Disequilibrium
and
Sandstone Uranium Deposits

U2009 – May 11, 2009

Robert D. Maxwell

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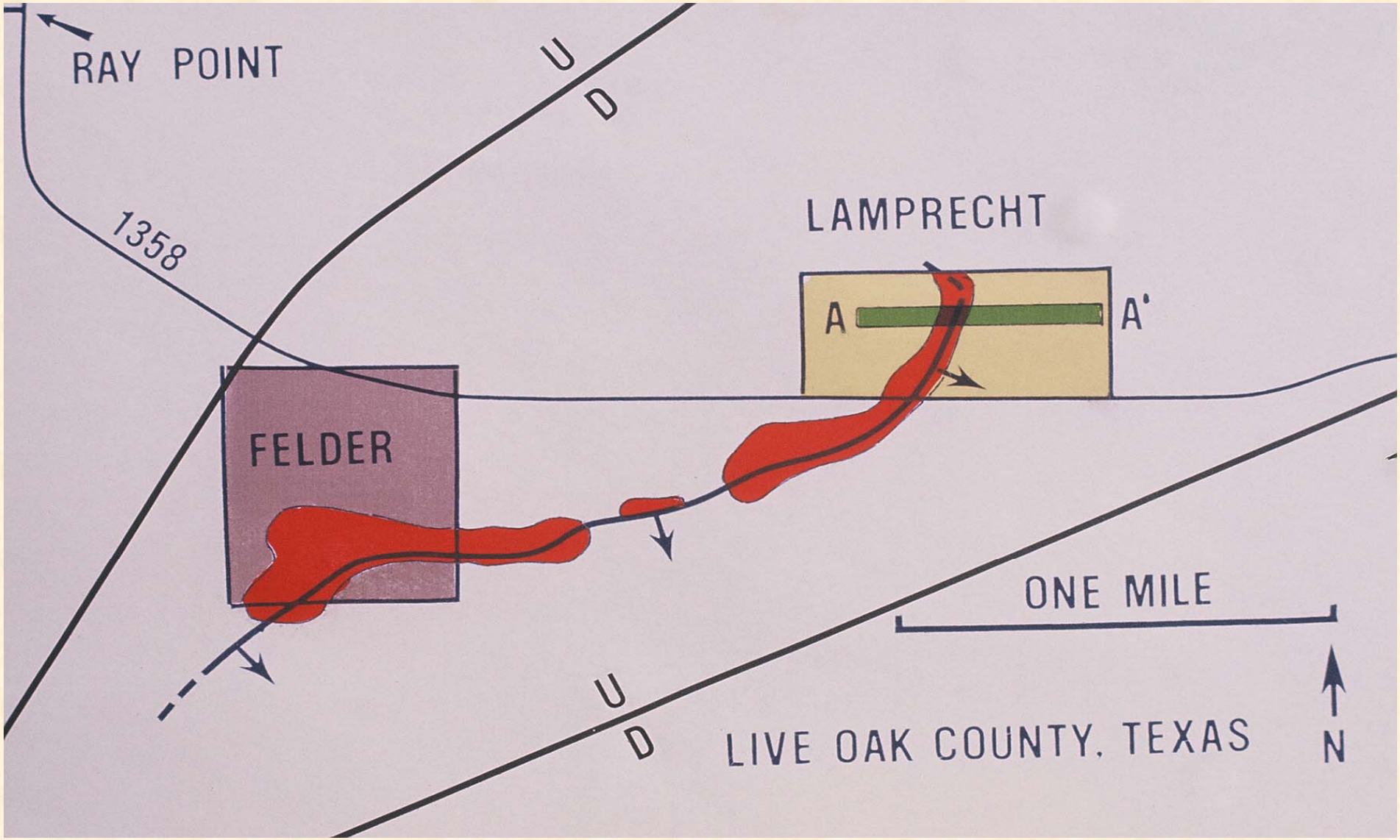
The Four Most Important Parameters for Evaluation of a Uranium Deposit

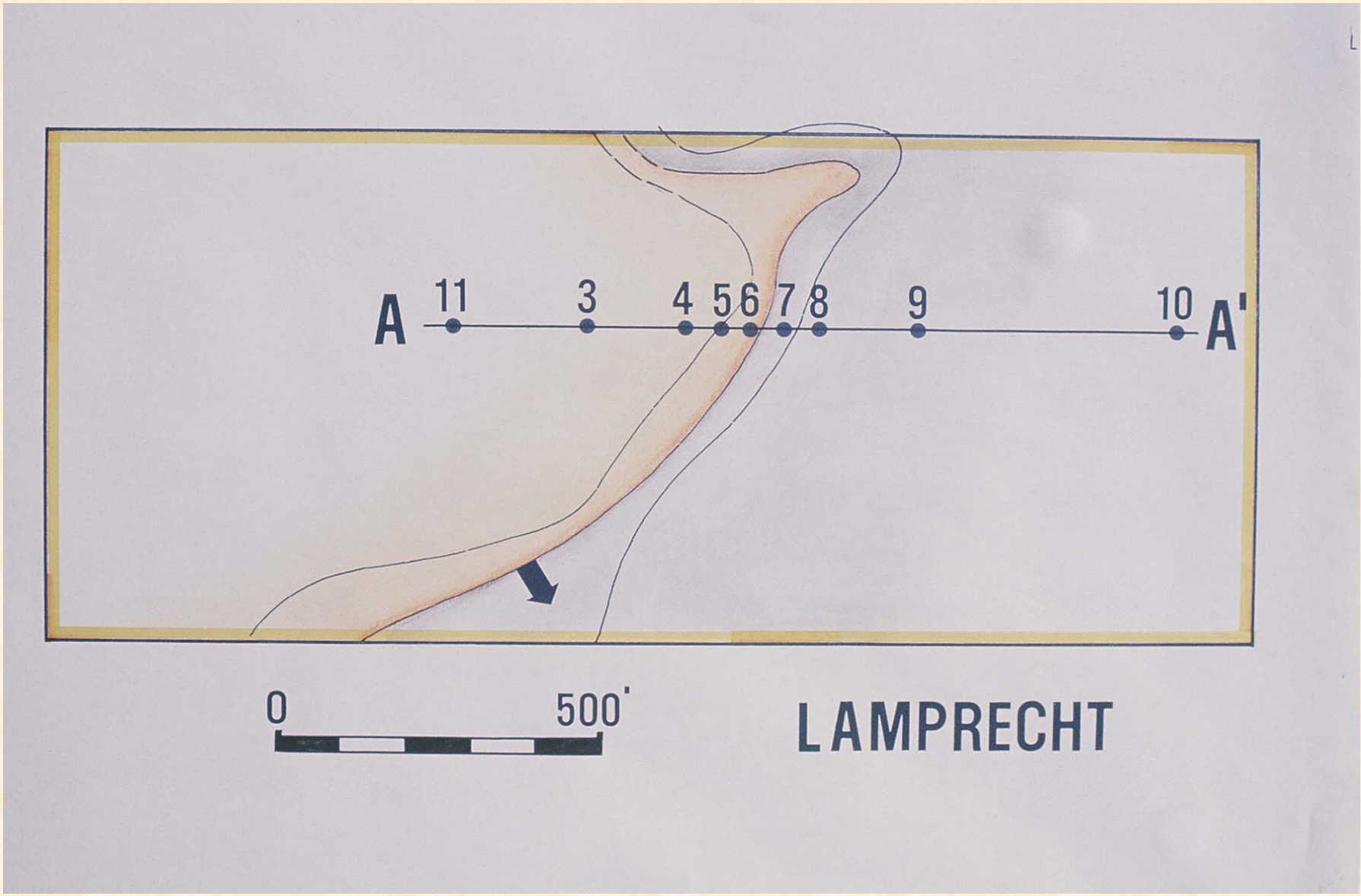
1. Cutoff selection
2. Dilution
3. Disequilibrium
4. Recovery

Disequilibrium

- U_3O_8 As deposited
- U_3O_8 At equilibrium with daughter products

- Daughter Products U_3O_8 (disequilibrium)


RAY POINT
U
D
1358
LAMPRECHT
A
A'
FELDER
ONE MILE
U
D
LIVE OAK COUNTY, TEXAS
N



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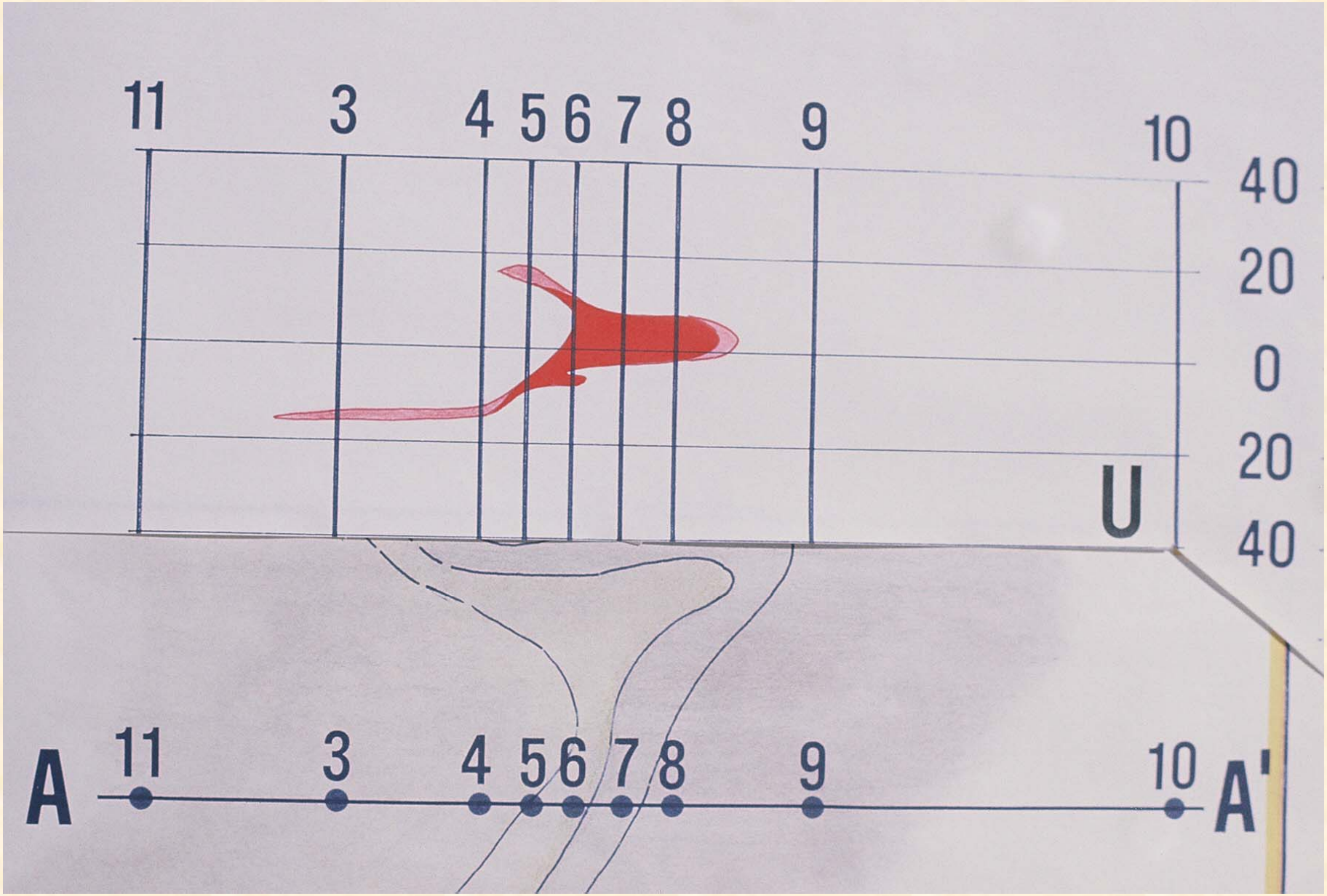
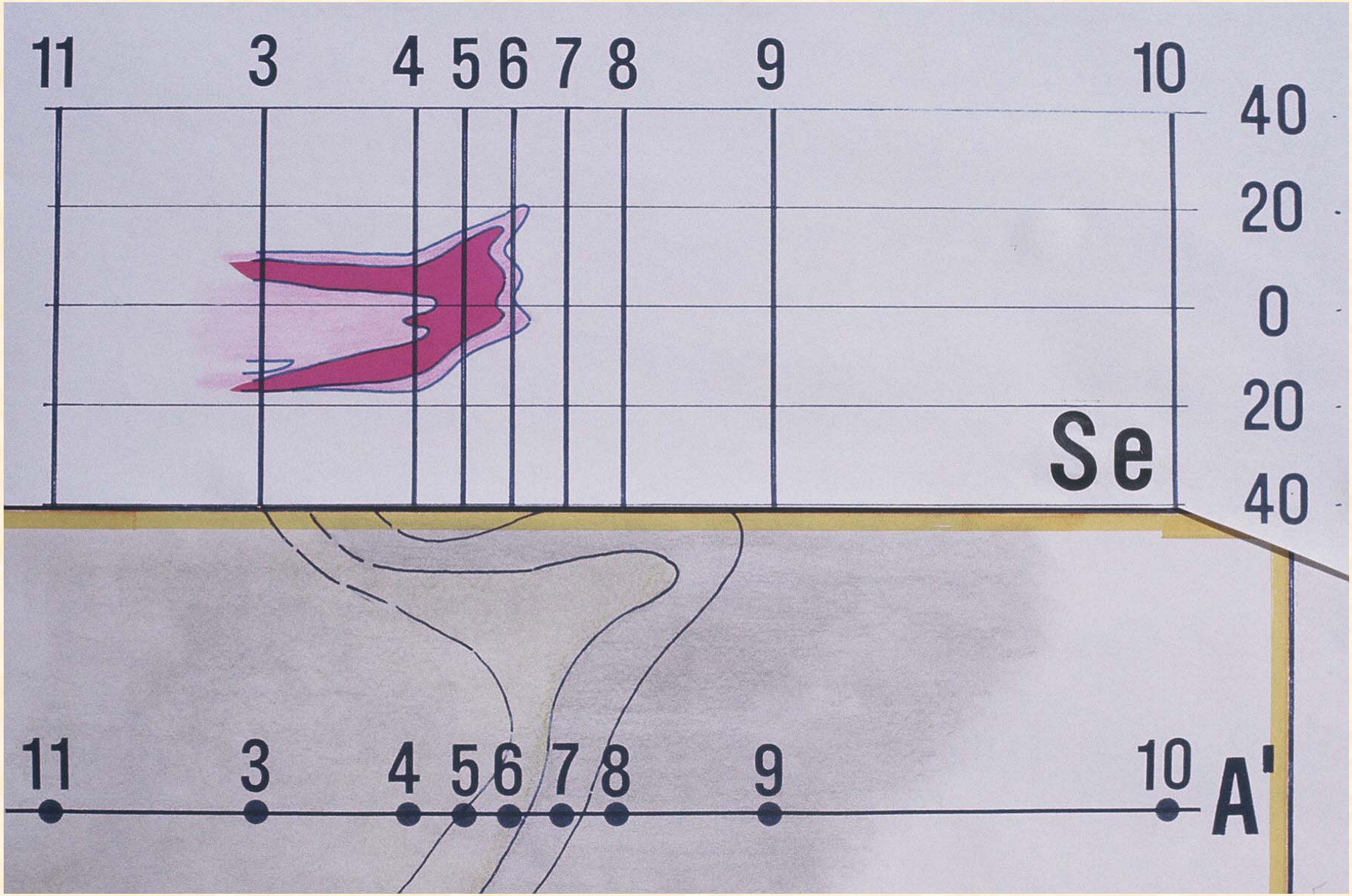
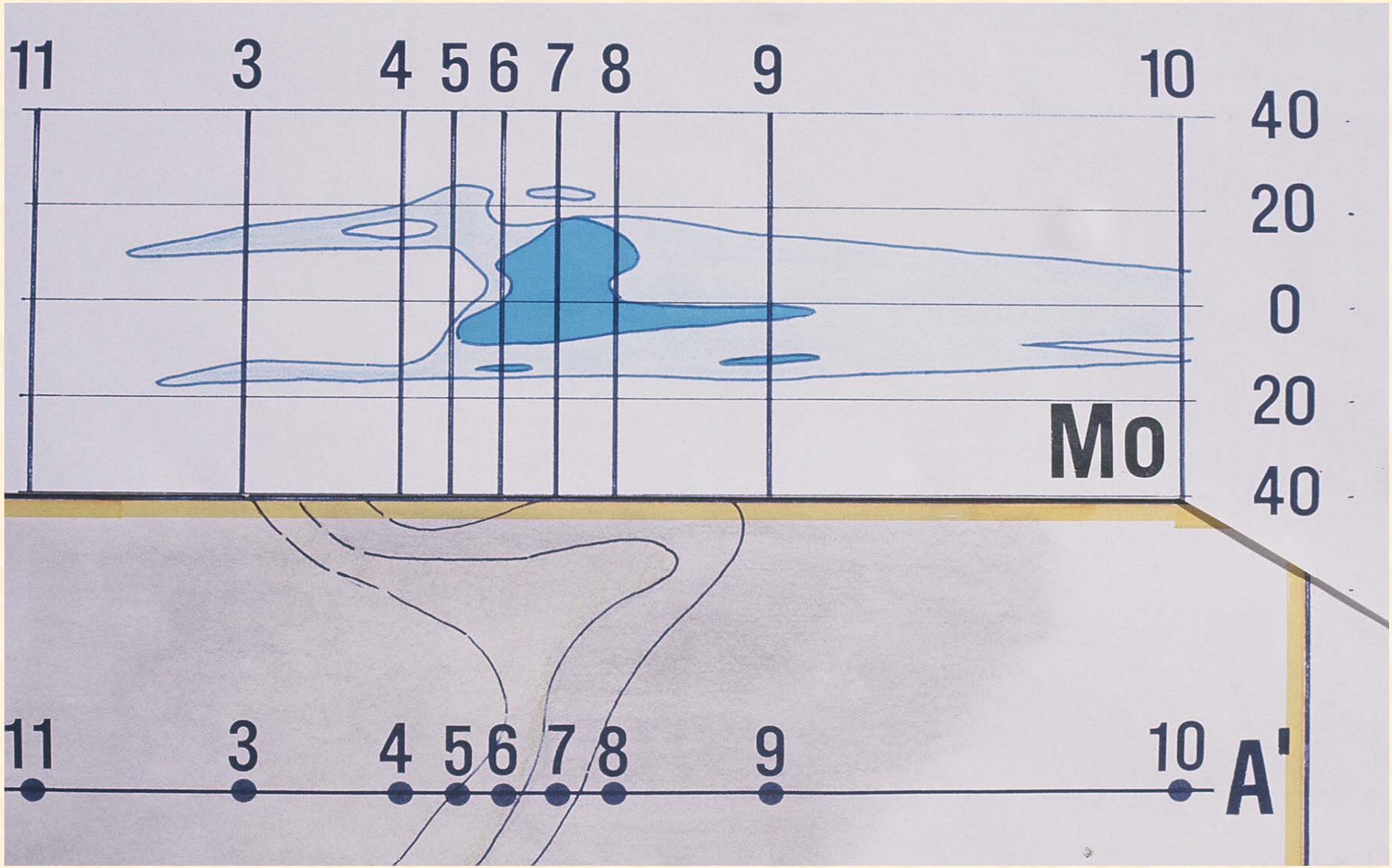
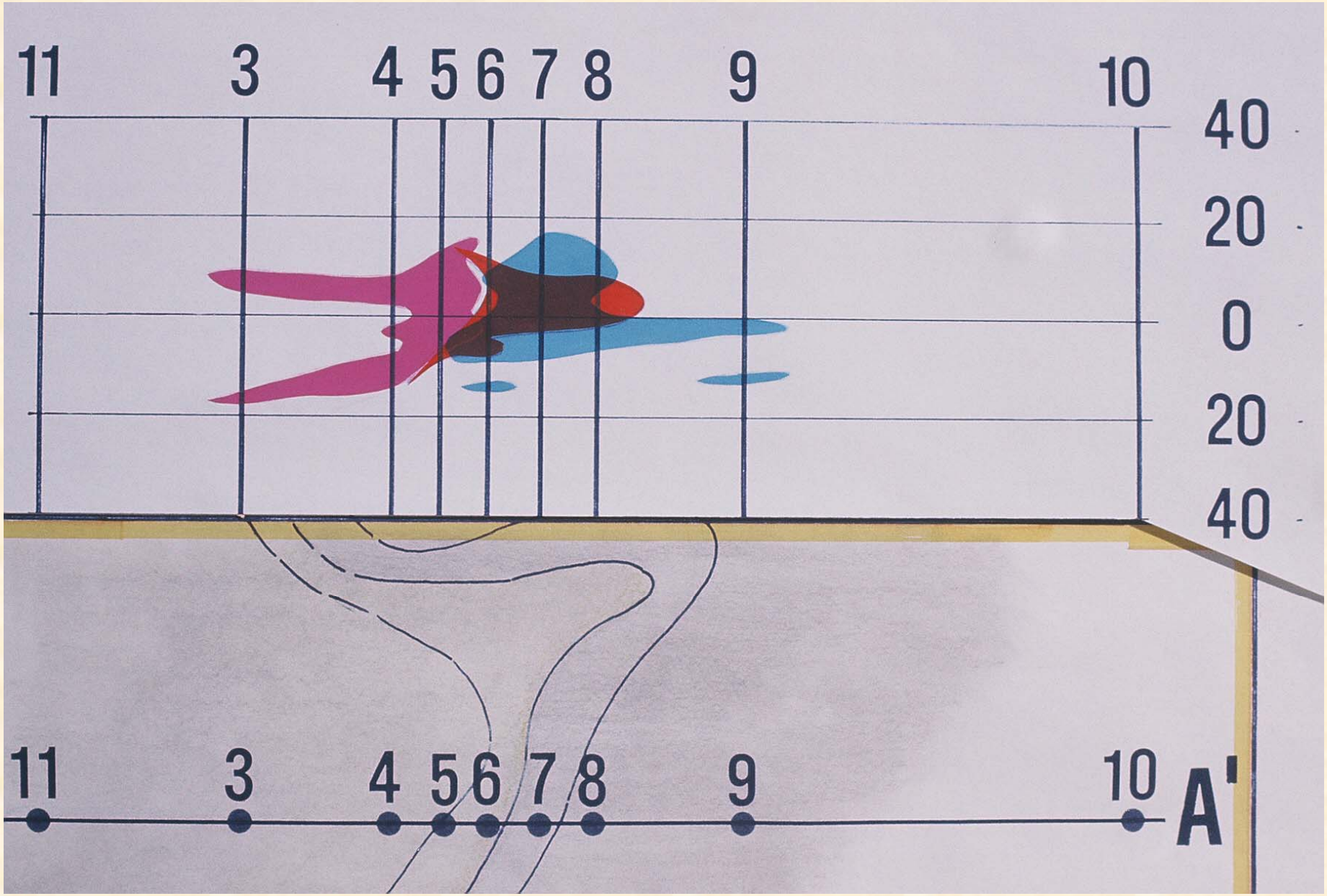
Beicker Pit – South Texas

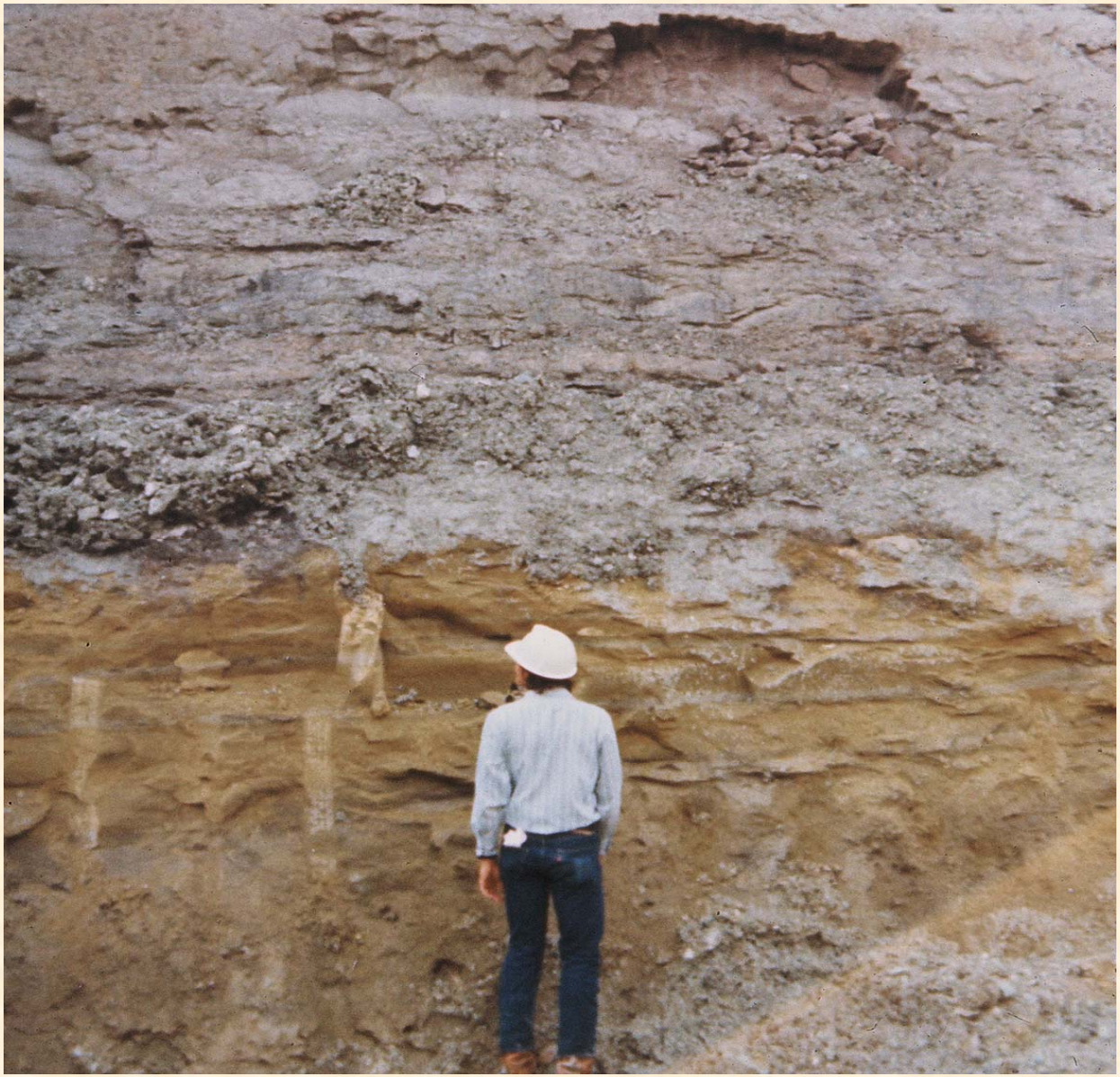
Shirley Basin, Wyoming, USA

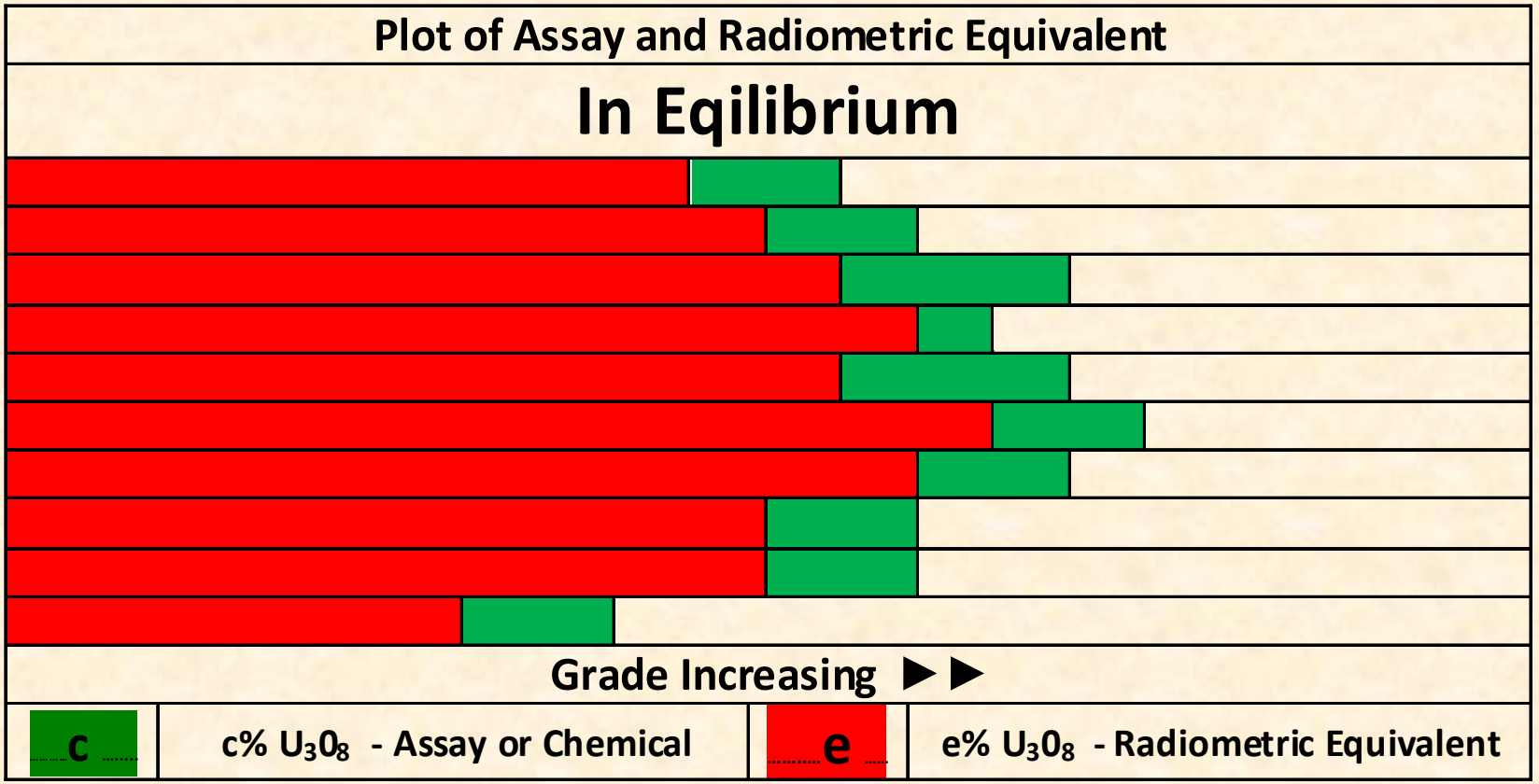

11
3
4
5
6
7
8
9
10
40
20
0
20
40
U
A
11
3
4
5
6
7
8
9
10
A'





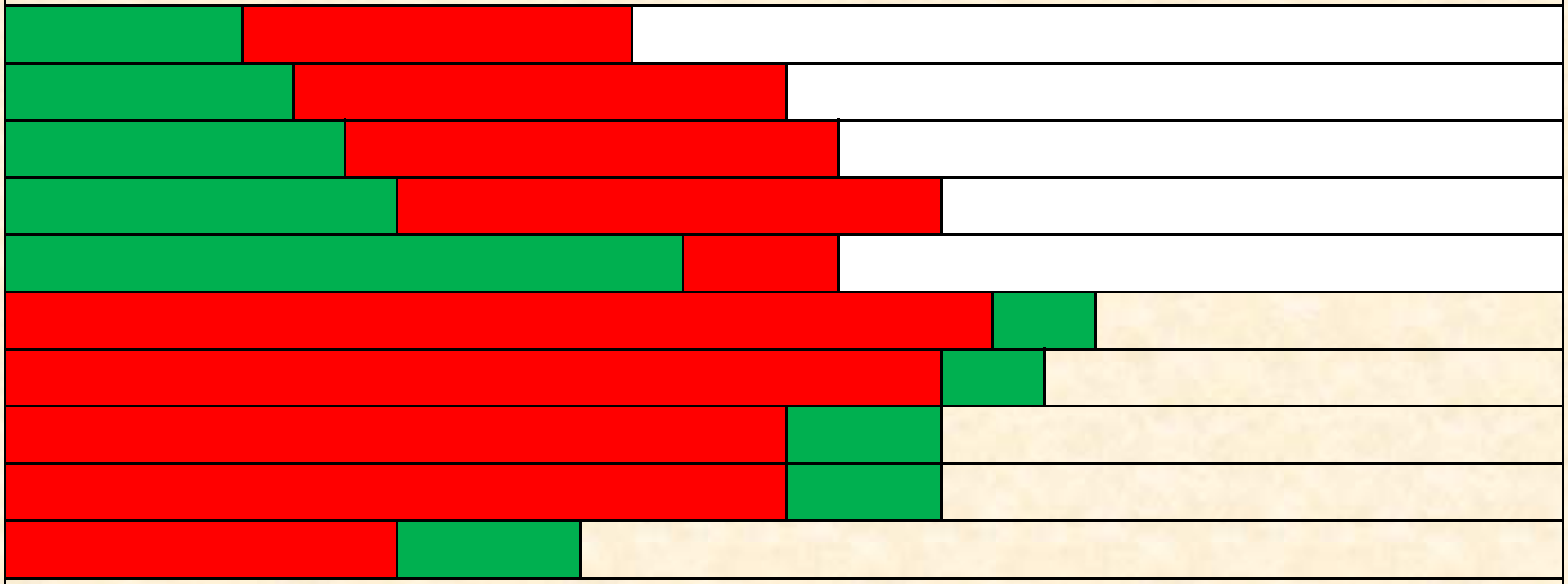





Plot of Assay and Radiometric Equivalent
In Eqilibrium
Grade Increasing ►►
c
c% U_3O_8 - Assay or Chemical
e
e% U_3O_8 - Radiometric Equivalent

Plot of Assay and Radiometric Equivalent

Partial Depletion

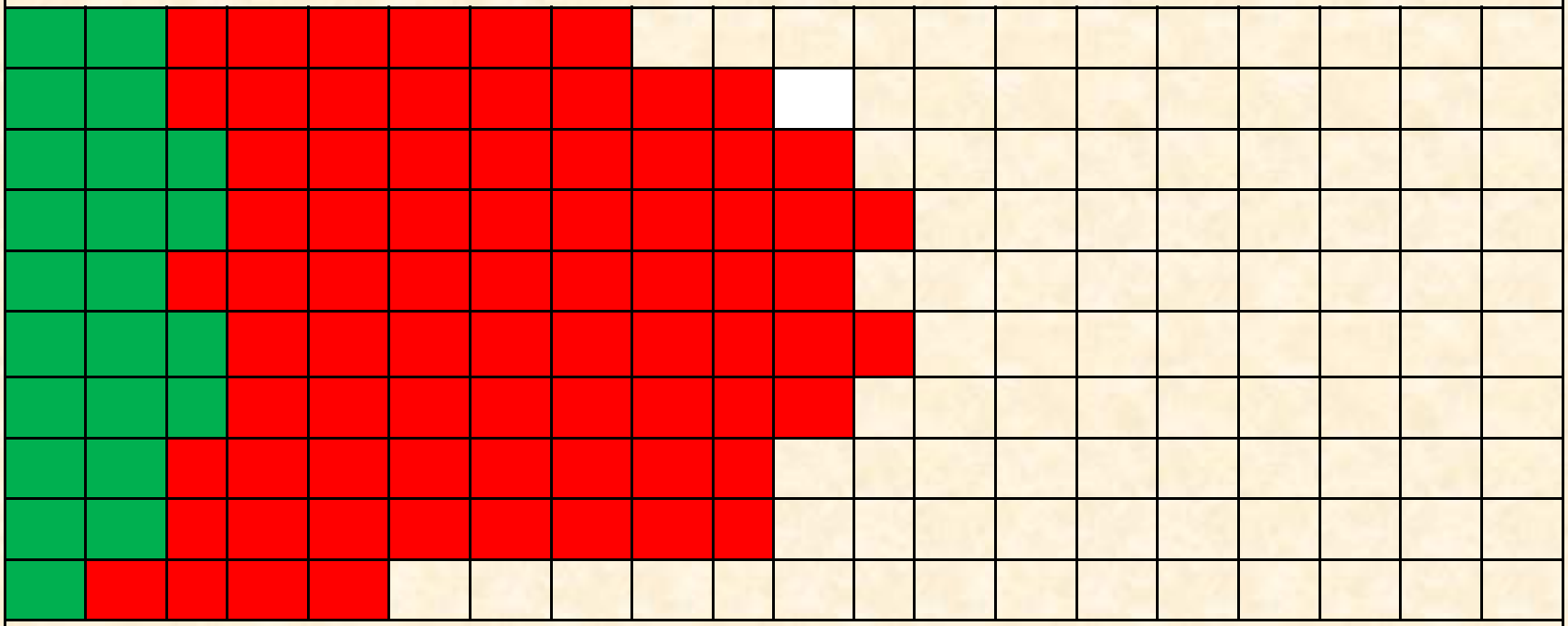


Grade Increasing ►►

c	c% U_3O_8 - Assay or Chemical	e	e% U_3O_8 - Radiometric Equivalent

Plot of Assay and Radiometric Equivalent

Depleted by Modern Oxidizing Groundwater

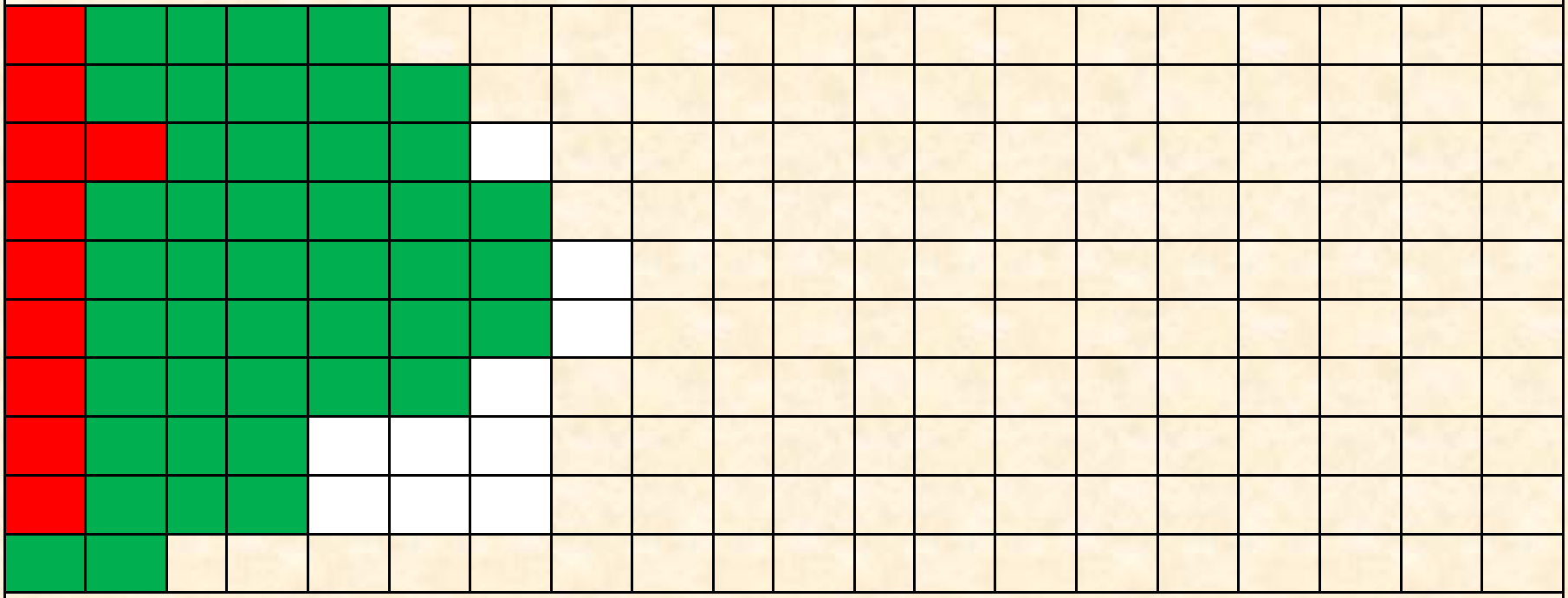


Grade Increasing ►►

c	c% U_3O_8 - Assay or Chemical	e	e% U_3O_8 - Radiometric Equivalent

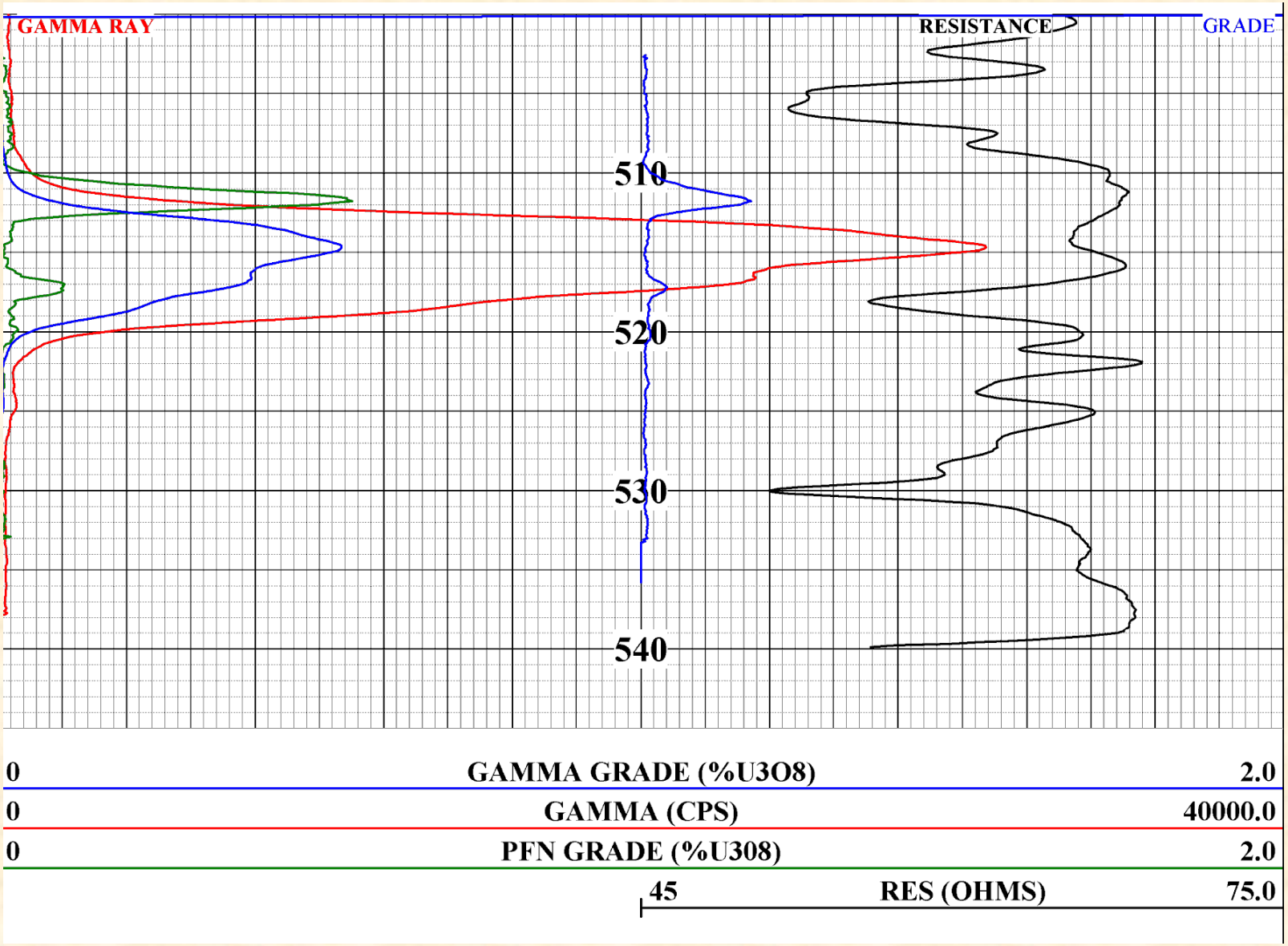
Plot of Assay and Radiometric Equivalent

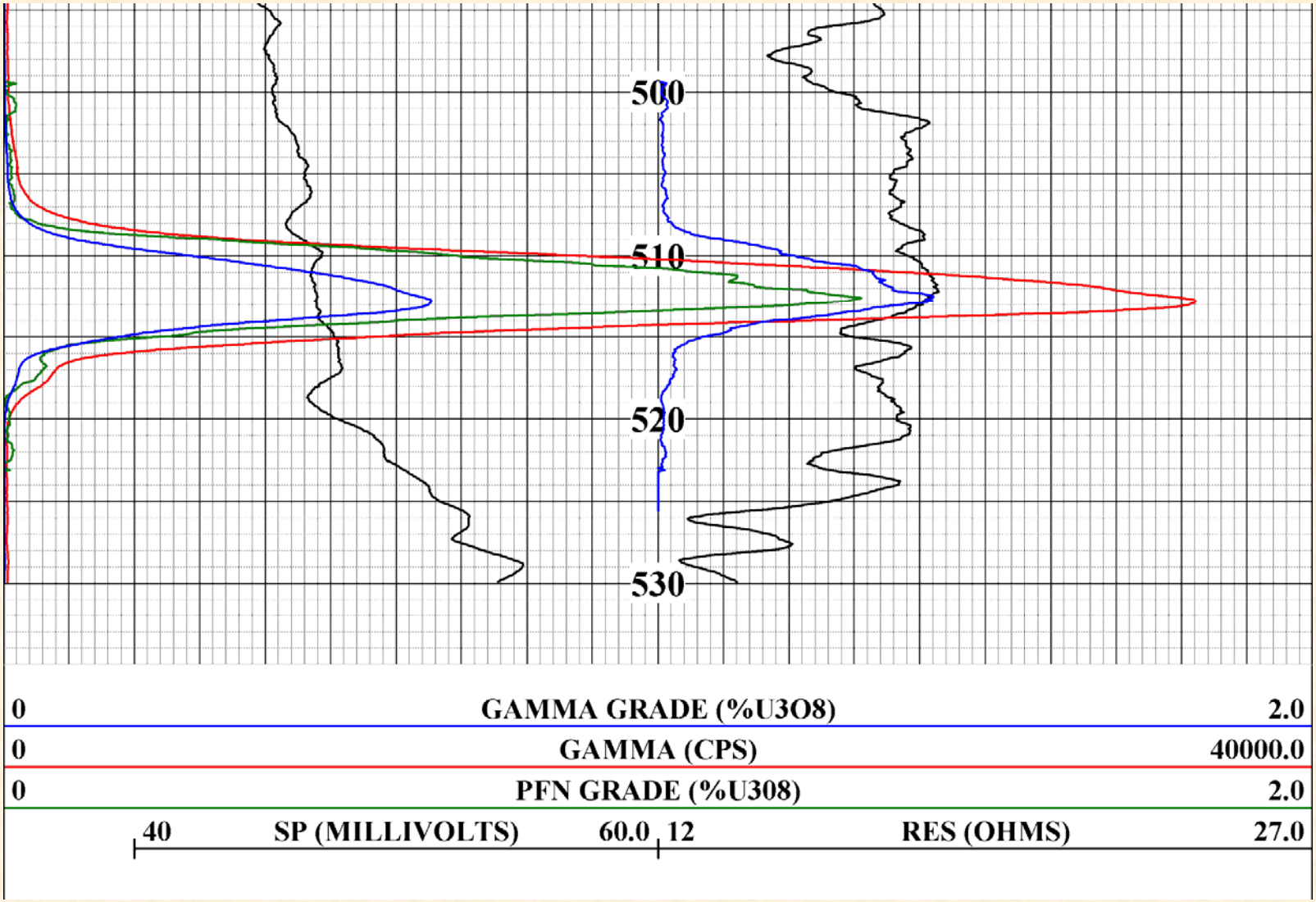
Dispersed Down the Groundwater Gradient

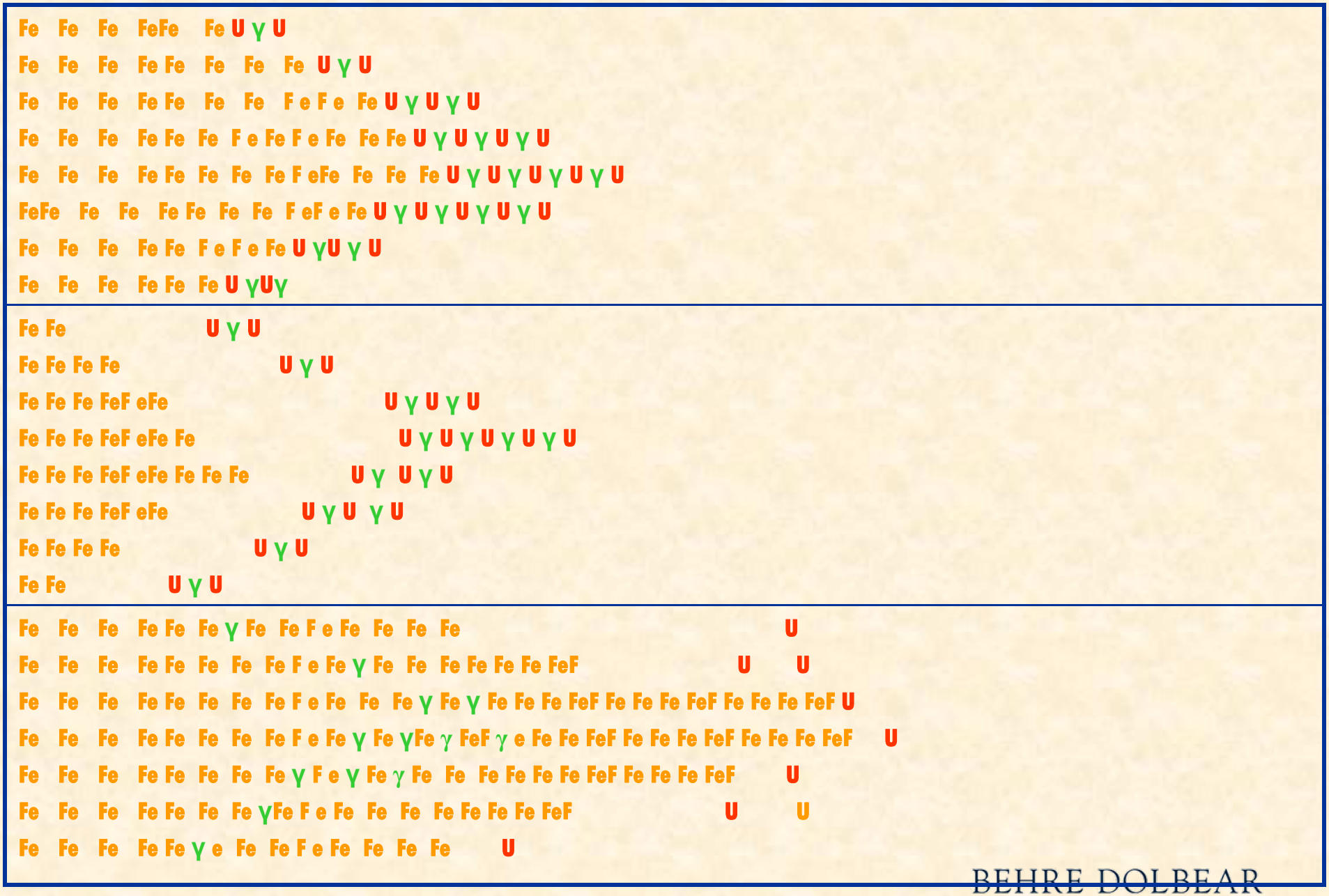


Grade Increasing ►►

c	c% U_3O_8 - Assay or Chemical	e	e% U_3O_8 - Radiometric Equivalent


GAMMA RAY
RESISTANCE
GRADE
510
520
530
540
0
GAMMA GRADE (%U3O8)
2.0
0
GAMMA (CPS)
40000.0
0
PFN GRADE (%U308)
2.0
45
RES (OHMS)
75.0


500
510
520
530
0
GAMMA GRADE (%U3O8)
2.0
0
GAMMA (CPS)
40000.0
0
PFN GRADE (%U308)
2.0
40
SP (MILLIVOLTS)
60.0
12
RES (OHMS)
27.0



States of Disequilibrium

In equilibrium:

Undisturbed, original quality, radiometric OK

Depleted zone:

Less U_3O_8 than deposited - radiometric overvalues this portion of deposit

Dispersed material:

Lower U_3O_8 grade than original, radiometric undervalues this portion of deposit

Impact of Disequilibrium

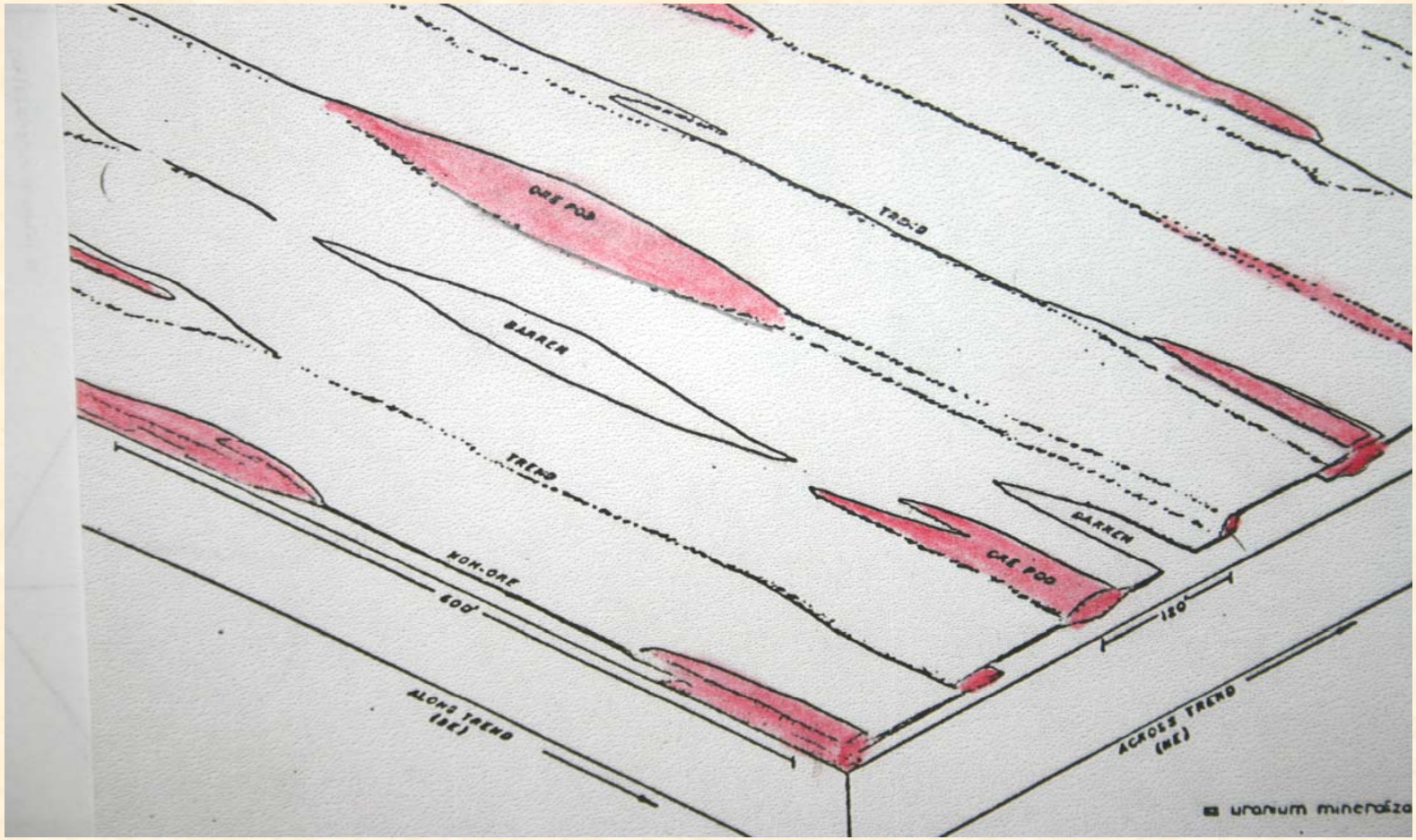
Depleted zones:

- Require more costly grade control
- Require assay tool or lab assay
- Less amenable to ISR extraction

Enriched zones:

- Require more costly grade control
- Require assay tool or lab assay
- Easily leached

Roeber/Fredrickson 'Rolls'



Section 23 Roll

Section 23 Ambrosia Lake - Dispersed

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