Technical Manager's Report

April 2023

General Introduction

This reporting period started with both Russell Staines (Op Com) and Paul Brown (Board) chairing their first Op Com and Board meetings respectively. And Michael Davies officially joined INAP in the role of special advisor for the Americas and has taken the lead in guiding the members on the update to the strategic plan. Much has happened in this reporting period with several new projects being discussed and others going through the review process. Training and education were the focus of two projects. The Queensland University of Technology was hired to develop an interactive game to teach people about the importance of AMD and discussions are underway on the development of AMD training modules based on the various GARD Guide chapters. Updating the GARD Guide chapters has continued. Work has begun on the Prevention and Mitigation chapter and the Mine Closure and Sustainability chapter is undergoing a major re-write following its review. Discussions on the scope for the next phase of the Mine Rock Stockpiles project was delayed but a new proposal was recently received and discussion are planned and work is expected to commence this year. The agreement for INAP to join the CRC-TiME network as an affiliate member for a one-year trial period was also finalized. Work on ICARD 2024, planned for Halifax, Canada is well underway. And members are extremely happy that in-person meetings are being planned for 2023 with the first in Denver in May.

INAP Op Com Meeting

The Q4 Virtual Op Com meeting was held on December 5/6, 2022. The first order of the meeting was for Russell Staines of BHP to take over as Chair of the Operations Committee from Paul Brown who is now the Board Chair. The 4-h meeting featured three presentations. INAP Op Com had recommended for approval the creation of a second Senior Advisory role, this one for Michael Davies for the Americas, and he presented some thoughts on what he sees as his new role within INAP. The second presentation was from Mike O'Kane, on recommendations on a proposed scope for the Phase II of the Mine Rock Stockpile project. And Paul Weber of Mine Waste Management presented a proposal to develop a series of educational modules based on the various chapters of the GARD Guide. All three were well received by the members. It was also discussed and recommended that INAP join the CRC-TiME network as an affiliate member for a one-year trial period. Updates on on-going projects were provided to members including a post-mortem on the virtual ICARD 2022, the GARD Guide chapter updates and the pit lake database.

INAP Australia (Bruce Kelley)

The focus for INAP in Australia continues to be engagement with CRC TiME and projects relevant to INAP. More recently, discussions have commenced with SMI re a shortened version of the Australian AMD workshop to be help in November 2023 (see below).

- **CRC TiME interaction**
  Following discussions at the last Op Com and Board meetings, approval was granted for INAP to explore potential for a formal relationship with CRC TiME. The most cost-effective approach was seen as INAP joining CRC TiME as an Affiliate Participant based on an in-kind contribution in 2023. This could be elevated to a minor cash contribution in future if required. INAP would be better positioned to participate more fully in projects and fund projects if appropriate.

Dr Boggs subsequently sent through participant documentation for INAP's consideration. These have been subject to legal review by the Company Secretary and deemed to be acceptable. The application to join the CRC was approved by the CRC TiME Board at its Board meeting in late March. INAP's in-kind contribution is being finalised at the time of compiling this report but is likely to be in the order of 100 hours per year.

As a reminder, the CRC Board has recently approved two major projects that are of direct relevance to INAP. Both projects have attracted significant industry support and a high level of funding.

Project 1:
Improved Prediction, Remediation and Closure of acid and neutral metalliferous drainage (AMD/NMD) sites by examination of mine waste behaviour at the meso scale.

Project 2:
Mine pit lake assessment and management: a national initiative to support mine closure and regional opportunities.

Funding for each of these projects is in the order of AUD$4 M cash and an equivalent in-kind amount. The projects will run over 3-4 years, so the investment is considerable.

- **SMI Australian AMD Workshop in 2023**
  SMI has initiated discussions with INAP around holding a 1.5-day AMD workshop in November 2023. I have encouraged SMI to hold this workshop in conjunction with the CRC TiME Annual Forum, which will be help from Tuesday November 21 to Thursday November 23 in the La Trobe Valley, which is about a 2-hour drive from Melbourne. This is a major brown coal mining and coal fired power station region with a long history. The region is now facing mine and power station closures with major impacts on the community. The SMI workshop would likely be held on Monday November 20, and then share a half-day session with the CRC Forum on the following day. Site visits would be arranged through the CRC. INAP would hold its Op Com and Board meetings to coincide with the above activities. Dates and details need to be finalised. The combination of the AMD workshop, CRC Annual Forum and INAP meetings offers an exciting event packed week.

INAP Americas (Michael Davies)

The newly approved role by the INAP Board had its initial period of activity from December 2022 to April 2023. Activities over this period included:

- Worked on several companies for considering membership within INAP including Vale and FMI. Frank discussion with FMI about long-standing perceptions from experiences many years ago.
- Spoke with several senior leaders in the consulting world with geochemical roles and/or staff about concept of a form of associate membership with INAP should the Board consider that model for adding to the industry integration – lots of very positive feedback with it being very clear if the vehicle was to be developed, there is strong appetite.
- Helped initiate the "roughly" once per month discussion amongst the Board Chair, Op Com Chair, Technical Manager and the two Senior Advisors. This relatively unstructured forum was developed to assist with momentum on programs, alignment on key topics and ensuring membership value from regularly scheduled sessions.

- Collated the previous Strategic Plan materials and developed summary material to be used to guide the Op Com members through a SWOT assessment across the five main pillars within INAP as input to a tweaked Strategic Plan – most significant additions coming in areas of expanded membership and inclusion of societal expectations arising from the emerging ESG controls/challenges/opportunities occurring within industry.
- Also continues to have regular interactions with the Technical Manager including phone calls on an as needed basis.

Global Alliance:

ADTI-MMS: David Williams continues to coordinate ADTI-MMS activities with the help of Patrick Williamson of Intera as ADTI-MMS co-chair.

Participated in monthly telephone meetings and provided an update on INAP activities during these calls. The ADTI-MMS website is available at: http://community.smenet.org/adti-mms/home?ssopc=1.

Key activities for the reporting period include the following:

- Of continued interest to INAP are the potential new volumes that are being considering by ADTI-MMS. One is on Biogeochemistry and a second on Mine Life Cycle Planning. Several ADTI members have expressed interest in helping with the new volumes. A proposed outline for the Biogeochemistry Volume has been developed by Lisa Kirk and Linda Figueroa and submitted to SME for review. Lisa and Linda will be working on this volume during Q2/Q3 2023. The Mine Life Cycle Volume is on hold for the near future.

- David Williams reviewed the new Mine Closure and Sustainability chapter of the GARD Guide and submitted comments.

IMWA: The proceedings from the International Mine Water Association's (IMWA) 2022 conference, held in Christchurch, New Zealand in November 2022 are now available from the IMWA website at: https://www.IMWA.info/imwaconferencesandcongresses/proceedings/328-proceedings-2022.html.

Preparations for IMWA 2023 are well underway. It will be held in Newport, Wales (UK) from July 17 to 21, 2023. The organizers have called the conference "Y DYFODOL | THE FUTURE" as they believe that the research work they do will play a role on what lies ahead of us. More information can be found at the conference website https://imwa2023.info/

As a reminder, the proceedings, as for all IMWA conferences, are available from the IMWA web site at www.IMWA.info.

MEND: In this reporting period, Richard Goulet has taken over as the Manager of the MEND Program from Patrick Chevalier. As a former MEND Manager, I have had conversations with Richard and provided historical information and am only a phone call away if needed.

Another successful BC-MEND ML/ARD Workshop was held on November 30/December 1 in Vancouver. Close to 200 "in-person" and 340 "virtual" participants attended this 29th edition. Presentation topics included case studies, prediction, tailings, fugitive dust, dry covers, and drainage treatment at mine sites in North America and Europe. The workshop also included the perspective of the Stk'emlúpsemc te Secwépemc First Nation, an overview of topics presented at the 2002 International Conference on Acid Rock Drainage (ICARD), and the BC Ministry of Mines guidance on technology readiness and policy foreshadowing. A highlight was information on the use of a Zamboni for dust suppression, a real Canadian solution! Registration was free for students, aboriginal groups, and community volunteers. Presentations from this and previous years, along with answers to questions from the virtual audience, are available for review at the BC-MEND website at http://bc-mlard.ca/.

An update on the MEND/INAP collaborative project on geochemical degradation with Klohn Crippen Berger is provided later in this report.

SMI (Australia): During the reporting period, SMI were completing their post-mortem on ICARD 2022 (budget, profit, and website). More can be found in the Virtual ICARD 2022 section below. And as per Bruce's note in his Australian report, plans are in the works for an AMD Workshop in November in La Trobe Valley.

And Mansour reported that SMI (Centre for Water in the Minerals Industry) has employed David Jones as an Industry Fellow within his group. David will be a great support for Mansour for the AMD Workshops and other AMD activities.

SANAP (General): With the departure of Jacques Wiertz and David Mulligan from SMI-ICE in Chile, there has not been much Communications regarding SANAP. Flavio Vasconcelos is still a SANAP contact in Brazil. Will try to follow-up with both groups in the next reporting period.

Strategic Plan - Path Forward

Happy to report that Michael (Davies) has graciously accepted to lead the development of an updated Strategic Plan. During the reporting period, several internal discussions were had with the leadership group and a path forward was developed as per reported in Mike's INAP Americas report.

Mine Rock Stockpile – Phase II/Phase III

Several delays were encountered for the Mine Rock Stockpile project (e.g., source control project) as a result of discussions around various approaches/concepts for a Phase II. A subcommittee was formed and several meetings were held in late 2022 and a scope was presented to Op Com in December. A more detailed proposal and budget was requested and was expected in Q1 2023.

Further delays were encountered as a result of IP issues encountered by OKane on how their proprietary "MRS modelling tool" is to be used in the project. The proposal was finally received and distributed to members and will be further discussed at the Denver meeting. This proposal is referred to as Phase III, Phase II being the development of the scope by the subcommittee ($10,000) completed for presentation at the Q4 2022 Op Com.

2022 ARD Leading Practice Award

A site award was presented to Detour Lake Mine, now Agnico Lake Mines, formerly Kirkland Lake Gold at ICARD 2022. A copy of the presentation and recording by Veronika (Raizman) during ICARD 2022 will be posted on the INAP website. INAP will also be presenting Agnico Eagle with two commemorative plaques (one in English and one on French). A final check on the translation will be requested from Agnico before producing the plaques.

Having Veronika present during the INAP Webinar Series was also discussed.

2024 ARD Leading Practice Award

The next set of awards are planned for ICARD in September 2024 and plans are for the selection committee to review the documentation required by the proponents to be considered for the awards. The two-stage process, introduced for the 2022 Awards will be used again. More discussion is needed on how to increase the number of submissions and how INAP can promote / showcase the award winners.

GARD Guide - Chapter 6 Prevention and Mitigation

WSP-Golder was awarded the contract to update Chapter 6 of the GARD Guide on October 13. Task 1 was to review the chapter considering all comments received and providing INAP with a brief outline on the contents that needs updating and other suggested changes to the chapter. This outline was received on February 17 and distributed to members for review and comments on February 20. Comments were provided to WSP-Golder on March 13.

After receiving the feedback from INAP, several team members met to discuss the path forward. A questionnaire will be prepared and circulated to members seeking key contacts and to identify more site examples that can be included in the chapter to add “real-world value” wherever possible.

GARD Guide - Chapter 11 Mine Closure and Sustainability

After a multitude of delays, the final draft of the new chapter on Mine Closure and Sustainability was received in Q4 2022. Reviews were complete by INAP members and by three external reviewers – Richard Marton, Doina Priscu and David Williams (ADTI). One key comment that came-up often was that there was not enough focus on geochemistry and it was more on general closure guidance. The link between general mine closure guidance and ARD/geochemistry needs to be strengthened in the next version. As one comment noted the chapter “needs to clearly focus on what is important from an ARD perspective – this is the primary role of the GARD Guide”.

In March, during a conversation with Rens Verburg, WSP-Golder, he acknowledged that losing Bjorn Weeks, the original project lead, had left a hole in the organization that was hard to fill. Comments were provided to WSP-Golder and a path forward was proposed. Key here is that WSP-Golder are fully committed to revising Chapter 11 to INAP’s requirements. A revised draft is expected in Q2 at the earliest.

Pit Lake Database Phase III (WSP-Golder)

Approval to realign the remaining funds in the Phase III contract to prioritize new data acquisition (e.g., literature surveys and pit lake data descriptions) was completed in Q4 2022. To maximize the value of these remaining funds, a listing of current pit lakes (147) in the database was distributed to members to identify pit lakes in publicly available literature that can be supplied to the contractor thus reducing their search effort. This was also done for several consultants known to be active in pit lake research work.

The information received was passed on to WSP-Golder. Devin Castendyk, project lead, will be presenting an update and ideas for a next phase during the Op Com in Denver.

Discussions are ongoing with regards to possible synergies between the CRC-TiME pit lake project and the INAP project. Public access to the data is something that comes up quite regularly. As Hugh (Davies) has mentioned in the past, if data continue to be added exclusively from public sources, then it would be easier to allow public access in the future.

INAP Webinar Series

The results of the recent survey of projects by members clearly indicate that the webinar series should be continued. This activity is regarded as a key deliverable to raise the INAP profile. Several topics of interest were identified but both projects are still in draft - Geochemical Degradation of Tailings and Fills and the Mine closure and Sustainability chapter for the GARD Guide are examples of possible webinars. The Detour Lake Mine leading practice awards presentation from ICARD 2022 is a possibility. And work on the draft script for the introductory video on INAP needs to be completed. A discussion on the path forward is planned for the Op Com meeting.

INAP Educational Game (Queensland University of Technology)

Rio Tinto were approached by QUT about a possible partnership project and Ros followed-up with INAP on the idea of potentially getting a team of students to develop some sort of education/interactive game to teach people about the importance of AMD. INAP's involvement is in-kind support consisting of providing guidance, clarification on requirements etc. Four students are currently working on the project and several meetings have been held. INAP is represented by Ros and Russell. The project was started in late March and an update will be provided at Op Com.

Educational Videos – Mine Waste Management

At the Q4 2022 Op Com, Paul Weber of Mine Waste Management presented a concept of having a series of AMD training modules developed. Six modules were proposed in a staged approach with possibly two modules produced per year. The six modules would be based on the contents of the GARD Guide with Module 1 being an introduction to AMD. Members were quite interested and it was agreed that a subcommittee be formed to further the discussion on creating the first module of the series. Plans are to further the discussion at the next Op Com.

Virtual ICARD 2022

The successful virtual ICARD 2022 conference was held from September 18 to 24, 2022. A report was provided at the Q4 Op Com meeting. A few items remained, profit and the future of the recordings, and are discussed here.

The final budget numbers were received in March and the conference recorded a surplus of close to $79,500 AUD. UQ's Partnerships and Development Manager reviewed all UQ/SMI expenditures and suggested that 25% of the profit, $20,000 AUD, be allocated to spend on the next ICARD (e.g., UQ student attendance) or other AMD related activities (e.g., AMD Workshop). More discussions are needed in terms of managing these funds. This may not be the best scenario in terms of the amount allocated but this, unfortunately, had not been previously discussed.

The second item was the future home of the recordings and the proceedings for ICARD 2022 now that the virtual platform is no longer available since March 31, 2023. The transfer of the ICARD 2022 content

has been completed to both UQ and INAP. Mansour Edraki (SMI) is following-up with UQ in terms of the amount of time it would take to have the website up and running. He mentioned that there could be a fee associated with managing the ICARD content on the website. I hope to have an update for the Q2 meeting. In the meantime, the ICARD 2022 proceedings will be made available on the INAP website.

ICARD 2024 – Halifax, Nova Scotia, Canada, September 16 to 20, 2024

Planning is well underway for the next ICARD in 2024. This in-person event, themed "Impact. Innovation. Intelligence." will be held at the Halifax Convention Centre in Nova Scotia, Canada. The Canadian Institute of Mining and Metallurgy (CIM) is the Professional Conference Organizer. The conference website can be found at https://icard2024.cim.org/

The Call for Abstracts is now open. A link has been provided from the INAP website. https://icard2024.cim.org/call-for-abstracts/ Abstracts closing date is November 10, 2023.

Work continues with the preparations of various documents for the event (e.g., short course requests, sponsorship prospectus and field trips).

Geochemical Degradation of Tailings and Fills (collaborative project with MEND)

At the December Op Com meeting, a discussion led by Chris (Kennedy) on the contents of the KCB report identified concerns on the contents of the draft report and a recommendation was made that the report needed significant revisions in terms of tone and approach on how the information was being presented. In an email to both INAP and MEND members, Chris had mentioned that the report was way too broad brushed with the risk and potentially unnecessarily alarmist. It was agreed that releasing the report as is could lead to new requirements and studies that do not necessarily help risk at all.

Following the meeting a request was sent to members to review the report and provide comments. MEND did the same to their members. Comments were collated from both groups and sent to Chris. Hugh (Davies) and Bill Price (representing MEND) agreed to assist Chris review the comments. A pre-call was organized for the subcommittee in April to share some general findings from reviewers, discuss concerns and recommended direction to finalize the report. This was followed with a call to KCB on April 18. Specific comments were provided to KCB after the meeting.

It should also be noted that MEND is considering running a workshop at Tailings and Mine Waste in Vancouver (November 2023) with geochemists and geotechnical specialists to understand the problem more thoroughly and to discuss a possible path forward. Prior to the workshop, both groups requested that a report be issued with the proposed changes. KCB indicated that they will respond to the various suggestions for the report in the next few weeks.

Toward Environmentally Responsible Resource Extraction Network (TERRE-NET)

Attended the TERRE-NET Board of Directors meeting on April 6. This meeting was scheduled to be held in late 2022 but was postponed to effectively work through a reconciliation of the TERRE-NET project accounts to finalize the Year 6 report to the Board.

Excellent progress was reported at the Board meeting. TERRE-NET has a total of 28 projects in seven themes and work done at 15 different sites. To date 16 projects are completed and 6 more will be done by June 2023, the official end of the program. In terms of budget, they have spent 91% of their budget and the program is expected to end in June 2023. A total of 87 students have been involved in the various projects and 67 have graduated and many have found work in the industry. Some of the students have received job offers and left the program early but are planning on finishing their degrees part-time.

In terms of research manuscripts, 43 have been published and 13 more submitted to journals. Once published they can be made available to partners. I have requested an update to the list of the publications. This list will be distributed to members. Members can request copies of the full manuscripts they would like to receive.

Plans are to have one final abbreviated Annual General Meeting as a hybrid event the week of June 26. This one-day event would be held at the University of Waterloo and consist of student presentations followed by both the Scientific Committee and Board meetings.

If there is one issue that I found with the TERRE-NET, it is that the excellent research that it has generated over the 7-years has not been broadcasted enough. One of the most important deliverables from the industry's standpoint is the number of students (67 +) that have successfully completed their studies and are now employed in some capacity in the mining industry.

In the December 2022 Technical Manager's Report, I had mentioned that the TERRE-NET investigators were pursuing options to extend the TERRE-NET research program and had submitted a proposal to the Canada First Research Excellence Fund (CFREF) program. INAP had provided a letter of support. There have been no further details provided on the status of this application and I will follow-up for an update.

Membership

The current membership of INAP includes the following mining companies:

Agnico Eagle Mines
BHP
Newcrest Mining Ltd.
Rio Tinto Ltd.
New Gold Inc.
MMG Limited
Anglo American
Kinross Gold Corporation
Newmont Mining Corp.
Teck Resources Limited
Boliden Mineral AB

INAP received several enquiries regarding membership during the reporting period. Albemarle have expressed interest in joining INAP in the tiered membership category and the approval process was recently started. And former member Barrick (Claudio Andrade) has reached out to INAP for current membership information. Invitations have been sent to non-member companies to attend the May Op Com in Denver and several have accepted (FMI and Vale).

Several changes to the INAP Leadership roles have taken place since December. Veronika Raizman of Agnico Eagle has taken over from Jean Cayouette as the new Agnico Eagle representative on the Board of Directors. She will also be continuing to represent Agnico Eagle on the Op Com. At the December Board meeting, members were pleased to approve the appointment of Michael Davies as Senior Advisor for the Americas.

With COVID being present over the last two years, in-person meetings were not possible and one of the key benefits of membership in INAP, is shared information gathered in discussions held during "in-person" meetings and outings associated with these meetings. Approval was granted to extend the tiered membership dues of $5K USD an extra year for the three companies that are currently tiered members (New Gold, Boliden and MMG).

Budget

The Op Com continues to provide research and information transfer programs within the budget generated by INAP. The table below summarizes the state of the budget through March 31, 2023, with projected bank balances for period ending December 31, 2023.

Projected Bank Balances for Period Ending March 31, 2023				
	Consolidated USD$	AUS$ 0.6712	USD$	CDN$ 0.7389
Assets				
Cash at Bank Local Currency		229,158	124,978	139,600
Cash at Bank (actual) – March 31, 2023	381,939	153,811	124,978	103,150
Non-Current				
ANZ Term Deposit	402,241	599,285		
Total Cash Reserve – March 31, 2023	784,180			
Actual/Estimated Income for 2023	122,586	48,951	90,000	0
Estimated Expenses Local Currency		33,380	145,000	20,300
Estimated Expenses for 2023 (Committed)	182,404	22,404	145,000	15,000
Expenses Carry Forward	9,750	0	9,750	
Uncommitted Budget Expenditure	359,930		359,930	
Estimated Cash Balance at Year End	354,682			

Projects and Project Proposals

A summary of current and proposed INAP projects is provided below.

Project	Researcher	INAP Budget	Status
Leading Practice Awards (Plaque and promotional video)		$3000	Plaque to be ordered. How best to promote award?
GARD Guide Chapter 11 - Mine Closure / Sustainability	WSP - Golder	$21000 invoiced of USD25,000	Ongoing – Major revisions needed. 2nd draft expected Q2 2023. Review ongoing.

Geotechnical/geochemical stability of tailings dams	KCB (Sudbury)	CDN10,000 of CDN16,500	Ongoing. Revisions to draft required. Contractor to provide path forward. Additional $ budgeted.
INAP Webinar Series	MWM - Perth	AUD18,600 + GST	Video + 6 extra webinars. Planned for 2023. Work on video script required.
Pit Lake Database Project – Phase III	WSP Golder	$14700 of USD31,000 paid in 2022	Ongoing.
Building Better Waste Rock Piles – Phase III	O'Kane Consultants	Phase II Scope $10,000 paid in 2023.	Phase III proposal to be discussed. Budget for 2023 is $100,000.
CRC-TiME		In-kind	Agreement signed in Q2 2023. INAP to contribute 100 hours of in-kind hours to CRC activities.
INAP Websites - Virtual ICARD 2021 / GARD Guide Websites	Interlinx (Webmaster)	USD 6000	Ongoing – Continuous updates and maintenance of the INAP and GARD Guide websites.
TERRE-NET	Various universities	In-kind	Program end date June 2023.
INAP Educational Game	Queensland University of Technology	In-kind	Ongoing. Update to be provided at Q2 2023 meeting.
Educational Module	Mine Waste Management	USD70,000	Placeholder in budget. To be further discussed.
Update of GARD Guide Chapter	Chapter 6	USD30,000 (2023)	Ongoing. Contract signed Q4 2022
Update of GARD Guide Chapter.	Chapter 8 Monitoring	USD 25,000 (2023)	Planned for 2023
ICARD 2024 Sponsorship		USD20,000 (2024)	Will be budgeted for 2024.

Members of the INAP Board and Op Com Leadership and Secretariat

INAP Board and Op Com Leadership and Secretariat members are:
Board Chair: Paul Brown, Rio Tinto
Op Com Chair: Russell Staines, BHP
Secretary: Jenni Lightowlers
Op Com Vice Chair: Open

Technical Manager: Gilles Tremblay
Technical Advisor (Australia): Bruce Kelley
Technical Advisor (Americas): Michael Davies
Administrative Assistant: Open

INAP Board & Op Com members and participants in 2023 INAP activities:
Agnico Eagle Mines: Veronika Raizman – Board/Op Com
Anglo American: Open – Board, Henrietta Salter - Op Com, Josh Pearse
BHP: Marilena Stimpfl– Board – Russell Staines Op Com
Kinross Gold Corporation: Tim Caldwell – Board, Alessandro Nepomuceno – Op Com
Newcrest Mining Limited: Blair Sands - Board, Brad Stokes – Op Com
Newmont Mining Corp: Jacob Croall - Board, Rynhard Kok and Hugh Davies – Op Com
Rio Tinto: Paul Brown – Board, Rosalind Green - Op Com
Teck Resources Limited: Chris Kennedy – Board, Vanessa Mann – Op Com
New Gold Inc.: Bethany Borody and Emily O'Hara – Op Com
Boliden Mineral AB: Seth Muller and Erik Ronne – Op Com
MMG Limited: Jonathan Crosbie – Op Com