

ANALOGS

ENGLISH
PEARCY

CNWARA #36

 **TELEDYNE**

407

FIELD BOOK



Property of _____

Address _____

Telephone _____

CNWRA
CONTROLLED
COPY *English* ⁰³⁶
Reaney

308 --- 0199402290009
Scientific Notebook #036
supporting the Geochemical
Natural Analog Research

This Book is manufactured of a High Grade
50% Rag Paper having a Water Resisting Surface,
and is sewed with Nylon Waterproof Thread.

Begin with

NOTE - ECD-37

INDEX

Required for each rock
sample:

- ID No.
- Loc. of site
- Description of sample
- Name and age of PM
(if known)
- Date of collection
- Name or initials of person
making entry

ALSO: - Photo, if necessary
or sketch, if necessary
- Location marked on
map, if necessary

Done in accordance with
TOP-016

INITIAL ENTRIES by ECP = English PEACOCK

3/2/92

3RD TRIP TO Peña Blanca

Participants include:

ECP] CNWRA
BWL]

L. Kovach] US NRC
J. Bradbury]

Philip Goodell] UTEP

Ignacio "Nacho" Reyes] UACH

Sergio Aturia] ININ

Luis Aguilar] SEMAR

Juan Enrique Garcia] CSUS

Rafael Martinez] CSUS

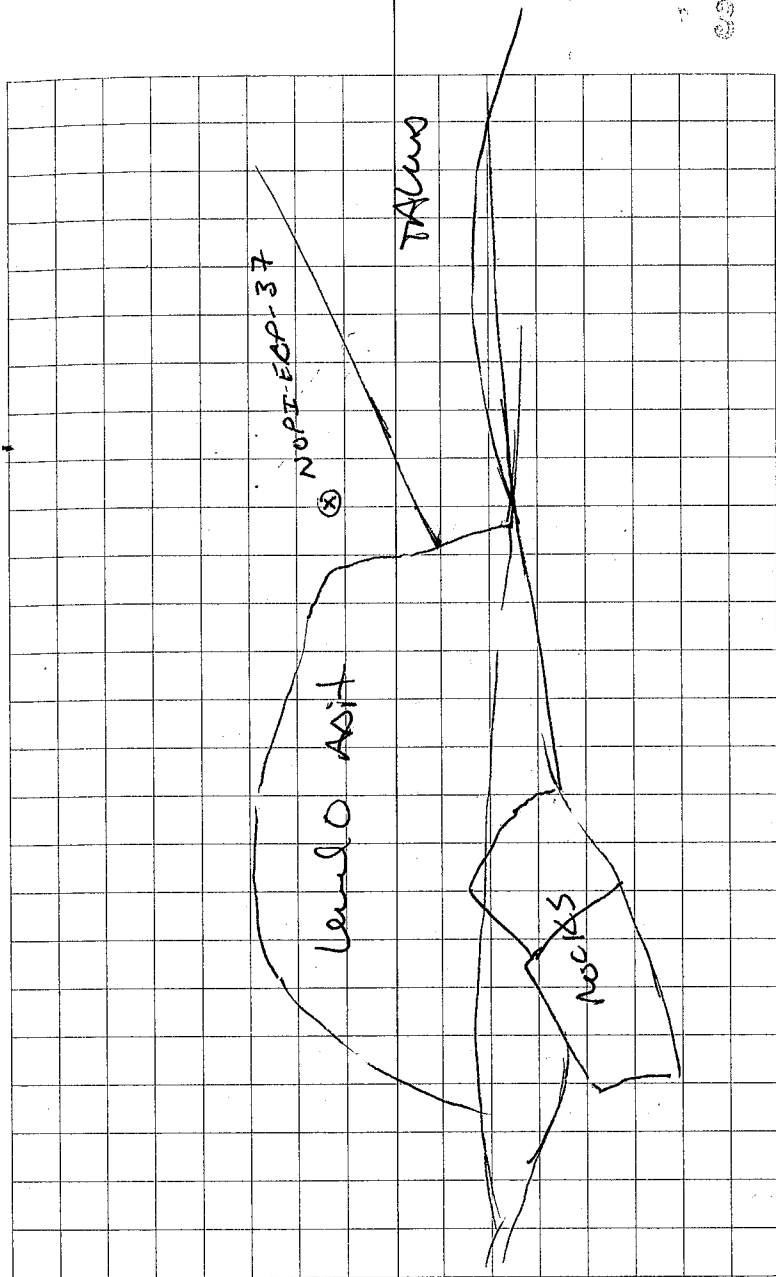
3/2/92 spent in initial
discussions with Mexican
Federal Agencies w/ regard
to collaboration + short
field trip to Sta. Eulalia
District.

NOPI-ECP-37

ECP
3/3/92

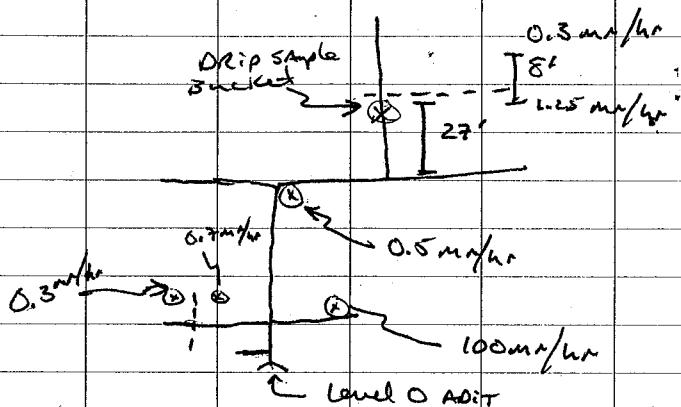
- opal covering monophane (?)
in breccia sample
~ 1 m to rt of level
O adit at ~
level of the top
of the O adit
- collected from the Nopel fm
level of the
breccia (see
diagram)

ECP 8/25/94



3/4/92 PCP

→ γ spectrometer measurements
in Level 0 adit with
LINDA KORACH.



These are contact γ measurements.

Dashed lines indicate
Approximate boundaries of
the breccia pipe.

3/4/92 LAK.

Traverse at +10 level.
along Ildelfonse Trench.

5 ft	0.7 - .8	mr/hr	35 ft	0.15	mr/hr
10	0.8 - .9		60	0.15	
15	0.6 - 1.0			~ cover	
20	1.2 - 1.3			alluvium	
25	1.6				
30	4				
35	2				
40	4				
45	0.4				
50	0.3		90	0.1	

✓ PCP 3/4/92 ✓

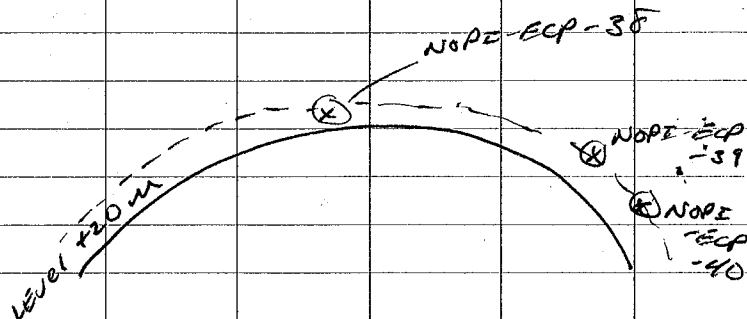
Distance is measured from edge
of +10 m Level $\pm 1-2$ ft.

EACH measurement is AN EYEBALL
Average of 3-5 contact γ
measurements.

6

NOPI-ECP-35

- Vesical fillings from the +20m level of Napal I
- Napal FM
- ECP 3/4/92



NOPI-ECP-39

- qtz (= quartz) crystals lining vesicals in Napal FM
- euhedral, may be vapor phase crystallization
- ECP-3/4/92

NOPI-ECP-40

- Same as NOPI-ECP-39 except from a "vent" structure within the Napal FM.
- ECP 3/4/92

NOPI-ECP-41

- core drill sample of High grade (i.e. magnetite-containing) ore from Napal I level 0 adit
- sample collected by Philip Goodell during trip in September 1991 with student CASTALLO
- location is a few cm from locations of NOPI-ECP-31, and 32
- ECP entry 3/20/92

NOPI-ECP-42

→ all information is
the same as for
NOPI-ECP-41
ECP 3/20/92

NOTE: on 3/3/92

L. Kovach and
ECP collected leaves
from a plant growing
near the base of
the high-grade ore
pile at Peña Blanca.
Roots were collected
from another plant of
the same type
growing nearby. These
samples were taken
for casual autoradiograph
experiments. Not
part of the Aopsal
project.

**Pages 9 and 10 Are Intentionally
Left Blank**

Fourth trip to Nopal I

11

MAY 1992

ECP

5/22/92 ECP

Jim Prikeyl
+ ECP + IR.

Yesterday we arrived at the Peña Blanca District just after noon and set up housekeeping at the Nopal Camp with Nacho Reyes, José (the watchman) and his wife, Celestina, who will cook for us.

We spent the afternoon surveying a 25m x 25m sample control grid over the cleared portion of the +10m level of the Nopal I deposit.

The clearing was done by José and his family under the supervision of Nacho Reyes (by subcontract with the Center). The clearing has been well-done and meets the

requirements of the contract.

For the sample grid, we used control points surveyed previously by IGNACIO (Nacho) Reyes on a 5m x 5m grid arranged in a N-S-E-W pattern. This grid was verified using a 50m tape measure. The perimeter of the sample grid was marked every 1 m using 2 1/2" P-K surveying nails (galvanized, hardened steel, 1/4" diameter, fluted edges). A 1" square of fluorescent orange plastic with a 1/4" hole in the middle through which the P-K nails ~~was~~ ^{are} were placed served to highlight the top

locations. Aluminum sample tags with copper attachment wires were used to label each perimeter nail. The nails were not driven all the way into the rock of the cleared surface, so that survey lines (braided nylon string) could be easily attached to lay out a grid.

This grid was laid out by ECP, Jim Pinkney (JOP) and Ignacio Reyes (Nacho or I.R.).

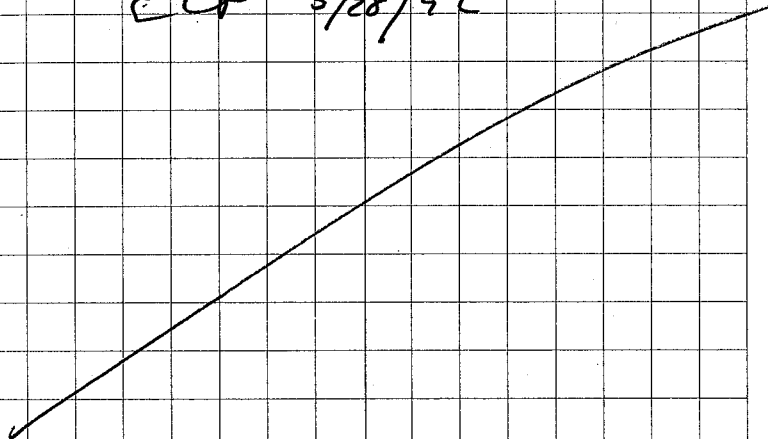
ECP spent part of the afternoon field checking portions of the geologic map of a 9 km² area and the Napal I deposit prepared by I.R. under subcontract

to the Center. After field checking and subsequent discussions with I.R., I decided to require that the map be drafted again before acceptance.

Last night, 5/21/92, we plotted the 1m x 1m grid points for the 25m x 25m area on the +10m level onto the geologic map of the +10m level prepared by I.R. (again under subcontract to the Center).

This morning, 5/22/92, J.D.P. + I.R. are making a contact gamma scintilometer survey of the gridded

area at the intersections of the survey lines defining the 1m x 1m grid. The gamma readings are being written directly onto the base map at the coordinate points plotted last night. For this survey, we are using a Ludlum Model 14C Geiger Counter with a model 44-6 gamma probe. (meter serial No. 83561).
~~22.5/12.5~~
 ECP
 5/22/92
 ECP 5/28/92



While JDA + IR are conducting the survey, I will field check the geologic map prepared by IR of the cleared portion of the +10 m surface.

During the survey, an outcrop w/ the highest readings at that time was noted to appear to contain uraninite at coordinates 22.5/12.5. The outcrop consists of a raised knob ~ 0.5 m diameter. Field appearance is very similar to the material removed from

the level 0 adit about 8 m below those coordinates.

Verification of Ildefonso's samples ECP 5/23/92

Sample: NI1C4

located by measuring from the NE corner of the breccia pipe to a point along Ildefonso sample trench equal to 19.6 m. location marked on outcrop with a (X) mark.

Some U-minead visible (u-phase?), rock generally kaolinized with abundant hematite.

Location marked above corresponds to our coordinates (16.5/12.3). Photographed.

NOTE (5/23/92 ECP) It appears that the reference point at the NE corner has fallen away since Ildefonso took samples, even within the last

15 MONTHS SINCE I ¹⁰¹ CAME. SO
reference is
uncertain.
208
18
✓ 1/20/82
[Sample C28]
- Location physically inaccessible
- photographed (No. 1 on
new roll), ~ 4.7m west
of NE Breccia pipe corner
well up on the
vertical face between
levels 0 + +10m.
Rock is kaolinized
Tn formation, with
some FeOx (see sketch
on p. 23)

[Sample C33]

As above, location
inaccessible, observed &
photographed from
level 0 m. (Photo No. 2)
Rock similar to C28,
somewhat more FeOx,
AND A Greater
intensity of fracturing.
(see sketch on p. 23)

19

[Photo No. 3 is of UO (?)
@ coordinates 22.5/12.5]

[Sample C23]

located on SW-NE vertical
face ~ 7m above level 0
+ ~ 3m below level +10;
about 3m S. west of the
S.W. edge of the level 0
A.O.T. (Photo No. 4)
(see also sketch up on p. 23)
Rock is highly fractured
Tn formation with
very strong FeOx, as is
that whole area.
U-minerals not visible at
sample point which is
physically inaccessible, but
one visible is similar
rocks a few meters
below.

Sample B6

located on N-S vertical face ~ 5m below the level +10m surface at a point ~ 15m North of the corner where ridge rose marked "S1" (that is, the southernmost extension of this face). (Photo No. 18^{ECPS/92})
See also sketch map on p. 23

Rock at this location is kaolinized T₁ formation with some ~~too~~ observable FeOx. ^{ECPS/92}

Sample point is near the intersection of the S.W. breccia-bounding fault and this N-S face.

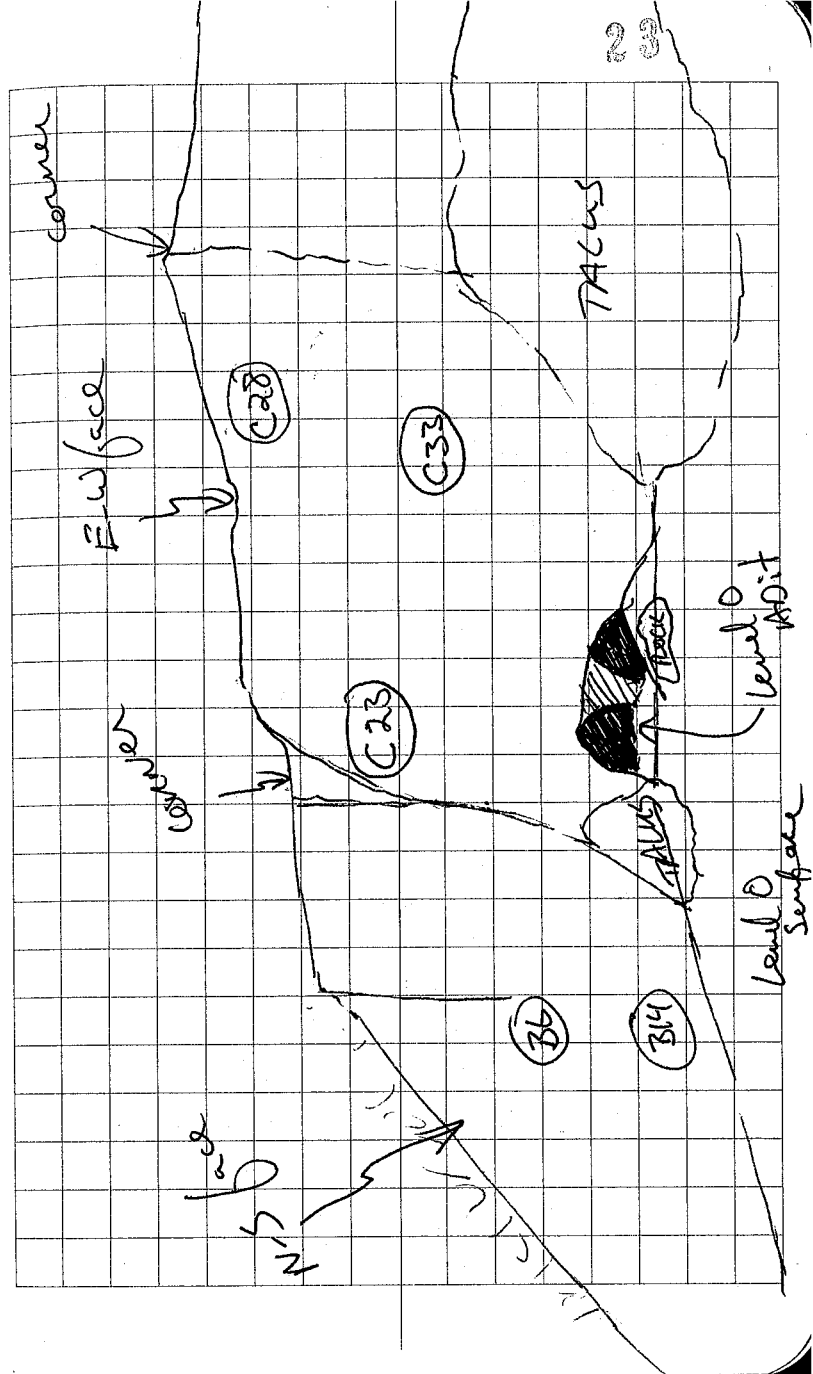
Some yellowed minerals are visible from level 0 vantage.

Actual sample point is ~ 5m up the face and is physically inaccessible.

Sample B-4

Location is on the same N-S face as B6, about 4m below sample B6, that is about 1m above level 0. (Photo No. 68^{ECPS/92}) also sketch map on p. 23

Rock is kaolinized T₁ formation with some FeOx, especially in heavily fractured zones. Yellow U-minerals, Mnophane(?) et al. occur here, especially along fracture surfaces. Location ~ 1m South of F. Reyes reference No. 10 painted on face.



NOTE: OBSERVATION by EOP,
 → After contouring the γ readings taken this morning and comparing them, quickly, to the level 0 to surface, there exists a pronounced γ high on the N-E side of the deposit which corresponds to FeOx coloring of orange/brown rather than the pink/red colors which predominate on the S.W. side. It may be that the red (i.e. Hematite Fe_2O_3) areas have been more oxidized and have the lost more Al than the yellow/orange/brown areas (i.e. Limonite) which have tended to retain their Al.

→ There is also a pronounced trend of higher γ values along base to the North of the breccia pipe which similarly corresponds to brown/orange alt. to pink/red to the E + W. of this trend which have lower γ readings.
 → In general, there is a broader spread of γ values to the N of the breccia pipe than to the S-SW of the pipe where the γ values drop off more abruptly.

5/23/92

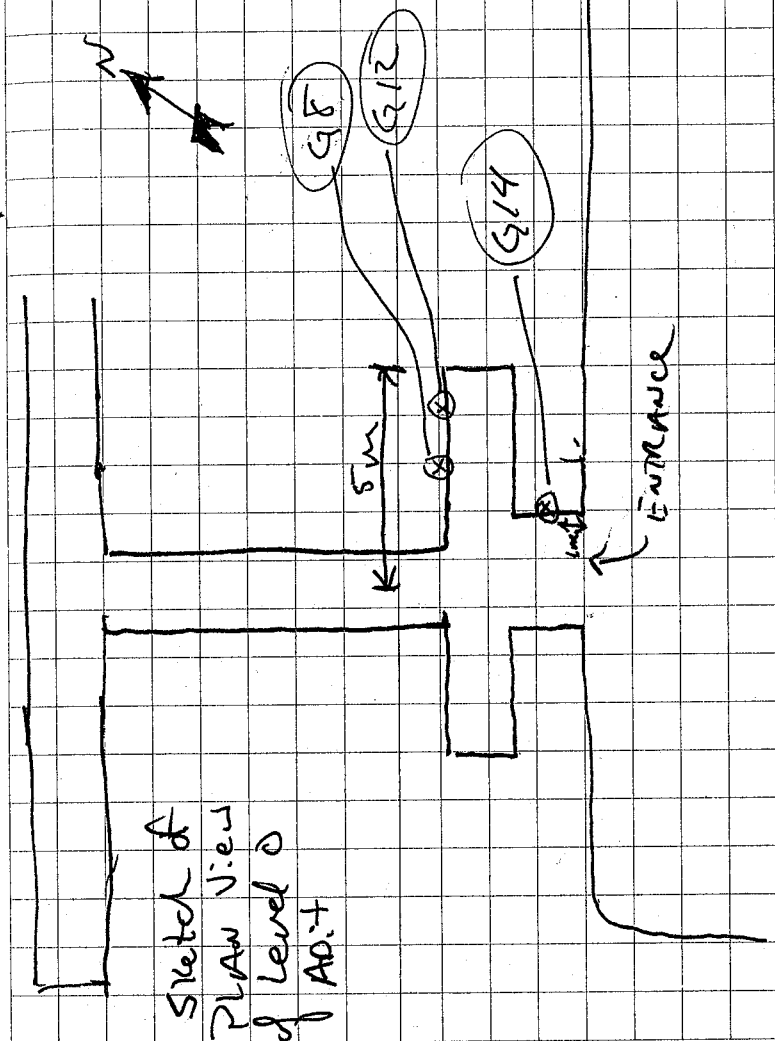
Qualification of ECP
Remaining Ideofone

Samples: Those inside
the Level 0 ADIT.

Sample G14

located ~ 1 m in front
entrance of Level 0
ADIT. S of location
somewhat uncertain
($\pm \sim 0.5$ m) because
there is no clear
reference to the outside
edge. Location photographed
(No. 13 on roll 2)
also marked on sketch
on p. 27

Rock is kaolitized breccia
of the T₁ formation,
fractures are hematitic,
some veins contain
yellow U-minerals,
very fine-grained,
cannot identify in
the field but probably
U-silicates.



Sample G8

located in N wall of
level 0 adit, NE
branch immediately to
the right upon
entering. Sample point

5/23/92 ~~is ~ 5.25 m NE
of centerline of main
adit; uncertainty about
± 0.5 meters.~~

There is a discrepancy
in Ildelfonse' location
map. If the distance
laterally from the
center of the main
adit NE to sample
point G8 is supposed
to be 5.25 m, the
entire distance from
the center to the
end of that branch
is only 5 m (± 0.2 m).
Therefore I will locate
the samples proportionately
along that face, using

Ildelfonse' sketch of
their relative
positions.

→ I estimate G8 to be
located ~ 3 m NE of
the centerline of the
main adit (see sketch
on p. 27) Location
photographed. No.
on roll 2)

Location not photographed
due to flash trouble
(even with new flash
batteries, it does not
function).

Rock at this location
is partially kaolinized
Ta breccia, abundant
U-mineralization, 5:1:alter,
Some areas are now
well silicified whereas
others are strongly
clay altered. There is also
minette nearby, within the
uncertainty of the sample
location.

Sample G12

Same location trouble as for G8. I estimate the actual location of G12 to be at ECP 5/23/92

4 m NE of the centerline of the main adit. See sketch on p. 27. No photo because of flash trouble noted before.

Rock at this point is brecciated T₁ formation, more strongly silicified than G8, also as at G8

have abundant U-mineralization (i.e. silicates)

there is change nearby, within the uncertainty of the sample location.

5/23/92 ECP

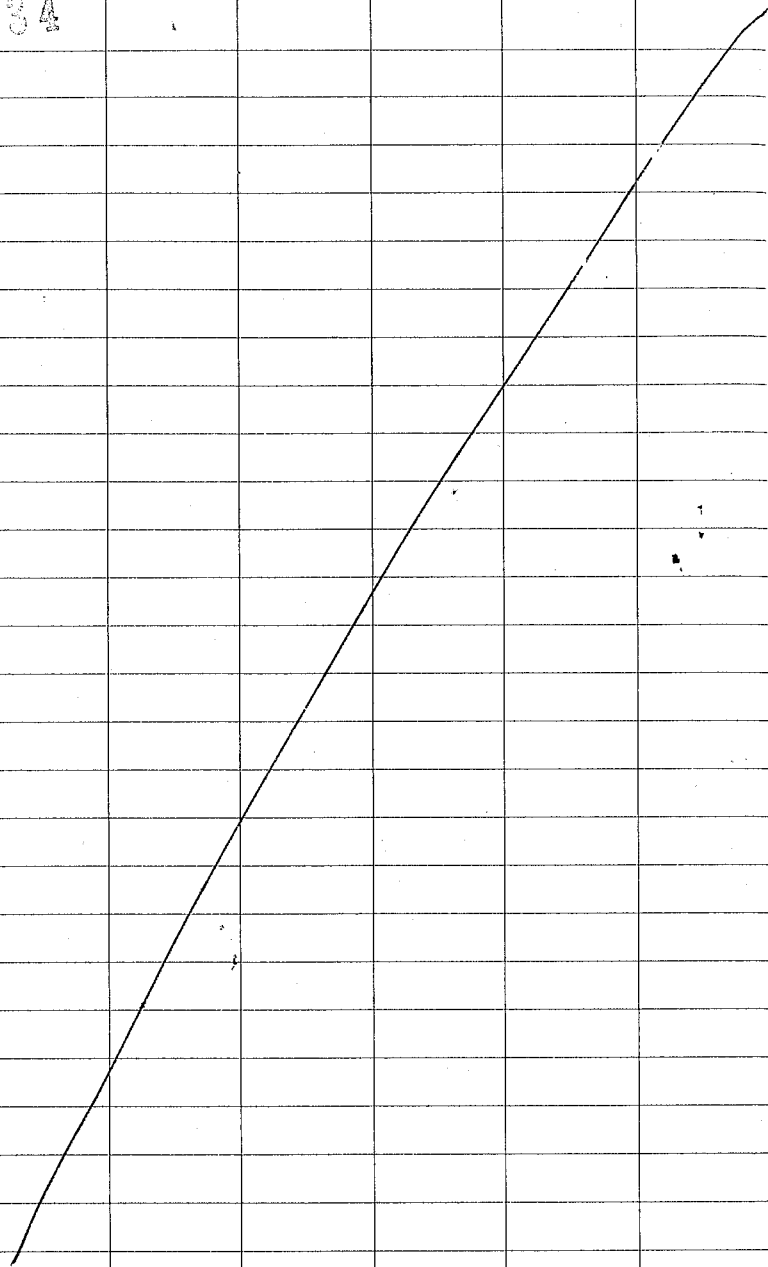
→ Two sample frames were chosen based on the contouring of the survey results, one frame NS + one TEW across the ore body. Locations are recorded in JOP's field book. Samples were taken by JOP about every meter, ECP photographed the entire length of each frame.

→ After lunch ECP IR, & JOP field checked the western portion of the 4 km² geologic map. Some outcrops of T₂ were absent, affecting structural interpretation on the map. Reps will

revise And re-submit
the map.

6/29/92 1ST VISIT TO
Santorini ECP

We have spent the past
week becoming familiar
with the local geology;
trying to sort out the
volcanic sequence both
for the Minoan eruptions
and the earlier volcanics.
We were also waiting
on the archaeologists to
arrive from Athens. Doreau
arrived this morning and
will give us a tour of
the site + discuss
possible research.



10:15 AM

Domo Counts 6/29/82

- vine roots found as deep as 7m into the till
 \Rightarrow some moisture at least that deep.
- Pigments:
 blue = "Egyptian Blue"
 yellow/red = ochres local
 blue/green = perhaps local Cu-ores
- Some artifacts are "completely oxidized"
 see 2nd conf. volume
- Pb artifacts are better preserved than Bronze
 some bronze completely gone
- * \rightarrow at A Home had bronze "vessels" which were completely oxidized (found in 1969)
 wrapped in straw and sitting on the bedrock

"ignimbrite" Volcanics, under collapsed ~~bedrock~~ EOP debris.

6/28/92

only 2-3 meters from the main channel of the "forest."

buried only perhaps 2 m beneath building debris & alluvium.

- some of the vessels were 10-30 cm across

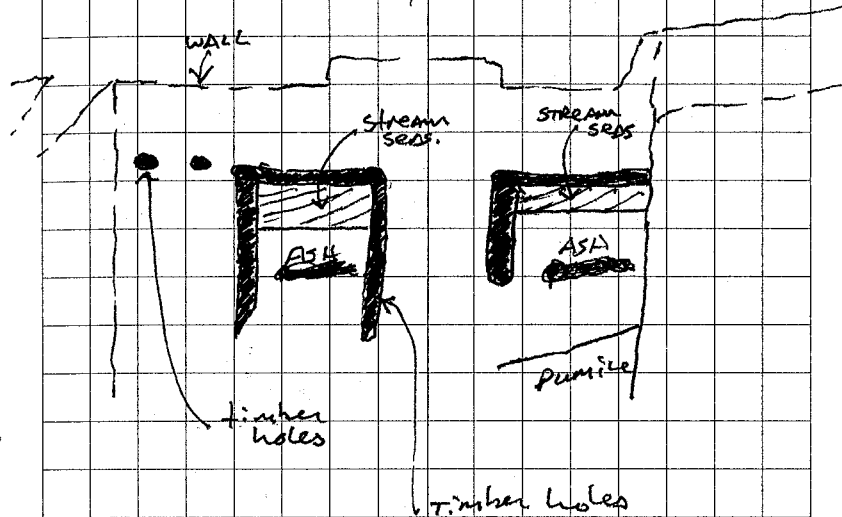
UPSIDE Down Bed Site
~4-5 m west of Room
D15

- excellent outcrop of pumice overlain by ASH with what is interpreted to be a destroyed bedframe upside down, along part of this site a 10-30 cm layer of pumice

remains above the paleosurface
* \Rightarrow a good place to try a metal detector

Along the main channel, immediately west of the channel just N. of the main public entrance

Have doorways which are as:



\rightarrow indicates episodic (?) infiltration of the mss by runoff water from the main channel

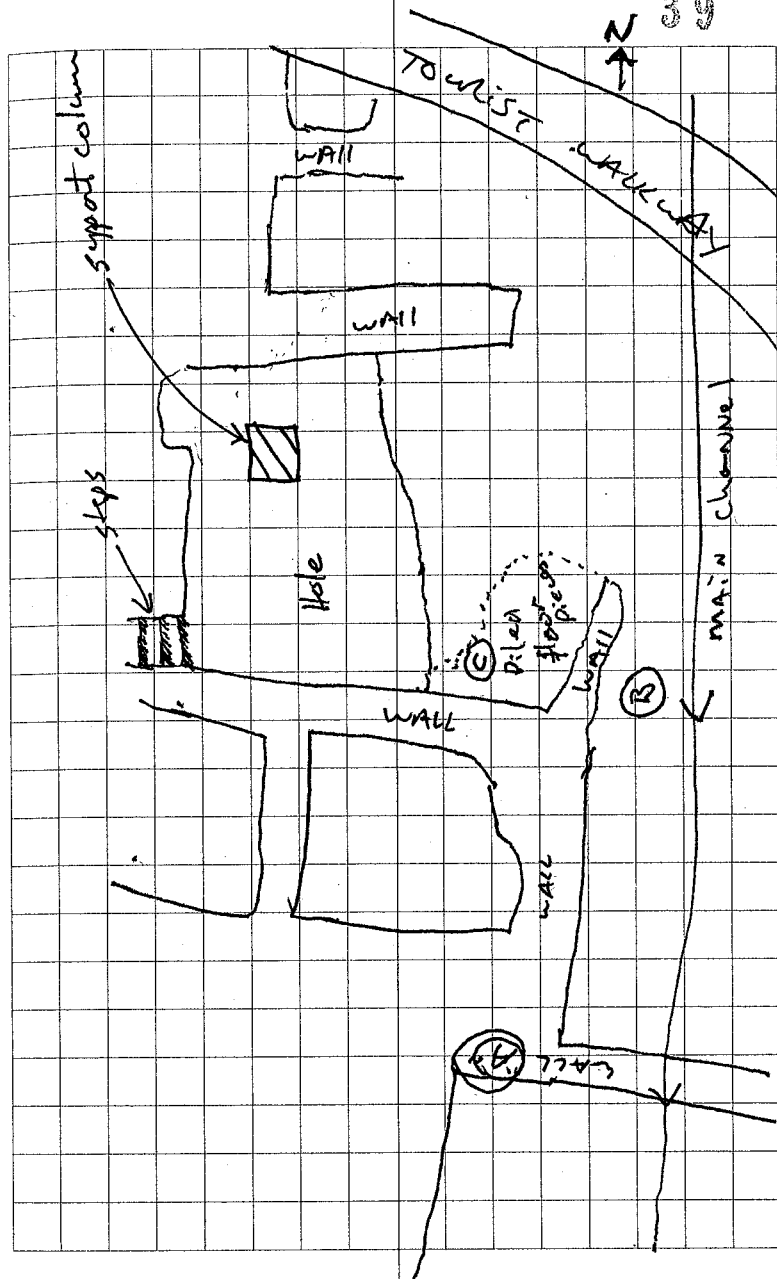
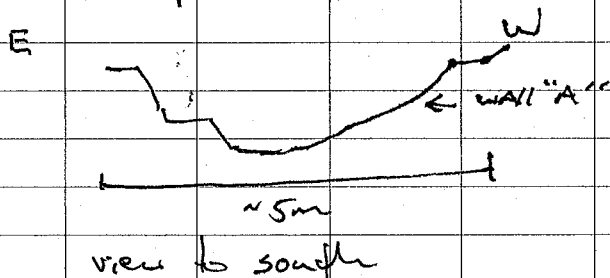
AT A House, bronze
artifact location

- see also pages 35-36,
this notebook

→ At this location, had
relatively large (10-30cm)
bronze vessels found on
the volcanic bedrock paleo
surface

→ referring to the location map on
page 39.

At location A have a wall which
extends perpendicular to the
main erosion channel and which
preserves an indication of
the paleoslope as:



→ By inference from wall A, the elevation of the paleosurface upon which the bronze was found was about $\frac{1}{2}$ m below the stream base at that point; also by inference from surrounding wall slopes, the ~~the~~ ECD depth of the ^{6/28/92} original, pre-excitation cover at that point was ~ 1.7m at location C

→ at location B there is evidence of a mud puddle w/ mudcracks about 2m from the bronze location

6/30/92 ECD

Sampling of bronze artifact location at Room A3

- coordinates of location recorded in RTG field book
- what is preserved at present is a layer about 5-8cm thick described by Downes as a "packed earth" floor which rests on the volcanic rock floor
- initial excavation was Sept. 1, 1970
- the top of the artifacts ~~was~~ located ~ 80cm above the current surface
- samples taken, recorded in W.M. Murphy notebooks.
- the deep basement here may be EARLY CYCLOPIC, ~1000 yrs older than MINOAN AKEOT.

CLAIRY PALYVON

MESSENIAS 1

ATHENS 15234

EXCAVATION AT

THULA I-III

MALIKNATOS 1967-1974

CAN. PURCHASEon view at the
American SchoolELEVATIONS:BASE of AS steps 25.97 m
above sea level

- THE BEDROCK beneath the
packed earth floor now
slopes steeply to the South
dropping some 5 cm over
~ 20-30 cm distance
- THE crevice South of the
preserved patch of
packed earth floor appears
to be a natural fracture
& may be lined w/ a
caliche-like material
- there are also fractures
in the bedrock walls of
the "cellar" ~ 2 m west
C. Dano

of the bronze artifact
location. Some of these
are relatively large
extending ~ 2 m
vertical; they may
extend underneath the
packed earth floor
where the bronze artifacts
were found.

FLOYD McCoy TACK: 6/30/92

→ the panice & ASAT were
emplaced essentially cold,
NOT HOT

Archaeological Society
Porephstionis 22
Athens

* - MARIANTOS Volumes 1967-1974
exp. Vol 4 1971 for 1970 season

IGME

61 MESSOGIAN ST.

Athens

70 Messogian St.

779 8412

see Mr. FYTIKIAS

(Geochemist)

MAPS AT 86
Messogian

* - Geologic maps

NATIONAL Archaeological Museum

→ Get Note from Donnas?

"X" = bronzes

* see + describe
artifacts

"π" = Potteries

* buy slides of
Aktionis
artifacts

X₁, X₂, X₃, X₄, X₅

Baking
Dish

3 ewers + 2 baking dishes

+ 1 goblet with a Pb piece

Donnas says these artifacts
are on display.

P17 v.4 Mariantos

* → a Pb weight was with
the bronze as well in the
NE corner of Δ3

~~6/~~ 7/1/92 [CP]

AT Room Δ3 samples taken
from the pile of
flagstones, these stones
covered the NE corner
of Δ3 over the spot where
the bronze artifacts
were found. Sample
descriptions + reference
Numbers will be in
WARM's notebook.

July 1, 1972 E.C.P. 47

Notes from Vol. IV of
 "Excavations at Thera"
 by SPYRIDON MARINATOS
 ATHENS ¹⁹⁷¹ ~~1970~~ by the
 Archaeological Society of
 Greece
 (1970 season)

NOTE: THIS volume was not available
 for purchase, so I am
 MAKING ADDITIONAL NOTES AT
 THE library of the
 archaeological society where
 they have no xerox machine.

P.5 "The waters of the torrent
 have now been definitively
 Averted."

P.7 • stratigraphy from "our well
 ... 100 m. South of the
 excavation."

"THE LAYERS were AS follows:
 The uppermost layer, between
 four and five metres thick,
 is volcanic dust (aspa

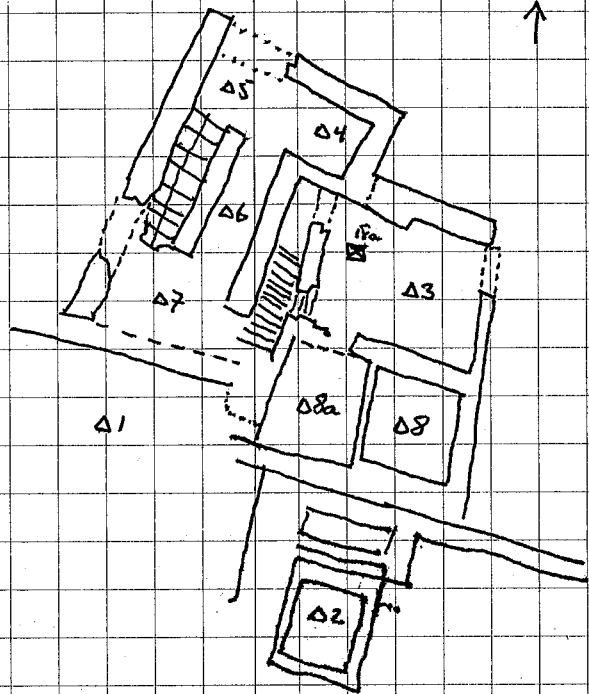
according to the local dialect). It contains SAND and other impurities AND is of a light grey colour. THIS LAYER is common in most parts of the AREA under excavation. Deeper down we met a layer of gravel AND SAND of 1.80 m. thick. THEN came pure ASHA, white AND soft 4 m. thick. At ten metres deep we met the pumice and after one further metre of depth we found the much desired water. Our well lies in the bed of the torrent, that is, at the deepest point reached by erosion. The depth of 11 m. at which we found water (brackish but quite drinkable) is just a hardly 1 m. above sea level."

p. 8 "Throughout the excavation, the ruins are generally buried in the pumice. Yet, the thickness of this latter layer rarely reaches 2 m. in the Akrotiri region. At times, the layer is very thin, only a few centimetres thick. At times it is totally absent."

From the map inset between pages 8 AND 9, I determined that the "well" for the roof support pillar at room AS is DESIGNATED well "15a." NO! THE correct DESIGNATION is "18a," confusion resulted from very small lettering, but the correct designation is APPARENT from TEXT on p. 9.

"QUARTERS Δ3 EAST of the aforementioned staircase and the «Altar» (shrine), there appeared another peculiar staircase made of stone (between Δ7 and Δ3 on the plan). It is very steep and very narrow. ITS steps consist of one or two stone-slabs each. The staircase has 3 flights. One flight of steps descends from the North, another from the South. And after having covered 5 steps, these two flights meet on a common threshold (pl. 19a) from which a third flight descends eastwards. The staircase is so steep that due to the disintegration of the wall, it is with great difficulty that one can distinguish 2-3 steps which end at a well preserved door (pl. 19b),..."

continued on
PAGE 52



THIS is a tracing of A portion of PLAN I, between pages 7 and 9

0 1 2 3 4 m

Continued from p 50:

"... ~~on~~ (pl. 19b), leading to Quarters Δ3 and the underlying cellar.

The excavated space beyond this door is one of the most peculiar. There were no walls to the East, but the space was packed with vessels and a jar which were literally suspended in the air (pl. 20a). On the photo one can see the common threshold of the triple staircase and the door with its jambs. How the staircase continued further down to the underlying Quarters Δ3 is not clear. It was perhaps a wooden one. It possibly took a bend to the North where a construction can be seen, like a buttress. It is not yet clear, if it is in place (pl. 20b). On the left we can see the jamb of the

aforesaid door, on the right a second jamb, and, between them the «buttress». Under the base of this construction, which becomes narrower in the lower part, we found the sunken stone-paved floor of a room. It can be seen at the bottom right-hand side of the picture and still better on the next pl. 21a. The flagstones were large and well-made but were preserved only in the N.E. part of the room, the EAST wall of which we had found in the meantime below the river bed. This room ^{exp 7/1/32} ~~is~~ was numbered Δ3, but it soon appeared that below it there was also an underground room cut into the rock. This is the only one of its kind so far, and that is why

it was named «cellar».
On pl. 21b appears very clearly the hole through which the remaining part of the paved floor slid into the cellar so that the N.E. corner (right) remained as if suspended.

According to the corresponding mention in the Journal of the Excavation (31.8.70) the central flagstones of the room «SANK DOWN to approx. 2m. deep», where «I ran into a new layer of pots and sherds. These are mostly coarse but there are also some beautiful sherds. A funnel-shaped rhyton is clearly distinguishable ... to the East side, one can distinctly see the cut in the rock and one wonders whether this could

be an underground room destined either as a place of worships or as a store-room».

Thus, we have ascertained that at this point of the dig we have at least four storeys (pl. 22a). The cellar, the first ground-floor (with the portion of its floor which escaped sinking), the second ground-floor, accessible from the North courtyard, with the staircases just described, and the upper storey on the floor of which there is the «altar». The wooden passage in pl. 22a is at a slightly lower level than this floor. It remains unknown whether there was still a higher storey or leastways the single attic on the roof which we know

from Egypt and from
KNOSSOS (faience «Town
Mosaic»).

P Further excavations
showed that not only the EAST
wall of the room is cut into
the rock but that the
rock is hewn further in the
N.E. corner. It forms a
kind of vaulted niche or
passage which was lined
by heaps of vessels, a very
large number of which also
covered the floor. Pl. 22b
shows the upper part of
the hewn rock literally
packed with vessels.

Only later on, after the
experience we gained
from the «Lilies Room»
(A2) did it cross
our minds that the
jars had probably been
stored there in haste

to protect them from further
earthquakes.

P This might also
explain the discovering of
still more precious finds.
At the level of the pavement
we had already uncovered a
bronze spouted goblet (pl. to 9/6
further on). From the asps
that had been deposited there
we sifted a stone-stopper of
a circular pyxis, a lead
weight and other smaller
objects (I. 9. 70). But on
the next day, under the
flagstone-floor, the first
Theran hoard of
bronze vases was found. It
is totally analogous to similar
utensils found buried in
the houses of KNOSSOS
(an earthquake, most
probably the same earthquake,
was the cause) and to

bronze vases found in the Royal Shells of Mycenae. Here the objects were found gathered closely together (pl. 23a). From the remains of an organic substance which had been imprisoned within the oxydation of the largest of the vases, we deduce that they must have been wrapped in a thick cloth (or perhaps a thin straw mat). The vessels were 3 ewers and two baking trays (see further pl. 92-95). In the photo can be seen the fossilized traces of the «mat» on the belly of the large ewer."

[quotation ends at the top of page 18]

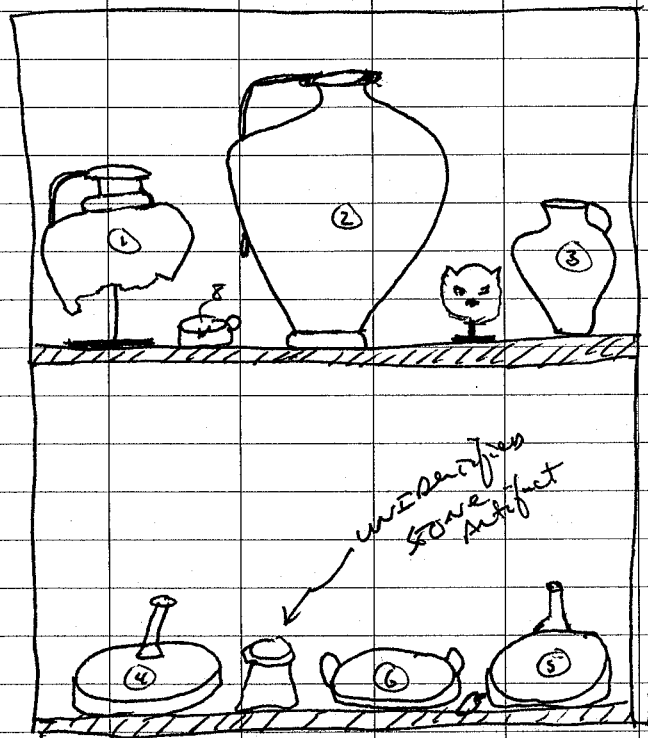
ECP July 1, 1992

July 1, 1992 ECP

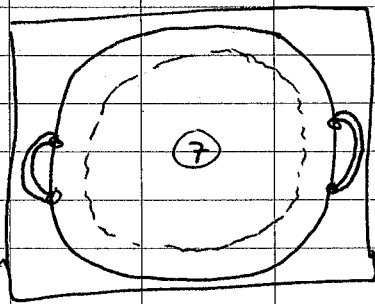
OBSERVATION of the bronze artifacts from Δ3 at the National Archaeological Museum in Athens

- THE BRONZE artifacts ARE DISPLAYED TOGETHER ON THE 2ND FLOOR OF THE MUSEUM IN A GLASS CASE. A LARGE BAKING PAN IS IN ANOTHER of the cases nearby & MAY ALSO BE FROM Δ3. THE LABELS ON THE EXHIBITS ONLY IDENTIFY THEM AS FROM AKROTIRI. I HAVE IDENTIFIED THEM AS FROM Δ3 BASED ON THE PHOTOS IN THE MARIANATHOS' VOLUMES FROM 1970 EXCAVATIONS.
- WITH PERMISSION OF THE GUARDS, I TOOK PHOTOGRAPHS OF THE PIECES, WITH & WITHOUT FLASH.

IN THE MAIN CASE:



IN A SEPARATE CASE:



→ THE NUMBERS ON THE SKETCHES ON PAGE 60 ARE MY OWN, FOR REFERENCE IN THESE NOTES.

→ EWERS 1, 2, & 3 APPEAR TO BE THESE FROM D3, AS DO BAKING DISKS 6 & 7 AND THE GOBLET / CUP / CAMP 8. I BELIEVE SKILLERS 4 AND 5 ARE FROM ELSEWHERE.

→ MAXIMUM DIMENSIONS OF THE ARTIFACTS ARE EXHIBITED (ESTIMATED)

- ① 25 cm Height, 30 cm width
- ② 55 cm " , 40 cm width
- ③ 25 cm " , 20 cm "
- ④ 30 cm DIAMETER
- ⑤ 30 cm DIAMETER
- ⑥ 30 cm DIAMETER
- ⑦ 45 cm DIAMETER
- ⑧ 10 cm DIAMETER

General comments:

ALL OF THE Pieces are heavily covered with coatings of Blue/Green copper-based alteration products covering most surfaces, portions of the surfaces are, however, relatively smooth and dark brown to black in color. The Blue/Green corrosion products are as thick as several millimeters in some areas.

#1 THIS EWER IS THE MOST DAMAGED. IT HAS MANY CRACKS & HOLES & ITS BASE IS MISSING. IT IS THE MOST ORNAMENTED OF THE Pieces & THE DESIGNS ARE CLEARLY VISIBLE. Some of the soil in which the piece was buried adheres to the corrosion products. This soil appears to be a medium grained sandy material. Quartz (?) grains are visible on some patches.

In other areas, the material appears finer-grained and could be ASH. There may be some DARK LITE fragments attached in places.
Ref. No. "BE. 1"

#2 THIS IS THE LARGEST EWER, AND THE BEST PRESERVED. IT IS NOT CRACKED AND HAS NO HOLES APPARENT. ON ITS LEFT SIDE (AS DISPLAYED) AT THE LEVEL OF THE BELLY & BENEATH, THE EWER IS DENTED IN. IN THIS DENTED AREA (~20 X 25 cm) DARK SANDY MATERIAL ADHERES TO THE CORROSION PRODUCTS. THIS "SAND" APPEARS SIMILAR TO THE LESS ABUNDANT MATERIAL ON #1 AND IS REMINISCENT OF THE ALLUVIUM WHICH INFILLS DOOR AND WINDOW SILLS IN A HOUSE ALONG THE TORRENT. BELOW THE BELLY, AT THE BOTTOM OF THE DENTED AREA, THE ATTACHED MATERIAL IS LIGHTER COLORED, AND MORE FINE-GRAINED AND APPEARS

to be volcanic ash or perhaps a fine-grained, light-colored mud. All of this ATTACHED EARTH MATERIAL HAS A surface with a texture similar to straw fibers, the "fibers" have different orientations but are similarly oriented over small areas (1-5 cm²).

COULD THIS BE THE REMNANTS OF THE "CLOTH" or "STRAW MATS" DESCRIBED BY MARIANATOS? Some of the ADHERED soil (?) APPEARS TO BE AS MUCH AS 0.5 cm THICK.

#3 THIS EWER IS HAS MANY SMALL DENTS + CRACKS. THERE IS SOME LIGHT-COLORED SANDY MATERIAL ADHERING TO THE CORROSION PRODUCTS. IT HAS SOME ORNAMENTATION, BUT NOT AS MUCH AS #1. THE BACK SIDE OF THE PIECE (AS DISPLAYED) HAS A LARGE DENT AND IS PUSHED IN NEARLY TO ITS

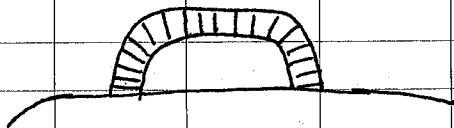
AXIS. DETAILED OBSERVATION OF THIS SIDE OF THE EWER IS NOT POSSIBLE AS IT IS POSITIONED.

#6 THIS BAKING DISH HAS A SIMILAR AMOUNT OF CORROSION TO THE EWER. THERE ARE NUMEROUS CRACKS + DENTS IN ITS BOTTOM SURFACE. THERE MAY BE SOME SOIL ADHERING TO ITS SURFACE, BUT NOT MUCH. CERTAINLY LESS THAN THAT REMAINING ON THE EWERS. THE BOTTOM OF THE PAN HAS ONE LARGE HOLE WHICH DOES NOT APPEAR TO GO COMPLETELY THROUGH, BUT DOES SHOW NUMEROUS (>15) THIN LAYERS OF CORROSION. THIS PIECE IS NUMBERED: "BE 1974.6"

66

#7

THIS LARGE BAKING DISH IS
NUMBERED: "BE 1974.1"
AGAIN, MATERIAL ADHERING TO
ITS SURFACE APPEARS TO BE
A MIXTURE OF SAND + ASH OR
MUD. CORROSION PRODUCTS ARE
UP TO SEVERAL MILLIMETERS
THICK. THERE ARE NO
OBVIOUS CRACKS, DENTS OR
HOLES. THE HANDLES
HAVE A CONVED PATTERN OF
GROOVES ENCIRCLING THEM AS:



THIS PATTERN REMAINS WELL-
PRESERVED.

5th trip to Peña Blanca 67

PARTICIPANTS include: ECP
E. PEARCY - CNURA 8/31/92
W. Murphy - "
J. Prieknyl - "
L. KOVACH - U.S. NRC
I. Reyes - UACH

- ON 8/20/92 traveled from
SAN Antonio to Chihuahua City
- ON 8/31/92 purchased supplies
(i.e. food) AND went to
the Nopal I CAMP, traveling
in a VAN supplied by
the Universidad de Chihuahua
(UACH) Autonomia
- afternoon of 8/31/92 we
reviewed maps and
structural and mineralogic
interpretations to update
L. Kovach AND I. Reyes;
AND then moved to
the deposit where we
tried to establish clear
cross-cutting relations
among fault sets AND
where we chose

specific locations for
detailed sampling and
γ- surveys.
specifically: the western
border of the
U-zone at ~12 m east

AND: the major E-W
fracture set
with obvious FeOx
staining.

24
8/25/94

SAMPLES OF E-W 69

fracture Filling by
I. Reyes 8/ ECP 9/1/92
9/1/92

fracture LOCATED
generally E-W from
0 m east to ~1/4 m E
between 13 m North
and 14 m North.

ALL samples in this
set are from ALTERED
in function and will
be collected by
- steel ECP 9/1/92
steel knife blade.

Samples consist of FeOx's
and perhaps MnOx's
± calcite ± silica
locations of EACH recorded
next.

NAP-ECP-

0.0 East	13.40 North
0.7	13.44
2.70	13.56
3.78	13.70
5.05	13.73
6.15	13.96
8.45	13.82
9.40	13.61
10.10	13.48
11.05	13.36
12.22	13.35
13.20	13.28
14.60	13.43

Above recorded by
E. Reyes

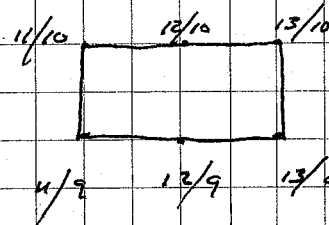
ECP
2/1/92

Are coordinates for
E-W vein filling samples
described on p. 69.

71

ECP 2/1/92

→ 2 m² Area from
coordinates:



remapped at greater
resolution to try to resolve
the pattern of U distribution
across the ore body
boundary and its relation to
fractures, fracture abundance
and FeOx occurrence.

→ JDP conducted a gamma
survey on the above
described area at a
0.20 m spacing, including
remeasuring the corner points
measured during the MAY '92
trip.

→ Excellent correspondence
was found to the May
values

→ with the increased

resolution the "simple" N-S trending boundary. Apparent with $1m \times 1m$ readings is gone, the higher resolution contours are roughly parallel (||) to the N-S boundary, but more complex.

→ There new γ readings were recorded directly onto a map of the area at a scale of $1" = 0.20 m$.

→ After the γ mapping, the 2nd area was mapped by ECP for fractures, alteration, and chlorophane occurrence.

→ There is only a very general relation between the mapped

fracture and alteration patterns and the γ intensity map.

→ The γ map was made using the same scintillometer as during the May trip with also the same operator (JOP) (see p15 this notebook).

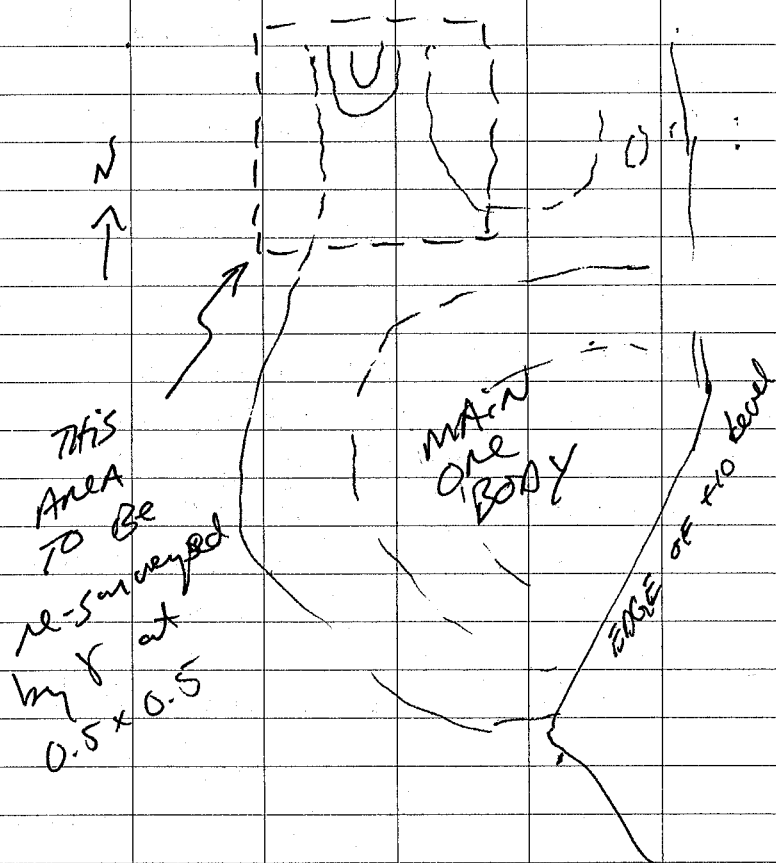
→ The geologic map by ECP was also done at $1" = 0.20 m$ for comparison.

9/1/92
ECP JOP + ECP LAID OUT NEW boundary PK nails along the N edge of the cleared area in order to bracket the anomalous high identified in the May trip.

→ JOP will re-survey that area at a $0.5 \times 0.5 m$ spacing to try to clean up its relation to

the lower grade areas
(i.e. lower γ areas)
to the E + W and
its relation to the
main ore body.

→ generally the
relations are:



9/1/82
EOP

→ 1 sample of opac crust
collected from
location 19.0/5.0 on +10 level
(which is the sample No.)

→ this crust is on fracture
surfaces in heavily
FeOx altered Tn.

→ THE idea here was THAT
THE EDGE OF THE +10 level
was the part closest
TO THE PALCO HILL SLOPE
(i.e. THE PRE-MINING
ground surface)
AND might have seen
ground water more
recently THAN OTHER
PARTS of the +10 level,
THE Abundant FeOx
MAY support THAT
relation — or may
BE coincidence.

→ Looking for a mobility
w/in the LAST 10⁶
years.

9/1/92 ECP

- samples taken perpendicular to E-W fracture sampled laterally (i.e. along its length) by I. Reyes.
- PHOTOS TAKEN before sampling
- ALTERED T_n
- sample No.'s = location on grid.

9/14/92
 sample NOPI-ECP- 4.5/13.80
 = 1st sample immediately N of fracture, including N side of fracture surface

GOING TO THE N!

9/14/92 NOPI-ECP- 4.5/13.83
 " " 4.5/13.86
 " " 4.5/13.90

measurements are to the approximate center of

the sample

Now, samples to the South of the fracture!

9/14/92
 NOPI-ECP- 4.5/13.77 includes some of the veinlet itself. AND wall rock to the south.

9/14/92 samples further south:
 NOPI-ECP- 4.5/13.73

" 4.5/13.65

" 4.5/13.62

9/2/92 ECP

- WORKING ON THE SAME E-W fracture as just described above, I will now collect another sample set perpendicular to the fracture at a location closer to the ore body (9.95 EAST)

9/14/92
NOPI-ECP-

Sample 9.95/13.5/
is the N side of the
fracture and the
nearest material just
N of the fracture.

Then, sampling to the N:

9/14/92

NOPI-ECP- 9.95/13.55

" 9.95/13.60

" 9.95/13.63

AGAIN, LOCATIONS N ARE
MEASURED TO THE
APPROXIMATE CENTER
OF THE SAMPLE.

→ all of these samples, AND
those to the S. of
this portion of
the fracture are of
altered Tn formation

Now sampling to the S of
the fracture.

9/14/92
NOPI-ECP-

→ Sample 9.95/13.48 includes
the S. side of the
fracture itself.

AND to the South:

9/14/92

NOPI-ECP- 9.95/13.45

" 9.95/13.39

" 9.95/13.33

208 9/29/92 Note: check sample No. 5
NOPI-ECP-43 + 44
which were collected
by WMM AND noted in
his field book. Collected
for permeability tests.
fresh Tn.

9/2/92 ECP

Observations of
fault relations at
Nopal I.
on level +10 wall

- ① low \angle left dipping
- ② near vertical right
dipping
- ③ near vertical
left dipping

on level +20 wall

- ① near vertical
- ② $\sim 45^\circ$ right dipping

-
- | | | |
|---|-------|----------------------------|
| ① | early | low \angle of calcite |
| ② | near | vert. st. dip |
| ③ | later | low \angle
of calcite |

Sample No. Nopi-ECP-46
of "vapor phase" quartz
collected on
level +20 at control
point No. 28, for
fluid inclusion work,
from the Tn formation
9/2/92 ECP

Sample
Nopi-ECP-28.3/13.0

9/2/92
ECP
Altered Tn from
"point" on level +10
cliff. This sample
was collected from the
point closest to
the pre-mining,
paleo ground surface.
That is, the point of the
one body most likely

to have been
weathered.

ECP 9/2/92

5/10

15/10

15/20

5/20

These are the
coordinates of the
flag crosses used
to photograph the
cleared area.

6th TRIP to Peña Blanca

MARCH 21 - 25, 1993

ECP

→ flew in to Chihuahua City
evening of 3/21

→ morning of 3/22
purchased food + supplies
and drove to Peña Blanca
with IGNACIO Reyes

→ Participants: ECP }
BWL } CNURA
JDP }

(IR) IGNACIO Reyes
(UACR)

ALSO ALONG ON THEIR OWN MAP,
BUT STAYING AT THE NOPAL I
CAMP WITH US ARE:

P. C. Goodell

Kathy Goodell

AND students: Virginia

Carey (sp?)

Cindy

all of UTEP

→ Afternoon of 3/22

→ looked over
newly cleared

Areas of Level +10 +
level 00 to try to
quantify subcutaneous work
with IR.

Area North of orebody
on level +10 HAS

been cleared from:

Cliff edge west to
the Zero line

AND N to +40 + +45m

→ LOOKS very good.

Area south and west of
orebody has been
cleared South to

- 5m AND west to

- 10m, A corner

still exists AT

(0, +5) so the

EW vein AT ~14m N

Does not HAVE

Any newly cleared
area.

but the cleared area S + W
looks good.

→ Afternoon of 3/22 Spent
repairing the original
grid control markers
AND establishing control
markers and nylon tulle
grid on the newly
cleared areas

→ Sample locations referenced
to this grid will have
an uncertainty of
ABOUT $\pm 5-10$ cm

3/23/93 ECP

- This morning JDP + IR begin
survey of newly cleared
areas of Level +10.
- We are using a 1m x 1m
grid just as before.
- We are using the SAME
meter + detector as
for earlier measurements.

that is:

Cudlum Model 14C
Geiger Counter with a
model 44-C gamma probe.
(meter serial No. 83561)

→ The γ readings are being
recorded directly on
a bore map showing the
reference grid locations.

→ Bwl is setting up to
sample BH12 in which
water still occurs
even though there has
been no rain or other
pptn since Dec. 19, 1992
when there was about
a 10cm snowfall.
This persistence of water
in BH12 suggests that
we are sampling a
perched water zone
rather than just
rain water runoff into

a borehole.

→ ECP will make observations/
measurements of the EW fracture
at 14m N to compare with
U measurements ALONG AND
perpendicular (\perp) to the
vein.

OBSERVATIONS ALONG EW fracture

0.30 @ ~14m N:

→ 0.10m East: Aperture ~2mm

ECP ALTERATION - FeOx ALONG EW frac.
3/23/93 - FeOx ALONG fract. is

approximately symmetric N + S
with a width of ~10cm.

THIS WIDTH IS VARIABLE

± 5 cm. Extent of FeOx
also appears to be related to

SMALL fractures which
intersect the main EW frac.

THESE SMALL fractures HAVE
apertures $\ll 1$ mm AND NO
discernable fillings.

200 3/23/93

~~0.0~~

4.5 m East:

Aperture: ~3 mm

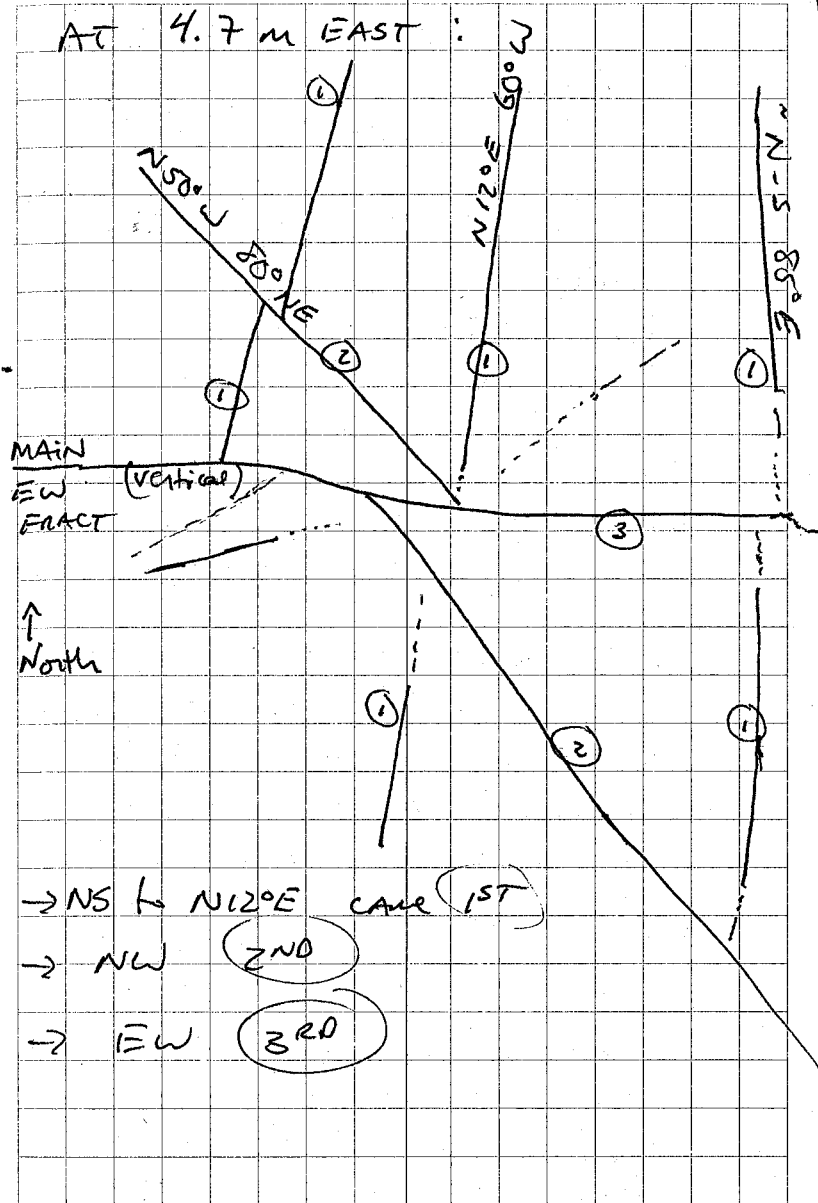
ALTERATION: ABUNDANT FeOx
vein filling; A light
colored clay altered
selvage ~2-3 mm wide
occurs along the vein.

(Note: AT 4.7 to 4.8 m East,
this clay ALTN is 0.5 to
1.0 cm width)

Outside of the thin-clay
altered zone, the host
rock is generally redder
than elsewhere nearby, but
there is no obvious FeOx
staining as at 0.3 m East.

There are Auxillary fractures
at this point, some of
which crosscut the
EW fracture, these also
have an identical
alteration to the EW
fracture.

AT 4.7 m East:



AT 5.9 m EAST ; 13.7 m North
 APERTURE 1-2 mm

ALTERATION, veinlet filled w/
 FeOx; There is A distinct
 light colored clay Alteration
 selvage ~2 mm wide Along
 the vein. Irregular
 FeOx staining outside the
 clay alt'n selvage, the
 FeOx staining has a maximum
 width of ~1 cm, but is
 ABSENT in some places

AT 5.9 m EAST ; 13.85 m North

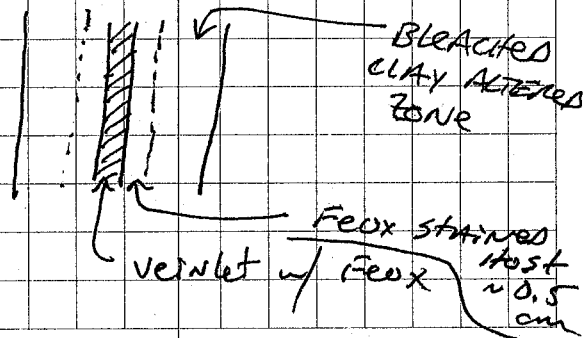
AT THIS point the EW fracture
 is more Diffuse with
 abundant small intersecting
 fractures; NO meaningful
 "aperture" is measurable.
 The central part of the
 EW fracture is
 encrusted with FeOx AND
 there is AN easily visible
 PATTERN of FeOx ALONG the
 face of the vein. The

FeOx staining extends to both
~~either~~ sides of the fracture
 ECP 3/2/93
 to a distance of ABOUT 6 cm.

THE central part of the EW
 vein / fracture at this point
 ALSO HAS CLAY ALTERED MATERIAL
 mixed in with the FeOx, though
 the relationship is jumbled.

AT 10.0 m EAST 13.5 m North

- Aperture: ~0.5 - 1.0 cm
- ALTERATION: ABUNDANT FeOx
 ALONG veinlet; BLEACHED ECP 3/2/93
 SELVAGE AROUND veinlet with
 width of 1.0 to 1.5 cm



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SAMPLES TAKEN 3/23/93 ECP
 Perpendicular to E-W
 Vein @ ~ 13.5 N.

I will take a third set
 of samples N and S of
 the vein to compare
 with those taken on the
 last trip.

Sample No's = location
 as:

NOPI-ECP- 0.30/13.36
 is the sample immediately
 S of the vein and
 includes the S side of
 the vein wall.

NOPI-ECP-
 → 0.30/13.34

NOPI-ECP- 0.30/13.31

NOPI-ECP- 0.30/13.28

NOPI-ECP- 0.30/13.26

93

NOW, Sampled to the
 North side of the vein:

NOPI-ECP- 0.30/13.41
 (this sample includes the
 N side of the vein.)

NOPI-ECP- 0.30/13.45

NOPI-ECP- 0.30/13.47

NOPI-ECP- 0.30/13.50

3/26/93
 * Notes - preliminary
 of all samples
 logged from NOPI-ECP
 to 313. From p 92 to p 97.

3/24/83

ECP 8/25/84

TODAY will sample Extension of EW vein @ ~14m North, complete sampling of BHIC + underground waters; AND complete sampling of EW fracture at N end of cleared area (~45m) AND collect caliche samples from crest top.

Sampling of EW vein @ ~14m N, extension

- this area cleared yesterday
- enough rain last night to wash off the dust

→ Samples Perpendicular (⊥) to vein:

NOPI - ECP - 5.40 / 14.20

is sample immediately South of the vein AND

including VEIN WALL.
moving to the S are:

NOPI - ECP - 5.40 / 14.16

NOPI - ECP - 5.40 / 14.12

NOPI - ECP - 5.40 / 14.08

NOW Samples North of the vein AT THIS POINT:

NOPI - ECP - 5.40 / 14.22

is immediately N of the vein AND includes some vein fill material (FeOx) ON TO THE North:

NOPI - ECP - 5.40 / 14.25

NOPI - ECP - 5.40 / 14.29

NOPI - ECP - 5.40 / 14.32

NOTE: 14.32 included a subsidiary FeOx-rich fracture.

VEIN FULL SAMPLES ALONG
EW VEIN EXTENSION

TAKEN BY I. Reyes 3/24/23
by scraping w/ a steel pocket knife

AT No.'s:

NOPI-ECP - (-) 1.15 / 13.77

NOPI-ECP - (-) 1.95 / 13.85

NOPI-ECP - (-) 2.95 / 14.05

→ NOPI-ECP (-) 5.40 / 14.21

(THIS SAMPLE TAKEN AT THE
POINT OF A ⊥ TRANSVERSE)

NOPI-ECP - (-) 7.25 / 14.15

NOPI-ECP (-) 6.30 / 14.32

NOPI-ECP (-) 7.25 / 14.15

AND 2 more taken by
Jim Prikeyl

NOPI-ECP - (-) 8.10 / 14.28

NOPI-ECP - (-) 8.95 / 14.60

Central crosses for Photos

2 Sets:

Southern Set AT:

0/0

10/0

10x10m

0/10

10/10

Northern Set AT:

10/15

10/30

15x15m

25/15

25/30

3/24/83 ECP

→ After lunch, JOP + ECP
photographed the
cleared surface and
collected chliche
samples from the
top of the Nopal I
cuesta (see JOP
note book).

→ At end of day, we
visited the ore pile
at the mill site.
ECP collected samples
of the plant used
for autoradiography
and took photos of
the plants on the
ore piles.

ECP 8/25/84
3/25/83 Packing to

Leave from the Nopal
Camp. We are leaving
some material behind
in the cabin:

(8) common dust masks

6 pair cotton glove liners

6 pair rubber gloves

5 Tyvek suits

Plastic sheeting

8 HEPA filters

3 masks

3 pair Tyvek boots

1 roll pink flagging

1/2 roll blue flagging

2 pair safety glasses

6 HDPE 1 liter bottles

→ Pet buffers 4, 7, 10
(~ 1/2 liter each)

→ 6E-7 photo GNO₃ ~ 1/2 liter

1 yellow carrying case

7/26/93 ECP

7th trip to Peña Blanca

ECP	JOP	IR
BWL	LR	Lauren Kovach

- Arrived in Chihuahua City evening of 7/25 from San Antonio
- morning of 7/26 purchased field supplies & drove to Nopal Camp.
- ^{ALL}MADE initial reconnaissance of newly cleared level 0 area
- IR. 5m x 5m control points surveyed for internal consistency & orthogonality
- 1m x 1m grid measured & tagged based on IR 5m controls
- Nikon strings & Altimeter tags used as before
- contact gamma survey begun by BWL & JOP
- Prior to beginning survey

γ meter was checked
Against previously
measured control γ
points on level
+10 m. Readings
on 7/26 were the
same at those points
as on earlier surveys.

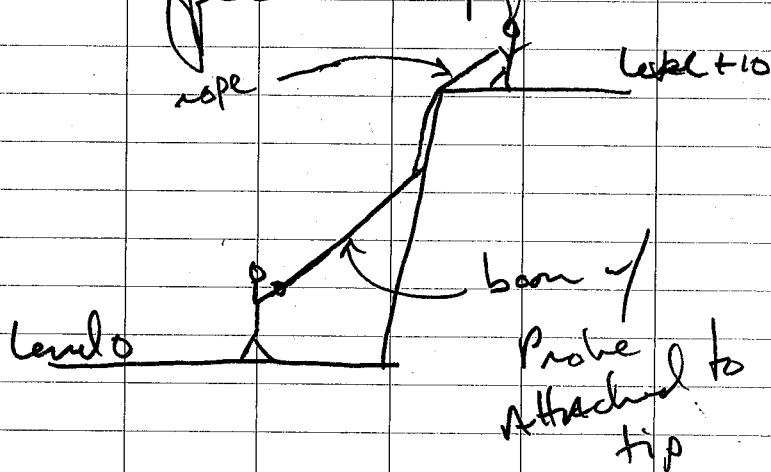
- current clearing has
not reached the
NE Bounding fault
on level 0. IR
estimates that it is
~ 3-5 beyond present
clearing.
- current clearing also
has not reached the
edge of the U anomaly,
though it has cleared
the U anomaly
limit.

7/27/93 ECP

- Tuesday: JDP + IR complete
Fl mapping of level 0
cleared area
- BWL constructs boom for
vertical face measurements
(8)
- ECP + LK review IR maps
of level +10, also
pull weeds which
had grown on N end
of level +10 cleared
area since last
trip. IR map is OK
some questions about
faults + alt'n, no major
complaints, questions
easily resolved.
- ECP + LK also repaired
5m x 5m location
grid (NAILS + tags on
level +10m, North
END.

- Before lunch, we tried out the boom / block + tackle arrangement for the vertical face & measurements. No good, the & probe swings & jolts too much, difficult to position & may destroy the probe.

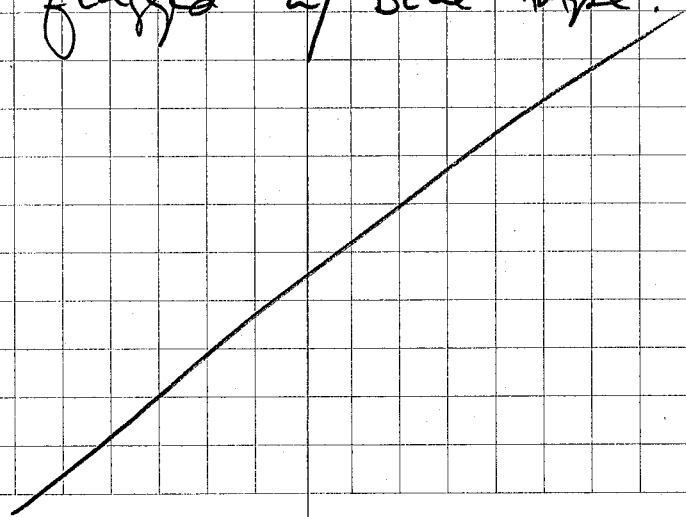
- After lunch:
Now try + different arrangement!



This arrangement allows good readings, but requires 4 people.

→ & mapping of vertical face completed !!!

→ used remainder of Day to complete maintenance on Level +10 in sample location grid, every 5m x 5m control point was tagged & flagged w/ Blue tape.



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7/25/93 Wednesday

ECP

- This morning BWL has collected additional samples of vein filling material from the 13.5m fracture on level +10m
- JDA has collected samples along traverses in level 0 cleared area, guided by geology & the survey
- ECP + LK + IR reviewed the geologic mapping of level 0. Needs more detail, level of detail is inconsistent from one area of the map to another

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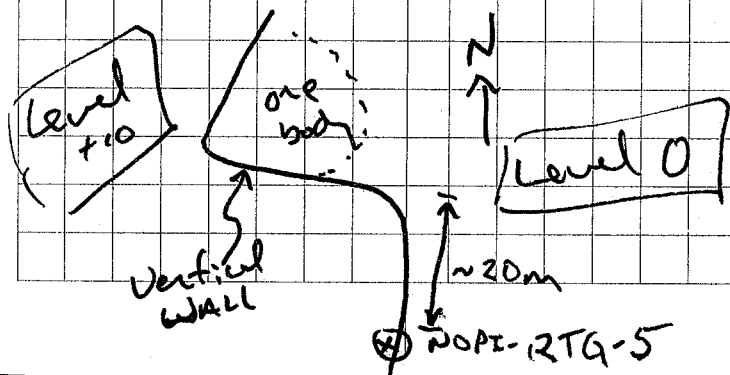
- ECP collected a sample of Nopal function tuff for hydrologic characterization. Alteration of this tuff is intermediate to the most altered and the next-most altered collected for hydrologic characterization on the last trip.

Sample No:

NOPI - RTG - 5

from vertical face between level 0 + level 10

At location:

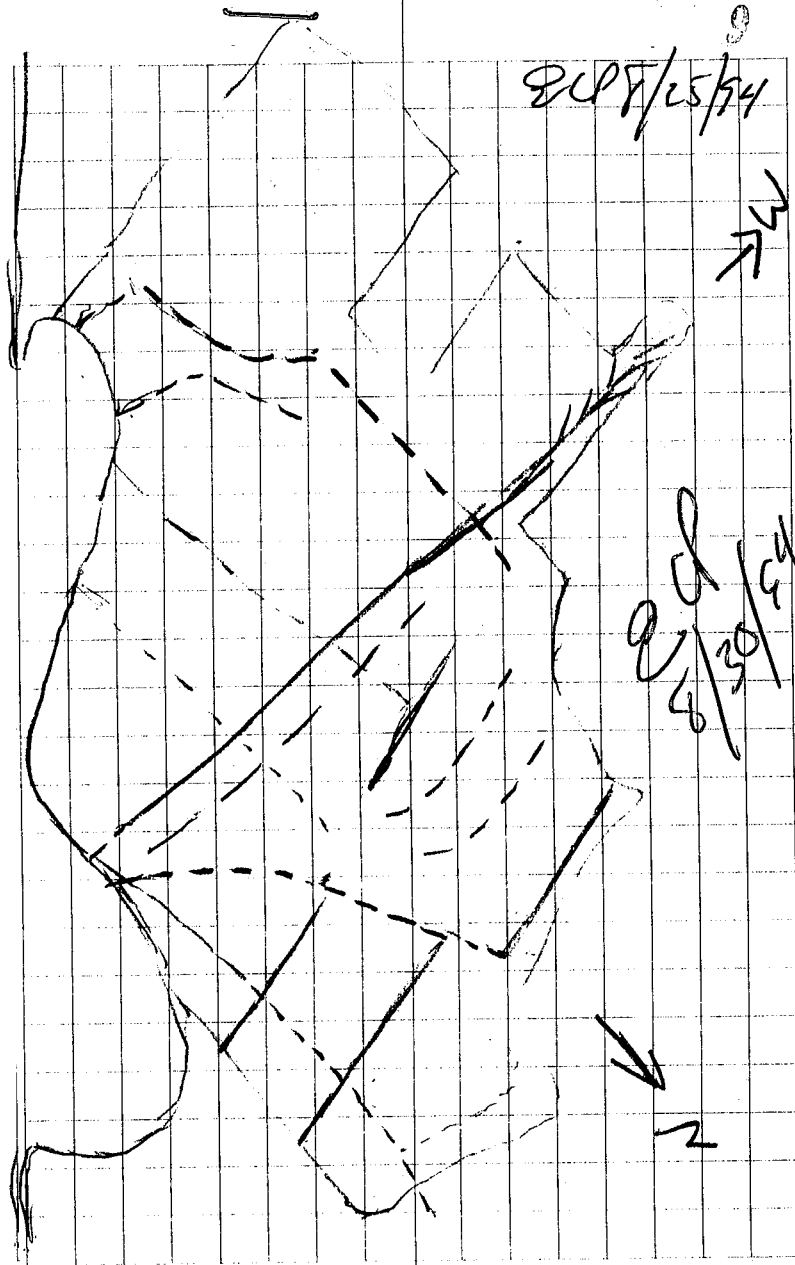


→ IR + LK are
conducting a
survey on the
creek around the
newly cleared
portion of level +10
around the fracture
at ~13.5mV.

2cl
4/30/94
ON PAGE 109 is a
Pencil sketch of
the view from
level +30m
of the cleared portion
of level +10m

This sketch ALSO MAPPED
ONTO Nopac I Detailed
topo base map -
in more detail, from
several perspectives.

- 5cl
4/30/94
- Level 0 sampling completed
 - U weed collected
 - culiche collected



110

7/29/83 - ECP

- 8 bags of the "U-Weed"

PHACELIA Robustus
collected from high
grade ore piles
from Nepal I.
on 7/25/83

- Possible hydrologic
field tests @
Nepal I outlined
during evening of
7/25/83

- on 7/29, return to
Chikankh City,
try to contact
Huffman to make
required additions
to geologic maps
of levels $\pm 10 \pm 100$
- will not be
available until
evening.

2ND TRIP TO AKROPOLIS

7/1/83 ECP

111

DR. KATERINA ALEXOPOULOU
= in charge of
 $\Delta 8a$ this Area
($\Delta 8a$)

→ bronze infant observed
in PLACE in $\Delta 8a$

Σ 25.922 m Above S. Land
= reference point in $\Delta 8a$
by survey

- infant at 1.42 m below
reference level
approx. at $\Delta 3A$

- ~~infant~~ "smaller" mound from
the "trench" ABOUT
0.5 m Above the level
of the $\Delta 8a$ bronze

→ TODAY MET with Dr. C.
Dones & Associates
→ learned of bronze discovery
in $\Delta 8a$
→ EXAMINED & TESTED HYDRO
Equipment.

→ PLACED A GYPSUM BLOCK to measure moisture potential IN ^{ECP} SIDE of "TORRENT" Gully North of EXCAVATION, (see RT Green field notes + MAP).

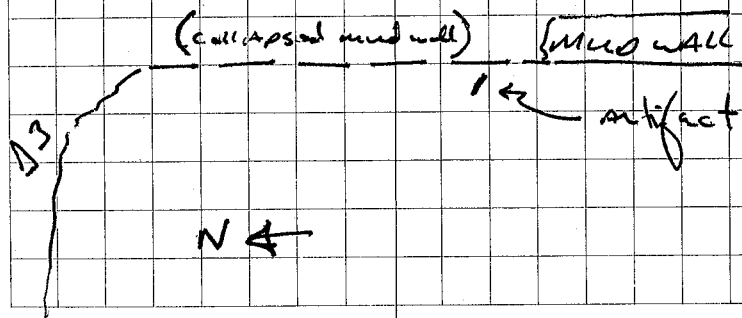
→ RENTED VAN EARLIER TODAY, for 2 weeks.

9/2/93 ECP

Will work today in Δ8a to sample sand beneath in PLACE.

- The artifact was unearthed on 8/31/93 (Tuesday) during excavations in Δ8a.
- The artifact is located near floor level, approximately against the east wall of Δ8a.

- the east wall of Δ8a is a "mud" wall, that is, not a bearing wall, but one ~ 4.5" thick constructed of mud, straw and gravel then covered with Alaskan composed of more mud.
- artifact is believed by Dunks to be buried in a mixture of "mud bricks," "stones" (from the walls), and "volcanic ash and pumice."
- As observed by ECP, the remaining artifact is ~ 3.5" long and about 0.10" wide.
- orientation is AS:



- "SAND" and "mud" believed by Doumas to be from the "torment" was found above the artifact, about 0.5m above the level of the artifact
- At the S.W. corner of $\Delta 8a$, on the top of the remaining wall, there is a reference point established by Doumas at 25.922 m above sea level; the artifact is located 1.42m below that reference level.
- Fragments of what is interpreted to be a handle were found on ECP 9/2/93 near the NW end of the artifact

above" - 0.99 to -1.29 - 1.39"

- A Nail fragment in $\Delta 8a$ found by sieving debris in NE corner of $\Delta 8a$ at a depth of " - 0.99 to -1.29 to -1.39" below the reference level of 25.922 m above sea level

→ A sample of bronze fragments from this nail was provided by Doumas, AS sample No. SAN - 010 AS per P. Hunka No. 15

9/2/93 ECP

SAMPLING of ASH MOUND Δ8a artifact

- Area was dusted of loose material using a soft artists - type water color brush AND then by gentle blowing
- Samples will be taken 1st perpendicular to the long axis of the artifact
- Distances will be measured from the centerline of the artifact which has an apparent width of about 0.1"
- Samples will be taken using A Swiss Army knife blade & tweezers AND the sample material will be placed in new plastic bags

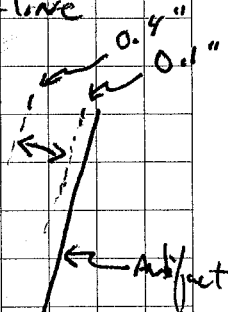
SAW - 011

Volcanic ASH (?) from
0.1" to 0.3" ECP 9/2/93

0.4"

from the centerline
of the artifact

AS:



SAW - 012

from 0.4" to 0.6"
from centerline of artifact

SAW - 013

from 0.6" to 0.95"
from centerline

SAW - 014

from 0.95" to 1.4"
from centerline

SAW - 015

from 1.4" to 2.1"

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/SAN-016/

from 2.1" to 3.2"
from centerline

/SAN-017/

from 3.2" to 3.7"
from centerline

/SAN-018/

one small fragment
of the oxidized
artifact itself.

/SAN-019/

fragments of "wood" 3
from the 88a
large artifact
as described
earlier p. 114 bottom

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KATERINA ALEXOPOULOU
Vitsi - Grammon 7, Philothei
Athens
Greece

SEND ANALYTICAL results
also to Alexopoulos
and to Douras

9/3/93 ECP

→ ECP AND WILLY SPENT
THE DAY establishing
A NS-EW coordinate
reference AND A
level reference
horizon for vertical
location

→ Elevation was measured
by lines + line levels
from a point surveyed
by Douras at 25.922m
above sea level

→ after construction of the reference system, a map of the room $\Delta 3$ was created by ECP using steel measures within the reference guides

→ RTG, WMM + ECP used steel tapes + the ~~reference~~ ^{ECP 9/5} reference guides to make a tape map of the $\Delta 3$ floor showing areas of "packed earth" and exposure of the Cape River tuff.

9/4/93 ECP

Saturday

→ TODAY we are to meet with ANNA Michailidou

to use the Chris Imboden (National Geographic Society) photographs from 9/70 to try to re-locate the positions of the $\Delta 3$ bronze artifacts.

→ RTG + WMM are setting up ~~ECP 9/4~~ up the Greek permeameter in the gully of the torrent N. of the excavation.

→ YES! with the use of photos from NAT'L Geographic + those of the Archaeologists we were able to definitively re-locate

the positions of the artifacts, using especially as reference marks a post at the S. wall of $\Delta 3$ and the profiles of stones in the West wall of $\Delta 3$.

19/5/93 ECP

→ I have constructed a measured profile of the vertical of the W. wall of $\Delta 3$

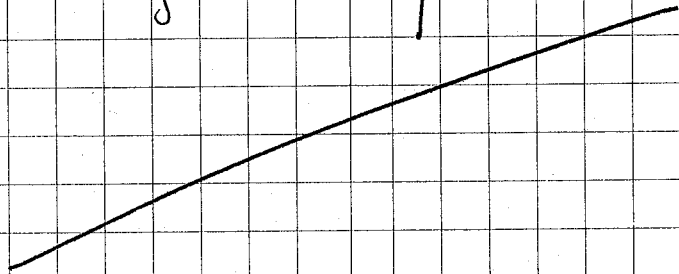
→ We have moved the flagstones from the S.W. corner of $\Delta 3$ which covered the area in which the bronzes were found.

→ the packed earth floor has been

partially excavated in a rectangular shape spanning the area in which the bronzes were found.

→ using the Nat'l Geographic photos ECP + UMR re-constructed the positions of the bronzes in the newly cleared area of $\Delta 3$. The positioning of the bronzes is probably accurate to within $\pm 5-10$ cm.

They were piled on top of, and jammed against one another in a tight array $\sim 1m \times 0.5m$



9/6/93

ECP

9/7/93

We located + sampled 7 areas in the SE corner of A3 above which the large boulders were found. We also reconstructed the precise locations of the artifacts using dummy pieces (rocks, brackets + etc). Final placement of these positions is about $\pm 5-10$ cm in any direction (i.e., max error - likely we have it better, < 5 cm). Notes on these activities and samples are recorded in WMM notes.

9/8/93 ECP

(Wednesday)

- Sample / SAN-053 /
- CAPE RIVA FM. Tuff
- collected by ECP in sub-basement on west side of A3 to provide a baseline mineralogy and chemistry for comparison to those under the boulders.
- This sample is a composite of 3 pieces taken from 3 locations along the sub-basement walls to give a more average idea of the Cape Riva composition.
- These are all purple tuff, crystal/lithic, moderate to lightly welded, low density, quite soft.
- We measured the depths of the A3 sample locations + of intermediate horizons.

These measurements are recorded in Wynn's notebook.

→ RTG continues to make hydrologic measurements each day. He is now working immediately outside D3 to the EAST of the EAST wall.

Sample SAW-054

ASH from D8A, from NE corner of the room. This sample will serve as a baseline comparison for mineralogy and chemistry of the D8A ash.
! unconsolidated, white ash with small (<1cm) pumice lapilli.

9/8/83 ECP

→ RTG + Wynn collect "core barrel" samples of Minoan tuff for laboratory hydrologic measurements.
→ ECP try to locate the well described in the 1970 Marianatos field notes as "100 m S of the excavation" and will try to match the recorded stratigraphy with that ~~record~~ observed in the area. ECP 9/8/83

Observations:

- ① there is no discernable "uppermost layer" of ash (aspa) as recorded; it may have eroded in this area
- ② next pze shows interpreted stratigraphy observed by ECP.

coarse gravel (dark)
interlayered
with lenses
of fine sand/seds
(~ 2m max)

"Ash" light gray to
brown, almost
variable lithic
fragments
(at least 3-4m
thick, max)

- This layer has
lenses of sand to
fine gravel
deposited within it
(easily visible in SE
area of excavation)
- some of these lenses
are embedded into
the top of the pumice
-
- Pumice

↘ cont'd

Pumice layer which
largely covers and
encloses the ruins
(as reported by
Marianatos, 1971)

- No alluvium was observed
by ECP to have pumice
deposited on top. All
alluvium appears to have
come after the pumice.
-

Sample SAN-055

corrosion material and
possibly a bronze
flake from the
large ever discovered
in A17 some
years past
(Marianatos era?)
Sample collected by ECP
on 2/2/83 after

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Photography of the
 Ever by
 Ari
 at the Akrooni
 Lab from the
 cloth placed
 under the ever
 for photography.

2#/25/94 E.C. Peery 131

8th Trip to Peña Blanca
 ECP, JOP, RTG, I Reyes
 Kristi Meyer visiting
 Her Thesis Area.

TODAY we traveled from
 SA to Chichunhue to
 Nopal arriving about
 5:00 pm at Nopal. We
 got settled and walked
 out to look at the
 newly cleared areas of
 the site.

3/1/94

ECP 8/25/94

TODAY we all started by
 driving to the top of the
 Nopal cuesta and
 Helping RTG Set up the
 Earth Conductivity equipment
 to discern a postulated
 perched water zone which
 may describe the most
 recent persistent
 Annually variable

water interaction with
the Nopal I deposits.

→ we set up a 160m
perimeter 40x40 meter
square, situated about
perhaps 150m depth.

→ JOP + ECP reviewed
+ qualified the new
level 100 clearing
and geologic mapping
of I. Reyes

→ ECP + JOP set up a
1m x 1m grid on
the newly cleared
portion of level 100
+ repaired the
earlier established
level 100 grid.

→ This afternoon ECP
+ JOP conducted
+ completed a contact
sampler survey of

the newly cleared portions
of level 100

→ RTG + DR continued
the EMI survey of
the back of the
cuesta moving to
the south in a
series of measurements
along a N to S
franchise. Locations
(i.e. corners of the
40x40 m induction
loop) are marked by
ABS plastic stakes, survey
flagging and 5/8" chains
of rock spray painted
fluorescent orange.

3/2/94

→ ECP + JOP are sampling
the newly cleared
portions of level 100

→ RTG + DR continued
the EMI conductivity
survey.

These samples collected
by ECP from the
altered V. hypsire
outside the level
too exposure of the
Nopal I deposit. This
set was collected
from miscellaneous
locations intended to
approximate mineral
separates (by color).

NOPI - 330

location 39/-10

white, friable clay,
perhaps smectite
± zeolite?

NOPI - 331

location 39.15/-10.20
red clay material
immediately adjacent

to NOPI - 330, these
samples were collected
using a teaspoon after
gently brushing away
loose material with
a soft bristle brush.

NOPI - 332

location 41.20/-8.0

white clay material
similar to NOPI - 330
but located adjacent
to a vein set with
FeOx, MnOx(?) +
U-mineral (apatite? urano-
phane?) filling.

NOPI - 333

location 41.25/-8.0

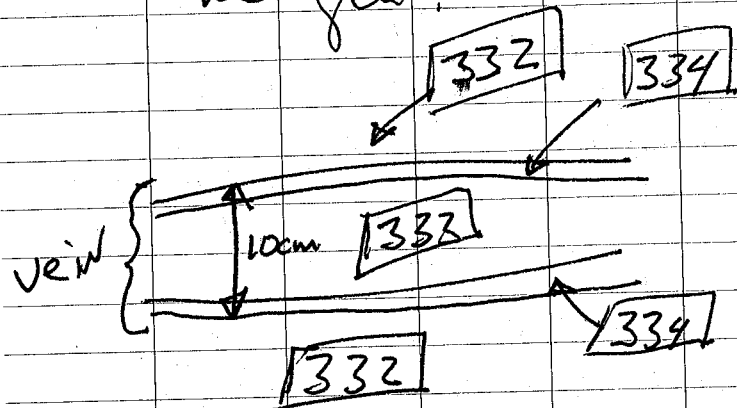
gray vein filling,
harder than clay.
⇒ quartz? or chalcedony?
Abundant unidentified

yellow U mine

NOPI-334

Location 41.0/-8.0

orange & black
material from
vein margins.
probably FeOx and
MnOx. Some
visible U mine
foam A thin
(~ 3-8 mm)
selvage along vein
margin.



NOPI-335

Location 36.3/-1.0

deep red/purple clay-
altered vitrophyre

NOPI-336

Location 36.8/0.70

white, clay-altered
vitrophyre

NOPI-337

Location 37.0/5.0

deep red/purple Altered
vitrophyre

NOPI-353

Location 23.0/-6.0

this sample is HANDPICKED
blakes of chromitite?
cannot from outcrops
at this location.

to be considered for possible U-series dating, if a good mineral separate can be obtained.

THIS NEXT series of samples were collected from Alay the same vein AS samples NOPI-332, 333 + 334.

NOPI-363

LOCATION: 39.0/-6.0

orange + black vein selvage, FeOx/MnOx? some visible yellow U-minerals, formed ~ 0.5 to 1.0 cm thick selvage.

TOTAL vein thickness is ~ 5 cm.

NOPI-364

LOCATION: 39.0/-6.0

vein filling material, very soft + friable, white clay some intermixed FeOx, some calcareous.

NOPI-365 39.0/-6.0

LOCATION: white clay altered vitrophyre outside vein ~ 3-10 cm outside vein margin

NOPI-366

LOCATION: 40.0/-7.0

SAME AS NOPI-364

NOPI-367

LOCATION: 40.0/-7.0

SAME AS NOPI-363 but thinner, ~ 2-5 mm

NOPI-368

Location 40.0/-7.0

Same as NOPI-365

Vein width (Aperture)
Here ~ 3-5 cmNOPI-369

Location: 42.35/-8.50

White, clay altered
vein, outside
vein. AT THISPoint, vein is
complex, Annastomosing,
total width is
Approximately 20-30 cmNOPI-370

Location: 42.0/-9.20

Orange + black

FeOx/MnOx? May
Vein margin. width
uncertain, < 3 cmNOPI-371Location: 42.50/-9.50
Vein filling, very similar
in appearance to
NOPI-333 Minor
U-minerals visible.→ This afternoon ROG +
IN continue ERT
Survey on Crest A
Dip slope.→ ECP + JDP repair
sample location grid
on level +10→ Sample A N-S traverse
across the N margin
of the ore body along
Plume trend
for γ mapping
controls + for
U-disequilibrium.→ ECP re-maps A
portion of the Northern

exposure where
rain/weathering
have now more
completely exposed
faults/fractures.
There are some
clear N-S trends
which were not
mapped earlier.

3/3/94

→ TODAY JDP + ECP
will continue sampling
level +10 + RTG +
EA will continue
Eul measurements.

ON 9/1/92 ECP
collected samples \perp to
the major EW fracture
(between 13 + 14 m N on
level +10 m) AT THE
FOLLOWING LOCATIONS:

4.5 m E	13.62 to 13.90 N
9.95 m E	13.33 to 13.63 N

on 3/23/93:

0.30 m E 13.26 to 13.50 m N

on 3/24/93

- 5.40 m E 14.08 to 14.32 m N

TODAY 3/3/94, START AT

9.95 m E, EW vein center
is AT 13.5 m N.

AT THIS POINT, FRACTURE
DENSITY \perp TO THE EW VEIN IS

27 fractures/50 cm to the North

41 fractures/50 cm to the South

NOTE I AM counting ALL
fractures visible TO THE EYE
on the outcrop along these lines.
THIS will be A minimum
estimate because portions of
the fractures are obscured
and some cracks are too
small to be seen without
magnification.

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EXTENDING THE L SAMPLES
AT 9.95 m E HAVE TO
THE SOUTH:

NOPE - 392
at 9.95 / 13.15

NOPE - 393
at 9.95 / 13.0

TO NORTH:

NOPE - 394
at 9.95 / 13.80

NOPE - 395
at 9.95 / 14.0

A SAMPLE TO EXAMINE
MATRIX DIFFUSION COLLECTED
INCLUDING THE VEIN WALL:

NOPE - 396
at 9.95 / 13.5

OBSERVATIONS AT 4.5 ME
ALONG THE EW VEIN.

Vein center is at 13.82 N.

fracture density is TO
South: 19 fracs / 10 cm

+ further S: 13 fracs / 10 cm

fracture density to North 5
is: 9 fracs / 10 cm
+ further 14 fracs / 10 cm

NOTE AT EACH LOCATION,
these fractures form a
complex anastomosing network

OBSERVATIONS AT 0.30 ME

TO SOUTH: 16 fracs / 10 cm

further S: 9 fracs / 10 cm

TO NORTH: 13 fracs / 10 cm

further N: 7 fracs / 10 cm

OBSERVATIONS AT -5.40 ME

TO SOUTH: 8 fracs / 10 cm

+ further S: 11 fracs / 10 cm

TO NORTH: 14 fracs / 10 cm

+ further N: 12 fracs / 10 cm

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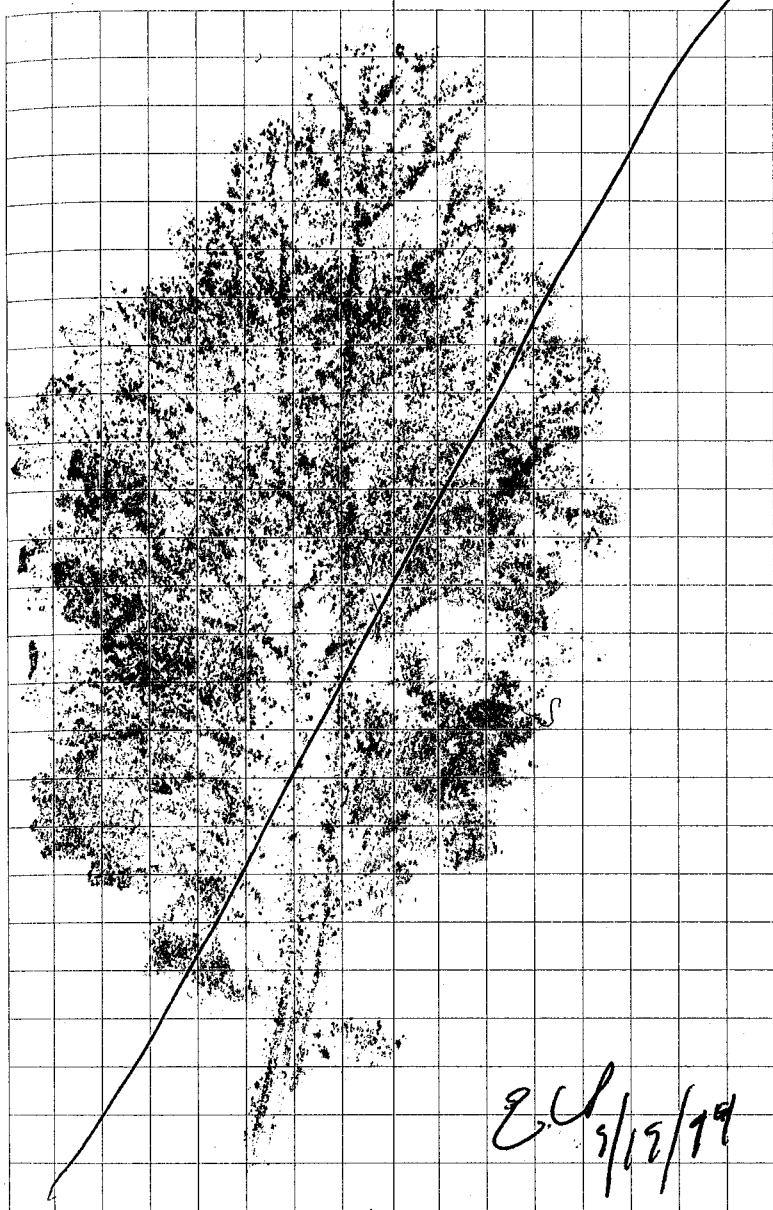
EW fracture aperture
measurements:

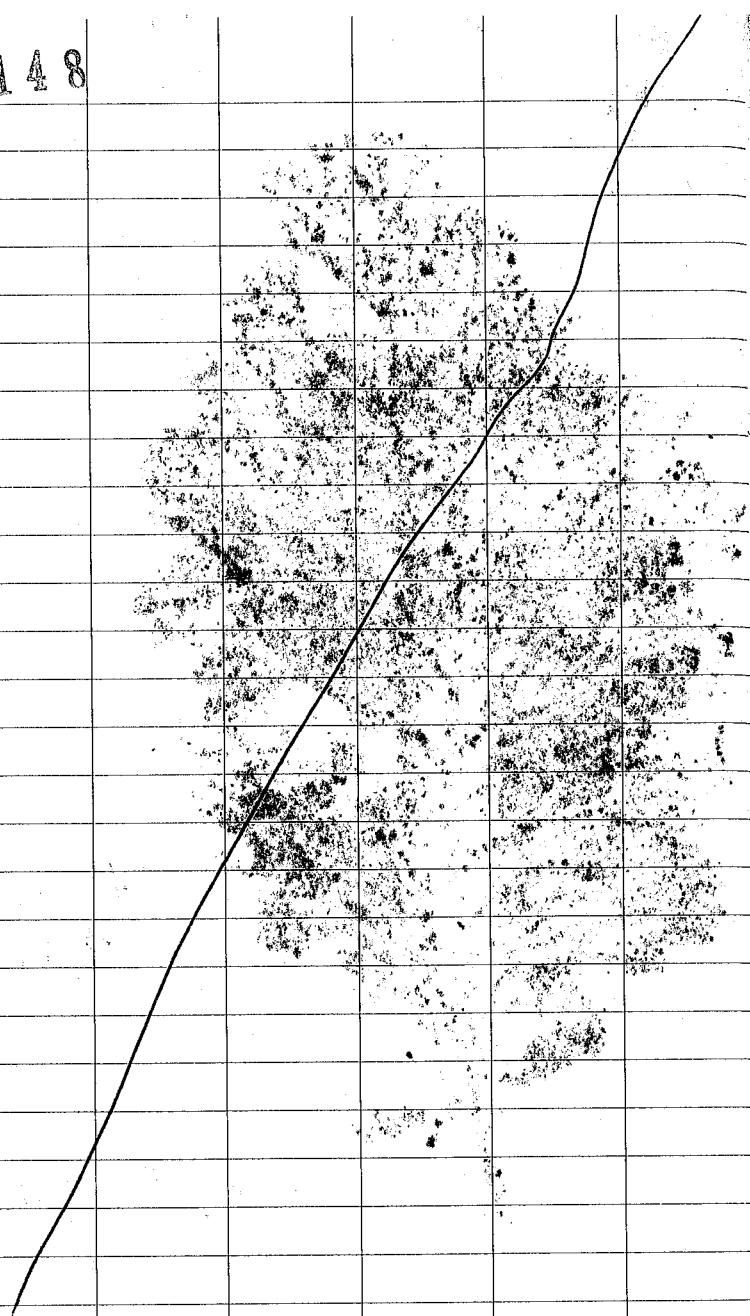
<u>Loc.</u>	<u>Aperture</u> ^{3/5/84} ECP
10 mE	0.7 mm 7 mm
9 mE	3 mm
6 mE	2 mm
5 mE	4 mm
0.6 mE	7 mm
-5.4 mE	6 mm

Average Aperture =
4.83 mm

This set of samples
collected of ^{of} TR
including vein wall
Along EW fracture
(for matrix Diffusion
measurements)
These go with sample
NOTE - 396.

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ECP
3/12/84



matrix Division

Samples:

NOPI-414

at 8.4 / 13.85

NOPI-415

at 4.50 / 13.80

NOPI-416

at -2.0 / 13.80

ECP
9/18/94

9/19/94 E.C. Pea
 9th trip to Peña Blanca
 ECP, RTG, DAP, LAK
 [KM visiting her thesis
 area.]

The NAWG Field trip to
 Peña Blanca was last
 Saturday 9/17/94 (see trip
 report for participant list).

→ Sunday we travelled to
 the site [after purchasing
 food, supplies, and hardware].

→ Sunday afternoon RTG, IR,
 & KM conducted conductivity
 tests, re-occupying the
 17 sites measured during
 the 8th trip.

→ ECP, DAP, KM repaired
 the grid on level +10
 & worked out a
 practical approach to
 fracture aperture &

Elb 9/20/94

fracture roughness
 measurements.

9/15/94 ECP

This morning RTG, KM, & IR
 & DAP worked on the
 conductivity measurements.

ECP & LAK made fracture
 measurements.

FRACTURE MEASUREMENTS

→ Working on the cleared
 area of level +10, ECP & LAK
 are measuring the:
 Location, strike & Dip, Aperture,
 fracture filling compositions, AND,
 where applicable, the
 aperture remaining within
 the fracture filling.

→ Data are recorded on
~~attached~~ ECP 9/19/94
 separate data sheets to

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ECP 9/20/94

Allow tracing of the fracture "roughness."

Roughness is recorded using STANOMO carpenter contour gauges. Apertures are measured using mm rulers or, for the smaller apertures, automotive feeler gauges.

ECP is using feeler gauges 20-FG-2.

LAK is using 20-FG-1.

These are STANDARD commercial gauges calibrated by W. Smithson (SWRI QA).

Locations are recorded to the center of each site.

where appropriate, fracture surfaces were further exposed by rock pick.

E.C.P 9/20/94

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→ Multiple measurements were made on the same fracture where available. These are noted on the data sheets.

→ Multiple roughness measurements were made on the same fracture surface where possible to allow evaluation of roughness variability on the same fracture.

→ Locations are ± 20 cm

→ ~~Apertures are ± 0 .~~

ECP 9/19/94

9/20/94 E.C.Pee

Yesterday DAP + IR placed RADiation detectors in the level +00 adit and ~ 80 m down the main shaft.

ECP 9/20/94

RTG, KM, & IR
Completed the conductivity
survey (on 9/15/94).

Fractures:

- Note our measurements are, typically, maximum apertures - because release of the confining stresses by mining will have tended to open the fractures especially on level 110 close to the edge - where the vertical face is free of lateral support to the east.
- The presence of FeOx , MnOx , calcite, & clay coatings on ALL (?) the measured fracture surfaces confirms that they are natural rather than mining-produced.

Pages 1 through 154 of this Scientific Notebook were reviewed for compliance with OAP-001 in response to Corrective Action Request 94-02. Corrections and clarifications were made as appropriate. In some cases, the date of a change will reflect the date of this review rather than the date of the original Scientific Notebook entry.

Randy Zalk

SWE- QA

11/02/94

continuation of
This Activity is
documented in
Notebook 21.

This notebook
is turned over
to QA records.

ECF
12/20/95

surrendered
dedicated
devoted
handed off
thrown AT ...