1207 N. Division
Spokane, Wash.

April 26, 1951

E GRANDE

TO: Chairman, Nonmetallics Commodity Committee

FRO: DMA Field Team, Region II

SUBJECT: DMA-130, Horsehead Lime Corporation

This application has been considered in conjunction with DMA-460 as suggested in your memorandum of February 1. Answers to specific questions raised in your preceding memorandum of January 31 are summarized herewith. A detailed discussion of these questions also is presented.

(1) The deposit is considered to contain limestone reserves adequate in quantity and grade to amortize the requested loan within 5 years at the proposed production rate. However, reserves available to open-cut mining will be largely depleted at the end of this period. Furthermore, the required rate of amortization necessarily will have to be unusually high. The calculated profit margin is considerably below that anticipated by the applicant.

Future plant operation will depend either on the development of additional reserves on company holdings 3 miles from the plant site (application appendix - Natural Resources) or a suitable leasing arrangement with the nearby Jones quarry.

(2) The electric transmission line supplying the plant can be placed in operating condition by the installation of an appropriate transformer bank. The cost of this installation will be nominal.

(3) An adequate, long-range supply of sawdust fuel is available throughout the Grant's Pass-Medford area.

(4) The water supply system as developed is adequate for plant needs.

(5) Overall physical condition of partly completed plant is satisfactory.

(6) The plant is well designed and capable of producing economically.

Recommendation

It is the opinion of the Field Team, Region II, that the requested loan is justified provided limestone and lime products in the quantity proposed are considered essential to the national security and defense.

By Field Team, Region II

A. E. Weissenborn, Executive Officer
U. S. Geological Survey

Glenn C. Reed

Glenn C. Reed, Acting for
V. E. Volin, Chief, Mining Division,
Region II, U. S. Bureau of Mines

(1) Adequacy and quality of limestone deposit (By Elton A. Youngberg, U.S.G.S.)

Quarry workings

The principal workings of the Horsehead Lime Corporation are two quarries advanced southwestward into the nose of a northeast-trending ridge. The limestone bed is exposed along the crest of this ridge. Its highest surface exposure along the ridge is about 290 feet vertically above the lower quarry floor.

The lower quarry was advanced along the outcrop for about 200 feet where the face attained a height of 70 feet. Argillaceous sediments on the hanging wall were stripped from the bed to a slope of 37°-40°. The footwall was stripped to 45°-50° slope which is 20°-25° flatter than the dip of the limestone bed. Apparently the economic stripping limit was reached as the lower portion of the face was advanced 25 feet by open stoping.

An upper quarry was started southeast of, and 228 feet above the floor of the lower quarry. A truck road about 2,000 feet long connects this quarry with ore bunkers at the lime plant. Quarrying had advanced about 150 feet along the strike of the limestone bed when operations ceased. At this place the quarry face was about 70 feet in height. In preparation for future mining the Horsehead Lime Corporation has stripped overburden to a point about 200 feet southwest of the quarry face where the known limestone body apparently terminates.

The Deposit

The limestone deposits in the Grant's Pass area are lenticular bodies in steeply dipping beds of metasedimentary rocks believed to be of Paleozoic age or older. The Horsehead quarries are located upon several of these bodies. The limestone beds exposed at the quarry faces are 30-40 feet thick, strike approximately northeast and dip 60°-70° to the southeast. The limestone is a coarsely crystalline white marble of high purity.

"ANALYSIS OF THE ROCK (U.S.B.D. SAMPLE NO. 9C) from the Oregon Lime Products Quarry is given below:"

SiO_2	0.05	CaO	55.61
Al_2O_3	0.21	MgO	0.34
Fe_2O_3 / FeO	0.28	Ignition Loss	42.88
		TOTAL	99.37

(Hodge, Edwin T., Market for Columbia River Hydroelectric power using Northwest minerals).

The limestone upon which the upper and lower quarries are situated appears to be the same bed. However, the lack of sufficient strike exposures, together with the known lenticular shapes of similar limestone bodies in the area, places some question as to whether the bed is continuous between the two quarries. At the upper quarry another limestone bed appears abruptly in the footwall. This bed, exposed continuously along strike for nearly 200 feet, apparently is terminated at either end by faults. It has an exposed width of 60 to 70 feet, strikes parallel to the trend of the other limestone beds, and dips 60°-70° to the southeast, conforming very closely to the attitude of the overlying limestone bed upon which the upper quarry is located. The two beds are separated on the surface by about 10 to 15 feet of metasediments.

The footwall bed is white, has a fine-grained to amorphous texture, and exhibits easily recognizable bedding planes. The footwall area is silicified and contains bands of quartzite 1 to 2 feet in thickness. Due to its high silica content, the lower 20-30 feet of this bed probably could not be classed as commercial limestone. Both limestone beds are terminated on the southwest end by a northwest-trending fault of unknown dip and magnitude.

The limestone lens exposed in the lower quarry extends northeastward under talus and mantle; therefore little is known concerning bed extensions in this direction.

Several basic dikes varying in thickness from 2 to 15 feet intrude the limestone in the upper quarry. These dikes have a general north-south strike and dip steeply to the west. Some displacement of the limestone occurs along the dikes, the greatest displacement observed being about 40 feet along a 15-foot thick dike at the northeast end of the quarry.

A second limestone deposit is owned by the Horsehead Lime Corporation in sec. 19, T. 38 S., R. 8 W. This deposit was not inspected because of lack of trails or roads into the property and inadequate directions concerning its location. A report by Hugh C. Ingle, Mining Engineer, and personal communication with Holloway and F. I. Bristol indicate that this deposit consists of a limestone outcrop along a steep slope. Erosion has exposed the hanging wall side of a limestone bed for about 300 feet along strike and 50 feet along its dip. Although the bed thickness is unknown, it has been estimated to range from 25 to 55 feet. This deposit has not been developed or explored. Its estimated distance from the lime plant site is 2-1/2 to 3 miles, the exact distance depending upon which route is selected for the proposed road.

Reserves

Indicated Tonnage

Block 160' long—Triangular in cross-section trending southwest from face of Upper Quarry—27,200 tons.

Block 160' long - Rectangular in cross-section—trending parallel to above block - 34,500 tons

Total indicated tonnage: 61,700 tons

Inferred Tonnage

Block: 430' long—Rectangular in cross-section from face of lower Quarry along strike to front of Upper Quarry.

(Est. average horizontal thickness- 35') 162,000 tons

Block: 234' long—Rectangular in cross-section—From front of Upper Quarry to Upper Quarry face—135' vertical—35' thick.

97,500 tons

Block: 100' deep block beneath triangular block of indicated ore: 64,000 tons

Block: 100' block beneath rectangular block of indicated ore: 41,000 tons

Total inferred ore:	364,500
Total indicated & inferred:	435,200

Production Costs (By U.S.B.M.)

An estimated cost of $1.69 per ton for crushed rock delivered to the lime plant bunkers is predicated on the following:

1. Reserves available to open-cut mining by standard quarry methods (fig. 1)

Indicated	62,000 tons
Inferred	214,000 tons
Total	276,000 tons
Recoverable (90 percent)	248,000 tons

2. Stripping ratio, waste to ore 1:0.75

3. Rate of mining ..... 48,000 annual tons

This cost, which includes road and quarry rehabilitation, is broken down as follows:

Item	Cost per ton, dollars
Labor, including payroll, taxes and insurance	$0.85
Explosives	.13
Supplies	.26
Electric power	.02
Maintenance	.35
Supervision	.08
	$1.69

Sharp increases in costs of crushed rock, sawdust fuel, supplies, labor, and freight will diminish considerably the profit margin anticipated by the applicant. The following schedule is considered to be more closely in accord with present conditions:

Product	Monthly output (tons)	Cost Grant's Pass	Cost Portland	Market price Portland	Monthly profit Portland market
Pebble lime	800	$13.47	$18.67	$24.00	$4,264
Hydrated lime	350	14.27	19.47	20.44	339
Processed lime	350	14.77	19.97	29.20	3,230
Raw rock	250	8.14	11.33	12.50	292
				Total	$8,125
				Annual	97,500

(2) Power transmission line

Mr. I. T. Bullis, District Manager, Oregon-Pacific Power Co., Medford, Oreg., was consulted regarding condition of the electric transmission line serving the Horsehead lime plant.

This line, constructed with No. 4 copper, now is capable of transmitting 700 kilowatts or about 1,000 horsepower. The installation of suitable transformers at the plant, however, would be required. This installation would be made on an "in and out" charge basis repayable to Horsehead Lime Corporation after 12 months operation at a rate of 20 percent of the monthly bill.

The former contract with Horsehead was based on a 400-horsepower load. Although this contract now has expired, the Oregon-Pacific Power Co. is ready to supply this plant with firm power up to the rated capacity of the installed transmission line.

(3) Proposed fuel, supply sources, and technical aspects of fuel utilization

These related problems were considered and investigated by Hal J. Kelly, Fuels Technology Division, Region II, Bureau of Mines. His opinions are presented in the following:

"The Horsehead Ore Co. at one time had a tentative contract to obtain screened sawdust from a nearby mill in quantities adequate to supply their needs. Since there are numerous sawmill operations in the vicinity, sawdust was chosen as the most economical fuel. Cost of burning lime with oil was estimated to be 1 dollar per ton over that of burning with sawdust according to Wolf Bauer, consulting engineer for the company. As this estimate was made in 1947 the differential is probably now even greater.

"A stand-by oil burning installation is recommended as insurance against enforced shut-downs resulting from interrupted fuel supply. Such an installation would cost about $6,000 and, as this represents only 1.71 percent of the total amount requested, it appears to be warranted.

"Use of sawdust as a fuel is entirely feasible for this operation as it is used in the Pacific Northwest in many industrial operations. The drying and reduction of the sawdust can be accomplished with the equipment at the plant according to Mr. K. J. Dohrer, consulting combustion engineer. He also said that sawdust from the Medford area had a B.t.u. value in excess of the commonly used figure of 8,700 per pound, dry basis. Danger in handling

dry sawdust was stressed by Mr. Bohrer and Professor Bror M. Grondal, University of Washington Forestry School. Both recommended filtering and confining of the extremely fine sawdust. A study of the original drawings of the Horsehead line plant shows that adequate precautions have been specified. Also warning alarms which are activated by amplified signals from strategically placed thermocouples in the fuel preparation system, are specified.

"One advantage of using sawdust is the type of flame produced. Sawdust will give a long, mild flame that results in a "soft" burned, easily hydrated lime which is ideal for building lime. This type of lime, incidentally, will result in the highest profit margin of any of the products.

"To summarize, the fuel is entirely adequate and supplies are apparently good. The fuel preparation plant is capable of producing the required amount of dried and ground sawdust."

(4) Availability of adequate water supply

The company has water rights for 77 acres in an irrigation system. Their ditch runs between the crushing plant and the burning, hydrating, and storage area. Water for mining is pumped to the quarry from the irrigation ditch. Water supply is adequate and suitable.

(5) Overall physical condition of partially completed plant

The overall physical condition of equipment was good despite several years exposure to the weather. Most of the motors had been removed from the machinery and sheltered in a warehouse. Motor starters, relays, etc., would have to be carefully dried and cleaned before using.

ost of the equipment was new when installed and will be easily placed in operating condition. The hydrator is an exception but was reportedly renovated when the plant was built. Its capacity is about 2-2-1/4 tons of hydrated lime per hour and would probably have to be augmented if production of hydrated lime is to be increased in the future. All other equipment is capable of handling the rated plant capacity or more.

If all needed equipment to complete the plant was on the site, 2 to 3 months would be required to start production of lime. Probably 5 to 6 months would be required under present conditions to acquire necessary equipment and start plant operation.

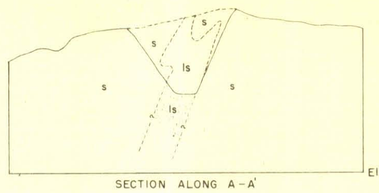
(6) Plant design and potential economic operation

Much of the requirement in (6) has been reviewed in (5), but two more points are worthy of mention. First, the jaw crusher is smaller than could be desired for future expansion and ease of handling of quarried material. Second, the primary crushing plant should have been located nearer the feed-end of the rotary kiln which would have facilitated handling of the lime rock. The plant is fundamentally well engineered and is capable of producing economically. The few mentioned shortcomings in equipment were undoubtedly due to efforts to cut costs.

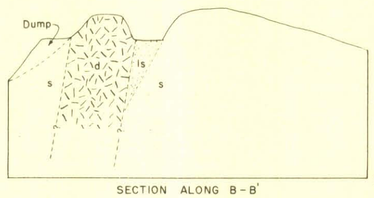
Map No. 1

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

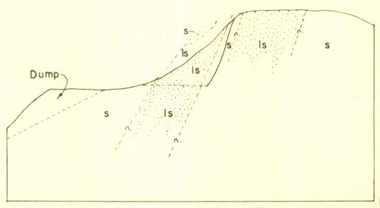
DEFENSE MINERALS ADMINISTRATION
DOCKET No. 130



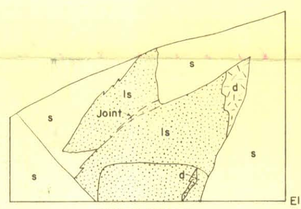
SECTION ALONG A–A'



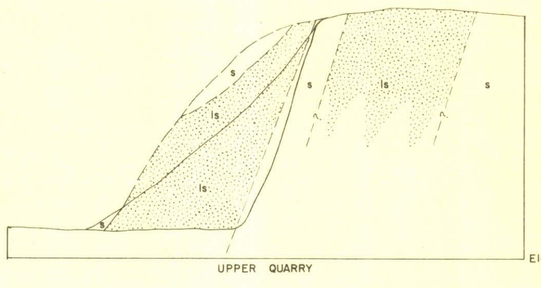
SECTION ALONG B–B'



SECTION ALONG C–C'



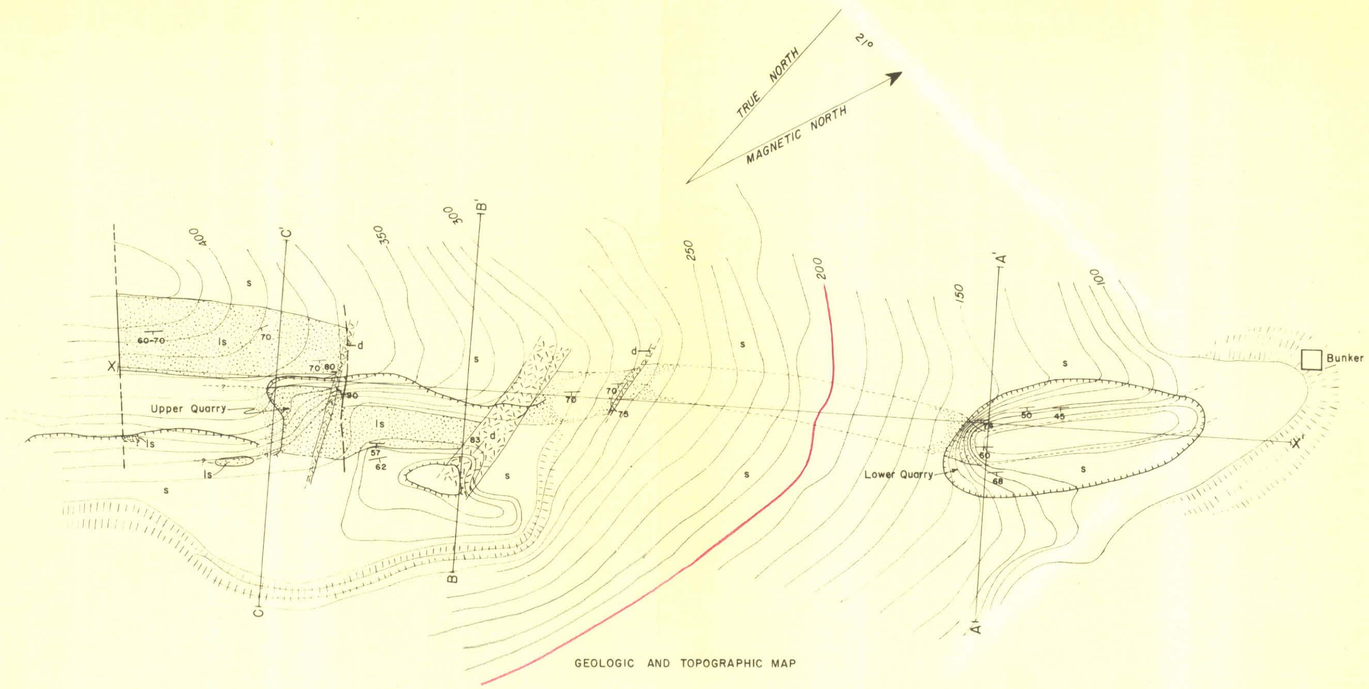
LOWER QUARRY



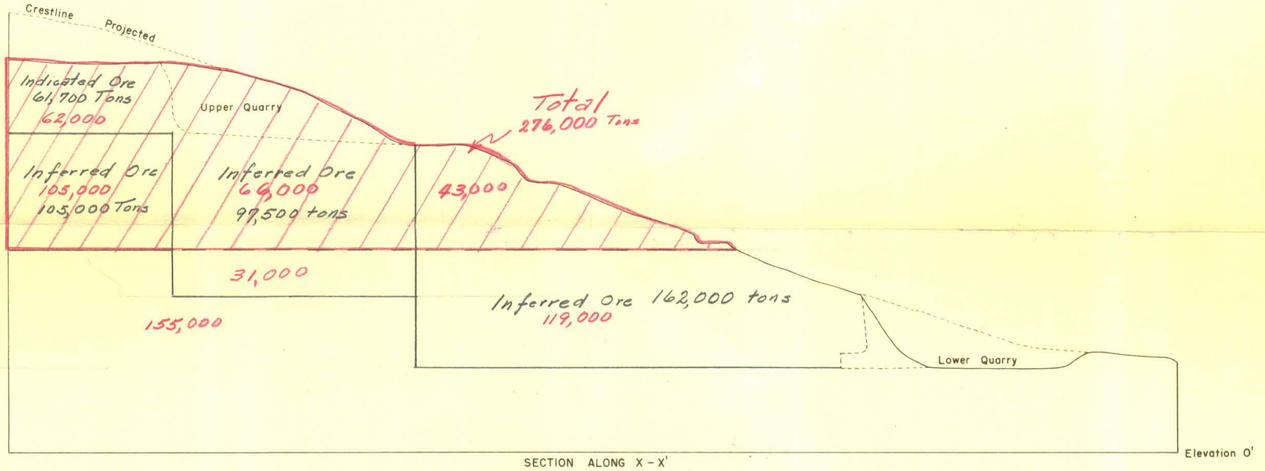
UPPER QUARRY

DIAGRAMMATIC SECTIONS OF UPPER AND LOWER QUARRIES

0 40 80 FEET



GEOLOGIC AND TOPOGRAPHIC MAP



SECTION ALONG X–X'

ORE RESERVS

Total indicated ore	61,700 tons
Total Inferred Ore	364,500 tons
Total Ore Reserves	435,200 tons

Hatched area represents tonnage available by normal quarrying methods (Bureau of Mines estimate)

EXPLANATION

- d — Diabase (?) dike
- ls — Limestone
- s — Metasedimentary rock
- Contact, dashed where approximately located, questioned where inferred
- 90 — Fault, dashed where approximately located, showing dip
- 62 — Strike and dip of beds
- Outline of workings, projected to line of sections
- Quarry
- Dump

Topography by plane table survey
Geology and topography by E. A. Youngberg and W. P. Puffett, March, 1951

GEOLOGIC MAP AND SECTIONS OF HORSEHEAD LIMESTONE DEPOSIT, SW¼ SEC. 15, T. 38 S., R. 5 W., JOSEPHINE COUNTY, OREGON

0 100 200 300 400 500 600 Feet

Contour interval 10 feet
Datum assumed