Financial Analysis of the Proposed New World Project:

With a Preliminary Calculation of Potential Buyout Prices

Crown Butte Mines, Inc.

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I. Introduction

Crown Butte Mines, Inc., a publicly held U.S. company with strong links to the Canadian-based Noranda Minerals family of corporations, is in the permitting stage of a proposed gold, copper, silver mine located on private and public lands in Park County, Montana, approximately 3 miles from Yellowstone National Park. Crown Butte has identified two separate deposits that they are seeking to mine in the historic New World Mining District just outside of Cooke City, Montana. The mine is proposed to produce about 130,000 ounces of gold, and byproduct copper and silver annually for about 15 years

Supporters of the project assert that construction and operation of the New World Mine would result in construction employment of up to 321 workers, with operations employment of about 175 employees. Crown Butte estimates that the annual payroll of the mine would be $7 million during operations and that greater than 75 secondary jobs would be created by the mine. In addition, Crown Butte claims yearly expenditures of $6.8 million would be spent in the regional economy for goods and services and $1.8 million would be earmarked for various state and local taxes in Montana (Crown Butte Mines, 1994).

Opponents of the project cite at least four major concerns:

1. The ore in the New World Mine contains a large quantity of sulfide minerals. Exposure of sulfide ores tailings to surficial waters and oxygen results in generation of sulfuric acid which could escape the proposed tailings impoundment and contaminate the regional water system. There are three likely drainages for the tailings impoundment location--they either flow directly into Yellowstone National Park, the Clarks Fork of the Yellowstone River (Wyoming's only Wild and Scenic River), or into the adjacent Absaroka-Beartooth Wilderness Area. Crown Butte has proposed a tailings technology which stores the tailings underwater (to impede acid generation) and routes existing drainages around the tailings. Opponents are skeptical about the efficacy and durability of this relatively unproven tailings impoundment technology, especially in the Yellowstone region with its high seismic and avalanche risks and outstanding hydrologic features. In addition, the effectiveness of reclamation at the site after the cessation of mining is an issue of concern to some.

2. The mine is sited in Montana, but the majority of population impacts would likely be felt in Wyoming where most of the mine workers are expected to locate (Western Economic Services, 1993). Both Wyoming and Montana have state legislation that mandates paying for expected socioeconomic impacts from large mining projects, but neither state has laws that cover cross-border impacts. All of the tax revenue from the mine (with the exception of taxes on payroll and income taxes on mine workers living in Wyoming) is expected to flow to Montana, while most of the socioeconomic impacts of the mine are likely to occur in Wyoming.

3. Some opponents focus on the minimal capitalization of Crown Butte Mines, Inc. (the U.S. company that is partially held through a chain of Canadian companies and has control of the New World Project assets). These people are concerned that if the mine is allowed to operate and runs into environmental or financial problems that Crown Butte Mines, Inc. could avoid financial responsibility for mine impacts by declaring bankruptcy. This action could then result in a Superfund designation for the site if bonding amounts are not sufficient for clean up, and remediation could then become the responsibility of U.S. taxpayers. This type of situation occurred with another Canadian mining company's venture in Colorado, the Summitville Mine.

4. The regions that would most likely have the largest impacts from the mine, Park County, Wyoming and Park County, Montana, have economies containing a large recreation and tourism component related to nearby Yellowstone National Park. Some residents are concerned that the mining activities and haul traffic just outside the Park, and the increased risk to the Park-area natural resources could have a negative impact on the existing tourism economic base.

The New World Mine must undergo several permitting steps before it is allowed to begin construction and operations. The Gallatin National Forest and Montana Department of State Lands declared that the firm's mine application to these agencies was complete in April 1993. An Environmental Impact Statement (EIS), as mandated by the National Environmental Policy Act, is in preparation. This EIS document will lay out a proposed project and several alternatives, with the expected environmental impacts of each described. One of the alternatives discussed in preliminary Environmental Protection Agency (EPA) scoping of the EIS preparation is a buyout alternative, where public funds are used to purchase Crown Butte's interest in the proposed mine, and the possibility of future mining at the site is barred.

Among the other regulatory hurdles that must be surmounted by Crown Butte are compliance with the State of Montana's water quality regulations promulgated in response to the Clean Water Act and Amendments. Also, the Army Corps of Engineers must issue a permit that allows for disturbance of the wetlands areas at the site. This permit is in response to a law that directs the Corps of Engineers to review all "upland sites" and assert that there is no other feasible alternative that would destroy less wetlands.

II. Purpose and Layout of the Study

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Many of the regulatory processes mentioned above require the consideration of financial costs in the determination of actions required by the regulatory agencies. This paper presents a financial model of the New World Mine, and examines the economic viability of the mine using Crown Butte's proposed Fisher Creek impoundment scenario under different pyrite tailings disposal alternatives, commodity prices, financing methods, and construction delay scenarios.

Although they are not explored in this study, this financial model also has the capability to examine the overall financial return from the project to Crown Butte Mines, Inc. under different geologic, construction and operations cost, and other economic and financial variable values. The financial model in this paper *does not* include several costs that could have an impact on the buyout price; (1) total costs spent on the project to date (sunk costs)--this model only estimates project profitability based on expected future spending; (2) socioeconomic impact payments that may be given to residents of Wyoming and/or Montana to remediate impacts of the project to neighboring communities; (3) bonding fees required by the U.S. Forest Service or Army Corps of Engineers to ensure that adequate reclamation and environmental safeguards are met; (4) the cost of any trust fund(s) that may be required to handle post-closure costs such as water-treatment (in perpetuity), and for remediation or prevention of other potential environmental impacts after the mine ceases production; and (5) the cost or value of any potential environmental liabilities that Crown Butte may have assumed with control of the historic mining sites of the New World District.

One of the major purposes of this study is to provide a series of numbers that adequately describe the expected value of ore production at the mine under different scenarios. The figures that are derived from this financial model can be used to estimate the financial impact of various proposed regulatory actions, alternative project configurations, future economic and financial conditions, and alternative mine grade and cost conditions that would affect project profitability. In addition, this model shows the expected annual cashflows that would occur under all of these different conditions, which allows one to estimate the likelihood of premature closure of the mine under some of the less profitable scenarios.

Perhaps the most useful purpose of this model is to estimate what is called the Net Present Value (NPV) of the expected mining cashflows. One method for determining a buyout price is to determine the NPV of the project. The NPV value represents the worth of all expected project costs and revenues from now until the end of the project, discounted back to the present. In economic theory, an investor should be indifferent between actually carrying out the entire project or receiving the NPV of the project paid today. Other names for the NPV of the project are economic rent and above-normal profits.

The next section of this paper is a description of the characteristics of the proposed mine, including three different pyrite tailings impoundment alternatives. Also included in the next section are the sources of data used in the financial model. Subsequent sections of this paper present the methodology of the financial model, and the results of several selected model runs. This study then examines the implications of the model results and future work needed to more comprehensively answer some of the important financial questions about the proposed New World Mine. Concluding this paper are a list of references, followed by an appendix with a sample model run.

III. Proposed New World Project Characteristics and Data Sources

Crown Butte proposes to mine two distinct orebodies during the life of the New World Mine. The Miller Creek orebody is a tabular stratabound replacement deposit containing about 2,162,000 tons of reserves grading 0.269 ounces of gold per ton, 1.56 ounces of silver per ton, and 0.90 percent copper. The Homestake orebody, an igneous stock replacement, has an estimated 5,799,000 tons of reserves with grades of 0.182 ounces per ton gold, 0.86 ounces per ton silver, and 0.68 percent copper. According to New World Project documents, Crown Butte expects to develop a 546,000 ton per year mine and mill to recover the gold, copper, and silver. Ore would be mined by underground methods via the Gold Dust adit (Stebbins, 1994).

Two different types of mill circuits are envisioned: (1) a gravity circuit to recover much of the coarser gold and some silver, and (2) multiple flotation circuits to recover copper, and the remaining recoverable gold and silver. Gravity concentrates are processed onsite, resulting in a doré (mixture of gold and silver) with an expected daily content of about 155 ounces of gold and 473 ounces of silver that is transported to the refinery. Approximately 60 tons of flotation concentrates would be produced daily from the operation with an expected content of about 124 ounces of gold, 551 ounces of silver, and approximately 10 tons of copper (Stebbins, 1994). Milling operations are expected to recover 90 percent of the gold and copper and 65 percent of the silver (Crown Butte Resources, 1994). The flotation concentrates would be thickened and de-watered and trucked to a rail siding in Cody, Wyoming where they would be shipped by train to the San Manuel smelter in southern Arizona. Tailings from the operation would be separated, with the coarser tailings mixed with cement and pumped back into the mined-out portion of the mine, and the finer tailings pumped directly to the tailings impoundment, located in Fisher Creek .

The 1994 Annual Report of Crown Butte Resources, Ltd. (the Canadian company that wholly owns the U.S. company, Crown Butte Mines, Inc.), describes many of the project characteristic used in this financial model (Crown Butte Resources, 1994). Another primary data source for this model comes from Scott Stebbins of Western Mine Engineering, Inc., who wrote a document titled *Capital and Operating Cost Estimate for the New World Project,* under contract to the Montana State Office of the Bureau of Land Management, (Stebbins, 1994). This document was prepared as part of the patent examination process and was obtained by the author under a Freedom of Information Act (FOIA) request from the Bureau of Land

Management. Crown Butte is attempting to convert a portion of the project area from public land ownership (containing unpatented mining claims) to private land ownership (fee simple ownership) by using the patenting provisions of the 1872 Mining Law. As part of this process, the patenter must show proof that the lands contain a mineral deposit that could reasonably be expected to be profitably produced. The Western Mine Engineering document, as part of this patent examination process, examines the costs of the proposed mine. Mr. Stebbin's report contains about 180 pages of very detailed engineering cost estimates which constitute a major source for the financial model inputs presented in this paper.

Another source of cost information, also authored by Scott Stebbins of Western Mine Engineering, and acquired by FOIA request from the U.S. Forest Service, is *Capital and Operating Cost Estimates of Pyrite Tailings Impoundment Alternatives for the New World Project* (Stebbins, 1995). This latter document examines the cost implications of two alternative tailings impoundment alternatives (1) separation of the pyrite fraction of the tailings for separate impoundment on the New World Project site (presumably in a more environmentally benign location than the primary tailings impoundment), and (2) separation of the pyrite fraction of the tailings for truck shipment to a secondary impoundment site in northwestern Wyoming, about 68 miles from the mine.

Mr. Rick Cohen, a mineral finance expert with the Goepel, Shields investment firm in Vancouver, British Columbia was instrumental in providing the likely financing arrangements--including data on typical gold loan mechanisms and interest rates, base case price and output assumptions, estimated mining costs, and other data. His preliminary financial investigation of the proposed mine, issued in November 1990 (Cohen, 1990) while he was employed at BBN James Capel of Toronto, was also useful in providing estimates for a combination net smelter royalty and state severance tax (5 percent) and combined federal and state tax rate (34 percent).

IV. Model Methodology

Conceptually, the New World Financial Model (NWFM) presented in this paper is quite simple. The model subtracts all costs from all revenues for every given year, calculates the combined federal/state tax impact, determines an annual cashflow amount and then repeats the process after adjusting for inflation. Reflecting the time-value-of-money concept, the model discounts future cashflows. The model recognizes that a dollar received today is worth more than a dollar received a year from now. I.e., a dollar received today could be invested in other investments, yielding a dollar plus interest a year from now. Therefore, each dollar of revenues and costs is discounted by the equivalent of a project interest rate (discount rate) each year that it is paid or received in the future. For example, \$100 received a year from now is valued at \$86.96 if we assume a discount rate of 15 percent (100/(1+0.15)). The same \$100 received two years from now would be worth \$75.61 ($100/(1+0.15)^2$).

The model is divided into four parts: (1) capital and operating cost worksheets, (2) assumption inputs table, (3) model calculation module, and (4) summary outputs table. Appendix A presents all four model portions for a base case scenario.

A. Capital and Operating Costs

The first portion of NWFM, capital and operating cost worksheets, is a compilation of the individual project component costs and timing as described in *Capital and Operating Cost Estimates for the New World Project* (Stebbins, 1994), and the alternative pyrite tailings handling publication, *Capital and Operating Cost Estimates of Pyrite Tailings Impoundment Alternatives for the New World Project* (Stebbins, 1995). This section of the model is primarily used to show the differential capital and operating cost requirements for the three different pyrite tailings impoundment alternatives.

B. Assumptions

Assumption input screens in the NWFM are designed such that a change in one or more of the numbers in the input rows flows through the model calculation module, and then the impact of the new assumption(s) is then reflected in the summary outputs screen. Table 1 shows a sample assumption input table for a base case. The major assumption input types are divided by horizontal double lines in the table. The first three rows of the table are the commodity prices for gold, silver, and copper, expressed in beginning-of-year (BOY) 1995 dollars. The values of $350 for gold, $5 for silver, and $1 for copper are the base case values purportedly assumed by New World project evaluators (Cohen, 1995).

The next ten rows correspond to financial variables that may affect the project. The base case inflation rate of 4 percent is this author's estimate of the approximate inflation rate prevailing over the last few years. The real cost of equity is not used in these model runs, but it is the implicit cost of obtaining equity funds (issuing stock or using retained earnings) by the company. The real discount rate is the assumed interest rate that the company could invest funds at and is used to discount all costs and revenues in the model, as discussed above. The base case value of 15 percent for the real discount rate is a standard assumption used by many firms in valuing projects. (The term real preceding any of these financial terms means that the value is applied after the adjusting for inflation).

Row 7 contains a binary switch for using project or corporate financing (1=project finance, 2=corporate finance). The first two years of the New World Project would be spent in constructing the mine and mill facility and no revenues would be forthcoming from metal production. A company with other projects having positive cashflows may be able to use some of the expenses incurred in constructing the New World Project in the year that they occurred to lower taxable income of another of the company's projects. The net result of using corporate taxable income is usually an increase in the profitability of the project because the tax benefits can be used in the year that they are incurred and are therefore not subject to discounting. The alternative tax case is project financing, which assumes that the company has only the project being evaluated to which the construction expenses could be applied to reduce taxable income. In the project financing case, as the project incurs expenses during construction, these expenses can only be deducted from taxable income after the project begins production and starts generating taxable income. Crown Butte Mines, Inc., has no other projects to apply any construction cost tax savings, therefore the author assumes that the New World Project can use only project financing.

Rows 8 through 10 allow the model user to choose the type and terms of financing used for the New World Project. Typically, for the sake of simplicity, the initial financial model of most projects assumes that the venture will use equity for financing all capital costs during the construction and operations (100 percent equity). This means that the debt proportion of total capital costs (referred to as leveraging) is zero. However, many projects ultimately borrow money to finance a portion of initial mine costs. NWFM assumes zero percent leveraging for unleveraged cases and the leveraged cases assume 60 percent leveraging (60 percent debt/40 percent equity) for all capital costs during the first two years of construction and the first year of operations. After the first year of operations, NWFM assumes that subsequent capital costs are financed by equity derived from the retained earnings of the project.

Table 1 - Sample Assumption Input Table

ASSUMPTIONS	VALUE
1. GOLD PRICE (BOY 1995 DOLLARS PER TROY OUNCE)	$350.00
2. SILVER PRICE (BOY 1995 DOLLARS PER TROY OUNCE)	$5.00
3. COPPER PRICE (BOY 1995 DOLLARS PER POUND)	$1.00
4. INFLATION RATE (PERCENT)	4.00%
5. REAL COST OF EQUITY (PERCENT)	
6. REAL DISCOUNT RATE (PERCENT)	15.00%
7. PROJECT FINANCE=1, CORPORATE FINANCE=2	1
8. DEBT PROPORTION OF TOTAL CAPITAL COSTS (LEVERAGING) (CONSTRUCTION + 1 YEAR)	0%
9. GOLD LOAN NOMINAL INTEREST RATE (NOMINAL PERCENT)	1.5%
10. TERM OF GOLD LOAN (NUMBER OF INTEGER YEARS, FROM 3 TO 12)	7
11. CORPORATE COMBINED FEDERAL + STATE TAX RATE (PERCENT)	34.00%
12. COMBINED NET SMELTER ROYALTY + STATE SEVERANCE TAX RATE (PERCENT)	5.00%
13. DEPLETION ALLOWANCE (PERCENT FOR GOLD,SILVER,COPPER)	15%
14. PROJECT DELAY (NUMBER OF INTEGER YEARS BEYOND 1995, FROM 0 TO 6)	1
15. FIRST CONSTRUCTION YEAR	1996
16. OVERHEAD OPERATING COSTS/YEAR DURING DELAY (MILLION BOY 1995 DOLLARS)	$1
17. FEDERAL ROYALTY (0=NO,1=YES)	0
18. FEDERAL GROSS ROYALTY RATE (PERCENT)	5.0%
19. UNPATENTED RESERVES (PERCENT OF TOTAL RESERVES)	10%
20. AVERAGE GOLD GRADE (TROY OUNCES/SHORT TON) (UPPER CUT @ 1.0 OZ/TON)	0.206
21. AVERAGE SILVER GRADE (TROY OUNCES/SHORT TON)	1.050
22. AVERAGE COPPER GRADE (PERCENT)	0.74%
23. PYRITE TAILINGS SCENARIO (1=BASE,2=SEPARATE ONSITE,3=SEPARATE OFFSITE)	1
24. MILL PRODUCTION DAYS/YEAR	365
25. MINE PRODUCTION DAYS/YEAR	260
26. MAXIMUM MILL THROUGHPUT (SHORT TONS/DAY)	2,100
27. MAXIMUM MINEABLE ORE (MILLION SHORT TONS)	7,961,000
28. MAXIMUM RECOVERABLE GOLD (TROY OUNCES)	1,475,969
29. MAXIMUM RECOVERABLE SILVER (TROY OUNCES)	5,433,383
30. MAXIMUM RECOVERABLE COPPER (POUNDS)	106,040,520
31. GOLD MILL RECOVERY FACTOR (PERCENT)	90.0%
32. SILVER MILL RECOVERY FACTOR (PERCENT)	65.0%
33. COPPER MILL RECOVERY FACTOR (PERCENT)	90.0%

NWFM assumes that any debt incurred is in the form of a specialized debt instrument called a gold loan. A gold loan is usually extended by a central bank that may have a significant quantity of gold reserves in its vaults. Many times, bank regulators mandate that gold reserves equal to some percentage of total bank assets or deposits be physically held by the bank. Recently, many banks have been loaning physical units of gold to gold mines (gold loans). A typical gold loan transaction proceeds as follows: a central bank loans physical units of gold to a mine builder who then liquidates the gold to finance the construction of the mine. As the mine produces gold, physical units of gold plus interest (in the form of gold) are repaid to the bank. The advantage of gold loans to a mine operator is that the interest rates on the gold loan are usually significantly lower than those on conventional loans. The central bank reaps an advantage because it is able to use gold reserves, which may otherwise be lying inactive in vaults, as an interest-bearing asset. (Of course, this simplified example does not detail the tradeoff of interest rates, term of loan, and various project risks between the borrower and lender.) Rows 9 and 10 of the assumption inputs table allow for the inputting of the interest rate (in non-inflation-adjusted terms), and the term of the gold loan for the project. Both of these base case assumption values are derived from discussions with Rick Cohen of Goepel, Shields (Cohen, 1995).

Rows 14 through 16 of the assumption inputs table control a project delay feature. In recognition of the potential for extensive delay before the New World may be built, these rows allow the user to specify an integer number from 0 to 6 representing the number of years from January 1, 1995 until the start of construction. While most of the costs and revenues would be equally discounted if delayed, Crown Butte has contracted with certain mining claim holders for payments in particular years, regardless of project approval status. In addition, the overhead operating costs/year assumption input (row 16) recognizes that Crown Butte incurs various overhead costs merely by keeping the project alive until approval for construction is (or is not) received. The base case number of $1 million for an annual overhead operating cost value is strictly an arbitrary estimate by this author for illustrative purposes.

Potential royalties payable to the federal government from unpatented mining claims are covered in assumption input rows 17 through 19. These rows were added to the model to account for possible revision of the no-royalty provision of the 1872 Mining Law on unpatented mining claims. The gross royalty rate of 5 percent (row 18) is one proposed royalty provision of ongoing legislative efforts. A value of 10 percent for the unpatented reserves fraction of total reserves (the proportion of total production potentially subject to federal royalty payments) (row 19) is based on statements in the Crown Butte Resources annual report (Crown Butte Resources, 1994). All cases of the NWFM reported in this paper assume that no federal royalty payments are required.

The remainder of the assumption input rows (rows 20 through 33) are related to the project-specific geologic and production factors. These values are derived from three sources (1) Crown Butte Resources, Ltd 1994 Annual Report (Crown Butte Resources, 1994), (2) Western Mine Engineering estimates of the capital and operating costs of the entire New World Project (Stebbins, 1994), and (3) Western Mine Engineering estimates of the capital and operating costs of alternative pyrite tailings impoundments for the New World Project (Stebbins, 1995). These assumption input columns are referenced by the model calculation module to ensure that the model does not exceed the constraints of the geology, or mining and milling processes. For example, there are checks built into the model calculation module that do not allow for gold, silver, and copper production in excess of total recoverable reserves of these commodities. These fourteen input assumptions may be varied in future model runs to check the impact of possible differences from the base case assumptions shown in Table 1.

Assumption input row 23, pyrite tailings scenario, is a user input number that allows for a choice between three different tailings impoundment alternatives: (1) base case--all tailings are impounded in the main tailings impoundment site, (2) separate onsite--pyrite tails are segregated from other tailings and moved to a different tailings impoundment location at the project site, and (3) separate offsite--pyritic tails are segregated from other tails and trucked to a different tailings impoundment location at a site 68 miles from the mine site, in Wyoming. Future modeling efforts may investigate alternative types of financial analysis with a much wider use of these input assumptions to allow for a more comprehensive evaluation of the New World Project.

C. Model Calculation Module

Appendix A presents the Model Calculation Module in its entirety for a selected base-case scenario.

D. Summary Outputs

Table 2 depicts a summary outputs table for a base case model run with the assumptions shown in Table 1. The value of each of the 23 rows in Table 2 is given in two different formats: (1) the second column of each row expresses the value in dollars per ounce of gold produced over the life of the mine, and (2) the third column expresses the value in net present value (NPV). For example, row 1 shows the capital cost of the project for this model run. Column 2 has a value of $172.02, and column 3 a value of $69,360,070. Thus, for every ounce of gold sold over the entire life of the New World Project, $172.02 of the sales revenue goes towards paying off the capital costs of the project (valued in beginning-of-year (BOY) 1995 dollars). Put another way, all annual cashflows spent to cover the capital costs of the New World Project, over the entire life of the project, are equivalent to a present day payment of $69,360,070 (valued in beginning-of-year 1995 dollars). This summary outputs table allows for a simple comparison of very complex cashflows to evaluate total project profitability, and the individual cost and revenue components that interact to result in the total project profitability.

Row 5 presents the total capital costs of the mine. Rows 2 through 4 show the costs of the various gold-loan components. Unleveraged cases (100 percent equity) show total capital costs in row 1--because all capital equipment is purchased with equity funds. Leveraged cases (60 percent debt/40 percent equity) use a loan to purchase 60 percent of the capital equipment in the two construction years and the first year of operations, with the remainder financed by equity funds. Therefore, for leveraged cases, total capital costs (row 5) are the sum of total equity costs (row 1) plus total loan costs (row 4).

Rows 6 and 8 describe the operating costs of the New World Project. The numbers shown in this row represent the variable costs of mining, milling, and shipping the ores, as well as the operating costs of reclaiming the project. These operating costs are tabulated prior to accounting for royalty and lease payments, and also do not include the impact of severance and income taxes, or byproduct copper and silver credits. Row 7 expresses the cost of delaying the start of construction beyond the beginning of 1995.

Rows 9 and 10 of Table 2 give an indication of the impact of royalty, lease, and severance tax payments for the project. If royalties were required from federal unpatented mining claims, the cost of those payments would be shown in row 11. Total operating costs, including the royalty, lease, and severance tax payments described above are shown in row 12.

Rows 13 and 14 value the byproduct credits that are obtained by the project from the sale of copper and silver. For example, in Table 2, $18.92 worth of silver and $70.99 worth of copper is produced over the life of the project for every ounce of gold produced. The total net present value of these byproducts over the life of the mine is $36,251,223 ($7,628,157 + $28,623,066). Row 15 shows the total operating cost of the mine including the royalty, lease, and severance tax payments, including the byproduct credits from selling the copper and silver.

Rows 16 through 18 depict the results of depletion and depreciation calculations, an important factor in determining the taxable income from the mine. NWFM uses a 7-year Modified Accelerated Cost Recovery System (MACRS) schedule for depreciation of capital costs. Total state and federal income taxes payable over the life of the project are shown in row 19. The total cost of the mine, taking into account all of the components discussed above is shown in row 20. Row 21 presents the total revenue derived from sales of the gold production from the mine, whereas row 22 adds back in the copper and silver revenues removed from cost calculations in rows 13 and 14, resulting in a total gross revenue obtained from sales of all metal commodities.

Table 2 - Sample Summary Outputs Table

		BOY 1995 Dollars	NPV
ANNUITY EQUIVALENT VALUE PER OUNCE OF GOLD PRODUCED		Per Ounce	BOY 1995 Dollars
1. Capital Cost (Equity Cost Only if Gold Loan Used)		$172.02	$69,360,070
2. Gold Loan Principal		$0.00	$0
3. Gold Loan Interest		$0.00	$0
4. Total Loan Cost		$0.00	$0
5. Total Loan + Capital (Equity) Cost		$172.02	$69,360,070
6. Operating Cost		$195.75	$78,926,347
7. Overhead Operating Cost (Delay Scenario)		$2.16	$869,565
8. Direct Operating Cost (Pre-Income Tax)		$195.75	$300,186,682
9. Advance Royalty & Lease Payments		$1.06	$427,970
10. Net Smelter Royalty and Severance Tax		$12.20	$4,918,911
11. Federal Royalties		$0.00	$0
12. Operating and Royalty/Lease Cost (Pre-Income Tax)		$211.16	$306,403,128
13. Total Silver Byproduct Credit		($18.92)	($7,628,157)
14. Total Copper Byproduct Credit		($70.99)	($28,623,066)
15. Total Operating Cost (Pre-Income Tax)		$119.10	$48,022,006
16. Depreciation		$90.04	$36,303,489
17. Depletion		$54.94	$22,152,291
18. Total Noncash		$144.98	$58,455,780
19. State and Federal Income Taxes		$28.88	$11,646,123
20.	TOTAL COST (AFTER-INCOME TAX)	$322.16	$129,897,764
21. Total Gold Revenue		$350.00	$141,121,968
22.	TOTAL GROSS REVENUE	$439.91	$177,373,191
23.	ABOVE-NORMAL PROFIT (ECONOMIC RENT)	$27.84	$11,224,204
24.	PAYBACK TO EQUITY (YEARS)	8	8
25.	RETURN TO EQUITY (ROE)(PERCENT)	18.72%	18.72%

Row 23 shows the "bottom-line" value labeled above-normal profit (economic rent). This figure represents what could be considered a value for buyout of the entire project. For example, the economic rent for the project shown in Table 2 is $27.84 per ounce of gold produced, or $11,224,204 in 1995 dollars. Thus, in economic theory, an investor with a discount rate of 15 percent would be indifferent between a present day cash payment of $11,224,204 or being given the approval to undertake the New World Mine Project as described in the assumptions input table.

Row 24 shows the results of calculations to determine how many years that it take to recover the equity invested in the project. This term is called the payback period. Finally, row 25 depicts the return on equity (ROE). An ROE of 15 percent (exactly equal to the discount rate) would yield an economic rent of zero. Any ROE in excess of 15 percent would yield a positive buyout price (economic rent), any ROE less than zero would result in the project being declared uneconomic. An ROE less than 15 percent would cause the project to be foregone because better yields would be obtained by the company by investing equity funds at the implicit 15 percent alternative project interest rate (as fixed by the discount rate).

V. Selected Model Results

This section presents the results of several NWFM model runs. Each of the different model scenarios is calculated for six different conditions; unleveraged (100 percent equity) and leveraged (60 percent gold loan/40 percent equity) with each of the three pyrite tailings impoundment alternatives. Base cases also include two project delay scenarios.

1. **Base Cases** - These represent an approximation of what this author believes are the base case assumptions used by New World Mine project evaluators. The scenarios shown under this case represent a relatively conservative project evaluation corresponding to a typical mining company's approach to project financing. Two additional model runs are done showing the impact of a 3 and 6 year delay in construction (start of construction in 1998 and 2001).

2. **Current Price Cases** - These cases substitute the current prices for gold, silver, and copper (April 24, 1995) into the assumption inputs table instead of the more conservative prices assumed in the base cases above.

3. **Breakeven Cases** - These model runs use the base cases as the starting point for the assumption inputs and then solve for the gold price that results in a project ROE equal to exactly 15 percent. The significance of these model runs is that, for each of the scenarios, a constant gold price for the life of the project below the breakeven level would result in the project being uneconomic.

A. Base Case Scenarios

The base case scenarios are meant to replicate the assumptions purportedly used by Crown Butte or other organizations entrusted with the financial evaluation for Crown Butte. These scenarios use relatively conservative future price assumptions: gold-$350.00 per ounce, silver-$5.00 per ounce, and copper-$1.00 per pound. Other important assumptions common to all base cases are: (1) discount rate-15 percent, (2) project finance, (3) gold loan term-7 years, (4) gold loan interest rate-1.5 percent (nominal), (5) first construction year-1996, and (6) overhead operating costs per year during delay-$1 million.

The eight different scenarios of the base cases show leveraged and unleveraged financing of the three different pyrite tailings disposal options, as well as two different delay scenarios. A portrayal of selected base case results is depicted in Table 3 and discussed below.

1. **Capital Costs**- Leveraging (use of debt financing) produces a very large impact on capital costs, and therefore total project profitability, because of the differential cost of equity funds versus debt funds. The total cost of debt to a project is the interest rate. With a 1.5 percent interest rate, the annual charge to the project is the total debt outstanding (debt principal) times the interest rate. On the other hand, the implicit "interest rate" charged to equity funds is the discount rate. Therefore, each dollar of equity funds is charged an annual fee of 15 percent (after inflation-adjustment), reflecting the opportunity cost of not using those equity funds on another project or investment. Given this discrepancy in the cost of equity versus debt funds, it is easy to see why there is such a large capital cost difference between the two financing methods.

Table 3 - Selected Assumptions and Results for Base Case Scenarios

Base Case Scenarios	Gold Price (1995$/ oz.)	Silver Price (1995$/ oz.)	Copper Price (1995$/ lb.)	Leverage (percent debt)	Capital Cost (1995$/ oz. Au)	Operating Cost (1995$/ oz. Au)	Total Cost (1995$/ oz. Au)	Total Revenue (1995$/ oz. Au)	Economi c Rent (1995$/ oz. Au)	Economic Rent (Buyout) (1995$)	Return on Equity (Percent)
Base Tailings[1], Unleveraged	$350.00	$5.00	$1.00	0%	$172.02	$211.16	$322.16	$439.91	$27.84	$11,224,204	18.72%
Base Tailings, Leveraged	$350.00	$5.00	$1.00	60%	$133.96	$211.16	$290.74	$439.91	$59.26	$23,895,146	30.66%
Base Tailings, Unleveraged, 3 year delay	$350.00	$5.00	$1.00	0%	$172.02	$216.85	$327.03	$439.91	$22.97	$7,004,147	17.92%
Base Tailings, Leveraged, 6 year delay	$350.00	$5.00	$1.00	60%	$133.96	$228.97	$306.65	$439.91	$43.35	$8,690,302	22.57%
Onsite Tailings[2], Unleveraged	$350.00	$5.00	$1.00	0%	$174.17	$211.88	$324.64	$439.91	$25.36	$10,225,970	18.36%
Onsite Tailings, Leveraged	$350.00	$5.00	$1.00	60%	$135.59	$211.88	$292.76	$439.91	$57.24	$23,079,275	29.98%
Offsite Tailings[3], Unleveraged	$350.00	$5.00	$1.00	0%	$176.62	$221.26	$334.09	$439.91	$15.91	$6,413,036	17.11%
Offsite Tailings, Leveraged	$350.00	$5.00	$1.00	60%	$137.48	$221.26	$301.80	$439.91	$48.20	$19,434,275	27.66%

[1]Base Tailings refers to all project tails disposed of in a single onsite tailings impoundment.
[2]Onsite Tailings refers to separation of the pyritic tails from other project tails with a separate impoundment for pyritic tails at the New World project site.
[3]Offsite Tailings refers to separation of pyritic tails from other project tails with the pyritic tails trucked to a disposal site 68 miles from the project site, in Wyoming.

Source: New World Financial Model

One might ask, if debt is so much cheaper than equity, why not use 100 percent debt financing for the project? The reason is because of the mechanics of using debt. Lenders require that, if any cashflow is generated in a project, that they must be paid before equity holders. Thus, if the project produces just enough money to satisfy the debt principal and interest, all of that money must go to the lender. The result of this low-project-revenues scenario is that the equity holders receive no funds from project cashflows. If the project cannot even generate enough revenues to satisfy the debt payments, then the project may be declared in default, oftentimes with the lenders seizing control of all the project assets to pay off the outstanding debt. Therefore, the equity holders must balance the cheaper cost of debt financing with the loss of total control of project assets required by lenders.

An noted above, the total cost of capital is significantly impacted by the type of financing--within each pyrite tailings option the cost of capital decreases by about $38 to $39 per ounce of gold produced if 60 percent leveraging is used on the project, rather than 0 percent leveraging.

The additional capital cost attributable to separate onsite pyrite tailings is about $2 per ounce of gold produced. Separating pyrite tailings and trucking them offsite adds about $3 to $4 per ounce of gold produced to capital costs, above the base tailings disposal option. Delay scenarios have no impact on capital costs.

2. **Operating Costs-** Leveraging has no impact on operating costs--debt financing is only used for capital costs. The increase in operating costs due to separate onsite disposal of pyrite tails is $0.72 per ounce of gold production. Trucking the pyrite tails offsite adds $10.10 per ounce of gold produced to base tailings disposal costs. A three year delay adds $5.69 to each ounce of gold produced compared with the analogous non-delayed scenario. If construction does not begin until 2001 (six year delay) the operating cost escalates by $17.81 compared to the same project with construction starting in 1996.

3. **Total Costs**- Capital, operating, tax, and all other project costs, as well as the byproduct credits, are summed to yield the total cost number shown as this financial component. The total cost increase of the unleveraged project over the leveraged project is about $32 per ounce of gold produced over the life of the mine. (The total cost difference is less than the capital cost difference due to leveraging discussed above, because the taxes are lower for the unleveraged cases. The lower taxes are the result of lower profitability of the project). Separate onsite tailings disposal costs are about $2 to $2.50 per ounce of gold produced more than the base tailings disposal, depending on whether the project is leveraged or not. Separate offsite pyrite tails disposal amounts to $11 to $12 per ounce of gold produced more than base tailings costs, and are also dependent on the degree of project leverage. The three year delay adds $4.87 per ounce to total costs and the six year delay increases total costs by $15.91 per ounce of gold production.

4. **Total Revenue-** The bases cases all have the same total revenue per ounce of gold produced--$439.91.

5. **Economic Rent (per ounce of gold)**- This number represents the excess cashflow above the required 15 percent rate of return of the project, expressed in dollars per ounce of gold produced over the life of the mine. Leveraging has the greatest impact on this number--differences between identical projects with different debt/equity financing results in a difference of about $32 per ounce of gold produced for all pyrite tailings disposal options. The decrease in economic rent due to separate onsite and offsite pyrite tailings disposal relative to base tailings disposal is the same as the total cost differences--about $2 to $2.50 and $11 to $12 per ounce of gold production, respectively. The three and six year delays decrease economic rent by the same as the changes in total costs--$4.87 and $15.91 per ounce, respectively.

6. **Economic Rent (net present value)-** Economic rent expressed in total net present value terms is shown by this number. This term may be thought of as the money needed to be paid today for a project evaluator to be indifferent between building the mine or accepting a buyout payment. Again, the major differences in buyout price are attributable to project leveraging. Each leveraged project generates about $12.5 to $13 million more in economic rent than its analogous unleveraged project. Separate onsite disposal for pyrite tailings results in a decrease in economic rent of about $0.8 to $0.9 million over the unseparated

tailings disposal option. Trucking the pyrite tails to a site in Wyoming decreases the economic rent of the project by about $4.5 to $5 million over the base tailings disposal option. Total buyout prices for all base case scenarios range from about $6.5 to about $24 million. The total net present value cost of the three year delay is just over $4 million, and the six year delay costs slightly more than $15 million 1995 dollars.

7. **Return on Equity (ROE)-** If the project's discount rate is 15 percent, a return on equity of 15 percent means that the project is just barely economic and the economic rent generated is exactly zero. Thus, projects with higher economic rents have a higher return on equity. The difference in the return on equity due to the type of financing is about 10 to 12 percent. I.e., a project financed by 100 percent equity financing could have an increase in the return to equity by about 10 to 12 percent if it was financed using a 60/40 mix of debt to equity (e.g., an increase in the ROE from about 19 to about 31 percent). A separate onsite pyrite tails disposal requirement for the project lowers the ROE by about 1 percent in the leveraged case and approximately 0.5 percent in the unleveraged case. Similarly, if separate offsite pyrite tailings disposal is mandated, the ROE of the project would be decreased by approximately 3 percent in the leveraged case and about 1.5 percent in the unleveraged case, compared with the base tailings disposal option. A three year delay on an unleveraged project decreases the ROE by about 0.8 percent, and a six year delay on a leveraged project lowers the ROE by slightly more than 8 percent.

B. Current Price Scenarios

Table 4 portrays the assumptions and results for the current price cases. The six scenarios given in Table 4 use the April 24, 1995 spot prices for gold, silver, and copper and apply them to the leveraged and unleveraged cases of the three different pyrite tailings disposal options.

Dollar differences between analogous leveraged and unleveraged current price cases are about $35 per ounce--comparable to base case scenarios. The cost gap between various pyrite tailings options within the current price scenarios are also very similar to the model runs for the base case scenarios.

An examination of the differences between similar model runs of the base case scenarios and the current price scenarios discloses the impact that raising the commodity prices has on the New World Project. Capital costs are unchanged between the base and current price scenarios, but operating costs increase marginally because royalty payments are based on a percentage of the commodity price. Therefore, an increase in all commodity prices causes an operating cost increase. Conversely, total costs actually decrease for the current price scenarios relative to the base case scenarios because the increase in the byproduct credit portion of total costs is larger than the increase in the royalty cost portion of operating costs. The net result of higher royalty payments and higher byproduct credits to the New World Project is a lower cost per ounce of gold produced.

Total revenues obtained by using the current prices for the commodities rather than the base case prices results in a jump of $68.12 in revenues per ounce of gold produced. This rise in revenue, combined with the increase in the royalty cost of the project, results in an increase in the economic rent of the project of from $48 to $52 per ounce of gold produced, relative to analogous projects using the base case prices. The total impact of assuming the higher gold, silver, and copper prices than base case prices to the project translates to a net present value increase of approximately $20 million. The range of buyout prices obtained with the current price scenarios is from about $26 to $45 million.

The return on equity is also correspondingly higher for current price scenarios as compared with analogous base case scenarios. Unleveraged case scenarios show an increase in the ROE of about 6 percent and leveraged case scenarios exhibit an approximate 12 percent rise in ROE compared with base case model runs.

Table 4 - Selected Assumptions and Results for Current Price Scenarios

Current Price Scenarios	Gold Price (1995$/ oz.)	Silver Price (1995$/ oz.)	Copper Price (1995$/ lb.)	Leverage (percent debt)	Capital Cost (1995$/ oz. Au)	Operating Cost (1995$/ oz. Au)	Total Cost (1995$/ oz. Au)	Total Revenue (1995$/ oz. Au)	Economic Rent (1995$/ oz. Au)	Economic Rent (Buyout) (1995$)	Return on Equity (Percent)
Base Tailings, Unleveraged	$390.65	$5.70	$1.35	0%	$172.02	$214.57	$314.10	$508.03	$76.55	$30,864,597	24.63%
Base Tailings, Leveraged	$390.65	$5.70	$1.35	60%	$133.96	$214.57	$279.32	$508.03	$111.33	$44,889,017	42.49%
Onsite Tailings, Unleveraged	$390.65	$5.70	$1.35	0%	$174.17	$215.28	$316.43	$508.03	$74.22	$29,926,645	24.25%
Onsite Tailings, Leveraged	$390.65	$5.70	$1.35	60%	$135.59	$215.28	$281.43	$508.03	$109.22	$44,037,152	41.72%
Offsite Tailings, Unleveraged	$390.65	$5.70	$1.35	0%	$176.62	$224.67	$325.21	$508.03	$65.44	$26,383,851	23.14%
Offsite Tailings, Leveraged	$390.65	$5.70	$1.35	60%	$137.48	$224.67	$290.68	$508.03	$99.97	$40,309,991	39.46%

Source: New World Financial Model

C. Breakeven Price Scenarios

The final set of model runs examines the New World Project finances by using a slightly different technique. Using base case assumptions as the starting point for all breakeven price scenarios, the gold price is continuously altered until an economic rent of zero (15 percent ROE) is obtained for all of the different pyrite tailings and leveraging cases. Results of these model runs are shown in Table 5.

Table 5 - Selected Assumptions and Results for Breakeven Price Scenarios

Breakeven Price Scenarios	Gold Price (1995$/ oz.)	Silver Price (1995$/ oz.)	Copper Price (1995$/ lb.)	Leverage (percent debt)	Capital Cost (1995$/ oz. Au)	Operating Cost (1995$/ oz. Au)	Total Cost (1995$/ oz. Au)	Total Revenue (1995$/ oz. Au)	Economic Rent (1995$/ oz. Au)	Economic Rent (Buyout) (1995$)	Return on Equity (Percent)
Base Tailings, Unleveraged	$313.44	$5.00	$1.00	0%	$172.02	$209.34	$313.44	$313.44	$0.00	$0	15.00%
Base Tailings, Leveraged	$268.69	$5.00	$1.00	60%	$133.96	$207.10	$268.69	$268.69	$0.00	$0	15.00%
Onsite Tailings, Unleveraged	$316.70	$5.00	$1.00	0%	$174.17	$210.21	$316.70	$316.70	$0.00	$0	15.00%
Onsite Tailings, Leveraged	$271.32	$5.00	$1.00	60%	$135.59	$207.94	$217.32	$271.32	$0.00	$0	15.00%
Offsite Tailings, Unleveraged	$329.40	$5.00	$1.00	0%	$176.62	$220.23	$329.40	$329.40	$0.00	$0	15.00%
Offsite Tailings, Leveraged	$283.43	$5.00	$1.00	60%	$137.48	$217.93	$283.43	$283.43	$0.00	$0	15.00%

Source: New World Financial Model

A comparison of the breakeven prices for the six different project financing and pyrite tailings options is another way of determining the total impact of these parameters on project profitability. The lowest breakeven price represents the most profitable project. The base tailings option with leveraging has a breakeven gold price of $268.69. An increase of $2.63 in the gold price would allow a breakeven situation for the separation of pyrite tailings for onsite disposal. An additional increase in the gold price of $12.11 to $283.43 would reach the breakeven price for offsite disposal of pyrite tailings, using debt financing. Thus, for leveraged projects, there is a difference of $14.74 in the gold price that would be needed to cover the additional costs of offsite tailings disposal, compared with the base case of commingled tailings.

An examination of the differences between the pyrite tailings disposal options without leveraging discloses slightly higher breakeven price differences. Base tailings disposal using 100 percent equity requires a gold price of $313.44 to breakeven. A gold price increase of $3.26 to $316.70 would allow for a project utilizing the separate onsite disposal of the tailings to breakeven. An additional gold price rise of $12.70 would cover the costs of trucking pyrite tailings to Wyoming. Thus. for unleveraged projects, the total gold price rise needed to finance the offsite tailings disposal above the base case tailings option is $15.96.

VI. Conclusions

The New World Financial Model (NWFM) examines the effect of a range of different project options on project profitability. The range of net present values, or potential buyout prices, calculated by assuming different financing options, commodity prices, and pyrite tailings options is from about $6.5 to approximately $45 million. The financing options (100 percent equity or 60 percent debt/40 percent equity) and the assumed future commodity prices have the largest impacts on project profitability. Requiring the separation of pyrite from other project tails has the effect of decreasing the profitability of the project by slightly less than $1 million in net present value terms, compared with the base tailings disposal option. If pyrite tailings were trucked to Wyoming for offsite disposal, the decrease in project profitability relative to the base tailings disposal option would amount to about $4.5 to $5 million in net present value terms.

If project approval is delayed, and one assumes $1 million in annual overhead costs during the delay, then a 3 year delay would cause a decrease in project profitability of about $4 million, and a six year delay would cause an approximate $15 million reduction in project's economic rent. This high cost of delay, even assuming a relatively modest annual overhead charge of $1 million, implies that Crown Butte has a large financial incentive to avoid project permitting delays.

It is very important to note that the results of the financial modeling reported in this study do not include a full calculation of complete buyout prices for the New World Project. Monies spent by Crown Butte to date (sunk costs) are not included in this analysis. Whether or not the sunk costs are fully or partially reimbursed is a policy decision outside the scope of this analysis. This study examines the proposed project from January 1, 1995 forward, and sets up the financial analysis accordingly.

Another important requirement for determining defensible buyout prices is that a comprehensive review of the other geologic parameters, project costs, commodity prices, and other project factors should be undertaken to gain a better understanding of the full range of potential inputs to the project and their impacts on project profitability. This model uses a form of financial modeling referred to as deterministic analysis. That is, all of the assumption inputs to the model are single values. While these single values may be the best single value estimates for project variables, a more complete analysis would come up with a full range of possible values for each project variable and input these into the model and examine the range of resulting project profitabilities.

A method for using a range of values for project variable estimates and allowing the ranges for all of the variables to interact, is called Monte Carlo simulation analysis. Monte Carlo analysis uses a range of possible values for each important project variable (usually a probability distribution is used), and then randomly combines the project variables according to their probability distributions many thousands of times. The result of these calculations is a range of values, or a probability distribution, that reflects the entire likely range of project profitability. One additional advantage of using this type of analysis over a deterministic approach is that Monte Carlo analysis gives one the capability of answering questions such as "What is the likelihood that the real New World Project would result in an economic rent in excess of $30 million?" A deterministic analysis yields a series of best guesses for the expected value the New World Project, whereas a Monte Carlo analysis provides not only the expected value of the project, but the entire range of likely values and the probability of achieving those values.

In conclusion, this study examines a number of important New World project variables and their effect on profitability, but there area at least five additional items that need to be addressed before a range of comprehensive, defensible buyout prices can be calculated; (1) a complete description of the costs, production, and other project parameters associated with alternative project siting options (e.g., underground mill, disposal of all tailings offsite, alternative mill sites, etc.); Also required are estimates of the magnitude and timing of (2) any potential socioeconomic impact payments to affected parties; (3) bonding and/or trust funds required by federal, state, and local authorities; and (4) an analysis of any potential liability assumed by Crown Butte's control of portions of the historical New World Mining District--an environmentally impacted mining area. The fifth task that would add a much greater understanding of the New World Project is (5) a Monte Carlo analysis to scope out the likely range and probabilities of project profitability.

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