60001838

Mining District File Summary Sheet

DISTRICT	Rosebud
DIST_NO	4010
COUNTY If different from written on document	Pershing
TITLE If not obvious	Rosebud Field Notebooks 2
AUTHOR	Mitchell P
DATE OF DOC(S)	1998
MULTI_DIST Y / (N?) Additional Dist_Nos:	
QUAD_NAME	Sulphur 7½'
P_M_C_NAME (mine, claim & company names)	Rosebud Mine; Rosebud Joint Venture
COMMODITY If not obvious	gold; silver
NOTES	Field notebook: geology NOTES: Scan covers 66p.

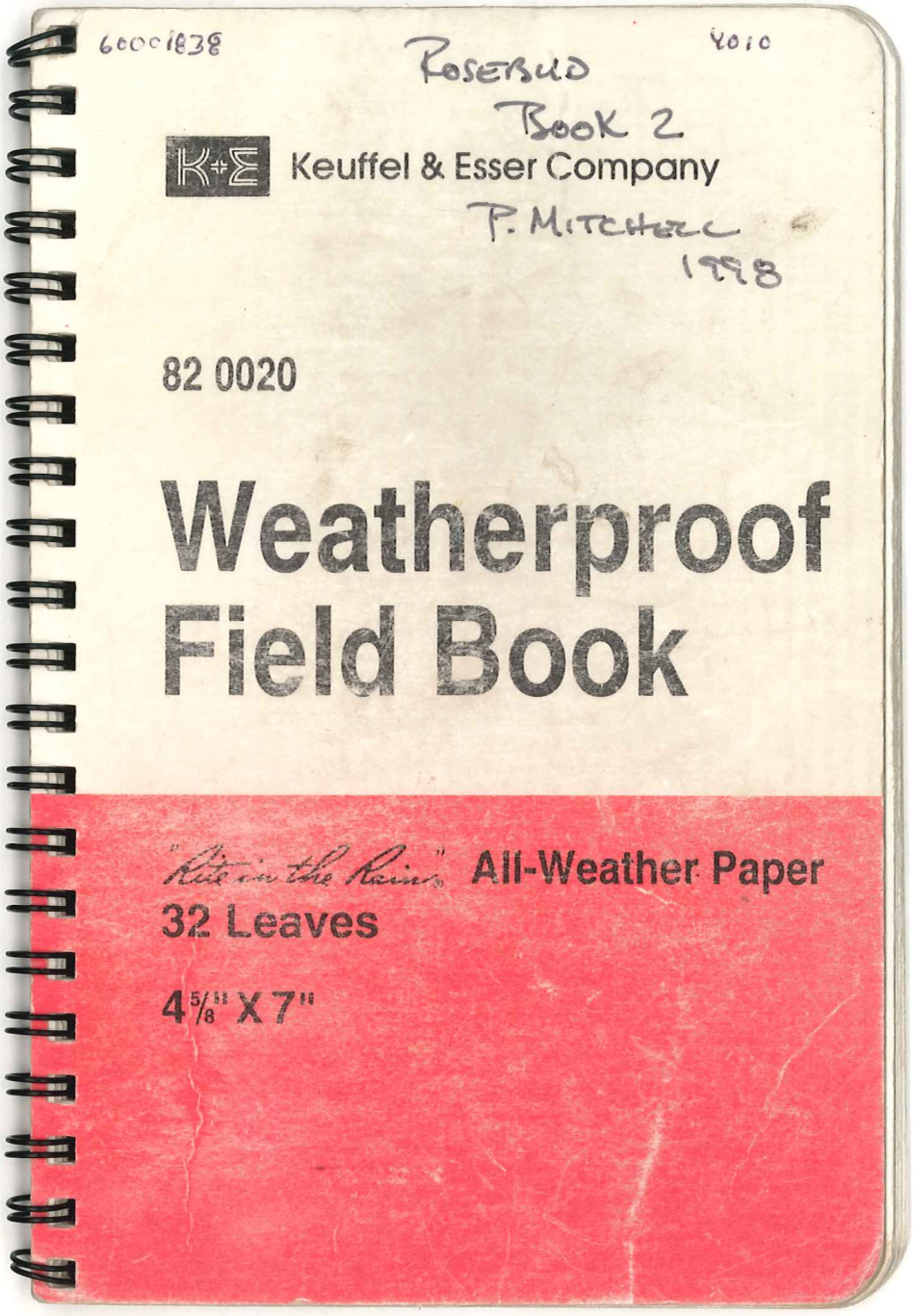
Keep docs at about 250 pages if no oversized maps attached
(for every 1 oversized page (>11x17) with text reduce
the amount of pages by ~25)

SS: DP 8/1/08
Initials Date

DB: _____
Initials Date

SCANNED: _____
Initials Date

Revised: 1/22/08


6000 1838
Yolo
ROSEBUD
BOOK 2
Keuffel & Esser Company
P. MITCHELL
1998
82 0020
Weatherproof
Field Book
"Rite in the Rain" All-Weather Paper
32 Leaves
4 5/8" X 7"

CURVE FORMULAS

$T = R \tan \frac{1}{2} I$

$T = \frac{50 \tan \frac{1}{2} I}{\text{Sin.} \frac{1}{2} D}$

$\text{Sin.} \frac{1}{2} D = \frac{50}{R}$

$\text{Sin.} \frac{1}{2} D = \frac{50 \tan \frac{1}{2} I}{T}$

$R = T \cot. \frac{1}{2} I$

$R = \frac{50}{\text{Sin.} \frac{1}{2} D}$

$E = R \text{ ex. sec } \frac{1}{2} I$

$E = T \tan \frac{1}{4} I$

$\text{Chord def.} = \frac{\text{chord}^2}{R}$

$\text{No. chords} = \frac{I}{D}$

$\text{Tan. def.} = \frac{1}{2} \text{ chord def.}$

The square of any distance, divided by twice the radius, will equal the distance from tangent to curve, very nearly.

To find angle for a given distance and deflection.

Rule 1. Multiply the given distance by .01745 (def. for 1° for 1 ft.) and divide given deflection by the product.

Rule 2. Multiply given deflection by 57.3, and divide the product by the given distance.

To find deflection for a given angle and distance. Multiply the angle by .01745, and the product by the distance.

GENERAL DATA

RIGHT ANGLE TRIANGLES. Square the altitude, divide by twice the base. Add quotient to base for hypotenuse.

Given Base 100, Alt. $10.10^2 \div 200 = .5$. $100 + .5 = 100.5$ hyp.

Given Hyp. 100, Alt. $25.25^2 \div 200 = 3.125$. $100 - 3.125 = 96.875 =$ Base.

Error in first example, .002; in last, .045.

To find Tons of Rail in one mile of track: multiply weight per yard by 11, and divide by 7.

LEVELING. The correction for curvature and refraction, in feet and decimals of feet is equal to $0.574\,d^2$, where d is the distance in miles. The correction for curvature alone is closely, $\frac{2}{3}d^2$. The combined correction is negative.

PROBABLE ERROR. If d_1, d_2, d_3, etc. are the discrepancies of various results from the mean, and if Σd^2 the sum of the squares of these differences and n=the number of observations, then the probable error of the mean $= \pm 0.6745\sqrt{\frac{\Sigma d^2}{n(n-1)}}$

MINUTES IN DECIMALS OF A DEGREE

1′	.0167	11′	.1833	21′	.3500	31′	.5167	41′	.6833	51′	.8500
2	.0333	12	.2000	22	.3667	32	.5333	42	.7000	52	.8667
3	.0500	13	.2167	23	.3833	33	.5500	43	.7167	53	.8833
4	.0667	14	.2333	24	.4000	34	.5667	44	.7333	54	.9000
5	.0833	15	.2500	25	.4167	35	.5833	45	.7500	55	.9167
6	.1000	16	.2667	26	.4333	36	.6000	46	.7667	56	.9333
7	.1167	17	.2833	27	.4500	37	.6167	47	.7833	57	.9500
8	.1333	18	.3000	28	.4667	38	.6333	48	.8000	58	.9667
9	.1500	19	.3167	29	.4833	39	.6500	49	.8167	59	.9833
10	.1667	20	.3333	30	.5000	40	.6667	50	.8333	60	1.0000

INCHES IN DECIMALS OF A FOOT

1-16	3-32	⅛	3-16	¼	5-16	⅜	½	⅝	¾	⅞
.0052	.0078	.0104	.0156	.0208	.0260	.0313	.0417	.0521	.0625	.0729
1	2	3	4	5	6	7	8	9	10	11
.0833	.1667	.2500	.3333	.4167	.5000	.5833	.6667	.7500	.8333	.9167

Rosebud JV - 1998 Book 2

JUNE 23, 1998

(49) From 2092N, 4776E

027° = REG. / 17° VA
23.5 - 27.5 - 28.5 m
73′ - 82′

bx = 080, 70E

Lower o/c 050, 85E = Flow lineation + jointing
"bottom" = 324° to AND p/c + 271° to Above

(50) 79 - 82 m @ 349° VA = 0
259 - 269′

o/c = 10 x 6′
@ 349°

glomeroporphyritic hbn - fsp Andesite

pl phenos ≈ 8% max = 1 x 4 mm (0.3 x 6 mm), $\bar{x}$ 0.8 x 2.0

Amp (hbn) = 3% → ±chl + lm = go + 10% jarosite

possibly hbn → chl ± ep + py → lm

pl 75 → Ab(?) ± Ep ± cal.
weak ~ 5% of fsp.

Mt → go

* possibly some sanidine phenos - if so then they are ~ 15% of Σ pl phenos (probably = less altd + Albite twins.

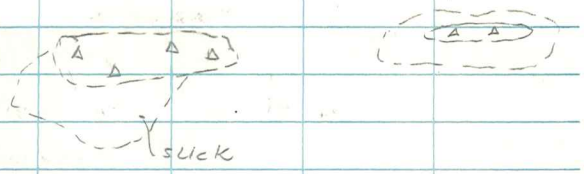
The Rock is starting to develop "popcorn" texture

Some vugs (primary?) are lined by qtz xls + some pl → clay mont? + local kaol?

(49) slicks = 063, 65W, rake = 063° Az, 05° plunge
= strike-slip / upper o/c

ALTN = Silica (flooding) + clay (Kaolinite?) ± Alunite

(49) XRD



Flow banding

phenos
- pl $\xrightarrow{100}$ clay (Kaolinite?) XRD 5%
- 3% Sanidine = Relatively fresh $\bar{x}$ = 2×5mm; max = 3×7mm
- Hbn 2-3% $\xrightarrow{100}$ chl $\xrightarrow{90+}$ clay + hm + go/j + Kaol?
- Mt $\xrightarrow{100}$ hm + go/j 2%

in	mm
0.1 =	2.54
0.2 =	5.08
0.3 =	7.62
0.4 =	10.16

168° = 343 / 348 > 52m = edge of switchback.

188° to next road junction

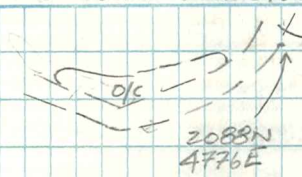
(51) = Hbn - Pl - San latite (flow banded = rx to (49)

ALTN = pervasive silicification w/ pl $\xrightarrow{100}$ clay (Kaol?) + hbn $\xrightarrow{100}$ chl + lm $\xrightarrow{100}$ clay

* NEED XRD + PTS TO WORK OUT ALTN

(52) — back a.z.

068° - 20m then 290° for 8m from 2088N 4776E



= qtz latite

Flow-banded Rhyolite w/ bipyramidal smoky Qtz phenocrysts ~ 1-2%

6-24-98

(53) ABOVE GORILLA

017, 59E = flow banding in glomeroporphyritic And

Mfc + Mt $\xrightarrow{100}$? $\xrightarrow{100}$ go + j (8:2)

plag $\xrightarrow{\pm 100}$ white mica (ser?) ± clay (earlier = Ab ± ep) + calcite = mod to strong (no vns)

(54) 125° post
160° pipe
=

bx = look v. HT + gas streaming it clearly cross-cuts lithology

Joints ? = bedding or fb = 021, 75-90 W ✓
= massive

hbn (2% Acicular phenos 0.1 to 0.4 × 1.0 × 4.0 mm)
+ bio (1×1 mm; trace to 1%) + rare < 1% plag phenos (< 3×2 mm) ± phyric vfg tuff or flow (lava)

hbn $\xrightarrow{100}$ chl? $\xrightarrow{100}$ hm + go + tr jar.

Mt $\xrightarrow{100}$ hm + go ± jar

2 small O/C surrounded by bx = rx float

VOLCANIC? BX

2092N, 4780E 7.0/10.5/20° VA = 13°

@ 4m = stream 293 & 098° START 54, 75, 89 END
173 240 285

(55) 7 . 11

J ± Fb = 067, 51W ✓

Slicks = 078, 68E 100% Dip Slip (rake = 90°)
J = 285, 75E

1055
068

(55) Dip slip slicks = gravity slide, not tectonic movement, other slicks =

Rx = hbn (1-2%) – pl (2-3%) – Sanidine (4-5%)
flow-banded latite (?) w/ ~5-8% rounded xenoliths which are too altd to identify

* There is very little bx, trace subparallel flow-foliation / jointing unlike (49)

Intense altn = hbn $\xrightarrow{100}$ cl (?) $\xrightarrow{100}$ clay + 95% leached
pl $\xrightarrow{100}$ ser + cal (?) $\xrightarrow{\pm 100}$ Kaolinite (?) (Dickite) or some clay. probably AA altn + leaching
Rock: Silicified, but possibly due to leaching of other metals ± addition of silica
Rf $\xrightarrow{100}$ clay ± ser/pyroph ??
Sanidine = ± fresh to weakly leached!

* Sample: pts + xed

O/C = on trend w/ (49).

Slicks = 341, 18E, "Fault" Slicks = 341° = 100% Strike slip

⇒ * Rock has trace to 1% bipyramidal smoky Qtz phenos to 2x2 mm across.

= Rx to (52), probably o/c @ (49) & (50) are = rx.

√ 56 done

(56) = Red Sand mx bx

mx = mud to fine pebbles, x̄ = med upper to coarse Lower Sand

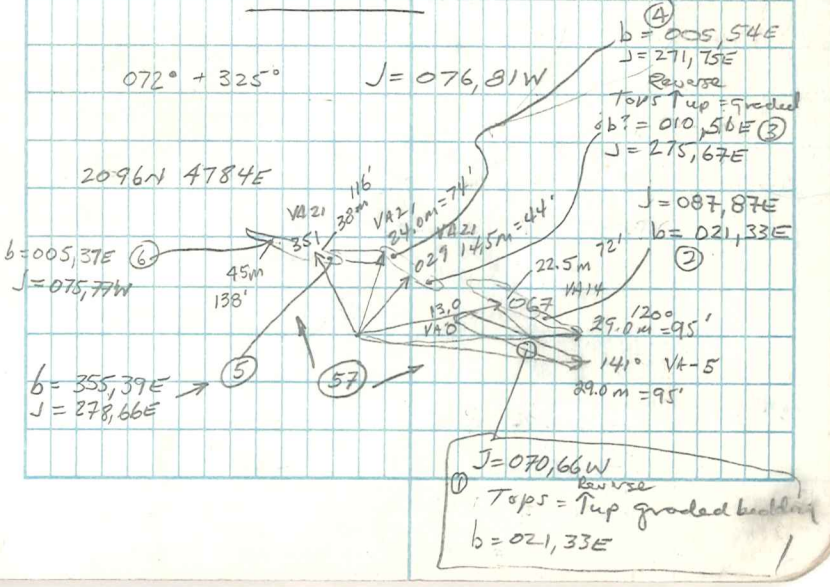
RF = Qtz latite, fb - rhyolite (?), fg tuff + hbn tuff, some dark clasts = ? but Volcanic.

Dominant clast = fb Qz Latite (1 ~ 40%)

Altn = Fsp $\xrightarrow{100}$ clay
Sanidine ± unaltd, minor leaching
mfc ± mt → hbn ± mica ??

Joints = 275, ±90, dom = 85E
→ * minor 42% rounded fragments ± trace ball-bearings ~ 30-40% = Subrounded

? DIATREME ?



(57A)

(57) = red sand mx bx = pepperite

Some flow rock aligned w/ bedding — in unit

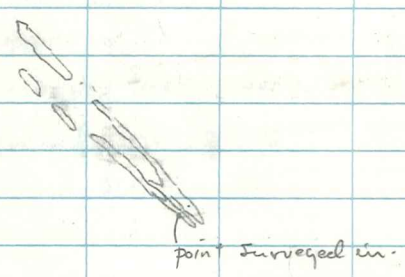
= breaking up w/ red mud injected into mx!

YES! I think anyway.

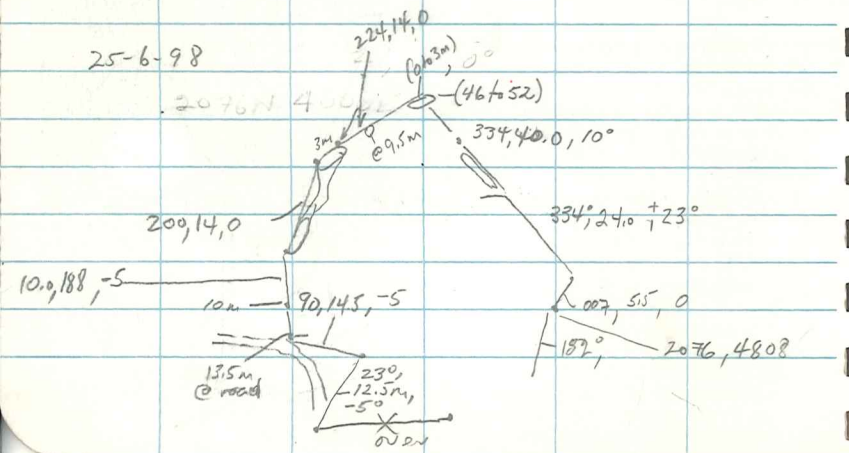
o/c = 217° to 2100N 4780E ✓ (2096N?)

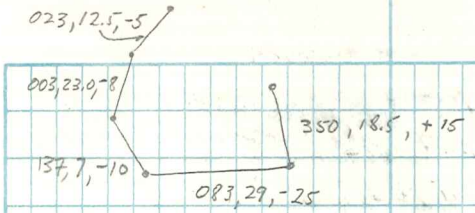
163° to 2096N, 4784E

Then o/c for 100' @ 325° = two beds ~ 20' apart



25-6-98





AZ	M	VA	FT
007	5.5	0	18 ✓
334	24.0	+23	72 ✓
"	40.0	"	121 ✓
"	46.0	"	139 ✓
334	52.0	+23	157 ✓
224	14.0	0	46 ✓
200	14.0	0	46 ✓
188	10.0	-5	33 ✓
"	13.5	"	44 ✓
090	14.5	-5	47 ✓
203	12.5	-5	41 ✓
003	23.0	-8	75 ✓
137	7.0	-10	23 ✓
083	29.0	-25	86 ✓
350	18.5	+15	57

NEVADA MOTEL — 0430-1715

BETHANY

ROCK TYPES MAY-JUNE

BASALT-ANDESITE greens

DACITE-RHYOLITE pink, rose

TRACHYTE-LATITE purples

RED MUD-SAND MATRIX Bx tuscan Red

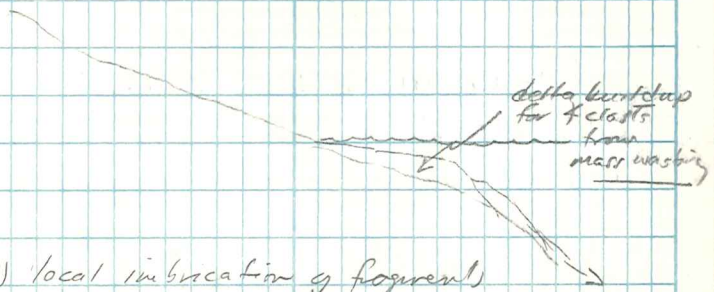
BELOW - probably all Chocolate

plagioclase phyric glassy tuff
Abundant broken plag phenos
hbn needles
trace Quartz

SANIDINE = 8, 9, 26, 34(?), 37
41-49, 51, 52, 55, 55A

26-6-98

possible origin for Badger = lacustrine turbidites



I (1) local imbrication of fragments
(2) reversal(?) graded beds
(3) layering / bedding
(4) Continuous beds
(5) Vertical + lateral extent of unit (multiple events)

Mass wasting = uniformity of clast composition.

II Lava flow to the edge of a lake w/ turbidite deposition of quenched fragments

(A) mixing of rounded (fluvial) + angular frags

@ 56 & 56"A" = "Red" Sandy - mud matrix to breccia — possibly Badger equivalent

* ~ 20' NNE of (56) = matrix (red) "clastic-looking" w/ abundant pale green to white mica (muscovite(?) after biotite(?)) w/ dissem 5= (py?)
= sub o/c to float

(56B) →

2096N
4780E
post
225°
168° 114°
post

(57) Red clastic mx bx w/ porphyritic clasts
¿Badge or not?

340° = stream

→ mx = bio(?) → pale green mica + sanidine = igneous matrix? = ¿intrusive bx?

(57A) = float HS

200, 120

190, 61

(58) Sub o/c / Float

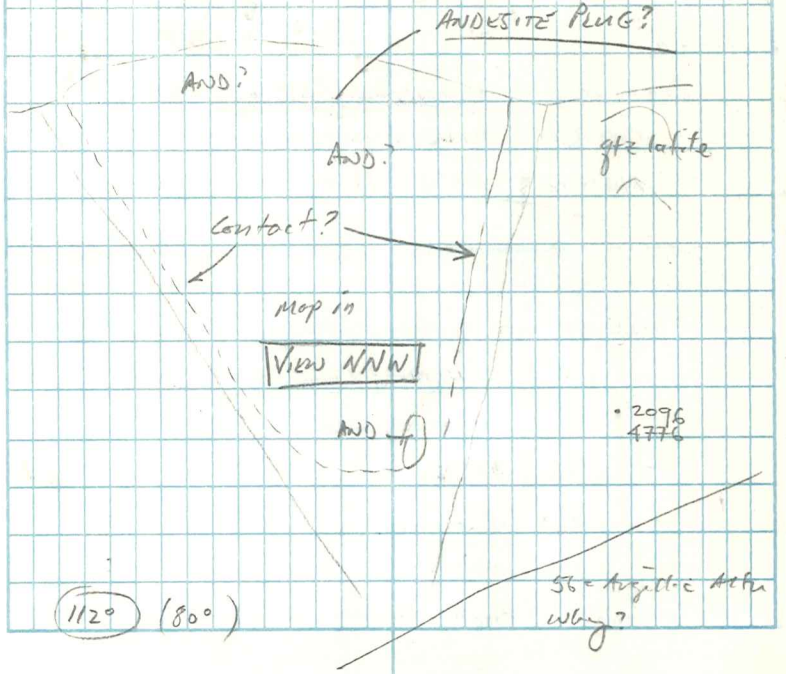
(59) Sub o/c to o/c of gorilla latite/rhyolite porphyry w/ vesicular blocks, dike ~ ¿1M wide? Could be 3 to 5M wide
Sanidine phenos

145°, 177

(60) 168, 38E = 348, 38E / 001, 44E (2nd)
= mud-rich Badger
o/c = 125° to Badger Survey

Look @ top of 408 for weakly altd rx! What is it.

• 2096N, 4776E



(112°) (80°)

bedding in Badger = bedded ≤ 0.25 - ≥ 1.0m

193½, 213½, 203

139° to road joint D/c = ~~345~~ 350°
44.6m = 146' 10' to 2'
55'

26-30m 171°
85-98

(61) Badger I b = 004,54E
234' 262 J = 283,68W 20-30/m
72-80m 28° VA
@ 76m rd - 8' South of line

Badger II
Breccia some = qtz latite
clasts = angular to rounded
Matrix = mica, sanidine, quartz

MONTHLY REPORT
(1) MAPPING IN WHITE ALPS - BROWN PALACE
MOTHER LODE
DREAMLAND

(2) INTRUSIONS & DIKES
(1) And (Glomero)
(2) qtz latite
Lavas (Hyalloclastite) = Lacustrine
± pepperites
(3) Badger I & II (4) STRATIGRAPHY POST MINE GROUP DEPOSITION

MAPPABLE ROCK TYPES

Glomeroporphyritic hbn-fsp ANDESITE (intrusion)
smoky quartz latite (intrusion)
hornblende-biotite latite tuff (chocolate)
biotite-sanidine-quartz intrusive breccia
red sand-matrix breccia (Badger)

basaltic andesite (dikes)
hbn-sanidine ash tuff (flow-banded)
moderately welded latite tuff

epiclastic facies volcanic sandstone + breccia

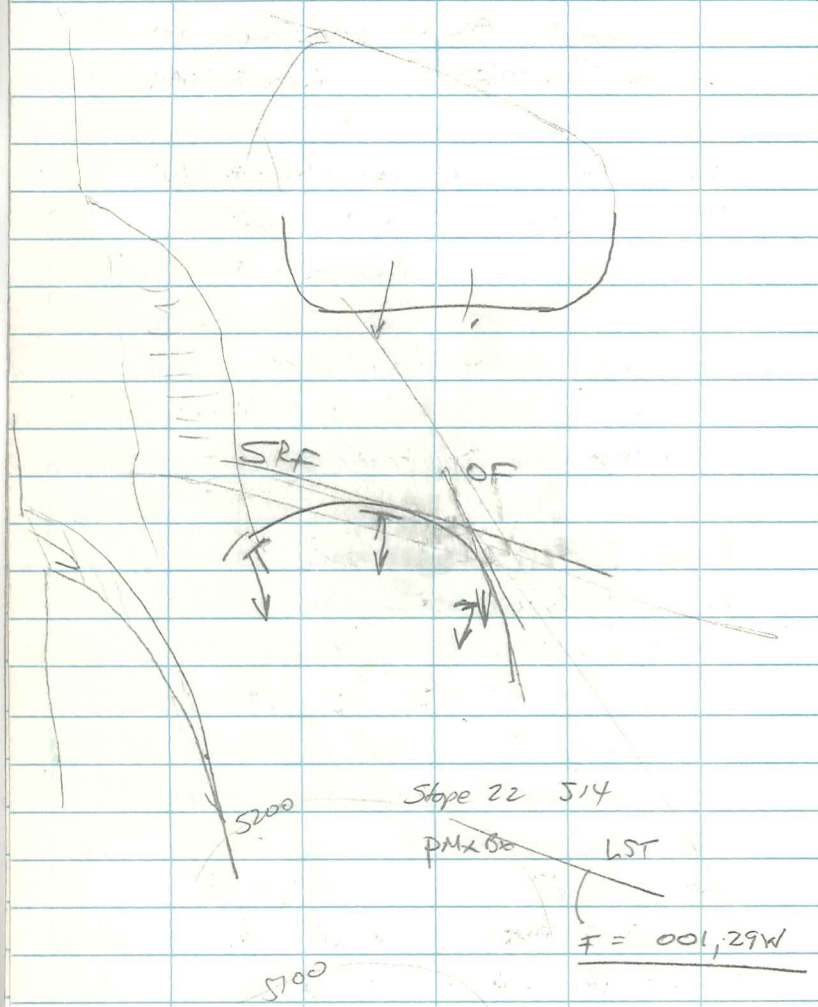
BARREL SPRINGS FORMATION
(1) rhyolite tephra-fall
(2) [illegible]

qtz-hbn-pl phyric glassy tuff (jig-saw bx)
to vfg x/n mix supported

flow-banded, aphyric latite

28-6-98 Rosebud U/G w/ Brian Moris & Dave Cole

SRF Contour fault Surface



* VITRIPHYRE (?) IS CHARICTERISTICALLY PRESENT ALONG THE CONTACT OF THE PINK MxBx (CHILL MARGIN?)

* HG = ALONG PLANAR LAMINATED / LST CONTACT IN STOPE 23. ⇒ FORMATIONAL CONTACT = AQUIFER FOR HT FLUID.

FOOTWALL of SOUTH RIDGE FAULT = SILICIFICATION, HANGING WALL = ILLITE/SER ± KAOL ± SM, DICKITE

Clay Min
- (1) H_2O + OH 59.33% @ 1410 nm (ILLITE 1406-1414, 1908-1912, 2198-2208 Singlet)
- (2) H_2O 40.37% 1912 nm
- (3) AlOH 46.92% 2198 nm
- (4) Fe Mg Si OH CO_3

High Al Illite

67.99 @ 1410
56.92 @ 1908
53.75 @ 2200

$CaCO_3$ + pyorgonite + clay

$CaCO_3$ + Marc = H.g. + Illite

DAVE COLE WHAT WE NEED TO DO —

A. Map property 1:6000 scale w/ local 1:2400

(1) Extensional tectonics role in ORE Local

(2) PARAGENESIS

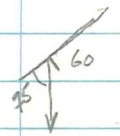
(3) Mineralogical difference between South & East Illite vs silicification

(4) FI data => depth of formation temperature difference / salinity between ORE Zones

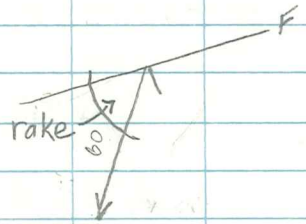
Faults

(1) strike + DIP

(2) rake of slicks



or 040, 60E r=75



* Clay w/ H.G. ore in Stope 21 = 100%

Illite = PIMA = High Al-Illite

ASSOCIATION = Illite - MARCASITE - BARITE - Calcite

* KNOW: MINERALIZATION = STEEP FRACTURES possibly RELATED TO MOVEMENT ON THE SRF.

A. MAPPING CONT

(5) Alteration Zoning w/in the mine and within the district USING THE PIMA.

(YANACOCHA = PIMA'ed all core)

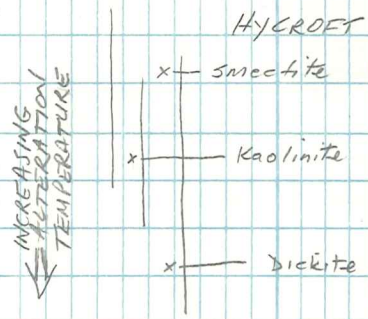
=> (6) orthophotos for Mapping

REAL X-SECTIONS W/ APPARENT DIP

Ag looks late

Au = x/s on Marcasite + pyrargyrite ? CHECK WHICH?

N↑

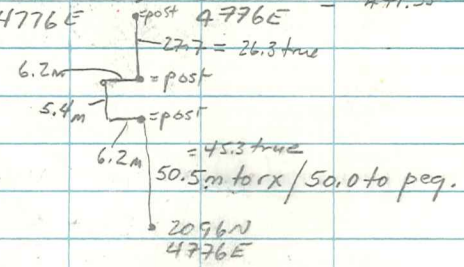


30-6-98 DREAMLAND (Rosebud Q Latite)

VA = 25°

2096N → 2100N = 441.35'
4776E 4776E

134.5m



45.3
5.4
50.7 m true

49.3 m → VA = 18° = 88.1 m
+34.5
83.8
26.3
57.5

70.5 @ 06 VA = 70.1m = 230.0

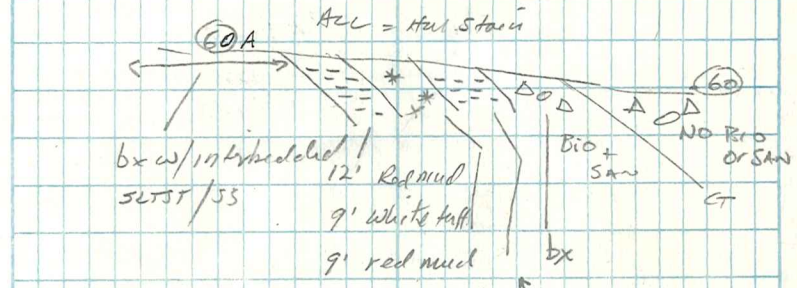
30 = 9.1m

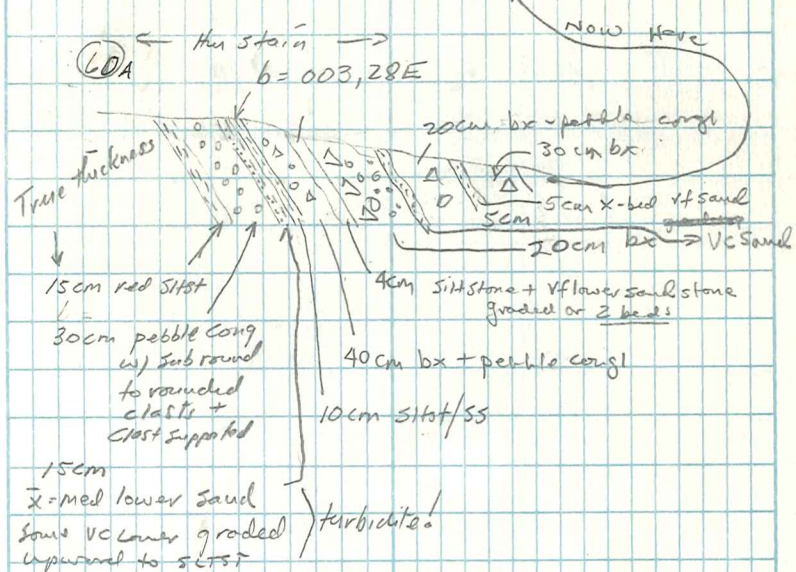
45.3 ≈ 149'
50.7 ≈ 166'
77.0 ≈ 253'

R = 073° 108' = o/c
R = 102° 95' = o/c

(60) 060,52W
085,34W } clay + white mica (Illite?) along fractures in Badger

Badger = No bio, No Sandline





COARSE grained units have sandline + bio(?)

Rd 27.5m @ 253° ± FLAT (≈90')

396' = 111 @ 226° VA = 9°

129 = road junct " FLAT = 28m = 92'

(62) Rosebud Quartz Latite (RQL)

phenos
- Pl 4% $\xrightarrow{100}$ Ab(?) $\xrightarrow{>80}$ white mica + clay
- San 4% $\xrightarrow{10}$ milky actin product = ?
- Hbn(?) 1-2% $\xrightarrow{100}$ green mica ± go >> j
- Mt(?) 3-4% $\xrightarrow{100}$ go >> j

no Qtz phenos seen.

(63) 068° & 121° to 358, 88E

fb = 001, 74E tight/closely fractured 1/4 to 6mm sheeted ok(s)

Rx = plagioclase phyric flow-banded dacite?

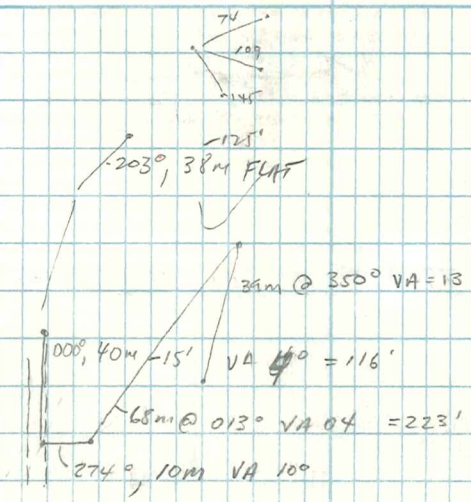
pl phenos = ~6-7% flow aligned, inked tabular ± ep + calcite

& ≈ 75 → Albite(?) = milky yellow rpl prod.

Mfe = ?% ≤ 3 $\xrightarrow{100}$ chl(?) → go ± hm

vfg rock = quench texture = dike/plug margin.

40m South = glomeroporphyritic w/ 10% plag phenos to 1x4mm clusters to 5mm across



64 = glomeroporphyritic Dacite(?)

fb = 021, 73E

Pl → Ab → white mica (ill. fr?) ± 100%

083
– 099
132

7-31-98

PETE'S TOUR

* New Rock type = White Alps porphyry

8-7-98 Friday

WHITE ALPS

RL 18, 79, 19, 80, 81, 83, 21, 2, 15, 290

RS 7,

97-401

RS-423C, 426C

2072N, 4784E

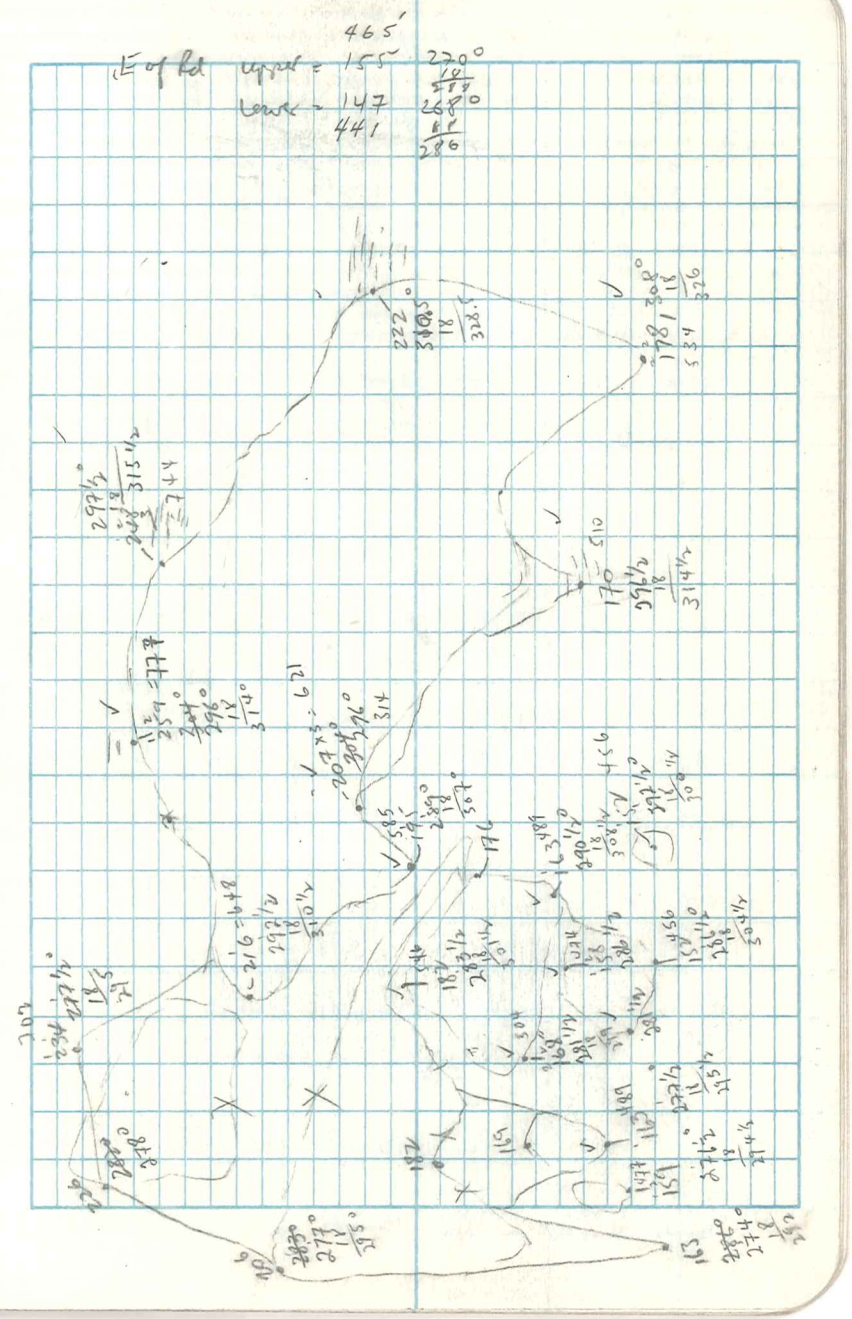
SUUNTO 008° = 026° BRUNTON

Declination = 18°E) = SUUNTO + 18 = TN

2° variance (Dec. set at 16°E on

Brunton Still add 18°

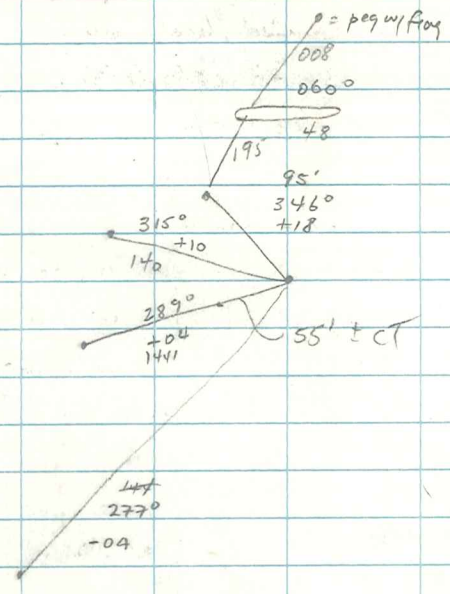
153	51	275° (18)	293°
162	54	268.5 (18)	286.5
183	61 (3)	261.5 (18)	279.5



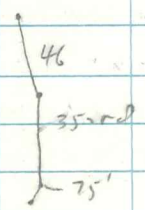
114
2
38
290
18
308°

69
23
327½
18
345.5

380/52



158°



195 | 85' → 255° 35'

2092N CT ≈ 012° +18'
FROM 4764E 012° ~30' = ≈ 1' dia o/c glassy

flow-banded (local) autobx w/ jig-saw tx porphyritic ¿qtz latite? (phenos of fsp + rare qtz, but no large sanidine + no large fsp, local glomeroporphyric tx silicification 3.

Probably Rosebud qtz latite, border phase, v. near CT w/ white Alps ppy.

Rock had 1-2% dissem s= (py?)

CT ≈ 305° to SE = ??

→ probably not on the anomaly

8-8-98 TM w/ MARK GOSSENS
4518422N
360143E

Stop 1

(All UTM = in meters)

Vfg chocolate tuff = concoidal fracture, hbn = 5-6% <0.1 × 1-2mm feldspar tr to 2% probably pl but possibly sanidine

mafic xenoliths (rounded) = trace to ≤ 1% (locally = 5%)

Some rounded rocks = boulders

⇒ * This may be Badger

Ridge to N = Chocolate ?

basal unit = lapilli stone to lapilli tuff

BADGER o/c 005, 18E possible slump on Ridge line
Red mud/sand mx bx w/ Dom to 100%
"Chocolate Fm" tuff fragments

b = 035, 55E probably in place ~25 m to N of last reading; taken on siltstone/mst partings in angular, tuff-rich conglomerate = possibly syn-eruptive sedimentary facies.

At prospect pit
027, 65 W = fracture w/ 1m ± SiO2 + clay alt'n
Rx = feldspar porphyritic tuff
pl phenos ≈ 5-8%, 1-2 × 2-4 mm + weakly glomeroporphyritic
possibly trace sanidine = ?

4518596N
360148E

b = ? possible to get reading here!

2080N
4800E } Badger float 100% to s/oc

2076N
4800E } Silicified 5 (mx = 8) (4-5 frags)
Float
Badger = definately pre-mineralization

2084N, 4748E = LBT (planar lam. Tuff) to W
≈ 50m = bedded to W.
fold/anti form?

2080N, 4744E float = LBT ?

near ridge line end of road
On Ridge line upper Hill (Anomaly)
4518498N
357532E } 1786m = DOZER (?) Tuff w/ fracture-controlled silica (Qtz?) + Hm/Go on fractures, some bx = Hydro T.
w/ bladed marasite ? possibly bladed calcite + drusy quartz
SAMPLE = High-graded

4518498N
357532E } A = Float / subo/c of bx + SiO2 ± bladed marc. = grab of High grade only

4518498 N
357532 E } B = ≈ 30 m @ 225° (down ridge) — High-grade "Vn" sample

= thin altn envelop + silicification (pseudovein) along fracture ≈ 8cm wide

V ≈ 045, 53 W = Possibly SiO2 = Holding up the ridge?
↳ possible slump

Rx = upper Dozer (?) tuff bx

B1 = Hm stained jasperoid vn
B2 = go 8/jar 2 stained silicified 3 ENVELOP
↳ separate vn/fracture

4515430 N
352560 E } + 40m N along ridge to bedding

b = 352, 55 E = Coarse ash tuff (pumiceous) thin bedded w/ vf tuff (± mud) partings locally
w/ "fresh Hro" chart

Sunday 9-8-98

362011 E
4515905 N } (m) UTM

fb or b = 285, 48 W

J = 055, 72 W = ≥ 20/m + limonite (g:j ≈ 6:4)

strong calcite on joints.
SAMPLE = "High-grade" from crushed zone
rx = shear/crush bx w/ abundant 1-2% limonite (g:j:h ≈ 5:0:5 to 6:4:0) is highly variable.

= "High-grade" bx vn
sample = along J. trend

rx = fine ash tuff (?) = flow banded + weakly? welded ± aphyric, w/ rare? hbn phenos and microlite ± Mt or py → hm (tr or less). Vfg dissem. Hm after py or Mt ≈ 1-3% Hbn max = 0.1 x 0.5 mm. (acicular)

2197600 N
486000 E } peg = rock? all talus @ stake

219800 N, 484400 E = UTM 451617 N
361650 E
= ~~talus~~ sloc = aphyric ± tuff
fine ash tuff. lithic lapilli
trace py/marc on dissem
strong Hm stain
over

25'E = o/c + mod silicification J = 016,78W w/ weak bx + shear and strong lm (g:j:h ≈ 3:1:6) stain

Rx may be autobx = jig-saw texture locally other places = lapillistone.

SAMPLE = silicified Hm (g:h ~ 2:8) stained HT ± tectonic bx
= 9810N, 4430E = "High-grade" vn bx

1988N
4820E } gravity float = talus = dom. fine - med ash tuff

1992N
4820E } gravity, Float = fine to med ash tuff possibly Dozer? = aphyric w/ v. weak bx + SiO2 = HT. trace autobx(?)

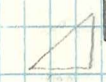
~200'N of station = HT bx w/ fine (≤1mm) Qz stringers + weak(~4) silicification and strong Hm, possibly 1-2% S= (py?) prior to leaching.

1996N
4820E } gravity; o/c = fine - med ash tuff trace/minor autobx? + lapalli tuff. minor HT bx w/ strong Hm - no attitude measureable possibly relatively (≤35°) flat dip??

↑

↓ Flag 317½° ≈ 200' = o/c
Fine to med ash tuff trace lithics, bx vn w/ SiO2
080,77E = ↗ ≤ 1cm w/ ~ 1-2 cm altn zone either side

Sample 1996N, 4820E + 200' @ 317½°
→ "High-grade" bx vn w/ SiO2 + Limonite ± Vn + selvage sample.



SMALL ADIT ~35' "caved" at portal to ~20'
Loc = 352½° from 1996N, 4820E ~700' in stream ~15' up on E side
F = 060, 64E oblique slip, rake = 35° @ 240°
Rx = fine ash tuff (Dozer?)
fracture zone 0.3 - 0.5m wide

2000N, 4820E = fine ash tuff Dozer(?)

Auld Lang Syne Fm

Qtz VNS w/ Carbonate Altn (brown but effervesces w/ HCl)

4515071N, 366529E

A = Qtz w/ dissem py ± wall rock

B = Wall rock ± Qtz VN

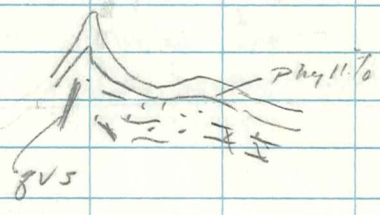
fine Upper to medium lower - grained SS. (quartzofeldspathic)

bed w/in phyllite beds hosts mineralization + QVS

b = ?; possibly small fault

~ attitude = 015, 70 W

= phyllite but isoclinally



Carbonate = altn

10-8-98 MINE (old "Rosebud") AREA

2197600N, 484000E

talus/float = fb - weakly fsp phyric (sanidine = ???) welded ash flow tuff or flow (vapor phase altn + solicification ± S=) + lithic lapilli tuff.

2072N, 4776E

(90)

Hbn microphenol/pheno tuff

060° to post by workings
110° to peg 2 south of
043° to peg 400' W of

b = 322, 41 W
J = 072, 68 W
10/m

86' 41'

Jasperoid

b = 280, 33 W
J = 080, 56 W
5/m

b = 284, 32 W
J 075, 76 W

local auto bx + jasp.
tuff = warped or variable bedding

061° = to 1
115° = to 2
042.5 = to 3

b = 314, 38 W
J = 075, 64 W
5/m

2086N
4776E

From 2072N, 4780E

CT = 132' @ 316°

base o/c = 267' @ 005° — 87 267

side o/c = 252' @ 335° + 300' — 84 252

middle o/c = 282' @ 343 + 357' — 94 282 — 117357

016° — 47 = 141'

118½° = oc

71yd = 213', @ 328°

014°
067° — 17 — 24 / 6 / 30'

031/
045/252½/008

258°

221°/041
247/67

050 ~ 25'

029
062/209/039

(89) Rosebud quartz latite (brecciated)

bx = jig-saw w/ angular to subrounded fragments
$\bar{x}$ = sub angular, fb + "tuffaceous" (even tx) fragments mixed, many w/ flat to curvilinear margins. Small fragments = 0.2 to 6mm max. dimension, $\bar{x}$ ≈ 1 to 2 mm across. Larger fragments 9mm to 2cm and angular to subrounded

bx appears to be autoclastic, non resedimented; possibly hydrothermal, However!

rx = Sanidine and quartz (glassy, clear, and mostly bipyrmidal phenocrysts occur in the rock fragments and in the matrix. qtz ≈ 1mm across w/ some 1×2 mm. Sanidine = <1mm (mx) to > 3×5mm (w/in rx fragments + fractured (?) xls in mx).

Mafic(?) xenoliths occur in some clasts and attain a size range of ≤1 to 5mm.

phenos = Amphibole ≈ 5%, Qtz ≈ 1%, Sanidine ≈ 3-5%

PIMA = MONTMORILLONITE + SILICA !

Alt'n = rf -> clay (illite?) ± kaolinite and silica. Silicification = 7. Plag >100 clay, sanidine ± unaltd Amph (Hbn?) $\xrightarrow{100}$ pale green (emerald green when thick) sheet silicate = chlorite?

Rf -> to early replaced by chlorite?

↓ S= (pyrite?) now $\xrightarrow{100}$ lm + Voids

* Matrix to the breccia = quartz or christobalite kassonite, which may indicate that the bx is hydrothermal.

Max. Amph. 4mm × 1.5mm, $\bar{x} \simeq 0.3 \times 1.0$ mm

(91) CONTACT - INTRUSIVE ?

Contact between Rosebud Qtz Latite (NE) and planar laminated latite tuff (SW). Rgl may cut off early mineralization in the plot, but most likely the veins are controlled by bedding in the tuff and stop at the Rgl.

Bill Silberman
(303) 278-1574 pm

Thursday 13 October 1998

2064N, 4784E = Qal

2060N, 4784E = soil/oc to float, 30' W & WSW

(92) = welded lapilli stone to tuff bx w/ flow-banding + "agglutinated" zones or bombs?

o/c = Rosebud Qtz Latite (?)

1% smoky Qtz some bipyramidal

3% 2x3-4mm fsp x/s $\xrightarrow{295}$ clay sanidine?

?% plag $\xrightarrow{100}$ clay + wx

3% Hbn $\xrightarrow{100}$ pale to dark green mica

o/c textures look like flow bx w/ welding some vfg lava(?) ± vesicular fragments w/ clasts from ash to cobble size, angular and jumbled. Vent facies.

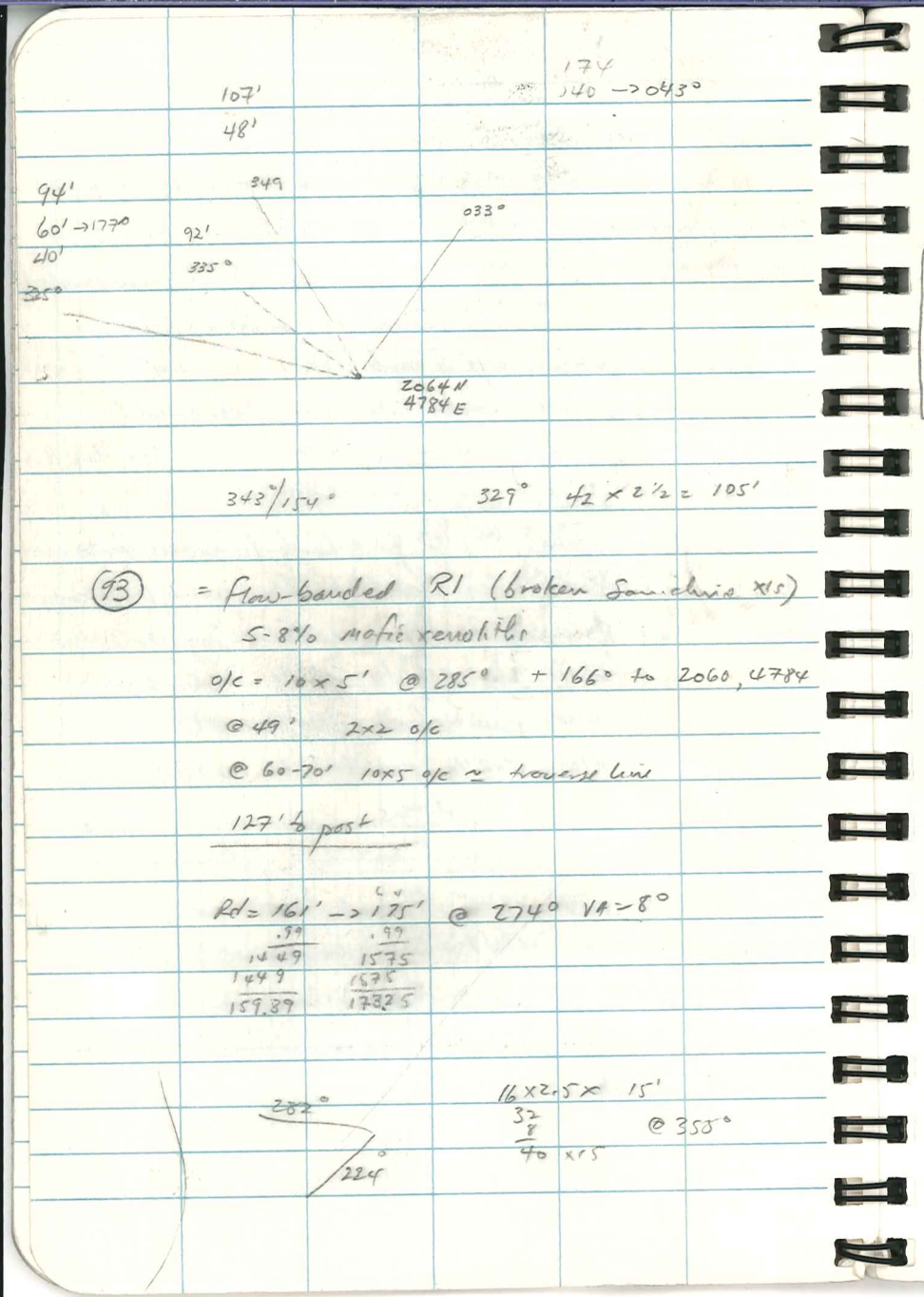
Also 5-8% rounded to irregular mafic xenoliths.

JHD (541) 737-1245 Rosebud Thesis

ANITA GRUNDER -1249 Short Course, Consulting

MTE (1650) 723-0575 Rosebud deposit type, Short Course

Steve Starkey



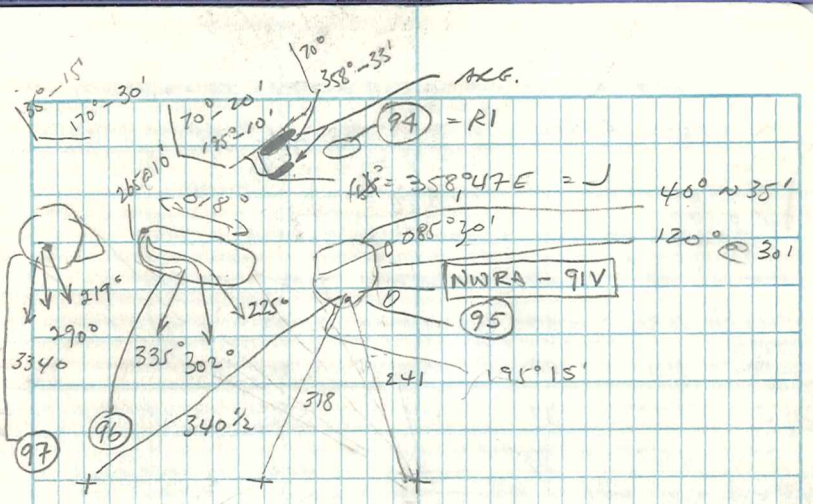
(93) = flow-banded RI (broken Sandine xls)
5-8% mafic xenoliths
o/c = 10 x 5' @ 285° + 166° to 2060, 4784
@ 49' 2x2 o/c
@ 60-70' 10x5 o/c ≈ traverse line
127' to post

Rd = 161' → 175' @ 274° VA = 8°
.99 .99
1449 1575
1449 1575
159.89 17825

282°
224°

16 x 2.5 x 15'
32
8
40 x 15

@ 355°



0-hbx-pl- Sandine porphyry (RI) w/ popcorn texture
∿10/m J = 052, 78E + silicification on joints = V
Sample
fb = 075, 63W ✓ silicified (jasperoid)
envelope = ∿ 1cm wide (each side)

(95)

(96) fb = 013, 42E ✓
ALTN J = 285, 51E = poorly developed ∿ 20/m
2 small zone ∿ 11 fb = silicification + kaol?
both zone ∿ 30cm wide and 2m long = ridge exp.

(97) fb = 350, 44E ✓
J = 068, 78E = poor developed ∿ 20/m

2064N, 4788E = float - R1 fb + minor bx

2068N, 4788E = o/c flow banded R1, ± no bx

14-8-98

From-To	Az°	Na°	Dist'	Dist T'	
1-2092 4780	163½	03	119	119	
2092 4780-2	150	05	81	81	
2-3	125½	04	104	104	o/c starts @ 64' 2± N
3-4	100½	05	159	158	o/c cont. N
@4, = o/c below, end! ford pg	170°		tot. ft pag = 283½	hill pag = 140½	
4-5	273	05	88		
5-6	064	05	131		
6-2	030	03	84	END of N side @ 7-5'	
7-8	008	±0	55		
	Adit = 004		347° to Hill pag		
8 to adit	030	0	100		
8 to rd	066	0	105		
8 to rd,	310	0	10		
rd, to adit	037	0			
Adit o/c	138				

$\bar{x}$ = SS = silicification 5

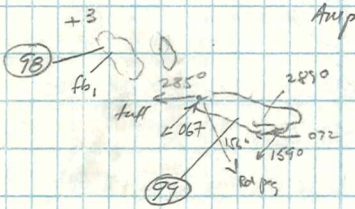
totally altd. o/c

(98) = Margin of R1 = flow-banded w/ mafic(?) xenoliths + gtz phenos, but all fsp → clay; less altd o/c to E have some sanidine phenos, but much less (3%) than the "interior" of the unit. Some bx (micro) bore + micro silicification (3-8) with jasperoid.

fb₁ = 006, 33E ✓ J₁ = 035-060 80W to 88E ~5/m

J₁ = 300, 85W ∈ 1m

Amp → 100 grass green mica → 120 kaol(?)



(99) alti + mein = 055, 62E, zone ~ 1.5m across

and = 080, 85E, zone ~ > 1m across

alti = following bed J set.

fb = ~ 315, 47E (variable)

fb, marginal (±1% sanidine phenos → clay >75 white)

fg phase

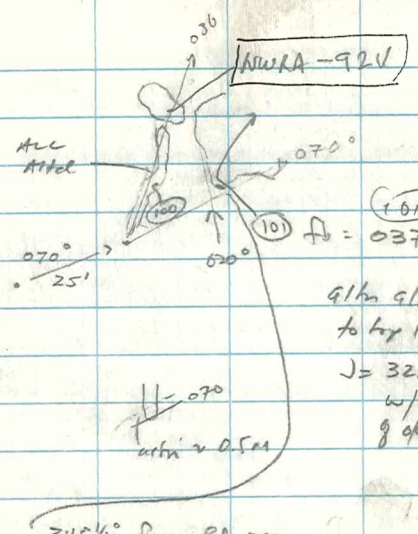
Silicification only along fractures

Amp → 100 grass green mica? → 120 kaol(?)

at end o/c J = 285, 88W ✓ w/ alti ~3/m

fb = 028, 68E ✓ w/ alti ~3m wide

> 100 partings/m



(101) ✓ fb = 037,56E > 100 partings/m

altn along west side o/c to top (uphill)

J = 322,68W ≤ 1/m w/ altn @ "bottom" of o/c = SW corner

345½° from Rd peg

252° from S of tuff

285° from tuff

317° from Hill

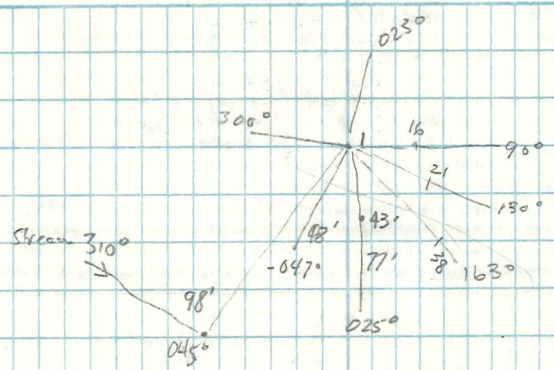
(101) fb = 037,56E

160°, 278°

(102) fb = 046,62E ✓ ~ 40 partings/m

J = 078, ±90 ≈ 12/m

Silicification 7



VA ~ 08°

@ 1 + 107 N (=106) = 327° to W o/c 23×3 = 69'

135° to E o/c 18×3 54'

AZ = 23°
BAZ = 202°

@ 1 + 203 N (=201) = 312° to SW o/c 34×3 = 102'

345° to NW o/c 36×3 = 108'

126° to E o/c 40'

@ 1 + 222 N (=220) = Adit 081° for 30'

Adit trends 090°

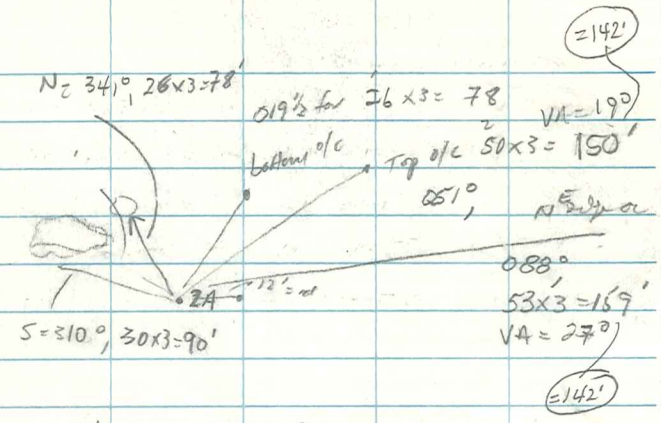
(103) rx = fb. R1 clay + S3 silica

J = 082,67W ~ 25/m ✓

fb ≈ 024,44E

END INCLINE AT 239' = 2A

EDGE RD ~ 12' to E



Stream = 341° for 25'

from 2A o/c = 019½° 92-11 = 81 to 114
at 81 o/c = 087° for ~20' then 045° 20' then 078°
at 114 o/c = 045°

from 3A = E/O/C to W o/c = 285° for 39'
Exposure = 030° 60' then 082°

top = 110° to Goop peg by glory hole
051° from tuff peg
009° to peg below prospects
023½ from 1

from point = 175° for 25'
080'
41x3 = 123 VA = -27°
=110'

SATURDAY 15-8-98

1. ADD Rd + O/C South of 2072N, 4784E
2. ADD O/C NW of Adit on W SIDE OF STREAM
3. CHECK N-SIDE OF FRIDAY'S LAST O/C
4. PLOT STREAM + O/C to CONNECT w/ Earlier WORK
5. MAP BADGER - ROSEBUD QUARTZ LATHE CONTACT
6. CHECK R1 - TUFF(?) CONTACT SE OF 2072N, 4784E

(104) Sample $\boxed{\text{C-1330}}$
J = 283,74E ~ 10/m ; 050, 82E to 75W (dom = 85W)
~ 10/m
bx zone = 055, 67E w/ variable attitudes
probably Hydrothermal, possibly a pebble dike.
O/C = R1 w/ San $\xrightarrow{20}$ clay pl $\xrightarrow{100}$ clay
Amp $\xrightarrow{100}$ grass green mica, silicification ~2
some silica veins/stringers, but mostly clay
+ S = ? $\xrightarrow{100}$ 1m (9:1 ~ 8:2).
$\boxed{\text{NWRA - 93V}}$ = limonite ± rx frags in bx "dike."
Incipient bx O/C ~ 40% bx / 60% fb disrupted

2076N, 4780E = 5' N (020) of main o/c
Due east of lower (Northern) exposure
= R1
* NEAR CT w/ fine ash tuff = xenoliths in R1
IN float, 1 piece of glomerophyric ANDESITE

RI

(105) fb = 018,54E ✓ 50-100 partings/m, variable

J = 079,83E ~ 6/m

Silicification = variable 1-9, $\bar{x}$ = 2-3, guess 3 at the base if Qtz along fb ring is 2°.

Sanidine $\xrightarrow{>80}$ clay ± 1m, Pl $\xrightarrow{100}$ clay; Sanidine = leached. Amph $\xrightarrow{100}$ grass-green mica

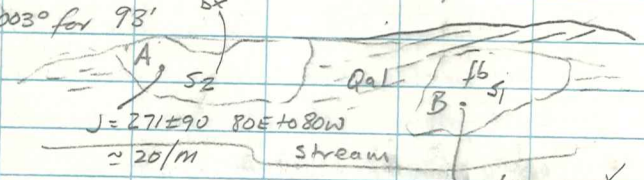
105 = Spring

Stream from 3A = 014°

= 2 o/cs along west bank

003° for 98'

(106)



J = 271±90 80E to 80W

≈ 20/m

Stream from 3A = 014°

fb = 325,75E ✓ to 012,72E ✓

>100 partings/m

J = 285,82 W

3A + 128-134 = o/c W side

135-141 = o/c E side

162-172 = o/c W side + bottom E

182 = start o/c west side

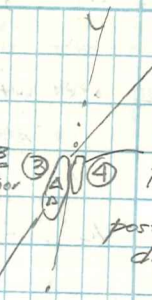
4A = 3A + 183' flat = ~ 285° to (64)

CHECK Location!

"CT" = exposed!

YEA! popcorn tx "grades" into bx tx + altn! = Altn CT + margin of dike! = glassy + fb ± vitrophyre

(107)



Silicification = 0

J = 355,67W ≈ 4/m?

popcorn texture + Hm/Sm altn

Silicification = 2-3

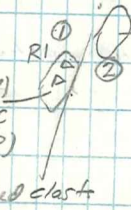
Dom RI bx w/ minor fb = near margin + bx = dom. mx (igneous? = autobx?).

post mineral??? or just not altd?

dike?? = RI w/ smoky Qz + Sam/Pl and Hbn

J = fb = 068,71W

popcorn tx RI w/ v. weak (Hm/Sm)? alteration.



J = 347,45W ≈ 5/m

J = 271,77E ≈ 2/m

fb may be ~ 345±90??

Silicification = 0

RI bx w/ clasts to 8cm (rounded) in mx of <4mm rf + mx (lava? mx?)

primary bx = ?

Some flow-banded clasts

Sanidine $\xrightarrow{>80}$ clay ± leached, Silicification ~ 2-3

pl $\xrightarrow{100}$ clay, Amp $\xrightarrow{100}$ grass green mica $\xrightarrow{>80}$ "white clay

Strong 1m stain on joints = Near margin of unit?

4A 0-151 feet 5A

from 4A to 5A 022° VA = +07°

(108) over

@154 = o/c on E

0-58' = o/c W side then Qt (RI) E

W side = Badger floats to stream

100-132 o/c W = RL bx

E = Badger float

132-151 = RI Qt

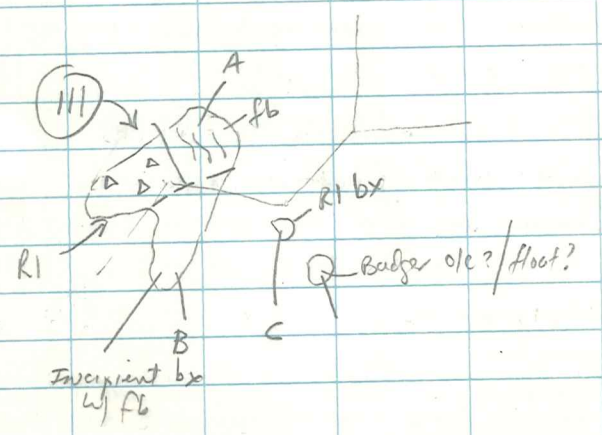
NOTE RI float w/ popcorn tx ± vfg/vitrophyre mixed w/ Badger near stream (up 20' max) drainage on E side $\overset{S}{\Rightarrow}$ CT on East slope

(108) Silica 3, = Sample for pima
J = 060,47 W ± fb (+30') ~5/m
J = 077,52 W (+52') ~ 10/m
J = 338,59 W " ~ 2/m
5A-6A = 55' @ 040° VA = 012°
0-25' R1 o/c E, R1 Q+W
@ 45' = o/o stream bed E side x2x1'

From 5A to (64) ≈ 240° (060°)

(110) = incipient bx (5 and) [5% o/c] mostly chilled
margin w/ Hm-SM(?) altn
no good fracts/fb

6A-7A = 32' @ 098°, VA = 12°
7A to stream junction @ old station = 052° for 27' VA = +3°



(111)
A = Hm/SM? altn
J =
fb = 340,65E ≥ 80 partings/m

B = Silicification 2 to 9, average = 56 = solid
possible bx dike = 040,86 W ≈ 20cm wide
J = 055,65 W ≈ 1/m; 287,77 W ~ 3/m
fb = 035,57E = ?? possible w/ ~ 20-30 partings/fractures/m (or less)

* on top of o/c B = float or o/c (can't tell) of pebble congl. w/ pebbles of R1 that looks like Badger — Bottom of Badger = R1 pebbles or R1 intruded Badger??
We may need to dig this location out!

(112)
o/c? = 051° to peg = prospect pit X
= 297° to peg on wall
= 223° to peg (earlier today)
possible o/c looks like Badger, but I think it is R1 (border phase) chilled margin bx.

* Need to Re check o/c on hill above (E) here!

(113) 200° from here ~40' = 2nd X w/ rx that look like Badger but could be R1
mult rx types = Badger??

pm = Near old WORKINGS

2nd Adit = 320° = 270° from Adit 1 ≈ 30'

From 7 = 260° ~ 15' = o/c
233° ~ 35'

INSIDE
258° @ 36'
274° @ 160-36 = 124' then point = 216'

216
36
180

→ From here 065° for 148' = END
@ 71' = 331° for ~30 to peg
END to peg = 267°

(113)

o/c to peg on drill Rd = 045°
peg in valley = 195°
peg on hill = 254°

R1
= o/c ± prospect pit of flow-banded R1
clear + smoky quartz phenos
Sanidine $\xrightarrow{10}$ clay pl $\xrightarrow{100}$ clay $\xrightarrow{?}$
Amph $\xrightarrow{100}$? $\xrightarrow{100}$ 1m ± clay + leached.
Some bx (10%) of o/c = ? primary ??
fb = near vert + contorted ~ strike = 355°
J = 035, ±90 ~1/m + poorly developed
Dozer trail $\xrightarrow{S}$ R1 covered by ~ 3' of Badger float

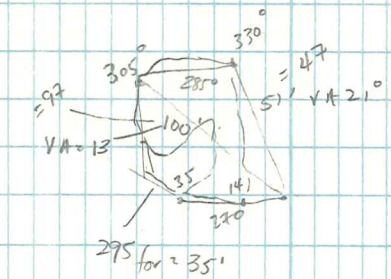
267°/53° = Rd + o/c = R1 = (113) ~ 40' SE
113 o/c probably S3 overall, maybe S2

(114)

o/c = 178° to valley peg
= 247 to hill
= 201 to road junction

000° for 115' VA = 21°
H. True dist = 107'

@ top = popcorn texture + sm (?) altn
J = 040, 83E ~ 6-10/m
fb ≈ North ±90
silicification = 2-8 $\bar{x}$ ≈ 4
Sanidine $\xrightarrow{>80}$ clay, pl $\xrightarrow{100}$ clay
Amph $\xrightarrow{100}$ grass green mica $\xrightarrow{>20}$ clay + 1m
bipyramidal smoky Qtz + clear qtz.



1. BASE = o/c, Roads, Streams
2. Overlay = Structure + Alteration

DREAMLAND / WHITE ALPS (south) 1 CAPS 0 200 400 600
ROSEBUD CAPS 2 1" = 200' 1:2400

18/8/98

Question:

Why is the Badger red?

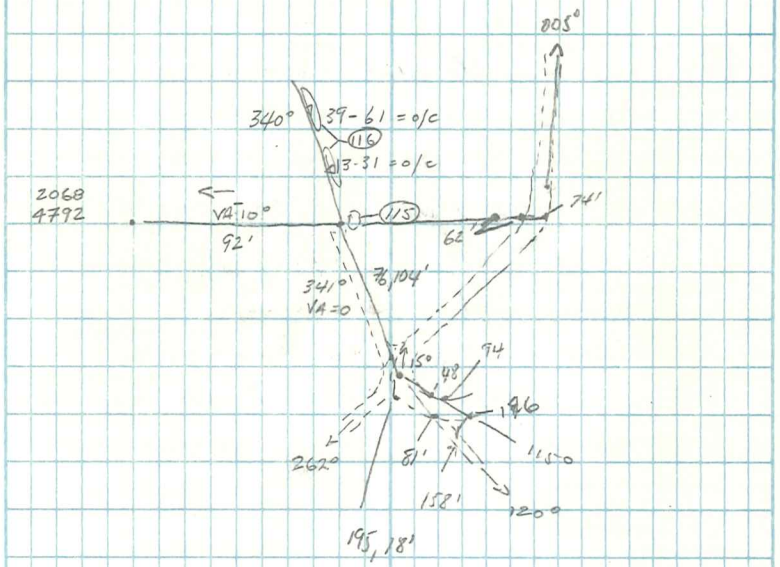
1. Rosebud Qtz latite intruded along the contact between Tc and Tb, baking the more porous Badger for a greater distance
   Mt + fe-mags → Hm

2. Plot up flow-banding in RL

   Joints: 0 - 5 black
   6 - 10 green
   11 - 20 orange
   > 20 red

DEXRON

Tom Weis – contract work



(115) = S o/c to o/c = platy, probably fb (yes) qtz latite w/ abundant xenoliths. (possibly xenoliths of chocolate tuff? Not mafic magma.)
mod arg altn = HS

(116) = rock, dom fb, but minor autobx ± parallel flow direction. = HS
61'

S o/c 0-25 = o/c + S/oc
35-112 = R1
@ 40' = (117) = good fb
312,58E 318,78E V
use

337°
@ 112' = (118) = S/oc siliceous, open-space hydrothermal breccia vn ~ 4 to 15cm wide. Sample = Hg of "vn" + minimal wall rx,
VA = -08°
Host = R1 - fb w/ minor (<10%) autoclastic bx, tr = glassy

@ 112' = NWRA - 94V

56' @ 194° to adit trending 094° = open stope on road above ~18' to top edge of dump then to rd = 274°
VA = 09°

ALTN < Hbn w/ Arg altn → green mica? or clay (100) → white clay Kaol? (>90)
Sanidine = leached >75% to 100 ± white clay!

60' = bend in rd + toe of the dump @ 141° VA = 08°

Rd = 008°, VA +02°, 36' 10-36' = Dozer cut to E
Rd = 020°, VA +05°, 53' 15-35 = o/c = R1

(118) = R1 HS/ALTN = V. strong clay (Kaol?)
fb + bx ratio = ?, prob. dom fb
LEACHING
→ No reliable fb attitudes (all fb) poor o/c = wx
float of silica - bx vn w/ lm ≈ before from o/c
= NWRA - 95V = sample of gossan ± envelop over 30' length of rd.
vn = stringers through zone
Strong arg. altn from "dump" to here.

10-29 = o/c
39-59 = S/oc
59-76 = o/c
88-96 = o/c
102-110 = o/c

≈ 12' from 102' to stake
END TAPE @ 133'
VA = +08°
AZ = 182°
2072N, 4792E

(119)
≈ 35' = VN, poor exposure ≤ 20 cm wide lm
≈ 055,72W + silica
@ ~ 70' = flow-banded R1 w/ leached sanidine

fracture zone w/ strong 1m (q:j:H ≈ 6:1:2)

(119) trends = 080, 72W to 300, 76W = 20/m

x = 290, 78W ✓

* * flow banding = 005, 32W = 2nd reversal!

poor? exposure, but fb probably OK

= similar to near peg. to the north

Altn =

Due E of 2472, 4792 = fb = 358, 42W

J = 285, 75E ~3/m

HS 2nd set 042, 88W ≈ 3/m

---

strong J set 275, 89W ~ 10/m or greater 20/m

main fract. zone = 080, 75W ≈ 30/m

(120) = fb = 340, 66W ✓ = R1 tr to ≤1% bipyrmidal → bipyrdinal smoky Qtz

HS Sanidine <25 → leached + clay

(1m G:J:H ≈ 6:2:2) plag 100 → white clay

leaching = light rock Amp 100 → green mica >90 → white clay + leached

± 25% leached or more = guess

O/C = 0-43' AZ = 029° VA = +07° DIST = 122' └ 121 True

Dt = 43'-57 @ 57 o/c in road

@ 70' o/c in East wall

O/C = 70-122 along E wall, in Rd 57-90'

(121) fb = 353, 45W ✓ = strong partings ≈ 50-70/m

J = 285, 88E / 080, 88W } x̄ = 080 looks dominant

≈ 10-15/m

Sanidine 30 → leached + clay

Amp 100 → green mica >85 → white clay

pl 100 → white clay

119 = S 1-2 =

120 = S 2-3

121 = S 0-1

O/C = 8-17 + Rd ½ AZ = 005°

= 48-52 E VA = +10°

DIST = 154° = 151.6' true.

S/OC = 52-70 E 67-70 = o/c

O/C = 80-88 E @ 88 v weak popcorn tx

O/C = 95-152 E

(122) J = 300, 88W ~ 40/m over 1m zone then ~3/m

San = 5-10% leached, pl 100 → white clay

Amp 100 → grass green mica

Rx = fb - R1 fb = ? = 015, 54W ✓

---

(123) fb = 028, 45W ✓

J = 057, 88W = 100/m over > 0.5m w/ 1m

(q:j:h ≈ 6:4:0)

J2 = 280, 76W ≈ 15-20/m

San >95 → leached + white clay

pl 100 → white clay

Amp 100 → pale green mica >95 → white clay

in popcorn tx rx ~ = 6' along rd San 5-10 → leach + clay

(124) Sanidine $\xrightarrow{>90}$ white clay / not leached

Amp $\xrightarrow{100}$ clay

pl $\xrightarrow{100}$ white clay

can't tell San from pl !

North END fb = 034, 58W ✓ — poorly developed: J = 330, 53E 20°/m

South END fb = 030, 56W ✓ — J = 300, 68E 10/m

(124) → clay probably montmorillonit

Az = 339°

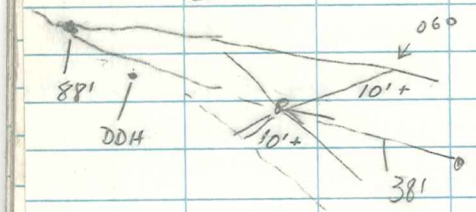
VA = +04°

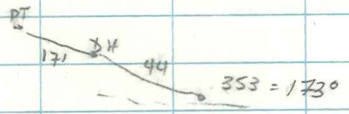
DIST = 88'

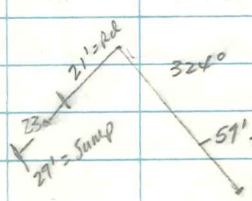
2076N
4092E
81'

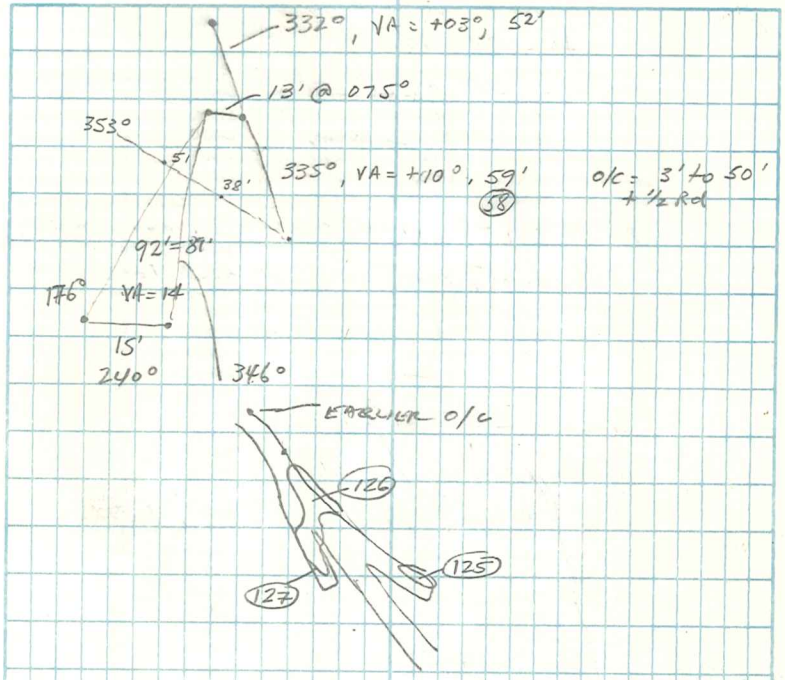
Pag to DH = 307½°

38 - 51 = sump









(125) J = 308, 72E = strong #/m = ? o/c poor

fb = 017, 63W ✓ = > 70 partings/m

Sanidine $\xrightarrow{\leq 20}$ Hm ± clay ? (mont ??)

pl $\xrightarrow{100}$ white clay

Amp $\xrightarrow{100}$? $\xrightarrow{100}$ clay ± Hm (green-brown?), mostly gone

qtz is present HS

over

(126) fb = 027, 70W ✓

J = 089, 32W = dominant set ~4/m (2to4)

weak jointing

Rf along this road (xenolith) are more abundant, more angular and longer + they look like Chocolate tuff!

Sandstone 25 (wx?) → clay w/o leach

Pl 100 → white clay

Amp 100 → green-brown sheet silicate (chl?) + Hm

—

(127) fb = 025, 47W ✓

J = 280, 84E to 315, 80E ~ 280 ft?

↳ use on map = stronger 2to3/m

probably strong sm altn here + 126 & 125

Since (124) S=0 — $\bar{x} \leq 25$

Sandstone ≤40 → clay (white) / no leaching

Pl 100 → white/yellow clay

Amph 100? → limonite = goethite ~ 1:1

± brown clay

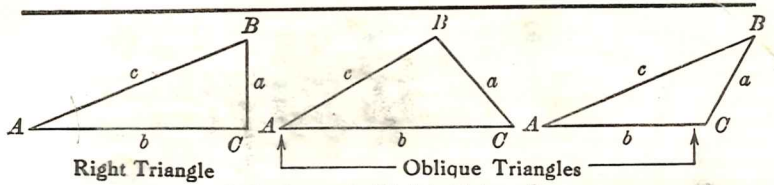
2076N, 4788E = BADGER o/c in road cut +

↳ = at top of Dozer cut (114) ! cut to Rd

NATURAL FUNCTIONS

°	Sine	Tan.	Cosine	Cotan.	°
0	0.0000	0.0000	1.0000	Infin.	90
1	0.0175	0.0175	0.9998	57.2900	89
2	0.0349	0.0349	0.9994	28.6363	88
3	0.0523	0.0524	0.9986	19.0811	87
4	0.0698	0.0699	0.9976	14.3007	86
5	0.0872	0.0875	0.9962	11.4301	85
6	0.1045	0.1051	0.9945	9.5144	84
7	0.1219	0.1228	0.9925	8.1443	83
8	0.1392	0.1405	0.9903	7.1154	82
9	0.1564	0.1584	0.9877	6.3138	81
10	0.1737	0.1763	0.9848	5.6713	80
11	0.1908	0.1944	0.9816	5.1446	79
12	0.2079	0.2126	0.9781	4.7046	78
13	0.2250	0.2309	0.9744	4.3315	77
14	0.2419	0.2493	0.9703	4.0108	76
15	0.2588	0.2679	0.9659	3.7321	75
16	0.2756	0.2867	0.9613	3.4874	74
17	0.2924	0.3057	0.9563	3.2709	73
18	0.3090	0.3249	0.9511	3.0777	72
19	0.3256	0.3443	0.9455	2.9042	71
20	0.3420	0.3640	0.9397	2.7475	70
21	0.3584	0.3839	0.9336	2.6051	69
22	0.3746	0.4040	0.9272	2.4751	68
23	0.3907	0.4245	0.9205	2.3559	67
24	0.4067	0.4452	0.9135	2.2460	66
25	0.4226	0.4663	0.9063	2.1445	65
26	0.4384	0.4877	0.8988	2.0503	64
27	0.4540	0.5095	0.8910	1.9626	63
28	0.4695	0.5317	0.8830	1.8807	62
29	0.4848	0.5543	0.8746	1.8041	61
30	0.5000	0.5774	0.8660	1.7321	60
31	0.5150	0.6009	0.8572	1.6643	59
32	0.5299	0.6249	0.8480	1.6003	58
33	0.5446	0.6494	0.8387	1.5399	57
34	0.5592	0.6745	0.8290	1.4826	56
35	0.5736	0.7002	0.8192	1.4281	55
36	0.5878	0.7265	0.8090	1.3764	54
37	0.6018	0.7536	0.7986	1.3270	53
38	0.6157	0.7813	0.7880	1.2799	52
39	0.6293	0.8098	0.7771	1.2349	51
40	0.6428	0.8391	0.7660	1.1918	50
41	0.6560	0.8693	0.7547	1.1504	49
42	0.6691	0.9004	0.7431	1.1106	48
43	0.6820	0.9325	0.7314	1.0724	47
44	0.6947	0.9657	0.7193	1.0355	46
45	0.7071	1.0000	0.7071	1.0000	45
°	Cosine	Cotan.	Sine	Tan.	°

TRIGONOMETRIC FORMULÆ



Solution of Right Triangles

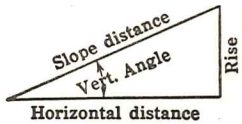
For Angle A. $\sin = \frac{a}{c}$, $\cos = \frac{b}{c}$, $\tan = \frac{a}{b}$, $\cot = \frac{b}{a}$, $\sec = \frac{c}{b}$, $\operatorname{cosec} = \frac{c}{a}$

Given	Required	
a, b	A, B, c	$\tan A = \frac{a}{b} = \cot B, c = \sqrt{a^2 + b^2} = a\sqrt{1 + \frac{b^2}{a^2}}$
a, c	A, B, b	$\sin A = \frac{a}{c} = \cos B, b = \sqrt{(c+a)(c-a)} = c\sqrt{1 - \frac{a^2}{c^2}}$
A, a	B, b, c	$B = 90° - A, b = a \cot A, c = \frac{a}{\sin A}$
A, b	B, a, c	$B = 90° - A, a = b \tan A, c = \frac{b}{\cos A}$
A, c	B, a, b	$B = 90° - A, a = c \sin A, b = c \cos A,$

Solution of Oblique Triangles

Given	Required	
A, B, a	b, c, C	$b = \frac{a \sin B}{\sin A}, C = 180° - (A + B), c = \frac{a \sin C}{\sin A}$
A, a, b	B, c, C	$\sin B = \frac{b \sin A}{a}, C = 180° - (A + B), c = \frac{a \sin C}{\sin A}$
a, b, C	A, B, c	$A + B = 180° - C, \tan \frac{1}{2}(A - B) = \frac{(a-b)\tan \frac{1}{2}(A+B)}{a+b}, c = \frac{a \sin C}{\sin A}$
a, b, c	A, B, C	$s = \frac{a+b+c}{2}, \sin \frac{1}{2}A = \sqrt{\frac{(s-b)(s-c)}{bc}}, \sin \frac{1}{2}B = \sqrt{\frac{(s-a)(s-c)}{ac}}, C = 180° - (A+B)$
a, b, c	Area	$s = \frac{a+b+c}{2}$, area $= \sqrt{s(s-a)(s-b)(s-c)}$
A, b, c	Area	area $= \frac{bc \sin A}{2}$
A, B, C, a	Area	area $= \frac{a^2 \sin B \sin C}{2 \sin A}$

REDUCTION TO HORIZONTAL



Horizontal distance = Slope distance multiplied by the cosine of the vertical angle. Thus: slope distance = 319.4 ft. Vert. angle = 5° 10′. From Table, Page IX. cos 5° 10′ = .9959. Horizontal distance = 319.4 × .9959 = 318.09 ft.
Horizontal distance also = Slope distance minus slope distance times (1 — cosine of vertical angle). With the same figures as in the preceding example, the following result is obtained. Cosine 5° 10′ = .9959. 1 — .9959 = .0041. 319.4 × .0041 = 1.31. 319.4 — 1.31 = 318.09 ft.

When the rise is known, the horizontal distance is approximately:—the slope distance less the square of the rise divided by twice the slope distance. Thus: rise = 14 ft., slope distance = 302.6 ft. Horizontal distance = $302.6 - \frac{14 \times 14}{2 \times 302.6} = 302.6 - 0.32 = 302.28$ ft.

MADE IN U. S. A.