JORC Competent Person – A baseline review in a global context

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Executive Summary

Study Objectives

This study was funded by the Australasian Institute of Mining and Metallurgy (AusIMM) and the Australian Institute of Geoscientists (AIG), as the Professional Organisation parent bodies of the Joint Ore Reserves Committee (JORC). The study examines the current requirements for mineral industry professionals to act as Competent Persons for Public Reports of Exploration Results, Mineral Resources and Ore Reserves issued in accordance with the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the JORC Code), 2012 Edition (JORC, 2012), and examines the history of the JORC Code and standards of Competent Person accreditation in countries with Committee for Mineral Reserves International Reporting Standards (CRIRSCO) "family" codes for reporting Mineral Resources and Mineral/Ore Reserves.

The study report includes an extensive review of:

- the history and development of the JORC Code in Australia;
- the development and adoption of CRIRSCO family Mineral Resource and Ore/Mineral Reserve reporting codes in other countries;
- the requirements of Qualified or Competent Persons under those codes;
- accreditation vs registration;
- what constitutes professionalism;
- professional standards applying to other professions in Australia and how our resources sector compares;
- stakeholder mapping; and
- potential for professional practice changes to achieve greater alignment between Competent Persons responsible for preparation of Public Reports in accordance with the JORC Code.

The JORC Code

The JORC Code (or Code) has not changed since the current version became effective in December 2012 and made mandatory from 1 December 2013. The Code has undergone a process of evolution since it was first published in 1989 and incorporated into the Australian Securities Exchange (ASX) Listing Rules.

JORC initiated an update to the Code in 2019 to address issues identified in the application of the Code since it was last revised, including both technical aspects of the Code and the need to provide investors clear, unbiased advice relating to other issues affecting Mineral Resource project development, particularly in the areas of environmental, social and governance (ESG) which have become increasingly prominent over the past decade. The JORC Code, in recent years, has been increasingly used by non-financial entities, including government departments as a standard for statutory reporting of Exploration Results and in mining tenure applications in both New Zealand and a growing number of Australian states.

Competence is one of the three principles of the JORC Code, along with transparency and materiality (JORC, 2012). The JORC Code is principles-based, rather than prescriptive, in how a Competent Person develops Exploration Targets, estimates Mineral Resources or Ore Reserves. The term "JORC compliant" refers to the manner of reporting and not to the collection, development and analysis of Exploration Results or the Mineral Resource or Ore Reserve estimates being reported. Competent Persons are responsible for ensuring the transparency and materiality of all information presented in Public Reports.

JORC is one of a growing family of reporting codes adopted internationally under the auspices of CRIRSCO. With the addition of the USA to countries using CRIRSCO Template compatible reporting codes, their use now covers 81% of global metals and minerals exploration and mining investment globally.

Competent Persons

Competent Persons are needed to assess, control and accept responsibility for the technical quality of data used in reporting exploration activity and results; resource and reserve estimation and parameters required to undertake studies of Mineral Resource potential viability and feasibility.

More than 600 AusIMM and AIG members acted as Competent Persons during 2021. Almost 1,800 members have acted in this capacity since 2015. The number of reports requiring compliance with the JORC Code submitted to the ASX and New Zealand Exchange (NZX) has been increasing yearly, despite cyclic fluctuations in the level of exploration and mining activity as reflected in exploration expenditure and mineral production statistics. Reports of Exploration Results comprised 90% of the Public Reports released in accordance with the Code during 2021, with Mineral Resource and Ore Reserve estimates comprising 8%, and scoping and feasibility studies only 2%. From 2015 to 2021, Exploration Results represent 75% of Public Reports. Further research may be able to establish the relative value of securities traded associated with each type of announcement.

Capital cost overruns and operational underperformance, associated with developing mining projects as they transition to production, have fuelled concerns by both regulators and minerals industry professionals that Competent Persons are potentially increasingly venturing beyond their realm of experience and hence competence.

Professionalism

Competent Persons are required by the JORC Code to be a Member or Fellow of the AusIMM or the AIG, or of a Recognised Professional Organisation (RPO). Professionalism is foremost in the definition of a Competent Person. Inherent in the definition of a Professional Organisation is a code of ethics that governs the activities of each member. Such codes require standards of professional behaviour and practice. It is most common for organisations to require a commitment to continuing professional development (CPD) to maintain Professional Organisation membership.

Both the AusIMM and the AIG require compliance by Members with their Institutes' Codes of Ethics. The AusIMM Code of Ethics requires members continue their professional development throughout their careers. The AusIMM Chartered Professional (CP) and the AIG Registered Professional Geoscientist (RPGeo) schemes both require satisfaction of annual CPD requirements to maintain Chartered or Registered Professional status (which may be subject to periodic auditing) but monitoring of other members CPD requirements is not undertaken.

The conditions of general and higher-level membership in the AusIMM and the AIG both provide processes by which complaints relating to the professional conduct of members may be assessed. Both the AusIMM and the AIG rely on complaints being lodged by any party, the effectiveness of which is being questioned. Around one-fifth of AIG members are also members of the AusIMM, suggesting that a significant proportion of professional geoscientists are members of both Institutes. The two Institutes have no formal arrangements in place by which a member suspended or expelled from one, could not seek membership of the other. Further, there is not currently any mechanism whereby a dual member, sanctioned / suspended / expelled by one Professional Organisation, is prohibited from continuing to act as a Competent Person through membership of the other Professional Organisation or any other relevant Professional Organisation internationally. The AIG requires applicants for membership to state whether they have been or are currently the subject of disciplinary action by another professional Institute.

Requirements of Competent Persons

Competent Persons are specifically required by the JORC Code to possess a minimum of five years relevant experience in:

1. the style of mineralisation or type of deposit under consideration; and,
2. the activity which that person is undertaking.

This requirement matches that of all the CRIRSCO family reporting codes with a minor exception in the definition of a Qualified Person in Canada.

The JORC Code requires Competent Persons on whose documentation a Public Report is based, to be named in the Public Report. The Competent Person must provide prior written consent to the form and context in which their information is included in a Public Report. The Competent Person's employer must also be named and any potential for a conflict of interest by the Competent Person or a related party disclosed within the Public Report.

The concept of what constitutes "relevant experience" is an area that has attracted considerable debate amongst professional geoscientists and other resource industry practitioners. CPD plays a pivotal role in development of relevant experience through mentoring and on the job learning, working, and interacting with experienced resource professionals.

Regulatory Oversight

High-profile mine development failures / underperformances in Canada relating to Mineral Resource and Mineral Reserve reporting errors or misstatements, and Feasibility Study errors have resulted in enhanced oversight by the Canadian Provincial / Territorial securities commissions when it comes to professional practice by Qualified Persons. Over the past 5 years, the securities commissions including the British Columbia and Ontario Securities Commissions (BCSC and OSC) have significantly ramped up their enforcement of NI 43-101 and CIM standards and best practice guidelines through the hiring of additional geological staff. This increased regulatory oversight includes scrutinizing a Qualified Person's experience (or lack thereof) when it comes to Mineral Resource and Mineral Reserve estimate statements disclosed in news releases and NI 43-101 technical reports in Canada. The securities commissions have made it their mission to prevent misleading or incorrect technical disclosure from being released in Canada.

Similar mine development failures / underperformances resulting in significant shareholder losses in Australia have been highlighted as an area of concern by the Australian Securities and Investment Commission (ASIC).

Professional licensing and regulation are widespread in professions in Australia, especially where professionals interact with, and advise individual members of the public. In some instances, licensure has become an onerous process, particularly where licensing of professionals is managed by government departments or authorities such as in the finance industry. Licensure has been a response to stakeholder outrage and concerns regarding the quality of advice and rapacious fee structures for the general public in notable instances, both in Australia and overseas. The registration regime for financial adviser licencing in Australia is arguably the strictest implemented to date in Australia and demonstrates the extent to which governments are prepared to act in instances where the public are perceived by authorities to be at risk due to inadequate industry self-regulation and lax professional practices.

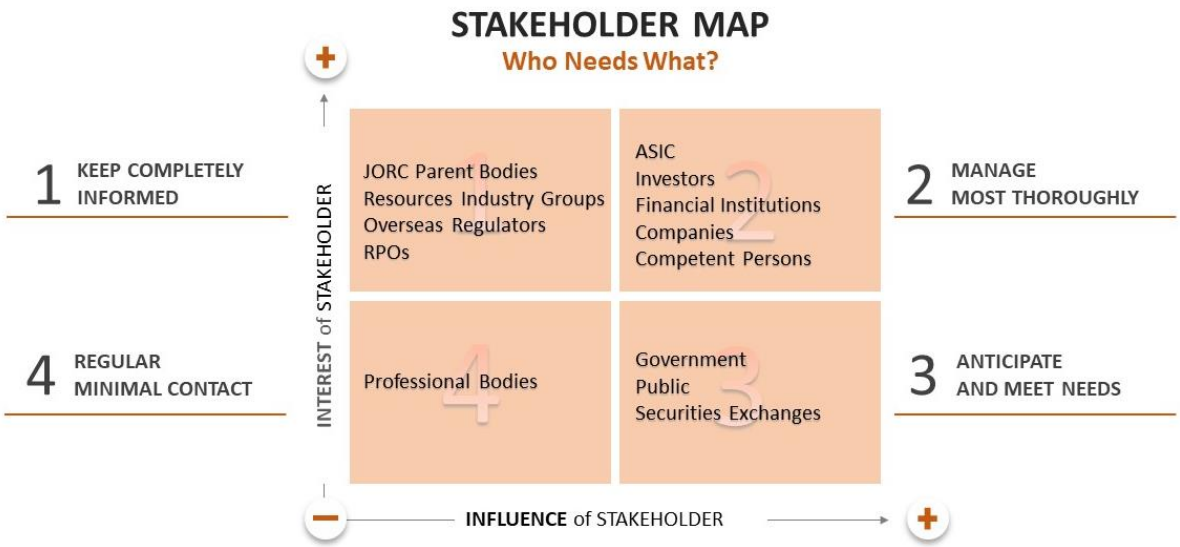
Only between 30 - 50% of geoscientists in Australia have demonstrated a commitment to professional ethics and standards through membership of a professional Institute, based on AusIMM and AIG membership data and the number of geoscientists practicing in Australia according to

Australian census data. It should be noted that all Competent Persons have elected to make this commitment.

A clear need for improvement in Competent Person accreditation and scrutiny is evident from both the response of industry professionals to the JORC stakeholder survey and from ASIC's written and verbal comments to JORC.

Stakeholder Mapping

Public Reports of Exploration Results, Mineral Resources and Ore Reserves estimates are of interest to a broad range of stakeholders. A stakeholder map has been developed by the Lead Author which groups stakeholders by interest and influence in relation to competence applied to the JORC Code. Identified stakeholders are both internal and public facing. Stakeholder groups are both domestic and international.



Stakeholder Consultation and Engagement

JORC conducted a widely publicised online survey that was open to all stakeholders between December 2020 and April 2021. The survey attracted more than 500 responses that were reviewed by the committee during April and May 2021. In the Competence area, the survey examined the definition of a Competent Person, competence, and responsibility and, other areas related to competence requiring clarity including assessment of competence both within and beyond an expert's domain.

Most survey respondents identified as having more than ten years' professional experience. Approximately 12% of respondents saw a need for greater clarity in the definition of a Competent Person. The term "relevant" represents a source of uncertainty in the Competent Person definition, with respondents seeking further clarity on the type of experience needed for a professional engaged in Public Reporting in accordance with the JORC Code to be considered competent.

Key topics identified by the stakeholder consultation survey included:

- better defining relevant experience;
- the need for improved guidance in applying the Code[1] ;
- the role of, and need for, peer review in establishing competence and helping to ensure report quality;

[1] Q2021 in JORC Survey

- access to Competent Person Curriculum Vitae (CV);
- a requirement for professional registration;
- effective Competent Person accreditation;
- training; and
- improved Competent Person guidance by parent bodies, the ASX and ASIC.

Some respondents proposed transparent disclosure of experience used to claim competence through self-assessment by Competent Persons.

The key issue expressed regarding relevant experience was the lack of information available publicly to meaningfully assess whether a Competent Person meets the JORC Code competency requirements, with many respondents commenting on this issue considering access to Competent Person CVs as an effective solution. Some respondents also saw value in an ability to track the work of Competent Persons through a Competent Persons register.

Some respondents identified and endorsed the need for Competent Persons to secure appropriately qualified and experienced advice on topics outside their areas of experience and expertise. The JORC Code was considered to be too focussed on geological factors in the competence area and needed to extend to issues related to estimation of capital and operating costs, scheduling, and risk analysis among other aspects of a study, some attributes of which can be unique to individual projects.

The need for a Competent Person team for studies, although already permitted by the JORC Code, was identified as an issue by a number of respondents with diverse backgrounds, noting that no individual can be competent for all aspects of any level of study, with meaningful consideration of the variety of disciplines required to apply the modifying factors being mentioned specifically. Competent Persons signing off on work outside their field of experience was a source of concern. The concept of a Competent Person team, managed by a lead Competent Person, drawing expertise from multiple disciplines, was seen as a means of improving report quality.

A CPD requirement was also seen as a logical addition to competence requirements that could include specific training in application of the JORC Code and Competent Person responsibilities.

Scrutiny of compliance of Public Reports by ASX and professional bodies was raised by respondents in several fields, reflecting the lack of visibility of complaints and ethics and standards processes. Uncertainty regarding the roles of JORC, the ASX and Professional Organisations in ensuring Public Reporting standards were met was also evident from survey responses.

The question as to whether the ASX and/or ASIC should be involved in Competent Person registration or accreditation was raised, with a general view that any move away from self-regulation of the sector resting with Professional Organisations could lead to reduced professional standards and limit the availability of suitably qualified and experienced persons prepared to act as Competent Persons.

<u>ASIC Concerns</u>

ASIC revealed, in correspondence with JORC, that it planned to conduct its own investor feedback project on the JORC Code. This did not eventuate due to priorities for ASIC and the COVID-19 pandemic, and it encouraged JORC to consult with investor representative groups, such as the Australian Shareholders Association, to obtain feedback on, and investor perceptions of the JORC Code. JORC invited representatives of the Shareholders Association to participate in the JORC online survey (as individuals and/or at organisation level), but no direct feedback was recorded.

ASIC made it clear that it does not have a mandate to examine compliance with professional or industry codes of practice and their relationship with the *Corporations Act 2001* (Corporations Act). ASIC does, however, have delegated responsibility from the Minister of Finance in Australia to

approve the JORC Code as included in the ASX Listing Rules. ASIC also noted increasing investor interest in ESG issues.

ASIC identified five principal areas of concern:

1. *Limited oversight and self-assessed competency for practitioners results in reports and statements prepared in accordance with the Code being of varying quality and in some cases being unreliable and incomparable.*
2. With respect to a number of high-profile mining project development failures *"… several instances where the root cause of investor loss has been the competence of the practitioners preparing information in accordance with the Code."*
3. The JORC Code may contribute to investor loss, particularly for assets and projects transitioning from exploration to development and production, with adverse impacts on market integrity and create competitive advantage for a subset of resource investors.
4. There is a regulatory push away from disclosure and warnings being used as a means of investor protection. It is questionable whether the principle of transparency relied on by the Code will meet the information needs of investors and regulators in coming years.
5. The existing Complaints and Ethics processes are not effective and that "enforcement is impractical in all but extreme cases."

ASIC is principally concerned about destruction of shareholder value by advanced Mineral Resources projects with their research identifying 58 mining and resource entities entering administration and 25 entities each experiencing a loss of more than $100 million and 50% of market capitalisation between 2015 and 2019.

ASIC pointed to elevated risks for companies when transitioning from exploration to development and production, where higher levels of capital were being raised and debt is introduced to a company's capital structure.

Differences in approach by different Competent Persons in Mineral Resource and Ore Reserves estimates for ostensibly similar deposits was also raised as a concern. The observation that some Mineral Resource and Ore Reserve estimates were subject to development and review of a team of consulting engineers, geologists, environmental scientists, business analysts, metallurgists, and other professionals. Whereas other Mineral Resource and Ore Reserve estimates may be the result of a single in-house or consulting geologist. These differences in approach were observed as resulting in materially different quality of reports rendering them incapable of being compared.

Also noted was a correlation of capital cost over-runs and poor operational performance for those projects whose technical and economic reports were completed with internal single CP sign-off, in contrast to projects with multiple contributors from various areas of expertise and more conservative assumptions resulting in better project execution outcomes during both development and operations.

Relevance also needed to be extended beyond experience with different styles of mineralisation and be clearer on requiring Competent Persons to report within their field of expertise (e.g., geologists should not assess non-geological modifying factors which could be more appropriately addressed by a mining engineer, metallurgist or other professional). ASIC claimed to have recognised a trend for Competent Persons to self-assess themselves as competent regardless of the nuances and complexities of a particular project.

Opaque disciplinary frameworks for Competent Persons were considered to be unsuited to ensuring best practice from practitioners.

Another issue targeted in this area included the application of different assumptions and business rules, particularly in determining grade cut-off grade criteria and prices, which ASIC viewed as a hinderance to comparing projects. Ambitious approaches to Mineral Resource and Ore Reserve estimation were singled out as a source of investor loss when projects advance to development and production and market capitalisations begin to inflate.

ASIC was also concerned that Competent Persons currently take a very narrow view of what constitutes a conflict of interest or bias.

A need for clear, concise, and effective disclosure (CC&E), as expressed in ASIC's Regulatory Guide 228, delivering information, recommendations and future plans, free of nuance and able to be readily understood by all users of Public Reports.

Academic Research related to Assessment of Competence

Self-assessment of competence by Competent Persons has been the subject of academic research and published papers in recent years and is frequently a discussion topic at geological and mining conferences. This work identified several areas, including the importance of experiential learning in developing professional capability, the role of mentoring in skills development, and articulation of professional standards as opportunities for improvement.

Compliance

Dealing with complaints asserting that a Competent Person has not complied with the JORC Code is a responsibility of the AusIMM and the AIG using processes detailed in their respective Codes of Ethics. The ASX is responsible for ensuring compliance by companies.

Complaints may be submitted to the Professional Organisations by anyone in relation to the professional conduct of any AusIMM or AIG member, for investigation and action by each Institute. Both Institute's complaints processes are intended to provide procedural fairness for members who are the subject of complaints by maintaining strict confidentiality during the complaint review process.

Serious adverse findings against members, involving disciplinary action, are occasionally published by both the AusIMM and the AIG, but there have been few instances of this historically. There are no established mechanisms for either Institute to share, between each other or with the ASX, in real-time, any current ethics proceedings or the outcomes of proceedings once finalised, apart from when outcomes are published. This approach has led to these processes being considered opaque, creating a misleading impression that little is being done.

Both the AusIMM and the AIG have adopted a two-tier Complaints and Ethics and Standards system where the Complaints Committee receives and assesses the veracity of complaints and, should the complaint appear to have merit, refers those with potential for a member to be penalised to the Ethics and Standards Committee for consideration.

A revised approach of communicating, via membership newsletters and Institute websites, detailing the nature of complaints and the resultant outcomes, from the point at which a complaint has been referred to the respective Ethics and Standards Committee, would be consistent with practices in civil and criminal matters and would increase the visibility of complaint outcomes and resolution.

Greater exposure and visibility of Professional Organisation complaints processes may be achieved without impairing members' rights to procedural fairness in complaints management.

Demonstration of Competence

Disclosure intended to help demonstrate competence have advanced considerably since the introduction of the JORC Code (2012) in the form of a Competent Person certificate now included in the CRIRSCO Template.

This certificate has also been incorporated in the latest version of the Pan European Reserves and Resources Reporting Committee (PERC) standard. Comparable documents are also required by NI 43-101 and the new U.S. reporting standard S-K 1300 which recently replaced the US Securities and Exchange Commission (SEC) Guide 7.

There may be benefit in aligning the JORC Competent Person Consent Form (available from the ASX and JORC websites) with the CRIRSCO Template Competent Person certificate.

Conclusions

The current review of the JORC Code presents an opportunity to address stakeholder concerns relating to competence and the conduct of Competent Persons.

Competency is multi-dimensional and in the context of the JORC Code and professional standards includes:

- definition of a Competent Person;
- qualifications and experience;
- assessment of competence;
- industry training courses;
- monitoring of Public Reports;
- peer review; and
- disciplinary frameworks.

The commissioning of this study demonstrates the commitment of the AIG and the AusIMM, as Professional Organisations and JORC parent bodies, to address these concerns by understanding the current state and examining ways forward to ensure that the status of the JORC Code as a principles-based standard for Public Reporting of Exploration Results, Mineral Resources and Ore Reserves is updated and maintained.

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1. Introduction

1.1 Scope

The Australasian Institute of Mining and Metallurgy (AusIMM) and the Australian Institute of Geoscientists (AIG) have formed a Joint Taskforce (the Taskforce) to review the framework of Competence and Competent Persons in collaboration with the Australasian Joint Ore Reserves Committee (JORC). JORC has formed a Competent Person Working Group (CPWG) to interact directly with the Taskforce.

The Taskforce has commissioned a Baseline Study to create a well-researched and complete document that contains all relevant information and history to inform stakeholder discussions on initiatives to be developed to address the issues of Competence and the Competent Person.

This Baseline Study represents a single-source reference document to support any future discussions on the topic of competence.

The Taskforce issued a request for a proposal which contained a detailed scope of work, including but not limited to:

Item	Description	Reference
a	Describing the current definition and framework relating to Competence and Competent Person.	Section 1
b	Providing a summary of identified and perceived issues relating to Competence and Competent Person.	Section 8 Section 9
c	Providing a Stakeholder map, including detailed (cross) references to each stakeholder's interest in Competence.	Section 7
d	Providing a JORC on-line survey response summary, relevant to the Competent Person issue.	Section 8
e	Providing a summary of ASIC correspondence on the Competent Person issue.	Section 9
f	Describing the history of relevant events, precursors, and previous discussions.	Section 3
g	Describing what other jurisdictions do regarding competence and their solutions and making an assessment of what solutions are deemed to be practical and effective for purpose, what solutions are not working.	Section 4
h	Describing what other industries do regarding competence and their solutions and making assessment of what solutions are deemed to be practical and effective for purpose, what solutions are not working.	Section 5
i	Preparing a full risk analysis, including providing an opinion as to the consequences of not doing anything.	Removed from scope
j	Providing a summary of outcomes of academic and other relevant studies/papers.	Section 11
k	Providing a discussion on differences between Accreditation versus Registration.	Section 6
l	Providing a discussion of transitional measures for any new definition	Removed from scope
m	Providing the data to support the Baseline Study, such as: number of acting Competent Persons who are members of AusIMM and/or AIG, number and type of transgressions, examples of Competency-related value destruction.	Section 0 Section 9.3 Section 12.4
n	Reviewing and suggesting an enforceable disciplinary process including the powers to suspend or expel a member.	Section 12

Each of these topics are addressed by the Lead Author in this report, with supporting content for item (f) provided by Peter Stoker and item (g) Canadian insights by Paul Teniere and other jurisdictions provided by Peter Stoker. Each author contributed to the review of the study.

1.2 Authors

1.2.1 Lead Author

Andrew Waltho
B.App.Sc (Hons), FAIG, RPGeo, FAusIMM, FGS, MIMMM, Professional Member SME, GAICD

Andrew Waltho is a geologist with 40 years' experience in exploration and mining geology, covering a range of commodities and deposit styles in Australia and internationally. Andrew currently works as an independent consultant, based in Brisbane, working with clients pursuing projects at all levels of exploration and operating mines. He is a Fellow of both AIG and AusIMM, a past-President and long-standing Director of AIG and a member of AIG's Complaints Committee. Andrew's interest in corporate governance is reflected in his membership of the Australian Institute of Company Directors as a graduate of the Institute's Company Directors Course. He is also a Director of the Australian Dental Association Queensland Branch, his consulting practice and an exploration and mining technology start-up company.

His career includes work with Rio Tinto, most recently as Chief Geologist Energy and Minerals where he led a small, specialist team identifying and evaluating both exploration and commercial opportunities in a range of commodities including uranium, thermal and coking coal, diamonds, heavy mineral sands, other industrial minerals and "new technology metals" with a focus on battery materials and other metals of potential use in emerging energy storage and battery technologies.

1.2.2 Contributing Authors

Peter Stoker OAM
HonFAusIMM

Peter Stoker, OAM, HonFAusIMM, is a principal geologist with AMC Consultants Pty Ltd and experienced in mine geology, Mineral Resource estimation, classification and Public Reporting, Feasibility Studies, project evaluation, due diligence studies, and mineral exploration.

He is the deputy chair of JORC, was Chair from 2005 to 2014, Secretary from 1999 to 2005 and a member of JORC since 1992. He is a JORC representative on the Committee for Mineral Reserves International Reporting Standards (CRIRSCO) and currently the Treasurer of CRIRSCO. Peter is also an Honorary Member of China Mining Association.

Peter was a contributor and steering committee member for Monograph 23 "Mineral Resources and Ore Reserves Estimation – The AusIMM Guide to Good Practice" and a contributor and peer reviewer for the second edition, Monograph 30. Peter has provided, or participated in presenting, CRIRSCO and JORC Code reporting training for the Philippines, Indonesia, Mongolia, Russia, and China as well as training courses in Australia and New Zealand.

Peter has written numerous papers on Mineral Resource and Ore Reserve estimation, classification, and exploration research. Peter was chair of the AusIMM's Geoscience Taskforce, an AusIMM Councillor, and a branch chairman and secretary. He was a member of the Coal Guidelines Committee that developed the 2014 Edition of the Australian Guidelines for the Estimation and Classification of Coal Resources, having also been involved with the preparation 2001 edition of the Coal Guidelines.

Paul Ténière
B.Sc. (Hon), M.Sc., P.Geo

Paul Ténière has nearly 25 years of diverse experience in the mining and oil & gas sectors in Canada, United States, and internationally, taking projects from exploration stage to mine development. Mr.

Ténière currently acts as an executive, board member, or technical advisor for several junior mining companies exploring and developing precious metal and base metal deposits and has significant capital markets and corporate finance experience. Mr. Ténière also works as an independent geological consultant and provides advice on Canadian National Instrument 43-101 (NI 43-101) and the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) standards and guidelines to mining companies in Canada.

As the former mining expert and Senior Listings Manager at the Toronto Stock Exchange (TSX) and TSX Venture Exchange, Mr. Ténière approved the listing of numerous mining companies and advised issuers on their NI 43-101 technical disclosure and corporate governance requirements. Mr. Ténière has also worked closely with the Canadian Securities Administrators (CSA) including the British Columbia Securities Commission (BCSC) and Ontario Securities Commission (OSC) mining staff on technical disclosure reviews, NI 43-101 report reviews, and co-presenting short courses on NI 43-101 and Canadian disclosure requirements. As an observer member of the Mining Technical Advisory and Monitoring Committee (MTAMC) between 2014 and 2018, Mr. Ténière provided advice to the CSA on technical issues relating to NI 43-101 disclosure requirements for the mining industry. Mr. Ténière has completed formal presentations on NI 43-101 and CIM standards for the Osgoode Certificate in Mining Law course, Prospectors and Developers Association of Canada (PDAC) short courses, Association of Professional Geoscientists of Ontario (APGO) seminar series, and other Professional Organisations and mining companies. Mr. Ténière also acts as a mentor through the APGO mentorship program and provides education and supervision to professional members having undergone disciplinary actions related to past NI 43-101 disclosure issues as Qualified Persons.

Mr. Ténière was formerly the Chief Geologist for Sherritt International Corp. and an Exploration Manager for Vale S.A. and Solid Energy New Zealand developing large-scale coal mining projects in Alberta, Saskatchewan, Australia, and New Zealand. As a geological and mining consultant, Mr. Ténière has worked on numerous carbonate-hosted Mississippi Valley Type (MVT) and SEDEX lead-zinc deposits, porphyry-style copper-lead-zinc deposits, and gold-silver-PGM deposits in Canada, United States, Latin America, Australia, New Zealand, and Europe. Mr. Ténière is a registered Professional Geologist (P.Geo.) in Ontario, Newfoundland, Labrador and New Brunswick and a Qualified Person as defined by NI 43-101. Mr. Ténière was a member of AusIMM between 2009 and 2012 and also has experience working under the JORC Code. Mr. Ténière has a Bachelor of Science (Honours) degree in Earth Sciences from Dalhousie University (1998), Nova Scotia, Canada, and a Master of Science degree in Geology from Acadia University (2002), Nova Scotia, Canada.

1.3 The JORC Code

The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves ('the JORC Code'), a professional code of practice that sets minimum standards for Public Reporting of minerals Exploration Results, Mineral Resources and Ore Reserves, was first published in 1989. The most recent revision was published in late 2012.

Since 1989 and 1992 respectively, the JORC Code has been incorporated in the Listing Rules of the Australian Securities Exchange (ASX) and New Zealand's Exchange (NZX), making compliance mandatory for listing public companies in Australia and New Zealand respectively. Public Reporting for ASX-listed companies by Competent Persons also requires awareness of Chapter 5 of the ASX Listing Rules (ASX, 1994) and ASX Guidance Note 31 (ASX, 2013).

In recent years, the JORC Code has been increasingly used by non-financial entities, including government departments, as a standard for statutory reporting of Exploration Results and in mining lease applications where a Mineral Resource or an Ore Reserve reported in accordance with the JORC Code is a requisite.

The JORC Code is now well accepted in Australasia where it provides a minimum standard for reporting of Exploration Results, Mineral Resources and Ore Reserves by requiring that Public Reports on these matters contain all the information that investors and their advisers would reasonably require for the purpose of making a balanced, informed judgement regarding the results and estimates being reported.

1.4 Materiality, Transparency and Competence

The JORC Code is a principles-based standard of best practice with the key principles of:

1. Transparency
2. Materiality
3. Competence

As stated in the JORC Code (JORC, 2012):

- **Transparency** requires that the reader of a Public Report is provided with sufficient information that is clear and unambiguous, sufficient to understand the report and not be misled by contained information or by omission of material information that is known to the Competent Person.
- **Materiality** requires that a Public Report contains all the relevant information that investors and their professional advisers would reasonably require, and reasonably expect to find in the report, for the purpose of making a reasoned and balanced judgement regarding the Exploration Results, Mineral Resources or Ore Reserves being reported. Where relevant information is not supplied an explanation must be provided to justify its exclusion.
- **Competence** requires that the Public Report is based on work that is the responsibility of suitably qualified and experienced persons who are subject to an enforceable professional code of ethics (Competent Person).

The latter principle, Competence, is the principal subject of this study.

The JORC Code is a principles-based code for Public Reporting requirements and was not designed nor intended to regulate how a Competent Person develops Exploration Targets or estimates Mineral Resources or Ore Reserves. Therefore, the JORC Code does not prescribe how aspects of resource evaluation should be undertaken. Instead, the JORC Code is a standard for the reporting of Exploration Results, Mineral Resources and Ore Reserves.

The term “JORC compliant” refers to the manner of reporting and not to the results and estimates being reported.

The phrases “JORC compliant Mineral Resource Estimate” or “JORC compliant Ore Reserves Estimate” demonstrate that this concept is lost on some practitioners acting as Competent Persons. The reporting of this information is what is required to be JORC compliant. The practices employed to derive those results need to be reported in a material and transparent manner that enables the reader to reach conclusions regarding their veracity and potential, inherent risks.

The Competent Person is responsible for ensuring the accuracy, transparency and materiality of all scientific and technical information presented in Public Reports relating to Exploration Targets, Exploration Results, Mineral Resources and Ore Reserves.

Risk is an essential element in any Mineral Resource development project, which when material to a project at any level, needs to be discussed and reported transparently, even when it may not be readily quantified. The ability to recognise and assess risks applying to projects is arguably a key, undocumented, requirement of Competent Persons for projects at any level.

The 2012 edition of the JORC Code (JORC, 2012) is limited on the subject of communicating project risk beyond reporting of Mineral Resources and Ore Reserves where communicating degrees of confidence in Mineral Resource and Ore Reserves estimates is achieved through classification as Inferred, Indicated or Measured; or Probable and Proved respectively. Beyond this, risk is only explicitly discussed in relation to associated with the reported Inferred Mineral Resources (clause 21, JORC, 2012) and any identified material naturally occurring risks in Section 4 of Table 1.

1.5 Application

While the most significant use of Public Reports prepared in accordance with the JORC Code is through public announcements by ASX-listed companies, the JORC Code is being increasingly used as a standard for Public Reporting in other areas including:

- reporting of Exploration Results, Mineral Resources and Ore Reserves to other securities exchanges in Australia, New Zealand, Papua New Guinea and some Asian countries;
- annual, statutory reporting of exploration activities to the New Zealand government; and
- supporting mining lease and other minerals tenure applications.

While the responsibility of a Public Report is the responsibility of the company acting through its Board of Directors, the Public Report must be based on, and fairly reflect, the information and supporting documentation prepared by a Competent Person (Clause 9, JORC 2012).

The requirement for submitting a Public Report to securities exchanges is triggered by continuous disclosure provisions in securities exchange Listing Rules that require any information that could materially impact the value of a company's securities to be reported to investors. There has been discussion in the past that this creates an unlevel playing field, where larger companies have fewer disclosure requirements compared with junior mining companies with lower market capitalisation, as such disclosure may not have a material impact on a larger company's securities.

In Australia, New Zealand and Papua New Guinea specifically, and numerous countries overseas, the underlying resources are often owned by the State, which provides permits and licences companies for mining companies to exploit them, creating an argument for greater, equitable provision of information. This level of information provision, including the provision of all digital data in specific formats, is beyond the reasonable requirements of Public Reporting to securities exchanges.

A number of State governments in Australia are examining the need for statutory exploration and mining reports to comply with the JORC Code. Statutory reports prepared in accordance with the JORC Code; however, may be subject to confidentiality provisions for a period of years, or for the full life of the tenement or successive forms of tenement granted by governments as a project develops through to production. Whereas Public Reports issued to securities exchanges become available to the public immediately.

Professional Organisations have the ability to accept and immediately consider complaints made in relation to securities exchange announcements but may have no ability to examine issues related to State-required statutory reports unless requested and facilitated by the government agencies to which reports are submitted. This is discussed further in Section 12 of this study.

1.6 Competent Persons in Australia

Australian consulting company, Opaxe Pty Ltd (Opaxe), recently reported that in the past seven years, 1,167 AusIMM, and 607 AIG members acted as Competent Persons for Public Reports of Exploration Results, Mineral Resources and Ore Reserves estimates in accordance with JORC 2012, released through the ASX. Last year (2021), 347 AusIMM members, 300 AIG members and 7 members of different RPOs signed off on Public Reports of Exploration Results, Mineral Resource and Ore Reserves estimates (Sterk, 2022). These figures represent a relatively small proportion of AusIMM and AIG members (around 10 - 15% of the membership of both Institutes).

1.7 Public Reports by ASX Companies

An analysis of data provided by Opaxe (Opaxe Pty Ltd, 2022) revealed that 12,696 Public Reports required to comply with the JORC Code were released between 1 January 2015 and 17 June 2022. The number of reports released through the ASX announcements system has increased each year since 2015 (Figure 1).

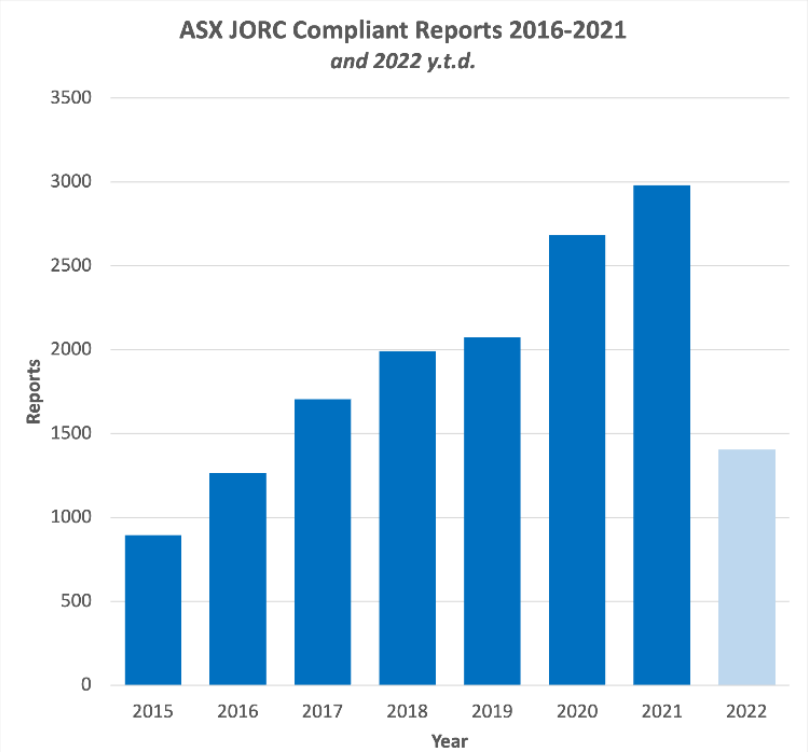

Figure 1. Growth in Public Reports issued in accordance with JORC 2012 (2015-2022)

Exploration reports (planned exploration announcements, drilling results, exploration updates) represented 75% of all reports during this period. Resource and Reserve estimates accounted for a further 20% of Public Reports with Studies (Scoping, Pre-Feasibility, Feasibility and optimisation) comprising the remaining 5% (Figure 2).

A similar review of data for 2021, when 2,980 Public Reports were made by ASX-listed companies in a single year produced quite different results, with exploration reports accounting for 90% of the total announcements for the year, Resource and Reserve Estimates 8% and studies only 2% (Figure 3).

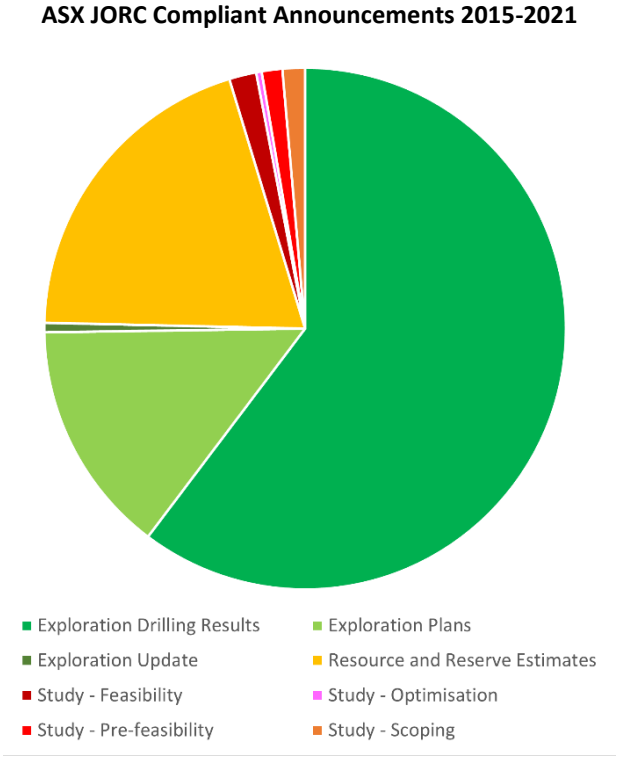

Figure 2. ASX Public Reports required to comply with the JORC Code (2012) 2015-2021

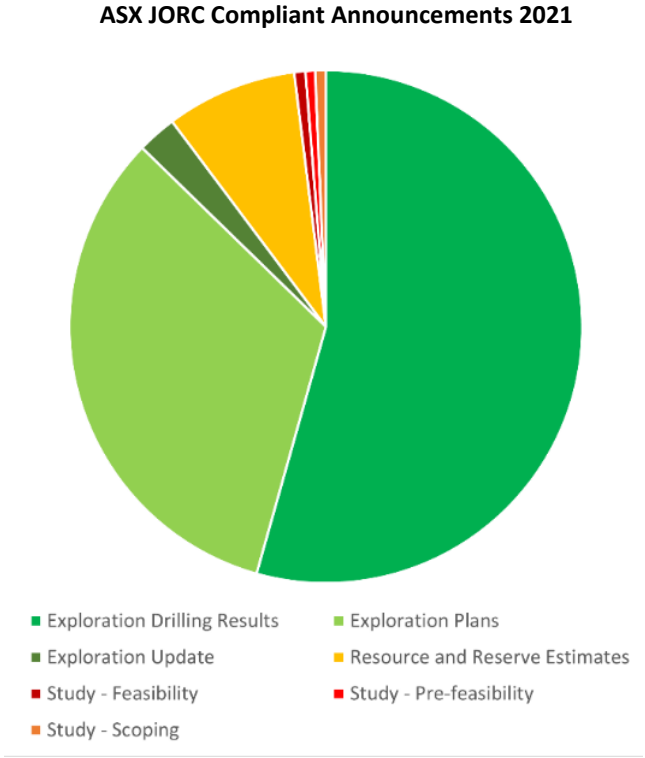

Figure 3. ASX Public Reports required to comply with the JORC Code (2012) Jan-Dec 2021

These figures demonstrate that:

- Public Reports prepared in accordance with the JORC Code by Competent Persons for ASX-listed companies relate mainly to reporting of Exploration Results (that have potential to impact the value of their owners' shares and are themselves, therefore, a subset of total exploration projects);
- only a relatively small proportion of exploration projects progress to any form of study, such as a Mineral Resource estimate or Feasibility Study (5% over the past five years, with only 2% of projects reaching Feasibility Study stage);
- most Competent Persons are geoscientists; and
- the volume of Public Reports has been increasingly steadily, year on year for the past five years, which could suggest that activity in this area may not be subject to the boom-and-bust cycles experienced in other aspects of mineral exploration in Australia.

The latter point is particularly significant in considering competence issues in that exploration geologists frequently cover a range of disciplines for early-stage exploration projects, especially securing access to land, and that contributions from other fields of practice, including mining engineering, metallurgy, project economics, environment, community relations and other specialist fields become more significant as a project progresses through to the various stages of economic studies.

The quantities in Figure 2 and Figure 3 do not take account of the value of company securities in each category, just the number of reports. Resource estimates and studies would be expected to represent a high proportion of reports if the results were weighted by the value of company securities.

2. Competent Persons

2.1 The CRIRSCO family of Reporting Codes and Standards

This section will examine competence requirements under the JORC Code and compare them with those applying under other CRIRSCO reporting codes.

The concept of Competent Person responsibility for documentation on which a Public Report of Exploration Results, Mineral Resources and Mineral/Ore Reserves is based, is a feature of all members of the family of reporting codes of which JORC is a member.

As each new or updated national reporting standard is developed, it is reviewed by the other members of CRIRSCO in cooperation with the particular national reporting committee, to ensure that it continues to maintain compatibility with other standards (CRIRSCO, 2022). Several CRIRSCO codes have been updated since the last update of the JORC Code in 2012, using experience gained in other CRIRSCO member countries (Figure 4). This knowledge and experience will be of benefit during the current JORC Code update.

The base map used for this image was obtained from: https://commons.wikimedia.org/wiki/File:Equal_Earth_projection_SW.jpg (Daniel R. Strebe, 2018)
The original and modified image are licensed under the Creative Commons Attribution-Share Alike 4.0 International license.

Figure 4. CRIRSCO members. CRIRSCO family reporting codes are being widely adopted throughout the world in major destinations for mining industry investment.

Securities exchanges in countries with CRIRSCO standard resource and reserve reporting codes account for 81% of the value of minerals industry companies globally (Revenue Watch Institute, 2022). The 870 ASX-listed mining companies, with a combined market capitalisation of A$712 billion, account for 10%. The distribution of capital invested in metals and minerals exploration and mining companies globally is shown in Figure 5. These figures do not account for companies listed on multiple exchanges, but this does not detract from an appreciation of the coverage of CRIRSCO family reporting codes.

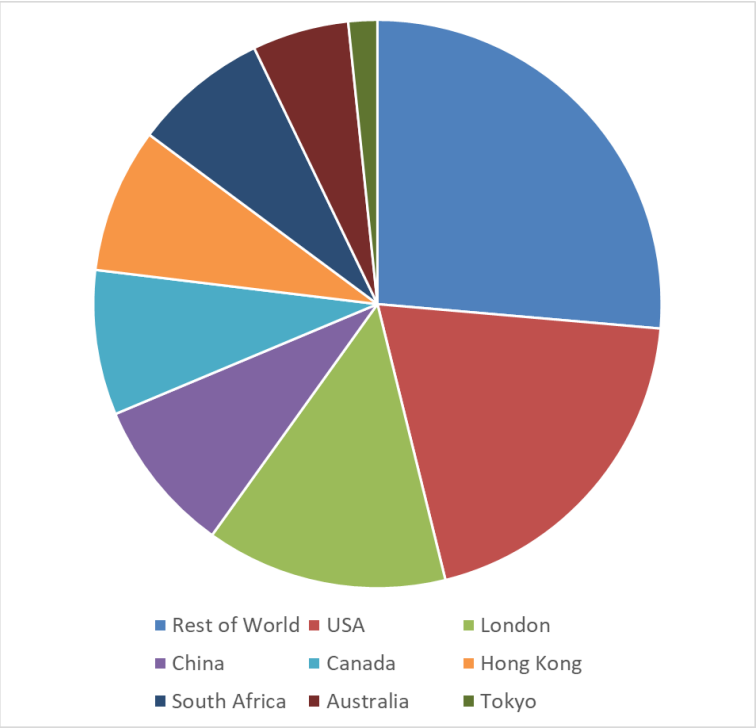

Figure 5. Distribution of capital invested in mining and metals companies globally (Revenue Watch Institute, 2022).

2.2 Intended Use of Reporting Codes

Reporting codes and standards help maintain confidence in both the securities markets and resource industry professions, by providing common definitions, agreed minimum reporting standards for balanced and transparent reporting, and allow for reciprocal recognition of professional qualifications.

Public Reports of Exploration Results, Mineral Resources and Ore Reserves prepared in accordance with the JORC Code (and other CRIRSCO family codes) are intended to:

- inform shareholders and other investors;
- avoid misleading public disclosure of scientific and technical information;
- reduce the chances of deliberate fraud from occurring;
- providing adequate information on the potential risks and uncertainties of mineral exploration and mining projects; and
- maintain the credibility of information reported by, and the reputation of, mining industry professionals.

Minerals industry professionals:

- provide expert services;
- give opinions, provide guidance and make judgements;
- provide advice that is relied upon by employers, investors, government authorities, the public and others to support making key decisions; and
- make decisions that affect business outcomes, the general public good, public safety and the environment.

Such services and opinions should be provided by an individual who has:

- sound knowledge and application of theory in their area of specific expertise (e.g., geoscience, mining engineering, metallurgy, finance, environment, communities, sustainable development, etc.);
- a commitment to exemplary standards of professional ethics;
- good judgement;
- awareness of the nature of the target audience; and
- relevant and up to date professional work experience and completed continuing professional development (CPD) (Burnett, 2022).

Burnett (2022) offers an alternative definition of a Competent Person:

> *"A Competent Person is a person applying a particular type of technical expertise to a topic with which they are familiar, who:*
>
> - *has made, or is aware of, the most common mistakes and errors that can be made;*
> - *has learned from their mistakes and seeks to avoid making them again;*
> - *believes in and adheres to the ethical code of the professional body to which they belong; and*
> - *is prepared to accept responsibility for and to defend their work."*

2.3 Why do we need Competent Persons?

Under JORC and other CRIRSCO family reporting codes, Competent Persons must:

- assess, control and accept responsibility for the technical quality of data used in reporting Exploration Results, Mineral Resource and Mineral/Ore Reserve estimation and parameters required to undertake studies of Mineral Resource potential viability and mining Feasibility Studies;
- understand how sample information relates to processing and marketing;
- critically assess the quality of geological data, including assay data and, if necessary, insist on changes to improve data quality and processes (Burnett, 2022); and
- provide consent that the Public Report fairly reflects the Competent Person's work in the form and context it is presented in the Public Report.

Competent Persons play a key role in ensuring investors and other stakeholders are provided with objective, reliable information for exploration and mining projects.

Competent Persons are responsible for the application of reporting codes and standards, bound by a code of ethics, and must accept responsibility for their work. They are also subject to disciplinary action by their Professional Organisations in the event of non-compliance with the relevant codes or standards (Burnett, 2022).

2.4 Requirements of a Competent Person under the JORC Code

The JORC Code (JORC, 2012) states (Clause 9):

> *"A Public Report concerning a company's Exploration Targets, Exploration Results, Mineral Resources or Ore Reserves is the responsibility of the company acting through its Board of Directors. Any such report must be based on, and fairly reflect, the information and supporting documentation prepared by a Competent Person".*

This is an important principle in the application of the JORC Code that creates context for other aspects of competence associated with the preparation and Public Reporting of Exploration Results, Mineral Resources or Ore Reserves estimates in accordance with the Code.

Competent Persons, in accordance with the JORC Code (2012), are required to:

1. Be a minerals industry professional who is a Member or Fellow of the AusIMM, the AIG, or of a Recognised Professional Organisation (RPO), a list of which is published on both the JORC (www.jorg.org) and Australian Securities Exchange (ASX) (www.asx.com.au) websites. These organisations have enforceable disciplinary processes, including the powers to suspend or expel a member.
2. Possess a minimum of five years relevant experience in the style of mineralisation or type of deposit under consideration and in the activity which that person is undertaking.

The JORC Code (2012) states:

> *"If the Competent Person is preparing documentation on Exploration Results, the relevant experience must be in exploration. If the Competent Person is estimating, or supervising the estimation of Mineral Resources, the relevant experience must be in the estimation, assessment and evaluation of Mineral Resources. If the Competent Person is estimating, or supervising the estimation of Ore Reserves, the relevant experience must be in the estimation, assessment, evaluation and economic extraction of Ore Reserves".*

The common feature of the AusIMM, the AIG and RPO organisations is that their members must be:

> *"suitably qualified and experienced persons who are subject to an enforceable professional code of ethics".*

Enforcement of the Codes of Ethics by the AusIMM and the AIG is examined in a subsequent section of this study.

2.5 Professionalism

2.5.1 Definitions

Professionalism is foremost in the definition of a Competent Person in the JORC Code (2012).

The Australian Council of Professions (ACOP), formerly Professions Australia, provides the following definition:

> *"A Profession is a disciplined group of individuals who adhere to ethical standards and who hold themselves out as and are accepted by the public as possessing special knowledge and skills in a widely recognised body of learning derived from research, education and training at a high level, and who are prepared to apply this knowledge and exercise these skills in the interest of others".*

(ACOP, 2003).

Inherent in this definition, ACOP states that a code of ethics governs the activities of each Profession. Such codes require behaviour and practice beyond the personal moral obligations of an individual. They define and demand high standards of behaviour in respect to the services provided to the public and in dealing with professional colleagues. Often, these codes are enforced by the Profession and are acknowledged and accepted by the community.

ACOP proposes the following definitions for Professionals:

> *"A Professional is a member of a Profession. Professionals are governed by codes of ethics and profess commitment to competence, integrity and morality, altruism and the promotion of the*

public good within their expert domain. Professionals are accountable to those they serve and to society".

(ACOP, 2003).

AusIMM and AIG Members and Fellows satisfy the ACOP definitions of both professions and professionals, as:

- both AusIMM and AIG Members and Fellows identify as belonging to a profession (a disciplined group of individuals who adhere to ethical standards and who hold themselves out as and are accepted by the public as possessing special knowledge and skills);
- both the AusIMM and the AIG have minimum educational standards that must be satisfied to be granted membership;
- members of both Institutes accept an obligation to comply with an enforceable Code of Ethics; and
- both Institutes have a purpose to deliver benefits to the broader community.

2.5.2 Importance of Professions

ACOP (2022) poses the question *"who can we trust?"* and proposes that *"deeply considered, expert guidance helps us successfully navigate the threats to our lives and livelihoods"*. ACOP (2022) notes that the capabilities of professionals are most called on to exercise science, experience and expertise in decision making. The preparation of the underlying technical information on which a Public Report is based clearly satisfies this need.

2.5.3 Continuing Professional Development

ACOP and a number of other Professional Organisations invoke a commitment to CPD as an essential requirement of being considered to be a professional. ACOP member associations must ideally demonstrate a requirement for members to undertake CPD, or at least promote the benefits of CPD to members.

Both the AusIMM's Chartered Professional (CP) and the AIG's Registered Professional Geoscientist (RPGeo) program require a commitment to CPD by participants to maintain chartered or registered status respectively. This requirement is periodically and randomly audited by both Institutes.

The AusIMM's Code of Ethics (Clause 8) states:

"Members of the AusIMM shall continue their professional development throughout their careers and shall actively assist and encourage those under their direction to also advance their knowledge and experience".

This creates an obligation for AusIMM members to both continually improve their skills and to also support continued skills development by peers and subordinates.

The AIG has no comparable clause in its Code of Ethics; however, it actively promotes and provides accessible and relevant CPD opportunities for Members.

Both Institutes also operate mentoring programs that enable Members to participate as both mentors and mentees and can be used to gain benefit from real-world experience in all fields of geoscience, including Mineral Exploration, Mineral Resource and Ore Reserve estimation and technical reporting.

2.6 Professional Ethics and Standards

Both the AusIMM and the AIG require their Members to comply with their Institutes' Codes of Ethics. These Codes provide a mechanism by which complaints relating to the professional conduct of members may be assessed. Both Institutes have rules and processes to deal with alleged breaches of the Institute's Code of Ethics (AIG, 2022; AusIMM, 2022). Members may be subject to sanctions if conduct that is the subject of a complaint is judged to have breached the Institute's Code of Ethics; this may range from a warning, to suspension, or termination of membership.

Complaints are dealt with by both Institutes in strict confidence. Adverse findings against members, particularly suspension or expulsion, may be published.

To date, both the AusIMM and the AIG have relied upon complaints being lodged by members of the public or their Institute members. Complaints must be submitted in writing and are able to be submitted online through both Institutes' websites.

The AIG has recently introduced a regular, random review of ASX announcements to provide increased knowledge of the JORC Code compliance issues. These reviews can be incorporated into Competent Person education initiatives offered by the Institute, which include seminars, workshops and occasional ethics and standards advice provided to Members as the need arises. Material issues identified through this process have resulted in complaints being initiated against AIG members, referral of complaints to the AusIMM, and have also been reported, in confidence, to the ASX, usually on the day of a news announcement release considered not to meet the JORC Code requirements being issued.

Around one-fifth of AIG geoscientists are also AusIMM members, that is, they are members of both Institutes. The two Institutes have no formal arrangements in place by which a member suspended or expelled from one cannot seek membership of the other. The AIG requires applicants for membership to state whether they have been or are currently the subject of any disciplinary action by another professional Institute.

2.7 Professional Competence

Epstein & Hundert (2002) define professional competence as:

> *"The habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values and reflection in daily practice for the benefit of the individual and community being served."*

Despite being developed in a medical profession context, the definition emphasises the importance of the following points.

- Communication: being mindful of the needs of stakeholders and their ability to understand and interpret information presented to them.
- Knowledge and technical skills: An expectation to possess knowledge gained through a combination of both formal instruction and experiential learning.
- Judgement (clinical reasoning): Understanding of the subject in question required to exercise judgement and determine appropriate pathways to the resolution of issues.
- Emotions: to be able to exercise empathy and appreciate the nature of interpersonal relationships in dealing with stakeholders.
- Values: ethics.
- Reflection: reviewing decisions to ensure that decisions have been matched with appropriate actions.

The elements listed in the above definition are both relevant in the preparation and presentation of Public Reports by Competent Persons and the use of Public Reports by stakeholders.

AusIMM and AIG membership requirements address all the points raised in the definition through:

- minimum educational standards to gain membership of either Institute;
- a requirement for relevant experience, including specified time in roles that involve exercise of professional discretion and judgement for Members and Fellows;
- a history of professional conduct; and
- agreement to adhere to a code of conduct, ethics and standards of professional practice.

Epstein & Hundert (2002) propose that:

- standards of competence must be measurable through mechanisms including examinations, subjective supervisor and peer assessment, and performance reviews; and
- a commitment to competence and excellence is a way of ensuring a culture of ethical behaviour.

2.8 Nomination of a Competent Person

The JORC Code requires the Competent Person(s) on whose information and documentation the Public Report is based, to be named in the Public Report. The Competent Person must consent to the inclusion of their information in a Public Report and to the form and context in which it appears. The Competent Person's employer must also be named and any potential for a conflict of interest by the Competent Person or a related party must be disclosed within the Public Report.

Companies may re-issue information presented in a previous Public Report where there is no new information without the Competent Person's written consent. A date and reference for the original Public Report, and the Competent Person's name and affiliation must be included (Clause 9, JORC, 2012).

2.9 Relevant Experience

Competent Persons are specifically required by the JORC Code to possess a minimum of five years relevant experience in:

1. the style of mineralisation or type of deposit under consideration; and,
2. the activity which that person is undertaking.

This requirement matches that of most CRIRSCO family reporting codes (discussed in Section 4).

The concept of what constitutes "relevant experience" is an area that has attracted considerable debate amongst professional geoscientists and other resource industry practitioners. Concerns raised include how competence requirements specified by the JORC Code can be met for commodities for which there has historically been a restricted cohort of experienced practitioners, and that rapidly become exploration targets due to changes in demand created by new technologies, or different styles of mineralisation becoming potentially viable due to improvements in processing costs (e.g., sedimentary uranium, nickel and cobalt laterites, lithium ionic clays and metals recoverable from naturally occurring brines).

CPD plays a pivotal role in development of relevant experience through mentoring and on-the-job learning, working with experienced resource professionals.

3. Previous Discussions Related to Competence and Competent Persons in Australia

3.1 Background

Information in the paper "History of Ore Reserve Classification and Reporting in Australia" by Pat Stephenson and Ken Glasson (Stephenson and Glasson, 1992) discusses the early history of the classification of Ore Reserves in Australia and elsewhere, with an emphasis on the recommendations for proposed nomenclature to be used to describe Ore Reserves. The paper points out that agreement in Australia between companies and professionals on uniform terminology was not achievable in the 1950s, as each mining company or "operation tended to estimate Reserves using methods developed specifically for its orebodies".

So, no progress was made on reporting of Ore Reserves until 1971, after the Poseidon Boom & Bust, a speculative share market boom and bust which followed the announcement on 1 October 1969 by Poseidon NL to the Adelaide stock exchange of the results of drill hole PH2 at Windarra, WA. This announcement included 40 Feet of 3.56% Ni and 0.55% Cu in massive sulphides (Sykes, 1978). The announcement continued:

> *"The Consulting geologists, Burrill and Associates Pty Ltd, quote that the mineralised zone has an indicated length of 1000 ft and a minimum width of 65 ft."*

The Poseidon NL shares, which were trading at about a dollar prior to that announcement, rose over the next five months to $280 per share. Multiple other companies listed or announced discoveries and also enjoyed remarkable share price rises.

After 11 March 1970, the Poseidon NL share price fell dramatically, and many other companies posted similar price drops. Poseidon NL's reporting and governance was poor; even though it had actually intersected massive sulphides. It provided the catalyst to some of the many other companies fraudulently reporting drilling results and "Ore Reserves".

The magnitude of the bust and the losses incurred by ordinary investors and the apparent use of inside information by some led the Australian Senate to set up the Senate Select Committee on Securities and Exchange on 19 March 1970.

The Australian Senate Select Committee became generally known as 'the Rae Committee' after its second Chairman Senator Rae. The senate committee reports, both the interim report of 18 July 1974 (Rae Report, 1974) and the final report of the Senate Select Committee on Securities and Exchange Final Report in 1975), documented the intertwined activities of geological consultants, company directors, and stock exchange committee members and noted significant conflict of interest issues, with information circulating within these groups prior to being released to shareholders and the public. While insider trading was not illegal then, what the Rae committee pointed out was the failure of the groups to comply with their obligations to shareholders, and the failure of any regulator to take action.

It is relevant to quote from the Rae Committee report on these matters at page 2.123, particularly related to the evidence of geologists Mr G.H.R. Burrill and his associate Mr. W.R.K. Jones (Rae Report, 1974):

> *"In our view, it is intolerable that consulting geologists should have free licence to behave in this way. Yet there was no evidence that any State regulatory authority or professional geological body had ever challenged their conduct. Mr Jones told us (in 1971) that geologists have not been subject to a code of ethics, unless they happened to be a member of the Institute of Mining and*

Metallurgy. He was a member of that body, but it apparently did not concern itself with the kinds of practices of geologists we have described."

Long before the Rae committee reports were tabled in the Senate, in September 1971, the Melbourne Stock Exchange asked the Australian Mining Industry Council (AMIC, now Minerals Council of Australia (MCA)) for its opinion on a proposal that use of US Bureau of Mines terminology should be included in listing requirements for mining companies. Shortly afterwards, the Senate Select Committee on Securities and Exchange invited the AusIMM to comment on evidence that, within the Australian mining industry, "there were no recommended or required standards or terminology for expression of Ore Reserves".

In response to these approaches, a Joint Committee was formed with representatives from both the AusIMM and AMIC with the brief to consider the matters raised by the Melbourne Stock Exchange and the Senate Select Committee (Stephenson and Glasson, 1992).

The Joint Committee made progress on these two requests, resulting in a Report in 1972 by the Joint Committee on Ore Reserves of the AusIMM and AMIC (AusIMM and AMIC, 1972). Further reports from 1975 to 1985 ultimately led to the first edition of the JORC Code in 1989.

3.2 The Joint Committee Reports 1972 to 1985

The concept of a Competent Person appears in the first report by the Joint Committee (AusIMM and AMIC, 1972). As well as discussing terminology recommended for reporting "on a company's ore or mineralisation position", it also concluded, at Conclusion C, that:

> "C. It followed therefore that estimates of Ore Reserves and reports on related matters at earlier stages should be prepared by "responsible professionally qualified" persons (quoting the Institution of Mining and Metallurgy, 1954) of appropriate experience."

No specific reference was provided for the "responsible professionally qualified" statement. In the Recommendations at 2 as below:

> "2. Responsibility for Reports
>
> The Committee believes that any statement on a company's ore or mineralisation position is and must be remain the sole responsibility of the Board of Directors. That is, a Board should not be required compulsorily to attach to its reports supporting documents signed by any other personnel.
>
> Where however, a Board of Directors chooses to include supporting documents on its ore or mineralisation situation, it should be a requirement that the signatory to any such documents be a Competent Person as defined below."

In Recommendation 3, definitions of a "Competent Person" (the first Australian definition), Competent Company, and Competent Report are provided for consideration by the Australian Associated Stock Exchanges (the forerunner to the ASX):

> "3. Requirement Regarding Competence
>
> The Committee considers that competence and experience are the most important factors involved in reporting on an ore or mineralisation situation. Because of this, it would not, in the opinion of the Committee, be unreasonable to expect any company exploring for minerals to meet a required level of competence, as a condition of listing with the Stock Exchanges.
>
> The Stock Exchanges should require companies exploring for minerals to establish their competence with the Australian Associated Stock Exchanges according to the definitions

below. The onus would be on each company, once its competence has been established, not only to maintain its status in this regard but also to ensure that any reports in the context of mineral exploration and assessment issued by the company, are based on work compiled by Competent Persons as defined.

1) Competent Person

Where reports on a company's ore or mineralisation situation are concerned, a person responsible for the compilation of such reports would be acceptable as "competent" if he is a Corporate Member of The Australasian Institute of Mining and Metallurgy, and also has a minimum of five years' experience in the field of activity in which he is reporting.

2) Competent Company

For the purposes of reporting on its ore or mineralisation situation, a company would be acceptable as "competent" if it employs or has engaged the services of a Competent Person or persons.

3) Competent Report

Any report or statement of technical fact, interpretation or assessment, made on behalf of a competent company, is assumed to conform to a desirable standard of competence. Provided that where a company's competence depends on its having engaged the services of an outside Competent Person, it shall for each such report or statement made hold a supporting document signed by that Competent Person."

A Corporate Member of the AusIMM was defined by Article 5 of the Institute's Royal Charter (1955) (AusIMM, 2007) as:

> "The Honorary Members, Life Members, Senior Members, Members, Senior Associate Members, Associate Members and Company Members shall be known as Corporate Members".

The membership grades were altered in the AusIMM By-Laws, Adopted October 2000 at item 6:

> "6. The Institute shall consist of Honorary Fellows, Fellows, Members and Company Members who shall be Corporate Members and Associates, Graduates, Students and Visiting Members."

In an amendment to its official listing requirements as of 1 March 1973 (AASE, 1973), the Australian Associated Stock Exchanges adopted a number of the Joint Committee recommendations, including the concept of a Competent Person (although the words "Competent Person" were not used). The Listing Rule Section 3.F. contained the new requirements as follows (AASE, 1974):

> "Reports – To be based on Professional Advice
>
> (3) Any report which relates to a company's ore of mineralisation to be based on and state that it is based on, or be accompanied by a statement signed in the same manner as the report that it is based on, information compiled by a person who is a corporate member of The Australasian Institute of Mining and Metallurgy who has had at least five (5) years' experience in the field of activity in which he is reporting or by a firm or company a partner or director of which is such a person (such person firm or company being hereinafter referred to as "the member" which expression included one or more such persons or companies).
> (4) Where the member is not a full-time employee of the reporting company a report based on information compiled by the member shall not be released by the reporting company unless the member has consented in writing to the inclusion in that report of matter

based on the information so compiled by him in the form and context in which it appears and the report or attached statement so states.

(5) Where the member is a full-time employee of the reporting company it must be stated in the report or attached statement that the report accurately reflects the information compiled by the member."

Thus, the concept of the Competent Person as developed by the Joint Committee of Industry and professional bodies, was accepted and included in the stock exchanges' Listing Rules.

Since this 1972 report simply introduced the Competent Person concept, Mr Rick West HonFAusIMM, who was the convenor of the Joint Committee from its inception until 1992, was contacted by the author of this study section, for additional background to the development of the Competent Person concept which was incorporated in that first 1972 report.

Mr West recounted that within both the Joint Committee on Ore Reserves, and amongst members of the committee and other professionals, there were examples of projects in Australia and PNG with reporting issues. In some cases, the issues were based on poor understanding of the mineralisation, and hence poor estimates. In other cases, reporting of information was not supported by facts. This led to discussions suggesting the need for a 'responsible professionally qualified' person to be required for estimating and reporting on 'ore or mineralisation".

Mr West also recalls that similar discussions were occurring in Canada and the United Kingdom, and there were discussions at an Ore Reserves Conference in Canada around this time. These discussions also recognised the need for a multidisciplinary team to be involved in Ore Reserve estimation and reporting, but that did not appear in the 1972 Report of the Joint Committee (West, 2022).

In 1975, the 1972 report was "revised and endorsed without change by the Joint Committee on Ore Reserves and reissued in April 1975 as the Report by Joint Committee on Ore Reserves AusIMM and AMIC, Revised and endorsed without change in April 1975. Thus, the Competent Person definition was unchanged.

The Joint Committee issued another report in March 1981 (AusIMM and AMIC, 1981) with slight changes to the Competent Person definition, principally introducing the concept of relevant experience.

3.3 Competent Person Definition

Where reports on a company's ore or mineralisation situation are concerned, persons responsible for the compilation of such reports would be deemed "competent" if they are Corporate Members of The Australasian Institute of Mining and Metallurgy, and also have a minimum of five years' experience in the fields of activity relevant to the estimates.

Further Joint Committee reports were released in March 1982 and June 1985; however, the 1981 Competent Person definition was retained, remaining substantially the same until in 1987, when a complete overhaul of the existing guidelines was undertaken (Stephenson & Glasson, 1992).

3.4 The JORC Code 1989

In February 1989, the Australasian Code for Reporting of Identified Mineral Resources and Ore Reserves (JORC, 1989) was issued, which included the following definition:

> "Competence
> 13. A "Competent Person" is a person who is a Corporate Member of the Australasian Institute of Mining and Metallurgy with a minimum of five years' experience in the relevant Resource and Ore Reserves assessment field."

As Edna Carew notes (Carew, 2007), the 1989 the JORC Code was swiftly incorporated into ASX's Listing Rules following a meeting of members of JORC with Martin Kinsky, ASX's General Counsel, who decided to make compliance with the JORC Code mandatory in the Listing Rules and would include the JORC Code as an appendix to those rules.

In Section 3B Periodic Reports of the ASX Listing Rules (ASX, 1994), the requirements to comply with the JORC Code were included as follows:

> "**Mining Exploration Companies – Additional Rules**
>
> (10) In addition to the information required by Listing Rule 3B (5), a mining exploration company shall give to the Home Exchange within one month after the end of each quarter a report giving all the information prescribed by, and in the form set out in, Appendix 8."

Appendix 8 was the 1989 JORC Code.

In May 1990, the Joint Committee issued "Guidelines to the Australasian Code for Reporting of Identified Mineral Resources and Ore Reserves" (AusIMM and AMIC, 1990) that contained the following guidance on the Competent Person:

> "**COMPETENT PERSON**
>
> The concept of a Competent Person was originally introduced in the 1972 Report by the Joint Committee on Ore Reserves, and the definition in the 1989 Code is not different in substance. The reference to a minimum of five years' experience is intended to encompass any experience which has specific relevance to the mineralisation under consideration. For example, in estimating vein gold mineralisation, experience in any high-nugget, vein-type mineralisation (such as tin, uranium etc.) is relevant, whereas experience in (say) massive-type deposits is not.
>
> Estimation of Ore Reserves is a team effort involving a number of disciplines. More than one member of the team may qualify as a Competent Person. The Competent Person or Persons who signs the report is responsible and accountable for all aspects of the report under the Code, and by virtue of being a Corporate Member of the AusIMM, is answerable to the AusIMM Ethics and Discipline Committee should that Committee become involved.
>
> The Joint Committee recognises that a difficulty may arise when a company with overseas interests wishes to report an overseas resource or reserve estimate prepared by a person who may not be a resident of Australia and who may therefore not be a member of the AusIMM. In such situations it is recommended that the directors issuing the report indicate that the person making the estimations of grade and tonnage has the required relevant experience in the type of mineralisation being reported that would allow him or her to qualify as a Competent Person were he or she to be a Corporate Member of The AusIMM."

These guidelines expanded on the relevant experience requirements in the definition of a Competent Person.

3.5 Subsequent Codes, The Rae Report and the Formation of the AIG

The Competent Person definition was expanded in subsequent editions of the JORC Code. In the 1992 Edition of the JORC Code, the AIG was added in the definition as an additional Professional Organisation to which a Competent Person could belong:

> 9. A 'Competent Person' is defined as a person who is a Corporate Member of The Australasian Institute of Mining and Metallurgy and/or the Australian Institute of Geoscientists with a minimum of five years' experience in the estimation, assessment and

evaluation of Mineral Resources and Ore Reserves which is relevant to the style of mineralisation under consideration.

As background to this change, it is relevant to note that there were adverse comments on the behaviour of some geologists in the 'Report from the Senate Select Committee on Securities and Exchange' (Rae Report, 1974) that on page 2.123 which states:

> *"We also draw attention to the evidence of the multiple roles of consulting geologists in Australia. Burrill and Associates were not only geological consultants to public companies, but there entangled in a range of activities directly associated with dealings in the shares of listed companies. This entanglement was deliberately organised as an integral part of the firm's business - one side of the business complementing the other. The objective was to make profits. Thus, the firm developed a specialised and well-organised system for gathering information about mining and exploration companies, for disseminating this for a fee among select clients, including brokers, and for dealing in the shares of these companies. This share-trading was so closely integrated with the geological consulting activities that the geologists themselves directly, and indirectly through their associated company, dealt in the shares of the companies to which they were consultants. This dealing took place on a national basis. Mr Burrill also advised international investors on their dealings in Australian shares; and we have said how he made use of his privileged position as the consulting geologist to Poseidon to benefit these investors at the time the placement of new shares was being arranged."*

As a result of these adverse comments and other comments made during the Senate Select Committee hearings and statements by the Chairman of the committee and reports of the Committee, members of the Geological Society of Australia (GSA), a learned society, actively discussed the introduction of a Code of Ethics to govern behaviour of geologists. The events are summarised in an AIG history article (Cramsie, 2002). The article states:

> *"In releasing his committee's report, Senator Rae proposed that geologists should be licenced".*

While this is a quote from Cramsie (2002), the source of the reported statement by Senator Rae is not referenced in the article. A search of Senate Hansard and enquiries of the Senior Clerk of Committees, Department of the Senate, Parliament of Australia did not reveal such a statement. However, it undoubtedly reflects the views of the Select Committee and may have been part of the draft final chapter of the select committee report, which was never finalised and released (Hardiman, 2022).

A search of the Senate Hansard records did not reveal any references to a proposal for geologists to be licenced in either of the committee reports, or in Senator Rae's speeches to the Senate when tabling the interim report (18 July 1974) or the final report of the Senate Select Committee on Securities and Exchange Final Report in 1975 (Rae Report, 1975).

In a speech to the Senate on 9 December 1971, Senator Rae did say the select committee "has taken evidence relevant to the regulation of geologists." However, that topic is not mentioned again.

When the interim report was tabled on 18 July 1974 (Rae Report, 1974), Hansard records that Senator Rae sought leave to continue his remarks at a later stage. Consequently, there was no discussion of the report when it was tabled, and it appears discussion on the notice of motion on 9 July 1974 to allow the Senate Select Committee to continue functioning did not take place until 24 October 1974, when it was dealt with, but the discussion was essentially procedural.

On Wednesday 20 August 1975, Senator Rae, in presenting the final report of the Senate Select Committee, which included Chapter 13 on Queensland Mines and Kathleen Investments, when referring to that Chapter, said in part:

"This Chapter contains matter extending beyond matters otherwise dealt with in the reports. In particular it details cases of insider trading, abuses and failures in relation to geological reporting and the dangers to the investing public of persons assuming roles of potential conflict of interest."

GSA members made significant progress towards licencing of geologists by the state governments, with draft legislation prepared and agreed by several states. But changes of government and the reluctance of many GSA members, led to the abandonment of that process. Instead in 1980 the main proponents proceeded to form the AIG, a professional Institute for geologists, geophysicists and other geological scientists, which came into existence in 1981. The AIG eventually became a parent body of JORC, with the AusIMM and MCA, and, as noted above, was included as an additional Professional Organisation (Waldie & Whyte, 2019) to which a Competent Person could belong in the 1992 edition of the JORC Code.

The separate "Guidelines to the Australasian Code for Reporting of Identified Mineral Resources and Ore Reserves" were published as an attachment to the September 1992 Code. The Competent Person information in the guidelines was significantly expanded as follows:

> **Competent Person**
>
> The key qualifier in the definition of a Competent Person is the word 'relevant'. Determination of what constitutes relevant experience is a difficult area and a degree of common sense has to be exercised.
>
> For example, in estimating vein gold mineralisation, experience in any high-nugget, vein-type mineralisation such as tin, uranium etc. is relevant whereas experience in (say) massive-type deposits is not.
>
> As a second example, five years' experience in beach sand deposits does not make a person 'competent' to evaluate and report on a river system of gold alluvials, since there is an order of magnitude difference in grades as well as considerable difference in the mechanism of transport and deposition.
>
> In addition to experience in the style of mineralisation, a Competent Person must have sufficient experience in the sampling and assaying techniques relevant to the deposit under consideration to be aware of problems which could affect the evaluation. Some appreciation of extraction and processing techniques applicable to that deposit type would also be important.
>
> As a general guide, persons being called upon to sign as a Competent Person should be clearly satisfied in their own minds that they could face their peers and demonstrate competence in the type of deposit under consideration. If doubt exists, the person should either seek opinions from other colleagues or should decline to sign as a Competent Person.
>
> Estimation of Ore Reserves is a team effort involving a number of disciplines and more than one member of the team may qualify as a Competent Person. The Competent Person (or Persons) who signs the report[2] is responsible and accountable for all aspects of the report under the Code. If the Competent Person is a Corporate Member of the AusIMM, he or she is answerable to the AusIMM Ethics Committee should that Committee become involved. If the Competent Person is a Corporate Member of the Australian Institute of Geoscientists (AIG)

[2] The 'report' referred to here is the Mineral Resource estimate report, a technical report upon which the Public Report is based, now referred to as the documentation. In earlier versions of the JORC Code and guidelines 'report' was used in two senses the Public Report and the technical report or documentation. It was often unclear in which sense it was being used.

then he or she is answerable to the AIG Ethics and Standards Committee should that Committee become involved.

A difficulty may arise when a company with overseas interests wishes to report an overseas Mineral Resource or Ore Reserve estimate prepared by a person who may not be a resident of Australasia and who may therefore not be a member of the AusIMM or of the AIG. In such situations the company must nominate a Competent Person or Persons to sign off the Mineral Resource or Ore Reserve estimate.

Much of this new guidance on relevant experience has formed the basis of all subsequent editions of the Code.

In 1992, the JORC Code was included in the New Zealand Stock Exchange Listing Rules.

The 1996 JORC Code, under the heading Competence and Responsibility, included the following:

8. A Mineral Resource or Ore Reserve report giving technical facts, interpretations or assessments of Mineral Resources or Ore Reserves must be prepared under the direction of, and signed by, a Competent Person or Persons.

9. A 'Competent Person' is defined as a person who is a Corporate Member of The Australasian Institute of Mining and Metallurgy and/or the Australian Institute of Geoscientists with a minimum of five years' experience in the estimation, assessment and evaluation of Mineral Resources and Ore Reserves which is relevant to the style of mineralisation under consideration.

The separate "Guidelines to the Australasian Code for Reporting of Identified Mineral Resources and Ore Reserves" were again published as an attachment to the July 1996 Code. The guidelines on the Competent Person were exactly the same as in the 1992 Guidelines, as quoted above, and are not repeated here.

Due to the differing interpretations between interpretations of the Code and the Guidelines, in the 1999 JORC Code the Guidelines were integrated within the Code (JORC, 1999), allowing variations of interpretation to be largely eliminated. In the process, some previous guidelines were included as Code and the guidance was shown within the Code in *indented italics*.

The 1999 JORC Code section containing the Competent Person definition was included in a section headed 'Competence and Responsibility' (JORC, 1999). The definition was revised as follows:

10. A 'Competent Person' is a person who is a Member or Fellow of The Australasian Institute of Mining and Metallurgy and/or the Australian Institute of Geoscientists with a minimum of five years' experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which that person is undertaking. If the Competent Person is estimating, or supervising the estimation of Mineral Resources, the relevant experience must be in the estimation, assessment and evaluation of Mineral Resources. If the Competent Person is estimating, or supervising the estimation of Ore Reserves, the relevant experience must be in the estimation, assessment, evaluation and economic extraction of Ore Reserves.

The guidance to the definition (in indented italics) was included directly after the definition. The guidance on relevant experience was considerably enhanced.

> *The key qualifier in the definition of a Competent Person is the word `relevant'. Determination of what constitutes relevant experience can be a difficult area and common sense has to be exercised. For example, in estimating Mineral Resources for vein gold*

mineralisation, experience in a high-nugget, vein-type mineralisation such as tin, uranium etc. will probably be relevant whereas experience in (say) massive base metal deposits may not be. As a second example, for a person, to qualify as a Competent Person in the estimation of Ore Reserves for alluvial gold deposits, he or she would need to have considerable (probably at least five years) experience in the evaluation and economic extraction of this type of mineralisation, due to the characteristics of gold in alluvial systems, the particle sizing of the host sediment, and the low grades involved. Experience with placer deposits containing minerals other than gold may not necessarily provide appropriate relevant experience.

The key word 'relevant' also means that it is not always necessary for a person to have five years' experience in each and every type of deposit in order to act as a Competent Person if that person has relevant experience in other deposit types. For example, a person with (say) 20 years' experience in Mineral Resource estimation in a variety of metalliferous hard-rock deposit types may not require five years specific experience in (say) porphyry copper deposits in order to act as a Competent Person. Relevant experience in the other deposit types could count towards the required experience in relation to porphyry copper deposits.

The guidance on multiple Competent Persons was expanded from just Ore Reserves reporting to also include specific guidance related to Mineral Resources reporting.

3.6 Recognised Professionals

In 2003, the ASX, on advice from JORC, introduced a procedure for identifying 'Recognised Overseas Professional Organisations' as accredited organisations to which Competent Persons must belong for the purpose of preparing Public Reports on Exploration Results, Mineral Resources and Ore Reserves for submission to the ASX (if they are not members of the AusIMM or AIG). The definition of a Competent Person in the paragraph dealing with professional membership was amended in the 2004 JORC Code to take account of this change (JORC, 2004a):

10. A 'Competent Person' is a person who is a Member or Fellow of The Australasian Institute of Mining and Metallurgy, or of the Australian Institute of Geoscientists, or of a 'Recognised Overseas Professional Organisation ('ROPO') included in a list promulgated from time to time."

The name of these recognised organisations was changed in 2012 JORC Code to Recognised Professional Organisation (RPO) to better reflect the general CRIRSCO situation where many members did not have solely sea borders like Australia and New Zealand. The paragraph in the definition of a Competent Person dealing with professional membership was amended in the 2012 JORC Code to take account of this change (JORC Code, 2012):

11. A 'Competent Person' is a minerals industry professional who is a Member or Fellow of The Australasian Institute of Mining and Metallurgy, or of the Australian Institute of Geoscientists, or of a 'Recognised Professional Organisation' (RPO), as included in a list available on the JORC and the ASX websites. These organisations have enforceable disciplinary processes including the powers to suspend or expel a member."

3.7 Responsibility for Competent Persons and Relationship with the ASX

One of the attractions of the JORC Code to the ASX was that there was someone, the Competent Person, responsible for the information reported on resources and reserves. Also, those Competent Persons were subject to a Code of Ethics and potential disciplinary procedures (initially) from the AusIMM and from 1992 also the AIG.

However, the manner of the application of those disciplinary procedures was not readily apparent, apart from reading the by-laws. Any complaints made were treated confidentially and so there was no visible enforcement or deterrent from the professional bodies to prevent failure of the Competent Person to comply with the reporting requirements of the JORC Code.

To the best of the author's knowledge, the AusIMM has only publicly named five individuals for breaching the JORC Code, and only one of those for a serious breach of the Code. That disciplinary action was subsequently overturned by the courts for lack of procedural fairness. It was not until the mid-2000s that annual reports on the activities of the AusIMM Complaints and Ethics committees were published, all be it anonymised.

Stephenson and Glasson (Stephenson & Glasson, 1992) also noted in relation to the introduction of the JORC Code in 1989 that:

> *"The (JORC) Committee is acting as an adviser to the Australian Stock Exchange with regard to compliance with the Code in Public Reporting by ASX-listed mining companies."*

This is understood to have been partially supported by the ASX.

By the mid-2000s, there was growing concern with the standard of reporting and the lack of any obvious monitoring and action to improve the reporting standards. There were a number of meetings, over four years, between the ASX, JORC and JORC's parent bodies the AusIMM, the AIG and the MCA, to attempt to improve the situation (JORC, 2004b, 2005, 2006; AusIMM, 2007). There may have been others for which records were unavailable.

There were several issues identified during these meetings as requiring attention; these included the following:

- A general concern within the mining industry that there was a lower level of monitoring of compliance with the JORC Code than was desirable. The ASX expressed the opinion that the AusIMM and AIG could do more to enforce better standards and quality of reporting by members acting as Competent Persons, the logic being that as many unacceptable Public Reports were the result of transgressions by Competent Persons, as they were the result of companies acting improperly. Since the Competent Person has to approve the release of information based on their work, they must carry some responsibility for the quality of the Public Report.
- The ASX proposed a panel review process, that would involve 20 to 30 quarterly reports being reviewed by "technically competent" people, who could then raise questions on the reports with the ASX.
- Concerns over lack of knowledge of the ASX complaints process and lack of transparency of the professional bodies' complaints and ethics processes.
- Lodgement of Competent Person Certificates with reports, to enable clear responsibility for the content of reports.
- The ASX referral of reports to the AusIMM or the AIG, including whether the ASX could refer reports to the AusIMM or the AIG in the manner of a complaint, without seeming to imply that the ASX was passing judgement on the Report and the Competent Person.
- Checklists for the ASX to assist it in determining when to seek external advice on reporting under the JORC Code.

The meetings were generally inconclusive, but the issue of responsibility for the quality of the Competent Person's work and the responsibility for monitoring report content were recurring themes.

There were also identified roadblocks to action, the most challenging being the issue of professional liability for professionals to be involved in reviewing reports through the proposed review panel, and the responsibility for the budget for this panel. No real progress was made, although the concept of the panel had been progressed to a list of suitable consultants held by the ASX from which to seek advice. Eventually, ASIC, and later the ASX, employed geologists to internally monitor reports.

There were some positive outcomes with a series of ASX Companies Updates prepared with the assistance of JORC. Extracts of four ASX Companies Updates: 03/08, 11/07, 03/07, 05/04, were appended to the 2004 JORC Code in 2008, at pages 21-31 (JORC, 2022). These updates, issued subsequent to publication of the Code, are important guides in the clarification and interpretation of the Code and should be read in conjunction with it.

3.8 Competent Person's Hotline

In the AusIMM Bulletin in early 2007 the CEO wrote that the AusIMM had "introduced a hotline" for advice and mentoring, with "six volunteers responding to our call for self-nominations" (Larkin, 2007). This was in response to Competent Persons indicating that they were feeling pressured to unreasonably modify the outcomes of their work and expressing concern that there was nowhere to turn for independent advice. The panel could be contacted by phone through the AusIMM Central Services or the CEO by email. However, not many people can remember the details of this hotline.

4. Competence Required for Resource and Reserve Reporting in Other Jurisdictions

4.1 Comparison of International Resource and Reserve Reporting Code Requirements

A comparison of the salient features of international resource and reserve reporting codes is provided by Table 1 below.

Table 1. Comparison of international Mineral Resource and Ore Reserve reporting code attributes

	Australasia	Brazil	Canada	Chile	Colombia	Europe	India	Indonesia	Kazakhstan	Mongolia	Russia	South Africa	Turkey	USA S-K 1300
CRIRSCO standard code	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Reporting standard recognised by national regulator	✓	✓	✓	✓	✓	✓	P	✓	✓	×	✓	✓	✓	✓
Competent Person Requirement	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mineral Resource Reporting Permitted	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Inferred Resources allowed in economic studies	✓	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Commodity price process specified by company management	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
RPO type reciprocal system	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	*
Minimum level of study required for Ore/Mineral Reserves	PFS	PFS	PFS	PFS	PFS	PFS	PFS	PFS	PFS	PFS	PFS	PFS	PFS	PFS

P *reflects partial recognition of the reporting standard by the national regulator*

**The US SEC specifies the attributes of acceptable Professional Organisations but has not published a list, relying instead on self-assessment of this by professionals acting as Qualified Persons.*

Table 1 demonstrates the extent of alignment of reporting standards that has been achieved in recent years with the broad adoption of CRIRSCO Template codes in major mining jurisdictions. These have included geographic expansion of countries using CRIRSCO family codes and, most significantly, the adoption of standards conforming to the CRIRSCO reporting template in the USA.

Some countries with CRIRSCO reporting codes that are endorsed by regulators also require disclosure of resources and reserves in a form that is incompatible with the CRIRSCO Template for statutory reporting purposes (e.g., India, Mongolia and Russia).

All CRIRSCO Template countries specify completion of a Pre-Feasibility or Feasibility Study in order to support the estimation and disclosure of Ore Reserves. In some countries this must include a life of mine (LOM) plan and production schedule.

The new system in the USA, S-K 1300, permits reporting of Exploration Results and Mineral Resources in addition to Ore Reserves. S-K 1300 became effective from 1 January 2021 and applies to all companies registered on U.S. securities exchanges who have mining as a significant part of their business. Disclosures required under S-K 1300 are summarised in Table 2.

Table 2. U.S. S-K 1300 Disclosure Requirements (Wolfe, 2020)

Company (Registrant)			
All Mining Properties		Each Material Mining Property	
Summary Disclosure[1]	**Internal Controls Disclosure**	**Individual Property Disclosure[1]**	**Technical Report Summary (TRS)[2]**
Lists details about all properties in the filing, including a summary of Mineral Reserves and Mineral Resources	Describes quality assurance/quality control (QA/QC) procedures upheld by the company to justify Mineral Reserves and Mineral Resources	Lists details about each **material** property in the filing, including Mineral Reserves and Mineral Resources	Lists details about each **material** property in the filling, including Mineral Reserves and Mineral Resources through 25 Report Sections

Note:

1. *Qualified Persons are required to estimate Mineral Reserves and Mineral Resources*
2. *Qualified Persons are required to estimate Mineral Reserves, Minerals Resources and author the TRS.*

The new USA disclosure regime differs from other CRIRSCO reporting codes in its treatment of Qualified Persons.

The rules define a 'qualified person' to mean an individual who is:

- a mineral industry professional with at least five years of relevant experience in the type of mineralisation and type of deposit under consideration and in the specific type of activity that person is undertaking on behalf of the registrant; and
- an eligible member or licensee in good standing of a Recognised Professional Organisation at the time the technical report is prepared.

Recognised Professional Organisations are described as:

- an organisation recognised within the mining industry as a reputable professional association; or
- a board authorized by U.S. federal, state or foreign statute to regulate professionals in the mining, geoscience or related field;
- able to admit eligible members primarily on the basis of their academic qualifications and experience;
- able to establish and require compliance with professional standards of competence and ethics;
- requiring or encouraging CPD;
- having and applying disciplinary powers, including the power to suspend or expel a member regardless of where the member practices or resides; and
- providing a public list of members in good standing.

The provision of a public list of members in good standing may currently represent an issue for AusIMM which does not publish a list of members due to privacy concerns. The AIG requires members to consent their inclusion of a searchable, publicly accessible membership list.

The AusIMM requires all members to continue their professional development throughout their careers. The AIG require CPD of Registered Professionals, but not of their general memberships, but do, demonstrably, encourage and facilitate it. Whether this restricts the ability of AusIMM and AIG

members to report in compliance with S-K 1300 if they do not have Chartered or Registered Professional status has yet to be made clear.

Qualified Persons may be individuals or multiple persons who equally assume responsibility for a disclosure (Dorsey and Whitney LLP, 2019; U.S. SEC, 2018; Wolfe, 2020). The technical report summary (TRS) must also clearly delineate the section or sections of the summary prepared by each qualified person (U.S. SEC, 2018, §229.1302 (b)(1)(i)).

A third-party firm comprising mining experts, such as professional geologists or mining engineers, may date and sign the TRS instead of, and without naming, its employee, member or other affiliated person who prepared the TRS (U.S. SEC, 2018, §229.1302 (b)(1)(ii)).

Qualified Person independence was debated by the SEC in formulating S-K 1300. The Commission, however, opted for transparent disclosure of relationships between Qualified Persons and registrants, rather than a requirement for independence in specified instances comparable with the provisions in place in Canada.

A TRS, as defined in S-K 1300, is prepared by the Qualified Person(s) responsible for Public Reports, A TRS which is considered similar in intent to Table 1 in JORC (2012), and technical reports under NI 43-101.

4.2 Competent Person Membership, Education and Experience Requirements in Other CRIRSCO Codes

4.2.1 Comparison of Competent/Qualified Person Requirements Between CRIRSCO Codes

The requirements for Competent Persons for professional Institutes and associations whose members can act as Competent or Qualified Persons in compliance with CRIRSCO family codes are outlined in each National Reporting Organisation (NRO) Code or Standard. These are summarised in Table 3 and Table 4.

The relationship of the NRO Code to the relevant disclosure regulations is also reviewed in Table 3. For instance, there is a seamless connection between the JORC Code and the ASX Listing Rules (the disclosure regulations) as the JORC Code is embedded in the ASX Listing Rules as an appendix (Appendix 5B) and reporting according to the JORC Code is mandated by ASX Listing Rule 5.6. The CRIRSCO standard definitions included in the CIM Definitions Standards are included by reference in NI 43-101, whereas the SME Guide is specifically not included or referenced by S-K 1300 in the USA, although it still provides a useful guide and supports other good practice in reporting.
The specified local POs and the acceptable membership classes for an individual member of the PO to act as a Competent or Qualified Person or equivalent are also specified in the respective codes or standards.

Most NROs also have a current or nascent RPO list. These RPO lists have not been used as a source of information (except for the JORC RPO list) as these lists vary in coverage, and in some cases different membership classes are listed in the RPO lists than exist in the home NRO's specification of membership classes for Competent Persons. The RPO lists of Canada and PERC for instance have different requirements for Australia & South Africa than does the local NROs. In addition, in Canada the process of adding professional associations to Appendix A included in 43-101 CP, is applied by CSA on application. In 2012, The Institution of Engineers Australia (EA) Chartered Professional Engineer (CPEng) was included in 43-101 CP Appendix A (CSA 2012). Enquiries revealed that EA was not aware of the inclusion. The inclusion was sought by a company wishing to lodge a report signed by an EA CPEng. It is interesting to note that EA is not a Professional Organisation recognised by JORC or the ASX as one of the professional bodies to which a Competent Person may belong for reporting in Australia and has never applied for such recognition.

All Institutes and associations require that Competent Persons be of good character. The Southern African Institute of Mining and Metallurgy (SAIMM) for example requires Fellows not to have been found to have breached the Institute's Code of Ethics for a minimum of five years.

There seems little point in detailed reviewing NROs, Codes and POs which do not have a direct link to disclosure regulations or significant Public Reporting associated with the Code, for instance the Russian Society of Subsoil Use Experts (OERN) NRO with its National Association of Subsoil Expertise (NAEN) Code and OERN PO, where there is no specific link to public disclosure and very limited Public Reporting. The Opaxe™ data reveals there have only been seven reports (6 Mineral Resource reports and one PFS) from 2017, 2018, and 2019, where the Competent Person was an Expert of OERN. These reports were all published by Highlands Gold Mining Limited, an unlisted public company, (Anderson, March 2022, personal communication). The Mongolian Professional Institute of Geosciences and Mining (MPIGM) NRO and the Mongolian Mineral Resources and Reserves Committee (MRC) Code, with MPIGM as the PO appears to be almost totally isolated from public disclosure. Some respondents to the JORC survey reported they had applied the Russian NAEN Code and the Mongolian MRC Code.

It also seems relevant to consider the purpose of any registration of professionals. The registration of professionals in the Provinces of Canada is for the protection of the public. Registration entitles the professional engineer or geologist to practice as a professional in that province. In relation to determining whether an individual is a Qualified Person for reporting in Canada, or a Competent Person for reporting in Australia, this Canadian provincial registration simply serves to satisfy the membership requirements of the respective definitions of Qualified and Competent Persons. It does not address the specific relevant experience requirements of the Competent Person definition, which must still be addressed by the individual's self-declaration to determine whether they meet the requirements to act as a Qualified or Competent Person in the particular circumstances. That is the registration is necessary, but not sufficient, for the individual to act as a Competent Person.

But there are, within some CRIRSCO NROs and their POs, registration procedures which are specific registrations to entitle the registrant to act as a Competent Person for the specific commodity, and not just provide a general professional registration as the membership part of self-declaration as a Competent Person. In Indonesia and Chile registration is necessary and sufficient for the registrant to act as a Competent Person as the registration also includes consideration of relevant experience and then specifies commodities and activities for which the individual is registered. There are really only these two NROs, where registration as a Competent Person occurs. So, it is worth examining both of those cases.

More recently PERC has admitted the Fennoscandian Association for Minerals and Metals Professionals (FAMMP) and the Iberian Mining Engineers Board (IMEB) to membership. Both of those organisations exist solely to admit members that qualify as meeting the requirements to act as a Competent or Qualified Persons for reporting Exploration Results, Mineral Resources and Reserves in accordance with the PERC Code. Both admit Members. The FAMMP publishes a members list and the IMEB established "a Public Registry of Persons Competent in Mining Resources and Reserves" so are both are essentially organisations for registration of Competent Persons.

The other consideration to determine which jurisdictions to review in more detail ought to be those jurisdictions where significant numbers of Public Reports are lodged. Based on information kindly provided by Opaxe Pty Ltd (Opaxe Pty Ltd, 2022), these jurisdictions are:

- the Canadian stock exchanges, dealt with in Section 4.3 below;

- the ASX in Australia, which is dealt with in Sections 1 and 2;
- the LSE main board and Alternative Investment Market (AIM), in the UK; and
- the JSE, South Africa, and the interaction with SAMCODES, SAIMM and GSSA.

The other NROs are too new or undeveloped to justify any more detailed review.

Several important observations can be drawn from Table 3 and Table 4:

1. Australia, South Africa and Kazakhstan, and now the USA under the S-K 1300 requirements, stand out as jurisdictions requiring Competent Persons to be a member of a recognised professional Institute or association.
2. Most other CRIRSCO codes require some form of professional registration which, in turn, requires registered professionals to undertake CPD, in addition to meeting standards of ethical conduct. The requirement for CPD is not necessarily restricted to professional Institutes or associations requiring registration but is common amongst professional Institutes or associations. What is not always present though, is a review or audit process to provide assurance that the required CPD is being undertaken by the member. This commonly only occurs with the AusIMM CP or AIG RPGeo status or registration.
3. Canada and Chile are countries with CRIRSCO family reporting codes where professional registration is managed by a statutory authority. Increasingly the requirement for registration under bodies established by law is apparent in many of the more recent NROs admitted to membership of CRIRSCO.
4. Registration that is a specific and solely to be able to act as a Competent Person is becoming more common, for instance in Chile, Indonesia, and India. This also is the commonly the case where the NRO is also the PO, as in the case of Chile, Mongolia, Brazil and Colombia, and also where the PO has been specifically established in order for its members to act as Competent Persons as is the case of the Fennoscandian Association for Minerals and Metals Professionals, and the IMEB, both of which were established to enable their members to report under the CRIRSCO family of Codes and Standards, in a similar manner to the Registered Member class of the SME in the USA. When the Registered Member class was created, reporting under the old SEC Industry Guide 7 did not require a Competent Person, but exchanges, apart from in Canada recognised the State and Territory Boards in the United States of America as RPOs as it is doubtful if the boards have the power to take disciplinary action outside the board's own State or Territory. Thus, the Registered Member class was established primarily as a means for the Registered Members to be able to act as Competent Persons outside the USA.

The requirement for more general registration exists, primarily, in countries where governments have deemed it necessary to establish statutes to ensure that obligations of professionals to the communities that they serve are met.

4.2.2 RPO Recognition

Most countries explicitly require self-assessment of competence by Competent/Qualified Persons as a requirement for RPO recognition, based on the description of an RPO. This is not a feature, however, of the CRIRSCO International Reporting Template (CRIRSCO, 2019).

Table 3. Requirements for Competent Persons CRIRSCO family of Codes, Standards and Guides

CRIRSCO NRO	JORC	CBRR	CIM[1]	Comisión Minera	CCRR	PERC	NACRI	KCMI	KAZRC	MPIGM	OERN	SAMCODES	UMREK	SME[2]
Requirements	Australasia	Brazil	Canada	Chile	Colombia	Europe	India	Indonesia	Kazakhstan	Mongolia	Russia	South Africa	Turkey	USA
Professional membership required	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Years of experience in the mining industry	5	10	5	10[3]	10	5	10	5	5	5	5	5	7	5
Years of relevant experience in the deposit type	5	5	-	5	5	5	5	5	5	5	5	5	7	5
Years in a Position of Responsibility	-	3	-	-	-	-	-	-	-	-	-	-	-	3
Areas of Expertise	No	Yes[13]	Yes	Yes	No	No	No	Yes	No	No	No	No	No	Yes
Denomination	Competent Person	Registered Qualified Professional	Qualified Person	Competent Person	Competent Person	Competent Person	Registered Competent Person	Competent Person Indonesia	Competent Person	Competent Person	Expert	Competent Person	Competent Person	Qualified Person
Code, Standard or Guide	JORC Code	CBRR Guide	CIM Definition Standards[4]	Chilean Code CH 20235	ECRR Standard	PERC Standard	IMIC Code	KODE – KCMI	KAZRC	MRC	NAEN Code	SAMREC Code	UMREK Code	SME Guide[5]
Disclosure regulation	ASX Listing Rules[6]	Encouraged[7]	NI 43-101	Law No. 20235	Not specified	Listing rules of exchanges	Indian Government Mineral Rules (MEMC 2015/ 2021)[12]	Acceptable for IDX, Mandatory for reports to DNRM	KAZRC[8]	Not clear or decided	Not specified	JSE LR Section 12[9]	Istanbul Stock Exchange (BİST)[10]	Regulation S-K 1300 (17 CFR §229.1300)[11]

Notes:

1. Qualified Person defined in NI 43-101 referenced in CIM Definition Standards
2. Qualified Person defined in S-K 1300
3. Comisión Minera requires "at least 10 years of professional seniority in any of the specialties associated with the mining business in the geo-mining-metallurgical field"
4. CIM Definition Standards are referenced by NI 43-101
5. S-K 1300 (national disclosure system known as Regulation S-K 1300 (17 CFR §229.1300)) does not reference the 2017 SME Guide. The SME guide was last updated on 4/28/2021, by including reference to S-K 1300 and S-K 1300's definition of a Qualified Person.

6. The ASX Listing Rule 5.6 requires reports to be prepared in accordance with the JORC Code which is included as a mandatory appendix 5A to the ASX Listing Rules.
7. ANM (National Mining Agency) February 7, Resolution No. 94/2022 creates the Brazilian System of Mineral Resources and Reserves (SBRRM), aligned with CRIRSCO and CBRR Guide. Not mandatory and not stock exchange related (?), but encouraged
8. KAZRC is mandatory for government reporting and accepted by KASE - Kazakhstan Stock Exchange and AIX - Astana International Exchange
9. DMR/CGS also require SAMCODES compliance with all submissions/applications
10. Also, the Banking Regulation & Supervision Agency of Turkey (BDDK) & Capital Markets Board of Turkey (SPK).
11. The SEC of USA specifically declined to link to the SME Guide: "The final rules also do not incorporate by reference or otherwise adopt on a going forward basis the technical report requirements in Canada's NI 43–101, JORC, or the SME Guide,"
12. Indian Government framed the Mineral Rules (MEMC 2015/ 2021) by conveniently combining the definitions from CRIRSCO and UNFC standards for reporting Exploration Results, Mineral Resources and mineral reserves by the Lessees to Indian Bureau of Mines. Acceptable to Securities and Exchange Board of India (SEBI0)
13. Areas of Expertise that CBRR register as a RQP are: Mineral Exploration, Mineral Resources Estimation, Mineral Reserves Estimation, Mineral Operations, Mineral Processing, Geotechnics, Environment and Sustainability, Economic Evaluation of Mineral Assets, Brazilian Mineral Regulation.

Source: Modified from "An overview of the CRIRSCO International Collaboration", slide 11, prepared by Edson Ribeiro, for the 2020 CRIRSCO AGM

Table 4. Competent Person Standards in CRIRSCO family Mineral Resource and Ore Reserve Public Reporting Codes

CRIRSCO MEMBERS	Country or region	Local Professional Bodies	Acceptable Member Designation	Professionally Registered	Competent Person Registered[1]	Normal[2] Entry Member Designation Requirements					
						University Degree	Minerals Industry Experience	Responsible Position	Examination	Referees	CPD
JORC	Australasia	AusIMM	Member or Fellow	No	No	Yes	3 years		no	Two professional referees[20]	Expected but not mandated
		AIG	Member or Fellow	No	No	Yes, in Geoscience with specified, minimum geology component	5 years	2 years	No	Two professional referees	Expected but not mandated
CBRR (Brazil)	Brazil[3]	CBRR	Registered Qualified Professional	No	Yes	Yes	10 years	3 years	No	Three professional referees	Expected[19]
CIM	Canada	Provincial/ territorial professional regulators[4]	PGeo, PEng[5]	Yes	Prof Yes QP/CP No[4]	4-year full-time bachelor's degree in an area of geoscience or engineering as appropriate	4 years (at least 1 in Canada or Canadian equivalent environment)	Demonstrates increasing responsibility	Professional Practice Examination,	3-4 references required of which 2-3 are P.Geo. or P. Eng.	ongoing CPD
Comisión Minera	Chile	Comisión Minera	Included in the Registro de Personas Competentes	No	Yes	Professional degree related to the sciences linked to the mining industry	5 years		Yes – Interview with Admission Committee	3 References to confirm experience (at least two from Competent Persons)	Ongoing CPD
CCRR	Colombia	CCRR	CCRR Registered	No	Yes	Yes	10 years		No	One referee who is also a Competent Person	

CRIRSCO MEMBERS	Country or region	Local Professional Bodies	Acceptable Member Designation	Professionally Registered	Competent Person Registered[1]	Normal[2] Entry Member Designation Requirements					
						University Degree	Minerals Industry Experience	Responsible Position	Examination	Referees	CPD
PERC	Europe	The Institute of Materials, Minerals and Mining (IOM3)[6]	Member (MIMMM) or Fellow (FIMMM)	No	May be registered but not required[7]	Bachelors Degree	4 years relevant experience		No	No for member	
		National Associations that constitute the European Federation of Geologists (EFG)[6]	European Geologist (EurGeol)		Prof. Yes, QP/CP No	Bachelors Degree in Geoscience	5 years		Professional practice report and interview	Two EurGeol sponsors	Ongoing CPD
		The Institute of Geologists of Ireland[6]	Professional Geologist (PGeo)		Prof. Yes, QP/CP No	Geoscience degree	5 years		Professional practice report or two reports	3 PGeos or EurGeols	Ongoing CPD
		The Geological Society of London[6]	Chartered Geologist or Chartered Scientist	Yes	Prof. Yes, QP/CP No	A recognised degree and already a Fellow of GSL (FGS)	4 to 5 years		Interview	A CGeol sponsor or an independent verifier combined with a CGeol mentor	3 years records on application
		Ferroscandian Association for Minerals and Metals Professionals (FAMMP)[6]	Member		Yes[8]	Relevant education for a Competent Person	5 years		Two technical reports supporting relevant experience	2 referees, one a member of FAMMP	Records of continued education with application
		Iberian Mining Engineers Board (IMEB)[6]	Member	Yes, but not by IMEB	Yes[9]	Bachelors or Masters degree in	10 years, including 5		Confirmation of professional certification, a	2 Members of IMEB	Ongoing CPD

CRIRSCO MEMBERS	Country or region	Local Professional Bodies	Acceptable Member Designation	Professionally Registered	Competent Person Registered[1]	Normal[2] Entry Member Designation Requirements					
						University Degree	Minerals Industry Experience	Responsible Position	Examination	Referees	CPD
						Mining Engineering	years relevant experience		professional case study & Interview		
NACRI	India	MEAI	Registered Competent Person (RCP)	No	Yes	Degree or equivalent diploma in mining or any other branch of engineering, or a post-graduate degree in Geology or Computer Science	For NACRI RCP: MEAI Life Member plus 10 years' experience		NACRI 40 hours mandatory training program on IMIC and pass the evaluation test	RCP must be a Life Member	Records of continued education with application.
KCMI	Indonesia	IAGI	CPI IAGI	No	Yes	Bachelor degree or higher	5 years		Interview based on presentation	3 referees	Ongoing CPD logbook[18]
		PERHAPI	CPI PERHAPI	No	Yes	Bachelor degree or higher	5 years		Interview based on presentation	3 referees	Ongoing CPD logbook[18]
KAZRC	Kazakhstan	PONEN	Member (MPONEN) or Fellow (FPONEN)	No	No	Graduate of an accepted university	5 years		Interview	2 professional members	Ongoing CPD
MPIGM	Mongolia	MPIGM	Registered in list of Mineral Council of Mongolia	Yes in Mongolia	Yes	Degree awarded	12 years practical experience	5 years within discipline	Interview if necessary	3sponsors, RPs or Fellows	Ongoing CPD
OERN	Russia	OERN	Expert	No	No	Degree	One year				
SAMCODES	South Africa	SAIMM	Member or Fellow	No	No	Relevant Tertiary Qualification	2 years			Proposer and Seconder	Ongoing CPD

CRIRSCO MEMBERS	Country or region	Local Professional Bodies	Acceptable Member Designation	Professionally Registered	Competent Person Registered[1]	Normal[2] Entry Member Designation Requirements					
						University Degree	Minerals Industry Experience	Responsible Position	Examination	Referees	CPD
		GSSA	Member or Fellow	No	No	University degree in Earth science	4 years			2 referees, both MGSSA	Ongoing CPD
		IMSSA	Member or Fellow	No	No	University degree or Certificated Mine Surveyor	2 years			Proposer and Seconder	As per SAGC CPD
		SACNASP[10]	Professional Natural Scientist	Yes	No	4 year degree	3 years	Some experience in a position of responsibility		Referees	Ongoing CPD statutory requirement
		ECSA[10]	Professional Engineer	Yes	No	Tertiary degree	3 years		Compulsory "Professional Review" including an interview		Renewal of registration linked with CPD
		SAGC[10]	Professional Mine Surveyor	Yes	No	Normally a 4 year Honours degree or an approved Mine Survey NQF qualification	Provisions for Work Integrated Learning (WIL) and employment experience		Law examination and practical test set by the Council plus an essay on professionalism and ethics	Requires an employment certificate and mentor to undertake WIL	Ongoing CPD statutory requirement
UMREK	Turkey	YERMAM	Professional Member (PM-YERMAM)	No	Yes	Yes	10 years	4 years in a senior technical position		2 referees, at least 1 a PM_YERMAM	
SME	USA	None specified in S-K 1300[11]	S-K 1300 specifies the requirements for a recognised	No	No						Encouraged

CRIRSCO MEMBERS	Country or region	Local Professional Bodies	Acceptable Member Designation	Professionally Registered	Competent Person Registered[1]	Normal[2] Entry Member Designation Requirements					
						University Degree	Minerals Industry Experience	Responsible Position	Examination	Referees	CPD
			professional association[12]								
		Society for Mining, Metallurgy and Exploration (SME)[13,15]	Registered Member (RM SME)[14]	No	Yes[12]	University Degree	7 years	3 years		Three endorsements by current SME registered members	Ongoing CPD required by Code of Ethics
		American Institute of Professional Geologists (AIPG)[13, 15]	Certified Professional Geologist (CPG)	Yes	Prof Yes, QP/CP No	Bachelors Degree in geological sciences	8 years			Six CPG sponsors	
		Mining and Metallurgical Society of America (MMSA)[13,15]	Qualified Potential (QP)	No	Prof Yes, QP/CP No	University Degree	10 years	5 years in position of responsibility within discipline.		3 sponsors (2 current MMSA members)	
		Any U.S. State or Territory in the USA[16]	Licenced or Registered as a professional Engineer (P.E.)	Yes	Prof Yes, QP/CP No						

Notes:

1. Is the registration specifically in order to act as a Competent Person, or just a professional registration? The "prof Yes QP/CP No" response means the registration is to practice engineering and geology. It is not a registration of Competent Persons.
2. In addition, most POs have provisions to cater for well experienced people to be granted membership in exceptional circumstances.
3. ANM (National Mining Agency) February 7, Resolution No. 94/2022 creates the Brazilian System of Mineral Resources and Reserves (SBRRM), aligned with CRIRSCO and CBRR Guide. Not mandatory and not stock exchange related (?) but encouraged.

4. The Provincial/Territorial professional regulators are Self-regulating organisations of engineers and/or geoscientists given authority or recognition by statute in a Canadian province or territory. They are generally similar; however, some provinces have combined engineering and geoscience regulators, others separate. The information here is derived from Engineers and Geoscientists BC (EGBC) and Geoscientists Canada.
5. Other post nominals also specified in some provinces. This provincial/territorial registration is to practice engineering and geoscience in the province or territory. It is not a registration of QPs which relies on the registered professional to self-declare their relevant experience. EGBC used as example.
6. This group are the European RPOs Recognised by PERC, and Membership Levels Required, some are registered professionals others are membership categories: https://percstandard.org/wp-content/uploads/2021/09/PERC-RPO-LIST-OCT-2021.pdf
7. MIMMM and FIMMM may apply for Chartered status by becoming registered with the Engineering Council (CEng), Science Council (CSci), and Council for the Environment (CEnv). The IOM3 website states it maintains a Register of Mineral Resources and Reserves Reporting (MRRR) practitioners, but this does not appear to exist as yet.
8. FAMMP is a non-profit association for individuals working in the mining sector and having the professional qualification and work experience to be able to function as Competent Persons (Qualified Persons is used synonymously) for Public Reporting of Exploration Results, Mineral Resources and mineral reserves in accordance with the internationally recognised PERC reporting standard, or another similarly CRIRSCO based reporting standard.
9. The Iberian Mining Engineers Board (IMEB) has a mandate, to make proposals for the elaboration of the statutes of its constitution and the accreditation procedures of the Competent Persons, registered with Qualification Commission of Competencies in Mining Resources and Reserves.
10. Multiple statutory professional registration bodies are recognised by the SAMREC Code as suitable POs.
11. The SEC of USA specifically declined to link to the SME Guide: "The final rules also do not incorporate by reference or otherwise adopt on a going forward basis the technical report requirements in Canada's NI 43–101, JORC, or the SME Guide,"
12. A recognised professional association is defined as part of the definition of a Qualified Person in S-K 1300: United States Securities and Exchange Commission, "Modernization of Property Disclosures for Mining Registrants," 83 Fed. Reg. 66,450
13. These following POs, including the SME Registered Member class, although not specified in S-K 1300 would meet the recognised professional association requirements of S-K 1300
14. The SME Registered Member was established primarily to provide a mechanism for USA professionals to meet the membership requirements of the JORC Code and NI 43-101 Competent and qualified Person definitions.
15. The SME, AIPG, and MMSA although not "local Pos" in the strict sense under S-K 1300 are recognised as RPOs in Australia.
16. The State and Territory Boards in the United States of America are not recognised by NROs, other than under NI 43-101, as it is doubtful if the boards have the power to take disciplinary action outside the board's own State or Territory.
17. The National Association of State Boards of Geology (ASBOG®: https://asbog.org/) at https://asbog.org/matrix/MatrixJuly2018.pdf has produced a matrix of the requirements of those States which do have licencing in place for geologists. All states have engineering licencing boards and are members of the National Council of Examiners for Engineering and Surveying which prepares examinations used by the State boards.
18. CPD logbook must be filled by the CPI as proof for continuing learning, but this CPD is not part of the entry requirements.
19. A new CPD Program is planned to be launched in 2022.
20. These referees must be professionals who have personal knowledge of the applicant. Acceptable professionals include Members & Fellows of the AusIMM or of any other professional association whose members are bound by a code of ethics; professionals authorised to witness Australian Commonwealth statutory declarations; and their international counterparts.

4.3 Canada

Canada can be considered to be a special case amongst CRIRSCO members, where the principles of Public Reporting of Exploration Results, Mineral Resources and Ore Reserves are described in the CIM Definition Standards on Mineral Resources and Mineral Reserves (CIM, 2014) and NI 43-101 (CSA, 2011), which is effectively a legal statute, managed by the provincial/territorial securities commissions, or collectively known as the Canadian Securities Administrators (CSA) (CSA, 2011). Form 43-101F1 (NI 43-101, 2022) prescribes in detail the format of a NI 43-101 technical report required to support announcements to Canadian Securities Commissions and Exchanges that must be made publicly available upon disclosure of material scientific and technical information.

Technical reports issued in compliance with NI 43-101 are made available through a publicly accessible and searchable, on-line database known as the SEDAR filing system (CSA, 2022). SEDAR provides the public and investors access to corporate filings, public securities documents, and NI 43-101 technical reports for Canadian public companies and has no parallel in other jurisdictions in terms of a source of technical information for mineral projects, until recently with the commencement of the SEC EDGAR system.

This section of the Competent Person Baseline Study examines how the Canadian securities commissions and the professional associations (known as professional regulators) that licence and regulate professional engineers and geoscientists in Canada (herein referred to as "Professionals") monitor and govern a Qualified Person's (or Competent Person's) work related to the mining industry. Under the Canadian regulatory system, each organisation is independent of each other (self-regulatory) but are each bound under securities law or professional practice by-laws or statutes and generally work in partnership when it comes to the overall monitoring and disciplining of Professionals (Figure 6).

Only a professional regulator can discipline a registered engineer or geoscientist for poor work practice. Complaints may be received from the securities commissions or other regulatory bodies (i.e., the Investment Industry Regulatory Organization of Canada (IIROC) or stock exchanges) and the public through anonymous whistle blower programs and direct contact via phone or email.

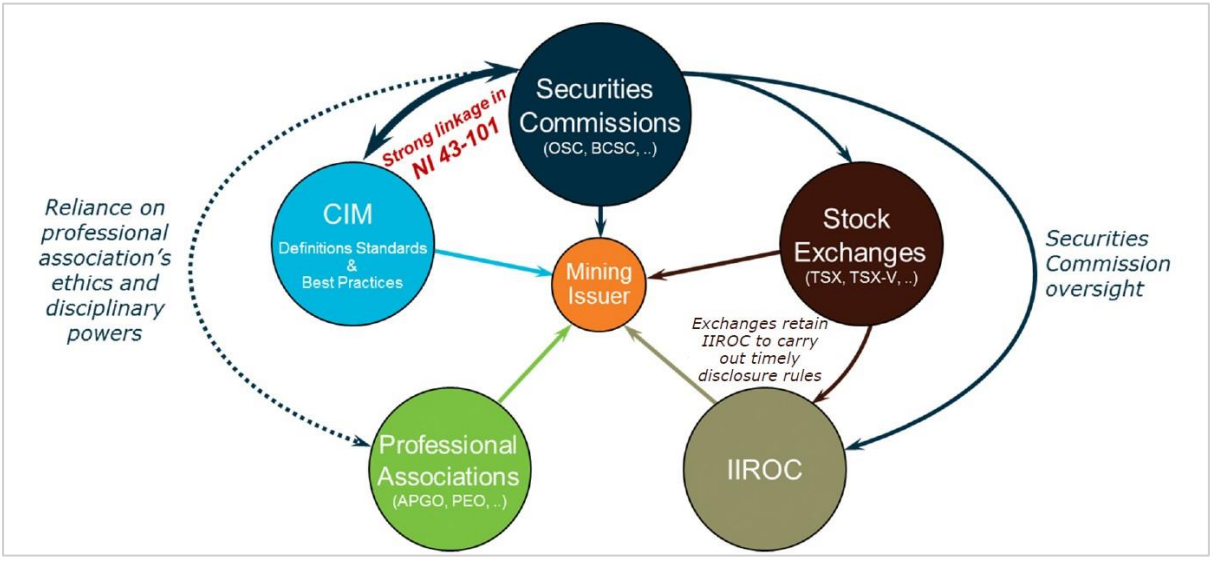

Figure 6. The regulatory environment for the reporting of Exploration Results, Mineral Resources and Ore Reserves in Canada (OSC, 2019)

In Canada, professionals are licenced and regulated by regulatory bodies in each province and territory (i.e., APGO or EGBC). It is not unusual for Professionals to be registered in more than one province and territory depending on where they perform their work duties. Each province and territory expect a Professional to register if they have performed work or they are signing off as a Qualified Person on a project under their jurisdiction. Some provinces have a "Mobility Agreement" with other provinces such as Ontario and British Columbia, but the extent of professional practice is limited or deemed as a temporary option in the second jurisdiction.

Under NI 43-101 rules and guidelines, all Qualified Persons signing off on scientific and technical information related to the mining industry must be registered as a Professional Geologist or Professional Engineer in at least one province or territory in Canada or acceptable foreign association as set out in the Companion Policy of NI 43-101 (NI 43-101, 2022a).

4.3.1 Role of Professional Regulators

The Professional Regulators are regulated by statute at the provincial/territorial level and their core legislated mandate is to protect the public interest. The Professional Regulators perform the following key functions:

- Admit eligible members on the basis of their academic qualifications and experience
- Academic: 4-year full-time bachelor's university degree in an area of geoscience or engineering, as appropriate
- Experience: 4 years with at least 1 year in Canada or a Canadian-equivalent work environment
- References: 3-4 references are required of which 2-3 must be a P.Geo. or P.Eng.
- Require compliance with professional standards of competence and ethics. This includes requiring applicants to pass the Professional Practice Examination (PPE) and possibly a Technical Examination prior to being approved as a member and Professional. A Technical Examination may be required to cover deficiencies in the fulfillment of the Professional Regulator's minimum knowledge requirements (i.e., international applicants or those that don't meet the minimum academic qualifications). Many regulators are moving to a competency-based assessment (CBA) model which is used to assess work experience.
- Require CPD and input of CPD hours with their Professional Regulator on an annual basis to maintain their registration as a Professional.
- Able to apply disciplinary powers, including the power to suspend or expel a member. This is typically done through the Professional Regulator's complaints and disciplinary committees (see further details below).
- Acceptable foreign associations under NI 43-101 are generally expected to admit members in a substantially similar manner as the Professional Regulators in Canada.

Professional regulators will expect members practicing in the mining industry to abide by CIM standards and guidelines for Mineral Resource and Mineral Reserve estimation, exploration best practices, and commodity-specific guidelines (CIM, 2014). In addition, Professionals must complete their work using mining industry best practice guidelines at the time, and it's recommended they also have their work peer reviewed. Professionals must also complete CPD activities on a yearly basis and record their CPD hours with their professional regulator by a set deadline to maintain their membership. This is a "self-monitored" process in Canada, and it is expected that Qualified Persons seek out technical assistance for projects if required or not sign off on any work they are not qualified for. See further details on Qualified Person requirements below.

4.3.2 Examples of Professional Regulators Across Canada

Association of Professional Engineers and Geoscientists of Alberta (APEGA) (https://www.apega.ca)

APEGA's main regulatory function is licensing individuals and companies that want to practise engineering and geoscience in the Province of Alberta. Applicants and companies that meet APEGA's standards for ethical, professional, and technical competency earn the right to practise and use reserved titles and designations. As part of its obligation to protect the public, APEGA has the legal right and requirement to restrict the practices of engineering and geoscience, along with the related titles and designations, to licenced individuals and companies. Only professional members and companies (permit holders) licenced by APEGA have the right to independently practice engineering or geoscience in Alberta. This is referred to as reserved practice. APEGA regulates the professions by ensuring that anyone they licence meets certain technical, ethical, and professional standards.

To protect the public, only APEGA permit holders and certain member categories have the right to use certain titles and designations. These are referred to as reserved titles and reserved designations (Table 5). In Alberta, if an individual is not licenced, they cannot use reserved titles or designations in job titles, on resumes, or on social media because the public may believe they have the right to practise engineering or geoscience. This could endanger public safety.

Table 5. APEGA Reserved Titles and Designations

Engineering Reserved Titles & Designations	**Geoscience Reserved Titles & Designations**
• Professional engineer • Professional licensee (engineering) • P.Eng. • P.L. (Eng.) • any title or abbreviation that implies you are licensed with APEGA • The word *engineer* combined with any name, title, description, letter, symbol, or abbreviation that implies you are licensed with APEGA	• Professional geoscientist • Professional geologist • Professional geophysicist • Professional licensee (geoscience) • P.Geo. • P.Geol. • P.Geoph. • P.L. (Geo.) • any title or abbreviation that implies you are licensed with APEGA • The word *geoscientist*, *geologist*, or *geophysicist* combined with any name, title, description, letter, symbol, or abbreviation that implies you are licensed with APEGA
Examples of Engineering Titles & Designations • Jane Doe, P.Eng., Structural Engineer • Jane Doe, P.L. (Eng.), Civil Engineer	**Examples of Geoscience Titles & Designations** • John Smith, P.Geo., Wellsite Geologist • John Smith, P.Geo., Hydrogeochemist

Professional Geoscientists Ontario (PGO) (https://www.pgo.ca)

Ontario's legislation under the Professional Geoscientists Act, 2000 (the Act), requires registration with PGO of anyone who intends to practise professional geoscience in Ontario, intends to use the professional geoscience designation (e.g., P.Geo., G.P), and represent themselves to the public as a professional geoscientist in Ontario.

Any individual who does any of the above or implies, or represents, that they are a professional geoscientist in Ontario or qualified to conduct professional geoscience in Ontario without being a registered member of PGO is in contravention of the Act.

To be granted a Certificate of Registration (P.Geo.) to practice professional geoscience in Ontario, an applicant must:

- be at least 18 years old
- be of good character
- hold a minimum of a Canadian four-year undergraduate science degree in an area of geoscience (or possess an equivalent or acceptable credential as determined by the Registration Committee), which fulfills the knowledge requirements, as set out by Geoscientists Canada
- pass any applicable examinations required by the Registration Committee, unless exempted.
- demonstrate at least 48 months of verifiable, acceptable geoscience work experience, of which at least 12 months has been acquired in a Canadian work environment, or equivalent, or
- hold a minimum 3-year undergraduate science degree in an area of geoscience (or possess an equivalent or acceptable credential as determined by the Registration Committee), and at least 10 years of relevant geoscience work experience obtained under the supervision and direction of one or more eligible supervisors
- demonstrate comparable knowledge and experience to the above through a combination of an alternative, acceptable credential and 10 years of acceptable geoscience work experience.

Like all other provincial jurisdictions in Canada, if an applicant is already registered as a Professional Geoscientist (P.Geo.) in another province the process to obtain registration is simplified and applicants need only pay an application fee and once approved pay the yearly registration fee.

Ordre des Géologues du Québec (OGQ) (http://www.ogq.qc.ca/en/home.html)

The right to practice geology in Québec requires a "Geologist's Permit" followed by Registration on the Roll of the Ordre legally, or a special authorisation. Only after becoming registered or obtaining a special authorisation does a person have the legal right to use the title or perform activities reserved to Geologists.

In Quebec, to obtain a Geologist's Permit four conditions must be satisfied (in sequence):

- having an accredited geology degree or its equivalent
- proving three years of pertinent experience after graduation, including one year in Canada
- having successfully passed the professional exam; and
- having demonstrated sufficient knowledge of the French language.

For the last item, French language rules and procedures are set by Office Québécois de la Langue Française (OQLF) as described in the Charter of the French Language (Publications Québec, 2021).

Engineers and Geoscientists British Columbia (EGBC) (https://www.egbc.ca)

The Professional Governance Act (PGA) is legislation that governs EGBC. It is umbrella legislation that applies to the regulatory bodies for engineering and geoscience, forestry, agrology, biology, and applied science technology. The PGA defines EGBC's mandate and governing authority and outlines the obligations and standards that all registrants under the PGA, including EGBC's registrants, must

meet. The Regulations further support the obligations and standards of the PGA. EGBC's Bylaws set out the specific standards, requirements, processes, and procedures that apply to EGBC and its registrants. The PGA also requires EGBC to regulate firms that engage in the practice of professional engineering or geoscience. Effective July 2, 2021, firms are required to register for a Permit to Practice with EGBC.

To apply for professional geoscientist (P.Geo.) registration with EGBC, applicants must first meet academic, experience, law and ethics, language and good character requirements determined by the Registration Committee. Applicants are required to have the equivalent of graduation from a 4-year full-time bachelor's program in applied science, engineering, geoscience, science or technology. If applicants do not have an undergraduate degree in geoscience with courses that satisfy the syllabus requirements, applicants may be assigned academic examinations and/or an interview.

Applicants must also demonstrate they have a minimum of 4 years of satisfactory geoscience work experience. At least one of these years must be gained in a Canadian Environment. If applicants gain experience in a different discipline from their academic qualifications, they need to undergo an academic review and possible interview and/or examinations.

In addition, EGBC applicants must write the Professional Practice Examination (as required in all other provincial jurisdictions) and complete the Professional Engineering and Geoscience Practice in BC online seminar. This online seminar was recently updated under the PGA (effective February 5, 2021) and its purpose is to provide an overview of the legal and ethical issues that affect both engineers and geoscientists in British Columbia. The seminar discusses current issues and provides insight into legislation that affects all practicing registrants. The online seminar is intended to be an interactive learning experience that can be accessed via desktop, laptop, tablet or mobile and is compatible with any browser.

Being a current registrant or licensee with another Canadian professional regulator allows applicants to gain registration more easily with EGBC. Becoming a registrant with EGBC does not affect an applicant's status with other Canadian professional regulators. To apply for EGBC membership as an existing Professional in another provincial jurisdiction, applicants must provide:

- a completed application form
- certified proof of Citizenship (Birth Certificate, Photo Page of Current Passport, or Permanent Resident Card)
- a resume/CV (applicants for Professional Licensees only)
- confirmation of existing Registration/Licensure (EGBC will contact an applicants indicated provincial/territorial Association(s)/Ordre. During the application process, applicants will be required to disclose their registration details for each of the Canadian professional regulators/Ordres they are registered with); and,
- pay application and registration fees once an applicant's membership has been approved by the Registration Committee.

4.3.3 Complaints and Disciplinary Committee Procedures in Canada

Each professional regulator in Canada has a statutory Discipline Committee that is responsible for hearing and determining on cases of professional misconduct, negligence or incompetence, brought against a professional registrant or certificate holder (P.Geo. or P.Eng.). A statutory Complaints or Investigations Committee first evaluates all formal complaints received against a registrant and directs an investigation or requests further information prior to forwarding the complaint to the Discipline Committee for review, hearings, and determining any disciplinary actions. The Complaints

Committee may also dismiss the complaint if the investigation and committee conclude it is not valid and may also hear any appeals from the registrant or original complainant.

PGO provides a flow chart indicating their Complaints Process and this is a typical example across the professional regulators in Canada (https://www.pgo.ca/files/Complaints-Flowchart.pdf). PGO and other professional regulators such as EGBC, APEGA, and OGQ also include a "Submit a Complaint" webpage on their websites to make it simple for individuals, whistle-blowers, or investors to submit a complaint against a professional member.

EGBC example: https://www.egbc.ca/Complaints-Discipline/Complaints-Discipline/Submit-a-Complaint

PGO example: https://www.pgo.ca/protecting-the-public/report-a-geoscientist

The complaints and investigation process remains confidential and typically becomes public once a disciplinary decision has been made by the Discipline Committee or a hearing notice is issued to the public. The professional regulators will publicly disclose the name and professional designation of their members who have undergone a disciplinary action, are involved in a formal hearing, or if a formal decision and disciplinary action has occurred. Details on all disciplinary decisions and notice of hearings are typically posted on the professional regulator's website and below are some examples:

EGBC Discipline Decisions and Notices: https://www.egbc.ca/Complaints-Discipline/Complaints-Discipline/Discipline-Hearings-Notices

PGO Discipline Decisions and Notices: https://www.pgo.ca/protecting-the-public/discipline-decisions

Generally, the entire disciplinary committee process and decisions are fully transparent in Canada and in rare occasions the names of the professional members are withheld. One example APEGA, which does post their Discipline decisions and orders, but has withheld the names of some disciplined members (https://www.apega.ca/enforcement/discipline-decisions). The reason for withholding their names from public disclosure is not always clear or explained in the APEGA decision orders.

4.3.4 Role of CIM

CIM creates, maintains, and updates the CIM Definition Standards for Mineral Resources and Mineral Reserves which is referenced in NI 43-101 (CIM, 2014). CIM also develop industry-leading best practices and guidelines for the mining industry in Canada including for mineral resource and reserve estimation, exploration work, and commodity-specific guidelines.

The CIM Definition Standards for Mineral Resources and Mineral Reserves dated May 2014 outline the resource and reserve categories and define modifying factors and Pre-Feasibility and Feasibility Study parameters. The CIM definition standards are referenced in NI 43-101 and all Professionals must follow these definitions under Canadian securities law for Canadian projects however if the issuer is incorporated or organized in a foreign jurisdiction or a Canadian issuer has properties in a foreign jurisdiction, an acceptable foreign Code may be used, provided the issuer reconciles these with the CIM definition standards (Figure 7). The CIM Best Practice guidelines include Estimation of Mineral Resources & Mineral Reserves (MRMR) Best Practice Guidelines (updated November 2019) and Mineral Exploration Best Practice Guidelines (updated November 2018) (CIM, 2022) and should be followed (Figure 7).

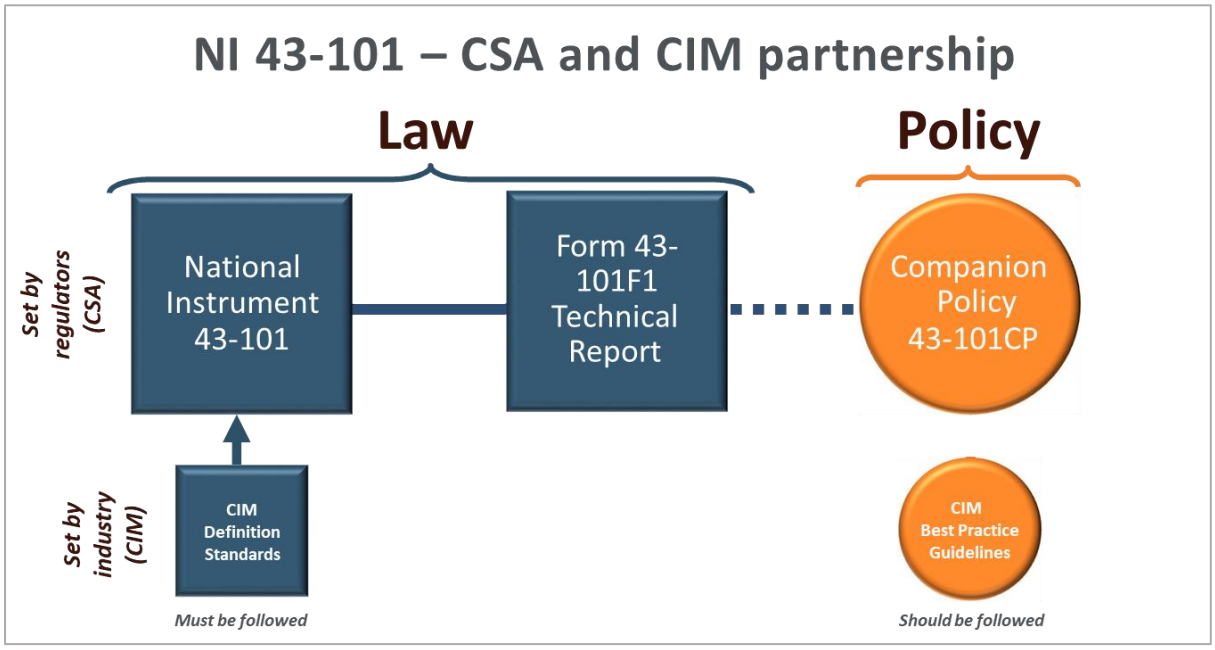

Figure 7. NI 43-101 and CIM partnership within Canadian securities law (OSC, 2019)

The May 2014 CIM MRMR definition standards specifically address "relevant experience" when it comes to Mineral Resource estimation:

> *"In addition to experience in the style of mineralization, a Qualified Person preparing or taking responsibility for mineral resource estimates must have sufficient experience in the sampling, assaying, or other property testing techniques that are relevant to the deposit under consideration in order to be aware of problems that could affect the reliability of the data. Some appreciation of extraction and processing techniques applicable to that deposit type might also be important."*

The CIM Mineral Exploration Best Practice Guidelines (revised November 2018) are meant to assist professional geoscientists, engineers, and exploration practitioners in planning, supervising, and executing mineral exploration programs in a high-quality manner in order to maintain public confidence. These guidelines are addressed towards the early stages of the mining cycle. The exploration best practice guideline topics include:

- project management;
- records and documentation;
- geological surveys;
- geophysical surveys;
- geochemical surveys;
- drilling programs;
- sample preparation, analysis, security, QA/QC; and
- mineral and commodity pricing for use in Mineral Resource and Mineral Reserve reporting.

The CIM Estimation of MRMR Best Practice Guidelines were updated in November 2019 and meant to give Professionals general guidance on the industry-accepted practices used for the preparation of MRMR estimates and determining "reasonable prospects for eventual economic extraction". MRMR Best Practice Guidelines are designed to provide common, principle-based guidance only.

They are not designed to provide detailed, prescriptive instructions on any aspect of the MRMR estimation procedures (Figure 8).

CHAPTER	SUBJECT	STATUS
1.0	**INTRODUCTION**	New
2.0	**HISTORY**	New
3.0	**GENERAL GUIDELINES - MINERAL DEPOSITS**	New
4.0	**THE MINERAL RESOURCE DATABASE**	
4.1	General Comments	Retained
4.2	Data collection, recording, storing and processing	Retained
4.3	Bulk Density Measurements	New
4.4	Quality Assurance/Quality Control	New
4.5	Data Adequacy	Retained
5.0	**GEOLOGICAL AND MINERALIZATION INTERPRETATIONS**	
5.1	Introduction	New
5.2	Primary Data Visualization	Retained
5.3	Geological Modeling	Retained
5.4	Mineralization Modeling	New
5.5	Estimation Domains	New
6.0	**MINERAL RESOURCE ESTIMATION**	
6.1	Introduction	Retained
6.2	Exploratory Data Analysis	Retained
6.3	Outlier Values	New
6.4	Sample Support and Compositing	Retained
6.5	Bulk Density Estimation	New
6.6	Topography and Excavation Models	New
6.7	Trend Analyses	New
6.8	Autocorrelation Studies (Measures of Spatial Continuity)	New
6.9	Mineral Resource Block Models	Retained
6.10	Resource Block Model Validation	Retained
6.11	Mineral Resource Categorization	New
6.12	Mineral Resource Statements	New
6.13	Mineral Resource Peer Reviews	New
6.14	Mineral Resource Risk Assessment	New

CHAPTER	SUBJECT	STATUS
7.0	**MINERAL RESERVE ESTIMATION**	
7.1	Introduction	Retained
7.2	Cut-off Grades of Values	New
7.3	Mining Methods	New
7.4	Geotechnical, Hydrogeological and Hydrologicals	New
7.5	Mine Designs	New
7.6	Dilution and Mining Losses	New
7.7	Mineral Reserve Categorization	Retained
7.8	Mineral Processing	New
7.9	Production Schedules	New
7.10	Workforce and Equipment Requirements	New
7.11	Capital Cost Estimates	New
7.12	Operating Cost Estimates	New
7.13	Additional Factors	Retained
7.14	Economic Analyses	New
7.15	Sensitivity Analyses	New
7.16	Mineral Reserve Statements	Retained
7.17	Stockpiles	Retained
7.18	Mineral Reserve Risk Assessments	Retained
7.19	Peer Reviews and Audits	Retained
8.0	**CONCLUSIONS**	New
9.0	**ACKNOWLEDGEMENTS**	New
10.0	**REFERENCES**	New
APPENDIX 1	GLOSSARY OF MINING TERMS	New

Figure 8. CIM Estimation of Mineral Resources and Mineral Reserves (MRMR) Format and Content

Recent high profile MRMR re-statements as a consequence of regulator reviews are mainly due to poor practical judgement and/or a poor understanding of the geological parameters of a mineral deposit or how the modelling software program functions (including lack of mentoring of junior staff). Like the JORC guidelines, the CIM definition standards and best practice guidelines are meant to guide Professionals on producing high quality work that would be judged acceptable by their peers.

4.3.5 Qualified Person Requirements under NI 43-101 and CIM

In Canada, and as defined under Section 1.1 of NI 43-101, a Qualified Person or "QP" means an individual who:

a. is an engineer or geoscientist with a university degree, or equivalent accreditation, in an area of geoscience, or engineering, relating to mineral exploration or mining;
b. has at least five years of experience in mineral exploration, mine development or operation or mineral project assessment, or any combination of these, that is relevant to his or her professional degree or area of practice;
c. has experience relevant to the subject matter of the mineral project and the technical report;
d. is in good standing with a professional association; and
e. in the case of a professional association in a foreign jurisdiction, has a membership designation that:
    i. requires attainment of a position of responsibility in their profession that requires the exercise of independent judgment; and
    ii. requires:
        A. a favourable confidential peer evaluation of the individual's character, professional judgement, experience, and ethical fitness; or
        B. a recommendation for membership by at least two peers and demonstrated prominence or expertise in the field of mineral exploration or mining.

In the case of item (e) above, the Canadian regulators expect a foreign Professional to have the equivalent professional membership status and meet similar criteria to a Canadian Professional and this includes a MAusIMM (CP), FAusIMM, FAusIMM (CP), MAIG, FAIG, MAIG (RPGeo) and FAIG (RPGeo) status as examples. An AusIMM Member (MAusIMM) without a CP designation would not be considered an acceptable Qualified Person under NI 43-101, as they are not considered to meet criteria (e)(i). The Companion Policy of NI 43-101 – Appendix A outlines the acceptable foreign associations and membership designations under NI 43-101 and may be updated from time to time.

Figure 9 below outlines the "4 E's" of a Qualified Person as a useful guide to what is expected from the Canadian regulators.

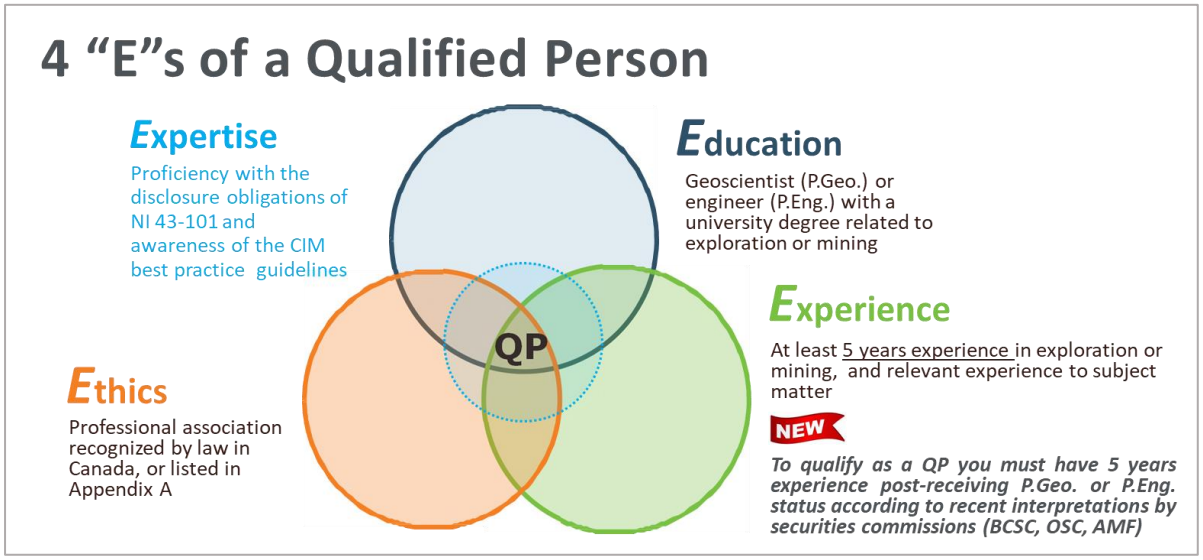

Figure 9. Canadian Qualified Person Requirements (modified from OSC, 2019, page 19)

Professionals should complete a "Qualified Person Self-Assessment" prior to commencing any engineering or geology project or task. The QP should be clearly satisfied that they could face their peers and demonstrate competence and relevant experience in the commodity, type of deposit and situation under consideration. The QP, based on their relevant experience and "professional judgement" is responsible for choosing the assumptions, methods, and practices used to verify, interpret, estimate, and report technical information. If the QP cannot complete these tasks effectively then they must not sign off on the technical work or seek the assistance of a QP with the relevant experience.

Examples of QP self-assessment questions include:

1. Would the vast majority of my peers agree with my professional judgement in defining, classifying, verifying, and reporting of Mineral Resource and Mineral Reserve estimates?
2. Have I considered and used all the representative data, and if not, have I considered the advantages and risks in not doing so?
3. Does the level of confidence (i.e., appropriate verification) in the underlying data support the project's stage of development?
4. Are my assumptions for economic extraction reasonable, realistic, and justified?
5. Have I considered potential mining and processing methods and costs, and applied reasonable constraints for reporting Mineral Resources (i.e., addressed "reasonable prospects for eventual economic extraction")?

6. Have I adequately presented the significant risks and uncertainties and potential ways that these areas could be addressed in future work and studies?

This list is modified from a 2014 paper published in the Southern African Institute of Mining and Metallurgy (Noppe, 2014) that is used by CSA staff in public presentations (C. Waldie pers. com.)

Example Scenario Involving a QP Self-Assessment:

Professional Geologist A is an independent consultant with over 15 years of experience in exploration and Mineral Resource estimation of gold, silver, base metals, and coal deposits in Canada, USA, and Australia. Professional Geologist A also has significant experience writing NI 43-101 technical reports and has authored or co-authored dozens of technical reports related to precious and base metals deposits as a QP. Professional Geologist A has been asked by a potential client running a publicly listed junior mining company to complete a Mineral Resource estimate and NI 43-101 technical report for a lithium brine project they recently acquired in Chile. In order to keep costs to a minimum the client has asked that Professional Geologist A complete the entire project including the site visit, Mineral Resource estimate, and NI 43-101 technical report without the assistance of other geologists or QPs.

Professional Geologist A informs the client that they do not have the minimum 5 years' experience in lithium brine projects and has never modelled these types of deposits and would therefore not meet the minimum QP requirements in this case. Professional Geologist A suggests to the client that they include a well-known lithium brine expert and hydrogeologist (Professional Geologist B) that has over 20 years of experience as a QP modeling lithium brine deposits in Chile, Argentina, and the USA. Professional Geologist B passes the QP Self-Assessment for lithium brine projects and would therefore qualify as a QP for the Mineral Resource estimate and associated disclosure (NI 43-101 technical report and news releases). Professional Geologist B would complete the site visit and Mineral Resource estimate for the lithium brine project and sign off on the data verification requirements for the project. Under the proposal, Professional Geologist A would support Professional Geologist B by contributing to certain sections of the NI 43-101 technical report and co-author the technical report. Professional Geologist A would not be able to sign off as a QP on the Mineral Resource estimate, site visit, and majority of the data verification requirements of the project.

Professional Geologist A explains to the client that adding Professional Geologist B to the project would increase the cost of the project, but they must be clearly satisfied that they could face their peers, professional association, and regulators and must demonstrate competence and relevant experience in the commodity, type of deposit and situation under consideration. The use of Professional B would also significantly minimize the risk of their professional association or the regulator questioning the competence of the QP completing the Mineral Resource estimate and having serious issues with their technical disclosure. The client pushes back, but Professional Geologist A stays firm on the requirement to also use Professional B in order to proceed. The client eventually agrees to the proposal and use of Professional B after considering the significant financial and reputational impact to their company by using a non-qualified QP to complete the Mineral Resource estimate.

The above QP assessment scenario is a composite example based on actual events, and one that professionals across Canada face daily. The constant pressure to win an assignment, please clients or "give them what they want" and still stay within the bounds of their professional practice, strict

ethical standards and experience requires strong confidence and maintaining a strict adherence to ethical standards and their duties as professional geologists and engineers (duty of care to the public). In Canada, the consequence for not meeting these requirements or poor practice due to inexperience is a typically a formal complaint from the regulator (securities commissions), whistle-blower, or public/shareholder to the professional's association and potentially facing a disciplinary committee if evidence of an offence(s) is clear (refer to Discipline Committee procedures under Section 4.3.3).

Types of offences investigated by the disciplinary committees of professional associations in Canada may include:

- falsifying data;
- fraudulent billing;
- inappropriate behaviour;
- technical work deficiencies;
- misrepresentation of findings; and
- other types of offenses or fraud.

This list is comparable with issues investigated by the professional standards of Professional Organisations in other countries (Bonham, Abbot, & Waltho, 2017).

If found guilty of any of these offences, or not meeting their obligations as a professional member, the disciplinary actions enforced by the professional associations in Canada may include:

- practice suspension (permanent or semi-permanent) or practice restriction for a period of time until the disciplinary committee feels the member is ready to practice again (most common);
- legal cost recovery (included in all disciplinary actions);
- administrative penalties to cover the professional association's costs;
- remedial education or training (i.e., formal mentoring process and requiring member to take courses on NI 43-101 and CIM standards and guidelines); and
- significant financial penalties depending on the severity of the offence especially involving cases of fraud that could also lead to criminal charges under the Canadian Criminal Code.

Another key aspect to consider when it comes to a Professional not meeting the QP requirements is the consequence on public disclosure of scientific and technical information either through news releases, corporate presentations, and especially in NI 43-101 technical reports. The important connection between Professional Practice and Public Disclosure of Technical Information is shown below in Figure 10.

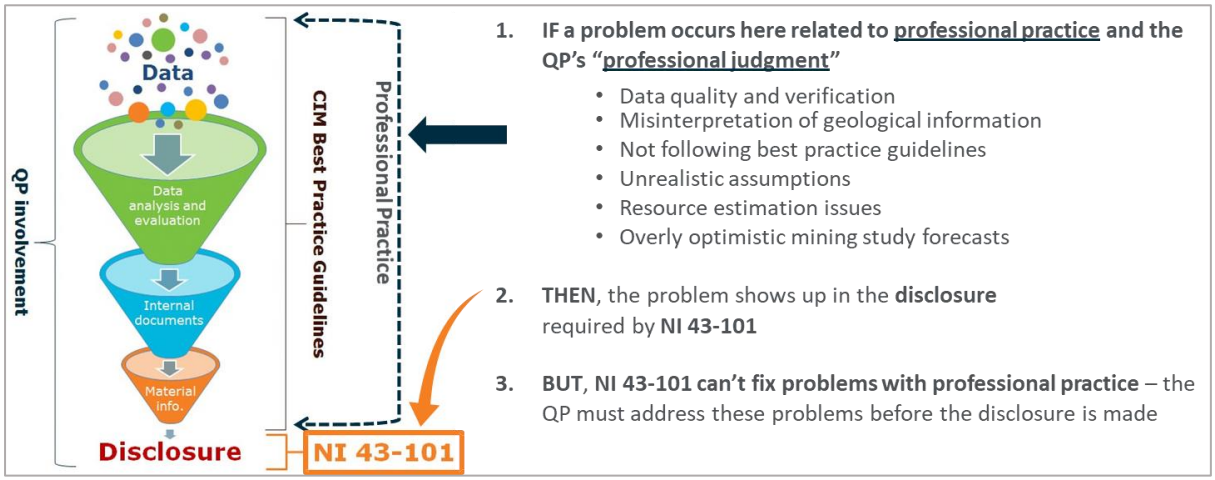

Figure 10. Professional Practice and Technical Disclosure (Modified from OSC, 2109, page 21)

The most important item to consider in this instance is the Professional's obligation to address any "problems" related to professional practice prior to any erroneous information being disclosed in a public disclosure document subject to NI 43-101. The majority of these problems can be addressed prior to public disclosure by implementing or mandating a detailed peer review process for all work completed by a Professional or QP.

4.3.6 Conclusions

This Section of the study has addressed the various organisations within the Canadian regulatory system with oversight when it comes to the disclosure of scientific and technical information related to the mining industry by QPs, including the enforcement of professional practice, NI 43-101 and CIM definition standards. In Canada, professionals are regulated by provincial/territorial bodies that regulate professional engineers and geoscientists and are mandated under provincial law to monitor professional practice by their members and enact disciplinary actions if poor practice or unethical issues have occurred (duty to protect the public).

Recent high-profile incidents in Canada involving Mineral Resource and Mineral Reserve reporting errors or misstatements, and mining study errors have resulted in enhanced oversight by the Canadian securities commissions and professional regulators when it comes to professional practice by QPs. Over the past 5 years, the securities commissions (regulators) including the BCSC and OSC have significantly increased their enforcement of NI 43-101 and CIM standards and best practice guidelines. This regulatory oversight includes scrutinizing a QP's experience or lack thereof when it comes to Mineral Resource and Mineral Reserve statements disclosed in news releases and NI 43-101 technical reports.

The securities commissions mandate is to protect investors from unfair, improper, or fraudulent practices and to foster fair, efficient, and competitive capital markets and confidence in capital markets. Part of commission staff's role is to prevent misleading or incorrect technical disclosure from being released to the public in Canada and report all non-compliance or poor work practice by a QP to their professional regulator. However, the commission disclosure reviews typically occur several weeks or even months after the original public filing or disclosure of the erroneous information, by which time the damage may have already occurred including significant shareholder losses or other financial issues. With over 2,000 private and public mining companies as reporting issuers in Canada, the securities commissions have a significant challenge in keeping up with enforcement of disclosure rules with minimal technical staff.

The regulators highly recommend reducing the risk of these high-profile incidents from occurring in the first place by having Professionals implement a QP self-assessment and detailed peer review process for all technical information they complete prior to its disclosure to the public.

4.4 Public Reporting Environment in Other CRIRSCO Member Countries

The following POs and the reporting environment warrant further discussion:

- Comisión Minera in Chile;
- KCMI and its POs: IAGI and PERHAPI in Indonesia;
- Europe and IOM3 in particular in the UK; and
- SAMCODES, SAIMM and GSSA in South Africa.

4.4.1 Comisión Minera, Chile

The professional bodies in Chile determined that a CRIRSCO style reporting Code was vital for Chile but realised that under the Chilean Constitution the professional bodies did not have the authority to discipline their members. This consequently led to the Chile joining CRIRSCO as the sixth member and proceeding to develop and have passed in 2007 Law No. 20, 235 which created Comisión Minera and the Public Registry of which is both the NRO and the PO with powers to register and discipline its members.

The registration is of Qualified Competent Persons with the area of competence also specified. There are currently (17 January 2022) 455 qualified professionals registered but the Comisión.

The Comisión Minera regulations specifically require at Article 16 that:

“Each of the technical reports and Public Reports that are signed or issued by a Competent Person must be preceded by a certificate of validity, which will be valid only for the requested (report).”

So, for each technical report prepared by the Competent Person a current certificate of validity for that report is required.

While the Comisión Minera has a formal complaints process, it appears the only article on the website that is related to complaints is the report of the AusIMM Life Ban on John Paterson following the reporting of fraudulent assays for the Boka project of Southwestern Resources Corp.

4.4.2 KCMI and its POs: IAGI and PERHAPI in Indonesia

Komite Cadangan Mineral Indonesia (KCMI) is the Indonesian Joint Committee for Mineral Reserves and is the committee that is responsible for the development, updating and socialisation of the KCMI Code. KCMI members consist of representatives from Association of Indonesian Mining Professionals (PERHAPI), Indonesian Association of Geologists (IAGI), Ministry of Energy and Mineral Resources of the Republic of Indonesia (Directorate General Mineral and Coal and Geological Agency Indonesia Bureau of Geology) and Indonesia Stock Exchange (IDX).

The first KCMI Code was issued in 2011, the Code was updated and revised in October 2017 coinciding with Indonesia’s admission to CRIRSCO. Compliance with the KCMI Code is required by the IDX where a statement of reserves signed by a Competent Person Indonesia (CPI) is used as the basis for mining companies that intend to list their shares on the IDX. The Ministry of Energy and Mineral Resources of the Republic of Indonesia requires that the reporting of Exploration Results, resources and mineral reserves shall refer to the KCMI Code and be signed by CPI.

KCMI also responsible for the registration of CPIs from both IAGI and PERHAPI. There are currently 435 CPI members on the KCMI list (http://www.kcmi.or.id/list-cpi-member). The application and

registration process is rigorous requiring education and experience (notarised) documentation, a presentation outlining career experience and competencies and a verification interview with a panel of CPIs for the commodity being applied for, Casley (2021, personal communication). Anecdotally there are a significant proportion of rejected applications, despite there being a desperate shortage of CPIs to meet the department reporting requirements. While expatriates are admitted to CPI registration, the department is currently only accepting Indonesian national CPIs for its reporting requirements, but this is not the case with IDX.

CPIs are registered with their areas of competence and the registered commodity is specified.

A review of the KCMI website located a memorandum (Circular Letter No. 6, KCMI, 2021) which discusses in general terms allegations about the reporting of Work Plans and Budgets and a statement that through the IAGI Ethics Committee and the PERHAPI Ethics Council these matters are being investigated.

4.4.3 Europe / United Kingdom

The most recent version of the PERC Standard became effective on 1 October 2021 and represents the most recent update of a CRIRSCO family code. The latest version of the standard defines a Competent Person in a manner comparable with most CRIRSCO family codes, including the JORC Code:

> *"A Competent Person is a Minerals industry professional, defined as a professional member, registrant or licensee of a Recognised Professional Organisation (RPO) in the list of Professional Organisations accredited by PERC, with enforceable disciplinary processes, including the powers to suspend or expel a member."*
>
> *"A Competent Person must have a minimum of five years relevant experience in the style of mineralisation or type of Mineral deposit under consideration and in the activity which that person is undertaking."*
>
> *"The Definition of 'Competent Person' is subject to any additional restrictions or conditions that may be required by any relevant regulatory authority, National Reporting Organisation (NRO), PERC Participating Organisation (PO), or Recognised Professional Organisation (RPO)." (PERC, 2021).*

Most of the PERC European based POs contain the same or similar guidance on relevant experience, the following is drawn from the Institute of Geologists of Ireland (IGI) Application Guidelines (IGI, 2022), adapted in turn from the Geological Society Continued Professional Development Training Guide for Engineering Geologists June 2016 (GSL, 2016) which states "It is essential that applicants for Professional Membership demonstrate the following key components of their relevant experience:

i. A clear understanding of the complexities of geology and of geological processes in space and time in relation to their area of expertise.
ii. Critical evaluation of geoscience information to generate predictive models.
iii. Effective communication both orally and in writing.
iv. Competency in the management of Health and Safety and environmental issues and other statutory obligations applicable to the applicant's area of work.
v. Clear understanding of the meaning and needs of professionalism, including a clear understanding of the Code of Ethics of the IGI and a commitment to its implementation.
vi. Commitment to CPD throughout the applicant's professional career.
vii. Competence in his/her area of expertise."

These relevant experience areas are commonly tested by the Geological Society on evaluation of a member application via a Professional Practice Report and or an interview.

As noted above the relationship of the PERC Standard (or any of the recognised CRIRSCO Codes) with reporting on the LSE main and premium boards is supervised by the Financial Conduct Authority (FCA), but there are no specific continuous disclosure requirements to comply with the any of the CRIRSCO family of Reporting Codes, however compliance when a prospectus is issued is required under the European Securities and Markets Authority (ESMA) Prospectus Directive and the FCA_2020_7 Brexit Implementation requiring continued adherence to the ESMA directive. However, the AIM market is not supervised by the FCA but by its owner the LSE. There are numerous examples both on the LSE main board and on AIM of non-compliant reporting claiming to be in accordance with the JORC Code, but missing the JORC Code Table 1s when required, etc, as well as potential reporting disasters, the Competent Person is exposed to potential ethics complaints for failing to ensure the Public Reports are compliant. Occasionally on the main board compromises such as making the JORC Code Table 1 "if not, why not" appendix available on the company website are achieved, but all this just emphasises the continuing dysfunctional relationship between the NRO, PERC, and the LSE.

For one of the UK based PERC POs, the Institute of Materials, Minerals & Mining (IOM3), it is instructive to observe how changes in membership procedures affect the credibility of the Competent Person System. On the IOM3 website Professional Membership page (IOM3, 2022) , the application requirements include education and a resume demonstrating the professional work experience. There is no longer a requirement for any referees to be included in the application. Some members have raised "what was seen as a potential weakness in vetting now there is no formal interview for Professional Member, notwithstanding that this can be used to support competence. PERC's other Professional Organisations all include interview and/or the need for higher professional qualifications (chartership or similar)", (Wells, N, Apr. 2022, pers. Comm.).

The IOM3 professional membership page also discusses how to also apply for Professional Registration (Chartered Qualifications), which has a higher bar for entry than Member, albeit a Member is recognised under PERC and the JORC Code as the minimum membership level for a Competent Person declaration. The page simply states:

> *"Minerals Reporting*
>
> *IOM3 maintains a Register of Mineral Resources and Reserves Reporting (MRRR) practitioners. If you wish to be recognised by the Institute for the purposes of Minerals Reporting, please contact the Membership team. The process for recognition requires an interview."*

This register appears to be voluntary but cannot be located on the IOM3 website and the IOM3 had not responded regarding its location at the time of writing. However, Wells, N, (Apr 2022, pers comm.) believes this statement may be partly to assuage those aggrieved by the removal of the interview process, and that the register may not yet be in place.

It is not apparent on the IOM3 website despite there being a Professional Standards & Development Board, there is no further access to this or any obvious complaints pathway.

On the IGI website, a complaints form and details of a confidential complaints procedure is available at: http://igi.ie/assets/uploads/2022/03/The-Institute-of-Geologists-of-Ireland-Complaints-Form.pdf.

4.4.4 SAMCODES, SAIMM and GSSA in South Africa

SAMCODES is the collective name for the South African Mineral reporting codes, SAMREC, SAMVAL and SAMOG, as well as the name of the overarching committee responsible for those Codes. The SAMREC Code is the CRIRSCO compatible mineral reporting code which is incorporated in the Johannesburg Stock Exchange (JSE) Listing Rules.

SAMCODES is the CRIRSCO NRO and there are three Professional Organisations; SAIMM, Geological Society of South Africa (GSSA), and Institute of Mine Surveyors of Southern Africa (IMSSA) as members of the SAMCODES committee and also local POs for Competent Persons. In parallel there are three statutory authorities which register professionals, South African Council for Natural Scientific Professions (SACNASP), Engineering Council of South Africa (ECSA), and South African Geomatics Council (SAGC), that register practicing natural scientists, engineers and (in the case of the mining industry) surveyors respectively. There is overlap between the two groups of bodies, particularly in relation to CPD which is a legal requirement for registration renewal.

For both the SAIMM and the GSSA, the SAMREC Code specifies Member as the minimum membership level satisfying the professional membership requirements for Competent Persons.

For SAIMM the application requirement is a tertiary qualification relevant to the minerals or associated industries, and have two years relevant working experience post qualification, be practising the profession and be a fit person to become a Member. The applicant must obtain signatures of a proposer and supporter who are Members or Fellows of SAIMM and having personal knowledge of the candidate's character, qualifications and experience. Since 1 July the member search facility will only return members who have given their consent for their names to be published. The site states: "If you have searched for a member and their details are not listed, this does not mean that they are not an active member."

It is relevant to note that, in a similar manner to the AusIMM, SAIMM Members are no longer included in the Canadian 43-101 Accepted Foreign Associations and Membership Designations, due to the limited required experience for admission.

In South Africa there is an interesting additional route available in the complaints process, in that complaints may be lodged with SAMCODES for the "conduct an initial investigation into a complaint and thence to correctly direct the complainant to the appropriate professional body for further deliberation and consideration in terms of that body's Code of Ethics". This was the result of a review of the then SAMCODES Standards Committee 'SSC' (SAMREC and SAMVAL Committee) and the need to develop an effective process for the handling of complaints about professional conduct.

Complaints can also be lodged directly with the professional body. The SAIMM has a Complaints and Ethics Committees listed on its website and the SAIMM's Code of Professional Conduct appears as By-law H in the 'Constitution and By-Laws' document in the 'About SAIMM' section of the SAIMM website. It is noted that "All cases are to be dealt with confidentially." No reports of the outcomes of Complaints or Ethics cases could be located on the SAIMM website.

To ensure the high quality of Competent Person Reports issued to the JSE in support of potential listings, "JSE maintains Reader's Panels which review all Competent Persons Reports (CPRs) and Mineral Asset Valuation Reports submitted to the JSE Limited. Such reports are reviewed for compliance with the JSE Listing Requirements that incorporate the relevant SAMCODES, and any other code recognised by the JSE for secondary listings, if required. Members of the Reader's Panels are appointed by the JSE, based on submissions through the SSC and are recognised experts in the

commodity and deposit under consideration" SAMCODES website NEWS JSE Reader's Panels (https://www.samcode.co.za/news/227-jse-reader-s-panels).

The Solid Minerals Readers Panel reviews Competent Person's Reports for listings and annual reports. The panel is a paid panel with the mandate and operating procedures set out in a document titled "Appendix 1A Solid Minerals Readers Panel Mandate" available from https://www.samcode.co.za/regulatory/stock-exchange. The panel members are paid, but anecdotally the payments are small, and also anecdotally the operation and administration of the system causes friction.

The Solid Minerals Readers Panel produce a report each year "Report back to the SSC; JSE Panel of Readers for Solid Minerals 2000 to 2021 and 2021 Review". This reports that 21 CPRs were reviewed in 2021, with 252 reports reviewed since the panel commenced in 2000. The report notes a significant improvement in CPRs from 2017 when annual training sessions were held to increase awareness of Codes (and Section 12 of the JSE Listing Rules). Prior to 2017 only 32.5% of the CPR's were approved by the second review with some requiring five reviews prior to approval, while after 2017 80.6% of CPRs were approved by the second review.

To join the GSSA, practising earth scientists who have obtained a university degree (or equivalent) from earth science training and/or who practice within the sphere of earth/geoscience, may apply to become a Member. The applicant must furnish the names and contact addresses of two references who can attest to their academic qualifications and professional experience. Both of the references must preferably be Members of the GSSA. In addition, 4 years practical experience is required to become a Member.

There is a filtered member search facility which appears to be a list of current members without any apparent privacy restrictions.

The CPD system is also aligned to the SACNASP recognised CPD system.

GSSA complaints process, like that of the SAIMM, is designed to protect the reputation of the member while an alleged breach is assessed, and that confidentiality is paramount, unlike the SAIMM there is no mention of the SSC or SAMCODES role in the process. However, also unlike the SAIMM, there is a summary report on the 15 separate complaints since 2010 at page 5 of the GSSA Complaints and Disciplinary Process (GSSA, 2022). This document includes a summary of the style of complaints and the difficulties with the process, but not the outcomes of the Complaints or Ethics committee hearings.

4.5 Discussion

In most CRIRSCO member countries, apart from Canada and more recently the USA under S-K 1300, a local, principles-based code of practice based broadly on the CRIRSCO International Template for Public Reports of Exploration Results, Mineral Resources and Mineral Reserves is given effect through the Codes of Ethics to which members of national resources industry Professional Organisations are obliged to comply and securities exchange Listing Rules, which require Public Reports to be prepared in compliance with the relevant code. The exception to this is Europe, where a number of securities exchanges specify the JORC Code as their Public Reporting standard rather than the Pan European Reserves and Resources Reporting Committee (PERC) Standard (PERC, 2021).

European securities exchanges also lack continuous disclosure obligations. Prospectus disclosure is required to be in accordance with the JORC Code, SAMREC Code, The CIM Definition Standards and Guidelines, the SME Guide, and the Certification Code of Chile (ESMA, 2011). However, according to the UK FCA, which supervises the LSE Main and Premium boards but not the AIM market, the ESMA

Prospectus Directive ought to influence continuous disclosure specifically related to the LSE, and presumably more generally:

> *"EMSA requirements for a prospectus on any further issues of shares (fundraisings like placings, open offers, etc) which require a prospectus provide an exemption which is structured to rely on previous continuous disclosure in accordance with an internationally accepted code. So, any issuers which doesn't disclose in accordance with an internationally acceptable code risks not being able to rely on an exemption from production of a prospectus in the future where there hasn't been sufficient continuous disclosure (in accordance with an internationally recognised code like JORC) to support the grounds for an exemption."*

The use of reporting codes other than the PERC Standard by European securities exchanges creates an issue for the PERC parent bodies who maintain the Codes of Ethics followed in reviewing and acting on complaints who would prefer to assess their veracity in accordance with their own standard for Public Reporting. The situation is further complicated by the European Commission favouring the United Nations Framework Classification for Fossil Energy and Mineral Resources (UNFC) which extends resources beyond identified energy resources and mineralisation with reasonable prospects for economic extraction in permitting reporting of Total Initial Resources (UNECE, 2013) which is not directly comparable with CRIRSCO family codes.

Both the PERC Standard and the JORC Code provide guidance on *relevance* with respect to experience, using text largely drawn from the CRIRSCO Template (CRIRSCO, 2019):

> *"The key qualifier in the definition of a Competent Person is the word 'relevant'. Determination of what constitutes relevant experience can be a difficult area, and common sense has to be exercised. For example, in estimating Mineral Resources for vein gold mineralisation, experience in a high-nugget, vein-type mineralisation such as tin, uranium etc. will probably be relevant, whereas experience in massive base metal deposits may not be.*
>
> *As a second example, to qualify as a Competent Person in the estimation of Mineral Reserves for alluvial gold deposits, considerable experience in the evaluation and economic extraction of this type of mineralisation would be needed. This is due to the characteristics of gold in alluvial systems, the particle sizing of the host sediment, and the low grades involved. Experience with placer deposits containing minerals other than gold may not necessarily provide appropriate relevant experience.*
>
> *The key word 'relevant' also means that it is not always necessary for a person to have five years' experience in each and every type of deposit in order to act as a Competent Person if that person has relevant experience in other deposit types. For example, a person with (say) 20 years' experience in estimating Mineral Resources for a variety of metalliferous hard-rock deposit types may not require five years specific experience in (say) porphyry copper deposits to act as a Competent Person. Relevant experience in the other deposit types could count towards the required experience in relation to porphyry copper deposits.*
>
> *In addition to experience in the style of mineralisation, a Competent Person taking responsibility for the compilation of Exploration Results and/or Mineral Resource estimates should have sufficient experience in the sampling and analytical techniques relevant to the deposit under consideration to be aware of problems, which could affect the reliability of data. Some appreciation of processing and beneficiation applicable to that deposit type is also important".*

The CIM Definition Standards for Mineral Resources and Mineral Reserves (CIM, 2014) also include this guidance, despite requiring less specific experience of Competent Persons.

This guidance around the term *relevant experience* is frequently overlooked by Competent Persons, especially when dealing with Public Reports for mineral commodities and deposit styles that may not have been the subject of systematic, recent exploration, such as uranium for which there has been little exploration since the Fukushima accident more than ten years ago, and commodities for which new demand is being generated by technological advances, especially in the development of new metallurgical techniques, metal alloys, and electricity transmission and storage. Exploration for sandstone-hosted uranium, nickel laterites, cobalt, rare earths, scandium and lithium are amongst any number of examples of this where experience and knowledge gained in exploration, resource and reserve evaluation for other commodities is an essential input.

Both the current CRIRSCO template (CRIRSCO, 2019) and PERC Standard (PERC, 2021) emphasise this aspect of the competence requirement as highlighted guidance in their respective documents to foster awareness of this issue.

5. Competence and Confidence in Other Australian Professions

5.1 Professional Licensure in Australia

Professional licensing and regulation are widespread for professions in Australia, especially where professionals interact with and advise members of the public.

The Corporations Amendment (Professional Standards of Financial Advisers) Act 2017 introduced reforms to raise standards of education, training and ethical standards of financial advisers introduced in the Corporations Act (2001) (ASIC, 2022).

Accountants require professional certification as a CPA (Certified Practising Accountant) with CPA Australia, or as a CA (Chartered Accountant) with Chartered Accountants Australia and New Zealand. Positions in corporate accounting usually require at least a bachelor's degree in accounting. Applicants with accounting qualifications must complete additional career development to gain certified or chartered status which includes commercial awareness, emotional intelligence, communication and collaboration skills, a technically skilled and solution-driven approach to problem solving, and an awareness of the social impacts of accounting (CPA Australia, 2022). CAs are required to undertake studies (Graduate Diploma of Chartered Accounting (GradDipCA) course) and complete three years Mentored Practical Experience (CAANZ, 2022).

Medical practitioners are required to be registered with the Medical Board of Australia and meet standards relating to their CPD, criminal history, communications skills (including English language skills), recency of practice; and eligibility for professional indemnity insurance (AHPRA, 2022a).

Health practitioners in a range of other fields, including dentistry, also need to be registered to practice in Australia (AHPRA, 2022b).

Registered nurses, and legal practitioners both require formal qualifications, practical experience, assessment, and demonstration of competence through a publicly managed examination and a commitment to CPD.

Australia does not have a uniform registration system for engineers (Engineers Australia, 2022):

- Queensland is the only jurisdiction with mandatory and comprehensive registration.
- South Australia and Western Australia have no registration or licensing provisions of any kind.
- In NSW, the ACT, Tasmania and Northern Territory, the registration or licensing regimes are for engineers involved in the building sector only. The regimes do not cover other areas of engineering like mechanical, electrical, aeronautical.
- Victoria passed the Professional Engineers Registration Act in 2019, which came into force in July 2021 initially 5 categories of engineer; civil, structural, mechanical, electrical and fire safety.

Registration requirements vary between states and engineers must be registered in each state where they intend to practice. The Mutual Recognition Act 1992 entitles an engineer registered in one state to be registered as an engineer in another (Engineers Australia, 2022).

Teachers must be registered in each Australian state. National standards have recently been introduced to promote mobility of qualified teachers between states (AITSL, 2022). Teachers must possess an appropriate Tertiary qualification and undertake professional experience in parallel with securing their qualifications. Teachers must meet required standards in seven fields of practice covering professional knowledge, syllabus and content delivery, maintaining a safe and supportive

learning environment; student assessment; engaging in CPD and professional engagement with colleagues, parents and the community.

Mutual recognition legislation enables teachers registered in one state to be eligible for registration in all other states.

5.2 Comparison of Standards

5.2.1 Overview

Minimum requirements for independent practice between Australian professions are summarised in the following table (Table 6).

Table 6. Summary comparison of membership / professional registration standards in Australia

Profession / Professional Institute	Degree qualifications	Post-graduate qualifications	Relevant experience	Peer review	Commitment to Professional Standards	C.P.D.	Mandatory Registration
AusIMM / AIG Member / Fellow	✓	×	✓	✓	✓	×	×
AusIMM / AIG Chartered / Registered Professional	✓	×	✓	✓	✓	✓	×
Accountants (CPA / CA)	✓	✓	✓	×	✓	✓	✓
Dentists	✓	×	✓	✓	✓	✓	✓
Engineers (Engineers Australia)	✓	×	✓	×	✓	✓[2]	✓[1]
Financial Advisers	✓	×	×	×	✓	✓	✓
Legal Practitioners	✓	×	✓	✓	✓	✓	✓
Medical Practitioner	✓	×	✓	✓	✓	✓	✓
Registered Nurses	✓	×	✓	×	✓	✓	✓
Teachers	✓	✓	✓	✓	✓	✓	✓

1. *Registration may be mandatory for some engineering disciplines in NSW, NT, Victoria, Queensland and Tasmania (https://www.engineersaustralia.org.au/engineering-registers/statutory-registration)*
2. *Applies to Engineers Australia's Chartered members, Applicants for Chartered Status, NER Registrants*

"Public facing" professions (e.g., medicine, nursing, law, dentistry, accounting and teaching) are described as having the strongest requirements for professional recognition and licensure, comprising management of licensure by a government agency or statutory authority, mandatory professional registration, qualifications, and a mandated commitment to CPD. The members of professions with these requirements deal with sensitive issues (health, education and care of children and personal finances) and provide services used by a broad cross-section of the community.

5.2.2 Australian Government Intervention in Professional Licensure

Financial advisers in Australia are an example of a profession where a need to protect investors by ensuring the quality of advice provided to them resulted in direct Commonwealth government intervention in the sector. In March 2017, the *Corporations Amendment (Professional Standards of Financial Advisers) Act 2017* commenced and introduced reforms to the *Corporations Act 2001* to raise the education, training and ethical standards of financial advisers. The professional standards require financial advisers to have an approved qualification, pass the financial adviser exam, participate in 40 hours of CPD each year and comply with the Financial Planners and Advisers Code of Ethics 2019 (Code of Ethics) (ASIC, 2022) and can only provide financial advice under an Australian Financial Services (AFS) licence.

Government scrutiny of financial advisers has been continuous, with further reforms to financial advisor licencing introduced in January 2019, and again in 2021 in response to findings arising from the Hayne Royal Commission into Australia's financial system (ASIC, 2022) that included making the Minister directly responsible for implementing and overseeing professional standards.

The registration regime for financial adviser licencing in Australia is arguably the strictest implemented to date in Australia, and an example of the extent to which governments are prepared to act in instances where the pubic are perceived to be at risk due to inadequate industry and professional practices.

Businesses offering financial services, including (but not limited to) provision of financial advice, operating a registered investment scheme, and dealing in or marketing financial products, are administered under the AFS licence scheme, also managed by ASIC (ASIC, 2022b). Holding an AFS licence does not provide a guarantee of the probity or quality of the licensee's services. ASIC must grant a licence if a business shows it can meet basic standards such as training, compliance, insurance, and dispute resolution. The business is responsible for maintaining these standards. Employees of AFS licenced businesses may need to maintain separate forms of professional recognition, assessed by ASIC during the licencing process to determine that the company is competent to a conduct financial services business.

5.3 Engineer's Australia Professional Engineer's Registration History

EA has been involved in registering engineers in several guises, over a period of years. Initially, The National Engineering Registration Board (NERB) was an independent engineering registration body, funded by a number of engineering associations - with representation from various government agencies and community groups, administered by EA.

NERB was eventually closed down around 2015 as it became apparent that despite its best efforts, its principal goal of being supported by national legislation was not going to be achieved (Durkin, Background on NER. Email to P. Stoker, 2022a). The NERB supervised the operation of the National Registers for Professional Engineers, Engineering Technologists and Engineering Associates which were administered by EA (Hartley, 2012). The National Professional Engineers Register (NPER) was, with the failure to achieve a national approach to registration, abandoned.

EA responded by introducing a National Engineering Register (NER) aligned to state-based registration systems for example RPEQ. The complex and irregular state-based registration systems or situations are set out in the EA brochure Registration of engineers: an overview (Engineers Australia, 2022). The transition from the NERB to a NER, which was introduced in 2017 was a three-year program with significant member consultation and whilst a big (and controversial) move at the time was ultimately widely applauded (Durkin, 2022b). Catalysts for the NER were incidents such as

the Wivenhoe Dam operation in the 2011 Brisbane Valley floods and the Opal Tower incident. One of the (later) recommendations of the investigation into the Opal Tower (Unisearch, 2019) was:

> *"The creation of a government Registered Engineers database developed in partnership with an appropriate professional body".*

EA provides a 2-tier assessment model: NER (base level compliance at a cost of $100 per annum) and CPEng (a higher standard since it is a 6-stage process that requires demonstration of 16 key competencies which are essentially peer-assessed - at a cost off $3,000). Around 30,000 engineers are now on the NER (with this number expected to increase as more states introduce legislation systems). Around 10,000 engineers are now CPEng (Durkin 2022b). A thorough review of the operation of NER in any design of a revised Competent Person system would seem warranted.

5.3.1 Public Confidence in Professions

The results of an annual Veracity Index published by Ipsos MORI, based on responses provided by almost 1,000 adults over 18 years of age in the United Kingdom (Ipsos MORI, 2020) (Figure 11) show that Nurses, Doctors, Engineers and Teachers enjoy the highest levels of public trust. The registration programs for these professions are designed to provide a mechanism by which the public standing of these professions is maintained and, ideally, further enhanced.

Scientists also enjoy strong public perception, although it would be a significant step to suggest that the same positive perception would apply to all specialist professions in a very broad field.

Not all professions with rigorous and mandated licensure requirements, however, enjoy high levels of public trust, as evidenced by the results for lawyers and police. The survey results do, however, clearly demonstrate that professionals, generally, enjoy stronger public perception than non-professional occupations.

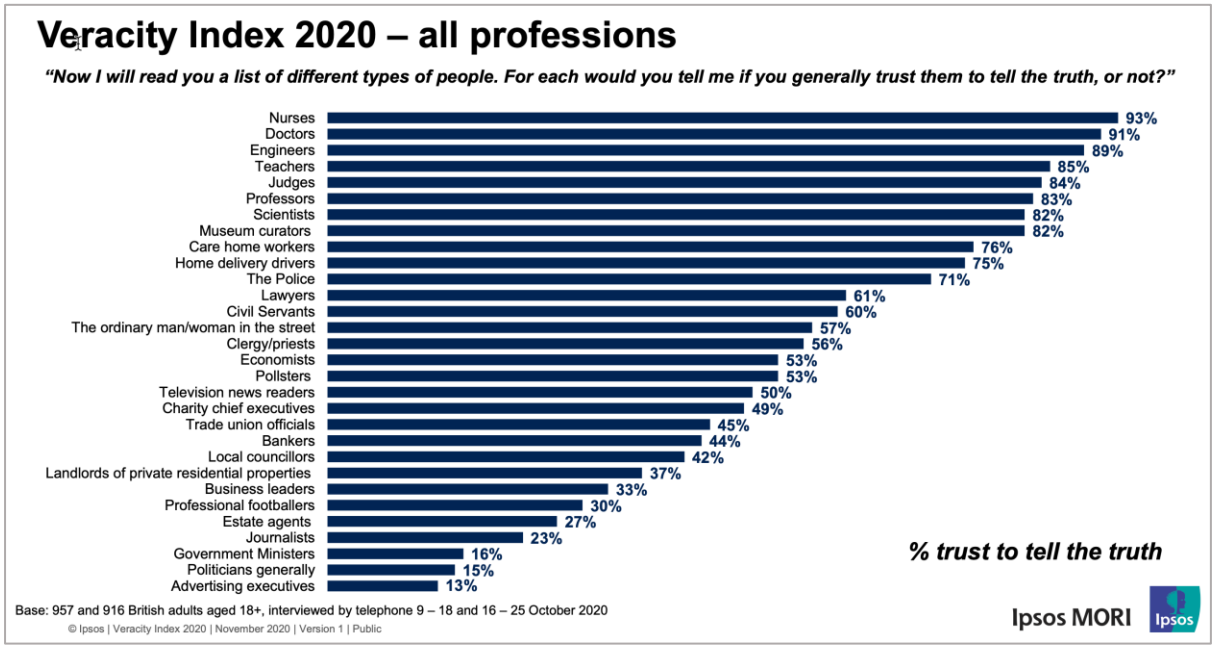

Figure 11. The Ipsos MORI Veracity Index 2020 lists Doctors and Teachers in the top four professions trusted by members of the public in 2020.

5.4 Commitment to Professional Ethics and CPD by Australian Resources Professionals

Many of the requirements for professional recognition and registration in Australia, notably including demonstration of competence by means other than peer review, and a commitment to CPD, are not required of geoscientists. Best estimates by the AIG and the AusIMM based on AusIMM and AIG membership data and compared to the number of geoscientists practicing in Australia according to Australian census data, suggest that only between 30 -50% of geoscientists in Australia have demonstrated a commitment to professional ethics and standards through membership of a professional Institute. However, it should be noted that all geoscientists and engineers acting as Competent Persons have inherently made this commitment.

5.5 Professional Risk

An interesting observation that is not regularly discussed in the context of professions is the ability of professionals to secure professional insurance to practice (e.g., public or broad-form liability and professional indemnity insurance). Medical practitioners and dentists, for example, must demonstrate that they have appropriate insurance cover to practice in Australia ((AHPRA, 2022a) (ADA, 2022). Solicitors and Barristers in Queensland must have professional indemnity insurance (Queensland Law Society, 2022). The relevant Professional Organisations in Australia play an active role in either arranging coverage on behalf of members or working closely with underwriters to ensure that they are aware of the specific risks faced by professionals in these areas of practice.

Self-employed resources industries professionals are advised by both the AusIMM and the AIG that professional indemnity and public liability insurance should be secured and maintained while undertaking independent professional practice. Both Institutes have arrangements with insurers to help secure required coverage.

Australian states were contemplating statutory reforms to tort law[3] around twenty years ago. This reform effort was in response to a perceived crisis in the insurance industry precipitated by a supposed spike in negligence claims and compensation awards (Wolff, 2013). Proposed reforms included provisions that would have provided limited liability for registered professionals that may have simplified the process, and reduced the cost of securing professional insurances, but these reforms failed to eventuate as the number of litigation lawsuits declined.

The difficulties reported by resource industry professionals seeking insurance, and the exemptions encountered for resource and reserve reports and mineral asset valuations are influenced by compliance with codes of practice, including the Institute's codes of ethics and both the JORC and VALMIN Codes.

This issue raises the consideration of whether an improvement to accreditation of resource industry practitioners would make professional indemnity insurance more accessible.

[3] A **tort**, in common law jurisdiction, is a civil wrong[1] (other than breach of contract) that causes a claimant to suffer loss or harm, resulting in legal liability for the person who commits the tortious act. It can include intentional infliction of emotional distress, negligence, financial loss, injury, invasion of privacy, and numerous other harms.

6. Professional Registration vs Accreditation

6.1 Professional Registration

Registration is defined by Macmillan (2022) as 'the process of recording names or information on an official list'. In the context of this report, the term has been defined (and included in the glossary) as 'Professional licensure/ability to practice in a particular field, assessed and managed by a government agency or statutory authority established by legislation or regulation.'

Registration of professionals involves meeting requirements established in law or government regulations and administered by government agencies of government appointed entities. Registration is required by professionals to practice in jurisdictions where it has been mandated (i.e. Canada). Penalties that may be incurred due to non-compliance with registration requirements are usually specified in the laws or regulations under which the registration scheme has been established. Registration may be referred to as certification in some jurisdictions, particularly in Europe.

Professional registration has the goal of ensuring professionals have the requisite knowledge, experience and resources to serve members of the public requiring their services. Registration schemes, in Australia, are typically:

- implemented by state or commonwealth legislation; and
- managed, monitored and maintained by government departments, authorities or agencies.

Registration usually requires professionals to meet specified education and experience requirements, may involve completion of further study or mandated mentoring, and an examination to formally assess their knowledge of technical and regulatory factors relevant to their field of practice.

Registration in nominated fields is a mandatory pre-requisite to practice. Registration schemes enshrined in legislation may be a basis for civil or criminal prosecution of professionals who fail to comply with registration requirements.

The professions subject to statutory registration, as discussed in Section 5, are primarily those engaged closely with the public, or whose work may impact public safety and wellbeing (i.e., public-facing professions).

There are aspects of Public Reporting to securities exchanges that may also be considered to possess this attribute, potentially making registration of mineral resources industry professionals a future option.

6.2 Accreditation

Accreditation is defined by Oxford Languages (2022) as 'the action or process of officially recognising someone as having a particular status or being qualified to perform a particular activity.' In the context of this report, the meaning of accreditation has been adapted to be the 'acknowledgement of the ability of a person to fulfil the defined requirements of a role or responsibility by a Professional Organisation.' and is defined as such in the glossary.

Accreditation requires compliance with recognised standards of professional practice by members of Professional Organisations. Accreditation may be a pre-requisite for resource sector professionals to work in specific areas of professional practice by both Professional Organisations.

Professional standards associated with accreditation may be enforced through the relevant Professional Organisations' Codes of Ethics to which association members agree to comply as a condition of membership. Professional Organisations have the ability to vary accreditation requirements in consultation with both Members and other stakeholders.

6.3 Accreditation in Mineral Resource Professions

Australasian mineral resources industry professionals have enjoyed considerable autonomy in professional accreditation. This is established by:

1. Professional Organisation membership requirements, which differ slightly between the AusIMM and the AIG.
2. Recognition of an ability to sanction, authorise and guarantee professional conduct satisfying required standards.

Applicants for AusIMM or AIG membership are assessed by the relevant Institute for compliance with educational and professional experience standards. The latter is confirmed by applicant sponsors who agree to support the membership applicant and are required to have direct knowledge of the applicant's professional experience and ethical standing.

Both Institutes have comparable educational standards, which are subject to regular review, particularly in the geoscience area due to curriculum changes at some Australian universities, namely the reduction of core geoscience units in the curriculum. The AIG does not currently accredit individual university courses, however, the AusIMM recognises specific courses as pathways to membership. Educational standards for overseas membership applicants are assessed with the aid of Qualification Assessments provided by the Department of Education, Skills and Employment (Department of Education, Skills and Employment, 2022).

The principal difference between AusIMM and AIG membership requirements is in the area of required experience, where AusIMM Members require three years of post-graduate experience while AIG members require five years, including two years in a role requiring exercise of professional judgement.

Both Institutes require compliance with their Codes of Ethics as a condition of membership, which are both enforceable under a two-tier complaints system where a Complaints Committee receives and assesses the veracity of complaints, which may be referred to an Ethics and Standards Committee for examination of the need for, and imposition of disciplinary action. Members are also able to appeal adverse Ethics and Standards decisions to their Institute's board. These systems are discussed further in Section 12.3 of this study.

6.4 Professional Accreditation Schemes

Both Institutes operate optional professional accreditation schemes (AusIMM CP or AIG RPGeo) that require more rigorous demonstration of relevant experience.

The AusIMM requires members maintaining their Chartered Professional status to undertake CPD and facilitate CPD by subordinates in the Institute's Code of Ethics. The AusIMM specifies a requirement of 150 hours of professional development over a rolling 3-year basis. The AIG does not specifically require CPD by members. Both the AusIMM and the AIG actively promote the benefits and desirability of CPD and provide members with access to a broad range of professional development opportunities.

CP or RPGeo status, however, is not a requirement for acting as a Competent Person.

6.5 Requirements to act as a Competent Person

Any member of the AusIMM or the AIG is able to act as a Competent Person if they assess themselves to meet the requirements specified in the JORC Code (JORC, 2012) of a Competent Person, including satisfying the 'five-years relevant experience' requirement to act as Competent Persons for Public Reports.

This form of self-assessment places considerable emphasis on the ethical conduct of the Competent Person in ensuring that they do satisfy the JORC Code Competency requirements. Compliance with these requirements may be tested, requiring a member to convince a panel of their peers that they meet the requirements of a Competent Person. This test would, however, only be triggered by receipt of a complaint by their Professional Organisation.

Both Institutes regularly offer short courses in the application of the JORC Code which evolve to address Competent Person guidance from JORC, the ASX and other securities exchanges using the JORC Code as a reporting standard, that have been well received by both members and users of Public Reports prepared in accordance with the JORC Code. However, as ASIC have noted, completion of a JORC Code training course is not considered a substitute for professional accreditation.

6.6 Options for improvement

JORC parent Professional Organisations, the AusIMM and the AIG, have two options available for improving management of members acting as Competent Persons in accordance with the JORC Code:

1. More comprehensive accreditation, where the AIG and the AusIMM retain responsibility for the accreditation and disciplining of Competent Persons; or,
2. Accepting registration of Competent Persons managed by a statutory or other external authority, with limited opportunity to shape requirements of Competent Persons.

ASIC correspondence with JORC in relation to the current update, reviewed in Section 9 of this study, sets out a clear desire for improvement in Competent Person accreditation and oversight through the Professional Organisations.

7. Stakeholders in Public Reporting of Exploration Results, Mineral Resources and Ore Reserves

7.1 Stakeholder Map

Public statements of Exploration Results, Mineral Resources and Ore Reserves are of interest to a broad range of stakeholders with varying interests and influence.

The stakeholder groups identified include a range of both domestic and international groups, and are both internal and public facing:

- representative/professional groups representing members of a broad range of professions and occupations involved in the assessment and development of mineral resources industry projects;
- JORC parent bodies (AusIMM, AIG and MCA), and recognised professional bodies (RPO) whose members have the ability to act as Competent Persons for Public Reports prepared in accordance with the JORC Code;
- resources industry groups that are not currently JORC parent bodies but have a direct interest in standards for Public Reports of Exploration Results, Mineral Resources and Ore Reserves, and the public perception of the minerals and mining industry and lobbying for industry-supportive policy settings;
- international corporate and securities market regulators;
- members of the general public;
- Governments, State and Federal;
- overseas securities exchanges that have adopted the JORC Code as a Public Reporting standard;
- banks, other financial sector participants involved in capital raising, mining industry finance, mergers and acquisitions, including private equity investors;
- brokers, investment advisors and equities analysts;
- ASX, NSX, NZX and other securities exchanges in Australia and New Zealand and PNG;
- ASIC;
- Competent Persons, and all members who aspire to this role;
- mining and exploration companies (or Publicly Listed resources sector companies);
- investment advisors and their representative group (i.e. Financial Services Institute of Australasia'), and
- investors and their representative groups (i.e. the Australian Shareholders Association).

The key stakeholders groups have been plotted onto a stakeholder map (Figure 12). The map shows axes of stakeholder interest versus stakeholder influence which may be divided into four quadrants representing the nature and management of individual stakeholder group needs:

1. Stakeholders that need to be kept informed of developments around competence in relation to the JORC Code (strong interest, limited influence).
2. Critical stakeholders whose interests, expectations and needs must be thoroughly managed (strong interest and influence).
3. Stakeholders with interests that must be anticipated and satisfied (limited interest, strong influence).
4. Minimal but regular contact is required to establish, build and maintain stakeholder relationships (limited interest and influence).

These are referred to as Segment 1 to Segment 4 stakeholders throughout this discussion respectively (Figure 12) A discussion of the rationale for the inclusion of each stakeholder group in the four sectors of the stakeholder map follows. Each sector of the map has distinct features.

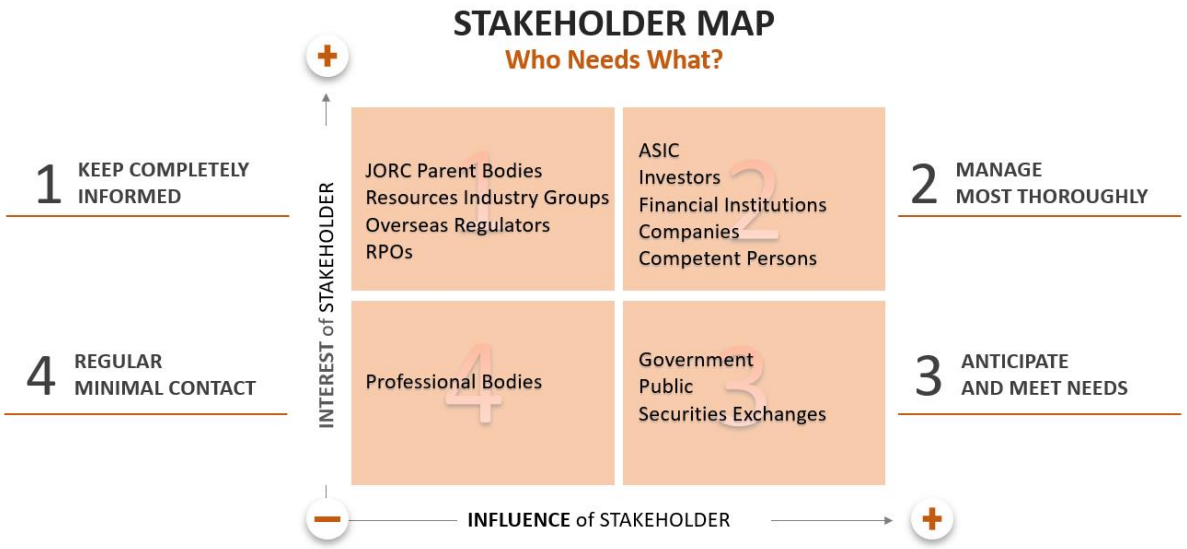

Figure 12. Competent Person stakeholder map

7.1.1 Segment 1: Keep Completely Informed

Segment 1 stakeholders have a need to be kept completely informed relating to the development and application of the JORC Code but limited influence in the code's content and application (Figure 13).

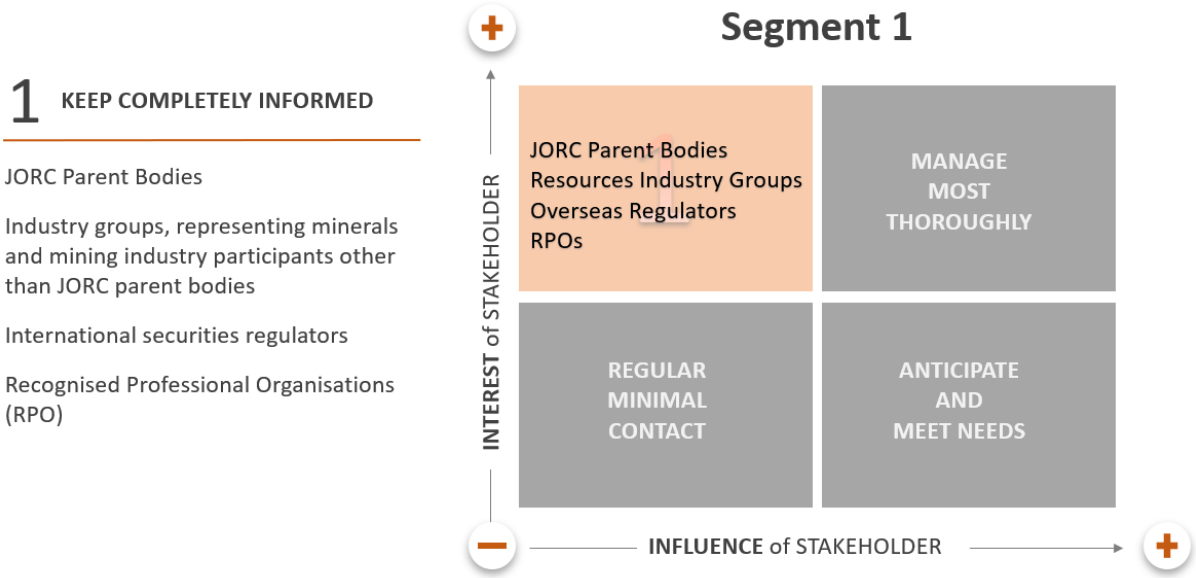

Figure 13: Segment 1 stakeholders - keep completely informed.

International securities regulators are included in Segment 1 due to an interest in monitoring the performance of the JORC Code in ensuring the quality of Public Reporting of information relating to exploration and mining projects for the information of investors. International regulators also have influence over the nature of reciprocal recognition arrangements under which the AusIMM and the AIG are recognised as RPOs. International securities regulators also have a direct interest in regulatory practices being applied in other countries that constitute sources of potential improvements in regulations and processes, and in responses to incidents in the application of other reporting codes beyond local experience but could have implications for their financial and regulatory systems. This interest is focussed by the widespread adoption of CRIRSCO standard reporting codes globally.

An area of particular concern is the use of RPO arrangements to circumvent registration requirements for Competent Persons, especially in Canada. Any review of NI 43-101 technical reports available on SEDAR (Canadian Securities Administrators, 2022) will reveal technical reports by Qualified Persons resident in Canada but acting as members of the AusIMM or the AIG, rather than as professionally registered geoscientists (PGeo) in a Canadian province. This practice has been raised directly in discussions between the Ontario Securities Commission (OSC) staff and the AIG Complaints Committee representatives. The requirement for resources industry professionals to be registered to work in Canada is clear. Any attempts to use RPO privileges to bypass registration requirements should be considered a potential threat to recognition of Australian RPOs by Canadian authorities and is something that could be proactively, easily and visibly addressed by the AusIMM and the AIG.

Recognised Professional Organisations and their members have a strong and direct interest in developments of the JORC Code. RPO members have only indirect input to the development of the JORC Code, but a direct interest in the application of the code. RPOs may be called upon to discipline members who have prepared and submitted Public Reports in accordance with the JORC Code. Close contact with RPOs is also a potential source of information and experience that may be used to improve the AIG and the AusIMM systems and processes through sharing of experiences.

Industry and Professional Organisations with members involved in the Australasian resources industries, professional members employed in these industries in non-technical roles; or organisations without an enforceable ethics and standards framework but have members employed in the resources sector; or whose members are end-users of Public Reports are also stakeholders. These groups have need to be kept abreast of refinements to the JORC Code and difficulties encountered in its application. This requirement affects both JORC and parent bodies.

The CRIRSCO Committee has an interest in ensuring continued alignment of international resource and reserve reporting codes.

JORC Parent Bodies (AIG, AusIMM and MCA) may appear to be an unusual inclusion in this quadrant, Inclusion of JORC Parent Bodies here reflects the relationship between the parent bodies and JORC which enjoys considerable autonomy in its day-to-day operations. Each of the Parent Bodies appoint four representatives to JORC, but committee members have an implied ability to reject proposed parent body representatives and have exercised this right on several occasions in recent years. This is partly moderated by parent bodies also being requested to endorse new appointments proposed by other parents. JORC is also able to appoint observers to the committee. The relationship between JORC and Parent Bodies, in many respects, does not require close management due to general alignment of views and objectives. Parent body approval of any changes to the JORC Code is ultimately required, which involves meaningful consultation with members. The Parent Bodies do

need to be kept completely informed of issues with potential to affect the operation and perception of the JORC Code which the Parent Bodies share a responsibility to maintain.

7.1.2 Segment 2: Manage Most Thoroughly

This is the largest and most diverse stakeholder group, dominated by externally facing stakeholders. Segment 2 stakeholders require the most intense and thorough management have both strong interest and influence in the JORC Code and the role of Competent Persons, including:

- Investors;
- business and commercial regulators, including ASIC and New Zealand's Financial Markets Authority (FMA);
- publicly listed resources sector companies;
- banks, private equity investors and managed investment funds; and

brokers and investment analysts and advisors working on behalf of clients to provide market intelligence, other forms of advice and services relating to minerals industry securities (Figure 14).

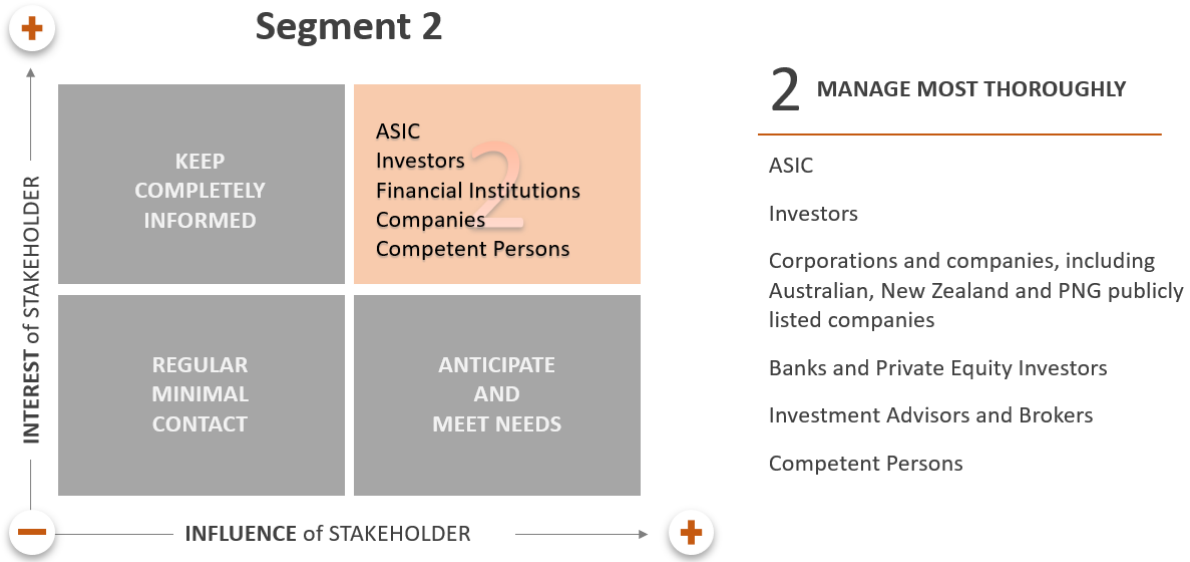

Figure 14. Segment 2 stakeholders requiring thorough management

Segment 2 stakeholders include professionals who rely on information presented in Public Reports prepared in accordance with the JORC Code.

The interests of these stakeholders are diverse and range from a need for reliable, readily accessible and interpreted, objective and material reporting of information relating to exploration and mining projects, providing advisory services to investors, offering alternative sources of capital to finance exploration and mining projects, to ensuring the orderly conduct of investment markets.

Investors are particularly important. They range from individual, small, private investors to more sophisticated investors including managed funds, superannuation providers and other corporations with capable technical and financial analysis capabilities. Transparent disclosure of material risks is a key concern, especially for small investors.

At the end of June 2021, there were 597,900 self-managed superannuation funds in Australia with more than 1.1 million members and $822 billion invested through them (Drury, 2021). The proportion of this investment in exploration and mining company securities in self-managed superannuation funds (SMSF) is not known but is likely to be significant due to lure of potentially above-average returns. Value destruction is of key concern to financial regulators. A corporate failure affecting funds invested by a large number of small investors has potential to incite public outrage which, historically, has been a trigger for government responses that have led to greater, statutory regulation of industry participants (e.g., financial advisers).

Securities industry regulators are responsible to governments and, through them, to the general public. Their role includes providing the necessary framework to ensure that the interests of investors and other market participants are protected and have the power to ensure that appropriate standards and practices are in place. ASIC have direct responsibility for licencing and ensuring the competence of businesses and individuals operating in the finance investment advisory and management fields in Australia, in response to government action to regulate these professions more tightly. ASIC has also expressed concern that there is no regulated "gatekeeper" that can be pursued in the event of failures in Public Reporting (G. Medcraft Pers Com), compounded by the lack of transparency of the complaints and disciplinary processes of the professional bodies.

7.1.3 Segment 3: Anticipate and Meet Needs

Segment 3 stakeholders, like Segment 2 stakeholders, require careful and proactive management. Despite having lesser interest in competence issues than other stakeholder groups, Segment 3 stakeholders (Figure 15) are able to exert considerable influence.

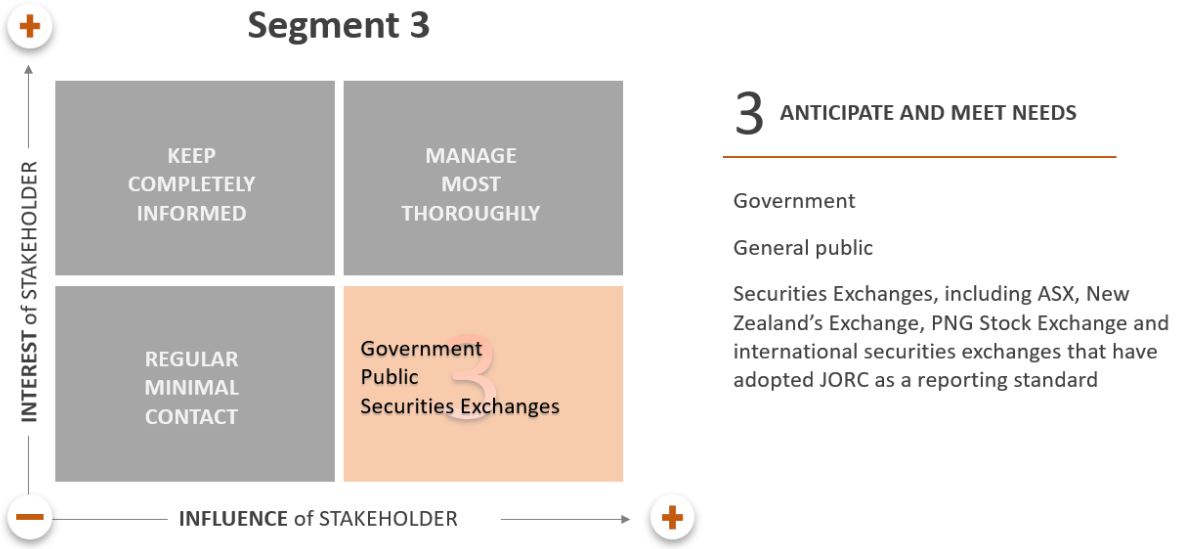

Figure 15. Segment 3 stakeholders requiring proactive management

The key risk with Segment 3 stakeholders is their ability to catalyse or implement changes on the basis of incomplete information, particularly in response to pressures exerted by other stakeholders.

The general public is able to exert considerable influence through voicing opinions, particularly in response to an event where other stakeholders' interests have been negatively affected (e.g. shareholder loss).

Governments may be readily influenced by public opinion, particularly adverse opinion that is not proactively countered with considered, well presented information. A dialogue with government relating to the continuous monitoring, improvement and enforcement of professional standards provides a source of confidence in professional integrity that can help to moderate the impacts of unexpected events affecting other stakeholders.

Securities exchanges are included in this group because their principal interest is in the smooth operation, profitability and integrity of their exchanges and measures to ensure this, are embodied in their Listing Rules. Exchanges need to be aware of issues that may necessitate these rules being updated.

7.1.4 Segment 4: Regular Minimal Contact

Segment 4 stakeholders, requiring regular but minimal contact, may be considered to comprise of other Professional Organisations and industry bodies (e.g. AMEC, FinSIA (Figure 16).

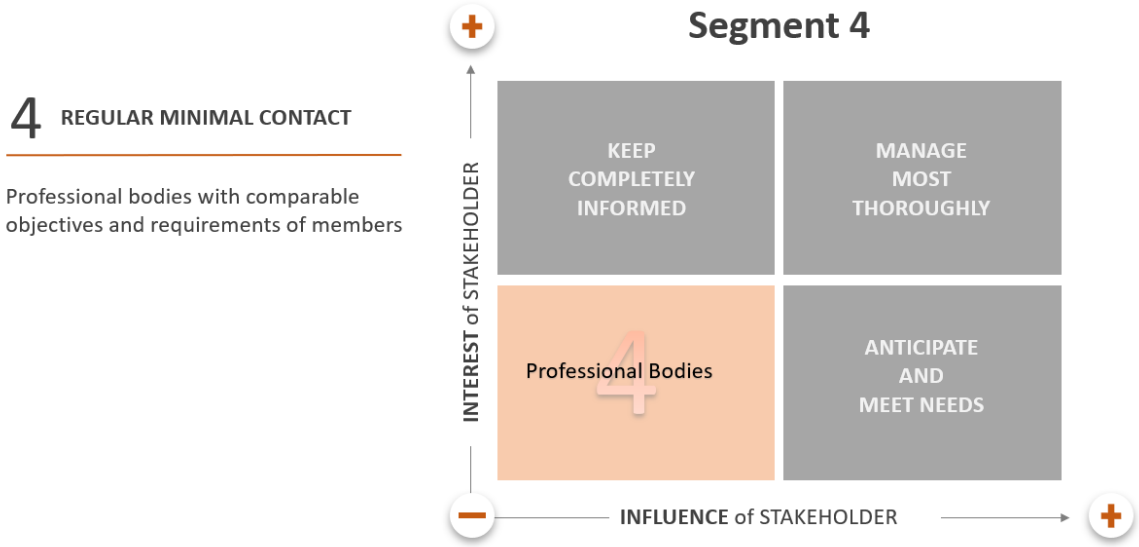

Figure 16. Segment 4 stakeholders requiring regular but minimal contact

Communication between Segment 4 groups is a potentially useful source of experience relating to core responsibilities of Professional Organisations, contributing to the development and continued improvement of best practice in both governance and professional standards.

8. Stakeholder Consultation and Engagement

8.1 The JORC Code Update Stakeholder Engagement Survey

Stakeholder engagement planned to be conducted during the initial stage of the JORC Code review was disrupted by COVID-19 pandemic management measures limiting travel and face to face engagement. JORC conducted a widely publicised, online survey that was open to all stakeholders between December 2020 and April 2021. The survey attracted more than 500 responses that were reviewed by JORC during April and May 2021. Most respondents identified as having more than ten years' professional experience.

In the Competence area, the survey examined:

- definition of a Competent Person,
- competence and responsibility; and
- other areas related to competence requiring clarity including assessment of competence both within and beyond an expert's domain.

Key topics identified in relation to the issues examined by the survey included:

- better defining relevant experience;
- the need for improved guidance in applying the Code (Q2021 in JORC Survey);
- the role of, and need for, peer review in establishing competence and helping to ensure report quality;
- access to Competent Person CVs;
- a requirement for professional registration;
- effective Competent Person accreditation;
- training; and
- improved Competent Person guidance by parent bodies, ASX and ASIC.

Responses to survey questions included a number of relevant points.

8.1.1 Relevant Experience

The term "relevant" represents a source of uncertainty in the Competent Person definition, with respondents seeking further clarity on the type of experience needed for a professional engaged in Public Reporting in accordance with the JORC Code to be considered competent. Respondents proposed transparent disclosure of experience would be beneficial.

Familiarity with geological and mining software, required to produce computational results, was distinguished from knowledge of how information was actually managed, and the inputs required to achieve meaningful results. This was also reflected in comments that experience in supervising drilling and sampling was perceived to be undervalued as relevant experience in Public Reporting of Exploration Results and Mineral Resources for the commodity concerned in favour of emphasis on geological modelling and resource estimation software skills.

Access to statements of relevant experience and Competent Person CVs was a consistent theme in survey responses. Some respondents also saw value in an ability to track the work of Competent Persons through a register of Public Reports.

Respondents identified and endorsed the need for Competent Persons to secure qualified and experienced advice on topics outside their areas of personal experience and expertise.

One respondent proposed that “relevant experience…” should be expressed as “experience relevant to…”, which may have merit in clarifying the relevant experience concept.

8.1.2 Competence

Numerous respondents identified accreditation and verification of competence as one of the key concerns.

A small number of respondents commented on the specification of competence currently being restricted to limited, largely geological topics and that it needed to be extended to issues related to studies including capital cost estimation, scheduling, and risk analysis.

The need for a Competent Person team for studies was identified as an issue by a number of respondents with diverse backgrounds, noting that no individual can be competent for all aspects of any level of study, with meaningfully establishing modifying factors mentioned specifically, amongst survey respondents. There was strong support evident for the concept of reports being the responsibility of a Competent Person team, managed by a nominated “lead” Competent Person. Reports adopting this approach were perceived to be more reliable than those largely derived by a single Competent Person.

There was strong support for readily available access to Competent Person CVs or other statements of qualifications and relevant experience from survey respondents across the spectrum of professions.

Some respondents discussed the relative quality of information reported in JORC Code Table 1 as a proxy for or reflection of relative competence, with issues of competence readily evident in discussion of specified topics. Including a “reasonable prospects” test in the JORC Code Table 1 was also identified as a means of indirectly exposing a lack of competence.

Support was expressed for a requirement for CPD by Competent Persons. Support for Competent Persons being required to complete training relating to the JORC Code and professional ethics was also supported by numerous survey respondents.

Some responses created an impression that the respective roles of the AusIMM, the AIG and JORC in managing the conduct of Competent Persons is not clearly understood, even amongst highly experienced (20+ years) geoscientists and engineers. This needs to be addressed by the AusIMM and the AIG. The RPO concept was also poorly understood by some survey respondents.

8.1.3 Peer Review

A view was evident that self-assessment of competence without peer review was an outdated concept, particularly in light of the confidentiality provisions in the processing of Complaints, which itself was also viewed to be outdated. Accreditation schemes operated by the AusIMM, and the AIG were seen as a means of addressing this issue.

One respondent proposed that there should be a mechanism for selective independent review of Mineral Resource and Ore Reserve estimates released by public companies, included in or aligned with practices for audits of a company’s financial statements. Scrutiny of compliance of Public Reports with the JORC Code by the ASX and professional bodies was raised by respondents in several fields, particularly company management, interpreted to reflect the lack of visibility of complaints and ethics and standards processes by the AusIMM and the AIG.

8.1.4 Professional Registration and Accreditation

Accreditation and peer endorsement of relevant experience and skills was identified as being preferable to self-assessment.

Respondents saw no productive role for the ASX and ASIC in Competent Person registration or accreditation, expressing the view that any move away from sole responsibility for this resting with Professional Organisations would lead to reduced professional standards and limit the availability of suitably qualified and experienced persons prepared to act as Competent Persons.

8.1.5 Training

Competent Persons engaged in reporting Mineral Resources or Ore Reserves estimates were considered to require detailed knowledge of both deposit characteristics, mining approaches and estimation methods applicable to the style of deposit under consideration to understand the applicability and limitations of different estimation methods.

CPD was identified as necessary to maintain skills by survey respondents.

8.1.6 Risk Analysis

The importance of risk analysis in relation to Ore Reserves was noted, with Ore Reserve estimates affected strongly by the application of Modifying Factors that may be subject to variation, making quoting a single grade and tonnage estimate potentially misleading. Good practice would include a sensitivity analysis of major assumptions including commodity price, metallurgical recovery, mining dilution, and grade performance.

8.2 Competent Person Baseline Study Input Survey

A short survey[4] was also conducted to collect additional data to that acquired by JORC Stakeholder engagement survey, discussed above, for use in the preparation of this study. The survey was designed to collect responses on specific issues where the information provided by the earlier JORC Stakeholder Engagement survey was considered to require additional input. The survey received 558 contributions, 7 - 17 February 2022. The survey was open to any interested person, but more than 96% of responses were received from AIG, AusIMM and RPO members. More than a quarter of respondents were AusIMM CPs or AIG RPGeos. Almost 70% of respondents had acted as a Competent Person within the previous five years. Some 85% of respondents routinely use Public Reports prepared in accordance with the JORC Code in the course of their work and to assess investment options.

8.2.1 Responses to Survey Questions

All survey respondents were familiar with the requirements of a Competent Person specified in the JORC Code. Some 66% of respondents considered the requirements to be appropriate. A quarter of respondents felt that the requirements were inadequate and needed to be strengthened. Comments on this issue included:

- a need to require RPGeo or CP status to place mining on a comparable footing with other Australian professions;
- greater transparency was needed in demonstrating requisite skills and experience;

[4] The survey questions were compiled by the Lead Author and were not independently assessed, reviewed or audited. Responses obtained from the survey were not reviewed or audited by the Contributing Authors or any other party independent or otherwise.

- transferability of skills and experience between commodities and deposit styles is not adequately recognised in the Competent Person definition;
- additional clarity regarding what constitutes relevant experience is needed. Taken literally, the Competent Person definition would restrict the ability of practitioners to report on styles of mineralisation and types of deposits for which new demand and exploration interest is being generated, but in which few would have direct experience; and
- an increase in visibility of disciplinary processes by Professional Organisations.

Several comments were received regarding the role of the JORC Code being used as a tool for communicating technical risk being underutilised or restricted by Mineral Resource and Ore Reserve classification being the principal means by which risk is communicated. Risks other than those directly related to grades and tonnes required greater consideration.

Almost 70% of respondents favoured a tiered approach to competence, with more stringent requirements for Competent Persons whose work underpins Mineral Resources and Ore Reserves estimates and Economic Studies as opposed to Competent Persons whose work contributes to the reporting of Exploration Results in Public Reports.

In relation to CPD, it was evident in the responses that what constitutes effective CPD is an area in which greater clarity and understanding is required, with a proportion of respondents considering self-guided learning, experiential learning, and mentoring, for example, to be outside the scope of CPD, which instead is focussed on courses offered by various providers. Similarly, CPD was described as expensive and inaccessible by a number of respondents. Respondents also mentioned the need for CPD in non-technical areas, including professional and ethical conduct and commercial factors affecting resources industry projects.

A number of other respondents pointed to more transparent disciplinary processes as being an effective means of improving the standard of Public Reports.

The opportunity for additional comments, aside from the questions asked directly by the survey, attracted comments on:

- independence was unrelated to competence;
- clarification of the responsibilities of Company Directors vs Competent Persons in relation to Public Reporting;
- reliance on specialist, frequently head office-based or consulting Mineral Resource and Ore Reserve estimation practitioners, rather than operational staff with the greatest knowledge of a deposit or mining operation, in Mineral Resource and Ore Reserve estimate preparation and Public Reporting;
- a need for contributions provided by professionals who are not members of the AusIMM or the AIG, who are specialists in their field of practice, to be included in Public Reports; and
- developing a searchable register of Public Reports, akin to Canada's SEDAR system for technical reports, able to be used to review the work of Competent Persons.

8.2.2 Coercion

Concerns regarding coercion were raised by some survey respondents, despite no questions being asked on this directly in the survey. Raising of the issue at all points to coercion being present in the resources industry. Concerns were raised regarding coercive behaviour by both companies and consulting firms, focusing on threats around employment continuity unless favourable reports, meeting company expectations, or being "on-message" with the company were prepared. The

prospect of repeat or continued engagement of consultants was also raised, which creates issues around independence. How and by what means this can be dealt with in the context of the JORC Code is a difficult but necessary question.

8.3 Summary

Stakeholder engagement provided by the two surveys identified several themes:

- a competency assessment and accreditation process for Competent Persons, managed by relevant Professional Organisations whose members act as Competent Person's (AusIMM and AIG), is considered to be preferable to externally managed regulation and registration;
- a need for transparency of Competent Person qualifications and relevant experience;
- the need to engage qualified and experienced professionals, with the greatest, direct exposure to projects in Public Report preparation;
- a need for greater clarity around what constitutes "relevant experience" in meeting Competent Person requirements;
- greater visibility of disciplinary processes by Professional Organisations;
- acknowledgement of the role of CPD, coupled with a need for improved information on acceptable CPD activities;
- consideration of the opportunity for multiple Competent Persons contributing to Public Reports within their respective fields of experience and expertise; and
- consideration to adoption of a tiered competency requirement, linked to the level of the activity or study covered by a Public Report.

9. ASIC Concerns with the JORC Code and Opportunities for Improvement

9.1 Introduction

ASIC views the current review of the JORC Code as an opportunity for improvement in several areas. JORC initiated consultation with ASIC in late 2019-early 2020. ASIC's initial responses outlined the role of the Commission and how it works with the JORC Code, the results of which were used to develop a summary of key issues and work plan for the code update (JORC, 2021).

ASIC envisaged conducting its own investor feedback project on the JORC Code, but this did not eventuate due to priorities for ASIC created by the COVID-19 pandemic. ASIC voiced concern regarding the length and technical focus of the JORC survey, and the need to have sufficient understanding of the JORC Code to place questions in context, which may have deterred investors from participating. ASIC did not complete the survey, electing to respond by letter which was viewed to be a more suitable form of response.

JORC was encouraged by ASIC to consult with investor representative groups, such as the Australian Shareholders Association, to obtain feedback on, and investor perceptions of the JORC Code during the update process. JORC invited representatives of the Shareholders Association to participate in the JORC online survey (as individuals and/or at organisation level), but no direct feedback was recorded.

ASIC also proposed that JORC should contact other users of Public Reports prepared in accordance with the Code including institutional investors, superannuation funds and brokers which may also be able to represent the views of investors.

ASIC's communication with JORC made it clear that the Commission does not have a mandate to focus on compliance with professional or industry codes of practice, including the JORC Code, but is interested in potential conflicts between these codes and the *Corporations Act 2001* (Corporations Act). ASIC is also interested in incorporation of the updated JORC Code into the Listing Rules of several securities exchanges in Australia, most notably the ASX.

The Commission also noted that JORC has, historically, focussed on technical elements of mineral project prospectivity and potential, but noted increasing investor interest in environment, social and governance issues (ESG).

9.2 Principal Areas of Concern

Based on correspondence with ASIC, the following areas should be examined during the current JORC Code update, as outlined in three letters to JORC (ASIC, 2020a, ASIC, 2020b, ASIC, 2021):

1. *Limited oversight and self-assessed competency for practitioners results in reports and statements prepared in accordance with the Code being of varying quality and in some cases being unreliable and incomparable.*
2. With respect to a number of high-profile mining project development failures - *"… several instances where the root cause of investor loss has been the competence of the practitioners preparing information in accordance with the Code."*
3. The JORC Code may contribute to investor loss, particularly for assets and projects transitioning from exploration to development and production, with adverse impacts on market integrity and create competitive advantage for a subset of resource investors.

4. There is a regulatory push away from disclosure and warnings being used as a means of investor protection. It is questionable whether the principle of transparency relied on by the Code will meet the information needs of investors and regulators in coming years.
5. The existing Complaints and Ethics processes are not effective and that "enforcement is impractical in all but extreme cases." .

9.3 Key Messages

Key messages delivered by ASIC, relevant to the consideration of competence include:

- **Avoiding inconsistencies with the Corporations Act**. ASIC does not consider that "*compliance with the Code will result in* ***compliance with the Corporations Act*****"**, but the Commission considered the Code to "*provide sound guidance to technical practitioners on how to address requirements of the Corporations Act*". ASIC cautioned JORC to ensure the Code update "*do not result in any inconsistencies between the Code and the requirements of the Corporations Act*" and, *"If there are inconsistencies between the Corporations Act and the Code, the Corporations Act will prevail*"[5].

  Compliance with the Corporations Act and ASIC guidance is a specific requirement of the VALMIN Code (2015), which ASIC would welcome as a specific inclusion in the updated JORC Code. The Corporations Act specifically prohibits misleading or deceptive statements, which have been an issue with forward looking statements, particularly associated with Scoping Studies, in the past.

- **Oversight and self-assessed competency**. ASIC notes "*the Code permits practitioners to undertake self-assessments to determine competency*". There appears, in the view of ASIC, "*to be limited oversight of such self-assessments*"[3]. "*Relevant experience*" was singled out by ASIC as being subject to different interpretations by individual Competent Persons. Relevance also needed to be extended beyond experience with different styles of mineralisation and be clearer on requiring Competent Persons to report within their field of expertise (e.g., geologists should not assess non-geological modifying factors which could be more appropriately addressed by a mining engineer, metallurgist or other professional).

  ASIC claims to "*have identified several instances where the root cause of investor loss has been the competence of the practitioners preparing information in accordance with the Code*". ASIC claimed to have recognised a trend for Competent Persons to self-assess themselves *"as having sufficient competency regardless of the nuances and complexities of a particular project*". Furthermore, ASIC "*see practitioners who recognise as technically competent often expanding that competency assessment into areas outside of their technical competency*"[6].

  ASIC suggested JORC "*consider the requisite qualifications and experience required in other technical and non-technical disciplines to establish competency to undertake specific assessments as part of the process to prepare a report*"[3].

- Consideration should be given to preparation of reports by teams of Competent Persons with **requisite qualifications and experience** in both technical and non-technical disciplines. ASIC pointed to inconsistencies between reports with similar subject matter, developed in some cases by a team of engineers, geoscientists, environmental scientists, business

[5] Extracts from ASIC letter to JORC 22 February 2021
[6] Extract from ASIC letter to JORC 4 March 2020

analysts, metallurgists and other professionals, and in others by a single employee or consulting geologist. This contributed to inconsistency in report quality, with reports in some cases being unreliable and incomparable. Concern was expressed by ASIC that competency evaluation criteria set out in the JORC Code were "*too subjective to be enforced [in a disciplinary process] in all but extreme cases*."

By comparison the authors note that in Canada this is addressed mainly in Form 43-101-F1 where geoscientists can be responsible for Sections 1-12, 14, and 23-27 of a NI 43-101 Technical Report but an engineer should be responsible for Sections 13 and 15-22, and a metallurgist for Section 13. In addition, there can be conditional reliance "on a report, opinion or statement of another expert who is not a qualified person, or on information provided by the issuer, concerning legal, political, environmental or tax matters relevant to the technical report"[7],

ASIC sees "*the proposed revision of the Code as an opportunity to improve the quality of Public Reports and estimates by expanding on the meaning of competency for practitioners and introducing more rigid requirements that can be objectively determined following basic enquiries by stakeholders, including the ethics committees of industry bodies*"[8].

- The **current disciplinary frameworks** followed by the AIG, the AusIMM and RPOs which is based on voluntary complaints-based oversight of Competent Persons contributes to variability in the quality of Public Reports. ASIC "*continue to have reservations that the current disciplinary framework and guidelines will ensure best practice from practitioners*". "*Under the existing complaints-based framework for the regulation of practitioners we have identified that issues relating to the judgement by the practitioner of their own competence is seldom reported as the basis for sanctions*."[3].
- ASIC expressed concern that Mineral Resource and Ore Reserve estimates for technically similar projects were frequently subject to differences in the approach followed by Competent Persons in determining **reasonable assumptions and business rules** (particularly in relation to pricing and cut-off assumptions) incorporated in estimates, which hindered comparison of mineral projects. Ambitious approaches to resource and reserve estimation were singled out as a source of investor loss when projects advance to development and production and market capitalisations begin to inflate.
- Disclosure of **conflicts of interest and bias** is required by the JORC Code, but no guidance is provided on what a conflict interest may be. ASIC suggests that Competent Persons take a narrow view on what may constitute a conflict, with the view frequently being confined to potential financial gain. ASIC consider "*it is appropriate for practitioners to disclose actual and perceived conflicts of interest*"[9]. "*It may assist Competent Persons if the Code clarifies that conflicts of interest may not be financial in nature alone and that other present or historical relationships with the company or other parties may give rise to actual or perceived conflicts of interest*"[3]. While acknowledging Independence is not required by the JORC Code, ASIC has encountered claims by practitioners that they are 'independent' but then go on to disclose prior work on the mineral property under consideration or historical relationships

7 43-101F1[F] Item 3.
8 Extract from ASIC letter to JORC 4 March 2020
9 Extracts from ASIC letter to JORC 22 February 2021

with the company or related parties, or the potential conflict arising from the prospect of future work.

- Dissatisfaction with an analogous type of "Sergeant Schultz" reasoning in Public Reports, such as "we are not aware of any issues with…. ("I see nothing, I hear nothing, I know nothing"), used to avoid stating that the work called for has not been commenced or completed. The latter should be stated transparently for readers to develop appropriate conclusions.
- **Increasing investor focus on ESG** may test the ability of Competent Persons to provide disclosure of a standard meeting investor expectations. ASIC updated its guidance and expectations of companies seeking to raise funds should include climate-specific risk disclosure in prospectuses (ASIC, 2019), which also has implications in this context.
- A need for **clear, concise, and effective disclosure** (CC&E), delivering information, recommendations and future plans, free of nuance and able to be readily understood by all users of Public Reports. ASIC specifically expressed the view that the code revision was an opportunity to clarify the relationship for the need for CC&E disclosure and the requirement to comply with the JORC Code principle of transparency.
- **Erosion of Shareholder Value –** In correspondence with JORC, ASIC reported the results of research that identified 58 mining and resource entities that entered administration and 25 entities which experienced loss of more than $100 million and 50% of market capitalisation between 2015 and 2019 (ASIC, 2020b). These issues were attributed by ASIC to:
    - poor production reconciliation to Mineral Resource and Ore Reserve grades during development and early production
    - underestimation of construction costs
    - higher than estimated production costs, particularly C1 costs
    - changes to macro-economic factors, including access to land delays, licensing and commodity prices.

  Three entities, with issues reconciling ore grades to reserve estimates resulted in collective investor losses exceeding $400 million notwithstanding favourable commodity prices at the time.

  ASIC pointed to elevated risks when companies when transitioning from exploration to development and production, where higher levels of capital were being raised and debt capital is introduced to a company's capital structure.

  ASIC revised and re-released Information Sheet 214 (INFO214) in October 2016 to clarify guidance for forward-looking statements in the mining and resources industry to draw together and better explain the existing rules on the disclosure of statements relating to future matters, including production targets and forecast financial information based on production targets, especially as they relate to Scoping Studies, and the requirement to *"have (and disclose) reasonable grounds for any assumptions that you make about your funding sources"* (ASIC, 2016).

  The Commission expressed ongoing concern that ambitious approaches to Mineral Resource and Ore Reserve estimation remains a contributor to investor loss when projects advance to the development and production stages and market capitalisations begin to inflate and

proposed that the JORC Code potentially contributed to these losses, as sophisticated institutional investors with greater knowledge of mineral asset valuation and extraction take advantage of identified shortcomings of Mineral Resource or Ore Reserves estimates to structure funding terms that will allow them to take control of assets for unfair value without the need for a takeover bid or scheme of arrangement.

- **Information Asymmetry -** Ensuring unrealistic and misleading statements regarding the prospects of mineral asset projects are not released to market was perceived by ASIC to be a key role of the JORC Code, but that reliance on competency and transparency to control the quality of Public Reports may result in information asymmetry in the market and potential investor harm as it largely relies on the technical knowledge and understanding of the reader.

  ASIC proposed that this could be addressed through a stated requirement for CC&E and restrictions on the derivative use of information prepared in accordance with the JORC Code with the Code compliant information distilled into promotional materials in an unbalanced manner without the risks and context of estimates also being translated. This places the onus on investors to seek out and self-inform on risks associated with statements they may have been presented in summary or abridged form. Release of abstracted information prepared by Competent Persons should require specific consent due to alteration of the form and context in which original consent for its release has been altered. Competent Persons may, however, not be aware of use of information prepared by them in this manner, placing the onus on companies for ensuring that this occurs.

ASIC clearly states in correspondence with JORC that improved standards and assessment of competence are essential. ASIC further strongly encouraged the Professional Organisation to progress towards accreditation of Competent Persons.

ASIC's comment that "*existing competency evaluation criteria set out in the JORC Code were too subjective to be enforced in all but extreme cases*" (ASIC, 2020b) requires due consideration by both the AusIMM and the AIG.

ASIC "*consider this to be an important area for consultation and consideration by the Committee and are supportive of the Committee taking bold steps to improve, validate and verify the competency of Competent Persons, particularly should it involve member bodies taking responsibility for the accreditation and oversight of their members. We would support clear, objective and enforceable competency requirements*" (ASIC 2020b).

The objectives outlined by ASIC's communications with JORC emphasise the need for:

- greater consistency in the assessment of competence;
- Competent Persons to work within their field of expertise and experience; and
- greater emphasis on the need for, and value of contributions of different specialists to the preparation of Public Reports, particularly for mineral assets and projects transitioning from exploration, through economic studies and feasibility, to development and production which coincides with increasing market capitalisation and project complexity.

10. Demonstration of Competence

10.1 The JORC Code 2012

The JORC Code 2012 requires Competent Persons to provide a simple declaration that includes:

- the Competent Person's name, employer and, if employed by the company, position;
- professional membership;
- a brief statement that the Competent Person has the required, relevant experience; and
- a statement of prior, written consent that the Competent Person agrees with the form and context in which their information is presented in the Public Report.

Several examples of suitable statements are provided in Appendix 3 of the JORC Code (JORC, 2012), including the following paragraph:

> *"The information in this report that relates to Exploration Targets, Exploration Results, Mineral Resources or Ore Reserves is based on information compiled by (insert name of Competent Person), a Competent Person who is a Member or Fellow of The Australasian Institute of Mining and Metallurgy or the Australian Institute of Geoscientists or a 'Recognised Professional Organisation' (RPO) included in a list that is posted on the ASX website from time to time (select as appropriate and insert the name of the professional organisation of which the Competent Person is a member and the Competent Person's grade of membership). '(Insert name of Competent Person) has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the 2012 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. (Insert name of Competent Person) consents to the inclusion in the report of the matters based on his (or her) information in the form and context in which it appears.'*

This form of statement lacks any information in the experience possessed by the Competent Person to verify their claim of competence.

10.2 PERC Standard

The latest version of the PERC Standard goes further by requiring a Competent Person Certificate, for which guidance is provided as a guide in Appendix 11 of the standard (PERC, 2021), which takes the following form shown in Figure 17 and closely follows the certificate proposed in the CRIRSCO International Reporting Template (CRIRSCO, 2019). Adhering to the standard ensures the provision of:

- the Competent Person is named and their affiliation;
- professional association membership details;
- qualifications;
- relevant experience that enables the Competent Person to provide the Public Report;
- work undertaken by the Competent Person in the preparation of the report;
- details of any site inspection undertaken by the Competent Person;
- the aspects of the Public Report for which the Competent Person is responsible;
- a statement of completeness of information used in Public Report preparation;
- confirmation that the report represents the Competent Person's view;
- information regarding the Competent Person's independence or relationship with the reporting entity / issuer;

- confirmation that the Competent Person is fully conversant of the PERC Standard requirements;
- remuneration stemming from preparation of the Public Report;
- disclosure of any conflicts of interest; and
- the Public Report is based on all relevant technical information available at the date of report preparation.

This certificate provides more material, detailed information relating to the competence and relevant experience of the Competent Person than provided by the comparable JORC Code statement discussed in Section 10.1.

Certificate of Competent Person

As the Competent Person responsible for the information on which the Public Report entitled [report title] is based, I hereby state:

1. My name is [Competent Person's name].
2. [Details of the position in the company, reporting entity name, address].
3. [Profession and details of registration body].
4. [Qualifications].
5. [Relevant experience].
6. I meet the requirements of a 'Competent Person' as defined explicitly in the PERC Reporting Standard.
7. [Work undertaken or services rendered].
8. [Site inspection details].
9. [Details of aspects of this Public Report for which the Competent Person is responsible].
10. I am not aware of any material fact or material change concerning the subject matter of the Public Report that is not reflected in the Public Report, the omission of which would make the Public Report misleading.
11. I declare that this Public Report appropriately reflects the Competent Person's view.
12. I am independent/not independent of [name of reporting entity/issuer].
13. I confirm that I have read all the relevant sections of the PERC Reporting Standard [year of issue]. The Public Report has been prepared under the requirements of the PERC Reporting Standard.
14. I do not have, nor do I expect to receive, a direct or indirect interest in the [project/ operation details] of the [name of reporting entity/issuer] OR I am an [employee/shareholder/director or other interested party] in respect of the [name of reporting entity/issuer] or the project/operation.
15. I have no conflicts of interest in respect of the reporting entity/issuer [name of reporting entity/issuer] or the project/operation.
16. At the effective date of the Public Report, to the best of my knowledge, information and belief, the Public Report contains all scientific and technical information required to be disclosed in order to make the Public Report not misleading.

Dated at [place] and [date].

[Signed]

[Name of Competent Person] [Name of Recognised Professional Organisation]

Figure 17. PERC Standard Competent Person Certificate (Appendix 11, PERC, 2021).

10.3 NI 43-101

NI 43-101 requires Competent Persons to provide a signed letter accompanying a technical report to Canada's provincial Securities Commissions stating:

- the Qualified Person's name and employer;
- professional membership;
- consent for the public filing and publication of the Technical Report for which they are the Qualified Person by both securities authorities and the company for which the report was prepared;
- consent for extracts to be included in related filings and news releases; and
- their familiarity with requirements for Disclosure Documents and the appropriate presentation of the Qualified Person's work in those documents.

Each Technical report contains a Qualified Persons certificate for each Qualified Person that has contributed to the report, which effectively matches the content of the Competent Person certificate required under the PERC Standard (discussed above in Section 10.2).

10.4 ASX Competent Person Consent Statement

The ASX requires companies to obtain the prior written consent of the Competent Persons to the form and context in which the Competent Person's work is presented in the Public Report. The prior written consent is required to be retained by the company for all Public Reports of Exploration Results, Mineral Resources and Ore Reserves (ASX, 2022).

ASX Listing Rule 5.22 provides that:

> "The market announcement must only be issued with the prior written consent of the Competent Person or persons as to the form and context in which the exploration results or estimates of mineral resources or ore Reserves (as the case may be) and the supporting information are presented in the market announcement."

The Competent Person may use the JORC Code Consent Form (available from the ASX and JORC websites) to confirm that the Competent Person(s) named in each announcement:

- have read and understand the JORC Code (2012);
- meet the requirements of a Competent Person set out in the JORC Code;
- are Members or Fellows of the AusIMM, the AIG, or an RPO;
- that they have reviewed the report to which the consent statement applies;
- has disclosed to the reporting company the full nature of the relationship between the Competent Person(s) and the company, including any issue that could be perceived by investors as a conflict of interest; and
- that the report is based on and fairly and accurately reflects work undertaken and conclusions reached by the Competent Person, in the form and context in which it appears in the report and any supporting documentation relating to Exploration Targets, Exploration Results, Mineral Resources and/or Ore Reserves.

Compliance with ASX Listing Rules is required by Australian Corporations Law, enforced by ASIC (https://asic.gov.au/about-asic/what-we-do/laws-we-administer/). The ASX can require clarifications or retractions and is able to take action against a listed entity for breaching the Listing Rules (for example, by suspending the entity's securities from quotation or removing the entity from the official list, but cannot fine, or impose any other criminal or civil penalties on, a listed entity for breaching the Listing Rules.

11. Academic Research Related to Assessment of Competence

11.1 Questions of Competence

The self-assessment of competence by mining industry professionals reporting in accordance with the JORC Code has been the subject academic research and several papers in recent years, and a topic discussed regularly within the AusIMM and the AIG by Competent Persons.

Literature on the topic ranges from conference presentations and articles in Professional Organisation newsletters, to a PhD thesis. These contributions provided varied approaches to the competence assessment issue.

11.2 Practice Based Competency Development

11.2.1 Research Outcomes

This formed the subject of a PhD thesis completed by Dr Jacqueline Coombes in 2013 (Coombes, 2013). Dr Coombes is a past AIG representative on JORC whose thesis was prepared with the aim of improving competency criteria and competency development processes within the mining industry, with the overarching goal of improving Mineral Resource estimate reporting standards. Dr Coombes recognised that geologists acting as Competent Persons in accordance with the JORC Code possessed a wide range of capabilities but was concerned by an apparent gap between self-assessed capability and questionnaire assessed technical competence. This created a risk that inflated self-assessed competency could discredit the profession and publicly listed exploration and mining companies and erode investor confidence. This situation mirrors themes encountered in this study. Dr Coombes recognised the importance of both practice exposure and reasoning ability amongst Mineral Resource geologists, as an alternative to relevant experience which forms the basis of competency required by both the JORC Code and other CRIRSCO family reporting codes.

The research underpinning Dr Coombes thesis was limited to the Australian exploration and mining industry reporting environment, which has changed somewhat since 2013, and results based on responses by a small group of participants to 12 survey questions, the results of which were subjected to Rasch analysis.

Dr Coombes research also identified the importance of professional networking and mentoring amongst geologists in focussing attention on relevant areas for professional development by individuals, particularly those who are not long-term employees of companies offering comprehensive professional development programs. Workplace learning, in parallel with formal learning, was viewed as being enhanced by participation in professional networks and communities that create interactions between professionals acting as Competent Persons (Figure 18).

This is elegantly summarised by the observation:

> *"Whilst formal learning processes equip professionals with the language of concepts while informal learning provides situational context that is vital for development of an ability to apply learning." (Coombes, 2013).*

The connection between formal learning and informal learning through application is contingent on timely exposure and, importantly, the accessible guidance of an expert, akin to an apprentice style arrangement. The strategic combination of formal and informal learning needs to be managed to ensure appropriate and timely exposure and application.

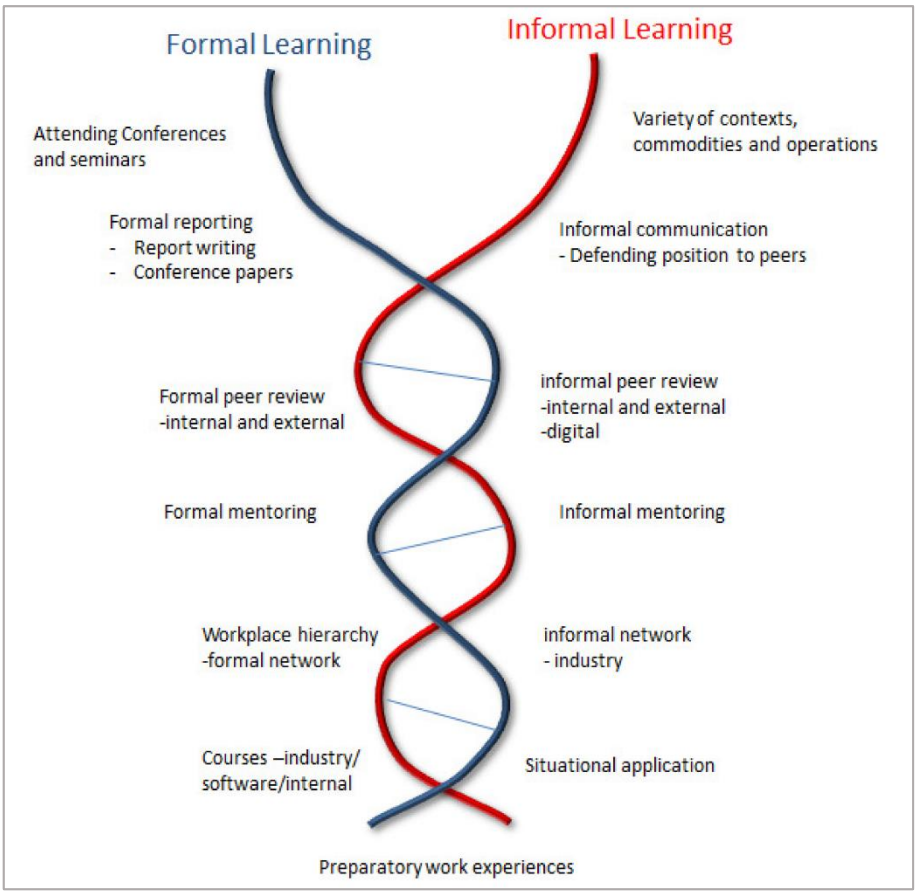

Figure 18. Dualism of formal and informal workplace learning (Coombes, 2013).

Figure 19. Ideal competency development organisation (Coombes, 2013)

The components of an ideal organisation to foster the development of competence (Figure 19) were considered by Dr Coombes to include:

1. Deliberate and targeted funding for resourcing access to expertise that delivers competency development;
2. Articulation of a set of professional standards that draws on the industry standards and is interpreted in the language and purpose of the organisation and supported by constructive sanctioning processes;
3. Allocation of roles and responsibilities that are structured, supported and managed to achieve the corporate standards; and,

4. Considered project and role diversification to enable development of both breadth and depth in competency, including multi-disciplinary interaction and purposeful technical review.

A generalised model of competency development for professional scientists was proposed which comprises three fundamental elements:

1. Articulation of the social structure within which the competency is developed, involving consideration of the structures, processes and human interactions that encompass competency development. This provides an appreciation of the context and importance of competency to the overall operational environment.
2. Competency targets need to be established through:
    a. Exposure in accordance with deliberate practice applications; and,
    b. Attainment of practice context reasoning.

    The first dimension provides a more deliberate measure of experience than simply years in the industry and reflects the opportunities for learning through workplace engagement. The second dimension reflects an ability to contextualise the practice and so contribute more purposefully as a competent industry expert.

3. Address the competency development factors. Professionals striving to achieve competency should address:
    a. Entry requirements specific to the practice;
    b. Workplace experiences that seek to develop breadth and depth, with specific attention to balancing both specialisation and multi-disciplinary experiences and operating across the business value chain at several sites;
    c. Symbiotic weaving of both informal and informal workplace learning methods;
    d. Deliberate development of learning networks that strive for breadth and depth in experts that can be accessed to guide, review and develop competency; and,
    e. Work in ideal organisations.

11.2.2 Critical Findings

Critical findings by Dr Coombes (Coombes, 2013) are summarised, as follows:

- The JORC Code has evolved over time in response to boom-bust economic conditions, not unlike those associated with the development of other international codes of practice.
- The JORC Code includes a specific, well-defined, Public Reporting structure.
- The Code is principles-based and includes no prescriptive evaluation, estimation, and classification process.
- Enforcement focuses on ethical behaviours in accordance with professional bodies' Codes of Ethics.
- Dissemination of information regarding the JORC Code occurs through both deliberate and implicit communication between various bodies, including JORC parent bodies, the ASX, ASIC and other stakeholders to a limited extent. The intent and outcomes of this communication, however, may be misinterpreted due to different discipline perspectives.
- A risk of corporate bullying of Competent Persons, by implicit and explicit means, exists despite reliance on the professional integrity of practitioners preparing information for release in accordance with the Code.

- The effectiveness of the system in sanctioning practitioners is vulnerable due to a lack of technical sanctions, visibility, Institute switching and delays between announcement and reprimand.
- The JORC Code is constantly evolving in response to internal factors, such as misrepresentations of intent by participants in the system, and to perceived anticipated misrepresentations.
- The JORC Code does evolve in response to changes to other, International codes, especially CRIRSCO family codes of practice, but proposed changes are evaluated for suitability to the use of the JORC system in Australasia.
- The introduction of the JORC Code has spawned the emergence of a sub-discipline in exploration and mining geology that focuses on the evaluation, estimation and classification of Mineral Resources.
- Experts have challenged the adequacy of a minimum of five years' relevant experience.
- The valuable contribution of workplace experiences to the development of competency has been noted by geoscientists. Of particular importance to Mineral Resource estimation and classification is exposure to geological contexts to provide both breadth and depth of understanding and an opportunity to learn through reflection and correction.
- Workplace learning plays an important role in the development of Mineral Resource estimation and classification capability in practical contexts.
- Professional membership grade or professional registration were shown not to be a means of differentiating between higher and lower order JORC Code reasoning. Resource geologists with more than the specified minimum of five years' relevant experience tended to possess higher levels of reasoning in relation to the JORC Code.
- Length of experience, experience in developing resource estimates for more than one commodity and resource reconciliation experience all contributed to increased reasoning amongst Competent Persons.
- Resource geologists did not exhibit an ability to reliably self-assess their competency.
- Training in scientific discipline and thinking during Tertiary education was needed to complement technical skills in geological interpretation and resource evaluation.
- Geologists at all levels value opportunities to learn through operational experience and appreciate opportunities for reflective learning associated with continuity of engagement with individual projects or service at an operating mine.
- Mentoring is critical to the development of competency. Most geologists access their immediate and previous connections for learning in a highly personalised manner.
- Learning networks may be egocentric and transient.
- Organisations play a critical role in competency development through providing access to learning opportunities and access to expertise, setting technical standards, provision of appropriately defined roles and responsibilities and provision of exposure to diverse projects.

Many of these points emerge in different aspects of competency for Mineral Resource and Ore Reserve estimation practitioners discussed throughout this study.

Coombes (2013) concluded that higher level reasoning in relation to the JORC Code was more consistently demonstrated by Competent Persons who had:

- at least 10 years' mining industry that includes at least five years' resource estimation experience;
- generated at least 15 resource estimates across at least two commodities; and

- at least 5 reconciliations of their own resource estimates.

This is referred to by Coombes (2013) as the "15-2-5" criteria. Satisfying the 15-2-5 criteria was seen as particularly important in being able to provide meaningful risk assessments. These criteria are beyond those specified for Competent Persons in the JORC Code (2012). A search of the Opaxe™ company reports intelligence database revealed only a very small number of Competent Persons with experience even approaching this metric.

It must be noted that Coombes (2013) specifically examined Mineral Resource estimation by individuals and did not broadly consider preparation and reporting of Mineral Resources in a team context, or other criteria relevant to Public Reporting of Exploration Results or Ore Reserves estimates. The study does address the question and contribute to an understanding of what it takes to develop Competent Persons for the JORC Code-compliant Public Reporting.

11.3 Effective Mentoring

Coombes (2012a) specifically examines the role of mentoring in the development of competence. Coombes (2012b) proposed that the mining industry exhibited a trend of placing inexperienced technical people into positions of responsibility beyond their readiness. These responsibilities included providing the fundamental basis for decision-making, a project's resource model or even daily production grade-control estimates. Relative isolation from experts coupled with the gravity of professional burden before readiness are discussed as sources of real concern with potentially serious implications for the overall success of projects and mining operations, and a source of significant stress for individuals.

Three key components of structured mentoring, required to deliver constructive, effective outcomes for individuals, their teams and organisations, were identified:

1. Readiness;
2. Connection; and,
3. Outcome / delivery focus (Figure 20)

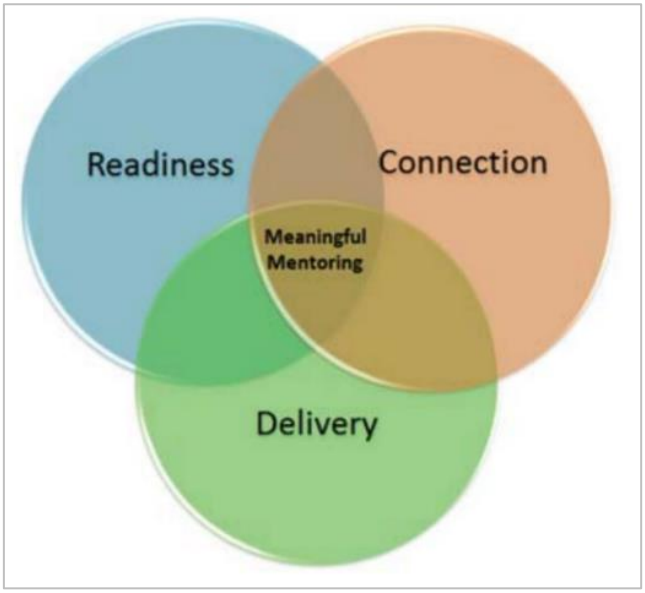

Figure 20. Three components of structured, meaningful mentoring (Coombes, 2012b)

Readiness involves mentors assessing their mentees' background, needs, expectations and reaching agreement on how their time invested in mentoring will be utilised.

Connection requires establishing trust, being open-minded and managing the relationship as a partnership, without which learning and professional development will not progress.

Outcome / Delivery must include both personal and business benefits, such as a demonstrable improvement in the mentee's technical and professional capabilities.

Exploration and mining are described as a technically focussed environment where participants are focused on problem solving through the application of intellect, experience, and skills against a background of limited support and time.

Mentoring plays a key role in experiential learning, recognised as a significant contributor to the development of competence.

11.4 Regulation of Competent Persons

Regulation by Competent Persons is examined by (Coombes, 2012a), who emphasised that due to the complexities and uniqueness of the Mineral Resources and Ore Reserves estimation processes, the JORC Code cannot be prescriptive, and that Competent Persons are required to apply judgement across the mine value chain. The JORC Code, necessarily, allows Competent Persons considerable freedom to exercise their professional judgement, but ensures they can be held to account for their actions (Stephenson & Miskelly, 2001).

In preparing Mineral Resource and Ore Reserve estimates, the Competent Person must choose, and is the only person permitted to choose, how an estimate should be classified (Vaughan & Felderhof, 2005). Competent Persons should also be prepared and able to defend their work and their relevant experience that enables them to fulfil their responsibilities in the presence of their peers (Vaughan & Felderhof, 2005).

Research related to the regulation of Competent Persons in Australia highlighted four areas of weakness (Coombes, 2012a):

1. Institute switching by poor performing or reprimanded Competent Persons.
2. Legal vulnerability undermining reprimands in the complaints process.
3. Current confidentiality requirement limits the firepower of the sanctioning processes.
4. The long turnaround time between complaints and action due to the volunteer structure of the committees limits the powers of sanction.

There have been incidences of a Competent Person, subject to reprimand or threat of reprimand, switching Institutes (e.g., resigning from the AusIMM and joining the AIG), taking advantage of confidentiality provisions relating to dealing with complaints by professional Institutes. This has been addressed to a limited extent by requiring membership applicants to certify that they are not the subject of a professional standards complaint or have been previously judged to have breached another Professional Organisation's Code of Ethics. This does hot, however, prevent a Competent Person being a member of multiple organisations whose members are able to be responsible for Public Reports in accordance with the JORC Code and simply stating a membership that is not subject to sanctions. There have been instances where, upon publication of an adverse Ethics and Standards / Professional Standards Committee finding, that the penalty applied by either the AIG or the AusIMM has been imposed, following review, by the other Professional Organisation. There have also been rare instances, upon review, of one Institute's decision, the other has considered the penalty imposed to be inappropriate, allowing the affected Member to continue to practice.

Both the AIG and the AusIMM have Directors and Officers insurance policies in place and maintain financial reserves that can be used to defend members in this situation, but it does raise the issue of maintenance and demonstration of professional standards to protect the reputations of all professionals. The Professional Organisations are encouraged to review membership terms and conditions to ensure, to the maximum extent achievable, that members are bound to accept the outcomes of the Ethics and Standards processes and indemnify the volunteers involved in those processes.

Professional Organisations are encouraged to publicise details of complaints, as transparency may encourage improvements in reporting. However, the name of the complainant should be strictly confidential to encourage bona-fide complaints.

Professional Institutes are required to give Members who are the subject of complaints adequate time to respond to allegations levied against them. The Professional Organisations also require time to consider complaints, which may involve engaging additional technical, ethics and legal expertise to deal with the matter. The time taken to deal with a complaint is invariably and unavoidably well in excess of the time required for Public Reports that do not comply with the JORC Code to have an impact on a company's share price.

Coombes (2012a) suggests some measures worthy of discussion include:

1. a single register of Competent Persons – regardless of professional institute membership;
2. a single JORC Ethics and Complaints committee with representation from the relevant bodies; and
3. an annual Fitness to Practice declaration, similar to the requirement by the Queensland Board of Professional Engineers.

11.5 Assessment of Relevant Experience Matrix

Legg (2014) proposed the use of a relevant-experience matrix by Competent Persons as a self-assessment of relevant experience measure. Legg (2014) emphasised the impact on employment of cyclicity in the exploration and mining industry on staff continuity and the availability of professionals required to act as Competent Persons created by professionals changing positions or employers, being made redundant or electing to become independent consultants. Companies were also recognised to face a dilemma in identifying appropriately experienced people to act as Competent Persons.

The relevant-experience matrix was proposed as a measure that could be used to both promote Competent Person capabilities and included as an appendix to Public Reports to demonstrate competence. Comparable outcomes could be achieved by including Competent Person CVs, with the shortcoming of information not being presented in a consistent format. The proposed competence matrix addresses this.

An example of the relevant experience matrix proposed by Legg is presented in **Error! Reference s ource not found.**.

The form of disclosure used could be the subject of considerable discussion but the proposal to include a statement of relevant experience, coupled with public access to CVs of individuals acting as Competent Persons has been a theme of more recent discussions, and incorporated, to some extent in the Competent Person certificates included in the current CRIRSCO Template (CRIRSCO, 2019) and PERC standard (PERC, 2021).

Company	Commodity	Deposit Type	Work Type	Time (yrs)	Cultural & Environment	Geology activities	Drilling	QA/QC
Pasminco	PbZn	Broken Hill Type (BHT)	Mine Geology, Exploration, Resource Estimation	3.0		0.45	0.60	
CODES	Cu	Sediment Hosted	Exploration	1.0	0.10	0.30		
Carpentaria Gold Mir	Au	Porphyry/ Granitiod	Mine Geology	0.5		0.13		0.08
Anglo Coal	Coal	Coal	Exploration	1.0	0.00	0.10	0.30	
Gold Fields Australia	Au	Archean Greenstone LODE	Exploration	1.5	0.15	0.15	0.45	0.08
Falconbridge	Cu	Iron Oxide Copper Gold	Exploration	0.3	0.03	0.13		
Falconbridge	PbZn	Broken Hill Type (BHT)	Exploration	0.8	0.08		0.45	0.04
IMC	Au	Epithermal	Mine Planning	0.4				
IMC	Coal	Coal	Mine Planning	0.4				
IMC	Ni	Laterite	Mine Planning	0.4				
IMC	PbZn	Broken Hill Type (BHT)	Resource Estimation	0.4				
Snowden	Al	Bauxite	Resource Estimation	0.1				0.01
Snowden	Cu	Sediment Hosted	Exploration, Geo-Metallurgy, Resource Estimation	1.9			0.19	0.19
Golder Assoc. NZ	GeoTech		Civil	0.2	0.06	0.08	0.06	
Golder Assoc. NZ	Au	Archean Greenstone LODE	Accoustic Televiewer	0.1			0.10	0.01
Golder Assoc. NZ	Magnetite	Archean Ironstone	Accoustic Televiewer	0.5			0.40	0.05
Golder Assoc. NZ	Au	Intrusive Related Gold Deposit (IRD)	Modelling	0.2				
Golder Assoc. NZ	Coal	Coal	Geo-Statistics, drill spacing analysis	1.0				
Vale	Coal	Coal	Resource Estimation, CQ data analysis	1.5				0.08
Golder	Cu Au	Porphyry	Geo Metallurgy, Resource Estimation	0.3				
IMC	Cu Au	Porphyry	Geo Metallurgy, Resource Estimation	0.8				
IMC	Ni	Ni Laterite	Resource Estimation (non JORC)	0.1		0.01		
Total Professional Experience (years)				**16.1**	**0.41**	**1.34**	**2.55**	**0.52**
Total Professional Experience (percentage)				**100%**	**3%**	**8%**	**16%**	**3%**

Table 7. Relevant experience matrix proposed by Legg (2014) for engagement on a structurally controlled base metals resource estimate.

12. Compliance

12.1 Responsibilities for Monitoring JORC Code Compliance for ASX-listed Entities

JORC plays no role in the application of the JORC Code but takes a direct interest in compliance issues to understand what refinements and improvements are required to the Code, and to provide guidance for Competent Persons in the Code's application.

Responsibility for monitoring Public Report compliance with the JORC Code rests with the ASX. Public Reports are the responsibility of the company through its Board of Directors and the ASX, as the market operator, monitors company compliance of Public Reports with the JORC Code. Complaints relating to an incorrect claim of Professional Organisation membership, or inappropriate professional or ethical conduct by a Competent Person, are the responsibility of the AusIMM and the AIG.

In 2003 the ASX introduced a procedure for identifying 'Recognised Professional Organisations' as accredited organisations to which Competent Persons must belong for the purpose of preparing reports on Exploration Results, Mineral Resources and Ore Reserves for submission to the ASX (if they are not members of the AusIMM or the AIG).

As part of the agreement to establish the RPO system, the ASX required that RPOs should not only be capable of dealing with ethical complaints made in respect of Competent Persons and the JORC Code, but that they are seen to be actively implementing this capability if any such complaints are made. Therefore, each RPO has an obligation that if one of its members, acting as a Competent Person under the JORC Code, is reported to the RPO for alleged non-compliance with the JORC Code, and the RPO's investigations uphold the alleged non-compliance, this finding should be communicated to the Chair of JORC when requested annually. In most cases, the RPOs responded that they had received no complaints related to the JORC Code. In only one instance however, a ROPO did state that a complaint related to one of its members was dealt with and the member disciplined.

12.2 Two Tier Complaints and Ethics and Standards Approach

Both the AusIMM and the AIG have adopted a two-tier Complaints and Ethics and Standards approach where:

1. A Complaints Committee receives and assesses the veracity of complaints.
2. Those assessed to have merit, require further examination and consideration of a penalty are referred to the Institute's Ethics and Standards Committee for further consideration and action.
3. A member who is the subject of an adverse Ethics and Standards Committee ruling may appeal the decision to the Institute's Board.

The approach is designed to deliver procedural fairness to both the Member and the complainant.

The Complaints Committee is able to deal with simple, procedural matters where a member should be made aware of an issue, but imposition of a penalty would not be recommended. Matters of this nature are discussed by the Chairs of the respective committees to confirm consensus for the adoption of this approach. Matters where imposition of a penalty may be considered are the responsibility of the Institute's Ethics and Standards or Professional Standards Committees.

The approach resembles that followed for both civil and criminal cases in the broader community where, in civil actions, the veracity of the case is assessed by a lower court, or in criminal matters charges are laid and prosecuted before courts by relevant, statutory authorities.

Both Institutes rely on voluntary reporting of matters requiring attention by the public or Members. The AIG Code of Ethics require members to report potential Code of Ethics breach, therefore a failure of a member to lodge a complaint is itself a breach, but compliance with this provision is effectively impossible to monitor and enforce.

12.3 AusIMM and AIG Complaints and Ethics and Standards Processes

Both Institutes require compliance with several, named standards and guidelines, of which the JORC Code (2012) is one, along with the VALMIN Code (2015).

Compliance issues for Competent Persons relating to the JORC Code principally relate to the underlying principles of transparency, materiality and competence.

Current practice requires complaints to be assessed and managed confidentially, until an adverse finding is made against a member and a penalty imposed, at which point details of the member found to have breached their Institute's Code of Ethics and details of the complaint may be published but, only in very rare instances, are published.

The respective Institute's Code of Ethics forms the basis against which complaints are assessed.

Penalties may include the issuing of an advisory notice, a caution, or issue of a formal remedy in the form of a warning, suspension of membership privileges, fines, cancellation of professional registration and termination of membership.

Members found to have breached the Institutes' Code of Ethics may be publicly named and both the details of the complaint and the penalty imposed published, however this is not common.

The AusIMM, since 2007, has published an annual report by the Complaints (now Professional Standards) and Ethics Committees providing an anonymised summary of the number of cases dealt with, the general nature of issues and an indication of outcomes. The AIG has included comparable summaries of Complaints and Ethics and Standards Committee considerations in reports to members presented at the Institute's annual general meeting, and used findings to prepare anonymised, advisory material for members acting as Competent Persons, published on the Institute's web site and in its member newsletter, AIG News. These practices fall far short of the reporting undertaken by Canadian Provincial Professional Associations.

The confidential processing of complaints has been the source of criticism of a lack of transparency and visibility of actions by both Institutes to maintain professional and ethical standards.

12.4 Visibility of Complaints

12.4.1 AusIMM

The AusIMM has published an annual compliance report in recent years. Copies of the most recent reports can be accessed here:

https://www.ausimm.com/bulletin/bulletin-articles/ausimm-annual-compliance-report-2021/

https://www.ausimm.com/bulletin/bulletin-articles/ausimm-annual-compliance-report-2020/

A summary of the AusIMM completed complaints related to alleged breaches of the JORC Code, the grounds for the complaints and the level of the outcome are summarised in Table 8. The table does not include complaints where no breach was found to have occurred.

Table 8. Summary of AusIMM completed complaints 2013-2021

Year	Number completed	Outcome	Alleged Complaint Grounds
2013	2	Investigation & low level outcome	Non-compliant Public Report
	1	Investigation & substantial outcome	Clause 17
2014	1	Investigation & substantial outcome	Competent Person status
2015	2	Investigation & further education recommended	Clause 50 & Non-compliant Public Report
	4	Investigation & low level outcome	Clauses 17 & 50 & Non-compliant Public Report
2016	9	Investigation & low level outcome	Clauses 3, 4, 5, 6, 9, 12, 18, 19, 22, 49 & Table 1
	1	Investigation & substantial outcome	Clauses 4 & 21
2017	7	Investigation & low level outcome	Clauses 5, 6, 9, 12, 13, 17, 19, 20, 22, 25, 27, 29, 33 & Non-compliant Public Report
	16	Not progressed – greater care recommended	Majority Clauses were 25 & 34
2018	7	Investigation & low level outcome	Clauses 5, 6, 9, 12, 13, 17, 19, 20, 22, 25, 27, 29, 33 & Non-compliant Public Report
	1	Investigation & substantial outcome	Clause 17
2019	2	Investigation & substantial outcome	Clauses 4, 9 & 17
2020	1	Investigation & low level outcome	Clause 11
2021	2	Investigation & low level outcome	Clauses 4, 11, 19 & 49

12.4.2 AIG

The AIG has not released comparable reports to members but does include information on the number of complaints relating to members' conduct dealt with each year in the President's report to members included in the proceedings for each Annual General Meeting which are available from the AIG website www.aig.org.au.

In recent years:

- one compliant was upheld in 2016 related to Table 1 but no adverse finding was made against the member;
- six complaints were upheld in 2017 related to Clause 11, 25 and Table 1 but no adverse findings were made against the members;
- four complaints were received against Members in 2018, all but one of which were related to the JORC Code and resulted in Members being cautioned but not disciplined;
- no complaints were received against Members during 2019;
- one complaint was received during 2020 but was not JORC related;
- thirty-six complaints, all related to the JORC Code, were considered during 2021, all of which resulted in Members being cautioned regarding aspects of their Public Reporting practices; and
- fifteen complaints, all related to the JORC Code, were considered during 2022 to 30th June. Again, all resulted in Members being cautioned regarding aspects of their Public Reporting practices.

The upturn in complaints during 2021 and 2022 was due to the AIG initiating random reviews of ASX announcements requiring compliance with the JORC Code.

The objective of this review was to provide information for this study and to identify needs for targeted education and training for members. Announcements by both the AIG and the AusIMM members were reviewed. Identified compliance issues by AusIMM members resulted in complaints being formally submitted for review by the Institute. A number of Public Reports were issued without a Competent Person being nominated, in which case, announcements were brought to the ASX's attention. These are not included in the figures listed above.

The review suggested that compliance with the JORC Code could be questioned in as many as 5% of announcements.

Information collected by the AIG has also been used to provide education and training to Members in (anonymised to preserve privacy), through the AIG website and articles in newsletters.

Recently, the trial was extended to commending members who were responsible for reports considered to be consistent with best practice.

The trial has received both negative and positive feedback from members. Negative feedback has mainly been received from companies who questioned the right of the AIG to question the conduct of their employee or consultant, particularly in response to an ASX query relating to the announcement in question. The response from members has been overwhelmingly positive, considering the commentary on their work as valuable feedback. Several members have taken the step of asking the Complaints Committee to review Public Reports prior to release in recent weeks, which is an unintended outcome of the trial.

The AIG is currently considering whether and how to maintain this scrutiny of members' performance as Competent Persons. Planned enhancements include producing an on-line dashboard providing real-time information regarding the Public Report review outcomes.

13. Conclusions

The current review of the JORC Code presents an opportunity to address stakeholder concerns relating to competence and the conduct of Competent Persons.

Competency is multi-dimensional and in the context of the JORC Code and professional standards includes:

- qualifications and experience;
- definition of a Competent Person;
- assessment of competence;
- industry training courses;
- monitoring of Public Reports;
- peer review; and
- disciplinary frameworks.

The commissioning of this study demonstrates the commitment of the AIG and the AusIMM, as Professional Organisations and JORC parent bodies, to address these concerns by understanding the current state and examining ways forward to ensure that the status of the JORC Code as a principles-based standard for Public Reporting of Exploration Results, Mineral Resources and Ore Reserves is updated and maintained.

Company directors retain full responsibility for Public Reports relating to mineral resource sector projects and operations being undertaken by their companies.

AusIMM and AIG members are held to account for an obligation to act in the best interests of the (investing) public, which includes taking steps to address practices contributing to risks facing investors including:

- the potential to create an uneven playing field for different types of investors through the manner in which information in Public Reports is presented;
- contributing to potential value destruction associated with mineral resources sector investments by failing to adequately and clearly communicate risks faced by resources projects at all levels, but particularly for projects transitioning into production; and
- failing to ensure that reports are prepared and presented by the most suitably qualified professionals, working within their areas of experience and expertise, with requisite knowledge and experience of all aspects of a project.

All mineral resource projects are subject to risk. The majority of Public Reports released each year relate to early-stage exploration. Early-stage exploration projects are subject to considerable geological risk associated with the potential for realising a discovery and securing access to land to acquire essential knowledge through exploration.

The nature and range of risk changes markedly as projects advance and, in doing so, require a greater range of inputs from increasingly diverse professional disciplines. These inputs cover both the technical and potential environmental, social and community impacts of projects that become increasingly prominent in project development and which may extend well beyond the project site. Risk becomes more complex as projects progress through feasibility towards development and the capital requirements of projects increase, requiring companies to attract funds from a greater range of investment sources.

14. References and Bibliography

AASE. (1973). *Amendments to the Official Lizting Requirements Reprint no. 1., 1 March 1973 in 1974-09 Amendments to Listing Requirements Prior to Sep-Oct 1974.* Melbourne: Australian Associated Stock Exchanges.

AASE. (1974). *Australian Associated Stock Exchanges Listing Manual Section 3F, September 1975. Additional Requirements for Mining Companies.* Melbourne: Australian Associated Stock Exchanges.

ACOP. (2003). *What is a profession?* Canberra: Australian Council of Professions: https://www.professions.org.au/what-is-a-professional/.

ACOP. (2022, March 7). *Professions, Professionals and Professionalism - an introduction.* Retrieved from Australian Council of Professions: https://www.professions.org.au/wp-content/uploads/What-is-a-Profession-Australian-Council-of-Professions.pdf

ACOP. (2022b, March 18). *Professionalism and Ethics.* Retrieved from Australian Council of Professions: https://www.professions.org.au/professionalism-ethics/

ADA. (2022, March 16). *Policy Statement 5.7 - Propfessional Indemnity*. Retrieved from Australian I=Dental Association: https://www.ada.org.au/Dental-Professionals/Policies/Third-Parties/5-7-Professional-Indemnity/ADAPolicies_5-7_ProfessionalIndemnity_V1.aspx

AHPRA. (2022a, March 7). *Registration.* Retrieved from Medical Board: https://www.medicalboard.gov.au/Registration.aspx

AHPRA. (2022b, March 7). *What we do.* Retrieved from AHPRA and National Boards: https://www.ahpra.gov.au/About-Ahpra/What-We-Do.aspx

AIG. (2022, May 19). *Ethics and Complaints Process*. Retrieved from Australian Institute of Geoscientists: https://www.aig.org.au/about-aig/geoscience-news/code-of-ethics/complaints/

AIG. (2022b, May 19). *Education Requirements for AIG Membership*. Retrieved from Australian Institute of Geoscientists: https://www.aig.org.au/education-requirements-for-aig-membership/

AITSL. (2022, March 7). *Prepare to teach*. Retrieved from Australian Institute for Teaching and School Leadership Kimited: https://www.aitsl.edu.au/prepare-to-be-a-teacher/prepare-for-practice

ASIC. (2016, October 12). *ASIC clarifies guidance for forward-looking statements in the mining and resources industry*. Retrieved from Australian Securities and Investments Commission: https://asic.gov.au/about-asic/news-centre/find-a-media-release/2016-releases/16-349mr-asic-clarifies-guidance-for-forward-looking-statements-in-the-mining-and-resources-industry/

ASIC. (2017). *ASIC Regulation of corporate finance: JUly to December 2017. ASIC Report 567.* Canberra: Australian Securities and Investments Commission.

ASIC. (2019). *Prospectues:: Effective dislosure for retail investors. Regukatory Guide 228.* Canberra: Australian Securities and Investments Commission.

ASIC. (2019b). *Disclosure: Why it shouldn't be the default. ASIC Report 632.* Canberra: Australian Securities and Investments Commission (ASIC), Dutch Authority for the Financial Markets (AFM).

ASIC. (2020a, March 4). RE: ASIC consultation and feedback for JORC Code update. *Letter to S. Hunt, JORC Chair*. Perth, W.A., Australia: unpublished.

ASIC. (2020b, March 20). RE: ASIC consultation and feedback for JORC Code update. *ASIC Letter to S. Hunt, JORC Chair*. Perth, W.A., Australia: unpublished.

ASIC. (2021, February 22). ASIC consultation and feedback for JORC Code update. *Letter to S. Hunt, JORC CHair*. Perth, W.A., Australia: unpublished.

ASIC. (2022, March 7). *Professional standards for financial advisers*. Retrieved from Australian Securities and Investments Commission: https://asic.gov.au/for-finance-professionals/afs-licensees/professional-standards-for-financial-advisers/

ASIC. (2022b, March 18). *What is an AFS Licence?* Retrieved from Australian Securities and Investments Commission: https://asic.gov.au/for-finance-professionals/afs-licensees/do-you-need-an-afs-licence/what-is-an-afs-licence/

ASX. (1994). *Listing Rules 1 July 1994, Section 3B Periodic Reports.* Melbourne: Australian Stock Exchange.

ASX. (2013, December 1). *ASX Guidance Note 31: Reporting on Mining Activities.* Retrieved from ASX: https://www.asx.com.au/documents/rules/gn31_reporting_on_mining_activities.pdf

ASX. (2022, Apr 25). *ASX Compliance Downloads - Competent Person Consent Form.* Retrieved from ASX: https://www2.asx.com.au/content/dam/asx/about/compliance/2012-jorc-competent-person-consent-form.pdf

AusIMM. (2007, Mar 15). Minutes, ASX and JORC / Parents Liaison Meeting, 15 Mar 2007. Sydney, NSW, Australia: unpublished.

AusIMM. (2007, June 24). Royal Charter 1955, included in: Resolutions to approve a Supplemental Royal Charter (2007) and for agreement to a revised Code of Ethics (2007). Melbourne, Vic., Australia.

AusIMM. (2022, May 19). *Code of Ethics*. Retrieved from AusIMM: https://www.ausimm.com/about-us/governance/code-of-ethics-and-professional-conduct-regulations/

AusIMM. (2022b, May 23). *Why become an AusIMM Chartered Professional?* Retrieved from AusIMM: https://www.ausimm.com/career-development/accreditation/chartered-professionals/

AusIMM and AMIC. (1972). *Report by the Joint Committee on Ore Reserves, April 1972.* Melbourne: The Australasian Institute of Mining and Metallurgy.

AusIMM and AMIC. (1981). *Reporting of Ore Reserves, Report by Joint Committee of the Australasian Institute of Mining and Metallurgy and Australian Mining Industry Council, Marcj 1981.* Melbourne: The Australasian Institute of Mining and Metallurgy.

AusIMM and AMIC. (1990). *Guidelines to the Australasian Code for Reporting of Identified Mineral Resources and Ore Reserves, May 1990.* Melbourne: Joint Committee of the Australasian Institute of Mining and Metallurgy and Australian Mining Industry Council.

BCSC. (2011, Jun 24). *NI 43-101 Standards of Disclosure for MIneral Projects.* Retrieved from British Columbia Securities Commission: https://www.bcsc.bc.ca/securities-law/law-and-policy/instruments-and-policies/4-distribution-requirements/current/43-101

BCSC. (2016, February 25). *Companion Policy 43-101CP to National Instrument 43-101 Standards of Disclosure for Mineral Projects*. Retrieved from British Columbia Securities Commission: https://www.bcsc.bc.ca/-/media/PWS/Resources/Securities_Law/Policies/Policy4/43101CP-CP-February-25-2016.pdf

Bonham, O., Abbot, D., & Waltho, A. (2017). An International Review of Disciplinary Measures in Geoscience - Both Procedures and Actions. *Geoscience Canada Vol 44, https://doi.org/10.12789/geocanj.2017.44.126*, 181-190.

Burnett, M. (2022). Competency: the role of Professional Organizations and the Competent Person. *An Introduction to the CRIRSCO family of reporting codes* (p. 50). London: Geological Society of London and the Pan-European Resources Reporting Committee.

CAANZ. (2022, March 7). *How to become a Chartered Accountant*. Retrieved from Chartered Accountants Australia-New Zealand: https://www.charteredaccountantsanz.com/become-a-member/memberships/chartered-accountant#Step3

Canadian Securities Administrators. (2022, April 3). *Homepage*. Retrieved from SEDAR: https://sedar.com/homepage_en.htm

Carew, E. (2007). *National Market Interest: The Drive to Unify Australia's Securities Markets.* Crows Nest, NSW: Allen & Unwin.

CIM. (2014). *CIM Definition Standards for Mineral Resources and MIneral Reserves, prepared by the CIM Standing Committee on Reserve Definitions.* Montreal: Canadian Institute of Mining, Metallurgy and Petroleum.

CIM. (2019, Nov 29). *Estimation of Mineral Resources & Mineral Reserves.* Retrieved from Standards, Best Practices & Guidance for Mineral Resources & Mineral Reserves: https://mrmr.cim.org/en/best-practices/estimation-of-mineral-resources-mineral-reserves/

CIM. (2022, March 16). *Standards, best practices and guidance for Mineral Resources and Mineral Reserves*. Retrieved from CIM MRMR: https://mrmr.cim.org

Coombes, J. (2012a, September 25). *Competency Proccesses - how we undermine our own self-regulation*. Retrieved from Australian Institute of Geoscientists: https://www.aig.org.au/competency-processes-how-we-undermine-our-own-self-regulation/

Coombes, J. (2012b). Structuring Meaningful Mentoring. *International Mine Management Conference* (pp. 15-21). Melbourne: AusIMM.

Coombes, J. (2013). *Practice based competency development: a study of resource geologists and the JORC code system.* Perth: PhD Thesis, Faculty of Business and Law, Edith Cowan University, https://ro.ecu.edu.au/theses/610.

CPA Australia. (2022, March 7). *Why study the CPA Program?* Retrieved from CPA Australia: https://www.cpaaustralia.com.au/become-a-cpa/the-benefits-of-being-a-cpa/why-study-the-cpa-program

Cramsie, J. (2002). Twenty-one Years Later: A perspective on the establishment of the AIG. *AIG News V 70, November 2002.*, pp 1-5.

CRIRSCO. (2019, November 1). *International Reporting Template for the public reporting of Exploration Targets, Exploration Results, Mineral Resources and Mineral Reserves November 2019.* Retrieved from CRIRSCO Committee for International Mineral Reserves Reporting

Standards: https://www.crirsco.com/docs/CRIRSCO_International_Reporting_Template_November_2019.pdf

CRIRSCO. (2022, March 3). *Current Activities.* Retrieved from CRIRSCO: Committee for MIneral Reserves International Reporting Standards: https://www.crirsco.com/activities

CSA. (2011). *National Instrument 43-101 Standards of Disclosure for Mineral Projects.* Montreal: Canadian Securities Administrators.

CSA. (2022, March 4). *Welcome*. Retrieved from SEDAR: https://www.sedar.com/homepage_en.htm

Department of Education, Skills and Employment. (2022, April 5). *Qualification Assessment*. Retrieved from Australian Government Department of Education, Skills and Employment: https://internationaleducation.gov.au/services-and-resources/services-for-individuals/Qualifications-assessments/Pages/Qualification-assessment.aspx

Dorsey and Whitney LLP. (2019, February 5). Retrieved from Understanding the SEC's New Mining Disclosure Rules: Questions and Answers: https://www.dorsey.com/newsresources/publications/client-alerts/2019/02/new-mining-disclosure-rules-2019#Qualified

Drury, B. (2021, November 15). *SMSF statistics: 1.1 million members with $822bn in super*. Retrieved from SuperGuide: https://www.superguide.com.au/smsfs/smsf-statistics

Durkin, S. (2022a, Mar 24). Background on NER. Email to P. Stoker. Melbourne, Vic, Australia.

Durkin, S. (2022b, Mar 24). Further Background on NER: Email to P. Stoker. Melbourne, Vic., Australia.

Engineers Australia. (2022, March 7). *Registration of engineers: an overview.* Retrieved from Engineers Australia: https://www.engineersaustralia.org.au/sites/default/files/resource-files/2021-05/registration-of-engineers-overview.pdf

Epstein, R. M., & Hundert, E. M. (2002). Defining and assessing professional competence. *JOurnal of the American Medical Association Vol 287 (2)*, 226-235.

ESMA. (2011, March 23). *Feedback Statement, Consultation Peper on proposed amendments to CESR's recommendations for the consistent implementation of the Prospectuses Regulation regarding mineral companies. ESMA/2011/67.* Retrieved from European Securities and Markets Authority: https://www.esma.europa.eu/sites/default/files/library/2015/11/2011_67.pdf

GSL. (2016, Jun 3). *The Geological Society of London.* Retrieved from Training Guide for Engineering Geologists: https://www.geolsoc.org.uk/~/~/media/shared/documents/Fellowship/GS%20Training%20Guide%20for%20Engineering%20Geologists.ashx

GSSA. (2022, Apr 25). *GSSA Complaints and Disciplinary Process.* Retrieved from Geological Society of South Africa: https://www.gssa.org.za/wp-content/uploads/GSSA-Complaints-Process.pdf

Hardiman, C. (2022, March 16). Email Request: Final Chapter of Volume 1 from the Senate Select Committee on Securities and Exchange with Attachment Hansard FRA-20 August 1975. P Stoker, unpublished. Canberra, ACT, Australia.

Hartley, R. G. (2012, Feb 29). *The Shortage of Engineering and Related Employment Skills, Submission to the Senate Education, Employment and Workplace Relations Committees.* Retrieved from Parliament of Australia: http://www.aph.gov.au/DocumentStore.ashx?id=6bab4906-915d-4f6f-b5b1-3904543f944d

IGI. (2022, Apr 25). *Guidelines for Application to the Institute of Geologists Ireland.* Retrieved from Institute of Geologists of ireland: http://igi.ie/assets/uploads/2022/02/The-Institute-of-Geologists-of-Ireland-Application-Guidelines.pdf

IOM3. (2022, Apr 25). *Professional Member (MIMMM).* Retrieved from IOM3 Institute of Materials, Minerals and Mining: https://www.iom3.org/membership/become-a-member/types-of-membership/professional-member-mimmm.html

Ipsos MORI. (2020, November). *Ipsos MORI Veracity Index 2020*. Retrieved March 16, 2022, from https://www.ipsos.com/sites/default/files/ct/news/documents/2020-11/veracity-index-2020_v2_public.pdf

JORC. (1989). *Australasian Code for Reporting of Identified Mineral Resources and Ore Reserves, 1989 Edition (September 1989).* Melbourne: Joint Committee of the Australasian Institute of Mining and Metallurgy and Minerals Council of Australia.

JORC. (1999). *Australasian Code for Reporting of Mineral Resources and Ore Reserves 1999 Edition.* Melbourne: Joiunt Ore Reserves Committee of the Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Australian Mining Industry Council, February 1989.

JORC. (2004a). *Australasian Code for Reporting Exploration Results, MIneral Resources and Ore Reserves, 2004 edition (December 2004).* Melbourne: Joint Ore Reserves Committee of the Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Australian Mining Industry Council.

JORC. (2004b, Oct 7). Notes on meeting between ASX, JORC, AusIMM and AIG, 7 Oct 2004, ASX office, Sydney. Sydney, NSW, Australia: unpublished.

JORC. (2005, Sep 7). Notes on a meeting between ASX and JORC, 7 Sep 2005. Perth, WA, Australia: unpublished.

JORC. (2006, Aug 3). Minutes of meeting between ASX and JORC, 3 Aug 2006. Sydney, NSW, Australia: unpublished.

JORC. (2012). *Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves - The JORC Code 2012 Edition.* Melbourne: Joint Ore Reserves Committee.

JORC. (2021). *JORC Summary Paper of Key Issues and Work Plan.* Carlton South, Melbourne: Joint Ore Reserves Committee of The Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia (JORC).

JORC. (2022, April 22). *Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves, 2004 Edition, with Australasian Securities Excahnge Companies Updates: 03/08, 11/07, 03/07, 05/04.* Retrieved from JORC Library: https://www.jorc.org/docs/jorc2004web_v2.pdf

KCMI. (2021, March 4). *Menjaga Integritas dan Profesionalisme.* Retrieved from Komite Cadangan Mineral Indonesia: http://www.kcmi.or.id/pdf/oLJ1jZQdSFGxmVBCfy7Dr8InHSdSELZkszSDNwY4.pdf

Larkin, D. (2007, Jan/Feb). From the CEO's Desk - the AusIMM Awards, Compliance with JORC and Domestic Exploration Expenditure. *AusIMM Bulletin*, pp. pp 5-6.

Legg, J. (2014, November). "Trust me - I'm a Competent Person. A transarent approach to demonstrate competency for JORC Reporting. *AIG News No. 118*, pp. 13-19.

Macmillan. (2022). Retrieved from Macmillan dictionary: https://www.macmillandictionary.com/

NI 43-101. (2022, April 6). *Form 43-101F1 (last updated 2011). NI 43-101 Standards of Disclosure for Mineral Projects, Technical Report Format.* Retrieved from British Columbia Securities Commission: https://www.bcsc.bc.ca/securities-law/law-and-policy/instruments-and-policies/4-distribution-requirements/current/43-101

NI 43-101. (2022a, April 6). *NI 43-101 (last updated 2016). Standards of Disclosure for Mineral Projects.* Retrieved from British Columbia Securities Commission: https://www.bcsc.bc.ca/securities-law/law-and-policy/instruments-and-policies/4-distribution-requirements/current/43-101

Noppe, M. (2014). Communicating confgidence in Mineral Resources and Mineral Reserves. *South African Institute of Mining and Metallurgy Vol 114 - March 2014*, p 213-222.

Opaxe Pty Ltd. (2022, March 01). *Explore.* Retrieved from Myopaxe: https://my.opaxe.com/explore

Oxford Languages. (2022). *Oxford Languages*. Retrieved from Oxford University Press.

PERC. (2021, October 1). *Pan European Reserves and Resources Reporting Committee (PERC) Standard.* Retrieved from Pan European Reserves and Resources Reporting Committee (PERC): https://percstandard.org/perc-standard/

Publications Québec. (2021, Dec 1). *Legis Quebec C11 Charter of the French Language*. Retrieved from Publications Quebec: https://www.legisquebec.gouv.qc.ca/en/pdf/cs/C-11.pdf

Queensland Law Society. (2022, March 16). *Professional Indemnity Insurance*. Retrieved from Queensland Law Society: https://www.qls.com.au/Practising-law-in-Qld/Regulation/Professional-Indemnity-Insurance

Rae Report. (1974). *Australian Securities Markets and their Regulation, Part 1, Report from the Senate Select Committee on Securities and Exchange, Volume 3, Parliament of Australia.* Canberra: Australian Government Publishing Service.

Rae Report. (1975). *Australian Securities Markets and their Regulation, Part 1, Report from the Senate Select Committee on Securities and Exchange Volume 3, Parliament of Australia.* Canberra: Australian Government Publishing Service.

Revenue Watch Institute. (2022, April 6). *Oil and Mining Companies on Global Stock Excahnges*. Retrieved from Revenue Watch: https://bit.ly/3uaW9FM

Stephenson, P. R., & Glasson, K. R. (1992). The History of Ore Reserve Classification and Reporting in Australia. *Proceedings of the AusIMM ANnual Conference, The State of the Art - A product of 100 years of Learning, Broken Hill 1992.* (pp. 121-125). Melbourne: The Australasian Institute of Mining and Metallurgy.

Stephenson, P. R., & Miskelly, N. (2001). Reporting Standards and the JORC Code. *Monograph 23: The AusIMM Guide to Good Practice*, 621-630.

Sterk, R. (2022, February 24). *Ever wondered how many professionals act as Competent Persons to sign off on public JORC reporting for mineral projects?* Retrieved from Linkedin: https://bit.ly/3BV5Pq9

Stoker, P. (2011). An example of monitoring compliance JORC, ASX and ASIC. *Competency and International Mineras Reporting* (p. 25). London: CRIRSCO, International Council on Mining and Metals.

Sykes, T. (1978). *The Money Miners: Australia's Mining Boom 1969-70.* Sydney: Wildcat Press.

TMX. (2022, April 6). *~43% of the world's public mining companies are listed on TSX and TSXV*. Retrieved from TMX - Toronto Stock Exchange, TSX Venture Exchange: https://www.tsx.com/listings/listing-with-us/sector-and-product-profiles/mining

U.S. SEC. (2018, December 4). *Modernization of Property Disclosures for Mining Registrants: A Small Entity Compliance Guide*. Retrieved from U.S> Securities and Excahnge Commission: https://www.sec.gov/corpfin/secg-modernization-property-disclosures-mining-registrants

UNECE. (2013). *United Nations Framework Classification for Fossil Energy and Mineral Resources 2009.* Retrieved from United Nations Economic Commission for Europe (UNECE): https://unece.org/fileadmin/DAM/ie/se/pdfs/UNFC/UNFCemr.pdf

Unisearch. (2019). *Opal Tower Investigation Final Report Independent Advice to NSW Minister for Planning and Housing, 19 Feb 2019.* Sydney: Unisearch Expert Opinion Services.

Vaughan, W. S., & Felderhof, S. (2005). International mineral resource and mineral reserve classification and reporting systems. *CIM Bulletin 98 (1086)*, 1-13.

Waldie, C., & Whyte, J. (2019, Oct 16). *Overview of NI 43-101 and Mining Disclosure Basics, Standards of Disclosure for Mineral Projects.* Retrieved from Professional Geologists of Ontario: https://www.pgo.ca/files/events/webinar-ni-43-101-2019.pdf

Waltho, A. E. (2022, May 12). *JORC Code Compliance Review*. Retrieved from Australian Institute of Geoscientists: https://www.aig.org.au/review-ofjorc-code-compliance/

West, R. (2022). Personal Communication. (P. Stoker, Interviewer)

Wolfe, D. (2020, April 27). *Requirements for Mining Companies Listed on a U.S. Stock Exchange are Changing - is Your Business Ready?* Retrieved from Golder: https://www.golder.com/insights/requirements-for-mining-companies-listed-on-a-u-s-stock-exchange-are-changing-is-your-business-ready/

Wolff, L. (2013). Litigiousness in Australia: lessons from comparitive law. *Deakin Law Review Vol 18, 2*, 271-289.

15. Glossary

A summary of key terms used in this study and their intended meaning and interpretation. The definitions of a number of terms are based on those included in the JORC Code (2012).

Term	Definition
accreditation	Acknowledgement of the ability of a person to fulfil the defined requirements of a role or responsibility by a Professional Organisation
Australian Professional Organisations	The Australian Professional Organisations are the AusIMM and the AIG.
competence	Possession of qualifications and experience.
Competent Person	A professional meeting the requirements of authors of Public Reports relating to Exploration Results, Mineral, Resources and Ore Reserves in accordance with the JORC Code.
Curriculum Vitae (CV)	A brief account of a person's education, qualifications and previous employment.
continuing professional development (CPD)	Continuing education and skills development intended to maintain the currency of existing qualifications and experience and knowledge of professional issues
continuous disclosure	An obligation of public companies to inform investors and potential investors of any information that could materially impact the value of a company's securities, specified in securities exchange Listing Rules.
ethics	Moral principles that govern a person's behaviour or the conducting of an activity
Exploration Results	data and information generated by mineral exploration programs that might be of use to investors, but which do not form part of a declaration of Mineral Resources or Ore Reserves.
Feasibility Study	A comprehensive technical and economic study of the selected development option for a mineral project that includes appropriately detailed assessments of applicable Modifying Factors together with any other relevant operational factors and detailed financial analysis that are necessary to demonstrate at the time of reporting that extraction is reasonably justified (economically mineable). The results of the study may reasonably serve as the basis for a final decision by a proponent or financial institution to proceed with, or finance, the development of the project. The confidence level of the study will be higher than that of a Pre-Feasibility Study.
Indicated Mineral Resource	That part of a Mineral Resource for which quantity, grade (or quality), densities, shape and physical characteristics are estimated with sufficient confidence to allow the application of Modifying Factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit. An Indicated Mineral Resource is

	subject to greater confidence in information and interpretation that an Inferred Mineral Resource.
Inferred Mineral Resource	That part of a Mineral Resource for which quantity and grade (or quality) are estimated on the basis of limited geological evidence and sampling. Geological evidence is sufficient to imply but not verify geological and grade (or quality) continuity. It is based on exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes.
materiality	A requirement that Public Reports to contain all information that investors and their advisers would reasonably require to assess a project in order to reach a "reasoned and balanced judgement" based on the information presented
Measured Mineral Resource	That part of a Mineral Resource for which quantity, grade (or quality), densities, shape, and physical characteristics are estimated with confidence sufficient to allow the application of Modifying Factors to support detailed mine planning and final evaluation of the economic viability of the deposit. A Measured Mineral Resource is subject to greater confidence in information and interpretation that an Indicated Mineral Resource.
Mineral Resource	Concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade (or quality) and quantity that there are reasonable prospects for eventual economic extraction.
NI 43-101	Canadian National Instrument 43-101 is a standard, referenced in legislation, specifying requirements for the presentation of Public Reports of Exploration Results, Mineral Resources and Mineral Reserves to Canadian securities exchanges
NRO	National Reporting Organisation, recognised by CRIRSCO for Public Reports of Exploration Results, Mineral Resources and Mineral/Ore Reserves
Ore Reserve	The economically mineable part of a Measured and/or Indicated Mineral Resource. It includes diluting materials and allowances for losses, which may occur when the material is mined or extracted and is defined by studies at Pre-Feasibility or Feasibility level as appropriate that include application of Modifying Factors.
Parent Bodies	The JORC Parent Bodies are the AusIMM, the AIG and the MCA.
Pre-Feasibility Study (PFS)	A Pre-Feasibility (Preliminary Feasibility) Study is a comprehensive study of a range of options for the technical and economic viability of a mineral project that has advanced to a stage where a preferred mining method, in the case of underground mining, or the pit configuration, in the case of an open pit, is established and an effective method of mineral processing is determined. It includes a

	financial analysis based on reasonable assumptions on the Modifying Factors and the evaluation of any other relevant factors which are sufficient for a Competent Person, acting reasonably, to determine if all or part of the Mineral Resources may be converted to an Ore Reserve at the time of reporting. A Pre-Feasibility Study is at a lower confidence level than a Feasibility Study.
Public Report	Any statement of Exploration Results, Mineral Resources and Ore Reserves and supporting information, available to the public, released for the purpose of guiding, informing and promoting investment decisions
professional association	Synonymous with Professional Organisation in the context of this study
Professional Organisation	Organisation representing professionals within a discipline or industry, with its structure described by a constitution and whose members agree to abide by an enforceable Code of Ethics as a condition of membership
Qualified Person	Effectively synonymous with Competent Person (used in Canadian and U.S. Public Reporting regimes)
registration	Professional licensure/ability to practice in a particular field, assessed and managed by a government agency or statutory authority established by legislation or regulation.
relevant experience	Experience in assessing the style mineralisation or deposit being evaluated and the activity that a Competent Person is undertaking
risk	Technical and commercial uncertainty associated with parameters forming the basis of Public Reports of Mineral Resources and Ore Reserves
Recognised Professional Organisation (RPO)	Recognised overseas Professional Organisation to which Competent Persons must belong for the purpose of preparing reports on Exploration Results, Mineral Resources and Ore Reserves for submission to the ASX
Scoping Study	An order of magnitude technical and economic study of the potential viability of Mineral Resources. It includes appropriate assessments of realistically assumed Modifying Factors together with any other relevant operational factors that are necessary to demonstrate at the time of reporting that progress to a Pre-Feasibility Study can be reasonably justified.
S-K 1300	Standard for Public Reporting of Exploration Results, Mineral Resources and Ore Reserves in the USA, effective 1 January 2021
stakeholder	A person with an interest or concern in something, especially a business.
self-accreditation	Accreditation asserted by individual practitioners, willing to have their qualifications and relevant experience prepared to demonstrate

	competence to a panel of their peers convened by a Professional Organisation of which they are a Member.
Table 1	Table 1 is a checklist or reference for use by those preparing Public Reports on Exploration Results, Mineral Resources and Ore Reserves, the format and use of which is set out in the JORC Code (2012).
transparency	A requirement that readers of Public Reports are provided with sufficient, clear and unambiguous information and "*not misled by omission of material information that is known to the Competent Person*".
VALMIN Code	Australasian Code for Public Reporting of technical assessments and valuations of mineral assets", commonly known as the VALMIN Code.

16. Abbreviations and Acronyms

ACOP	Australian Council of Professions
AFS	Australian Financial Services
AIG	Australian Institute of Geoscientists
AIM	Alternative Investment Market
AMIC	Australian Mining Industry Council (now MCA)
APEGA	Association of Professional Engineers and Geoscientists of Alberta
APGO	Association of Professional Geoscientists of Ontario
ASIC	Australian Securities and Investment Commission
ASX	Australian Securities Exchange
AusIMM	Australasian Institute of Mining and Metallurgy
BCSC	British Columbia Securities Commission
CA	Chartered Accountant
CBA	competency-based assessment
CC&E	clear, concise and effective
CEO	Chief Executive Officer
CIM	Canadian Institute of Mining, Metallurgy and Petroleum
CP	AusIMM Chartered Professional
CPA	Certified Practising Accountant
CPD	Continuing Professional Development
CPEng	Chartered Professional Engineer (Engineers Australia)
CPI	Competent Person Indonesia
CPRs	Competent Persons Reports (South Africa)
CPWG	Competent Person Working Group
CRIRSCO	Committee for Mineral Reserves International Reporting Standards
CSA	Canadian Securities Administrators
CV	Curriculum Vitae
EA	Engineers Australia
ECSA	Engineering Council of South Africa
EDGAR	Electronic Data Gathering, Analysis, and Retrieval system (SEC)
EGBC	Engineers and Geoscientists British Columbia
ESG	Environmental, social and governance
ESMA	European Securities and Markets Authority
FAIG	Fellow of Australian Institute of Geoscientists
FAMMP	Fennoscandian Association for Minerals and Metals Professionals
FAusIMM	Fellow of Australasian Institute of Mining and Metallurgy
FCA	Financial Conduct Authority (UK)
FMA	New Zealand's Financial Markets Authority
GradDipCA	Graduate Diploma of Chartered Accounting
GSA	Geological Society of Australia
GSSA	Geological Society of South Africa
IAGI	Indonesian Association of Geologists
IDX	Indonesia Stock Exchange
IGI	Institute of Geologists of Ireland

IIROC	Investment Industry Regulatory Organization of Canada
IMEB	Iberian Mining Engineers Board
IMSSA	Institute of Mine Surveyors of Southern Africa
INFO214	ASIC Information Sheet 214
IOM3	Institute of Materials, Minerals & Mining
JORC	Joint Ore Reserves Committee
JSE	Johannesburg Stock Exchange
KCMI	Komite Cadangan Mineral Indonesia (Indonesian Joint Committee for Mineral Reserves)
LOM	life of mine
LSE	London Stock Exchange
MAIG	Member of the Australian Institute of Geoscientists
MAusIMM	Member of the Australasian Institute of Mining and Metallurgy
MCA	Minerals Council of Australia
MIMMM	Member of the Institute of Materials, Minerals & Mining (IOM3)
MPIGM	Mongolian Professional Institute of Geosciences and Mining
MRC	Mongolian Mineral Resources and Reserves Committee
MRMR	Estimation of Mineral Resources & Mineral Reserves (CIM Best Practice guidelines)
MRRR	Mineral Resources and Reserves Reporting (IOM3)
MTAMC	Mining Technical Advisory and Monitoring Committee
NAEN	National Association of Subsoil Expertise (Russia)
NER	National Engineering Register
NERB	National Engineering Registration Board
NI 43-101	Canadian National Instrument 43-101
NPER	National Professional Engineers Register
NRO	National Reporting Organisation
NSW	New South Wales
NZX	New Zealand Exchange
OERN	Russian Society of Subsoil Use Experts
OGQ	Ordre des Géologues du Québec
OQLF	Office Québécois de la Langue Française
OSC	Ontario Securities Commission
P.Eng.	Registered Professional Engineer
P.Geo.	Registered Professional Geologist
PDAC	Prospectors and Developers Association of Canada
PERC	Pan European Reserves and Resources Reporting Committee
PERHAPI	Association of Indonesian Mining Professionals
PGA	Professional Governance Act (British Columbia)
PGO	Professional Geoscientists Ontario
PNG	Papua New Guinea
PO	PERC Participating Organisation
QA/QC	Quality assurance and Quality control
QP	Qualified Person
ROPO	Recognised Overseas Professional Organisation
RPGeo	AIG's Registered Professional Geoscientist
RPO	Recognised Professional Organisation

SACNASP	South African Council for Natural Scientific Professions
SAGC	South African Geomatics Council
SAIMM	Southern African Institute of Mining and Metallurgy
SAMCODES	collective name for the South African Mineral reporting codes
SAMOG	South African Code for the Reporting Of Oil and Gas Resources
SAMREC	South African Code for the Reporting of Exploration Results, Mineral Resources and Mineral Reserves
SAMVAL	South African Code for the Reporting of Mineral Asset Valuation
SEC	US Securities and Exchange Commission
SEDAR	System for Electronic Document Analysis and Retrieval (Canada)
S-K 1300	U.S. reporting standard S-K 1300
SME	Society for Mining, Metallurgy and Exploration
SMSF	Self-managed superannuation funds
SSC	SAMCODES Standards Committee
TRS	Technical Report Summary
TSX	Toronto Stock Exchange
UNFC	United Nations Framework Classification
USA	United States of America