Module 2: JORC Code & The Resource / Reserve Hierarchy

Why this matters

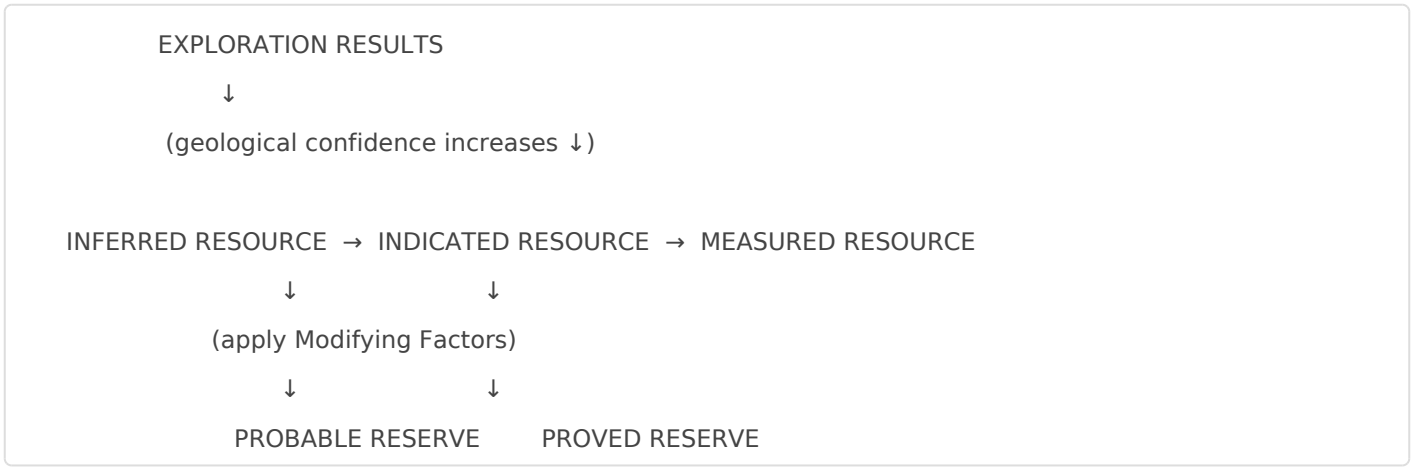
The JORC Code is **the rulebook** for how Australian-listed mining companies report exploration results, mineral resources, and ore reserves. It is the single biggest source of retail confusion and the single biggest place companies legally mislead unsophisticated investors.

If you can't read a JORC table and explain what each category means, you are gambling — not investing — in mining.

The basics

- **JORC** = Joint Ore Reserves Committee
- **Current code:** JORC Code 2012 (released December 2012). A revised version has been in consultation for several years; check the JORC website for current status.
- **Mandatory** for all ASX-listed companies reporting exploration results, resources, or reserves.
- Aligned to the international **CRIRSCO** template, so JORC, NI 43-101 (Canada), SAMREC (South Africa), PERC (Europe) and SK-1300 (US SEC) are broadly equivalent though not identical. (More on the differences later in this module.)

The hierarchy (most important diagram in mining)



Two key rules baked into this diagram:

1. **Inferred resources cannot be converted directly to reserves.** They must first be upgraded to Indicated or Measured via additional drilling. This is a hard rule and one of the most common things companies blur in their wording.
2. **Reserves require Modifying Factors to be applied.** A resource is a geological estimate; a reserve is an *economic* statement that the rock can be mined and processed profitably under defined assumptions.

Resource categories

Inferred Resource

- Lowest geological confidence.
- Drill spacing wide (often hundreds of metres).
- Tonnage and grade are estimated based on limited sampling.
- **Cannot be used in reserve calculations.**
- **Cannot be used in PFS or DFS economics** (with very narrow exceptions).
- *Can* be used in Scoping Studies — which is one reason scoping studies are not bankable.

Indicated Resource

- Moderate confidence.
- Drill spacing tight enough that geological and grade continuity can reasonably be assumed.
- **Can be converted to Probable Reserves** after Modifying Factors.
- Required basis for PFS economics.

Measured Resource

- Highest geological confidence.
- Very tight drill spacing, often supported by trenching, channel sampling, or underground development.
- **Can be converted to Proved Reserves** (or Probable, depending on confidence in Modifying Factors).

Sub-categories you'll see

Modifiers like "in-situ" vs "extractable", "open-pittable" vs "underground", or constraints by depth or pit shell. Read carefully — companies sometimes report a big global resource then quietly disclose only a fraction is within an economic pit shell.

Reserve categories

Probable Reserve

- Derived from Indicated (or sometimes Measured) Resources after applying Modifying Factors.
- Lower confidence than Proved.

Proved Reserve

- Derived from Measured Resources after applying Modifying Factors.
- Highest confidence economic mining inventory.

The Modifying Factors

To convert a resource to a reserve, the Competent Person must apply realistic assumptions about:

- **Mining** (method, dilution, recovery, geotech)
- **Processing** (metallurgical recovery, throughput)
- **Metallurgical** (test work supporting flowsheet)
- **Infrastructure** (power, water, roads, port access)

- **Economic** (commodity price, opex, capex, royalties, taxes)
- **Marketing** (offtake potential, product specifications)
- **Legal** (tenements, mining leases)
- **Environmental** (approvals, rehabilitation)
- **Social** (community agreements, ILUAs)
- **Governmental** (royalty regimes, foreign investment rules)

If any of these don't stack up, the resource cannot become a reserve. Many "huge resources" never become reserves because of metallurgy, infrastructure, or social licence.

Competent Person (CP) requirement

Every public report of exploration results, resources, or reserves must:

1. Be signed off by a **Competent Person** — a member of AusIMM, AIG, or a recognised overseas equivalent (RPEQ, etc.).
2. Have at least 5 years' relevant experience in the style of mineralisation/deposit type and the activity being reported.
3. Include a **named consent** statement that the CP has reviewed and approved the form and context of the announcement.

If the CP statement is missing, vague about credentials, or the CP is the company's CEO with no relevant background — that's a flag.

Reading a JORC resource table

A standard table looks like:

Category	Tonnes (Mt)	Grade (g/t Au)	Contained Au (Moz)
Measured	5.0	2.5	0.40
Indicated	12.0	1.8	0.69
Inferred	25.0	1.4	1.13
Total	**42.0**	**1.65**	**2.22**

What to actually look at:

1. **% of resource that is Inferred.** If it's 60%+, the headline ounces are largely speculative. Many junior "1Moz+" announcements are 70-90% Inferred.
2. **Cut-off grade applied.** Always disclosed in the announcement footnotes. A resource at 0.3 g/t cut-off vs 0.8 g/t cut-off describes a fundamentally different deposit.
3. **Top-cut applied.** Were extreme high-grade assays capped (e.g., capped at 30 g/t)? If not, the average grade may be skewed by a few bonanza intercepts.
4. **Density assumption.** Tonnage = volume × density. Wrong density = wrong tonnage.
5. **Constraints.** Was the resource constrained inside a pit shell at a given commodity price? At what price?

Common gotchas (where companies legally mislead)

"Exploration Target"

This is **NOT** a JORC resource. It's a conceptual range (e.g., "10–25 Mt at 1.5–2.5 g/t Au"). The JORC code allows it but requires explicit wording that it is conceptual, not a resource estimate, and based on insufficient drilling. Companies often headline this and bury the disclaimer.

Historical Estimates

Often quoted by companies that have just acquired old projects. **Not JORC-compliant** unless re-validated by a Competent Person under the 2012 Code. Headlines like "historical resource of 500,000 oz" are essentially marketing until JORC-validated. Covered in detail in the foreign-and-historical-estimates section below.

"Ore"

Strictly, "ore" means rock that is *economically* extractable — i.e., reserve-quality. Companies use "ore" loosely for inferred resources, which is technically non-compliant. Watch the language.

Resource on resource on resource

Multiple updates in a year, each headlined as if it's a fresh discovery, when it's the same deposit being re-drilled and re-categorised. Look at how the *Indicated + Measured tonnes* are growing, not just the headline total.

"No new drilling, just changed parameters" — the parameter-shuffle MRE

This is one of the more important patterns to recognise because it looks like progress and isn't.

A Mineral Resource Estimate (MRE) update can grow the headline resource without any new drilling at all, simply by changing the input parameters:

- **Lowering the cut-off grade** — sweeps in more low-grade material that was previously below cut-off
- **Raising the assumed commodity price** — extends the economic pit shell, capturing more material at depth or at the edges
- **Loosening the geological continuity assumption** — links blocks of mineralisation that were previously separate
- **Changing the top-cut** — letting bonanza intercepts have more influence on the average grade
- **Re-classifying based on revised drill spacing rules** — moving material from Inferred to Indicated without new drilling, on the basis of the geologist's revised judgment

None of this is necessarily wrong. Cut-offs should reflect current commodity prices. Geological models do get refined. But when an MRE update grows materially **without new drilling**, the right read is "the same rock has been re-described" — not "we've discovered more ore."

How to spot it

When an MRE update is announced:

1. **Read the methodology section.** It will state how many new holes were drilled since the last update. If the answer is "none" or "very few", the change is parametric.
2. **Compare the cut-off used.** A drop from 0.5 g/t to 0.3 g/t can grow tonnage 30–50% on the same drilling.
3. **Compare the commodity price assumption.** If the price assumption moved from $1500/oz to $2500/oz, the pit shell and economics expand without any geological change.
4. **Look at the Indicated + Measured tonnage in particular.** Adding Inferred tonnes is easier than adding I+M tonnes. The latter requires real new drill data.
5. **Read the Competent Person statement.** It will (or should) note any methodology changes.

Example of what this looks like in announcements

A company reports: "Updated MRE delivers 35% increase in contained gold, project now hosts 2.7 Moz Au." Reading the body:

- Same number of drill holes as the prior MRE
- Cut-off lowered from 0.5 g/t to 0.3 g/t
- Gold price assumption lifted from US$1800/oz to US$2400/oz
- Top-cut raised from 25 g/t to 50 g/t
- Pit shell expanded as a result of the higher price

The deposit is exactly the same. The headline 35% growth is parametric. The Indicated + Measured fraction may even be lower than before (because the new Inferred tonnes added at lower cut-off are likely Inferred-only).

A genuine resource upgrade would include a meaningful new drilling campaign, with hole counts and metres drilled since the prior estimate disclosed in the methodology section.

When parameter changes are legitimate

They aren't always misleading. If gold prices have genuinely doubled, lowering the cut-off and re-running the pit shell is the correct technical response — the prior MRE was conservative for current conditions. The flag isn't "they changed parameters." The flag is "they changed parameters and headlined it as a resource growth event without making clear what drove the change."

The honest version of the same announcement would be: "MRE re-stated under updated price and cut-off assumptions; headline tonnage increased 35% with no change to the underlying geology or drilling."

The promotional version is: "Resource grows 35%."

Same numbers, different read. The body of the announcement is where the truth lives.

Foreign and historical estimates — what they are and how to read

them

A common situation: an ASX company acquires a project that already has a resource estimate calculated under a non-JORC code (Canada's NI 43-101, the US SEC's SK-1300, South Africa's SAMREC, etc.) or under no modern code at all (a "historical estimate" from the 1980s, 1990s, or earlier).

These cannot be reported as a JORC resource, but ASX **does** allow them to be disclosed under specific rules.

The CRIRSCO family

The Committee for Mineral Reserves International Reporting Standards (CRIRSCO) sets a template that JORC, NI 43-101, SK-1300, SAMREC, PERC, and others all derive from. They share the same hierarchy (Inferred → Indicated → Measured for resources, Probable → Proved for reserves) and the same conceptual framework around Modifying Factors and Competent Persons (or "Qualified Persons" in the North American codes).

The codes are conceptually equivalent but **not identical**. Differences exist in:

- Specific drill spacing requirements for each classification
- The level of detail required in technical reports
- Filing and disclosure mechanisms
- The application of classification judgment in marginal cases

NI 43-101 (Canada)

National Instrument 43-101 is Canada's mandatory mineral disclosure standard, in force since 2001. Reports are signed off by a "Qualified Person" (the Canadian equivalent of a Competent Person), filed publicly on SEDAR+, and tend to be more detailed than the equivalent ASX disclosures.

Key practical points:

- NI 43-101 technical reports are typically more comprehensive — they include detailed sections on geology, drill data, QA/QC, metallurgical testwork, and economic analysis
- They're publicly downloadable from SEDAR+ (sedarplus.ca) at no charge
- The Indicated → Measured threshold under NI 43-101 is broadly aligned with JORC, though application can differ
- A NI 43-101 resource is the closest international cousin to a JORC resource

SK-1300 (US SEC)

The US SEC modernised its mineral disclosure rules in 2018 (effective 2021), replacing the old "Industry Guide 7" — which was famously restrictive (it didn't allow companies to disclose Resources at all, only Reserves). SK-1300 brought the US into rough alignment with JORC and NI 43-101.

- Uses "Qualified Person" terminology
- Allows Resource and Reserve reporting in the same hierarchy
- Filed via the SEC's EDGAR system
- Slightly more conservative in some areas than JORC/NI 43-101

SAMREC (South Africa) and PERC (Europe)

Functionally similar to JORC for African and European projects respectively. PERC tends to be more common for European projects (especially Sweden, Finland, Spain, Portugal). SAMREC is the standard for South African and many sub-Saharan African operations.

ASX Listing Rule 5.12 — how foreign estimates get reported

ASX Listing Rule 5.12 allows a company to disclose a foreign estimate (an estimate calculated under NI 43-101, SK-1300, SAMREC, or another recognised foreign code) but with strict requirements:

1. **The estimate is not classified as a JORC resource** until a Competent Person reviews and signs off
2. The company must clearly state that it is **not reported in accordance with JORC Code 2012**
3. The company must disclose **whether a Competent Person has done sufficient work to consider the estimate JORC-compliant** — and if not, what work is required to bring it up to JORC standard
4. The company must state that the estimate **must not be relied upon** in the same way as a JORC-compliant resource

This is why ASX announcements about foreign-acquired projects often include a long disclaimer paragraph alongside the foreign estimate numbers.

Why this matters legitimately

The use case is straightforward: a company acquires a project that already has, say, an NI 43-101 resource from a prior Canadian or TSX listing. On day one of the acquisition, the company can disclose that the project hosts X tonnes at Y g/t under NI 43-101. They then commission a Competent Person to do the work — usually 6 to 18 months — to convert the estimate to JORC. This work involves reviewing the underlying drill data, validating QA/QC, sometimes drilling twin holes, and producing a fresh CP report.

Letting the market price in the underlying value during this transition is reasonable. Forcing the company to keep a known resource secret for 18 months would be the wrong outcome.

Where to be careful

Pre-2014 NI 43-101 reports used slightly different rules. Always check the date of the foreign estimate report. Reports from the early 2000s may have been calculated under standards that are now considered loose by current practice.

Historical estimates are *different* from foreign estimates. A historical estimate is a pre-modern-code calculation — a 1980s calculation, a 1990s calculation, a Soviet GKZ resource — that doesn't conform to *any* current code. ASX allows these to be disclosed under Listing Rule 5.12 too, but with even stricter disclaimers. The qualification typically reads something like: "the historical estimate is not reported in accordance with the JORC Code 2012 and a Competent Person has not done sufficient work to classify the historical estimate as a Mineral Resource in accordance with the JORC Code 2012."

Treat historical estimates with significantly more scepticism than NI 43-101 or SK-1300 estimates. The methodology, sampling, and assays underpinning them often don't meet modern standards. Re-validation frequently results in significant downgrades.

What to expect when foreign estimates get converted to JORC

A few rules of thumb:

- The JORC version is usually the **same size or smaller** than the foreign estimate, rarely larger
- Material classified as **Indicated under NI 43-101 may be reclassified as Inferred under JORC** because of differing application of confidence judgment
- Old historical estimates frequently lose 20–40% of their headline tonnage on JORC re-validation, sometimes more
- **Grades may be revised downward** if top-cuts get applied where they weren't before, or if old assays from inadequate QA/QC procedures get excluded

- The re-stated JORC number is the one you should use for valuation; the foreign estimate is for orientation

Do not extrapolate from headline foreign estimates. Wait for the JORC re-statement, then re-anchor your valuation.

The perpetual-foreign-estimate pattern (covered in Module 8)

Some companies disclose a foreign estimate at acquisition and never seem to deliver the JORC version. 12 months pass, then 18, then 24, with quarterly reports continuing to mention "the JORC re-statement is in progress." This is a behavioral red flag covered in detail in Module 8 — at minimum it raises the question of why the JORC work is taking so long, and at worst it suggests the company knows the JORC version will be substantially smaller than the foreign estimate they keep referring to.

Why "10Moz" doesn't mean what you think

A 10Moz Au resource sounds enormous. But:

- If 70% is Inferred, you have 3Moz of bankable rock until further drilling.
- If grade is 0.6 g/t, the project is marginal at best (gold).
- If cut-off was set at 0.3 g/t, lifting the cut-off to 0.8 g/t might leave you with 2Moz.
- If the deposit is at 800m depth and the company is a $20m junior, no one is mining it for 15 years.
- If it's in a jurisdiction with permitting/sovereign risk, it might never be mined.
- If it's reported as a NI 43-101 estimate that hasn't been JORC-validated, the JORC version may be smaller.
- If the headline grew through parameter shuffle rather than new drilling, the deposit hasn't changed.

Resource size **without context** is meaningless. This is the most common retail mistake in mining.

Practical exercise

Pull up the latest resource update from any ASX gold or copper junior you follow. Answer:

1. What % of the contained metal is Inferred vs Indicated vs Measured?
2. What cut-off grade was used? What was used in the prior estimate?
3. Was a top-cut applied? At what value? Same as prior estimate?
4. Is the resource constrained inside a pit shell? At what commodity price?
5. Who is the Competent Person and are they independent of the company?
6. **How many new drill holes / metres have been drilled since the prior estimate? If "none", the headline change is parametric.**
7. **Is any part of the disclosed resource a foreign estimate or historical estimate, not yet JORC-validated?**

If you can answer these for every position you hold, you're ahead of 95% of retail.

What I'm uncertain about

- Whether the JORC 2012 Code revision (long in consultation) has been finalised at the time you're reading this. Worth checking the JORC website (jorc.org) for current status.
- Specific recent ASX enforcement actions — there have been periodic crackdowns on misleading resource statements but I'd want to verify recent specifics rather than name them from memory.
- Specific application differences between JORC and NI 43-101 in marginal cases. The high-level framework above is solid; for specific edge cases, refer to the actual code documents.
- The 20–40% downgrade rule of thumb for historical estimate re-validation is anecdotal and varies enormously by deposit. Some are fine; some collapse to nothing.

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