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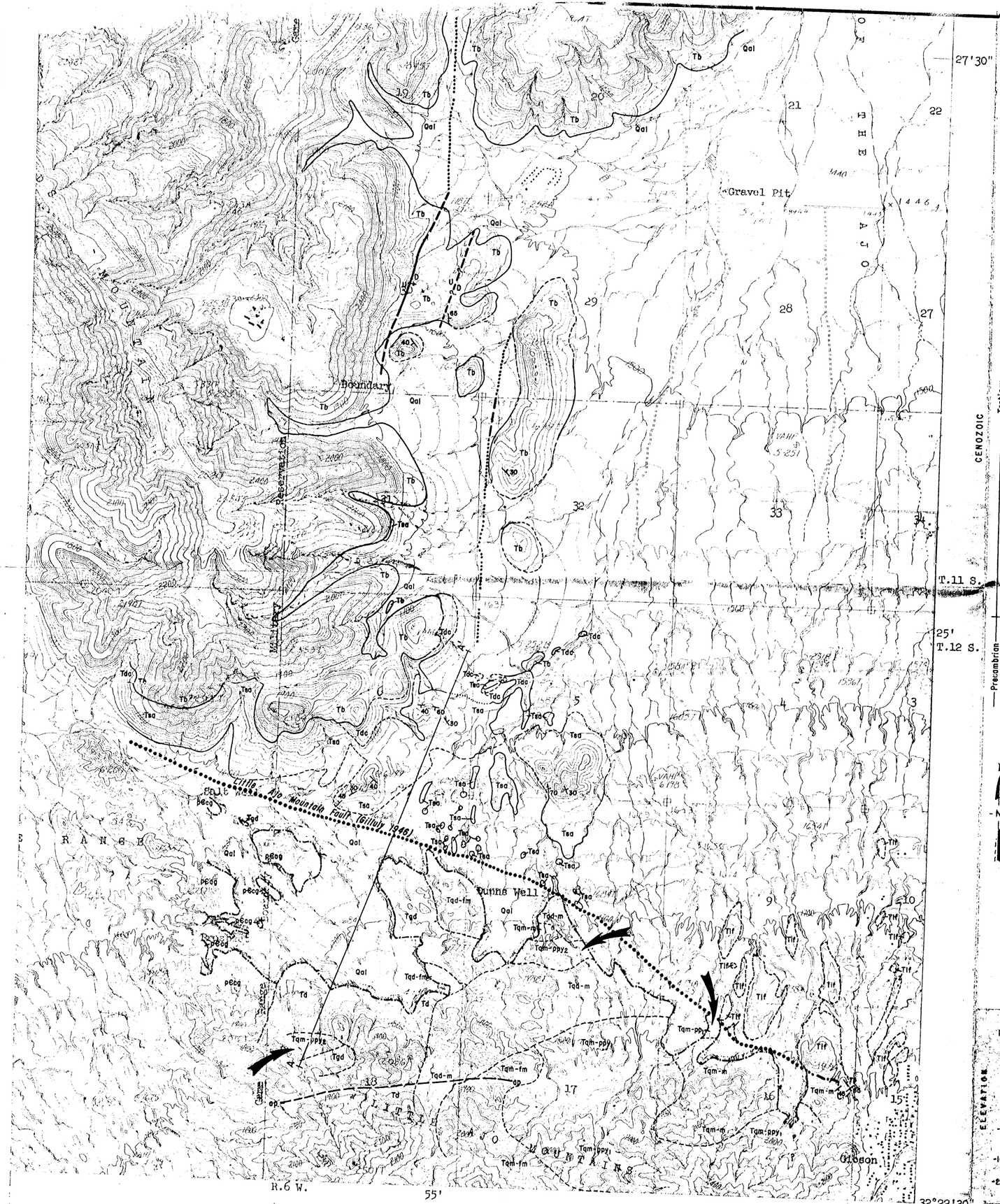


EXPLANATION

Qal	Alluvium and colluvium
Tba	**Batamote Andesite:** dense dark gray aphanitic andesite, weathering red, occasionally with phenocrysts of plagioclase and hornblende.
Tdc	**Daniels Conglomerate:** fluviatile conglomerate with pebbles of dominantly volcanic origin and Sneed andesite composition averaging less than 2" dia. and up to 4' in size.
Tsa	**Sneed Andesite:** hornblende andesite flows with intercalated vitrophyres and crystal and pumiceous tuffs of rhyolitic composition.
Tlf	**Locomotive Fanglomerate:** poorly sorted, poorly bedded, coarse, locally derived polymictic desert fan deposit. Clasts of Cardigan Gneiss and plutonic phases of Cornelia stock average less than 1" dia. with fragments of Chico Shunie quartz monzonite ranging up to 5' dia., reddish sand sized matrix.

North Part Cornelia Stock (65 - 58 MY)

Tqd	Tqm-fm	Tqm-ppy$_{1,2}$	Tqm-m
Granodiorite: fine grained, equigranular, variable amounts of quartz and K-feldspar.	**Quartz monzonite:** fine to medium grained, seriate plagioclase < 1mm to 3-4mm.	**Quartz monzonite:** porphyritic, fine grained quartz - K-feldspar groundmass, plagioclase phenocrysts to 3-4mm	**Quartz monzonite:** medium grained, seriate plagioclase 1 to 6mm.

Td	Tqd-fm	Tqd-m
Diorite: fine grained, equigranular, ± K-feldspar	**Quartz diorite:** fine to medium grained, equigranular	**Quartz diorite:** medium grained, equigranular

pCcg	**Cardigan gneiss:** medium grained biotite gneiss, variable texture, locally highly contorted. Contains medium grained muscovite-bearing granitic pods from several inches to 100 ft. across.

CENOZOIC — Quaternary; Tertiary — Paleocene; Precambrian

Pre-mineral — post-mineral contact

Geologic contact, dashed where inferred

Strike and dip of bedding

Strike and dip of joint

Shear zone with dip

Fault, dotted where approximate

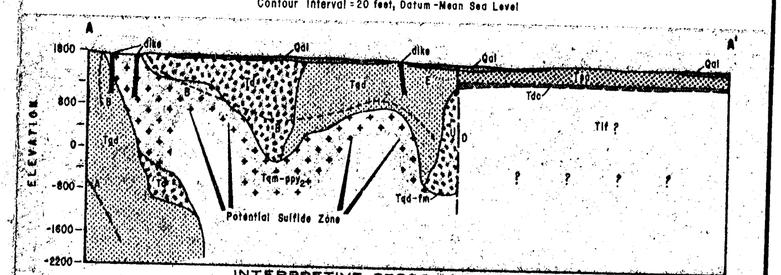
ap — — — Airphoto linear

Favorable host rock, similar to porphyritic quartz monzonite host rock in New Cornelia pit.

N

0 500 1000 2000 3000 4000 5000 6000 7000 8000 FEET — 1 Mile

Scale in Feet (1:24,000)
Contour Interval = 20 feet, Datum - Mean Sea Level



INTERPRETIVE CROSS SECTION A-A'
Looking Northwesterly (Horiz & Vertical Scale: 1" = 2000')

Note:
Topographic data is from a portion of Ajo NW, Pima Co., Arizona
Advance sheet by Pacific Area Geological Survey, mapped 1963

Kennecott Exploration, Inc.
Exploration Services Department

TOPOGRAPHIC & GEOLOGIC BASE
NORTH CORNELIA STOCK, AJO, ARIZONA

SCALE 1" = 2000'	NO. A41-001
ORIGINATOR M.B. Jones, T. Loucks, 1974	
DRAFTING U.S.G.S., M.B. Andersen	REVISED

PLATE I

Ajo-Kino Peak Quadrangles, Arizona (02720285)

Search activity in western Arizona during the quarter concentrated on the covered area adjacent to the Cornelia stock in the Ajo quadrangle and in the Growler Pass area of the Kino Peak quadrangle (Fig. 7). Both areas have postmineral cover of Tertiary volcanics and fanglomerate and Recent alluvium. One investigator concentrated on the bedrock alteration and mineralization adjacent to cover while another worked on the post-mineral volcanic and fanglomerate stratigraphy.

Sneed embayment. -- The Sneed embayment between the Little Ajo Mountains and Childs Mountain is considered a favorable area for prospecting because it is adjacent to the Cornelia stock. Phelps Dodge's New Cornelia mine, at the southeast edge of the stock, is thought by Gilluly (1946) to be in a downdropped cupola of the stock. The orebody is partly in the Cornelia Quartz Monzonite and partly in the Concentrator Andesite. The Concentrator Andesite crops out only on the southeast side of the stock east of the Gibson fault, but it is possible that this andesite may occur under cover in the Sneed embayment. The alteration of the Concentrator Andesites on Pinnacle Peak shows a wide specularite zone overlapping the inner epidote and outer sericite alteration zones.

The northern portion of the Cornelia stock adjacent to the Sneed embayment has 3 square miles of weak to intense outer halo propylitized (albite, epidote, actinolite, and chlorite) quartz monzonite. The stock and the Cardigan Gneiss to the west are cut by an east-west quartz latite porphyry dike swarm. These indications of alteration and late magmatic activity adjacent to cover near the Sneed embayment are justification for geophysical follow-up.

Growler Pass. -- At the southern end of the Growler Mountains, 10 to 15 miles southwest of Ajo, there are several indications of a porphyry-type system. One IP line was surveyed through the Growler Pass by BCM several years ago and had a weak response. Neither follow-up nor subsequent geology was done in the area. An area of 20 square miles has isolated hills

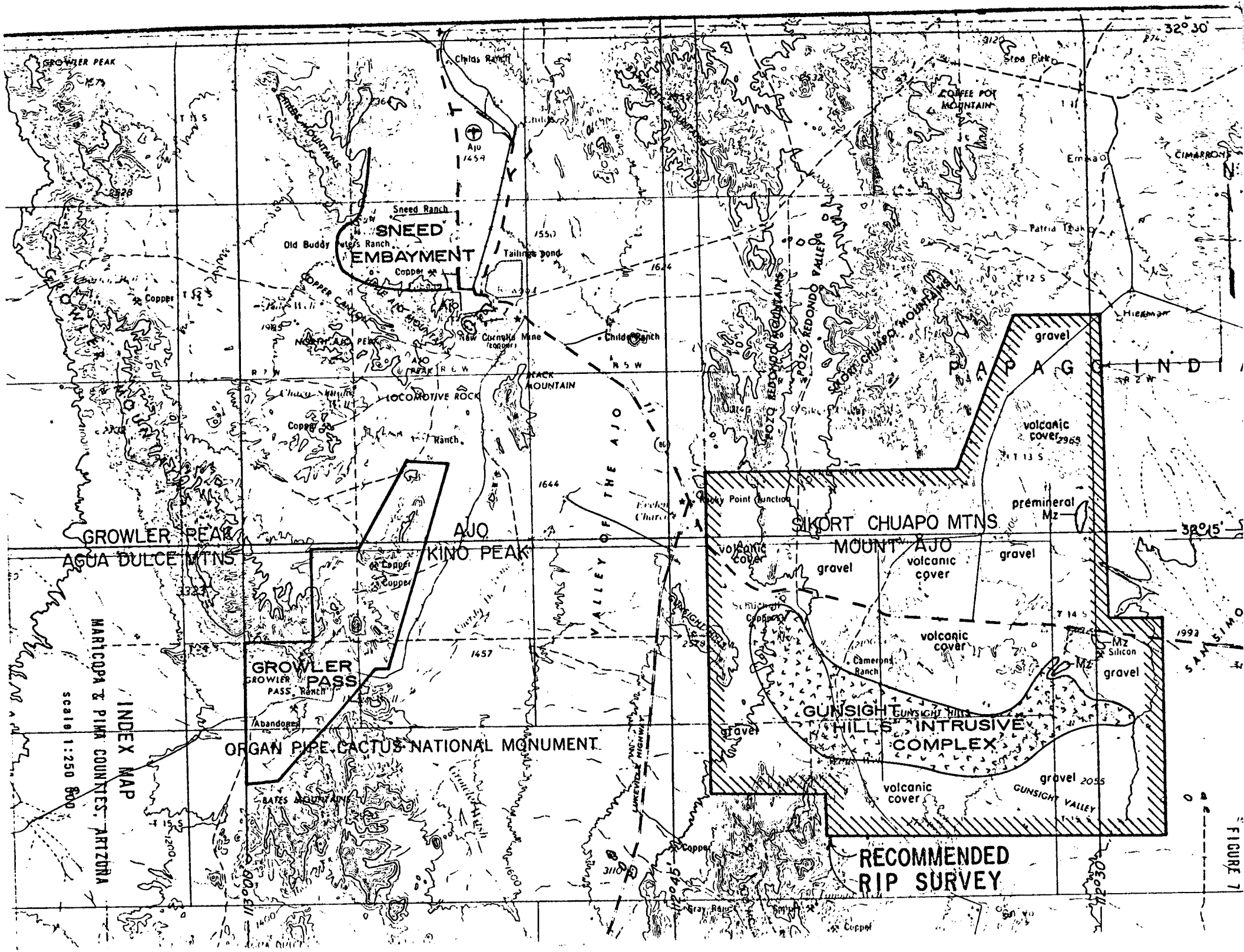

32° 30'
GROWLER PEAK
Childs Ranch
Stee Peak
COFFEE POT MOUNTAIN
CIMARRON
Emesa
Patria Tank
Hickman
Sneed Ranch
SNEED EMBAYMENT
Old Buddy Peters Ranch
Tailings pond
Copper
COPPER CANYON
NORTH AJO PEAK
AJO PEAK
Raw Cornelia Mine (copper)
Childs Ranch
BLACK MOUNTAIN
LOCOMOTIVE ROCK
Ranch
POZO REDONDO MOUNTAINS
POZO REDONDO VALLEY
SIKORT CHUAPO MOUNTAINS
PAPAGO IND
gravel
volcanic cover
premineral Mz
Rocky Point Junction
SIKORT CHUAPO MTNS
MOUNT AJO
GROWLER PEAK
AGUA DULCE MTNS
AJO
KINO PEAK
VALLEY OF THE AJO
GUNSIGHT HILLS
Cameron's Ranch
Mz Silicon
GUNSIGHT HILLS INTRUSIVE COMPLEX
GUNSIGHT VALLEY
GROWLER PASS
GROWLER PASS Ranch
Abandoned
ORGAN PIPE CACTUS NATIONAL MONUMENT
BATES MOUNTAINS
LUKEVILLE HIGHWAY
Gray Ranch
Smith
RECOMMENDED RIP SURVEY
30° 15'
INDEX MAP
MARICOPA & PIMA COUNTIES, ARIZONA
scale 1:250 000

FIGURE 7

Blue Stone Property, Pinal County, Arizona: The property is located approximately 30 miles north of Tucson and less than one mile from the Coppercrete project. The property consists of two unpatented lode claims. Copper oxide mineralization is restricted to narrow low and high-angle structures. The property is not recommended for acquisition at this time. If drilling results from Coppercrete and Last Chance show encouragement then the property should be acquire for land position.

Sneed Embayment, Pima County, Arizona: The area is located approximately four miles NW of the Ajo deposit. Kennecott evaluated the property in 1974 mentioning the presence of copper oxide mineralization and favorable alteration outcropping adjacent to an alluvial-covered area. The copper mineralization observed is restricted to narrow fracture-controlled structures within unaltered Precambrian gneiss. The copper prospects are within the Cabeza Prieta Wilderness Refuge. The area also contains widespread propylitic alteration (epidote and chlorite). The copper prospects and the area in question are bounded to the north by the Little Ajo Mountain fault. The throw of the fault is reported to be in the order of no less than 5,000 feet. The property will not be pursued further.

Copper Giant, Pima County, Arizona: Further work in the area clearly indicated a zone of one mile by minimum 1500 feet of exotic copper mineralization within the Locomotive conglomerate. In the same area a monolithic breccia with weak copper mineralization was traced over a distance of 1500 feet. The mineralization at Copper Giant is apparently very similar to Buckeye. A field visit is planned to Buckeye in order to better evaluate the potential of Copper Giant. Records found through the Anaconda files do not indicate more than 12 holes drilled in an area of 1.5 square mile. Some holes were not assayed throughout the Locomotive conglomerate since the target at the time was to intersect copper mineralization within the basement rock.

Kennecott Exploration, Inc.
Exploration Services Department

Geologic Research Division

October 24, 1974

MEMO TO: D. C. Bulmer
Project Manager, Arizona Search

FROM: John E. Welsh

SUBJECT: Preliminary Report: North Cornelia Stock, Ajo District, Pima County, Arizona by M. B. Jones and T. A. Loucks

A RIP survey is recommended in the Sneed Ranch embayment adjacent to the Cornelia stock. Field work in the spring of 1974 identified favorable alteration in the stock and associated dikes in the western outcrops of the stock. The alteration is not continuous with the Ajo district, so this is a separate target area. The inferred Little Ajo fault may have downdropped premineral volcanics so that favorable andesite host rocks possibly underlie the covered embayment.

Phelps Dodge has a major exploration program south and west of the Little Ajo Mountains. This is largely exploring through the Tertiary Locomotive Fanglomerate. The Sneed embayment is a less obvious exploration area, but this report documents the favorable alteration in the stock and the associated copper prospects at the extreme northwest end of the Little Ajo Mountains.

The area was inspected by Bulmer and Welsh with Jones explaining the alteration and target concept in the spring of 1974.

John E. Welsh /gp
John E. Welsh

JEW:gp
Attachment

cc: H. L. Bauer
M. T. Pana w/o attach.
G. D. Van Voorhis ✓
J. C. Wilson

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Kennecott Exploration, Inc.
Exploration Services

GEOLOGIC RESEARCH DIVISION

PRELIMINARY REPORT: NORTH CORNELIA STOCK AJO DISTRICT, PIMA COUNTY, ARIZONA

by

M. B. Jones and T. A. Loucks

October 1974

CONTENTS

ILLUSTRATIONS

PRELIMINARY REPORT: NORTH CORNELIA STOCK
AJO DISTRICT, PIMA COUNTY, ARIZONA

by

M. B. Jones and T. A. Loucks
October 1974

SUMMARY AND CONCLUSIONS

The Cornelia stock, host to the Phelps-Dodge New Cornelia mine, is a composite pluton which in the map area consists of diorite, quartz diorite, granodiorite, and quartz monzonite. The stock and enclosing host, the Precambrian Cardigan Gneiss, are intruded by an east-west-trending premineral dike swarm of andesites, dacites, latites, and quartz latites. Cardigan Gneiss, Cornelia stock, and dikes are hydrothermally altered to varying intensities by a propylitic assemblage of albite, epidote, chlorite, and actinolite. Potassic alteration consisting of weak pervasive sericite, weak secondary potassium feldspar, and weak to moderate secondary biotite is restricted to the northwest portion of the stock and adjacent gneiss. Observed mineralization consists of pyrite, chalcopyrite, and bornite, and supergene malachite, neotocite, and pitch limonite in gneiss and quartz-latite dikes that cut the gneiss just northwest of the stock. Anomalous copper values range from 39 ppm to 1.75%. Alteration and mineralization may be caused by porphyritic quartz monzonite that crops out in small areas near the edge of postmineral cover. This rock type is similar to the porphyritic host in the New Cornelia mine. Distribution of mineralization, anomalous metal values, and hydrothermal alteration is approximately concentric about sec. 7, T. 12 S., R. 6 W. Most of this section is covered by a thin veneer of alluvium, probably less than 50 feet thick. The northern part of the stock is covered by postmineral alluvium, fanglomerate, and possibly volcanic rocks to a depth of 0-300 feet.

A RIP survey is recommended to outline potential porphyry-type mineralization similar to the New Cornelia orebody, a secondarily enriched, low total sulfide system. Twenty-two sections that include the northern part of the Cornelia stock, the Cardigan Gneiss, and potential Cenozoic sedimentary and volcanic cover north of the stock are recommended for RIP. This area consists of secs. 31-34, T. 11 S., R. 6 W.; secs. 3-10 and 16-18, T. 12 S., R. 6 W.; and secs. 1-3 and 10-13, T. 12 S., R. 7 W. (Fig. 1). In addition, the alteration anomaly warrants at least one northwest-trending dipole-dipole IP line across sec. 7, T. 12 S., R. 6 W.

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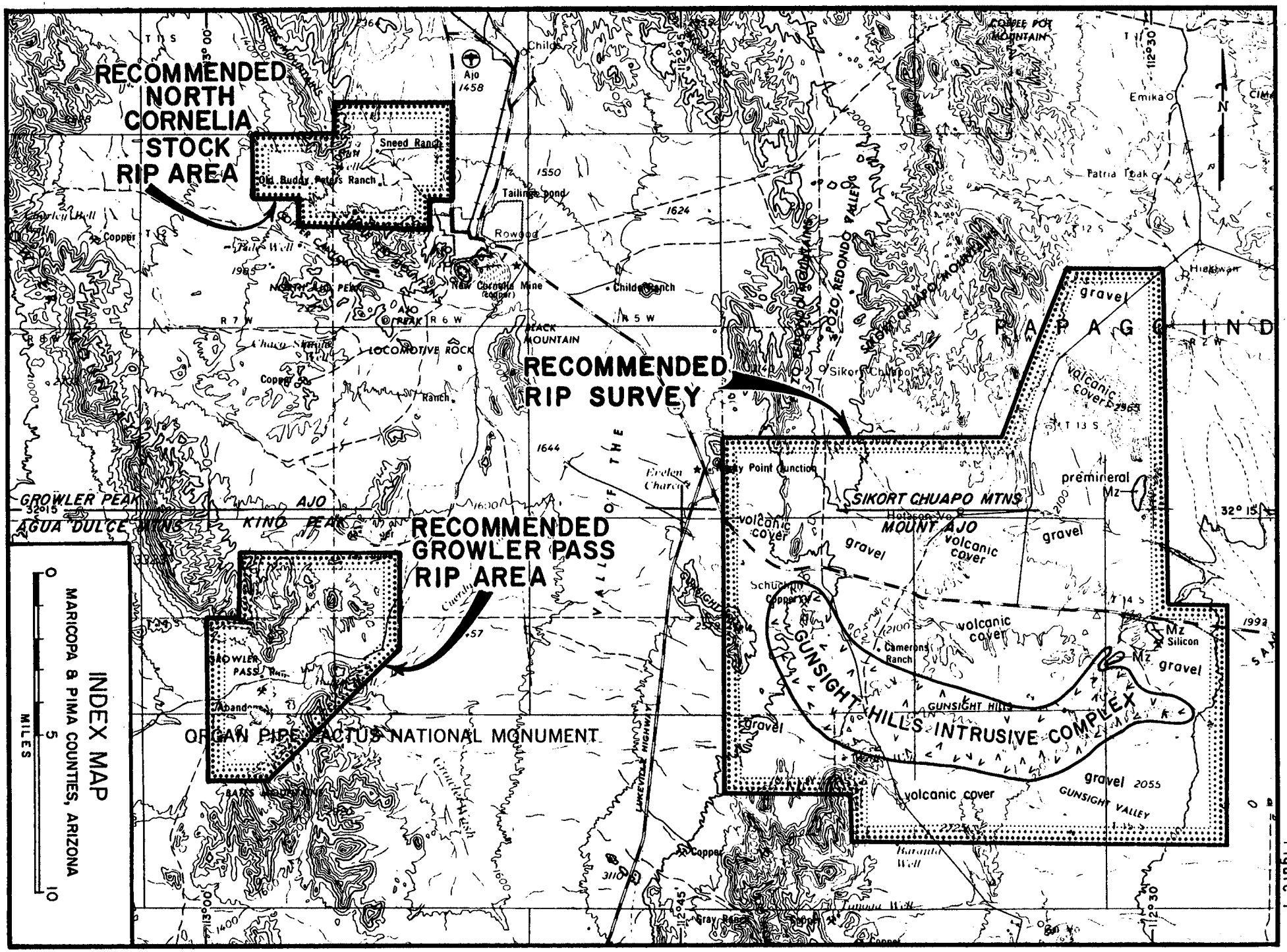
RECOMMENDED NORTH CORNELIA STOCK RIP AREA
RECOMMENDED RIP SURVEY
RECOMMENDED GROWLER PASS RIP AREA
INDEX MAP
MARICOPA & PIMA COUNTIES, ARIZONA
MILES
0
5
10
ORGAN PIPE CACTUS NATIONAL MONUMENT
GROWLER PEAK
AGUA DULCE MTNS
KINO PEAK
AJO
SIKORT CHUAPO MTNS
MOUNT AJO
GUNSIGHT HILLS INTRUSIVE COMPLEX
GUNSIGHT VALLEY
RAPAGO IND
VALLEY OF THE
POZO REDONDO VALLEY
LOCOMOTIVE ROCK
BLACK MOUNTAIN
Ajo
Childs
Rowood
Tailings pond
Sneed Ranch
Old Buddy Peters Ranch
New Cornelia Mine (copper)
Childs Ranch
Copper
Ranch
Sikort Chuapo
Emika
Patria Peak
Hickiwan
Evelen Charco
premineral
Mz
gravel
volcanic cover
Schuchuli
Cameron's Ranch
Silicon
Gray Ranch
Tunnel Well
Granite Wash
Lakeville Highway
Cuerda
Abandoned
Bates Mountains
Growler Pass
Coffee Pot Mountain
Cima
N

Figure 1

PURPOSE

Host rocks, alteration, and mineralization in the north part of the Little Ajo Mountains, 2-6 miles northwest of the Phelps-Dodge New Cornelia mine, were sampled and mapped at a scale of 1:24,000 in order to identify favorable geologic-alteration trends adjacent to postmineral cover. In addition, postmineral rocks were mapped to determine thickness and distribution of cover. Geology of the Little Ajo Mountains, Cornelia stock, and New Cornelia orebody was previously mapped by Gilluly (1946) and summarized by Adair (1961). Additional study of the stock includes petrology by Wadsworth (1968) and geochemistry by Graybeal (1973). Dixon (1966) updated the geology of the orebody. MacDougall (1961) compiled an aeromagnetic survey of the Ajo area at a scale of 1:31,680, and a gravity survey of the area is recorded at a scale of 1:62,500 on BCM Geophysical Division gravity map No. 32-112-SW.

GEOLOGY

Exposed host rock at the north margin of the Laramide Cornelia stock is Precambrian Cardigan biotite gneiss. Additionally, a 2-foot-wide inclusion of possible Paleozoic quartzite is present in the northwest part of the stock. Cenozoic volcanic and sedimentary rocks cover the northernmost exposures of the stock. These Tertiary units, in order of decreasing age, are Locomotive Fanglomerate (6,000-12,000 feet), Sneed Andesite (3,000 feet), Daniels Conglomerate (250 feet), and Batamote Andesite (600-800 feet). The valleys are covered with Quaternary alluvium.

The Cornelia stock is a composite pluton that shows concentric zoning inward from its western and southern contacts (Wadsworth, 1968). A border zone consists of equigranular fine- to medium-grained quartz diorite. An intermediate zone of equigranular medium-grained granodiorite grades inward to several quartz monzonite units distinguished by their differing textures. Wadsworth did not study the northernmost part of the stock. However, he did identify the host quartz monzonite in the New Cornelia orebody as the probable faulted off and displaced upper cupola of one of the porphyritic quartz monzonite units in the interior of the stock.

The northernmost part of the Cornelia stock also shows crude concentric zoning (Plate 1). Border phases consist of equigranular fine- to medium-grained diorite, equigranular fine- to medium-grained quartz diorite, and equigranular medium-grained quartz diorite. Interior phases consist of seriate fine- to medium-grained quartz monzonite, porphyritic fine-grained quartz monzonite, and seriate medium-grained quartz monzonite. In addition, three outcrop areas in the northwest part of the stock consist of an equigranular fine- to medium-grained rock type with variable composition approximated by

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granodiorite. Modal analyses of representative samples are shown in Table 1. Contacts between plutonic phases were not observed, but crosscutting map patterns and small outcrop areas of quartz monzonite enclosed within diorite and quartz diorite suggest that the granodiorite and quartz monzonite units intruded the dioritic units. Furthermore, porphyritic quartz monzonite that forms small outcrop areas within the diorite units is texturally and mineralogically similar to the quartz monzonite unit that both Wadsworth (1968) and Graybeal (1973) suggest is the host to the New Cornelia orebody. These small areas of porphyritic quartz monzonite crop out near or adjacent to alluvial cover and indicate that favorable host rocks to mineralization may occur at depth and to the north under alluvium and postmineral volcanic rocks. Petrographic analyses will further define the composition and relationships of the various plutonic phases.

DIKES

Premineral porphyritic dikes containing phenocrysts of plagioclase, hornblende, and quartz (in order of decreasing abundance) form an east-west-trending swarm that cuts the stock and the Cardigan Gneiss (Plate 1a). Most dikes dip moderately to steeply north. Dike types include andesite, dacite, latite, and quartz latite. Individual dikes are up to 100 feet wide and 1 mile long. Quartz latite dikes that cut mineralized gneiss in the NW$\frac{1}{4}$ sec. 7, T. 12 S., R. 6 W. contain noticeably larger and more abundant quartz phenocrysts than other dikes. These dikes also contain traces of sulfides.

FAULTS

The New Cornelia orebody, which lies within the cupola of the Cornelia stock, was downdropped to the east on the north-striking Gibson fault (Gilluly, 1946). Subsequently, the Little Ajo Mountains were tilted 40°-50° to the south on the post-Locomotive Little Ajo Mountain fault. This fault strikes northwest and is concealed under alluvium north of the Little Ajo Mountains. East-west postmineral andesitic dikes in the stock show left lateral displacements of about 100 feet on northerly striking faults. With one exception, the Tertiary stratigraphy shows no vertical fault offsets greater than about 100 feet. A north-trending fault in the Batamote Andesite dropped the eastern block 200-300 feet in secs. 29-32, T. 11 S., R. 6 W. There is no indication that the porphyritic quartz monzonite that crops out in the north part of the stock is allochthonous or has been faulted into place similar to the cupola in the New Cornelia orebody.

BRECCIA

One small outcrop of breccia about 50 feet wide and surrounded by alluvium is present just south of the Little Ajo Mountain fault near Dunns Well. The texture and mineralogy of the breccia indicate that it is probably an intrusive

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breccia. The rock is neither megascopically sheared nor composed of gouge similar to outcrops of quartz monzonite cut by the east end of the Little Ajo Mountain fault. In thin section, individual crystals are mostly 1-3 mm in diameter and appear fragmented and abraded. In addition, the rock is moderately replaced by secondary K-feldspar and traces of secondary biotite and tourmaline.

HYDROTHERMAL ALTERATION

The north part of the Cornelia stock (Plate 1b) contains widespread propylitic alteration (albite, epidote, chlorite, actinolite) that is present, at least locally, throughout the map area. Hematite, potassic alteration (sericite, potassium feldspar, biotite), and sulfide mineralization are restricted to the northwest part of the stock and adjacent gneiss. Most of the altered rocks are very weakly stained with goethite and coated with manganese skims.

1. Albite. K-feldspar destructive bleaching is common throughout the north part of the stock and in the premineral dikes. Limited petrographic analyses indicate bleaching is produced by development of secondary albite. Most albite is cloudy white, but in some occurrences toward the west it is glassy or vitreous gray to blue-gray. Intense pervasive secondary albite alteration is often associated with pervasive secondary actinolite. Bleach zones form envelopes less than 1 inch wide adjacent to chlorite and/or actinolite seams and also range up to bands 100 feet wide that trend approximately east-west parallel to the principal jointing. In these wide bands a strong cross jointing or fracturing is developed that appears to localize and control the distribution of alteration.

2. Epidote and chlorite are also widely distributed throughout the north part of the Cornelia stock, premineral dikes, and gneiss. They form fracture coatings or veinlets and disseminated replacements (generally epidote after plagioclase, chlorite after mafics). These alteration minerals are more intensely developed in the northwest part of the stock (chlorite is not shown on the alteration overlay).

3. Actinolite forms both fracture coatings and pervasive disseminations where it tends to replace primary amphibole. It has an acicular habit and generally forms radiating sheaves. Actinolite is present in the south part of the mapped area and also in premineral Concentrator andesitic volcanics adjacent to the New Cornelia mine. The distribution of megascopic actinolite (see alteration overlay) is in part adjacent to and overlaps the zone of secondary biotite. This relationship is similar to that at Bingham where the zone of secondary biotite grades downward and outward into an actinolite zone (John, 1974).

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4. Hematite forms scattered fracture coatings and slickensided surfaces in the northwest part of the stock and adjacent gneiss. It is generally earthy red, but under the binocular microscope small specular flakes are identifiable. Some specularite crystals are up to one-half inch across in gneiss.

5. Sericite: Very weak pervasive sericite alteration occurs in dikes in the middle of sec. 8 and in the eastern part of sec. 7.

6. Potassium feldspar veins are present in two places in the NW$\frac{1}{4}$ of sec. 17 (see alteration overlay). Other occurrences of secondary K-feldspar shown on the overlay indicate very weak, pervasive replacement of plagioclase. A diorite inclusion showing very weak K-feldspar alteration is present within a bleached dike that is otherwise devoid of potassium feldspar in the NE$\frac{1}{4}$ of sec. 18. The breccia near Dunns Well is strongly altered by pervasive secondary K-feldspar.

7. Biotite: Secondary biotite alteration, generally weak in intensity, occurs in the northwest part of the stock and in some nearby outcrops of gneiss. It appears to be best developed in premineral dikes. One dike in the NE$\frac{1}{4}$ sec. 13, T. 12 S., R. 7 W. that cuts the gneiss shows an alteration gradient in which the intensity of secondary biotite increases from west to east. In addition, trace amounts of secondary biotite are associated with secondary potassium feldspar and tourmaline in the breccia at the north margin of the stock.

8. Mineralization: Observed mineralization in the mapped area is restricted to Precambrian gneiss and crosscutting dikes in the NW$\frac{1}{4}$ sec. 7, T. 12 S., R. 6 W. In this area many prospect pits expose weak fracture-controlled bornite, chalcopyrite, pyrite, malachite, neotocite, pitch limonite, goethite, and hematite. Porphyritic quartz latite dikes that cut the gneiss contain traces of disseminated bornite. Additionally, outcrops of gneiss to the west (sec. 12, T. 12 S., R. 7 W.) have prospect pits on weak copper mineralization.

Fresh and altered single hand samples of most of the rock and dike types were analyzed for whole rock copper, molybdenum, lead, and zinc by Rocky Mountain Geochemical Corporation. For all the samples background values (determined visually) are:

Copper:	$\leq$15 ppm
Molybdenum:	$\leq$2 ppm
Lead:	$\leq$40 ppm and generally $\leq$20 ppm
Zinc:	$\leq$55 ppm

Geochemical values are tabulated in Table 2 and shown on the geochemical overlay (Plate 1c).

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TABLE 2

Cu, Mo, Pb, Zn Geochems (ppm), North Cornelia Stock, Ajo, Arizona

Sample No.	Rock Type	Description	Alteration	Cu	Mo	Pb	Zn
A-75A	Diorite		Fresh	10	1	10	45
A-75B	Diorite		Bleached	5	1	10	15
A-81	Diorite	fine-medium grained	Fresh	5	-1	10	110
A-11	Quartz Diorite	fine grained	Fresh	-5	-1	10	55
A-47A	Quartz Diorite	medium grained	Fresh	5	1	10	30
A-64A	Quartz Diorite	fine grained	Fresh	15	-1	120	35
A-101	Quartz Diorite	medium grained	Bleached	5	-1	10	40
A-62B	Granodiorite	fine-medium grained	Chlorite, biotite?	5	1	10	40
A-73A	Granodiorite	fine-medium grained	Biotite?	5	1	10	50
A-83A	Granodiorite	fine grained	Fresh	5	1	10	80
A-201	Granodiorite	fine grained	Fresh	40	2	10	55
A-202	Granodiorite	fine grained	Bleached	15	-1	20	30
A-21A	Quartz Monzonite	fine grained, porphyritic	Bleached	15	1	10	45
A-21B	Quartz Monzonite	medium grained, porphyritic	Fresh	5	1	10	20
A-22A	Quartz Monzonite	medium grained, seriate porphyritic	Fresh	60	2	30	30
A-22B	Quartz Monzonite	medium grained, seriate porphyritic	Bleached	5	1	10	15
A-74	Quartz Monzonite	fine grained, porphyritic	Fresh	150	1	10	15
A-85A	Quartz Monzonite	medium grained, seriate porphyritic	Fresh	5	-1	20	20
A-85B	Quartz Monzonite	medium grained, seriate porphyritic	Bleached	5	-1	20	10
A-99	Quartz Monzonite	fine grained, porphyritic	Fresh	5	1	10	30
A-82	$p\epsilon$ Gneiss		Biotite-hematite skims	35	-1	20	80
A-92	$p\epsilon$ Gneiss		Mal, G, H, Py, Pitch limonite	1.75%	2	40	20
A-95A	$p\epsilon$ Gneiss		Malachite, G, H	325	-1	10	45
	-- DIKES --						
A-47B	Andesite		Bleached	-5	-1	10	15
A-55B	Andesite		Actinolite-Epidote	5	-1	10	25
A-55C	--	Dioritic inclusion	Weak K-spar	5	-1	10	150
A-60B	Andesite		Fresh	5	-1	10	45
A-79	Andesite		Biotite, Chlorite	5	-1	10	30
A-75C	Dacite		Chlorite-Epidote	15	-1	10	35
A-70	Latite		Chlorite-Biotite-Magnetite	5	1	10	25
A-78	Latite		Biotite?	5	-1	10	25
A-200	Latite		Chlorite-Magnetite	5	2	10	25
A-88	Quartz Latite		Fresh?	5	-1	10	30
A-83B	Rhyolite/Quartz Latite		Hematite	5	-1	-10	25
A-93	Rhyolite/Quartz Latite		Fresh?	5	-1	10	30
A-94	Rhyolite/Quartz Latite		Mal, G, H, Bn	0.39%	-1	10	25
A-96	Rhyolite/Quartz Latite		K-spar?	10	-1	10	25

Highest copper values are in the Precambrian gneiss and crosscutting dikes in the northwest part of the area (NW$\frac{1}{4}$ sec. 7, T. 12 S., R. 6 W.). The highest copper value, 1.75%, is from silica-rich gneiss (A-92) that contains chalcopyrite, malachite, and pitch limonite. Gneiss sample A-95 contains 325 ppm Cu and is from a prospect trench with malachite stains. A rhyolite-quartz latite dike (A-94) that contains malachite and traces of bornite contains 0.39% Cu.

With the exception of one sample (A-22A), all other anomalous metal values come from relatively fresh samples that surround the alluvial-covered area of sec. 7, T. 12 S., R. 6 W. The anomalous metal values are consistent with and reinforce the alteration trends that are approximately concentric about this same area. Additionally, the limited data indicate that alteration characterized by bleaching has not added metals to the rock.

POSTMINERAL COVER

Postmineral stratigraphic relationships in the area between the Cornelia stock and Childs Mountain suggest that premineral cover in the proposed RIP survey area is about 300 feet thick.

Locomotive Fanglomerate appears to be the basal unit and thins northwestward toward the alluvial plain between Salt Well and the Sneed Ranch. Post-fanglomerate movement along the Little Ajo Mountain fault suggests that postmineral cover has been largely eroded south of the fault. The Sneed Andesite was examined in detail and subdivided into 17 units. Stratigraphic relations of these units show that they thicken eastward and may correlate with lithologic units of the Sikort Chuapo quadrangle (J. Welsh, personal communication). Basal Sneed Andesite, as defined by the angular unconformity mapped by Gilluly (1946) southwest of Salt Well, does not outcrop west of R. 7 W. In sec. 26, T. 11 S., R. 7 W. an unconformity with 925 feet of section missing is recorded where upper Sneed Andesite is missing beneath the Batamote Andesite. Two miles southeast the missing units begin to crop out and thicken to the east. Daniels Conglomerate is 250 feet thick at the type area west of the Cornelia stock, yet only 70 feet is seen to crop out in the proposed survey area. The RIP survey would be conducted south of Childs Mountain thereby avoiding 800 feet of Batamote Andesite. Quaternary alluvium west of Sneed Ranch ranges in thickness from 0-30 feet (see section on geophysics).

These postmineral stratigraphic relationships that were determined from bedding attitudes, unconformities, lateral correlations, and eastward thickening of units indicate that postmineral cover is about 300 feet thick in the area bounded by Salt Well, Childs Mountain, Sneed Ranch, and the Cornelia stock.

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GEOPHYSICS

Gravity: Roger Andrews believes that the contoured Bouguer anomaly (BCM Geophysics map 32-112-SW, scale 1:62,500) indicates shallow depth of gravel just north of the exposed stock. East of the Sneed Ranch, however, the gradient reveals rapid thickening of cover.

Aeromagnetics: MacDougall (1961) appraised the aeromagnetic survey (scale 1:31,680, flight elevations 500 feet) of the Ajo area (Plate 1d). Strong magnetic highs correspond to outcrops of Cardigan Gneiss and Concentrator Volcanics. The Cornelia stock generally corresponds to total field values of 3,250-3,350 gammas. Roger Andrews (personal communication) noted that pronounced magnetic gradient trending west-northwest through the northern portions of secs. 7, 8, and 9, T. 12 S., R. 6 W. may correspond to the alluvium-covered fault. If this is true, the aeromagnetic fault trace is up to 1 mile north of the Little Ajo Mountain fault, as mapped by Gilluly (1946). Furthermore, this implies that premineral rock may occur at shallow depth beneath alluvium and fanglomerate cover between Gilluly's fault trace and the aeromagnetic fault trace.

ACTIVE CLAIMS

→ Lee Price (430 Palo Verde, Ajo, Arizona) owns Sneed Ranch (sec. 5, T. 12 S., R. 6 W.). He reports to have power of attorney or own over 32 claims in sec. 7 and the Copper Valley claims in the NW$\frac{1}{4}$ secs. 7 and 12, T. 12 S., R. 7 W. He owns and operates a churn drill rig and has actively drilled his claims between breakdowns of his rig. Supposedly, he had drilled 250-300 feet through the Sneed Andesite into sulfide-bearing rock in the SW$\frac{1}{4}$ sec. 5 or the NW$\frac{1}{4}$ sec. 8, T. 12 S., R. 6 W.

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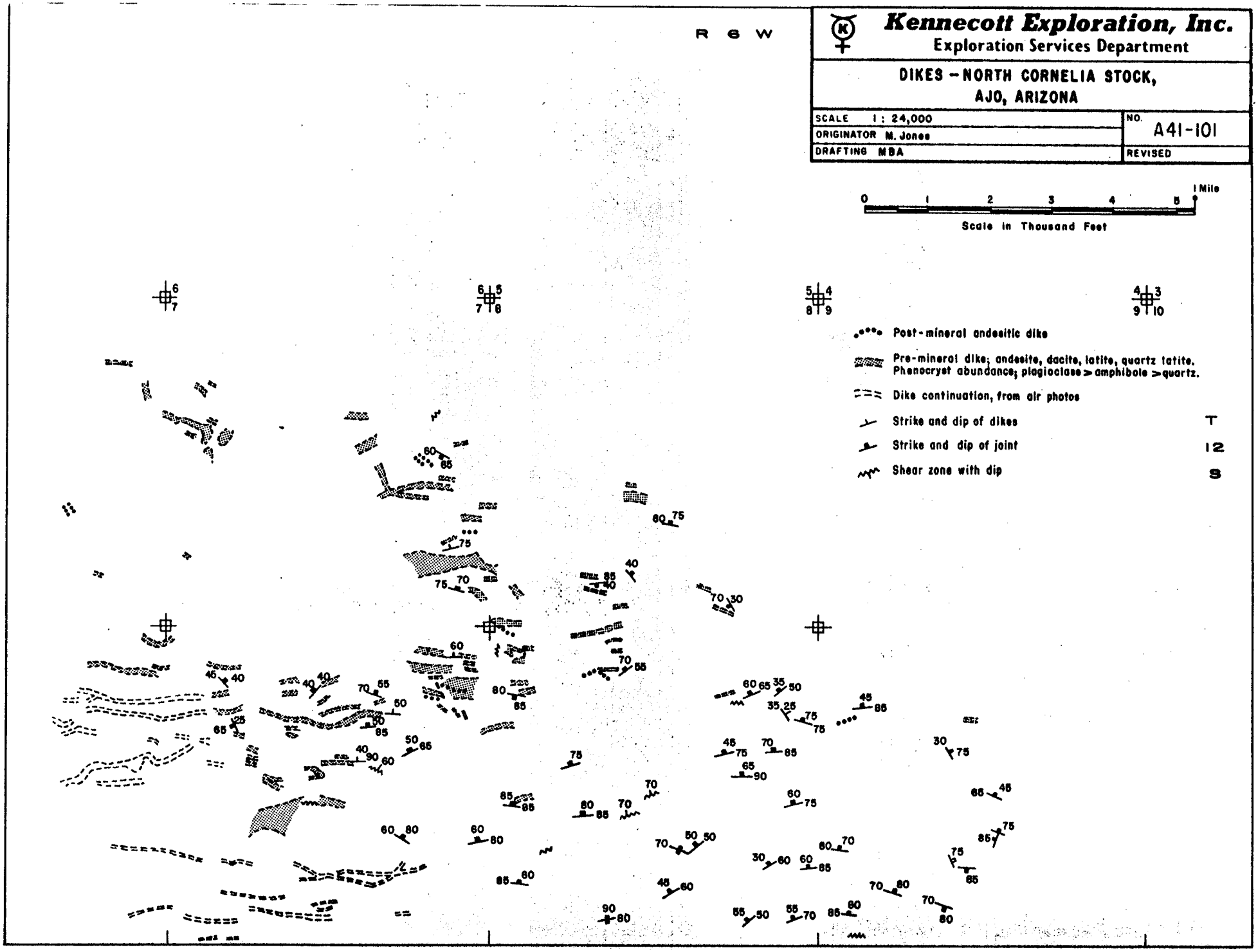
Kennecott Exploration, Inc.
Exploration Services Department
DIKES – NORTH CORNELIA STOCK,
AJO, ARIZONA
SCALE 1 : 24,000
ORIGINATOR M. Jones
DRAFTING MBA
NO. A41-101
REVISED
0 1 2 3 4 5 1 Mile
Scale in Thousand Feet
R 6 W
T 12 S
Post-mineral andesitic dike
Pre-mineral dike; andesite, dacite, latite, quartz latite.
Phenocryst abundance; plagioclase > amphibole > quartz.
Dike continuation, from air photos
Strike and dip of dikes
Strike and dip of joint
Shear zone with dip

Plate 1a

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DIKES – NORTH CORNELIA STOCK, AJO, ARIZONA

SCALE 1 : 24,000	NO. A41-101
ORIGINATOR M. Jones	
DRAFTING MBA	REVISED

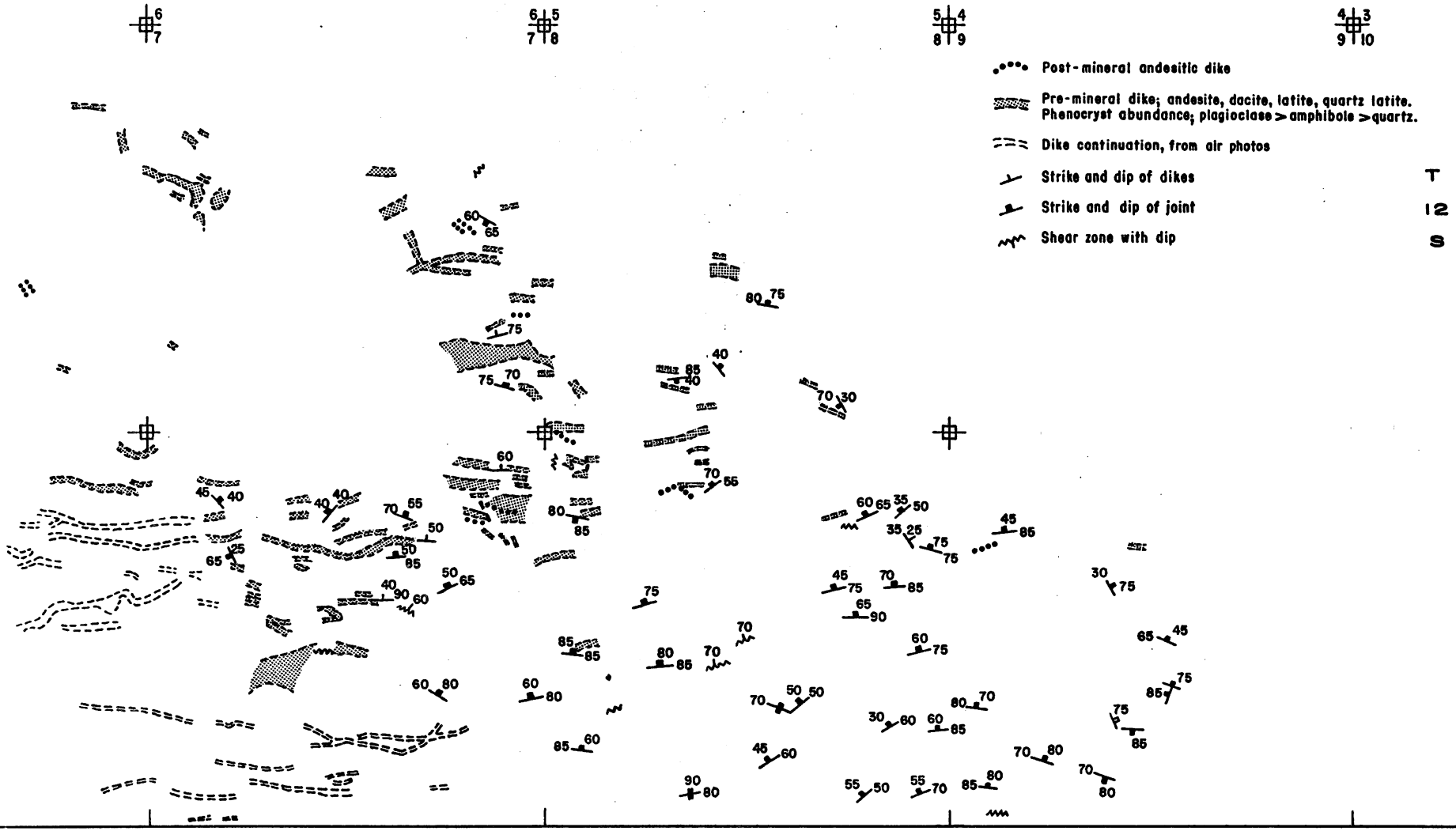
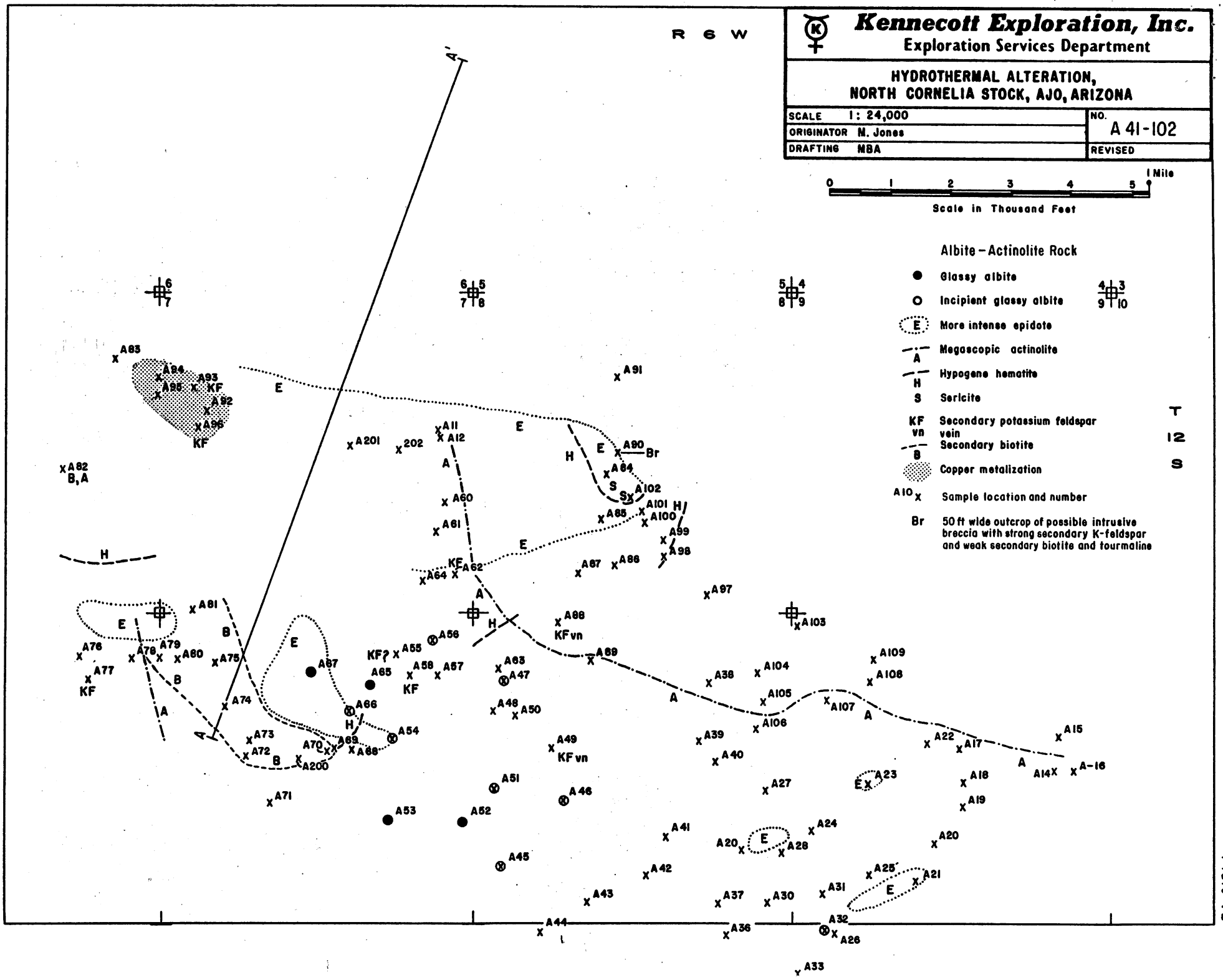


Plate 1a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Exploration Services Department
HYDROTHERMAL ALTERATION,
NORTH CORNELIA STOCK, AJO, ARIZONA
SCALE 1: 24,000
ORIGINATOR M. Jones
DRAFTING MBA
NO. A 41-102
REVISED
0 1 2 3 4 5 1 Mile
Scale in Thousand Feet
R 6 W
T 12 S
Albite-Actinolite Rock
Glassy albite
Incipient glassy albite
More intense epidote
Megascopic actinolite
Hypogene hematite
Sericite
Secondary potassium feldspar vein
Secondary biotite
Copper metalization
Sample location and number
Br 50 ft wide outcrop of possible intrusive breccia with strong secondary K-feldspar and weak secondary biotite and tourmaline

Plate 1b

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GEOCHEMICAL ANALYSIS OF SAMPLES
NORTH CORNELIA STOCK, AJO, ARIZONA

SCALE 1 : 24,000	NO. A41-701
ORIGINATOR N. Jones	
DRAFTING MBA	REVISED

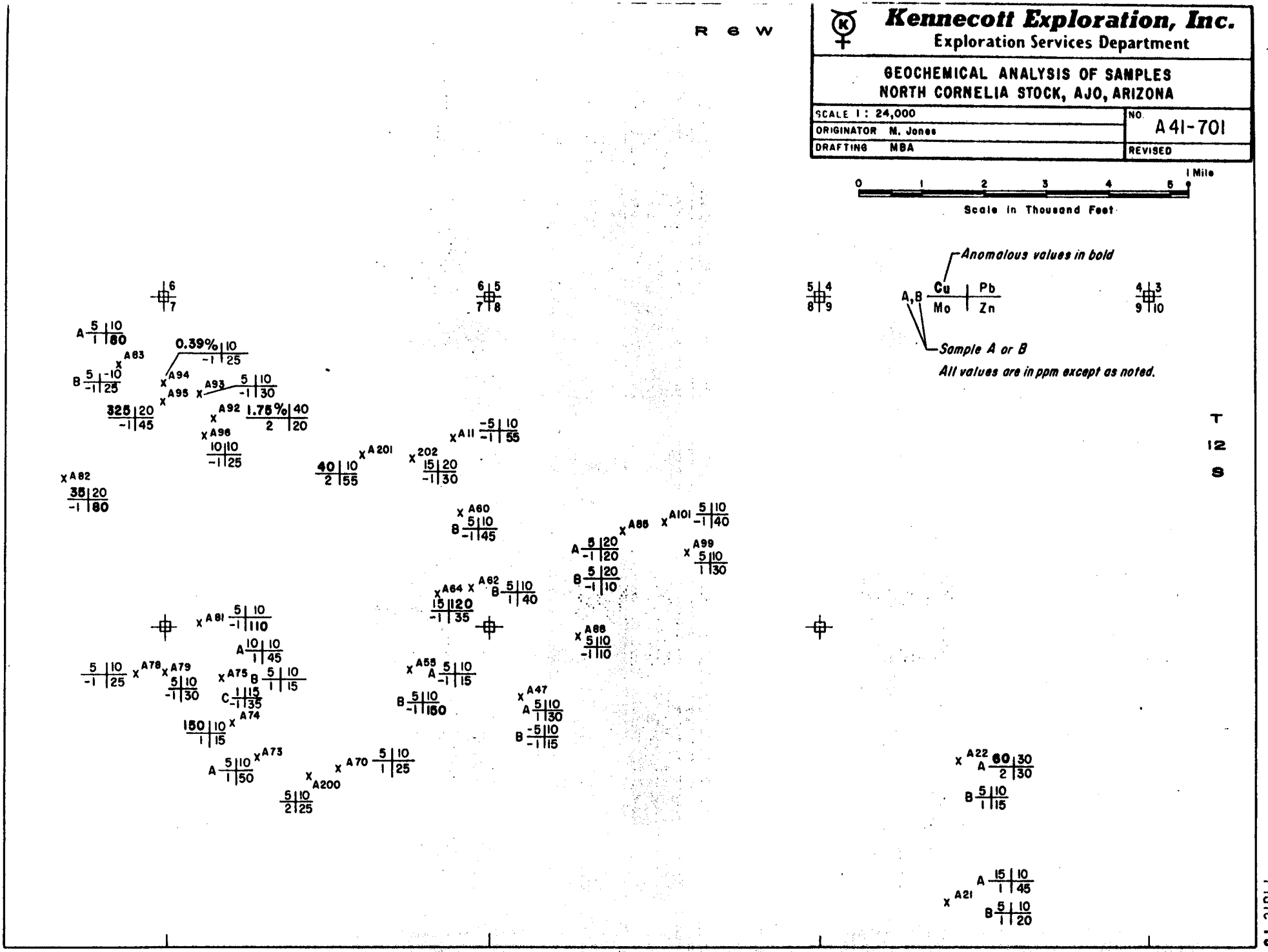


Plate 1c

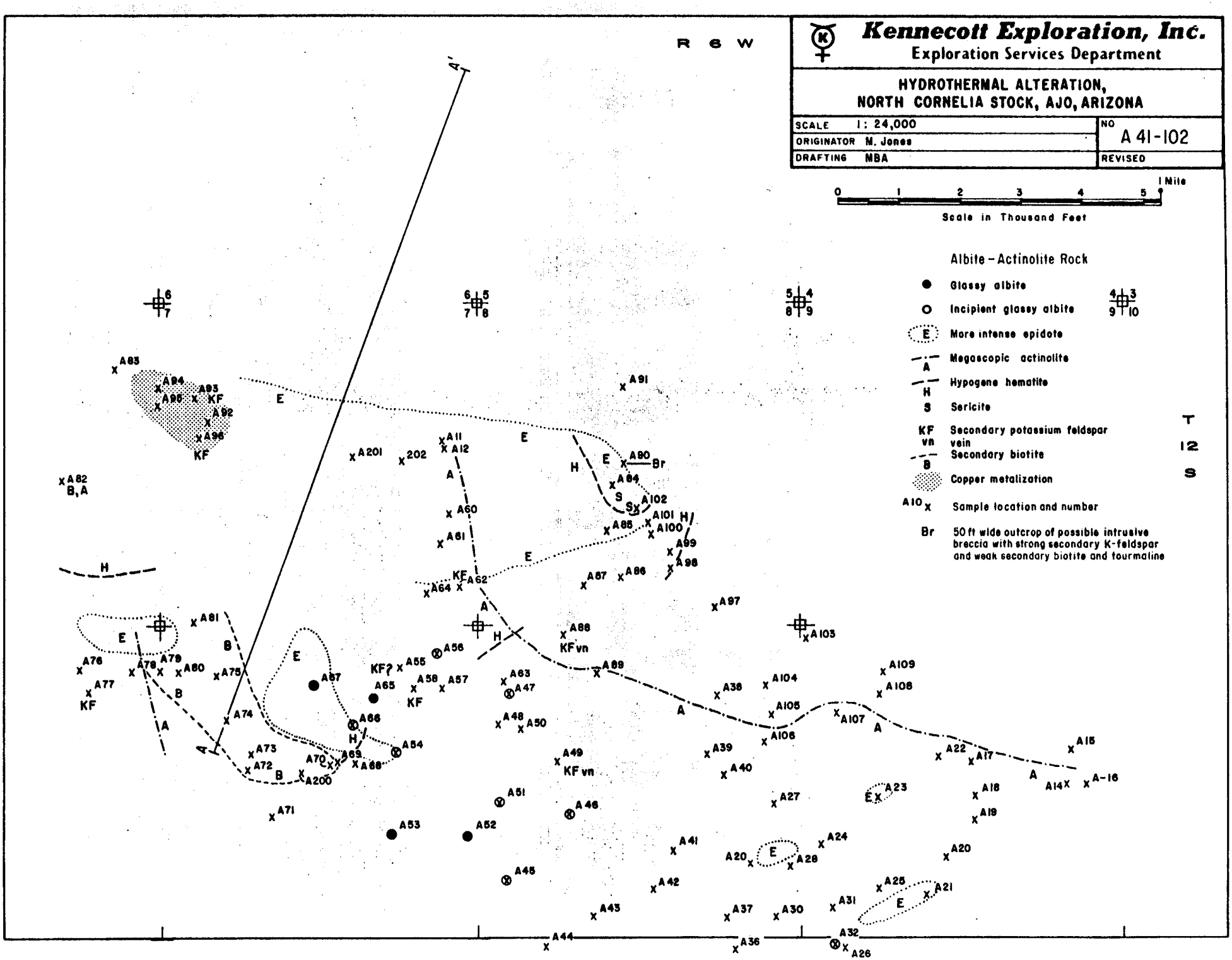
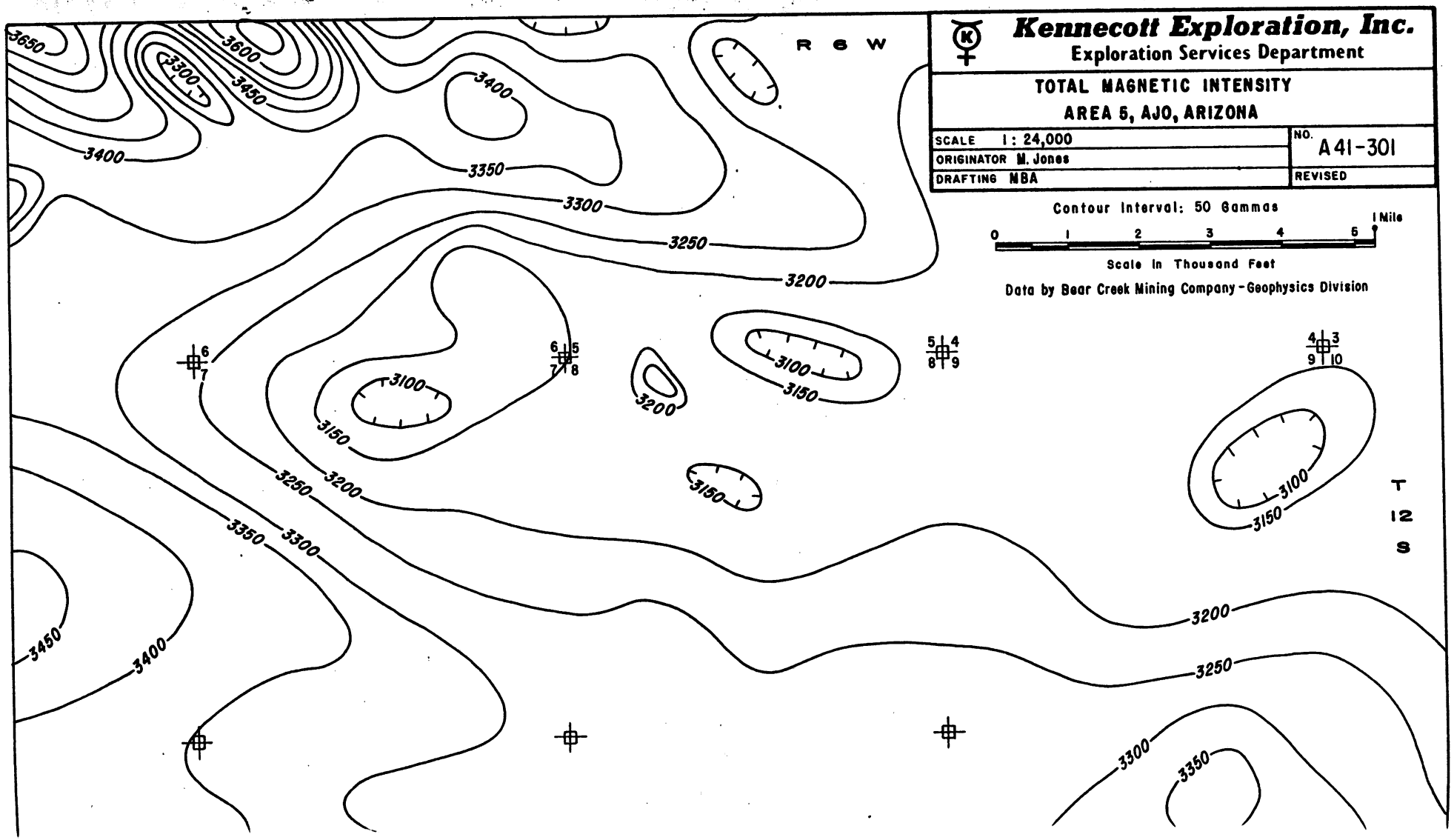
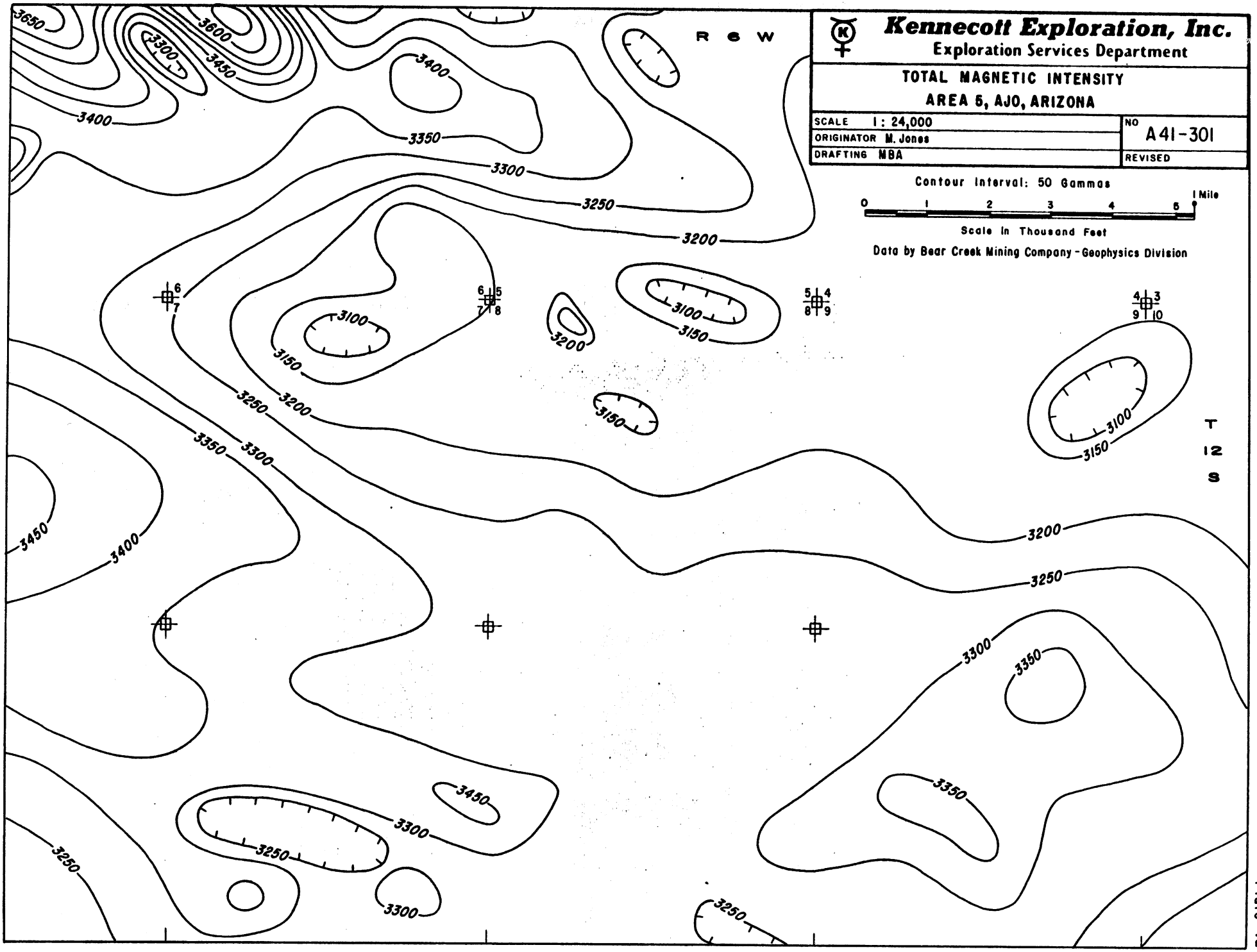

Kennecott Exploration, Inc.
Exploration Services Department
HYDROTHERMAL ALTERATION,
NORTH CORNELIA STOCK, AJO, ARIZONA
SCALE 1: 24,000
ORIGINATOR M. Jones
DRAFTING MBA
NO A 41-102
REVISED
R 6 W
T 12 S
0 1 2 3 4 5 1 Mile
Scale in Thousand Feet
Albite-Actinolite Rock
Glassy albite
Incipient glassy albite
More intense epidote
Megascopic actinolite
Hypogene hematite
Sericite
Secondary potassium feldspar vein
Secondary biotite
Copper metalization
Sample location and number
Br 50 ft wide outcrop of possible intrusive breccia with strong secondary K-feldspar and weak secondary biotite and tourmaline

Plate 1b


Kennecott Exploration, Inc.
Exploration Services Department
TOTAL MAGNETIC INTENSITY
AREA 5, AJO, ARIZONA
SCALE 1 : 24,000
NO. A41-301
ORIGINATOR M. Jones
DRAFTING MBA
REVISED
Contour Interval: 50 Gammas
0 1 2 3 4 5 1 Mile
Scale in Thousand Feet
Data by Bear Creek Mining Company - Geophysics Division
R 6 W
T 12 S
3650
3600
3450
3400
3350
3300
3250
3200
3150
3100


Kennecott Exploration, Inc.
Exploration Services Department
TOTAL MAGNETIC INTENSITY
AREA 5, AJO, ARIZONA
SCALE 1 : 24,000
ORIGINATOR M. Jones
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Contour Interval: 50 Gammas
0 1 2 3 4 5 1 Mile
Scale in Thousand Feet
Data by Bear Creek Mining Company - Geophysics Division
R 6 W
T 12 S
3650
3600
3450
3400
3350
3300
3250
3200
3150
3100

Plate 1d

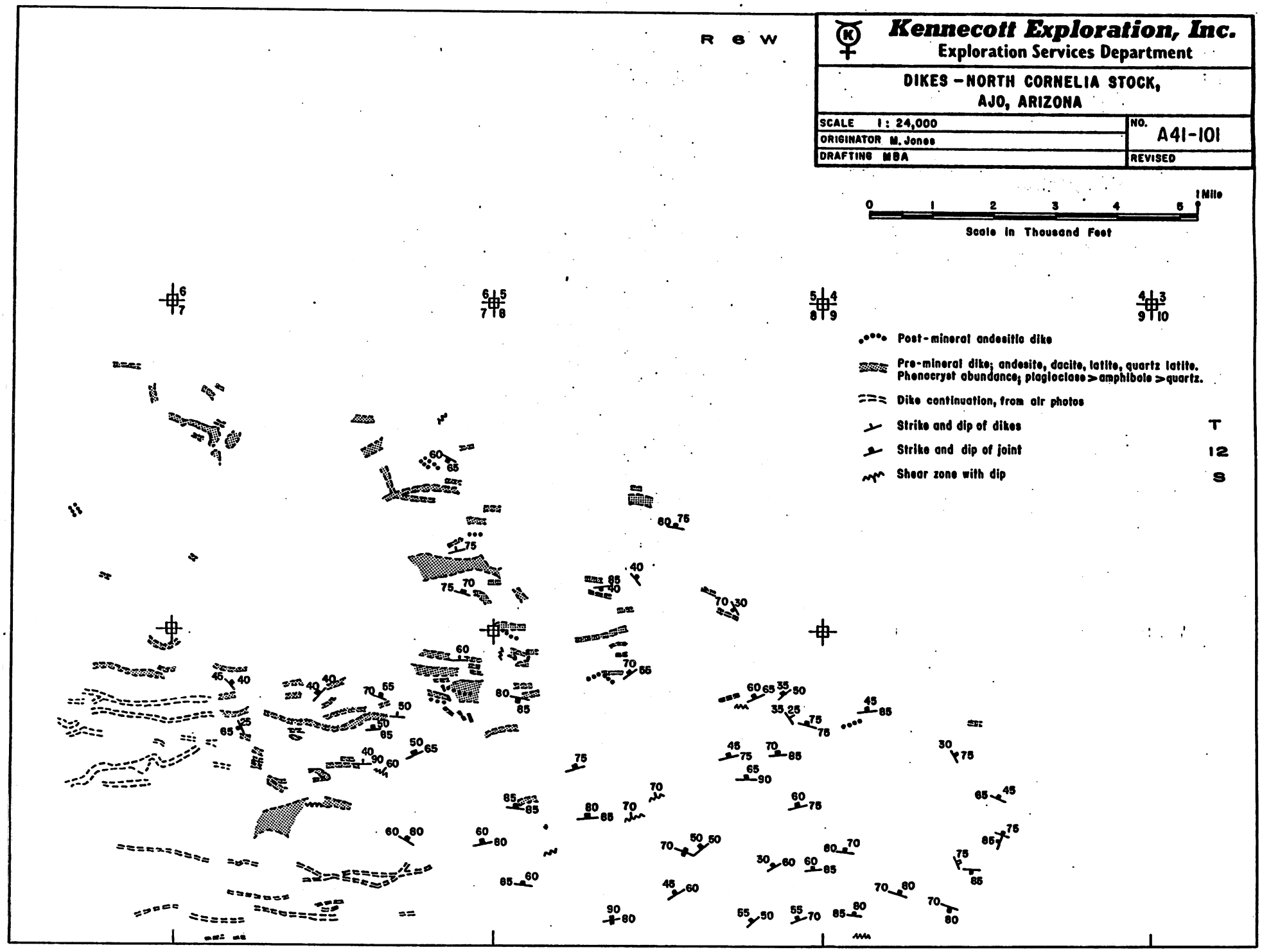
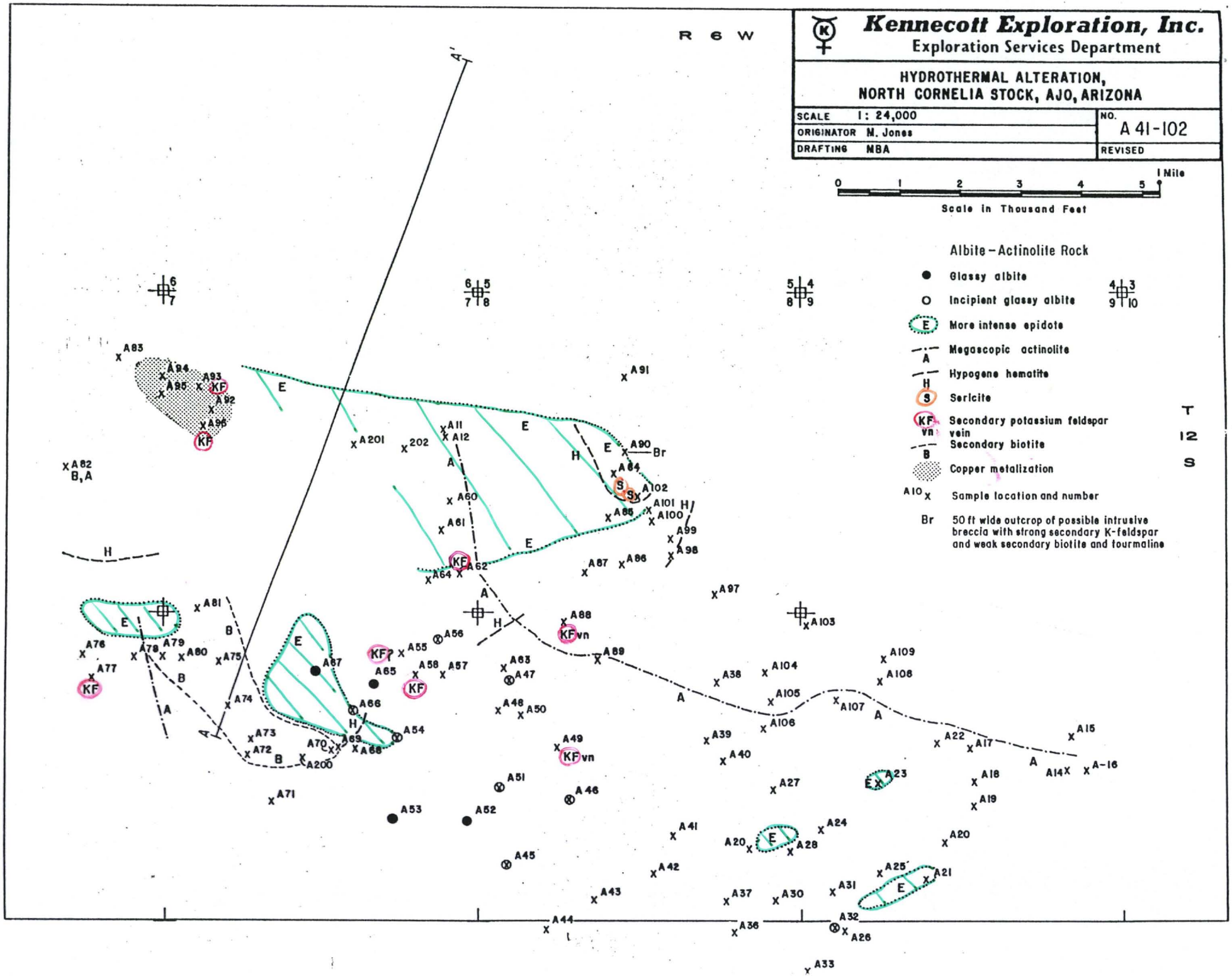

Kennecott Exploration, Inc.
Exploration Services Department
DIKES – NORTH CORNELIA STOCK, AJO, ARIZONA
SCALE 1 : 24,000
NO. A41-101
ORIGINATOR M. Jones
DRAFTING MBA
REVISED
R 6 W
T 12 S
0 1 2 3 4 5 1 Mile
Scale in Thousand Feet
Post-mineral andesitic dike
Pre-mineral dike; andesite, dacite, latite, quartz latite. Phenocryst abundance; plagioclase > amphibole > quartz.
Dike continuation, from air photos
Strike and dip of dikes
Strike and dip of joint
Shear zone with dip

Plate 1a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HYDROTHERMAL ALTERATION,
NORTH CORNELIA STOCK, AJO, ARIZONA
SCALE 1: 24,000
ORIGINATOR N. Jones
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R 6 W
T 12 S
0 1 2 3 4 5 1 Mile
Scale in Thousand Feet
Albite-Actinolite Rock
Glassy albite
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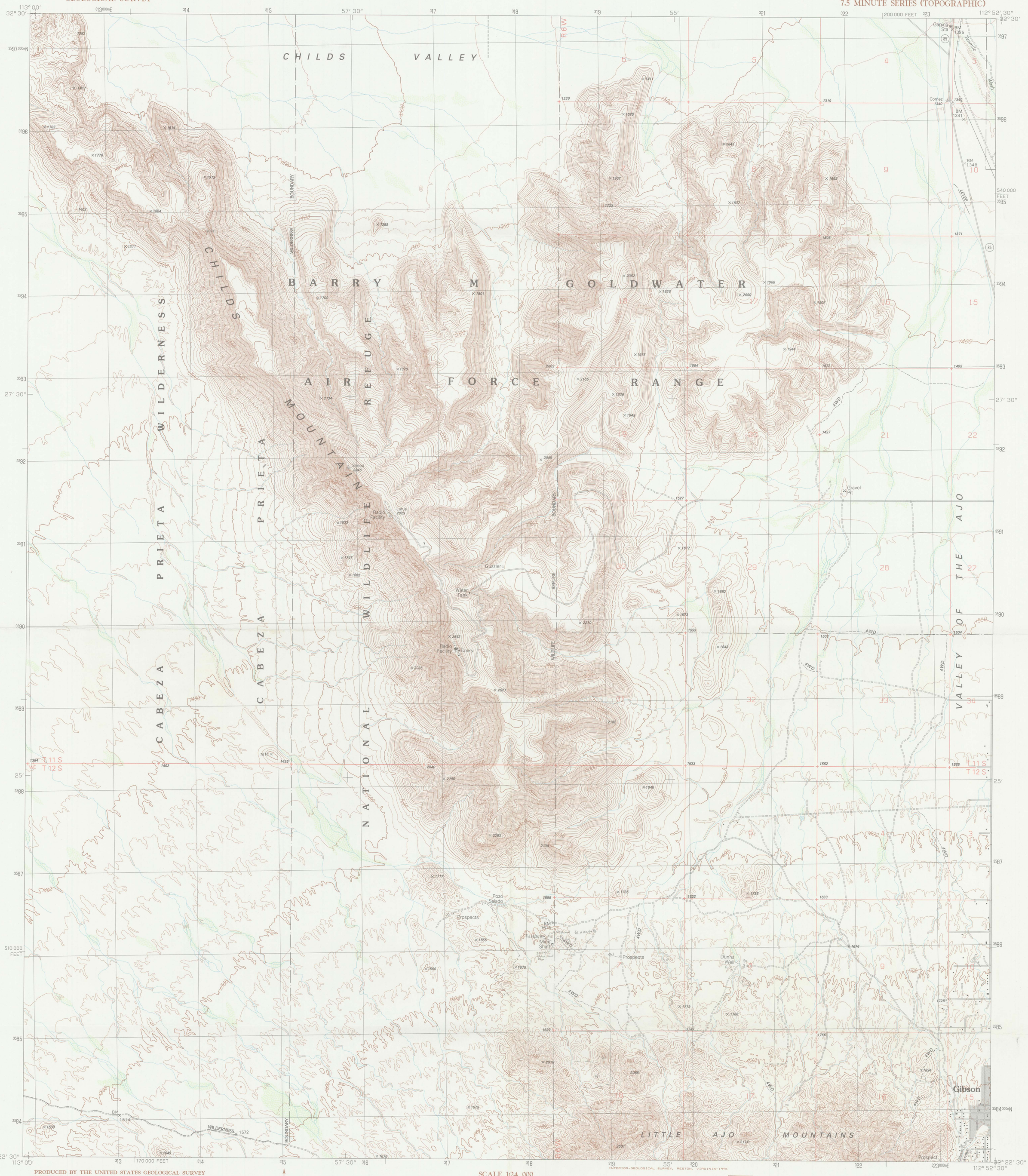
Secondary potassium feldspar vein
Secondary biotite
Copper metalization
Sample location and number
Br 50 ft wide outcrop of possible intrusive breccia with strong secondary K-feldspar and weak secondary biotite and tourmaline

Plate 1b

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

CHILDS MOUNTAIN QUADRANGLE
ARIZONA-PIMA CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



PRODUCED BY THE UNITED STATES GEOLOGICAL SURVEY
CONTROL BY . . . . . USGS, NOS/NOAA
COMPILED FROM AERIAL PHOTOGRAPHS TAKEN 1961
FIELD CHECKED 1963
LIMITED REVISION FROM AERIAL PHOTOGRAPHS TAKEN . . . . . 1985 AND 1986
FIELD CHECKED . . . . . 1988 MAP EDITED 1990
PROJECTION . . . . . TRANSVERSE MERCATOR
GRID: 1000-METER UNIVERSAL TRANSVERSE MERCATOR . . . . . ZONE 12
10,000-FOOT STATE GRID TICKS . . . . . ARIZONA, CENTRAL ZONE
UTM GRID DECLINATION . . . . . 1°02′ WEST
1990 MAGNETIC NORTH DECLINATION . . . . . 12° EAST
VERTICAL DATUM . . . . . NATIONAL GEODETIC VERTICAL DATUM OF 1929
HORIZONTAL DATUM . . . . . 1927 NORTH AMERICAN DATUM

To place on the predicted North American Datum of 1983, move the projection lines as shown by dashed corner ticks (5 meters south and 67 meters east)

There may be private inholdings within the boundaries of any Federal and State Reservations shown on this map

Gray tint indicates area in which selected buildings are shown

Where omitted, land lines have not been established

Public Land Survey System is shown as published in 1963 and verified or supplemented in 1988

NORTH

PROVISIONAL MAP
Produced from original manuscript drawings. Information shown as of date of field check. T

SCALE 1:24 000

KILOMETERS
METERS
MILES
FEET

CONTOUR INTERVAL 20 FEET

To convert feet to meters multiply by .3048
To convert meters to feet multiply by 3.2808

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U.S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225
OR RESTON, VIRGINIA 22092

ARIZONA

QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1 East Pass
2 Midway SW
3 Deadman Gap
4 Growler Peak
5 Ajo North
6 Temporal Pass
7 Chico Shunie
8 Ajo South

ADJOINING 7.5′ QUADRANGLE NAMES

ROAD LEGEND

Improved Road . . . . . .
Unimproved Road . . . . . .
Trail . . . . . .

Interstate Route U.S. Route State Route

CHILDS MOUNTAIN, ARIZONA
PROVISIONAL EDITION 1990

32112-D8-TF-024

Ajo-Kino Peak Quadrangles, Arizona (02720285)

Search activity in western Arizona during the quarter concentrated on the covered area adjacent to the Cornelia stock in the Ajo quadrangle and in the Growler Pass area of the Kino Peak quadrangle (Fig. 7). Both areas have postmineral cover of Tertiary volcanics and fanglomerate and Recent alluvium. One investigator concentrated on the bedrock alteration and mineralization adjacent to cover while another worked on the post-mineral volcanic and fanglomerate stratigraphy.

Sneed embayment. -- The Sneed embayment between the Little Ajo Mountains and Childs Mountain is considered a favorable area for prospecting because it is adjacent to the Cornelia stock. Phelps Dodge's New Cornelia mine, at the southeast edge of the stock, is thought by Gilluly (1946) to be in a downdropped cupola of the stock. The orebody is partly in the Cornelia Quartz Monzonite and partly in the Concentrator Andesite. The Concentrator Andesite crops out only on the southeast side of the stock east of the Gibson fault, but it is possible that this andesite may occur under cover in the Sneed embayment. The alteration of the Concentrator Andesites on Pinnacle Peak shows a wide specularite zone overlapping the inner epidote and outer sericite alteration zones.

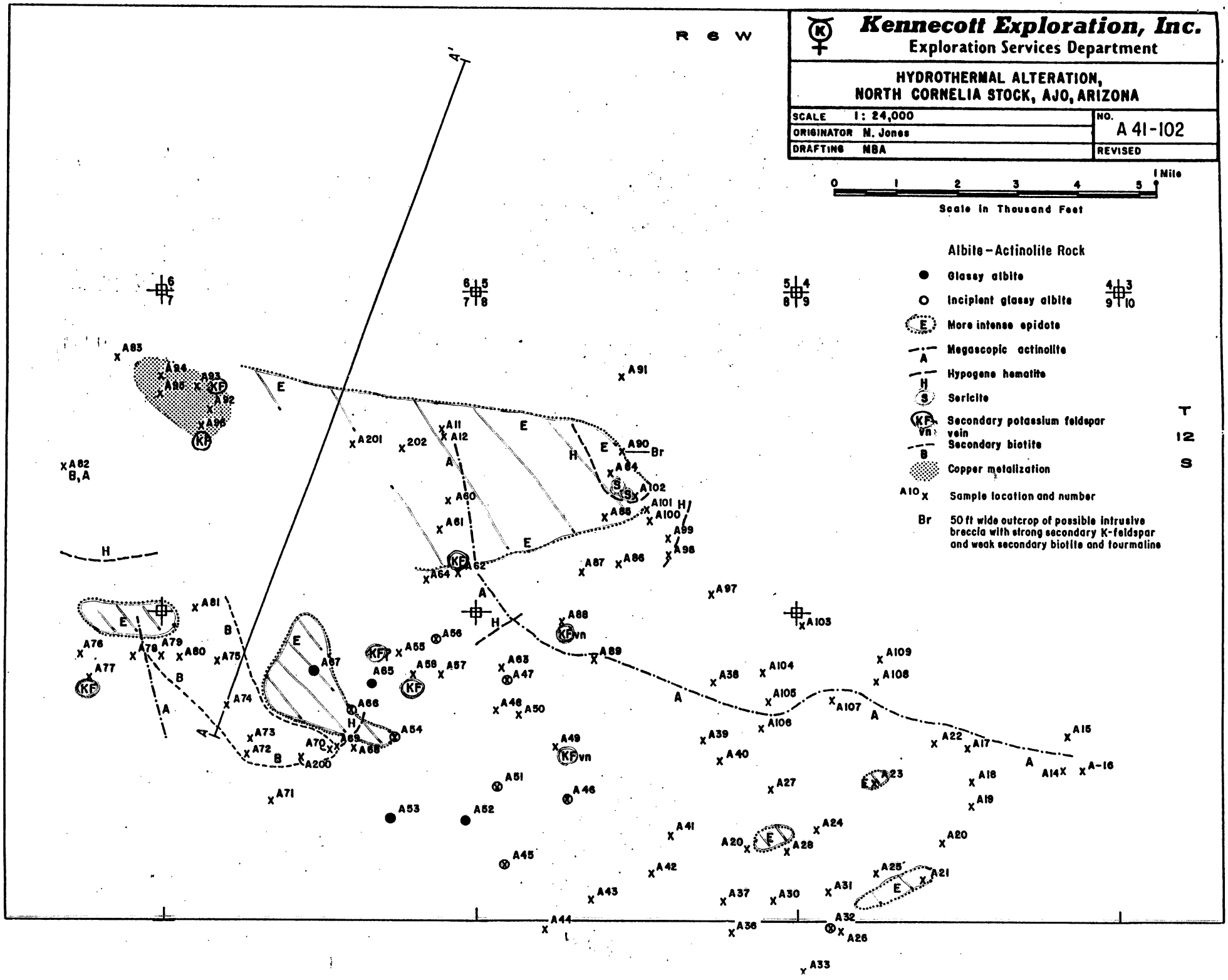
The northern portion of the Cornelia stock adjacent to the Sneed embayment has 3 square miles of weak to intense outer halo propylitized (albite, epidote, actinolite, and chlorite) quartz monzonite. The stock and the Cardigan Gneiss to the west are cut by an east-west quartz latite porphyry dike swarm. These indications of alteration and late magmatic activity adjacent to cover near the Sneed embayment are justification for geophysical follow-up.

Growler Pass. -- At the southern end of the Growler Mountains, 10 to 15 miles southwest of Ajo, there are several indications of a porphyry-type system. One IP line was surveyed through the Growler Pass by BCM several years ago and had a weak response. Neither follow-up nor subsequent geology was done in the area. An area of 20 square miles has isolated hills

Blue Stone Property, Pinal County, Arizona: The property is located approximately 30 miles north of Tucson and less than one mile from the Coppercrete project. The property consists of two unpatented lode claims. Copper oxide mineralization is restricted to narrow low and high-angle structures. The property is not recommended for acquisition at this time. If drilling results from Coppercrete and Last Chance show encouragement then the property should be acquire for land position.

Sneed Embayment, Pima County, Arizona: The area is located approximately four miles NW of the Ajo deposit. Kennecott evaluated the property in 1974 mentioning the presence of copper oxide mineralization and favorable alteration outcropping adjacent to an alluvial-covered area. The copper mineralization observed is restricted to narrow fracture-controlled structures within unaltered Precambrian gneiss. The copper prospects are within the Cabeza Prieta Wilderness Refuge. The area also contains widespread propylitic alteration (epidote and chlorite). The copper prospects and the area in question are bounded to the north by the Little Ajo Mountain fault. The throw of the fault is reported to be in the order of no less than 5,000 feet. The property will not be pursued further.

Copper Giant, Pima County, Arizona: Further work in the area clearly indicated a zone of one mile by minimum 1500 feet of exotic copper mineralization within the Locomotive conglomerate. In the same area a monolithic breccia with weak copper mineralization was traced over a distance of 1500 feet. The mineralization at Copper Giant is apparently very similar to Buckeye. A field visit is planned to Buckeye in order to better evaluate the potential of Copper Giant. Records found through the Anaconda files do not indicate more than 12 holes drilled in an area of 1.5 square mile. Some holes were not assayed throughout the Locomotive conglomerate since the target at the time was to intersect copper mineralization within the basement rock.


Kennecott Exploration, Inc.
Exploration Services Department
HYDROTHERMAL ALTERATION,
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SCALE 1: 24,000
ORIGINATOR M. Jones
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NO. A 41-102
REVISED
0 1 2 3 4 5 1 Mile
Scale in Thousand Feet
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Albite-Actinolite Rock
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More intense epidote
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Hypogene hematite
Sericite
Secondary potassium feldspar vein
Secondary biotite
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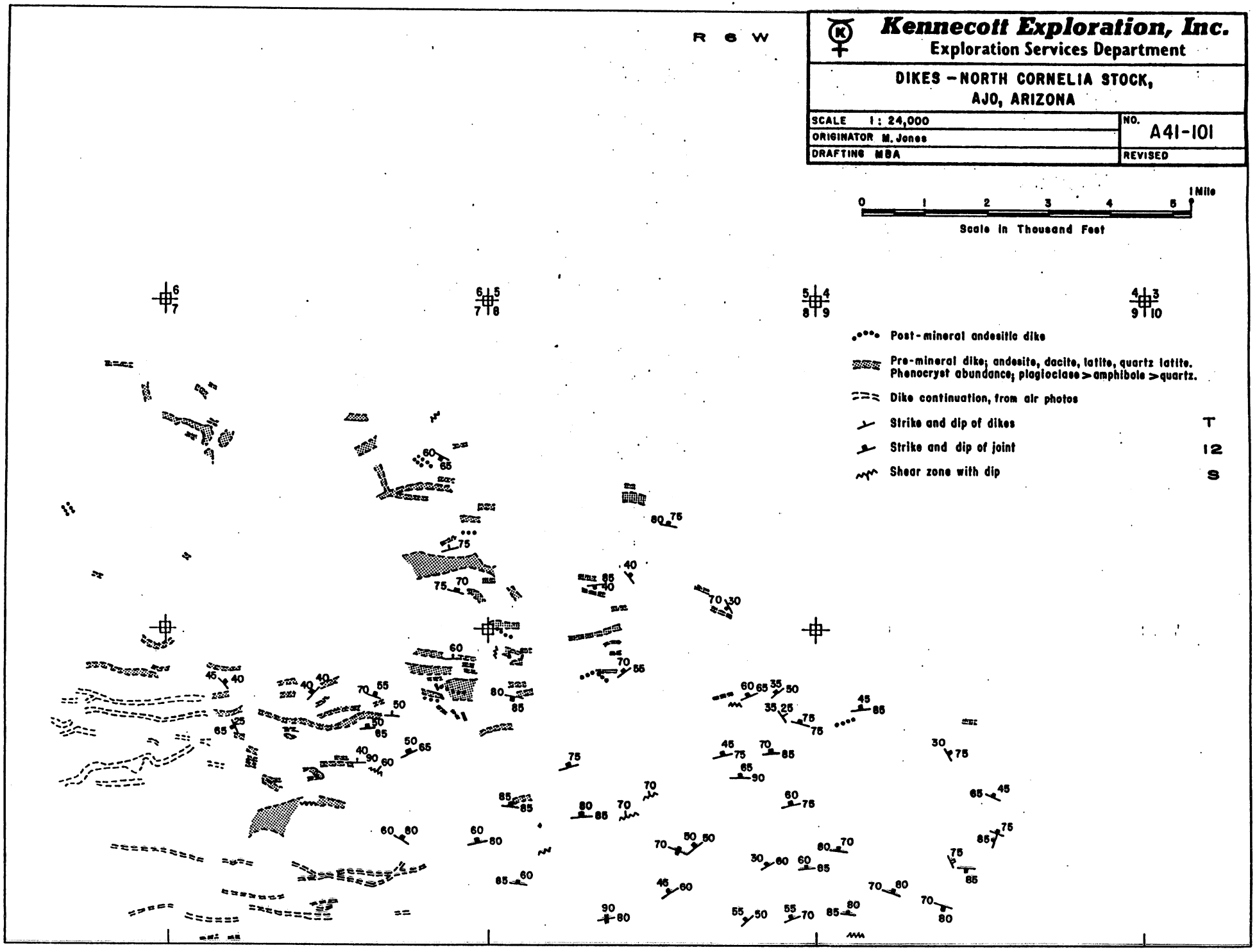
Br 50 ft wide outcrop of possible intrusive breccia with strong secondary K-feldspar and weak secondary biotite and tourmaline

Plate 1b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AJO, ARIZONA
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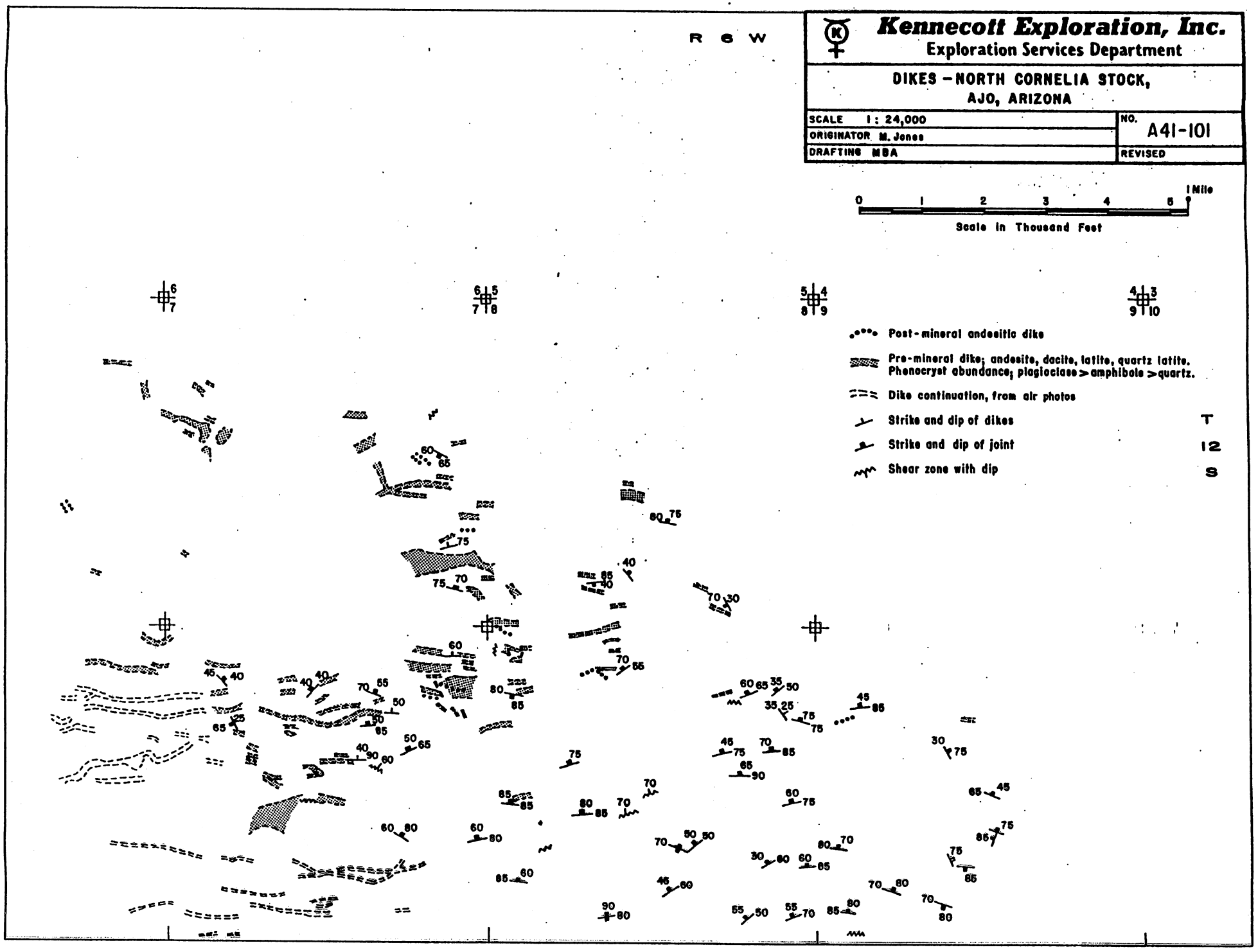
ORIGINATOR M. Jones
DRAFTING MBA
NO. A41-101
REVISED
R 6 W
T 12 S
0 1 2 3 4 5 1 Mile
Scale in Thousand Feet
Post-mineral andesitic dike
Pre-mineral dike; andesite, dacite, latite, quartz latite.
Phenocryst abundance; plagioclase > amphibole > quartz.
Dike continuation, from air photos
Strike and dip of dikes
Strike and dip of joint
Shear zone with dip

Plate 1a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AJO, ARIZONA
SCALE 1 : 24,000
ORIGINATOR M. Jones
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0 1 2 3 4 5 1 Mile
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