

ATTACHMENT C

COST ESTIMATES
FOR
RECLAMATION
OF
WHITE MESA FACILITIES
BLANDING, UTAH

PREPARED BY
INTERNATIONAL URANIUM (USA) CORP.
1050 17th STREET, SUITE 950
DENVER, COLORADO 80265

**Cost Estimates for
Reclamation**

Of

White Mesa Mill

Blanding, Utah

JULY 2000

Source Material License No. SUA-1358

Docket No. 40-8681

Cost Estimates for Reclamation of White Mesa Mill

Table of Contents

1. Cost Summary
2. Mill Decommissioning
3. Cell 2 Calculations
4. Cell 3 Calculations
5. Cell 4A Calculations
6. Cell 1 Calculations
7. Miscellaneous Cost Calculations
8. Rock Production Costs
9. Equipment Costs
10. Labor Costs
11. Long Term Care Calculation

Project Startup	
ID	Task Name
1	Start Reclamation
2	Obtain Permit for Borrow Site Section 16
3	Reclamation Complete
Mill Decommissioning	
4	Mill Building Demolition
5	Ore Feed and Concretion
6	SX Building Demolition
7	C&D Crush Removal
8	Vandium Oxidation Circuit Removal
9	Baler Plant Demolition
10	Sample Plant Demolition
11	Mk. Tankage and Spare Parts
12	Change Equipment Storage Area
13	Main Shop Warehouse Demolition
14	Mkt Yard Decommission
15	Ore Storage Pits Decommission
16	Remove Mill Yard and Ore Pad
17	Remove Office Building
18	Score Strip Survey
19	Characterization Survey
20	Windblown Cleanup
21	Final Status Survey
22	Quality Control
23	Reclamation of Cell 4A
24	Dewatering
25	Remove Packing
26	Remove Liner and Contaminated Materials
27	Quality Control
28	Reclamation of Cell 2
29	Dewatering
30	Place Remnant of Shipping LA
31	Place Upper 12' Platform
32	Place Clay Layer (Random Barrier)
33	Place Upper Random Fill (Fract Barrier)
34	Place Rock Armor
35	Quality Control
36	Reclamation of Cell 14
37	Dewatering
38	Crest Removal
39	Contaminated Material Removal
40	Topped Application
41	Construct Outer Channel
42	Installation of Clay Liner
43	Disposal of Mill Dumps and Contaminated Soil
44	Place Lower Random Fill
45	Place Clay Layer (Random Barrier)
46	Place Upper Random Fill (Fract Barrier)
47	Place Rock Armor
48	Quality Control
49	Reclamation of Cell 3
50	Dewatering
51	Place Remnant of Shipping LA
52	Place Upper 12' Platform
53	Place Clay Layer (Random Barrier)
54	Place Upper Random Fill (Fract Barrier)
55	Place Rock Armor
56	Quality Control
57	Reclamation of Cell 25
58	Dewatering
59	Place Remnant of Shipping LA
60	Place Upper 12' Platform
61	Place Clay Layer (Random Barrier)
62	Place Upper Random Fill (Fract Barrier)
63	Place Rock Armor
64	Quality Control

WHITE MESA MILL RECLAMATION COST ESTIMATE
July 2000

		<u>July 2000 Estimate</u>
Mill Decommissioning		\$1,505,167
Cell 2		\$1,082,870
Cell 3		\$1,565,444
Cell 4A		\$120,128
Cell 1		\$1,234,212
Miscellaneous		\$1,939,480
Subtotal Direct Costs		<u>\$7,447,302</u>
Profit Allowance	10.00%	\$744,730
Contingency	15.00%	\$1,117,095
Licensing & Bonding	2.00%	\$148,946
Long Term Care Fund		\$606,721
Total Reclamation		<u>\$10,064,794</u>
Revised Bond Amount		<u><u>\$10,064,794</u></u>

MILL DECOMMISSIONING

MILL DECOMMISSIONING

Mill Building Demolition

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	720	\$12,757
Mechanics	hrs	\$13.80	640	\$8,829
Laborers	hrs	\$10.35	320	\$3,311
Small Tools	hrs	\$1.25	960	\$1,200
Cat 769 Haul Truck	hrs	\$60.52	640	\$38,735
Truck Drivers	hrs	\$12.74	640	\$8,154
Cat 988 Loader	hrs	\$95.68	160	\$15,308
Cat 375 Excavator	hrs	\$123.76	160	\$19,802
PC-400 with Shears	hrs	\$159.84	160	\$25,574
65 Ton Crane	hrs	\$55.91	160	\$8,946
30 Ton Crane	hrs	\$40.80	80	\$3,264
Equipment Maintenance (Butler)	hrs	\$10.01	1,360	\$13,617
Concrete Removal	sf	\$3.30	37,500	\$123,750

Total Mill Building Demolition

\$283,247

Ore Feed Demolition

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	48	\$850
Mechanics	hrs	\$13.80	64	\$883
Laborers	hrs	\$10.35	32	\$331
Small Tools	hrs	\$1.25	96	\$120
Cat 769 Haul Truck	hrs	\$60.52	64	\$3,873
Truck Drivers	hrs	\$12.74	64	\$815
Cat 988 Loader	hrs	\$95.68	16	\$1,531
Cat 375 Excavator	hrs	\$123.76	16	\$1,980
PC-400 with Shears	hrs	\$159.84	16	\$2,557
30 Ton Crane	hrs	\$40.80		\$0
Equipment Maintenance (Butler)	hrs	\$10.01	112	\$1,121

Total Ore Feed Demolition

\$14,063

SX Building Demolition

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	240	\$4,252
Mechanics	hrs	\$13.80	320	\$4,415
Laborers	hrs	\$10.35	160	\$1,655
Small Tools	hrs	\$1.25	480	\$600
Cat 769 Haul Truck	hrs	\$60.52	320	\$19,367
Truck Drivers	hrs	\$12.74	320	\$4,077
Cat 988 Loader	hrs	\$95.68	80	\$7,654
Cat 375 Excavator	hrs	\$123.76	80	\$9,901
PC-400 with Shears	hrs	\$159.84	80	\$12,787
65 Ton Crane	hrs	\$55.91		\$0
30 Ton Crane	hrs	\$40.80		\$0
Equipment Maintenance (Butler)	hrs	\$10.01	560	\$5,607
Concrete Removal	sf	\$3.30	55,970	\$184,701

Total SX Building Demolition

\$255,017

CCD Circuit Removal

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	195	\$3,455
Mechanics	hrs	\$13.80	120	\$1,655
Laborers	hrs	\$10.35	60	\$621
Small Tools	hrs	\$1.25	180	\$225
Cat 769 Haul Truck	hrs	\$60.52	120	\$7,263
Truck Drivers	hrs	\$12.74	120	\$1,529
Cat 988 Loader	hrs	\$95.68	30	\$2,870
Cat 375 Excavator	hrs	\$123.76	30	\$3,713
PC-400 with Shears	hrs	\$159.84	30	\$4,795
65 Ton Crane	hrs	\$55.91	30	\$1,677
30 Ton Crane	hrs	\$40.80	15	\$612
Equipment Maintenance (Butler)	hrs	\$10.01	315	\$3,154
Concrete Removal	sf	\$3.30	15,000	\$49,500

Total CCD Circuit Removal

\$81,070

MILL DECOMMISSIONING

Sample Plant Removal

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	24	\$425
Mechanics	hrs	\$13.80	32	\$441
Laborers	hrs	\$10.35	16	\$166
Small Tools	hrs	\$1.25	48	\$60
Cat 769 Haul Truck	hrs	\$60.52	32	\$1,937
Truck Drivers	hrs	\$12.74	32	\$408
Cat 988 Loader	hrs	\$95.68	8	\$765
Cat 375 Excavator	hrs	\$123.76	8	\$990
PC-400 with Shears	hrs	\$159.84	8	\$1,279
30 Ton Crane	hrs	\$40.80		\$0
Equipment Maintenance (Butler)	hrs	\$10.01	56	\$561
Concrete Removal	sf	\$3.30	4,200	\$13,860

Total Sample Plant Removal

\$20,892

Boiler Demolition

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	120	\$2,126
Mechanics	hrs	\$13.80	160	\$2,207
Laborers	hrs	\$10.35	80	\$828
Small Tools	hrs	\$1.25	240	\$300
Cat 769 Haul Truck	hrs	\$60.52	160	\$9,684
Truck Drivers	hrs	\$12.74	160	\$2,038
Cat 988 Loader	hrs	\$95.68	40	\$3,827
Cat 375 Excavator	hrs	\$123.76	40	\$4,951
PC-400 with Shears	hrs	\$159.84	40	\$6,394
65 Ton Crane	hrs	\$55.91		\$0
30 Ton Crane	hrs	\$40.80		\$0
Equipment Maintenance (Butler)	hrs	\$10.01	280	\$2,804
Concrete Removal	sf	\$3.30	2,900	\$9,570

Total Boiler Demolition

\$44,728

Vanadium Oxidation Circuit Removal

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	48	\$850
Mechanics	hrs	\$13.80	64	\$883
Laborers	hrs	\$10.35	32	\$331
Small Tools	hrs	\$1.25	96	\$120
Cat 769 Haul Truck	hrs	\$60.52	64	\$3,873
Truck Drivers	hrs	\$12.74	64	\$815
Cat 988 Loader	hrs	\$95.68	16	\$1,531
Cat 375 Excavator	hrs	\$123.76	16	\$1,980
PC-400 with Shears	hrs	\$159.84	16	\$2,557
65 Ton Crane	hrs	\$55.91		\$0
30 Ton Crane	hrs	\$40.80		\$0
Equipment Maintenance (Butler)	hrs	\$10.01	112	\$1,121
Concrete Removal	sf	\$3.30	1,200	\$3,960

Total Vanadium Oxidation Circuit Removal

\$18,023

Main Shop/Warehouse Demolition

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	96	\$1,701
Mechanics	hrs	\$13.80	128	\$1,766
Laborers	hrs	\$10.35	64	\$662
Small Tools	hrs	\$1.25	192	\$240
Cat 769 Haul Truck	hrs	\$60.52	128	\$7,747
Truck Drivers	hrs	\$12.74	128	\$1,631
Cat 988 Loader	hrs	\$95.68	32	\$3,062
Cat 375 Excavator	hrs	\$123.76	32	\$3,960
PC-400 with Shears	hrs	\$159.84	32	\$5,115
Equipment Maintenance (Butler)	hrs	\$10.01	224	\$2,243
Concrete Removal	sf	\$3.30	19,300	\$63,690

Total Main Shop/Warehouse Demolition

\$91,816

MILL DECOMMISSIONING

Office Building Demolition

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	72	\$1,276
Mechanics	hrs	\$13.80	96	\$1,324
Laborers	hrs	\$10.35	48	\$497
Small Tools	hrs	\$1.25	144	\$180
Cat 769 Haul Truck	hrs	\$60.52	96	\$5,810
Truck Drivers	hrs	\$12.74	96	\$1,223
Cat 988 Loader	hrs	\$95.68	24	\$2,296
Cat 375 Excavator	hrs	\$123.76	24	\$2,970
PC-400 with Shears	hrs	\$159.84	24	\$3,836
Equipment Maintenance (Butler)	hrs	\$10.00	168	\$1,680
Concrete Removal	sf	\$3.30	12,100	\$39,930

Total Office Building Demolition

\$61,023

Misc. Tankage & Spare Parts Removal

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	24	\$425
Mechanics	hrs	\$13.80	32	\$441
Laborers	hrs	\$10.35	16	\$166
Small Tools	hrs	\$1.25	48	\$60
Cat 769 Haul Truck	hrs	\$60.52	32	\$1,937
Truck Drivers	hrs	\$12.74	32	\$408
Cat 988 Loader	hrs	\$95.68	8	\$765
Cat 375 Excavator	hrs	\$123.76	8	\$990
PC-400 with Shears	hrs	\$159.84	8	\$1,279
Equipment Maintenance (Butler)	hrs	\$10.00	56	\$560
Concrete Removal	sf	\$3.20		\$0

Total Misc. Tankage & Spare Parts Removal

\$7,031

Mill Yard Decontamination

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	582	\$10,312
Cat 637 Scraper	hrs	\$140.50	257	\$36,110
Cat 988 Loader	hrs	\$95.68	65	\$6,219
Cat D8N Dozer With Ripper	hrs	\$68.67	65	\$4,463
Cat D7 Dozer	hrs	\$57.90	65	\$3,764
Cat 651 Waterwagon	hrs	\$72.12	65	\$4,688
Cat 14G Motorgrader	hrs	\$48.93	65	\$3,180
Equipment Maintenance (Butler)	hrs	\$10.01	582	\$5,827

Total Mill Yard Decontamination

\$74,563

Ore Storage Pad Decontamination

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	429	\$7,601
Cat 637 Scraper	hrs	\$140.50	189	\$26,555
Cat 988 Loader	hrs	\$95.68	48	\$4,593
Cat D8N Dozer With Ripper	hrs	\$68.67	48	\$3,296
Cat D7 Dozer	hrs	\$57.90	48	\$2,779
Cat 651 Waterwagon	hrs	\$72.12	48	\$3,462
Cat 14G Motorgrader	hrs	\$48.93	48	\$2,348
Equipment Maintenance (Butler)	hrs	\$10.01	429	\$4,295

Total Ore Storage Pad Decontamination

\$54,930

Equipment Storage Area Cleanup

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	154	\$2,729
Cat 637 Scraper	hrs	\$140.50	69	\$9,695
Cat 988 Loader	hrs	\$95.68	17	\$1,627
Cat D8N Dozer With Ripper	hrs	\$68.67	17	\$1,167
Cat D7 Dozer	hrs	\$57.90	17	\$984
Cat 651 Waterwagon	hrs	\$72.12	17	\$1,226
Cat 14G Motorgrader	hrs	\$48.93	17	\$832
Equipment Maintenance (Butler)	hrs	\$10.01	154	\$1,542

Total Equipment Storage Area Cleanup

\$19,801

MILL DECOMMISSIONING

Revegetate Mill Yard & Ore Pad

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	231	\$4,093
Cat 637 Scraper	hrs	\$140.50	132	\$18,547
Cat 988 Loader	hrs	\$95.68	0	\$0
Cat D8N Dozer With Ripper	hrs	\$68.67	33	\$2,266
Cat D7 Dozer	hrs	\$57.90	33	\$1,911
Cat 651 Waterwagon	hrs	\$72.12		\$0
Cat 14G Motorgrader	hrs	\$48.93	33	\$1,615
Equipment Maintenance (Butler)	hrs	\$10.01	231	\$2,313

Total Revegetate Mill Yard & Ore Pad

\$30,744

Total Demolition and Decontamination

\$1,056,948

CLEANUP OF WINDBLOWN CONTAMINATION

Scoping Survey

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Soil Samples	each	\$50.00	100	\$5,000
Survey Crew	hrs	\$13.19	752	\$9,917
Sample Crew	hrs	\$13.19	1,312	\$17,301

Total Scoping Survey

\$32,218

Characterization Survey

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Soil Samples	each	\$50.00	472	\$23,600
Sample Crew	hrs	\$13.19	1,136	\$14,980

Total Characterization Survey

\$38,580

Final Status Survey

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Soil Samples	each	\$50.00	300	\$15,000
Sample Crew	hrs	\$13.19	3,552	\$46,840

Total Final Status Survey

\$61,840

Windblown Cleanup

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	1,190	\$21,084
Cat 637 Scraper	hrs	\$140.50	680	\$95,543
Cat D8N Dozer With Ripper	hrs	\$68.67	170	\$11,674
Cat D7 Dozer	hrs	\$57.90	170	\$9,844
Cat 14H Motorgrader	hrs	\$48.93	170	\$8,317
Soil Samples	each	\$50.00	500	\$25,000
Survey Crew	hrs	\$13.19	163	\$2,149
Sample Crew	hrs	\$13.19	83	\$1,095
Equipment Maintenance (Butler)	hrs	\$10.01	1,190	\$11,915

Total Windblown Cleanup

\$186,621

Quality Control

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Quality Control Contractor	hrs	\$62.00	2,080	\$128,960

Total Quality Control

\$128,960

Total Cleanup Windblown Contamination

\$448,219

TOTAL MILL DECOMMISSIONING

\$1,505,167

INTERNATIONAL URANIUM (USA) CORP.
COST ESTIMATE

PROJECT..... DATE..... CALC BY..... SHEET..... OF.....

MILL DECOMMISSIONING

1) REMOVAL OF CONTAMINATED MATERIALS FROM MILL YARD.

ASSUME:

- 18" (1.5 feet) WILL HAVE TO BE REMOVED
- AREA (FROM CAD) = 1,643,453 ft²
- = 37.8 ACRES

Therefore Volume Moved = $[1,643,453 \times 1.5] \div 27 = 91,302 \text{ yd}^3$

$\frac{91,300 \text{ yd}}{355 \text{ yd/hr}} = \boxed{257 \text{ hours}}$

say

$\boxed{91,300 \text{ yd}^3}$

Haul Route # 2

2) REMOVAL OF CONTAMINATED MATERIALS FROM CDS Pits

ASSUME:

- 18" WILL HAVE TO BE REMOVED
- AREA (FROM CAD) = 976,780 ft²
- = 22.4 ACRES.

Therefore

Volume Moved = $[976,780 \times 1.5] \div 27 = 54,265 \text{ yd}^3$

say $\boxed{54,300 \text{ yd}^3}$

$\frac{54,300 \text{ yd}}{287 \text{ yd/hr}} = \boxed{189 \text{ hours}}$

Haul Route # 3

INTERNATIONAL URANIUM (USA) CORP.
COST ESTIMATE

IE/PROJECT..... Date..... Calc by..... Sheet..... of.....

MILL DECOMMISSIONING

3) DEMOLITION EQUIPMENT

- KAMATSU PC400 (OR CAT EQUIVALENT) WITH La Bounty Shears (hydraulic)
- CAT 275L BACKHOE W/ GRAPPLES.
- 769C ROCK TRUCKS (4 ea)
- 988 LOADER (1 ea)

4) DEMOLITION CREW.

- HEAVY EQUIPMENT OPERATORS - PC400, 275, 988
- DUST CONTROL - 2 - LABORERS
- MECHANICS - CUTTING UP OF DEBRIS TO REMOVE VOIDS 4
- TRUCK DRIVERS - 4 ea - 769D TRUCKS

5) TOOL & EXPENDABLE ALLOWANCE, COVERING THE FOLLOWING:

- SAFETY GEAR
- HAND TOOLS
- BOTTLED GASES & TORCHES.
- ALLOW 1.25 / MAN HOUR FOR ALL BUT H.E. OPERATORS + TRUCK DRIVERS

PROJECT

Date

Cost by

Sheet of

MILL RECONSTRUCTION

6) DETAILING TIME ESTIMATES. (SHEAR & GERRARD)

• MILL BUILDING	20 days
• COARSE ORE	2 days
• SX BUILDING	10 days
• CCD, RT, LAKEWARE	5 days
• SAMPLE PLANT	1 day
• BOILER	5 days
• VANADIUM OXIDATION	2 days
• SHOP/WAREHOUSE	4 days
• OFFICE BUILDING	3 days
• MIX TANKS & NORTH FOOT	4 days

7) FOUNDATION DETAILING

- ASSUME THAT MEANS 020-750-0440 OVER ENTIRE AREA OF STRUCTURES WITH SURFACE @ \$3.33/sq ft
- DEEPS ARE AS FOLLOWS. (FROM CAN)

MILL BUILDING	37,500	120,000
SX BUILDING	55,970	179,100
SHOP/WAREHOUSE	19,280	61,700
OFFICE	12,100	38,700
SAMPLE PLANT	4,200	13,400
DIESEL SHOP	2050	6,600
BOILER	2900	9,300
LABOR @ 2.75, EQUIP @ .55		

INTERNATIONAL URANIUM (USA) CORP.
COST ESTIMATE

PROJECT Date Calc by Sheet of

MILL DECOMMISSIONING

B) REVEGETATION

Assume ---

- Mill Road Area = 1,643,453 ft²
- OEE Pad Area = 976,780 ft²
- Race 6"
- 637 Route #4 APPROXIMATES HAVE

$$\frac{\text{Hour}}{\text{yd}^3} \left[[1,643,453 + 976,780] \text{ ft}^2 + \frac{1}{2} \text{ ft} \right] \div 27 \frac{\text{ft}^3}{\text{yd}^3} = 48,522 \text{ yd}^3$$

SPY

$$\boxed{48,600 \text{ yd}^3}$$

$$\frac{48,600 \text{ yd}^3}{360 \text{ yd}^3/\text{hr}} = \boxed{132 \text{ "637" hours}}$$

MILL DECOMMISSIONING

WIND BLOWN CONTAMINATION

1) Scoping Survey

- INITIAL SURVEY WILL BE CONDUCTED ON A AREA TO BE DETERMINED BUT FOR THIS ESTIMATE IT IS DEFINED AS AN AREA APPROXIMATED BY A PERIMETER 1000 FEET OUTSIDE OF THE RESTRICTED AREA BOUNDARIES THIS IS CONSERVATIVE SINCE WIND BLOWN CONTAMINATION WOULD MOST LIKELY BE FOUND DOWN WIND OF THE SITE, WHICH IS ON THE EAST SIDE OF THE RESTRICTED AREA
- AREA DETERMINED BY CAP. = 38,728,000 ft²

AREA REQUIRING WIND BLOWN SURVEY IS

TOTAL AREA -	38,728,000 ft ²
Cell 4A	1,909,000 ft ²
Cell 3	3,234,000 ft ²
Cell 2	2,987,000 ft ²
Cell 1	2,576,000 ft ²
MILL YARD	1,643,000 ft ²
ORE STORAGE PAD	977,000 ft ²
	<hr/>
	25,402,000 ft ²

- ASSUME PLACEMENT OF STANDARD NRC/EPA 10 X 10 meter grid (1076 ft²)
- ASSUME Scoping Survey Completed by Scanning WITH MR meter Hold Close TO ground while traveling at ± 0.5 m/sec AS per Guidance IN NUREG 5849.
- SURVEY CREW OF 2 Capable of SETTING 500 grid points per Day

$$\frac{25,402,000 \text{ ft}^2}{1076 \text{ ft}^2} = 23,600 \text{ Grid points}$$

$$\frac{23,600 \text{ Points}}{500 \text{ Points/Day}} \approx 47 \text{ Days}$$

$$2 \text{ men} \times 8 \text{ hrs} \times 47 \text{ Days} = \boxed{752 \text{ manhrs}} - \text{Survey}$$

- Scanning Crew Consists of 2 men -

- Coverage $0.5 \text{ m/sec} \times 60 \text{ sec/min} \times 8 \text{ hrs/day} = 14,400 \text{ m/day}$
Assume .8 eff. factor
 $14,400 \text{ m/day} \times .8 = 11,520 \text{ m/day}$

Wind blown Contamination - Scoping Survey

- Assume 30 meter Path for each 10 x 10 grid to cover 10% of surface area (per NUREG 5549)

$$\text{CREW CAN SCAN } \frac{11,520 \text{ m/day}}{30 \text{ m/grid}} = 384 \text{ Grids/day}$$

$$\therefore \frac{23,600 \text{ Grids}}{384 \text{ Grids/day}} \approx 62 \text{ Day TO Complete INITIAL SCAN}$$

$$62 \text{ Days} \times 2 \text{ men} \times 8 \text{ hrs/day} = \boxed{992 \text{ man hrs}}$$

- Assume MAP PRODUCTION + DATA Reduction take SCANNING CREW AN ADDITIONAL 20 Days TO Complete

$$20 \text{ Days} \times 2 \text{ men} \times 8 \text{ hrs/day} = \boxed{320 \text{ man hrs}}$$

$$\text{TOTAL SCANNING Man hrs} = \boxed{1312}$$

- Scoping Survey will require 100 Contamination Soil Samples at a Cost of \$ 50.00 /each (Unit + R 226)
- Samples Can be taken at same time as Scanning takes place.

2) CHARACTERIZATION SURVEY -

Survey of areas identified as affected areas of Scoping Survey

• ASSUMES:

- 20% of area will require additional Sampling
- Probing will be used, 4 probe sites /grid (2 in, 2 out)
- Soil Samples will be required on 10% of Grid Samples
 - Samples will be for Unit + R 226
 - Cost / Sample = \$ 50 (LAB)

$$\frac{25,402,000 \text{ ft}^2}{1076 \text{ ft}^2/\text{grid}} = 23,608 \text{ Grids} \times .2 = 4722 \text{ Grids}$$

- Crew can cover 100 Grids /day probing
- Crew can take 25 Soil Samples /day

$$\text{Probing takes } \frac{4722 \text{ Grids}}{100 \text{ Grids/day}} \approx \boxed{47 \text{ Days}}$$

$$47 \times 2 \times 8 = \boxed{752 \text{ hrs}}$$

WINOBSAN CONTAMINATION - Groundwater Survey

Soil Samples are 10% of Free grids

$$4721 \times .10 = 472 \text{ Soil Samples}$$

$$472 \text{ Samples} \approx \frac{25 \text{ samples/box}}{19.095} \times 800 \times 2 = \boxed{304 \text{ hrs}}$$

Map preparation + Data Reduction for 5 days

$$5 \times 2 \times 5 = \boxed{180 \text{ hrs}}$$

$$\text{Total Hrs} = \boxed{1136 \text{ man hrs}}$$

3) RECONCILIATION CONTRACT SURVEY

• Provided by QA/QC Contractor

4) FINAL STATUS SURVEY

- IN ORDER TO GAIN FINAL RESULTS, WILL REQUIRE 4 Gamma Estimates
- FOR EACH 100 m² GRID SQUARE IN THE AFFECTED AREA (202 g Area)
- 200 RANDOM SOIL SAMPLES WILL BE OBTAINED FROM THE AFFECTED AREA (802 g Area)
- WILL REQUIRE 100 CONFORMANCE SAMPLES FOR THE AFFECTED AREA

$$25,402 \div 1076 \text{ ft}^2/100 \text{ m}^2 = 23,607 \text{ Grids Total}$$

$$23,607 \times 0.20 = 4,721 \text{ Grids Directed}$$

$$4,721 \times 4 = 18,886 \text{ Gamma Estimates}$$

• (Can Take 100 Random Samples/Day

$$\therefore 18,886 \div 100 = 188.86 \text{ days}$$

• (Can Take 25 Soil Samples/Day

$$\therefore [200 + 100] \div 25 = 12 \text{ days}$$

• Assume 20 additional Days for Data Reduction + Report Generation

INTERNATIONAL URANIUM (USA) CORP.
COST ESTIMATE

PROJECT..... Date..... Calc by..... Sheet..... of.....

MILL DECOMMISSIONING
WIND BLOWN CONTAMINATION (Cont)

5) CLEAN-UP.

- ASSUME 20% OF AREA SURVEYED REQUIRES CORRECTIVE ACTION
- 6" OF SOIL WILL BE STRIPPED

$$\begin{aligned} \text{Therefore } 25,402 \text{ M}^2 \times 0.20 \times 0.5 \text{ Ft} &= 2,540,000 \text{ Ft}^3 \\ &\approx 94,000 \text{ yd}^3 \\ \text{say } &\boxed{94,100 \text{ yd}^3} \end{aligned}$$

- AS IT IS NOT KNOWN WHAT AREAS MAY BE CONTAMINATED, ASSUME THE USE OF 637 MAIL ROUTE #6 TO BE CONSERVATIVE
- BECAUSE OF THE POTENTIAL FOR IRREGULAR & DISCONNECTED AREAS, EFFICIENCY WILL BE ONLY 50% OF REGULAR 637 EFFICIENCY.

$$\begin{aligned} \text{Therefore } 277 \text{ yd}^3/\text{hr} \times 0.50 &= 138.5 \text{ yd}^3/\text{hr} \\ \text{say } &\boxed{138 \text{ yd}^3/\text{hr}} \end{aligned}$$

$$\begin{aligned} \text{Therefore } 94,100 \text{ yd}^3 \div 138 \text{ yd}^3/\text{hr} &= 681 \text{ scraper hours} \\ \text{say } &\boxed{680 \text{ hours}} \end{aligned}$$

RECLAMATION OF CELL 2

RECLAMATION OF CELL 2

Obtain Permits for Clay Borrow Site - Section 16

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Permits & Licenses	ea	\$10,000.00	5	\$50,000

Total Obtain Permits for Clay Borrow Site - Section 16

\$50,000

Place Remainder of Bridging Lift

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	178	\$3,154
Cat 627F Scraper	hrs	\$140.50	78	\$10,959
Cat 815C Compactor	hrs	\$66.15	20	\$1,323
Cat D8N Dozer With Ripper	hrs	\$68.67	20	\$1,373
Cat D7 Dozer	hrs	\$57.90	20	\$1,158
Cat 651 Waterwagon	hrs	\$72.12	20	\$1,442
Cat 14G Motorgrader	hrs	\$48.93	20	\$979
Equipment Maintenance (Butler)	hrs	\$10.01	178	\$1,782

Total Place Remainder of Bridging Lift

\$22,171

Place Lower Random Fill (12")

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	902	\$15,981
Cat 637 Scraper	hrs	\$140.50	402	\$56,483
Cat 825 Compactor	hrs	\$66.15	100	\$6,615
Cat D8N Dozer With Ripper	hrs	\$68.67	100	\$6,867
Cat D7 Dozer	hrs	\$57.90	100	\$5,790
Cat 651 Waterwagon	hrs	\$72.12	100	\$7,212
Cat 14G Motorgrader	hrs	\$48.93	100	\$4,893
Equipment Maintenance (Butler)	hrs	\$10.01	902	\$9,032

Total Place Lower Random Fill (12")

\$112,872

Clay Layer

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	1,690	\$29,943
Cat 825 Compactor	hrs	\$66.15	320	\$21,167
Cat D8N Dozer With Ripper	hrs	\$68.67	300	\$20,601
Cat D7 Dozer	hrs	\$57.90	0	\$0
Cat 651 Waterwagon	hrs	\$72.12	300	\$21,635
Cat 14G Motorgrader	hrs	\$48.93	320	\$15,656
Cat 980 Loader	hrs	\$64.99	300	\$19,496
5000 Gallon Water Truck	hrs	\$40.64	150	\$6,095
Highway Trucks	hrs	\$40.00	2,400	\$96,000
Truck Drivers	hrs	\$12.74	2,400	\$30,577
Equipment Maintenance (Butler)	hrs	\$10.01	4,090	\$40,952

Total Place Clay Layer

\$302,123

RECLAMATION OF CELL 2

Upper Random Fill

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	1,990	\$35,258
Cat 637 Scraper	hrs	\$140.50	796	\$111,842
Cat 825 Compactor	hrs	\$66.15	199	\$13,163
Cat D8N Dozer With Ripper	hrs	\$68.67	199	\$13,665
Cat D7 Dozer	hrs	\$57.90	199	\$11,523
Cat 651 Waterwagon	hrs	\$72.12	199	\$14,352
Cat 14G Motorgrader	hrs	\$48.93	199	\$9,736
5000 Gallon Water Truck	hrs	\$40.64	199	\$8,087
Equipment Maintenance (Butler)	hrs	\$10.01	1,990	\$19,925

Total Place Upper Random Fill

\$237,551

Rock Armor

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	825	\$14,617
Cat D7 Dozer	hrs	\$57.90	275	\$15,924
Cat 651 Waterwagon	hrs	\$72.12	275	\$19,833
Cat 14G Motorgrader	hrs	\$48.93	275	\$13,454
Rock Cost Delivered	CY	\$3.34	66,200	\$220,965
Equipment Maintenance (Butler)	hrs	\$10.01	825	\$8,261

Total Place Rock Armor

\$293,053

Quality Control

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Quality Control Contractor	hrs	\$62.00	1,050	\$65,100

Total Quality Control

\$65,100

TOTAL RECLAMATION OF CELL 2

\$1,082,870

Volume Calculations
CELL 2

2/10/99

1) AREA OF CELL 2 - $2986,660 \text{ ft}^2 = \boxed{68.56 \text{ ACRES}}$

2) AREA OF CELL 2 STILL OPEN 2/10/99 (SEE FIGURE A)

$1000 \times 200 \text{ APPROXIMATE AREA} \approx 200,000 \text{ sf (4.6 ACRES)}$

3) ASSUMPTIONS:

- Bridging layer is placed using random fill from PILES WEST OF CELL 2
- Cell will be graded to Design elevation utilizing finer materials in random fill stockpiles and from "Clay" stockpiles.
- Clay will be mined, blended & hauled from borrow site located in Section 16 - 4 miles south of the mill - using Belly dump Trucks - Clay Layer on top of Cell only, except on South Slope Common to Cell 3
- The upper 2 feet of random fill will be placed utilizing the fine random fill and clay stockpiles
- Rock for side armor, Top armor and Toe aprons will come from an off-site gravel source 1 mile north of Blainey, Rock will be produced through screening, stockpiled and Trucked to the site at the time of use. Belly dump Trucks will dump gravel in windrows on the top and sides of the Cell.

4) Bridging Layer (Random Fill) LEFT TO PLACE

$$\frac{200,000 \text{ ft}^2 \times 3 \text{ ft}}{27 \text{ ft}^3/\text{cy}} = 22,222 \text{ cy} \rightarrow \boxed{23,000 \text{ cy}}$$

5) Bring Lower random fill up to Design elevations

Assume Full Area of Cell \times 1 foot thick

$$\frac{2,986,660 \text{ ft}^2 \times 1 \text{ ft}}{27 \text{ ft}^3/\text{cy}} = 110,617 \text{ cy} \rightarrow \boxed{110,700 \text{ cy}}$$

Volume Calculation Cell 2
(cont)

- 6) PLACEMENT OF CLAY LAYER (1 foot Thick on Top of cell ONLY)

Full Area of Cell x 1ft thick

$$\frac{2986,660 \text{ ft}^2 \times 1 \text{ ft}}{27 \text{ ft}^3/\text{cy}} = 110,617 \text{ cy} \rightarrow \boxed{110,700 \text{ cy}}$$

- 7) Upper Random Fill Volume - Top of Pile

Full Area of Cell x 2 ft Thick

$$\frac{2986,660 \text{ ft}^2 \times 2 \text{ ft}}{27 \text{ ft}^3/\text{cy}} = 221,234 \text{ cy} \rightarrow \boxed{221,300 \text{ cy}}$$

- 8) ARMOR PROTECTION - TOP OF CELL

Full Area of Cell x .5 ft

$$\frac{2986,660 \text{ ft}^2 \times .5 \text{ ft}}{27 \text{ ft}^3/\text{cy}} = 55,309 \text{ cy} \rightarrow \boxed{55,400 \text{ cy}}$$

- 9) Cell 2 North Slope (Slope #1) Common with Cell 1

- Average height = 12 feet
- Length = 2600 ft

- a) Random Fill to Reshape Slope From 3:1 TO 5:1

$$\begin{aligned} \text{First Wedge} & \left[\frac{12 \times 12 \times 5}{2} - \frac{12 \times 12 \times 3}{2} \right] \times 2600 \\ & = \frac{374,400 \text{ ft}^3}{27 \text{ ft}^3/\text{cy}} = 13,867 \text{ cy} \\ & = \boxed{13,900 \text{ cy}} \end{aligned}$$

Remaining Random Fill

$$\begin{aligned} & \left[\frac{15 \times 15 \times 5}{2} - \frac{12 \times 12 \times 5}{2} \right] \times 2600 \\ & = \frac{526,500 \text{ ft}^3}{27 \text{ ft}^3/\text{cy}} = \boxed{19,500 \text{ cy}} \end{aligned}$$

Volume Calculations Cell 2
(CONT)

Total Random Fill N Slope = $\boxed{33,400 \text{ cy}}$

b) Rock Armour 8" THICK - (67 ft)

$$\left[\frac{15.67 \times 15.67 \times 5}{2} - \frac{15 \times 15 \times 5}{2} \right] \times 2600 \text{ ft}$$

$$\frac{132,957 \text{ ft}^3}{27 \text{ ft}^3/\text{cy}} = 4925 \text{ cy} \rightarrow \boxed{5000 \text{ cy}}$$

c) Toe Apron $\frac{2 \times 7 \times 2600}{27} = 1348 \text{ cy} \rightarrow \boxed{1400 \text{ cy}} - \boxed{6400 \text{ cy}}$

10) North Slope Common with mine yard

- Average height 1 ft
- Average Length 900 ft

a) Random Fill - Wedge - $\left[\frac{1 \times 1 \times 5}{2} - \frac{1 \times 1 \times 3}{2} \right] \times 900 \text{ ft}$

$$\frac{900 \text{ ft}^3}{27 \text{ ft}^3/\text{cy}} = 33 \text{ cy} \rightarrow \boxed{100 \text{ cy}}$$

Remaining Fill \rightarrow Random $\left[\frac{4 \times 4 \times 5}{2} - \frac{1 \times 1 \times 5}{2} \right] \times 900 \text{ ft}$

$$\frac{33,750 \text{ ft}^3}{27 \text{ ft}^3/\text{cy}} = 1250 \text{ cy} \rightarrow \boxed{1300 \text{ cy}}$$

Total Random Fill $\boxed{1,400 \text{ cy}}$

b) Rock Armour 8" THICK

$$\left[\frac{4.67 \times 4.67 \times 5}{2} - \frac{4 \times 4 \times 5}{2} \right] \times 900$$

$$\frac{13,070 \text{ ft}^3}{27 \text{ ft}^3/\text{cy}} = 484 \text{ cy} \rightarrow \boxed{500 \text{ cy}}$$

No Toe Apron No Fill

Volume Calculation Cell 2
(CONT)

11) Cell 2 West Dike Slope #3

- Average Height 2 ft
- Length 500 ft.

a) Random Fill

$$\text{Wedge} \left[\frac{2 \times 2 \times 5}{2} - \frac{2 \times 2 \times 3}{2} \right] \times 500 = 2000 \text{ ft}^3 \\ = 74 \text{ cy} \rightarrow \boxed{100 \text{ cy}}$$

$$\text{Remaining Random fill} \left[\frac{5 \times 5 \times 5}{2} - \frac{2 \times 2 \times 5}{2} \right] \times 500$$

$$= \frac{26,250 \text{ ft}^3}{27 \text{ ft}^3/\text{cy}} = 972 \text{ cy} \Rightarrow \boxed{1000 \text{ cy}}$$

$$\text{Total} \quad \boxed{1100 \text{ cy}}$$

b) Rock Armor

$$\left[\frac{5.67 \times 5.67 \times 5}{2} - \frac{.5 \times 5 \times 5}{2} \right] \times 500$$

$$= \frac{8936 \text{ ft}^3}{27 \text{ ft}^3} \approx 331 \text{ cy} \rightarrow \boxed{400 \text{ cy}}$$

TOE Apron (?) → not required for slope 10' Long - Drainage from Cell goes south to Cell 3 and then off of South Slope of Cell 3

12) Cell 2 East Dike (Slope #4)

- Average height 1 ft
- Length = 1250 ft

a) Random Fill

$$\text{Wedge Form \# 10} \quad 1 \text{ ft}^3/\text{LF}$$

$$1 \text{ ft}^3/\text{LF} \times 1250' = 1250 \text{ ft}^3$$

$$= 46 \text{ cy} \rightarrow \boxed{100 \text{ cy}}$$

$$\text{Remaining Random Fill - Form \# 10} \quad 37.5 \text{ ft}^3/\text{LF}$$

$$\frac{37.5 \text{ ft}^3/\text{LF} \times 1250 \text{ LF}}{27 \text{ ft}^3/\text{cy}} = 1736 \text{ cy} \rightarrow \boxed{1800 \text{ cy}}$$

$$\text{Total - Random Fill}$$

$$\boxed{1900 \text{ cy}}$$

Volume Calculation Cell 2
(cont)

12 (cont) Rock Armor 8" (.67') Thick

Using #10 14.52 ft³/LF Dike

$$14.52 \times 1250 \text{ LF} = 18,152 \text{ ft}^3$$

$$\frac{18,152 \text{ ft}^3}{27 \text{ ft}^3/\text{cy}} \Rightarrow 672 \text{ cy} \rightarrow \boxed{700 \text{ cy}}$$

No Toe Armor

13) South Slope Cell 2 Comm with Cell 3

- Average Height 3 ft
- Length 3500 ft

a) Random Fill - Wedge $\rightarrow \left[\frac{3 \times 3 \times 5}{2} + \frac{3 \times 3 \times 5}{2} \right] \times 3500$

$$= \frac{31500 \text{ ft}^3}{27} = 1167 \text{ cy}$$

$$\rightarrow \boxed{1200 \text{ cy}}$$

b) Clay Layer $\left[\frac{4 \times 4 \times 5}{2} - \frac{3 \times 3 \times 5}{2} \right] \times 3500$

$$\frac{61250 \text{ ft}^3}{27} = 2268 \text{ cy} \rightarrow \boxed{2300 \text{ cy}}$$

c) Random Fill (upper) $\left(\frac{6 \times 6 \times 5}{2} - \frac{4 \times 4 \times 5}{2} \right) \times 3500$

$$\frac{175000 \text{ ft}^3}{27} = 6481 \text{ cy} \rightarrow \boxed{6500 \text{ cy}}$$

d) Rock Armor -

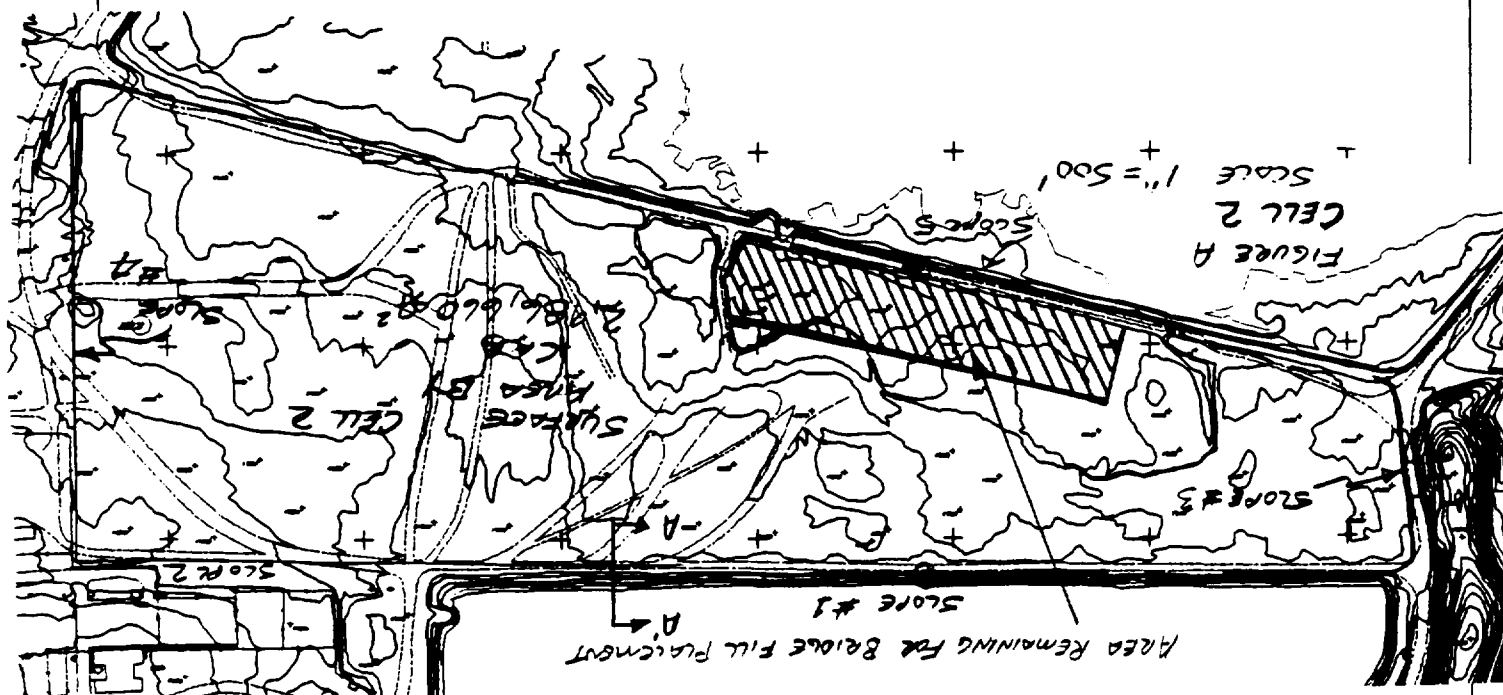
$$\left(\frac{6.67 \times 6.67 \times 5}{2} - \frac{6 \times 6 \times 5}{2} \right) \times 3500$$

$$\frac{74,275 \text{ ft}^3}{27} = 2751 \text{ cy} \rightarrow \boxed{2800 \text{ cy}}$$

No Toe Armor

COST ESTIMATE

Cell 2 Volume Calculations



SECTION A-A (NOT TO SCALE)

SHOWN COVER (6" TOP)

3:1 DIRT

3:1

Random Fill

Wedge

3:1

Rock Armor (8" Slope)

TOE APRON

BOTTOM OF CELL 1

AFTER CEMENTS AND LINER REMOVED.

TAILS

Random Fill

Gravel

Typical SECTION THRU EXISTING DIKE

After Cystos and Linc removed.

Bottom of Cell 1

TOE APRON

Rock Armor (8" slope)

Showing cover (6" top)

SECTION A-A (NOT TO SCALE)

Volume Calculations
Cell 2

Volume Summary.

	Bridge Layer	Lower Random	Clay	Upper Random	Remove
TOP OF CELL	23,000	110,700	110,700	221,300	55,400
NORTH (Slope #1)		13,900	—	19,500	6,400
NORTH (Slope #2)		100	—	1,300	500
WEST (Slope #3)		100	—	1,000	400
EAST (Slope #4)		100	—	1,800	700
SOUTH (Slope 5)		1200	2,300	6,500	2800
TOTALS	23,000	126,100	113,000	251,400	66,200

PROJECT QUANTITIES

Cell Slopes

Slope No.		Height feet	Length feet	EXISTING DIKE "A"		WEDGE "B"		RANDOM FILL "C"		RANDOM FILL "D"		RIPRAP "E"	
				AREA	VOL (CY)	AREA	VOL (CY)	AREA	VOL (CY)	AREA	VOL (CY)	AREA	VOL (CY)
1	Cell 2 North dike	12	2,600	216.0	20,800	144.0	13,867	62.5	6,019	140.0	13,481	51.7	4,976
2	Cell 2 North Dike	1	900	1.5	50	1.0	33	7.5	250	30.0	1,000	15.0	500
3	Cell 2 West Dike	2	500	6.0	111	4.0	74	12.5	231	40.0	741	18.3	340
4	Cell 2 East Dike	1	1,250	1.5	69	1.0	46	7.5	347	30.0	1,389	15.0	694
5	Cell 2 South Dike	3	3,500	0.0	0	9.0	1,167	17.5	2,269	50.0	6,481	30.7	3,976
Cell 2 Slope Totals			6,150		21,031		15,187		9,116		23,093		10,485
6	Cell 3 West Dike	2	1,100	6.0	244	4.0	163	12.5	509	40.0	1,630	18.3	747
7	Cell 3 South Dike	16	1,750	384.0	24,889	256.0	16,593	82.5	5,347	180.0	11,667	65.0	4,213
8	Cell 3 South Dike	39	1,700	2,281.5	143,650	1,521.0	95,767	197.5	12,435	410.0	25,815	141.7	8,920
9	Cell 3 East Dike	6	800	54.0	1,600	36.0	1,067	32.5	963	80.0	2,370	31.7	938
Cell 3 Slope Totals			5,350		170,383		113,589		19,255		41,481		14,819
Total Material Requirements (CY)					191,414		128,776		28,370		64,574		25,304

NOTE:

Values shown in the "Area" column are the CROSS SECTIONAL AREA for the component in SQUARE FEET.

Values shown in the "Volume" column are the component's area x length converted to CUBIC YARDS.

CELL 2 RECLAMATION

CAT 637 RESOURCE REQUIREMENTS

	Volume	Route	Yds/Hr	%	Equip hrs
Cell 2 Bridging Lift					
Tailings Surface	23,000	5	296	100%	77.7
				TOTAL	77.7
Cell 2 Lower Random fill					
Tailings surface	110,700	5	296	67%	250.6
Tailings Surface	110,700	4	368	33%	99.3
Slope 1	13,900	5	296	100%	47.0
Slope 2	100	4	368	100%	0.3
Slope 3	100	5	296	100%	0.3
Slope 4	100	4	368	100%	0.3
Slope 5	1,200	5	296	100%	4.1
				TOTAL	401.7
Cell 2 Upper Random Fill					
Tailings surface	221,300	5	296	67%	500.9
Tailings Surface	221,300	4	368	33%	198.4
Slope 1	19,520	5	296	100%	65.9
Slope 2	1,300	4	368	100%	3.5
Slope 3	100	5	296	100%	0.3
Slope 4	1,800	4	368	100%	4.9
Slope 5	6,500	5	296	100%	22.0
				TOTAL	796.0
Cell 2 Rock Armour use Highway Trucks					

WHITE MESA MILL REC '99

Clay Production

Haulage From Section 16

Haul Profile From Section 16 - LONOCO

#	Segment Length	Grade		Loaded	Empty
1	2000'	4%	600 m.	1 min	.65
2	1500'	11%	540 m	1.8 min	1 min
3	4200'	1.8%	1260 m	1.4 min	1.2 min
4	5600'	0.5%	1600 m	1.6 min	1.5 min
5	5700'	1.4%	1710 m	1.75 min	1.6 min
6	5200'	0.8%	1560 m	1.5 min	1.48 min
	<u>24,500'</u>			<u>9.05 min</u>	<u>7.43 min</u>

4.6 MILE TRIP LOADED

9.2 MILE ROUND TRIP

16.48 min

Clay = 2300^{cu}/cy house

FIXED TIMES - LOADING -

9001 7cy Bucket 3 passes to load
.5 min/cycle = 1.5 minutes load

Dump → using belly dumps → Continuous

1.5 minutes to load x 8 trucks = 12 minutes
Cycle is 18 minutes → 6 minutes to spread

OFF ROAD APPLICATION 22 cy/load

Cycle time = 18 minutes/truck

50 minutes/hr = 2.7 cycles/hr

22 cy/cycle x 2.7 cycles/hr x 8 trucks
= 475.2 cy/hr.

Cell 2 = $\frac{118,000 \text{ cu cy clay}}{8} = 14,750 \text{ cu cy}$ = 297 hrs Load + haulage + Dozer
(DOZER RATE 300 cy/hr / day =)

= 141,250 cu cy = 297 hrs (8 trucks) Spreading + compacting takes place
on material hauled.

Using 2 Loaders.

TRUCKS	297 x 1 =	297 hrs	- 2376 hrs (Excess hrs to stop 08 + Prep Site 297 - 300 297 300 + 20 297 300 300 + 20
DOZER	300 x 1 =	300 hrs	
LOADER	297 x 1 =	297 hrs	
GASOLINE	237 x 1 =	237 hrs	
MAN	288 x 1 =	288 hrs	
COMPACTOR			



INTERNATIONAL URANIUM (USA) CORP.
COST ESTIMATE

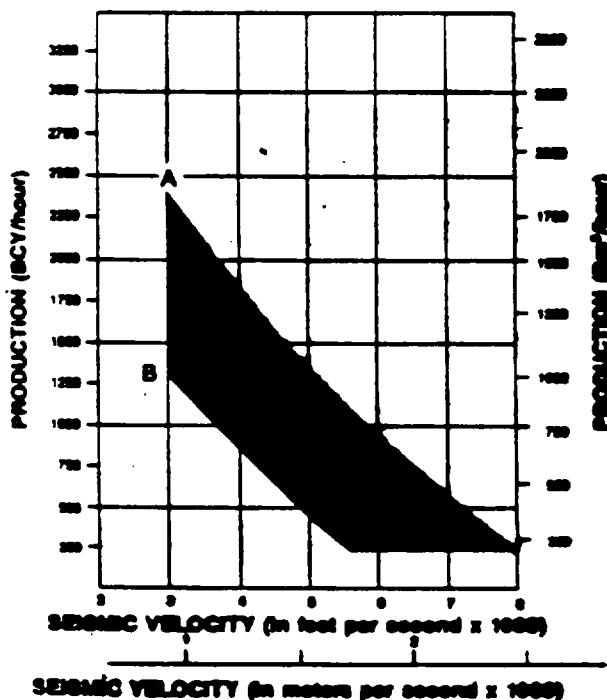
PROJECT WHITE MESA ROLL Date Calc by Sheet of

CLAY PRODUCTION COSTS
- SECTION 16 SOURCE -

1). CLAY PRODUCTION

- CLAYS WILL BE RIPPED FROM SOURCE @ SECTION 16
- APPROX 400 VERTICAL FEET OF BRUSHY BASIN EXPOSURE
- FROM CAT HAND BOOK ---
MAX SEISMIC VELOCITY OF CLAY \approx 6000 FT/SEC

DBL WITH SINGLE SHANK



KEY
A - IDEAL
B - AVERAGE

- BASED ON THE ABOVE, DB CAT SHOULD BE ABLE TO PRODUCE AT LEAST 250 BCY/HOUR WITH AN AVERAGE OF -

500 BCY/HR

- WE WILL ASSUME THAT THE CAT IS UTILIZED EVERY DAY OF CLAY PRODUCTION FOR RIPPING AND OR DOING BLENDED/ PREPARATION.

RECLAMATION OF CELL3

RECLAMATION OF CELL 3

Dewatering of Cell 3

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Dewatering of Cell 3	hrs	\$0.48	62,400	\$30,000

Total Dewatering of Cell 3

\$30,000

Place Remainder of Bridging Lift

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	1,945	\$34,465
Cat 637 Scraper	hrs	\$140.50	865	\$121,536
Cat 825 Compactor	hrs	\$66.15	216	\$14,304
Cat D8N Dozer With Ripper	hrs	\$68.67	216	\$14,832
Cat D7 Dozer	hrs	\$57.90	216	\$12,507
Cat 651 Waterwagon	hrs	\$72.12	216	\$15,578
Cat 14G Motorgrader	hrs	\$48.93	216	\$10,568
Equipment Maintenance (Butler)	hrs	\$10.01	1,945	\$19,477

Total Place Remainder of Bridging Lift

\$243,268

Place Lower Random Fill (12")

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	1,745	\$30,913
Cat 637 Scraper	hrs	\$140.50	775	\$108,891
Cat 825 Compactor	hrs	\$66.15	194	\$12,816
Cat D8N Dozer With Ripper	hrs	\$68.67	194	\$13,322
Cat D7 Dozer	hrs	\$57.90	194	\$11,233
Cat 651 Waterwagon	hrs	\$72.12	194	\$13,991
Cat 14G Motorgrader	hrs	\$48.93	194	\$9,491
Equipment Maintenance (Butler)	hrs	\$10.01	1,745	\$17,470

Total Place Lower Random Fill (12")

\$218,127

Clay Layer

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	1,975	\$34,993
Cat 637 Scraper	hrs	\$140.50	0	\$0
Cat 825 Compactor	hrs	\$66.15	375	\$24,805
Cat D8N Dozer With Ripper	hrs	\$68.67	350	\$24,034
Cat D7 Dozer	hrs	\$57.90	0	\$0
Cat 651 Waterwagon	hrs	\$72.12	350	\$25,241
Cat 14G Motorgrader	hrs	\$48.93	375	\$18,347
Cat 980 Loader	hrs	\$64.99	350	\$22,746
5000 Gallon Water Truck	hrs	\$40.64	175	\$7,111
Highway Trucks	hrs	\$40.00	2,800	\$112,000
Truck Drivers	hrs	\$12.74	2,800	\$35,674
Equipment Maintenance (Butler)	hrs	\$10.01	4,775	\$47,811

Total Place Clay Layer

\$352,761

RECLAMATION OF CELL3

Upper Random Fill

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	2,490	\$44,117
Cat 637 Scraper	hrs	\$140.50	996	\$139,943
Cat 825 Compactor	hrs	\$66.15	249	\$16,470
Cat D8N Dozer With Ripper	hrs	\$68.67	249	\$17,098
Cat D7 Dozer	hrs	\$57.90	249	\$14,418
Cat 651 Waterwagon	hrs	\$72.12	249	\$17,957
Cat 14G Motorgrader	hrs	\$48.93	249	\$12,182
5000 Gallon Water Truck	hrs	\$40.64	249	\$10,118
Equipment Maintenance (Butler)	hrs	\$10.01	2,490	\$24,932

Total Place Upper Random Fill **\$297,237**

Rock Armor

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	948	\$16,796
Cat D7 Dozer	hrs	\$57.90	316	\$18,298
Cat 651 Waterwagon	hrs	\$72.12	316	\$22,789
Cat 14G Motorgrader	hrs	\$48.93	316	\$15,460
Rock Cost Delivered	CY	\$3.34	76,110	\$254,043
Equipment Maintenance (Butler)	hrs	\$10.01	948	\$9,492

Total Place Rock Armor **\$336,879**

Quality Control

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Quality Control Contractor	hrs	\$62.00	1,406	\$87,172

Total Quality Control **\$87,172**

TOTAL RECLAMATION OF CELL 3

\$1,565,444

2/16/99

Volume Calculations Cell 3

1) Area of Top of cell by Cas - 3,234,252 ft²

74.25 ACRES

2) Area of Bridging layer (lower random) placed
1,030,000 ft²

25 ACRES

3) ASSUMPTIONS:

- Bridging Layer (Random Fill) comes from random fill stockpiles west of Cells - using haul route #6.
- STOCKPILES DESIGNATED AS "CLAY" will be used for top 12" of lower random fill
- Clay for the random barrier will be mined, blended, and hauled from Section 16 four miles South of the mill. 8" on slopes, 6" on top + 2'x7' apron at bottom of south slopes
- 2 foot layer of upper random fill will come from finer material in random fill stockpiles and "Clay" stockpiles
- Rock armor for top, side slopes, and toe aprons will come from same source as Cell 2 Rock Armor. → Gravel pit North of Blending.
- Clay layer extends over only the top of Cell NOT on slopes.

4) Bridging layer left to place

$$\frac{(3,234,252 \text{ ft}^2 - 1,030,000 \text{ ft}^2) \times 3 \text{ ft}}{27 \text{ ft}^3/\text{cy}} = \text{CY}$$

$$\frac{2154252 \times 3}{27} = 239,361 \text{ CY}$$

239,400 CY

5) Bring lower random fill up to design elevations (assume even slope area for estimate, in reality parts of east end of pond is up to elevation already.)

$$\frac{3,234,252 \text{ ft}^2 \times 1 \text{ ft}}{27 \text{ ft}^3/\text{cy}} = 119,787 \text{ cy} \rightarrow 119,800 \text{ cy}$$

2,17,59

Volume Calculations Cell 3

- 6) Placement of Clay Layer (four thick) over full area Top of Cell

$$\frac{3,234,252 \text{ ft}^2 \times 4 \text{ ft}}{27 \text{ ft}^3/\text{cy}} = 119,773 \text{ cy} \rightarrow \boxed{119,900 \text{ cy}}$$

[.8 Comp factor]

- 7) upper random fill volume over full area of Cell

$$\frac{3,234,252 \text{ ft}^2 \times 2 \text{ ft}}{27 \text{ ft}^3/\text{cy}} = 239,574 \text{ cy} \rightarrow \boxed{239,600 \text{ cy}}$$

- 8) Armor protection - TOP OF CELL 6" (.5 ft)

$$\frac{3,234,252 \text{ ft}^2 \times .5 \text{ ft}}{27 \text{ ft}^3/\text{cy}} = 59,894 \text{ cy} \rightarrow \boxed{59,900 \text{ cy}}$$

- 9) CELL 3 WEST SLOPE (Slope #6) 2 foot high, 1100 feet long

- NO CLAY ON SLOPES
- TOE APRON ONLY AT BASE OF LONG SLOPES OR WHERE DRAINAGE OFF OF THE CELL IS DIRECTED
- Random fill wedge \rightarrow NO EXISTING DIKE \rightarrow SO TRANSITION FROM TOP CORNER

$$\left(\frac{2 \times 2 \times 5}{2} \times 1100 \text{ ft} \right) / 27 = 407 \text{ cy} \rightarrow \boxed{410 \text{ cy}}$$

- Random Fill $\left(\frac{5 \times 5 \times 5}{2} - \frac{2 \times 2 \times 5}{2} \right) \times 1100 \text{ ft} \rightarrow 57,750 \text{ ft}^3$

$$\frac{57,750 \text{ ft}^3}{27 \text{ ft}^3/\text{cy}} = 2138 \text{ cy} \rightarrow \boxed{2,200 \text{ cy}}$$

- Rock Armor

$$\left(\frac{5.67 \times 5.67 \times 5}{2} - \frac{5 \times 5 \times 5}{2} \right) \times 1100 \rightarrow 19,659 \text{ ft}^3$$

$$\frac{19,659 \text{ ft}^3}{27 \text{ ft}^3/\text{cy}} = 728 \text{ cy} \rightarrow \boxed{730 \text{ cy}}$$

Volume Calculation Cell 3

10) Cell 3 South Dike (West End) Slope #7

• 16 ft average height

• 1750 feet long

Random Fill Wedge → 3:1-S:1 Covered →

$$\left[\frac{16 \times 16 \times 5}{2} - \frac{16 \times 16 \times 3}{2} \right] \times 1750 \text{ ft} \rightarrow 448,000 \text{ ft}^3$$

$$448,000 \text{ ft}^3 = 16,592 \text{ cy} \rightarrow \boxed{16,600 \text{ cy}}$$

Random fill - 1

$$\left[\frac{19 \times 19 \times 5}{2} - \frac{16 \times 16 \times 5}{2} \right] \times 1750 = 459,375 \text{ ft}^3$$

$$459,375 \text{ ft}^3 = 17,013 \text{ cy} \rightarrow \boxed{17,100 \text{ cy}}$$

$$\left[\frac{19.67 \times 19.67 \times 5}{2} - \frac{15 \times 19 \times 5}{2} \right] \times 1750 \rightarrow$$

Rock Armor -
Slope - 8" Thick

Rock Armor at toe of slope

$$113,351 \text{ ft}^3 = 4198 \text{ cy} \rightarrow \boxed{4200 \text{ cy}}$$

$$2' \text{ Thick} \times 7' \text{ Wide} \times 1750' \text{ Long} = 907 \text{ cy} \rightarrow \boxed{1000 \text{ cy}}$$

11) Cell 3 South Dike (East End Common with Cell 4A) Slope #5

- 39 ft average height
- 1700 ft long
- Toe spread full length

Random Fill Wedge

$$\left[\frac{39 \times 39 \times 5}{2} - \frac{39 \times 39 \times 3}{2} \right] \times 1700 \text{ ft} \rightarrow 2,585,700 \text{ ft}^3$$

$$2,585,700 \text{ ft}^3 = 95,766 \text{ cy} \rightarrow \boxed{95,800 \text{ cy}}$$

Volume Calculations Cell 3

2/16/99

11) CONT

Upper Random Fill

$$\left[\frac{42 \times 42 \times 5}{2} - \frac{39 \times 39 \times 5}{2} \right] \times 1700 \rightarrow 1,032,750 \text{ ft}^3$$

$$\frac{1,032,750 \text{ ft}^3}{27 \text{ ft}^3/\text{cy}} \rightarrow 38,250 \text{ cy} \rightarrow \boxed{38,300 \text{ cy}}$$

Rock Armor

$$\left[\frac{42.67 \times 42.67 \times 5}{2} - \frac{42 \times 42 \times 5}{2} \right] \times 1700 \rightarrow 241,098 \text{ ft}^3$$

$$\frac{241,098 \text{ ft}^3}{27 \text{ ft}^3/\text{cy}} = 8930 \text{ cy} \rightarrow \boxed{8950 \text{ cy}}$$

Rock Toe Armor

$$\frac{2' \times 7' \times 1700 \text{ ft}}{27 \text{ ft}^3/\text{cy}} = 881 \text{ cy} \rightarrow \boxed{900 \text{ cy}}$$

Total Rock

$$\boxed{9850 \text{ cy}}$$

12) Cell 3 East Slope

- Average height 4 feet
- 800 feet Long



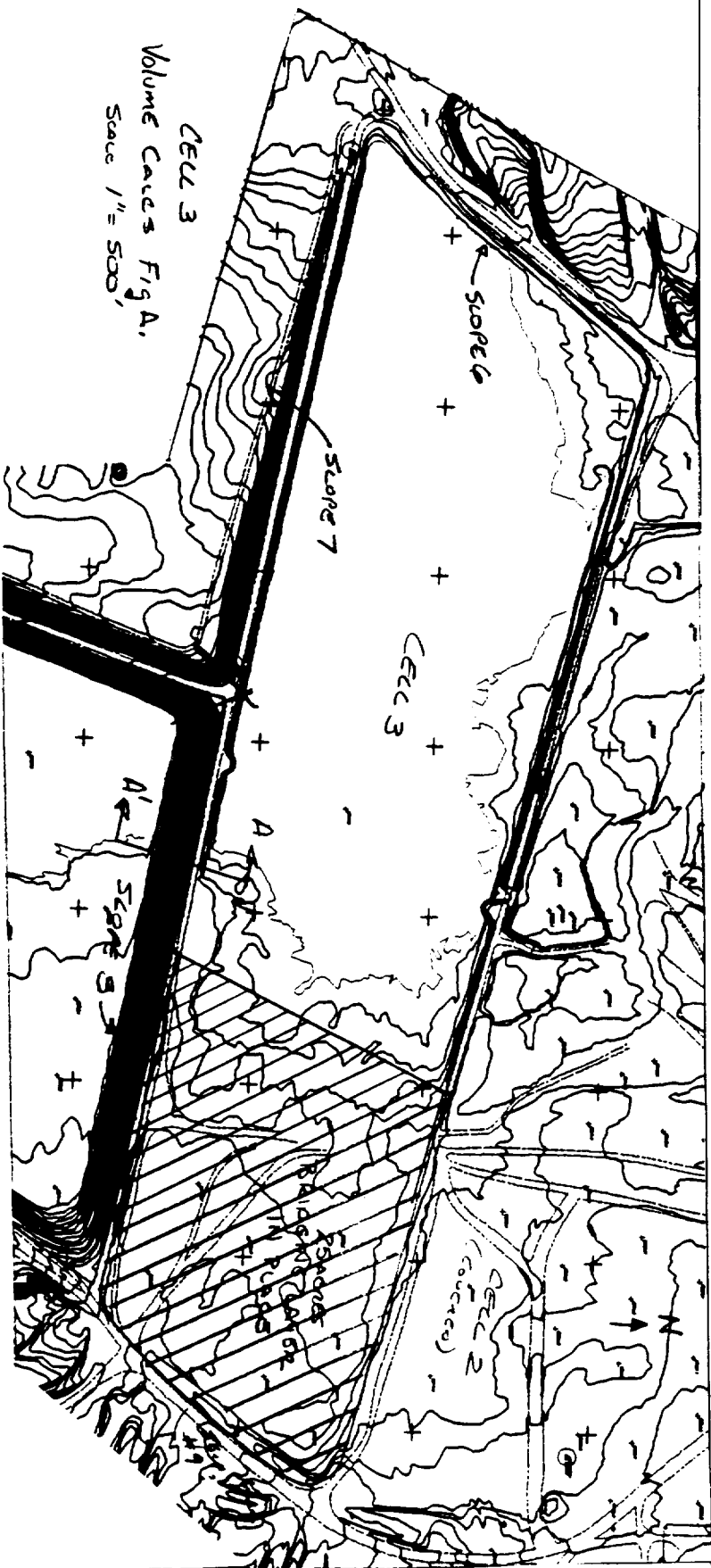
$$\text{Random Fill (No existing dike)} = \frac{4 \times 4 \times 5}{2} \times 800 = 32,000 \text{ ft}^3$$

$$\frac{32,000 \text{ ft}^3}{27 \text{ ft}^3/\text{cy}} = 1185 \text{ cy} \Rightarrow \boxed{1200 \text{ cy}}$$

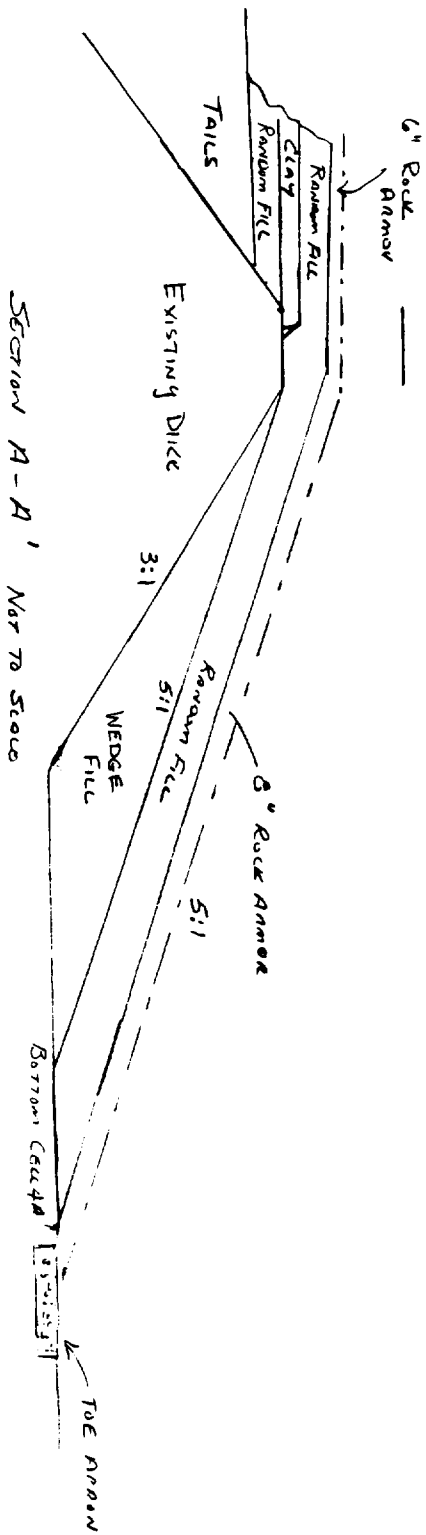
$$\text{Rock Remove} = \left(\frac{4.67 \times 4.67 \times 5}{27} - \frac{4 \times 4 \times 5}{2} \right) \times 900 = 11,618 \text{ ft}^3$$

$$\frac{11,618 \text{ ft}^3}{27 \text{ ft}^3/\text{cy}} \Rightarrow \boxed{430 \text{ cy}} \rightarrow$$

NO TOE ARMOR



CELL 3
Volume Cages Fig A,
Scale 1" = 500'



Volume Calculation Cell 3

Volume Summary

	Bridge Layer	Lower Rane	Clay	Upper Known	Area
TOT OF CELL	239,400	119,800	119,800	239,400	59,900
WEST SLOPE (#6)	—	410	—	2,200	730
SOUTH DIKE (#7)	—	16,600	—	17,100	5,200
SOUTH DIKE (#8)	—	95,800	—	38,300	9,850
EAST BLOKE (#9)	—	—	—	1,200	480
TOTALS (CY)	239,400	232,610	119,800	298,200	76,110

CELL 3 PRODUCTION
(USE SAME ASSUMPTION AS CELL 2)
CLAY

$$\text{CLAY Volume} = 119,000 \text{ CY} = 149,750 \text{ CY} \quad \text{• 8 swell factor}$$

$$\text{TRUCKING } 475 \text{ CY/hr} - 8 \text{ TRUCKS} + 1 \text{ LOADER}$$

$$149,750 \text{ CY} \div 316 \text{ hr} + 10\% \Rightarrow \text{USE } 350 \text{ hrs}$$

$$350 \times 8 \text{ TRUCKS} = 2800 \text{ hrs}$$

980 Loader - 350 hrs
DSN DOZER W/ripper - 350 hrs
CAT 651 W/riper - 350 hrs
CAT 825 Compactor - 375 hrs
CAT 146 Grader - 395 hrs
5000 Gallon Water Tank - 175 hrs

Rock Armor

$$\text{Rock Armor Volume} = 76,110 \text{ CY} - 38 \text{ CY/Truck} \times 8 \text{ Trucks}$$

304 CY/hr - Delivered
Say 25% extra time to finish spreading -
291 CY/hr \rightarrow 316 hrs

CELL 3 RECLAMATION

CAT 637 RESOURCE REQUIREMENTS

	Volume	Route	Yds/Hr	%	Equip hrs
Cell 3 Bridging Lift					
Tailings Surface	239,400	6	277	100%	864.3
				TOTAL	864.3
Cell 3 Lower Random Fill					
Tailings surface	119,800	6	296	100%	404.7
Slope 6	410	6	296	100%	1.4
Slope 7	16,600	6	368	100%	45.1
Slope 8	95,800	6	296	100%	323.6
Slope 9	0	6	368	100%	0.0
				TOTAL	774.9
Cell 3 Upper Random fill					
Tailings surface	239,400	6	296	100%	808.8
Slope 6	2,200	6	296	100%	7.4
Slope 7	17,100	6	368	100%	46.5
Slope 8	38,300	6	296	100%	129.4
Slope 9	1,200	6	368	100%	3.3
				TOTAL	995.3
Cell 3 Rock Armour use Highway Trucks					

CELL 4A CLEANUP

CELL 4A CLEANUP

Dewatering of Cell 4A

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Dewatering of Cell 4A	hrs	\$0.48	11,500	\$5,529

Total Dewatering of Cell 4A

\$5,529

Remove Fencing

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Cat 988 Loader	hrs	\$95.68	40	\$3,827
Equipment Operators	hrs	\$17.72	40	\$709
Equipment Maintenance (Butler)	hrs	\$10.01	40	\$401
Laborers	hrs	\$10.35	160	\$1,655

Total Remove Fencing

\$6,592

Remove Liner & Contaminated Material to Cell 3

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	303	\$5,368
Cat 769 Truck	hrs	\$60.52	606	\$36,677
Truck Driver	hrs	\$12.74	606	\$7,721
Cat 988 Loader	hrs	\$95.68	303	\$28,990
Equipment Maintenance (Butler)	hrs	\$10.01	909	\$9,102

Total Remove Liner & Contaminated Material to Cell 3

\$87,858

Quality Control

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Quality Control Contractor	hrs	\$62.00	325	\$20,150

Total Quality Control

\$20,150

TOTAL CELL 4A CLEANUP

\$120,128

INTERNATIONAL URANIUM (USA) CORP.
COST ESTIMATE

PROJECT: Date: Cost by: Sheet: 01

CELL 4A WORK

1) ASSUMPTIONS

- ALL XTALS ARE PICKED UP WITH LINER
- AVERAGE OF 1 FOOT UNDER LINER WILL GO TO CELL 3
- ALL DIRT MATERIAL IS UNCONTAMINATED & CAN BE UTILIZED FOR CELL 3 COVER, THEREFORE, NO COST IS PLACED AGAINST ITS REMOVAL
- AREA OF CELL FOR VOLUME ESTIMATES IS 1,909 M²
- CRYSTALS ESTIMATED TO BE 6" THICK OVER ENTIRE AREA

Therefore

QUANTITY OF CONTAMINATED MATERIAL =

$$[1,909,000 \times [6\frac{1}{2} + 12\frac{1}{2}]] \div 27 \text{ ft}^3/\text{yd}^3 = 106,055$$

soy

$$\boxed{106,100 \text{ yd}^3}$$

and

BASED ON HALL COUNT & PROFILE, EFFICIENCY = 175 yd³/truck hour.

$$106100 \text{ yd}^3 \div 175 \text{ yd}^3 = 606 \text{ TRUCK HOURS} \\ = 303 \text{ FLEET HOURS (2 TRUCKS)}$$

RECLAMATION OF CELL1

RECLAMATION OF CELL 1

Dewatering of Cell 1

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Dewatering of Cell 1	hrs	\$0.48	62,400	\$30,000

Total Dewatering of Cell 1 **\$30,000**

Crystal Removal

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	2,695	\$47,749
Cat 769 Truck	hrs	\$60.52	2,157	\$130,548
Truck Drivers	hrs	\$12.74	2,157	\$27,481
Cat 988 Loader	hrs	\$95.68	539	\$51,570
Cat D8N Dozer With Ripper	hrs	\$68.67	539	\$37,012
Cat 375 Excavator	hrs	\$123.76	539	\$66,709
Cat 651 Waterwagon	hrs	\$72.12	539	\$38,872
Cat 14G Motorgrader	hrs	\$48.93	539	\$26,371
Equipment Maintenance (Butler)	hrs	\$10.01	4,852	\$48,582

Total Crystal Removal **\$474,893**

Contaminated Materials Removal

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	616	\$10,914
Cat 637 Scraper	hrs	\$140.50	308	\$43,275
Cat D8N Dozer With Ripper	hrs	\$68.67	77	\$5,287
Cat 825C Compactor	hrs	\$66.15	77	\$5,093
Cat 651 Waterwagon	hrs	\$72.12	77	\$5,553
Cat 14G Motorgrader	hrs	\$48.93	77	\$3,767
Equipment Maintenance (Butler)	hrs	\$10.01	616	\$6,168

Total Contaminated Materials Removal **\$80,058**

Topsoil Application

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	240	\$4,252
Cat 637 Scraper	hrs	\$140.50	120	\$16,861
Cat D8N Dozer With Ripper	hrs	\$68.67	40	\$2,747
Cat 651 Waterwagon	hrs	\$72.12	40	\$2,885
Cat 14G Motorgrader	hrs	\$48.93	40	\$1,957
Equipment Maintenance (Butler)	hrs	\$10.01	240	\$2,403

Total Topsoil Application **\$31,104**

RECLAMATION OF CELL1

Construct Channel

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	858	\$15,202
Cat 637 Scraper	hrs	\$140.50	272	\$38,217
Cat 769 Truck	hrs	\$60.52	450	\$27,235
Truck Drivers	hrs	\$12.74	450	\$5,733
Cat 988 Loader	hrs	\$95.68	150	\$14,352
Drilling & Blasting Contractor	BCY	\$1.50	89,100	\$133,650
Cat 14G Motorgrader	hrs	\$48.93	218	\$10,666
Cat D8N Dozer With Ripper	hrs	\$68.67	218	\$14,970
Equipment Maintenance (Butler)	hrs	\$10.01	1,308	\$13,097

Total Construct Channel

\$273,121

Place Clay Liner

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	355	\$6,290
Cat 637 Scraper	hrs	\$140.50	0	\$0
Cat 825 Compactor	hrs	\$66.15	60	\$3,969
Cat D8N Dozer With Ripper	hrs	\$68.67	60	\$4,120
Cat D7 Dozer	hrs	\$57.90	0	\$0
Cat 651 Waterwagon	hrs	\$72.12	60	\$4,327
Cat 980 Loader	hrs	\$64.99	60	\$3,899
5000 Gallon Water Truck	hrs	\$40.64	30	\$1,219
Highway Trucks	hrs	\$40.00	435	\$17,400
Truck Drivers	hrs	\$12.74	435	\$5,542
Cat 14G Motorgrader	hrs	\$48.93	85	\$4,159
Equipment Maintenance (Butler)	hrs	\$10.01	1,580	\$15,820

Total Place Clay Liner

\$66,745

Place Lower Random Fill

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	602	\$10,666
Cat 637 Scraper	hrs	\$140.50	172	\$24,167
Cat 825 Compactor	hrs	\$66.15	86	\$5,689
Cat D8N Dozer With Ripper	hrs	\$68.67	86	\$5,906
Cat D7 Dozer	hrs	\$57.90	86	\$4,980
Cat 651 Waterwagon	hrs	\$72.12	86	\$6,202
Cat 14G Motorgrader	hrs	\$48.93	86	\$4,208
Equipment Maintenance (Butler)	hrs	\$10.01	602	\$6,028

Total Place Lower Random Fill

\$67,844

RECLAMATION OF CELL1

Clay Cap

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	305	\$5,404
Cat 637 Scraper	hrs	\$140.50	0	\$0
Cat 825 Compactor	hrs	\$66.15	55	\$3,638
Cat D8N Dozer With Ripper	hrs	\$68.67	55	\$3,777
Cat D7 Dozer	hrs	\$57.90	0	\$0
Cat 651 Waterwagon	hrs	\$72.12	55	\$3,967
Cat 14G Motorgrader	hrs	\$48.93	55	\$2,691
Cat 980 Loader	hrs	\$64.99	55	\$3,574
5000 Gallon Water Truck	hrs	\$40.64	30	\$1,219
Highway Trucks	hrs	\$40.00	440	\$17,600
Truck Drivers	hrs	\$12.74	440	\$5,606
Equipment Maintenance (Butler)	hrs	\$10.01	305	\$3,054

Total Place Clay Cap

\$50,529

Upper Random Fill

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	688	\$12,190
Cat 637 Scraper	hrs	\$140.50	172	\$24,167
Cat 825 Compactor	hrs	\$66.15	86	\$5,689
Cat D8N Dozer With Ripper	hrs	\$68.67	86	\$5,906
Cat D7 Dozer	hrs	\$57.90	86	\$4,980
Cat 651 Waterwagon	hrs	\$72.12	86	\$6,202
Cat 14G Motorgrader	hrs	\$48.93	86	\$4,208
5000 Gallon Water Truck	hrs	\$40.64	86	\$3,495
Equipment Maintenance (Butler)	hrs	\$10.01	688	\$6,889

Total Place Upper Random Fill

\$73,724

RECLAMATION OF CELL1

Rock Armor

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	90	\$1,595
Cat D7 Dozer	hrs	\$57.90	30	\$1,737
Cat 651 Waterwagon	hrs	\$72.12	30	\$2,164
Cat 14G Motorgrader	hrs	\$48.93	30	\$1,468
Rock Cost Delivered	CY	\$3.34	8,607	\$28,729
Equipment Maintenance (Butler)	hrs	\$10.01	90	\$901

Total Place Rock Armor

\$36,593

Quality Control

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Quality Control Contractor	hrs	\$62.00	800	\$49,600

Total Quality Control

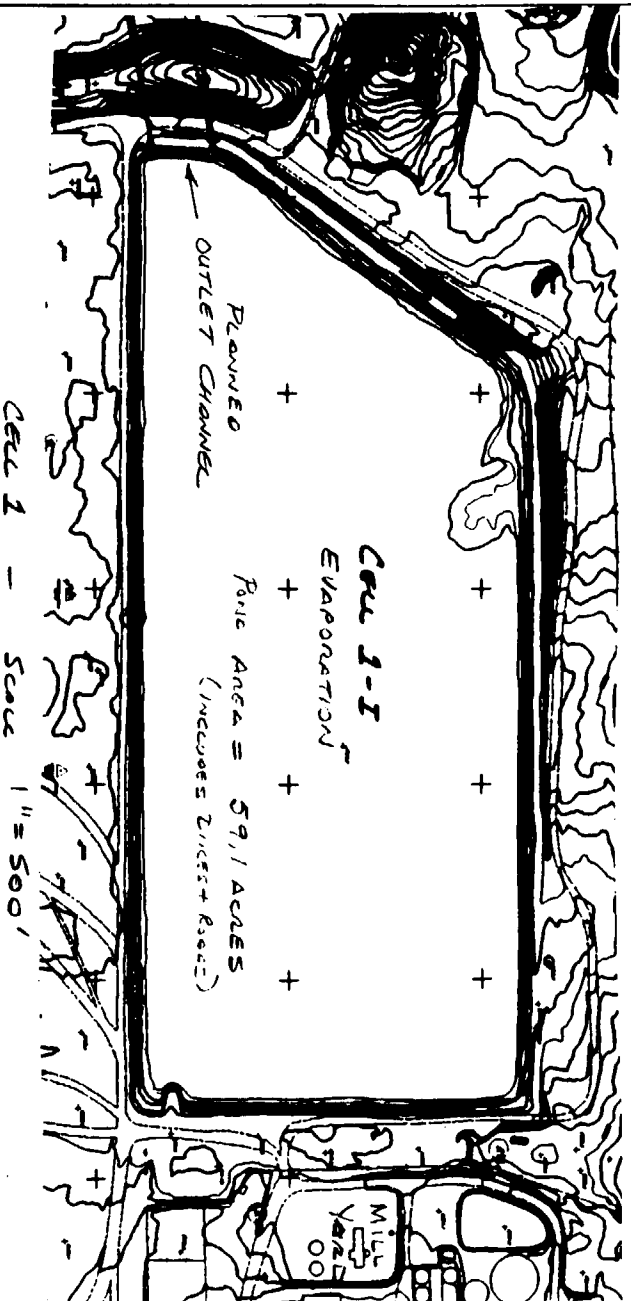
\$49,600

TOTAL RECLAMATION OF CELL 1

\$1,234,212



Cell 1 Volume Calculations



1) Cell Volume + Liner Cover

- Cellar thickness based on historical elevation of top of Cellar layer and Area mapping → Assume 3 ft thick
- Soil cover over PVC. Liner 1 1/2' by design over as built.
- Liner Cellar are Soil Cover all piled up at same time.

$$\text{Area of Pond } 2,575,703 \text{ ft}^2 \times (3 \text{ ft} + 1.5 \text{ ft}) = 429,253 \text{ Cy}$$

$$27 \text{ ft}^3/\text{Cy}$$

$$\rightarrow 429,300 \text{ Cy}$$

2) Volume of Contaminated material under Liner

- Assume for purposes of this estimate that 1 ft of Contaminated material must be removed from under liner for whole cell

$$\frac{2,575,703 \text{ ft}^2 \times 1 \text{ ft}}{27 \text{ ft}^3/\text{Cy}} = 95,396 \text{ Cy} \rightarrow 95,400 \text{ Cy}$$

3) Time Required to haul Xyls + Liner Cover Assuming the use of 4-769 Trucks, a 275C Truckload, 988 Loads. Assume haul Route #1 for production (199 Cy/hd truck/hr)

$$\frac{429,300 \text{ Cy}}{199 \text{ Cy/hr}} = 2157 \text{ truck hrs} - 539 \text{ hrs/truck}$$

CELL VOLUME CALCULATIONS

4)

TIME REQUIRED TO REMOVE MATERIAL FROM UNDER LINER IN PLACE
IN CELL #3 - USE HAUL ROUTE #2 - 4 SCRAPERS

$$\frac{95,500 \text{ cy}}{310 \text{ cy/hr/scraper}} = 308 \text{ scraper hours} \quad 4 \text{ scrapers} = 77 \text{ hrs/unit.}$$

5) TOP SOIL VOLUMES → place 6" of Top Soil over AREA of

$$\text{Cell 1} - \frac{2,575,703 \text{ ft}^2 \times .5 \text{ ft}}{27 \text{ ft}^3/\text{cy}} \approx 47,693 \text{ cy}$$

$$\rightarrow 48,000 \text{ cy}$$

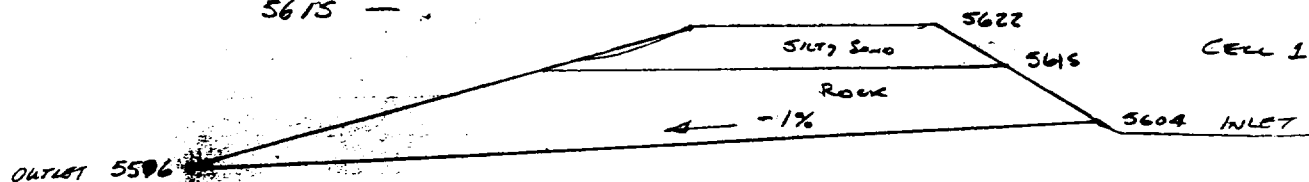
USE Scraper fleet Assume Route 1 → 310 cy/hr/scraper

$$\frac{48,000 \text{ cy}}{310 \text{ cy/hr/scraper}} \approx 155 \text{ hrs using one scraper}$$

if use 4 scrapers $\approx 40 \text{ hrs/unit.}$

6) DISCHARGE CHANNEL VOLUME →

- CHANNEL WILL HAVE BASE WIDTH OF 150 ft - Side Slope 3:1
- CHANNEL FLOW LINE WILL DROP AT .01 ft/ft (1%)
- ROCK ELEVATION BASED ON DRILL LOGS + CONSTRUCTION REPORT IS AT 5615 -

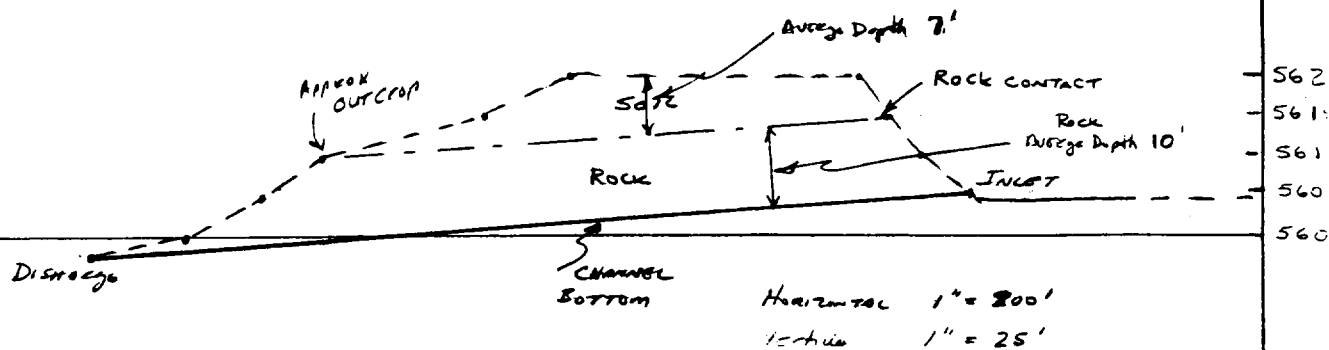


Random Fill and Top Soil STOCKPILES will be used in the RECLAMATION OF Cells 2 + 3 and the mill yard before discharge channel is built.

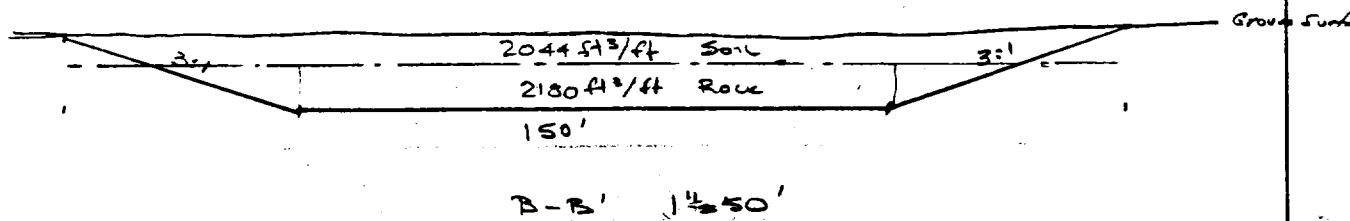
Cell 1 Volume Calculations

OUTLET CHANNEL SECTIONS

SECTION A-A'



1852.9



• ASSUME

Rock = 81 cy/ft channel length

Soil = 76 cy/ft channel length

800 ft channel =

64,800 cy Rock

60,800 cy Soil

• USE SCRAPERS ON SOIL REMOVAL

• DRILL AND BLOST ROCK USE TRUCKS TO HAUL AWAY

BASED ON EPH'S EXPERIENCE DURING CONSTRUCTION - ROCK DOES NOT RIP
BLASTING IS REQUIRED.

• ASSUME ROUTE 1 FOR TRUCKS + SCRAPERS

Trucks - 199 cy/truck/hr

Scrapers - 310 cy/hr

INTERNATIONAL URANIUM (USA) CORP.
COST ESTIMATE

Channel Excavation (Continued)

Boic → $\frac{60,800 \text{ cy}}{310 \text{ cy/hr}} = 196 \text{ scraper hrs} \Rightarrow 50 \text{ hr/individual scraper}$
4 scrapers

Rock → $\frac{64,800 \text{ cy}}{199 \text{ cy/hr}} = 325 \text{ truck hrs} \Rightarrow 2 \text{ trucks} = 163 \text{ hrs/cy}$

Drilling + Blasting Rock → 10 ft average Depth → \$1.50/cy
Based on Record Contractor Quote



22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS





AMERICAN MINE SERVICES

BOB
HUMBREE
(303) 389-4125

August 13, 1998

Via Fax:

Attn: Mark Kerr, KLG Associates, Inc.

Re: Drilling and Blasting Limestone, Mill Creek, Oklahoma

We are please to submit the following proposal to provide all equipment, labor and materials for the above referenced project as follows:

Description	Unit Price	Est. Quantity
Mobilization	\$8,000.00	1
Drill and Blast Cuts >20' Deep	\$ 1.35/CY	30,000 CY
Seismic Monitoring	\$300.00/EA	2

General Clarifications:

- > Layout and grade control by others
- > Excavation by others
- > Explosives storage on site
- > Pricing assumes two 10 hour drilling shifts per day for 6 days per week
- > If bonding is required add 1%
- > Night working lights by others
- > Pricing assumes dry hole conditions, add \$.15 per CY if wet hole conditions are encountered
- > Pricing is based on a minimum of 30,000 CY shot during a 10 day period

If you have any questions or need additional information, please feel free to contact me at 303.499.4770.

Sincerely,

C. B. Statten, Project Manager

Recent
QUOTE for
Drill + Blast
use \$1.50 / CY

Calculation / Work Sheet

Page of

Project: Rec. Plan Revision 3.0 by:

Date 07-06-00

Revision to Topsoil Cost - Cell 1-I

5) Place 6" of Topsoil over open area of Cell 1-I

Total area of Cell 1 - w/ side slopes = 60 ac.

Area consumed by new disposal area =

$$(175' + 100') \times 2,600 = 715,000 \text{ ft}^2 = 16.41 \text{ ac.}$$

use 16.-

Total area to be topsoiled = 60 - 16 = 44 acres

$$\text{Total volume} = \frac{44 \times 43,560 \times 0.5 \text{ ft}}{27} = 35,493 \text{ yd}^3$$

Use scraper fleet - assume Route No. 1

310 yd³ / hr / machine

$$\frac{35,493 \text{ yd}^3}{310} = 114.5 \text{ hr}$$

use 3 machines

38.17 hr. -

use 40 hr. x 3

120 hr.

Total

Calculation / Work Sheet

Project: Rec. Plan Revision 3.0 by: _____

Page _____ of _____
Date 07-06-00

Revision to Channel construction cost.

New channel width - 1,200 ft (was 800 ft)

- Assume Rock 81 cy / ft of channel length
Soil 76 " " " " "

1100 ft 89,100 cy Rock

83,600 cy soil

- use scrapers on soil removal
- Drill & Blast Rock - use trucks to haul

Based on EFN's experience during construction -
Rock is not easily ripped - Blasting is required

- Assume Route 1 for Trucks and Scrapers.

Trucks 199 yd³ / truck / hr

Scrapers 310 " scraper / "

Rock - $\frac{89,100 \text{ yd}^3}{199} = 448 \text{ hr}$ - 3 trucks - 150 hr. ea.
450 hr

Soil $\frac{83,600 \text{ yd}^3}{310} = 270$ - 4 units = 675 = 68 hr ea.
272 hr

Support equipment - 150 hr. + 68 hr. = 218 hr.

Calculation / Work Sheet

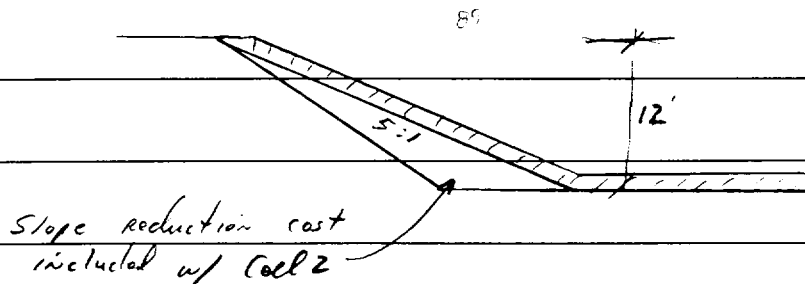
Project: Rec. Plan Revision 3.0 by: _____

Page _____ of _____

Date 07-06-00

Installation of Clay Liner in Cell 1-I

Clay liner - average depth of Tailings - 18'



$$\text{Slope length} = (5 \times 18) = 90'$$

$$\text{Horizontal length} = 176$$

$$175 + 90 = 265$$

$$265 - 89 = 176$$

$$\text{Total length} = 266$$

$$266 \text{ ft}$$

$$266 \text{ ft} \times 12' \times 2600 \text{ ft} = 691,600 \text{ ft}^2$$

$$25,615 \text{ yd}^3 \text{ liner}$$

Clay production cost - from Cell 2 estimate

$$22 \text{ yd}^3 \text{ per cycle} \times 2.7 \text{ cycles/hr} = 59.4 \text{ yd}^3 \text{ per hour/truck}$$

$$\text{Use 8 trucks} = 475 \text{ yd}^3/\text{hr.}$$

$$\frac{25,615 \text{ yd}^3}{475} = 54 \text{ hr.} - \text{ use } 60 \text{ hr}$$

Calculation / Work Sheet

Project: Rec. Plan Revision 3.0 by: _____

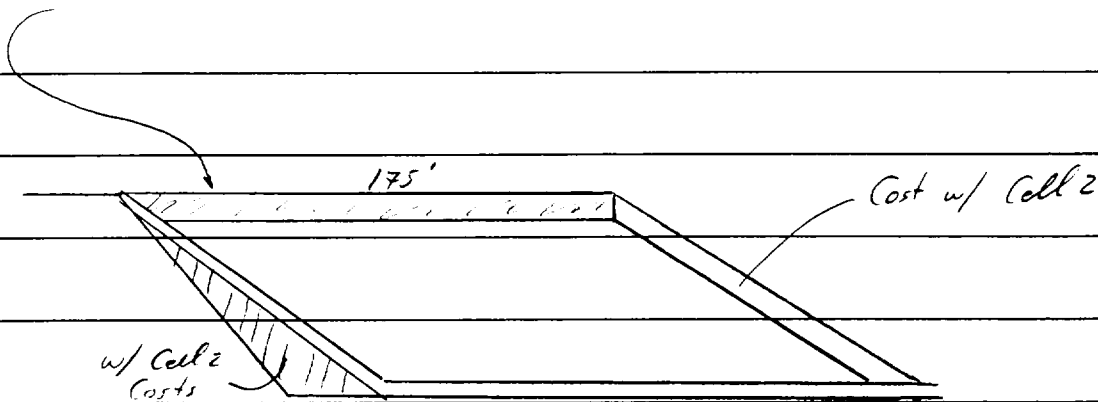
Page _____ of _____

Date 07-06-00

Installation of lower Random Fill

North Slope lower Random Fill included with
Cell 2 Cost (19,500 yd³)

lower Random Fill on extensive Area.



3' thick - 175' wide x 2600 ft

50,556 yd³

Use Route 5 haulage - scrapers $\Rightarrow 296 \text{ yd}^3/\text{hr.} = 171 \text{ hr.}$

USE 2 scrapers - 87 hr. each USE 174

Calculation / Work Sheet

Project: Rec. Plan Revision 3.0 by

Page of

Date 07-06-00

Clay Cap - top and side slope

top - 175 ft

slope - 90 ft

265 ft x 1.0 ft thick x 2,600 ft

25,518 yd³

Use same haulage factor for clay liner

22 yd³ per truck cycle - x 2.7 cycles/hr -

59.4 yd³
per hour/truck

8 trucks = 475 yd³/hr = 53.7 hr - use 55

440 truck hr

55 other

Calculation / Work Sheet

Page ____ of ____

Project: Rec. Plan Revision 3.0 by: JLL

Date 07-06-00

Place Upper Random Fill

2'-0" lay over top and slope

Total width - $175' + 90' = 265'$

$265 \times 2600 \times 2'-0" = 1,378,000 \text{ ft}^3$

$= 51,037 \text{ yd}^3$

Use Route 5 haulage - scrapers $296 \text{ yd}^3/\text{hr} = 172 \text{ hr.}$

Use 2 scrapers $= 86 \text{ hr.}$

Calculation / Work Sheet

Page of

Project: Rec. Plan Revision 3.0 by: SKL

Date 07-06-00

Installation of Rock Armor

Top of new area = 175' x 2600 ft

6" Thick 175 x 2600 x 0.5 = 227,500 ft³

8,426 yd³

Toe Apron on East and West sections

(175' x 7' x 2' Thick) x 2 = 4900 ft³ = 182 yd³

Upstream slope and toe apron runing east-west included
in Cell 2 Rectantlin Costs

Total 8,607 yd³

8,607 yd³ - 38 yd³ / touch 226.5 hr - use 227

use 8 touchers 28.31 hr - use 30

MISCELLANEOUS ITEMS

MISCELLANEOUS ITEMS

Equipment Mobilization

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Butler Machinery Mobilization	LS	\$148,200.00	1	\$148,200
Other Equipment Mobilization	LS	\$2,500.00	1	\$2,500

Total Equipment Mobilization **\$150,700**

Office Facilities

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Run New Powerline	LS	\$15,000.00	1	\$15,000
Utilities for Offices	months	\$1,000.00	36	\$36,000

Total Temporary Office Facilities **\$51,000**

Wheel Wash Facility

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Laborers	hrs	\$10.35	8,320	\$86,084
Construct Wheel Wash Facility	LS	\$50,000.00	1	\$50,000

Total Wheel Wash Facility **\$136,084**

MANAGEMENT/SUPPORT

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Manager/Engineer	hrs	\$48.69	6,240	\$303,826
Radiation Safety Officer	hrs	\$37.87	6,240	\$236,309
Secretary	hrs	\$15.01	6,240	\$93,680
Clerk	hrs	\$12.51	4,866	\$60,877
Environmental Technician	hrs	\$20.02	4,866	\$97,403
Maintenance Foreman	hrs	\$27.51	6,240	\$171,661
Chemist	hrs	\$22.52	2,080	\$46,840
Security	hrs	\$7.78	18,720	\$145,583
Safety Engineer	hrs	\$20.02	4,160	\$83,271
Misc. Materials & Supplies	hrs	\$36.45	6,240	\$227,448
Health Physics Costs	hrs	\$64.81	2,080	\$134,800

Total Management/Support **\$1,601,696**

TOTAL MISCELLANEOUS ITEMS

\$1,939,480

ROCK PRODUCTION COST

Assumptions:

Rock is obtained from gravel source north of Blanding, UT that is a BLM Public pit
 Rock is processed by screening only, no crushing is required 1.25 CY of feed for 1 CY of product
 Rock is produced and stockpiled at the site
 Site is 7 road miles from the mill, 6 miles of which is paved public highway
 Rock will be hauled in 22 CY bellydump trucks, contract haulers (\$45.00/hr)
 Rock will be dumped in windrows on Cells by trucks, spread by grader, and compacted by D7 Dozer
 Trucks can average 30 MPH (1.75 rounds/hr)

	Product Required (CY)	Reject Factor	Material Feed to Plant (CY)	Plant Throughput (CY/hr)	Plant Operating Hours
Material fed to plant	146,000	25.0%	182,500	122	1,500

PRODUCTION OF RIPRAP

Resource Description	Units	Cost/Unit	Task Units	Task Cost
Equipment Operators	hrs	\$17.72	2,340	\$41,460
Laborer	hrs	\$10.35	1,500	\$15,520
Cat D8N Dozer With Ripper	hrs	\$68.67	365	\$25,064
Cat 980 Loader	hrs	\$64.99	1,975	\$128,353
Screening Plant w/conveyors	hrs	\$55.00	1,500	\$82,500
Contract Highway Trucks - Bellydumps	hrs	\$45.00	3,800	\$171,000
Equipment Maintenance (Butler)	hrs	\$10.01	2,340	\$23,430

Total Production of RipRap

\$487,326

RIPRAP COST PER CUBIC YARD DELIVERED

\$3.34

EQUIPMENT COSTS

WHITE MESA MILL RECLAMATION COST
HOURLY EQUIPMENT COSTS 1999 DOLLARS

Actual equipment rates quoted from Butler machinery 6 month rental period
November 3, 1998

Units	RATE		MTCE	FUEL	FUEL @	TOTAL	Mob/Demob	Mob/Demob	Operating Hrs	
	MONTHLY	HOURLY	EXPENDABLES	USAGE	\$0.75	COST	per machine	Totals	per Month	
637E Scraper	4	21,200	120.45	2.05	24.0	18.00	\$140.50	\$10,800.00	\$43,200.00	704
D8N Dozer	1	10,800	61.36	0.93	8.5	6.38	\$68.67	\$7,400.00	\$7,400.00	176
D7H Dozer	1	9,100	51.70	0.95	7.0	5.25	\$57.90	\$6,400.00	\$6,400.00	176
825C Compactor	1	9,600	54.55	1.10	14.0	10.50	\$66.15	\$7,300.00	\$7,300.00	176
980 F Loader	1	10,000	56.82	1.42	9.0	6.75	\$64.99	\$7,300.00	\$7,300.00	176
988 F Loader	1	15,000	85.23	1.45	12.0	9.00	\$95.68	\$8,600.00	\$8,600.00	176
769C Haul Truck	4	9,200	52.27	1.50	9.0	6.75	\$60.52	\$7,400.00	\$29,600.00	704
375 Excavator	1	19,600	111.36	1.90	14.0	10.50	\$123.76	\$15,000.00	\$15,000.00	176
651 Water Wagon	1	10,000	56.82	1.80	18.0	13.50	\$72.12	\$8,000.00	\$8,000.00	176
5000 gal Water Truck	1	5,700	32.39	0.75	10.0	7.50	\$40.64	\$3,000.00	\$3,000.00	176
14G Motor Grader	1	7,700	43.75	1.05	5.5	4.13	\$48.93	\$5,600.00	\$5,600.00	176
16G Motor Grader	1	11,000	62.50	1.20	8.5	6.38	\$70.08	\$6,800.00	\$6,800.00	176

\$148,200.00 3,168

Equipment Rental Rate Quoted by Power Motive, Denver, Colorado (2/2/99) for PC400 Kamatsu Excavator with LaBounty MSD 70R Shear

PC-400 w Shear 22,950.00 130.40 18.94 14.0 10.50 \$159.84 \$2,500.00

Small tools allocation - Demolition -
\$1.25/mechanic labor hour for
oxygen/acetalene, expendables

\$1.25

Total Equipment Mobilization

\$150,700.00

Butler Equipment Maintenance Cost

Monthly Maintenance Flat Rate	Planned Operating Hours/month	Availability Factor	Maintenance Cost per Operating Hour
\$29,500.00	3,168	0.93	\$10.01

Crane Rental Rates

	RATE		MTCE	FUEL	FUEL @	TOTAL
	MONTHLY	HOURLY	EXPENDABLES	USAGE	\$0.88	COST
30 ton Hydraulic Crane	7,500	42.61	2.05	15.0	11.25	\$55.91
65 ton Hydraulic Crane	5,500	31.25	2.05	10.0	7.50	\$40.80



(701) 232-0033
FAX (701) 298-1717

DATE:

11-3-98

TO:

Bob Hembree

COMPANY:

International Uranium Corp.

FROM:

OSCAR SWENSON

DIRECT DIAL (AUDIX):

701-298-1733

ACKNOWLEDGE RECEIPT OF THIS FAX ☐ YES ☐ NO

NUMBER OF PAGES:
(INCLUDING THIS COVER SHEET)

NOTES:

Locations: Bismarck, Fargo, Grand Forks, Minot, Aberdeen, Rapid City, Sioux Falls



Butler



Butler Machinery Company • (701) 232-0033 • FAX (701) 298-1717 • 1351 Page Dr. • Box 9559 • Fargo, ND 58106

NOVEMBER 3, 1998

**INTERNATIONAL URANIUM CORPORATION
ATTN: BOB HEMBREE
1050 SEVENTEENTH ST. SUITE 950
DENVER CO 80265**

DEAR BOB:

THANK YOU FOR THE INVITATION TO QUOTE INTERNATIONAL URANIUM CORPORATION (IRC) THE EQUIPMENT NEEDED FOR THEIR MINING PROJECT IN BLANDING, UTAH. BUTLER MACHINERY COMPANY (BUTLER) RESPECTFULLY SUBMITS OUR PROPOSAL FOR A MAINTAINED FLEET OF CATERPILLAR MACHINES.

LISTED ON ATTACHMENT A, YOU WILL FIND THE MODELS, QUANTITIES, MONTHLY RENTAL RATES, HOURS ALLOWED PER MONTH, EXCESS HOUR CHARGE, GUARANTEED NUMBER OF MONTHS RATES ARE BASED UPON, TOTAL FREIGHT CHARGES AND THE MAINTENANCE RATE PER HOUR FOR MATERIALS ONLY.

ALL RATES SHOWN ON ATTACHMENT A DO NOT INCLUDE ANY STATE, LOCAL, PROPERTY OR ANY OTHER TAXES THAT MAY BE APPLICABLE.

RATES ARE BASED UPON ELECTRIC HOUR METER READINGS WHICH ARE ATTACHED TO THE DASH OF EACH MACHINE. RATES ARE BASED ON 176 HOURS OF USE EACH MONTH. EXCESS HOUR CHARGES, IF ANY, WILL BE CALCULATED AND INVOICED AT THE END OF THE PROJECT. THERE WOULD BE NO CREDIT ISSUED FOR ANY HOURS UNDER THE ALLOWED DURING THE TERM OF THIS PROPOSAL. IF IRC ELECTS TO DOUBLE SHIFT MACHINES, THEN BUTLER WOULD INVOICE THOSE HOURS AT THE END OF EACH MONTH (TO FIGURE THE DOUBLE SHIFT RATES, TAKE THE EXCESS HOUR RATE SHOWN ON ATTACHMENT A TIMES THE NUMBER OF HOURS).

RATES ARE BASED UPON A MINIMUM GUARANTEE OF 6 MONTHS AND A PACKAGE DEAL.

MAINTENANCE:

THE MAINTENANCE RATES PER HOUR LISTED ON ATTACHMENT A INCLUDES THE MATERIAL PART ITEMS ONLY, SUCH AS AIR, OIL, AND FUEL FILTERS, LUBRICANT OILS, GREASE, ANTI-FREEZE, BATTERIES, FAN BELTS, LIGHTS AND MAKE-UP OILS. BUTLER WOULD INVOICE IRC ACTUAL HOURS USED ON MACHINES AT THE END OF EACH MONTH.

Fargo, 58106
3402 36th Ave. S.
P.O. Box 9559

Bismarck, 58502
3630 Miriam Ave.
P.O. Box 757

Minot, 58702
1506 Hwy. 2, Bypass E
P.O. Box 1058

Grand Forks, 58208
1201 S. 46th St.
P.O. Box 12280

Rapid City, 57709
3801 Deadwood Ave. N.
P.O. Box 2070

Sioux Falls, 57101
3201 N. Louise Ave.
P.O. Box 1307

Aberdeen, 57402
4950 E. Highway 12
P.O. Box 38

NOVEMBER 3, 1998

PAGE 2

OUR MONTHLY MAINTENANCE CHARGE WOULD BE \$29,500.00, WHICH INCLUDES OUR LABOR, SPECIALIZED LUBE TRUCKS, SUPPORT VEHICLES AND EQUIPMENT, SPECIALIZED TOOLING, SCHEDULED OIL SAMPLING, PARTS TRAILERS AND INVENTORIES, MILEAGE AND TRAVEL EXPENSE. BUTLER WILL PROVIDE TWO (2) FULL-TIME MAINTENANCE TECHNICIANS ON SITE FIFTY (50) HOURS PER WEEK ON A SCHEDULE TO BE DETERMINED, MONDAY THROUGH FRIDAY. IRC WOULD HAVE TO SCHEDULE THE MACHINES AVAILABLE FOR A TIME FRAME YET TO BE DETERMINED ADEQUATE FOR BUTLER MAINTENANCE PERSONNEL TO PERFORM THE REQUIRED MAINTENANCE. BUTLER WOULD INVOICE IRC FOR THE MONTHLY MAINTENANCE CHARGE AT THE BEGINNING OF EACH MONTH.

REPAIRS:

BUTLER WOULD BE RESPONSIBLE FOR ALL REPAIRS INCLUDING PARTS AND LABOR ON OUR MACHINES OTHER THAN FAILURES CAUSED BY DAMAGES OR MIS-USE. REPAIRS INCLUDE ITEMS AS MINOR AS STARTERS, ALTERNATORS, WATER PUMPS, HYDRAULIC HOSES, ETC. TO THE MAJOR ITEMS SUCH AS ENGINES, TRANSMISSIONS, DIFFERENTIALS, BRAKES, HYDRAULIC PUMPS AND CYLINDERS, ETC. IF TIME PERMITS AND IRC REQUESTS BUTLER'S TECHNICIAN TO PERFORM REPAIRS OR MAINTENANCE ON THEIR MACHINES, OUR HOURLY CHARGE WOULD BE \$47.00 PER HOUR PLUS MATERIALS.

FREIGHT:

FREIGHT CHARGES INCLUDE BOTH DELIVERY AND RETURN, ASSEMBLY, AND DISASSEMBLY OF EQUIPMENT.

IRC'S RESPONSIBILITIES INCLUDE:

OPERATORS. PROVIDE THE OPERATORS AS NEEDED TO OPERATE MACHINES AS STATED IN CATERPILLAR'S OPERATING GUIDE. BUTLER WILL PROVIDE, AT NO EXPENSE TO IRC, QUALIFIED TRAINING INSTRUCTORS FOR THE PURPOSES OF TRAINING OPERATORS. THIS TRAINING WOULD TAKE PLACE ON THE JOBSITE AT THE INITIAL START UP OF THE JOB AND WOULD INCLUDE CLASSROOM, WALK AROUND, AND IN IRON DEMONSTRATIONS.

FUEL. SUPPLY AND FILL ALL FUEL FOR EQUIPMENT INCLUDING BUTLER'S SERVICE VEHICLES.

DAMAGES. THIS INCLUDES GLASS BREAKAGE, BENT HANDRAILS, STEP LADDERS, FENDERS, ETC. BUTLER'S NORMAL POLICY FOR REPAIRING DAMAGES TO RENTAL MACHINES IS TO REPAIR THEM WHEN THE RENTAL PERIOD IS COMPLETED, HOWEVER, IF THE DAMAGED ITEM IS OF A SAFETY CONCERN, WE WOULD REPAIR THE DAMAGES AS SOON AS POSSIBLE AFTER THEY OCCURRED. AN ITEMIZED LIST OF THE PARTS AND LABOR REQUIRED WOULD BE PROVIDED TO IRC PRIOR TO STARTING THE REPAIR, AND INVOICED AT CURRENT LIST PRICES PLUS FREIGHT UPON COMPLETION.

NOVEMBER 3, 1998
PAGE 3

UNDERCARRIAGE AND TIRES: IRC WOULD BE RESPONSIBLE FOR ALL TIRE WEAR INCLUDING TIRE DAMAGES ON THE MACHINES WITH AN ASTERISK LISTED ON ATTACHMENT A. EQUIPMENT WOULD HAVE TO BE RETURNED WITH SAME BRAND AND MODEL TIRES AS WHEN DELIVERED, OR PRORATED ACCORDINGLY BY PERCENTAGE OF TIRE WEAR AND CONDITION AT TERMINATION OF RENTAL PERIOD.

UPON DELIVERY OF MACHINES, A REPRESENTATIVE OF BUTLER, A REPRESENTATIVE OF IRC AND A REPRESENTATIVE FROM AN INDEPENDENT TIRE DEALER OR MANUFACTURER WOULD JOINTLY VERIFY IN WRITING THE CONDITION, PERCENTAGE OF WEAR, AND TIRE VALUE. UPON TERMINATION OF RENTAL, WE WOULD AGAIN HAVE THE REPRESENTATIVES MENTIONED ABOVE DETERMINE THE CONDITION, PERCENTAGE OF WEAR, AND TIRE VALUES. ANY DIFFERENCES NOTED, WOULD THEN BE CHARGED OR CREDITED TO IRC INCLUDING BOTH MATERIALS AND LABOR.

UNDERCARRIAGE WEAR ON ALL TRACK TYPE MACHINES WOULD BE BUTLER'S EXPENSE.

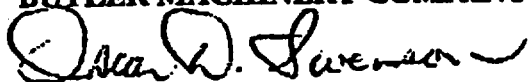
GROUND ENGAGING TOOLS:

IRC WOULD BE RESPONSIBLE FOR ALL PARTS RELATING TO GROUND ENGAGING TOOLS (G.E.T.), I.E. CUTTING EDGES, RIPPER TIPS AND PROTECTORS, BUCKET TIPS AND ADAPTERS, EDGES BETWEEN ADAPTERS, WEAR PLATES ON BOTTOM OF BUCKETS AND ALL MOUNTING HARDWARE. BUTLER WOULD INSTALL THESE ITEMS ON AN AS NEEDED BASIS AT THE CURRENT CATERPILLAR LIST PRICE PLUS FREIGHT AT NO ADDITIONAL LABOR COSTS. ALL MACHINES WOULD BE DELIVERED WITH NEW G.E.T. ITEMS AND ARE TO BE RETURNED WITH NEW.

WE WISH TO THANK IRC AND YOU FOR GIVING US THE OPPORTUNITY TO PRESENT OUR PROPOSAL AND FOR ALL THE CONSIDERATION WE RECEIVE.

SINCERELY YOURS,

BUTLER MACHINERY COMPANY



OSCAR D. SWENSON
RENTAL FLEET MARKETING MANAGER

ODS/ddl

cc: JOEL NIKLE, RENTAL FLEET MANAGER

ATTACHMENT A
INTERNATIONAL URANIUM CORPORATION
EQUIPMENT NEEDED FOR JOB IN BLANDING, UTAH
NOVEMBER 3, 1998

<u>MODEL</u>	<u>QTY</u>	<u>MONTHLY RENTAL RATE</u>	<u>HOURS ALLOWED PER MONTH</u>	<u>EXCESS HOUR CHARGE</u>	<u>MINIMUM GUARANTEED NUMBER OF MONTHS RATE BASED UPON</u>	<u>TOTAL** FREIGHT CHARGES TO & FROM</u>	<u>MAINTENANCE RATE PER HOUR</u>
*637E	4	\$21,200 EA.	176 EA.	\$66 EA.	6 EA.	\$10,800 EA.	\$2.05 EA.
D9N/RIPPER	1	13,300	176	42	6	8,600	1.40
D8N/RIPPER	1	10,800	176	34	6	7,400	1.15
D7H/RIPPER	1	9,100	176	28	6	6,400	.95
825C	1	9,600	176	30	6	7,300	1.10
980F	1	10,000	176	32	6	7,300	1.15
*988F	1	15,000	176	48	6	8,600	1.45
*769C	4	9,200 EA.	176 EA.	28 EA.	6 EA.	7,400 EA.	1.50 EA.
375L	1	19,600	176	56	6	15,000	1.90
10,000 GALLON WATER WAGON	1	10,000	176	30	6	8,000	1.80
5,000 GALLON WATER WAGON	1	5,700	176	18	6	3,000	.75
14G/RIPPER	1	7,700	176	24	6	5,600	1.05
16G/RIPPER	1	11,000	176	34	6	6,800	1.20

* PLUS TIRE WEAR

** INCLUDES ASSEMBLY AND DISASSEMBLY

Date: Feb 22, 1999

INTERNATIONAL URANIUM
BLANDING UTAH

ATTN: WALLY BRICE

CONFIDENTIAL PRICE INFORMATION FAX # 1 435 678 2224

TERMS: NET 15 DAYS ON TRANSPORT LOADS

Red dyed diesel for off road use delivered in transport quantities to various sites

	Blanding	Sunday Mines	La Sal Mine	Dove Creek
Rack dsl #2	\$0.4250	\$0.3825	\$0.3825	\$0.4485
Freight	\$0.0450	\$0.0500	\$0.0550	\$0.0400
Taxes	\$0.0000	\$0.0063	\$0.0000	\$0.0063
Margin	\$0.0200	\$0.0200	\$0.0200	\$0.0200
Sales Tax	\$0.0000	\$0.0000	\$0.0000	\$0.0000
Total Price	\$0.4900	\$0.4586	\$0.4576	\$0.5128

Utah charges sales tax on dyed diesel fuel .06%

Red dyed diesel for off road use delivered in bottail load (500-2000) to various sites

	Blanding	Sunday Mines	La Sal Mine	Dove Creek
Rack dsl # 2	\$0.4275	\$0.3825	\$0.3825	\$0.4485
Frt & Margin	\$0.1500	\$0.1500	\$0.1500	\$0.1500
Taxes	\$0.0000	\$0.0063	\$0.0000	\$0.0063
Sales Tax	\$0.0000	\$0.0000	\$0.0000	\$0.0000
Total Price	\$0.5775	\$0.5388	\$0.5326	\$0.6028

Utah Charges sales tax on dyed diesel .06%

No Lead Gasoline 86 octane gasoline delivered in transport loads to various sites

	Blanding	Sunday Mines	La Sal Mine	Dove Creek
Rack	\$0.4300	\$0.3900	\$0.3900	\$0.4450
Freight	\$0.0450	\$0.0500	\$0.0550	\$0.0400
Taxes	\$0.4280	\$0.4103	\$0.4280	\$0.4103
Margin	\$0.0200	\$0.0200	\$0.0200	\$0.0200
Total Price	\$0.9240	\$0.8703	\$0.8940	\$0.9153

No Lead Gasoline 86 octane delivered in bottail deliveries(500-2000) to various site

	Blanding	Sunday Mines	La Sal Mine	Dove Creek
Rack	\$0.4800	\$0.3900	\$0.3900	\$0.4450
Frt & Margin	\$0.1500	\$0.1500	\$0.1500	\$0.1500
Taxes	\$0.4280	\$0.4103	\$0.4280	\$0.4103
Total Price	\$1.0090	\$0.9603	\$0.9690	\$1.0053

Propane Delivered Transport Loads Blanding Utah

	Blanding
Rack	\$0.2700
Freight	\$0.0450
Margin	\$0.0100
Taxes	\$0.0000

Total Price \$0.3250 +.06 % Utah Sales Tax exchpx 0

Propane bottail loads delivered to various sites

	Blanding	Sunday Mine	La Sal Mine	Dove Creek
Rack	\$0.2700	\$0.2700	\$0.2700	\$0.2700
Frt & Margin	\$0.1500	\$0.1500	\$0.1500	\$0.1500
Taxes	\$0.0000	\$0.0000	\$0.0000	\$0.0000
Total Price	\$0.4200	\$0.4200	\$0.4200	\$0.4200

*Utah charges .06% sales tax on propane**Colorado charges .03% sales tax*

FROM: FRALEY & CO. INC CORTIZ COLORADO NEIL JONES 1 800 392 8939

801 201-7418

Webb's Cranes

100 Ton Hydraulic
 \$4800 Mob. & Demob. w/operator
 200/hr. on site
 \$100/Per Diem

Blanding, UT

Not available 10/9/98

75 Ton Conventional w/operator
 \$3900 Mob. & Demob.
 \$180/hr. on site
 \$100 Per Diem

200 hr/mo.

Not available 10/9/98

40 Ton Rough Terrain (Our Operator)

\$6000/month

\$200/week

\$1632 mob & demob

Not available 10/9/98

Hewlett Packard

LaVerlye & Son

Crane Service TO, 122.00

~~65~~ 65 Ton

\$7,500.00/month

\$3600.00 mob. & Demob.

50 Ton \$7,000.00/month

\$3,600.00 mob & Demob.

POWER MOTIVE CORP

FAX Transmission

To: *Bob Embree*
Company: *I.U.C.*
From: TERRY BERG

Date: *2/25/99*
C.C.
FAX #: *303.389.4165*

*FOLLOWING PAGES SHOW CONFIGURATION
OF THE DEC SCREEN-ITS*

THE 4x10 SIZE RENTS @ 8,800.00/MO.

THE 5x12 SIZE RENTS @ 10,600.00/MO.

*3" ON TOP DECK & 1/2" ON BOTTOM
DECK IS A COMFORTABLE SET-UP
FOR EITHER PLANT.*

THANKS

T. Berg

VOICE: 303-355-5900 FAX: 303-388-9328

1 of 7

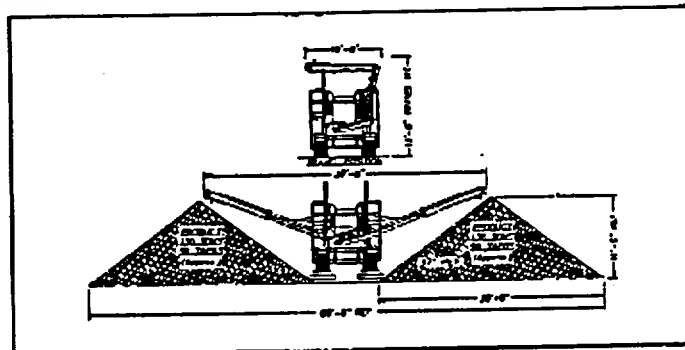
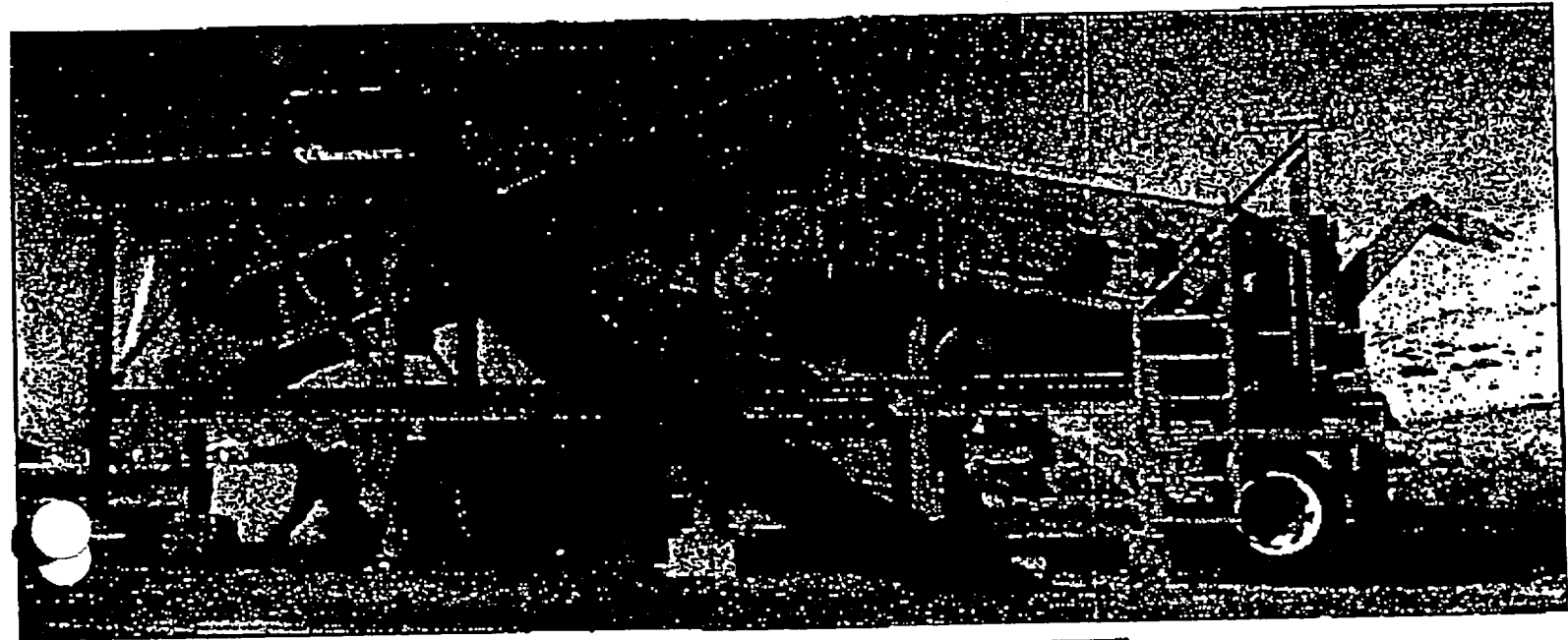
5000 VASQUEZ BLVD, DENVER, CO 80216



Construction Equipment Co.

SCREEN-IT 4 X 10

2 of 7



TRANSPORT

Height: 13'6" Fifth Wheel Pull
Width: 10'0" Spring Suspension, air brakes
Length: 39' Lights, oil filled hubs

ENGINE

4 cylinder Deutz; 46 HP - Air Cooled
65 gallon fuel tank

OPTIONS

4 individual jacking legs
Shredder
Grizzly dump
Stacking Conveyors
Ball decks

HOPPER

5.5 cu. yard charging hopper
Height to load 12'3"
Side Loading width 12'0"

SCREEN

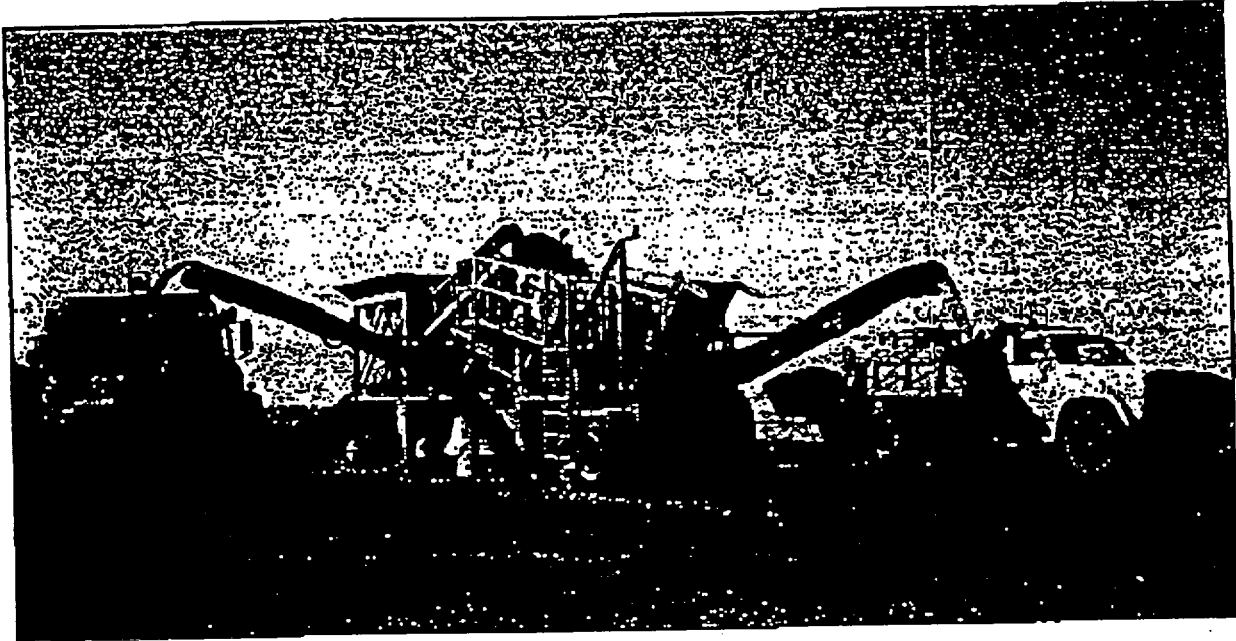
4 x 10; 2 Deck Screen
Hydraulic drive 5/8" Throw
Rubber Spring Suspension

CONVEYORS

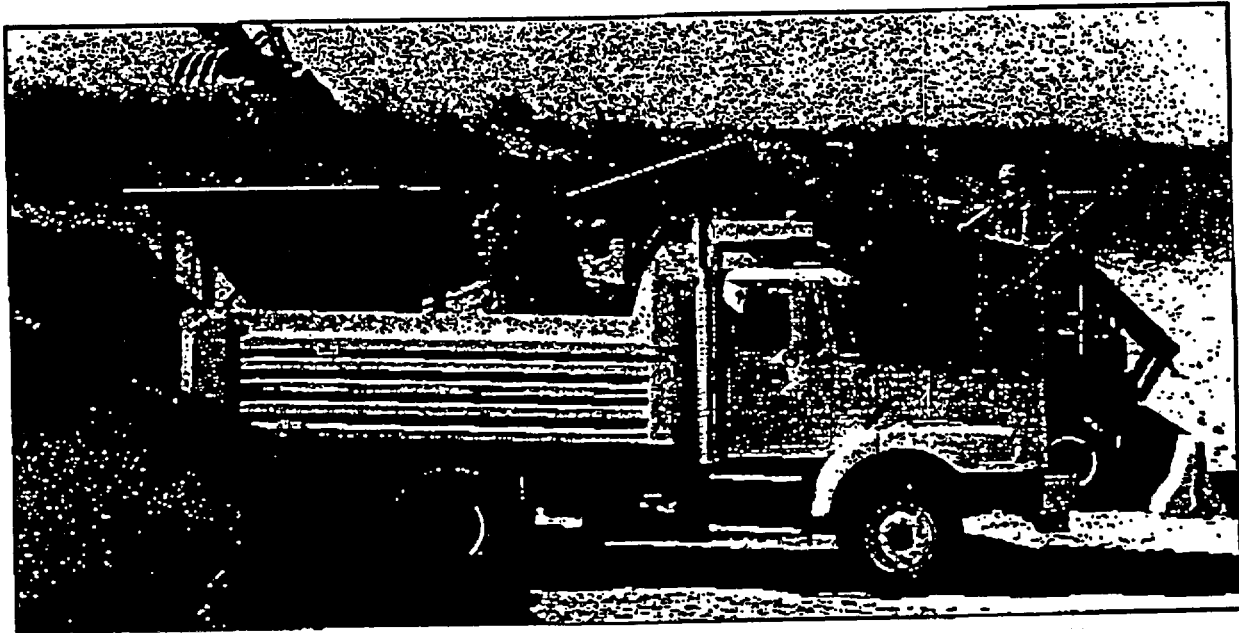
36" wide feed conveyor
36" wide under screen conveyor
24" side discharge conveyor
24" rear discharge conveyor

**Diesel Hydraulic-Self Contained
Portable and Easy to Set Up**

3 of 7



**High Production
Screens Sand and Gravel**



Conveyors Can Load Directly Into Truck



Construction Equipment Co.

18650 S.W. Pacific Hwy
Tualatin, OR 97062
503-692-9000
Fax 503-692-6220

Area Dealer

**POWER MOTIVE
5000 VASQUEZ BLVD.
DENVER, CO 80216
PHONE: (303) 355-5900
FAX: (303) 388-9325**



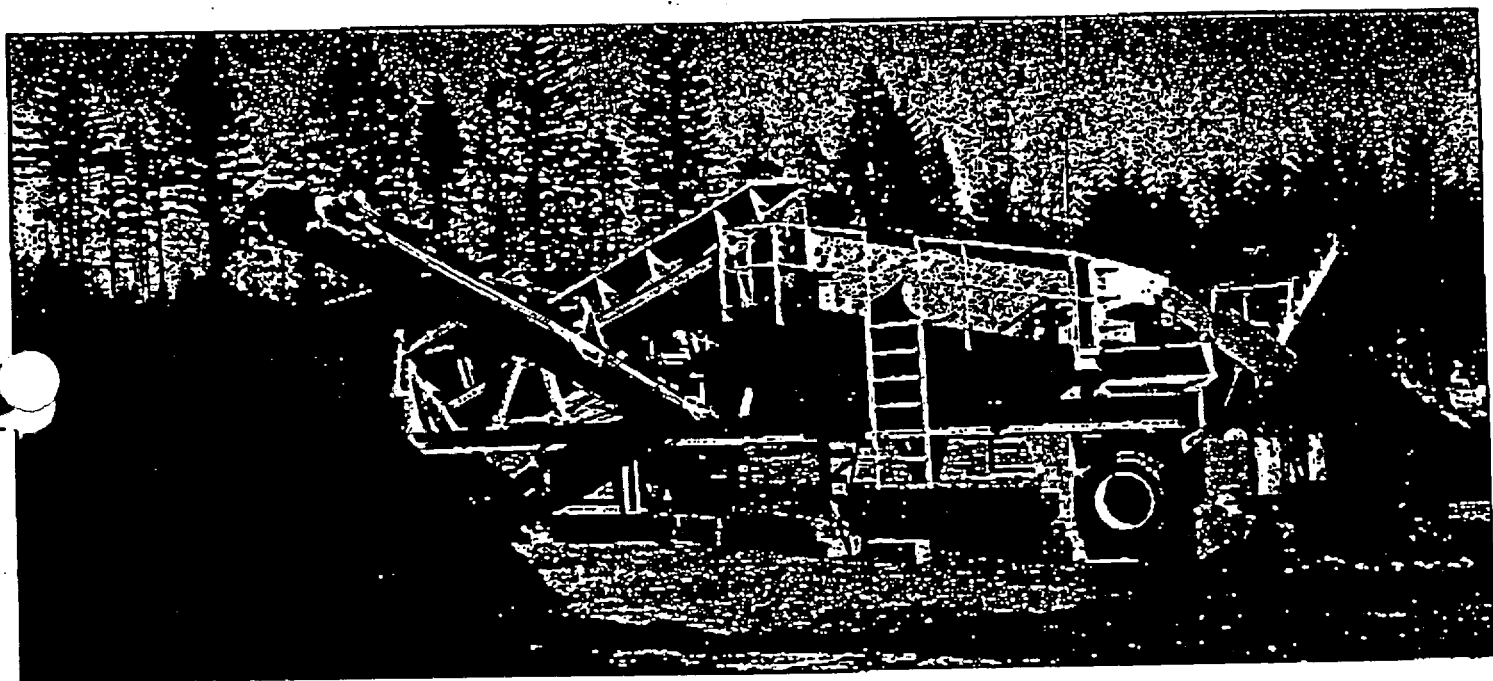
Construction Equipment Co.

SCREEN IT - Series II

Highly Portable - All Hydraulic Setup

Produces Three Different Products


4 of 7



SCREENS COMPOST 120-140 YARDS PER HOUR
SCREENS GRAVEL UP TO 600 TONS PER HOUR

**SCREENS: LOG YARD WASTE, COMPOST, BARK, TOP SOIL,
SAND & GRAVEL, TRASH, C & D, STUMPS, CONCRETE,
ROCK AND MANY RECYCLE MATERIALS**

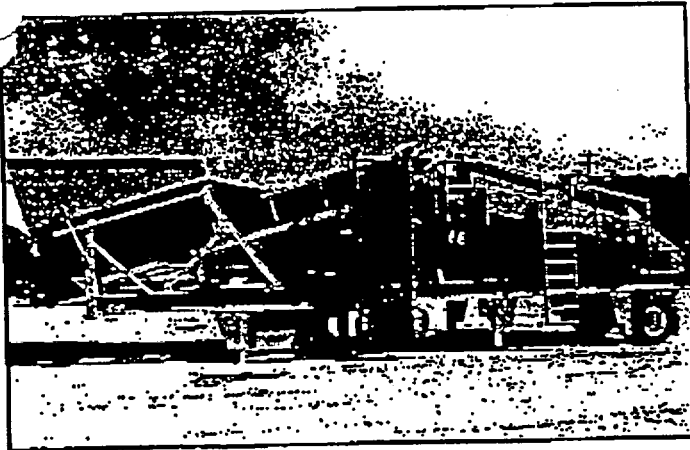
Patent #5234564

 **Construction Equipment Co.**
P.O. Box 1271
Lake Grove, Oregon 97035
503-635-4427
Fax 503-635-7819

Area Dealer

ALL HYDRAULIC FOLD AND SETUP

5 of 7



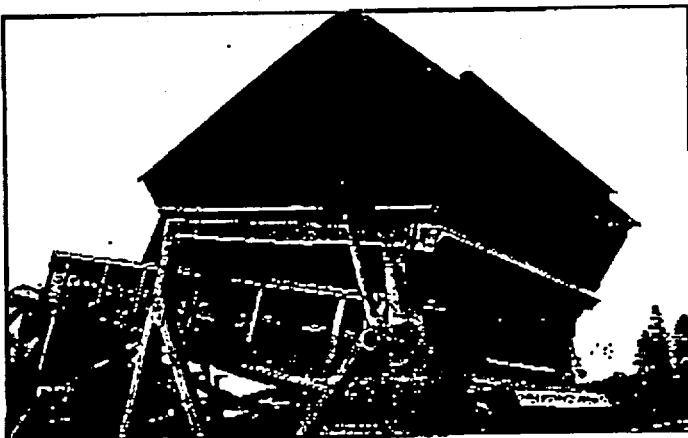
Travel position of the SCREEN IT in which feed conveyor and hopper hydraulically slide back and lower down to transportation height, while hopper wings fold in.



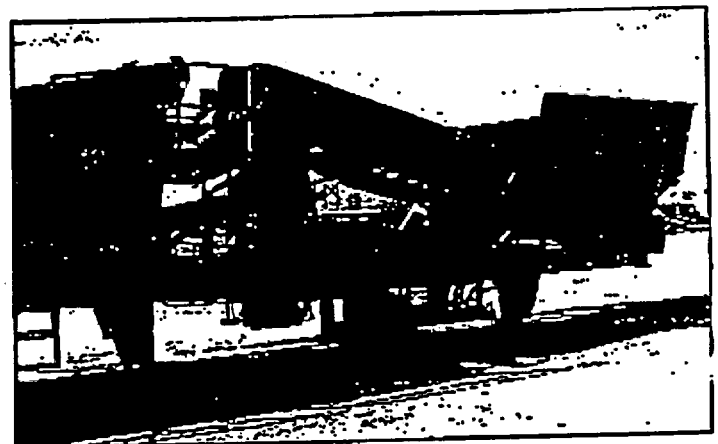
Hydraulic jacking legs are standard for cantilever style blocking, but four (4) individual jacking legs can be an option.



Side and rear discharge conveyors hydraulically fold out to the height of 14'.



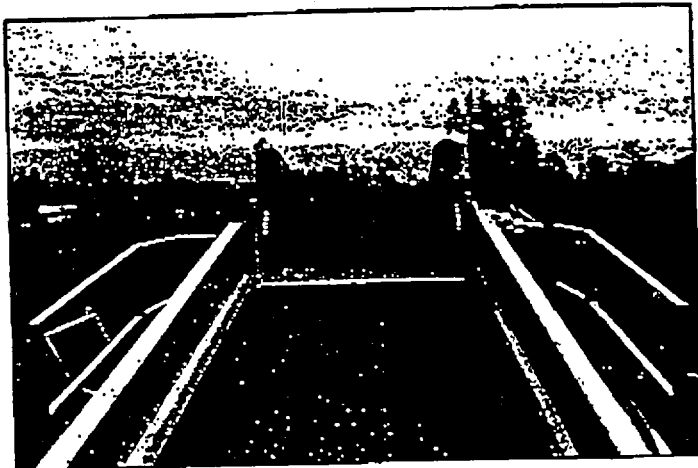
Feed conveyor moves up and forward hydraulically, while the hopper wing walls extend for operation.



Feed conveyor hydraulically moves back and down for transport.



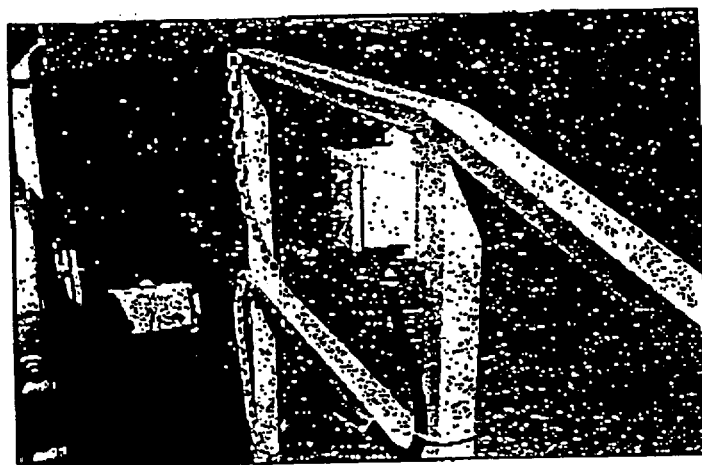
The charging hopper folds out to the width of 14' while in its working position.



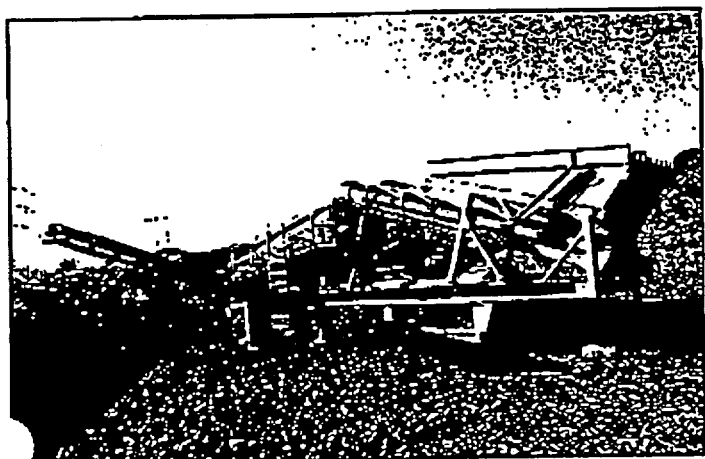
A 48" wide variable feed conveyor with 20" rubber lagged head pulley feeds a 5 x 12 2 Deck screen.



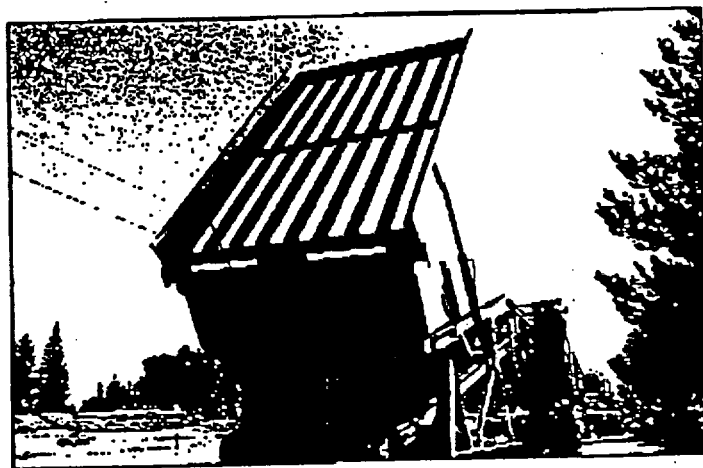
Control panel and hydraulic controls are all located in turnkey area. Powered by a Deutz 4 cylinder, 70 HP diesel engine.



Actuator switch to control speed of feed conveyor is located on the catwalk platform along with kill switch. Actuator switch also located at control panel.



The SCREEN IT has an optional 14 foot long by 8 foot wide hydraulic dumping grizzly. An operator controlled remote dumping system is also available.

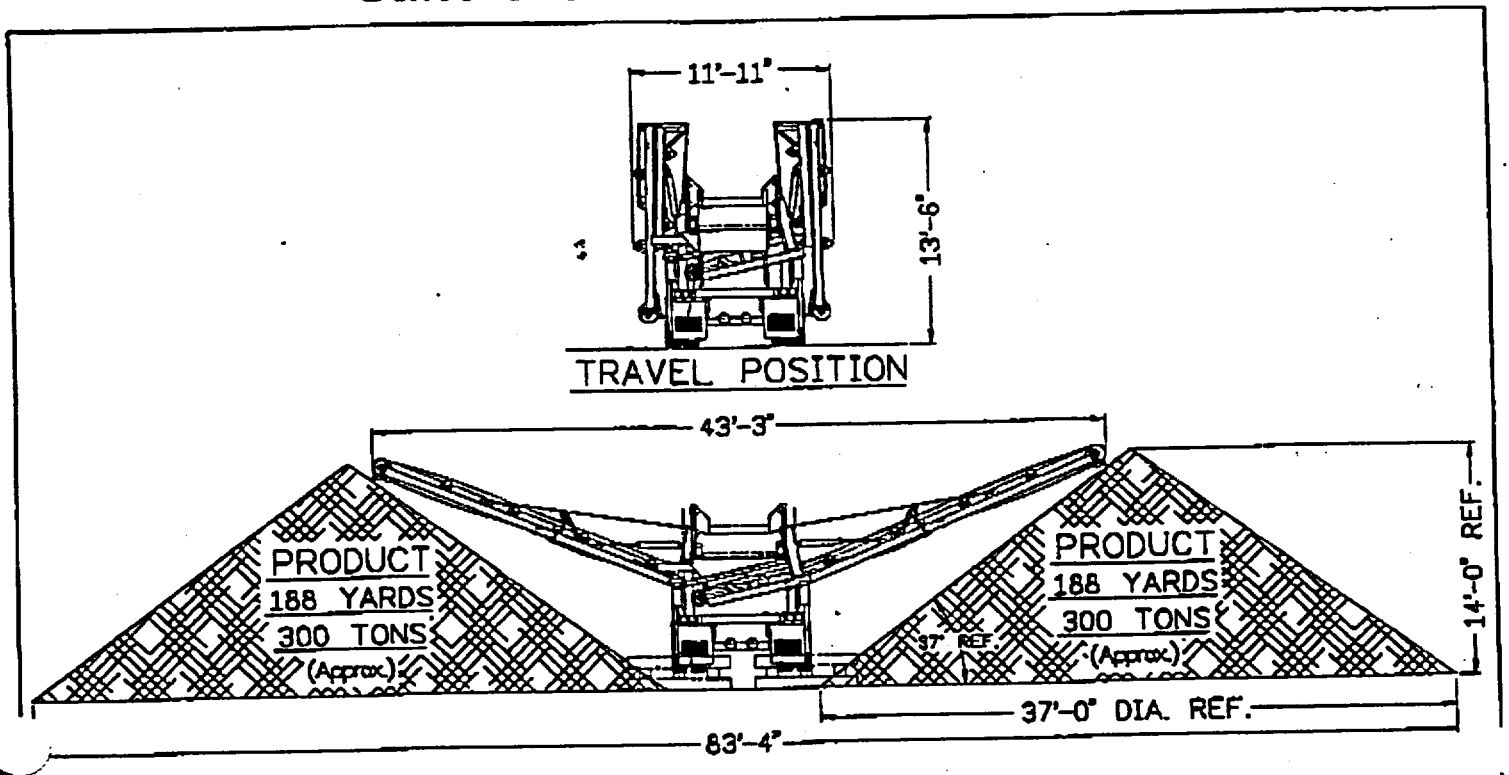


The optional grizzly dumps to the rear of the plant.

SCREENING,

Topsoil To 250 yds./hr.
Sand & Gravel To 600 Tons/hr.

7 of 7



HYDRAULIC DRIVE

TRANSPORT

Height: 13' 6" Fifth wheel pull
Width: 11' 11" Spring suspension, air brakes
Length: 43' 0" Lights, oil filled hubs
Weight: 38,600 Transport speed 65 mph

HOPPER

14.5 cu. yard charging hopper
Height to load 13' 6"
Width at rear 14' - Working position
Width at rear 8' - Travel position

ENGINE

4 cylinder Deutz
70 HP • Air Cooled
65 gallon fuel tank
110 gallon hydraulic tank

SCREEN

5 x 12, 2 Deck with step deck
Hydraulic drive with 3/8" to 5/8" throw
Rubber spring suspension

OPTIONS

4 individual jacking legs
Shredder
Grizzly Dump
Stacking conveyors
79 HP Turbo Diesel (Water Cooled)
98 HP Turbo Diesel (Air Cooled)

CONVEYORS

48" wide feed conveyor 23' 10" long
42" wide under screen conveyor
30" side discharge conveyor 18' 4" long
30" rear discharge conveyor 18' 4" long

637 SCRAPER EFFICIENCY

NOMINAL CAPACITY

31

HAUL ROUTE	TRAVEL TIME	FIXED TIME	EFFICIENCY	MINUTES PER TRIP	TRIPS/ HOUR	YARDS/ HOUR
1	3.90	1.20	85%	6.0	10.0	310
2	3.25	1.20	85%	5.2	11.5	355
3	4.30	1.20	85%	6.5	9.3	287
4	3.10	1.20	85%	5.1	11.9	368
5	4.15	1.20	85%	6.3	9.5	296
6	4.50	1.20	85%	6.7	8.9	277
7	3.75	1.20	85%	5.8	10.3	319

CAT 637 SCRAPER

TRAVEL TIMES FOR CAT 637 SCRAPERS BASED ON PROJECTED HAUL ROUTES

Haul Segment	Distance Feet	Distance Meters	Rolling Resistance	Grade %	Ave Speed MPH	Time Min
--------------	---------------	-----------------	--------------------	---------	---------------	----------

1a	200	67	7.5	0.0	9.1	0.25
1b	500	167	5.0	0.0	12.6	0.45
1c	200	67	3.0	2.5	9.1	0.25
1d	1400	467	3.0	0.0	18.7	0.85
1e	250	83	3.0	0.0	9.5	0.30
1f	250	83	3.0	0.0	11.4	0.25
1g	1400	467	3.0	0.0	21.2	0.75
1h	200	67	3.0	(2.5)	11.4	0.20
1i	400	133	5.0	0.0	13.0	0.35
1j	200	67	7.5	0.0	9.1	0.25
						3.90

2a	200	67	7.5	0.0	9.1	0.25
2b	2150	717	3.0	(0.5)	22.2	1.10
2c	250	83	5.0	0.0	9.5	0.30
2d	250	83	5.0	0.0	11.4	0.25
2e	2250	750	3.0	+0.5	23.2	1.10
2f	200	67	7.5	0.0	9.1	0.25
						3.25

3a	250	83	7.5	0.0	8.1	0.35
3b	3300	1100	3.0	-0.5	23.4	1.60
3c	250	83	5.0	0.0	9.5	0.30
3d	250	83	5.0	0.0	11.4	0.25
3e	3300	1100	3.0	+0.5	25.0	1.50
3f	250	83	7.5	0.0	9.5	0.30
						4.30

4a	350	117	7.5	-3.5	11.4	0.35
4b	1450	483	3.0	0.0	19.4	0.85
4c	250	83	5.0	0.0	9.5	0.30
4d	250	83	5.0	0.0	11.4	0.25
4e	1700	567	3.0	0.0	22.7	0.85
4f	500	167	7.5	+3.5	11.4	0.50
						3.10

CAT 637 SCRAPER

Haul Segment	Distance Feet	Distance Meters	Rolling Resistance	Grade %	Ave Speed MPH	Time Min
--------------	---------------	-----------------	--------------------	---------	---------------	----------

5a	1400	467	7.5	-2.75	15.9	1.00
5b	1350	450	3.0	0.0	19.2	0.80
5c	250	83	5.0	0.0	9.5	0.30
5d	250	83	5.0	0.0	11.4	0.25
5e	2250	750	3.0	0.0	23.2	1.10
5f	700	233	7.5	-5.5	11.4	0.70
						4.15

6a	600	200	7.5	0.0	11.4	0.60
6b	900	300	3.0	-3.3	20.5	0.50
6c	1450	483	3.0	0.0	19.4	0.85
6d	400	133	5.0	0.0	11.4	0.40
6e	400	133	5.0	0.0	11.4	0.40
6f	1450	483	3.0	0.0	22.0	0.75
6g	900	300	3.0	+3.3	17.0	0.60
6h	450	150	7.5	0.0	12.8	0.40
						4.50

7a	750	250	7.5	-1.5	12.2	0.70
7b	1600	533	3.0	0.0	20.2	0.90
7c	350	117	5.0	0.0	11.4	0.35
7d	350	117	5.0	0.0	11.4	0.35
7e	1600	533	3.0	0.0	22.7	0.80
7f	750	250	7.5	+1.5	13.1	0.65
						3.75

769C TRUCK EFFICIENCY

NOMINAL CAPACITY

25

HAUL ROUTE	TRAVEL TIME	FIXED TIME	EFFICIENCY	MINUTES PER TRIP	TRIPS/ HOUR	YARDS/ HOUR
1	3.90	2.50	85%	7.5	8.0	199
2	3.05	2.50	85%	6.5	9.2	230
3	4.00	2.50	85%	7.6	7.8	196

CAT 769 TRUCKS

TRAVEL TIMES FOR CAT 769C TRUCKS BASED ON PROJECTED HAUL ROUTES

Haul Segment	Distance Feet	Distance Meters	Rolling Resistance	Grade %	Ave Speed MPH	Time Min
1a	200	67	7.5	0.0	7.6	0.30
1b	500	167	5.0	0.0	12.6	0.45
1c	200	67	3.0	2.5	9.1	0.25
1d	1400	467	3.0	0.0	18.7	0.85
1e	250	83	3.0	0.0	9.5	0.30
1f	250	83	3.0	0.0	11.4	0.25
1g	1400	467	3.0	0.0	22.7	0.70
1h	200	67	3.0	(2.5)	11.4	0.20
1i	400	133	5.0	0.0	13.0	0.35
1j	200	67	7.5	0.0	9.1	0.25
						3.90
2a	200	67	7.5	0.0	7.6	0.30
2b	2150	717	3.0	(0.5)	24.4	1.00
2c	250	83	5.0	0.0	9.5	0.30
2d	250	83	5.0	0.0	11.4	0.25
2e	2250	750	3.0	+0.5	26.9	0.95
2f	200	67	7.5	0.0	9.1	0.25
						3.05
3a	250	83	7.5	0.0	8.1	0.35
3b	3300	1100	3.0	-0.5	25.0	1.50
3c	250	83	5.0	0.0	9.5	0.30
3d	250	83	5.0	0.0	11.4	0.25
3e	3300	1100	3.0	+0.5	28.8	1.30
3f	250	83	7.5	0.0	9.5	0.30
						4.00
4a	350	117	7.5	-3.5	11.4	0.35
4b	1450	483	3.0	0.0	19.4	0.85
4c	250	83	5.0	0.0	9.5	0.30
4d	250	83	5.0	0.0	11.4	0.25
4e	1700	567	3.0	0.0	22.7	0.85
4f	500	167	7.5	+3.5	11.4	0.50
						3.10

CAT 769 TRUCKS

Haul Segment	Distance Feet	Distance Meters	Rolling Resistance	Grade %	Ave Speed MPH	Time Min
5a	1400	467	7.5	-2.75	15.9	1.00
5b	1350	450	3.0	0.0	19.2	0.80
5c	250	83	5.0	0.0	9.5	0.30
5d	250	83	5.0	0.0	11.4	0.25
5e	2250	750	3.0	0.0	23.2	1.10
5f	700	233	7.5	+5.5	11.4	0.70
						4.15

6a	600	200	7.5	0.0	11.4	0.60
6b	900	300	3.0	-3.3	20.5	0.50
6c	1450	483	3.0	0.0	19.4	0.85
6d	400	133	5.0	0.0	11.4	0.40
6e	400	133	5.0	0.0	11.4	0.40
6f	1450	483	3.0	0.0	22.0	0.75
6g	900	300	3.0	+3.3	17.0	0.60
6h	450	150	7.5	0.0	12.8	0.40
						4.50

7a	750	250	7.5	-1.5	12.2	0.70
7b	1600	533	3.0	0.0	20.2	0.90
7c	350	117	5.0	0.0	11.4	0.35
7d	350	117	5.0	0.0	11.4	0.35
7e	1600	533	3.0	0.0	22.7	0.80
7f	750	250	7.5	+1.5	13.1	0.65
						3.75

LABOR COSTS

Specified Wages

Heavy Construction		1998 Estimate Labor Rates**		0.1397	0.2128		
Labor Classification	Base Rate	Mandated Fringe	Labor Burden (FICA, SUI, FUI, etc.	Company Benefits (medical, life insure, etc)	Fringe Costs	Labor Cost/HR	
Boiler Makers	\$19.60	\$8.76	\$2.74	no added cost	\$11.50	\$31.10	
Millwrights	\$19.83	\$3.25	\$2.77	\$0.97	\$6.99	\$26.82	
Ironworkers	\$19.92	\$6.66	\$2.78	no added cost	\$9.44	\$29.36	
Carpenters	\$10.81		\$1.51	\$2.30	\$3.81	\$14.62	
Cement Masons	\$11.52		\$1.61	\$2.45	\$4.06	\$15.58	
Electricians	\$14.52	\$2.71	\$2.03	\$0.38	\$5.12	\$19.64	
Ironworkers - Reinforcing	\$11.00		\$1.54	\$2.34	\$3.88	\$14.88	
Laborers (including pipelayers)	\$7.65	\$1.60	\$1.07	\$0.03	\$2.70	\$10.35	
Pipefitters	\$12.60		\$1.76	\$2.68	\$4.44	\$17.04	
POWER EQUIPMENT OPERATORS							
Backhoes	\$10.00		\$1.40	\$2.13	\$3.53	\$13.53	
Cranes	\$10.43		\$1.46	\$2.22	\$3.68	\$14.11	
Dozers++	\$13.10		\$1.83	\$2.79	\$4.62	\$17.72	
Graders	\$12.67		\$1.77	\$2.70	\$4.47	\$17.14	
Loaders	\$11.26		\$1.57	\$2.40	\$3.97	\$15.23	
Scrapers+	\$10.00		\$1.40	\$2.13	\$3.53	\$13.53	
Trackhoes	\$10.00		\$1.40	\$2.13	\$3.53	\$13.53	
Tractors	\$9.42		\$1.32	\$2.00	\$3.32	\$12.74	
TRUCK DRIVERS	\$9.42		\$1.32	\$2.00	\$3.32	\$12.74	

Note: base rates do not include FICA, worker comp, unemployment, or company benefits which increase the cost per hour

** General Decision UT980009 - Modification 0 - 2/13/98

++ Operator Rate used in 1999 estimate

LABOR COSTS

<u>Nonspecified Wages</u>	Base Rate	Mandated Fringe	Labor Burden (FICA, SUI, FUI, etc.)	Company Benefits (medical, life insure, etc)	Fringe Costs	Labor Cost/HR
Survey Crew Member	\$9.75	\$0.00	\$1.36	\$2.07	\$3.44	\$13.19
Sample Crew Member	\$9.75	\$0.00	\$1.36	\$2.07	\$3.44	\$13.19
Mechanic (Demolition)	\$10.20	\$0.00	\$1.42	\$2.17	\$3.60	\$13.80
Manager/Engineer	\$36.00	\$0.00	\$5.03	\$7.66	\$12.69	\$48.69
Radiation Safety Officer	\$28.00	\$0.00	\$3.91	\$5.96	\$9.87	\$37.87
Secretary	\$11.10	\$0.00	\$1.55	\$2.36	\$3.91	\$15.01
Clerk	\$9.25	\$0.00	\$1.29	\$1.97	\$3.26	\$12.51
Engineer	\$28.00	\$0.00	\$3.91	\$5.96	\$9.87	\$37.87
Environmental Technician	\$14.80	\$0.00	\$2.07	\$3.15	\$5.22	\$20.02
Safety Engineer	\$14.80	\$0.00	\$2.07	\$3.15	\$5.22	\$20.02
Maintenance Foreman	\$20.34	\$0.00	\$2.84	\$4.33	\$7.17	\$27.51
Security Personnel	\$5.75	\$0.00	\$0.80	\$1.22	\$2.03	\$7.78
Chemist	\$16.65	\$0.00	\$2.33	\$3.54	\$5.87	\$22.52



INTERNATIONAL
URANIUM (USA)
CORPORATION

6425 S. Highway 191 ♦ P.O. Box 809 ♦ Blanding, UT 84511 ♦ 435 678-2221 ♦ 435 678 2224 (fax)

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Harold Roberts
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GENERAL DECISION UT980009 02/13/98 UT9
General Decision Number UT960009

Superseded General Decision No. UT970009

State: Utah

Construction Type:
HEAVY

County(ies):

BEAVER	IRON	SEVIER
CARBON	JUAB	UINTAH
DAGGETT	KANE	WASHINGTON
EMERY	PIUTE	WAYNE
GARFIELD	SAN JUAN	
GRAND	SAN PETE	

HEAVY CONSTRUCTION PROJECTS

Modification Number C Publication Date 02/13/1998

COUNTY(ies):

BEAVER	IRON	SEVIER
CARBON	JUAB	UINTAH
DAGGETT	KANE	WASHINGTON
EMERY	PIUTE	WAYNE
GARFIELD	SAN JUAN	
GRAND	SAN PETE	

BOILO192B 04/01/1996

BOILERMAKERS	Rates 19.60	Fringes 8.76
--------------	-------------	--------------

CMRPO721B 10/29/1995

MILLWRIGHTS	Rates 19.83	Fringes 5.25
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IRON0027G 07/01/1997

IRONWORKERS:	Rates	Fringes
General Labor	18.00	6.66

SCU15001A 03/01/1990

	Rates	Fringes
CARPENTERS	10.81	
CEMENT MASONS	11.52	
ELECTRICIANS	14.52	2.71
IRONWORKERS:		
Reinforcing	11.00	
LABORERS (including		
pipelayers)	7.65	1.60
PIPEFITTERS	12.60	9.25
POWER EQUIPMENT OPERATORS:		
Backhoes	10.00	
Cranes	10.43	
Dozers	13.10	
Graders	12.67	
Loaders	11.26	
Scrapers	10.00	
Trackhoes	10.00	
Tractors	9.42	
TRUCK DRIVERS	9.62	

2000

11-03-98 18:05

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To: w.deal@cisna.com
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Subject: Heavy Construction Davis-Bacon wages

Heavy Construction Projects

Modification Number **Publication Date**
 0 02/13/1998

County (ies)

Beaver	Iron	Sevier
Carbon	Juab	Uintah
Daggett	Kane	Washington
Emery	Piute	Wayne
Garfield	San Juan	
Grand	San Pete	

	Rates	Fringes
Boilermakers	19.60	8.76

	Rates	Fringes
Milhwrights	19.83	3.25

	Rates	Fringes
Ironworkers:Structural	18.92	6.66

	Rates	Fringes
Carpenters	10.81	
Cement Masons	11.52	
Electricians	14.52	2.71
Ironworkers:Reinforcing	11.00	
Laborers (including pipelayers)	7.65	1.60
Pipefitters	12.60	
Power Equipment Operators:		
Backhoes	10.00	
Cranes	10.43	
Dozers	13.10	
Graders	12.67	
Loaders	11.26	
Scrapers	10.00	
Trackhoes	10.00	
Tractors	9.42	
Truck Drivers	9.42	

Let me know if this works out o.k.
 Shauna :)

PAGE 9
 PREPARED: 03:14 PM 03-Feb-99
 ALP036

INTERNATIONAL URANIUM (USA) CORP
 SALARY ALLOCATION-JOURNAL ENTRY SUPPORT
 JAN 31, 1999
 (FINAL)

		SALARY	PENSN	BONUS	TAXES	INSUR	VACAT	HOLIDY	SICK	OTHER	DENOHD	TOTAL	PRPTY	VACAT	HOLIDY	SICK	OTHER
249	3H	[REDACTED] 1,280.00	12.50		168.38	234.00	32.57	65.23	13.01			1,805.69	1,727.45		78.24		
294	3H	[REDACTED] 1,296.00			212.26	234.00	33.57	67.03	13.47			1,856.33	1,775.93		80.40		
307	3H	[REDACTED] 1,576.00			238.17	234.00	39.36	78.84				2,166.37	2,071.81		94.56		
214	3H	[REDACTED] 1,612.00			243.51	234.00	40.13	80.37	16.03			2,226.04	2,129.64		96.40		
306	3H	[REDACTED] 1,649.09			247.45	234.00	40.93	81.97	18.44			2,271.88	2,173.56		98.32		
.....																	
OPERATIONS - HOURLY			201,681.02	602.15	28,185.40	5,682.11	1,900.32	0.00	249,341.32	12,032.88	324.00	616.32					
				0.00	24,948.00	9,781.64	0.00	272,780.64	10,466.12								

1.353 overall
 Bureau
 .1397 Taxes → Fees
 .21288
 Benito # 42,914.22
 # 28,185.40

LONG TERM CARE CALCULATION

Long Term Care Calculation

Base Amount (Starting in Dec. 1978)	\$250,000
CPI-U December, 1978	67.7
CPI-U January, 1999	164.3

Adjusted Long Term Care = $\$250,000 \times (\text{CPI-U most recent} / \text{CPI-U Dec., 1978})$

Adjusted Long Term Care	\$606,721
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Consumer Price Indexes



Table 1. Consumer Price Index for All Urban Consumers (CPI-U): U. S. City Average, by expenditure category and commodity and service group

Table 1. Consumer Price Index for All Urban Consumers (CPI-U): U.S. city average, by commodity and service group

(1982-84=100, unless otherwise noted)

CPI-U	Relative importance, December 1998	Unadjusted indexes			U
		Dec. 1998	Jan. 1999	perce Jan. 199	
Expenditure category					
All items	100.000	163.9	164.3	1	
All items (1967=100)	-	491.0	492.3		
Food and beverages	16.408	162.7	163.9	2	
Food	15.422	162.3	163.6	2	
Food at home	9.691	162.6	164.3	2	
Cereals and bakery products	1.544	182.3	184.2	2	
Meats, poultry, fish, and eggs	2.569	147.3	146.4	-1	
Dairy and related products (1).....	1.088	157.6	161.2	8	
Fruits and vegetables	1.440	200.7	208.6	3	
Nonalcoholic beverages and beverage materials	1.049	131.7	133.5	-0	
Other food at home	2.002	152.4	153.0	2	
Sugar and sweets .....	.377	150.1	151.7	0
Fats and oils .....	.309	151.9	150.5	7
Other foods	1.316	166.9	167.7	2	
Other miscellaneous foods (1) (2).....	.320	104.9	104.1	3	
Food away from home (1).....	5.730	163.0	163.5	2	
Other food away from home (1) (2).....	.175	103.3	103.5	3	
Alcoholic beverages .....	.986	167.2	167.6	1
Housing	39.828	161.3	161.8	2	
Shelter	30.283	184.0	184.7	3	
Rent of primary residence (3).....	7.007	174.9	175.3	3	
Lodging away from home (2) (3).....	2.376	103.8	107.1	1	
Owners' equivalent rent of primary residence (3) (4).....	20.529	190.7	191.0	3	
Tenants' and household insurance (1) (2).....	.371	99.9	99.7	-0	
Fuels and utilities	4.735	126.6	126.2	-2	
Fuels	3.801	111.4	110.9	-3	
Fuel oil and other fuels .....	.227	86.1	86.6	-10
Gas (piped) and electricity (3).....	3.574	118.9	118.3	-2	
Household furnishings and operations	4.810	126.6	126.8	1	

Apparel	4.831	130.7	127.9	-1
Men's and boys' apparel	1.358	130.3	128.1	-1
Women's and girls' apparel	1.939	122.4	117.7	-2
Infants' and toddlers' apparel (1).....	.272	129.6	130.0	4
Footwear .....	.876	127.5	125.6	-1
Transportation	16.999	140.7	140.4	-1
Private transportation	15.653	137.2	136.7	-1
New and used motor vehicles (2).....	7.843	100.9	100.6	0
New vehicles	4.983	144.1	144.4	0
Used cars and trucks (1).....	1.914	153.1	150.6	1
Motor fuel	2.493	86.2	85.0	-13
Gasoline (all types)	2.476	85.7	84.5	-13
Motor vehicle parts and equipment .....	.549	101.2	101.2	-0
Motor vehicle maintenance and repair	1.624	169.6	169.8	2
Public transportation (1).....	1.346	188.4	190.4	1
Medical care	5.713	245.2	246.6	3
Medical care commodities	1.252	225.6	225.9	3
Medical care services	4.461	249.6	251.3	3
Professional services (3).....	2.854	224.6	225.8	3
Hospital and related services (3).....	1.354	291.4	294.4	3
Recreation (2).....	6.120	101.2	101.7	1
Video and audio (1) (2).....	1.748	100.7	101.4	0
Education and communication (2).....	5.478	100.7	100.9	1
Education (2).....	2.694	104.7	105.0	4
Educational books and supplies .....	.203	257.3	258.4	5
Tuition, other school fees, and childcare	2.492	301.7	302.4	4
Communication (1) (2).....	2.783	97.1	97.3	-2
Information and information processing (1) (2).....	2.580	96.9	96.9	-2
Telephone services (1) (2).....	2.327	100.3	100.7	0
Information and information processing other than telephone services (1) (5) .....	.253	34.8	33.8	-26
Personal computers and peripheral equipment (1) (2).....	.148	64.2	61.4	-36
Other goods and services	4.624	250.3	255.4	10
Tobacco and smoking products	1.159	331.2	354.2	39
Personal care (1).....	3.465	158.3	158.9	2
Personal care products (1).....	.742	148.7	149.9	2
Personal care services (1).....	.973	168.3	168.8	2
Miscellaneous personal services	1.491	237.8	238.9	3
Commodity and service group				
Commodities	42.109	142.2	142.5	0
Food and beverages	16.408	162.7	163.9	2
Commodities less food and beverages	25.702	130.2	129.9	-0
Nondurables less food and beverages	14.345	132.1	131.8	-0
Apparel	4.831	130.7	127.9	-1
Nondurables less food, beverages, and apparel	9.514	137.8	138.8	0
Durables	11.356	127.4	127.1	-0
Services	57.891	185.7	186.3	2
Rent of shelter (4).....	29.912	191.5	192.3	3
Transportation services	6.963	188.4	188.8	0
Other services	10.768	219.5	220.5	3
Special indexes				
All items less food	84.578	164.2	164.5	1
All items less shelter	69.717	157.8	158.1	1

All items less medical care	94.287	159.4	159.8	1
Commodities less food	26.688	131.7	131.4	-3
Nondurables less food	15.331	134.2	133.9	0
Nondurables less food and apparel	10.500	139.7	140.7	0
Nondurables	30.753	147.5	147.9	1
Services less rent of shelter (4).....	27.979	192.8	193.3	1
Services less medical care services	53.429	179.8	180.3	2
Energy	6.294	98.9	98.1	-7
All items less energy	93.706	172.3	172.9	2
All items less food and energy	78.284	174.8	175.3	2
Commodities less food and energy commodities	23.967	143.9	143.7	1
Energy commodities	2.720	86.3	85.2	-12
Services less energy services	54.316	192.5	193.2	2
Purchasing power of the consumer dollar	-	\$.610	\$.608	
Purchasing power of the consumer dollar - old base	-	\$.204	\$.203	

1 Not seasonally adjusted.

2 Indexes on a December 1997=100 base.

3 This index series was calculated using a Laspeyres estimator. All other item s
geometric means estimator in January, 1999.

4 Indexes on a December 1982=100 base.

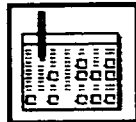
5 Indexes on a December 1988=100 base.

- Data not available.

NOTE: Index applies to a month as a whole, not to any specific date.



Table of Contents



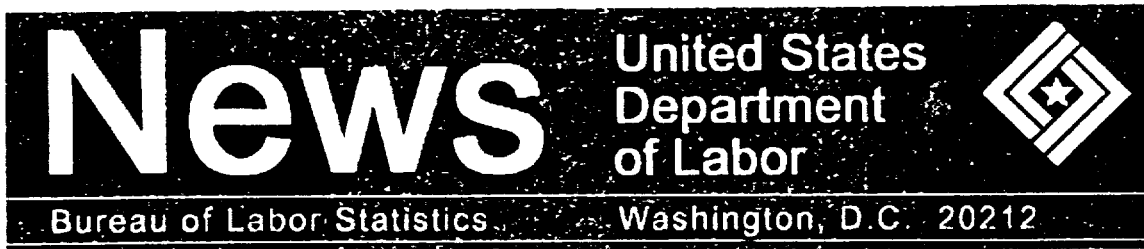
Consumer Price Indexes

Bureau of Labor Statistics

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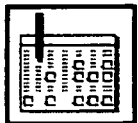
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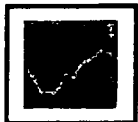
Consumer Price Index

Table of Contents

- [Consumer Price Index Summary](#)
- [Table 1. Consumer Price Index for All Urban Consumers \(CPI-U\): U. S. City Average, by expenditure category and commodity and service group](#)
- [Table 2. Consumer Price Index for All Urban Consumers \(CPI-U\): Seasonally adjusted U. S. City Average, by expenditure category and commodity and service group](#)
- [Table 3. Consumer Price Index for All Urban Consumers \(CPI-U\): Selected areas, all items index](#)
- [Table 4. Consumer Price Index for Urban Wage Earners and Clerical Workers \(CPI-W\): U. S. City Average, by expenditure category and commodity and service group](#)
- [Table 5. Consumer Price Index for Urban Wage Earners and Clerical Workers \(CPI-W\): Seasonally adjusted U. S. City Average, by expenditure category and commodity and service group](#)
- [Table 6. Consumer Price Index for Urban Wage Earners and Clerical Workers \(CPI-W\): Selected areas, all items index](#)
- [Table 1\(LAS\). Consumer Price Index for All Urban Consumers \(CPI-U-XL\): U.S. city average, by expenditure category and commodity and service group using a Laspeyres Estimator](#)
- [Table 2\(LAS\). Consumer Price Index for Urban Wage Earners and Clerical Workers \(CPI-W-XL\): U.S. city average, by expenditure category and commodity and service group using a Laspeyres Estimator](#)
- [Table 3\(LAS\). Consumer Price Index for All Urban Consumers \(CPI-U-XL\): Selected areas, all items index using a Laspeyres Estimator](#)
- [Table 4\(LAS\). Consumer Price Index for Urban Wage Earners and Clerical Workers \(CPI-W-XL\): Selected areas, all items index using a Laspeyres Estimator](#)
- [Text version of entire news release](#)



[Consumer Price Indexes](#)



[Data Home Page](#)



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2-19-1999

U.S. Department Of Labor
Bureau of Labor Statistics
Washington, D.C. 20212

Consumer Price Index

All Urban Consumers - (CPI-U)

U.S. city average

All items

1982-84=100

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.
1913	9.8	9.8	9.8	9.8	9.7	9.8	9.9	9.9	10.0	10.0	10.1
1914	10.0	9.9	9.9	9.8	9.9	9.9	10.0	10.2	10.2	10.1	10.2
1915	10.1	10.0	9.9	10.0	10.1	10.1	10.1	10.1	10.1	10.2	10.3
1916	10.4	10.4	10.5	10.6	10.7	10.8	10.8	10.9	11.1	11.3	11.5
1917	11.7	12.0	12.0	12.6	12.8	13.0	12.8	13.0	13.3	13.5	13.5
1918	14.0	14.1	14.0	14.2	14.5	14.7	15.1	15.4	15.7	16.0	16.3
1919	16.5	16.2	16.4	16.7	16.9	16.9	17.4	17.7	17.8	18.1	18.5
1920	19.3	19.5	19.7	20.3	20.6	20.9	20.8	20.3	20.0	19.9	19.8
1921	19.0	18.4	18.3	18.1	17.7	17.6	17.7	17.7	17.5	17.5	17.4
1922	16.9	16.9	16.7	16.7	16.7	16.7	16.8	16.6	16.6	16.7	16.8
1923	16.8	16.8	16.8	16.9	16.9	17.0	17.2	17.1	17.2	17.3	17.3
1924	17.3	17.2	17.1	17.0	17.0	17.0	17.1	17.0	17.1	17.2	17.2
1925	17.3	17.2	17.3	17.2	17.3	17.5	17.7	17.7	17.7	17.7	18.0
1926	17.9	17.9	17.8	17.9	17.8	17.7	17.5	17.4	17.5	17.6	17.7
1927	17.5	17.4	17.3	17.3	17.4	17.6	17.3	17.2	17.3	17.4	17.3
1928	17.3	17.1	17.1	17.1	17.2	17.1	17.1	17.1	17.3	17.2	17.2
1929	17.1	17.1	17.0	16.9	17.0	17.1	17.3	17.3	17.3	17.3	17.3
1930	17.1	17.0	16.9	17.0	16.9	16.8	16.6	16.5	16.6	16.5	16.4
1931	15.9	15.7	15.6	15.5	15.3	15.1	15.1	15.1	15.0	14.9	14.7
1932	14.3	14.1	14.0	13.9	13.7	13.6	13.6	13.5	13.4	13.3	13.2
1933	12.9	12.7	12.6	12.6	12.6	12.7	13.1	13.2	13.2	13.2	13.2
1934	13.2	13.3	13.3	13.3	13.3	13.4	13.4	13.4	13.6	13.5	13.5
1935	13.6	13.7	13.7	13.8	13.8	13.7	13.7	13.7	13.7	13.7	13.8
1936	13.8	13.8	13.7	13.7	13.7	13.8	13.9	14.0	14.0	14.0	14.0
1937	14.1	14.1	14.2	14.3	14.4	14.4	14.5	14.5	14.6	14.6	14.5
1938	14.2	14.1	14.1	14.2	14.1	14.1	14.1	14.1	14.1	14.0	14.0
1939	14.0	13.9	13.9	13.8	13.8	13.8	13.8	13.8	14.1	14.0	14.0
1940	13.9	14.0	14.0	14.0	14.0	14.1	14.0	14.0	14.0	14.0	14.0
1941	14.1	14.1	14.2	14.3	14.4	14.7	14.7	14.9	15.1	15.3	15.4
1942	15.7	15.8	16.0	16.1	16.3	16.3	16.4	16.5	16.5	16.7	16.8
1943	16.9	16.9	17.2	17.4	17.5	17.5	17.4	17.3	17.4	17.4	17.4
1944	17.4	17.4	17.4	17.5	17.5	17.6	17.7	17.7	17.7	17.7	17.7
1945	17.8	17.8	17.8	17.8	17.9	18.1	18.1	18.1	18.1	18.1	18.1
1946	18.2	18.1	18.3	18.4	18.5	18.7	19.8	20.2	20.4	20.8	21.3

1947	21.5	21.5	21.9	21.9	21.9	22.0	22.2	22.5	23.0	23.0	23.1
1948	23.7	23.5	23.4	23.8	23.9	24.1	24.4	24.5	24.5	24.4	24.2
1949	24.0	23.8	23.8	23.9	23.8	23.9	23.7	23.8	23.9	23.7	23.8
1950	23.5	23.5	23.6	23.6	23.7	23.8	24.1	24.3	24.4	24.6	24.7
1951	25.4	25.7	25.8	25.8	25.9	25.9	25.9	25.9	26.1	26.2	26.4
1952	26.5	26.3	26.3	26.4	26.4	26.5	26.7	26.7	26.7	26.7	26.7
1953	26.6	26.5	26.6	26.6	26.7	26.8	26.8	26.9	26.9	27.0	26.9
1954	26.9	26.9	26.9	26.8	26.9	26.9	26.9	26.9	26.8	26.8	26.8
1955	26.7	26.7	26.7	26.7	26.7	26.7	26.8	26.8	26.9	26.9	26.9
1956	26.8	26.8	26.8	26.9	27.0	27.2	27.4	27.3	27.4	27.5	27.5
1957	27.6	27.7	27.8	27.9	28.0	28.1	28.3	28.3	28.3	28.3	28.4
1958	28.6	28.6	28.8	28.9	28.9	28.9	29.0	28.9	28.9	28.9	29.0
1959	29.0	28.9	28.9	29.0	29.0	29.1	29.2	29.2	29.3	29.4	29.4
1960	29.3	29.4	29.4	29.5	29.5	29.6	29.6	29.6	29.6	29.8	29.8
1961	29.8	29.8	29.8	29.8	29.8	29.8	30.0	29.9	30.0	30.0	30.0
1962	30.0	30.1	30.1	30.2	30.2	30.2	30.3	30.3	30.4	30.4	30.4
1963	30.4	30.4	30.5	30.5	30.5	30.6	30.7	30.7	30.7	30.8	30.8
1964	30.9	30.9	30.9	30.9	30.9	31.0	31.1	31.0	31.1	31.1	31.2
1965	31.2	31.2	31.3	31.4	31.4	31.6	31.6	31.6	31.6	31.7	31.7
1966	31.8	32.0	32.1	32.3	32.3	32.4	32.5	32.7	32.7	32.9	32.9
1967	32.9	32.9	33.0	33.1	33.2	33.3	33.4	33.5	33.6	33.7	33.8
1968	34.1	34.2	34.3	34.4	34.5	34.7	34.9	35.0	35.1	35.3	35.4
1969	35.6	35.8	36.1	36.3	36.4	36.6	36.8	37.0	37.1	37.3	37.5
1970	37.8	38.0	38.2	38.5	38.6	38.8	39.0	39.0	39.2	39.4	39.6
1971	39.8	39.9	40.0	40.1	40.3	40.6	40.7	40.8	40.8	40.9	40.9
1972	41.1	41.3	41.4	41.5	41.6	41.7	41.9	42.0	42.1	42.3	42.4
1973	42.6	42.9	43.3	43.6	43.9	44.2	44.3	45.1	45.2	45.6	45.9
1974	46.6	47.2	47.8	48.0	48.6	49.0	49.4	50.0	50.6	51.1	51.5
1975	52.1	52.5	52.7	52.9	53.2	53.6	54.2	54.3	54.6	54.9	55.3
1976	55.6	55.8	55.9	56.1	56.5	56.8	57.1	57.4	57.6	57.9	58.0
1977	58.5	59.1	59.5	60.0	60.3	60.7	61.0	61.2	61.4	61.6	61.9
1978	62.5	62.9	63.4	63.9	64.5	65.2	65.7	66.0	66.5	67.1	67.4
1979	68.3	69.1	69.8	70.6	71.5	72.3	73.1	73.8	74.6	75.2	75.9
1980	77.8	78.9	80.1	81.0	81.8	82.7	82.7	83.3	84.0	84.8	85.5
1981	87.0	87.9	88.5	89.1	89.8	90.6	91.6	92.3	93.2	93.4	93.7
1982	94.3	94.6	94.5	94.9	95.8	97.0	97.5	97.7	97.9	98.2	98.0
1983	97.8	97.9	97.9	98.6	99.2	99.5	99.9	100.2	100.7	101.0	101.2
1984	101.9	102.4	102.6	103.1	103.4	103.7	104.1	104.5	105.0	105.3	105.3
1985	105.5	106.0	106.4	106.9	107.3	107.6	107.8	108.0	108.3	108.7	109.0
1986	109.6	109.3	108.8	108.6	108.9	109.5	109.5	109.7	110.2	110.3	110.4
1987	111.2	111.6	112.1	112.7	113.1	113.5	113.8	114.4	115.0	115.3	115.4
1988	115.7	116.0	116.5	117.1	117.5	118.0	118.5	119.0	119.8	120.2	120.3
1989	121.1	121.6	122.3	123.1	123.8	124.1	124.4	124.6	125.0	125.6	125.9
1990	127.4	128.0	128.7	128.9	129.2	129.9	130.4	131.6	132.7	133.5	133.8
1991	134.6	134.8	135.0	135.2	135.6	136.0	136.2	136.6	137.2	137.4	137.8
1992	138.1	138.6	139.3	139.5	139.7	140.2	140.5	140.9	141.3	141.8	142.0
1993	142.6	143.1	143.6	144.0	144.2	144.4	144.4	144.8	145.1	145.7	145.8
1994	146.2	146.7	147.2	147.4	147.5	148.0	148.4	149.0	149.4	149.5	149.7
1995	150.3	150.9	151.4	151.9	152.2	152.5	152.5	152.9	153.2	153.7	153.6
1996	154.4	154.9	155.7	156.3	156.6	156.7	157.0	157.3	157.8	158.3	158.6
1997	159.1	159.6	160.0	160.2	160.1	160.3	160.5	160.8	161.2	161.6	161.5
1998	161.6	161.9	162.2	162.5	162.8	163.0	163.2	163.4	163.6	164.0	164.0
1999	164.3										

LONG TERM CARE CALCULATION

Long Term Care Calculation

Base Amount (Starting in Dec. 1978)	\$250,000
CPI-U December, 1978	67.7
CPI-U January, 1999	164.3

Adjusted Long Term Care = $\$250,000 \times (\text{CPI-U most recent} / \text{CPI-U Dec., 1978})$

Adjusted Long Term Care	\$606,721
-------------------------	-----------

ATTACHMENT D

RECLAMATION MATERIAL CHARACTERISTICS

PREPARED BY

INTERNATIONAL URANIUM (USA) CORP.

INDEPENDENCE PLAZA

1050 17TH STREET, SUITE 950

DENVER, CO 80265

Attachment D - Reclamation Material Characteristics

Material proposed for use in the reclamation of the White Mesa Mill tailings cells is available from stockpiles on the site, which were generated from construction of the existing cells. In the case of clay material for radon barrier, it is available to supplement the onsite material from the Section 16 borrow site located approximately 3 miles to the south of the exiting cells.

The characteristics of the materials are generally described in the text of the Reclamation Plan. In addition, test work was completed on the clay borrow material as well as the onsite stockpiles.

The Section 16 clay material was originally tested in 1982 by D'Appolonia Consulting Engineers, Inc. This test work included:

- Classification
 - Grain size, sieve and hydrometer
 - Atterberg limits
 - Specific gravity
- X-ray diffraction
- Cation Exchange Capacity
- Exchangeable Cations
- Modified Proctor
- Permeability

A copy of the full D'Appolonia Report is included in this Attachment

The onsite random fill and clay stockpiles were sampled and characterized in a program detailed in the April 15, 1999, submittal to the NRC, "Additional Clarifications to the White Mesa Mill Reclamation Plan". A copy of this sampling and testing program are included in this Attachment as well as the results of the characterization work. The samples were characterized for:

- Classification
 - Grain size and sieve
 - Atterberg limits
- Standard Proctor

The results of these tests for the onsite stockpiled material are included in this Attachment.

D'APPOLONIA

CONSULTING ENGINEERS, INC.

March 8, 1982

Project No. RM78-682B

Mr. H. R. Roberts
Energy Fuels Nuclear, Inc.
1515 Arapahoe Street
Three Park Central, Suite 900
Denver, Colorado 80202

Letter Report
Section 16 Clay Material Test Data
White Mesa Uranium Project
Blanding, Utah

Dear Harold:

This report presents the results of field investigations and laboratory tests performed on Section 16 clay material. The material tested was obtained from borings and test pits made in April 1979. The laboratory tests were performed and the data retained in our files until your recent request for the data.

Field Investigations

The area of investigation is a canyon located in Section 16, about three miles south of the mill site. Seven borings were drilled as part of the field investigations. These borings, 100 through 106, are located approximately as shown on Figure 1.

The borings were drilled with a rig provided by Energy Fuels using the rotary method with air pressure to flush out the cuttings. Samples were obtained by sampling the cuttings on five foot intervals. Only qualitative information on the subsurface materials is available because of the method of drilling and sampling utilized. However, the qualitative information and samples obtained are suitable to provide preliminary data on the character of the subsurface materials present.

Three test pits (1-3) were excavated to obtain bulk samples for laboratory testing. The location of the test pits is shown on Figure 1.

Samples from Boring 2-16 drilled by Energy Fuels in November 1978 were also provided to D'Appolonia for testing. The location of Boring 2-16 is shown on Figure 1.

Subsurface Conditions

The subsurface conditions in the canyon, based on the boring data, are shown on Cross Sections A-A' and B-B' presented on Figures 2 and 3, respectively. The plan locations of these cross sections is shown on Figure 1. As shown on the cross sections, the subsurface consists of a surficial layer of red clayey and silty sand about five feet thick. The underlying material is mostly a red or gray silty clay. The consistency of the silty clay layer varies from stiff to hard, based on observations of the drillers and rig during drilling. A lense or layer of very hard silt was noted in Boring 105. This layer appears to be a well cemented unit from the cutting samples obtained. In Boring 106, the surficial sand layer was about 20 feet thick and a clayey sand layer was also encountered at a depth of about 30 feet.

The laboratory soil classifications for the tested samples are also shown on Cross Sections A-A' and B-B'. The testing program is discussed in detail in the following section, however, the testing results indicate that the silty clay layer is mostly a CL or CH material with one sample being a SM and two a ML. These test results show the material is basically a fine grained soil with a varying amount of silt and clay size particles. The plasticity characteristics of the material vary from low to high. Further discussion of the test results and material characteristics is given below.

Water in the borings was not noted except for Boring 104 for which a depth of about 43 feet was measured. This depth is not considered completely reliable since it was measured only one day after drilling and the water level may not have had time to stabilize.

Laboratory Test Results

The laboratory testing program conducted on samples from the borings and test pits included the following types of tests:

- o Classification
 - Grain size, sieve and hydrometer
 - Atterberg limits
 - Specific gravity
- o X-Ray Diffraction
- o Cation Exchange Capacity
- o Exchangeable Cations
- o Modified Proctor Compaction Density
- o Permeability

The results of the classification tests are given on Table 1. The soil classifications given are shown on Cross Sections A-A' and B-B' (Figures 2 and 3) and were discussed above.

The cation exchange capacity (CEC) and exchangeable ions were conducted to evaluate the type of clays present and the chemical effects resulting from contact with the tailings liquid. Tests were run on samples from Test Pits 2 and 3 samples and Boring 103 (15-20 foot depth). Soil from each sample was treated by soaking in simulated tailings liquid for 48 hours before testing. Both treated and untreated (as received) samples were tested and the results are presented on Table 2. Results of the testing are summarized as follows:

- o The untreated samples indicate pH (1:1) values between 7.40 and 8.35 with CEC values in the 45-56 meq/100g range. The predominate exchangeable ions are calcium and sodium for Test Pits 2 and 3 and calcium and magnesium for Boring 103 (15-20 ft).
- o The treated samples indicate pH (1:1) values between 1.70 and 2.35 with CEC values in the 90-100 meq/100g range. The predominate exchangeable ions are hydrogen, calcium, and magnesium for all the samples.

These results indicate that exposure to the tailings water causes:

- the pH (1:1) of the material to decrease.
- the exchangeable hydrogen and magnesium to increase.
- the exchangeable calcium and sodium to decrease.
- the CEC to increase by a factor of about two due primarily to the large increase in exchangeable hydrogen.

The effects of these changes on clay material properties, particularly permeability, is discussed in the following paragraphs.

The X-ray diffraction tests were run on material from the same three samples as tested for CEC and exchangeable ions. The x-ray diffraction testing was conducted to evaluate the type of clay minerals occurring in the material. The results of the testing are given on Table 3. As shown, about 50 percent of the material is quartz, 25 percent montmorillonite, 25 percent illite, and minor percentages of other minerals. Montmorillonite is an active clay mineral which typically has a low coefficient of permeability. Illite is also a clay mineral, but it is typically relatively inactive with a somewhat higher coefficient of permeability.

Modified Proctor compaction tests were conducted on four different samples. Test Pits 1, 2 and 3 samples were tested and a composite sample from Boring 2-16 (85 to 210 feet depth). The results of the modified Proctor tests are given on Table 1. The average maximum dry density measured is 107 pounds per cubic foot and the average optimum water content is 17.5 percent.

Permeability tests were conducted on compacted samples of material from Boring 2-16 (composite 85-120 feet), Boring 101 (composite 0-25 feet), Boring 103 (composite 0-25 feet) and Test Pit 2. The tests were conducted in permeability cells with a confining pressure applied around the sample which is encased in a rubber membrane. A differential pressure was applied across the sample and flow of fluid through the sample measured. Both distilled water and simulated tailings liquid were used in the tests. The tests on Borings 101 and 103, and Test Pit 2 were conducted over a period of about five months to assess the effects of tailings liquid on the permeability of the material. The tests were conducted with distilled water for about two months to establish saturation and steady state flow. Tailings liquid was then introduced to the sample and the test continued for three more months. The results of the permeability tests are presented on Table 4 along with other pertinent sample data. The material has an average coefficient of permeability with water of 3.3×10^{-10} centimeters per second and 5.1×10^{-10} centimeters per second with simulated tailings liquid. The test results indicate that the permeability of the material was essentially the same with distilled water and tailings liquid and no degradation of the material was indicated.

Conclusions and Recommendations

Based on the field and laboratory investigations discussed above, conclusions which can be made regarding the materials in Section 16 are:

- o The material is mostly a silty clay (CL to CH) with slight variation in properties. The clay minerals are mostly montmorillonite with some illite.
- o The material varies laterally with some layers or lenses of sand and silt. The consistency of the material also varies from stiff to hard or very hard.
- o The permeability values of the material are very low and long-term permeability tests conducted with simulated tailings liquid indicate little change in permeability with time. This result is in good agreement with the results of the CEC, exchangeable ion tests and x-ray diffraction test results.
- o The clay material is suitable for use as borrow for use as a clay liner or in situ as a natural liner layer.

Recommendations for further assessment of the clay for use as a borrow area or in situ clay liner source are:

- o Geotechnical borings with split spoon samples to assess the material characteristics more specifically, including consistency, natural water content, and classification.

Mr. H. R. Roberts

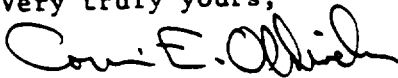
5

March 8, 1982

- o Field permeability tests (falling or rising head) in the borings to measure the in situ permeability.
- o Installation of piezometers to determine the ground water level.

Additional discussion of the above recommendations can be provided as necessary depending on your needs.

Very truly yours,



Corwin E. Oldweiler
Project Engineer

CEO:par

DAF POLONL

(1) These samples are Test Pits
(2) Sample tested before soaking.
(3) Sample tested after soaking 16 hours.

LABORATORY TEST RESULTS

TABLE 1

BORING/ TEST PIT	SAMPLE DEPTH (FEET)	GRAIN SIZE ANALYSIS			ATTENBERG LIMITS			UNCS CLASSIFICATION	SPECIFIC GRAVITY	DRY DENSITY (PCF)	OPTIMUM PROCTOR VALUES (PERCENT)
		SAND (PERCENT)	SILT (PERCENT)	CLAY (PERCENT)	LIQUID (PERCENT)	PLASTIC (PERCENT)	CLAY (PERCENT)				
101	0-5	61	22	17	24.0	18.5	5.5	SC-BM	-	-	-
	5-10	26	48	26	58.9	24.1	34.8	CM	-	-	-
	10-15	10	50	40	73.0	28.2	44.8	CM	-	-	-
	15-20	7	54	39	103.0	31.2	71.8	CM	2.59	-	-
102	5-10	-	-	-	-	-	NP	ML	-	-	-
	10-15	-	-	-	20.3	10.2	10.1	CL	-	-	-
	15-20	-	-	-	17.0	14.9	2.1	BM	2.71	-	-
103	0-5	70	18	12	17.0	14.9	2.1	BM	-	-	-
	5-10	15	38	47	73.8	24.9	48.9	CM	-	-	-
	10-15	13	49	38	59.8	26.6	33.2	CM	-	-	-
	15-20	13	50	37	71.0	21.6	49.4	CM	-	-	-
104	0-5	55	30	15	18.4	16.2	2.2	BM	-	-	-
	5-10	30	43	27	31.2	16.5	14.7	CL	-	-	-
	10-15	66	17	17	-	-	-	-	-	-	-
	15-20	37	31	32	35.7	11.8	23.9	CL	-	-	-
105	0-5	58	22	20	-	-	NP	BM	-	-	-
	5-10	65	17	18	-	-	NP	SM	-	-	-
	10-15	62	17	21	24.0	12.0	12.0	SC	-	-	-
	15-20	17	36	47	71.0	18.9	52.1	CM	-	-	-
	17	40	43	108.0	25.0	83.0	92.8	CM	-	-	-
2(1)	-	17	50	33	141.2	18.4	122.8	CM	-	-	-
3(1)	-	3	42	55	115.0	23.0	92.0	CM	2.60	-	-
2-16	65	-	-	-	32.0	15.8	16.2	CL	-	-	-
	125	7	43	50	57.5	25.9	31.6	CM	-	-	-
	180	-	-	-	148.5	25.3	123.0	CM	-	-	-
		COMPOS 85-210		95	-	-	-	SW-SC	-	-	-
		COMPOS 85-210		18	-	-	-	CL-MI	2.72	-	-
				47	35	-	-	-	-	115.8	14.7

TABLE 2

CATION EXCHANGE CAPACITY AND EXCHANGEABLE CATION
TEST RESULTS

PARAMETER	UNITS	UNTREATED SAMPLES			TREATED SAMPLES ⁽¹⁾		
		TEST PIT 2	TEST PIT 3	BORING 103	TEST PIT 2 ⁽²⁾	TEST PIT 3	BORING 103
pH (1:1)	-	8.35	7.40	7.60	2.30	2.35	1.70
Buffer pH	-	NA	NA	NA	2.28	2.20	2.15
Exchangeable:							
H	meq/100g	0	0	0	56.6	57.6	58.2
Ca	meq/100g	19.5	21.1	25.8	12.3	13.5	18.7
Mg	meq/100g	4.3	4.9	15.4	17.0	20.3	17.8
Na	meq/100g	20.0	28.0	6.5	3.7	6.5	2.6
K	meq/100g	1.2	2.5	0.6	0.8	1.6	0.5
Cation Exchange Capacity (CEC)	meq/100g	45	56	48	90	100	98

(1) Samples soaked in simulated tailings liquid for 48 hours before testing.

(2) Represents triplicate results.

TABLE 3

X-RAY DIFFRACTION SEMI-QUANTITATIVE RESULTS

SAMPLE	QUARTZ	ANDESINE	MONTMORILLONITE	ILLITE	MIXED LAYER
Test Pit 2	50%+	-5%	10-25%	10-25%	5-10%
Test Pit 3	50%+	5-10%	10-25%	10-25%	5-10%
Boring 101 (15'-20' Depth)	50%+	5-10%	25-50%	Trace	-5%

TABLE 4
PERMEABILITY TEST RESULTS

BORING/ TEST PIT	SAMPLE DEPTH (FEET)	INITIAL CONDITIONS		COEFFICIENTS OF PERMEABILITY	
		DRY DENSITY (PCF)	WATER CONTENT (PERCENT)	WITH DISTILLED WATER (CM/SEC)	WITH TAILINGS LIQUID (CM/SEC)
103	0-25	116.7	13.3	1.2×10^{-9}	9.4×10^{-10}
101	0-25	117.5	14.6	5.2×10^{-10}	7.5×10^{-10}
2	-	110.7	14.7	4.7×10^{-10}	2.3×10^{-10}
2-16	85-210	101	15	-	1.0×10^{-10}
2-16	85-210	110	15	-	5.5×10^{-10}

Soil Sampling and Testing Program – White Mesa Mill

The purpose of this Soil Sampling and Testing Program is to verify the soil classification, gradation and compaction characteristics (standard proctor) of the stockpiled random fill and clay materials that will be used for cover materials on the tailings cells at the White Mesa Mill. Additionally this program will verify the compaction characteristics and gradation of the random fill materials utilized in the platform fill previously placed on Cells 2 and 3.

Sampling

Sampling will take place on each of six stockpiles of random fill (designated RF-1 through RF-6 on Exhibit A), two clay material stockpiles (C-1 and C-2 on Exhibit A), and on platform fill areas in Cells 2 & 3. A total of 9 samples will be taken from the random fill stockpiles. Two (2) samples will be taken from the clay stockpiles and three (3) samples will be taken from the covered areas of the cells. Samples will be taken from test pits excavated by a backhoe. Samples will be taken from a depth of 8 feet in stockpiles and from 2 foot depth in cells. One backhoe bucket full of material will be taken from the test pit at the specified depth and dumped separately. This sample will be quartered and one quarter will be screened to minus 2" (rocks over 8" will be removed prior to screening). Two five gallon sample buckets will be filled with sample randomly selected from the screened fraction. Oversized material remaining after the screening of the sample will be visually classified and then weighed. Sample locations will be indicated on a site map and sample descriptions will recorded and maintained in the facility's records. A total of fourteen samples will be submitted for testing during this program.

Testing

Samples will be packaged and shipped to a certified commercial testing laboratory for testing. Tests will be run on each sample for standard proctor (ASTM D698), particle size analysis (ASTM C117 and ASTM C136), soil classification (ASTM D2487) and plasticity index (Atterberg limits ASTM D4318).

DRAWING RM 78-682-B9

CHECKED BY

APPROVED BY

DATE

BY

DATE

BY



2-16

T 36 S

N 305,000

E 2,579,000

E 2,580,000

B'

B-103

A

B-100

B-101

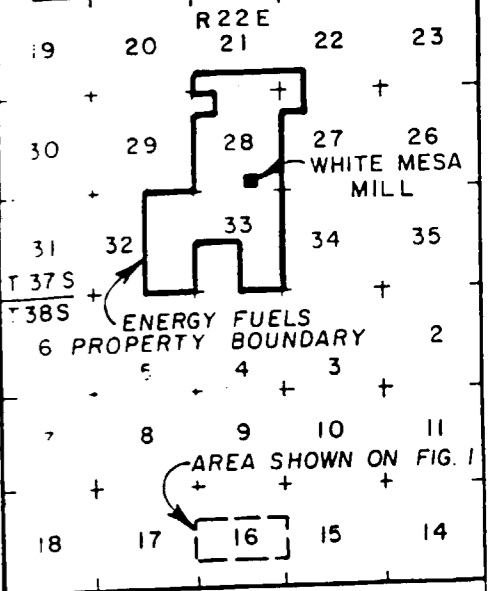
B-102

B-105

TP-3

TP-2

TP-1



KEY PLAN

N.T.S.

N 305,000

51450

B-106

A'

FIGURE 1

LOCATION OF BORINGS AND SUBSURFACE CROSS SECTIONS

PREPARED FOR

ENERGY FUELS NUCLEAR, INC.
DENVER, COLORADO

IDENTIFICATION

REFERENCE

TOPOGRAPHIC MAP OF BLANDING MILL SITE, SHEET 4, BY DELTA AERIAL SURVEYS, INC., 12-8-76

E 2,579,000

SECTION 16

R 22 E

51210

E 2,580,000

B

B-104

B

SCALE

200 0 200 FEET

CONTOUR INTERVAL = 10 FEET

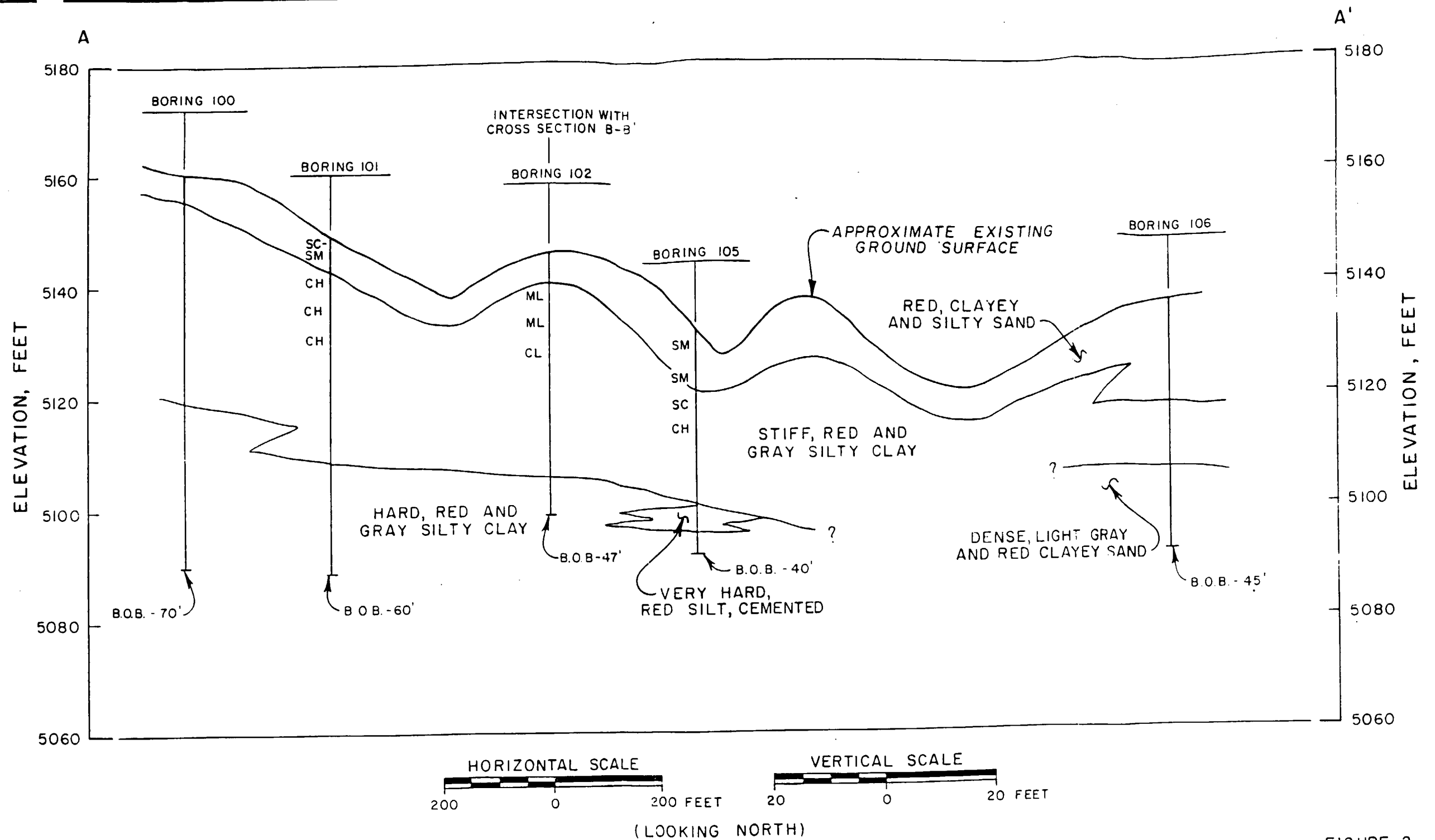


FIGURE 2

SUBSURFACE CROSS SECTION A-A

PREPARED FOR

ENERGY FUELS NUCLEAR, INC.
 DENVER, COLORADO

THE DEPTH AND THICKNESS OF THE SUBSURFACE STRATA INDICATED ON THE SECTIONS WERE GENERALIZED FROM AND INTERPOLATED BETWEEN THE TEST BORINGS. INFORMATION ON ACTUAL SUBSURFACE CONDITIONS EXISTS ONLY AT THE LOCATION OF THE TEST BORINGS AND IT IS POSSIBLE THAT SUBSURFACE CONDITIONS BETWEEN THE TEST BORINGS MAY VARY FROM THOSE INDICATED.

LEGEND:
 CH - LABORATORY SOIL CLASSIFICATION (UNIFIED SOIL CLASSIFICATION SYSTEM)

NOTES:

1. FOR PLAN LOCATION OF CROSS SECTION, SEE FIGURE 1.
2. VERTICAL EXAGGERATION EQUALS 10X.

IDENTIFICATION

DRAWN BY R. Bricker
 CHECKED BY C. V. 3/8/82
 APPROVED BY W. S. 3/22/82
 DRAWING NUMBER RM78-682-B8

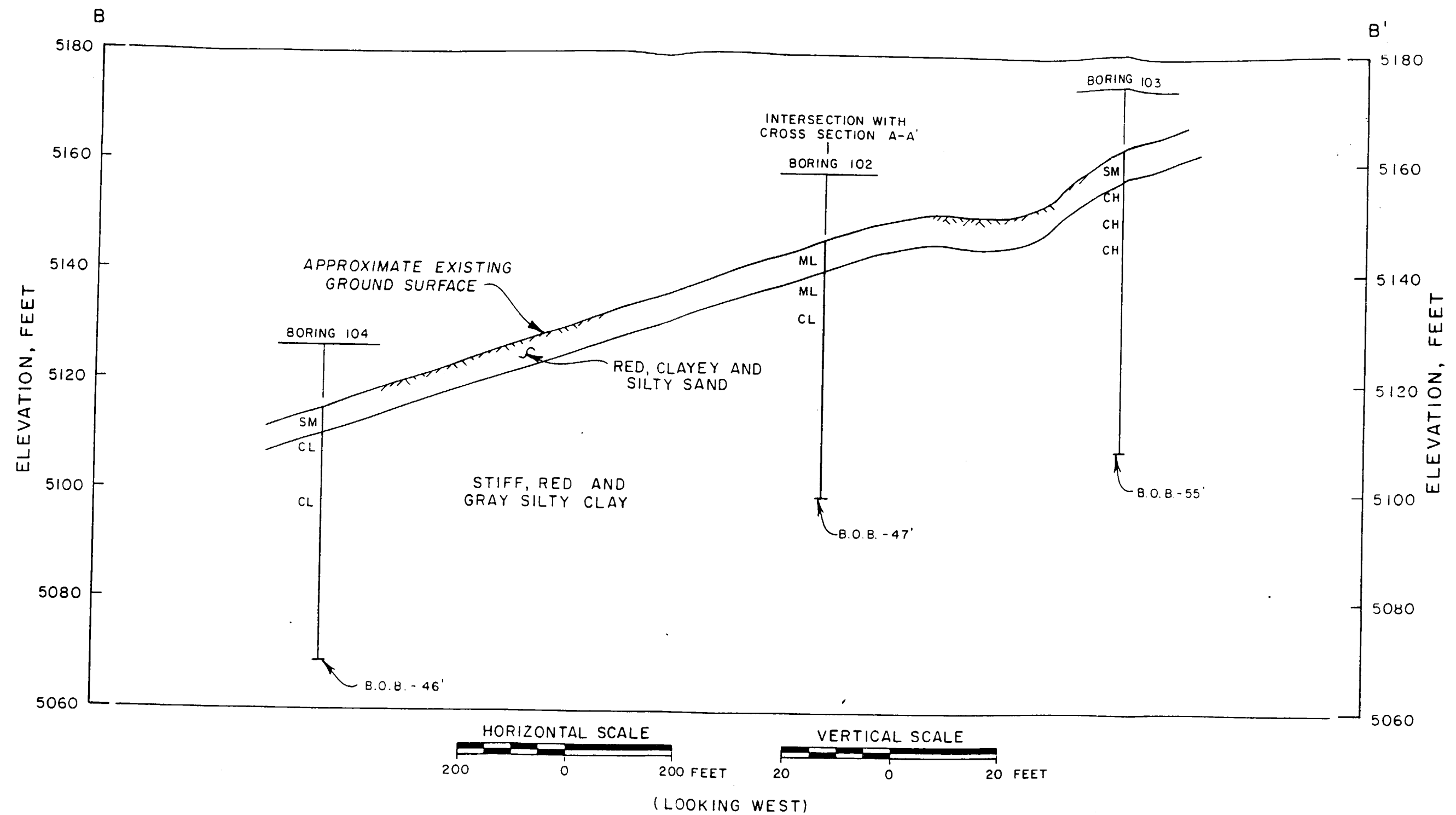


FIGURE 3

THE DEPTH AND THICKNESS OF THE SUBSURFACE STRATA INDICATED ON THE SECTIONS WERE GENERALIZED FROM AND INTERPOLATED BETWEEN THE TEST BORINGS. INFORMATION ON ACTUAL SUBSURFACE CONDITIONS EXISTS ONLY AT THE LOCATION OF THE TEST BORINGS AND IT IS POSSIBLE THAT SUBSURFACE CONDITIONS BETWEEN THE TEST BORINGS MAY VARY FROM THOSE INDICATED.

LEGEND:
 CH - LABORATORY SOIL CLASSIFICATION (UNIFIED SOIL CLASSIFICATION SYSTEM)

NOTES:
 1. FOR PLAN LOCATION OF CROSS SECTION, SEE FIGURE 1.
 2. VERTICAL EXAGGERATION EQUALS 10 X.

SUBSURFACE CROSS SECTION B-B'

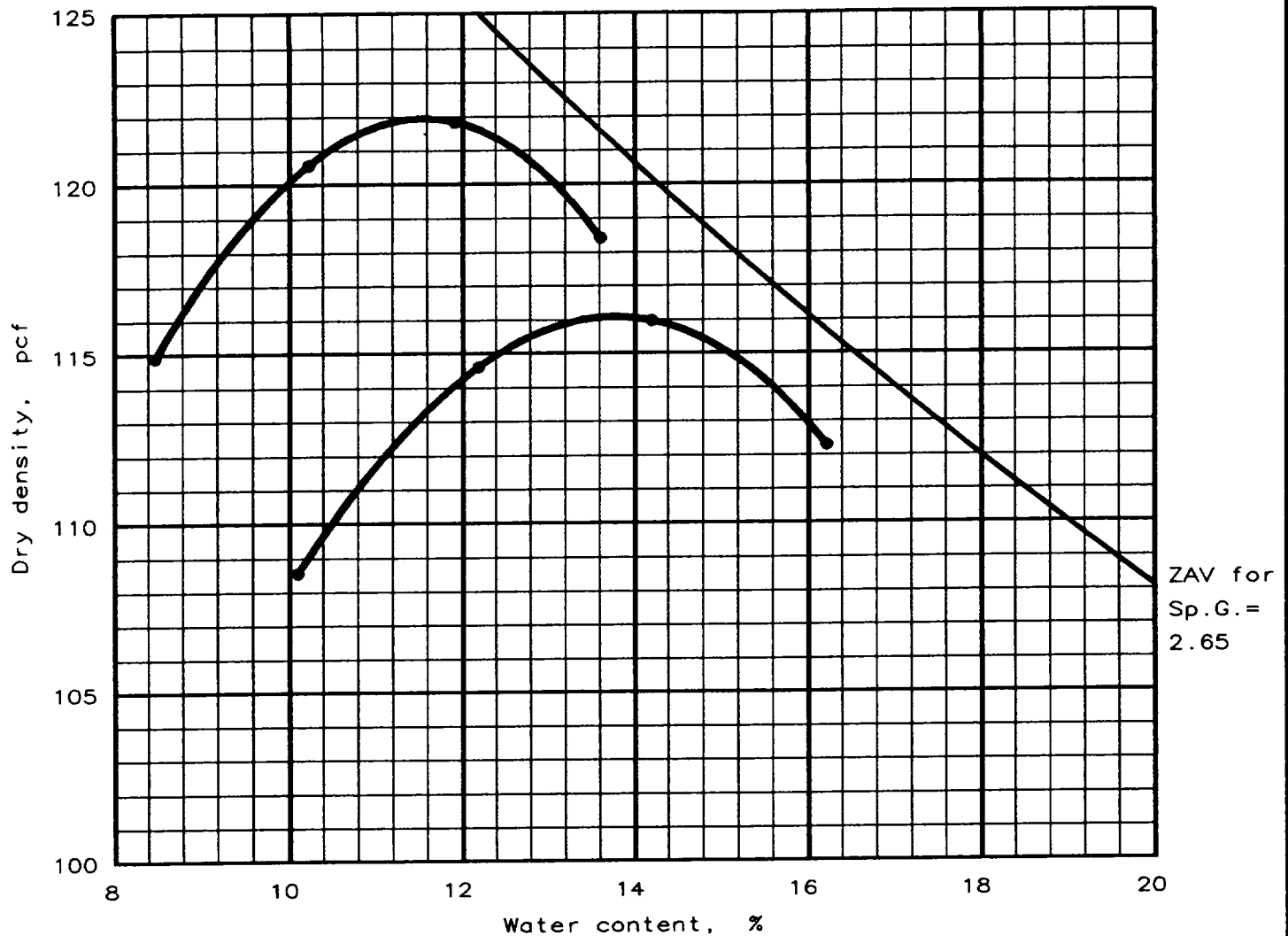
PREPARED FOR
 ENERGY FUELS NUCLEAR, INC.
 DENVER, COLORADO

IDENTIFICATION

**THIS PAGE IS AN
OVERSIZED DRAWING
OR FIGURE,
THAT CAN BE VIEWED AT
THE RECORD TITLED:
EXHIBIT A:
SOIL SAMPLING AND TESTING
PROGRAM SAMPLE AND
STOCKPILE LOCATIONS
WITHIN THIS PACKAGE...OR,
BY SEARCHING USING THE
DRAWING NUMBER:
EXHIBIT A**

NOTE: Because of this page's large file size, it may be more convenient to copy the file to a local drive and use the Imaging (Wang) viewer, which can be accessed from the Programs/Accessories menu.

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Procedure B, Standard
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in	% < No.200
	USCS	AASHTO						
			N/A %	2.65			16.1 %	

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 122.0 pcf Optimum moisture = 11.6 %	116.1 pcf 13.8 %	2-1-W Sand, clayey, grvly, brn

Project No.: 804899
Project: International Uranium Corporation
Location: Soil Sample Testing

Date: 5/3/99

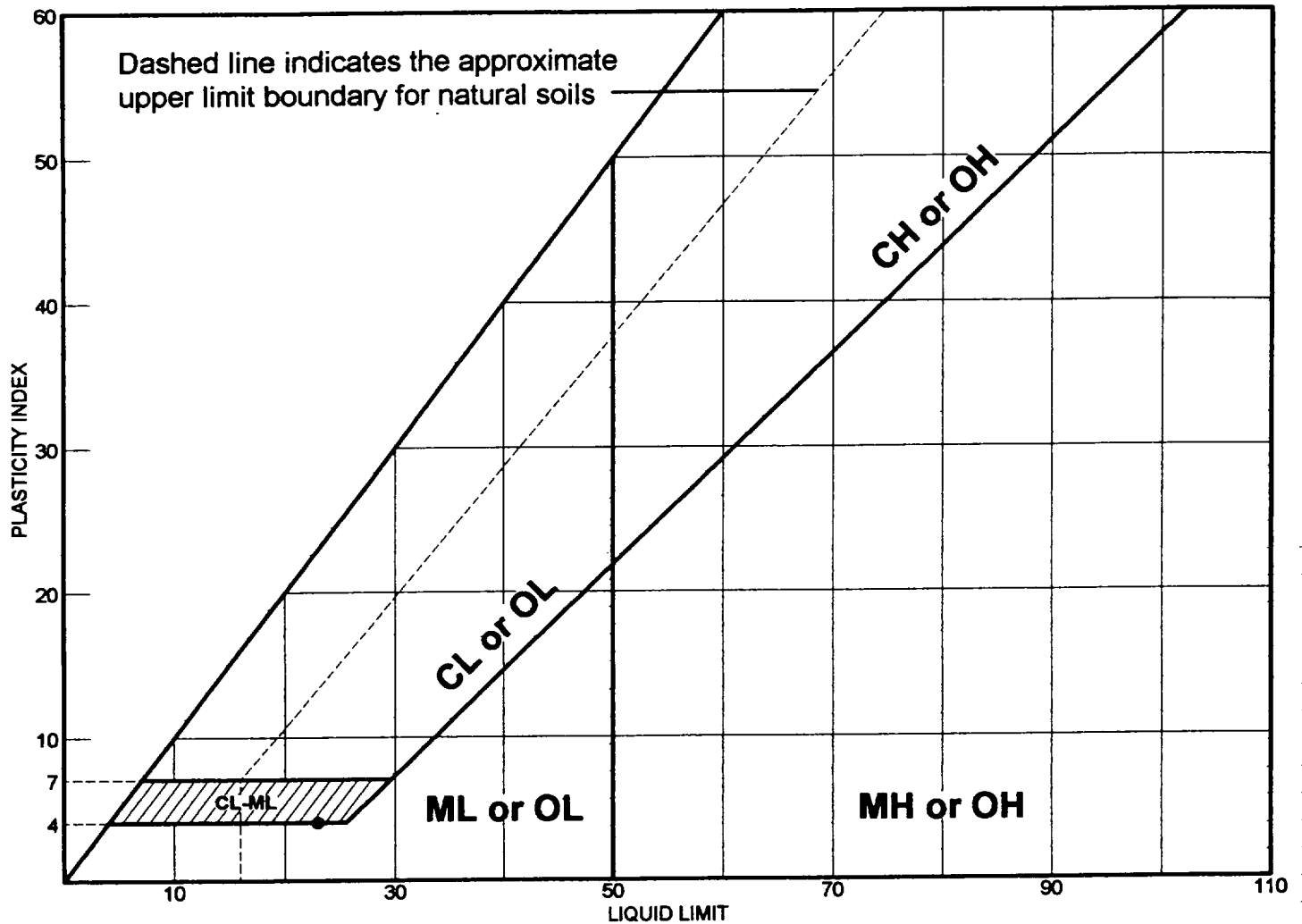
Remarks:

SUBMITTED BY: Client
TESTED BY: JH

MOISTURE-DENSITY RELATIONSHIP TEST
WESTERN COLORADO TESTING, INC.

Fig. No. 7

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
•	Sand, very clayey, sl silty, red	23	19	4	56.9	25.1	SM

Project No. 804899 Client: International Uranium Corporation

Project: Soil Sample Testing

• Source:

Sample No.: 2-1-W

Remarks:

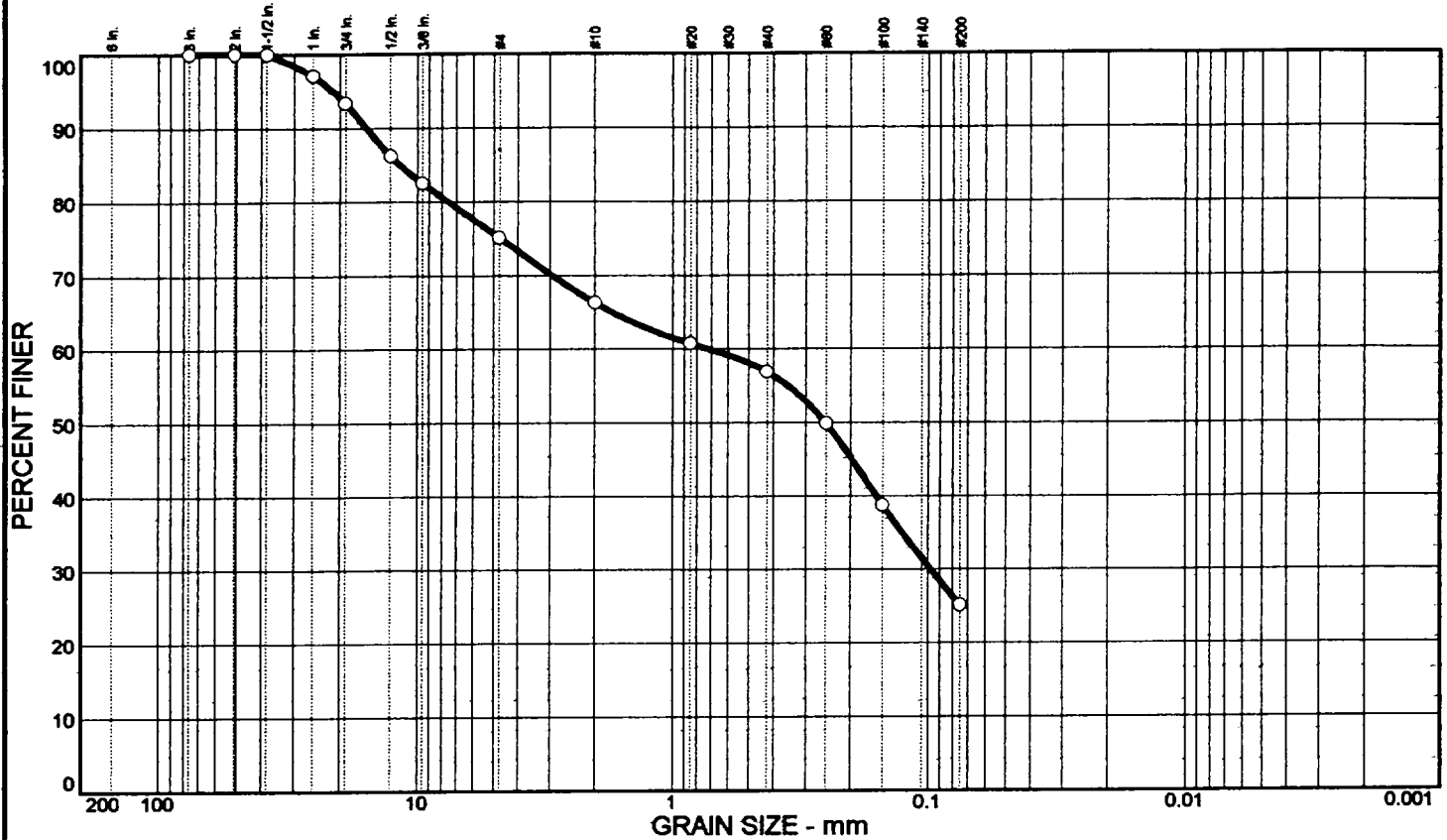
• Tested By: JH

LIQUID AND PLASTIC LIMITS TEST REPORT

WESTERN COLORADO TESTING, INC.

Figure 22

PARTICLE SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
	24.8	50.1			SM	A-2-4(0)	19	23

SIEVE inches size	PERCENT FINER		
	○		
3	100.0		
2	100.0		
1.5	100.0		
1	97.1		
3/4	93.4		
1/2	86.3		
3/8	82.6		
GRAIN SIZE			
D ₆₀	0.726		
D ₃₀	0.0973		
D ₁₀			
COEFFICIENTS			
C _c			
C _u			

SIEVE number size	PERCENT FINER		
	○		
#4	75.2		
#10	66.3		
#20	60.7		
#40	56.9		
#60	49.9		
#100	38.8		
#200	25.1		

SOIL DESCRIPTION
 ○ Sand, very clayey, sl silty, red

REMARKS:
 ○ Tested By: JH

○ Source:

Sample No.: 2-1-W

WESTERN COLORADO TESTING, INC.

Client: International Uranium Corporation

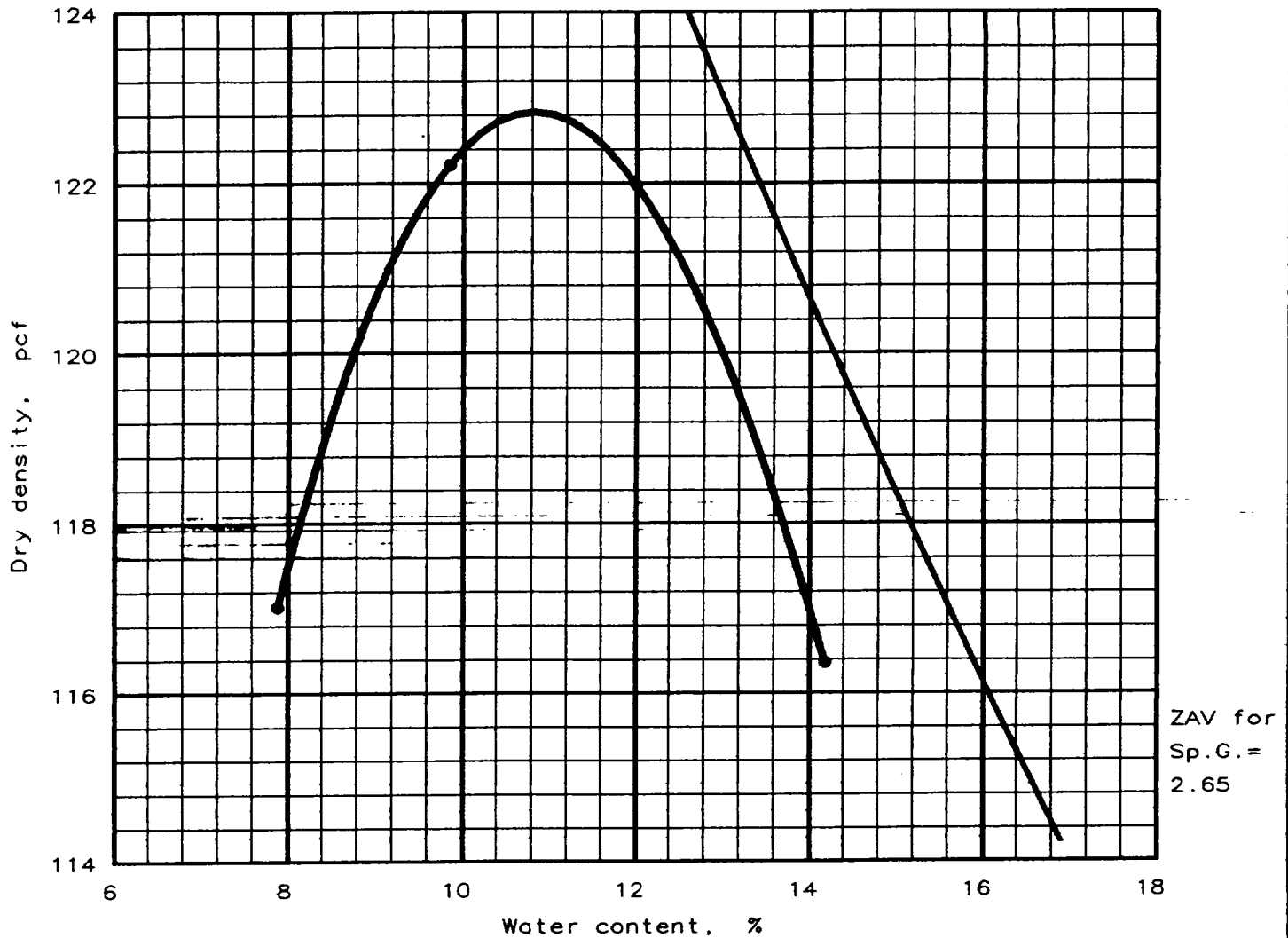
Project: Soil Sample Testing

Project No.: 804899

Figure

38

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Procedure B, Standard
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in	% < No.200
	USCS	AASHTO						
			N/A %	2.65			13.4 %	

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 122.8 pcf Optimum moisture = 10.8 %	122.8 pcf 10.8 %	2W-7C Sand, silty, gravelly, br

Project No.: 804899
Project: International Uranium Corporation
Location: Soil Sample Testing

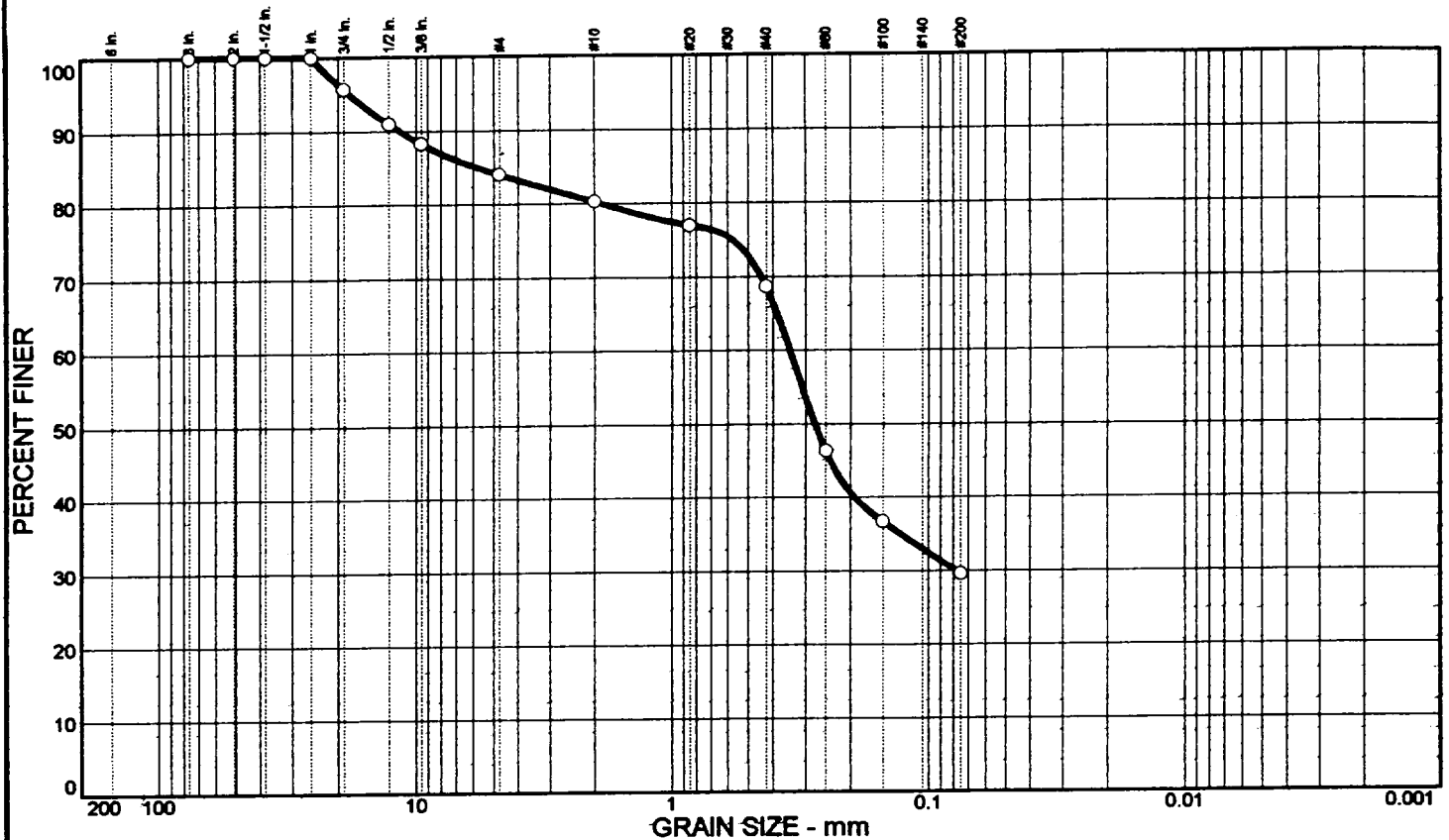
Date: 5/3/99

Remarks:
SUBMITTED BY: Client
TESTED BY: JH

MOISTURE-DENSITY RELATIONSHIP TEST
WESTERN COLORADO TESTING, INC.

Fig. No. 8

PARTICLE SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
	15.9	54.5			SM	A-2-4(0)	NP	

SIEVE Inches size	PERCENT FINER		
	○		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	95.7		
1/2	91.0		
3/8	88.3		
GRAIN SIZE			
D60	0.344		
D30	0.0781		
D10			
COEFFICIENTS			
Cc			
Cu			

SIEVE number size	PERCENT FINER		
	○		
#4	84.1		
#10	80.3		
#20	77.0		
#40	68.6		
#60	46.4		
#100	36.7		
#200	29.6		

SOIL DESCRIPTION
 ○ Sand, silty, gravelly, brown

REMARKS:
 ○ Tested By: JH

○ Source:

Sample No.: 2W-7C

WESTERN COLORADO TESTING, INC.

Client: International Uranium Corporation

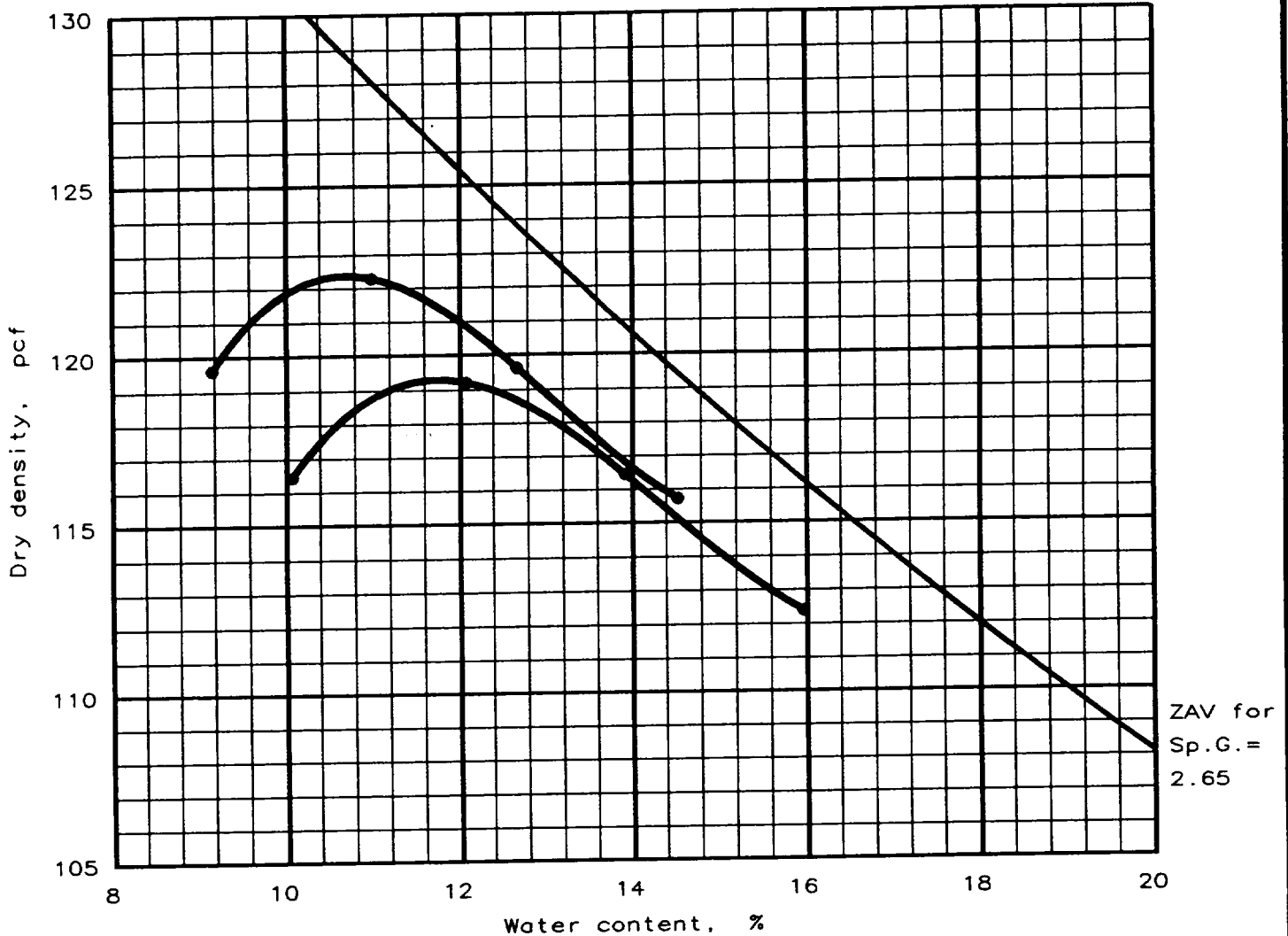
Project: Soil Sample Testing

Project No.: 804899

Figure

39

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Procedure C, Standard
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in	% < No.200
	USCS	AASHTO						
			N/A %	2.65			9.0 %	

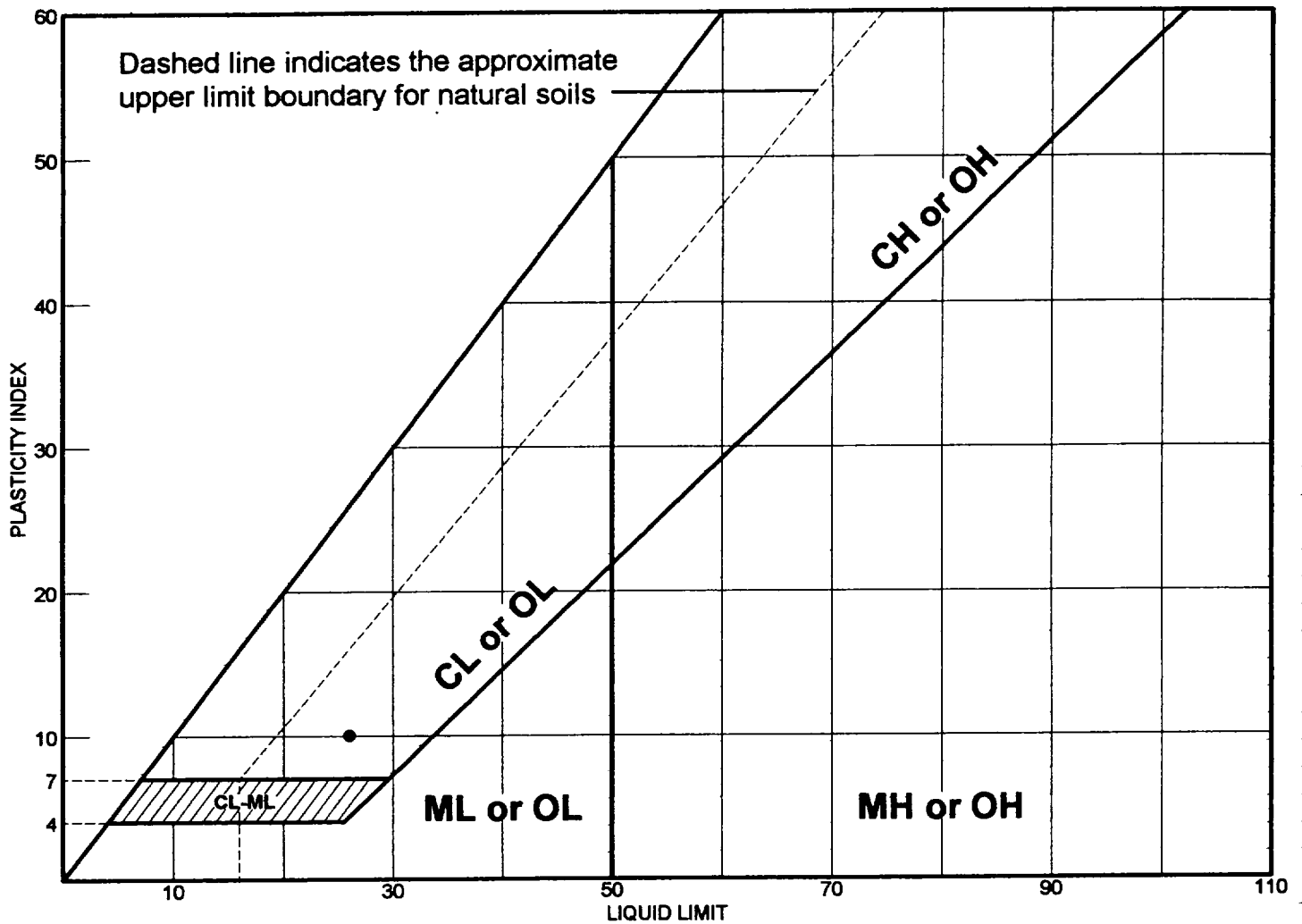
ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 122.4 pcf Optimum moisture = 10.7 %	119.3 pcf 11.8 %	3-1C Sand, clayey, grvly, brn

Project No.: 804899 Project: International Uranium Corporation Location: Soil Sample Testing Date: 5/3/99	Remarks: SUBMITTED BY: Client TESTED BY: JH
--	---

MOISTURE-DENSITY RELATIONSHIP TEST
WESTERN COLORADO TESTING, INC.

Fig. No. 9

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
•	Sand, clayey, gravely, brown	26	16	10	69.5	36.9	SM

Project No. 804899 Client: International Uranium Corporation

Project: Soil Sample Testing

• Source:

Sample No.: 3-1C

Remarks:

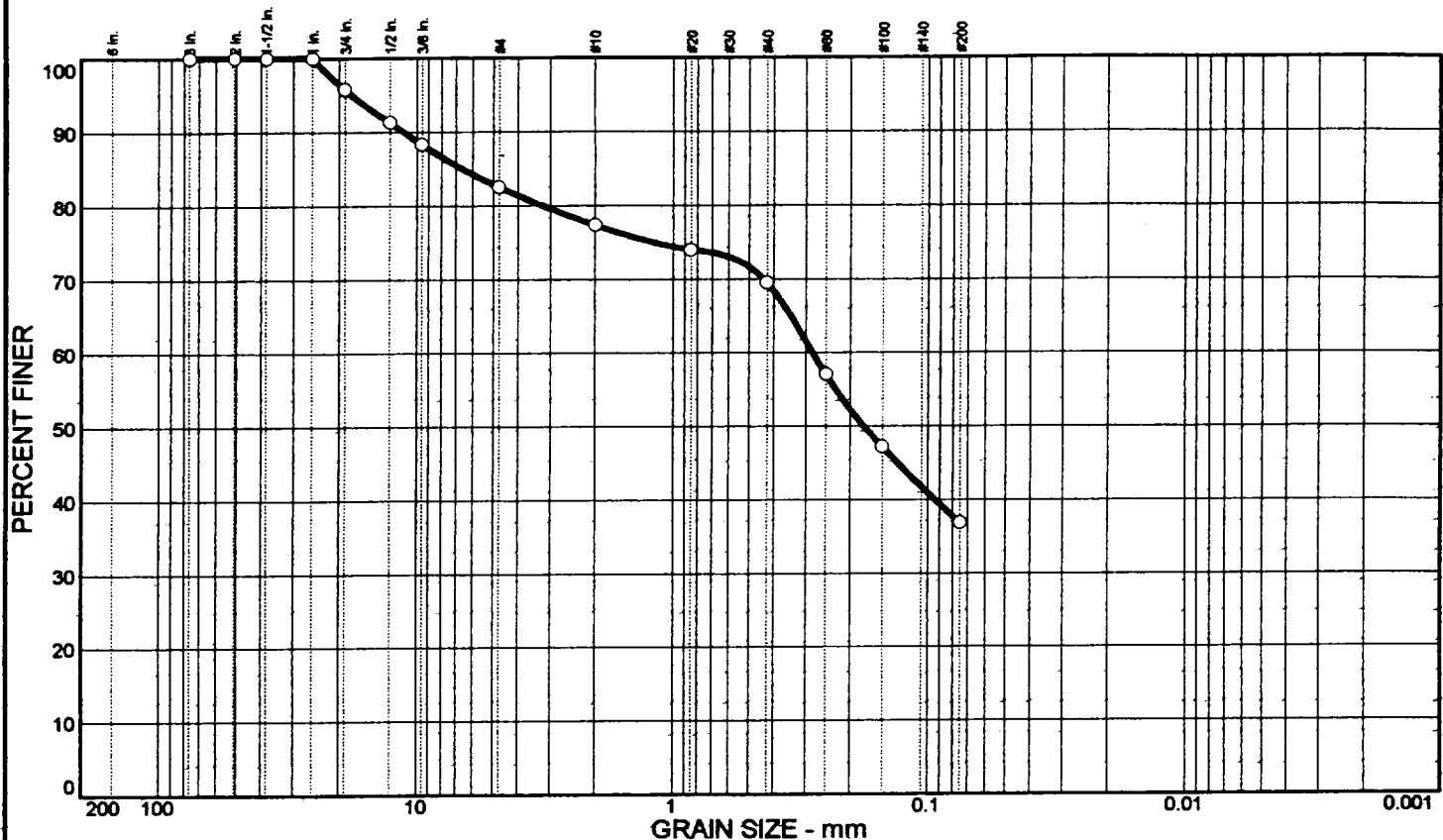
• Tested By: JH

LIQUID AND PLASTIC LIMITS TEST REPORT

WESTERN COLORADO TESTING, INC.

Figure 23

PARTICLE SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
	17.4	45.7			SM	A-4(0)	16	26

SIEVE inches size	PERCENT FINER		
	○		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	95.8		
1/2	91.3		
3/8	88.3		
GRAIN SIZE			
D ₆₀	0.282		
D ₃₀			
D ₁₀			
COEFFICIENTS			
C _c			
C _u			

SIEVE number size	PERCENT FINER		
	○		
#4	82.6		
#10	77.4		
#20	74.0		
#40	69.5		
#60	57.0		
#100	47.2		
#200	36.9		

SOIL DESCRIPTION
 ○ Sand, clayey, gravelly, brown

REMARKS:
 ○ Tested By: JH

○ Source:

Sample No.: 3-1C

WESTERN COLORADO TESTING, INC.

Client: International Uranium Corporation

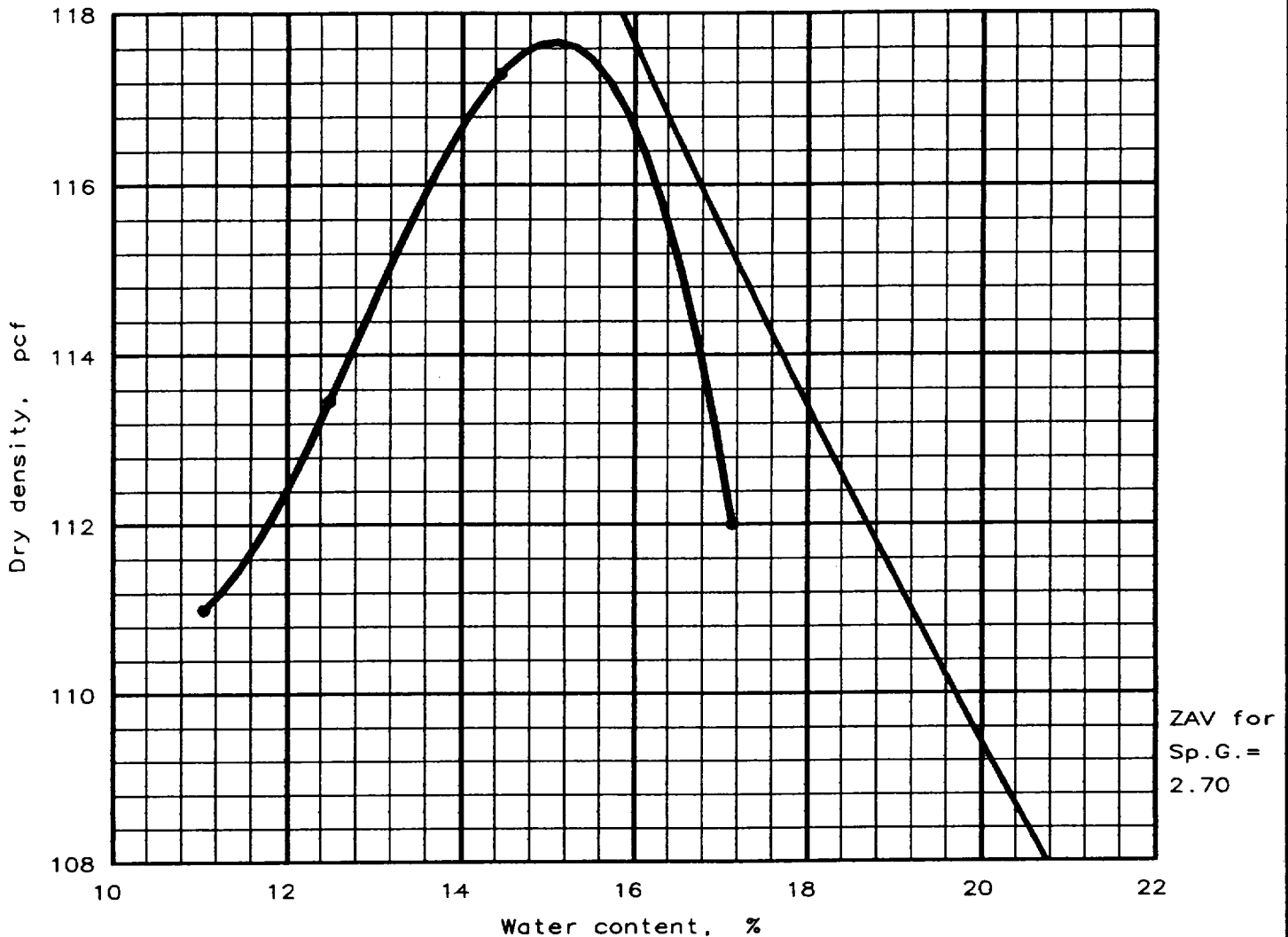
Project: Soil Sample Testing

Project No.: 804899

Figure

40

MOISTURE-DENSITY RELATIONSHIP TEST



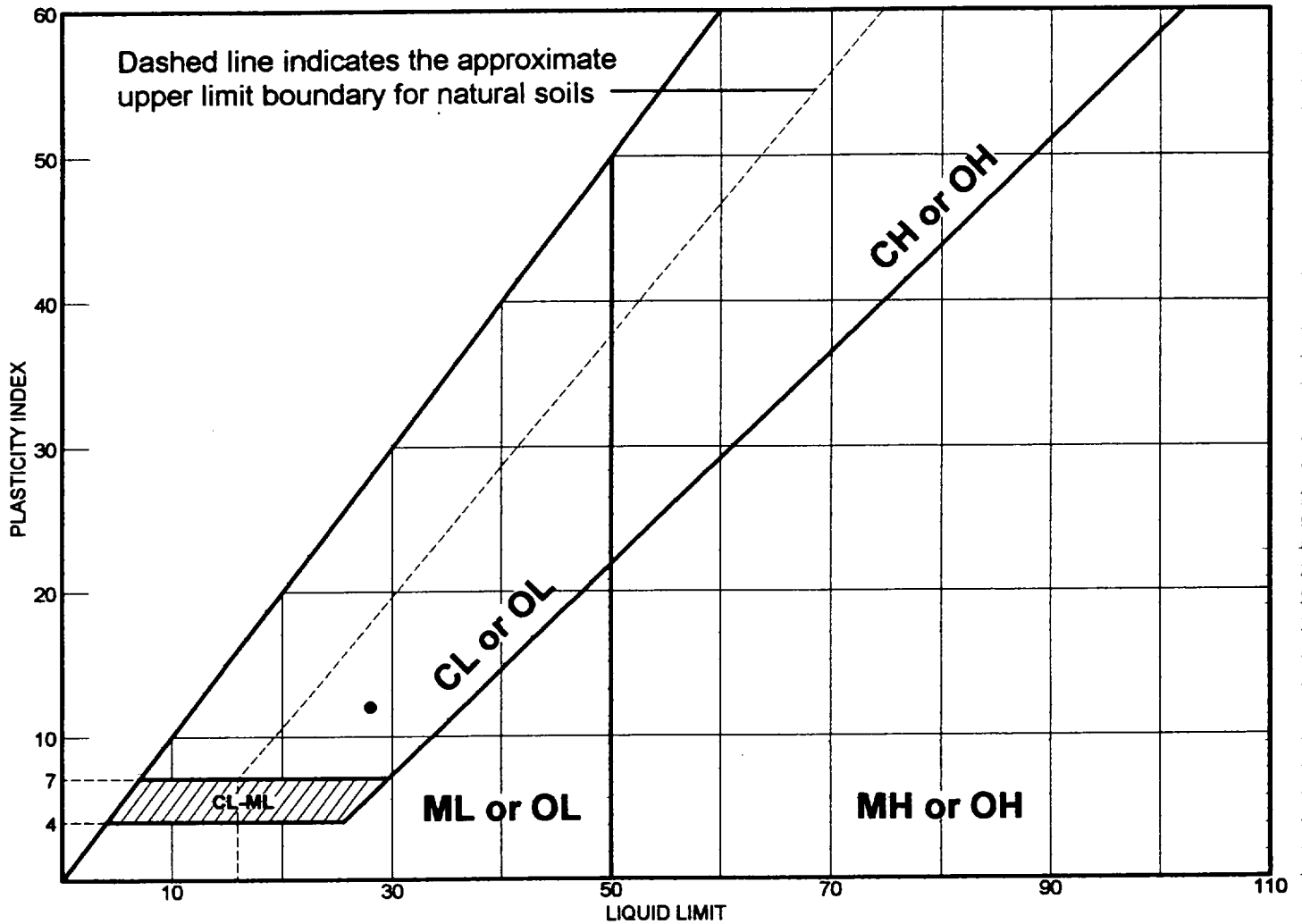
Test specification: ASTM D 698-91 Procedure A, Standard
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No. 4	% < No. 200
	USCS	AASHTO						
			N/A %	2.70				

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 117.7 pcf Optimum moisture = 15.1 %	117.7 pcf 15.1 %	C1-S1 Clay, v sandy, silty, rd

Project No.: 804899 Project: International Uranium Corporation Location: Soil Sample Testing Date: 5/3/99	Remarks: SUBMITTED BY: Client TESTED BY: JH
MOISTURE-DENSITY RELATIONSHIP TEST WESTERN COLORADO TESTING, INC.	
Fig. No. <u>10</u>	

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Clay, very sandy, silty, red	28	16	12	98.3	64.8	CL

Project No. 804899 Client: International Uranium Corporation

Project: Soil Sample Testing

● Source:

Sample No.: C1-S1

Remarks:

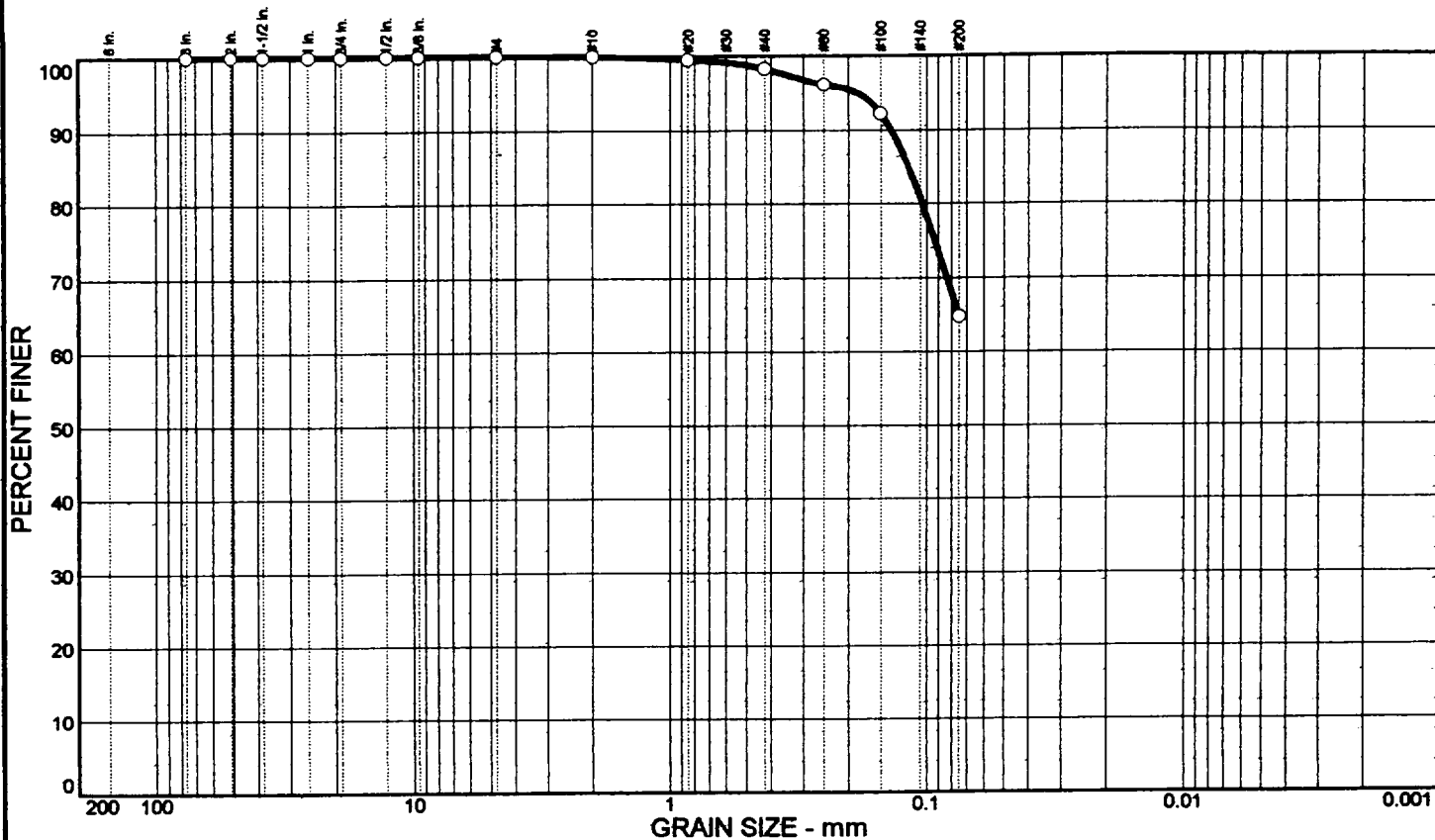
● Tested By: JH

LIQUID AND PLASTIC LIMITS TEST REPORT

WESTERN COLORADO TESTING, INC.

Figure 24

PARTICLE SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
0.0	0.0	35.2			CL	A-6(5)	16	28

SIEVE	PERCENT FINER		
inches size	○		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	100.0		
1/2	100.0		
3/8	100.0		
GRAIN SIZE			
D ₆₀			
D ₃₀			
D ₁₀			
COEFFICIENTS			
C _c			
C _u			

SIEVE	PERCENT FINER		
number size	○		
#4	100.0		
#10	99.9		
#20	99.5		
#40	98.3		
#60	96.2		
#100	92.3		
#200	64.8		

SOIL DESCRIPTION ○ Clay, very sandy, silty, red
REMARKS: ○ Tested By: JH

○ Source:

Sample No.: C1-S1

WESTERN COLORADO TESTING, INC.

Client: International Uranium Corporation

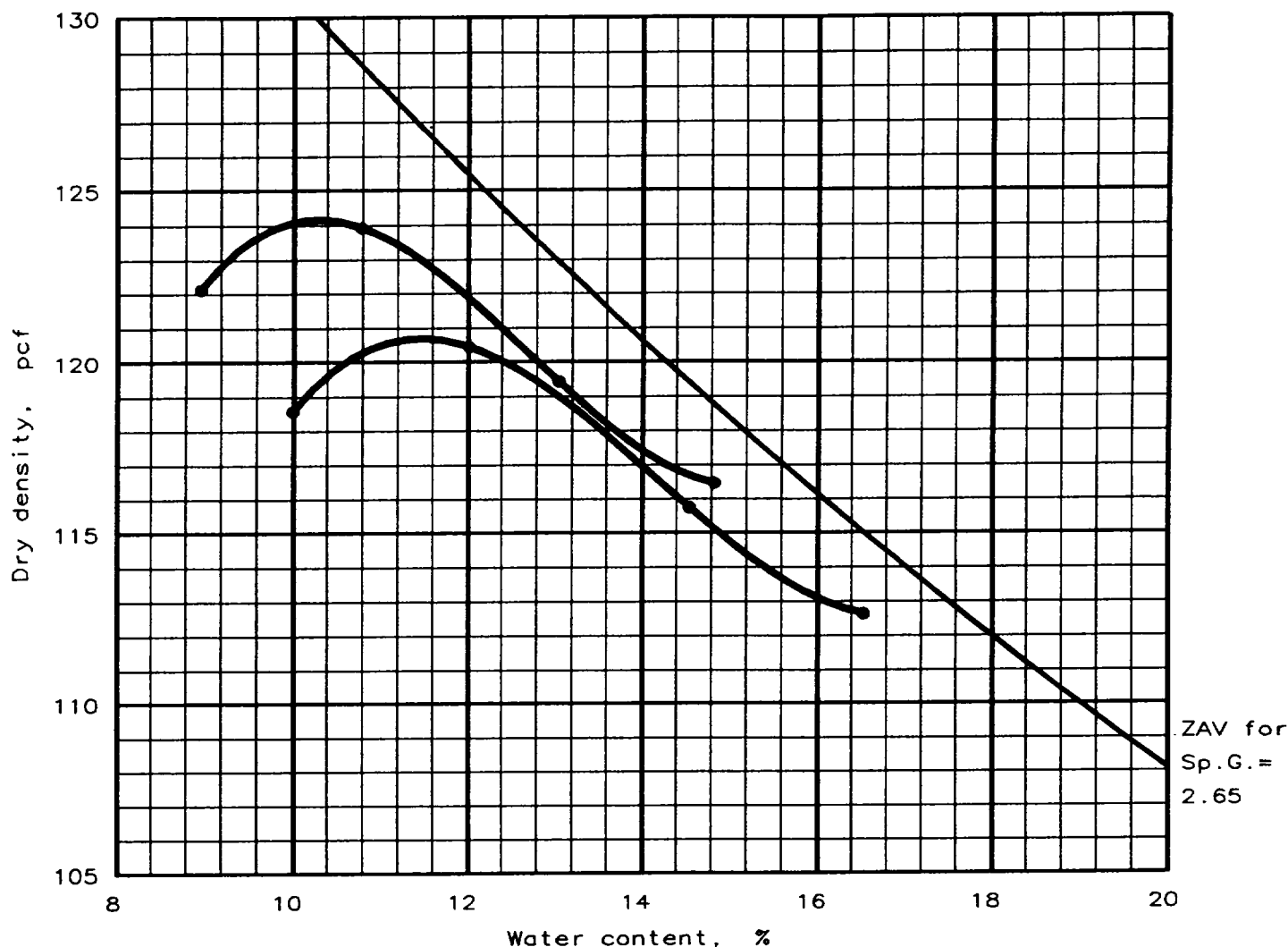
Project: Soil Sample Testing

Project No.: 804899

Figure

41

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Procedure C, Standard
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in	% < No.200
	USCS	AASHTO						
			N/A %	2.65			10.3 %	

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 124.2 pcf Optimum moisture = 10.3 %	120.7 pcf 11.5 %	C2-S1 Sand, clayey, grvly, brn

Project No.: 804899
Project: International Uranium Corporation
Location: Soil Sample Testing

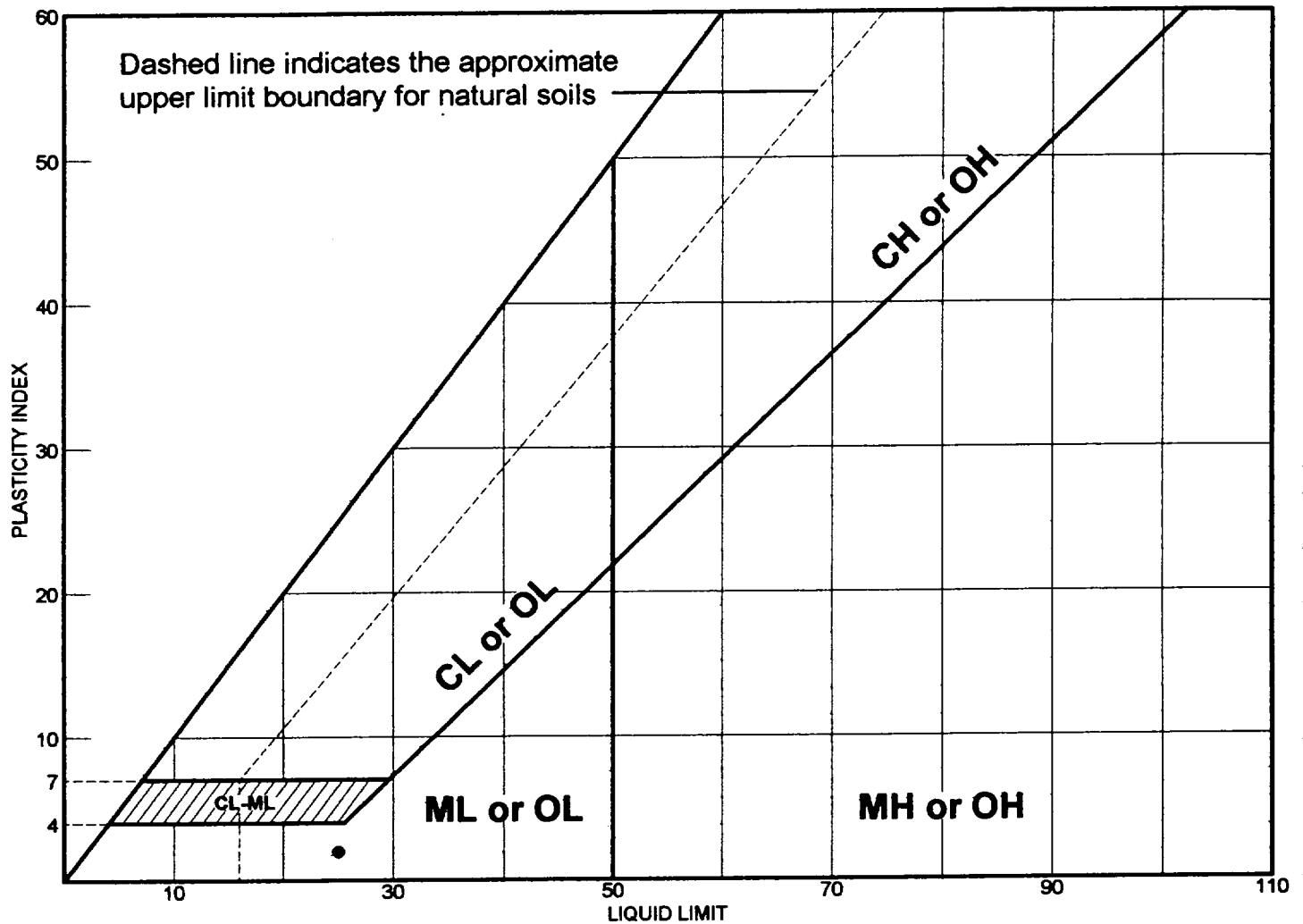
Date: 5/3/99

Remarks:
SUBMITTED BY: Client
TESTED BY: JH

MOISTURE-DENSITY RELATIONSHIP TEST
WESTERN COLORADO TESTING, INC.

Fig. No. 11

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
•	Sand, clayey, gravely, brown	25	23	2	48.2	26.7	SM

Project No. 804899 Client: International Uranium Corporation

Project: Soil Sample Testing

• Source:

Sample No.: C2-S1

Remarks:

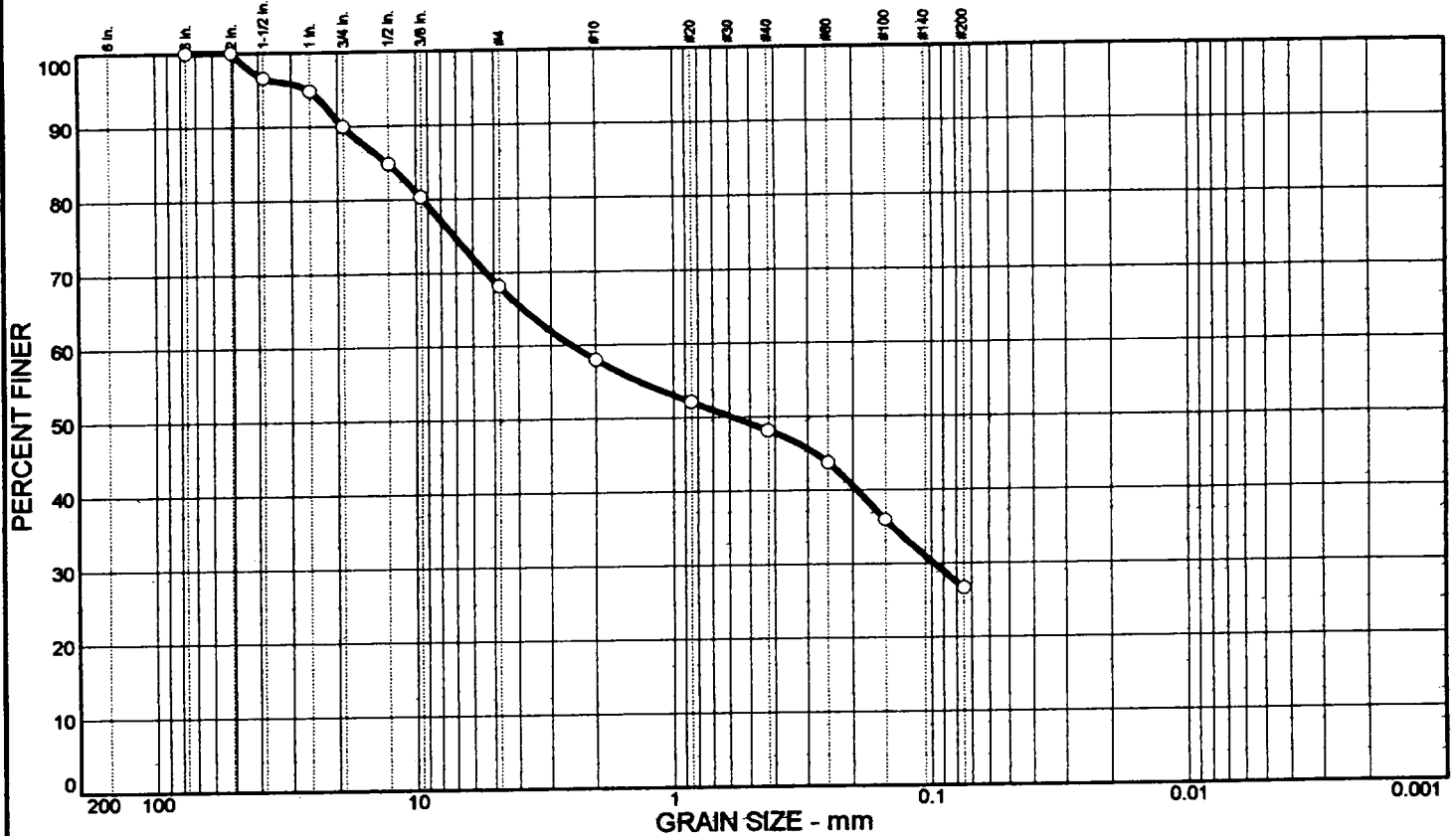
• Tested By: JH

LIQUID AND PLASTIC LIMITS TEST REPORT

WESTERN COLORADO TESTING, INC.

Figure 25

PARTICLE SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
	31.9	41.4			SM	A-2-4(0)	23	25

SIEVE inches size	PERCENT FINER		
3	100.0		
2	100.0		
1.5	96.6		
1	94.8		
3/4	90.0		
1/2	84.9		
3/8	80.3		
GRAIN SIZE			
D ₆₀	2.48		
D ₃₀	0.0977		
D ₁₀			
COEFFICIENTS			
C _c			
C _u			

SIEVE number size	PERCENT FINER		
#4	68.1		
#10	58.0		
#20	52.1		
#40	48.2		
#60	43.8		
#100	36.0		
#200	26.7		

SOIL DESCRIPTION

○ Sand, clayey, gravelly, brown

REMARKS:

○ Tested By: JH

○ Source:

Sample No.: C2-S1

WESTERN COLORADO TESTING, INC.

Client: International Uranium Corporation

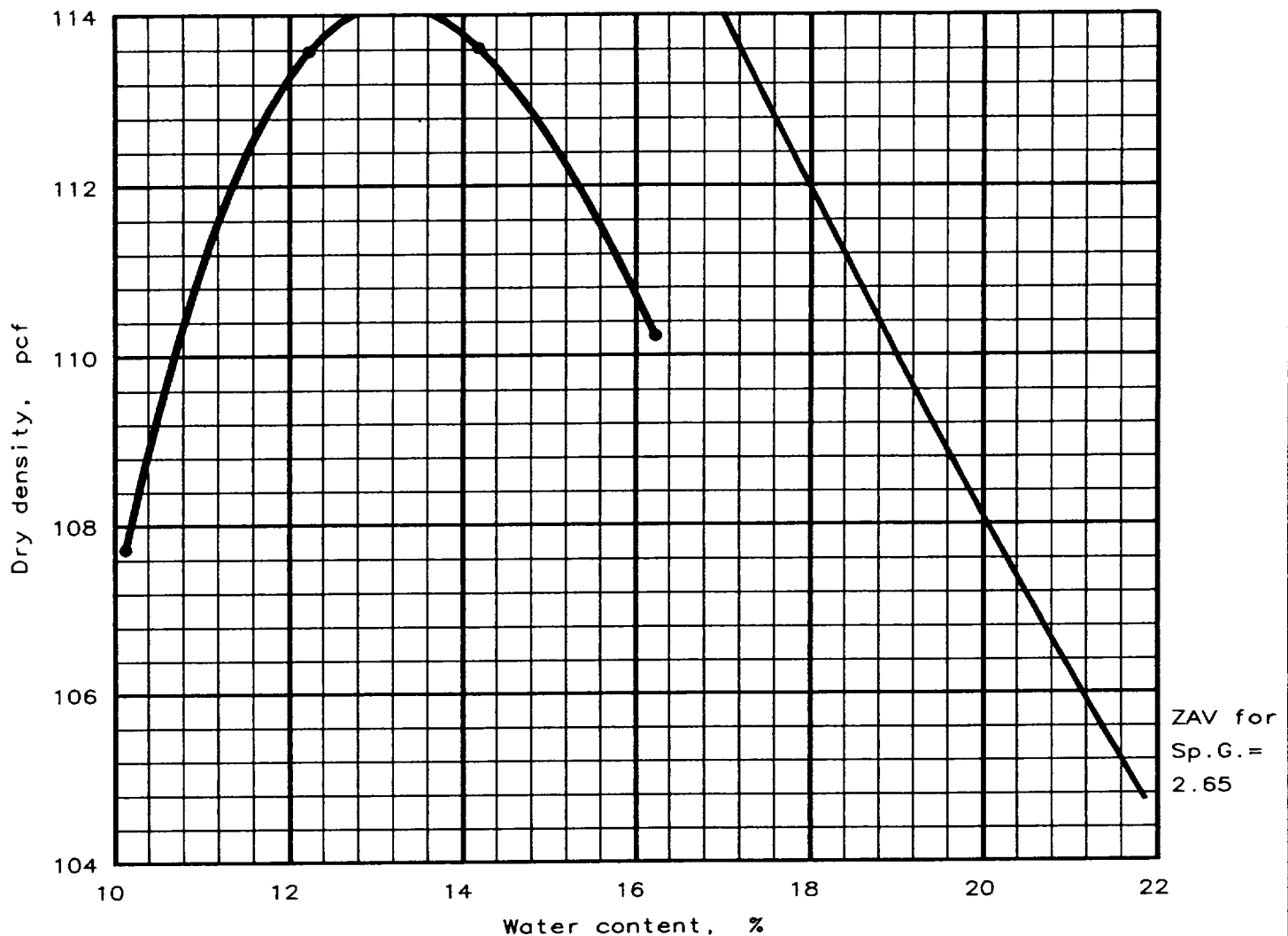
Project: Soil Sample Testing

Project No.: 804899

Figure

42

MOISTURE-DENSITY RELATIONSHIP TEST

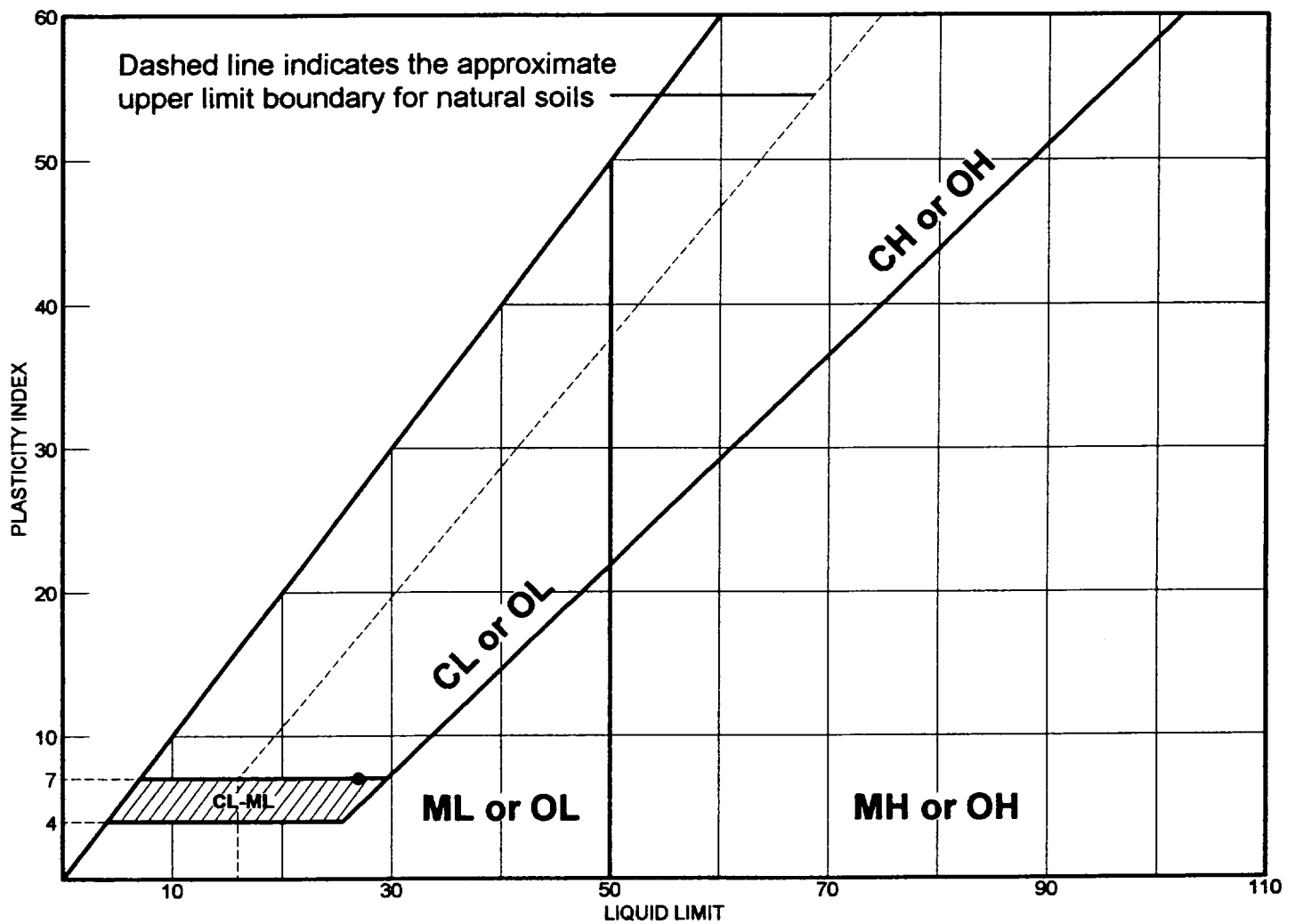


Test specification: ASTM D 698-91 Procedure A, Standard
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No. 4	% < No. 200
	USCS	AASHTO						
			N/A %	2.65				

ROCK CORRECTED TEST RESULTS		UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 114.1 pcf Optimum moisture = 13.2 %		114.1 pcf 13.2 %	RF1-S1 Clay, silty, sandy, red
Project No.: 804899 Project: International Uranium Corporation Location: Soil Sample Testing Date: 5/3/99			Remarks: SUBMITTED BY: Client TESTED BY: JH
MOISTURE-DENSITY RELATIONSHIP TEST WESTERN COLORADO TESTING, INC.			Fig. No. <u>12</u>

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Clay, silty, sandy, red	27	20	7	99.1	63.1	ML

Project No. 804899 Client: International Uranium Corporation

Project: Soil Sample Testing

● Source:

Sample No.: RF1-S1

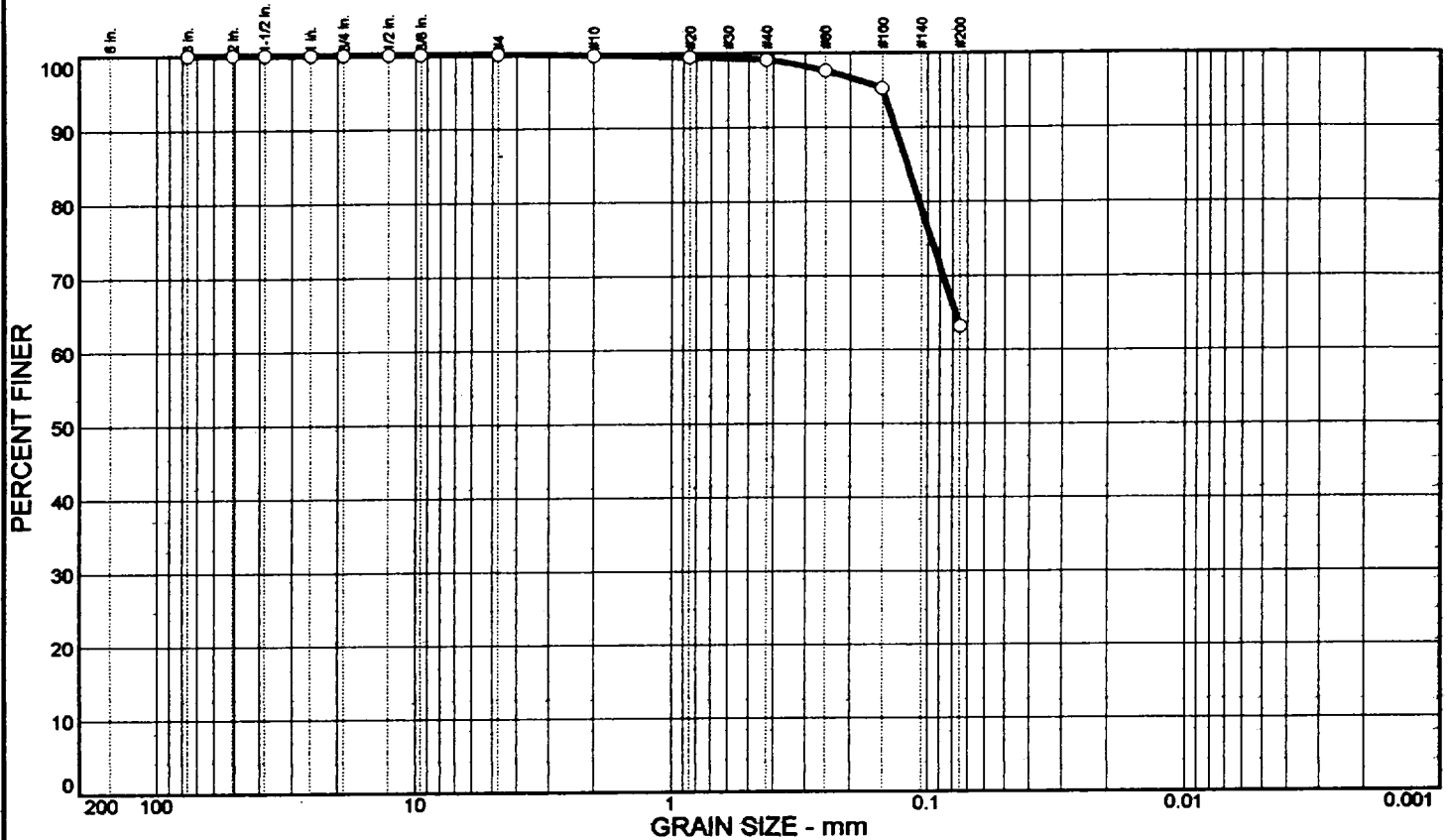
Remarks:

● Tested By: JH

LIQUID AND PLASTIC LIMITS TEST REPORT

WESTERN COLORADO TESTING, INC.

PARTICLE SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
0.0	0.0	36.9			ML	A-4(0)		

SIEVE	PERCENT FINER		
inches size	○		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	100.0		
1/2	100.0		
3/8	100.0		
GRAIN SIZE			
D ₆₀			
D ₃₀			
D ₁₀			
COEFFICIENTS			
C _c			
C _u			

SIEVE	PERCENT FINER		
number size	○		
#4	100.0		
#10	99.8		
#20	99.5		
#40	99.1		
#60	97.6		
#100	95.2		
#200	63.1		

SOIL DESCRIPTION ○ Clay, silty, sandy, red
REMARKS: ○ Tested By: JH

○ Source:

Sample No.: RF1-S1

WESTERN COLORADO TESTING, INC.

Client: International Uranium Corporation

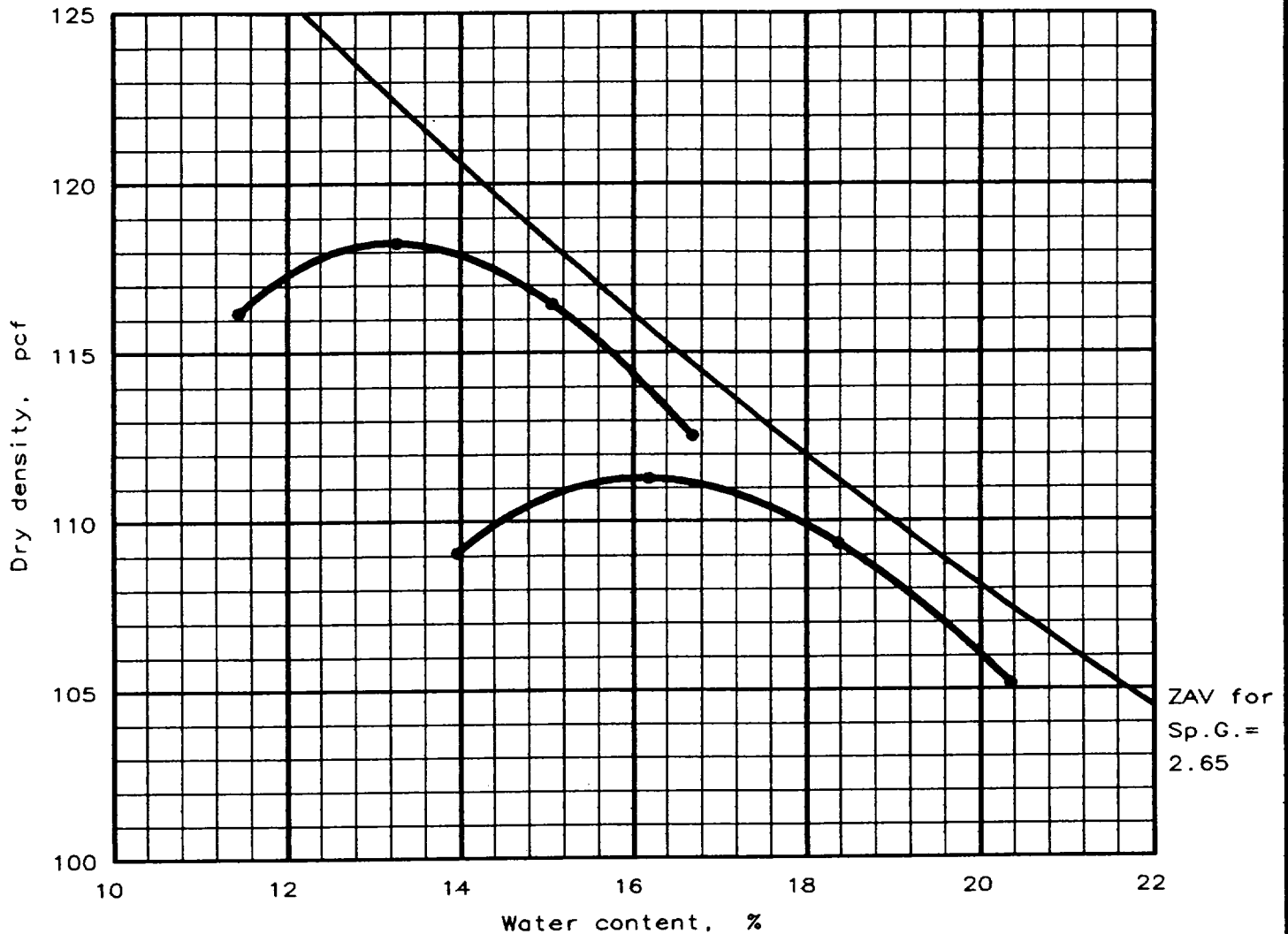
Project: Soil Sample Testing

Project No.: 804899

Figure

43

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Procedure B, Standard
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in	% < No.200
	USCS	AASHTO						
			N/A %	2.65			18.0 %	

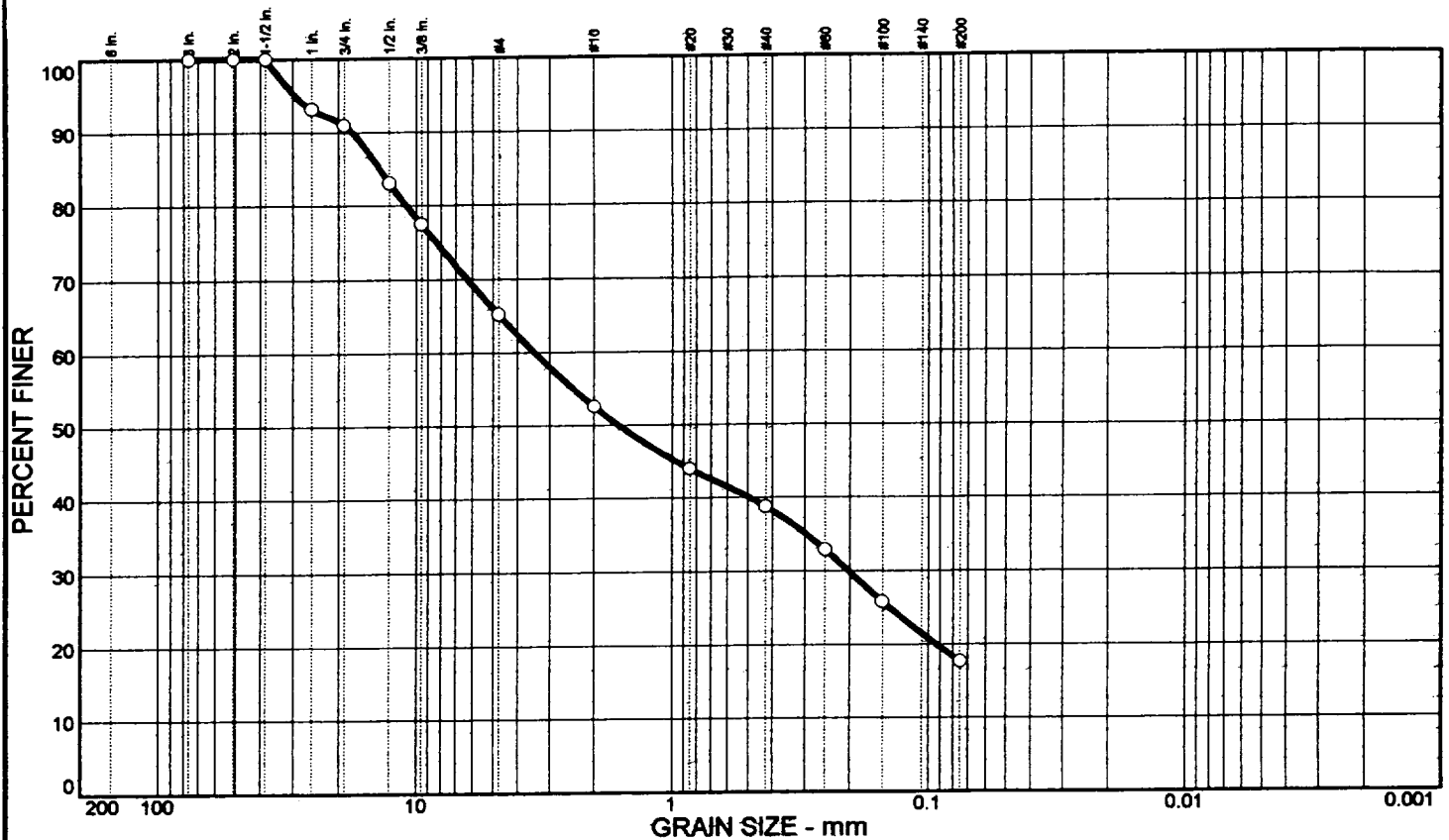
ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 118.3 pcf Optimum moisture = 13.2 %	111.3 pcf 16.1 %	RF2-S1 Sand, clayey, grvly, brn

Project No.: 804899 Project: International Uranium Corporation Location: Soil Sample Testing Date: 5/3/99	Remarks: SUBMITTED BY: Client TESTED BY: JH
--	---

MOISTURE-DENSITY RELATIONSHIP TEST
WESTERN COLORADO TESTING, INC.

Fig. No. 13

PARTICLE SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
	34.8	47.5			SM	A-1-b	NP	NP

SIEVE inches size	PERCENT FINER		
	○		
3	100.0		
2	100.0		
1.5	100.0		
1	93.2		
3/4	91.0		
1/2	83.1		
3/8	77.5		
GRAIN SIZE			
D ₆₀	3.42		
D ₃₀	0.203		
D ₁₀			
COEFFICIENTS			
C _c			
C _u			

SIEVE number size	PERCENT FINER		
	○		
#4	65.2		
#10	52.6		
#20	44.0		
#40	38.8		
#60	32.9		
#100	25.8		
#200	17.7		

SOIL DESCRIPTION
 ○ Sand, si clayey, gravelly, brown

REMARKS:
 ○ Tested By: JH

○ Source:

Sample No.: RF2-S1

WESTERN COLORADO TESTING, INC.

Client: International Uranium Corporation

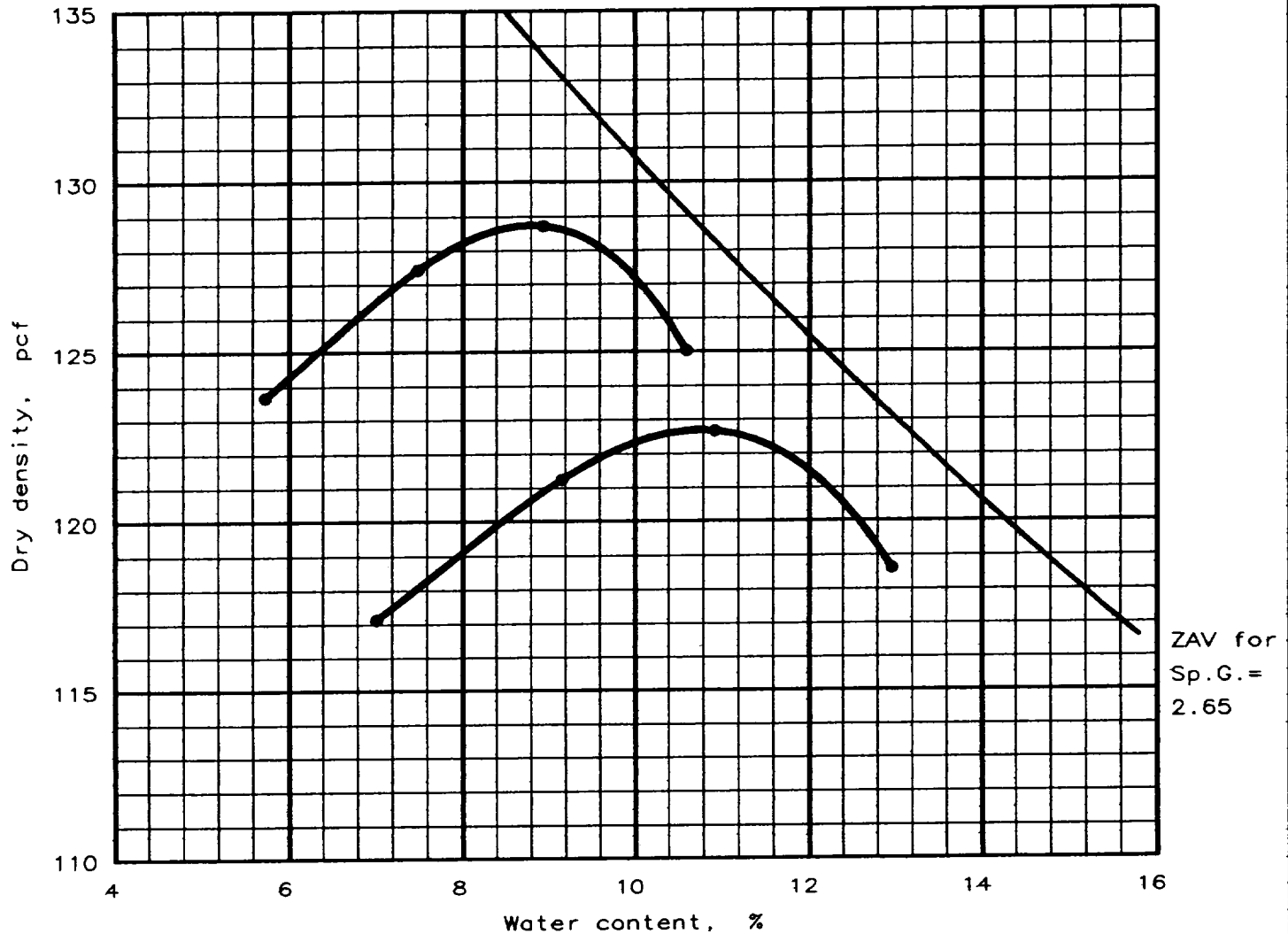
Project: Soil Sample Testing

Project No.: 804899

Figure

44

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Procedure C, Standard

Oversize correction applied to each point

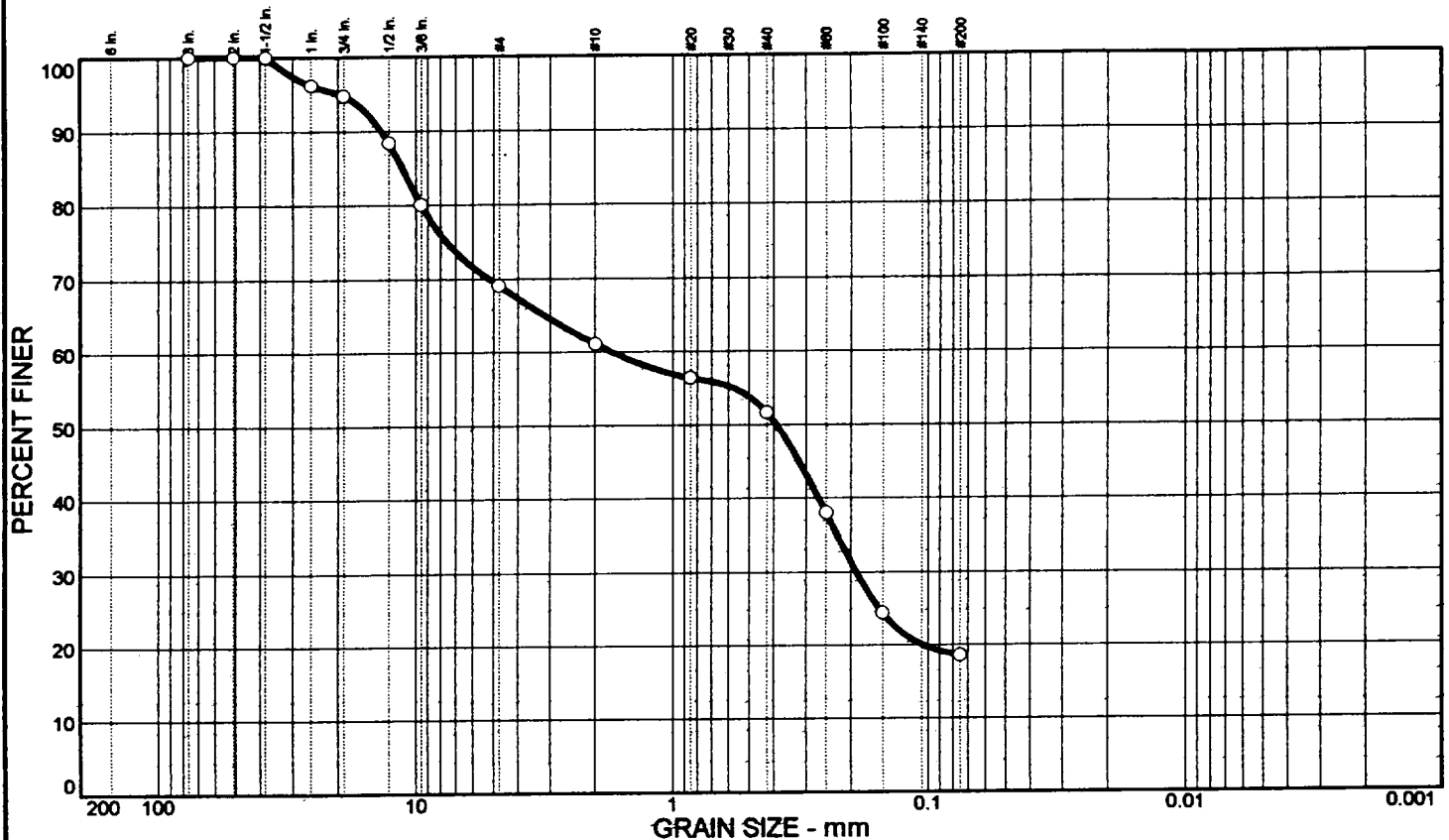
Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in	% < No.200
	USCS	AASHTO						
			N/A %	2.65			18.2 %	


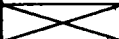
ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 128.7 pcf Optimum moisture = 8.8 %	122.7 pcf 10.8 %	RF2-S2 Sand, gravelly, brown

Project No.: 804899 Project: International Uranium Corporation Location: Soil Sample Testing Date: 5/3/99	Remarks: SUBMITTED BY: Client TESTED BY: JH
MOISTURE-DENSITY RELATIONSHIP TEST WESTERN COLORADO TESTING, INC.	

Fig. No. 14

PARTICLE SIZE DISTRIBUTION TEST REPORT

[illegible]

SIEVE inches size	PERCENT FINER		
	○		
3	100.0		
2	100.0		
1.5	100.0		
1	96.2		
3/4	94.8		
1/2	88.4		
3/8	80.1		
	GRAIN SIZE		
D ₆₀	1.73		
D ₃₀	0.190		
D ₁₀			
	COEFFICIENTS		
C _c			
C _u			

SIEVE number size	PERCENT FINER		
	○		
#4	69.1		
#10	61.1		
#20	56.4		
#40	51.7		
#60	38.0		
#100	24.4		
#200	18.6		

○ Sand, gravelly, brown

REMARKS:

○ Tested By: JH

○ Source:

Sample No.: RF2-S2

WESTERN COLORADO TESTING, INC.

Client: International Uranium Corporation

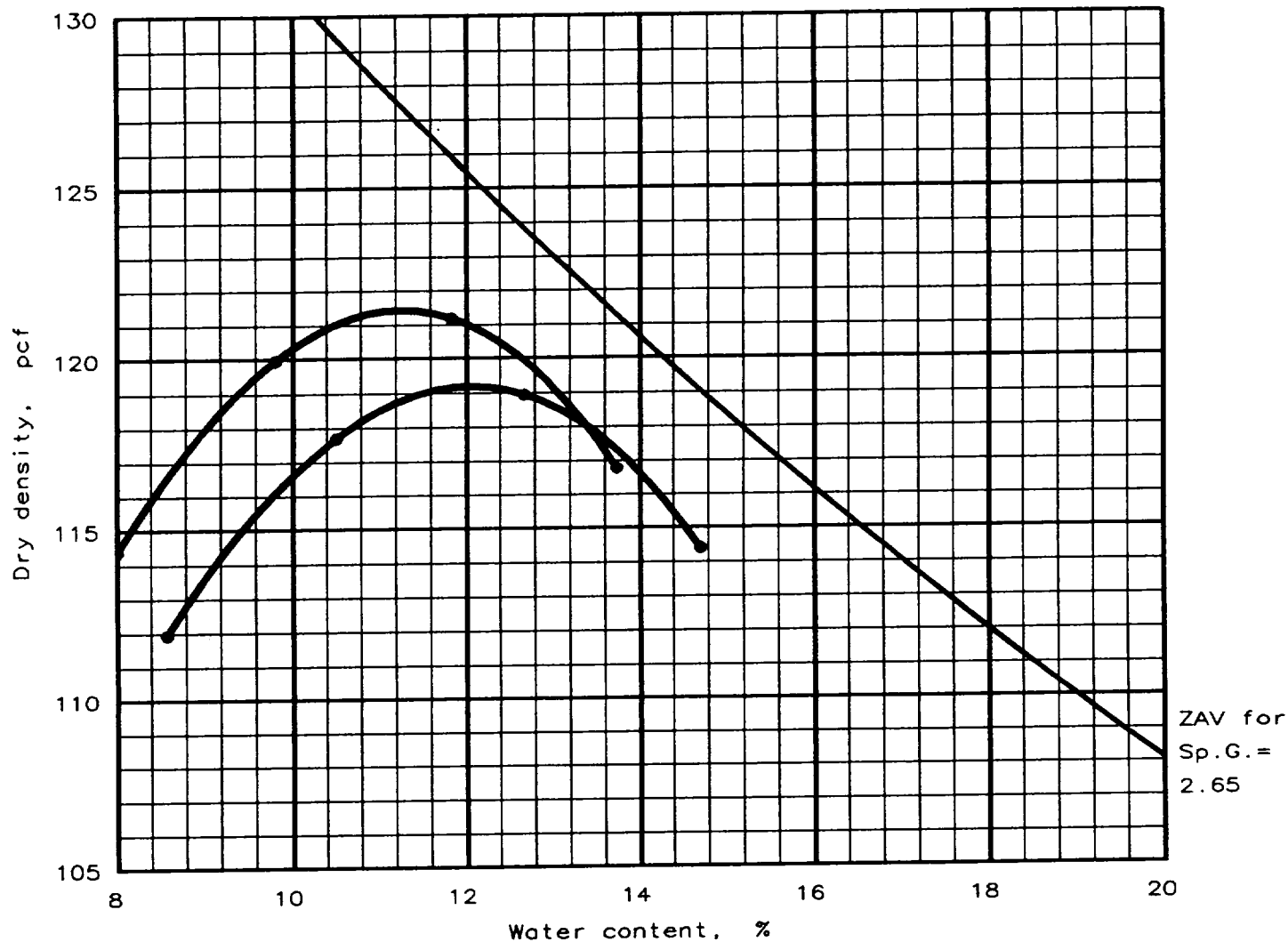
Project: Soil Sample Testing

Project No.: 804899

Figure

45

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Procedure C, Standard
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in	% < No.200
	USCS	AASHTO						
			N/A %	2.65			6.6 %	

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 121.4 pcf Optimum moisture = 11.3 %	119.2 pcf 12.1 %	RF3-S1 Sand, clayey, grvly, brn

Project No.: 804899
Project: International Uranium Corporation
Location: Soil Sample Testing

Date: 5/3/99

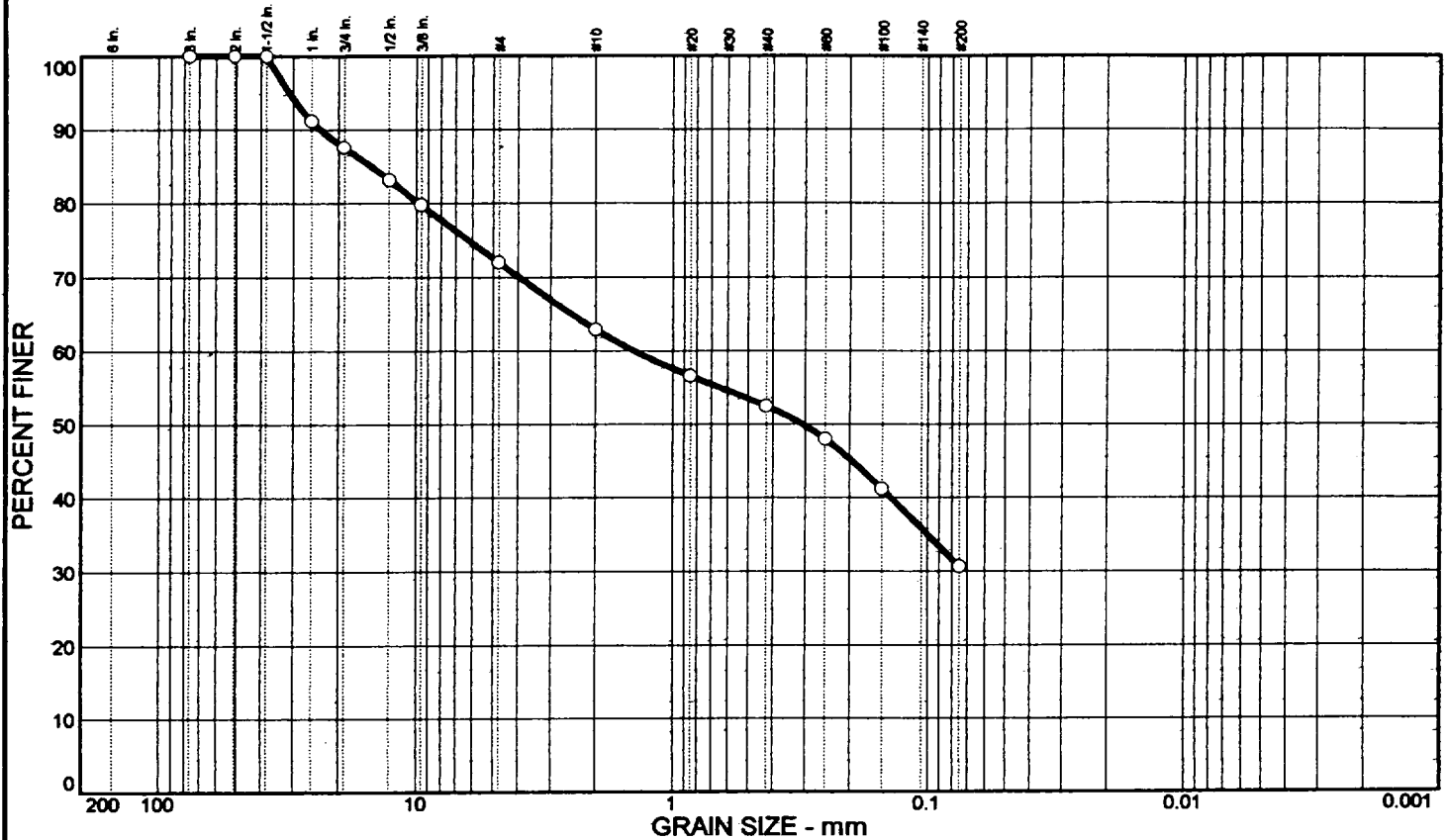
Remarks:

SUBMITTED BY: Client
TESTED BY: JH

MOISTURE-DENSITY RELATIONSHIP TEST
WESTERN COLORADO TESTING, INC.

Fig. No. 15

PARTICLE SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
	28.0	41.4			SM	A-2-4(0)	NP	

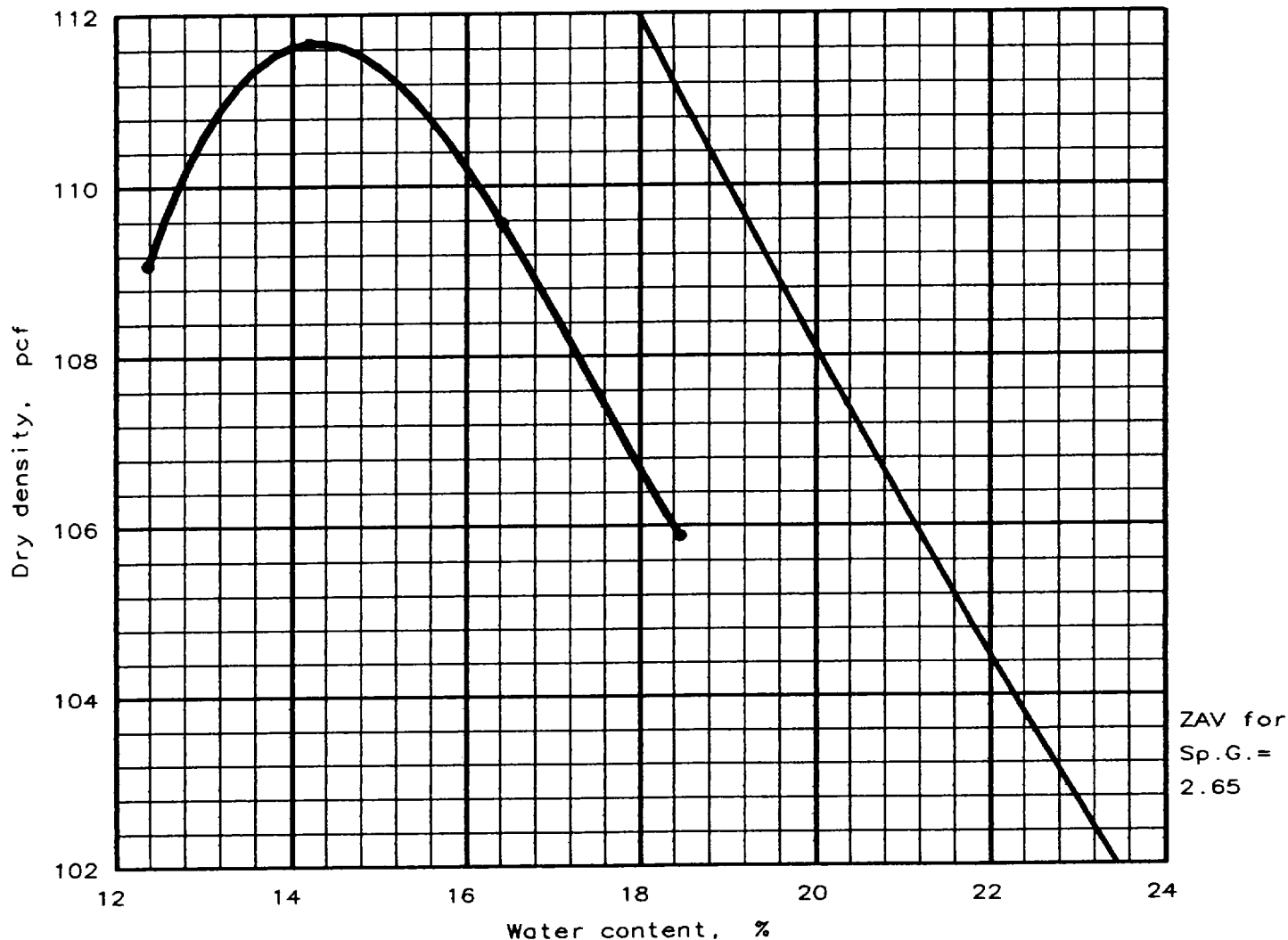
SIEVE inches size	PERCENT FINER		
	○		
3	100.0		
2	100.0		
1.5	100.0		
1	91.2		
3/4	87.6		
1/2	83.2		
3/8	79.8		
<div></div>	GRAIN SIZE		
D60	1.41		
D30			
D10			
<div></div>	COEFFICIENTS		
Cc			
Cu			

SIEVE number size	PERCENT FINER		
	○		
#4	72.0		
#10	62.9		
#20	56.6		
#40	52.5		
#60	48.0		
#100	41.2		
#200	30.6		

SOIL DESCRIPTION
○ Sand, sl clayey, gravelly, brown

REMARKS:
○ Tested By: JH

MOISTURE-DENSITY RELATIONSHIP TEST

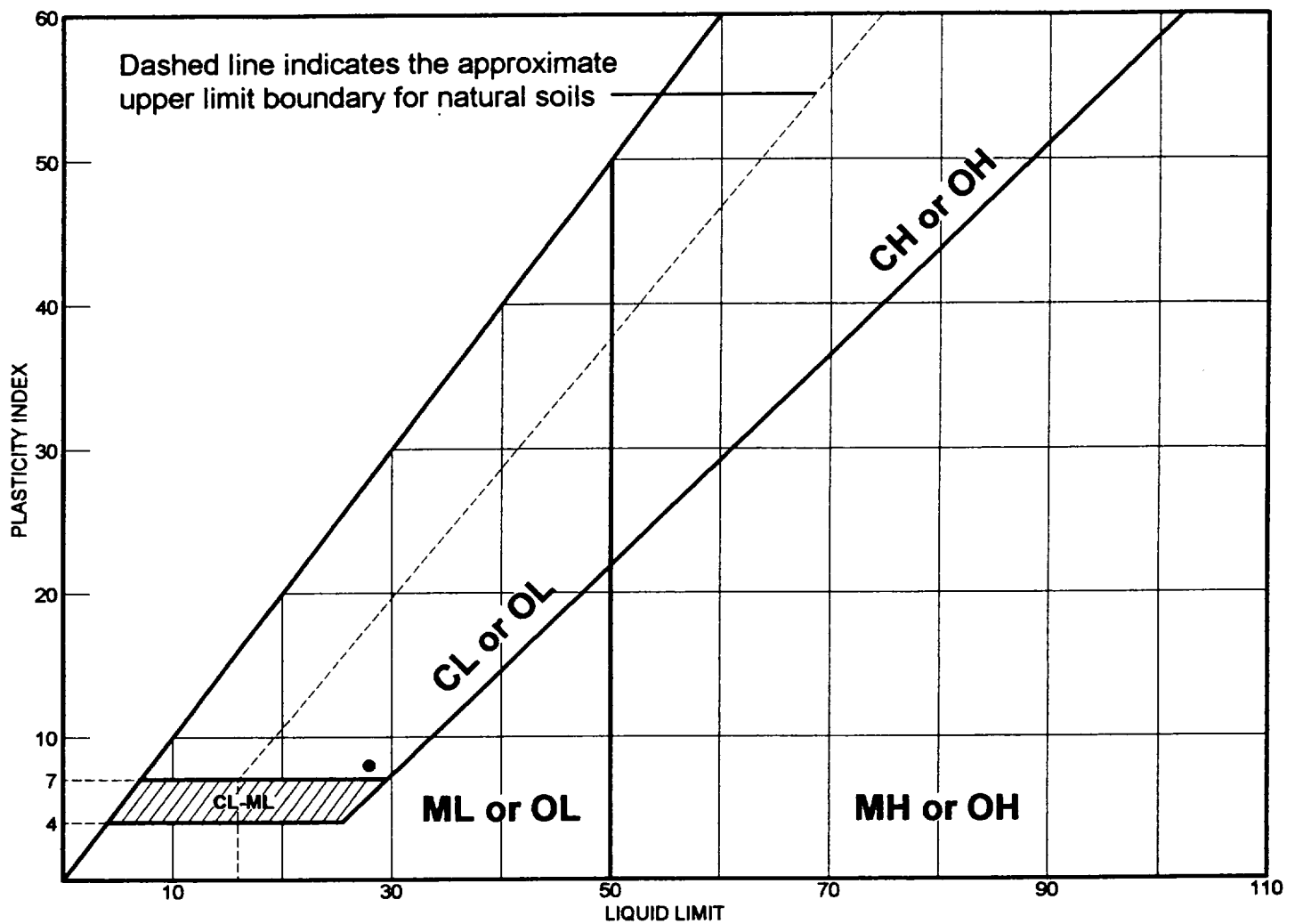


Test specification: ASTM D 698-91 Procedure A, Standard
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No. 4	% < No. 200
	USCS	AASHTO						
			N/A %	2.65				

ROCK CORRECTED TEST RESULTS		UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 111.7 pcf Optimum moisture = 14.3 %		111.7 pcf 14.3 %	RF3-S2 Clay, v sandy, red
Project No.: 804899 Project: International Uranium Corporation Location: Soil Sample Testing Date: 5/3/99			Remarks: SUBMITTED BY: Client TESTED BY: JH
MOISTURE-DENSITY RELATIONSHIP TEST WESTERN COLORADO TESTING, INC.			Fig. No. <u>16</u>

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Clay, very sandy, red	28	20	8	69.0	39.0	SM

Project No. 804899 Client: International Uranium Corporation

Project: Soil Sample Testing

● Source:

Sample No.: RF3-S2

Remarks:

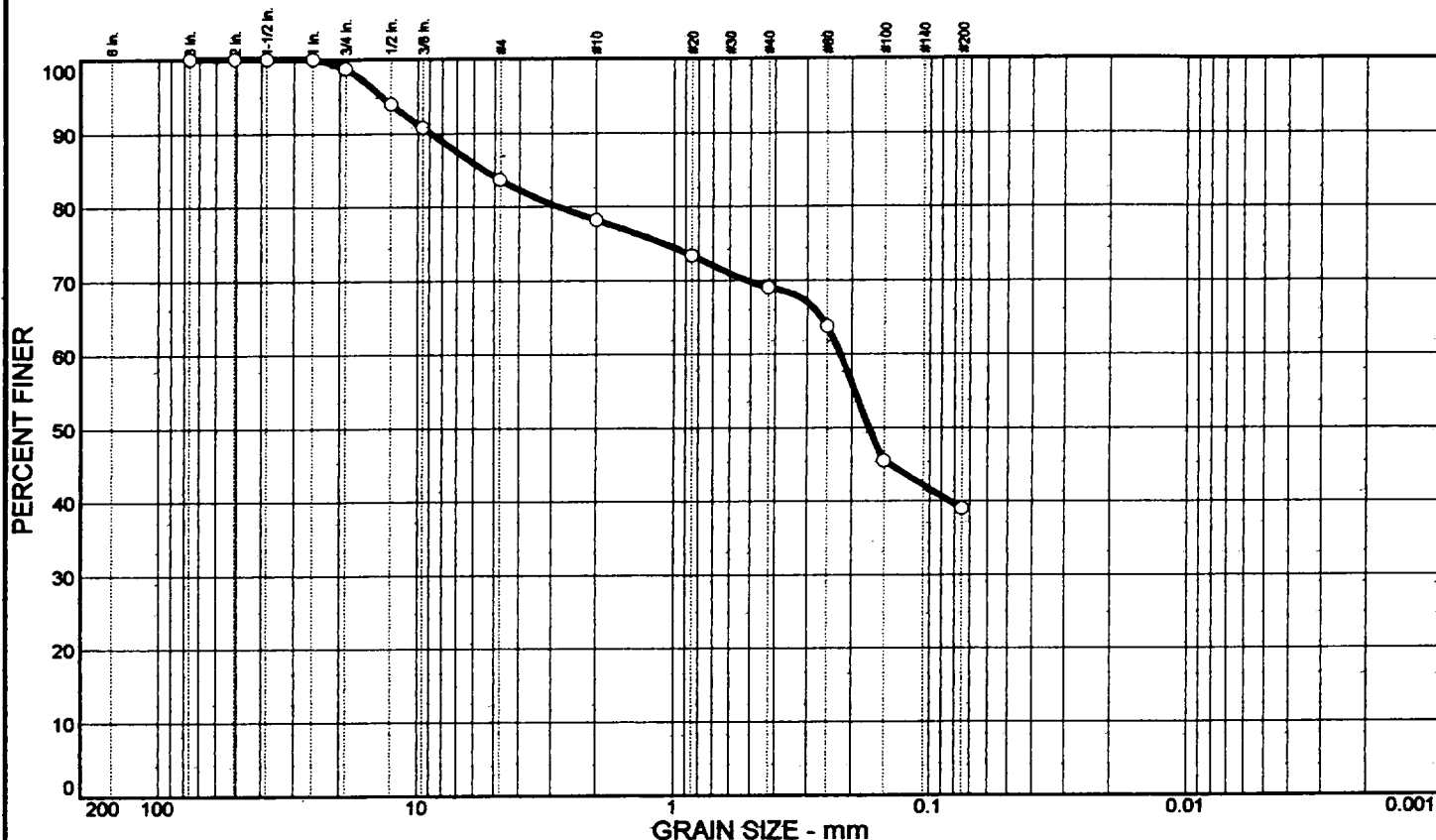
● Tested By: JH

LIQUID AND PLASTIC LIMITS TEST REPORT

WESTERN COLORADO TESTING, INC.

Figure 27

PARTICLE SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	16.3	44.7			SM	A-4(0)		

SIEVE inches size	PERCENT FINER		
	○		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	98.7		
1/2	94.0		
3/8	90.8		
GRAIN SIZE			
D ₆₀	0.222		
D ₃₀			
D ₁₀			
COEFFICIENTS			
C _c			
C _u			

SIEVE number size	PERCENT FINER		
	○		
#4	83.7		
#10	78.2		
#20	73.4		
#40	69.0		
#60	63.7		
#100	45.5		
#200	39.0		

SOIL DESCRIPTION
 ○ Clay, very sandy, red

REMARKS:
 ○ Tested By: JH

○ Source:

Sample No.: RF3-S2

WESTERN COLORADO TESTING, INC.

Client: International Uranium Corporation

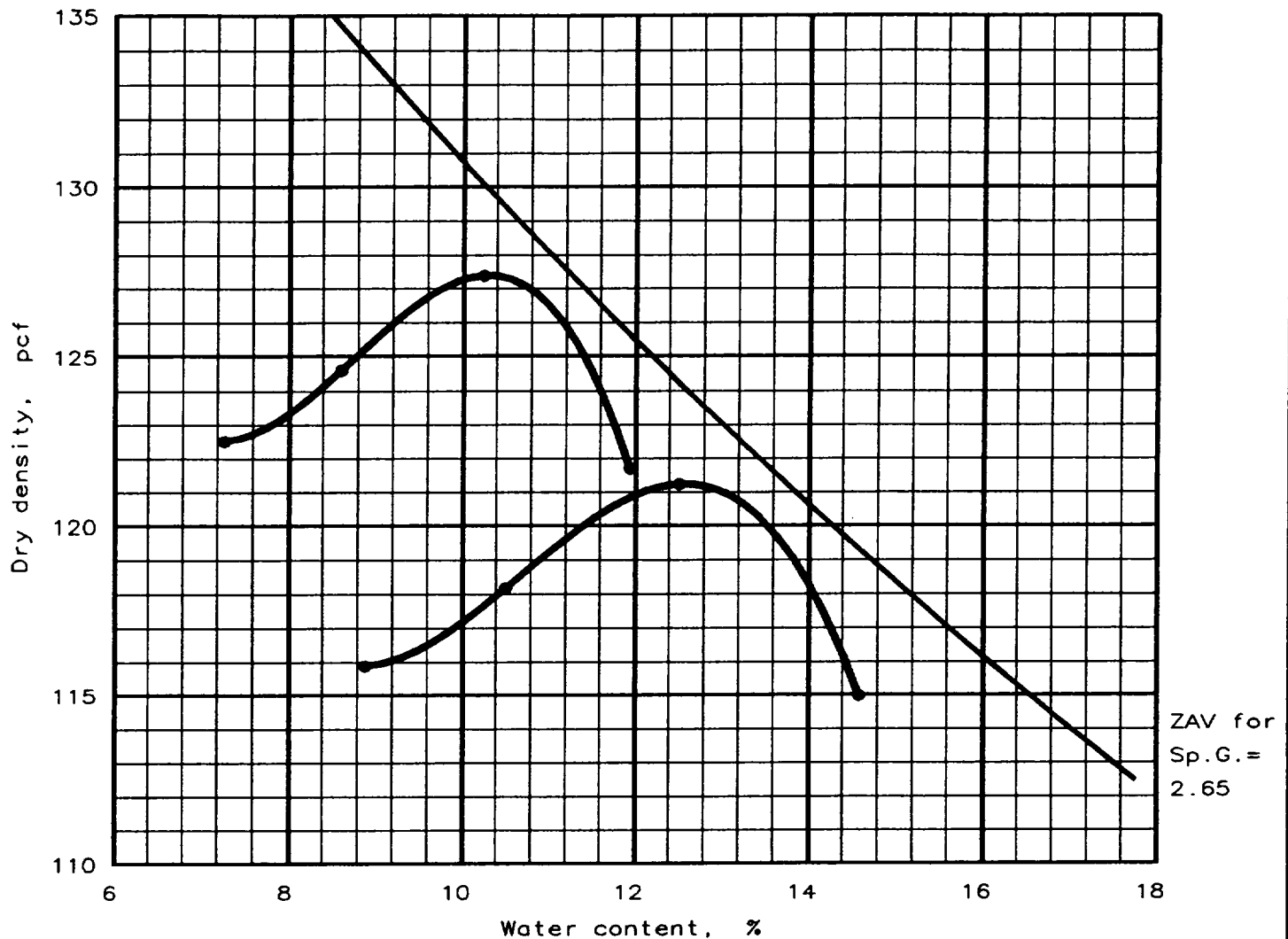
Project: Soil Sample Testing

Project No.: 804899

Figure

47

MOISTURE-DENSITY RELATIONSHIP TEST

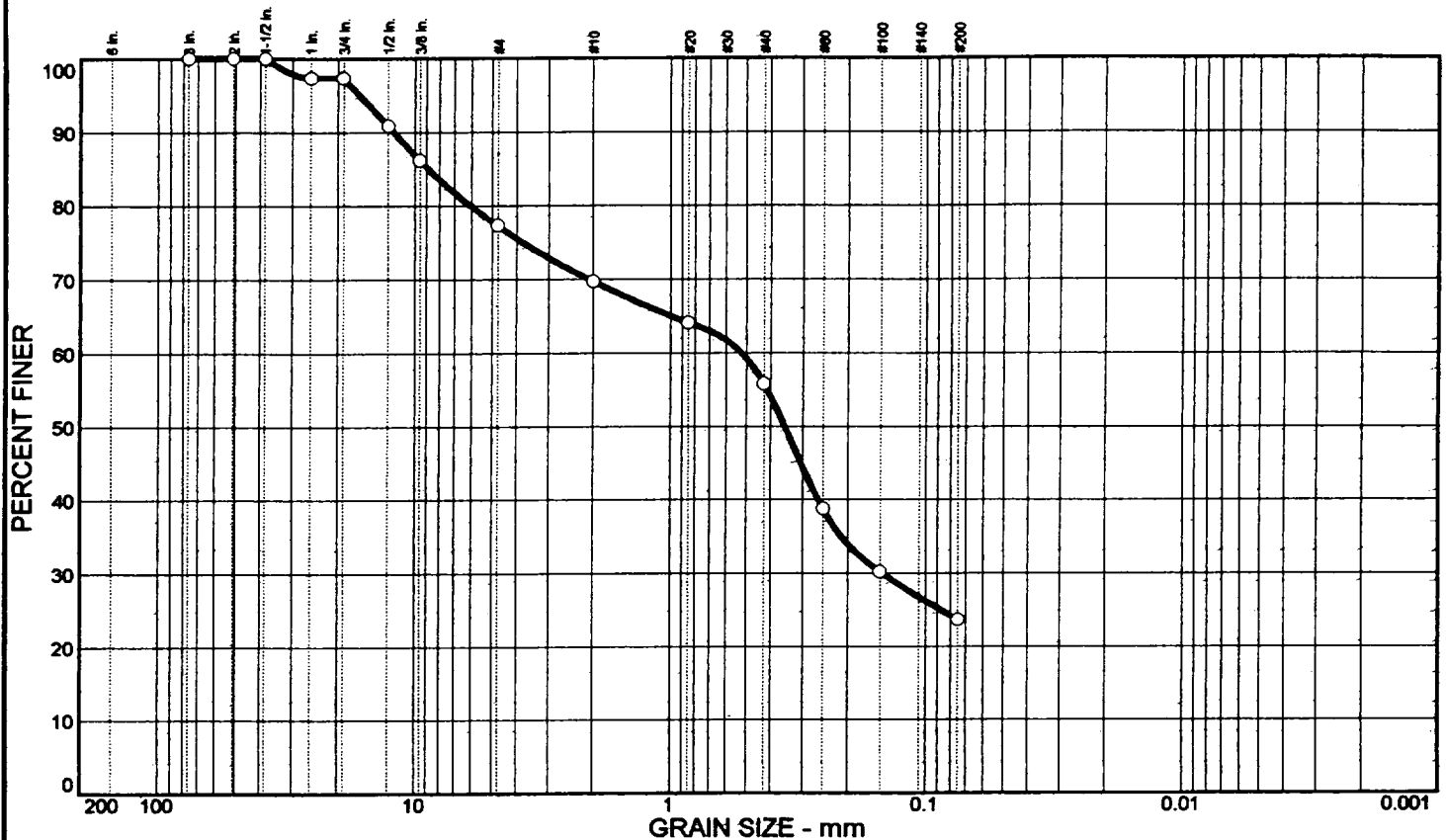


Test specification: ASTM D 698-91 Procedure C, Standard
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in	% < No.200
	USCS	AASHTO						
			N/A %	2.65			18.1 %	

ROCK CORRECTED TEST RESULTS		UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 127.4 pcf Optimum moisture = 10.3 %		121.3 pcf 12.6 %	RF3-S3 Sand, clayey, grvly, brn
Project No.: 804899 Project: International Uranium Corporation Location: Soil Sample Testing Date: 5/3/99			Remarks: SUBMITTED BY: Client TESTED BY: JH
MOISTURE-DENSITY RELATIONSHIP TEST WESTERN COLORADO TESTING, INC.			Fig. No. <u>17</u>

PARTICLE SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
	22.7	53.6			SM	A-2-4(0)	NP	NP

SIEVE inches size	PERCENT FINER		
	○		
3	100.0		
2	100.0		
1.5	100.0		
1	97.4		
3/4	97.4		
1/2	90.9		
3/8	86.2		
GRAIN SIZE			
D ₆₀	0.523		
D ₃₀	0.147		
D ₁₀			
COEFFICIENTS			
C _c			
C _u			

SIEVE number size	PERCENT FINER		
	○		
#4	77.3		
#10	69.7		
#20	64.1		
#40	55.8		
#60	38.8		
#100	30.2		
#200	23.7		

SOIL DESCRIPTION ○ Sand, sl clayey, gravelly, brown
REMARKS: ○ Tested By: JH

○ Source:

Sample No.: RF3-S3

WESTERN COLORADO TESTING, INC.

Client: International Uranium Corporation

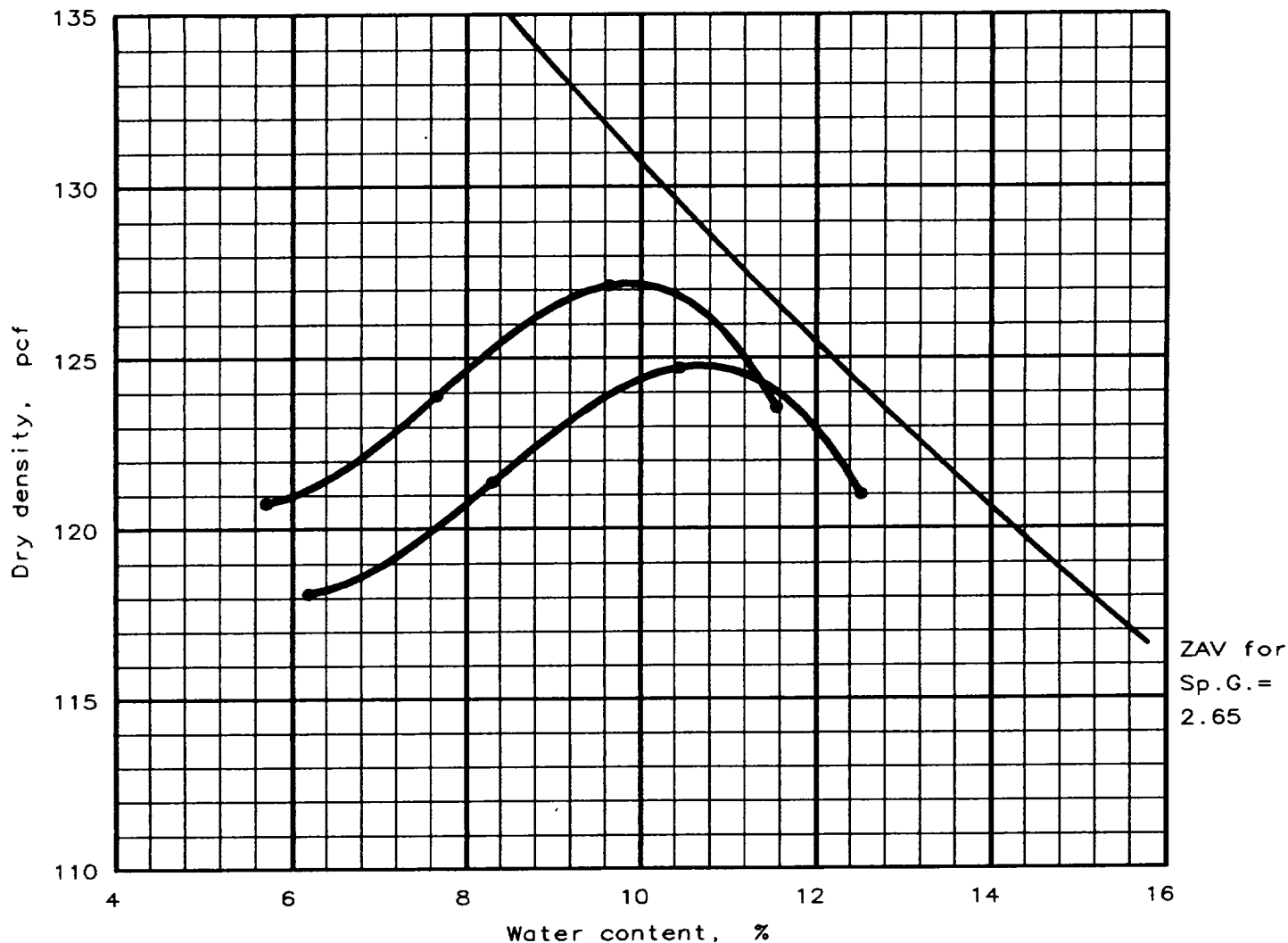
Project: Soil Sample Testing

Project No.: 804899

Figure

48

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Procedure C, Standard
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in	% < No.200
	USCS	AASHTO						
			N/A %	2.65			7.7 %	

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 127.2 pcf Optimum moisture = 9.9 %	124.8 pcf 10.7 %	RF4-S1 Sand, clayey, grvly, brn

Project No.: 804899
Project: International Uranium Corporation
Location: Soil Sample Testing

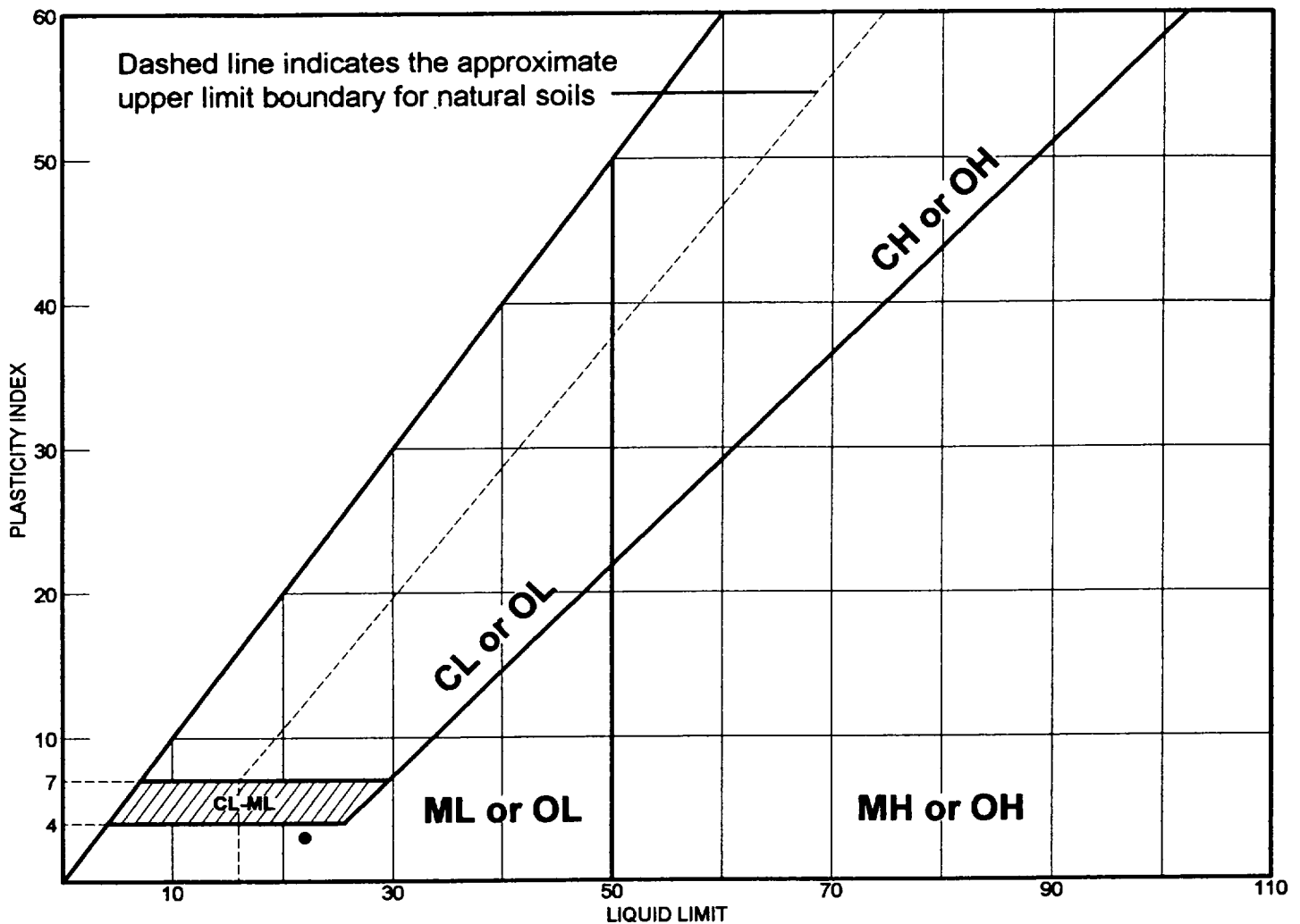
Date: 5/3/99

Remarks:
SUBMITTED BY: Client
TESTED BY: JH

MOISTURE-DENSITY RELATIONSHIP TEST
WESTERN COLORADO TESTING, INC.

Fig. No. 18

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
•	Sand, clayey, gravelly, brown	22	19	3	51.1	25.5	SM

Project No. 804899 Client: International Uranium Corporation

Project: Soil Sample Testing

• Source:

Sample No.: RF4-S1

Remarks:

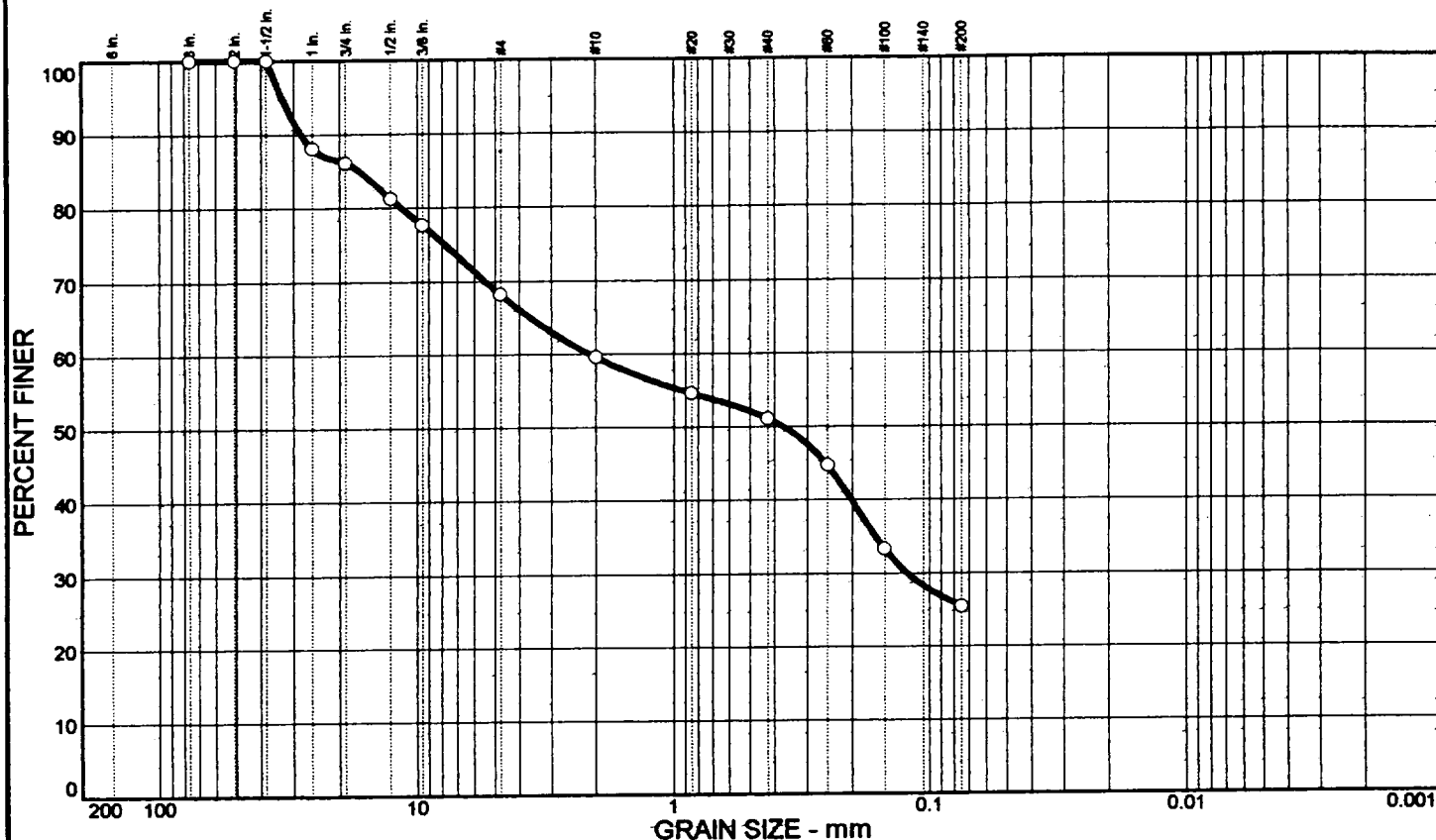
• Tested By: JH

LIQUID AND PLASTIC LIMITS TEST REPORT

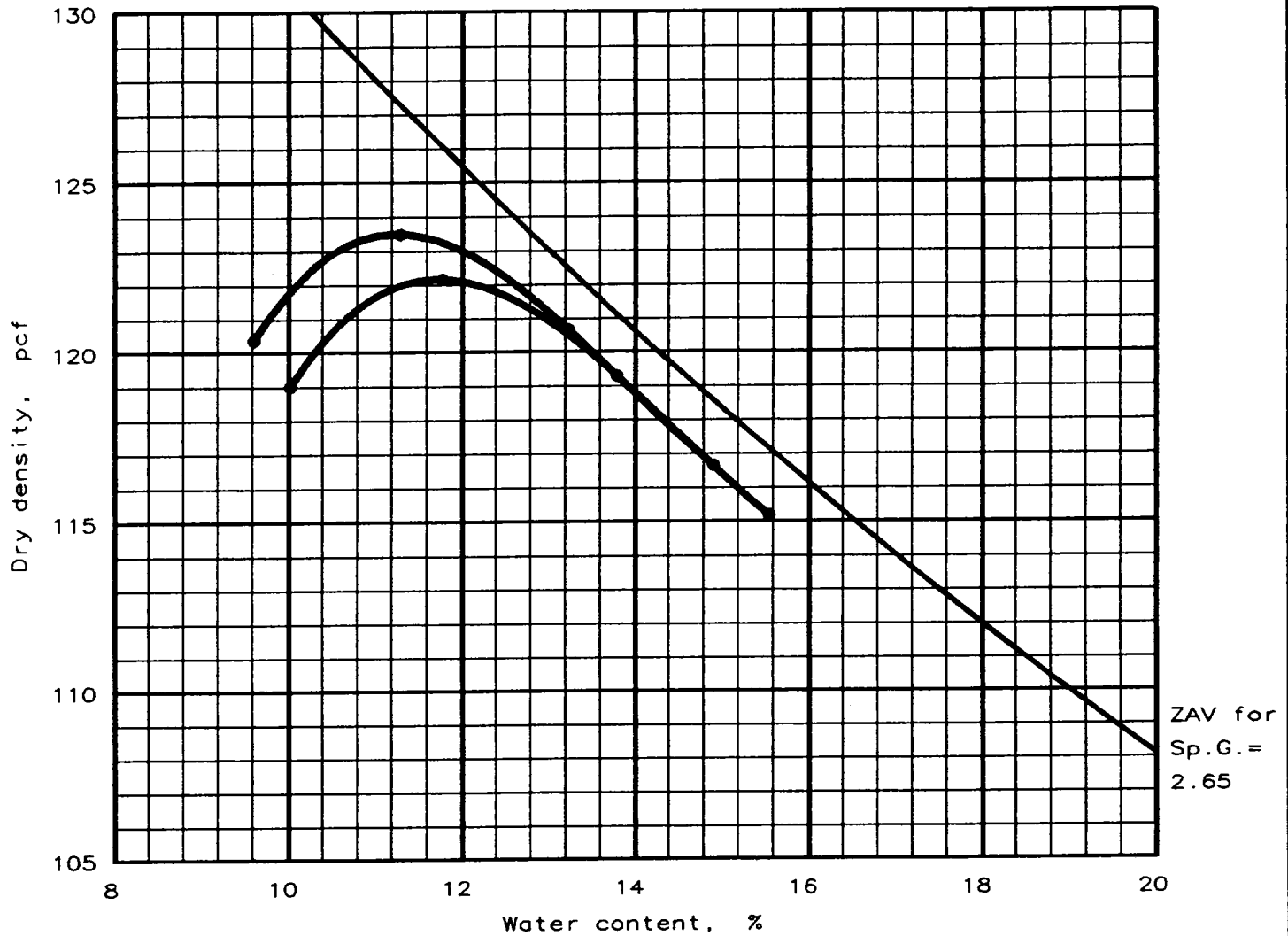
WESTERN COLORADO TESTING, INC.

Figure 28

PARTICLE SIZE DISTRIBUTION TEST REPORT



MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Procedure B, Standard
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in	% < No.200
	USCS	AASHTO						
			N/A %	2.65			4.1 %	

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 123.5 pcf Optimum moisture = 11.3 %	122.2 pcf 11.7 %	RF5-S1 Sand, clayey, grvly, brn

Project No.: 804899
Project: International Uranium Corporation
Location: Soil Sample Testing

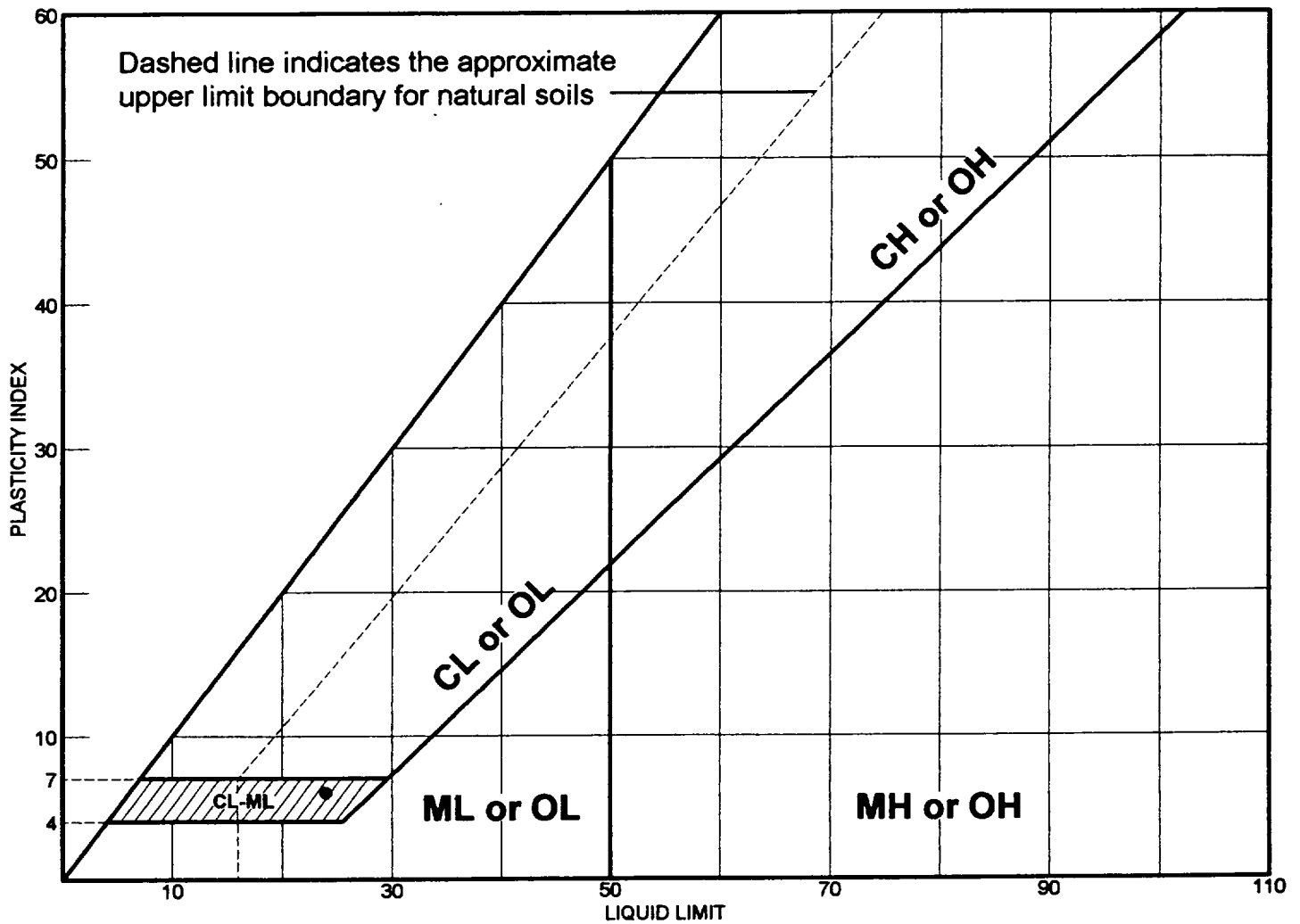
Date: 5/3/99

Remarks:
SUBMITTED BY: Client
TESTED BY: JH

MOISTURE-DENSITY RELATIONSHIP TEST
WESTERN COLORADO TESTING, INC.

Fig. No. 19

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Sand, clayey, gravelly, brown	24	18	6	74.3	41.6	SM

Project No. 804899 **Client:** International Uranium Corporation

Project: Soil Sample Testing

● **Source:**

Sample No.: RF5-S1

Remarks:

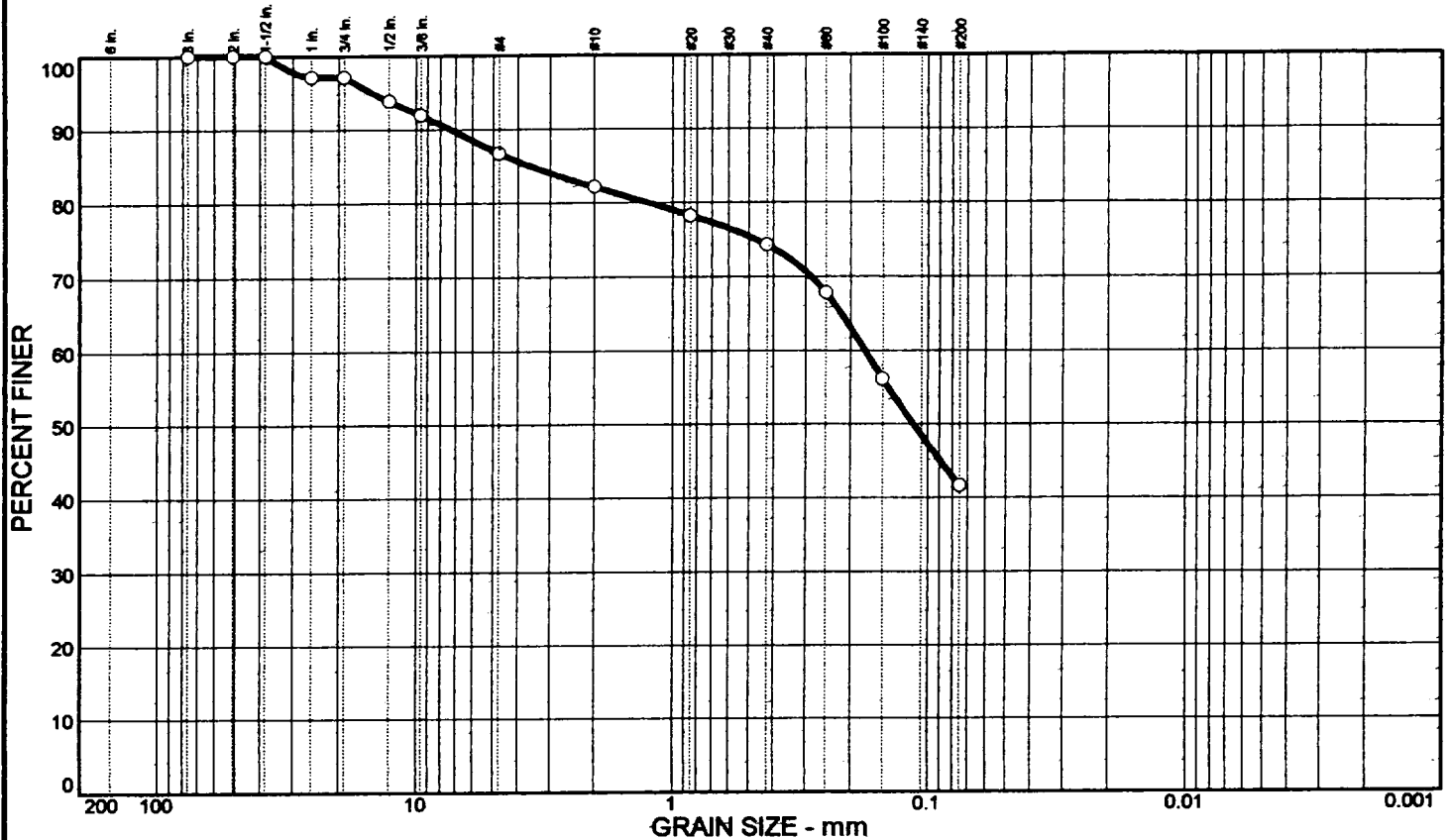
● Tested By: JH

LIQUID AND PLASTIC LIMITS TEST REPORT

WESTERN COLORADO TESTING, INC.

Figure 29

PARTICLE SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
	13.2	45.2			SM	A-4(0)		

SIEVE inches size	PERCENT FINER		
	○		
3	100.0		
2	100.0		
1.5	100.0		
1	97.2		
3/4	97.2		
1/2	93.9		
3/8	92.0		
GRAIN SIZE			
D ₆₀	0.176		
D ₃₀			
D ₁₀			
COEFFICIENTS			
C _c			
C _u			

SIEVE number size	PERCENT FINER		
	○		
#4	86.8		
#10	82.2		
#20	78.3		
#40	74.3		
#60	67.8		
#100	56.2		
#200	41.6		

SOIL DESCRIPTION
 ○ Sand, clayey, gravelly, brown

REMARKS:
 ○ Tested By: JH

○ Source:

Sample No.: RF5-S1

WESTERN COLORADO TESTING, INC.

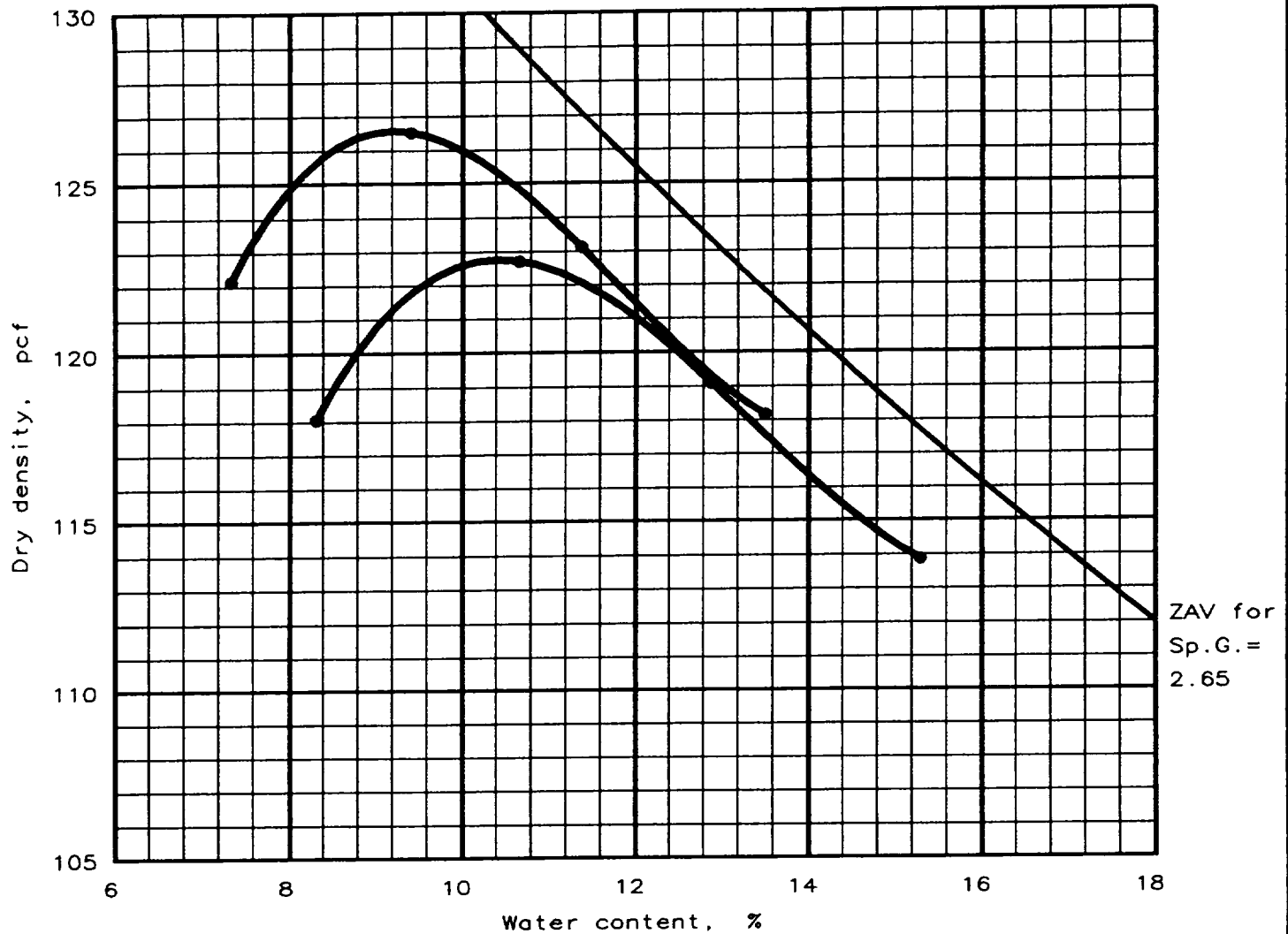
Client: International Uranium Corporation

Project: Soil Sample Testing

Project No.: 804899

Figure 50

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Procedure C, Standard
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in	% < No.200
	USCS	AASHTO						
			N/A %	2.65			11.7 %	

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 126.6 pcf Optimum moisture = 9.2 %	122.8 pcf 10.4 %	RF6-S1 Sand, clayey, grvly, brn

Project No.: 804899
Project: International Uranium Corporation
Location: Soil Sample Testing

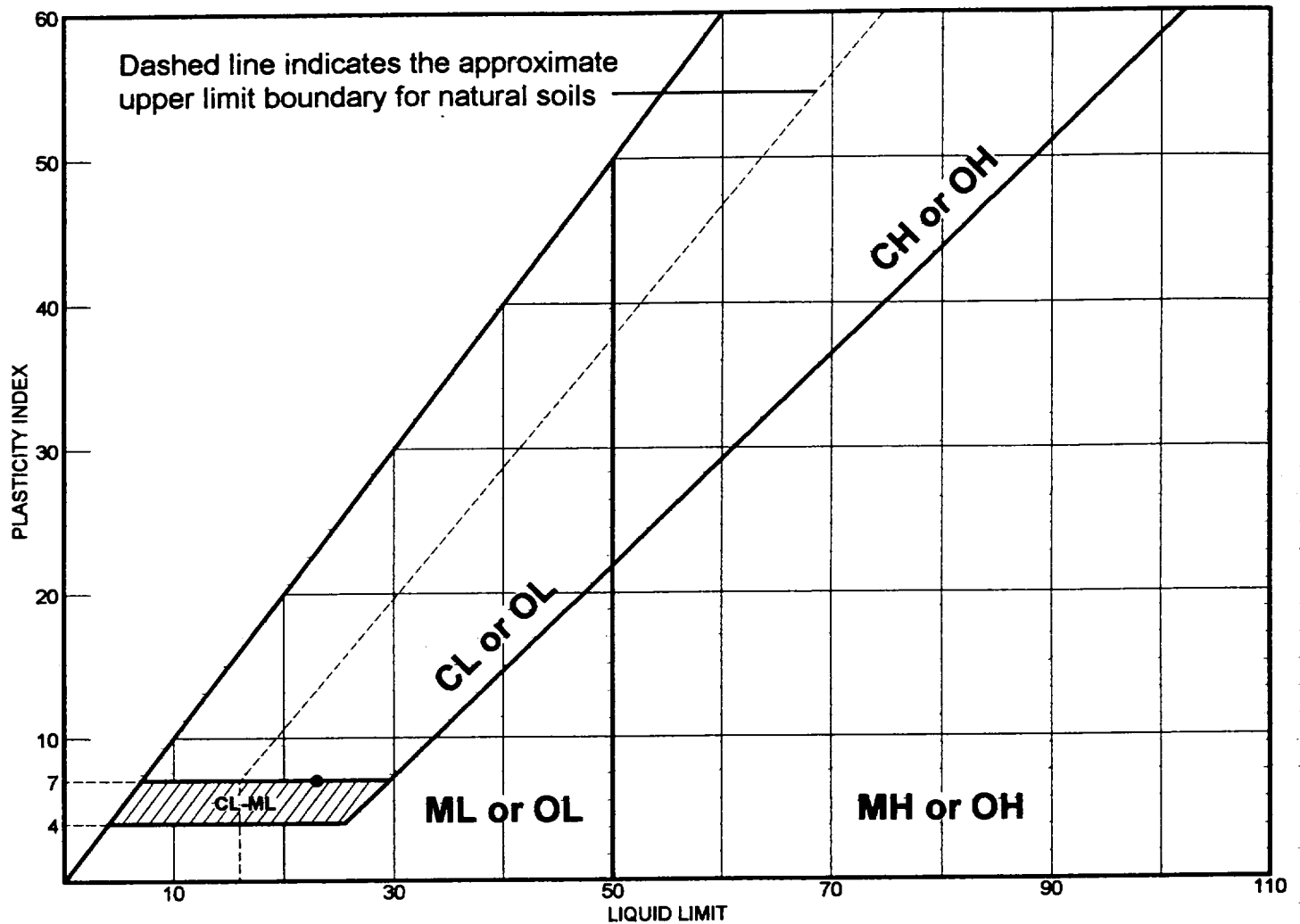
Date: 5/3/99

Remarks:
SUBMITTED BY: Client
TESTED BY: JH

MOISTURE-DENSITY RELATIONSHIP TEST
WESTERN COLORADO TESTING, INC.

Fig. No. 20

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
•	Sand, clayey, gravely, brown	23	16	7	53.0	30.6	GC-GM

Project No. 804899 Client: International Uranium Corporation

Project: Soil Sample Testing

• Source:

Sample No.: RF6-S1

Remarks:

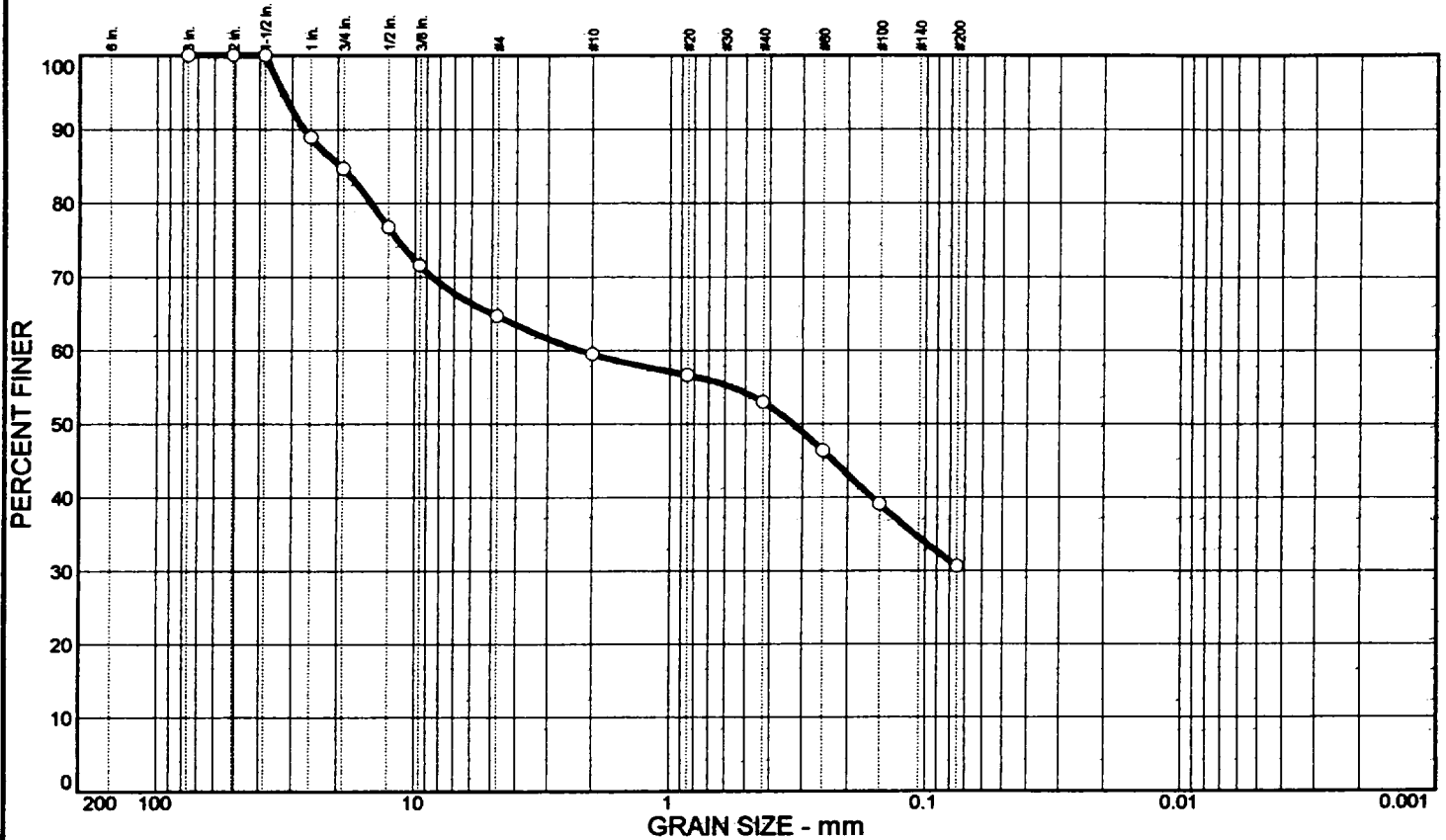
• Tested By: JH



LIQUID AND PLASTIC LIMITS TEST REPORT

WESTERN COLORADO TESTING, INC.

Figure 30

PARTICLE SIZE DISTRIBUTION TEST REPORT

[illegible]

SIEVE inches size	PERCENT FINER		
	○		
3	100.0		
2	100.0		
1.5	100.0		
1	88.9		
3/4	84.7		
1/2	76.8		
3/8	71.6		
	GRAIN SIZE		
D ₆₀	2.23		
D ₃₀			
D ₁₀			
	COEFFICIENTS		
C _c			
C _u			

SIEVE number size	PERCENT FINER		
	○		
#4	64.7		
#10	59.5		
#20	56.7		
#40	53.0		
#60	46.4		
#100	39.1		
#200	30.6		

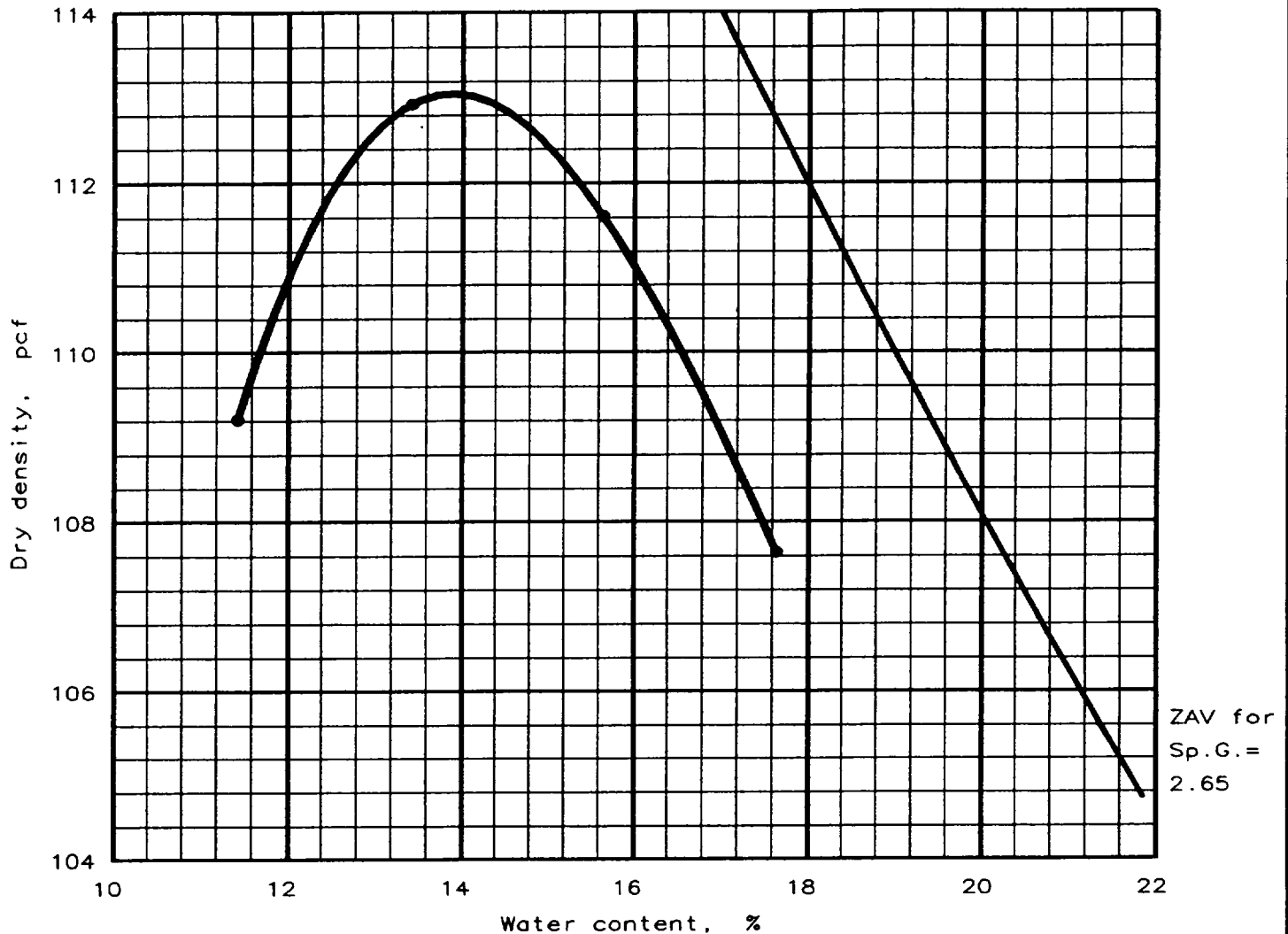
○ Sand, clayey, gravelly, brown

○ Tested By: JH

Sample No.: RF6-S1

Figure 51

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Procedure A, Standard
Oversize correction applied to each point

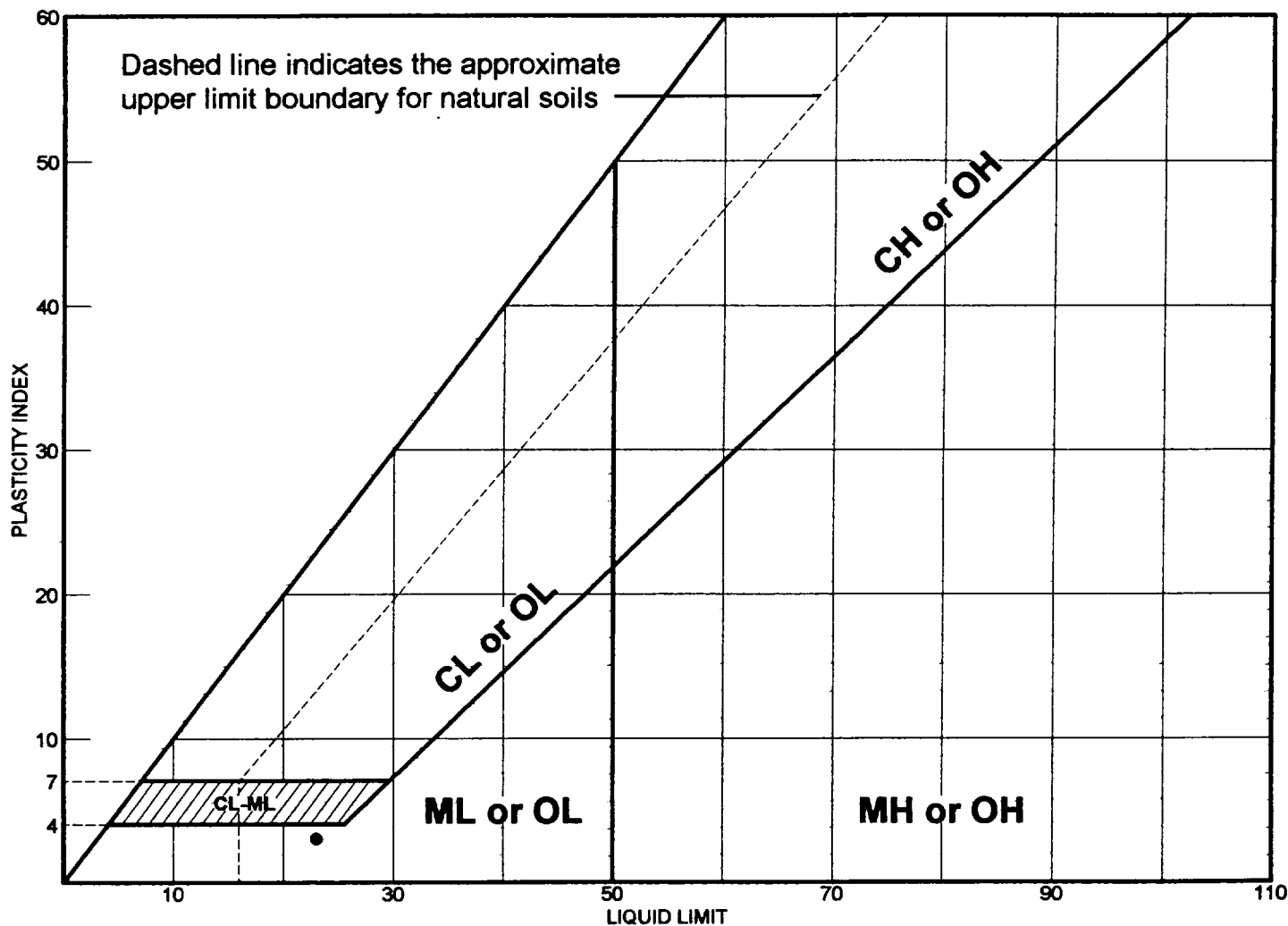
Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No. 4	% < No. 200
	USCS	AASHTO						
			N/A %	2.65				

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 113.1 pcf Optimum moisture = 13.9 %	113.1 pcf 13.9 %	RF7-S1 Clay, v sandy, silty, rd

Project No.: 804899 Project: International Uranium Corporation Location: Soil Sample Testing Date: 5/3/99	Remarks: SUBMITTED BY: Client TESTED BY: JH
MOISTURE-DENSITY RELATIONSHIP TEST WESTERN COLORADO TESTING, INC.	

Fig. No. 21

LIQUID AND PLASTIC LIMITS TEST REPORT



MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
• Clay, very sandy, silty, red	23	20	3	88.6	56.8	ML

Project No. 804899 Client: International Uranium Corporation

Project: Soil Sample Testing

• Source:

Sample No.: RF7-S1

Remarks:

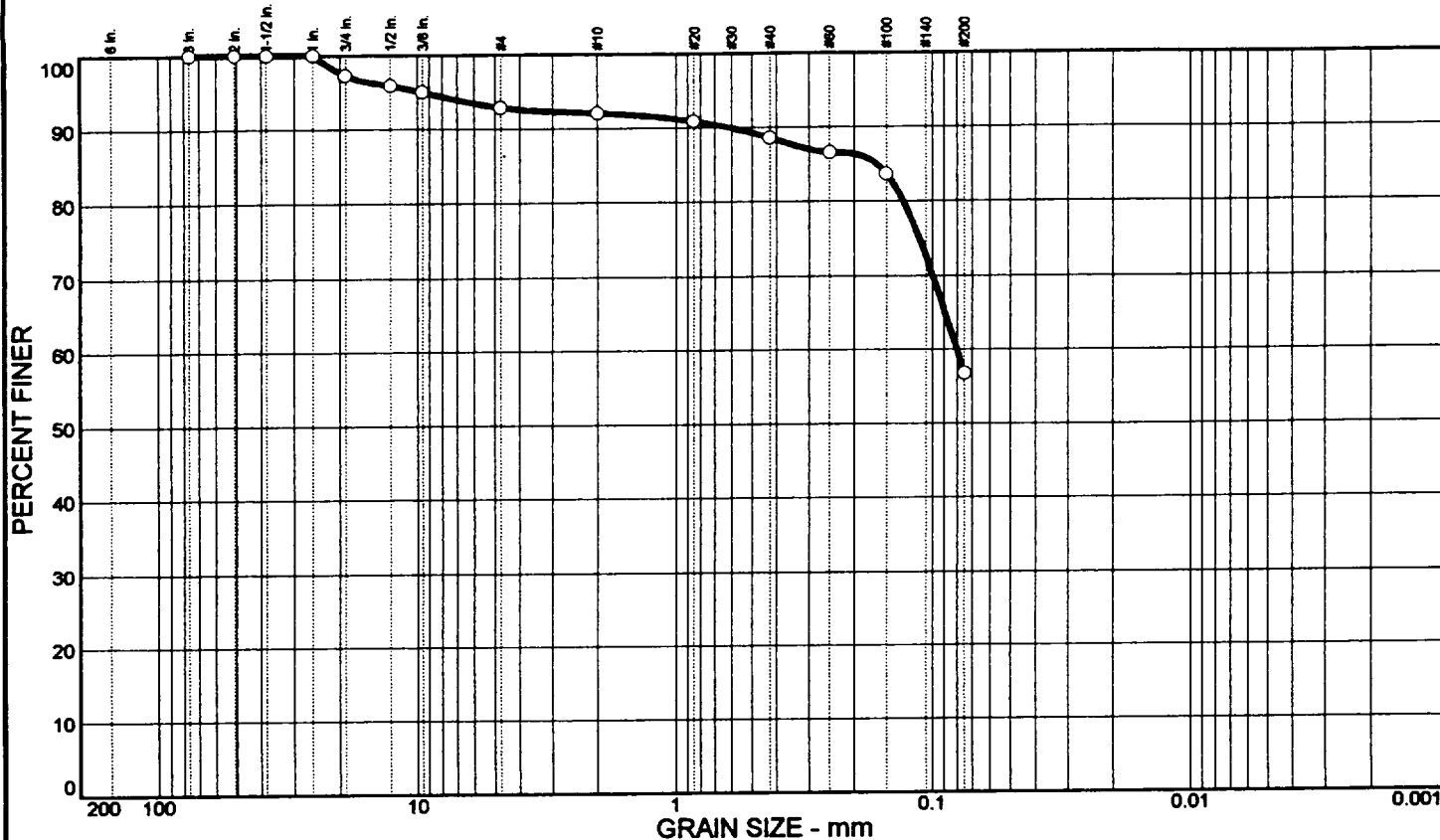
• Tested By: JH

LIQUID AND PLASTIC LIMITS TEST REPORT

WESTERN COLORADO TESTING, INC.

Figure 31

PARTICLE SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
	7.1	36.1			ML	A-4(0)	20	23

SIEVE inches size	PERCENT FINER		
	○		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	97.3		
1/2	95.9		
3/8	95.0		
GRAIN SIZE			
D ₆₀	0.0801		
D ₃₀			
D ₁₀			
COEFFICIENTS			
C _c			
C _u			

SIEVE number size	PERCENT FINER		
	○		
#4	92.9		
#10	92.1		
#20	90.9		
#40	88.6		
#60	86.6		
#100	83.7		
#200	56.8		

SOIL DESCRIPTION
 ○ Clay, very sandy, silty, red

REMARKS:
 ○ Tested By: JH

○ Source:

Sample No.: RF7-S1

WESTERN COLORADO TESTING, INC.

Client: International Uranium Corporation

Project: Soil Sample Testing

Project No.: 804899

Figure

52

ATTACHMENT E

**EVALUATION OF POTENTIAL SETTLEMENT
DUE TO EARTHQUAKE-INDUCED LIQUEFACTION
AND
PROBABILISTIC SEISMIC RISK ASSESSMENT**

**PREPARED BY
INTERNATIONAL URANIUM (USA) CORP.
INDEPENDENCE PLAZA
1050 17TH STREET, SUITE 950
DENVER, CO 80265**

EVALUATION OF POTENTIAL SETTLEMENT DUE TO EARTHQUAKE-INDUCED LIQUEFACTION
INTERNATIONAL URANIUM CORPORATION, WHITE MESA MILL
5/6/99

An evaluation of potential settlement due to earthquake-induced liquefaction of tailings at International Uranium Corporation's White Mesa mill has been performed, and the results are reported below. This analysis applies to cells #2 and #3 and uses conditions of those cells that existed before May 1999, ore sieve analyses, calculated average in-place density, seismic analyses by Knight Piesold, and typical physical property values from the literature. Two analyses were performed using methods applied to the Maybell UMTRA site by Morrison-Knudsen Engineers (per information supplied by the NRC to IUC).

Method I is the Stress Ratio method of Takimatsu and Seed, 1987¹. This method uses the SPT blow counts (N) as input for the analysis. No N values are available for the White Mesa tailings, so N values were estimated (see page 2 of calculations) using the grain size properties determined in recent tests by Western Colorado Testing Inc. and the average in-place density determined by IUC from volumetric calculations. The N values are conservatively estimated to range from 0 at ground surface to 8 at 35 feet depth, values consistent with very loose to loose fine grained (relative density 0 to 35), non-plastic soils according to Terzaghi et al, 1996², and NAVFAC DM-7, 1971³. According to KME's UMTRA Design Procedures, Chap. 11, App. 11B, Fig 11B-2, this is conservative because under field conditions the minimum relative density should be about 36%. For additional conservatism, it was assumed that the tailings are completely saturated below ground surface. The results of this calculation, tabulated on page A2, indicate that the maximum settlement should be about one foot in 35 feet of tailings and that most of that settlement originates in the upper 15 feet. According to Borns and Mattson, 1999⁴, an earthen cover of the type used on tailings impoundments should not exhibit cracking in response to rapid settlement until differential settlement exceeds about 0.75%. At White Mesa, estimated differential settlements are not significant (less than 1%) over the tailing cell with the possible exception of the inslope areas where differential settlement, expressed as vertical feet of settlement over horizontal distance, could exceed 0.01 (1%) in the upper 5 feet and between 10 and 20 feet of the inslope depth. Differential settlements would be accommodated initially by plastic deformation of the cover, then by cracking, so not all of the differential

¹ Takimatsu, K. and H.B. Seed, 1987; "Evaluation of Settlements in Sands Due to Earthquake Shaking", Journal of Geotechnical Engineering, ASCE, Vol. 113, No. 8

² Terzaghi, k., R.B. Peck, and G. Mesri, 1996; *Soil Mechanics in Engineering Practice*, 3rd Edition, John Wiley & Sons

³ Dept. Of Navy, Navy Facilities Engineering Command, 1971; Design Manual *Soil Mechanics, Foundations, and Earth Structures*, NAVFAC DM-7

⁴ Borns, D. And E. Mattson, 1999, "Simulated Subsidence of the Monticello Cover", Sandia National Laboratories Draft Report, 3/10/99

settlement would be expressed by offset along fractures. However, if it is conservatively assumed that all differential settlement is expressed in fracture offset, then the largest offset would be about 0.175 feet (2.1 inches) about 30-45 feet from the top of the cell inslope. It is more likely that this differential settlement would result in some cover flexure or, at worst, several small fractures with offsets totaling not more than 2.1 inches.

The other method used for analysis, MKE's Method II, is from the Committee on Earthquake Engineering, 1985⁵. It is based on evaluating the shear strain in the tailings caused by an earthquake. It relies not on N values but on shear wave velocities and shear modulus/ maximum shear modulus ratio, both of which are estimated based on empirical data. This removes the effect of uncertainty associated with the lack of site-specific in-place tailings characterization. Using the same assumptions as in Method I, the estimated maximum settlement from liquefaction is 0.0581 feet, or 0.7 inches. The associated differential settlements are all well below the 0.75% threshold of concern for cracking of the cover.

The differences in settlement estimates of the two methods are substantial, about 17.5 times. However, the two estimates probably provide bounding limits for the range of likely liquefaction-induced settlement. If the Method I results are used, then the following consequences of the design earthquake liquefaction would be conservatively predicted:

maximum settlement - 1.015 feet in the deepest part of the cell, up to 0.4 feet along the cell margins over the inslope

maximum differential settlement - 2.7% within about 15 feet horizontal distance of the top of inslope,
1.2% to 0.8 % between 30 and 60 feet from top of inslope

impacts on cover - settlement of cover in response to tailing settlement, with maximum flexure over the upper half of the inslopes, where some cracking is possible with offsets less than two inches and probably less than one inch

⁵ Committee on Earthquake Engineering, Commission on Engineering and Technical Systems, National Research Council, 1985; "Liquefaction of Soils During Earthquakes", National Academy Press

EVALUATION OF LIQUEFACTION POTENTIAL
WHITE MESA MILL TAILINGS

Tailing Samples Parameters

from tests by Western Colorado Testing Inc., April 1999

Sample #	USCS	LL	PI	Max. Dry Density pcf	Optimum Moisture %	% #200
C2-ST1	SM	NP	NP	109.2	15.2	24.1
C2-TS2	ML	29	29	103.5	20.8	82.7
C2-TS3	SM	NP	NP	110.4	16.0	32.7
C2-TS4	SM	NP	NP	107.4	16.8	32.2
C3-TS1	ML	24	23	105.7	16.0	60.8
C3-TS2	SM	NP	NP	105.4	15.3	23.0
ave. for	SM	NP	NP	108.1	15.8	28.0
ave. for	ML	26.5	26	104.6	18.4	71.75

Seismic Parameters

Design Life	1000 yrs	from Knight Piesold (Julio Valera), 4/23/99
Return Period	10000 yrs	from Knight Piesold (Julio Valera), 4/23/99
Peak Horiz Acceler.	0.18g	from Knight Piesold (Julio Valera), 4/23/99
Seismic Coeff.	0.12g	(DOE, 1989, Technical Approach Document, Revision II, Uranium Mill Tailings Remedial Action Project)

Tailing In-place Characteristics

From mill screen analyses:

Ore					
Blanding #4	Anchutz #1	Hanksville #2A	Hanksville #1	Average	
% #200	27.2	30.7	37.6	23.2	29.7

Ave. Dry Unit Wt. of all tailings, in pcf = 86.31 from IUC volumetric calcs.

From this value and ave. % #200, ave. unit wts of sand and slimes would be:

Ave. pcf = $86.31 = SD_{pcf} * .703 + SL_{pcf} * .297$

Parameters:

T_{av} = ave cyclic shear stress from earthquake, psi
 P_o = total overburden pressure at depth considered, psi = $(86.31 + n \cdot 62.4) \cdot \text{depth} = (86.31 + 0.478 \cdot 62.4) \cdot \text{depth} = 116.1 \text{ pcf} \cdot \text{ft}$
 P_o' = effective overburden pressure at depth considered, psi = $P_o - \text{depth} \cdot 62.4$
 r_d = stress reduction factor (1.0 at surface to 0.89 at 35') per Kovacs and Solomne, 1984
 a_{max} = peak acceleration at ground surface = .18g
 N_1 = SPT N value normalized to an effective overburden pressure of 1 tsf
 and effective energy delivered to drill rods of 60% of theoretical
 free-fall energy
 $N_1 = C_n \cdot N$
 N = SPT N value
 C_n = correction factor based on effective overburden pressure at depth of SPT count

Assumptions:

- 1) N values are assumed to increase with depth, from 1 to 8 (see page 3)
- 2) Tailings are saturated to ground surface

Estimation of N Values:

No SPT tests have been performed, so N values are estimated using physical properties of samples, average in-place dry density, and standard soil mechanics references.

- 1) From NAVFAC DM-7, Fig. 3-7, relative density ranges from 0 to 35% for SM to ML soil with dry density of 86.31 pcf, and corresponding N values range from 1 to 8 (Fig. 4-2).
- 2) From MKE UMTRA Design Procedures, Chap. 11, App. 11B, Fig. 11B-2, minimum relative density under field conditions is about 36%, corresponding to $N_1 = 0$, and maximum relative density (100%) corresponds to N_1 of about 47.
- 3) Based on 1 and 2 above, it is reasonable to estimate that the relative density of the SM/ ML tailings in-place is at least 35% and that the N values range from 1 at the surface to 8 at 35 feet depth.

$$N_1 = C_n \cdot N$$

N_1 = corrected SPT value
 N = recorded SPT value
 C_n = correction coeff.
 $= 0.77 \log_{10} (20 / (P_o' / 2000))$

z	N	P_o'	C_n	N_1
5	1	269	1.67	1.67
10	2	537	1.44	2.88
15	3	806	1.31	3.92
20	4	1074	1.21	4.84
25	5	1343	1.14	5.68
30	6	1611	1.07	6.44
35	8	1880	1.02	8.18

Calculation of Settlement:

$$\text{shear stress ratio } T_{av}/P_o' = 0.65 \cdot (a_{max}/g) \cdot (P_o/P_o') \cdot r_d$$

Depth, z ft	N_1	P_o psf	P_o' psf	P_o/P_o'	r_d	T_{av}/P_o'	Vol. strain % (1)	Thickness of Layer, ft	Settlement ft
5	1.67	581	269	2.162	1	0.2530	8	5	0.4
10	2.88	1161	537	2.162	0.98	0.2479	5	10	0.5
15	3.92	1742	806	2.162	0.96	0.2428	4.5	15	0.675
20	4.84	2322	1074	2.162	0.95	0.2403	4	20	0.8
25	5.68	2903	1343	2.162	0.93	0.2352	3.6	25	0.9
30	6.44	3483	1611	2.162	0.92	0.2327	3.2	30	0.96
35	8.18	4064	1880	2.162	0.89	0.2251	2.9	35	1.015

(1) from Fig 6, Tokimatsu and Seed, 1987

Differential Settlements over Cell Inslopes:

Slopes are 3H:1V

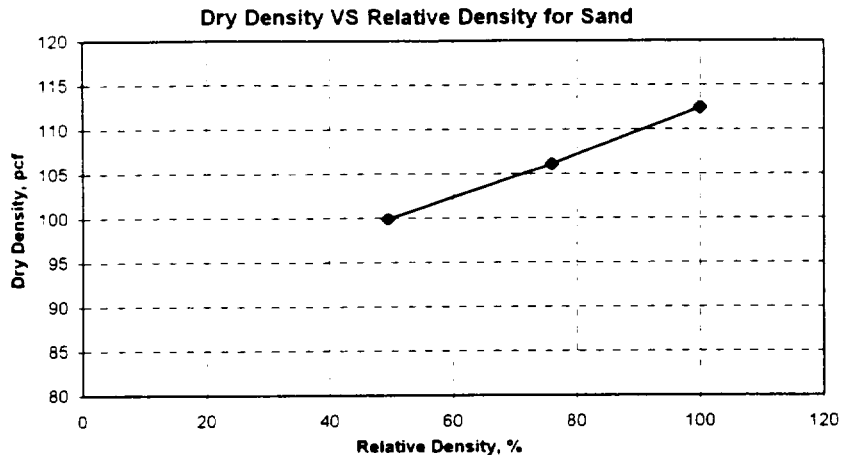
Horizontal Distance over slope ft.	Depth of Tailings over slope ft.	Settlement ft.	Differential Settlement, vertical ft./ horizontal ft.
15	5	0.4	0.027
30	10	0.5	0.007
45	15	0.675	0.012
60	20	0.8	0.008
75	25	0.9	0.007
90	30	0.96	0.004
105	35	1.015	0.004

CORRELATION BETWEEN RELATIVE DENSITY AND ABSOLUTE DRY DENSITY OF SANDS

By AKK
5/6/99

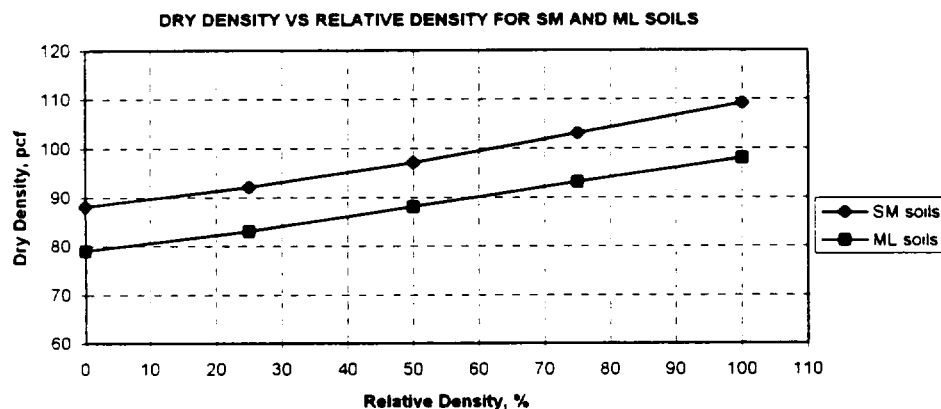
after Terzaghi et al, 1996, Fig 44.1

Relative Density	Dry Density	
	pcf	Mg/m ³
49.5	99.89	1.6
76	106.1	1.7
100	112.4	1.8



after NAVFAC DM-7, 1971, Fig. 3-7

Relative Density, %	Dry Density, pcf SM soils	Dry Density, pcf ML soils
0	88	79
25	92	83
50	97	88
75	103	93
100	109	98



Based on these relationships, the average dry density of 86.31 pcf corresponds to relative density in the 0% to 40% range, depending on the amount of silt vs sand. Therefore, N values would range from 1 at ground surface to 8 at depths of 35-40 ft.

Parameters:

T = peak shear stress from earthquake, psi
 P_o = total overburden pressure at depth considered, psi = $w \cdot z$
 r_d = stress reduction factor (1.0 at surface to 0.9 at 30', 0.8 at 40')
S = strain
g = acceleration of gravity, ft/sec/sec
a = peak acceleration at ground surface = 0.18g
w = unit weight, pcf
z = depth, ft.
d = mass density
G = shear modulus
 G/G_{max} = modulus reduction factor for strain
 V_s = shear wave velocity, fps
pr = Poisson's ratio
 E_A = axial strain
h = thickness of layer, ft.
dh = settlement in layer, ft.

Assumptions:

- 1) Tailings are saturated to ground surface
- 2) $G/G_{max} = 0.80$
- 3) $V_s = 3000$ fps, per Committee on Earthquake Engineering, 1985
- 4) pr = 0.5
- 5) Shear wave travels path that is 45 degrees from vertical, so $E_{lateral} = pr \cdot E_A$

Calculations:

$$S = T/G = ((a/g) \cdot P_o \cdot r_d) / G = ((a/g) \cdot (w \cdot z) \cdot r_d) / G = a \cdot z \cdot (w/g) \cdot r_d / G$$

$$G_{max} = d \cdot V_s^2 = (w/g) \cdot V_s^2$$

$$d = G_{max} / V_s^2 = w/g$$

$$S = a \cdot z \cdot d \cdot r_d / G = a \cdot z \cdot (G_{max} / V_s^2) \cdot r_d / G = a \cdot z \cdot r_d / (V_s^2 \cdot (G / G_{max}))$$

$$= a \cdot z \cdot r_d / (V_s^2 \cdot 0.80) = 1.25 \cdot a \cdot z \cdot r_d / V_s^2 = 1.25 \cdot a \cdot z \cdot r_d / (3000)^2$$

$$= 1.25 \cdot (0.18 \cdot 32.2) \cdot z \cdot r_d / 90000 = 1.25 \cdot (0.18 \cdot 32.2) \cdot z \cdot r_d / 90000$$

$$S = 0.0000805 \cdot z \cdot r_d$$

$$r_d = 1.0 \text{ at surface to } 0.9 \text{ at } 30', 0.8 \text{ at } 40' \quad (\text{Kovacs and Solomne, 1984})$$

$$E_A = S / (1 + pr) = dh / h = 0.00008 \cdot z \cdot r_d / 1.5$$

$$dh = 0.00008 \cdot z \cdot r_d \cdot h / 1.5$$

Settlements:

Depth, z ft	r_d	Thickness of Layer, h, ft	Strain S	Axial Strain E_A	Settlement dh, ft
5	1	5	0.0004	0.00027	0.0013
10	0.98	10	0.0008	0.00052	0.0052
15	0.96	15	0.0012	0.00077	0.0115
20	0.95	20	0.0015	0.00101	0.0203
25	0.93	25	0.0019	0.00124	0.0310
30	0.92	30	0.0022	0.00147	0.0442
35	0.89	35	0.0025	0.00166	0.0581

Differential Settlements over Cell Inslopes:

Slopes are 3H:1V

Horizontal Distance over slope ft.	Depth of Tailings over slope ft.	Settlement ft.	Differential Settlement, vertical ft./ horizontal ft.
15	5	0.0013	0.0001
30	10	0.0052	0.0003
45	15	0.0115	0.0004
60	20	0.0203	0.0006
75	25	0.0310	0.0007
90	30	0.0442	0.0009
105	35	0.0581	0.0009

Memorandum

Date: April 23, 1999

International Uranium Corporation

To: Mr. Harold R. Roberts

From: Julio E. Valera

Re: **Probabilistic Seismic Risk Assessment**

As stipulated by the Nuclear Regulatory Commission (NRC) in their "Draft Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites under Title II of the Uranium Mill Tailings Radiation Control Act", (UMTRCA) - NUREG-1620, a probabilistic seismic hazard analysis (PSHA) may be considered as an acceptable method to a deterministic maximum credible earthquake (MCE) analysis for establishing the peak horizontal acceleration (PHA) for a site.

The NRC draft standard (Section 1.4) states the following: "An exceedance value no greater than 10^{-4} per year should be used in determining the PHA for the site. This 10^{-4} value represents a 1 in 10 chance of the site exceeding the PHA in a 1,000-year period, which is appropriate for a 1,000-year design life". Based on this understanding, Knight Piesold has performed a simplified seismic risk assessment for IUC's White Horse Mesa Uranium Mill Tailings Facility to establish the probabilistic PHA for the site. The simplified PSHA has made use of probabilistic seismic hazards maps recently developed for the contiguous USA as part of a joint effort by the Federal Emergency Management Agency (FEMA), and the U. S. Geological Survey (USGS) to develop new maps for use in seismic design. A detailed description of the development of the maps is contained in the USGS Open-File Report 96-532, National Seismic Hazards Maps: Documentation, June 1996 by Frankel et al. (1996). The maps provide probabilistic ground motion design parameters with 2%, 5% and 10% probabilities of exceedance in 50 years, corresponding to recurrence intervals of 475, 975 and 2500 years, respectively. The maps were developed using a soft-rock site as the reference site condition which is reasonably representative of the conditions at White Horse Mesa mill site. A probability of exceedance of 10% for a 1,000 year design life as stipulated by the NRC corresponds to a recurrence interval of 10,000 years. A similar probability of exceedance for a 200 year design life corresponds to an earthquake recurrence interval of 2000 years.

The latitude and longitude for the White Horse Mill are $37^{\circ} 35' N$, and $109^{\circ} 30' W$, respectively. Using these coordinates, values of PHA were obtained from the USGS seismic hazards maps at the three recurrence intervals previously mentioned. These are plotted in the accompanying figure versus return period. A best-fit straight line and curve were fitted to the data to extrapolate to larger return periods. The following PHA values were obtained for the White Horse Mesa Mill site:

<u>Design Life (yrs)</u>	<u>Return Period (yrs)</u>	<u>PHA (g)</u>
200	2,000	0.11
1,000	10,000	0.18

Mr. Harold R. Roberts
Probabilistic Seismic Risk Assessment

April 23, 1999

Thus based on extrapolation of the USGS data, a PHA equal to 0.18g would correspond to the 10,000 year event for the site.

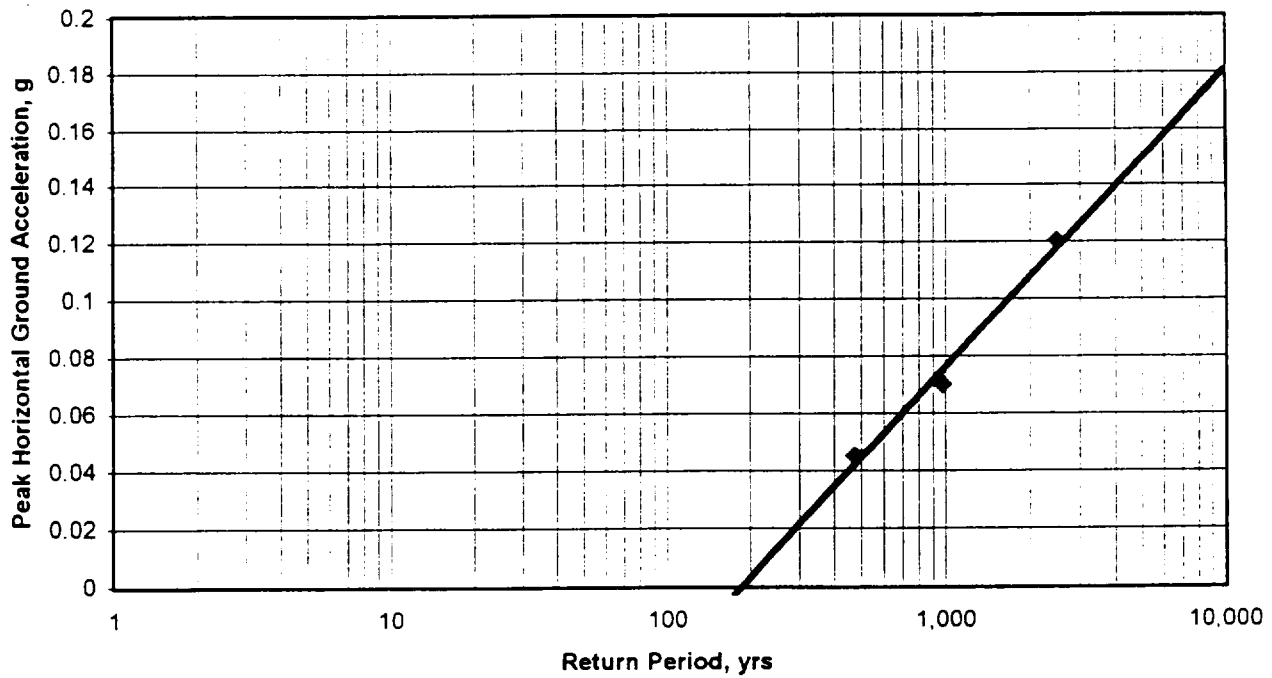
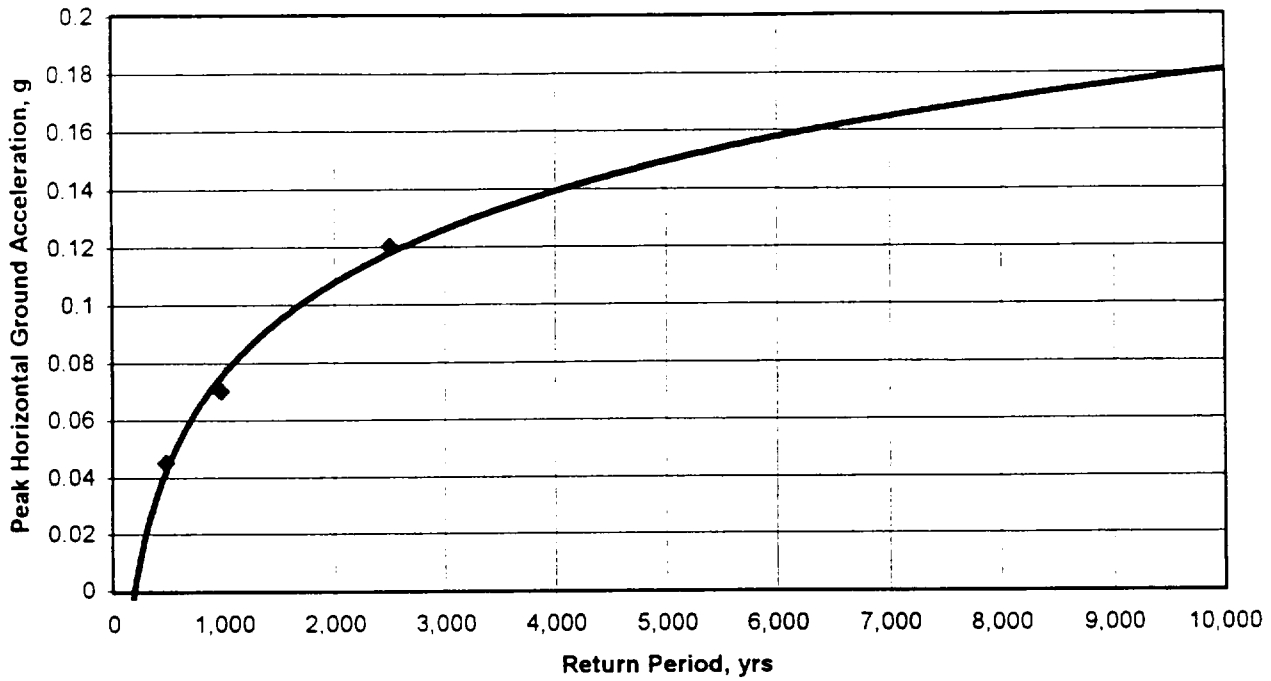
In Section 1.4.3 of NUREG-1620 the NRC states that in order "*to assess potential site ground motion from earthquakes not associated with known tectonic structures (i.e., random or floating earthquakes), the largest floating earthquake reasonably expected within the tectonic province (no smaller than magnitude 6.2) should be identified*". They also state that a site-to-source distance of 15 km should be used for floating earthquakes within the host tectonic province in a deterministic analysis.

In addition to the PHA, it is necessary to establish the magnitude of the corresponding earthquake in order to conduct a liquefaction assessment of the tailings impoundment. An estimate of this magnitude was obtained using the acceleration attenuation relationship developed by Campbell and Bozorgnia (1994) which is considered by the NRC as an acceptable relationship. The attenuation relationship used for this study assumed strike-slip faulting and soft rock site conditions. A site-to-source distance of 15 km was also used with a PHA of 0.18g to establish the corresponding magnitude. By coincidence a magnitude of 6.2 was obtained.

Thus based on this simplified seismic risk assessment, a magnitude 6.2 earthquake producing a PHA of 0.18g at the mill site represents the 10,000 year event which has a 10% probability of exceedance during a mine life of 1000 years.

White Mesa
Ground accelerations from Frankel et al. (1996)

return period, yrs	accel.
475	0.045
975	0.07
2500	0.12



White Mesa Mill - Soil Testing, tailings samples



WESTERN
COLORADO
TESTING,
INC.

529 25 1/2 Road, Suite B-101
Grand Junction, Colorado 81505
(970) 241-7700 • Fax (970) 241-7783

May 4, 1999
WCT #804899

International Uranium USA Corporation
Independence Plaza, Suite 950
1050 17th Street
Denver, Colorado 80265

Subject: Soil Sample Testing

As requested, we have completed the soil laboratory work for International Uranium USA Corporation. The testing performed included the following:

- 21 Sieve Analyses
- 21 Atterberg Limit Tests
- 21 Standard Proctor Tests (ASTM D698)
- 6 Hydrometer Tests
- 6 Specific Gravity Tests

Data sheets are included for each test except for the specific gravities. The results of these are shown below:

<u>Sample</u>	<u>Avg. Bulk Specific Gravity</u>	<u>Avg. Bulk Specific Gravity (SSD)</u>	<u>Apparent Specific Gravity</u>	<u>Absorption Percent</u>
C2 - TS1	2.337	2.468	2.673	5.372
C2 - TS2	2.137	2.392	2.868	11.926
C2 - TS3	2.157	2.359	2.705	9.396
C2 - TS4	2.265	2.432	2.721	7.402
C3 - TS1	2.456	2.562	2.746	4.294
C3 - TS2	2.349	2.464	2.655	4.900

Page 2
International Uranium USA Corporation
WCT #804899
May 4, 1999

We have been happy to be of service. If you have any questions or we may be of further assistance, please call.

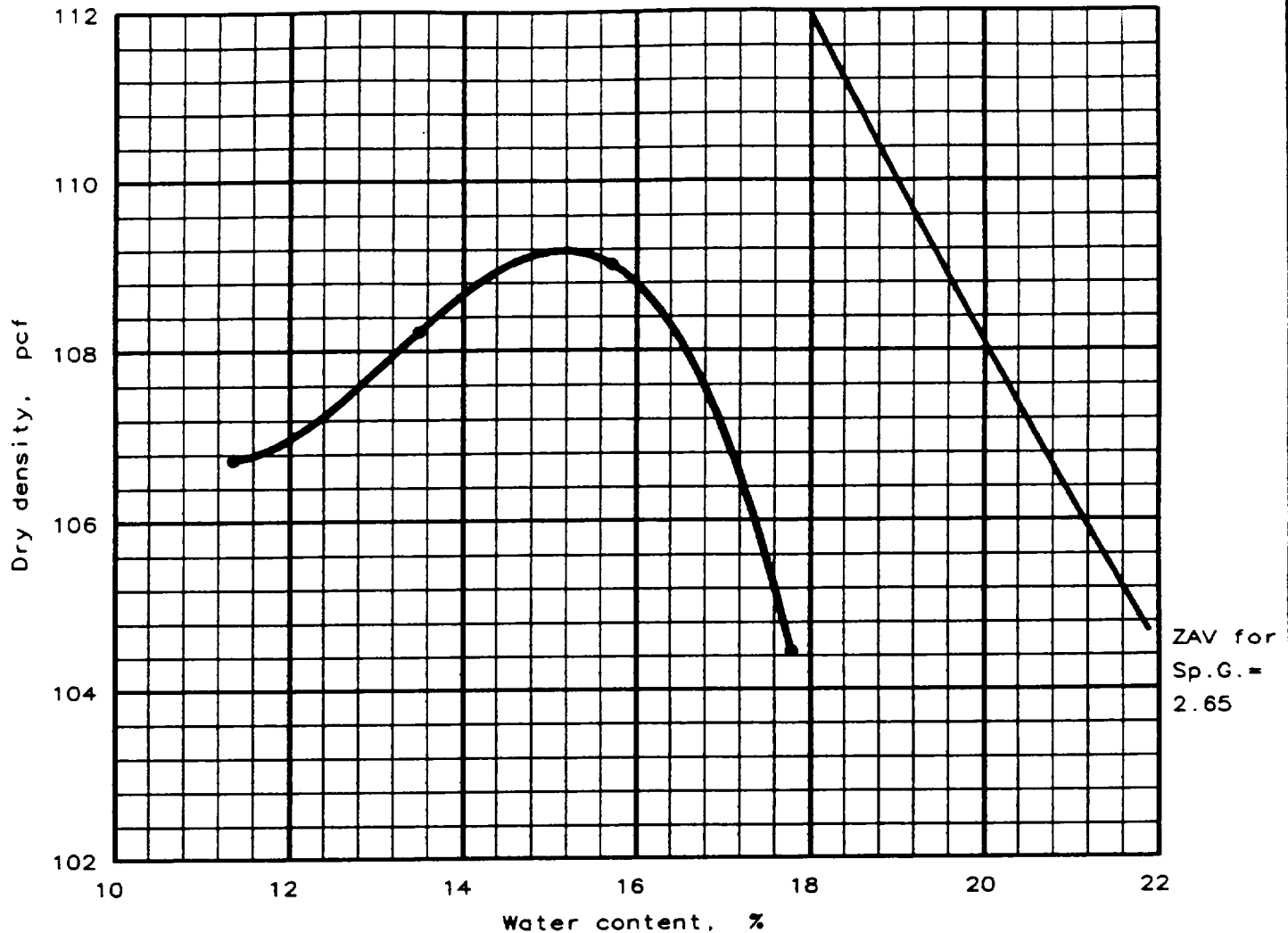
Respectfully Submitted:
WESTERN COLORADO TESTING, INC.



Wm. Daniel Smith, P.E.
Senior Geotechnical Engineer

WDS/mh
Mob: job#8048L0504

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Procedure A, Standard
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No. 4	% < No. 200
	USCS	AASHTO						
			N/A %	2.65				

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 109.2 pcf Optimum moisture = 15.2 %	109.2 pcf 15.2 %	C2-ST1

Project No.: 804899
Project: International Uranium Corporation
Location: Soil Sample Testing

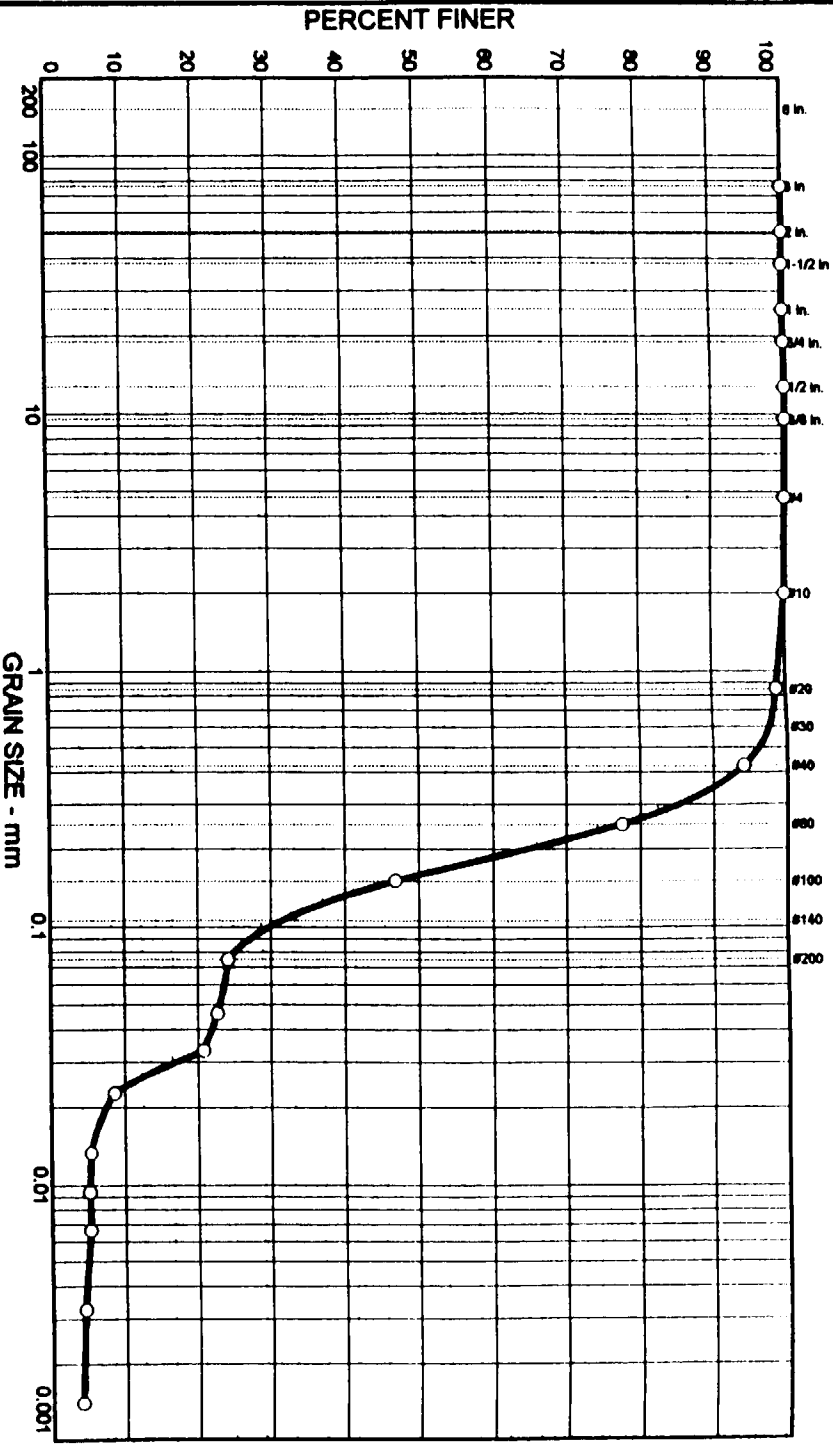
Date: 4/27/99

Remarks:
SUBMITTED BY: Client
TESTED BY: JH

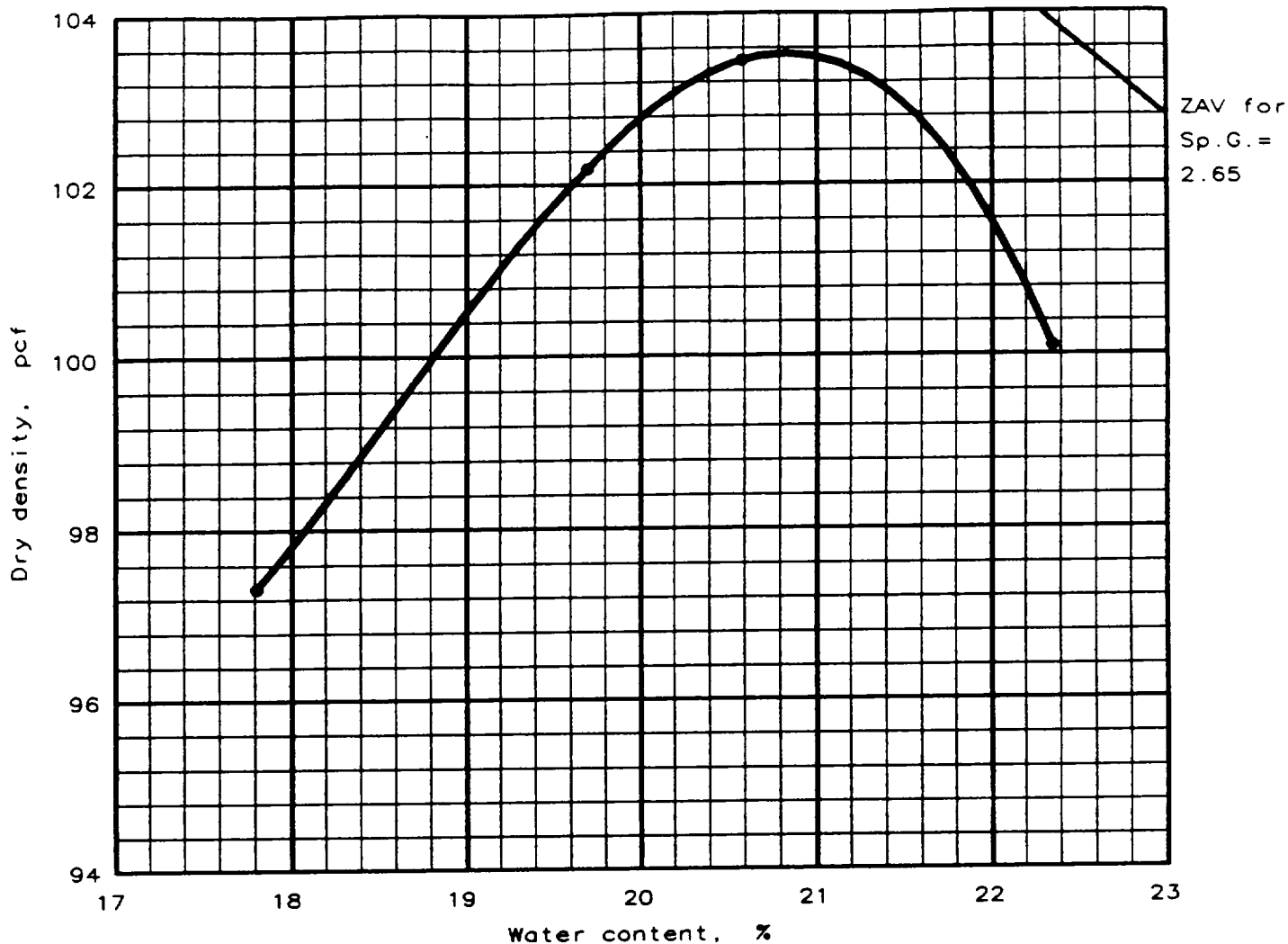
MOISTURE-DENSITY RELATIONSHIP TEST
WESTERN COLORADO TESTING, INC.

Fig. No. 11

PARTICLE SIZE DISTRIBUTION TEST REPORT



MOISTURE-DENSITY RELATIONSHIP TEST



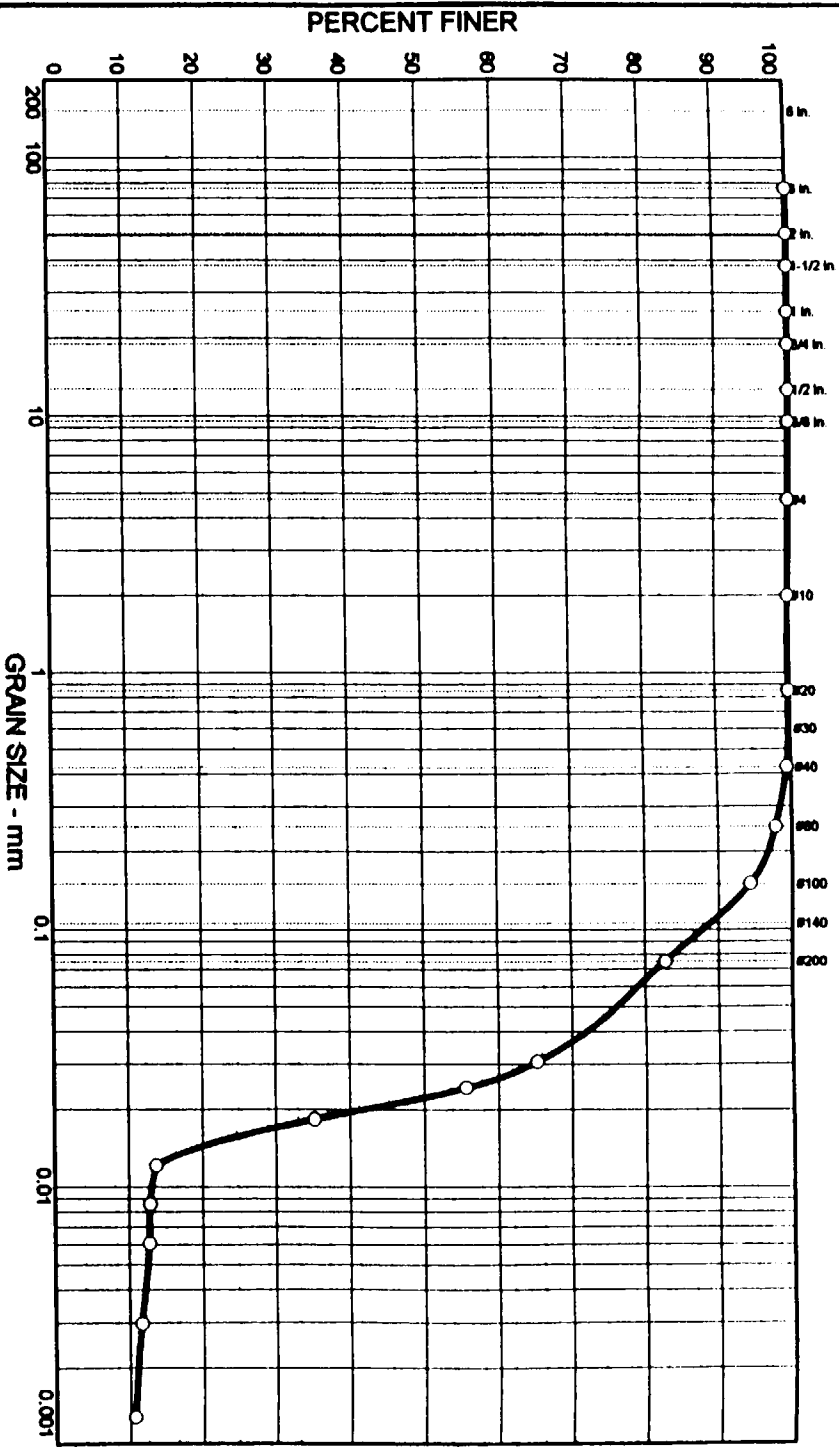
Test specification: ASTM D 698-91 Procedure A, Standard
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No. 4	% < No. 200
	USCS	AASHTO						
			N/A %	2.65				

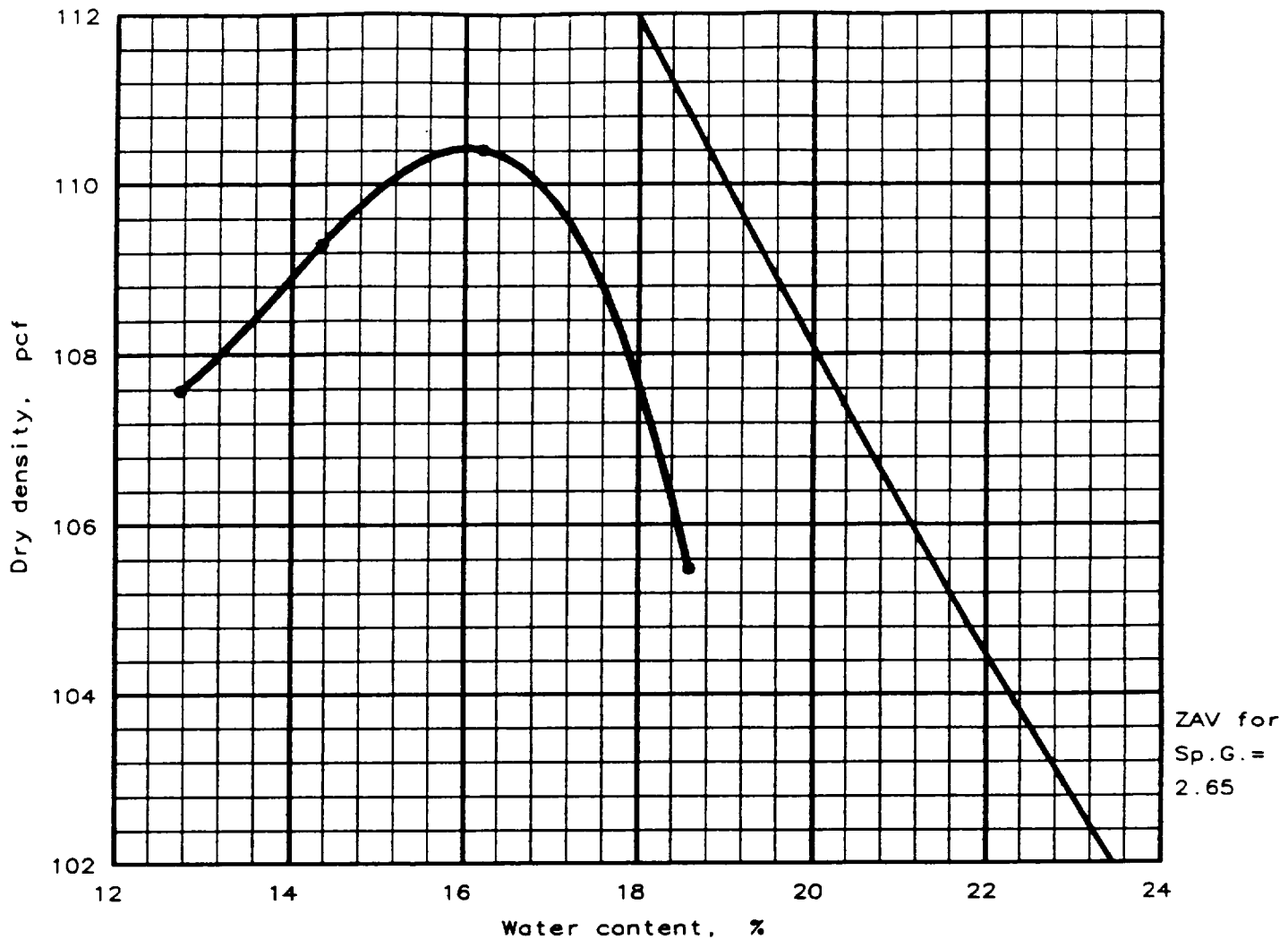
ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 103.5 pcf Optimum moisture = 20.8 %	103.5 pcf 20.8 %	C2-TS2

Project No.: 804899 Project: International Uranium Corporation Location: Soil Sample Testing Date: 4/27/99	Remarks: SUBMITTED BY: Client TESTED BY: JH
MOISTURE-DENSITY RELATIONSHIP TEST WESTERN COLORADO TESTING, INC.	
Fig. No.	<u>2</u>

PARTICLE SIZE DISTRIBUTION TEST REPORT



MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Procedure A, Standard
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No. 4	% < No. 200
	USCS	AASHTO						
			N/A %	2.65				

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 110.4 pcf Optimum moisture = 16.0 %	110.4 pcf 16.0 %	C2-TS3



Project No.: 804899 Project: International Uranium Corporation Location: Soil Sample Testing Date: 4/27/99	Remarks: SUBMITTED BY: Client TESTED BY: JH
MOISTURE-DENSITY RELATIONSHIP TEST WESTERN COLORADO TESTING, INC.	Fig. No. <u>3</u>

PERCENT FINER

GRAIN SIZE - mm

Grain Size (mm)	Percent Finer (%)
200	100
100	100
75	100
60	100
40	100
30	100
25	100
20	100
15	100
12.5	100
10	100
7.5	100
6	100
4.75	100
3.75	100
3.0	100
2.5	100
2.0	100
1.5	100
1.18	100
0.85	100
0.75	100
0.6	100
0.425	100
0.3	100
0.25	100
0.2	100
0.15	100
0.125	100
0.106	100
0.085	100
0.075	100
0.06	100
0.05	100
0.0425	100
0.0375	100
0.03	100
0.025	100
0.02	100
0.015	100
0.0125	100
0.0106	100
0.0085	100
0.0075	100
0.006	100
0.005	100
0.00425	100
0.00375	100
0.003	100
0.0025	100
0.002	100
0.0015	100
0.00125	100
0.00106	100
0.00085	100
0.00075	100
0.0006	100
0.0005	100
0.000425	100
0.000375	100
0.0003	100
0.00025	100
0.0002	100
0.00015	100
0.000125	100
0.000106	100
0.000085	100
0.000075	100
0.00006	100
0.00005	100
0.0000425	100
0.0000375	100
0.00003	100
0.000025	100
0.00002	100
0.000015	100
0.0000125	100
0.0000106	100
0.0000085	100
0.0000075	100
0.000006	100
0.000005	100
0.00000425	100
0.00000375	100
0.000003	100
0.0000025	100
0.000002	100
0.0000015	100
0.00000125	100
0.00000106	100
0.00000085	100
0.00000075	100
0.0000006	100
0.0000005	100
0.000000425	100
0.000000375	100
0.0000003	100
0.00000025	100
0.0000002	100
0.00000015	100
0.000000125	100
0.000000106	100
0.000000085	100
0.000000075	100
0.00000006	100
0.00000005	100
0.0000000425	100
0.0000000375	100
0.00000003	100
0.000000025	100
0.00000002	100
0.000000015	100
0.0000000125	100
0.0000000106	100
0.0000000085	100
0.0000000075	100
0.000000006	100
0.000000005	100
0.00000000425	100
0.00000000375	100
0.000000003	100
0.0000000025	100
0.000000002	100
0.0000000015	100
0.00000000125	100
0.00000000106	100
0.00000000085	100
0.00000000075	100
0.0000000006	100
0.0000000005	100
0.000000000425	100
0.000000	

[illegible]

SIEVE inches size	PERCENT FINER		
	○		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	100.0		
1/2	100.0		
3/8	100.0		
	GRAIN SIZE		
D ₆₀	0.151		
D ₃₀	0.0425		
D ₁₀	0.0084		
	COEFFICIENTS		
C _c	1.42		
C _u	18.03		

SIEVE number size	PERCENT FINER		
	○		
#4	100.0		
#10	100.0		
#20	98.9		
#40	96.4		
#60	86.9		
#100	59.6		
#200	32.7		

○ Sand, silty, gray/brown

REMARKS:

○ Tested By: JH

○ **Source:**

Sample No.: C2-TS3

WESTERN COLORADO TESTING, INC.

Client: International Uranium Corporation

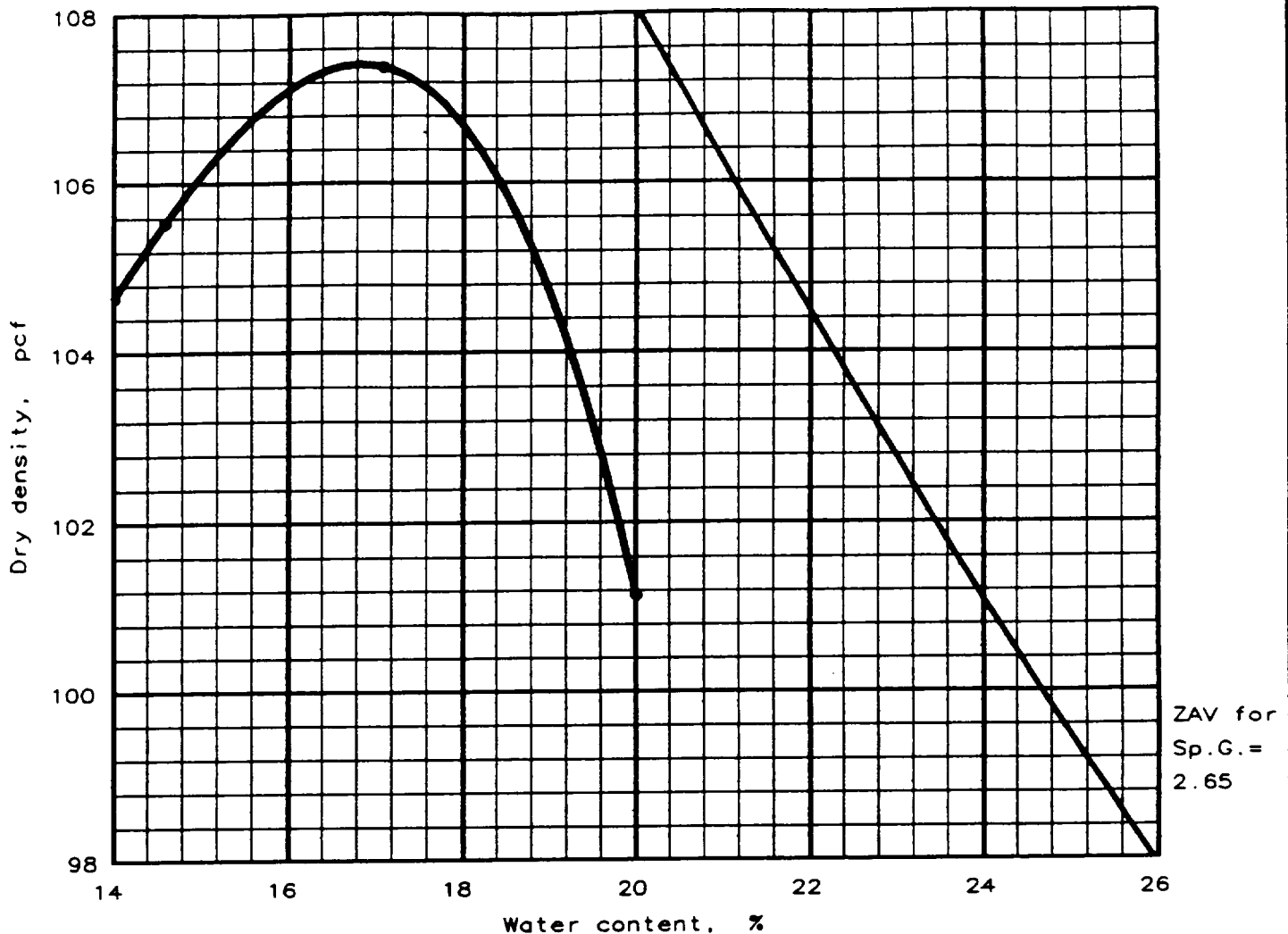
Project: Soil Sample Testing

Project No.: 804899

Figure

34

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Procedure A, Standard
 Oversize correction applied to each point

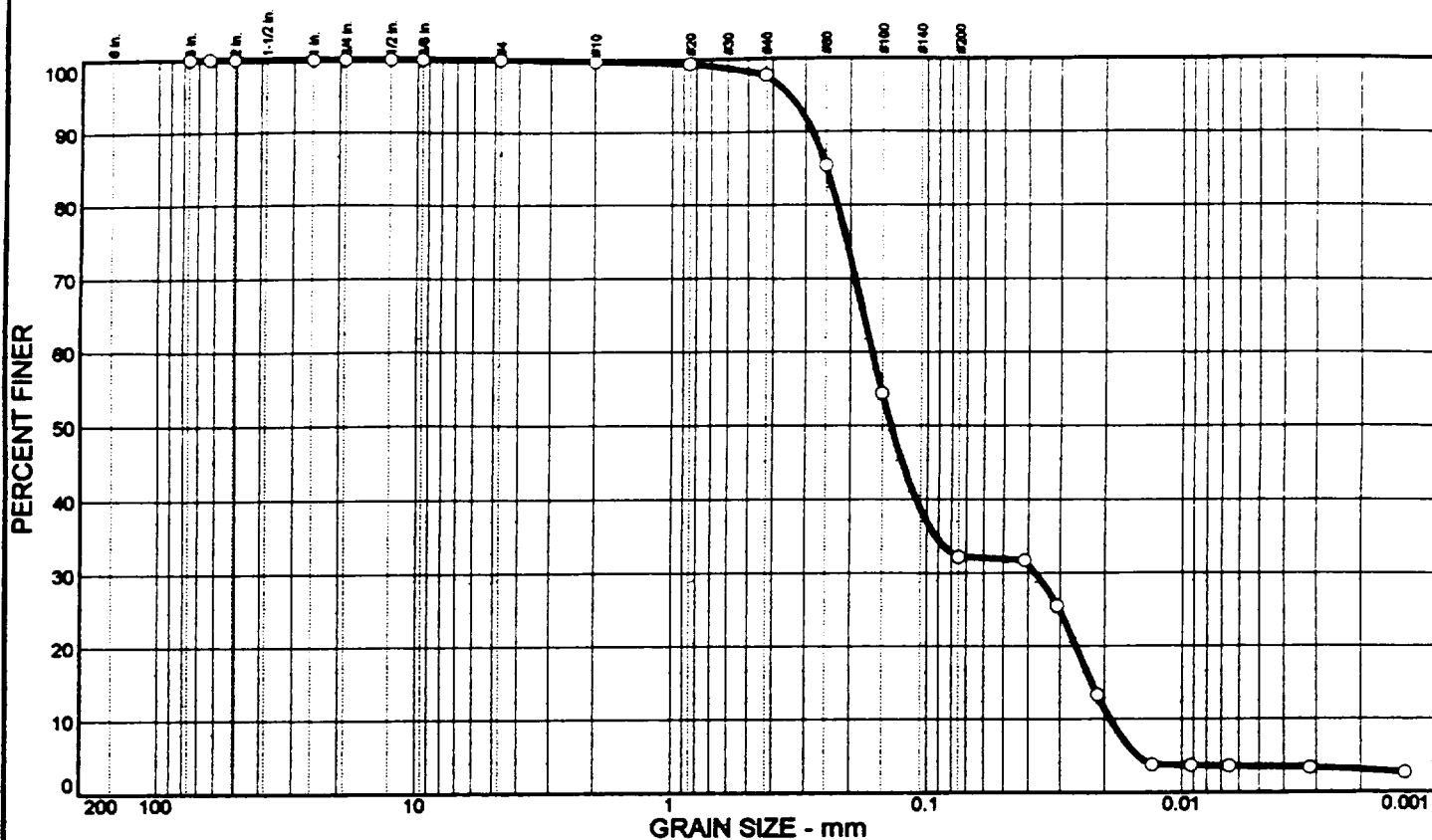
Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No. 4	% < No. 200
	USCS	AASHTO						
			N/A %	2.65				

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 107.4 pcf Optimum moisture = 16.8 %	107.4 pcf 16.8 %	C2-TS4

Project No.: 804899 Project: International Uranium Corporation Location: Soil Sample Testing Date: 4/27/99	Remarks: SUBMITTED BY: Client TESTED BY: JH
MOISTURE-DENSITY RELATIONSHIP TEST WESTERN COLORADO TESTING, INC.	

Fig. No. 4

PARTICLE SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
0.0	0.0	67.8	28.7	3.5	SM	A-2-4(0)	NP	NP

SIEVE	PERCENT FINER		
inches size	○		
3	100.0		
2.5	100.0		
2	100.0		
1	100.0		
3/4	100.0		
1/2	100.0		
3/8	100.0		
GRAIN SIZE			
D ₆₀	0.164		
D ₃₀	0.0376		
D ₁₀	0.0189		
COEFFICIENTS			
C _c	0.45		
C _u	8.69		

SIEVE	PERCENT FINER		
number size	○		
#4	100.0		
#10	99.8		
#20	99.4		
#40	97.8		
#60	85.4		
#100	54.4		
#200	32.2		

SOIL DESCRIPTION
 ○ Sand, silty, gray/brown

REMARKS:
 ○ Tested By: JH

○ Source:

Sample No.: C2-TS4

WESTERN COLORADO TESTING, INC.

Client: International Uranium Corporation

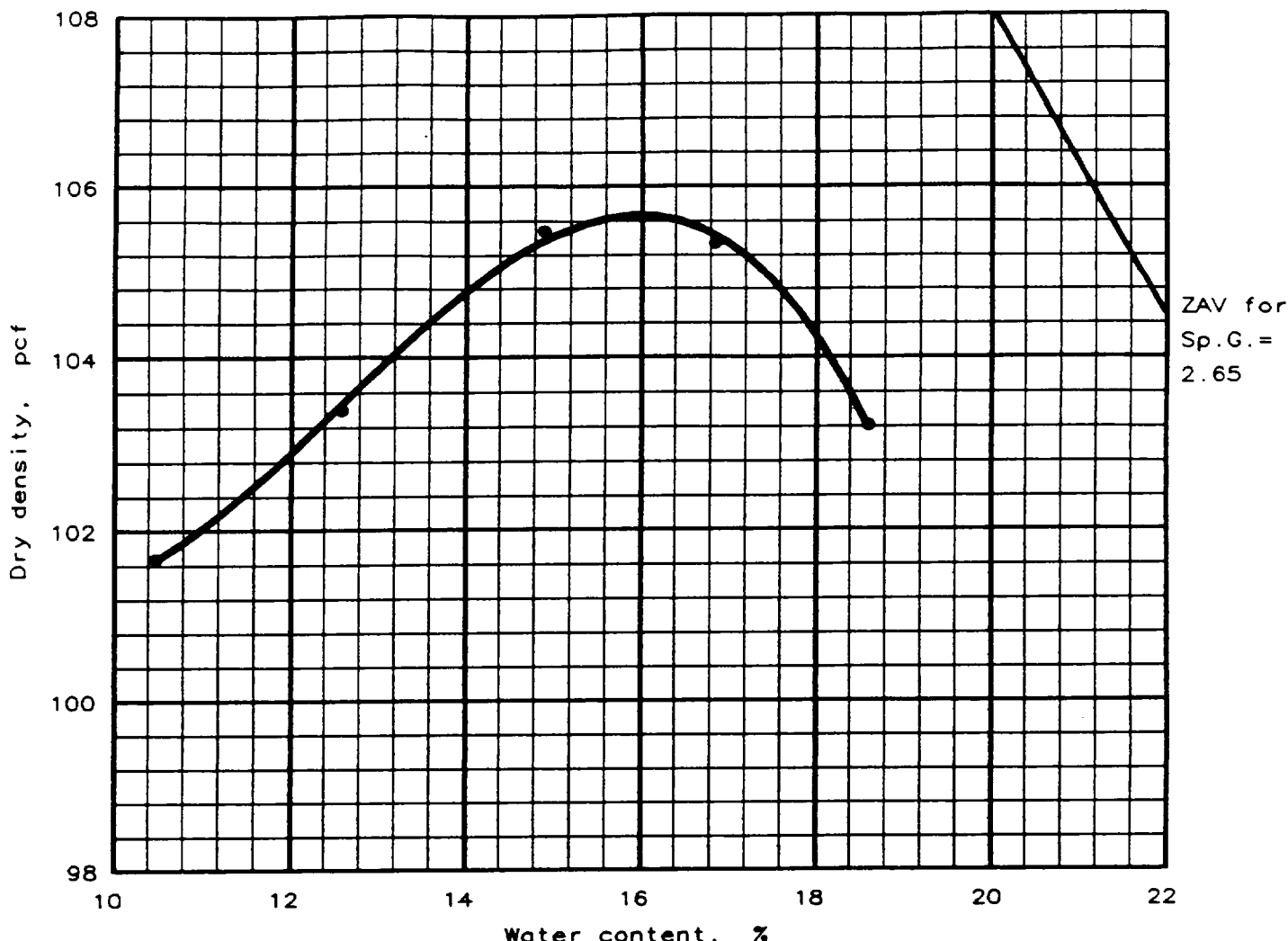
Project: Soil Sample Testing

Project No.: 804899

Figure

35

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Procedure A, Standard
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No. 4	% < No. 200
	USCS	AASHTO						
			N/A %	2.65				

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 105.7 pcf Optimum moisture = 16.0 %	105.7 pcf 16.0 %	C3-TS1

Project No.: 804899 Project: International Uranium Corporation Location: Soil Sample Testing Date: 4/27/99	Remarks: SUBMITTED BY: Client TESTED BY: JH
MOISTURE-DENSITY RELATIONSHIP TEST WESTERN COLORADO TESTING, INC.	
Fig. No. <u>5</u>	

The graph shows a grain size distribution curve for a soil sample. The Y-axis represents 'PERCENT FINER' from 0 to 100. The X-axis represents 'GRAIN SIZE - mm' on a logarithmic scale from 200 to 0.001. The curve starts at 100% finer for grain sizes down to about 4.75 mm, then drops sharply between 0.425 mm and 0.075 mm, and levels off near 0% finer for grain sizes below 0.075 mm.

Grain Size (mm)	Percent Finer (%)
4.75	100
2.0	100
0.85	100
0.425	100
0.25	98
0.15	90
0.075	82
0.0425	35
0.025	28
0.015	20
0.0075	4
0.006	2
0.00425	1
0.0025	1
0.0015	0.5
0.00075	0.2
0.000425	0.1

[illegible]

SIEVE		PERCENT FINER	
inches	mm		
3	75	100.0	
2	85	100.0	
1.5	100	100.0	
1	118	100.0	
3/4	150	100.0	
1/2	200	100.0	
3/8	250	100.0	
GRAIN SIZE			
D ₆₀	0.075		
D ₃₀	0.075		
D ₁₀	0.075		
COEFFICIENTS			
C _c	1.08		
C _u	4.45		

SIEVE number size	PERCENT FINER		
	○		
#4	100.0		
#10	100.0		
#20	99.9		
#40	99.1		
#60	96.3		
#100	87.8		
#200	60.8		

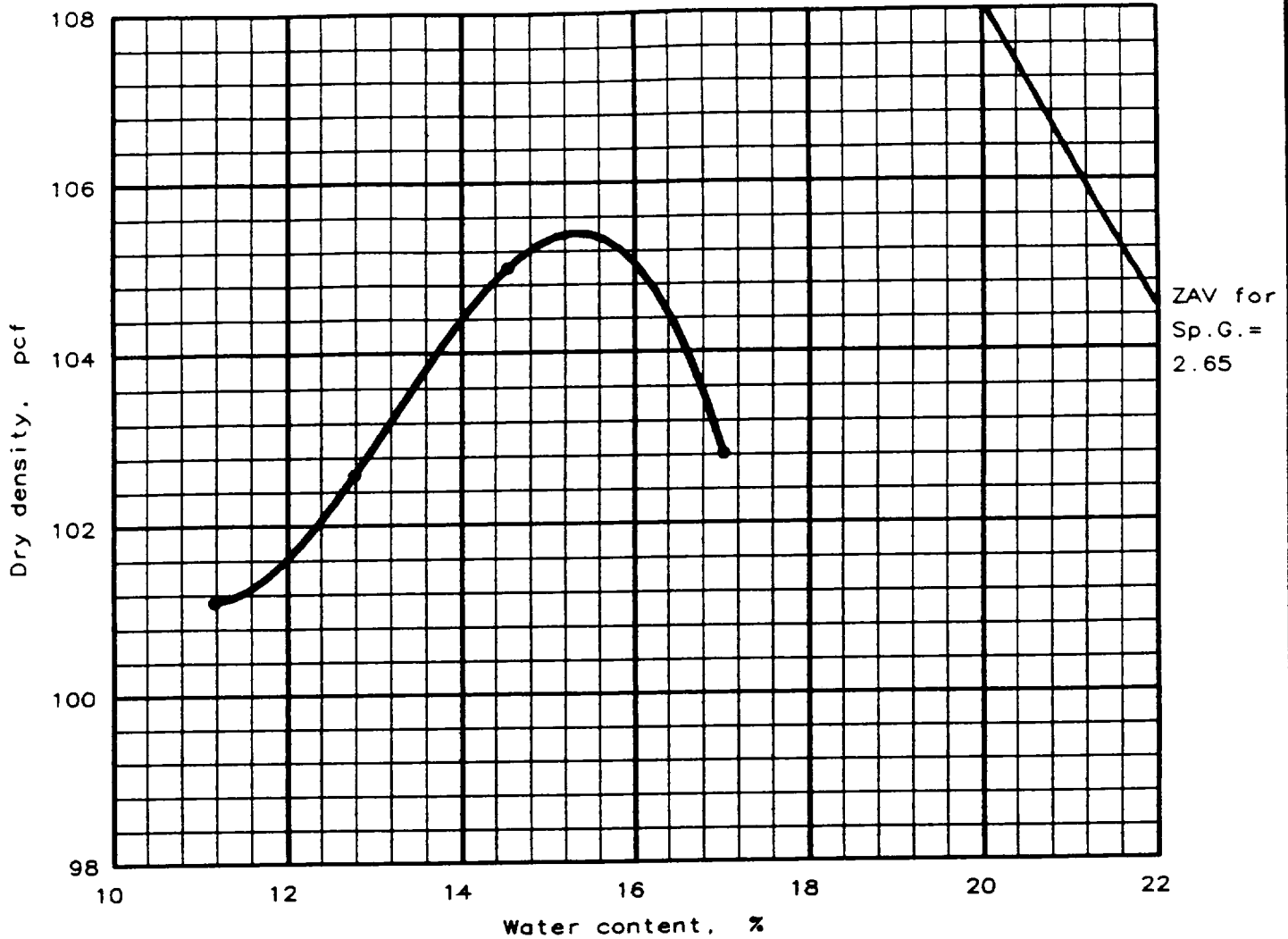
○ Silt, sandy, brown

○ Tested By. JH

Sample No.: C3-TS1

Figure 36

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Procedure A, Standard
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No. 4	% < No. 200
	USCS	AASHTO						
			N/A %	2.65				

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 105.4 pcf Optimum moisture = 15.3 %	105.4 pcf 15.3 %	C3-TS2

Project No.: 804899
Project: International Uranium Corporation
Location: Soil Sample Testing

Date: 4/27/99

Remarks:
SUBMITTED BY: Client
TESTED BY: JH

MOISTURE-DENSITY RELATIONSHIP TEST
WESTERN COLORADO TESTING, INC.

Fig. No. 6

Grain size distribution curve showing Percent Finer versus Grain Size (mm). The curve indicates a well-graded soil.

Grain Size (mm)	Percent Finer (%)
200	100
100	100
75	100
60	100
40	100
30	100
25	100
20	100
15	100
12.5	100
10	100
7.5	100
6	100
4.75	100
3.75	100
3	100
2.5	100
2	100
1.5	100
1.18	100
0.85	100
0.75	100
0.6	100
0.425	100
0.3	100
0.25	100
0.2	100
0.15	100
0.125	100
0.106	100
0.085	100
0.075	100
0.06	100
0.05	100
0.0425	100
0.0375	100
0.03	100
0.025	100
0.02	100
0.015	100
0.0125	100
0.0106	100
0.0085	100
0.0075	100
0.006	100
0.005	100
0.00425	100
0.00375	100
0.003	100
0.0025	100
0.002	100
0.0015	100
0.00125	100
0.00106	100
0.00085	100
0.00075	100
0.0006	100
0.0005	100
0.000425	100
0.000375	100
0.0003	100
0.00025	100
0.0002	100
0.00015	100
0.000125	100
0.000106	100
0.000085	100
0.000075	100
0.00006	100
0.00005	100
0.0000425	100
0.0000375	100
0.00003	100
0.000025	100
0.00002	100
0.000015	100
0.0000125	100
0.0000106	100
0.0000085	100
0.0000075	100
0.000006	100
0.000005	100
0.00000425	100
0.00000375	100
0.000003	100
0.0000025	100
0.000002	100
0.0000015	100
0.00000125	100
0.00000106	100
0.00000085	100
0.00000075	100
0.0000006	100
0.0000005	100
0.000000425	100
0.000000375	100
0.0000003	100
0.00000025	100
0.0000002	100
0.00000015	100
0.000000125	100
0.000000106	100
0.000000085	100
0.000000075	100
0.00000006	100
0.00000005	100
0.0000000425	100
0.0000000375	100
0.00000003	100
0.000000025	100
0.00000002	100
0.000000015	100
0.0000000125	100
0.0000000106	100
0.0000000085	100
0.0000000075	100
0.000000006	100
0.000000005	100
0.00000000425	100
0.00000000375	100
0.000000003	100
0.0000000025	100
0.000000002	100
0.0000000015	100
0.00000000125	100
0.00000000106	100
0.00000000085	100
0.00000000075	100
0.0000000006	100
0.0000000005	100
0.000000000425	100
0.000000000375	100
0.0000000003	100
0.00000000025	100
0.0000000002	100
0.00000000015	100
0.000000000125	100
0.000000000106	100
0.000000000085	100
0.000000000075	100
0.00000000006	100
0.00000000005	100
0.0000000000425	100
0.0000000000375	100
0.00000000003	1

SIEVE		PERCENT FINER		
inches size	○			
3	100.0			
2	100.0			
1.5	100.0			
1	100.0			
3/4	100.0			
1/2	100.0			
3/8	100.0			
GRAIN SIZE				
D ₆₀	0.185			
D ₃₀	0.102			
D ₁₀	0.0260			
COEFFICIENTS				
C _c	2.16			
C _u	7.12			

SIEVE		PERCENT FINER		
number size	○			
#4	100.0			
#10	99.9			
#20	99.0			
#40	94.6			
#60	78.1			
#100	46.9			
#200	23.0			

SOIL DESCRIPTION

○ Sand, silty, gray/brown

REMARKS:

○ Tested By: JH

Sample No.: C3-TS2

Figure 37

Tailings Cell 2 - Dry Density Calculation

Cell 2 – Original Design Volume

2,380,000 tons @ 92 dpcf	=	1,916.264 yd ³
Design change to east end - + 5%	=	95,000 yd ³
Total as built volume	=	2,011,264 yd ³
Remaining storage volume	=	<u><23,000></u> yd ³
		1,988,264 yd ³

Total Tailings to Date

As of October 23, 1989	2,299,708 tons
Cabot	12,000 tons
On-Site Waste	<u>5,000 tons</u>
	2,316,708 tons
	<u>2,316,708 tons</u>
	1,988,264 yd ³ = 86.31 dpcf

TO: Bill Deal
FROM: Shannon Clark
DATE: June 25, 1997
SUBJECT: Cell 3 Calculated Capacity Left

I was asked by you, to find the original capacity of Cell 3 and the capacity we have left to fill.

In the Environmental files I found where John Hamrick had listed the cells and capacities and , off the 19 C's had calculated the from inception tons deposited to each cell.

Cell 2	2,299,708	
Cell 3	1,249,000	(+600,000 tons = License Amendment)

as of October 23, 1989.

I then went to Gary Richards to find the dry tons fed to the mill to date off of the 19C report Fed to the mill, inception to-date, is 3,757,344 tons. We have produced 14,050 tons of Yellowcake and 16,200 tons of Vanadium.

3,757,344	Dry tons fed to mill
<u>- 14,050</u>	YC produced in tons
3,743,294	Tons to tails
<u>- 16,200</u>	Vanadium Produced
3,727,094	Tons to tails
<u>- 2,299,708</u>	Tons deposited into Cell 2
1,427,386	Tons in Cell 3 at this point
2,091,717	Available tons in Cell 3 at time of construction
<u>- 1,427,386</u>	Tons deposited into Cell 3 as of now
664,331	Tons of space left in Cell 3 (in theory)

This calculates out to be 68% full.

White Mesa Mill - Screen Analysis of Ore Feed to Leach

Table 5

Screen Analysis of Feed Ore to Leach

Grind conditions:

Rod mill 7-5/8" diam x 9-1/2", steel, ribbed, 85/90 rpm
Rod charge 8.9 kg
Ore charge 1.00 kg, minus 6-mesh
% solids 50
Time 3 min

Size Mesh (Tyler)	Weight Distribution, %			
	Blanding No. 4 HRI-11868	Anschutz No. 1 HRI-11870	Hanksville No. 1 ^{1/} HRI-11175-1	Three-Ore Composite
+35	0.0	0.0	0.5	
35x48	2.5	0.2	1.9	1.2
48x65	16.2	7.4	15.3	12.7
65x100	25.0	25.2	26.2	28.9
100x150	18.7	21.9	19.5	20.1
150x200	10.4	14.6	13.4	13.7
200x270	4.5	7.6	6.2	6.0
270x325	1.5	2.8	1.8	2.9
-325	21.2	20.3	15.2	14.5
	100.0	100.0	100.0	100.0

^{1/} Data from June 15, 1977 report "Uranium Recovery from Hanksville and Blanding Station Ores."

Screen Analysis of Blanding No. 4, Anschutz No. 1, and
Hanksville No. 2A Ore Feed to Leach

Grinding conditions:

Mill	Rod, steel, 7-5/8" diam x 9-1/2", ribbed, 85/90 rpm		
Rod charge	Steel rods, 9" in length		
	Diam inch	No. of Rods	Weight kg
	1/4	6	0.54
	3/8	7	1.11
	1/2	16	4.49
	5/8	6	2.76
			8.90
Ore charge	1.0 kg, minus 6-mesh		
H ₂ O	1.0 kg		
Time	3 min		

Screen analysis:

Size Mesh (Tyler)	Weight Distribution, %		
	Blanding No. 4 HRI-11868	Anschutz No. 1 HRI-11870	Hanksville No. 2A HRI-11869
+28			12.3
28x35	0.0	0.0	11.3
35x48	2.5	0.2	13.5
48x65	16.2	7.4	9.2
65x100	25.0	25.2	7.1
100x150	18.7	21.9	4.8
150x200	10.4	14.6	4.2
200x270	4.5	7.6	3.0
270x325	1.5	2.8	2.3
-325	21.2	20.3	32.3
	100.0	100.0	100.0

ATTACHMENT F

RADON EMANATION CALCULATIONS

(REVISED)

PREPARED BY

INTERNATIONAL URANIUM (USA) CORP.

INDEPENDENCE PLAZA

1050 17TH STREET, SUITE 950

DENVER, CO 80265

Memorandum

Date: April 15, 1999

1626B

To: File 1626B

From: Roman Popielak and Pete Duryea

Re: **Radon Emanation Calculations (Revised)**

At the request of International Uranium (USA) Corporation (IUC), we have completed a series of analyses of the expected levels of radon flux from the White Mesa uranium tailings facility for the tailings cover design. These analyses accounted for recent comments from the United States Nuclear Regulatory Commission (NRC).

Analysis Methodology and Input Parameters

The analyses conducted and described herein adopted the methods and approach detailed in NRC Regulatory Guide 3.64 and more specifically the computer code RADON Version 1.2. The code, which considers one-dimensional steady state gas diffusion, requires input data including: layer thickness, porosity, dry density, radium activity, emanation coefficient, gravimetric water content and radon diffusion coefficient. These input data were based exclusively on available data from previous work by others including Rogers and Associates Engineering Corporation, Advanced Terra Testing, Chen and Associates, D'Appolonia Consulting Engineers Inc. and TITAN Environmental. Key laboratory data and a summary of parameters selected for these analyses are presented in the attached Table 1.

The current cover design includes 2.0 feet of random fill (frost barrier fill) over 1.0 foot of compacted clay which in turn overlies 3.0 feet of random fill (platform fill). In the analyses, the thickness of final cover was reduced by 6.8 inches to 1.4 feet to account for the depth of frost penetration as evaluated by TITAN Environmental. The actual tailings thickness is on the order of 44 feet, which meets the NRC guidelines for an infinitely thick source, and hence it could be modeled in program RADON as a 500.0-centimeter thick layer. Available data on the in-situ density of the tailing was used. All available historical Proctor compaction results for the other materials were evaluated to select appropriate maximum dry densities for the clay and random fill.

The clay layer and frost barrier fill, which are to be placed and compacted as engineered fill materials, were modeled with 95-percent standard Proctor compaction. The platform fill material is dumped and spread directly on top of the tailing surface. Once in place, the material is compacted by selective routing of equipment traffic, and it then provides a working surface for subsequent operations such as placement and compaction of the clay layer and frost barrier fill. The compaction of material comprising the platform is expected to be higher at its top than at its contact with the tailings.

File 1626B

Radon Emanation Calculations (Revised)

Within the platform fill, the surficial material is likely to exhibit fairly high compaction given the influence of the contact stresses exerted by equipment traffic and later by the compaction of overlying material. Such stresses diminish with depth, so lower portions of the platform fill will not have experienced as significant a compactive effort. Compaction of the platform fill is therefore likely to range from about 80-percent of standard Proctor at the base of the random fill immediately above the tailing to 90- to 95-percent of standard Proctor compaction at the top of the platform fill immediately below the equipment loads just described.

The porosity of each of the materials/sublayers was calculated from its dry density and specific gravity of soil solids. Radium activities and emanation coefficients were selected for each soil type from available lab data, and the long term water contents were selected for the analyses as follows. In the absence of other data, the tailing was modeled with a 6.0 percent by weight moisture content as the NRC recognizes that value as a practical lower bound for soils in the western United States. Long term moisture content can be conservatively modeled as the residual (or irreducible) water content from capillary moisture retention data since a lower value is more critical, that is it yields a higher radon flux. Such data was provided and used for the random fill and the clay.

The final, and one of the more critical parameters, was the radon diffusion coefficient. This parameter is dependent upon the porosity and degree of saturation of the soil, and although lab data was available, it was for conditions other than those modeled. So in the absence of diffusion coefficient data at the porosities and degrees of saturation of interest, a correlation provide by the NRC was employed to compute the diffusion coefficients adopted for the analyses. These values ranged from 0.0071 to 0.0507 cm²/sec. It should be noted that the resultant values did seem to match well with the trends observed in the available laboratory data.

Results and Conclusions

Since there were not data available describing the degree and distribution of compaction in the platform fill, a series of analyses were conducted based on varying assumptions about the condition of that material. In each of those cases, the platform fill was divided into a series of sublayers whose thickness and degree of compaction were selected based upon engineering judgement and previous experience with similar situations.

The two cases of distribution of compaction considered to represent the conditions anticipated at White Mesa are presented in attached Figure 1 as Case I and Case II. The results of the radon flux evaluation for those two cases are attached. For the reasonably conservative input parameters listed herein and an interim cover comprising 1.0 foot each at 80-, 90 and 95-percent compaction as shown as Case I in Figure 1, a radon flux at the ground surface of 18.2 pCi/m²/sec is expected. For Case II with 0.5 foot of 95-percent compaction material overlying 1.0 feet of 90-percent compaction material and 1.5 feet of 85-percent compaction material, the radon flux at the ground surface is 19.8 pCi/m²/sec. Both of these results are within the 20.0 pCi/m /sec limit specified by the NRC.

April 15, 1999

File 1626B

Radon Emanation Calculations (Revised)

Therefore, it appears that the cover design should be acceptable assuming that the conditions described herein do not vary significantly from those in the field.

In conclusion, empirical knowledge of the site conditions should be taken under consideration in evaluation of the model results. At present, approximately 80-percent of Cell No.2 is covered with the random fill (platform fill). This fill supports traffic of the heavy, 30 ton haulers. Hence the degree of compaction of the layer(s) as represented in the radon flux models (see Figure 1) may have already been achieved in certain locations within the cell. The platform fill has been very effective to date in attenuating the radon flux, which as currently recorded is 7.4 pCi/m²/sec which is well below the standard of 20.0 pCi/m²/sec. Based on these observations, it would appear that the performance of the tailings cover, which will ultimately include the clay layer and frost barrier fill in addition to the fill currently in place, as a barrier controlling radon flux is anticipated to meet the regulatory requirements.

Table 1
Laboratory and Model Input Data

LABORATORY DATA												
Material	Specific Gravity	Max. Dry Unit Wt.	Max. Dry Density	95% Max. Dry Density	Porosity ⁽¹⁾	Dry Density	Radium Activity	Emanation Coefficient	Water Content	Diffusion ⁽⁷⁾ Coefficient	Saturation ⁽²⁾	Diffusion ⁽³⁾ Coefficient
	G _s	γ _{dry,max}	ρ _{dry,max}	ρ _{dry,95% max}	n	ρ _{dry}	(pCi/g)		w	D	S	D
		(pcf)	(g/cm ³)	(g/cm ³)		(g/cm ³)			(% by wt.)	(cm ² /sec)		(cm ² /sec)
Tailings	2.85	104.0	1.67	1.58	0.491	1.45	981.0	0.19	13.2	2.00E-02	0.390	2.07E-02
	2.85	104.0	1.67	1.58	0.495	1.44	981.0	0.19	19.1	8.40E-03	0.556	1.06E-02
Rnd. Fill (Comp.)	2.67	120.2	1.93	1.83	0.307	1.85	1.9	0.19	6.5	1.60E-02	0.392	1.63E-02
	2.67	120.2	1.93	1.83	0.311	1.84	1.9	0.19	12.5	4.50E-04	0.740	1.99E-03
Clay (Site #1)	2.69	121.3	1.94	1.85	0.312	1.85	2.2	0.20	8.1	1.60E-02	0.480	1.12E-02
	2.69	121.3	1.94	1.85	0.316	1.84	2.2	0.20	12.6	1.40E-03	0.734	2.13E-03
Clay (Site #4)	2.75	108.7	1.74	1.65	0.400	1.65	2.0	0.11	15.4	1.10E-02	0.635	5.48E-03
	2.75	108.7	1.74	1.65	0.400	1.65	2.0	0.11	19.3	4.20E-04	0.796	1.34E-03
Clay (UT-1)	2.39	113.5	1.82	1.73	0.280	1.72	1.5	0.22	14.5	9.10E-03	0.890	2.84E-04

SELECTED MODEL INPUT DATA

Material	Specific ⁽⁶⁾ Gravity	Max. Dry ⁽⁶⁾ Unit Wt.	Max. Dry Density	Specified Dry Density	Porosity ⁽¹⁾	Dry ⁽⁴⁾ Density	Radium ⁽⁶⁾ Activity	Emanation ⁽⁶⁾ Coefficient	Water ⁽⁵⁾ Content	Diffusion ⁽³⁾ Coefficient	Saturation ⁽²⁾
	G _s	γ _{dry,max} (pcf)	ρ _{dry,max} (g/cm ³)	ρ _{dry,spec} (g/cm ³)	n	ρ _{dry} (g/cm ³)	(pCi/g)		w (% by wt.)	D (cm ² /sec)	S
Tailings	2.85	N/A	N/A	N/A	0.583	1.19	981.0	0.19	6.0	5.07E-02	0.122
Rnd. Fill @ 80% Std.	2.67	120.2	1.93	1.54	0.423	1.54	1.9	0.19	9.8	2.12E-02	0.357
Rnd. Fill @ 85% Std.	2.67	120.2	1.93	1.64	0.387	1.64	1.9	0.19	9.8	1.62E-02	0.415
Rnd. Fill @ 90% Std.	2.67	120.2	1.93	1.73	0.351	1.73	1.9	0.19	9.8	1.15E-02	0.484
Rnd. Fill @ 95% Std.	2.67	120.2	1.93	1.83	0.315	1.83	1.9	0.19	9.8	7.05E-03	0.570
Clay @ 95% Std.	2.72	100.0	1.60	1.52	0.440	1.52	1.9	0.18	14.1	1.30E-02	0.488

(1) $n = 1 - (\rho_{dry} / G_s / \rho_w)$

(2) $S = w * G_s * \rho_{dry} / \rho_w / (G_s * \rho_w - \rho_{dry})$

(3) $D = 0.07 \exp(-4(S - S_n^2 + S^5))$ per NRC correlation

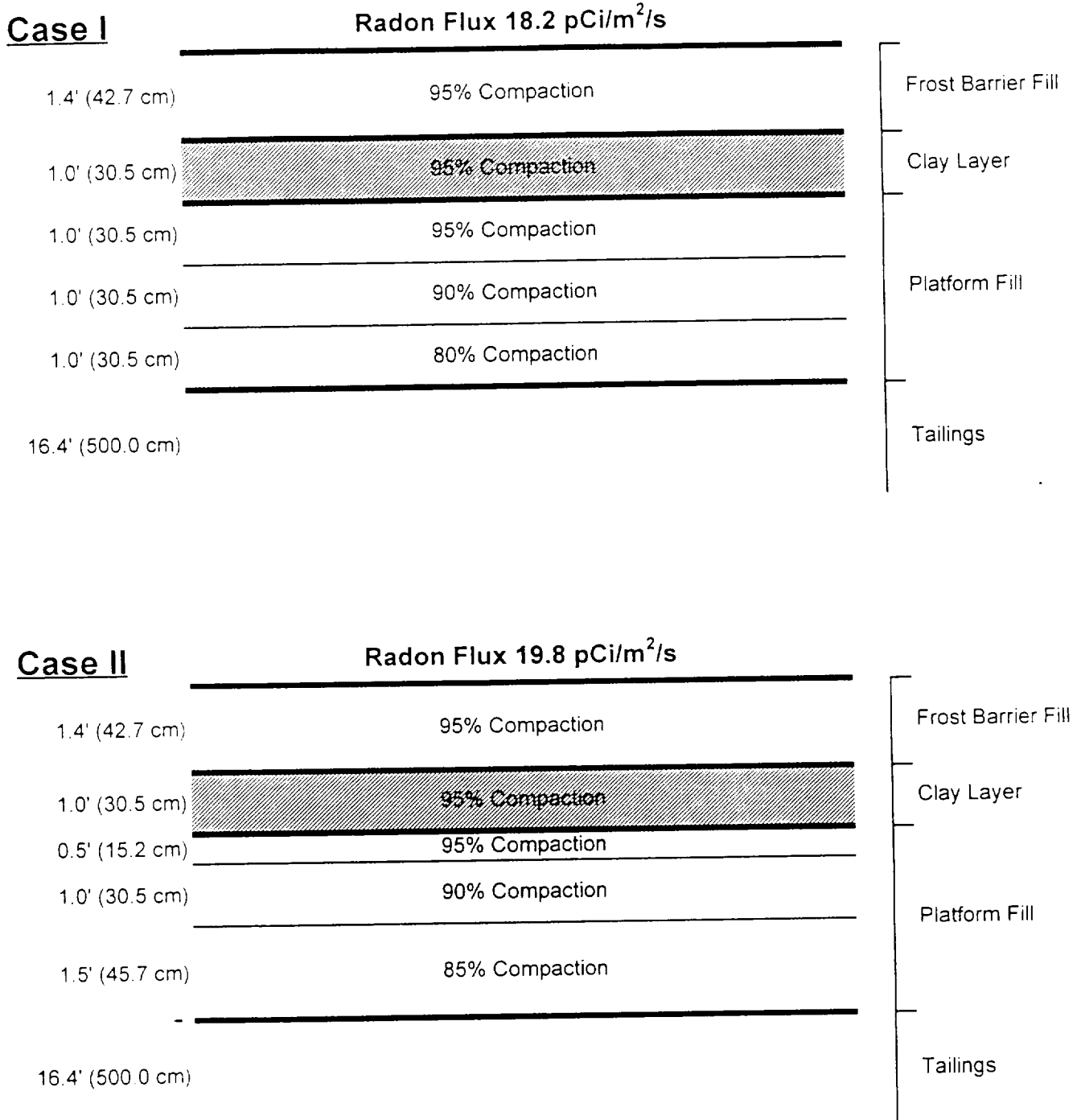
(4) Tailings based on 74.2 pcf. Rnd. Fill ranges from 80 to 95% Std. Proctor. Clay based on 95% Std. Proctor.

(5) Tailings based on w=6% per NRC. Others based on capillary moisture data. Rnd. Fill w=9.8% and Clay w=14.1% (average of two tests).

(6) Values for clay are an average of test results.

(7) Individual lab test results.

Figure 1
Cover Cross Sections for Radon Flux Models



Note: Percent compaction is based upon the maximum dry density by standard Proctor.

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U.S. Nuclear Regulatory Commission Office of Research

RADON FLUX, CONCENTRATION AND TAILINGS COVER THICKNESS
ARE CALCULATED FOR MULTIPLE LAYERS

WHITE MESA CASE I

CONSTANTS

RADON DECAY CONSTANT	.0000021	s ⁻¹
RADON WATER/AIR PARTITION COEFFICIENT	.26	
SPECIFIC GRAVITY OF COVER & TAILINGS	2.65	

GENERAL INPUT PARAMETERS

LAYERS OF COVER AND TAILINGS	6	
DESIRED RADON FLUX LIMIT	20	pCi m ⁻² s ⁻¹
LAYER THICKNESS NOT OPTIMIZED		
DEFAULT SURFACE RADON CONCENTRATION	0	pCi l ⁻¹
SURFACE FLUX PRECISION	0	pCi m ⁻² s ⁻¹

LAYER INPUT PARAMETERS

LAYER 1

THICKNESS	500	cm
POROSITY	.583	
MEASURED MASS DENSITY	1.19	g cm ⁻³
MEASURED RADIUM ACTIVITY	981	pCi/g ⁻¹
MEASURED EMANATION COEFFICIENT	.19	
CALCULATED SOURCE TERM CONCENTRATION	7.990D-04	pCi cm ⁻³ s ⁻¹
WEIGHT % MOISTURE	6	%
MOISTURE SATURATION FRACTION	.122	
MEASURED DIFFUSION COEFFICIENT	.0507	cm ² s ⁻¹

LAYER 2

THICKNESS	30.5	cm
POROSITY	.423	
MEASURED MASS DENSITY	1.54	g cm ⁻³
MEASURED RADIUM ACTIVITY	1.9	pCi/g ⁻¹
MEASURED EMANATION COEFFICIENT	.19	
CALCULATED SOURCE TERM CONCENTRATION	2.760D-06	pCi cm ⁻³ s ⁻¹
WEIGHT % MOISTURE	9.8	%
MOISTURE SATURATION FRACTION	.357	
MEASURED DIFFUSION COEFFICIENT	.0212	cm ² s ⁻¹

LAYER 3

THICKNESS	30.5	cm
POROSITY	.351	
MEASURED MASS DENSITY	1.73	g cm^{-3}
MEASURED RADIUM ACTIVITY	1.9	pCi/g^{-1}
MEASURED EMANATION COEFFICIENT	.19	
CALCULATED SOURCE TERM CONCENTRATION	3.737D-06	$\text{pCi cm}^{-3} \text{ s}^{-1}$
WEIGHT % MOISTURE	9.8	%
MOISTURE SATURATION FRACTION	.483	
MEASURED DIFFUSION COEFFICIENT	.0115	$\text{cm}^2 \text{ s}^{-1}$

LAYER 4

THICKNESS	30.5	cm
POROSITY	.315	
MEASURED MASS DENSITY	1.83	g cm^{-3}
MEASURED RADIUM ACTIVITY	1.9	pCi/g^{-1}
MEASURED EMANATION COEFFICIENT	.19	
CALCULATED SOURCE TERM CONCENTRATION	4.404D-06	$\text{pCi cm}^{-3} \text{ s}^{-1}$
WEIGHT % MOISTURE	9.8	%
MOISTURE SATURATION FRACTION	.569	
MEASURED DIFFUSION COEFFICIENT	.0071	$\text{cm}^2 \text{ s}^{-1}$

LAYER 5

THICKNESS	30.5	cm
POROSITY	.44	
MEASURED MASS DENSITY	1.52	g cm^{-3}
MEASURED RADIUM ACTIVITY	1.9	pCi/g^{-1}
MEASURED EMANATION COEFFICIENT	.18	
CALCULATED SOURCE TERM CONCENTRATION	2.481D-06	$\text{pCi cm}^{-3} \text{ s}^{-1}$
WEIGHT % MOISTURE	14.1	%
MOISTURE SATURATION FRACTION	.487	
MEASURED DIFFUSION COEFFICIENT	.013	$\text{cm}^2 \text{ s}^{-1}$

LAYER 6

THICKNESS	42.7	cm
POROSITY	.315	
MEASURED MASS DENSITY	1.83	g cm^{-3}
MEASURED RADIUM ACTIVITY	1.9	pCi/g^{-1}
MEASURED EMANATION COEFFICIENT	.19	
CALCULATED SOURCE TERM CONCENTRATION	4.404D-06	$\text{pCi cm}^{-3} \text{ s}^{-1}$
WEIGHT % MOISTURE	9.8	%
MOISTURE SATURATION FRACTION	.569	
MEASURED DIFFUSION COEFFICIENT	.0071	$\text{cm}^2 \text{ s}^{-1}$

DATA SENT TO THE FILE 'RNDATA' ON DRIVE A:

N	F01	CN1	ICOST	CRITJ	ACC
6	-1.000D+00	0.000D+00	0	2.000D+01	0.000D+00

LAYER	DX	D	P	Q	XMS	RHC
1	5.000D+02	5.070D-02	5.830D-01	7.990D-04	1.225D-01	1.190
2	3.050D+01	2.120D-02	4.230D-01	2.760D-06	3.568D-01	1.540
3	3.050D+01	1.150D-02	3.510D-01	3.737D-06	4.830D-01	1.730
4	3.050D+01	7.100D-03	3.150D-01	4.404D-06	5.693D-01	1.830
5	3.050D+01	1.300D-02	4.400D-01	2.481D-06	4.871D-01	1.520
6	4.270D+01	7.100D-03	3.150D-01	4.404D-06	5.693D-01	1.830

BARE SOURCE FLUX FROM LAYER 1: 6.938D+02 pCi m⁻² s⁻¹

RESULTS OF THE RADON DIFFUSION CALCULATIONS

LAYER	THICKNESS (cm)	EXIT FLUX (pCi m ⁻² s ⁻¹)	EXIT CONC. (pCi l ⁻¹)
1	5.000D+02	1.417D+02	2.911D+05
2	3.050D+01	8.383D+01	1.976D+05
3	3.050D+01	5.158D+01	1.220D+05
4	3.050D+01	3.608D+01	5.146D+04
5	3.050D+01	2.274D+01	4.139D+04
6	4.270D+01	1.824D+01	0.000D+00

-----*****! RADON !*****-----

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RADON FLUX, CONCENTRATION AND TAILINGS COVER THICKNESS
ARE CALCULATED FOR MULTIPLE LAYERS

WHITE MESA CASE II

CONSTANTS

RADON DECAY CONSTANT	.0000021	s ⁻¹
RADON WATER/AIR PARTITION COEFFICIENT	.26	
SPECIFIC GRAVITY OF COVER & TAILINGS	2.65	

GENERAL INPUT PARAMETERS

LAYERS OF COVER AND TAILINGS	6	
DESIRED RADON FLUX LIMIT	20	pCi m ⁻² s ⁻¹
LAYER THICKNESS NOT OPTIMIZED		
DEFAULT SURFACE RADON CONCENTRATION	0	pCi l ⁻¹
SURFACE FLUX PRECISION	0	pCi m ⁻² s ⁻¹

LAYER INPUT PARAMETERS

LAYER 1

THICKNESS	500	cm
POROSITY	.583	
MEASURED MASS DENSITY	1.19	g cm ⁻³
MEASURED RADIUM ACTIVITY	981	pCi/g ⁻¹
MEASURED EMANATION COEFFICIENT	.19	
CALCULATED SOURCE TERM CONCENTRATION	7.990D-04	pCi cm ⁻³ s ⁻¹
WEIGHT % MOISTURE	6	%
MOISTURE SATURATION FRACTION	.122	
MEASURED DIFFUSION COEFFICIENT	.0507	cm ² s ⁻¹

LAYER 2

THICKNESS	45.7	cm
POROSITY	.387	
MEASURED MASS DENSITY	1.64	g cm ⁻³
MEASURED RADIUM ACTIVITY	1.9	pCi/g ⁻¹
MEASURED EMANATION COEFFICIENT	.19	
CALCULATED SOURCE TERM CONCENTRATION	3.213D-06	pCi cm ⁻³ s ⁻¹
WEIGHT % MOISTURE	9.8	%
MOISTURE SATURATION FRACTION	.415	
MEASURED DIFFUSION COEFFICIENT	.0162	cm ² s ⁻¹

LAYER 3

THICKNESS	30.5	cm
POROSITY	.351	
MEASURED MASS DENSITY	1.73	g cm^{-3}
MEASURED RADIUM ACTIVITY	1.9	pCi/g^{-1}
MEASURED EMANATION COEFFICIENT	.19	
CALCULATED SOURCE TERM CONCENTRATION	3.737D-06	$\text{pCi cm}^{-3} \text{ s}^{-1}$
WEIGHT % MOISTURE	9.8	%
MOISTURE SATURATION FRACTION	.483	
MEASURED DIFFUSION COEFFICIENT	.0115	$\text{cm}^2 \text{ s}^{-1}$

LAYER 4

THICKNESS	15.2	cm
POROSITY	.315	
MEASURED MASS DENSITY	1.83	g cm^{-3}
MEASURED RADIUM ACTIVITY	1.9	pCi/g^{-1}
MEASURED EMANATION COEFFICIENT	.19	
CALCULATED SOURCE TERM CONCENTRATION	4.404D-06	$\text{pCi cm}^{-3} \text{ s}^{-1}$
WEIGHT % MOISTURE	9.8	%
MOISTURE SATURATION FRACTION	.569	
MEASURED DIFFUSION COEFFICIENT	.0071	$\text{cm}^2 \text{ s}^{-1}$

LAYER 5

THICKNESS	30.5	cm
POROSITY	.44	
MEASURED MASS DENSITY	1.52	g cm^{-3}
MEASURED RADIUM ACTIVITY	1.9	pCi/g^{-1}
MEASURED EMANATION COEFFICIENT	.18	
CALCULATED SOURCE TERM CONCENTRATION	2.481D-06	$\text{pCi cm}^{-3} \text{ s}^{-1}$
WEIGHT % MOISTURE	14.1	%
MOISTURE SATURATION FRACTION	.487	
MEASURED DIFFUSION COEFFICIENT	.013	$\text{cm}^2 \text{ s}^{-1}$

LAYER 6

THICKNESS	42.7	cm
POROSITY	.315	
MEASURED MASS DENSITY	1.83	g cm^{-3}
MEASURED RADIUM ACTIVITY	1.9	pCi/g^{-1}
MEASURED EMANATION COEFFICIENT	.19	
CALCULATED SOURCE TERM CONCENTRATION	4.404D-06	$\text{pCi cm}^{-3} \text{ s}^{-1}$
WEIGHT % MOISTURE	9.8	%
MOISTURE SATURATION FRACTION	.569	
MEASURED DIFFUSION COEFFICIENT	.0071	$\text{cm}^2 \text{ s}^{-1}$

DATA SENT TO THE FILE 'RNDATA' ON DRIVE A:

N	F01	CN1	ICOST	CRITJ	ACC
6	-1.000D+00	0.000D+00	0	2.000D+01	0.000D+00

LAYER	DX	D	P	Q	XMS	RHO
1	5.000D+02	5.070D-02	5.830D-01	7.990D-04	1.225D-01	1.190
2	4.570D+01	1.620D-02	3.870D-01	3.213D-06	4.153D-01	1.640
3	3.050D+01	1.150D-02	3.510D-01	3.737D-06	4.830D-01	1.730
4	1.520D+01	7.100D-03	3.150D-01	4.404D-06	5.693D-01	1.830
5	3.050D+01	1.300D-02	4.400D-01	2.481D-06	4.871D-01	1.520
6	4.270D+01	7.100D-03	3.150D-01	4.404D-06	5.693D-01	1.830

BARE SOURCE FLUX FROM LAYER 1: 6.938D+02 pCi m⁻² s⁻¹

RESULTS OF THE RADON DIFFUSION CALCULATIONS

LAYER	THICKNESS (cm)	EXIT FLUX (pCi m ⁻² s ⁻¹)	EXIT CONC. (pCi l ⁻¹)
1	5.000D+02	1.382D+02	2.930D+05
2	4.570D+01	7.131D+01	1.485D+05
3	3.050D+01	4.602D+01	9.400D+04
4	1.520D+01	3.921D+01	5.586D+04
5	3.050D+01	2.469D+01	4.491D+04
6	4.270D+01	1.977D+01	0.000D+00

ATTACHMENT G

CHANNEL AND TOE APRON
DESIGN CALCULATIONS
OF
WHITE MESA FACILITIES
BLANDING, UTAH

PREPARED BY
INTERNATIONAL URANIUM (USA) CORP.
INDEPENDENCE PLAZA
1050 17TH STREET, SUITE 950
DENVER, CO 80265

ATTACHMENT 7 - RESPONSE TO NRC COMMENTS 7/17/98
TABLE OF SIX-HOUR LOCAL PMP RAINFALL DEPTH VS DURATION FOR WHITE MESA MIL

6-Hour Storm Rainfall is 10 inches (ref: Hydrologic Design Report for White Mesa Mill, 1990)

6/1 Hr Ratio for WHITE MESA is 1.22 (Figure 4.7 and Table 4.4, HMR 49)

ONE-HOUR PMP IS: 8.20 inches at 5000 ft. elevation
 97.0% or 7.95 inches at 5600 ft. elevation (1)

DURATION HOURS	% OF 1-HR PMP	RAINFALL DEPTH, IN INCHES, AT AVERAGE ELEVATION OF: (based on Table 6.3A, HMR 49)			
			5000 ft		5600 ft(1)
0	0		0.00		0.00
0.25	74		6.07		5.88
0.5	89		7.30		7.08
0.75	95		7.79		7.55
1	100		8.20		7.95
2	111		9.10		8.83
3	116		9.51		9.22
4	119		9.75		9.46
5	121		9.92		9.62
6	122		10.00		9.70

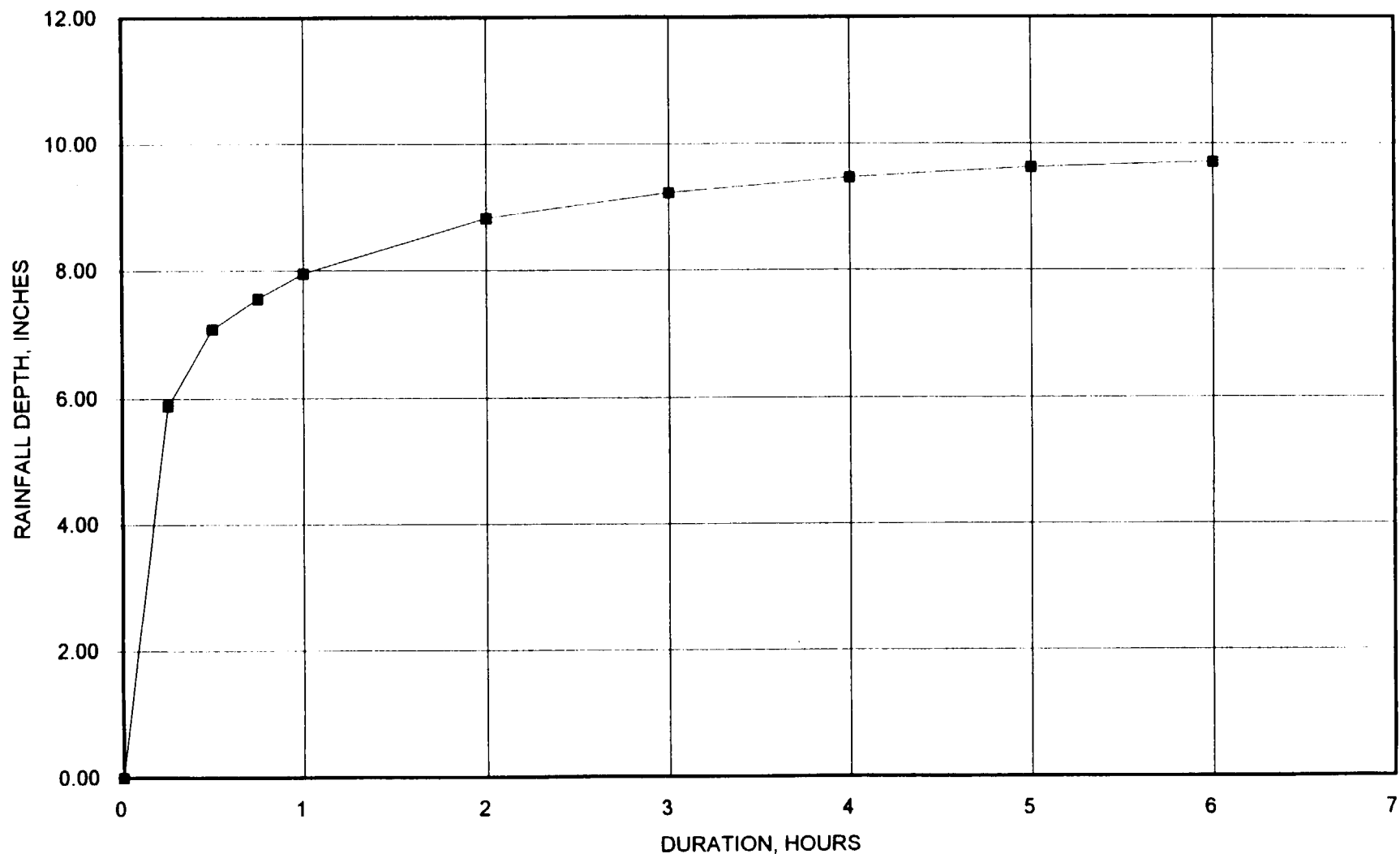
Plot of data is adaptation of Figure 12.10, HMR 55A, to site rainfall.

(1) Average elevation of site in vicinity of base of cell 4A each tanks

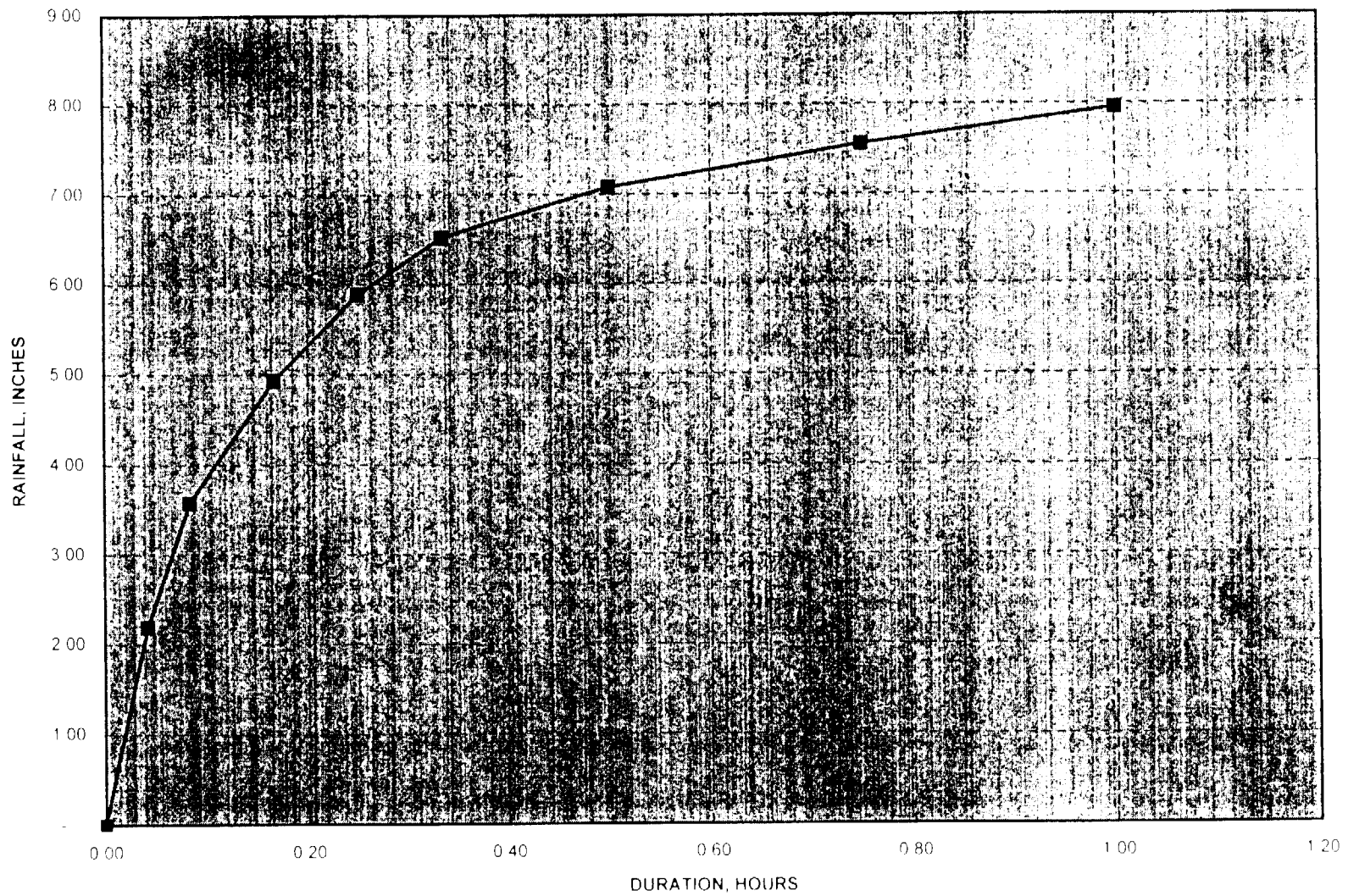
TIME DISTRIBUTION OF FIRST ONE HOUR, OR THE ONE-HOUR PMP
(after Table 2.1, NUREG CR 4620)

RAINFALL DURATION MINUTES	RAINFALL DURATION HOURS	% OF ONE-HOUR PMP	RAINFALL DEPTH IN INCHES AT ELEVATION:	
			5000 ft	5600 ft(1)
0	0	0	0	0
2.5	0.04	27.5	2.25	2.19
5	0.08	45	3.69	3.58
10	0.17	62	5.08	4.93
15	0.25	74	6.07	5.88
20	0.33	82	6.72	6.52
30	0.50	89	7.30	7.08
45	0.75	95	7.79	7.55
60	1.00	100	8.20	7.95

DEPTH VS DURATION FOR 6-HR PMP
WHITE MESA MILL, UTAH
ATTACHMENT 8 RESPONSE TO NRC COMMENTS 7/17/98



RAINFALL-DURATION CURVE FOR ONE-HOUR PMP AT WHITE MESA MILL
ATTACHMENT 9 - RESPONSE TO NRC COMMENTS 7/17/98



ATTACHMENT 11 RESPONSES TO NRC COMMENTS 7/17/98

RATIONAL METHOD CALCULATION OF PMF PEAK DISCHARGE, VELOCITY, AND DEPTH THROUGH CELL #1 DISCHARGE CHANNEL

FLOW PATH ELEMENT	ELEMENT LENGTH L	MAX ELEV	MIN. ELEV.	GRADIENT S	SLOPE ANGLE degrees	tc hours	RAINFALL WITHIN tc (1)	i in/hr	SURFACE AREA acres	PEAK DISCHARGE Q, cfs
LONGEST	4800	5655	5610	0.0094	0.54	0.54	7.20	13.43	143	1344

FLOW PARAMETERS IN CELL #1 DISCHARGE CHANNEL AT PEAK PMF DISCHARGE

	Channel Bottom Width, b ft	Channel Side Slopes	Channel Gradient, s ft/ft	Manning Coeff., n	Qn ^{1.49} s ^{1.49} 5	Flow Depth, y ft	Cross Section Area of Flow a, ft ²	Hydraulic Radius R, ft	a(R) ^{1.49} 67	Velocity v fps	Allowable Peak Velocity fps (COE, 1970)
Bedrock Channel	100	3:1	0.0100	0.025	226	1.62	169.9	1.54	226.95	7.96	8-10
Bedrock Channel	120	3:1	0.0100	0.025	226	1.45	180.3	1.40	225.46	7.45	8-10

**RATIONAL METHOD CALCULATION OF PMF PEAK DISCHARGE, VELOCITY, DEPTH AND SCOUR THROUGH CELL 4A BREACH
WITH BREACH WIDENED TO 200 FEET - IUC WHITE MESA**

FLOW PATH ELEMENT	ELEMENT LENGTH L	MAX ELEV	MIN ELEV	GRADIENT S	SLOPE ANGLE degrees	tc hours	RAINFALL WITHIN tc (1)		SURFACE AREA acres	PEAK DISCHARGE Q, cfs
CELL 2 COVER	1230	5619.5	5617	0.0020	0.12	0.34	6.53	19.29	41.30	637
CELL 2/3 BERM	10	5617	5615	0.2000	11.31	0.34	6.54	19.24	1.10	654
CELL 3 COVER	900		5613.2	0.0020	0.11	0.61	7.30	12.01	35.12	992
CELL 3/4A BERM	180		5577.2	0.2000	11.31	0.62	7.40	11.92	6.40	1053
CELL 4A	1400	5577.2	5562	0.0109	0.62	0.82	7.70	9.42	27.70	1262
CELL 4A INSLOPES	80	5599	5560	0.4875	25.99	0.04	2.00	47.62	5.68	216
CELL 4A BREACH	275	5562	5560	0.0073	0.42	0.92	7.80	8.44	0.38	1481

FLOW PARAMETERS IN CELL 4A BREACH AT PEAK PMF DISCHARGE

	Breach Bottom Width, b ft	Breach Side Slopes	Breach Channel Gradient, s ft/ft	Manning Coeff., n	Q/1.49*s ^{1.5}	Flow Depth, y ft	Cross Section Area of Flow a, ft ²	Hydraulic Radius R, ft	a/(R) ^{1.67}	Velocity v fps	Allowable Peak Velocity fps (COE, 1970)	Riprap Size d50 inches (ref 1)
Soil (SM) Channel	200	3:1	0.0073	0.03	350	1.39	283.8	1.36	348.59	5.20	2-4	4.00
Rock Channel	200	3:1	0.0073	0.025	291	1.25	254.7	1.23	291.78	5.82	8-10	N/A

[NOTE: If rounded rock (river cobbles and gravel) is used, rock size should be increased by 33%, per Fig. 4.10, NUREG /CR 4651, Vol. 2

Reference 1 - Fig 4.11, NUREG CR 4620

DEPTH OF SCOUR OF CELL 4A BREACH CHANNEL

All methods used are from Pemberton, E.L., and J.M. Lars, 1984, "Computing Degradation and Local Scour", Technical Guideline for Bureau of Reclamation

ds = depth of scour, ft.
q = unit discharge, cfs/ft

		Soil Channel 200' wide
Method 1	ds = K*q^0.24 K = constant, 2.45	
	q =	5.2
	ds =	3.64
Method 2	ds = 0.25 dm dm = mean water depth at design discharge =	1.4
	ds =	0.34
Method 3	ds = 0.6*dfo dfo = q^0.666/Fbo^0.333 = Fbo = zero bed factor = 1.0 ft/s^2 for fine sand	3.00
	ds =	1.80
Method 4	ds = 0.25 * dma dma = unit cross section of flow =	1.39
	ds =	0.35
Method 5	ds = dm*((Vm/Vc)-1) Vm = mean velocity = Vc =	5.22 2
	ds =	2.19
AVERAGE SCOUR DEPTH, ft =		1.66

ROCK APRON DESIGN TABLE - TAILING CELL EROSION PROTECTION WHITE MESA MILL

FLOW PATH ELEMENT	ELEMENT LENGTH L ft	ELEMENT WIDTH W ft	GRADIENT S ft/ft	SLOPE ANGLE degrees	tc (minimum is 0.042) hours	RAINFALL WITHIN tc inches	INTENSITY in/hr	Peak Unit Discharge q cfs/ft	d50 inches
APRON	10	1	0.01	0.57	0.60	7.29	12.07	1.80	7.3

Notes:

The top cover element length is 2450 ft. This was used in the calculations for time of concentration and peak unit discharge.

The outslope element length is 240 ft. This was used in the calculations for time of concentration and peak unit discharge.

The d50 for the outslope was calculated per Abt. S.R. and Johnson, T.L., "Riprap Design for Overtopping Flow," ASCE Journal of Hydraulic Engineering, 1991.

The d50 for the apron was calculated per Abt. S.R., Johnson, T.L., Thornton, C.I., and Trabant, S.C., "Riprap Sizing at Toe of Embankment Slopes," ASCE Journal of Hydraulic Engineering, July 1998.

DEPTH OF SCOUR AT DOWNSTREAM EDGE OF TOE APRON

All methods used are from Pemberton, E.L., and J.M. Lara, 1984, "Computing Degradation and Local Scour", Technical Guideline for Bureau of Reclamation.

ds = depth of scour, ft.

q = unit discharge, cfs/ft

Method 1 $ds = K \cdot q^{0.24}$

K = constant, 2.45

q = 1.81 cfs/ft

ds = 2.82 ft

Method 2 $ds = 0.25 \cdot dm$

dm = mean water depth at design discharge

ds = 0.22 ft.

Method 3 $ds = 0.6 \cdot dfo$ $dfo = q^{0.666} / Fbo^{0.333}$ Fbo = zero bed factor = 1.0 ft/s² for fine sand

ds = 0.09 ft

Method 4 $ds = 0.25 \cdot dma$

dma = unit cross section of flow = 0.87 ft

ds = 0.22 ft

Method 5 $ds = dma \cdot ((Vm/Vc) - 1)$

Vm = mean velocity = 1.81/0.78 fps

Vc = 0.5 fps

ds = 3.17 ft

AVERAGE SCOUR DEPTH = 1.30 ft

minimum depth of downstream edge scour barrier

ATTACHMENT H

**ROCK TEST RESULTS
BLANDING AREA GRAVEL PITS**

**PREPARED BY
INTERNATIONAL URANIUM (USA) CORP.
INDEPENDENCE PLAZA
1050 17TH STREET, SUITE 950
DENVER, CO 80265**

TO: Harold R. Roberts

cc: William N. Deal

FROM: Robert A. Hembree

DATE: November 20, 1998

SUBJECT: Rock Test Results – Blanding Area Gravel Pits

Attached you will find the results for lab tests that were performed on rock samples obtained from three gravel sources around the White Mesa Mill. These samples were taken from the Cow Canyon pit located just north of Bluff (15 miles south of the mill), the Brown Canyon pit located on the east side of Recapture Canyon four miles northeast of the mill, and the North Pit located one mile northeast of Blanding. A 75 pound sample of material was collected from each site, each sample was crushed and screened to a +1/2 -1 1/2 inch size. Testing was performed by Western Colorado Testing in Grand Junction, Colorado. All samples were tested for specific gravity, absorption, sulfate soundness and L.A. Abrasion.

Test results indicate that all three sites score high enough to be used as rip rap sources for the reclamation cover at the mill (see attached scoring calculations). The Cow Canyon site scores high enough that there would be no over-sizing required; it is suitable for use in channels as well as on side and top slopes. The Brown Canyon site requires the most over-sizing at nineteen percent (19%). The North Pit material would require over-sizing of 9.35%. These test results prove that there are sources of rip rap material within a reasonable distance of the mill site. The average over-sizing factor for the three sites is 9.5%, which is well below the 25% number used in the 1996 reclamation cost estimate. The over-sizing factor used in the Titan Design Study was also 25%.

Based on the results of the testing IUC could use any of these three sites. The North Pit would be the most reasonable choice of material sites since it has a lower over-sizing factor than the Brown Canyon site and is closer to the mill than the Cow Canyon site. The North Pit also has the advantage of being an established public pit on BLM administered land.

RAH/rah

International Uranium (USA) Corp.
WHITE MESA MILL RECLAMATION

NRC Rip Rap Scoring Calculations

Weighting Factors for Igneous Rocks

Oversizing for side slopes, top slopes, and well drained toes and aprons

Rock Scoring less than 50% is rejected, rock scoring over 80% does not require oversizing

Cow Canyon Pit (Bluff)

Lab Test	Lab Results	Score	Weight	Score x Weight	Max. Score
Specific Gravity	2.63	7.5	9	67.5	90
Absorption, %	0.47	8.25	2	16.5	20
Sodium Sulfate Sound., %	0.2	10	11	110	110
L.A. Abrasion, %	6.4	7.5	1	7.5	10
Totals				201.5	230

Overall Score 87.61 %

Oversizing none %

Brown Canyon Site

Lab Test	Lab Results	Score	Weight	Score x Weight	Max. Score
Specific Gravity	2.525	5.5	9	49.5	90
Absorption, %	2.61	1.75	2	3.5	20
Sodium Sulfate Sound., %	5.5	7.5	11	82.5	110
L.A. Abrasion, %	10.3	4.75	1	4.75	10
Totals				140.25	230

Overall Score 60.98 %

Oversizing 19.02 %

North Pit (N. Blanding)

Lab Test	Lab Results	Score	Weight	Score x Weight	Max. Score
Specific Gravity	2.557	6.25	9	56.25	90
Absorption, %	2.84	1.25	2	2.5	20
Sodium Sulfate Sound., %	3.2	8.75	11	96.25	110
L.A. Abrasion, %	6.3	7.5	1	7.5	10
Totals				162.5	230

Overall Score 70.65 %

Oversizing 9.35 %



**WESTERN
COLORADO
TESTING,
INC.**

529 25 1/2 Road, Suite 3-101
Grand Junction, Colorado 81505
(970) 241-7700 • Fax (970) 241-7783

**November 16, 1998
WCT #811898**

**International Uranium USA Corporation
Independence Plaza
1050 17th Street
Denver, Colorado 80265**

Attention: Mr. Bob Hembree

Reference: Rock Durability Testing

As requested, three (3) potential sources of riprap for use in reclamation of tailings ponds in Blanding, Utah were tested for rock durability. The riprap material was obtained, crushed to testing size, and delivered to Western Colorado Testing, Inc. by the client. The three sources of material were tested for specific gravity and absorption (ASTM C127), Sodium Sulfate Soundness (ASTM C88), and Los Angeles Abrasion (ASTM C131). The results of the testing are provided below.

Material Source: Cow Canyon	
Test	Result
Bulk Specific Gravity, g/cc	2.630
SSD Specific Gravity, g/cc	2.642
Apparent Specific Gravity, g/cc	2.663
Water Absorption, %	0.47
Sodium Sulfate Soundness, Avg. % Loss	0.2
L.A. Abrasion, % Loss @ 100 Rev.	6.4

Material Source: Brown Canyon	
Test	Result
Bulk Specific Gravity, g/cc	2.460
SSD Specific Gravity, g/cc	2.525
Apparent Specific Gravity, g/cc	2.629
Water Absorption, %	2.61
Sodium Sulfate Soundness, Avg. % Loss	5.5
L.A. Abrasion, % Loss @ 100 Rev.	10.3

Material Source: North Pit	
Test	Result
Bulk Specific Gravity, g/cc	2.485
SSD Specific Gravity, g/cc	2.557
Apparent Specific Gravity, g/cc	2.674
Water Absorption, %	2.84
Sodium Sulfate Soundness, Avg. % Loss	3.2
L.A. Abrasion, % Loss @ 100 Rev.	6.3

If there are any questions or if additional testing is needed,
please feel free to contact our office.

Respectfully Submitted:
WESTERN COLORADO TESTING, INC.



Kyle Alpha
Construction Services Manager

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