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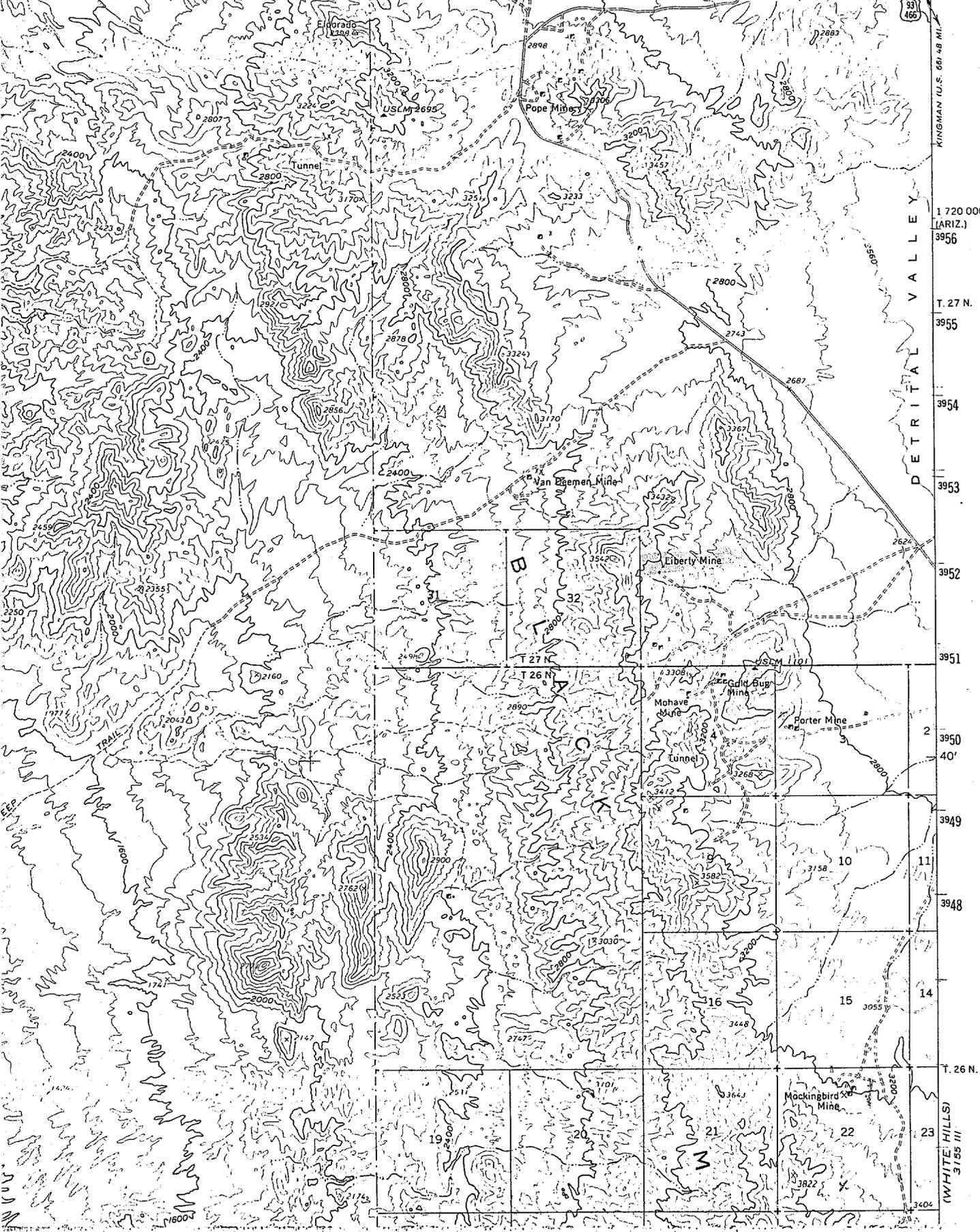
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MT. PERKINS QUADRANGLE
ARIZONA-NEVADA
15 MINUTE SERIES (TOPOGRAPHIC)

3155 IV
(SENATOR MOUNTAIN)

ANYONJ 716 717 718 35' 719 720 721 R. 21 W. 270 000 FEET (ARIZ.) 724 HOOVER DAM 27 MI. 114° 30' 35° 45'



KINGMAN I.U.S. 661.48 MI.
1 720 000 FEET (ARIZ.)
3956
T. 27 N.
3955
3954
3953
3952
3951
2
3950
40'
3949
3948
T. 26 N.
(WHITE HILLS) 3155 II

June 3, 1987

To: J.D. Sell

From: F.R. Koutz

Liberty Mine
Sec. 32, 33, T27N, R21W
Gold Bug District
Mohave County, AZ

I attach an ERS, set of 16 Au-Ag assays (TAJ-481), sample-field notes and sample map (1:62,500) of the Liberty Mine. The Liberty Mine area is a hematitic color anomaly which was noted from a hill top SW of the Gold Bug-Mohave Mines 1 mile to the south. The Liberty Mine color anomaly is 1 mile SE to 2 miles SSE of the Van Deemen property with some +2.2 m.t. of 0.042 opt Au and presently being extension/fill-in drilled by Arizona Star Resources (VSE) partner of Fischer-Watt Gold Co. The hoistman at the Gold Bug Mine said that the Liberty had been reverse-circulation drilled by Freeport (Reno) several years ago.

The ERS and field notes are fairly self-explanatory. The Liberty Mine area consists of Precambrian mica schists, granitic to dioritic gneiss, all with local pegmatite-aplite dikes all locally strongly foliated (generally NE-strike, dips 20-80° NW). The schists have all been obviously folded--some isoclinally although there is considerable stomp, contortion and drag. There are a few apparently Mid-Late Tertiary andesitic to rhyolitic dikes in the area. The area has only recently been unroofed from upper plate Patsy Mine Volcanics (mostly andesitic flows and flow breccias 1 mile to the NW at Van Deeman. There must be significant NE-striking fault between Liberty and Van Deeman as the low-angle Patsy Mine lower fault contact is 400-800' below the tops of the higher hills around the Liberty, Mohave and Gold Bug Mines.

The Liberty is part of another set of stacked synthetic listric fault systems (mapped and drilled by Heidrick and Wilkens among others) with local antithetic and orthogonal high angle offsets and mineralization feeders. The Liberty Mine itself is in a fault breccia with minor UG production from flat slopes where intersected by higher-angle feeders. Values across several feet of structure ranged up to 18-40 ppm Au and 38 ppm Ag. Values from Freeport drill cuttings ran <.02-.2 ppm Au.

The BLM microfiche indicated that Freeport had some 60+ "Liberty" claims in 1983, but dropped them in December 1985. They were subsequently refiled by Chuck and Margie Kunkes. I contacted the Freeport geologist, Alan Morran, who confirmed that Freeport had returned the claims to the Kunkes, the underlying claimants who have picked up most of the nearby countryside including Van Deemen in the last 10-15 years. Freeport staked because the previous claims were in disarray. The Kunkes' have since learned enough exploration/mining vocabulary "to be dangerous."

Freeport drilled +22 RDH (RC) in the property in 1985. They hit a number of discontinuous .0X opt Au (mostly <.05 opt) and a few 5-10' zones of 0.1 opt Au near to low-high angle breccia intersections. In the field it appeared that many RDH were preferentially sited near high-angle structures. Unfortunately, below the oxidation level ($\pm 100'$) values dropped off sharply and there was little dissemination away from structure. Freeport also spent considerable time mapping the area and collected several 100 geochem samples, analyzed for a number of elements. Silver, arsenic and molybdenum were particularly anomalous among other elements. There is a 1000' x 1000' As anomaly that halos Au mineralization. Freeport confirmed that there was a good relationship between the more mafic metamorphics and gold mineralization, but the gold is probably genetically related to Mid-Tertiary volcanism-intrusives and faulting. Freeport thought the drill results were discouraging. Freeport gave a complete set of data to the Kunkes including geologic mapping.

It appears that the Liberty Mine is a poorly developed distal end of the Van Deemen system and the best targets have been tested. The Fischer-Watt people have obviously looked at the Liberty data and probably do not want it at Kunkes' price. However, it is worth obtaining the data for the record/educational purposes. The Kunkes have other "good looking" ground not under option. The Kunkes are presently on vacation, but I will stop by and look at what they have sometime this summer.

FRK:mek

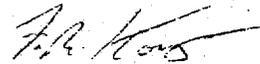
Attachments:

ERS

Sample Map

Field/Sample Notes

Assays TAJ-481


F. R. Koutz

ASARCO EXPLORATION RECORD

President & General Manager
 Chuck & Margie Kunkes
 Box 1652
 Dolan Springs, AZ 86441
 602-767-3831

FIELD EXAMINATION
 LITERATURE SEARCH
 ASARCO FILE

Gold Bug Dist.

Section I General Indexing

① Name(s) of Property or Area LIBERTY MINE (Golden Age - 1936)				② Country Mohave Co.		③ State or Province Arizona			
⑥ Latitude 35°42'N		⑦ Longitude 114°32'N		⑧ AMS Sheet Kingman		④ USGS Quad Mt. Perkins -15'		⑤ File or Gore No.	
⑨ Examined by F.R. Koutz		⑩ Date 5/7/87		⑪ Office Tucson		⑫ Field Days 6 hours			

Section II Sources of Information

Date Typed 6/1/87

⑬ References	Author	Date	Title	Publications	Vol. No.
	Wilkins, J.	1984	Arizona Geol. Soc. Fall Field Trip Guidebook (Day 1 +1979 Map)		
	Gardner, E.D.	1936	Au Mine + Mill, Black Mtns:	USGM IC 6901 p. 57	
	Fischer-Watt Gold + AZ Star Res. (Prospectus 6/30/86) Van Deemen Property 1 mi. NW				

Section III Appraisal

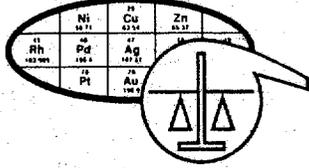
USGS PP-374E, 1963 C.R. Longwell

⑭ Recommendations <input type="checkbox"/> Action Now <input type="checkbox"/> Too Low Grade <input type="checkbox"/> Too Small/Spotty <input type="checkbox"/> Ownership Problem <input type="checkbox"/> Access Problem <input checked="" type="checkbox"/> Obtain Drill Data		⑮ Post Producer <input type="checkbox"/> Producer <input type="checkbox"/> Mineral Deposit <input checked="" type="checkbox"/> Prospect <input checked="" type="checkbox"/> Freeport-Rep. Drilled 1985		Detachment + <input checked="" type="checkbox"/> Listic Fits <input checked="" type="checkbox"/> Geologic Concept <input checked="" type="checkbox"/> Geochem Anomaly <input type="checkbox"/> Geophy Anomaly <input type="checkbox"/> Relict Potent. in District		⑯ Production Commodity Tons Grade Au ore X00 .X opt	
⑰ Num. Drill Holes <u>22+ (?)</u> Approx Total Footage <u>(4000'±?)</u>		⑱ Excavations Sev. shafts to <u>100'</u> <u>~1000' Workings</u>		⑲ Reserves <input type="checkbox"/> Measured Commodity <input type="checkbox"/> Estimated Tons Grade None			
<input type="checkbox"/> Spectro. Analysis Attached		<input checked="" type="checkbox"/> Assays Attached TAJ-481		<input checked="" type="checkbox"/> Geochem Results Attached			

Section IV Geologic Data

⑳ Commodity or Contained Metals Au ^o -Ag (Reported As+Mo anomal.)	
㉑ Ore Minerals-Major Au-Ag Minor Py Tcpy-CuOx Minor	
㉒ Host Rocks-Major Qtz-Mus-schist gr-gneiss diorite sch Minor felsic/mafic dikes to N. Patsy Mine Volc.	
㉓ Age of Host Rocks pE +pegs(pE) pE mT? 18.6 - 14.5 m.y.	
㉔ Nature of Exposures Good: Desert pediment + low hills, fair to good outcrop (schist is slumped). 200-400' relief. Pegmatites plus felsic and mafic dikes locally lace area	
㉕ Alteration Bleaching-sericite plus hematitic flooding-silicification along structures	
Much of mafics locally chloritized ㉖ Total Extent Hvy color anom: 2:800'x500', mod color anom. Halo ± 1/2 mile.	
㉗ Structure WNW to NNW 10 to 30° NE low angle shears (detachment-related)	
with NW & ± NE high angle listric normal faults. Foliation in schist rolls alot.	
㉘ Ore Occurrence In low angle struct. plus intersecting/feeding higher angle struct. Heavy bleaching/hem. flooding usually limited to <10' structure. Spotty. Best Freeport results: 5-10' of 0.1 opt Au in a few D.H. ㉙ Age of Mineralization post 14.5my, pre 11.9 my (faulting)	
㉚ Conclusions & Recommendations A short distance into footwall of listric fault system. Not as well developed as VanDeemen. Considerable areas of fresh-looking schist/gneiss between shear zones are probably waste. Low angle/high angle shears may coalesce at shallow depth but mostly stacked listric-normal faults in Dist. rather than master detachment. Worth obtaining Freeport's sampling/drill data plus Kunkes has other zones in district not held by Fischer-Watt. "1936, USBM: 1-6' 25° vein: av. 3', ore bunchy, 125' drift in vein-small shipments" Au values drop sharply below oxidiz. zone (±100' depth).	

(For additional space use extra sheets)



SKYLINE LABS, INC.
 1775 W. Sahuaro Dr. • P.O. Box 50106
 Tucson, Arizona 85703
 (602) 622-4836

PRELIMINARY
 REPORT OF ANALYSIS

JOB NO. TAJ 481
 May 28, 1987
 BH-1 TO LIB-15
 SHIPMENT NO.: BH & LIB
 PAGE 1 OF 1

ASARCO INCORPORATED
 Attn: Mr. Fleetwood R. Koutz
 Southwestern Exploration
 P.O. Box 5747
 Tucson, Arizona 85703

Analysis of 16 Rock Chip Samples

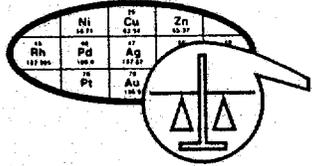
ITEM	SAMPLE NO.	Au (ppm)	Ag (ppm)
5	LIB-1	.09	.8
6	LIB-2	.02	<.2
7	LIB-3	.29	18.0
8	LIB-4	<.02	<.2
9	LIB-5	.32	55.0
10	LIB-6A	.93	34.0
11	LIB-6B	<.02	.2
12	LIB-7	4.20	18.0
13	LIB-8	.40	8.8
14	LIB-9	6.00	38.0
15	LIB-10	>10.00*	32.0
16	LIB-11	.20	.2
17	LIB-12	.05	.2
18	LIB-13	<.02	.4
19	LIB-14	.03	.2
20	LIB-15	1.50	3.0

*NOTE: Greater than normal geochemical range.
 Please advise if fire assay is needed.

NOTE: Gold, Silver and Platinum results pending.

cc: Asarco Incorporated
 Southwestern Exploration
 P.O. Box 5747
 Tucson, Arizona 85703
 Attn.: Mr. James D. Sell
 Ms. Mary Kavanagh





SKYLINE LABS, INC.

1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 481
June 5, 1987
BH-1 TO LIB-15
SHIPMENT NO.: BH & LIB
PAGE 1 OF 2

ASARCO INCORPORATED
Attn: Mr. Fleetwood R. Koutz
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

ASARCO Incorporated

JUN 8 1987

Analysis of 14 Rock Chips and 6 Drill Cuttings

SW Exploration

ITEM	SAMPLE NO.	Au (ppm)	Ag (ppm)
5	LIB-1	.09	.8
6	LIB-2	.02	<.2
7	LIB-3	.29	18.0
8	LIB-4	<.02	<.2
9	LIB-5	.32	55.0
10	LIB-6A	.93	34.0
11	LIB-6B	<.02	.2
12	LIB-7	4.20	18.0
13	LIB-8	.40	8.8
14	LIB-9	6.00	38.0
15	LIB-10	>10.00*	32.0
16	LIB-11	.20	.2
17	LIB-12	.05	.2
18	LIB-13	<.02	.4
19	LIB-14	.03	.2
20	LIB-15	1.50	3.0

FIELD Sample NOTES

①

LIBERTY MINE AREA E/4 SEC 32, W/4 SEC 33 T27N R21W, Mt. Perkins, AZ. 15' TOPO
PRESENT OWNERS: CHUCK + MARGIE KUNKES (CHARLES + MARGARET) (also? LUSR Box 970 Kingman 86401)
Box 1652 Dolan Springs, AZ 86441 602-767-3831

Previous operations: Boulder Inn + Airport, W/4 SEC on US 93
"LIB" CLAIMS STAKED 12/02/85 AFTER OUIR CLAIMED FROM FREEMANT - RENO
THE KUNKES have most of claims in Pope - Van Deeman Mine Area. (KUNKES Previous by Map)

"21st Century Enterprises" NOT retrieved young dies. own AIRTRAX

- STRONG, HEAVY + GOETH color anomaly for 500' NW x 500' NE-W of LIBERTY MINE ADIT + SHAFT
water color anomaly surrounds + extends 1/2 mi. NE, ALSO NE trending color anomaly @
+ NE of ^{32,33} ST4. THERE ARE 12 positive RDT 5' probes RDT around Liberty mine
(3 Treas. Drill Areas) plus about 5 RDT around ^{32,33} ST4 Note that 1979 Handbook
+ Williams Map shows 2 DDH in 0.8 mi. NE of Liberty mine @ Saddle between Hills 3432 +
3367. Drilling 1985 (2 stages?) by FREEMANT RENO.. All sample TAGS FPP-series

- Bedrock is biotite + muscovite granite gneiss and schist with local mafic - diorite
schist and Qtz-Fs-muscovite pegmatite. PE metamorphics are well foliated + about primarily
NE to NNE axes at high to low angles. But foliations rolls around a lot. Locally 1-10'
quartz vein-pods - strongly banded other 1/25' - facing areas. Some NW + NE folia
plus mafic dikes - seldom foliated. Area is similar but less well developed - altered compared
to Van Deeman mine 1 mi. NW with low angle - detachment faults and lower plate tectonic
normal faults. There is probably more than one low angle fault surface in area. High angle
tectonic faults + dikes are locus and prob. bedrocks of mineralization. One mile to NW
the upper plate PATSEY MINE Volcanics (18.5 - 14.5^{Ma}) are topographically some 400 feet - 600 feet
lower than the Liberty mine area so the area has probably been recently extended beneath the
"masked" detachment at the base of the Patsey mine Volc. (or on old topography on NE-
striking fault down to NW between Van Deeman + Liberty).

Samples: (SW corner SEC 33) Au/Ag ppm TAG - 481 Skyline
LIB-1 @ FPP-124 Al Tag. NW felsic dike in N25E schist. 3' to them w/ 10% Qtz vein.
.09/1.8 3x3' FACE sample of pit (3 of 2 pits) - 30' of dump
LIB-2 Drill cuttings @ Saddle: m-d Kgy 1-2% hem. mica schist plus a little Qtz
.02/1.2 T? pyrite (non-oxidized and v. fg.) Mostly cuttings unoxidized. Rep sample of cuttings
LIB-3 N40E foliation - shear in outcrop. S-8% Hem + jarosite. Zone with total under
29/18 LIB-2 to NE 50' shaft in FW. 10' Horiz. sample across zone in pit FPP-114 to
lower part of zone bleached. Dike intrudes here? 10% Qtz vults in foliation (N40E)
] parallel (Fischer - VATT photos) @ corner SEC ^{32/33} 5/4 1915 GLO.
LIB 4: Down Rd (N20W to #2) TAG FPP 110' Drilled Road Cut, could be used Drill part
.02/1.2 AREA sample 20' DIA. Hem = 2% G = 3% striated schist. (Box from MAPS SIDE.)

Samples: LIB 5 @ FPP 102+103, 140' SW of SEC CORN.; PIT 8' x 12' x 5' deep.

NW strike 103° N shear - foliation, 5% Hem - sheared schist with dike (?) bleached.

LIB-6 T945 Altay, N70W silicified vein + felsite dike. Drill cuttings 20' East (Preston Rank?)

6-A: @ T1096 N30E TRENCH 50' long. 20' sample @ SW END by silica Rib. NW strike 103° NW

.93/34 Shear/foliation BUT schist is very contacted here

6-B: Drill cuttings - dike + felsite schist B's Gwth. T? py RDT site Ripped.

2.02/1.2
LIB-7: @ 2 SHAFTS SW 1/4 SW 1/4 SEC 33, N60W QTZ VN. NW shaft ~100' deep. S SHAFT ~

42/18. 40' deep inclined with vein 50°W - 100T dump. Sample from dump @ SE incl. shaft 3% Gwth,

85% wh. QTZ. Some Granite intrudes schist. 2x2 SW CORN LIB-19.

LIB-8: E-W QTZ VN. 70-80° S. Discont. 150' T Dump, 40' shaft, Rep. Dump sample T box on

4/8.8 Dump. 85% wh. QTZ 5% Hem, 2% Gwth. T irridesc. py. (or cpy?) QTZ with Bx'd.

- Detach is less than 100' ABOVE PRESENT SURFACE.

@ corner SEC 33 LIB 17/20? Loc. Map. 2x2 Rotten Notice Freeport Exp. plan. 27 SEPT 83 Rmody

Malorrows Box 1911 Reno, NV

- Liberty ADIT + shaft ± 10-30° flat VN - shear. plus local higher angle faulters / fault zones

ADIT IN 60' (plus 20' ADIT TRENCH) to shear in BACK N70W, 20-30° N; then 70' more N70W

to shaft station. (35' below SURF in ADIT) plus shaft goes down another 50' to lower levels.

- Secondary ADIT, decline into shaft - (SSW cut); thence 80' N60W, 40-70° N along strike in BACK

Rolls down; thence N20W, 20-30° 40' more feet; thence 80' more to end of tunnel N40W 40° N

Back in tunnel ("U" man here 50' pillar - a little stoping). Only a little stoping in workings -

less than 100T. Looks like some 1850's - 60's work from junk / pieces in ADIT, pipe

for rails. Jy + white low angle QTZ VN some cluse in 10-30° fault zone, ~ SSW T dump @

MAIN ADIT. ADIT ABOUT 370' long (215 + 245)

LIB 9: selected material on tin: Tan + white QTZ + Bx'd schist (silicified) 8% Hem, 1-2% Gwth

6.0/36 Best low angle fault zone with Hem. Flouling looks like 1-3' thick. Bx'd cut tailer on end

OFFICE (?) site. FPP-042-040 @ SSW decline to shaft (FPP-043 1/2 way between 2 ADITS)

LIB 10: 1 1/2' cut. FPP-041 + 040. Incl. 9" QTZ VN (bedded) - Bx'd wh. + dense QTZ + Hem plus

>10 (18, 30, 40)
32. 9" sheared schist below N45W 25° NE trend of Liberty Fault zone at decline

- 100' on strike FPP-037, FPP-038 (S = VN??), FPP-039 @ N60W 60° NE shear that rolls

into cuts 25° NE flat shear. Another N70W 75° E fault zone 2-3' wide. Fresh tan mine

was 50' SSW of mine zone. pile of cuttings on Rd @ NW END

LIB-11: Drill cuttings - some oxidiz. Mostly green chlorite (andalusite?) schist, 1-2% py,

12/2 with 1-2% py in QTZ I cpy (cov) TANISHA.

LIB-12: 200' S60W down Rd. @ FPP-061: 2' N30E 200' shear in schist (in foliation)

05/2 - Drill cuttings 2/3 are pink-dusty unweathered 1/3 green chlorite. Freeport obviously
drillings on structure to get values!

360' to LIB-12 from parking spot @ Brent function N70W Road.

At least 4 TRENDS of RDH - drill Roads mostly ripped. 2 more holes on 200-300' Q up Rd.

From LIB-11 - Hole C FPP-053-055 N20E 60°N shear. Trench 20' wide, 50' long 8' deep.

On saddle overlooking Van Deeman to NW Road is ripped but doesn't look drilled FPR-077E ridge Satchel
Diva. schist. Hard to get samples on drill roads over Liberty ripped/windrowed

- LIB-13' N30E from LIB-12 Lower Rd. DKgy. - green cuttings ~50' E of outcrop zone + 290° curv in Dr.
- LIB-14 - N28E of LIB-11 : cuttings on lip of Rd. a little Qtz T. + pyrite 100' NB of Dump SHAFT (is)
- LIB-15 - N50E-40°W SHAFT, N70W 50°W shear intersection SHAFT 50' deep plus DRIFTS? -

1.5/3.0 Rep. sample of Mo of Dump ~30% wt. Qtz. Heavy shear zone 4-8' thick - winds down then workings. Sample: Hg = 7% Cu = 2% (purple schist wallrock) [COX stain in clay

- All of above looks very much like Van Deeman BUT lots of fresh looking schist - gneiss between High and low angle shear zones = lots of waste!

- Assay for Au (.02 ppm - Au) Ag only at this time

- CONTACT FREEMONT - Reno (702-826-3000 Allen Program) - called 5/21/87 - will stop by to look at data & on Kunkes when get assay & BACK (HE will BE with them June 2-7)

Allen Munns called back May 26 and gave me details of Freemonts 1985 Liberty mine

Drilling program Total about 22 holes (20-21 actually completed?) There were 2 or 3 on "Buckside" to SW. Their best drilled values were 500' of O. lpt in several holes - usually more & less

They found that oxidation extended down about 100' (deeper in general in Box street. Thus away. But Au values dropped off sharply below oxidation zone. Best values at 16' level & intersections

Several geochem. samples taken - A number of elements were anomalous besides Au - particularly AS, Ag & Mo. 1000x Cu & As anomaly. Freemont considered results discouraging. Studied area when Anasako had Van Deeman. Says Kunkes is getting rich on everyone's option payments Kunkes is a self-taught miner. Never

knows all the geology terms - frequently misusing terms: "Kunkes enough to be dangerous

Also has ground in Nevada. Freemonts Bullard Mt property w. of HARCOURT MTS (Aguila Area) & PEDRE project near BARTON have both been dropped. (They stowed up on

Freemont Golds May 87 prospectus). Munns's Territory is Reno (SW NV), AZ, Nevado, N. Mex. He asked about Santa Cruz Stats. (IP?)

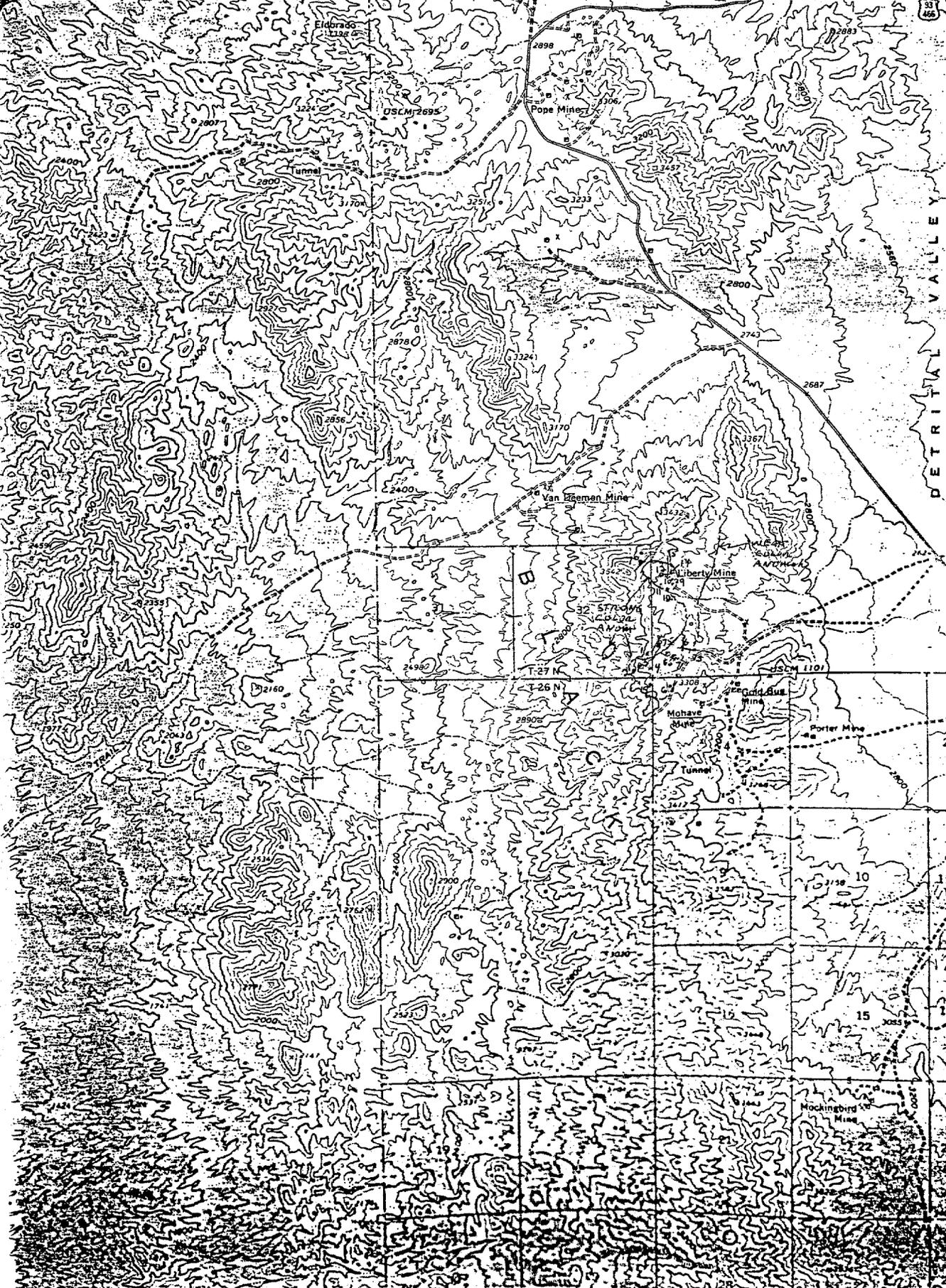
Kunkes has complete SET of DR assay data, Geochem. results, geologic map? - (Freemont did lots of mapping of DISTRICT) & Freemont would need Kunkes's permission to release data. Kunkes may be reluctant to pass out negative results (or what he thinks was negative)

⇒ Verdict: Very poorly developed distal part of Van Deeman system. Probably little likelihood of ADDITIONAL drill targets but Freemont/Kunkes data worth obtaining for the record/education. Kunkes may also have other good bets in the district but undoubtedly high priced & picked over by Fischer-WATT & others (incl. Santa Fe) Apr 16/87

MT. PERKINS QUADRANGLE
ARIZONA-NEVADA
15 MINUTE SERIES (TOPOGRAPHIC)

SENATOR MOUNTAIN

R. 21 W. 270 000 FEET (ARIZ.) HOOPER DAM 27 MI. 114° 30' 35° 45'



HIGHMAN U.S. 66 48 MI.
DETRITIAL VALLEY
1 720 000 FEET (ARIZ.)
T. 27 N.
T. 26 N.
WHITE HILLS

F.R. KOUTZ
MOHAVE Co.

LIB SAMPLES
5/7/57
TAS-481

T. 26 N.

June 4, 1987

F.R. Koutz

Liberty Mine
Gold Bug District
Mohave County, AZ

Your memo and ERS has been received and distributed to New York.

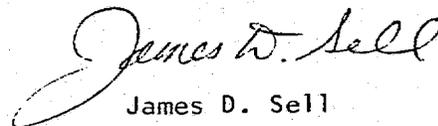
In dealing with the Kunkes and other Liberty type deposits, it is well to secure as much data as possible without any further obligation other than friendship and a few more samples added to their inventory.

Although you mention "stacked" systems, it is not apparent as to the closeness of the stacked systems, either the flattish zones or the high-angled listric systems, which constitute such a situation. I would hope that you will soon be able to project such zones that will enhance the probability of better values distributed over a viable area.

As is becoming apparent, it is necessary to have a feeder system coming into the structurally prepared flattish-listric in order to secure the necessary grades of ore, and, of course, the size for open-pit potential. Again, such footwall features might be evident but need to be projected into the necessary structurally prepared system.

If the Van Deemen area is a lower part of a stacked system which involves the Liberty Mine area, then I would be interested in the valley west of the Liberty Mine where such a lower system may be in suboutcrop.

How do you relate the detachment zone at the Mockingbird Mine with the Liberty and Van Deemen zones?



James D. Sell

JDS:mek

cc: R.L. Brown (w/att.FRK memo)
W.L. Kurtz

June 4, 1987

J.D. Sell

Liberty Mine (Addendum)
Gold Bug District
Mohave County, Arizona

Thank you for your comments on my June 3 Liberty Mine memo. Rest assured that I will get as much "free" data out of Kunkes as possible.

I attach several things that will clear up your questions: "Stratigraphic and Tectonic Setting of the North Central Black Mtns. & Detrital Valley" by Joe Wilkins (1984 AGS Field Trip hand-out to go with guidebook). This shows the style of rotated and laterally transported Tertiary, Laramide and Precambrian sections along a downward-flattening and coalescing synthetic listric normal fault system or "stacking." These faults may be offset by orthogonal antithetic faults (Basin and Range age?). This style is present in detail at a variety of scales.

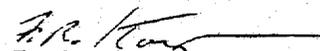
Note that Heidrick and Wilkens mapped (AGS Guidebook) Sec. 28 & 29 N&NW of the Liberty Mine including Van Deemen (but they did few Au-Ag assays).

You are right, it is necessary to determine which systems, directions and projections carry values of viable grade and size. Which level structurally Liberty or Van Deemen are on is uncertain. The Van Deemen (or another) flat breccia zones (westerly dips) were apparently drilled through under the Liberty Mine flat fault (N70W, 20-30°NE). Perhaps Freeport's geologic maps and drill sections will show this relationship. But I also know that many of these low angle fault surfaces are themselves folded--so strike and dip are not good criteria to correlate fault surfaces. I have found no good way to tell which high or low angle fault is a feeder (when projected). Intersections of fractures-fissures in fairly competent rock are necessary (= breccia). The ore-grade pods at these intersections are seldom larger than an acre and are difficult to project (and mine-plan).

You are right that the valley to the west of the Liberty Mine is of interest, and, in fact, is part of the Van Deemen Property (attachment), and has been locally drilled by Amselco, Kunkes, Fischer-Watt and others. Freeport held parts of Sec. 31 (and may have also drilled there). Much of the area is apparently so thickly covered with alluvium to preclude an open pit. Beyond the west side line of R21W is Lake Mead Nat. Rec. Area (NPS).

Mockingbird is part of the same flat-fault system that extends under most of the Black Range (and into California) and includes Van Deemen/Liberty. Which plate or slice Mockingbird is in is impossible to tell at present. I'm not sure that this is a genetically important question to the development of open-pit gold mines here. The relationship to mineralizing Tertiary intrusives is more important.

FRK:mek
Att. (2)


F. R. Koutz

1984 - AGS GUIDES
- HANDOUT -
Fall Field Trip

STRATIGRAPHIC AND TECTONIC SETTING OF THE NORTH-CENTRAL
BLACK MOUNTAINS AND DETRITAL VALLEY,
MOHAVE COUNTY, ARIZONA

by Joe Wilkins, Jr.

Howie
2/17/89

INTRODUCTION

The initial mapping in the area (figure 1) was a reconnaissance geologic map by Longwell who outlined the general volcanic stratigraphy of the region. Subsequent work by Anderson (1971, 1978) and Anderson and others (1972) have further defined the volcanic stratigraphy and the tectonic setting of the Lake Mead - Eldorado Mountains, Nevada area. A younger series of flat-lying volcanic and sedimentary rocks which unconformably cap older sequences have been mapped by Longwell (1928, 1963), correlated by Lucchitta (1979) and Blair (1978), and age-dated by Damon (1967, 1979) and Anderson and others (1972).

The majority of the previous geologic studies have been in the Lake Mead and Southeastern Nevada areas. Except for Anderson's (1978) map of the Black Canyon 15" Quadrangle, the only previous work in the North-central Black Mountains, Detrital Valley and the White Hills has been cursory reconnaissance-type surveys.

In 1977 and 1979, during a porphyry copper exploration program, about 20 square miles in the North-central Black Mountains and White Hills were mapped and sampled and 3 holes drilled in Detrital Valley. The data acquired form the basis for the following report and field trip guide.

STRATIGRAPHY

A generalized stratigraphic column showing Longwell's (1963) section and Anderson and others' (1972) modification is shown on figure 2. In this portion of Arizona and Nevada there is a minimum of 16,000 feet of volcanic flows, tuffs, tuff breccias and volcanoclastic sedimentary rocks deposited on a Precambrian basement. This volcanic sequence is unconformably overlain by 3000 to 5000 feet of late Tertiary to Holocene sedimentary rocks, volcanic flows and tuffs, and alluvium. At least 16,000 feet of Paleozoic and Mesozoic rocks, present on the Colorado Plateau (to the East) and near Las Vegas (to the West) have been removed from this area.

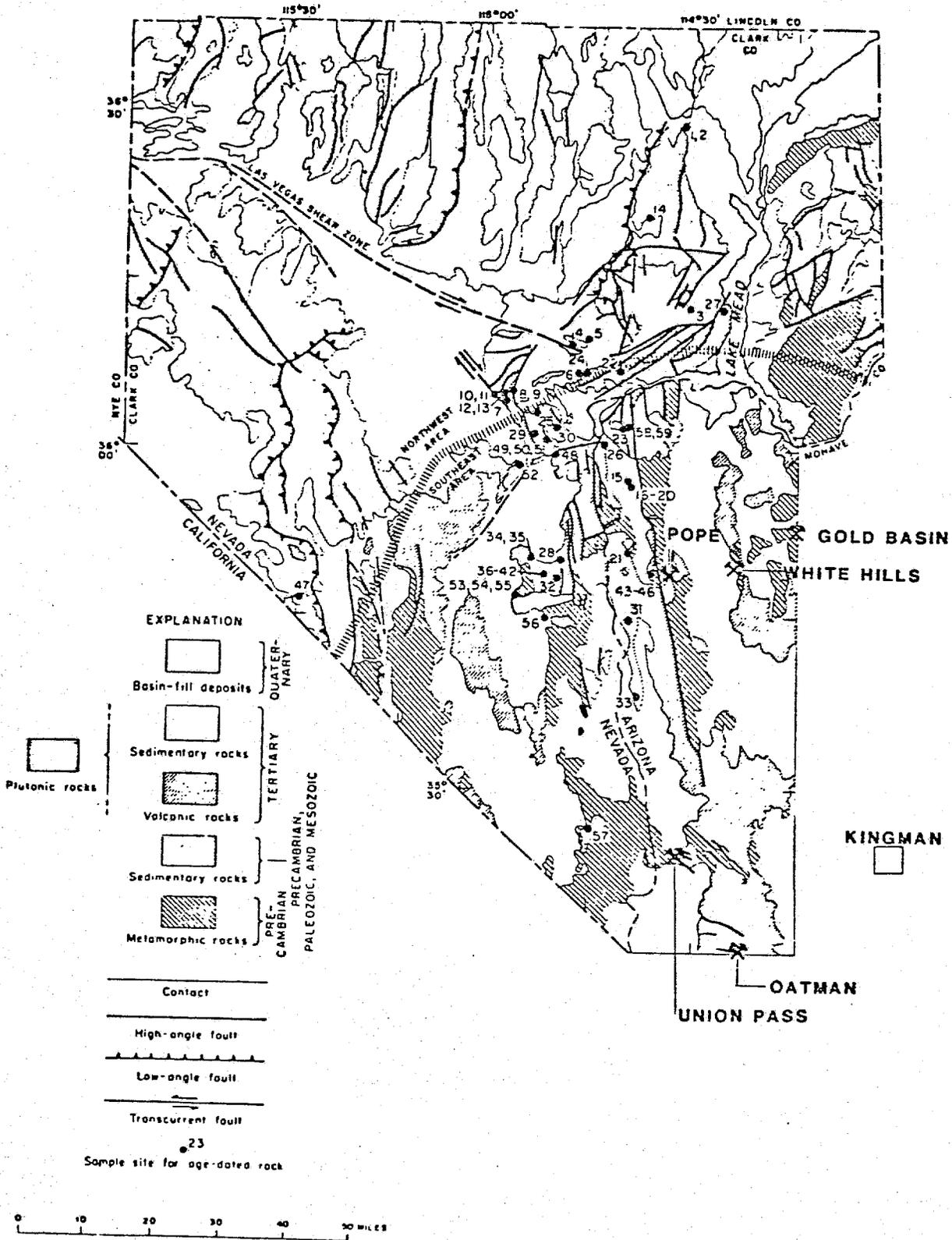


Figure 1 Regional geological setting and location map

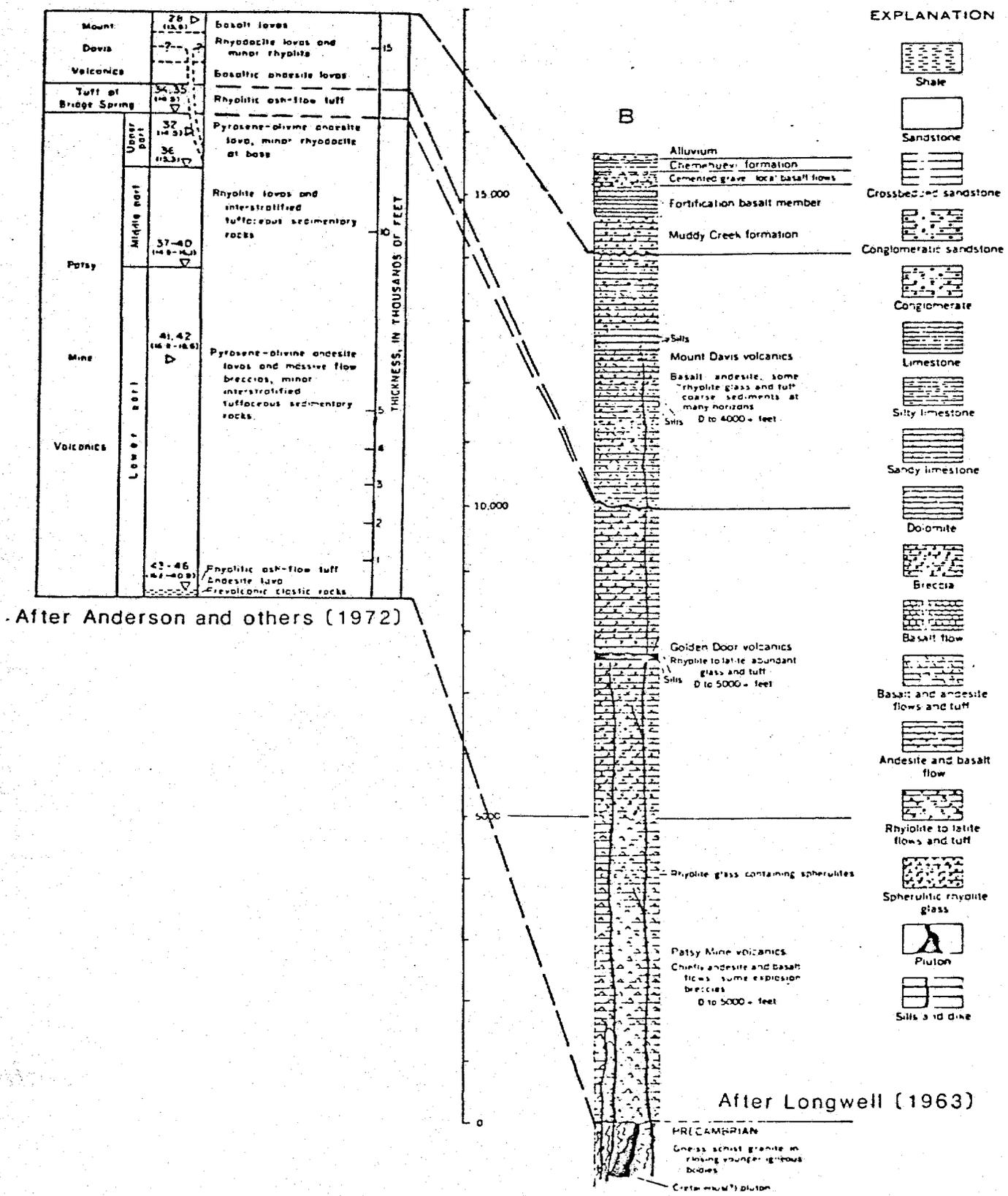


Figure 2. Generalized stratigraphic section of the volcanic, volcaniclastic and sedimentary rocks in the Detrital Valley and North Central Black Mountains, Mohave County, Arizona.

Patsy Mine Volcanics.

The Patsy Mine volcanics, deposited on Precambrian basement and Laramide (?) intrusions, consist of 13,000-14,000 feet of flows, flow breccias, lahars, vitrophyres, tuffs, tuff breccias and welded tuffs ranging in composition from andesite to rhyolite. Longwell (1963) subdivided the volcanic pile into 2 units: the Patsy Mine and the Golden Door. The original Patsy Mine consisted of about 5000 feet of dark-colored andesite to basalt flows, flow breccias, and lahars with minor pyroclastics. The Golden Door units were a lighter-colored sequence, about 5000 feet thick, and dominantly rhyolite to rhyodacite flows, flow breccias, vitrophyres and tuffs. Anderson (1971) dropped the Golden Door nomenclature, added the units to the Patsy Mine sequence, and subdivided the section as follows:

Lower part - 9100 feet, pyroxene-olivine
andesite flows and flow breccias.

Middle part - 2700 feet, rhyolite flows and tuffs

Upper part - 1500 feet, pyroxene - olivine andesite
with rhyodacite at the base.

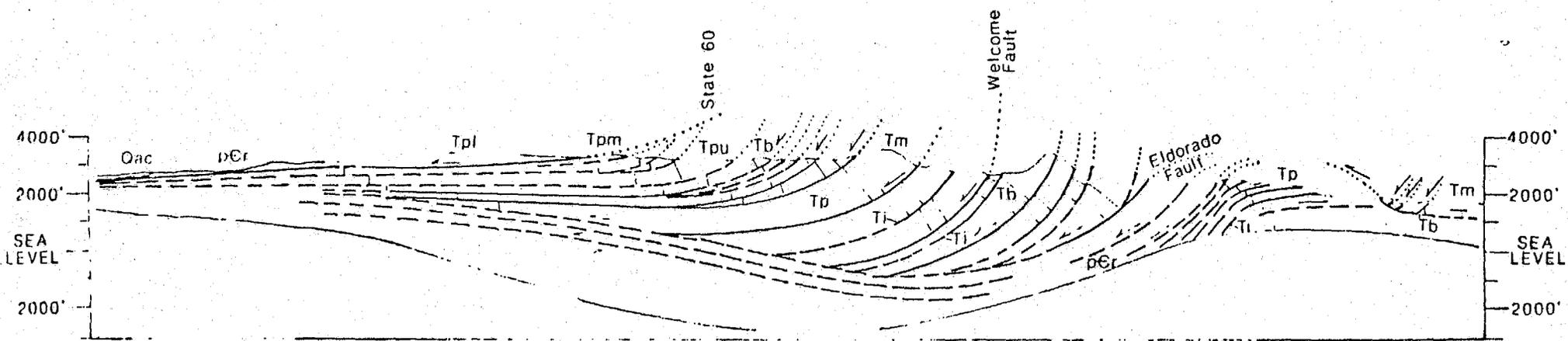
K-Ar ages for the Patsy Mine range from 18.6 at the base to 14.5 at the top with several discordant ages (22.8, 27.9, 40.8 m.y.) present in lower units (Anderson and others, 1972).

Bridge Spring Tuff.

The Bridge Spring tuff is a 700-foot thick, sheet-like welded rhyolite ashflow tuff that is widespread in the Eldorado Mountains, Nevada, and Chemehuevi Valley, California. It has not been recognized in the central Black Mountains, Arizona. The tuff conformably overlies the Patsy Mine volcanics and was K-Ar dated at 14.5 m.y. (Anderson and others 1972).

Mount Davis Volcanics.

The Mount Davis volcanics include about 2000 feet of flows, flow breccias, and tuffs intercalated with coarse fanglomerates composed of Precambrian gneiss-schist clasts or Precambrian schist-gneiss plus tertiary volcanic clasts. Compositions vary from olivine basalt to andesite with some rhyodacites. The base of the Mount Davis was K-Ar dated at 14.6 m.y. and the top of the sequence dated at 12.0 to 11.8 m.y. (Anderson and others 1972).



EXPLANATION

- Oac Alluvium
- Tm Mount Davis Volcanic
- Tb Bridge Spgs. Tuff
Patsy Mine Volcanics
- Tpu Upper
- Tpm Middle
- Tpl Lower
- pCr Schist gneiss

Figure 3. Cross-Section in the Eldorado Mountain, Nevada
After Anderson (1971)

Muddy Creek Formation.

The Muddy Creek formation unconformably overlies (usually with a strong angular unconformity) Mount Davis and Patsy Mine units. The Muddy Creek formation is a valley-fill sequence of interfingering fanglomerates, sandstones, shales, siltstones, evaporites, a marine limestone, basalt flows and tuffs. The marine limestone is the Hualapai limestone member and was assigned marine origin by Blair (1978) on the basis of microfossils and chert geochemistry. K-Ar ages of tuffs and basalt flows in the Hualapai member are 8.4 and 11.9 (Blair, 1978). In Detrital Valley, the Muddy Creek formation has a minimum thickness of at least 2000 feet.

Fortification Hill Basalt.

The Fortification Hill basalt member of the Muddy Creek formation is a series of flat-lying, mesa-capping basalt flows at or near the top of the Muddy Creek formation. Several flows appear to cap Colorado River gravels (Damon, 1978), and may be younger than the Muddy Creek. A whole rock K-Ar date for the lowermost flow unit on Fortification Hill was 5.88 m.y. and the basalt at Sandy Point yielded a 3.8 m.y. date (Damon, 1979).

TECTONICS

Virtually all of the pre-Muddy Creek lithologies in the North-central Black Mountains, the White Hills, and Detrital Valley are allochthonous. The schist-gneiss basement, the Laramide porphyry copper system, and the Patsy Mine and Mount Davis volcanics all display geologic features which are characteristic of mass transport along high and low-angle normal faults. This style of thin-skinned crustal deformation in an extensional environment was elegantly documented by Anderson (1971) in the Eldorado Mountains, Nevada. The cross-section on figure 3 is Anderson's (1971) East-West section through the Eldorados and graphically illustrates the extensional tectonic setting.

Structural Style.

In contrast to detachment-faulted terranes, especially those related to metamorphic cone complexes, (Davis and others, 1980, Reynolds and Rehrig, 1980) there does not appear to be a basal detachment fault (in this area) flooring an extended upper plate sequence. Instead distributed shear along stacked listric normal faults appears to accommodate the crustal stretching. As shown by Anderson (1971) and on figure 3, a 2 km thick section of crustal rocks have been rotated and transported laterally along a series of downward flattening listric normal faults. Detachment-style

faults which are present (as shown on figure 3 and as low-angle normal faults on figure 4) appear to be flat portions of listric normal faults or perhaps earlier listric faults rotated by a later set of listric faults.

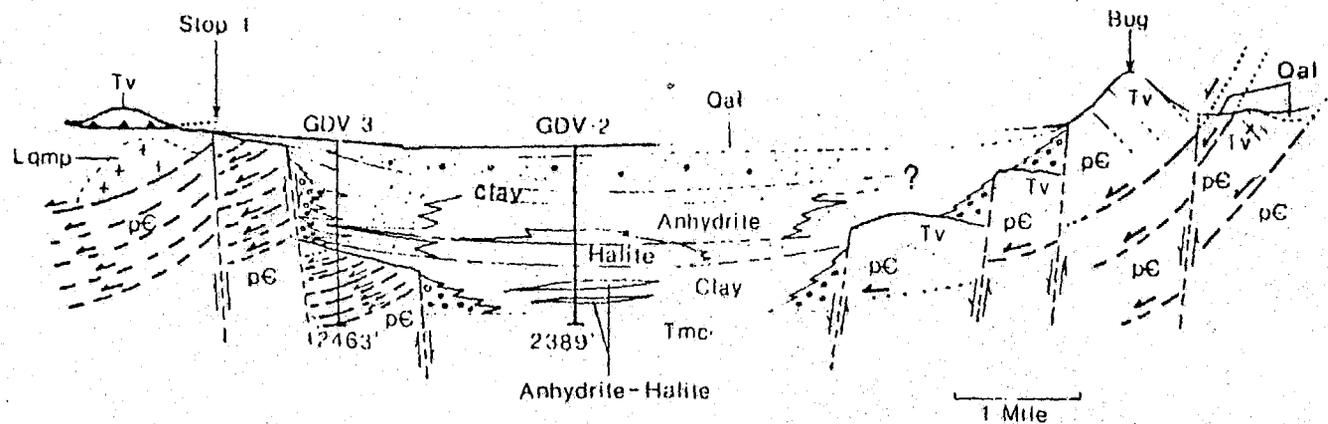
The terranes are characterized by moderately to steeply-dipping (occasionally overturned) Patsy Mine and Mt. Davis volcanics. As noted by Anderson (1971) an orthogonal relationship between stratigraphic units and the rotating faults is usually present. That is, the angle between the fault and the bedding attitude of the hanging wall unit is 90 degrees; the steeper the dip the flatter the fault. Brittle deformation, including breccias, megabreccias, antithetic and sympathetic high-angle faults and shear zones commonly obscures or obliterates the primary depositional fabric in the volcanic rocks adjacent to the fault plane. The deformation decreases upward, downward, and away from the fault plane. The faults are sinuous structures which trend NNW and consistently dip west. Movement appears to have been S80°W-directed.

Age of Faulting.

The age of faulting, though not directly datable, can be inferred from the ages of the rocks involved and those not involved. Extension began in mid-to-late Patsy Mine time or about 16 to 14 m.y. Extension was in effect prior to Mount Davis time as indicated by consistently flatter dips in the Mount Davis volcanics compared to the Patsy Mine volcanics. The Mount Davis volcanics and related fan-glomerates are probably a synkinematic sequence common to extensional terranes. For comparison, in the Whipple-Buckskin Complex, the synkinematic Copper Basin formation is consistently less rotated than the pre-tectonic Gene Canyon formation (Frost, 1982, Davis and others, 1980).

Extensional tectonism ended following Mt. Davis time and before Muddy Creek time - between 12.0 and 11.9 m.y.

On the A.G.S. field trip (Fall 1984) we will examine several aspects of the stratigraphy and tectonics which are exposed in the Pope Mine Area.

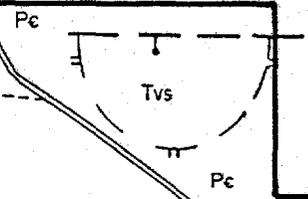


SCHEMATIC CROSS-SECTION ACROSS DETRITAL VALLEY,
 MOHAVE COUNTY, ARIZONA
 Figure 5

Is this E16 or is it missing

19 20

20 21



T
27
N

30 29

29 28

31

32 33

Tvs

Tvs

Tvs

Tvs

Tvs

Tvs

Pc

Pc

Tvs

Pc

LEGEND

- Tertiary volcanics sediments
- Precambrian gneiss & schist
- Detachment fault; hachures on down dip side.
- Normal fault; dot on downthrown side
- Shaft
- Adit
- Tunnel
- Roads

Van Deemen Shaft

LIBERTY
MINE

APPENDIX E

ARIZONA STAR RESOURCE CORP.
 VAN DEEMEN PROPERTY
 BLACK MOUNTAINS
 MOHAVE COUNTY, ARIZONA

GEOLOGY

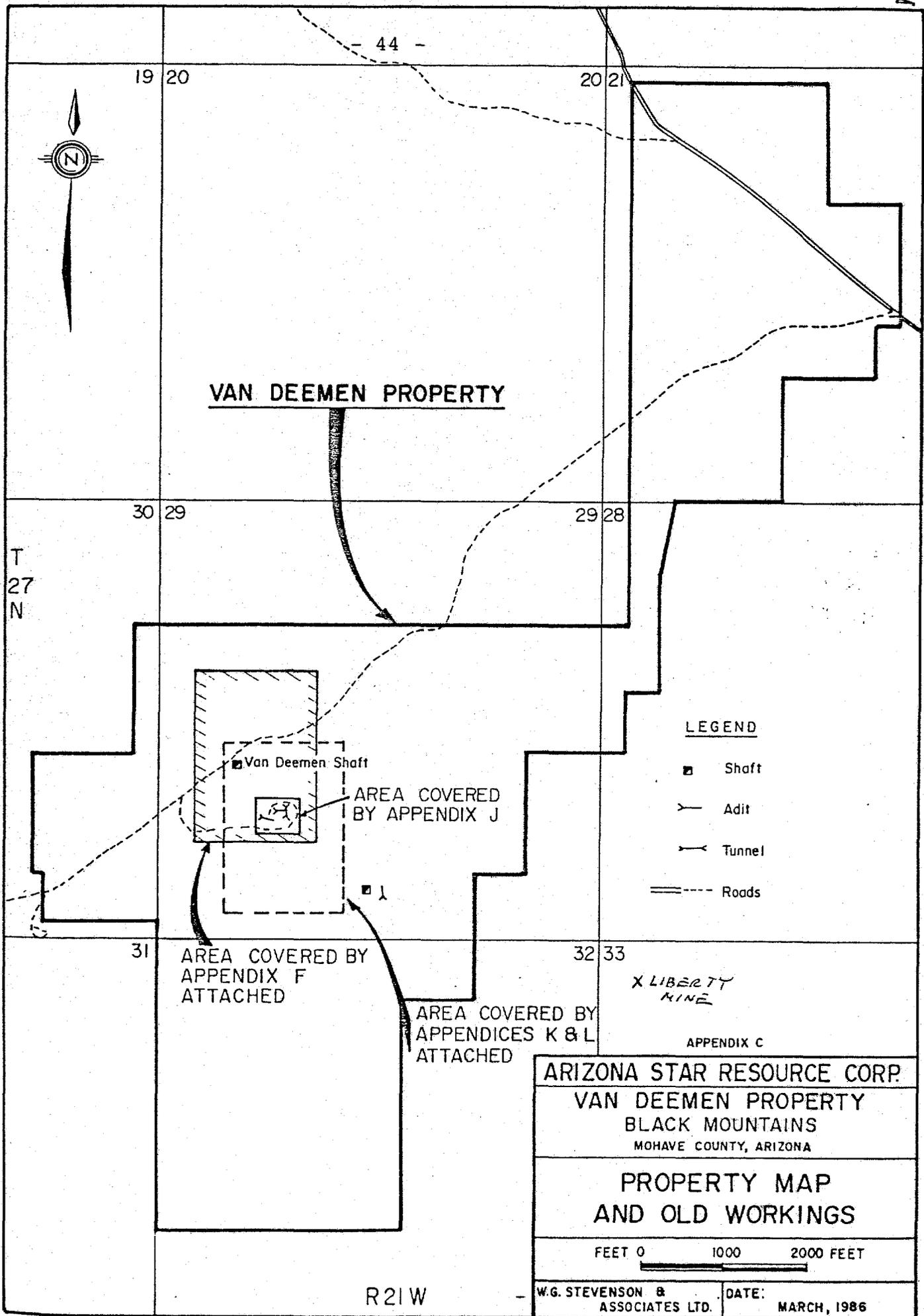
FEET 0 1000 2000 FEET



R21W

W.G. STEVENSON & ASSOCIATES LTD.

DATE: MARCH, 1986



VAN DEEMEN PROPERTY

LEGEND

- Shaft
- Adit
- Tunnel
- Roads

AREA COVERED BY
APPENDIX F
ATTACHED

AREA COVERED BY
APPENDICES K & L
ATTACHED

X LIBERTY
MINE

APPENDIX C

ARIZONA STAR RESOURCE CORP.
VAN DEEMEN PROPERTY
BLACK MOUNTAINS
MOHAVE COUNTY, ARIZONA

**PROPERTY MAP
AND OLD WORKINGS**

FEET 0 1000 2000 FEET

W.G. STEVENSON &
ASSOCIATES LTD.

DATE:
MARCH, 1986

R21W

ASARCO

Exploration Department
Great Basin Division

Peter G. Vikre
Manager

Liberty Mine Data
Mohave Co., AZ

June 15, 1987

Charles and Marguerite Kunkes
Box 1652
Dolan Springs, AZ 86441

Dear Mr. and Mrs. Kunkes:

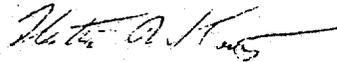
I talked with Allan Moran of Freeport (Reno) Exploration today and he indicated that he will be sending you directly two (2) complete sets of The Liberty Mine Area data package: One for safekeeping and another for a "Loaner". They would rather have you pass out the data than themselves. Mr. Moran indicated it would be a week or so before this copying is completed.

I have sent the three (3) maps I borrowed from you (Geology 1" = 500', Liberty Mine Geology 1" = 200' and 1" = 500' Drill Holes plus IP lines) to Tucson for copying. Our draftsman will return them directly to you. You should also be receiving a copy of ASARCO's 1986 Annual Report and "Metal Magic" - that tells about ASARCO a few years ago.

I will not be in your area until early-mid July, and will contact you before then about getting copies of Geochemistry, soil and sample location maps & assays.

Thank you for your help and hospitality.

Very truly yours,



Fleetwood R. Koutz
Geologist
S.W. Exploration Division

FRK;mar

cc: J.D. Sell

→ Kunkes has almost all the Ground Nef Muckingbird to N of Van Deemans & East of Lake Mead N.R.A. ALTHOUGH 99% of Freeport's drilling only hit "Trace" Au with very rare to oolite intermits. The Geochem DATA (mapping etc) is worth having for pro record. I've told Kunkes that I probably wouldn't be able to spend any time on Liberty UNTIL late fall.

ASARCO

Exploration Department
Great Basin Division
Peter G. Vikre
Manager

Liberty Mine Data
Mohave Co., AZ

June 15, 1987

Charles and Marguerite Kunkes
Box 1652
Dolan Springs, AZ 86441

Dear Mr. and Mrs. Kunkes:

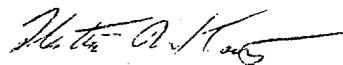
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Fleetwood R. Koutz
Geologist
S.W. Exploration Division

FRK;mar

cc: J.D. Sell

→ Kunkes HAS almost all the Ground N of Mockingbird to N of Van Deeman & East of Lake Road N.R.A. ALTHOUGH 99% of Freeport's drilling only hit "Trace" Au with very rare to opt intercepts The Geochem DATA /mapping etc is worth having for the record. I've told Kunkes that I probably wouldn't be able to spend any time on Liberty UNTIL late Fall.

June 4, 1987

F.R. Koutz

Liberty Mine
Gold Bug District
Mohave County, AZ

Your memo and ERS has been received and distributed to New York.

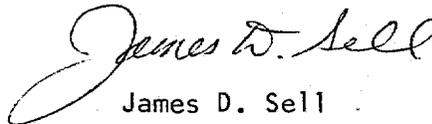
In dealing with the Kunkes and other Liberty type deposits, it is well to secure as much data as possible without any further obligation other than friendship and a few more samples added to their inventory.

Although you mention "stacked" systems, it is not apparent as to the closeness of the stacked systems, either the flattish zones or the high-angled listric systems, which constitute such a situation. I would hope that you will soon be able to project such zones that will enhance the probability of better values distributed over a viable area.

As is becoming apparent, it is necessary to have a feeder system coming into the structurally prepared flattish-listric in order to secure the necessary grades of ore, and, of course, the size for open-pit potential. Again, such footwall features might be evident but need to be projected into the necessary structurally prepared system.

If the Van Deemen area is a lower part of a stacked system which involves the Liberty Mine area, then I would be interested in the valley west of the Liberty Mine where such a lower system may be in suboutcrop.

How do you relate the detachment zone at the Mockingbird Mine with the Liberty and Van Deemen zones?


James D. Sell

JDS:mek

cc: R.L. Brown (w/att.FRK memo)
W.L. Kurtz

June 3, 1987

To: J.D. Sell

From: F.R. Koutz

Liberty Mine
Sec. 32, 33, T27N, R21W
Gold Bug District
Mohave County, AZ

I attach an ERS, set of 16 Au-Ag assays (TAJ-481), sample-field notes and sample map (1:62,500) of the Liberty Mine. The Liberty Mine area is a hematitic color anomaly which was noted from a hill top SW of the Gold Bug-Mohave Mines 1 mile to the south. The Liberty Mine color anomaly is 1 mile SE to 2 miles SSE of the Van Deemen property with some +2.2 m.t. of 0.042 opt Au and presently being extension/fill-in drilled by Arizona Star Resources (VSE) partner of Fischer-Watt Gold Co. The hoistman at the Gold Bug Mine said that the Liberty had been reverse-circulation drilled by Freeport (Reno) several years ago.

The ERS and field notes are fairly self-explanatory. The Liberty Mine area consists of Precambrian mica schists, granitic to dioritic gneiss, all with local pegmatite-aplite dikes all locally strongly foliated (generally NE-strike, dips 20-80° NW). The schists have all been obviously folded--some isoclinally although there is considerable slump, contortion and drag. There are a few apparently Mid-Late Tertiary andesitic to rhyolitic dikes in the area. The area has only recently been unroofed from upper plate Patsy Mine Volcanics (mostly andesitic flows and flow breccias 1 mile to the NW at Van Deeman. There must be significant NE-striking fault between Liberty and Van Deeman as the low-angle Patsy Mine lower fault contact is 400-800' below the tops of the higher hills around the Liberty, Mohave and Gold Bug Mines.

The Liberty is part of another set of stacked synthetic listric fault systems (mapped and drilled by Heidrick and Wilkens among others) with local antithetic and orthogonal high angle offsets and mineralization feeders. The Liberty Mine itself is in a fault breccia with minor UG production from flat slopes where intersected by higher-angle feeders. Values across several feet of structure ranged up to 18-40 ppm Au and 38 ppm Ag. Values from Freeport drill cuttings ran <.02-.2 ppm Au.

The BLM microfiche indicated that Freeport had some 60+ "Liberty" claims in 1983, but dropped them in December 1985. They were subsequently refiled by Chuck and Margie Kunkes. I contacted the Freeport geologist, Alan Morran, who confirmed that Freeport had returned the claims to the Kunkes, the underlying claimants who have picked up most of the nearby countryside including Van Deemen in the last 10-15 years. Freeport staked because the previous claims were in disarray. The Kunkes' have since learned enough exploration/mining vocabulary "to be dangerous."

Freeport drilled +22 RDH (RC) in the property in 1985. They hit a number of discontinuous .0X opt Au (mostly <.05 opt) and a few 5-10' zones of 0.1 opt Au near to low-high angle breccia intersections. In the field it appeared that many RDH were preferentially sited near high-angle structures. Unfortunately, below the oxidation level ($\pm 100'$) values dropped off sharply and there was little dissemination away from structure. Freeport also spent considerable time mapping the area and collected several 100 geochem samples, analyzed for a number of elements. Silver, arsenic and molybdenum were particularly anomalous among other elements. There is a 1000' x 1000' As anomaly that halos Au mineralization. Freeport confirmed that there was a good relationship between the more mafic metamorphics and gold mineralization, but the gold is probably genetically related to Mid-Tertiary volcanism-intrusives and faulting. Freeport thought the drill results were discouraging. Freeport gave a complete set of data to the Kunkes including geologic mapping.

It appears that the Liberty Mine is a poorly developed distal end of the Van Deemen system and the best targets have been tested. The Fischer-Watt people have obviously looked at the Liberty data and probably do not want it at Kunkes' price. However, it is worth obtaining the data for the record/educational purposes. The Kunkes have other "good looking" ground not under option. The Kunkes are presently on vacation, but I will stop by and look at what they have sometime this summer.

FRK:mek

Attachments:

ERS

Sample Map

Field/Sample Notes

Assays TAJ-481



F. R. Koutz

Present claim owner
 Chuck & Margie Kunkes
 Box 1652
 Dolan Springs, AZ 86441

ASARCO EXPLORATION RECORD

FIELD EXAMINATION LITERATURE SEARCH ASARCO FILE

602-767-3831

Gold Bug Dist.

Section I General Indexing

① Name(s) of Property or Area LIBERTY MINE (Golden Age - 1936)				② Country Mohave Co.		③ State or Province Arizona	
⑥ Latitude 35°42'N		⑦ Longitude 114°32'N		④ USGS Quad. Mt. Perkins -15'		⑤ File or Core No.	
⑧ AMS Sheet Kingman		Township 27N		Range 21W		Section 32, 33	
⑨ Examined by F.R.Koutz						⑩ Date 5/7/87	
⑪ Office Tucson						⑫ Field Days 6 hours	

Section II Sources of Information

Date Typed 6/1/87

⑬ References	Author	Date	Title	Publications	Vol. No.
	Wilkins, J.	1984	Arizona Geol.Soc.Fall Field Trip Guidebook (Day 1 +1979 Map)		
	Gardner, E.D.	1936	Au Mine + Mill, Black Mtns:	USGM IC 6901 p. 57	
	Fischer-Watt Gold + AZ Star Res.(Prospectus 6/30/86) Van Deemen Property 1 mi.NW				

Section III Appraisal

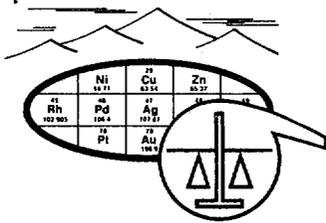
USGS PP-374E, 1963 C.R. Longwell

⑭ Recommendations <input type="checkbox"/> Action Now <input type="checkbox"/> Too Low Grade <input type="checkbox"/> Too Small/Spotty <input type="checkbox"/> Ownership Problem <input type="checkbox"/> Access Problem <input checked="" type="checkbox"/> Obtain Drill Data		⑮ Post Producer <input type="checkbox"/> Producer <input type="checkbox"/> Mineral Deposit <input checked="" type="checkbox"/> Prospect <input checked="" type="checkbox"/> Freeport-Rep <input checked="" type="checkbox"/> Drilled 1985		Detachment + <input checked="" type="checkbox"/> Listric Fits <input checked="" type="checkbox"/> Geologic Concept <input checked="" type="checkbox"/> Geochem Anomaly <input type="checkbox"/> Geophy Anomaly <input type="checkbox"/> Relict Poten <input type="checkbox"/> in District		⑯ Production Commodity Tons Grade Au ore X00 .X opt	
⑰ Num. Drill Holes 22+ (?) Approx Total Footage (4000'±?)		⑱ Excavations Sev. shafts to 100' ~1000' Workings		⑲ Reserves <input type="checkbox"/> Measured Commodity <input type="checkbox"/> Estimated Tons Grade None			
<input type="checkbox"/> Spectro. Analysis Attached		<input checked="" type="checkbox"/> Assays Attached TAJ-481		<input checked="" type="checkbox"/> Geochem Results Attached			

Section IV Geologic Data

① Commodity or Contained Metals Au ^o -Ag (Reported As+Mo anomal.)	
② Ore Minerals-Major Au-Ag Minor Py Tcpy-CuOx Minor	
③ Host Rocks-Major Qtz-Mus-schist gr-gneiss diorite sch Minor felsic/mafic dikes to N Patsy Mine Volc.	
④ Age of Host Rocks pE +pegs(pE) pE mT? 18.6 - 14.5 m.y.	
⑤ Nature of Exposures Good: Desert pediment + low hills, fair to good outcrop (schist is slumped). 200-400' relief. Pegmatites plus felsic and mafic dikes locally lace area	
⑥ Alteration Bleaching-sericite plus hematitic flooding-silicification along structures	
Much of mafics locally chloritized ⑦ Total Extent Hvy color anom: 2:800'x500', mod color anom. Halo 1/2 x 1/2 mile.	
⑧ Structure WNW to NNW 10 to 30° NE. low angle shears (detachment-related) with NW & ±NE high angle listric normal faults. Foliation in schist rolls alot.	
⑨ Ore Occurrence In low angle struct. plus intersecting/feeding higher angle struct. Heavy bleaching/hem.flooding usually limited to <10' structure. Spotty. Best Freeport results: 5-10' of 0.1 opt Au in a few D.H. ⑩ Age of Mineralization post 14.5my, pre 11.9 my (faulting)	
⑪ Conclusions & Recommendations A short distance into footwall of listric fault system. Not as well developed as VanDeemen. Considerable areas of fresh-looking schist/gneiss between shear zones are probably waste. Low angle/high angle shears may coalesce at shallow depth but mostly stacked listric-normal faults in Dist. rather than master detachment. Worth obtaining Freeport's sampling/drill data plus Kunkes has other zones in district not held by Fischer-Watt. "1936, USBM: 1-6' 25° vein: av. 3', ore bunchy, 125' drift in vein-small shipments" Au values drop sharply below oxidiz. zone (±100' depth).	

(For additional space use extra sheets)



SKYLINE LABS, INC.
 1775 W. Sahuaro Dr. • P.O. Box 50106
 Tucson, Arizona 85703
 (602) 622-4836

PRELIMINARY
 REPORT OF ANALYSIS

JOB NO. TAJ 481
 May 28, 1987
 BH-1 TO LIB-15
 SHIPMENT NO.: BH & LIB
 PAGE 1 OF 1

ASARCO INCORPORATED
 Attn: Mr. Fleetwood R. Koutz
 Southwestern Exploration
 P.O. Box 5747
 Tucson, Arizona 85703

Analysis of 16 Rock Chip Samples

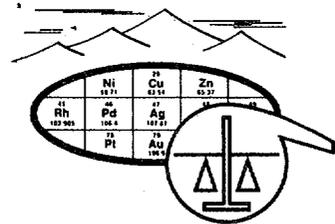
ITEM	SAMPLE NO.	Au (ppm)	Ag (ppm)
5	LIB-1	.09	.8
6	LIB-2	.02	<.2
7	LIB-3	.29	18.0
8	LIB-4	<.02	<.2
9	LIB-5	.32	55.0
10	LIB-6A	.93	34.0
11	LIB-6B	<.02	.2
12	LIB-7	4.20	18.0
13	LIB-8	.40	8.8
14	LIB-9	6.00	38.0
15	LIB-10	>10.00*	32.0
16	LIB-11	.20	.2
17	LIB-12	.05	.2
18	LIB-13	<.02	.4
19	LIB-14	.03	.2
20	LIB-15	1.50	3.0

*NOTE: Greater than normal geochemical range.
 Please advise if fire assay is needed.

NOTE: Gold, Silver and Platinum results pending.

cc: Asarco Incorporated
 Southwestern Exploration
 P.O. Box 5747
 Tucson, Arizona 85703
 Attn.: Mr. James D. Sell
 Ms. Mary Kavanagh





SKYLINE LABS, INC.
 1775 W. Sahuaro Dr. • P.O. Box 50106
 Tucson, Arizona 85703
 (602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 481
 June 5, 1987
 BH-1 TO LIB-15
 SHIPMENT NO.: BH & LIB
 PAGE 1 OF 2

ASARCO INCORPORATED
 Attn: Mr. Fleetwood R. Koutz
 Southwestern Exploration
 P.O. Box 5747
 Tucson, Arizona 85703

ASARCO Incorporated

JUN 8 1987

Analysis of 14 Rock Chips and 6 Drill Cuttings

SW Exploration

ITEM	SAMPLE NO.	Au (ppm)	Ag (ppm)
5	LIB-1	.09	.8
6	LIB-2	.02	<.2
7	LIB-3	.29	18.0
8	LIB-4	<.02	<.2
9	LIB-5	.32	55.0
10	LIB-6A	.93	34.0
11	LIB-6B	<.02	.2
12	LIB-7	4.20	18.0
13	LIB-8	.40	8.8
14	LIB-9	6.00	38.0
15	LIB-10	>10.00*	32.0
16	LIB-11	.20	.2
17	LIB-12	.05	.2
18	LIB-13	<.02	.4
19	LIB-14	.03	.2
20	LIB-15	1.50	3.0

May 7, 1987

FIELD Sample NOTES

①

LIBERTY MINE AREA E/4 SEC 32, W/4 SEC 33 T27N R21W, MT. PERKINS, AZ 15' TOPO

PRESENT OWNERS: CHUCK + MARGIE KUNKES (CHUCK + MARGARET) (also? LVSZ Box 970 Kingman 86401)
Box 1652 Dolan Springs, AZ 86441 602-767-3831

Previous operators: Boulder Inert "Frigant" NE/4 SEC on US 93

"LIB" CLAIMS STAKED 12/2/85 AFTER OUI CLAIMED FROM FREEMAN - REV. (KUNKES PURCHASED FROM)
THE KUNKES HAVE MOST OF CLAIMS IN PRE- VAN DEEMAN MINE AREA.

"21st CENTURY ENTERPRISES" NOT RECORDED YET. DOES OWN ANIMATE

- STROWS HEMT + GOETH. COLON ANOMALY FOR 800' NW x 500' NE-W/4 LIBERTY MINE AREA + SHARP
water color mineral. swanwick + extends 1/2 mi NE. ALSO NE trending colon anomaly @
+ NE 9 ^{32,33}/₅₄ THERE ARE 12 positive R/DH 5' PROB R/DH AROUND LIBERTY MINE
(3 THOUS DRILL ROADS) PLUS ABOUT 5 R/DH AROUND ^{32,33}/₅₄ NOTE THAT 1979 HERDICK
+ WILLIAMS MAP SHOWS 2 DDH N 0.8 MI NE OF LIBERTY MINE @ SADDLE BETWEEN HILLS 3432 +
3367. DRILLING 1985 (2 STAGES?) BY FREEMAN REV. ALL SAMPLE TAGS FPP - SERIES

- Bedrock is BIOTITE + MUSCOVITE GRANITE GNEISS AND SCHIST WITH LOCAL MAFIC-DEGRITE
schist and QTZ FS-muscov. pegmatite. σ E metamorphics ARE WELL FOLIATED \pm ABOUT PRIMARILY
NE TO NNE AXES AT HIGH TO LOW ANGLES BUT FOLIATION ROLLS AROUND A LOT. LOCALLY 1-10'
quartz vein-pods - strongly bivalvular often 1/25' - facing AREA. SOME NW + NE ALBIC
plus mafic dikes - seldom foliated. AREA IS SIMILAR BUT LESS WELL DEVELOPED - AT LEAST COMPARED
TO VAN DEEMAN MINE 1 MI NW WITH LOW ANGLE - DETACHMENT FAULTS AND LOWER PLATE LITHIC
MINERAL FAULTS. THERE IS PROBABLY MORE THAN ONE LOW ANGLE FAULT SURFACE IN AREA. HIGH ANGLE
LITHIC FAULTS + DIKES ARE LOWS AND PROB. FEEDERS OF MINERALIZATION. ONE MILE TO NW
THE UPPER PLATE PATSEY MINE VOLCANICS (18.5 - 14.5^{MY}) ARE TOPOGRAPHICALLY SOME 400 FEET ABOVE
LOWER FROM THE LIBERTY MINE AREA SO THE AREA HAS PROBABLY BEEN RECENTLY EXTENDED BECAUSE THE
"MUSTER" DETACHMENT AT THE BASE OF THE PATSEY MINE VOLC. (ON AN OLD TOPOGRAPHY ON NE-
STRIKING FAULT DIPS TO NW BETWEEN VAN DEEMAN + LIBERTY).

Samples: (SW CORNER SEC 33) Au/Ag ppm TAJ - 481 SKYLINE

- LIB-1 @ FPP-124 AT TAG. NW FELSIC DIKE IN N25E SCHIST. 320 TON W/ 10% QTZ VUL.
09/18 3x3' FACE SAMPLE PIT (3 OF 2 PITS) - 30 T DUMPS
- LIB-2 Drill cuttings @ Saddle. m-d. Kgy 1-2% hem. mica schist plus a little QTZ
02/12 T? pyrite (Manganese and v. fg.) Mostly cuttings on axializ. Rep. sample of cuttings
- LIB-3 N40E ^{30-40°N} foliation - shear in outcrop. S-8% HEMT + JARDITE. ZONE WITH THIN UNDER
29/18 LIB-2 TO NE. SB' SHALT IN FW. 10' HORIZ. SAMPLE ACROSS ZONE IN PIT FPP-114 TON
Lower part of zone blocked. DIKE intrudes here? 10% QTZ VULTS IN FOLIATION (N60E)
↓ parallel (Fischer-VATT photos) @ CORNER SEC ³²/₅₄ ³³/₅₄ 1915 GLO.
- LIB 4: Down Rd (N20W to #2) TAG FPP 110 Dozed Road Cut, could be REPROD DRILL ROAD
2.02/1.2 AREA SAMPLE 20' DIA. HEM = 2% G = 3% STRAINED SCHIST. (FIX FROM NORTH SIDE)

FRK
5/7/87
(2)

LIBERTY MINE
AREA

SAMPLES: LIB 5 @ FPP 602+103, 140' SW of SEC CUAN. PIT 8' x 8' x 5' deep.

NNW strike 103° N shear - foliation, 5% Hem - sheared schist with dkt (?) Bleached

LIB-C T945 Adit, N70W silicified VN + felsite dkt. Drill cuttings 20' EAST (Fresh Rock?)

6-A: @ T1096 N30E TRENCH 50' long, 20' sample @ SW END by silica rib. NW strike 103° NE

.93/34 Shear/foliation BUT schist is very cuttacted here

6-B: Drill cuttings - diorite ± felsite schist 6% Gwth. T? py RDIT site Ripped.

4.02/12 LIB-7: @ 2 SHAFTS SW 1/4 SW 1/4 SEC 33, N60W QZ VN. NW shaft ~100' deep. S. shaft ~

42/18, 40' deep inclined with VN 50°W -100' T Dump. Sample from Dump @ SE incl. shaft 3% Gwth, 85% wh. Qtz. Some Granite intrudes schist. 2x2 SW CUAN LIB-19.

4/8.8 LIB-8: E-W QZ VN. 70-80° S. Discant. 150' T Dump, 40' shaft, Rep. Dump sample T Lox on Dump. 85% wh. Qtz 5% Hem, 2% Gwth. T. Irrides. py. (or cry?) QZ w/ly Bx'd.

- Detach. T's less than few 100' ABOVE PRESENT SURFACE.

@ center sec 33 LIB 17/20? loc. near 2x2 when notice footprint Ex. plus. 27 SEPT 83 Randy Malorrown Box 1911 Reno, NV

- Liberty ADIT + shaft ± 10-300 flat VN - shear. plus local higher angle foldens / fault zones

ADIT IN 60' (plus 20' ADIT TRENCH) to shear in BACK N70W, 20-30° N; then 70' more N30W to shaft station. (30' below SURF in ADIT) plus shaft goes down another 50' to lower levels

- Secondary Adit, decline into shaft - (SSW cut); thence 80' N60W, 40-70° N along strike; BACK ROLLs down; thence N20W, 20-30° 40' more feet; thence 50' more to end of tunnel N40W 42° N

BACK IN TUNNEL ("U" man like 50' pitkin - a little stoping). Only a little stoping in workings -

less than few 100' T. Looks like some 1850's - 60's work from JUNK / MANS in ADIT, pipe for rails. Gy white low angle QZ VN some cluse in 103° fault zone, ~ SSW T dump @

MAIN ADIT. ADIT ABOUT 370' long (215 + 245)

LIB 9: Selected material on tin: Tan + white QZ + Bx'd schist (silicified) 8% Hem. + 2% Gwth

6.0/38 Best low angle fault zone with Hem. Flowing looks like 1-3' thick. Bunt out tailen on old OFFICE(?) site. FPP-042-040 @ SSW decline to shaft (FPP-043 1/2 way between 2 ADITS)

LIB 10: 1 1/2' cut, FPP-041 + 040. Incl. 9" QZ VN (Bedded) - Banded wh + daisy QZ + Hem plus 32. 9" sheared schist below. N45W 25° NE trend of Liberty Fault zone at decline

- 100' on strike FPP-037, FPP-038 (S = VN??), FPP-039 @ N60W 60° NE shear fault ROLLs into cut 25° NE flat shear. Another N70W 75° E fault zone 2-3' wide. Freshen this mine

was 20' SSW of mine zone. pile of cuttings on Rd @ NW END

LIB-11: Drill cuttings - some oxidiz. Mostly green chlorite (andalusite?) schist, 1-2% py, 12/2 with 1-2% py in QZ + cry (cov) TANNISH.

LIB-12: 200' S60W down Rd. @ FPP-061: 2' N30E 80° shear in schist (in foliation)

05/2 - Drill cuttings 2/3 me pink-dusty unmineral 1/3 green chlorite. Frequent obviously drillings on structure to get values!

360' to LIB-12 from parking spot @ Bunt foundation N70W Road.

At least 4 tiers of RDH drill Rinds mostly ripped. 2 more holes on 200-300' Q up Rd.
From LIB-11. Hole @ FPP-053-05 N20E 60N shear. Trunk 20' wide, 50' long 8' deep.

On saddle overlooking Van Deeman to NW Rind is ripped but doesn't look drilled. FPP-072 @ ridge Gatchel.
Dred. schist. Hard to get samples on drill rinds over Liberty Ripped/windrowed.

- LIB-13' N30E From LIB-12 lower Rd. DKgy. - green cuttings. ~50' E of outcrop zone + 20% conc in gr.
- LIB-14' N28E of LIB-11: cuttings on lip of Rd. a little Qtz. T + Pyrite 100' NE of Dump shaft (is

- LIB-15' N80E - 40W SHAFT, N70W 50-60W shear intersection. SHAFT 50' deep - plus drifts? -
1.5/3.0 Rep. sample of Mo of Dump ~30% white Qtz. Heavy shear zone 4-8' thick - winds down then
workings. Sample: Hg = 7% Cu = 2% (mass schist w/ fault) T Cox strain in clay

All of above looks very much like Van Deeman BUT lots of fresh looking schist - 7 miles
between High and low angle shear zones = lots of waste!

- Assay for Au (.02 ppm - AA) Ag only at this time.
- Contact Freepoint Reno (702-826-3000 Allen Mann) - called Spiller - will send data
w/ Ken Kunkas when get Assays back. (HE WILL BE OUT OF TOWN JUNE 2-7)

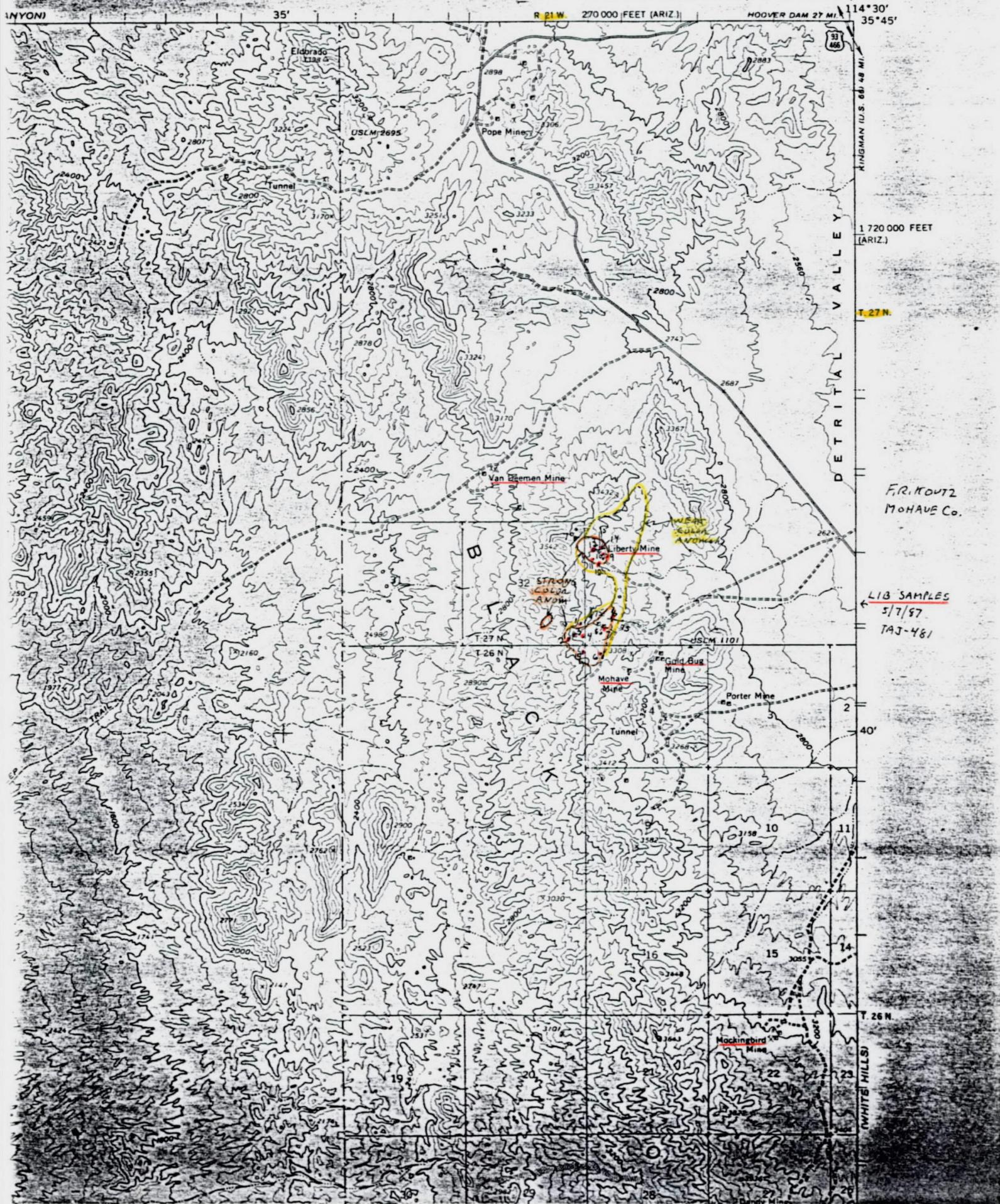
Allen Mann called back May 26 and gave me details of Freepoint 1985 Liberty mine
Drilling program. Total about 22 holes (20 actually completed?) There were 2 or 3 on "Backside"
to SW. Their best drilled values were 5 to 10' of 0.1 opt in several holes - usually have 4 less
They found that oxidation extended down about 100' (deeper in general in Box shaft. Pans away.
But Au values dropped off sharply below oxidation zone. Best holes at 15' down &
intersection. Several geochem. samples taken - A number of elements were anomalous
besides Au - particularly AS, Ag & Mo. 1000x1000' Au anomaly. Freepoint considered
results discouraging. Studied area when Ausenco had Van Deeman. Says Kunkas is
getting rich on everyone's option payments. Kunkas is a self-taught miner. Now
knows all the geology terms - frequently misusing terms: "knows enough to be dangerous"
Also has ground in Nevada. Freepoint Bullard Mt. property w. of HARCOURT MTS (Aguila
Area) & PEDRI project near BASTON have both been dropped. (They showed up on
Freepoint Gold's May 87 prospectus). Mann's Territory is Reno (SW NW), AZ, Nevada, N. Mex.
He asked about Santa Cruz States. (IP?)

Kunkas has complete set of DH Assay data, Geochem. results, geologic map? - (Freepoint did
lots of mapping of District) & Freepoint would need Kunkas's permission to release data. Kunkas
may be reluctant to pass out negative results (or what he thinks was negative.)

⇒ Verdict: Very poorly developed distal end of Van Deeman system. Probably little likelihood
of additional drill targets but Freepoint/Kunkas data worth obtaining for the record/
education. Kunkas may also have other good bets in the District but undoubtedly high priced
& picked over by Fischer-Watt & others (incl. Santa Fe) JPL/VLS 5/26/87

MT. PERKINS QUADRANGLE
ARIZONA-NEVADA
15 MINUTE SERIES (TOPOGRAPHIC)

SENATOR MOUNTAIN



114° 30' 35" 45' W

R 21 W 270 000 FEET (ARIZ.)

HOVER DAM 27 MI.

KINGMAN U.S. 66 48 MI.

1 720 000 FEET (ARIZ.)

T 27 N

DET RITALL VALLEY

F.R. MOUTZ
MOHAVE CO.

LIB SAMPLES
5/7/57
TAJ-481

T 26 N

40'

10

11

15

16

17

18

19

20

21

22

23

24

25

WHITE HILLS

T 26 N

June 4, 1987

J.D. Sell

Liberty Mine (Addendum)
Gold Bug District
Mohave County, Arizona

Thank you for your comments on my June 3 Liberty Mine memo. Rest assured that I will get as much "free" data out of Kunkes as possible.

I attach several things that will clear up your questions: "Stratigraphic and Tectonic Setting of the North Central Black Mtns. & Detrital Valley" by Joe Wilkins (1984 AGS Field Trip hand-out to go with guidebook). This shows the style of rotated and laterally transported Tertiary, Laramide and Precambrian sections along a downward-flattening and coalescing synthetic listric normal fault system or "stacking." These faults may be offset by orthogonal antithetic faults (Basin and Range age?). This style is present in detail at a variety of scales.

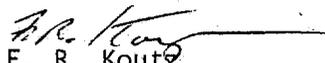
Note that Heidrick and Wilkens mapped (AGS Guidebook) Sec. 28 & 29 N&NW of the Liberty Mine including Van Deemen (but they did few Au-Ag assays).

You are right, it is necessary to determine which systems, directions and projections carry values of viable grade and size. Which level structurally Liberty or Van Deemen are on is uncertain. The Van Deemen (or another) flat breccia zones (westerly dips) were apparently drilled through under the Liberty Mine flat fault (N70W, 20-30°NE). Perhaps Freeport's geologic maps and drill sections will show this relationship. But I also know that many of these low angle fault surfaces are themselves folded--so strike and dip are not good criteria to correlate fault surfaces. I have found no good way to tell which high or low angle fault is a feeder (when projected). Intersections of fractures-fissures in fairly competent rock are necessary (= breccia). The ore-grade pods at these intersections are seldom larger than an acre and are difficult to project (and mine-plan).

You are right that the valley to the west of the Liberty Mine is of interest, and, in fact, is part of the Van Deemen Property (attachment), and has been locally drilled by Amselco, Kunkes, Fischer-Watt and others. Freeport held parts of Sec. 31 (and may have also drilled there). Much of the area is apparently so thickly covered with alluvium to preclude an open pit. Beyond the west side line of R21W is Lake Mead Nat. Rec. Area (NPS).

Mockingbird is part of the same flat-fault system that extends under most of the Black Range (and into California) and includes Van Deemen/Liberty. Which plate or slice Mockingbird is in is impossible to tell at present. I'm not sure that this is a genetically important question to the development of open-pit gold mines here. The relationship to mineralizing Tertiary intrusives is more important.

FRK:mek
Att. (2)


F. R. Koutz

1984 - AGS Guide Book
- HAND OUT -
Fall Field Trip

STRATIGRAPHIC AND TECTONIC SETTING OF THE NORTH-CENTRAL
BLACK MOUNTAINS AND DETRITAL VALLEY,
MOHAVE COUNTY, ARIZONA

by Joe Wilkins, Jr.

W. Wilkins
2/17/87

INTRODUCTION

The initial mapping in the area (figure 1) was a reconnaissance geologic map by Longwell who outlined the general volcanic stratigraphy of the region. Subsequent work by Anderson (1971, 1978) and Anderson and others (1972) have further defined the volcanic stratigraphy and the tectonic setting of the Lake Mead - Eldorado Mountains, Nevada area. A younger series of flat-lying volcanic and sedimentary rocks which unconformably cap older sequences have been mapped by Longwell (1928, 1963), correlated by Lucchitta (1979) and Blair (1978), and age-dated by Damon (1967, 1979) and Anderson and others (1972).

The majority of the previous geologic studies have been in the Lake Mead and Southeastern Nevada areas. Except for Anderson's (1978) map of the Black Canyon 15" Quadrangle, the only previous work in the North-central Black Mountains, Detrital Valley and the White Hills has been cursory reconnaissance-type surveys.

In 1977 and 1979, during a porphyry copper exploration program, about 20 square miles in the North-central Black Mountains and White Hills were mapped and sampled and 3 holes drilled in Detrital Valley. The data acquired form the basis for the following report and field trip guide.

STRATIGRAPHY

A generalized stratigraphic column showing Longwell's (1963) section and Anderson and others' (1972) modification is shown on figure 2. In this portion of Arizona and Nevada there is a minimum of 16,000 feet of volcanic flows, tuffs, tuff breccias and volcanoclastic sedimentary rocks deposited on a Precambrian basement. This volcanic sequence is unconformably overlain by 3000 to 5000 feet of late Tertiary to Holocene sedimentary rocks, volcanic flows and tuffs, and alluvium. At least 16,000 feet of Paleozoic and Mesozoic rocks, present on the Colorado Plateau (to the East) and near Las Vegas (to the West) have been removed from this area.

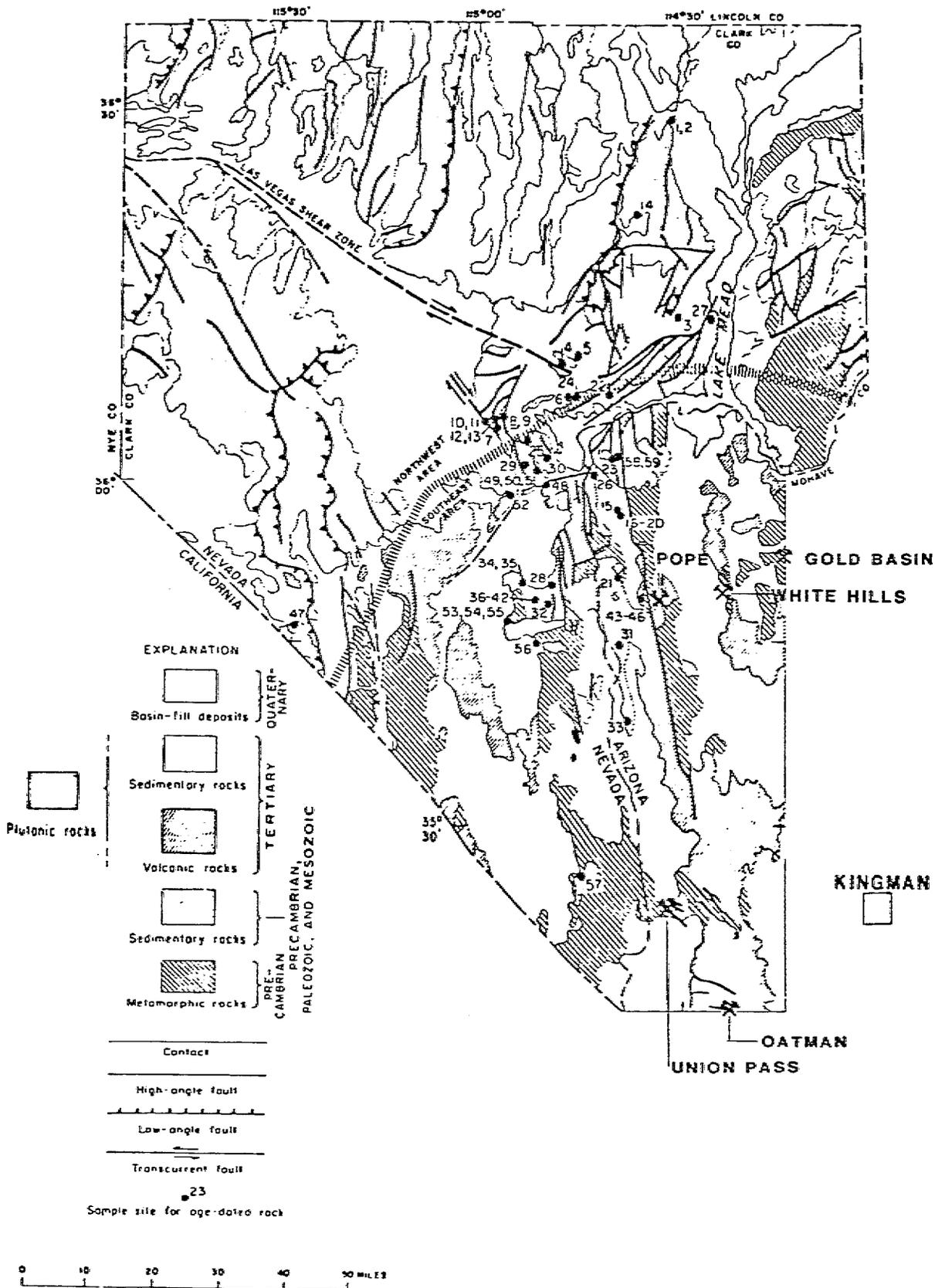
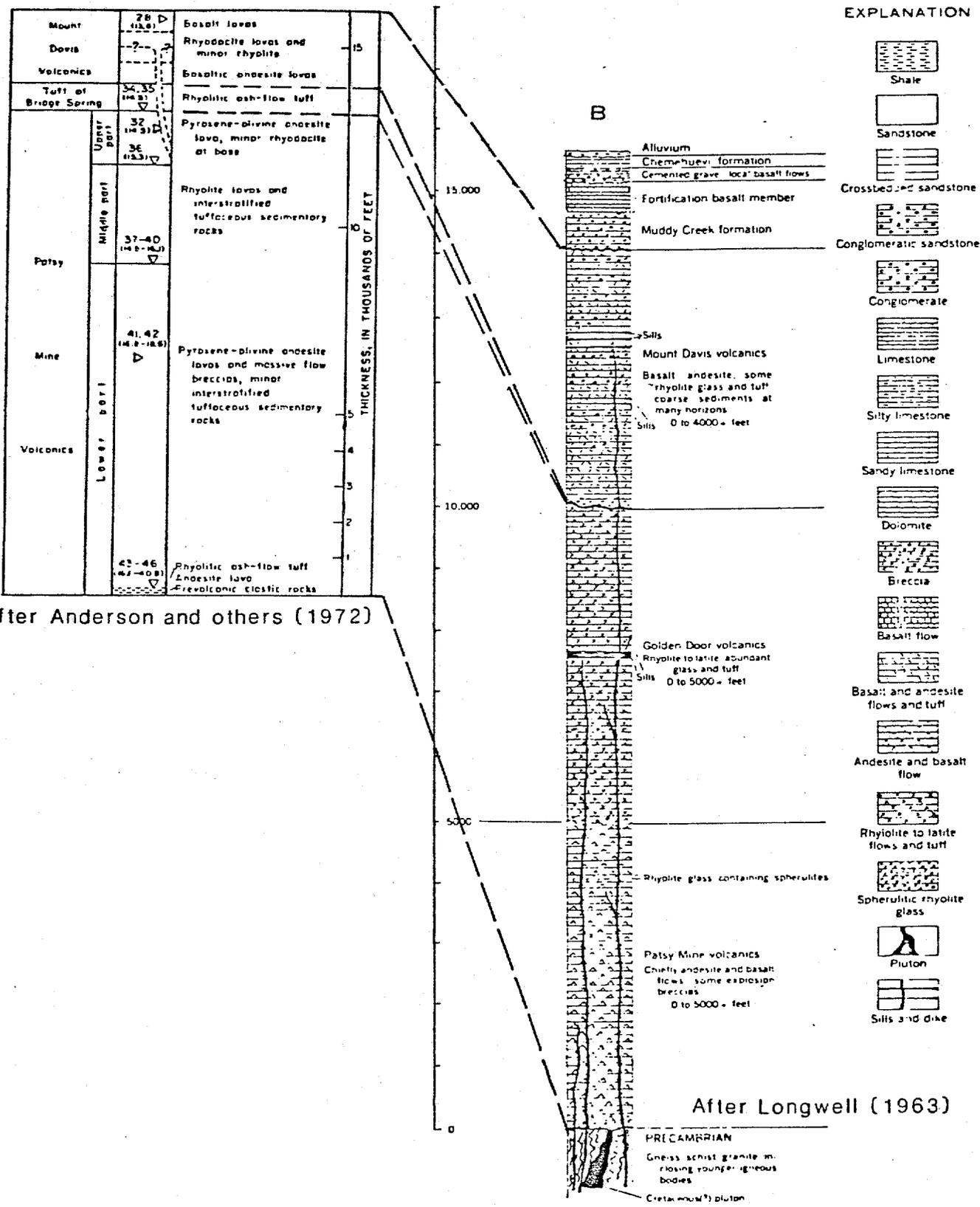


Figure 1 Regional geological setting and location map



After Anderson and others (1972)

After Longwell (1963)

Figure 2. Generalized stratigraphic section of the volcanic, volcaniclastic and sedimentary rocks in the Detrital Valley and North Central Black Mountains, Mohave County, Arizona.

Patsy Mine Volcanics.

The Patsy Mine volcanics, deposited on Precambrian basement and Laramide (?) intrusions, consist of 13,000-14,000 feet of flows, flow breccias, lahars, vitrophyres, tuffs, tuff breccias and welded tuffs ranging in composition from andesite to rhyolite. Longwell (1963) subdivided the volcanic pile into 2 units: the Patsy Mine and the Golden Door. The original Patsy Mine consisted of about 5000 feet of dark-colored andesite to basalt flows, flow breccias, and lahars with minor pyroclastics. The Golden Door units were a lighter-colored sequence, about 5000 feet thick, and dominantly rhyolite to rhyodacite flows, flow breccias, vitrophyres and tuffs. Anderson (1971) dropped the Golden Door nomenclature, added the units to the Patsy Mine sequence, and subdivided the section as follows:

- Lower part - 9100 feet, pyroxene-olivine
andesite flows and flow breccias.
- Middle part - 2700 feet, rhyolite flows and tuffs
- Upper part - 1500 feet, pyroxene - olivine andesite
with rhyodacite at the base.

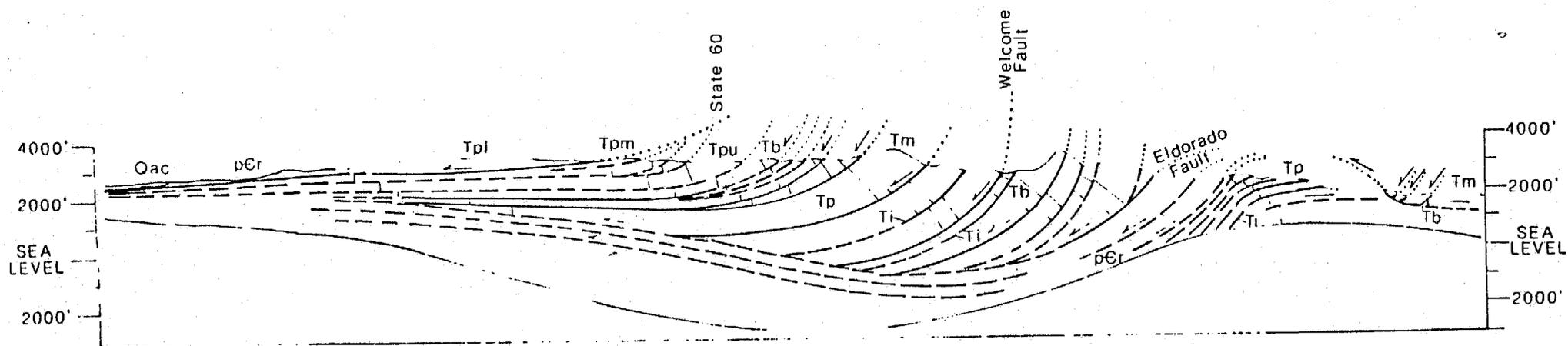
K-Ar ages for the Patsy Mine range from 18.6 at the base to 14.5 at the top with several discordant ages (22.8, 27.9, 40.8 m.y.) present in lower units (Anderson and others, 1972).

Bridge Spring Tuff.

The Bridge Spring tuff is a 700-foot thick, sheet-like welded rhyolite ashflow tuff that is widespread in the Eldorado Mountains, Nevada, and Chemehuevi Valley, California. It has not been recognized in the central Black Mountains, Arizona. The tuff conformably overlies the Patsy Mine volcanics and was K-Ar dated at 14.5 m.y. (Anderson and others 1972).

Mount Davis Volcanics.

The Mount Davis volcanics include about 2000 feet of flows, flow breccias, and tuffs intercalated with coarse fanglomerates composed of Precambrian gneiss-schist clasts or Precambrian schist-gneiss plus tertiary volcanic clasts. Compositions vary from olivine basalt to andesite with some rhyodacites. The base of the Mount Davis was K-Ar dated at 14.6 m.y. and the top of the sequence dated at 12.0 to 11.8 m.y. (Anderson and others 1972).



EXPLANATION

- Oac Alluvium
- Tm Mount Davis Volcanic
- Tb Bridge Spgs. Tuff
- Tpu Patsy Mine Volcanics
Upper
- Tpm Patsy Mine Volcanics
Middle
- Tpl Patsy Mine Volcanics
Lower
- pCr Schist gneiss

Figure 3. Cross-Section in the Eldorado Mountain, Nevada
After Anderson (1971)

Muddy Creek Formation.

The Muddy Creek formation unconformably overlies (usually with a strong angular unconformity) Mount Davis and Patsy Mine units. The Muddy Creek formation is a valley-fill sequence of interfingering conglomerates, sandstones, shales, siltstones, evaporites, a marine limestone, basalt flows and tuffs. The marine limestone is the Hualapai limestone member and was assigned marine origin by Blair (1978) on the basis of microfossils and chert geochemistry. K-Ar ages of tuffs and basalt flows in the Hualapai member are 8.4 and 11.9 (Blair, 1978). In Detrital Valley, the Muddy Creek formation has a minimum thickness of at least 2000 feet.

Fortification Hill Basalt.

The Fortification Hill basalt member of the Muddy Creek formation is a series of flat-lying, mesa-capping basalt flows at or near the top of the Muddy Creek formation. Several flows appear to cap Colorado River gravels (Damon, 1978), and may be younger than the Muddy Creek. A whole rock K-Ar date for the lowermost flow unit on Fortification Hill was 5.88 m.y. and the basalt at Sandy Point yielded a 3.8 m.y. date (Damon, 1979).

TECTONICS

Virtually all of the pre-Muddy Creek lithologies in the North-central Black Mountains, the White Hills, and Detrital Valley are allochthonous. The schist-gneiss basement, the Laramide porphyry copper system, and the Patsy Mine and Mount Davis volcanics all display geologic features which are characteristic of mass transport along high and low-angle normal faults. This style of thin-skinned crustal deformation in an extensional environment was elegantly documented by Anderson (1971) in the Eldorado Mountains, Nevada. The cross-section on figure 3 is Anderson's (1971) East-West section through the Eldorados and graphically illustrates the extensional tectonic setting.

Structural Style.

In contrast to detachment-faulted terranes, especially those related to metamorphic cone complexes, (Davis and others, 1980, Reynolds and Rehrig, 1980) there does not appear to be a basal detachment fault (in this area) flooring an extended upper plate sequence. Instead distributed shear along stacked listric normal faults appears to accommodate the crustal stretching. As shown by Anderson (1971) and on figure 3, a 2 km thick section of crustal rocks have been rotated and transported laterally along a series of downward flattening listric normal faults. Detachment-style

faults which are present (as shown on figure 3 and as low-angle normal faults on figure 4) appear to be flat portions of listric normal faults or perhaps earlier listric faults rotated by a later set of listric faults.

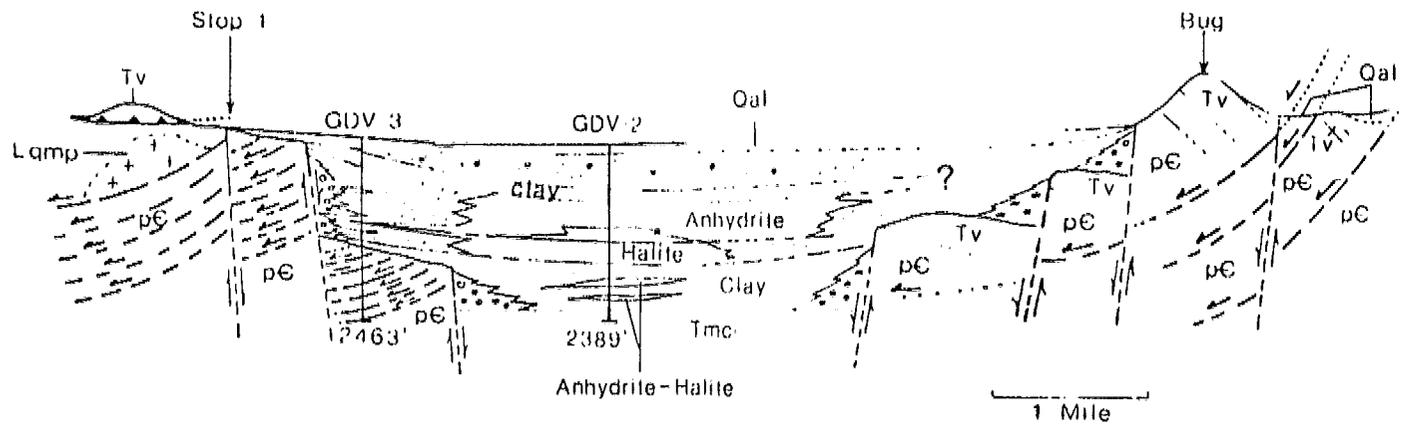
The terranes are characterized by moderately to steeply-dipping (occasionally overturned) Patsy Mine and Mt. Davis volcanics. As noted by Anderson (1971) an orthogonal relationship between stratigraphic units and the rotating faults is usually present. That is, the angle between the fault and the bedding attitude of the hanging wall unit is 90 degrees; the steeper the dip the flatter the fault. Brittle deformation, including breccias, megabreccias, antithetic and sympathetic high-angle faults and shear zones commonly obscures or obliterates the primary depositional fabric in the volcanic rocks adjacent to the fault plane. The deformation decreases upward, downward, and away from the fault plane. The faults are sinuous structures which trend NNW and consistently dip west. Movement appears to have been S80°W-directed.

Age of Faulting.

The age of faulting, though not directly datable, can be inferred from the ages of the rocks involved and those not involved. Extension began in mid-to-late Patsy Mine time or about 16 to 14 m.y. Extension was in effect prior to Mount Davis time as indicated by consistently flatter dips in the Mount Davis volcanics compared to the Patsy Mine volcanics. The Mount Davis volcanics and related fan-glomerates are probably a synkinematic sequence common to extensional terranes. For comparison, in the Whipple-Buckskin Complex, the synkinematic Copper Basin formation is consistently less rotated than the pre-tectonic Gene Canyon formation (Frost, 1982, Davis and others, 1980).

Extensional tectonism ended following Mt. Davis time and before Muddy Creek time - between 12.0 and 11.9 m.y.

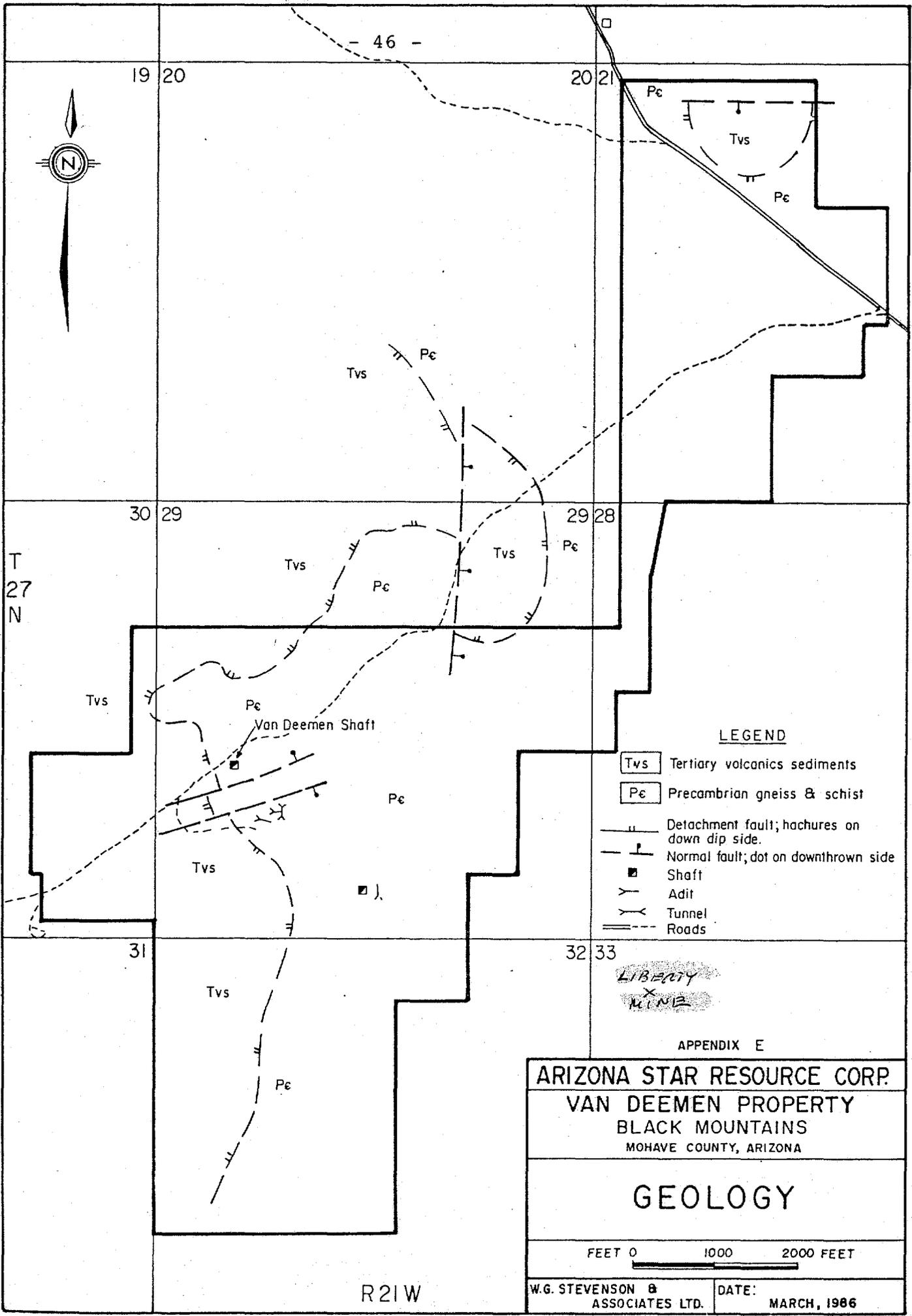
On the A.G.S. field trip (Fall 1984) we will examine several aspects of the stratigraphy and tectonics which are exposed in the Pope Mine Area.



**SCHEMATIC CROSS-SECTION ACROSS DETRITAL VALLEY,
MOHAVE COUNTY, ARIZONA**

Figure 5

*1.5
pC
on left missing*



LEGEND

- Tvs Tertiary volcanics sediments
- Pc Precambrian gneiss & schist
- Detachment fault; hachures on down dip side.
- Normal fault; dot on downthrown side
- Shaft
- Adit
- Tunnel
- Roads

*LIBERTY
MINE*

APPENDIX E

ARIZONA STAR RESOURCE CORP.
 VAN DEEMEN PROPERTY
 BLACK MOUNTAINS
 MOHAVE COUNTY, ARIZONA

GEOLOGY

FEET 0 1000 2000 FEET

W.G. STEVENSON &
 ASSOCIATES LTD.

DATE:
 MARCH, 1986

R21W

19 20

20 21



VAN DEEMEN PROPERTY

30 29

29 28

T
27
N

Van Deemen Shaft

AREA COVERED
BY APPENDIX J

LEGEND

- Shaft
- Adit
- Tunnel
- Roads

31

AREA COVERED BY
APPENDIX F
ATTACHED

32 33

AREA COVERED BY
APPENDICES K & L
ATTACHED

X LIBERTY
MINE

APPENDIX C

ARIZONA STAR RESOURCE CORP.

VAN DEEMEN PROPERTY
BLACK MOUNTAINS
MOHAVE COUNTY, ARIZONA

**PROPERTY MAP
AND OLD WORKINGS**

FEET 0 1000 2000 FEET

W.G. STEVENSON &
ASSOCIATES LTD.

DATE: MARCH, 1986

R21W