BISON BASIN PROJECT

ENVIRONMENTAL AND RADIOLOGICAL

QUALITY ASSURANCE PROGRAM

LICENSE NUMBER SUA-1396

DOCKET NUMBER 40-8745

JULY, 1981

OGLE PETROLEUM INC.

1.0 FACILITY ORGANIZATION AND ADMINISTRATIVE PROCEDURES

1.1 Organization

The authority and responsibilities of each level of management as shown in Table 1.1-1 are as follows:

The President of Ogle Petroleum Inc. is responsible for all of the practices and decisions made by those management personnel reporting to him. He delegates the authority for the decisions in the Minerals Division to the Vice President of Ogle Petroleum Inc. who is responsible for the Minerals Division.

The Vice President responsible for the Minerals Division reports directly to the President of the Company and is responsible for all activity in the Division including in-situ uranium recovery and uranium processing. He delegates the authority for the decisions in the in-situ mining operations to the Manager of Mining.

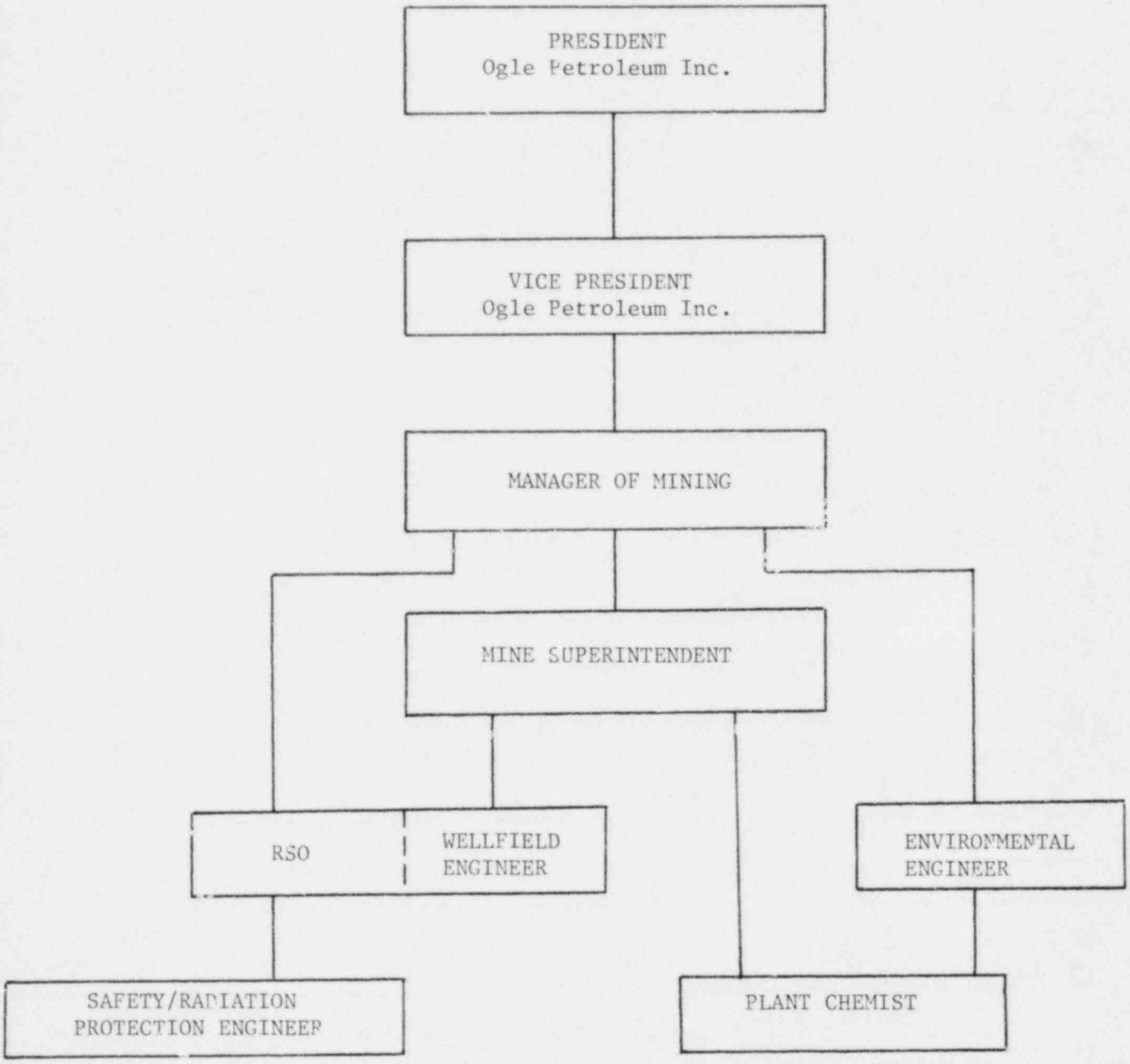
The Manager of Mining is responsible to the Vice President for conducting the company's in-situ uranium recovery and uranium processing operations in a safe and efficient manner. These responsibilities include production operations, maintenance procedures, and overall security and safety practices. The Radiation Safety Officer (RSO) reports on a direct line to the Manager of Mining in all matters relating to radiation safety and security.

The Mine Superintendent is responsible for directing all activities and personnel at the project site with the exceptions of the RSO and the Environmental Engineer who reports directly to the Manager of Mining. The Mine Superintendent also reports directly to the Manager of Mining.

The Wellfied Engineer is designated, in writing, as the RSO responsible for the establishment, implementation, and day-to-day operation of the Bison Basin Project radiation safety program. The Wellfield Engineer, in carrying out his responsibility as the RSO, reports directly to the Manager of Mining.

TABLE 1.1-1

FACILITY ORGANIZATION



The Environmental Engineer is responsible for conducting all environmental monitoring programs, reviewing monitoring data, and preparing reports on the monitoring programs. The Environmental Engineer reports on a direct line to the Manager of Mining in all matters relating to environmental monitoring and compliance.

The Plant Chemist is responsible for conducting the chemical analyses of various wellfield, plant process and monitor well samples. The Plant Chemist, in carrying out his responsibilities, reports directly to the Mine Superintendent on process matters and directly to the Environmental Engineer on environmental monitoring matters.

The place of work of the Manager of Mining is Ogle Peteroleum Inc's. office in Casper, Wyoming. The place of work of the Mine Superintendent, RSO, and Plant Chemist is the Bison Basin Mine Site. The Enviromental Engineer maintains offices and titles at both the Casper office and the Bison Basin Mine Site and his time is divided between these two locations.

The above organization is designed to meet the radiation safety and environmental monitoring requirements of an in-situ uranium solution mining operation with 30 to 40 employees.

1.2 Radiation Safety Staff

The RSO, with the assistance of his staff and with the assistance and supervision of the Manager of Mining, is responsible for plant safety and the radiological protection of plant personnel and the public. This responsibility includes training of all personnel in radiation and industrial safety, monitoring performance and quality control of radiological analyses, monitoring plant effluents, monitoring and evaluating and maintaining records of personnel exposures and plant area surveys, posting radiation areas, providing for Radiation Safety Staff surveillance of tasks in higher than routine radiation exposure areas, maintaining plant radiation monitoring equipment, preparing reports to regulatory agencies, and developing procedures for radiological protection. He is also responsible for investigating personnel safety-related incidents. He reviews normal plant procedures and equipment for radiological safety. Both the Manager of Mining and the RSO have the authority to cancel, postpone, or modify any operation or process which poses an immediate radiological hazard. The RSO reports directly to the Manager of

Mining. He works closely with the Mine Superintendent but is not part of the line organization at the mine in regard to his RSO duties and responsibilities.

A Safety/Radiation Protection Engineer makes up the RSO's staff and assists the RSO in implementing the radiological safety program. The Safety/Radiation Protection Engineer will be assigned cirtually fulltime to safety program activities. If he is asked to perform other duties, these will not be in production or in areas where his program duties are impaired.

1.3 Minimum Technical Qualifications for Radiation Safety Program and Environmental Monitoring Positions

Minimum qualifications have been established for key positions in implementing the radiation safety and environmental monitoring programs (i.e., developing, conducting, approving and auditing the program). These requirements are documented in OPI's job descriptions and are summarized below for each position (only Bachelor Degrees from accredited colleges or universities fulfill the educational requirement).

Vice President of Ogle Peteroleum Inc.: Must have a Bachelor Degree in engineering or geology or related physical science from an accredited college or university or equivalent relevant experience. He must have demonstrated knowledge and competence in administration, personnel management, business procedures, and an in-depth knowledge of uranium mining and processing operations. A minimum of ten years of management experience is required.

Manager of Mining: Must have a Bachelor Degree in engineering or related physical science from an accredited college or university or equivalent relevant experience. He must have demonstrated knowledge and competence in administration, personnel management, business procedures, and an in-depth firsthand knowledge of uranium mining and processing operations. Additionally, the Manager of Mining must have knowledge of radiation detection instruments and the biological effects of radiation. A minimum of five years of mangement experience is required of which three years must have been in the uranium in-situ mining industry.

Radiation Safety Officer (RSO): The minimum technical qualifications of the RSO will be in accordance with license condition number 13 (SUA 1396), and any amendments thereto.

Safety/Radiation Protection Engineer (SRPE): The minimum technical qualifications of the SRPE will be in accordance with license condition number 13 (SUA 1396), and any amendments thereto.

Environmental Engineer: Must have a Bachelor Degree in environmental engineering or physical science from an accredited college or university, equivalent relevent experience in environmental monitoring and reporting, or a combination of experience and education. Relevant experience equivalent to a Bachelor Degree shall be at least one year of environmental monitoring related work.

Plant Chemist: Must have a Bachelor Degree in chemistry or physical science from an accredited college or university, equivalent relevant experience in chemical procedures and analysis, or a combination of experience and education. Relevant experience equivalent to a Bachelor Degree shall be at least one years work as a chemical technician.

1.4 Administrative Procedure

Administrative policies and procedures will be documented to clearly delineate the authorities and responsibilities for each level within the organizational structure with regard to environmental-safety related activities.

The results of sampling, analyses, surveys, monitoring, equipment calibration, training, reports on audits and inspections, subsequent reviews, investigations, and corrective actions will be documented and maintained for at least five years.

The Licensee will maintain written operating procedures specifically for the radiation safety program and the environmental monitoring and control program; and written procedures pertaining to all activities carried on in an area will be available in each area where radioactive material is processed, handled, or stored and will be reviewed at least annually. In addition, for any work or maintenance involving a radiological risk for which there is no effective operating procedure, a Special Work Permit signed by the Radiation Safety Staff will be prepared and used for performing these activities.

The Licensee will maintain a management control program which will include the above mentioned written operating procedures, reviewed and approved by the RSO, for all aspects of uranium processing operations including the radiation safety program and the environmental monitoring and control program. Approval by the RSO will be indicated by his signature on the procedure.

2.0 Groundwater Sampling

During the mining phase, groundwater samples will be collected every two weeks from excursion monitor wells. These samples will be collected from both production zone and non-production zone aquifers for detection of possible horizontal and/or vertical migrations of the leach solution (Fig. 2.3, FES April, 1981).

2.1 Sample Collection

Prior to sampling each monitor well, the water level within the well casing will be measured and recorded. Water quality samples from each well will be obtained after displacing two casing volumes of water, a volume of water at which the specific conductivity stabilizes. The water samples will then be collected in clean bottles either glass or plastic, which will be rinsed with the water being collected. Each sample bottle will be labeled with the well number, date, and type of preservation, if any.

2.2 Sample Preservation

Immediately following sample collection, samples will be filtered through a 0.45 micron filter and preserved as indicated in "Methods for Chemical Analysis of Water and Wastes." EPA-600/4-79-020, March, 1979.

2.3 Sample Analysis

As soon as possible following sample collection and preservation, chemical analyses will be conducted in the mine laboratory for the upper control limit parameters and other parameters necessary to compute an anion-cation balance. Specific conductivity and total bicarbonate plus carbonate will be analyzed immediately to avoid any changes in values which may occur if the sample is allowed to age for a long period of time.

All analyses will be performed in accordance with "Methods for Chemical Analysis of Water and Wastes," EPA-600/4-79-020, March, 1979, or "Standard Methods for the Examination of Water and Wastewater," American Public Health Association.

3.0 Surface Water Sampling

Surface water samples will be collected once each year during the spring season at three sampling sites. Samples will also be collected after major thunderstorms when surface runoff occurs. Surface water sampling points include two sites on West Alkali Creek - one upstream from the point where runoff from the project area enters West Alkali Creek and one downstream from the point where runoff enters the creek. The third site of surface water collection is Grassy Lake (Fig. 4.3, FES, April, 1981).

3.1 Sample Collection

Each surface water sample collected will be done by grab sampling. Samples will be collected in either glass or plastic bottles, which will be labeled with the sample location, date and type of sample preservation, if any. Prior to the collection of the sample, each sample bottle will be rinsed with the water being collected to insure sample quality. Conductiviy, pH, and temperature will be measured at the time of collection.

All data pertaining to the surface water samples will be carefully recorded on a sampler's data sheet which will be on file at the mine office.

3.2 Sample Preservation

All surface water samples will be preserved in accordance with "Methods for Chemical Analysis of Water and Wastes," EPA-600/4-79-020, March, 1979. The samples will then be packed in insulated coolers (on ice i necessary) and delivered to a commercial laboratory for analysis.

3.3 Sample Analysis

All surface water samples will be delivered to an EPA-certified commercial laboratory for analysis of the parameters listed in the long list (Table 4.1, FES April, 1981). Results of the analysis will be reviewed and placed on file at the mine office.

4.0 Pond Monitor Well Sampling

Four pond monitor wells will be sampled on a quarterly basis at the project site. as a precationary measure, these four wells are completed in the unconfined aquifer underlying the pond area to serve as leakage detectors in the event of failure of the pond line.

4.1 Sample Collection

At each quarterly sampling, the water level in the wells will be determined and recorded on a data sheet. Water samples will then be collected by bailing the well. Samples will then be transferred to plastic or glass bottles which will be rinsed out with the water being sampled. Each sample bottle will be labeled with the well identification number, the date, and type of preservation used, if any. All data pertaining to the samples will be recorded on a sampler's data sheet will be kpet on file at the mine office.

4.2 Sample Preservation

Evaporation pond monitor well samples will be filtered through a 0.45 micron filter and then preserved as prescribed in "Methods for Chemical Analysis of Water and Wastes, "EPA 600/4-79-020, March, 1979.

4.3 Sample Analysis

Chemical analyses of water samples collected from the evaporation pond monitor wells will be submitted to the mine laboratory for analysis immediately following collection. Sample analysis will include the upper control limit parameters, and will be done in accordance with "Methods for Chemical Analysis of Water and Wastes," EPA 600/4-79-020, March, 1979, or "Standard Methods for the Examination of Water and Wastewater," American Public Health Association.

5.0 Sediment Sampling

Three sediment samples will be collected once each year at the same locations from which surface water samples are obtained (Fig. 4.3, FES, April, 1981).

5.1 Sample Collection

Prior to the collection of sediments at each location, a transect line with random sampling points located along it, will be established across the sampling location. Samples obtained at random points along the transect line will help to insure that a representative composite sample is obtained at each location. Once this transect line is established, the sampler will collect a small sediment sample at each point along the line. Samples will be collected with a clean tool or a bottom sampling dredge. Each sample will be placed in a clean plastic sample bag which will form a composite sample. Sample bags will be labeled with the sample location and the date.

All pertinent information will be recorded on a sampling data sheet and will be kept on file at the mine office.

5.2 Sample Preparation

Sediment samples will be returned to the mine laboratory for preparation. Each sample will be dried for 24 hours at 110°C in a clean oven to avoid any contamination. Following drying, each composite sample will be mixed and blended to insure homogeneity. Special care will be taken to insure that these samples are not contaminated in the drying process. Drying ovens which have been used for drying slurries or ores may cause serious contamination of environmental samples. If such conditions do exist, sediment samples will be delivered to a commercial laboratory for preparation.

5.3 Sample Analysis

All sediment samples will be delivered to an EPA-certified commercial laboratory for analysis of natural uranium, radium-226, thorium-230, and lead-210. Results of the analysis will be reviewed and placed on file at the mine office.

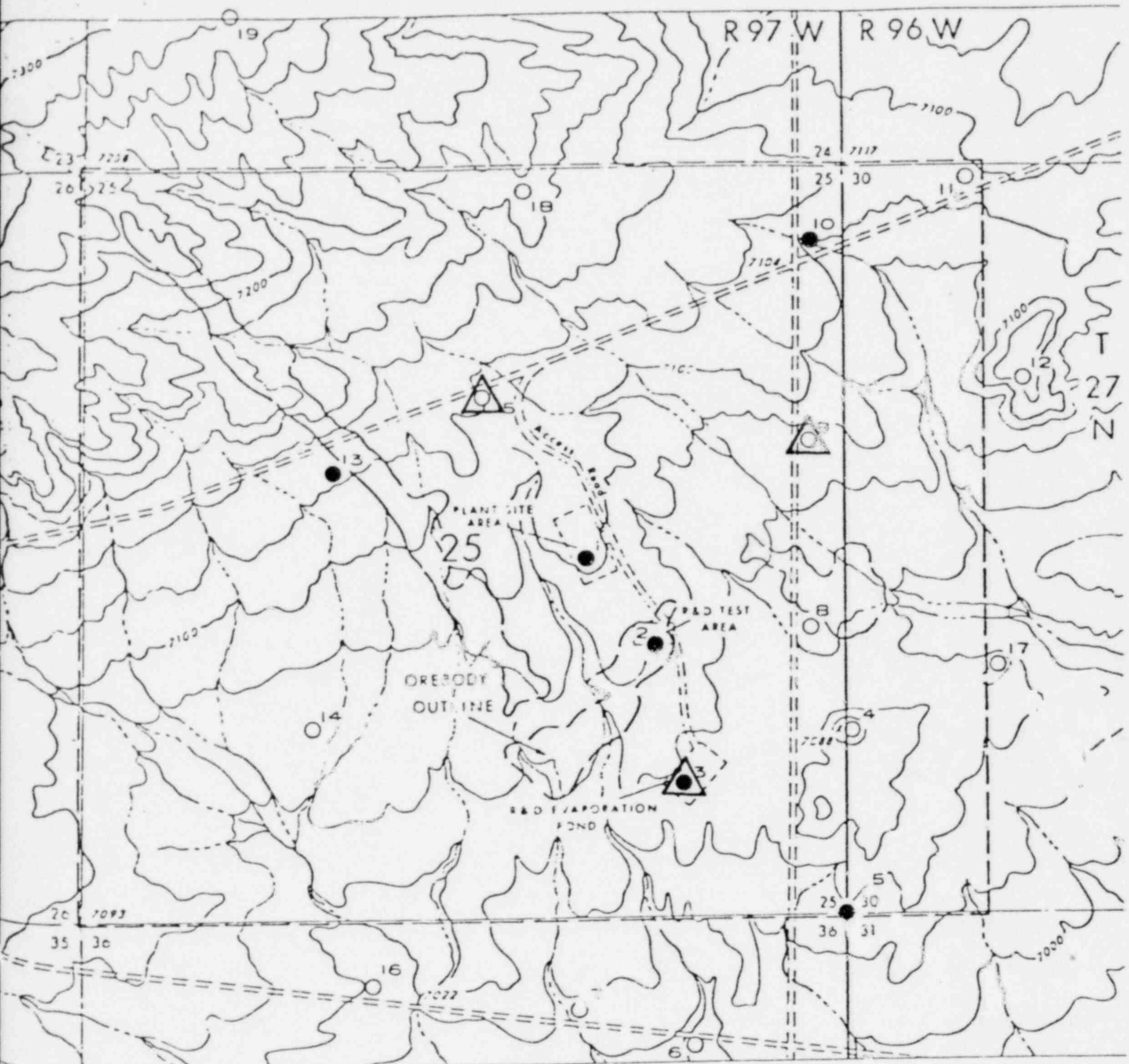
6.0 Soil and Vegetation Sampling

Soil and vegetation samples shall be collected annually from three locations within Section 25, T27N, R97W. These collection sites will be located at existing thermoluminescence dosimetry (TLD) sites shown on Fig. 6.1. The three TLD sites designated for soil and vegetation sampling sites are numbers three, nine, and fifteen. Location number fifteen shall serve as an upwind sampling site, while numbers three and nine will serve as downwind sampling locations. Descriptions of these locations are listed on Table 6.1.

6.1 Sample Collection

The field collection of soil and vegetation samples will be concurrent with each other. The time of sample collection should take place at or near the end of the growing season. In most instances, late August or early September will be the optimum time of the year for aquiring these samples.

A composite sample of soil and vegetation will be obtained from



0 1000 2000

SCALE 1" = 1000'

Explanation

● Dosimeter Location

△ Soil & Vegetation Sampling Location

— — — Project Area Boundary

LOCATION 21- Intersection of Bison Basin
● Oil Field Road and Bison Basin Mine Road

LOCATION 22- Intersection of US 287 and
● Bison Basin Oil Field Road

FOR LOCATION PARTICULARS-SEE NEXT PAGE

OGLE PETROLEUM INC.

BISON BASIN PROJECT
BISON BASIN MINE

SAMPLING AND

DOSIMETER LOCATIONS

Figure 6.1

TABLE 6.1

SAMPLING AND DOSIMETER LOCATIONS

LOCATION NUMBER	DESCRIPTION OF LOCATION	TYPE OF SAMPLE
1	Plant Site	Dosimeter
2	Well 140-tc (25 gpm demonstration wellfield area)	Dosimeter
3	Evaporation Pond	Soil, vegetation, dosimeter
5	SE corner, Section 25	Dosimeter
9	Road S. of Plant, SE Drainage	Soil vegetation
10	NE Corner, Section 25	Dosimeter
13	Survey Marker, OP-43 (WELL 141-TC)	Dosimeter
15	N-NE of Plant (1500 ft)	Soil, vegetation
21	Bison Basin Oil Field (Approx. 8 miles E-NE of Plant)	Dosimeter
22	Sweetwater Station at Junction of U.S. 287 and Bison Basin Oil Field Road (Approx. 20 air miles N-NE or Plant)	Dosimeter

each site.

Soil samples will be taken in (1) 0-5 cm, (2) 5-10 cm, and (3) 10-15 cm increments in depth. Special care will be employed in collection and handling of samples, as to not contaminate one sample with another. Each soil sample will be carefully transferred to a clean plastic sample bag. Sample bags will be labeled as to the sampling location, the soil depth and the date.

Vegetation samples shall also be collected in the same general vicinity of soil sample collection sites. Composite samples of vegetation will also be collected, which may or may not contain a combination of grasses, shrubs, and forbs. Comparison studies may also be performed on the above mentioned vegetation types. Field collection of vegetation will be accomplished by clipping the above ground portion of the plant (i.e. leaves, stems, and seed heads) and transferring the vegetative matter to clean plastic sample bags. Sample bags will be labeled with a sample location number and the date of sample collection. Any data pertaining to the sample will be recorded on a data sheet and be placed on file at the mine office.

6.2 Sample Preparation

Following the collection of soil and vegetation samples, they will be delivered to the mine laboratory for drying and packaging.

Both soil and vegetation samples will be dried for 24 hours at $110^{\circ}C$. Drying will be done in a clean laboratory type oven. Special care will be taken to insure that these samples are not contaminated in the drying process. Drying ovens which have been used for drying yellowcake slurries or ores may cause serious contamination of environmental samples. If such conditions do exist, soil and vegetation samples will be delivered to a commercial laboratory for preparation.

6.3 Sample Analysis

Soil and vegetation samples will be delivered to an outside commercial laboratory for analyses of radionuclide concentrations. Soil samples will be analyzed for natural uranium, radium-226, and lead-210. Radium-226 and lead-210 analyses will be performed on vegetation samples.

The commercial laboratory which performs these analyses will be an EPA-certified laboratory which also incorporates a rigid and thorough quality assurance program in its operation.

Results of the analyses will be reviewed by one or more members of the environmental staff, and placed on file at the mine office, and forwarded to the NRC in the next semi-annual report.

7.0 Environmental-Radiological Air Sampling

During the mining and restoration phase of the Bison Basin project, air samples will be collected for one week each month at or near the boundary of the processing plant area. Each air sample will be analyzed for radon-222 concentrations which may be emitted from the plant facilities via ventilation systems.

Each air sampling site will be located within one hundred feet of the processing plant building. Air sampling sites will be located (1) southeast of the plant, (2) northwest of the plant, and (3) east of the processing plant (Fig. 7.0)

8.0 Environmental Dosimetry

Throughout the mining and restoration phase of the Bison Basin project, OPI will continue to monitor site radiological levels.

8.1 Data Collection

Site radiological level will be monitored during the operational and restoration phases of the project. Radiological levels will be measure at 8 of 22 locations previously used to obtain baseline data (Fig. 6.1). Locations include 1, 2, 3, 5, 10, 13, 21, and 22. Locations 21 and 22 are not shown on Figure 6.1, but a description of their location is listed in Table 6.1.

Data will be collected at the locations listed above using thermoluminescent dosimeters (TLD) provided by Eberline Instrument Corporation. Site environmental TLD badges will be exchanged on a quarterly basis and analyzed by Eberline.

Data reports are received from Eberline in a format approved in lieu of preparation of NRC Form 5. Additional reports including year end summaries and statistical listing are also provided by Eberine.

Data obtained on site radiological levels using TLD badges will be reported to the NRC on an semi-annual basis.

9.0 Laboratory Quality Assurance

The analytical laboratory must provide accurate and timely quantitative and qualitative data for environmental monitoring and decision making. To be of any value, this data must accurately describe the chemical constituents of any sample submitted to the laboratory.

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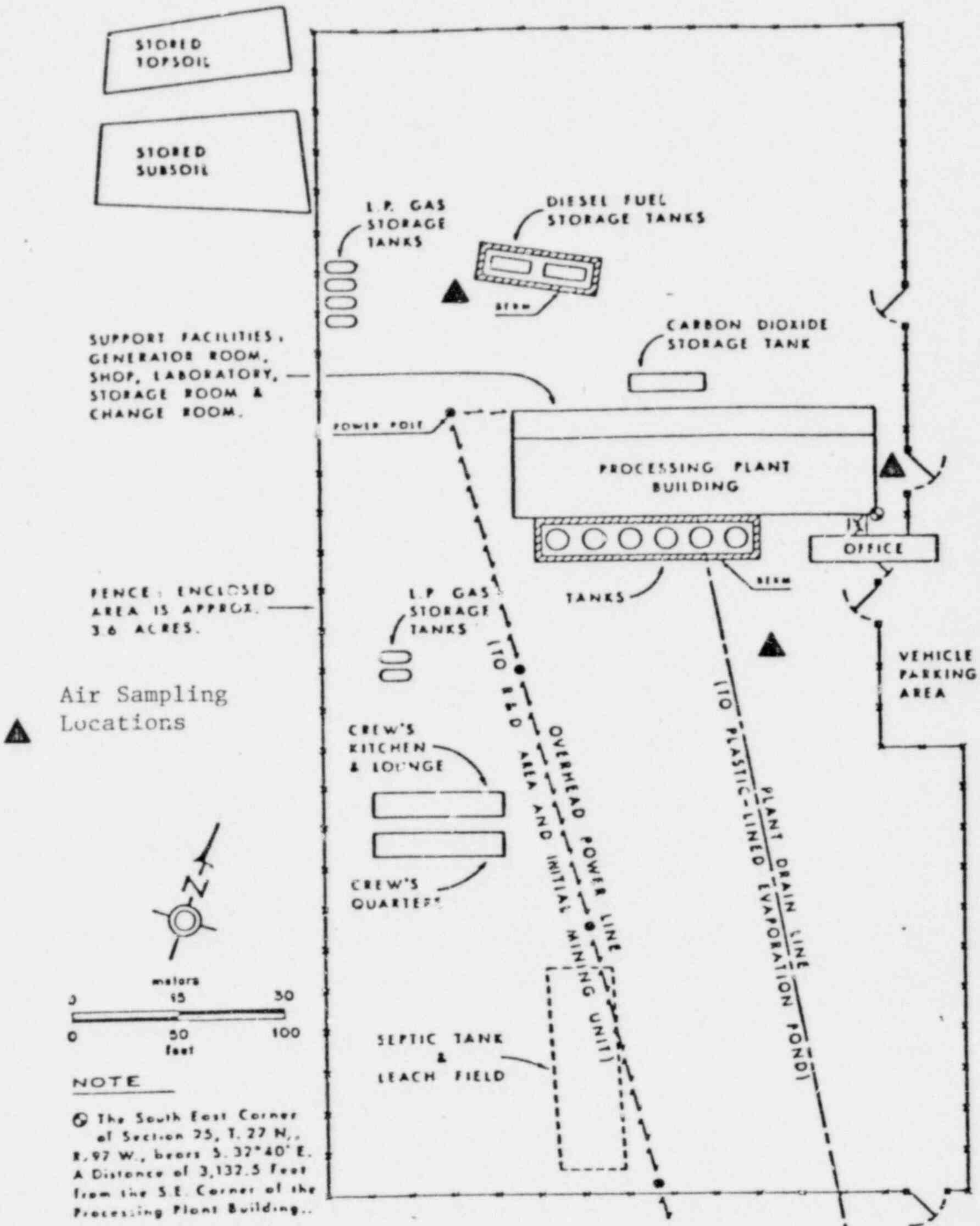

Fig. 7.0 Plant facilities layout. Source: FES, Fig. 7.0

Because of the importance of laboratory results in determining practical courses of action that may be followed, the mine laboratory at OPI's Bison Basin Project adheres to a basic quality assurance (QA) program designed to meet the criteria outlined in the "Handbook for Analytical Quality Control in Water and Wastewater Laboratories," EPA-600/4-79-019, March, 1979. Additional procedures of quality control are derived from "Standard Methods for Examination of Water and Wastewater" 14th Edition, 1975, APHA, AWWA.

9.1 Mine Laboratory Quality Assurance

9.1.1 Methodologies and Procedures

OPI's mine laboratory analyzes its samples in accordance with accepted methods outlined and described in "Standard Methods for the Examination of Water and Wastewater" and "Methods for Chemical Analysis of Water and Wastes" EPA-600/4-79-020, 1979.

9.1.2 Supplies and Reagents

All chemicals and reagents purchased for the mine laboratory are certified AC[illegible] grade. Chemicals are dated upon receipt and expiration dates are adhered to.

High purity water is used in all procedures and especially when standards and reagents are made. Laboratory water is either distilled or de-ionized after first passing through a reverse osmosis system.

9.2 Instrumentation

9.2.1 Calibration

Every seven to ten days, each instrument will be checked and calibrated by the laboratory supervisor. All reagents used for titrimetric determinations are also standardized within the same period of time.

9.2.2 Maintenance

All laboratory instrumentations and equipment will be maintained on a daily basis. Each instrument will be kept clean and in good working order.

9.3 Daily Calibrations, Splits, Duplicates, and Controls

9.3.1 Daily Calibrations

A calibration curve composed of a minimum of one reagent blank and three standards will be determined at the beginning of each run. The calibration curve will serve in calculating the concentration of the parameter contained in each sample. The blank used in the calibration curve will periodically be analyzed in the run to check for any deviations from the original calibration.

9.3.2 Sample Splits

Once each month, a water sample obtained from a monitor well will be split and sent to an outside commercial laboratory and the mine laboratory for identical analysis. Sample splits will provide a comparison of the abilities of both labs when analyzing the same sample. This will also be beneficial in detecting any problems or errors which may not be apparent in intralaboratory checks.

A different monitor well sample will be used each month for sample splits.

Results from both labs on sample splits will be documented and kept on file at the mine office.

9.3.3 Duplicate Samples

The practice of duplicating a sample and analyzing each portion will be used by the mine laboratory to demonstrate the ability to accurately reproduce analytical results.

At least one duplicate sample will be prepared and run with each set of environmental samples for each parameter analyzed. If the sample load is heavy, one duplicate will be analyzed every 15 samples.

The results obtained from duplicate samples will be used to determine mathematically, the percent error of the analysis. Should the percent error exceed ± 10 percent, the procedure, reagents, equipment, or instrumentation will be suspected of bias and actions will be taken to alleviate the problem.

9.3.4 Spiked Samples

Spiked samples will be incorporated into OPI's mine laboratory quality assurance programs. Spiked samples are prepared by taking a sample, for each parameter to be analyzed, and adding to it a known concentration of that parameter which will effectively double the concentration of the original sample. The spiked sample along with the original unspike sample are then analyzed and percent recovery is computed with the following equation:

$$\% \text{ Recovery} = \frac{\text{Observed value} \times 100}{\text{Spike value} + \text{analyzed value}}$$

At least one spiked sample will be prepared and analyzed with each sample run of each parameter analyzed. Should the sample load be heavy, one spiked sample will be analyzed every fifteen samples.

9.3.5 Sample Standards

Certified standards of known concentration values which will be obtained from either the EPA or commercial sources will be used in the QA program. These certified standards will be submitted to the mine lab and an outside commercial laboratory on a quarterly basis as blind samples. Neither laboratory will be informed as to what concentration of elements are in each blind sample. Blind samples are samples of known concentrations used to obtain unbiased data from different laboratories.

Once results are received from the laboratory, the observed value and the certified value will be compared and both values will be reported back to the lab for their reference.

9.4 Commercial Laboratory Quality Assurance

Only EPA-certified commercial laboratories which incorporate stringent quality assurance programs into their services are employed by OPI for outside analyses.

The commercial laboratory presently performing analyses for OPI analyzes samples with the accepted methods as presented in "Standard Methods for the Examination of Water and Wastewater," 14th Edition, 1975 APHA, AWWA; "Methods for Chemical Analysis of Water and Wastes," 1979 USEPA; and "ASTM Standards," part 31, water, American Society for Testing and Materials.

The lab presently used by OPI uses the following procedures in its QA program for each analytical run: (1) a calibration curve composed of a minimum of a reagent blank and three standards, (2) known references standards supplied by the EPA which are analyzed daily for the parameter measured, (3) at least one duplicate sample and one spiked sample are analyzed every 10 samples, and (4) quality control charts or a tabulation of the mean and standard deviation are prepared to document the validity of the data.

Quality assurance data will be provided for OPI's inspection and review. The QA program of the commercial laboratory will be periodically reviewed by the staff.

10.0 Documentation

All data concerning environmental sampling and analysis will be concisely documented and filed at the mine office. A field data sheet will be prepared for each type of sample, with all pertinent data carefully listed on the form.

Sample assays will appear on laboratory work sheets. Results of analyses will be recorded on appropriate report forms and forwarded to the proper agencies. Laboratory work sheets will be kept on file indefinitely at the mine office.

Laboratory equipment calibration records and Quality Assurance data forms will be maintained and filed at the mine office.

11.0 Minimum Detectable Limits

The detection limits for the commercial laboratory currently utilized by OPI and OPI's mine laboratory are presented on the attached table:

MINIMUM DETECTION LIMITS

Detection Limits

	Commercial Lab Detection Limits (mg/1)	Mine Lab Detection Limits (mg/1)
Calcium (Ca)	0.01	0.5
Magnesium (Mg)	0.01	0.1
Chloride (Cl)	1.0	1.0
Sulfate (SO_4)	1.0	1.0
Carbonate (CO_3)	0	0
Bicarbonate (HCO_3)	0	0
Boron (B)	1.0	
Flouride (F)	0.05	
Sodium (Na)	0.01	0.5
Potassium (K)	0.01	0.5
Ammonia (NH_4)	0.05	
Nitrate (NO_3)	0.05	
Nitrite (NO_2)	0.01	
Aluminum (Al)	0.05	
Arsenic (As)	0.002	
Barium (Ba)	0.02	
Cadmium (Cd)	0.005	
Chromium (Cr)	0.01	
Copper (Cu)	0.01	
Iron (Fe)	0.05	
Lead (Pb)	0.05	
Manganese (Mn)	0.01	
Mercury (Hg)	0.001	
Molybdenum (Mo)	0.05	
Nicket (Ni)	0.01	
Selenium (Se)	0.002	
Zinc (Zn)	0.005	
Uranium (U)	0.005	0.1
Vanadium (V)	0.05	
Radon-222		
Radium-226	2×10^{-10} uCi/ml	
Thorium-230	2×10^{-10} uCi/ml	
Lead-210	1×10^{-9} uCi/ml	

12.0 Radiological Monitoring

The radiological monitoring program will be conducted according to license conditions, Sections 3.4 and 3.5 of OPI's May 15, 1980 submittal, and the July 19, 1980 submittal.

12.1 Equipment

Equipment used for the radiological monitoring program were manufactured by Eberline Instrument Corporation and are listed below along with the units sensitivity.

Item	Model	Sensitivity
Portable Alpha Counter with Air Proportional Alpha Probe	PAC-6/AC24	10 CPM±10%
Beta-Gamma Survey Meter	E530/HP-270	0.01 mrem ±10%
Scintillation Alpha Counter	SAC-4	2×10^{-4} W.L.
Scintillation Detector, Cell and Mini Scaler	SAC-R5/SC-6/MS-3	0.2 pCi/1
Regulated Air Sampler	RAS-1	

12.2 Calibration Standards

Three radionuclide standards are used in calibrating the instruments. The standards were obtained from Eberline and are NBS traceable. The three standards are listed in the following table.

Radionuclide Standard	Serial No.	Activity
Thorium-230	S-1539	510 dpm
Thorium-230	11095	840 dpm
Cesium-137	CS-7A	8 u Ci

In addition to the onsite calibration with the above standards, the equipment is inspected and calibrated by the manufacturer when the efficiency number changes significantly.

12.3 Efficiency and Calibration Checks

The SAC-R5, scintillation detector, and MS-3 scaler are efficiency checked on a monthly basis according to the manufactures directions. The determined efficiency number is incorporated into the appropriate calculations.

The SC-6 scintillation cell is checked for contamination buildup and background concentrations each time it is used. Data obtained from the check is incorporated into the appropriate calculations. After use the cell is purged with bottled air to prevent a rapid build up of the background concentration.

The SAC-4 scintillation alpha counter is efficiency checked daily with an NBS traceable standard. The effiency number obtained is used in the calculations.

The Beta-Gamma survey meter and the portable Alpha counter are both checked on a monthly basis using the NBS traceable radionclude standards.

In addition to the effiency checks performed on the sampling equipment, all new batches of filters are routinely background checked.

All information derived from the calibration, efficiency checks, and regular sampling is recorded and placed on file at the mine.

12.4 Quality Control of Radiological Monitoring

Quality control of the radiological monitoring program is achieved through accurate calibration of the instruments, and efficiency checks and frequent reviews of all data pertaining to calibration, efficiency checks, and sampling.