NOTE:
SUPPLEMENTAL
STANDARDS

DEPARTMENT OF ENERGY
ALBUQUERQUE OPERATIONS OFFICE
CONTRACT NO. DE-AC04-83AL18796

Radiological and Engineering Assessment

Vicinity Property No. DU-144A

Remedial Actions
Contractor
for the
Uranium Mill Tailings
Remedial Actions
Project

Vicinity Property No. DU-144A

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

Radiological and Engineering Assessment: Property DU-144A

ADDRESS: Truck-by-Pass
(Camino del Rio)
Durango, CO 81301

OWNER'S NAME: Colorado Dept. of HWY
OWNER'S ADDRESS: 214 West 6th Street
Durango, CO 81301

TENANTS NAME: _____

TELEPHONE NUMBER _____ (if available)

TELEPHONE NUMBER (303) 247-4202 (if available)

PROPERTY DATA:

Structures and utilities are shown on Drawing DU-144A-010.

Property Use: Single Residence _____; Commercial _____; 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. # N/A
South - V.P. # DURANGO PROCESSING SITE : DU-544/545
East - V.P. # N/A
West - V.P. # DURANGO PROCESSING SITE

Interior Involvement: Yes _____; No X

Major Structural _____; Minor Structural _____; Dislocation _____

RADIOLOGICAL DATA:

Gamma Exposure Rate Survey

Survey Method

Outdoor gamma surveys were conducted in accordance with the RAC Procedure 011. These surveys were conducted over the entire property, with particular attention to the areas as described in this document.

Survey Results

Surface gamma readings on the property range from 14 to 57 micro R/hr (Table 3.1 and 3.2). This may be compared with the background for the Durango site of 14 micro R/hr.

Test Pit

Survey Method

A trackhoe was used to dig 8 test pits in one area suspected of being contaminated. Due to unstable slag conditions and the presence of large riprap complete characterization of this area was not possible.

Survey Results

Contamination was found in 3 of the 8 test pits that were dug.

Soil Samples

Soil samples were collected from the test pits at various depths. Contamination in excess of EPA standards was found in 4 of 31 samples taken (Table 3.3); however, due to the slag sluffing into the test pits, representative samples were difficult to obtain. Twenty three soil samples were collected in Area G and analyzed for Ra-226. The results of analysis may be seen in Table 3.4. Four soil samples were collected in Areas A, B, C and D (Table 3.5).

Estimated Extent of Contamination

Five areas of contamination were identified; Areas A, B, C, D, and F. Additionally, Area G was identified due to the presence of a lens of uranium. However, the deposit in Area G does not exceed the EPA standards or NRC guidelines, as discussed in Appendix D.

The limits and depths of contamination in these areas are shown on drawing DU-144A-015.

Recommended Remedial Action

Option I

MK-Ferguson recommends application of Supplemental Standards to the five contaminated areas. The exposed portions of Areas A, B, C and G will tentatively be covered with 2 feet of backfill and riprap per the Site Restoration Plan, yet to be submitted. Areas D and F are presently covered with 2 feet of riprap.

Option II

In Areas A and C; excavate to an estimated depth of 2 feet, resurvey and restore.

In Area B excavate to an estimated depth of 3 feet, resurvey and restore.

In Areas D and F; remove the radiologically clean riprap, excavate Area D to an estimated depth of 2.5 feet and an estimated depth of 2 feet in Area F, resurvey and restore.

JUSTIFICATION CHECKLIST FOR APPLICATION OF SUPPLEMENTAL STANDARDS

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

_____	a) Risk injury to worker/public
_____	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:

Five areas are proposed for application of supplemental standards.

Areas A, B and C have been excavated down to the water table and Ra-226 concentration in these Areas range from 40 pCi/g to 114 pCi/g. Further excavation in Areas A and C would require Z-pile along the rivers edge, pumping operations and water treatment. Continued excavation of Area C would require excavation of a 30 vertical cliff of radiological clean slag. As agreed upon by the RAC, TAC, CDH, DOE and NRC further excavation in these areas was not warranted due to the high cost relative to the long term benefits. These areas will be covered with a minimum of two feet of backfill and riprap per the Durango Site Restoration Plan, yet to be submitted. With this cover in place general area exposure rates will be near background levels. Background for the Durango Site is 14 micro R/hr. The estimated volume of contaminated material that would remain in these areas is 125 cy.

Area D is presently covered with 3 feet of riprap. Contamination is sporadically distributed throughout the 2.5 foot layer of soil beneath the riprap. Ra-226 concentrations is soil in this area range from <1.5 to 35 pCi/g. General area exposure rates are near background. The estimated volume of contaminated material that would remain in this area is 120 cy.

Area F is presently covered with 3 feet of riprap. Contamination is sporadically distributed throughout the 2 foot layer of soil beneath the riprap. Ra-226 concentrations in soil in this area range from <1.5 to 166.0 pCi/g. General area gamma exposure rates range from 16 to 25 micro R/hr. The estimated volume of contaminated material that would remain in this area is a 600 cy.

Contamination in Area G does not exceed EPA standards for Ra-226; however, a lens of uranium is exposed at the high water mark on the bank of the Animas River. This lens varies from 1 to 6 inches in thickness. The extent to which the lens extends on to the property is undetermined due to an over burden of radiologically clean material that varies in thickness from 2 to 25 feet. This overburden consists mostly of slag generated by a lead smelter that operated from the 1880's to 1930. Ra-226 concentration in soil in the Uranium Lens Area range from <1.5 to 12.1 pCi/g, (Table 3.4), appendix D contains information about the uranium in this area. General area gamma exposure rates range from 14.1 to 19.1 micro R/hr. The exposed portions of the uranium lens will tentatively be covered with 2 feet backfill and riprap per the Durango Site Restoration Plan, yet to be submitted. With 2 feet of backfill and riprap over the exposed portion of the lens, exposure rates would be reduced to background levels.

With Option I completed general area gamma exposure rates on the property would range from 14 to 25 micro R/hr. If a man spent 8 hours a day, 5 days a week, 50 weeks a year in a 25 micro R/hr radiation field, he would receive about 50 millirem of gamma exposure in one year. This is one tenth ' amount allowed the general public (10 CFR 20.105). The amount of c ıation material that will remain in place is approximately 845 cuL .

The ' of removing the contaminated material would be excessive due to the n. J to remove the existing riprap and slag overburden from these areas, compared to the actual health benefits realized.

JUSTIFICATION CHECKLIST FOR APPLICATION
OF SUPPLEMENTAL STANDARDS - cont'd.

Additional cost without application of Supplemental Standards = $237,500.00 (further breakdown provided in Table 4.2 of this REA).

This is a 304 percent increase over the estimated remedial action cost for the preferred option.

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?
	N/A	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? (Attach comments or record of teleconference). (See Appendix C).

Estimated volume of contamination material to remain = 845 (cy).

Contaminated area to remain = 1150(sy).

Range for contaminated areas = 14 to 25 (micro R/hr) [at 3 feet above surface].

Range Ra226 concentration in soil in contaminated area = <1.5 to 166.0 (pCi/g).

Engineering Assessment

Estimated quantities are shown in Tables 4.1 and 4.2.

Occupant relocation: Required _____; Not Required ___X___.

Application of Supplemental Standards

The cost of removing the contaminated material would be excessive due to the need to remove the existing riprap and slag overburden from areas "D", "F", and "B"; and the need for special construction techniques in areas A and C. With 2 feet of fill material covering areas "A", "B", "C" and "G", the relative health risks are minimized. Land usage in above areas are not expected to change.

Remedial Action Options (Complex Properties Only)

N/A

Table 3.1
OUTDOOR GAMMA SCREENING
Property DU-144A

LOCATION	CONTACT (Micro R/hr)	1 METER (Micro R/hr)
25	23	21
26	20	19
27	57	25
28	17	16
29	21	18
30	18	16
31	15	17
32	17	17
33	20	19
34	21	19
35	17	16
36	14	16
37	16	16
38	16	16
39	21	20
40	16	17
41	17	17
42	18	18
43	16	16
44	22	21
45	18	17

Table 3.1 Cont'd.
OUTDOOR GAMMA SCREENING
Property DU-144A

LOCATION	CONTACT (Micro R/hr)	1 METER (Micro R/hr)
46	18	20
47	17	16
48	15	17
49	24	18
50	16	16
51	14	14
52	18	17
53	19	17
54	16	18
55	17	17
56	16	19
57	21	17
58	16	15
59	25	17
60	32	18
61	18	18
62	23	18
63	22	24
64	20	20
65	20	17

Table 3.1 Cont'd.
OUTDOOR GAMMA SCREENING
Property DU-144A

LOCATION	CONTACT (Micro R/hr)	1 METER (Micro R/hr)
66	18	17
67	27	21
68	24	23
69	23	20
70	15	16
71	25	15
72	22	16
73	16	17
74	15	16
75	16	16
76	22	18
77	26	19
78	24	24
79	18	18
80	18	18
81	20	21
82	21	24

Table 3.2
OUTDOOR GAMMA SCREENING (Area G)
Property DU-144A

LOCATION	CONTACT (Micro R/hr)	1 METER (Micro R/hr)
C-38-3		
1	15.2	16.9
2	14.3	15.3
C-38-9		
1	14.7	16.0
2	14.5	15.0
C-38-14		
1	16.1	14.1
2	14.2	14.7
C-38-19		
1	14.2	14.5
2	14.8	14.5
C-38-25		
1	16.0	15.8
2	15.4	15.6
C-46-5		
1	14.4	15.1
2	14.9	14.8
C-46-10		
1	15.4	16.0
2	18.6	18.6

Table 3.2 Cont'd.
OUTDOOR GAMMA SCREENING (Area G)
Property DU-144A

LOCATION	CONTACT (Micro R/hr)	1 METER (Micro R/hr)
C-46-15		
1	18.3	18.2
2	17.1	18.0
C-46-20		
1	18.5	17.7
2	19.8	19.1
E-6-5		
1	18.0	18.2
2	17.3	17.7
3	16.5	16.2
4	15.8	17.3
5	17.3	15.7

Table 3.3
TEST PIT SOIL SAMPLE SURVEY
Property DU-144A

Test Pit	Sample ID	Depth	Ra-226 Concentration (pCi/g)
1	1	1′	166.0
1	2	2′	18.9
1	3	8′	14.8
1	4	10′	6.16
2	1	1′	18.4
2	2	2′	16.0
2	3	5′	14.9
2	4	9′	9.6
3	1	1′	14.1
3	2	2′	13.4
3	3	3′	13.3
3	4	4′	11.0
4	1	1′	6.2
4	2	2′	3.5
5	1	1′	<1.5
5	2	2′	2.2
5	3	3′	3.2
5	4	4′	4.0
6	1	1′	11.4
6	2	2′	14.5

Table 3.3 Cont'd.
TEST PIT SOIL SAMPLE SURVEY
Property DU-144A

Test Pit	Sample ID	Depth	Ra-226 Concentration (pCi/g)
6	3	3′	11.8
6	4	4′	12.5
7	1	1′	7.5
7	2	2′	9.5
7	3	3′	7.0
7	4	4′	7.7
8	1	1′	8.1
8	2	2′	12.0
8	3	3′	17.4
8	4	4′	<1.5
8	5	5′	1.9

Table 3.4
AREA G SOIL SAMPLE SURVEY
Property DU-144A

LOCATION	SAMPLE ID	DEPTH	Ra-226 CONCENTRATION (pCi/g)
C-38-3	15318	0-6"	2.0
C-38-3	15316	0-6"	2.7
C-38-9	15317	0-6"	4.7
C-38-9	15315	0-6"	1.9
C-38-14	15320	0-6"	3.1
C-38-14	15311	0-6"	3.8
C-38-19	15321	0-6"	2.0
C-38-19	15312	0-6"	2.3
C-38-25	15302	0-6"	2.4
C-38-25	15300	0-6"	<1.5
C-46-5	15319	0-6"	1.7
C-46-5	15314	0-6"	1.8
C-46-10	15304	0-6"	1.9
C-46-10	15299	0-6"	1.8
C-46-15	15310	0-6"	<1.5
C-46-15	15297	0-6"	2.5
C-46-20	15303	0-6"	2.0
C-46-20	15301	0-6"	1.7
E-6-5	15313	0-6"	12.1
E-6-5	15305	0-6"	3.9

Table 3.4 Cont'd.
AREA G SOIL SAMPLE SURVEY
Property DU-144A

LOCATION	SAMPLE ID	DEPTH	Ra-226 CONCENTRATION (pCi/g)
E-6-5	15309	0-6"	2.7
E-6-5	15298	0-6"	2.5
E-6-5	15308	0-6"	3.7

Table 3.5
Areas A, B, C, and D Soil Sample Survey
Property DU-144A

LOCATION	SAMPLE ID	DEPTH	Ra-226 CONCENTRATION (pCi/g)
Area A	DU-SS-18413	0-6"	40 pCi/g
Area B	DU-SS-18414	0-6"	67 pCi/g
Area C	DU-SS-18415	0-6"	114 pCi/g
Area D	DU-SS-16139	0-6"	35 pCi/g

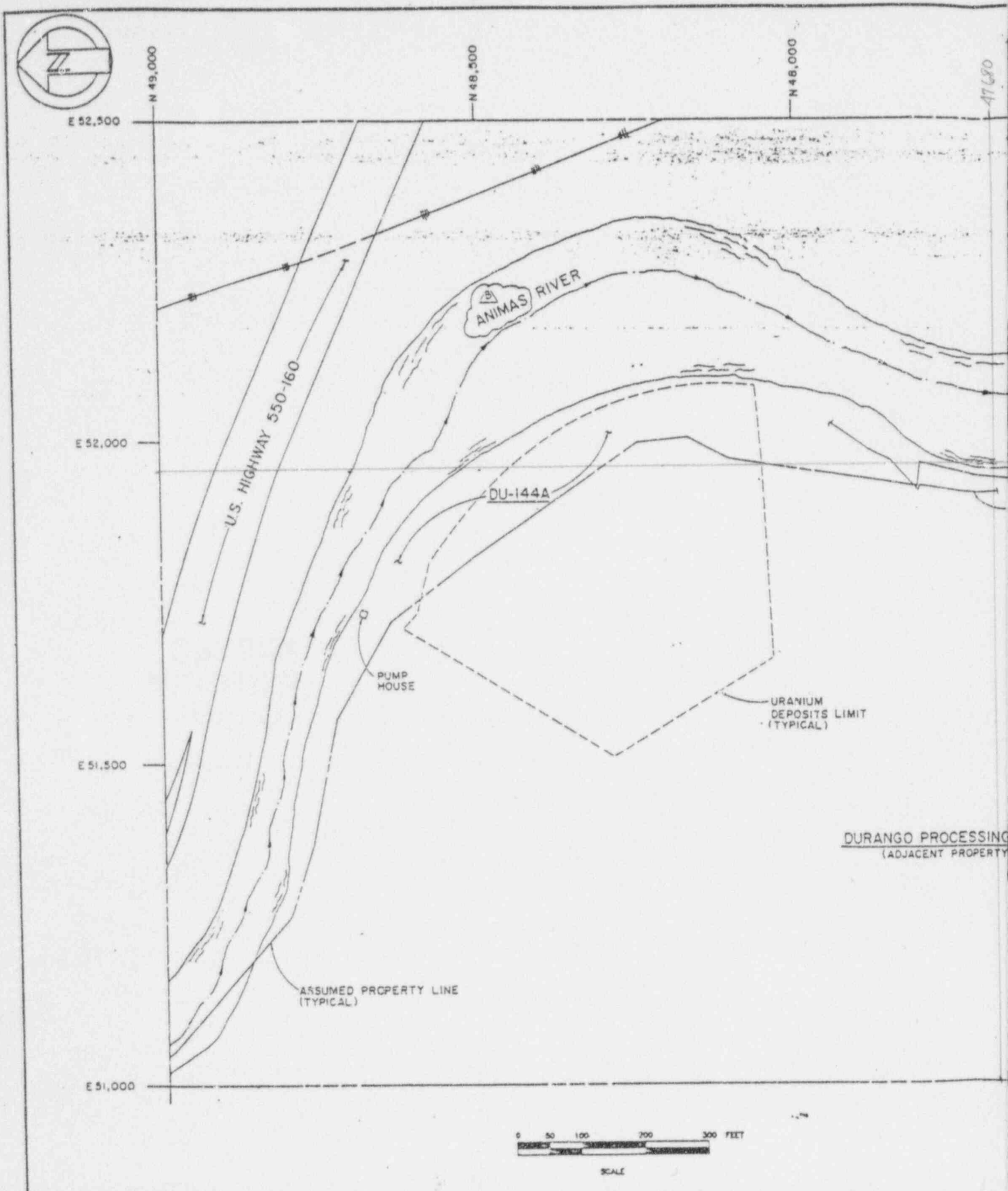
Table 4.1
REMEDIAL ACTION OPTION I COST ESTIMATE
Property DU-144A

No.	Activity	Unit Cost	Quantity	Estimated Cost
3.1	Bulk Common Fill	11.06	3,762 cy	41,608.00
4.1	Riprap	25.90	800 cy	20,720.00
			Subtotal	62,328.00
		5% Subcontractor's Contingency		3,116.00
		20% Overhead and Profit		12,466.00
			Rounded Total	78,000.00

Table 4.2
Cost for Not Applying Supplemental Standards
Property DU-144A

No.	Activity	Unit Price	Quantity	Estimated Cost
1.1	Z-Pile	7.50	10,500 sq ft	78,750.00
2.1	Excavation (Areas A & C)	9.60	85 cy	816.00
2.2	Remove, Salvage & Replace Riprap	5.90	1,015 cy	5,989.00
2.3	Excavation (Areas D & F)	9.60	720 cy	6,912.00
2.4	Slag Excavation	10.46	4000 cy	41,840.00
2.5	Excavation (Area B)	9.60	40 cy	384.00
3.1	Bulk Common Fill	11.06	5000 cy	55,300.00
			Subtotal	$189,991.00
			5% Subcontractor's Contingency	9,500.00
			20% Overhead & Profit	37,998.00
			TOTAL (Rounded)	$237,500.00

*An additional cost for water treatment would be required, but a reasonable cost estimates is difficult due to many variables.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N 48,000
E 52,500
E 52,000
E 51,500
E 51,000
ANIMAS RIVER
U.S. HIGHWAY 550-160
DU-144A
PUMP HOUSE
URANIUM DEPOSITS LIMIT (TYPICAL)
ASSUMED PROPERTY LINE (TYPICAL)
DURANGO PROCESSING
(ADJACENT PROPERTY
0 50 100 200 300 FEET
SCALE

N 47,500

LEGEND

PROPERTY LINE

AG WALL

SITE

9707090022-01

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

DESIGNED	DRAWN
SM	EJM

CHECKED S. MANSOORIFAR

REVISED

RECOMMENDED

SITE PLAN
DU-144A
DURANGO, COLORADO
URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT

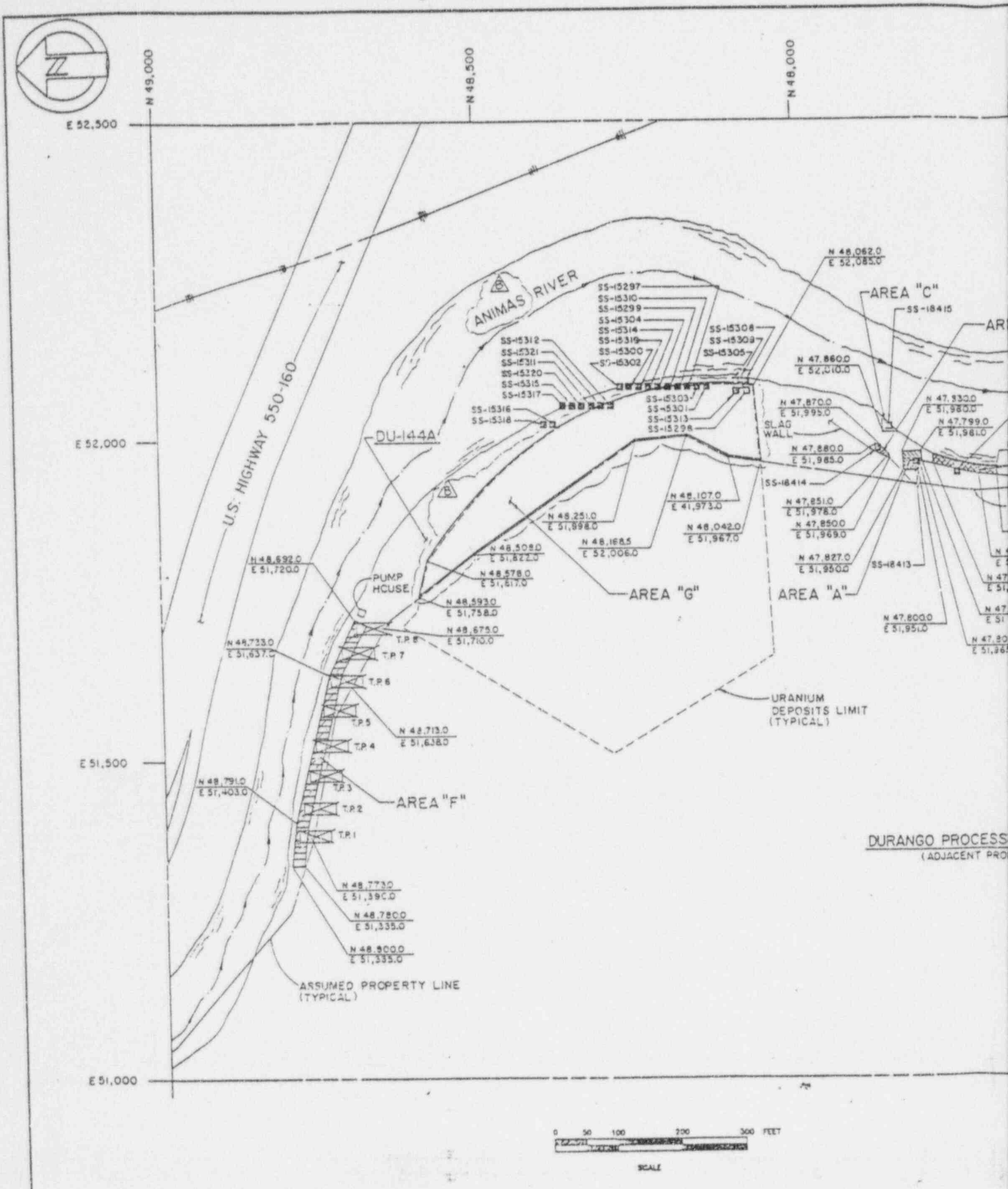
APPROVED	DATE	DOE PROJECT MANAGER	DATE	DOE PROJECT ENGINEER	DATE
NR		NR		NR	

NO.	DATE	REVISIONS	DRAWN BY	CHECKED BY	APPROV. LDE	APPROV. DA	PROJ ENG	APPROV. DOE
B	[illegible]	REVISED FINAL REA	EJM	SM	SM	[illegible]	[illegible]	—
A	11-20-97	FINAL REA SUBMITTAL	EJM	SM	SM	[illegible]	[illegible]	—

MK-FERGUSON
A MORRISON KNUDSEN COMPANY

PROJECT NO. DE-AC04-83AL18796

DRAWING NO. DU-144A-010 REV. B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N 48,500
N 48,000
E 52,500
E 52,000
E 51,500
E 51,000
ANIMAS RIVER
U.S. HIGHWAY 550-160
DU-144A
AREA "C"
AREA "G"
AREA "A"
AREA "F"
SLAG WALL
PUMP HOUSE
URANIUM DEPOSITS LIMIT (TYPICAL)
ASSUMED PROPERTY LINE (TYPICAL)
DURANGO PROCESS
(ADJACENT PRO
SS-15297
SS-15310
SS-15299
SS-15304
SS-15314
SS-15319
SS-15300
SS-15302
SS-15306
SS-15308
SS-15305
SS-15312
SS-15321
SS-15311
SS-15320
SS-15315
SS-15317
SS-15316
SS-15318
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E 51,950.0
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E 51,951.0
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E 51,965.0
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N 47,799.0
E 51,961.0
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E 51,390.0
N 48,780.0
E 51,335.0
N 48,900.0
E 51,335.0
T.P.8
T.P.7
T.P.6
T.P.5
T.P.4
T.P.3
T.P.2
T.P.1
0 50 100 200 300 FEET
SCALE

N 47,500

A "B"

SS-16139

7,680.0
1,954.0

AREA "D"

AG WALL

7,680.0
1,942.0
708.0
945.0
900
800

880
840

G SITE
RTY)

LEGEND

SS-15312 — SOIL SAMPLE DESIGNATION

T.P.7 — TEST PIT DESIGNATION

ESTIMATED DEPTH OF CONTAMINATION

2 FEET DEPTH OF SPORADIC CONTAMINATION- 600 C.Y.
(COVERED WITH 3 FEET OF CLEAN RIP-RAP)

2 FEET - 85 C.Y.

3 FEET - 40 C.Y.

2 FEET AND 6 INCHES - 120 C.Y.
(COVERED WITH CLEAN RIP RAP)

NOTES:

1. SUPPLEMENTAL STANDARDS IN ACCORDANCE WITH 40 CFR SECTION 192.22 (C) SHALL APPLY TO LOW LEVEL RADIOACTIVELLY CONTAMINATED MATERIAL. APPROXIMATIVELY 850 CUBIC YARDS REMAIN IN PLACE.
2. AREAS "A", "B", "C" AND "G" SHALL BE COVER WITH 2 FEET OF COMPACTED COMMON FILL AS DETERMINED BY THE DURANGO SITE RESTORATION PLAN.

9707090022-02

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

DESIGNED	DRAWN	CHECKED	REVIEWED	RECOMMENDED	APPROVED	DATE	DOE PROJECT MANAGER	DATE	DOE PROJECT ENGINEER	DATE
	EJM				NR		NR		NR	

RADIOLOGICAL SURVEY DATA
DU-144A
DURANGO, COLORADO
URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT

NO.	DATE	REVISIONS	DRAWN BY	CHECKED BY	APPROV. LOE	APPROV. DH	PROJ ENG	APPROV. DOE
B		REVISED AREA "G"	EJM					
A		FINAL REA SUBMITTAL	EJM					

MK-FERGUSON
A MORRISON KNUDSEN COMPANY

PROJECT NO. DE-AC04-83AL18796
DRAWING NO. DU-144A-015 REV. B

APPENDIX A

RADIOLOGICAL SURVEY DATA

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

INTER-OFFICE CORRESPONDENCE

MK-FERGUSON CO
ALBUQUERQUE
AUG 01 1989
RECEIVED

DATE August 1, 1989

TO Rob Pommerening/Frank Petelka

FROM Alan Erickson

LOCATION Albuquerque

LOCATION Durango

SUBJECT Supplemental Standard Areas on the Durango Processing Site

As discussed during the meeting held on 7/17/89 with Steve Hamp, DOE, Pat Martinek, CDH, and Mark Jackson, TAC, at the Durango Site, the following areas will be submitted for application of Supplemental Standards to Vicinity Property DU-144.

1. Riprap Area Adjacent to Animas River - Contaminated material exists beneath the riprap that extends from the lower pump house to Sta. N48,800, E51,335 along the Animas River. Based on test pit data adjacent to the riprap, we found contaminated material only in test pit No. 1 to a depth of 1 foot beneath the riprap but there is a possibility additional contaminated material may exist below the remainder of the riprap in areas that could not be characterized properly due to unstable slag conditions and the large riprap. Radiologically clean riprap, consisting of various sizes of materials up to 6 feet in diameter, would have to be removed prior to removal of any contaminated material. The area is also adjacent to a UMTRA related, radiologically clean slag slope/wall. The slag would have to be benched to allow for excavation of the contaminated material below the riprap resulting in possible cross-contamination of a large quantity of slag. See attachment 1 for the test pit data.

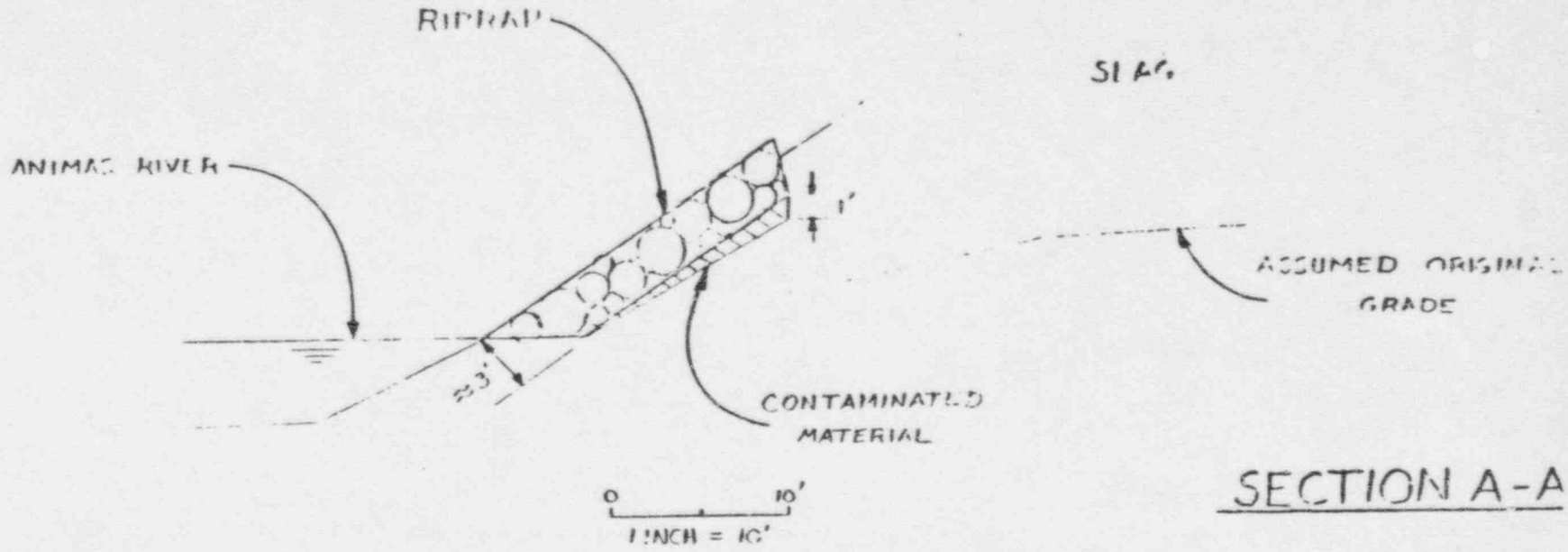
2. Uranium Lens - The lens of uranium contamination is visible at the high water level elevation on the Animas River slope face. The lens averages 1-6 inches thick and extends an unknown length under the slag on the site. Assuming the lens extends 20 feet on the site the quantity would be 100 cubic yards and if it extends to the property line the quanitity would be 350 cubic yards of contaminated material. The lens is beneath 2 feet to 25 feet of radiologically clean material as shown on the attached drawing section. Should the lens extend to the property line, up to approximately 15,000 cubic yards of radiologically clean material would have to be excavated prior to excavation of the lens. See attachment 2 for the sample data.

As agreed to by Steve Hamp, DOE, Pat Martinek, CDH, and Mark Jackson, TAC, during the meeting of 7/17/89, the following areas will be submitted for application of Supplemental Standards to the Durango Site by use of a RAP Modification.

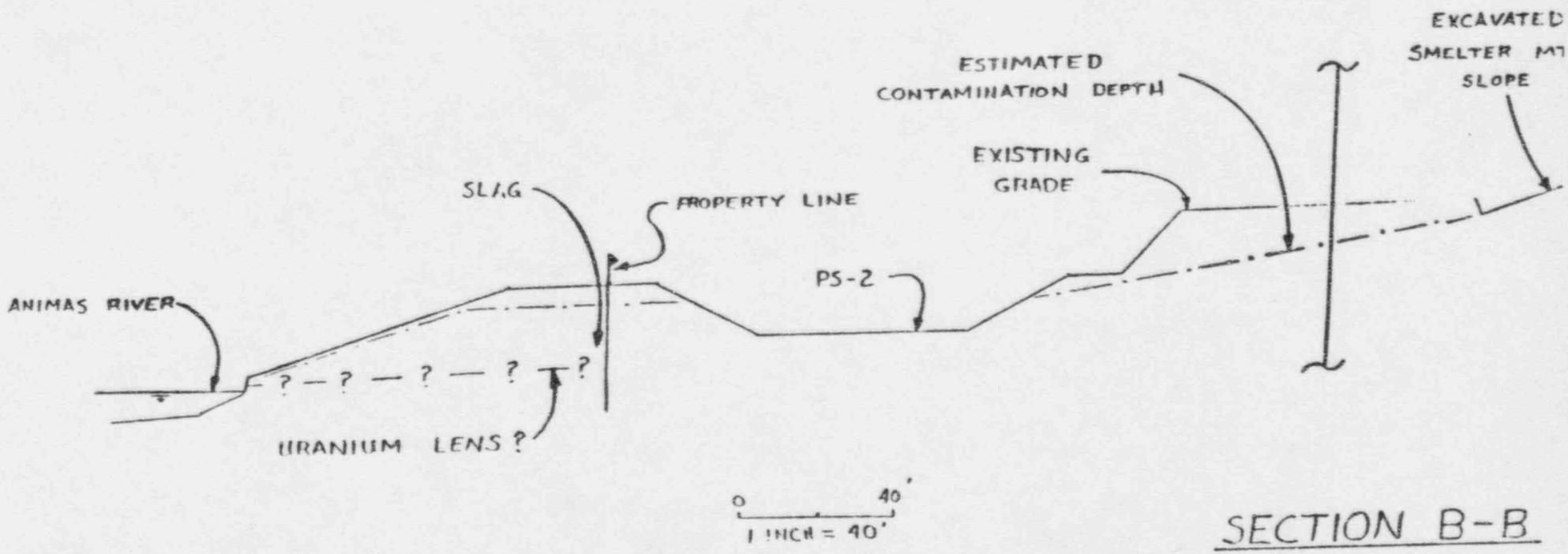
1. Attached is data for the Animas River Bank area addressed in MK-F letter to DOE No. 89-3050-465 dated June 23, 1989. Samples were obtained from the bottom of excavation and results show only a minimal amount of contaminated material remained below water level. The estimated amount of contamination remaining is 150 cubic yards. (2' depth) See attachment 3 for sample data. The excavation depths are shown on the attachment and the area was immediately backfilled to 6 inches above the Animas River water level.

2. Uranium Lens - The uranium lens on the Durango Site is visible only in a 25 foot area beneath the slag near the pump house at the Animas River. It is unknown the extent that the lens extends into the Site. The lens has not been identified in the excavation of the Smelter Mountain Slope at this time, but the quantity could amount to approximately 100-1500 cubic yards of material assuming it extends 100 feet on the site or to the limits shown on the drawing, respectively. To remove this lens, we estimate up to approximately 30,000 cubic yards of radiologically clean material would have to be excavated. See attachment 2 for data from the uranium lens samples.

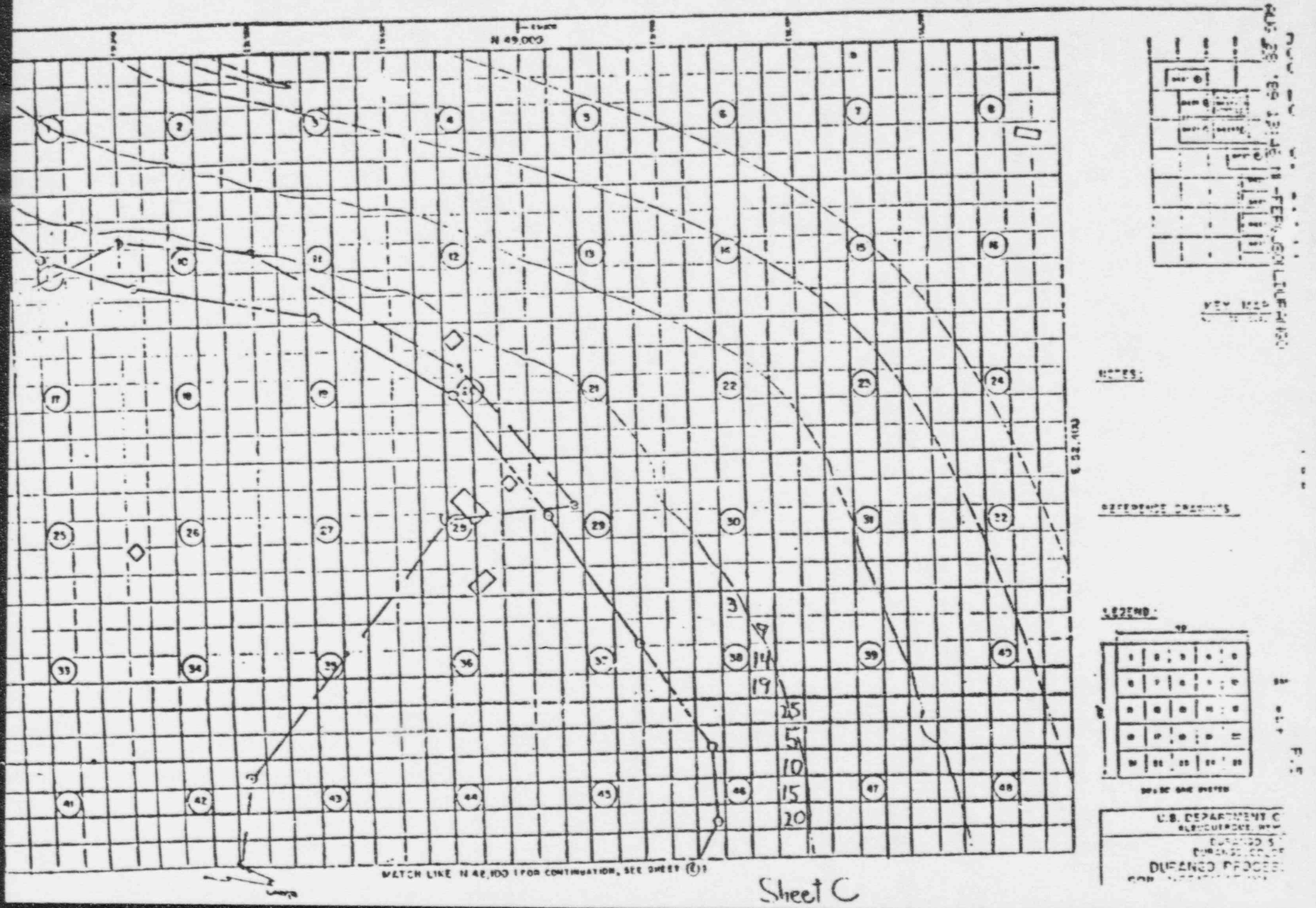
AE/tg



SECTION A-A



SECTION B-B


N 49,000
MATCH LINE N 48,100 I FOR CONTINUATION, SEE SHEET (E)
NOTES:
REFERENCE DRAWINGS
LEGEND:
U.S. DEPARTMENT C
DURANGO PROCES

Sheet C

MORRISON KNUDSEN

OUTDOOR GAMMA SCREENING SURVEY DATA SHEET

SHEET ______ OF ______ PAGE ______

LOGGING CREW: cdc JC

DATE: 8-28-89

PROPERTY ID: S.1e C3

INSTRUMENT ID NO.: 2220 21975 w/ 4410 19875

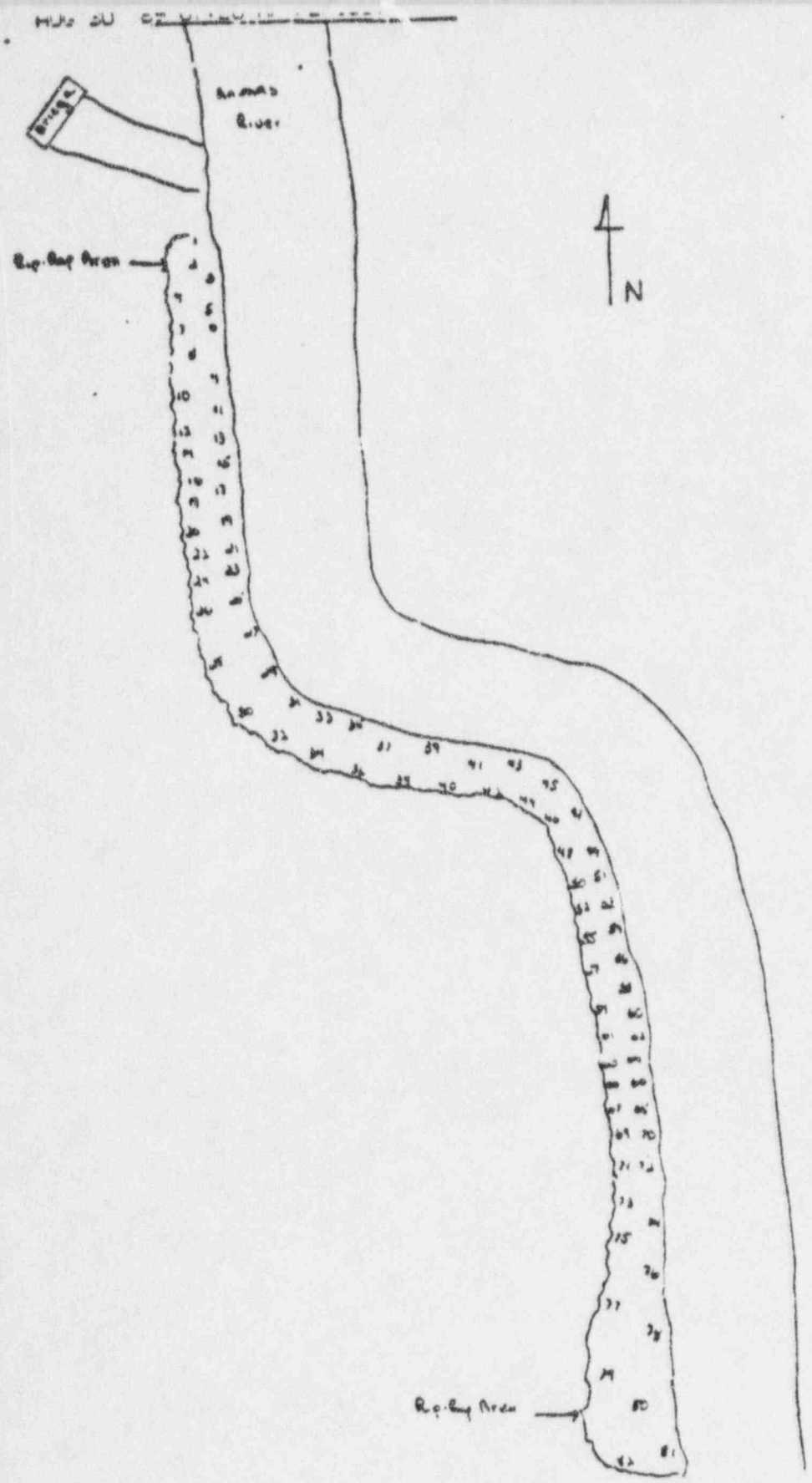
BACKGROUND CALCULATION:

#1 ______ + #2 ______ + #3 ______ = ______ ÷ 3 = ______ COUNTS/.1MIN

AREA:		AREA:		AREA:		AREA:	
POINT ID	READING µR/hr COUNTS/.1MIN	POINT ID	READING µR/hr COUNTS/.1MIN	POINT ID	READING µR/hr COUNTS/.1MIN	POINT ID	READING µR/hr COUNTS/.1MIN
1	c 1421 µR/hr 19 m 914 15	25	c 2441 23 m 2281 21	49	c 2604 24 m 1845 19	73	c 1442 16 m 1463 17
2	c 1373 15 m 1416 16	26	c 2075 20 m 1985 19	50	c 1400 16 m 1474 16	74	c 1350 15 m 1367 16
3	c 2051 21.0 m 3249 26	27	c 7873 57 m 2878 25	51	c 1103 14 m 1121 14	75	c 1405 16 m 1505 16
4	c 3449 27 m 2326 23	28	c 1583 17 m 1479 16	52	c 1782 18 m 1553 17	76	c 2311 22 m [illegible] 15
5	c 2050 20 m 1825 8	29	c 2260 21 m 1707 18	53	c 1924 19 m 1595 17	77	c 3072 24 m 1545 19
6	c 2084 26 m 2215 22	30	c 1738 18 m 1441 16	54	c 1413 16 m 1695 19	78	c 2663 24 m 2647 24
7	c [illegible] 20 m [illegible] 17	31	c 1340 15 m 1365 1[illegible]	55	c 1363 17 m 1549 17	79	c 1721 18 m 1844 18
8	c 1751 18 m 1532 16	32	c 1619 17 m 1453 17	56	c 1595 16 m 1814 16	80	c 1729 17 m 1712 18
9	c 1748 18 m 1444 17	33	c 2601 20 m 1940 19	57	c 2215 21 m 1619 17	81	c 2032 20 m 2241 21
10	c 2009 21 m 2006 20	34	c 2210 21 m 2105 19	58	c 1502 16 m 1372 15	82	c 2241 21 m 2463 24
11	c 1442 16 m 1496 16	35	c 1548 17 m 1471 16	59	c 2881 25 m 1601 17		
12	c 2208 21 m 1770 18	36	c 1154 14 m 1314 16	60	c 3921 32 m 1844 19		
13	c 2642 23 m 2215 21	37	c 1393 16 m 1498 [illegible]	61	c 1746 18 m 1818 18		
14	c 2053 21 m 914 19	38	c 1551 16 m 1445 16	62	c 2539 23 m 1750 15		
15	c 2057 22 m 2204 19	39	c 2249 21 m 2114 20	63	c 17916 122 m 2784 26		
16	c 2009 26 m 1825 18	40	c 1400 16 m 1604 17	64	c 2130 22 m 2036 20		
17	c 1413 19 m 1667 17	41	c 1456 17 m 1583 17	65	c 2281 26 m 1583 19		
18	c 1640 15 m 1239 15	42	c 1749 18 m 1895 18	66	c 1632 18 m 1571 17		
19	c 1659 17 m 2195 21	43	c 1446 16 m 1500 16	67	c 3143 27 m 2217 21		
20	c 3181 27 m 2236 20	44	c 2297 22 m 2240 21	68	c 2678 24 m 2528 22		
21	c 1665 17 m 1627 17	45	c 1798 18 m 1864 17	69	c 2528 23 m 2094 20		
22	c 2283 21 m 2349 20	46	c 1837 18 m 2113 20	70	c 1362 15 m 1497 16		
23	c 2447 23 m 1824 18	47	c 1500 17 m 1526 16	71	c 2825 25 m 1351 15		
24	c 1410 16 m 1403 15	48	c 1820 15 m 1547 17	72	c 2344 22 m 1532 16		

REMARKS: CONTROL = C
METER = M

BOTH EXPOSURE RATES


N

OUTDOOR GAMMA SCREENING
SURVEY DATA SHEET

LOGGING CREW: C M Worsham

SHEET _____ OF _____ PAGE _____

DATE: 8-29-84

PROPERTY ID: Site

INSTRUMENT ID NO.: 1-22-20 #31464 / 6-44-10 #54967

BACKGROUND CALCULATION:

#1 _____ + #2 _____ + #3 _____ = _____ ÷ 3 = _____ COUNTS/.1MIN

AREA: Grid #C-38-8			AREA: Grid #C-38-9			AREA: Grid #C-38-10			AREA: Grid #C-38-13		
POINT ID	READING COUNTS/.1MIN		POINT ID	READING COUNTS/.1MIN		POINT ID	READING COUNTS/.1MIN		POINT ID	READING COUNTS/.1MIN	
#1-Contact	1329	15.2	#1-Contact	1257	14.7	#1-Contact	1480	16.1	#1-Contact	1176	14.2
#1-1meter	1549	16.9	#1-1meter	1458	16.0	#1-1meter	1244	14.6	#1-1meter	1231	14.5
#2-Contact	1184	14.3	#2-Contact	1224	14.5	#2-Contact	1183	14.2	#2-Contact	1267	14.8
#2-1meter	1350	15.3	#2-1meter	1295	15.0	#2-1meter	1244	14.7	#2-1meter	1227	14.5

REMARKS _____

URANIUM EXPOSURE RATES

MORRISON KNUDSEN

OUTDOOR GAMMA SCREENING
SURVEY DATA SHEET

LOGGING CREW: C M Wagoner

SHEET _____ OF _____ PAGE _____

DATE: 8-29-89

PROPERTY ID: Site

INSTRUMENT ID NO.: 1-22-10 #31964 / 1-44-10 #54467

BACKGROUND CALCULATION:

#1 _____ + #2 _____ + #3 _____ = _____ ÷ 3 = _____ COUNTS/1MIN

AREA: Grid C-38-25			AREA: Grid C-46-5			AREA: Grid C-46-10			AREA: Grid C-46-15		
POINT ID	READING COUNTS/1MIN		POINT ID	READING COUNTS/1MIN		POINT ID	READING COUNTS/1MIN		POINT ID	READING COUNTS/1MIN	
#1-Contact	1464	16.0	1-Contact	1209	14.4	#1-Contact	1357	15.4	#1-Contact	1818	18.2
#1-1-meter	1421	15.8	#1-1-meter	1323	15.1	#1-1-meter	1459	16.0	#1-1-meter	1800	18.2
#2-Contact	1357	15.4	#2-Contact	1291	14.9	#2-Contact	1861	18.6	#2-Contact	1629	17.1
#2-1-meter	1401	15.6	#2-1-meter	1270	14.8	#2-1-meter	1869	18.6	#2-1-meter	1772	18.0

REMARKS _____

MORRISON KNUDSEN

OUTDOOR GAMMA SCREENING
SURVEY DATA SHEET

LOGGING CREW: C.M. Workman

SHEET _____ OF _____ PAGE _____

DATE: 8-29-89

PROPERTY ID: Site

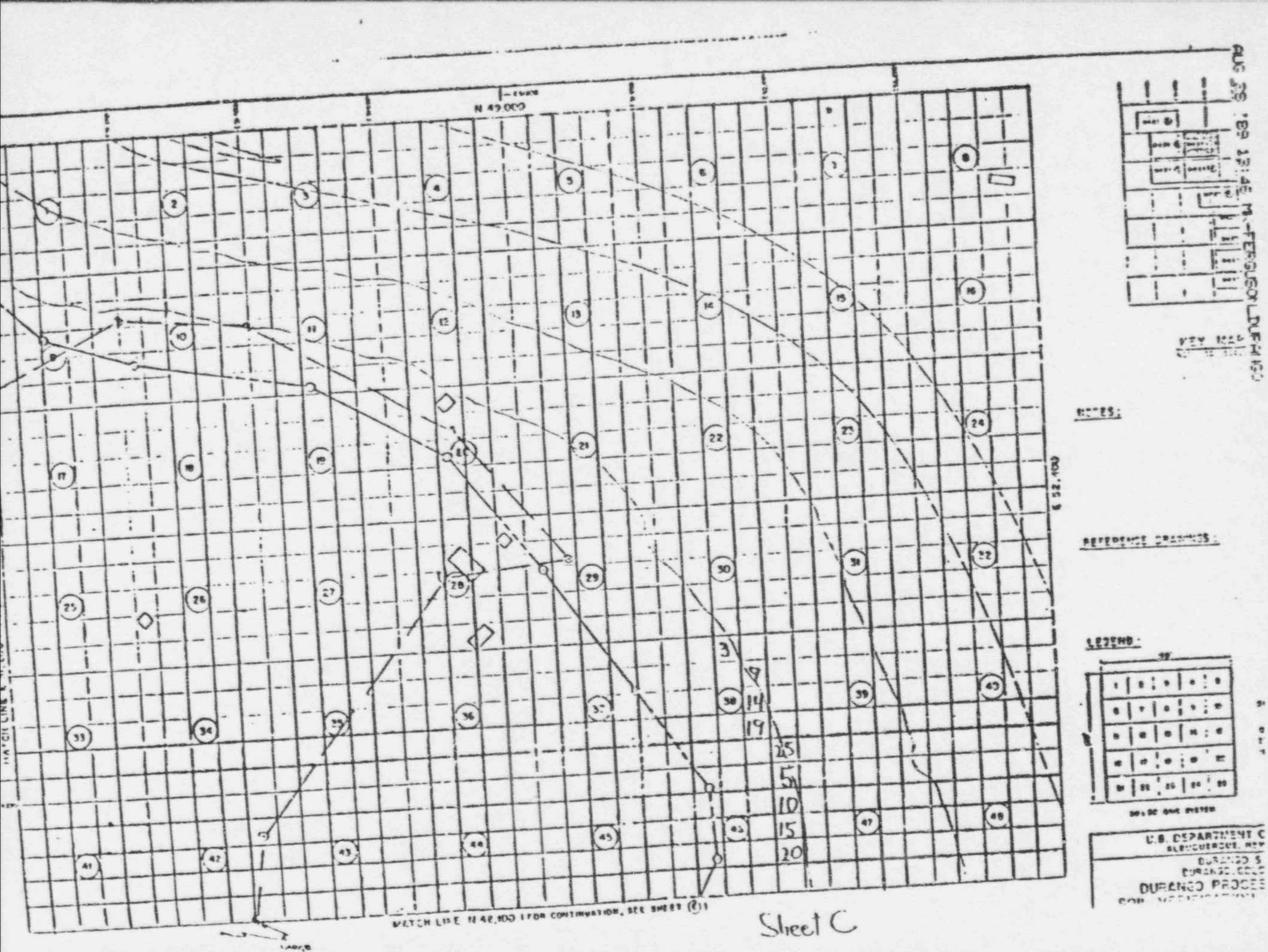
INSTRUMENT ID NO.: L-22-20 #3194/1444-10 #54967

BACKGROUND CALCULATION:

#1 _____ + #2 _____ + #3 _____ = _____ ÷ 3 = _____ COUNTS/1MIN

AREA: Grid C-46-20			AREA: Grid E-6-5			AREA:			AREA:	
POINT ID	READING COUNTS/1MIN		POINT ID	READING COUNTS/1MIN		POINT ID	READING COUNTS/1MIN		POINT ID	READING COUNTS/1MIN
1-Center	1847	18.5	1-Center	1764	18.0					
1-Inside	1721	17.7	1-Inside	1799	18.7					
2-Center	2058	19.8	2-Center	1662	17.3					
2-Inside	1946	19.1	2-Inside	1720	17.7					
			3-Center	1530	16.5					
			3-Inside	1485	16.2					
			4-Center	1426	15.2					
			4-Inside	1429	15.2					
			5-Center	1656	17.3					
			5-Inside	1417	15.7					

REMARKS: _____

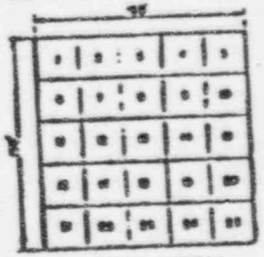

N 49,000
MATCH LINE N 42,800 (FOR CONTINUATION, SEE SHEET (2))
NOTES:
REFERENCE DRAWINGS:
LEGEND:
U.S. DEPARTMENT
DURANGO PROJE
Sheet C

KEY MA

NOTES:

REFERENCE DRAWINGS:

LEGEND:



U.S. DEPARTMENT
ALBUQUERQUE, NE
DURANGO
DURANGO, CO
DURANGO PROJE
SOIL VERIFICATION
SHEET

1 1

OCS #: 98-
OCS #4: 285411
OCS #5: 285403

PW-PERGUSON/CHEM-NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

SITE NAME DURANGO
SITE AREA _____

OCS SERIAL NO. _____

COUNT DATE INITIAL / 30 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	OCS# INITIAL / 20 DAY	FUNCTION NO. INITIAL / 20 DAY	MASS WET / DRY	Ra 226 INITIAL / 20 DAY	QC SAMPLE	LABORATORY RESULT Ra 226	LABORATORY RESULT Th 230	DEPTH <15 cm / >15 cm	TECH INITIAL / 30 DAY	REMARKS
7-11-89	DU-SS 15330	100-36	7-11-89		3	4.04E2	633.3	<1.5				✓	MW	2432-43/85-90L 10' Comp.
7-12-89	DU-SS 15331	275-1	7-12-89		3	1.33E3	403.8	3.29				—	RF	1859 SWL 4000 AD 2185 BOTTOM FRONT GATE
7-12-89	DU-SS 15332	275-2	7-12-89		3	5.47E2	489.4	<1.5				✓	RF	Composite readings obtained Area C $\bar{x}$ = 2000 cpm dle 7-13-89
7-12-89	DU-SS 15333	275-3	7-12-89		3	5.14E2	586.5	<1.5				✓	CTW	Area A Southside of House @ 1800 cpm comp
7-12-89	DU-SS 15334	275-4	7-12-89		3	5.86E2	521.3	<1.5				✓	MW	Area A. Westside of House 1800 CPM @
7-12-89	DU-SS 15335	275-5	7-12-89		3	2.72E3	489.5	5.56				—	RF	Readings 16 cpm to 2000 cpm Area C FRONT GATE
7-12-89	DU-SS 15336	275-6	7-12-89		4	7.36E2	490.3	1.60				—	RF	AREA D Composite $\bar{x}$ = 1800 cpm
7-12-89	DU-SS 15337	100-37	7-12-89		5	7.01E2	714.5	<1.5				—	RF	2+45-2+58/85-90L <10' FROM IND. STRUCTURE POST ETC.
7-12-89	DU-SS 15338	TP#1 #2	7-12-89		3	1.16E4	612.9	18.9		3.7 ± .9	11 ± 1	—	RF	Δ 4450 cpm Im 16800 cpm Uranium 43 ug/gm
7-12-89	DU-SS 15339	TP#1 #3	7-12-89		4	7.91E3	532.6	14.8		3.7 ± .9	11 ± 1	—	RF	6' Δ 3350 cpm Uranium 28.2 ug/gm
7-12-89	DU-SS 15340	TP#1 #1	7-12-89		5	9.41E4	547.0	166.0		140 ± 10	150 ± 10	—	RF	1' Im 9860 cpm Uranium Δ 10,000 cpm Thorium PT OP 35,000 cpm 142 ug/gm
7-12-89	DU-SS 15341	275-7	7-12-89		3	5.21E2	559.1	<1.5				✓	RF	AREA C UNDER SIDEWALK INSIDE GATE 7711 cpm

REVIEWED BY _____

NOTE: all soil sample results are in pCi/gm

Site Correction Factor = 1.42 (x) − .1391 (05-10-89)
Count Time = 500 sec, unless noted otherwise.

VP Correction Factor = 1.35 (x) + .505 MDA-5pCi/g
(02-03-88) = 1.98 (x) − 1.40 5-15pCi/g

Test Pits Soil

OCS #3: 96430
OCS #4: 285411
OCS #5: 285403

MK-FERGUSON/CHEM-NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

SITE NAME DURANGO
SITE AREA _____

OCS SERIAL NO. _____

COUNT DATE / INITIAL / 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	OCS# / INITIAL / 20 DAY	FUNCTION NO. / INITIAL / 20 DAY	MASS / WET / DRY	Ra 226 / INITIAL / 20 DAY	QC SAMPLE	LABORATORY RESULT Ra 226	LABORATORY RESULT Th 230	DEPTH <15 cm / >15 cm	TECH / INITIAL / 20 DAY	REMARKS
7-12-89	DU-85 15342	275-8 278 R7	7-12-89		4	1.01 E3	567.8	1.81				✓	RF	AREA C UNDER GARAGE OUTSIDE GATE 2759 cpm
7-12-89	DU-85 15343	275-9	7-12-89		5	1.74E3	483.9	3.60				✓	RF	AREA C UNDER GARAGE (CURB) 2481 cpm
7-12-89	DU-85 15344	100-38	7-12-89		3	6.70 E2	581.2	<1.5				✓	RF	2+65, 98L AREA B 8=1600 cpm 12" BGH 2000 cpm
7-12-89	DU-85 15345	100-39	7-12-89		4	1.10E3	680.7	1.62				✓	RF	2+58-2+80/82-88L AREA B OP 2000 cpm Δ 680 cpm (conc)
7-12-89	DU-85 15346	TP-7	7-12-89		5	1.06E3	637.2	1.66		3.2 ±.9	2.4 ±.7	✓	PT	SOIL Δ1680 Uranium 19.7ug/gm
7-12-89	DU-85 15347	TP#2 #1	7-12-89		3	1.20 E4	653.1	18.4				✓	RF	SLAG Δ1760 1'
7-12-89	DU-85 15348	TP#2 #3	7-12-89		4	1.08 E4	747.2	14.4		2.8 ±.8	11 ±1	✓	RF	SLAG 4' Δ1750 Uranium 35.0ug/gm
7-12-89	DU-85 15349	TP#2 #4	7-12-89		5	7.38E3	766.6	9.63		2.4 ±.8	8.4 ±1.2	✓	RF	SLAG 9' Δ1650 Uranium 34.4ug/gm
7-12-89	DU-85 15350	TP#2 #2	7-12-89		3	1.20E4	750.6	16.0				✓	RF	SLAG 2' Δ1830
7-12-89	DU-85 15351	TP#3 #3	7-12-89		4	9.24E3	695.1	13.3				✓	RF	SLAG 3' Δ1910
7-12-89	DU-85 15352	TP#3 #1	7-12-89		5	1.02E4	721.1	14.1		2.9 ±.8	13 ±1	✓	RF	SLAG 1' Δ1700 Uranium 46.5ug/gm
7-12-89	DU-85 15353	TP#3 #4	7-12-89		3	7.60E3	692.5	10.97		8.2 ±.9	14 ±1	✓	RF	SLAG 4' Δ1900 44.1

REVIEWED BY _____

NOTE: All soil sample results are in pCi/gm

Site Correction Factor = 1.42 (x) − .1391 (05-10-89)
Count Time = 500 sec, unless noted otherwise.

PT Correction Factor = 1.35 (x)+.505 MDA-5pCi/g
(02-03-88) = 1.98 (x)-1.40 5-15pCi/g

OCS #3: 984369
OCS #4: 285411
OCS #5: 285403

MK-FERGUSON/CHEM-NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

SITE NAME DURANGO
SITE AREA _____

OCS SERIAL NO. _____

COUNT DATE INITIAL / 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	OCS# INITIAL / 20 DAY	FUNCTION NO. INITIAL / 20 DAY	MASS WET / DRY	Ra 226 INITIAL / 20 DAY	QC SAMPLE	LABORATORY RESULT Ra 226	LABORATORY RESULT Th 230	DEPTH <15 cm / >15 cm	TECH INITIAL / 20 DAY	REMARKS
7-12-89	DU-SS 15355	TP#3-2	7-12-89		4	1.02E4	758.6	13.4				✓	RF	SLAG 2' Δ1880
7-12-89	DU-SS 15355	TP#4 #1'	7-12-89		5	4.63E3	751.2	6.16				✓	RF	SLAG 1' Δ611
7-12-89	DU-SS 15356	TP#1-4	7-12-89		3	3.46E4	683.2	5.06		20 ± 2	42 ± 3	✓	RF	SLAG 4' Δ4510 Uranium 54.6mg/gm
7-12-89	DU-SS 15357	TP#4-2	7-12-89		4	219E3	631.5	3.47		1.6 ± .6	2.8 ± .7	✓	RF	SLAG 2' Δ515 Uranium 9.8ug/gm
7-12-89	DU-SS 15358	TP#3 5-1 -2	7-12-89		5	9.66E2	758.6	<1.5		1.3 ± .6	1.3 ± .5	✓	RF	SLAG 2' Δ1880 Uranium 2.8ug/gm
7-12-89	DU-SS 15359	TP#5-4	7-12-89		3	2.74E3	689.4	3.97		3.5 ± .9	3.6 ± .8	✓	RF	SLAG 4' Δ583 Uranium 6.7ug/gm
7-12-89	DU-SS 15360	TP#5-3	7-12-89		4	2.28E3	722.5	3.16				✓	RF	SLAG 3' Δ553
7-12-89	DU-SS 15361	TP5-2	7-12-89		5	1.47E3	667.5	2.20				✓	RF	SLAG 2' Δ444
7-12-89	DU-SS 15362	TP#6-4	7-12-89		3	9.34E3	745.6	12.5		4.8 ± 1.0	15 ± 2	✓	RF	SLAG 4' Δ Uranium 38.0ug/gm
7-12-89	DU-SS 15363	TP-6 2	7-12-89		4	1.05E4	722.6	14.5		5.8 ± 1.1	17± 2	✓	RF	SLAG 2' Δ Uranium 485
7-12-89	DU-SS 15364	TP#6-1	7-12-89		5	9.19E3	802.2	11.4		4.7 ± 1.0	18± 1	✓	RF	SLAG 1' Δ U 26.8ug/gm
7-12-89	DU-SS 15365	TP#6-3	7-12-89		3	8.29E3	765.1	11.8		4.0 ± 1.0	15± 2	✓	RF	SLAG 3' Δ U 26.8ug/gm

REVIEWED BY _____

NOTE: All soil sample results are in pCi/gm

Site Correction Factor = 1.42 (x) − .1391 (05-10-89)
Count Time = 500 sec, unless noted otherwise.

VP Correction Factor = 1.35 (x)+.505 MDA-5pCi/g
(02-03-88) = 1.98 (x)-1.40 5-15pCi/g

OCS #3: 984369
OCS #4: 285411
OCS #5: 285403

HK-FERGUSON/CHEM-NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

SITE NAME DURANGO
SITE AREA ____________

OCS SERIAL NO. ____________

COUNT DATE INITIAL / 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	OCS# INITIAL / 20 DAY	FUNCTION NO. INITIAL / 20 DAY	MASS WET / DRY	Ra 226 INITIAL / 20 DAY	QC SAMPLE	LABORATORY RESULT Ra 226	LABORATORY RESULT Th 230	DEPTH <15 cm / >15 cm	TECH INITIAL / 20 DAY	REMARKS
7-12-89	DU-SS 15368	TA7-2	7-12-89		4	7.16E3	756.7	9.46				✓	RF	SLAG 2' Δ1390
7-12-89	DU-SS 15367	TP#7-4	7-12-89		5	6.47E3	837.9	7.72				✓	RF	SLAG 4' Δ1020
7-12-89	DU-SS 15368	TP#7-1	7-12-89		3	5.56E3	743	7.48		1.9 ±.7	7.3 ±1.1	✓	RF	SLAG 1' Δ1200 Uranium 20.2ug/gm
7-12-89	DU-SS 15369	TP#7-3	7-12-89		4	5.28E3	757.2	6.97		1.1 ±.5	5.4 ±1.0	✓	RF	SLAG 3' Δ1060 Uranium 20.2ug/gm
7-12-89	DU-SS 15370	BOTTOM OF SLAG WALL	7-12-89		5	1.06E4	695.6	16.4		0.6 ±.9	17 ±2	✓	RF	Uranium 83.6ug/gm
7-12-89	DU-SS 15371	E. SIDE OF PUMP HOUSE	7-12-89		3	2.57E3	430	5.98		3.1 ±.9	1.8 ±.6	✓	RF	YELLOW COLOR Uranium 228ug/gm
7-12-89	DU-SS 15372	TP8-1	7-12-89		4	4.96E3	614.7	8.07		1.5 ±.6	8.4 ±1.2	✓	RF	Δ1160 Uranium 81.1ug/gm
7-12-89	DU-SS 15373	TP#8-2	7-12-89		5	7.13E3	594.1	12.0		2.3 ±.7	10 ±1	✓	RF	SLAG 2' Δ2070 Uranium 64.5ug/gm
7-12-89	DUSS 15374	TP8-3	7-12-89		3	1.10E4	631.4	<15 (2.44 pt)				✓	PT	SLAG
7-12-89	DUS 15375	DM-5	7-12-89		4	7.20E2	395.1	1.82				✓	PT	1410CPTM O. PHNOR 1'S OF N PRO. BOUN. 8' W OF E PRO. BOUN.
7-12-89	DUSE 15376	275-10	7-12-89		5	5.28E2	463.7	<15				✓	PT	AREA C 1905CPTM
7-12-89	DUSS 15377	TPB-5	7-12-89		4	1.14E3	615.2	1.85		1.6 ±.7	1.6 ±.6	✓	PT	Δ965 Uranium DIRT 26.7ug/gm

NOTE: All soil sample results are in pCi/gm

REVIEWED BY ____________

Site Correction Factor = 1.42 (x) - .1391 (05-10-89)
Count Time = 500 sec, unless noted otherwise.

VP Correction Factor= 1.35 (x)+.505 MDA-5pCi/g
(02-03-88) = 1.98 (x)-1.40 5-15pCi/g

)1

OCS #3: 984369
OCS #4: 285411
OCS #5: 285403

NO-PERCULOR/CHEM-NUCLEAR
OPPOSED CRYSTAL SYSTEM RECORD

SITE NAME DURANGO
SITE AREA _____

OCS SERIAL NO. _____

COUNT DATE / INITIAL / 20 DAY	SAMPLE NUMBER	SAMPLE LOCATION	DATE SAMPLED	DATE SEALED	OCS# / INITIAL / 20 DAY	FUNCTION NO. / INITIAL / 20 DAY	MASS / WET / DRY	Ra 226 / INITIAL / 20 DAY	QC SAMPLE	LABORATORY RESULT / Ra 226	LABORATORY RESULT / Th 230	DEPTH / <15 cm / >15 cm	TECH / INITIAL / 20 DAY	REMARKS
7-12-89	DuSS 15378	TP8-4	7-12-89		5	8.00E2	600.2	<1.5		1.7 ± .7	1.2 ± .5	/ ✓	PT	Δ775 uranium DIRT 4.9 ug/gm
7-12-89	OU-1J 15379	100-40	7-12-89		3	3.02E3	581.0	5.20				/ ✓	DJW	2+60/93L under sidewalk 1+00 UP / 1000
7-12-89	OU-1J 15380	100-41	7-12-89		5 5PT	3.43E3	571.5	6.00				/ ✓	DJW	2+60/94L underside walk 1200 UP / 1000A
7-12-89	DuSV 15381	275-1	7-12-89		3	3.14E2	546.5	<1.5				/ ✓	PT	GRID 1 AREA A 0+34.0 / 05.0L
7-12-89	DuSV 15382	275-2	7-12-89		5	3.15E2	479.4	<1.5				/ ✓	PT	GRID 2 AREA B 0+35 / 28.0 L
7-12-89	DuSV 15383	275-3	7-12-89		3	6.67E2	473.6	<1.5				/ ✓	PT	GRID 3 AREA C 0+42 / 41.0L
7-12-89	DuSV 15384	275-4	7-12-89		4 5PT	6.11E2	471.6	<1.5				/ ✓	PT	GRID 4 AREA D -5.0 / 26.0L
7-12-89	DuS 15385	275-D	7-12-89		3	4.73E2	504.8	<1.5				/ ✓	PT	GRID 4-D AREA D -5.0 / 26.0L
7-12-89	DuSS 15386	100-42	7-12-89		4 5PT	1.65E3	593.2	2.78				/ ✓	PT	2+58, 94L UNDER SW. 2300 UP, 1000A
7-12-89	DuSS 15387	PUMPHOUSE #1	7-12-89		3	9.45E4	5750	164.35				✓ /	PT	E SIDE Δ4150 CORRELATION
7-12-89	DuSS 15388	PUMPHOUSE #2	7-12-89		5	7.50E4	4650	114.50				✓ /	PT	S. SIDE Δ3360 CORRELATION
7-12-89	DuSS 15389	PUMPHOUSE #3	7-12-89		3	2.49E3	500.8	4.97				✓ /	PT	E. SIDE 6' AWAY Δ628 CORRELATION

NOTE: All soil sample results are in pCi/gm

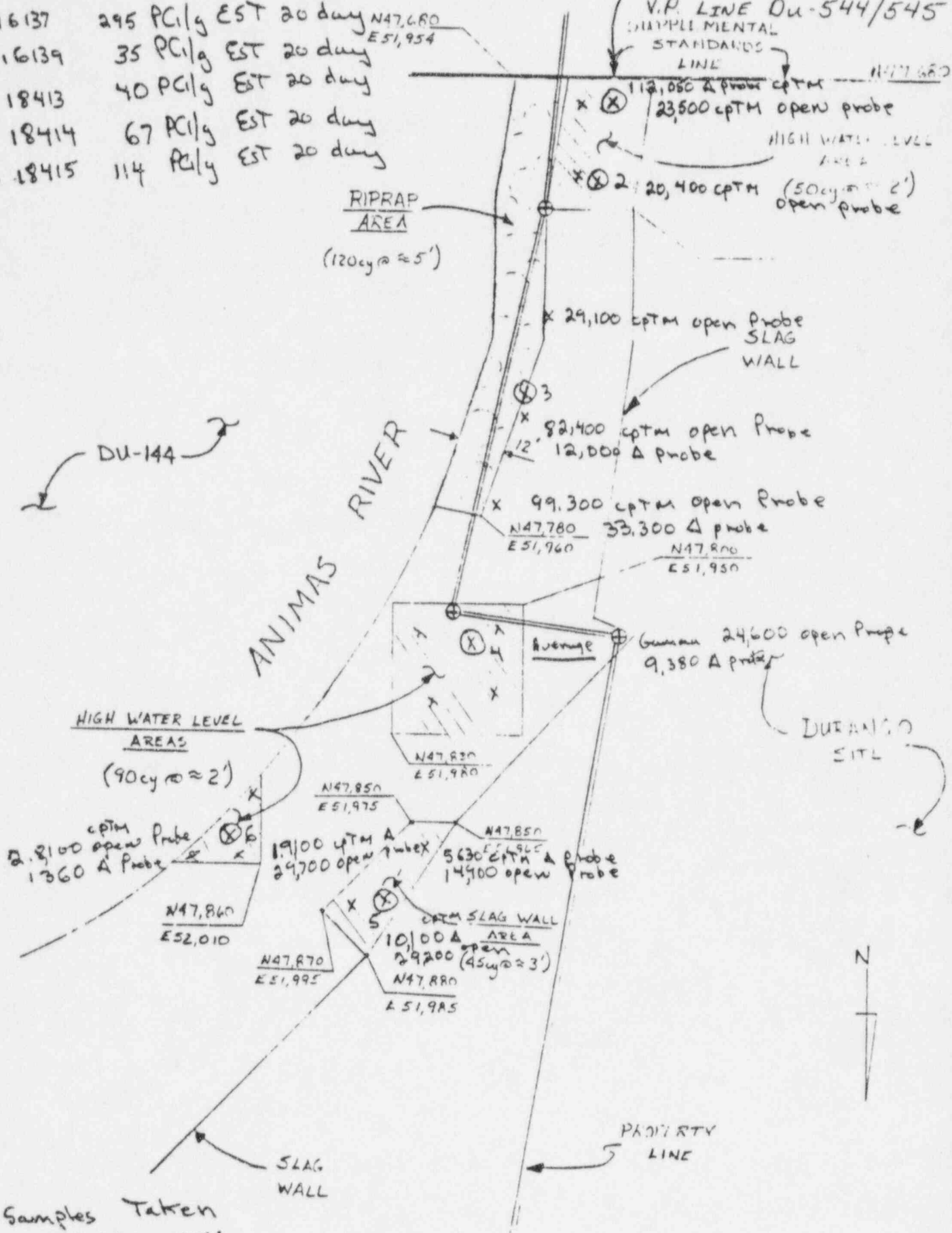
REVIEWED BY _____

Site Correction Factor = 1.32 (x) – .1391 (05-10-89)
Count Time = 500 sec, unless noted otherwise.

VP Correction Factor = 1.35 (x)+.505 MDA-5pCi/g
(02-03-88) = 1.98 (x)-1.40 5-15pCi/g

Soil Sample

① DUSS 16138 147 PCi/g EST 20 day
② DUSS 16137 295 PCi/g EST 20 day
③ DUSS 16139 35 PCi/g EST 20 day
④ DUSS 18413 40 PCi/g EST 20 day
⑤ DUSS 18414 67 PCi/g EST 20 day
⑥ DUSS 18415 114 PCi/g EST 20 day



* Soil Samples Taken when available access (Hardness of Slag and Levee access)

FIGURE 34

SOUTHERN AREAS

DU-544/545

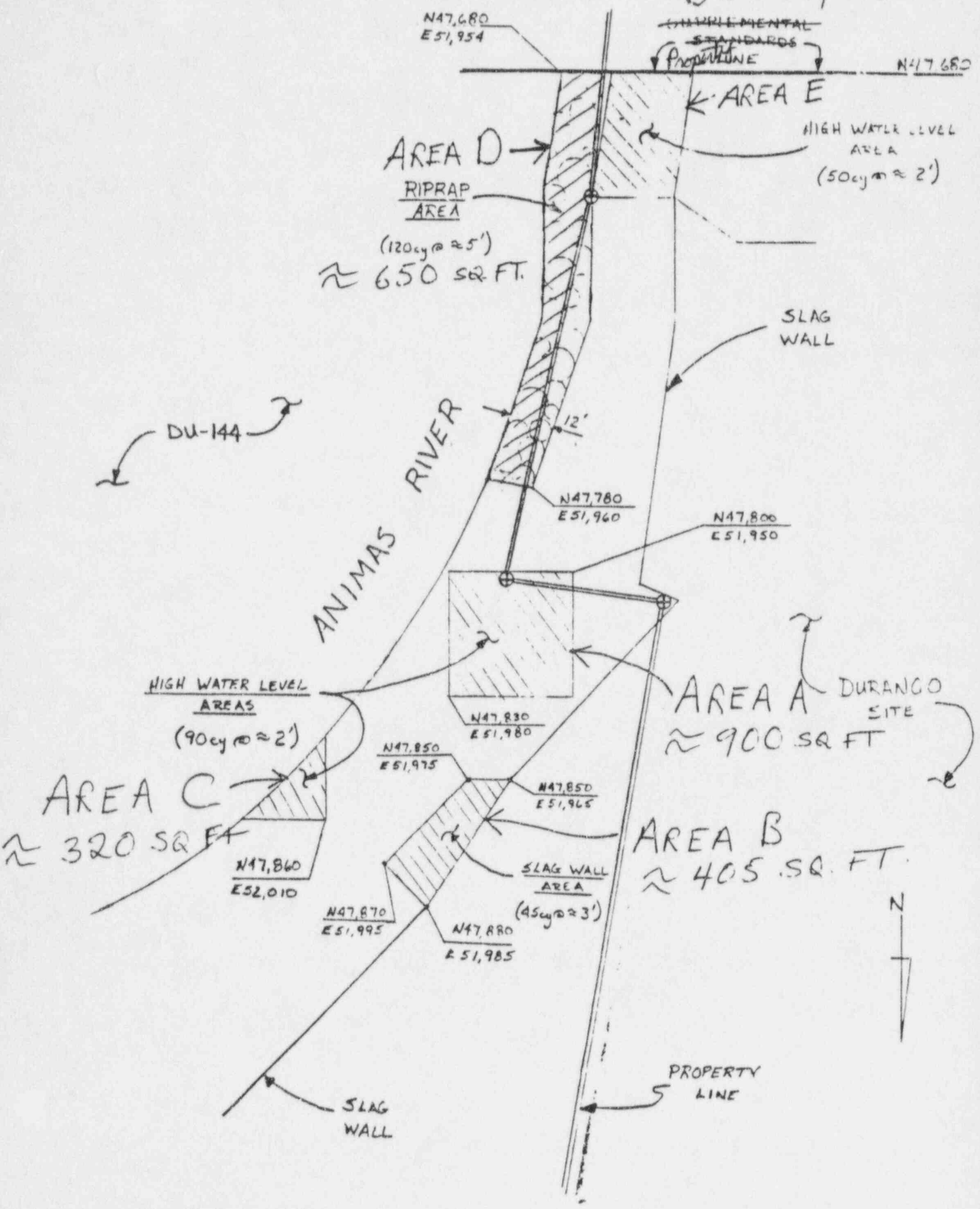


FIGURE 3.5

APPENDIX B

LEGAL DESCRIPTION

LEGAL DESCRIPTION

DU-144 has been divided into two portions, to simplify the application for Supplemental Standards to one portion of the property. This property is HWY 550/160 right of way. A portion of the property on the east side of the highway was previously remediated. The part of the property of concern is the highway right of way on the west side of the highway. More specifically the highway right of way on the west side of the Animas River adjacent to the Durango UMTRA Processing Site.

APPENDIX C

OWNERS/STATE AND DOE COMMENTS TO APPLICATION OF SUPPLEMENTAL STANDARDS

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

September 7, 1989

Alfred A. Shablo
District Engineer
Colorado Department of Highways
214 West 6th Street
Durango, CO 81301

SUBJECT: Use of Supplemental Standards - DU-144

Dear Mr. Shablo:

In accordance with the Uranium Mill Tailings Radiation Control Act (UMTRA) of 1978, Public Law 95-604, the Department of Energy (DOE) included property (DU-144) for remedial action. Further evaluation of the contamination on your property has been performed and a recommendation has been proposed to leave the contaminated material and place 2' of soil and riprap over the area. This recommendation is proposed per the Code of Federal Regulations 40 CFR 192, Supplemental Standards. We are basing the recommendation on the criteria presented below. Your comments/concurrence are requested.

The Radiological and Engineering Assessment (REA) performed on the property (DU-144) has revealed that radioactive contaminated materials are present in two areas on your property; the Riprap Area and Uranium Lens Area (Figure 3.1). The contamination in the Riprap Area is presently covered with 3 feet of radiologically clean riprap. Contamination is sporadically distributed through the 2 foot layer of soil beneath the riprap. In the Uranium Lens Area, contamination is present in a 1 to 6 inch lens that is exposed at the high water mark on the bank of the Animas River. This lens possibly extend from the river back to the property line beneath 2 to 25 feet of radiologically clean overburden.

The overburden consists mainly of slag generated by a lead smelter that was operated from the 1880's to 1930. It has been tentatively proposed that 2 feet of backfill and riprap be placed over the exposed portions of the Uranium Lens along the river. The cover will be blended to match the existing topography.

Because of the cost involved in cleaning up the material, coupled with the low health hazard, we are recommending that the contaminated material in these areas be left in place. This action is permitted under Title 40, Code of Federal Regulations, Section 192.21 and 22. The sections of the EPA Standards, which are established for the cleanup of Uranium mill tailings, allow residual radioactive materials to remain in place when certain conditions are met. The criteria defining when remedial action need not take place (Supplemental Standards) are as follows:

(1) The estimated cost of remedial action is unreasonably high relative to the long-term benefits, and the residual radioactive materials do not pose a clear present or future hazard.

After the proposed remedial action occurs and the Uranium Lens has been covered with 2' of backfill and riprap, general area radiation levels will range from 14 to 25 micro R/hr. Background for the Durango area is 14 micro R/hr. If a person spent 8 hours a day, 5 days a week, for 50 weeks in a 25 micro R/hr radiation field, he would receive about 50 millirem of gamma exposure in one year. This is one-tenth the amount allowed the general public (10 CFR 20.105). The actual amount of contaminated material that will remain in place after remedial action is approximately 940 cubic yards.

In compliance with the EPA regulations found in the Code of Federal Regulations 40 192.21, we solicit your comments concerning this action. We are attaching a copy of the applicable sections of the Code of Federal Regulations for your convenience in responding to this proposed action. To comply with EPA regulations, we must receive a written response with your concurrence/comments. We request your response by September 18, 1989.

If you have any questions or need additional information concerning this matter, please call either Dave Charlton of my staff at 1-800-443-4379, or Ms. Jolene Garcia of the U.S. Department of Energy at (505) 846-1238.

Sincerely,

MK-Ferguson Company

J. G. Oldham
Project Director

JGO/RAP/RDJ/mno
Enclosures
cc: w/o enclosures:
J. Garcia, DOE/UMTRA
C. Moore, TAV/UMTRA
Document Control

2439F

STATE OF COLORADO

DEPARTMENT OF HIGHWAYS
District V Maintenance Section 03

214 W. 6th Street
Durango, Colorado 81301
(303) 259-0021

October 3, 1989

A. A. Shablo
District Engine

MK-FERGUSON CO.
ALBUQUERQUE

OCT 06 1989

RECEIVED

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

Dear Mr. Oldham:

I gave verbal approval to your plan of leaving the contamination in place on our property to Mr. Ron Jacobs by telephone today. This letter will confirm our approval to go ahead with your plans.

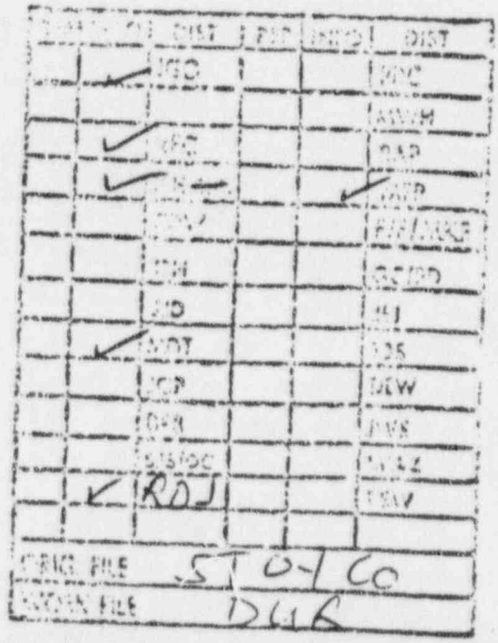
If we can be of further assistance, please feel free to contact us.

Sincerely,

Jon T. Vickers

Jon T. Vickers
Maintenance Superintendent

JTV:mh
cc: Shablo
Watson
File



DUR-144A
FILE

STATE OF COLORADO

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

Roy Romer
Governor

Thomas M. Vernon, M.D.
Executive Director

November 1, 1989

J. G. Oldham
MK-Ferguson Company
P.O. Box 9136
Albuquerque, New Mexico 87119

Re: State Concurrence on Durango Processing Site Draft REA for DUR-144, File No. DUR-XIII.N

Dear Mr. Oldham:

On October 10, we received from your staff a Draft Radiological and Engineering Assessment (REA) for Vicinity Property No. Dur 144. The State herein provides concurrence on this document.

The Vicinity Property Dur 144 includes a strip of land located between the processing site to the south and the Animas River to the north. Approximately 940 cubic yards of contaminated material have been identified along this strip in areas beneath either 2 to 20 foot thick slag piles or 3 foot thick riprap. The REA states that the decontamination of these areas would require removal of the overlying slag and riprap piles at great expense as compared to the long-term health benefits.

The recommended option involves backfilling the contaminated exposed area beneath the slag pile with two feet of backfill material and riprap. No action is recommended in the riprap area. It is stated that health risks associated with exposure to these contaminated areas after the recommended remediation will be minimal.

We concur that supplemental standards should appropriately be applied to this area, and that the recommended options will satisfactorily protect the public health and environment.

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: B. Franz, CDH
M. Matthews, DOE
J. Garcia, DOE
M. Thomson, MK-F

REP	INFO	DIST	REP	INFO	DIST
	✓	JGO			FDC
					MW/H
	✓	REC			EAP
	✓	JEH/GFJ			AFP
		CDW			FJF/MKE
		JEH			GG/DD
		JJD			JEI
	✓	MBT			
		JGP			
		DDP			JWS
		SJS/DC			WAZ
					RSW
ORIG. FILE		STF-60			
WORK FILE		DuR			

FILE

DU-144A

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 (Ptarmigan Place/Denver)
(303) 248-7198 (Grand Junction Regional Office)

Roy Romer
Governor

Thomas M. Vernon, M.D.
Executive Director

MK-FERGUSON CO.
ALBUQUERQUE

JAN 08 1990

RECEIVED

December 28, 1989

J. G. Oldham
MK-Ferguson Company
P.O. Box 9136
Albuquerque, New Mexico 87119

Re: State Concurrence on Durango Processing Site Final REA for DU-144A, File DUR-XIII.N

Dear Mr. Oldham:

We are pleased to provide State concurrence on the Final REA for DU-144A.

On November 1, 1989, we provided State concurrence on the draft REA for DU-144. The final REA is substantitively similar to the draft REA. Therefore, our comments have not changed.

We concur that supplemental standards should be applied to this area, and that the recommended options will satisfactorily protect the public health and environment.

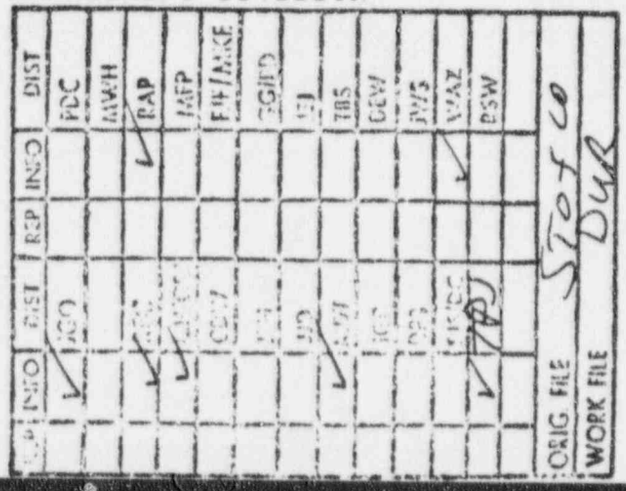
If you have any questions, please contact Patricia Martinek at (303) 331-4828.

Sincerely,

Edward L. Bischoff
UMTRA Program Manager

HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION

cc: B. Franz, CDH
M. Matthews, DOE
J. Garcia, DOE



Rob P.

RADIOLOGICAL AND ENGINEERING ASSESSMENT (REA)
Review Form

DOE Location No. Du 144A Rev. No. 0

PRIORITY: ☒ ROUTINE ☐ URGENT DATE 11-29-89
REQUESTED RESPONSE BY 12-15-89
COMMENTS: RECOMMENDATION OF SUPPLEMENTAL STANDARDS AS PREVIOUSLY DISCUSSED BY TAC, CDH, DOE, NRC.

Robert A Pomeroy 11-29-89
VP MANAGER DATE
CONT. ON ATTACHED SHEET NO. ____

TAC

DATE RECEIVED 1/25/90 (REVISED)
☐ RECOMMEND APPROVAL ☒ RECOMMEND APPROVAL AS NOTED BELOW ☐ DO NOT RECOMMEND APPROVAL AS NOTED BELOW

COMMENTS: SEE ATTACHED
Standard REA response form is appropriate

Concurred by phone 2/1/90
Robert Ogle Murphy 1/29/90
TAC DATE
CONT. ON ATTACHED SHEET NO. ____

STATE

DATE TRANSMITTED ____
☐ APPROVED ☐ APPROVED AS NOTED ☐ NOT APPROVED AS NOTED
RESPONSE DATE ____ ATTACHED RESPONSE ON SHEET NO. ____

NRC

DATE TRANSMITTED ____
☐ APPROVED ☐ APPROVED AS NOTED ☐ NOT APPROVED AS NOTED
RESPONSE DATE ____ ATTACHED RESPONSE ON SHEET NO. ____

TRIBE

DATE TRANSMITTED ____
☐ APPROVED ☐ APPROVED AS NOTED ☐ NOT APPROVED AS NOTED
RESPONSE DATE ____ ATTACHED RESPONSE ON SHEET NO. ____

DOE-UMTRA

DATE RECEIVED Nov 30 1989
☐ APPROVED ☒ APPROVED AS NOTED ☐ NOT APPROVED AS NOTED
COMMENTS:

MK-FERGUSON CO.
ALBUQUERQUE
FEB 02 1990
RECEIVED

Paul Thompson 2/1/90
DOE VP MANAGER DATE
SHEET NO. 1 OF ____

RADIOLOGICAL AND ENGINEERING ASSESSMENT (REA)
Review Form

Date Received: 1/25/90 (Revised) DOE Location No. DU-144A
Date due DOE:

[X] RECOMMEND APPROVAL AS NOTED BELOW

[ ] DO NOT RECOMMEND APPROVAL AS NOTED BELOW

REVIEWED BY: Robert Murphy DATE: 1/29/90

REVIEWED BY: _____ DATE: _____

VP MANAGER: Richard M. Nova DATE: 2/1/90

PAGE	COMMENT
2	In "Estimated Extent of Contamination" section, the following should be added to the end of the first paragraph: "However, the deposit in Area G does not exceed the EPA standards or NRC guidelines, as discussed in Appendix D."
2	In "Option I" section, it should be stated that areas D and F are presently covered with 2 feet of riprap.
2	In "Option II" seciton, the depths should be specified as estimated.
2	In "Option II" section, the excavation depth in Area D is inconsistent with drawing DU-144A-015, which indicates a depth of 2½ feet. (Also on page 3.)
5	Estimated volume of material to remain should be 845 cy.
17	Is this the cost for common fill and riprap?
18	Item 1.1 should state "Z-Pile" not "2-Pile." Item 2.1 should indicate a quantity of 85 cy and Item 2.5 should indicate a quantity of 40 cy (per Drawing DUR-144A-015). Item 2.5 should indicate Area B.
App. C	The most recent letter from CDH should be included.

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

REVIEW COMMENTS

UMTRA Project No. DE-AC04-83AL18796

Date February 6, 1990

Page 1 of 1

Site Name: Durango

Site No.: DU-144A

Document Reviewed: Radiological and Engineering Assessment (REA)

Reference (Drwg. No., Spec. Sec., Etc.)	Reviewer	Comment	Resolution
Page 2	TAC	In "Estimated Extent of Contamination" section, the following should be added to the end of the first paragraph: "However, the deposit of Area G does not exceed the EPA standards or NRC guidelines, as discussed in Appendix D."	Agreed, REA revised.
Page 2	TAC	In "Option I" section, it should be stated that Areas D and F are presently covered with 2 feet of riprap.	Agreed, REA revised.
Page 2	TAC	In "Option II" section, the depths should be specified as estimated.	Agreed, REA revised.
Page 2	TAC	In "Option II" section, the excavation depth in Area D is inconsistent with drawing DU-144A-015, which indicated a depth of 2.5 feet. (Also on page 3)	REA revised to indicate an estimated depth of 2.5 feet in Area D.
Page 5	TAC	Estimated volume of material to remain should be 845 cy.	Agreed, REA revised.
Page 17	TAC	Is this the cost for common fill and riprap?	The cost for riprap will be added to the table.
Page 18	TAC	Item 1.1 should state "Z-Pile" not "2-Pile." Item 2.1 should indicate a quantity of 85 cy and Item 2.5 should indicate a quantity of 40 cy (per Drawing DU-144A-015). Item 2.5 should indicate Area B.	Agreed, REA revised.
Appendix C 2786F	TAC	The most recent letter from CDH should be included.	See Appendix C.

APPENDIX D

URANIUM LENS DISCUSSION

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 19, 1989

89-3050-705

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)

bcc: M.D. Thomson - DUR (w/attachment)
M.F. Petelka (w/attachment)
R.E. Cooney (w/attachment)
T. Jennings (w/attachment)
J.B. Turner (w/attachment)
File - EDT (w/attachment)
HS-018-09-89 (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.

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY
UMTRA PROJECT OFFICE
P.O. BOX 9136
ALBUQUERQUE, NEW MEXICO 87119