

Antimony in the ground isn't antimony in ammunition

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The strategic supply question isn't where's the antimony or the processor. It's what components form the chain of mining, processing and manufacturing that we need to go from the resource to the end product the buyer is paying for. It may be from quartz vein-hosted stibnite to:

Military-grade antimony sulphide (Sb_2S_3) → primer composition → primer/fuze → ammunition item in military service.

This perspective changes the analysis.

A stibnite resource has to become representative mine feed.

That feed has to produce a concentrate or intermediate with chemistry a processor can actually accept.

The processor has to be technically compatible **and commercially available**.

Recovery matters.

Impurities matter.

Payability and penalties matter.

Capacity has to be available, not merely installed.

The resulting product has to meet specification.

For some applications, it then has to be qualified by another manufacturer.

And if strategic provenance matters, the material has to remain traceable as it passes between companies, processors, traders, jurisdictions and product forms.

This is where even an apparently complete supply chain can become opaque and start developing holes.

An offtake to a trader can solve the producer's commercial problem without telling us where the antimony ultimately goes.

A processor can produce antimony without establishing that it can accept the feed from the mine you are trying to connect to it.

A facility can have nameplate capacity without having feed, available capacity or even being operational.

A government procurement contract can establish demand without identifying the mine supplying the material.

And a resource located in one jurisdiction can pass through processing and commercial relationships in several others, while depending on technology controlled elsewhere, before resulting in a usable product.

This doesn't necessarily mean the asset, contract or facility is deficient.

The question is: what does your supply chain analysis need to answer?

Tracing critical mineral supply chains in both directions:

Resource → product → end user

and

Required product → specification → processor → acceptable feed → resource

will illuminate the components and interfaces requiring work.

There may be no problem per se to solve - a government, company or customer may simply decide it wants a capability it does not currently possess.

The analytical task is still the same:

What must be true for the intended outcome to exist?

What has actually been demonstrated?

What remains unknown?

An unknown is not a weakness.

It means the available evidence does not answer the question.

Know the source. Trace it wherever it goes.

Because the tonnes that matter are not necessarily the tonnes we can count.

They are the tonnes that can become the product somebody actually pays for.



Photo credit: US Army

Antimony is strategically important again.

China's dominance of antimony mining and processing, export restrictions, defence requirements and the limited number of established processing routes outside China have accelerated interest in new mines, operation restarts, refining capacity, strategic stockpiles and supply chains.

As I mapped antimony supply chains from resources through mineralogy, processing routes, processors, product specifications, offtakes and potential end users, I found myself confronting a more fundamental problem.

When I ask:

Where can diversified antimony supply be secured?

Starting from the resource doesn't answer the question.

Antimony in a resource is not antimony supply.

A mine producing concentrate is not necessarily connected to a compatible processor.

A processor with antimony capability is not necessarily available to a particular mine.

An offtake does not necessarily identify where material will ultimately be refined.

Installed processing capacity is not necessarily operating or commercially available capacity.

And a material containing antimony is not necessarily qualified for the application for which strategic supply is required.

The further the supply chain is followed, the more the question changes.

The relevant question becomes:

Which mineral resources can produce a processor compatible feed, through an available and strategically acceptable processing route, into the specific qualified antimony product required by the intended user at sufficient volume, cost and reliability?

If you want gold you explore for gold but if you want antimony for ammunition it isn't so simple.

Mining begins with geology.

Where is the antimony?

How large is the resource?

What is the grade?

What mineral hosts it?

Can it be extracted?

Can it be mined?

But if the objective is strategic supply rather than resource inventory you need the information that satisfies the strategic objective: the product.

What product is actually required?

Antimony enters industrial systems in materially different forms.

Antimony metal can enter lead alloys used in batteries and other applications.

Antimony trioxide is used extensively within flame-retardant systems.

Antimony sulphide has specialised applications including ammunition.

High-purity antimony enters semiconductor materials including indium antimonide and gallium antimonide.

These are not interchangeable.

Nor are their specifications, manufacturing pathways or qualification requirements.

The physical chain looks more like:

ore → concentrate/intermediate → processor → qualified antimony metal / oxide / sulphide → formulated material or component → end user

But even that representation conceals considerable complexity.

For defence applications, for example, demonstrating the chemistry of an upstream concentrate is not equivalent to demonstrating that the final material has been qualified for ammunition manufacture.

MIL-DTL-159E applies to antimony sulphide for ammunition.

99.65% antimony metal is a different product from the antimony trisulfide specified for ammunition primers under MIL-DTL-159E.

The question at each supply chain link becomes:

What does it produce, to what specification, and can that product enter the next required stage?

There is no generic tonne of antimony

Two deposits can report the same contained antimony and represent very different potential supply.

We often see mineralogy and grade reported.

What we don't see so clearly is liberation, deportment, associated elements, concentrate chemistry, recovery, variability and the requirements of the downstream processor.

Stibnite (Sb_2S_3) is the principal antimony mineral in many deposits and pure Sb_2S_3 theoretically contains approximately 71.7% Sb.

Reporting from a recent high-grade antimony deposit highlighted 90.8% stibnite alongside a total antimony assay of 71.9% Sb.

What this highlights is that mineralogical and analytical reconciliation must occur before those results can form evidence of representative feed quality. It's why geology moves to resources and onto reserves – levels of confidence as to what material may become the feed that actually enters the mine processor. Metallurgical testwork follows that progression through bench-scale testing, bulk samples, pilot plants and demonstration plants. These progressively increase confidence, but actual production-plant performance on representative operating feed is only established once the plant is operating.

A high-grade sample of mineralization can demonstrate that exceptionally rich material exists but it cannot establish the chemistry, variability or metallurgical behaviour of representative mine feed.

Processors, refiners, manufacturers and end users don't purchase a geological headline or test recovery.

They receive physical material with everything the geology brings with it.

Contaminants like arsenic, lead, mercury, sulphur.

Gold or other associated payable constituents.

Gangue.

Mineralogical complexity.

Variability in grade and behaviour.

The commercial question isn't only recovery but recovery of what product, at what specification, with what impurity rejection, from what representative feed?

Geology determines possibility. Specification determines relevance.

Finding antimony is easier than configuring a complete supply chain

Once I began mapping individual antimony projects against processors and downstream products, a recurring pattern emerged.

There is often substantial information about the individual assets.

Mining companies disclose resources, grades, metallurgy and development plans.

Processors describe products and sometimes capacity.

Traders announce offtake agreements.

Governments announce contracts, finance, strategic partnerships and industrial-policy initiatives.

End users publish specifications selectively.

Viewed independently, the components can create the appearance of an emerging supply chain.

But:

A exists.

And:

B exists.

does not establish:

$A \rightarrow B$.

The missing evidence frequently sits at the interface.

Can that mine's concentrate actually enter that processor's system?

What feed specification does the processor require?

What are its arsenic, lead and mercury limits?

What recovery can the mine achieve while meeting those limits?

Does the processor accept third-party primary concentrate at all?

Is capacity available?

What are the payability and penalty terms?

Where does the refined material go?

Has the final product been qualified?

Who controls the material as it moves through the chain?

Those questions begin to separate an asset inventory from a supply chain map.

And several examples illustrate why.

United States Antimony Corporation (“USAC”)

USAC processes antimony through Madero in Mexico and Thompson Falls in Montana, with different feed sources and intermediate products moving through different routes. USAC has supplied 99.65% antimony metal under a US Defense Logistics Agency contract.

That sounds straight-forward but the movement of material is more complex.

The Montana operation produces antimony oxide, metal ingots, trisulphide and precious metals, while the Mexican facilities primarily produce antimony metal ingots and a lower grade antimony oxide. USAC states approximate product concentrations of 71.4% for antimony trisulphide, 83% for antimony oxide and 99.65% for antimony metal. At its Madero smelter, it has also developed processing methods to remove arsenic and iron contaminants from feed used in antimony ingot production.

Yet even here, following the supply chain creates more questions.

How is individual mine feed allocated between facilities?

What are the relevant feed specifications and recoveries?

How does material provenance move through the Madero and Thompson Falls processing configuration?

The five-year sole-source Indefinite Delivery, Indefinite Quantity (IDIQ) contract, under which individual delivery orders determine actual purchases, runs through September 2030 and covers 99.65% antimony metal ingots. The maximum stated value in the Q2 filing is \$245 million but the 2025 10-K form had referred to \$248 million. Delivery orders - not the contract ceiling - create actual delivery obligations and each shipment is recognised only when delivered and formally accepted by Defense Logistics Agency (“DLA”).

So questions arise:

What proportion of the announced contractual ceiling ultimately translates into physical purchased volume?

And importantly, the Defense Logistics Agency is purchasing material for strategic stockpile purposes.

It is therefore a customer in the procurement chain, but not necessarily the manufacturer physically converting that metal into the ultimate defence component.

Supply chains are much simpler to trace institutionally than physically.

Perpetua Resources Corp (Perpetua), US

Perpetua holds the Stibnite Gold Project through its wholly owned subsidiary Idaho Gold Resources Company, LLC. Probable Mineral Reserves of 104.625 Mt at 1.43 g/t Au, 0.064% Sb and 1.91 g/t Ag, containing 67,443 tonnes of antimony (there are no Proven Mineral Reserves) have been reported. Early works commenced in October 2025 and additional critical-path construction commenced in May 2026, while full construction remained subject to financing and a final investment and construction decision in the Q2 2026 filing. Gold and antimony production is targeted for 2029. Securing commercial off-site processing and offtake remains an active workstream. In September 2025, Perpetua reported discussions with numerous parties including Clarios, Glencore, Nyrstar, Sunshine Silver and Trafigura, whilst the Idaho National Laboratory modular pilot plant is testing ore sourced from the Stibnite Gold Project at approximately one tonne per day to characterise and separate antimony as part of a programme designed to demonstrate production of military-specification antimony trisulphide.

But those facts cannot be collapsed into a commercial supply chain claim. They represent different components of a potential supply chain at materially different levels of confidence. This distinction is easy to lose in strategic minerals discussions because technical progress and commercial-chain development often occur simultaneously.

Larvotto Resources Limited's Hillgrove project, Australia

The Hillgrove gold-antimony mine owned by Larvotto Resources Limited (Larvotto) commenced production on 31 August 2026. Hillgrove is forecast to produce 4,900 tonnes of antimony and 40,500 ounces of gold per annum over an initial eight-year mine life. The study basis forecasts an average antimony concentrate grade of 60.1% Sb and 23.4 g/t Au. It has a US\$4.0 million secured prepayment facility, provided by XCLR Commodities Limited, in conjunction with the seven-year antimony concentrate offtake agreement with Wogen Resources Limited ("Wogen") which establishes a commercial marketing route, while public disclosures do not identify the downstream refinery or final customer. Larvotto has publicly identified arsenic as a known deleterious element in relation to gold-concentrate treatment. Public disclosures reviewed do not identify the arsenic content of the antimony concentrate, nor the acceptance limits or penalty structure applying under the Wogen offtake.

Multiple questions arise:

Where will the concentrate actually be refined?

Into what product?

At what facility?

Against what feed specification?

What recovery and penalty structure applies?

What final jurisdiction receives the refined material?

And ultimately, who qualifies and utilises it?

There is nothing inherently problematic about that opacity. Traders perform an important commercial function. But an offtake to a trader answers a different question from supply chain traceability.

Knowing who buys the concentrate is not the same as knowing where the antimony ultimately goes.

Alkane Resources Limited's Costerfield mine, Australia

Costerfield is another operating underground gold-antimony mine in Victoria. In 2025, then-owner Mandalay Resources (Mandalay) supplied antimony-bearing material under contract to USAC's Madero smelter in Mexico. USAC described the material as antimony "ore".

Two shipments totalling 110 tons were processed at Madero.

A third shipment of 55 tons left Melbourne on 17 March 2025 for Manzanillo, Mexico but was routed by the shipping line through Ningbo-Zhoushan, China. Chinese Customs detained the cargo for approximately 82 days and required its return to Australia. No reason for the detention was provided. The shipment was returned to Australia and subsequently dispatched again toward its intended Mexican processing route but public disclosures reviewed do not establish whether it was ultimately processed at Madero.

By August 2025, USAC stated that further supply would depend on renegotiating the contract because Mandalay material contained arsenic above the contracted specification.

An operating mine, antimony concentrate and an offtake contract did not, by themselves, create a reliable mine-to-processor pathway.

Costerfield, now owned by Alkane Resources Limited (Alkane), continues to produce antimony recovered into a gold-antimony concentrate and sells that product under existing arrangements. Public disclosure reviewed does not establish the current downstream processor, processing terms or final destination.

Nyrstar Port Pirie Pty Ltd multi-metals processing facility, South Australia

Nyrstar Port Pirie Pty Ltd (Nyrstar) is an integrated multi-metals recovery plant and one of the world's largest primary lead smelting facilities. It processes lead-rich concentrates and smelting-industry by-products sourced from Australia and internationally through an integrated top-submerged-lance furnace, blast furnace and lead refinery.

Nyrstar states that antimony production at Port Pirie is primarily enabled through lead processing and that the demonstration plant can treat a wide range of local and global concentrates. Public disclosure reviewed does not identify the specific antimony-bearing feed used for the first cast. The demonstration plant produced its first antimony metal in November 2025. On 17 February 2026, Nyrstar announced the first shipment of Australian-produced commercial-grade antimony metal to an Australian domestic manufacturer on the east coast.

Subject to further investment and upgrades, Nyrstar states that Port Pirie could scale to potential production of up to 5,000 tonnes of refined antimony metal per annum by 2028.

Potential capacity is not current sustained production capability. It's not supply.

This distinction becomes especially important in media and generalist reporting where capacity from multiple sites is aggregated.

A facility may be operating, configured around secondary or specialised feed, integrated into another metallurgical circuit, commercially committed, technically constrained, idle or effectively stranded.

Those categories should not be added together as though they represent equivalent tonnes of available processing.

Strategic & Precious Metals Processing (FZC) LLC, Oman

Strategic & Precious Metals Processing (FZC) LLC (SPMP) and its majority shareholder, the Oman Investment Authority, are seeking foreign investment for the Sohar antimony smelter which requires 60,000 tons of antimony "ore" annually for efficient operation and was designed to produce antimony metal, antimony trioxide and gold doré. It has not operated commercially since a deal with a Russian antimony mine collapsed in early 2022 after Russia's attack on Ukraine. The U.S. International Trade Administration (USITA) reported that a technical test of the facility in December 2023 was "successful", but provides no information as to the test feed, duration, throughput, recovery, product output or criteria for success.

A facility that has not been operating commercially for several years and requires new investment should not be treated as current available supply simply because the physical plant exists.

Conversely:

Campine NV in Belgium operates antimony recycling from industrial residues and production of antimony trioxide and lead alloys;

AMG Critical Materials N.V.'s operations in France convert antimony metal into antimony trioxide;

Nihon Seiko Co., Ltd.'s Nakase Refinery in Japan produces antimony trioxide, antimony metal, sodium antimonate and antimony trisulphide; and

Korea Zinc Company Ltd.'s Onsan Smelter in Republic of Korea recovers antimony within its integrated multi-metal processing system.

But the existence of those capabilities does not establish that each facility can receive any proposed antimony feed. Some processing systems are substantially based on secondary materials and industrial residues which is why recycling should be mapped as its own supply chain rather than treated as an indistinguishable extension of mined supply.

Primary and secondary antimony can ultimately contribute to the same strategic requirement but they don't necessarily travel through the same industrial system.

So the same discipline should apply to future processing.

Project Crucible, the planned integrated smelter being developed by Korea Zinc subsidiary Crucible Metals, LLC, is located at the former Nyrstar Clarksville zinc smelter site in Tennessee, US. Project Crucible is modelled on Korea Zinc's Onsan Smelter at approximately half its scale. The facility is planned to process approximately 1.1 million tons of raw materials annually and produce 540,000 tons of finished products in aggregate across multiple metals, with antimony one of 13 planned metal products. Phased operations are targeted from 2029. Korea Zinc has disclosed a broad zinc-lead-copper operating sequence, but antimony-specific capacity, feed requirements, product specification and the timing of antimony production have not been publicly disclosed.

It therefore belongs in the development pipeline, not current capacity.

Geopolitical analysis, however, frequently combines:

- operating production;
- construction;
- planned facilities;
- government-supported proposals;
- demonstration plants; and
- nameplate capacity

into a single picture of future supply.

Combining these categories materially overstates what is actually available while understating differences in deliverability confidence and time.

We're much clearer about this in the exploration-to-final-investment-decision funnel, but once an asset enters the Feasibility Corridor (where feasibility studies are produced) we can become surprisingly blind to its continuing fragility.

An exploration project with exceptional assays is not equivalent to a defined resource.

A resource is not equivalent to a reserve.

A reserve is not equivalent to a financed mine.

A financed mine is not equivalent to stable production.

And production is not equivalent to qualified downstream supply.

Time is part of the supply chain.

Qualification may be the least visible gate

One of the key findings from working backwards through the chain, from product to resource, is that much of the analysis isn't mining at all. It's processing and manufacturing. There are a multitude of projects, fewer operating mines and even fewer processors, while the material they produce must move through a greater number of manufacturers. Processing is a pinch point. But these manufacturers don't all require the same input material.

Consider antimony sulfide for ammunition.

A project may demonstrate high-grade stibnite.

It may produce a concentrate.

That concentrate may have attractive chemistry.

It may even be described against a military-related chemistry specification.

But that does not necessarily establish final-product qualification.

The downstream chain still has to move through conversion, final-material specification, testing, lot acceptance and manufacture.

The same principle applies elsewhere.

Antimony metal entering a lead alloy still has to become a component.

Antimony trioxide enters flame-retardant formulations before becoming part of polymers, cables, textiles or other products.

High-purity antimony entering InSb or GaSb semiconductor systems moves through material, crystal and device manufacturing before reaching a defence or industrial system.

The strategically relevant chain therefore extends further than:

mine → refinery.

It can become:

Sb metal → lead alloy → battery grid/projectile/component → OEM; or

Sb_2O_3 → flame-retardant package/masterbatch → polymer/cable/textile/component → OEM; or

Sb_2S_3 → primer composition → primer/fuze → ammunition item → military service; or

High-purity Sb → InSb/GaSb material or crystal → detector/device → defence system

Once the chain is represented this way, another problem becomes visible.

The customer that matters strategically may be several transactions removed from the mine.

And each interface can introduce its own specification, qualification, provenance and commercial requirement.

Geography alone does not establish supply chain provenance

A resource can sit in a politically aligned jurisdiction while:

ownership;

processing;

technology;
financing;
trading;
contractual control; or
downstream conversion
introduces another dependency.

Similarly, a resource in a country that is not a formal treaty ally may still form part of an important strategic or trade relationship.

For supply chain purposes, jurisdiction therefore needs to be considered at each stage rather than assigned once at the resource.

Formal alliances, strategic and trade relationships, ownership, processing location, contractual control and geopolitical exposure can each change as material moves through the chain.

Nor does locating a resource outside a particular jurisdiction necessarily establish that the resulting product can reach the intended customer without passing through processing, technology or commercial relationships controlled by that jurisdiction.

Resource location is not supply chain provenance. Geopolitical exposure has to be traced throughout the chain.

So if you start with:

Where are the antimony projects?

a project database is sufficient.

If the question is:

Where are the processors?

a processing-capacity database may be sufficient.

But if the question is:

Which antimony supply chains could actually deliver a particular strategic product?

neither is enough.

And when we then elevate the analysis to geopolitical risk, diversification and resilience more questions arise.

The chain therefore has to be traced in both directions: from resource to product, and from required product back to the source capable of supplying it. Where traceability stops, the unanswered interface becomes part of the risk.

The unknowns may be more useful than the knowns.

The same categories of missing information recur around feed compatibility, processing availability, commercial terms, provenance, qualification and final destination.

Those gaps identify where supply chain development work is actually required.

Strategic policy implications

Governments are increasingly intervening throughout critical mineral supply chains.

But intervention into “antimony” is itself too broad a concept. So I ask: what is the strategic objective?

What capability is the intervention trying to create?

Additional mine supply?

Concentrate production?

Primary refining?

Secondary recovery?

99.65% metal?

Antimony trioxide?

Military-grade antimony sulphide?

High-purity material?

A particular downstream component?

And where in the chain is the actual constraint preventing that capability from existing?

Funding another mine does not solve a processor-compatibility constraint.

Building a processor does not solve incompatible feed.

Producing refined material does not solve customer qualification.

Stockpiling an upstream product does not necessarily create resilience if the country cannot convert it into the material required during disruption.

And supporting nominal capacity does not guarantee commercially sustainable operation.

Policy should attach to the constraint that governs the intended outcome, if there is one.

The analytical task is therefore not simply to accumulate more information but to determine:

What must be true for the intended outcome to be satisfied?

Then:

Which of those conditions has actually been demonstrated?

And finally:

Which unanswered question could change the decision?

Because the most important question is not always the one we started with.

Sometimes the real work is finding the question that determines the answer.

A recent U.S. intervention illustrates the distinction.

In April 2026, the U.S. International Development Finance Corporation (DFC) signed a US\$5 million Project Development agreement with Pela Global Limited (Pela Global) to support preparation of a JORC 2012 Mineral Resource Estimate, an Environmental and Social Impact Assessment, and progression toward feasibility for the proposed restart of the Krstov Dol underground antimony mine in the Republic of North Macedonia and development of a future processing route. The operation historically produced antimony concentrate by flotation, with stibnite documented among the principal antimony minerals. Historical GKZ-classifications (1984) reported 135,159 tonnes at 4.62% Sb in B+C1 categories, 38,845 tonnes at 1.59% Sb in C2 and 2.916 million tonnes at 0.5% Sb in D1. These remain historical GKZ classifications and are not current JORC Code Mineral Resources or Ore Reserves. Pela states that further exploration and verification are required before a current Mineral Resource can be estimated. Pela Global has also collaborated with U.S.-based PGM Processing, LLC to explore a commercial offtake arrangement involving potential processing in the United States.

Intervention is directed toward building the evidence required to determine whether strategic potential can become deliverable supply.

The appropriate intervention may not be to fund supply. It may be to fund the evidence needed to determine what supply can be made deliverable and how.

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