AMERICAN INSTITUTE OF HYDROLOGY
Bulletin
The Society for Certification of Hydrology Professionals

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January 31, 2018

AIH is here to serve the profession and the members

- **AIH is the only organization that certifies professionals in the fields of surface water and groundwater hydrology, and water quality both nationally and internationally.**
- **AIH provides educational training venues to the professionals in the field of hydrologic sciences.**
- **AIH speaks to lawmakers on behalf of you and the profession as an advocacy**

The President's Message

Dear AIH members:

Greetings! I hope you all had a productive 2017, and are on your way to a successful 2018 as well. An important step for AIH in 2017 was moving our headquarters from Southern Illinois University to The Adept Group located near Denver, Colorado. The recent communications you have been receiving have been coming from our new office. Some of the goals of this transition were to avail ourselves of a host of expanded services and provide more value to our members. The physical move was accomplished in June of 2017, and the move of all other services was accomplished gradually in subsequent months.

The Executive Committee has been conducting monthly phone/webex meetings during all of last year to shepherd this transition and to bring our new executive director, Nicole Singleton, and her team up to speed with AIH activities. The executive committee also arranged a physical meeting middle of January, 2018, in Denver to get to know the management team members, and to discuss several items of strategic significance that could not be easily done over a phone. We are using this transition as an opportunity to revisit some of our policies and procedures and modify them to be more efficient and to better align with the current management structure. These include updating of the website, better processes for evaluating applications, modern-

(continued on page 2)

In this Issue:

The President's Message

izing the administration of exams for certification, implementing a more transparent and professional accounting process, developing processes and procedures for award nominations and selections, and many others. We will be working on finalizing and implementing these in the following months.

We also seek your help in several ways to make AIH more useful to our members. Here are some opportunities that will be coming your way enabling you to be active and better connected with AIH:

1. Respond to emails about renewing memberships: We would like to update our records and make them current as we switch to this new system. This will allow us to have updated member profiles. Also, we are moving to an annual renewal of membership cycle that will occur in the November to January time frame each year.

2. When ready, we will send out a survey to seek your input and help us prioritize the services that we would like to offer through AIH. Your feedback will help us bring better value to the members and to the community at large.

3. Be on the lookout for award nominations, which we hope to make a regular feature. We look forward to receiving many strong nominations for the awards so that we are able to recognize outstanding people in the various areas of hydrology. Going forward, we hope to make these decisions early in the year so that winners are able to attend the events where the awards will be presented.

4. Please consider in what leadership roles you or your colleagues can serve AIH. We expect to have officer elections towards the end of 2018, but it is important that we receive more nominations. Details about which positions are opening up will be made available in the coming months. Additionally, we are looking for volunteers to serve on our Board of Registration. These members evaluate new applications for their credentials and experience, and make recommendations to Chairman of Board of Registration for what the applicant needs to do to obtain certification.

5. Do bring to our attention your suggestions for interesting hydrologic items, news articles, reports, etc. that we can post on our website.

As always, feel free to reach me or any member/s of the executive committee with suggestions.

Warm regards.
Rao S. Govindaraju
Bowen Engineering Head & Christopher B. and Susan S. Burke Professor of Civil Eng.
550 Stadium Mall Drive
Purdue University
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From the Executive Director's Desk

Dear AIH Members,

We are excited about 2018 and all that is in store for the American Institute of Hydrology (AIH), its members, and other stakeholders. While 2017 was a year of transition, it was also a year of growth. AIH continued to welcome new members, certified a number of hydrologists and hydrologists in training, presented numerous awards to outstanding contributors to the hydrologic industry during the American Water Resources Association Conference, and moved its headquarters office to a new management company.

This year, we plan to continue to build upon this momentum. In fact, in January 2018, the AIH Executive Committee will meet to consider its operational needs and strategic focus to ensure that the organization continues to evolve and grow to meet the needs of you—our valued member.

In recent months, AIH launched a new website. With this new platform, you will notice ease in access, increased functionality, and the ability to update your own profile. We also hope that the new platform will allow for increased networking with access to the online directory. Be sure to update your profile by logging in and reviewing your profile.

Note the annual memberships run from January – December. A late fee of $25 is applied to all memberships submitted after January 15 each year. Be sure to maintain your membership by renewing online, via mail, or calling us at (303) 339-0523.

Please encourage your colleagues to consider becoming a part of the American Institute of Hydrology. By creating awareness and growing our numbers, together, we can work to enhance and strengthen the standing of hydrology as a science and profession.

Our Executive Office is excited to support the Institute. Please contact the AIH Executive Office should you have any questions or need assistance.

Sincerely,
Nicole A. Singleton, MBA, MAC
Executive Director
American Institute of Hydrology

Technical Paper

1,2,3 – Trichloropropane in Groundwater – Fresno and Kern Counties, California

By Kenneth C. Ames, PhC, PG, BSK Associates (kames@bskassociates.com)

This paper was erroneously printed partially in the August 2017 issue of the Bulletin. It is now reprinted in full.

Introduction

1,2,3 – trichloropropane (TCP) has entered the environment primarily as a degreasing solvent and as an impurity in soil fumigants, used to control nematodes. As a result, TCP is observed in surface- and groundwater in North America and Europe at concentrations as high as 100 micrograms per liter (µg/L) (Ozekin, 2016). Although the US Environmental Protection Agency (USEPA) has not issued a maximum contaminant level (MCL) for drinking water, TCP is a suspected carcinogen with a reference concentration of 0.0004 µg/L for a 10-6 cancer risk. Furthermore, states such as Hawaii have established a MCL (0.6 µg/L) and California has a notification level and proposed MCL of 0.005 µg/L or 5 parts per trillion (ppt).

TCP in California Groundwater

The use of TCP as a degreasing solvent, as well as impurity in soil fumigants, has resulted in TCP being detected in many areas of California where groundwater is the primary or sole source of drinking water (*Figure 1*).

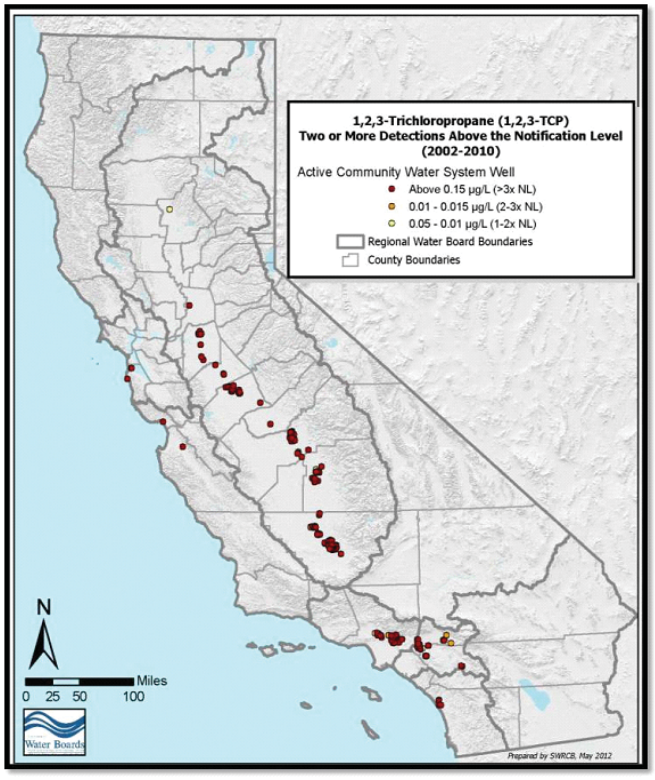

***Figure 1* – Communities in California affected by TCP in groundwater (from CA DWR).**

TCP is a dense non-aqueous liquid (DNAPL) that has been observed in deep wells and is a very recalcitrant compound, because it has a long hydrolysis half-life (100-800 years) and does not biodegrade readily (50-200 years) in groundwater (Cohen and others, 2011). Water purveyors, large and small, have recognized this as an issue for some time and the limited amount of research performed in determining well-head treatment methods to remove TCP from drinking water has shown that most tradition methods, such as coagulation, sedimentation, and filtration are not feasible (Ozekin, 2016). The use of reverse osmosis, catalytic oxidation, and reductive precipitation have shown some promise but the use granular activated carbon has been shown to be the most cost-efficient method thus far; however, its use has a finite capacity requires periodic replacement. As such, California Water Service recently signed a contract with Calgon Carbon Corporation for $13.2M to supply material and associated equipment to treat 30 wells (Calgon Carbon Corporation Press Release, 03/29/2017).

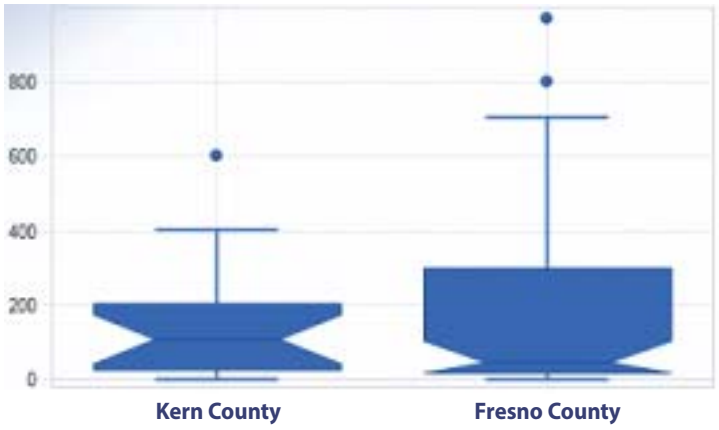

***Figure 2* – Box plots of TCP concentrations in Kern and Fresno Counties (outliers with concentrations greater than 1000 ppt were excluded from Fresno Co. plot).**

While the focus of TCP in groundwater has been on public and private drinking water suppliers that must adhere to Federal and State drinking water standards, there has been no investigation of the general quality of groundwater that is affected or the impact this issue may have to domestic users that rely on these same aquifers for drinking water. There are thousands of domestic wells in the central valley of California that are not required to be tested or treated for various compounds, including potential regulation for TCP, to protect human health. In Fresno County, there are more than 18,000 domestic wells that have been permitted since 1977, alone (Tom Fuller, Fresno County Health Department, May 30, 2017, personal communication).

TCP in Groundwater in Fresno and Kern Counties

Literature that illustrates the extent TCP in groundwater in either Fresno or Kern Counties has not been found. However, data collected by the US Geological Survey (USGS), as part of various studies where TCP was detected in groundwater, was found in both their NWIS and STORET

Technical Paper

1,2,3 – Trichloropropane in Groundwater – Fresno and Kern Counties, California

databases. A total of nearly 500,000 records stored, inclusive for both Fresno and Kern Counties, was searched for detected concentrations of TCP. While site information was limited, the latitudes and longitudes along with total well depths were found that enabled iso-contour maps to be formed, along with the summary statistics, for the areas studied.

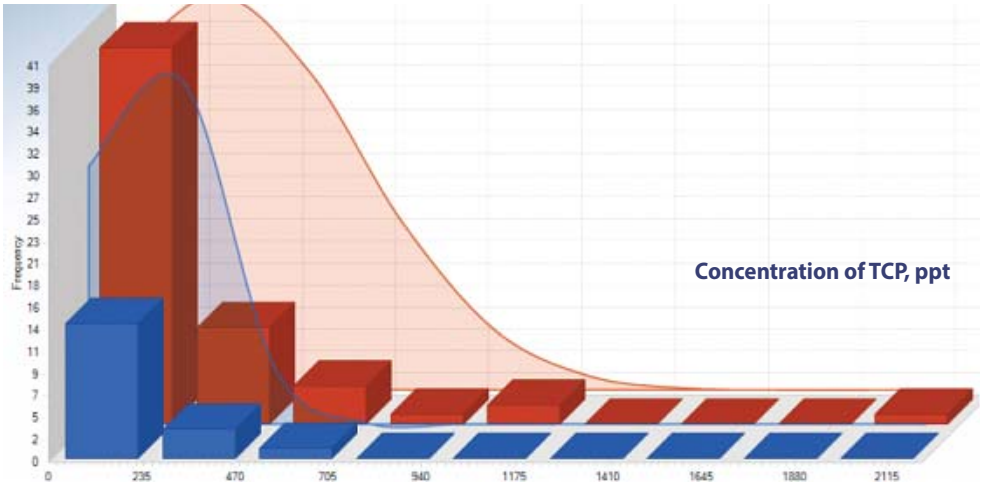

Figure 3 **– Frequency of occurrences, with Fresno County in red and Kern County in blue.**

For Fresno County, the mean, median, and maximum concentrations observed were 233, 63.5, and 2,120 parts per trillion (ppt), respectively, based 55 unique observations (Figure 2). While then mean, median, and maximum concentrations in Kern County were 154, 109.5, and 600 ppt, respectively, based on 15 unique observations.

All data were log-normally distributed (*Figure 3*), which is common with environmental data; however, it should be noted that the median concentrations for both counties exceed the proposed State of California MCL of 5 ppt by at least on order of magnitude, as well as exceed the proposed immediate response limit of 50 ppt. Iso-countour maps were generated for both Fresno and Kern Counties (*Figures 4 and 5*), based on the same USGS data retrieved from their NWIS and STORET data bases.

Although both figures (especially that for Kern County) are based on limited data, they clearly show that the distribution of TCP in groundwater within both counties is wide-spread. In Fresno County, elevated concentrations of TCP are centered around Fresno and Clovis, with lesser concentrations to the south and areas to the east; however, the highest concentrations observed center around Orange Cove, in the eastern section of the county where values greater than 1000 ppt were detected.

In Kern County, the Bakersfield area has concentrations around 200-300 ppt, with increasing concentrations apparently to the north to as great as 600 ppt. However, the concentrations of TCP drop off significantly both to the west and east of Bakersfield. In both counties, the distribution of TCP observed in Figures 4 and 5 are likely tied to historic land use. Regardless, these are not typical chlorinated solvent plumes that have been defined in many areas of California but extend tens, if not hundreds, of miles in the aquifers systems used by not only public supply systems but domestic users, as well. Therefore, it is unlikely that traditional methods, such as pump and treat, chemical injection, or monitored natural attenuation, will provide the mitigation needed to those do-

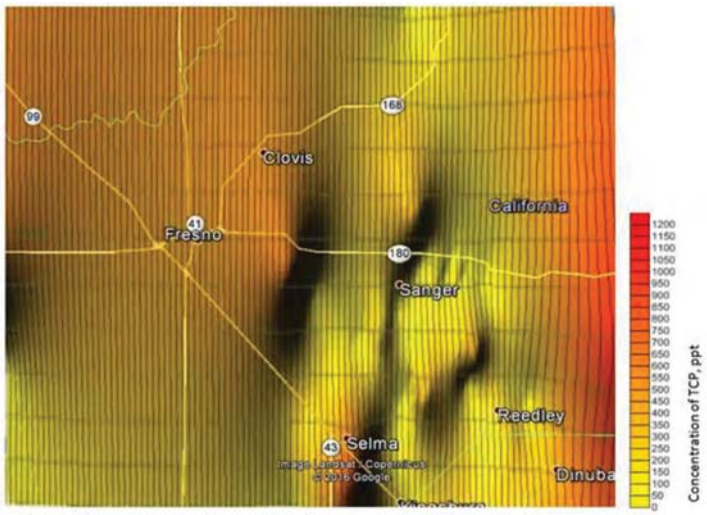

Figure 4 **– Iso-contour map of TCP in groundwater, Fresno County.**

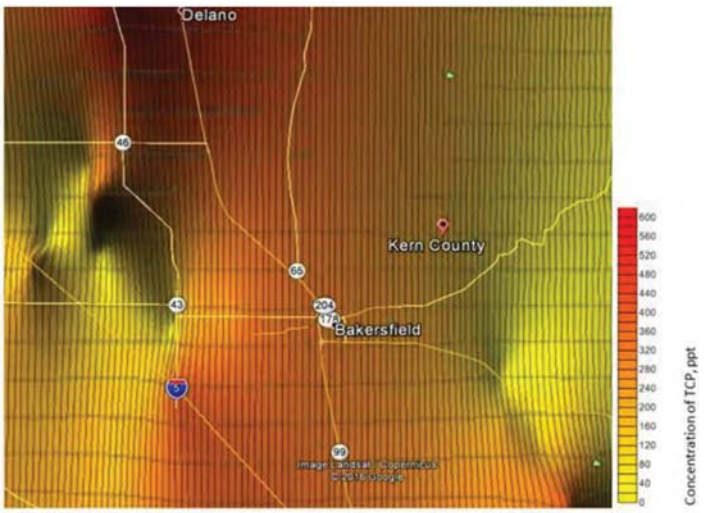

Figure 5 **– Iso-contour map of TCP in groundwater, Kern County.**

Technical Paper

1,2,3 – Trichloropropane in Groundwater – Fresno and Kern Counties, California

mestic users. The current research shows that GAC systems, which are being employed by many water systems, may be the best choice for domestic users, just much smaller systems that are readily available.

This author is also looking into the increased efficacy of GAC, when either reductive dechlorination or catalytic oxidation is used prior to degrade TCP into daugheter products that may adsorb better to GAC. This may not provide a solution to domestic users but may be more cost-efficient to water systems that may already employ some of these mechanisms for other contaminants.

References Cited

Calgon Carbon Corporation Press Release, 03/29/2017

Cohen, S.Z., and others, 2011, DBCP and TCP in groundwater in California and Hawaii: Comparison of vadose zone and saturated zone modelling with monitoring results; presentation before the Division of Environmental Chemistry at 242nd ACS National Meeting, unpaged.

Tom Fuller, Fresno County Health Department, May 30, 2017, personal communication.

U.S. Geological Survey, NWIS and STORET Databases. https://waterdata.usgs.gov/nwis and ahttps://water.usgs.gov/owq/data.html

Ozekin, K., 2016, 1,2,3-Trichloropropane state of science, Water Research Foundation, unpaged.

Opinion

Professional Development of Hydrologists in an Era of Nexuses

By Dr. Faisal Hossain (AIH Vice President for Academic Affairs), University of Washington (fhossain@uw.edu)

I was recently involved in authoring a monograph with my colleagues titled "*100 years of Hydrology*" for the centennial celebration of American Meteorological Society (AMS). As I was writing my part focusing mostly on water management applications, it quickly dawned on me that the history of hydrology and that of the practicing hydrologist was actually more than a century old. For example, in ancient India, the amount rain in an area was recorded for each year and used as a proxy for estimating food production and taxation rate for the following year. In Sri Lanka, giant-sized reservoirs were built in the 1st century B.C. during the reign of King Wasabha (67 – 111 BC). In fact, the development of hydrology as a proper scientific discipline was driven by professionals who wanted to solve real world problems, such as Robert Horton, who had written about infiltration and runoff production that is commonly used to express runoff generation process from precipitation in many of today's watershed management models.

Lately, the disciplinary boundaries have started to disappear as hydrology continues to evolve from dynamic hydrology, to hydrometeorology; from hydrometeorology to global hydrology enabled by remote sensing to now where we increasingly talk about 'nexuses'. The term nexus has become a buzz word and used to define cross disciplinary topics centered around water and allied resources (like food-water nexus, water-health nexus or water-energy nexus). So what does this mean for the professional hydrologist and continuing education or professional development in this era of increasing nexuses?

Today, professional hydrologists apply hydrology as a profession to help protect public interest and the profession from non-professional, sub-standard or unethical practices in a field involving water. Because of the continually changing nature of the field of hydrology that is becoming more inter-disciplinary and the societal challenges, it has become more imperative than before for hydrologists to continue their professional development throughout their careers by keeping current in their specialty fields as well as the nexuses. For example, design or changing best management practices of large irrigation schemes in the 21st century cannot be tackled anymore in a stand-alone way focusing only on hydrology and agricultural management (as was done in the 20th century). Crop productivity, climate change, land use land cover impacts (on water quality and quantity), biogeochemistry and sustainability of water (re)use, have now become important when designing an irrigation system. Large water services infrastructure, whether they are new or old, demand appreciation of other disciplines that are not considered part of the traditional hydrology realm. For example, a large new dam or an old one can be assessed of its future risk of failure only with the use of global or regional climate models and comprehensive atmospheric records beyond just point rainfall records that have traditionally driven frequency analyses.

For the professional hydrologist, to become more literate in these nexuses, it is important to participate in continuing education courses, reading in the technical literature, and attending professional meetings and seminars, particularly those that are not in the traditional hydrology topics. Scientific societies that cater to an inter-disciplinary audience, are often a good starting point for such

Opinion

Professional Development of Hydrologists in an Era of Nexuses

professional development. Examples are, American Geophysical Union (AGU), American Meteorological Society (AMS) or the Consortium of Universities for the Advancement of Hydrologic Science (CUAHSI). Soon, on the AIH website, we plan to provide some directions on what may constitute professional development hours in order to maintain certification. We urge readers to take a look or ask us. And in the meantime, please consider attending the annual meetings of scientific societies to get a good grasp of what 'nexuses' really mean for the professional hydrologist. ■

AIH Awards

Congratulations to 2017 AIH Award Winners

Congratulations to recipients of AIH's 2017 awards for outstanding accomplishments in the fields of groundwater, surface water, water quality, and institute development announced during the AWRA 2017 Annual Conference:

Dr. Lynn Gelhar (Massachusetts Institute of Technology) – Charles Vernon Theis – 2017 Groundwater Hydrology Award

Dr. Kenneth W. Potter (University of Wisconsin at Madison) – 2017 Ray K. Linsley Surface Water Hydrology Award

Dr. David Williams, (David T. Williams & Associates) – AIH Founders Award

Dr. Jimmy Kao (National Sun Yat Sen University in Taiwan) – 2017 Robert G. Wetzel

***(L to R)* David Williams, Stephen Burges *(2003 Ray K. Linsley Surface Water Hydrology Award Winner),* Kenneth Potter, Jamil Ibrahim (AIH VP of Institute Development).**

CALL FOR CONTRIBUTIONS

AIH invites members to contribute original articles for publication in the Bulletin as well as tips about news that may interest fellow hydrologists. Original articles must be between 800 - 1,200 words and be relevant to the practice or science of hydrology. News may be any development of interest to hydrologists such as policy or legislative changes that impact the profession, new scientific advances, open positions (professional/academic) for hydrologists or awards or recognition for hydrologists. Send contributions to Nicole Singleton, Executive Director, at admin@aihydrology.org.

COMMUNICATIONS COMMITTEE

AIH invites members to join the AIH Communications Committee. The committee is charged with improving the quality of communications of AIH with its members and the general public. If interested, please contact the committee chair, Rahul Ranade, at rahul.ranade@meadhunt.com.

In Memoriam

Sandor Csallany (1928 - 2016)

In the December 2016 issue of this Bulletin, we announced the passing away of Sandor Csallany, a founding member of American Institute of Hydrology. This memoriam was submitted by Roman Kanivetsky, another founding member.

Sandor Csallany was born in Szentes, Hungary, on April 15, 1928. He completed degrees in Civil Engineering, Hydraulic Engineering, and Hydrology at the Technical University of Budapest, began his professional career, and married. His family fled into Austria at the time of the Hungarian Uprising in the fall of 1956, and continued to the United States in 1957 where Sandor joined the Illinois Water Survey.

In the U.S., Sandor was challenged by observing that his adopted country lacked a society focused on promoting discourse among water professionals on the many important issues facing water resources planning and management. He recruited colleagues who joined him in forming the American Water Resources Association on March 17, 1964. Sandor immediately went to work writing letters inviting professionals nationwide to an initial meeting in Chicago in 1965. Since then, AWRA has grown steadily to become an influential force for an interdisciplinary perspective in water resources management.

Sandor then took the step of facilitating this important collaboration at the international scale and recruited Gabor Karadi and also Emil Mosanyi from the University of Karleruhe in Germany in founding the International Water Resources Association on December 10, 1971. The new association rapidly gained membership and prestige under the enthusiastic leadership of Ven Te Chow, a world renowned hydrologist from the University of Illinois. Sandor also saw a need for ensuring the public that water resources management was supported by well-trained hydrologists. Since states did not register hydrologists, he advocated that the community itself certify expertise in hydrology and joined with Alexander Zaporezec and Roman Kanivetsky in 1979 in formulating a plan that culminated in establishment of the American Institute of Hydrology on March 27, 1981. Once again, he went to work with phone calls and letters recruiting leading hydrologists, fund raising, and organizing examinations for demonstrating merit. AIH has also matured through the years and become recognized for certifying excellence of practicing surface and groundwater professionals. Through the many years since, Sandor has kept close contact with all three organizations.

Thousands of water professionals around the world recognized his contributions and mourned his passing on June 8, 2016 in St. Paul, Minnesota. His personal career after leaving the Illinois Water Survey, included a time at Western Kentucky University and then many years as a practicing consulting engineer in Minneapolis. He is an Honorary Member of the Hungarian Academy of Engineering and has been awarded Certificates of Merit from Budapest University of Technology (Golden and Diamond Awards). He leaves Agnes his wife of 61 years and his son Adam. ■

AIH Executive Committee Meeting in Denver

Members of the AIH Executive Committee (EC) met in Denver on January 13, 2018. A wide variety of topics related to the organization were discussed including the certification program, AIH finances, management updates, bylaws, and awards. Most importantly, EC members deliberated on the strategic direction of the organization. Watch out for communication from AIH for various developments that resulted from this meeting. ■

L to R: Stephanie Ehlerding (Marketing & Membership Specialist), Nicole Singleton (Executive Director), Zhuping Sheng, David Williams, Jamil Ibrahim, Nick Textor, Greg Bevenger, Rahul Ranade, Govindaraju S. Rao, Faisal Hossain, John L. Nieber.