# WORK PLAN FOR
# AMBIENT AIR MONITORING
# ENERGY FUELS RESOURCES CORPORATION
# URANIUM MILL LICENSING SUPPORT
# PIÑON RIDGE MILL
# MONTROSE COUNTY, COLORADO
# KLEINFELDER PROJECT NO. 83088

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## 1.0 INTRODUCTION

This Air Monitoring Work Plan provides guidance for the assessment of the local air quality through collection of various air quality measurements for the environmental baseline study at Energy Fuels Resources Corporation (EFR) proposed Piñon Ridge Mill (the "Site") located in Montrose County, Colorado. Data will be collected at five air monitoring stations (network) located on site (three stations) and one each upwind and downwind of the site vicinity in order to obtain a representative block of data for assessment.

The project is under the regulation of the Colorado Department of Public Health and Environment (CDPHE) and the mill license (radioactive source materials license), will be issued and administered by CDPHE. Monitoring sites were chosen according to guidance outlined in Nuclear Regulatory Commission (NRC) Regulatory Guide (Reg. Guide) 3.63 Onsite Meteorological Measurement Program for Uranium Recovery Facilities – Data Acquisition and Reporting (NRC Reg. Guide 3.63); NRC Reg. Guide 4.14 Radiological Effluent and Environmental Monitoring at Uranium Mills (NRC Reg. Guide 4.14); and Environmental Protection Agency (EPA) Meteorological Monitoring Guidance for Regulatory Modeling Applications (MMGRMA) (EPA-454/R-99-005).

The Site is located 14 miles northwest of Naturita at 16910 Highway 90, Montrose County, Colorado. The property consists of approximately 880 acres that include the Southwest ¼ of the Southeast ¼ of Section 5, all of Section 8, the North ¼ of Section 17, and the Southeast ¼ of the Northwest ¼ of Section 17, Township 46 North, Range 17 West, of the New Mexico Principal Meridian.

## 2.0 SOURCE ENVIRONMENT

### 2.1. Topographical description

The Site is located in the western portion of Montrose County in a geographic region referred to as the Paradox Valley. Site elevation ranges between 5440 and 5900 feet above mean sea level (amsl). The majority of the Site is relatively flat with less than 200 of elevation change across it. Monogram Mesa rises to approximately 6600 amsl feet southwest of the Site and Davis Mesa rises to approximately the same elevation on the north side of the Paradox Valley.

### 2.2. Land-use description

Land in the region is a mix of federal land, managed by the Bureau of Land Management, and private land. Land-use in the region is primarily agricultural, grazing and mining. Native vegetation includes sagebrush-grass and piñon–juniper with sagebrush-grass the dominant form on Site. The Site is located on private land owned by EFR. Off-Site air monitoring locations are located on private land leased by EFR.

## 2.3. Topographical map of source and environs

See Figure 2.

## 2.4. Climatological description

The climate in western Colorado is considered semi-arid. The plateau and valley topography of lower western Colorado is generally more protected by surrounding high terrain and has a greater uniformity of weather than the eastern plains. The nearby town of Naturita has an average high temperature of 90° F for the month of July and 43° F for the month of January; Naturita has an average low temperature of 58° F in July and 18° F in January.

## 2.5. Description of proposed site activity

EFR proposes to construct and operate a conventional acid leach uranium mill on the Site. The mill will process ores produced within a reasonable truck hauling distance of the Site and will have a design capacity of 1,000 tons per day. The operating life of the mill will be 20 to 30 years. See Figure 3 for the Site layout including air monitoring locations.

## 2.6. Nearby population

Bedrock, CO, Naturita, CO and Nucla, CO are the nearest towns. Bedrock, CO, an unincorporated town, located eight miles northwest of the site has an estimated (unreported) population of less than 100. The towns of Naturita and Nucla are located 14 miles to the southeast on the San Miguel River. Naturita and Nucla have a population of approximately 700 each.

# 3.0 SAMPLING PROGRAM DESCRIPTION

## 3.1. Ambient air monitoring time period

Based on NRC Reg. Guides 3.63 and 4.14, pre-operational particulate matter (PM-10) air monitoring will occur for at least twelve months prior to the submittal of the radiation permit application at Sites #1 and #2 (see Figure 3 for monitoring site locations). The Tisch Hi-Vol samplers will monitor radionuclides at all five monitoring locations.

Monitoring will continue during mill construction and until reclamation has been satisfactorily completed. Revisions to the monitoring plan may be made in the future based on permit requirements.

## 3.2. Selection of monitoring sites

Selection of air monitoring station locations was based on both the preoperational and operational air monitoring criteria set forth in NRC Reg. Guide 4.14. Three monitoring locations were selected near the Site boundaries, a fourth location was selected as a background location to the northwest, and a fifth location was selected at the nearest

residence located to the southeast. Wind direction is assumed to be predominantly from northwest and from the southeast. There appears to be a down-valley and an up-valley flow through the area. The five selected monitoring locations are discussed below.

Air Monitoring Site #1: This location is also referred to as Met Site #1 and is located near the northern boundary of the Site. This location will include the 10 meter (10m) meteorological tower, and one of the two onsite PM-10 monitoring locations.

Air Monitoring Site #2: This location is also referred to as Met Site #2 and is located near the eastern boundary of the Site. This location will include the 30 meter (30m) meteorological tower, and one of the two on-site PM-10 monitoring locations.

Air Monitoring Site #3: This location is also referred to as West Site and is located near the western boundary of the Site.

Air Monitoring Site #4: This location is also referred to as the Cooper Site and is located northwest of the Site. This site is assumed to be upwind. This site will be the background site following startup of operations.

Air Monitoring Site #5: This location is also referred to as the Carver Site and is located southeast of the Site. This site is assumed to be a downwind site, and was chosen as the site of the nearest residence.

## 4.0 MONITOR SITE DESCRIPTIONS

### 4.1. Locations

The Site is located at 16910 Highway 90, Montrose County, Colorado. See Figure 3 for locations of the monitoring sites.

**Table 1 – *Monitor Site Locations***

| Locations | UTM Zone 12 (NAD83) | |
|---|---|---|
| | Easting | Northing |
| Site #1 (North Site) – 10m Tower | 695211.43 | 4237487.24 |
| Site #2 (East Site) – 30m Tower | 695930.42 | 4235452.56 |
| Site #3 (West Site) | 694443.09 | 4235724.28 |
| Site #4 – (Cooper Site) Upwind Resident | 691915.11 | 4239229.41 |
| Site #5 – (Carver Site) Downwind Resident | 700247.01 | 4232787.61 |

### 4.2. Sampler air intake (inlet) heights

Particulate sampler inlet heights will be 2 – 6 meters above the ground surface.

## 4.3. Meteorological tower descriptions

Site #1 will include the 10m tower and measure the following parameters based on EPA MMGRMA guidance:

- wind speed,
- wind direction,
- sigma theta,
- vertical wind speed,
- temperature,
- relative humidity,
- delta temperature,
- barometric pressure,
- solar radiation,
- precipitation, and
- evaporation.

Instruments will be placed at the 10m, 2m, and ground levels. Instruments will be installed on booms at a minimum distance of two tower widths from the tower. The booms will be oriented into the prevailing wind directions. At the 10m level, wind speed, wind direction, sigma theta, vertical wind speed, and delta temperature will be measured. At the 2m level, temperature, relative humidity, delta temperature, barometric pressure, and solar radiation will be measured. At the ground level, precipitation and evaporation will be measured.

Site #2 will include the 30m tower and measure the following parameters based on EPA MMGRMA guidance:

- wind speed,
- wind direction,
- sigma theta,
- temperature,
- relative humidity,
- delta temperature,
- barometric pressure, and
- solar radiation.

Instruments will be placed at the 30m and 2m levels. Instruments will be installed on booms at a minimum distance of two tower widths from the tower. The booms will be oriented into the prevailing wind directions. At the 30m level, wind speed, wind direction, sigma theta, vertical wind speed, and delta temperature will be measured. At the 2m level, temperature, relative humidity, delta temperature, barometric pressure, and solar radiation will be measured.

Sigma theta values for both sites will be calculated from wind monitor readings. Wind gusts will be measured at both of the sites. The measurement will indicate the speed of

the gust based on a 3-second average of the wind speed, along with the gust direction and time of the gust.

### 4.4. Distance from obstructions and heights of obstructions

Site visits were performed in order to verify that the site locations were free from obstructions. The distance from obstructions for towers is 10 times the height of the nearest building / obstruction away from the nearest building / obstruction.

### 4.5. Distance from other sources (stationary and mobile)

Other sources in the area include the following: (distances are distance from the Site)

**Mines:**

To the south along Monogram Mesa:

- Cotter Corporation (JD-7 Pit) approximately 1 mile;
- Cotter Corporation (C-JD-7) approximately 1 mile;
- Nuvemco, LLC (Monogram-Jo Dandy) approximately 1 mile;
- Nuvemco, LLC (Monogram Mines) approximately 1 mile;
- Cotter Corporation (Mineral Joe Claims) approximately 2 miles;
- Cotter Corporation (C-JD-8) approximately 2 miles;
- Gold Eagle Mining Inc. (C-JD-5) approximately 2 miles;
- Dennison Mines Corp. (Van 4 Shaft) approximately 4 miles;
- Cotter Corporation (JD-9 Mine) approximately 5 miles;
- Blue Energy Corp. (Tramp Mine) approximately 6 miles;
- Cotter Corporation (CM 25 Mine) approximately 7 miles;
- Umetco Minerals Corp (Club Mines) approximately 7 miles; and
- Western Fuels-Colorado, LLC (Third Park Federal Drilling 2007) approximately 8 miles.

### 4.6. Photographs

Please see Appendices A, B, C, D, and E for site photographs of all five air monitoring locations. Each site has five photographs from the site location as follows:

- Close-up photo of ground cover, and views of the site to the north, south, east, and west.

## 5.0 METHODOLOGY DESCRIPTION

### 5.1. Name of monitoring equipment manufacturer and model designations

**Table 2 - Site #1**

| Site #1 (North Site)- Meteorological and Ambient Air | | | |
|---|---|---|---|
| Location: UTM Zone 12 - 695211.43E, 4237487.24N | | | |
| **Equipment** | **Manufacturer** | **Model Number** | **Quantity** |
| Tower (10 meter) | Universal Tower | 9-30 (Aluminum Tower) | 1 |
| Wind Speed - Wind monitor | RM Young | 05305-5 | 1 |
| Wind Direction – Wind monitor | RM Young | 05305-5 | 1 |
| Sigma-theta | Calculated | | |
| Wind Gust - Speed | Calculated | | |
| Wind Gust - Direction | Calculated | | |
| Vertical wind monitor | RM Young | 27106T w/ 08254 prop | 1 |
| Vertical wind monitor | RM Young | 27106 w/ 08274 prop | 1 |
| Temperature & Delta T – (10m & 2m) | RM Young | 41342 | 2 |
| Temperature bath calibration (NIST) | RM Young | 00835 | 2 |
| Aspirated Radiation Shield | RM Young | 43502 | 2 |
| Barometric pressure | Campbell Scientific - Vaisala | CS106 | 1 |
| Precipitation | MetOne | 385 | 1 |
| Precipitation wind screen | Novalynx | 260-952 | 1 |
| Solar Radiation | Campbell Scientific – LI-COR Pyranometer | LI200X-L11 | 1 |
| Datalogger | Campbell Scientific | CR3000 | 1 |
| Modem | Campbell Scientific | COM220 | 1 |
| Relative Humidity w/ temp | Campbell Scientific | HMP45C-L7 | 1 |
| RH Radiation Shield | Campbell Scientific | 41003-5 | 1 |
| $PM_{10}$ | Thermo | FRM 2000 | 1 |
| Radionuclide Hi-Vol | Tisch Environmental | TE-5170DV-BL | 1 |
| Evaporation Gauge | Novalynx | 255-100 | 1 |
| Evaporation Pan | Novalynx | 255-200 | 1 |
| Radon-222 | Laundauer | Radtrak – Outdoor / #3409 | 1 |
| Background Radiation | Laundauer | X9 Environmental Dosimeter | 1 |

## Table 3 - Site #2

| Site #2 (East Site) – Meteorological and Ambient Air | | | |
|---|---|---|---|
| Location: UTM Zone 12 – 695930.42E, 4235452.56N | | | |
| **Equipment** | **Manufacturer** | **Model Number** | **Quantity** |
| Tower (30 meter) | US Tower | HDX5106MDPL | 1 |
| Wind Speed - Wind monitor | RM Young | 05305-5 | 1 |
| Wind Direction - Wind monitor | RM Young | 05305-5 | 1 |
| Sigma-theta | Calculated | | |
| Wind Gust - Speed | Calculated | | |
| Wind Gust - Direction | Calculated | | |
| Vertical wind monitor | RM Young | 27106T w/ 08254 prop | 1 |
| Vertical wind monitor | RM Young | 27106 w/ 08274 prop | 1 |
| Temperature & Delta T – (30m & 2m) | RM Young | 41342 | 2 |
| Temperature bath calibration (NIST) | RM Young | 00835 | 2 |
| Aspirated Radiation Shield | RM Young | 43502 | 2 |
| Barometric pressure | Campbell Scientific – Vaisala | CS106 | 1 |
| Solar Radiation | Campbell Scientific – LI-COR Pyranometer | LI200X-L11 | 1 |
| Datalogger | Campbell Scientific | CR3000 | 1 |
| Modem | Campbell Scientific | COM220 | 1 |
| Relative Humidity w/ temp | Campbell Scientific | HMP45C-L7 | 1 |
| RH Radiation Shield | Campbell Scientific | 41003-5 | 1 |
| $PM_{10}$ | Thermo | FRM 2000 | 1 |
| Radionuclide Hi-Vol | Tisch Environmental | TE-5170DV-BL | 1 |
| Radon-222 | Laundauer | Radtrak – Outdoor / #3409 | 1 |
| Background Radiation | Laundauer | X9 Environmental Dosimeter | 1 |

**Table 4 - Site #3**

| Site #3 (West Site) - Ambient Air – 1592510.44N, 2058836.29E | | | |
|---|---|---|---|
| Location: UTM Zone 12 – 694443.09E, 4235724.28N | | | |
| **Equipment** | **Manufacturer** | **Model Number** | **Quantity** |
| Radionuclide Hi-Vol | Tisch Environmental | TE-5170DV-BL | 1 |
| Radon-222 | Laundauer | Radtrak – Outdoor / #3409 | 1 |
| Background Radiation | Laundauer | X9 Environmental Dosimeter | 2 |

**Table 5 - Site #4**

| Site #4 (Cooper Site - Northwest Resident) – Ambient Air | | | |
|---|---|---|---|
| Location: UTM Zone 12 – 691915.11, 4239229.41N | | | |
| **Equipment** | **Manufacturer** | **Model Number** | **Quantity** |
| Radionuclide Hi-Vol | Tisch Environmental | TE-5170DV-BL | 1 |
| Radon-222 | Laundauer | Radtrak – Outdoor / #3409 | 1 |
| Background Radiation | Laundauer | X9 Environmental Dosimeter | 1 |

**Table 6 - Site #5**

| Site #5 (Carver Site - Southeast Resident) – Ambient Air | | | |
|---|---|---|---|
| Location: UTM Zone 12 – 700247.01E, 4232787.61N | | | |
| **Equipment** | **Manufacturer** | **Model Number** | **Quantity** |
| Radionuclide Hi-Vol | Tisch Environmental | TE-5170DV-BL | 1 |
| Radon-222 | Laundauer | Radtrak – Outdoor / #3409 | 1 |
| Background Radiation | Laundauer | X9 Environmental Dosimeter | 1 |

## 5.2. Description of calibration system to be used

**Meteorology**

Wind speed / wind direction monitor

R.M. Young 5305 monitor will be calibrated according to manufacturer specifications. Equipment needed for calibration:

- R.M. Young 18112 Vane Angle Bench Stand
- Compass with tripod
- R.M. Young 21145 Torque Gauge
- R.M. Young 18802 Anemometer Drive
- Calibration field form

Temperature / relative humidity sensors

RM Young temperature / relative humidity sensors will be calibrated with the following equipment:

- Certified temperature measurement device
- Certified relative humidity measurement device

Temperature / relative humidity sensors will be replaced on an annual basis with spare certified sensors. The removed sensors will be sent to the manufacturer or other qualified personnel for recertification.

## Particulate monitors

Thermo Partisol FRM 2000 PM-10

Partisol FRM 2000 samplers will be calibrated according to manufacturer specifications and standard operating procedures developed by Kleinfelder personnel. Equipment needed for calibration is listed below:

- Certified flow meter capable of gauging 0.2 to 20 liters per minute (lpm)
- Certified temperature measurement device
- Certified pressure measurement device

Tisch Hi-Vol

Tisch Hi-Vol samplers will be calibrated according to manufacturer specifications and standard operating procedures developed by Kleinfelder personnel. Equipment needed for calibration is listed below:

- Certified Orifice Calibrator Transfer Standard
- Slack tube manometer
- Tygon tubing for static pressure connections
- Faceplate charts for continuous recorder
- Calibration field form
- Plastic cap for constant volume sample sensor

## Radon Monitors

Landauer Radtrak and X9

The Radtrak and X9 monitors are pre-calibrated from the manufacturer.

## 5.3. Standard operating procedures for calibration

In Appendix I: RM Young 5305 SOP calibration procedures.
In Appendix I: RM Young 27106T and 27106 SOP calibration procedures.
In Appendix I: RM Young 41342 SOP calibration procedures.
In Appendix I: Campbell HMP45C SOP calibration procedures.
In Appendix I: Campbell LI200X SOP calibration procedures.
In Appendix I: Campbell CS106 SOP calibration procedures.
In Appendix H: Partisol FRM 2000 SOP calibration procedures.
In Appendix G: Tisch 5170 Hi-Volume SOP calibration procedures.

The Radtrak and X9 monitors are pre-calibrated from the manufacturer.

## 5.4. Description of audit system to be used

Audits will be performed independently of EFR and Kleinfelder personnel. Information regarding the auditor's system has been provided below. See appendices for audit information.

**Meteorology**

Wind speed / wind direction monitor

R.M. Young 5305 monitor will be audited with the following equipment:

- R.M. Young 18112 Vane Angle Bench Stand
- Compass with tripod
- R.M. Young 21145 Torque Gauge
- R.M. Young 18802 Anemometer Drive
- Calibration field form

Vertical Wind speed monitors

R.M. Young 27106T and 27106 monitors will be audited with the following equipment:

- R.M. Young 21145 Torque Gauge
- Calibration field form

Temperature / relative humidity sensors

RM Young temperature / relative humidity sensors will be audited with the following equipment:

- Certified temperature measurement device
- Certified relative humidity measurement device

**Particulate monitors**

Partisol FRM 2000 PM10 samplers will be audited with the following equipment:

- Certified flow meter capable of gauging 0.2 to 20 lpm
- Certified temperature measurement device
- Certified pressure measurement device

Tisch Hi-Vol

Tisch Hi-Vol samplers will be audited with the following equipment:

- Certified Orifice Calibrator Transfer Standard
- Slack tube manometer
- Tygon tubing for static pressure connections
- Faceplate charts for continuous recorder
- Calibration field form
- Plastic cap for constant volume sample sensor

**Radon Monitors**

Landauer Radtrak and X9

The Radtrak and X9 monitors are pre-calibrated from the manufacturer.

### 5.5. Standard operating procedure for audit

In Appendix L: RM Young 5305 auditor SOP.
In Appendix L: RM Young 27106T and 27106 auditor SOP.
In Appendix L: RM Young 41342 auditor SOP.
In Appendix L: Campbell HMP45C auditor SOP.
In Appendix L: Campbell LI200X auditor SOP.
In Appendix L: Campbell CS106 auditor SOP.
In Appendix L: Partisol FRM 2000 auditor SOP.
In Appendix L: Tisch 5170 Hi-Volume auditor SOP.

The Radtrak and X9 monitors are pre-calibrated from the manufacturer.

### 5.6. Type of flow control and flow recorder

The Tisch 5170 High Volume sampler utilizes a volumetric flow controller and a TE-5009 continuous flow recorder.

The Partisol FRM 2000 PM10 sampler utilizes a mass flow controller with active volumetric flow control system. Flow is logged and recorded electronically.

## 5.7. Standard operating procedures for filter pad changes

Filter exchange and pad change procedures are outlined in the standard operating procedures compiled in the appendices.

## 5.8. Standard operating procedures for daily instrument checks

Instrument checks are outlined in the standard operating procedures compiled in the appendices.

## 5.9. Maintenance schedule

Partisol FRM 2000 $PM_{10}$

Preventative maintenance activities will be performed as recommended by the manufacturer. Major maintenance activities are listed below.

**Table 7 - Partisol FRM 2000 $PM_{10}$ Maintenance Activities**

| | |
|---|---|
| Inlet cleaning | Monthly |
| Clean instrument cabinets | Monthly |
| Perform leak check | Monthly |
| Inspect / replace instrument seals | Monthly |
| Check battery voltage levels | Annually |
| Inspect / replace in-line filters | Semi-annual / annual |

Tisch Hi-Vol 5170

Preventative maintenance activities will be performed as recommended by the manufacturer. Maintenance activities outlined in the operations manual are listed below.

**Table 8 - Tisch Hi-Vol 5170 Maintenance Activities**

| | |
|---|---|
| Inspect instrument seals | Monthly |
| Inspect / replace power cords | Monthly |
| Clean filter screen | Monthly |
| Inspect filter holder frame gasket | Every Two Weeks |
| Verify elapsed time meter operation | Daily |
| Verify flow recorder operation | Daily |

Meteorology Components

**Table 9 - Meteorological Maintenance Activities**

| | |
|---|---|
| Observe movement of wind direction | Daily |
| Observe movement of wind speed propellers | Daily |
| Clean solar radiation sensor | Monthly |

## 5.10. Equations used for calculating PM10 at standard and actual conditions

The Partisol FRM 2000 is capable of logging the flow rate in either standard or actual conditions. The FRM 2000 will be set to log data in standard conditions. Conversions from both actual to standard and standard to actual are listed below.

Converting from standard to actual flow is performed as follows:

$$Qa = Qstd \times \frac{760}{Pa} \times \frac{Ta}{298.15}$$

Converting from actual to standard flow is performed as follows:

$$Qstd = Qa \times \frac{298.15}{Ta} \times \frac{Pa}{760}$$

Where:

Qa = Actual flow
Qstd = Standard flow
Ta = Ambient temperature in °K
Pa = Ambient barometric pressure in mmHg

## 5.11. Precision check – method and procedures, calculation formula

Precision check is not applicable. There will be no collocated monitors.

## 5.12. Zero-span check – method and procedures, control limits

Zero-span check is not applicable. There will be no gaseous monitors.

## 5.13. Calibration of laboratory equipment

The Quality Assurance Project Plans (QAPPs) from ACZ and IML, are included in Appendix F. The calibration of laboratory equipment can be viewed in the QAPPs.

## 5.14. Procedures for maintaining traceability to National Institute of Standards & Technology (NIST) equipment and standards

Equipment such as the temperature / RH probes and flow, temperature, and pressure meters will be certified to NIST standards on an annual basis. Original certification records will be kept at the EFR site office. Copies of these records will be kept at the appropriate Kleinfelder office.

## 6.0 DATA REPORTING

### 6.1. Description of data acquisition system

Meteorological data will be retrieved from the meteorological stations via a satellite modem, until compatible cell phone service or landline service is available. Utilization of a communications program called Loggernet will enable daily retrieval from the on-site data loggers. Data will be downloaded into a database for verification and validation.

Particulate monitoring data will be retrieved manually from the Partisol FRM 2000 PM10 monitor by the field technicians on sample forms at the time of filter retrieval. Data will be transferred from the sample forms into a database for verification and validation.

Monitoring data will be retrieved manually from the Tisch Hi-Vol 5170 monitor by the field technicians on sample forms at the time of filter retrieval. Data will be transferred from the sample forms into a database for verification and validation.

Data from the Landauer Radon and gamma monitors' samples will be provided by the laboratory as an analytical report, which will be entered into a spreadsheet upon receipt.

### 6.2. Type of Data Logger

Components of the data logging system are listed below.

**Table 10 - Data Logger Components**

| Component | Manufacturer | Model |
|---|---|---|
| Data logger | Campbell | CR3000 |
| Communications software | Campbell | Loggernet |
| Satellite Modem | NAL Research | A3LA-MPT |

***Note: If cell phone service or landline phone service becomes available, we will switch from the current satellite phone service and modem.**

### 6.3. Procedures for verifying data correctness

Data validation and verification will be conducted based on procedures consistent with the EPA Air Quality System (AQS).

### 6.4. Format of data submission

Data will be reported in electronic format as outlined in the CDPHE Ambient Air Monitoring Requirements document. Frequency of data reporting and content is outlined in Section 6.5.

Meteorological data will be submitted in columnar format, as an ASCII file, with each row as one hourly record and each column as one measured parameter.

Particulate data will be submitted in EXCEL spreadsheet format.

## 6.5. Frequency of data reporting

Data will be submitted on a quarterly and annual basis to the Air Pollution Control Division (APCD) and the Radiation Management Unit (RMU).

Quarterly reports summarizing monitoring activities at the sites, monthly averages of meteorological conditions, sampling data sheets, analytical reports, audit sheets and calibration sheets will be generated and submitted to the APCD and RMU. Quarterly reports will be submitted to the APCD and RMU within 45 days after the end of the quarter.

Annual reports will compile the data from the quarterly reports and summarize for the entire year. The annual report will contain evaluation of data trends. The annual report will be submitted to APCD and RMU within three months after the end of the year.

## 6.6. Processed data

Data will be processed to the necessary format for use with the modeling program MILDOSE AREA. The MILDOSE AREA program requires a STAR data format. The data will be formatted into the STAR format for use in MILDOSE.

## 6.7. Procedure for immediate reporting of an exceedance

Data observed as an exceedance will be reviewed for accuracy and reported as soon as practical to the APCD and RMU.

## 6.8. Chain of custody

Field sampling forms will serve as chain of custody records for retrieved samples. Each original form completed after sample retrieval will be sent to the laboratory with collected filter samples. Two copies of each form will be generated; one sample form will be retained at the EFR site office and one form will be sent to the appropriate Kleinfelder office.

## 6.9. Storage of records

Original sampling data sheets, analytical reports, audit sheets and calibration sheets (data sheets) will be stored at the EFR site office. Copies of data sheets will be made and sent to the appropriate Kleinfelder office as back-up data records.

Meteorological data will be retrieved on a daily basis via automated Data Collection System (DCS). Retrieved records will be loaded into database format through the use of Loggernet and tabulated into ASCII text files for data submission according to the schedule outlined in Section 6.5.

Particulate monitoring data acquired from field data sheets will be tabulated by Kleinfelder personnel into EXCEL spreadsheets. The spreadsheets will be checked for

accuracy and stored for data submission according to the schedule outlined in Section 6.5.

The data will be entered into the project GIS database on a regular basis. The GIS database will ultimately be used to generate reports to CDPHE.

## 7.0 QUALITY ASSURANCE PROGRAM

### 7.1. Calibration frequency

Calibration procedures will be performed according to the following schedule:

**Table 11 - Calibration Frequency**

| | |
|---|---|
| Particulate monitors | Quarterly |
| Radon 222 | Manufacturer pre-calibrated |
| Direct radiation | Manufacturer pre-calibrated |
| Radon Flux | Manufacturer pre-calibrated |
| Wind monitor | Semi-annual |
| Vertical Wind monitor | Semi-annual |
| Temperature/RH | Semi-annual |
| Barometric pressure | Semi-annual |
| Precipitation | Semi-annual |
| Evaporation | Semi-annual |
| Solar insolation | Semi-annual |

### 7.2. Independent quarterly audit program

Independent auditing will be performed on a quarterly basis by VSI. A plan outlining audit procedures and instruments to be used for auditing equipment is provided in the appendices.

**Table 12 - Audit Frequency**

| | |
|---|---|
| Particulate monitors | Quarterly |
| Radon 222 | ___N/A |
| Direct radiation | ___N/A |
| Radon Flux | ___N/A |
| Wind monitor | Semi-annual |
| Vertical wind monitor | Semi-annual |
| Temperature/RH | Semi-annual |
| Barometric pressure | Semi-annual |
| Precipitation | Semi-annual |
| Solar insolation | Semi-annual |

### 7.3. Internal quality control procedures

In the event of any operational errors or missed sampling events, a corrective action procedure will be implemented. The monitoring project manager for the site, as well as the monitoring project manager for Kleinfelder, will investigate the cause and effect of the incident, take corrective action, and prepare a letter to the APCD and RMU.

### 7.4. Data precision and accuracy calculation procedures

There are no collocated monitors for measurement precision calculations. The X9 radiation monitors will be collocated at one site. Monthly flow checks on the Partisol FRM 2000 PM10 will be completed by the field technician.

### 7.5. Goal for percentage data recovery

According to the Prevention of Significant Deterioration (PSD) regulations, the data recovery goal for meteorological data is 90% data recovery per quarter. The PSD data recovery goal for pollutant data is 80% per quarter. The minimum annual acceptable data recovery for $PM_{10}$ data is 75% valid data.

### 7.6. Acceptable audit performance limits

Acceptable audit limits are listed by instrument in the tables below:

**Table 13 - Audit Performance Limits**

| Thermo FRM 2000 $PM_{10}$ | | |
|---|---|---|
| Flow rate | Temperature | Pressure |
| +/- 4% | +/- 2 °C | +/- 10 mmHg |

| Tisch Hi-Vol 5170 |
|---|
| Flow rate |
| +/- 7% |

| RM Young 5103 – Wind Speed | | |
|---|---|---|
| Threshold | Accuracy | Distance Constant |
| <0.5 meters/second | <0.2 meters/second + 5% of observed | <5 m at 1.2kg/$m^3$ |

| RM Young 5103 – Wind Direction | | |
|---|---|---|
| Threshold | Accuracy | Delay Distance |
| <0.5 meters/second | <3 degrees relative to sensor mount or index<br><5 degrees overall | <5 m at 1.2kg/$m^3$ |

| RM Young 27106T – Vertical Wind Speed | | |
|---|---|---|
| Threshold | Accuracy | Delay Distance |
| <0.4 meters/second | <0.2 meters/second + 5% of observed | <2.1 m at 1.2kg/$m^3$ |

| RM Young 27106 – Vertical Wind Speed | | |
|---|---|---|
| Threshold | Accuracy | Delay Distance |
| <0.25 meters/second | <0.2 meters/second + 5% of observed | <2.1 m at 1.2kg/$m^3$ |

| RM Young 41342 – Temperature | |
|---|---|
| Accuracy | Resolution |
| <0.5 ° C | 0.1 ° C |

| RM Young 41342 – Delta-Temperature | |
|---|---|
| Accuracy | Resolution |
| <0.1 ° C | 0.01 ° C |

| Campbell Scientific HMP45C – Relative Humidity |
|---|
| Accuracy |
| <5 ° C |

| Met One 385 – Precipitation | |
|---|---|
| Accuracy | Resolution |
| <0.254 mm or 0.01",<br>+/- 0.5% at 0.5"/hr and<br>+/- 1.0% at 1" to 3"/hr | 0.254 mm |

| Campbell (Vaisala) PTB110 – Barometric Pressure | |
|---|---|
| Accuracy | Resolution |
| < 3 mb (0.3 kPa) | 0.5 mb |

| Campbell (LI-COR) LI200X – Solar Radiation | |
|---|---|
| Accuracy | Resolution |
| < 5% of observed | 10 W/$m^2$ |

| Landauer Radtrak and X9 |
|---|
| Manufacturer will provide this information |

### 7.7. Action taken in response to a failed audit

The auditor will notify Kleinfelder and EFR personnel of auditing results upon completion of the quarterly audits. In the case of a failing audit, responsible individuals will make immediate repair, maintenance, and calibration to remedy the situation. The auditor will arrange a time to repeat the audit procedures on the instrument in question.

## 8.0 PERSONNEL

### 8.1. Project Staff

Kleinfelder's proposed project staff and their respective roles are detailed in Table 14. The overall project organization is shown schematically in Figure 1. Additional qualified

and experienced staff (existing and new) may be added after submitting this ambient air monitoring work plan. These staff will be identified and their roles assigned before work begins.

Program management, administration, and quality assurance oversight will be conducted out of Kleinfelder's regional office located in Albuquerque, New Mexico. The Field Manager (FM) will provide onsite oversight and will assist the field team with technical, operational, or other project-related issues.

## 8.2. Organization chart

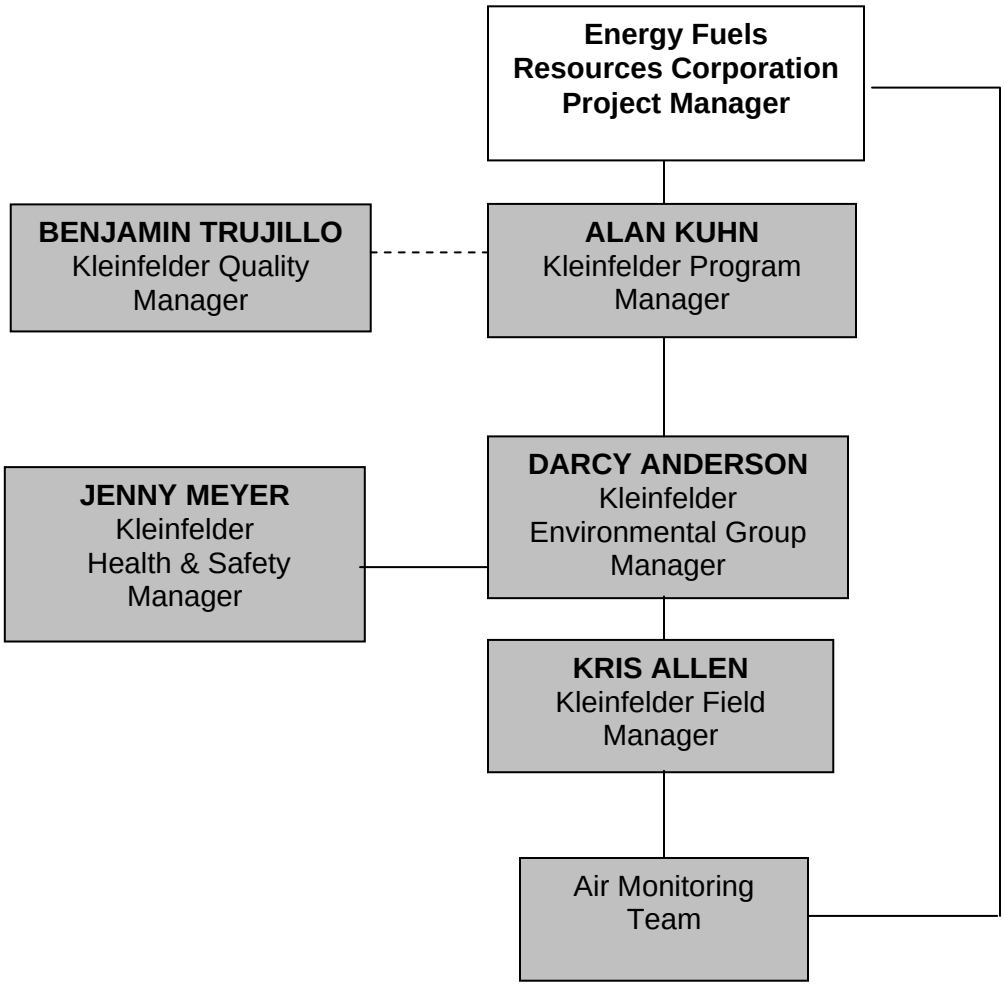


***Figure 1 - Project Organization Chart***

## 8.3. Division of responsibilities

**Table 14 - Roles and Responsibilities**

| Name | Project Role | Responsibilities | Experience |
|---|---|---|---|
| Alan Kuhn | Program Manager | Program Management Controls, Client Interaction | Engineering, Licensing, Operations Management |
| Benjamin Trujillo | Quality Manager | Quality Assurance | Quality Assurance, Quality Control |
| Jenny Meyer, CIH | Health and Safety Manager | Kleinfelder Health & Safety Plan and Compliance | Industrial Hygiene. Field Investigations |
| Darcy Anderson | Environmental Group Manager | Project Technical Oversight | Environmental Sciences, Project Management |
| Thomas Lavery | Senior Technical Staff | Technical Reviewer | Environmental Sciences |
| Kris Allen | Field Project Manager/Site Safety Officer | Field Management, Ambient Air Sampling, Logistical Coordinator | Air Quality, Field Management, Meteorology |
| Sarah Walters | Technical Staff | Ambient Air Sampling | Air Quality, Meteorology |
| TBD | Field Staff | Sampling | Field Work, Environmental Science |

TBD = To be determined.

# 9.0 STANDARDS AND REFERENCES


1. Environmental Protection Agency (EPA) Meteorological Monitoring Guidance for Regulatory Modeling Applications (MMGRMA) (EPA-454/R-99-005).

2. Quality Assurance Handbook for Air Pollution Measurements Systems, Vol. II, Part 2, USEPA, Environmental Monitoring Systems Laboratory.

3. EPA, 1995. Quality Assurance Handbook for Air Pollution Measurement Systems. Vol. V, Meteorological Measurements. EPA/600/R-94/038d, U.S. Environmental Protection Agency, Research Triangle Park, NC.

4. Ambient Air Monitoring Requirements for the Air Pollution Control Division of the Colorado Department of Public Health and Environment, Technical Services Program Air Pollution Control Division, April 2001.

5. U.S. Nuclear Regulatory Commission Regulatory Guide, Office of Standards Development, Regulatory Guide 4.14 – Radiological Effluent and Environmental Monitoring at Uranium Mills, Revision 1, April 1980.

6. U.S. Nuclear Regulatory Commission Regulatory Guide, Office of Standards Development, Regulatory Guide 3.8 – Preparation of Environmental Reports for Uranium Mills, Revision 2, October 1982.

7. U.S. Nuclear Regulatory Commission Regulatory Guide, Office of Nuclear Regulatory Research, Regulatory Guide 3.63 – Onsite Meteorological Measurement Program For Uranium Recovery Facilities – Data Acquisition and Reporting, March 1988.