40-6659

PETROTOMICS COMPANY

TIDEWATER OIL COMPANY • MANAGING PARTNER

P. O. BOX 184 • CASPER, WYOMING

January 12, 1962

H Cabell

United States Atomic Energy Commission
Washington 25, D. C.

Re: DLR:DFH
Docket No. 40-6659

Attention: Mr. Donald A. Nussbaumer, Chief
Source and Special Nuclear Materials Branch
Division of Licensing and regulations

Gentlemen:

With reference to the above subject letter dated December 14, 1961, we herewith submit the requested information itemized as per subject letter.

We trust the attached information will suffice to expedite the approval of our Source Material License so we can meet our March 1962 start-up schedule.

Very truly yours,

PETROTOMICS COMPANY

By____________________
N. A. Grant P. E.
Project Manager

NAG:mah
Enclosures

copy ... / Comp. 1/24/62

A/16

40-6659

Item 1.

The radiation safety will be the assigned responsibility of G. K. Coates, the Mill Superintendent. Mr. Coates is the former Superintendent and Manager of the Commission-owned mill in Monticello, Utah. Since the closing of the Monticello Mill in January, 1960, Mr. Coates has been associated with the Winchester, Mass. laboratory group working on radiation problems encountered in the processing of uranium ores.

While at Monticello, Mr. Coates directed the formation of the radiological safety program, which is described in detail in the Winchester Laboratory Report Win-114 and which is used as the basis for the radiological safety work in practically all of the domestic mills. During the association with the Winchester Laboratory, Mr. Coates assisted in special studies in the field of dust contamination and effluent decontamination.

The following references are given as a source of confirmation of the experience and qualification of Mr. Coates:

Mr. E. C. Van Blarcum, Division of Raw Materials

Mr. D. Walker, Division of Inspection

Mr. D. Lowe, Division of Compliance

Mr. A. E. Jones, Manager of Grand Junction Operations Office

Mr. Coates will be assisted in the sampling, surveying and record keeping by Mr. B. Moulden, who is designated as radiologist on the attached chart. Mr. Moulden has a B.S. degree, major in mathematics with a minor in physics. He has also experience in

Item 1 (Cont'd)

in Beta-Gamma survey work and has some experience in a chemical laboratory. Mr. Moulden will also receive additional training in air sampling and radiation survey work in one of the operating mills prior to the start up of the Petrotomics plant.

Item 2.

The Petrotomics Mill is located in the center of the Shirley Basin approximately 32 air miles south of Casper, Wyoming. Shirley Basin is a high (7,000 feet) basin area approximately 40 miles in diameter, surrounded by mountain ranges of 8,000 to 10,000 ft. elevation. It is a semi-arid area devoid of trees and with very little surface water other than Spring run-off. Residual snow fall is light and annual precipitation amounts to less than 10 inches of moisture. There is no cultivated ground within 20 miles of the plant area.

The nearest inhabited area is a uranium mining camp of some 200 people located 5 miles north of the plant site. The nearest permanent settlement is Medicine Bow, Wyoming some 30 air miles south.

There will not be a residential area associated with the mill and all employees will commute from Casper or Medicine Bow. Workmen will be housed in overnite motel type accommodation for their work period.

The attached map, A-1, of the plant area locates the disposal area and shows the topography of the immediate plant area.

The attached township map shows the topography of a larger area which includes the only stream in the area (Little Medicine Bow River) shown in red. This is a small stream flowing approximately

Item 2. (Cont'd)

9,000,000 gallons per day. There are no known withdrawals of water from the Little Medicine Bow River for either culinary or irrigation purpose between the Petrotomics plant and the town of Medicine Bow. Any liquid escaping the tailings area would have to flow a distance of 5 miles through dry gullies before reaching the river. This is shown by the blue line on the attached township map. Water will be supplied to the mill from the open mine pit adjacent to the mill. Water is pumped from the mine to a series of three settling ponds thence to an elevated 200,000 gallon tank which supplies both process water and water for fire protection.

Item 3.

The liquid effluent survey program will consist of taking water samples from drill holes located below the tailings dam. The samples taken on a monthly basis could indicate possible subsurface seepage, if there is a change in composition of the water between sample periods. Should a change be noted, it would have to be related to the effluent in the disposal area to indicate that source.

It is highly improbable that liquid effluent will escape from the impounding area since the area is underlain by an impervious layer of Bentonitic shale. (See accompanying geologic cross-section). This has been well demonstrated by the complete failure of a sewage disposal system using seepage lines. The water discharge would not go into the ground.

In addition, the slime portion of the tailings will further seal the bottom of the disposal area to the already impervious nature of the ground.

There will be no planned surface discharge since the large area of the tailings pond will provide for evaporation of the total liquid portion of the waste material. As a precautionary measure, a second dam has been built to trap any effluent that might get past the main dam. Also a ditch has been cut above the disposal area to catch all surface run-off.

Item 3. (Cont'd)

Uranium analysis will be made using standard fluorometric procedures. Radium and Thorium Assays will be sent to one of the several commercial laboratories doing such determinations.

ITEM 4

CONSTRUCTION AND INTEGRITY

OF DISPOSAL AREA

January 12, 1962

Mr. Norman A. Grant, Project Manager
Petrotomics Company
P. O. Box 184
Casper, Wyoming

Dear Mr. Grant:

The following is a description, design, etc., of the mill tailings basin, as requested in the A. E. C. letter dated December 14, 1961, and further referred to as DRL:DrH, Docket No. 40-6659 in connection with our request for a Source Material License. This is to comply with part 4 of the request.

Attached is a map marked Exhibit A-1 which shows the planned layout, longitudinal profile along the center line of the dam, and typical cross section of the dam at A-A. These all show the present dam with top at 1040 elevation and the proposed final dam with top at 1060 elevation.

On this map is also shown the surface water runoff interceptor ditch and a typical cross-section of the same as well as the direction of the prevailing winds.

No further future extensions are shown as when this dam is completed to the 7060 elevation, it has ample capacity to take care of the Petrotomics needs thru 1966 - the term of the present contract with the A. E. C. This is shown by the accompanying graph which shows a total sand capacity up to the 7058 elevation of 77,000 tons using a 1.35 ton per cu. yd. factor.

The maximum height of the final dam will be 54 feet, the top width will be 40 feet as it may also serve as a road to areas west of the plant site. The slopes are to be 2:1 as indicated on Exhibit A-1. There will be no embankment surface protection because the prevailing winds are from the west-southwest as also indicated on Exhibit A-1.

When the pond is filled to final level, there will still be 2' of freeboard, thus insuring against any slopping over of any contained liquid. Under normal conditions, there will never be an excess of liquid as the average evaporation rate for this area is 42" per year and the average total precipitation is less than 12" per year. Any possible seep will be retained in the seep dam located 50 feet downstream as shown on Exhibit A-1.

The present dam and seep dam were constructed in early October and the tailings dam was filled with fresh water to check for any leaks or seeps, but none were found.

In constructing this portion of the dam, a keyway, shown on Exhibit A-1 cross-section, was cut by scraper, down into the impervious bentonitic material shown on the included Stratagraphic and Structural Cross Section. This keyway was then filled with an impervious clay, placed and compacted in thin layers by Euclid T.S. 24 Scrapers. The same material was used and material placed in like manner in constructing the rest of the present dam.

Similar construction procedures will be employed in completing the rest of the final dam embankment which will contain approximately 58,000 cubic yards of clay till material when completed.

There are no present indications of any conditions which might lead to the accidental release of waste material other than failure of the impounding dam, which would release only the clear effluent.

This is highly improbable because of the mass of the dam, the impervious material of which it will be constructed and the low profile required to build a dam of sufficient retaining capacity. Also the character of the underlying impervious bentonitic shale to which the dam is firmly keyed.

The fact that the tailings basin is subject to run-off from a watershed area of less than 600 acres, most of which will be diverted around the dam by interceptor ditches, precludes the possibility of washout of the dam structure by run-off.

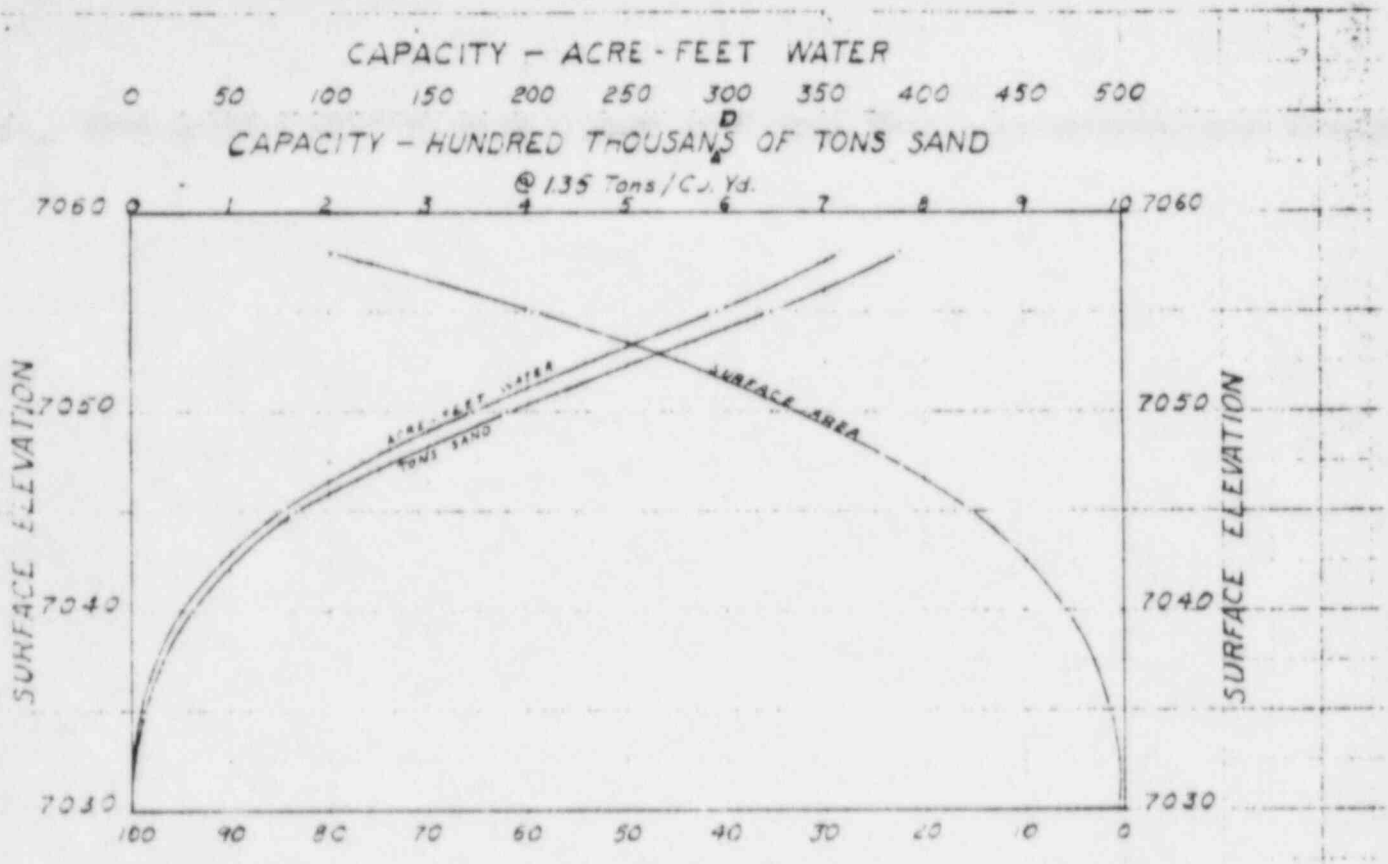
Any possible accidental release of waste effluent would have no environmental effect as it would flow down a dry, uninhabited draw for about 5 miles before joining the flow of the Little Medicine Bow River. In normal seasons any possible released material would be soaked up, and evaporated before it could possibly reach the River.

As a further preventative measure, the tailings dam will be checked daily as a routine operational function.

Very truly yours,

G. T. Pearsheur, [illegible]
Mine Superintendent
Minnesota Registered Mining
Engineer No. 2330

GTP:mah



AREA - CAPACITY CURVES

MILL TAILINGS DISPOSAL BASIN DATA

ELEVATION	SURFACE AREA ACRES	CUMULATIVE VOLUME ACRE FEET WATER	CUMULATIVE VOLUME TONS SAND
7030	0.22	0	0
7035	1.45	6.15	13,400.01
7040	5.95	28.65	62,398.68
7045	15.60	76.90	167,498.72
7050	35.21	174.95	380,998.79
7055	59.66	297.20	647,298.89
7058	79.88	357.68	778,998.76
	120.00	480.0	

Item 5.

a. The primary and secondary crushing areas are ventilated by natural draft roof ventilators. All conveyor transfer points and all crushing equipment are fully enclosed and plenums are provided for connection to a dust collection system if dusting occurs. There is no collection system in the original installation since the ore will contain at least 10% moisture after it has been stockpiled for several months. Ore received directly from the mine will contain 15% or higher moisture. The sandy character of the Petrotomics ore produces a product wherein only 10% of the mined ore will require crushing. (10% plus 1 inch).

b. If necessary, fog nozzles will be installed at hoppers and transfer points should any dry ore or dust conditions occur.

c. Dust Collection Equipment -

Type:

One American Air Filter Skimmer Centrifugal Precipitator, size 8, preceeding and in series with,

One American Air Filter Roto-Clone, Size 1½, Type N, Hydrostatic Precipitator.

Capacity:

AAF Skimmer Centrifugal Precipitator, Size 8, 1500 cfm

AAF Roto-Clone, Size 1½, Type N, Hydrostatic Precipitator.

1500 cfm at a total system resistance of 10" water pressure.

1281

Item 5c (Cont'd)

Location:

The above two items of dust collecting equipment are located in the yellow cake drying-packaging area, specifically, in the drying room. The drying room is on the mezzanine floor immediately above the packaging room. The packaging and drying rooms are sealed separately and are under negative pressure initiated by the dust collection system. Dust plenums extend through the concrete floor of the drying room into the packaging area. The yellow cake conveyor over the drum filling stations is sealed and connected to the dust collecting system. The yellow cake drum sampler is also totally enclosed and connected to the dust plenum.

Flue gases from the dryer and air from the dust plenum enter the centrifugal precipitator to effect removal of coarse particles of yellow cake. Dry solids collected in the centrifugal precipitator are discharged into the packaging conveyor system. Air infiltration dampers are installed on the dust plenum intake to the centrifugal precipitator to provide a constant negative pressure to the dryer and also cool the flue gases to about 400°F. The discharge of the centrifugal precipitator is connected to the intake of the hydrostatic precipitator.

The hydrostatic precipitator has a capacity of about $2\frac{1}{2}$ times the dryer flue gas discharge rate of 600 cfm. The Roto-Clone unit

Item 5c (Cont'd)

cleans the air of particulate matter by the combined action of centrifugal force and a thorough intermixing of water and dust-laden air. A continuous sludge sluicing arrangement is used to remove the collected material. The sludge is pumped back to the yellow cake filtration stage. A metal stack discharges the dust free gases to the atmosphere above the mill building approximately 40 feet above ground level.

The dust collection system is electrically interlocked with the drying and packaging system to effect complete stoppage of yellow cake movement in the entire system in the event the dust collector electrical drive fails. An automatic audio alarm is also connected to the interlock system. Air that is exhausted from the drying and packaging rooms must pass through the dust collection system.

The efficiency of the dust collection equipment is based on the proven performance of a similar installation in use in a uranium mill in this area. A Roto-Clone of the same capacity is connected directly to a dryer of the same type and size to be used in the Petrotomics mill. It is reported that the radiation levels in the stack gases are well below the MPC levels.

The attached Stearns-Roger drawing number 03-1-01, Mill Building General Arrangement, shows the location of the dust collection equipment relative to the drying and packaging areas.

All other areas in the mill buildings are vented with gravity type ventilators.

AC-6659

Item 6

The low level beta-gamma survey meter to be used in the survey will be calibrated using the manufacturer's attached standardization disk. This is a radium source disk having an energy level within the 0.05 to 2.0 mr/hr. range. This will provide for calibration in the range needed for the survey.

The survey meter is first zero calibrated to adjust for background, then calibrated against the standard source.

Calibration will be performed a minimum of twice daily during extensive survey activities and calibrated before each use during spot-check surveys. Beta-gamma levels will be recorded to maintain a full time record for each survey location.

Airborne radioactive survey procedures will follow those set forth in the A. E. C. Health and Safety Laboratory Report - HASL-40 and those outlined in Winchester Laboratory Report Win-114. Briefly these provide for a sample collection period of 15 to 30 minutes. The filter paper is then removed, placed in a glassine envelope and taken to the laboratory for analysis. Air-flow rates will be at 18 liters per minute through the filter during the collection period. (Average intake of air by a man during normal physical exertion.)

In the laboratory, the sample will be completely dissolved keeping volume of dissolution as low as possible in order to keep the concentration of dissolved radioactive material at the highest possible concentration. The solution is then assayed by standard fluorometric

procedure. The results then are calculated to give the concentrations of Unit Volume of air (microcuries per cubic meter.). This has established the area concentration so comparison can be made with the limits set forth in 10C. F. R. 20.

This concentration can also be incorporated with the employees' work time in the sampled atmosphere to evaluate the employers average weighted exposure.

Weather conditions will also be noted during the sampling to determine if different weather conditions contribute to different dust levels.

Records of each employee's exposure will be maintained on A. E. C. forms 4 and 5.

40-4459

L&R File Copy

Item 8.

The initial survey will include all areas of the plant. This will be done in order to establish the areas in which radioactive dust occurs. Once these dust areas are established, they will be surveyed on a monthly basis. Special areas such as the Crushing Area and final product drying and packing areas will be surveyed weekly to establish levels and indicate the need, if any, for corrective action. Experience has shown these areas to be the primary one in which dust levels may be high. In each area, a series of three GA samples will be collected at a height of 5 feet above the floor and at least 3 feet away from any obstructions. Each sample run will be for a period long enough to involve as large a volume of air as possible. Two BZ samples will be taken at each work location of the man in the area. An example of this would be during the loading and changing of product drums and during the sampling of the drums. BZ samples will be collected as closely as possible to the operator's nose in order to sample as nearly as possible the air he is breathing.

Time studies will also be employed to determine the occupancy period in each atmosphere. Occupancy time in each area can only be determined from actual operational studies.

The survey program will be adequate to determine the exposure to each employee as well as measure the degree of compliance with the requirements of 10CFR20.

1281

40-4459

Item 9

The only stack which could possibly discharge radioactive material, will be on the product dryer. Gases discharged from this dryer will be passed first through a dry cyclone and then through a wet Roto-Clone scrubber where all particulate matter is removed prior to discharge of the gases to the atmosphere through the stack. This stack will discharge into the atmosphere at a height of 40 feet above the ground and 10 feet above the mill roof. Any release of radioactive material from this stack would be from the malfunction of the scrubbers and dust collector resulting in immediate corrective action. Loss of any radioactive material from this stack will be loss of final product.

This stack will be sampled weekly by using a venturi tube and withdrawing a measured volume of air which is passed through a No. 41 Watman Filter. The filter is anaylzed for uranium and the concentration of uranium per unit volume of air calculated.

Item 10

External radiation exposure to employees will be determined by combining their work time in an area with the survey level as determined by instrument. Should this indicate the employee is possibly being exposed to as much as 75 mr. per week (25% of MPD), he will be required to wear a film badge to determine the exact exposure he is receiving.

(a). The Mt. Sparis model SC-129 meter proposed in the initial application will not be used for the following reasons:

1. It is a scintillometer type of instrument reading only gamma radiation.

2. It is difficult to field calibrate.

3. It is highly sensitive to mass action and its reliability would be too erratic for use in mild survey work.

The instrument to be used for plant survey work will be the Model 106C Geiger Counter built by Precision Radiation Instruments of Los Angeles, California. This is a highly mobile instrument able to stand up under field usuage. It is calibrated in mr/hr. so will provide for direct reading. The three scales 0-0.2, 0-2.0, and 0-20 mr/hr. will cover all ranges of radiation encountered in a uranium mill. Field calibration is simple, easy and reliable when using the attached radium source standard. It records both beta and gamma radiation.

Item 10 (Cont'd)

The counter tube is located within the chassis of the instrument, but a window type opening provides for Beta pickup. The window can be shielded to record a straight gamma radiation reading.

(b). When an employees's work time in an area is combined with the radiation level of the area, the amount of radiation he receives in the area is determined. The sum total of all these amounts determine the daily and weekly exposure. In the case of a film badge survey the exposure value recorded by the badge will be pro-rated over the hours or weeks the badge was worn to determine exposure. In all cases where it is indicated that an employee may be receiving 25% or more of his maximum permissible dose, he will be surveyed on a continuous basis as well as being rotated to work in other areas with low levels. No employee will be continuously used in an area where he would be exposed to radiation above MPC levels should such an area exist.

Continuous exposure records will be maintained on all employees receiving as much as 25% of the MPD.

4/0-6159

RADIATION SAFETY

Uranium products, such as are handled at this plant, are radioactive; that is, they emit particles and waves from disintigrations of their atomic nuclei which can be detected only with special electronic equipment. Although these nuclear radiations when present in sufficient quantity are known to cause harmful effects upon the human body, concentrations of this magnitude have not been experienced in the uranium milling industry. Limits prescribed in the Federal Regualtions (10 CFR 20) provide for an additional factor of safety which sets the amounts of radiation exposure to employees at levels much below any known injurious concentrations.

Radiation levels in the various areas of the mill will be checked periodically with an air filter and a scintilation counter to see that they remain below the maximum permissable concentrations; however, in order to insure safe working conditions, the following rules must be observed:

1. Specific rules posted in each area providing for protection from radiation exposure will be complied with without exception.

2. Working areas must be kept clean. All spills are to be cleaned up immediately.

3. Avoid creating dust conditions such as those caused when using compressed air for clean-up purposes. All dust will be collected by vacuum or washing down with water.

4. Respirators will not be worn as a protective device for radiation exposure; their use will be required as protection from irritating chemical dust and smoke.

5. Persons working in final product areas will remove outer clothing worn in the area and wash face and hands before leaving to eat.

6. Shower facilities will be provided, and all operating personnel are expected to shower following each shift, particularly those working in areas where final product is handled.

7. Any cuts or open sores will be properly covered in order to prevent the accidental entry of radioactive material.

8. Authorized drinking water will be provided. Do not drink from the water taps.

9. On jobs where the wearing of film badges is required, instructions for their use must be followed exactly to assure the accuracy of the test results.

OPERATING INSTRUCTIONS FOR ALL EMPLOYEES

HANDLING FINAL PRODUCT

The following items provide for your protection. Your compliance with these instructions is required when working in this area.

1. There will be no smoking in this area. Leave your cigarettes outside the area.

2. Maximum cleanliness is required. Clean up any dust or slurry spills immediately. Avoid tracking or carrying this material to other areas.

3. The equipment is fully enclosed and will not liberate dust when operating properly. Do not operate the drying or packaging equipment in an improper manner. Always double check the dust collection system.

4. The clothing furnished to you is for use only in this area and must be removed before leaving. If the clothing becomes smeared or dirty it should be changed and the dirty clothes laundered.

5. Do not bring your lunch or anything to eat into this area.

6. Always wash your hands and face before smoking or eating. Avoid any act which could lead to the entry of final product into your nose or mouth.

7. Your observance of good personal hygiene is of utmost importance. You should always bathe and change to other clothing when leaving work.

OPERATING INSTRUCTIONS FOR CRUSHER AREA

The following items provide for your protection. Your compliance with these instructions is required when working in this area.

1. Use water to wash down any spills.

2. Clean up all dust accumulations before they become scattered.

3. Inform the foreman immediately of any leaks or breaks in the equipment or hooding which will permit dust to escape into the general area.

4, Wash your hands and face before smoking or eating. You should take a shower when you go off shift.

40-6659

Item 12

Respirators will not be used as a protective device against radiation exposure. Respirators will be used for dust protection (non-radioactive dusts) and for such purposes as spray painting or fiberglass application.

FROM: Petrotomics Company
Casper, Wyoming
(W. A. Grant)

DATE OF DOCUMENT: Jan. 12, 1962 | DATE RECEIVED: Jan. 19, 1962
LTR. x | MEMO: | REPORT: | OTHER:

TO: Donald A. Nussbaumer, Chief
U. S. Atomic Energy Commission
Washington 25, D. C.

ORIG.: x | CC: xx | OTHER:

ACTION NECESSARY ☐ | NO ACTION NECESSARY ☐ | CONCURRENCE ☐ | COMMENT ☐ | DATE ANSWERED: | BY:

CLASSIF.: Unclassified | POST OFFICE REG. NO.:

FILE CODE: 40-6659

DESCRIPTION: (Must Be Unclassified)

Ltr. furnishing information requested in our 12-14-61 ltr. and transmitting

ENCLOSURES:

1. Answers to Items 1 thru 12 of our letter
2. Dwg. Nos. 03-1-01; Map of Tailing Pond Impound; Map Structural Cross Section Thru Tailing Area; and Exhibit A-1.

REFERRED TO	DATE	RECEIVED BY	DATE
Nussbaumer	1-19-62		
w/file cy. & folder compliance copy.			
Hennen	1/19	Harmon	1/19

REMARKS:

Mail Room Distribution:
1. Public Document Room

U. S. ATOMIC ENERGY COMMISSION

MAIL CONTROL FORM FORM AEC-326S (8-60)

U. S. GOVERNMENT PRINTING OFFICE: 1961 — 613958

January 12, 1962

Mr. Norman A. Grant, Project Manager
Petrotomics Company
P. O. Box 184
Casper, Wyoming

Dear Mr. Grant:

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Attached is a map marked Exhibit A-1 which shows the planned layout, longitudinal profile along the center line of the dam, and typical cross section of the dam at A-A: These all show the present dam with top at 1040 elevation and the proposed final dam with top at 1060 elevation.

On this map is also shown the surface water runoff interceptor ditch and a typical cross-section of the same as well as the direction of the prevailing winds.

No further future extensions are shown as when this dam is completed to the 7060 elevation, it has ample capacity to take care of the Petrotomics needs thru 1966 - the term of the present contract with the A. E. C. This is shown by the accompanying graph which shows a total sand capacity up to the 7058 elevation of 779,000 tons using a 1.35 ton per cu. yd. factor.

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When the pond is filled to final level, there will still be 2' of freeboard, thus insuring against any slopping over of any contained liquid. Under normal conditions, there will never be an excess of liquid as the average evaporation rate for this area is 42" per year and the average total precipitation is less than 12" per year. Any possible seep will be retained in the seep dam located 100 feet downstream as shown on Exhibit A-1.

The present dam and seep dam were constructed in early October and the tailings dam was filled with fresh water to check for any leaks or seeps, but none were found.

In constructing this portion of the dam, a keyway, shown on Exhibit A-1 cross-section, was cut by scraper, down into the impervious bentonitic material shown on the included Stratagraphic and Structural Cross Section. This keyway was then filled with an impervious clay, placed and compacted in thin layers by Euclid T.S. 24 Scrapers. The same material was used and material placed in like manner in constructing the rest of the present dam.

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There are no present indications of any conditions which might lead to the accidental release of waste material other than failure of the impounding dam which would release only the clear effluent.

This is highly improbable because of the mass of the dam, the impervious material of which it will be constructed and the low profile required to build a dam of sufficient retaining capacity. Also the character of the underlying impervious bentonitic shale to which the dam is firmly keyed.

The fact that the tailings basin is subject to run-off from a watershed area of less than 600 acres, most of which will be carried around the dam by interceptor ditches, precludes the possibility of washout of the dam structure by run-off.

Any possible accidental release of waste effluent would have no environmental effect as it would flow down a dry, uninhabited draw for about 5 miles before joining the flow of the Little Medicine Bow River. In normal seasons any possible released material would be soaked up, and evaporated before it could possibly reach the River.

As a further preventative measure, the tailings dam will be checked daily as a routine operational function.

Very truly yours,

G. T. Beardshear

G. T. Beardshear, P.E.
Mine Superintendent
Minnesota Registered Mining
Engineer No. 2550

GTB:mah

1962

ITEM 5

CONSTRUCTION AND INTEGRITY

OF DISPOSAL AREA

PETROTOMICS COMPANY
P. O. BOX 184
CASPER, WYOMING
ADDITIONAL INFORMATION
TO BE SUBMITTED

ITEM 5. TAILINGS DAM - DESCRIPTION, INTEGRITY, CAPACITY, ETC.

Mill waste is in the form of a sand slurry. The liquid phase of the waste will be acidic and will contain dissolved radioactive materials. Concentrations of Uranium, Thorium and Radium will be determined and monitored after mill startup. All mill waste will be impounded in a restricted enclosure behind an earthen dam.

The dam was engineered and constructed to include a key on the footing to insure a positive seal. A bentonitic clay and sand mixture was used as fill for the dam. The surface of the impounded area above the dam is covered with a layer of bentonitic material that has a natural tendency to seal the surface when wet. Addition of the fine sands from mill waste will aid in sealing the bottom of the reservoir. All test drill holes in the tailings pond area have been plugged with cement to insure against seepage of radioactive waste to underground permeable sand strata. The tailings pond area has adequate capacity to impound 100 percent of the mill waste through 1966.

Periodic inspection of the dam will be made and the necessary maintenance will be accomplished to prevent overflow and seepage. A ditch will be maintained around the impounded area to divert the natural run-off of the area below the dam.

In the event seepage is detected or suspected below the dam, samples of the effluent will be analyzed for Uranium, Thorium, and Radium 226.

Item 5.

The liquid effluent survey program will consist of taking water samples from drill holes located below the tailings dam. The samples taken on a monthly basis could indicate possible subsurface seepage, if there is a change in composition of the water between sample periods. Should a change be noted, it would have to be related to the effluent in the disposal area to indicate that source.

It is highly improbable that liquid effluent will escape from the impounding area since the area is underlain by an impervious layer of Bentonitic shale. (See accompanying geologic cross-section). This has been well demonstrated by the complete failure of a sewage disposal system using seepage lines. The water discharge would not go into the ground.

In addition, the slime portion of the tailings will further seal the bottom of the disposal area to the already impervious nature of the ground.

There will be no planned surface discharge since the large area of the tailings pond will provide for evaporation of the total liquid portion of the waste material. As a precautionary measure, a second dam has been built to trap any effluent that might get past the main dam. Also a ditch has been cut above the disposal area to catch all surface run-off.

Item 5. (Cont'd)

Uranium analysis will be made using standard fluorometric procedures. Radium and Thorium Assays will be sent to one of the several commercial laboratories doing such determinations.