

**Colorado Department of Public Health and Environment  
Hazardous Materials & Waste Management  
Radiation Management Program  
4300 Cherry Creek Drive South HMWMD-B2  
Denver CO 80246-1530**

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**RADIOACTIVE MATERIAL LICENSE APPLICATION**

INSTRUCTIONS: Refer to OR-RH-11 for a detailed explanation of the requirements for completing this application. This application must be signed and dated. An application fee in the amount specified in Part 12 of the *Colorado Rules and Regulations Pertaining to Radiation Control* must accompany an application for a new license. Mail the completed application, attachments, and fee payment to the Colorado Department of Public Health and Environment, Radiation Management Program, HMWMD – B2, 4300 Cherry Creek Drive South, Denver, Colorado 80246-1530. All radioactive materials licenses are issued in accordance with the general requirements contained in the State of Colorado *Rules and Regulations Pertaining to Radiation Control* and Title 25, Article 11, CRS.

1. Application for a New License:  
**This is an application for a new Radioactive Material License – Recovery Operations – Mill (at a single location). In accordance with the radiation fee schedule, dated March 2<sup>nd</sup>, 2009, Fee Category 2.A2 Class I, the annual fee of \$94,300.00. The Piñon Ridge Mill is subject to full cost fees, the annual fee will be due upon approval of the Radioactive Material License.**
2. Applicant Name:  
**Energy Fuels Resources Corporation, a wholly owned U.S. subsidiary of Energy Fuels Inc., a Canadian Corporation**
3. Tax Payer Identification Number:  
**55-0912046**
4. Mailing Address:  
**Energy Fuels Resources Corporation  
44 Union Boulevard, Suite 600  
Lakewood, Colorado 80228**
5. Department to use Radioactive Material:  
**Piñon Ridge Mill**
6. Contact:  
**Mr. Frank Filas, P.E.  
Phone: 303-974-2140  
Fax: 303-974-2141  
E-mail Address: f.filas@energyfuels.com**  
Indicate if you wish to receive informational notifications by e-mail: **Yes**

7. Facility Address:

**16910 Highway 90  
Bedrock, Colorado 81411**

No radioactive materials at any address in Item 4: \_\_\_\_\_

**The address listed in item #4 is the mailing address of the Energy Fuels corporate office in Lakewood, Colorado. No radioactive materials will be located at this office.**

8. Radioactive Material  
Element and Mass

A. Uranium Ore  
(contains natural  
uranium and decay  
products)

B. Yellowcake Product  
(contains natural  
uranium)

C. Byproduct Material  
11e.(2) (contains decay  
products of natural  
uranium)

D. Cs-137 Density  
Gauges (**approximately  
15, see attached Figure  
1**)

9. Chemical/Physical Form,  
Manufacturer and Model Number

A. U-nat in various mineral  
forms, average grade of 0.23%  
(maximum ore pad capacity of  
100,000 tons)

B. U<sub>3</sub>O<sub>8</sub>, UO<sub>2</sub>, UO<sub>3</sub>, UO<sub>4</sub>  
(maximum storage of  
~~110,000~~**330,000** lb. [~~120-360~~**55-**  
gallon drums])

C. Tailings waste from the  
extraction of uranium and  
vanadium (Stored in three  
tailings cells with a full capacity  
of 2.4 million tons each)

D. Sealed Source, Thermo-  
Scientific DensityPro or  
equivalent

10. Maximum Activity

A. **60 Ci Ra-226** <sup>(a)</sup>

B. ~~31-85~~**85 Ci U-nat** <sup>(b)</sup>

C. **115 Ci U-nat, 1,400 Ci Ra-  
226, 1,400 Ci Th-230, and  
1,400 Ci Pb-210** per tailings  
cell <sup>(a,c)</sup>

D. 10 – 200 mCi **Cs-137** each

Note: Cs-137 check sources for radiation detection instruments will be on-site but are not included here as they will be generally licensed quantities, i.e. 10 µCi or less.

a) Based on ~~an~~ expected radium-226, thorium-230 and lead-210 activities in 0.23% grade uranium ore of 647 pCi/g for each radionuclide.

b) Based on a specific activity of ~~622-565~~ 622-565 pCi U-nat/mg ~~for~~ yellowcake at 98.2% purity.

~~b)c~~ Based on an expected U-nat activity in tailings of 53 pCi/g (1324 pCi/g U-nat in ore multiplied by 4% U-nat remaining in tailings after processing).

11. Purpose for Radioactive Material: (attach additional sheets if needed for items 8 through 11)

- A. **Receive uranium bearing ore, with the intent to concentrate into “yellowcake” and vanadium oxide (“black flake”).**
- B. **Store yellowcake product in a secure setting, with the intent to sell on the open market and transfer to authorized parties.**
- C. **Dispose of byproduct material, as defined by Section 11e.(2) of the US Atomic Energy Act, in an onsite tailings impoundment, with eventual transfer of long-term ownership to the Department of Energy or State of Colorado.**
- D. **Sealed source Cs-137 nuclear density gauges will be used for process material density measurements.**

12. The Radiation Safety Officer (RSO) is:

**Mr. Steven H. Brown. See Attachment 1 for qualifications and certifications.**

13. Individual Users:

- A. **Radiation Safety Officer (Mr. Steven H. Brown) has the sole responsibility for the use and management of all radioisotopes.**
- B. **Assistant RSO, Mr. ~~Zachary Rogers, EIT~~ Jess Fulbright**
- C. **Radiation/Safety Technicians (4), to be determined**
- D. **Quality Assurance Officer, Mr. Zachary Rogers, EIT**
- E. **GIS/AutoCAD Technician, to be determined**
- ~~F.~~ **Plant Manager, Mr. Robert R. Monok**
- ~~G.~~ **General Mill Foreman, Mr. Wallace W. “Butch” Brice**
- H. **Mill Foremen (4), to be determined**
- I. **Maintenance Foreman, Mr. Michael Rutter**
- J. **Chief Lab Chemist, to be determined**
- K. **Plant Metallurgist, to be determined**
- ~~L.~~ **Vice President of Regulatory Affairs, Mr. Frank J. Filas, P.E.**

The Piñon Ridge Mill Health and Safety Organization Chart is included with this application as Attachment 2.

Qualifications for these personnel and other key personnel are included as Attachments 1 and 3.

**Technical qualifications of the RSO will be consistent with Section 2.4.1 of NRC Regulatory Guide 8.31 and qualifications of the Assistant RSO, QA Officer, and RSTs’ will be consistent with Section 2.4.2 of Regulatory Guide 8.31. Typical RSO and Authorized User Training Course Outlines are included as Attachment 4.**

14. Radiation Detection Instruments (attach additional sheets if needed)

Manufacturer and Model of Instrument/Probe	Surface Area	Radiation Detected	Number Available	Sensitivity Ranges	Efficiency (4π geometry)	Background reading
Ludlum 12S micro R meter	1” dia. x 1” thick	Gamma	TBD	175 cpm per uR/hr ( <sup>137</sup> Cs)	N/A	N/A
Ludlum 43 series alpha detector	75 sq cm detector or equivalent	Alpha	TBD	N/A	35 % ( <sup>239</sup> Pu)	≤ 3 cpm
Ludlum 44-9 pancake GM probe	12 sq cm Pancake detector or equivalent	Alpha Beta Gamma	TBD	3300 cpm per mR/hr	< 1% - 32%	≤ 60 cpm
Ludlum 44-10 gamma scintillation probe	2” dia. x 2” thick	Gamma	TBD	900 cpm per uR/hr ( <sup>137</sup> Cs)	N/A	≤ 9750 cpm
Ludlum 2241 series scaler/ratemeter	N/A	Alpha Beta Gamma	TBD	N/A	N/A	N/A
Ludlum 2929 alpha/beta sample counter	20.3 sq cm	Alpha Beta/ Gamma	TBD	N/A	Alpha: 37% - 39% Beta: 8% - 29%	Alpha: ≤ 3 cpm Beta/ Gamma: ≤ 80 cpm

Radiation detection instruments will be used for equipment, vehicle, air, and personnel radiation surveys as outlined in the radiological procedures, Appendix D of the Piñon Ridge Mill Health and Safety Plan (Exhibit J1).

15. Calibration of Radiation Detection Instruments

Frequency of Calibration:

**Manufacturers recommended frequency.**

Attach a copy of your calibration procedures. If a commercial service is to be used, provide the company's:

**Instruments will be sent to the manufacturer (below) for calibration:**

**Ludlum Measurements Inc.**

**501 Oak Street**

**Sweetwater, Texas 79556**

**Radioactive materials license number:**

**LO1963 (Texas Commission on Environmental Quality)**

16. Personal Monitoring Devices

**(see Radiological Procedure RH-210, Piñon Ridge Mill Health and Safety Plan, Exhibit J1)**

Type of Device:

**TLD/OSL**

Name of Supplier (must be NVLAP approved):

**To be determined, but will be NVLAP certified**

Radiation Detected:

**Ionizing radiation, in the form of Gamma rays**

Exchange Frequency:

**Quarterly**

Audible Radiation Dosimeter used (Y/N):

**No**

Pocket Dosimeter is used (Y/N):

**No**

(If audible and/or pocket dosimeters are used, attach calibration procedures)

17. Facilities and Equipment

A. Attach a description of the types of counting, handling, and safety equipment used in connection with radioactive materials.

**Please see the Piñon Ridge Mill Health and Safety Plan, Appendix D Radiological Health and Safety Procedures (Exhibit J1).**

B. Attach an explanatory sketch of your facility. Identify the locations of special handling equipment; fume hoods; storage containers; shielding; safety equipment; etc. Also identify the locations where radioactive material warning signs, Notice to Employees, and emergency telephone numbers are posted.

**See Drawing 900-GA-003, Basic Engineering report Selected Drawings (Exhibit A1) for Laboratory and Change House Building Layout**

**See the Piñon Ridge Mill Facility Operating Plan for facility layout and Laboratory Facilities and Plans (Appendix D)**

**See the Emergency Response Plan (Exhibit J5) for safety equipment locations**

**Radioactive material warning signs will be posted in accordance with Procedure RH-030, Mill Health and Safety Plan (Exhibit J1)**

**Notice to employees and emergency telephone numbers will be posted at the Safety Department Office, Guard Gate, Administration Building, Change Room, Control Room, and Lunch room**

- C. Public Dose Limits: Attach calculations and/or survey results to demonstrate compliance with dose limits for members of the public at all storage and use locations.

**See the Estimates of Radiation Doses to Members of the Public from the Piñon Ridge Mill (Exhibit J2).**

18. Attach a description of your radioactive materials program. The information must reflect your current program and procedures. (See instructions in OR-RH-11 for a list of procedures that must be included.)

**See the Piñon Ridge Facility Operating Plan (Exhibit B2), Mill Health and Safety Plan (Exhibit J1), Estimates of Radiation Doses to Members of the Public from the Piñon Ridge Mill (Exhibit J2), Emergency Response Plan (Exhibit J5), Operational Monitoring Plan (Exhibit J6), Material Containment Plan (Exhibit J7) and Security Plan (Exhibit M1).**

19. Waste Disposal

- A. Attach procedures for the disposal of radioactive waste:

**The Radioactive Material License that Energy Fuels Resources Corporation is seeking will authorize disposal of radioactive materials in the on-site evaporation pond system (raffinate outflow from the plant) as well as disposal of solid radioactive materials (waste tailings from the milling operation) in one of three designed tailings cells. Following closure of the mill, the tailings management system will be reclaimed to appropriate long-term standards in accordance with 6 CCR 1007-1, Part 18 and Appendix A. The stabilized tailings will be transferred to the Department of Energy, Legacy Management Office or the State of Colorado for long-term custodial care. See the Tailings Cell Design Report (Exhibit A6), Evaporation Pond Design Report (Exhibit A7), Decommissioning Plan (Exhibit K1), Tailings Cell Closure Plan (Exhibit K2), and Specifications for Closure and Reclamation of Mill Facilities (Exhibit K3).**

- B. If a commercial service is to be used other than to transport, then also specify the name, address, radioactive materials license number and expiration date of the company providing the services. Also describe the types of services provided. NOTE: Companies providing this service must have a Radioactive Materials License that authorizes this service.

**Nuclear density gauges will be returned to the manufacturer of origin (below) for disposal.**

**Thermo Fisher Scientific Process Instruments Division  
1410 Gillingham Lane  
Sugar Land, TX 77478**

**Radioactive materials license number:  
L03524 (Texas Department of State Health Services)**

Expiration Date:

**December 2017**

Description of services provided:

**Acquisition of sealed sources, technical support, calibration /repair, and compliant disposal.**

20. Financial Assurance (refer to RH 3.9.5)

**In accordance with RH 3.9.5, Energy Fuels Resources Corporation is committed to provide a financial assurance warranty for decommissioning in the amount of \$11,748,000 prior to approval of the License application. See the Piñon Ridge Mill Decommissioning and Reclamation Cost Estimate (Exhibit K4). Energy Fuels Resources Corporation will provide such financial assurance in the form of a cash deposit or certificate of deposit as provided by RH 3.9.5.4(2) or by a surety bond issued by a fidelity or surety company as provided by RH 3.9.5.4(3)(a).**

21. CERTIFICATION:

THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATE ON BEHALF OF THE APPLICANT NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT RADIATION CONTROL REGULATION AND THAT ALL INFORMATION CONTAINED HEREIN, INCLUDING ANY SUPPLEMENTS ATTACHED HERETO, IS TRUE AND CORRECT TO THE BEST OF OUR KNOWLEDGE AND BELIEF.

Applicant Named in Item 2:

**Energy Fuels Resources Corporation, a wholly owned U.S. subsidiary of Energy Fuels Inc., a Canadian Corporation**

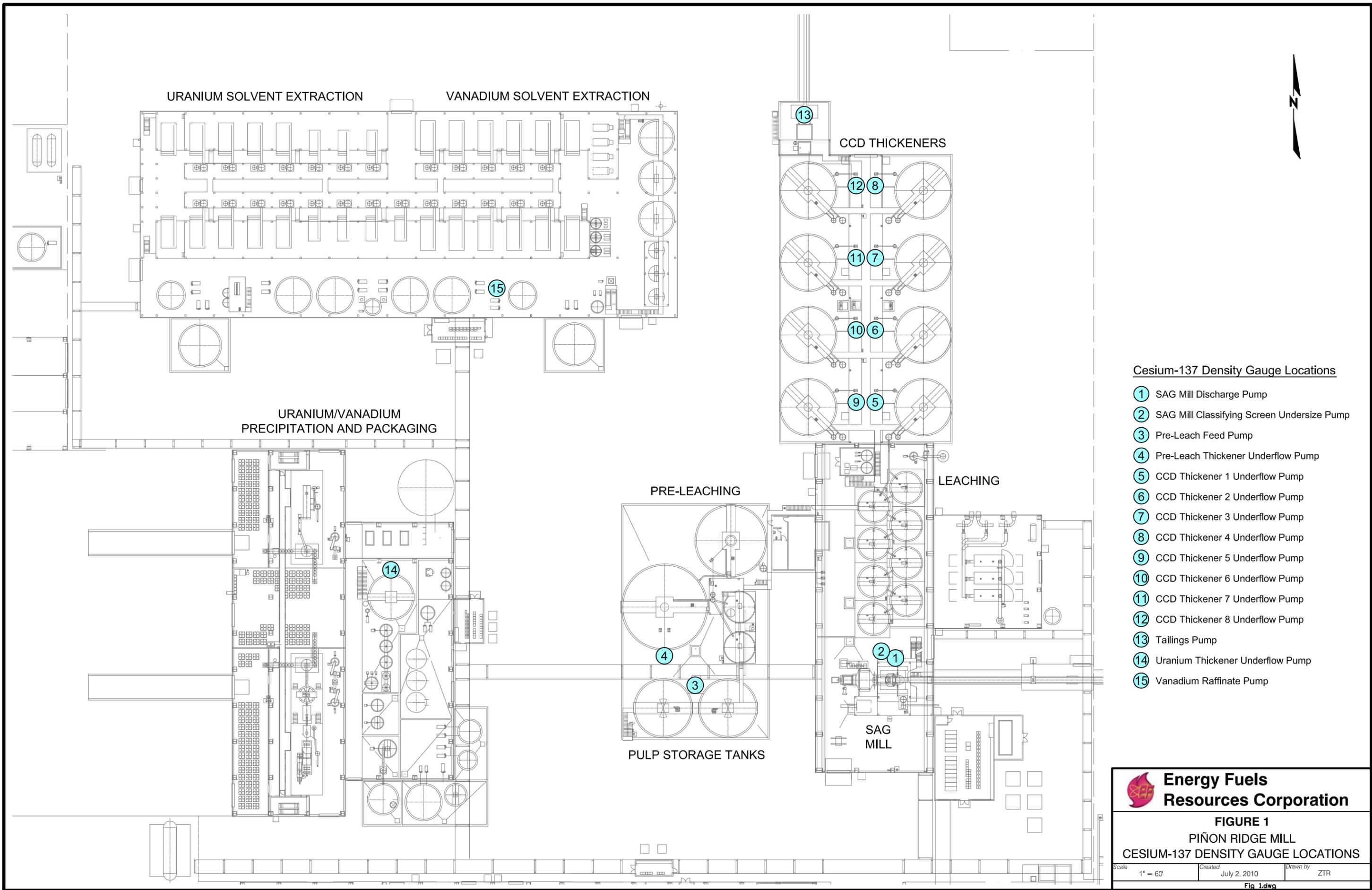
By: \_\_\_\_\_ Date: \_\_\_\_\_

Printed Name of Official: Mr. Stephen Antony

Printed Title of Official: Executive Vice President/Chief Operating Officer

Radiation Safety Officer: \_\_\_\_\_ Date: \_\_\_\_\_

Printed Name of Radiation Safety Officer: Mr. Steven H. Brown



**Cesium-137 Density Gauge Locations**

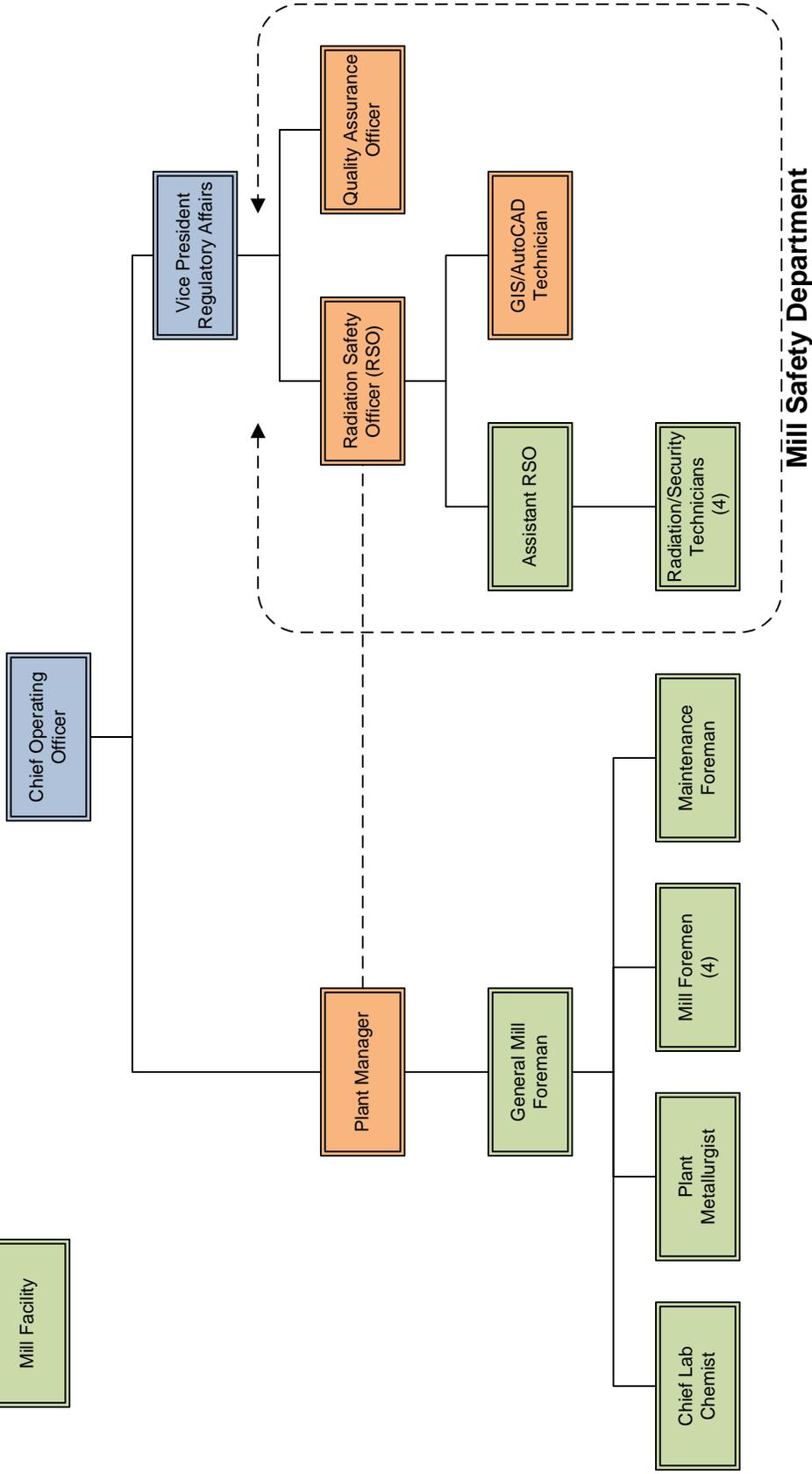
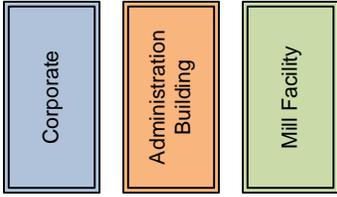
- ① SAG Mill Discharge Pump
- ② SAG Mill Classifying Screen Undersize Pump
- ③ Pre-Leach Feed Pump
- ④ Pre-Leach Thickener Underflow Pump
- ⑤ CCD Thickener 1 Underflow Pump
- ⑥ CCD Thickener 2 Underflow Pump
- ⑦ CCD Thickener 3 Underflow Pump
- ⑧ CCD Thickener 4 Underflow Pump
- ⑨ CCD Thickener 5 Underflow Pump
- ⑩ CCD Thickener 6 Underflow Pump
- ⑪ CCD Thickener 7 Underflow Pump
- ⑫ CCD Thickener 8 Underflow Pump
- ⑬ Tailings Pump
- ⑭ Uranium Thickener Underflow Pump
- ⑮ Vanadium Raffinate Pump

 <b>Energy Fuels Resources Corporation</b>		
<b>FIGURE 1</b> PIÑON RIDGE MILL CESIUM-137 DENSITY GAUGE LOCATIONS		
Scale	Created	Drawn by
1" = 60'	July 2, 2010	ZTR
Fig 1.dwg		

**Attachment 1**  
**Qualifications and Certifications of the**  
**Radiation Safety Officer, Mr. Steven H. Brown**

**Attachment 2**  
**Piñon Ridge Mill Health and Safety Organization Chart**

# Piñon Ridge Mill Health and Safety Organization Chart



**Attachment 3**  
**Qualifications of Key Personnel**

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## **EDUCATION**

Mesa State College – 1977

Trinidad State Junior College – 1981

BOAC Management Course – 1982

Department of Housing and Urban Development – Specialist – 1986

Larimer County Vo-Tech – 1987

Certified Retail Industry Analyst – 1991

North Carolina State University Industrial Extension Service – Safety & Health Management Systems – 2007

Mine Radiation Monitoring and Reporting – Ben Kilgore – 2007

## **MSHA QUALIFICATIONS**

<u>Date</u>	<u>Description</u>
1981	Impoundment Inspection
1981	Noise Level Testing
1981	Dust Equipment Calibration & Maintenance (UG/SUR)
1981	Dust Sampling (UG/SUR)
1981	Methane Underground
1981	Oxygen Deficiency (UG)
1981	Methane Surface
1981	Oxygen Deficiency (SUR)

## **MSHA CERTIFICATIONS**

<u>Date</u>	<u>Description</u>
10/31/81	Dust Cal/Main (UG/SUR)
10/31/81	Dust Sampling (UG/SUR)
11/24/81	Instructor – Noise Generation and Control
06/21/07	Instructor – Unlimited

## **SUMMARY**

Mr. Fulbright implements all phases of the baseline data collection program for the Piñon Ridge Mill. Mr. Fulbright is responsible for submittal, management and implementation of all health and safety plans, policies and programs required by the Mine Safety and Health Administration (MSHA) for Energy Fuel's mining properties. These responsibilities included design of the Diesel particulate Matter (DPM) Monitoring Program, Emergency Escape Plan, Gamma Exposure Monitoring Program, Ground Control Plan, Hazard Communication Program, Hearing Conservation Plan, Radon Daughter Monitoring Program, Respirable Dust/Silica Monitoring Program, Training Plan and Underground Emergency Response Plan. In addition, Mr. Fulbright composes, conducts and documents all health and safety training for Energy Fuels and has recently assumed responsibility for weed control and reclamation field activities on BLM and DOE properties. Mr. Fulbright also coordinates the San Juan Mine Rescue Cooperative, which involves total management of the cooperative covering eleven member companies.

## **EXPERIENCE**

Mr. Fulbright has more than 11 years of experience in the mining industry, including over 7 years in the mine safety and health field.

His employment history includes:

- Energy Fuels Resources; Safety Director (2007-Present)
- Fruita Consumers Cooperative/Timberline ACE Hardware, Nucla/Telluride, CO; Store Manager (1990-2007)
- FPI Management, Sacramento, CA; Project Director (1985-1990)
- Carbon County Coal Company, Hanna, WY; Safety Coordinator (1980-1985)
- Dave Blake Mining, Nucla, CO; Contract Uranium Miner (1978-1980)
- Ranchers Exploration and Development Company (aka Durita Development), Naturita, CO; Solvent Extraction Operator (1977-1978)
- Union Carbide Corporation, Uravan, CO; AeroFall Ball Mill Operator (1977)

### **Special Note:**

During his tenure with Carbon County Coal Company, Mr. Fulbright had the privilege of serving on the Rescue Raider Mine Rescue Team in the capacity of Map Man. The Rescue Raiders were nationally ranked first in Mine First Aid and second in Mine Rescue at the 1981 National Mine Rescue and First Aid Contest in Louisville, Kentucky.



# Michael Ray Rutter

## Maintenance Supervisor

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### EDUCATION

Effective Maintenance Management Seminar (2008)

NEC Code Class (1996, 2007)

### CERTIFICATIONS

Crane Operator, up to 100-ton, 2002

CPR, 2010

Medical First Responder, 2010

### SUMMARY

Mr. Rutter oversees all maintenance and scheduling for Energy Fuels Colorado and Utah mines. His responsibilities include electrical maintenance of mining equipment and construction at the Whirlwind Mine and Energy Queen Mine and baseline data collection equipment maintenance at the Piñon Ridge Mill. He also participates as a First Responder and Firefighter for the La Sal Volunteer Fire Department.

### EXPERIENCE

Mr. Rutter has more than 11 years experience as an electrician and he has been working in the mining industry for more than 6 years. His mining industry work includes high-voltage electrical construction and maintenance, vehicle maintenance, heavy machinery operation, inventory maintenance, contractor oversight, planning, bidding, scheduling, and invoicing of projects, employee training, and safety and first aid experience. His electrical work includes management, project estimation, commercial and residential wiring, and NEC Code compliance.

His employment history includes:

- Energy Fuels Resources; Maintenance Supervisor (2007-Present)
- La Sal Volunteer Fire Department, La Sal, UT; First Responder/Firefighter (2005-Present)
- Lisbon Valley Mine, La Sal, UT; Maintenance Planner (2005-2007)
- Asarco Inc. – Silver Bell Complex, Marana, AZ; High-Voltage Electrician (2004-2005)
- First Rate Electric, Tucson, AZ; Lead Electrician (2001-2004)
- Aarmor Electric, Vail, AZ; Lead Electrician (2000-2001)
- Electrical Excellence, Tucson, AZ; Service Department Supervisor (1999-2000)



**Attachment 4**  
**Typical RSO and Authorized User**  
**Training Course Outlines**

**Nevada Technical Associates, Inc.**  
**Radiation Safety Officer**  
**Course Outline**

Starting time: 8:30 each day. The course will end at about noon on Friday. The topics below will be more or less evenly distributed over the duration of the course. Attendees will receive a manual of several hundred pages and a course certificate.

1. Introduction
  - a. Course objectives and schedule
  - b. Origins of nuclear science
  - c. Atomic structure, isotopes, nuclear stability
  - d. Equations of radioactive decay
  
2. Radioactive Decay Processes
  - a. Alpha emission
  - b. Beta emission
  - c. Gamma emission
  - d. Other decay processes
  - e. Statistics of radioactive decay
  
3. Radiation Detection and Measurement
  - a. Gas-filled chambers
  - b. Scintillation detectors
  - c. Semi-conductors
  - d. Photographic emulsions
  
4. Interaction of Radiation with Matter
  - a. Modes of interaction
  - b. Heavy charged particle interactions
  - c. Beta particle interaction
  - d. Gamma ray interaction
  - e. Neutron interaction

## 5. Biological Effects of Radiation

- a. Radiation quantities and units
- b. Quality factors
- c. Biological effects
- d. Mechanisms of biological damage
- e. Acute, whole-body gamma radiation
- f. Risk of stochastic effects
- g. Fatality rates in various industries
- h. Radiation dose from natural and man-made sources

## 6. Shielding

- a. Charged particle shielding
- b. Photon shielding
- c. Neutron shielding
- d. Facility shielding

## 7. Personnel Radiation Dosimetry Devices and Methods

- a. External monitoring
- b. External dose evaluation
- c. Internal monitoring
- d. Internal dose assessment

## 8. Federal and State Regulations

- a. Chronology of standards
- b. Sources of standards, recommendations and requirements
- c. Basis of Standards
- d. Current regulations
- e. Licensing procedure

## 9. Radiological Safety Surveys, Records and Documentation

- a. Surveys and inspections
- b. Radiological Controls and ALARA
- c. Records and documents
- d. Operating and emergency procedures and document control

## 10. Radioactive Material Transportation and Disposal Regulations

- a. Applicable regulations
- b. Categories, packaging and limits
- c. Manifests, records, markings, and labels
- d. Radwaste disposal methods, sites, records and regulations

## 11. Radiological Emergencies

- a. Definitions, classifications and phases
- b. Notifications and assistance
- c. Response: isolation, radiation and medical evaluations
- d. Review of accident causes and recent accidents

## 12. Drafting a Radiological Safety Plan (student exercise)

- a. Attendees prepare program
- b. Exercise review

## **Radiation Safety for Authorized Users and Supervisors of Authorized Users Course Outline**

This course is designed for authorized users of radioactive materials and supervisors of authorized users. It is an introductory course that is suitable for those with no previous training in radiation safety and as a refresher course for those who have had previous formal training.

This course provides training in the following subjects:

1. Atomic and Nuclear Structure
2. Principles of Radioactive Decay
3. Radioactive Decay Processes, including alpha emission, gamma emission and beta emission
4. Radiation Detection Instruments including gas filled instruments, scintillation detectors and semi-conductors
5. Interaction of Radiation with Matter including interaction of alpha particles, beta particles and gamma rays
6. Biological Effects of Radiation
7. Shielding, Distance, and Exposure Time
8. Radiological Surveys, Records and Documentation