose to collect gypsum from this location, please limit your collecting to a few pieces, and leave some for other individuals which will follow.

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and Silurian Rocks of the Northern Peninsula of Michigan; University of Michigan Museum of Paleontology, *Papers of Paleontology*, No. 9.

Poindexter, O. F., 1936(?), *Geology of Schoolcraft County*, Michigan Geological Survey unpublished manuscript, 70 pages.

Sinclair, W. C., 1959, Progress Report Number 22, Reconnaissance of the Ground-Water Resources of Schoolcraft County, Michigan; State of Michigan, Department of Conservation, Geologic Survey Division, prepared in Cooperation with the U. S. Geological Survey.

Voice, P. J., Harrison, W. B., III, and Grammer, G. M., 2017, A reevaluation of the Burnt Bluff Group (Llandoverly, Silurian, Michigan Basin) from subsurface and outcrop data: Development of a time-transgressive depositional model, in Grammer, G. M., Harrison, W. B., III, and Barnes, D.A., eds., *Paleozoic Stratigraphy and Resources of the Michigan Basin*: Geological Society of America Special Paper 531, p. 55-79, doi: 10.1130/2017.2531(04).

Students - Reminder

Don't Forget: Each Student Chapter must submit two articles for publication in *Geologically Speaking* each year to qualify for Section funding. Send the articles to Adam Heft at adam.heft@wsp.com.

I Want To Publish Your Articles!



Hey everyone, I would like to encourage you to submit your articles for publication! As the Michigan Section Editor, and also the 2021-22 National Editor, I am working to put together two top-quality publications for our members. This is not a one person job. This is where you come in. I

welcome your technical articles, case studies, opinion pieces, mini field guides, and letters to the Editor.

The guidelines are pretty simple for articles for *Geologically Speaking*. All submissions must be professional and may not violate the AIPG code of ethics. They also may not have been submitted for publication elsewhere. While most submissions will be accepted, we do not accept articles that are a sales pitch for a product or company.

The deadline for submitting articles for TPG is two months before the start of the quarter for which the TPG edition is published. Thus, February 1 is the deadline for the Apr/May/June edition.

Please submit your articles of no more than 3,200 words in MS Word format directly to me or to Dorothy Combs at National Headquarters at aipg@aipg.org. All graphics (photos, figures, or tables) should be submitted in .jpg, .tiff or other standard format at 300 dpi. Please ensure your graphics are clean and easy to read to make things easier for the editorial staff. Complete information on submitting an article may be found on National's website at: <https://aipg.org/page/TPGInformation>.

I'd like to encourage our members to consider submitting an article related to Michigan geology in advance of the Annual Meeting that will be held in Marquette in 2022.

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Welcome New Members

The Michigan Section is continuing to grow. Please welcome the following new CPGs, Professional Members, Early Career Professionals, Associate Members, and Students:

Joshua Boren, MEM-3296; Mariah Burnett, MEM-3298; Paul Glasser, CPG-12106; Goran Kovacevic, AS-0184; Brian Meisel,

CPG-12108; and Brandon Schultz, SA-11064.

To each of our new members, welcome to our Section. We encourage you to attend Section meetings and other events. You are also invited to provide information for the Member's Corner articles.

Coming Events

October 23-26, 2021: Rescheduled 57th Annual AIPG Meeting to be held in Sacramento, California. The Role of Geoscientists for Resiliency, Sustainability and Opportunities in a Changing Environment. The meeting venue will be the Hilton Sacramento Arden West.

October 28, 2021: Rapid and Effective Characterization of Building Susceptibility to Vapor Intrusion with Building Pressure Control. https://www.michigan.gov/egle/0,9429,7-135-3308_3333-549843--,00.html.

November 8, 2021: AIPG Virtual Book Club: Getting Green Done by Auden Schendler. <https://aipg.org/events/EventDetails.aspx?id=1558114&group=>

December 2, 2021: Groundwater Modeling for Non-Modelers. <https://register.gotowebinar.com/register/1174845085294139660>

June 14-15, 2022: (NOTE DATE UPDATE) Environmental Risk Management Workshop at the Ralph A. MacMullan Conference Center, Roscommon, Michigan.

August 6-9, 2022: 58th Annual AIPG Meeting to be held in Marquette, Michigan. See article in this edition of *Geologically Speaking* regarding meeting planning.

Interesting Geology Links

The Editor has received links to various interesting geology-related sites. Some of the more interesting links are included here. If you have any links to geology-related sites that you would like to share, please forward them (with a citation, if applicable) to the Editor.

Thanks to Mark Francek of Central Michigan University for sharing via the "Earth Science Site of the Week" emails. This edition features a few "fun" links.

Volcanic Eruption in Iceland: <https://www.youtube.com/watch?v=f3BD8vqYTho>.

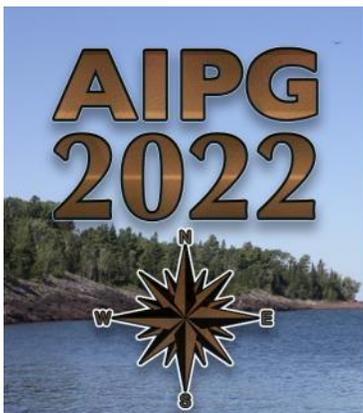
Landslide Occurs in Alta, Norway: <https://www.youtube.com/watch?v=nK584ol5zNk>.

Amazing Flash Flood/Debris Flow in Utah: https://www.youtube.com/watch?v=_yCnQuILmsM.

Member's Corner

The Member's Corner includes information about the Section's membership. This is your chance to provide information on where you are and what you are doing. Simply send the information to the Editor for inclusion in this section.

No Member's Corner articles were received for this edition of *Geologically Speaking*.



Annual Meeting Planning

The Michigan Section AIPG will be hosting the 2022 Annual Meeting in Marquette on August 6-9, 2022. The planning committee is growing, but needs your help! The committee is co-chaired by Adam Heft and Sara Pearson. If you are interested in helping with the 2022 Annual Meeting or would like to be on the planning committee, please email either Adam or Sara at [ad-am.heft@wsp.com](mailto:adam.heft@wsp.com) or pearsons@michigan.gov.

As one of the most active AIPG Sections, Michigan aims to have an exciting program and a highly successful Annual Meeting with many attendees. If you have any suggestions or ideas that will make the 2022 Annual Meeting one to remember, please pass them along.

The planning committee has narrowed the list of potential field trips currently under consideration to five:

- Eagle Mine/Mill: Surface tour (underground tour is unlikely)
- Pictured Rocks: Miner's Castle, Miner's Falls, Munising Falls, and boat tour
- Tilden Mine/Mill, includes a visit to the main mine pit
- Historic Iron Mining: Michigan Iron Industry Museum, Jackson Mine Park, Cliffs Shaft Museum
- Republic Mine and Reclamation: Overlook, rock piles, tailings reclamation

An additional trip featuring Precambrian geology in the Marquette District may also be included. In addition, we may include a trip to the Quincy Mine and Seaman Mineral Museum.

There are a number of other locations that participants would find interesting. Because we can't include everything, the plan is to provide meeting participants with access to the Geology in Michigan mini field guides that have appeared in this and prior/future editions of *Geologically Speaking*. These will include, at a minimum, the following locations:

- Champion Mine
- Fayette/Big Spring

- Gulliver/Gould City Limestone Quarries
- Lake Ellen Kimberlite
- Pictured Rocks National Lakeshore
- Presque Isle Park
- Harvey Quarry
- Stonington Peninsula
- Waterfall Tour

We may also provide information to meeting participants on the following activities:

- Brewery Tour
- Lake Superior Fishing Charter

The Field Trips are being evaluated by Allan Blaske and Dave Adler, with input from Mark Petrie. We expect that the field trips will be finalized by the end of this year, and that the descriptions will be available in early 2022.

Although meeting planning is moving ahead, we need your help! In the coming months, the call for abstracts, sponsors, and exhibitors will be released. We'll want people to help with the following:

- **Technical Session Committee members** to help review/evaluate abstracts for technical presentations;
- **Advertising/Exhibitor Committee members** to help identify and get sponsors and exhibitors;
- **Swag Coordinator** to help coordinate swag for the meeting, including T-shirts and other items
- **A silent auction coordinator**. As part of the meeting activities, we will be holding a silent auction. The proceeds of which will go to the Foundation of the AIPG. We need to obtain items to be auctioned at this event. If you have items you would be willing to donate for this cause, please consider doing so.

Look for additional updates on the Annual Meeting planning in future editions of *Geologically Speaking*!

ASBOG Exam Update

Twelve individuals took the ASBOG FG exam at Central Michigan University on Friday, October 1st. Registration is now open for the next exam, which will be administered on March 18, 2022. Relevant dates for taking the exam this March are:

- January 1, 2022 – apply to CMU

- January 14, 2022 – register with ASBOG
- March 18, 2022 – FG exam at CMU

Additional details are available at: se.cmich.edu/asbog and will be provided in the next edition of *Geologically Speaking*.

Member Input Sought

The Section Executive Committee is seeking input from members on a variety of topics. Do you have any suggestions regarding speakers/presentation topics that you would like to hear? What about field trips or other events? Some place you'd like to see us go, or something you think the membership would enjoy doing?

Then make your voice heard; please send your suggestions to one of the members of the Executive Committee; any of the six members would be glad to hear from you. AIPG is your organization. Please help keep it relevant and interesting for all by participating.

Support our Sponsors!

The Section Executive Committee would like to remind its members to support the companies advertising in this publication. Consider working with these compa-

nies, and when you speak with their representatives, let them know that you saw their ad in the Michigan Section AIPG publication *Geologically Speaking*.



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This presentation focuses on how physical and chemical data collected through BPC at sites can be used to char-

acterize the range of potential impacts that may arise from VI under the typical operating (baseline) conditions of the building. The second part of the presentation will include how the technique was adapted to work within Michigan's regulatory framework through the development of a standard operating procedure (SOP).

Presenters: Bryan VanDuinen, P.E.(MI) and Theresa Gabris, P.G. (VA), Geosyntec.

This webinar qualifies for 1 CEH/PDH.

How to attend the Online Webinar:

To attend the online webinar register at <https://register.gotowebinar.com/register/6749964970517931788>



After registering, you will receive a confirmation email containing information about joining the webinar.

Michigan Section's 10th Annual Environmental Risk Management Workshop

The Michigan Section hosted its 10th Annual Environmental Risk Management Workshop on June 15-17 2021. This year's event was held virtually via Whova and the theme was "The Data Tell the Story."

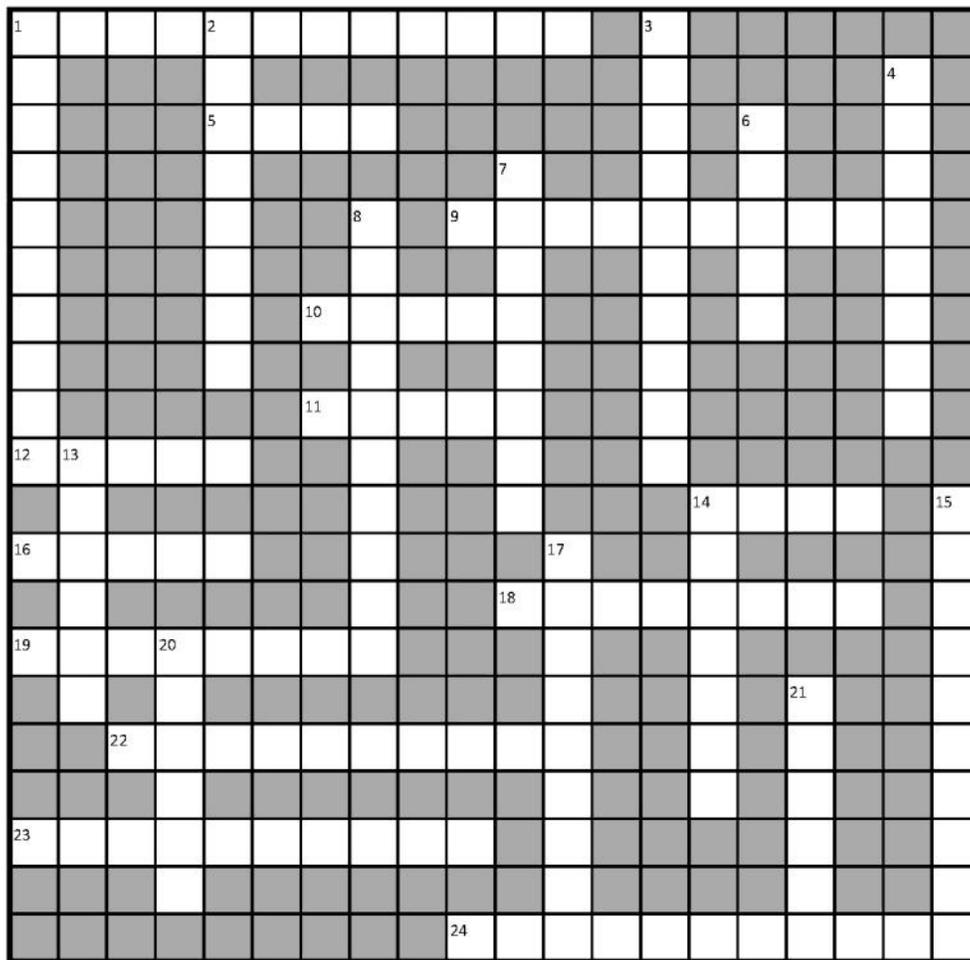
Although this year was not the in-person event that we were hoping for, we were still able to deliver high-quality technical presentations for our participants. Many of the technical presentations were recorded so that individuals can go back and listen in again.

Sara, Tammy and Adam would like to extend our thanks for participants and their patience for those talks that experienced

minor technical difficulties, and a big thank you for our sponsors. Also thanks to our session moderators, Chris Gellasch, Gail Carr, and Matt Germane.

Next year's Workshop will be held on June 14-15, 2022 at the Ralph A. MacMullan Conference Center in Higgins Lake! Please save the date; Sara and the rest of the Workshop planning committee are looking forward to welcoming you back to an in-person event next year!

Geology Crossword #7



Across

1. Equivalent to the Ellsworth Shale
5. Petoskey stone of the U.P.
9. Something fishy here
10. Tropical tree
11. Jurassic Formation
12. Oronto Group coastal town
14. Of Marquette pillows
16. Oval iron formation
18. Cambrian sandstone
19. Marquette District Iron Formation
21. Oldest Marquette rock
22. Equivalent to the Utica Shale
23. Nothing witchy here
24. Widely used building stone

Down

1. Fiery Cliffs
2. Cliff-dweling hardwood
3. Citrus spot in an ocean
4. Not pine or spruce trees, but nice
6. Goegebic equivalent to the Michigamme
7. Law enforcer
8. Blue eyed cat metamorphic
13. Oldest Goegebic formation
14. Equivalent to the Sturgeon Quartzite
15. Of Badwater
17. Rock at Piers Gorge
20. Gassy Devonian shale
21. Oldest Marquette District rock

*The solution to this geology crossword will be included in the next edition of *Geologically Speaking*.