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PRINTED: 06/24/2002

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES AZMILS DATA

PRIMARY NAME: SANTA RITA LIMESTONE QUARRY

ALTERNATE NAMES:

FAGAN
HOMESTAKE LIME
SANTA RITA MARBLE QUARRY
MOUNT FAGAN MARBLE
BUTCH
RED STAR
SABADA
PFIZER LIMESTONE QUARRY
SPECIALTY MINERALS QUARRY
GEORGIA MARBLE QUARRY

PIMA COUNTY MILS NUMBER: 188

LOCATION: TOWNSHIP 18 S RANGE 15 E SECTION 11 QUARTER SE
LATITUDE: N 31DEG 52MIN 36SEC LONGITUDE: W 110DEG 46MIN 33SEC
TOPO MAP NAME: CORONA DE TUCSON - 7.5 MIN

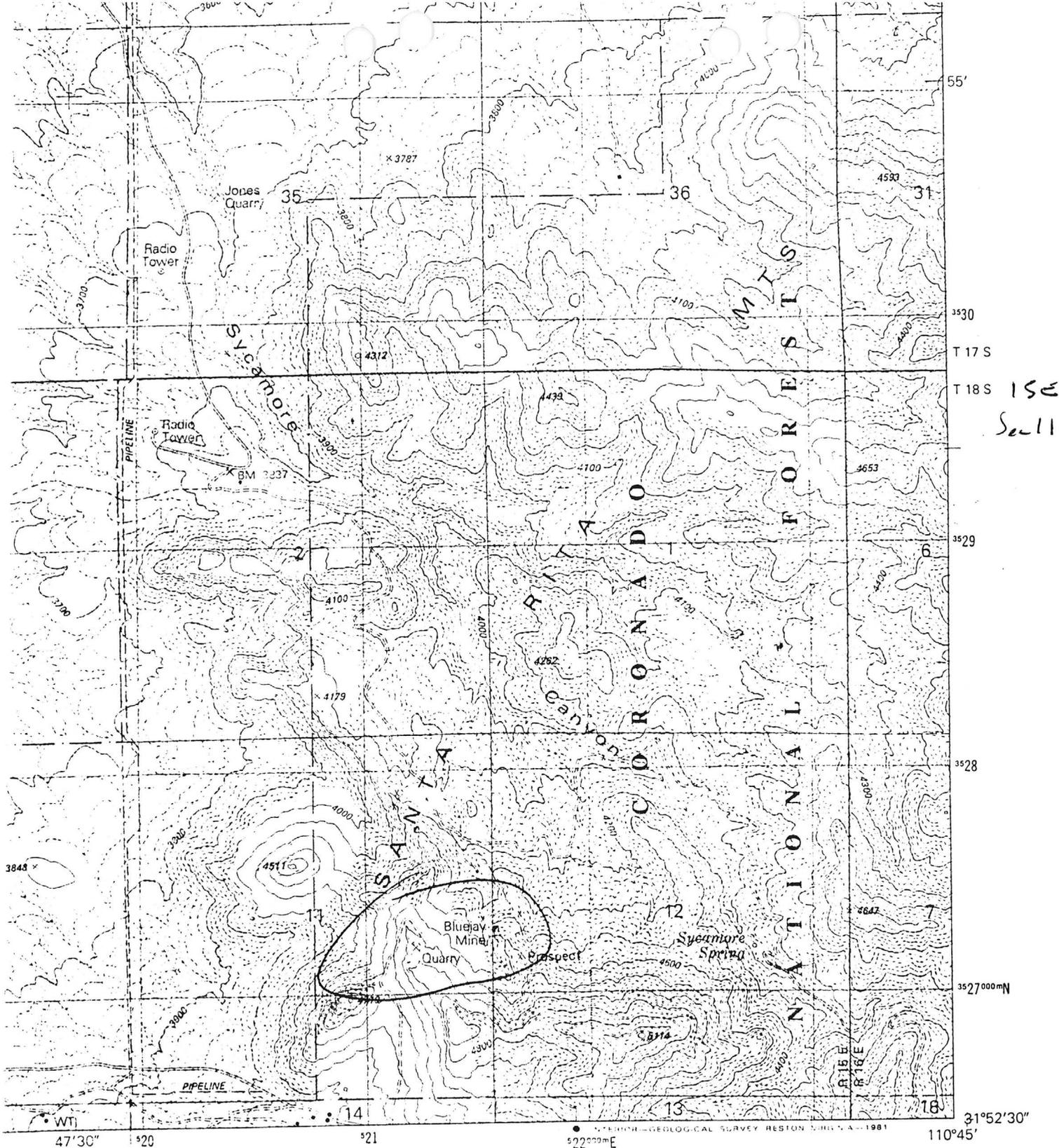
CURRENT STATUS: PRODUCER

COMMODITY:

CALCIUM CACO3 FILLER
CALCIUM LIMSTONE
STONE MARBLE

BIBLIOGRAPHY:

S.B. KEITH, AZBM BULL. 189, P. 128, 1974
USBM PROD TABS
ADMMR SANTA RITA LIMESTONE QUARRY FILE
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EYDE, T.H., & DAN EYDE, 1992, PRESENT & PAST
PRODUCERS OF WHITE CALCIUM CARBONATE PRODUCT
IN INDUSTRIAL MINERALS OF THE TUCSON AREA &
SAN PEDRO VALLEY, SE ARIZ., AZ GEOL. SOC.
FIELD TRIP GUIDE, APR 4 & 5, 1992, PP 37-47
PHILLIPS, KEN A., 1992, MINERAL ECONOMICS OF
INDUSTRIAL MINERALS IN SOUTHEASTERN ARIZONA
IN INDUSTRIAL MINERALS OF THE TUCSON AREA &
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FIELD TRIP GUIDE, APR 4 & 5, 1992, PP 31-42



15E
Section 11

MILE SANTA RITA Limestone



QUADRANGLE LOCATION

From
WIDE WORLD OF MAPS INC.
ARIZ. MAP SHOP & GALLERY
 Phoenix, Arizona

ROAD CLASSIFICATION

- Primary highway, hard surface
- Secondary highway, hard surface
- Light-duty road, hard or improved surface
- Unimproved road
- Interstate Route
- U. S. Route
- State Route

EMPIRE RANCH
3607 SW

CORONA DE TUCSON, ARIZ.
 NE 4 SAHUARITA 15' QUADRANGLE
 N 3152 5-W 11045/7.5

Santa Rita Limestone Quar

ABSTRACTED FROM ADMMR ACTIVE MINES DIRECTORY, 1992

Pima County

PFIZER<R>Specialty Minerals Division

Limestone

Santa Rita^v Quarry T18S R15E Sec. 15

Sahuarita, AZ, 1-800-255-5832 - Employees: 20- Located 15 miles southeast of Sahuarita - White marble quarry - Crushed and/or ground for landscape, functional filler, and chemical uses - Raymond roller mills - Sizing and bagging plant - Markets in Arizona and southwestern United States.

Site Manager Carlos Cardadeiro

ABSTRACTED FROM ADMMR ACTIVE MINES DIRECTORY, 1991

CALCIUM PRODUCTS OF ARIZONA

Santa Rita Quarry T18S R15E Sec. 15

P.O. Box 70, Sahuarita, AZ 85629 - Phone 444-7061, 1-800-345-5635

- Employees: 15 - Located 15 miles southeast of Sahuarita - White marble quarry - Crushed and/or ground for landscape, functional filler, and chemical uses - Raymond roller mills, sizing and bagging plant - Markets in Arizona and southwestern United States.

General Partner/Manager Bob Knox

Partner
Leon Knox

Production Foreman Bill De
Spain

Maintenance Foreman Anthony Bruno

ABSTRACTED FROM ADMMR ACTIVE MINES DIRECTORY, 1990

CALCIUM PRODUCTS OF ARIZONA

Santa Rita Quarry T18S R15E Sec. 15

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General Partner/Manager Bob Knox

Partner Leon Knox

Production Foreman Bill De Spain

Maintenance Foreman Anthony Bruno

ABSTRACTED FROM ADMMR ACTIVE MINES DIRECTORY, 1988

CALCIUM PRODUCTS OF ARIZONA

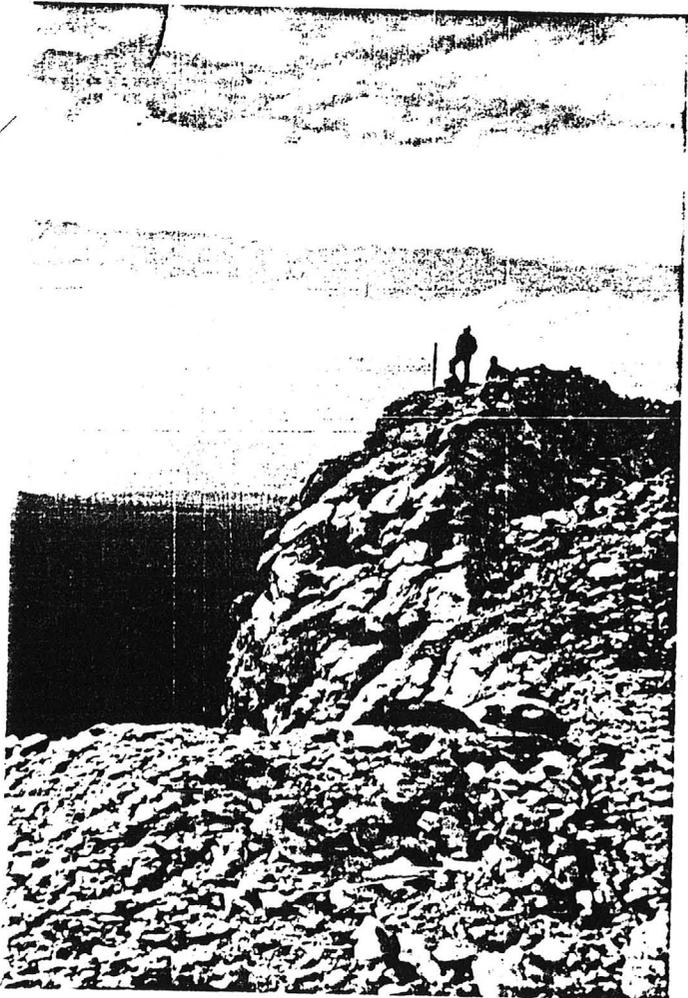
Santa Rita Quarry

T18S R15E Sec. 11

P.O. Box 70, Sahuarita 85629 - Phone 576-1424 - (Radio Extension - Dial 1112) or 1-800-345-5635 - Employees 5 - Located 15 miles southeast of Sahuarita - White marble and limestone for landscape use - Grinding plant under development.

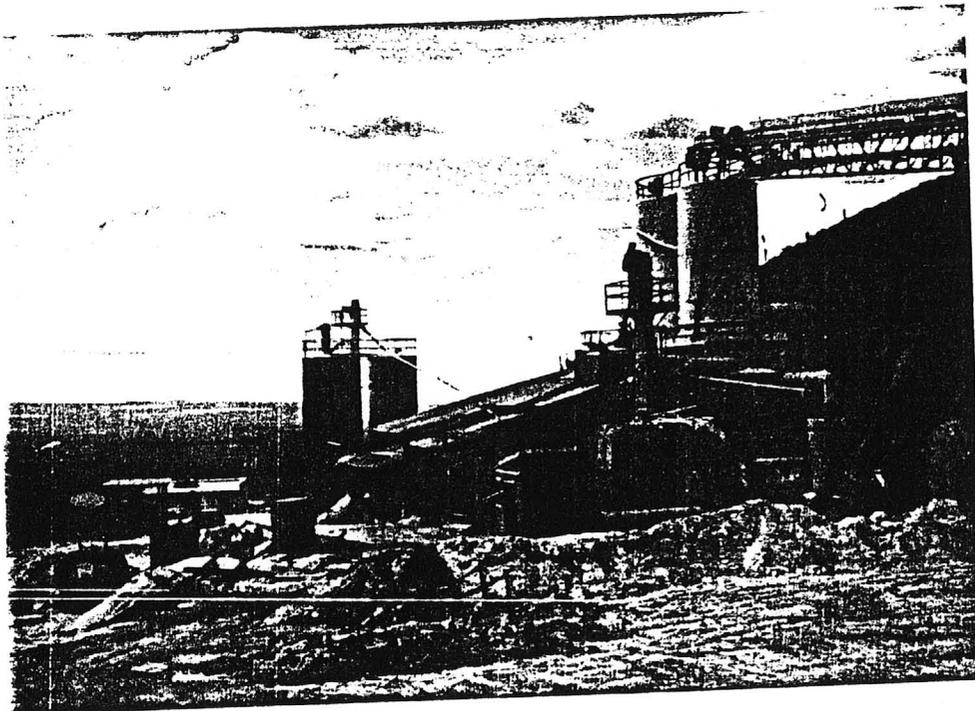
General Partner Bob Knox
Manager Bill Devitt

4/5/92. Santa Rita Limestone
Quarry.

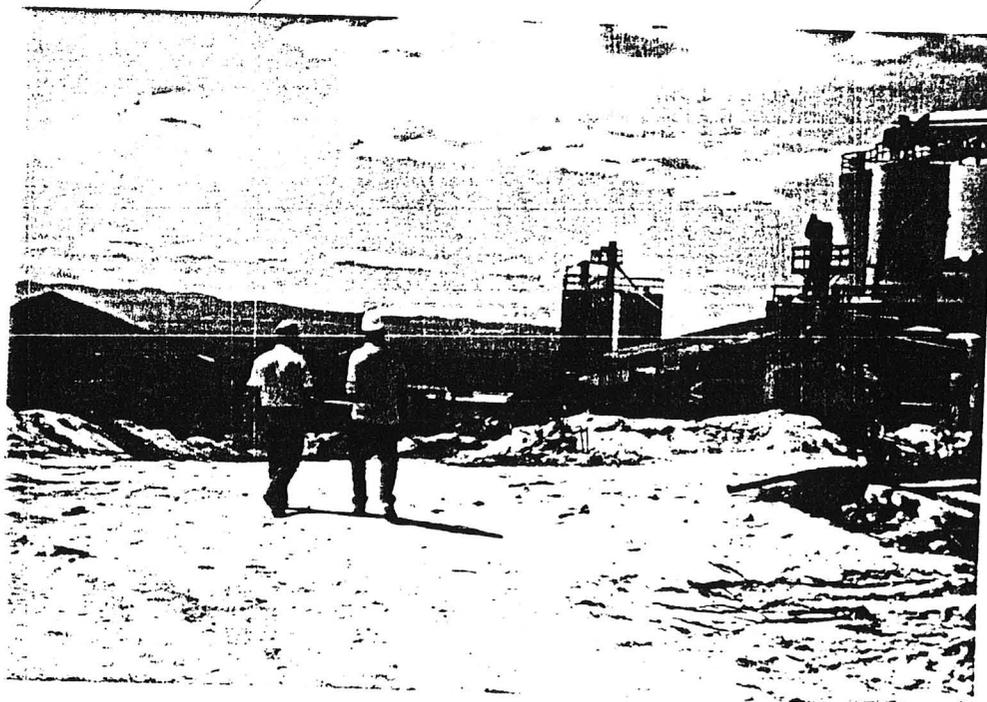


* Originals in photo file.

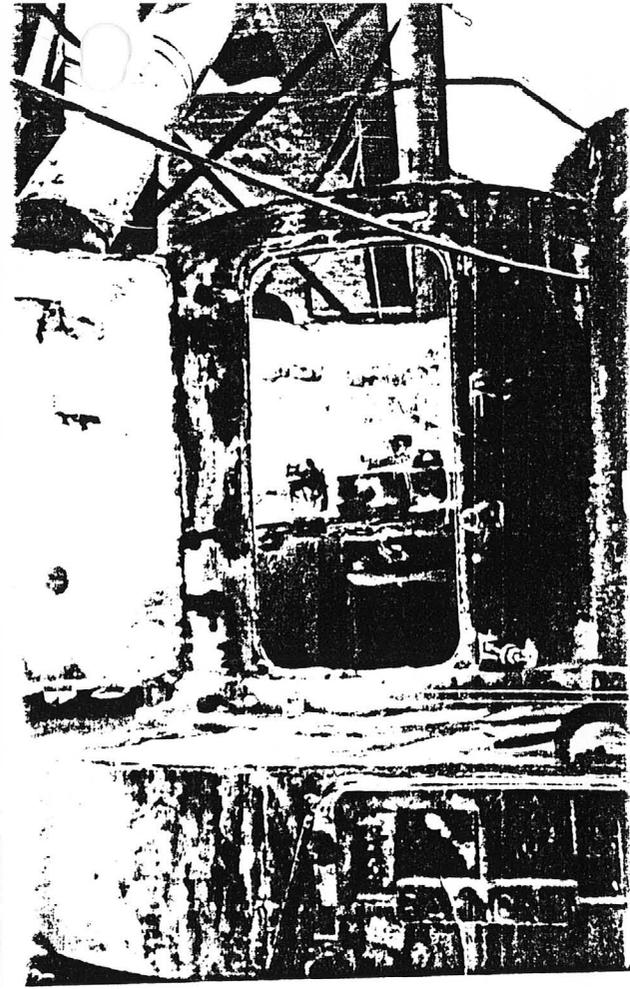
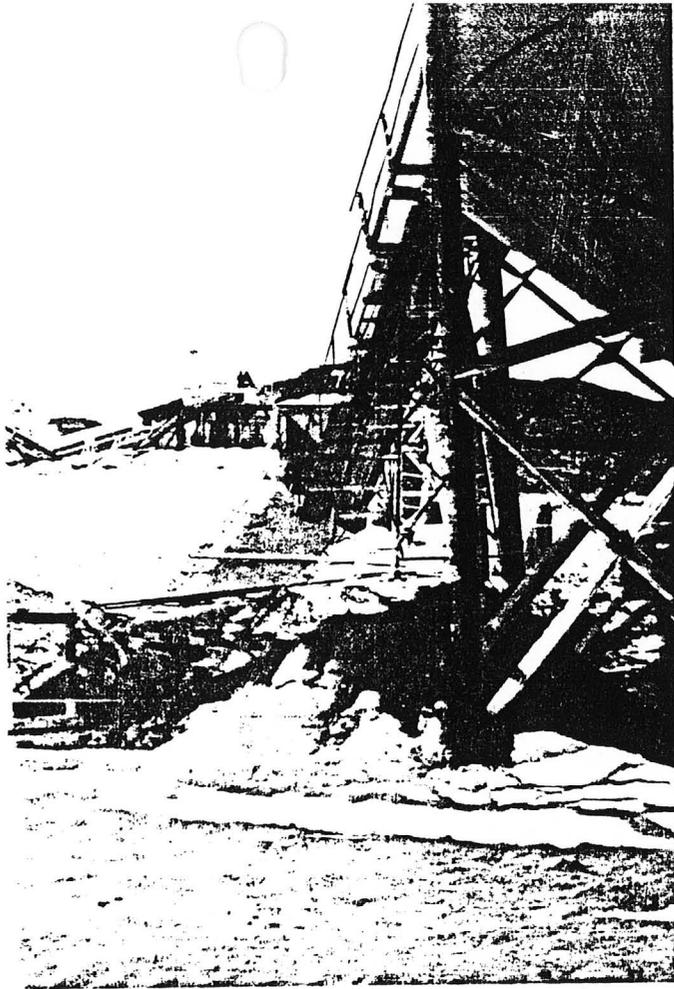
4/5/92. Raymond Mills dust collector, classifiers, bagging plant and storage bins for ground limestone plant.



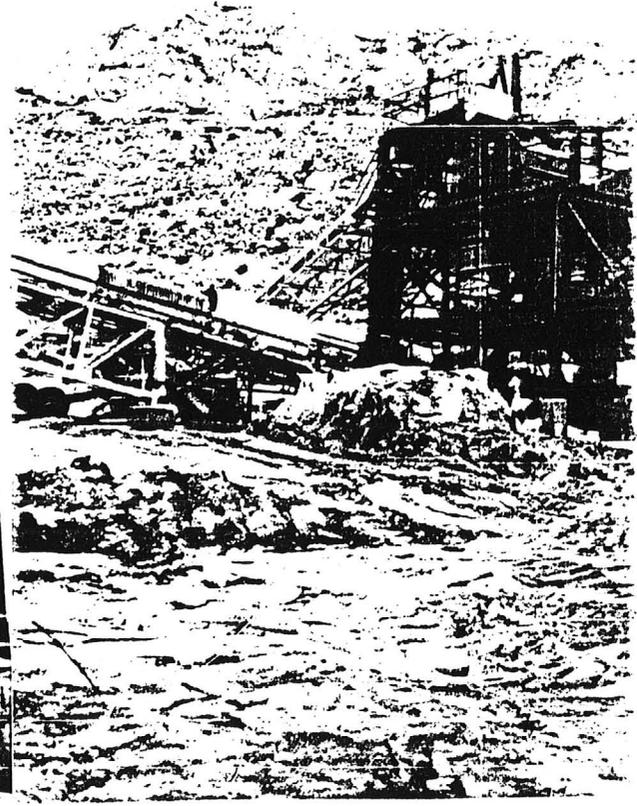
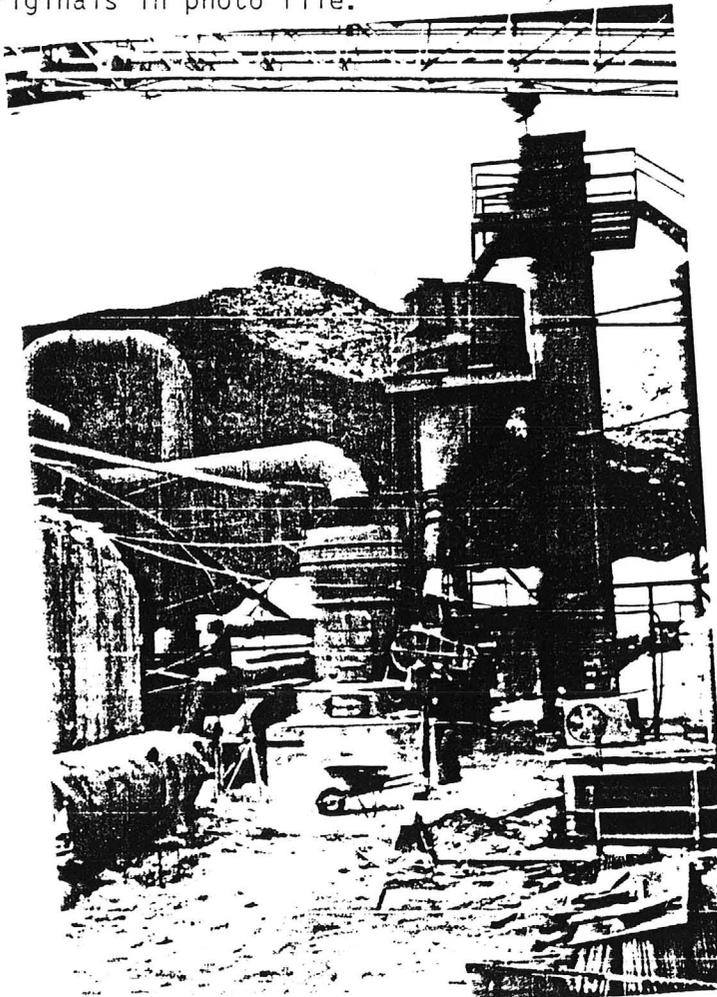
4/5/92. Limestone grinding plant.



*Originals in photo file.



Santa Rita Limestone Quarry. 4/5/92
Originals in photo file.



SANTA RITA LIMESTONE QUARRY

PIMA COUNTY

NJN WR 1/29/88: Bill Devitt (card) of Calcium Products of Arizona (card) reported that they have not yet set up the crusher and grinding plant at Santa Rita Limestone Quarry (file) Pima County. They are selling some decorative stone boulder pieces from the pit. He invited the Department engineers to visit the property.

HEM WR 5/13/88: The Santa Rita Limestone Quarry, Pima County was visited. The quarry is currently in operation but only producing a few hundred tons a week for use as landscape stone. The operator, Calcium Products, is seeking funding for a mill capable of producing a fine ground product for use as a mineral filler. Mining is scheduled to end soon at the north quarry site due to excessive overburden but a new site called the South Quarry is being prepared. The South Quarry and Mills site are near MILS 188, while the North Quarry is in T18S R15E Sec 11 SE. This operation is perceived by the general public as having created a giant white scar on the north face of the Santa Rita Mtns. In reality the white "scar" is mostly a natural outcrop of white marble and limestone surrounded by darker plutonic rocks.

SANTA RITA LIMESTONE QUARRY

PIMA COUNTY

RRB WR 5/8/87: Nick Fischer, Sales Representative, Calcium Products of Arizona, P O Box 70, Sahuarita, Arizona 85629, 1-800-345-5635 - home phone (602) 838-9080 brought in a sample of limestone from the Santa Rita Limestone Quarry (file) Pima County, and discussed possible markets. He will be back to get some information Mr. Phillips has gathered for him. Calcium Products of Arizona is a part of Jennott Mining Inc. This is apparently the company represented by Bob Knox, 6170 Lehman Drive, Suite C-100, Colorado Springs, CO 80907 (See RRB WR 6.13.86 and 6/20/86).

NJN WR 5/9/87: Nick Fisher, Calcium Products of Arizona (card) visited and donated a piece of recrystallized limestone (now marble) to the Museum. The specimen MM-M013 is from the Santa Rita Limestone Quarry (file) Pima County, which the company is putting into production. Specimen was white with crystals up to 1/3 inch and believed to be plus 98% calcium carbonate.

KAP WR 5/15/87: Nick Fischer, Sales Representative, Calcium Products of Arizona, P O Box 70, Sahuarita, Arizona 85629, phone 791-3041 Ext 1029 (a mobile phone), 1-800-345-5635, and 838-9080 (Mr. Fischer's home phone) was in to discuss markets for his company's future production of ground calcium carbonate. (Santa Rita Limestone Quarry - file) Pima County. A number of suggestions were made, most of which he was already pursuing. A Pacific Molasses liquid feed plant planned for Cas Grande may be their largest customer. The calcium carbonate (ground marble) product will be fine ground using Raymond Mills. The marble is very white and should find wide spread use as a mineral filler.

MG WR 7/31/87: Although some material is being sold for landscaping purposes, most of the mine product produced by Calcium Products at the Santa Rita limestone quarry (file) Pima County is being stockpiled. A grinding plant to reduce the material to -250 mesh (?) will be installed soon. Individuals may be employed to hand pick any material that would reduce the whiteness of the product.

KAP WR 1/15/88: Talked with Nick Fisher of Calcium Products, Santa Rita Limestone Quarry (file) Pima County, Phoenix area phone 838-9080 regarding the lime industry. He is trying to see if Calcium Products might be justified in putting in a lime plant. He said that things are pretty much at a standstill with Calcium Products.

SANTA RITA LIMESTONE QUARRY

PIMA COUNTY

VBD WR 3/16/76: Their lime plant in the Santa Rita Mts. It was resold to Mexican interests and is being reassembled near Naco, Sonora.

RRB WR 6/13/86: Bob Knox, 6170 Lehman Dr., Suite C-100, Colorado Springs, CO 80907, called for information about starting a mining operation. He is investigating the feasibility of operating the Santa Rita Limestone Quarry on the north end of the Santa Rita Mountains, Pima Co. I sent him a copy of "Pertinent Data" and offered our help.

RRB WR 6/20/86: Bob Knox visited to get acquainted and reports that he intends to produce limestone for the chemical and pharmaceutical market from the Santa Rita Limestone Quarries, Pima Co.

MG WR 10/3/86: The Santa Rita limestone quarry (MILS 188, Pima Co) is in the SE $\frac{1}{4}$, Sec 11, T18S R15E; our records incorrectly locate the quarry in the NE $\frac{1}{2}$, Sec 14. The mill site is in the N $\frac{1}{2}$, Sec 14, T18S R15E.

MG WR 10/3/86: The Santa Rita limestone quarry (Pima Co) is reportedly owned by Mr. Sherwood Owens. Mr. Bob Knox (c) and his associates have filed an initial plan of operations to mine the limestone for chemical and pharmaceutical purposes. The property is on forest service ground and the forest service is now debating whether the limestone is locatable or leasable; several years ago this same limestone was judged locatable by the BLM.

NJN WR 3/20/87: Dick Mieritz (c) reports the local address of Calcium Products of Arizona, a Colorado corporation (c), is P O Box 70, Sahuarita, Arizona 85629 office phone in Tucson 323-4667, mobile phone for mine 576-1424, at the beep ask for 1037. Bill Devitt (c) is in charge of the mining and crushing operation at the Santa Rita Limestone Quarry (file) Pima County. They plan to mine marble and market it as decorative stone, paint fillers and agricultural supplements. Although the mine is in Coronado National Forest, they have set up a crushing plant on the adjacent BLM land and will eventually set up a grinding plant.

HOMESTAKE PRODUCERS

In the Helvetia District Homestake Producers are developing their new lime plant. Of note in Pima County has been the newspaper attack on the limestone operations on the Homestake Production Co. GWI QR 4/1/71

Mine visit - Santa Rita Mining Co. lime plant. GWI WR 4/26/71

In Helvetia the Santa Rita Mining Co. limestone division continues work on their lime plant. They have obtained the contract to supply lime to Sierrita Mill of Duval-Sierrita. On April 23 a committee of the State Legislature held hearings in Green Valley where the citizens (some) were protesting the lime plant and Anaconda mining operations. Until the lime plant is in production, Santa Rita is buying lime thru Paul Lime company. GWI QR 6/30/71

Directory of Mining - August 1971 - 28 men.

December 6, 1971 - Learned Santa Rita Mining Co. (Homestake Production Co.) bought the Paul Lime Plant.

Santa Rita Mining Co. is producing lime from their Helvétia Plant. GWI QR 9/71

The Santa Rita Mining company continued with their lime stone mine and lime kiln in the Santa Rita Mts. in spite of continued pressure from the Green Valley area to have them removed from the tax rolls. GWI QR Oct-Dec '71

Santa Rita Mining Co. Lime Plant. GWI WR 5/9/72

Paul Spur Lime has a new county road around the south side of their operations. The Company has been purchased by Home-Stake Production Co. with J. Robison the vice president. The Santa Rita Mining Company continues to produce lime from their plant inspite of Newspaper articles, etc., from the Green Valley area. This could result in a landmark case if it gets into the courts. GWI QR Jan.-March'72

The Santa Rita Mining Co. is continuing production from their lime property while the various media complain about the operation. GWI 4 ½ '72

Jack Robison called and stated that all the old officers of the Homestake Producers had left the company and probably would be sued for mismanagement of funds. GWI WR 9/25/73
Owen Tip-Paul Lime and Santa Rita called to give us information on the staff, tonnage, etc. He ton, mgr. said that Homestake Producers problems should not affect their limestone operations. of GWI WR 9/25/73

HOMESTAKE PRODUCERS

Construction work at the Homestake Producers Company Lime Plant near Helvetia appears to be proceeding on schedule. GWI QR 6-30-70

Homestake Producers continued building their plant near Helvetia. GWI QR 10-1-70

Homestake Producers continue working on their lime plant near Helvetia. The kiln for the plant was observed at the Sahuarita railroad siding in November. Their mailing address is Sahuarita, Arizona 85629 GWI QR 12-31-70

Homestake Producers - Lawyer Title Building - 199 N. Stone - Jim Girard, Production Mgr. Sahuarita office - Box 37 (should be in production within 30 days) information from Herbert Dye, Tulsa office. GWI Note 2-18-71

Gerry Weathers said Homestake Productions has bought the Carlotta Mine. FTJ WR 2-26-71

J. (John) L. Robison, Vice President in charge of mining. Formerly with/McGee. Kerr-
GW. WR
3-11-71

J.L. Robison, new manager of Homestake Production Co. was in to get acquainted with the department. He says they will soon begin producing lime for Duval's mills soon. GW WR 3-11-71

To Carlotta mine. Talked to Joe Hoyt, driller for Metler Bros. Drilling Co. He was drilling the 3rd and last hole. He thinks PMC is in with Homestake Productions on the drilling and hopes Metler gets his money. FTJ WR 3-31-71

Home-Stake Production Co., Room 308, Financial Center, Phoenix. Dennis K. Pickens, Sr. Vice President; George Freeman, Manager of Mines in Phoenix office. They are going to incorporate an Arizona company for all their oil, gas, and metal activities in Arizona. Limestone property will operate under Santa Rita Mining Co - Joe Robison, ;Manager in Tucson. (Details not fully complete as of 4-16-71) JHJ conf. with Mr. Pickens

- - -
4-16-71 Mr. J. L. Robison now Sr. Vice President of Home-Stake Production Co. Phoenix office is closed. Tucson office - Suite 305, 199 N. Stone, Tucson (Robison's private phone: 791-9135). Mr. Robison appointed Vice President and Manager of Santa Rita Mining Co. the subsidiary company who will be mining limestone in Pima County. Mr. Dennis K. Pickens no longer with the firm.

Homestake Producers were exploratory drilling on the Carlotta mine west of Castle Dome at the close of the quarter. FTJ QR 4-5-71

HOMESTAKE PRODUCTION COMPANY

Homestake Production Company of Tulsa Oklahoma announced the building of a lime plant at Helvetia. GWI Quarterly Report 2/27/70

The Home-Stake Production Company of Tulsa Oklahoma, started working on their lime plant near Helvetia. GWI Quarterly Report 4/1/70

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES

VERBAL INFORMATION SUMMARY

1. Information from: Tim Whitney, Murco Wall Products
2. Address:
3. Phone:
4. Mine or property name: Santa Rita Limestone
5. ADMMR Mine file:
6. County:
7. MILS Number:
8. Operational Status:
9. Summary of information received, comments, etc.:

Jury still out.

Start up problem.

Rate 7 $\frac{1}{2}$ tons/hr, actual at 4

First load about 1-19-1990

Murco has picked up 5 loads, rejected 3 primarely because of sizing.

Date: 1-24-1990

Ken A. Phillips

Santa Rita Quarry file

CALIFORNIA INSTITUTE OF TECHNOLOGY

PHYSICS DEPARTMENT 161-33
PASADENA, CA 91125

tel. (818) 395-4304, fax (818) 568-8263
e-mail novikov@cco.caltech.edu

August 1, 1996

Ken A. Phillips, Chief Engineer
Department of Mines and Mineral Resources
State of Arizona

Dear Mr. Phillips:

This is to inform you that we have finally completed the search for low radioactive aggregate for our Palo Verde neutrino laboratory. We've chosen marble from Queen Creek - one out of three options in Arizona you've suggested to us.

We went through many samples of minerals which we have received from many places in the USA and Canada. We have measured radioactivities in the samples by means of γ -spectrometry, using Caltech's low background facility (semiconductor Ge detector). The sensitivity of this technique is ~ 1 ppb - well below of the required purity of materials needed for the construction (~ 100 ppb of ^{238}U , ^{232}Th , ^{40}K).

Please find enclosed the results of our measurements. Some samples have shown U, Th, K concentrations much below that from Queen Creek. However, radioactivities in the final concrete mixture are governed by radioactivities in cement (16.5% by weight). From this point of view, as well as for reasons of cost (material+shipping), the marble from Queen Creek is clearly our best option. Concentrations of ^{238}U , ^{232}Th and ^{40}K in the final concrete mixture based on marble from Queen Creek are very close to our design goal.

I would like to thank you again for your cooperation which was very important for the progress of our neutrino experiment.

Sincerely yours,



Dr. Vladimir M. Novikov

Sand & Gravel

S A M P L E	CONCENTRATION, ppb		
	K-40	U-238	Th-232
BASALT Phoenix, AZ	2110+/-100	3420+/-460	14682+/-2041
SAND B-9 Palo Verde, AZ	2578+/-124	1492+/-230	6643+/-1109
MARBLE (<i>Queen Creek Limestone</i>) Queen Creek, AZ	111+/-9	434+/-62	142+/-69
MARBLE (<i>Santa Rita Quarry</i>) Sahuarita, AZ	62+/-11	238+/-46	159+/-104
DOLOMITE Kingman, AZ (<i>Shipley Pit</i>)	43+/-4	262+/-35	188+/-44
DOLOMITE Salinas, CA	2.2+/-1.4	120+/-20	< 68
DOLOMITE Haley, Ontario	27+/-3	68+/-11	69+/-24
OLIVINE Bellingham, WA	2.4+/-0.6	< 4	10+/-7

Cement

HOLNAM, Theodore, AL	371+/-31	6602+/-846	4447+/-746
ORDINARY, Phoenix, AZ	633+/-25	1365+/-175	3288+/-451
WHITE, Waco, TX	118+/-9	1898+/-242	2359+/-337

Samples here described from the mine listed below are contained in the AzDMMR collection of reference samples.

Date Taken: 04/04/92
Date Logged: 09/30/93
Sample Number: 04/04/92-019

MINE: Santa Rita Limestone (*file*)
COUNTY: Pima
LOCATION: Select sample from main quarry
DESCRIPTION: Select sample of crystalline marble from quarry.
MATERIAL: White marble

Date Taken: 04/04/92
Date Logged: 09/30/93
Sample Number: 04/04/92-022

MINE: Santa Rita Limestone
COUNTY: Pima
LOCATION: Stockpile of landscape material.
DESCRIPTION: White marble; -1" crushed and screened landscape material.
MATERIAL: Marble.
COMMENTS: SMI's -1" landscape material which wholesales for \$11.00 per ton bulk in truckload quantities.

Date Taken: 05/00/93
Date Logged: 09/30/93
Sample Number: 05/00/93-024

MINE: Santa Rita Limestone
COUNTY: Pima
LOCATION: Sample from bag of SMI's pool mix at Mason Mart
DESCRIPTION: Marble sand, white, crushed, screened, and blended.
MATERIAL: Marble sand. SMI's blend for swimming pool plaster sand.
COMMENTS: Why isn't as white as the material from Basins, Wyoming? Does it matter? A sample was sent to ATL for sieve analysis.

Arizona Department of Mines and Mineral Resources

MINE VISIT

Information from: Tony Bruno, Maintenance Manager
Calcium Products of Arizona

Mine: Santa Rita Limestone Quarry

ADMMR Mine File: Same

County: Pima

No. of Claims - Unpatented: Number of claims not known

Owner (if different from above): Sherwood Owens

Address:

Operating Company: Calcium Products of Arizona

Pertinent People and/or Firm: Bob Knox (of Calcium Products)

Commodities: Calcium carbonate, ground limestone for filler applications, athletic field lining chalk, crushed landscape rock, marble boulders for landscape use.

Operational Status: Operating

Summary of information received, comments, etc.:

A visit was made to the above operation. Tony Bruno, Maintenance Manager, provided a tour.

The operation produces three primary products: a filler grade ground limestone for the wall board joint cement manufacturing industry, a marble gravel for landscape use, and decorative marble boulders. A additional product, athletic field lining chalk, is produced as a byproduct. In actuality it is an off grade filler material that may have oversize particles or contamination by dark specks. About 22 loads of 24 tons each of the joint cement material is shipped bulk to Murco Wall Products in Buckeye each month. An additional truckload or two a week of bagged joint cement material is being shipped to Highland Products. Landscape rock and gravel and landscape boulders are sold in individual orders.

White crystalline marble is quarried from two pits on the property; the main quarry and the south quarry. Most production, and the cleaner material has been produced from the main quarry. Only a couple of hundred tons has been produced from the south quarry.

Mining is accomplished by drilling benches with an air track drill, loading and shooting the bench. Broken material is loaded in a 25 ton mine truck and

hauled to a coarse ore stockpile at the crushing plant. Considerable amount of extreme oversize has been produced by the blasting methods. The marble deposit is crossed by a number of dark veins of material which have been selectively avoided or removed to minimize contamination of the white marble. More or less three benches have been developed in the main quarry. Additional development work is needed for improvements in quality and production efficiency from the quarry. Drilling and blasting is done as needed a few times a year.

Crude ore is fed across a grizzly to a 36" X 24" jaw crusher, the discharge of which is screened to produce a 2" landscape rock. Minus 2" material reports to a secondary 18" X 24" jaw crusher, screens and a set of rolls to produce various sizes of landscape material and minus 5/8 inch feed for the Raymond mill. The crushing - screen plant is reportedly rated at 90 tons/hr and is operated on an 8 hour day, 5 day a week basis. Raymond mill feed is conveyed to a 50-100 ton coarse ore feed bin.

Coarse ore is fed to the Raymond mill circuit by a conveyor with magnets to remove any iron contamination. Feed to the Raymond mill is pressurized and heated to 200°C. Ground classified product is remove from the top of the mill under a vacuum. Discharge particle size is determined by a combination of feed air pressure, discharge vacuum, and wissor rpm. The Raymond mill is purported to be rated at 7 tons per hour, but only able to produce 2 - 2.5 tons per hour. It is run about 22 hours per day, 7 days a week. Mill discharge is run through a cyclone to produce the final 100% -70 mesh, 90% -325 mesh product for wall board joint cement. Any material which does not meet particle size specifications or contains any contamination is bagged separately for hopeful sale as athletic field lining chalk. Forty to 50 tons of such material was in inventory at the time of my visit.

Date: March 15, 1990 Ken A. Phillips
Signature ADMMR

General Information

PRICING: Limestone products are priced per ton (unless otherwise stated), 20 ton minimum truckloads for each F.O.B. point indicated, freight collect. Prices subject to change without notice. Invoiced prices will be those in effect at time of shipment.

QUANTITY DIFFERENTIALS: TL/CL (20 ton minimum) – List
10-20 Tons: Add \$30.00/Ton
5-10 Tons: Add \$50.00/Ton
Less Than 5 Tons: Add \$75.00/Ton

All mineral products available from a single F.O.B. point may be combined to obtain the truckload price.

TERMS: Net 30 days.

MINIMUM ORDER: \$300.00 per F.O.B. point.

PACKAGING: 50 lb. multiwall paper bags except where noted.
*Stretch wrapped at no additional cost.

PALLETS: A \$13.00 per pallet deposit required. A \$2.00 per pallet service charge will be deducted upon the return of a reusable pallet. One-way pallets available at \$9.00 each.

SLIP SHEETS: No charge.

STRETCHWRAP: Available at \$5.00/pallet.



SPECIALTY MINERALS

For information, order placement or your LTL Distributor, please contact the nearest office listed below.

SALES OFFICES

LOS ANGELES, CA 90023—2800 AYERS AVENUE.....(213) 780-0420
Robert Lee or (800) 255-5832

BETHLEHEM, PA 18107.....(215) 882-8720
John Fruhmann

Technical Service:
EASTON, PA 18042(215) 250-3289

Marketing:
EASTON, PA 18042(215) 250-3036

PRICE LIST

EFFECTIVE: JANUARY 1, 1992

Pima County, Arizona

PRICE PER TON
F.O.B. SAHUARITA, ARIZONA
T/L - 20 TON MIN.

	CODE	PRODUCT NAME	BAG	BULK
MARBLEWHITE ®	WAMW4500	Marblewhite A 4500	\$70.00	-
	WAMW0325	Marblewhite A 325	49.00	29.00
	WAMW0200	Marblewhite A 200	47.00	28.00
	WAMW2000	Marblewhite A 2000	42.00	-
	WAMW 0050	Marblewhite A 50	43.00	-
FEED LIMESTONE	WACG0069	Calcium Grits A 69	48.00	28.00
MARBLEMIX ®	WAPM1600	Marblemix A	46.00	29.00
DECORATIVE STONE	WADR1000	Viroc ® A #1	-	20.00 14.00
	WADR 2000	Viroc A # 2	-	21.00 14.00



SPECIALTY MINERALS

PFIZER INC., 235 EAST 42nd STREET, NEW YORK NY 10017

Santa Rita file (Prima) Cor

APR 20 1990

DATE: April 19, 1990

TO: N. R. Fuller

SUBJECT: TSR 3515-90-3 MURCO WALL PRODUCTS
(An Addendum to March 30, 1990 Report) *Not @ ADMMA*

We received a sample of Cal Product #325, a competitive limestone, for evaluation of its various properties.

The results are as follows:

	<u>CA Prod #325</u>	<u>MW 325</u>
AVE. PSD	18.15 Microns	12.7 Microns
Dry Brightness	92.1	94.50
Plus b	2.9	1.50
Oil Absorption	15.0	15.0
CaCO ₃	96.93%	97.0%
Acid Insolubles/ including SiO ₂	2.4%	0.53%
+80 Mesh	Clear	Clear
+325 Mesh	6.9%	1.0%

Alton Brumfield
Alton Brumfield
Quality Assurance Manager

AB:js

cc: R. E. Lee
R. Rinker
G. R. Jividen
R. Parikh
C. Cardadeiro
File AB90-14

Bondar-Clegg & Company Ltd.
 130 Pemberton Ave.
 North Vancouver, B.C.
 V7P 2R5
 (604) 985-0681 Telex 04-352667



Santa Rita Quarry, Pima

**Geochemical
 Lab Report**

A DIVISION OF INCHCAPE INSPECTION & TESTING SERVICES

DATE PRINTED: 1-FEB-91

REPORT: V91-32033.0

PROJECT: SAHUARO PETRO PAGE 1A

SAMPLE NUMBER	FLMMENT UNITS	SiO2 PCT	TiO2 PCT	Al2O3 PCT	Fe2O3 PCT	MnO PCT	MgO PCT	CaO PCT	Na2O PCT	K2O PCT	LOI PCT	P2O5 PCT
R2 A28328	<i>SHIPLEY PIT</i>	9.16	0.01	0.28	0.20	0.03	15.30	33.00	<0.01	0.03	41.39	0.22
R2 A28335	<i>SANTA RITA</i>	3.17	<0.01	0.26	0.06	0.03	0.33	54.80	<0.01	0.02	41.72	0.18

Sample A28335 from Santa Rita limestone quarry. Sample is of hand picked white marble.

Bondar-Clegg & Company Ltd.
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Geochemical Lab Report

A DIVISION OF INCHCAPE INSPECTION & TESTING SERVICES

REPORT: V91-32033.0

DATE PRINTED: 1-FEB-91

PROJECT: SAHUARO PETRO

PAGE 1B

SAMPLE NUMBER	FILMENT UNITS	Totals PCT	BaO PCT	Cr2O3 PCT	S Tot PCT
R2 A28328		99.62	<0.00	<0.01	<0.02
R2 A28335		100.57	<0.00	<0.01	0.02

Bondar-Clegg & Company Ltd.
 130 Pemberton Ave.
 North Vancouver, B.C.
 V7P 2R5
 (604) 985-0681 Telex 04-352667



Geochemical
 Lab Report

A DIVISION OF INCHCAPE INSPECTION & TESTING SERVICES

REPORT: V91-32033.0 (COMPLETE)

REFERENCE INFO:

CLIENT: ARIZONA DEPARTMENT OF MINES
 PROJECT: SAHUARO PEIRO

SUBMITTED BY: K. PHILLIPS
 DATE PRINTED: 1-FEB-91

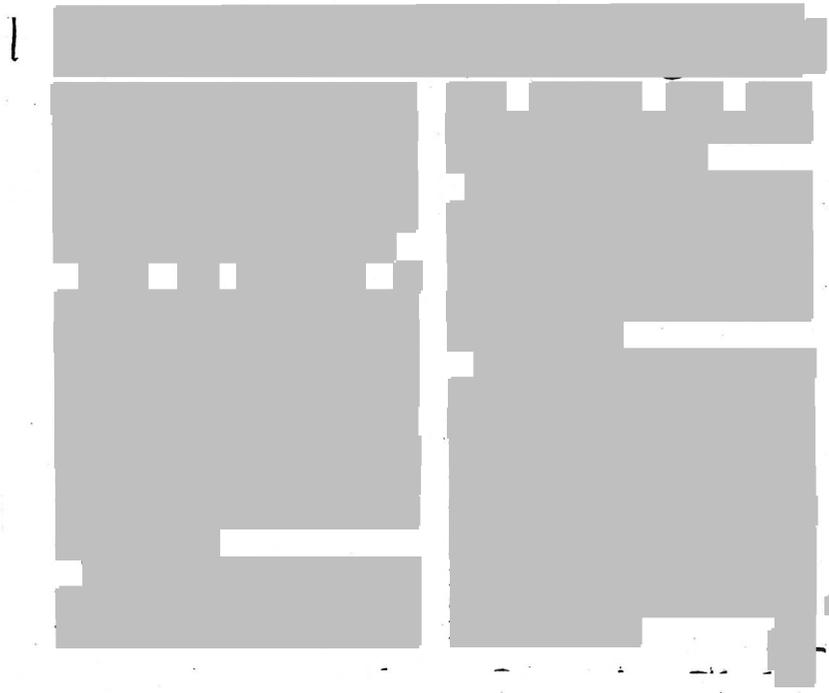
ORDER	ELEMENT	NUMBER OF ANALYSES	LOWER DETECTION LIMIT	EXTRACTION	METHOD
1	SiO2 Silica	2	0.01 PCT	Borate fusion	DC Plasma Emission
2	TiO2 Titanium (TiO2)	2	0.01 PCT	Borate fusion	DC Plasma Emission
3	Al2O3 Alumina (Al2O3)	2	0.01 PCT	Borate fusion	DC Plasma Emission
4	Fe2O3 Total Iron as Fe2O3	2	0.01 PCT	Borate fusion	DC Plasma Emission
5	MnO Manganese (MnO)	2	0.01 PCT	Borate fusion	DC Plasma Emission
6	MgO Magnesium (MgO)	2	0.01 PCT	Borate fusion	DC Plasma Emission
7	CaO Calcium (CaO)	2	0.01 PCT	Borate fusion	DC Plasma Emission
8	Na2O Sodium (Na2O)	2	0.01 PCT	Borate fusion	DC Plasma Emission
9	K2O Potassium (K2O)	2	0.01 PCT	Borate fusion	DC Plasma Emission
10	LOI Loss On Ignition	2	0.01 PCT		Gravimetric
11	P2O5 Phosphorous (P2O5)	2	0.01 PCT	Borate fusion	DC Plasma Emission
12	Totals Whole Rock Totals	2	0.01 PCT		
13	BaO Barium (BaO)	2	0.01 PCT	Borate fusion	DC Plasma Emission
14	Cr2O3 Chromium (Cr2O3)	2	0.01 PCT	Borate fusion	DC Plasma Emission
15	S Tot Sulphur (Total)	2	0.02 PCT		leco

SAMPLE TYPES	NUMBER	SIZE FRACTIONS	NUMBER	SAMPLE PREPARATIONS	NUMBER
R ROCK OR BED ROCK	2	2 -150	2	PULVERIZING	2

REPORT COPIES TO: MR. KEN PHILLIPS
 MR. MIKE DOYLE

INVOICE TO: MR. MIKE DOYLE

*Santa Rita Quarry
(S)*



CALCIUM PRODUCTS OF ARIZONA

P.O. BOX 70 / SAHUARITA, ARIZONA 85629
TUCSON AREA (602) 791-3041 EXT. 1029
INFORMATION 1 (800) 345-5635

March 27, 1987

ir

Gentlemen:

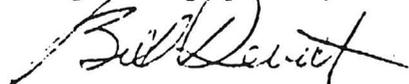
This letter is notification that mining operations will be initiated in the near future at the Santa Rita limestone quarry. Location is 12 miles ESE of Sahuarita, in Sections 11 & 14, T18S, R15E, Pima County.

Drilling and blasting will develop feed for a crushing and screening plant recently constructed onsite. A continuous operation (40 hr/week) is planned, with plant expansion to include grinding facilities to produce fine white mineral filler for various industrial uses.

Operation of the quarry (Section 11) is under approved permit with the U.S. Forest Service; the plantsite (Section 14), under approved permit with the BLM.

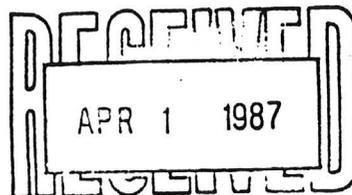
We anticipate your personnel will soon be visiting onsite. To communicate, our mine office radiophone requires dialing the extension following a ring and tone signal. Or you can leave a message with our Tucson answering service at 323-4667.

Very truly yours,



Bill Devitt
Mining Engineer
Manager

cc: R. Knox -



ARIZONA DEPT. OF MINES & MINERAL RESOURCES
STATE OFFICE BUILDING
416 W. CONGRESS, ROOM 161
TUCSON, ARIZONA 85701

HOME-STAKE SULPHUR COMPANY

P. O. BOX 7277
INDIAN SCHOOL STATION
PHOENIX, ARIZONA 85011

RECEIVED
OCT 27 1969

Affiliated with:

HOME-STAKE PRODUCTION COMPANY
PHILTOWER BUILDING
TULSA, OKLAHOMA 74103

October 27, 1969

Arizona Department of Mineral Resources
Mineral Building
Fairground,
Phoenix 85007

Dear Sirs,

We refer to article appearing in last Friday's Gazette on analysis of copper mining situation with emphasis on Arizona prepared by Mr. B.H.Gerwin.

We would very much appreciate receiving copy of this report and attach stamp to cover postage.

Yours very truly,

HOME-STAKE PRODUCTION COMPANY

D. K. Pickens

Dennis K. Pickens
Senior Vice President

HOME-STAKE PRODUCTION COMPANY.

P O BOX 7277
INDIAN SCHOOL STATION
PHOENIX ARIZONA 85011

U.S. DEPARTMENT OF MINERAL RESOURCES
Mineral Building, Fairgrounds
Phoenix, Arizona

1. Information from: Tucson Daily Citizen 8-14-70 (R.E. Wilber) (See article)
Address: ~~Home State Products~~
2. Mine: Home State Production Co
320 Acres - Grants
3. No. of Claims - Patented ?
Unpatented ?
4. Location: _____
5. Sec _____ Tp _____ Range _____
6. Mining District _____
7. Owner: _____
8. Address: _____
9. Operating Co.: _____
10. Address: _____
11. President: _____
12. Gen. Mgr.: James Girard
13. Principal Metals: _____
14. No. Employed: 35
15. Mill, Type & Capacity: _____
16. Present Operations: (a) Down (b) Assessment work (c) Exploration
(d) Production (e) Rate _____ tpd.
17. New Work Planned: _____

18. Misc. Notes: 8 million tons 2000 T.P.D.

Date: 8-18-70

JW D
(Signature)

(Field Engineer)

Empire Mts. Group Limestone
(AKA Mt. Fagan Limestone)
Pima Co.

Pox 595
Sahuarita, Arizona
October 23, 1964

Mr. Mark Lintz
Pox 672
Prescott, Arizona

Dear Mr. Lintz:

Enclosed is some of the information that I promised you. The area enclosed in red is the most important area for the limestone. It is where the samples were taken, including the sample sent to the Colorado School of Mines.

The average grade of 47 samples is 96.798 CaCO₃. If the one low sample is thrown out the remaining average 97.51. Our geologist estimated a reserve of 30,000,000 tons on the lease M982.

I would suggest that you pick up a quadrangle map of the Empire Mountains and if you do not have one, borrow a Southern Arizona Guidebook II, published by the Arizona Geological Society.

I hope that the enclosed material will be of help, sorry for the long delay.

Very truly yours,


G. W. Irvin

ARIZONA DEPT. OF MINES & MINERAL RESOURCES
STATE OFFICE BUILDING
416 W. CONGRESS, ROOM 161
TUCSON, ARIZONA 85701

Empi Group Limestone
(AKA: Mt. Fagan Limestone)
Pima Co.

ANALYSIS OF LIMESTONE SAMPLES

Sample No.	% CaCO ₃	% MgCO ₃	% Insoluble Residue	% Fe and Al oxides by difference	Remarks
1-A-1	96.32	0.43	3.18	0.07	Insol. matter high in clay & mica; organic matter present.
1-A-2	97.66	0.14	1.90	0.30	
1-A-3	97.77	0.28	1.73	0.22	
1-A-4	95.77	0.28	5.70	0.25	
1-A-5	97.16	0.00	2.25	0.50	
1-A-6	65.67	0.00	33.66	0.47	
1-A-7	95.37	0.00	4.33	0.23	
1-A-8	99.02	0.28	0.61	0.08	Organic mat. present.
1-A-9	96.24	0.14	1.53	0.06	
1-A-10	96.52	0.14	2.31	0.53	
1-A-11	94.33	0.03	4.13	0.07	
1-A-12	93.02	0.14	5.36	0.10	
1-A-13	93.02	0.42	1.22	0.54	
1-A-14	95.67	0.28	1.27	0.37	
1-A-1-1	97.04	0.00	2.92	0.03	
1-A-2-2	93.33	0.28	1.20	0.14	
1-A-3-3	95.23	0.00	3.43	0.60	
1-A-4-4	--	--	--	--	
1-A-5-5	97.97	0.14	1.88	0.41	
1-A-6-6	93.00	1.27	2.01	0.60	

Sample No.	% CaCO ₃	% MgCO ₃	% Insoluble Residue	% Fe and Al oxides by difference	Remarks
1-A-7-7	96.33	1.70	1.30	0.15	
1-A-8-8	98.64	0.00	1.00	0.36	
1-A-9-9	98.20	0.14	1.16	0.50	
1-A-10-10	98.07	0.42	0.99	0.51	
1-A-11-11	95.30	0.14	4.11	0.45	
1-A-12-12	98.16	0.42	1.16	0.26	
1-A-13-13	98.37	0.28	1.20	0.14	
2-B-1	98.88	0.14	0.57	0.41	
2-B-2	99.10	0.57	0.18	0.14	
2-B-3	98.47	0.14	1.07	0.31	
2-B-4	---	---	---	---	
2-B-5	97.70	0.28	1.68	0.34	
2-B-6	---	---	---	---	
2-B-7	98.65	0.42	0.54	0.38	
2-B-8	99.21	0.00	0.20	0.60	
2-B-9	99.28	0.14	0.53	0.05	
2-B-10	97.34	0.42	1.90	0.33	
1-O-1	98.45	0.56	0.77	0.22	
1-O-2	99.27	0.28	0.14	0.30	
1-O-3	95.71	3.24	0.60	0.45	

Sample No.	% CaCO ₃	% MgCO ₃	% Insoluble Residue	% Fe and Al oxides by difference	Remarks
1-B-1-1	98.78	0.00	0.58	0.65	Much mica present; phosphate may be present.
1-B-2-2	91.52	4.25	3.64	0.59	
1-B-3-3	99.11	0.14	0.33	0.42	
1-B-4-4	99.45	0.14	0.05	0.36	
1-B-5-5	97.32	0.00	2.16	0.52	
1-B-6-6	97.76	0.57	1.35	0.32	
1-B-7-7	97.05	0.00	1.97	0.98	
1-B-8-8	97.50	0.14	0.07	0.29	
1-B-9-9	99.07	0.14	0.66	0.13	
1-B-10-10	98.13	0.27	1.05	0.54	

In addition to silica, the insoluble matter contained varying amounts of clay, mica and organic matter. Iron and aluminum were uniformly low. The proportion of aluminum to iron tended to be higher in those specimens that contained mica.

Total number of samples = 47.

Unweighted average = 96.8% CaCO₃
 Leave out 1-A-6 Average 97.51% CaCO₃
 Leave out 1-B-2-2 MgCO₃ = .35
 Insol 1.71 45 sample
 FeO 1.33

s/ R. Z. Kothavala

ARIZONA DEPT. OF MINES & MINERAL RESOURCES
 STATE OFFICE BUILDING
 416 W. CONGRESS, ROOM 161
 TUCSON, ARIZONA 85701

Empire Mtns. Group Limestone
(AKA: Mt. Fagan Limestone)

September 20, 1960.

Mr. O. A. Rockwell
Director of Ore Purchases
Chemical and Metals Division
The Eagle-Picher Company
Miami, Oklahoma.

Dear Mr. Rockwell,

Mr. Ruppel sent me a copy of your letter of September 12th for comment. It may facilitate things if I comment directly to you.

Tom Nye, a geologist, who wrote the report which you examined intended the cost analysis to be only of a preliminary character with leeway for enlargement of capacity and diversification of products. I certainly agree with you that one might become established in the lime business for a somewhat smaller capital investment than that "guesstimated" by Mr. Nye.

Western-Knapp Engineering Company in preliminary calculations came up with an estimated operation cost of \$10.00 per ton, and this approximates costs of Paul's Lime plant at Douglas.

Tom Nye contacted each of the mining companies and obtained the following hot lime consumption figures:

Magma	2.3	t.p.d.	
Silver Bell	17	"	
Mission	32	"	(Estimated)
Duval	25	"	
Pima	4.5	"	
Banner	1.5	"	
	<u>82.3</u>	t.p.d.	

The limestone source is unusually pure and uniform -- a massive crystalline Mississippian limestone horizon. A representative sample was taken in the Empire Mountain deposit and sent to the Colorado School of Mines Research Foundation Laboratory for testing and they submitted a fairly complete report stating:

*Based on the data resulting from this study, our opinions are as follows:

- (1) Material as represented by the sample may be considered as chemical grade high calcium limestone.
- (2) If limestone, as represented by the sample, were quarried or mined and prepared for conventional rotary kiln feed, minus one-quarter inch rejects (commonly referred to as "quarry screening") would be in the neighborhood of 15% to 25% of the quarry or mine operation. However, material as represented by the sample does not burn in a manner normally anticipated for high calcium commercial limestones; instead, the sample material "decrepitates" and disintegrates. This fact changes the concept of quarry screening reject material, and suggests that practically all this material, as quarried or mined, could be used for kiln feed.
- (3) The sample material calcines to a good grade of high calcium chemical quick lime within the time and temperature range normal for this calcining operation in rotary lime kilns. The silica content of the quick lime produced in our studies is somewhat higher than that of commercially high calcium quick limes, which average between $\frac{1}{2}$ % and 1% SiO_2 . However, other usual impurities such as iron, magnesium, sulphur, and phosphorous are gratifying low.
- (4) The quick lime produced from the sample by simulated rotary lime kiln technique is of excellent white appearance and is extremely reactive chemically--particularly this quick lime slakes easily and violently upon contact with water.
- (5) When slaked in an excess of water to result in a conventional milk-of-lime slurry, the quick lime produced from the sample yields a hydrated lime, the particles of which are better than 90% passing a 200 mesh standard screen.
- (6) When slaked with only sufficient water to yield the conventional dry hydrate lime product, the quick lime produced from the sample would yield a relatively coarse dry hydrate. It would probably be necessary to further pulverize this dry hydrate in order to obtain a dry hydrate of sufficient fine particle size to be quickly reactive in applications such as those involving pH control.
- (7) While dust loss as the result of decrepitation during calcination does not appear excessive (on the basis of the two burns made), the fact that decrepitation occurs suggests that a hearth furnace or possibly a fluid bed operation might be more desirable than a rotary kiln

type operation. The limestone of the New England Lime Company, Adams, Massachusetts, decrepitates similarly, and is being processed in a fluo-solids kiln.

(8) While it has not been possible to prepare a dry hydrated lime product essentially passing 100 mesh from this quick lime, it is quite possible that the desired fineness would result if the material were processed in a large conventional hydrator such as a Clyde Hydrator or Kritzer Hydrator. These commercial units permit the longer retention periods and higher temperatures necessary to obtain fine particle size during hydration. However, since there is a strong indication that this quick lime does not yield the usual fine particle during dry hydration, this item should be further studied in advance of any commercial dry hydration operation involving this material."

There is little question in our minds as to either the chemical quality or quantity in the limestone deposit in the Empire Mountains. It is the only large deposit in this area, and the market appears to be favorable.

If you are going to be in the Tucson area either for the Open Pit Mining Symposium or on your way to the Mining Congress in Las Vegas, I would consider it a pleasure to talk with you about the industrial minerals possibilities, and show you the deposits under consideration.

Perhaps in the meantime Mr. Simons will clarify the question as to type of participation.

Sincerely,



Willard C. Lacy
Professor of Geology

cc: H.J. Ruppel
G.W. Irvin

ARIZONA DEPT. OF MINES & MINERAL RESOURCES
STATE OFFICE BUILDING
416 W. CONGRESS, ROOM 161
TUCSON, ARIZONA 85701

Empire Mtns Group Limestone
Pima Co.

Report on

Survey of Market
for
High Calcium Lime Products
From
Mt. Fagin Limestone Deposit



By

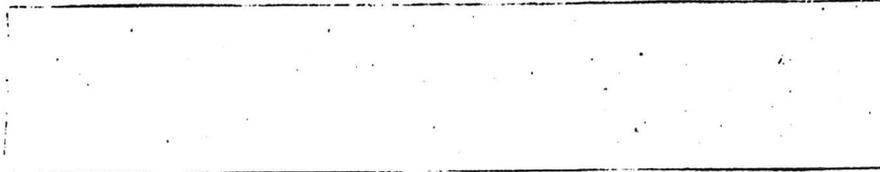
Colorado School of Mines Research Foundation, Inc.
Golden, Colorado

Project No. 191107

April 26, 1965

ARIZONA DEPT. OF MINES & MINERAL RESOURCES
STATE OFFICE BUILDING
416 W. CONGRESS, ROOM 161
TUCSON, ARIZONA 85701

Report on
Survey of Market for
High Calcium Lime Products
From Mt. Fagin Limestone Deposit



By

Colorado School of Mines Research Foundation, Inc.
Golden, Colorado

April 26, 1965
Project No. 191107

Approved:



E. H. Crabtree
Director



C. J. Lewis
Director of Research

OBJECTIVE AND SCOPE

The purpose of this study has been to ascertain whether there is a sufficiently attractive market for lime and limestone products which might be produced from the Mt. Fagin limestone deposit near Sahuarita, Arizona, to warrant further developments leading to a commercial lime and limestone operation based on the deposit. To accomplish this objective, the following work was initially believed necessary: -

1. Examination of the present market for high calcium limestone, high calcium quicklime and high calcium hydrated lime within an approximately 500 mile radius of the Mt. Fagin ore body.
2. Locating the present suppliers of the indicated products within this area, including price structure and freight rates to the extent possible.
3. Evaluation of future trends with respect to new sources of supply or new markets for the indicated products which might be anticipated as the result of economic growth or technology.
4. Preparation of a formal report summarizing the results of the foregoing effort as indicated, together with any opinions and conclusions which the Research Foundation believes justified on the basis of the information resulting from this study.

This objective and scope is more fully outlined in a letter of December 30, 1964 from C. J. Lewis of the Research Foundation to Mr. Jesse H. Knight of Cordillera Petroleum of Canada, Limited. (Appendix)

In accordance with the Research Foundation's verbal understanding with Mr. Knight, the work as outlined was allowed much flexibility in the interest of practicability and efficiency as information became available.

FOREWORD

This study may be considered as the market survey phase of a project which was started by letters of November 7, 1959 and December 30, 1959 from Mr. G. A. Freeman, of Transarizona Resources, Inc. to C. J. Lewis of the Research Foundation. This initial work involved examination of limestone samples and resulted in a report to Transarizona Resources, Inc., dated February 10, 1960, entitled "Evaluation of Limestone Samples for Production of Lime". In essence, the report stated that limestone, represented by the samples studied, decrepitates and disintegrates to a relatively small particle during burning to quicklime and the resulting quicklime may be considered to be a good chemical grade of high calcium quicklime. The February 10 report enumerated 9 opinions based on the work done.

Subsequently, a contractual arrangement of October 8, 1962 between the Tucson Lime and Chemical Company, Inc. and the Colorado School of Mines Research Foundation, Inc. involved the processing of a large sample of high calcium limestone presumably represented by the samples involved in the February 10 report. This processing consisted of passing $-3/4$ " limestone through a direct gas-fired pilot rotary kiln to obtain information on calcining characteristics of the limestone as well as to obtain a substantial quantity of the quicklime product for further evaluation. This work resulted in a report dated November 28, 1962 to Tucson Lime and Chemical Company entitled "Rotary Kiln Calcination of Limestone Sample". In essence, this report states that limestone represented by the sample is amenable to

quicklime production via the direct-fired rotary kiln and that the dust loss due to decrepitation of the calcine to about $-1/8$ " does not appear economically prohibitive. Reference is made in the November 28 report to the quicklime product being off-color as compared to the normal white high calcium quicklimes of commerce, as well as to the gratifyingly reactive nature of the quicklime during slaking.

Still later, the Research Foundation received a telegram dated September 27, 1963 signed "Tucson Lime and Chemical Company, Limited Per New Astral Mining and Resources, Limited" which authorized the Research Foundation to proceed with certain plasticity determination studies. This was followed by an authorization letter of October 9, 1963 from Plaxton and Company, 80 King Street West, Toronto 1, Canada. This plasticity study involved the preparation of hydrated lime at the Research Foundation using a sample of the quicklime product to which reference is made in the November 28 report and then submitting this hydrated lime to testing laboratories for its evaluation in terms of Type "S" building lime requirements. This work resulted in a letter report of November 29, 1963 from the Research Foundation to Mr. Herbert Plaxton. In essence, the letter stated that the high calcium hydrated lime which could be produced by conventional methods from the quicklime product of the November 28 report would very likely meet Type "S" building lime requirements but could scarcely hope to compete on a performance basis with the Type "S" hydrate produced by pressure hydrating dolomitic quicklime. The report also recommended a market survey to

ascertain the local situation with reference to high calcium lime products from the deposit of interest. Since Messrs. J. D. Mason and G. A. Freeman received copies of the November 29, 1963 letter report, and are involved with this present market survey study, the foregoing reference to the November 29 report appears to be in order.

Finally, under date of December 30, 1964, Mr. Jesse H. Knight of Cordillera Petroleum of Canada, Limited authorized the Research Foundation to conduct the market survey which is reported in the pages following.

WORK DONE

1. The National Lime Association was contacted to obtain up-to-date information on the location of existing lime plants or lime plants under construction, particularly in the Southwestern United States. A map locating such installations appears in the Appendix.

2. Questionnaires were mailed to a total of 482 concerns within a 500 mile radius of Sahuarita, Arizona in the United States, exclusive of copper mills. Names of the concerns were obtained from up-to-date trade directories and selected on the basis of the Research Foundation's experience pertaining to the type of operations which do or could use lime. The questionnaire as well as the complete list of those receiving it appears in the appendix.

3. The 500 mile radius area around Sahuarita, Arizona was divided into 75 mile, 75 mile to 150 mile, and 150 mile to 500 mile radius regions and said regions subsequently considered in terms of market potential and competition. A map indicating these radius regions appears in the appendix. The map also includes the same radii working outward from the Paul Lime Company plant at Paul Spur, Arizona and the U. S. Lime Products plant at Nelson, Arizona.

4. Mr. C. J. Lewis of the Research Foundation visited the Mt. Fagin ore body in conjunction with calls on potential lime users in the Tucson and Phoenix areas.

5. Potential competition, railroads, purchasing agents, lime salesmen, etc. were contacted with reference to various factors which might affect the

feasibility of establishing a high calcium lime plant at or near the Mt. Fagin limestone body.

6. C. J. Lewis personally contacted the copper mills in New Mexico and Arizona in the course of which field trip he also visited the Paul Lime plant near Douglas, Arizona and the Hoopes Lime plant near Globe, Arizona. Some photographs taken in the course of this field trip appear in the appendix.

CONCLUSIONS

1. The market for high calcium quicklime which may be considered as the local market for a lime burning operation at or near the Mt. Fagin limestone deposit is at present at least 35,800 net tons per year. Practically all of this potential market is represented by flotation quicklime for the copper mills in the local market area.

2. The use of flotation quicklime by the existing copper mills in the local area will probably increase due to some expansion, and also because of the completely new Anaconda Copper milling operation which is expected to be on stream within a few miles of Sahuarita in the last quarter of 1969.

3. If flotation quicklime for the copper milling industry is excluded, the remaining local market for limestone and/or lime products from the Mt. Fagin ore body is relatively meager and very vulnerable to competition from established producers of lime products.

4. The Paul Lime Company with complete rotary kiln, and supplementary high calcium lime processing operations at Paul Spur, Arizona is at present well-established in the market area which may be considered as the local market area for a lime-producing operation based on the Mt. Fagin limestone deposit.

5. The Hoopes Lime Company with a rotary kiln operation, a few miles from Miami, Arizona, is well-established in the Globe-Miami copper milling area.

6. The U. S. Lime Products Division of The Flintkote Company with

plants at Henderson, Nevada and Nelson, Arizona, is well-established in the Kingman-Bagdad, Arizona copper milling area.

7. Possibility of negotiating a long-term arrangement with Anaconda Copper Company with reference to supplying flotation quicklime for their announced new operations near Sahuarita warrants careful consideration.

RESULTS

I. Typical Rail Freight Rates on Lime. (Information received from railroads).

From Nelson, Arizona (U. S. Lime Products) to Phoenix, Arizona:

Minimum 15 ton car	\$6.70 per net ton
Minimum 20 ton car	\$5.70 per net ton

From Lucerne Valley, California (Charles Pfizer Lime Plant) to Phoenix, Arizona:

Minimum 30,000 lbs.	\$18.40 per net ton
--------------------------	---------------------

From Lucerne Valley, California to Tucson, Arizona:

Minimum 30,000 lbs.	\$20.60 per net ton
--------------------------	---------------------

From Cushenburg Railhead, California (presumably freight interchange for Henderson, Nevada lime plants) to Casa Grande, Arizona:

Minimum 30,000 lbs.	\$16.20 per net ton
--------------------------	---------------------

From Paul Spur, Arizona to Bisbee, Arizona:-

Presumably minimum 25 ton cars	\$0.89 per net ton
--------------------------------------	--------------------

From Paul Spur, Arizona to Ajo, Arizona:

Presumably minimum 25 ton cars	\$4.30 per net ton
--------------------------------------	--------------------

*From Paul Spur, Arizona to Phoenix, Arizona:

Presumably minimum 15 ton carloads	\$6.60 per net ton (approximately)
--	---------------------------------------

*(Information received from Paul Lime plant)

Flotation quicklime from Paul Spur, Arizona to Sahuarita, Arizona:

Minimum 44 ton car \$2.50 per net ton

Flotation quicklime from Paul Spur, Arizona to Tucson, Arizona:

Minimum 44 ton car \$2.50 per net ton

Typical Truck Freight Rates

From Paul Spur, Arizona to Morenci, Arizona \$24.60 per net ton

From Paul Spur, Arizona to Silver Bell, Arizona \$4.00 per net ton

2. Typical Prices.

Bulk pebble quicklime from Paul Spur, Arizona . \$14.00 per net ton
f.o.b. Bisbee, Arizona

Type "S" hydrated lime f.o.b. Paul Lime Plant, Paul Spur, Arizona
\$1.20 per bag or \$23.00 per net ton

Chemical hydrated lime in bags f.o.b. Paul Lime plant

\$21.85 per net ton

Bulk quicklime f.o.b. Paul Lime plant

\$14.00 to \$16.00
per net ton

Bulk pebble quicklime f.o.b. A.S. & R. Mission Unit, near
Sahuarita, Arizona - \$15.00 to \$16.00 per net ton carload delivery

Bulk quicklime f.o.b. other copper mills near Sahuarita (Duval, Pima)
Arizona - \$17.50 to \$18.00 per net ton f.o.b. bin site truck delivery

Chemical hydrated lime in bags from Paul Spur, Arizona to San Manuel,
Arizona - \$0.73 per bag f.o.b. warehouse truck delivery.

Copper mills, Miami, Arizona - pebble quicklime in bulk -
\$15.50 per net ton f.o.b. lime bins truck delivery.

Inspiration Copper Company, Christmas, Arizona - pebble quicklime
in bulk - \$15.50 to \$16.00 per net ton f.o.b. lime bins truck delivery.

Miracle hydrated lime in bags (Type "S"), Henderson, Nevada to Phoenix, Arizona - \$0.96 per 50 lb. bag f. o. b. dealer's warehouse.

Miracle hydrated lime in 50 lb. bags f. o. b. dealer's warehouse - Phoenix, Arizona - \$1.30 to \$1.40 retail.

3. Information on Building Lime Market.

(a) National Lime Association claims 95% of the market for masonry (building) lime is either Type "S" hydrated lime or quicklime putty. Quicklime putty involves a high local demand since it is not practical to truck the putty any distance.

(b) The Superlite Builders Supply Company, Phoenix, Arizona, the largest building supply dealer in the area, states that all lime for mortar and stucco in the area is high plasticity and that Miracle lime (Type "S" dolomitic) from U. S. Lime Division of The Flintkote Company, Henderson, Nevada, furnishes at least half of all Type "S" lime sold in the Phoenix area.* About 125 to 150 small dealers in the Phoenix area sell Miracle lime for between \$1.30 and \$1.40 per bag. A large retail order is considered to be from 10 to 20 bags. Superlite would be interested in a new source of Type "S" lime providing its plasticity were at least as high as that of Miracle lime.

(c) The Paul Lime Company of Paul Spur, Arizona, produces a high calcium Type "S" lime by special hydrating process believed to include a chemical additive to produce plasticity. Paul's Type "S" high calcium hydrate is having difficulty competing with Miracle lime from Henderson, Nevada.

* \$0.96 per 50 lb. paper bag delivered.

4. Limestone.

(a) No major uses for limestone from the Mt. Fagin limestone body have been located.

(b) It is highly unlikely that the new Spreckles Sugar Company mill which is expected to be on stream in the area early in 1967, could use Mt. Fagin limestone. It is conventional practice in a sugar beet refinery to burn limestone to quicklime and treat the raw sugar solution with quicklime to form a soluble compound of calcium sucrate. This solution is then clarified and blown with carbon dioxide gas from the lime kiln producing the quicklime in the first place. The carbon dioxide gas treatment precipitates the calcium of the calcium sucrate as a calcium carbonate sludge while simultaneously regenerating the sugar in a pure water soluble form. The sugar solution is clarified and crystallized to produce the commercial sugar product.

Conventional practice is to burn the limestone in a vertical lime kiln since this type of kiln is the most efficient in terms of both quicklime and carbon dioxide recovery as well as in terms of the cyclic operation of a beet sugar refinery. Obviously, a limestone which decrepitates during burning to lime would block the upward draft of a vertical lime kiln. Spreckles Sugar Company specifications for their limestone at present are minimum calcium carbonate 93%, maximum magnesium carbonate 4%, maximum silica 2%, fine grained limestone which will not shatter or decrepitate. While the Mt. Fagin deposit meets the chemical specifications, it does not meet the physical specifications. Spreckles Sugar expects to consume about 20,000 net tons of

limestone per year and do not plan to recover the by-product calcium carbonate sludge.

5. Soil Stabilization Market.

(a) This is a large market for high calcium hydrated lime in Texas, Ohio, Indiana, and other relatively high rainfall states, especially where freezing and thawing along highways occurs. However, the State of Arizona has not yet begun to use hydrated lime for soil stabilization in conjunction with highway maintenance and/or construction programs. Arizona is very much interested, particularly with reference to stabilization of chinley clay along Highways 66 and 40 and Highway 89 north of Flagstaff. The University of Arizona has a research program under way on Arizona soil stabilization and Arizona State University is attempting to get some work started in this field.

6. Agricultural Markets for Lime.

(a) This area has not been positively examined during the course of this market survey. Arizona agricultural soils are, for the most part, alkaline and the consumption of agricultural lime in Arizona is known to be relatively small. No indication of any important use of agricultural lime was apparent during the approximately 2500 mile field trip surveying the copper mills. Dr. W. H. Fuller, Head of the Department of Agricultural Chemistry and Soils at the University of Arizona, stated that Arizona soils are calcareous or soon become calcareous as the result of irrigation water and that, for this reason, lime is not used on Arizona soils for agricultural purposes.

7. Response to Questionnaires.

Of the 482 questionnaires mailed, returns were as follows:

(a) Total replies	189,	representing a return of	39%.
(b) No reply at all	247,	representing	51%.
(c) Returned to sender, unopened,	46,	representing	10%.
(d) Returns indicating no interest,	154,	representing	32%.
(e) Returns affirmative	35,	representing	7%.
Total % accounted for			100%.

8. Chemical and Miscellaneous Markets for Lime.

(a) Based on the response to the affirmative questionnaires, conversations with City of Phoenix Purchasing Office, lime producers and lime salesmen, this market is relatively insignificant although growing with population and industrial expansion.

(b) The located market (see affirmative replies in the appendix) is as follows:

0 to 75 mile radius of Sahuarita	less than 50 tons of hydrated lime per year.
75 to 150 mile radius of Sahuarita	about 250 tons of high calcium quicklime, and less than 160 tons of high calcium hydrated lime. There is apparently some market for a Type "S" hydrated lime as well as dolomitic quicklime in this area.

150 to 500 mile radius of Sahuarita

fairly attractive for one lime plant but obviously (see appendix) not to be considered as a support for a new lime plant near Sahuarita in view of the already well-established competition (see map, appendix).

It is again emphasized that the questionnaires have not necessarily covered all of the potential market, particularly the market beyond the 150 mile radius of Sahuarita, but a serious effort has been made to have the questionnaires cover at least the major potential in the 150 mile radius. It is obvious from the returns that the market within the 150 mile radius is not such that would afford a quicklime plant only at Sahuarita, either adequate sales potential or adequate "local situation" protection unless the plant at Sahuarita were firmly anchored to the flotation quicklime market. This latter being the case, a high calcium lime plant at Sahuarita might then find it possible to broaden its base for the purpose of obtaining additional lime markets, particularly the market for chemical hydrated lime in bags.

9. Market for Flotation Lime for Copper Mills.

(a) The market for flotation quicklime in the area highly local to Sahuarita is as follows:

<u>Company</u>	<u>Location</u>	<u>Present annual consumption flotation quicklime (net tons)</u>
A. S. & R.	Sahuarita	6000
Duval Copper	Sahuarita	8400
Pima Mining Co.	Sahuarita	7200

(b) In addition to the foregoing, the following may, for all practical purposes, be considered a part of the local market:

Phelps Dodge	Ajo	8700 net tons
A. S. & R.	Silver Bell	5500 net tons

(c) The foregoing present consumption in the local and near local copper milling market thus totals to 35,800 tons per year.

(d) To the foregoing may be added an additional 7200 tons for Pima Mining Company which expects to double its capacity in the reasonably near future; and also, an estimated 25,000 tons per year of flotation quicklime for Anaconda Copper Company's mill which is scheduled to be in production the last quarter of 1959 near Sahuarita.

(e) Flotation quicklime is presently delivering into the Sahuarita area in a price range of from about \$15.00 to about \$17.50 per net ton, depending on contract and on whether delivery is by rail or truck. Truck freight from Paul Spur to Silver Bell was \$4.00 per net ton in March, 1965; rail freight from Paul Spur to Ajo was \$4.30 per net ton in March, 1965.

(f) The following copper mills should not be considered as offering potential market for lime produced at or near the Mt. Fagin limestone ore

body:

- | | |
|--|--|
| (1) Kennecott Copper, Hurley, New Mexico | captive |
| (2) Phelps Dodge Corporation, Morenci, Arizona .. | captive |
| (3) Phelps Dodge Corporation, Bisbee, Arizona ... | too near
Paul Lime
plant. |
| (4) Magma Copper, San Manuel, Arizona..... | captive |
| (5) Kennecott Copper, Hayden, Arizona..... | captive |
| (6) Inspiration Copper Company, Christmas, Arizona | too near
Hoopes
Lime plant. |
| (7) Inspiration Copper, Miami, Arizona | too near
Hoopes
Lime plant. |
| (8) Miami Copper Company, Miami, Arizona..... | too near
Hoopes
Lime plant. |
| (9) Duval Copper Company, Kingman, Arizona.... | too near
U. S. Lime
Products
plant. |
| (10) Bagdad Copper Company, Bagdad, Arizona ... | too near
U. S. Lime
Products
plant. |

(g) One local copper mill, Pima Mining Company, will probably change from truck delivery to rail delivery of lime by July, 1965.

Further information pertinent to the above items (a) through (g) appears in the appendix.

COMMENTS

Because reports of this nature may remain active for a considerable time and their ultimate distribution can not be completely anticipated, the Research Foundation has intentionally withheld some information sources and some supporting data from this report. However, such backup information is in the Research Foundation's files and can be examined by those properly authorized to do so.

The following comments in addition to the conclusions already stated, are based on the information gathered during this market survey, other pertinent information which the Research Foundation can ethically use, and the nearly 15 years of experience of Mr. C. J. Lewis in the lime industry: -

1. The freight rate of \$2.50 per net ton for bulk flotation quicklime from the Paul Lime plant to the Sahuarita-Tucson area is surprisingly low. Indeed, this rate may not be much more than the amortization cost on a net ton of lime produced in a new lime plant as compared with that of a lime plant which has been or is nearly amortized. This may be one reason why the Pima Mining Company near Sabuarita will soon be taking flotation lime from the Paul Lime plant via rail delivery all the way. Further activity with reference to a commercial lime plant at or near the Mt. Fagin deposit should include an examination of this freight rate to establish whether it is a special rate similar to the special rates on fluxing quicklime from eastern lime plants to major steel producing areas. Another line of activity could include informing the local

copper mills that truck deliveries may be available from a Mt. Fagin operation, thus making it unnecessary to anticipate railroad delivery to the lime bins of these copper mills. This \$2.50 per net ton freight rate may prove to be the limiting factor with reference to the economics of a lime plant based on the Mt. Fagin deposit.

2. The value of the Mt. Fagin limestone deposit, assuming proved reserves and conventional mining costs, should, as a source for quicklime production by a new lime company, be assessed in terms of the local market for copper mill flotation quicklime. Other possible markets for both limestone and high calcium lime products which a new company might develop from Mt. Fagin limestone ore are too small and too well served from other sources to afford justification for a new company operation on the Mt. Fagin ore body.
3. The foregoing comment is somewhat less pertinent in the case of an existing and well-established high calcium lime operation interested in expanding its operation by locating a lime plant to use Mt. Fagin limestone ore. An existing operation such as the Paul Lime Company at Paul Spur, Arizona or the U. S. Lime Products Division of The Flintkote Company at Nelson, Arizona might gain some advantage if, in addition to the flotation lime for the copper mills in the local area, the potential of a lime plant near Sahuarita could be used to supplement the present market coverage or to strengthen an existing position in the lime industry.

4. As has already been pointed out in this report, potential markets covering high calcium building lime, agricultural lime, limestone and limestone products, and lime for soil stabilization should be considered as practically non-existent as far as the market potential for Mt. Fagin ore body products is concerned. This leaves only the flotation quicklime requirement of the local area and the small but gradually growing market for general purpose chemical quicklime and hydrated lime within the Phoenix-Tucson area.
5. It may be expected that the Paul Lime Company will continue to ship chemical lime products into the Tucson-Phoenix area as well as make every effort to maintain a market for their Type "S" building lime. It may also be expected that the U. S. Lime Products Division at Nelson, Arizona, having an already well-established market for Type "S" lime from Henderson, Nevada, will continue to be also a source of high calcium chemical lime in the Phoenix-Tucson area. It seems unwise, therefore, that a "new company" lime plant with operations based on the Mt. Fagin deposit, should depend on any markets other than the flotation lime market in the local area. At the same time, it is reasonable to anticipate that a "new company" operation so based would, under the market shelter of the local copper mills, gradually obtain its share of the high calcium chemical lime business in the competitive area.
6. Since the Mt. Fagin limestone ore body as represented by the limestone sample covered in the November 28, 1962 report decrepitates during burning, it should be possible to feed all limestone mined directly to a

rotary kiln and ship all quicklime produced directly for flotation, thus simplifying operations and avoiding the necessity for stockpiling quarry screenings or disposing of quicklime dust and fines via a hydration plant. While this is probably a minor consideration, profitwise, it is a factor opposing the relatively high amortization cost on a new lime plant which must compete with an established operation at Paul Spur, Arizona.

7. It should be borne in mind that the Paul Lime plant was shipping about 70 tons per day of flotation quicklime to the Phelps Dodge mill at Morenci, Arizona until November, 1964. The Morenci mill then became a captive lime operation. Loss of tonnage business of this nature would no doubt encourage the Paul Lime Company's efforts to maintain their present markets in the Sahuarita area. On the other hand, no indication has been found that the copper mills in the Sahuarita area have any traditional obligation to a lime operation as apparently exists around Miami and Douglas, Arizona; and it is believed that the copper mills in the Sahuarita area would welcome a second source of flotation quicklime, particularly a local source.

8. There is strong likelihood that the copper milling industry in the Sahuarita area will substantially increase its ore processing tonnages within the reasonably near future. It is reported on reliable authority that interest in copper mining and milling operations around Safford, Arizona are likely to remain dormant for the next 10 years while existing mills near Sahuarita undergo planned expansion and Anaconda Copper brings in its announced new mill near Sahuarita late in 1969.

These factors further reflect the potential interest of the copper mills around Sahuarita in a new and/or second source of flotation quicklime.

9. Rounding off the present 36,000 net ton per year quicklime useage distributed between the mills at Ajo, Silver Bell and the Sahuarita area, this calculates to approximately 107 net tons per day quicklime from a plant operating 335 days per year. These figures are believed to be realistic. The 335 day operating year allows for 30 days down time for maintenance of the rotary kiln. This, in turn, indicates about 200 net tons per day limestone feed to the kiln. On the basis of known expansion under way in the Sahuarita area, this further calculates to an eventual 200 tons per day of flotation quicklime use involving about 400 tons per day of limestone ore feed.

The potential profit which might be realized from an operation based on 200 net tons per day limestone feed to kiln involves many, many factors, the consideration of which is not part of this market survey study. However, the following are offered as "order of magnitude" figures which could be used to give an economic flavor to the market survey information just reported: -

Total cost of raw limestone as fed to rotary kiln	\$ 1.00
	(per net ton)
Cost of fuel for converting 1 ton of limestone to quicklime	1.25
	(per net ton)
Operating cost per ton of limestone burned	1.25
	(per net ton)
5-year amortization - \$750,000 (guesstimated) investment for processing 200 tons limestone per day	<u>2.25</u>
	(per net ton)
Total costs per net ton	\$ 5.75

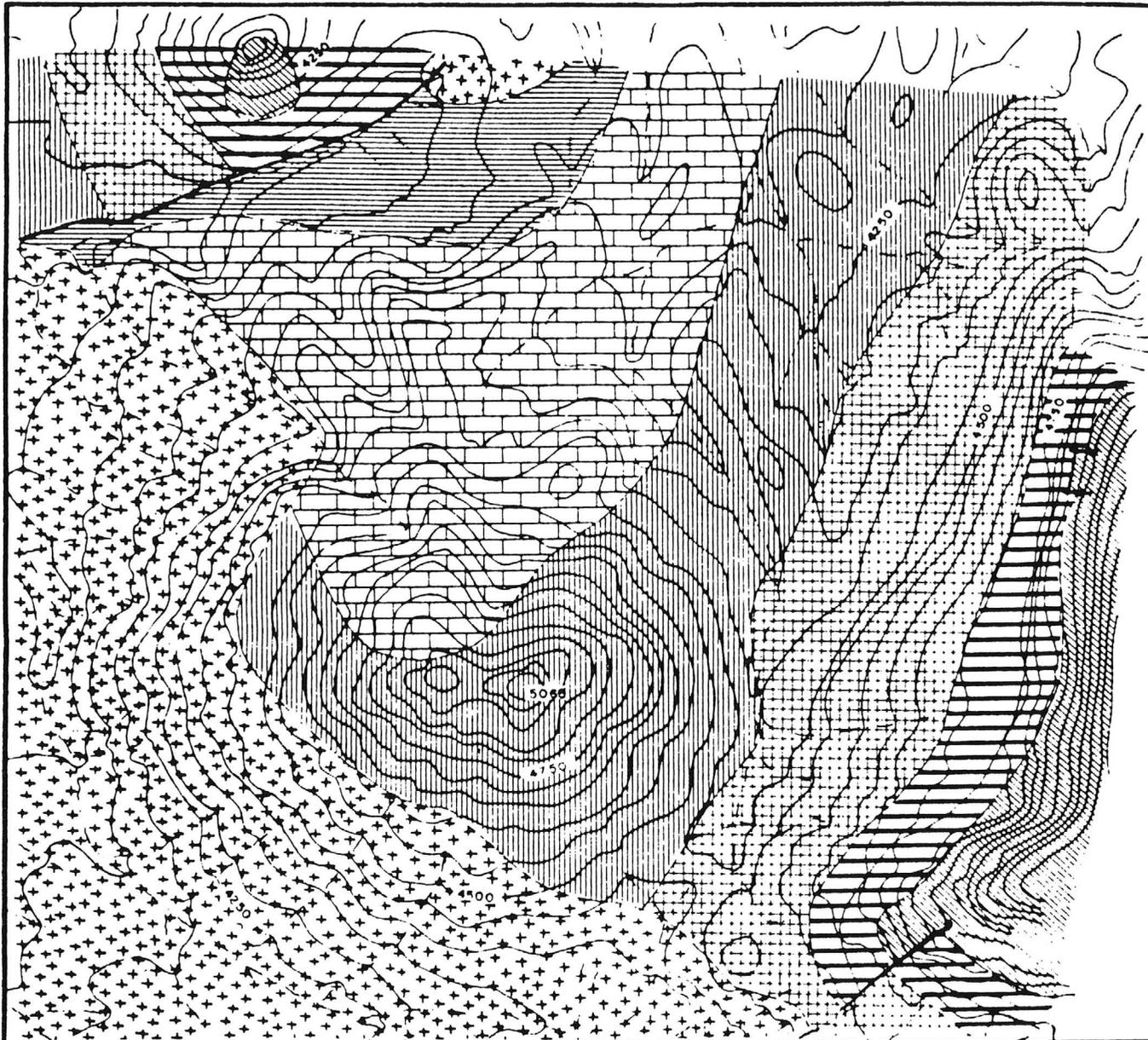
Approximate yield of product as quicklime (due to loss of approximately 44% by weight carbon dioxide gas) ...	56%
Cost per ton of quicklime $\frac{(\$5.75)}{(.56)}$	\$ 10.27 (per net ton)
Estimated quicklime price net ton f.o.b. plant	\$ 14.00
Potential estimated profit 100 tons per day quicklime shipment.....	\$ 373.00

The foregoing figures are very, very rough and are included herein simply to give some economic flavor to this report and to provide some basis for considering the next phase which should logically be an economic feasibility study based around what we now know about the limestone ore body, its calcining characteristics and the potential market for the product.

10. Based on all information and knowledge at our disposal concerning the potential of the Mt. Fagin limestone deposit, we believe the item merits further study, particularly involving economic feasibility studies and direct contact between the principals involved and the copper mills in the market area described.

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STATE OFFICE BUILDING
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TUCSON, ARIZONA 85701

APPENDIX

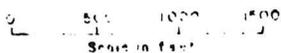


GEOLOGY OF MONTANA MOUNTAIN

EMPIRE MTS., ARIZONA

Adapted by T. S. Nye, 10-59, from field report by R. Miller, 1941

Contour Interval 50 feet

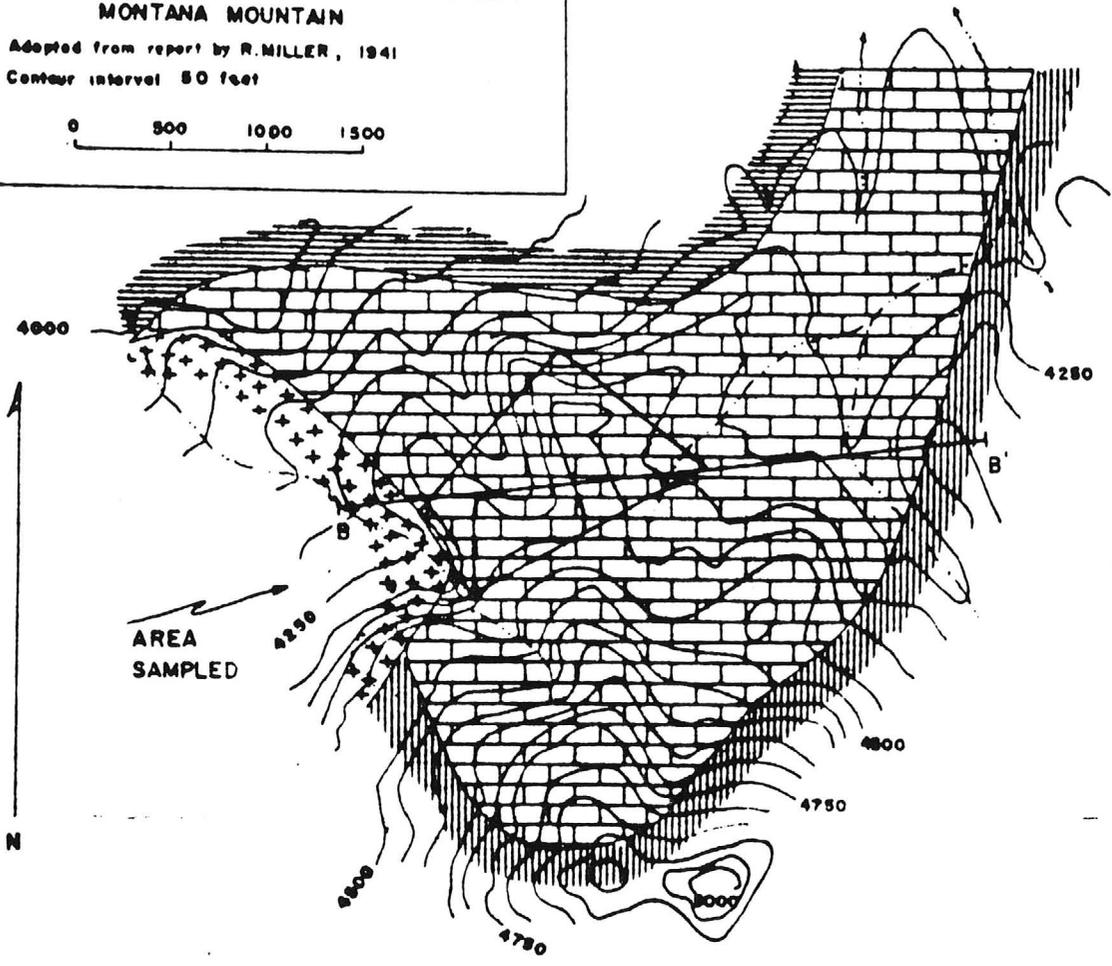
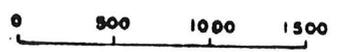


- | | | |
|---------------|--|------------------|
| Tertiary? | | Quartz Monzonite |
| | | Snyder Hill fm |
| Permian | | San Andres fm. |
| | | Yucca fm |
| Pennsylvanian | | Naco ls |
| Mississippian | | Escabred ls |
| Carboniferous | | Abrigo fm. |
| | | Contact |
| | | Fault |
| | | Contour |
| | | Stream Channel |

TN

GEOLOGIC MAP OF LIMESTONE DEPOSIT MONTANA MOUNTAIN

Adapted from report by R. MILLER, 1941
Contour interval 50 feet



STRUCTURE SECTION BB'

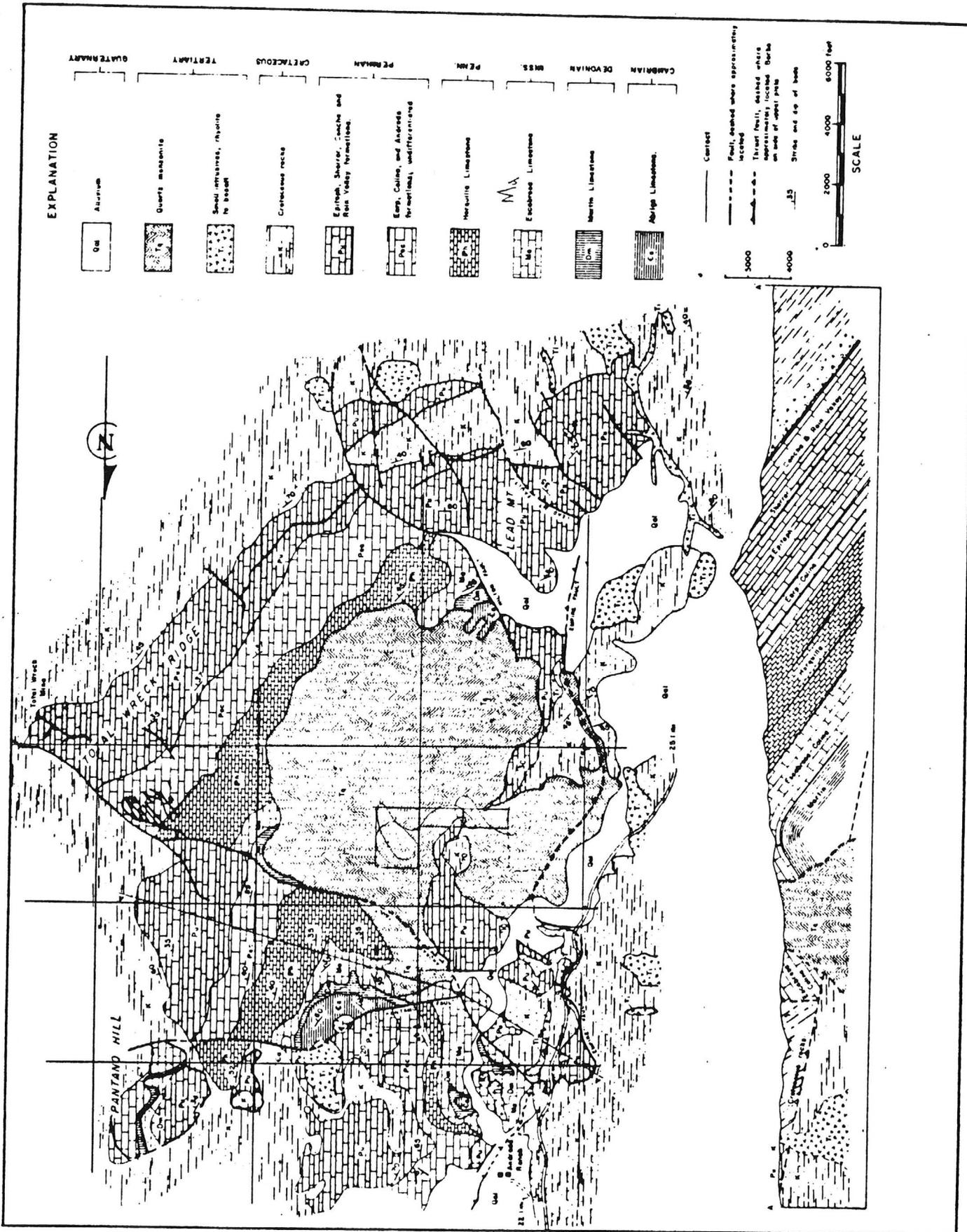


FIGURE 23. Generalized geologic map and cross section of the Lead Mine area.

16E 17E

S.P. R.R.

To Tucson

RINCON VALLE QUAD

To Benson

16S

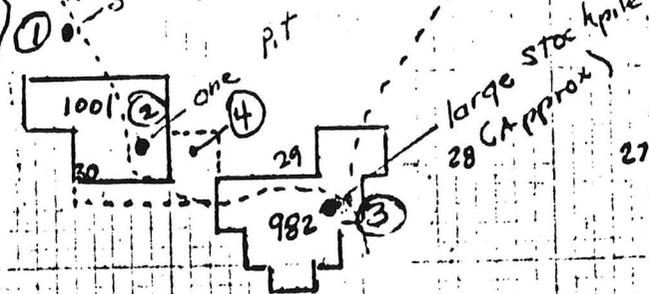
17S

EMPIRE MT. QUAD

POWER LINE BUREAU RECLAMATION

Andrade Ranch stuck here

Murphy Ranch



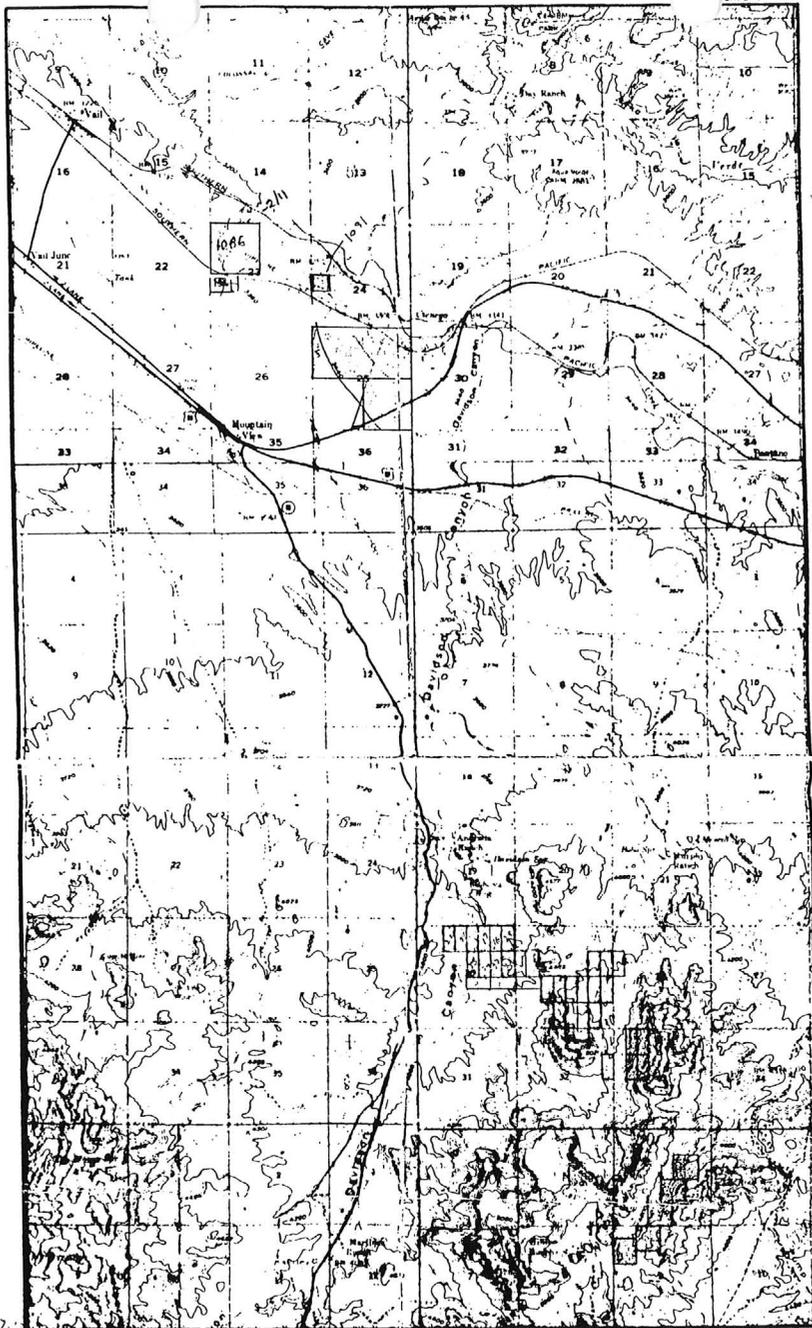
1 mile = 1 inch

Sonora

GAS LINE

R17C

LATE 1



R17C

16

17

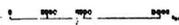
7000
 1001-1001-
 982-280-
 1061-Car. 11

18

City
 Sec. 17-17
 L1-4
 SW 3/4
 E 1/2
 SW 1/4
 NW-SE

LOCATION MAP OF GYPSUM AND LIMESTONE DEPOSITS

Contour Interval 40 feet



- Gypsum claims
- Limestone claims
- Sand and gravel applications

Sec. 17 SW 1/4 17-17 SW 1/4
 A 3000
 B 2700

17-17
 Section G
 1-3-3-3

SW Cor. Sec. 17

RESUME OF MARKET STUDY OF LIME
MARKET FOR A TUCSON AREA PLANT

A summary of the market survey completed by Mr. Thomas S. Nye in June 1960 is as follows:

TABLE I

Estimated Consumption for Tucson Area
(exclusive of outlying towns - Benson, Ft. Huachuca, Nogales, Casa Grande, etc.):

	<u>Quicklime</u> (Tons per Day)	<u>Hydrated Lime</u>
Mines	82.3	
City	1.3	
Construction industry	<u>4.2</u>	<u>20.8</u>
	<u>87.8</u>	<u>20.8</u>
Summary:		
Total tons per day		<u>108.6</u>
Total tons per month		<u>3,255.0</u>

TABLE II

Estimated total market for Tucson Area plant.

	<u>Minimum*</u> (Tons per Day)	<u>Maximum</u>
Southern Arizona Mine Operations	140	160
Construction Industry:		
Tucson Area	15	25
Phoenix Area	45	85
Southern California	10	20
New Mexico	<u>10</u>	<u>20</u>
	<u>225</u>	<u>310</u>

* With the exception of the Tucson area mines, the "minimum" estimates are considered conservative or minimal.

The total market in the Tucson area ranges from approximately 75 to 125 tons per day of hot and hydrated lime. At least 70% of the market is accounted for by the mining industry. Capture of the mining market can be done with little difficulty, and will give a solid base from which you can operate while capturing the construction trade.

The mining industry will normally take about 82 tons per day, averaged over a period of years. Their consumption is dependent upon the nature of the ore (not necessarily grade), which varies daily. On occasion they will require more than their maximum quoted figures, in order to treat aberrant blocks of ore. Thus, in order to avoid embarrassment and ill feeling, and in order to satisfy maximum demands, you should be able to furnish as much as 110 tons per day for the mining companies, exclusive of any allotment to the construction industry.

In addition to the Tucson area mines, potential markets include copper mills at San Manuel, Miami, Hayden, and Inspiration. Although these mills are currently supplied largely by their own kilns, some lime is ordered from Paul Lime and the Nelson division of Miracle Lime; if lime could be furnished to them at a reasonable price, they might consider abandoning their own production facilities in the interests of greater efficiency, better quality of lime, and less trouble for themselves.

San Manuel, for instance, consumes between 17 and 51 tons of lime per day. Assuming an average figure of 20 tons per day (low) for each of the above mills, you have a possible additional market of 80 tons per day.

With the exception of Banner Mining Co., which prefers its lime in coarse sizes (1/2 - 3/4"), the mining industry prefers fine-grained lime. The only problem would be excessive dust, which could be taken care of by screening before leaving the plant, as stated in earlier correspondence. As for users of pebble lime in the construction industry, I have noted only one, and the small demand for pebble lime can be taken care of at the plant by screening to produce the desired size.

For the purposes of proposed capacity of the lime kiln, refer to Table II. I believe that a minimum initial capacity of 150 tons per day is warranted, and that plans for rapid expansion to 250-300 tons per day should be maintained in readiness. In the long run, you would probably be better off starting with a 200-ton capacity plant.

Personnel of the Chambers of Commerce of Tucson and Phoenix have given the following figures, based on information from the city and county planning and zoning boards:

Pima County (exclusive of military installations): 4616 single residence permits granted during 1959.

Phoenix: 12,500 single residences constructed in 1959.

These figures are exclusive of industrial and apartment construction, business construction, and alterations.

It follows then, that the market for lime in the Phoenix area may be closer to triple the Tucson market.

Currently, Miracle lime shipped from plants at Nelson, Arizona, and Henderson, Nevada, enjoys a virtual monopoly of the construction industry trade. Ten years ago Miracle was unknown, and other brands of lime controlled the market. You are in a position, transportation cost-wise, to capture the market from Miracle.

Favorable factors are:

1. The ability to sell an excellent grade of lime at a lower price.
2. Dissatisfaction on the part of many merchants because of periods when Miracle was totally unavailable; they would welcome a steady source of supply.
3. A ready-and-willing market in the copper mills, which will give you a solid base from which to go after the construction industry trade.

Regarding markets in Southern California and New Mexico: Paul Lime is currently selling lime in these two areas.

I am not aware of any lime plants in New Mexico at this time.

Markets in the glass industry and steel industry should be investigated. There is a glass industry in Southern California. Steel rolling mills and manufacturers of grinding balls are located in the Phoenix area. Iron and steel manufacturing plants are planned for the El Paso area in the near future, to treat iron from mines in New Mexico, and may require chemical lime.

According to Lauer of White Eagle Stucco in Phoenix, the Ashgrove lime plant in Missouri has a "Base" or cost of \$7.00/ton, which Lauer considered extremely low. Assuming Industrial Minerals has a base of \$10.00 per ton, I believe that you can see that the profit potential is quite healthy. Reference is made to the estimates in Table III.

TABLE III

Estimated profit per ton for 150 tons per day operation

1. Tucson area mines:

Sale price	<u>\$15.00</u>
Base cost	<u>10.00</u>
Transportation	<u>3.00</u>
	<u>13.00</u>
Profit	<u>\$ 2.00</u>

2. Tucson construction:

Sale price	<u>\$25.00</u>
Base cost	<u>10.00</u>
Transportation	<u>1.50</u>
Bagging	<u>1.50</u>
	<u>13.00</u>
Profit	<u>\$12.00</u>

3. Phoenix Construction:

Sale price	<u>\$25.00</u>
Base cost	<u>10.00</u>
Transportation	<u>5.00</u>
Bagging	<u>1.50</u>
	<u>16.50</u>
Profit	<u>\$ 8.50</u>

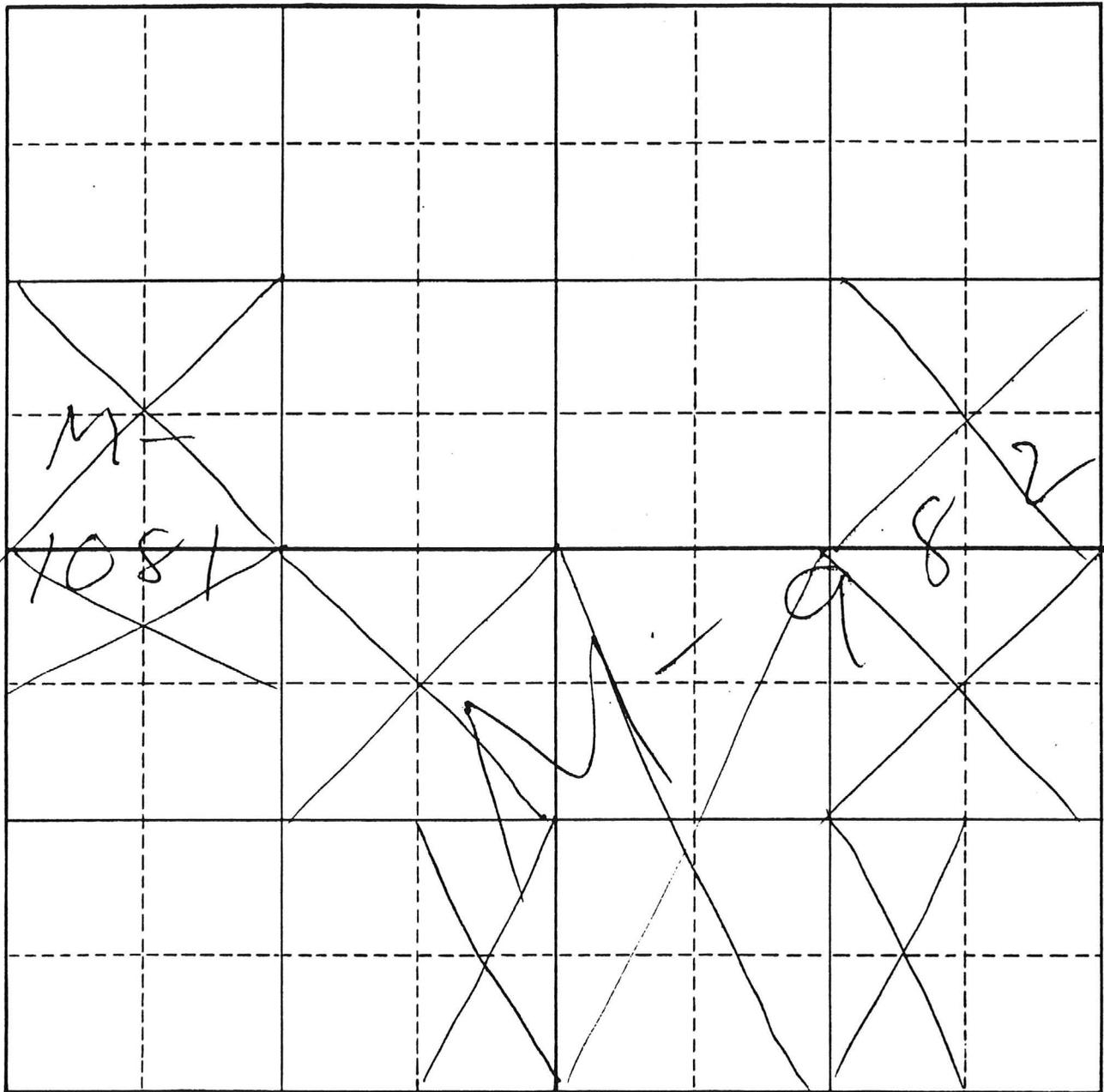
4. Approximate wholesale prices for hydrated lime:

	<u>Phoenix</u>	<u>Tucson</u>
Paul Lime	30.00	27.50
Miracle Lime	36.00	38.00
Proposed Tucson plant	25.00	25.00

The above figures are estimates, calculated to give a picture of initial conditions of plant operations. With proper marketing efforts, profits should double within five years.

ARIZONA DEPT. OF MINES & MINERAL RESOURCES
STATE OFFICE BUILDING
416 W. CONGRESS, ROOM 161
TUCSON, ARIZONA 85701

Section 29 Township 17S Range 17E



800 400 0 800 1600 2400 Feet

982 - Walter M. Burris
1081 - Pollard Simons

5280 Feet	} 1 Mile	66 Feet	} 1 Chain	43560 Sq. Ft.	} 1 Acre
320 Rods					
1760 Yards					
80 Chains					

Scale: _____

April 12, 1965

Leasing Division
State Land Department
State Office Building
Phoenix, Arizona 85007

Gentlemen:

I would like to obtain a mining lease on the following enclosed recorded Type "B" Claims. For your information this is the same area as the old M-1081 lease to Pollard Simons. All of the location notices and Corner Posts are in place as shown on the map below.

Very truly yours

Walter Burris
Andrada Ranch
Box 830 Route 7
Tucson, Arizona
Tel-623 9745

Keep
Empire Mtns. Group limestone
(AKA: Mt. Fagan Limestone)
Pima Co.

SUMMARY REPORT

MOUNT FAGAN LIME DEPOSIT

ARIZONA

by

J. D. Mason, Prof. Eng.

July 1, 1961.

1138 Melville Street,
Vancouver 3, B.C.

(This supersedes preliminary report prepared Dec. 10, 1959).

ARIZONA DEPT. OF MINES & MINERAL RESOURCES
STATE OFFICE BUILDING
416 W. CONGRESS, ROOM 161
TUCSON, ARIZONA 85701

Brought forward: \$ 302,500

(e) OPERATING CAPITAL:

Allow breaking 10,000 tons of ore (under contract)	\$ 10,000
Min labor, 6-man crew @ \$18 per day, 6 months	18,200
Bags	3,000
Fuel, Calciner - 850 Maf per day @ 38¢ - 4 months	32,000
Fuel, Power Plant - allow	3,500
Automobile Operation	500
Supply Purchase	4,000
Deposits and Rentals	1,000
Repairs	2,000
Overhead	13,000
Advertising	5,000
Insurance	<u>2,500</u>
Sub-Totals	\$ 93,700
Add additional working capital	<u>50,000</u>
TOTAL MONY REQUIRED:	\$ 446,200

Notes: No allowance made for sale of production during first four months. This should provide the necessary contingency.

SUMMARY REPORT

MOUNT PAGAN LIME DEPOSIT

SUMMARY & CONCLUSIONS:

The Mount Pagan lime deposit is one of exceptional purity, consisting of uniform, high-grade, white calcium carbonate.

Calcine tests and analyses show that the deposit will produce both quick and hydrated lime of excellent quality. The white color and purity indicate the probability of other premium markets.

Ore reserves appear adequate for a lifetime operation.

The location and high-grade nature of the deposit indicate that it will have an assured captive market in the Tucson area. It will also be able to compete favorably in rest of Arizona, except in the northern portion of the State.

The economics are attractive. Costs of around \$11.00 per ton are indicated for bulk lime as against a present selling price in the area of \$17.00 per ton for an inferior product. Unfortunately, due to existing contracts, only half the assured mining market will be available in the first 14 years of operation. Investigation shows that the best costs are achieved with a kiln of not less than 100 tons capacity per 24 hours.

RECOMMENDATIONS:

1. The deposit should be geologically mapped and enough systematic drilling and open-cutting completed to prove ten years' ore reserve at 200 tons per day. Estimated cost \$20,000.
2. A representative bulk sample of 15-20 tons should be obtained at an existing full-scale plant.
3. The building and other industrial markets should be investigated.
4. If the above confirms the preliminary investigation, plans should be made to have the deposit in production in one year's time.

LOCATION and ACCESS:

The limestone deposit is located ten miles south of Vail Station on the Tucson-Tucson highway some twenty-five miles southeast of Tucson, Arizona. The railroad, main gas transmission line and three-phase power line pass near Vail.

When the property is developed a road will be rehabilitated to Sahurita on the Nogales highway. This will save some twenty miles on product haulage to the various mines in this area.

PROPERTY and AGREEMENT:

The property consists of nine unpatented mineral claims. Title has been checked. The claims are held under an option agreement whereby minimum annual royalties of \$5,000 are payable. Royalties are due at a rate of 20c per ton of finished product until \$50,000 has been paid. The rate shall be 10c per ton thereafter. The agreement runs for 99 years.

DEPOSIT:

The limestone deposit is over 200 feet in width and consists essentially of pure, white, recrystallized calcium carbonate. The foot-wall contact is composed of a dioritic porphyry intrusive. A tunnel partially cross-cuts the deposit 30 feet below the surface outcrop. Many millions of tons of highgrade lime are indicated by surface exposures and the underground work. A mapping and drilling program is necessary to establish continuity of grade. Mining of the deposit presents no problems. Drilling costs and powder consumption would be low and extraction can be made by open-pit or glory-hole method. The terrain is such that a gravity plant could be installed.

SAMPLING and METALLURGICAL TESTING:

Channel samples taken in drift 80 feet below surface assayed as follows:

Samples commencing near face and proceeding towards portal.

<u>M A S O N</u>				<u>F R E E M A N</u>	
<u>Width</u>	<u>CaO %</u>	<u>Fe %</u>	<u>SiO₂ %</u>	<u>Width</u>	<u>CaO %</u>
27.5'	54.3	0.3	2.5	49'	53.8
42'	52.4	0.35	3.7	22'	53.5
46'	54.0	0.35	2.4	53'	53.2

Notes- The above are channel samples. On a 1500-lb. bulk sample the Colorado School of Mines obtained iron assays of 0.02%. Additional iron determination is necessary.

POTENTIAL CUSTOMERS:

The following mines are in the immediate area of the deposit and represent a captive market due to the fact that this deposit will produce a superior product with substantial savings in freight and haulage:

- Banner Mines: Use 1,000 lbs. per day delivered in bulk presently by Paul's Lina. (Plan on increasing tonnage substantially).
- Duval: Use 20-25 tons per day buying in bulk; have contract with Paul's, one year to run. Pay \$17.00 per ton delivered.
- Pima: Use 3 to 4 tons per day; purchase from U.S. Lina; pay \$16.75 per ton at site; buy in bulk.
- B. M. & K: Use 1,000 lbs. per day.
- Lake Shore Mines: Use 1,000 lbs. per day.
- Silver Bell: Use 12 to 15 tons per day. Contract expires in less than one year.
- Christmas: Seven tons per day. Production started in 1950.
- Shattuck-Denn: 2.5 tons of hydrated lime per day, paying \$30.00 per ton landed.
- Mission: A new mine, started by American Smelting & Refining Company. Will be in production by 1962 and will use 20 to 30 tons per day of lime.

There are five or six large mines northeast of Tucson where the Mount Fagan deposit will be competitive as to haulage distance and should be able to secure part of the business due to the superior product.

BUILDING TRADES:

Preliminary testing has indicated that the lime will be satisfactory for use in plaster and the building trade. Final testing required to verify. The City of Tucson is less than twenty-five miles away and consists of a quarter-million people. Therefore, the Mount Fagan Lime should be able to undersell all competitors.

With regard to Phoenix, which is some 150 miles away, the Mount Fagan is still the closest deposit. Phoenix has some 400,000 people.

There are numerous towns of up to 30,000 people in the Tucson-Phoenix area.

There would appear to be a market for 25-50 tons per day of crushed white limestone in the Tucson-Phoenix area for roofing granules, paying \$15.00 per ton at present.

OTHER USES:

Lime is the third most commonly used industrial material, being exceeded only by sulphur and sulphuric acid. It is the cheapest commercial alkali.

Due to the extreme whiteness of the lime, which is uncommon, it will find a ready market as a "whiting" and as a filler. This type of material is rare in California and is in demand.

Due to its extremely low iron content, the material should find ready acceptance in the glass manufacturing industry in California.

J. D. Mason, Presl. Eng.

JDM:hs.
July 1, 1961.

ESTIMATE - OPERATING COSTS LIME OPERATION, MT. PAGAN AREA

Assume 100 tons lime production per day, 8.5 million b.t.u. per ton of lime, 44% ignition and dust loss; installation of plant at mine with gas line installed; sale of fines from crushing will offset loss involved; product sold in bulk.

	<u>Per Day</u>
Mining 100 tons per day @ 90c per ton	\$ 180.00
Crushing & Screening @ 25c per ton, 200 tons	50.00
Haulage of finished product to railroad or customer, 110 tons @ \$1.00	110.00
Calcina fuel costs, 8.5 million b.t.u. = 3.5 Mcf gas @ 38c x 110 tons	355.00
Calcina power, labor & maintenance @ \$150.00 per day	<u>150.00</u>
Total Daily Direct Costs:	\$ 845.00

Direct Cost per ton of Limes $\frac{845}{110} = \$ 7.70$

Indirect Costs:

Management, supervision and accounting	\$ 60.00
Taxes, insurance, postage, stationery, etc.	30.00
Amortization of plant over 5 years	75.00
Repairs & refractory lining maintenance @ 50c per ton	55.00
Royalty payments, 20c per ton	22.00
Selling costs, estimate 40c per ton	<u>44.00</u>
Total Indirect Costs per Day	\$ 286.00

Indirect Cost per ton of Limes $\frac{286}{110} = \$ 2.60$

Total Cost for Producing 1 Ton of Bulk Lime = \$ 10.30

Notes- Lime sold in bags to building trade would cost approximately \$4.50 per ton more for bagging and there would be 60c per ton extra delivery costs to the Tucson area.

Hydrated lime would also have an added cost for hydrating and bagging. However, quick lime adds 20% in weight when hydrated, so would compensate.

\$1.00 per ton should be added as a contingency.

Tests on Mt. Pagan lime show ignition loss of 44%. This compares favorably with other limes, which average closer to 50%.

PRELIMINARY ESTIMATE - CAPITAL COST & OPERATING CAPITAL

(a) GENERAL:

Road Construction	\$ 10,000
Site Preparation	4,000
Water Tank & Facilities - Domestic	1,500
Single Phase Power	2,000
Tool and Storage Shed	1,500
Hand Tools	2,000
Pickup Truck	3,000
Parts Stock	4,000
Loader & Fork Lift Truck	<u>13,000</u>

Sub-Totals:

\$ 47,000

(b) MINE:

Mine Preparation	\$ 4,000
Conveying Equipment	3,100
Crusher & Screening Plant	20,000
Crusher & Screening Plant Installation	1,500
Coarse & Fine Ore Hops	5,000
Fan Feeders	1,500
Power Plant	10,000
Ventilation Equipment	<u>2,500</u>

Sub-Totals:

\$ 51,000

(c) CALCINE PLANT:

Mill, purchase and erection - Assume	\$ 95,000
Batch Hydrator and Crushing	15,000
Storage Bins, 3 steel	12,000
Bagging Plant and Storage	6,000
Conveyors	2,500
Office and Living Quarters	2,000
Office Equipment	1,000
Asst. Equipment	<u>1,000</u>

Sub-Totals:

\$ 134,500

(d) GR. LINES 3" - 10 miles

\$ 70,000

\$ 70,000

Carried forward:

\$ 302,500

SANTA RITA MARBLE

77204051
Kelly

CALCIUM PRODUCTS OF ARIZONA

P.O. BOX 70 / SAHUARITA, ARIZONA 85629
TUCSON AREA (602) 791-3041 EXT. 1029
INFORMATION 1 (800) 345-5635

March 27, 1987

State Mine Inspector
State Office Building
416 W. Congress, Rm 189
Tucson AZ 85701

STATE MINE INSPECTOR
APR 1 1987

Gentlemen:

This letter is notification that mining operations will be initiated in the near future at the Santa Rita limestone quarry. Location is 12 miles ESE of Sahuarita, in Sections 11 & 14, T18S, R15E, Pima County.

Drilling and blasting will develop feed for a crushing and screening plant recently constructed onsite. A continuous operation (40 hr/week) is planned, with plant expansion to include grinding facilities to produce fine white mineral filler for various industrial uses.

Operation of the quarry (Section 11) is under approved permit with the U.S. Forest Service; the plantsite (Section 14), under approved permit with the BLM.

We anticipate your personnel will soon be visiting onsite. To communicate, our mine office radiophone requires dialing the extension following a ring and tone signal. Or you can leave a message with our Tucson answering service at 323-4667.

Very truly yours,
Bill Devitt

Bill Devitt
Mining Engineer
Manager

cc: R. Knox

Santa Rita Limestone Quarry (file)
CALCIUM PRODUCTS OF ARIZONA

Pima Co.

P.O. BOX 70 / SAHUARITA, ARIZONA 85629
 TUCSON AREA (602) 791-3041 EXT. 1029
 INFORMATION 1 (800) 345-5635
 December 30, 1987

TO: Lob Knox

FROM:

SUBJECT: Santa Rita Quarry Area Limestone Reserves Estimate

have calculated the tonnage of:

- a) Escabrosa Limestone
- b) recoverable white limestone (at 40% of total)
- c) overburden

mineable by surface quarrying, with pit slopes overall 45° and overburden removal limited to 100-ft maximum depth, for the entire deposit outcropping in our area. 75% of the tonnage is within our original claim block; 25% lies outside to the southwest

Tonnages for:	Our Claim Block	on <i>Helvetia</i> Co.	TOTAL
Escabrosa Limestone	87,814,000	28,692,000	116,506,000
distribution	75.4%	24.6%	
strip ratio	.071	0.100	
if 40% white limestone	35,126,000	11,477,000	46,603,000
strip ratio <i>TOB/STONE</i>	.178	.250	
Overburden	6,235,000	2,871,000	9,106,000
distribution	68.5%	31.5%	
			<u>163,107,000</u>

On the accompanying topo/geologic map of our area (from a PhD thesis by Vard H. Johnson, Univ. of AZ, 1941) have colored the surface outcrop of the Escabrosa Limestone, indicated our claim boundary, and drawn cross-section lines A-A' thru G-G'. Both horizontal and vertical scale are 500 ft per inch. A series of five graph sheets show the location of the 15 sections, approximate dip of the limestone bed (from the geology map) and pit wall limits on a 45° slope intersect adjacent overburden to 100-ft maximum depth. Area of limestone for each section was determined in sq ft. The distance between sections was multiplied by the average of two end areas to get cu ft, then divided by 12.5 cu ft/ton to give tonnage.

It is felt the tonnages are on the conservative side due to the selection of cross-sectional areas, the moderate pit slope, and the low-density tonnage factor used.

Note that a quarter of the reserves are on the new claim group

GR
Santa Rita file 10/14



Employee Communication
Corporate Personnel

VOL. 41, NO. 38
DECEMBER 23, 1991

PFIZER SPECIALTY MINERALS ACQUIRES CALCIUM PRODUCTS OF ARIZONA

Pfizer Specialty Minerals, a subsidiary of Pfizer Inc, announced that it has purchased the assets and limestone reserves of Calcium Products of Arizona from Sahuarita Mining Ltd of Colorado Springs. Terms were not disclosed.

Walter Nazarewicz, President of Pfizer Specialty Minerals, said the company would immediately launch a \$3 million modernization project to upgrade the facilities as part of an intensified program for expanding limestone sales in the Southwest.

Located some 30 miles southeast of Tucson, Calcium Products of Arizona will operate as part of Pfizer's Limestone West product complex, centered in Lucerne Valley, California, under Plant Manager Jim Mulkey. Lucerne Valley will provide management support in the areas of geology, engineering, and personnel.

In addition to its use in animal feed and as joint compound for the construction industry, limestone has applications in pool sand, decorative rock, cultured marble, asphalt, and other markets.

The installation of new on-site testing and quality control equipment will greatly improve product quality and uniformity, Mr. Nazarewicz said, adding that process automation will substantially increase mill capacity. Separate storage facilities will be provided for various limestone grinds intended for distinct markets.

BULLETIN
.....
Timely Information for All Employees

You can help preserve the beauty of the Santa Rita Mountains, and other scenic areas in Arizona and the West; help preserve your investment in a home; help insure the preservation of our environment; and help insure the orderly development of the Nation's land resources by writing today to ALL of these elected officials:

U.S. Sen. Paul J. Fannin
Senate Office Building
Washington, D. C.

U.S. Sen. Barry Goldwater
Senate Office Building
Washington, D. C.

U.S. Rep. Morris K. Udall
House Office Building
Washington, D. C.

Governor Jack Williams
State Capitol
Phoenix, Arizona.

State Sen. James F. McNulty, Jr.
Arizona Senate
Phoenix, Arizona.

State Rep. Richard Pacheco
Arizona House of Representatives
Phoenix, Arizona.

State Rep. William R. Ryan
Arizona House of Representatives
Phoenix, Arizona.

Tell them you want them to do everything in their power to stop the spread of mining into the Santa Rita Mountains and other scenic areas of Arizona . . . Tell them you want them to do whatever they can to promote the repeal or revision of the Federal Mining Law of 1872--as proposed in a Bill introduced by Representative Morris K. Udall . . . Tell them you want the people of Arizona to have some defense against, and some power over, the big mining companies.

(This advertisement has been paid for as a public service by the following citizens of Green Valley and the Santa Cruz Valley who DO care what happens to Arizona.)

Francis Allin, M.D.
Gene Alyea
David I. Aspell
George B. Baldwin
Frederick G. Behner
Ralph A. Bergsten
Donald Berman
Virginia Bissell
George H. Bowman
E. C. Bryden
Msgr. John F. Burns

H. N. Carver
Rev. John P. Christensen
Thomas B. Dancey
Robert F. Dempster
Steve Emerine
Charles M. French
Robert M. Gray
Henry C. Hawley
Florence P. Horner
Carl Hvidsten
Rector W. Johnson

W. Boyd Kegg
Charlotte R. Kenerson
Severn P. Ker, Jr.
Oscar G. Kohl
Fred H. Kramer
Thomas J. Kullman
George H. Larsen
Rev. Leland R. Larson
Charles D. Lewis
Robert Lindquist
Gaylord W. Luft

George E. Marx
Leo C. Nelson
James P. Newell
Dudley L. Parsons
Dorothy D. Patton
Winifred Ritzer
John C. Robertson
Orris Rowland
Frances Sample
Roland G. Scherer
Cedric L. Smith

Maurice Spear
Louis B. Stevenson
Gertrude Tanner
Edwin H. Taze
Maurice Thomas
Emerson H. Todd
A. Russell Treadway
K. A. Trowbridge
Ted Turpin
Joseph N. Vaughan
William M. Vogt

Ann Wallin
Ward W. Watrous
William S. Weeks
Ruth K. Weirick
Monty D. Wilson
Nathaniel R. Winslow
Jack Wyatt