VANADIUM CORPORATION OF AMERICA
DURANGO, COLORADO

DOCKET NO. 40-6589

EXTRA

August 7, 1961

L&R:ND

Mr. J. C. Delaney, Chief
Nuclear Materials Branch
Division of Licensing and Regulation
U. S. Atomic Energy Commission
Washington, D. C.

Subject: License Application for Naturita Concentrator (Upgrader), Naturita, Colorado.

Dear Mr. Delaney:

We now have all the information required in your letter of March 31, 1961, for a license application for the Naturita Concentrator (Upgrader).

We are enclosing the following drawings:

1. Naturita Mill Site
2. Plan of the Naturita Concentrator (Upgrader) showing general arrangement of dust system.
3. Elevation of Naturita Concentrator (Upgrader) showing arrangement of dust system.
4. Flowsheet for Naturita Concentrator (Upgrader)
5. D-53 drawing showing design calculations for dust collecting system for No. 1 Scrubber.
6. D-55 drawing showing details of Scrubber No. 1
7. D-54 design calculations for Scrubber No. 2.
8. D-56 details of Scrubber No. 2.

Before answering the thirteen specific questions listed in your letter of March 30, 1961, we wish to make some general comments as follows:

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The Naturita Concentrator (Upgrader) is located on our old mill plant site near Naturita, Colorado and will treat carnotite type ore from the surrounding area. The capacity of the Concentrator (Upgrader) will be 400 tons per day and will produce approximately 300 tons of tailings to remain at the plant site and 100 tons of concentrate for shipment, by truck, to our plant at Durango, Colorado for further processing.

Under Item 7 of your letter of March 31st we will discuss the flowsheet, but here we want to mention that this operation is primarily a mechanical separation of the ore containing slime material from the barren sand grains of the carnotite type sandstone ore. Although we use a small amount of acid in the first part of the wet process, this acid is entirely consumed by the calcium carbonate in the ore. This is entirely a mechanical concentration plant producing no leach liquors or no chemical products. Because of this process, the tailings produced are entirely different from tailings produced by a uranium chemical process in that practically all the radioactive material goes into the concentrate producing a sand tailing very low in radioactivity.

We expect the Concentrator (Upgrader) to be in full operation sometime during September, 1961 and will inform you at least a week before full operations start.

We are giving below our answers to the 13 specific questions of your March 30, 1961 letter:

1. The qualifications and experience of the personnel in this organization assigned the responsibility for developing, conducting and administering the radiation safety program for the Concentrator (Upgrader).

Name: R. G. Vesper

Title: Director of Safety and Radiation Control

Highest Academic
Degree: High School, 1943

Experience and Qualifications:

Laboratory Technician, Metals Reserve Plant, Durango, Colorado 1943 - 1945.

Laboratory Technician, Root-Norton Assayers & Chemists, Durango, Colorado 1945 - 1948.

Vanadium Corporation of America, Durango, Colorado, 1948 - present-
Responsibilities have included:

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Chemist in charge of laboratories of both Naturita and Durango Vanadium Corporation of America mills.

Assistant Mill Superintendent at both Naturita and Durango Vanadium Corporation of America Mills.

Since July 1, 1959, Director of Safety and Radiation Control at Vanadium Corporation of America uranium and milling facilities at Monument, Naturita and Durango. Has immediate supervision of two (2) full time personnel who perform air sampling and respirator maintenance. Since August 1960 has been assisted in coordination of the safety and radiation control program by Dr. R. F. Bell and Mr. J. C. Cilliland, University of Colorado Medical Center, Denver, Colorado, who are retained by the Company as medical consultants.

Name: James C. Gilliland

Highest Academic Degree: B. S. Chemical Engineering, University of Nebraska, 1949. M. S., Industrial Hygiene Engineering, Harvard University, 1959.

Position in University: Assistant Professor of Industrial Hygiene Engineering in Department of Medicine.

Scientific Experience: Industrial Hygiene Engineering Consultant with the Division of Industrial Medicine - 9½ years. Duties include both field and laboratory evaluations of the many factors involved in offering a general industrial hygiene service to industry. He also performs extrinsic research activities and acts as statistician for the Division.

Relationship to Company: To assist Dr. Bell in his capacity as consultant.

Name: Robert F. Bell

Title: Consultant to Company

Highest Academic Degree: M.D., University of Colorado, 1937

Position in University: Assistant Clinical Professor Acting Head of Division of Industrial Medicine, University of Colorado Medical Center.

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Scientific
Experience: Residencies: 1 year - University of Maryland Hospital, Baltimore, Md.; 1 year - Sheppard Enoch Pratt Hospital, Baltimore, Md.; 1 year - Salt Lake Clinic, Salt Lake City, Utah; 1 year - (Preceptorship) Dr. K. C. Sawyer, Denver, Colorado.

Teaching Appointments: Clinical Instructor in Physical Diagnosis of Chest, Johns Hopkins University - 1 year; Clinical Instructor, University of Colorado - 5 years; Assistant Clinical Professor, University of Colorado--10 years.

Industrial Physician with E. I. duPont de Nemours & Co., Inc. - 10 years, the last 6 years of which was in the capacity of Medical Supervisor.

From 1951 to present time; Acting Head of Division of Industrial Medicine, in addition to maintaining a private practice; duties with Division include medical consultation with industry, teaching and administration.

2. Description of the area in which the Concentrator (Upgrader) is located, including the location and size of nearby inhabited areas, locations of streams and rivers, and sources of water supply for the plant.

Referring to the Naturita Mill Site drawing showing the Concentrator (Upgrader) buildings and surrounding areas, this mill site is two and one-half ($2\frac{1}{2}$) miles west of the town of Naturita, Colorado and one-half ($\frac{1}{2}$) mile west of the Vancoram town site where approximately sixty (60) families live. The nearest dwelling to the Concentrator (Upgrader) on the northwest is approximately 3000 ft., known as the Davies residence and its exact location by bearing and distance is given on this drawing. The nearest dwellings on the southeast are approximately 1800 feet from the Concentrator (Upgrader) and both are located by bearing and distance on this same drawing. The mill site is bounded on the northeast by the San Miguel river and on the southwest by the Colorado State Highway No. 141. The water supply is from a well on the mill site and is also shown on this drawing and indicated as "pumps".

3. Description of the method for restricting both the plant and tailings area from unauthorized entry.

The old Naturita plant site was fenced with exception of the northeast side which was made inaccessible from the outside by the San Miguel river. During construction the fence along the highway adjacent to the new construction has been removed. Also, in several other places it was necessary to remove some of the fence during this construction period. Our plans include fencing and posting the Concentrator (Upgrader)

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area and the old and new tailing areas with possible exception of a short distance on each side of the office and scale house adjacent to Highway 141. Our plans do not include a fence along the San Miguel river because of the inaccessibility by nature of the river, but will include posting along the river. All the plant area will be posted to meet the specifications of 10 CFR 20.

4. The ultimate control or disposition of solid and liquid plant tailings.

The solid tailings from the Concentrator (Upgrader) will be approximately 300 dry tons per twenty-four (24) hours and will be piled in the area disignated "new tailing area" on the mill site drawing. A description of this tailing and method of piling is as follows:

The tailings will be pumped in a slurry containing approximately 40% solids from the building designated as "grinding and concentrating" and will follow the line marked "tailing lines and trestle" out to the new tailing area. This slurry will be fed to a hydro-classifier in the center of the area which makes two products, one a sand tailing for discard containing approximately 20% water and the other a very dilute slurry containing most of the water which is returned to the Concentrator (Upgrader). To the cone discharge sand is added fresh water from our well then discharged on to the pile, by pumping, for final piling. As stated previously, this sand tailing has a very low level radioactivity. The liquid effluent accompanying this final sand tailing is mostly fresh well water and will also be of a very low level radioactivity. Because of the coarseness of this sand tailing there will be no liquid effluent as it will evaporate and also seep down through the solid tailing pile. All the other liquids in the Concentrator (Upgrader) are re-circulated within the plant and are not discharges.

5. A description of the liquid effluent survey program if water or other liquids are used in the upgrading process.

Since it is agreed there will be no liquid effluent leaving our new tailing area, there will be no sampling program. However, there will be a drainage ditch from the Concentrator (Upgrader) area which will contain overflows from our water tanks and which will occasionally contain spillage from the Concentrator (Upgrader). This ditch will not enter the river directly, but will go through a settling pond for the removal of any small amount of solids. The clear overflow from this settling pond will discharge into the river. Daily samples of this overflow will be taken and composited for analysis on a monthly basis. In addition we will take a weekly sample of the San Miguel river above and below the mill site which will be composited for monthly analysis.

6. Description of the equipment used to remove solid radioactive material and soluble radium if tailings are discharged directly in a ground or surface water supply.

See answer to Question 5.

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7. Flow diagram of the upgrading process and a diagram of plant layout, indicating areas and points in the process where dust is generated.

We are enclosing herewith a flowsheet of the process and also a plan and elevation drawing of the Concentrator (Upgrader).

The process starting with the rod mill grinding the ore is a wet process. The process starting with the dumping of the ore on the receiving ore pad and ending with the wet grinding rod mill, which includes crushing, sampling, storing and conveying the ore, would generally be called a dry process, but for our Naturita Concentrator (Upgrader) we term it a damp process. We have a complete dust gathering system for this part of the Concentrator (Upgrader) incorporated into the No. 1 scrubber plans and a very extensive moisturization of the ore from the time it is received until it is fed into the wet grinding rod mill. This will not only reduce the dust load going to No. 1 scrubber but will permit more accurate sampling for the custom ore shippers so they receive a more accurate sample from which a substantial amount of higher grade dust has not been removed. You will note on the flowsheet we show a moisture blender between the jaw crusher and sampling plant for accomplishing part of this moisturization process.

On the plan and elevation drawing enclosed, the pickup points for the dust included in the No. 1 scrubber installation are shown in detail. The dust from these pickup points will be treated in the No. 1 wet scrubber for the removal of this dust from the air and the recovery of the solids in slurry. Although the concentrate which is dried still will contain approximately 10% moisture, the gases discharged from these dryers will be collected and treated in the No. 2 scrubber, this is also shown on the plan and elevation drawing of the Concentrator (Upgrader).

8. Description of dust collection and ventilation equipment that are to be used when the plant is in operation, including the type, capacity and locations of such equipment, e.g. ore transfer points, crushing, grinding, etc.

There are two dust collecting systems, one we call No. 1 scrubber system which includes all the crushing, sampling, conveying and bucking room areas; and the No. 2 scrubber system which removes the dust from the dryer gas discharges. This dust equipment and systems was designed under the direction of Mr. R. A. Davidson, our Chief Engineer in Cambridge, Ohio. (Mr. Davidson designed our No. 2 scrubber dust installation here at our Durango plant which is now working very satisfactory). The no. 1 scrubber system is a balanced system which uses one fan and one scrubber, the detail calculations part of which are shown on drawing D-53 enclosed. The size

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of the various pickup pipes vary so that each pipe takes the correct amount of inlet air and contained dust. As previously mentioned in this letter, we expect that due to the moisturization our ore dust load in this system will be greatly reduced and the accuracy of our sampling of custom ore will be improved. The details of this No. 1 scrubber system are shown on drawings D-53 and D-55 as well as on the plan and elevation drawing of the Concentrator (Upgrader). The No. 2 scrubber for the Dryer discharges is not a balanced system but includes a fan for each dryer. This fan discharges dryer gas with its contained dust into the No. 2 scrubber. You will note that although we will have two dryers in our original installation, we have included the possibility of a third dryer and third fan for this dryer. The details of the No. 2 scrubber system are shown on drawings D-54 and D-56 as well as the plan and elevation drawing of the Concentrator (Upgrader).

9. Description of the survey program which will be followed to determine concentrations of airborne radioactivity within work areas, including the make, model number and capacity of sampling devices, and the step-by-step procedures for sample analysis.

Equipment to be used for the collection of airborne radioactivity samples with work areas is:

Gast Mfg. Co. line operated pump, Model AD-140 Millipore filters, Type HA plain, 29 mm. diameter. Sampling will be performed at a flow rate of 10-11 liters per minute. Sampling pumps are calibrated with a 0.25 cubic foot per revolution wet test meter.

The collected sample is directly counted in an Eberline Scintillation Alpha Counter, Model SAC-1. The count obtained is related to dpm by appropriate calculation and eventually expressed as uc/ml gross alpha or uranium activity.

10. Description of the procedure to be followed in determining the average daily and weekly exposures to airborne radioactivity for each employee who may frequently or occasionally occupy areas where the air contamination exceeds MPC values specified in 10 CFR 20.

A complete survey will be made three to four weeks after operation of this plant begins. Every job activity, including general air, will be sampled. Samples will be taken at random over a two to three day period. The number of samples that will be involved from the initial survey cannot be determined at this time. From the results of this initial survey a complete survey method can be submitted that will describe the program on a continuing basis.

11. Description of plant discharge stacks including stack heights, types and concentrations of effluents expected to be discharged, method for controlling release of radioactive material, and methods for determining the concentration of radioactive

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material released to the environs.

There will be two discharge stacks in the Concentrator (Upgrader). No. 1 on the No. 1 scrubber and No. 2 on No. 2 scrubber. The No. 1 scrubber stack will be 40 inches in diameter and 25 feet high. This stack will set on the ore pad which is the highest point in the plant area. The No. 2 stack will be 40 inches in diameter and 40 feet high and will set adjacent to the dryer building. The effluents from these stacks will be very low in radioactivity. During the initial survey the scrubber stacks will be sampled with an impinger type sample and the uranium determined and calculated from this sample. The continuing stack sampling program will also be described at the same time as the program in Item 10. During each quarter high volume samples will be taken at the periphery of the restricted area and uranium or gross alpha will be determined. This sampling will determine the contamination to the unrestricted areas.

12. Description of the method for determining exposure of employees to external radiation.

When the Concentrator starts operation filter badges will be used on the operating personnel, and continued for 60 days, to determine external radiation exposure. From these results we can then determine whether it is necessary to continue or apply for exemption from the use of filter badges.

13. A copy of the written radiological safety operating instructions supplied to employees.

We are enclosing a copy of our radiation instructions for the Durango plant which are now in process of being revised. We are also in process of making instructions specific to our Naturita Concentrator (Upgrader).

Very truly yours,

Fred A. Brinker

Fred A. Brinker
General Manager Western Div.

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