DOE/UMTRA--050503- -Attach.6

DE93 010388

ATTACHMENT 6

SUPPLEMENTAL STANDARDS FOR DURANGO PROCESSING SITE

TABLE OF CONTENTS

SUPPLEMENTAL STANDARDS APPLICATIONS FOR REGION I ADJACENT TO ANIMAS RIVER

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
URANIUM RECOVERY FIELD OFFICE
BOX 25325
DENVER, COLORADO 80225

SEP 19 1989

URFO:DLJ
Docket No. WM-48
040WM048950E

Mark L. Matthews
Acting Project Manager
Uranium Mill Tailings Project Office
Department of Energy
P. O. Box 5400
Albuquerque, New Mexico 87115

Dear Mr. Matthews:

We have reviewed your July 18, 1989 submittal requesting approval for supplemental standards and Modification No. 1 for the Durango Remedial Action Plan.

We agree that supplemental standards are applicable for the residual material along the Animas River. Supplemental standard approval is for the area described in Figure 2 of your submittal only. We have concluded that the supplemental standard criteria (40 CFR Part 192.21) concerning risk of injury to workers and environmental harm to be applicable to this proposal.

We therefore, approve proposed Modification No. 1 to the Durango, Colorado Final Remedial Action Plan (Rev. 1, dated 6/23/89).

During a visit to the site on September 6, 1989, members of my staff observed this particular area along with several other areas that are currently being considered for supplemental standards or vicinity property designation. While examining these areas, a small "seam" of crystallized uranium salts which has formed along the river bank along the slag and original ground interface was pointed out. The deposit is thought to be the result of an old spill on the slag pile that is slowly leaching through the slag and daylighting at the river bank. Due to problems encountered with excavating and drilling in the slag, the extent of this uranium deposit has not been defined.

Your staff indicated that DOE has no plans to cleanup this area as the hazard averaged over the entire slag pile will be negligible. We do not consider this to be consistent with the approach of reducing exposure to the public to levels

as close to the standards as is reasonably achievable. Therefore we suggest that DOE reexamine the possible hazard to the public along the accessible river bank.

If you have any questions please contact me or D. L. Jacoby of my staff on FTS 776-2805.

Sincerely,

Ramon E. Hall
Director

Case Closed: 040WM048950E

0225/
Dur

MKO/UMT/0989-0944

ENGINEERS
AND
CONSTRUCTORS

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

HEADQUARTERS OFFICE
ONE ERIEVIEW PLAZA
CLEVELAND OHIO U S A 44114
PHONE (216) 523-5600/TELEX 985542

REPLY TO MK-FERGUSON COMPANY
REMEDIAL ACTIONS
CONTRACTOR-UMTRA PROJECT
PO BOX 9136
ALBUQUERQUE NEW MEXICO U S A 87119

89-3050-688

September 12, 1989

Mr. Mark L. Matthews
Acting Project Manager
U.S. Department of Energy
Uranium Mill Tailings Remedial Action Project Office
First National Bank Building
Suite 1700
5301 Central Avenue N.E.
Albuquerque, New Mexico 87108

SUBJECT: Proposed Durango Site RAP Mod. Rev. 2, Animas River Bank

REFERENCE:
1. Letter No. 89-3050-485 to Mark L. Matthews from J.G. Oldham dated July 6, 1989.
2. Contract No. DE-AC04-83AL18796

Dear Mr. Matthews:

Revision 1 of the proposed Remedial Action Plan Modification (RAP Mod.) No. 1 (attached) for the Durango, Colorado Site, has been altered slightly to incorporate verbal comments received from the U.S. Nuclear Regulatory Commission. No significant technical changes were made as the comments were for clarification.

As was described previously (Reference 1), an area of the flood plain at Durango, including the river bank, was found to contain Ra-226 at concentrations in excess of the EPA Standards. Because of the proximity of the material to the river, complete excavation would require the use of Z-pile, at an estimated cost of approximately $750,000.00. MK-Ferguson continues to recommend that the upper three feet of the material be removed while leaving the river bank in place. After this excavation is performed, approximately 500 cubic yards of material will remain in place with an estimated average activity of 30 pCi/g. Supplemental Standards are suggested for the residual material. A radiological analysis of the deposit, including a calculation of radon flux from the area is attached. This analysis shows that there should be negligible health effects associated with the residual material.

1987B

Because excavation is nearly complete in the affected area, MK-Ferguson requests your concurrence on the proposed Modification as soon as possible. Should you have any questions or comments regarding this Modification, please do not hesitate to contact Dr. Frank Petelka of my staff at 766-3040.

Sincerely,

MK-FERGUSON COMPANY

J.G. Oldham
Project Director

JGO/MFP/ss
Enclosures
cc: E. Damler, DOE/UMTRA (w/encl.)
B. Sellers, DOE/UMTRA (w/encl.)
M. Jackson, TAC/UMTRA (w/encl.)
M. Miller, TAC/UMTRA (w/encl.)
P. Martinek, CDH (w/encl.)
HS-011-09-89

PROPOSED MODIFICATION No. 1
DURANGO, COLORADO
FINAL REMEDIAL ACTION PLAN
CHANGE NO. 1
REV. 1, 6/23/89

A. Description:

The purpose of this change is to establish an excavation protocol for radium-226 (Ra-226) adjacent to the Animas river at the Durango, Colorado, mill tailings site. As required in 40 CFR 192.22(a), Ra-226 will be excavated to levels that are as low as is reasonably achievable (ALARA). ALARA conditions at the Durango site will be met by the following:

1) Excavate (generally 6") contaminated materials to as close to the river bank as is feasible, leaving sufficient material for the purpose of stability.

2) Excavate contaminated materials away from the river bank as deep as is possible, and in any event to a minimum of 1 foot below existing river water elevation.

The Department of Energy's commitment to comply with Environmental Protection Agency (EPA) standards for groundwater remains unchanged.

B. Resulting changes to the RAP:

Page C-2 of UMTRA-DOE/AL 050503.0000, June 1986, "Remedial Action Plan and Site Design for Stabilization of the Inactive Uranium Mill Tailings Site at Durango, Colorado." Add the following paragraphs before the last paragraph of Section C.1, "Introduction":

"If Ra-226 and its decay products are present in areas immediately adjacent to the Animas river, supplemental standards shall be applied per 40 CFR 192.21(b). Remedial actions shall reduce levels of residual activity to levels that come as close to meeting the otherwise applicable standards as is reasonable under the circumstances.

Supplemental standards may be applied when Ra-226 contamination is present in the Animas river bank. When present in the river bank, residual Ra-226 more than 1 foot back from the bank will be excavated to levels that are as low as reasonably achievable (ALARA). ALARA conditions at the Durango site will be met by excavating the material to levels that should, via modeling and RAECOM analysis, limit radon flux at the restored surface to 3.9 pCi/m^2-s (a projected 0.02 WL in a hypothetical structure). Supplemental standards will be applied to the excess Ra-226 contamination left in the river bank and at depth.

Page C-7 of UMTRA-DOE/AL 050503.0000, June 1986, "Remedial Action Plan and Site Design for Stabilization of the Inactive Uranium Mill Tailings Site at Durango, Colorado." Add the following paragraphs to the end of Section C.3.4, "Final Radiological Verification Survey for Land":

"For areas in which a significant fraction of the material being sampled is rock or gravel, the nine-plug composite 30x30 foot grid may be collected by using a shovel or other implement to take bulk samples, separating the fines from the rock using a #4-mesh screen and determining the weight of the fines and rock fractions. The fines shall then be counted for Ra-226 following the standard RAC-015 specifications and quality controls. The resulting radium concentration will be corrected to a final, reportable concentration utilizing the mass ratios of the rock/fines fractions.

Supplemental Standards will be applied, and the residual radioactive material exceeding the Standard given in 40 CFR 192.12(a) left in place, based on the criteria in 40 CFR 192.21(b). Estimated area, volume, and average concentration will be documented in the site completion report".

C. Overall Impact to Design and Complete Remedial Action

This change simplifies construction and avoids expenditures which would be unreasonably high relative to the long-term benefits. The change results in low-level contaminated material remaining in some areas of the river bank. This material will produce an estimated maximum radon flux at the restored surface of 3.9 pCi/m^2-s. Furthermore, the material is in a location where construction of structures is not likely and any future excavation will mix the contamination with clean materials and dilute the concentration. The deposit is not expected to impact the groundwater conditions at the Durango site and should not impact future compliance with the EPA groundwater standards (when finalized).

D. Compliance of Revised Design with EPA Standards

The revised design complies with Supplemental Standards defined under 40 CFR 192.22(a) as "coming as close to meeting the otherwise applicable standard as is reasonable under the circumstances", reducing residual activity to levels that are as low as is reasonably achievable. Additional excavation should not be required to meet the proposed EPA groundwater standards for chemical contaminants.

Excavation of the residual Ra-226 remaining on the river bank would produce environmental harm clearly excessive compared to the health benefits to persons living on or near the site. Since the contaminated materials present a negligible health hazard, any environmental harm is excessive. Environmental harm caused by remedial action will include destruction of the present river bank, effects from diversion of the river to facilitate construction, and unacceptable turbidity from the release of large quantities of silt into the downstream water during remedial action. The revised design meets the intent of the as low as reasonably achievable (ALARA) philosophy in 40 CFR 192.22(a), and complies with the criterion in 40 CFR 192.21(b).

In summary, a supplemental standard for cleanup of this area will be applied as described in paragraphs A-D above. The revised design should not affect future compliance with proposed EPA groundwater standards.

E. Reason for Change

This change reduces the residual radioactivity to levels as low as reasonably achievable while avoiding both excessive environmental harm from, and costs of, remedial action which would be unreasonably high relative to the benefits. The contaminants left in place will not pose a significant present or future threat to the general public.

RAECOM analysis shows that given the above conditions, residual Ra-226 concentrations averaging 36 pCi/g (the maximum remaining measured value) would produce radon a Rn-222 flux ranging from 0.00 to 1.4 pCi/m^2-s, resulting in hypothetical working levels ranging from zero to 0.007. These results, shown on Table 2, indicate that to ensure Rn-222 control to the habitable building standard of 0.02 (40 CFR 192.12(b)(1)), the excavation depth should be a approximately 1 foot below the average river stage. Note: The 20 pCi/m^2-s flux standard given in 40 CFR 192.02(b)(1) would be met with no additional excavation.

Recommended Excavation Protocol:

There are two options for the excavation of the material adjacent to the river; one would require extensive engineering and construction support and would remove all the contamination, the other would be less complex but would leave a small quantity of residual activity.

Option 1 - Complete removal of contamination: The area would need to be surrounded by Z-pile to minimize water infiltration into the excavation. Since the contamination extends into the river, the Z-pile would be placed in the river channel, extending some distance from the bank. The excavation would be dewatered, the water would require treatment prior to release offsite. Complete decontamination would also destroy approximately 280 linear feet of river bank

Option 2 - Partial decontamination: The area would be excavated to a minimum depth of one foot below present river stage. The present river bank would remain in place; excavation would begin approximately one foot back from the bank. An attempt would be made to increase the depth of excavation with distance from the river bank. Approximately 500 cubic yards of contaminated material containing an average of 30 pCi/g would remain. Under this option, the final remedial action plan will require modification to allow the use of supplemental standards based on 40 CFR 192.21(b) (environmental harm).

References:

1. Radon Attenuation Effectiveness and Cover Optimization (RAECOM, IBM PC Version).

2. Draft Generic Environmental Impact Statement on Uranium Milling; NUREG-0511; April 1979.

3. Lung Cancer Risk from indoor Exposure to Radon Daughters; ICRP 50; 1979.

4. USNRC. 1987. Draft Regulatory Guide and Value/Impact Statement, Calculation of Radon Flux Attenuation by Earthen Uranium Mill Tailings Covers. Task WM 503-4.

5. USDOE. 1984. Draft Remedial Action Plan and Site Conceptual Design for Stabilization of the Inactive Uranium Mill Tailings Site at Durango, Colorado.

6. Code of Federal Regulations, Title 40 Part 192; Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings.

7. USDOE, 1988. Final Calculations, Volume IV, Redesign of Disposal Embankment. Uranium Mill Tailings Remedial Action Project (UMTRAP), Durango, Colorado.

Table 1
RADIUM CONCENTRATION
Durango Slag-Area Riverbank

TEST PIT NUMBER	DEPTH (ft.)	ESTIMATED FINAL Ra-226 (pCi/g)*
1	Surface	61
	1	4
	2	<1.5
	3	9
2	Surface	69
	1	87
	2	21
	3	31
3	1	85
	2	48
	3	30
	4	7
	5	4
	6	36
	7	21
4	Surface	42
	0.5	6
5	Surface	10
	0.5	2
6	Surface	10**
	0.5	8**
7	Surface	6**
	0.5	4**

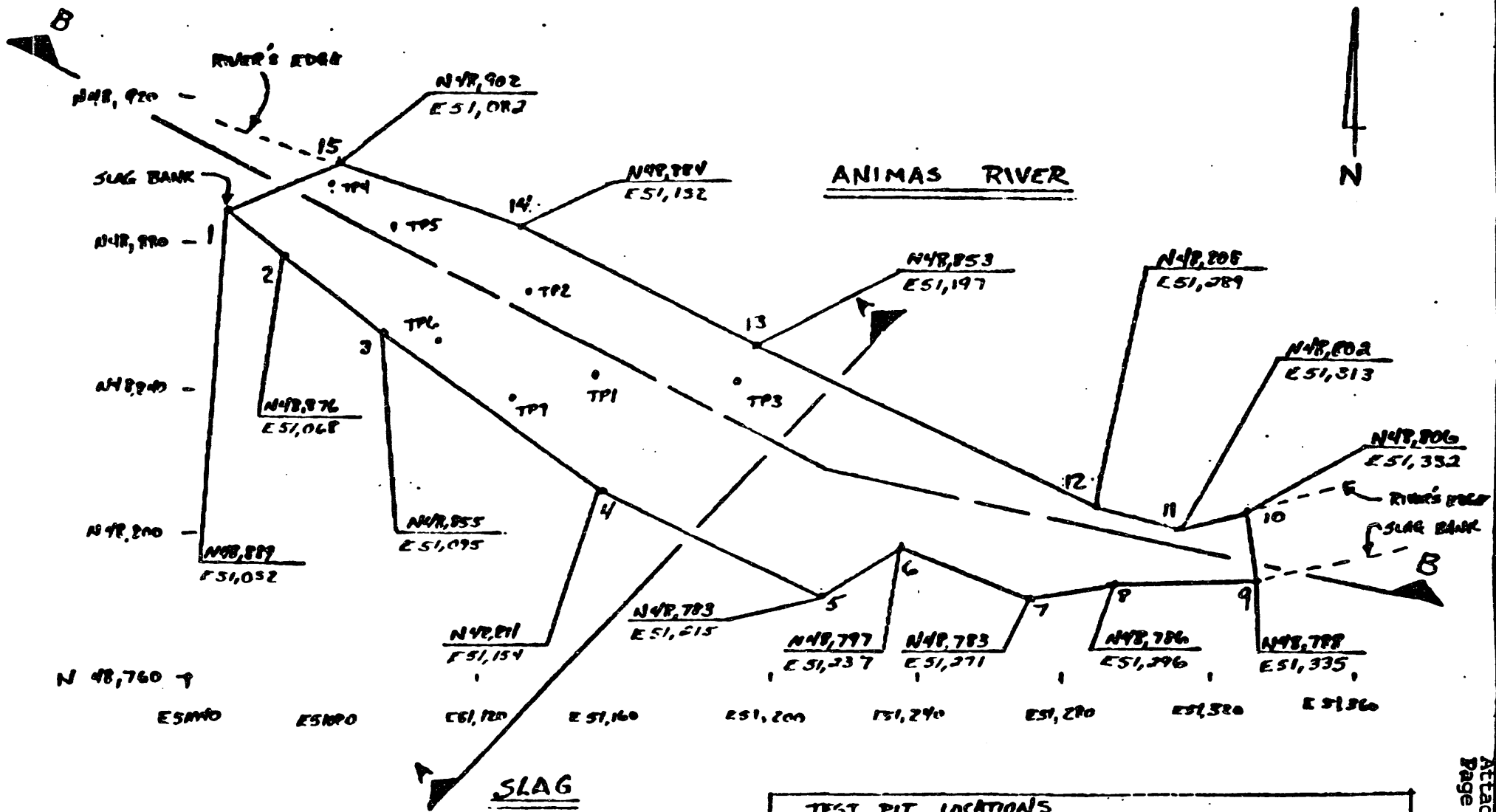
Footnotes:
*Sample dried prior to OCS analysis. Correction factor of 1.2 applied.
**Wet samples. Correction factor of 1.4 applied.

Table 2
ESTIMATED Rn-222 FLUX AND
HYPOTHETICAL INDOOR RADON DAUGHTER CONCENTRATION
Durango Slag-Area Riverbank

Case 1:	Minimum excavation (1 ft. below water level), 2 feet of backfill	
	Rn-222 flux = 1.4 pCi/m^2-s	WL = 0.02
Case 2:	1 foot of additional excavation, 3 feet of backfill	
	Rn-222 flux = 0.00 pCi/m^2-s	WL <0.001
Case 3:	2 feet of additional excavation, 4 feet of backfill	
	Rn-222 flux = 0.00 pCi/m^2-s	WL <0.001
Case 4:	3 feet of additional excavation, 5 feet of backfill	
	Rn-222 flux = 0.00 pCi/m^2-s	WL <0.001

APPENDIX A

RAECOM COMPUTER CODE OUTPUT



SCALE : 1" = 40'

TEST PIT LOCATIONS	
TP1 - N48,846, E51,153	TP5 - N48,885, E51,097
TP2 - N48,866, E51,134	TP6 - N48,853, E51,110
TP3 - N48,842, E51,192	TP7 - N48,898, E51,130
TP4 - N48,896, E51,080	

FIGURE 1

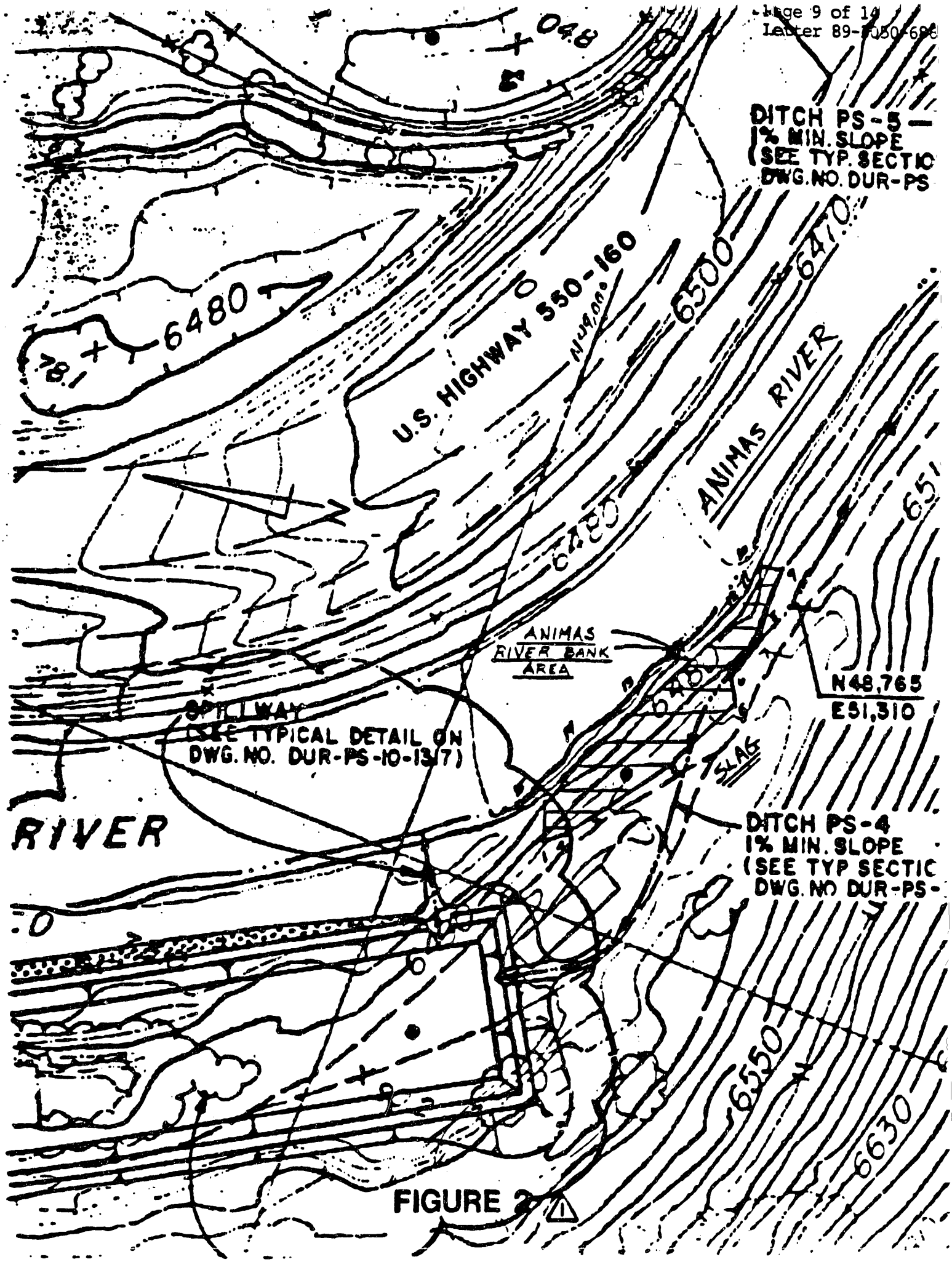
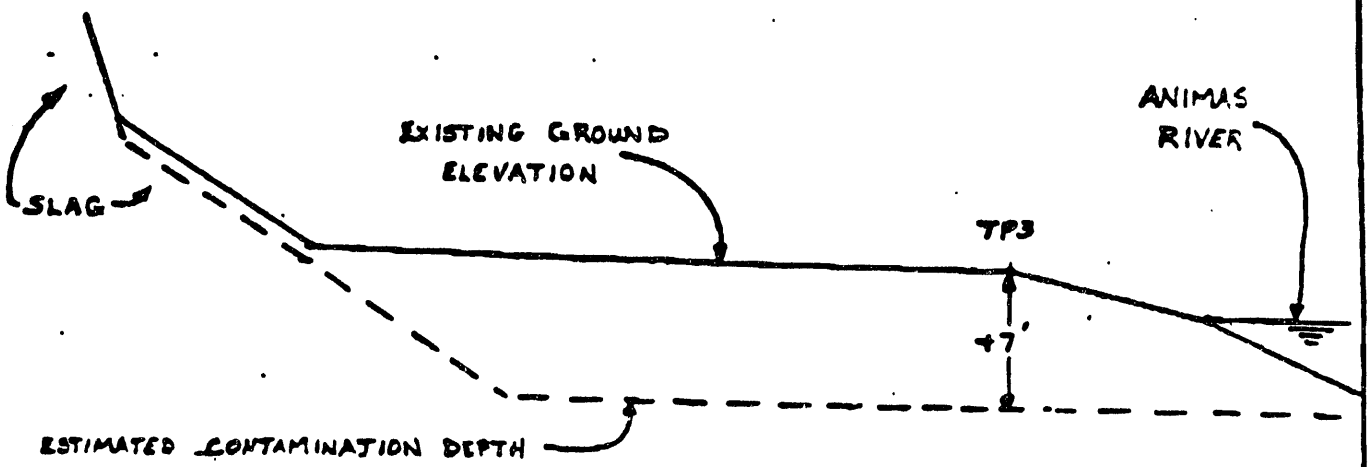

DITCH PS-5
1% MIN. SLOPE
(SEE TYP. SECTIO
DWG. NO. DUR-PS
U.S. HIGHWAY 550-160
N14°00'
6500
6470
6480
ANIMAS RIVER
6450
ANIMAS
RIVER BANK
AREA
N48,765
E51,310
SPILLWAY
(SEE TYPICAL DETAIL ON
DWG. NO. DUR-PS-10-13(7)
SLAG
RIVER
DITCH PS-4
1% MIN. SLOPE
(SEE TYP SECTIC
DWG. NO DUR-PS-
6550
6630

FIGURE 2 ⚠1

EXISTING

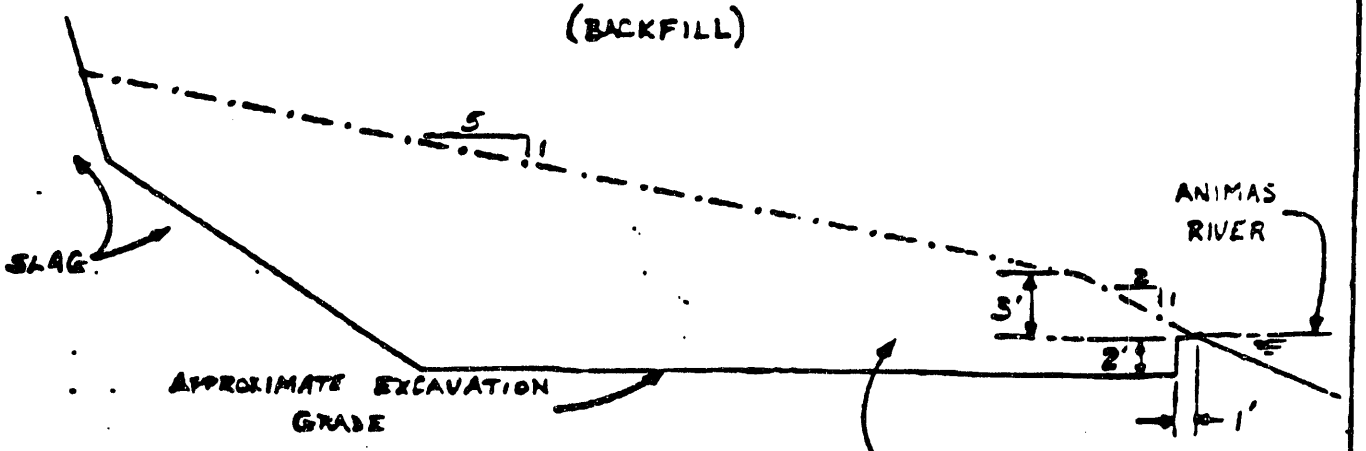


SECTION A-A

SCALE: 1" = 10'

PLANNED REMEDIAL ACTION

(BACKFILL)



*EXCAVATION DEPTH MAY INCREASE AT THE DIRECTION OF THE CONTRACTOR IF GROUND WATER CONDITIONS ALLOW

SECTION A-A

SCALE: 1" = 10'

FIGURE 3

RAECOBPC.BAS

OUTPUT INFORMATION : 14:52:16 06-23-1989
BOTTOM FLUX = 0 pCi/m^2/sec
AIR CONC. = 0 pCi/l
BARE LAYER 1 FLUX = 1.77 pCi/m^2/s
NO OPTIMIZATION APPLIED

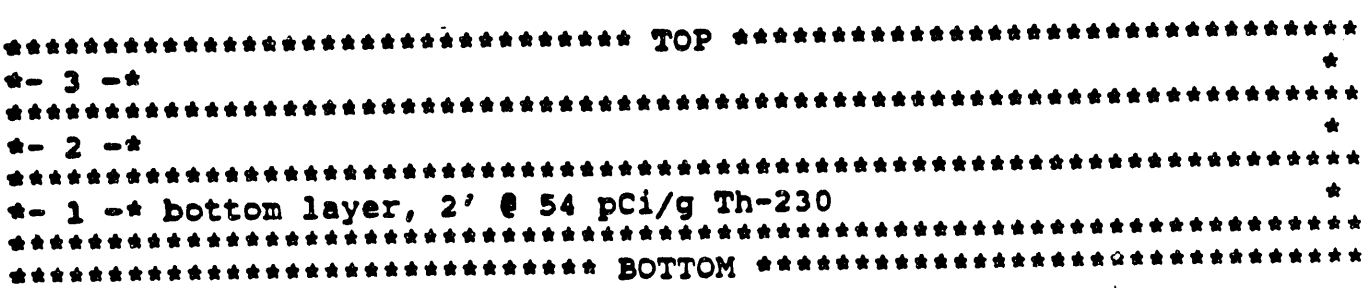
L	THICK (cm)	POR	MOIST (%)	SOURC (pCi/g)	E.F.	DENS (g/cm^3)	DIFF COEF	FLUX (pCi/m^2/s)	CONC. (pCi/cm^3)	MIC
2	61.0	.44	10	0	.32	1.5	0.02000	1.43	0.0	0.748
1	213.0	.44	10	36	.32	1.5	0.00005	1.72	1.1	0.748

********** TOP **********
- 2 - *
****
- 1 - bottom layer, 2' @ 54 pCi/g Th-230 *
****
********** BOTTOM **********

RAECOBPC.BAS

OUTPUT INFORMATION : 14:52:29 06-23-1989
BOTTOM FLUX = 0 pCi/m^2/sec
AIR CONC. = 0 pCi/l
BARE LAYER 1 FLUX = 1.77 pCi/m^2/s
NO OPTIMIZATION APPLIED

L	THICK (cm)	POR	MOIST (%)	SOURC (pCi/g)	E.F.	DENS (g/cm^3)	DIFF COEF	FLUX (pCi/m^2/s)	CONC. (pCi/cm^3)	MIC
3	61.0	.44	10	0	.32	1.5	0.02000	0.00	0.0	0.748
2	30.0	.44	10	0	.32	1.5	0.00005	0.00	0.0	0.748
1	182.0	.44	10	36	.32	1.5	0.00005	0.88	19.6	0.748



RAECOBPC.BAS

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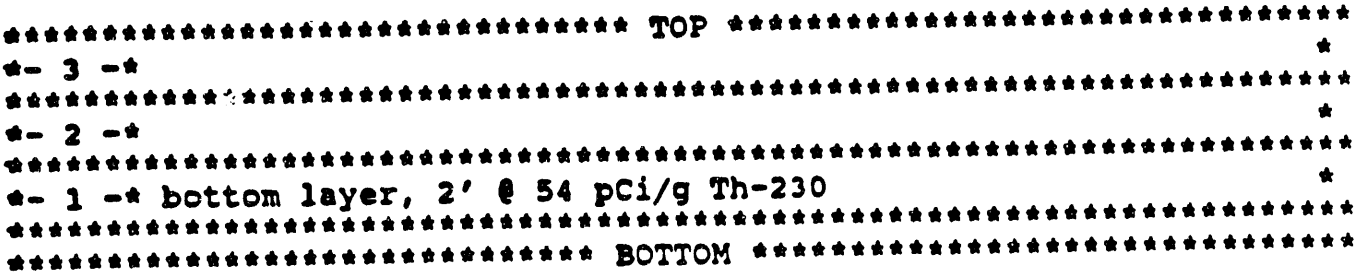
BARE LAYER 1 FLUX = 1.77 pCi/m^2/s
NO OPTIMIZATION APPLIED

L	THICK (cm)	POR	MOIST (%)	SOURC (pCi/g)	E.F.	DENS (g/cm^3)	DIFF COEF	FLUX (pCi/m^2/s)	CONC. (pCi/cm^3)	MIC
3	61.0	.44	10	0	.32	1.5	0.02000	0.00	0.0	0.748
2	61.0	.44	10	0	.32	1.5	0.00005	0.00	0.0	0.748
1	152.0	.44	10	36	.32	1.5	0.00005	0.88	19.6	0.748



RAECOBPC.BAS

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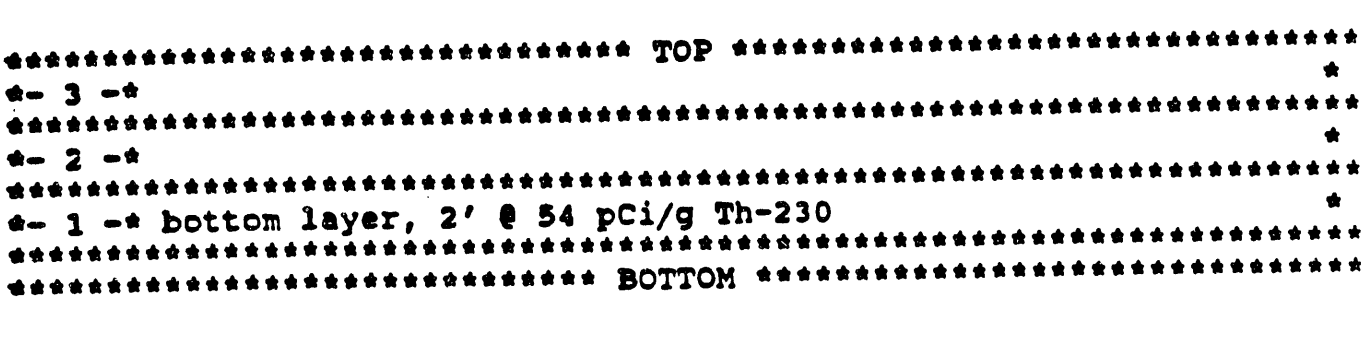
AIR CONC. = 0 pCi/l
BARE LAYER 1 FLUX = 1.77 pCi/m^2/s
NO OPTIMIZATION APPLIED

L	THICK (cm)	POR	MOIST (%)	SOURC (pCi/g)	E.F.	DENS (g/cm^3)	DIFF COEF	FLUX (pCi/m^2/s)	CONC. (pCi/cm^3)	MIC
3	61.0	.44	10	0	.32	1.5	0.02000	0.00	0.0	0.748
2	91.0	.44	10	0	.32	1.5	0.00005	0.00	0.0	0.748
1	122.0	.44	10	36	.32	1.5	0.00005	0.88	19.6	0.748



SUPPLEMENTAL STANDARDS APPLICATIONS FOR

SMELTER MOUNTAIN

MKO/UMT/1084-1020

0.12.2.6
DUR

ENGINEERS
AND
CONSTRUCTORS

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

HEADQUARTERS OFFICE
ONE ERIEVIEW PLAZA
CLEVELAND OHIO U S A 44114
PHONE (216) 523 5600 TELEX 985542

REPLY TO MK-FERGUSON COMPANY
REMEDIAL ACTIONS
CONTRACTOR UMTRA PROJECT
PO BOX 9136
ALBUQUERQUE NEW MEXICO U S A 87119

October 4, 1989

89-3050-734

Mr. Mark L. Matthews
Acting Project Manager
U.S. Department of Energy
Uranium Mill Tailings Remedial Action Project Office
First National Bank Building
5301 Central Avenue N.E.
Suite 1700
Albuquerque, New Mexico 87108

SUBJECT: Durango - RAP Modification No. 2
Supplemental Standards for Processing Site

REFERENCE: Contract No. DE-AC04-83AL18796

Dear Mr. Matthews:

Attached is a proposed Remedial Action Plan Modification (RAP Mod.) No. 2, Revision 0, for the Durango, Colorado, site (Attachment I). This RAP Mod. is to apply Supplemental Standards to steeply-sloping areas contained within the boundaries of the Processing Site which are contaminated with windblown tailings. The removal of this contaminated material is not justified due to the steepness of the slopes upon which the material is found. Because of this steepness:

1. It would be extremely dangerous to attempt to remove the material by ordinary construction methods.

2. If the material were removed, the removal operation would cause serious environmental harm.

3. The possibility is remote that anyone will come into contact with the contaminated material if it is left in place.

4. The cost of removal of the material would be extremely high.

The Colorado Department of Health, the Owner of the Processing Site, has concurred in the recommendation that remediation not be performed in these areas. Supplemental Standards should be applied to the residual material, based upon the criteria given in 40 CFR 192.21(a) and -(b).

In the interest of economy, we have had only a few sets of photo enlargements made. We enclose three sets (2 pictures each, with overlays). Please forward at least one set to the NRC when you request their approval.

If you have any questions, please contact Rob Cooney of my staff.

Sincerely,

MK-Ferguson Company

J. G. Oldham
Project Director

JGO/TPJ/kja

Enclosures:
1. Proposed Modification No. 2 to Durango, Colorado, Final Remedial Action Plan, Revision 0, 10/04/89
2. Application of Supplemental Standards, Durango Processing Site, October 5, 1989 (booklet)
3. Site Photo Enlargements

cc: F. Bosiljevac, DOE/UMTRA (w/enc. 1 & 2)
E. Damler, DOE/UMTRA (w/enc. 1, 2 & 3)
M. Jackson, TAC (w/enc. 1 & 2)
E. Bischoff, CDH (w/enc. 1 & 2)

PROPOSED MODIFICATION NO. 2 TO DURANGO, COLORADO, FINAL REMEDIAL ACTION PLAN REVISION 0, 10/04/89

A. Description

The purpose of this Modification is to establish Supplemental Standards for certain steeply-sloping areas of the UMTRA Processing Site in Durango, Colorado. The two areas are: (1) on the slopes of Smelter Mountain above the footprints of the old tailings piles and the tailings pile access roads, with a small area just to the south of the old tailings piles, between the UMTRA haul road and the Animas River, and (2) on the slope of Smelter Mountain above the UMTRAP haul road, just above the area of the raffinate ponds.

As required by 40 CFR 192.22(a), Ra-226 has been excavated to a level that is as low as is reasonably achievable (ALARA). Excavation of windblown Ra-226 from the areas for which Supplemental Standards are here sought would not be reasonable under the circumstances which exist. Therefore, it is requested that Supplemental Standards be applied for these areas.

B. Resulting changes to the RAP:

Page C-2 of UMTRA-DOE/AL 050503.0000, June 1986, Remedial Action Plan and Site Design for Stabilization of the Inactive Uranium Mill Tailings Site at Durango, Colorado. Add the following paragraph before the last paragraph of Section C.1, "Introduction":

> "If Ra-226 and its decay products are present in areas on the slopes of Smelter Mountain which slope so steeply that: (1) Attempts to excavate the Ra-226 would pose a clear and present risk to excavation workers, or (2) Attempts to excavate the Ra-226 would directly produce environmental harm that is clearly excessive compared to the health benefits to persons living on or near the site, now or in the future, or (3) Both conditions apply, then the Ra-226 shall be left in place."

C. Overall Impact to Design and Complete Remedial Action

This change eliminates unnecessary danger to remediation workers and eliminates the environmental damage which would otherwise result from disturbing these steeply-sloping areas with established vegetation. The change results in low-level contamination remaining on the steep slopes of Smelter Mountain. The material is in locations where construction of structures is not likely, and the areas in which the material will be left in place adjoin Vicinity Property areas which will not be remediated for the same reasons.

D. Compliance of Revised Design with EPA Standards

The revised design, after the application of Supplemental Standards, will meet the test given by 40 CFR 192.22(a), in that it "[comes] as close to meeting the otherwise applicable standards as is reasonable under the circumstances." Therefore, the application of Supplemental Standards is appropriate.

First, excavation of this material would, in the words of 40 CFR 192.21(a), "pose a clear and present risk to [remedial action] workers" attempting to remove it. These slopes are extremely steep and extremely high, so much so that it has been estimated that remediation would cost over four million dollars merely for this comparatively small area; the high price reflects the difficulty of the work, which would require extraordinary methods of construction to allow the work to be done with a reasonable degree of safety. In addition, in the words of 40 CFR 192.21(b), removal of this material would "directly produce environmental harm that is clearly excessive compared to the health benefits to persons living on or near the site, now or in the future." It is suggested that removal of the material would produce no benefits to the health of any present or prospective resident; the site is uninhabitable, and the area is not contaminated to a degree which could affect the health of anyone nearby. Therefore, any environmental harm done by the remediation activities would outweigh the nonexistent health benefits to be gained. The environmental harm which remediation would cause can be seen by observing the pictures of the site; the established vegetation, which has taken many years to become thus established, reduces erosion of the slope (including erosion of the contaminated material, which is thus hindered from being deposited below, where people might come into contact with it). By these two criteria, therefore, it is appropriate to establish Supplemental Standards for compliance with EPA requirements.

E. Reason for Change

This change reduces the residual radioactivity to levels as low as reasonably achievable while avoiding the risk of injury to workers, as well as avoiding environmental harm which would be clearly excessive compared to any health benefits to be gained. In addition, this change avoids costs of remediation which are excessive compared to the benefit to be gained.

APPLICATION OF
SUPPLEMENTAL STANDARDS
DURANGO PROCESSING SITE

OCTOBER 5, 1989

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY
Remedial Actions Contractor-UMTRA Project
P.O. Box 9136
Albuquerque, New Mexico 87119

Table of Contents

Section I

Radiological Survey Assessment

Application of Supplemental Standards: Durango Processing Site

ADDRESS: Smelter Mountain
Durango, CO 81302

OWNER'S NAME: Colorado Dept. of Health

PROPERTY DATA:

Structures and utilities are shown on Drawing DUR-PS-10-0910

Property Use: Single Resident _____ ; Comercial _____: School _____

Multiple Residence _____; Vacant Lot _____; Church _____: Open Land X

Age of structures: Less than 50 years old _____;
Greater than 50 years old _____ (attach form _____)

Adjacent included/spillover vicinity properties:

North - V.P. # DU-235
South - V.P. # DU-545
East - V.P. # DU-544, DU-545
West - V.P. # DU-545

Interior Involvement: Yes N/A ; No N/A

Major Structural _____; Minor Structural _____ Dislocation N/A

RADIOLOGICAL DATA:

Gamma Exposure Rate Survey

Survey Method

In accordance with RAC Procedure 011, outdoor gamma surveys were conducted on those portions of the Durango Processing Site that were accessible. A complete grid survey and/or surface scan of the Site was not performed due to the steepness and instability of the slope of some areas of the property and the danger to personnel.

Survey Results

Gamma survey results were not recorded; however, field personnel established generalized gamma radiation levels of 25-30 micro R/hr with "hot spots" of up to 60 micro R/hr.

Borehole Survey

Subsurface radiological surveys on the steep slopes of the Durango Processing Site were not performed because of the physical danger to personnel.

Radon/Radon Daughter Survey

Radon/radon daughter surveys were not performed because there are no structures on the property.

Soil Samples

Soil samples were collected from areas of the site where Supplemental Standards are to be applied. Of the 264 soil samples analyzed, 201 exceeded EPA standards. Activity ranged from less than 1.3 to 651 pci/g. Table 1 contains the location and concentration of the most recent samples obtained. Soil sample data not shown in the table may be seen on Drawings DUR-PS-10-0921 through 0926.

Estimated Extent of Contamination

The areas of interest are shown on Drawing DU-PS-10-0927. The approximated area is 308,958 square yards. This area exhibits the characteristics of a typical windblown property. It is sporadically contaminated in the top six inches of soil with steep, washed areas at or near background Ra-226 concentrations while more level and vegetated areas have higher activity.

Recommended Remedial Action

MK-Ferguson recommends the application of Supplemental Standard to the windblown areas on the Durango Processing Site.

Section II

Cost Estimate

Table 4.1
Cost For Not Applying Supplemental Standards

RECOMMENDED OPTION

Activity No.	Activity	Unit Price	Quantity	Estimated Cost
DP.1	Hand Excavation	18.30	2,903 cy	$ 53,125.00
DP.2	Bulk Excavation (Slope)	4.91	48,590 cy	238,577.00
DP.3	Bulk Removal (Slope Excavation)	5.37	51,493 cy	276,517.00
DP.4	Bulk Excavation (Haul Roads)	3.21	176,787 cy	567,486.00
DP.5	Bulk Removal (Haul Roads)	2.03	176,787 cy	358,878.00
DP.6	Bulk Backfill (Haul Roads)	7.86	176,787 cy	1,389,546.00
DP.7	Native Seeding	1.44	257,488 sy	370,783.00
DP.8	Erosion Control	LS	LS	162,746.00
	Subtotal			$3,417,658.00
	5% Subcontractor's Contingency			170,883.00
	20% Overhead & Profit			683,532.00
	Total (Rounded)			$4,272,000.00

Section III

Supplemental Standards Checklist

JUSTIFICATION CHECKLIST FOR APPLICATION
OF SUPPLEMENTAL STANDARDS
DURANGO PROCESSING SITE

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

_X_ a) Risk injury to worker/public

_X_ b) Environmental harm

_X_ 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:

Durango Processing Site - Durango, Colorado

a. The steepness of grade and the instability of the east slope of Smelter Mountain do not permit the use of construction techniques common to the UMTRA Project. The use of nonstandard techniques magnifies the risk of injury to personnel who would be involved in the decontamination of the mountain.

b. The health hazard associated with the windblown tailings on the Durango Processing Site is not significant when compared to the monetary costs of, and environmental harm caused by, remediation. The deposit is sporadic, located in an area that precludes extended contact with the general population. Mechanized decontamination of the side of the mountain will cause severe damage to the local ecology. The amount of environmental damage done would be excessive, when compared to the benefit of the decontamination.

c. The windblown tailings on the Durango Processing Site do not pose a clear hazard to the general public. as there are no habitable structures and there is no extended human activity on the slope of the mountain. The future hazard to the public is small, it is unlikely that the mountain's eastern slope will ever be used extensively by the general public because of its steepness and convoluted nature.

JUSTIFICATION CHECKLIST FOR APPLICATION OF SUPPLEMENTAL STANDARDS - CONT'D.

Additional cost without application of Supplemental Standards - $4,272,000.00 (further breakdown provided in Table 4.1).

Yes	No	If Supplemental Standards are Applied:
X		1. Open Land?
	X	2. Occupied Building?
N/A		3. If yes to No. 2, is contaminated area beneath or within 10 feet of a building?
	X	4. Anticipated change of land use within the next 5 years?
	X	5. If yes to No. 4, then will land use produce health risk?
	X	6. Is contamination in a habitable area?
X		7. Have owners comments been solicited? (CDH Concurrence is being pursued by transmittal of this document).

Estimated volume of contaminated material to remain = 51,493 (cy)

Contaminated area to remain = 308,958 (sy)

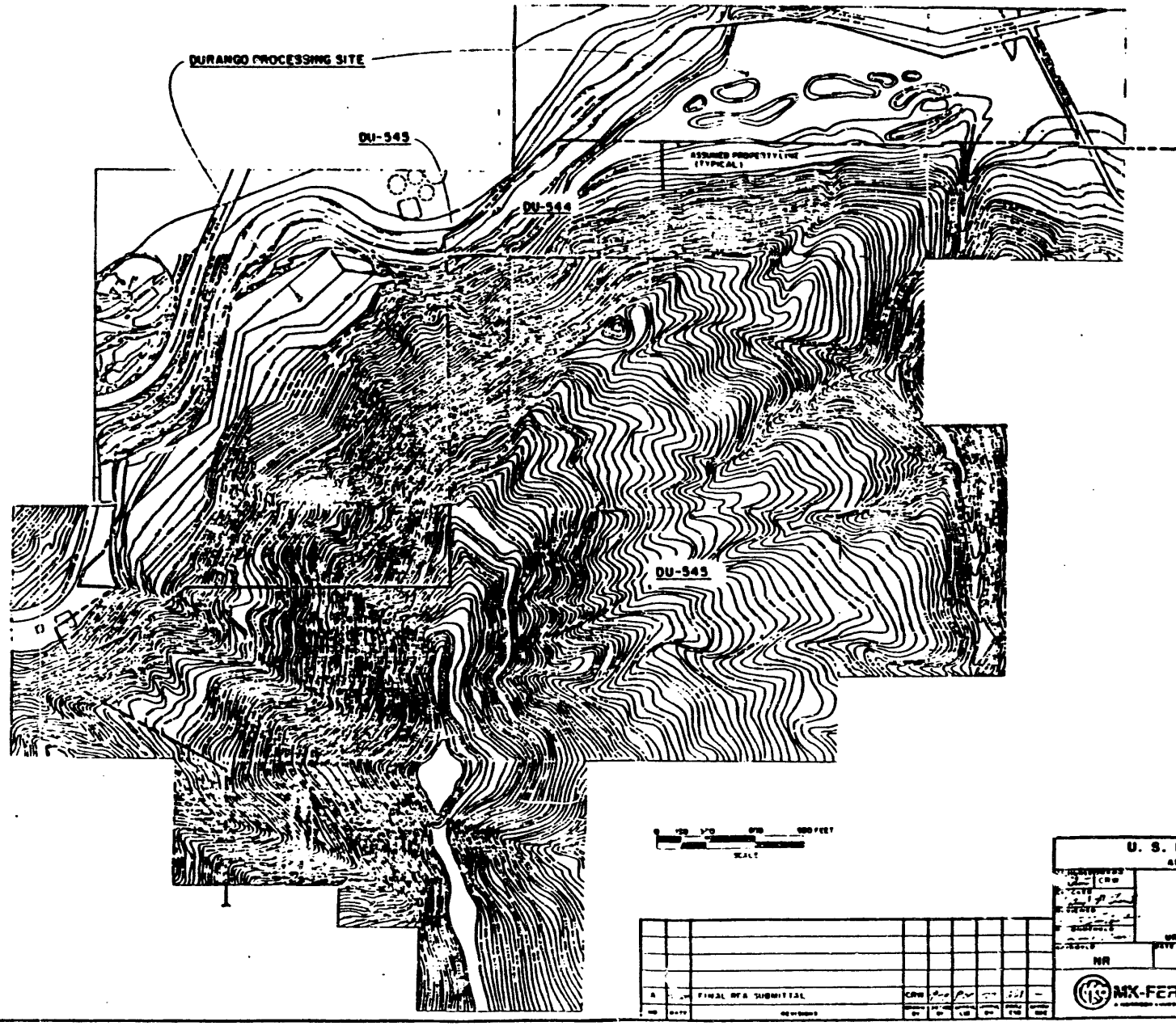
Range for contaminated areas = 25 to 60 (micro R/hr).

Range radium-226 concentration in soil in contaminated area = less than 1.3 to 651 (pCi/g).

If tailings are below or within 10 feet of the structure, radon daughter concentration = N/A (WL).

Section IV

Drawings



A		FINAL RFA SUBMITTAL	CRW										

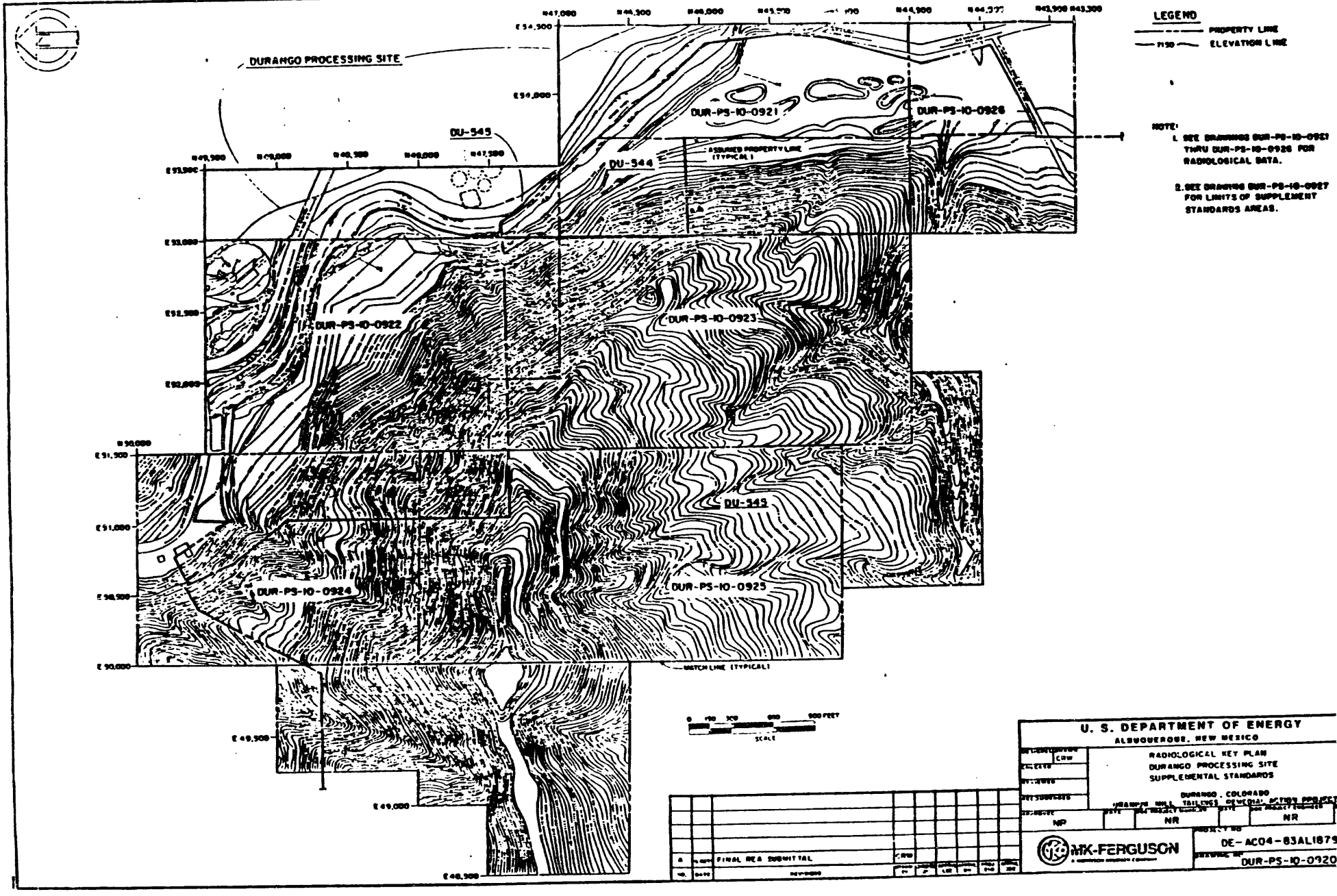
U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

SITE PLAN
DURANGO PROCESSING SITE
URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT
DURANGO, COLORADO

DESIGNED	DATE	PROJECT ENGINEER	DATE	PROJECT MANAGER
NR		NR		NR

MK-FERGUSON
A HALLIBURTON COMPANY

PROJECT NO. DE-AC04-83AL18796
DRAWING NO. DURPS-10-0910


DURANGO PROCESSING SITE
DU-545
DU-544
DUR-PS-10-0921
DUR-PS-10-0926
DUR-PS-10-0922
DUR-PS-10-0923
DU-543
DUR-PS-10-0924
DUR-PS-10-0925
ASSUMED PROPERTY LINE (TYPICAL)
MATCH LINE (TYPICAL)
LEGEND
PROPERTY LINE
ELEVATION LINE
NOTE:
1. SEE DRAWINGS DUR-PS-10-0921 THRU DUR-PS-10-0926 FOR RADIOLOGICAL DATA.
2. SEE DRAWING DUR-PS-10-0927 FOR LIMITS OF SUPPLEMENT STANDARDS AREAS.
SCALE
U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO
RADIOLOGICAL KEY PLAN
DURANGO PROCESSING SITE
SUPPLEMENTAL STANDARDS
DURANGO, COLORADO
URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT
NP
NR
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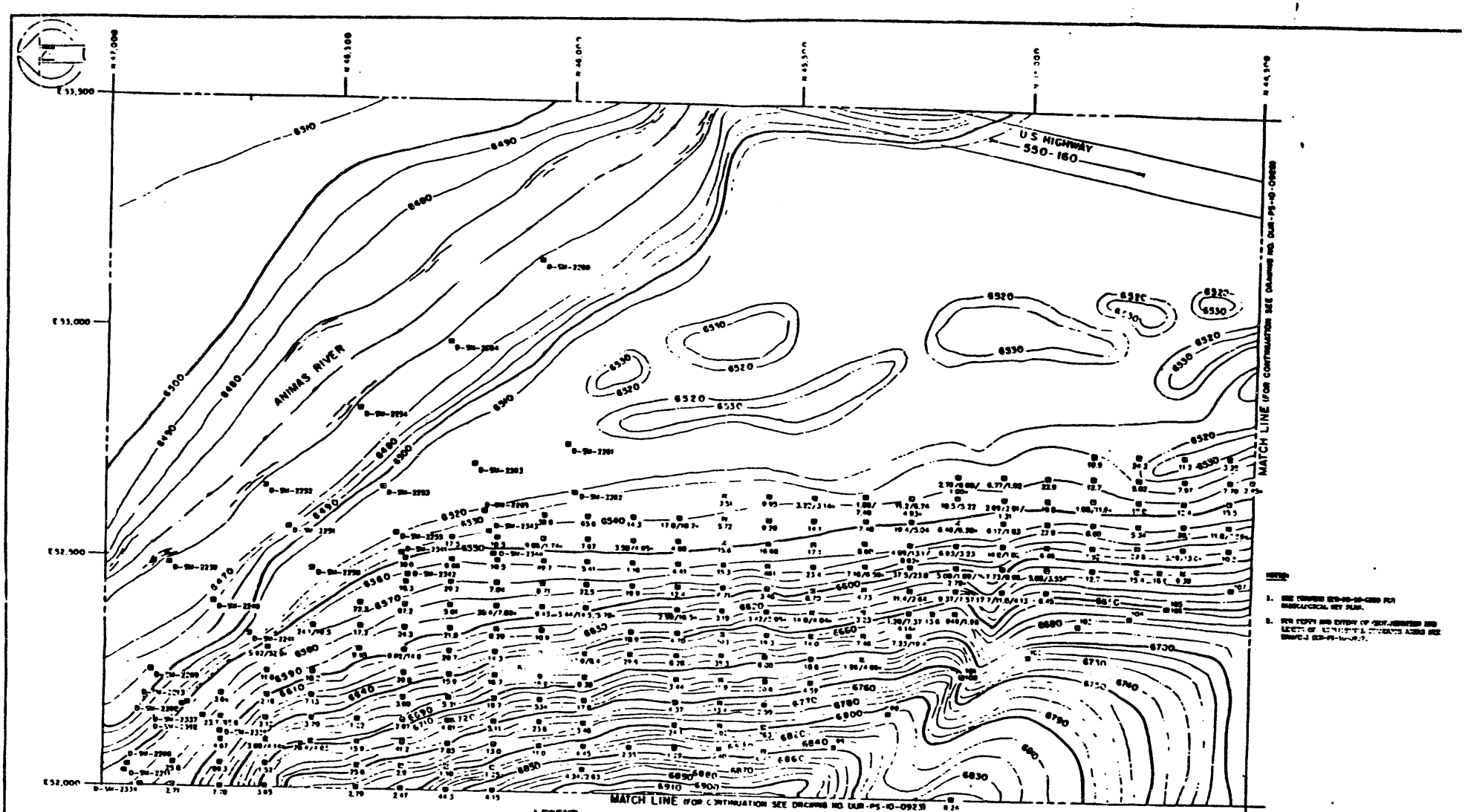
MK-FERGUSON
DE-AC04-83AL18796
DUR-PS-10-0920
FINAL RFA SUBMITTAL



LEGEND

REV	DATE	DESCRIPTION	BY
A		FINAL BRA SUBMITTAL	DJH

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

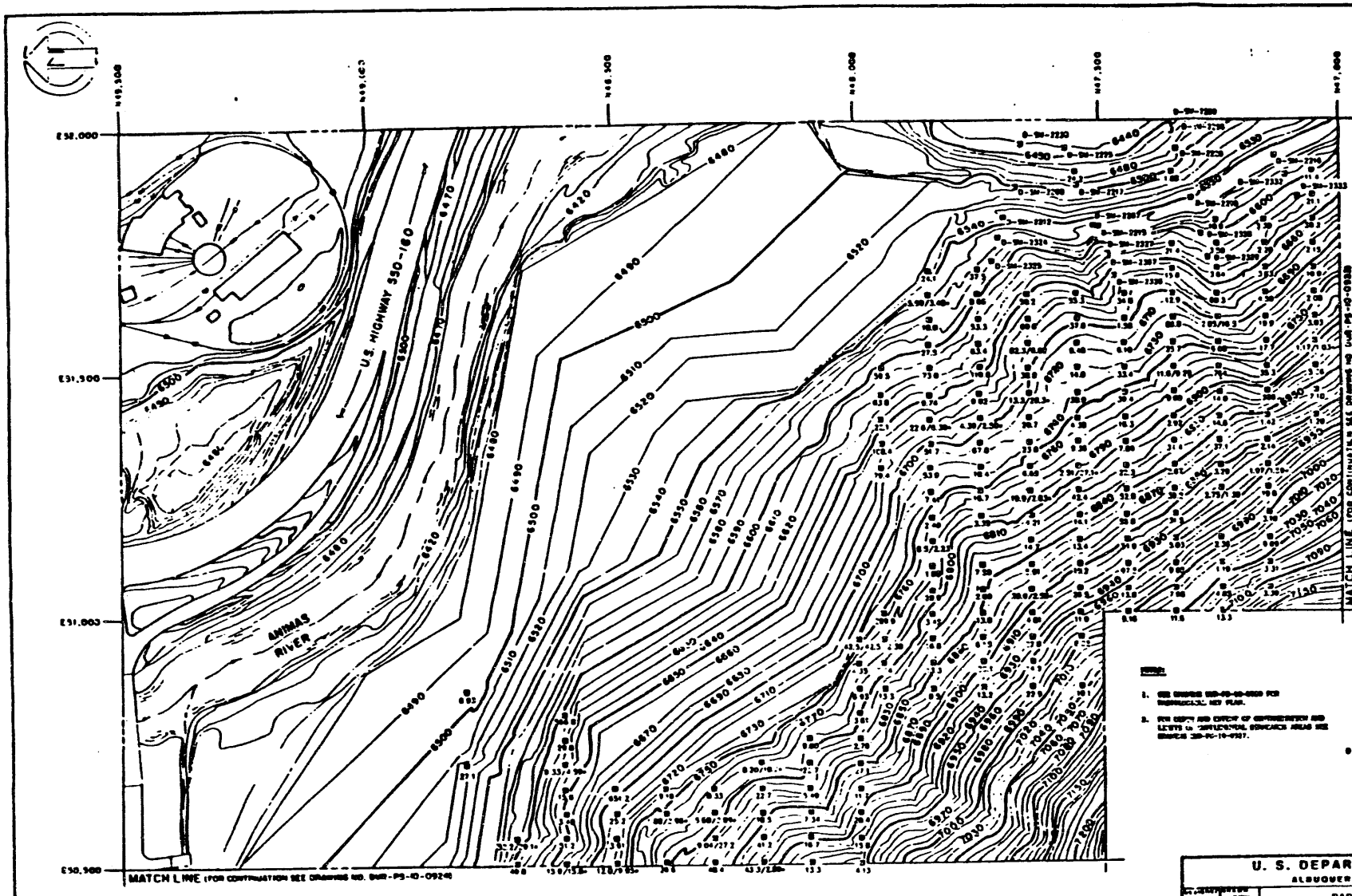
RADIOLOGICAL SURVEY DATA
DURANGO PROCESSING SITE
SUPPLEMENTAL STANDARDS
SHEET 1 OF 6
DURANGO COLORADO

NR		NR		NR	

MK-FERGUSON

CONTRACT NO. DE-AC04-83AL18796

DRAWING NO. DUR-PS-10-0921 REV A



A		FINAL RFA SUBMITTAL	DJR	
NO.	DATE	REVISIONS	DRAWN BY	CHECKED BY

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

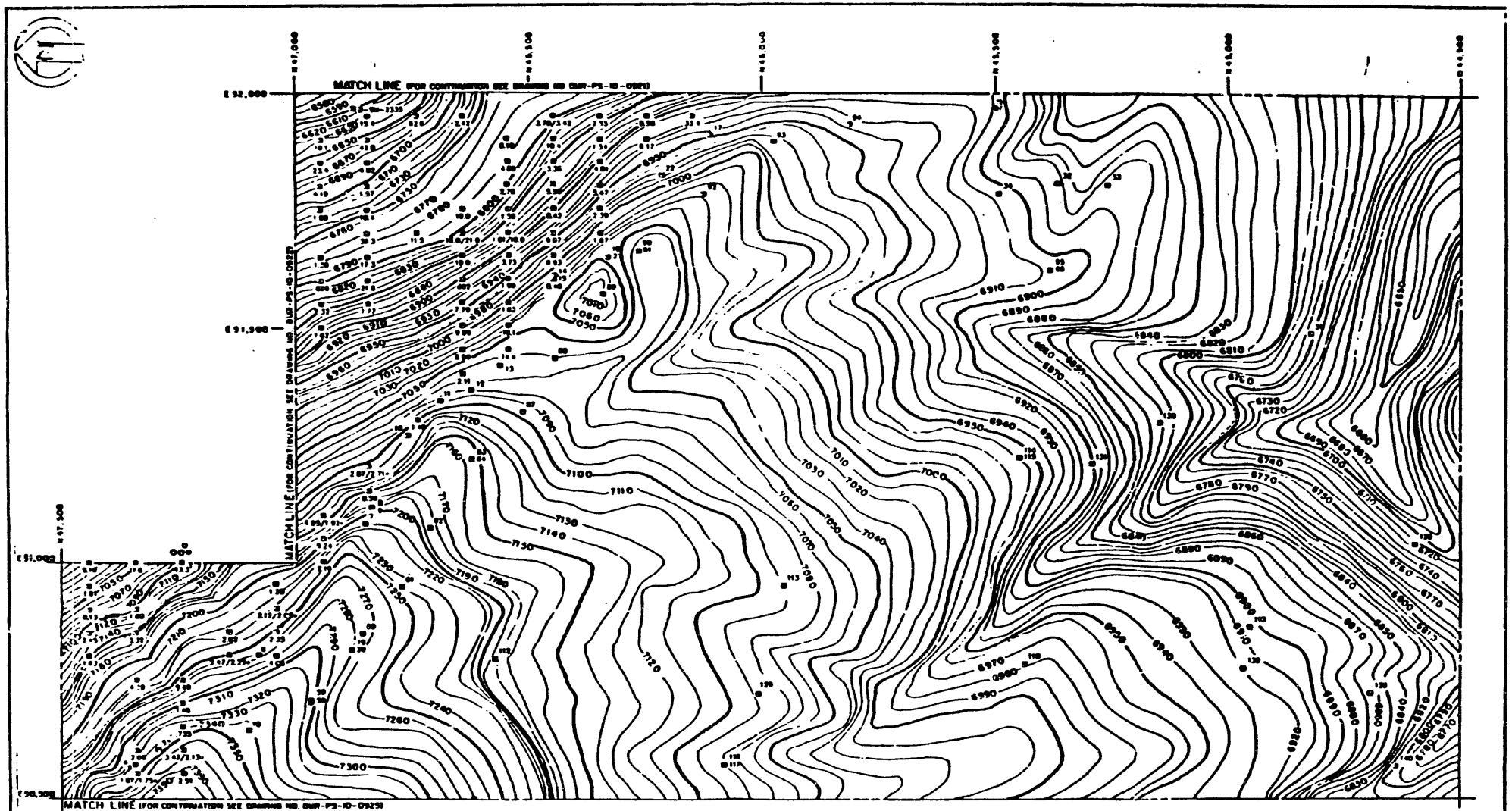
RADIOLOGICAL SURVEY DATA
DURANGO PROCESSING SITE
SUPPLEMENTAL STANDARDS
SHEET 2 OF 6
DURANGO, COLORADO

NR | NR | NR

MK-FERGUSON

DE-AC04-83AL18796

DUR-PS-10-0922



LEGEND

NOTES:

1. SEE DRAWING DUR-PS-10-0930 FOR REMEDIATION KEY PLAN.
2. FOR EXTENT AND DEPTH OF CONTAMINATION AND LIMITS OF SUPPLEMENTAL STANDARDS AREAS, SEE DRAWING DUR-PS-10-0927.

REV	DATE	REVISIONS	BY
A	9/18	FINAL REA SUBMITTAL	DJH

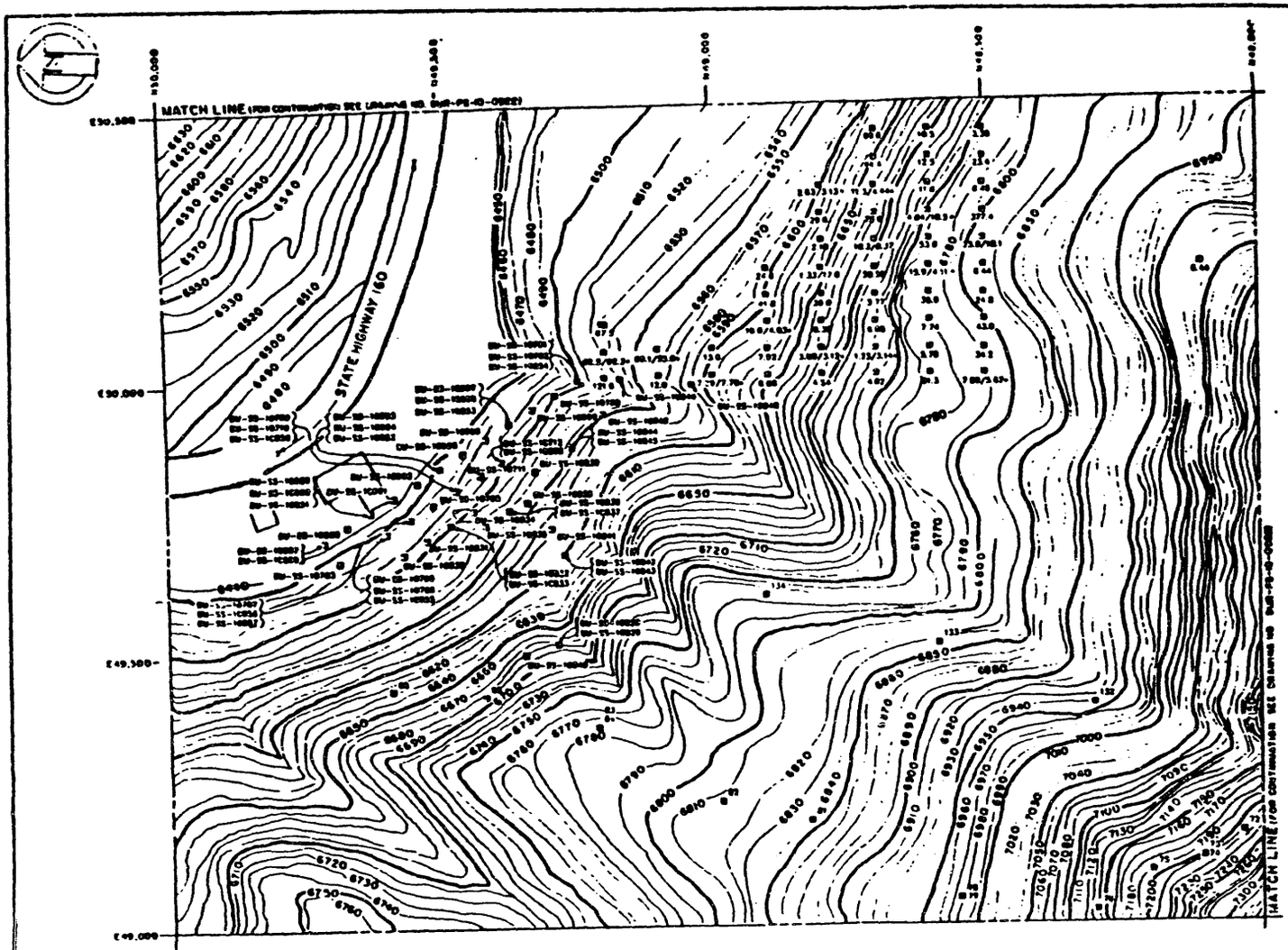
U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

RADIOLOGICAL SURVEY DATA
DURANGO PROCESSING SITE
SUPPLEMENTAL STANDARDS
SHEET 3 OF 6
DURANGO, COLORADO

DES.	DRN.	CHK.	APP.
NR	NR	NR	

MK-FERGUSON

PROJECT NO. DE-AC04-83AL18796
DRAWING NO. DUR-PS-10-0923 REV. A



LEGEND

NOTES

1.

2.

SCALE

A		FINAL RFA SUBMITTAL		DJR				
NO.	DATE	REMARKS	BY	CHK	APP			

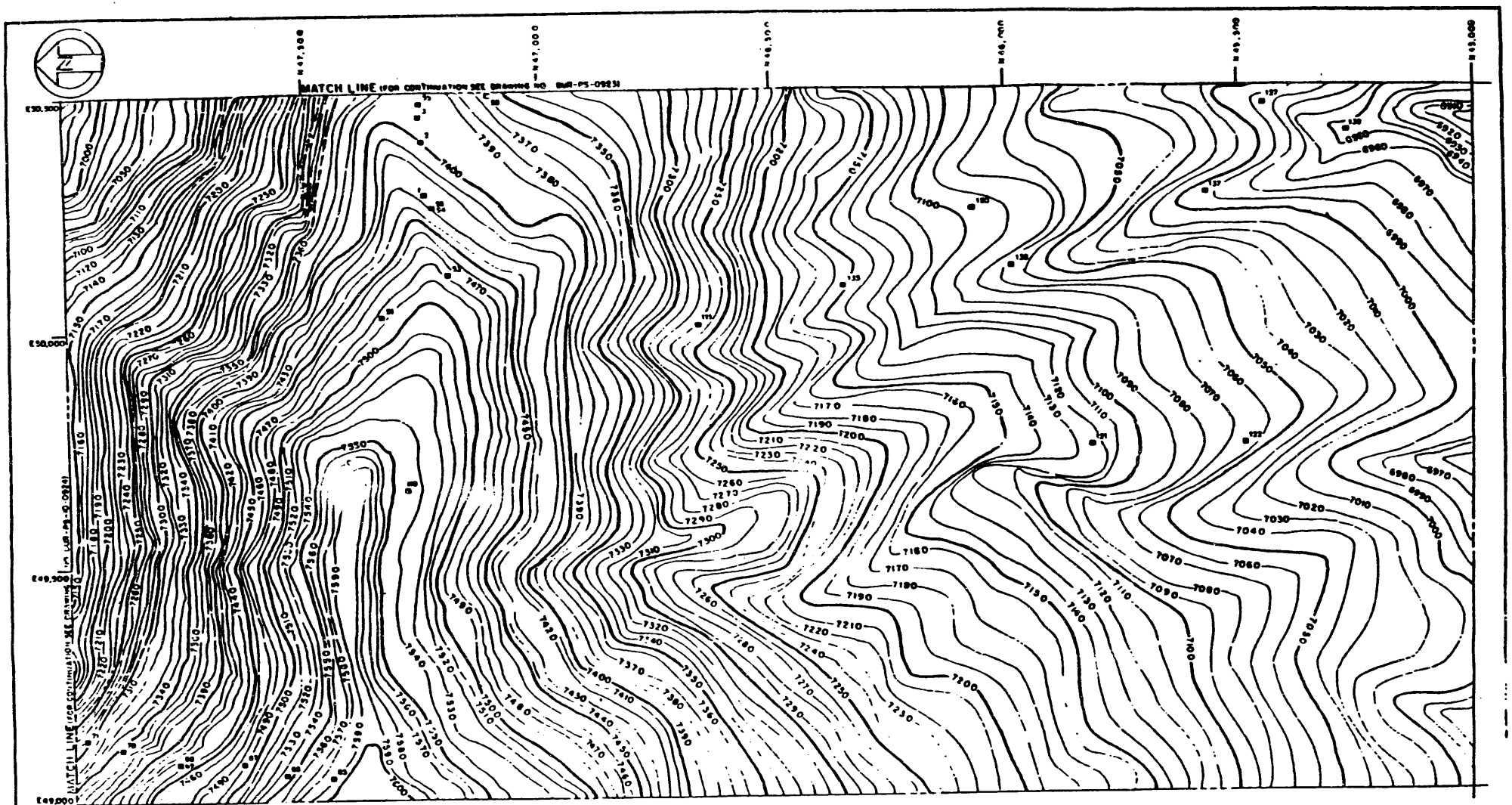
U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

CRG	RADIOLOGICAL SURVEY DATA		
	DURANGO PROCESSING SITE		
	SUPPLEMENTAL STANDARDS		
	SHEET 4 OF 8		
	DURANGO, COLORADO		
NR	NR	NR	

MK-FERGUSON

PROJECT NO. DE-AC04-83AL18796

DRAWING NO. DUR-PS-10-0924 REV. A



LEGEND

CHEM-NUCLEAR SOIL SAMPLE DESIGNATION

NOTES:

1. SEE DRAWING DUR-PS-10-0926 FOR INTERSECTION KEY PLAN.
2. FOR PROFILE AND EXTENT OF CONTAMINATION AND LEVEL OF SUPERFICIAL STRATA, SEE AREAS SEE DRAWING DUR-PS-10-0927.

REV	DATE	DESCRIPTION	BY
A		FINAL RFA SUBMITTAL	DJA

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

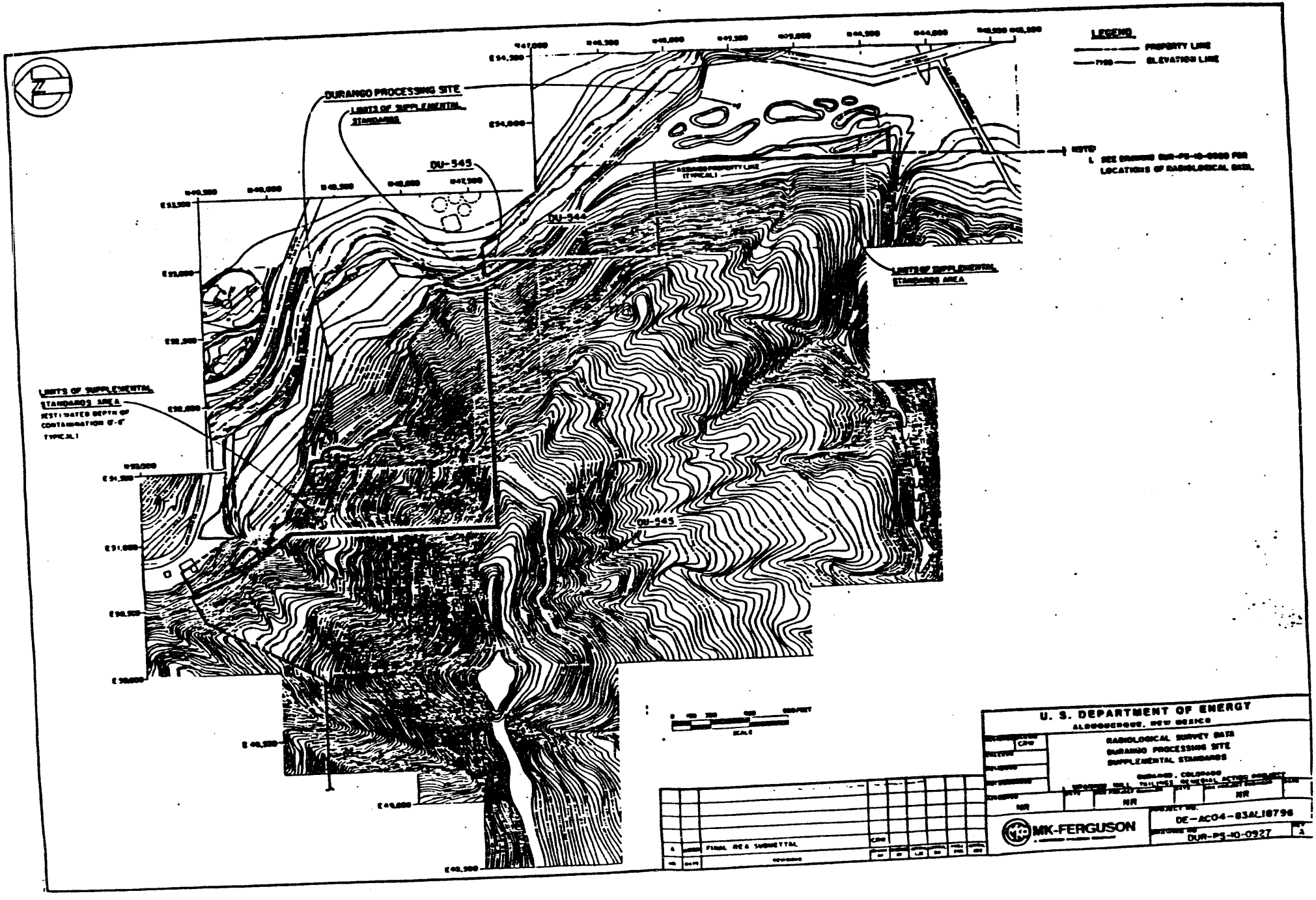
RADIOLOGICAL SURVEY DATA
DURANGO PROCESSING SITE
SUPPLEMENTAL STANDARDS
SHEET 5 OF 6
DURANGO, COLORADO
DURANGO MILL TAILINGS REMEDIAL ACTION PROJECT

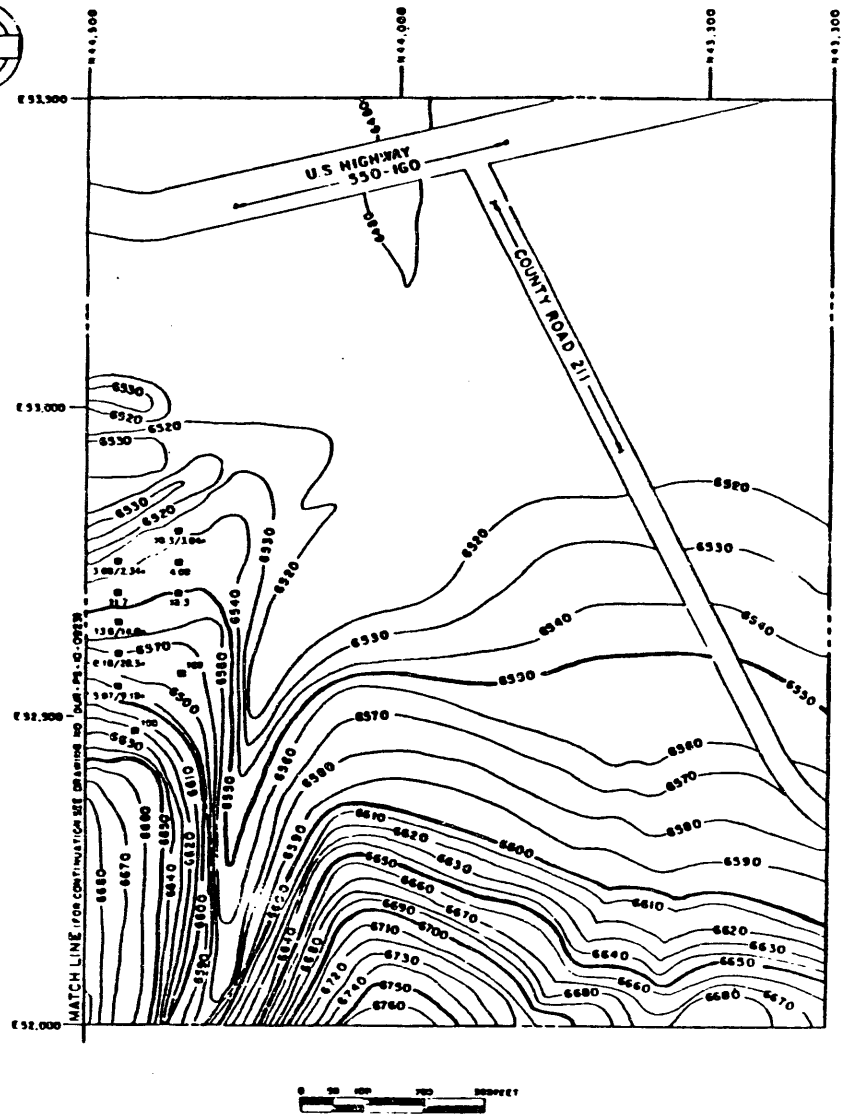
DESIGNED	DRAWN	CHECKED	APPROVED
NR	NR	NR	

MK-FERGUSON

PROJECT NO. DE-AC04-83AL18796

DRAWING NO. DUR-PS-10-0925 REV A


DURANGO PROCESSING SITE
LIMITS OF SUPPLEMENTAL STANDARDS
DU-345
DU-344
DU-345
LIMITS OF SUPPLEMENTAL STANDARDS AREA
LIMITS OF SUPPLEMENTAL STANDARDS AREA
LEGEND
PROPERTY LINE
ELEVATION LINE
NOTE:
1. SEE DRAWING DUR-PS-10-0000 FOR LOCATIONS OF RADIOLOGICAL DATA.
U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO
RADIOLOGICAL SURVEY DATA
DURANGO PROCESSING SITE
SUPPLEMENTAL STANDARDS
DURANGO, COLORADO
MK-FERGUSON
DE-AC04-83AL18796
DUR-PS-10-0927
FINAL AEA SUBMITTAL



LEGEND

4.00 ● BOREHOLE LOCATION AND NUMBER DESIGNATION WHICH PREFIX NO-4 OMIT, DUR-CE-10-0041 AND OMIT DUR-CE-10-0000. READING IN pCi/g

0.41/283.0 ● REAL SAMPLE LOCATION AND NUMBER DESIGNATION WHICH PREFIX NO-4 OMIT, DUR-CE-10-0041 AND OMIT DUR-CE-10-0000 IN pCi/g. (SUBSURFACE DEPTH CROSSED WITH A DASHED.)

100 ● HIGH-RESIDUAL REAL SAMPLE DESIGNATION

NOTES:

1. SEE DRAWING DUR-PS-10-0924 FOR RADIOLOGICAL KEY PLAN.
2. FOR EXTENT AND DEPTH OF CONTAMINATION AND LIMITS OF REMEDIATION, BOUNDARIES AREAS SEE DRAWING DUR-PS-10-0927.

A		FINAL REA SUBMITTAL	DJK						

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

RADIOLOGICAL SURVEY DATA
DURANGO PROCESSING SITE
SUPPLEMENTAL STANDARDS
SHEET 6 OF 6
DURANGO, COLORADO
URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT

NR		NR		NR	

MK-FERGUSON

PROJECT NO DE-AC04-83AL18796

DRAWING NO DUR-PS-10-0926 REV A

Section V

Photographs

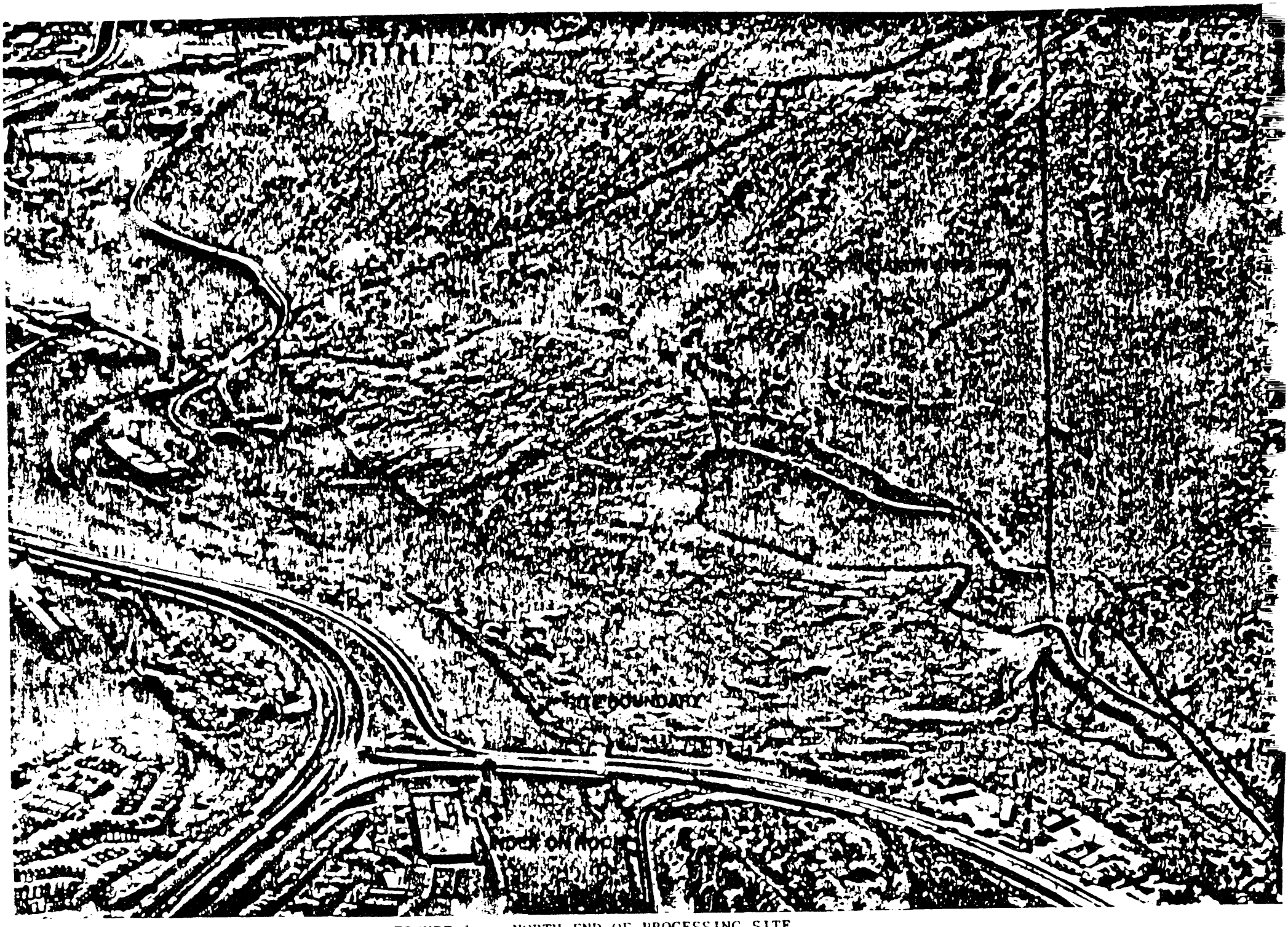


FIGURE 1 -- NORTH END OF PROCESSING SITE

Section VI

Radiological Tables

Table 1
SOIL SAMPLE SURVEY
Property - Durango Processing Site

SAMPLE ID	LOCATION	DEPTH	ESTIMATED FINAL CONCENTRATION (pCi/g)
D-SM-2208*	0+09,60L	0-6"	73.2
D-SM-2212	0+00,06R	0-6"	10.6
D-SM-2215	2+00,05R	0-6"	3.8
D-SM-2217	2+00,90L	0-6"	8.0
D-SM-2225	2+00,River	0-6"	9.2
D-SM-2228	0+00,River	0-6"	10
D-SM-2254	16+00,River	0-6"	7.4
D-SM-2260	20+00,River	0-6"	16.2
D-SM-2261	20+00,100L	0-6"	16.2
D-SM-2263	18+00,100L	0-6"	40.4
D-SM-2264	18+00,8' from river	0-6"	19.6
D-SM-2267	1+90,00L	0-6"	6.4
D-SM-2324	0+00,50R	0-6"	10.6
D-SM-2325	0+00,100R	0-6"	6.2
D-SM-2326	2+00,111R	0-6"	30.0
D-SM-2367	2+00,68R	0-6"	6.6
4**	N47352E50569	0-6"	4.6
5**	N47352E50569	6-12"	3.6
57	N47301E50600	0-6"	3.1

*The baseline for these samples is the centerline of the haul road.
**These samples were acquired radomly during a survey performed to further characterize DU-544/545.

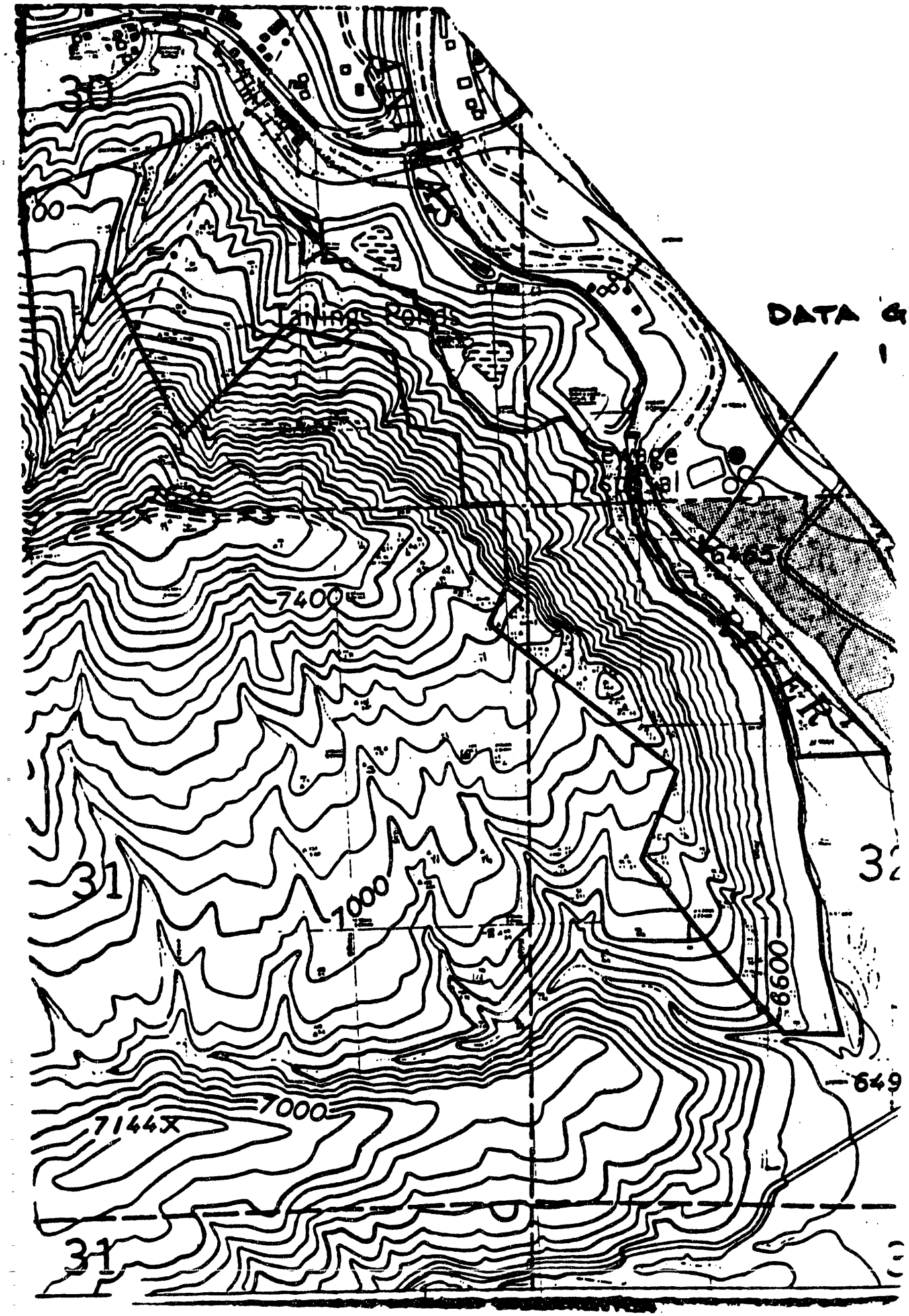
Table 1 Cont'd.
SOIL SAMPLE SURVEY
Property - Durango Processing Site

SAMPLE ID	LOCATION	DEPTH	ESTIMATED FINAL CONCENTRATION (pCi/g)
DU-SS-10832	See Drawing	>6"	19.7
DU-SS-10833	" "	<6"	8.03
DU-SS-10834	" "	<6"	8.7
DU-SS-10835	" "	<6"	5.7
DU-SS-10838	" "	<6"	6.02
DU-SS-10840	" "	<6"	35.8
DU-SS-10844	" "	<6"	9.5
DU-SS-10845	" "	>6"	29.8
DU-SS-10846	" "	<6"	9.1
DU-SS-10847	" "	>6"	4.6
DU-SS-10848	" "	<6"	3.7
DU-SS-10849	" "	<6"	2.9
DU-SS-10860	" "	<6"	1.5
DU-SS-10861	" "	<6"	1.8

Appendix A

Radiological Survey Data

DATA GROUP 1


DATA GROUP
1
Tanner Ponds
7400
7000
7144X
1000
8600
649
31
32

PROPOSED HAUL ROAD SURVEY

Scanning and soil sample surveys have been conducted of the proposed haul road from it's origin near the smelter stack to the raffinate pond area. Soil samples were collected from the haul road, below the road to the river's edge, and to a distance of 100 feet above the road on the mountain side. Hazardous climbing conditions precluded a more extensive soil sampling effort above the haul road on Smelter Mountain.

The scanning survey above the haul road on Smelter Mountain was conducted in two stages. The first effort entailed three people who walked parallel to the road along the side of the mountain some one to two hundred feet apart. The ambient gamma level observed was 25 - 30 ur/hr with hot spots approaching 60 ur/hr. The second survey involved two people walking along the top ridge and on both sides of the ridge. Again, an ambient gamma level of 25 - 30 ur/hr was observed until directly above the smelter smoke stack. That area had gamma levels of 18 - 20 ur/hr.

The haul road and areas above and below exhibit all the characteristics of a typical windblown property. Steep, washed out areas are at or near background, while more level and vegetated areas have higher activity levels.

Carl Begley

Carl Begley

6/4/86

SOIL SAMPLE ANALYSIS PROPERTY ID.: DU- Mill Site

PURPOSE: REA Haul Road Survey

SAMPLE ID. #	AREA	COORDINATES	DEPTH	INITIAL COUNT (pCi/g)	ESTIMATED FINAL (pCi/g)	COMM.
D-SM-2208		0+09,60L		36.6	73.2	
D-SM-2209		10+00, 100L		9.3	18.6	
D-SM-2210		4+00, SR		5.0	10.0	
D-SM-2211		8+00, SR		2.0	4.0	
D-SM-2212		0+0,6R		5.3	10.6	
D-SM-2213		10+00, SR		1.5	3.0	
D-SM-2214		6+00, 100L		19.8	39.6	
D-SM-2215		2+00, SR		1.9	3.8	
D-SM-2216		6+00, SR		2.5	5.0	
D-SM-2217		2+00, 90L		4.0	8.0	
D-SM-2224		6+00, River		87.5	175.0	
D-SM-2225		2+00, River		4.6	9.2	
D-SM-2226		4+00, 100L		8.0	16.0	
D-SM-2227		4+00, River		1.4	2.8	
D-SM 2228		0+00, River		5.0	10.0	
D-SM-2229		8+00, 100L		102.5	205.0	
D-SM 2230		8+00, River		17.0	34.0	
D-SM-2231		10+00, River		9.6	19.2	

SOIL SAMPLE ANALYSIS PROPERTY ID.: DU- Mill Site

PURPOSE: REA Haul Road Survey

SAMPLE ID.#	AREA	COORDINATES	DEPTH	INITIAL COUNT (pCi/g)	ESTIMATED FINAL (pCi/g)	COMM.
D-SM-2239		12+00, River		2.0	4.0	
D-SM-2240		12+00, 100L		3.9	7.8	
D-SM-2241		12+00, SR		4.5	9.0	
D-SM-2250		14+00, SR		5.2	10.4	
D-SM-2251		14+00, 100L		20.7	41.4	
D-SM-2252		14+00, River		6.1	12.2	
D-SM-2253		16+00, 100L		5.4	10.8	
D-SM-2254		16+00, River		3.7	7.4	
D-SM-2255		16+00, SR		7.1	14.2	
D-SM-2260		20+00, River		8.1	16.2	
D-SM-2261		20+00 100L		6.0	12.0	
D-SM-2262		20+00, SR		5.6	11.2	
D-SM-2263		18+00, 100L		20.2	40.4	
D-SM-2264		18+00, 8' from river (W)		9.8	19.6	
D-SM-2265		18+00, SR		2.4	4.8	
D-SM-2266		8+15 OR		3.2	6.4	
D-SM-2267		1+90, OL		6.6	13.2	4104 SOIM
D-SM-2268		9+90, OL		2.8	5.6	2957 SOIM

SOIL SAMPLE ANALYSIS PROPERTY ID.: DU- Mill Site
Haul Road Survey
PURPOSE: REA

SAMPLE ID. #	AREA	COORDINATES	DEPTH	INITIAL COUNT (pCi/g)	ESTIMATED FINAL (pCi/g)	COMM.
D-SM-2269		4+00 15' from river	0-6"	1.9	3.8	3022 calm
D-SM-2270		22+20, 10R	0-6"	16.4	32.8	4656 calm
D-SM-2271		22+00, 01R	0-6"	5.3	10.6	3473 calm
D-SM-2272		24+00, 0R	0-6"	7.9	15.8	
D-SM-2273		26+00, 0R	0-6"	4.1	8.2	3459 calm
D-SM-2274		26+00, 8R		1.7	3.4	3494 calm
D-SM-2275		28+00, 13R		3.2	6.4	3204 calm
D-SM-2276		29+15, 10R	0-6"	0.8	1.6	
D-SM-2277		30+00, 4R		4.6	9.2	3375 calm
D-SM-2278		30+00, 16R	0-6"	17.7	35.4	4659 calm
D-SM-2279		32+50, 10R		1.4	2.8	2521 calm
D-SM-2280		32+00, 0R	0-6"	3.7	7.4	3451 calm
D-SM-2283		34+00, 0R	0-6"	4.4	8.8	2625 calm
D-SM-2284		36+00, 0L	0-6"	3.4	6.8	3136 calm
D-SM-2285		37+90, 0R	0-6"	4.7	9.4	3928 calm
D-SM 2307		32+00, 50R	0-6"	28.8	57.6	5516 calm
D-SM-2309		32+00, 100R	0-6"	27.8	55.6	5082 calm
D-SM-2310		34+00, 50R	0-6"	15.9	31.8	3924 calm

SOIL SAMPLE ANALYSIS PROPERTY ID.: DU- Mill Site Haul Road Survey

PURPOSE: REA

SAMPLE ID.' #	AREA	COORDINATES	DEPTH	INITIAL COUNT (pCi/g)	ESTIMATED FINAL (pCi/g)	COMM.
D-SM-2311		34+00, 100R	0-6"	31.7	63.4	#673 colm
D-SM-2329		4+00, 133R	0-6"	7.1	14.2	colm
D-SM-2312		36+00, 50R	0-6"	9.8	19.6	4242 colm
D-SM-2292		22+00, 50R	0-6"	11.6	23.2	7007 colm
D-SM-2293		22+00, 100R	0-6"	4.7	9.4	3552 colm
D-SM-2294		20+00, 100R	0-6"	27.6	55.2	4949 colm 4287@50
D-SM-2295		20+00, 50R	0-6"	7.2	14.4	
D-SM-2296		4+00, 25' from river	0-6"	5.2	10.4	
D-SM-2297		12+00, 30' from river	0-6"	9.3	18.6	5892 colm
D-SM-2298		18+00, OR	0-6"	7.1	14.2	4742 colm
D-SM-2299		24+00, 50R	0-6"	25.1	50.2	6723 colm
D-SM-2300		24+00, 100R	0-6"	16.3	32.6	3930 colm
D-SM-2301		26+00, 100R	0-6"	11.2	22.4	4346 colm
D-SM-2302		26+00, 50R	0-6"	11.1	22.2	4095 colm
D-SM-2303		28+00, 50R	0-6"	24.1	48.2	5446 colm
D-SM-2304		28+00, 100R	0-6"	22.8	45.6	5324 colm
D-SM-2305		30+00, 50R	0-6"	17.7	35.4	4999 colm
D-SM-2306		30+00, 100R	6-6"	11.3	22.6	4519 colm

SOIL SAMPLE ANALYSIS PROPERTY ID.: DU- Mill Site

PURPOSE: _____

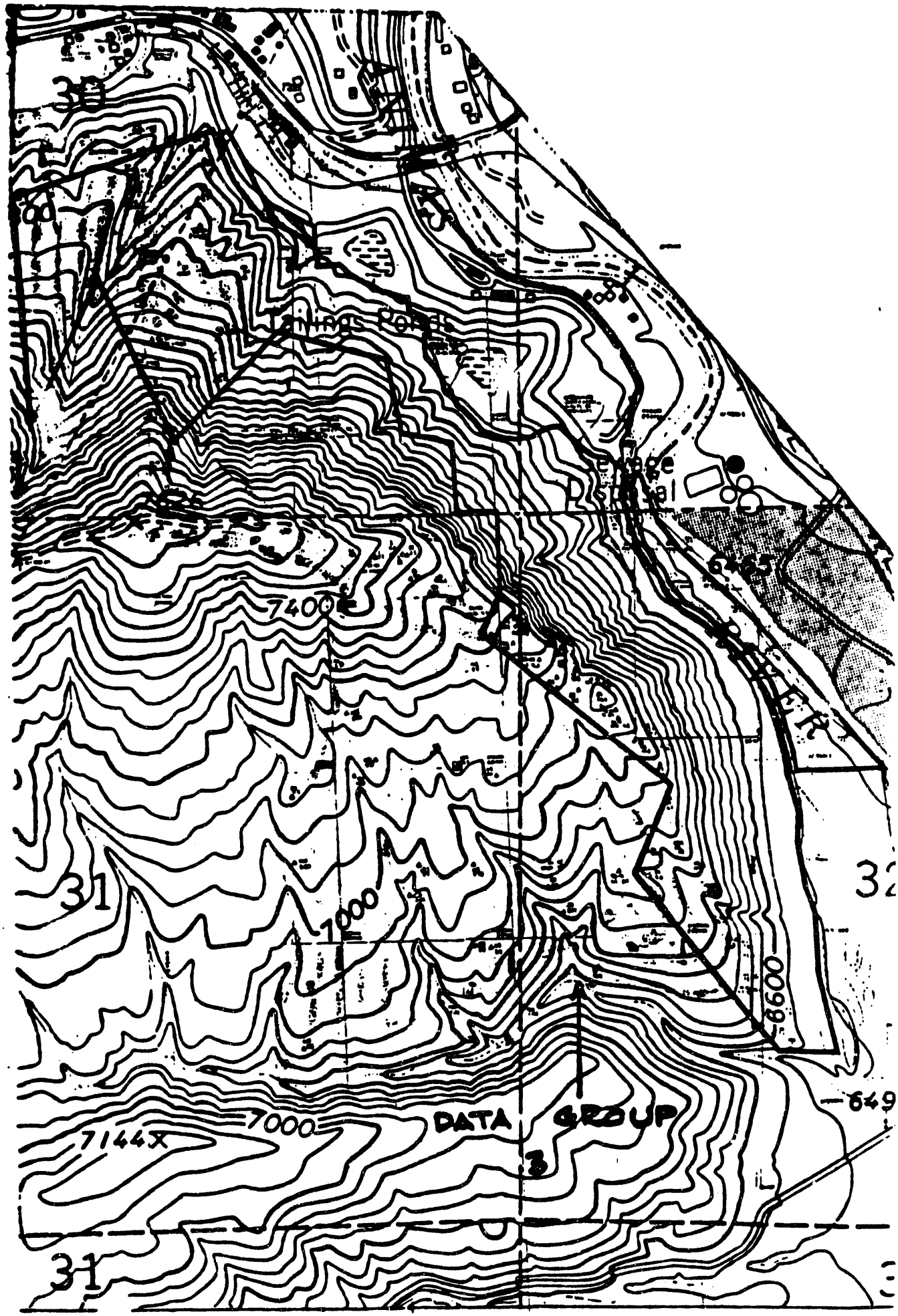
SAMPLE ID. #	AREA	COORDINATES	DEPTH	INITIAL COUNT (pCi/g)	ESTIMATED FINAL (pCi/g)	COMM.
D-SM-2313		36+00, 100R	0-6"	5.3	10.6	4242 CPTM
D-SM-2324		0+00, 50R	0-6"	12.3	24.6	7903 CPTM
D-SM-2325		0+00, 100R	0-6"	3.1	6.2	1M = 7212 6.6 CPM
D-SM-2326		2+00, 111R	0-6"	15.0	30.0	
D-SM-2327		2+00, 63R	0-6"	0.8	1.6	1M = 4058 [illegible]
D-SM-2328		4+00, 83R	0-6"	2.8	5.6	2436 CPTM

SOIL SAMPLE ANALYSIS PROPERTY ID.: DU- Mill Site

PURPOSE: REA

SAMPLE ID. #	AREA	COORDINATES	DEPTH	INITIAL COUNT (pCi/g)	ESTIMATED FINAL (pCi/g)	COMM.
D-SM-2332		6+00, 50R	0-6"	38.2	76.4	4452 5280 cpm
D-SM-2333		6+00, 100R	0-6"	6.9	13.8	4375 cpm
D-SM-2334		8+00, 50R	0-6"	45.7	91.4	5283 cpm
D-SM-2335		8+00 100R	0-6"	38.7	77.4	7761 cpm
D-SM-2336		10+00, 100R	0-6"	2.7	5.4	2780 cpm
D-SM-2337		10+00, 50R	0-6"	1.7	3.4	2843 cpm
D-SM-2338		12+00, 94R	0-6"	34.8	69.6	6775 cpm
D-SM-2339		14+00, 50R	0-6"	23.2	46.4	7638 cpm
D-SM-2340		14+00, 100R	0-6"	5.2	10.4	4021 cpm
D-SM 2341		16+00, 50R	0-6"	33.6	67.2	6564 cpm
D-SM-2342		16+00, 100R	0-6"	41.5	83.0	6255 cpm
D-SM-2343		18+00, 50R	0-6"	48.5	97.0	7217 cpm
D-SM-2344		18+00, 100R	0-6"	15.4	30.8	5622 cpm
D-SM-2367		2+00, 68R	0-6"	3.3	6.6	4233 cpm
D-SM-2368		10+00, 50R	0-6"	4.0	8.0	3200 cpm

DATA GROUP 3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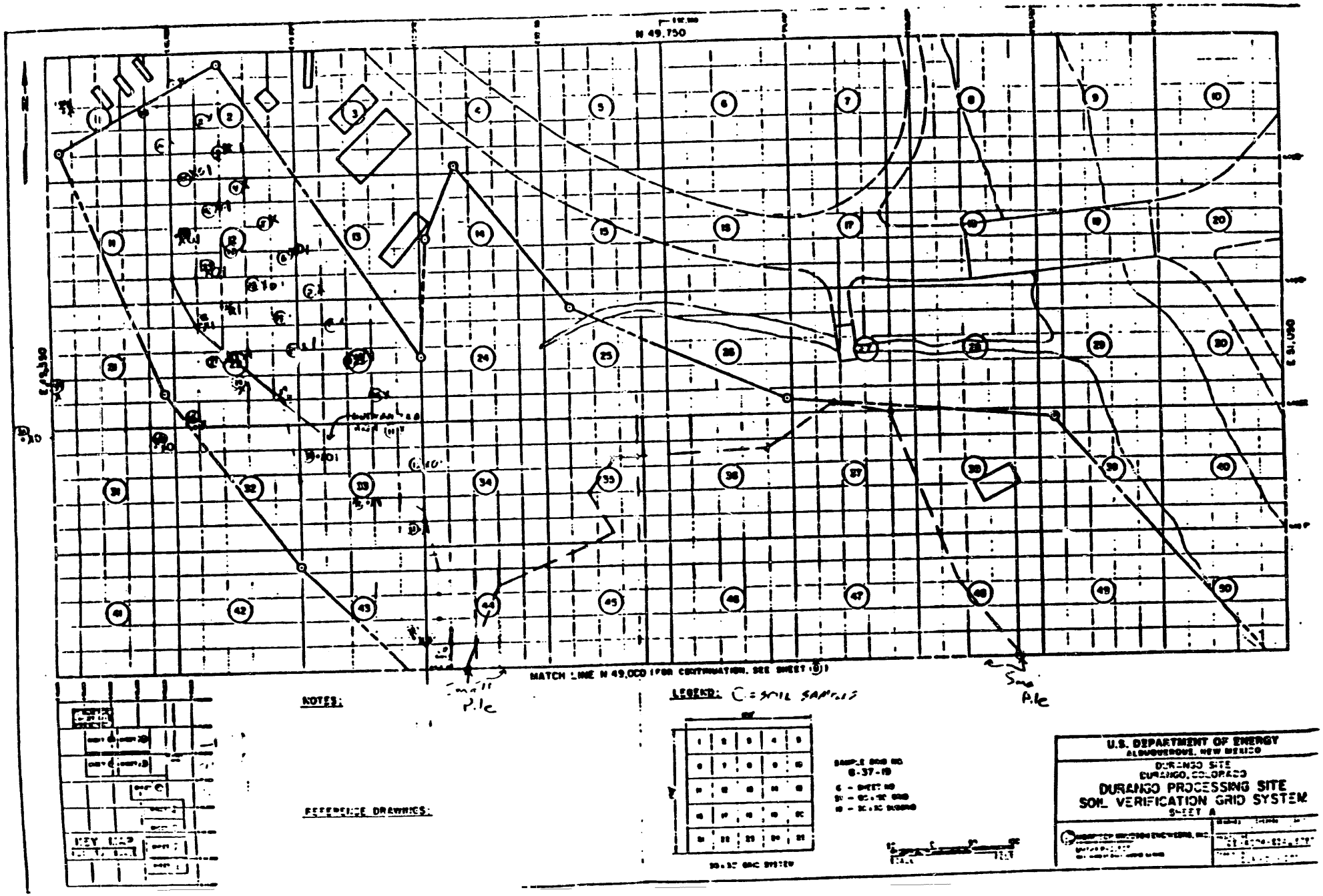

N 49,750
MATCH LINE N 49,000 (FOR CONTINUATION, SEE SHEET 6)
Small Pile
Small Pile
NOTES:
REFERENCE DRAWINGS:
LEGEND:
U.S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO
DURANGO SITE
DURANGO, COLORADO
DURANGO PROCESSING SITE
SOIL VERIFICATION GRID SYSTEM
SHEET A

INTERMOUNTAIN/CHEM-NUCLEAR

DIFFUSION CRYSTAL ASSAY RECORD

OCS #1 Serial #9864369

OCS #2 Serial #2805411

SITE BANK Durango

SITE AREA

COUNT TIME (MINUTES) 20 MIN	SAMPLE NUMBER	RADON EXCRETION	DATE SAMPLED	DATE SEALED	TIME (MINUTES) 20 MIN	CONCENTRATION (pCi/L) 20 DAY	BASE WEIGHT GRAM	Rn 226 (MINUTES) 20 DAY	QC CHECK	Ra 226	Th 230	DEPOSIT <.03 gm	DECAY (MINUTES) 20 DAY	REMARKS
9286	DNI-			9-8	1	1.30E3	540.6	2.36					55	
9-28	DNI-SV10686	332-2	9-2		2	220E3	532	4.14				✓		#2
9-2	DNI-SS10687			9-8	1	2.05E4	429.4	47.7				✓	55	#1 N49774 E49706
9-28	DNI-SV		9-2		1	3.38E4	313	86.0						
9-2	DNI-SS10688			9-6	1	1.14E3	587.0	2.45				V	55	#2 N49673 E49734
9-28	DNI-SV		9-2		1	2.71E3	558	4.86						
9-2	DNI-SS10689			9-8	1	3.34E4	475.4	67.4				V	55	#3 N49631 E49760
9-28	DNI-SV		9-2		1	4.59E4	458	100.2						
9-2	DNI-SS10690			9-8	1	2.04E4	461.0	44.2				J	55	#3 N49631 E49760
9-28	DNI-SV		9-2		1	2.79E4	434	64.3						
9-2	DNI-SS10691			9-8	1	2.26E3	489.2	4.62				V	55	#4 N49587 E49767
9-28	DNI-SV		9-2		1	3.16E3	467	6.77						
9-2	DNI-SS10692			9-8	1	2.10E3	533	3.94				V	55	#5 N49546 E49693
9-28	DNI-SV		9-2		1	3.50E3	501.5	6.90						
9-2	DNI-SS10693			9-8	1	3.92E3	434.6	9.02				✓	55	#6 N49505 E49839
9-28	DNI-SV		9-2		1	6.04E3	401	15.1						
9-2	DNI-SS10694			9-8	1	3.27E3	442.3	7.38				V	55	#6 N49505 E49839
9-28	DNI-SV		9-2		1	3.70E3	416	8.89						
9-2	DNI-SS10695			9-8	1	8.30E3	386	14.1				V	55	#7 N49463 E49865
9-28	DNI-SV		9-2		1	1.07E4	556	19.2						
9-2	DNI-SS10696			9-9-88	1	1.81E4	561.0	32.3				V	55	#8 N49420 E49890
9-28	DNI-SV		9-2	9	1	4.12E4	471.2	83.9				✓		
9-2	DNI-SS10697			9-9:55	1	2.61E4	537.1	48.6				✓	55	#9 N49377 E49916
	DNI-SV		9-2		1	2.33E4	563	41.3						

REVIEWED BY

NOTE: All soil sample results are in pCi/gm.

Site Correction Factor = 1.31(x) + .749 (10/21/87) VP Correction Factor = 1.35(X) + .505 for (RDA = 5 pCi/g (2/3/88)

HI-PERMISSION/CHEM-NUCLEAR

DEPOSIT CRITICAL DESIGN RECORD

OCS #1 Serial #9N4369

OCS #2 Serial #2N5411

DESK NAME Hernandez

DESK DATA

COUNT DATE ORIGINAL / 30 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	INCUB ORIGINAL / 30 DAY	EMISSION NO. ORIGINAL / 30 DAY	MASS MEG / DAY	Rn 220 ORIGINAL / 30 DAY	QC CHECK	RADIOPHOSE RESULT Rn 220	RADIOPHOSE RESULT Th 228	DEPOSIT >83 cm / <83 cm	TECH ORIGINAL / 30 DAY	REMARKS
					X		681.7							
9-2-86	HH-SS10677		9-2											NA377
	HH-SV			9-8	1	9.20E4	681.7	61.6				V	M	#9 E49916
9-2	HH-SS10698		9-2			6.33E4	655	96.6				V	M	N49384
9-2X	HH-SV			9-8	2	2.47E4	604	40.9						#10 E49942
9-2	HH-SS10699		9-2		1	4.15E4	576	72.0				V	M	N49291
9-2X	HH-SV			9-8	2	3.01E4	562.0	53.6						#11 E49967
9-2	HH-SS10700		9-2		1	5.83E4	523	111.5				V	M	N49249
9-2X	HH-SV			9-8	2	2.91E3	573.6	5.07						#12 E49994
9-2	HH-SS10701		9-2		2	2.44E3	520	14.3					M	N49249
9-2X	HH-SV			9-8	2	2.85E4	571.4	49.9				V		#12 E49994
9-2	HH-SS10702		9-2		2	4.37E4	544	80.3				V	M	N49687
9-2X	HH-SV			9-8	2	1.57E3	527.7	2.92						#13 N49688
9-2	HH-SS10703		9-2		2	3.73E3	514	726				V	M	N49644
9-2X	HH-SV			9-8	2	2.13E3	549.8	3.87						#14 E49694
9-2	HH-SS10704		9-2		2	5.03E3	531	9.42					M	N49602
9-2X	HH-SV			9-8	2	6.80E3	558.8	12.2				V		#15 E49721
9-2	HH-SS10705		9-2		2	110E4	533	20.6				V	M	N49602
9-2X	HH-SV			9-8	2	2.02E3	601.0	3.36						#15 E49721
9-2	HH-SS10706		9-2		2	4.37E3	585	7.55				V	M	N49859
9-2X	HH-SV			9-8	2	2.83E5	586	499.5						#16 E49747
9-2	HH-SS10707		9-2		2	3.44E5	540	631.0				V	M	N49817
9-2X	HH-SV			9-8	2	3.59E4	583.2	61.6						#17 E49773
9-2	HH-SS10708		9-2		2	4.68E4	560	83.7						
9-2X	HH-SV													

REVIEWED BY _____

NOTE: All soil sample results are in pCi/gm.

Site Correction Factor = 1.31(x) + .749 (10/21/87) VP Correction Factor = 1.35(X) + .505 for (HDA - 5 pCi/g (2/3/88)

BASE AREA _____

FINAL DATE (MILITARY) DD MM	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SCALED	INCUB. (MILITARY) DD MM	FUNCTION NO. (MILITARY) DD MM	MASS DET. cpm	Bq DET. (MILITARY) DD MM	QC	S.ANOMALOUS DESIGN. Bq 226	Bq 228	RECEIVED .03 cc	RECEIVED .03 cc	RECEIVED DD MM	REMARKS
9-26	INI-			9-8	1	1.30E3	540.6	4.36							
9-26	INI-SV10686	332-2	9-2		2	2.20E3	532	9.14				✓			#2
9-2	INI-SS10687			9-8	1	2.05E4	429.4	47.7				✓			#1
9-28	INI-SV		9-2		1	3.38E4	313	86.0							
9-2	INI-SS10688			9-8	1	1.14E3	587.0	2.45				V			#2
9-28	INI-SV		9-2		1	2.71E3	558	4.86							
9-2	INI-SS10689			9-8	1	3.34E4	485.8	67.4				V			#3
9-28	INI-SV		9-2		1	4.59E4	458	100.2							
9-2	INI-SS10690			9-8	1	2.04E4	461.0	44.2				✓			#3
9-28	INI-SV		9-2		1	2.79E4	434	64.3							
9-2	INI-SS10691			9-8	1	2.25E3	489.2	4.62				V			#4
9-28	INI-SV		9-2		1	3.16E3	467	6.77							
9-2	INI-SS10692			9-8	1	2.10E3	533.3	3.94				V			#5
9-28	INI-SV		9-2		1	3.50E3	507.5	6.90							
9-2	INI-SS10693			9-8	1	3.92E3	434.6	9.02				✓			#6
9-28	INI-SV		9-2		1	6.04E3	401	15.1							
9-2	INI-SS10694			9-8	1	3.27E3	442.3	7.38				V			#6
9-28	INI-SV		9-2			3.70E3	416	7.87							
9-2	INI-SS10695			9-8	1	8.30E3	386	14.1				V			#7
9-28	INI-SV		9-2		1	1.07E4	356	19.2							
9-2	INI-SS10696			9-9.88	1	1.81E4	361.0	32.3				V			#8
9-28	INI-SV		9-2	9	1	4.12E4	411.2	83.9				✓			
9-2	INI-SS10697			9-9.88	1	2.61E4	371.1	48.6				✓			#9
	INI-SV		9-2		1	2.33E4	363	46.3							

REVIEWED BY _____

NOTE: All soil sample results are in pCi/gm.

Site Correction Factor = 1.31(x) + .749 (10/21/87) VP Correction Factor = 1.35(X) + .505 for (INA - 5 pCi/g (2/3/88)

NM-PERMISSION/CHEM-NUCLEAR

DEPOSITION CARDINAL DIVISION RECORD

OCS #1 Serial #984369

OCS #2 Serial #285411

SITE NAME Durango

SITE AREA

DE PAGE OTAL PAGE	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	INCUBATION INITIAL 30 DAY	EMANATION NO. INITIAL 30 DAY	MASS WET DRY	Rn 220 INITIAL 30 DAY	QC CHECK	RADIATIONS Rn 220	RADIATIONS Rn 220	DEPTH .03 cc .03 cc	DECAY INITIAL 30 DAY	REMARKS
-26	DNI-SS10709			9-8	2	208E3	528.4	3.94						NM9915 E49799
-28	DNI-SV		9-2		2	3.78E3	493	7.67				V		#18
2	DNI-SS10710			9-7	2	4.12E4	560.3	73.6				V		NM9477 #18 E49799
1-28	DNI-SV		9-2		2	5.47E4	539	101.5				V		NM9431
-2	DNI-SS10711				2	2.12E4	525.9	40.4						#19 E49826
1-	DNI-SV		92		2	3.75E4	502	74.7				V		NM9393
2	DNI-SS10718			9-9,88	2	2.54E3	419	6.06						#20 E49699
-29	DNI-SV		9-2		1	4.28E3	378.8	11.30				V		elevated area along east side of fence
5-88	DNI-SS10713 DNI-SV	337	9-6		1	1.61E3	582.4	2.72						
6	DNI-			9-8	1	1.19E3	617	1.95				V		4+20, 150R
28	DNI-SV10714	059-178	9-6		2	1.39E3	584	2.38	QC					
6	DNI-			9-8	1	9.19E2	612.0	150				V		4+50, 190R
28	DNI-SV10715	059-179	9-6		2	1.86E3	590	3.15						
6	DNI-			9-9	1	7.50E2	587.3	126				V		4+50, 210R
9	DNI-SV10716	059-180	9-6		2	1.34E3	568	2.36						
6	DNI-			9-9	1	9.76E2	608.6	160				V		4+50, 210R Dup
28	DNI-SV10717	059-180D	9-6		2	1.06E3	582	2.15						
6	DNI-			9-9	1	1.01E3	620.0	163				V		4+50; 240R
29	DNI-SV10718	059-181	9-6		2	1.81E3	605	299						
6	DNI-			9-9	1	6.14E2	558.1	1.16				V		4+50, 270R
29	DNI-SV10719	059-182	9-6		2	1.43E3	508	281						
-6	DNI-			9-9	1	7.26E2	549.3	1.32				V		4+50, 270R
28	DNI-SV10720	059-183	9-6		2	1.32E3	519	2.50						

REVIEWED BY

NOTE: All soil sample results are in pCi/gm.

Site Correction Factor = 1.31(x) + .749 (10/21/87) VP Correction Factor = 1.35(X) + .505 for (RDA - 5 pCi/g (2/3/88)

HR-FERGUSON/CAHN-NUCLEAR

DEPOSLEW CRYSTAL DESIGN RECORD

SITE NAME Durango

SITE AREA

OCS #1 Serial #984369

OCS #2 Serial #285411

CRYSTAL DATE INITIAL / 30 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	INCSR INITIAL / 30 DAY	EMISSION NO. INITIAL / 30 DAY	MASS NET DRY	Rn 226 INITIAL / 30 DAY	DC SUBTR	LABORATORY RESULTS Rn 226	LABORATORY RESULTS Th 230	DEPTH <.03 cc / >.03 cc	TECH INITIAL / 30 DAY	REMARKS
9-8 66	DU-SC10827			9-7	2	1.44E5	670	214.9		NOT LAB				N42000
9-8	DU-SV	R16	9-7	8:20	1	2.47E5	670	368.6	LSES	150.4		✓		G41000
9-6	DU-SS10828			9-9-88	1	3.71E4	559.0	66.4				✓		Δ7126 surface
10-1	DU-SV	DA #21	9-7		1	6.77E4	522.2	1105						open 22636 open
9-6	DU-SS10829			9-9-88	1	7.66E3	555.2	13.8						Δ7126.
10-1	DU-SV	DA #21	9-7		1	1.72E4	510.0	330				✓		surface open 2636 open
9-6	DU-SS10830			9-9-88	1	1.28E5	633.7	202.0				✓		Δ35250
10-1	DU-SV	DA #22	9-7		1	1.99E5	651.5	3408						surface open 6446 open
9-6	DU-SS10831			9-9-88	1	2.09E3	640.0	3.27				✓		
10-1	DU-SV	DA #23	9-7		1	3.58E3	600.05	597						
9-6	DU-SS10832			9-9-88	1	6.39E3	577.4	11.4						Δ1470 surface
10-1	DU-SV	DA #24	9-7		1	1.07E4	544.2	19.60				✓		open 5257 open
9-8	DU-SS10833			9-9-88	1	2.50E3	508.6	4.28				✓		Δ1470 open surface
10-1	DU-SV	DA #24	9-7		1	4.36E3	542.7	8.03						open 3867 open
9-8	DU-SS10834			9-9-88	1	2.26E3	514.6	4.39				✓		Δ1256 open surface
10-1	DU-SV	DA #25	9-7		1	3.95E3	462.1	8.46						open 5106 open
9-8	DU-SS10835			9-9-88	1	2.03E3	582.9	3.48				✓		Δ1220 open surface
10-1	DU-SV	DA #26	9-7		1	3.14E3	549.5	5.71						open 4513 open
9-8	DU-SS10836			9-9-88	1	1.50E3	523.6	2.86						Δ1340 open surface
10-1	DU-SV	DA #27	9-7		1	2.92E3	499.7	5.84				✓		open 5777 open
9-6	DU-SS10837			9-9-88	1	1.88E3	524.6	3.58				✓		Δ1340
10-1	DU-SV	DA #27	9-7		1	311E3	491.4	6.33						open 5777
9-6	DU-SS10838			9-9-88	2	2.32E3	551.5	4.21				✓		Δ1564 open surface
10-1	DU-SV	DA #28	9-7		1	3.19E3	530.09	602						open 5626 open

REVIEWED BY

NOTE: All soil sample results are in pCi/gm.

Site Correction Factor = 1.35(X) + .505 for (RDA - 5 pCi/g (2/3/88)

(10/21/87)

INTERFERROMAGNETIC/CHEMI-NUCLEAR

OPPOSED CRYSTAL DESIGN RECORD

OCS #1 Serial #984369

OCS #2 Serial #285411

BASE BANK Durango

BASE AREA

CHANGE DATE INITIAL / 30 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	INCUB. INITIAL / 30 DAY	FUNCTION NO. INITIAL / 30 DAY	MASS NET / DAY	No 226 INITIAL / 30 DAY	BC CHECK	RADIATION RESULT No 226	RADIATION RESULT Th 230	DEPTH .69 cc / .89 cc	TECH INITIAL / 30 DAY	REMARKS
9-8 C 6 / 10-1	DU-SS10839 / DU-SV	DA #29	9-6-88	9-9-88	2 / 1	1.40E4 / 3.96E4	415.2 / 322.1	33.7 / 29.5				✓		Δ3470 Optim Surf Opm 7714 Optim
9-8 / 10-1	DU-SS10840 / DU-SV	DA #34	9-8	9-9-88	2 / 1	1.08E4 / 1.58E4	489.2 / 441.7	22.1 / 35.5				✓		Δ4285 Optim Surf Opm 13570 Optim
10-1 / 9-8	DU-SS10841 / DU-SV	DA #35	9-8	9-9-88	1 / 1	8.86E3 / 1.66E4	417.6 / 352.1	21.2 / 42.1				✓		Δ2481 Optim Surf Opm 8605
9-8 / 10-1	DU-SS10842 / DU-SV	DA #36	9-8	9-9-88	2 / 2	1.56E4 / 2.50E4	518 / 502.7	30.1 / 49.7				✓		Δ4431 Optim Surf Opm 13758
9-30 / 9-8	DU-SS10843 / DU-SV	DA #36	9-8	9-9-88	2 / 2	7.66E3 / 1.30E4	529.1 / 507.1	14.5 / 26.6				✓		Δ4431 Optim Surf Opm 13952
9-30 / 9-8	DU-SS10844 / DU-SV	DA #30	9-8	9-9-88	2 / 2	3.49E3 / 4.93E3	538.6 / 521.6	6.36 / 9.45				✓		Δ2531 Optim Surf Opm 8445
9-30 / 9-8	DU-SS10845 / DU-SV	DA #30	9-8	9-9-88	2 / 2	9.88E3 / 1.47E4	538.6 / 499.3	18.7 / 28				V		Δ2531 Optim Surf Opm 8445
9-30 / 9-8	DU-SS10846 / DU-SV	DA #30	9-8	9-9-88	2 / 2	3.33E3 / 4.64E3	501.8 / 512.4	6.26 / 9.06				✓		Δ1569 Optim Surf Opm 8017
9-8 / 10-3	DU-SS10847 / DU-SV	DA #31	9-8	9-9-88	2 / 2	1.78E3 / 2.41E3	547.2 / 530.4	3.25 / 4.63				V		Δ129 Optim Surf Opm 681 Optim
9-8 / 10-1	DU-SS10848 / DU-SV	DA #33	9-8	9-9-88	2 / 2	1.49E3 / 1.94E3	546.2 / 524.3	2.73 / 3.70				✓		Δ129 Optim Surf Opm 681 Optim
9-8 / 10-1	DU-SS10849 / DU-SV	DA #33	9-8	9-9-88	1 / 2	8.21E2 / 1.21E3	450.0 / 478.4	1.82 / 2.84				✓		
9-8 / 10-1	DU-SS10850 / DU-SV	DA #32	9-8	9-9-88	1 / 2	6.00E3 / 6.85E3	436.2 / 374.0	14.1 / 17.17				✓		20"
9-8 C 6 / 10-1	DU-SS10839 / DU-SV	DA #29	9-6-88	9-9-88	2 / 1	1.40E4 / 3.96E4	415.2 / 322.1	33.7 / 29.5				✓		Δ3470 Optim Surf Opm 7714 Optim

REVIEWED BY

NOTE: All soil sample results are in pCi/gm.

1.35(X) + .505 for (DA - 5 pCi/g (2/3/88)

File Documentation Number # 3[illegible] (10/21/87)

NR-FERGUSON/CHEM-NUCLEAR

OPPOSED CRYSTAL SYSTEM RECORD

OCS #1 Serial #984369

OCS #2 Serial #205411

DATA BANK Durango

DATA AREA

TIME DATE SPECTRAL 30 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	SPECTRAL 30 DAY	FUNCTION NO. SPECTRAL 30 DAY	MASS MEI DAY	Rn 226 SPECTRAL 30 DAY	QC CODES	RADIONUCLIDE RESULT Rn 226	Th 230	DEPTH cm cm	TECH SPECTRAL 30 DAY	REMARKS
9-6-88	DU-SS085V	DA #3	9-6	9-9-88	1	6.78E3	406.3	16.7						20" depth
10-1	DU-SV				2	7.19E3	382.3	20.2				✓		
9-6	DU-SS10852	DA #6	9-8	9-9-88	1	1.83E3	391	468						20" depth
10-1	DU-SV				2	3.15E3	345	8.59				1		
9-6	DU-SS10853	DA #9	9-8	9-9-88	1	1.76E4	362.3	31.0						20" depth
10-1	DU-SV				2	2.67E4	530.2	50.4				✓		
9-6	DU-SS10854	DA #12	9-6	9-9-88	1	1.01E3	500.6	2.02						20" depth
10-1	DU-SV				2	1.72E3	954.1	3.79				✓		
9-8	DU-SS10855	DA #15	9-8	9-9-88	1	4.36E5	641.3	680.0						20" Depth
10-1	DU-SV				2	5.05E5	557.7	659.3				✓		Surface 20" 42309 open STM Open
9-6	DU-SS10856	DA #16	9-6	9-9-88	1	1.03E5	544.5	189.2						20" depth
10-1	DU-SV					1.23E5	492.8	216.6						
9-6	DU-SS10857	DA #16	9-6	9-9-88	1	1.07E5	529.4	183.7				✓		
10-1	DU-SV				2	1.22E5	515.7	216.6						20" Depth
9-8	DU-SS10858	DA #18	9-8	9-9-88	1	5.14E3	539.2	9.62				✓		
6-1	DU-SV				2	6.04E3 1.50E3	485.5	12.54						20" Depth
9-8	DU-SS10859	DA #20	9-8	9-9-88	1	5.19E3	439.4	3.41						
10-1	DU-SV				2	1.64E3	424.9	4.18				✓		20"
	DU-SS10857	DA #20 21	9-6		+	1.58E3								
	DU-SV				1	6.21E2	509.4	1.22				✓		N48400 SW E50870 Th230 = 1.21 pCi/g N48400E50900
9-8	DU-													
	DU-SV10860	B-30-20	9-8		1	7.67E2	535.6	1.43	20			✓		Th230 = .907
9-8	DU-													
	DU-SV10861	B-3120	9-8											

REVIEWED BY

Note: All soil sample results are in pCi/gm.

Site Correction Factor = 1.35(X) + .505 for (RDA - 5 pCi/g (2/3/88)

1.35(X) + .505 for (RDA - 5 pCi/g (10/21/87)

SAMPLE #	N	E	ELV.		DPTH	EST. PCI/G
1.	47242.640	50283.319	7482		1740	5.9
2.	47246.844	50395.975	7444		1630	4.0
3.	47252.505	50448.772	7425		1830	5.3
4.	47352.431	50568.808	7375		2030	4.6
5.	47352.431	50568.808	7375	*	2030	3.6
6.	47086.542	50802.601	7301		2100	5.1
7.	46861.740	51081.872	7235		2320	8.4
8.	46847.297	51117.020	7224		2710	8.0
9.	46847.297	51117.020	7224	*	2710	4.8
10.	46770.369	51270.204	7180		2450	11.3
11.	46697.608	51344.066	7164		2570	10.0
12.	46631.202	51367.412	7148		3200	13.8
13.	46568.380	51419.139	7131		3130	16.
14.	46443.405	51610.641	7065		3610	25.5
15.	46443.405	51610.641	7065	*	4440	16.9
16.	46336.738	51649.005	7073		4440	33.0
17.	46116.516	51909.602	7015		4130	29.0
18.	47109.336	50641.531	7336		1800	4.3
19.	46890.872	50812.501	7247		2000	6.0
20.	46890.872	50812.501	7247	*	2000	4.4
21.	46336.738	51649.005	7073		2710	8.9
22.	46221.081	51824.396	7041		5300	3.7
23.	49685.340	49375.227	6584		3160	3.3
24.	49728.885	49417.246	6592		4830	38.2
25.	49728.885	49417.246	6592	*	4830	9.6
26.	49457.582	49018.866	6739		4130	21.7
27.	49509.869	48980.055	6746		3730	15.6
28.	49346.905	48857.223	6781		3780	22.6
29.	49888.699	48306.353	6555		2200	4.3
30.	49352.850	48293.455	6759		2750	12.8
31.	44822.225	51489.244	6851		2845	4.4
32.	45370.010	51807.100	6872		2260	4.6
33.	45264.006	51805.512	6887		3253	19.5
34.	45496.015	51784.814	6905		2900	51.0
35.	47262.311	47896.199	7609		1360	2.1
36.	47423.763	48047.500	7510		1530	2.4
37.	47684.710	48164.531	7397		1920	2.6
38.	47684.710	48164.531	7397	*	1920	UNDA
39.	47894.231	48269.029	7350		1720	2.8
40.	48099.034	40024.134	7211		1930	13.4
41.	48287.579	48318.383	7162		1786	UNDA
42.	48454.292	48462.387	7051		2086	6.7
43.	48454.292	48462.387	7051	*	2086	3.4
44.	48576.843	48530.879	6979		1772	2.7
45.	48663.123	48585.030	6919		1874	2.8
46.	48931.737	48723.703	6863		2275	8.8
47.	49190.759	48866.203	6808		1830	4.0
48.	49190.759	48866.203	6808	*	1830	2.5
49.	49488.036	49032.236	6724		2527	5.4
50.	49733.817	49192.407	6684		2047	3.5
51.	47335.717	50024.771	7548		1450	6.0
52.	4792.610	50113.229	7536		1500	UNDA
53.	47226.979	50253.964	7491		1170	2.9
54.	47226.979	50253.964	7491	*	1170	UNDA
55.	47251.616	50477.223	7418		1500	2.5
56.	47104.026	50493.829	7373		1580	4.6
57.	47301.449	50600.444	7323		1660	3.1
58.	46977.841	50705.584	7283		1870	4.5
59.	46977.841	50705.584	7283	*	1870	1.0

60.	46866.833	50847.203	7241		1710	2.5
61.	46783.574	50945.788	7219		2030	6.3
62.	46721.031	51072.581	7201		1920	2.9
63.	46630.096	51219.818	7159		2760	6.3
64.	46630.096	51219.818	7159	*	2760	4.2
65.	47452.158	49046.859	7610		1370	1.3
66.	47351.840	49054.086	7557		1480	(MDA
67.	47642.004	49080.333	7510		1640	(MDA
68.	47777.685	49080.521	7438		1610	(MDA
69.	47777.685	49080.521	7438	*	1610	(MDA
70.	47901.313	49112.402	7387		1960	4.8
71.	47976.082	49133.389	7326		2400	6.2
72.	48036.224	49157.602	7276		1950	(MDA
73.	48108.518	49112.577	7215		1850	(MDA
74.	48108.518	49112.577	7215	*	1850	2.3
75.	48202.963	49088.073	7141		2050	3.1
76.	48306.199	49016.853	7072		2460	10.6
77.	48465.298	48992.046	6990		1870	(MDA
78.	48556.846	49042.124	6947		2170	(MDA
79.	48556.846	49042.124	6947	*	2170	(MDA
81.	48831.914	49186.376	6843		2320	3.9
82.	48991.947	49221.169	6807		2690	(MDA
83	49217.713	49359.118	6770		3380	8.6
84.	49217.713	49359.118	6770	*	3380	13.3
85.	49426.680	49416.919	6715		3440	9.7
86.	49596.220	49430.435	6644		2970	5.1
87.	46518.486	51320.397	7128		3100	13.7
88.	46449.392	51434.066	7070		2550	5.1
89.	46346.813	51570.275	7059		3520	25.0
90.	46270.204	51662.411	7069		2960	12.8
91.	46270.204	51662.411	7069	*	2960	4.8
92.	46130.291	51783.319	7028		3600	12.3
93.	45978.967	51895.696	6984		2160	10.2
94.	45813.764	51933.120	6956		2050	1.7
95.	45386.377	51623.235	6827		2230	4.7
96.	45386.377	51623.235	6927	*	2230	3.4
97.	45491.087	51983.475	6892		2540	5.2
98.	45409.188	52107.389	6871		3120	17.3
99.	45291.726	52181.542	6824		2410	5.6
100.	45134.854	52265.101	6804		3410	7.1
101.	45134.854	52265.101	6804		3410	4.8
102.	44990.104	52307.795	6793		3130	14.6
103.	44881.902	52377.641	6767		4820	1.1
104.	44766.450	52396.956	6740		2670	7.8
105.	44685.569	52420.957	6720		3370	15.0
106.	44685.569	52420.957	6720	*	3370	9.3
107.	44544.037	52463.779	6692		2510	1.4
108.	44423.669	52478.251	6640		2760	5.1
109.	44348.092	52570.580	6596		2800	9.5
110.	47284.237	49656.279	7544		1200	2.4
111.	46657.992	50000.542	7270		1530	2.6
112.	46580.818	50793.527	7208		1760	3.5
113.	45957.254	50948.161	7036		1930	5.0
114.	45451.283	51223.043	6924		1670	(MDA
115.	45451.283	51223.043	6924	*	1670	2.8
116.	46088.700	50566.700	7065		1940	5.1
117.	46088.705	50566.700	7065		1760	4.7
118.	45439.733	50781.713	6987		2090	6.0
119.	44953.600	50861.284	6909		1870	3.4
120.	44600.151	51037.861	6810		2090	6.0
121.	45813.764	49740.050	7100		1750	1.4
122.	45683.095	49739.971	6999		1700	3.6

123.	44707.075	49786.748	6883	1880	1.4
124.	44383.197	49738.183	6815	1980	5.3
125.	44432.542	50933.388	6721	2170	3.9
126.	44695.051	50719.559	6801	2350	7.6
127.	45446.539	50463.312	6951	2190	3.5
128.	46066.907	50242.362	7061	1860	4.6
129.	46012.404	50718.837	7035	2370	9.5
130.	45148.148	51298.852	6796	1750	3.9
131.	45296.350	51210.385	6663	2340	2.9
132.	48306.417	49394.969	7025	3781	26.6
133.	48591.044	49507.892	6871	3192	12.7
134.	48908.366	49600.798	6786	3565	11.2
135.	46344.419	50081.195	7137	1650	2.5
136.	45986.456	50121.097	7101	1570	2.8
137.	45567.810	50274.632	7014	1500	4.9
138.	45268.657	50403.620	6961	1550	2.7
139.	44968.079	50773.246	6903	1760	3.8
140.	44640.370	50562.826	6867	1720	3.7
141.	44401.741	50688.033	6811	1990	2.0

* Sample taken @ 6-12 inches

ns= no sample taken

Appendix B

Correspondence

DUR

STATE OF COLORADO

COLORADO DEPARTMENT OF HEALTH

4210 East 11th Avenue
Denver, Colorado 80220
Phone (303) 320-8333

MK-FERGUSON CO.
ALBUQUERQUE

SEP 12 1989

RECEIVED

Roy Romer
Governor

Thomas M. Vernon, M.D.
Executive Director

September 5, 1989

J.G. Oldham
Project Director
MK-Ferguson Company
P.O. Box 9136
Albuquerque, NM 87119

Re: Smelter Mountain Supplemental Standards. DU-544/545; DUR X

Dear Mr. Oldham:

We have reviewed the additional information you provided by letter of 7/19/89 concerning application of supplemental standards at the site noted above and find it to conform with the requirements of 40 CFR 192. All measurements appear to be in conformance with the Vicinity Properties Management and Implementation Manual. Thus, our concerns expressed by letter of June 23, 1989 have been addressed and you may consider our concurrence to be effective on that date.

If you have any questions, please contact me.

Sincerely,

Edward L. Bischoff
UMTRA Project Manager
Hazardous Materials and
Waste Management Division

ELB:lh:5079K

cc: Bud Franz/CDH
Jody Garcia/DOE

APP	INFO	DIST	REP	INFO	DIST
	✓	USGS			DOE
					DWH
	✓	REC		✓	BAP
		[illegible]/CRS			BAP
		CDW			BIA/ALB
		[illegible]H			[illegible]LD
		WD			[illegible]
	✓	[illegible]DT			[illegible]
		[illegible]			DFW
		DPB			UMS
		SJS/DC			WAZ
					RDW
ORIG. FILE					STD+CO
WORK FILE					DUR

ENGINEERS
AND
CONSTRUCTORS

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

HEADQUARTERS OFFICE
ONE ERIEVIEW PLAZA
CLEVELAND, OHIO U.S.A. 44114
PHONE (216) 523-5600/TELEX: 985642

REPLY TO: MK-FERGUSON COMPANY
REMEDIAL ACTIONS
CONTRACTOR-UMTRA PROJECT
P.O. BOX 9136
ALBUQUERQUE, NEW MEXICO U.S.A. 87119

September 18, 1989

Mr. Ed Bischoff
Hazardous Material and Waste Management
Remedial Programs Section
Colorado Department of Health
4210 East 11th Avenue
Denver, CO 80220

SUBJECT: UMTRA Project - Durango
Supplemental Standards - Smelter Mountain (DUR X).

REFERENCE: 1. MK-F letter, Oldham to Bischoff, dated February 23, 1989
2. CDH letter, Bischoff to Oldham, dated September 5, 1989

Dear Mr. Bischoff:

Our referenced letter requested the concurrence of CDH, as property owner, in the application of supplemental standards to the steep slopes contained within the Durango Processing Site boundaries. Your referenced letter granted concurrence but referred only to the Vicinity Property areas DU-544/545.

You advised Tom Jennings of my staff on September 14, 1989, that the concurrence granted by your letter applies also to the areas within the Processing Site boundaries as described by our referenced letter. This is to confirm that information for the record.

If you have any questions, please contact Rob Cooney of my staff.

Sincerely,

MK-Ferguson Company

J. G. Oldham
Project Director

JGO/TPJ/kja

cc: G. A. Franz, CDH
F. Bosiljevac, DOE/UMTRA
E. Damler, DOE/UMTRA
J. Garcia, DOE/UMTRA
M. Jackson, TAC

bcc: R. E. Cooney
T. P. Jennings
R. A. Pommerening
M. D. Thomson
File

3464K

SUPPLEMENTAL STANDARDS APPLICATIONS FOR REGION II ADJACENT TO ANIMAS RIVER

MKO|UMTP290-0157

3.30.9

ENGINEERS
AND
CONSTRUCTORS

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

HEADQUARTERS OFFICE
ONE ERIEVIEW PLAZA
CLEVELAND, OHIO U.S.A. 44114
PHONE (216) 523-5600/TELEX 985542

REPLY TO MK-FERGUSON COMPANY
REMEDIAL ACTIONS
CONTRACTOR-UMTRA PROJECT
PO BOX 9136
ALBUQUERQUE NEW MEXICO U.S.A. 87119

February 20, 1990

90-3050-123

Mr. Mark L. Matthews
Acting Project Director
U.S. Department of Energy
Uranium Mill Tailings Remedial Action Project Office
First National Bank Building
Suite 1700
5301 Central Avenue N.E.
Albuquerque, New Mexico 87108

SUBJECT: Application for Supplemental Standards - Durango Site, Region II

REFERENCE: 1. Letter No. 89-3050-688 to Mark L. Matthews from J. G. Oldham, dated September 12, 1989.

2. Contract No. DE-AC04-83AL18796

Dear Mr. Matthews:

On September 6, 1989, representatives from the NRC, DOE, State, RAC and TAC visited the Durango Site. At this meeting the application of supplemental standards to areas of contamination within the site boundaries was discussed. Two regions of contamination on the Animas River bank were included in this discussion. A complete radiological characterization for the first of these regions was provided in Reference 1. Reference 1 proposed modification of the Durango, Colorado Final Remedial Action Plan (Rev. 1, dated 6/23/89) to allow the application of supplemental standards to areas on the site. This modification has been approved.

During excavation in the second region along the Animas River, radiological contamination was found to extend below the water table in three areas. Two of these areas were excavated to one foot below the existing water elevation. The contamination in the third area is beneath a five to seven foot layer of backfill and riprap that is adjacent to the Animas River. Complete excavation in these areas would require the use of Z-pile at an estimated cost of $325,000.00, and the removal of all the riprap and backfill overburden. This would destroy 120 linear feet of the riverbank, causing excessive environmental harm. MK-Ferguson recommends that this material be left in place, leaving the riverbank undisturbed. If the material is left in place approximately 65 cubic yards of material

will remain in place. The estimated average Ra226 concentrations in these areas range from 35 to 221 pCi/g. A radiological analysis (attached) shows that there should be negligible health effects associated with the residual material. The application of supplemental standards is recommended for this residual material.

Because excavation in nearly complete at the Durango processing site, MK-Ferguson requests your comments/concurrence on the application of Supplemental Standards as soon as possible. Should you have any questions regarding this matter, please do not hesitate to contact Dr. Frank Petelka of my staff at 766-3040.

Sincerely,

MK-FERGUSON COMPANY

J. G. Oldham
Project Director

JGO/MFP/RDJ/mno
Enclosures:
cc: w/enclosures:
E. Damler, DOE/UMTRA
B. Sellers. DOE/UMTRA
M. Jackson, TAC/UMTRA
M. Miller, TAC/UMTRA
P. Martinek, CDH
SH-011-09-89

Radiological Analysis
Animas River Bank
Region II
Durango, Colorado Site

Introduction

Excavation control to the 15 pCi/g radium-226 (Ra-226) standard at certain areas along the Animas River on the Durango Site would require extensive engineering and construction support. Elevated Ra-226 concentrations (greater than 15 pCi/g) have been encountered immediately adjacent to the river at depths in excess of 3 feet below the present river stage. Decontamination to such depths to ensure compliance with the EPA standards will, in our opinion, become unreasonable. This work does not appear to be in keeping with the intent of the standards.

Because the principal reason for radium removal is reduction of radon daughter concentrations (RDC) in homes to be built onsite, and because radon produced at depth will be attenuated in clean fill cover before entering such homes, it is appropriate to calculate the depth of excavation needed under a home to reduce RDC to acceptable levels. Potential impact was assessed through radon emanation estimation, using the RAECOM computer model (Reference 1). The radon flux value obtained from RAECOM can be used to calculate the RDC expected in a hypothetical structure located on the property, as predicted by Reference 2. An analysis of the available data, with the results implemented in the RAECOM model, follows.

Elevated Ra-226 concentrations were encountered during final radium excavation of the flood plain below the large tailings pile, adjacent to the slag area. Data from 4 soil samples collected in the region were analyzed to provide an estimate of the Ra-226 concentration profile. Results are given in Table 1. Three areas of contamination exist in Region II; Areas 2A, 2B and 2C. Contamination in Areas 2A and 2C has been excavated one foot below the water table. The estimated depth of the contamination that remains in these areas is 2 feet. In Area 2B a layer of contamination is present beneath 5 to 7 feet of radiological clear riprap and backfill. The estimated thickness of this layer of contamination is 2.5 feet with the top of the layer 6 inches below the water table. Figure 1 shows the location of Region II on the site and Figure 2 shows the aerial extent of contamination in Region II. The estimated material in each area is also given on Figure 2.

Impact Analysis:

Radon concentration in a hypothetical structure is given in Appendix J of Reference 2 by:

$C = \theta AB/VR$ Where: C = Rn-222 concentration (pCi/m^3)
θ = Rn-222 flux (pCi/m^2-s)
A = Area over which flux enters (m^2)
B = Flux reduction factor in entering structure
V = Volume of structure (m^3)
R = Effective Rn-222 Removal Rate (s^{-1})

Radon-222 flux was calculated by RAECOM. The coefficients used in the analysis were:

$A = 103\ m^2$, $B = 0.5$, $V = 250 m^3$, and $R = 1.98E\text{-}4\ s^{-1}$ (one air change per 1.4 hours). The flux reduction factor is a conservative value given in Reference 2. The assumed value for the air change rate is conservative based on the information in ICRP 50, "Lung Cancer Risk from Indoor Exposure to Radon Daughters", page 7. Using these assumptions, a radon flux of 3.9 pCi/m^2-s will produce an indoor air concentration of approximately 4.0 pCi/l, which, assuming 50 percent equilibrium, will result in an RDC of 0.02 WL.

Radon Emanation Estimation Assumptions:

Emanation fraction: The site specific emanating fraction of radon-222 produced from Ra-226 decay of 0.32 was assumed, based on information provided in Reference 7.

RAECOM model parameters: A diffusion coefficient of 0.02 was selected as representative of the unsaturated fill material covering the residual Ra-226 deposit (Reference 7). The moisture content was assumed to be 10% for unsaturated and 25% for saturated material. The diffusion coefficient of the saturated layer is much smaller, about 10^{-5} cm^2/s (References 2 and 4). The bulk density was 1.5 g/cm^3, the porosity was 0.44 (Reference 7).

The deposit is immediately adjacent to the Animas river. Although no habitable buildings are expected to be built above the deposit because of flooding potential, slab-on-grade construction is assumed. Basements would not be possible due to the presence of water.

Results:

The RAECOM model was used to evaluate existing conditions in all these areas, with 10 feet of backfill on Areas 2A and 2C, and 5 feet of backfill and riprap on Area 2B. Radon escaping from the residual material must diffuse first through the saturated soil layer, and then through the unsaturated backfill layer before entering a hypothetical structure.

RAECOM analysis shows that given the above conditions, residual Ra-226 concentrations would produce a radon Rn-222 flux ranging from 0.2 to 0.9 pCi/m^2-s, resulting in hypothetical working levels ranging from 0.001 to 0.005. These results, shown on Table 2, indicate that radon daughter concentrations (RDC) in a habitable building would not exceed the standard of 0.02 (40 CFR 192.12 (b) (1)). The 20 pCi/m^2-s flux standard given in 40 CFR 192.02 (b) (1) would also be met with no additional excavation.

Recommended Excavation Protocol:

There are two options for the excavation of the material adjacent to the river; one would require extensive engineering and construction support and would remove all the contamination, the other would be less complex but would leave a small quantity of residual activity.

Option 1 - Complete removal of contamination: The area would need to be surrounded by Z-pile to minimize water infiltration into the excavation. Since the contamination extends to the river bank, the Z-pile would be placed in the river channel, extending some distance from the bank. The excavation would be dewatered, the water would require treatment prior to release offsite. Complete decontamination would also destroy approximately 120 linear feet of riverbank.

Option 2 - Partial decontamination: The contamination in Areas 2A and 2C has been excavated to one foot below the water table and covered, on average, with 10 feet of backfill. The contamination in Area 2B was left in place. Option two recommends that all three of these Areas be left in their present condition. This would require the application of Supplemental Standards. MK-Ferguson recommends that Supplemental Standards be applied to these areas based on conditions outlined in Modification No. 1 to the Durango, Colorado Final Remedial Action Plan (Rev. 1, dated 6/23/89).

References:

1. Radon Attenuation Effectiveness and Cover Optimization (RAECOM, IBM PC Version).

2. Draft Generic Environmental Impact Statement on Uranium Milling; NUREG-0511; April 1979.

3. Lung Cancer Risk from indoor Exposure to Radon Daughters; ICRP 50; 1979.

4. USNRC. 1987. Draft Regulatory Guide and Value/Impact Statement, Calculation of Radon Flux Attenuation by Earthen Uranium Mill Tailings Covers. Task WM 503-4.

5. USDOE. 1984. Draft Remedial Action Plan and Site Conceptual Design for Stabilization of the Inactive Uranium Mill Tailings Site at Durango, Colorado.

6. Code of Federal Regulations, Title 40 Part 192; Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings.

7. USDOE, 1988. Final Calculations, Volume IV, Redesign of Disposal Embankment. Uranium Mill Tailings Remedial Action Project (UMTRAP), Durango, Colorado.

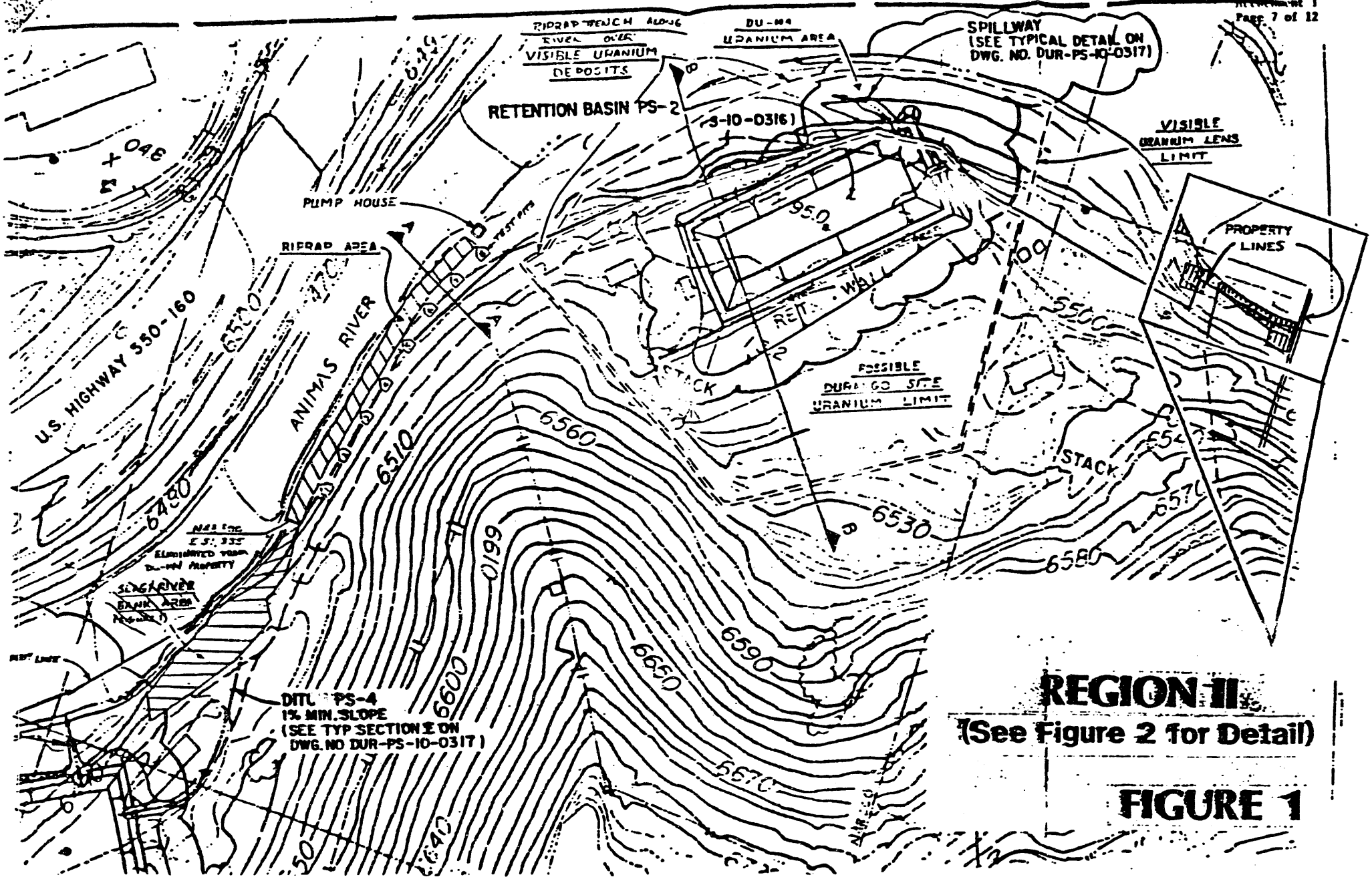
Table 1
SOIL SAMPLE SURVEY
ANIMAS RIVER BANK REGION II

LOCATION *	SAMPLE ID	Ra-226 CONCENTRATION (pCi/g)
AREA 2A	DU-SS-16137	295
AREA 2A	DU-SS-16138	147
AREA 2B	DU-SS-16139	35
AREA 2C	DU-SS-18413	40

*See Figure 2 for locations

Table 2
ESTIMATED Rn-222 FLUX AND
HYPOTHETICAL INDOOR RADON DAUGHTER CONCENTRATION
Animas Riverbank Region II

Area 2A:	With 10 feet of backfill, Rn-222 flux = 0.9 pCi/m^2-s	WL = 0.005
Area 2B:	With 10 feet of backfill, Rn-222 flux = 0.68 pCi/m^2-s	WL <0.004
Area 2C:	With 5 feet of backfill, Rn-222 flux = 0.2 pCi/m^2-s	WL <0.001



REGION II

(See Figure 2 for Detail)

FIGURE 1

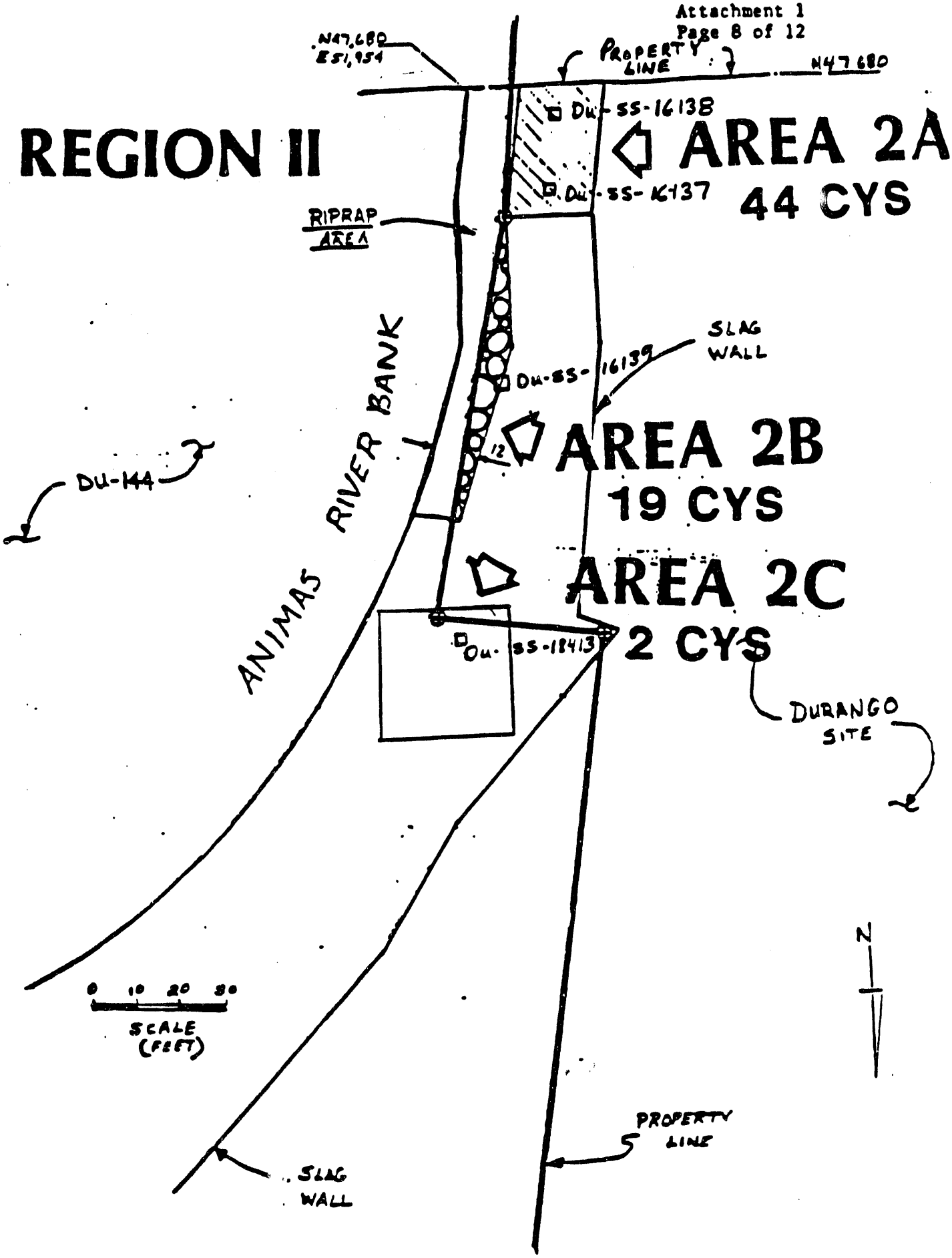

N47,680
E51,154
PROPERTY LINE
N47,680
REGION II
DU-SS-1613B
AREA 2A
44 CYS
DU-SS-K137
RIPRAP AREA
SLAG WALL
DU-SS-16139
ANIMAS RIVER BANK
AREA 2B
19 CYS
DU-144
AREA 2C
2 CYS
DU-SS-18413
DURANGO SITE
0 10 20 30
SCALE (FEET)
N
PROPERTY LINE
SLAG WALL

FIGURE 2

APPENDIX A

RADCOM COMPUTER CODE OUTPUT

AREA 2A

RAECOBPC.BAS

OUTPUT INFORMATION : 11:46:26 02-09-1990
BOTTOM FLUX = 0 pCi/m^2/sec
AIR CONC. = 0 pCi/l
BARE LAYER 1 FLUX = 10.86 pCi/m^2/s
NO OPTIMIZATION APPLIED

L	THICK (cm)	POR	MOIST (%)	SOURC (pCi/g)	E.F.	DENS (g/cm^3)	DIFF COEF	FLUX (pCi/m^2/s)	CONC. (pCi/cm^3)	MIC
2	305.0	.44	10	0	.32	1.5	0.02000	0.93	0.0	0.748
1	61.0	.44	25	221	.32	1.5	0.00005	10.60	5.8	0.369

********** TOP **********
- 2 - BACKFILL *
****
- 1 - TAILINGS *
****
********** BOTTOM **********

OUTPUT INFORMATION : 13:58:42 02-13-1990
BOTTOM FLUX = 0 pCi/m^2/sec
AIR CONC. = 0 pCi/l
BARE LAYER 1 FLUX = 1.72 pCi/m^2/s
NO OPTIMIZATION APPLIED

L	THICK (cm)	POR	MOIST (%)	SOURC (pCi/g)	E.F.	DENS (g/cm^3)	DIFF COEF	FLUX (pCi/m^2/s)	CONC. (pCi/cm^3)	MIC
2	152.0	.44	10	0	.32	1.5	0.02000	0.68	0.0	0.748
1	76.0	.44	25	35	.32	1.5	0.00005	1.68	0.8	0.369

********** TOP **********
- 2 - BACKFILL *
****
- 1 - TAILINGS *
****
********** BOTTOM **********

OUTPUT INFORMATION : 11:48:58 02-09-1990
BOTTOM FLUX = 0 pCi/m^2/sec
AIR CONC. = 0 pCi/l
BARE LAYER 1 FLUX = 1.97 pCi/m^2/s
NO OPTIMIZATION APPLIED

L	THICK (cm)	POR	MOIST (%)	SOURC (pCi/g)	E.F.	DENS (g/cm^3)	DIFF COEF	FLUX (pCi/m^2/s)	CONC. (pCi/cm^3)	MIC
2	305.0	.44	10	0	.32	1.5	0.02000	0.17	0.0	0.748
1	61.0	.44	25	40	.32	1.5	0.00005	1.92	1.0	0.369

********** TOP **********
- 2 - BACKFILL *
****
- 1 - TAILINGS *
****
********** BOTTOM **********

COL/UMT/0210-0024 3.30.9

STATE OF COLORADO

COLORADO DEPARTMENT OF HEALTH

4210 East 11th Avenue
Denver, Colorado 80220-3716
Phone: (303) 320-8333

Telefax
(303) 322-9076 (Main Building Denver)
(303) 320-1529 (Platrnugan Place Denver)
(303) 248-7198 (Grand Junction Regional Office)

Roy Romer
Governor

Thomas M. Vernon, M.D.
Executive Director

March 14, 1990

Mr. Mark L. Matthews
Acting Project Manager
U.S. Department of Energy
Uranium Mill Tailings Remedial Action Project Office
First National Bank Building
5301 Central Avenue N.E.
Albuquerque, New Mexico 87108

Re: Durango UMTRA Processing Site Region II Application for Supplemental Standards, File No. DUR-XIII.N

Dear Mr. Matthews:

On February 26, 1990, we received from MK-Ferguson Company an application for Supplemental Standards for Region II of the UMTRA Processing Site. Herein is our concurrence on this application.

The application recommends leaving approximately 65 cubic yards of tailings in place. These tailings are located at or below the water table, and immediately adjacent to the Animas River. Removal of these tailings would require surrounding the excavation with Z-pile to prevent river encroachment, dewatering, and destruction of 120 feet of riverbank, at an estimated cost of $325,000.

The application states that the tailings are and will remain covered either by 5 to 7 feet of backfill and riprap or by roughly 10 feet of backfill. Therefore, radon attenuation and erosion protection should be adequate to protect human and health and the environment from these tailings. Because the tailings are located so close to the Animas River, it is unlikely that any structures will be built in this area, thereby minimizing potential problems of indoor radon concentrations.

We concur with the Supplemental Standards Application for Region II, and believe that human health and the environment will be adequately protected.

If you have any questions, please contact Patricia Martinek at (303) 331-4828.

Sincerely,

Edward L. Bischoff
UMTRA Program Manager
Hazardous Materials
and Waste Management Division

cc: E. Damler, DOE
J. G. Oldham, MK-F
M. Kearney, TAC

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
URANIUM RECOVERY FIELD OFFICE
BOX 25325
DENVER, COLORADO 80225

SEP 19 1989

URFO:DLJ
Docket No. WM-48
040WM048950E

Mark L. Matthews
Acting Project Manager
Uranium Mill Tailings Project Office
Department of Energy
P. O. Box 5400
Albuquerque, New Mexico 87115

Dear Mr. Matthews:

We have reviewed your July 18, 1989 submittal requesting approval for supplemental standards and Modification No. 1 for the Durango Remedial Action Plan.

We agree that supplemental standards are applicable for the residual material along the Animas River. Supplemental standard approval is for the area described in Figure 2 of your submittal only. We have concluded that the supplemental standard criteria (40 CFR Part 192.21) concerning risk of injury to workers and environmental harm to be applicable to this proposal.

We therefore, approve proposed Modification No. 1 to the Durango, Colorado Final Remedial Action Plan (Rev. 1, dated 6/23/89).

During a visit to the site on September 6, 1989, members of my staff observed this particular area along with several other areas that are currently being considered for supplemental standards or vicinity property designation. While examining these areas, a small "seam" of crystallized uranium salts which has formed along the river bank along the slag and original ground interface was pointed out. The deposit is thought to be the result of an old spill on the slag pile that is slowly leaching through the slag and daylighting at the river bank. Due to problems encountered with excavating and drilling in the slag, the extent of this uranium deposit has not been defined.

Your staff indicated that DOE has no plans to cleanup this area as the hazard averaged over the entire slag pile will be negligible. We do not consider this to be consistent with the approach of reducing exposure to the public to levels

as close to the standards as is reasonably achievable. Therefore we suggest that DOE reexamine the possible hazard to the public along the accessible river bank.

If you have any questions please contact me or D. L. Jacoby of my staff on FTS 776-2805.

Sincerely,

Ramon E. Hall
Director

Case Closed: 040WM048950E

JACOBS ENGINEERING GROUP INC.
ALBUQUERQUE OPERATIONS

JEGA/UMT/0390-0163

5301 CENTRAL AVENUE N.E. — SUITE 1700, ALBUQUERQUE, NEW MEXICO 87108
TELEPHONE (505) 845-4030

March 26, 1990

Mr. Mark Matthews
Acting UMTRA Project Manager
U.S. Department of Energy
Uranium Mill Tailings Project Office
5301 Central Avenue, N.E., Suite 1720
Albuquerque, New Mexico 87108

Attention: Elizabeth Damler/Beth Sellers

Re: Durango Processing Site
Application for Supplemental
Standards, Region II
Contract No. DE-AC04-82AL14086

Dear Mark:

The Technical Assistance Contractor staff has completed its review of proposed application of supplemental standards in Region II of the Durango, Colorado designated site. This proposal was transmitted to you by letter on February 20, 1990 by MK-Ferguson. We agree in principle that supplemental standards should be applied to the residual radioactive material in this region. However, we feel that the supporting documentation is not complete and may result in negative comments from the Nuclear Regulatory Commission. Our concerns are in three general areas of the documentation.

First, the documentation does not provide any data to substantiate the estimated depths of contamination. Based on conversations with members of the MK-F staff, this data is not available. Therefore, the documentation should provide justification as to how these depths were estimated. Possibly, they may have been based on simply professional judgement or field experience with similar deposits on the Durango site. The basis for the estimates should be provided along with any supporting evidence.

Second, one of the areas (2C) contains an estimated two cubic yards and is not very close to the water's edge. The documentation does not provide any justification as to why this small deposit could not be removed. Based on our experience with the adjacent vicinity property, we realize that the area in question is at the bottom of a steep cliff and is not accessible along the bottom of the cliff except by entering the river. We also realize that this deposit is contiguous with a deposit on the vicinity property, which would result in an excavation volume much larger than the two cubic yards within the designated site. We recommend that this information be incorporated into the documentation to justify leaving the small deposit within the designated site.

Third, the analysis of the potential radon concentration in a house built on these deposits assumed ten feet of backfill. This assumption seems to contradict the statements in their documentation that Area 2B is beneath 5 to 7 feet of riprap and backfill and that the deposits are in the flood plain for the Animas River. Further, the Radiological and Engineering Assessment for the adjacent vicinity property (DU-144A) indicates the deposit contiguous to Area 2C will have two feet of backfill. During our conversations with the MK-F staff, we were told that the ten feet was picked as an average depth since the backfill will range from seven to fifteen feet and that the backfill is required because of the nearby slag wall. To clarify this issue, the justification for the assumed ten feet of backfill should be specified in the documentation.

Should you have any questions, please contact Dr. Robert Murphy of my staff or me.

Very truly yours,
JACOBS ENGINEERING GROUP INC.

Steven R. Hill, Manager
Albuquerque Operations Office

SRH/MLM/ROM/sh

cc: DGonzales
MKearney
RMurphy

CONSIDERATION OF URANIUM LENS UNDER SLAG

ENGINEERS
AND
CONSTRUCTORS

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

HEADQUARTERS OFFICE
ONE ERIEVIEW PLAZA
CLEVELAND, OHIO U.S.A. 44114
PHONE: (216) 523-5600/TELEX: 985542

REPLY TO MK-FERGUSON COMPANY
REMEDIAL ACTIONS
CONTRACTOR UMTRA PROJECT
P.O. BOX 9136
ALBUQUERQUE, NEW MEXICO U.S.A. 87119

September 5, 1989

89-3050-663

Mr. Mark L. Matthews
Acting Project Manager
U.S. Department of Energy
Uranium Mill Tailings Remedial Action Project Office
First National Bank Building
Suite 1700
5301 Central Avenue N.E.
Albuquerque, New Mexico 87108

SUBJECT: Uranium On Durango Processing Site

REFERENCE: Contract No. DE-AC04-83AL18796

Dear Mr. Matthews:

A thin lens of uranium has been found in an area of the Durango Processing Site along the Animas River. The lens is located immediately below a layer of slag, from Smelter Rapids to the pump house. The lens is thin and the uranium appears to be collecting on the relatively impervious clay layer beneath the slag. The areal extent of the deposit is not known. The uranium layer is exposed along approximately 600 feet of the river bank at an elevation that is below the yearly high water level. Soil samples, collected at 25 foot intervals along the layer, show an average uranium concentration of 94 pCi/g.

Although the deposit appears to contain uranium at concentrations in excess of the guideline presented in the U.S. NRC's Branch Technical Position, it is the RAC's opinion that additional excavation or the application of supplemental standards is not warranted. Supplemental standards, per the relevant criterion (f) of 40 CFR 192.21, shall be applied where "Radionuclides other than radium-226 and its decay products are present in sufficient quantity and concentration to constitute a significant radiation hazard..." The uranium lens does not pose a significant hazard because of its location and relatively low average uranium concentration. Sample results and a map showing sample locations are attached.

Unless directed otherwise, the RAC will take no further action concerning the uranium deposit. Remedial action is nearly complete and restoration will begin soon. The exposed uranium area will be backfilled, with riprap placed adjacent to the river. If you have any questions, or need additional information, please contact Dr. Frank Petelka of my staff at 766-3040.

Sincerely,

MK-FERGUSON COMPANY

J.G. Oldham
Project Director

JGO/MFP/ss
cc: E. Damler - DOE/UMTRA
D. Mann - DOE/UMTRA
B. Summers - DOE/UMTRA
M. Jackson - TAC/UMTRA
M. Miller - TAC/UMTRA
P. Martinek - CDH

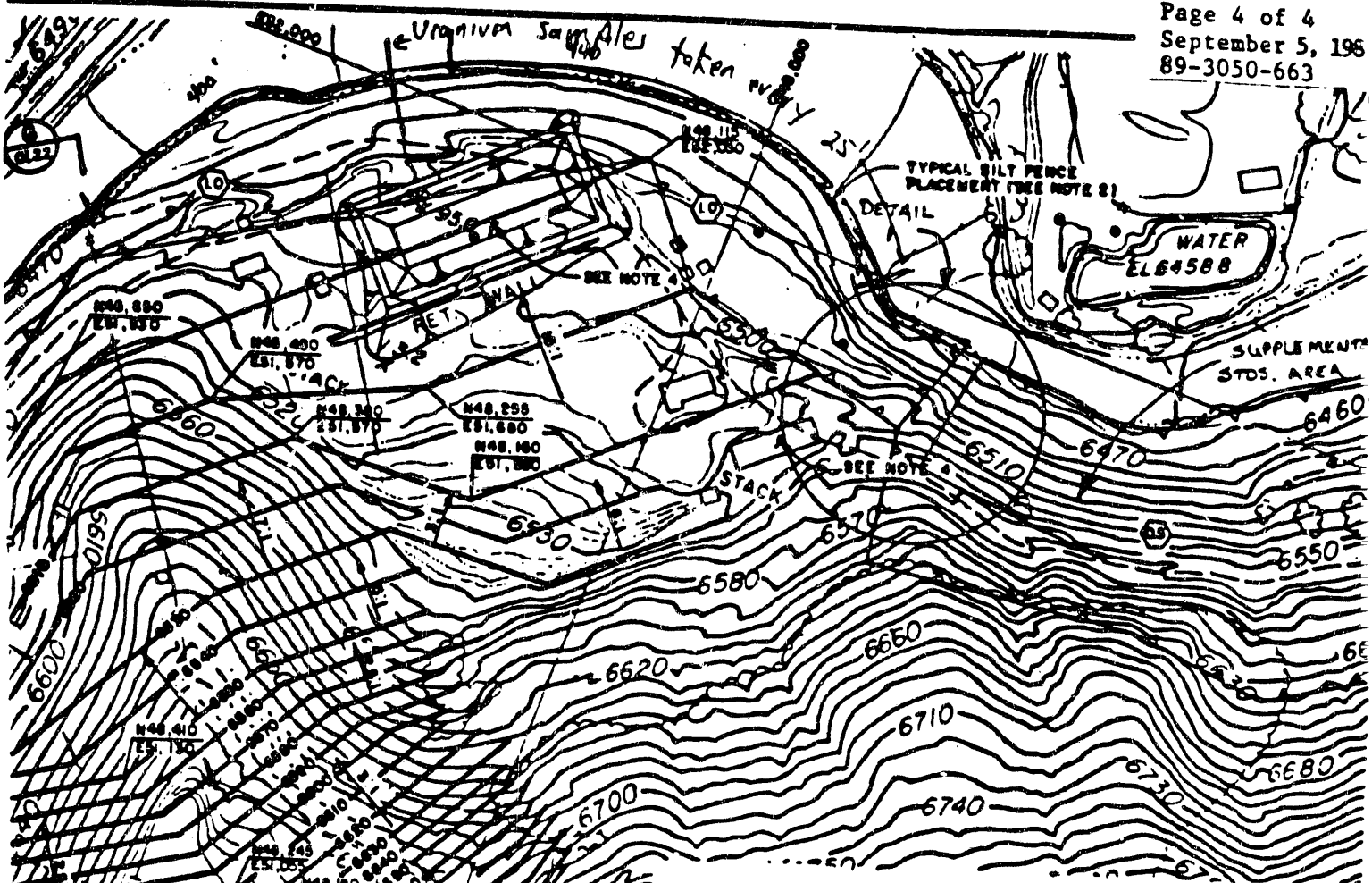
RESULTS OF ANALYSIS

Sample Identification	Ra-226 pCi/gram ±Precision*	Th-230 pCi/gram ±Precision*	Uranium ug/gram ppm	* ~pCi/g
DU-SS-15297	1.9 ± 0.7	1.7 ± 0.6	19.6	13
DU-SS-15298	1.6 ± 0.7	1.7 ± 0.6	279	190
DU-SS-15299	2.0 ± 0.7	1.7 ± 0.6	32.1	22
DU-SS-15300	1.4 ± 0.6	1.7 ± 0.6	198	130
DU-SS-15301	2.0 ± 0.7	1.5 ± 0.5	111	75
DU-SS-15302	4.5 ± 1.0	5.6 ± 1.0	450	310
DU-SS-15303	2.7 ± 0.8	3.0 ± 0.8	6.4	4.4
DU-SS-15304	1.6 ± 0.6	1.5 ± 0.5	5.9	4.0
DU-SS-15305	3.2 ± 0.9	5.7 ± 1.0	123	84
DU-SS-15308	4.0 ± 1.0	5.7 ± 1.0	82.4	56
DU-SS-15309	2.3 ± 0.7	2.1 ± 0.6	119	81
DU-SS-15310	1.3 ± 0.6	1.6 ± 0.6	61.2	42
DU-SS-15311	1.3 ± 0.6	1.6 ± 0.6	61.9	42
DU-SS-15312	3.6 ± 0.9	3.5 ± 0.8	182	120
DU-SS-15313	19 ± 2	28 ± 2	331	220
DU-SS-15314	2.6 ± 0.8	1.9 ± 0.6	73.6	50
DU-SS-15315	3.0 ± 0.8	3.2 ± 0.8	249	170
DU-SS-15316	1.8 ± 0.7	1.8 ± 0.6	7.2	4.9
DU-SS-15317	3.6 ± 0.9	4.0 ± 0.8	330	220
DU-SS-15318	4.2 ± 1.0	2.8 ± 0.7	47.0	32
DU-SS-15319	2.5 ± 0.8	2.1 ± 0.6	47.2	32
DU-SS-15320	1.2 ± 0.6	7.5 ± 1.1	401	270
DU-SS-15321	6.9 ± 1.2	1.7 ± 0.6	22.7	15

* Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 2σ

* U_{NAT}; ASSUMED PPM WAS ALSO U_{NAT}

Approved by D. Parker



NOTES:

1. EXCAVATION INDICATED IS APPROXIMATE. ACTUAL EXCAVATION SHALL BE DETERMINED IN THE FIELD BY THE CONTRACTOR.
2. DURING EXCAVATION, SILT FENCES SHALL BE UTILIZED IN THE VICINITY OF EXCAVATION TO CONTROL SILT. SUBCONTRACTOR SHALL SUBMIT A SILT CONTROL PLAN FOR APPROVAL BY CONTRACTOR. SEE TYPICAL SILT FENCE DETAIL ON DWG. NO. DUR-PS-10-0318.
3. AFTER REMOVAL OF CONTAMINATED MATERIAL, ALL DISTURBED AREAS SHALL BE GRADED TO DRAIN. FINAL GRADING WILL BE DEPENDENT ON ACTUAL QUANTITIES OF EXCAVATION AT THE PROCESSING SITE AND THE BODO CANYON DISPOSAL SITE AND WILL BE PERFORMED TO SMOOTH CONTOURS AS DIRECTED BY THE CONTRACTOR. SIX INCHES OF SELECT BACKFILL WILL BE PLACED OVER THE DISTURBED AREA AND IT SHALL BE MULCHED AND SEEDED.
4. SEE CONSTRUCTION FACILITIES ON DWG. NO. DUR-PS-10-0313.
5. ADDITIONAL EXCAVATION ALONG THE ROAD CONNECTING THE MILLSITE AND RAFFINATE AREA IS SHOWN ON DWG. NO. DUR-PS-10-0314.

REFERENCE DRAWINGS:

DUR-PS-10-0313 CONSTRUCTION FACILITIES - PLAN (SHEET 3 OF 3)
DUR-PS-10-0318 CONSTRUCTION FACILITIES - DETAILS (SHEET 3 OF 4)

LEGEND:

(10) ESTIMATED AVERAGE DEPTH OF EXCAVATION (STRIPPING IN FEET)
APPROXIMATE LIMIT OF STRIPPING
SILT FENCE

SCALE 100 0 100 200 FEET

25 "OR HAY BALES" IN NOTE 2							
ADDITIONAL STRIPPING AREA AND NOTE 5							
FOR CONSTRUCTION	-	-	-	-	-	-	

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

DURANGO SITE
DURANGO, COLORADO
DURANGO PROCESSING SITE

EXCAVATION PLAN
(SHEET 1 OF 2)

MORRISON-KNUDSEN ENGINEERS, INC.

PROJECT NO. DE-AC04-83AL18706

ENGINEERS
AND
CONSTRUCTORS

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

HEADQUARTERS OFFICE
ONE ERIEVIEW PLAZA
CLEVELAND OHIO U S A 44114
PHONE (216) 523 5600 TELEX 985542

9/11/89

Doug FYI

REPLY TO MK-FERGUSON COMPANY
REMEDIAL ACTIONS
CONTRACTOR UMTRA PROJECT
P.O. BOX 9136
ALBUQUERQUE NEW MEXICO U S A 87119

89-3050-672

September 8, 1989

Mr. Mark L. Matthews
Acting Project Manager
U.S. Department of Energy
Uranium Mill Tailings Remedial Action Project Office
First National Bank Building
Suite 1700
5301 Central Avenue N.E.
Albuquerque, New Mexico 87108

SUBJECT: Uranium On Durango Processing Site

REFERENCE: 1. Letter No. 89-3050-663 from J.G. Oldham to M.L. Matthews, dated September 5, 1989.
2. Contract No. DE-AC04-83AL18796

Dear Mr. Matthews:

As you are aware, a meeting between the DOE/NRC/State/TAC/RAC was held at the Durango site on September 6, 1989, to discuss the use of supplemental standards. This letter is to inform you of the actions the RAC will take, as a result of this meeting, with respect to the uranium deposit discussed in Reference 1.

The paucity of characterization information was a concern identified during the meeting. As was stated in Reference 1, the areal extent of the uranium deposit is not known. A characterization is not practical because the slag is up to 30 feet thick in this area. The uranium is thought to have originated from materials dumped during mill setup or operation. Under this scenario, the uranium has traveled down through the fractured slag, migrated laterally along the relatively impervious original ground surface, and is seeping out at the face adjacent to the Animas River. Under these conditions, the uranium is assumed to exist as a thin layer beneath the entire slag area.

In an effort to define the thickness of the layer, the RAC will collect samples from two locations previously shown to contain elevated uranium. Four samples will be taken from each location; three samples representing 2 inch horizons, followed by one sample representing the next 6 inch horizon. Since none of the previous samples showed elevated radium or thorium, the samples will be analyzed for uranium only.

The results of the supplemental survey will be used to thickness-average the previously determined uranium concentration. A recommendation, along with the available data, will be transmitted to you for review as soon as it is available.

The restoration plans for the area were misstated in the previous letter. The slag above the uranium area will be backfilled, seeded, and mulched. Riprap will not be placed adjacent to the river.

If you have any questions, or need additional information, please contact Dr. Frank Petelka of my staff at 766-3040.

Sincerely,

MK-FERGUSON COMPANY

J.G. Oldham
Project Director

JGO/MFP/ss
cc: E. Damler - DOE/UMTRA
D. Mann - DOE/UMTRA
B. Sellers - DOE/UMTRA
M. Jackson - TAC/UMTRA
M. Miller - TAC/UMTRA
P. Martinek - CDH

ENGINEERS
AND
CONSTRUCTORS

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

HEADQUARTERS OFFICE
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Doug
FYI

REPLY TO MK-FERGUSON COMPANY
REMEDIAL ACTIONS
CONTRACTOR UMTRA PROJECT
PO BOX 9136
ALBUQUERQUE, NEW MEXICO U S A 87119

89-3050-705

September 19, 1989

Mr. Mark L. Matthews
Acting Project Manager
U.S. Department of Energy
Uranium Mill Tailings Remedial Action Project Office
First National Bank Building
Suite 1700
5301 Central Avenue N.E.
Albuquerque, New Mexico 87108

SUBJECT: Uranium on Durango Processing Site

REFERENCE:
1. Letter No. 89-3050-672 from J.G. Oldham to M.L. Matthews dated September 8, 1989.
2. Letter No. 89-3050-663 from J.G. Oldham to M.L. Matthews dated September 5, 1989.
3. Contract No. DE-AC04-83AL18796

Dear Mr. Matthews:

The supplemental radiological survey of the uranium lens on the Durango Site has been completed. As was described in Reference 1, soil samples were taken from adjacent to the river at three of the four locations previously identified as having the largest uranium concentrations (Reference 2). Three samples were collected from each location, representing 0 to 2 inch, 2 to 4 inch, and 4 to 6 inch horizons. The samples were analyzed for uranium only.

The results, given on the attached Table, show that the uranium exists as a thin layer. In addition, the uranium concentrations in the supplementary samples averaged 15% of the levels found in the initial samples. The sampling techniques used for the two surveys were different, which provides a potential explanation of the results. The initial samples were collected from the surface of the river bank; the samples included a portion of the white colored precipitate that is found in several locations. The second set of samples were collected from areas after a vertical cut was made to expose the different horizons; the supplementary samples do not contain the precipitate.

The evidence suggests that the uranium is weeping out in a thin layer from under the slag, and that the sub-slag soils probably do not contain significant amounts of uranium. Assuming that the supplementary data also describes the remainder of the elevated uranium areas identified during the

initial surveys, the volume-averaged uranium concentrations should be below the U.S. NRC's unrestricted disposal guidelines. The precipitate layer is below the annual high water mark and should be washed away during spring runoff. No environmental impact is expected since the small amount of uranium released will be diluted by the large river volume, in a process akin to natural flushing. Under these conditions, additional excavation or the application of supplemental standards is not warranted.

This completes the RAC's actions concerning the uranium lens. If you have any questions, or need additional information, please contact Dr. Frank Petelka of my staff at 766-3040.

Sincerely,

MK-FERGUSON COMPANY

J.G. Oldham
Project Director

JGO/MFP/ss
Attachment
cc: E. Damler - DOE/UMTRA (w/attachment)
B. Sellers - DOE/UMTRA (w/attachment)
M. Jackson - TAC/UMTRA (w/attachment)
M. Miller - TAC/UMTRA (w/attachment)
P. Martinek - CDH (w/attachment)

TABLE 1

LOCATION	PRELIMINARY RESULTS	DEPTH	TOTAL URANIUM CONCENTRATION (pCi/g)
E-6-5	(186 pCi/g) DU-SS-15298	0-2"	53*
		2-4"	65*
		4-6"	19*
		Average	46
C-38-14	(267 pCi/g) DU-SS-15320	0-2"	55
		2-4"	37
		4-6"	0.9
		Average	31
C-38-9	(220 pCi/g) DU-SS-15330	0-2"	69
		2-4"	2.4
		4-6"	1.5
		Average	24

*Sample contained some slag.

EXCAVATION PROTOCOL FOR THORIUM-230 IN RAFFINATE POND AREA

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
URANIUM RECOVERY FIELD OFFICE
BOX 25325
DENVER, COLORADO 80225

MAY 31 1991

URFO:DLJ
Docket No. WM-48
040WM048130E

U.S. Department of Energy
ATTN: Mark L. Matthews, Project Manager
Uranium Mill Tailings Project Office
P.O. Box 5400
Albuquerque, New Mexico 87115

Dear Mr. Matthews:

We have reviewed your May 15, 1991, request for approval of Modification No. 4 to the Preliminary Revised Final Remedial Action Plan (RAP) for the Durango, Colorado, Uranium Mill Tailings Remedial Action site. You requested supplemental standards for the excavation protocol of thorium-230 contamination at the processing site based on the ALARA principal. In addition, the proposed modification to the RAP would change the methodology for calculating the concentrations of Ra-226 and Th-230 by allowing a "mass correction factor" to eliminate measurement bias due to the large amount of uncontaminated rock and gravel at the processing site. Although this change to the methodology does not result in a clean up effort as conservative as the original methodology, it will provide acceptable results which meet the standard.

Our review indicates that the application of supplemental standards is appropriate and NRC therefore concurs with the proposed Modification No. 4, Change No. 1, Revision B, dated May 15, 1991, for the Durango UMTRA site. It is our understanding that DOE will provide the data supporting the clean up criteria that was used and will identify all remaining contaminated areas in the Final Completion Report. The enclosed list of concerns resulted from the review of the support information submitted with the preliminary revised final Remedial Action Plan and were informally conveyed to your office on May 1, 1991. If the information included in the Final Completion Report does not adequately support the application for supplemental standards, additional cleanup may be required.

Should you have any questions, please contact D. L. Jacoby of my staff on FTS 554-2815.

Sincerely,

Edward F. Hawkins

for Ramon E. Hall
Director

Enclosure:
As stated

cc:
M. Abrams, DOE
S. Hamp, DOE

ENCLOSURE

1. The emanation coefficient used in the analysis is not in agreement with the coefficient that was used for the same material in the RAP cover design. DOE should either use the same value (.35) or justify the use of a different value for the material that was left in place at the processing site.

2. Similarly, based on the physical parameters used to represent the in place material, the specific gravity was calculated to be 2.76. The cover analysis used a specific gravity of 2.53 for the same material. DOE should either use the same value or justify the use of a different value for the material that was left in place at the processing site.

3. Excavation depths are shown on figure A-4, however, fill depths are not given. It is impossible to evaluate the applicable limits without fill depths (final contours).

4. Excavation depth for Areas B1, B2, and B3 is shown to be 9 feet on figure A-4. However, it appears that this depth may be reduced if the limits "provided in Table 2 (for example, 60 pCi/g at 7 feet)" are met. Table 2, page 17, does not have an entry for 7 feet, it begins at 9.1 feet of fill. DOE needs to clarify this procedure.

mko|umt|0591-0398

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REPLY TO: MK-FERGUSON COMPANY
REMEDIAL ACTIONS
CONTRACTOR-UMTRA PROJECT
P.O. BOX 9136
ALBUQUERQUE, NEW MEXICO U.S.A. 87119

May 14, 1991

91-3050-415

Mr. Mark L. Matthews
Project Manager
U.S. Department of Energy
Uranium Mill Tailings Remedial Action Project Office
First National Bank Building
5301 Central Avenue N.E.
Suite 1700
Albuquerque, New Mexico 87108

SUBJECT: Proposed Modification No. 4 to Durango Site RAP (Ponds Area Th-230), Rev. B.

REFERENCE: 1) Letter No. 91-3050-365 dated April 17, 1991 from J.G. Oldham to M.L. Matthews

2) Contract No. DE-AC04-83AL18796

Dear Mr. Matthews:

Pursuant to Steve Hamp's request, attached is Revision B of the proposed Remedial Action Plan Modification (RAP Mod) No. 4 for the Durango, Colorado Site.

Reference to the monetary costs associated with the RAP Mod was removed from the text during the change from Revision A to Revision B. A change was also made to section C to mention that the follow-on groundwater work will be considered under Uranium Mill Tailings Groundwater Restoration Project.

5093H

If you have any questions, please contact Dr. Frank Petelka at (505) 766-3047.

Sincerely,

MK-Ferguson Company

J.G. Oldham
Project Director

JGO/MFP/drh

cc: S. Hamp - DOE/UMTRA (w/attach)
C. Esparza Baca - DOE/UMTRA (w/attach)
M. Miller - TAC/UMTRA (w/attach)

MODIFICATION NO. 4
DURANGO, COLORADO
PRELIMINARY REVISED FINAL REMEDIAL ACTION PLAN
CHANGE NO 1
REV. B, 5/14/91

A. Description:
The purpose of this change is to establish an excavation protocol for thorium-230 (Th-230) contamination in the absence of excess radium-226 (Ra-226) at the Durango, Colorado, mill tailings site. As required in 40 CFR 192.21(f), Th-230 will be excavated to levels that are as low as is reasonably achievable (ALARA). ALARA conditions at the Durango site will be met by imposing the following supplemental standard:

Excavate Th-230 to a 1,000 year ingrowth corrected Ra-226 concentration of 5 pCi/g above background (14 pCi/g Th-230 with no residual Ra-226 today) in the first 6 inch soil layer and 15 pCi/g above background (42 pCi/g Th-230 with no residual Ra-226 today) in any subsequent 6 inch layer.

The change also allows for the use of a mass correction factor to eliminate measurement bias.

The Department of Energy's commitment to comply with Environmental Protection Agency (EPA) standards for groundwater remains unchanged.

B. Resulting changes to the RAP:
Page C-2 of UMTRA-DOE/AL 050503.0000, June 1986, "Remedial Action Plan and Site Design for Stabilization of the Inactive Uranium Mill Tailings Site at Durango, Colorado." Add the following paragraphs before the last paragraph of Section C.1, "Introduction":

"If other residual radionuclides other than Ra-226 and its decay products are present in sufficient quantity and concentration to pose a significant radiation hazard, supplemental standards shall be applied (40 CFR 192.21(f)). Remedial actions, in addition to satisfying the control and cleanup standards, shall reduce other residual radioactivity to levels that are as low as reasonably achievable (40 CFR 192.22(b)).

Supplemental standards may be applied when Th-230 contamination is present in the absence of excess Ra-226. The need for excavation of this material will be determined by comparing the Th-230 concentration to a guideline equivalent to the Ra-226 standard. This guideline is based upon the residual Ra-226, corrected for decay, and the Ra-226 ingrowth from Th-230."

Page C-7, add the following paragraphs to the end of Section C.3.4, "Final Radiological Verification Survey for Land":

"For areas in which a significant fraction of the material being sampled is rock or gravel, the nine-plug composite 30x30 foot grid may be collected by using a shovel to take bulk samples, separating the fines from the rock using a #4-mesh screen and determining the weight of the fines and rock fractions. The fines shall then be counted for Ra-226 following the standard RAC-015 specifications and quality controls. The resulting Ra-226 and Th-230 concentrations will be corrected to a final, reportable bulk concentration by dividing the activity measured in the fine fraction by the mass of the entire sample (rocks plus fines). Larger areas with uniform composition will be corrected by the average of the measured fractions.

In areas where elevated Th-230 is present, excavation first should be to prescribed Ra-226 standards, then verified in accordance with standard procedures, as discussed above. At the time that the radium analysis sample is collected in each grid, a duplicate, 200-gram sample of the well-mixed material shall be analyzed for Th-230 concentration. Grid-by-grid results for thorium analyses shall be compared to a Th-230 guideline which is equivalent to the Ra-226 standard. This guideline is based on the residual Ra-226, corrected for decay, and the Ra-226 ingrowth from Th-230."

C. Overall Impact to Design and Completed Remedial Action

This change simplifies construction and avoids environmental harm which would be unreasonably high relative to the long-term benefits. The change results in low-level contaminated material remaining in the fines at depth in some areas of the former raffinate ponds area. The material is in a location where construction of structures is not likely and any future excavation will mix the contamination with clean materials and dilute the concentration. As part of the Uranium Mill Tailings Groundwater Restoration Project, DOE will re-evaluate groundwater conditions at the Durango site and take any action which may be required to ensure compliance with applicable standards.

D. Compliance of Revised Design with EPA Standards

The revised design complies with Supplemental Standards defined under 40 CFR 192.22(a) as "coming as close to meeting the otherwise applicable standard as is reasonable under the circumstances" and 40 CFR 192.22(b) as "reducing other residual radioactivity to levels that are as low as is reasonably achievable".

The mass averaging technique is required because soil, as defined by the EPA standards in 40 CFR 192.11 includes "all unconsolidated materials...including...gravels and small rocks". It has been demonstrated that the activity encountered on the UMTRA Project is associated with the fine particles and that the larger particles (small rocks and cobbles) are not contaminated. The typical soil analysis

performed on the UMTRA Project excludes these uncontaminated larger particles and the reported activity is therefore biased high. The mass fraction correction factor eliminates this bias.

The residual Th-230 is a radionuclide "other than radium-226 and its decay products" that is "present in sufficient quantity and concentration" and may "constitute a significant radiation hazard...", per 40 CFR 192.21(f). If not removed, a significant radiation hazard could occur from exposure to contaminated dust and radon daughter products. However, after excavation, the present and future hazards will be insignificant. The introduction to 40 CFR 192.21 states that Supplemental Standards in Section 192.22 "shall" be applied in the case of subsection 192.21(f). Section 192.22(b) requires compliance with the Ra-226 cleanup standards and reduction of other residual radioactivity (i.e. Th-230) to levels as low as reasonably achievable (ALARA). Excavation of Th-230 to levels below the 1,000 year ingrowth corrected values, equivalent to the EPA Ra-226 standards, does not further reduce health hazards significantly. The revised design complies with the intent of ALARA, therefore, the criterion in paragraph (f) is applicable. Additional excavation should not be required to meet the proposed EPA groundwater standards for chemical contaminants.

In summary, the revised design complies with Supplemental Standards, using the criterion in 40 CFR 192.21(f) in that residual radioactivity is reduced to levels as low as reasonably achievable. The revised design should not affect future compliance with EPA groundwater standards.

E. Reason for Change

This change reduces the residual radioactivity to levels as low as reasonably achievable. The contaminants left in place will not pose a significant present or future threat to the general public.

END

DATE FILMED

9/15/93