1201 N. Division St.
Spokane 2, Wash.

MEMORANDUM September 18, 1951

To: F. E. Volin, Chief, Mining Division, Region II

From: John D. Bardill, Metallurgist, Region II

Subject: Economic considerations of application for DMA production loan to recover tungsten concentrates from placer grounds by W. A. Moon, Drummond, Montana - DMA Docket No. 1060.

Applicant has applied for a DMA production loan in the amount of $60,000 to purchase drag-line dredging equipment, a washing-concentration plant, and provide working capital to dredge placer ground at the head of Henderson Creek, Granite County, Mont., to recover principally scheelite with gold as a by-product. Sampling indicates approximately 520,000 cubic yards of material containing about $1.12 in scheelite and $0.23 in gold per cubic yard, at the tungsten price of $63.00 per unit WO_3.

Conservatively, applicant has arbitrarily reduced the grade to $0.48 in tungsten and $0.22 in gold per cubic yard for a total of $0.70 which should yield about 3,835 units of WO_3 and 3,270 ounces of gold with an estimated profit of about $134,000 before taxes.

Recommendations

Approval of the loan is recommended:

1. Because the dredging operations would be productive of tungsten concentrates in a short time and should net applicant a good profit.

2. The applicant is a very competent operator, having dredged the adjacent property between 1943 and 1949, and can capably manage this proposed operation.

3. Milling facilities for custom tungsten bearing black sands and some tungsten ores will be made available for the district when the concentrating plant is rehabilitated.

Mr. W. A. Moon, of Drummond, Mont., the applicant, has under lease or lease with option to purchase numerous patented and unpatented claims in Henderson Gulch, Granite County, Mont., which he proposes to placer mine to recover scheelite and gold. The description of the claims has been adequately described in the docket but the legal status of the claims or leases has not been investigated.

The H & H Mines from May 1943 to December 1944 successfully dredged the ground adjacent to and downstream from the mining claims proposed to be dredged by applicant. Reported production during this period was approximately 17,000 units of WO_3 (scheelite) and 18,000 ounces of gold from an estimated 4,000,000 cubic yards of material for about 4 miles downstream. During the entire preliminary period of prospecting and subsequent dredging of this ground, Mr. Moon was general manager in charge for the company.

Applicant proposes to mine the ground with a 1-1/2 cubic yard Northwest dragline, concentrating the black sands containing the scheelite and gold on a 60-inch dry land washing plant mounted on cat treads equipped with six 42" x 42" Pan American rougher jigs and one cleaner jig. The black sands recovered in the washing plant will be treated at the Henderson Gulch concentrating plant which he plans to purchase apart from the funds requested in the loan. The operation essentially will be identical to the H & H Mines except that instead of a bucket-line dredge with jigs, a dragline and jig plant on cat treads will be employed because of the terrain. All of the

equipment has been located and is presently held under option to purchase and will be bought as soon as the loan funds are available. Details of estimated equipment costs, mining costs and mining methods are included under Questions 8 and 10 in the Docket, Form MF-101

Ore Reserves

Applicant submits only three test churn drill holes, one shaft, and six bank samples as a basis to estimate value and yardage of material reserves to be dredged. See "Composite Geologic & Assay Plan Map" for locations and attached copies drill and shaft logs; also, copies of Montana Laboratory Company assay sheets. Based on the three test churn drill holes applicant estimates WO_3 at $1.12 and gold content at $0.23 or a total of $1.35 per cubic yard with an estimated average depth of 22 feet. The plan is to dredge a swath about 115 feet wide adjacent to and south of the creek, a distance of approximately 3,400 feet from the downstream boundary, upstream west to the Sunrise Mine dump. This would approximate 320,000 cubic yards of potential dredging ground.

Six bank-pit samples of overburden taken immediately adjacent to and north of the creek and adjoining the first cut to be dredged showed scheelite values ranging from about $0.56 to $2.50 per cubic yard with an arithmetical average of $1.41. Applicant estimates the average depth for a return cut to be dredged at about 15 feet with a length of about 3,400 feet and width of about 115 feet. This cut would contain about 200,000 yards.

These few evidences of sampling and estimating may seem inadequate for such positive assertions as have been made by applicant. However, the following facts should be given due weight in considering applicant's estimates of reserves:

1. Applicant's excellent performance production record, knowledge of the nature of the ground over a period of 5 years, and occurrence of the scheelite and gold values made him sufficiently confident to forego an extended exploratory period. Instead, he plans to proceed immediately to productive operations. Applicant's experience record as a competent operator is extremely important in an operation of this kind.

2. Production record for period 1943 through 1949 showed about 17,000 units WO_3 and 18,000 ounces gold or a gross value of $1,735,000 with WO_3 at $63.00 per unit and gold at $35.00 per ounce. This production from an estimated 4,000,000 is equivalent to a $0.4337 recovery per cubic yard, including the leaner unprofitable ground which finally terminated operations. At the time of cessation of dredging in 1949 the scheelite was extremely fine and difficult to recover. Recovery at that time is reported at $0.11 in gold and $0.03 in tungsten at $22.00 per unit WO_3 per cubic yard of material dredged.

3. An operating period from April 4 to October 14, 1946 when 312,518 cubic yards were dredged yielded an average of 0.191 pounds WO_3 per cubic yard or at $63.00 per unit, $0.62 for tungsten and $0.22 for gold, making a total of $0.84 per cubic yard.

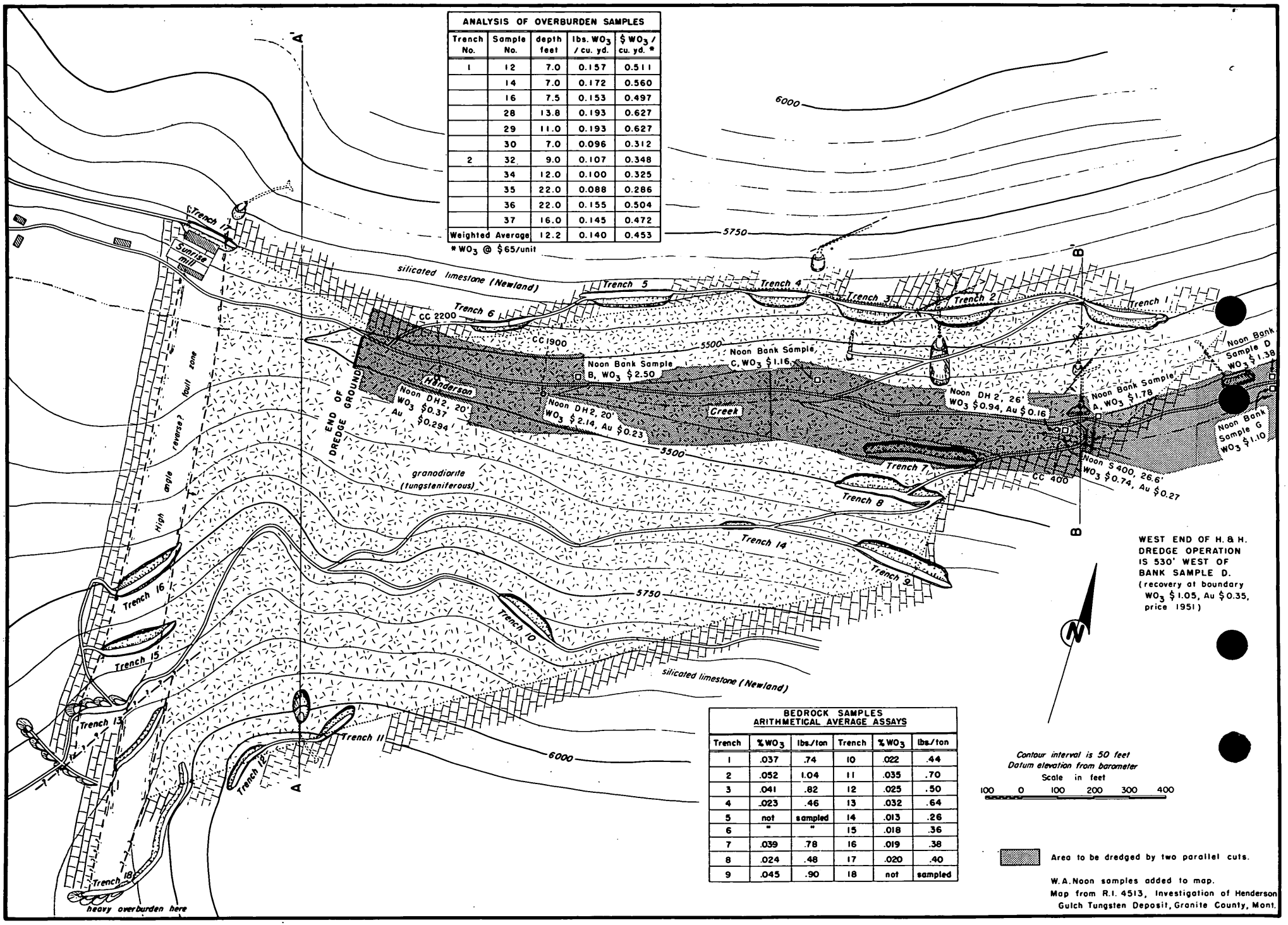
4. The H & H Mines dredging operations at the point of commencement in 1943 (lower downstream boundary of applicant's claims) reportedly yielded at 1951 metal prices $1.05 per cubic yard in WO_3 and $0.35 in gold for a total of $1.40.

5. Eleven samples of <u>overburden</u> taken from Trenches 1 and 2 during a Bureau of Mines project "Investigation of Henderson Gulch

Tungsten Deposit, Granite County, Montana" described in Report of Investigations 4513, indicated an average depth of 12.2 feet containing 0.140 pounds WO_3 per cubic yard or equivalent to $0.453. Assuming usual average gold content of $0.22 per cubic yard, the gross value becomes $0.77. Trenches 1 and 2 are approximately 1,000 and 1,400 feet respectively west of the downstream boundary of applicant. Also, the trenches are about 200 feet above and 400 feet horizontally from the creek bottom where normally the values would be more concentrated. Refer to amended map attached from R. I. 4513 entitled "Figure 4 - Plan map showing Bureau of Mines trenches in relation to areal geology." The project was concerned with the tungsten content of the bedrock; consequently, only a few samples of overburden were taken.

6. Bureau of Mines samples of bedrock from 15 of 18 trenches (3 trenches did not reach bedrock) indicated tungsten-bearing material varying from 0.26 to 1.04 pounds WO_3, or $0.84 to $3.38 per ton. Trenches were located on both sides of creek and as much as 500 feet above the creek bed. The inference is that since bedrock is tungsten-bearing on both sides of the creek, erosion over a long period undoubtedly concentrated it in the area proposed to be dredged by applicant. Refer to Figure 4.

7. Values should be higher upstream near the source of the gold and tungsten than downstream where operations terminated. Applicant's reduction in his estimate to $0.70 recoverable per cubic yard, of which $0.48 is return from scheelite and $0.22 from gold for the entire yardage, seems reasonable in view of the above mentioned important pertinent factors, and should be accepted.



ANALYSIS OF OVERBURDEN SAMPLES

Trench No.	Sample No.	depth feet	lbs. WO_3 / cu. yd.	$ WO_3 / cu. yd. *
1	12	7.0	0.157	0.511
	14	7.0	0.172	0.560
	16	7.5	0.153	0.497
	28	13.8	0.193	0.627
	29	11.0	0.193	0.627
	30	7.0	0.096	0.312
2	32	9.0	0.107	0.348
	34	12.0	0.100	0.325
	35	22.0	0.088	0.286
	36	22.0	0.155	0.504
	37	16.0	0.145	0.472
Weighted Average		12.2	0.140	0.453

* WO_3 @ $65/unit

BEDROCK SAMPLES ARITHMETICAL AVERAGE ASSAYS

Trench	% WO_3	lbs./ton	Trench	% WO_3	lbs./ton
1	.037	.74	10	.022	.44
2	.052	1.04	11	.035	.70
3	.041	.82	12	.025	.50
4	.023	.46	13	.032	.64
5	not	sampled	14	.013	.26
6	"	"	15	.018	.36
7	.039	.78	16	.019	.38
8	.024	.48	17	.020	.40
9	.045	.90	18	not	sampled

FIG. 4 PLAN MAP SHOWING BUREAU OF MINES TRENCHES IN RELATION TO AREAL GEOLOGY

Collateral

Applicant in his docket has submitted as collateral used equipment under option to purchase contract in the amount of $59,750 having an estimated new value of approximately $110,860. Because of the shortage of equipment and slow deliveries during the present emergency, applicant states he can dispose of the equipment under option to purchase at a price considerably more than his option price.

According to applicant, the lessors of the mining claims proposed to be dredged have agreed to subordinate the properties to the loan. As collateral, in addition to the equipment which would barely cover the loan, it might be well to have about $25,000 pledged from the production from the first cut to be dredged from which a net profit of about $127,000 has been estimated.

Repayment of Loan

Since the repayment of the loan at the rate of $12.00 per unit WO_3 suggested by applicant for the 3835 units to be recovered would not be adequate, a revision of this provision should be made. Probably 20 percent of the net returns from the sale of the scheelite concentrates and gold would be a reasonable rate of repayments until the loan had been paid in full in an estimated 265 working days.

Feasibility of Applicant's Proposal

The last operating costs for the period April 1, 1949 to December 20, 1949 at an average rate of about 70,000 cubic yards monthly were $0.117 per cubic yard as reported by Mr. Noon. These costs included everything except royalties to the lessors of the mining claims.

Although applicant does not specifically state in the docket the average daily yardage to be dredged, it is understood to be about 1,750 yards requiring about 300 working days to mine the 520,000 cubic yards.

The equipment which is under an option to purchase contract is immediately available when the loan is granted and seems to be adequate for the proposed job.

The concentrating mill under option on a purchase contract for $20,000 has proven satisfactory in the past to produce high-grade scheelite concentrates. Several modifications in the flow sheet might reduce milling costs substantially.

The present scheme of drying the dredge concentrates, then removing the iron in a high intensity dry magnetic separator should be changed to remove the iron from the wet concentrates with a low intensity wet magnetic separator, eliminating the drying step. Use of the wet magnetic separator would probably increase the mill capacity appreciably above the present 75 tons per day. The rotary kiln which was intended to reduce hematite to magnetite could be eliminated or used as a dryer since the quantity of hematite in the black sands is negligible.

The mill will have extra capacity for treating custom black sands or if a crushing and grinding circuit is added, high-grade tungsten ores could be milled there. An estimated 15 tons of black sands containing 5 - 3 percent WO_3 should be produced daily from the dredge.

An analysis of scheelite concentrates from the H & H Mines operations shows the material to fulfill P-57 specifications except for bismuth, which is about 0.1 percent high. The concentrate should have a ready market with little or no penalties for impurities.

On the accepted basis of applicant's estimated $0.48 for scheelite and $0.22 for gold per cubic yard and a total yardage of 520,000 yards, the following results may be anticipated:

Estimated Operating Costs:

Estimated total costs on basis of applicant's estimates at rate of 1,750 cubic yards per 3-shift day.

	Cents Cost/cu.yd.
Mining costs (see details under Question 10) per day of $220.40 at 1,750 cu. yds.	12.59
Milling costs (see details under Question 11) per day of $194.40 at 1,750 cu. yds.	11.29
Royalty to lessors on recovery of $0.70 per cu. yd. at 7-1/2 percent	5.25
Estimated total cost per cubic yard	29.12¢

Note: Above costs include amortization of equipment over life of operation.

Latest reported bids for scheelite concentrates are f.o.b. mill at $63.00 per unit WO_3 without penalties for impurities for this particular scheelite concentrate.

Estimated Gross Value and Production:

Tungsten:

520,000 cu. yds. at 0.1475 lbs. ($0.48) ÷ 20 lbs./unit 3835 units WO_3

Value at $63 per unit WO_3; 3835 x $63 $240,605

Gold:

520,000 cu.yds. at $0.22/cu.yd. ÷ $35 per ounce 3270 ounces

Value 520,000 cu.yds.at $0.22/cu.yd. $114,400

Estimated Gross value of products $355,005

Estimated Operating Profit:

Estimated gross recoverable values	$355,005
Estimated overall costs; 520,000 cu.yds. at $0.30/yd.	156,000
	$199,005
Less repayment of $60,000 loan in an estimated 265 working days plus 4% interest for 2 years (assuming operation will start in early spring of 1952).	64,800
Estimated net operating profit	$134,205

Note: Estimated life of operation at 300 working days at 1,750 cu. yds. per day.