

NI 43-101 Technical Reports: Basics and Pitfalls

Standards of Disclosure for Mineral Projects

Craig Waldie, P.Geo., Senior Geologist, Corporate Finance

Jim Whyte, P.Geo., Senior Geologist, Corporate Finance

November 13, 2019

Caution

"The views expressed in this presentation are the personal views of the presenting staff and do not necessarily represent the views of the Commission or other Commission staff.

The presentation is provided for general information purposes only and does not constitute legal or technical advice.

Information has been summarized and paraphrased for presentation purposes and the examples have been provided for illustration purposes only. Responsibility for making sufficient and appropriate disclosure and complying with applicable securities laws remains with the company.

Information in this presentation reflects securities laws and other relevant standards that are in effect as of the date of the presentation.

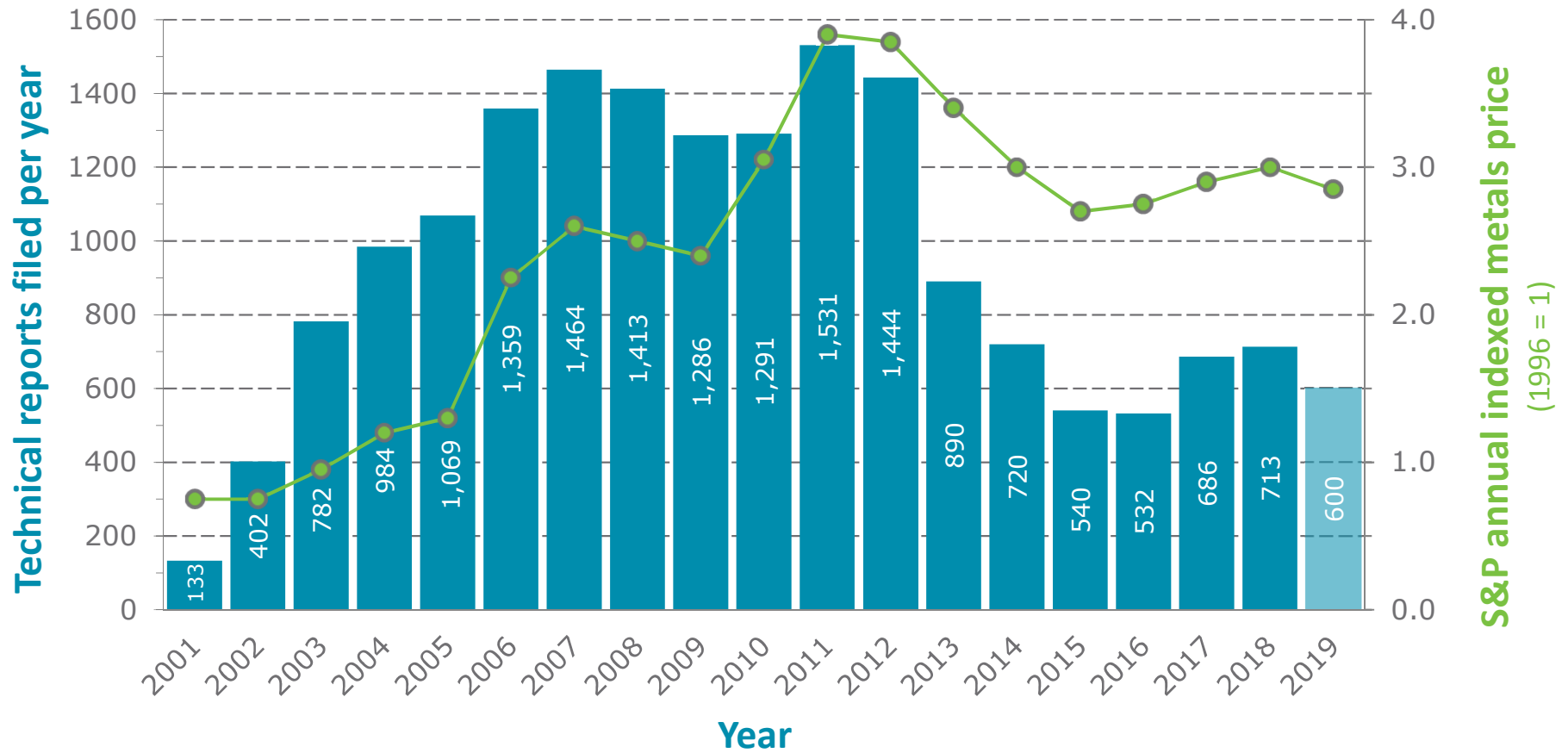
The contents of this presentation should not be modified without the express written permission of the presenters."

Presentation outline

Topics	Slides
Technical report basics	4-11
Exploration to production: Disclosure in technical reports <ul style="list-style-type: none">• Exploration• Mineral resource• Preliminary economic assessment• Mineral reserve• Production	12-39
<i>Questions and Answers</i>	

Technical report basics

Technical reports filed/year (2001 to 2019 est)



S&P Global annual indexed metal price
(Au, Ag, Cu, Ni, Co, Pt, Mo, Zn)

5 “W”s (and 1 “H”) of technical reports

WHO

Prepared by QPs, often independent of the company and property

WHAT

Current summary of material technical info. on a material property

WHERE

Triggered by milestone events and filed within a specific timeframe

WHEN

Filed publically on SEDAR

WHY

Supports company’s technical disclosure and aids investor’s decision

HOW

Must follow prescribed Form 43-101F1 and NI 43-101 rules

“Milestones” trigger technical reports

Property Milestones

- 1st time disclosure of:
 - Mineral resources
 - Preliminary economic assessment
 - Mineral reserves
- Material change to any of the above

Company Milestones

- 1st time reporting in Canada
- Filing any of the following where the material technical information is **not** already supported by a current technical report:
 - Preliminary (long form) prospectus
 - Preliminary short form prospectus
 - (1st time or material change to MR/PEA/MR)
 - Information or proxy circular
 - Offering memorandum
 - Rights offering circular
 - Annual information form
 - Valuation
 - TSX Venture offering document
 - Take-over bid circular

Independent technical reports

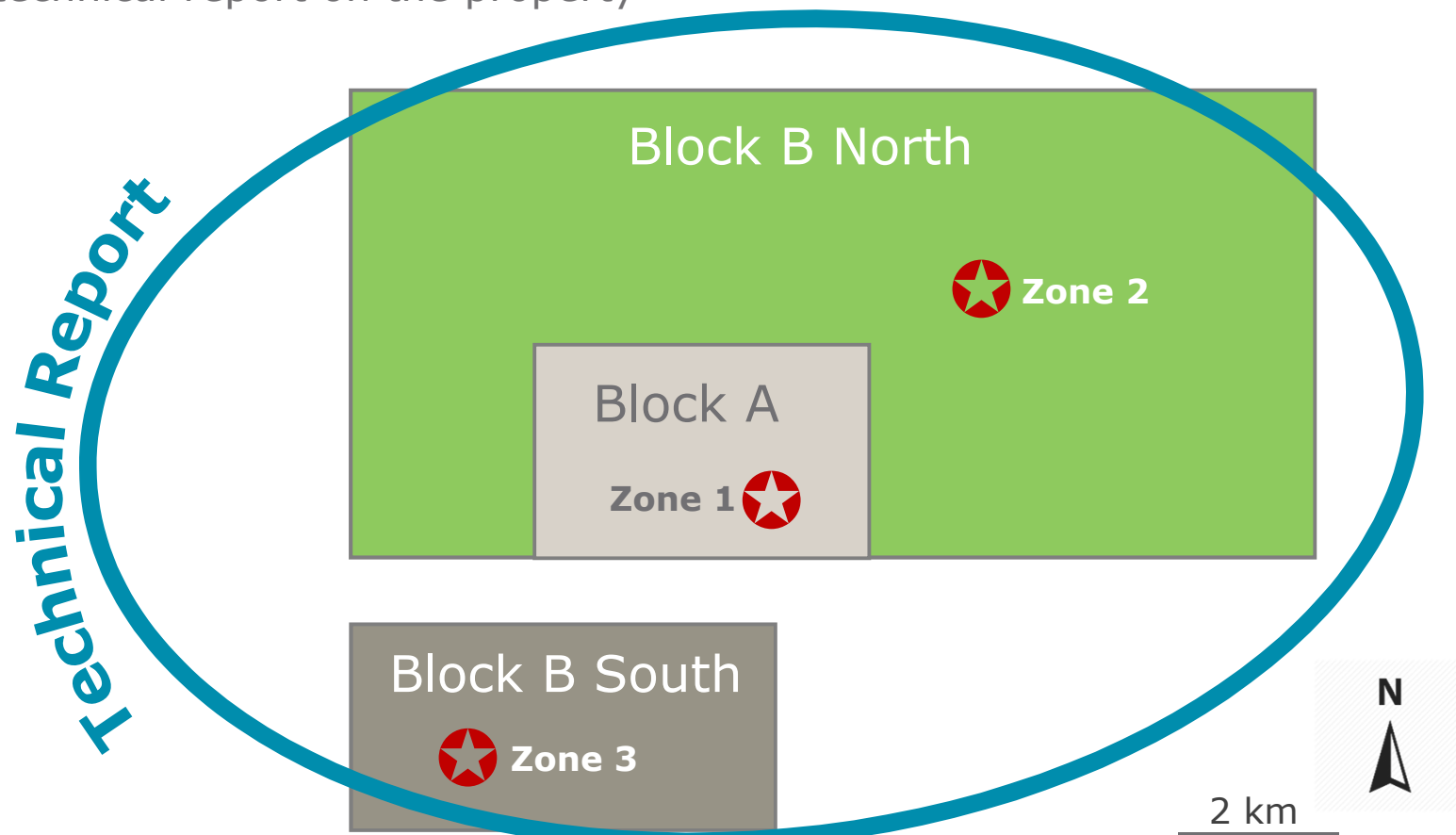


s. 5.3

- **ALL** QPs signing the technical report must be independent for the following situations:
 - First-time reporting issuer in Canada
 - Filing a preliminary long form prospectus
 - 1st time disclosure of a mineral resource, PEA, or mineral reserve
 - >100% change to an existing mineral resource or mineral reserve
- Exemption from independence for “producing issuers”
 - Gross revenue > \$30M in recent fiscal year; and
 - Gross revenue > \$90M in last three fiscal years

Single technical report

If underlying mineral deposits would likely be developed using **common infrastructure** then there should only be **ONE** current technical report on the property



“Items” in Form 43-101F1 Technical Report

- Item 1: Summary
- Item 2: Introduction
- Item 3: Reliance on Other Experts
- Item 4: Property Description and Location
- Item 5: Accessibility, Climate, Local Resources, Infrastructure and Physiography
- Item 6: History
- Item 7: Geological Setting and Mineralization
- Item 8: Deposit Types
- Item 9: Exploration
- Item 10: Drilling
- Item 11: Sample Prep., Analyses and Security
- Item 12: Data Verification
- Item 13: Mineral Processing and Met. Testing
- Item 14: Mineral Resource Estimates
- Item 15: Mineral Reserve Estimates
- Item 16: Mining Methods
- Item 17: Recovery Methods
- Item 18: Project Infrastructure
- Item 19: Market Studies and Contracts
- Item 20: Environmental Studies, Permitting and Social or Community Impact
- Item 21: Capital and Operating Costs
- Item 22: Economic Analysis
- Item 23: Adjacent Properties
- Item 24: Other Relevant Data and Information
- Item 25: Interpretation and Conclusions
- Item 26: Recommendations
- Item 27: References

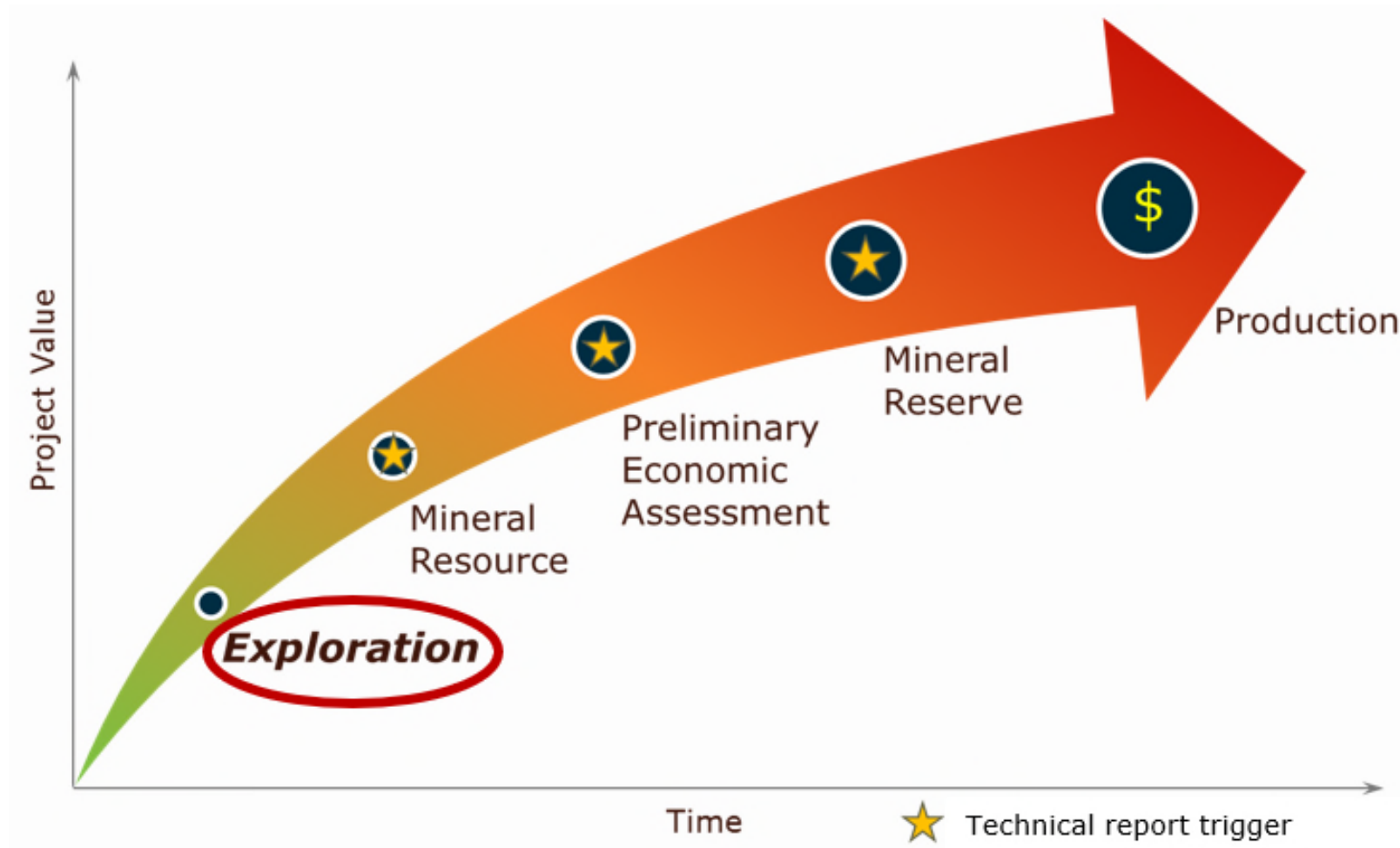
Note: *Items 15 - 22 are required for a technical report on an “advanced property”*

High-level fatal flaw checklist – all stages

- **QP certificates**
 - QP's relevant experience for the task
 - Independence, if required
 - Site visit - who, when, and what
- **Summary section**
 - Clear, concise, and complete
- **Reliance on other experts**
 - No disclaimers for technical data
 - Stated reliance for non-technical information
- **Exploration target & historical estimate**
 - Basis, source, and cautionary statements
 - Not treated as a mineral resource
- **Data verification**
 - Steps taken by QP to verify the data
- **Mineral resource & mineral reserve estimate**
 - Verification and validation of data
 - Assumptions and cut-off grade are reported and reasonable
 - Metallurgical recovery
 - 2014 CIM Definition Standards
 - Constraints applied to the estimate
- **Mining study & economic analysis**
 - PEA, PFS, and FS are used properly
 - Taxes, discount rate, sensitivity
- **Environmental and social issues**
 - Permitting challenges identified
 - Social license issues highlighted
- **Risks**
 - Potential impacts are clearly disclosed

Exploration to production: Disclosure in technical reports

Mineral project stage – Exploration



Exploration information

Do

- ✓ Describe the type of samples
- ✓ Include drill hole location information
- ✓ Report higher grade zone within interval
- ✓ Report all the results - good and bad
- ✓ Provide the name and location of the lab, analytical method, and comment on the QA/QC procedure
- ✓ Report historical estimates and exploration targets correctly, including cautionary language

Don't

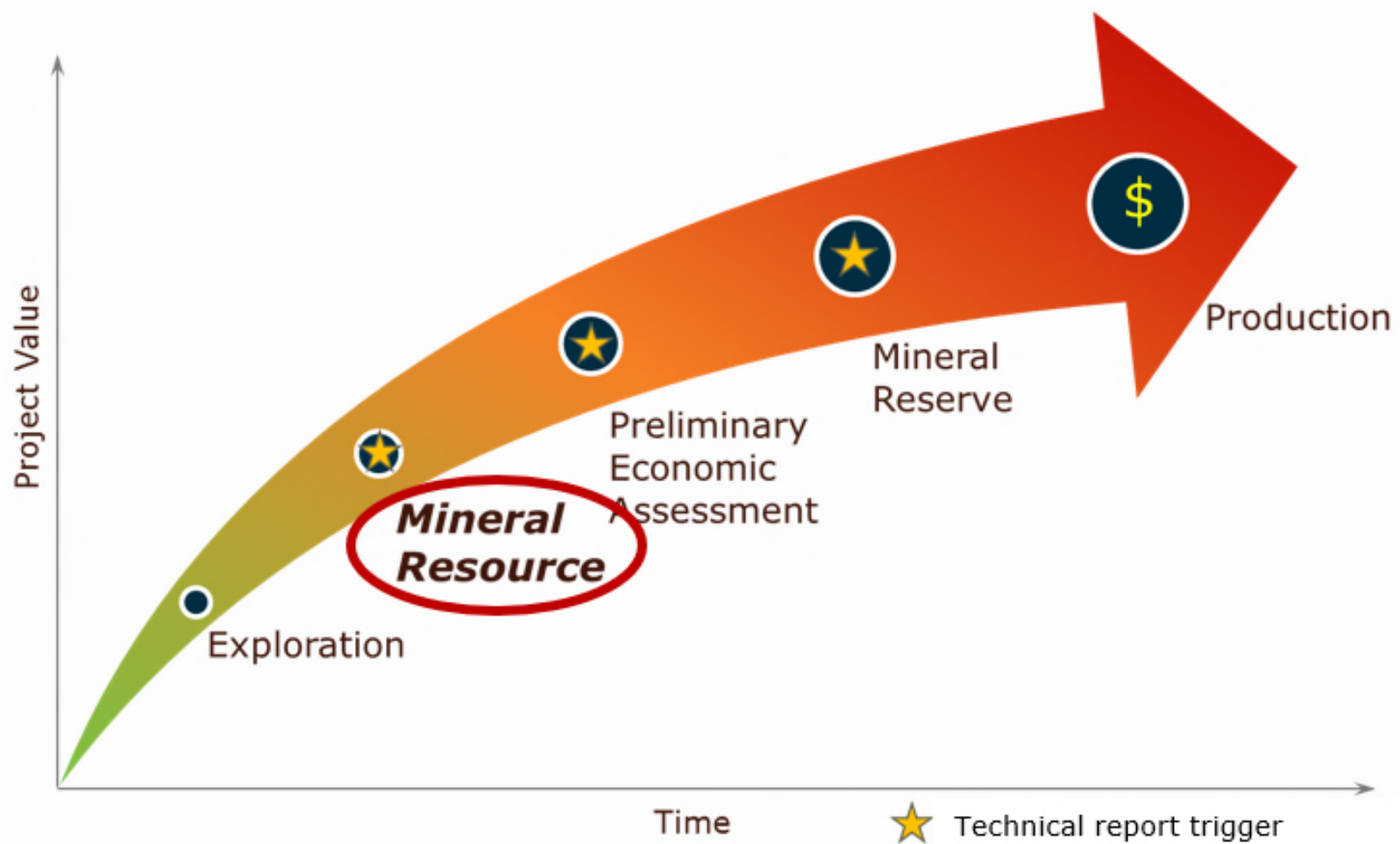
- ✗ Report visual estimates of grade
- ✗ Selectively reporting "up to" results
- ✗ Omit stating true widths of drill intervals
- ✗ Stretch assay results beyond support
- ✗ Misrepresent a geophysical or geochemical anomaly as a deposit
- ✗ Report gross metal values
- ✗ Report economics on an historical estimate or exploration target

Technical report: Exploration stage

- **Item 2: Introduction**
 - Site visit – who, when, what was done
- **Item 4: Property description & location**
 - Legal rights, interest, and legible maps
 - Access, surface rights, able to work
- **Item 6: History**
 - Historical work on Company's property?
 - Historical estimate disclosed properly with cautionary statements
- **Item 9: Exploration and 10: Drilling**
 - Work by Company, if none – state this
- **Item 11: Sample prep., analysis, & security**
 - Assay methods, lab name and location
 - QA/QC procedures (company and lab)
 - QP's opinion on the adequacy of procedures
- **Item 12: Data verification**
 - Verification by the QP to confirm data
 - QP's opinion on adequacy of the data
- **Item 14: Mineral resource estimate**
 - None!
- **Item 23: Adjacent property**
 - Don't "oversell" the neighbour's success
 - Cautionary statements
- **Item 25: Interpretations & conclusions**
 - Describe risks, uncertainties, & impacts
- **Item 26: Recommendations**
 - Limited to two phases of work, cost breakdown for each phase, contingent on previous results?

+ Items noted in fatal flaw checklist

Mineral project stage – Mineral resource



Mineral resource

- **Definition of a mineral resource [CIM Definition Standards - May 2014]**
 - Concentration or occurrence of solid material of economic interest in or on the Earth's crust
 - Form, grade or quality, and quantity is such that it has **reasonable prospects for eventual economic extraction**
 - Location, quantity, grade or quality, continuity and other geological characteristics are known, estimated or interpreted from specific geological evidence and knowledge, including sampling

Additional Guidance:

- *Tonnes & grade figures are not precise calculations and should be referred to as "estimates"*
- *Round-off the estimate to a reasonable number of significant figures (i.e. 2 to 3)*

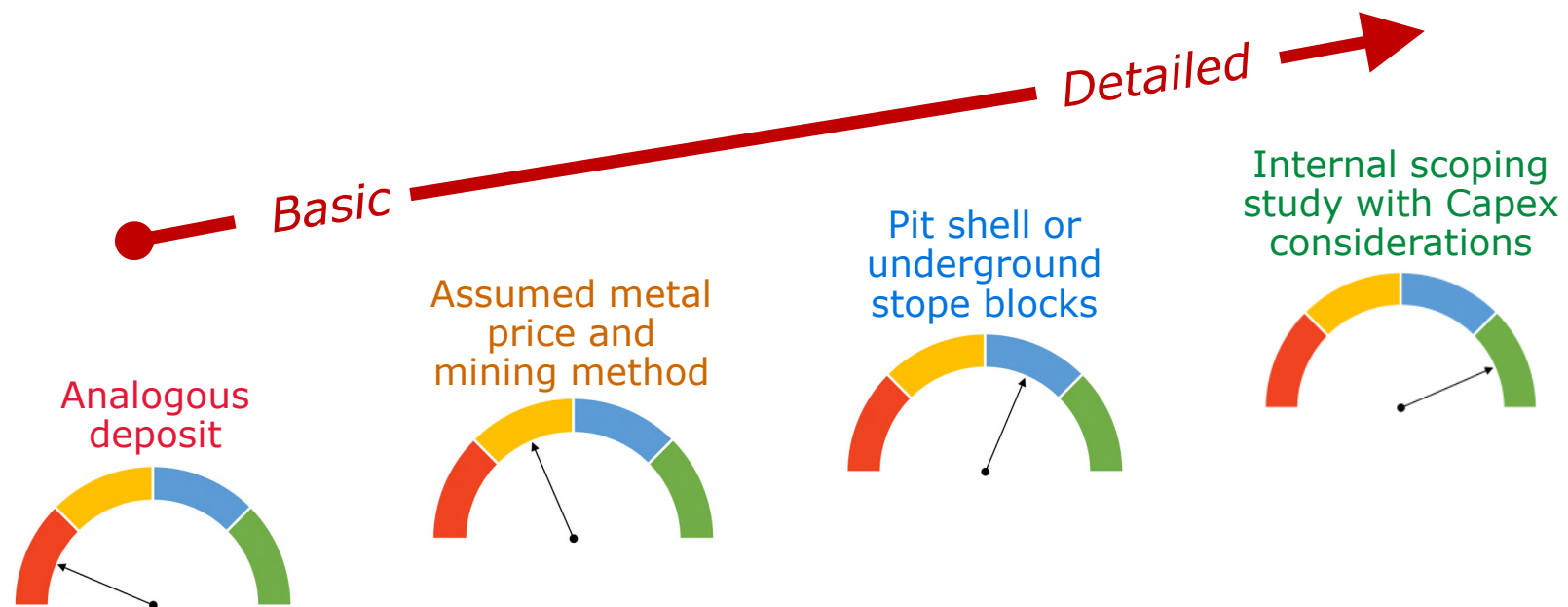
CIM guidance – “reasonable prospects”

- Implies a “judgment call by the QP” in respect of the technical and economic factors likely to influence the prospect of “eventual economic extraction”
- Provide clear justification of the cut-off grade used to report resources which reflects the deposit scale, location, geology, and the grade continuity
 - Commodity price (reasonable long-term price)
 - Metallurgical recovery
 - Mining and processing method
 - Costs for mining, processing, and general and administrative

Resource estimates are “expressions of professional judgement and opinion” based on a sufficient level of knowledge, relevant experience, and awareness of industry best practice

Estimating resources – QP judgement

Observed variation in “**judgement call by the QP**” for determining that a mineral resource estimate has “reasonable prospects for eventual economic extraction”



NI 43-101 relies on the **QP** to use “**reasonable professional judgment**”, but this judgement can vary significantly from practitioner to practitioner

Potentially misleading resource disclosure

- **Not conforming to CIM Definition Standards and CIM Best Practices**
 - Reporting a “global” resource estimate or a “mineral inventory”
 - Failure to consider the geologic model
 - Presenting an “unconstrained” resource estimate
 - Not explaining how the estimate meets “reasonable prospects for eventual economic extraction” (*i.e.* mining, metallurgy, costs, and price assumptions)
 - Unrealistic cut-off grade (*i.e.* open-pit cut-off grade used for an underground deposit)
 - Different cut-off grades used for different metals (*i.e.* Cu and Au) from the same deposit
 - Indicated and measured resources without any supporting metallurgical sampling

Possible intervention by the regulator:

- *May require the QP to provide additional disclosure (or revise the disclosure) to show how they determined the mineral resource has “reasonable prospects for eventual economic extraction”*

Mineral resource estimates

Do

- ✓ Provide the effective date
- ✓ Report both tonnes and grade
- ✓ Provide key assumptions, parameters, and methods
- ✓ Constrain the resource estimate
- ✓ State how equivalent grades were calculated
- ✓ Make use of section 3.5 of NI 43-101

Don't

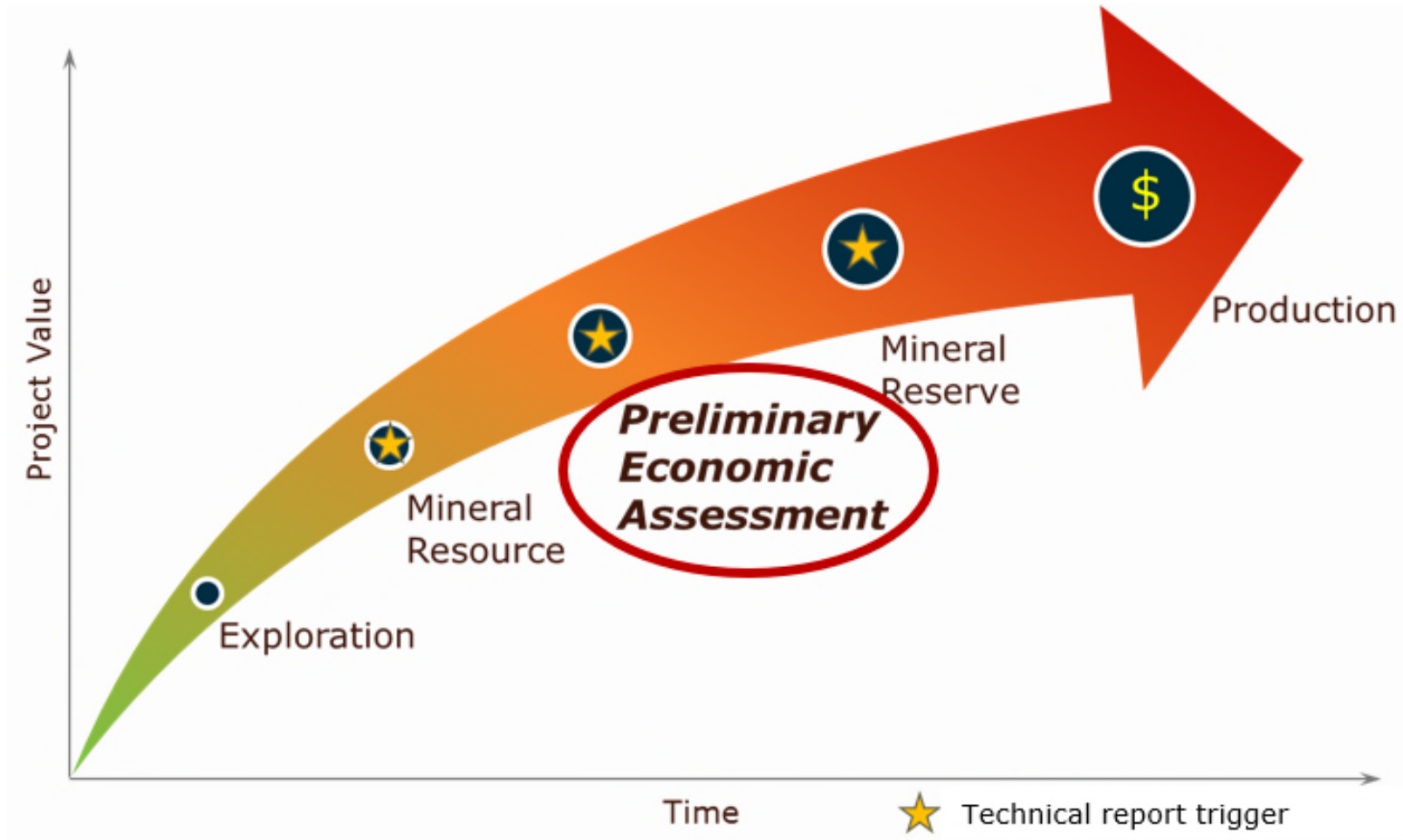
- ✗ Report only contained metal
- ✗ Report gross metal values
- ✗ Use non-compliant resource modifiers, or report estimates without categories
- ✗ Misuse of the term "ore"
- ✗ Add inferred resources to other categories of resources
- ✗ Ignore CIM Definition Standards and CIM Best Practice Guidelines

Technical report: Resource stage

- **QP Certificate**
 - QP's "relevant experience" with resource estimation
 - Independence, if required
- **Item 11: Sample prep., analysis, security**
 - Assay methods, lab independence
 - QA/QC procedures (Company specifically)
 - QP's opinion on the adequacy of procedures
- **Item 12: Data verification**
 - Independent verification by the QP to confirm data including treatment of "legacy data"
 - QP's opinion on the adequacy of the data for use in the resource estimate
- **Item 13: Mineral processing**
 - Testing results, representative samples, deleterious elements
- **Item 14: Mineral resource estimate**
 - Mineralization controls, geological model, bulk density
 - Continuity analysis and variography
 - Block model parameters and validation
 - Classification methodology
 - Reasonable prospects for eventual economic extraction and constraints applied to the estimate (prices, mining, recovery, costs, etc.)
 - Resource statement, effective date, etc.

**+ Items noted in fatal flaw
checklist and exploration stage**

Mineral project stage – PEA



Preliminary economic assessment

- **Definition of a “preliminary economic assessment” [s. 1.1]**
 - Means a study, other than a pre-feasibility or feasibility study, that includes an economic analysis of the potential viability of mineral resources
- **Guidance about a PEA [s. 1.1(4) of 43-101CP]**
 - PEA can include a study commonly referred to as a scoping study
 - PEA can be based on measured, indicated, or inferred mineral resources, or a combination of any of these
 - PEA disclosure includes forecast production rates, capital costs, operating costs, projected cash flows, etc.

Appropriate uses of a PEA

- *Road map for planning and strategic decision making*
- *Preparing for a prefeasibility study*
- *Public disclosure to raise capital and advance the project*

3 types of technical and economic studies

Disclosure concerns

Criteria	Technical & Economic Studies		
Type of Study	Preliminary Economic Assessment (PEA)	Prefeasibility Study (PFS)	Feasibility Study (FS)
Concept	"What it <u>could</u> be"	"What it <u>should</u> be"	"What it <u>will</u> be"
Objective	Early stage conceptual assessment of the <u>potential economic viability</u> of mineral resources	Realistic economic and engineering studies sufficient to <u>demonstrate economic viability</u> and establish mineral reserves	Detailed study of how the mine will be built, used as the basis for a <u>production decision</u>
Cost Accuracy	+/- 25-50%	+/- 15-25%	+/- 10-15%
Engineering	<5%	<20%	<50%
Mineral Estimate Inputs	Inferred/Indicated/Measured Resources	Indicated & Measured Resources	
Mineral Estimate Outputs	Inferred/Indicated/Measured Resources	Probable & Proven Reserves	

Caution: Generalized for presentation purposes

CSA Staff Notice 43-307 on PEAs (Aug 16, 2012)



Canadian Securities
Administrators

Autorités canadiennes
en valeurs mobilières

CSA Staff Notice 43-307

Mining Technical Reports - Preliminary Economic Assessments

- Provides PEA guidance in seven areas:
 - **Misuse of a PEA as a proxy for a PFS**
 - **PEAs done in conjunction with a PFS or a FS**
 - **PEA disclosure and technical report triggers**
 - Potentially misleading PEA results
 - PEA disclosure that includes by-products
 - Relevant experience of QPs
 - Consequences of disclosure deficiencies or errors

Article: "CSA Staff Notice 43-307 provides important guidance on disclosure of PEAs"
G. Gosson, Nov 2012, CIM Magazine

PEA after reserves – What is not allowable?

- **Don't!**

- Use the PEA to update, modify, or add to the PFS, FS, or LOM plan
- Include mineral reserves in the PEA
- Incorporate inferred resources into the same production profile, economic analysis, cash flow, or mine plan based on reserves
- Treat the PEA as if it has the same level of detailed mine design and planning as the PFS, FS or LOM plan

- **Two key issues that need to be satisfied with any PEA after reserves**

1) CSA Staff Notice 43-307: don't misuse the PEA!

2) CIM's position: no inferred "*backdoored*" into the PFS, FS, or LOM plan at developed mines

PEA is always disclosed as a standalone economic analysis (in Item 24) separate from the results of a PFS, FS, or LOM plan

Preliminary economic assessment

Do

- ✓ Provide a clear statement of the main assumptions
- ✓ Prepare analysis on a 100% equity basis
- ✓ Include required cautionary language (2.3(3)(a) and 3.4(e))
- ✓ Use a reasonable range for the sensitivity analyses
- ✓ Use the correct terms (PEA, PFS, FS) for the type of mining study

Don't

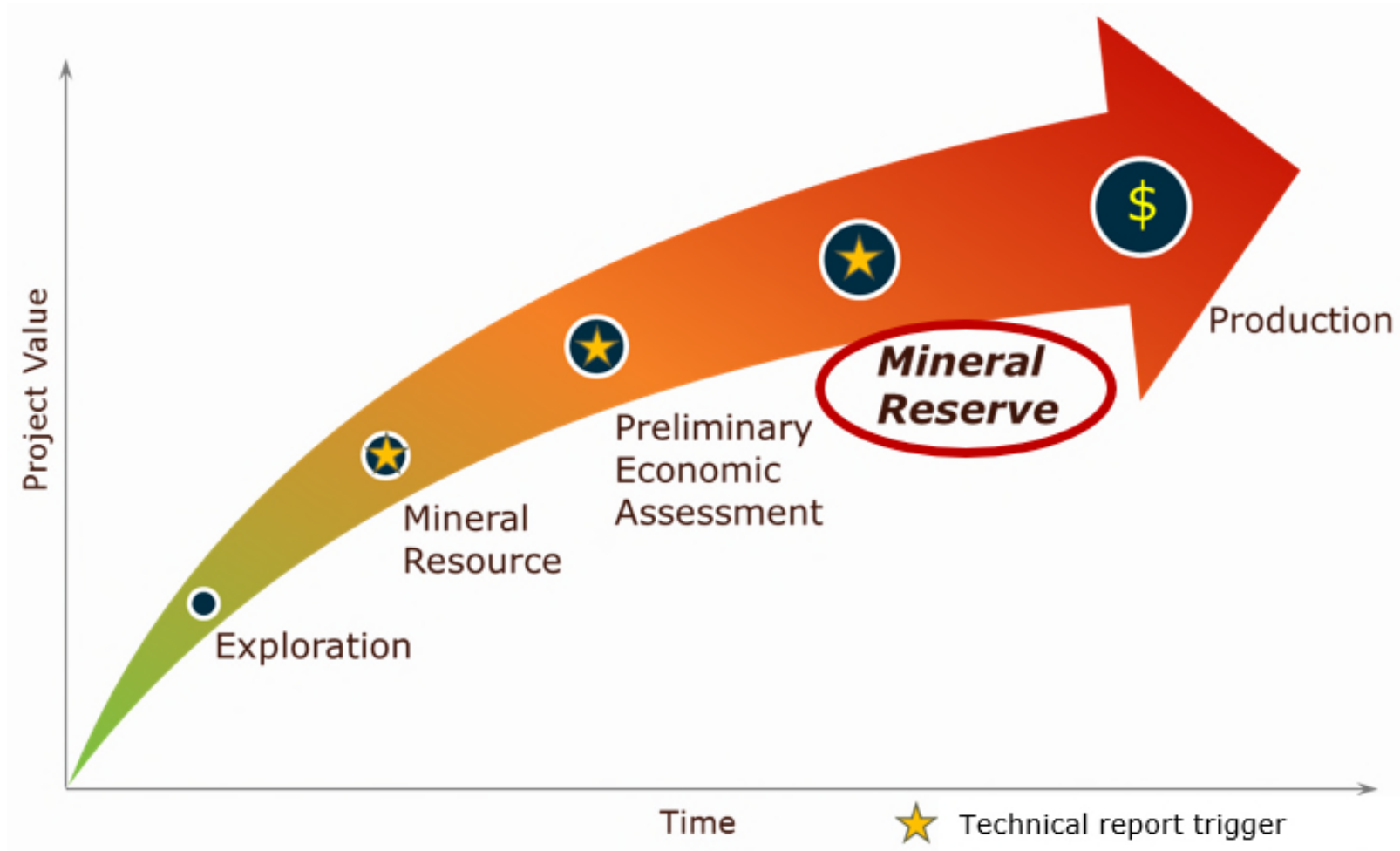
- ✗ Disclosure an economic analysis on an exploration target or historical estimate
- ✗ Report only pre-tax values
- ✗ Use an unrealistic discount rate
- ✗ Combine the outcomes of a PEA with the outcomes based on reserves
- ✗ Misuse the PEA-level study
- ✗ Omit risks related to mining from mineral resources instead of reserves

Technical report: PEA stage

- **QP Certificate**
 - QP's "relevant experience" with mining studies
 - **Item 14: Mineral resource estimate**
 - Same as resource stage points
 - **Item 15: Mineral reserve estimate**
 - None!
- Items 16 to 22 "advanced property"**
- **Item 16: Mining methods**
 - Proposed mining method, production rate, mine life
 - **Item 17: Recovery methods**
 - Potential recoverability, flow sheet, process plant
 - **Item 18: Project infrastructure**
 - Not just the roads and rail
 - Tailings, dams, dumps, and stockpiles
 - **Item 19: Market studies & contracts**
 - Critical for industrial and "battery" minerals and metals
 - **Item 20: Environmental studies, permitting & social or community impact**
 - BIG issues related to project risk!
 - Discuss obtaining and maintaining "social license"
 - **Item 21: Capital & operating costs**
 - PEA cost accuracy! - Its not a PFS or FS
 - Explain and justify basis for cost estimates
 - **Item 22: Economic Analysis**
 - Taxes! Discount rate! Sensitivity analysis!

+ Items noted in fatal flaw checklist, exploration stage, and resource stage

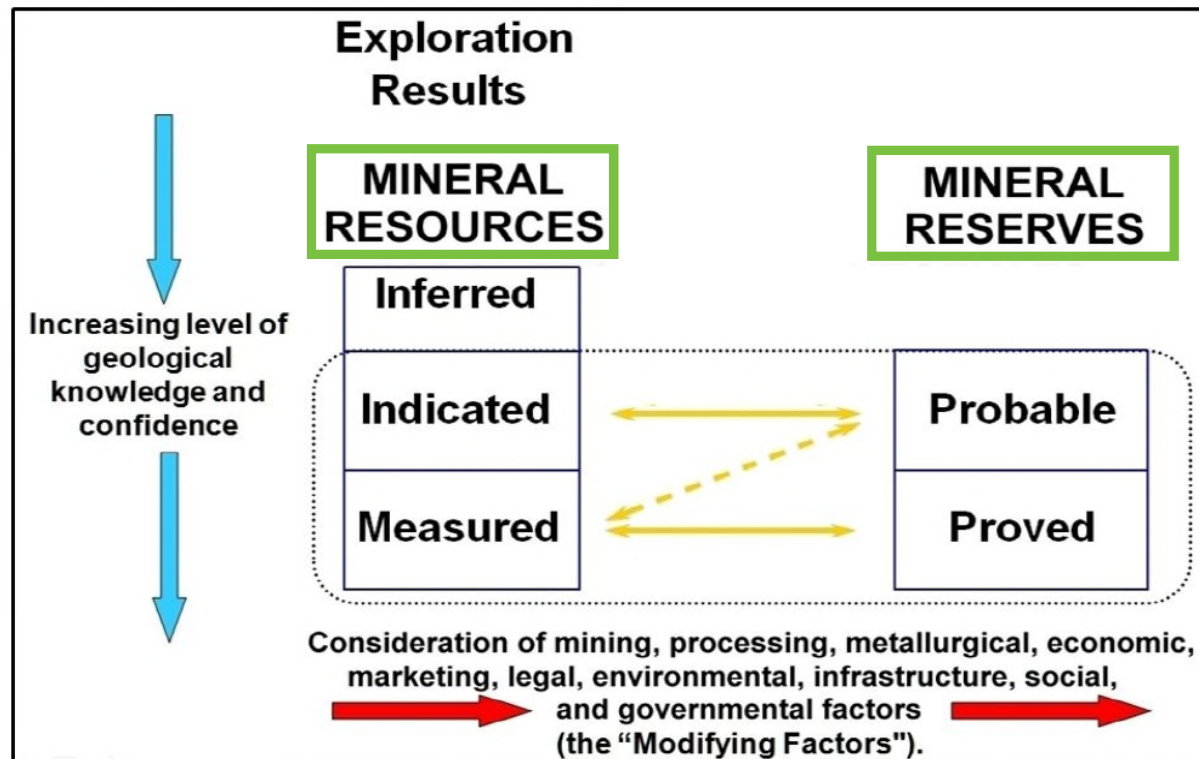
Mineral project stage – Mineral reserve



Mineral reserve

- **Definition of a mineral reserve [CIM Definition Standards - May 2014]**
 - Economically mineable part of a measured and/or indicated mineral resource after taking account of all relevant **Modifying Factors**
 - Includes diluting materials and allowances for losses which may occur during mining
 - State the “reference point” at which mineral reserves are defined, usually the point where the ore is delivered to the processing plant (i.e. mill feed)
 - Reserves are defined by studies at prefeasibility (PFS) or feasibility (FS) level that demonstrate at the time of reporting extraction could be justified

Relationship between resources & reserves



Mineral Reserves must account for ALL the **Modifying Factors:**

- Mining
- Processing
- Metallurgical
- Economic
- Marketing
- Legal
- Environmental
- Infrastructure
- Social
- Governmental

CRIRSCO Template (October 2019)

Top five factors for capital cost overruns

- 1 Aggressive and unrealistic schedules
- 2 Lack of properly developed testwork/defined design criteria/work scope
- 3 Client pressure to minimise the initial capital requirements
- 4 Underestimation or insufficient critical data from early engineering studies
- 5 Overestimated accuracy/underestimated contingency

Survey of 49 industry representatives in 2015

Source: *Mining for Value: Industry Leaders Disclose Lessons Learned from the Supercycle - 2018*

Mineral reserve estimates

Do

- ✓ Provide the effective date
- ✓ Report both tonnes and grade
- ✓ Provide key assumptions, parameters, and methods
- ✓ Account for all the modifying factors
- ✓ Note if resources are reported inclusive or exclusive of reserves
- ✓ Make use of section 3.5 of NI 43-101

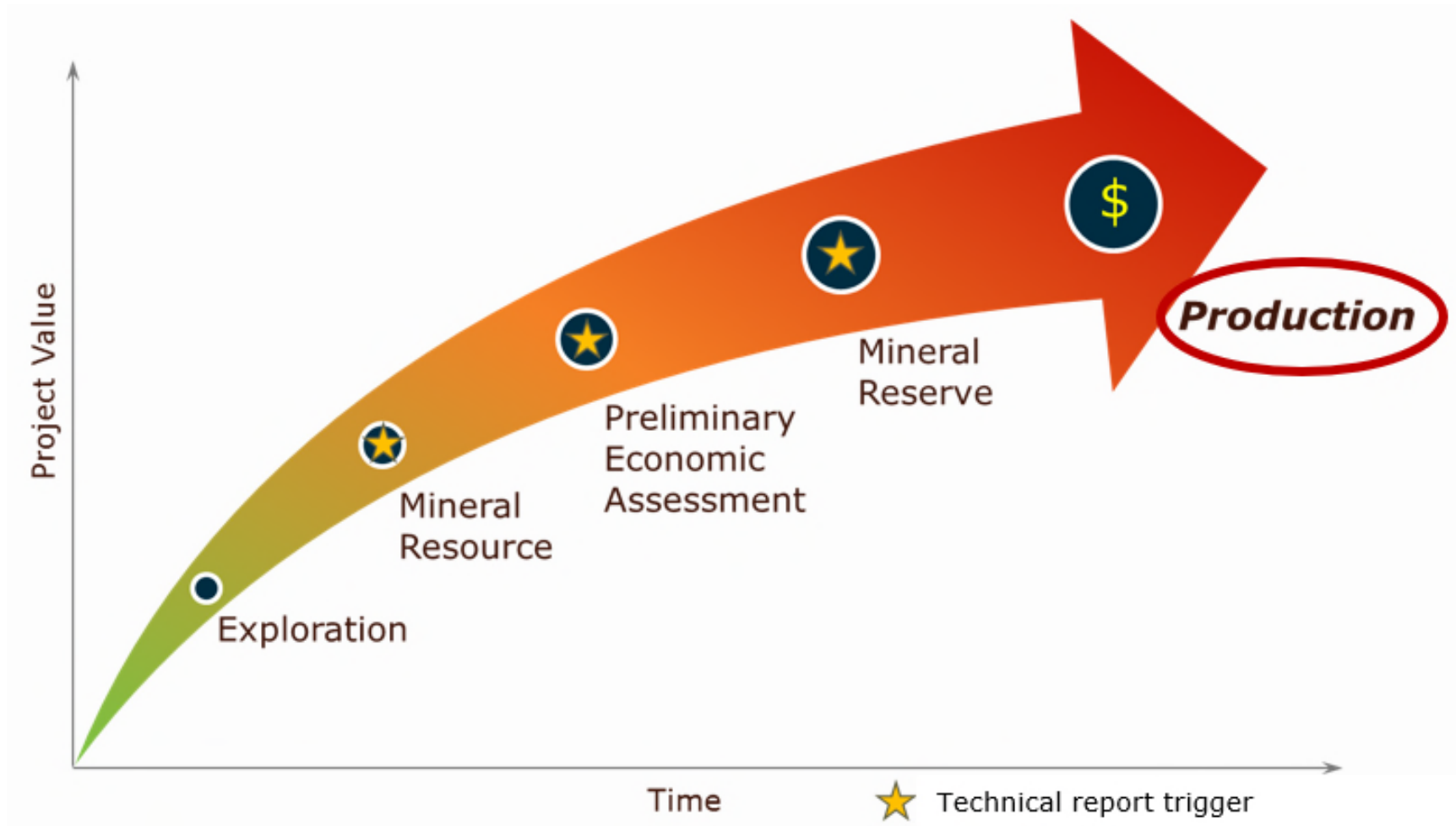
Don't

- ✗ Report only contained metal
- ✗ Report gross metal values
- ✗ Use non-compliant reserve modifiers, or report estimates without categories
- ✗ Report combined resources and reserves
- ✗ Convert inferred resource to reserves
- ✗ Ignore CIM Definition Standards and CIM Best Practice Guidelines

Technical report: Reserve stage

- **QP Certificate**
 - QP's "relevant experience" with mining studies (PFS and FS)
 - **Item 14: Mineral resource estimate**
 - Are resources inclusive or exclusive of reserves?
 - **Item 15: Mineral reserve estimate**
 - How were resources converted to reserves?
 - Account for ALL the modifying factors
- Items 16 to 22 "advanced property"**
- **Item 16: Mining methods**
 - **Item 17: Recovery methods**
 - **Item 18: Project infrastructure**
 - **Item 19: Market studies & contracts**
 - **Item 20: Environmental studies, permitting & social or community impact**
 - CRITICAL area for project risk!
 - Communities care about water and waste!
 - Discuss obtaining and maintaining "social license"
 - **Item 21: Capital & operating costs**
 - Cost accuracy for a PFS or FS - Its not a PEA!
 - **Item 22: Economic analysis**
 - Prepared on a project basis, and 100% equity
 - Reasonable discount rate and sensitivity analysis range
- + Items noted in fatal flaw checklist, exploration stage, resource stage, and PEA stage**

Mineral project stage – Production



Technical report: Production stage

Items 16 to 22 "advanced property"

- **Item 16: Mining methods**
- **Item 17: Recovery methods**
- **Item 18: Project infrastructure**
- **Item 19: Market studies & contracts**
- **Item 20: Environmental studies, permitting & social or community impact**
- **Item 21: Capital & operating costs**
- **Item 22: Economic analysis**
 - "Producing issuers" may exclude the economic analysis for properties in production, unless a material expansion is planned

+ Items noted in fatal flaw checklist, exploration stage, resource stage, and reserve stage

All technical reports

Do

- ✓ Make sure QPs have relevant experience
- ✓ Remember the purpose of the report
- ✓ Describe the risks and uncertainties
- ✓ Provide full, true, and plain facts about the mineral property
- ✓ Use the 2014 CIM Definition Standards
- ✓ Follow the CIM Best Practice Guidelines
- ✓ Have the draft report **peer reviewed**

Don't

- ✗ Assume all reports are reviewed
- ✗ Forget the audience reading the report
- ✗ Use the technical report as a data dump
- ✗ Forget there is only 1 current technical report
- ✗ Neglect the summary section
- ✗ Ignore QP independence requirements
- ✗ Disclaim responsibility for technical data

Thank You!

Craig Waldie
Senior Geologist

416-593-8308
cwaldie@osc.gov.on.ca

Jim Whyte
Senior Geologist

416-593-2168
jwhyte@osc.gov.on.ca

