FEB 21 1989

040-08980

Docket No. 99990001 Non-Licensee

Heritage Minerals, Inc.
ATTN: John F. Lord, P.E.
Plant Manager
P.O. Box 12
Lakehurst, New Jersey 08733

Gentlemen:

Subject: Routine Inspection No. 99990001/89-001

On January 12, 1989, Laurence F. Friedman, Ph.D., C.H.P., of this office conducted a routine safety inspection at Route 70, Mile Marker 41, Lakehurst, New Jersey of activities involving source material. The inspection was an examination of your activities as they relate to radiation safety and to compliance with the Commission's regulations. The inspection consisted of observations by the inspector, interviews with personnel, and a selective examination of representative records. The findings of the inspection were discussed with yourself at the conclusion of the inspection. A copy of the NRC inspection report is enclosed.

Based on the results of this inspection, it appears that your activities were not conducted in full compliance with NRC requirements. A Notice of Violation is enclosed as Appendix A and categorizes each violation by severity level in accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions," 10 CFR Part 2, Appendix C (Enforcement Policy). You are required to respond to this letter and in preparing your response, you should follow the instructions in Appendix A.

During the discussions of our findings at the conclusion of the inspection, Dr. Friedman explained that one of your options to correct the violation cited in Appendix A to this letter is to apply for and obtain an NRC license authorizing the possession and use of source material. For your convenience, we have enclosed an application form and a licensing guide.

A/1

ITEM # 1 OFFICIAL RECORD COPY ML DL HERITAGE - 0001.0.0
02/16/89

RETURN ORIGINAL TO REGION I IE:07

Please keep in mind that the enclosed licensing guide was written for a facility which may be larger or smaller than yours or employ different materials. For example, if you can demonstrate that the maximum radiation levels in your plant are less than some acceptable value, it may not be necessary to have a radiation monitoring program or to issue personnel monitoring devices. The same principal can be extended to air monitoring, contamination control, and other areas of the radiation safety program. Include your rational for omitting any element of the radiation safety program in your application. The services of a health physics consultant may be helpful in completing the application. If you have any questions, you may contact Dr. Friedman at (215) 337-5276.

In accordance with Section 2.790 of the NRC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations, a copy of this letter and your reply will be placed in the Public Document Room.

The responses directed by this letter and the accompanying Notice are not subject to the clearance procedures of the Office of Management and Budget as required by the Paperwork Reduction Act of 1980, PL 96-511.

Your cooperation with us is appreciated.

Sincerely,

Original Signed By:
John D. Kinneman

John D. Kinneman, Chief
Nuclear Materials Safety Section B
Division of Radiation Safety
and Safeguards

Enclosures:
1. Appendix A, Notice of Violation
2. NRC Region I Inspection Report No. 99990001/89-001
3. 10 CFR Part 19, 20, 40, 51, 170
4. Decommissioning Rule
5. Branch Technical Position for Onsite Disposal of Source Material
6. Form NRC-313
7. Licensing Guide

cc:
Public Document Room (PDR)
Nuclear Safety Information Center (NSIC)
State of New Jersey

bcc:
Region I Docket Room (w/concurrences)
Management Assistant, DRMA
L. Rouse, NMSS/IMSB
J, Kinneman, RI

RI:DRSS
Friedman/bc
02/17/89

RI:DRSS
Kinneman
02/17/89

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ML DL HERITAGE - 0002.0.0
02/16/89

APPENDIX A

NOTICE OF VIOLATION

Heritage Minerals, Inc.
Lakehurst, New Jersey 08733

Docket No. 99990001
Non-Licensee

As a result of the inspection conducted on January 12, 1989, and in accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions," 10 CFR Part 2, Appendix C (Enforcement Policy) (1988), the following violation was identified:

10 CFR 40.3 requires that no person receive title to, own, receive, possess, use, transfer, or deliver any source material after removal from its place of deposit in nature, except as authorized in a specific or general license issued by the NRC pursuant to the regulations in 10 CFR Part 40. Source material is defined [10 CFR 40.4(h)] as (1) uranium or thorium, or any combination thereof, in any physical or chemical form, or (2) ores which contain by weight one-twentieth of one percent (0.05%) or more of (i) uranium, (ii) thorium, or (iii) any combination thereof. 10 CFR 40.13, "Unimportant quantities of source material," provides an exemption for any person who receives, possesses, uses, transfers, or delivers source material in any chemical mixture, compound, solution, or alloy in which the source material is by weight less than one-twentieth of one percent (0.05%) of the mixture, compound, solution, or alloy.

Contrary to this requirement, as of January 12, 1989, Heritage Minerals, Inc., possessed and used table concentrate and monazite waste in which the concentrations of source material were greater than 0.05% by weight, and was not authorized to do so in a specific or general license issued by the NRC.

This is a Severity Level IV violation. (Supplement VI)

Pursuant to the provisions of 10 CFR 2.201, Heritage Minerals, Inc., is hereby required to submit to this office within thirty days of the date of the letter which transmitted this Notice, a written statement or explanation in reply, including: (1) the corrective steps which have been taken and the results achieved; (2) corrective steps which will be taken to avoid further violations; and (3) the date when full compliance will be achieved. Where good cause is shown, consideration will be given to extending this response time.

OFFICIAL RECORD COPY ML DL HERITAGE - 0003.0.0
02/16/89

APPENDIX A

NOTICE OF VIOLATION

Heritage Minerals, Inc.
Lakehurst, New Jersey 08733

Docket No. 99990001
Non-Licensee

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U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 99990001/89-001

Docket No. 99990001

License No. none Priority ___ Category ___ Program Code ___

Licensee: Heritage Minerals, Inc.

P. O. Box 12

Lakehurst, New Jersey 08733

Facility Name: Heritage Minerals, Inc.

Inspection At: Route 70, Mile Marker 41, Lakehurst, N. J.

Inspection Conducted: January 12, 1989

Inspector: Laurence F. Friedman 2/17/89
Laurence F. Friedman, Ph.D., C.H.P. date
Senior Health Physicist

Approved by: John D. Kinneman 2/17/89
John D. Kinneman, Chief date
Nuclear Materials Safety Section B

Inspection Summary: Special Safety Inspection Conducted January 12, 1989 (Report No. 99990001/89-001)

Areas Inspected: Location, geology and hydrology of site; history of site; current process; tour of plant; collection and analysis of samples.

Results: One violation was identified: Possession of source material without an NRC license.

DETAILS

1. Persons Contacted

Heritage Minerals, Inc.

*John F. Lord, P.E., Plant Manager
Tony V. Cuculic, Chief Engineer

State of New Jersey, Department of Environmental Protection

*Peter C. Taylor, Central Bureau of Field Operation, Division of Hazardous Waste Management
*Karl W. Muessig, Ph.D., Geologist, N. J. Geological Survey, Division of Water Resources

*indicates those present at Exit Interview

2. Location, Geology and Hydrology of the Site

The Heritage Mineral, Inc., site is located in Manchester Township, Ocean County, New Jersey. A map showing the general location of the site is included as Attachment 1. A more detailed map showing the location of the settling pond and dredge pond (see below) is included as Attachment 2. Maps showing the layout of the plant are included as Attachments 3 and 4.

The Plant Manager stated that the entire site has an area of 7000 acres. He estimated that 1000-1200 acres had been involved in the mining operation. He stated that the balance of the site had not been disturbed. The plant itself, including the feed pile, settling pond and tailings piles occupies, an area estimated by the Plant Manager at 450-500 acres.

According to the New Jersey Geological Survey, the site is located on the Atlantic Coastal Plain. The formations are sandy and permeable to at least 1500 feet, where some clay is encountered, and bedrock is not encountered until at least 3000 feet.

The uppermost aquifer at the site is the Cohansey. Depth below grade to seasonal high water of this aquifer is approximately six feet.

3. History of Site

The following information was obtained from the New Jersey Department of Environmental Protection, and was confirmed by the Plant Manager. In 1957, ASARCO Incorporated purchased the previously undeveloped site, and initiated studies to delineate an ilmenite ore body. The New Jersey Geologist estimated that this ore contained 70% quartz (SiO_2), 29% ilmenite (TiO_2), and the remaining 1% zirconium, monazite, etc.,

including rare earths and uranium and thorium. Development of the site began in 1971, and active mining operations began in 1973.

Mining consisted of a hydraulic dredge operating on the exposed surface of the Cohansey aquifer which extracted a sand slurry for transfer to a dewatering barge. Water and gravel was separated and returned to the dredge pond, and the sand slurry was pumped to the wet mill. At the wet mill, the heavier minerals were separated from the lighter fraction by physical methods. This lighter fraction, comprising approximately 96% of the original mass, was returned to the dredge pond.

The heavier ore fraction, containing titanium dioxide, zircon, quartz, kyanite, sillimanite, and other trace minerals, was stockpiled to allow for dewatering. This material was fed to a rotary kiln for drying, and was then screened to remove coarse material, more than 99% quartz, which was deposited in a pile behind the dry mill.

The electrically conductive titanium dioxide-bearing minerals were separated from the non-conductive materials electrically, and the product was further refined magnetically to produce the final ilmenite product. This product represented approximately 2.5% of the original mass. The dry-mill tailings were stockpiled for future processing, and comprise the present "New Feed" pile to the east of the dry mill.

ASARCO halted operations in March 1982. The hydraulic dredging operations stopped, but the processing plant was used for experimental purposes under a lease to Humphreys Engineering until September 1982. Humphreys evaluated the possibility of producing a zircon product from the stockpiled dry-mill tailings.

In 1984-85, Kerr-Magee considered buying the property, and brought in Hazen Research, Inc., to perform studies of the process. Attachment 5 is a table from the Hazen report showing source material concentrations at various points in the process. The table was furnished to the inspector by the licensee during the inspection.

The property was purchased by the present owner, the Houson Corporation, which is owned by the Hovnanian family, in 1986. The facilities were leased to Mineral Recovery, Inc., and operated by them until August 1987. From August 1987 to the present, operations have been conducted by Heritage Minerals, Inc., which is owned by Houson.

4. Current Process

The current operation, which the Plant Manager stated is identical with the process studied by Kerr-Magee, processes the dry-mill tailings from the ASARCO operation to extract zircon and leucoxene (titanium dioxide). A flow chart of the process is included as Attachment 6. The "New Feed" on the chart is the dry-mill tailings from ASARCO. The material is

physically processed using water spirals and tables to separate light material, which is sent to a hopper where it is combined with the tailings from the dry mill.

The remaining, heavy material is kiln dried and passed to the dry mill where it is screened and separated electrically and magnetically. The non-conductors zircon and monazite are separated from the conductors, leucoxene (65% titanium dioxide) and rutile (92+% titanium dioxide).

Both streams are then further refined magnetically. The zircon product is separated from the monazite in the dry mill. The monazite goes into a hopper where it is combined with the tailings from the wet mill. The contents of the hopper are mixed with water and piped out to the combined tailings pile, located behind (to the north of) the wet mill. Some of the leucoxene is separated as product, and some is further refined into rutile by magnetic separation from residual zircon, which is recycled. Both the rutile and leucoxene are sold as product.

The Plant Manager stated that the stock of New Feed at the start of operations in November 1986 was approximately 1.2-1.6 x 10^6 short tons, of which an estimated 250,000-300,000 tons remain. Except for product shipped, an estimated 50,000-60,000 tons reported as TiO_2, the balance, approximately 1.0 x 10^6 tons, is in the combined plant tailings pile. Approximately 2600 tons of zirconium product and 800 tons of titanium product are produced each month. Approximately 25,000 tons of wet-mill tailings and 300 tons of dry-mill tailings are produced each month. Twenty per cent of the dry-mill tailings is monazite, a sand which contains source material. The Plant Manager estimated that present supplies of feed stocks (the "New Feed") would last approximately eight more months. Current plans are to reprocess the combined plant tailings, using the current process, to recover the same products. This process is expected to take another three years. No decision has been made as to whether to continue operations beyond that time.

The inspectors also discussed a housing and recreational development proposed for the site by the present owner. The development is planned around the lakes left by the dredging operation and is currently awaiting various state and local permits. The Plant Manager stated that development would start at the east end of the site and that the present plant location would be developed last. The entire project is expected to take 20 years.

5. Tour of Plant

The inspectors from the NRC and the State of New Jersey toured the plant. The plant operates 24 hours a day, seven days a week, and employs a total of 50 workers. The plant consists of the wet mill, a 200 by 100 foot building, half of which is used, and the dry mill, a 100 by 100 foot

building, all of which is used. There are also a service and office building and various small out buildings.

Background radiation levels were measured at the turn-off from Route 70 with a Ludlum Model 19 micro-R meter, and observed to be 7 uR/hr. Ambient radiation levels in the wet mill building and the dry mill building were approximately 50 uR/hr, except in the area of the dryer product discharge (dry mill feed) where levels of 300 uR/hr were measured. Levels of 240 uR/hr were measured in the vicinity of the dry-mill tailing discharge.

Workers were observed to be wearing single use, disposable dust masks while working in the dry mill. Little dust was actually observed, as virtually all fines are removed in the wet mill.

The inspectors noted that there was no health physics program, and the Plant Manager stated that no surveys for radiation or radioactive material were performed.

The inspectors also toured the combined plant tailings pile. Radiation levels over the pile were approximately 30 uR/hr.

6. Collection and Analysis of Samples

Six samples of plant feed stock, in-process material, and tailings were collected. The position of each sample in the process stream is indicated on Attachment 6. The samples ranged in mass from 786 to 1544 grams. Each sample was analyzed by gamma spectroscopy using an intrinsic germanium detector calibrated for the geometry of the samples (Marinelli beaker) with NBS-traceable standards. No attempt was made to dry the samples, which makes the reported weight-per cent values low. The activity of lead-212 was taken as the activity of thorium in the sample, and the activity of protactinium-234m was taken as the activity of uranium. These nuclides were assumed to be in equilibrium with the thorium-232 and uranium-238 parents, respectively. Activities were converted to masses using specific activities of 1.09E-1 uCi/g for thorium-232 and 3.33E-1 uCi/g for uranium-238. The weight-per cent of thorium, uranium, and total source material in each sample is reported in Table 1. Based on the analysis of the sample of combined plant tailings and the estimate of the total mass of these tailings, there appears to be approximately 62 tons each of uranium and thorium in the combined plant tailings pile.

The table concentrate had a source material concentration of 0.074% and the monazite waste has a source material concentration of 0.585%.

"Source material" is defined [10 CFR 40.4(h)] as (1) uranium or thorium, or any combination thereof, in any physical or chemical form, or (2) ores which contain by weight one-twentieth of one percent (0.05%) or more of

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The finding that Heritage Minerals, Inc., possessed and used table concentrate and monazite waste in which the concentrations of source material were greater than 0.05% by weight without being authorized to do so by an NRC license is an apparent violation of 10 CFR 40.3.

7. Exit Interview

The results of the inspection were discussed with the individuals indicated in Section 1. The inspector explained the provisions of 10 CFR Part 40, and that whether Heritage Minerals, Inc., would have to apply for an NRC license depended on the results of the analysis of the samples.

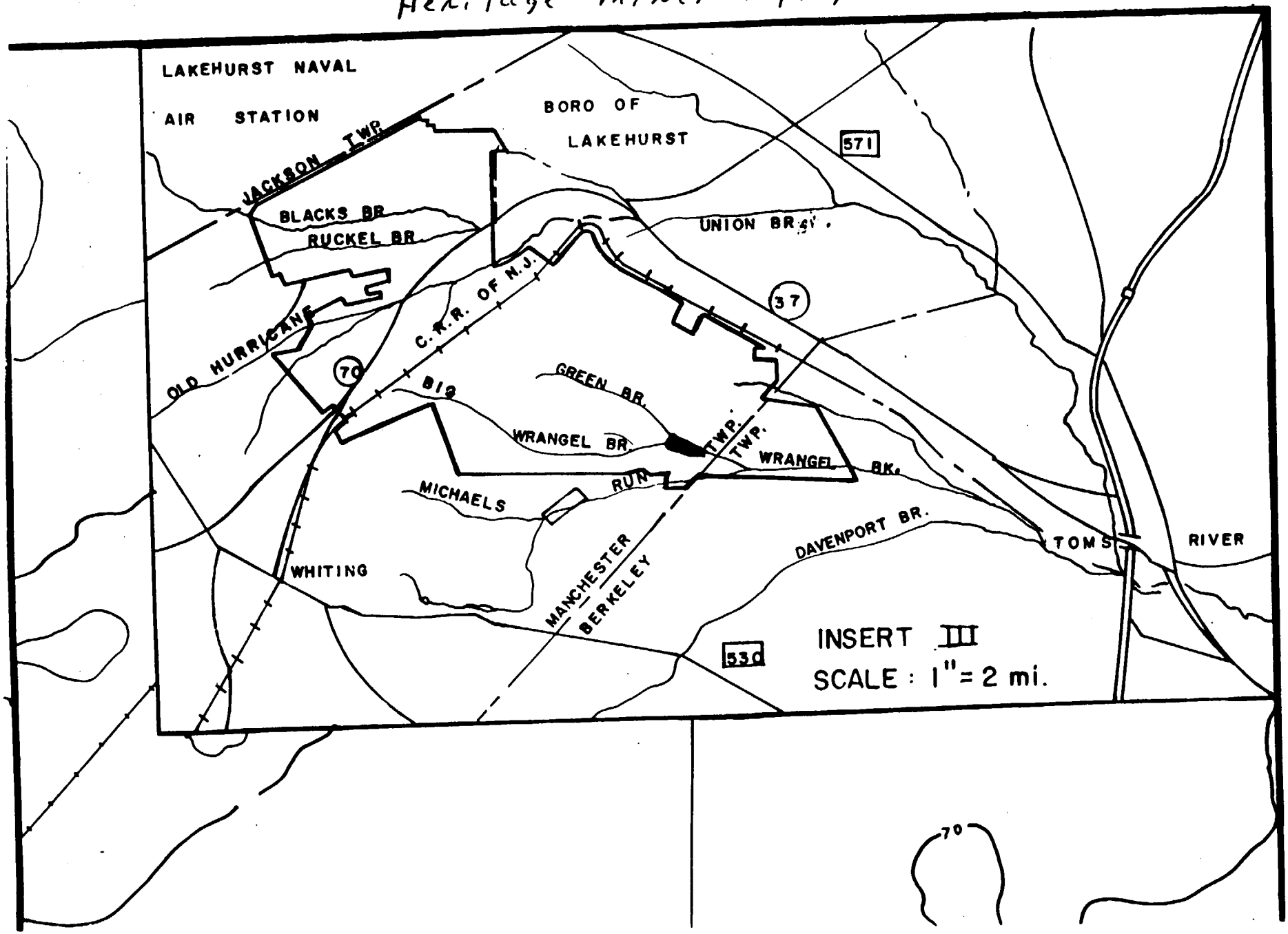
The Plant Manager showed the inspectors a memorandum of a meeting in August 1986 between the then Plant Manager and a consultant, and a representative of the NRC, at which the NRC representative stated that, since the intermediate process streams were combined with other material before discharge to the tailings pile, the process could be viewed as a "black box," and that an NRC license was not required. The Plant Manager stated that he would cooperate in applying for a license if one was now deemed to be required.

TABLE 1

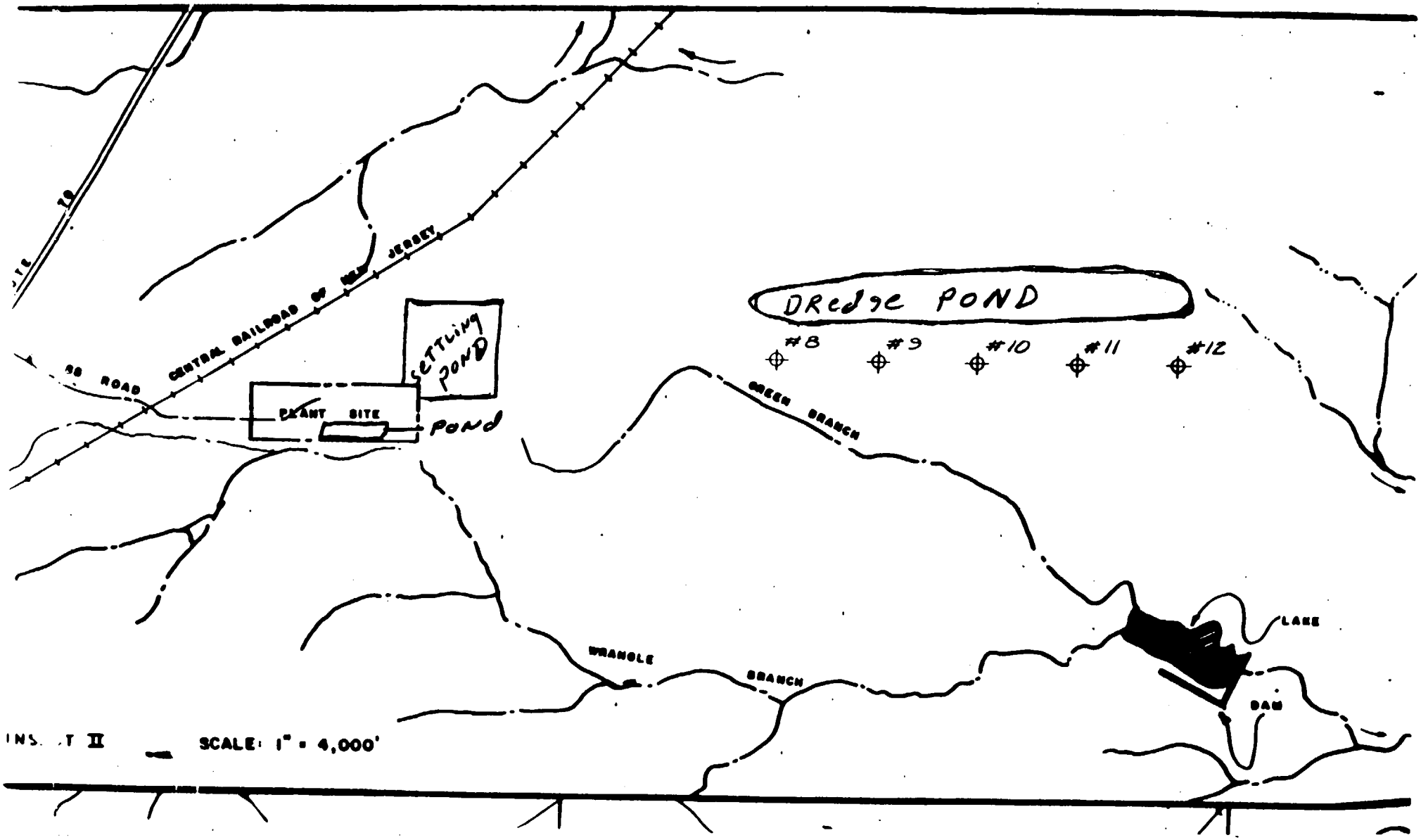
SOURCE MATERIAL CONCENTRATION IN SAMPLES (WET BASIS)

Sample No.	Sample Identity	% Th	% U	% Source Mat.
1	table concentrate	0.048	0.026	0.074
2	new feed	0.009	0.009	0.018
3	combined plant tailings	0.006	0.006	0.012
4	monazite waste	0.539	0.047	0.585
5	zircon product	0.007	0.029	0.035
6	leucoxene product	0.010	0.004	0.014

Heritage mineral property



ATTACHMENT 1
99990001/89-001

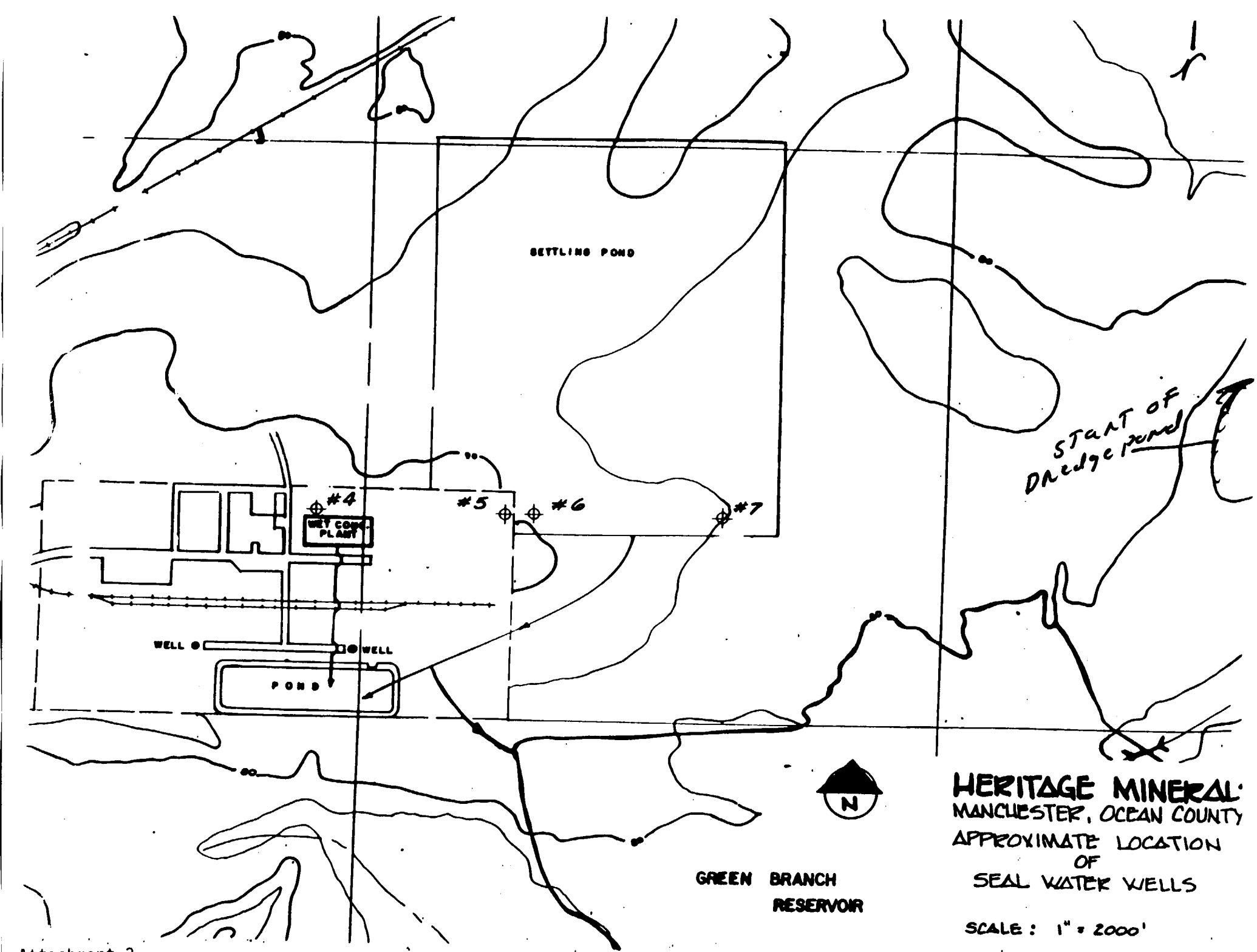


N

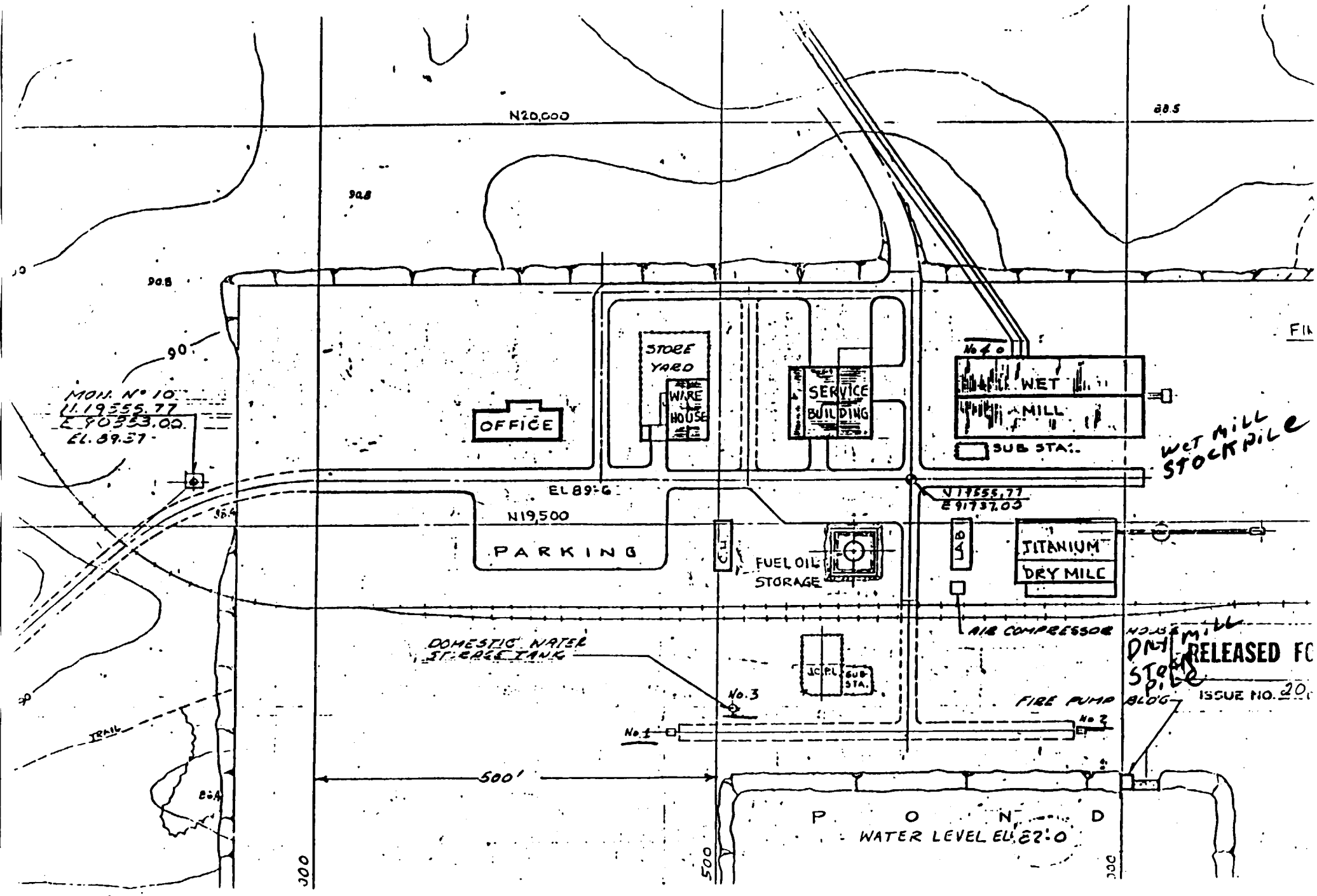
HERITAGE MINERAL
MANCHESTER, OCEAN COUNTY
APPROXIMATE LOCATION
OF
SEAL WATER WELLS

SCALE: 1" = 2000'

Attachment 2
99990001/89-001



Attachment 3



Attachment 4
99990001/89-001

Final Zircon Conc	% Fe_2O_3
Unscrubbed	0.17
10 min scrub	0.066
4 min scrub	0.070

Screen Analyses of Various Products

Screen analyses were made on various products during the course of testing, mainly to determine if certain sized particles were being retained or lost preferentially. These screen analyses are contained in Appendix C-1.

Table 5 gives the screen analyses for the bulk zircon concentrate. Table 6 contains the screen analyses for the three TiO_2 products. As mentioned previously, all of the valuable minerals are in the 60- x 200-mesh size range.

Thorium and Uranium Assays and Distribution throughout the Flowsheet

Radiometric assays on the as-received sand showed 130 ppm ThO_2 and 55 ppm U_3O_8. Radiometric analyses throughout the flowsheet are summarized in Table 7. The thorium and uranium are enriched in the induced roll magnetic product from the table concentrate which is where the monazite concentrates. This product assays 20791 ppm ThO_2 (approx 2.08% ThO_2), and 1120 ppm U_3O_8.

The spiral plant tailings assay 0.7 ppm ThO_2 and 3 ppm U_3O_8. If the monazite-rich products are added to these tailings, the calculated assays increase to around 140 ppm ThO_2 and 11 ppm U_3O_8.

Rare Earth Content of Monazite-rich Product

The total rare earth plus thorium and P_2O_5 content of the monazite-rich product (induced roll magnetic from table concentrate) was determined by wet chemical methods.

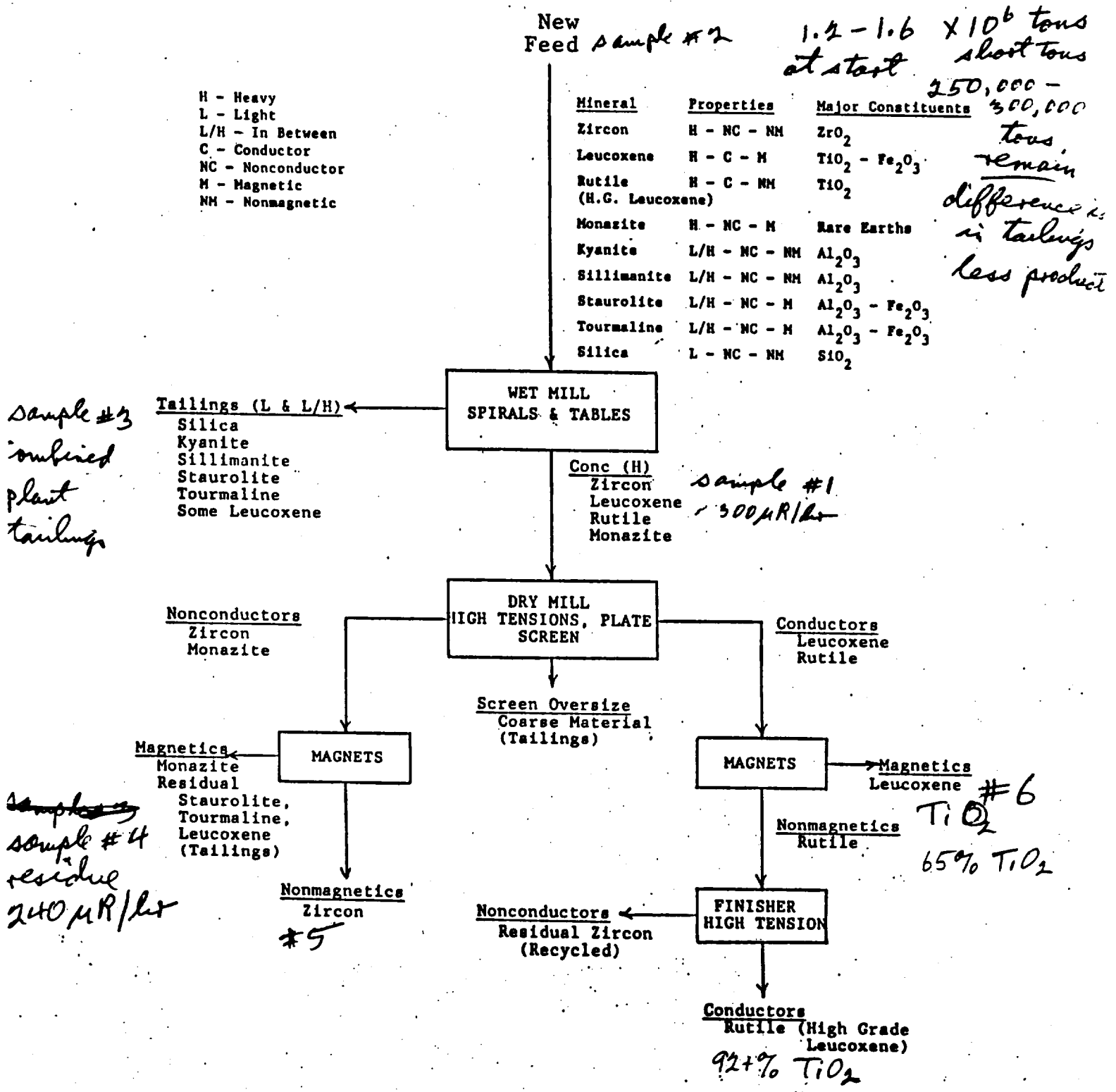
Table 7

U_3O_8 and ThO_2 Distribution in Current Flowsheet

	ThO_2			U_3O_8	
	Wt %	ppm	Distr %	ppm	Distr %
Feed to spiral plant (calc)	(100.00)	(130)	(100.0)	(55)	(100.0)
Spiral plant tail (calc)	(67.93)	(0.7)	(0.4)	(3)	(4.1)
Scavenger tail	59.8	0.5	0.2	3	3.5
Recleaner scavenger tail -65 mesh	8.13	3	0.2	4	0.6
Spiral plant concentrate	(32.07)	(407)	(99.6)	(152)	(95.9)
TiO_2 conc (calc)	(6.26)	(55)	(2.8)	(27)	(3.3)
Lower TiO_2	4.36	52	1.8	25	2.1
70% TiO_2	1.06	78	0.6	30	0.6
+90% TiO_2	0.84	55	0.4	30	0.6
TiO_2 plant tailing (calc)	(25.16)	(500)	(96.6)	(188)	(92.5)
Table conc (calc)	(10.88)	(965)	(85.8)	(300)	(64.1)
Mag	0.46	20791	73.3	1120	10.2
Nonmag (zircon)	10.42	156	12.5	264	53.9
Table mid	7.73	163	9.7	178	27.0
Table tail	6.55	23	1.1	11	1.4
Miscellaneous mids	0.65	NA	-	NA	-

1/ Based on data from Deister Co. Test and Flowsheet D-4 through D-6.

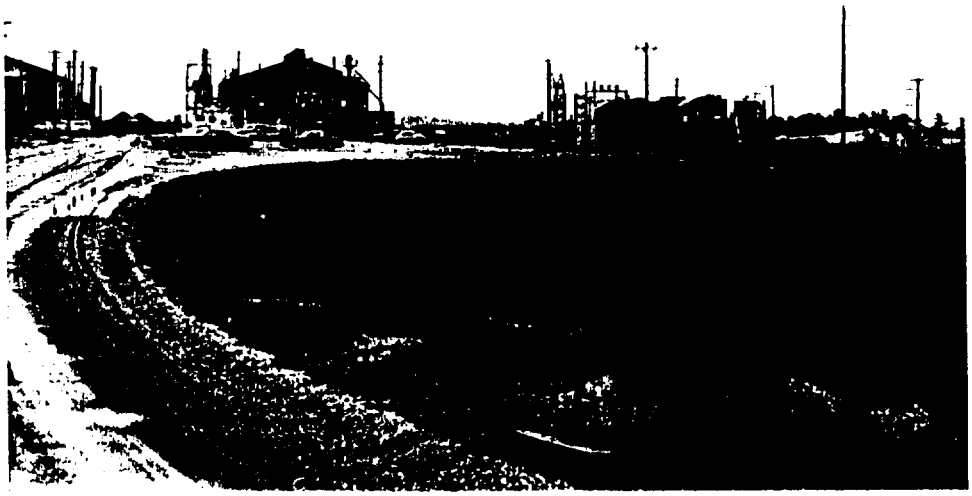
Attachment 6
99990001/89-001



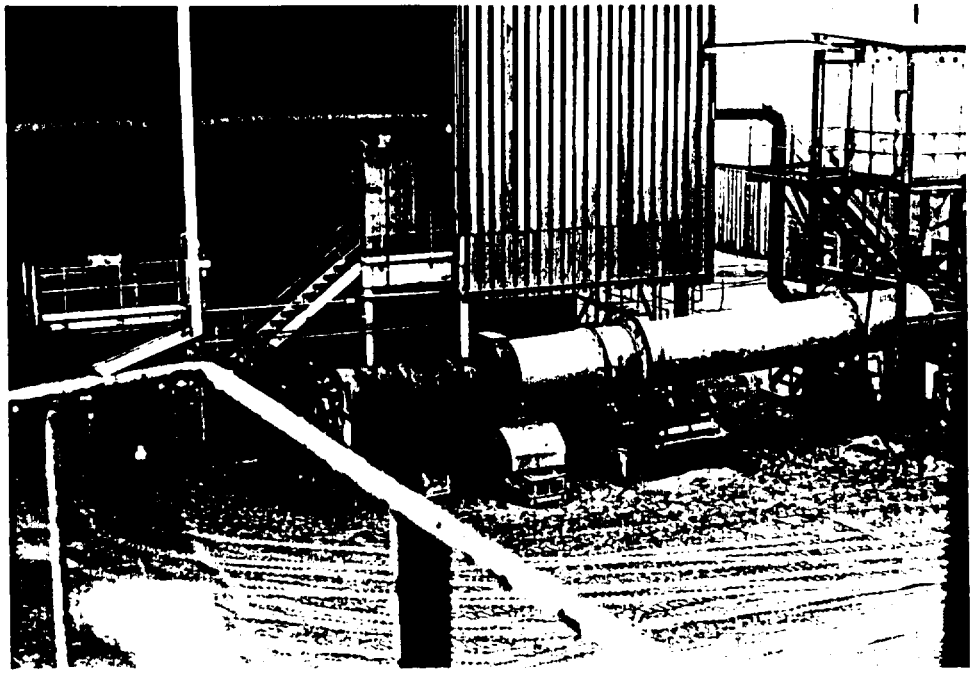
MINERALOGICAL FLOWSHEET

February 26, 88

over last 2 years 50,000 - 60,000 tons product shipped.



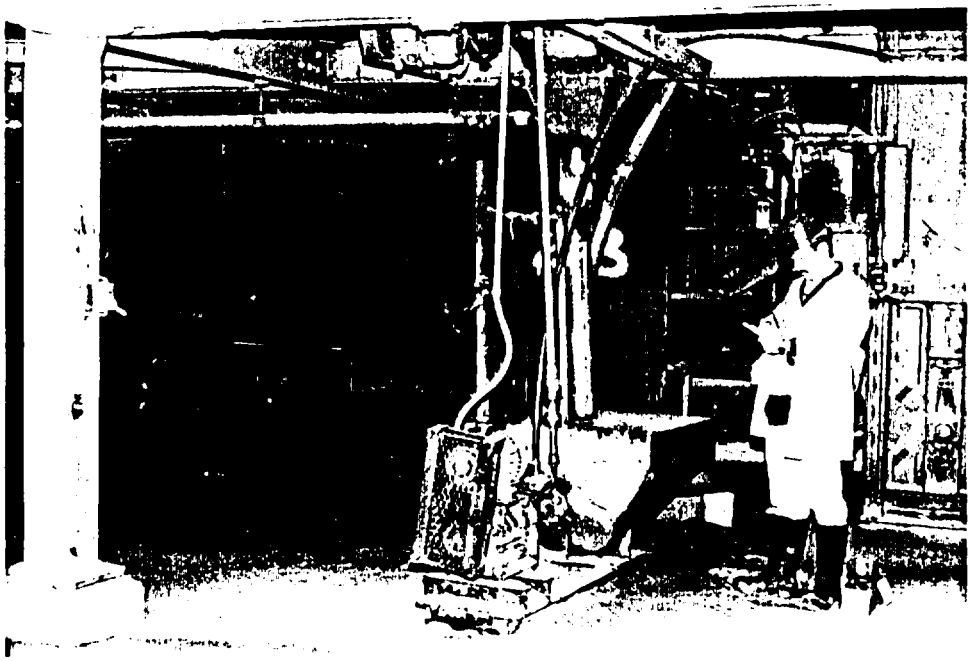
Two views of plant from entrance road



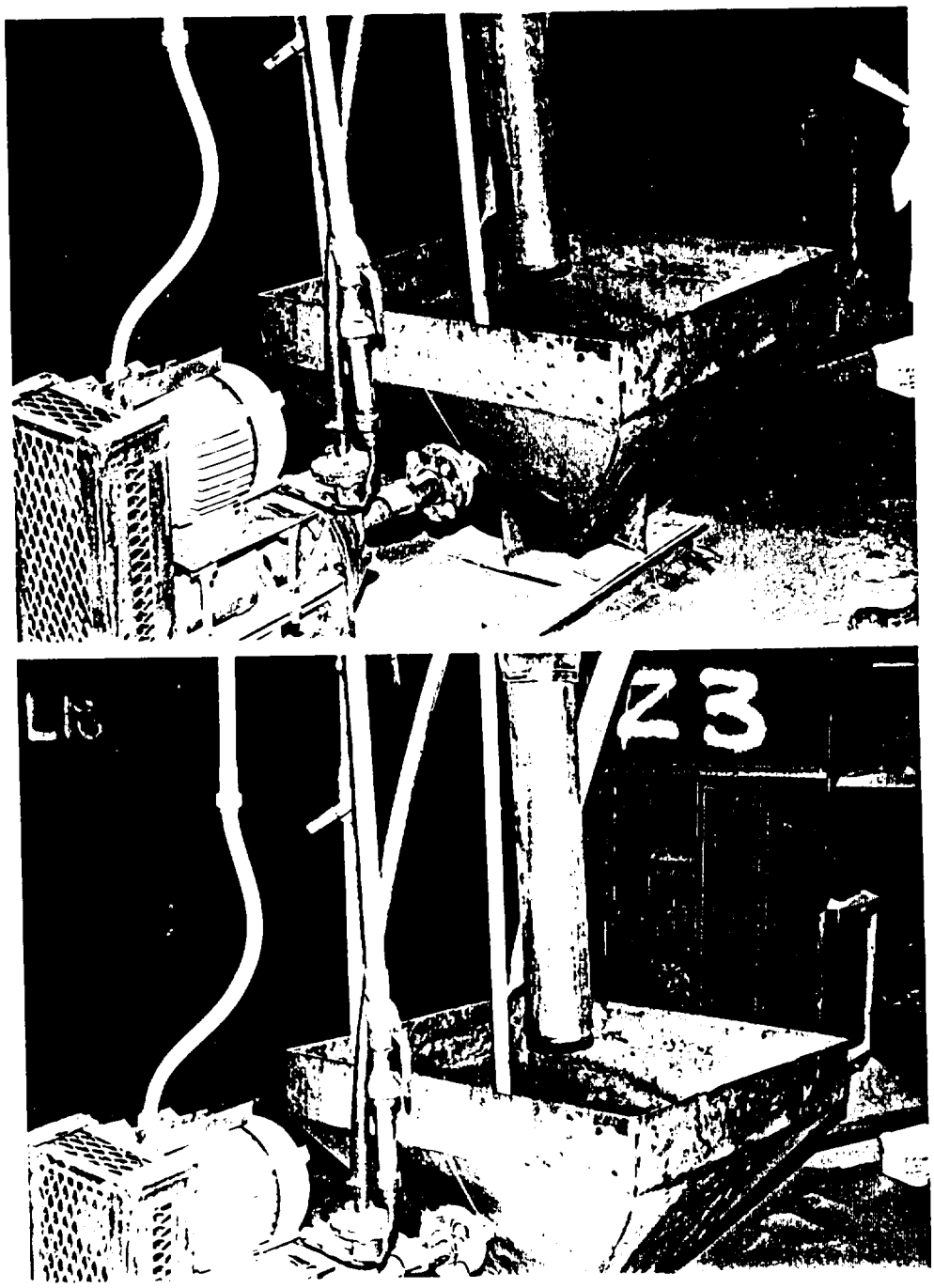
From wet mill, looking East to dryer and dry mill
(location of sample #1)

Combined plant tailings concentrate
From wet mill, looking NE

Looking SE towards New Feed pile
Settling pond contains process water which is recirculated



Sampling point for Monazite Waste
(Sample #4)



Sampling point for Monazite Waste
(Sample #4)

Pa-234m = U Pb-212 = Th

Heritage Minerals, Inc.

sample #	TH (μC:/g)	U (μCi/g)	Th (%)	U (%)	total
1 table concentrate	5.23 E-5	8.8 E-5	0.048	0.026	0.074
2 new feed	9.54 E-6	3.1 E-5	0.009	0.009	0.018
3 combined plant tailings	6.77E-6	1.9 E-5	0.006	0.006	0.012
4 monazite waste	5.871E-4	1.557 E-4	0.539	0.047	0.585
5 zircon product	7.17 E-6	9.6 E-5	0.007	0.029	0.035
6 TiO_2	1.092 E-5	1.4 E-5	0.010	0.004	0.014

Region I FORM 304
(8/88)

U.S. NUCLEAR REGULATORY COMMISSION

SAMPLE RECORD SHEET
REGION I LABORATORY

LAB CONTROL NUMBER: 301379

ROUTINE / X URGENT — DATE NEEDED: ASAP

SAMPLE LOCATION: Heritage Metals

DATE ANALYSIS BEGAN: 1-24-89 — DATE COMPLETED: 1-27-89

ANALYZED BY: ATM / JJL — DATE:

COLLECTED BY: L. Friedman — DIVISION: DRSS — PHONE: 5276

CONTACT NOTIFIED: L. Friedman — DATE: 1-27-89

APPROVED BY: JJL — DATE: 1-27-89

SAMPLE NO.	SAMPLE DATE	SAMPLE HOUR	SAMPLE DESCRIPTION	ANALYZE FOR	INSTRUMENT USED	QUANTITY USED g	DATE COUNTED	COUNT TIME	GROSS COUNT	BACKGROUND	NET COUNT		RESULT ±1σ * μCi/g
1	1/12	10:00	table concentrate	Pb-212	mobile lab	1414.8	1/25	2000					(5.23±0.03)E-5 (52%)
				Pa-234m									(8.8±1.5)E-5 (50%)
2	1/12	10:00	new feed	Pb-212	mobile lab	786.4	1/25	2000					(9.54±0.13)E-6 (50%)
				Pa-234m									(3.1±0.9)E-5 (50%)
3	1/12	10:00	combine plant tailings	Pb-212	mobile lab	9269	1/25	2000					(6.77±0.11)E-6 (50%)
				Pa-234m									(1.9±0.7)E-5 (52%)
4	1/12	10:00	magzite waste	Pb-212	In-house γ-spec	1251.9	1/27	1000					(5.871±0.012)E-4 (52%)
				Pa-234m									(1.557±0.014)E-4 (50%)
5	1/12	10:00	zircon product	Pb-212	mobile lab	15443	1/25	2000					(7.17±0.12)E-6 (50%)
				Pa-234m									(9.6±1.4)E-5
6	1/12	10:00	TiO_2	Pb-212	mobile lab	1324.1	1/25	2000					(1.092±0.011)E-5 (52%)
				Pa-234									(1.4±0.7)E-5 (50%)

*Random uncertainties reported are 1 standard deviation, 1σ. small negative and other results ≤ 2σ are interpreted as including "zero" or as not detected. If appropriate, estimates of possible systematic errors are reported in parentheses.

(pink) 2. INSPECTOR

Region I FORM 303 (8-88)

U.S. NUCLEAR REGULATORY COMMISSION

REQUEST FOR ANALYSIS

Region I Laboratory

LABORATORY USE ONLY

CONTROL NUMBER: 89-1379

SAMPLE LOCATION (LICENSEE): Heritage Metals - Lakehurst, N.J.

LICENSE NO.	DOCKET NO.
non-licensee	99990001

SAMPLES SUBMITTED

#(TOTAL)	TYPE	VOLUME	WEIGHT
6	Marinelli beaker (solid)	500ml	

DATE SAMPLES SUBMITTED: 1/13/89

PRIORITY: ✓ ROUTINE; URGENT ***

SAMPLE COLLECTION INTERVAL

	MONTH	DAY	YEAR	TIME
START	1	12	89	1000
STOP	1	12	89	1300

INSPECTOR RESPONSIBLE: J. Friedman

PHONE EXT.: 5276

	ANALYSIS TO BE PERFORMED	LIST DESIRED LLD (Optional)		OTHER TYPE OF ANALYSIS (Specify)	LIST DESIRED LLD (Optional)
	GROSS ALPHA		✓	Thorium	500 ppm
	GROSS BETA				
	GAMMA SPEC				
	TRITIUM				
	CARBON-14				
	IODINE-125				

REMARKS

After γ spec., consider sending samples for fluorescense analysis.

Samples may contain considerable amount of moisture (some collected out doors in rain)

NOTE: Samples will be discarded after analysis unless reasons are noted above in Remarks.

*** **FOR URGENT USE ONLY**– Signature Blocks below must be filled out by the Inspector's appropriate Section Chief and by the Chief, Effluents Radiation Protection Section BEFORE submitting this form to the Region I Laboratory.

SIGNATURE – APPROPRIATE NUCLEAR MATERIALS SAFETY SECTION CHIEF | DATE

SIGNATURE – CHIEF, EFFLUENTS RADIATION PROTECTION SECTION | DATE

(pink) 2. INSPECTOR

Region I FORM 304
(8/88)

SAMPLE RECORD SHEET
REGION I LABORATORY

U.S. NUCLEAR REGULATORY COMMISSION

LAB CONTROL NUMBER: 301440

[X] ROUTINE [ ] URGENT

DATE NEEDED:

SAMPLE LOCATION: Heritage Minerals / Nord Ilmenite

COLLECTED BY: B. Ullrich | DIVISION: DRSS | PHONE: 5040

DATE ANALYSIS BEGAN:

DATE COMPLETED: 4-23-90

CONTACT NOTIFIED | DATE:

ANALYZED BY: TOR | DATE:

APPROVED BY: TOR | DATE: 4/23/90

SAMPLE NO.	SAMPLE DATE	SAMPLE HOUR	SAMPLE DESCRIPTION	ANALYZE FOR	INSTRUMENT USED	QUANTITY USED	DATE COUNTED	COUNT TIME	GROSS COUNT	BACKGROUND	NET COUNT		RESULT ±1σ * pCi/g
1	4/17	1200	SOIL N1	Ac-228	γ spec	1024.6 g	4/18	2.000 S					(1.8±0.2) E-6 (15%)
				Pb-212									(1.82±0.06) E-6 (15%)
				Bi-212									(1.0±0.4) E-6 (15%)
2	4/17	1200	SOIL N2	Ac-228		703.9 g	4/19	2000 S					(1.46±0.05) E-5 (15%)
				Pb-212									(1.44±0.02) E-5 (15%)
				Bi-212									(9.4±6.7) E-6 (15%)
3	4/17	1200	SOIL H1	Ac-228		778.8 g	4/19	2000 S					(4.0±0.2) E-6 (15%)
				Pb-212									(3.46±0.09) E-6 (15%)
				Bi-212									(2.4±0.4) E-6 (15%)
4	4/17	1200	SOIL H2	Ac-228		815.4 g	4/18	2000 S					(1.90±0.04) E-5 (15%)
				Pb-212									(1.92±0.02) E-5 (15%)
				Bi-212									(1.33±0.09) E-5 (15%)

*Random uncertainties reported are 1 standard deviation, 1σ. small negative and other results ≤ 2σ are interpreted as including "zero" or as not detected. If appropriate, estimates of possible systematic errors are reported in parentheses.

(pink) 2. INSPECTOR

Region I FORM 304
(8/88)

SAMPLE RECORD SHEET
REGION I LABORATORY

U.S. NUCLEAR REGULATORY COMMISSION

LAB CONTROL NUMBER 301440

[X] ROUTINE [ ] URGENT — DATE NEEDED

SAMPLE LOCATION

DATE ANALYSIS BEGAN — DATE COMPLETED 4-23-90

ANALYZED BY JOR — DATE

COLLECTED BY — DIVISION — PHONE

CONTACT NOTIFIED — DATE

APPROVED BY JOR — DATE 4/23/90

SAMPLE NO.	SAMPLE DATE	SAMPLE HOUR	SAMPLE DESCRIPTION	ANALYZE FOR	INSTRUMENT USED	QUANTITY USED	DATE COUNTED	COUNT TIME	GROSS COUNT	BACKGROUND	NET COUNT		RESULT ±1σ * pCi/g
5	4/17	1200	SOIL H3	Ac-228	γ spec	1353.0 g	4/19	3000 s					(2.04±0.02)E-3 (15%)
				Pb-212									(1.721±0.009)E-3 (15%)
				Bi-212									(1.38±0.04)E-3 (15%)
6	4/17	1200	SOIL H4	Ac-228		413.4 g	4/20	2000 s					(9.2±0.4)E-6 (15%)
				Pb-212									(9.1±0.2)E-6 (15%)
				Bi-212									(7.4±0.8)E-6 (15%)

*Random uncertainties reported are 1 standard deviation, 1σ. small negative and other results ≤ 2σ are interpreted as including "zero" or as not detected. If appropriate, estimates of possible systematic errors are reported in parentheses.

(pink) 2. INSPECTOR

Region I FORM 303
(8-88)

U.S. NUCLEAR REGULATORY COMMISSION

REQUEST FOR ANALYSIS
Region I Laboratory

LABORATORY USE ONLY

CONTROL NUMBER: 301440

SAMPLE LOCATION (LICENSEE): HERITAGE MINERALS (B) NORD ILMENITE

LICENSE NO.	DOCKET NO.
A none B none	040-08980 040-08987

SAMPLES SUBMITTED

#(TOTAL)	TYPE	VOLUME	WEIGHT
6	soil - in Marinelli		
1	water		

DATE SAMPLES SUBMITTED: 4-18-90

PRIORITY: [X] ROUTINE [ ] URGENT ***

SAMPLE COLLECTION INTERVAL

	MONTH	DAY	YEAR	TIME
START	4	17	90	11:30 A
STOP	4	17	90	2:30 P

INSPECTOR RESPONSIBLE: BETSY ULRICH

PHONE EXT.: 5040

	ANALYSIS TO BE PERFORMED	LIST DESIRED LLD (Optional)		OTHER TYPE OF ANALYSIS (Specify)	LIST DESIRED LLD (Optional)
	GROSS ALPHA				
	GROSS BETA				
X	GAMMA SPEC				
	TRITIUM				
	CARBON-14				
	IODINE-125				

REMARKS

Note: Heritage Sample #3 is monazite sand ~100 mR/h
This is a split sample w/ license for comparative analysis with their lab.

Also, please report the 4 Heritage samples separately from the 3 Nord samples. Thanks.

Expecting U/Th in samples.

NOTE: Samples will be discarded after analysis unless reasons are noted above in Remarks.

*** **FOR URGENT USE ONLY**— Signature Blocks below must be filled out by the Inspector's appropriate Section Chief and by the Chief, Effluents Radiation Protection Section BEFORE submitting this form to the Region I Laboratory.

SIGNATURE – APPROPRIATE NUCLEAR MATERIALS SAFETY SECTION CHIEF | DATE

SIGNATURE – CHIEF, EFFLUENTS RADIATION PROTECTION SECTION | DATE

(pink) 2. INSPECTOR

MINIMUM DETECTABLE ACTIVITY REPORT (ND PC VERSION MAR 88)

PEAK WIDTH = 3.00 FWHM. CONFIDENCE LEVEL = 4.66.

NUCLIDE	BKG	ENERGY	MINIMUM uCi /UNIT
BE-7	38.	477.59	5.2988E-07
NA-22	12.	1274.50	8.0350E-08
NA-24	6.	1368.53	5.9983E-08
CL-38	5.	1642.42	1.5444E-07
AR-41	12.	1293.64	7.5270E-08
SC-46	16.	889.25	6.7962E-08
CR-51	61.	320.08	4.9194E-07
MN-52	8.	1434.06	7.2805E-08
MN-54	12.	834.83	5.4916E-08
MN-56	15.	846.75	5.9300E-08
CO-57	67.	122.06	3.0772E-08
C0-58	19.	810.76	6.7328E-08
FE-59	12.	1099.22	1.2426E-07
CO-60	11.	1332.46	8.0173E-08
ZN-65	13.	1115.52	1.4558E-07
NI-65	5.	1481.84	2.3691E-07
ZN-69M	32.	438.63	4.8440E-08
SE-75	45.	400.65	4.4265E-07
AS-76	30.	559.10	1.2724E-07
BR-82	21.	776.49	8.0270E-08
BR-84	12.	881.50	1.0288E-07
KR-85M	83.	151.18	3.9151E-09
KR-85	85.	513.99	2.0631E-05
SR-85	85.	513.99	8.9328E-08
RB-85	7.	1076.63	5.9900E-07
KR-87	47.	402.58	9.2358E-08
KR-88	56.	196.32	1.0998E-07
RB-88	19.	898.02	3.1259E-07
Y-88	4.	1836.01	6.4314E-08
RB-89	11.	1031.88	5.8301E-08
SR-91	14.	1024.30	2.1647E-07
Y-91M	33.	557.57	5.1945E-08
Y-91	19.	1204.90	3.1846E-05
Y-92	16.	934.50	4.8871E-07
Y-93	54.	266.90	5.5688E-07
NB-95	15.	765.79	5.5923E-08
ZR-95	23.	756.72	1.2364E-07
NB-97	28.	657.90	5.7900E-08
ZR-97	48.	507.63	1.2794E-06
MO-99	21.	739.58	4.8911E-07
TC-99M	87.	140.51	3.3233E-08
RU-103	26.	497.08	5.3358E-08
RH-105	68.	318.90	2.6394E-07
RH-106	23.	621.84	HALF LIFE TOO SHORT
CD-109	93.	88.04	9.7484E-07
AG-110M	28.	657.70	6.8659E-08
CD-113M	54.	255.00	3.7608E-05
SN-113	54.	255.12	1.9492E-06
SB-122	22.	563.93	6.9824E-08
SB-124	3.	1691.02	1.0516E-07

PEAK WIDTH = 3.00 FWHM. CONFIDENCE LEVEL = 4.66.

NUCLIDE	BKG	ENERGY	MINIMUM uCi /UNIT
SB-125	33.	427.90	1.5720E-07
SN-125	9.	1066.60	6.8944E-07
SB-127	17.	685.20	1.4623E-07
TE-129M	29.	695.88	2.1222E-06
I-130	17.	536.09	4.1215E-08
I-131	43.	364.48	5.5861E-08
TE-131M	19.	773.67	1.6574E-07
TE-131	30.	452.32	1.7427E-07
XE-131M	64.	163.93	1.4035E-06
I-132	18.	667.69	4.9907E-08
TE-132	57.	228.16	3.9710E-08
XE-133M	54.	233.22	3.3724E-07
XE-133	74.	81.00	8.8655E-08
I-134	11.	884.09	7.1553E-08
CS-134	28.	795.84	9.3257E-08
I-135	10.	1260.41	2.4739E-07
XE-135M	23.	526.56	3.1339E-08
XE-135	63.	249.79	4.3648E-08
CS-136	11.	1048.07	8.1174E-08
CS-137	40.	661.64	9.1593E-08
CS-138	10.	1435.86	7.9507E-08
XE-138	47.	258.31	5.7306E-08
BA-139	72.	165.85	1.5743E-07
CE-139	72.	165.85	3.7357E-08
BA-140	26.	537.32	2.0481E-07
LA-140	6.	1596.49	7.2306E-08
CE-141	72.	145.44	5.7799E-08
CE-143	45.	293.26	9.1263E-08
CE-144	73.	133.54	2.5498E-07
PR-144	29.	696.49	2.7275E-06
ND-147	91.	91.11	1.2205E-07
EU-152	9.	1112.02	4.6151E-07
SM-153	98.	103.20	1.1731E-07
TA-182	19.	1121.28	2.5650E-07
W-187	19.	685.81	1.8983E-07
HG-203	39.	279.19	4.4509E-08
BI-214	35.	609.31	1.4520E-07
PB-214	57.	351.92	1.3639E-07
RA-226	68.	186.21	9.6456E-07
U-235	73.	143.76	2.6719E-07
NP-239	43.	277.60	2.5434E-07
AM-241	68.	59.50	.0000E+00
AC-228	23.	911.07	3.0109E-07
BI-212	23.	727.17	5.5494E-07
PB-212	65.	238.63	8.7457E-08
PA-234M	20.	1001.03	1.4240E-05