

RADIOLOGIC AND ENGINEERING ASSESSMENT

FOR

DOE ID NO.: GJ-00343-CS  
ADDRESS: 711 HORIZON DRIVE

SEPTEMBER 1987

FOR

URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT OFFICE

ALBUQUERQUE OPERATIONS OFFICE

DEPARTMENT OF ENERGY

BY

UNC GEOTECH  
P.O. Box 14000  
Grand Junction, Colorado 81502-5504

APPROVED BY

Joseph E. Virgona  
J. VIRGONA  
DOE PROJECT ENGINEER

DATE

9/15/87

**SUPPLEMENTAL  
STANDARDS**

G00343RE:993A

8711030433 870929  
PDR WASTE  
WM-39 PDR

## 1.0 INTRODUCTION

The property is a commercial business located at 711 Horizon Drive, Grand Junction, Colorado.

The legal description is as follows: Beginning north  $89^{\circ} 57' 30''$  west 275 feet and north  $0^{\circ} 02' 30''$  east 389.3 feet from the south 1/4 corner of Section 36, T.1N, R.1W of the Ute Meridian, thence north  $31^{\circ} 32' 30''$  east 175 feet, thence north  $58^{\circ} 27' 30''$  west 344.95 feet, thence south  $15^{\circ} 36'$  west 189.18 feet, thence south  $58^{\circ} 27' 30''$  east 300 feet to the beginning, Mesa County, Colorado.

The purpose of this assessment is to evaluate the extent of uranium millsite contamination at this property. This assessment includes recommended remedial action, estimated volume of material to be removed, and estimated cost of the proposed action.

## 2.0 EVALUATION

This structure is not over 50 years old. Therefore, it does not meet the eligibility criteria for consideration of inclusion on the National Register of Historic Places.

There is no owner preference with respect to remedial action and no legal or other complications are foreseen at this time.

The design drawings give a general description of the property and work required to remove contaminated material. The design is based upon the Remedial Action Recommendations discussed in Appendix A and the Justification for Supplemental Standards discussed in Appendix B.

The estimated volume of material to be removed as a result of remedial action with supplemental standards applied is presented in Tables 1.1 and 1.2. The estimated volume is: interior, 0 cu. yd.; exterior 24 cu. yd.

The cost estimate to perform remedial action on this property with supplemental standards applied is presented in Table 1.1. The estimated cost is \$837.

The estimated volume of material to be removed as a result of remedial action without supplemental standards applied is presented in Tables 1.3 and 1.4. The estimated volume is: interior, 0 cu. yd.; exterior 217 cu. yd.

The cost estimate to perform remedial action on this property without supplemental standards applied is presented in Table 1.3. The estimated cost is \$9,865.

TABLE 1.1  
 AREA/VOLUME AND COST ESTIMATES  
 WITH SUPPLEMENTAL STANDARDS APPLIED

DOE ID NO. 6J-00343-CS

PAGE 1 OF 2

LOCATION		SURFACE/ SUBSURFACE	MATERIAL (TYPE)	CONTAMINATED		AREA (SQ.FT.)	AVG DEPTH (INCHES)	VOLUME (CY)	UNIT COST/UNITS	AMOUNT (\$)
AREA	INT. EXT.			YES	NO					
A	X	SURFACE	BASE	X		1120	6	20.7	30.00 CY	622
		SUBSURFACE				0		0.0		0
B	X	SURFACE	BASE	X		95	12	3.5	30.00 CY	106
		SUBSURFACE				0		0.0		0

NOTE: AREAS C AND D ARE EXCLUDED FROM REMEDIAL  
 ACTION DUE TO SUPPLEMENTAL STANDARDS APPLICATION



TABLE 1.1 (Cont.)  
AREA/VOLUME AND COST ESTIMATES

OTHER INTERIOR COSTS  
=====

PAGE 2 OF 2

ITEM NO.	ITEM	QUANTITY	UNIT COST/UNITS	AMOUNT (\$)
1				0
				-----
TOTAL OTHER INTERIOR				0
TOTAL INTERIOR SURFACE/SUBSURFACE				0
				-----
TOTAL INTERIOR				0

OTHER EXTERIOR COSTS  
=====

ITEM NO.	ITEM	QUANTITY	UNIT COST/UNITS	AMOUNT (\$)
1				0
				-----
TOTAL OTHER EXTERIOR				0
TOTAL EXTERIOR SURFACE/SUBSURFACE				728
				-----
TOTAL EXTERIOR				728
				=====
TOTAL INTERIOR/EXTERIOR				728
CONTINGENCY				15 109
				-----
TOTAL ESTIMATED CONSTRUCTION COST				837
DISLOCATION				0
SHUTDOWN COST				0
BUYOUT COST				0
				-----
TOTAL ESTIMATED PROJECT COST				837



TABLE 1.2

## AREA/VOLUME SUMMARY

=====

INTERIOR:CONTAMINATED	0.0	CY	0 SF	0.0 SM
UNCONTAMINATED	0.0	CY		
	-----			
INTERIOR TOTAL	0.0	CY		
EXTERIOR:CONTAMINATED	24.3	CY	1215 SF	112.9 SM
UNCONTAMINATED	0.0	CY		
	-----			
EXTERIOR TOTAL	24.3	CY		
PROJECT TOTALS	24.3	CY	1215 SF	112.9 SM

TABLE 1.3  
 AREA/VOLUME AND COST ESTIMATES  
 WITHOUT SUPPLEMENTAL STANDARDS APPLIED

DOE ID NO. 6J-00343-CS

PAGE 1 OF 2

LOCATION			CONTAMINATED		AREA (SQ.FT.)	AVG DEPTH (INCHES)	VOLUME (CY)	UNIT COST/UNITS	AMOUNT (\$)
AREA	INT. EXT.	SURFACE/ SUBSURFACE	MATERIAL (TYPE)	YES NO					
A	X	SURFACE	BASE	X	1120	6	20.7	30.00 CY	622
		SUBSURFACE			0		0.0		0
B	X	SURFACE	BASE	X	95	12	3.5	30.00 CY	106
		SUBSURFACE			0		0.0		0
C	X	SURFACE	BASE	X	750	42	97.2	30.00 CY	2917
		SUBSURFACE			0		0.0		0
D	X	SURFACE	CONCRETE	X	736	6	13.6	5.00 CY	68
		SUBSURFACE	BASE	X	736	36	81.8	30.00 CY	2453

TABLE 1.3 (Cont.)  
AREA/VOLUME AND COST ESTIMATES

OTHER INTERIOR COSTS  
=====

PAGE 2 OF 2

ITEM NO.	ITEM	QUANTITY	UNIT COST/UNITS	AMOUNT (\$)
1				0
TOTAL OTHER INTERIOR				0
TOTAL INTERIOR SURFACE/SUBSURFACE				0
TOTAL INTERIOR				0

OTHER EXTERIOR COSTS  
=====

ITEM NO.	ITEM	QUANTITY	UNIT COST/UNITS	AMOUNT (\$)
1	MAINTAINING SERVICE DURING REMEDIAL ACTION	175	3.00 LF	525
2	REMOVE/REPLACE EXISTING SEWER LINE	175	6.50 LF	1138
3	TRAFFIC CONTROL	1	750.00 LS	750
TOTAL OTHER EXTERIOR				2413
TOTAL EXTERIOR SURFACE/SUBSURFACE				6166
TOTAL EXTERIOR				8578
TOTAL INTERIOR/EXTERIOR				8578
CONTINGENCY				15 1287
TOTAL ESTIMATED CONSTRUCTION COST				9865
DISLOCATION				0
SHUTDOWN COST				0
BUYOUT COST				0
TOTAL ESTIMATED PROJECT COST				9865



TABLE 1.4

## AREA/VOLUME SUMMARY

=====

INTERIOR:CONTAMINATED	0.0	CY	0 SF	0.0 SM
UNCONTAMINATED	0.0	CY		
	-----			
INTERIOR TOTAL	0.0	CY		
EXTERIOR:CONTAMINATED	203.3	CY	2701 SF	251.0 SM
UNCONTAMINATED	13.6	CY		
	-----			
EXTERIOR TOTAL	216.9	CY		
PROJECT TOTALS	216.9	CY	2701 SF	251.0 SM

## APPENDIX A

### RADIOLOGICAL ASSESSMENT FOR DOE ID NO. GJ-00343-CS

#### TABLE OF CONTENTS

1. RADIOLOGIC SURVEY
2. TEAM LEADER NOTES
3. FIGURE 3.1, EXTERIOR GAMMA EXPOSURE RATES
4. FIGURE 3.2, EXTERIOR SAMPLE LOCATIONS
5. FIGURE 3.3, EXTERIOR ESTIMATED EXTENT OF CONTAMINATION
6. TABLE 3.1, RADIUM CONCENTRATIONS AT EXTERIOR LOCATIONS
7. TABLE 3.2, SUMMARY OF INTERIOR GAMMA EXPOSURE RATES

### 3.0 RADIOLOGIC SURVEY

#### 3.1 Introduction

Radiologic assessment data were collected by UNC at DOE ID No. GJ-00343-CS on December 3, 1986. Data collection methods were performed in accordance with procedures fully described in the Radiologic Support Operations Procedures Manual GJ-07(86) (Bendix Field Engineering Corporation, 1986). These data were evaluated to determine the areal and vertical extent of uranium mill tailings contamination at this property as well as any other contaminated material that may have originated from the millsite. The assessment data collected on this property were analyzed and determined to be in excess of the Environmental Protection Agency (EPA) criteria as set forth in the 'Standards for Remedial Action at Inactive Uranium Processing Sites' (40 CFR 192).

A review of the historical information available for this property was conducted to determine the areas of potential contamination identified during previous radiologic assessments.

#### 3.2 Gamma Exposure-Rate Surveys

##### 3.2.1 Exterior Findings

Area Background: 16 uR/h  
Gamma Exposure Rates Range from: 15 to 61 uR/h

Exterior gamma exposure-rate survey results are shown in Appendix Figure 3.1.

##### 3.2.2 Interior Findings

Area Background: 14 uR/h  
Gamma Exposure Rates in Habitable Areas Range from:  
12 to 15 uR/h

Interior gamma exposure-rate measurements are summarized in Appendix Table 3.2.

#### 3.3 Boreholes, Soil Samples, and Other Measurements

Area Background: 1.9 pCi/g

Areas which displayed elevated gamma levels were further investigated; the locations and types of these investigations are shown in Appendix Figure 3.2. Data from these investigations are included in Appendix Table 3.1.

#### 3.4 Radon/Radon Decay Product Concentration (RDC)

No RDC measurements were taken by UNC.



### 3.5 Extent of Contamination

Appendix Figure 3.3 shows identified areas and estimated depths of contamination on this property, based on assessments of all measurements taken. As noted in this figure, areas recommended for remedial action that contain identified residual radioactive materials are:

- (Area A) In-Situ Ra-226: 28.3 pCi/g  
Surface Material: Dirt  
Location: West and southwest of building  
Total Depth of Contamination: 6 inches  
Comments: There are 5 deposits in this area.
- (Area B) In-Situ Ra-226: 12.4 pCi/g  
Surface Material: Dirt  
Location: West of building  
Total Depth of Contamination: 12 inches
- (Area C) In-Situ Ra-226: 330.0 pCi/g  
Surface Material: Dirt  
Location: East of building  
Total Depth of Contamination: >36 inches  
Comments: There is a main sewer line that underlies this area. The depth of contamination is based on ORNL soil sample data. There are 3 deposits in this area.
- (Area D) In-Situ Ra-226: None taken  
Surface Material: Concrete  
Location: East of building  
Total Depth of Contamination: >36 inches  
Other (height or thickness): Concrete thickness unknown  
Comments: There are 2 deposits in this area. The depth of contamination is based on ORNL soil sample data.

Additional information pertinent to this property is discussed in the Team Leader Notes.

### 3.6 Summary of Remedial Action Recommendations

Areas A and B are exterior tailings deposits and should be removed. Areas C and D are buried deposits associated with a city sewer main. Supplemental Standards should be applied, see Appendix B for justification.

<870121.0901>

Team Leader Notes

Date: December 3, 1986

To: Files

From: T.R. Unrein

Subject: Team Leader Notes - GJ-00343-CS

\*\*\*\*\*

Address: 711 Horizon Drive

Owner: Beverly B. Cleghorn

Mailing Address: 804 35th, West Des Moines, Iowa 50265

Telephone: (515) 223-0797 (Home)

Tenant: Avis Young Used Cars Telephone: (303) 243-2847

Year Built: 1966

Team Members: (TL) T.R. Unrein, H. Mattison, M. Gilfillan,  
L. Kula, H. Lucero

Instruments: See Operational Equipment Summary sheet

The Colorado Department of Health (CDH) and Oak Ridge National Laboratory (ORNL) data indicates elevated gamma readings southwest of the building adjacent to the south property line and southeast of the building along Horizon Drive. ORNL indicated that there is a main sewer line in this area which was being repaired and that tailings were found to be associated with the line (see Table 3.1). No interior contamination was indicated.

The UNC survey team gamma scanned the entire property. Elevated readings were found southeast of the building (along Horizon Drive), west of the building, and 2 small areas adjacent to the south property line. The range of gamma readings in background areas is 110 to 140 counts per second (cps).

Further investigations with delta scintillometer measurements were conducted to establish the areal and vertical extents of contamination.

All areas of contamination were located from permanent structural reference points or from baselines established along the south and west sides of the building.

An interior gamma survey was performed to characterize the gamma readings within habitable areas of the structure, the range is 80 to 120 cps. The interior gamma survey indicated no contamination. The footing/foundation was not investigated due to no interior contamination.

The water, gas, and sewer lines were not located during the radiologic survey. The water meter pit readings were 155 cps at the top and 195 cps at the bottom.

This property used to be a gas station. There is a possibility that buried gas tanks could be present. A point source was located in grid block 260170. The exact location of the property line in this area could not be determined so it will not be pursued as a spillover. There were no elevated gamma readings south of this point source.

The property was returned to pre-survey condition before the UNC survey team departed.

TRU:bgr



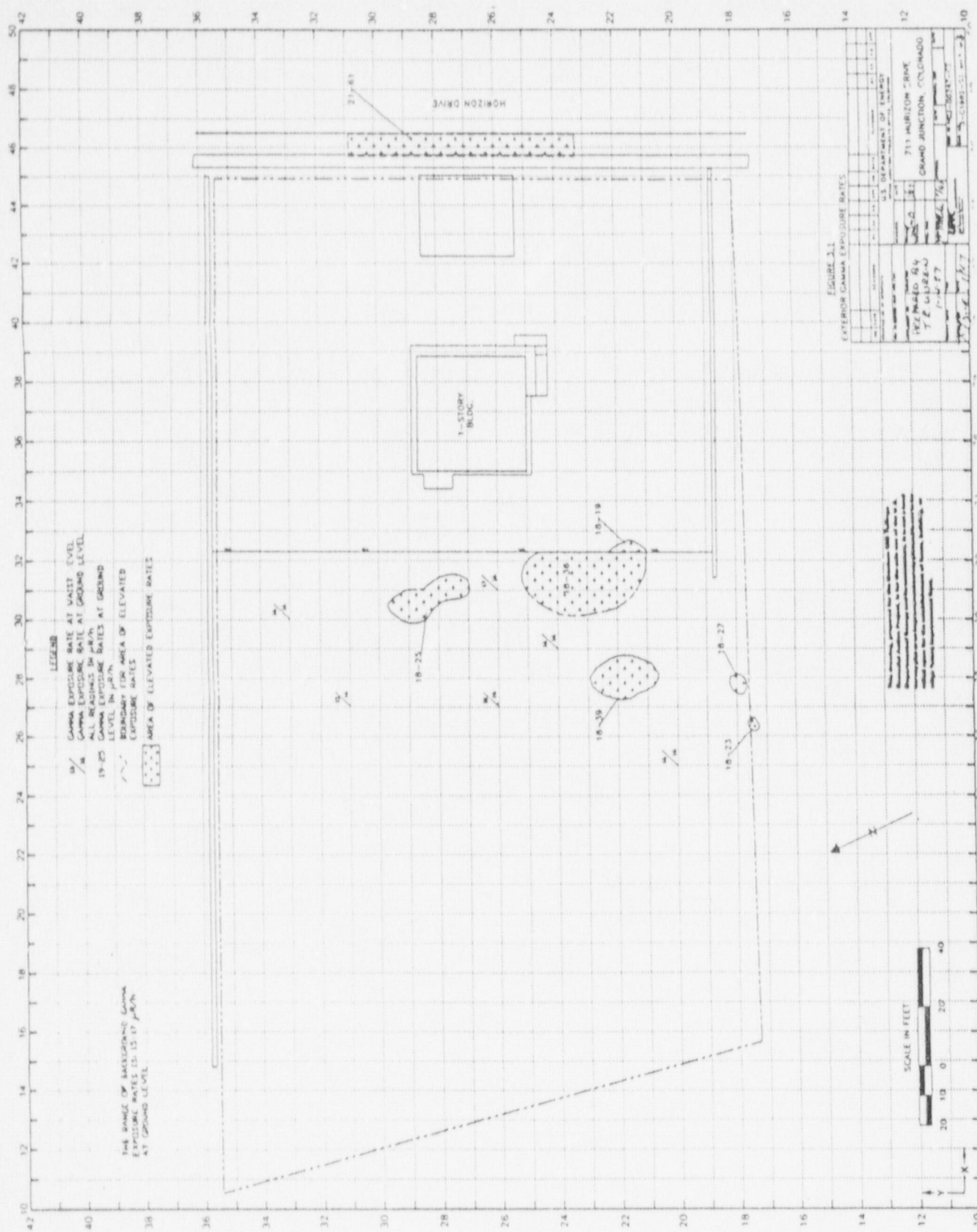
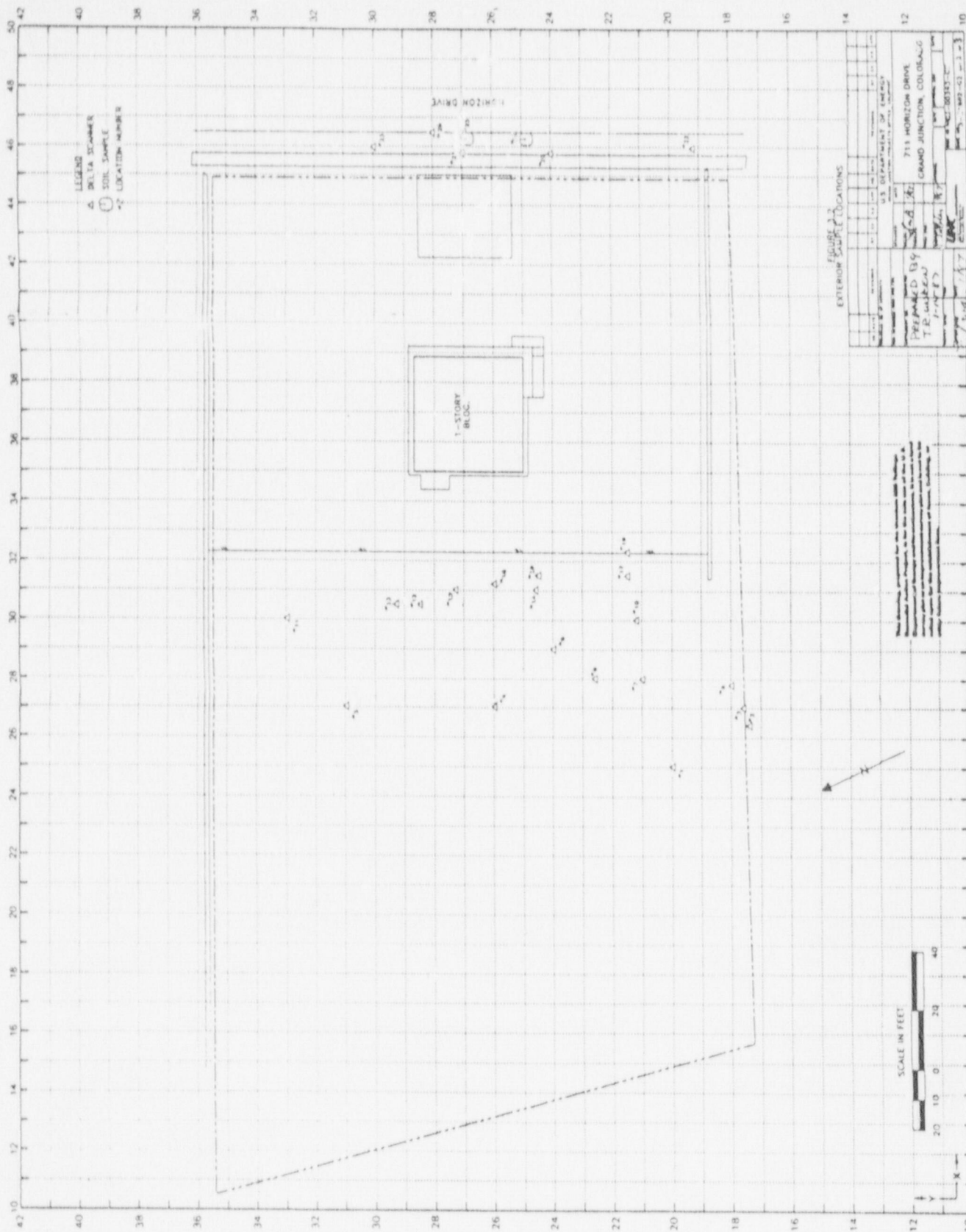
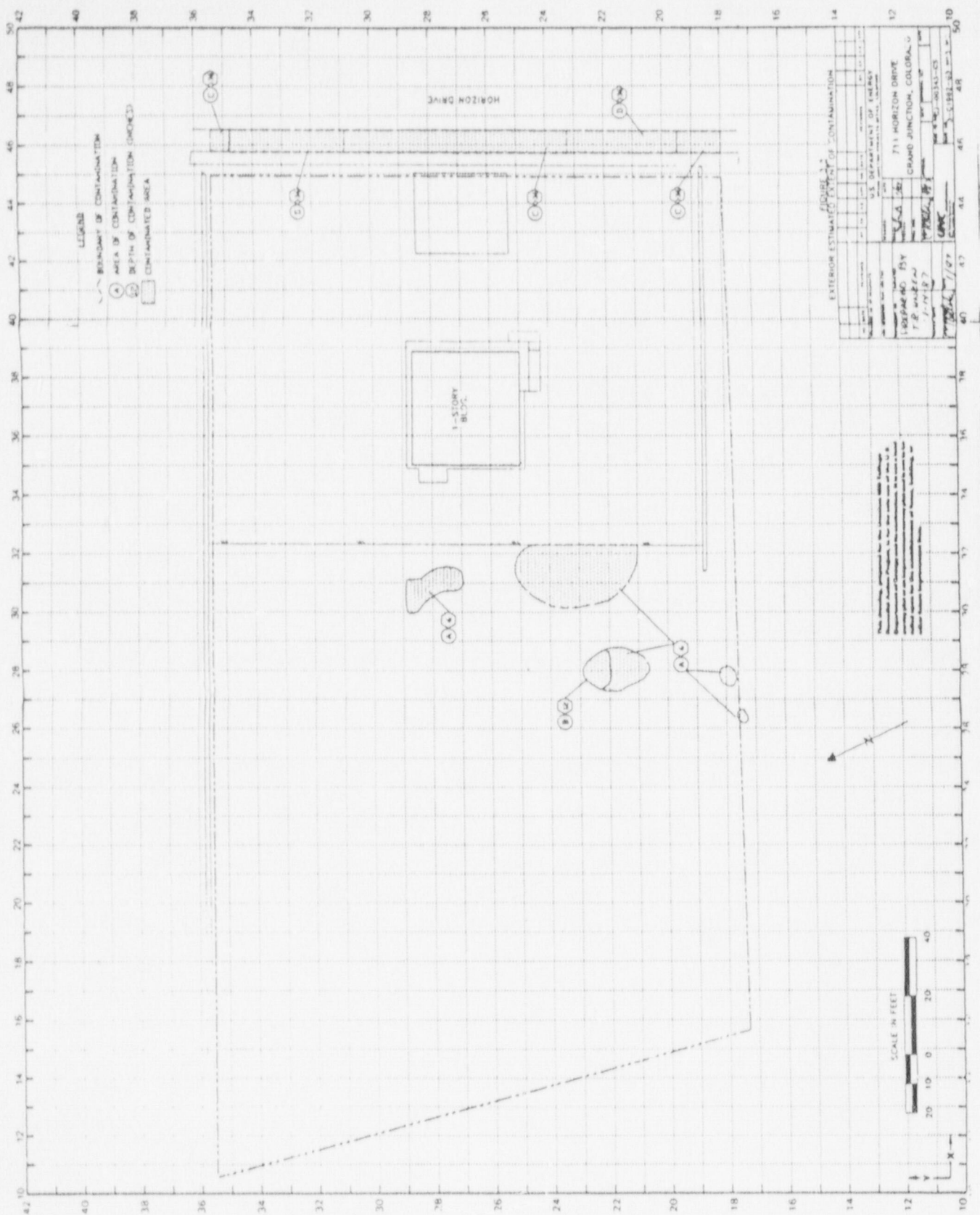


FIGURE 3.1  
SUPERIOR GAMMA EXPOSURE RATES







## Radium Concentrations at Exterior Locations

DOE ID #GJ-00343-CS

711 Horizon Drive

Page 1 of 2

In-Situ Ra-226 (pCi/g)

Loc #	Grid Location	Depth (in.)	Meas. Type	Non- Deconv.	Deconv.	Chem.	Comments
1	250200	00	DS	1.6		*	Background
2	264174	00	DS	6.3		*	Dirt/Point source
		06	DS	2.2		*	
3	270176	00	DS	1.6		*	Dirt
4	270260	00	DS	1.8		*	Background
5	270310	00	DS	1.5		*	Background
6	278180	00	DS	9.9		*	Dirt
		06	DS	6.1		*	
7	280210	00	DS	28.3		*	Dirt
		06	DS	5.3		*	
8	280226	00	DS	4.0		*	Dirt
		06	DS	12.4		*	
		12	DS	4.8		*	
9	290240	00	DS	2.4		*	Background
10	300212	00	DS	2.1		*	Dirt
11	300330	00	DS	2.3		*	Background
12	305285	00	DS	3.7		*	Dirt
13	305293	00	DS	2.2		*	Dirt
14	310246	00	DS	5.7		*	Dirt
		06	DS	3.2		*	
15	310273	00	DS	8.3		*	Dirt
		06	DS	7.5		*	
16	312260	00	DS	3.0		*	Dirt
17	315215	00	DS	11.2		*	Dirt
		06	DS	3.2		*	
18	315245	00	DS	2.6		*	Dirt



## Radium Concentrations at Exterior Locations

DOE ID #GJ-00343-CS

711 Horizon Drive

Page 2 of 2

## In-Situ Ra-226 (pCi/g)

Loc #	Grid Location	Depth (in.)	Meas. Type	Non-Deconv.	Deconv.	Chem.	Comments
19	323215	00	DS	2.5		*	Asphalt
		00	DS	2.1		*	Dirt
		06	DS	4.0		*	
		06	DS	3.2		*	Hx/Asphalt
20	458240	00	DS	1.4		*	Concrete
		00	DS	12.8		*	Dirt
		06	DS	2.0		*	
21	458270	00	DS	<1.0		*	Concrete
		00	DS	3.1		*	Dirt
		06	DS	1.7		*	
		10	DS	<1.0		*	Hx/Concrete
22	460192	00	DS	1.7		*	Dirt
		06	DS	1.5		*	
		12	DS	2.8		*	
23	460300	00	DS	19.4		*	Dirt
		06	DS	7.9		*	
24	463248	30-36	SS			330.0	ORNL Data
25	463268	30-36	SS			310.0	ORNL data
26	465280	00	DS	62.2		*	Dirt
		00	DS	1.4		*	Curb

Measurement GB = GAD-6 Borehole  
Types: GS = GAD-6 Surface  
DS = Delta Scintillometer  
TC = Total Count Borehole  
SS = Soil Sample  
DH = Downhole Scintillometer

Notes: DC = Depth of Contamination  
\* = No Soil Sample Taken  
[n] = Reading Taken n-Inches  
Above Floor or Ground  
Date of Survey = 12-03-86  
Team Leader = TRU

Table 3.2

## Summary of Interior Gamma Exposure Rates

DOE ID No. GJ-00343-CS

711 Horizon Drive

Page 1 of 1

=====						
Location	Number of Readings Taken at Waist Level	Range at Waist Level (uR/h)	Mean at Waist Level (uR/h)	Number of Readings Taken at Surface	Range at Surface (uR/h)	Mean Surface (uR/h)
-----	-----	-----	-----	-----	-----	-----
Ground	*	*	*	*	12-15	*
Floor						
=====						

\* A walking gamma scan was performed to confirm the absence of interior contamination.

## APPENDIX B

### APPLICATION FOR SUPPLEMENTAL STANDARDS DOE ID NO. GJ-00343-CS

#### TABLE OF CONTENTS

1. Justification for Application of Supplemental Standards
2. Meeting/Telephone Conference Record (with Property Owner)
3. Letter from City of Grand Junction Regarding Tailings Contamination  
Associated with Utility Lines

## JUSTIFICATION FOR APPLICATION OF SUPPLEMENTAL STANDARDS

DOE ID NO.: GJ-00343-CS

ADDRESS: 711 Horizon Drive

Application of Supplemental Standards is in accordance with 40 CFR 192.22  
Subpart (x) (check the appropriate Subpart)

- ☒ a) risk injury to worker or public
- ☐ b) environmental harm
- ☒ c) high cost relative to long-term benefits
- ☐ d) high cost of cleaning up building relative to benefits
- ☐ e) no known remedial action
- ☐ f) radionuclides other than Ra-226 exist

### Brief Condition Description and Justification:

#### Criterion A and C

The residual radioactive tailings are located around the main sewer line buried at a depth of approximately 36 inches. The sewer line runs parallel to Horizon Drive in the street right-of-way. Horizon Drive is a four-lane main thoroughfare from the airport and interstate into the city. To remove the tailings in this area it will require the workers to work adjacent to a high traffic area and it will also expose the traffic (public) to a long open trench.

The exposure rate at ground level over the contaminated area averages 23 uR/h. This is about 150% of normal background and gives an annual dose rate of 202 mR if one were to occupy the area full time. Typical dose for Colorado is between 150 and 200 mR/yr. The general public would not spend more than a couple of minutes in that area per day.

It is unlikely that the land use will change in the future. Thus the benefit of removing the contamination is minimal and the residual radioactive tailings would not pose a significant hazard.

### Property Considerations:

	<u>Yes</u>	<u>No</u>
1. Open Land	<u>      </u>	<u>X</u>
2. Occupied Building	<u>X</u>	<u>      </u>
3. If yes to No. 2, is contaminated area beneath or within 10 feet of building	<u>      </u>	<u>X</u>
4. Anticipated change of land use within next 5 years	<u>      </u>	<u>X</u>
5. If yes to No. 4, then will land use produce health risk	<u>      </u>	<u>X</u>
6. Is contamination in habitable area	<u>      </u>	<u>X</u>
7. Owners comments solicited (see attached comments or record of teleconference)	<u>X</u>	<u>      </u>



Radiological Considerations:

Exposure rate range at ground level over contaminated area(s) = 15 to 61 uR/h

Average exposure rate at ground level over contaminated area(s) = 23 uR/h

Radium concentration range in soil in contaminated area(s) = 3.1 to 330 pCi/g

Average radium concentration in soil in contaminated area(s) = 135 pCi/g

Contamination below or within 10 feet of structure, radon daughter concentration = N/A WL

Engineering Considerations

Estimated volume of contaminated material to remain = 179 cy

Area remaining underlain by contaminant = 165 sy

Additional cost without application of supplemental standards = \$9,028  
(further breakdown provided in Table 1.3)

This is a 1,078% increase over estimated RA cost for preferred option.

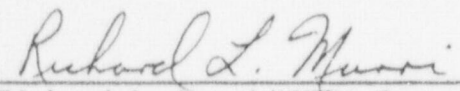
Prepared by:

  
Robert D. Rowlands/Senior Architect

Date:

8/18/87

Reviewed by:

  
Richard L. Murri/UMTRA Geoscientist

Date:

8-19-87



UNC Geotech  
2597 B 3/4 Road  
P.O. Box 14000  
Grand Junction, Colorado 81502-5504  
303/242-8621

#### MEETING/TELEPHONE CONFERENCE RECORD

Date: August 5, 1987

Time: 3:35 p.m.

DOE ID Number: GJ-00343-CS

Location Address: 711 Horizon Drive

Between Beverly B. Cleghorn, Owner of property, telephone number 243-0396 and Rob Rowlands of UNC Geotech, extension 592.

SUMMARY: Mrs. Cleghorn, the property owner, wishes to have the tailings contamination (Areas A and B) removed from her property. She has no strong feelings regarding the tailings contamination (Areas C and D) associated with the city sewer line, which is located in the right-of-way outside her legal property boundary. She'll go along with whatever we (UNC Geotech) recommend.

FOLLOW-UP ACTION REQUIRED: None

G00343TC:993A:BA



August 6, 1987

City of Grand Junction, Colorado

81501-2668

250 North Fifth Street

Mr. Robert D. Rowlands  
UNC Geotech  
P.O. Box 14,000  
Grand Junction, CO 81502

Re: Removal of Mill Tailings/Around Water and Sewer Mains

Dear Mr. Rowlands:

I am writing at your request to address our concerns with the removal of uranium mill tailings from around City water and sewer mains.

Most of the City's water mains consist of old cast iron pipe under pressures ranging from 60 to 100 psi. The cast iron pipe is typically in poor condition, evident from the history of high numbers of pipeline breaks. Even slight vibrations or disturbances can cause the pipe to leak or break. Because of the corroded condition of these mains, removal of mill tailings from around the pipe would not be possible without taking the mains out of service and replacing the old pipe. The City would be interested in working with UNC and participating in such a program.

Where new water mains have already been constructed, the old pipes have been disconnected from the distribution system.

The City has been recording water main breaks, prioritizing the lines and replacing cast iron water mains annually since 1976. In 1987, approximately 10,200 feet of water mains are scheduled for replacement.

Many of the City's sewer mains are also bedded in mill tailings. These sewer lines are typically on very flat grades and consist of short (4') sections of ungasketed clay tile pipe. The removal of tailings from around the sanitary sewer lines would probably require removing the pipeline from service, regrading and replacement of the old pipe. Again, the City would be interested in participating in such a project. Since most of the City's sewer lines are combined systems, carrying sanitary sewage and storm runoff, there are very few intermittent storm sewers.

Soil conditions throughout the City are very poor, usually consisting of wet clays. Often very wide excavations are required to protect workmen in the trenches. Our experience with trench support boxes has not been successful in these soil conditions.



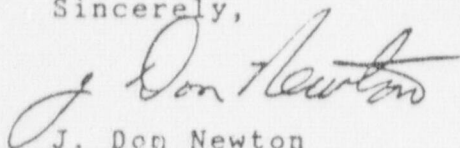
Another problem with excavating utilities would be the disturbance of traffic on City streets. Proper lane closures, detours and other traffic control would be required to protect the workmen and the public in the construction area.

A concern we have related to this subject is that after the mill tailings disposal sites are removed and cleaned up, we will continue to have water main breaks and replace old water and sewer mains bedded in mill tailings. There will need to be a local site maintained for the disposal of contaminated materials which are excavated from these utility trenches.

In summary, it is our opinion that mill tailings could be removed from around water and sewer mains provided that service is maintained to customers, provisions are made for dealing with unstable soil conditions and for replacement of deteriorated pipe, and proper traffic control is provided during construction.

Please call if you have any questions or wish to discuss this subject further.

Sincerely,

A handwritten signature in cursive script that reads "J. Don Newton".

J. Don Newton  
City Engineer

xc: Jim Shanks  
Greg Trainor  
File

JDN:skw