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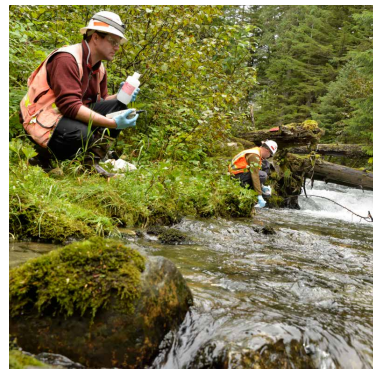
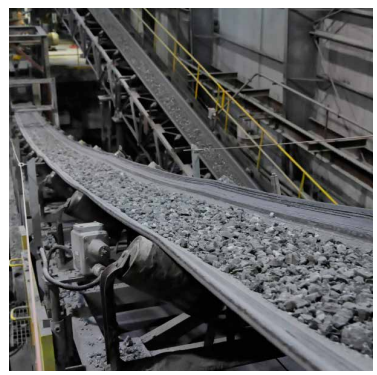
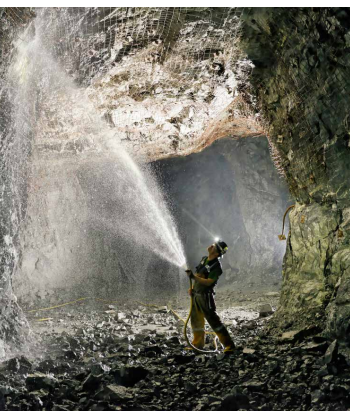






Permitting, Economic Value and Mining in the United States

Prepared for

The National Mining Association

Executive Summary

Of all the developed nations, unexpected and often unnecessary delays in obtaining mining permits afflict the U.S. most severely. Despite being blessed with a vast reserve of mineral resources, the U.S. only accounts for 7 percent of world-wide spending on mineral exploration and production is currently reliant on a population of mature mining projects. The average remaining life of active mines in the U.S. and the share of projects in advance development have also fallen in recent years.

Meanwhile, the demand for minerals to supply the defense, advanced energy, high-tech electronics, medical, and transportation industries is rising. The U.S., while leading on the manufacturing of these technologies, is lagging in the production of the minerals needed to make them.

SNL Metals & Mining quantifies for the first time how much permitting delays impair and discourage investments in mineral development projects. It found that on average, a typical mining project loses more than one-third of its value as a result of unexpected delays in receiving the numerous permits needed to begin production. The longer the wait, the more the value of the investment is reduced, even to the extent that the project ultimately becomes an unviable investment. The report also shows the increasing likelihood of new mines stagnating at the exploration stage, with far fewer advancing to actual production, putting security of the country's mineral supply at risk.

In the U.S., the requirement for multiple permits and multiple agency involvement is the norm, as is the involvement of other stakeholders, including local indigenous groups, the general public and nongovernmental organizations. As a consequence of the country's inefficient permitting system, it takes on average seven to 10 years to secure the permits needed to commence operations in the U.S. To put that into perspective, in Canada and Australia, countries with similarly stringent environmental regulations, the average permitting period is two years.

In these countries, the timeline for the government to respond is more clearly outlined, the specification of lead agencies is clearer and the responsibility for preparing a well-structured environmental review is given to the mining company, not the government.

Mining is a long-term investment; from exploration to closure and site remediation, projects typically have a life span of several decades. Although geology and topography dictate where a deposit is located and how it is mined, it is economics that determines whether the project proceeds or not. Even a large high-grade deposit will remain unmined if the revenue-cost balance and timetable are not advantageous.

Mining companies accept that there will always be some element of delay during the development period and will build appropriate contingency and mitigation measures into their business plan. However, delays for unforeseen reasons, or the delays to the expected process, are a real problem for the industry, and by extension, the U.S. economy as a whole.

KEY FINDINGS

- Unexpected delays in the permitting process alone reduce a typical mining project's value by more than one-third.
- The higher costs and increased risk that often arise from a prolonged permitting process can cut the expected value of a mine in half before production even begins.
- The combined impact of unexpected, and open-ended, delays and higher costs and risks can lead to mining projects becoming financially unviable.

EXAMPLES

The **Rosemont Copper** project in Arizona continues in its attempts to secure permits, five years after the originally planned start date of 2010. Over this period, the value of the project has fallen from $18 billion to $15 billion despite much higher copper prices.

The **Kensington gold** mine in Alaska was plagued by permitting issues during development. It commenced production in 2010, nearly 20 years after the originally planned start date of 1993. By the time the mine opened, the capital cost of building the mine had increased by 49 percent, and the company had reduced planned gold production by nearly a third, to focus mining operations on the most profitable part of the deposit only.

Twin Metals Minnesota is still in a relatively early stage of the permitting process, completing a prefeasibility study in 2014. The developers have acknowledged that the delay in receiving permits, or the possibility of denial, could be a significant business risk to the project.

3. THE FINANCIAL COST OF CHANGE

There are a significant number of factors that affect the operating and financial performance of a mine as have been discussed in section two. To illustrate the importance of sequencing of revenue and expenditure over the life of a project, SNL has developed a financial model for a simulated gold mine: Enterprise. This hypothetical U.S. project was the subject of a Feasibility Study in 2015, which envisaged an 11-year mine life with production beginning in 2018 (see Annex A for model details).

To illustrate the impact permitting delays have on a project's finances, three scenarios were developed:

Scenario 1. Incremental costs – Additional costs to meet unexpected permitting requirements are incurred but production is not delayed.

Scenario 2. Production lags – Development time for the mine is extended due to unexpected permitting delays, so production is "on hold" for a period.

Scenario 3. Additional risk – Prolonged delays lead to changes that affect the discount rate investors use to assess the mine's value.

For each of these scenarios, the simulation contrasts the projected cash flows for the project with that of the original Feasibility Study. The impact of these changes are observed by taking "snap shots" of the mine's finances at two-year intervals after the initial study.

3.1 SCENARIO 1 - INCREMENTAL COSTS

Having applied for environmental permits in 2015, the Enterprise project was originally expected to reach production in 2018. However, the findings from the environmental assessment required changes to the mine plan. The company, in order to meet its 2018 production deadline, spent more money during the construction and early-production phases.

In this model, the costs envisaged in the original study are increased on three subsequent occasions. Table 1 shows the extra costs required to meet the permit requirements, the impact this has on total investment and the resultant lower value of the project.

In the Feasibility Study, costs linked specifically to the environment were put at $50 million, with the total project investment estimated at $370 million. The feasibility study assessed the value of the mine at $291 million.

SIMULATED INCREMENTAL COSTS

2017 $15 million in environmental cost has been added in 2016 and 2017, and an annual $2 million water treatment charge is added for 10 years from 2018. This increases the total capital cost from the $370 million estimated in the Feasibility Study to $420 million. The extra costs reduce the project's value by 12 percent, from $291 million to $256 million.

2018-2019 Additional environmental costs of $50 million are incurred in 2018 and $20 million in 2019. This increases the total capital cost to $490 million. The additional costs reduce the project's value by a total 28 percent from $291 million to $209 million.

2020-2022 A further water treatment charge of $10 million was paid in 2020, and an extra annual $2 million is estimated for 16 years after 2022. This increases the total capital costs from the $370 million estimated in the Feasibility Study to $532 million. This ultimate cost of $532 million (44 percent more than the original estimate) is based on case studies from the North American mining industry.

TABLE 1 CHANGES TO TOTAL INVESTMENT AND MINE VALUE DUE TO INCREMENTAL COSTS

	Total Environmental Costs ($ million)	Total Investment ($ million)	Mine Value* ($ million)
Feasibility Study (2015)	50 **	370	291
2017	100	420	256
2019	170	490	209
2021	212 ***	532	194

* Assuming all other factors unchanged, and discount rate of 8 percent
** Includes $1 million per year water control costs
*** Includes $3 million per year water control costs

Source: SNL Metals & Mining

In this scenario, the timing of start-up, and the project's assumed risk, are left unchanged.[1]

[1] All project valuations are calculated at a discount rate of 8 percent

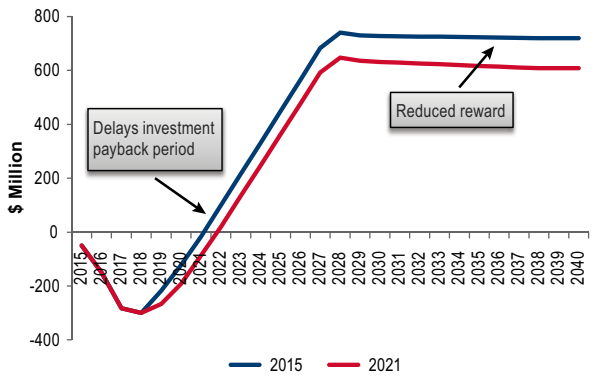
In aggregate, the additional costs reduce the project's value by 33 percent from $291 million to $194 million. This calculated value represents only 37 percent of the capital invested in the project, compared with the 79 percent estimated in the Feasibility Study. These changes are certainly detrimental to the attractiveness of the venture but are probably not sufficient to render the project unviable (Figure 2).

To illustrate the extent these incremental costs impact the total financial flows for the mining firm, Figure 3 reflects these increases as relative to every $100 spent by the mine. Initially, it was assumed $100 would be spent in the construction of the mine in 2015, which would increase to $173 in the next year and so on. As the mine experiences its increased environmental permitting compliance cost, construction costs have increased to $203 in 2016 ($30 higher) than anticipated.

The incremental cost changes in 2016-2017 reflect the costs incurred as the company reacts to findings from the Environmental Impact Statement (EIS) and acts appropriately to qualify for its permits. In 2018, these extra costs fall as the company "holds" construction, awaiting its permits to come through.

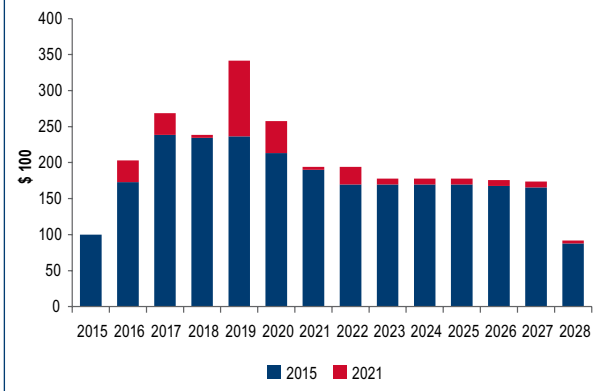
In 2019, the full impact of these extra costs, induced by permitting requirements, can be seen. Within the original plan, the mine would have spent $236 in this year; instead, it needs to spend an additional $105, nearly 70 percent more than envisaged.

FIGURE 2 EFFECT OF INCREMENTAL COSTS ON CUMULATIVE CASH FLOWS



Source: SNL Metals & Mining

FIGURE 3 PROJECTED INCREMENTAL COST



Source: SNL Metals & Mining

As the mine goes into production in 2018, the incremental production costs experienced each year can be seen in the Figure 3. While they taper off after 2020, for every $100 in costs the mine was expecting to spend, it has to face an additional $4 for each of the remaining years of production.

Incremental costs and the impact on the financial flows of the project, as a result of extensive changes required to meet permitting criterion, can be illustrated by a real mine: the Rosemont Copper mine in Arizona.

CASE STUDY: ROSEMONT COPPER MINE – ARIZONA

Location:	30 km southeast of Tucson, Arizona
Current owner:	Hudbay Minerals Inc. (80 percent)
Discovery:	1985
Original planned start-up:	2010
Actual production:	Awaiting permits

Source: SNL Metals & Mining

Rosemont Copper, owned by Hudbay Minerals Inc. (acquired from Augusta Resources Corp. in July 2014), is an open-pit copper/molybdenum/silver deposit located in Arizona. It is expected to be one of the largest copper mines in the U.S. and, as currently designed, could account for 10 percent of current U.S. copper production.

The Rosemont Copper deposit was discovered in the 1960s by Anaconda and Anamax, with Asarco purchasing the rights to the land and deposit in 1987-1988. In 1998, the company planned to bring the project into production by 2010.

TABLE 2 CHANGES TO ROSEMONT COPPER MINE FEASIBILITY STUDIES

	2007	2009	2012	% Change between 2007 and 2012
Mineral Production				
Cathode (klb)	113,960	155,514	-	
Copper (klb)	3,909,600	4,077,220	5,108,580	31
Gold (koz)	262	300	354	35
Silver (koz)	47,899	50,081	59,958	25
Molybdenum (klb)	81,000	95,016	112,680	39
Total Revenue ($ 1000)	13,133,132	13,028,594	19,216,579	46
Initial Capital Costs ($ 1000)	916,806	990,403	1,253,844	37
Operating Costs ($ 1000)	4,336,278	4,679,882	7,149,473	65
Pre-production Cost ($ 1000)	68,482	48,068	116,100	70
Reclamation Bond Fee ($ 1000)	17,956	18,974	11,043	-38
Reclamation Expenses ($ 1000)	23,941	25,298	34,657	45

Source: based on NI-401 Technical Reports issued by the company in 2007, 2009, 2012. Accessed via <www.SEDAR.com>

In 2005, the project changed hands once again, being acquired by Augusta for $20.8 million. The company estimated capital costs to develop the project at $636-806 million. In July 2007, the company submitted its mine plan to the U.S. Forest Service (USFS), which would initiate the EIS and public consultation processes. The company expected to receive approval for construction by 2009 and production to commence by 2010. By December of that year, Augusta had begun to place orders for the purchase and delivery of equipment required for the construction of the mine. By April 2008, the company had awarded a $56 million engineering procurement construction management contract.

By 2009, the mine development and processing facility construction were expected to cost $713 million, part of the $897 million required to develop the project as a whole. Mining was expected to start at the end of 2011, with the first copper cathode produced in March 2012.

By the end of 2009, the company had received its ground water withdrawal permit and state approval of its reclamation permit, but awaited three other major approvals (State Aquifer Protection Permit, Air Emissions Permit, and a United States Army Corps of Engineers [USACOE] Section 404 Permit) before construction could begin. The USFS initially informed the company of a delay in the draft EIS from November 2009 to February 2010, with the first draft being finally delivered in November 2010. The company expected a final EIS and Record of Decision (RoD) to be submitted by early 2011. A few months after the USFS scheduled January 2012 for the RoD, the company continued to plan construction in the third quarter of 2012.

In April, it received its Aquifer Protection Permit from the Arizona Department of Environmental Quality (ADEQ), with the total number of key permits received rising to six. The Clean Water Act Section 404 and Air Quality remained the only major permits yet to be approved, although the company expected to receive these by the end of 2012. By November, 90 percent of the company's permitting process was complete, and the final issuance of the EIS and RoD remained.

In January 2013, the Air Quality Permit was received, with only the Clean Water Act Section 404 Permit from the USACOE remaining. Augusta expected to receive this permit when the RoD on the Plan of Operations from the USFS was given. The company expected to start production in the summer of 2013. The company had, by this time, signed off-take agreements for nearly 70 percent of its projected mine output.

The final EIS and draft RoD were published in December 2013, two years later than intended, with objections to be filed by February 2014. With extensive comments and objections received to the final EIS, the

Regional Forester required more time than the 30-day period to draft his response. In May 2014, Coronado National Forest requested the U.S. Fish and Wildlife Service (USFWS) reinitiate formal consultation for the Rosemont Copper project to address issues of endangered species. The RoD would not be signed until the completion of the consultation.

In July 2014, Hudbay acquired control of Rosemont Copper from Augusta Resources (for $520 million), although its due diligence process reported that, "Hudbay believes Augusta's management continues to be overly optimistic about the permitting timeline ... With Hudbay's significant technical expertise and superior financial capacity, Hudbay believes it is better positioned than Augusta to advance the Rosemont Copper project through the final stages of permitting and into construction..."

In March 2015, litigation led to the revocation of Rosemont's Air Quality Control Permit. As of this date, Hudbay lacks two major permits before it can move into construction, and still awaits the final RoD.

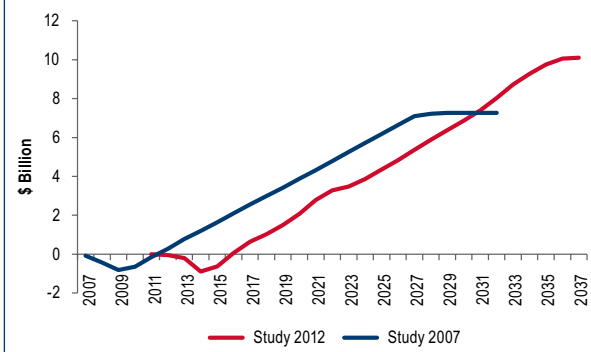
Three feasibility studies have been released for the Rosemont Copper mine, in 2007, 2009 and most recently in 2012. Each subsequent study has reassessed the mine operations, with resultant changes in production levels and revised estimates for costs of construction, production and revenues. Table 2 shows the changes in project plans in each subsequent feasibility study.

Between 2007 and 2012, as the project continued to wait for permits to be approved, the company's mine plans changed. In terms of production, the most notable change is the removal of cathode production—a value added product from copper concentrate. Total projected revenues from the project rose by 46 percent, between 2007 and 2012. However, the initial capital costs to construct the project increased by 37 percent and the operating costs by a further 67 percent over the same time. Pre-production costs increased by 70 percent, with estimates for reclamation expenses up by 45 percent.

Each of the studies states the construction period to be three years; however, the start of production is delayed from the original 2010 (in the 2007 study) to 2015 (in the 2012 study). Figure 4 shows the changes in projected cash flows in the technical studies published in 2007 and 2012. The flows have shifted outwards reflecting the delay in production.

This delay reduced the project's current value. If the project had proceeded, as scheduled in 2010, the value of the project to investors was $18 billion in 2007.[2] With the delay to 2015, the value of the project for investors has fallen to $15 billion in 2007, even though expected revenues for the project had increased (Table 2). The investors will receive their returns later than expected, and thus the value of the project for them is lower. What is not reflected in Figure 4 is the holding cost for the company, incurred between 2007 and 2015.

FIGURE 4 CHANGES IN PROJECTED CASH FLOW FOR ROSEMONT COPPER MINE



Source: based on NI-401 Technical Reports issued by the company in 2007, 2009, 2012. Accessed via <www.SEDAR.com>

[2] at a discount rate of 8 percent

TIMELINE – ROSEMONT COPPER MINE

1987-1988 Asarco purchased the copper reserves and 486 hectares of Arizona land without mineral potential for $1 million in cash and conducted assessment work.

1993 Asarco reported no near-term plans to develop the project but continued to conduct assessment work annually.

1998 In February, plans for the copper mine were on hold due to low copper prices. Asarco stated that it must spend money on current operations rather than on future development. The company planned on bringing Rosemont Copper on stream in 2012.

2005 In June, Augusta entered into an agreement to acquire Rosemont Copper for $20.8 million payable over three years. In September, a prefeasibility study on a 54,000-73,000 tons/day copper-molybdenum mine and milling complex and a corresponding technical report were planned for completion in the March 2006 quarter.

2009 Augusta received state approval of its reclamation plan at Rosemont Copper. As of February 2009, Augusta had received a 20-year groundwater withdrawal permit. The company required five other major approvals before construction could commence, including a reclamation permit, state aquifer protection permit, air emissions permit, and an USACOE Section 404 permit.

2011 Rosemont Copper submitted to the ADEQ an application for an Air Quality Permit. Rosemont filed a lawsuit against Pima Country over permit delays, for not meeting the 30-day timeframe after the county declared application complete.

2012 The project obtained the Aquifer Protection Permit from ADEQ. The USFS published a draft EIS open to public comments. More than 25,000 comments were submitted and all substantive comments were identified, coded and organized.

2013 Rosemont received the Air Quality permit for the Rosemont project from ADEQ. Fourteen individuals and groups sued County Superior Court against water quality permit.

2014 Surface Water Quality Mitigation Plan approved by ADEQ. This meant that Rosemont Copper received its Clean Water 401 certificate, which is required before the 404 certificate from the USACOE.

2015 Superior Court of Arizona Maricopa reversed ADEQ decision to approve the Air Quality Permit. The permit application was ordered to return again to ADEQ for further consideration using the proper criteria.

3.2 SCENARIO 2 - PRODUCTION LAGS

In the second simulation, the production from the Enterprise mine is delayed by one year on each of three subsequent occasions. The production lag is based on real examples in the North American mining industry and is considerably less onerous than the delays suffered by some projects, for example the Kensington gold mine in Alaska. The capital and operating costs and assumed risk of the mine are left unchanged. The model assumes an annual 8 percent discount rate to value the future cash flows.

SIMULATED PRODUCTION LAGS

2019 There is a one-year lag in reaching commercial production, which now commences in 2019 rather than 2018. The total capital costs remain unchanged at $370 million, as does the timing of this expenditure (although in reality, a delay would likely cause capital costs to increase slightly). The delay reduces the project's calculated value by 14 percent from $291 million to $250 million.

2020 There is a further one-year lag in the start of commercial production, which is now expected to start in 2020. This reduces the project's value by a total of more than 27 percent from $291 million to $211 million.

2021 Production is now expected in 2021, with all other factors remaining unchanged. This reduces the project's value by almost 40 percent from $291 million to under $176 million. This value represents 47 percent of the capital invested in the project, compared with the 79 percent envisaged in the Feasibility Study.

Table 3 shows the total revenue and investment for the project, which have not been changed in this model. However, the delay in production shifts the revenue stream for the project further into the future, while costs remain as they were. The current value of the mine's cash flow declines for each consecutive year of delay.

TABLE 3 CHANGES TO TOTAL INVESTMENT AND MINE VALUE DUE TO DELAYED PRODUCTION

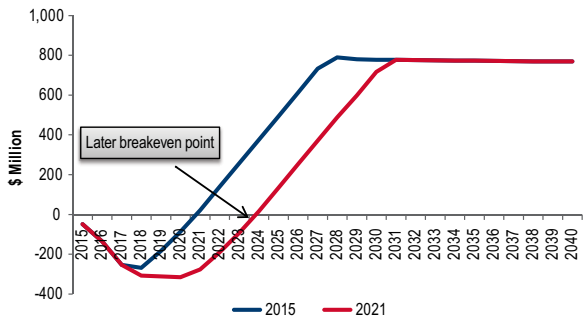
	Total Revenue ($ million)	Total Investment ($ million)	Mine Value* ($ million)
Feasibility Study (2015)	2,020	370	291
2017	2,020	370	250
2019	2,020	370	211
2021	2,020	370	176

*Discount rate of 8%

Source: SNL Metals & Mining

These changes are less detrimental to the financial attractiveness of the venture than the extra-cost scenario in the first model. Although the total delay of three years in the start of commercial production reduces the project's value by almost 40 percent, it is not, in itself, a fatal development. Figure 5 shows the changed cash flow profile as production delays are experienced, resulting in a delayed breakeven year for the project.

FIGURE 5 EFFECT OF PRODUCTION DELAYS ON CUMULATIVE CASH FLOW



Source: SNL Metals & Mining

In more simplified terms, to gauge the value of the delay in revenue stream, we assume the total revenue received from the mine has remained unchanged at $2,020 million over the life of the mine. The value of that revenue to investors is only $1,036 million, as they are received later rather than sooner.

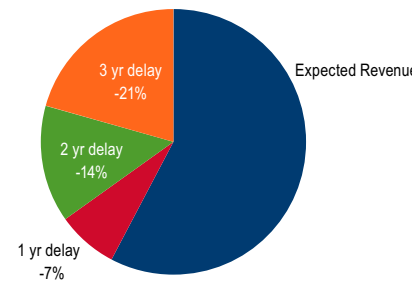
For every year of delay, the revenue stream is pushed further into the future and its value is reduced.

Figure 6 illustrates the loss in value to investors. The pie represents the value of the total revenue initially expected from the project ($1,036 million). A one-year delay causes revenues to lose 7 percent of their present value. A two-year delay in production increases this loss to 14 percent of the expected value, and three years exacerbates this to 21 percent.[3]

Therefore, for every $100 in revenue, a one-year delay reduces the value to $93, a two-year delay to $86 and a three-year delay to $79.

A real life example of this cost is provided by the Kensington gold mine in Alaska, which suffered persistent production delays due to permitting issues. Originally expected to start in 1993, the mine finally began production in 2010. As the revenue stream for the mine has been pushed out further, its design has been changed to accommodate the delay in production.

FIGURE 6 LOSS IN CURRENT VALUE OF EXPECTED REVENUE FROM DELAYS



Source: SNL Metals & Mining

[3] assuming a discount rate of 8 percent

TABLE 4 CHANGES TO KENSINGTON MINE OPERATIONS

Feasibility Studies	Expected Production	Capital Cost ($ million)	Cash Production Cost ($/oz.)	Mined Output (million tons/year)	Milled Output (oz./year)
Initial Plan (1990)	1993	195	225	1.32	200,000
Final Plan (2006)	2010	290	302	0.44	135,000

Source: SNL Metals & Mining

CASE STUDY: KENSINGTON GOLD MINE – ALASKA

Location:	72 km north of Juneau, Alaska
Current owner:	Coeur Mining, Inc. (100 percent)
Discovery:	1897
Planned production:	1993
Actual production:	2010 (June)

Source: SNL Metals & Mining

The Kensington gold mine has a long history of exploration, design changes and permitting revisions. The property was acquired from a Texas-based oil company for $20 million in early 1987, and an equal joint venture was established between the operator Echo Bay Mines and Coeur Mining. The latter acquired Echo Bay's 50 percent interest in 1995 for $32.5 million plus a scaled Net Smelter Return royalty payment.

Production was initially expected to start in 1993; however, with permitting delays, the mine only reached commercial production 17 years after planned. Table 4 shows the difference the delay in production meant for operations.

The mine was originally slated to cost $195 million to construct, with production costs expected to be $225 per ounce. The mine would excavate 1.32 million tons of ore, with an expected gold production of 200,000 ounces per year.

By the time of the feasibility study for the final mine plan in 2006, production had been delayed to 2010. The capital cost for constructing the mine had increased by 49 percent to $290 million. In the years between the initial and the final study, production costs had escalated, and it would now cost 34 percent more to produce an ounce of gold than initially forecasted. In the 2006 plan, the company downgraded its intended production, reducing the size of the mined ore output by nearly one-third, resulting in lower gold production each year.

Kensington's 17-year production delay can be a traced back to a number of permitting issues. The mining company required the following major permits:

- USFS approval for Plan of Operation (PoO);
- USACOE's Section 404 for tailing impoundment construction;
- Environmental Protection Agency's (EPA) National Pollutant Discharge Elimination System (NPDES) Permit for the discharge of waste water;

TIMELINE – KENSINGTON MINE

1987 Property acquired for $20 million and JV formed.

1990 First permits sought.

1991 EIS completed and favorable RoD by USFS. Appeals lodged.

1992 EIS approved and "Major Mine" permit issued. Appeals lodged.

1993 Engineering optimization and drilling occurred. Company expected all permits by 1994.

1994 EPA issued positive Technical Assistance Report in November.

1995 Coeur bought Echo Bay's 50 percent for $32.5 million and a scaled net returns royalty.

1996-2000 Low gold price led to write-downs totaling $128 million in 1998 and 2001.

2003 Mine plan optimized and Supplemental EIS sought.

2004 USFS approved Supplemental EIS, which was appealed.

2005 $50.2 million spent but legal challenges persist.
USFS rejected appeal by environmental group.
EPA gave National Pollution Discharge Elimination System Permit.
USACOE gave 404 Wetlands Permit.
Permits received from Alaska Coastal Management and Department of Governmental Coordination.
Two environmental groups filed a fresh appeal, which was rejected. This concluded the administrative appeal process.

2006 $2.2 million drilling program identified significant additional resource potential.

2007 Spending reached $270 million, with a further $50 million needed.
Despite legal appeals, new EIS Permit upheld by USFS.
Permits for construction obtained, but production delayed by litigation over tailings permit.
Construction continued on activities not impacted by the legal challenge.

2008 Legal challenges continued to delay construction work.

2009 U.S. Supreme Court reversed Court of Appeals decision invalidating permit.
USACOE re-activated 404 Permit, clearing the way for tailings construction.

2010 Began processing ore, with commercial production in July 2010.

- City and Borough of Juneau (CBJ) Large Mine Permit; and
- Numerous minor permits for construction and operations.

The USFS did not approve the PoO until mid-1992, and even then, an "administrative" appeal was immediately filed. This alleged that the EIS did not satisfy the requirements of the National Environmental Policy Act (NEPA) due to inadequacy of the baseline data used to analyze the environmental impact and failure to adequately consider alternative methods of mining and waste disposal. The USFS rejected the appeal.

In September 1992, parties opposed to the project requested the USFS to withdraw its approval on the grounds that the plan was not complete at the time of approval. In November 1992, these grounds were also rejected by the USFS. In the same month, the CBJ approved the Large Mine Permit, but in April 1993, a group filed a state appeal against this approval.

In July 1995, in response to concerns expressed by the environmental community, the company decided to make limited changes to the project. This triggered the need for a supplemental EIS and the amendment of key permits. The key changes involved relocating the effluent discharge point from Lynn Canal to Sherman Creek to a point adjacent to the tailings impoundment and construction of a water treatment plant.

In September 1995, Coeur entered into an agreement with the EPA and the Alaska Department of Environmental Conservation for a permitting process timeline. Coeur expected to receive draft permits by May 1996 and the final permits two months later.

In February 1996, Coeur entered into an agreement with a coalition of environmental groups that eliminated a potential legal challenge by the groups to the Kensington project, and encouraged them to drop a mooted Supreme Court appeal. Under the agreement, Coeur provided additional environmental input while maintaining its permitting schedule.

The low gold price in the late 1990s led to write-downs totaling $128 million in 1998 and 2001. This resulted in the re-design of the mine plans, and so a Supplemental EIS was required. In late 2004, the USFS approved the Supplemental EIS, and an appeal was denied. Coeur expected to receive the remaining permits by mid-2005, with commercial production in 2006.

Further delays resulted in the company disclosing, in 2009, that litigation had contributed to an increase in capital costs, and that a write-down could be necessary should the expectation of the long-term price for gold fall below $750 per ounce (as of end-February 2009 the gold price was $937).

Mine production finally commenced in mid-2010.

3.3 SCENARIO 3 - ADDITIONAL RISK

In this simulation, it is assumed that the perceived risk of the Enterprise venture has increased because of lack of clarity on when permitting may be completed. This raises the discount rate that investors would use to assess the likely current value of their investment. The timing of the production and the capital and operating costs of the mine are left unchanged from those envisaged by the Feasibility Study.

SIMULATED ADDITIONAL RISK

Due to delays in obtaining permits, it is seen as appropriate by the investors to lift the discount rate from 8 to 10 percent. This reflects investor uncertainty in the long-term viability of the project. The total capital costs remain unchanged at $370 million, as does the timing of this expenditure and the resultant cash flow from the mine.

This raised risk profile can be appreciated by looking at the proposed Twin Metals Minnesota underground copper-nickel mine project in northeast Minnesota, which is at a very early stage of development. Though the proposed project enjoys substantial local community and state elected official support, the project is also facing resistance from environmental organizations, even though the company has as yet to apply for any of its major permits.

CASE STUDY: TWIN METALS POLY-METALLIC MINE – MINNESOTA

Location:	18 km northeast Babbitt, Minnesota
Current owner:	Antofagasta Plc. (100 percent)
Discovery:	1996
Planned production:	Pre-feasibility stage
Actual production:	Awaiting feasibility study and permitting

Source: SNL Metals & Mining

The Twin Metals Minnesota (TMM) project is, of this date, at a pre-feasibility stage, and is developing its Mine Plan of Operations (MPO). The property is wholly owned by Antofagasta Plc., which completed its acquisition of Duluth

Metals Ltd. in January 2015. The proposed underground mine is expected to extract copper, nickel, platinum, palladium, gold and silver. The current life of mine is expected to be 30 years, however, as more detailed studies take shape, the mine may well continue for a longer period.

Of the case studies highlighted in this report, TMM is at the earliest stages of the mineral development process. Having completed a prefeasibility study in mid-2014, the company is now in the process of reviewing and optimizing the preliminary mine plan, which will be followed by the development of an MPO for submission to the Bureau of Land Management (BLM) and the Minnesota Department of Natural Resources. Once the MPO development is submitted, it will automatically start the EIS process. Major permits will be awarded on the basis of the findings of the EIS.

The project will be subject to NEPA at the federal level and the Minnesota Environmental Policy Act (MEPA) at the state level, with a number of federal and state agencies as well as tribal councils and local governments feeding into the review and consultation process. The TMM team has been conducting environmental studies and assessments of key environmental issues over the past five years and continues to gather and analyze data that will feed into the EIS preparation.

The EIS review process and RoD are expected to take years, with the company's latest pre-feasibility study noting: "… environmental review and permitting [processes],

TABLE 5 KEY PERMITS REQUIRED FOR TWIN METALS MINNESOTA PROJECT

Regulatory Requirement	Jurisdiction	Agency
Mining-specific Permits		
Permit to mine	State	Department of Natural Resources
Federal Mine Plan Operations	Federal	Bureau of Land Management (with US Forest Service input)
Environmental Permits		
National Pollutant Discharge Elimination System/State Disposal System for process water and storm water discharges	State	Minnesota Pollution Control Agency
	Federal	Environment Protection Agency
Injection of underground fluid	Federal	Environment Protection Agency
Discharge of dredged and fill materials/wetlands conservation	Federal	US Army Corps Engineers/Environment Protection Agency
	State	Department of Natural Resources
Water appropriation	State	Department of Natural Resources
Public waters work permit	State	Department of Natural Resources
Dam safety	State	Department of Natural Resources
Air emissions control	State	Minnesota Pollution Control Agency
	Federal	US Forest Service/Environment Protection Agency
Resource Conservation and Recovery Act/solid waste storage	State	Minnesota Pollution Control Agency
	Federal	Environment Protection Agency
HV transmission line	State	Minnesota Public Utilities Commission
Gas pipeline	State	Minnesota Public Utilities Commission
Special use and road use permits	Federal	US Forest Service
Local Permits		
Conditional use	County	
Building	County	

Source: Twin Metals Minnesota, Technical Report on Pre-Feasibility Study, October 2014

including the development and issuance of an EIS is likely to take several years, and the final decisions regarding the EIS program and permits are subject to appeal. This could cause significant delays to the commencement of the project."

Concurrently to the EIS process, as necessitated by NEPA and MEPA, TMM also plans to file applications for a variety of other federal and state permits (see Table 5 for a list of key permits).

While, in terms of time management and project resources, it is prudent to initiate other permitting processes, the impact the EIS and its findings have on the overall project timelines can be disadvantageous. The EIS process may take longer than projected by the mining company due to the need for more information from the company by federal agencies, time for stakeholder consultation and comments, the length of the review process and the need to respond to appeals filed against the findings of the EIS.

Furthermore, the findings themselves can require changes to the mine design, which in turn may require new permits to be issued.

As the company proceeds to develop its technical and feasibility studies, including information for the EIS, the prefeasibility study outlines estimated expenditures of $57-74 million over the next few years.

The environmental cost component is estimated to be the largest within these costs:

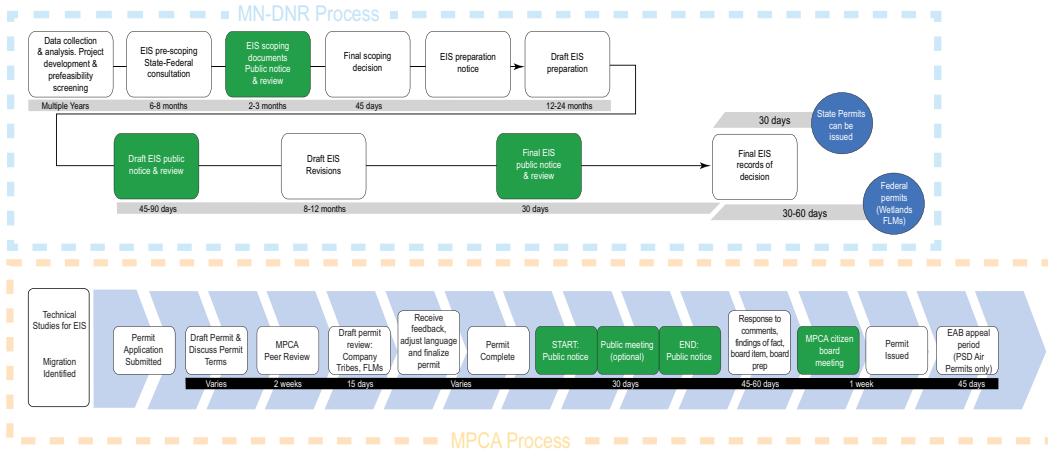
- Environmental studies: $35-40 million
- Drilling: $11-16 million
- Engineering: $6-8 million
- On-going pilot plant program: $5-10 million

So what economic impact does a long, complex, unpredictable permitting process have for a "young" project like Twin Metals?

By the end of 2014, Duluth Metals Ltd. (co-owners of the project pre-2015) had invested more than $250 million in the project, with its joint venture partner. Estimates in the prefeasibility study indicate the preliminary mine plan would require another $2.77 billion to be spent in developing and constructing the mine prior to mining operations. Over its projected 30-year mine life, the preliminary mine plan is estimated to require a total capital expenditure of $5.41 billion.

Estimates for the preliminary mine plan include 12 million labor hours during a three-year construction period and 850 full-time jobs when the mine is in operation. In addition, an estimated 1,700 to 1,900 indirect jobs for the region's economy are expected to be created.

FIGURE 7 TWIN METALS AND STAGES OF THE PERMITTING PROCESS



Source: TMM Project, company presentation, February 3, 2015

3. THE FINANCIAL COST OF CHANGE

continued

Given the early development stage of the TMM, the possible costs, incurred solely due to permitting delays, cannot be quantified. The company acknowledges environmental risks and permitting as business risks that are normal to the industry. It also acknowledges that there are no assurances that all permits and approvals required to proceed to construction and production will be obtained on reasonable terms and/or on a timely basis.

In speaking to the environmental legislation evolving in the U.S., the company expects stricter standards and enforcements to become more common, with increased fines and penalties for non-compliance, more stringent environmental assessments of proposed projects and a heightened degree of responsibility for the company.

In addition to TMM, Antofagasta Plc. has a number of other projects at various stages of development in Australia, Canada, Chile, Mexico and Portugal. As a public listed entity, the shareholder value for the company is important. The company, if faced with unmanageable delays to the Twin Metals project, may be required by its shareholders to prioritize other, less risky projects, where progress to construction and production is more likely to occur in a timely manner.

TIMELINE – TWIN METALS MINNESOTA PROJECT

2000 In April, Wallbridge completed an economic scoping study of the Nokomis deposit (renamed "Maturi Deposit" in 2012).

2006 In October, Duluth Metals began trading on the Toronto Stock Exchange after successfully completing its IPO and concurrent private placement for gross proceeds of C$11.65 million ($10.2 million), which would be used primarily to fund a two-phase exploration program on its Maturi Extension property.

2008 In January, a scoping study was completed on the Nokomis deposit (renamed "Maturi Deposit in 2012).

2010 Twin Metals Minnesota LLC founded as a joint venture of Duluth Metals Ltd. and Antofagasta plc.

2011 In April, Duluth Metals reported that the project was renamed the Twin Metals Minnesota Project, or "TMM," and included the Nokomis deposit (renamed "Maturi Deposit" in 2012) and additional resources on newly acquired adjacent properties. A conceptual study was conducted.

2012 In late July, Twin Metals expected the capital investment to develop and build the TMM project to exceed $2 billion. Twin Metals submits a Special Use Permit (SUP) application to the USFS requesting access to federal lands in the Superior National Forest for the hydrogeology study.

2013 USFS starts preparing an environmental assessment under policies in the NEPA to review the SUP application. In October, USFS invites interested parties to provide comments to be submitted within one month.

2014 Prefeasibility study completed in June 2014.

2015 Antofagasta acquires Duluth and TMM.