

RADIOLOGIC AND ENGINEERING ASSESSMENT

FOR

DOE ID NO.: GJ-02294-RS  
ADDRESS: 2231 NORTH 21ST STREET

AUGUST 1985

FOR

URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT OFFICE

ALBUQUERQUE OPERATIONS OFFICE

DEPARTMENT OF ENERGY

BY

BENDIX FIELD ENGINEERING CORPORATION  
P.O. Box 1569  
Grand Junction, Colorado 81502

APPROVED BY

*Michael K. Tucker*  
M. TUCKER  
DOE PROJECT ENGINEER

DATE

*August 20, 1985*

REA02294:REA-708

8509100411 850821  
PDR WASTE PDR  
WM-54

## TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1.0 EXECUTIVE SUMMARY . . . . .	1
1.1 Introduction . . . . .	1
1.2 Evaluation and Recommendation . . . . .	1
2.0 PROPERTY DESCRIPTION . . . . .	2
2.1 General Description . . . . .	2
2.2 Existing Facilities and Structures . . . . .	2
3.0 RADIOLOGIC SURVEY . . . . .	4
3.1 Introduction . . . . .	4
3.2 Gamma Exposure-Rate Surveys . . . . .	4
3.2.1 Exterior Findings . . . . .	4
3.2.2 Interior Findings . . . . .	4
3.3 Boreholes, Soil Samples, and Other Measurements . . . . .	4
3.4 Radon/Radon Daughter Concentration . . . . .	5
3.5 Extent of Contamination . . . . .	5
4.0 RECOMMENDED REMEDIAL ACTION . . . . .	7
4.1 Decontamination and Restoration . . . . .	7
4.2 Evaluation of Recommended Remedial Action . . . . .	7
5.0 REFERENCES . . . . .	8
6.0 APPENDIX . . . . .	9

## 1.0 EXECUTIVE SUMMARY

### 1.1 Introduction

The location, DOE ID No. GJ-02294-RS, is a single-family residence located at 2231 North 21st Street, Grand Junction, 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.

### 1.2 Evaluation and Recommendation

The action recommended is the removal of contaminated material and restoration of the property to its original condition. The identified residual radioactive material found on this property is tailings; the estimated volume is: exterior, 14 cu. yd.; interior, 0 cu. yd.

Estimated cost to perform remedial action, including dislocation when applicable, is \$1,287. Remedial action on this property will take approximately 8 days to complete.

## 2.0 PROPERTY DESCRIPTION

### 2.1 General Description

Address: 2231 North 21st Street, Grand Junction, Colorado

Zoning: Residential (RSF-8)

Lot Size: Approximately 7,500 sf (0.17 acres)

Legal Description: Lot 18, Sungold Park Annex, City of Grand Junction, County of Mesa, State of Colorado.

Point of Reference: This property is located approximately 3 mile(s) north of the State of Colorado Tailings Repository. Appendix Figure 2.1 shows the property location relative to its surroundings.

Utilities: Utility locations are shown in Appendix Figure 2.2.

Electrical:	Overhead/Underground
Gas:	Underground
Telephone:	Overhead
Sewer:	Underground
Water:	Underground
Cable TV:	Overhead

Bordering Properties:

North:	Bookcliff Avenue
South:	Single-family residence
East:	North 21st Street
West:	Alley

### 2.2 Existing Facilities and Structures

Primary Structure:

Type:	Single-story residence with attached carport
Size:	Approximately 1,962 sf
Construction Date:	1955
Construction:	Wood-frame
Foundation:	Concrete stemwall on spread footing
Footing Depth:	Not Determined
Basement:	Yes - full
Crawl Space:	None
Condition:	Good



Other Structures:

Type:	Carport/storage shed
Size:	Approximately 260 sf
Construction:	Wood-frame
Foundation:	None
Condition:	Good

General Remarks:

There is an "Above Ground" swimming pool west of the main structure. Structures, utilities, landscaping, and other special features of this property are included in Appendix Figure 2.2.

Historical Data:

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.

### 3.0 RADIOLOGIC SURVEY

#### 3.1 Introduction

Radiologic data were collected by Bendix at DOE ID No. GJ-02294-RS on July 18, 1985. Data collection methods were performed in accordance with procedures fully described in the Radiologic Support Operations Procedures Manual GJ-07(84) (Bendix Field Engineering Corporation, 1984). 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.

A review of historical information from the files of the Colorado Department of Health (CDH) and the inclusion data from Oak Ridge National Laboratory (ORNL) was conducted. These records indicate contamination west of the primary structure, and a small deposit east of the carport in the driveway.

The Bendix radiologic survey was designed to investigate the entire property, with emphasis on previously identified areas of contamination. Conclusions based upon data analyses are discussed in Section 3.5, Extent of Contamination. Photocopies of the Official Survey Report, team leader notes, deconvolution graphs, and Exterior Gamma Scan map are included in the Appendix (Section 6.0).

#### 3.2 Gamma Exposure-Rate Surveys

##### 3.2.1 Exterior Findings

Background Readings: 13 to 16 uR/h  
Highest Outside Gamma Reading (HOG): 116 uR/h

Exterior radium-concentration measurements are presented in Appendix Table 3.1. Exterior exposure-rate survey results are shown in Appendix Figure 3.1.

##### 3.2.2 Interior Findings

Background Readings: 14 to 18 uR/h  
Highest Inside Gamma Reading (HIG): 26 uR/h

Interior radium-concentration measurements are presented in Appendix Table 3.2. Interior gamma exposure-rate measurements are summarized in Appendix Table 3.3.

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

Areas which displayed elevated gamma levels were further investigated; these areas are shown in Appendix Figures 3.2a, 3.2b, and 3.2c. Data from these investigations are included in Appendix Tables 3.1 and 3.2.

### 3.4 Radon/Radon Daughter Concentration (RDC)

Determined by CDH: 0.005 gross working level (WL). No RDC measurements were taken by Bendix.

### 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) Surface Material: Soil  
 Direction From Primary Structure: West  
 Other Directions: Northwest of pool  
 Total Depth of Contamination: 6 inches  
 Comments: This area extends outside the fence line.  
 Approximate Square Footage: 50
- (Area B) Surface Material: Soil  
 Direction From Primary Structure: West  
 Other Directions: West of pool  
 Total Depth of Contamination: 12 inches  
 Comments: This area is adjacent to and west of the fence line.  
 Approximate Square Footage: 78
- (Area C) Surface Material: Lawn  
 Direction From Primary Structure: West  
 Other Directions: West of the pool  
 Total Depth of Contamination: 15 inches  
 Comments: The contamination may extend under the pool.  
 Approximate Square Footage: 81
- (Area D) Surface Material: Lawn  
 Direction From Primary Structure: West  
 Other Directions: Adjacent to Area C  
 Total Depth of Contamination: 6 inches  
 Approximate Square Footage: 35
- (Area E) Surface Material: Lawn  
 Direction From Primary Structure: Northwest  
 Other Directions: South of the north fence line  
 Total Depth of Contamination: 6 inches  
 Approximate Square Footage: 24
- (Area F) Surface Material: Soil  
 Direction From Primary Structure: Northwest  
 Other Directions: Northwest corner of primary structure  
 Total Depth of Contamination: 9 inches  
 Comments: The contamination does not extend past the property line.  
 Approximate Square Footage: 28

- (Area G) Surface Material: Flagstone  
Direction From Primary Structure: West  
Other Directions: Adjacent to the primary structure  
Total Depth of Contamination: 12 inches  
Other (height or thickness): 2-inch-thick flagstone  
Comments: The flagstone is movable.  
Approximate Square Footage: 95
- (Area H) Surface Material: Soil  
Direction From Primary Structure: North  
Other Directions: Adjacent to the primary structure  
Total Depth of Contamination: 18 inches  
Comments: Contamination is above the gas line.  
Approximate Square Footage: 16
- (Area I) Surface Material: Gravel  
Direction From Primary Structure: Southeast  
Other Directions: East of carport  
Total Depth of Contamination: 6 inches  
Other (height or thickness): 1-inch-thick gravel  
Comments: The contamination does not extend under the  
concrete.  
Approximate Square Footage: 15

#### 4.0 RECOMMENDED REMEDIAL ACTION

##### 4.1 Decontamination and Restoration

The recommended remedial action for this property, DOE ID No. GJ-02294-RS, includes removal of all areas identified as containing radioactive material (as discussed in Section 3.5 and shown in Appendix Figure 3.3) and transport of removed material to the disposal site.

After remedial action is completed, the areas involved will be restored to original condition in accordance with the Bendix drawings, Vicinity Properties General Construction Specification (Bendix Field Engineering Corporation, 1984), and Statement of Work for Construction Subcontractor.

Dislocation of the occupants will not be required for this remedial action.

##### 4.2 Evaluation of Recommended Remedial Action

Volume calculations of the areas included for remedial action are presented in Appendix Table 4.1. Cost estimates are presented in Appendix Table 4.2.

Estimated cost of remedial action is \$1,287.

This remedial action will result in removal of the identified residual radioactive materials.

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

## 5.0 REFERENCES

ARIX, A Professional Corporation, Procedures Manual for the Grand Junction Remedial Action Program, for Colorado Department of Health, Radiation Control Division, and the U.S. Department of Energy, 1983.

Bendix Field Engineering Corporation, Procedures Manual Radiologic Support Operations Grand Junction Vicinity Properties, (GJ-07), for U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico, 1984.

Bendix Field Engineering Corporation, Engineering, Construction, and Land Support Manual Grand Junction Vicinity Properties Project, (GJ-08), for U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico, 1984.

Bendix Field Engineering Corporation, Grand Junction Vicinity Properties Operating Manual, (GJ-16) for U.S. Department of Energy, Nuclear Energy Programs, Division of Remedial Action Projects, UMTRA, 1984.

Bendix Field Engineering Corporation, Vicinity Properties General Construction Specification, for U.S. Department of Energy, Nuclear Energy Programs, Division of Remedial Action Projects, UMTRA, 1984.

Bendix Field Engineering Corporation, Environmental Assessment of Preliminary Cleanup Activities at Offsite Properties Contaminated by Tailings from the Grand Junction Inactive Uranium Millsite, (GJ-04), for U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations, Albuquerque, New Mexico, 1983.

U.S. Department of Energy, Programmatic Memorandum of Agreement (DOE No. DE-GM04-84AL28460) between the U.S. Department of Energy, the Advisory Council on Historic Preservation, and the Colorado State Historic Preservation Officer, for UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico, 1984.

U.S. Department of Energy, Vicinity Properties Management and Implementation Manual, for UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico, 1984.

U.S. Environmental Protection Agency, Standards for Remedial Action at Inactive Uranium Processing Sites (40 CFR Part 192), Washington, D.C., 1983.

## 6.0 APPENDIX

This Appendix contains the following:

Appendix Tables:

Table 3.1	Radium Concentrations at Exterior Locations
Table 3.2	Radium Concentrations at Interior Locations
Table 3.3	Summary of Interior Gamma Exposure Rates
Table 4.1	Area and Volume Calculations
Table 4.2	Estimated Cost of Decontamination and Restoration

Appendix Figures:

Figure 2.1	Vicinity Map
Figure 2.2	Site Plan
Figure 3.1	Exterior Grid-Point Exposure Rates
Figure 3.2a	Interior Sample Locations
Figure 3.2b	Interior Sample Location
Figure 3.2c	Exterior Sample Locations
Figure 3.3	Exterior Estimated Extent of Contamination

Official Survey Report

Team Leader Notes

Deconvolution Graphs (Apparent Radium-226 Concentration)

Exterior Gamma Scan Map

## Radium Concentrations at Exterior Locations

DOE ID #GJ-02294-RS

2231 North 21st Street

Page 1 of 7

Loc #	Grid Location	Depth (in.)	Meas. Type	In Situ Ra-226 (pCi/g)		Chem Ra-226 (pCi/g)	Comments
				Tot. Ct	Spectr.		
5	124248	00	DS	9.2		*	West property line
		03	TC	9.2		*	
		06	TC	10.4		*	In alley
		09	TC	8.1		*	
		12	TC	5.9		*	DC = 12 inches
		15	TC	4.6		*	Based on the
		18	TC	4.2		*	deconvolution graph
		21	TC	4.1		*	
		24	TC	4.0		*	
		27	TC	4.0		*	
		30	TC	4.1		*	
		33	TC	4.2		*	
6	126270	00	DS	5.4		*	West property line
		03	TC	4.3		*	West of west fence
		06	TC	4.1		*	in alley
		09	TC	3.8		*	
		12	TC	3.8		*	DC = 6 inches
		15	TC	3.7		*	Based on all
		18	TC	3.6		*	available data
		21	TC	3.7		*	
		24	TC	3.7		*	
		27	TC	3.6		*	
		30	TC	3.7		*	
7	130237	00	DS	2.5		*	West of pool
		03	TC	3.5		*	
		06	TC	3.6		*	
		09	TC	3.7		*	DC = 6 inches
		12	TC	3.7		*	Based on all
		15	TC	3.7		*	available data
		18	TC	3.8		*	
		21	TC	3.8		*	
		24	TC	3.9		*	
		27	TC	3.9		*	
		30	TC	4.0		*	
8	130270	00	DS	1.1		*	West property line
		06	DS	1.8		*	



## Radium Concentrations at Exterior Locations

DOE ID #GJ-02294-RS

2231 North 21st Street

Page 2 of 7

Loc #	Grid Location	Depth (in.)	Meas. Type	In Situ Ra-226 (pCi/g)		Chem Ra-226 (pCi/g)	Comments
				Tot. Ct	Spectr.		
9	132247	00	DS	7.2		*	West of pool  DC = 15 inches Based on the deconvolution graph
		03	TC	8.0		*	
		06	TC	9.0		*	
		09	TC	9.0		*	
		12	TC	7.4		*	
		15	TC	6.0		*	
		18	TC	5.1		*	
		21	TC	4.6		*	
		24	TC	4.4		*	
		27	TC	4.3		*	
		30	TC	4.2		*	
		33	TC	4.2		*	
10	132255	00	DS	1.2		*	West of pool
		06	DS	<1.0		*	
11	155278	00	DS	1.3		*	Background  DC = 0 inches
		00	GS		1.3	*	
		03	TC	3.1		*	
		06	TC	3.3		*	
		09	TC	3.5		*	
		12	TC	3.5		*	
		15	TC	3.6		*	
		18	TC	3.6		*	
		21	TC	3.6		*	
		24	TC	3.7		*	
		27	TC	3.9		*	
		30	TC	4.0		*	
12	173280	00	DS	7.2		*	Near north property line
		06	DS	2.1		*	
13	188275	00	DS	1.5		*	West of primary structure  DC = 0 inches
		03	TC	3.3		*	
		06	TC	3.5		*	
		09	TC	3.7		*	
		12	TC	3.7		*	
		15	TC	3.7		*	
		18	TC	3.7		*	
		21	TC	3.7		*	
		24	TC	3.6		*	
		27	TC	3.8		*	

## Radium Concentrations at Exterior Locations

DOE ID #GJ-02294-RS

2231 North 21st Street

Page 3 of 7

Loc #	Grid Location	Depth (in.)	Meas. Type	In Situ Ra-226 (pCi/g)		Chem Ra-226 (pCi/g)	Comments
				Tot. Ct	Spectr.		
13	188275	30	TC	3.9		*	
		33	TC	4.0		*	
		36	TC	4.0		*	
		39	TC	4.0		*	
		42	TC	4.1		*	
14	190258	00	DS	1.1		*	Concrete
15	191261	00	DS	1.8		*	Sewer line
		03	TC	4.3		*	
		06	TC	4.3		*	DC = 0 inches
		09	TC	4.4		*	
		12	TC	4.3		*	
		15	TC	4.1		*	
		18	TC	4.0		*	
		21	TC	3.9		*	
		24	TC	3.8		*	
		27	TC	3.9		*	
		30	TC	3.8		*	
		33	TC	3.9		*	
		36	TC	4.1		*	
		39	TC	4.2		*	
		42	TC	4.2		*	
		45	TC	4.1		*	
		48	TC	4.3		*	
		51	TC	4.3		*	
		54	TC	4.4		*	
		57	TC	4.2		*	
		60	TC	4.3		*	
		63	TC	4.2		*	
		66	TC	4.1		*	
		69	TC	4.1		*	
		72	TC	3.9		*	
		75	TC	3.9		*	
		78	TC	3.9		*	
		81	TC	3.8		*	
		84	TC	3.8		*	
		87	TC	3.8		*	
		90	TC	3.8		*	
		93	TC	3.8		*	
		96	TC	3.8		*	

## Radium Concentrations at Exterior Locations

DOE ID #GJ-02294-RS

2231 North 21st Street

Page 4 of 7

Loc #	Grid Location	Depth (in.)	Meas. Type	In Situ Ra-226 (pCi/g)		Chem Ra-226 (pCi/g)	Comments
				Tot. Ct	Spectr.		
16	193284	00	DS	5.0		*	Northwest corner of primary structure
		03	TC	5.5		*	
		06	TC	5.1		*	
		09	TC	4.5		*	DC = 9 inches Based on the deconvolution graph
		12	TC	4.1		*	
		15	TC	3.9		*	
		18	TC	3.7		*	
		21	TC	3.7		*	
		24	TC	3.6		*	
		27	TC	3.6		*	
		30	TC	3.6		*	
		33	TC	3.6		*	
		36	TC	3.6		*	
		39	TC	3.6		*	
		42	TC	3.5		*	
17	194268	[06]	DS	4.0		*	Horizontal
		00	DS	71.3		*	
		00	GS		30.7	*	Horizontal
		03	TC	37.3		*	West of primary structure
		06	TC	29.2		*	
		09	TC	18.7		*	DC = 12 inches Based on the deconvolution graph
		12	TC	12.6		*	
		15	TC	8.8		*	
		18	TC	6.6		*	
		21	TC	5.5		*	
		24	TC	4.9		*	
		27	TC	4.6		*	
		30	TC	4.4		*	
		33	TC	4.3		*	
		36	TC	4.3		*	
		39	TC	4.2		*	
		42	TC	4.2		*	
		45	TC	4.2		*	
		48	TC	4.2		*	
		51	TC	4.2		*	
		54	TC	4.1		*	
		57	TC	4.2		*	
		60	TC	4.2		*	
		63	TC	4.2		*	
		66	TC	4.2		*	
		69	TC	4.2		*	
		72	TC	4.2		*	
		75	TC	4.0		*	

## Radium Concentrations at Exterior Locations

DOE ID #GJ-02294-RS

2231 North 21st Street

Page 5 of 7

Loc #	Grid Location	Depth (in.)	Meas. Type	In Situ Ra-226 (pCi/g)		Chem Ra-226 (pCi/g)	Comments
				Tot. Ct	Spectr.		
17	194268	78	TC	4.0		*	
		81	TC	4.0		*	
		84	TC	4.0		*	
		87	TC	4.1		*	
18	200282	[06]	DS	<1.0		*	Horizontal
		00	DS	1.6		*	
		00	DS	<1.0		*	On concrete
		03	TC	3.4		*	North side of
		06	TC	3.6		*	primary structure
		09	TC	3.7		*	
		12	TC	3.8		*	DC = 0 inches
		15	TC	3.8		*	
		18	TC	3.9		*	
		21	TC	3.9		*	
		24	TC	3.9		*	
		27	TC	4.0		*	
		30	TC	4.0		*	
		33	TC	3.9		*	
		36	TC	3.9		*	
		39	TC	3.9		*	
		42	TC	4.1		*	
		45	TC	4.1		*	
		48	TC	4.0		*	
		51	TC	4.0		*	
		54	TC	4.0		*	
		57	TC	4.1		*	
		60	TC	4.1		*	
		63	TC	4.0		*	
		66	TC	4.1		*	
		69	TC	4.2		*	
		72	TC	4.3		*	
		75	TC	4.3		*	
		78	TC	4.4		*	
		81	TC	4.4		*	
		84	TC	4.2		*	
		87	TC	4.1		*	
		90	TC	3.9		*	
		93	TC	3.8		*	
		96	TC	3.8		*	
19	205239	[06]	DS	<1.0		*	Horizontal
		00	DS	1.2		*	
		03	TC	3.3		*	

## Radium Concentrations at Exterior Locations

DOE ID #GJ-02294-RS

2231 North 21st Street

Page 6 of 7

Loc #	Grid Location	Depth (in.)	Meas. Type	In Situ Ra-226 (pCi/g)		Chem Ra-226 (pCi/g)	Comments
				Tot. Ct	Spectr.		
19	205239	06	TC	3.6		*	
		09	TC	3.5		*	DC = 0 inches
		12	TC	3.6		*	
		15	TC	3.7		*	
		18	TC	3.6		*	
		21	TC	3.7		*	
		24	TC	3.7		*	
		27	TC	3.6		*	
		30	TC	3.6		*	
		33	TC	3.7		*	
		36	TC	3.7		*	
		39	TC	3.7		*	
		42	TC	3.7		*	
		45	TC	3.7		*	
		48	TC	3.7		*	
		51	TC	3.7		*	
		54	TC	3.6		*	
		57	TC	3.6		*	Auger refusal
20	209281	00	DS	3.4		*	Gas line
		06	DS	5.7		*	
		12	DS	3.7		*	
		18	DS	1.2		*	
		24	DS	<1.0		*	At gas line
21	221246	[06]	DS	<1.0		*	Horizontal
		00	DS	<1.0		*	Adjacent to
		06	DS	1.9		*	primary structure
22	221260	00	DS	1.4		*	Water line
		03	TC	3.2		*	
		06	TC	3.4		*	
		09	TC	3.5		*	East side of
		12	TC	3.7		*	
		15	TC	3.7		*	DC = 0 inches
		18	TC	3.8		*	
		21	TC	3.8		*	
		24	TC	3.8		*	
		27	TC	3.8		*	
		30	TC	3.8		*	
		33	TC	3.8		*	
		36	TC	3.8		*	
		39	TC	3.8		*	
		42	TC	3.8		*	

## Radium Concentrations at Exterior Locations

DOE ID #GJ-02294-RS

2231 North 21st Street

Page 7 of 7

Loc #	Grid Location	Depth (in.)	Meas. Type	In Situ Ra-226 (pCi/g)		Chem Ra-226 (pCi/g)	Comments
				Tot. Ct	Spectr.		
22	221260	45	TC	3.7		*	
		48	TC	3.8		*	
		51	TC	3.8		*	
		54	TC	3.8		*	
		57	TC	3.9		*	
		60	TC	3.8		*	
		63	TC	3.7		*	
		66	TC	3.8		*	
		69	TC	3.7		*	
		72	TC	3.8		*	
		75	TC	3.6		*	
		78	TC	3.6		*	
		81	TC	3.6		*	
		84	TC	3.6		*	
		87	TC	3.6		*	
		90	TC	3.6		*	
		93	TC	3.6		*	
23	248234	00	DS	10.5		*	On driveway
		06	DS	1.5		*	
24	251234	00	DS	1.7		*	On concrete

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

Notes: DC = Depth of Contamination  
\* = No Soil Sample Taken  
[n] = Reading Taken n-Inches  
Above Floor or Ground  
Date of Survey = 07-18-85  
Team Leader = BMM

## Radium Concentrations at Interior Locations

DOE ID #GJ-02294-RS

2231 North 21st Street

Page 1 of 1

Loc #	Grid Location	Depth (in.)	Meas. Type	In Situ Ra-226 (pCi/g)		Chem Ra-226 (pCi/g)	Comments
				Tot. Ct	Spectr.		
1		[03]	DS	<1.0		*	On wall
		00	DS	1.3		*	Southwest basement
2		[06]	DS	1.4		*	On wall
		00	DS	<1.0		*	
3		[06]	DS	1.0		*	On wall
		00	DS	<1.0		*	
4		[06]	DS	8.8		*	On west wall of
		00	DS	9.4		*	ground floor

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

Notes: DC = Depth of Contamination  
 \* = No Soil Sample Taken  
 [n] = Reading Taken n-Inches  
 Above Floor or Ground  
 Date of Survey = 07-18-85  
 Team Leader = BMM



Table 3.3  
Summary of Interior Gamma Exposure Rates

DOE ID No. GJ-02294-RS      2231 North 21st Street      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)
Room A	09	15-17	16	09	16-18	17
Room B	09	14-17	15	08	15-17	16
Room C	08	16-17	16	08	16-17	17
Room D	01	16-16	16	01	16-16	16
Room E	09	14-18	16	09	15-18	16
Room F	04	13-21	18	04	14-26	20
Room G	02	18-16	17	02	16-19	18
Storage	*	*	*	*	13-14	*

=====

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



Table 4.1  
Area and Volume Calculations  
DOE ID No. GJ-02294-RS

Page 1 of 1

<u>AREA</u>	<u>CALCULATIONS(ft)</u>	<u>SF</u>	<u>DEPTH(ft)</u>	<u>CF</u>	<u>CUBIC YARDS</u>
EXTERIOR					
	Contaminated Fill				
A	5 x 10 =	50	x 0.5 =	25	
B	6 x 13 =	78	x 1.0 =	78	
C	9 x 9 =	81	x 1.3 =	105	
D	7 x 5 =	35	x 0.5 =	18	
E	6 x 4 =	24	x 0.5 =	12	
F	7 x 4 =	28	x 0.8 =	22	
G	5 x 19 =	95	x 1.0 =	95	
H	8 x 2 =	16	x 1.5 =	24	
I	5 x 3 =	15	x 0.5 =	8	
TOTAL VOLUME - EXTERIOR				= 387	= 387/27 = 14

See Appendix Figure 3.3 For Areas

=====

Table 4.2  
Estimated Cost of Decontamination and Restoration  
DOE ID No. GJ-02294-RS

Page 1 of 1

---

EXTERIOR

Remove identified residual radioactive material

10 cy @ \$14.50/cy (machine-open) \$ 145

4 cy @ \$44/cy (manual-open) 176

Replace areas with compacted roadbase

4 cy @ \$11.50/cy 46

Replace areas with topsoil

10 cy @ \$9.50/cy 95

Replace areas with sod

140 sf @ \$.50/sf 70

Remove/replace flagstone

95 sf @ \$.50/sf 48

---

TOTAL EXTERIOR \$ 580

TOTAL INTERIOR 0

ACCESS CONTROL 200

---

SUBTOTAL \$ 780

CONTINGENCY @ 10% 78

---

SUBTOTAL \$ 858

CONTRACTOR OVERHEAD & PROFIT @ 50% 429

---

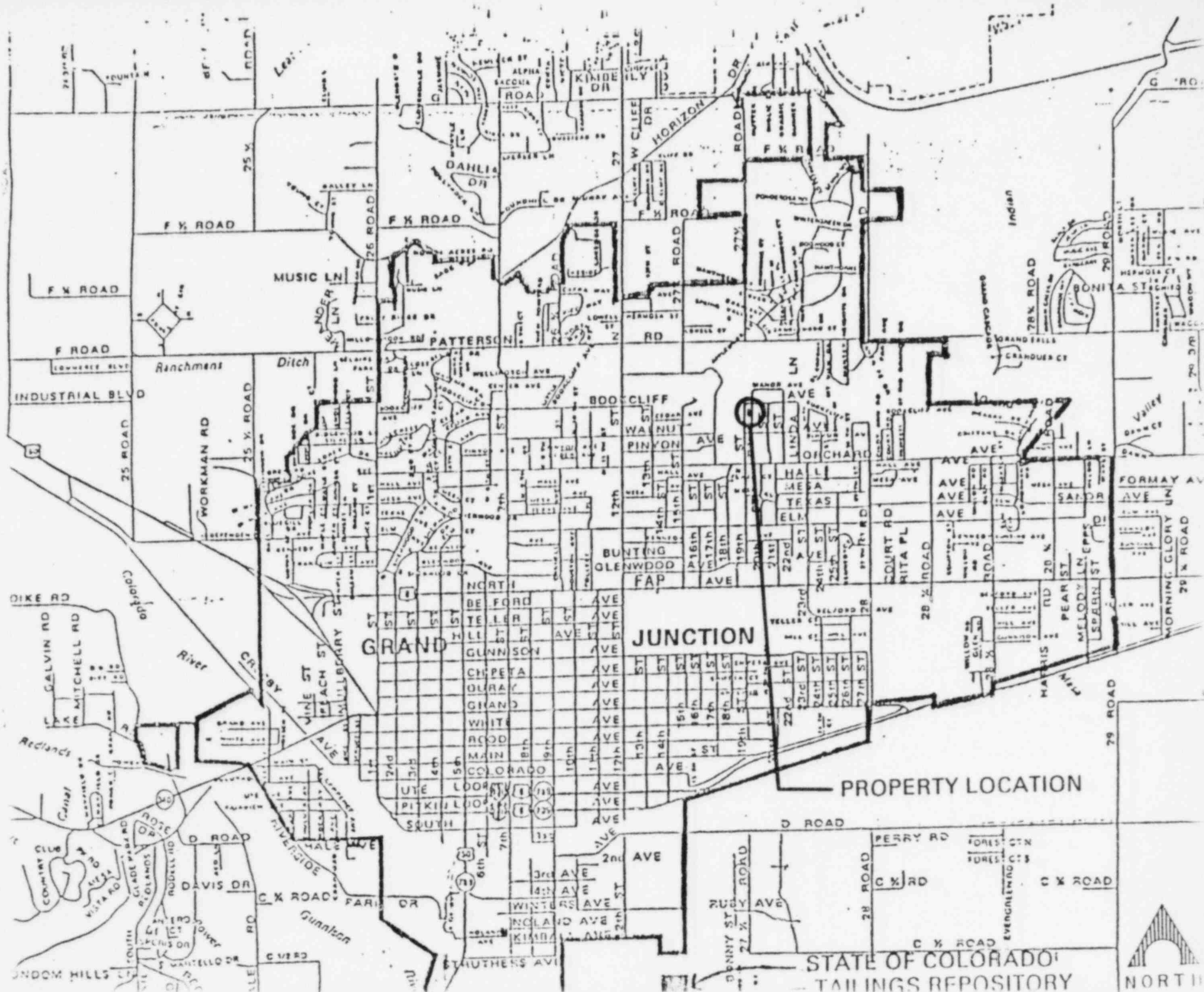
GRAND TOTAL \$ 1,287

---

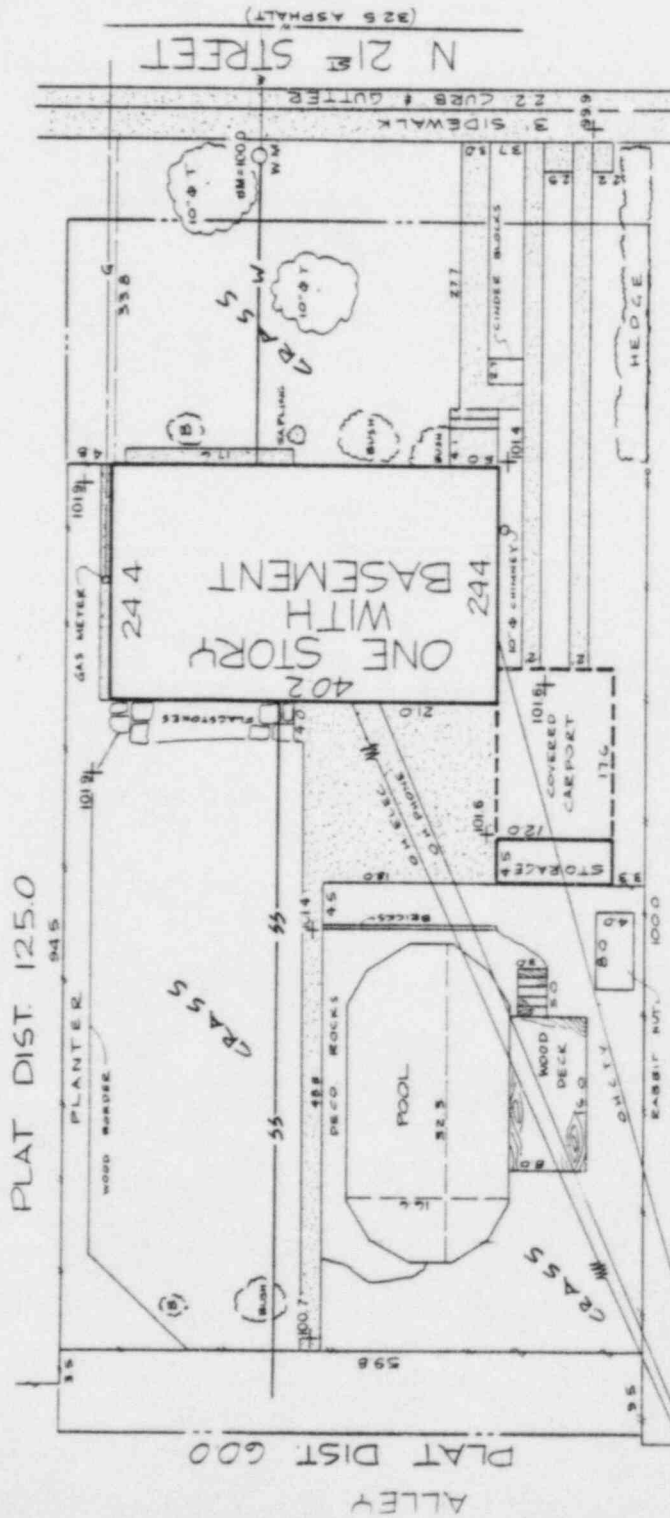
LR081385

REA02294/REA-708/AP

FIGURE 2.1  
VICINITY MAP

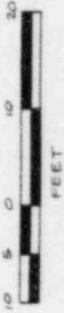


PLAT DIST 125.0



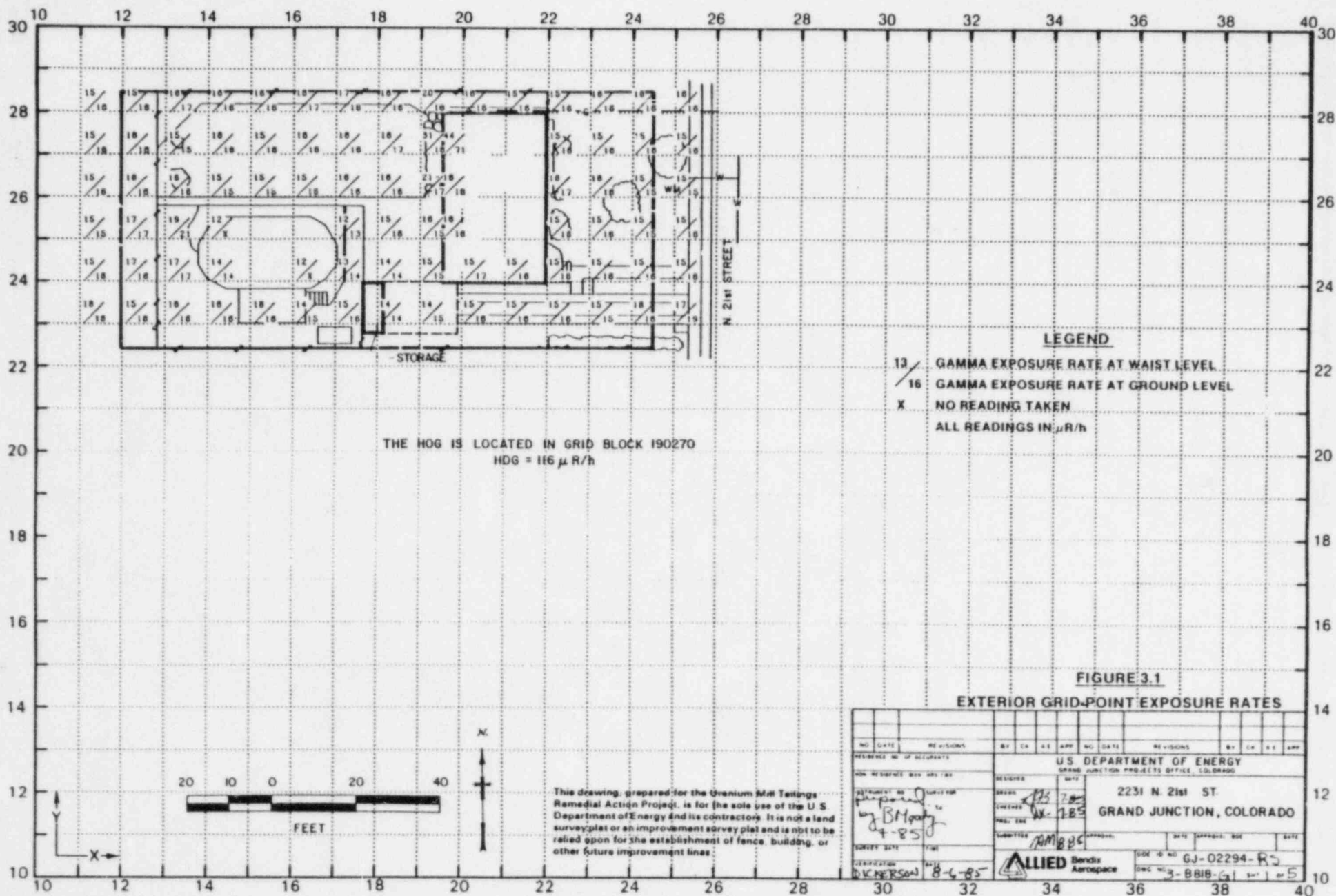
LOT 18 SUNGOLD PARK ANNEX  
GRAND JCT. MESA COUNTY COLO.

FIGURE 2.2 SITE PLAN



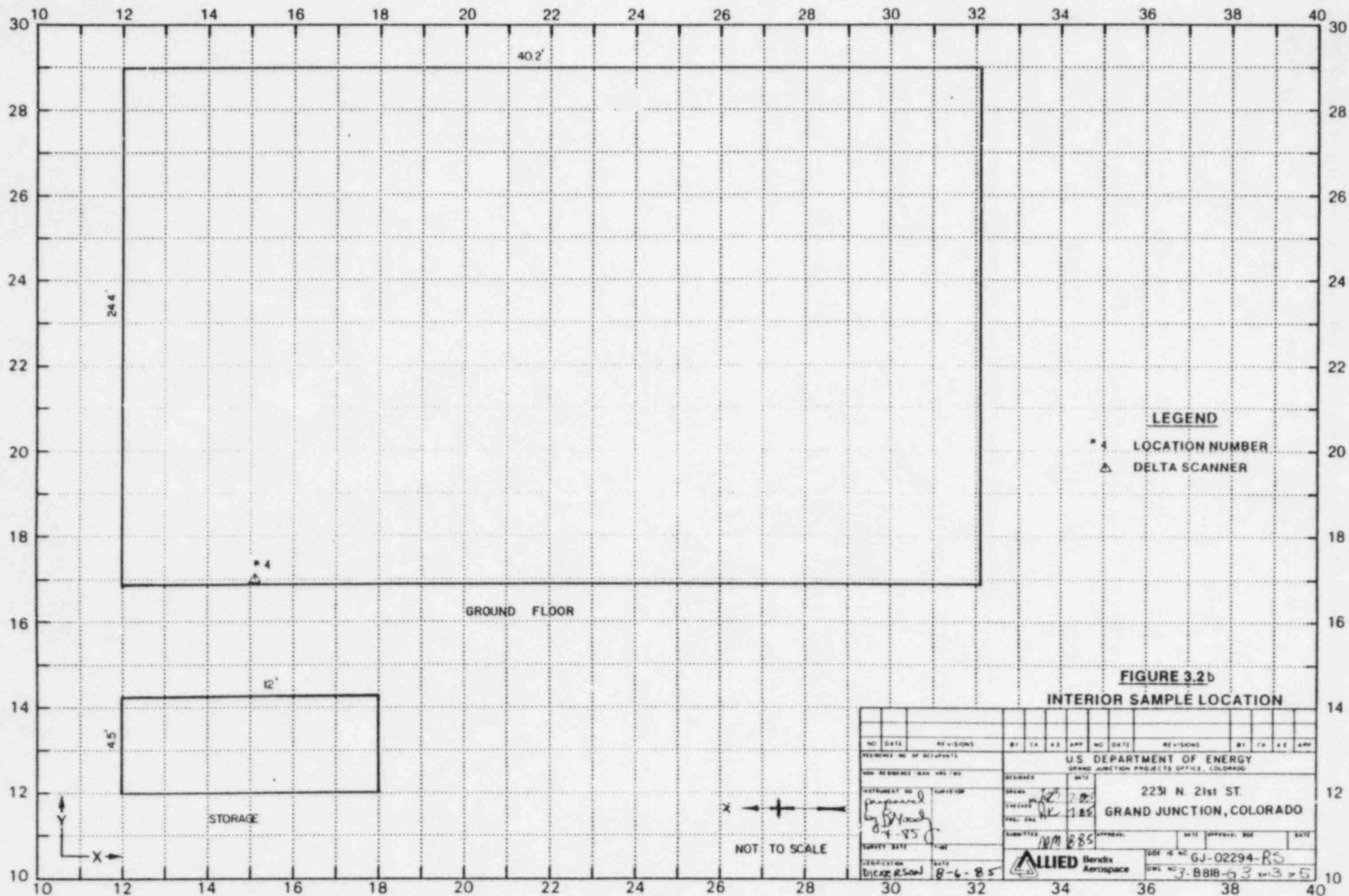
This drawing, prepared for the Uranium Mill Tailings Remedial Action Project, is for the site use of the U.S. Department of Energy and its contractors. It is not a land survey plan for an improvement survey plan and is not to be relied upon for the establishment of 'ancestral' building or other record information.

U.S. DEPARTMENT OF ENERGY	DOE ID NO.
GRAND JUNCTION PROJECT OFFICE, COLORADO	GJ02294 RS
ADDRESS 2231 N 21st ST	ALUMED
GRAND JCT. COLORADO	ALUMED
SURV WHL/7-11-85 DRAFT T3/7-12-85	ALUMED
DRAWING NO. 3-C 010 F1	OK 7-12-85
	SHEET 1 OF 1

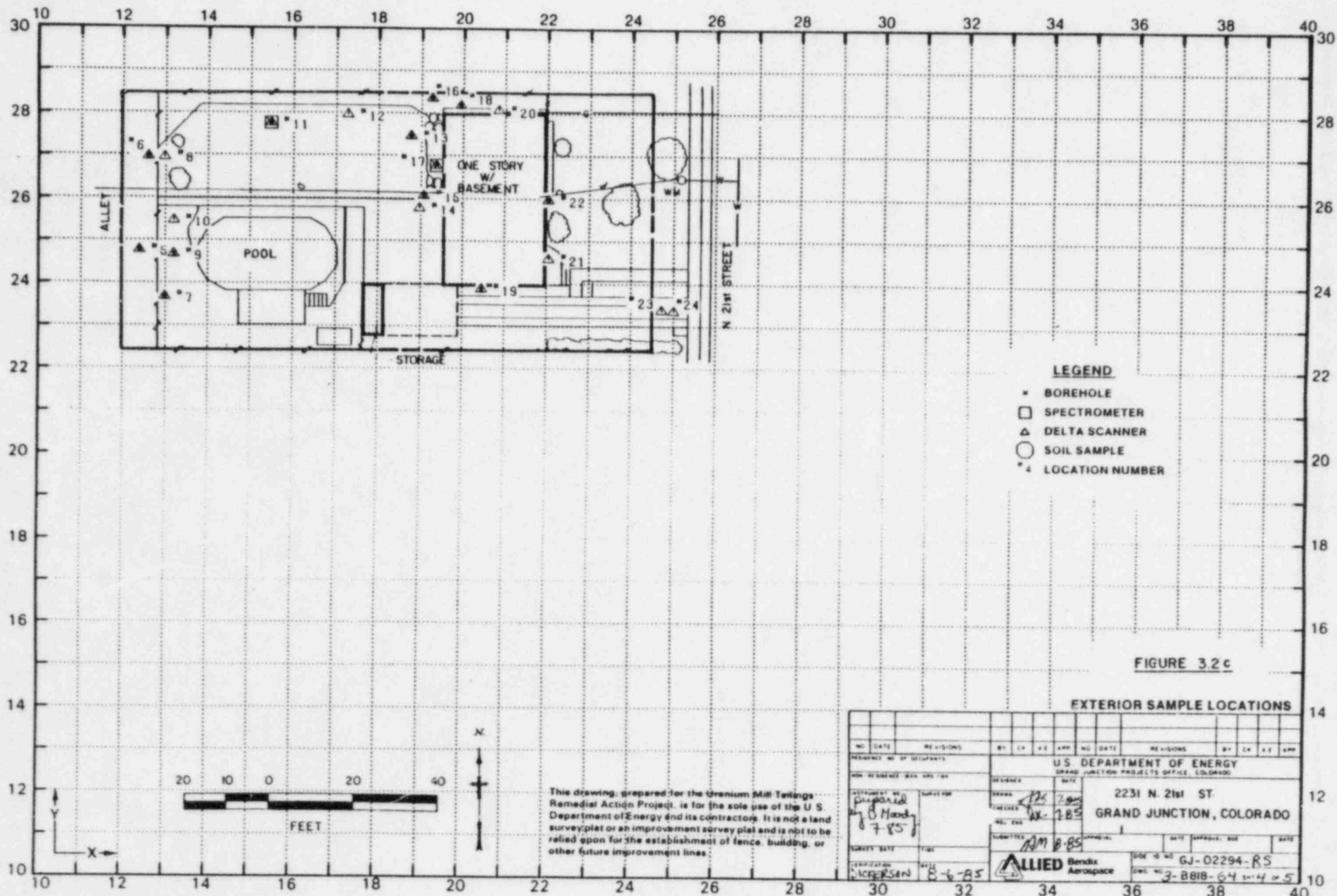




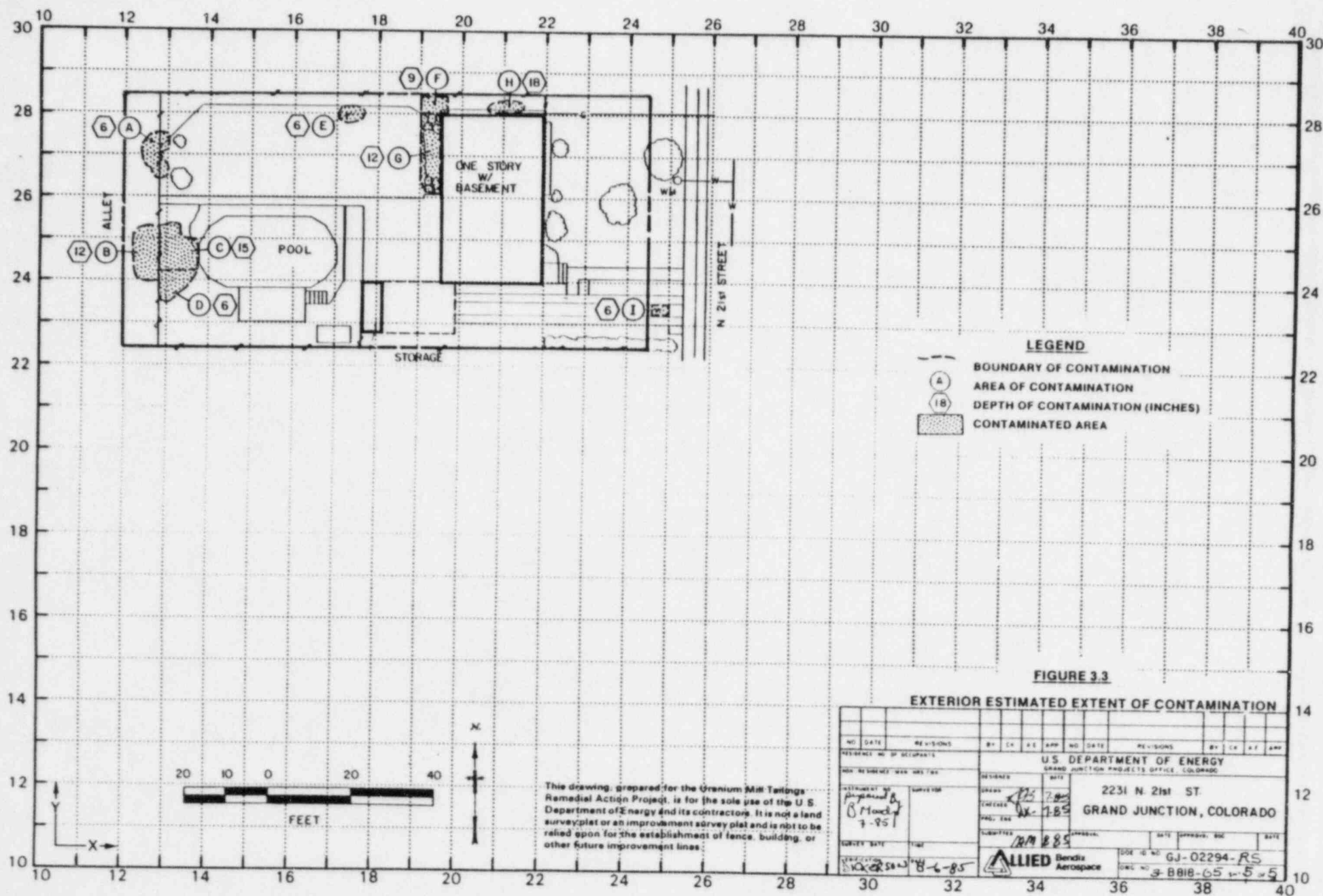




NO.	DATE	REVISIONS	BY	CHK	APP	NO.	DATE	REVISIONS	BY	CHK	APP
<p>U.S. DEPARTMENT OF ENERGY GRAND JUNCTION PROJECTS OFFICE, COLORADO</p> <p>2231 N. 21st ST. GRAND JUNCTION, COLORADO</p> <p>DESIGNED: <i>[Signature]</i> DATE: <i>7-85</i>            CHECKED: <i>[Signature]</i> DATE: <i>1-85</i>            DRAWN: <i>[Signature]</i> DATE: <i>7-85</i></p> <p>SUBMITTER: <i>NM RBS</i> APPROVAL: <i>[Signature]</i> DATE: <i>7-85</i></p> <p>ALLIED Bendix Aerospace</p> <p>DOC NO: GJ-02294-RS            DPC NO: 3-8818-G3 SHEET 3 OF 5</p>											







U.S. DEPARTMENT OF ENERGY  
URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT  
GRAND JUNCTION VICINITY PROPERTIES

Official Survey Report

Property Address 2231 North 21st Street  
Property Owner Robert Childs  
Address of Owner (if different from above) \_\_\_\_\_  
Report Prepared By Brenda Moody

I. PRESENCE/ABSENCE OF RESIDUAL RADIOACTIVE MATERIALS

1 1 No evidence of residual radioactive material on surveyed property.

1 XXXX Residual radioactive materials found at the following locations:

1 XXXX In open areas.

1 XXXX Under or around exterior improvements.

1 1 Under or around a typically nonoccupied structure.

1 XXXX Under or around a typically occupied structure.

II. RESULTS OF RADIOLOGIC ASSESSMENT

1 1 Levels of radiation from residual radioactive materials, if any, do not exceed EPA Standards and no action is required under the Uranium Mill Tailings Remedial Action Project.

1 XXXX Levels of radiation from residual radioactive materials exceed EPA Standards such that Remedial Action is recommended and will be accomplished, with your consent, as soon as budget and schedule permit.

cc:

G. A. Franz, III, GJ/CDR  
J. Themelis, Mgr. UMTRA Proj. Off.

HIC = 26 uR/h  
HOG = 116 uR/h

ALLIED Bendix  
Aerospace

Bendix Field Engineering Corporation  
Grand Junction Operations  
Grand Junction, Colorado

Date: July 18, 1985

To: Files

From: Brenda Moody

Subject: Team Leader Notes - GJ-02294-RS

Address: 2231 North 21st Street

Owner: Robert Childs

Occupancy: Six (tenants)

Team Members

B. Moody (Team Leader)  
L. Kula  
R. Herman

S. Southern  
M. Gilfillan  
D. Bell

Instruments

See Operational Summary sheet

Colorado Department of Health (CDH) and Oak Ridge National Laboratory (ORNL) information indicates contamination west of the primary structure, west of the pool, an isolated section in the driveway, and east of the primary structure. The house was built in 1955.

A complete walking scan was performed, elevated areas were investigated as shown on the Sample Locations map.

The interior gamma survey was performed. The concrete basement walls and floor were investigated with delta scanners. All readings taken indicate the lack of contamination in the structure.

Team Leader Notes  
Brenda Moody  
GJ-02294-RS  
July 18, 1985  
Page 2

Location 4 (delta scanner) indicates shine from the exterior area along the primary structure.

The gas line was investigated at Location 209281. Contamination extends to approximately 18 inches. The water line at Location 221260 appears free of contamination. The approximate location of the sewer line is location 191261.

Spillover was spot scanned on the north, south, and west sides. There was no spillover. The contamination west of the primary structure does not extend into the alley.

There is a large pool in the backyard. This pool is above ground, therefore contamination west of the pool may extend underneath a portion of it.

No injuries occurred, all personnel were alpha scanned before leaving the site.

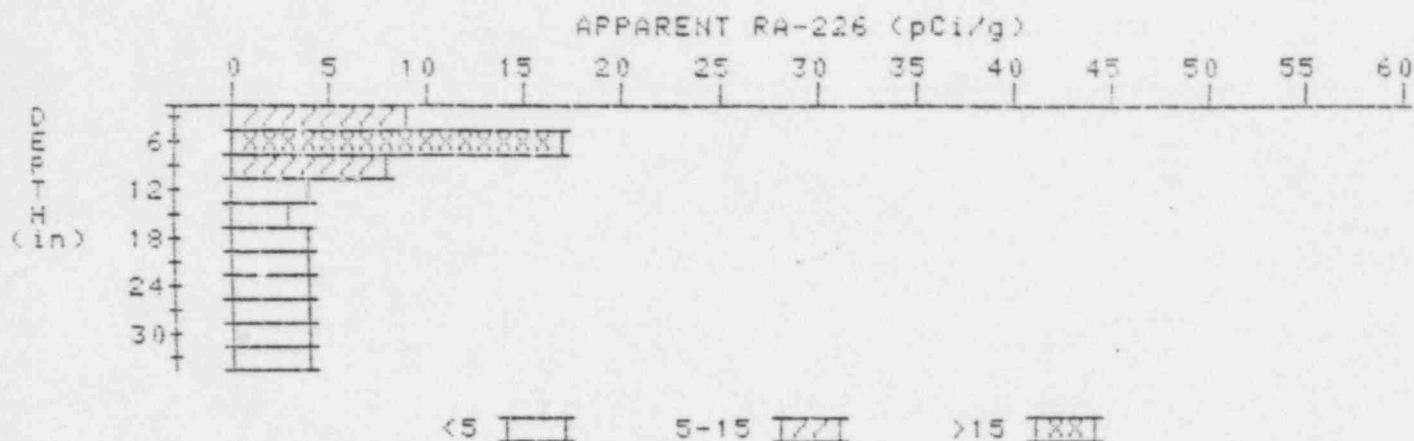
# APPARENT RADIUM-226 CONCENTRATION DECONVOLUTION GRAPH

5

PROPERTY NUMBER: GJ-02294-RS

HOLE NUMBER: 5

LOCATION: 124248



Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	9.2	9.2
6	10.4	16.6
9	8.1	7.9
12	5.9	4.3
15	4.6	3.0
18	4.2	3.7
21	4.1	4.1
24	4.0	3.8
27	4.0	3.8
30	4.1	4.1
33	4.2	4.2

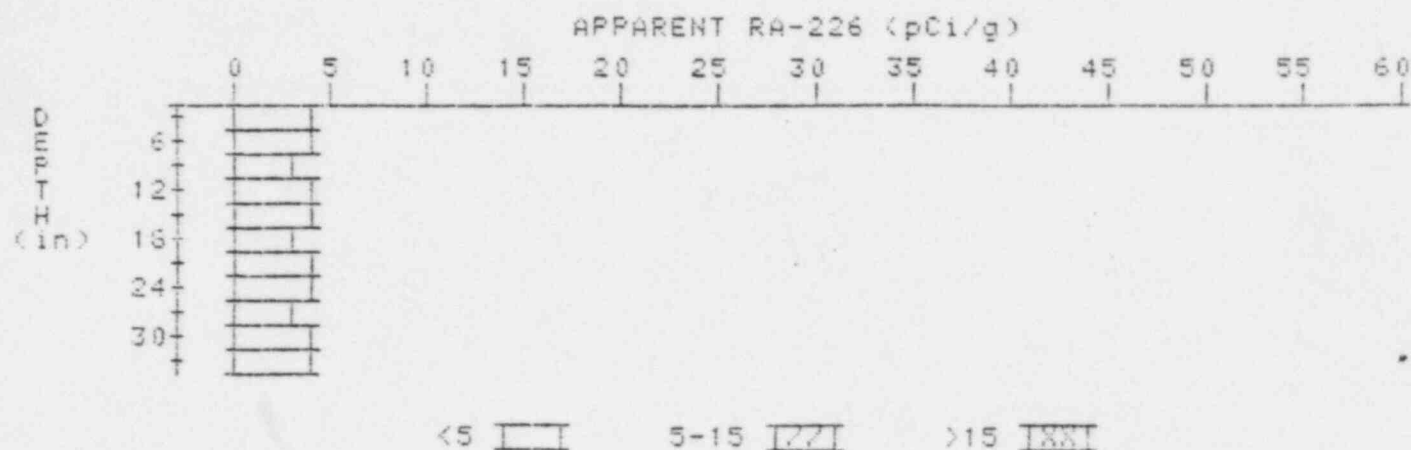
# APPARENT RADIUM-226 CONCENTRATION DECONVOLUTION GRAPH

6

PROPERTY NUMBER: GJ-02294-RS

HOLE NUMBER: 6

LOCATION: 126270



Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	4.3	4.3
6	4.1	4.3
9	3.8	3.3
12	3.8	4.0
15	3.7	3.7
18	3.6	3.2
21	3.7	3.9
24	3.7	3.9
27	3.6	3.2
30	3.7	3.9
33	3.7	3.7

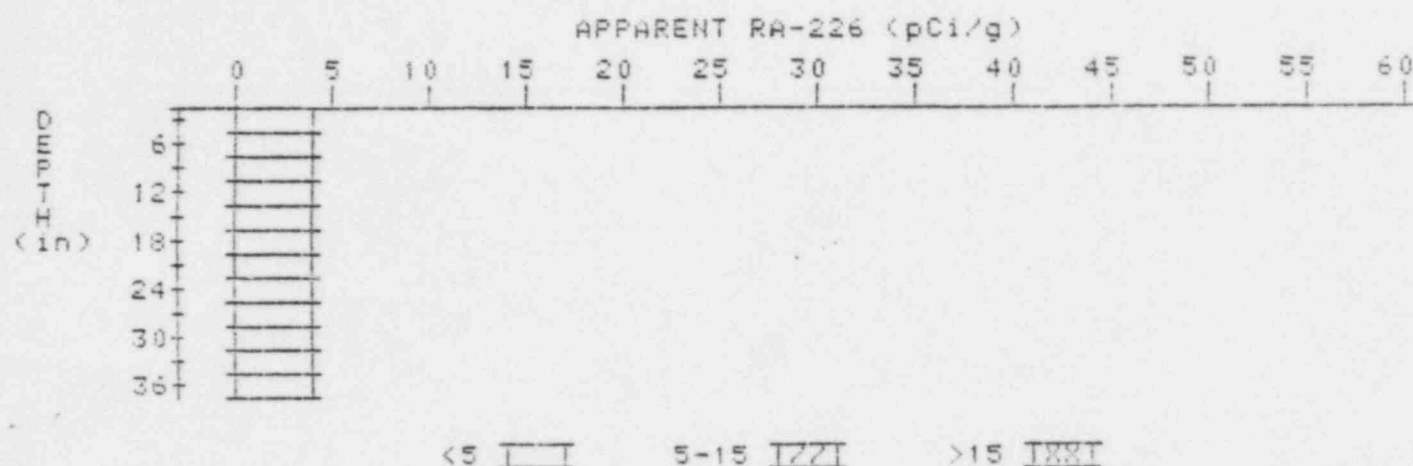
# APPARENT RADIUM-226 CONCENTRATION DECONVOLUTION GRAPH

7

PROPERTY NUMBER: GJ-02294-RS

HOLE NUMBER: 7

LOCATION: 130237



Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	3.5	3.5
6	3.6	3.6
9	3.7	3.9
12	3.7	3.7
15	3.7	3.5
18	3.8	4.0
21	3.8	3.6
24	3.9	4.1
27	3.9	3.7
30	4.0	4.0
33	4.1	4.5
36	4.0	4.0



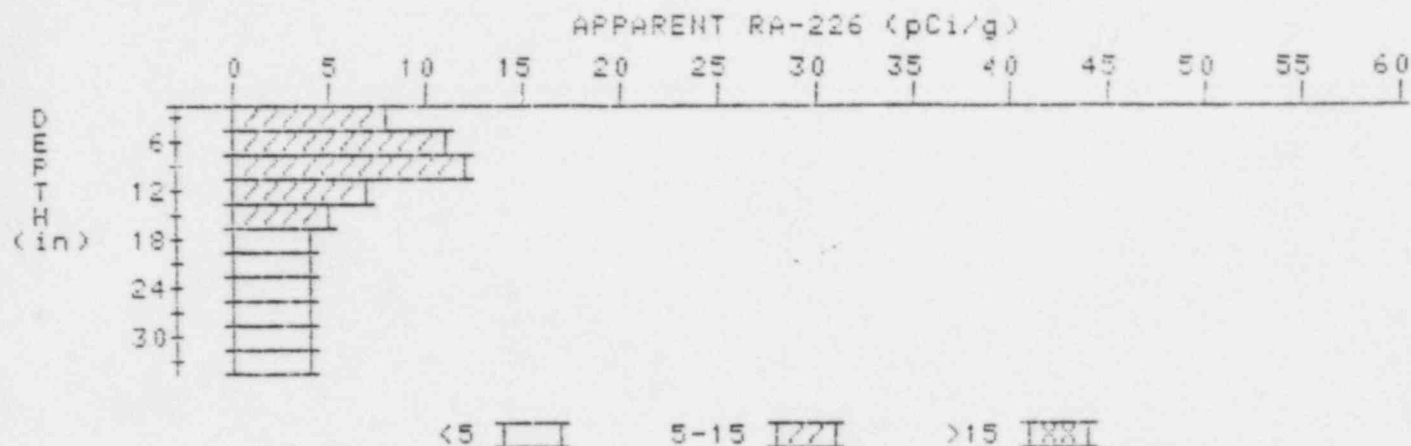
# APPARENT RADIUM-226 CONCENTRATION DECONVOLUTION GRAPH

9

PROPERTY NUMBER: GJ-02294-RS

HOLE NUMBER: 9

LOCATION: 132247



Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	8.0	8.0
6	9.0	10.8
9	9.0	11.8
12	7.4	7.0
15	6.0	5.1
18	5.1	4.4
21	4.6	4.1
24	4.4	4.2
27	4.3	4.3
30	4.2	4.0
33	4.2	4.2

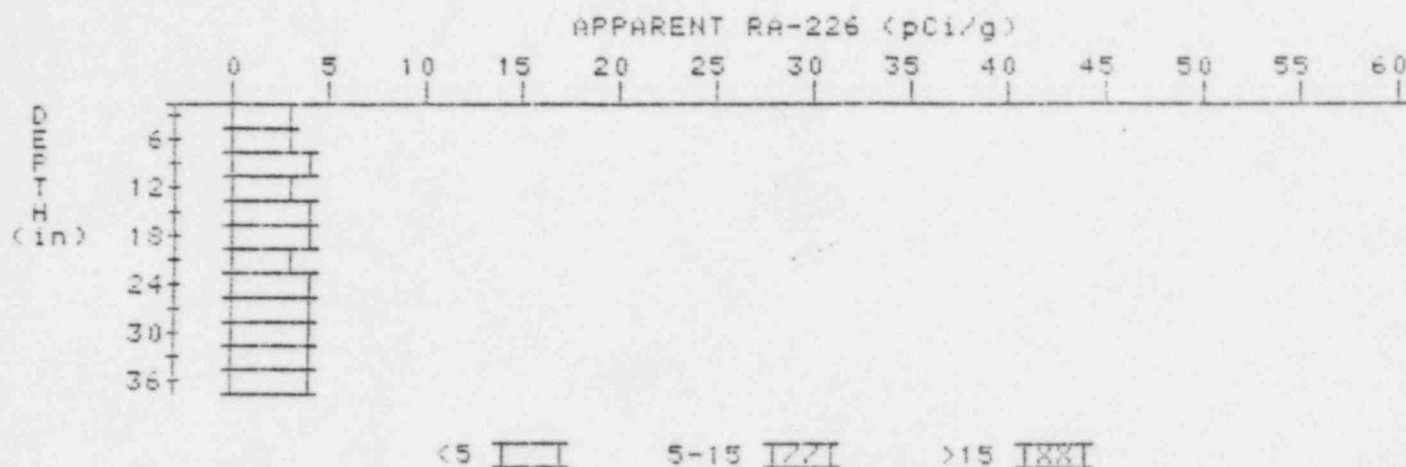


# APPARENT RADIUM-226 CONCENTRATION 11 DECONVOLUTION GRAPH

PROPERTY NUMBER: GJ-02294-RS

HOLE NUMBER: 11

LOCATION: 155278



Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	3.1	3.1
6	3.3	3.3
9	3.5	3.9
12	3.5	3.3
15	3.6	3.8
18	3.6	3.6
21	3.6	3.4
24	3.7	3.5
27	3.9	4.1
30	4.0	4.2
33	4.0	3.8
36	4.1	4.1

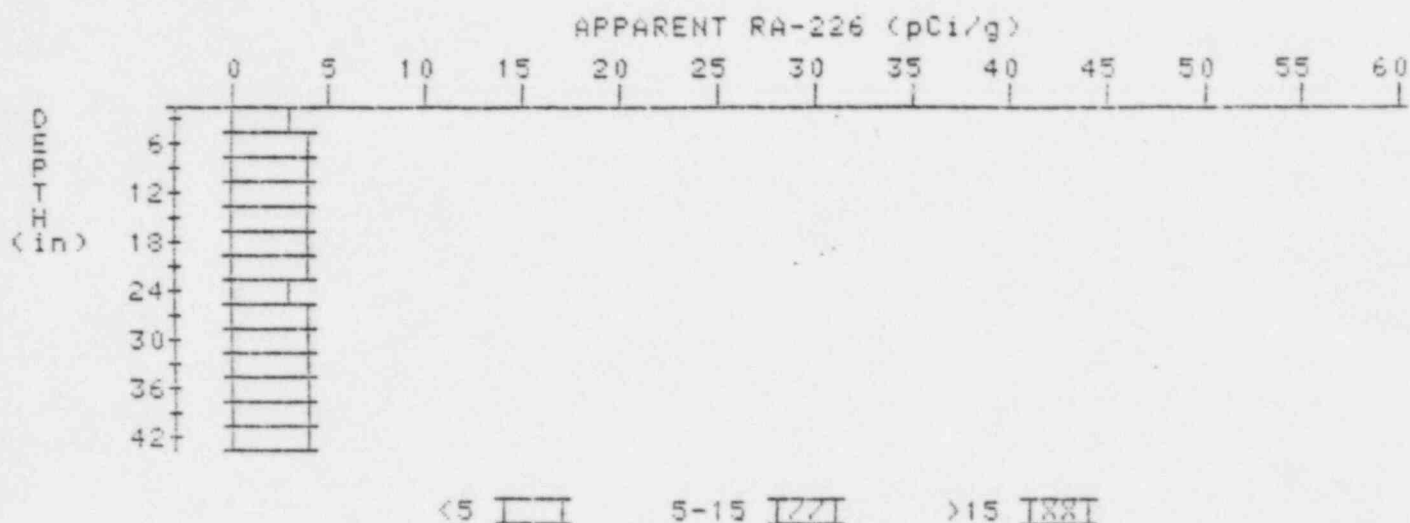
# APPARENT RADIUM-226 CONCENTRATION DECONVOLUTION GRAPH

13

PROPERTY NUMBER: GJ-02294-RS

HOLE NUMBER: 13

LOCATION: 188275



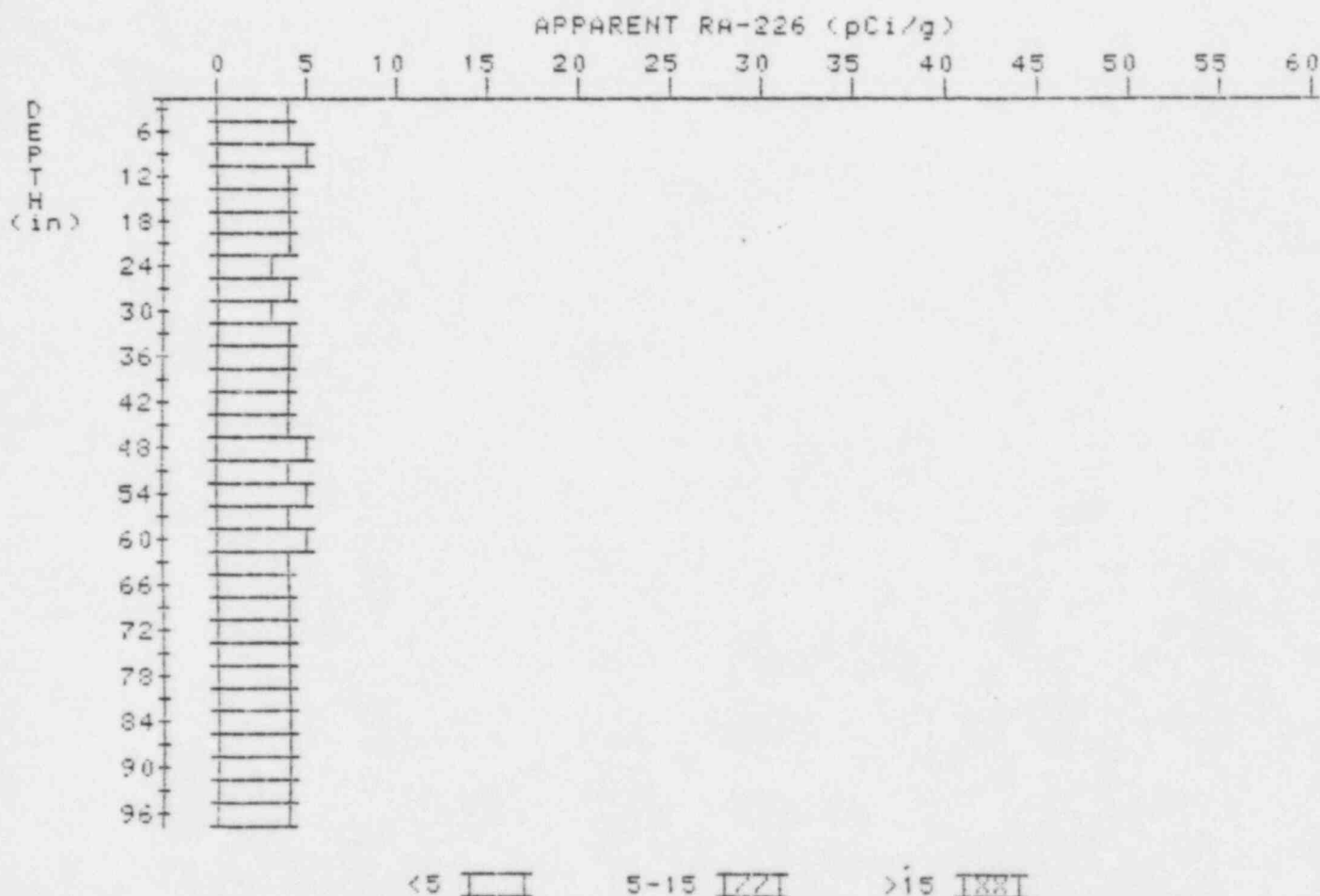
Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	3.3	3.3
6	3.5	3.5
9	3.7	4.1
12	3.7	3.7
15	3.7	3.7
18	3.7	3.7
21	3.7	3.9
24	3.6	3.1
27	3.8	4.0
30	3.9	3.9
33	4.0	4.2
36	4.0	4.0
39	4.0	3.8
42	4.1	4.1

# APPARENT RADIUM-226 CONCENTRATION 15 DECONVOLUTION GRAPH

PROPERTY NUMBER: GJ-02294-RS

HOLE NUMBER: 15

LOCATION: 191261



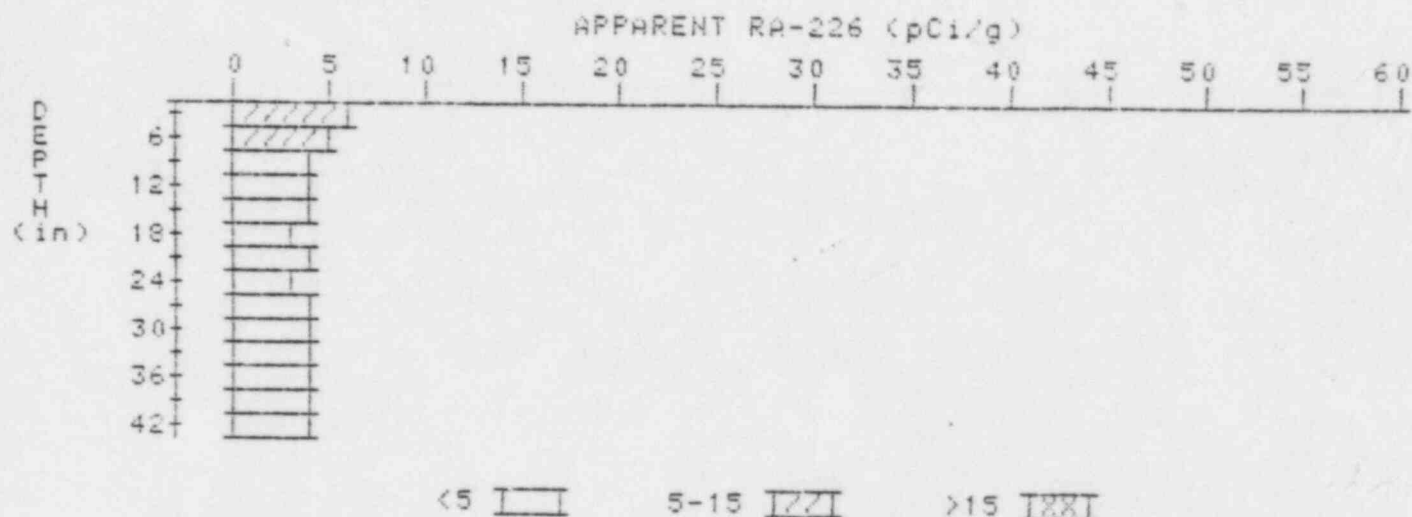
Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	4.3	4.3
6	4.3	4.1
9	4.4	4.8
12	4.3	4.5
15	4.1	3.9
18	4.0	4.0
21	3.9	3.9
24	3.8	3.4
27	3.9	4.3

30  
33  
36  
39  
42  
45  
48  
51  
54  
57  
60  
63  
66  
69  
72  
75  
78  
81  
84  
87  
90  
93  
96

[illegible][illegible]

# APPARENT RADIUM-226 CONCENTRATION 16 DECONVOLUTION GRAPH

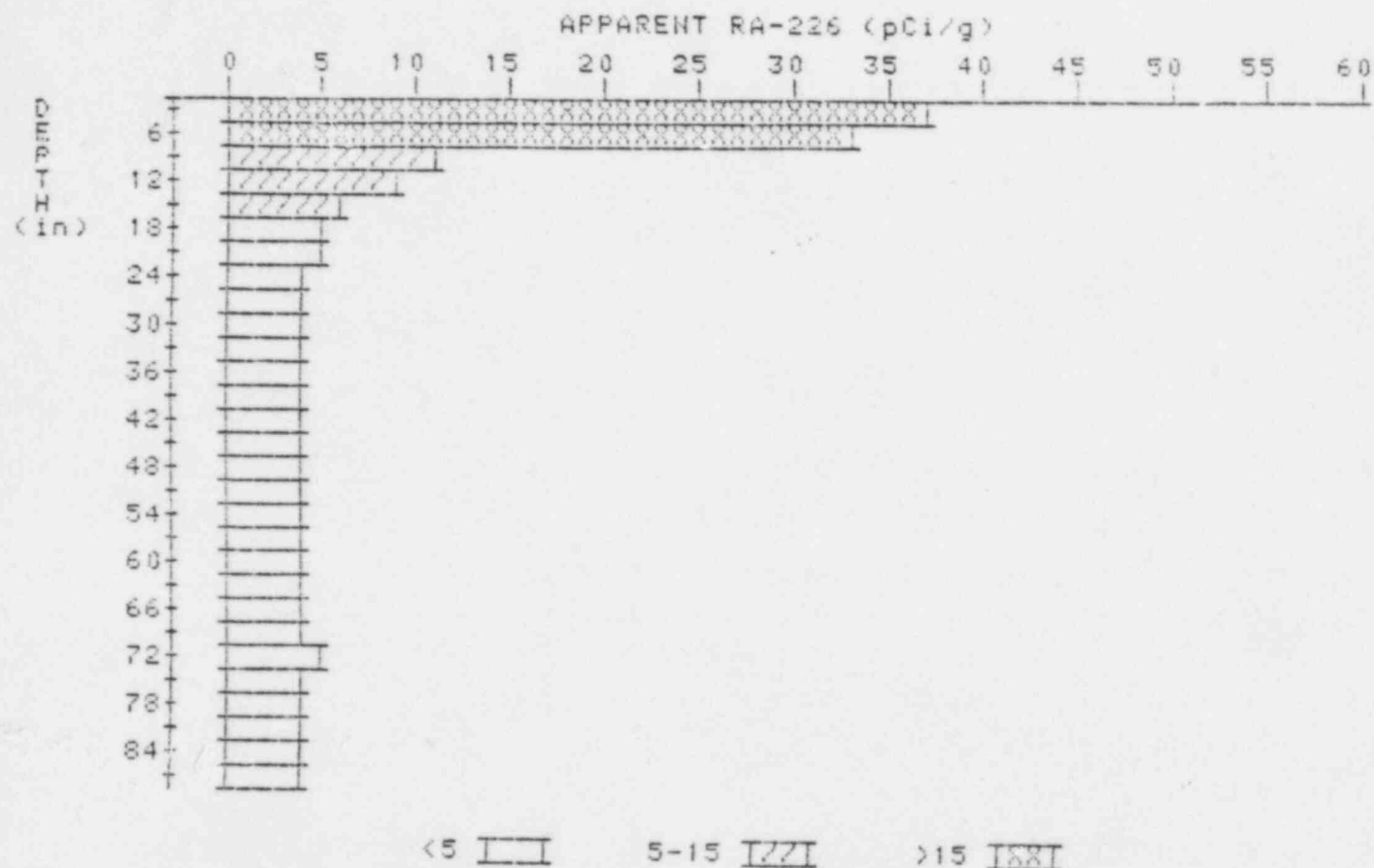
PROPERTY NUMBER: GJ-02294-RS  
HOLE NUMBER: 16  
LOCATION: 193284



Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	5.5	5.5
6	5.1	5.5
9	4.5	4.1
12	4.1	3.7
15	3.9	3.9
18	3.7	3.3
21	3.7	3.9
24	3.6	3.4
27	3.6	3.6
30	3.6	3.6
33	3.6	3.6
36	3.6	3.6
39	3.6	3.8
42	3.5	3.5

# APPARENT RADIUM-226 CONCENTRATION 17 DECONVOLUTION GRAPH

PROPERTY NUMBER: GJ-02294-RS  
HOLE NUMBER: 17  
LOCATION: 194268



Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	37.3	37.3
6	29.2	33.5
9	18.7	10.9
12	12.6	8.5
15	8.8	6.0
18	6.6	4.6
21	5.5	4.6
24	4.9	4.4
27	4.6	4.4
30	4.4	4.2
33	4.3	4.1

36  
39  
42  
45  
48  
51  
54  
57  
60  
63  
66  
69  
72  
75  
78  
81  
84  
87

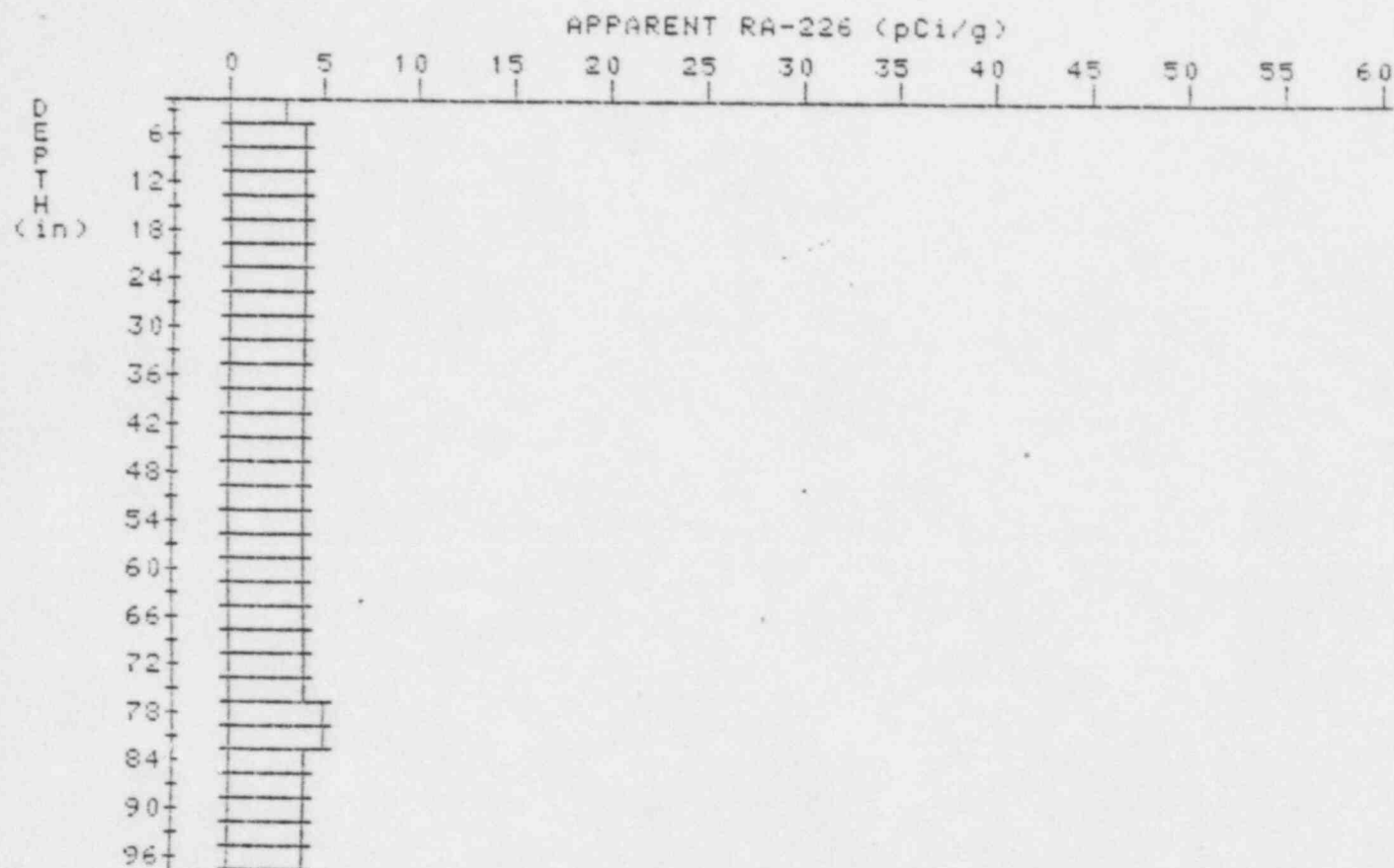
4.3  
4.2  
4.2  
4.2  
4.2  
4.2  
4.1  
4.2  
4.2  
4.2  
4.2  
4.2  
4.2  
4.0  
4.0  
4.0  
4.0  
4.1

4.5  
4.0  
4.2  
4.2  
4.2  
4.4  
3.7  
4.4  
4.2  
4.2  
4.2  
4.6  
3.6  
4.0  
4.0  
3.8  
4.1



# APPARENT RADIUM-226 CONCENTRATION 18 DECONVOLUTION GRAPH

PROPERTY NUMBER: GJ-02294-RS  
HOLE NUMBER: 18  
LOCATION: 200282



<5 II 5-15 IIII >15 IIII

Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	3.4	3.4
6	3.6	3.8
9	3.7	3.7
12	3.8	4.0
15	3.8	3.6
18	3.9	4.1
21	3.9	3.9
24	3.9	3.7
27	4.0	4.2

30  
33  
36  
39  
42  
45  
48  
51  
54  
57  
60  
63  
66  
69  
72  
75  
78  
81  
84  
87  
90  
93  
96

4.0  
3.9  
3.9  
3.9  
4.1  
4.1  
4.0  
4.0  
4.0  
4.1  
4.1  
4.0  
4.1  
4.2  
4.3  
4.3  
4.4  
4.4  
4.2  
4.1  
3.9  
3.8  
3.8

4.2  
3.7  
3.9  
3.8  
4.5  
4.3  
3.8  
4.0  
3.8  
4.3  
4.3  
3.6  
4.1  
4.2  
4.5  
4.1  
4.6  
4.6  
4.0  
4.3  
3.7  
3.6  
3.8

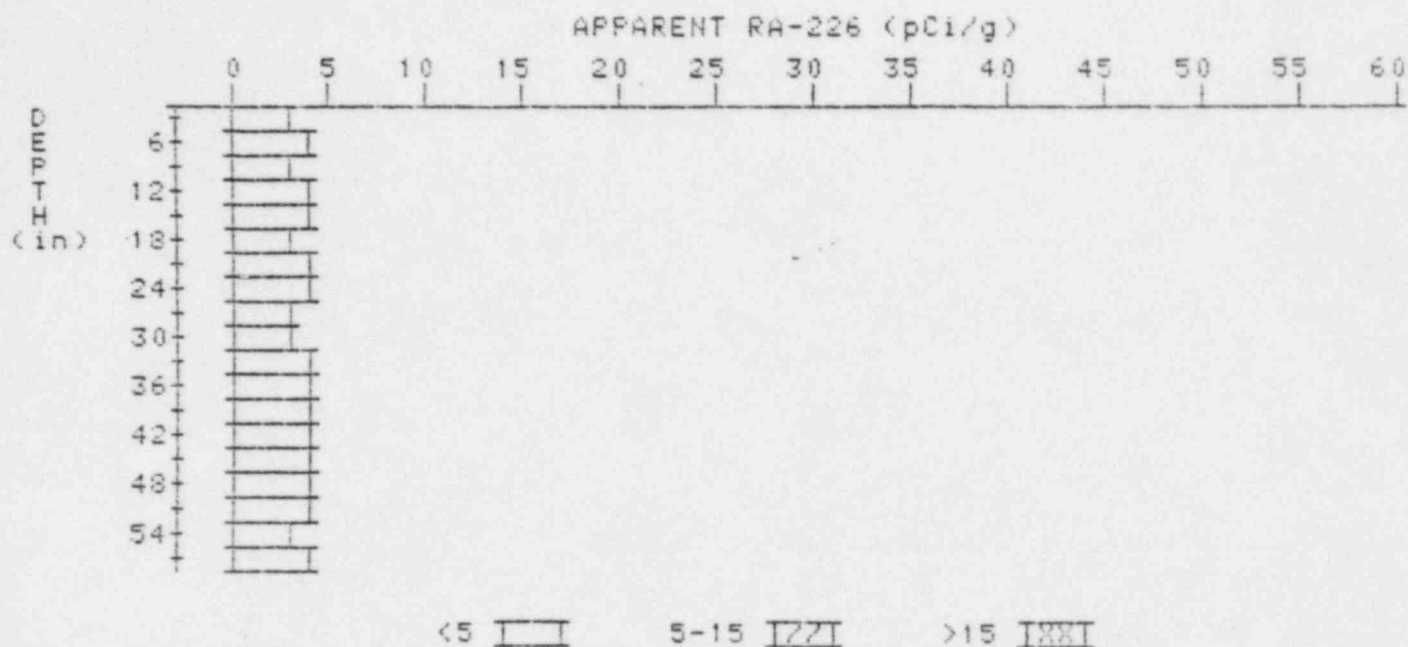
# APPARENT RADIUM-226 CONCENTRATION DECONVOLUTION GRAPH

19

PROPERTY NUMBER: GJ-02294-RS

HOLE NUMBER: 19

LOCATION: 205239



Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	3.3	3.3
6	3.6	4.3
9	3.5	3.1
12	3.6	3.6
15	3.7	4.1
18	3.6	3.2
21	3.7	3.9
24	3.7	3.9
27	3.6	3.4
30	3.6	3.4
33	3.7	3.6
36	3.7	3.7
39	3.7	3.7
42	3.7	3.7
45	3.7	3.7
48	3.7	3.7
51	3.7	3.9
54	3.6	3.4

57

3.6

3.6

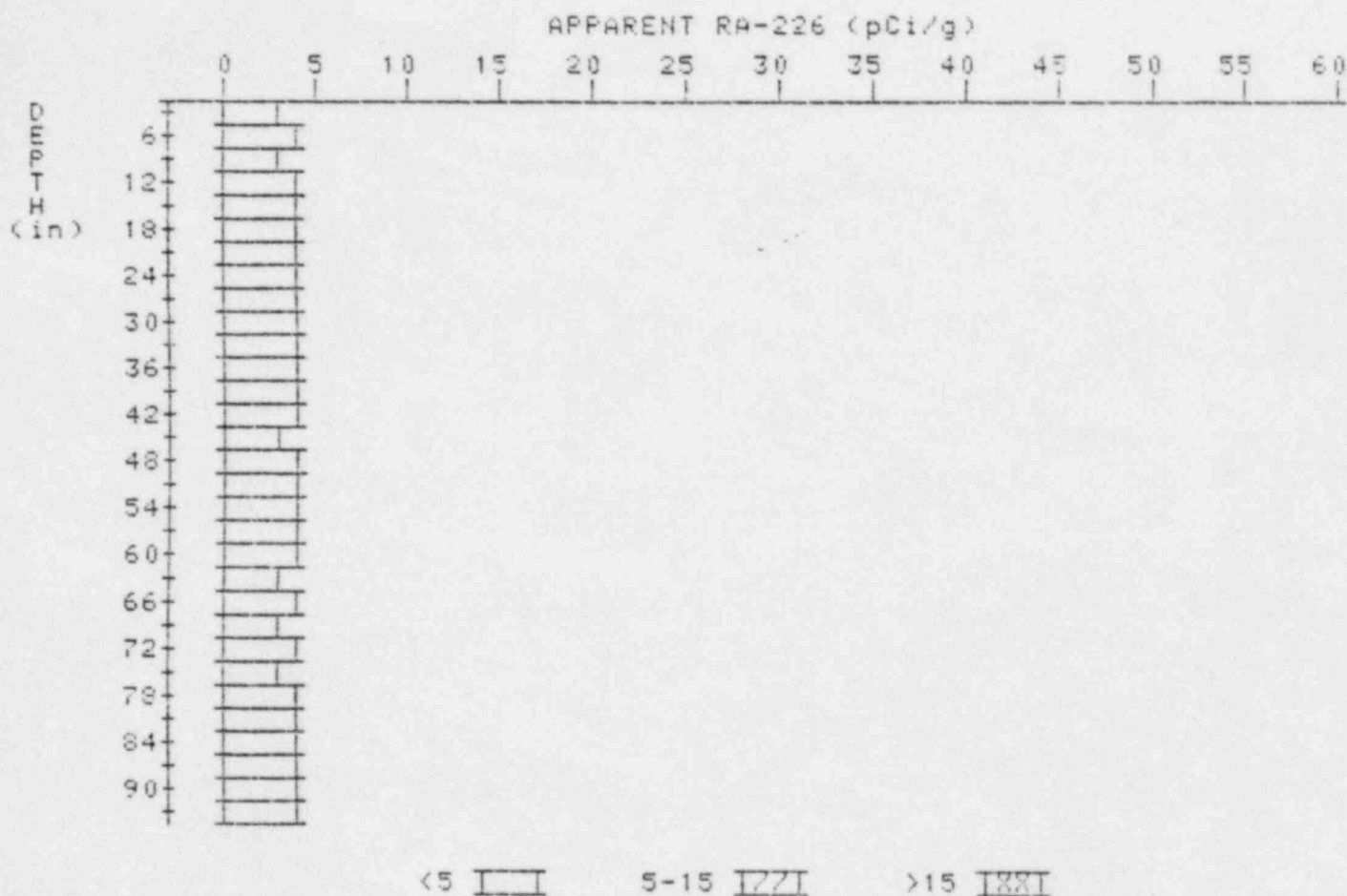
# APPARENT RADIUM-226 CONCENTRATION 22

## DECONVOLUTION GRAPH

PROPERTY NUMBER: GJ-02294-RS

HOLE NUMBER: 22

LOCATION: 221260



Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	3.2	3.2
6	3.4	3.6
9	3.5	3.3
12	3.7	4.1
15	3.7	3.5
18	3.8	4.0
21	3.8	3.8
24	3.8	3.8
27	3.8	3.8

30  
33  
36  
39  
42  
45  
48  
51  
54  
57  
60  
63  
66  
69  
72  
75  
78  
81  
84  
87  
90  
93

3.0  
3.0  
3.0  
3.0  
3.0  
3.7  
3.0  
3.0  
3.0  
3.0  
3.0  
3.7  
3.0  
3.7  
3.0  
3.0  
3.0  
3.0  
3.0  
3.0  
3.0  
3.0

3.0  
3.0  
3.0  
3.0  
4.0  
3.3  
4.0  
3.0  
3.6  
4.3  
3.0  
3.3  
4.0  
3.6  
4.3  
3.0  
3.0  
3.0  
3.0  
3.0  
3.0  
3.0

