



## CHARCOAL CANISTER RADON SURVEY QUALITY ASSURANCE PROJECT PLAN

UMUAQ  
Ute Mountain Ute Tribe  
Environmental Programs Department

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January 15, 2013

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## I. INTRODUCTION AND DISTRIBUTION LIST

### 1 Introduction

This Quality Assurance Project Plan (QAPP) is consistent with the guidance issued by the U.S. Environmental Protection Agency (EPA Interim Guidelines for Preparing QA Plans [EPA 1980]; EPA Requirements for QA Project Plans [EPA 1992a]). This Plan is formatted in a way that allows the Ute Mountain Ute Air Quality Program (UMUAQ) staff to reference easily pertinent portions of this document. The 16 elements recommended by the EPA (EPA Interim Guidelines for Performing QA Plans [EPA 1980]) are all included although some have been combined. For example, corrective actions are included with each section for which it is appropriate, instead of discussing all corrective actions in a separate section. The nomenclature used in this QAP is appropriate for the operations of Environmental Programs, and every effort has been made to maintain consistency with the latest EPA guidance (QA Guidance for RMP Participants [EPA 1993 draft]).

### 2 Distribution List

This report reflects current operations, and therefore is often updated and revised. The QA Manager has responsibility for incorporating changes, and ensuring that the changes are reviewed and approved by the management, as indicated by their dated signatures on the signature page. After significant revisions, revised copies of this QAPP are distributed to the following key personnel:

Environmental Specialist (Project QA Manger), Tomoé Natori

Signature & Date \_\_\_\_\_

Environmental Programs Department (EPD) Director, Scott Clow

Signature & Date \_\_\_\_\_

EPA Region 8 Tribal Assistance Program, Randy Brown

Signature & Date \_\_\_\_\_

## II PROJECT ORGANIZATION

The Radon Testing Program will be managed and implemented by the UMUAQ, with reliance on an independent laboratory for analytical services.

### 1 Personnel at Ute Mountain Ute Tribe

EPD Director

- Oversee project
- Assign duties relative to the project
- Review QAPP

Environmental Specialist

- Preparation of the QAPP
- Prioritization of the public buildings to be tested
- Receipt and evaluation of laboratory data
- QA/QC of the radon database
- Preparation of progress and final reports to the Tribal Assistance Program Project Officer

Air Quality Technician and Brownfields Coordinator

- Test kit deployment, retrieval, and shipment to the laboratory
- Creation and maintenance of a building database and map
- Re-test determinations
- Re-test deployment, retrieval and shipment to the laboratory

### 2 EPA Region 8 Technical Contact

- Provides review of Radon Measurement QAPP

### 3 Independent Laboratory

Test kits and laboratory services will be provided by *Radon Testing Corporation of America (RTCA)* of Elmsford, New York. *RTCA* is privately held corporations that manufacture and analyzes activated charcoal radon measurement samplers used for measuring radon concentrations in indoor air. The companies' organization and employee responsibilities may be reviewed in the Appendix A, *Quality Manual*, which is attached to this QAPP.

## III PROBLEM DEFINITION/BACKGROUND

The Ute Mountain Ute Tribal Lands (Tribal Lands) are located mostly in extreme southwestern Colorado, with portions in southeastern Utah and northwestern New Mexico, encompassing four counties, Montezuma (CO), La Plata (CO), San Juan (UT) and San Juan (NM). The Tribal Lands in total are 597,288 acres, including approximately 933 square miles in total area of Trust Lands, and 27,354 acres of Fee Lands that is used primarily for cattle ranching. They are the homeland for the Ute Mountain Ute Tribe's Weeminuche Band whose population is approximately 2,200. The Tribal seat is located in Towaoc (pronounced Toy-uk), Colorado, at the base of the Ute Mountain in Montezuma County. This area is commonly known as The Four Corners Region, reflecting the unique intersection of four

states of Colorado, Utah, New Mexico, and Arizona. The intersection point of the four states is the southwestern corner of Colorado and also of the Tribal Lands. Ute Mountain Ute Tribe (UMUT) has two population centers---Towaoc in Colorado and White Mesa in Utah. The Tribe's economy is based on farming and ranching, gaming and tourism, oil and gas production, and some other small businesses.

Radon is a colorless, odorless radioactive gas that is released from the natural breakdown of uranium in soil, rock and, to some extent, water. It is considered to be the second leading cause of lung cancer in the United States, responsible for approximately 21,000 lung cancer deaths per year. In 1993, the U.S. EPA developed the *Map of Radon Zones*, which identifies areas of high, moderate and low potential for elevated radon levels. The zone delineations are based on criteria including geology, aerial radioactivity, soil permeability, indoor radon measurement data and foundation type. The Counties within the Tribal Lands are in Zone 1 (Montezuma) and Zone 2 (La Plata, San Juan-UT and San Juan-NM). Zone 1 areas are considered to have potential for radon levels above the EPA's 4picoCuries per liter of air (pC/L) action level.

#### **IV PROJECT/TASK DESCRIPTION**

This project involves the measurement of radon within tribally owned public buildings. The measurements will primarily be performed during the winter months when closed-building conditions generally exist as a normal living condition. Each public building will be evaluated through the use of an *RTCA's* short-term (3 to 7 days exposure duration) activated charcoal adsorber test packet. The laboratory results will be compared to the EPA's recommended action level of 4pC/L (to provide maximum environmental health protection for the Tribal lands residents and workers, the residential standard will also be applied to public and commercial buildings). Those homes or public buildings that possess analytical results of 4pC/L or greater will be subject to a follow-up confirmatory test using the same test packet in the same location with identical protocols as the initial measurement. If the average of the two test results remains higher than 4pC/L, the EPD will perform a continuous radon monitoring in cooperation with the Southern Ute Indian Tribe's Environmental Program. If the result of continuous monitoring returns higher than 4pC/L, tenants will be advised to consider mitigation.

#### **V PROJECT OBJECTIVES**

##### **1 Problem Statement**

Smokers face an increased risk of developing radon-related lung cancer and smoking rates are nearly 10% higher among American Indians/Alaska Natives than among the general population (American Lung Association, June 2007).

##### **2 Decision**

The project is intended to continue the assessment of the levels of radon and/or radon decay products in homes and public buildings on the Reservation. The results will be used

to provide the UMUAQ with the necessary information to make informed recommendations to participating homeowners and public building managers regarding indoor air quality and potential mitigation procedures.

### **3 Inputs to Decision**

Short-term (3 to 7 day exposure duration) activated charcoal test packets will be used to measure the radon concentrations in public buildings. The radon test packets will be obtained from, and analyzed by *RTCA*, Elmsford, New York.

### **4 Study Boundaries**

The project is limited to tribally-owned public buildings on the Tribal lands. At each measurement location, an activated charcoal test packet will be placed two (2) to six (6) feet above the floor in the lowest living area of the home or building. The test packet's opening will face toward an open area of the room, and will be placed at least four (4) inches from other objects. The detector will be placed at least 12 inches from the outside walls of the building, and no less than 36 inches from any opening in the outside walls, such as windows or doorways.

### **5 Decision Rule**

If the results of the mitigation measurement exceed the USEPA recommended action level of 4pC/L, appropriate mitigation strategies will be suggested to the resident or building manager.

### **6 Limits on Decision Errors**

Offices or buildings that exhibit analytical results that exceed the USEPA recommended action level of 4pC/L will be offered a second test. All follow-up tests will be conducted using an *RTCA* test packet in the same location with identical protocols as the initial measurement. If the average of the two results exceeds 4pC/L, the homeowner or building manager will be notified and appropriate mitigation techniques will be recommended.

### **7 Design for Obtaining Data**

Tribal-owned public buildings will be measured for radon and/or radon decay products.

## **VI SPECIAL TRAINING REQUIREMENTS/CERTIFICATION**

The Air Quality Technician and Brownfield Coordinator will have successfully completed the self-study and in-house training on radon measurement using charcoal with the Environmental Specialist. When the initial series of survey are complete, they will attend

the training provided by the Midwest Universities Radon Consortium at the University of Minnesota, St. Paul.

## **VII DOCUMENTATION AND RECORDS**

The Environmental Specialist is responsible for ensuring that the most current copy of the QAPP (draft or approved status) is available to project personnel, the EPA Radiation Quality Assurance Coordinator, and the EPA TAP Project Officer. The current version of the QAPP will be identified in the upper right hand corner of each document page.

The Environmental Specialist will ensure that data is recorded appropriately on the test packets and on field data collection sheets, and that the test packets are deployed in sequential order of serial numbers. All entries will be made using indelible ink, with no erasures. If an incorrect entry is recorded, the information will be drawn through with a single strike mark that will be initialed and dated. The Environmental Specialist is responsible for the maintenance of all documents, records and laboratory analytical results.

### **1 Test Packet Deployment/Retrieval Records**

Indelible ink will be used to label all test packets. An in-house field data collection form has been developed for use during the deployment and retrieval of the test packets. The form will include the name of the homeowner, address, location of the device, start date and time, stop date and time, the serial number of the test packet, temperature and any additional information that is pertinent to the test site (such as evidence of tampering or whether “closed-building” conditions exist). This documentation will demonstrate that proper sampling protocol was performed in the field.

### **2 Sample Tracking Records**

Chain-of-custody control will be used for this project. It is important that radon test devices not be exposed to outdoor air without being closed, that radon test kits not to be tampered with during exposure, and that records of shipping devices and a receipt of data can be tracked. A logbook will be used to record shipments and shipping labels will be kept in the radon files. All radon test kits will be kept in original boxes on a designated shelf, and a check off list will be used to track which devices have been deployed, where, and start-stop dates, as well as shipping dates, and receipt of results.

### **3 Analytical Data**

Analytical data will be submitted to the Environmental Specialist by *RTCA* for evaluation and recommendation for re-test, as appropriate. All data will be kept confidential and shared only with the building manager for privacy purposes. The information will be stored in an Excel spreadsheet, which is accessible only to the Environmental Specialist.



## VIII SAMPLING METHODS REQUIREMENTS

The indoor air at each structure included in the project will be tested once using an *RTCA* short-term (3 to 7 day exposure duration) activated charcoal test packet for radon and/or radon decay products. All participants will be reminded to make sure all external doors, windows and vents are kept closed beginning 12 hours before the start of the test period. Placement of the packets will follow the protocols provided by *RTCA*.

### 1 Measurement Device Location Selection

- Each test packet will be placed within the lowest level that contains a room that is used regularly.
- A position should be selected where the detector will not be disturbed during the measurement period and where there is adequate room for the device.
- The test packet should not be placed in areas near drafts caused by heating, ventilation and air conditioning vents, doors, fans and windows. Additionally, areas near excessive heat, such as fireplaces and direct sunlight, and areas of high humidity should be avoided.
- The packet locations should not be less than three (3) feet from windows or other openings in an exterior wall. If there are no openings along the exterior wall, the test device should be placed at least 12 inches from the exterior wall.
- The packet must be placed within the normal breathing zone of two (2) feet to six (6) feet from the floor. It can be placed on a table or shelf, or may be suspended from the ceiling or interior non-masonry wall.

### 2 Preparation of Measurement Device

- Record the test packet serial number on a new field data form, along with the homeowner's name and address.
- Remove the cellophane packaging.
- Using a waterproof pen, record the name and address, test start hour and date on the back of the test packet and on the field data form, as indicated in the Test Starting Instructions Sheet.
- Record the selected location for the test packet deployment on the field data form.
- With the opening of the test packet pointed up, push the opposite sides of the packet together to make a square, as indicated in the Test Starting Instructions Sheet.
- Insert the block of foam into the opening of the packet by holding the block by the plastic tab, inserting it only far enough to match up with the edges of the test packet. Verify that the foam fills the opening and holds the packet open, as indicated in the Test Starting Instructions Sheet.

### 3 Placement Of Measurement Device

- Do not place the test packet within three feet of another activated charcoal device. (Exception: Two test packet devices may be placed within four inches of one another for quality control purposes.)
- Place the open end of the packet with the foam facing an open area of the room.
- Verify that the open end of the packet is not obstructed.

#### 4 Measurement Device Retrieval

- Each test packet will be retrieved no earlier than three (3) days, and no later than seven (7) days, after its deployment.
- **Do not remove the test packet from the area until the packet has been sealed.**
- Remove and discard the foam and plastic hook from the test packet (use scissors to remove the hook).
- Inspect the area for deviations of conditions that had been noted on the field data form at the time of deployment.
- Record the serial number of the test packet on the field data form.
- Record the test end time hour, day of the month, and average room temperature on the back of the packet in the spaces provided, and on the field data form.
- Fold back the envelope flaps on the test packet. Remove the cover tape from the adhesive strip and seal the envelope flaps together.
- Verify that the packet is sealed **air-tight**. Repair any tears or unsealed flaps with a small piece of plastic tape or cellophane tape.
- Mail each test packet to *RTCA* within 24 hours of its retrieval from the test location, following the manufacturer's directions.
- Record the post office location, date, and time the test packet was mailed on the field data form.

### IX SAMPLE HANDLING AND CUSTODY REQUIREMENTS

All tribally-owned facilities will be tested using a dedicated test packet with a unique, pre-printed serial number for proper identification. All required information will be recorded on each test packet and on field data forms using indelible ink. The Environmental Health Specialist is responsible for the care and custody of the test packet samples, including transport of the exposed test packets to the post office for mailing to *RTCA* for analyses. Each test packet will be mailed to *RTCA* within 24 hours of retrieval. Chain-of-custody documentation is not required for this project. *RTCA* will be responsible for logging and storage of the exposed test packets according to their standard procedures.

### X ANALYTICAL METHODS REQUIREMENTS

*RTCA* will analyze all test packets at their analytical laboratory in Elmsford, New York. All test packets will be analyzed in accordance with the procedures outlined in the September 2012 document entitled *QUALITY MANUAL*, in Appendix A, which is attached to this QAPP.

### XI QUALITY CONTROL REQUIREMENTS

The quality assurance objectives for this project are to develop and implement procedures for field sampling, laboratory analyses, and reporting that will provide high quality, reliable results. Specific procedures regarding these items are presented in other sections of the QAPP.

## 1 Precision

Precision is a measure of the degree to which two or more measurements are in agreement. Field precision is assessed through the collection and measurement of field duplicates or replicates, which will be deployed in circumstances involving more than 50 test kits. Total precision is a measurement of the variability associated with the entire sampling and analytical process. It is evaluated through the analyses of duplicate or replicate field samples and measures the variability introduced by both the laboratory and field operations. One field duplicate test packet will be exposed for every ten primary test packet exposures when more than 50 test kits are deployed. Field duplicates will not be deployed in testing individual homes, unless more than 50 residences are tested at one time.

Duplicate results will be assessed using the relative percent difference (RPD) between duplicate test packet measurement concentrations. For duplicate measurements, the RPD will be calculated as follows:

$$RPD = \frac{(D1-D2) \times 100\%}{(D1 + D2) / 2}$$

where:

RPD = relative percent difference

D1 = sample value

D2 = duplicate sample value

The objective for the precision of radon concentrations using *RTCA* test packets at or above 4pC/L is an average of 10 percent relative difference.

## 2 Accuracy

Accuracy is the degree of agreement between an observed value and an accepted reference value. Accuracy in the field is assessed through the adherence to all sample collection, handling, preservation, and holding times. Laboratory accuracy is assessed through the analysis of matrix spikes or standard reference materials, and the determination of percent recoveries. This procedure will be performed by the *RTCA* laboratory, according to their QAPP.

## 3 Representativeness

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. It is dependent on the proper design of the sampling program and will be satisfied by ensuring that the field sampling plan is followed and that proper sampling techniques are used. The Environmental Specialist will ensure that all EPA radon testing protocols for deployment and retrieval of activated charcoal radon detection devices are followed. Representativeness in the laboratory is ensured through the use of proper analytical procedures, analyses of samples within holding times, and analyses and assessment of field duplicate samples when they are used.

#### **4 Comparability**

Comparability is an expression of the confidence with which one data set can be compared with another. It is dependent on the proper design of the sampling program and will be satisfied by ensuring that the field sampling plan is followed and that proper sampling techniques are used. Planned data is comparable when similar sample collection and analytical methods are used and documented in the QAPP. This QAPP addresses comparability by specifying appropriate field methods and presenting the *RTCA* 's *QUALITY MANUAL*, in Appendix A, which is attached to this QAPP.

#### **5 Completeness**

Completeness is the amount of valid data obtained compared to the amount that was expected to be obtained under normal conditions. The number of valid results divided by the number of planned data points, expressed as a percentage, determine the completeness of the data set. Completeness for this project is not specified since the number of data points is contingent upon voluntary participation.

### **XII INSTRUMENTATION/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE RECORDS**

There is no specialized field equipment necessary to implement the test packet deployment/retrieval phase of this project. Each test packet will be evaluated for suitable use prior to deployment as specified in Section B1. The *RTCA* and technical staff will be responsible for all laboratory instrument and equipment tests, inspections and maintenance.

### **XIII INSTRUMENT CALIBRATION AND FREQUENCY**

*RTCA* will be responsible for the calibration of all analytical instruments. The calibration procedures are described in the laboratory's Quality Manual document in Appendix A, which is attached to this QAPP.

### **XIV INSPECTION/ACCEPTANCE REQUIREMENTS FOR SUPPLIES**

Each test packet will be evaluated for suitable use prior to deployment as specified in Section VIII. *RTCA* will be responsible for inspection and acceptance determination of any supplies used in their laboratory.

### **XV DATA MANAGEMENT**

An in-house field data form that includes the name of the homeowner or renter, address, location of the device, start date and time, stop date and time, device ID number,

temperature and any additional information that is pertinent to the test site will be the initial documentation for all test devices deployed. The information will be transferred to an Excel spreadsheet by the Environmental Specialist as the tests are completed. The forms will be bound and kept on file at the EPD office.

Analytical data will be submitted to the Environmental Specialist by *RTCA* for evaluation and recommendation for re-testing, as appropriate. The information will be added to the Excel spreadsheet database and the accuracy of previously transferred data will be verified at that time. All data will be kept confidential and will be shared only with the building manager for privacy purposes.

## **XVI ASSESSMENTS AND RESPONSE ACTIONS**

No external audits are planned for this program. The Environmental Specialist will ensure that the elements of the QAPP are implemented as prescribed. Assessment of test packet deployment, retrieval, scheduling and data management will be periodically performed via discussions between the Environmental Specialist and the Environmental Program Director. Any need for corrective action will be identified during these reviews and implemented immediately.

All laboratory assessments and corrective actions will be performed by *RTCA* according to described in the laboratory's Quality Manual document in Appendix A, which is attached to this QAPP.

## **XVII REPORTS TO MANAGEMENT**

Programmatic and financial status reports will be submitted to the EPA TAP Officer on a bi-annually basis, in accordance with the terms and conditions of the grant.

## **XVIII DATA VALIDATION AND USABILITY**

Sections **VIII** and **IX** of this document outline the details necessary for the consistent deployment, retrieval and sample shipment methods. Adherence to the stated protocols will ensure the data's usability from a field collection standpoint.

Laboratory data validation procedures at *RTCA* is outlined in their *Quality Manual*. The laboratory will provide notice with, or in lieu of, the analytical results with respect the data's accuracy or validity. These notices are related to the following conditions noted by the laboratory on receipt of the test packets:

- Time elapsed since close of the test and receipt at the laboratory
- Exposure to excessive moisture
- Exposure to extreme temperatures
- Insufficient information supplied with the test packet

- Improperly sealed test packets

These notices will be reviewed to assess the usability of an individual analytical result.

## **XIX RECONCILIATION WITH DATA QUALITY OBJECTIVES**

Data quality assessment (DQA) follows the data validation and verification steps. As such, DQA determines how well the validated data can support their intended use. The Environmental Specialist will evaluate the data to determine if it will meet the data quality objectives outlined in Section V.

## **XX REFERENCES**

Map of Radon Zones, <http://www.epa.gov/radon/zonemap.html>

Radon Measurement Proficiency Program Handbook, 1991. USEPA Air and Radiation (ANA-464), EPA 5201/1-91-006.

## **XXI APPENDICES**

A. *Radon Testing Corporation of America (RTCA)'s Quality Manual*