ATLAS CORPORATION

Republic Plaza, 370 Seventeenth Street, Suite 3140
Denver, CO 80202
Telephone (303) 629-2440 Fax: (303) 629-2445

RICHARD E. BLUBAUGH
Executive Vice President

April 20, 1999

King Stablein, Chief
U.S. Nuclear Regulatory Commission
High-Level Waste and Uranium Recovery
Projects Branch (MS-T7J9)
Division of Waste Management
Office of Nuclear Material Safety and Safeguards
Washington, D.C. 20555-0001

**Re: Docket No. 40-3453, Request to Amend License No. SUA-917 to Permit the Installation of a New Gas Pipeline within the Restricted Area**

Dear Mr. Stablein:

This is a request to amend Source Material License No. SUA-917 to permit Mid-Atlantic Pipeline Company (MAPCO) to install a new gas pipeline in its existing easement across Atlas' property and within the restricted area of the Atlas mill and tailings site. The enclosed drawing (MAPCO No. 601-UT-GR-RX-49.1, last revised 3-15-99) contains the easement alignment and details of the pipeline installation. Atlas has agreed to allow MAPCO to install a new 16-inch diameter gas pipeline within the confines of the existing easement and in a new extension of that easement provided MAPCO meets NRC requirements. In addition to placing the new pipeline sufficiently below the design grade of the proposed reclamation plan, MAPCO also will lower the existing 10-inch pipeline, although not necessarily at the same time.

Atlas advised MAPCO that a plan for preventing contaminated or potentially contaminated soils being placed over the newly placed pipeline would be necessary. This requirement resulted from a telephone conversation between the undersigned and Messrs. Holonich and Fliegel on November 30, 1998.

The enclosed plan, "Installation of New Gas Pipeline within Restricted Area of the Atlas Mill Tailings Site," prepared by Environmental Restoration Group, Inc. of Albuquerque, New Mexico, addresses decontaminating surface soils in the pipeline corridor prior to excavation, development of a gamma radiation action level, removal of contaminated soil and excavation control monitoring, surface soil verification, trenching and backfill procedures and restoration of the pipeline corridor. Preparatory to the excavation and pipeline placement, MAPCO performed four shallow borings in the easement right-of-way. Sample results (enclosed) for Gross Alpha, Gross Beta, Ra-226 and uranium were



NL05

B/3

analyzed by Barringer Laboratories, Inc. of Golden, Colorado, for the soils collected from 6-inches to one-foot and from one-foot to two-feet. The results will assist MAPCO in directing its decontamination and monitoring efforts.

In addition, MAPCO has agreed that personnel monitoring will be necessary and will be conducted under existing NRC approved procedures. Atlas' existing personnel monitoring procedures will be followed to monitor potential personnel exposure to radioactive materials during the pipeline installation process.

Atlas Corporation hereby requests NRC to amend License SUA-917 to permit MAPCO to install the new 16-inch pipeline and to lower the existing 10-inch pipeline, both within the restricted area, in accordance with the enclosed plan and procedures and the existing personnel monitoring procedures.

Further, as MAPCO is progressing rapidly in its project to the point where it needs to begin final planning for the installation across Atlas' property, Atlas requests that NRC act on this license amendment request as expeditiously as possible.

We look forward to hearing from you soon. Please contact the undersigned if you have any questions concerning this request.

Sincerely,

Richard E. Blubaugh

Enclosures

cc: G. B. Shafter
D. L. Edwards
Gary Harkey, MAPCO

**Installation of New Gas Pipeline within Restricted Area of the Atlas Mill Tailings Site**

License No. SUA-917
Docket No. 40-3453

February 1998

Prepared for:

Atlas Corporation
Atlas Minerals Uranium Mill Site
Republic Plaza
370 Seventeenth Street, Suite 3050
Denver, CO 80202

Prepared by:

Environmental Restoration Group, Inc.
12809 Arroyo de Vista NE
Albuquerque, NM 87111

**Installation of New Gas Pipeline within Restricted Area of the Atlas Mill Tailings Site**

## 1.0 Introduction

Atlas Corporation, owner of the Atlas Minerals Uranium Mill Site, intends to allow Mid Atlantic Pipeline Company (MAPCO) to exercise its option of laying a gas pipeline across the northeastern edge of the mill site. The 30-ft wide easement lies along State Highway 190 within the radiological control area and does not encroach upon the area where the uranium mill tailings pile will be stabilized. A corridor up to 150 feet wide and 1400 feet long will be decontaminated prior to laying the pipeline. Work associated with laying the pipe will be constrained to the decontaminated corridor.

The corridor passes through areas of the site where ore handling was the primary activity. Windblown tailings and uranium processing liquids or other residues should have had no or minimal impact on this portion of the site.

Atlas has prepared this plan and associated procedures to assure that the corridor meets the unrestricted release criteria of 10 CFR Part 40, Appendix A, Technical Criterion No. 6. The plan addresses removal of the contaminated material, soil verification, monitoring for radioactivity during the digging of the pipe trench and the placement of backfill, and site restoration. All work will be done in accordance with existing Atlas radiation safety procedures as specified in the NRC Radioactive Materials License.

## 2.0 Plan for Decontaminating Surface Soils in Pipe Corridor

### 2.1 Preliminary Radiological Survey

A radiological survey will be conducted in the pipe corridor to establish gamma-ray levels prior to soil removal. A 2-inch by 2-inch NaI detector will be coupled to a ratemeter/scaler and the area scanned using standard operating procedures. Gamma-ray levels will be documented at a density sufficient to delineate areas exhibiting tailings or ore concentrations above background. If there is evidence of gamma shine from the nearby tailings pile or other sources, a lead collimator will be placed on the detector to minimize these external influences.

### 2.2 Development of a Site Background Ra-226 Concentration

In order to assure compliance with the cleanup criteria, a site background Ra-226 concentration will be developed using procedures specified in Appendix D of the Final Reclamation Plan for the Uranium Mill and Tailings Area Located in Moab, Utah.

### 2.3 Development of a Gamma-Ray Action Level

Since there are no historical records or other evidence of spillage of processed uranium or process liquids in this area, elevated gamma levels will be assumed to arise from the presence of Ra-226 from uranium ore with only a slight possibility of windblown tailings contamination. A gamma-ray action level for the radiological survey equipment will be developed by correlating soil sample Ra-226 results with the corresponding gamma-ray count rates using Standard Operating Procedure 2.09 (attached). A gamma-ray action level corresponding to 5 pCi/g above background, at the 95 percent confidence level, will be calculated.

An on-site NaI gamma-ray spectrometer will be used to analyze the soil samples. If time does not permit for full in-growth of the Rn-222 and daughters, a quick-count technique will be employed. This technique compensates for the fact that the Rn-222 in the samples has not reached secular equilibrium. The samples will be dried and sealed. Samples will be counted approximately one day after they are sealed and again after two or more days. The Ra-226 concentration will then be calculated using radioactive decay equations. A minimum of 20 percent of the soil samples will be sent to a vendor laboratory for confirmation of the on-site analyses.

### 2.4 Contaminated Soil Removal and Excavation Control Monitoring

Contaminated surface soils will be removed from the pipe corridor using a blade (road grader) or other heavy equipment. The contaminated soils will transported to a central location within the site. Standard industrial dust suppression methods will be applied, if necessary. Radiological surveys will be conducted after lifts of contaminated soil are removed. Lifts will be removed until all excavated areas are below the gamma action level. In areas where gamma shine prevents the action level to be met, verification of cleanup will rely upon sampling of the affected grid blocks.

### 2.5 Surface Soil Verification

The excavated area will be divided into grid blocks of approximately 100 $m^2$. A final high density radiological survey will be conducted to assure that no grid block gamma levels exceed the action level. An average gamma-ray level for each grid block will be developed by averaging a minimum of nine gamma measurements within each grid block or by taking an integrated count rate for one minute while walking within the grid block at regular intervals.

A minimum of ten percent of the grid blocks will be samples. Grids with the highest average gamma levels will be included in this ten percent. Additional grid blocks will be sampled if they are required to obtain a representative sample from each region of the corridor. This will occur only if most of the grid blocks with the highest average gamma levels are grouped in one segment of the corridor. The top six-inch layer will be sampled by preparing a five-point-composite sample using SOP 2.10 (attached). The samples will be analyzed on the on-site gamma spectrometer. Grid blocks not meeting the cleanup criterion of 5 pCi/g above background will be further decontaminated until the Ra-226 concentrations for all sampled grid blocks are within the 5 pCi/g plus background limit. Should a failure occur, the grid block with the next highest average gamma count rate will be sampled. This process will continue until no failures occur. All final verification samples will be submitted to a vendor laboratory for Ra-226 analysis.

## 3.0 Trenching and Backfill

During the digging of the pipe trench, the operator will be instructed to advise management of any soil that has the properties of fill material. A determination will be made in each case whether the material has radiological contamination using a combination of gamma-ray measurements and analysis of soil samples. Contaminated material will be removed from the area until near background levels are reached. The final excavated surface will be documented (location, depth, etc.). A five-point composite sample will be prepared for each 100 $m^2$ area and analyzed on the on-site spectrometer and compared to the 15 pCi/g plus background cleanup limit for subsurface areas, assuming that backfill will be applied to the area. If the excavated surface is smaller than 100 $m^2$, the sampling procedure will be applied to that surface by taking a five-point composite sample.

Should subsurface contamination be found in an extended area, the contaminated soil within forty feet of the centerline of the pipe trench will be removed. If necessary, areas where contamination extends beyond that boundary will be documented so that the contaminated soils may be removed at a later date.

Prior to placement of the clean trench material as backfill, a gamma survey of the pile will be conducted. Any anomaly above the gamma action level will be investigated via soil sampling and on-site gamma spectral analysis. Only soils with Ra-226 concentrations less than 5 pCi/g plus background will be used for backfill.

## 4.0 Restoration

All contaminated material will be consolidated in a low profile pile and stabilized with a chemical stabilizer, soil cover, or synthetic cover. The corridor will be graded so that the area is free draining with no water collection points within the area. The area will then be seeded.

**Standard Operating Procedure 2.09**

**Correlation Between Gamma-Ray Measurements and Ra-226 in Soil**

## 1. Purpose

To describe the procedure for developing a correlation between hand-held gamma-ray measurement instruments and the Ra-226 concentration in the top 6-inch layer of soil.

## 2. Discussion

The cleanup of surface soils contaminated with Ra-226 normally is done using in-situ gamma-ray measurements to guide the cleanup activities. Such factors as emanation fraction, Ra-226 concentration vertical profile, gamma shine from nearby sources, and topography all have an influence on the gamma-ray measurements and the technician has to be aware of these possible influences when interpreting measurements. With these precautions, the use of this technique for most situations has been demonstrated to provide sufficient accuracy to assure that an area has been successfully decontaminated.

The procedure that follows results in a correlation between Ra-226 concentration in the top 6-inches of soil and the gamma-ray count rate from hand-held radiation detectors. It is appropriate for use in areas where there are no strong gamma-ray sources, no buried radioactive material, and where the topography is relatively flat.

## 3. Procedure

### 3.1 Field Equipment

_______Radiation detectors and associated rate meters, scalers, and collimators

_______Post-hole digger or other tools used for obtaining 6-inch deep soil samples

_______MicroR-meter capable of measuring exposure rates ranging from background levels to 100 microR/h

_______Soil Sample labels and bags

_______Copies of Form 209A (one for each point) and Form 2.09B(one for each instrument)

_______Ink pen

_______Measuring tape (6 feet minimum)

### 3.2 Field Data Collection

A. Using the microR meter, locate study areas generally contaminated at levels that provide exposure rate readings taken at 1 meter height of background, 18, 20, 25, 30, 35, 40, and 50 microR/h. Areas should not be in shine areas and should be on relatively flat terrain. Each study area should be large enough that a few steps in any direction should not affect the reading. Record the data for each location on ERG Form 2.09A.

B. At each study area, strike a 36-inch diameter circle on the ground surface. Give each area a unique identifier (e.g. SP1, SP2, etc). All gamma measurements should be made at the center of the circle and at a height specified on the data sheet. The height should be determined by the height that the detector is placed during actual use (e.g., microR meter at 1 m, bare NaI probe at 12-18 inches, collimated NaI probe at 6 inches). Assure that this height is maintained during all measurements.

C. Prior to disturbing the surface soils, make all gamma-ray measurements and record the results on the ERG Form 2.09B data form. For rate meters, put the response switch on slow and wait for 10 seconds with the detector in place. Look at the meter 10 times and record the readings. When using a rate meter/scaler, integrate the counts over a one minute counting time. A single measurement is sufficient when using the instrument in the scaler mode using a counting time to detect 10,000 or more events. Record the data on the ERG Form 2.09B data form for that study point.

D. After all gamma-ray data are reviewed for completeness, draw perpendicular lines through the center of the circle. Take five soil samples from each circle to a depth of six inches. The first sample should be taken from the center of the circle. The other four samples should be centered at a distance of nine inches from the center and on the perpendicular lines. Label the five samples using the study area unique identifier followed by the sample number (e.g. SP1-1, SP1-2, SP1-3, etc.). Record the sample numbers on Appendix A data form.

E. Repeat the above steps for each study point.

### 3.3 Laboratory

A. Dry each sample using standard operating procedures

B. Make a composite sample using an equal mass of soil from each of the five samples for each point. Pulverize and blend the composite sample until a homogeneous mixture has been obtained. Label this sample with a unique identifier that can be traced to the specific study point.

C. Select aliquots from the composite samples of appropriate size for analysis and QA checks.

D. Perform the Ra-226 assays using standard operating procedures.

### 3.4 Data Analysis

A. Enter the Ra-226 concentration-gamma count rate data pairs for each instrument in a spreadsheet (e.g. Lotus 123) having the capability to do a linear regression.

B. Do a least-squares linear regression and plot the results. Evaluate the suitability of the results for use in predicting the Ra-226 concentrations in soils.

C. Develop cut-off gamma count-rates and/or exposure rates that correspond to Ra-226 concentrations of interest, considering errors in predicting the concentrations and desired safety factors. Confidence limit lines may be calculated and displayed with the correlation using methods described in Walpole, R. E. & Meyers, R. H., 1978. Probability and Statistics for Engineers and Scientists. New York, New York: Macmillan Publishing Company.

ERG Form 2.09A

| Location I.D. | Exposure Rate | Soil Sample Numbers | Location I.D | Exposure Rate | Soil Sample Numbers |
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ERG Form 2.09B

Ratemeter/Scaler Model____________________ Detector ____________________

Serial Number____________________ Serial No.____________________

Count Time____________________(if applicable) Reading units____________________

Technician____________________

| Location I. D. | Reading |
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| Location I. D. | Reading |
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## STANDARD OPERATING PROCEDURE 2.10

## VERIFICATION SAMPLING FOR RELEASE OF LAND

### 1.0 Purpose

This procedure provides guidance on conducting radiological surveys for Ra-226 contaminated soils to assure that the area meets the cleanup criteria. The most common cleanup criteria are specified in terms of a limit for Ra-226 of 5 pCi/g above background, averaged over a 15-cm thick layer of 100 $m^2$ area for the top surface layer and a limit of 15 pCi/g above background for deeper layers.

### 2.0 Discussion

This procedure presents the approach for conducting the soil sampling associated with demonstrating compliance with the cleanup criteria. It is the responsibility of the user to assure that this procedure conforms to the plan that has been approved by the appropriate regulatory agency.

### 3.0 Procedure

### 3.1 Field Equipment

______ Post-hole digger or other tools used for obtaining 6-inch deep soil samples

______ Hand trowel or spatula

______ Plastic bags and soil sample labels

______ Indelible ink pen

______ Measuring tape

### 3.2 Soil Sampling

A. Using a tape measure or knotted rope, mark the location of the center of the grid block and the four other sampling locations as shown in Figure 1.

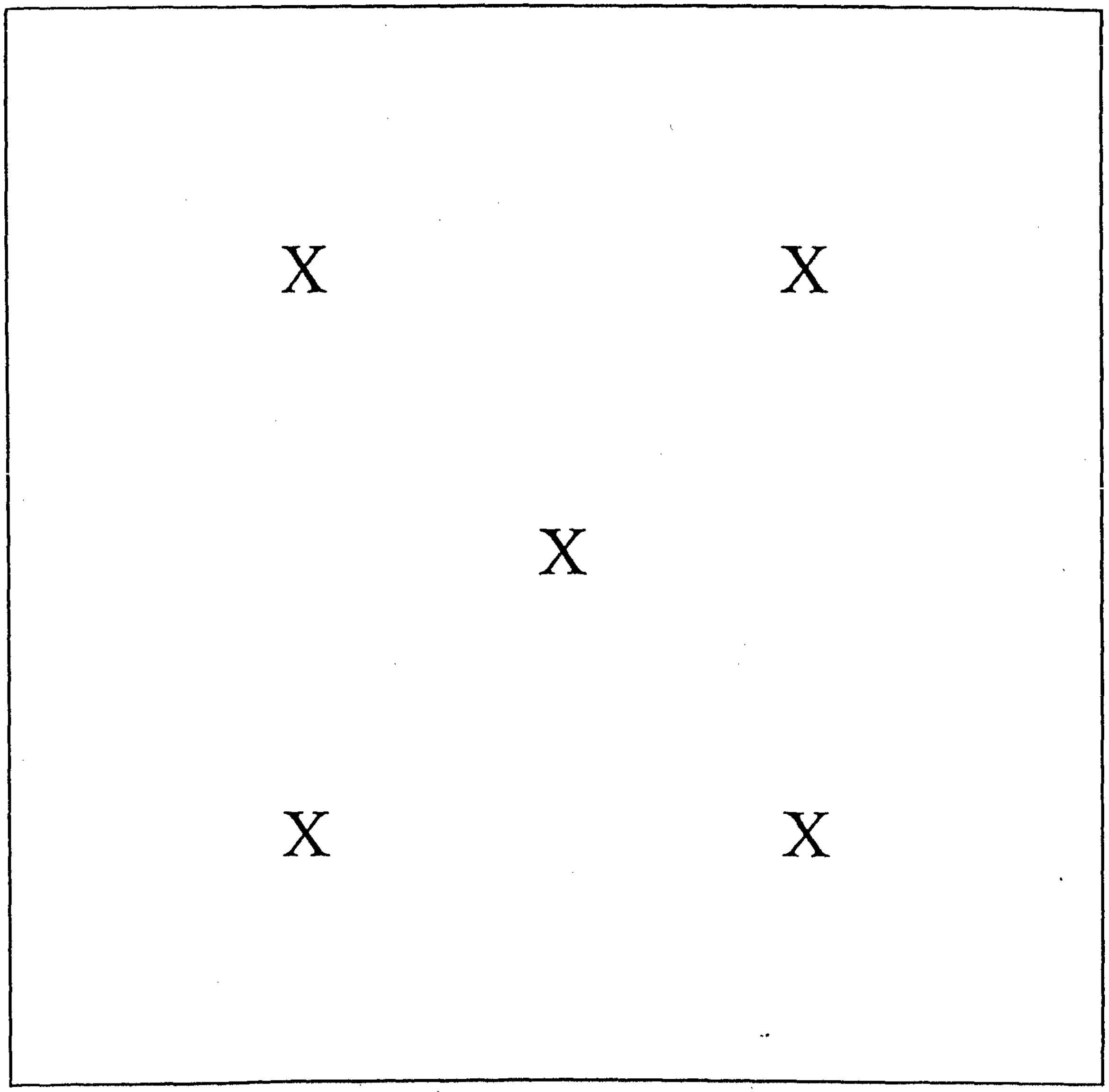
B. Take a six-inch deep soil sample at each of the five locations. Assure that the sample shape is as close to a right circular cylinder as possible so that it is representative of the six-inch layer. Another method is to dig a post hole and take uniform side wall samples with a hand spatula or other tool. Bag each sample individually, labeling the sample with a unique identifier that is linked to the grid block and sample location (e. g. H3-C, H3-NW, H3-NE, etc. are samples from grid block H3).

C. Dry each sample.

D. Take an equal mass from each of the five samples to prepare a composite sample. Pulverize and blend the composite sample until a homogeneous mixture has been obtained. Fill a sample jar or to the desired mass, seal and label the sample with the sample number, seal date and time.

E. Carefully archive the individual samples and unused portion of the composite so that it may be identified and retrieved at a later date.

Figure 1 Grid Block Sampling Locations



# Rocky Mountain Loop Project
# Existing 10" Rocky Mountain Pipeline
# Proposed Line Lowering

**API RP 1117 PIPE LOWERING**

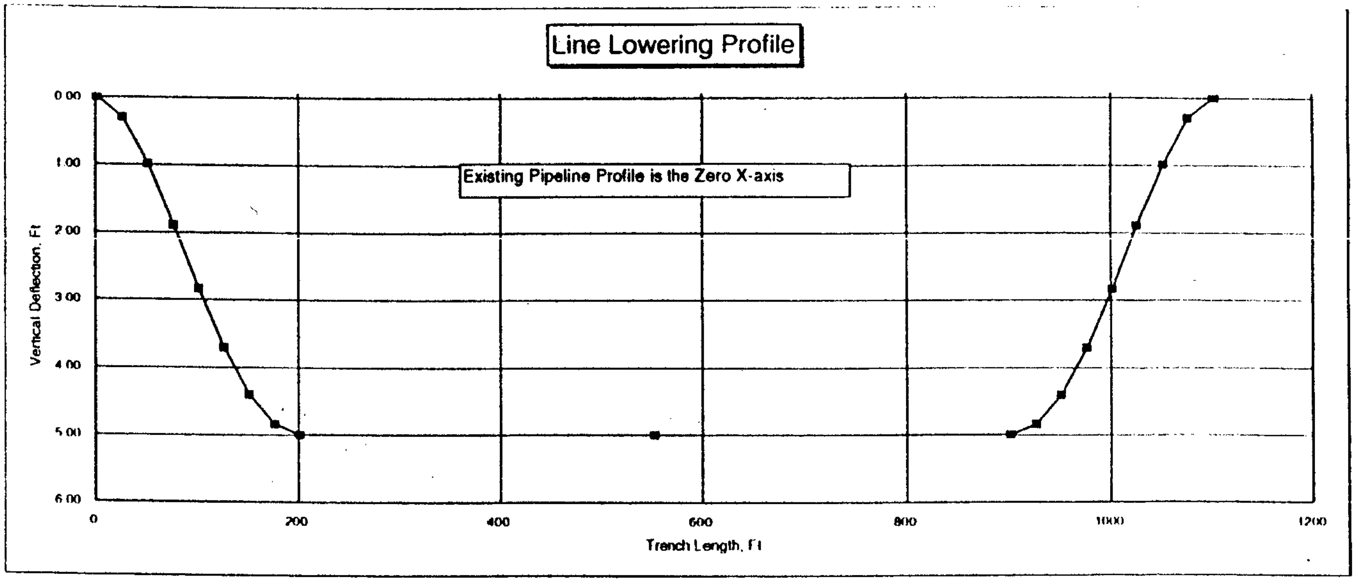
| | |
|---|---|
| MAOP, P= | 1440 PSI |
| PIPE OD, D= | 10.75 IN |
| PIPE WT, t= | 0.25 IN |
| DESIRED VERTICAL DEFLECTION, DELTA= | 5 FT |
| Original Installation Temperature of pipe, T1= | 95 F |
| Operating Temperature of pipe when Lowering, T2= | 60 F |
| DESIGN FACTOR, Fd= | 0.78 |
| SMYS= | 52,000 PSI |
| POISSON'S RATIO, u= | 0.3 |
| ELASTIC MODULUS, E= | 2.9E+07 PSI |
| LINEAR COEFFICIENT OF EXPANSION, ALPHA= | 0.0000065 /F |

| | |
|---|---|
| LONGITUDINAL TENSILE STRESS DUE TO INTERNAL PRESS, Sp= | 9,288 PSI |
| LONGITUDINAL TENSILE STRESS DUE TO TEMP CHANGE, St= | 6,598 PSI |
| EXISTING LONGITUDINAL STRESS IN PIPE, Se= | 15,886 PSI |
| TOTAL TRENCH LENGTH TO ACHIEVE MIDSPAN DEFLECTION, L= | 403 FT |
| LENGTH OF OBSTRUCTION, Lo= | 700 FT |
| TOTAL LENGTH OF PIPE LOWERING, Lt= | 1103 FT |
| TRENCH LENGTH TO REACH MAX MIDSPAN DEFLECTION PT, L/2= | 202 FT |
| CENTER LINE OF OBSTRUCTION CROSSING, CL= | 3,207,915 FT |
| MAX FREESPAN BETWEEN PIPE SUPPORTS, Ls= | 57.40 FT |

TABLE 1 - Profile elevations

| Station (ft) | X, ft | | Deflection (ft) |
|---|---|---|---|
| 3,207,363 | 0 | | 0.00 |
| 3,207,363 | 0 | | 0.00 |
| 3,207,363 | 0 | | 0.00 |
| 3,207,363 | 0 | | 0.00 |
| 3,207,363 | 0 | | 0.00 |
| 3,207,363 | 0 | | 0.00 |
| 3,207,363 | 0 | | 0.00 |
| 3,207,363 | 0 | | 0.00 |
| 3,207,365 | 2 | | 0.00 |
| 3,207,390 | 27 | | -0.31 |
| 3,207,415 | 52 | | -1.00 |
| 3,207,440 | 77 | | -1.90 |
| 3,207,465 | 102 | | -2.84 |
| 3,207,490 | 127 | | -3.71 |
| 3,207,515 | 152 | | -4.40 |
| 3,207,540 | 177 | | -4.85 |
| 3,207,565 | 202 | MIDSPAN | -5.00 |
| 3,207,915 | 552 | CL OBST | 5.00 |
| 3,208,265 | 902 | MIDSPAN | 5.00 |
| 3,208,290 | 927 | | 4.85 |
| 3,208,315 | 952 | | 4.40 |
| 3,208,340 | 977 | | 3.71 |
| 3,208,365 | 1002 | | 2.84 |
| 3,208,390 | 1027 | | 1.90 |
| 3,208,415 | 1052 | | 1.00 |
| 3,208,440 | 1077 | | 0.31 |
| 3,208,465 | 1102 | | 0.00 |
| 3,208,467 | 1103 | | 0.00 |
| 3,208,467 | 1103 | | 0.00 |
| 3,208,467 | 1103 | | 0.00 |
| 3,208,467 | 1103 | | 0.00 |
| 3,208,467 | 1103 | | 0.00 |
| 3,208,467 | 1103 | | 0.00 |
| 3,208,467 | 1103 | | 0.00 |
| 3,208,467 | 1103 | | 0.00 |

**DRAWING NO.** 10" Rocky Mountain Pipeline dwg no. gr49_1



BARRINGER LABORATORIES, INC.
15000 W. 6TH AVE., SUITE 300 GOLDEN, CO 80401 (303) 277-1687 FAX (303) 277-1689

2-Mar-99

Dave Fadling
TERRACON
92 West 3900 South
Suite 100
Salt Lake City, UT 84107

Attn:
Project: Atlas 61995002 PO #:
Received: 17-Feb-99 09:45

Job: 991380E Status: Final

**ANALYTICAL REPORT PACKAGE**

BARRINGER LABORATORIES, INC.
15000 W. 6TH AVE., SUITE 300 GOLDEN, CO 80401 (303) 277-1687 FAX (303) 277-1689

2-Mar-99
Page: i

Dave Fadling
TERRACON
92 West 3900 South
Suite 100
Salt Lake City, UT 84107

Attn:
Received: 17-Feb-99 09:45
Project: Atlas 61995002 PO #:

Job: 991380E Status: Final

**CASE NARRATIVE**

A total of 8 Soil samples were received on 17-Feb-99. As stated in the chain of custody, the samples were run for the following analyses: Gross Alpha, Gross Beta, Ra-226 and U. A table, to cross reference your sample ID to ours, is attached. Our procedures are summarized on the Quality Control Data Sheet.

Quality control standards for organic and inorganic analyses followed the appropriate SW-846 or EPA methodology. Quality control standards for radiochemistry followed our standard operating procedures or contractual requirements.

Signed: ............ 3/4/99
Radiochemistry
Manager

Signed: ............
Project Review 3/4/99

BARRINGER LABORATORIES, INC.
15000 W. 6TH AVE., SUITE 300 GOLDEN, CO 80401 (303) 277-1687 FAX (303) 277-1689

2-Mar-99
Page: ii

Dave Fadling
TERRACON
92 West 3900 South
Suite 100
Salt Lake City, UT 84107

Attn:
Received: 17-Feb-99 09:45
Project: Atlas 61995002
PO #:

Job: 991380E
Status: Final

| Lab-ID | Matrix | Client Sample ID | Sampled |
|---|---|---|---|
| 991380-1 | Soil | B-1 @ 0.5-1.0 | 11-Jan-99 |
| 991380-2 | Soil | B-1 @ 1.0-2.0 | 11-Jan-99 |
| 991380-3 | Soil | B-2 @ 0.5-1.0 | 12-Jan-99 |
| 991380-4 | Soil | B-2 @ 1.0-2.0 | 12-Jan-99 |
| 991380-5 | Soil | B-3 @ 0.5-1.0 | 13-Jan-99 |
| 991380-6 | Soil | B-3 @ 1.0-2.0 | 13-Jan-99 |
| 991380-7 | Soil | B-4 @ 0.5-1.0 | 13-Jan-99 |
| 991380-8 | Soil | B-4 @ 1.0-2.0 | 13-Jan-99 |

BARRINGER LABORATORIES, INC.
15000 W. 6TH AVE., SUITE 300 GOLDEN, CO 80401 (303) 277-1687 FAX (303) 277-1688

2-Mar-99
Page: R-1
Job: 991380E
Status: Final

TERRACON

Analyte: Gross Alpha
Fraction: Total
Method: 900.0
Units: pCi/g

Project: Atlas 61995002
Date Analyzed: 02/24-03/02
LLD: sample specific

| Lab Id | Date Sampled | Matrix | Sample Id | Concentration± 2σ | LLD |
|---|---|---|---|---|---|
| 991380-1 | 11-Jan-99 | Soil | B-1 @ 0.5-1.0 | 34±8 | 9 |
| 991380-2 | 11-Jan-99 | Soil | B-1 @ 1.0-2.0 | 4±5 | 8 |
| 991380-3 | 12-Jan-99 | Soil | B-2 @ 0.5-1.0 | 286±19 | 8 |
| 991380-4 | 12-Jan-99 | Soil | B-2 @ 1.0-2.0 | 143±15 | 8 |
| 991380-5 | 13-Jan-99 | Soil | B-3 @ 0.5-1.0 | 3±5 | 8 |
| 991380-6 | 13-Jan-99 | Soil | B-3 @ 1.0-2.0 | 12±6 | 8 |
| 991380-7 | 13-Jan-99 | Soil | B-4 @ 0.5-1.0 | 70±10 | 8 |
| 991380-8 | 13-Jan-99 | Soil | B-4 @ 1.0-2.0 | 12±6 | 8 |

Analyte: Gross Beta
Fraction: Total
Method: 900.0
Units: pCi/g

Project: Atlas 61995002
Date Analyzed: 02/24-03/02
LLD: sample specific

| Lab Id | Date Sampled | Matrix | Sample Id | Concentration± 2σ | LLD |
|---|---|---|---|---|---|
| 991380-1 | 11-Jan-99 | Soil | B-1 @ 0.5-1.0 | 34±7 | 10 |
| 991380-2 | 11-Jan-99 | Soil | B-1 @ 1.0-2.0 | 15±7 | 10 |
| 991380-3 | 12-Jan-99 | Soil | B-2 @ 0.5-1.0 | 158±12 | 14 |
| 991380-4 | 12-Jan-99 | Soil | B-2 @ 1.0-2.0 | 87±9 | 12 |
| 991380-5 | 13-Jan-99 | Soil | B-3 @ 0.5-1.0 | 23±6 | 9 |
| 991380-6 | 13-Jan-99 | Soil | B-3 @ 1.0-2.0 | 24±6 | 9 |
| 991380-7 | 13-Jan-99 | Soil | B-4 @ 0.5-1.0 | 52±8 | 10 |
| 991380-8 | 13-Jan-99 | Soil | B-4 @ 1.0-2.0 | 20±7 | 10 |

Analyte: Ra-226
Fraction: Total
Method: SM-705
Units: pCi/g

Project: Atlas 61995002
Date Analyzed: 02/23-02/24
LLD: sample specific

| Lab Id | Date Sampled | Matrix | Sample Id | Concentration± 2σ | LLD |
|---|---|---|---|---|---|
| 991380-1 | 11-Jan-99 | Soil | B-1 @ 0.5-1.0 | 8.6±1.4 | 0.4 |
| 991380-2 | 11-Jan-99 | Soil | B-1 @ 1.0-2.0 | 0.8±0.5 | 0. |
| 991380-3 | 12-Jan-99 | Soil | B-2 @ 0.5-1.0 | 53.6±3.53 | 0.39 |
| 991380-4 | 12-Jan-99 | Soil | B-2 @ 1.0-2.0 | 32.1±2.84 | 0.52 |
| 991380-5 | 13-Jan-99 | Soil | B-3 @ 0.5-1.0 | 1.5±0.65 | 0.4 |
| 991380-6 | 13-Jan-99 | Soil | B-3 @ 1.0-2.0 | 1.0±0.60 | 0.5 |
| 991380-7 | 13-Jan-99 | Soil | B-4 @ 0.5-1.0 | 10.8±1.65 | 0.58 |
| 991380-8 | 13-Jan-99 | Soil | B-4 @ 1.0-2.0 | 1.4±0.68 | 0.6 |

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2-Mar-99
Page: R-2
Job: 991380E
Status: Final

TERRACON

Analyte: Uranium
Fraction: Total
Method: ASTM D2907
Units: µg/g

Project: Atlas 61995002
Date Analyzed: 02/23-02/24
LLD: 0.2

| Lab Id | Date Sampled | Matrix | Sample Id | Concentration | LL[illegible] |
|---|---|---|---|---|---|
| 991380-1 | 11-Jan-99 | Soil | B-1 @ 0.5-1.0 | 15 | 0.[illegible] |
| 991380-2 | 11-Jan-99 | Soil | B-1 @ 1.0-2.0 | 4.3 | 0.[illegible] |
| 991380-3 | 12-Jan-99 | Soil | B-2 @ 0.5-1.0 | 17 | 0.[illegible] |
| 991380-4 | 12-Jan-99 | Soil | B-2 @ 1.0-2.0 | 93 | 0.[illegible] |
| 991380-5 | 13-Jan-99 | Soil | B-3 @ 0.5-1.0 | 4.9 | 0.[illegible] |
| 991380-6 | 13-Jan-99 | Soil | B-3 @ 1.0-2.0 | 3.8 | 0.[illegible] |
| 991380-7 | 13-Jan-99 | Soil | B-4 @ 0.5-1.0 | 43 | 0.[illegible] |
| 991380-8 | 13-Jan-99 | Soil | B-4 @ 1.0-2.0 | 6.2 | 0.[illegible] |

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2-Mar-99
Page: Q-1
Job: 991380E
Status: Final

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QUALITY CONTROL REPORT

| Sample Id | Gross Alpha Total pCi/g | + 2σ | Gross Beta Total pCi/g | + 2σ |
|---|---|---|---|---|
| Duplicate | 143 | ±15 | 87 | ±9 |
| Duplicate | 164 | ±16 | 93 | ±9 |
| RER | 0.39 | | 0.20 | |
| Std (found value) | 102 | ±4 | 88 | ±2 |
| Std (true value) | 103 | | 87 | |
| Std % rec. | 99 | | 100 | |
| Blank | 0.0 | ±0.2 | 0.0 | ±0.4 |
| Spike % rec. | 98 | | 100 | |

| Sample Id | Ra-226 Total pCi/g | + 2σ |
|---|---|---|
| Duplicate | 0.8 | ±0.5 |
| Duplicate | 1.1 | ±0.53 |
| RER | 0.28 | |
| Std (found value) | 107 | ±6.84 |
| Std (true value) | 99.0 | |
| Std % rec. | 108 | |
| Blank | 0 | ±0.1 |
| Spike % rec. | 103 | |

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2-Mar-99
Page: Q-2
Job: 991380E
Status: Final

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QUALITY CONTROL REPORT

| Sample Id | Uranium Total µg/g |
|---|---|
| Duplicate | 6.2 |
| Duplicate | 6.3 |
| RPD | 2.9 |
| Std (found value) | 510 |
| Std (true value) | 510 |
| Std % rec. | 100 |
| Blank | U |
| Spike % rec. | 98 |

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2-Mar-99
Page: Q-3

Dave Fadling
TERRACON
92 West 3900 South
Suite 100
Salt Lake City, UT 84107

Attn:
Received: 17-Feb-99 09:45
Project: Atlas 61995002
PO #:

Job: 991380E
Status: Final

**Abbreviations:**

**Parameters:**
Ra-226 : Radium-226

**Units:**
pCi/g : picoCuries per gram
µg/g : micrograms per gram

**Quality codes:**
U : Undetected

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2-Mar-99
Page: Q-4

Dave Fadling
TERRACON
92 West 3900 South
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Salt Lake City, UT 84107

Attn:
Received: 17-Feb-99 09:45
Project: Atlas 61995002 PO #:

Job: 991380E Status: Final

QUALITY CONTROL DATA SHEET

Received by: kz Via: UPS

Sample Container Type: plastic bag
Additional Lab Preparation: 100 Mesh

| Parameter | Method | Preservative | Init | Analysis Dates |
|---|---|---|---|---|
| Gross Alpha | 900.0 | None | CWP | 02/24-03/02 |
| Gross Beta | 900.0 | None | CWP | 02/24-03/02 |
| Ra-226 | SM-705 | None | AML | 02/23-02/24 |
| U | ASTM D2907 | None | FT | 02/23-02/24 |

Barringer Laboratories, Inc. will return or dispose of your samples 30 days from the date your final report is mailed, unless otherwise specified by contract. Barringer Laboratories, Inc. reserves the right to return samples prior to the 30 days if radioactive levels exceed our license.