Form ADM-012

MEMO NEW JERSEY STATE DEPARTMENT OF ENVIRONMENTAL PROTECTION

TO File DATE 1-9-89

FROM Pete Taylor

SUBJECT Heritage Mineral Company, Route 70, Manchester Twp., Ocean County

guess at original material
70% quartz SiO_2
29% ilmenite TiO_2
1% Zr, monazite, etc. V, Th, rare earths

HISTORICAL DATA

History of Operations

ilmenite

The results of a study published in 1956 by a New Jersey State Geologist indicated that high concentrations of ~~illuminate~~ existed in Manchester Township. Based on this study, ASARCO Incorporated purchased the previously undeveloped property in 1957 and initiated an investigation to delineate the ore body. In response to market conditions, the development of the site did not commence until 1971. Active mining operations began in mid 1973. TiO_2

ASARCO halted operations in March 1982. Although the hydraulic dredging was terminated, the processing plant was used for experimental purposes under a lease to Humphreys Engineering until September 1982. The stockpiled dry mill tailings were used to feed the processing plant during this experiment which was intended to evaluate the possibility of producing a zircon product from these tailings.

current feedstock 15 pCi/g per NJGS/DEP

Hovnanian family

The property was purchased by the current owner in 1986. The facilities were then leased and operated from 1986 through August 1987 by Mineral Recovery, Inc. During this period the plant was under the operation of Dr. Naquib. Dr. Naquib took over in the middle of 1986. Dr. Naquib spent the rest of 1986 refitting the plant and did not start production until 1987. Dr. Naquib said that when he took over Heritage there was already problems with oil spills as well as PCB contaminated transformers. He also said that possibly machinery and contaminants had been dumped into the big lagoon and that the small lagoon was actually a "slime pit" and bottom sediment is actually plant waste.

2d level tailings — not sampled as of 1/12/89

Dr. Naquib said that a major problem, which he reported to the owners, was the large amount of radioactive monazite ore from the mine tailings which emitted a low level of radiation (similar to radon). He said that this was also a problem in the dry house with the large amount of dust that is produced there. He said that he had been in contact with the NRC about this problem, but does not know if the new management has followed up on this problem. He said that because of long term exposure, the employees should be monitored and that the radiation would have to be cleaned up before any housing development is built on the property.

Dr. Naquib said that he left because he could not get the owners to spend any money on improvements to the plant to raise the safety standards at the plant.

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SMO-1321

From August 1987 to the present, operations have been conducted by Heritage Minerals, Inc.

8/87

Mr. Lord, the original mining engineer who opened the plant in the 50's, has been in charge since that date. His version of why Dr. Naquib is no longer running the operation differs considerably from Dr. Naquib's version. Mr. Lord said that the present owners, Houson Corporation, let Dr. Naquib go because he was not performing up to expectation.

owned by Hoonanian
Houson owns Heritage

When questioned about the radiation, Mr. Lord said that they had thought about applying for a license to mine the monazite. Upon investigation, however, they decided that it was too expensive to get involved with the radioactive minerals on the property. Mr. Lord said that the radiation was low level radiation, and because the mine tailings were spread around and not produced as a product, was not regulated.

Geology

The Heritage Minerals facility is located in the Atlantic Coastal Plain. This general geologic province is formed by an immense thickening wedge of unconsolidated and semi-consolidated sediments lying on well-indurated bedrock. The surface formation is comprised of Bridgeton formation to a depth of approximately 10 to 25 feet. Successive formations and approximate thickness are the Cohansey (50-70'); the Kirkwood (50-300'); Manasquan (300-500'); Navesink, Red Bank sand, Hornerstown sand and Vincentown sand (500-800'); Mount Laurel sand and Wenonah formation (800-900')' Marshalltown (900-1200'); Englishtown, Merchantville and Woodbury clay (1200-1500'); Raritan and Magothy formations (1500-3000'). At a depth of 3000' or greater precretaceous crystalline bedrock is encountered.

Hydrogeology

The uppermost aquifer at this site is the Cohansey. The depth to seasonal high water is approximately six feet below grade in the vicinity of the plant. Based on an evaluation of available data including local topographic data, drainage basin delineations and the location of surface water, undisturbed ground water is assumed to flow in a south to southeast direction. However, several production related operations may have significantly affected local flow patterns. The settling basins located to the northeast of the wet mill and the recycle reservoir situated south of the dry mill are unlined lagoons. At various times during plant operation the water elevation in these ponds was greater than the static ground water elevation. It is assumed that with the highly drained soils in this area infiltration through these ponds would have impacted the local ground water flow regime. Furthermore, wells #3 and #4, located north of the wet mill and northwest of the recycle pond, respectively, draw on the Cohansey. The radius of influence of these wells may have extended to some subject areas.

Product Data

Current operations involve the processing of the stockpiled dry mill tailings to extract zircon, leucoxene and other minerals not previously marketed.

In general, the operation during ASARCO ownership consisted of the following.

1. A hydraulic dredge operating on the exposed surface of the Cohansey aquifer extracted a sand slurry for transfer to a dewatering barge.

2. After separating and returning gravel and water the dredge pond, the ore bearing sand slurry was pumped to the wet mill.

3. Physical separation of the heavier minerals from the lighter fraction was accomplished in the wet mill. The sand slurry was fed through a series of vertical spirals which achieved the said separation. The lighter fraction, comprising about 96% of the original mass, was returned to the dredge pond. Additional water required in this process was supplied from two deep wells and the recycle reservoir.

4. The heavier ore fraction containing titanium dioxide (TiO_2) zircon, quartz, kyanite, silliminite and other trace minerals was stockpiled to allow for dewatering prior to transfer to the dry mill.

1000 tons pile behind dry mill 99% gravelly gravel-like material "rice"

5. The stockpiled wet mill product was fed to a rotary kiln for drying and then screened to remove any remaining undesirable coarse particles. The screen product was further processed in the dry mill while the coarse material (primarily quartz) was wasted.

6. The electrically conductive TiO_2 bearing minerals were separated from the nonconductors by high tension (23,000 volts DC @ 0.5 Ma).

7. The high tension conductors were further processed magnetically to produce the final ilmenite product for sale. This product constituted about 2.5% of the original mass.

8. The tailings from the dry mill, containing zircon, leucoxene, rutile and other minerals were stockpiled near the dry mill for future processing. This material represents the remaining 2.5% of the original mass. Additional details of the methods of mining and milling at this site are contained in Attachment A.

Hazardous Waste

During active operation this facility has been involved in the mining and milling of ilmenite and other mineral ores. As previously indicated this has been accomplished by gravity, electrical and magnetic means. No hazardous materials, as defined by Appendix A of N.J.A.C. 7:1E, are directly utilized or generated by this process.

Fuel oil stored on the site is used for heating buildings, firing the rotary kiln and fueling mobile equipment. Solvents and lubricating oils are used for the maintenance of machinery.

Areas of Contamination

The original complaint of contamination came from Lt. Murza, NJDEP, Fish and Game. He noticed petroleum products entering the stream of the neighboring wildlife area. His investigation led to the finding of the following areas of contamination on the Heritage Mineral site. These areas include both surface, ground and ground water contamination.

1. Well #3 was found to be contaminated with benzene (0.3 ppb), 1,1,1 Trichloroethane (1.0 ppb), Trichloroethylene (0.5 ppb) in a sample collected on March 7, 1988, and analyzed by Henderson Laboratory for Heritage.

2. Well #3 was found to be contaminated with benzene (50 ppb), Methylene chloride (16,000 ppb), Xylene (2,000 ppb), Ethyl Benzene (720 ppb) in a sample collected on March 21,1988, and analyzed by Henderson Laboratory for Heritage.

3. The soil around well #1 was oil stained with what appeared to be oil from the well pump.

4. The soil around well #2 was oil stained.

5. The soil around the intake and exit valves for the two aboveground #2 fuel oil tanks was saturated with oil. There is a possibility that a 20,000 gallon discharge to ground happened in this area within the last 3-5 years.

6. The soil around the aboveground waste oil tank (#5) was stained and the excavation was filled with oil.

7. Heritage indicated that prior to 1982 a trailer used for the storage of lubricants and solvents was packed on site in close proximity to well #4, behind the wet mill. There is not record of the types of materials that were stored in the trailer.

8. A large area presently used for the storage of waste material (15 acres) to the north of the plant site had several problem spots. There were three large tanks sitting aboveground. These tanks were at one time in the ground at this location. One waste pile consisted of lab waste labeled hydrochloric acid, sodium hydroxide, and many more with illegible labels. Approximately 100-150 55-gallon drums labeled oil, hydraulic oil and apple concentrate. There was much stained soil in this area. There were seven old transformers on floats an three very old pot transformers in this location. Mr. Lord indicated that all oils that might have contained PCB's were removed. This area had many areas of stained soil.

9. A #2 fuel oil spill adjacent to the 50,000 gallon tank. Spill caused by open valve during fuel delivery. Same tank a "short time ago blew up like a balloon" according to Mr. Lord, due to a clogged air vent. Tank integrity is questionable.

10. The ground behind the fenced area in the rear of the warehouse was stained. The area appears as though it was recently graded. The area to the side of the warehouse contained drums and equipment.

11. An underground fuel oil line between the dry mill and wet mill buildings sprang a leak. This line is approximately 10 ft. below grade. Past employees state that the line in this area leaked off and on from the opening of the plant.

On 12-13-88 at 1315 hours I inspected the Heritage Mineral site for possible radiation emission from the mineral monazite concentration and left in the tailing.

I used a Ludlum survey meter model 19 serial #51836 calibrated on 8/27/87 to a CS 137 gamma. All readings were taken in the slow registering mode. The meter was reset between each reading and each sample was allowed 60 seconds to register before the reading was taken. I obtained the following results during the survey.

Sample Number	Location (See Enclosed Sketch) (Appendix B)	Reading in Micro R/H
1	Route 70 and plant driveway (background).	4
2	Parking lot in front of Administration Office.	27
3	Monitoring well #2.	29
4	East production well.	100
5	Monitoring well #4.	110
6	East end of dry mill.	135
7	East end of wet mill.	170
8	North side of wet mill.	50
9	Monitoring well #5. (Well found uncapped lock, cap and keys lying nearby).	105
10	Monitoring well #1 (waste tank area).	35
11	West side of wet mill	70
12	Inside wet mill door.	70

13	West side of dry mill.	200
14	Brick furnace, North side of dry mill.	230
15	Inside dry mill door.	70

Mean readings during survey 100-150 micron R/M.

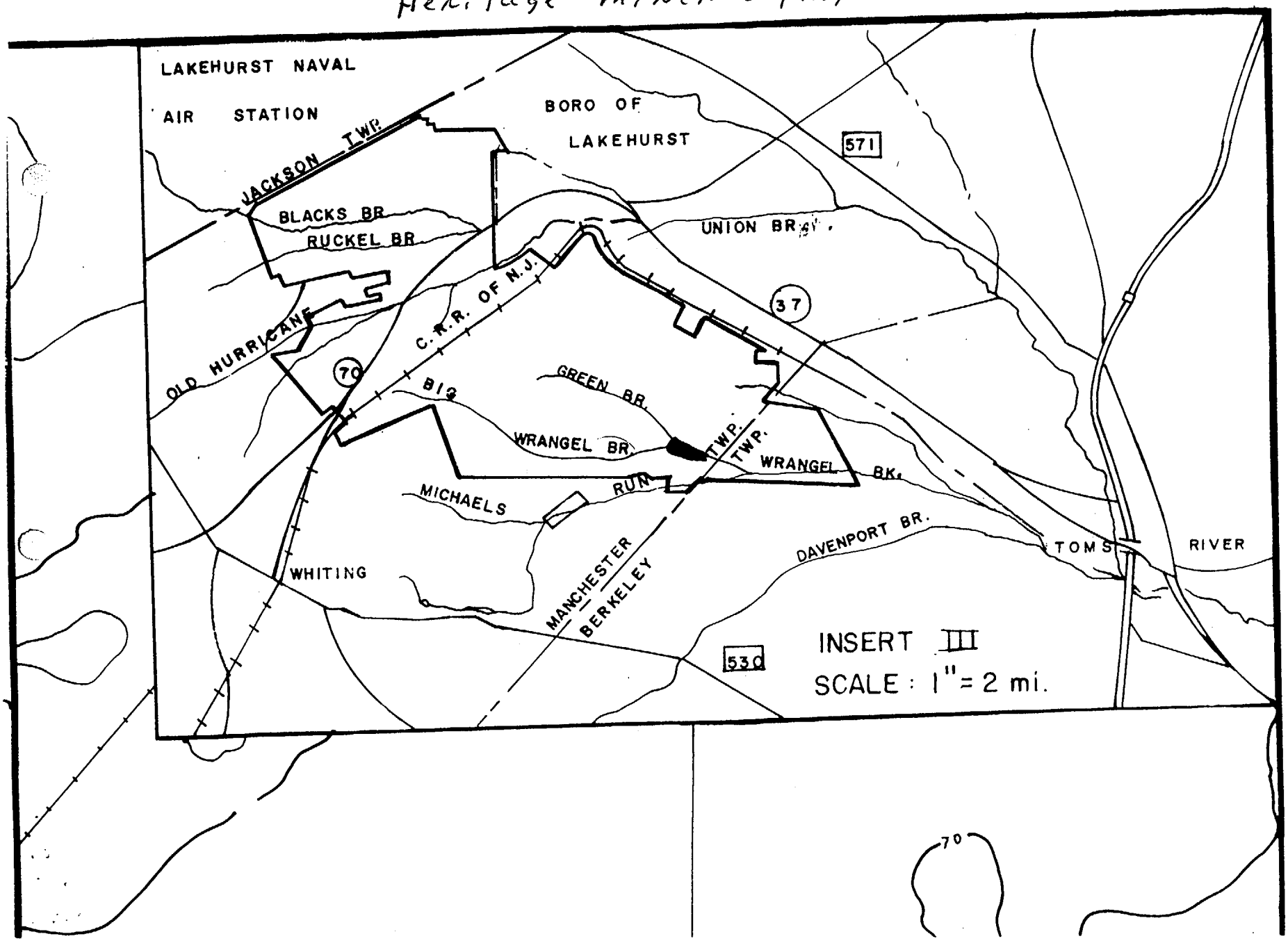
After the survey I had a talk with John Lord, plant manager. I mentioned the possibility of radiation due to the monazite on the property. He said that his had been cleared with the NRC and since the monazite itself was not being refined and the levels of radiation so low, that the NRC allow this disposal and did not regulate it.

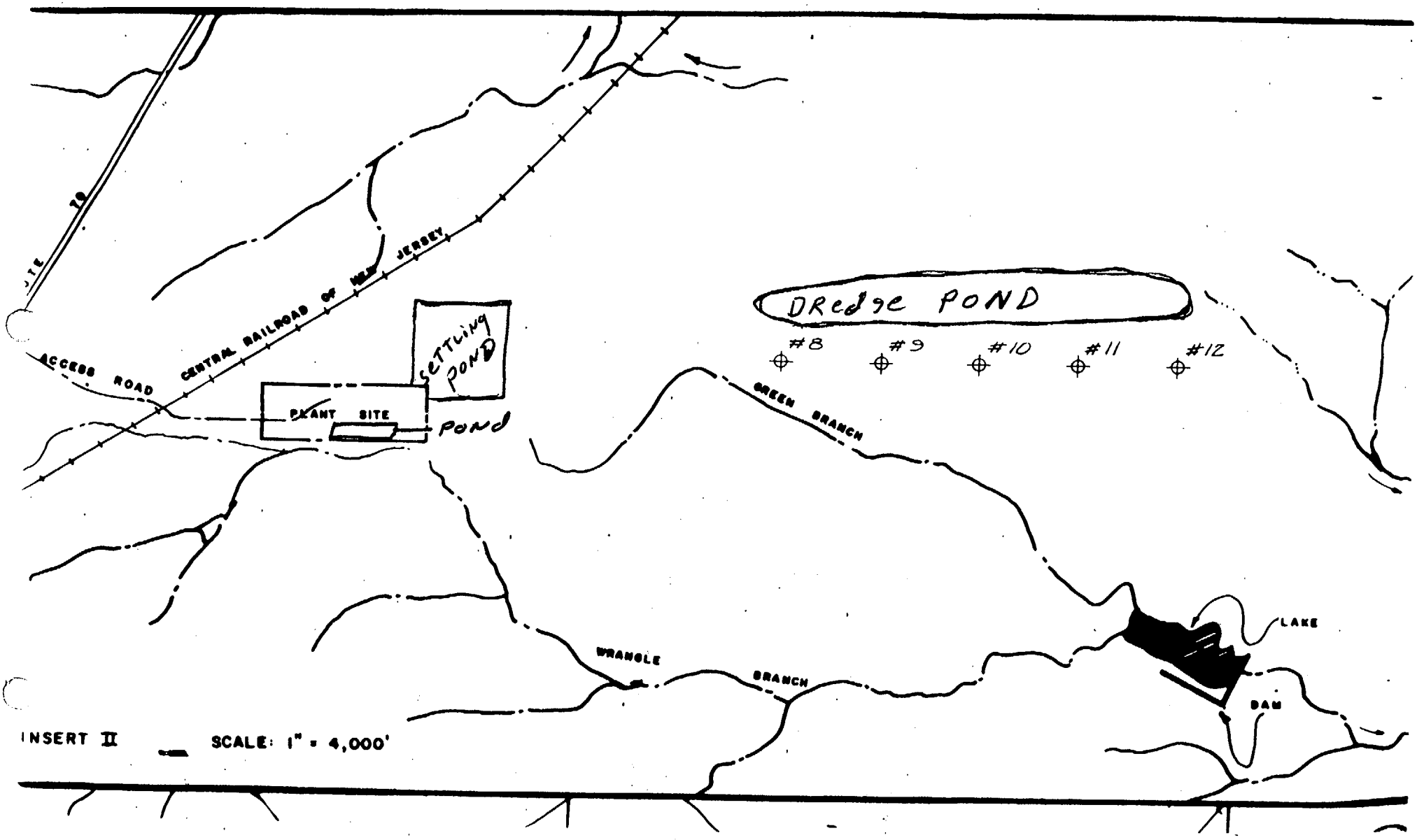
Mr. Lord also said that all ten monitoring wells are in and that wells 5-10 have just been developed. Sampling will take place in a couple of weeks. Wells 1-4 have been sampled and Mr. Lord is awaiting results.

I left the site at 1500 hours.

df

Heritage mineral property



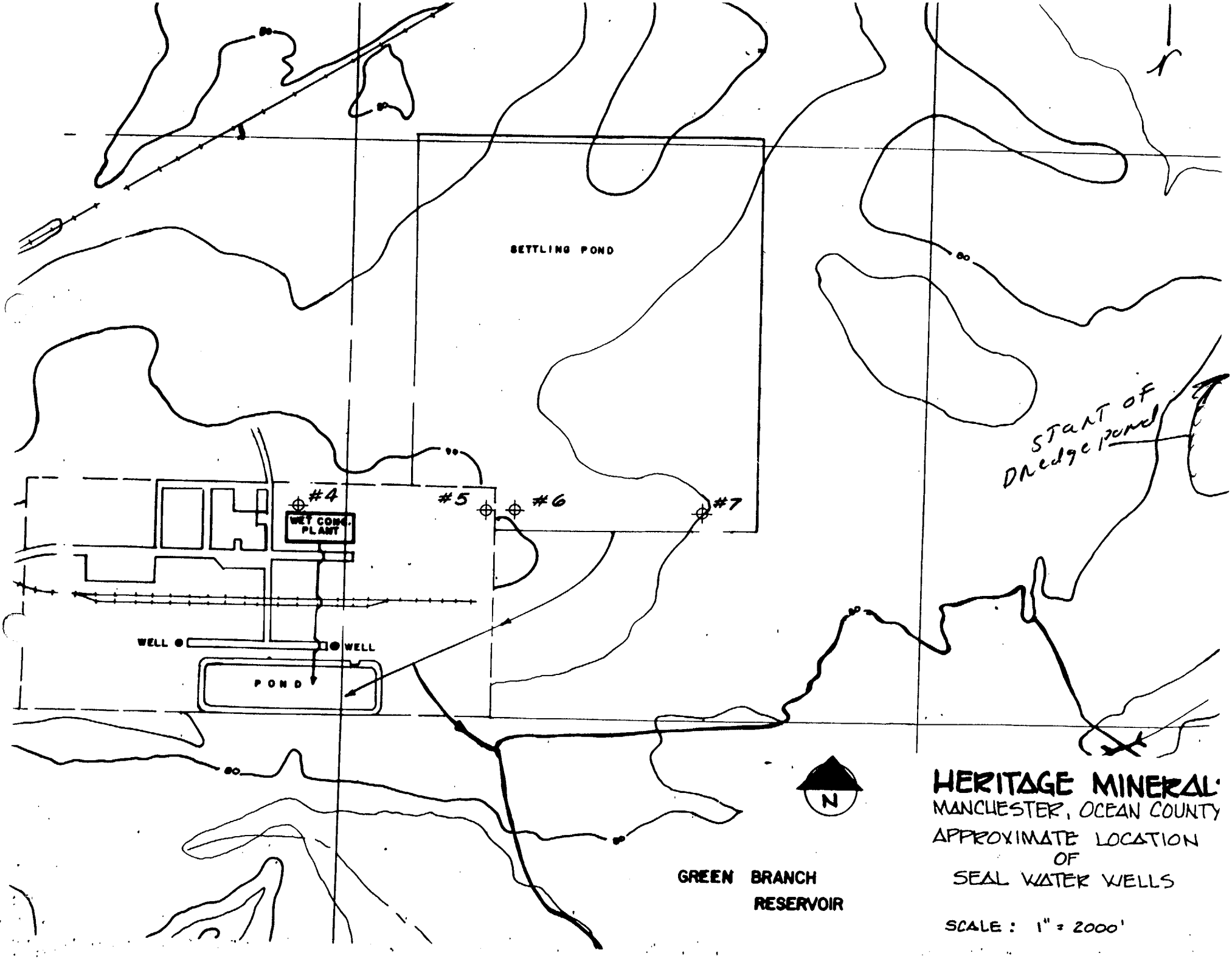


HERITAGE MINERAL

MANCHESTER, OCEAN COUNTY

APPROXIMATE LOCATION OF SEAL WATER WELLS

SCALE: 1" = 2000'

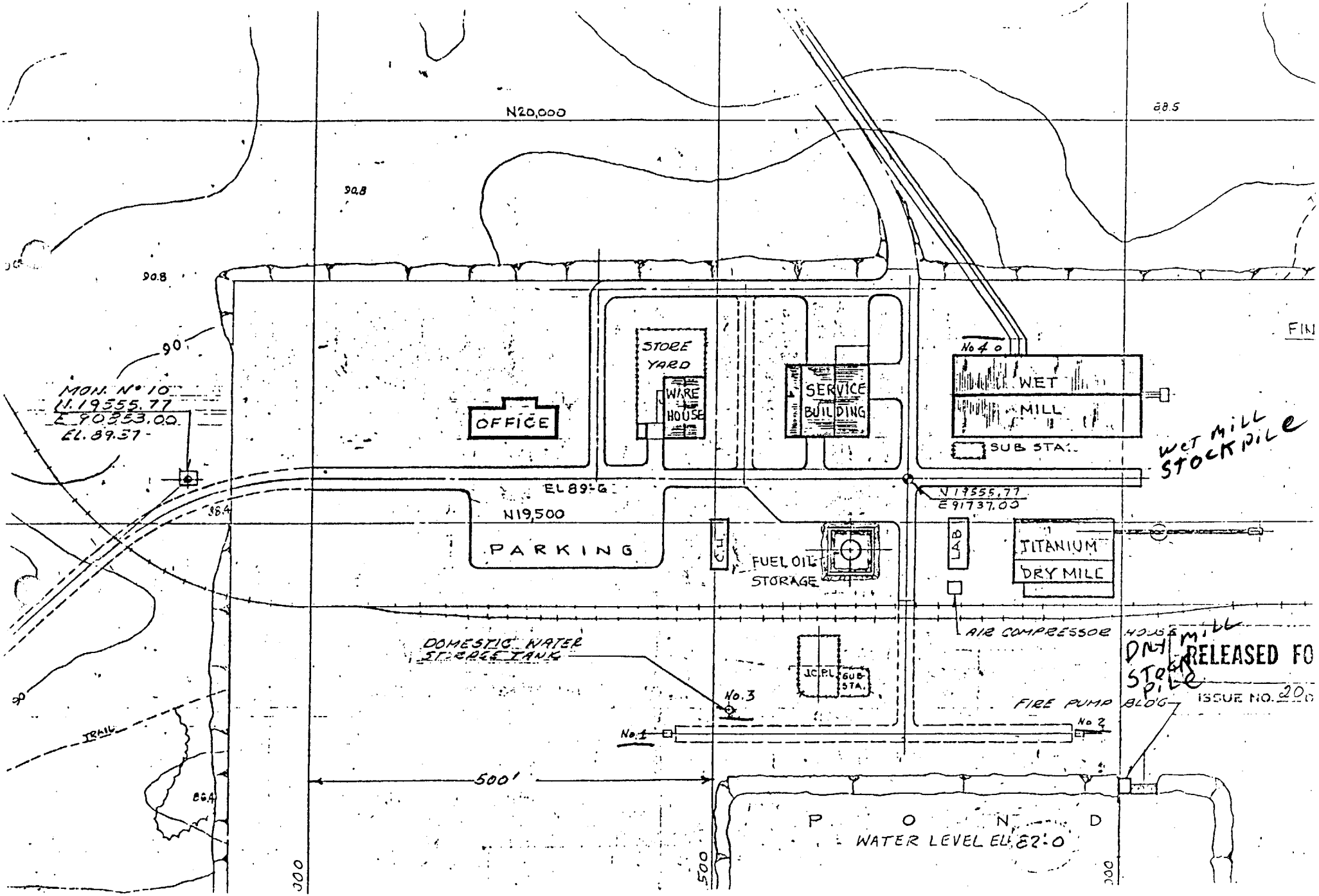


HERITAGE MINERAL

MANCHESTER, OCEAN COUNTY

APPROXIMATE LOCATION OF SEAL WATER WELLS

SCALE : 1" = 2000'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Appendix A

MINING EQUIPMENT AND EQUIPMENT

GENERAL

The Asarco dredge is a custom built twenty inch electric powered hydraulic cutter suction type.

SPECIFICS

The hull is one piece welded construction, 120 feet long (47 meters), 33 foot breadth (13 meters) and 7 feet deep (2.75 meters).

The dredge is equipped with 36 inch diameter and 85 foot long (33.5 meters) spuds.

Hydraulic cutter drive circuit powered by one (1) 600 hp, 1,800 RPM, 4,160 volt cross line start motor.

Dredge pump is Pettibone-Mullikin centrifugal single suction volute type, 24 inch diameter suction, 20 inch diameter discharge c/w 54 inch diameter impeller.

Pump powered by 1,000 hp wound rotor 50 percent speed control, 4,160 volt 1,800 RPM motor.

Dredge ladder welded steel construction 92 feet (36 meters) long for a minimum digging depth of 20 feet (7.9 meters) to a maximum of 65 feet (25.6 meters) below surface of water.

Cutterhead, 60 inch diameter, is spiral type with plain replaceable cutters. It is driven by four Staffa hydraulic motors and rotates at 28 RPM (normal).

Hauling winches are rated at 50,000 pounds of line pull at 80 feet/minute and have a capacity of 500 feet of 1 1/8 inch wire rope.

Swing winch are driven by a single 125 hp, double shaft, 450 volt, 1,200 RPM motor driving through two eddy current clutches.

Spud hoist is a two drum type of equal rating powered by a single 125 hp, 1,800 RPM, 460 volt motor.

Dredge ladder is also equipped with a Jet Venturi, 24 inch suction supplied by a Goulds 9,000 pump, 14 x 10, driven by a 400 hp, 800 RPM, 4,160 volt motor.

Mine control is accomplished by a Ohmart model CL-20 density measuring assembly.

OPERATION

Economical and hydraulic extraction of the loosely consolidated alluvial sands moves the ore at relatively high pipeline velocities thus moving approximately 20 percent solids at 20,000 GPM.

Mining is accomplished utilizing 150 foot (59 meters) cuts and to depths dictated by the drilling results.

Face widths vary between 500 (197 meters) to 750 (295 meters) feet.

Mined ore is conveyed to a floating dewatering barge at approximately 1,250 TPH via a pontoon supported pipeline system which is varied from 600 (236 meters) to 1,000 (394 meters) feet.

DEWATERING BARGE

The floating barge is 80 feet (31.5 meters) by 63 feet (25 meters) wide and supports three (6 feet [2.4 meters] by 14 feet [5.5 meters]) double deck screens, a 6 foot (2.4 meters) by 14 foot (5.5 meters) single deck screen and a 24 foot (9.5 meters) thickener.

Also included are necessary slurry transfer and seal and flush water pumps.

The equipment is housed in a 56 foot (22 meters) by 58 foot (23 meters) by 28 foot (11 meters) eaves height prefabricated building.

The function of the double deck screens is to accommodate the dredge fines and remove the 1 1/4 inch oversize fraction, i.e., roots, clay, and gravel, and return this to the dredge pond. The plus 1/4 inch fraction removed by the second deck reports to a sump and is fed via a 10 inch by 8 inch slurry pump to a single deck 6 foot (2.4 meters) by 14 foot (5.5 meters) scavenger screen. This screen's plus 1/4 inch oversize fraction also reports to the dredge pond. The underflow of this screen combines with the primary screen underflow and reports to a 24 foot (9.5 meters) deep sump which feeds the gravity concentrator via a 16 inch slurry transfer unit which pumps at 12,000 GPM, 30 percent solids by weight and 1.25 specific gravity.

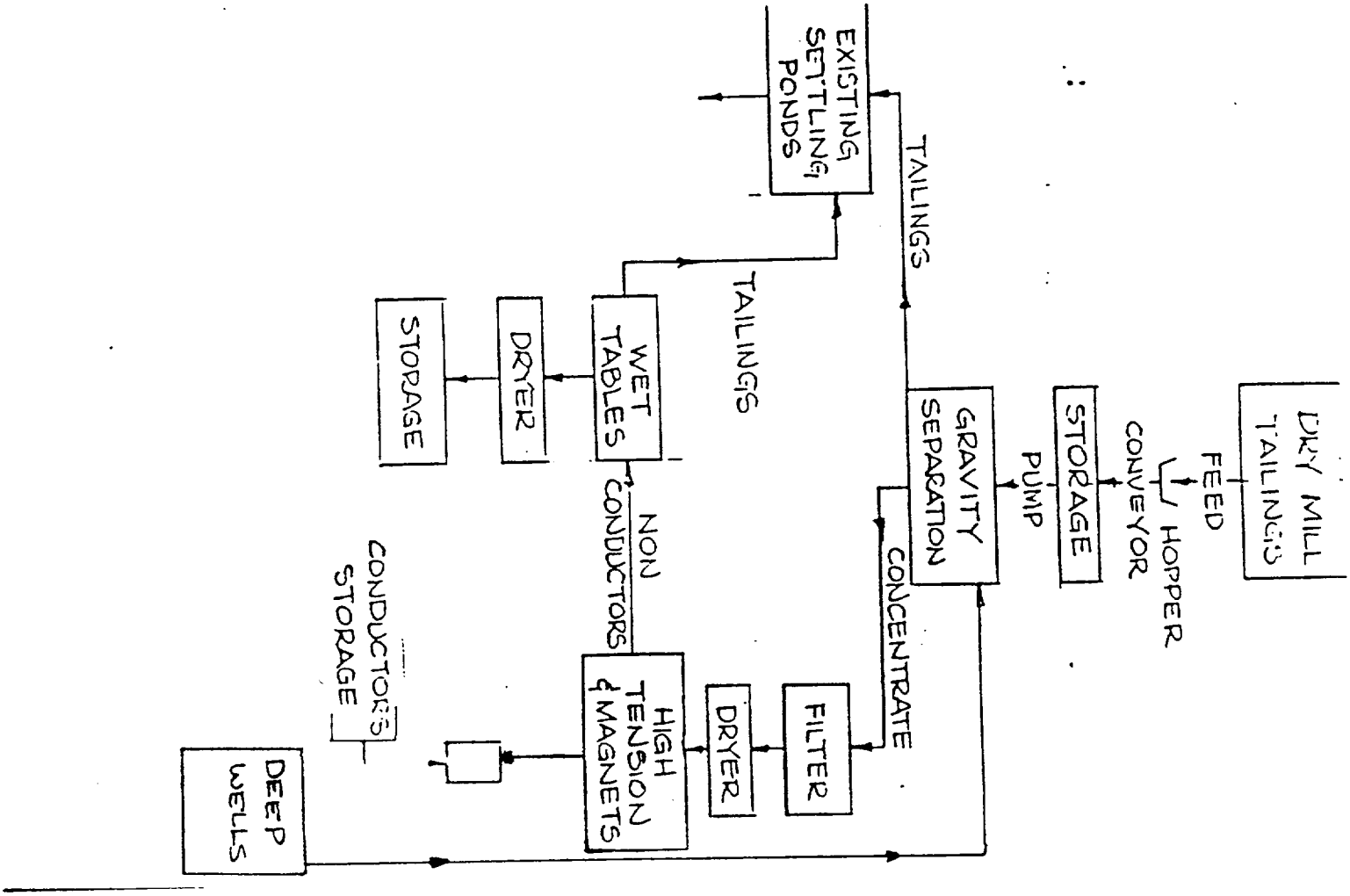
DWR-.053
3/81

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES
CN 029, Trenton, N.J. 08625

DISCHARGE SURVEILLANCE REPORT

Permit # NJ0000574
Date 6/2/87

PLANT DIAGRAM AND FLOW SEQUENCE:



WET MILL EQUIPMENT AND OPERATION

Housed in a prefabricated building, 269 feet (90 meters) by 109 feet (45 meters) by 56 feet (22 meters) at the peak are the following:

1,024 Humphrey rougher spirals

320 cleaner spirals

160 finisher spirals

2-48 inch screw classifiers

4 Denver attrition cells and necessary transfer pumps and cyclones

Feed for the gravity plant is transported from the dewatering barge at the rate of 1,151 TPH and in order to maintain 14 feet (5.5 meters) per second slurry velocity, 20 inch diameter pipe was selected for this service. Since the plant terrain is relatively level, pump drives provide the power necessary to overcome pipe friction, therefore, two 450 hp pumps are required at every 1,500 foot intervals, number depending on dredge location. Two pumps are indicated due to the tailings having to be returned to the dredge pond.

Concentrating to upgrade the solids to 41.5 percent TiO_2 is done by initially feeding the ore to 1,024 spirals. The spirals exploit the different specific gravities of the sands and heavy minerals by a combination of sluicing and centrifugal action. The ore pulp gravitates through a five turn stationary spiral trough with a mean radius of 8 inches. The vertical drop per turn is 13 inches. Heavier Ilmenite particles stay on the inside, while lighter sands climb to the outside. The resulting slurry bands are discharged through a system of vaned

ports which split the pump into three distinct fractions.

The rougher tails are transported by booster pumps to the dredge pond as backfill, removing more than 95 percent of the waste sand. The middlings gathered in the sumps below are re-fed into the rougher circuit. Rougher concentrate is put through a cleaner circuit consisting of 320 spirals. The cleaner cycle also splits three fractions with the tails going back to the rougher feed, middlings to the cleaner cycle and the concentrate moving to a final finisher circuit.

Note that the cleaner spiral feed is screened on six 4 foot (1.6 meters) by 10 foot (3.9 meters) screens to eliminate what we call the "rice" material, (silica sand), so called because of its appearance. Also, the oversize product is again screened twice to recover any value that may have been carried over on the initial six screens.

The finisher circuit includes 160 three turn spirals which recover two fractions. Finisher tails are recycled to the cleaner circuit and the finisher concentrate into a 44 inch Eagle dewatering screw. The screw insures a uniform 78 to 80 percent solids feed to attrition scrubbers. This circuit is the key to the Dry Mill process. Grain-to-grain contact removes surface coatings and disintegrates slime-forming particles.

Each cell of the Denver scrubber features a super-intense scrubbing zone created by two large high flow, opposed differential pitch propellors.

DRY MILL EQUIPMENT AND OPERATION

The main Dry Mill is 120 feet (47 meters) long by 95 feet (37.5 meters) by 46 feet (18 meters) high and components are:

- 7 1/2 foot (2.95 meters) by 70 foot (27.6 meters) Kennedy Van Saun counterflow rotary dryers
- 34 Carpco high tension separators - rougher
- 24 Carpco high tension separators - cleaner
- 14 Carpco high tension separators - scavenger
- 8 twin roll magnetic separators
- 3 Mineral Deposits Ltd. plate separators

Stockpiled Wet Mill concentrate is loaded into the Dry Mill material hopper by an International 100 payloader. The hopper feeds a 200 ton live storage bin. A revolving table feeder provides a uniform feed of 36 TPH into the rotary dryer. A Peabody burner system heats concentrate to 325°F, drying them to 99.5 percent (bone dry). Heated concentrate is then screened into two fractions, a plus 20 mesh material which goes to waste, and the Ilmenite bearing minus 20 mesh fraction which is fed to the 34 high tension roughers.

Carpco separators utilize the "relative conductivity" of the different materials to separate the ore. Concentrate gravity fed onto a moving rotor, receives a direct current spray of 23,000 volts at 4 ma. Ilmenite and rutile particles have a high conductivity and do not assume a charge

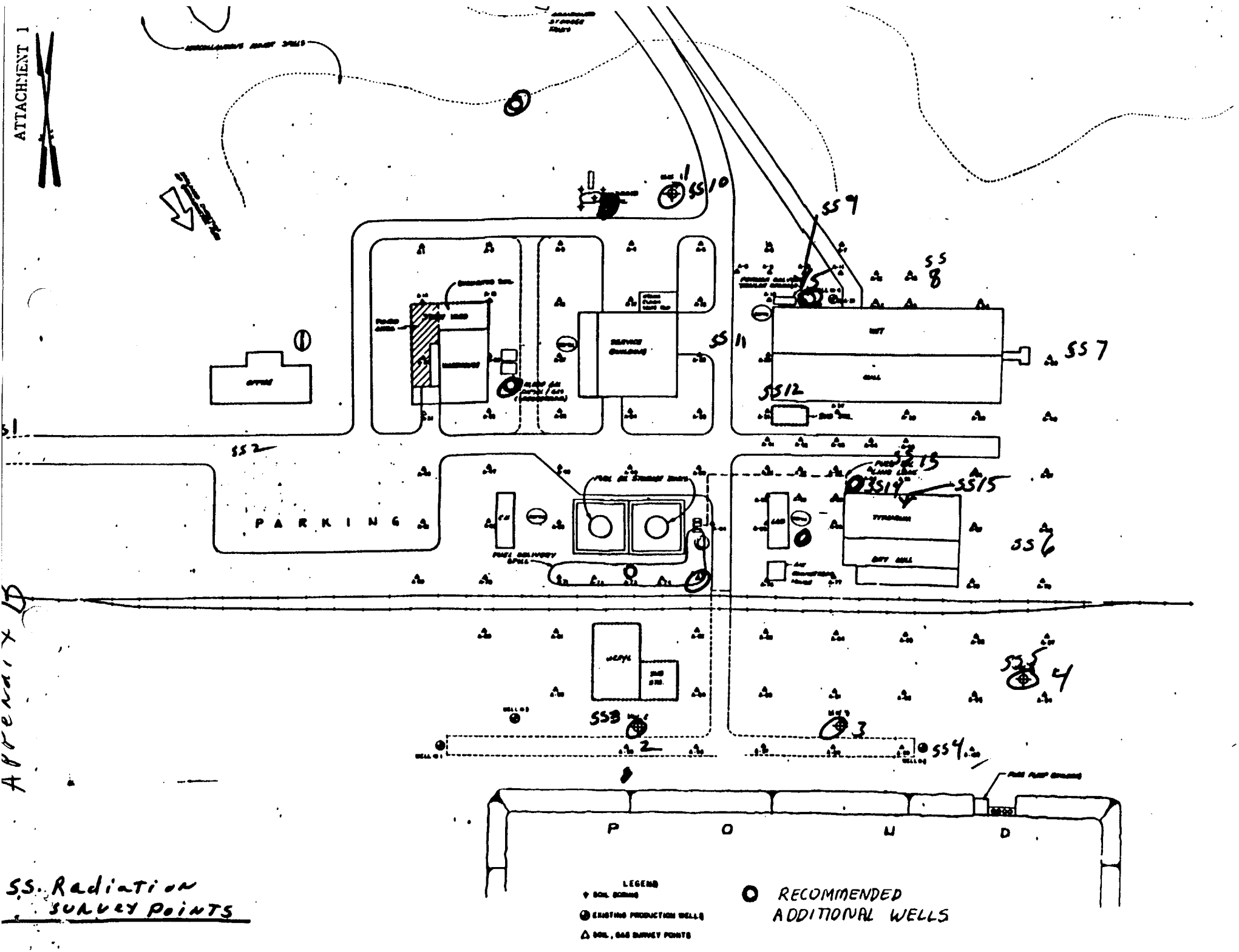
easily. These particles, when leaving the rotor, follow the flight path which would occur if there were no charging effect at all. On the other hand, the relatively low-conductive silica and zircon (tails) assume an attractive charge and are pinned to the rotor and are brushed off at distinct later intervals.

Rougher tails are conveyed to 14 high tension scavenger circuits for further separation. Rougher concentrates are further refined by 25 high tension separators. Cleaner tails are returned to the rougher circuit.

Cleaner concentrates are conveyed and gravity fed to eight ten roll magnetic separators. The magnetics are conveyed to four 200 ton storage bins for subsequent loading into railcars. The non-magnetic report to a residue screen with the plus 30 mesh oversize reporting to tails; the undersize is again split into plus and minus 50 mesh fractions and each report to MDL plate separators. The concentrate of these separators reports to the third plate separator with the concentrate fraction from this separator being conveyed to the storage bin. The tails from this final MDL are returned to the residue to screen. The middlings are recirculated. The initial plus 50 plate separator tails are further refined by a slow roll high tension machine with only the conductor fraction returning to the high tension rougher circuit.

Output of the Dry plant is 23 TPH of 63.5 percent TiO_2 and recovery is 97.0 percent.

ATTACHMENT 1



Appendix D

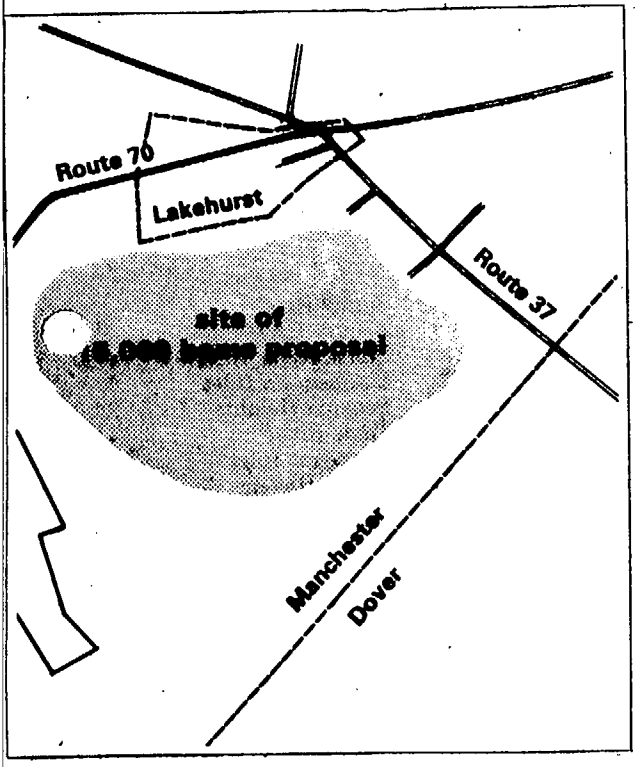
SS. Radiation Survey Points

OCEAN COUNTY
Observer
WEDNESDAY
May 4
1988
Toms River, N.J.

VOL. 136 NO. 106 SINCE 1850 25¢

15,000-unit project in works

Manchester board gets 20-year plan



By Thomas Poole
Staff Writer

MANCHESTER — A developer wants to build a 15,000-unit development, complete with a public golf course and lakes, in the center of the township.

A general development plan for the project that is to be built over 20 years was presented to the Planning Board on Tuesday at an informal work session in the Municipal Building.

Heritage Minerals Inc. wants to develop 3,965 acres southeast of Route 70 and east of Route 37, which the company now mines, a spokeswoman said.

Heritage Minerals is owned by Hirari Hovnanian, developer of several major sites in Ocean County, including Holiday City at Berkeley and Holiday City in the Silverton section of Dover Township.

The developer and the township reached a development agreement concerning the tract, said spokeswoman Tanya Hovnanian, a relative of the developer.

The agreement allows the developer to present the general plan to the Planning Board as a Planned Unit Development, she said.

The township has 95 days from April 22, to accept it, request modifications or reject it, said planning board lawyer Nicholas Montenegro. The plan was submitted to the board April 22.

Nancy Wright, an attorney representing the developer, told the board 70 percent of the proposed development is a retirement communities.

The other 30 percent is to be made up of single-family homes, she said.

Ms. Wright also said the developer proposes 1 million square feet of commercial development on the site and is setting aside land to dedicate to the school system and other public facilities.

An equal amount of institutional construction space, to made up of health care facilities and nursing homes, is planned as well, she said.

Mayor Joseph F. Murray, a Planning Board member, said the proposed development is the type of growth the township needs.

"I have seen these (Planned Unit Developments) in Maryland and they are the type of concept we need in Manchester," said Murray, who was not at the meeting. "This is an excellent chance for our township to move ahead."

One feature of the proposed development is that roads within it will connect the township's eastern and western sections from the Whiting area to Route 37.

"This will open up the township for east-west travel," Murray said in a phone interview from his home Tuesday. "Up to now, Manchester has been a town of small communities. This development will allow us to become one large community."

The developer also plans to donate 20 acres to the township for the construction of a school, Ms. Wright said.

Another five acres will be given to the township for the building of police, fir

Continued on Page 9