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Tittel

THE ANDØRJA MAGNETITE PROJECT

Forfatter	Dato År	Bedrift (oppdragsgiver og/eller oppdragstaker)
Miller & Associates	August 1989	A/S Seal Bay Minerals

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Sammendrag, innholdsfortegnelse eller innholdsbeskrivelse

rapporten er en prosjektevaluering foretatt av firmaet "Miller & Associates". Prosjektanalysen har følgende inndeling: Malmreservesituasjonen, Btytningsmetoder, Oppredning, Lokale forhold, Kostnadsanalyse, Markedsforhold, Kapitalkilder, Informasjonsbaser.

Rapporten konkluderer med at det finnes en potensiell attraktiv gruveoperasjon på Andørja. Det er imidlertid påkrevet med fortsatt kontakt med salgsgrupperinger og mulige investorer. Dersom man starter med minimal kapital som foreslått, vil dette lette letingen etter investorer, men størrelsen må gi rom for en akseptabel inntjening (fortjeneste).

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T:/ orienterings

Søyland

CLINTON L. MILLER
President

16 August, 1989

A/S Seal Bay Minerals
A. Tvereggensv 10
7037 Trondheim, Norway

Dear Mr. Søyland:

Attached is the report of this Organization on the Andørja Magnetite project.

We envision the coming development of this mining operation in view of the series of positive elements now existant. The basic studies which we have reviewed, the attitude of the Government and local representatives, and the international market situation all combine to permit this conclusion on our part. Requisite is a continuation of the on-going contacts with international product - sales organziations and the establishment of a capital source.

We wish to express our sincere appreciation for the reception accorded our representative by your organization and the several officials of the Norwegian and local government entities. Their positive attitude with respect to investment in mining suggests that mining projects will be an important part of Norwegian industrial expansion during the coming decade.

It was a distinct pleasure to have had this opportunity to visit Norway and to observe the mining potential there.

Clinton L. Miller
President

THE ANDØRJA MAGNETITE PROJECT

A review
by
Miller & Associates
August, 1989

Heather Page
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Miller and Associates

CLINTON L. MILLER
President

18 August, 1989

A/S Seal Bay Minerals
A. Tvereggensv. 10
7037 Trondheim Norway

Attention: Mr. Johannes Søyland
Administrative Director

Subject: The Andørja Magnetite Project

At the request of Mr. Johannes Søyland, following the presentation of a series of reports, maps, and mining data on the several Magnetite deposits in Norway, our Mr. Clinton L. Miller arrived in Molde, Norway on 9 August, 1989. He visited the Rodsand and area, inspected the Malm milling operation of Fosdalen, and traversed the Andørja mining site, including the adit in the ore zone there.

Conversations were held with Bergmester Nordsteien in Trondheim, with Mr. Snorre Tessem of Fosdalen Industries in Malm, with Mayor Arne Ekman of Ibestad Community and with Reidulf Arntzen of Ibestad Mech. Verksted in Hamnvik. All of these gentlemen were most helpful and presented a positive attitude toward mining investment, in this area.

Summary

A Magnetite Deposit of reasonable grade, and in a location permitting easy access, lies on the South-East Coast of Andjørja Island.

The reserve is delineated by a series of diamond drill holes, a long surface exposure and a 150-meter adit cross-cutting a portion of one of the zones. A large tonnage is proven by professional standards with at least an order of magnitude greater tonnage of indicated ore.

Extraction by open pit and/or underground room-and-pillar methods should present minimal operating problems. Milling, to up-grade the Magnetite ores to an international market grade, will present no problems. Additional values may be developed by extracting the sulfide and Olivene portions of the mined material and by preparing the waste rock for sale to the European Construction Industries. Options for milling the ores exist. The mill of Malm has appropriate capacity available for lease at least in the early start-up years. A site is available at the surface of the mine area and the underground rock strengths would apparently permit the excavation of an underground mill site without serious support problems. A ship-mounted mill may prove to be an attractive approach in terms of installation costs. This certainly merits further study.

Facilities for ship loading of products either exist (Fosdalen) or could be readily prepared.

A series of tests on concentration have been run. They indicate that the ore is amenable to concentration and that internationally acceptable products can be prepared at reasonable cost.

The cost analyses are supported by comparative data from throughout the Norwegian mining industry. In our judgement the cost summary, as developed, is rational and represents an acceptable base for market studies and economic calculations.

We envision this time to be appropriate for investment in Magnetite operations. We understand several organizations are planning a reduced operating level or outright closure. There is a definite market for sink-float Magnetite in East and West Europe and the United States. Markets for higher quality Magnetite products have been investigated and are available. It seems possible that an iron ore for the steel industry could be sold at profit. The secondary production of sulfides, Apatite and construction materials might provide an important adjunct to the magnetite sales.

In view of the complex international sales pattern we conclude that placing all marketing actions in the hands of an experienced participating group would, at least in the early years, be an approach which would permit executive and staff concentration on production facets and associated costs and capital return. As the project develops and as several of the Scandinavian operations reduce production levels or cease operations, an expanded production might be programmed.

At least two sales organizations are in contact and interest in the proposed products is evident

Several capital sources, we conclude, merit contact. These include:

1. Marketing Organizations -
2. Scandinavian capital sources
3. U.S./Foreign mining organizations.
4. Foreign Banks - U.S. particularly.
5. Small investment groups in Latin America and in U.S.

We understand that the Norwegian Government may be a possible source of capital grant funding.

We conclude that an input of foreign capital plus association with a marketing organization would represent a positive situation. This merits, we judge, a priority approach.

We calculate, using the within-the-report-indicated data, an NPV for this project of $13.8 million and a ROR of 52.5%.

PROJECT ANALYSIS

The following report sections develop the several bases for the report data. Sources are indicated, as are observations and comments from the several persons contacted. This Organization's observations conclusions, and recommendations are noted.

ORE RESERVE SITUATION

The ore - zones at the Andørja area are remarkably well tested. The cores, which were reviewed at Rodsand, and the laboratory rejects, are available for further review and study. The 20,000 meters of drilling plus the pilot adit give reason for confidence in the figures presented. We conclude that a proven reserve of 50 million tons at 29.3% contained Magnetite, of which 15 million tons could be extracted by open pit, is a responsible professional evaluation.

Extensive tonnages of probable ore are indicated between the two higher grade areas, to the Northwest and to the East (under the sound level). Once capital requirements are out of the cost picture these areas will contain a major reserve. In effect the mineral area is open to the Northwest and down dip to the East.

At a projected extraction rate of 680,000 tons per year the proven reserve is adequate for the return-of-capital period plus a further twenty year's operations.

We conclude there is a reserve base sufficient to provide ores for several decades operations, at grades which may provide attractive earnings.

EXTRACTION METHODS

Mining by open-pit is possible for the early years of an extended program. Equipment required and working approaches are standard and will require minimum personnel preparation. Winter conditions will cause problems, but not insurmountable ones.

Extracting be any of several room - and - pillar approaches is feasible. The Rock Mechanics aspects of room development merits study at an early stage, as opposed to a hit - or - miss program. The success of such methods is totally dependent on the dimension of roof spans which will stand safely. Again, equipment for these type methods is readily available.

It will be important in final planning, to provide for upper zone mining ahead of the lower zone, to insure maximum extraction of upper zone ores, and to assist in maintaining the stability of all underground workings. Proper pillar positioning in both zones will be required to avoid stress development and possible downward thrusting of under-cut pillars.

Subject to appropriate rock strata strengths we conclude that the proposed approach is a viable one. It will permit high, efficient, production while providing flexibility in the event of possible structural problems. As experience is developed such a general method may be modified into a standardized system.

One of the real advantages of working underground is that the rigors and cost related to

winter operations are reduced. This factor, we suggest, merits serious consideration when early stage financial analyses are being developed.

Both approaches, properly equipped, and with appropriate maintenance programs, will require a minimum of manpower.

MILLING

It would be possible, at some operating expense increase, to start production using leased facilities at the Fosdalen mill at Malm. Additional costs will be required for mill-facility leasing, for additional handling, and transport expense. The mill and its operation is very impressive and would certainly serve for Andørja ores.

A decision to lease involves the final plans of Fordalen, the level of financing available to Andørja in the initial stages, and directoral considerations of capital and interest costs versus start-up timing and operating expenses.

A Ship-mounted mill has been proven a feasible alternative in the Candian North. The preparation of the requisite pier facilities for the ship/mill and product loading would not be overly expensive at the mine site. Once designed, such a unit might be expensive to modify. As production of non-Magnite products is considered, local site costs might be reduced in comparison to a conventional milling facility.

A conventional land-based mill site is readily available, and the design and construction of such a facility would not be difficult. A decision to go ahead with such an installation would accept a slower capital return, but might permit full-tonnage production as early as the markets would permit. In consideration of the dimension of the reserves, such a conventional approach merits consideration, capital funding permiting. Expansion or modification as indicated would not be a serious problem.

The construction of a mill underground at the site merits study, we suggest. The advantages include reduction of heating costs, and utilization of rock walls with possibly reduced construction costs. With the entire operation within the mountain, as at Mesters Veg, the climate factor would be considerably lessened. Negatives are the rock mechanics aspect, difficulty of modification, and the sound impact on the work force.

We conclude that disposal of non-saleable products ought not to be a problem. First, they might be utilized to provide materials for an industrial site in conjunction with the mine and shipping facilities. Later it may be possible to find a market for all the broken ore contents, i.e. construction gravels and sands, Apatite, and sulfides. At any rate with the sulfides removed there should be minimal environmental problems from these inert materials, whether disposed on land at increased expense or into the Fjord.

Power is available and is not foreseen as a problem. One great international advantage which Norway possesses is relatively inexpensive power. The higher-up-the hillside lakes might be utilized as sources of milling water. Since such water would have to be pipe-carried the mill, we suggest the installation of a local hydro-electric plant merits consideration.

THE LOCAL SITUATION

Local manpower, at the relatively low levels proposed, would not be a problem. Some training would be required in the early stages, of course. Local personnel housing apart from office facilities would not be required. The United States mining experience with women, particularly in milling operations, has been almost totally positive and we recommend hiring considerations be based on reputation and ability, and not sex.

The near-by maintenance facilities at Hamnvik would apparently provide all requirements for low and high level mine and mill maintenance. This would reduce capital requirements and accessory operating staff.

Medical facilities are available on the island and on nearby Rolla, with a major hospital at Harstad. Again, no investment is indicated in this area.

COST ANALYSIS

Costs, as ever, are a function of project dimension. Our review has covered those elements as presented by Seal Bay, and we consider their figures to be relatively in line within the Scandinavian pattern. We conclude that, capital sources permitting, the more attractive financial approach would seem to be one of commencing operations at 680,000 tons of ore mined per year with 200,000 tons per year of saleable product. For at least the first five years the Fosdale mill would be used with the intent of buying this mill of the operation closes. Perhaps a lease-purchase agreement might be negotiated, at that time, with the Government.

The reviewed studies indicate an estimated operating cost including interest and depreciation of $17.65 U.S. per metric ton of product, FOB shipping unit. This included a depreciation element at 10% of total costs and interest at 50% of depreciation. We are assuming a real 25% tax rate in consideration of the Norwegian tax code provision which allows for one-half of the tax to be set aside for expansion or related investments. This in effect becomes the equivalent of the U.S. depletion allowances.

Thus the cost formula in this instance based on 200,000 tons of saleable product per year - becomes an estimated (in U.S. Dollars):

Total Cost/mtn	$17.65	
Depreciation (10%)	1.76	(-)
Interest (5%)	.89	(-)
Operating Costs less depreciation and interest	15.00	

We recommend this figure be considered as only a sound preliminary estimate.

We conclude the cost data is well within the limits anticipated on initial prefeasibily studies at the stage.

DCF CALCULATION
ASSUMPTIONS:

Start - up capital $4,000,000. Production after one year at an annual rate of 680,00 tons milled, and 200,000 tons of product produced.

Cost of product $20 per ton as a conservative factor. This includes interest and depreciation at $3.00/ton. Gross income $30 per ton of product

Interest 13%
Discount factor 10%

Mining by open pit for a twenty year period. This effectively extracts the open pit reserve.

Milling at Fosdalen mill at Malm.

Annual Gross Starting in Year Two -	$6,000,000	
Annual Costs	4,000,000	(includes $3/ton of interest and depreciation)
Annual Operating Net	2,000,000	
Taxes - 50% of operating net	$1,000,000	
Investment Credit (50% of Tax)	500,000	
Developed cash flow =	$2,100,000	(1,000,000 + 600,000 + 500,000)

DCF of twenty years of this cash flow
rate at above factors becomes $13.8 million at a ROR of 52.5%

The US banking community views this as a very interesting fincancial estimate.

We conclude this is an acceptable preliminary estimate for financial consideration.

Noteworthy is the increasingly positive earnings situation when product sales increase.

MARKET ANALYSIS

Markets for the proposed production exist. This is evinced by the interest of both German and American traders in the proposed output.

World Magnetite production has been lessening steadily during the past decade and there are indications that this trend will continue. Meanwhile the demand for sink-float Magnetite, high-quality material for the steel industry, and minor other products holds relatively steady. Brazil can certainly compete with any other producers, but serious economic, political, and financial problems are evident. The Brazilian Magnetite situation is threatened by economic near - chaos, at this time.

The dominant Scandinavian position is weakening as several producers either reduce operating levels or close down. This trend is being accelerated as lessened Government support for basically uneconomic operations is provided.

A Norwegian magnetite operation possesses several very real advantages in international competition . First, low cost power; second, location on tide water; third, nearness to European ports by cheap water transport; fourth; ability, freight-wise, to compete in the U.S. because of the very expensive U.S Rail costs.

In summary it appears that a properly managed, tide-water Magnetite operation ought to be able to compete successfully in a quality - product market. The projected costs at Andørja indicate that this operation would find a market niche once product quantity and quality become known. It is suggested that the production of increased value product be the priority operating target. Apparently, although recoveries and saleable tonnages drop, these factors would more than offset by increase value per ton of product..

CAPITAL SOURCES

We envision a series of potential start up funding sources.

1) Sales marketing organizations might represent attractive participating associates. They would provide entrance to markets with an on-going reason to obtain the best possible arrangements. This type of expertise would be an important adjunct to operating and executive skills which would be vital to the successful development of the project. We recommend continued discussions in this area.

2) Scandinavian capital sources we envision as including established mining organizations and banking groups. This approach will require giving up a major equity position at least in the case of mining groups. It does have the advantage of association with a organization knowledgeable in the industry. Both Boliden and Otokumpo have been active in international projects during the past decade.

3. Foreign Mining Organzations with a basic interest in Scandinavian exploration might view an installation at Andørja as an attractive way of assuming a position in mining which would provide the financing for major exploration studies. This to a certain extent would be similar to the Arco investment in Norwegian Graphite. Both Nickel and Gold continue as metals of interest in the world exploration scene. BHP-Utah, with their operations in iron and steel in Australia, might prove interested in some type of association. Inco is searching internationally for new Nickel reserves. They, too, might find such a project of interest.

There are certainly many other groups who should be contacted. Once again, a relationship with a major entity will involve ceding equity.

4) Foreign banks, particularly those with established positions in Norway, might find a relatively small project such as Andørja attractive. This would be particularly true with an established market for the products. Citibank of New York, and several others there, would be organizations worth contacting. The first requisite from the Bankers perspective is market. Thus an arrangement with on of the sales groups and an international banking organization might provide and interested combination.

5) Small investment groups from Latin America and the U.S. are constantly searching for opportunities such as Andørja. At least one New York Bank, Chase Manhatten, maintains a Division whose role is to assist would- be foreign investors in locating attractive targets. The bank charges for the assistance, but a real service is provided. We suggest contact with such a banking group is warranted. This would offer an increased contact base with perhaps a lessened demand for equity involvement as contrasted with interest in earnings levels and profit distribution programs.

INFORMATION BASES

This organizaiton has been in continuing contact with Mr. Soyland for the past several years. Reports, maps, and data assemblages have been available for review.

Background in this organization includes operational experience in the New Jersey Magnetites in the United States and studies of the massive Magnetite - Copper zones in Peru, including the Marcona Property.

The recent trip included visits to the Rodsand mill and core-storage area, to the Fosdalen mill at Malm, to the mine site on Andorja and to the Iberstad Verks at Hamnvik. A series of conversations were most helpful in providing information on attitudes, situations and the legal framework locally and throughout Norway.

1. Mr. Ole Nordsteien, the Bergmeister, was particularly helpful with his knowledge of the specific area and recent Norwegian mining developments.

2. Mr. Snorre Tessem graciously provided a most interesting tour of the Fosdalen Mill and a review of the mining situation there

3. Mayor Arne Ekman, Mayor of Iberstad community, assisted by Rodman Alf Skog,

and Teacher Dag Indresand provided an appreciated tour of the mine site and underground adit, the island facilities, and discussions of the local situation.

4. Mr. Reidulf Arntzen conducted a tour of the impressive ship maintenance and construction facilities at Hamnvik.

Each of these individuals provided most helpful comments on the broad mining situation and the local attitudes related to the Andørja project. Their assistance is greatly appreciated. We hope that there will be opportunities for further contact with each in the near future.

We conclude that a potentially attractive mining operation exists at Andørja. Requisite is continuing contact with the sales groups and possible investment sources. Starting with minimal capital, as proposed, will facilitate the investment search, but the programmed dimension must provide for an early attractive-earnings level.

We cannot, and do not, guarantee the success of any operation which may be undertaken Our opinions, as presented, reflect analyses of a proposed program by senior professionals with wide experience in such projects, but no assurances are implied.

If we can provide any further assistance or expanded comments please call.

Respectfully submitted

Miller and Associates

By: Clinton L. Miller
President