



# Economic Contribution of Coastal Maine Botanical Gardens

2022

Prepared by Michael LeVert, Stepwise Data Research

# Objective and Report Structure

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## A. Executive Summary

CMBG contributed significant economic value to the Maine and Lincoln County economies in 2021.

The Coastal Maine Botanical Gardens (CMBG) operations in the Boothbay region continue to drive significant economic value to the state's economy in terms of total economic output, earnings, and jobs.

In 2021, the total economic contribution of CMBG in the Maine economy is estimated at \$41.9 million in business output, \$15.2 million in total earnings, and 490 total jobs. Within Lincoln County alone, CMBG supported \$24.5 million in business output, \$8.8 million in total earnings, and 310 total jobs.

The largest component of this economic contribution came from the regional spending of CMBG's 336,000 visitors – the most visitors the Gardens has had in a single year since opening in 2007 – who spent an estimated \$15 million in the Maine economy.

CMBG's operating and capital expenses also rose to record levels in 2021, as the organization rebounded from the impact of the pandemic on its operations and visitation. The Gardens paid Maine-based vendors located in 51 Maine communities a total of \$1.5 million. CMBG employees hailed from 40 Maine towns and collectively earned \$3.4 million in salaries.

## B. Total Economic Contribution - Maine

In 2021, CMBG supported \$15.2M in earnings and 490 jobs in the Maine economy.

In 2021, Coastal Maine Botanical Gardens spent \$7.9M on operations and capital expenditures. As one of the state's top attractions, CMBG attracted 336,400 visitors who, in addition to spending at the Gardens, spent an estimated \$15.2M in the Maine economy. This direct contribution of \$23.1M in spending included \$8.8M in salaries and supported 300 jobs across the state.

As this direct spending rippled through the Maine's economy, an additional \$18.8M in indirect and induced spending by suppliers, employees, and visitors was generated, including an additional \$6.4M in wages across 190 Maine jobs.

**In total, CMBG supported an estimated \$41.9 million in business output, \$15.2 million in earnings, and 490 jobs in the Maine economy in 2021.**

Figure 1: CMBG 2021 Maine Economic Contribution Summary

	Output Spending	Earnings	Jobs
Operations and Capital	\$7.9M	\$3.9M	130
Visitors	\$15.2M	\$5.0M	170
<b>Direct Contribution</b>	<b>\$23.1M</b>	<b>\$8.8M</b>	<b>300</b>
Indirect & Induced Contribution	\$18.8M	\$6.4M	190
<b>Total Contribution</b>	<b>\$41.9M</b>	<b>\$15.2M</b>	<b>490</b>
<b>Multiplier (average)</b>	<b>1.8</b>	<b>0.7</b>	<b>21.1</b>

## B. Total Economic Contribution – Lincoln County

In Lincoln County, CMBG supported \$8.8M in earnings and 310 jobs in 2021.

The majority of CMBG’s economic contribution was in Lincoln County.

Visitor spending was concentrated within Lincoln County, accounting for an estimated 73% of direct visitor spending (\$11.4M), 87% of earnings related to visitation (\$4.3M), and 71% of jobs related to visitation (120).

Indirect spending by the Garden’s supply chain and induced spending by employees galvanized an additional \$5.5M in output, \$629K in wages, and 60 jobs across Lincoln County.

**In total, CMBG supported \$24.5M in output (58%), \$8.8M in earnings (58%), and 310 jobs (64%) within Lincoln County.**

The Garden’s additional economic contribution of \$17.4M in output, \$6.4M in earnings, and 180 jobs were dispersed across the state.

Figure 2: CMBG 2021 Economic Contribution Regional Split

	Output Spending	Earnings	Jobs
<b>Operations and Capital</b>	\$7.9M	\$3.9M	130
<b>Visitors</b>	\$15.2M	\$5.0M	170
Lincoln County	\$11.1M	\$4.3M	120
Maine, Non-Lincoln County	\$4.1M	\$629K	50
<b>Direct Contribution</b>	\$23.1M	\$8.8M	300
<b>Indirect &amp; Induced Contribution</b>	\$18.8M	\$6.4M	190
Lincoln County	\$5.5M	\$629K	60
Maine, Non-Lincoln County	\$13.3M	\$5.7M	130
<b>Total Contribution</b>	\$41.9M	\$15.2M	490
<b>Lincoln County</b>	\$24.5M	\$8.8M	310
<b>Maine, Non-Lincoln County</b>	\$17.4M	\$6.4M	180

## C. Economic Contribution of Visitors

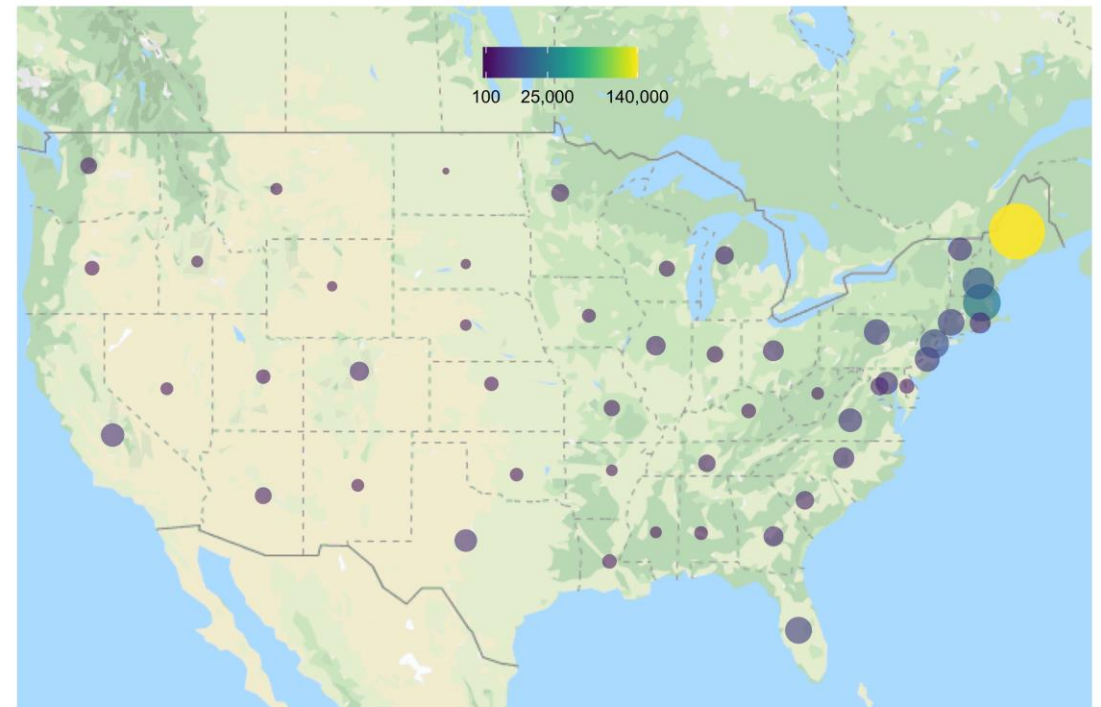
CMBG's 336,400 visitors in 2021 spent \$15.2M and supported \$5.0M in earnings and 170 jobs in Maine.

The largest component of CMBG's economic contribution came from the regional spending of their visitors. In 2021, 336,400 people visited the Gardens, the most visitors the Garden has ever had in a single year since opening in 2007, and spent an estimated \$15.2M in the Maine economy.

Visitors came all 50 U.S. states, including Hawaii, Alaska, and from Puerto Rico, and Guam. Roughly three-quarters of visitors were from Maine and one-quarter hailed from outside of Maine. (For the purpose of the economic modeling, Maine-based visitors and CMBG members are considered day-visitors; visitors from outside of Maine are assumed to have stayed overnight.)

In addition to spending at CMBG, itself, visitors spent an estimated \$5.8M at Maine restaurants, \$3.1M on lodging, \$2.0M at retail stores, and \$1.2M on other recreational activities. In total, the \$15.2M of direct visitor spending contributed to earnings and jobs in the Maine economy across a multitude of sectors.

Figure 3: CMBG Visitors, 2021



## D. Economic Contribution Over Time

Over the past eight years, CMBG's total revenue has doubled and visitation has tripled.

CMBG has grown significantly since 2014, with much of that growth experienced since 2019. Operational revenue has more than doubled since 2019 (+111%) and increased steadily even through the pandemic. The number of visitors to the Gardens has tripled since 2014 and, despite a pandemic-related dip, increased 50% since 2019.

Figure 4a: CMBG Total Revenue, 2014 – 2021

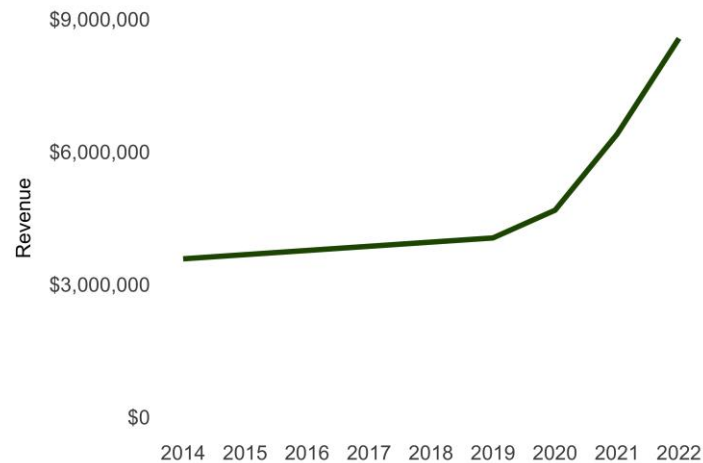
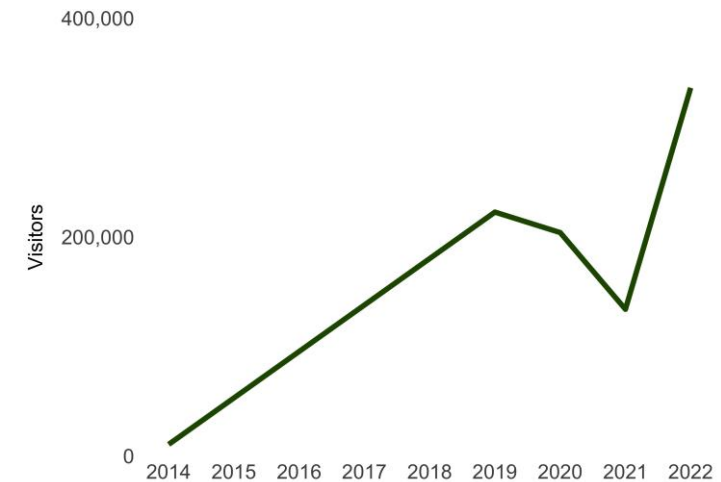


Figure 4b: CMBG Visitor Count, 2014 – 2021



## E. Spotlight on Employees

In 2021, CMBG employees hailed from 40 towns across Maine and collectively earned \$3.4M.

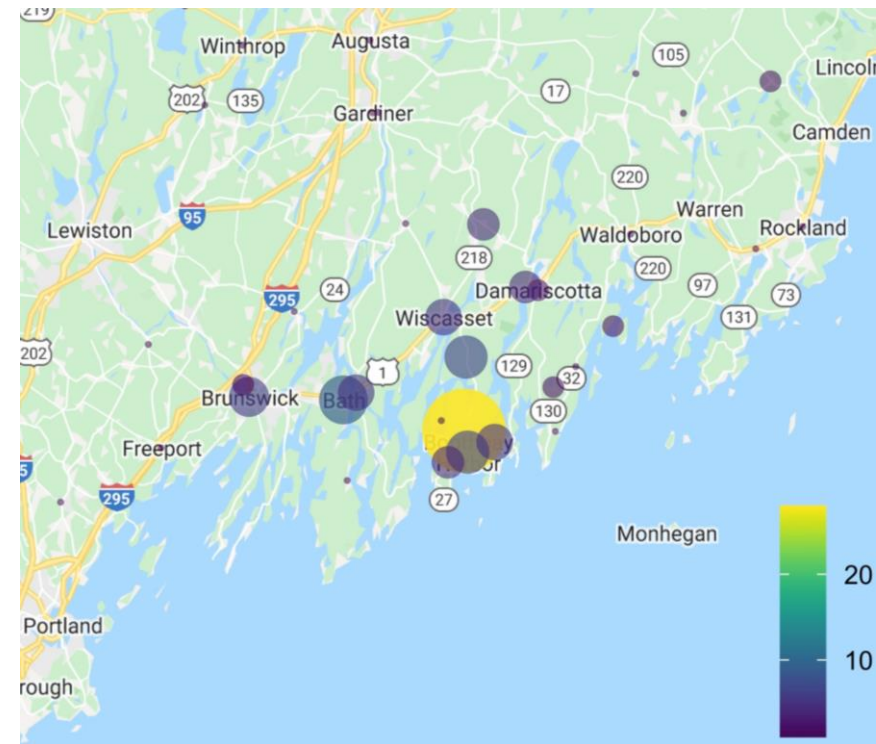
### Key Points

In 2021, CMBG paid salaries to employees from 40 Maine towns in 8 counties, with the majority of employees living in Lincoln County (58%), in and around Boothbay. Collectively, CMBG employees earned \$3.4M in 2021 and the average salary for a full-time, non-executive employee was \$39,000, about the average for all workers in Lincoln County.

The average employee has been with CMBG for 5.5 years. Since 2021, approximately 40 people have moved to the Boothbay region from outside the region to work at the Gardens.

Looking ahead, as a result of a comprehensive review of compensation, in April 2022 CMBG increased the average salary for a full-time, non-executive to \$58,700. This increase added \$550K to CMBG's total payroll and many staff received raises and/or changes in their titles and job descriptions.

Figure 5: CMBG Employees, 2021



*CMBG employees spanned 40 towns in 2021 which are not all depicted in the map above.*



## F. Spotlight on Vendors

CMBG paid 160 local Maine vendors \$1.5 million in 2021.

### Key Points

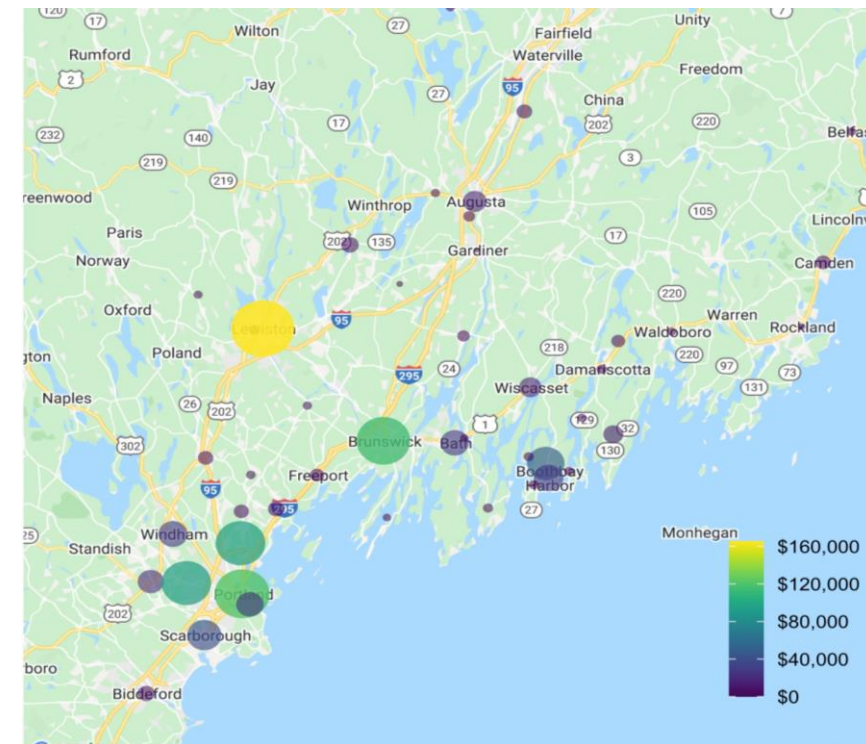
In 2021, CMBG paid 160 Maine-based vendors \$1.5 million dollars to support the Garden's operations and capital projects.

The network of CMBG vendors spanned 51 communities across the state from Portland to Mount Desert. Together, they covered 13 of Maine's 16 counties.

Of the 160 total Maine-based vendors, 47 companies were located in Lincoln County.

\$115K or 8% of CMBG's 2021 spending with Maine vendors went to companies based in Lincoln County.

Figure 6: CMBG Maine Vendors, 2021



*CMBG vendors in 2021 spanned 51 towns in Maine, whose locations are not all depicted in the map above.*

# G. Projected Economic Contribution in 2027

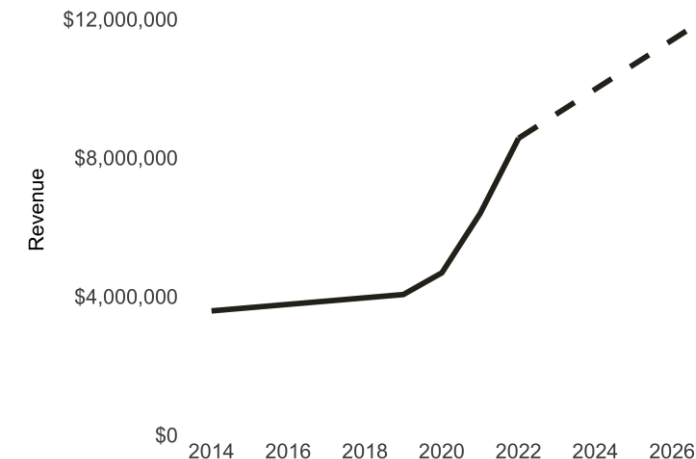
By 2027, CMBG aims to significantly grow its operations, visitation, and economic contribution.

The sharp growth in visitation and revenue that CMBG has realized since 2019 is due to multiple factors including increased demand from the public for meaningful outdoor activities and, in response to this demand, CMBG’s development of popular new exhibits. CMBG invested \$20 million in capital expenditures in 2018. CMBG aims to invest an additional \$42.5 million in capital projects between 2022 and 2027 to support further increases in visitation (projected at +12%) and revenue (+40%). If these projections for visitors and revenue are realized, and assuming that CMBG’s operating expenses and visitor spending patterns follow the same basic structure in 2027 as they do today, CMBG’s economic contribution to the Maine economy in 2027 will rise proportionately, supporting a total of 640 jobs and \$19.9M in earnings.

**Figure 7: CMBG Projected Economic Contribution, 2021 vs. 2027**

	Visitors	Revenue	Economic Contribution		
			Output	Earnings	Jobs
2021 Estimate	336K	\$8.6M	\$41.9M	\$15.2M	490
<b>2027 Projection</b>	<b>378K</b>	<b>\$12.1M</b>	<b>\$54.8M</b>	<b>\$19.9M</b>	<b>640</b>
<i>Change</i>	<i>12%</i>	<i>40%</i>	<i>31%</i>		

**Figure 8: CMBG Actual and Projected Revenue, 2014 – 2027**



## H. Technical Appendices

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## Methodology Overview

Economic contribution is defined as the gross change to an economy as a result of an organization, in this case CMBG, or an event, policy, or other economic shock or change to the economy. The economic contribution of CMBG consists of spending both by CMBG on payroll wages and benefits and from operational and capital spending on vendor services and supplies, as well as the spending by visitors to CMBG. Together, the spending by CMBG and visitors represent the direct economic contribution. The total economic contribution of CMBG is arrived at by adding the direct contribution to the indirect contribution, which is the economic activity that results from recurring rounds of spending from vendors, as well as the induced contribution, which is spending resulting from employee earnings. The analysis presented total economic contribution for both the state of Maine and Lincoln County by utilizing vendor data provided by CMBG.

The analysis estimates total economic contribution as closely as possible to the definition provided above by following the rounds of spending as it flows through supply chain levels. Much like CMBG operations, vendor businesses employ workers and spend money on vendors to conduct their operations. Likewise, workers from these businesses spend their wages in the local economy on things like food, housing, transportation, healthcare, and entertainment, which all catalyze similar spending cycles. Also attributable to CMBG is the spending that accrues from visitors, who also spend on lodging, restaurants, shopping, and other entertainment as part of their visit to CMBG.

Direct operational and capital expenditures, as well as total employee and visitor data, are provided by CMBG. The transaction detail data are used to simulate indirect and induced spending effects using the US Bureau of Economic Analysis (BEA) Regional Input-Output Modeling System II (RIMS). RIMS represents industry and household spending relationships to determine how each dollar spent by CMBG ripples through the economy, stimulating additional economic activity. Economic activity is measured using three common indicators: economic output, earnings, and jobs.

*The analysis was prepared by Michael LeVert of Stepwise Data Research, with assistance from Chris Rogers and Laura Fairman.*

# H. Technical Appendices

## Definitions

**Direct effects** include those resulting from initial rounds of spending from CMBG operations and capital expenditures and spending by CMBG visitors during the year.

**Indirect effects** result from spending by CMBG at vendors that support operational activities, as well as by CMBG visitors in the tourism sector..

**Induced effects** result from local consumption demand spending by CMBG employees, and employees of suppliers supported by CMBG vendor spending, and employees of businesses supported by CMBG visitor spending. Workers and households spend earnings in the local economy on goods and services such as food and housing, which in turn support economic activity in the state and local economy.

**Employment** is estimated as the number of jobs, both full-time and part-time, and includes wage and salaried employees, sole proprietors, and active partners. Employment is reported as inclusive of both the number of full-time (FT) and part-time jobs (PT). Both FT and PT jobs are counted with equal weight and are not distinguished by the model, which is commonly reported in government reported employment data as well as other economic models.

**Earnings** include all pre-taxed wage and salary related earnings, employee supplements (benefits), and proprietor income resulting from direct, indirect, and induced employment. Total earnings are not additive to total output, but rather are accounted for in those measures and can be understood as the associated labor income.

**Economic output** is a measure of the total value of all goods and services produced as a result of the operational and capital expenditures in 2021, including payroll, value-added from production, and intermediate sales. Total output can also be interpreted as total industry sales, inclusive of all intermediate inputs. Total output is inclusive of total earnings.

# H. Technical Appendices

## Methodology Procedures

### Assumptions

- The geographic region of focus is the state as well as Lincoln county. Data provided by CMBG included operating revenues and expenses and capital expenditures at the line-item detailed level, employee counts and compensation data with home zip code, vendor spending with zip code, and visitor counts with home zip code, among other descriptive data.

### Estimating CMBG Economic Contribution

- A “bill-of-goods” approach was used to estimate the economic contribution, following the RIMS II methodology: see [bea.gov/resources/methodologies/RIMSII-user-guide](http://bea.gov/resources/methodologies/RIMSII-user-guide).
- CMBG’s total 2021 expenses by account code were mapped to RIMS II industry codes for analysis. Thus, the appropriate RIMS II industry multiplier was assigned to each line item in CMBG’s statement of functional expenses. Where a RIMS II industry code could not be identified for an expense, the home industry code for CMBG was used, which includes the industry of museums, historical sites, zoos, and parks (NAICS code 712000). This process was used for all 2021 operating and capital expenses.
- Each expenses was then reduced by an estimate of the percent that was spent within Maine (or Lincoln County). This regional expense estimate was derived by analyzing the zip codes for all vendors paid by CMBG. For instance, if an expense went entirely to an out-of-state vendor, those expenses were excluded from the indirect and induced contribution estimates; if 50% of an expense went to vendors located within Maine, 50% of the expense was included in the modeling. Lincoln County estimates were constructed in a similar way, through detailed review of 2021 expenses against the zip codes of vendors and employees. The percentage of employees and vendors within a region resulted in the total spend. When exact regional expense estimates were not possible, the average percentage of regional spending for all vendors was used – 73% for the Maine model and 9% for the Lincoln County model.

### Estimating Visitor Contribution on Economic Output

- Visitor data for 2021 was provided by the CMBG. Visitors were split into daytime and overnight visitors based on their home zip code. All visitors from Maine zip codes (and CMBG visitors who are members) were considered day visitors. All visitors from locations outside of Maine were considered overnight visitors.
- Using 2020 Maine Office of Tourism data on the economic Contribution of visitors, such as average party size and spending amount per trip, spending estimates were built for daytime and overnight visitors. Spending by CMBG visitors for one day (no lodging expenses) for day visitors and one day and one night for overnight visitors was included in the economic analysis.
- Visitor spending in Maine was adjusted to reflect only the gross margins for retail, transportation, and groceries. These margins were estimated at 30% for retail and groceries and 47% for transportation. Transportation expenses were assumed to be related mostly to gasoline expenses. The 47% estimate for transportation was derived from the US Energy Office Administration’s analysis that indicates 53% of gasoline costs are from the underlying commodity. See: <https://www.eia.gov/energyexplained/gasoline/factors-affecting-gasoline-prices.php>. Within these industries, the majority of spending is not captured by the local economy, but absorbed by supply chain outside of the state. The results of this method implied an average spending by CMBG overnight visitors of \$92 (including lodging and meals) and by day visitors of \$40. The weighted average for all visitors was \$45.
- The model’s output for average earnings per job (which includes full- and part-time employment) and average output per job appear reasonable and in line with other analyses. Similarly, the final multipliers, which include the contributions of operating, capital, and visitor spending, are reasonable and consistent with other analyses.

	Maine	Lincoln County
<b>TOTAL CONTRIBUTION</b>		
Average Earnings per Job	\$31,000	\$28,000
Average Output per Job	\$86,000	\$79,000
<b>MULTIPLIER</b>		
Output	1.81	1.29
Earnings per Dollar of Output	0.66	0.46
Employment per Million Dollars of Output	21.1	16.4

## H. Technical Appendices

### Methodology Output: Total Economic Contribution Regional Split

		Direct Contribution	Lincoln County Contribution	Elsewhere in State of Maine Contribution	Total Contribution
Output	Operations	\$6,988,700	\$8,841,200	\$4,969,300	\$13,810,500
	Capital	\$883,400	\$67,300	\$665,300	\$732,700
	Visitors	\$15,238,400	\$15,576,500	\$11,778,000	\$27,354,500
	<b>TOTAL</b>	<b>\$23,110,600</b>	<b>\$24,485,000</b>	<b>\$17,412,700</b>	<b>\$41,897,800</b>
Earnings	Operations	\$3,871,800	\$4,388,700	\$1,662,700	\$6,051,400
	Capital	-	\$16,100	\$216,700	\$232,800
	Visitors	-	\$4,422,700	\$4,472,400	\$8,895,100
	<b>TOTAL</b>	<b>\$3,871,800</b>	<b>\$8,827,400</b>	<b>\$6,351,900</b>	<b>\$15,179,300</b>
Employment	Operations	130	140	40	180
	Capital	-	0	5	5
	Visitors	-	170	135	305
	<b>TOTAL</b>	<b>130</b>	<b>310</b>	<b>180</b>	<b>490</b>



# Katahdin Woods and Waters

National Monument  
Maine

NPS.gov (<https://www.nps.gov/>) / Park Home (<https://www.nps.gov/kaww/index.htm>) / Learn About the Park (<https://www.nps.gov/kaww/learn/index.htm>) / News (<https://www.nps.gov/kaww/learn/news/index.htm>) / News Releases

## NEWS RELEASE

# Tourism to Katahdin Woods and Waters National Monument creates \$3.3 million in Economic Benefits

Report shows visitor spending supports 38 jobs in local economy

Date: June 10, 2021 [Subscribe \(https://www.nps.gov/feeds/getNewsRSS.htm?id=kaww\)](https://www.nps.gov/feeds/getNewsRSS.htm?id=kaww) [5 \(https://www.nps.gov/feeds/getNewsRSS.htm?id=kaww\)](https://www.nps.gov/feeds/getNewsRSS.htm?id=kaww) | [What is RSS](#)

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**PATTEN, MAINE** – A new National Park Service (NPS) report shows that approximately 41,000 visitors to Katahdin Woods and Waters National Monument in 2020 spent \$2.7 million in communities near the park. That spending supported 38 jobs in the local area and had a cumulative benefit to the local economy of \$3.3 million.

"Katahdin Woods and Waters National Monument is almost five years old, so this is the first time we have been included in the NPS economic report," said Superintendent Tim Hudson. "It is exciting that the monument, located in part of the traditional Penobscot homeland, attracted 41,000 visitors with its long cultural and natural history. It is even more exciting that this occurred with the monument's limited accommodations and facilities, which are in their infancy.

"The visitors came to promote their own physical and mental wellness and expressed this with such activities as hiking, canoeing, snowmobiling, biking, fishing, hunting, and observing the darkest skies in the northeast. As we grow the amenities for visitors in concert with the Katahdin Region, we expect many more people to find their park at Katahdin Woods and Waters as part of their experience to enjoy this part of the country and all that it offers."

Together, more than half of the expenditures by visitors went to hotels and restaurants in the gateway communities. Other expenses included retail, gas, groceries and recreation industries. The regional area for Katahdin Woods and Waters National Monument includes Aroostook, Penobscot, and Piscataquis Counties.

Overall, the report shows \$14.5 billion of direct spending by more than 237 million park visitors in communities within 60 miles of a national park. This spending supported 234,000 jobs nationally; 194,400 of those jobs are found in these gateway communities. The cumulative benefit to the U.S. economy was \$28.6 billion.

Looking at the economics of visitor spending nationally, the lodging sector had the highest direct effects, with \$5 billion in economic output nationally. The restaurants sector was had the second greatest effects, with \$3 billion in economic output. Visitor spending on lodging supported more than 43,100 jobs and more than 45,900 jobs in restaurants. Visitor spending in the recreation industries supported more than 18,100 jobs and spending in retail supported more than 14,300 jobs.

Report authors also produce an interactive tool that enables users to explore visitor spending, jobs, labor income, value added, and output effects by sector for national, state, and local economies. Users can also view year-by-year trend data. The interactive tool and report are available at the NPS Social Science Program webpage: <https://www.nps.gov/subjects/socialscience/vse.htm> (<https://www.nps.gov/subjects/socialscience/vse.htm>)

To learn more about national parks in Maine and how the National Park Service works with Maine communities to help preserve local history, conserve the environment, and provide outdoor recreation, go to [www.nps.gov/maine/](http://www.nps.gov/maine/) (<https://www.nps.gov/maine/>).

[www.nps.gov](http://www.nps.gov) ([https://gcc02.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.nps.gov%2F&data=04%7C01%7CJohn\\_Warren%40nps.gov%7Cec41ed291f754b337bd308d92c0efeb3%7C0693b5ba4b184d7b9341f32f400a5494%7C0%7C0%7C63758926517273130%7CUnknown%7CTWFPbGZsb3d8eyJWljoIMC4wLjAwMDAiLCJQJoiV2luMzliLCJBTiI6k1haWwiLCJXVCi6Mn0%3D%7C1000&sdata=IFUULDM7C9%2BHWriJou9JetBxNQ5%2B3q7LqM%2FFO6Vb3f4%3D&reserved=0](https://gcc02.safelinks.protection.outlook.com?url=http%3A%2F%2Fwww.nps.gov%2F&data=04%7C01%7CJohn_Warren%40nps.gov%7Cec41ed291f754b337bd308d92c0efeb3%7C0693b5ba4b184d7b9341f32f400a5494%7C0%7C0%7C63758926517273130%7CUnknown%7CTWFPbGZsb3d8eyJWljoIMC4wLjAwMDAiLCJQJoiV2luMzliLCJBTiI6k1haWwiLCJXVCi6Mn0%3D%7C1000&sdata=IFUULDM7C9%2BHWriJou9JetBxNQ5%2B3q7LqM%2FFO6Vb3f4%3D&reserved=0))


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# Letter to the editor: Maine forest products industry welcomes movement on work authorization

[pressherald.com/2023/02/10/letter-to-the-editor-maine-forest-products-industry-welcomes-movement-on-work-authorization](https://pressherald.com/2023/02/10/letter-to-the-editor-maine-forest-products-industry-welcomes-movement-on-work-authorization)

February 10, 2023



Recently it was announced that Sens. Susan Collins and Angus King are working together to shorten the time period for asylum seekers to obtain work authorization. If passed, the Asylum Seeker Work Authorization Act of 2023 would shorten the time significantly from a process that can take years to just 30 days.

Considering the challenges Maine's aging workforce demographics poses for the forest industry and others, the Maine Forest Products Council applauds Collins and King for their support of this bill.

In Maine, the forest products industry is an \$8.1 billion industry that sustains about 33,000 jobs (that's one out of every 24 jobs). As our industry has evolved, the demand for workers has remained higher than our aging workforce can support. According to one study, the forest products industry will need about 5,000 additional workers by 2030. The future of our industry is bright. Paper products are in high demand as consumers prioritize products that are renewable, climate friendly and recyclable, and new companies are investing in Maine as the industry transitions to meet future needs. But our success will depend on our ability to find enough workers to fill these jobs.

Allowing legal asylum seekers to enter the workforce more quickly could be an important part of the demographic solution for our industry and others. Maine's forest products industry has an abundance of good-paying jobs, and as they transition into our communities, asylum seekers should be permitted to find meaningful work. This bill is a win-win-win for employers, communities and new Mainers.

**Krysta West**

*deputy director, Maine Forest Products Council  
Readfield*

filed under:

letter to the editor

© 2023

Stocks / Materials



# Wolfden Resources

TSXV:WLF Stock Report

LAST PRICE	MARKET CAP	7D	1Y
CA\$0.09	CA\$14.8m	12.5%	-53.8%



UPDATED 10 Oct, 2023

DATA Company Financials + 1 Analyst

Add to watchlist

Add to portfolio

...

## Company Overview

- 1 Valuation
- 2 Future Growth
- 3 Past Performance
- 4 Financial Health
- 5 Dividend
- 6 Management
- 7 Ownership
- Other Information

## WLF Stock Overview

Wolfden Resources Corporation engages in the acquisition, exploration, and development of mineral properties in Canada and the United States.

[About the company](#)

### REWARDS

### RISK ANALYSIS

- ⚠ Makes less than USD\$1m in revenue (CA\$0) >
- ⚠ Highly volatile share price over the past 3 months >
- ⚠ Has less than 1 year of cash runway >
- ⚠ Does not have a meaningful market cap (CA\$15M) >

+ 1 more risk

[See All Risk Checks](#)



### Snowflake Analysis

Adequate balance sheet with weak fundamentals.

Data Learn ...

## Wolfden Resources Corporation Competitors





# Mining Disclosure Essentials:

NI 43-101 reporting fundamentals, industry best practices,  
and useful guidance for TSX and TSXV issuers

Craig Waldie, *P.Geo.*, Senior Geologist, OSC  
James Whyte, *P.Geo.*, Senior Geologist, OSC  
Paul Ténière, *P.Geo.*, Senior Manager Mining  
TSX & TSX Venture

March 7, 2018

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

# Presentation outline

## NI 43-101 basics

- Qualified person
- Misconceptions

## Disclosure: Exploration to production

- Exploration
- Mineral resource
- Preliminary economic assessment
- Mineral reserve
- Production

## TMX - Technical disclosure best practices and tips for mining professionals and executives

- 2017 year in mining
- TMX disclosure policies
- Material information
- Timely disclosure rules
- Technical disclosure requirements
- Common disclosure issues
- Useful contacts
- News release exercise

## Technical report basics

### Technical report common disclosure pitfalls

- Item 1: Summary
- Item 2: Introduction
- Item 3: Reliance on other experts
- Item 12: Data verification
- Item 14: Mineral resource estimates
- Items 16 to 22 for an advanced property
- Item 20: Environmental studies, permitting and social or community impact
- Item 21: Capital and operating costs
- Item 22: Economic analysis
- Item 25: Interpretation and conclusions
- QP certificate

### Key staff notices

### Question and answer session

# Key take away message





2018



# NI 43-101 Basics

*"Rule-makers cannot mandate ethical behaviour – nor can they prevent scandals. But they can create markets in which all those involved understand that the playing field is level"*

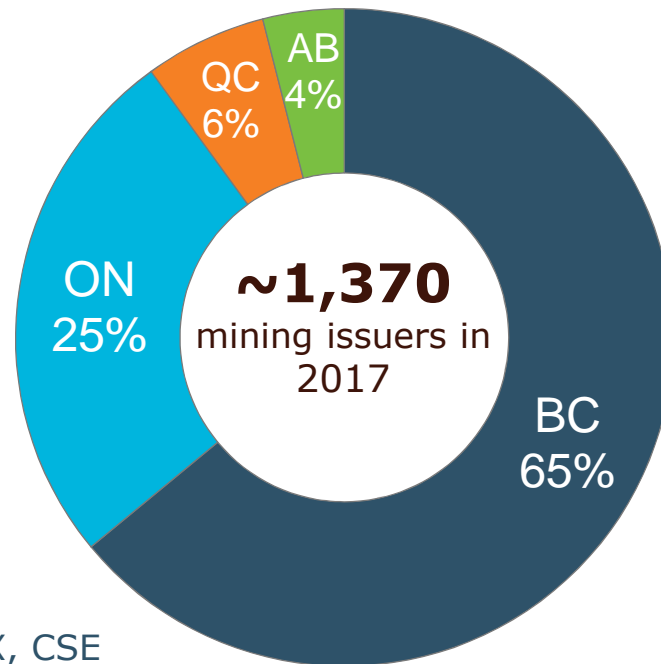
*Arthur Levitt, former Chairman of the SEC – January 2008*



# Canadian regulatory landscape for mining issuers



# Provincial oversight of mining issuers

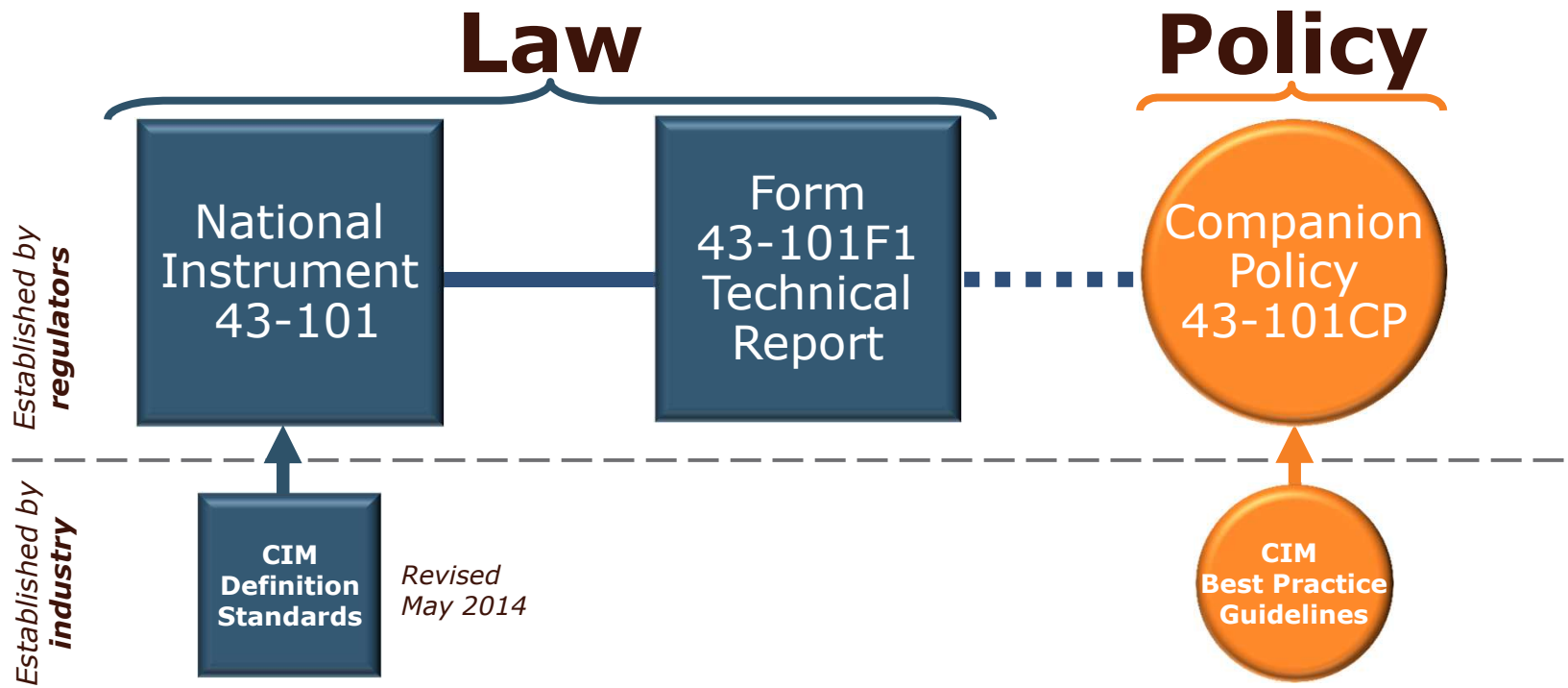


TSX, TSXV, NEX, CSE

## Technical review staff

- BCSC - 3
- OSC - 2
- AMF - 2
- TSX - 1
- TSX-V - 3
- IIROC - 1

# 3 Parts to NI 43-101 (aka the "Mining Rule")



# What are the core principles of NI 43-101?



Qualified  
Person



Standards &  
Best Practices



Technical  
Report

***"Disclosure with professional accountability"***

# CIM Definition Standards

**CIM DEFINITION STANDARDS** - For Mineral Resources and Mineral Reserves

Prepared by the *CIM Standing Committee on Reserve Definitions*  
Adopted by CIM Council on May 10, 2014

## FOREWORD

The CIM Definition Standards on Mineral Resources and Reserves (CIM Definition Standards) establish definitions and guidance on the definitions for mineral resources, mineral reserves, and mining studies used in Canada. The Mineral Resource, Mineral Reserve, and Mining Study definitions are incorporated, by reference, into National Instrument 43-101 – Standards of Disclosure for Mineral Projects (NI 43-101). The CIM Definition Standards can be viewed on the CIM website at [www.cim.org](http://www.cim.org).

# CIM Best Practice Guidelines

- CIM Estimation of Mineral Resources and Mineral Reserves Best Practice Guidelines (2003-2012)
  - Potash
  - Industrial minerals
  - Coal
  - Uranium
  - Laterites
  - Placers
  - Rock-hosted diamonds
  - Mineral brines
- CIM Guidance on Commodity Pricing in Resource and Reserve Estimation (2015)
- CIM Best Practice Guidelines for Mineral Processing (2011)
- CIM Guidelines for Reporting of Diamond Exploration Results (2003)
- CIM Exploration Best Practice Guidelines (2000)



# Where to find CIM Definition Standards and CIM Best Practice Guidelines

The screenshot shows the CIM website interface. At the top, the navigation menu includes 'HOME', 'ABOUT CIM', 'NEWS & EVENTS', 'SOCIETIES & BRANCHES', 'PUBLICATIONS & TECHNICAL RESOURCES' (circled with a red '1'), 'STUDENTS', and 'MEMBER SERVICES'. Below the navigation, there are sections for 'Publications', 'Technical Resources', and 'Industry Resources'. The 'Standards & Guidelines for Resources & Reserves' link is circled with a red '2'. On the right side, there is a 'Standards Home' section with a search bar and a dropdown menu for 'Select Resource Site...'. Below this, the 'Standards & Guidelines for Resources & Reserves' page is shown, with a 'STANDARDS NAVIGATION' sidebar. The sidebar contains links for 'About Us', 'Official Standards & Guidelines' (circled with a red '3'), 'CIM Definition Standards for Mineral Resources and Mineral Reserves', 'CIM Definition Standards - Industry Consultation', 'CSA-CIM Working Committee', 'CIM Best Practice Guidelines' (circled with a red '3'), and 'Canadian Disclosure Regulations for Minerals, Oil & Gas'. Arrows point from the text 'CIM Definition Standards' to the 'Official Standards & Guidelines' link and from 'CIM Best Practice Guidelines' to the 'CIM Best Practice Guidelines' link.



www.cim.org



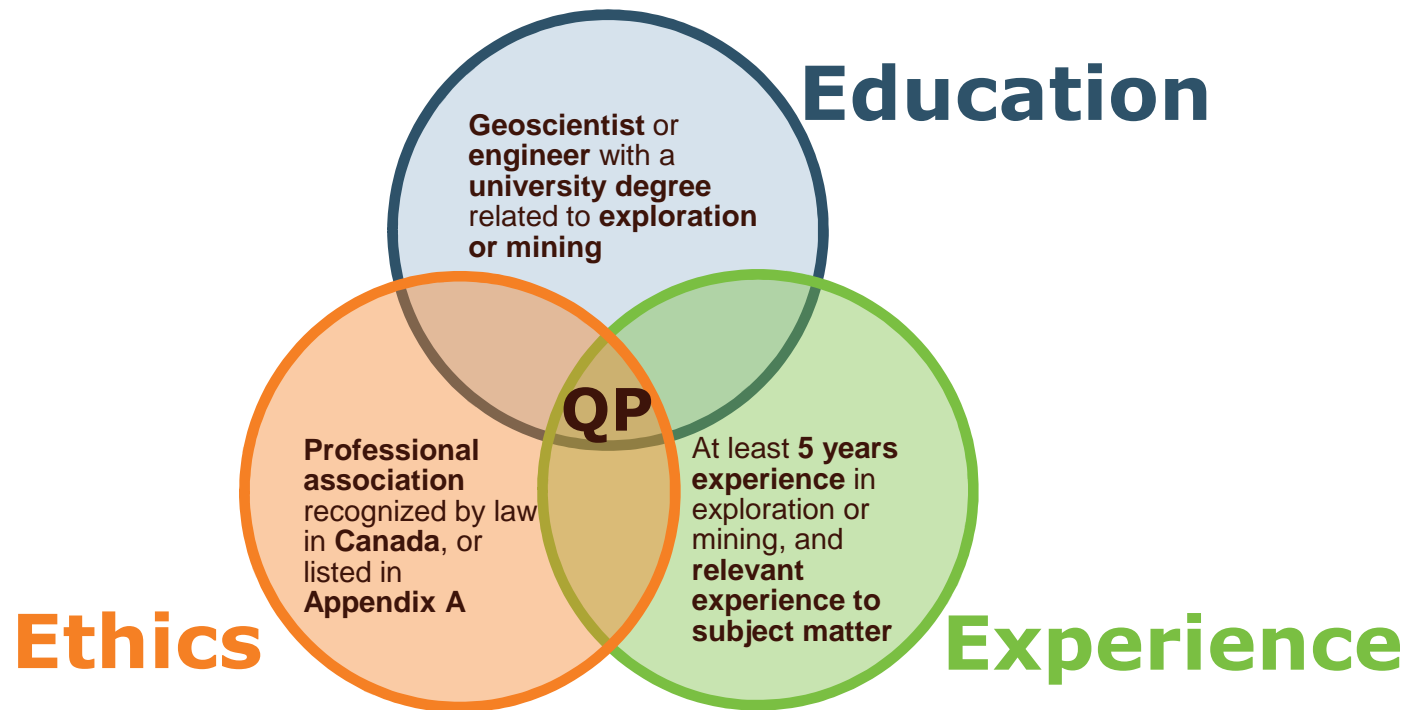
# Qualified Person

*"What it all comes down to, and always will, is the integrity, honesty, competence and experience of the person performing the work—period!"*

*B. Cook, Exploration Insights – December 11, 2013*



# 3 "E"s of a qualified person



## 4th “E”

### **Expertise** with the requirements and obligations of **NI 43-101**

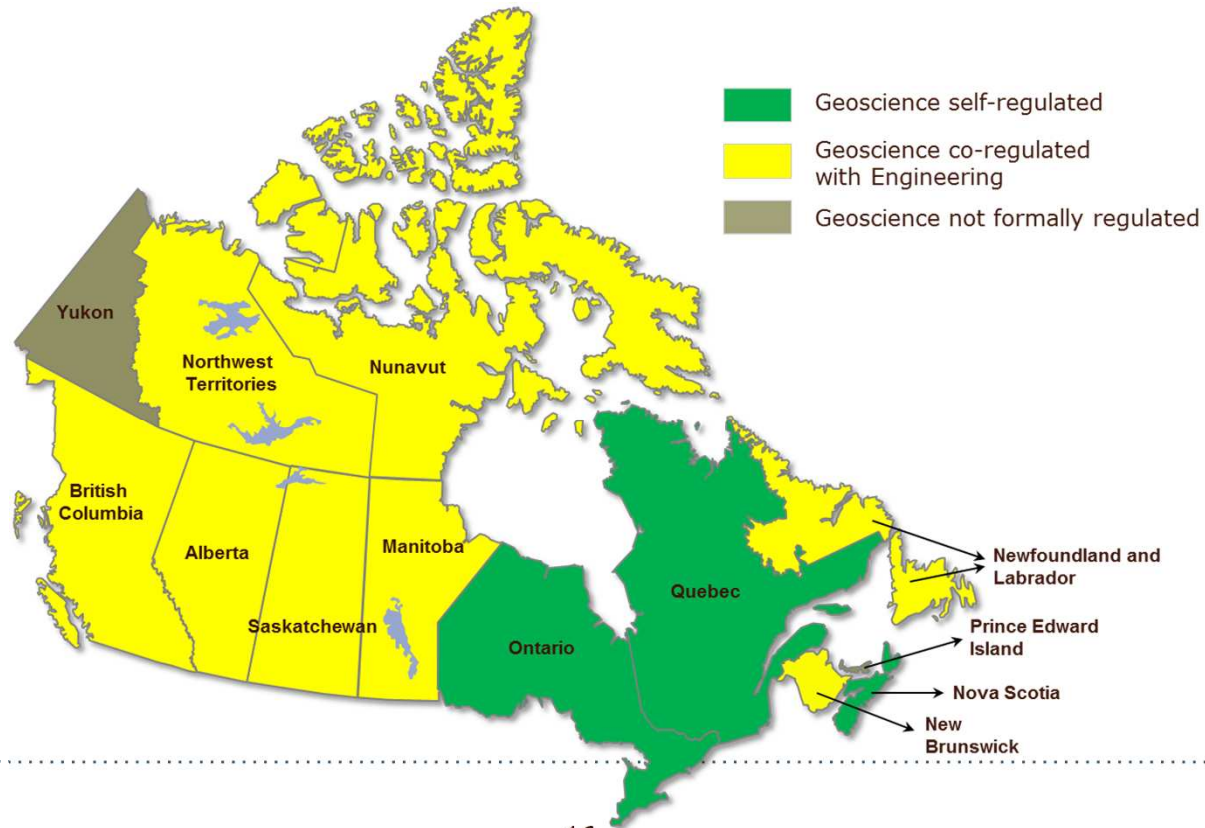
- Disclosure prepared in compliance with NI 43-101 requires an additional skill set including a high level of proficiency with:
  - CIM Definition Standards
  - CIM Best Practice Guidelines
  - NI 43-101 disclosure rules and policies
  - CSA staff notices and guidance

---

*Professional competence does not automatically imply NI 43-101 disclosure competence*

---

# Ethics: Canadian professional associations



# Ethics: Appendix A - Foreign associations

(Feb. 25, 1016)

		Foreign Association	Membership Designation
United States	}	American Institute of Professional Geologists (AIPG)	Certified Professional Geologist (CPG)
		The Society for Mining, Metallurgy and Exploration, Inc. (SME)	Registered Member
		Mining and Metallurgical Society of America (MMSA)	Qualified Professional (QP)
		Any state in the United States of America	Licensed or certified as a professional engineer
Europe	}	European Federation of Geologists (EFG)	European Geologist (EurGeol)
		Institute of Geologists of Ireland (IGI)	Professional Member (PGeo)
		Institute of Materials, Minerals and Mining (IMMM)	Prof. Member (MIMMM), Fellow (FIMMM), Chart. Sci. (CSi MIMMM), or Chart. Eng. (CEng MIMMM)
Australasia	}	Geological Society of London (GSL)	Chartered Geologist (CGeol)
		Australasian Institute of Mining and Metallurgy (AusIMM)	Fellow (FAusIMM) or Chart. Prof. Member or Fellow [MAusIMM(CP), FAusIMM(CP)]
		Australian Institute of Geoscientists (AIG)	Member (MAIG), Fellow (FAIG) or Reg. Prof. Geosci. Member or Fellow (MAIG RPGeo, FAIG RPGeo)
		The Institution of Engineers Australia (Engineers Australia)	Chartered Professional Engineer (CPEng)
South Africa	}	The Institution of Professional Engineers New Zealand (Engineers New Zealand)	Chartered Professional Engineer (CPEng)
		Southern African Institute of Mining and Metallurgy (SAIMM)	Fellow (FSAIMM)
		South African Council for Natural Scientific Professions (SACNASP)	Professional Natural Scientist (Pr.Sci.Nat.)
Chile	}	Engineering Council of South Africa (ECSA)	Professional Engineer (Pr.Eng.) or Prof. Certificated Engineer (Pr.Cert.Eng.)
		Comisión Calificadora de Competencias en Recursos y Reservas Mineras	Registered Member
Russia		Russian Society of Subsoil Use Experts (OERN)	Expert

# “Relevant experience” - QP self assessment



*"The qualified person 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"*



[www.cim.org](http://www.cim.org)

*Article: "Standards for QPs: how to evaluate relevant experience"  
C. Waldie & J. Whyte, Jun/Jul 2012, CIM Magazine*

## 5 “C”s of the QP’s responsibility

- **Comply** with your professional association’s code of ethics
  - Perform work only in your area of competency and be honest and objective
- **CIM** definition standards and best practices
  - Follow CIM Standards and Best Practice Guidelines
- **Conduct** data verification
  - Perform a reasonable level of due diligence and validation of technical data
- **Communicate** the project risks
  - Clearly report on the material risks in a manner understandable to investors
- **Check** the company’s disclosure
  - Helps reduce the risk of being misquoted

## 5 “C”s of the company’s responsibility

- **Company** is responsible for its disclosure
  - Company’s directors and officers are responsible for their disclosure
- **Compliance** with rules and policies
  - Must comply with securities laws and stock exchange policies
- **Choose** an appropriate QP
  - Company is responsible for choosing an appropriate QP for the task
- **Current** site visit
  - Company must arrange its affairs so a QP can carry out a current site visit
- **Correctly** use the QP’s information and advice
  - Allow the QP to review the technical disclosure, and any revisions to it, before filing



# Misconceptions about NI 43-101

*Remember:*

- *NI 43-101 sets "minimum" standards for disclosure of technical information*
- *The qualified person, based on his/her relevant experience and professional judgement, is responsible for choosing the methods, assumptions, and practices used for verifying, interpreting, and reporting of the technical information*



# NI 43-101: What it's meant to be

## DISCLOSURE RULE

- Requires that public reporting of technical information is:
  - Signed off by a professional (QP) who takes responsibility for the information
  - Clear, balanced, and not misleading – transparency is key!
  - Understandable to a reasonably informed investor
  - Consistent in its use of standardized terms and definitions
  - Based on reasonable assumptions which are clearly explained
  - Unbiased and identifies the potential risks and uncertainties

# NI 43-101: What it's not meant to be

- **It's not a guarantee of good work**
  - It places an obligation on the issuer to have work done by a QP
  - The QP is supposed to do it right
- **It's not a cookbook for mineral estimation**
  - The rule sets disclosure standards, not estimation practices
  - It's designed so others can review and judge the QP's work
- **It's not a vetting process at the regulatory agency**
  - Just because a technical report is filed doesn't mean it's compliant
  - It's the issuer's responsibility to comply

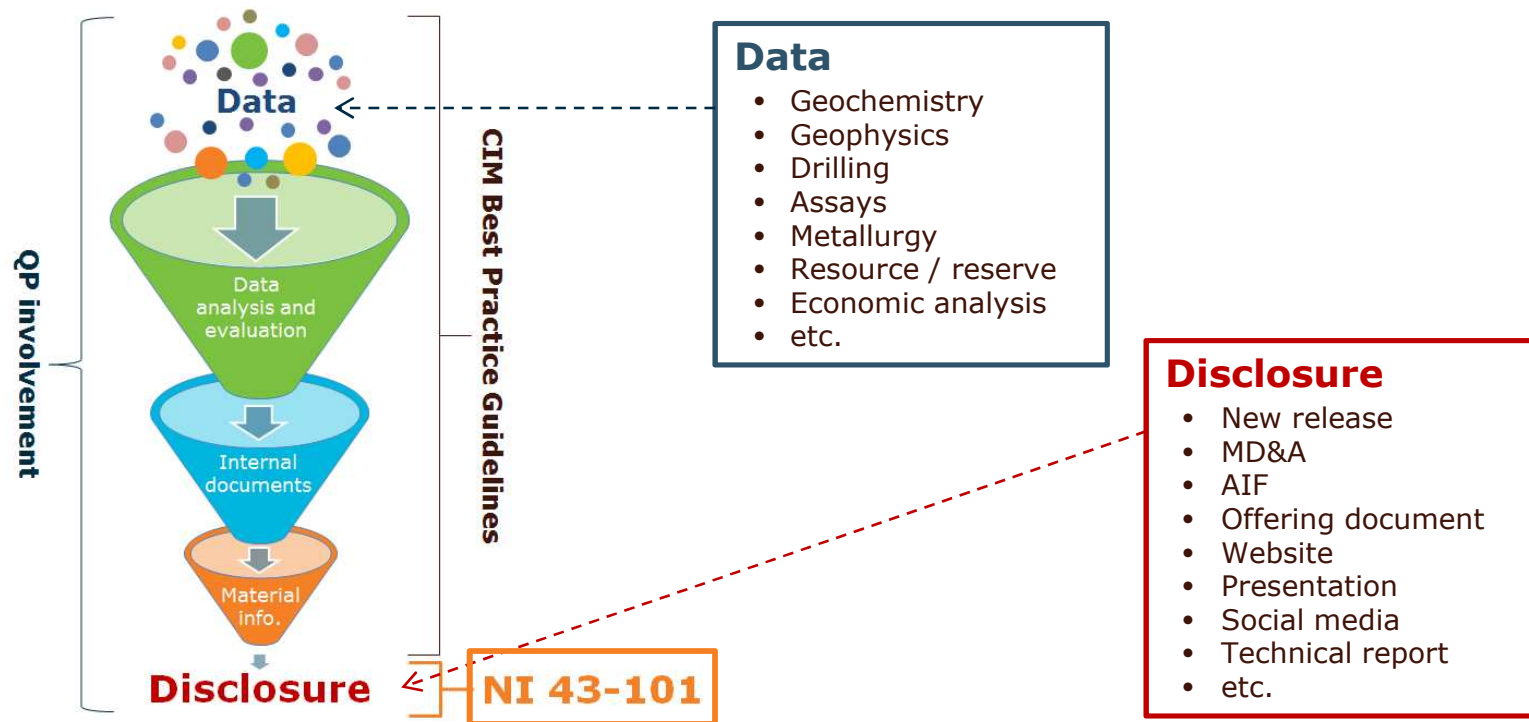


# NI 43-101 Disclosure: Exploration to Production

*"NI 43-101 plays a significant role in promoting public confidence in our markets and establishing Canada as the world leader in mining disclosure standards."*

*BCSC 2012 Mining Report – January 2013*

# Process: From data to disclosure



# Websites = disclosure

## The definition of “written disclosure” includes websites

- Information posted on or linked to an issuer’s website is considered to be “endorsed” by the issuer and part of its disclosure under NI 43-101
  - Examples of voluntary website disclosure:
    - Corporate presentations and fact sheets
    - Links to third party content (analysts’ reports, media articles, newsletters, etc.)
    - Social media posts and blogs

March 9, 2017 - CSA Staff Notice 51-348



CSA Staff Notice 51-348

*Staff’s Review of Social Media Used by Reporting Issuers*

April 9, 2015 - CSA Staff Notice 43-309



CSA Staff Notice 43-309

*Review of Website Investor Presentations by Mining Issuers*

# Technical reviews by the regulator

(Conducted through a formal comment letter and response process)

- **Continuous disclosure review**

- Website (all of it)
- News releases (past year)
- MD&A (past year)
- AIF (if filed)
- Technical reports (current ones)
- Social media (linked to website)

- **Prospectus review**

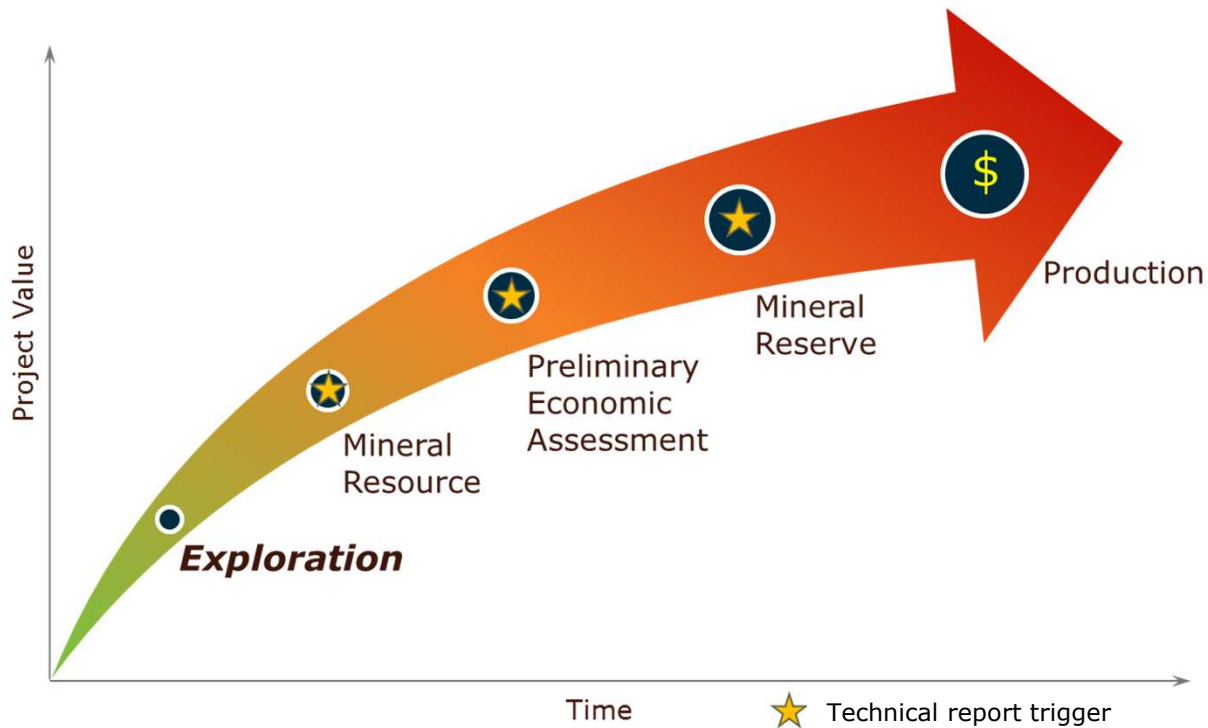
- Prospectus
- Documents incorporated by reference
  - AIF, news releases, MD&A, etc.
- Technical reports (current ones)
- Website (all of it)

---

### ***So what if the issuer doesn't comply?***

- *Clarifying / retracting news release*
- *Placed on refilings and errors list*
- *Placed on default list*
- *Cease trade order*
- *Enforcement order under the Act*
- *Class action lawsuit (civil liability under the Act)*
- *Securities Act charges (5 years/ \$5 million fine)*
- *Criminal Code charges (up to 14 years)*
- *QP - Professional liability and disciplinary action*

# Mineral project stage – Exploration



# Drilling results disclosure

- **Drilling information [s. 3.3]**

- Type of drilling
- Collar location, azimuth, and dip of drill holes
- Relevant assays and depth of samples
- Higher grade intervals within lower grade intersection
- True widths of mineralization, if known
- QA/QC program applied

- **Lab information [s. 3.3]**

- Analytical method and sample size
- Name and location of lab and relationship to the company

- **Data verification [s. 3.2]**

- Statement of how the QP verified the data, or reasons for failure to verify

---

***Potentially misleading disclosure!***

- *Reporting visual estimates of mineralization*
  - *Reporting "non-standard" weighted-average intersections*
-



# Historical estimate disclosure

- **Disclosing a historical estimate [s. 2.4]**

- Use the original terminology
- Identify source & date of historical estimate, including any technical report
- Comment on relevance and reliability of the historical estimate
- Provide key assumptions about how the historical estimate was prepared
- State whether or not historical estimate uses CIM categories
- Comment on work program needed to upgrade or verify the historical estimate
- State with equal prominence the following:
  - *QP has not done sufficient work to classify historical estimate as a current resource*
  - *Company is not treating the historical estimate as a current resource*

---

*"Historical estimate" – a non-verified estimate prepared prior to issuer's interest in the property*

---

# Exploration target disclosure

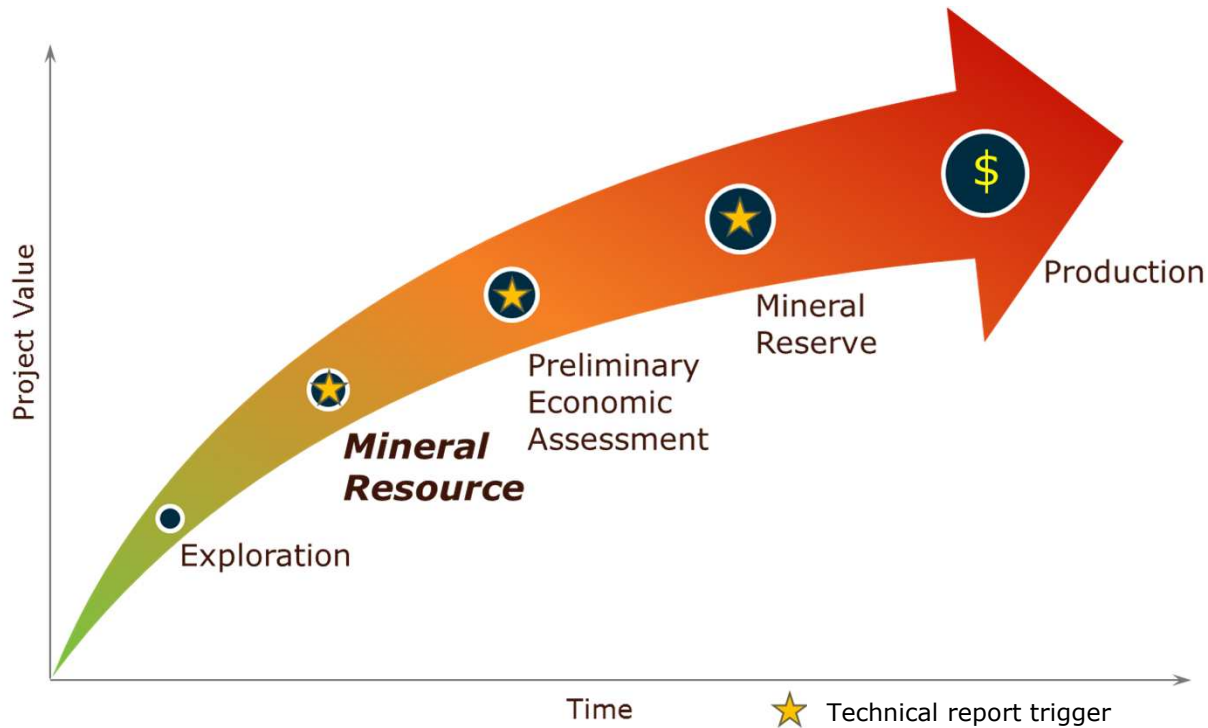
- **Disclosing an exploration target [s. 2.3(2)]**
  - Provide a range of tonnes and grade
  - Provide the basis on which exploration target has been determined
  - States with equal prominence the following:
    - *Potential quantity and grade is conceptual in nature*
    - *Insufficient exploration to define a mineral resource*
    - *Uncertain if a mineral resource estimate will be delineated*

---

*Exploration target is not defined in CIM or NI 43-101 (but is defined in CRIRSCO)*

- *Statement of the exploration potential in a defined geological setting*
- *Insufficient exploration to estimate a mineral resource*
- *Further exploration could test the validity of the exploration target*

# 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
- Basis for determining “reasonable prospects” needs to be clearly stated and should include:
  - Cut-off grade
  - Commodity price
  - Metallurgical recovery
  - Mining and processing method
  - Mining, processing, and general and administrative costs

---

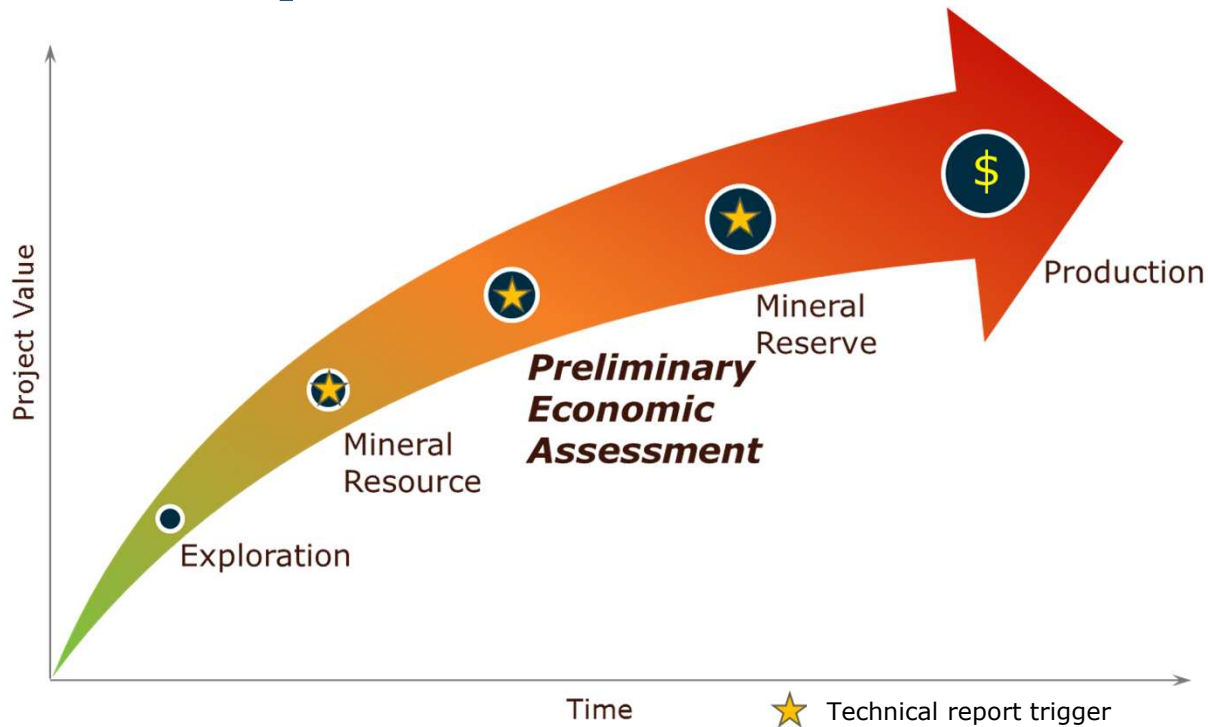
*“Resource estimates are expressions of judgement and opinion based on knowledge, experience, and industry practice”*

*Forward looking information cautionary statement*

# Mineral resource disclosure

- **Disclosing a mineral resource [s. 2.2] and [s. 3.4]**
  - CIM categories of mineral resources (inferred, indicated, and measured)
  - Quantity and grade of each resource category
  - Inferred resources reported separately from other categories
  - Tonnes and grade for each category if the contained metal is disclosed
  - Effective date of the resource estimate
  - Key assumptions, parameters, and methods used
  - Any known risks that could materially affect potential development
  - Statement required if results of an economic analysis of resources is disclosed:
    - *“mineral resources that are not mineral reserves do not have demonstrated economic viability”*

# Mineral project stage – Preliminary economic assessment (PEA)



# Preliminary economic assessment

- **Definition of a “preliminary economic assessment” [s. 1.1]**
  - Means a study, other than a prefeasibility (PFS) or feasibility study (FS), that includes an economic analysis of the potential viability of mineral resources
- Appropriate uses of a PEA
  - Road map for planning and strategic decision making
  - Preparing for a prefeasibility study
  - Public disclosure of the potential economics to raise capital and advance the project



# Limitations of a PEA

- PEA-level study can be a very useful, but it has limitations:
  - Underestimates the costs and complexities of the project
  - Sets expectations for NPV, IRR, etc. that may not be achieved in later studies (PFS/FS)
  - Often uses overly optimistic metal recoveries and metal price assumptions
  - Tends to be overly reliant on converting inferred resources to indicated resources
  - Early permitting process may restrict changes to the future mine design
  - May be misleading if the PEA treats inferred resources as mineral reserves
  - High risk of project failure if the PEA is used as basis for making a production decision

---

*PEA after mineral reserves is often a BIG disclosure problem – much more on this later*

---

# Preliminary economic assessment disclosure

- **Disclosing a PEA [s. 2.3(3)]**

- May disclose the results of a PEA that includes inferred resources if the disclosure states with equal prominence:
  - *PEA is preliminary in nature*
  - *Includes inferred resources that are too speculative geologically to have the economic considerations applied to them*
  - *No certainty that the PEA will be realized*

- Also:

- States the basis and assumptions for the PEA
- Describes the impact of the PEA on any previous PFS or FS

# Production decision without mineral reserves

- Guidance [Companion Policy s. 4.2(6)]
  - **Decision is the responsibility of the issuer and its management and board**
  - Decision is typically based on at least a prefeasibility study establishing mineral reserves which reduces the risk of economic and technical failure
  - Without disclosing the added risks, the issuer may be misleading investors
- Quarterly MD&A
  - Disclose that the production decision is not based on a technical report supporting mineral reserves

---

## How do you avoid making misleading disclosure? - State the RISKS!

- *Production decision is not based on demonstrated economic viability (i.e. mineral reserves)*
  - *Such projects have a much higher risk of economic or technical failure*
  - *Project failure may adversely impact the issuer's future profitability*
-

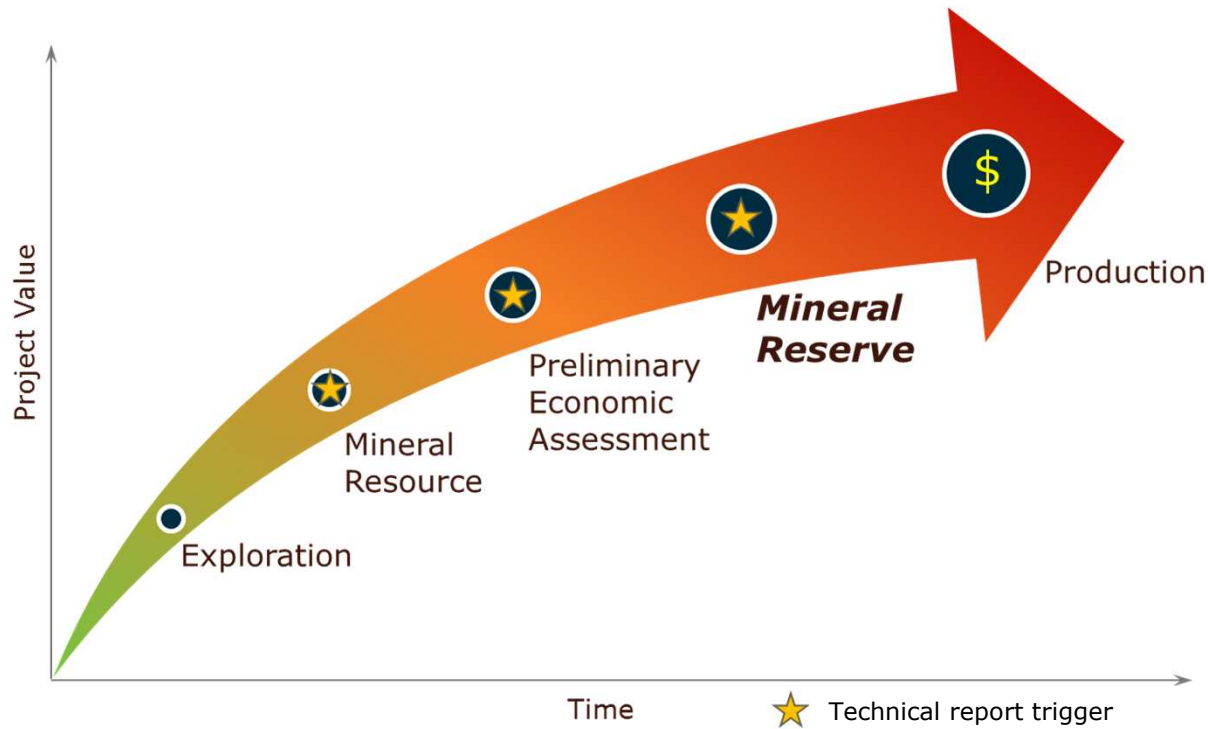
## Example: Caution about production decision based on a PEA

Risks { *"The Company advises that it has not based its production decision on a feasibility study of mineral reserves, demonstrating economic and technical viability, and, as a result, there may be an increased uncertainty of achieving any particular level of recovery of minerals or the cost of such recovery, including increased risks associated with developing a commercially mineable deposit."*

Impact of risks { *Historically, such projects have a much higher risk of economic and technical failure. There is no guarantee that production will begin as anticipated or at all or that anticipated production costs will be achieved.*  
*Failure to commence production would have a material adverse impact on the Company's ability to generate revenue and cash flow to fund operations. Failure to achieve the anticipated production costs would have a material adverse impact on the Company's cash flow and future profitability."*

PEA caution { *The Company further cautions that the PEA is preliminary in nature. No mining study has been completed. Mineral resources are not mineral reserves and do not have demonstrated economic viability. There is no certainty that the PEA will be realized."*

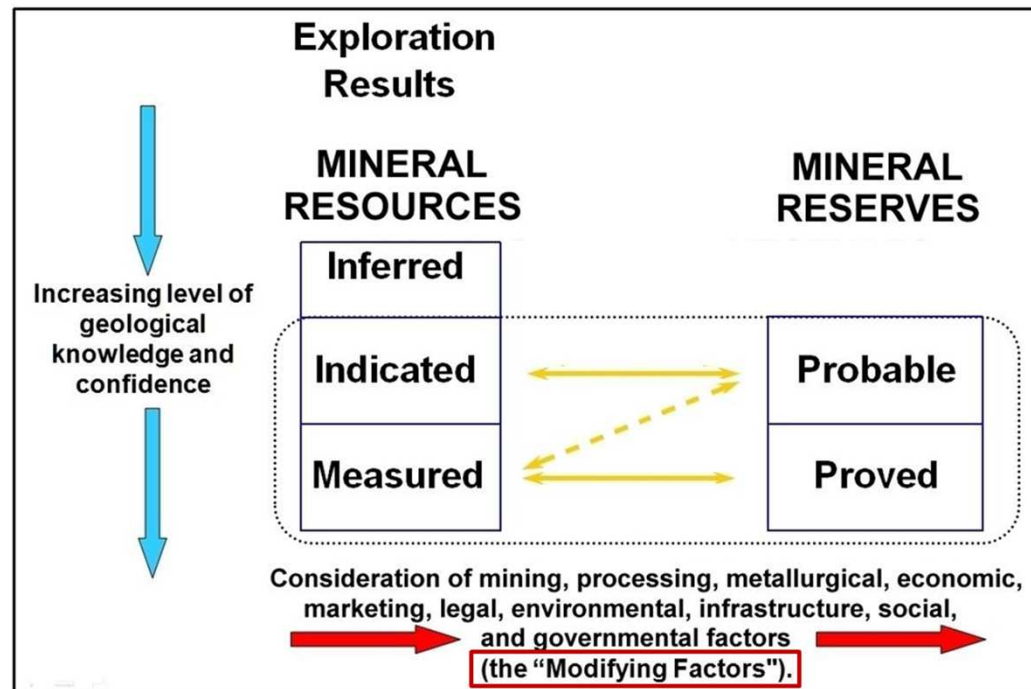
# Mineral project stage – Mineral reserve



# 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
  - 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



*CRIRSCO International Reporting Template Nov. 2013*

# Mineral reserve disclosure

- **Disclosing a mineral reserve [s. 2.2] and [s. 3.4]**
  - CIM categories of mineral reserves (proven and probable reserves)
  - Quantity and grade of each reserve category
  - Effective date of the reserve estimate
  - Key assumptions, parameters, and methods used
  - Any known risks that could materially affect potential development
  - Statements:
    - Whether mineral resource are reported inclusive or exclusive of mineral reserves?
    - "*Mineral resources that are not mineral reserves do not have demonstrated economic viability*" if results of an economic analysis of resources is disclosed



# Reclassifying reserves back to resources

## Guidance from CRIRSCO (2013)

- Clause 29
  - If re-evaluation indicates that any part of the mineral reserves is no longer viable, such mineral reserves **must** be re-classified as mineral resources

## SME Guide (2017)

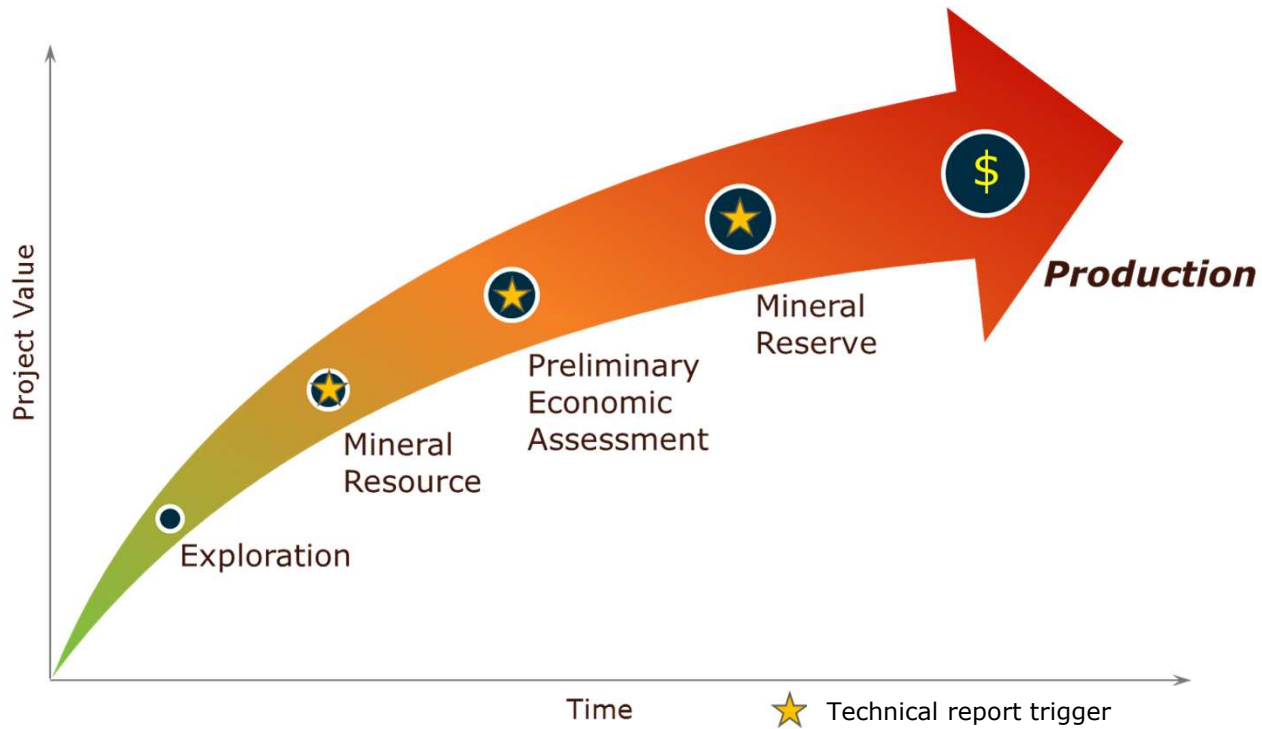
- Clause 48 "Reserve Test"
  - A Reserve Test should be conducted at least annually for Mineral Reserves to verify that at a minimum the future undiscounted cash flow from reserves is positive
  - The cash flow ignores all sunk costs and only considers future operating (including royalties and severance taxes) and closure costs as well as future capital costs

---

**Feb 6, 2018:** Barrick is reclassifying Pascua-Lama's proven and probable gold reserves of approx. 14 Moz, which are based on an open pit mine plan, as measured and indicated resources

---

# Mineral project stage – Production



# Annual resource & reserve estimates – Updates and reconciliation

Annual Information Form (AIF) requires disclosure of mineral resource and mineral reserve estimates as at the issuer's financial year end

- Projects in production
  - Provide an annual update of resource and reserve estimates
  - Good disclosure should also include reconciliation to the previous year's estimates
  - Annual estimates from a producing mine do not trigger a new technical report [see 43-101CP s. 4.2(10)]
- Projects not in production
  - AIF discloses the most recent resource and reserve estimates with effective dates

---

**Note:** AIF Form 51-102F2 (Item 5.4) was revised in June 2015

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# Technical Disclosure Best Practices and Tips for Mining Professionals and Executives

Paul Ténrière, M.Sc., P.Geo.  
Senior Manager Mining  
Toronto Stock Exchange & TSX Venture

March 7, 2018



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# Topics To Be Discussed

- 2017 Year in Mining
- TMX Disclosure Policies
- Material Information
- Timely Disclosure Rules
- Technical Disclosure Requirements
- Common Disclosure Issues
- Useful Contacts
- News Release Exercise

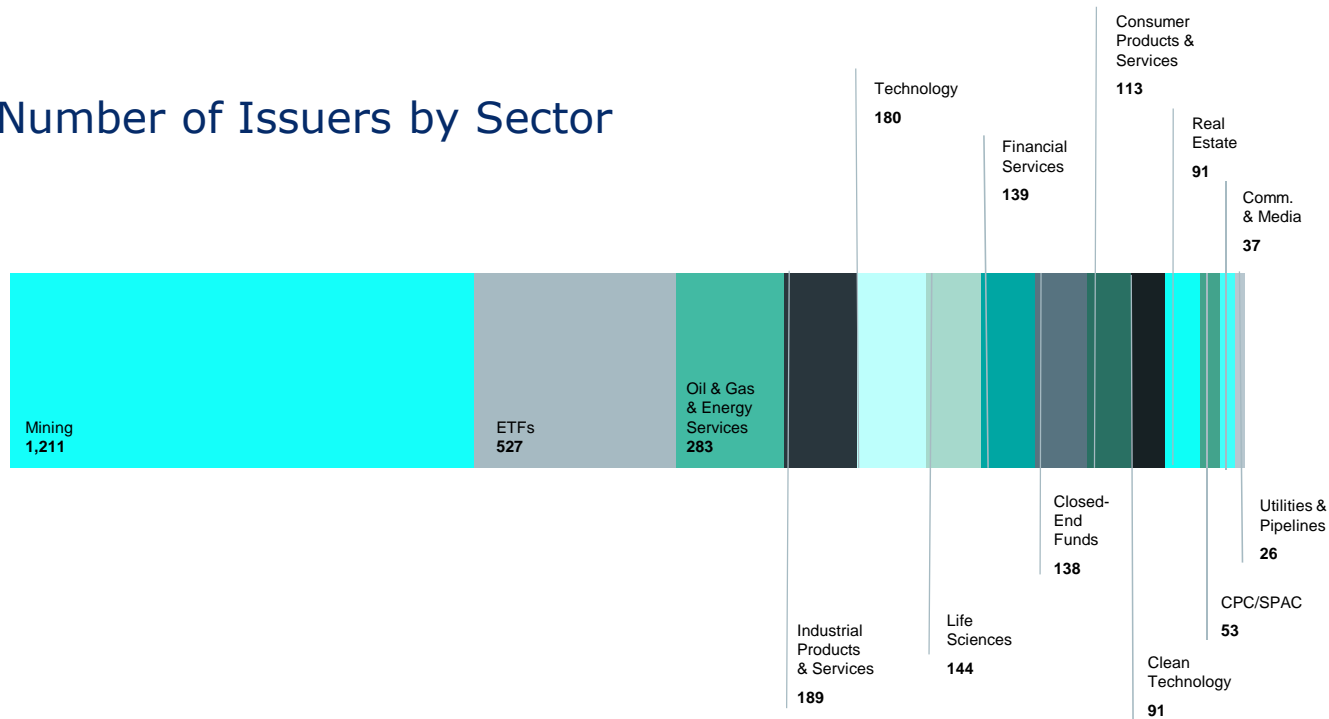


*"If you think compliance is expensive, try non-compliance"*

- Former U.S. Deputy Attorney General Paul McNulty

# 2017 Year in Mining

## Number of Issuers by Sector



# 2017 Year in Mining

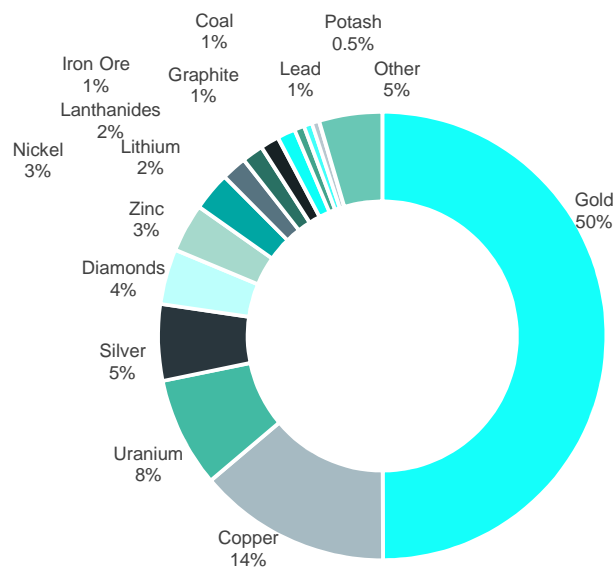
## Number of TSX/TSXV Mining Properties by Stage



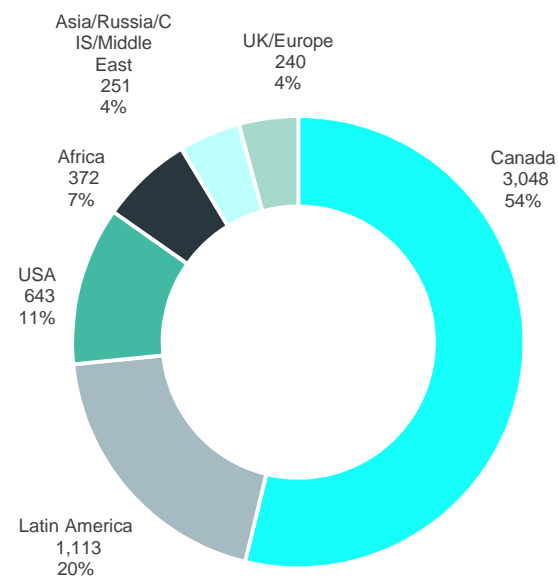


# 2017 Year in Mining

## Breakdown of TSX and TSXV Mining Projects by Primary Metals



## Breakdown of TSX and TSXV Mining Projects by Location



# The Leading Exchange

## 2017 Mining Markets at a Glance

	TSX	TSXV	TSX & TSXV	LSE	AIM	ASX	JSE	HKEx	NYSE & NYSE MKT
Number of Mining Issuers Listed	224	987	1,211	32	117	616	22	46	100
Equity Capital Raised (C\$ billions)	5.2	3.2	8.4	0.2	0.7	5.4	1.4	4.4	3.2
Number of Financings	194	1,219	1,413	7	115	606	3	15	19
Market Capitalization (C\$ billions)	290.9	22.9	313.8	587.0	8.7	445.8	51.1	84.5	964.7
New Mining Listings	7	48	55	1	8	34	2	1	3

# New Mining Listings in 2017

	Name	Root Ticker	QMV (C\$) at 31-Dec-2017	Type of Listing	HQ Location
TSX	Nexa Resources S.A.	NEXA	\$3,268 M	IPO	Brazil
	Clean TeQ Holdings Limited	CLQ	\$870 M	Other	Australia
	SolGold plc	SOLG	\$865 M	Other	Australia
	Ero Copper Corp.	ERO	\$569 M	IPO	BC
	Roxgold Inc.	ROXG	\$521 M	TSXV Grad	ON
	Gold Standard Ventures Corp.	GSV	\$514 M	TSXV Grad	BC
	Leagold Mining Corporation	LMC	\$442 M	TSXV Grad	BC
	First Mining Finance Corp.	FF	\$342 M	TSXV Grad	BC
	Excelsior Mining Corp.	MIN	\$252 M	TSXV Grad	BC
	Cardinal Resources Limited	CDV	\$203 M	Other	Australia
	Nighthawk Gold Corp.	NHK	\$140 M	TSXV Grad	ON
	Titan Mining Corporation	TI	\$124 M	IPO	BC
	Ascendant Resources Inc.	ASND	\$52 M	TSXV Grad	ON
	Mason Resources Corp	MNR	\$19 M	Other	BC
	NewCastle Gold Ltd. (acquired Dec. 2017)	NCA	NA	TSXV Grad	ON
	TSX Venture	New Pacific Metals Corp.	NUAG	\$194 M	COB
LSC Lithium Corporation		LSC	\$129 M	QT from NEX	ON
Fiore Gold Inc.		F	\$83 M	Other	ON
Superior Gold Inc.		SGI	\$73 M	IPO	ON
SRG Graphite Inc.		SRG	\$72 M	RTO	Quebec
Integra Resources Corp.		ITR	\$53 M	Other	ON
Agua Resources Limited		AGRL	\$49 M	Other	Australia
Adventus Zinc Corporation		ADZN	\$18 M	IPO	ON
Avidian Gold Corp.		AVG	\$17 M	QT from NEX	ON
Lithoquest Diamonds Inc.		LDI	\$16 M	RTO from NEX	BC
M2 Cobalt Corp.		MC	\$14 M	QT	BC
Fireweed Zinc Ltd.		FWZ	\$14 M	IPO	BC
Contact Gold Corp.		C	\$14 M	RTO	BC
Compass Gold Corporation		CVB	\$12 M	RTO from NEX	BC
URZ Energy Corp.		URZ	\$12 M	IPO	BC
Abraplata Resource Corp.		ABRA	\$11 M	RTO from NEX	BC
Five Star Diamonds Limited	STAR	\$11 M	QT from NEX	Brazil	

Continued on next slide.

# New Mining Listings in 2017 (cont'd)

Name	Root Ticker	QMV (C\$) at 31-Dec-2017	Type of Listing	HQ Location
Canadian Orebodies Inc.	CORE	\$10.3 M	Other	ON
Group Eleven Resources Corp.	ZNG	\$10.3 M	IPO	Ireland
VR Resources Ltd.	VRR	\$9.7 M	QT	BC
Boreal Metals Corp.	BMX	\$8.8 M	Other	BC
Kenadyr Mining (Holdings) Corp.	KEN	\$8.8 M	QT from NEX	BC
Canadian Mining Corp.	CNG	\$8.2 M	Other	BC
Golden Ridge Resources Ltd.	GLDN	\$7.9 M	RTO	BC
Ceylon Graphite Corp.	CYL	\$7.5 M	RTO	NS
Cabral Gold Inc.	CBR	\$7.4 M	RTO from NEX	BC
Goliath Resources Limited	GOT	\$7.3 M	QT from NEX	Quebec
Aintree Resources Inc.	AIN	\$6.9 M	QT from NEX	BC
Aloplex Gold Inc.	AEX	\$6.8 M	IPO	ON
Aztec Minerals Corp.	AZT	\$6.6 M	IPO	BC
Tethyan Resources PLC	TETH	\$6.2 M	Other	Jersey
Global Energy Metals Corporation	GEMC	\$5.5 M	Other	BC
Harfang Exploration Inc.	HAR	\$5.5 M	QT from NEX	Quebec
Silver Viper Minerals Corp.	VIPR	\$5.4 M	IPO	BC
OneCap Investment Corporation	OIC	\$5.2 M	QT from NEX	Quebec
Kintavar Exploration Inc.	KTR	\$4.5 M	QT from NEX	Quebec
Rockridge Gold Ltd.	ROCK	\$3.3 M	IPO	BC
Broome Capital Inc.	BCP	\$3.1 M	QT from NEX	BC
BTU Metals Corp.	BTU	\$3.1 M	QT from NEX	BC
Trifecta Gold Ltd.	TG	\$3.0 M	Other	BC
Voyageur Minerals Ltd.	VM	\$2.4 M	QT from NEX	AB
Orford Mining Corporation	ORM	\$2.3 M	QT from NEX	ON
Casa Minerals Inc.	CASA	\$2.1 M	QT from NEX	BC
Enerspar Corp.	ENER	\$1.4 M	QT from NEX	ON
Essex Minerals Inc.	ESX	\$1.2 M	IPO	BC
Inomin Mines Inc.	MINE	\$1.1 M	QT	BC
Riley Resources Corp.	RLY	\$0.4 M	QT	BC
Saifish Royalty Corp.	FISH	-	Other	British Virgin Islands

TSX Venture

# TSX: 2017 Largest Mining Financings

Company	Gross Proceeds (C\$)	Type of Financing	Exploring In	Exploring For
Nexa Resources S.A.	\$732 M	IPO	Brazil, Peru	Zinc
Alamos Gold Inc.	\$329 M	PO	Manitoba, Mexico, Ontario	Gold
Osisko Gold Royalties Ltd. (Nov.)	\$300 M	PO	Royalty Streaming	Royalty Streaming
Osisko Gold Royalties Ltd. (Aug.)	\$275 M	PP	Royalty Streaming	Royalty Streaming
Trevali Mining Corporation	\$265 M	PP	Burkina Faso, Namibia, New Brunswick, Peru	Copper, Silver, Zinc
HudBay Minerals Inc.	\$242 M	PO	Arizona, Manitoba, Peru	Copper, Gold, Silver, Zinc
New Gold Inc.	\$233 M	PO/PP	Australia, Arizona, BC, Mexico	Gold
Continental Gold Inc.	\$184 M	PP	Colombia	Gold
Heron Resources Limited	\$140 M	PP	Australia	Copper, Gold, Zinc
Ero Copper Corp.	\$127 M	IPO	Brazil	Copper, Gold, Silver

# TSXV: 2017 Largest Mining Financings

Company	Gross Proceeds (C\$)	Type of Financing	Exploring In	Exploring For
Cobalt 27 Capital Corp.	\$200 M	PO	Royalty Streaming	Royalty Streaming
Leagold Mining Corporation (Mar.)*	\$175 M	PO	Mexico	Gold
Trek Mining Inc. **	\$83 M	PP	Brazil, California	Gold
Bluestone Resources Inc.	\$80 M	PP	Guatemala	Gold, Silver
Leagold Mining Corporation (Apr.)*	\$67 M	PP	Mexico	Gold
Novo Resources Corp.	\$56 M	PP	Australia	Gold
Barkerville Gold Mines Ltd.	\$44 M	PP	BC	Gold
New Pacific Metals Corp.	\$44 M	PP	Bolivia, China, Yukon	Gold, Silver
Rathdowney Resources Ltd.	\$42 M	PP	Poland	Lead, Silver, Zinc
Itafos	\$42 M	PP	Brazil	Phosphate

# TMX Disclosure Policies

- TSX Company Manual Timely Disclosure Policy (Sections 406 - 423.4)
  - Appendix B: Disclosure Standards for Companies Engaged in Mineral Exploration, Development & Production
- TSXV Corporate Finance Manual
  - Policy 3.3 Timely Disclosure
  - Appendix 3F Mining Standards Guidelines
  - Appendix 3E News Release Guidelines

The screenshot shows the TMX website header with the logo and navigation links: HOME, LISTINGS, TRADING, and TSX COMPANY SERVICES. Below the header is a banner image. The main content area is titled 'TSX & TSXV Issuer Resources'. Underneath, there is a section for 'TSX Issuer Resources' with a list of links: TSX Listings Staff, TSX Company Manual (circled in red), Staff Notices, TSX SecureFile, Corporate Governance, Continuous Disclosure, Declaring Dividends or Distributions, Issuer Fees, S&P/TSX Index Eligibility, and Third Party Contacts. Below this is a section for 'TSX Venture Exchange Issuer Resources' with a list of links: TSX Venture Exchange Corporate Finance Manual (circled in red), Publications, NEX, Info TSX Venture, TSX Venture Exchange Market Information, and Graduation to Toronto Stock Exchange.

# Material Information

- TSX issuer responsible for determining if information to be disclosed is material
  - Sec. 407 and 410 provides examples
  - Material information must be disseminated on an approved news wire service
- TSXV specifies events deemed material in nature that require immediate disclosure
  - Policy 3.3 quite prescriptive
  - List found in Policy 3.3 – Sec. 3.8
- TSXV specifies material information that must be pre-filed with IIROC prior to disseminating news release (Policy 3.3 – Sec. 4.2)
  - Reverse Takeovers, Changes of Business or other reorganizations
  - Qualifying Transactions, Reviewable Transactions, including corporate acquisitions or dispositions
  - Change of control
  - Future-oriented financial information or other operating projections
  - Disclosure of mineral resources/ reserves or oil and gas reserves



# Timely Disclosure Rules



- TSX news release dissemination
  - Material information between 8am to 5pm ET = always pre-file with IIROC before disseminating
  - Material information outside 8am to 5pm ET = always copy to IIROC and advise them of dissemination
  - Non-material information = not required to send copy to IIROC, but recommend in case wrong determination of materiality made
- IIROC may halt briefly to disseminate material news
- Technical news releases are reviewed and cleared by IIROC geologist

# Timely Disclosure Rules



- TSX Venture news release dissemination
  - If significant announcement is ready to be made between 8am and 4pm ET, IIROC must be advised in advance by telephone or email
  - If announcement is to be released after 4pm ET, or before 8am ET, must leave IIROC a message summarizing pending announcement, at time announcement ready to be made
  - Refer to Policy 3.3 – Sec 4 news releases must follow Appendix 3E and 3F
- If waiting on a pre-filing decision or technical review please be patient and do not disseminate until instructed to do so by IIROC Market Surveillance

# Technical Disclosure Requirements



- Technical disclosure requirements defined in NI 43-101 and CIM standards, and Appendix B for TSX issuers / Appendix 3F for TSXV
- Must identify Qualified Person (QP) as defined in NI 43-101 responsible for work conducted on property
- QP must confirm they have read and approved technical disclosure
- Websites, corporate presentations, fact sheets, continuous disclosure documents (AIF, MD&A, annual reports) must follow these rules
- Exchanges and Canadian Securities Administrators (CSA) routinely check for compliance

# Technical Disclosure Requirements



## Exploration and Drilling Results - Balanced Disclosure is Key!

- New project disclosure:
  - General description of geological environment
  - Type of samples and assay tests, location map or table of results
  - QA/QC procedures
  - Assay laboratory description and any independent data verification or auditing
- Early exploration activities/results (i.e. soil or geophysical surveys) must be described as preliminary in nature and not conclusive of a mineral deposit
- Analytical results should be reported in a timely manner and always report both positive and negative results including 'no significant assay' intervals

# Technical Disclosure Requirements



## Exploration and Drilling Results

- Report all assay results
  - If three holes are disclosed as part of a six hole program, balance must be reported as soon as assay results are available
  - Early exploration projects – disclose DH location-type, azimuth, dip, depth of holes
- Comment on the true width of the drill sample (state if not yet known)
- Metal equivalents
  - Disclose grade of each metal/mineral used to establish metal/mineral equivalent grade
  - Disclose metal prices used, recovery assumptions, and metal equivalent calculation
  - Conversions should be restricted to similar commodities, and not used to convert base metals to precious metals

# Technical Disclosure Requirements



## Production Cost Reporting

- Gold producers should follow the World Gold Council Production Cost Standard to provide further transparency into the costs associated with producing gold
- All-In Sustaining Costs (AISC) and All-In Costs – used by most major Canadian gold producers
- Future production cost reporting standards specific to base metal producers and other commodities will be coordinated through CSA & CIM

# Common Disclosure Issues



1. Overly promotional language – immediately flagged by IIROC and Exchanges and if not vetted may result in news release in question being retracted and clarifying statement issued
  - × World Class Discovery!
  - × Bonanza Grades!
  - × Exceptionally High Grade Results!
  - World Class Deposit!
  - Abundant Visible Gold!
  - Spectacular and Extraordinary!
2. Burying bad/material news at the middle or end of a long news release
3. Improper use of metal equivalents leading to misleading technical disclosure
4. Not disclosing whether drill hole intersections are true widths, potential assay stretching issues, no discussion on sampling/assaying methods

# Common Disclosure Issues



5. Qualified Person statement not included in technical disclosure, or QP has obviously not reviewed news release prior to being issued by company
6. Use of term "NI 43-101 compliant" in disclosure materials, and lack of disclaimers when reporting historical resource estimates
  - Please note there is no regulatory process for confirming whether a mineral resource or reserve estimate or technical report is "NI 43-101 compliant"
  - "... *XXX completed (or prepared) in accordance with NI 43-101*" or similar



# Common Disclosure Issues



## 7. Misuse of “target for further exploration” or “exploration target” category

- Disclose only as range of tonnes & grades with supporting details and cautionary statement - NI 43-101 Restricted Disclosure Section 2.3(2)
- Economic analysis (PEA) cannot include exploration target tonnages & grades

## 8. Discussing production potential without economic analysis

- Any forward-looking comment regarding production without a supporting economic analysis and mining study (PEA, PFS or FS) will not comply with NI 43-101 reporting requirements
- Cannot quantify recovered metals or mine life, or any suggestion of production, profits or profitability

# Common Disclosure Issues



9. Disclosing the results of a PEA, PFS or FS that do not also include after-tax economic results (NPV and IRR) for a project
10. QA/QC procedures not disclosed as required by NI 43-101
11. JORC resources not reconciled to CIM definitions
12. Adding Inferred Resources to Measured & Indicated Resources (permitted under JORC but not NI 43-101), and cautionary statements not included
13. Missing technical information required under NI 43-101 disclosure rules especially disclosure of exploration information & resource/reserve estimates

# Useful Contacts

## **IIROC – Market Surveillance**

TSX issuers filing news releases:

- TSX SecureFile (preferred option - encrypted)
- Tel: (416) 646-7220
- Fax: (416) 646-7263
- Email: [pr@iiroc.ca](mailto:pr@iiroc.ca)

TSX Venture issuers filing news releases:

- Tel: (604) 643-2792
- Fax: (604) 643-2799
- Email: [prwest@iiroc.ca](mailto:prwest@iiroc.ca)

## **Toronto Stock Exchange (TSX)**

Compliance and Disclosure:

- Tel: (416) 947-4767
- Toll Free: 1-888-873-8392
- E-mail: [disclosure@tmx.com](mailto:disclosure@tmx.com)

Mining Disclosure and Listing Requirements:

- Tel: (416) 947-4447
- E-mail: [paul.teniere@tmx.com](mailto:paul.teniere@tmx.com)

## **TSX Venture Exchange (TSXV)**

Compliance and Disclosure:

- Tel: (604) 488-3124
- Fax: (604) 688-6051
- Email: [complianceanddisclosure@tsxventure.com](mailto:complianceanddisclosure@tsxventure.com)

# News Release Exercise

**Please Refer To Handouts**

**TMAC Resources Inc. (TSX:TMR)**

**NioCorp Developments Ltd. (TSX:NB)**

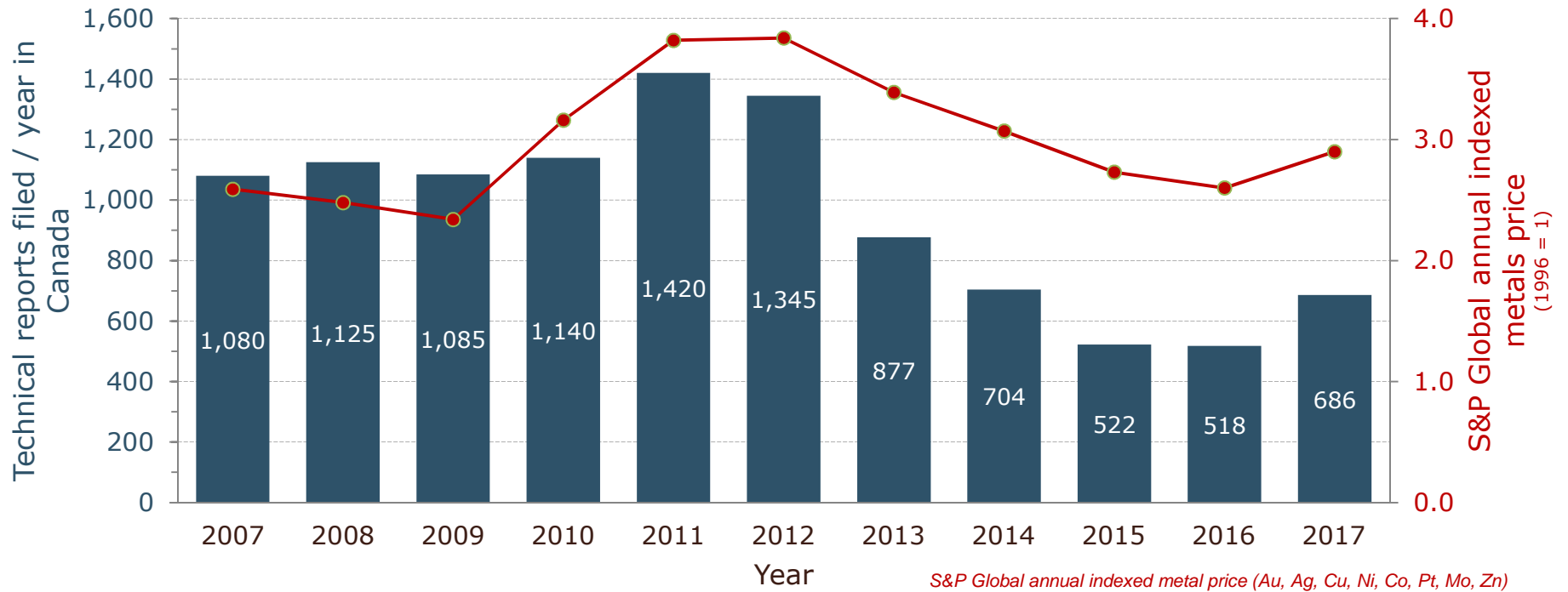




# Technical Report Basics

*Technical reports prepared in accordance with NI 43-101 support a mining company's most important asset – their material mineral properties*

# Technical reports filed per year (2007 to 2017)



# Not all technical reports are created equal!



- The quality and reliability of the technical report all comes down to the integrity, honesty, competence, and experience of the QPs preparing the technical report

# Misconceptions about technical reports

- ✘ *Technical reports are "approved" by the regulator before being publically filed on SEDAR*
- ✘ *The company has a "43-101" report, so it must be a good property*
- ✘ *The technical report is over 300 pages, so it must be an advanced property and close to production*
- ✘ *How could the project fail? – it had a "43-101" technical report!*

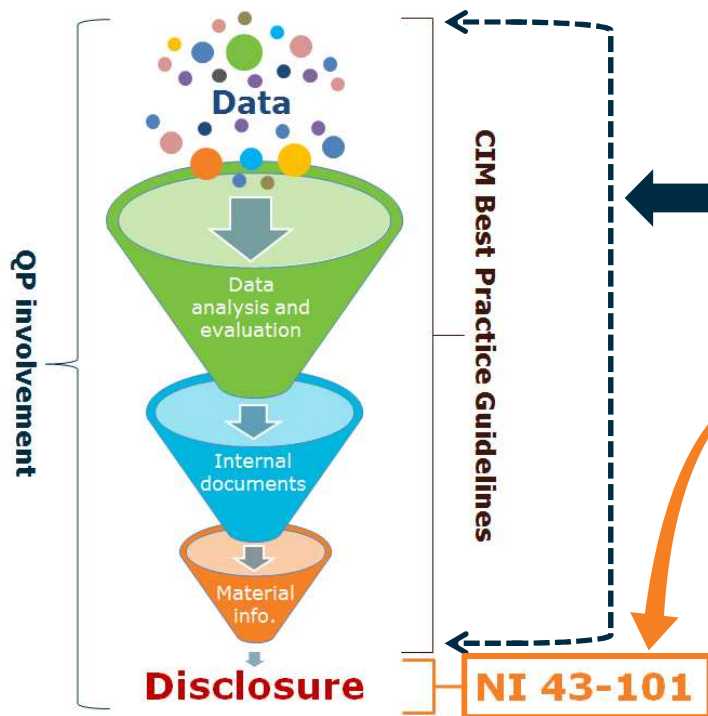
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## **Remember:**

- *NI 43-101 sets minimum standards for disclosure of technical information*
- *The QP is responsible for the methods, assumptions, and judgements used for verifying, interpreting, and reporting of the technical information*



# Disclosure vs. state of practice



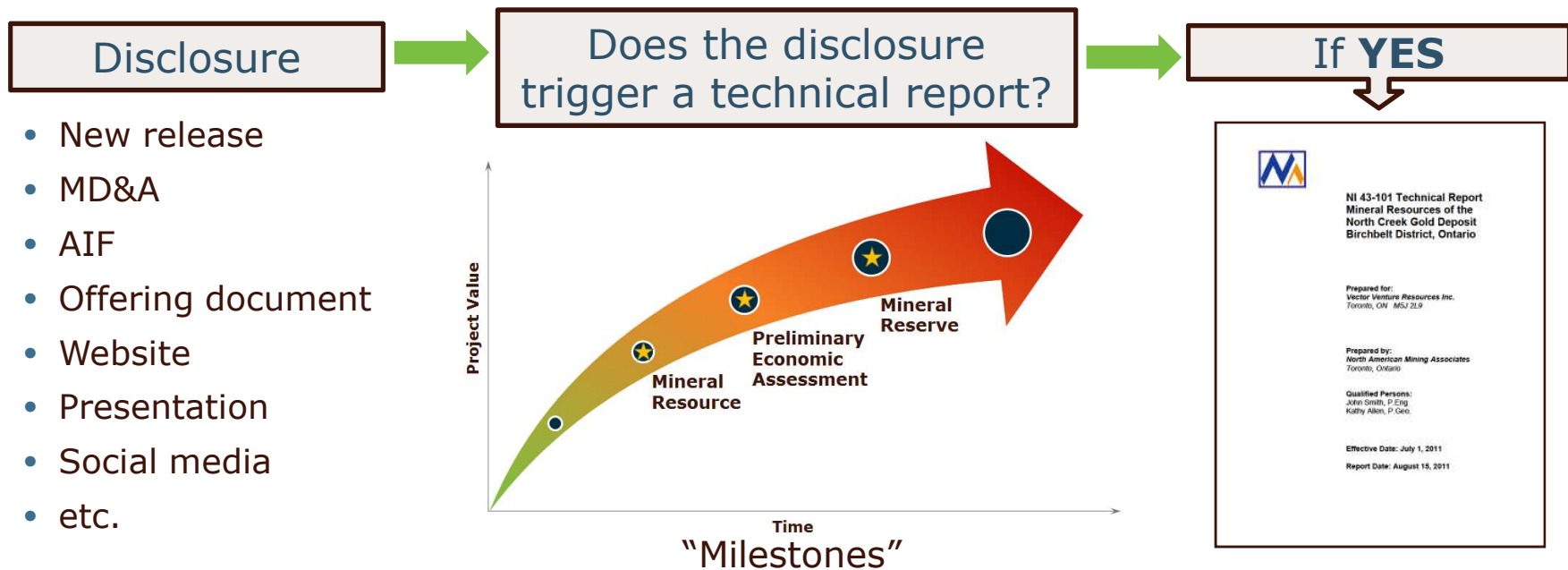
① **IF** a problem occurs up here with the **state of practice**

- Data quality
- Misinterpretation of information
- Not following best practice guidelines
- Unrealistic assumptions
- Resource estimation issues
- Overly optimistic mining study forecasts

② **THEN**, the problem shows up down here in the **disclosure** in the **technical report**

③ **BUT**, NI 43-101 can't fix problems with the **state of practice** – these problems need to be addressed by the **QP** before the disclosure is made

# Process: Disclosure to filing a technical report



# “Milestones” trigger technical reports

## Property Milestones

- First time disclosure of:
  - Mineral resource
  - Preliminary economic assessment
  - Mineral reserve
- Material change to any of the above

*“Property success or revision triggers”*

## Company Milestones

- First 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
    - (1<sup>st</sup> 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

*“Company event triggers”*

# Mineral property with multiple deposits

***Can an issuer file separate technical reports for different deposits on the same mineral property?***

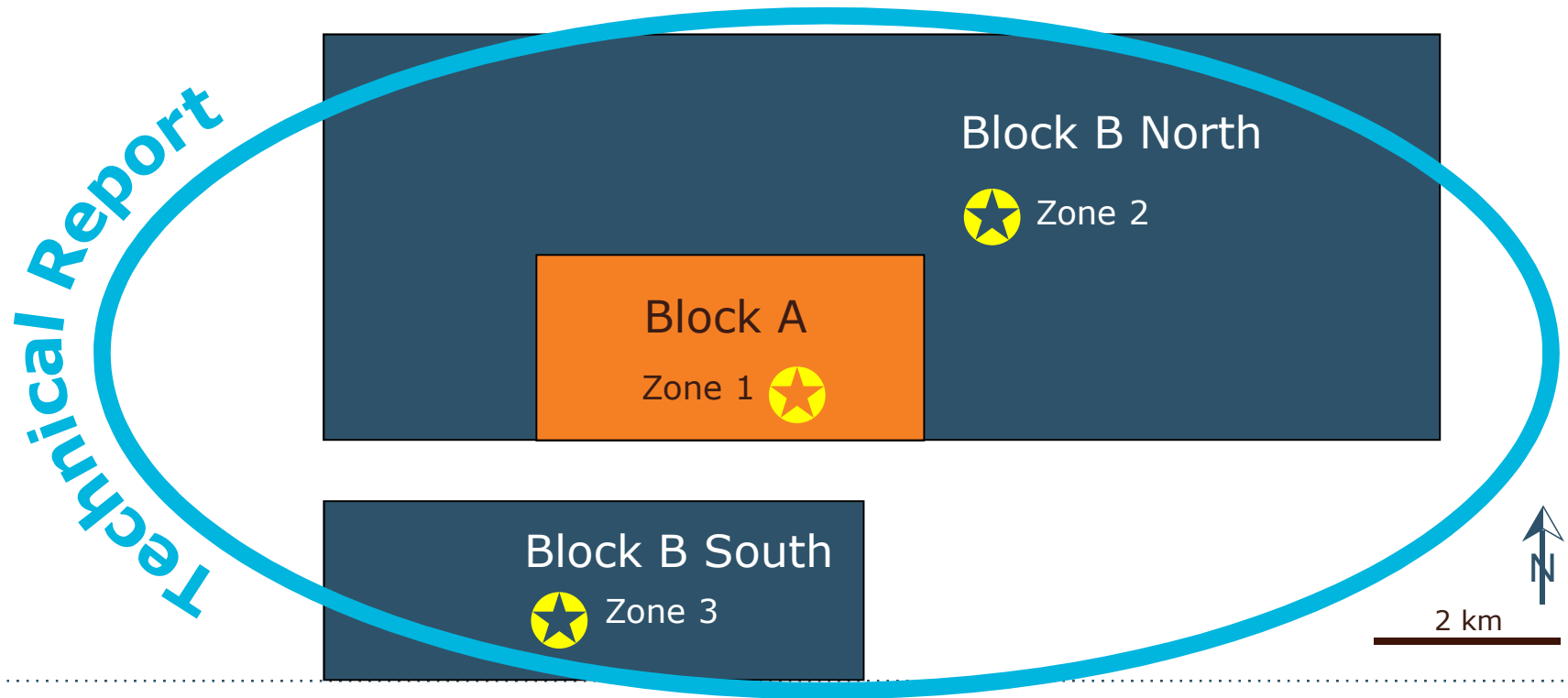
- **No** (generally)
- Companion Policy says:
  - 1.1(6) - a “property” includes claims that are contiguous or in close proximity that any underlying deposits would likely be developed using **common infrastructure**
  - 4.2(8) - a technical report when filed must be complete and current and there should only be **one current technical report** on a property at any point in time

---

*Determination generally depends upon:*

- *Existing or proposed infrastructure (i.e. central mill)*
  - *How the issuer is reporting the potential development of the mineral deposits*
-

# Example: Single technical report



# How big should a technical report be?

- **General rule of thumb**

- Technical reports provide material information at a “summary-level”
- Disclosure should focus on what's important for the stage of development of the property
- Limit the pages of appendices

- **Observation**

- Average of 137 technical reports filed on SEDAR (April 2016 to June 2017)

<b>Property Stage</b>	<b>Pages</b>	<b>Mb</b>
Exploration (21)	94	5.3
Resource (36)	168	6.0
PEA (15)	240	7.0
Reserve (27)	354	12.6
Operating (38)	257	7.3

# Independent technical reports



[s. 5.3]

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

# Determining independence

- **Independence test [s. 1.5]**

- QP is independent if there is no circumstance that, in the opinion of a “reasonable person” aware of all relevant facts, could interfere with the QP’s judgment regarding the preparation of the technical report

- **Guidance** [Companion Policy]

- Interpreting the “reasonable person” test [1.5]
  - Provides a non-exhaustive list of situations where the QP is not independent
- Objectivity of the QPs [5.3(3)]
  - Staff may question the objectivity of the QPs
  - May ask for additional information, additional disclosure, or involvement of another QP



# Self-assessment questions for the QP

- Would the vast majority of my peers agree with my logic in defining, classifying, and reporting the mineral estimates?
- Are my assumptions for eventual economic extraction reasonable and realistic?
- Have I considered approximate mining parameters and costs for reporting resource estimates?
- Would informed investors understand the assumptions, factors, procedures used?
- Does the project's stage of development reflect the level of confidence in the underlying data?
- Have I considered and used all representative data, and if not, have I considered the advantages and risks in not doing so?
- Have I applied realistic and justifiable mining and processing factors in determining the mine plan and schedule for reporting the reserve estimates?
- Have I adequately presented the significant areas of risk and uncertainty and potential ways that these could be addressed in future work and studies?

---

*Modified from Mark Noppé - March 2014*

# Tips for QPs preparing technical reports

## Top 10 tips

- ✓ Make sure you (the QP) have an appropriate amount of “relevant experience”
- ✓ Know the purpose of the technical report (*i.e.* triggering event)
- ✓ Setup a basic template for the technical report
- ✓ Use a checklist based on the disclosure requirements
- ✓ Use the current 2014 CIM Definition Standards
- ✓ Follow the CIM Best Practice Guidelines
- ✓ Review the guidance in the various CSA Staff Notices
- ✓ Write a concise and complete summary of the significant findings
- ✓ Clearly state the potential risks and uncertainties with the project
- ✓ Have the draft technical report **peer reviewed**

# CIM guidance - Peer review and audit

- **CIM Best Practice Guidelines – Estimation of Resources and Reserves (2003)**
  - Peer Review
    - Best practice includes use of an internal peer review of the estimate including inputs, methodology, underlying assumptions, and the results of the estimate itself
  - Audits/Governance
    - Best practice includes completion of a properly scoped audit carried out by an impartial QP
    - Audit should consider the methodology, reasonableness of assumptions, and a review for conformity to the definitions and classifications
    - Audit should be documented in a manner that recognizes good corporate governance





# Technical Report Common Disclosure Pitfalls

*Regulators enforce disclosure requirements and have little or no effect on the results or outcomes of the technical report prepared by the QP*

# Form 43-101F1

(Note: Focus will be on bold items, but all are important)

**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 Metallurgical 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

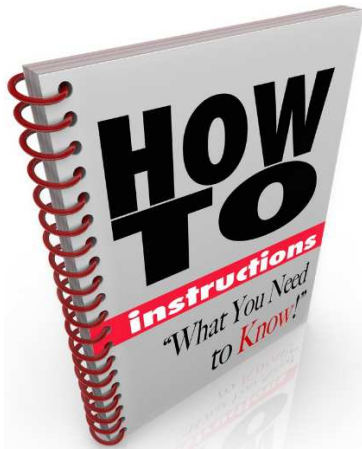
**Item 25: Interpretation and Conclusions**

Item 26: Recommendations

Item 27: References

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

# Don't forget to read the instructions



1. Objective of a technical report is to provide a summary of the material information about the mineral property
2. Look at NI 43-101 definitions and rules
3. Report should be understandable to a reasonable investor
4. Items 1 to 14 and 23 to 27 for all properties plus 15 to 22 for "advanced properties"
5. Each report replaces the previous report, may summarize existing information, but QP still takes responsibility
6. QP determines the level of detail necessary for the report
7. Limited disclaimers allowed for information by non-QP experts
8. Appendices may be used - but keep them short
9. Remember to sign and file the QP certificates and consents

# Item 1: Summary

## A key part of any technical report

- Briefly summarize the “key findings” relative to the property’s stage of development
  - Property description and ownership
  - Exploration and drilling status
  - Data verification and site visit
  - Mineral resource and reserve estimates (if applicable)
  - Mining studies and economic analysis (if applicable)
  - QP’s conclusions and recommendations

---

### **Observation by the regulator:**

- *The summary section is usually about 5% of the total pages of a technical report*
-

## Item 2: Introduction

### Identifies the purpose and sets the framework of the technical report

- Terms of reference
  - Discuss objectives and scope of the technical report
  - Clearly state the purpose of the technical report (linked to the triggering event)
  - Identify the QPs involved and their responsibilities in the technical report
- Site visit
  - Who, when, and what was done during the site visit

---

#### **Suggestion:**

- *Consider a table to show the QP responsibilities and site visit dates*
-



# Example: Table of QP responsibilities

Table 2: Qualified Persons

Company	Qualified Person	Site Visit	Responsibility
SRK	QP 1	July 6-10, 2015	Overall responsibility on behalf of SRK. Project Management (Executive Summary, Sections 1 to 11, 18, 21, 22, 23, 26, and parts of 24 and 25)
SRK	QP 2	June 16-18, 2014 December 14-16, 2016 November 8-9, 2017	Geology and Mineral Resources (Section 13, parts of 24 and 25)
SRK	QP 3	No Visit	Review of Processing and Recovery Method (Sections 12, 16, and parts of 20)
SRK	QP 4	December 14-16, 2016 November 8-9, 2017	Underground Mining and Mineral Reserves (Parts of Sections 14, 15, 20, 24, and 25)
Independent	QP 5	June 10-12, 2014 June 16-18, 2014 July 6-10, 2015 December 14-16, 2016 October 9-13, 2017	Open Pit Mining and Mineral Reserves (Parts of Sections 14, 15, 17, 20, 24, 25, and 26)
SRK	QP 6	No Visit	Environmental and Social and Permitting (Section 19)

# Item 3: Reliance on other experts

## Opinions of an expert for non-technical information

1. May rely on a report or opinion related to:
  - Legal, political, environmental, or tax matters
    - Identify:
      - Report, opinion, or statement
      - Date and author
      - Section of the technical report to which the reliance applies
  
2. May also rely on a report or opinion related to:
  - Valuations for diamonds and gemstones
  - Pricing for commodities where pricing not publicly available
    - Identify:
      - Qualifications of expert, potential risks and any verification by the QP

# Example: Reliance on property title opinion

## Mineral Tenure

*"The QPs have not reviewed the mineral tenure, nor independently verified the legal status, ownership of the Project area or underlying property agreements.*

*The QPs have fully relied upon, and disclaims responsibility for, information derived from legal experts for this information through the following document:*

*Letter from Clark Wilson LLP titled XYZ Resources Ltd. – Mineral Claim Title dated October 29, 2017. Information from this letter has been used in Section 4 of this technical report."*

## Item 12: Data verification

### The project's stage of development needs to reflect the level of data verification and confidence in the information

(eg. No data verification = No mineral resource estimate)

- Describe the data verification by the QP
  - Steps taken by the QP to verify the data used in the technical report
  - Any limitations on data verification, or failure to verify, and reasons why
  - QP's opinion on the adequacy of the data for the purposes used in the technical report

---

#### Example: QP's opinion on data verification

*"Based on the data verification performed, it is the QP's opinion that the collar coordinates, downhole surveys, lithologies, and assay results are considered suitable to support the mineral resource estimation."*

# Example: Types of data verification

- **Database check**
  - Drill collar coordinates
  - Down-hole deviations
  - Lithology and alteration
  - Assay data
  - Error checks
- **Site visit due diligence**
  - Drill collar locations in the field
  - Logging and sampling facilities
  - Core storage
  - Inspection of drill core recovery and mineralization
  - Independent sampling, if appropriate
  - Laboratory visit, if appropriate

---

*"Assume nothing ... check everything ... trust no one." Harry Parker, AMEC - May 10, 2004*

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# Item 14: Mineral resource estimates

**Mineral resource = “reasonable prospects of eventual economic extraction”**

- Summarize
  - Key assumptions, parameters, and methods to determine resources
  - Comply with disclosure required by s. 2.2, 2.3, and 3.4
    - 2.2 - All disclosure of mineral resources and mineral reserves
    - 2.3 - Restricted disclosure
    - 3.4 - Written disclosure of mineral resources and mineral reserves
  - For metal equivalents - report the individual grades and assumptions used
  - Discuss any material factors that could affect the mineral resource estimates
    - Environmental, permitting, legal, title, socio-economic, political, other factors

# Example: Key assumptions, parameters & methods

- **Assumptions**

- Cut-off grade and basis for its determination
- Commodity prices
- Mining and processing method
- Metallurgical recovery
- Costs related to mining, processing, and G&A

- **Methods**

- Ordinary kriging, inverse distance squared, polygonal, etc.

- **Parameters**

- Appropriate geological model for the deposit type
- Cutting factors
- Bulk density
- Search distances and minimum samples per block
- Interpolation distances and directions

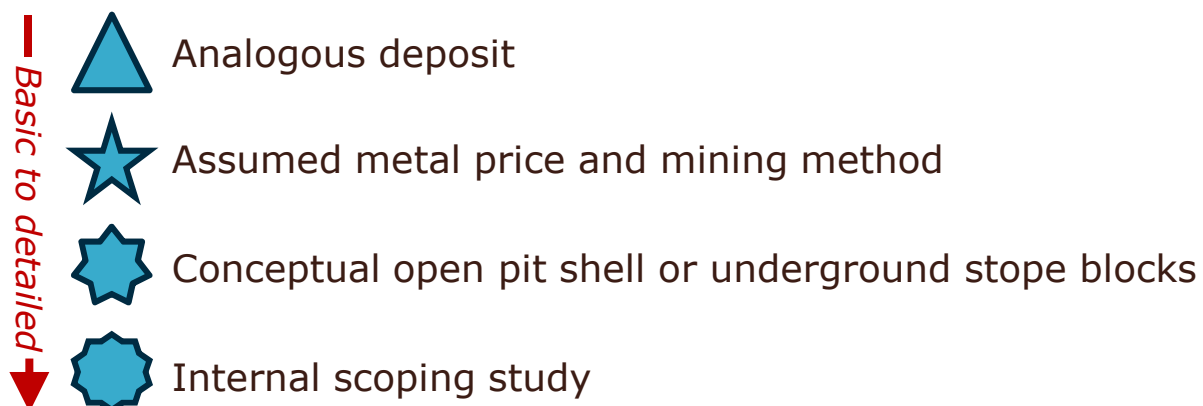
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**Note:** *The cut-off grade needs to reflect the assumed mining method*

---

## Variation in “judgement by the QP”

- Observed basis used by QPs for determining that a mineral resource estimate has “reasonable prospects for eventual economic extraction”



---

### **Possible intervention by the regulator:**

- May require the QP to provide additional disclosure about how they determined the mineral resource has “reasonable prospects for eventual economic extraction”



# Example: Reasonable prospects assumptions

## ***Assessing reasonable prospects for eventual economic extraction***

*To assess reasonable prospects for eventual economic extraction, an optimized pit shell was prepared using general technical and economic assumptions listed below to constrain the estimated resource blocks.*

*Technical and economic parameters for assessing reasonable prospects:*

<i>Gold Price</i>	<i>US\$1,300/oz</i>
<i>Silver Price</i>	<i>US\$17/oz</i>
<i>Gold Recovery</i>	<i>85%</i>
<i>Silver Recovery</i>	<i>45%</i>
<i>Exchange Rate</i>	<i>US\$:C\$ 1 to 0.80</i>
<i>Mining Cost</i>	<i>\$1.50/tonne</i>
<i>Processing Cost</i>	<i>\$7.25/tonne</i>
<i>G&amp;A Cost</i>	<i>\$1.05/tonne</i>
<i>Pit Slope</i>	<i>45 degrees</i>

# What is a reasonable metal price?

## **CIM Guidance on Commodity Pricing in Resource & Reserve Estimation (2015)**

- Consider the stage of development (resource vs. reserve vs. production)
  - Long term average (5 years or longer)
  - Consistent with peers (consensus pricing)
  - Contract price
  - Current price
  - Specialist reports (commodities with no published price)
- Observation by the regulator – commonly used standard
  - Lesser of the 3-year trailing average or current spot price



# What does NI 43-101 say about using best practice guidelines?

- General Guidance (6) of Companion Policy 43-101CP
  - QP is not specifically required to follow the CIM best practices guidelines
  - However, a QP acting as a “professional”, will generally respect industry standard practices, as established by CIM or similar organizations in other jurisdictions
  - Issuer’s that disclose technical information not conforming to industry standard practices could be making **misleading disclosure**

---

## **Note:**

- *Regulators may challenge an issuer's disclosure if it appears to deviate from published industry best practices*
-

# Industrial/specialty mineral resources

## Ex: Lithium, graphite, silica, etc.

### CIM Best Practice Guidelines – Industrial Minerals (2003)

- Potential viability of an industrial/specialty mineral deposit differs significantly from a metallic mineral deposit in one key area - **marketing factors**
  - Mineral characteristics of the deposit must meet the demands of the market
  - Economic viability is significantly affected by factors such as:
    - Physical, chemical, and quality characteristics of the mineral
    - Size and concentration of the market
    - Transportation costs
- Driver of potential value is the “quality” of the deposit, not the tonnage, grade or amount of contained mineral

---







*“Without a market, an industrial mineral deposit is merely a geological curiosity”*

*Peter Harben, Industrial Minerals Consultant*

---

# Use of an “acceptable foreign code”

Include in the technical report a reconciliation of “material” differences to the CIM Definition Standards [s. 7.1(2)]

Foreign Code	Country or Region
	Australasian (JORC Code)
	Europe (PERC Code)
	South Africa (SAMREC Code)
	Chile (Certification Code)
	United States (Industry Guide 7)
	Russia (NAEN Code)
<i>Any foreign code consistent with CRIRSCO</i>	<b>Appendix A.1</b> of Companion Policy 43-101CP lists Additional Acceptable Foreign Codes (February 2016)

# Items 16 to 22 for an “advanced property”

“Advanced property”: reserves (based on a PFS or FS), or resources and a PEA

16. Mining Methods
17. Recovery Methods
18. Project Infrastructure
19. Market Studies and Contracts
20. Environmental Studies, Permitting and Social or Community Impact
21. Capital and Operating Costs
22. Economic Analysis

---

## ***Instruction for Items 16 to 22***

- *PEA, PFS, and FS generally analyze and assess the same geological, engineering, and economic factors with increasing detail and precision*
  - *Items 16 to 22 can be used as a framework for reporting the results of all three studies*
-

# 3 types of technical and economic studies

Disclosure concerns



Criteria	Technical & Economic Studies		
Type of Study	<b>Preliminary Economic Assessment (PEA)</b>	<b>Prefeasibility Study (PFS)</b>	<b>Feasibility Study (FS)</b>
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	+/- 30-50%	+/- 20-25%	+/- 10-15%
Contingency	35%	15%	10%
Engineering	0-5% completed	5-15% completed	15-50% completed
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. Based on SME and AACE.

# 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**
  - **PEA done in conjunction with a PFS, FS, or LOM plan**
  - **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



# CIM guidance - Inferred in economic studies

## CIM Definition Standards (2014)

- Guidance on inferred resources in publicly disclosed PFS, FS, and LOM plans reflects the prohibition on including inferred resources in these studies
  - **PFS or FS** must not include inferred resources in the:
    - Economic analysis
    - Production schedules
    - Mine life
  - **Developed mines** must not include inferred resources in the:
    - Life of mine plans
    - Cash flow models

---

Article: "Implementation of 2014 CIM Definition Standards" P. Bankes, Aug/Sep 2015, CIM Magazine

---

# PEA after reserves – What is allowable?

## 1. Issuer takes a **step backwards**

- Entire project moves back to a PEA stage
  - May be due to new property ownership, new information, etc.
  - All reference to mineral reserves is removed from the disclosure

## 2. Issuer **re-scopes** an existing project

- Based on significant new information or a different production scenario
  - New discovery or deposit type on the same property
  - Change in mining or processing method
  - Change to infrastructure requiring significant capital investment
- **Clearly separate** the detailed mine design and economics (PFS or FS) supporting reserves (*Items 15-22*) from the conceptual mine design and economics (PEA) on resources (*Item 24*), and don't include reserves in the PEA

# 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 mineral reserves
  - Treat inferred resources as if they have the same confidence as mineral reserves
  - Treat the PEA as if it has the same detailed design and planning as the PFS, FS or LOM plan
- Two fundamental 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 in the PFS and FS, or the LOM plan at a developed mine

---

*The PEA is always disclosed as an independent and standalone analysis from the PFS, FS, or LOM plan*

---

# Item 20: Environmental studies, permitting and social or community impact

## Water, tailings, and waste are critical areas of project risk

- Environmental and permitting - summarize
  - Environmental studies completed and issues that may materially impact extraction
  - Requirements for tailings disposal and water management
  - Project permit requirements and the status of permits
  - Requirements for reclamation bonds
  - Mine closure costs

---

*"The public couldn't care less about our productivity levels and ROI. They absolutely do care what we do with our waste streams – waste water and solid waste. This is where our industry interacts with the public."*

*Douglas Morrison, CEO, Centre for Excellence in Mining Innovation (CEMI) - January 16, 2018*

---

# Item 20: Environmental studies, permitting and social or community impact

## Obtaining and maintaining “social license” is critical for mineral projects

- Social or community impact - discuss
  - Potential social or community related requirements and plans for the project
  - Status of negotiations or agreements with local communities

---

**BLACKROCK**<sup>®</sup> 2018 letter to CEOs (BlackRock manages **\$6.3 trillion** in assets)

*"Society is demanding that companies, both public and private, serve a social purpose. ... Companies must benefit all of their stakeholders, including shareholders, employees, customers, and the communities in which they operate."*

# Item 21: Capital and operating costs

## Provide adequate context and justification for the estimated costs

- Summarize
  - Capital and operating costs with major components in tabular form
  - Explain and justify the basis for the cost estimates
- Remember s. 2.3(4) on use of the terms PFS and FS
  - Must only use the term prefeasibility study (PFS) or feasibility study (FS) if the study satisfies the criteria set out by the CIM Definition Standards

---

*Approximate level of cost accuracy for each study: PEA  $\pm$  30-50%, PFS  $\pm$  20-25%, FS  $\pm$  10-15%*

---

# Example: Basis for capital cost estimates

Table 21-3: Basis of Estimate Summary

Item	Estimate Basis
<b>Equipment</b>	
Major Equipment	Multiple budget quotations using general engineering specifications and data sheets based on the design criteria and process flow diagrams. Also includes single source pricing from select designated suppliers. Tank costs are based on quotes from equipment suppliers for specific CIC and ADR tanks, and/or steel take offs and steel prices using sizes specified in the design criteria.
Minor Equipment	Budget quotations based on brief specifications and/or process flow diagram information. Where quotations were not received costing used from previous similar projects was used.
<b>Materials</b>	
Concrete	Preliminary concrete quantities are estimated based on the GA drawings and experience with similar projects. A 5% allowance is added in the build-up for spillage and over pour. Unit rate costs are based on contractor quoted pricing from suppliers in Ontario. The concrete unit rates include batching costs, aggregate crushing and screening, rebar, forming, pouring and finishing. Structural backfill quantities were estimated by JDS using basic engineering and experience.
Structural Steelwork	Structural steel quantities are estimated based on the GA drawings and experience with similar projects. Unit rate costs for supply are based on budgetary quotations from steel fabricator in Ontario. Construction and erection hours are based on experience with similar projects.

# Item 22: Economic analysis

## Assumptions should be reasonable and defensible

- Provide
  - Clear statement of the main assumptions (a table is useful)
  - Cash flow forecasts on an annual basis for the life of the project
  - NPV, IRR, and payback (using a reasonable discount rate)
  - Taxes, royalties and government levies applicable to the project
  - Sensitivity analysis with a “reasonable range” using parameters significant to the particular project
- Instruction
  - “Producing issuers” may exclude the economic analysis for properties in production, unless a material expansion is planned



# Economic analysis - Points to consider

## Economic analysis should be prepared:

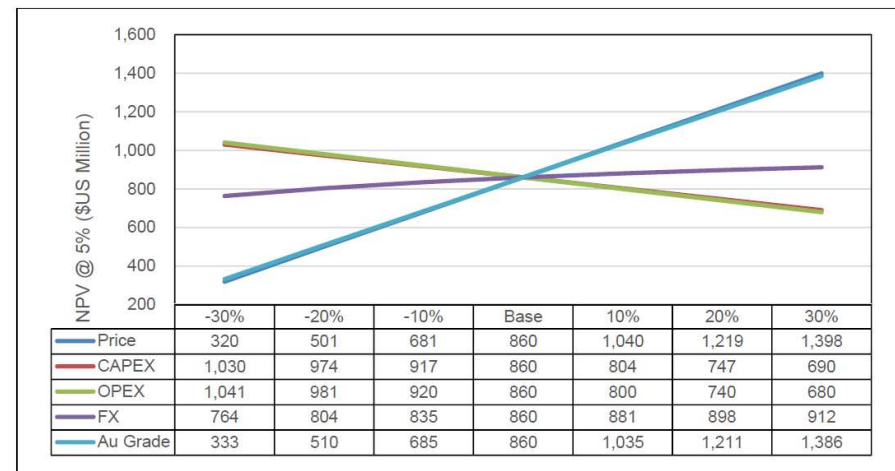
- On a project basis
  - No issuer specific provisions such as for tax losses, etc.
- On a 100% equity basis
  - Not a combination of debt and equity
- By considering the metal streaming contract price
  - If a Cu stream is in place for the Au project, use the contract Cu price, not assumed price
- Using a reasonable discount rate
  - Dependent upon commodity, project location, stage of development, etc.
- On a pre-tax and after-tax basis
  - Everyone pays taxes!

# Extending the “shelf life” of a technical report

## Guidance

- Companion policy [s. 4.2(7)]
  - Economic analyses are based on assumptions that can change over time
  - Economic and financial outcome information can quickly become outdated
  - The “shelf life” of the technical report can be extended by providing an appropriate sensitivity analysis of key variables:
    - Commodity price
    - Recovery
    - Capital and operating costs
    - Foreign exchange rate
    - Discount rate
    - Etc.

Figure 23.2: After-Tax NPV5% Sensitivities



# Item 25: Interpretation and conclusions

## Clearly communicate the project's material risks and uncertainties

- Summarize
  - Relevant results and interpretations
  - Significant risks and uncertainties that may reasonably affect the reliability or confidence in:
    - Exploration information
    - Mineral resource or mineral reserve estimates
    - Projected economic outcomes
  - Potential impacts of these risks to the project's potential viability or continued viability

---

### **Observation:**

- *This is a critical step and may help the QPs identify "interconnected" risks*

# Example: Risks and potential impacts (Mineral resources)

Table 69: Risk categories used

Risk Category	Definition
	Fatal Flaw (significant material risk to metal)
	Moderate (metal may be at risk)
	Low (unlikely to have material affect on metal)
	Insignificant (errors detected, but immaterial)
	Potential upside or opportunity

Table 70: Project Risk Table (Coloured by risk category)

Project	Balogo
Data Management System	Opportunity to improve on excel and passport-based data capture and storage, with a move towards more secure relational database structure to improve integrity and more efficiencies in data management, storage and security.
Geology	No digital geology data provided.
QAQC	Past QAQC failures has led to the exclusion of eight drill holes from the MRE database.
Artisanal Workings	No survey data for artisanal workings. Surface metal may be at risk.
Nature of Gold Mineralisation	Visible Au and extremely high grade Au mineralisation may be discontinuous. Close spaced grade control required.
Dry in-situ bulk density	Oxide and transitional density is not based on actual measured values, due to likely oversampling of competent material in core. This leads to uncertainty in the density values used for approx. 30% of the mineralisation, but based on CSA Global's experience, these values are unlikely to be too high.
Topography	Topography based on drill hole collars. Has had to be expanded for mine planning work. May place some oxide mineralisation at risk.

Table continued ...

# QP certificate

## Follow the requirements in s. 8.1(2) of NI 43-101

- The QP certificate must state information for (a) through (i)
  - a) QP's name, occupation and address
  - b) Technical report name and date
  - c) QP's relevant experience and professional association**
  - d) Site visit**, or not
  - e) Items of responsibility**
  - f) Independent**, or not
  - g) Prior involvement with property
  - h) Prepared in compliance with NI 43-101
  - i) Technical report is not misleading

## Example: Relevant experience statement (Responsible for mineral resource estimate section)

- Deficient Example:

*I have practiced my profession continuously since graduation from university in 1987.*

- Better Example:

*I have worked as a professional geologist for 30 years since graduation from university in 1987. My relevant experience for the purpose of the Technical Report includes:*

- *Since 2006 - Consulting geologist specializing in mineral resource and mineral reserve estimation and audits for a variety of early and advanced stage precious and base metal projects in Canada, Africa, Chile and Mexico; and*
- *1995 to 2005 - Employed at several underground and open pit gold and copper mining operations in Canada and held positions of Mineral Resources Manager, Chief Mine Geologist and Chief Evaluation Geologist with the responsibility for estimation of mineral resources and mineral reserves for development projects and operating mines.*

# Key staff notices for mining issuers

Date	Topic	Reference
Jul 22, 2011	<b>Mineral Brines</b>	<b>OSC Staff Notice 43-704</b> <i>Mineral Brine Projects and NI 43-101</i>
Aug 16, 2012	<b>Preliminary Economic Assessments</b>	<b>CSA Staff Notice 43-307</b> <i>Mining Technical Reports – Preliminary Economic Assessments</i>
Nov 9, 2012	<b>Emerging Markets</b>	<b>OSC Staff Notice 51-720</b> <i>Issuer Guide for Companies Operating in Emerging Markets</i>
Feb 21, 2013	<b>Foreign Professional Associations</b>	<b>CSA Staff Notice 43-308 (Revised)</b> <i>Professional Associations under NI 43-101</i>
Jun 13, 2013	<b>Forward Looking Information</b>	<b>CSA Staff Notice 51-721</b> <i>Forward Looking Information Disclosure</i>
Jun 27, 2013	<b>Technical Reports</b>	<b>OSC Staff Notice 43-705</b> <i>Staff's Review of Technical Reports by Ontario Mining Issuers</i>
Dec 11, 2013	<b>Non-GAAP Financial Measures</b>	<b>OSC Staff Notice 52-722</b> <i>Staff's Review of Non-GAAP Financial Measures</i>
Feb 6, 2014	<b>Mining MD&amp;A</b>	<b>OSC Staff Notice 51-722</b> <i>Review of Mining Issuers' MD&amp;A and Guidance</i>
Apr 9, 2015	<b>Website Investor Presentations</b>	<b>CSA Staff Notice 43-309</b> <i>Review of Website Investor Presentations by Mining Issuers</i>
Feb 25, 2016	<b>Companion Policy 43-101CP</b>	<b>CSA Notice</b> <i>Changes to Companion Policy 43-101CP</i>

# How to improve compliance – review these:





# Thank You!

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## Paul Ténère

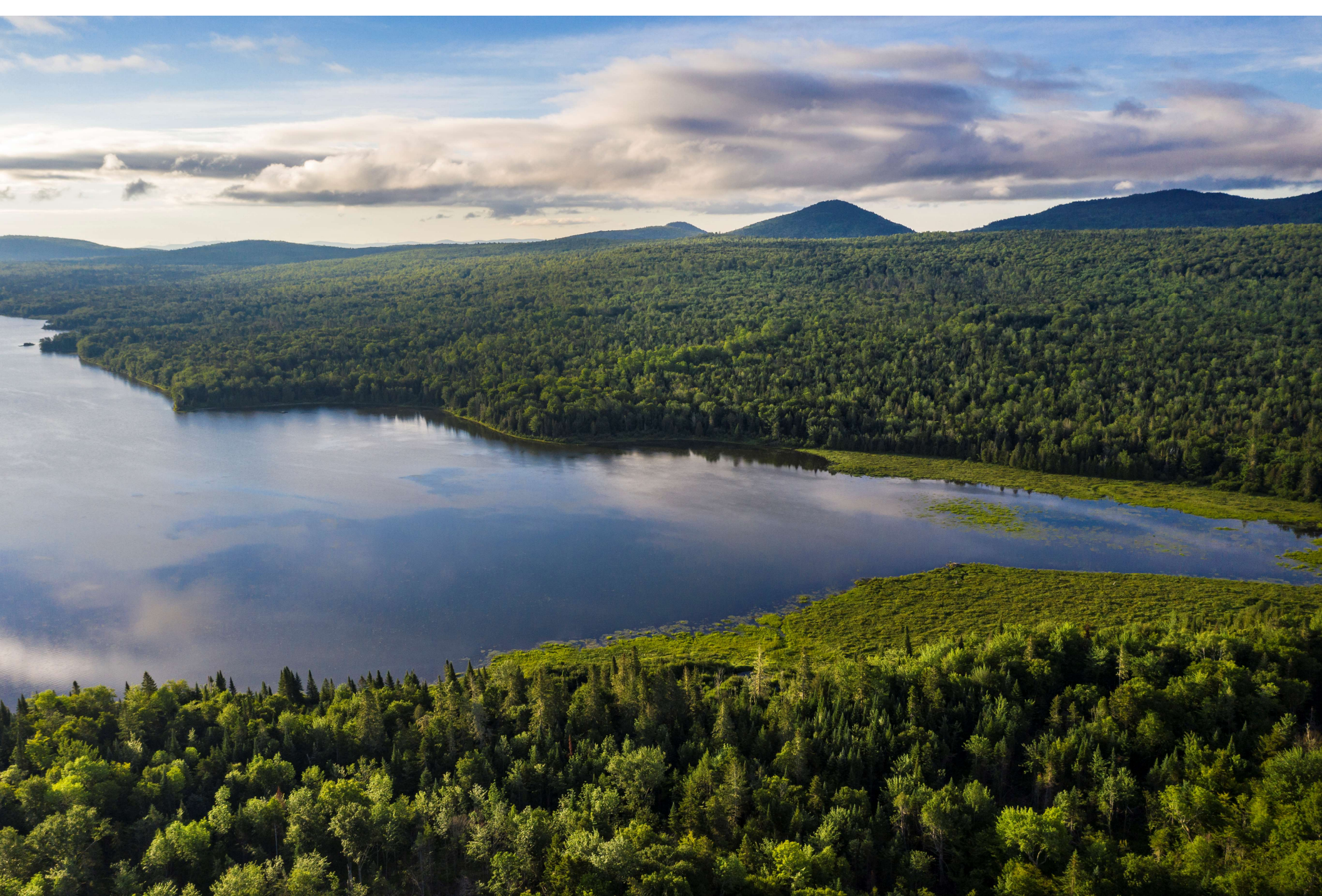
*Senior Manager Mining  
TSX & TSX Venture*

[paul.teniere@tmx.com](mailto:paul.teniere@tmx.com)

416-947-4447



*Graphic after IKEA*



Aerial view of Pleasant Lake with Pickett Mountain (triangular-shaped mountain in background). Photo by JMonkman/NRCM



View toward Mt Katahdin and Shin Ponds from Mt Chase. Photo by J Monkman/NRCM



Photo by Judy Berk



Photo by Jon Luoma





Pickett Mountain Pond. Photo by JMonkman/NRCM



Dark skies over Katahdin Woods & Waters National Monument. Photo by John T. Meader





Oxbow, Upper East Branch, Penobscot River, Katahdin Woods & Waters National Monument. Photo by Jon Luoma



Common Loons. Photo by Tina Richard

INTERNATIONAL APPALACHIAN TRAIL

GRAND PITCH LEAN-TO	6.7 MI	→
LUNKSOOS LEAN-TO	16.7 MI	→
DEASEY MTN	18.4 MI	→
WASSATAQUIOK LEAN-TO	24.2 MI	→
KATAHDIN LAKE - IAT/SIA SOUTHERN TERMINUS	29.7 MI	→
ROARING BROOK ROAD - BSP	34.6 MI	→
← GRAND LAKE ROAD	0.3 MI	

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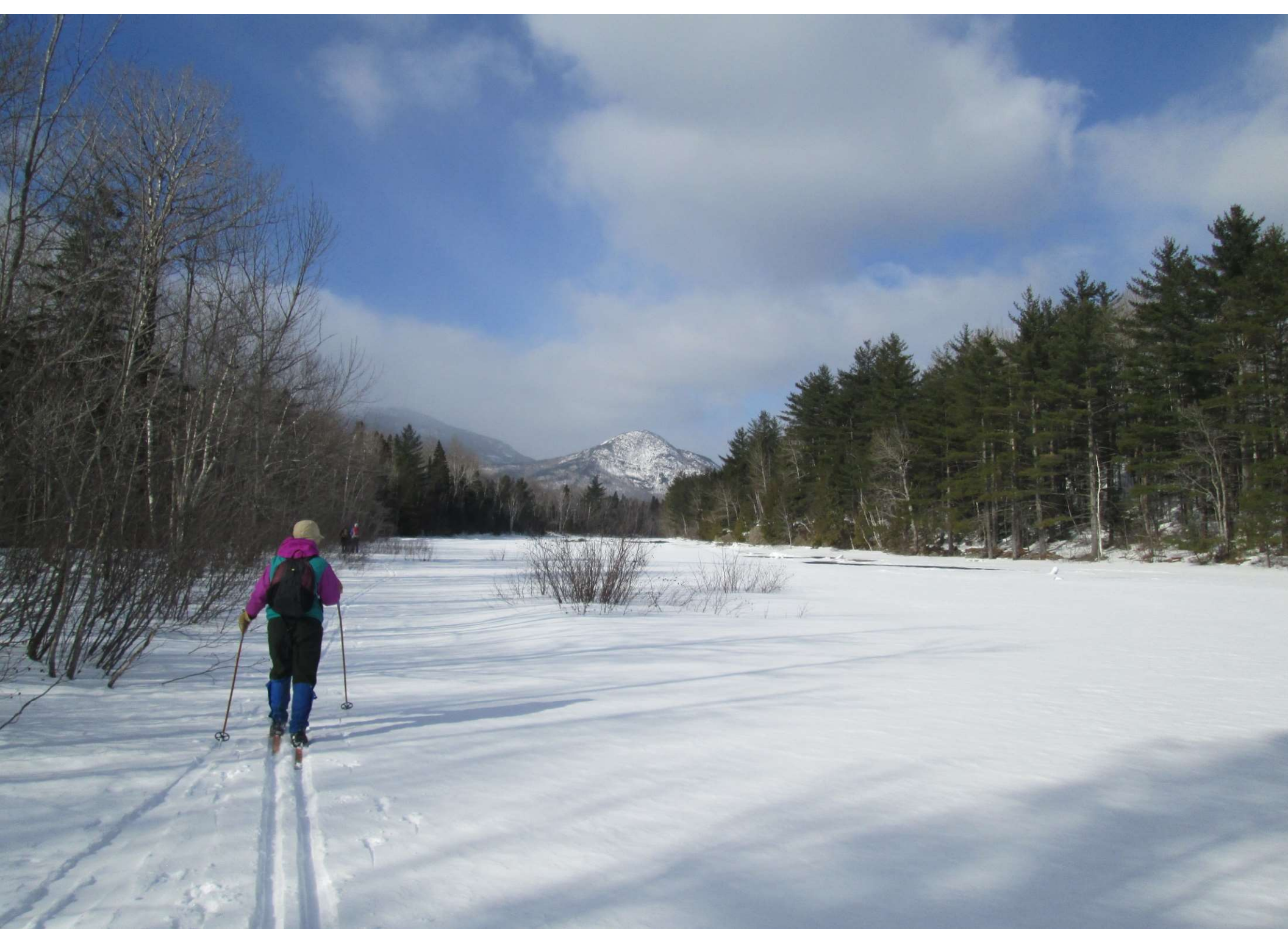


Photo by Leslie Burhoe



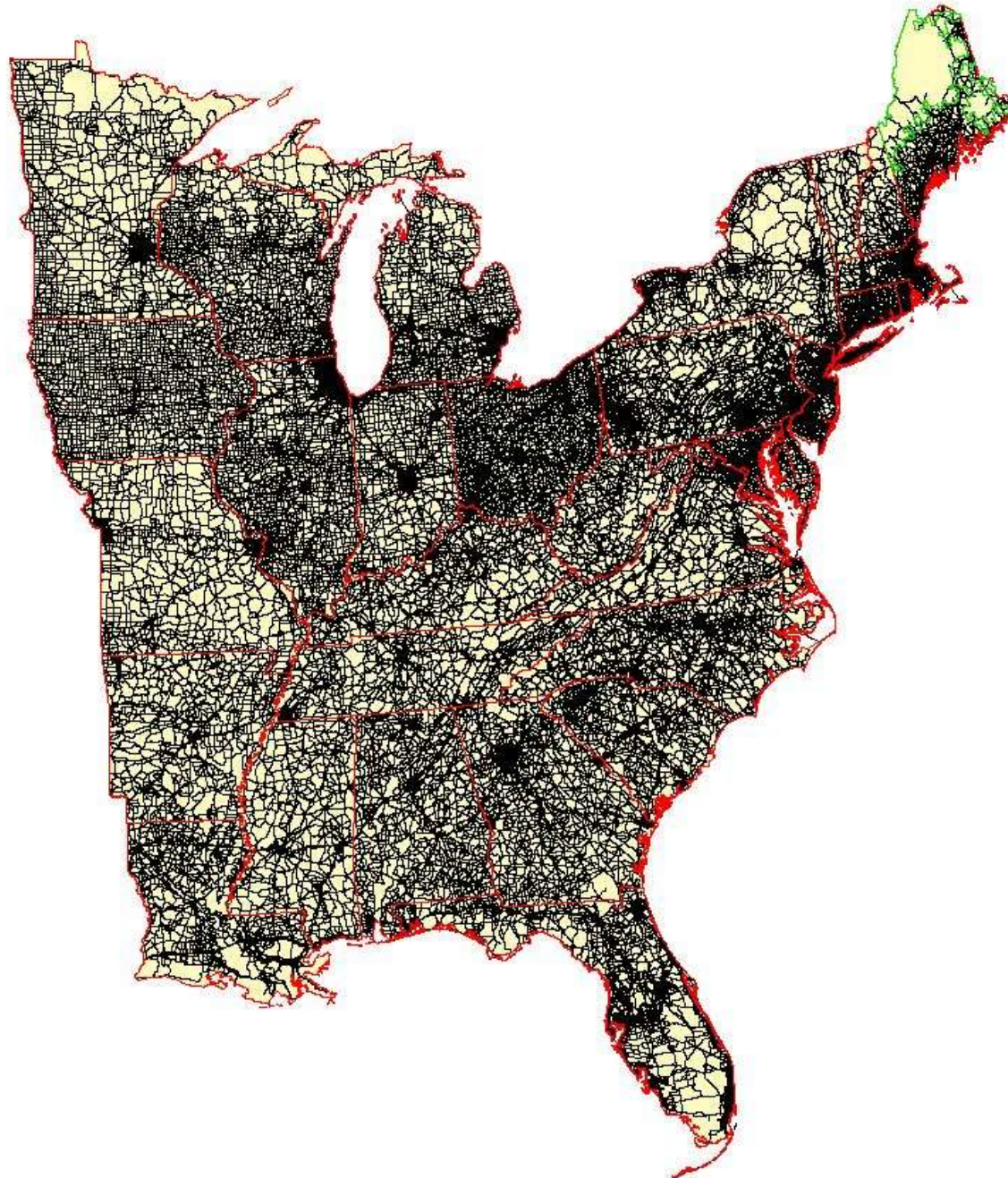
View toward Pleasant Lake from summit of Mt. Chase. Photo by J Monkman/NRCM





Cloud over summit of Mt. Chase with Pickett Mountain Pond in foreground. Photo by J Monkman/NRCM

**Primary public roads**







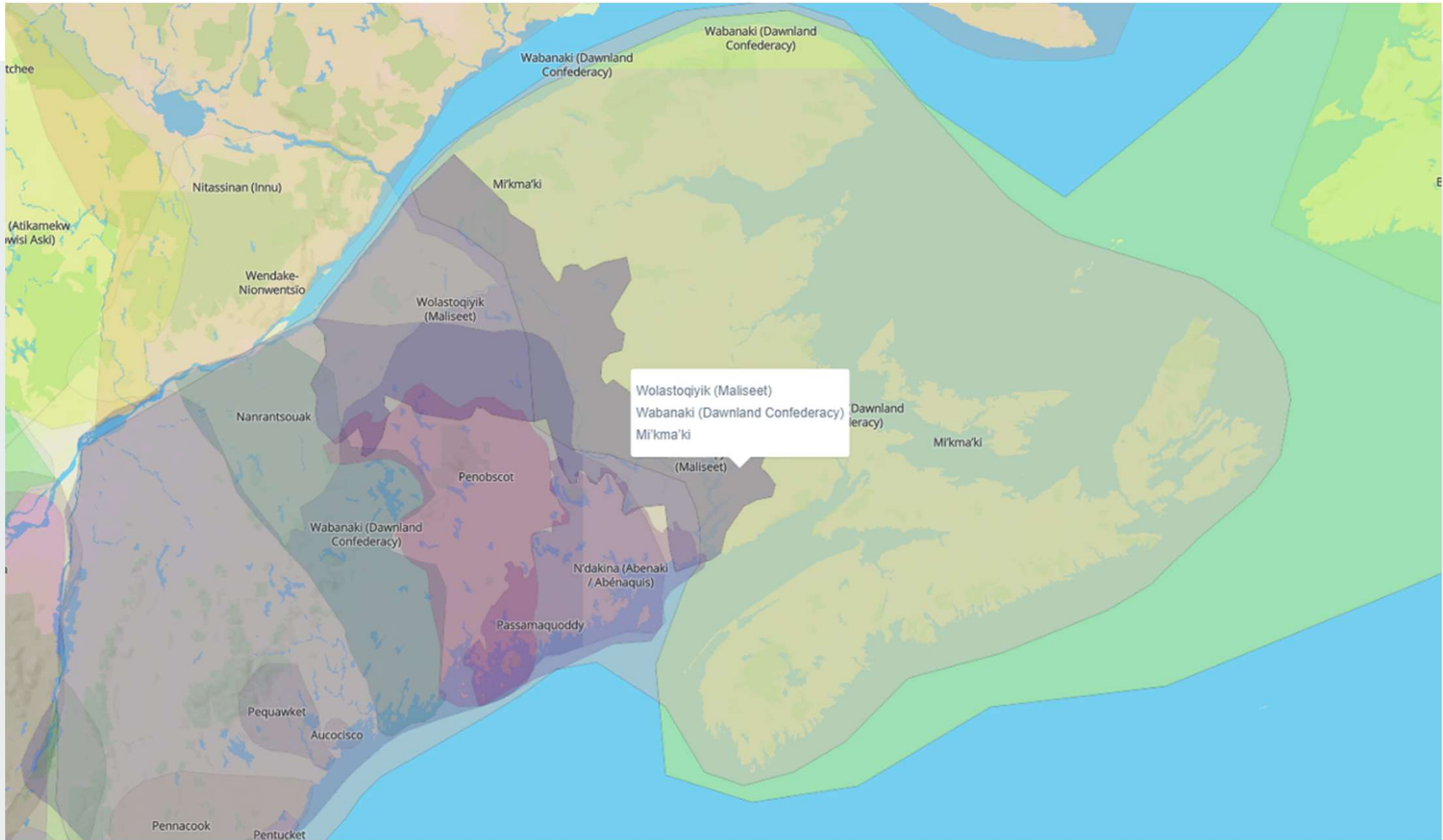
Pickett Mountain and Pickett Mountain Pond. Photo by JMonkman/NRCM

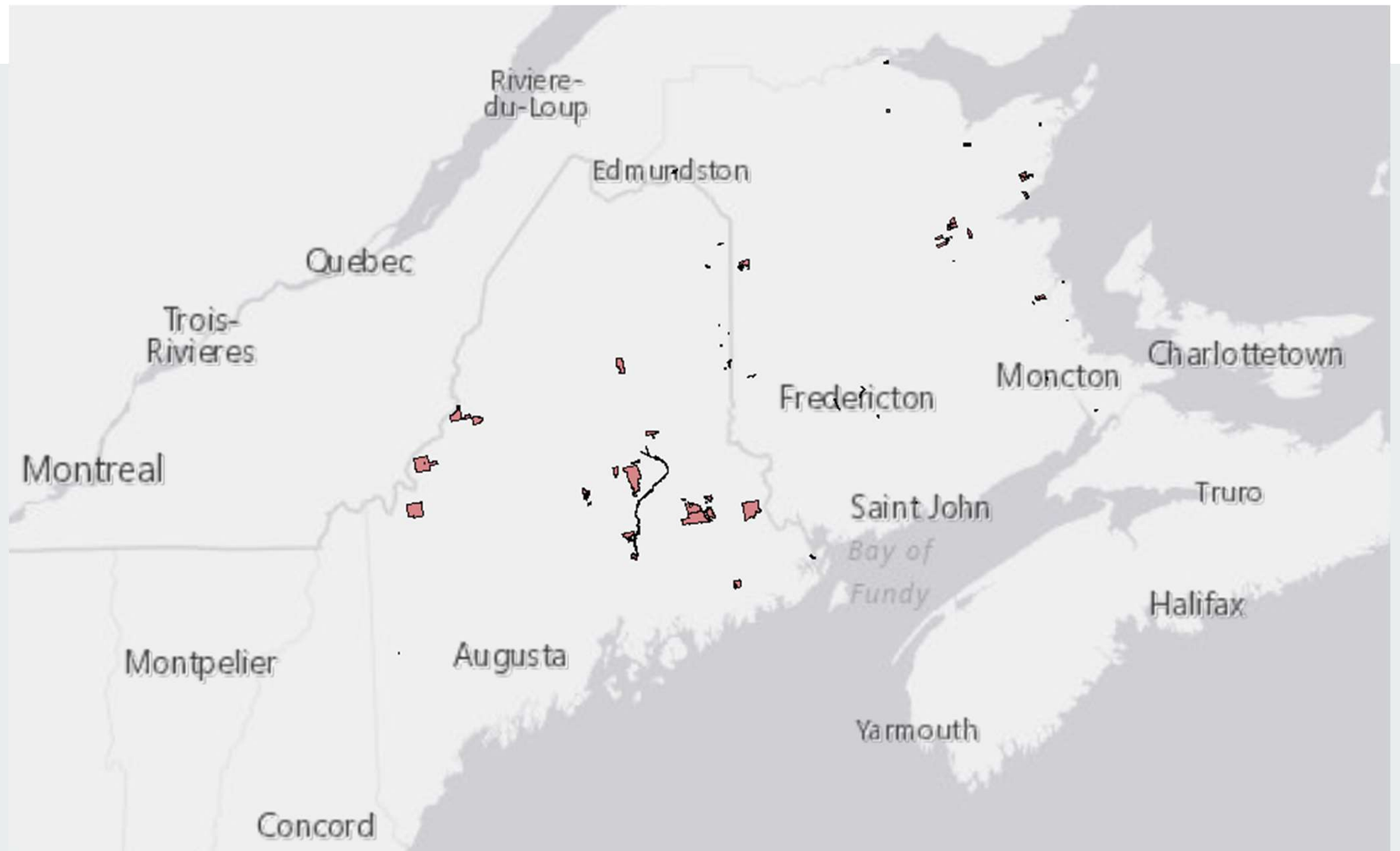
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# Isaac St. John

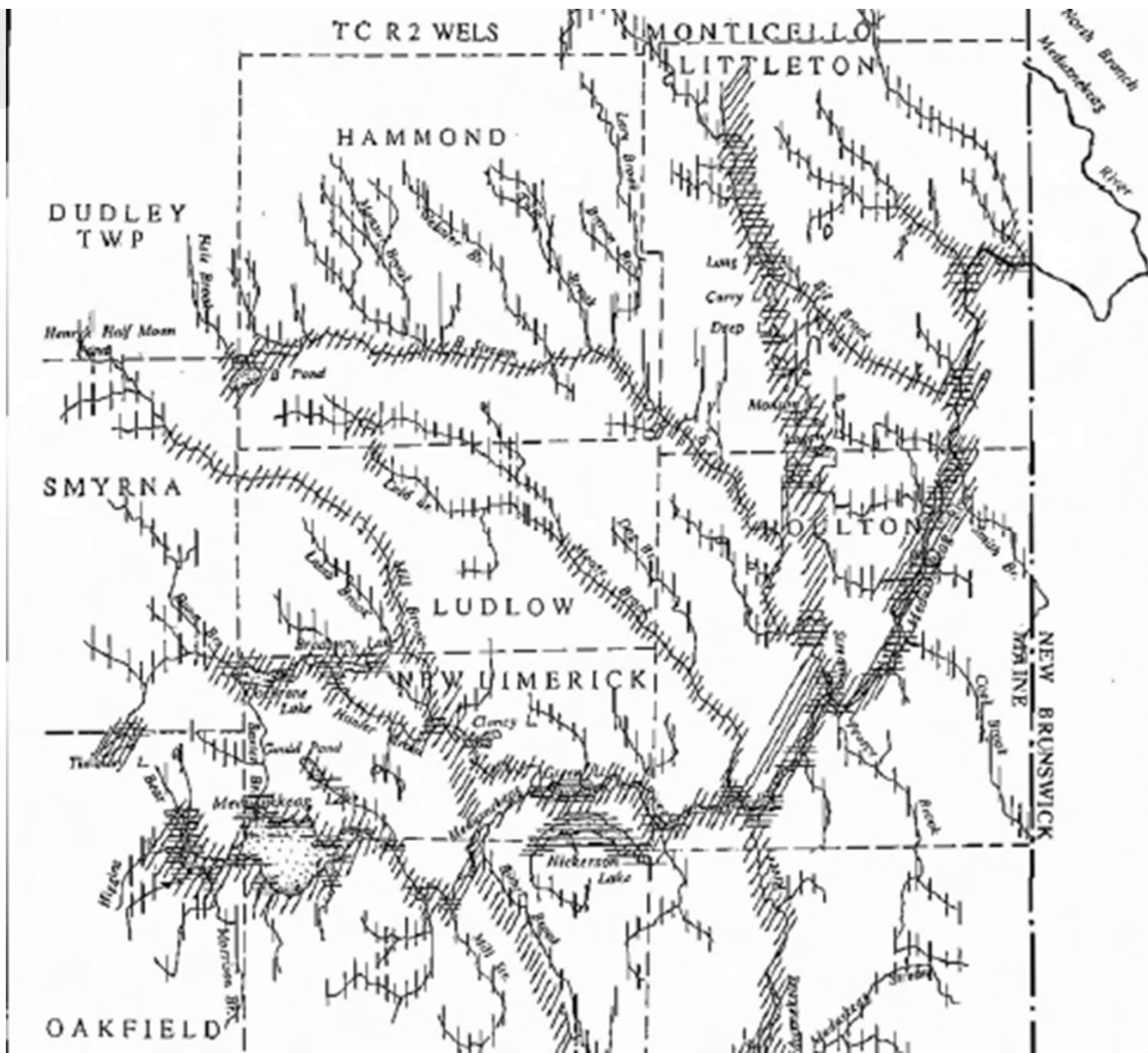
Tribal Historic Preservation Officer  
Metaksonekiyak/Houlton Band of Maliseet Indians













# Pickett Mountain Deposit, Maine: Geochemical Issues

Ann Maest, PhD  
Buka Environmental  
12 October 2023



# Qualifications

- Undergrad in geology, Boston University; Androscoggin Lake pluton
- PhD Princeton, geochemistry and water resources
- US Geological Survey, researcher & project chief, 6 years; first encounter with mine water; build lab for water analysis
- Environmental Defense Fund, DC; pollution prevention in mining
- Environmental consultant, Boulder, Colorado: US EPA, States of Montana & New Mexico, US Dept. of Justice, tribes, NGOs, Govts of El Salvador & Peru
- National Academy of Sciences: Study committees, Committee on Earth Resources, Board on Earth Sciences and Resources (BESR)
- Invited speaker on mining issues, United Nations

# Discussion of Chevron Ecuador Lawsuit

# Qualifications – Last Ten Years

- Chevron lawsuit, settlement in 2013
- Re-elected to National Academy of Sciences' Board on Earth Sciences and Resources
- Selected as Associate Editor, International Mine Water Association
- Worked for governmental clients, communities, NGOs, tribes, and First Nations on mining and environmental monitoring issues in Europe, Canada, the US, Mexico, South America
- Worked with the mining industry, NGOs, and others to create and implement a mine certification standard for industry; helped create auditable sustainability standard for industry leaders in diamond sector
- Gave presentations and workshops at national & international conferences on technical capacity building, geochemical modeling, baseline water quality
- Published peer-reviewed papers on mine waste geochemistry, interdisciplinary watershed modeling, re-mining (mine waste as source of renewable energy metals)

# Acid Rock Drainage/Metal Leaching (ARD/ML)

- ARD/ML (aka acid mine drainage, or AMD) is the most environmentally damaging and enduring water quality problem associated with metal mining, especially in sulfide deposits
- Acid drainage has substantial adverse effects on aquatic life



*AMD in Cement Creek entering Animas River, Colorado; USGS*

# Overall Acid Mine Drainage Reaction



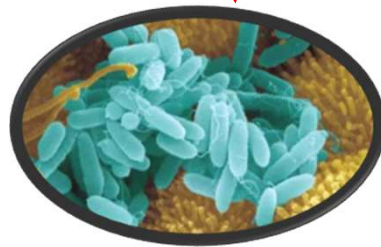
Pyrite + Oxygen + Water



Acid + Sulfate + Iron Precipitate

*Dissolves other minerals: Pb, Zn, As, Cd*

*Increasing concentrations AMD indicator*



*Microbes  
speed up reaction by  
1 million times*



# AMD Risks and Responses

- Developing mines in sulfide deposits requires careful consideration and experience to predict, prevent, monitor, and manage AMD
- Once AMD starts it is very difficult to stop
  - Bolivia (500 years), Spain/Portugal (5000 years)
- Perpetual management and treatment can be required if AMD develops
- Prevention is best

# Pickett Mountain AMD Potential

- Pyrite levels 45-60% in the ore; pyrite is primary source of AMD
- The sulfides of economic interest (zinc, lead, and copper) are “overlain and in sharp contact with massive pyrite” (Preliminary Economic Assessment at 28)
- Ore, mine walls, waste rock, and tailings will all have high acid generating potential
- All will be exposed to oxygen and water, creating conditions for AMD
- Nearly certain that AMD will develop

# Walls of Underground Workings

- Walls will be exposed to oxygen and water
- “Within the Project Area, the potential sources of acid rock drainage are *limited* to mineralize [sic] rock from underground being temporarily stored on the surface” (Application, Section 10.5.1.2; emphasis added)
- Pyrite and other sulfides will remain on walls of underground mine and be in waste rock, ore, and tailings



Source: A. Maest, Buckhorn Mine, Washington State



# Response to Jim Finley

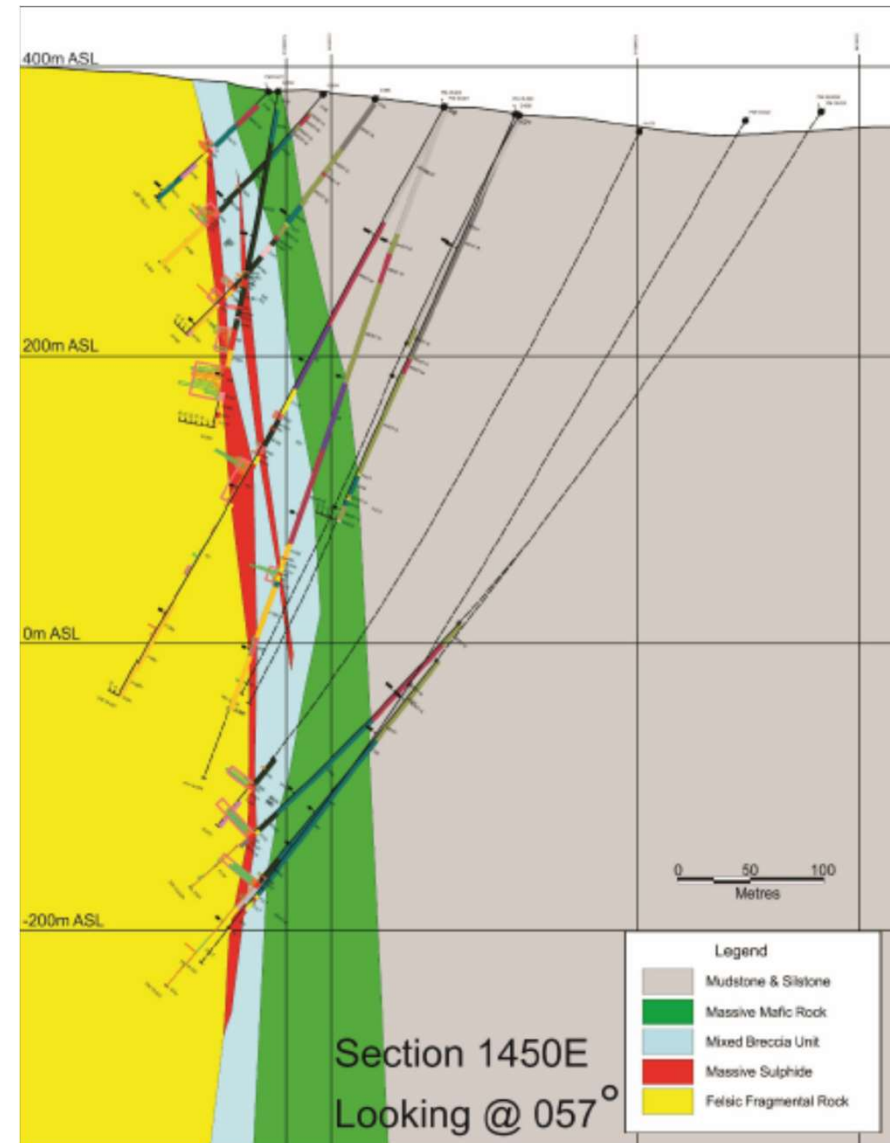
- Finley: walls could produce ARD/ML (p. 6)
- Implies ARD/ML from mine walls will only occur during closure
- Water will flow into mine during operations and entire life of mine
- Seasonally fluctuating water levels – exposure to water and oxygen even after closure
- Mine walls could easily have been characterized already
- Need a plan for preventing or minimizing acid drainage/metal leaching from walls

# Geochemical Testing Including Acid-Base Accounting: Not Enough Samples

- Only 7 samples tested
  - Variety of geologic units dictates much more testing is needed at this stage of development
  - No information in Application about location or rock types
  - Dudek (p. 5): 5 samples in footwall, 2 in hanging wall
- None represent ore, waste rock, walls, tailings
- No shortage of samples to test
  - 2019 Pickett Mountain mineral resource estimate: 940 of the total **2,550 samples** from 148 drill holes used to create block model

# Cross-section of the Pickett Mountain deposit

*At least 5 different lithologic units + alteration within units*



A-Z Mining Professionals, 2019, Fig. 7.5

# Geochemical Testing – Equivocal and Limited Results

- Acid-base accounting results
  - 3 Potentially Acid Generating (PAG); 4 non-PAG, but all 7 samples need additional testing (mineralogy, long-term leach)
  - RPC realizes a “special consultant” needed
  - Not known if these 7 samples would generate acidic drainage and not from ore body
- Total metals results
  - Elevated antimony, arsenic, cadmium (47x), cobalt, mercury, lead (63x), thallium, and zinc (30x) compared to average crustal abundances → potential for metal leaching
  - High values not limited to 3 “PAG” samples
  - Long-term leach testing should have been started already

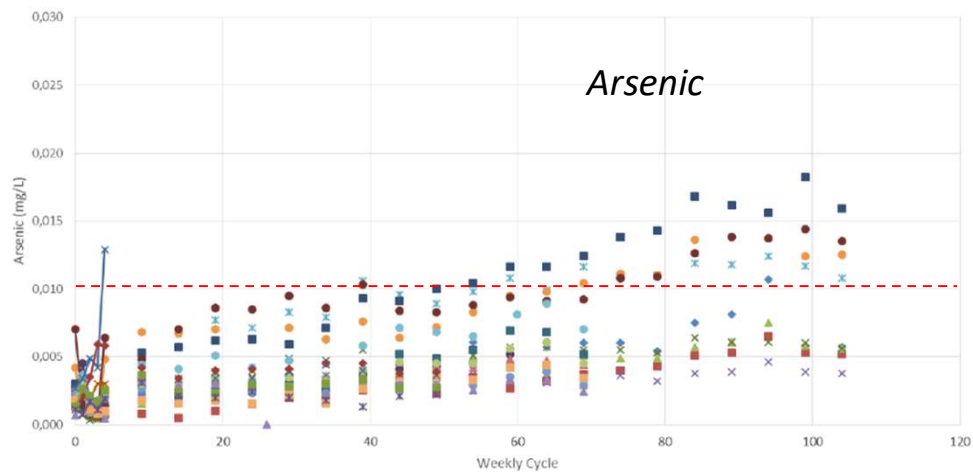
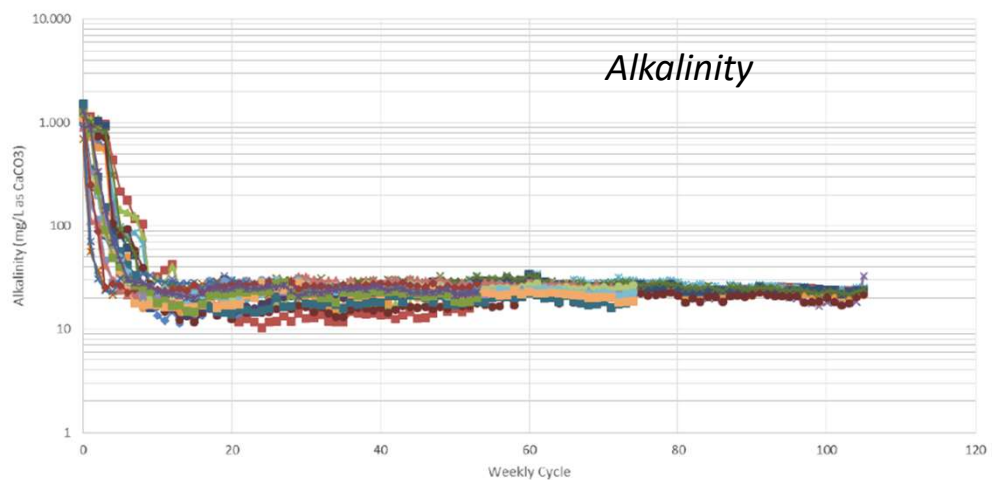
# Water Treatment Study: Modeling Shortcomings

- Numerous shortcomings in Wolfden's water treatment modeling study:
  - Halfmile Mine, New Brunswick, Canada – unsupported as representative
  - Missing key parameters
    - Texas Water Development Board 2014: All major cations and anions required as inputs; validity depends on accuracy of inputs (many are missing)
  - *Conclusion: very poor design and quality assurance = unreliable results*
- Source of target water quality values not defined
  - Samples appear to be from surface water, yet discharging to groundwater
  - Results said to be included but are not

# Treatment Plant Brine Disposal

- No information on quality of brine produced
- Brine will likely have high metal and sulfate concentrations (what is removed by reverse osmosis treatment) – more membranes needed
- Need long-term leach tests on cemented rock fill made with brine
- Risk of leaching to site groundwater and surface water in perpetuity

# Buckhorn Mine, Cemented Rockfill Testing



# Mine Water Capture

- You can only treat what you can capture
- Dewatering will not capture all mine influenced water - uncertainty
- 93% of operating copper mines in the US failed to capture and control mine wastewater and resulted in adverse water quality impacts (Gestring, 2019)



# Uncaptured Mine Water

- Uncaptured mine influenced water will contaminate downgradient water resources and lead to undue adverse impacts to water resources
- Wolfden should present a plan to capture all mine influenced water at the mine site

# Predictions vs Reality: Kuipers and Maest, 2006

- 104 EISs reviewed, 25 case study mines
- 76% had mine-related exceedences of water quality standards
- Highest risk of underpredicting water impacts
  - Moderate to high ARD/ML potential + close to water resources
  - 93% with these factors had groundwater quality exceedences
  - 86% of those predicted no exceedences
  - Pickett Mountain has these factors
- Mitigation measures failed in 64% of mines

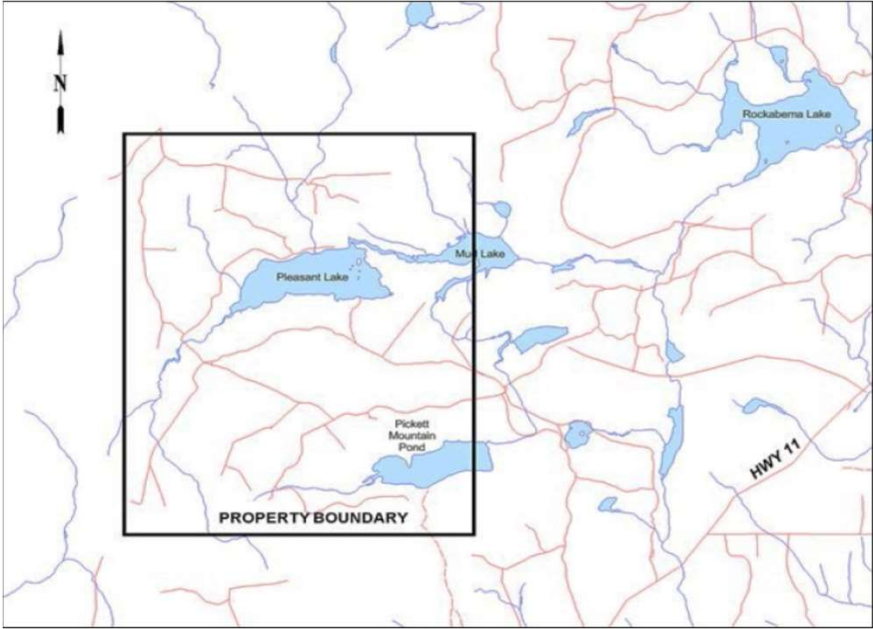
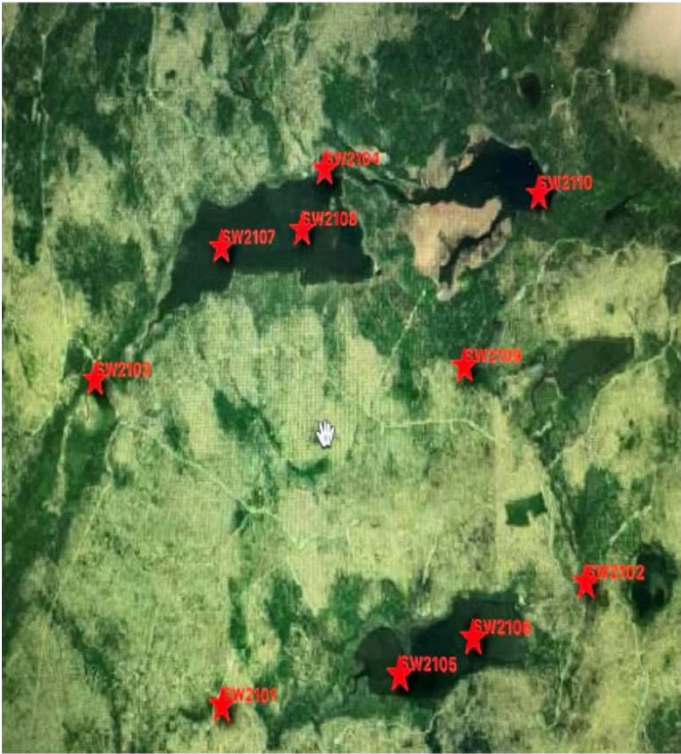
# Modern mines have water quality problems too

- Buckhorn Mine, Washington State
  - All ore processed off-site, but many permit exceedences on the mine site from blasting, previous water treatment, sulfide mineral oxidation
- Eagle Mine, Michigan
  - All ore processed off-site; sulfate concentrations increasing and much higher than predicted

# Fate and Transport

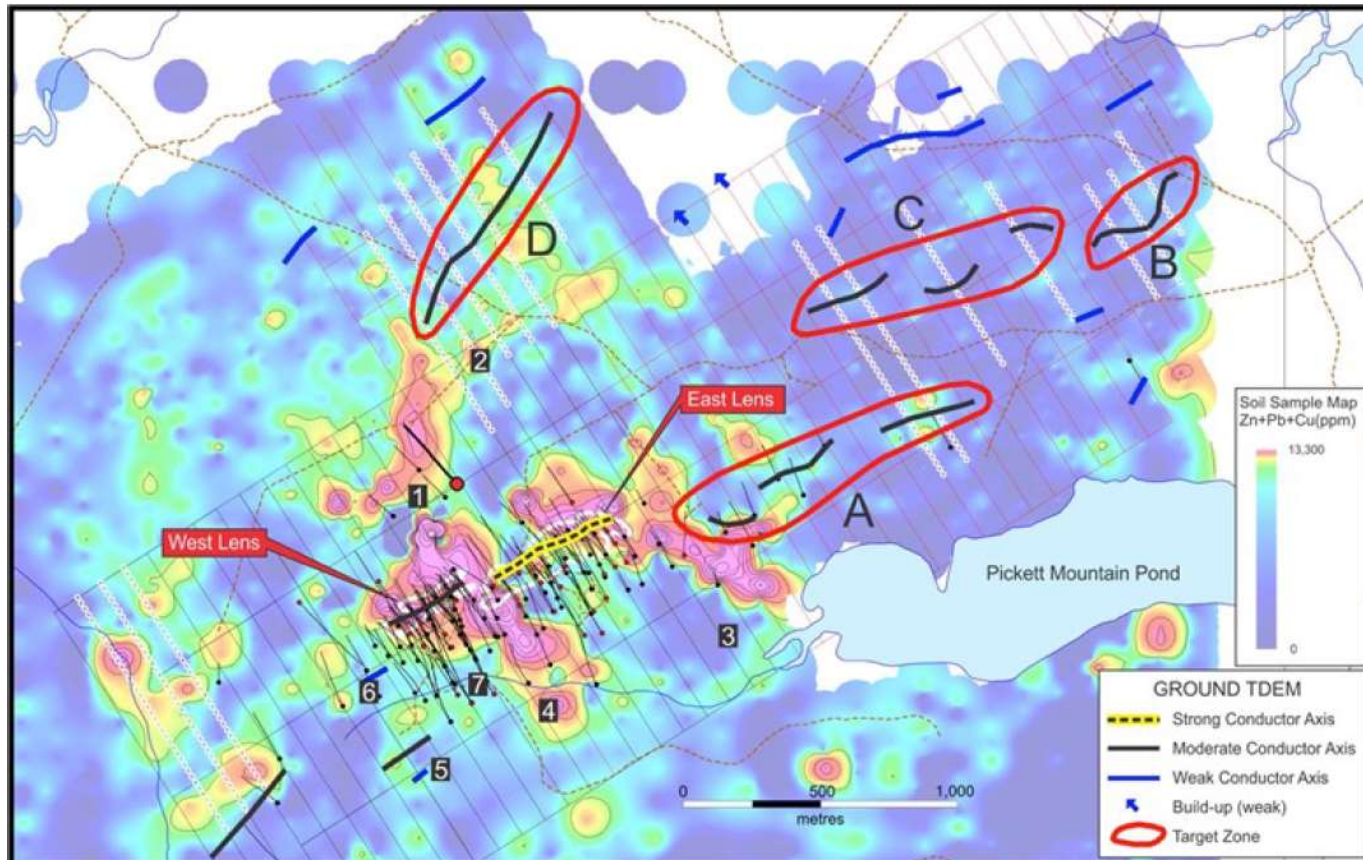
- Sources → Pathways → Receptors
- Receptors: Pickett Mountain Pond, Pleasant Lake, Mud Lake, Grass Pond, streams leading to and from them (map)
- Waters at and near mine site are very clean with very little buffering capacity
  - Low alkalinity – cannot handle acidic inputs
  - Low hardness – toxicity to aquatic life at very low metal concentrations
- Continued exploration will likely bring mine influenced water sources closer to these receptors

Locations from “Groundwater study” conducted by Wolfden, Sept. 2021 (left) and location map showing ponds within and near the property boundary (right)



Sources: Left: Application at 469 (Attachment 10-D, Appendix 1); Right: A-Z Mining Professionals, 2019, Fig. 4.2.

# Future targets and Zn-Pb-Cu soil compilation map



# Water Balance

- Estimated hydrologic budget for dewatering underground mine and surrounding groundwater is only 30 gallons/minute (Application at 292, Table 10-1)
- No basis for estimate presented and no site-specific information
- Climate change not considered
- Bypass flows not estimated (uncaptured mine water); unrealistic assumption of no leakage from ore/waste rock storage facilities

# Summary

- Pickett Mountain deposit has inherently high acid generation and contaminant leaching potential and is close to groundwater and surface water → higher potential for water quality impacts
- More work should have been done already to understand water quality that could be generated from mining – walls of underground mine must be considered
- Water treatment study has so many shortcomings – has not demonstrated ability to meet Maine's strict discharge requirements
- Water balance presents no basis for dewatering rate and does not consider uncaptured mine water or climate change
- Ore and future targets close to high-quality fisheries and water resources with very little capability to counteract effects of acid mine drainage.



**WITNESS STATEMENT OF ANN MAEST**

I, Ann Maest, of United States citizenship, and residing in Boulder, Colorado, declare under penalty of perjury as follows:

1. I am a Managing Scientist at Stratus Consulting, Inc. (“Stratus”), where I have worked intermittently since 1993. Stratus is an environmental consulting firm located in Boulder, Colorado. Stratus was hired to work on projects related to the case of *Maria Aguinda y otros v. Chevron Corporation* in Lago Agrio, Ecuador (the “Lago Agrio Litigation”) by Steven Donziger and Kohn, Swift & Graf through a contract with Kohn, Swift & Graf in August of 2007, and I began working on the project as a Stratus employee in 2007. Prior to that, between 2006 and 2007, I worked on the “Ecuador Project” on behalf of E-Tech.

**INITIAL RETENTION AND ROLE IN THE CASE  
WITH E-TECH INTERNATIONAL**

2. My initial contact with Steven Donziger was in or around November 2005 through the organization I was working with at the time, E-Tech. E-Tech is a nonprofit organization providing environmental technical consulting support to communities in less industrialized countries. My first discussion with Steven Donziger was during a conference call on November 29, 2005. Kohn, Swift & Graf hired E-Tech and me to do environmental consulting in connection with the Lago Agrio Litigation. Donziger directed our work on behalf of Kohn, Swift & Graf.

3. I formally began working for Donziger on behalf of the Lago Agrio Plaintiffs (LAPs) in the Lago Agrio Litigation in or around January 2006, providing environmental consulting services. In that role, I took direction from Donziger, who described himself as the lead United States lawyer for the LAPs. Donziger told me what tasks he wanted me to perform. He

AM

edited and approved drafts of statements or reports I would issue, and otherwise directed all of my work and the work of E-Tech.

4. My initial role in the case was as a technical consultant on behalf of the LAPs, and I publicly appeared in the matter by issuing reports on behalf of the LAPs. At Donziger's direction, I authored a report in conjunction with William Powers and Mark Quarles titled "How Chevron's Sampling and Analysis Methods Minimizes Evidence of Contamination" dated March 8, 2006. This report was just an initial assessment based on incomplete information. I never performed a follow-up analysis as the judicial inspections progressed.

**THE GLOBAL INSPECTION PROJECT, THE MARCH 2007  
MEETINGS IN ECUADOR AND *CRUDE* FILMING**

5. In March 2007, I traveled to Ecuador to meet with the LAPs' legal and technical team and Donziger. Also on this trip were Charles Champ and Richard ("Dick") Kamp. We were in Ecuador on this trip from March 2 to March 6, 2007. The purpose of this trip as described to me by Donziger was to show Charles Champ around the concession and bring him up to speed.

6. During this trip, on March 3, 2007, at the LAPs' representatives offices in Quito, Ecuador (also known as the "Selva Viva" offices), I participated in a lengthy strategy meeting of the LAPs' team about preparation of the upcoming global expert report.

7. The March 3<sup>rd</sup> meeting and other meetings in which I was involved with Donziger were videotaped by the *Crude* film crew. Based on my personal observations, the film crew took direction from Donziger regarding what to film and when to turn their cameras on and off. I saw the *Crude* film crew follow Donziger's instructions on many occasions.

8. Among those attending the March 3, 2007 planning meeting in Quito were Donziger, Pablo Fajardo, Luis Yanza, Fernando Reyes, and other consultants and lawyers for the LAPs. Also attending the meeting was Richard Cabrera, whom Pablo Fajardo referred to as a “perito,” or expert. Donziger told me prior to the meeting that Cabrera would be there, and he was hoping Cabrera would be appointed as the Ecuadorian Court’s expert tasked with performing the global damage assessment requested by the LAPs.

9. It was clear from the presentations and from my discussions with people at the meeting that the LAPs planned to conduct the global damages assessment. In particular, I understood Fajardo’s statements captured in the outtake from *Crude*: “[a]nd here is where we do want the support of our entire technical team . . . of experts, scientists, attorneys, political scientists, so that all of us will contribute to that report—in other words—you see . . . the work isn’t going to be the expert’s. All of us bear the burden,” to mean that the LAPs’ lawyers and consultants would contribute to Cabrera’s work and report.

10. I reviewed the Declaration of the Fernando Reyes regarding the March 3, 2007 meeting. Mr. Reyes’s recollections of the events for which we both were present are consistent with my own, except that I do not recall Mr. Champ’s presentation.

11. During a lunch with Kamp, Donziger and Charles Champ on March 4, 2007, Kamp told Donziger that having the perito at the meeting was “bizarre.” Donziger told Kamp not to talk about it and said, “That’s the way it works.”

12. In discussions around the time of the March 2007 meetings, Donziger made it clear to me that it was vital that the coordination between the LAPs and Cabrera be kept secret.

13. At the March 4, 2007, meeting, Kamp, Champ and I raised issues with Donziger about the environmental data we had seen. In particular, I found in my analysis of the data that there was no evidence that contamination had migrated away from the pits. As I told Donziger, “all the reports are saying it’s [*i.e.*, groundwater contamination] just at the pits and the stations and nothing has spread anywhere at all.” And when Champ told Donziger that “there is not enough information on that groundwater” and that “the one hole in the remediation is the water,” Donziger instructed the camera crew capturing the conversation to stop filming, stating, “[T]here’s another point I got to make . . . to these guys, but I can’t get this on camera.”

14. The only water sampling evidence I saw from the LAPs’ team involved testing water from hand auger samples taken in or near pits. This is not a proper methodology for collecting groundwater samples unless the soil particles are removed by filtering or by allowing them to settle out. I am aware that at least some of the LAPs’ sampling results were unreliable because of the presence of soil particles in the samples. I requested from Donziger and the Quito team on multiple occasions that additional groundwater sampling be conducted but never received approval for that sampling. At no time while working on the Ecuador Project did I see any data supporting a finding of groundwater contamination from TexPet operations away from the pits.

15. When I told Donziger that there was a significant gap in the groundwater data, he suggested that we could “extrapolate” to ascribe contamination to areas where no sampling had been done and “get money for it.” He then said that all of this “for the court is just smoke and mirrors and bullshit.” Donziger’s statements on film focusing on “getting money” and using and misusing facts and data to support whatever position he wanted to take in the litigation are representative of Donziger’s statements on these subjects.

16. It was my impression that Donziger was not interested in the results of scientific evaluations of the area unless he could use them to attack Chevron. Donziger seemed interested in increasing the damage claims as high as possible.

17. When Champ told Donziger during a March 4, 2007 meeting that we needed to be totally transparent with Chevron in terms of what sampling was to be conducted and what the sampling data was showing, Donziger informed us that his goal was that “they don’t know shit.” To achieve this goal, Donziger indicated to me to keep my involvement with Cabrera and the global damages assessment, and that of the other LAPs’ consultants and lawyers, secret. I followed his instructions in that regard at all times while I was working on the Ecuador Project.

**DIRECTION AND CONTROL BY DONZIGER**

18. In conversations with Donziger about the scope of the work that would need to be done for a global damages assessment, it became apparent that a larger consulting firm would be needed. I had previously worked for Stratus Consulting and suggested to Donziger that he retain them for this work.

19. Donziger first contacted Stratus on or about March 27, 2007, via a conference call I arranged that included Donziger, David Chapman, David Mills, and me. Donziger then met with Stratus on April 26, 2007, at Stratus’ offices in Boulder, Colorado. A portion of this meeting was filmed by the *Crude* film crew. Joshua Lipton, Douglas Beltman, David Chapman, Preston Sowell, and I attended the meeting with Donziger. At that meeting, Donziger described Stratus’ work as the preparation of a damage assessment for the Lago Agrio litigation. Donziger described the specific elements of damages that he wanted to include in the assessment using an April 22, 2007 memorandum that he had previously provided to Joshua Lipton. In a prior email to

Joshua Lipton, which I have reviewed, Donziger stated that the damages claim would probably be “many billions of dollars[.]” At some point in time, Donziger said damages against Chevron could be in the range of \$5-6 billion dollars.

20. I am aware that Stratus entered into a retention agreement with Kohn, Swift & Graf on August 20, 2007.

21. Stratus began working on the Ecuador Project in August of 2007 after first meeting with Donziger on April 27, 2007 in Stratus’s Boulder, Colorado office. I had previously taken direction for my work on the project from Donziger, and, from that point forward, Stratus took its direction for its work on the Ecuador Project from Donziger, who described himself as the lead American lawyer for the LAPs. Donziger indicated what tasks he wanted Stratus to perform, edited and approved drafts of statements or reports Stratus would issue, and assigned, approved, and directed all of Stratus’ work on the Ecuador Project. It is my understanding that from Stratus’s retention in August 2007 until its work on the matter ceased, Donziger was Stratus’s principal point of contact for its work on the Ecuador Project, and he directed work on behalf of Kohn, Swift & Graf.

22. At no time was my work on the Ecuador Project directed by any of the named plaintiffs in the Lago Agrio Litigation, nor did I ever have any contact with those named plaintiffs or receive an instruction that I understood to come directly from any of the named plaintiffs. I have had no indication that any of those named plaintiffs ever reviewed anything Stratus or I prepared in connection with the Ecuador Project. Rather, to the extent I received directions from Ecuadorians, those directions came via individuals such as Pablo Fajardo, who I understood to be also representing the LAPs.

23. Based on my experience during my time as one of the LAPs' environmental consultants, Donziger exercised near complete control over major decisions of strategy for the Ecuador Project, particularly as related to our work, the media, and public relations. Aside from the issue of funding, I do not recall an instance in which Donziger stated a need to get prior approval from any other individual for a course of action. While others, including Pablo Fajardo, participated in decisionmaking regarding the litigation, it was apparent to me that those in the LAPs' Quito office, including Pablo Fajardo, looked to Donziger for direction.

24. Regarding budgeting and funding, it was apparent that Donziger had a significant degree of control, but that for large expenditures, he initially reported to Joe Kohn. Nonetheless, we at Stratus understood Donziger to have control of strategy decisions.

#### **DONZIGER INSTRUCTIONS REGARDING SECRECY**

25. Donziger insisted at all times that all aspects of Stratus' work, including Stratus' meetings with Cabrera, their involvement in drafting the Cabrera Report and the November 2008 Cabrera Response to the LAPs' September 2008 comments or objections regarding the Cabrera Report (the "Cabrera Response") remain absolutely secret.

#### **CABRERA MEETINGS**

26. Donziger asked Douglas Beltman and me to travel to Ecuador in early January 2008. During this trip, Douglas Beltman and I met with Richard Cabrera, Steven Donziger, Luis Villacreces, perhaps Pablo Fajardo and Luis Yanza, and others at the private residence of Juan Aulestia in Quito. Based on interactions between Cabrera, Donziger and Villacreces, they were

familiar with each other. No one was present from Chevron, and it was evident from the location and discussion that the meeting was meant to be secret.

27. Based on my two interactions with Cabrera and a review of his background, Cabrera lacked the qualifications and experience to prepare a multidisciplinary environmental damage assessment himself or to design such a report.

28. At no time did I ever see any indication or meet anyone I understood to be a member of Cabrera's independent team of experts. To the contrary, individuals that I am aware of who assisted in preparing the Cabrera Report and Cabrera Response were affiliated with or working at the direction of Donziger and the LAPs.

29. At no point during my time working on the Ecuador Project, including at the January 2008 meeting was there any suggestion that Cabrera was preparing his own report.

**DRAFTING OF THE CABRERA REPORT AND ANNEXES**

30. I have reviewed the witness statement of Douglas Beltman regarding drafting of the Cabrera Report and annexes. I am not aware of any facts or data that contradict any of his statements or conclusions. His recollection of the drafting process and related events are consistent with my own. I never discussed the substance of any part of the Cabrera Report or any annex with Richard Cabrera nor received any inquiry from him regarding that report. During the time of working on materials for the Cabrera Report, I never saw or heard any indications from Donziger, Fajardo, or any other member of the LAPs' team, or anyone else, that Chevron was given the opportunity to submit information or documents to Cabrera. In the many discussions of the drafting of the report, no one affiliated with the LAPs' team suggested that Chevron would be given



the opportunity to provide their own comments, documents, information, data, narratives, summaries, analyses, or reports to Cabrera.

31. In all the work Stratus performed, including the drafting of portions of the Cabrera Report, Donziger never instructed Stratus or me to conduct any analysis of the contamination in the former concession area caused by PetroEcuador, including recent spills by PetroEcuador. Donziger never told Stratus or me to attribute any of the contaminated soil samples or pits to PetroEcuador.

**OVERARCHING ASSUMPTIONS OF THE CABRERA REPORT**

32. Donziger directed Stratus not to take into account the ongoing remediation in the former concession area, which was known at the time as the “PEPDA” program, when developing the damages assessment.

33. I was aware of the Settlement Agreement and Release that existed between TexPet, Petroecuador and the Republic of Ecuador. I was also aware that pursuant to the Remedial Action Plan (“RAP”) that was part of that settlement, TexPet had agreed to remediate specified sites in the former concession area. The damages assessment in the Cabrera Report is not limited to only those sites that TexPet agreed to remediate in the RAP. To the contrary, the majority of the sites included in the Cabrera Report’s damages assessment are sites that were not TexPet’s responsibility to remediate pursuant to the RAP.

34. The Cabrera Report does not address whether the cleanup actions it recommends Chevron pay for were already being undertaken or contemplated by others or had been completed. Stratus and I were aware that PEPDA was remediating a number of pits in the former

concession area. Therefore, a number of the pits that the Cabrera Report finds require cleanup had already been remediated or were in the process of being remediated by PetroEcuador as part of the PEPDA program at the time the Cabrera Report was filed.

35. Donziger did not seem to be happy about the PEPDA program even though its purpose was to remediate the very petroleum pits that the LAPs and Donziger said were causing contamination. Donziger made it clear to me that it would not be good for the litigation if the area was cleaned up by PetroEcuador, or if people in the region were provided with better housing by other organizations.

36. An assumption of the Cabrera Report was that the soil cleanup levels identified by the LAP lawyers were the appropriate ones to use in the damages assessment. During my work on the Cabrera Report, I was aware that the total petroleum hydrocarbon (TPH) cleanup level in the former concession area used by Ecuador in 2008 for the PEPDA remediation was 2,500 ppm TPH. However, as Douglas Beltman indicated in a March 4, 2008 email to Juan Pablo Saenz “[s]omewhere along the line someone decided that the 1,000 mg/kg [equivalent to 1,000 ppm] TPH standard for ‘ecosistemas sensibles’ is the one to use for our case, and I’m trying to write up a justification for it.” I came to understand that Donziger and the LAP lawyers had decided that the 1,000 ppm standard should apply, and that they later decided that the cleanup level should be lowered from 1,000 ppm to 100 ppm. This resulted in a very large increase to the damage figure for soil clean-up.

37. Another overarching assumption provided to Stratus was the number of pits in the former concession area. The LAPs’ representatives provided us with a “pit inventory” that they created to use in conducting the damages assessment that listed 917 pits as having been

constructed by TexPet. We never verified the existence of the 917 pits shown on the inventory. Obviously, the pit count is a critical variable in determining the scope of any remediation. I have no independent basis to believe the pit count provided to us by the LAPs was accurate or reliable.

38. Pursuant Donziger's instructions, Stratus had to conduct its damages assessment work using only the data and information that was provided to us. Stratus was not allowed to collect the additional data that it thought was relevant to the assessment. The damages assessment in the Cabrera Report and Cabrera Response are based on many assumptions provided by Donziger and the LAPs' representatives that neither I nor Stratus know to be true or accurate. In addition, I have come to understand that the Cabrera process was tainted by Donziger and the LAPs' representatives. As a consequence, the damages assessment in the Cabrera Report and Cabrera Response are not reliable. I disavow the Cabrera Report and Cabrera Response, and they are not reliable bases for the Ecuadorian court to rely upon in rendering its judgment.

**THE CABRERA NOVEMBER 2008 RESPONSE**

39. The LAPs' comments on the Cabrera Report generally approve of the report but claim that "[t]he omissions we have been able to detect in Expert Richard Cabrera's Expert Report greatly favor the interests of the defendant, given that said omissions either minimize or fail to consider certain environmental damage and legislation that should definitely be taken into account in the evaluation." The comments, including the portions prepared by Stratus, do not disclose that the Cabrera Report was drafted by Stratus or the LAPs' representatives. With the comments the LAPs were literally commenting on their own work. For example, at Donziger's direction Stratus prepared the soil remediation cost estimate to the Cabrera Report of \$1.7B based on a remediation standard of 1,000 ppm of TPH. It then prepared comments claiming that "the

cleanup proposed by the Perito is inadequate, and it will not restore the environment to its original state before the environmental damage occurred” and “we consider 100 ppm TPH to be a much better cleanup level that will achieve an environmental restoration that is much closer to the conditions prior to the damage caused by Texaco, as instructed by the Court.” The text then states “the total cost to remediate soils to 100 ppm TPH should be \$2,743,000,000.” For context, Donziger had insisted on using a standard of 1,000 ppm even though the remediation level used by PEPDA is 2,500 ppm. He then insisted on further lowering that to 100 ppm in the Cabrera Response.

40. We began planning the LAPs’ comments on the Cabrera Report shortly after it was filed. Steven Donziger, Pablo Fajardo, Luis Yanza, Doug Beltman, Jen Peers, and I met in Boulder June 4-5, 2008, to discuss, among other things, the planned comments. Karen Hinton was also present on June 4th. I understood these comments to be a “formal response to the Court about the Expert’s Report.” Douglas Beltman communicated an extensive to-do list for the comments project. Douglas Beltman, David Mills, Jennifer Peers, and I all worked on portions of the text for the comments. We completed our work in the United States and sent our work on the comments to the LAPs’ team when completed. Stratus instructed Brian Lazar to alter the language of portions we had already drafted to sound “more like the Perito.” Stratus drafted portions of “Cabrera’s” responses to the LAPs comments throughout October and November 2008. I assumed that the portions of the Cabrera Response that Stratus was drafting would be filed with the Ecuadorian Court as if written by Cabrera.

41. The LAPs’ comments, including the portions prepared by Stratus, do not disclose that the Cabrera Report was drafted by Stratus or the LAPs.

42. I understood that on September 16, 2008, the LAPs submitted their comments to “the Expert Report filed by Expert, Richard Cabrera Vega,” containing our work on the comments.

**DAMAGES CATEGORIES IN THE  
CABRERA REPORT AND CABRERA RESPONSE**

43. I have reviewed the witness statement of Douglas Beltman regarding the damages categories in the Cabrera Report and Cabrera Response. I am not aware of any facts or data that contradict any of his statements or conclusions. As to the limited portions of the Cabrera Report and Cabrera Response I was involved in, I agree with and adopt Mr. Beltman’s statements and conclusions. As to the parts I was not involved in, I am not qualified to verify any of the alleged damages or proposed remedies in those portions of the Cabrera Report and Cabrera Response. I have no basis to believe that those damages or proposed remedies are valid or accurate. I have reviewed Mr. Beltman’s statements and have no reason to doubt his conclusion that the Cabrera damages assessment is tainted, is not supported by reliable information, and cannot support a valid damage claim. I therefore disavow the Cabrera Report and Cabrera Response.

**THE STRATUS COMMENTS**

44. Douglas Beltman drafted the Stratus Comments and they were signed by myself and 4 other Stratus scientists. By the time I signed the comments, it was apparent that Cabrera was not neutral. Because the Cabrera Report and Cabrera Response are not supported by reliable information and because I now understand that the Cabrera Process was tainted by Donziger and the LAPs’ representatives, I withdraw and disavow any endorsement of the Cabrera Report and Cabrera Response, including the December 1, 2008 Stratus comments.



**SITE VISITS**

45. Throughout the time I worked on the Ecuador Project, I only visited the Oriente on 3 or 4 occasions. In total, I have visited approximately 20-25 sites in the former concession area. Most of the sites I visited were chosen for me by Donziger or the LAPs' representatives. I do not know whether the visible surface conditions I saw at those sites are representative of all sites in the former concession. I do not have personal knowledge of whether the conditions I saw at those sites, including any pits or spills, were caused by the activities of PetroEcuador, TexPet or some other operator.

**HAVOC LAB**

46. I am aware that LAPs' experts during the judicial inspection utilized the facilities of the Havoc Lab. I personally visited Havoc Lab. Havoc Lab had two significant shortcomings related to its ability to measure polycyclic aromatic hydrocarbons (PAHs) and chromium VI (Cr(VI)) in samples. Havoc did not have the equipment needed to conduct determinations of individual PAHs and instead did a "total PAH" and divided it into individual PAHs. This methodology produces unreliable data. Therefore, any Havoc PAH values (total or individual) reported for soil or water are scientifically unsound and cannot be relied upon. In contrast, the method Chevron used for individual PAHs is reliable.

47. Additionally Havoc sent out samples for Cr(VI) determination (they did not have the equipment do perform them in-house). The holding time for Cr(VI) measurement in water samples is 24 hours, and it is highly unlikely that any water samples sent out for Cr(VI) analysis by Havoc were analyzed by another laboratory within the holding time. I do not know the name of the laboratory that Havoc sent Cr(VI) samples to and I do not know whether that laboratory

had the proper equipment or utilized proper methodologies. I thus have no basis for concluding that any of the Cr(VI) data submitted by the LAPs during the judicial inspections were valid.

48. I understand that in the judgment the court relied upon expert reports from the judicial inspections. Thus the comparisons between PAH and Cr(VI) concentrations in the LAPs' samples and Ecuadorian standards are unreliable.

#### **STRATUS 1782 PROCEEDINGS**

49. I became aware of Chevron's request for discovery under Section 1782 around February 2010. I was, at that time, prepared to make full disclosure and turn over documents requested regarding my role in the Cabrera Report and Cabrera Response. Indeed, I disclosed all material facts regarding my involvement in the Cabrera Report to my counsel, Joe Silver and Martin Beier, of Silver & DeBoskey.

50. For all of my reports and testimony, I based my opinions and conclusions on a series of assumptions and data provided to me by Donziger and the LAPs' representatives that I do not know to be true. In addition, I now believe that the damages assessment in the Cabrera Report and Cabrera Response is tainted. Therefore, I disavow any and all findings and conclusions in all of my reports and testimony on the Ecuador Project. Like my colleague Douglas Beltman, I deeply regret that I allowed myself to be used in the Lago Agrio Litigation in the way that I was, as detailed throughout this statement.

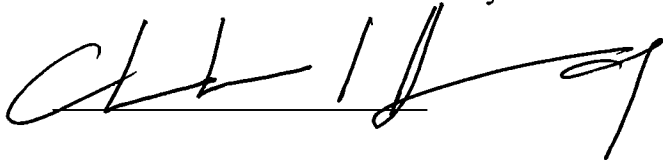
I state under penalty of perjury under the laws of the United States of America that the foregoing is true and correct. Executed on March 21, 2013 in New York, New York.



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ANN MAEST

Sworn to before me on this <sup>22nd</sup> ~~21st~~ day of March 2013



Notary Public

**CHEIKH S. DIENG**  
Notary Public, State of New York  
No. 01DI6271613  
Qualified in New York County  
Commission Expires Nov. 05, 2016

