ANALOGS

ENGLISH
PEARCY

CNWRA #36

TELEDYNE

407

FIELD BOOK

[redacted]

Property of _____

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CNWRA
CONTROLLED
COPY English Pearcy 036

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 NOPI - ECD - 37

INDEX

Required for each rock sample:

- ID No.
- Loc. of site
- Description of sample
- Name and age of FM (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

Above in accordance with TOP-016

INITIAL ENTRIES BY ECP = English PEARCY = ECP

3/2/92

3RD TRIP TO Peña BLANCA

Participants include:

ECP
BWL] CNWRA

L. KOVACH
J. Bradbury] US NRC

Philip Goodell] UTEP

IGNACIO "Nacho" Reyes] UACH

Sergio ATURIA] ININ

Luis Aguilar] SEMIP

Juan Enrique GARCIA] CSNS

Rafael Martinez] CSNS

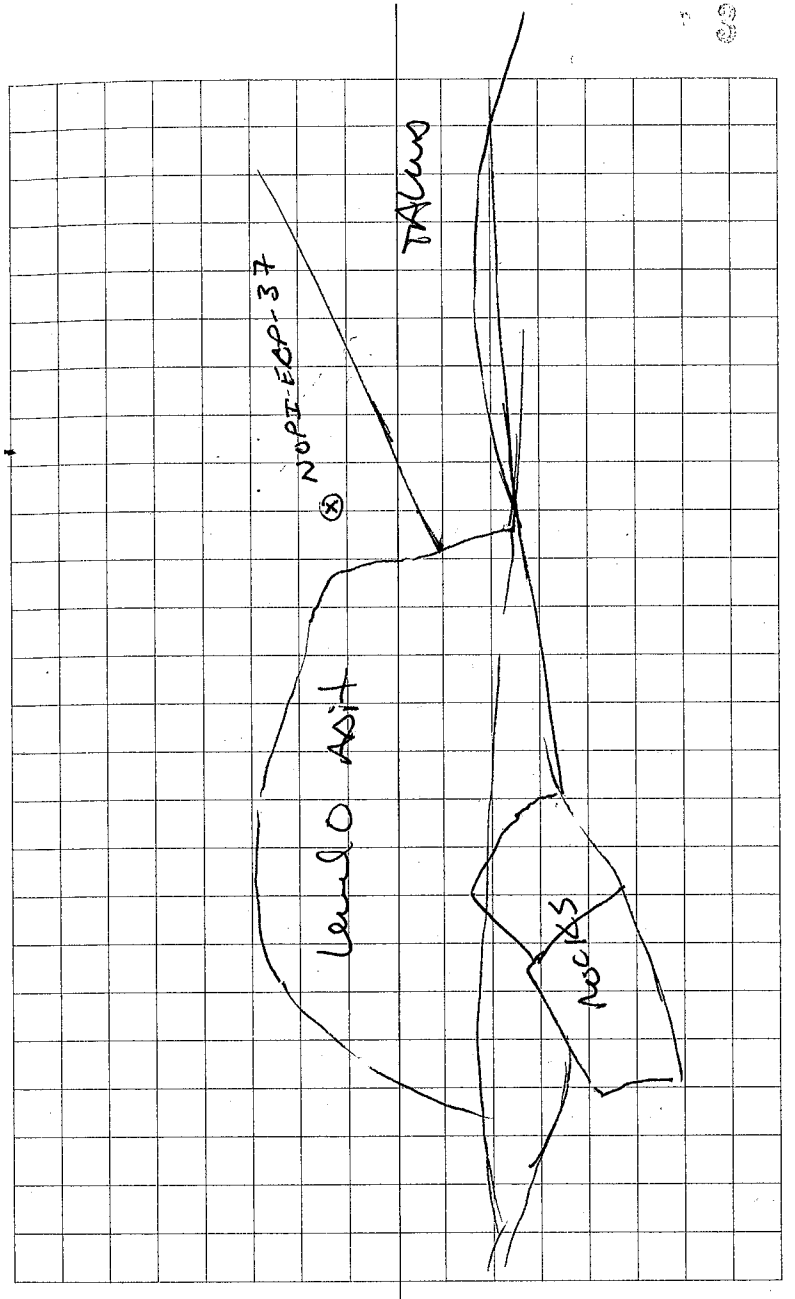
3/2/92 spent in initial discussions with Mexican Federal Agencies w/regard to collaboration + short field trip to Sta. Eulalia District.

NOPI-ECP-37

ECP 3/3/92

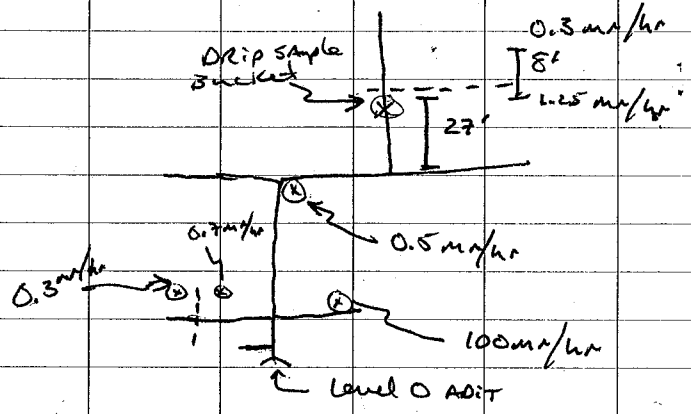
- opal covering manganese (?) in breccia sample ~ 1m to rt of level 0 adit at ~ level of the top of the adit
- collected from the Nopal I-M level of the breccia (see diagram)

ECP 8/25/84



3/4/92 ECP

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



These are contact γ measurements.

DASHED LINES INDICATE Approximate boundaries of the breccia pipe.

3/4/92 LAK.

Traverse at +10 level. along Ildefonse 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 alluvium	
20	1.2 - 1.3		
25	1.6		
30	4		
35	2		
40	4	---- Approximate ore boundary	
45	0.4		
50	0.3	90	0.1

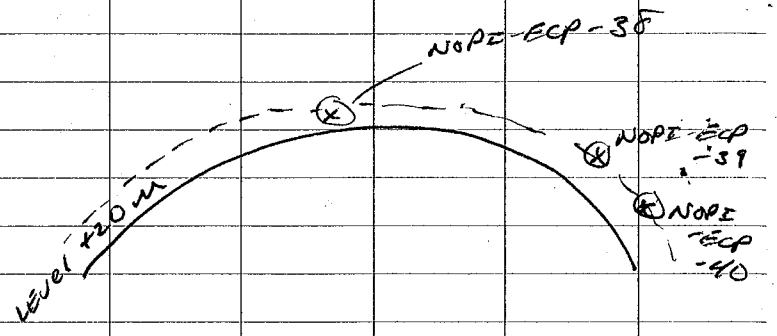
ECP 3/4/92

Distance is measured from edge of +10 m Level ± 1-2 ft.

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

NOPI - ECP - 38

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



NOPI - ECP - 39

- qtz (= quartz) crystals lining vesicles in Nopal 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 Nopal FM.

ECP 3/4/92

NOPI - ECP - 41

- core drill sample of high grade (i.e. uraninite-containing) ore from Nopal 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

8

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 autoradiography experiments. Not part of the Nopal project.

Pages 9 and 10 Are Intentionally
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Fourth trip to Nopal I
MAY 1992

ECP

5/22/92 ECP

Jim Prikryl + ECP + I.R.

Yesterday we arrived at the Peña Blanca District just after noon and set up house keeping 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 2½" P-K surveying nails (galvanized, hardened steel, ¼" diameter, fluted edges). A 1" square of fluorescent orange plastic with a ¼" hole in the middle through which the P-K nails ~~was~~ were placed served to highlight the ~~top~~ ECP 5/22/92

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 strings) could be easily attached to lay out a grid.

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

ECP spent part of the afternoon field checking portions of the geologic map of a 4 km² area around the Nopal I deposit prepared by I.R. under subcontract

to the Center. After field checking and subsequent discussions with IR, 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 +10 m level prepared by I.R. (again under subcontract to the Center).

This morning, 5/22/92, J.D.P. + IR 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 JDP + IR are conducting the γ survey, I will field check the geologic map prepared by IR of the cleared portion of the +10 m surface.

During the γ 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 Ildefonse' samples ECP 5/22/92

Sample: NI1C4

Located by measuring from the NE corner of the breccia pipe to a point along Ildefonse sample trench equal to 14.6 m. Location marked on outcrop with a ⊗ mark. Some U-mineral 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 Ildefonse took samples, even within the last

15 MONTHS SINCE I NOT CAME. SO reference is uncertain.

18

QCL 5/23/82

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 Tr 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 Adit. (PHOTO No. 4) (see also sketch map on p. 23)

Rock is Highly fractured Tr formation with very strong FeOx, as is that whole area.

U-minerals not visible at sample point which is physically inaccessible, but are 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 the fuse marked "Δ1" (that is, the southernmost extension of this face). (Photo No. 68 ECP 5/22/92 See also sketch map on p. 23)

Rock at this location is Kaolinized Tn formation with some ~~no~~ observable FeOx. ECP 5/22/92

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

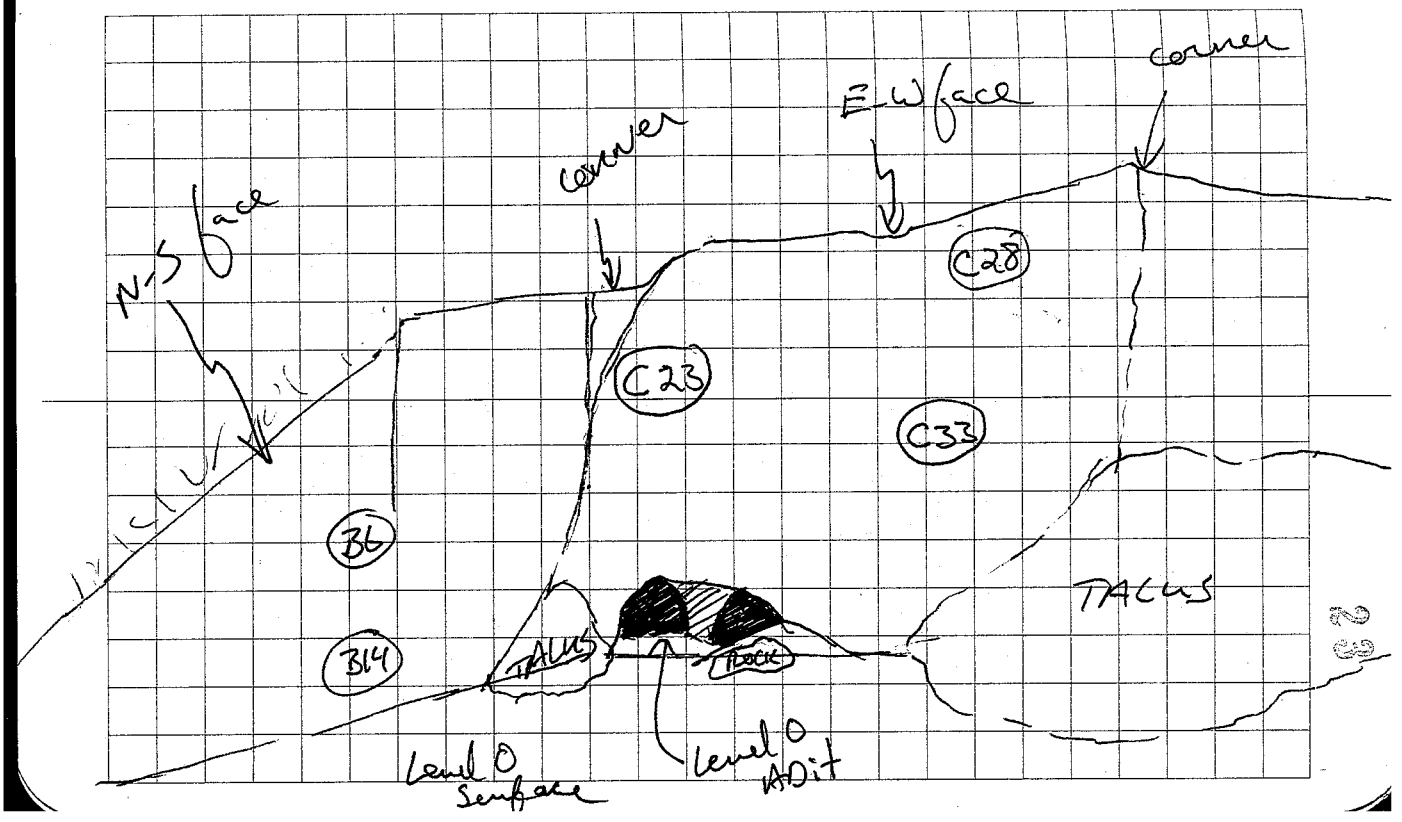
Some yellow minerals are visible from level 0 vantage.

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

Sample B-14

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 ECP 5/22/92 also sketch map on p. 23)

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


corner
E-W face
corner
N-S face
C28
C23
C33
36
TALUS
314
TALUS
ROCK
Level 0
Surface
Level 0
ADit

NOTE: OBSERVATION by ECP,
→ After contouring the γ readings taken this morning and comparing them, quickly, to the level +10 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 thus lost more U than the yellow/orange/brown areas (i.e. Limonite) which have tended to retain their U.

→ There is also a pronounced trend of higher γ values along 1 zone to the North of the breccia pipe which similarly corresponds to brown/orange alt'n vs 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.

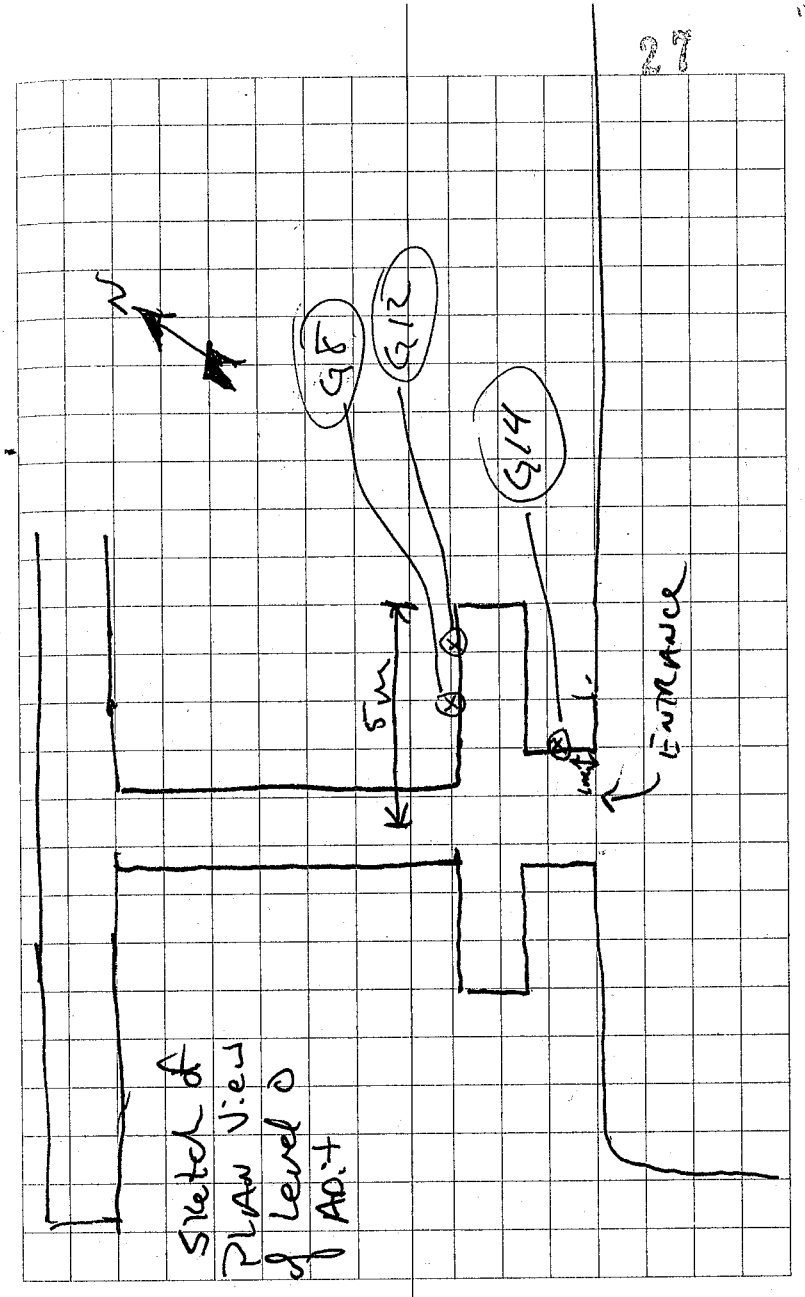
5/23/82 ECP

Qualification of Remaining Undeformed Samples: Those inside the Level 0 Adit.

Sample G14

located ~1m inside front entrance of Level 0 Adit. So location somewhat uncertain (± ~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 Kaolinized breccia of the Tn formation, fractures are hematitic, some veinlets 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 is ~ 5.25 m NE of centerline of main adit; uncertainty about ± 0.5 meters.~~

ECP 5/23/92

There is a discrepancy in Ildefonse' 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

Ildefonse' 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 Tr breccia, abundant U-mineralization, silicates, some areas are more well silicified whereas others are strongly clay altered. There is also uraninite 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 Tn formation, more strongly silicified that G8, also as at G8 have abundant U-mineralization (i.e. silicates) there is chamite nearby, within the uncertainty of the sample location.

5/23/92 ECP

→ Two sample traverses were chosen based on the contouring of the γ survey results, one traverse NS & one EW across the ore body. Locations are recorded in JDP's field book. Samples were taken by JDP about every meter. ECP photographed the entire length of each traverse.

→ After lunch ECP, IR, & JDP field checked the western portion of the 4 km² geologic map. Some outcrops of Tc 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. Doumas arrived this morning and will give us a tour of the site + discuss possible research.

ECP

10:15 AM

Domo's Comments 6/29/82

- vine roots found as deep as 7m into the tuff
  ⇒ 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 comp. volume

- Pb artifacts are better preserved than Bronze
  some bronze completely gone

*⇒ at Δ Home had bronze "vessels" which were completely oxidized (found in 1969) wrapped in straw and sitting on the bedrock

"ignimbrite" volcanics, under collapsed ~~breccia~~ EEP debris. 6/28/82
only 2-3 meters from the main channel of the "torrent."
buried only perhaps 2 m beneath building debris + alluvium.
- some of the bronze vessels were 10-30 cm across

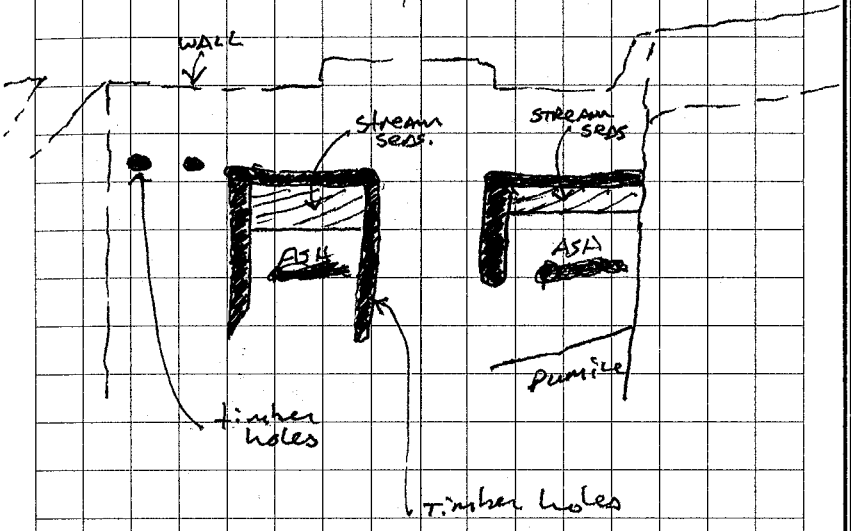
UPSIDE Down Bed Site
~4-5 m west of Room
Δ15

- 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 palessurface
* ⇒ a good place to try a metal detector

ALONG the MAIN channel, immediatly west of the channel just N. of the MAIN public entrance

HAVE DOORWAYS which are as:



→ indicates episodic (?) infiltration of the ruins by runoff water from the MAIN channel

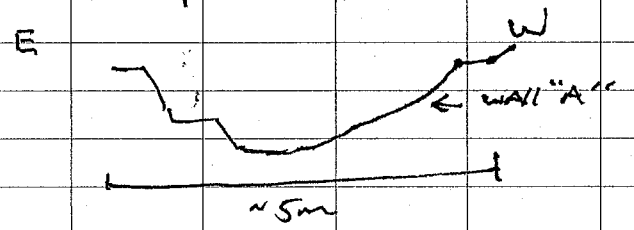
AT Δ House, bronze artifact location

- see also pages 35-36, this notebook

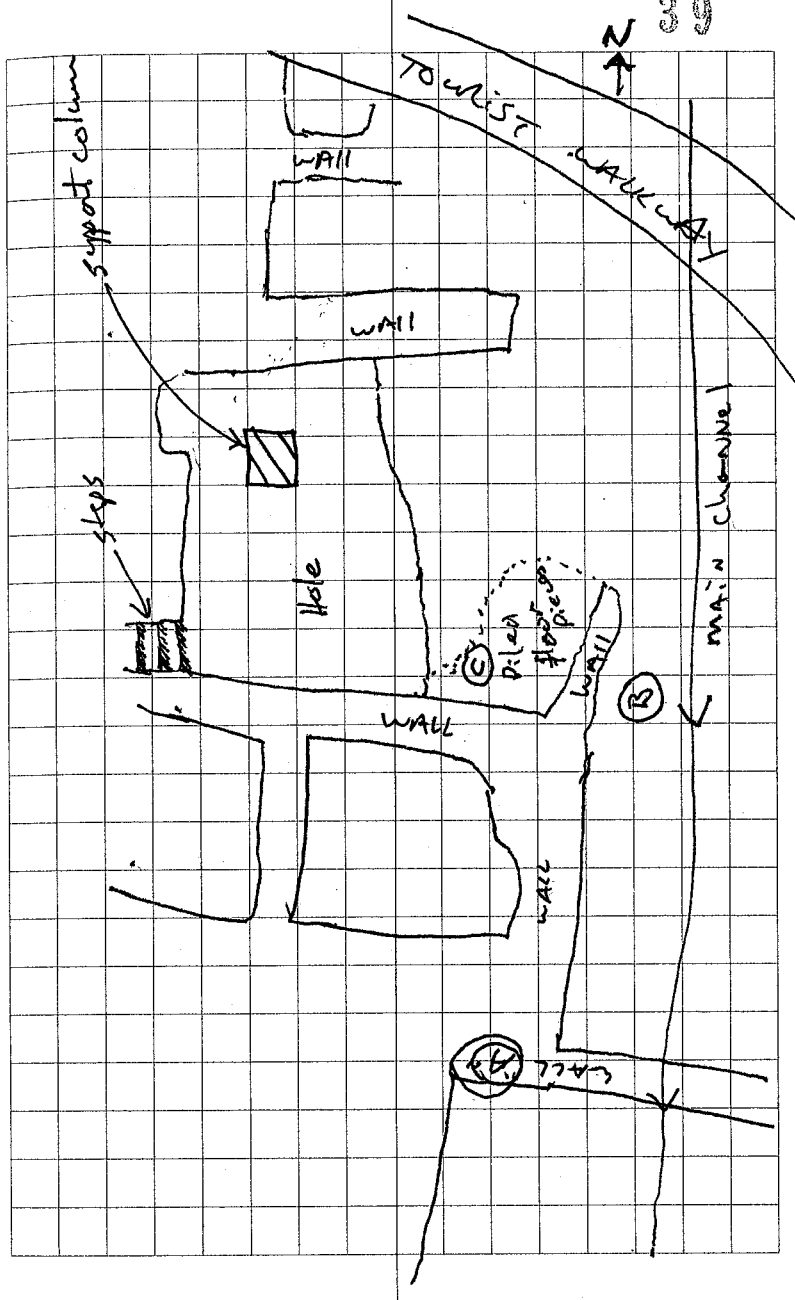
→ AT this location, had relatively large (10-30cm) bronze vessels found on the volcanic bedrock paleo surface

→ refering 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:



view to south



→ By inference from WALL A, the elevation of the paleosurface upon which the bronze was found was about ½ m below the stream base at that point; also by inference from surrounding wall slopes, the ECP depth of the original, pre-excavation cover at that point was ~1.7m at location C 6/28/92

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

6/30/92 ECP

Sampling of bronze artifact location at room Δ3

→ coordinates of location recorded in RTG field book

→ WHAT is preserved at present is a layer about 5-8 cm thick described by Doumas as a "packed earth" floor which rests on the volcanic rock floor

→ initial excavation was Sept. 1, 1970

→ the top of the artifacts ~~were~~ was located ~80cm above the current surface

→ samples taken, recorded in W.M. Murphy notebook.

→ the deep basement here may be EARLY CYCLADIC, ~1000 yrs older than MINOAN AKROTIRI

CLAIRY PALYVOU
MESSENIAS 1
ATHENS 15234

"EXCAVATION AT
THERA I - VII"
MARIANATOS 1967 - 1974

CAN PURCHASE
on view at the
American School

ELEVATIONS:
BASE of Δ3 steps 23.97 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. Doumas

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 TALK: 6/30/92

→ the pumice + ASH were emplaced essentially cold, NOT HOT

Archaeological Society
Panepistemion 22
Athens

✓* - MARIANATOS volumes 1967-1974
esp. Vol 4 1971 for 1970 season

IGME
61 Messogian St.
Athens
70 Mesogion St.
779 84/2
see Mr. Fytikias
(Geochemist)

✓* - Geologic MAPS

MAPS AT 86 Mesogion

NATIONAL Archaeological Museum
→ Get Note from Domas ?

"X" = bronzes
"π" = Potteries

* see + describe Artifacts
* buy slides of Akrotiri Artifacts

X_1, X_2, X_3, X_4, X_5

Baking Dish

3 ewers + 2 baking dished
+ 1 goblet with a Pb piece

Domas says these artifacts are on display.

p17 v. 4 Marianatos

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

~~6/~~ 7/1/92 PCP

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 WMM's Notebook.

July 1, 1972 E.C.P.

Notes from Vol. IV of "Excavations at Thera" by Spyridon Marinatos Athens ~~1970~~ 1971 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 ASPA, 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 (brakish but quite drinkable) is just A handy 1 m. Above sea level."

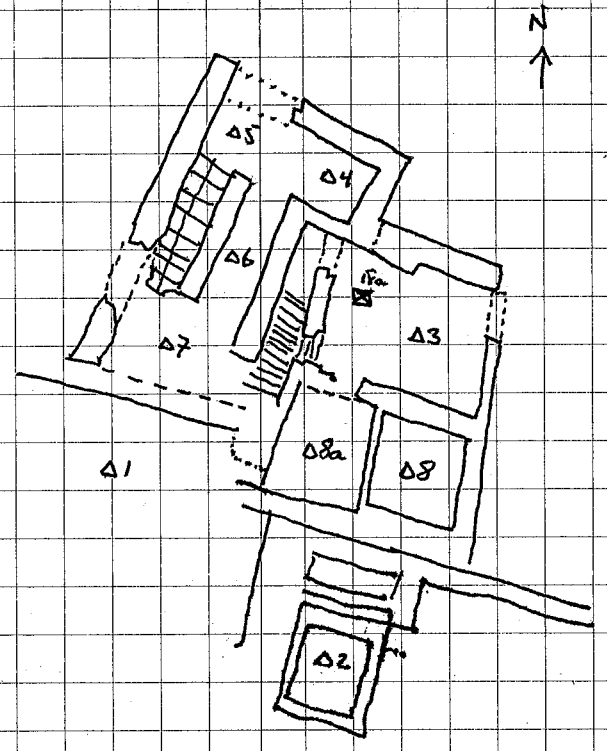
p. 8 "Throughout the excavation, the ruins are generally buried in the pumice. Yet, the thickness of this latter layer rarely reaches 2 m. in the Akrotiri region. At times, the layer is very thin, only A few centimetres thick. At times it is totally absent."

FROM the MAP inset between pages 7 AND 9, I determined that the "well" for the roof support pillar AT room Δ5 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.

PAGE 16 AND following:

"QUARTERS Δ3 EAST of the aforementioned staircase and the «BITAN» (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

aforementioned 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 ~~is~~ was ECP 7/1/92 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»).

¶ 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 barred 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» (Δ2) did it cross our minds that the jars had probably been stored there in haste

to protect them from further earthquakes.

¶ 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 91b further on). From the aspa that had been deposited there we sifted a stone-stopper of a circular pyxis, a lead weight and other smaller objects (1.9.70). 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 Shafts of Mycenae. Were 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]

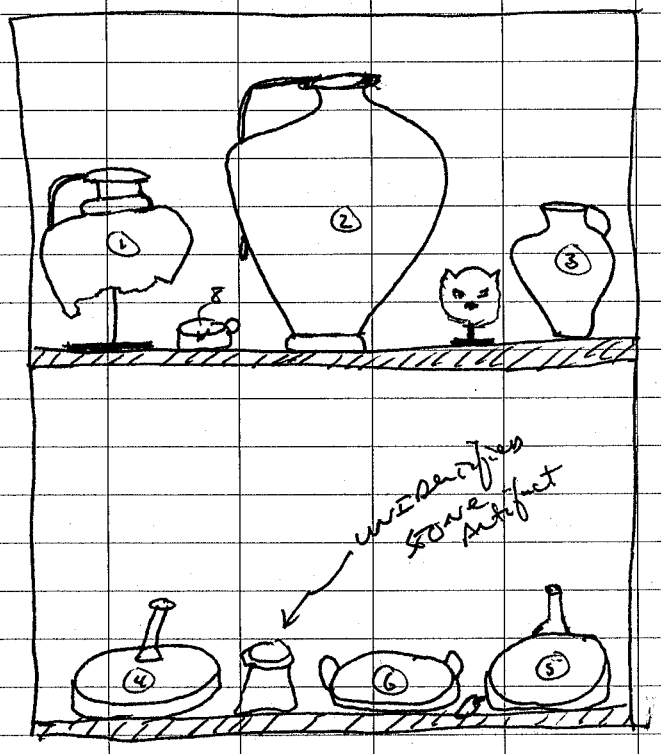
ECP July 1, 1992

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

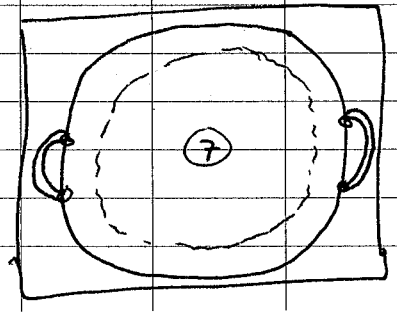
→ THE BRONZE Artifacts ARE DISPLAYED TOGETHER ON THE 2ND FLOOR of the MUSEUM IN A GLASS CASE. A LARGE BAKING PAN is in ANOTHER of the cases nearby & MAY ALSO BE from Δ3. THE LABELS ON THE EXHIBITS ONLY IDENTIFY THEM AS from AKROTIRI. I HAVE IDENTIFIED them AS from Δ3 based on the photos in the MARIANATOS' 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 THOSE from Δ3, AS DO BAKING DISHES 6 + 7 AND THE GOBLET/CUP/LAMP 8. I Believe SKILLETS 4 AND 5 are from elsewhere.

→ MAXIMUM DIMENSIONS OF THE artifacts AS 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 corroded 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 LITHIC 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

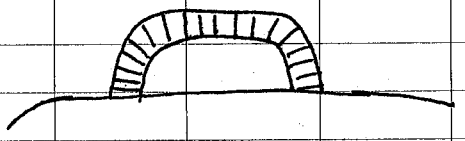
to be volcanic ash or perhaps a fine-grained, light-colored mud. ALL of this ATTACHED EARTH MATERIAL HAS A surface with a texture similar to STRAW fibers, the "fibers" HAVE different orientations but are similarly oriented over small AREAS (1-5 cm²). COULD THIS BE THE REMNANTS OF THE "CLOTH" or "STRAW 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 Ewers. 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"

#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 CARVED PATTERN OF GROOVES ENCIRCLING THEM AS:



THIS PATTERN REMAINS well-preserved.

5th trip to Peña Blanca

PARTICIPANTS include: ECP

E. PEARCY - CNWRA 8/31/92
W. Murphy - "
J. Prikryl - "
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 Autónoma de Chihuahua (UACH)

→ 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 boundary of the U-zone at ~12 m east

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

8/25/94
EP

FRACTURE FILLING BY
I. Reyes ~~8/~~ EEP 9/1/92
9/1/92

FRACTURE LOCATED GENERALLY E-W from 0 m EAST to ~14 m E between 13 m North and 14 m North.
ALL SAMPLES in this set are from ALTERED Tn formation and will be collected by ~~stell~~ EP 9/1/92 steel knife blade.
SAMPLES consist of FeOx's and perhaps MnOx's ± calcite ± silica
Locations of EACH recorded next.

NORD-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

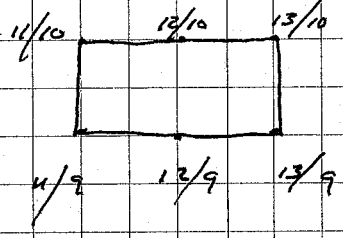
Above recorded by E. Reyes

ECP 9/1/92

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

ECP 9/1/92

→ 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 x 1m readings is gone,

→ the higher resolution contours are roughly parallel (||) to the N-S boundary, but more complex

→ These 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 2m² area was mapped by ECP for fractures, alteration, and chamosphere 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 scintilometer as during the May trip with also the same operator (JDP) (see p.15 this notebook)

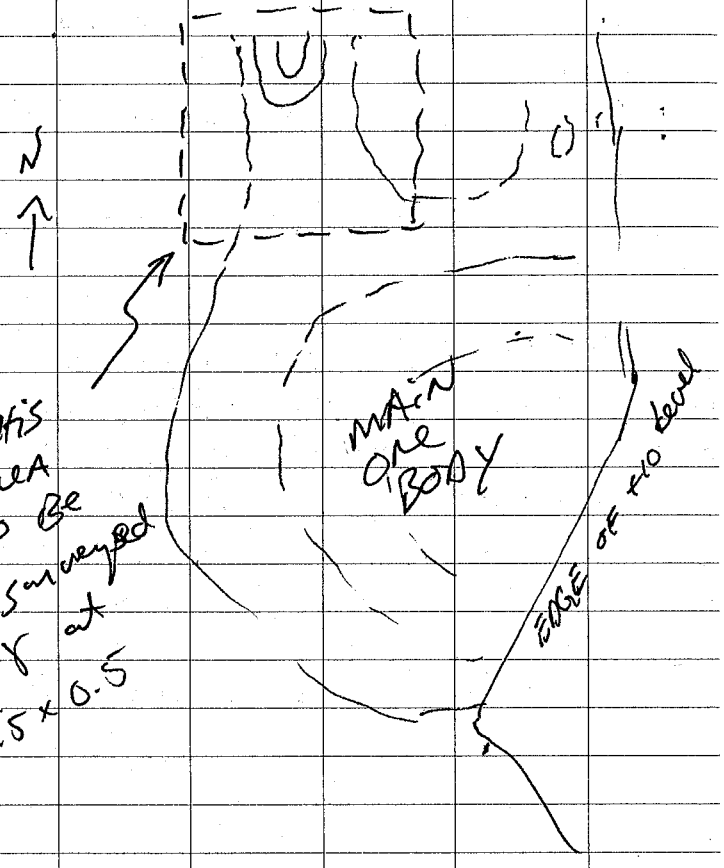
→ the geologic map by ECP was also done at 1" = 0.20 m for comparison.

9/1/92 ECP JDP + 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.

→ JDP will re-survey that area at a 0.5 x 0.5 m spacing to try to clear up its relation to

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

→ generally the relations are:



9/1/82
EOP

→ 1 sample of opal 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 PALEO 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 happenstance.

→ looking for U mobility w/in THE LAST 10^6 years.

9/2/92 ECP

→ samples taken perpendicular to E-W fracture sampled laterally (i.e. along its length) by I. Reyes.

→ PHOTOS TAKEN before sampling

→ ALTERED TA

→ sample No.'s = location on grid.

JP 9/14/92 NOPI-ECP-

sample 4.5 / 13.80

= 1st sample immediately N of fracture, including N side of fracture surface

GOING TO THE N:

NOPI-ECP- 4.5/13.83

JP 9/14/92 " 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:

JP 9/14/92

NOPI-ECP- 4.5/13.77 includes some of the veinlet itself. AND WALL ROCK TO THE SOUTH.

samples further south:

JP 9/14/92

NOPI-ECP- 4.5/13.73

" 4.5/13.66

" 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)

JP 9/14/92
NOPI-ECP-

Sample 9.95/13.51 is the N side of the fracture and the nearest material just N of the fracture.

Then, sampling to the N:

JP 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.

JP 9/14/92
NOPI-ECP-

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

AND to the South:

JP 9/14/92
NOPI-ECP- 9.95/13.45

" 9.95/13.39

" 9.95/13.33

JP 9/14/92 Note: check sample No.'s 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 Napal I.
on level +10 wall

① low ∡ left dipping
② near vertical right dipping
③ near vertical left dipping

on level +20 wall

① near vertical
② ~45° right dipping

① early low ∡ w/calcite
② near vert. dip
③ later low ∡ w/out calcite

Sample No. Napi-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 Napi-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, JDP } CNURA

(IR) IGNACIO Reyes (UACH)

ALSO ALONG ON THEIR OWN MIP, 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 0 to try to qualify subcontract 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 twine grid on the newly cleared areas

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

3/23/93 ECP

- THIS MORNING JDP + IR begin γ survey of newly cleared areas of level +10.
- We are using A 1m × 1m grid just as before.
- We are using the SAME γ meter + Detector AS for earlier measurements.

that is:
Ludlum Model 14C
Geiger Counter with a
model 44-C gamma probe.
(meter serial No. 83561)

→ The γ readings are being
recorded directly on
a base 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 (⊥) to the
vein.

OBSERVACIONES ALONG EW fracture
0.30 @ ~14m N:
→ 0.15m East: Aperture ~2mm
ECP ALTERATION - FeOx along EW frac.
3/23/93 - FeOx around fract. is
approximately symmetric N + S
with a width of ~10cm.
This width is variable
± 5cm. Extent of FeOx
halo appears to be related to
small fractures which
intersect the main EW frac.
These small fractures have
apertures << 1mm and no
discernable fillings.

EP 3/23/93

~~0.5~~

4.5 m East:

Aperture: ~3 mm

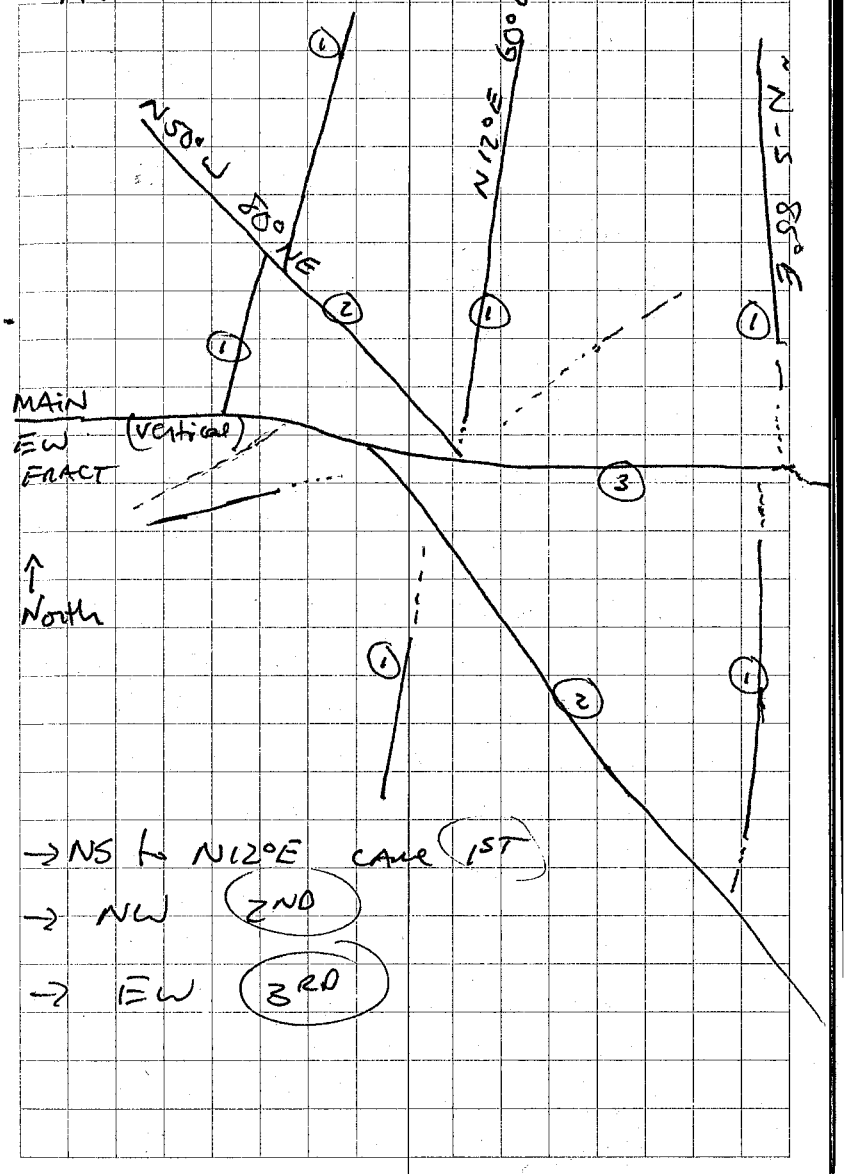
ALTERATION: ABUNDANT FeOx vein filling; A light colored, clay altered selvage ~2-3 mm wide occurs along the vein.

(Note: AT 4.7 to 4.8 m East, this clay ALT'N 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:



→ NS to N12°E cave (1ST)

→ NW (2ND)

→ EW (3RD)

AT 5.9 m EAST ; 13.7m North

APERTURE 1-2 mm

ALTERATION, veinlet filled w/ FeOx ; There is A Distinct Light colored clay ALTERATION selvage ~2mm wide Along the vein. IRREGULAR FeOx staining outside the CLAY ALT'N selvage, The FeOx staining HAS A MAXIMUM WIDTH of ~1cm, but is ABSENT in some PLACES

AT 5.9 m EAST ; 13.85 m North

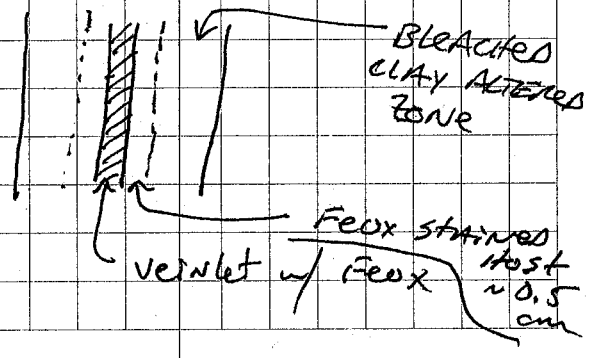
AT THIS Point the EW fracture is more Diffuse with abundant small intersecting fractures ; NO meaningful "aperture" is measurable. The central part of the EW fracture is encrusted with FeOX AND there is AN EASILY visible PATTERN of FeOX ALONG THE face of the vein. The

FeOx staining extends to both ~~Either~~ sides of the fracture ECP 3/23/93 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 ALTERED ALONG veinlet ; ~~BLEACHED~~ ECP 3/23/93 SELVAGE AROUND veinlet with WIDTH OF 1.0 to 1.5 cm



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

Now, samples 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
* Note - prefixes of ~~all~~ samples changed from NOPI-ECP to 393. From p92 thru p97.

3/24/93 ECP 8/25/94

TODAY will sample Extension of EW vein @ ~14m North, complete sampling of BH12 + underground waters; AND complete sampling of EW fracture at N end of cleared area (~ 45N); AND collect caliche samples from crestal top.

$\boxed{\text{Sampling of EW vein @ ~14 N, extension}}$

- 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 includes A subsidiary FeOx-rich fracture.

VEIN fill SAmples ALONG EW VEIN Extension

TAKEN BY F. Reyes 3/20/93
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 ⊥ traverse)

NOPI-ECP-(-)7.25 / 14.15

NOPI-ECP (-)6.30 / 14.32

NOPI-ECP (-)7.25 / 14.15

AND 2 more taken by
Jim Prikryl

NOPI-ECP-(-)8.10 / 14.28

NOPI-ECP-(-)8.95 / 14.60

Central crosses for Pitots

2 Sets:

Southern set AT:

0/0
10/0 10x10 m
0/10
10/10

Northern Set AT:

10/15
10/30 15x15 m
25/15
25/30

3/24/83 ECP

→ After lunch, JDP + ECP photographed the cleared surface and collected caliche samples from the top of the Nopal I cuesta (see JDP notebook).

→ 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

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

→ 65-71% HNO_3 ~ 1/2 liter

1 yellow carrying case

7/26/93 ECP
7th trip to Peña Blanca

[ECP JDP IR
BWL LK 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 reconnaisance 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
- Nycon strings & Aluminum tags used as before
- contact gamma survey begun by BWL & JDP
- Prior to beginning survey

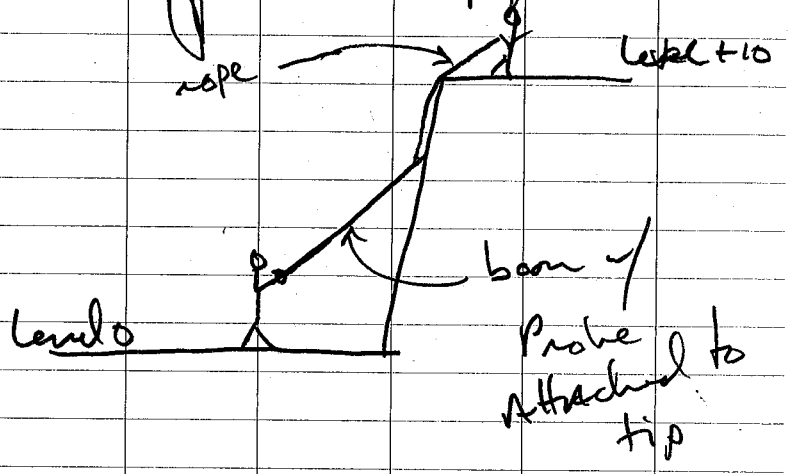
γ meter was checked against previously measured control γ points on level +10 m. Readings on 7/26 were the same at those points as on earlier surveys.

- 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 Uranophane limit.

7/27/93 ECP

- Tuesday: JDP + IR complete γ mapping of level 0 cleared area
- BWL constructs boom for vertical face measurements (γ)
- 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 γ measurements. No good, the γ probe swings + twists too much, difficult to position + may destroy the probe.
- After lunch: now try + different arrangement!



This arrangement allows good readings, but requires 4 people.

→ γ mapping of vertical face completed !!!

→ used remainder of day to complete maintenance on level +10 m sample location grid, every 5m x 5m control point was tagged + flagged w/ blue tape.

7/28/93 Wednesday

ECP

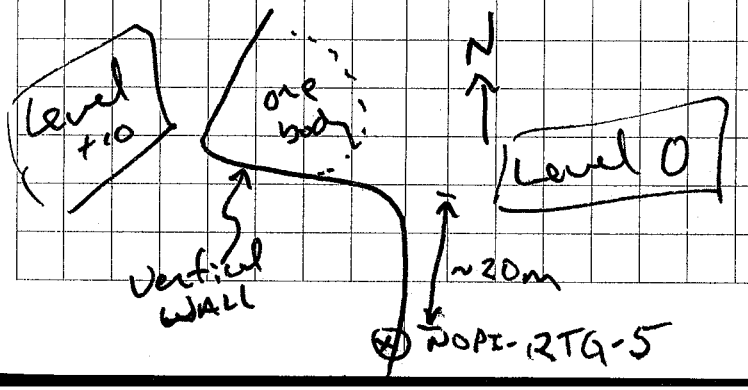
- This morning BWL has collected additional samples of vein filling material from the 13.5 m N fracture on level +10m
- JDA has collected samples along traverses on level 0 cleared area, guided by geology & the survey
- ECP + LK + DR reviewed the geologic mapping of level 0. Needs more detail. Level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

- ECP collected a sample of Nopal formation tuff for lithologic characterization. Alteration of this tuff is intermediate to the most altered and the next-most altered collected for lithologic 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 γ survey on the area around the newly cleared portion of level +10 around the fracture at ~13.5 mN.

EC 8/30/94

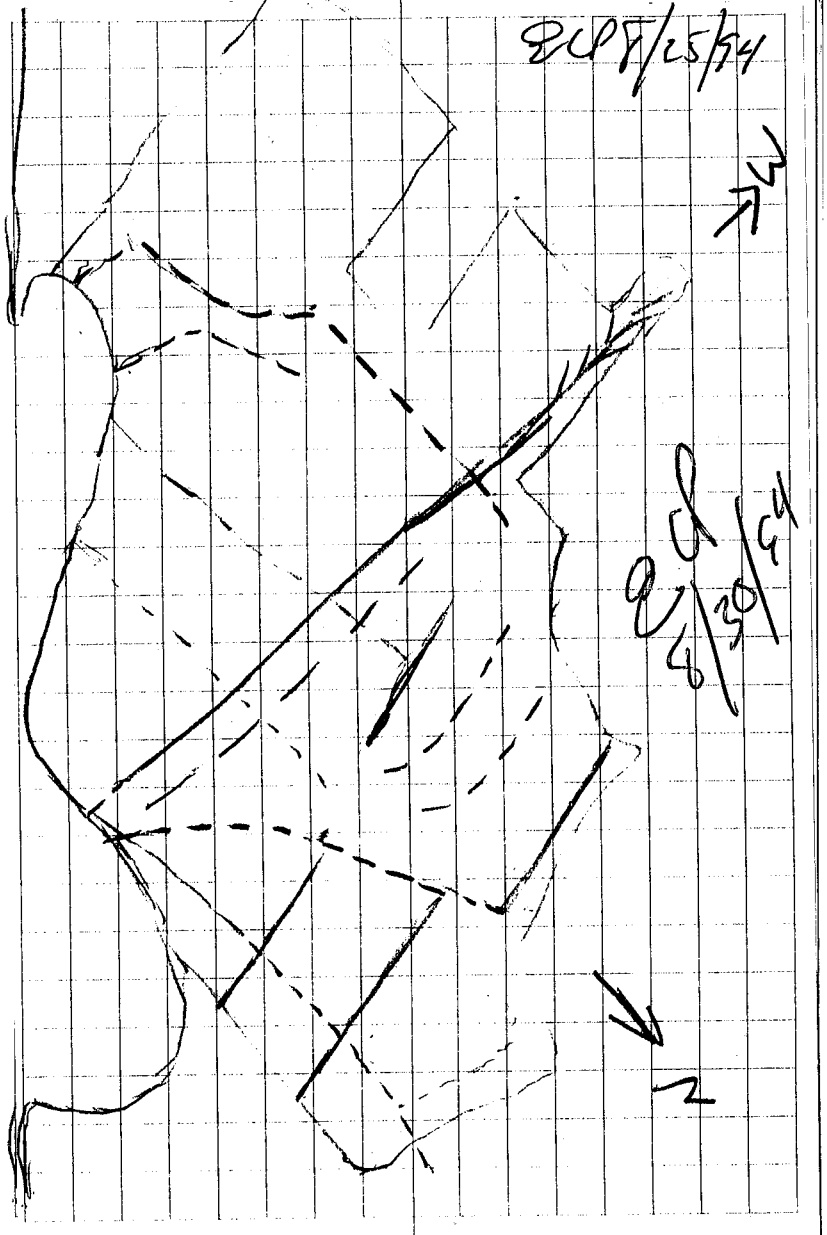
ON PAGE 109 is A Pencil sketch of the view from level +30 m of the cleared portion of level +10 m

See BWL Notebook

This sketch ALSO MAPPED ONTO NOPAL I Detailed topo base map — In more Detail, from several perspectives.

→ Level 0 sampling completed
→ U weed collected
→ caliche collected

EC 8/25/94



EC 8/30/94

7/29/93 ECP

- 8 bags of the "U-weed" PHACELIA Robustus collected from high grade ore piles from Nopal I, on 7/28/93
- Possible Hydrologic field tests @ Nopal I outlined During Evening of 7/28/93
- on 7/29, return to Chihuahua City, try to contact draftsman to make required additions to geologic maps of levels +10 + +00
- will not be available until evening.

2ND TRIP TO AKROTIRI

9/1/93 ECP

DR. KATERINA ALEXOPOULOU = in charge of this Area (Δ8a)

Δ 8a

→ Bronze artifact observed in PLACE in Δ8A

Σ 25.922 m Above S. Level = reference point in Δ8a by survey

- Artifact at 1.42 m below reference level

- Dolomite "sand + mud from the torrent" ABOUT 0.5 m Above the level of the Δ8a bronze

→ TODAY MET with Dr. C. Domos + Associates

→ Learned of bronze Discovery in Δ8a

→ EXAMINED + TESTED HYDRO Equipment.

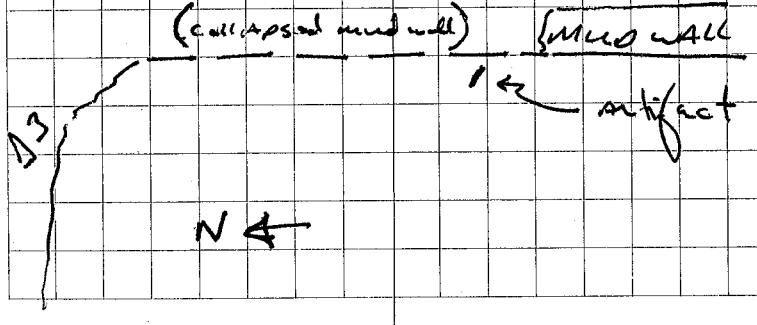
→ PLACED A GYPSUM BLOCK to measure moisture potential INSIDE of "TORRENT" Gully North of EXCAVATION, (see R.T. Green field notes + MAP).

→ RENTED VAN EARLIER TODAY, for 2 weeks.

9/2/93 ECP will work today in Δ8a to sample sound bamze 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 PLASTER composed of more mud.
- artifact is believed by Dumbs 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 "torrent" was found above the artifact, about 0.5 m above the level of the artifact

→ At the S.W. corner of Δ8a, 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 1.42 m 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

Δ8a NAIL

above "-0.99 to -1.29 - 1.39"

→ A NAIL fragment in Δ8a found by sieving debris in NE corner of Δ8a 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.'s

9/2/93 ECP

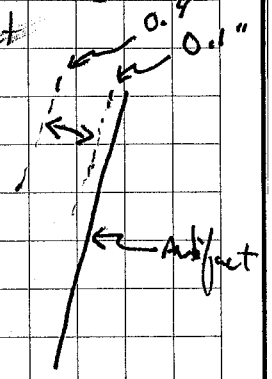
SAMPLING of ASH AROUND Δ8a artifact

- 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

SAN - 011

Volcanic ASH (?) from 0.1" to ~~0.3"~~ 0.4" ECP 9/2/93 from the centerline of the artifact

AS:



SAN - 012

from 0.4" to 0.6" from centerline of artifact

SAN - 013

from 0.6" to 0.95" from centerline

SAN - 014

from 0.95" to 1.4" from centerline

SAN - 015

from 1.4" to 2.1"

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"?
from the 58a
bronze artifact
as described
earlier p. 114 bottom

Katerina Alexopoulou
Vitsi - Grammou 7, Philothei
Athens
Greece

SEND ANALYTICAL results
ALSO to ALEXOPOULOU
AND to DOUMAS

9/3/93 ECP

→ ECP AND WHM 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 DOUMAS at 25.922m
above sea level

→ after construction of the reference system, A map of the room Δ3 was created by ECP using steel tape measures within the reference guides

→ RTG, WMM + ECP used steel tapes + the ~~reference~~ ECP 9/3 reference guides to make a topo map of the Δ3 floor showing areas of "packed earth" and of exposure of the Cape Riva tuff.

9/4/93 ECP

Saturday

→ TODAY we are to meet with ANNA Michailidou to use the Otis Imboden (National Geographic Society) photographs from 9/70 to try to re-locate the positions of the Δ3 bronze artifacts.

→ RTG + WMM are setting ~~of~~ ECP 9/4 up the Guelph 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 pit in the S. wall of Δ3 and the profiles of stones in the West wall of Δ3.

9/5/93 ECP

→ I have constructed a measured vertical profile of the W. wall of Δ3

→ We have moved the flagstones from the S.W. corner of Δ3 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 & WKM re-constructed the position of the bronzes in the newly cleaned area of Δ3. The position of the bronzes is probably accurate to within ±5-10 cm.

They were piled on top of, and jammed against one another in a tight array ~ 1m x 0.5m

9/6/93 ECP
9/7/93

We located + sampled 7 areas in the SE corner of Δ3 above which the large bumps were found. We also reconstructed the precise locations of the artifacts using dummy pieces (rocks, baskets + etc). Final placement of these positions is about ± 5-10 cm in any direction (i.e., MAX error - likely we have it better, < 5cm). 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 Δ3 to provide a baseline mineralogy and chemistry for comparison to those under the bumps. 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, gritty sa/t.
- We measured the depths of the Δ3 sample locations + of intermediate horizons.

These measurements are recorded in WMM's Notebook.

→ RTG continues to make hydrologic measurements each day. He is now working immediately outside Δ3 to the EAST of the EAST Wall.

Sample SAN-054

ASH from Δ8A, from NE corner of the room. This sample will serve as a baseline comparison for mineralogy and ~~ash~~ ECP 9/8/93 chemistry of the Δ8A ash, : unconsolidated, white ash with small (<1 cm) pumice lapilli.

9/9/93 ECP

→ RTG + WMM 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 9/9/93

Observations:

① there is no discernable "uppermost layer" of ash (aspa) as recorded; it may have eroded in this area

② next page shows integrated stratigraphy observed by ECP.

coarse gravel (dark) interlayered with lenses of fine gravel seds (~ 2m MAX)

"ASH" light gray to brown, abundant 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 eroded 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 Ewer discovered in Δ17 some years PAST (Marianatos era ?) sample collected by ECP on 9/9/93 after

Photography of the Ewer by Ari ____ at the AKROTIRI LAB from the cloth placed under the Ewer for photography.

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

TODAY we traveled from SA to Chihuahua 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.

ECP 8/25/94

3/1/94

TODAY we all started by driving to the top of the Nopal cuesta AND Helping RTG set up the EM / conductivity equipment to discern A postulated perched water zone which may describe the most recent persistent / annually variable

water interaction with the Nopal I deposit.

→ we set up A 160m perimeter 40x40 meter square, should detect perhaps 150m depth.

→ JDP + ECP reviewed + quantified the new level 100 cleaning and geologic mapping of I. Reyes

→ ECP + JDP set up A 1m x 1m grid on the newly cleaned portion of level 100 + repaired the earlier established level 100 grid.

→ This afternoon ECP + JDP conducted + completed A contact gamma survey of

the newly cleaned portion of level 100

→ RTG + IR continued the EM survey of the back of the crusta moving to the south in A series of measurements along a N to S traverse. Locations (i.e. corners of the 40 x 40 m induction loop are marked by ABS plastic stakes, survey lagging and by cairns of rock spray painted fluorescent orange.

3/02/94

→ ECP + JDP are sampling the newly cleaned portions of level 100

→ RTG + IR continue the EM conductivity survey.

These samples collected by ECP from the altered Vitrophyre 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 Copal? uranophane?) filling.

NOPI - 333

Location 41.25/-8.0

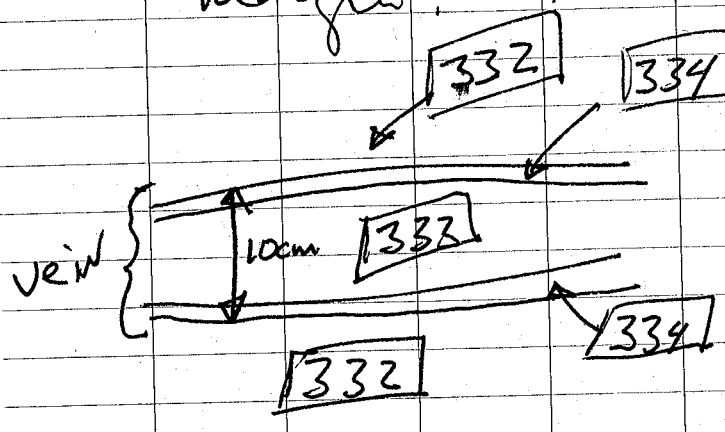
gray vein filling, harder than clay. => quartz? or chalcedony? Abundant unidentified

yellow U minerals

NOPI - 334

Location 41.0 / -8.0

orange & black material from vein margins. probably FeOx and MnOx. Some visible U minerals. forms 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 23.0 / -6.0

Location

This sample is hand picked flakes of cranophane? Consists 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 calcedony.

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 cm.

NOPI-369

Location: 42.35/-8.50

White, clay altered vitrophyre outside vein. At this point, vein is complex, anastomosing, total width is approximately 20-30cm

NOPI-370

Location: 42.0/-9.20

orange + black FeOx/MnOx? Along vein margin. width uncertain, <3cm

NOPI-371

Location: 42.50/-9.50

vein filling, very similar in appearance to NOPI-333. Minor u minerals visible.

→ This afternoon RTG + IR continue EM survey on Cuesta 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 margin contrasts + for U-disequilibria.

→ 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 + IR will continue EM measurements.

ON 9/1/92 ECP collected samples ⊥ 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 mN

on 3/24/93

- 5.40 mE 14.08 to 14.32 mN

TODAY 3/3/94, START AT

9.95 mE, EW vein center is AT 13.5 mN.

AT THIS POINT, FRACTURE DENSITY ⊥ TO THE EW VEIN is

27 fractures / 50cm 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 traverses ARE obscured AND some cracks ARE TOO small TO Be seen without MAGNIFICATION.

EXTENDING THE ⊥ SAMPLES AT 9.95 m E HAVE to THE South:

NOPI - 392
at 9.95 / 13.15

NOPI - 393
at 9.95 / 13.0

TO NORTH:

NOPI - 394
at 9.95 / 13.80

NOPI - 395
at 9.95 / 14.0

A SAMPLE TO EXAMINE MATRIX Diffusion collected including the vein WALL:

NOPI - 396
at 9.95 / 13.5

OBSERVATIONS AT 4.5 mE ALONG THE EW vein.
Vein center is A 13.82 N.
fracture density is TO South: 19 fracs / 10 cm
+ further S: 13 fracs / 10 cm

fracture density to North 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

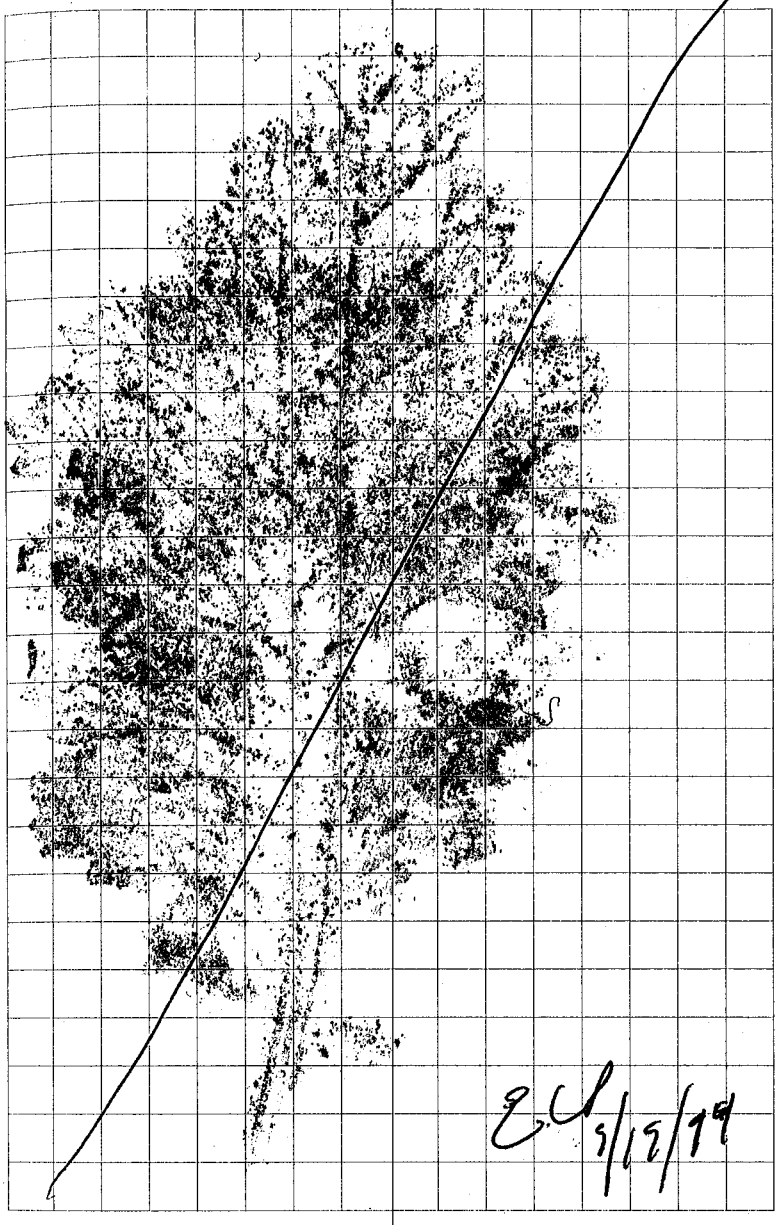
OBSERVATIONS AT -5.40 mE
TO SOUTH: 8 fracs / 10 cm
+ further S: 11 fracs / 10 cm
TO NORTH: 14 fracs / 10 cm
+ further N: 12 fracs / 10 cm

EW fracture Aperture measurements:

Loc.	Aperture 3/3/94 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 TN including vein wall along EW fracture (for matrix diffusion measurements) these go with sample NOPI-80396.



ECP 9/19/94

Matrix Diffusion

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. Pee

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 + fracture roughness measurements.

9/19/94 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

ECP 9/20/84

Allow tracing of the fracture "roughness."
Roughness is recorded using STANDARD 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 9/20/84

→ 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 9/18/84

9/20/84 E.C.P

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 9/19/94).

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 +10 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 QAP-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 Falck
SWRC-QA
11/02/94

jumped to #21 in '95

Continuation of ↑
This activity is
documented in
Notebook 21.

This notebook
is turned over
to QA records.

ECP
12/20/95

surrendered
dedicated
devoted
handed off
thrown AT ...