



Exploration Insights

by Brent Cook

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This week, while I am traveling, we present Part I (of II) of what Tim Oliver considers the most important and obvious red flags investors should be aware of when reviewing a mine development technical report. Tim is a registered Professional Engineer with extensive real-life experience in conducting and performing all aspects of mining and economic studies. He spent the most notable years of his 37-year career with Phelps Dodge Corporation (now Freeport McMoRan) and M3 Engineering. He currently works independently, and on an associate basis with Behre Dolbear.

Although there is considerably more to evaluating a detailed mine study--way more than we can go into-- this list provides a quick set of checks to either kill the investment idea or move on to more detail. Our goal is to filter out the bad investments as efficiently as possible, then move on.

Just as importantly, the list provides a basis from which to look at the earliest drill results and metallurgical tests, and make a back-of-the-envelope guesstimate of what the project has to show if it is to become economic. What strikes me about Tim's 10 Signs of a Bogus Study is that, as with our earlier list (EI Dec. 15, 2013), a company's objectives, competence, and honesty are what matters first. Figure that out and the rest is relatively easy.

The Rant

Top 10 Signs of a Bogus NI 43-101 Study

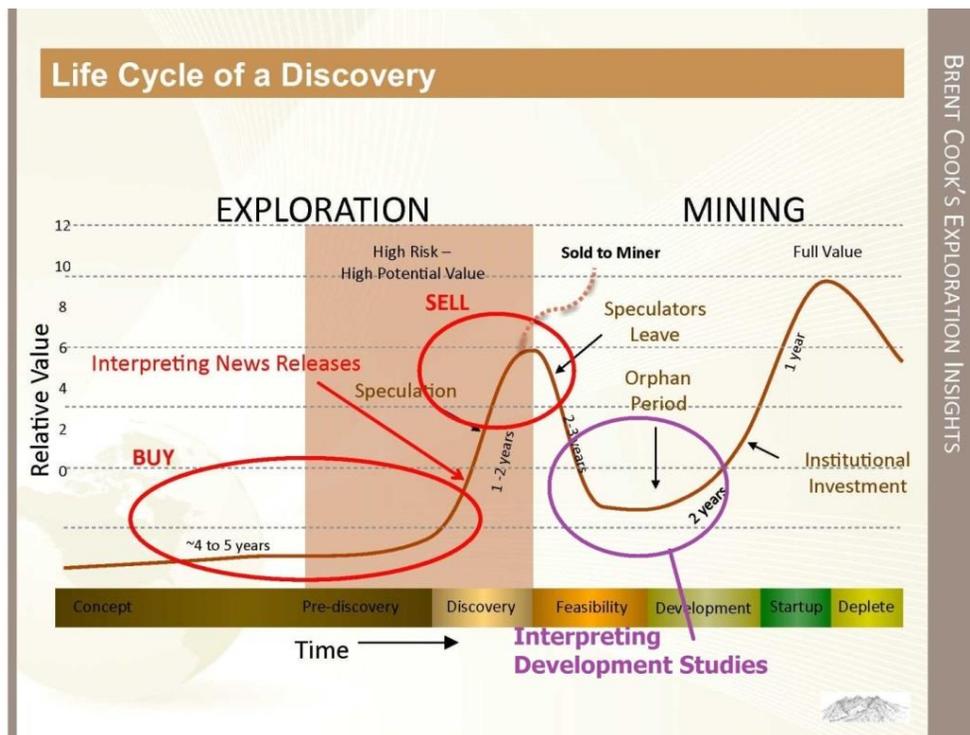
By Tim Oliver

Last September Brent published an article in [The Gold Report](#) and filed some comments in [Inca Kola News](#) weighing in on a lively debate about NI 43-101 studies. He said, "I personally find these [NI 43-101] reports extremely useful and read many every week. Some are very high quality, many sloppy and too many crap, but the ability to make those assessments is critical to forming an investment decision."

I too read several studies each week. But, where Brent focuses on the resource estimates and geology, I focus on the engineering studies: Preliminary Economic Assessments (PEA), Pre-Feasibility (PFS) and Feasibility Studies (FS). In fact, I recently made up a list of 10 signs of a bogus study. When I shared the list with Brent at a recent Cambridge House event in Palm Springs, he invited me to submit this piece.

There are two types of “technical reports” under NI 43-101: the resource statement, and the mine project development study. Each type of study presents an investment opportunity, as shown below (Figure 1, from Brent’s presentation in Palm Springs).

The red ellipse “buy” corresponds to the discovery and resource investigation opportunity. The purple ellipse shows the investment opportunity during the feasibility/development stage.



(Fig. 1: Life Cycle of a Discovery)

Brent’s January 13, 2014, article in The Gold Report titled “[Rules of Thumb for Junior Mining Speculators: A Light at the End of the Tunnel](#)” describes his method of evaluating properties during the first stage. Today’s article begins to address the second stage—economic mine development.

Mine development studies are an established practice for progressively evaluating a mineral prospect’s potential value. NI 43-101 [codified](#) some of the study elements and set out certain requirements for public disclosure, including the requirement that a “qualified person” vouch for the report.

Mineral deposit owners conduct development studies for three reasons and outcomes. We will call them “motivations.” By understanding management’s “motivation” a potential investor is better equipped to assess the validity of the study, and thereafter the potential risks and rewards inherent in the company.

Motivations

1. Management is serious: The owner wishes to objectively assess the development potential of the deposit through a rigorous engineering analysis. Let’s use the term *real* here.

2. Management seems lost: That is, the owner seems to desire only to comply with the NI 43-101 disclosure requirements. The study is superficial and meets minimum requirements. This will be referred to as *misdirected*.
3. The owner wants to promote a marginal property: Put lipstick on a pig. This will be called *sham*.

The "small gold mine"

I use a generic model of a small underground gold mine with a standard cyanide leach mill to measure the financial effects of the various tricks discussed in the list.

USING THE LIST

This list is a tool I use to evaluate studies. It isn't exact and won't provide a distinct answer; however, by following the instructions you will be better able to interpret the motives of the companies issuing the studies.

#1 Qualified Person (QP) Conflict of Interest

An authentically independent evaluation adds great value to a mineral deposit. Clearly, the owner of a deposit benefits financially from a "positive" study. The street responds, and the stock price rises.

Anything less than full independence subtracts from that value; yet, time and again, owners appoint themselves or their employees as QPs. This is a clear conflict that reveals itself easily via the list of QPs. This conflict arises either from a misdirected or sham effort. It may be difficult to tell which, from this item alone. NI 43-101 contains some weak protections from this type of blatant conflict.

The role of the consultant or engineering firm presents a second potential conflict. In the case of our small gold mine, a firm's fees for the development studies might total over US\$1 million; fees to design and oversee mine and plant construction will be about US\$15 million! Clearly, the engineering firm benefits when the project goes the distance-- whether the mine ultimately succeeds or not.

The FS estimate sets the project construction budget. Could it be that some of the huge cost overruns currently plaguing the industry might be partially the result of biased low FS estimates?

A third conflict exists in the desire of individuals and teams for success. Each successful stage carries a bigger budget, nicer commemorative jackets, better parties and, more visibility, status, and fees. Job satisfaction, personal recognition, the continuation of the team effort, and the warm regard of the client all result from a successful study.

While the first type of conflict signals a sham project, both real and misdirected studies could fall victim to either the second or third types of conflict.

#2 – QP Unqualified

Here is a quotation from the biography in one QP Certification:

I have worked as a Geological Engineer/Resource Estimation Geologist for a total of seven years since my graduation from university; as an employee of a major mining company, a major engineering company, and as a consulting engineer. I have estimated numerous mineral resources containing copper/silver and have 7 years of precious and base metals experience.

Oh Really? When I was on my third job in seven years, I was barely qualified for Happy Hour.

Be particularly alert to the metallurgist's qualifications. One prominent firm had a Geologist QP sign off on the metallurgical testing (and the recovery rate).

The unqualified QP is evidence of a misdirected owner.

A sham study will show an impressive list of non-employee "impartial" contributors.

#3 Unrealistic Commodity Price Deck

NI 43-101 does not dictate a method of commodity price estimation. The US SEC suggests using a three-year trailing average, but that's clearly unrealistic in a volatile market. Nonetheless, this method is common.

A July PEA issued by a US-based precious metals producer used a gold price of \$1500 per ounce and a silver price of \$26 per ounce. Prices at that time were about \$1300 per ounce for gold and \$22 per ounce for silver, and falling rapidly. Even at that, the project could only squeeze out an IRR of 16.5%.

The inflated cost deck is an obvious and common flaw used by misdirected and sham projects equally.

#4 Unrealistic Metallurgical Recoveries

Metallurgical recovery (how much metal makes it out of the rock and into the market) and metal prices are two of most sensitive economic factors in mining. For our small gold mine, a 0.5% difference in the recovery might have a 2.5% difference on the NPV and a 0.25% difference on the internal rate of return (IRR).

Recovery calculations rely on complicated and extensive sampling and laboratory analysis. The metallurgist interprets the test results and, according to his or her judgment and experience, estimates recovery. Any concession to pressure for a slight change in base case recovery can have a profound effect on project economics.

A sham owner will push for the best recovery the metallurgist can tolerate. The misdirected owner will probably not.

#5 Signs of Desperation

Cost Shaving

My favorite part of a study is the initial capital review. The equipment list has everyone's pet features: every pump has a standing spare, the mill has a fancy automated liner changer, the truck shop has a service bay for every three trucks in the haul fleet, and the environmental department has a yoga lounge.

The complete team gathers together for the first time since the kickoff meeting. They enjoy a nice dinner where everyone is enthusiastic and the scenario is rosy. Expensive wine flows.

Next, the financial team conducts the first economic model run, and, guess what? The project is underwater. So, time to cut some nuts, or "rationalize" the base case. And the fun begins.

As more and more fat gets trimmed, the economics look better and better. A good project survives the first few rounds of rationalization and a viable project base case emerges. A misdirected or a sham project owner may resort to desperate cost shaving measures.

Continued...

Part 2:

Fortunately, Tim Oliver has submitted Part 2 of his Top 10 Signs of a Bogus NI 43-101 for this week's letter. With the advent of the post Bre-X Canadian National Instrument 43-101, an entire industry has emerged to fulfill those regulatory requirements. As we have often discussed, there is a wide range in quality in these reports; and, as Tim notes, the motivation behind the report is a prime consideration for anyone reading said report.

Although only an engineer could be expected to catch some of the nuances Tim discusses, I think the overriding idea-- that a company's honesty and competence is reflected in the quality of the report-- is critical to any investment decision.

Top 10 Signs of a Bogus NI 43-101 Study--Continued

By Tim Oliver

In EI March 1, 2014 we explored the first five of ten signs of a bogus NI 43-101 study.

Let's review some of the opening thoughts:

Mineral deposit owners conduct development studies with one of three reasons and outcomes in mind. We will call them "motivations." By understanding management's "motivation" a potential investor is better equipped to assess the risks and rewards inherent in the company.

Motivations

1. Management is serious. The owner wishes to objectively assess the development potential of the deposit through a rigorous engineering analysis. Let's use the term real here.
2. Management seems lost. That is, the owner seems to desire only to comply with the NI 43-101 disclosure requirements. The study is superficial and meets minimum requirements. This will be referred to as misdirected.

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USING THE LIST

This list is a tool I use to evaluate studies. It isn't exact and won't provide a distinct answer. It's merely a tool I use so I remember to check those things I've learned to be telling. Follow the instructions and you will be better able to interpret the motives of the companies issuing the studies.

#5 Signs of Desperation

Part 1 introduced the "Signs of Desperation" with a description of circumstances arising in the preparation of a study that might lead to desperation cost shaving efforts. Today we pick up the discussion with some specific "red flags."

Cost Shaving

- Schedule squeeze (see item #9)
- Using a contract mining group rather than a company's own people and equipment in an open pit; it costs more, but allows swapping capital expenditure (capex) for operating expenditure (opex). This may be a prudent move if the project is particularly capital sensitive. Often, however, it is just a way to reduce initial capital to avoid "sticker shock."
- The maintenance shop has too few haul truck service bays. The design should consider at least one service bay for every five trucks in the haulage fleet. This is a symptom of desperation, not a big saver.
- Any used equipment (a study should never have used equipment in the base case unless the owner owns the equipment).
- Suspiciously deferred construction of key facilities (adding bays to truck shop in year four, or deferred construction of flood control: "It probably won't rain during the first five years").
- Run of mine (ROM) leaching plan (eliminates crushing plant but can have disastrous effect on recovery during actual operations).
- Lack of construction camp ("the contractors will handle it").

Unrealistic Financial Factors

Study managers select financial variables for the cost model. These measures are flimsy camouflage, since most analysts see right through them. However, using the right variables can yield results that look good in a news release—the soul of a promotion:

1. Discount Rate <7%

The discount rate is the cost of capital. Mining capital projects are risky-- a particularly acute problem recently. A prudent discount rate is 8%. Five percent is unrealistically low, but not uncommon in NI 43-101 studies.

The problem is that most mines (particularly gold) cannot handle a high discount rate.

The NPV for our small gold mine would be US\$42 million at 5% and US\$30 million at 7.5%.

2. Pre-tax IRR

Financial models should account for taxes. (A pre-tax IRR is unrealistic but looks better in the all-important news release.)

3. Too little working capital (<2 months opex)

Working capital is how much money a mine operator will need to cover costs until the first revenue arrives. A rule of thumb for working capital is three months of operating costs. Anything less than two months is unrealistic.

Consider a copper mine producing copper concentrate to be smelted in China, a common practice. Is it realistic to believe the first check will arrive before the proverbial "slow boat to China" can deliver the concentrate? One remedy is a concentrate broker, but the broker's fee could kill the economics, otherwise. I have never seen a broker's fee in a cost model.

4. Owner's cost too low – look for calculation sheet

Owner's costs are cost expenses incurred by the owner that are not operating or capital costs but are necessary to get the mine underway. Some examples are: first fills of consumables such as grinding media and reagents, training costs, computer and communication system costs, etc.

Owner's costs for the small gold mine were US\$11 million including a US\$6.3 million power line. Owner's costs should be tabulated in the capital cost estimate, but presented in the economic model. I've seen a number of studies with no owner's costs included at all.

Prefeasibility (PFS) Skipping

Beware of a project development that skips the PFS stage. In my experience, the PFS can be the most important stage. It is where the engineer performs tradeoff studies and asks the difficult "what ifs." While it is possible to proceed from the PEA report to the FS report without publishing the PFS report, the work of a PFS must be

done, and the schedule and budget must accommodate the engineering. Furthermore, the PFS report is the first time an owner can declare reserves.

A misdirected study may show signs of desperation. The effort will be ham-handed and obvious. Look for contract mining with the contractor supplying the truck shop and construction camp. Run-of-mine with little supporting metallurgical testing, used equipment in key areas, a one-year construction schedule, and extreme optimism on permitting are all tools of a slapdash effort to squeeze out positive finances. Also look for a pre-tax model with working capital and owner's cost missing altogether.

The sham study will deceive more artfully. One trick is to show owner's cost as a raw number rather than a percentage. US\$20 million looks like a lot. But if the three month opex is US\$50 million, it is not enough.

#6 Lack of Engineering Documentation

The engineering designs and calculations support the cost basis just as the cost basis supports the cost estimate.

Study reports must present designs and calculations sufficient to support the equipment selection and facility construction details. The report must contain enough drawings and specifications to demonstrate completion of the required degree of engineering. Look for, at a minimum, a site layout plan, pit outlines or underground development diagrams, a detailed Process Flow Diagram, General Arrangement Drawings for major facilities, site specifications, and an environmental permit table. As the studies advance from PEA to FS, the detail of engineering will increase. A FS might contain 30 or more engineering drawings.

Lack of engineering signals a misdirected effort.

A sham study will present many drawings and specifications, but they are only window dressing. If the report seems to have more drawings than it needs, including numerous colored maps and three-dimensional drawings, it might be a sham.

#7 Unrealistically Low Contingency

Contingency is often misunderstood to be a slush fund for sloppy estimating. In fact, it is a calculated factor based on a careful risk evaluation. The contingency is not budgeted for what could go wrong. It is budgeted for what will go wrong, and it *will* it be spent.

Contingencies decrease with increasing design detail. Here is a rule of thumb for contingencies for the three NI 43-101 study stages: PEA: 25%; PFS: 15-20%; and FS: 10-15%.

The study should discuss the contingency used and how it was calculated. A lower contingency is acceptable if the study makes a thoughtful and compelling case based on design details.

A recent FS used a Monte Carlo simulation to calculate an 8% contingency. At first I was impressed by the fancy pants statistical treatment for a basic calculation. Then I realized it was just window dressing to justify a too-low contingency.

If the study report offers a low contingency unsupported by detailed engineering, it is probably a result of a sham, regardless of the fancy calculation method.

#8 Lame Cost Basis Discussion

A PFS or an FS is a life support system for a cost estimate. The report must detail the basis for the costs, i.e. where the data came from. Without access to source data, the reviewer might suspect that the cost estimate was either pulled from mid-air or was back-calculated from a desired financial result. Either way, the entire study is bogus. When the owner and the study manager collude to underestimate costs, the cost basis will be weak.

Look for the source of capital cost data for mechanical equipment, earthmoving costs, steel, concrete, consumables (chemicals and grinding media), labor, power, etc. The Cost Basis section should be several pages long and should address all the major cost elements.

As a rule of thumb, a cost estimate for a PFS should list vendor budgetary quotes for at least 70% of mechanical equipment value. A FS should show quotes for at least 90% of the mechanical equipment value. These are common metrics, and a good study will highlight them.

If the study has no discussion of the source of the cost data but shows table after table displaying the same data in all manner of ways, it is probably a sham. If the cost basis discussion is slipshod or absent and the cost data is summarized in a single table, the study is misdirected.

#9 Absent or Unrealistic Project Schedule

Schedules are often created backwards. The owner knows when he or she wants to say the project will be completed and has an idea when it will start. The schedule must fit in between, rather than reflecting realistic timeframes.

If a report does not show a reasonably detailed project schedule, it is hiding something.

As a rule of thumb, any project with an initial capital cost greater than US\$1 billion will require at least two years to construct. If the cost is over US\$2 billion, the construction period should approach three years. "Compressing" the schedule is a favorite technique for trimming capex.

Environmental permitting will take at least five years in the US or Canada and at least three years elsewhere.

Absence of a schedule signals a sloppy report prepared in haste under a tight budget, in order to comply with the law corresponding to the misdirected study.

An overly compressed but highly detailed schedule is a sign of desperation and project promotion corresponding to a sham.

#10 New or Exotic Technology

Beware of breakthroughs or special "proprietary" technology. Mining projects are risky enough without introducing experimental complex processes.

If the study presumes a deposit's riches are only recovered using some special recovery techniques, run away.

Ask if the technology or equipment is, or has ever been, successfully used in a similar commercial operation.

A common truism applies: "If it seems too good to be true, it is."

Item #10 is a symptom of a misdirected or sham study. Using exotic recovery processes to compensate for difficult metallurgy shows the owners are either lazy or lost or lying.

Brent Cook

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